The Best Choice for the Most Benefit!

We are committed to providing premium benefits to all of our customers.

AC Servo Drive

Xmotion

L7P Series

EtherCAT® Conformance tested



Safety Precautions

- Read all safety precautions before using this product.
- After reading this manual, store it in a readily accessible location for future reference.

LS ELECTRIC

Introduction

Hello. Thank you for choosing LS ELECTRIC L7P Series.

This user manual describes how to use this product safely and efficiently.

Failure to comply with the guidelines outlined in this manual may cause personal injury or damage to the product. Be sure to read this manual carefully before using this product and follow all guidelines contained therein.

- The contents of this manual are subject to change without notice.
- The reproduction of part or all of the contents of this manual in any form, by any means or for any purpose is strictly prohibited without the explicit written consent of LS ELECTRIC.
- LS ELECTRIC retains all patents, trademarks, copyrights and other intellectual property rights to the material in this manual. The information contained in this manual is only intended for use with LS ELECTRIC products.

Safety Precautions

Safety precautions are categorized as either Danger or Cautions, depending on the severity of the precaution.

Precautions	Meaning
⚠ Danger	Failure to comply with these guidelines may cause serious injury or death.
⚠ Caution	Failure to comply with these guidelines may cause personal injury or property damage.

- Precautions listed as Cautions may also result in serious injury.

■ Electric Safety Precautions

⚠ Danger
▪ Before wiring or inspection tasks, turn off the power. Wait 15 minutes until the charge lamp goes off, and then check the voltage. ▪ Ground both the servo drive and the servo motor. ▪ Only specially trained technicians may perform wiring on this product. ▪ Install both the servo drive and servo motor before performing any wiring. ▪ Do not operate the device with wet hands. ▪ Do not open the servo drive cover during operation. ▪ Do not operate the device with the servo drive cover removed. ▪ Even if the power is off, do not remove the servo drive cover.

■ Fire Safety Precautions

⚠Caution
▪ Install the servo drive, the servo motor and the regenerative resistor on non-combustible materials. ▪ Disconnect the input power if the servo drive malfunctions.

■ Installation Precautions

Store and operate this product under the following environmental conditions.

Environment	Conditions	
	Servo Drive	**Servo Motor**
Ambient temperature	0 ~ 50 ℃	0 ~ 40 ℃
Storage temperature.	-20 ~ 65 ℃	-10 ~ 60 ℃
Ambient humidity	Below 90% RH (no condensation)	20~80% RH(no condensation)
Storage humidity		
Altitude	Up to 1000m	
Spacing	▪ When installing 1 unit: • More than 40 mm at the top and bottom of the control panel • More than 10 mm on the left and right sides of the control panel ▪ When installing 2 or more units: • More than 40 mm at the top of the control panel • More than 40 mm at the bottom of the control panel • More than 30 mm on the left and right sides of the control panel • More than10 mm between units • Refer to “2.2.2 Installation in the Control panel”	-
Etc	▪ Ensure the installation location is free from dust, iron, corrosive gas, and combustible gas. ▪ Ensure the installation location is free from vibrations or the potential for hard impacts.	

⚠Caution
▪ Install the product with the correct orientation. ▪ Do not drop the product or expose it to hard impact. ▪ Install this product in a location that is free from water, corrosive gas, combustible gas, or flammable materials. ▪ Install this product in a location capable of supporting the weight of this product. ▪ Do not stand on the product or place heavy objects on top of it. ▪ Always maintain the specified spacing when installing the servo drive. ▪ Ensure that there are no conductive or flammable debris inside the servo drive or the servo motor. ▪ Firmly attach the servo motor to the machine. ▪ Install the servo motor with a correctly oriented decelerator. ▪ Do not touch the rotating unit of the servo motor during operation. ▪ Do not apply excessive force when connecting the couplings to the servo motor shaft. ▪ Do not place loads on the servo motor shaft that exceed the specified amount.

■ Wiring Precautions

⚠Caution
▪ Be sure to use AC power for the input power of the servo drive. ▪ Always use an AC 380-480 V power input for the servo drive. ▪ Be sure to connect the ground terminal of the servo drive to the ground terminal. ▪ Do not connect commercial power directly to the servo motor. ▪ Do not connect commercial power directly to the U, V, W output terminals of the servo drive. ▪ Connect the U, V, W output terminals of the servo drive directly to the U, V, W input terminals of the servo motor, but do not install magnetic contactors between the wires. ▪ Always use pressurized terminals with insulation tubes when connecting the servo drive power terminal. ▪ When wiring, be sure to separate the U, V, and W cables for the servo motor power and encoder cable. ▪ Always use the robot cable if the motor moves. ▪ Before you perform power line wiring, turn off the input power of the servo drive, and then wait until the charge lamp goes off completely. ▪ Note3) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

■ Startup Precautions

⚠Caution
▪ Check the input voltage (AC 380-480 V) and power unit wiring before supplying power to the device. ▪ The servo must be in the OFF mode when you turn on the power. ▪ Before you turn on the power, check the motor's ID and the encoder pulse for L7P□ □□□. ▪ Set the motor ID [0x2000], encoder type [0x2001] and the encoder pulse [0x2002] for L7P□ □□□ first after you turn on the power. After you complete the above settings, set the drive mode for the servo drive that is connected to the upper level controller in [0x3000]. ▪ Refer to ‘Chapter 3.5 Input/Output Signal Wiring’ and perform I/O wiring of the servo drive mode. ▪ You can check the ON/OFF state for each input terminal of I/O at [0x60FD].

■ Handling and Operating Precautions

⚠Caution
▪ Check and adjust each parameter before operation. ▪ Do not touch the rotating unit of the motor during operation. ▪ Do not touch the heat sink during operation. ▪ Be sure to attach or remove the I/O and ENCODER connectors when the power is off. ▪ Extreme change of parameters may cause system instability.

■ Usage Precautions

⚠Caution
▪ Install an emergency cut-off switch, which immediately stops operation in an emergency. ▪ Reset the alarm when the servo is off. Be warned that the system restarts immediately if the alarm is reset while the servo is on. ▪ Use a noise filter or DC reactor to minimize electromagnetic interference. This prevents nearby electrical devices from malfunctioning due to interference. ▪ Only use approved servo drive and servo motor combinations. ▪ The electric brake on the servo motor stops operation. Do not use it for ordinary braking. ▪ The electric brake may malfunction if the brake degrades or if the mechanical structure is improper (for example, if the ball screw and servo motor are combined via the timing belt). Install an emergency stop device to ensure mechanical safety.

■ Malfunction Precautions

⚠Caution
▪ Install a servo motor with an electric brake or separate the brake system for use during emergencies or device malfunctions. ▪ After solving the problem and ensuring safe operation, deactivate the alarm and resume operation. ▪ Do not approach the machine until the problem is solved.

■ Repair/Inspection Precautions

⚠Caution
▪ Before performing servicing tasks, turn off the power. Wait 15 minutes until the charge lamp goes off, and then check the voltage. Enough voltage may remain in the condenser after the power is off to cause an electric shock. ▪ Only authorized personnel may repair and inspect the device or replace its parts. ▪ Do not modify this device in any way.

■ General Precautions

⚠Caution
▪ This user manual is subject to change due to product modification or changes in standards. If such changes occur, we issue a new user manual with a new product number.

■ Product Application

⚠Caution
▪ This product is not designed or manufactured for machines or systems intended to sustain human life. ▪ This product is manufactured under strict quality control conditions. Nevertheless, install safety devices if installing the device in a facility where product malfunctions may result in a major accident or a significant loss.

■ EEPROM Lifespan

⚠Caution
▪ The EEPROM is rewritable up to 4 million times for the purpose of recording parameter settings and other information. The servo drive may malfunction if the total number of the following tasks exceeds 4 million, depending on the lifespan of the EEPROM. • EEPROM recording as a result of parameter changes • EEPROM recording as a result of an alarm

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1. Product configuration

1.1 Product Verification

1. Check the name tag to verify that the product received matches the model ordered

- Does the servo driver's name plate match?
- Does the servo motor's name plate match?

2. Check the product components and options.

- Are the type and length of cables correct?
- Does the regenerative resistor conform to the required standard?
  - Is the shape of the shaft correct?
  - Are there any abnormalities after mounting the oil seal or brake?
  - Are the gearbox and the gear ratios correct?
  - Is the encoder format correct?

3. Check the exterior of the device.

- Are there any foreign substances or humidity in the device?
- Is there any discoloration, contaminant, damage or disconnected wire?
- Are the bolts tightly fastened to the joints?
- Is there any abnormal sound or excessive friction during operation?

1.2 Product Specifications

■ L7P Series Product Type

L7 P B 004 U AA

Series name
L series

Drive type	
S	Standard I/O
N	Network
NH	Network & All-in One
P	Standard I/O & Index

Input voltage
A : 200[Vac]
B : 400[Vac]

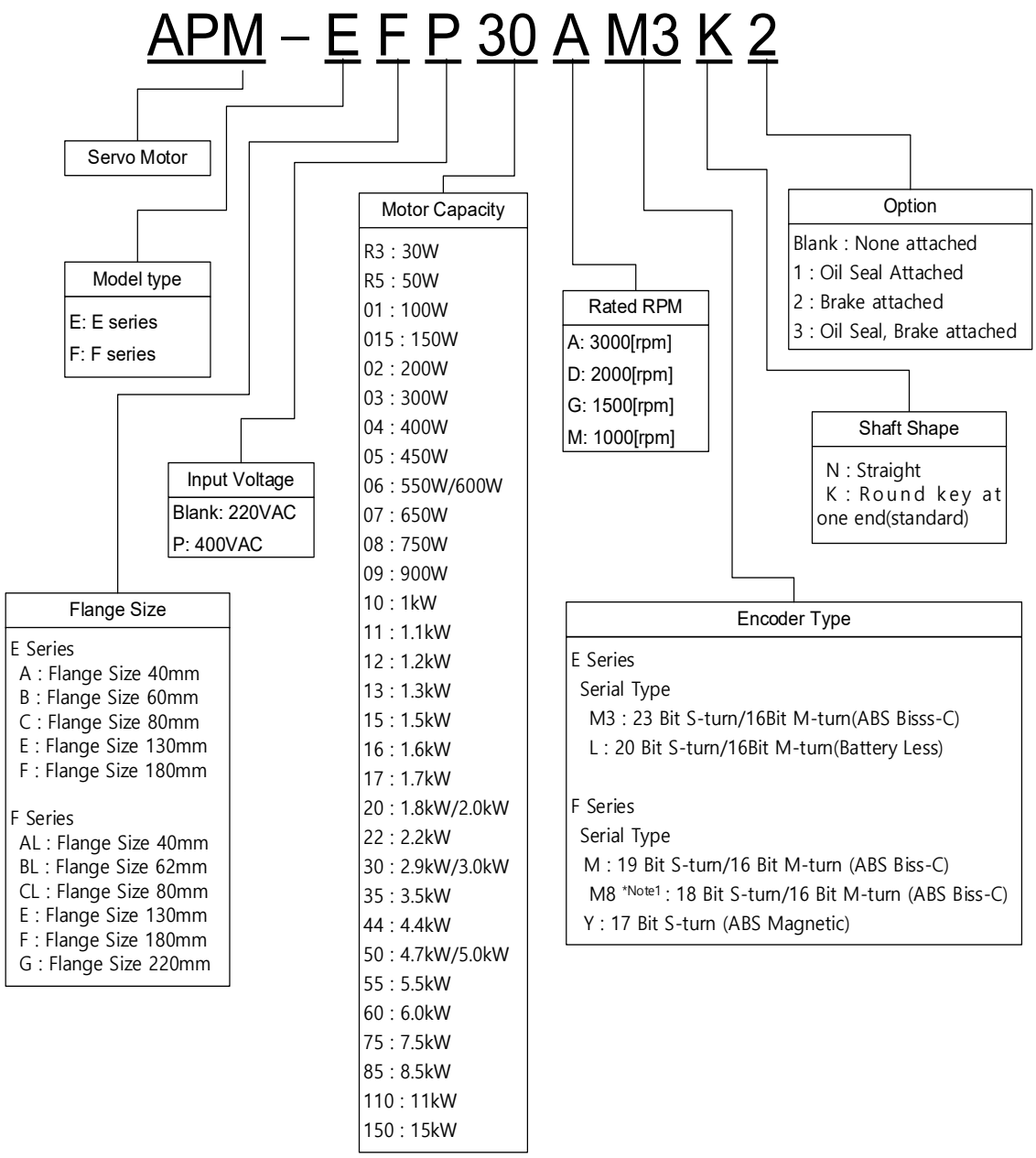
Capacity(200[V])	
001	100[W]
002	200[W]
004	400[W]
008	800[W]
010	1[kW]
020	2[kW]
035	3.5[kW]
050	5.0[kW]
075	7.5[kW]
150	15[kW]

Capacity(400[V])	
010	1[kW]
020	2[kW]
035	3.5[kW]
050	5.0[kW]
075	7.5[kW]
150	15[kW]

Encoder	
U	Universal

Option	
Blank	Standard
Marked	Exclusive

■ Servo Motor Product Format

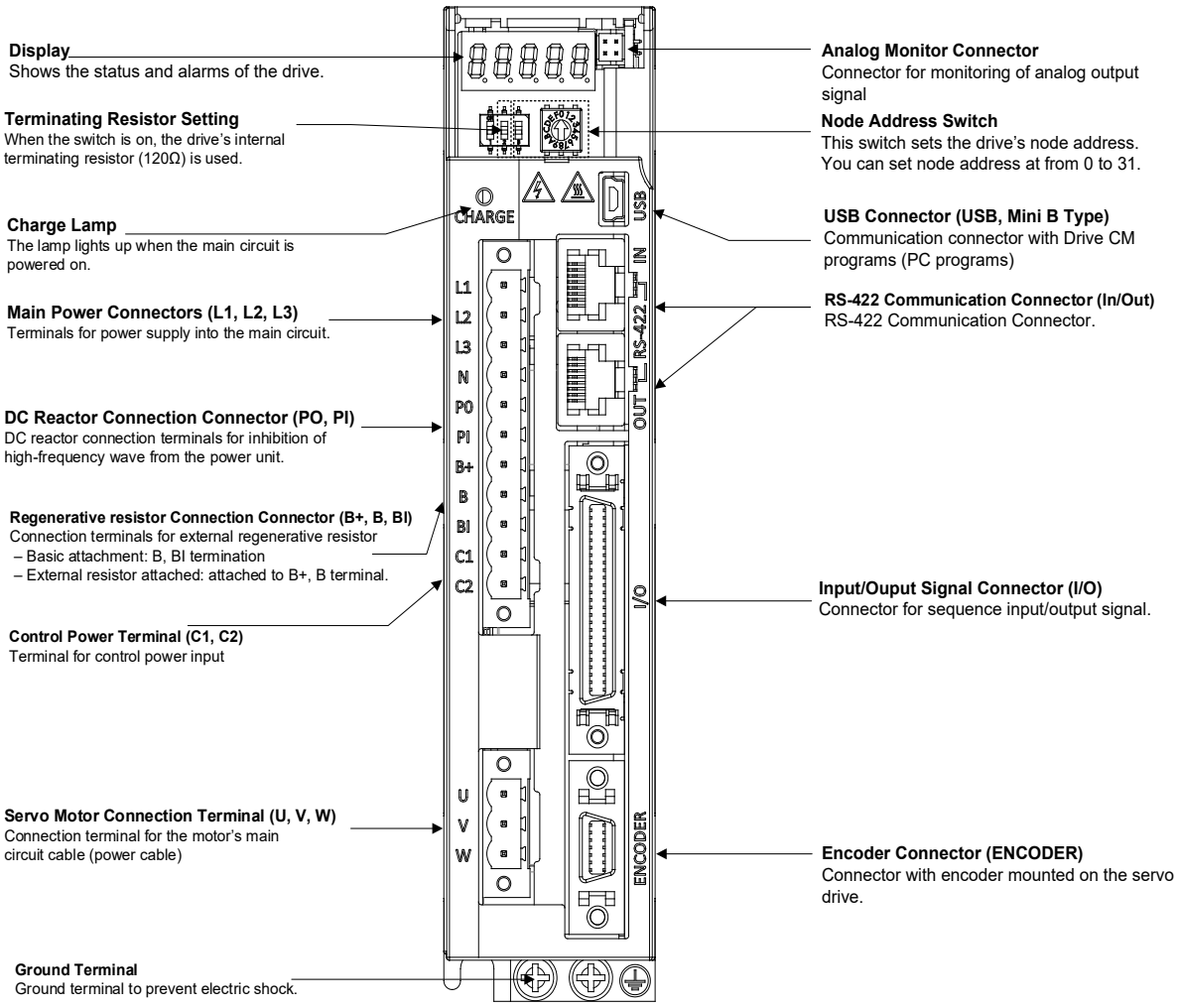


*Note 1: M8 Encoder is only applicable to FAL products.

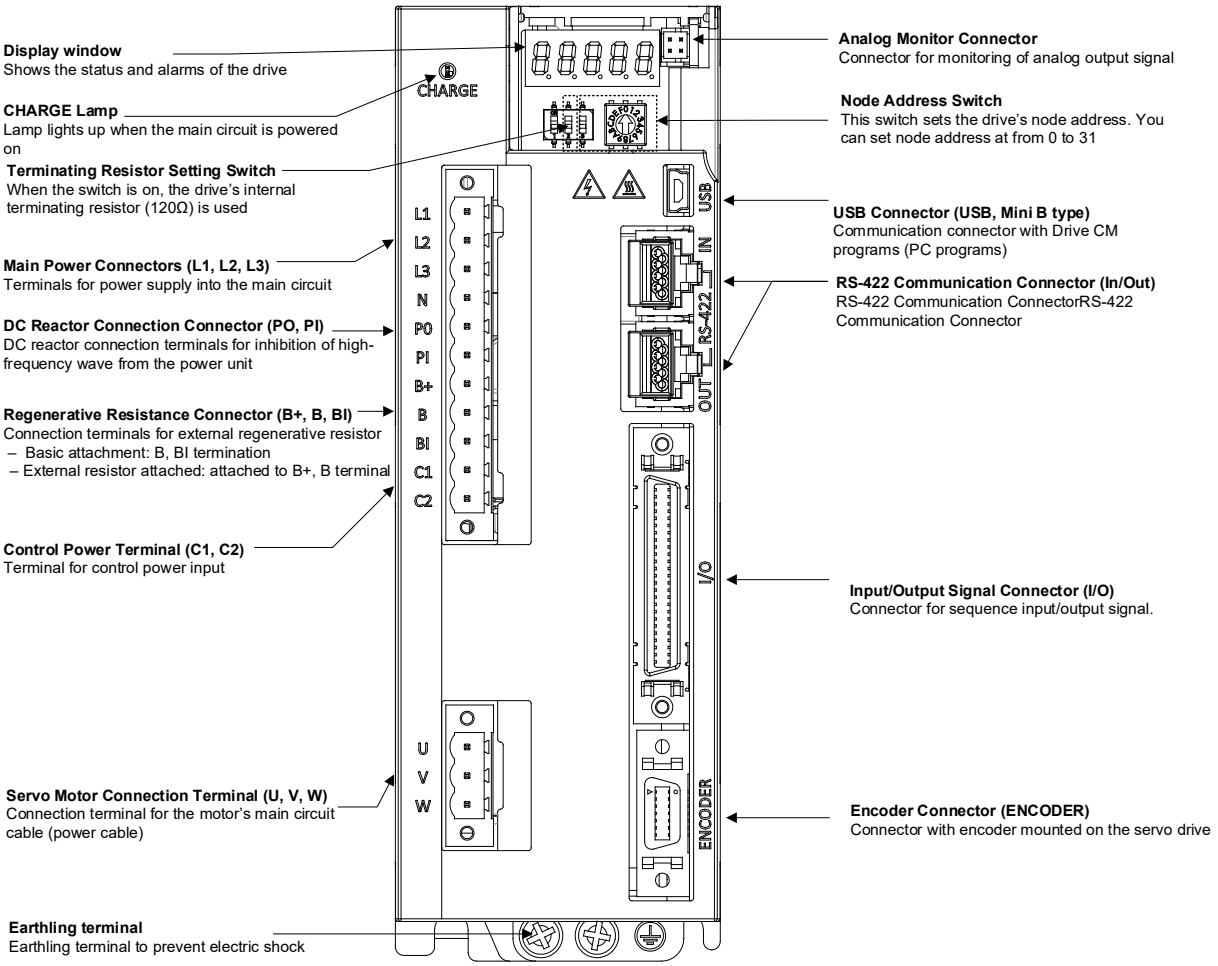
1.3 Part Names

1.3.1 Servo Drive Parts

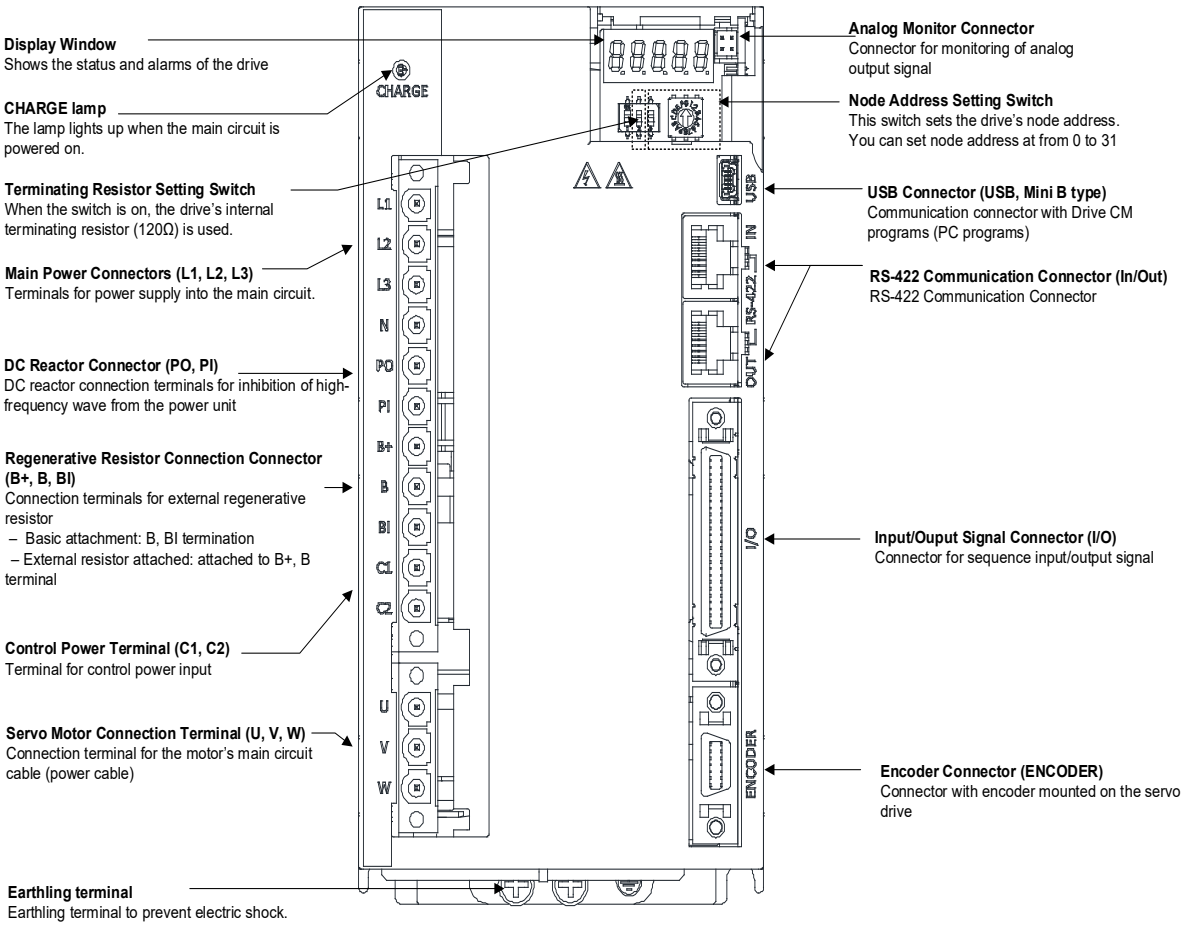
100W, 200W, 400W (200[V])



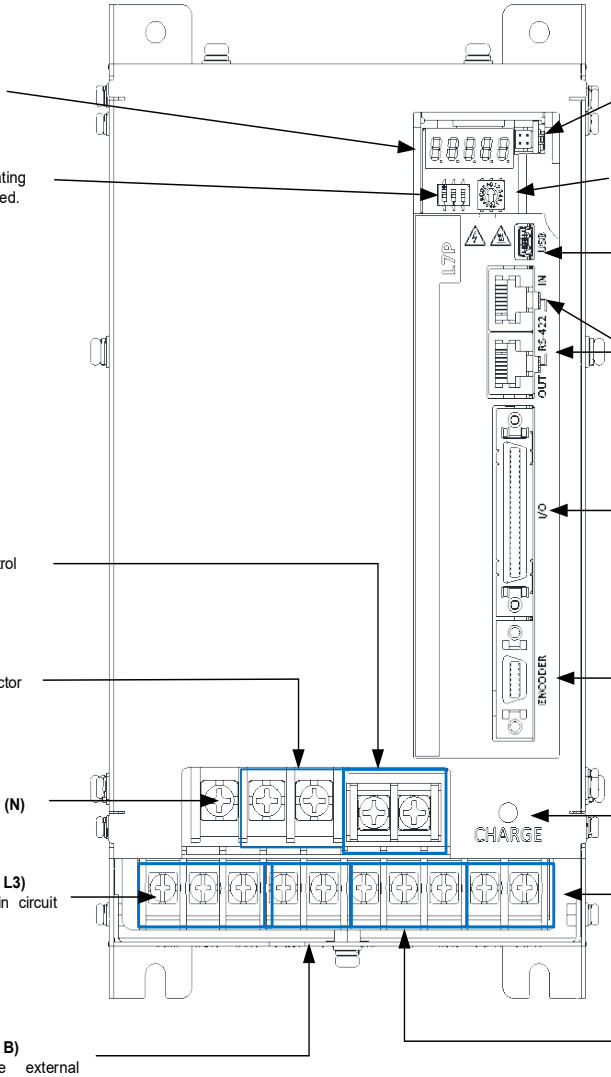
■ 800W, 1kW (200[V])



■ 2kW, 3.5kW (200[V])



■ 5KW(200[V])



Display
It shows drive status, alarms, etc.

Terminating resistor setting switch
When the switch is On, the terminating resistance (120Ω) inside the drive is used.

Connector for analog monitors
It is a connector for checking the analog output signal.

Node address setting switch
This switch is to set the node address of the drive. You can set the node addresses from 0 to 31.

USB connector (USB, Mini B type)
This is a connector for communication with the Drive CM program tool (PC program).

RS-422 communication connector (IN / OUT)
This is a connector for RS-422 communication.

Input/output signal connector (I/O)
This connector is for sequence input/ output signals.

Control power terminals (C1 and C2)
These terminals connect to the control power input.

DC reactor connector (PO, PI)
These terminals connect to the DC reactor to suppress high-frequency power.

Encoder connector (ENCODER)
This connector connects to the encoder installed in the servo motor.

*** It is not a connector for connection (N)**

CHARGE lamp
This turns on when the main circuit power is on.

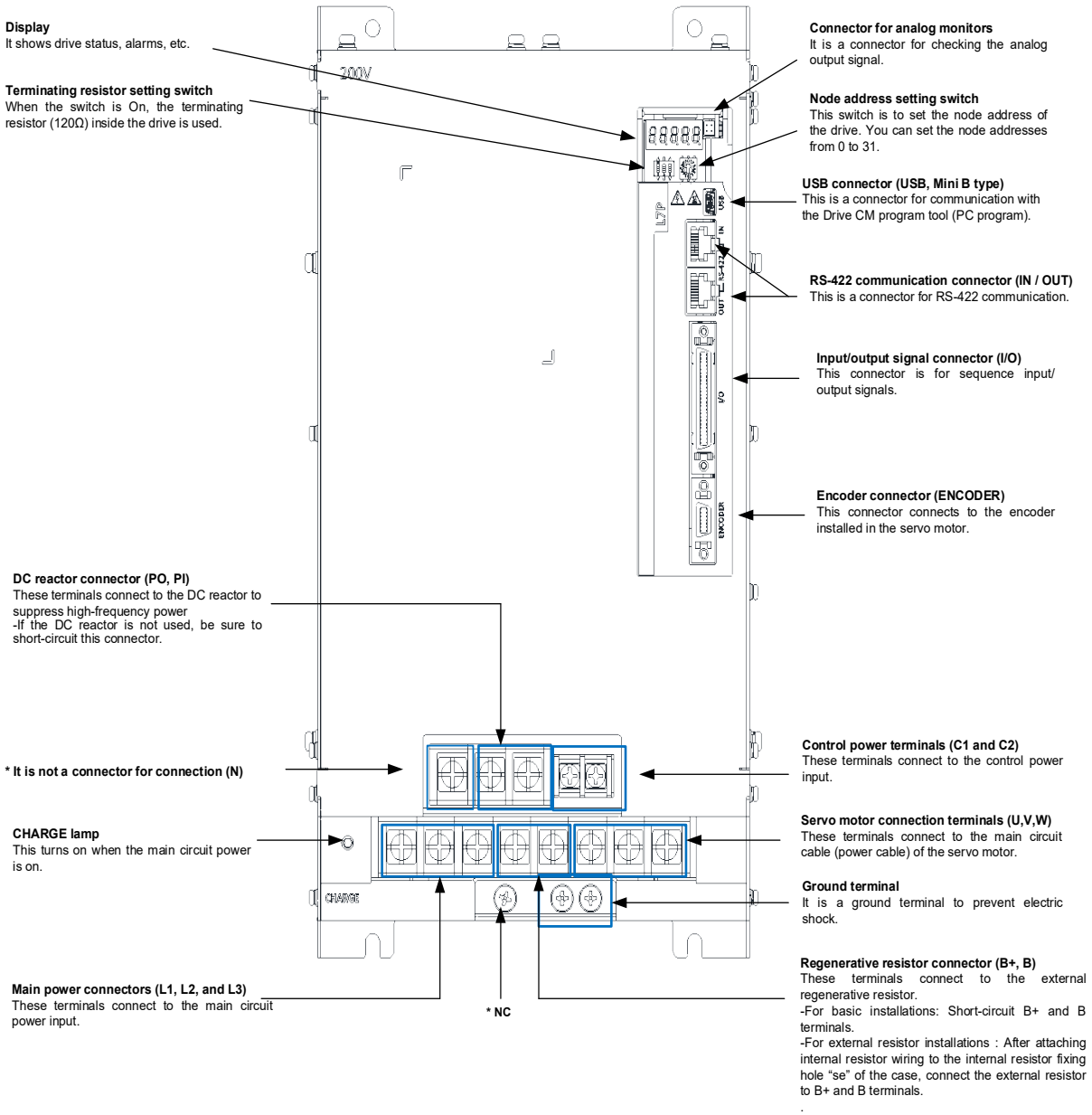
Main power connectors (L1, L2, and L3)
These terminals connect to the main circuit power input.

Ground terminal
It is a ground terminal to prevent electric shock.

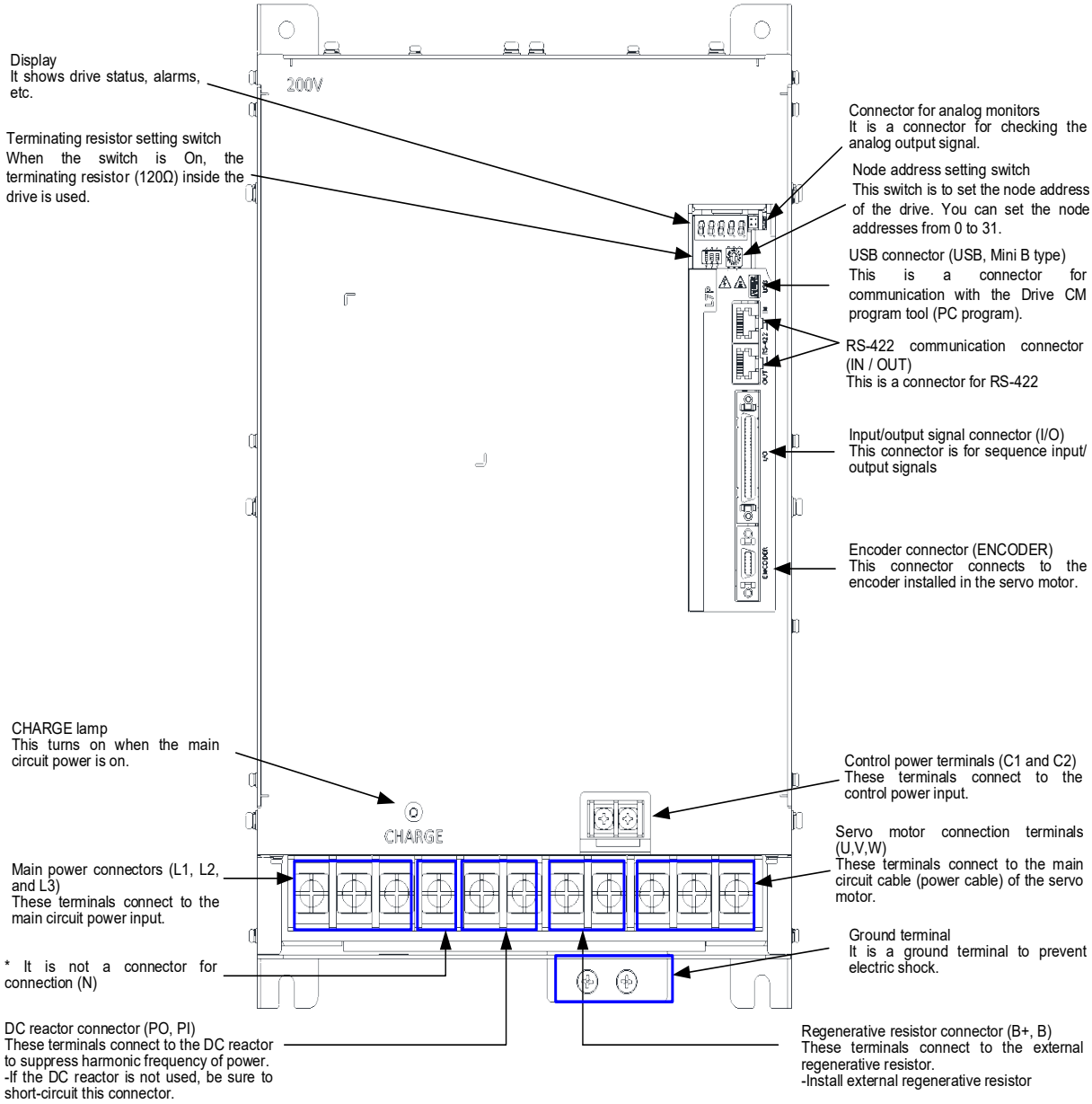
Servo motor connection Terminal(U,V,W)
It is a connection terminal of the cable (Power line) for the main circuit of servo motor.

Regenerative resistor connector (B+, B)
These terminals connect to the external regenerative resistor.
- For basic installations: Short-circuit B+ and B terminals.
- For external resistor installations : After attaching internal resistor wiring to the internal resistor fixing hole “se” of the case, connect the external resistor to B+ and B terminals.

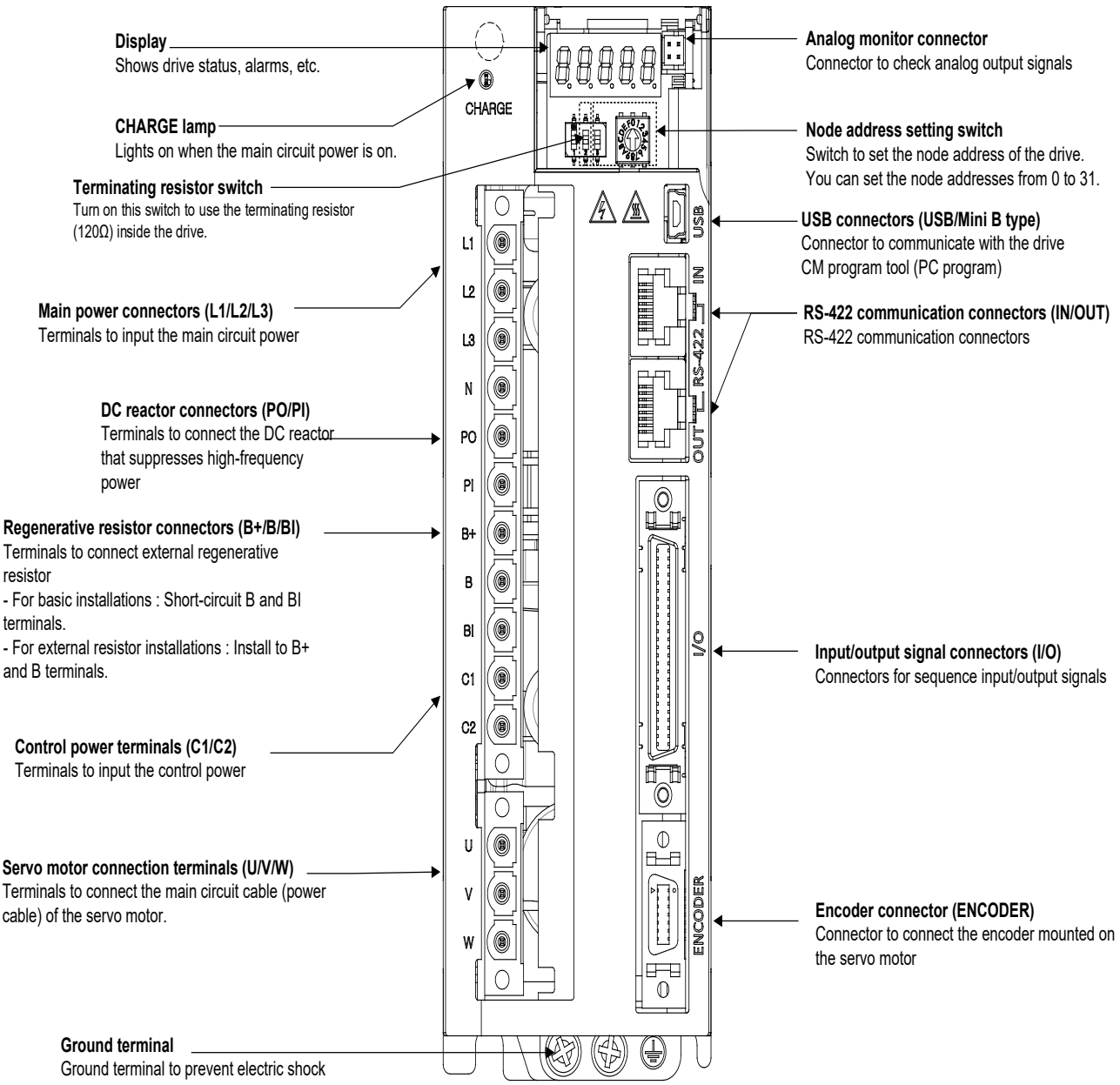
■ 7.5KW(200[V])


Display
It shows drive status, alarms, etc.
Terminating resistor setting switch
When the switch is On, the terminating resistor (120Ω) inside the drive is used.
Connector for analog monitors
It is a connector for checking the analog output signal.
Node address setting switch
This switch is to set the node address of the drive. You can set the node addresses from 0 to 31.
USB connector (USB, Mini B type)
This is a connector for communication with the Drive CM program tool (PC program).
RS-422 communication connector (IN / OUT)
This is a connector for RS-422 communication.
Input/output signal connector (I/O)
This connector is for sequence input/ output signals.
Encoder connector (ENCODER)
This connector connects to the encoder installed in the servo motor.
DC reactor connector (PO, PI)
These terminals connect to the DC reactor to suppress high-frequency power
-If the DC reactor is not used, be sure to short-circuit this connector.
* It is not a connector for connection (N)
CHARGE lamp
This turns on when the main circuit power is on.
Main power connectors (L1, L2, and L3)
These terminals connect to the main circuit power input.
* NC
Control power terminals (C1 and C2)
These terminals connect to the control power input.
Servo motor connection terminals (U,V,W)
These terminals connect to the main circuit cable (power cable) of the servo motor.
Ground terminal
It is a ground terminal to prevent electric shock.
Regenerative resistor connector (B+, B)
These terminals connect to the external regenerative resistor.
-For basic installations: Short-circuit B+ and B terminals.
-For external resistor installations : After attaching internal resistor wiring to the internal resistor fixing hole “se” of the case, connect the external resistor to B+ and B terminals.
.
200V
L3P
USB
IN
OUT
I/O
ENCODER
CHARGE

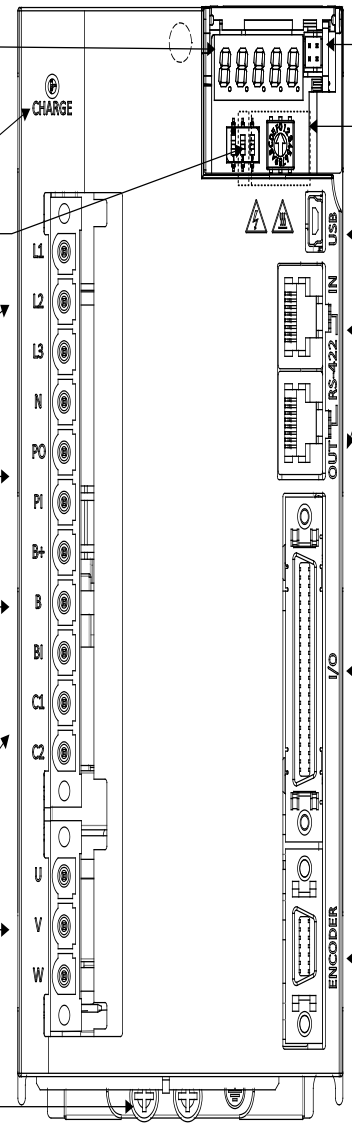
■ 15KW (200[V])


Display
It shows drive status, alarms, etc.
Terminating resistor setting switch
When the switch is On, the terminating resistor (120Ω) inside the drive is used.
200V
Connector for analog monitors
It is a connector for checking the analog output signal.
Node address setting switch
This switch is to set the node address of the drive. You can set the node addresses from 0 to 31.
USB connector (USB, Mini B type)
This is a connector for communication with the Drive CM program tool (PC program).
RS-422 communication connector (IN / OUT)
This is a connector for RS-422
Input/output signal connector (I/O)
This connector is for sequence input/ output signals
Encoder connector (ENCODER)
This connector connects to the encoder installed in the servo motor.
CHARGE lamp
This turns on when the main circuit power is on.
CHARGE
Control power terminals (C1 and C2)
These terminals connect to the control power input.
Servo motor connection terminals (U,V,W)
These terminals connect to the main circuit cable (power cable) of the servo motor.
Main power connectors (L1, L2, and L3)
These terminals connect to the main circuit power input.
* It is not a connector for connection (N)
Ground terminal
It is a ground terminal to prevent electric shock.
DC reactor connector (PO, PI)
These terminals connect to the DC reactor to suppress harmonic frequency of power.
-If the DC reactor is not used, be sure to short-circuit this connector.
Regenerative resistor connector (B+, B)
These terminals connect to the external regenerative resistor.
-Install external regenerative resistor

■ 1kW (400[V])


Display
Shows drive status, alarms, etc.
CHARGE lamp
Lights on when the main circuit power is on.
Terminating resistor switch
Turn on this switch to use the terminating resistor (120Ω) inside the drive.
Main power connectors (L1/L2/L3)
Terminals to input the main circuit power
DC reactor connectors (PO/PI)
Terminals to connect the DC reactor that suppresses high-frequency power
Regenerative resistor connectors (B+/B/BI)
Terminals to connect external regenerative resistor
- For basic installations : Short-circuit B and BI terminals.
- For external resistor installations : Install to B+ and B terminals.
Control power terminals (C1/C2)
Terminals to input the control power
Servo motor connection terminals (U/V/W)
Terminals to connect the main circuit cable (power cable) of the servo motor.
Ground terminal
Ground terminal to prevent electric shock
CHARGE
L1
L2
L3
N
PO
PI
B+
B
BI
C1
C2
U
V
W
USB
IN
RS-422
OUT
I/O
ENCODER
Analog monitor connector
Connector to check analog output signals
Node address setting switch
Switch to set the node address of the drive.
You can set the node addresses from 0 to 31.
USB connectors (USB/Mini B type)
Connector to communicate with the drive CM program tool (PC program)
RS-422 communication connectors (IN/OUT)
RS-422 communication connectors
Input/output signal connectors (I/O)
Connectors for sequence input/output signals
Encoder connector (ENCODER)
Connector to connect the encoder mounted on the servo motor

■ 2kW, 3.5kW (400[V])



Display
Shows drive status, alarms, etc.

CHARGE lamp
Lights on when the main circuit power is on.

Terminating resistor switch
Turn on this switch to use the terminating resistor (120Ω) inside the drive.

Main power connectors (L1/L2/L3)
Terminals to input the main circuit power

DC reactor connectors (PO/PI)
Terminals to connect the DC reactor that suppresses high-frequency power

Regenerative resistor connectors (B+/B/BI)
Terminals to connect external regenerative resistor
- For basic installations : Short-circuit B and BI terminals.
- For external resistor installations : Install to B+ and B terminals.

Control power terminals (C1/C2)
Terminals to input the control power

Servo motor connection terminals (U/V/W)
Terminals to connect the main circuit cable (power cable) of the servo motor.

Ground terminal
Ground terminal to prevent electric shock

Analog monitor connector
Connector to check analog output signals

Node address setting switch
Switch to set the node address of the drive.
You can set the node addresses from 0 to 31.

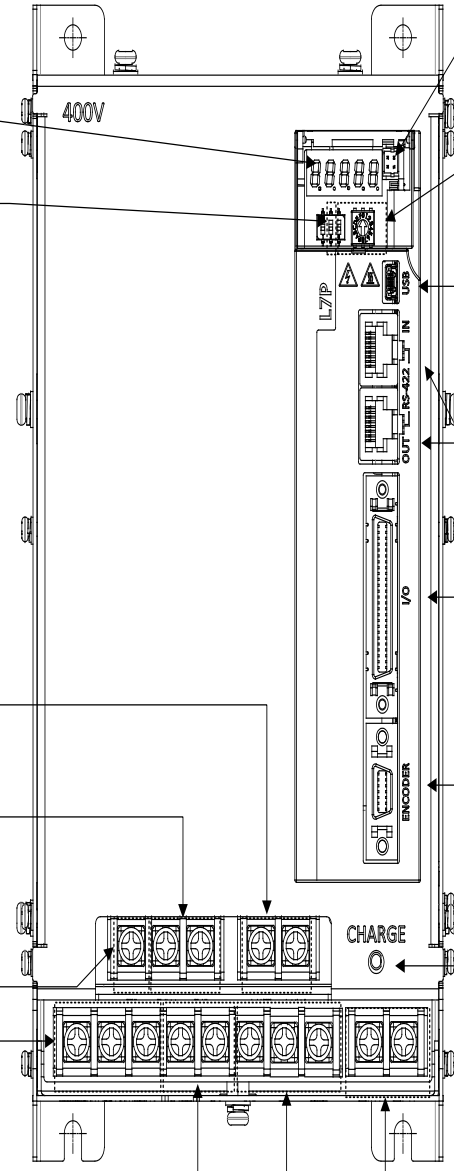
USB connectors (USB/Mini B type)
Connector to communicate with the drive CM program tool (PC program)

RS-422 communication connectors (IN/OUT)
RS-422 communication connectors

Input/output signal connectors (I/O)
Connectors for sequence input/output signals

Encoder connector (ENCODER)
Connector to connect the encoder mounted on the servo motor

■ 5KW(400[V])



Display
Shows drive status, alarms, etc.

Terminating resistor switch
Turn on this switch to use the terminating resistor (120Ω) inside the drive.

Analog monitor connector
Connector to check analog output signals

Node address setting switch
Switch to set the node address of the drive. You can set the node addresses from 0 to 31.

USB connectors (USB/Mini B type)
Connector to communicate with the drive CM program tool (PC program)

RS-422 communication connectors (IN/OUT)
RS-422 communication connectors

Input/output signal connectors (I/O)
Connectors for sequence input/output signals

Control power terminals (C1/C2)
Terminals to input the control power

Encoder connector (ENCODER)
Connector to connect the encoder mounted on the servo motor

DC reactor connectors (PO/PI)
Terminals to connect the DC reactor that suppresses high-frequency power
- Be sure to short-circuit this connector when you do not use the DC reactor.

CHARGE lamp
Lights on when the main circuit power is on.

*** Not a connector for connection (N)**

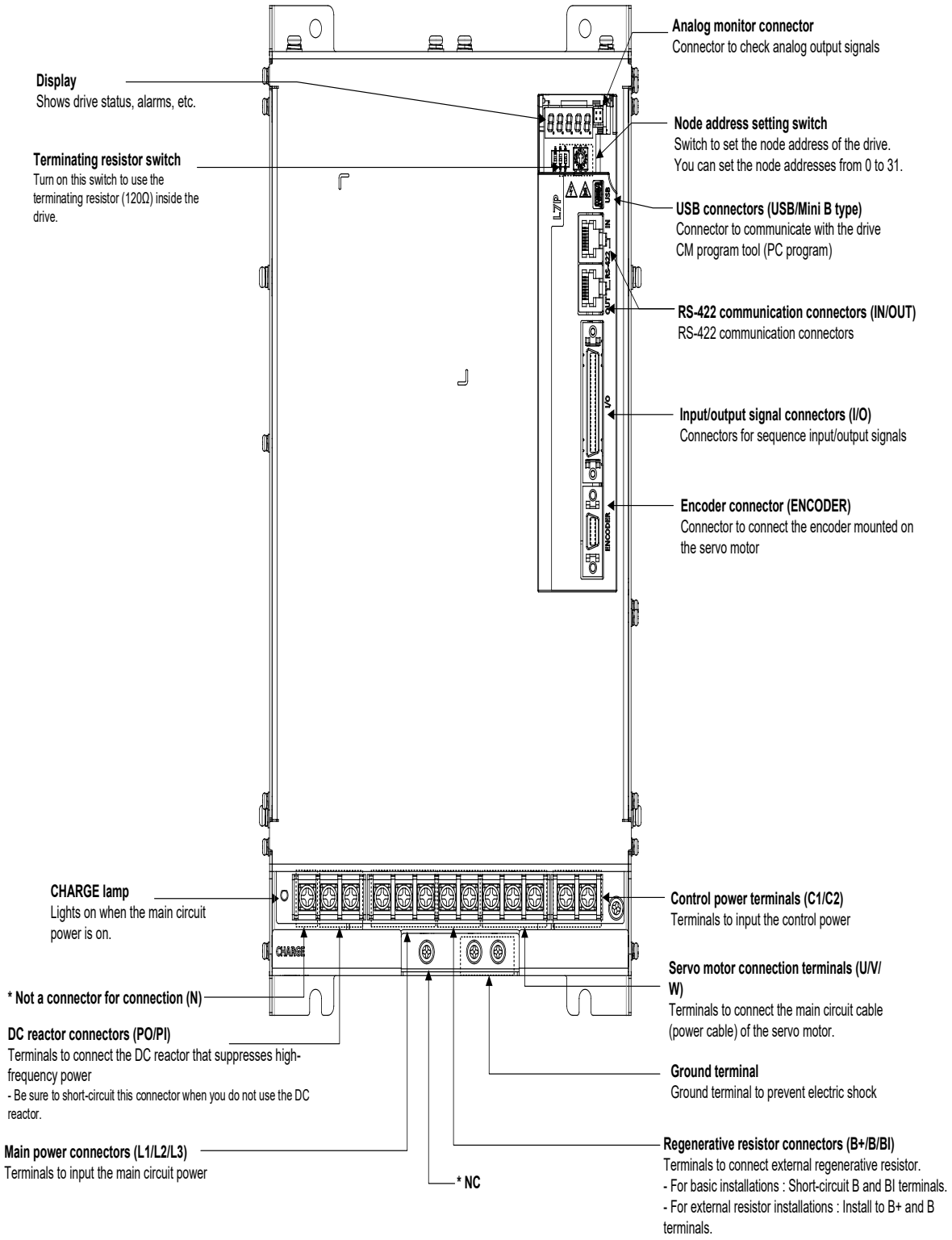
Main power connectors (L1/L2/L3)
Terminals to input the main circuit power

Ground terminal
Ground terminal to prevent electric shock

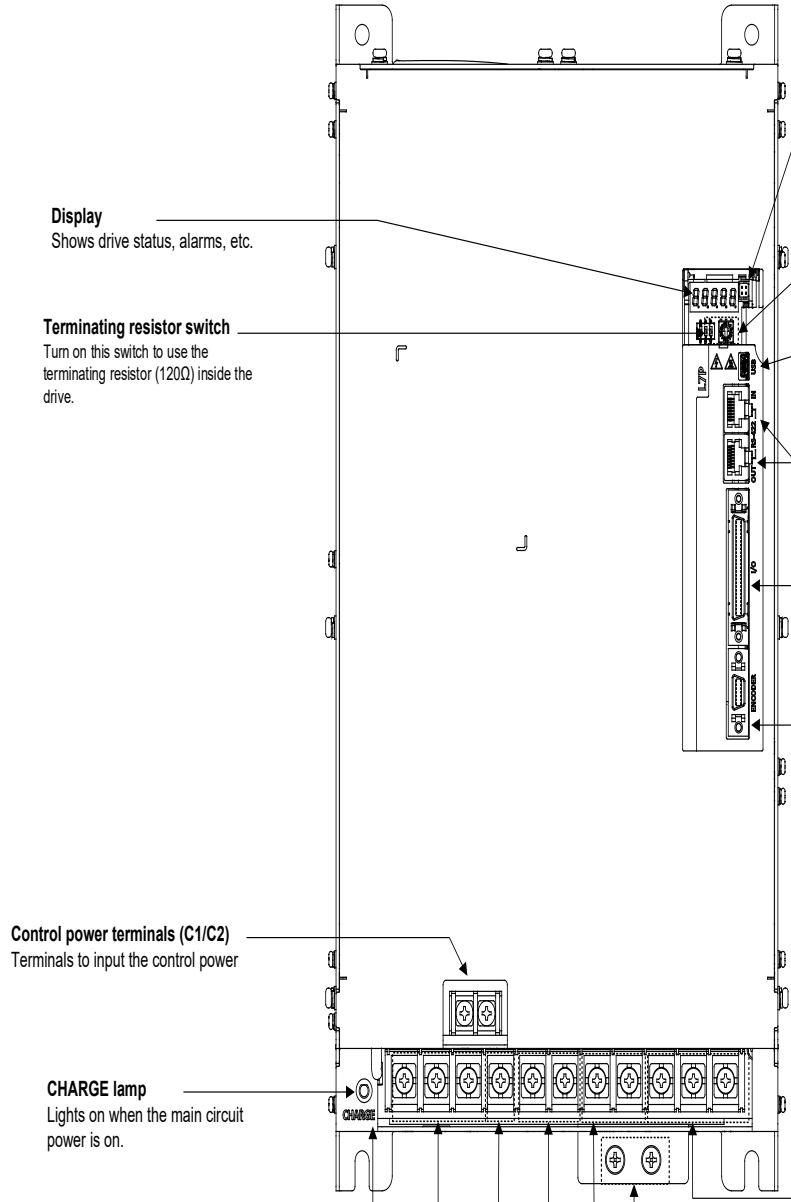
Regenerative resistor connectors (B+/B/BI)
Terminals to connect external regenerative resistor.
- For basic installations : Short-circuit B and BI terminals.
- For external resistor installations : Install to B+ and B terminals.

Servo motor connection terminals (U/V/W)
Terminals to connect the main circuit cable (power cable) of the servo motor.

■ 7.5kW (400[V])


Analog monitor connector
Connector to check analog output signals
Display
Shows drive status, alarms, etc.
Node address setting switch
Switch to set the node address of the drive.
You can set the node addresses from 0 to 31.
Terminating resistor switch
Turn on this switch to use the terminating resistor (120Ω) inside the drive.
USB connectors (USB/Mini B type)
Connector to communicate with the drive CM program tool (PC program)
RS-422 communication connectors (IN/OUT)
RS-422 communication connectors
Input/output signal connectors (I/O)
Connectors for sequence input/output signals
Encoder connector (ENCODER)
Connector to connect the encoder mounted on the servo motor
CHARGE lamp
Lights on when the main circuit power is on.
Control power terminals (C1/C2)
Terminals to input the control power
Servo motor connection terminals (U/V/W)
Terminals to connect the main circuit cable (power cable) of the servo motor.
* Not a connector for connection (N)
DC reactor connectors (PO/PI)
Terminals to connect the DC reactor that suppresses high-frequency power
- Be sure to short-circuit this connector when you do not use the DC reactor.
Ground terminal
Ground terminal to prevent electric shock
Main power connectors (L1/L2/L3)
Terminals to input the main circuit power
* NC
Regenerative resistor connectors (B+/B/BI)
Terminals to connect external regenerative resistor.
- For basic installations : Short-circuit B and BI terminals.
- For external resistor installations : Install to B+ and B terminals.
CHARGE
USB
IN
OUT
RS-422
I/O
ENCODER

■ 15kW (400[V])



Analog monitor connector
Connector to check analog output signals

Display
Shows drive status, alarms, etc.

Node address setting switch
Switch to set the node address of the drive.
You can set the node addresses from 0 to 31.

Terminating resistor switch
Turn on this switch to use the terminating resistor (120Ω) inside the drive.

USB connectors (USB/Mini B type)
Connector to communicate with the drive CM program tool (PC program)

RS-422 communication connectors (IN/OUT)
RS-422 communication connectors

Input/output signal connectors (I/O)
Connectors for sequence input/output signals

Encoder connector (ENCODER)
Connector to connect the encoder mounted on the servo motor

Control power terminals (C1/C2)
Terminals to input the control power

CHARGE lamp
Lights on when the main circuit power is on.

Servo motor connection terminals (U/V/W)
Terminals to connect the main circuit cable (power cable) of the servo motor.

Main power connectors (L1/L2/L3)
Terminals to input the main circuit power

*** Not a connector for connection (N)**

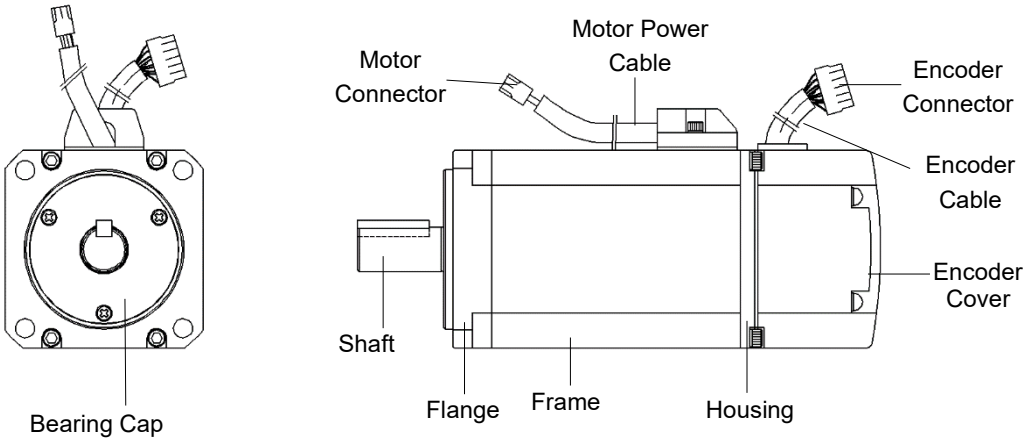
Ground terminal
Ground terminal to prevent electric shock

DC reactor connectors (PO/PI)
Terminals to connect the DC reactor that suppresses high-frequency power
- Be sure to short-circuit this connector when you do not use the DC reactor.

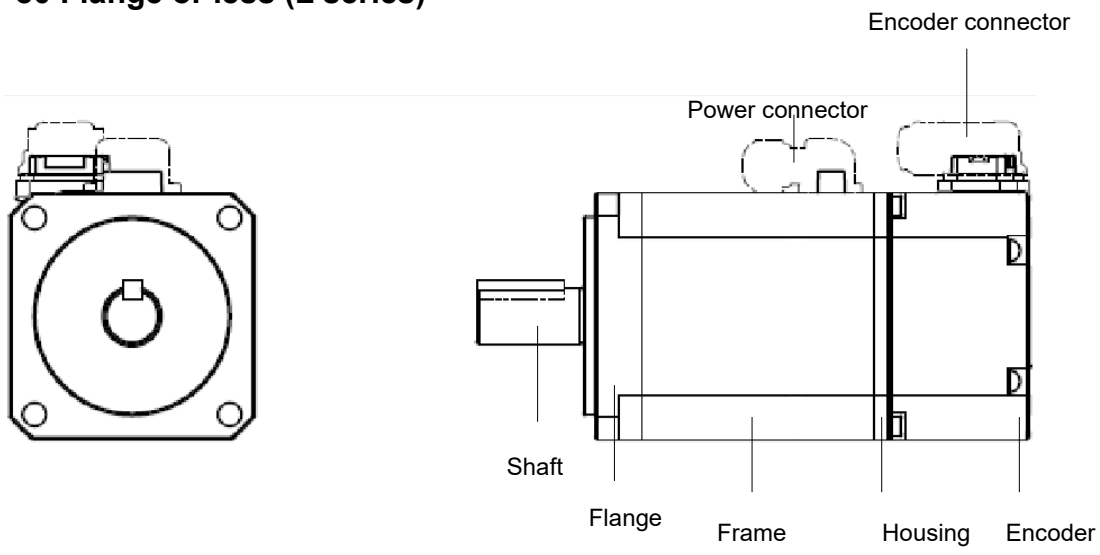
Regenerative resistor connectors (B+/B/BI)
Terminals to connect external regenerative resistor.
- For basic installations : Short-circuit B and BI terminals.
- For external resistor installations : Install to B+ and B terminals.

1.3.2 Servo Motor Parts

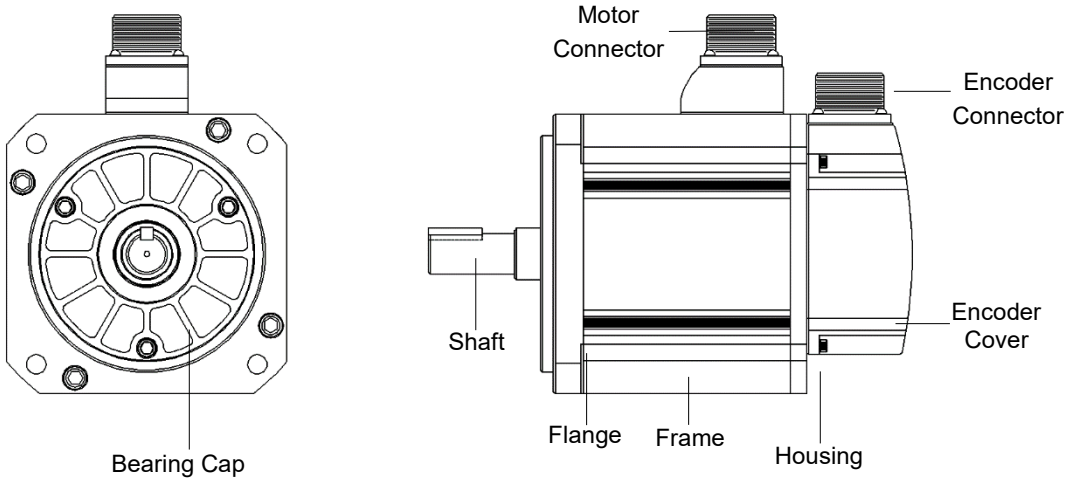
•80 Flange or less



•80 Flange or less (L series)



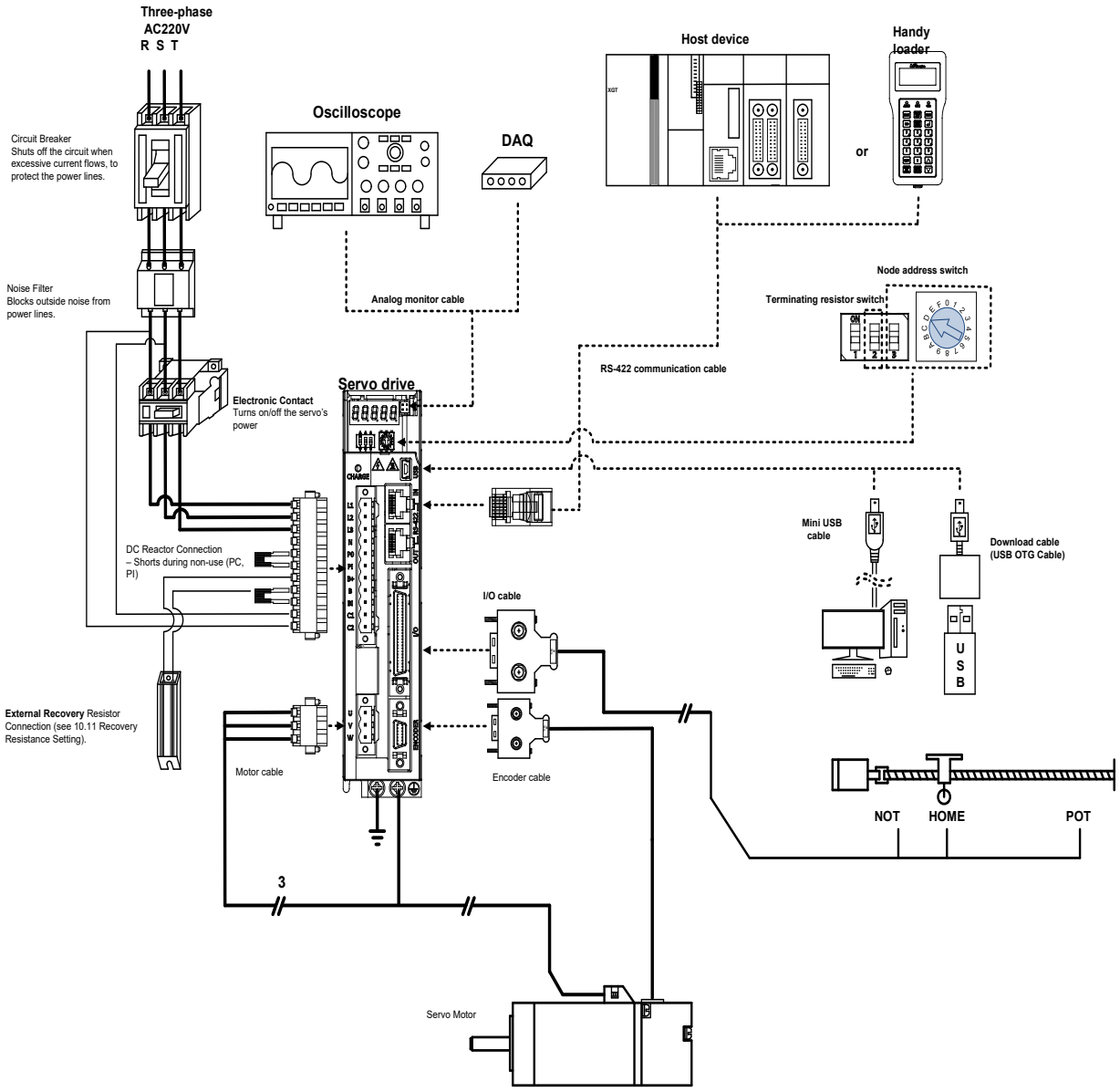
•130 Flange or higher



1.4 System configuration example

The figure below shows an example of system configuration using this drive.

•200[V]/100[W] drive example



⚠ Caution

- The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.
- When using basic installations -Short-circuit (B, BI)

2. Product feature

2.1 Servo Motor

2.1.1 Product feature

■ Heat Sink Spec.

Classification	Size(mm)	Classification
FAL / EA	250x250x6	Aluminum
FBL / EB	250x250x6	
FCL / EC	250x250x12	
FE / EE	350x350x20	
FF / EF	550x550x30	
FG	650x650x35	
EF (4.5kW or higher)	650x650x36	

※ In the case of product specifications, it is the data measured after applying the heat sink.

■ Precautions for using servo motors

※ In case of IP rating, the shaft penetration part is excluded.

※ When attaching a reducer, the IP grade of the reducer part is not guaranteed.

※ If bending occurs beyond the specifications specified in the cable standard, the indicated IP rating may not be satisfied.

※ The corresponding protection level is satisfied only when the dedicated cable is used.

※ If you want a high-speed response, you need to use it with a lower load inertia.

※ The allowable load inertia ratio of a motor is the standard for driving a servo motor at a constant speed.

※ Continuous use of overload current does not guarantee continuous use of more than 100% output.

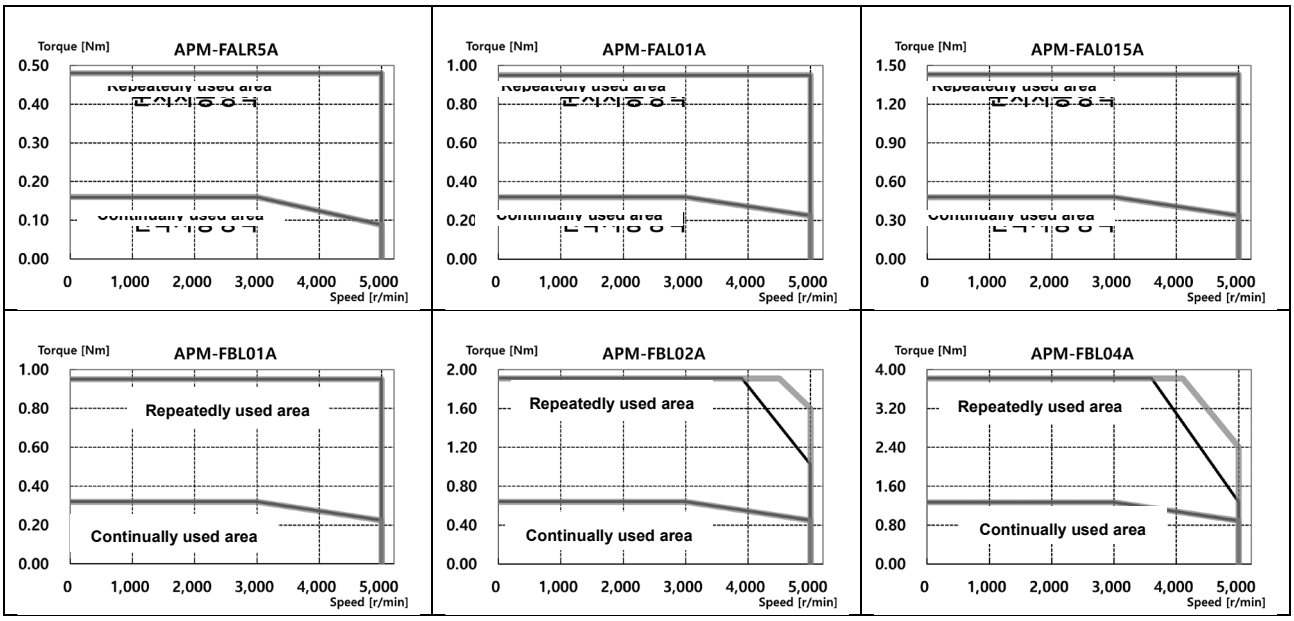
※ This device satisfies the electromagnetic wave test standard (EN 60034-1) for industrial use (Class A), so it is intended for use in industrial environments.

※ When using the Batteryless encoder option, there must be no strong magnetic fields around the encoder cover.

■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		FALR5A	FAL01A	FAL015A	FBL01A	FBL02A	FBL04A
Applicable Drive (L7PAxx□)		L7PA001		L7A002	L7PA001	L7PA002	L7PA004
Rated Output	[kW]	0.05	0.10	0.15	0.10	0.20	0.40
Rated Torque	[N·m]	0.16	0.32	0.48	0.32	0.64	1.27
	[kgf·cm]	1.62	3.25	4.87	3.25	6.49	12.99
Maximum Instantaneous Torque	[N·m]	0.48	0.96	1.43	0.96	1.91	3.82
	[kgf·cm]	4.87	9.74	14.62	9.74	19.48	38.96
Rated Current	$[A]_{\Phi.ac.rms}$	0.95	1.25	1.60	0.95	1.45	2.60
Peak Current	$[A]_{\Phi.ac.rms}$	2.85	3.75	4.80	2.85	4.35	7.80
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	$[kg·m^2x10^{-4}]$	0.023	0.042	0.063	0.091	0.147	0.248
	$[gf·cm·s^2]$	0.024	0.043	0.065	0.093	0.150	0.253
Permitted Load Inertia		Motor inertia x 30		Motor inertia x 20			
Rated Power Rate	[kW/s]	10.55	23.78	36.19	11.09	27.60	27.07
Velocity, Position Detector	Standard	Serial Multi-Turn Built-in Type(18bit)			Serial Multi-Turn Built-in Type(19bit)		
Specifications and Features	Protection Method	Fully enclosed self-cooling IP67 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Use temperature: 0~40 [°C], maintenance temperature: -10~60 [°C]					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight or corrosive or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	0.31	0.45	0.61	0.56	0.74	1.06

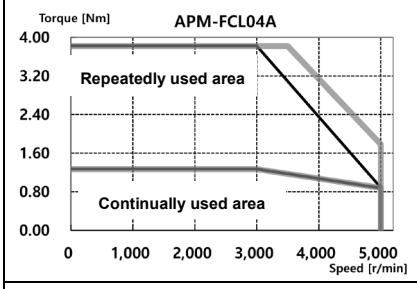
♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**

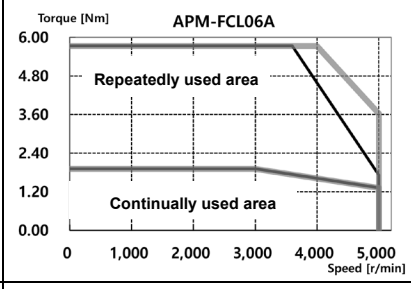


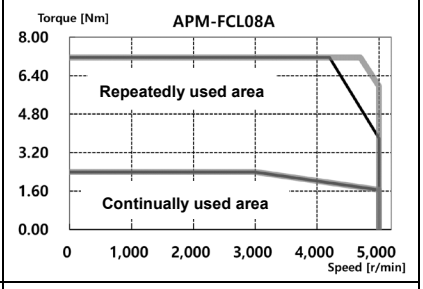
■ Product Features [200V]

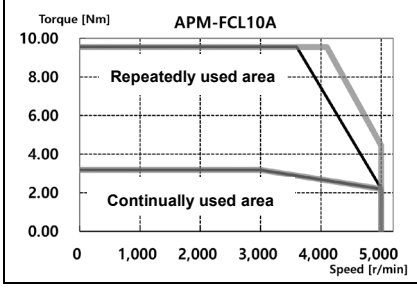
Servo Motor Type (APM-□□□□□)		FCL04A	FCL06A	FCL08A	FCL10A		
Applicable Drive (L7PAxxx□)		L7PA004	L7PA008		L7PA010		
Rated Output	[kW]	0.40	0.60	0.75	1.00		
Rated Torque	[N·m]	1.27	1.91	2.39	3.18		
	[kgf·cm]	12.99	19.49	24.36	32.48		
Maximum Instantaneous Torque	[N·m]	3.82	5.73	7.16	9.55		
	[kgf·cm]	38.98	58.47	73.08	97.44		
Rated Current	[A]Φ.ac.rms	2.58	3.81	5.02	5.83		
Peak Current	[A]Φ.ac.rms	7.75	11.42	15.07	17.50		
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	[kg·m²x10⁻⁴]	0.530	0.897	1.264	1.632		
	[gf·cm·s²]	0.541	0.915	1.290	1.665		
Permitted Load Inertia		Motor inertia x 15					
Rated Power Rate	[kW/s]	30.60	40.66	45.09	62.08		
Velocity, Position Detector	Standard	Serial Multi-Turn Built-in Type(19bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP67 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Use temperature: 0~40 [°C], maintenance temperature: -10~60 [°C]					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight or corrosive or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	1.52	2.14	2.68	3.30		

♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**





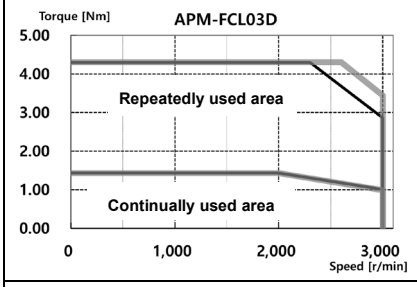


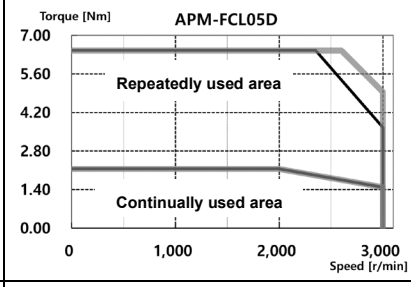


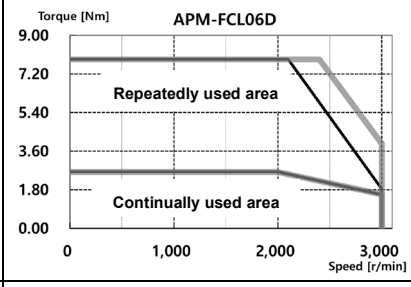
■ Product Features [200V]

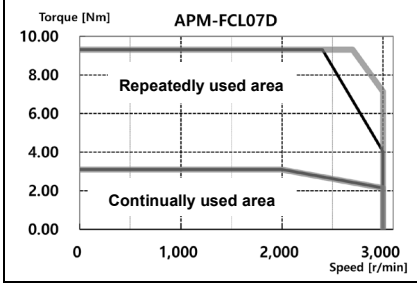
Servo Motor Type (APM-□□□□□)		FCL03D	FCL05D	FCL06D	FCL07D		
Applicable Drive (L7PAxxx□)		L7PA004	L7PA008				
Rated Output	[kW]	0.30	0.45	0.55	0.65		
Rated Torque	[N·m]	1.43	2.15	2.63	3.10		
	[kgf·cm]	14.62	21.92	26.80	31.67		
Maximum Instantaneous Torque	[N·m]	4.30	6.45	7.88	9.31		
	[kgf·cm]	43.85	65.77	80.39	95.01		
Rated Current	[A]Φ.ac.rms	2.50	3.05	3.06	3.83		
Peak Current	[A]Φ.ac.rms	7.51	9.16	9.18	11.50		
Rated Rotation Velocity	[r/min]	2000					
Maximum Rotation Velocity	[r/min]	3000					
Moment of Inertia	[kg·m²x10⁻⁴]	0.530	0.897	1.264	1.63		
	[gf·cm·s²]	0.541	0.915	1.290	1.66		
Permitted Load Inertia		Motor inertia x 15					
Rated Power Rate	[kW/s]	38.73	51.47	54.56	59.03		
Velocity, Position Detector	Standard	Serial Multi-Turn Built-in Type(19bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP67 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Use temperature: 0~40 [°C], maintenance temperature: -10~60 [°C]					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight or corrosive or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	1.26	2.12	2.66	2.78		

♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , ■: 3-phase AC230V**]**





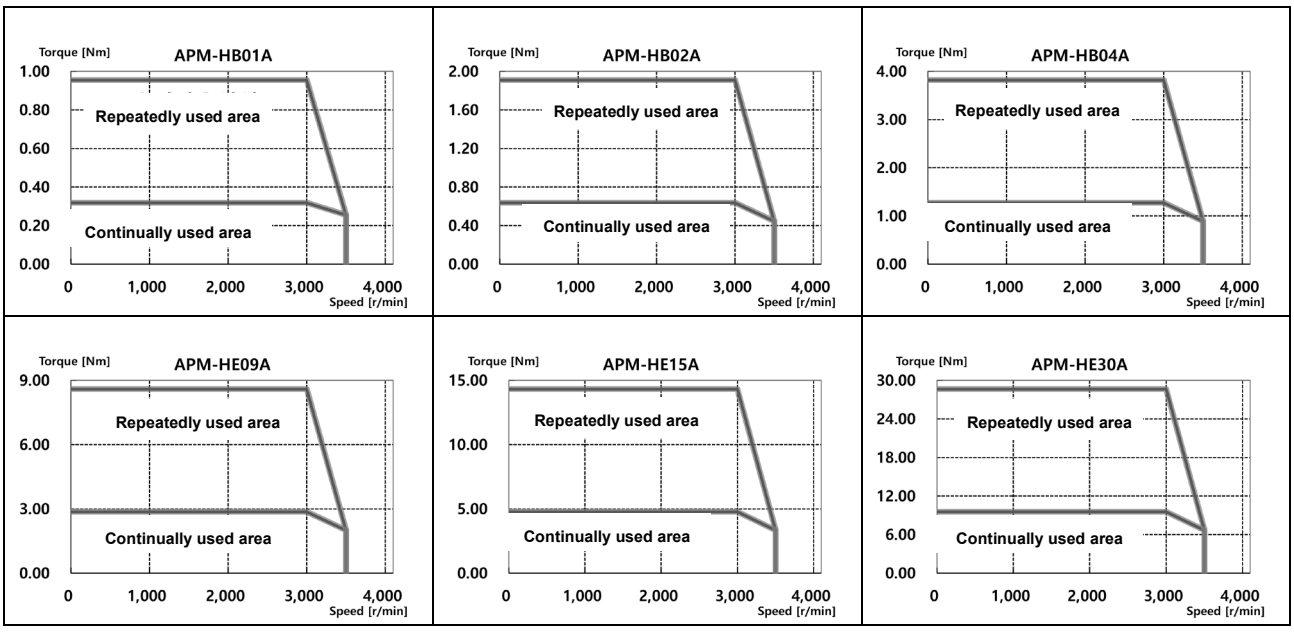




■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		HB01A	HB02A	HB04A	HE09A	HE15A	HE30A
Applicable Drive (L7PAxxx□)		L7PA002		L7PA004	L7PA008	L7PA020	L7PA035
Rated Output	[kW]	0.1	0.2	0.4	0.9	1.5	3
Rated Torque	[N·m]	0.32	0.64	1.27	2.86	4.77	9.55
	[kgf·cm]	3.25	6.50	12.99	29.23	48.72	97.44
Maximum Instantaneous Torque	[N·m]	0.95	1.91	3.82	8.59	14.32	28.65
	[kgf·cm]	9.74	19.49	38.97	87.69	146.15	292.33
Rated Current	A	1.65	1.63	2.89	4.95	8.23	16.30
Peak Current	A	4.95	4.89	8.67	14.85	24.69	51.48
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	3500					
Moment of Inertia	[kg·m²x10⁻⁴]	0.27	0.33	0.46	19.56	22.27	31.81
	[gf·cm·s²]	0.27	0.34	0.47	19.96	22.72	32.46
Permitted Load Inertia		Motor inertia x 20			Motor inertia x 10		
Rated Power Rate	[kW/s]	3.34	11.98	34.47	4.10	10.01	22.03
Velocity, Position Detector	Standard	Quadrature type incremental 1024P/R			Quadrature Type Incremental 2048P/R		
Specifications and Features	Protection Method	Fully enclosed self-cooling IP55 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	0.9	1.2	1.7	5.8	7.4	10.83

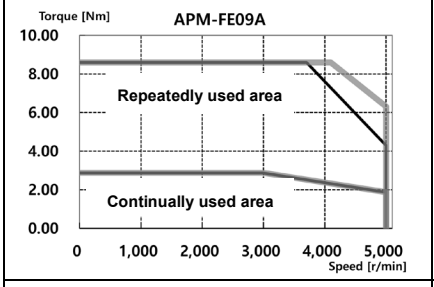
♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**

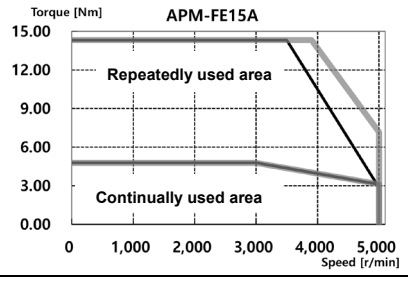


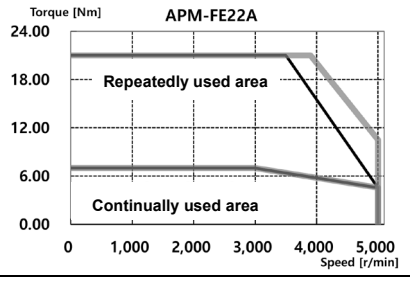
■ Product Features [200V]

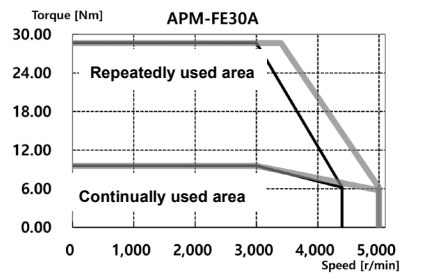
Servo Motor Type (APM-□□□□□)		FE09A	FE15A	FE22A	FE30A		
Applicable Drive (L7PAxxx□)		L7PA010	L7PA020		L7PA035		
Rated Output	[kW]	0.9	1.5	2.2	3.0		
Rated Torque	[N·m]	2.87	4.78	7.00	9.55		
	[kgf·cm]	29.20	48.70	71.50	97.40		
Maximum Instantaneous Torque	[N·m]	8.59	14.32	21.01	28.65		
	[kgf·cm]	87.70	146.10	214.40	292.30		
Rated Current	A	6.45	9.15	13.24	16.09		
Peak Current	A	19.35	27.45	39.72	48.27		
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	[kg·m²x10⁻⁴]	5.66	10.18	14.62	19.04		
	[gf·cm·s²]	5.77	10.39	14.92	19.43		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	14.47	22.38	33.59	47.85		
Velocity, Position Detector	Standard	Serial Multi-Turn(19-bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	5.0	6.7	8.5	10.1		

♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**





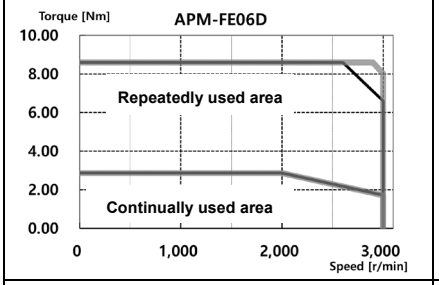


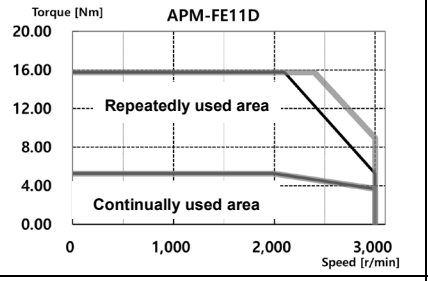


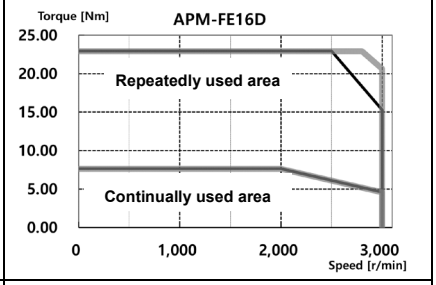
■ Product Features [200V]

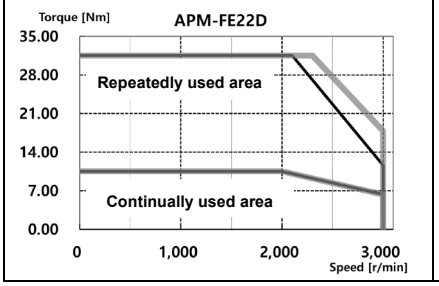
Servo Motor Type (APM-□□□□□)		FE06D	FE11D	FE16D	FE22D		
Applicable Drive (L7PAxxx□)		L7PA008	L7PA010	L7PA020			
Rated Output	[kW]	0.6	1.1	1.6	2.2		
Rated Torque	[N·m]	2.86	5.25	7.63	10.50		
	[kgf·cm]	29.22	53.57	77.92	107.14		
Maximum Instantaneous Torque	[N·m]	8.59	15.75	22.92	31.51		
	[kgf·cm]	87.66	160.71	233.76	321.42		
Rated Current	A	4.56	6.47	10.98	12.97		
Peak Current	A	13.68	19.41	32.94	38.91		
Rated Rotation Velocity	[r/min]	2000					
Maximum Rotation Velocity	[r/min]	3000					
Moment of Inertia	[kg·m²x10⁻⁴]	5.66	10.18	14.62	19.04		
	[gf·cm·s²]	5.77	10.39	14.92	19.43		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	14.49	27.08	39.89	57.90		
Velocity, Position Detector	Standard	Serial Multi-Turn(19-bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	5.0	6.7	8.5	10.1		

♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**





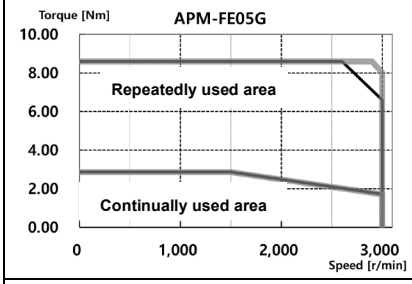


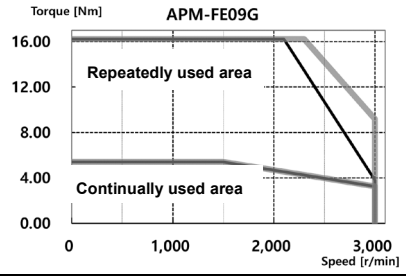


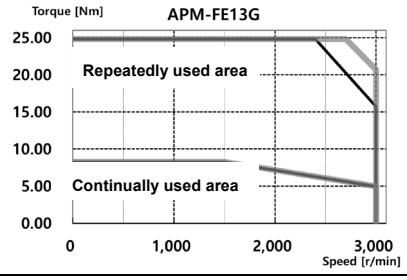
■ Product Features [200V]

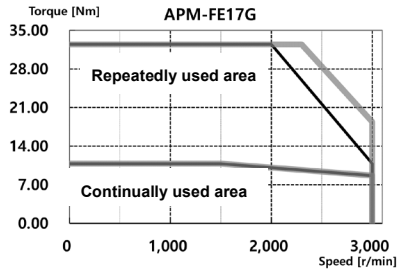
Servo Motor Type (APM-□□□□□)		FE05G	FE09G	FE13G	FE17G		
Applicable Drive (L7PAxxx□)		L7PA008	L7PA010	L7PA020			
Rated Output	[kW]	0.45	0.85	1.3	1.7		
Rated Torque	[N·m]	2.86	5.41	8.27	10.82		
	[kgf·cm]	29.22	55.19	84.41	110.38		
Maximum Instantaneous Torque	[N·m]	8.59	16.23	24.82	32.46		
	[kgf·cm]	87.66	165.57	253.23	331.14		
Rated Current	A	4.56	6.67	11.90	13.36		
Peak Current	A	13.68	20.01	35.7	40.08		
Rated Rotation Velocity	[r/min]	1500					
Maximum Rotation Velocity	[r/min]	3000					
Moment of Inertia	[kg·m²x10⁻⁴]	5.66	10.18	14.62	19.04		
	[gf·cm·s²]	5.77	10.39	14.92	19.43		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	14.49	28.74	46.81	61.46		
Velocity, Position Detector	Standard	Serial Multi-Turn(19-bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	5.0	6.7	8.5	10.1		

♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**





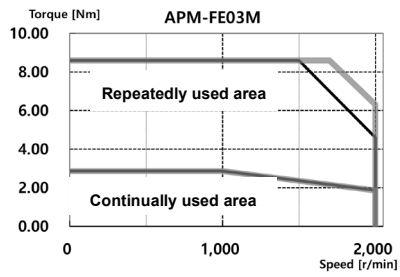


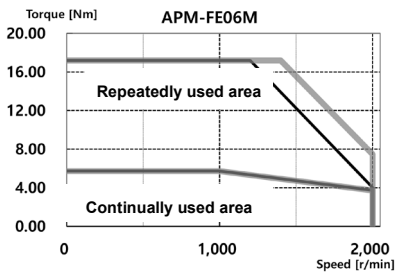


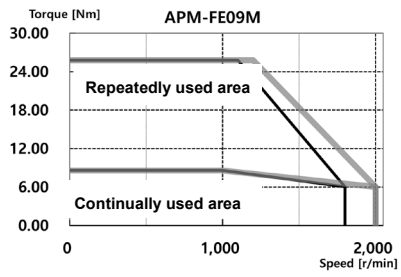
■ Product Features [200V]

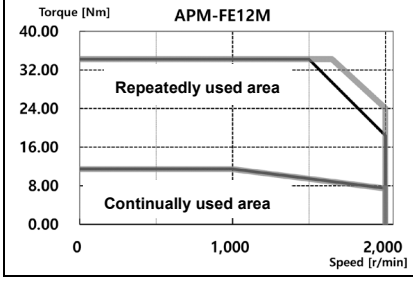
Servo Motor Type (APM-□□□□□)		FE03M	FE06M	FE09M	FE12M		
Applicable Drive (**L7**PAxxx□)		**L7PA004**	**L7PA008**	**L7PA010**	**L7PA020**		
Rated Output	[kW]	0.3	0.6	0.9	1.2		
Rated Torque	[N·m]	2.86	5.72	8.59	11.46		
	[kgf·cm]	29.22	58.4	87.7	116.9		
Maximum Instantaneous Torque	[N·m]	8.59	17.18	25.77	34.22		
	[kgf·cm]	87.66	175.3	262.9	349.1		
Rated Current	A	2.73	4.56	6.18	10.67		
Peak Current	A	8.19	13.68	18.54	32.01		
Rated Rotation Velocity	[r/min]	1000					
Maximum Rotation Velocity	[r/min]	2000					
Moment of Inertia	[kg·m²x10⁻⁴]	5.66	10.18	14.62	19.04		
	[gf·cm·s²]	5.77	10.39	14.92	19.43		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	14.49	32.22	50.48	68.91		
Velocity, Position Detector	Standard	Serial Multi-Turn(19-bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	5.0	6.7	8.5	10.1		

♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**





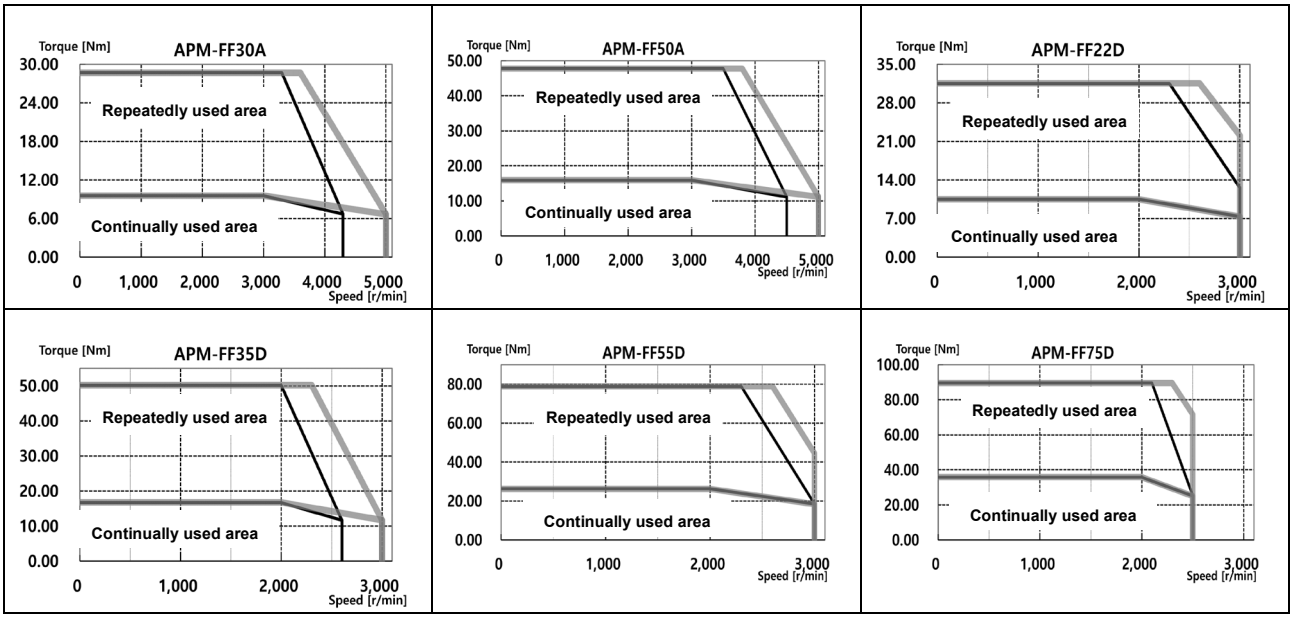




■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		FF30A	FF50A	FF22D	FF35D	FF55D	FF75D
Applicable Drive (L7PAxxx□)		L7PA035	L7PA050	L7PA020	L7PA035	L7PA050	L7PA075
Rated Output	[kW]	3.0	5.0	2.2	3.5	5.5	7.5
Rated Torque	[N·m]	9.55	15.91	10.50	16.70	26.25	35.81
	[kgf·cm]	97.40	162.30	107.10	170.40	267.80	365.40
Maximum Instantaneous Torque	[N·m]	28.65	47.74	31.50	50.10	78.76	89.53
	[kgf·cm]	292.3	487.00	321.30	511.40	803.4	913.5
Rated Current	A	15.26	26.47	13.07	16.48	28.78	32.95
Peak Current	A	45.78	79.41	39.21	49.44	86.34	82.375
Rated Rotation Velocity	[r/min]	3000		2000			
Maximum Rotation Velocity	[r/min]	5000		3000			2500
Moment of Inertia	[kg·m²x10⁻⁴]	27.96	46.56	27.96	46.56	73.85	106.7
	[gf·cm·s²]	28.53	47.51	28.53	47.51	75.36	108.9
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	32.59	54.33	39.43	59.89	93.27	120.15
Velocity, Position Detector	Standard	Serial Multi-Turn (19bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.5	17.4	12.5	17.4	25.12	33.8

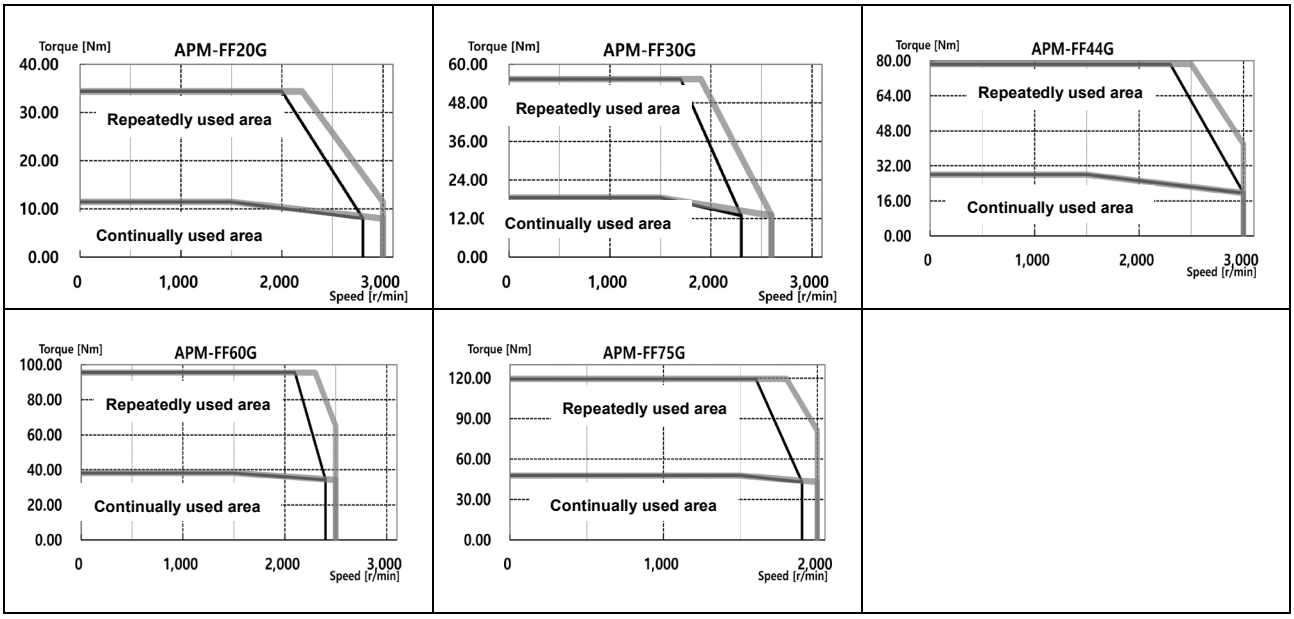
♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		FF20G	FF30G	FF44G	FF60G	FF75G	
Applicable Drive (L7PAxxx□)		L7PA020	L7PA035	L7PA050	L7PA075	L7PA075	
Rated Output	[kW]	1.8	2.9	4.4	6.0	7.5	
Rated Torque	[N·m]	11.45	18.46	28.00	38.20	47.70	
	[kgf·cm]	116.9	188.3	285.7	389.80	487.20	
Maximum Instantaneous Torque	[N·m]	34.35	55.38	78.4	95.50	119.3	
	[kgf·cm]	350.60	564.90	799.6	974.90	1,217.3	
Rated Current	A	12.16	15.98	30.70	35.14	35.26	
Peak Current	A	36.48	47.94	85.96	87.85	88.15	
Rated Rotation Velocity	[r/min]	1500					
Maximum Rotation Velocity	[r/min]	3000	2700	3000	2500	2200	
Moment of Inertia	[kg·m²x10⁻⁴]	27.96	46.56	73.85	106.70	131.30	
	[gf·cm·s²]	28.53	47.51	75.36	108.90	134.00	
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	46.92	73.14	106.15	136.73	173.63	
Velocity, Position Detector	Standard	Serial Multi-Turn (19bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.5	17.4	25.2	33.8	38.5	

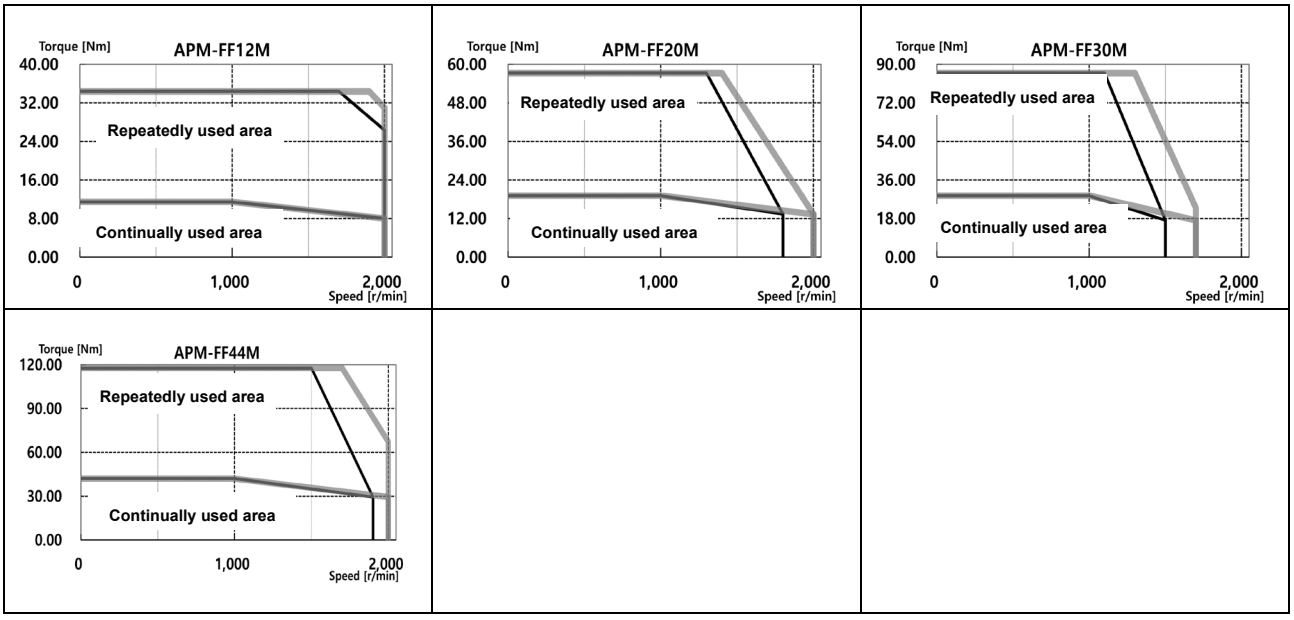
♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		FF12M	FF20M	FF30M	FF44M		
Applicable Drive (L7PAxxx□)		L7PA020		L7PA035	L7PA050		
Rated Output	[kW]	1.2	2.0	3.0	4.4		
Rated Torque	[N·m]	11.46	19.09	28.64	42.02		
	[kgf·cm]	116.9	194.8	292.2	428.7		
Maximum Instantaneous Torque	[N·m]	34.38	57.29	85.94	105.05		
	[kgf·cm]	350.70	584.40	876.60	1071.52		
Rated Current	A	11.01	12.96	16.58	30.60		
Peak Current	A	33.03	38.88	49.74	85.68		
Rated Rotation Velocity	[r/min]	1000					
Maximum Rotation Velocity	[r/min]	2000		1700	2000		
Moment of Inertia	[kg·m²x10⁻⁴]	27.96	46.56	73.85	106.7		
	[gf·cm·s²]	28.53	47.51	75.36	108.9		
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	46.94	78.27	111.04	165.38		
Velocity, Position Detector	Standard	Serial Multi-Turn (19bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.5	17.4	25.2	33.8		

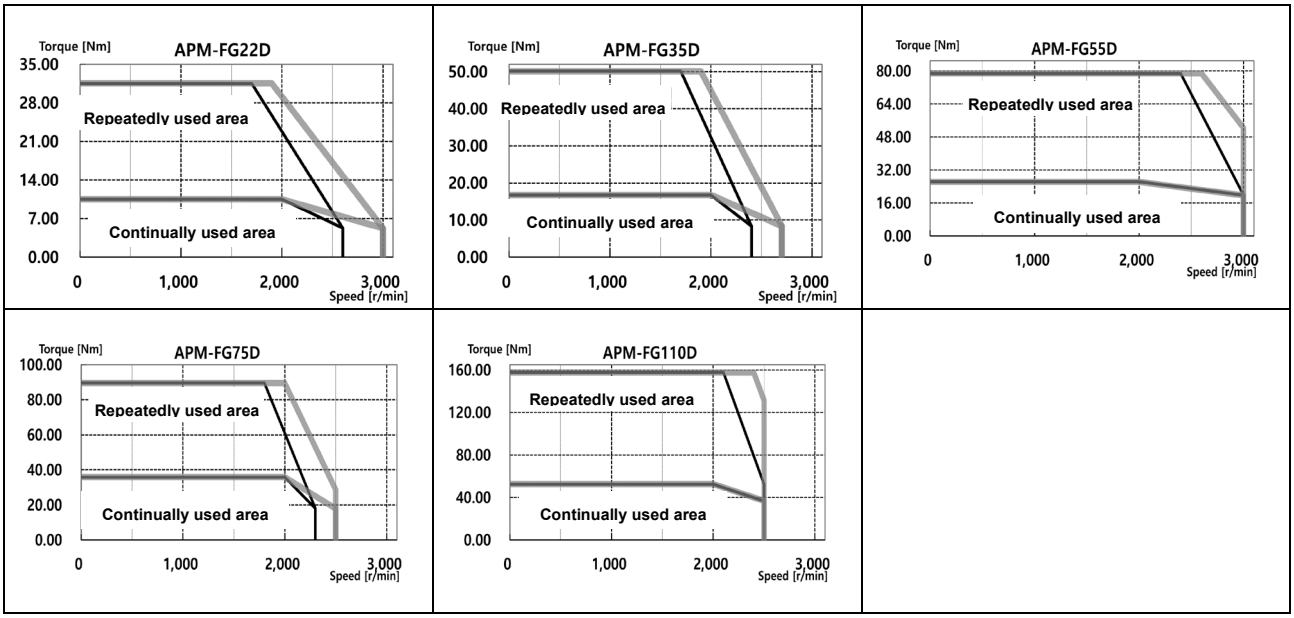
♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		FG22D	FG35D	FG55D	FG75D	FG110D	
Applicable Drive (L7PAxxx□)		L7PA020	L7PA035	L7PA050	L7PA075	L7PA150	
Rated Output	[kW]	2.2	3.5	5.5	7.5	11	
Rated Torque	[N·m]	10.50	16.71	26.25	35.81	52.52	
	[kgf·cm]	107.1	170.4	267.8	365.4	525.9	
Maximum Instantaneous Torque	[N·m]	31.51	50.12	78.76	89.53	157.55	
	[kgf·cm]	321.30	511.30	803.4	913.5	1,607.60	
Rated Current	A	10.25	14.67	29.74	30.17	51.39	
Peak Current	A	30.75	44.01	89.22	75.43	154.17	
Rated Rotation Velocity	[r/min]	2000					
Maximum Rotation Velocity	[r/min]	3000	2700	3000	2500		
Moment of Inertia	[kg·m²x10⁻⁴]	41.13	71.53	117.72	149.4	291.36	
	[gf·cm·s²]	41.97	72.99	120.12	152.45	297.31	
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	26.78	38.99	58.51	85.83	94.65	
Velocity, Position Detector	Standard	Serial Multi-Turn (19bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	15.4	20.2	28.12	33.45	66.2	

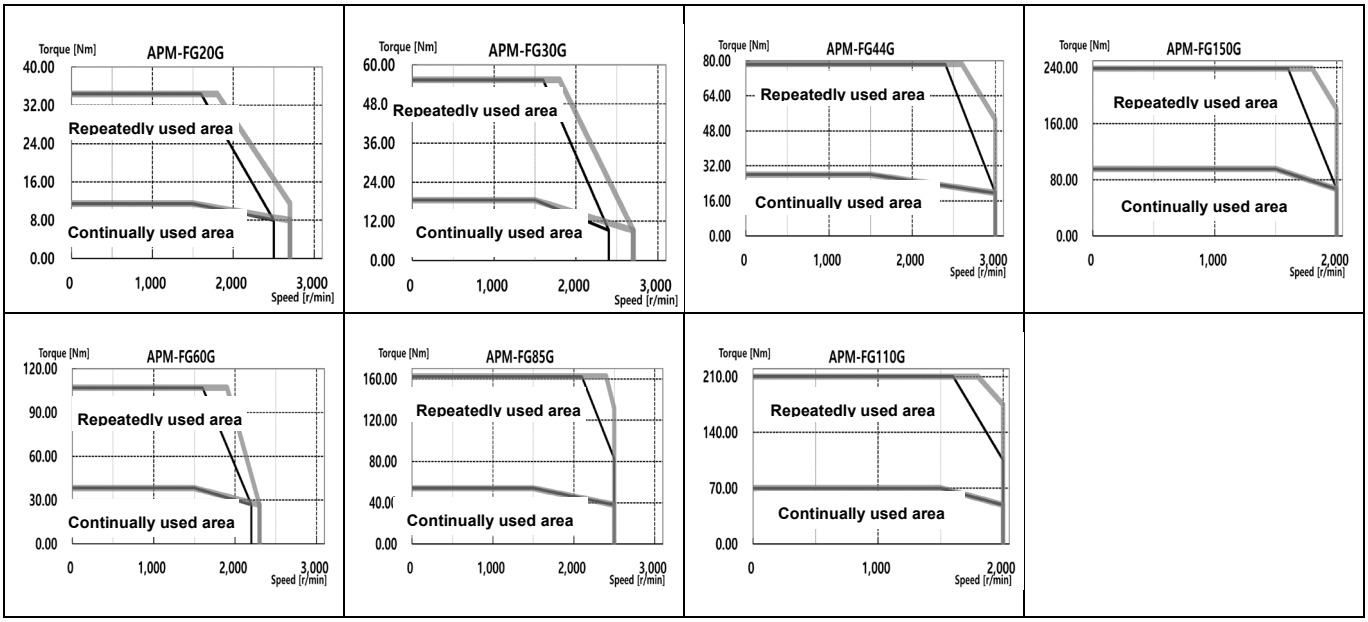
♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		FG20G	FG30G	FG44G	FG60G	FG85G	FG110G	FG150G
Applicable Drive (L7PAxxx□)		L7PA020	L7PA035	L7PA050	L7PA075	L7PA150		
Rated Output	[kW]	1.8	2.9	4.4	6.0	8.5	11	15
Rated Torque	[N·m]	11.50	18.50	28.00	38.2	54.11	69.99	95.45
	[kgf·cm]	116.9	188.4	285.8	389.7	552.1	714.2	974
Maximum Instantaneous Torque	[N·m]	34.40	55.40	78.4	95.5	162.32	209.97	238.63
	[kgf·cm]	350.80	565.1	800.24	974.3	1,656.30	2,142.60	2,435
Rated Current	A	11.18	16.21	31.72	32.18	52.94	59.3	75.6
Peak Current	A	33.54	48.63	88.82	96.54	158.82	177.9	189
Rated Rotation Velocity	[r/min]	1500						
Maximum Rotation	[r/min]	2700	2700	3000	2500	2500	2000	2000
Moment of Inertia	[kg·m²x10⁻⁴]	14.13	71.53	117.72	149.4	291.36	291.36	424.57
	[gf·cm·s²]	41.97	72.99	120.12	152.45	297.31	297.31	416.08
Permitted Load Inertia		Motor inertia x 5						
Rated Power Rate	[kW/s]	31.91	47.66	66.64	97.63	100.48	168.27	223.44
Velocity, Position Detector	Standard	Serial Multi-Turn (19bit)						
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)						
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·						
	Time Rating	Continuous						
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C						
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)						
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas						
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)						
Weight	[kg]	15.4	20.2	28	33.5	66.2	66.3	92.2

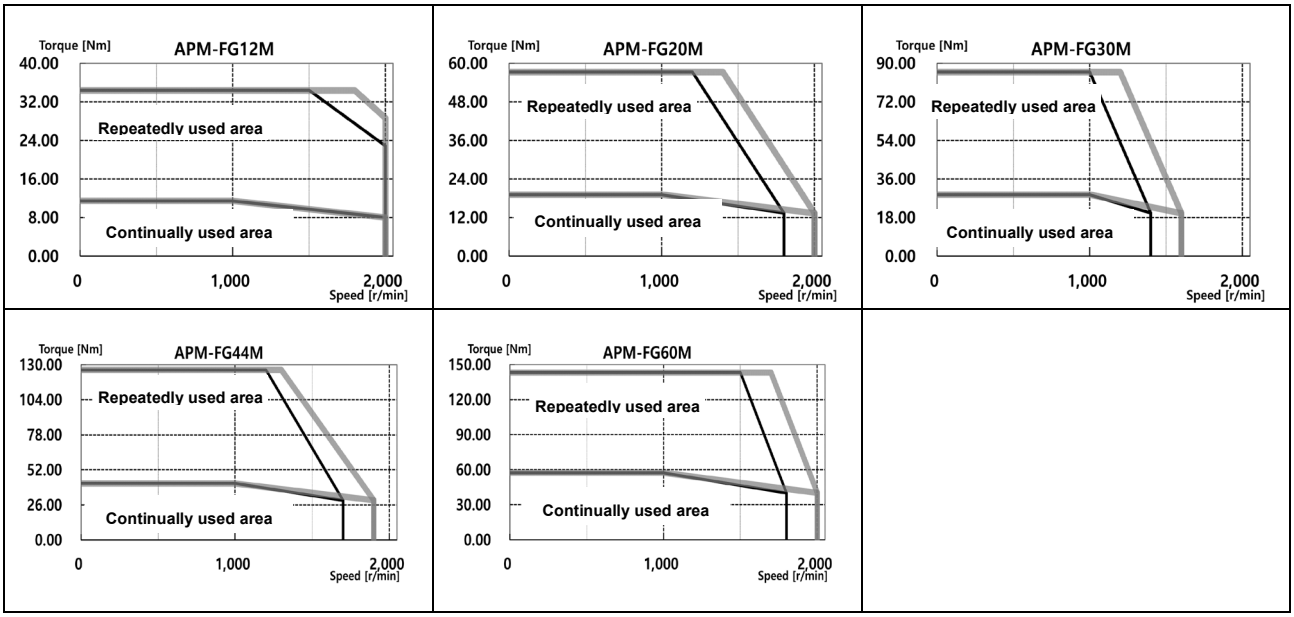
♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		FG12M	FG20M	FG30M	FG44M	FG60M	
Applicable Drive (L7PAxxx□)		L7PA020		L7PA035	L7PA050	L7PA075	
Rated Output	[kW]	1.2	2.0	3.0	4.4	6.0	
Rated Torque	[N·m]	11.50	19.10	28.60	42.00	57.29	
	[kgf·cm]	116.9	194.9	292.3	428.7	584.6	
Maximum Instantaneous Torque	[N·m]	34.40	57.30	85.90	126.00	143.2	
	[kgf·cm]	350.8	584.6	876.9	128.61	1,432.4	
Rated Current	A	11.28	13.10	15.52	27.26	39.32	
Peak Current	A	33.84	39.3	46.56	81.78	98.30	
Rated Rotation Velocity	[r/min]	1000					
Maximum Rotation Velocity	[r/min]	2000		1600	1900	2000	
Moment of Inertia	[kg·m²x10⁻⁴]	41.13	71.53	117.72	149.40	291.36	
	[gf·cm·s²]	41.97	72.99	120.12	152.45	297.31	
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	31.91	51.00	69.70	118.14	112.65	
Velocity, Position Detector	Standard	Serial Multi-Turn (19bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	15.4	20.2	28.0	33.5	66.2	

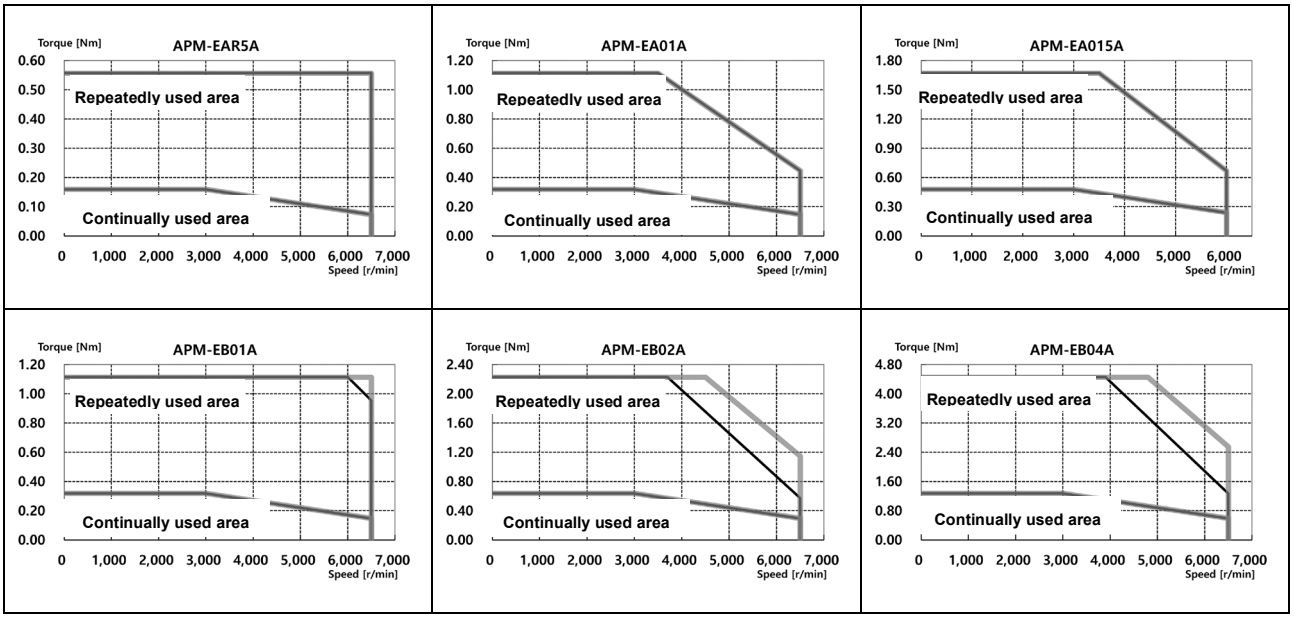
♦Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		EAR5A	EA01A	EA015A	EB01A	EB02A	EB04A
Applicable Drive (L7PAxxx□)		L7PA001		L7PA002	L7PA001	L7PA002	L7PA004
Rated Output	[kW]	0.05	0.10	0.15	0.10	0.20	0.40
Rated Torque	[N·m]	0.16	0.32	0.48	0.32	0.64	1.27
	[kgf·cm]	1.62	3.25	4.87	3.25	6.49	12.99
Maximum Instantaneous Torque	[N·m]	0.48	0.96	1.43	0.96	1.91	3.82
	[kgf·cm]	4.87	9.74	14.62	9.74	19.48	38.96
Rated Current	$[A]_{\Phi.ac.rms}$	1.17	1.10	1.21	1.15	1.37	2.65
Peak Current	$[A]_{\Phi.ac.rms}$	3.51	3.3	3.63	3.45	4.11	7.95
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	$[kg·m^2x10^{-4}]$	0.038	0.071	0.123	0.172	0.309	0.584
	$[gf·cm·s^2]$	0.039	0.072	0.125	0.176	0.315	0.596
Permitted Load Inertia		Motor inertia x 30			Motor inertia x 20		x15
Rated Power Rate	[kW/s]	6.68	14.31	18.61	5.89	13.10	27.78
Velocity, Position Detector	Stanadard	Serial Multi-Turn Built-in Type(23Bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP67 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	0.26	0.37	0.55	0.59	0.76	1.10

♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**

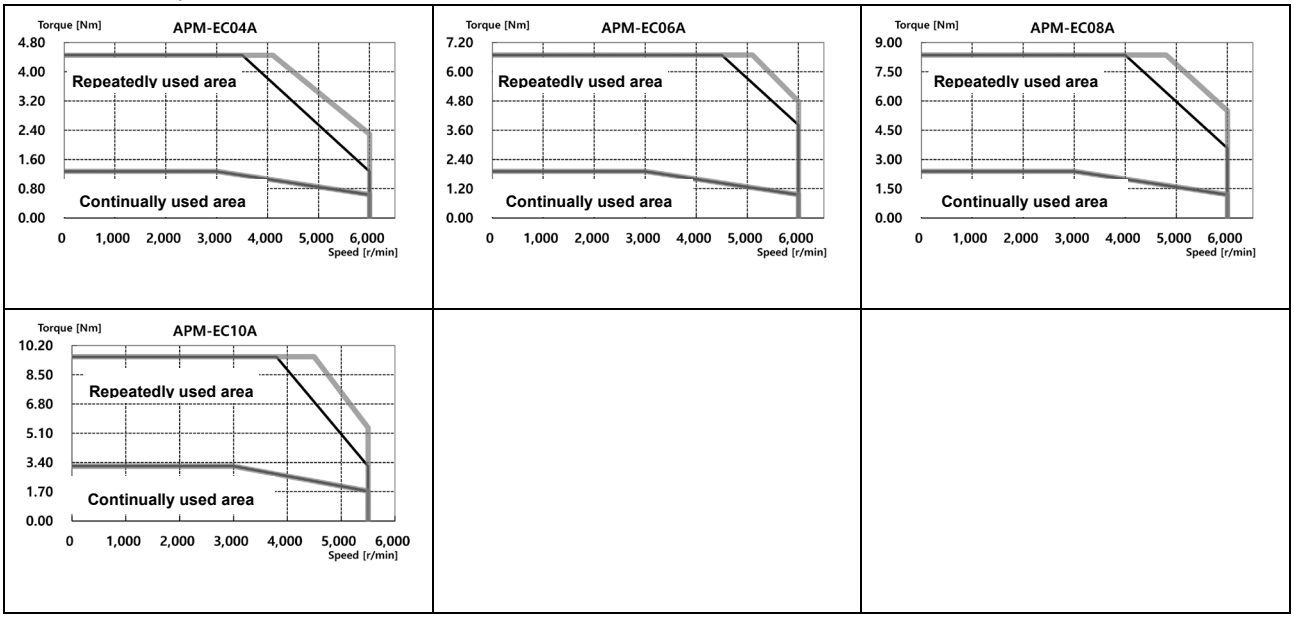


1) For EA products, the usage area is the same regardless of the input voltage (200/230V).

■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		EC04A	EC06A	EC08A	EC10A		
Applicable Drive (L7PA□□)		L7PA004	L7PA008	L7PA008	L7PA010		
Rated Output	[kW]	0.4	0.6	0.75	1.0		
Rated Torque	[N·m]	1.27	1.91	2.39	3.18		
	[kgf·cm]	12.99	19.49	24.36	32.48		
Maximum Instantaneous Torque	[N·m]	3.82	5.73	7.16	9.55		
	[kgf·cm]	38.98	58.47	73.08	97.44		
Rated Current	[A]Φ.ac.rms	2.52	4.29	4.63	5.30		
Peak Current	[A]Φ.ac.rms	7.56	12.87	13.89	15.91		
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	[kg·m²x10⁻⁴]	0.861	1.410	1.567	2.352		
	[gf·cm·s²]	0.879	1.439	1.599	2.400		
Permitted Load Inertia		Motor inertia x 15			x10		
Rated Power Rate	[kW/s]	18.82	25.86	36.36	43.08		
Velocity, Position Detector	34TStandard	Serial Multi-Turn Built-in Type(23Bit)					
	34TOption	33T Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	34TProtection	Fully enclosed self-cooling IP67 (excluding shaft penetration part)·					
	34TTime Rating	Continuous					
	34TAmbient	34TOperating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	34TAmbient	34TUse humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	34TAtmosphere	No direct sunlight, corrosive gas, or combustible gas					
	34TAnti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	1.41	1.86	2.00	2.69		

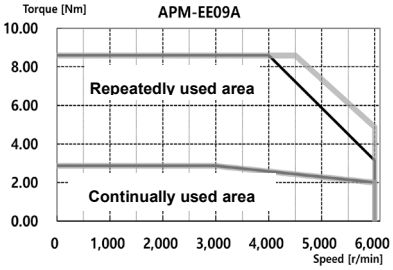
♦ Rotation velocity - Torque characteristics [■: 3-phase AC200V , ■: 3-phase AC230V]

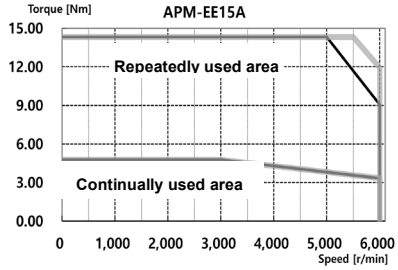


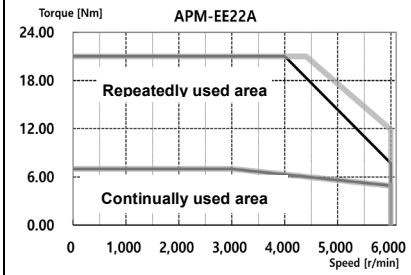
■ Product Features [200V]

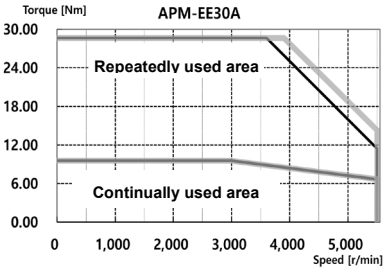
Servo Motor Type (APM-□□□□□)		EE09A	EE15A	EE22A	EE30A		
Applicable Drive (L7PA□□)		L7PA010	L7PA020		L7PA035		
Rated Output	[kW]	0.9	1.5	2.2	3.0		
Rated Torque	[N·m]	2.86	4.77	7.00	9.55		
	[kgf·cm]	29.20	48.70	71.40	97.40		
Maximum Instantaneous Torque	[N·m]	8.59	14.32	21.01	28.65		
	[kgf·cm]	87.70	146.10	214.3	292.20		
Rated Current	[A]	6.17	10.96	12.08	14.29		
Peak Current	[A]	18.51	32.88	36.24	42.87		
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	6000			5500		
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.04	27.14	39.93	56.46		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**





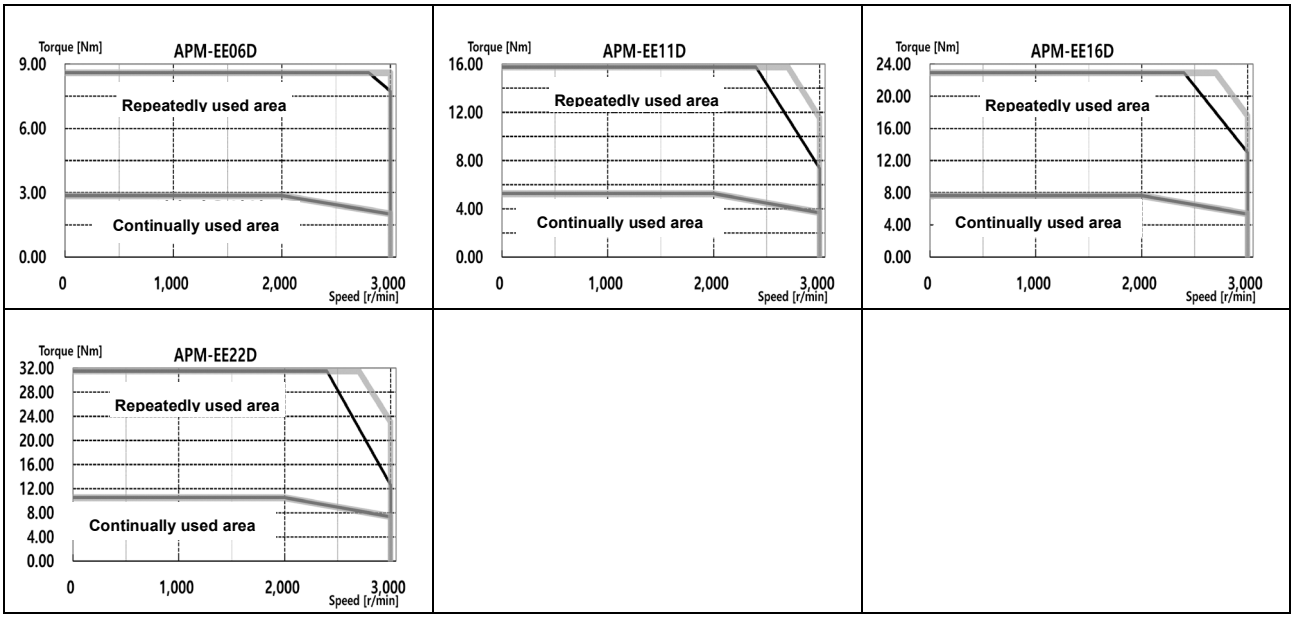




■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		EE06D	EE11D	EE16D	EE22D		
Applicable Drive (L7PA□□)		L7PA008	L7PA010	L7PA020			
Rated Output	[kW]	0.6	1.1	1.6	2.2		
Rated Torque	[N·m]	2.86	5.25	7.64	10.50		
	[kgf·cm]	29.23	53.59	77.95	107.19		
Maximum Instantaneous Torque	[N·m]	8.59	15.76	22.92	31.51		
	[kgf·cm]	87.7	160.78	233.86	321.56		
Rated Current	[A]	4.29	5.73	8.86	10.94		
Peak Current	[A]	12.87	17.19	26.58	32.82		
Rated Rotation Velocity	[r/min]	2000					
Maximum Rotation Velocity	[r/min]	3000					
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.04	32.84	47.53	68.32		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

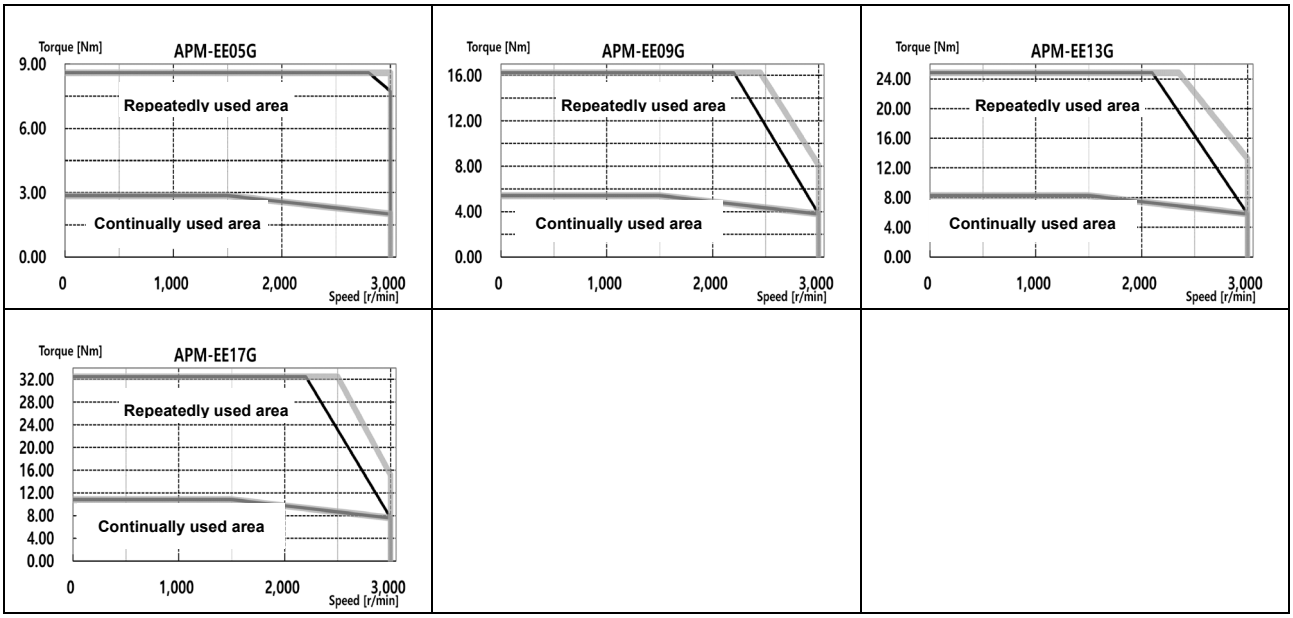
♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		EE05G	EE09G	EE13G	EE17G		
Applicable Drive (L7PA□□)		L7PA008	L7PA010	L7PA020			
Rated Output	[kW]	0.45	0.85	1.3	1.7		
Rated Torque	[N·m]	2.86	5.41	8.27	10.82		
	[kgf·cm]	29.22	55.19	84.41	110.38		
Maximum Instantaneous Torque	[N·m]	8.59	16.23	24.82	32.46		
	[kgf·cm]	87.66	165.57	253.23	331.14		
Rated Current	[A]	4.19	5.98	9.66	11.49		
Peak Current	[A]	12.57	17.94	28.98	34.47		
Rated Rotation Velocity	[r/min]	1500					
Maximum Rotation Velocity	[r/min]	3000					
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.04	34.86	55.78	72.52		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

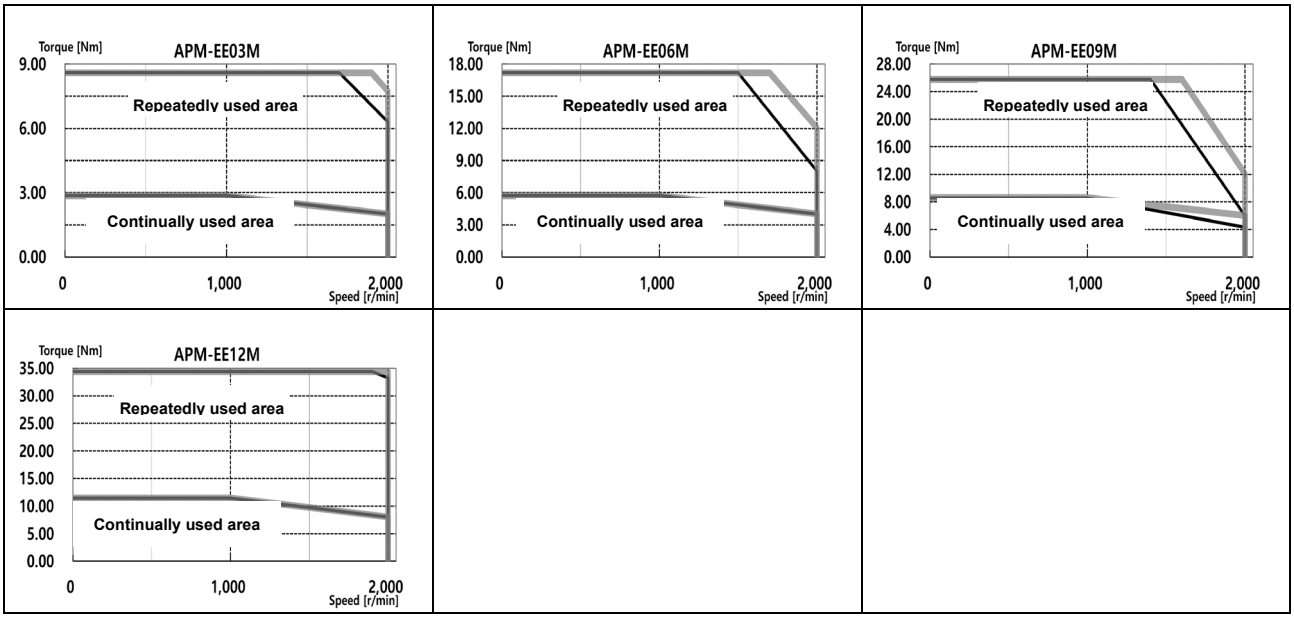
♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**



■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		EE03M	EE06M	EE09M	EE12M		
Applicable Drive (L7PA□□)		L7PA004	L7PA008	L7PA010	L7PA020		
Rated Output	[kW]	0.3	0.6	0.9	1.2		
Rated Torque	[N·m]	2.86	5.73	8.59	11.46		
	[kgf·cm]	29.23	58.47	87.7	116.93		
Maximum Instantaneous Torque	[N·m]	8.59	17.19	25.78	34.38		
	[kgf·cm]	87.70	175.4	263.09	350.79		
Rated Current	[A]	2.71	4.22	5.73	10.07		
Peak Current	[A]	8.13	12.66	17.19	30.21		
Rated Rotation Velocity	[r/min]	1000					
Maximum Rotation Velocity	[r/min]	2000					
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.04	39.08	60.15	81.31		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

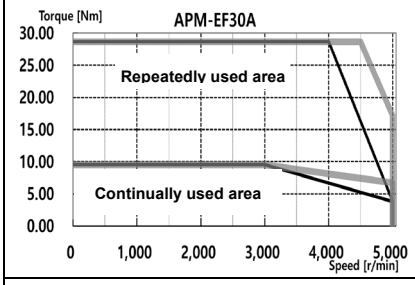
♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , ■: 3-phase AC230V**]**

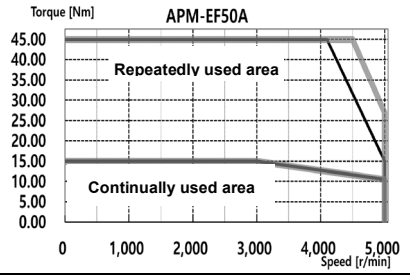


■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		EF30A	EF50A				
Applicable Drive (L7PA□□)		L7PA035	L7PA050				
Rated Output	[kW]	3.0	4.7				
Rated Torque	[N·m]	9.55	14.96				
	[kgf·cm]	97.44	152.66				
Maximum Instantaneous Torque	[N·m]	28.65	44.88				
	[kgf·cm]	292.33	457.98				
Rated Current	[A]	15.31	24.6				
Peak Current	[A]	45.93	73.8				
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82				
	[gf·cm·s²]	29.02	40.633				
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	32.06	56.21				
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1				

♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**

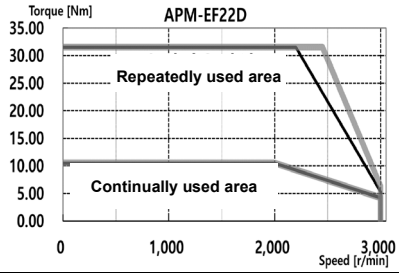


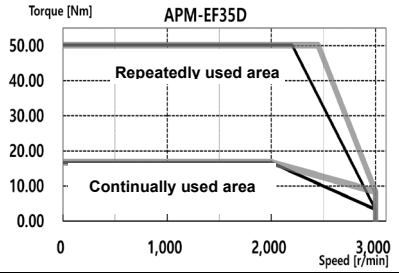


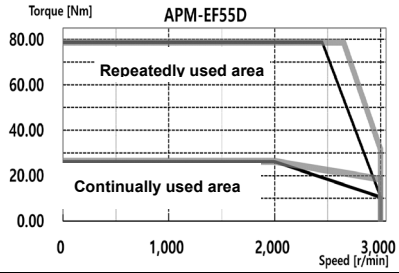
■ Product Features [200V]

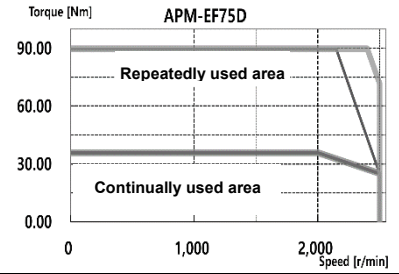
Servo Motor Type (APM-□□□□□)		EF22D	EF35D	EF55D	EF75D		
Applicable Drive (L7PA□□)		L7PA020	L7PA035	L7PA050	L7PA075		
Rated Output	[kW]	2.2	3.5	5.5	7.5		
Rated Torque	[N·m]	10.50	16.71	26.26	35.81		
	[kgf·cm]	107.19	170.52	267.96	365.41		
Maximum Instantaneous Torque	[N·m]	31.51	50.13	65.65	89.52		
	[kgf·cm]	321.56	511.57	669.91	913.52		
Rated Current	[A]	10.45	16.22	26.63	31.27		
Peak Current	[A]	31.35	48.66	66.58	78.18		
Rated Rotation Velocity	[r/min]	2000					
Maximum Rotation Velocity	[r/min]	3000			2500		
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82	63.37	91.99		
	[gf·cm·s²]	29.02	40.633	64.663	93.867		
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	38.80	70.13	108.82	139.40		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1	20.8	27.7		

♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V , ■: 3-phase AC230V]**





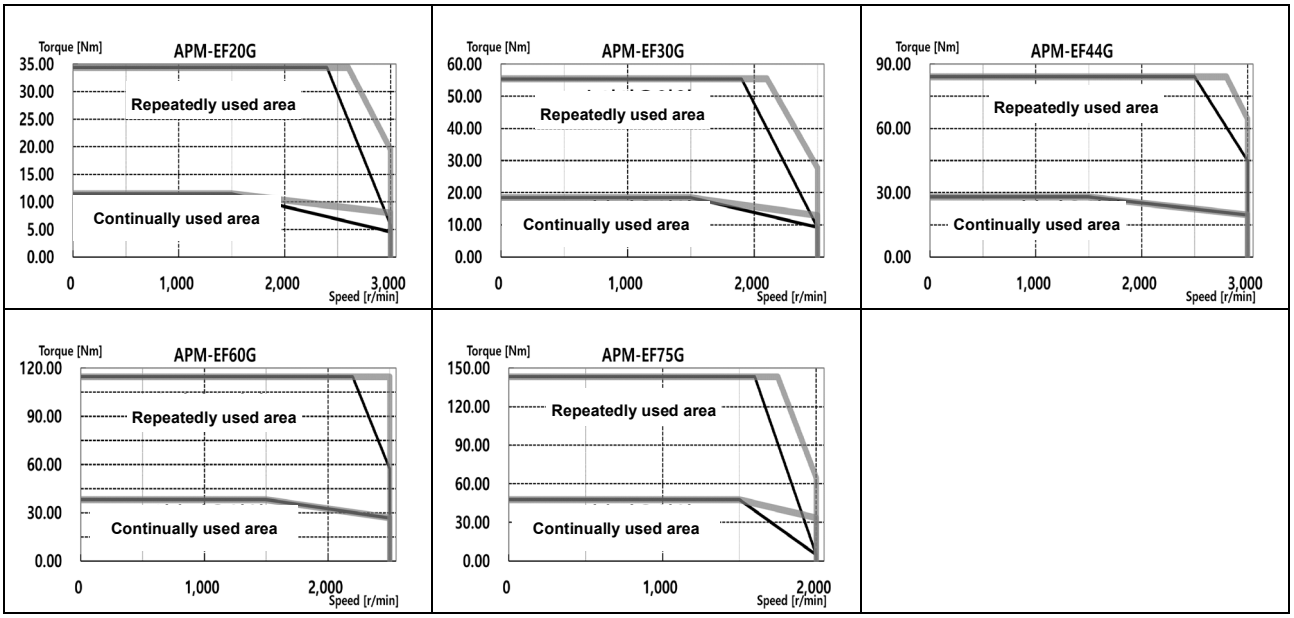




■ Product Features [200V]

Servo Motor Type (APM-□□□□□)		EF20G	EF30G	EF44G	EF60G	EF75G	
Applicable Drive (L7PA□□)		L7PA020	L7PA035	L7PA050	L7PA075	L7PA075	
Rated Output	[kW]	1.8	2.9	4.4	6	7.5	
Rated Torque	[N·m]	11.46	18.46	28.01	38.2	47.75	
	[kgf·cm]	116.93	188.39	285.83	389.77	487.21	
Maximum Instantaneous Torque	[N·m]	34.38	55.39	84.03	95.49	143.24	
	[kgf·cm]	350.79	565.16	857.49	974.42	1461.63	
Rated Current	[A]	11.21	15.05	28.66	34	30.45	
Peak Current	[A]	33.63	45.15	85.98	85	91.35	
Rated Rotation Velocity	[r/min]	1500					
Maximum Rotation Velocity	[r/min]	3000	2500	3000	2500	2000	
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82	63.37	91.99	106.65	
	[gf·cm·s²]	29.02	40.633	64.663	93.867	108.827	
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	46.17	85.6	123.82	158.61	213.76	
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1	20.8	27.7	32	

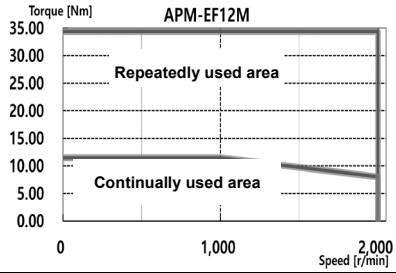
♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**

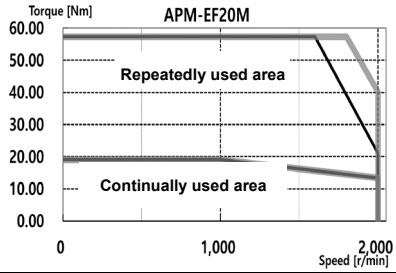


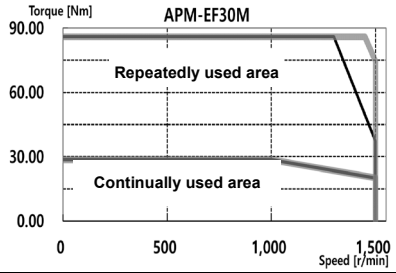
■ Product Features [200V]

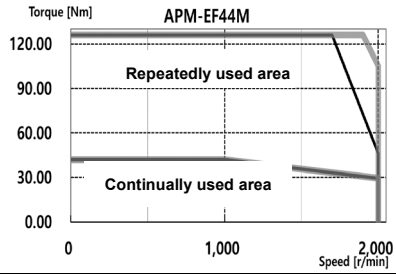
Servo Motor Type (APM-□□□□□)		EF12M	EF20M	EF30M	EF44M		
Applicable Drive (L7PA□□)		L7PA020		L7PA035	L7PA050		
Rated Output	[kW]	1.2	2.0	3.0	4.4		
Rated Torque	[N·m]	11.46	19.10	28.65	42.02		
	[kgf·cm]	116.93	194.88	292.33	428.74		
Maximum Instantaneous Torque	[N·m]	34.38	57.30	85.94	126.05		
	[kgf·cm]	350.79	584.65	876.98	1286.23		
Rated Current	[A]	11.24	13.46	15.53	29.77		
Peak Current	[A]	33.72	40.38	46.59	89.31		
Rated Rotation Velocity	[r/min]	1000					
Maximum Rotation Velocity	[r/min]	2000		1500	2000		
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82	63.37	91.99		
	[gf·cm·s²]	29.02	40.633	64.663	93.867		
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	46.17	91.6	129.51	191.91		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1	20.8	27.7		

♦ Rotation velocity - Torque characteristics **[■: 3-phase AC200V** , **■: 3-phase AC230V]**





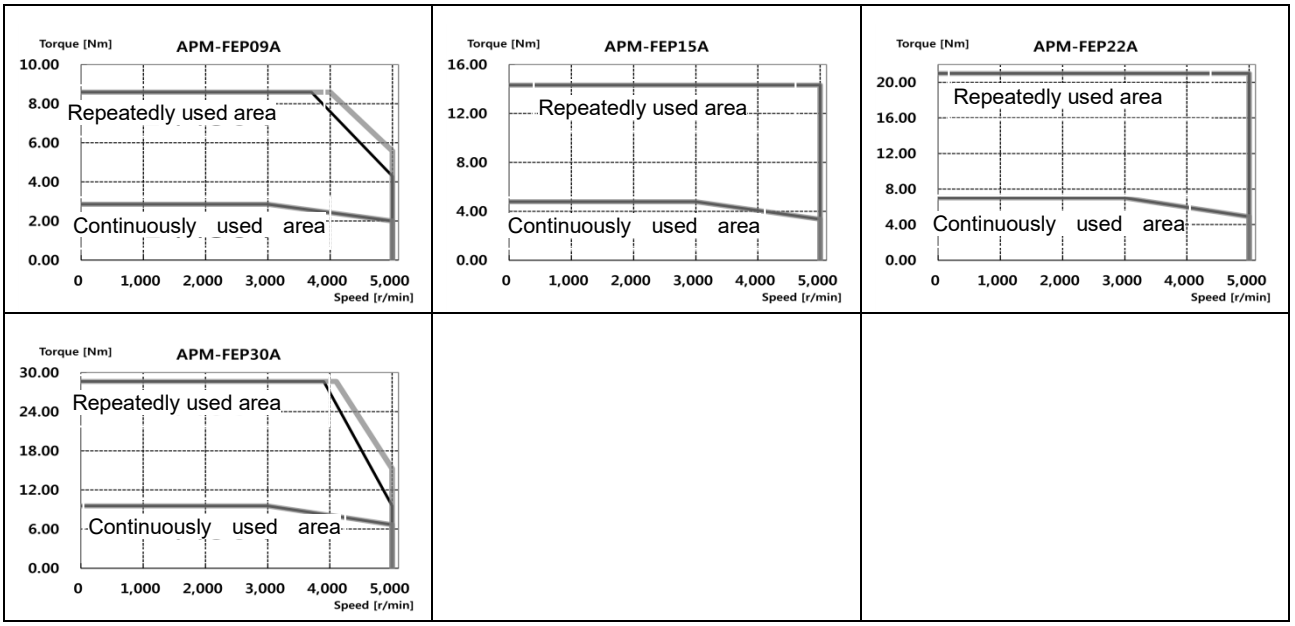




■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FEP09A	FEP15A	FEP22A	FEP30A	-	-
Applicable Drive(L7**PBxxx**□)		**L7PB010**	**L7PB020**		**L7PB035**		
Rated output	[kW]	0.9	1.5	2.2	3.0		
Rated torque	[N·m]	2.86	4.77	7.00	9.55		
	[kgf·cm]	29.23	48.72	71.46	97.44		
Instantaneous maximum torque	[N·m]	8.59	14.32	21.01	28.65		
	[kgf·cm]	87.7	146.16	214.37	292.33		
Rated Current	[A]	3.47	6.68	7.64	9.94		
Maximum Current	[A]	10.40	20.03	22.92	29.81		
Rated rotation speed	[r/min]	3000					
Maximum rotation speed	[r/min]	5000					
Inertia moment	[kg·m2x10-4]	5.659	10.179	14.619	19. 040		
	[gf·cm·s2]	5.774	10.387	14.917	19.429		
Allowable load inertia		Motor inertia x 10					
Rated power rate	[kW/s]	14.50	22.40	33.55	47.89		
Speed Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	5.5	7.54	9.68	11.78		

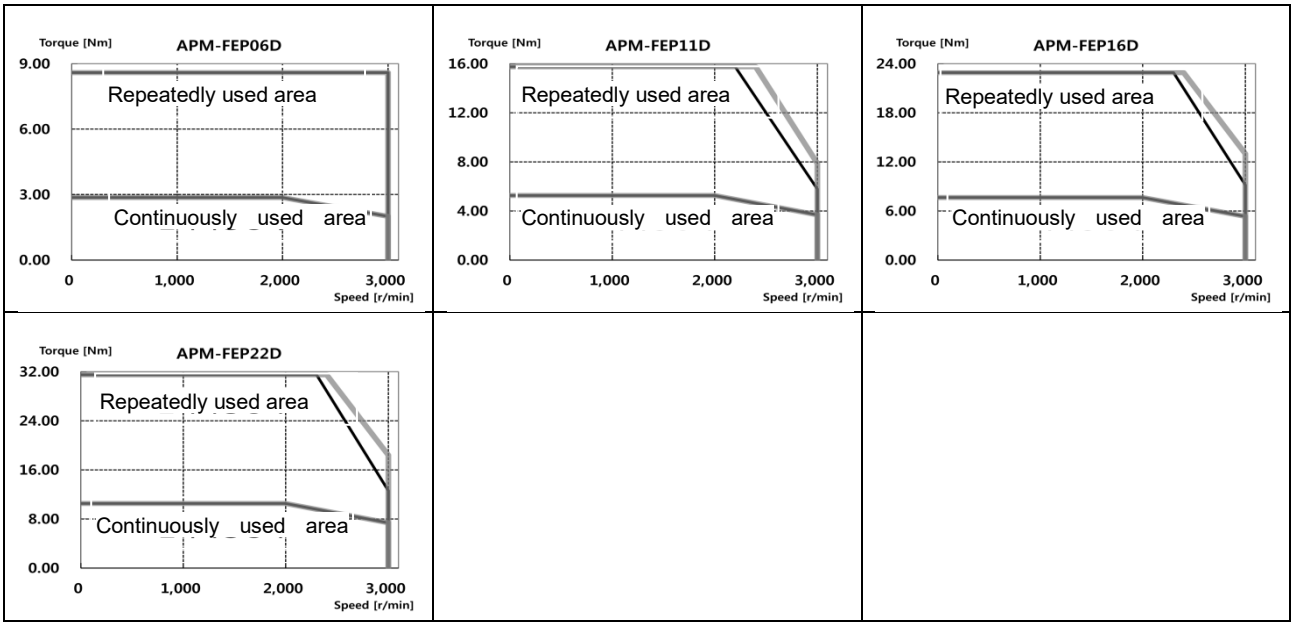
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FEP06D	FEP11D	FEP16D	FEP22D	-	-
Applicable Drive(L7**PBxxx**□)		**L7PB010**		**L7PB020**			
Rated output	[kW]	0.6	1.1	1.6	2.2		
Rated torque	[N·m]	2.86	5.25	7.64	10.5		
	[kgf·cm]	29.23	53.59	77.95	107.19		
Instantaneous maximum torque	[N·m]	8.59	15.76	22.92	31.51		
	[kgf·cm]	87.7	160.78	233.86	321.56		
Rated Current	[A]	3.28	3.40	4.97	6.80		
Maximum Current	[A]	9.83	10.19	14.92	20.04		
Rated rotation speed	[r/min]	2000		2000			
Maximum rotation speed	[r/min]	3000		3000			
Inertia moment	[kg·m2x10-4]	5.659	10.179	14.619	19.040		
	[gf·cm·s2]	5.774	10.387	14.917	19.429		
Allowable load inertia		Motor inertia x 10					
Rated power rate	[kW/s]	14.50	27.10	39.92	57.95		
Speed Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	5.5	7.54	9.68	11.78		

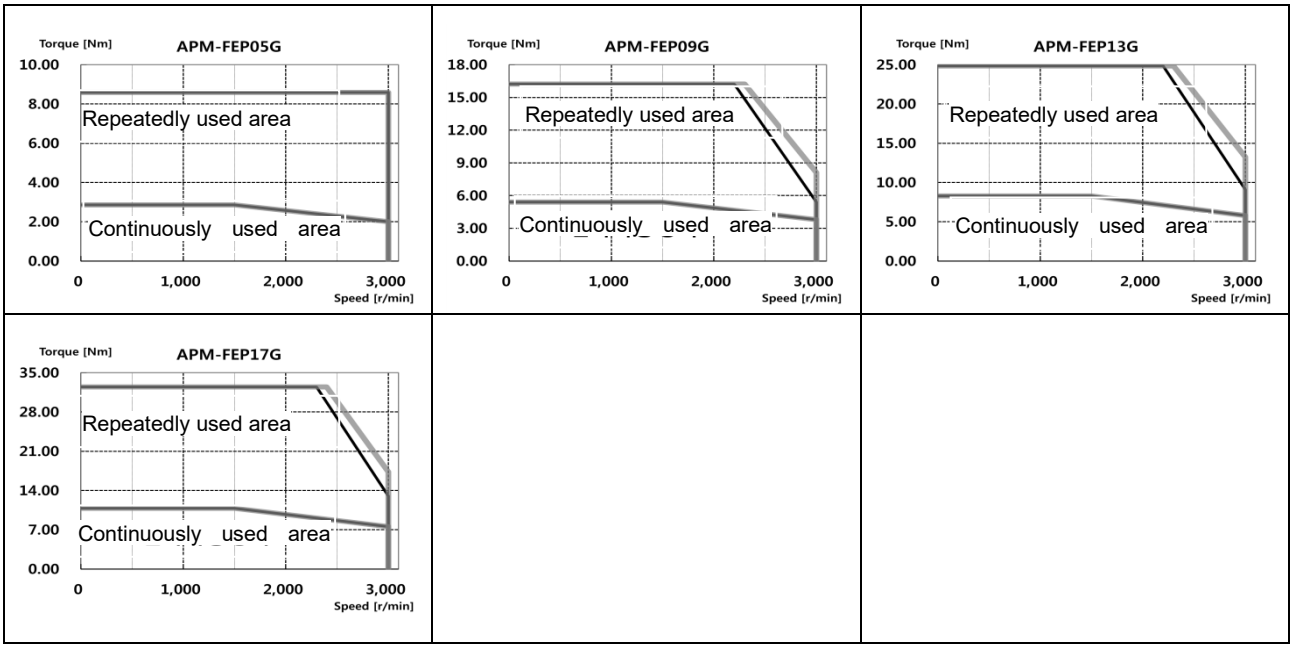
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FEP05G	FEP09G	FEP13G	FEP17G	-	-
Applicable Drive(L7**PBxxx**□)		**L7PB010**		**L7PB020**			
Rated output	[kW]	0.45	0.85	1.3	1.7		
Rated torque	[N·m]	2.86	5.41	8.28	10.82		
	[kgf·cm]	29.23	55.22	84.45	110.43		
Instantaneous maximum torque	[N·m]	8.59	16.23	24.83	32.47		
	[kgf·cm]	87.70	165.65	253.35	331.30		
Rated Current	[A]	3.28	3.50	5.39	7.01		
Maximum Current	[A]	9.83	10.50	16.16	21.02		
Rated rotation speed	[r/min]	1500					
Maximum rotation speed	[r/min]	3000					
Inertia moment	[kg·m2x10-4]	5.659	10.179	14.619	19.040		
	[gf·cm·s2]	5.774	10.387	14.917	19.429		
Allowable load inertia		Motor inertia x 10					
Rated power rate	[kW/s]	14.50	28.77	46.85	61.52		
Speed, Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	5.5	7.54	9.68	11.78		

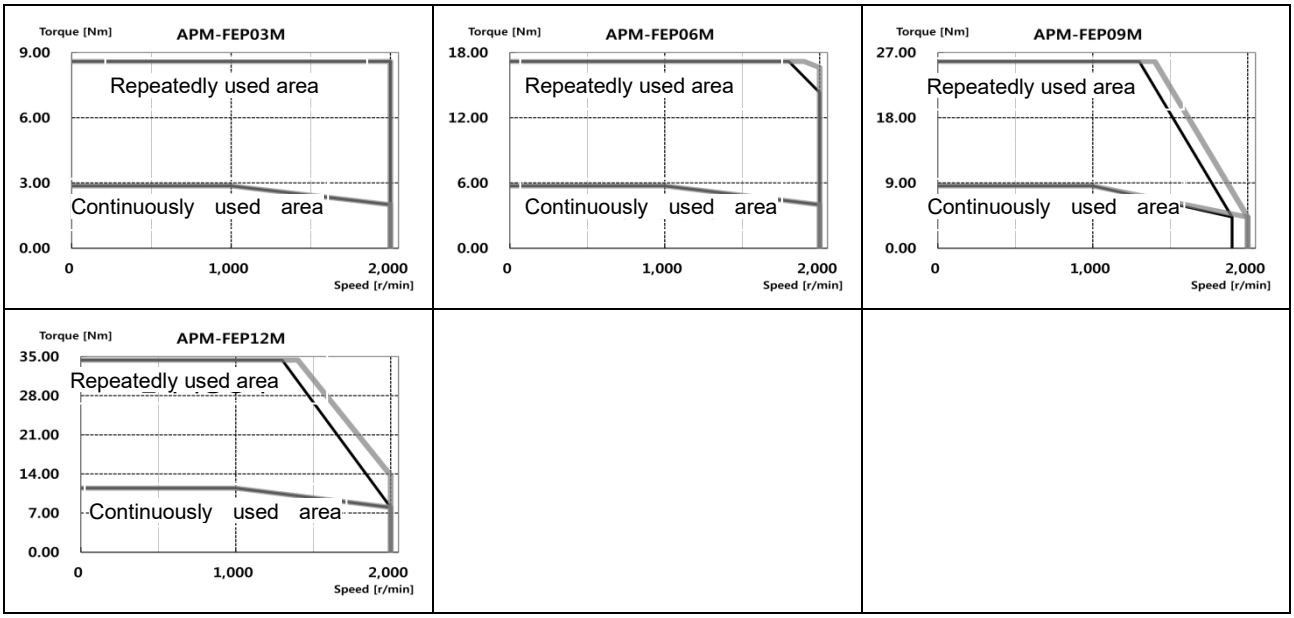
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FEP03M	FEP06M	FEP09M	FEP12M	-	-
Applicable Drive(L7PBxxx□)			L7PB010		L7PB035		
Rated output	[kW]	0.3	0.6	0.9	1.2		
Rated torque	[N·m]	2.86	5.73	8.59	11.46		
	[kgf·cm]	29.23	58.47	87.70	116.93		
Instantaneous maximum torque	[N·m]	8.59	17.19	25.78	34.38		
	[kgf·cm]	87.70	175.40	263.09	350.79		
Rated Current	[A]	3.28	3.28	3.33	4.87		
Maximum	[A]	9.83	9.83	9.99	14.60		
Rated rotation speed	[r/min]		1000				
Maximum rotation speed	[r/min]		2000				
Inertia moment	[kg·m2x10-4]	5.659	10.179	14.619	19.040		
	[gf·cm·s2]	5.774	10.387	14.917	19.429		
Allowable load inertia			Motor inertia x 10				
Rated power	[kW/s]	14.50	32.25	50.53	68.97		
Speed, Position detector	Standard		Serial Type 19 [bit]				
	Option		X				
Specifications and features	Method of protection		Fully closed·self-cooling IP65 (excluding axis penetration)				
	Time rating		Continuous				
	Ambient temperature		Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]				
	Ambient humidity		Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)				
	Atmosphere		No direct sunlight, corrosive gas, or combustible gas				
	Anti-vibration		Vibration acceleration 49[m/s2](5G)				
Weight	[kg]	5.5	7.54	9.68	11.78		

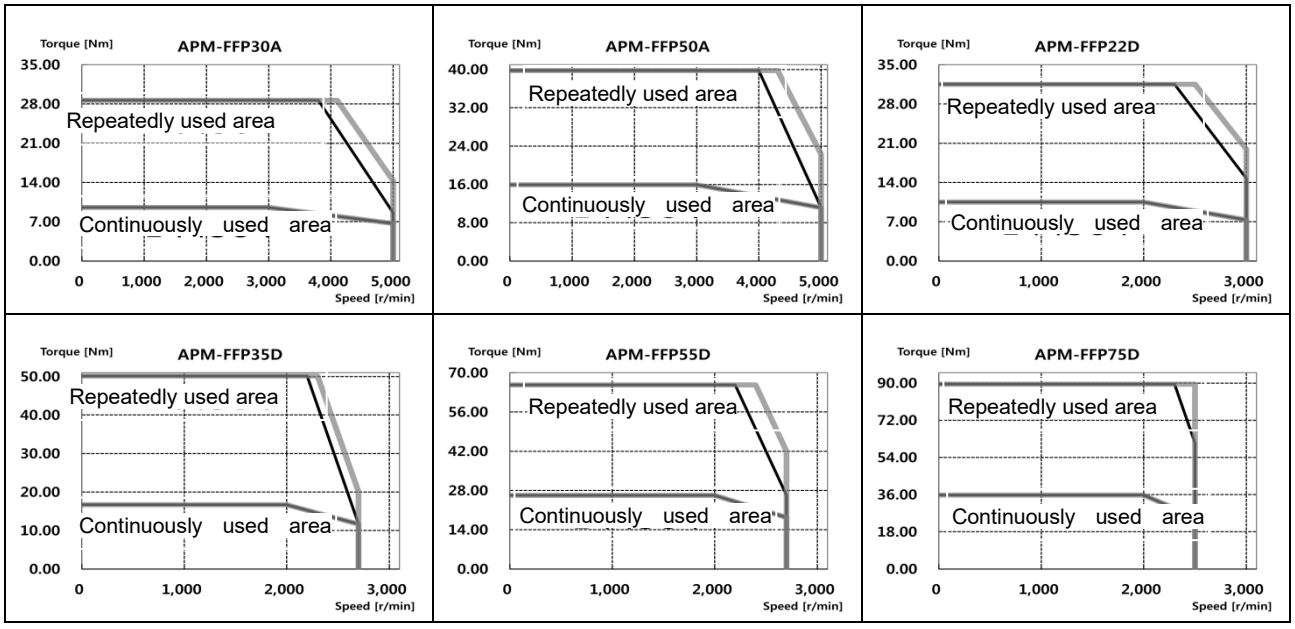
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FFP30A	FFP50A	FFP22D	FFP35D	FFP55D	FFP75D
Applicable Drive(L7**PBxxx**□)		**L7PB035**	**L7PB075**	**L7PB020**	**L7PB035**	**L7PB050**	**L7PB075**
Rated output	[kW]	3.0	5.0	2.2	3.5	5.5	7.5
Rated torque	[N·m]	9.55	15.92	10.50	16.71	26.26	35.81
	[kgf·cm]	97.44	162.40	107.19	170.52	267.96	365.41
Instantaneous maximum torque	[N·m]	28.65	39.79	31.51	50.13	65.65	89.52
	[kgf·cm]	292.33	406.01	321.56	511.57	669.84	913.52
Rated Current	[A]	9.79	16.07	6.93	9.09	14.70	18.97
Maximum Current	[A]	29.38	40.18	20.80	27.26	36.75	47.42
Rated rotation speed	[r/min]	3000		2000			
Maximum rotation speed	[r/min]	5000		3000	2800	2700	2500
Inertia moment	[kg·m2x10-4]	27.960	46.560	27.960	46.560	73.850	106.730
	[gf·cm·s2]	28.531	47.510	28.531	47.510	75.357	108.908
Allowable load inertia		Motor inertia x 5					
Rated power rate	[kW/s]	32.61	54.40	39.46	59.98	93.38	120.15
Speed, Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	12.4	17.7	12.4	17.7	26.3	35.6

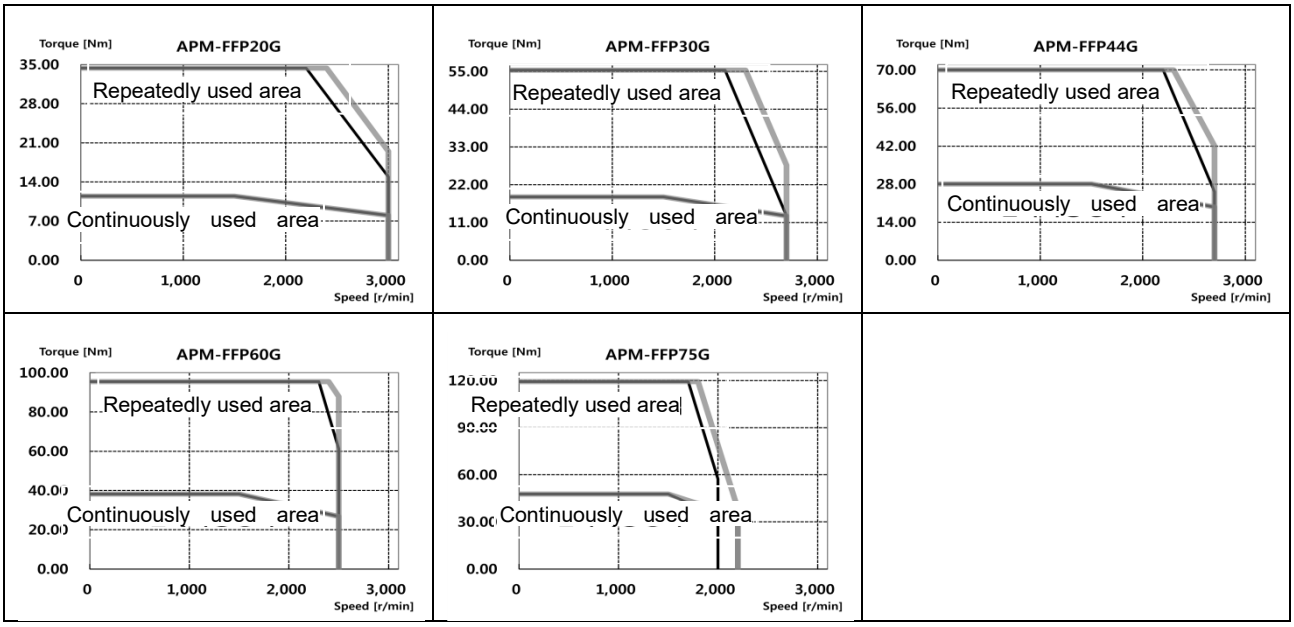
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FFP20G	FFP30G	FFP44G	FFP60G	FFP75G	-
Applicable Drive(L7**PBxxx**□)		**L7PB020**	**L7PB035**	**L7PB050**	**L7PB075**		
Rated output	[kW]	1.8	2.9	4.4	6.0	7.5	
Rated torque	[N·m]	11.46	18.46	28.01	38.20	47.75	
	[kgf·cm]	116.93	188.39	285.83	389.77	487.21	
Instantaneous maximum torque	[N·m]	34.38	55.39	70.02	95.49	119.37	
	[kgf·cm]	350.79	565.16	714.48	974.42	1218.02	
Rated Current	[A]	7.56	10.04	15.68	20.23	20.01	
Maximum Current	[A]	22.69	30.12	39.20	50.58	50.03	
Rated rotation speed	[r/min]	1500					
Maximum rotation speed	[r/min]	3000	2700	2700	2500	2200	
Inertia moment	[kg·m2x10-4]	27.960	46.560	73.850	106.730	131.290	
	[gf·cm·s2]	28.531	47.510	85.306	108.908	133.969	
Allowable load inertia		Motor inertia x 5					
Rated power rate	[kW/s]	46.96	73.21	106.25	136.70	173.64	
Speed, Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	12.4	17.7	26.3	35.6	39.4	

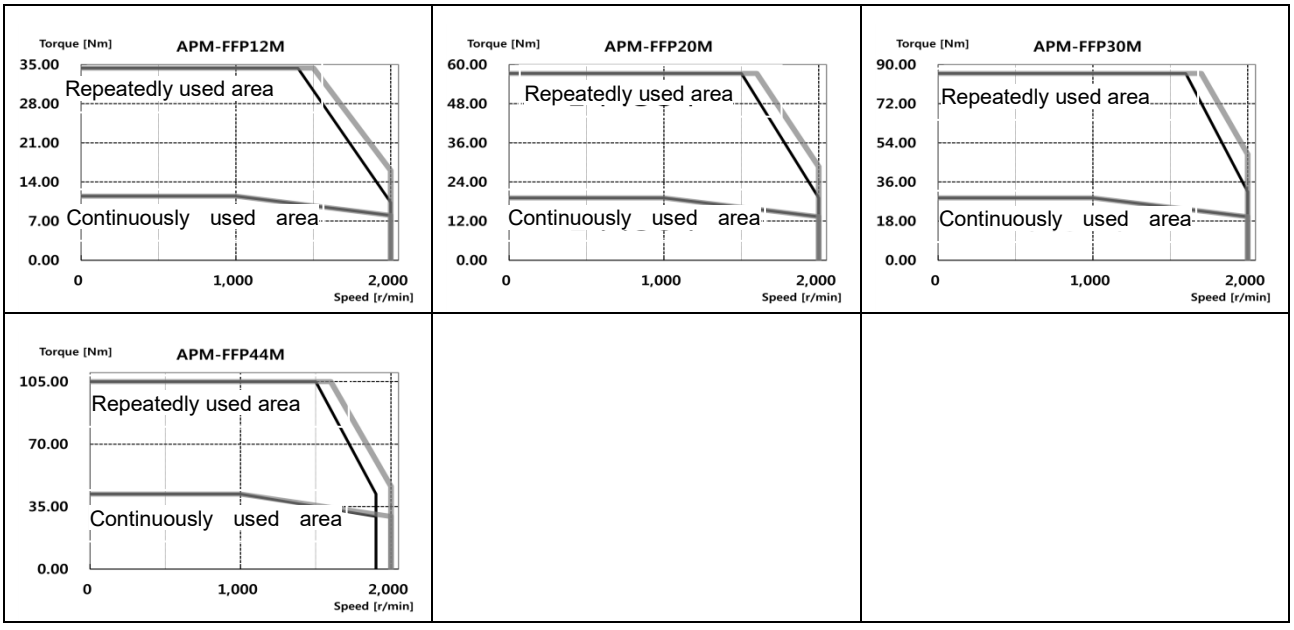
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FFP12M	FFP20M	FFP30M	FFP44M	-	-
Applicable Drive(L7**PBxxx**□)		**L7PB020**		**L7PB050**	**L7PB050**		
Rated output	[kW]	1.2	2.0	3.0	4.4		
Rated torque	[N·m]	11.46	19.10	28.65	42.02		
	[kgf·cm]	116.93	194.88	292.33	428.74		
Instantaneous maximum torque	[N·m]	34.38	57.30	71.62	105.05		
	[kgf·cm]	350.79	584.65	730.81	1071.85		
Rated Current	[A]	4.83	7.94	11.90	16.69		
Maximum Current	[A]	14.50	23.83	35.70	41.73		
Rated rotation speed	[r/min]	1000					
Maximum rotation speed	[r/min]	2000		1700	2000		
Inertia moment	[kg·m2x10-4]	27.960	46.560	73.850	106.730		
	[gf·cm·s2]	28.531	47.510	75.357	108.908		
Allowable load inertia		Motor inertia x 5					
Rated power rate	[kW/s]	46.96	78.34	111.13	145.48		
Speed, Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	12.4	17.7	26.3	35.6		

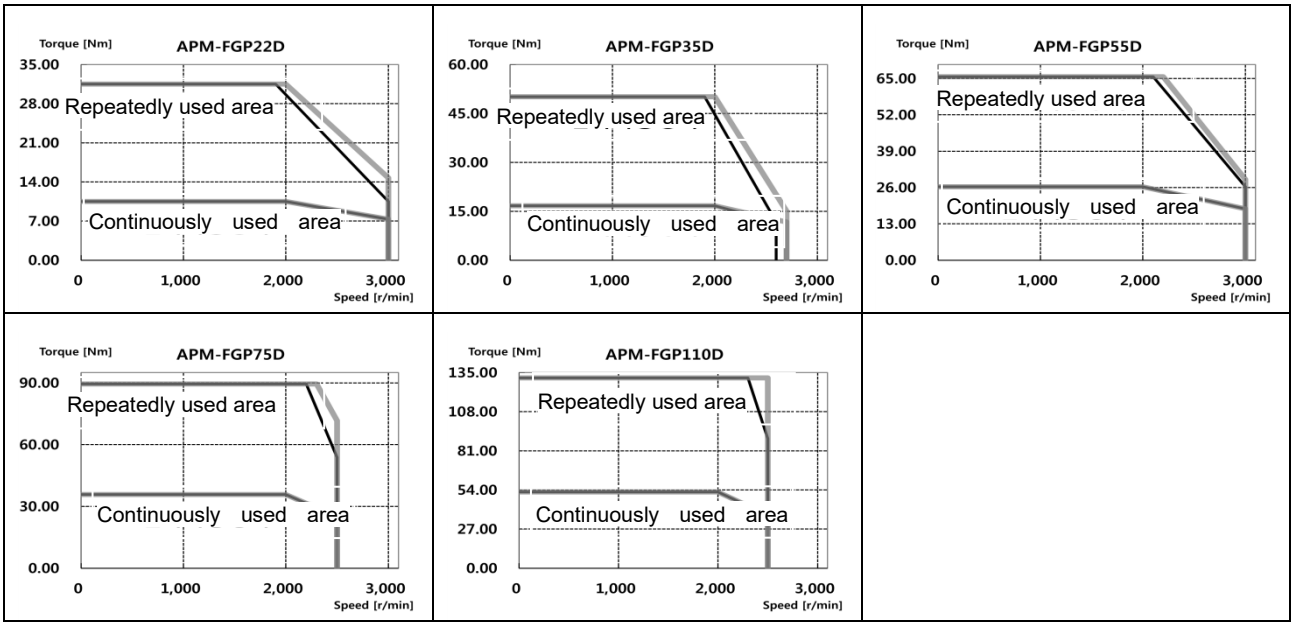
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FGP22D	FGP35D	FGP55D	FGP75D	FGP110D	-
Applicable Drive(L7**PBxxx**□)		**L7PB020**	**L7PB035**	**L7PB050**	**L7PB075**	**L7PB150**	
Rated output	[kW]	2.2	3.5	5.5	7.5	11.0	
Rated torque	[N·m]	10.50	16.71	26.26	35.81	52.52	
	[kgf·cm]	107.19	170.52	267.96	365.41	525.9	
Instantaneous maximum torque	[N·m]	31.51	50.13	65.65	89.52	131.30	
	[kgf·cm]	321.56	511.57	669.84	913.52	1339.69	
Rated Current	[A]	7.12	8.73	16.04	19.10	27.41	
Maximum Current	[A]	21.35	26.20	40.1	47.76	68.52	
Rated rotation speed	[r/min]	2000					
Maximum rotation speed	[r/min]	3000	2700	3000	2500		
Inertia moment	[kg·m2x10-4]	41.130	71.530	117.720	149.400	291.36	
	[gf·cm·s2]	41.969	72.990	120.122	152.449	297.31	
Allowable load inertia		Motor inertia x 5					
Rated power rate	[kW/s]	26.83	39.04	58.58	85.83	94.68	
Speed, Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	16.95	21.95	30.8	37.52	66.2	

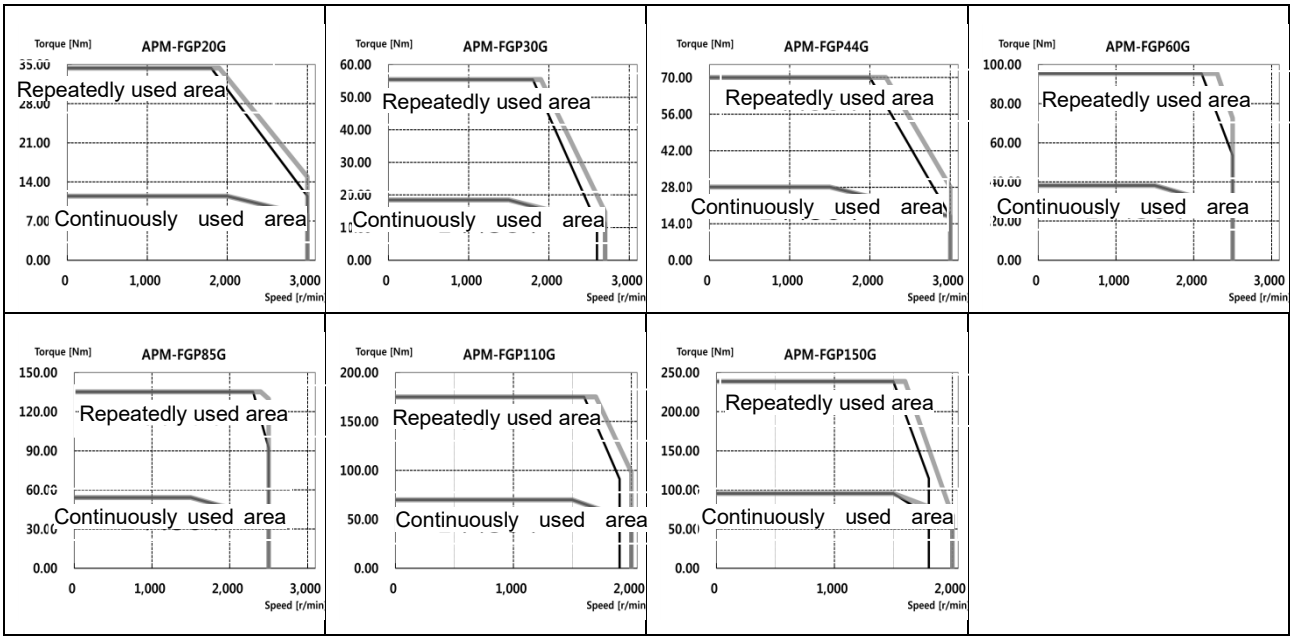
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FGP20G	FGP30G	FGP44G	FGP60G	FGP85G	FGP110G	FGP150G
Applicable Drive(L7**PBxxx**□)		L7PB020	L7PB035	L7PB050	L7PB075	L7PB150		
Rated output	[kW]	1.8	2.9	4.4	6.0	8.5	11.0	15.0
Rated torque	[N·m]	11.46	18.46	28.01	38.20	54.11	70.03	95.49
	[kgf·cm]	116.93	188.39	285.83	389.77	552.17	714.57	974.42
Instantaneous maximum torque	[N·m]	34.38	55.39	84.03	95.49	135.28	175.07	238.73
	[kgf·cm]	350.79	565.16	857.49	974.42	1380.43	1786.43	2436.05
Rated Current	[A]	7.76	9.65	17.11	20.38	28.24	28.02	35.71
Maximum Current	[A]	23.29	28.95	46.19	50.95	70.60	70.05	89.25
Rated rotation speed	[r/min]	1500						
Maximum rotation speed	[r/min]	3000	2700	3000	2500	2500	2000	2000
Inertia moment	[kg·m2x10-4]	41.130	71.530	117.720	149.400	291.36	291.36	424.57
	[gf·cm·s2]	41.969	72.990	120.122	152.449	297.31	297.31	416.08
Allowable load inertia		Motor inertia x 5						
Rated power rate	[kW/s]	25.531	42.41	59.25	84.36	100.5	168.3	234.44
Speed, Position detector	Standard	Serial Type 19 [bit]						
	Option	X						
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)						
	Time rating	Continuous						
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]						
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)						
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas						
	Anti-vibration	Vibration acceleration 49[m/s2](5G)						
Weight	[kg]	16.95	21.95	30.8	37.52	66.2	66.3	92.2

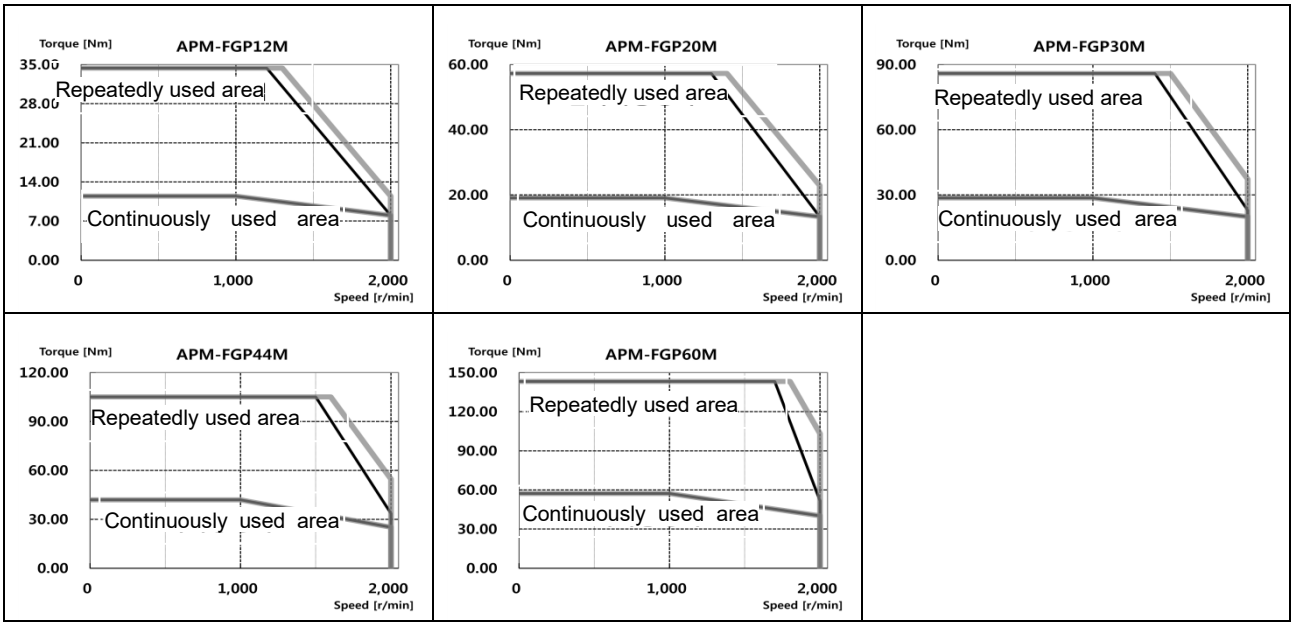
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V



■ Product Features [400V]

Servo Motor Name (APM-□□□□□□)		FGP12M	FGP20M	FGP30M	FGP44M	FGP60M	-
Applicable Drive(L7**PBxxx**□)		**L7PB020**		**L7PB035**	**L7PB050**	**L7PB075**	
Rated output	[kW]	1.2	2.0	3.0	4.4	6.0	
Rated torque	[N·m]	11.46	19.10	28.65	42.02	57.30	
	[kgf·cm]	116.93	194.88	292.33	428.74	584.65	
Instantaneous maximum torque	[N·m]	34.38	57.30	85.94	113.45	143.24	
	[kgf·cm]	350.79	584.65	876.98	1157.59	1461.63	
Rated Current	[A]	4.75	7.88	11.74	17.39	20.23	
Maximum Current	[A]	14.24	23.64	35.22	46.95	49.69	
Rated rotation speed	[r/min]	1000					
Maximum rotation speed	[r/min]	2000					
Inertia moment	[kg·m2x10-4]	41.130	71.530	117.720	149.400	291.36	
	[gf·cm·s2]	41.969	72.990	120.122	152.449	297.31	
Allowable load inertia		Motor inertia x 5					
Rated power rate	[kW/s]	31.93	50.99	54.93	118.17	112.64	
Speed, Position detector	Standard	Serial Type 19 [bit]					
	Option	X					
Specifications and features	Method of protection	Fully closed·self-cooling IP65 (excluding axis penetration)					
	Time rating	Continuous					
	Ambient temperature	Operating temperature: 0~40[°C], Storage temperature : -10~60[°C]					
	Ambient humidity	Ambient humidity: 80[%]RH, Storage humidity: 90[%]RH (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49[m/s2](5G)					
Weight	[kg]	16.95	21.95	30.8	37.52	66.2	

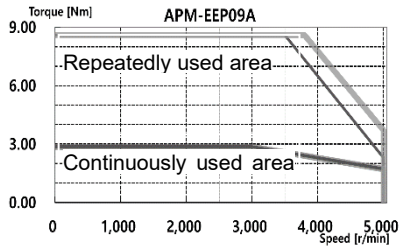
♦Rotation Speed - Torque Characteristics: 3 phase AC380V, ■ : 3 phase AC400V

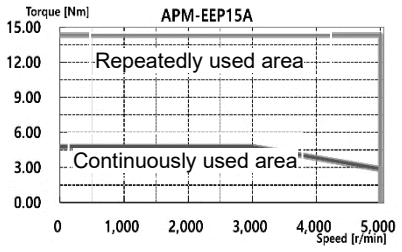


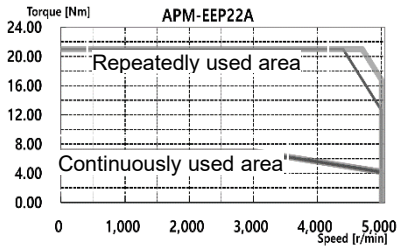
■ Product Features [400V]

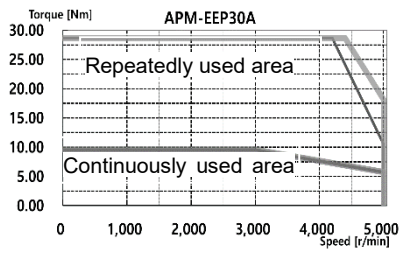
Servo Motor Type (APM-□□□□□)		EEP09A	EEP15A	EEP22A	EEP30A		
Applicable Drive (L7PBxxx□)		L7PB010	L7PB020		L7PB035		
Rated Output	[kW]	0.9	1.5	2.2	3.0		
Rated Torque	[N·m]	2.86	4.77	7.00	9.55		
	[kgf·cm]	29.20	48.70	71.40	97.40		
Maximum Instantaneous Torque	[N·m]	8.59	14.32	21.01	28.65		
	[kgf·cm]	87.70	146.10	214.3	292.20		
Rated Current	[A]	3.26	6.37	7.77	9.88		
Peak Current	[A]	9.78	19.11	23.31	29.64		
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.00	27.12	39.87	56.41		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

♦ Rotation velocity - Torque characteristics **[■ : 3-phase AC380V , ■ : 3-phase AC400V]**





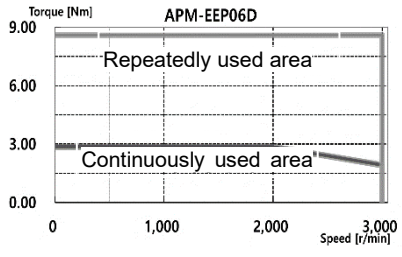


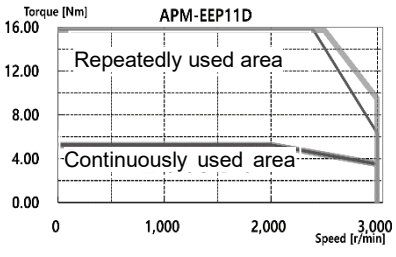


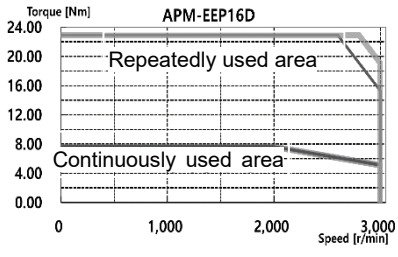
■ Product Features [400V]

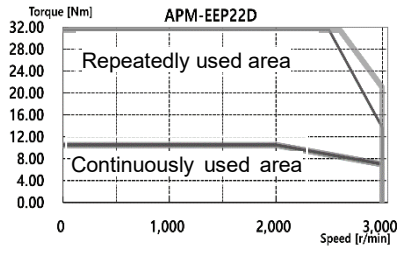
Servo Motor Type (APM-□□□□□)		EEP06D	EEP11D	EEP16D	EEP22D		
Applicable Drive (L7PBxxx□)		L7PB010		L7PB020			
Rated Output	[kW]	0.6	1.1	1.6	2.2		
Rated Torque	[N·m]	2.86	5.25	7.64	10.50		
	[kgf·cm]	29.23	53.59	77.95	107.19		
Maximum Instantaneous Torque	[N·m]	8.59	15.76	22.92	31.51		
	[kgf·cm]	87.7	160.78	233.86	321.56		
Rated Current	[A]	3.14	3.39	5.1	6.64		
Peak Current	[A]	9.42	10.17	15.3	19.92		
Rated Rotation Velocity	[r/min]	2000					
Maximum Rotation Velocity	[r/min]	3000					
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.03	32.84	47.52	68.32		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

♦ Rotation velocity - Torque characteristics **[■ : 3-phase AC380V , ■ : 3-phase AC400V]**





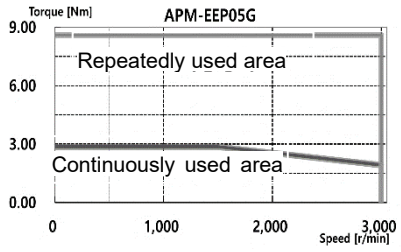


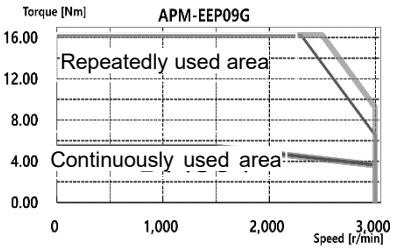


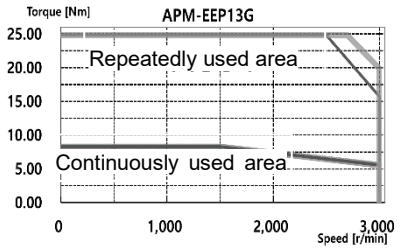
■ Product Features [400V]

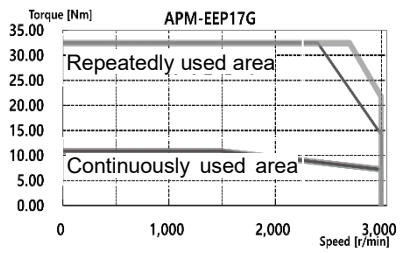
Servo Motor Type (APM-□□□□□)		EEP05G	EEP09G	EEP13G	EEP17G		
Applicable Drive (L7PB□□)		L7PB010		L7PB020			
Rated Output	[kW]	0.45	0.85	1.3	1.7		
Rated Torque	[N·m]	2.86	5.41	8.27	10.82		
	[kgf·cm]	29.22	55.19	84.41	110.38		
Maximum Instantaneous Torque	[N·m]	8.59	16.23	24.82	32.46		
	[kgf·cm]	87.66	165.57	253.23	331.14		
Rated Current	[A]	3.14	3.46	5.52	6.84		
Peak Current	[A]	9.42	10.38	16.56	20.52		
Rated Rotation Velocity	[r/min]	1500					
Maximum Rotation Velocity	[r/min]	3000					
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.03	34.84	55.83	72.49		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

♦ Rotation velocity - Torque characteristics **[■ : 3-phase AC380V , ■ : 3-phase AC400V]**





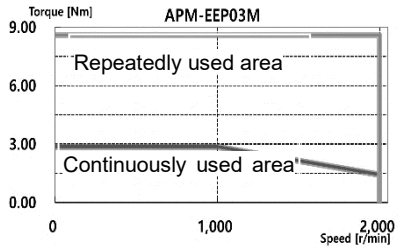


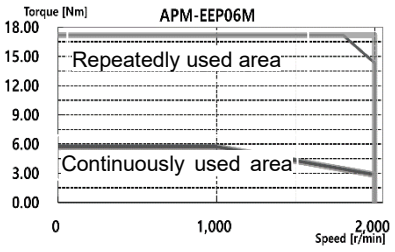


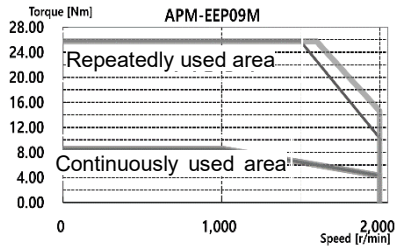
■ Product Features [400V]

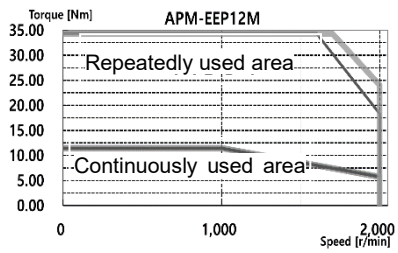
Servo Motor Type (APM-□□□□□)		EEP03M	EEP06M	EEP09M	EEP12M		
Applicable Drive (L7PB□□)		L7PB010			L7PB020		
Rated Output	[kW]	0.3	0.6	0.9	1.2		
Rated Torque	[N·m]	2.86	5.73	8.59	11.46		
	[kgf·cm]	29.23	58.47	87.7	116.93		
Maximum Instantaneous Torque	[N·m]	8.59	17.19	25.78	34.38		
	[kgf·cm]	87.70	175.4	263.09	350.79		
Rated Current	[A]	3.1	3	3.59	4.95		
Peak Current	[A]	9.3	9	10.77	14.85		
Rated Rotation Velocity	[r/min]	1000					
Maximum Rotation Velocity	[r/min]	2000					
Moment of Inertia	[kg·m²x10⁻⁴]	4.55	8.4	12.28	16.15		
	[gf·cm·s²]	4.643	8.571	12.531	16.48		
Permitted Load Inertia		Motor inertia x 10					
Rated Power Rate	[kW/s]	18.03	39.09	60.15	81.31		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	4.7	6.2	7.8	9.4		

♦ Rotation velocity - Torque characteristics **[■ : 3-phase AC380V , ■ : 3-phase AC400V]**





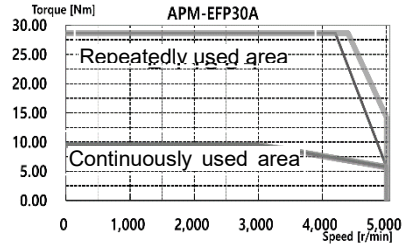


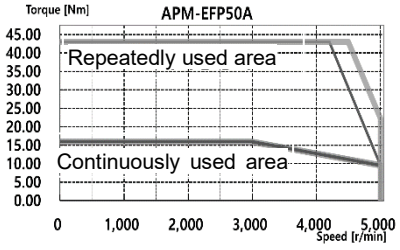


■ Product Features [400V]

Servo Motor Type (APM-□□□□□)		EFP30A	EFP50A				
Applicable Drive (L7PB□□)		L7PB035	L7PB050				
Rated Output	[kW]	3.0	5.0				
Rated Torque	[N·m]	9.55	15.92				
	[kgf·cm]	97.44	162.45				
Maximum Instantaneous Torque	[N·m]	28.65	42.97				
	[kgf·cm]	292.33	438.47				
Rated Current	[A]	15.31	15.87				
Peak Current	[A]	45.93	42.85				
Rated Rotation Velocity	[r/min]	3000					
Maximum Rotation Velocity	[r/min]	5000					
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82				
	[gf·cm·s²]	29.02	40.633				
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	32.06	63.65				
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1				

♦ Rotation velocity - Torque characteristics **[■ : 3-phase AC380V , ■ : 3-phase AC400V]**

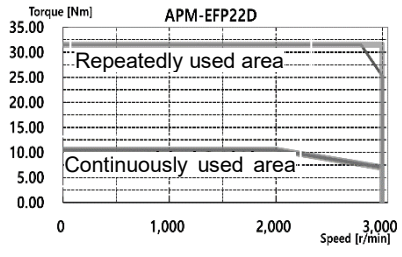


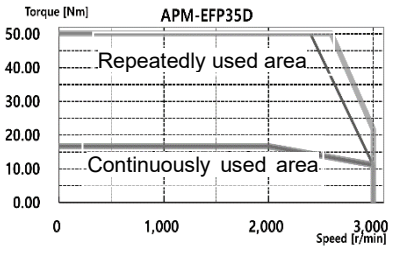


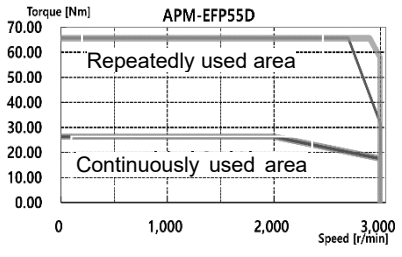
■ Product Features [400V]

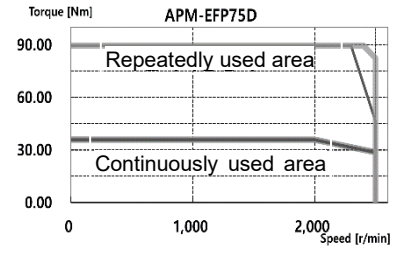
Servo Motor Type (APM-□□□□□)		EFP22D	EFP35D	EFP55D	EFP75D		
Applicable Drive (L7PBxxx□)		L7PB020	L7PB035	L7PB050	L7PB075		
Rated Output	[kW]	2.2	3.5	5.5	7.5		
Rated Torque	[N·m]	10.50	16.71	26.26	35.81		
	[kgf·cm]	107.19	170.52	267.96	365.41		
Maximum Instantaneous Torque	[N·m]	31.51	50.13	65.65	89.52		
	[kgf·cm]	321.56	511.57	669.91	913.52		
Rated Current	[A]	7.26	9.78	16.01	18.2		
Peak Current	[A]	21.78	29.34	40.03	45.5		
Rated Rotation Velocity	[r/min]	2000					
Maximum Rotation Velocity	[r/min]	3000			2500		
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82	63.37	91.99		
	[gf·cm·s²]	29.02	40.633	64.663	93.867		
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	38.77	70.12	108.82	139.40		
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1	20.8	27.7		

♦ Rotation velocity - Torque characteristics **[■ : 3-phase AC380V , ■ : 3-phase AC400V]**





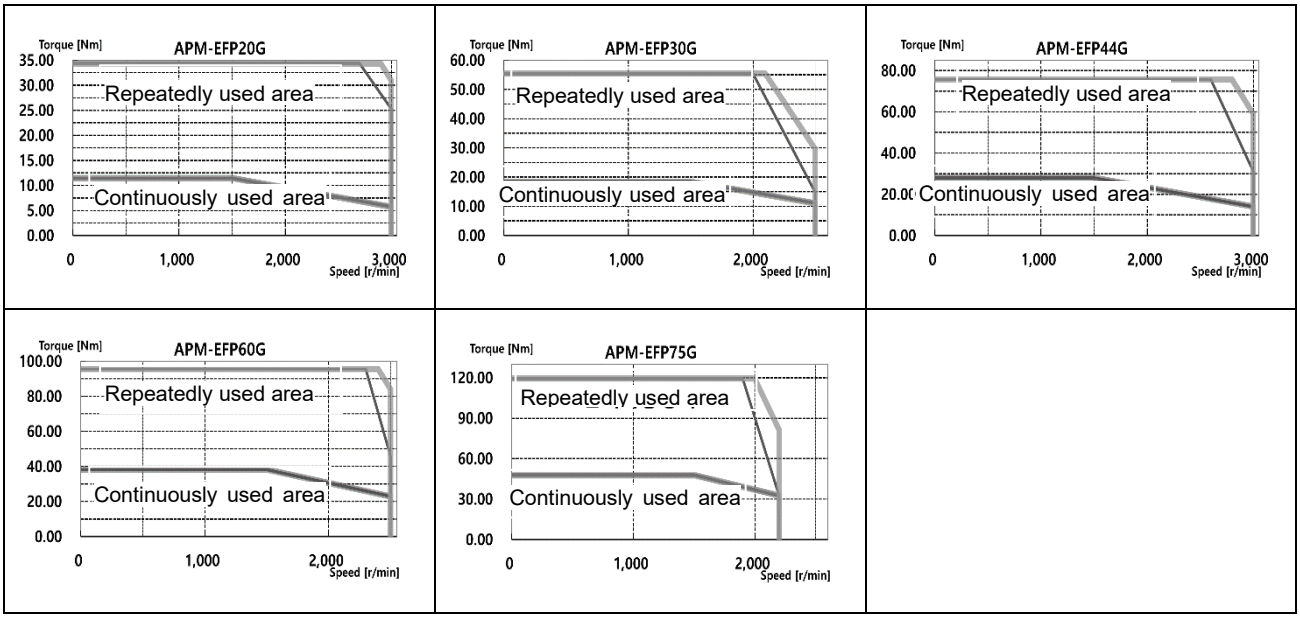




■ Product Features [400V]

Servo Motor Type (APM-□□□□□)		EFP20G	EFP30G	EFP44G	EFP60G	EFP75G	
Applicable Drive (L7PB□□)		L7PB020	L7PB035	L7PB050	L7PB075	L7PB075	
Rated Output	[kW]	1.8	2.9	4.4	6	7.5	
Rated Torque	[N·m]	11.46	18.46	28.01	38.2	47.75	
	[kgf·cm]	116.93	188.39	285.83	389.77	487.21	
Maximum Instantaneous Torque	[N·m]	34.38	55.39	75.63	95.49	119.37	
	[kgf·cm]	350.79	565.16	857.49	974.42	1218.06	
Rated Current	[A]	7.82	9.42	17.07	19.05	20.61	
Peak Current	[A]	23.46	28.26	46.09	47.63	51.525	
Rated Rotation Velocity	[r/min]	1500					
Maximum Rotation Velocity	[r/min]	3000	2500	3000	2500	2200	
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82	63.37	91.99	106.65	
	[gf·cm·s²]	29.02	40.633	64.663	93.867	108.827	
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	46.17	85.6	123.82	158.61	213.76	
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1	20.8	27.7	32	

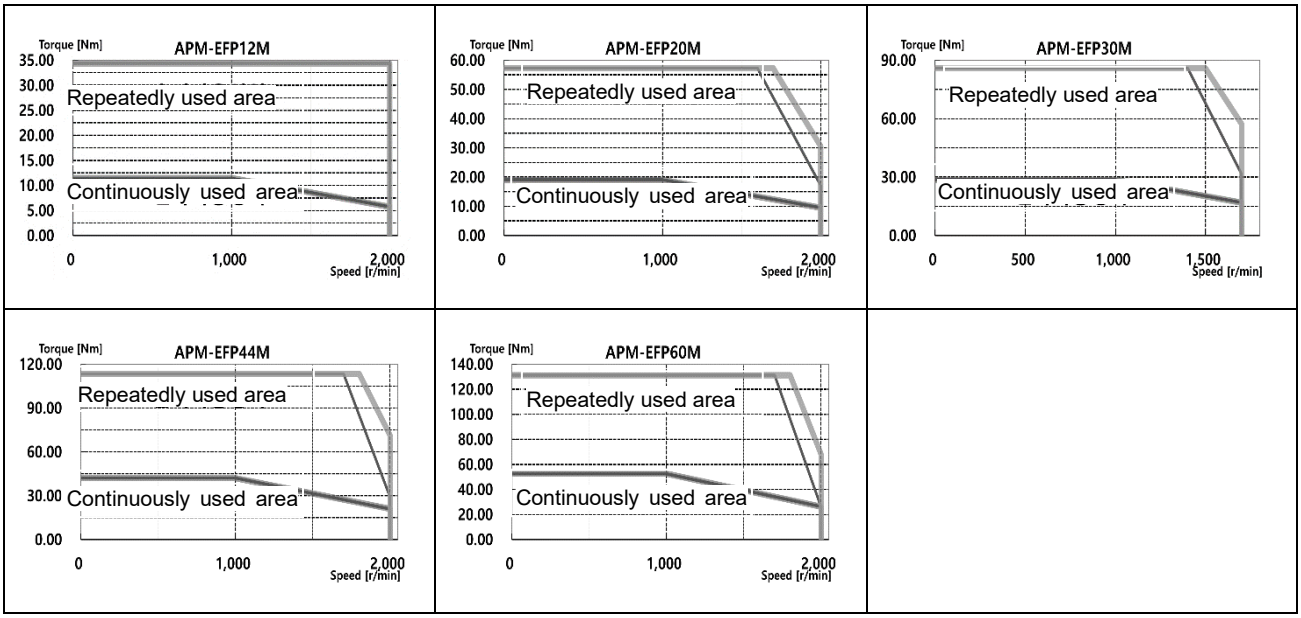
♦ Rotation velocity - Torque characteristics [■ : 3-phase AC380V , ■ : 3-phase AC400V]



■ Product Features [400V]

Servo Motor Type (APM-□□□□□)		EFP12M	EFP20M	EFP30M	EFP44M	EFP60M	
Applicable Drive (L7PB□□)		L7PB020		L7PB035	L7PB050	L7PB075	
Rated Output	[kW]	1.2	2.0	3.0	4.4	6.0	
Rated Torque	[N·m]	11.46	19.10	28.65	42.02	52.52	
	[kgf·cm]	116.93	194.88	292.33	428.74	535.93	
Maximum Instantaneous Torque	[N·m]	34.38	57.30	85.94	113.45	131.3	
	[kgf·cm]	350.79	584.65	876.98	1157.65	1339.82	
Rated Current	[A]	5.98	7.67	9.83	16.47	20.11	
Peak Current	[A]	17.94	23.01	29.49	44.47	50.275	
Rated Rotation Velocity	[r/min]	1000					
Maximum Rotation Velocity	[r/min]	2000		1500	2000	2000	
Moment of Inertia	[kg·m²x10⁻⁴]	28.44	39.82	63.37	91.99	106.65	
	[gf·cm·s²]	29.02	40.633	64.663	93.867	108.827	
Permitted Load Inertia		Motor inertia x 5					
Rated Power Rate	[kW/s]	46.17	91.6	129.51	191.91	258.65	
Velocity, Position Detector	Standard	Serial Multi-Turn (23bit)					
	Option	Batteryless : Serial Multi-Turn Absolute Type (20Bit)					
Specifications and Features	Protection Method	Fully enclosed self-cooling IP65 (excluding shaft penetration part)·					
	Time Rating	Continuous					
	Ambient Temperature	Operating temperature: 0 - 40°C, Storage temperature: -10 - 60°C					
	Ambient Humidity	Use humidity: 80[%] RH, maintenance humidity: 90[%] RH or lower (no condensation)					
	Atmosphere	No direct sunlight, corrosive gas, or combustible gas					
	Anti-vibration	Vibration acceleration 49 [m/s2] (5G)					
Weight	[kg]	12.1	15.1	20.8	27.7	32	

♦ Rotation velocity - Torque characteristics **[■ : 3-phase AC380V , ■ : 3-phase AC400V]**



■ Electric brake specification





Applicable Motor Series	FAL/EA	FBL/EB	FCL/EC	FE(P)/EE(P)	FF(P)/EF(P)	FG(P)	FG(P)110G FG(P)150G
Purpose	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance
Input voltage [V]	DC 24V	DC 24V	DC 24V	DC 24V	DC 24V	DC 24V	DC 24V
Statical Friction Torque [N•m]	0.32	1.47	3.23	10.4	48	74	120
Braking method	Spring brake	Spring brake	Spring brake	Spring brake	Spring brake	Spring brake	Spring brake
Insulation grade	Grade F	Grade F	Grade F	Grade F	Grade F	Grade F	Grade F

Note 1) The same specifications apply to all electric brakes installed in our servo motors.

Note 2) Electric brakes are designed to maintain a stop. Never use them for absolute braking.

Note 3) The characteristics of the electric brakes were measured at 20°C.

Note 4) These brake specifications are subject to change. Check the voltage specifications shown on your specific motor.

Note 5) FAL, FBL, FCL and FE(P) Series brakes satisfy UL specification class 2.

Note 6) Do not apply **DC24V** power (for interface only) to electronic brakes.

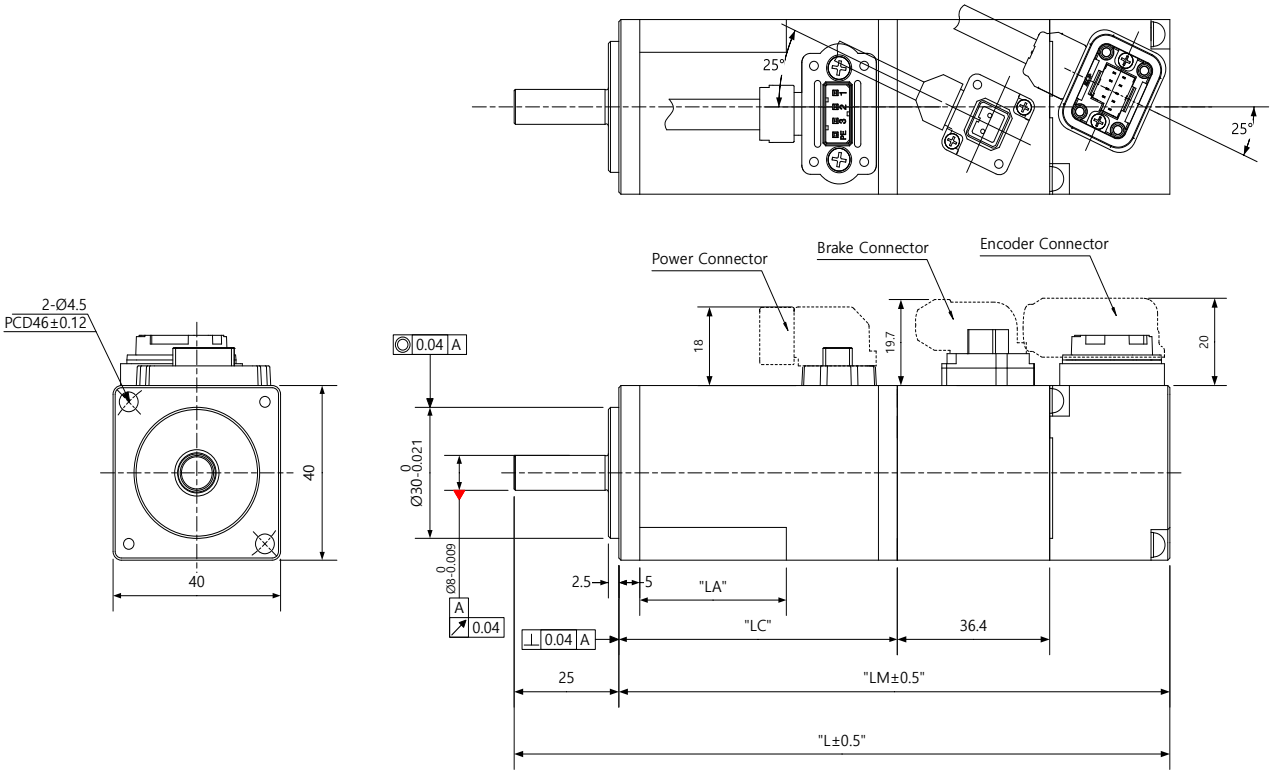
You MUST use power source only for electronic brake.

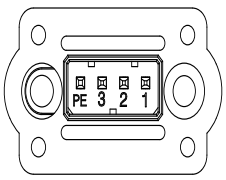
2.1.2 Outline drawing

■ **FAL Series | APM – FALR5A**

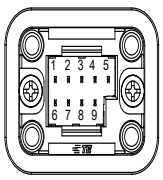
APM – FAL01A

APM – FAL015A

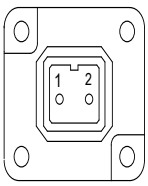




Pin No.	Signal name
1	U
2	V
3	W
PE	FG



Multi Turn (M)			
Pin No.	Signal name	Pin No.	Signal name
1	MA	6	/MA
2	SLO	7	/SLO
3	GND_B	8	VDD_B
4	0V	9	+5V
5	Shield		



Pin No.	Signal name
1	BK+
2	BK-

<Power Connector pin arrangement> <Encoder Connector pin arrangement> <Brake Connector pin arrangement>

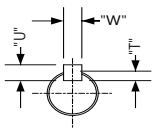
Model name	Dimension				Weight(Kg)
	L	LM	LC	LA	
FALR5A	**103.2(139.6)**	**78.2(114.6)**	**49.5**	**23**	**0.31(0.66)**
FAL01A	**120.2(156.6)**	**95.2(131.6)**	**66.5**	**35**	**0.45(0.80)**
FAL015A	**140.2**	**115.2**	**86.5**	**35**	**0.61**

Note1) Use DC power (24 V) to operate the brake

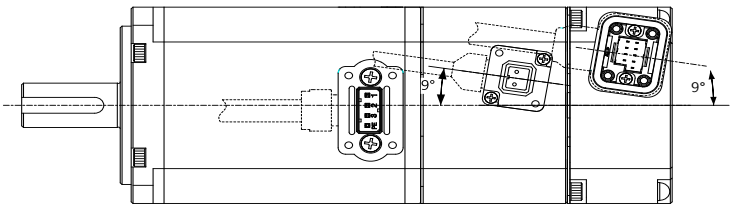
Note2) The sizes in parentheses apply when attached to the brakes.

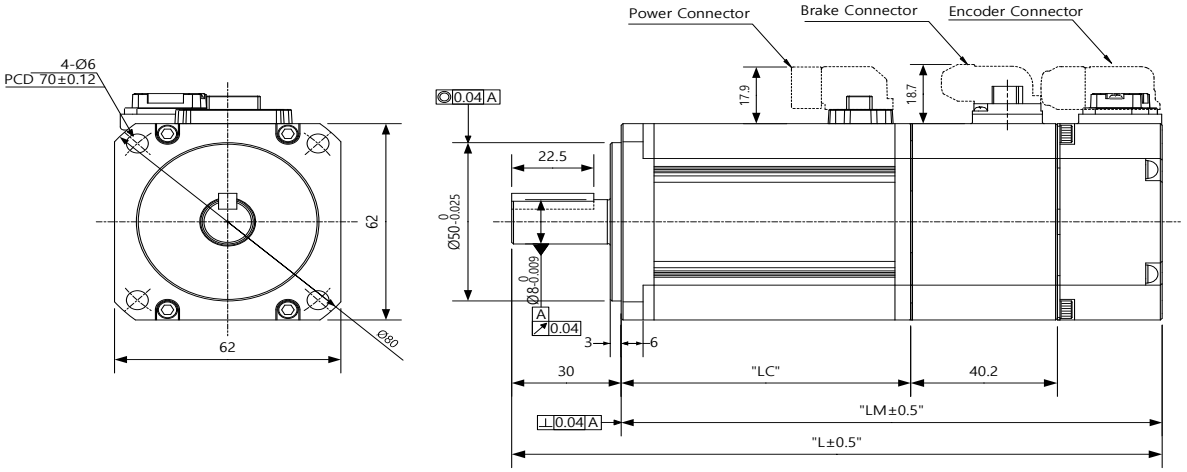
Note3) When connecting FAL products, connect the power cable first.

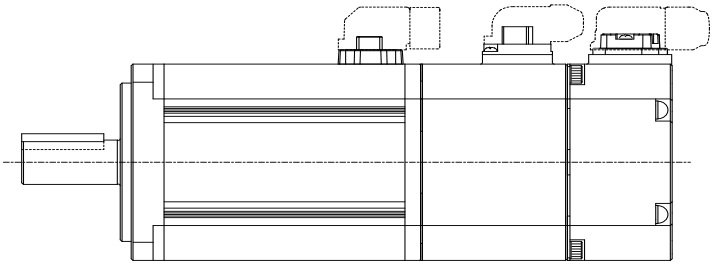
■ **FBL Series | APM – FBL01A, FBL02A, FBL04A**



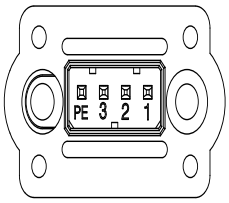
(Shaft End Dimension Detail)





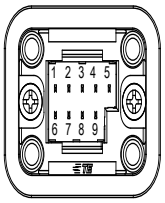


<When the cable is pulled out in the opposite direction of the axis>



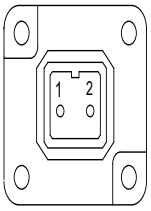
Pin No.	Signal name
1	U
2	V
3	W
PE	FG

<Power Connector pin arrangement>



Multi Turn (M)			
Pin No.	Signal name	Pin No.	Signal name
1	MA	6	/MA
2	SLO	7	/SLO
3	GND_B	8	VDD_B
4	0V	9	+5V
5	Shield		

<Encoder Connector pin arrangement>



Pin No.	Signal name
1	BK+
2	BK-

<Brake Connector pin arrangement>

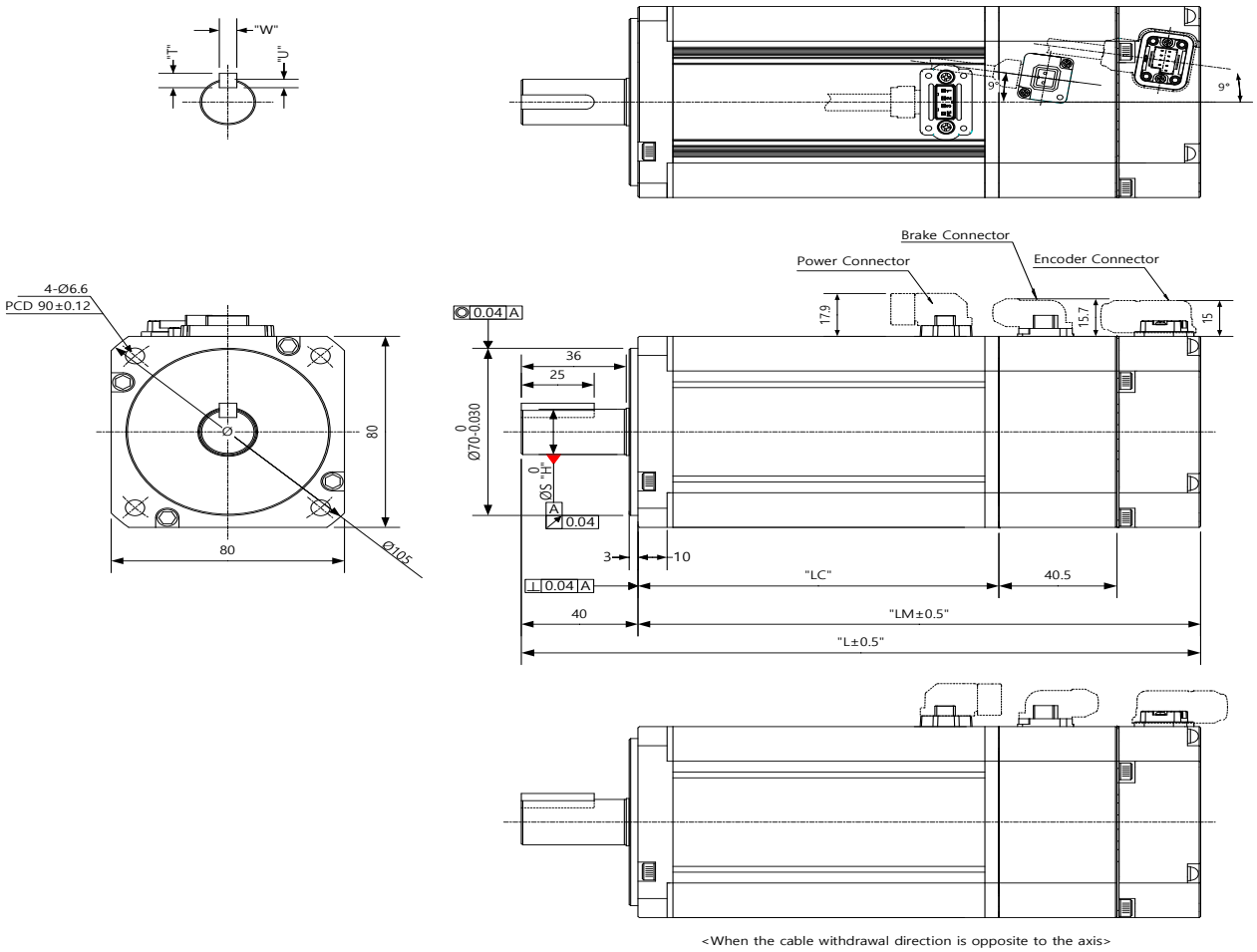
Model name	Dimension					Key dimension			Weight(Kg)
	L	LM	LC	S	H	T	W	U	
FBL01A	**107.2(147.2)**	**77.2(117.2)**	**48.5(48.3)**	**14**	**-0.018**	**5**	**5**	**3**	**0.56(1.3)**
FBL02A	**118.2(158.2)**	**88.2(128.2)**	**59.5(59.3)**	**14**	**-0.018**	**5**	**5**	**3**	**0.74(1.48)**
FBL04A	**138.2(178.2)**	**108.2(148.2)**	**79.5(79.3)**	**14**	**-0.018**	**5**	**5**	**3**	**1.06(1.8)**

Note1) Use DC power (24 V) to operate the brake

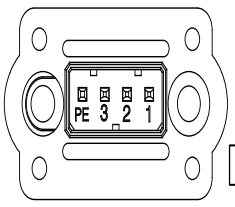
Note2) The sizes in parentheses apply when attached to the brakes.

■ **FCL Series | APM – FCL04A, FCL03D, FCL06A, FCL05D**

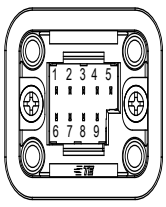
APM - FCL08A, FCL06D, FCL10A, FCL07D



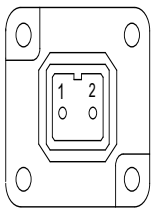
<When the cable withdrawal direction is opposite to the axis>



Pin No.	Signal name
1	U
2	V
3	W
PE	FG



Multi Turn (M)			
Pin No.	Signal name	Pin No.	Signal name
1	MA	6	/MA
2	SLO	7	/SLO
3	GND_B	8	VDD_B
4	0V	9	+5V
5	Shield		



Pin No.	Signal name
1	BK+
2	BK-

<Power Connector pin arrangement> <Encoder Connector pin arrangement> <Brake Connector pin arrangement>

Model name	Dimension					Key dimension			Weight(Kg)
	L	LM	LC	S	H	T	W	U	
FCL04A,FCL03D	138.7(179.5)	98.7(139.5)	70(69.8)	14	-0.018	5	5	3	1.52(2.32)/1.26(2.06)
FCL06A,FCL05D	156.7(197.5)	116.7(157.5)	88(87.8)	19	-0.021	6	6	3.5	2.14(2.94)/2.12(2.92)
FCL08A,FCL06D	174.7(215.5)	134.7(175.5)	106(105.8)	19	-0.021	6	6	3.5	2.68(3.48)/2.66(3.46)
FCL10A,FCL07D	192.7(233.5)	152.7(193.5)	124(123.8)	19	-0.021	6	6	3.5	3.30(4.10)/2.78(3.58)

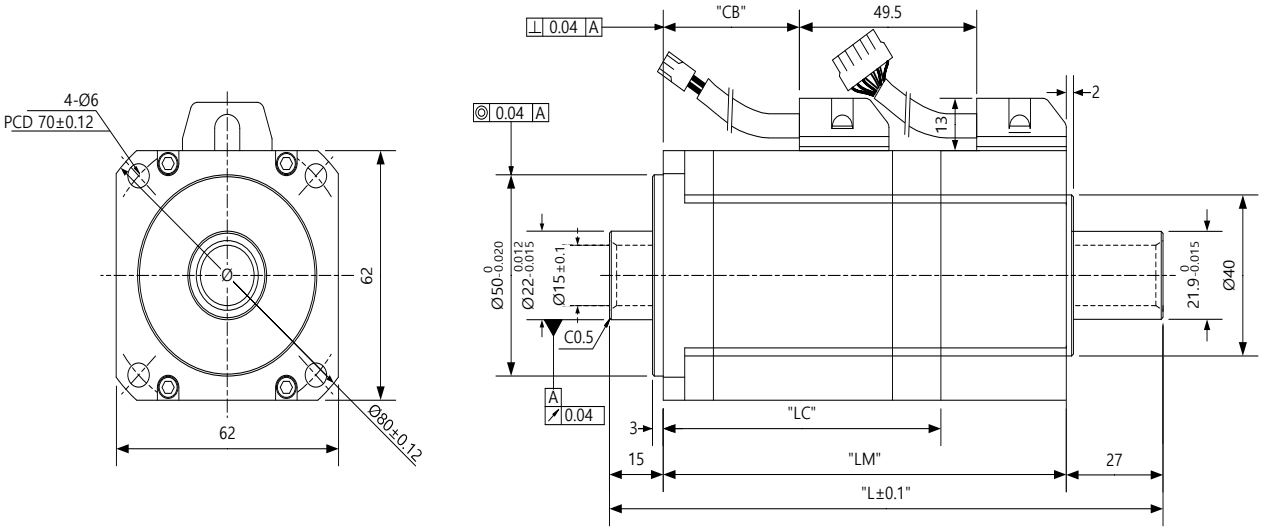
Note1) Use DC power (24 V) to operate the brake

Note2) The sizes in parentheses apply when attached to the brakes.

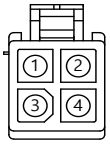
■ **HB Series | APM-HB01A (Hollow Shaft)**

APM-HB02A (Hollow Shaft)

APM-HB04A (Hollow Shaft)



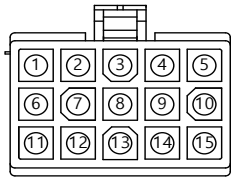
<Power Connector>



Pin No.	Signal name
1	U
2	V
3	W
4	FG

Plug : 172167-1(AMP)

<Encoder Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
1	A	6	/Z	11	W
2	/A	7	U	12	/W
3	B	8	/U	13	+5V
4	/B	9	V	14	0V
5	Z	10	/V	15	SHIELD

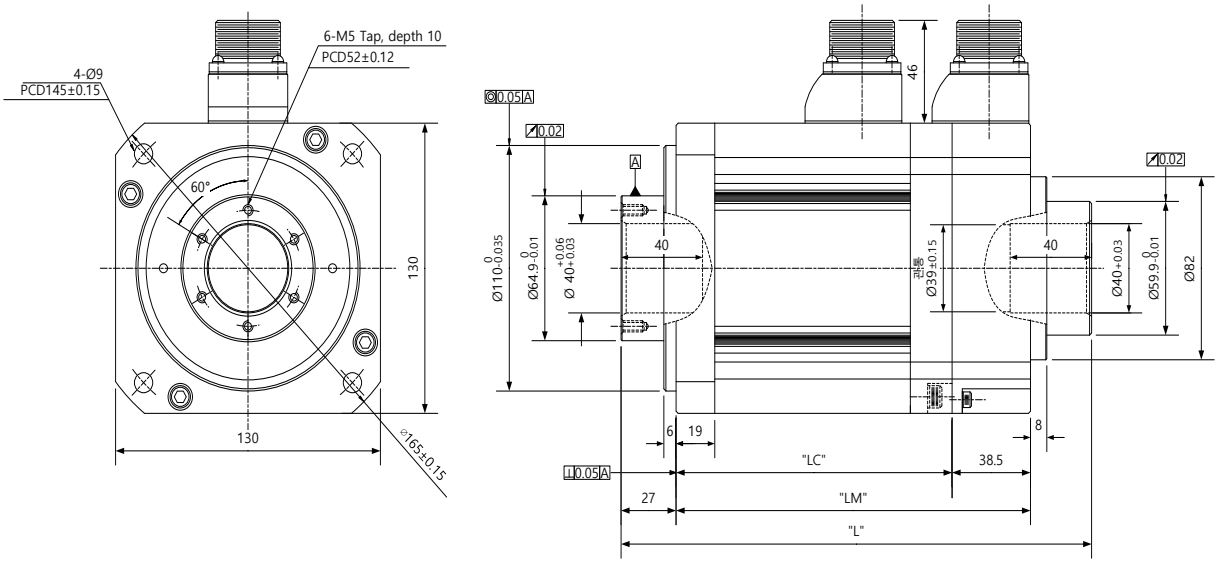
Plug : 172171-1(AMP)

Model	Dimension				Hollow Shaft	Weight(Kg)
	L	LM	LC	CB		
HB01A	140.5	98.5	68.5	24	15	0.89
HB02A	154.5	112.5	82.5	38	15	1.16
HB04A	182.5	140.5	105.5	66	15	1.69

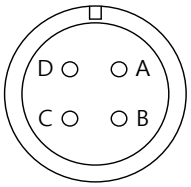
■ **HE Series | APM-HE09A (Hollow Shaft)**

APM-HE15A (Hollow Shaft)

APM-HE30A (Hollow Shaft)



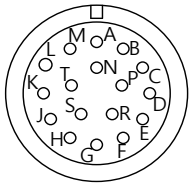
<Power Connector>



Pin No.	Signal name
A	U
B	V
C	W
D	FG

Plug : MS3102A20-4P

<Encoder Connector>

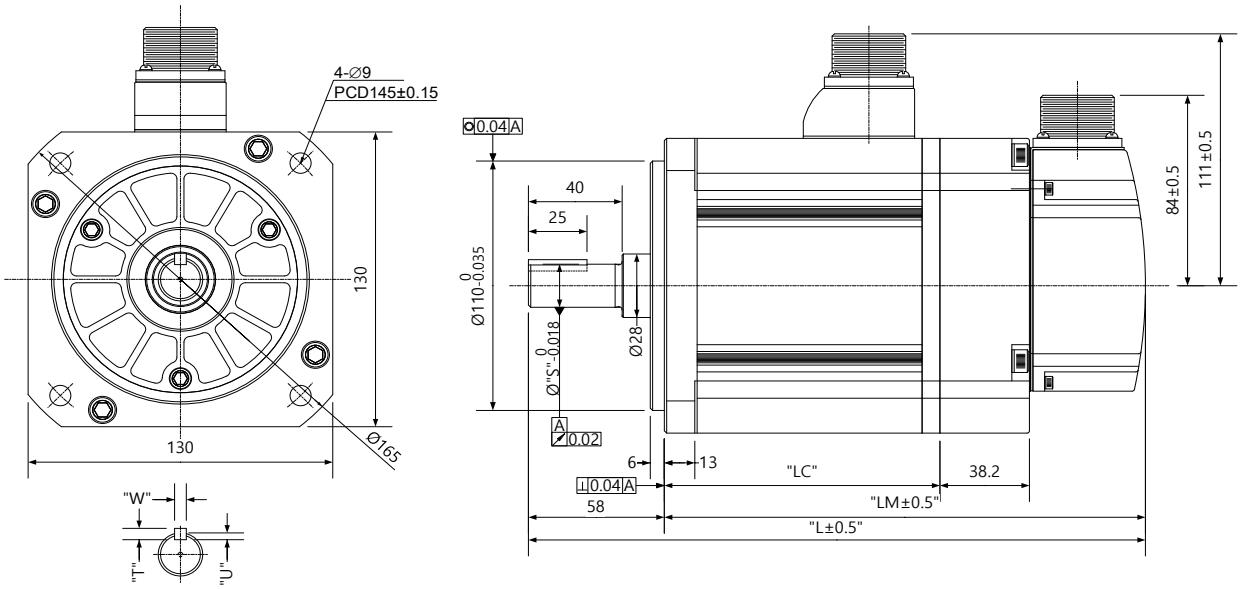


Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	A	F	/Z	P	W
B	/A	K	U	R	/W
C	B	L	/U	H	+5V
D	/B	M	V	G	0V
E	Z	N	/V	J	SHIELD

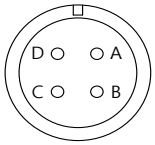
Plug : MS3102A20-15P

Model	Dimension			Hollow Shaft	Weight(Kg)
	L	LM	LC		
HE09A	207	150	111.5	40	5.8
HE15A	231	174	135.5	40	7.4
HE30A	279	222	183.5	40	10.83

■FE(P) Series | APM-FE(P)09A, FE(P)06D, FE(P)05G, FE(P)03M, FE(P)15A, FE(P)11D, FE(P)09G, FE(P)06MAPM-FE(P)22A, FE(P)16D, FE(P)13G, FE(P)09M, FE(P)30A, FE(P)22D, FE(P)17G, FE(P)12M



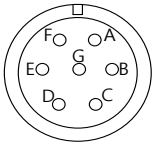
<Power Connector>



Pin No.	Signal name
A	U
B	V
C	W
D	FG

Plug : MS3102A20-4P

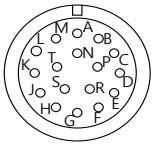
<Brake Type Connector>



Pin No.	Signal name	Pin No.	Signal name
A	U	D	FG
B	V	E	BK+
C	W	F	BK-

Plug : MS3102A20-15P

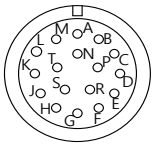
<Serial M-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	GND_B	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	V_{DD_B}	N	-	J	SHIELD

Plug : MS3102A20-29P

<Serial S-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	-	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	-	N	-	J	SHIELD

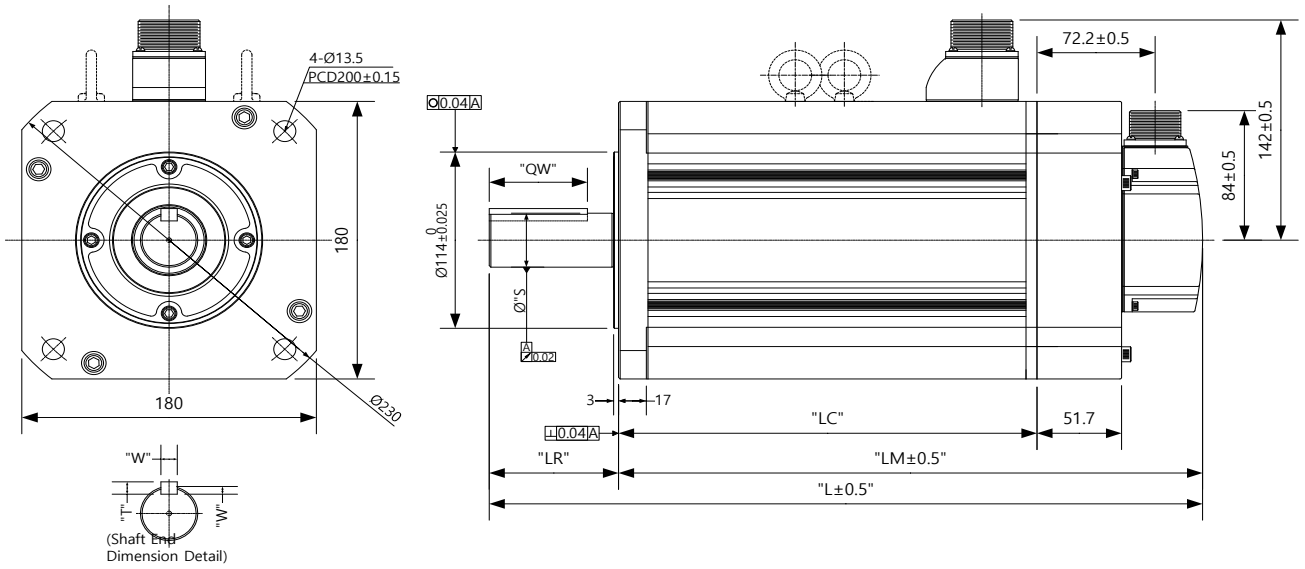
Plug : MS3102A20-29P

Model	Dimension				Key dimension			Weight(Kg)
	L	LM	LC	S	T	W	U	
FE09A,FE06D, FE05G,FE03M	197.3(235.3)	139.3(177.3)	89.8(89.6)	19	5	5	3	5.04(6.58)
FE15A,FE11D, FE09G,FE06M	217.3(255.3)	159.3(197.3)	109.8(109.6)	19	5	5	3	6.74(8.28)
FE22A,FE16D, FE13G,FE09M	237.3(275.3)	179.3(217.3)	129.8(129.6)	22	6	6	3.5	8.48(10.02)
FE30A,FE22D, FE17G,FE12M	255.3(293.3)	197.3(235.3)	147.8(147.6)	24	7	8	4	10.05(11.59)

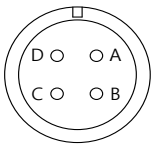
Note1) Use DC power (24 V) to operate the brake

Note2) The sizes in parentheses apply when attached to the brakes.

■ FF(P) Series | APM-FF(P)30A, FF(P)22D, FF(P)20G, FF(P)12M, FF(P)50A, FF(P)35D, FF(P)30G, FF(P)20M, APM-FF(P)55D, FF(P)44G, FF(P)30M, FF(P)75D, FF(P)60G, FF(P)44M, FF(P)75G



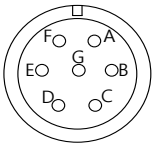
<Power Connector>



Pin No.	Signal name
A	U
B	V
C	W
D	FG

Plug : MS3102A22-22P

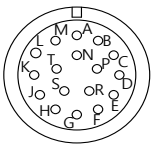
<Brake Type Connector>



Pin No.	Signal name	Pin No.	Signal name
A	U	D	FG
B	V	E	BK+
C	W	F	BK-

Plug : MS3102A24-10P

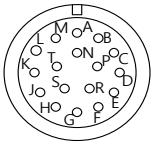
<Serial M-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	GND_B	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	V_{DD}_B	N	-	J	SHIELD

Plug : MS3102A20-29P

<Serial S-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	-	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	-	N	-	J	SHIELD

Plug : MS3102A20-29P

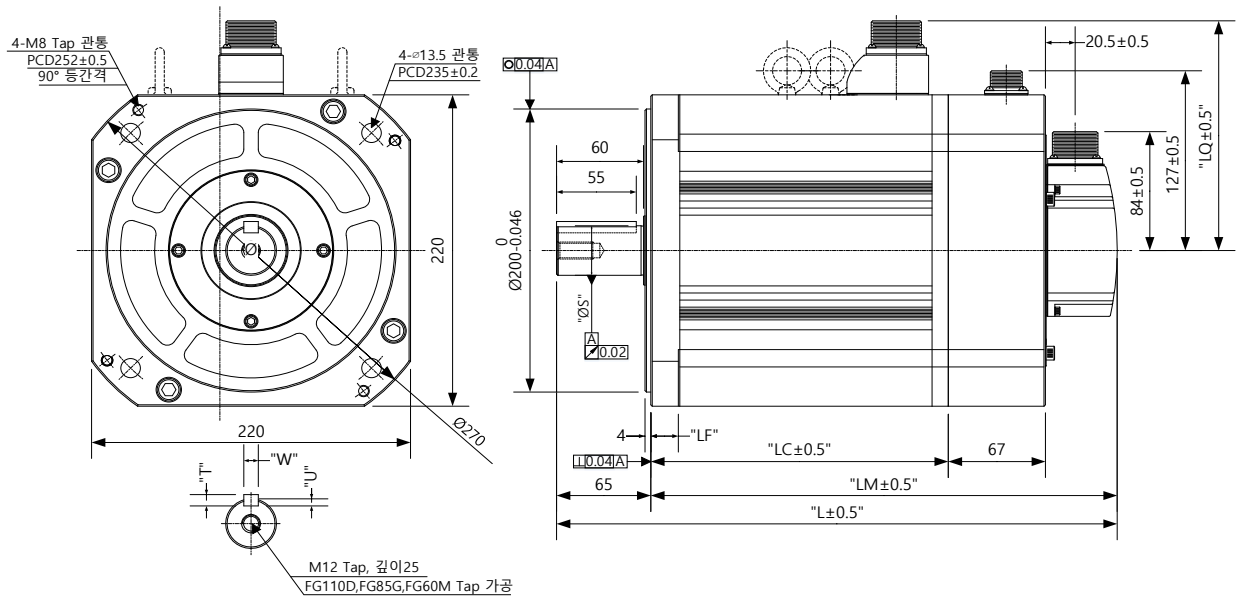
Model	Dimension					Key dimension				Eye bolt	Weight (Kg)
	L	LM	LC	LR	S	QW	T	W	U		
FF30A, FF22D FF20G, FF12M	257.5(308.9)	178.5(229.9)	129(128.7)	79	35 (0~+0.01)	60	8	10	5	X	12.5 (19.7)
FF50A, FF35D FF30G, FF20M	287.5(338.9)	208.5(259.9)	159(158.7)								17.4 (24.6)
FF55D, FF44G FF30M	331.5(382.9)	252.5(303.9)	203(202.7)							O	25.2 (32.4)
FF75D, FF60G, FF44M	384.5(435.9)	305.5(356.9)	256(255.7)		42 (-0.016~0)			12			33.8 (41.0)
FF75G**(Nnote3)**	439.5	326.5	277	113		96					38.5

Note1) Use DC power (24 V) to operate the brake

Note2) The sizes in parentheses apply when attached to the brakes.

Not3) For FF75G model, use MS connector 32-17P.

■FG(P) Series | APM-FG(P)22D, FG(P)20G, FG(P)12M, FG(P)35D, FG(P)30G, FG(P)20M, FG(P)55D, FG(P)44GAPM- FG(P)30M, FG(P)75D, FG(P)60G, FG(P)44M, FG(P)110D, FG(P)85G, FG(P)60M



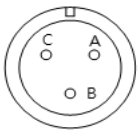
<Power Connector>



Pin No.	Signal name
A	U
B	V
C	W
D	FG

Plug : MS3102A22-22P
(주 3) Plug : MS3102A32-17P

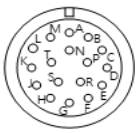
<Brake Connector>



Pin No.	Polarity
A	BK+
B	BK-
C	NC

Plug : MS3102A14-7P

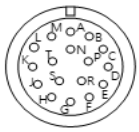
<Serial M-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	GND_B	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	VDD_B	N	-	J	SHIELD

Plug : MS3102A20-29P

<Serial S-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	-	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	-	N	-	J	SHIELD

Plug : MS3102A20-29P

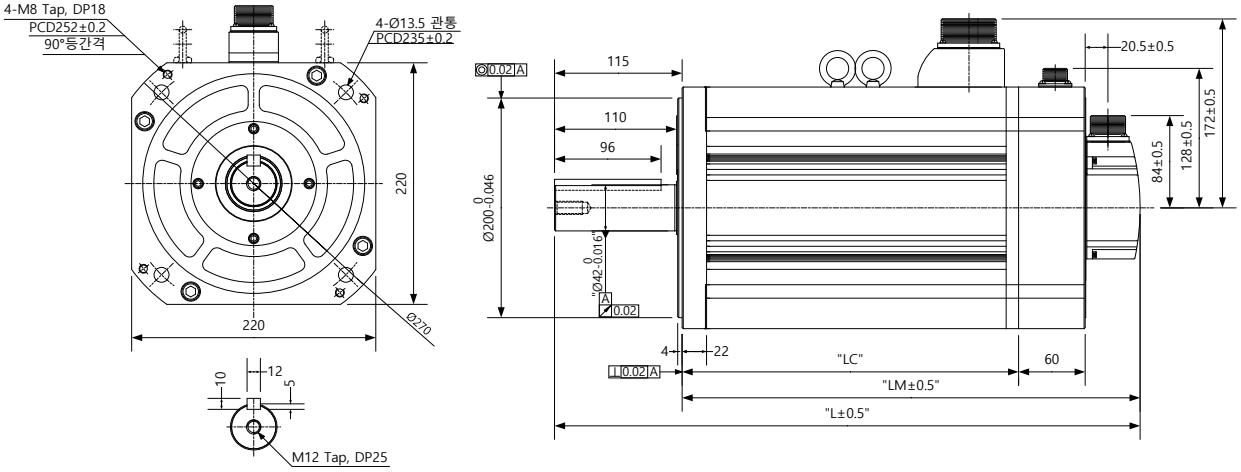
Model	Dimension						Key dimension			Power Connector	Weight (Kg)
	L	LM	LC	LF	LQ	S	T	W	U		
FG22D, FG20G FG12M	229.5 (295.7)	164.5 (230.7)	115 (114.2)	19	162	35 (-0.016~0)	8	10	5	MS3102A 22-22P	15.42 (29.23)
FG35D, FG30G FG20M	250.5 (316.7)	185.5 (251.7)	136 (135.2)								20.22 (34.03)
FG55D, FG44G FG30M	282.5 (348.7)	217.5 (283.7)	168 (167.2)								28.02 (41.83)
FG75D, FG60G FG44M,	304.5 (370.7)	239.5 (305.7)	190 (189.2)			42 (-0.016~0)		12			33.45 (47.26)
FG110D, FG85G FG60M(note3)	418.5 (484.7)	353.5 (419.7)	304 (303.2)	21	173	45 (-0.016~0)		10	6	MS3102A 32-17P	66.2 (82.6)

Note1) Use DC power (24 V) to operate the brake

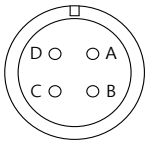
Note2) The sizes in parentheses apply when attached to the brakes.

Note3) Connector specification is MS3102A32-17P

■ FG (P) Series | APM-FG (P) 110G



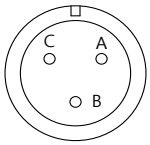
<Power Connector>



Pin No.	Signal name
A	U
B	V
C	W
D	FG

Plug : MS3102A32-17P

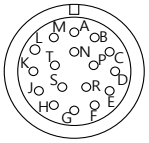
<Brake Connector>



Pin No.	Polarity
A	BK+
B	BK-
C	NC

Plug : MS3102A14-7P

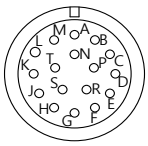
<Serial M-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	GND_B	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	V_{DD}_B	N	-	J	SHIELD

Plug : MS3102A20-29P

<Serial S-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	-	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	-	N	-	J	SHIELD

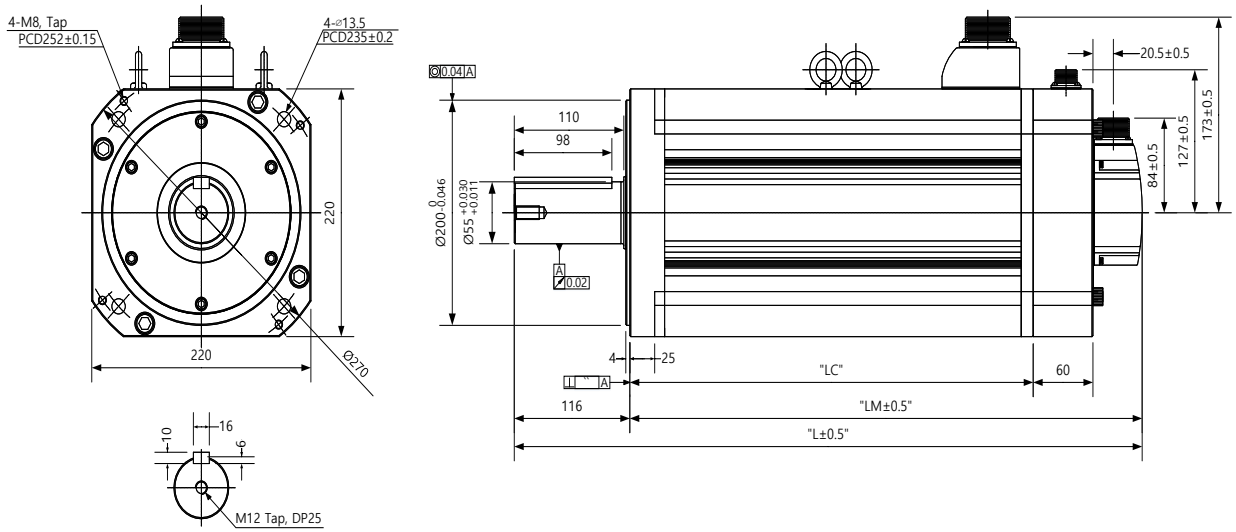
Plug : MS3102A20-29P

Model	Dimension			Power Connector	Weight (Kg)
	L	LM	LC		
FG110G	468.5(527.7)	353.5(419.7)	304(303.2)	MS3102A 32-17P	66.3(82.7)

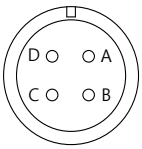
Note1) Use DC power (24 V) to operate the brake

Note2) The sizes in parentheses apply when attached to the brakes.

■ FG (P) Series | APM-FG(P)150G



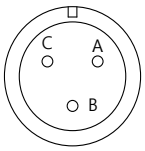
<Power Connector>



Pin No.	Signal name
A	U
B	V
C	W
D	FG

Plug : MS3102A32-17P

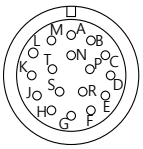
<Brake Connector>



Pin No.	Polarity
A	BK+
B	BK-
C	NC

Plug : MS3102A14-7P

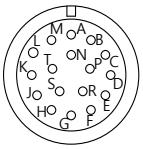
<Serial M-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	GND_B	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	VDD_B	N	-	J	SHIELD

Plug : MS3102A20-29P

<Serial S-Turn Connector>



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A	MA	F	-	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	-	N	-	J	SHIELD

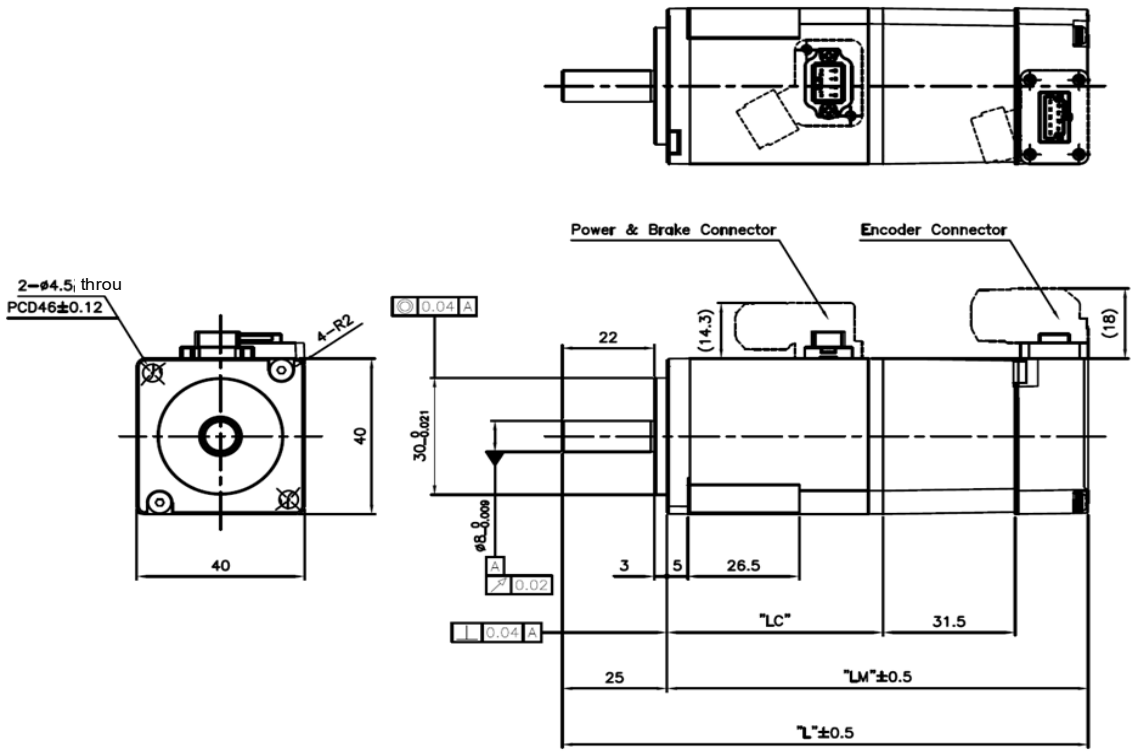
Plug : MS3102A20-29P

Model	Dimension			Power Connector	Weight(Kg)
	L	LM	LC		
FG150G	574(630.5)	458(514.5)	408(405)	MS3102A 32-17P	92.2(108.6)

Note1) Use DC power (24 V) to operate the brake

Note2) The sizes in parentheses apply when attached to the brakes.

■ **EA Series | APM - EAR5A, EA01A, EA015A**





SC-MC6P-AK2G-04

Pin No.	Phase
1	FG
2	W
3	V
4	U

<Power pin array>



SC-MC6P-AK2G-05

Pin No.	Phase
1	FG
2	W
3	V
4	U
A	BK+
B	BK-

<Power & Brake pin array>



RECEPTACLE : JN13CD09PN1
PIN : JN-24S-C1B-B1-10000

Pin No.	Encoder Phase	Pin No.	Encoder Phase
1	SHIELD	6	GND_B
2	$\overline{SLO}$	7	VDD_B
3	SLO	8	0V
4	$\overline{MA}$	9	+5V
5	MA		

<Encoder pin array>

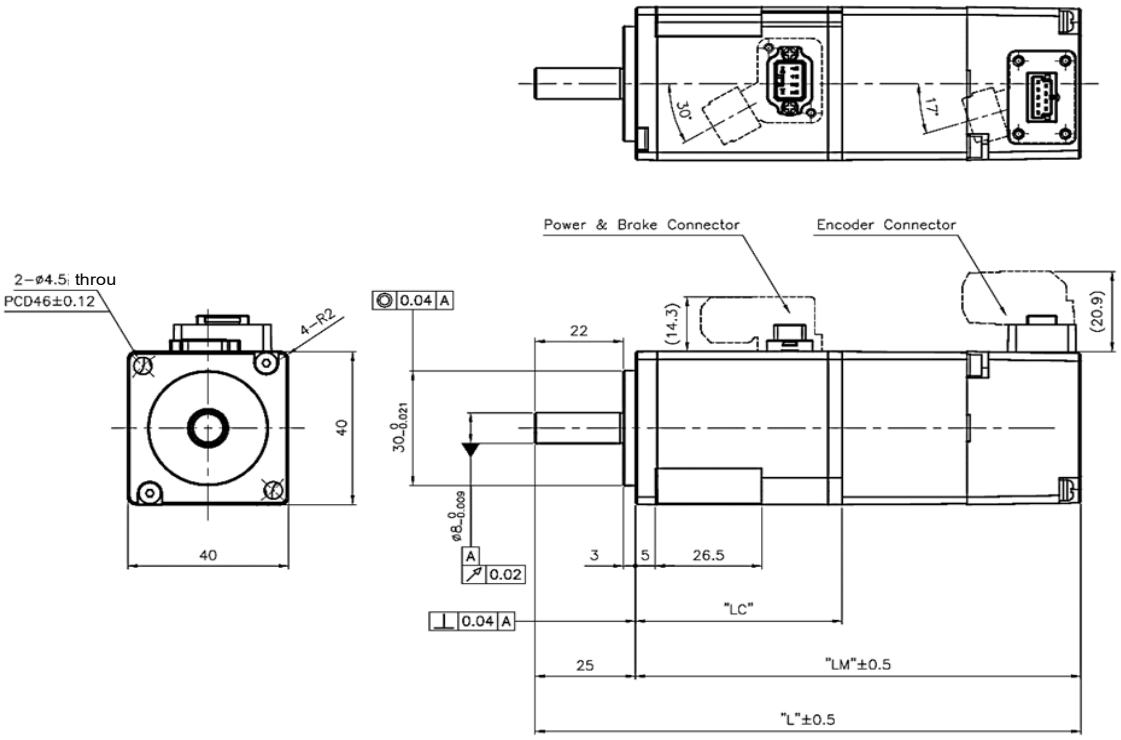
Model	External Dimensions			Weight (kg)
	L	LM	LC	
EAR5A	80.1(111.4)	55.1(86.4)	37.7(37.5)	0.26(0.44)
EA01A	94.1(125.4)	69.1(100.4)	51.7(51.5)	0.37(0.55)
EA015A	116.1	91.1	73.7	0.55

Note1) Use DC 24 [V] for the power to open the brake.

Note2) The size in parentheses is of an attachable brake.

Note3) When connecting an EA product, please connect the power cable first.

■ EA Series (Batteryless) | APM - EAR5A, EA01A, EA015A





SC-MC6P-AK2G-04

Pin No.	Phase
1	FG
2	W
3	V
4	U

<Power pin array>



SC-MC6P-AK2G-05

Pin No.	Phase
1	FG
2	W
3	V
4	U
A	BK+
B	BK-

<Power & Brake pin array>



RECEPTACLE : JN13CD09PN1
PIN : JN-24S-C1B-B1-10000

Pin No.	Encoder Phase	Pin No.	Encoder Phase
1	SHIELD	6	-
2	$\overline{SLO}$	7	-
3	SLO	8	0V
4	$\overline{MA}$	9	+5V
5	MA		

<Encoder pin array>

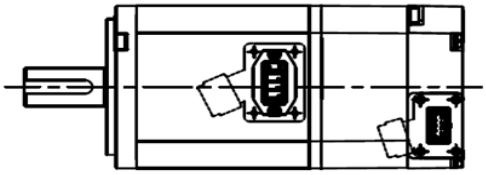
Model	External Dimensions			Weight (kg)
	L	LM	LC	
EAR5A	91.9(122.0)	66.9(97.0)	38.5(37.5)	0.26(0.44)
EA01A	105.9(136.0)	80.9(111.0)	52.5(51.5)	0.37(0.55)
EA015A	127.9	102.9	74.5	0.55

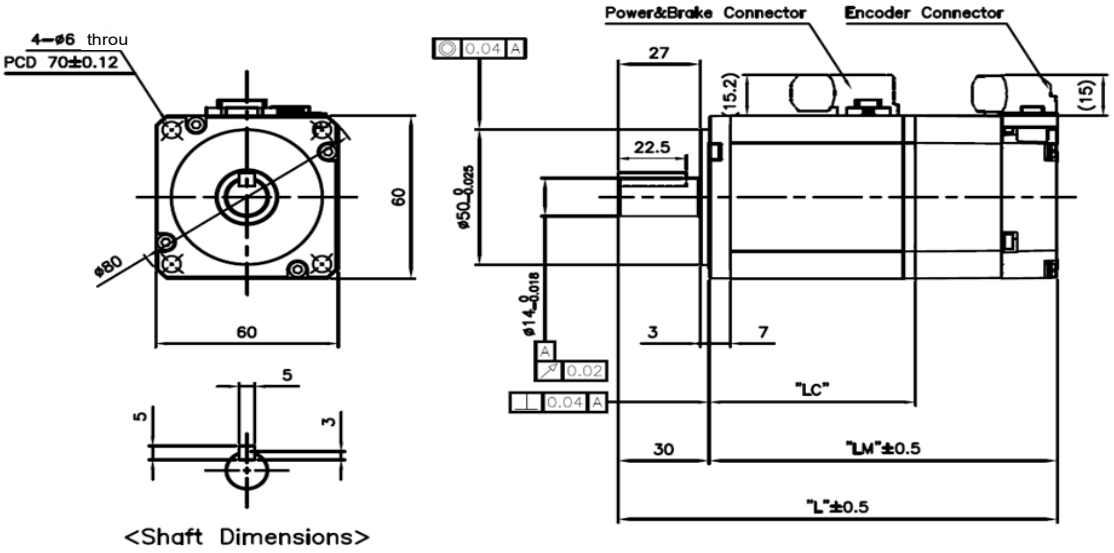
Note1) Use DC 24 [V] for the power to open the brake.

Note2) The size in parentheses is of an attachable brake.

Note3) When connecting an EA product, please connect the power cable first.

■ EB Series | APM – EB01A, EB02A, EB04A







SC–MC6P–AJ2G–05

Pin No.	Phase
1	U
2	V
3	W
4	FG

<Power pin array>



SC–MC6P–AJ2G–04

Pin No.	Phase
1	U
2	V
3	W
4	FG
A	BK+
B	BK–

<Power & Brake pin array>



RECEPTACLE : JN13CD09PN1
PIN : JN–24S–C1B–B1–10000

Pin No.	Encoder Phase	Pin No.	Encoder Phase
1	SHIELD	6	GND_B
2	$\overline{SLO}$	7	VDD_B
3	SLO	8	0V
4	$\overline{MA}$	9	+5V
5	MA		

<Encoder pin array>

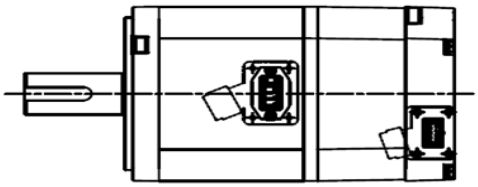
Model	External Dimensions			Weight (kg)
	L	LM	LC	
EB01A	89.2(117.5)	59.2(87.5)	41(40.8)	0.59(0.95)
EB02A	98.2(126.5)	68.2(96.5)	50(49.8)	0.76(1.12)
EB04A	116.2(144.5)	86.2(114.5)	68(67.8)	1.10(1.46)

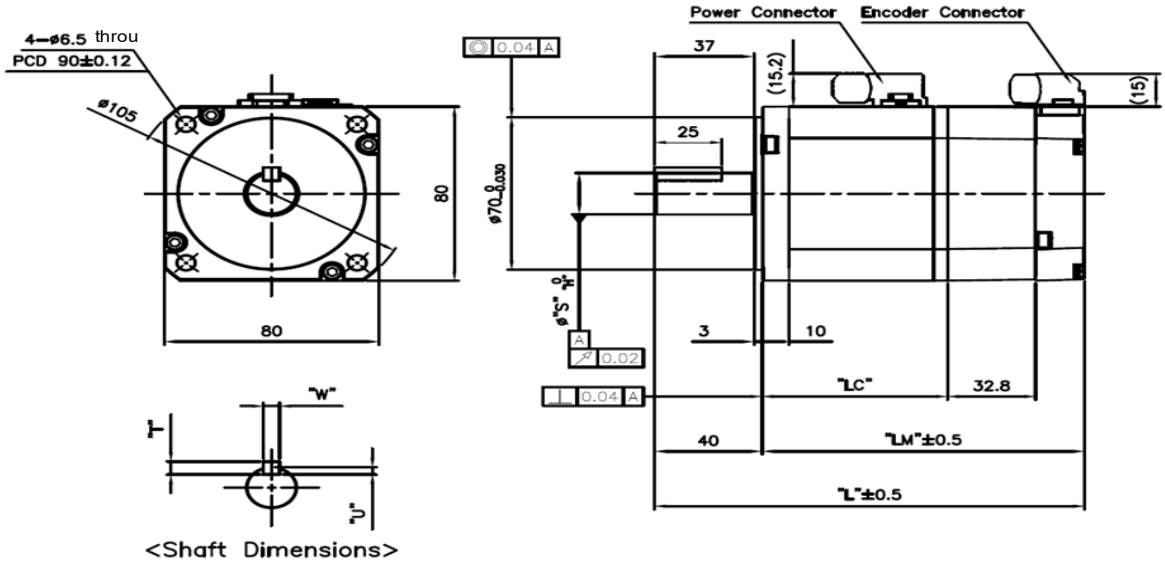
Note1) Use DC 24 [V] for the power to open the brake.

Note2) The size in parentheses is of an attachable brake.

Note3) When using a batteyless encoder, the standard model L,LM: 11.8mm and the brake model L,LM: 12mm increase.

■ EC Series | APM – EC04A, EC06A, EC08A, EC10A





<Shaft Dimensions>



SC-MC6P-AJ2G-05

Pin No.	Phase
1	U
2	V
3	W
4	FG

<Power pin array>



SC-MC6P-AJ2G-04

Pin No.	Phase
1	U
2	V
3	W
4	FG
A	BK+
B	BK-

<Power & Brake pin array>



RECEPTACLE : JN13CD09PN1
PIN : JN-24S-C1B-B1-10000

Pin No.	Encoder Phase	Pin No.	Encoder Phase
1	SHIELD	6	GND_B
2	$\overline{SLO}$	7	VDD_B
3	SLO	8	0V
4	$\overline{MA}$	9	+5V
5	MA		

<Encoder pin array>

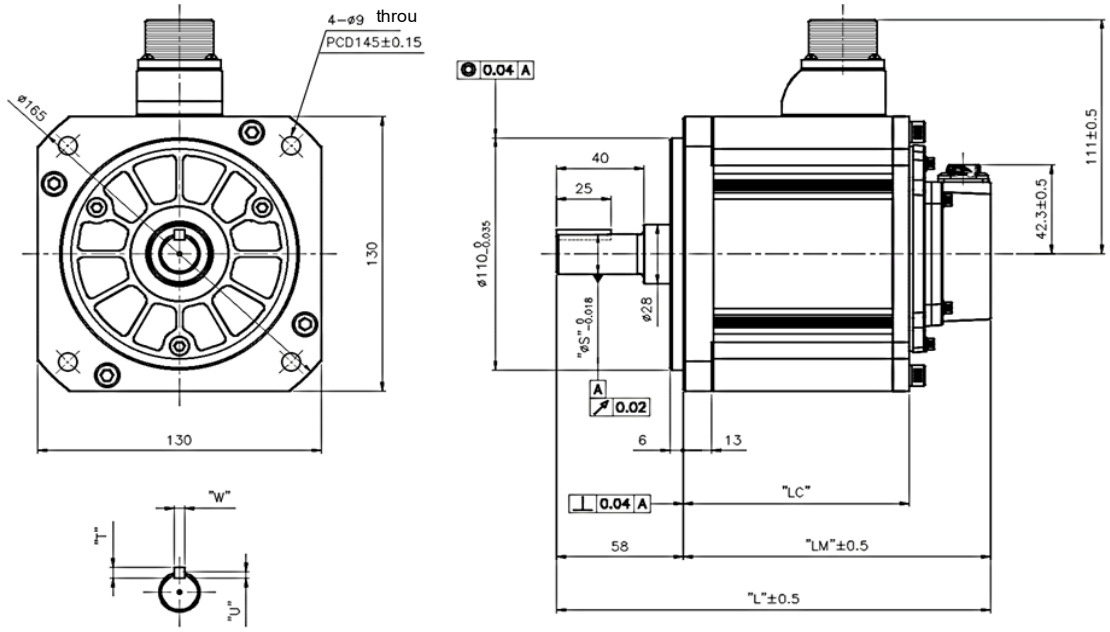
형명	External Dimensions					Key 치수			Weight (kg)
	L	LM	LC	S	H	T	W	U	
EC04A	115.2(148)	75.2(108)	57	14	-0.018	5	5	3	1.41(2.08)
EC06A	127.2(160)	87.2(120)	69	19	-0.021	6	6	3.5	1.89(2.53)
EC08A	131.2(164)	91.2(124)	73						2.00(2.67)
EC10A	151.2(184)	111.2(144)	93						2.69(3.36)

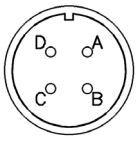
Note1) Use DC 24 [V] for the power to open the brake.

Note2) The size in parentheses is of an attachable brake.

Note3) When using a batteyless encoder, the standard model L,LM: 11.8mm and the brake model L,LM: 12mm increase.

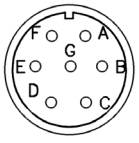
■ **EE(P) Series | APM – EE(P)09A, EE(P)06D, EE(P)05G, EE(P)03M, EE(P)15A, EE(P)11D, EE(P)09G, EE(P)06M, EE(P)22A, EE(P)16D, EE(P)13G, EE(P)09M, EE(P)30A, EE(P)22D, EE(P)17G, EE(P)12M**





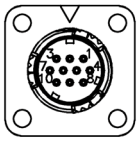
MS3102A20–4P
(4 pole plug)

Pin No.	Phase
A	U
B	V
C	W
D	FG



MS3102A20–15P
(7 pole plug)

Pin No.	Phase
A	U
B	V
C	W
D	FG
E	BK+
F	BK–



SC–CMV1–R10PTG–4
(10 pole plug)

Pin No.	Encoder Phase	Pin No.	Encoder Phase
1	+5V	6	MA
2	0V	7	$\overline{MA}$
3	–	8	SLO
4	VDD_B	9	$\overline{SLO}$
5	GND_B	10	SHIELD

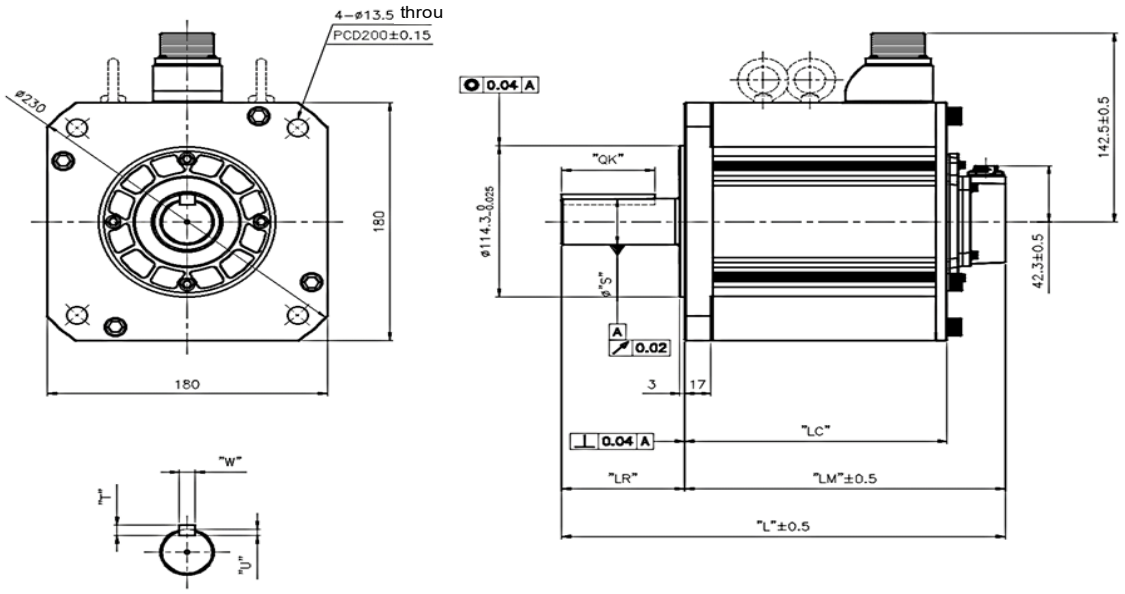
Model	External Dimensions			Key Dimension				Weight (kg)
	L	LM	LC	S	T	W	U	
EE(P)09A, EE(P)06D, EE(P)05G, EE(P)03M	181(219)	123(161)	85.8(85.6)	19	5	5	3	4.7(6.3)
EE(P)15A, EE(P)111D, EE(P)09G, EE(P)06M	199(237)	141(179)	103.8(103.6)	19	5	5	3	6.2(7.8)
EE(P)22A, EE(P)16D, EE(P)13G, EE(P)09M	217(255)	159(197)	121.8(121.6)	22	6	6	3.5	7.8(9.4)
EE(P)30A, EE(P)22D, EE(P)17G, EE(P)12M	235(273)	177(215)	139.8(139.6)	24	7	8	4	9.4(11)

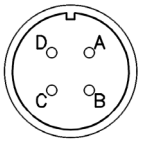
Note1) Use DC 24 [V] for the power to open the brake.

Note2) The size in parentheses is of an attachable brake.

Note3) When using a batteyless encoder, the standard model L,LM: 11.2mm increase.

■ **EF(P) Series | APM – EF(P)30A, EF(P)22D, EF(P)20G, EF(P)12M, EF(P)50A, EF(P)35D, EF(P)30G, EF(P)20M, EF(P)55D, EF(P)44G, EF(P)30M, EF(P)75D, EF(P)60G, EF(P)44M, EF(P)75G,EF(P)60M**





MS3102A22-22P
(4 pole plug)

Pin No.	Phase
A	U
B	V
C	W
D	FG



MS3102A24-10P
(7 pole plug)

Pin No.	Phase
A	U
B	V
C	W
D	F/G
E	BK+
F	BK-



SC-CMV1-R10PTG-4
(10 pole plug)

Pin No.	Encoder Phase	Pin No.	Encoder Phase
1	+5V	6	MA
2	0V	7	$\overline{MA}$
3	–	8	SLO
4	VDD_B	9	$\overline{SLO}$
5	GND_B	10	SHIELD

Model	External Dimensions				Key Dimension					Eye bolt	Weight (kg)
	L	LM	LC	LR	S	QK	T	W	U		
EF(P)30A, EF(P)22D, EF(P)20G, EF(P)12M	231.7(283.1)	152.7(204.1)	115.5(115.2)	79	35 (+0.1~0)	60	8	10	5	X	12.1(19.3)
EF(P)50A, EF(P)35D, EF(P)30G, EF(P)20M	248.7(300.1)	169.7(221.1)	132.5(132.2)				8	10	5		15.1(22.3)
EF(P)55D, EF(P)44G, EF(P)30M	284.7(336.1)	205.7(257.1)	168.5(168.2)				8	10	5	O	20.8(28)
EF(P)75D, EF(P)60G, EF(P)44M	326.7(378.1)	247.7(299.1)	210.5(210.2)		42 (0~-0.016)		8	12	5		27.7(34.9)
EF(P)7G,EF(P)60M	381.7	268.7	231.5	113		96	8	12	5		32

Note1) Use DC 24 [V] for the power to open the brake.

Note2) The size in parentheses is of an attachable brake.

Note3) When using a batteyless encoder, the standard model L,LM: 11.2mm increase.

2.1.3 Motor type and ID

[200V]

Model name	ID	Watt	Note
HB01A	37	100	Hollow Shaft
HB02A	15	200	Hollow Shaft
HB04A	16	400	Hollow Shaft
HE09A	77	900	Hollow Shaft
HE15A	78	1500	Hollow Shaft
HE30A	39	3000	Hollow Shaft
DB03D-I	651	63	
DB06D-I	652	126	
DB09D-I	653	188	
DC06D-I	661	126	
DC12D-I	662	251	
DC18D-I	663	377	
DD12D-I	671	251	
DD22D-I	672	461	
DD34D-I	673	712	
DE40D-I	682	838	
DE60D-I	683	1257	
DFA1G-I	691	1728	
DFA6G-I	692	2513	
DG3CS	643	1728	
DBF03D	6051	63	
DCF06D	6061	126	
DDF12D	6071	251	
EAR5A	6001	50	
EA01A	6002	100	
EA015A	6003	150	
EB01A	6004	100	
EB02A	6005	200	
EB04A	6006	400	
EC04A	6007	400	
EC06A	6008	600	
EC08A	6009	800	
EC10A	6010	1000	

Model name	ID	Watt	Note
EE09A	6161	900	
EE15A	6162	1500	
EE22A	6163	2200	
EE30A	6164	3000	
EE06D	6165	600	
EE11D	6166	1100	
EE16D	6167	1600	
EE22D	6168	2200	
EE03M	6169	300	
EE06M	6170	600	
EE09M	6171	900	
EE12M	6172	1200	
EF30A	6181	3000	
EF50A	6182	5000	
EF12M	6189	1200	
EF20M	6190	2000	
EF30M	6191	3000	
EF44M	6192	4000	
EF20G	6193	1800	
EF30G	6194	2900	
EF44G	6195	4400	
EF60G	6196	6000	
EF75G	6197	7500	
EE05G	6198	450	
EE09G	6199	850	
EE13G	6200	1300	
EE17G	6201	1700	
EF22D	6202	2200	
EF35D	6203	3500	
EF55D	6204	5500	
EF75D	6205	7500	

Model name	ID	Watt	Note
FALR5A	702	50	
FAL01A	703	100	
***FAL015A**	**706**	**150**	**Mass-produced since March 2018**
FBL01A	714	100	
FBL02A	715	200	
FBL04A	716	400	
FCL04A	729	400	
FCL06A	730	600	
FCL08A	731	750	
FCL10A	732	1000	
FCL03D	733	300	
FCL05D	734	450	
FCL06D	735	550	
FCL07D	736	650	
FE09A	761	900	
FE15A	762	1500	
FE22A	763	2200	
***FE30A**	780	3000	**Mass-produced since October 2019**
FE06D	765	600	
FE11D	766	1100	
FE16D	767	1600	
FE22D	768	2200	
FE03M	769	300	
FE06M	770	600	
FE09M	771	900	
FE12M	772	1200	
FE05G	773	450	
FE09G	774	850	
FE13G	775	1300	
FE17G	776	1700	

Model name	ID	Watt	Note
FF30A	781	3000	
FF50A	782	5000	
FF22D	785	2200	
FF35D	786	3500	
FF55D	787	5500	
FF75D	788	7500	
FF12M	789	1200	
FF20M	790	2000	
FF30M	791	3000	
FF44M	792	4000	
FF20G	793	1800	
FF30G	794	2900	
FF44G	795	4400	
FF60G	796	6000	
FF75G	804	7500	
FG22D	811	2200	
FG35D	812	3500	
FG55D	813	5500	
FG75D	814	7500	
FG110D	815	11000	
FG12M	821	1200	
FG20M	822	2000	
FG30M	823	3000	
FG44M	824	4400	
FG60M	825	6000	
FG20G	831	1800	
FG30G	832	2900	
FG44G	833	4400	
FG60G	834	6000	
FG85G	835	8500	
FG110G	836	11000	
FG150G	837	15000	

*** FAL015A : Use ID 704 for models produced before March 2018.**

*** FE30A : Use ID 764 for models produced before October 2019.**

[400V]

Model name	ID	Watt	Note
FEP09A	261	900	
FEP15A	262	1500	
FEP22A	263	2200	
***FEP22A**	**277**	**2200**	**Mass production after March 2018**
FEP30A	264	3000	
FEP06D	265	600	
FEP11D	266	1100	
FEP16D	267	1600	
FEP22D	268	2200	
FEP03M	269	300	
FEP06M	270	600	
FEP09M	271	900	
FEP12M	272	1200	
FEP05G	273	450	
FEP09G	274	850	
FEP13G	275	1300	
FEP17G	276	1700	
FFP30A	281	3000	
FFP50A	282	5000	
FFP22D	285	2200	
FFP35D	286	3500	
FFP55D	287	5500	
FFP75D	288	7500	
FFP12M	289	1200	
FFP20M	290	2000	
FFP30M	**298**	**3000**	**Mass production after March 2018**
FFP44M	292	4400	
FFP20G	29	1800	
FFP30G	294	2900	

Model name	ID	Watt	Note
FFP44G	295	4400	
FFP60G	296	6000	
FFP75G	297	7500	
FGP22D	311	2200	
FGP35D	312	3500	
FGP55D	313	5500	
FGP75D	314	7500	
FGP110D	315	11000	
FGP12M	321	1200	
FGP30M	322	2000	
FGP30M	**338**	**3000**	**Mass production after March 2018**
FGP44M	324	4400	
FGP60M	325	6000	
***FGP60M**	**326**	**6000**	**Mass production after March 2018**
FGP20G	331	1800	
FGP30G	332	2900	
FGP44G	333	4400	
FGP60G	334	6000	
FGP85G	335	8500	
FGP110G	336	11000	
FGP150G	337	15000	

*** FEP22A : For models produced before March 2018, use ID 263.**

*** FFP30M : For models produced before March 2018, use ID 291.**

*** FGP30M : For models produced before March 2018, use ID 323**

*** FGP60M : For models produced before March 2018, use ID 325**

Model name	ID	Watt	Note
EEP09A	2261	900	
EEP15A	2262	1500	
EEP22A	2263	2200	
EEP30A	2264	3000	
EEP06D	2265	600	
EEP11D	2266	1100	
EEP16D	2267	1600	
EEP22D	2268	2200	
EEP03M	2269	300	
EEP06M	2270	600	
EEP09M	2271	900	
EEP12M	2272	1200	
EEP05G	2273	450	
EEP09G	2274	850	
EEP13G	2275	1300	
EEP17G	2276	1700	

Model name	ID	Watt	Note
EFP30A	2281	3000	
EFP50A	2282	5000	
EFP22D	2298	2200	
EFP35D	2299	3500	
EFP55D	2300	5500	
EFP75D	22301	7500	
EFP12M	2289	1200	
EFP20M	2290	2000	
EFP30M	2291	3000	
EFP44M	2292	4400	
EFP60M	2302	6000	
EFP20G	2293	1800	
EFP30G	2294	2900	
EFP44G	2295	4400	
EFP60G	2296	6000	
EFP75G	2927	7500	

2.2 Servo Drive

2.2.1 Product Features

200[V]

Item \ Model name		L7PA001U	L7PA002U	L7PA004U	L7PA008U	L7PA010U	L7PA020U	L7PA035U	L7PA050U	L7PA075U	L7PA150U
Input power	Main power	Three-phase AC200 ~ 230[V](-15 ~ +10[%]), 50 ~ 60[Hz]									
	Control power	Single-phase AC200 ~ 230[V](-15 ~ +10[%]), 50 ~ 60[Hz]									
Rated current [A]		1.4	1.7	3.0	5.2	6.75	13.5	16.7	32	39.4	76
Maximum current [A]		4.2	5.1	9.0	15.6	20.25	40.5	50.1	90.88	98.5	190
Encoder Type		Quadrature(Incremental) BiSS-B, BiSS-C(Absolute, Incremental) Tamagawa Serial(Absolute, Incremental) EnDat 2.2									
Control performance	Speed control range	Maximum 1 : 5000									
	Frequency response	Maximum 1 kHz or above (when the 19-bit serial encoder is applied).									
	Speed regulation	±0.01% or lower (when the load changes between 0 and 100%) ±0.1% or less (temperature of 25℃ (±10))									
	Speed acceleration/deceleration time	Linear or S-shaped acceleration/deceleration (0~10,000[ms], 0~1,000[ms] unit setting possible)									
	Input frequency	1[Mpps], Line drive / 200[kpps], Open collector									
	Input pulse method	Sign + pulse string, CW+CCW, Phase A/B									
RS422 communication spec	Communication standard	ANSI/TIA/EIA-422 standard									
	Communication protocol	MODBUS-RTU									
	Connector	RJ45 x 2									
	Synchronization type	Asynchronous type									
	Transmission speed	9600 /19200/38400/57600 [bps] Can be set at [0x3002].									
	Transmission distance	Up to 200[m]									
	Current consumption	100[㎃] or less									
	Terminating resistor	Dip S/W(On/Off), Built-In 120Ω									
Digital I/O	Digital input	Input voltage range: DC 12[V] ~ DC 24[V] A total of 16 input channels (allocable) You can selectively allocate 33 functions. (*SV_ON, *POT, *NOT, *A-RST, *START, *STOP, *REGT, *EMG, *HOME, *HSTART, *ISEL0, *ISEL1, *ISEL2, *ISEL3, *ISEL4, *ISEL5, PCON, GAIN2, P_CL, N_CL, MODE, PAUSE, ABSRQ, JSTART, JDIR, PCLR, AOVR, SPD1/LVSF1, SPD2/LVSF2, SPD3, PROBE1, PROBE2, INHIBIT) Note) * Default allocation signal.									

	Digital output	Rated voltage and current: DC 24 V ± 10%, 120 ㎃ A total of 8 input channels (allocable) You can selectively allocate 19 kinds of output. (*ALARM±, *READY±, *BRAKE±, *INPOS1±, *ORG±, *EOS±, *TGON±, *TLMT±, VLMT±, INSPD±, ZSPD±, WARN±, INPOS2±, IOUT0±, IOUT1±, IOUT2± IOUT3±, IOUT4±, IOUT5±) Note) * Default allocation signal.
Analog input	Analog input	Total 2 channel Analog speed input(Command/Override) -10[V] ~ +10[V] Analog torque input(Command/ limit) -10[V] ~ +10[V]
	Analog output	A total 2 input channels (allocable) You can selectively allocate 15 kinds of output.
USB Communication	Function	Firmware download, parameter setting, adjustment, auxiliary functions, and parameter copy function.
	Communication Specification	Conform to the USB 2.0 Full Speed Standard.
	Connected device	PC or USB storage medium
Built-in Functions	Dynamic braking	Standard built-in (activated when the servo alarm goes off or when the servo is off)
	Regenerative braking	Both the default built-in brake and an externally installed brake are possible
	Display function	Seven segments (5 DIGIT)
	Self-Setting Function	Possible to set the drive node address by using Rotary Switch
	Add-on functions	Gain adjustment, alarm history, JOG operation, origin search
	Protection functions	Overcurrent, overload, excessive current limit, overheat, overvoltage, undervoltage, overspeed, encoder error, position following error, current sensing error, etc.
Operating ambient environment	Operating ambient temperature /Storage temperature	0 ~ 50 [℃] / -20 ~ 65 [℃]
	Ambient humidity /Storage humidity	80% RH or less (no condensation) /90% RH or less (no condensation)
	Etc	Indoors in an area free from corrosive or combustible gases, liquids, or dust.

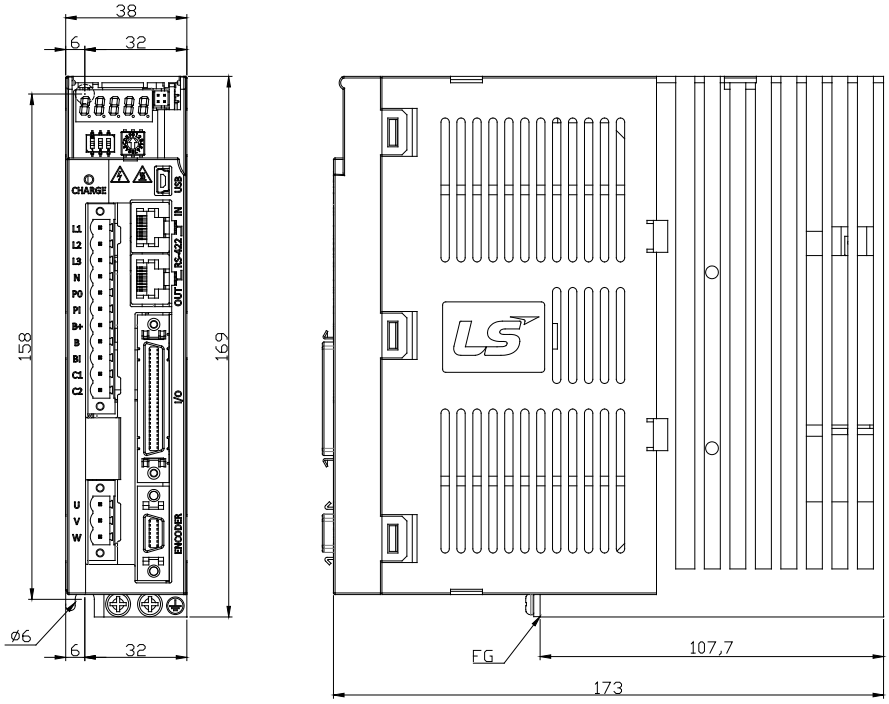
400[V]

Item \ Model name		L7PB010U	LPB020U	L7PB035U	L7PB050U	L7PB075U	L7PB150U
Input power	Main power	Three-phase AC380 ~ 480[V](-15 ~ +10[%]), 50 ~ 60[Hz]					
	Control power	Single-phase AC380 ~ 480[V](-15 ~ +10[%]), 50 ~ 60[Hz]					
Rated current [A]		3.7	8	10.1	17.5	22.8	39
Maximum current [A]		11.1	24	30.3	47.25	57	97.5
Encoder Type		Quadrature(Incremental) BiSS-B, BiSS-C(Absolute, Incremental) Tamagawa Serial(Absolute, Incremental) EnDat 2.2					
Control performance	Speed control range	Maximum 1 : 5000					
	Frequency response	Maximum 1 kHz or above (when the 19-bit serial encoder is applied).					
	Speed regulation	±0.01% or lower (when the load changes between 0 and 100%) ±0.1% or less (temperature of 25℃ (±10))					
	Speed acceleration/deceleration time	Linear or S-shaped acceleration/deceleration (0~10,000[ms], 0~1,000[ms] unit setting possible)					
	Input frequency	1[Mpps], Line drive / 200[kpps], Open collector					
	Input pulse method	Sign + pulse string, CW+CCW, Phase A/B					
RS422 communication spec	Communication standard	ANSI/TIA/EIA-422 standard					
	Communication protocol	MODBUS-RTU					
	Connector	RJ45 x 2					
	Synchronization type	Asynchronous type					
	Transmission speed	9600 /19200/38400/57600 [bps] Can be set at [0x3002].					
	Transmission distance	Up to 200[m]					
	Current consumption	100[㎃] or less					
	Terminating resistor	Dip S/W(On/Off), Built-In 120Ω					
Digital I/O	Digital input	Input voltage range: DC 12[V] ~ DC 24[V] A total of 16 input channels (allocable) You can selectively allocate 33 functions. (*SV_ON, *POT, *NOT, *A-RST, *START, *STOP, *REGT, *EMG, *HOME, *HSTART, *ISEL0, *ISEL1, *ISEL2, *ISEL3, *ISEL4, *ISEL5, PCON, GAIN2, P_CL, N_CL, MODE, PAUSE, ABSRQ, JSTART, JDIR, PCLR, AOVR, SPD1/LVSF1, SPD2/LVSF2, SPD3, PROBE1, PROBE2, INHIBIT) Note) * Default allocation signal.					

	Digital output	Rated voltage and current: DC 24 V ± 10%, 120 ㎃ A total 8 input channels (allocable) You can selectively allocate 19 kinds of output. (*ALARM±, *READY±, *BRAKE±, *INPOS1±, *ORG±, *EOS±, *TGON±, *TLMT±, VLMT±, INSPD±, ZSPD±, WARN±, INPOS2±, IOUT0±, IOUT1±, IOUT2± IOUT3±, IOUT4±, IOUT5±) Note) * Default allocation signal.
Analog input	Analog input	Total 2 channel Analog speed input(Command/Override) -10[V] ~ +10[V] Analog torque input(Command/ limit) -10[V] ~ +10[V]
	Analog output	A total 2 input channels (allocable) You can selectively allocate 15 kinds of output.
USB Communication	Function	Firmware download, parameter setting, adjustment, auxiliary functions, and parameter copy function.
	Communication Specification	Conform to the USB 2.0 Full Speed Standard.
	Connected device	PC or USB storage medium
Built-in function	Dynamic braking	Standard built-in (activated when the servo alarm goes off or when the servo is off)
	Regenerative braking	Both the default built-in brake and an externally installed brake are possible
	Display function	Seven segments (5 DIGIT)
	Self-Setting Function	Possible to set the drive node address by using Rotary Switch
	Add-on functions	Gain adjustment, alarm history, JOG operation, origin search
	Protection functions	Overcurrent, overload, excessive current limit, overheat, overvoltage, undervoltage, overspeed, encoder error, position following error, current sensing error, etc.
Operating ambient environment	Operating ambient temperature /Storage temperature	0 ~ 50 [℃] / -20 ~ 65 [℃]
	Ambient humidity /Storage humidity	80% RH or less (no condensation) /90% RH or less (no condensation)
	Etc	Indoors in an area free from corrosive or combustible gases, liquids, or dust.

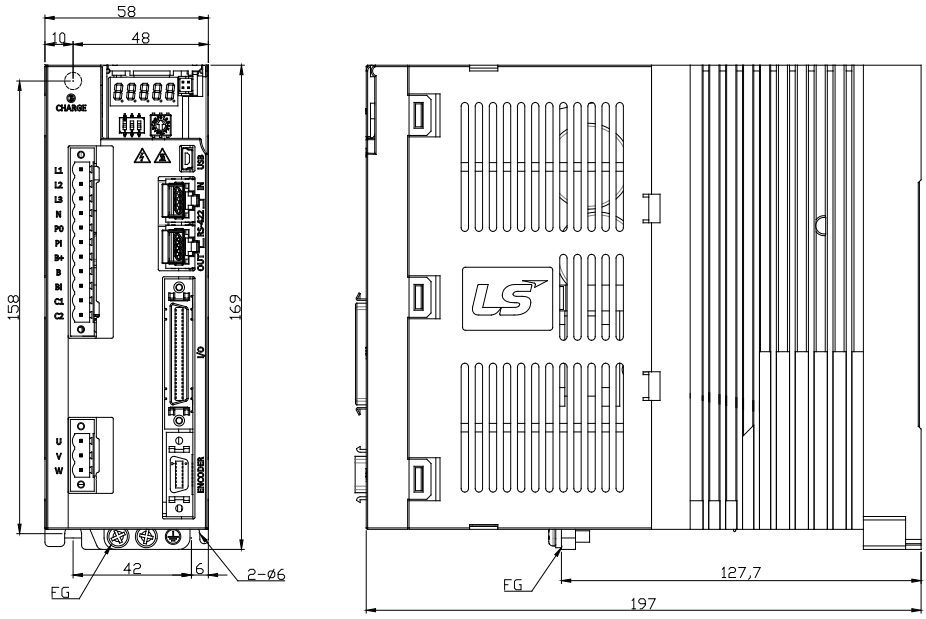
2.2.2 Outline drawing

■ L7PA001U ~ L7PA004U



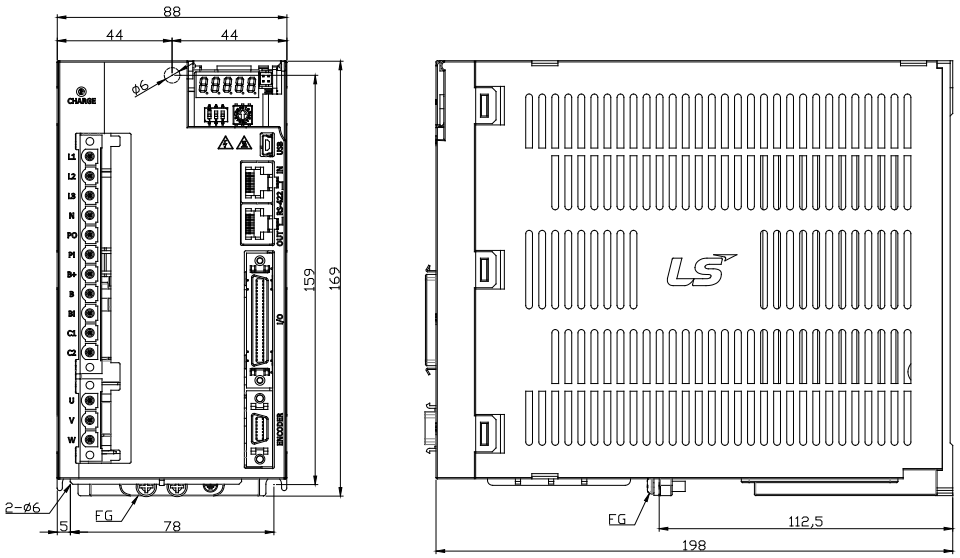
★ Weight: 1.0[kg]

■ L7PA008U / L7PA010U



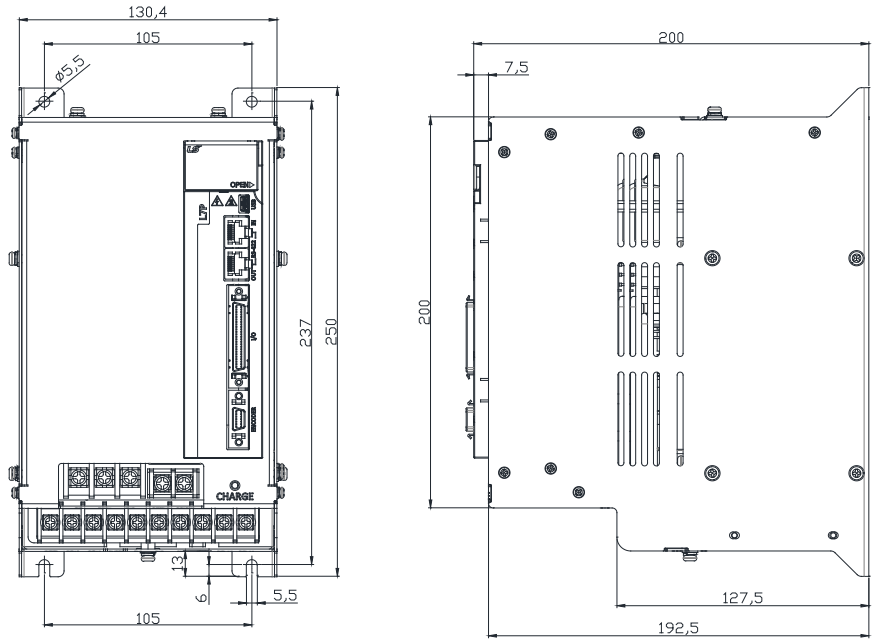
★ Weight: 1.5[kg] (including cooling pan)

■ L7PA020U / L7PA035U



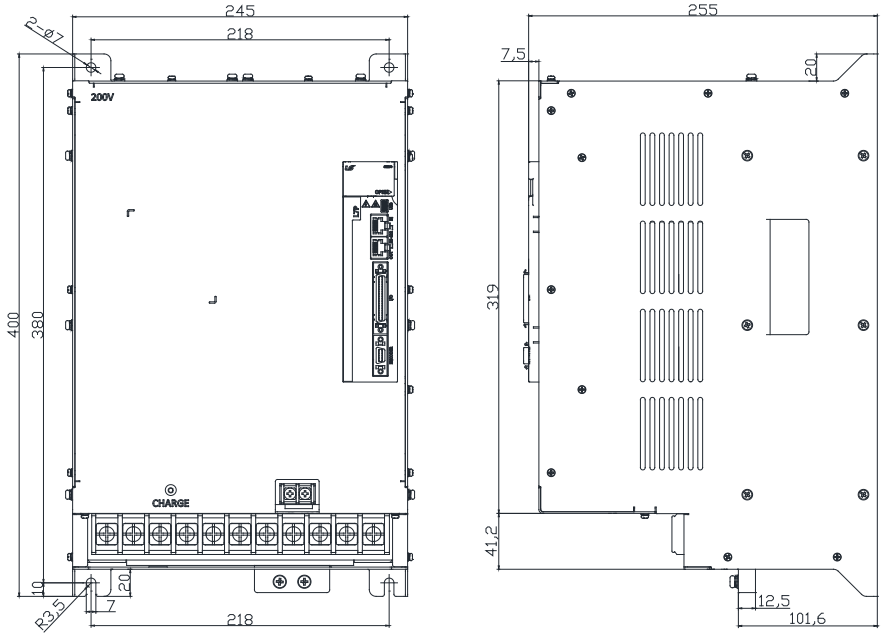
★ **Weight: 1.5[kg] (including cooling pan)**

■ L7PA050U



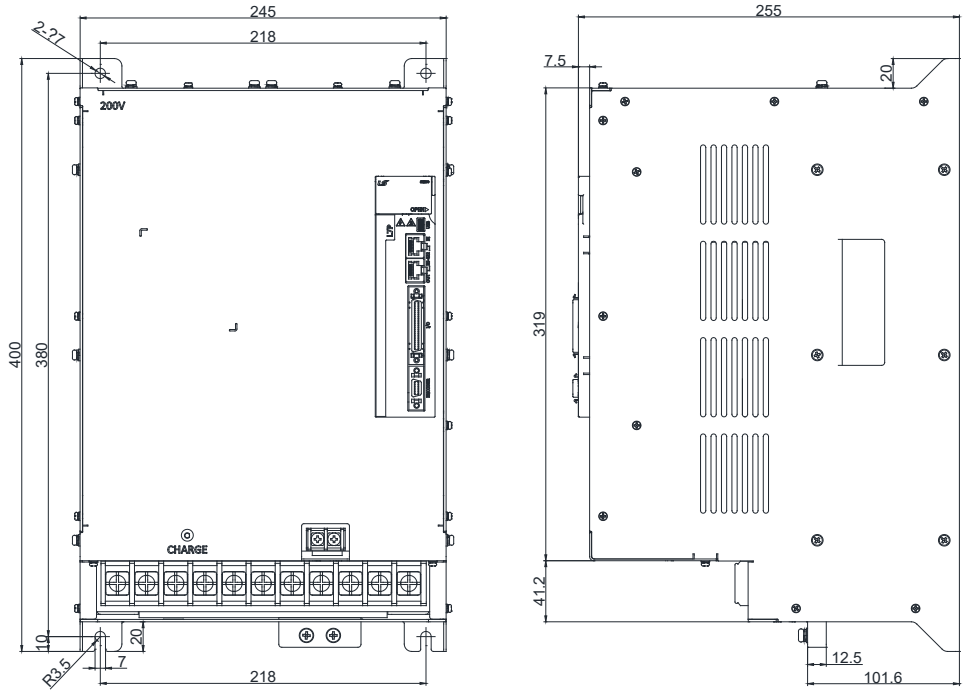
★ **Weight: 5.5[kg] (including cooling pan)**

■ L7PA075U



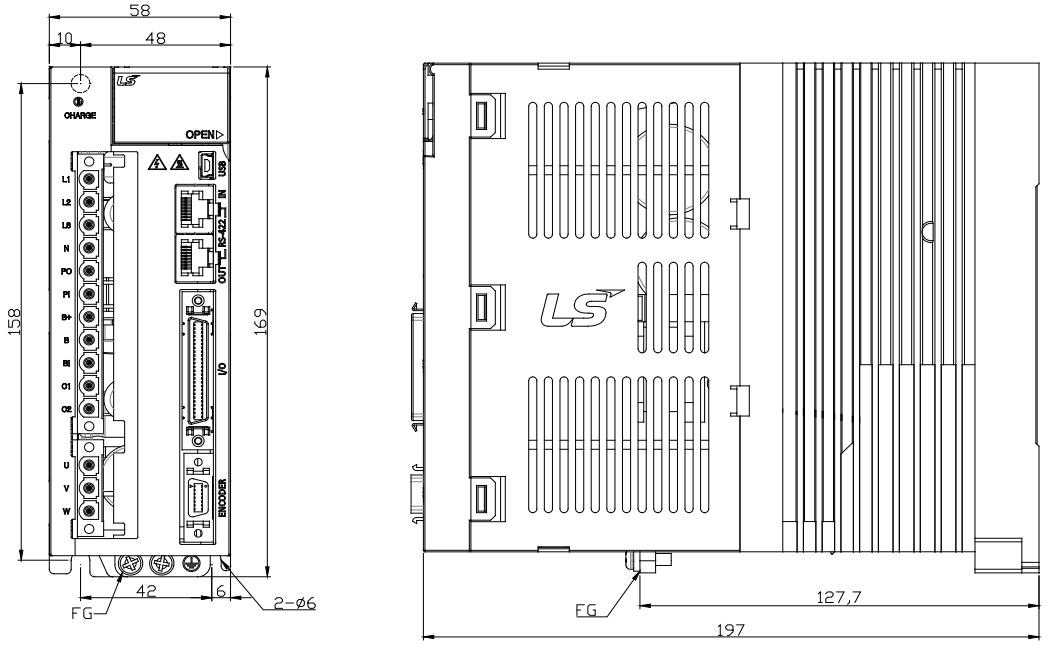
★ **Weight: 9.7[kg] (including cooling pan)**

■ L7PA150U



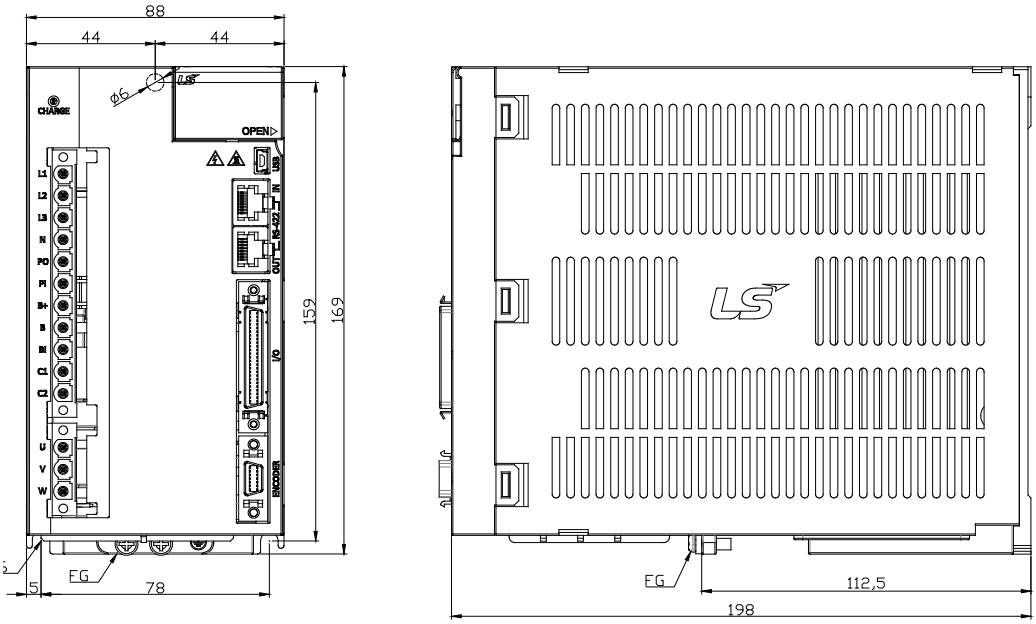
★ **Weight:** 16.2[kg] (including cooling pan)

■ L7PB010U



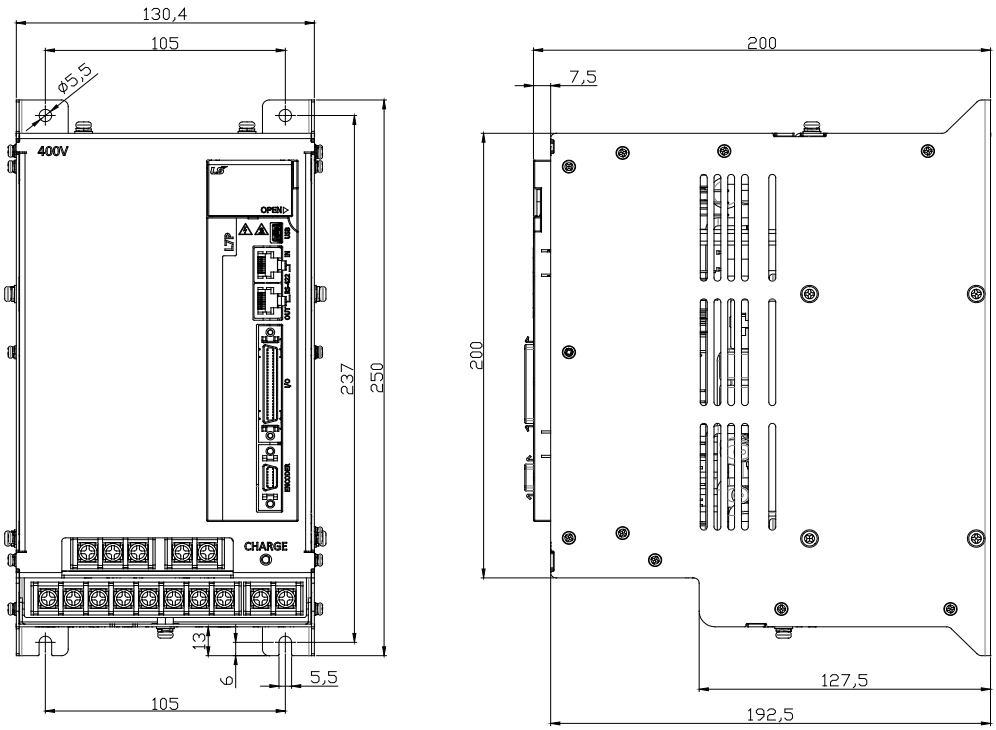
1.5[kg] (including cooling pan)

■ L7PB020U / L7PB035U



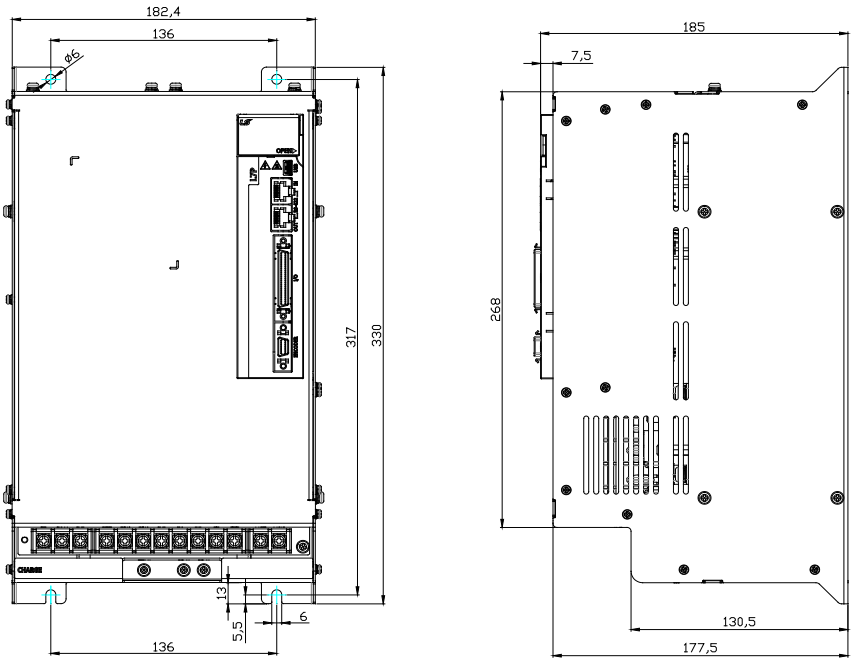
***Weight: 2.5[kg] (including cooling pan)**

■ L7NHB050U



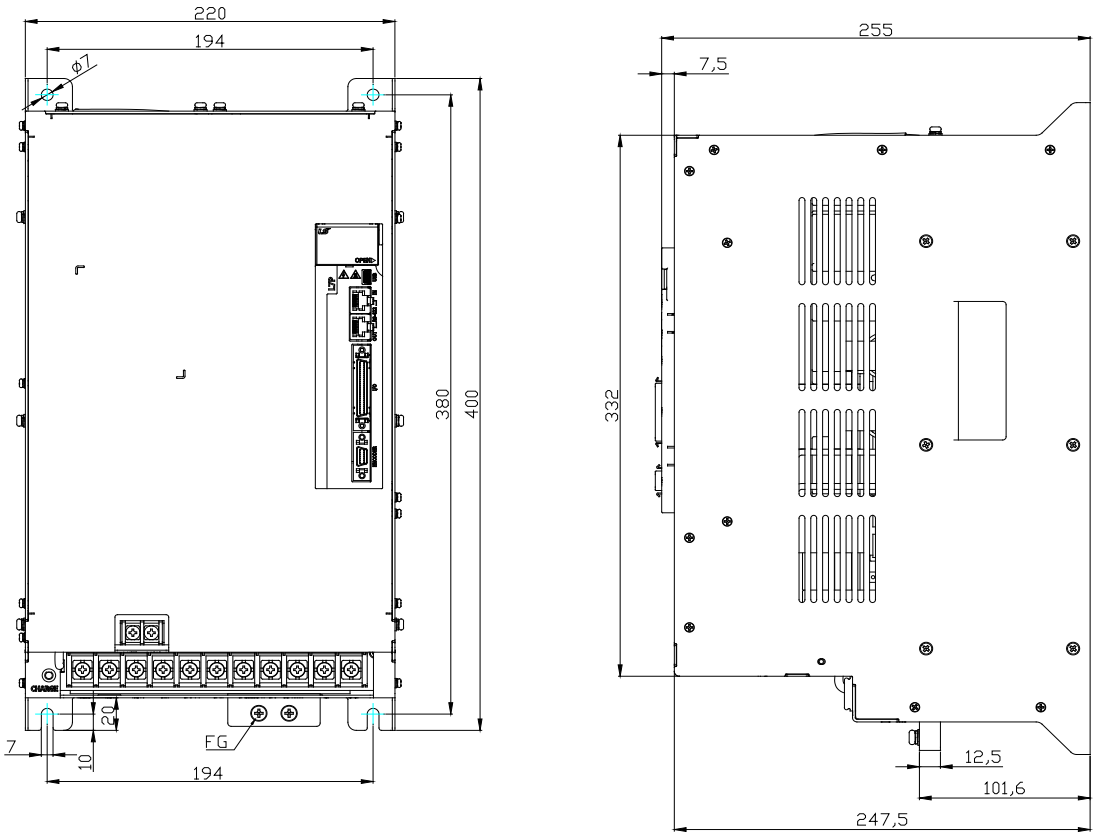
***Weight: 5.5[kg] (including cooling pan)**

■ L7NHB075U



***Weight: 8.5[kg] (including cooling pan)**

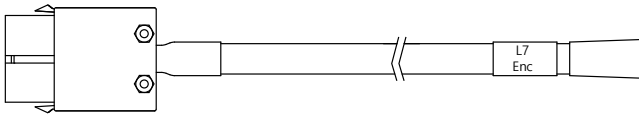
■ L7PB150U

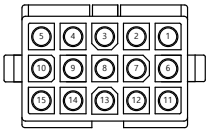


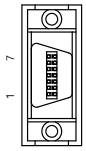
***Weight: 15.5[kg] (including cooling pan)**

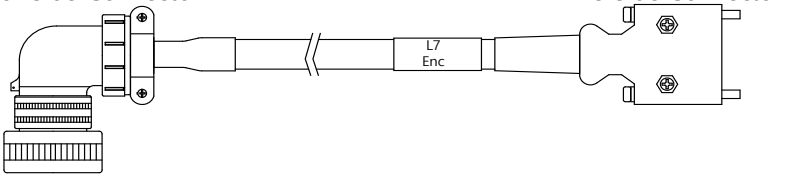
2.3 Options and Peripheral Devices

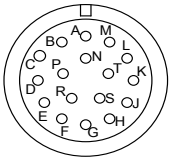
■ Option (Incremental encoder cable)

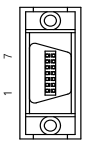
<table>
<tr><td>Classification</td><td>For signal</td><td>Product name</td><td>Small capacity AMP Type INC encoder cable</td></tr>
<tr><td>Product name (*Note 1)</td><td>APCS- E□□□AS</td><td>Applicable Motors</td><td>All model of APM-SA/SB/SC/HB SERIES INC</td></tr>
<tr><td>Specification</td><td colspan="3">
Motor Side Connector — Drive Side Connector




<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th></tr>
<tr><td>1</td><td>A</td><td>6</td><td>/Z</td><td>11</td><td>W</td></tr>
<tr><td>2</td><td>/A</td><td>7</td><td>U</td><td>12</td><td>/W</td></tr>
<tr><td>3</td><td>B</td><td>8</td><td>/U</td><td>13</td><td>+5V</td></tr>
<tr><td>4</td><td>/B</td><td>9</td><td>V</td><td>14</td><td>0V</td></tr>
<tr><td>5</td><td>Z</td><td>10</td><td>/V</td><td>15</td><td>SHIELD</td></tr>
</table>


<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th></tr>
<tr><td>1</td><td>W</td><td>8</td><td>/Z</td></tr>
<tr><td>2</td><td>/W</td><td>9</td><td>Z</td></tr>
<tr><td>3</td><td>V</td><td>10</td><td>/B</td></tr>
<tr><td>4</td><td>/V</td><td>11</td><td>B</td></tr>
<tr><td>5</td><td>U</td><td>12</td><td>/A</td></tr>
<tr><td>6</td><td>/U</td><td>13</td><td>A</td></tr>
<tr><td>7</td><td>0V</td><td>14</td><td>+5V</td></tr>
<tr><td colspan="2">Plate</td><td colspan="2">SHIELD</td></tr>
</table>
1. Motor connection
a. CAP Spec(15 Position) : 172163-1(AMP)
b. SOCKET spec.:170361-1(AMP)
2. Drive connection (CN2)
a. CASE Spec. : 10314-52A0-008(3M) or SM-14J(Suntone)
b. Connector Spec. : 10114-3000VE(3M) or SM-14J(Suntone)
3. Cable spec.: 7Px0.2SQ or 7Px24AWG
</td></tr>
<tr><td>Classification</td><td>For signal</td><td>Product name</td><td>Medium-large capacity MS Type INC encoder cable</td></tr>
<tr><td>Product name (*Note 1)</td><td>APCS- E□□□BS</td><td>Applicable Motors</td><td>All model of APM-HE SERIES INC</td></tr>
<tr><td>Specification</td><td colspan="3">
Motor Side Connector — Drive Side Connector




<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th></tr>
<tr><td>A</td><td>A</td><td>F</td><td>/Z</td><td>P</td><td>W</td></tr>
<tr><td>B</td><td>/A</td><td>K</td><td>U</td><td>R</td><td>/W</td></tr>
<tr><td>C</td><td>B</td><td>L</td><td>/U</td><td>H</td><td>+5V</td></tr>
<tr><td>D</td><td>/B</td><td>M</td><td>V</td><td>G</td><td>0V</td></tr>
<tr><td>E</td><td>Z</td><td>N</td><td>/V</td><td>J</td><td>SHIELD</td></tr>
</table>


<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th></tr>
<tr><td>1</td><td>W</td><td>8</td><td>/Z</td></tr>
<tr><td>2</td><td>/W</td><td>9</td><td>Z</td></tr>
<tr><td>3</td><td>V</td><td>10</td><td>/B</td></tr>
<tr><td>4</td><td>/V</td><td>11</td><td>B</td></tr>
<tr><td>5</td><td>U</td><td>12</td><td>/A</td></tr>
<tr><td>6</td><td>/U</td><td>13</td><td>A</td></tr>
<tr><td>7</td><td>0V</td><td>14</td><td>+5V</td></tr>
<tr><td colspan="2">Plate</td><td colspan="2">SHIELD</td></tr>
</table>
1. Motor connection (MS: Military Standard)
a. PLUG spec.: MS3108B 20-29S
2. Drive connection (CN2)
a. Case spec.: 10314-52A0-008(3M) or SM-14J(Suntone)
b. CONNECTOR spec.: 10114-3000VE(3M) or SM-14J(Suntone)
3. Cable spec.: 7Px0.2SQ or 7Px24AWG
</td></tr>
</table>

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

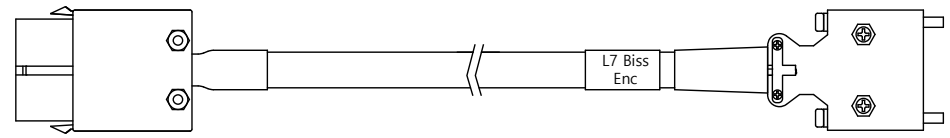
Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

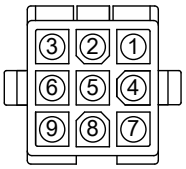
■ Option [serial encoder cable]

Classification	For signal	Product name	Small capacity AMP Type serial encoder cable (single turn)
Product name (*Note 1)	APCS- E□□□CS	Applicable Motors	All model of APM-SB/SC SERIES S-turn

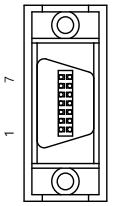
Specification

Motor Side Connector — Drive Side Connector





Pin No.	Encoder Signal	Pin No.	Encoder Signal
1	MA	6	-
2	/MA	7	+5V
3	SLO	8	0V
4	SLO	9	SHIELD
5	-		



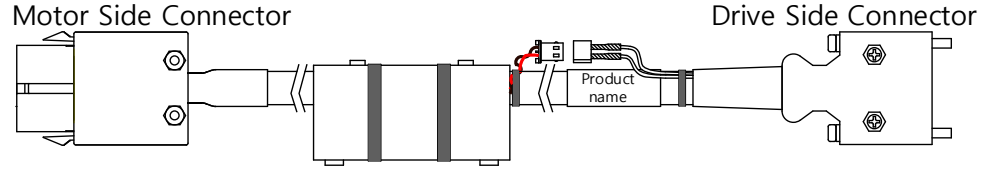
Pin No.	Encoder Signal	Pin No.	Encoder Signal
1	-	8	-
2	-	9	-
3	MA	10	-
4	/MA	11	-
5	SLO	12	-
6	/SLO	13	-
7	0V	14	+5V
Plate		SHIELD	

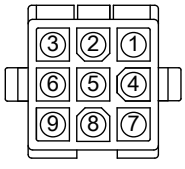
1. Motor connection
a. CAP Spec(9 Position) : 172161-1(AMP)
b. SOCKET spec.:170361-1(AMP)
2. Drive connection (CN2)
a. Case spec.: 10314-52A0-008(3M) or SM-14J(Suntone)
b. Connector Spec. : 10114-3000VE(3M) or SM-14J(Suntone)
3. Cable spec.: 3Px0.2SQ or 3Px24AWG

Classification	For signal	Product name	Small capacity AMP Type serial encoder cable (multi turn)
Product name (*Note 1)	APCS- E□□□CS1	Applicable Motors	All model of APM-SB/SC SERIES M-turn

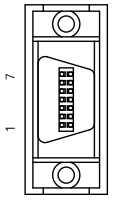
Specification

Motor Side Connector — Drive Side Connector





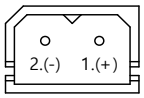
Pin No.	Encoder Signal	Pin No.	Encoder Signal
1	MA	6	GND_B
2	/MA	7	+5V
3	SLO	8	0V
4	SLO	9	SHIELD
5	VDD_B		



Pin No.	Encoder Signal	Pin No.	Encoder Signal
1	-	8	-
2	-	9	-
3	MA	10	-
4	/MA	11	-
5	SLO	12	-
6	/SLO	13	-
7	0V	14	+5V
Plate		SHIELD	

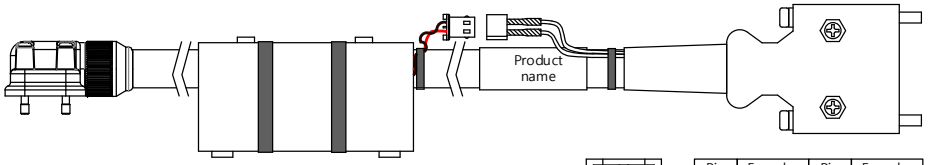
1. Motor connection
a. CAP Spec(9 Position) : 172161-1(AMP)
b. SOCKET spec.: 170361-1 (TE)
2. Drive connection (CN2)
a. Case spec.: 10314-52A0-008(3M) or SM-14J(Suntone)
b. Connector Spec. : 10114-3000VE(3M) or SM-14J(Suntone)
3. Cable spec.: 4Px0.2SQ or 4Px24AWG
4. Battery connection
a. CONNECTOR spec.: 5267-02A(Molex)
b. Battery spec.: ER6V(TOSHIBA, AA, 3.6V, 2000mAh)

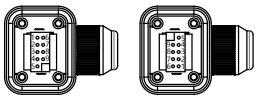
Battery Connector

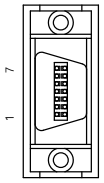


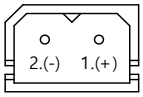
Pin No.	Encoder Signal	Wire color
1	BATTERY(VDD_B)	Red
2	BATTERY 0V(GND_B)	Black

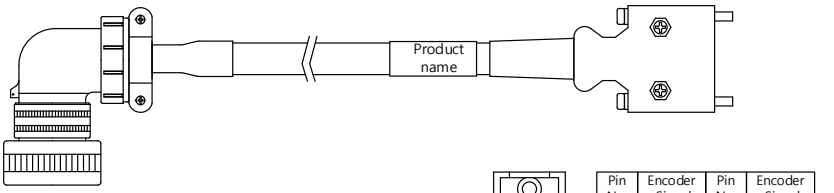
■ Option [serial encoder cable]

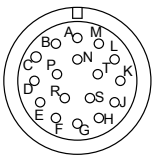
<table>
<tr><td>Classification</td><td>For signal</td><td>Product name</td><td>Small capacity Flat type motor serial encoder cable(multi turn)</td></tr>
<tr><td>Product name
(*Note 1)</td><td>APCS- E□□□ES1(Front Direction)/
APCS- E□□□ES1-R(Rear Direction)</td><td>Applicable Motors</td><td>All model of APM-FAL/FBL/FCL SERIES M-turn</td></tr>
<tr><td>Specification</td><td colspan="3">
Motor Side Connector


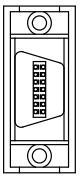


<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th></tr>
<tr><td>1</td><td>MA</td><td>6</td><td>/MA</td></tr>
<tr><td>2</td><td>SLO</td><td>7</td><td>/SLO</td></tr>
<tr><td>3</td><td>-</td><td>8</td><td>-</td></tr>
<tr><td>4</td><td>0V</td><td>9</td><td>+5V</td></tr>
<tr><td>5</td><td>SHIELD</td><td></td><td></td></tr>
</table>


<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th></tr>
<tr><td>1</td><td>-</td><td>8</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>9</td><td>-</td></tr>
<tr><td>3</td><td>MA</td><td>10</td><td>-</td></tr>
<tr><td>4</td><td>/MA</td><td>11</td><td>-</td></tr>
<tr><td>5</td><td>SLO</td><td>12</td><td>-</td></tr>
<tr><td>6</td><td>/SLO</td><td>13</td><td>-</td></tr>
<tr><td>7</td><td>0V</td><td>14</td><td>+5V</td></tr>
<tr><td colspan="2">Plate</td><td colspan="2">SHIELD</td></tr>
</table>
1. Motor connection
a. CAP Spec(9 Position) : 2201825-1(Tyco)
b. SOCKET spec.: 2174065- 4(Tyco)
2. Drive connection (CN2)
a. Case spec.: 10314-52A0-008(3M) or SM-14J(Suntone)
b. CONNECTOR spec.: 10114-3000VE(3M) or SM-14J(Suntone)
3. Cable spec.: 4Px0.2SQ or 4Px24AWG 4. Battery connection
4. Battery connection
a. CONNECTOR spec.: 5267-02A(Molex)
b. Battery spec.: ER6V(TOSHIBA, AA, 3.6V, 2000mAh)
Battery Connector


<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Wire color</th></tr>
<tr><td>1</td><td>BATTERY(VDD_B)</td><td>Red</td></tr>
<tr><td>2</td><td>BATTERY 0V(GND_B)</td><td>Black</td></tr>
</table>
</td></tr>
<tr><td>Classification</td><td>For signal</td><td>Product name</td><td>Medium-large capacity MS Type serial encoder cable (single turn)</td></tr>
<tr><td>Product name
(*Note 1)</td><td>APCS- E□□□DS</td><td>Applicable Motors</td><td>All models of APM-FE(P)/FF(P)/FG(P) SERIES S-turn</td></tr>
<tr><td>Specification</td><td colspan="3">
Motor Side Connector




<table>
<tr><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th><th>Pin No.</th><th>Encoder Signal</th></tr>
<tr><td>A</td><td>MA</td><td>F</td><td>-</td><td>P</td><td>-</td></tr>
<tr><td>B</td><td>/MA</td><td>K</td><td>-</td><td>R</td><td>-</td></tr>
<tr><td>C</td><td>SLO</td><td>L</td><td>-</td><td>H</td><td>+5V</td></tr>
<tr><td>D</td><td>/SLO</td><td>M</td><td>-</td><td>G</td><td>0V</td></tr>
<tr><td>E</td><td>-</td><td>N</td><td>-</td><td>J</td><td>SHIELD</td></tr>
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<tr><td>2</td><td>-</td><td>9</td><td>-</td></tr>
<tr><td>3</td><td>MA</td><td>10</td><td>-</td></tr>
<tr><td>4</td><td>/MA</td><td>11</td><td>-</td></tr>
<tr><td>5</td><td>SLO</td><td>12</td><td>-</td></tr>
<tr><td>6</td><td>/SLO</td><td>13</td><td>-</td></tr>
<tr><td>7</td><td>0V</td><td>14</td><td>+5V</td></tr>
<tr><td colspan="2">Plate</td><td colspan="2">SHIELD</td></tr>
</table>
1. Motor connection (MS: Military Standard)
a. PLUG spec. : MS3108B 20-29S
2. Drive connection (CN2)
a. Case spec.: 10314-52A0-008(3M) or SM-14J(Suntone)
b. CONNECTOR spec.: 10114-3000VE(3M) or SM-14J(Suntone)
3. Cable spec.: 3Px0.2SQ or 3Px24AWG
</td></tr>
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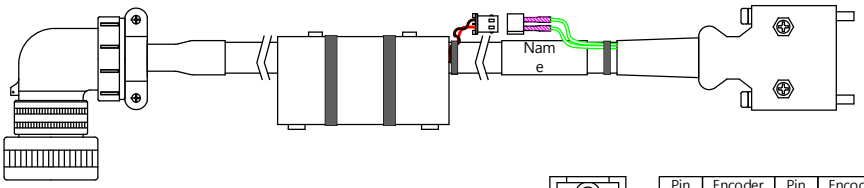
■ Option [serial encoder cable]

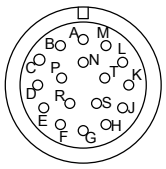
Classification	For signal	Product name	Medium-large capacity MS Type serial encoder cable (multi turn)
Product name (*Note 1)	APCS- E□□□DS	Applicable Motors	All models of APM-FE(P)/FF(P)/FG(P) SERIES M-turn

Specification

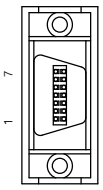
Motor Side Connector

Drive Side Connector





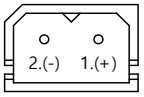
Pin No.	Encoder Signal	Pin No.	Encoder Signal	Pin No.	Encoder Signal
A	MA	F	-	P	-
B	/MA	K	-	R	-
C	SLO	L	-	H	+5V
D	/SLO	M	-	G	0V
E	-	N	-	J	SHIELD



Pin No.	Encoder Signal	Pin No.	Encoder Signal
1	-	8	-
2	-	9	-
3	MA	10	-
4	/MA	11	-
5	SLO	12	-
6	/SLO	13	-
7	0V	14	+5V
Plate		SHIELD	

1. Motor connection (MS: Military Standard)
a. PLUG spec. : MS3108B 20-29S
2. Drive connection (CN2)
a. CASE Spec. : 10314-52A0-008(3M) or SM-14J(Suntone)
b. Connector Spec. : 10114-3000VE(3M) or SM-14J(Suntone)
3. Cable spec.: 4Px0.2SQ or 4Px24AWG
4. Battery connection
a. CONNECTOR spec.: 5267-02A(Molex)
b. Battery spec.: ER6V(TOSHIBA, AA, 3.6V, 2000mAh)

Battery Connector

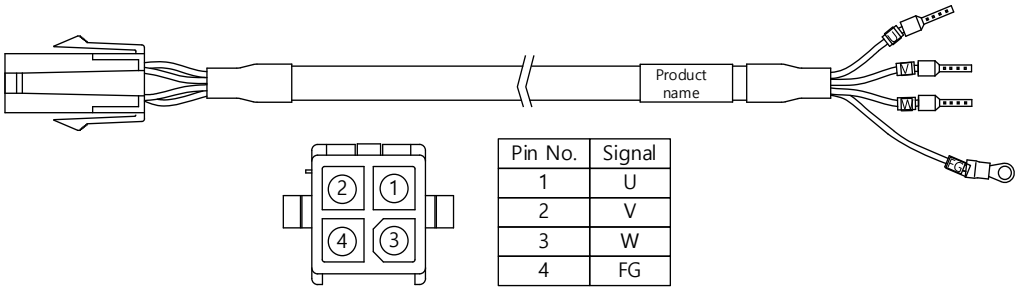
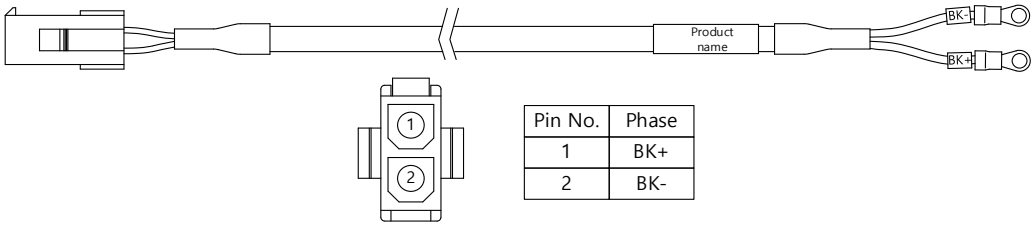


Pin No.	Encoder Signal	Wire color
1	BATTERY(VDD_B)	Red
2	BATTERY 0V(GND_B)	Black

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

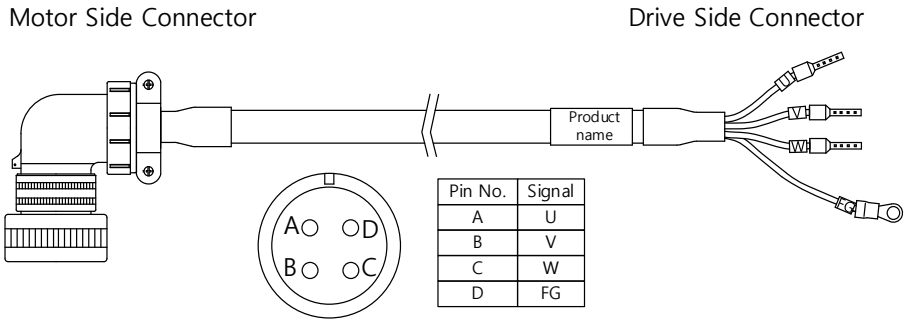
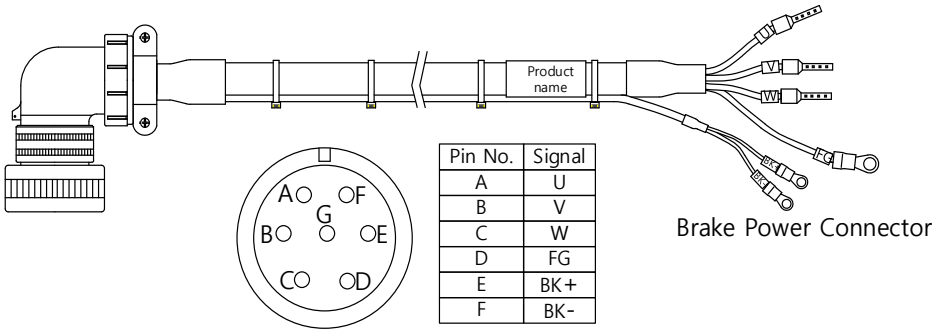
■ [200V] Option (Standard power cable)

Classification	Power	Product name	Small capacity AMP Type power cable
Product name (*Note 1)	APCS- P□□□GS	Applicable Motors	All model of APM-SA/SB/SC/HB SERIES
Specification	Motor Side Connector / Drive Side Connector  Pin No. / Signal: 1 U, 2 V, 3 W, 4 FG **1. Motor connection** **a. CAP Spec(4 Position) : 172159-1(AMP)** **b. SOCKET spec.: 170362-1 (TE)** **2. Drive connection(U,V,W,PE)** **a. U,V,W pin spec.: 1512** **B FG pin spec.: 1.5x4 (Ring Terminal)** **3. Cable spec.: 4Cx0.75SQ or 4Cx18AWG**		
Classification	For brake open type	Product name	Small capacity AMP Type brake cable
Product name (*Note 1)	APCS- P□□□KB	Applicable Motors	All model of APM-SA/SB/SC SERIES
Specification	Motor Side Connector / Brake Power Connector  Pin No. / Phase: 1 BK+, 2 BK- **1. Motor connection** **a. CAP Spec(2 Position) : 172157-1(AMP)** **b. SOCKET spec.:170362-1(AMP)** **2. Brake power** **a. Connection terminal spec. : 1.5x3 (Ring Terminal)** **3. Cable Spec. : 2Cx0.75SQ or 2Cx19AWG**		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

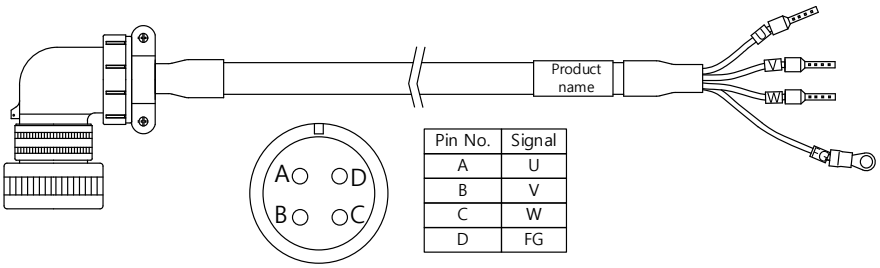
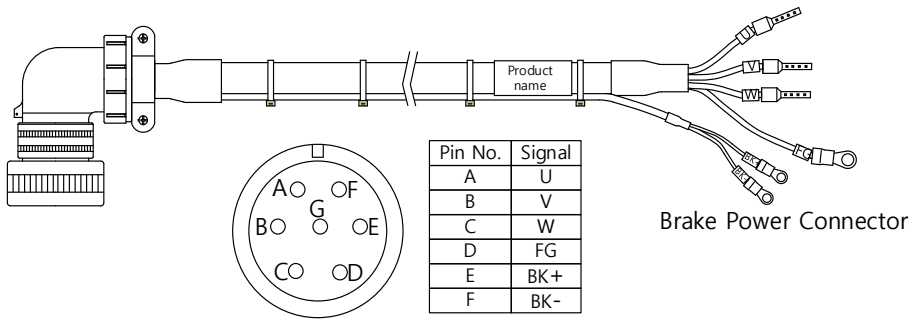
■ [200V] Option (Standard power cable)

Classification	Power	Product name	Medium capacity MS Type power cable(for 130 Flange)
Product name (*Note 1)	APCS- P□□□HS	Applicable Motors	All model of APM-FE/HE SERIES
Specification	 Pin No. / Signal: A–U, B–V, C–W, D–FG **1. Motor connection(MS: Military Standard)** **a. PLUG spec.: MS3108B 20-4S** **2. Drive connection(U,V,W,PE)** **a. U,V,W pin spec.: 2512** **b. FG pin spec.: 2.5x4(Ring Terminal)** **3. Cable spec.: 4Cx2.5SQ or 4Cx14AWG**		
Classification	Power and Brake	Product name	Medium capacity MS Type power/brake cable(for 130 Flange)
Product name (*Note 1)	APCS- P□□□NB	Applicable Motors	All model of APM-FE SERIES
Specification	 Pin No. / Signal: A–U, B–V, C–W, D–FG, E–BK+, F–BK- **1. Motor connection** **a. PLUG spec. : MS3108B 20-15S(MS)** **2. Drive connection** **a. U, V, W pin spec: 2512** **b. FG pin spec. : 2.5 x 4(Ring Terminal)** **3. Power Cable spec.: 4Cx2.5SQ or 4Cx14AWG** **4. Brake power connection** **a. Connection terminal spec: 1.5 x 3(Ring Terminal)** **5. Brake Cable spec.: 2Cx0.75SQ or 2Cx19AWG**		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

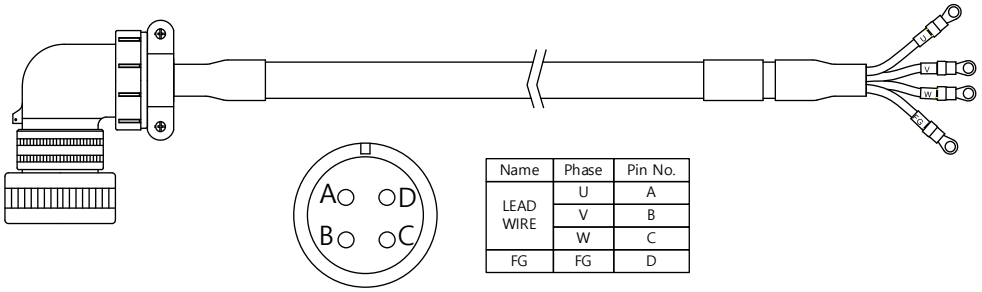
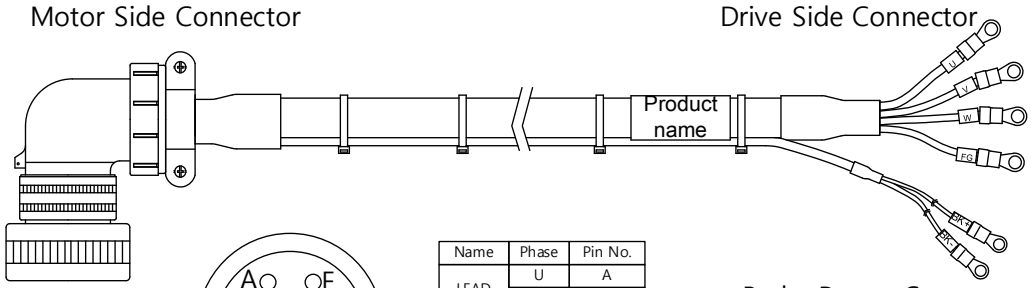
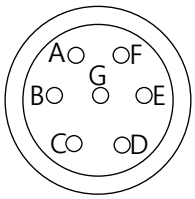
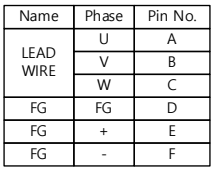
■ [200V] Option (Standard power cable)

Classification	Power	Product name	Medium capacity MS Type power cable(180/ 220 Flange)
Product name (*Note 1)	APCS- P□□□IS	Applicable Motors	FF30A, FF22D, FF35D, FF20G, FF30G,FF12M, FF20M, FF30M FG22D, FG35D, FG20G, FG12M, FG20M, FG30M
Specification	Motor Side Connector / Drive Side Connector  Pin No. / Signal: A–U, B–V, C–W, D–FG 1. Motor connection(MS: Military Standard) a. PLUG spec. : MS3108B 22-22S 2. Drive connection(U,V,W,PE) a. U,V,W pin spec.: 2512 b. FG pin spec. : 2.5x4 (Ring Terminal) 3. Cable spec.: 4Cx2.5SQ or 4Cx14AWG		
Classification	Power and Brake	Product name	Medium capacity MS Type power/brake cable(for 180 Flange)
Product name (*Note 1)	APCS- P□□□PB	Applicable Motors	FF30A, FF22D, FF35D, FF20G, FF30G, FF12M, FF20M, FF30M
Specification	Motor Side Connector / Drive Side Connector  Pin No. / Signal: A–U, B–V, C–W, D–FG, E–BK+, F–BK- 1. Motor connection a. PLUG spec.: MS3108B 24-10S(MS) 2. Drive connection a. U, V, W pin spec: 2512 b. FG pin spec. : 2.5 x 4(Ring Terminal) 3. Power Cable spec.: 4Cx2.5SQ or 4Cx14AWG 4. Brake power connection a. Connection terminal spec. : 1.5 x 3(Ring Terminal) 5. Brake Cable spec.: 2Cx0.75SQ or 2Cx19AWG		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

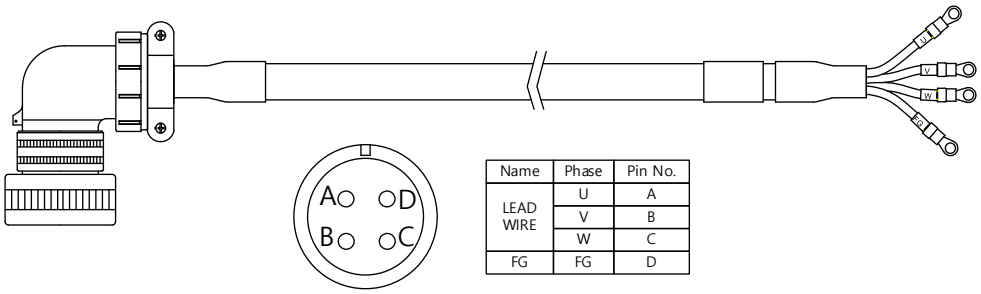
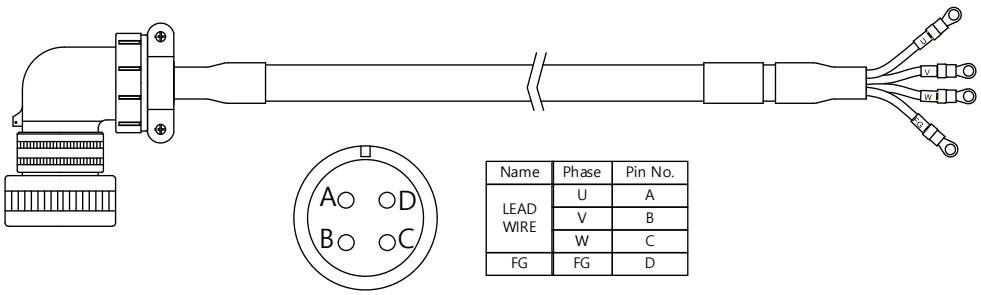
■ [200V] Option (Standard power cable)

Classification	Power	Product name	Medium capacity MS Type power cable(180/ 220 Flange)
Product name (*Note 1)	APCS- P□□□JS	Applicable Motors	FF50A, FF55D, FF44G, FF44M, FG55D, FG44G, FG44M
Specification	Motor Side Connector / Drive Side Connector  1. Motor connection(MS: Military Standard) a. PLUG spec. : MS3108B 22-22S 2. Drive connection(U,V,W,PE) a. U,V,W,FG pin spec.: 6. 0x 5(Ring Terminal) 3. Cable spec.: 4Cx6.0SQ or 4Cx10AWG		
Classification	Power and Brake	Product name	Medium capacity MS Type power/brake cable(for 180 Flange)
Product name (*Note 1)	APCS- P□□□LB	Applicable Motors	FF50A, FF55D, FF44G, FF44M
Specification	Motor Side Connector / Drive Side Connector    1. Motor connection(MS: Military Standard) a. PLUG spec.: MS3108B 24-10S 2. Drive connection(U,V,W,PE) a. U,V,W,FG pin spec.: 6. 0x 5(Ring Terminal) 3. Power Cable spec.: 4Cx6.0SQ or 4Cx10AWG 4. Brake power connection a. Connection terminal spec.: 1.5 x 3(Ring Terminal) 5. Brake Cable spec.: 2Cx0.75SQ or 2Cx19AWG		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

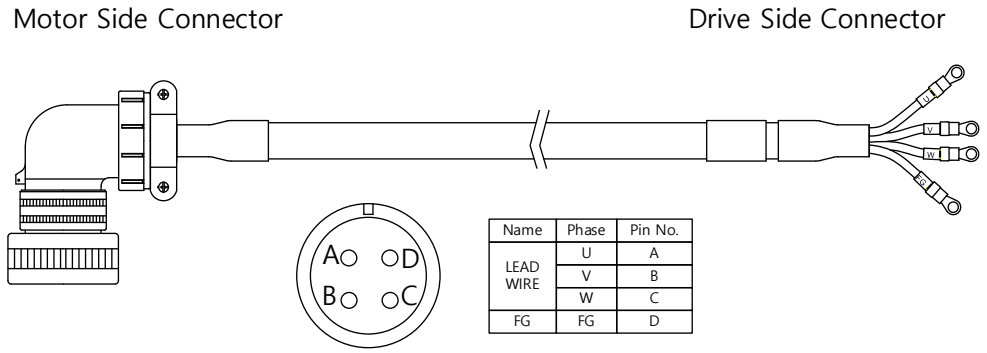
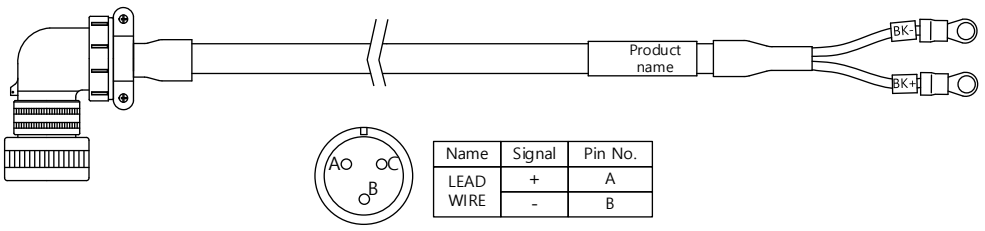
■ [200V] Option (Standard power cable)

Classification	Power	Product name	Medium capacity MS Type power cable(for 220 Flange)
Product name (*Note 1)	APCS- P□□□MS	Applicable Motors	FG60M, FG75G
Specification	Motor Side Connector / Drive Side Connector  1. Motor connection(MS: Military Standard) a. PLUG spec. : MS3108A 32-17S 2. Drive connection(U,V,W,PE) a. U,V,W,FG pin spec.: 10 x 5(Ring Terminal) 3. Cable spec.: 4Cx6.0SQ or 4Cx10AWG		
Classification	Power	Product name	Medium capacity MS Type power cable(for 220 Flange)
Product name (*Note 1)	APCS- P□□□OS	Applicable Motors	FG85G, FG110D, FG110G
Specification	Motor Side Connector / Drive Side Connector  1. Motor connection(MS: Military Standard) a. PLUG spec.: MS3108A 32-17S 2. Drive connection(U,V,W,PE) a. U,V,W,FG pin spec.: 14 x 6(Ring Terminal) 3. Cable spec.: 4Cx16SQ or 4Cx5AWG		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

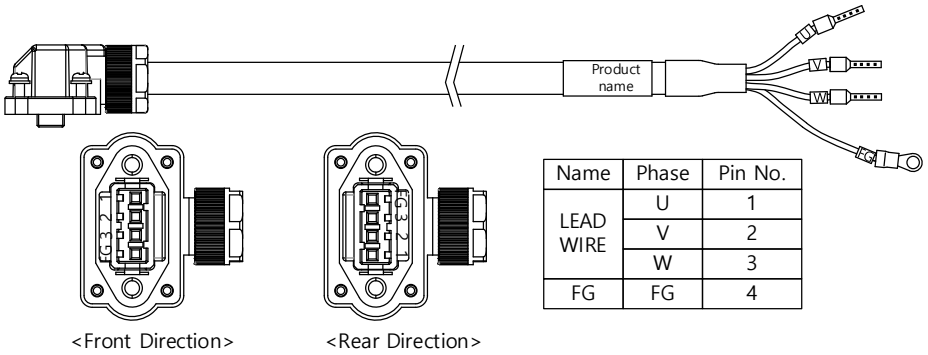
■ [200V] Option (Standard power cable)

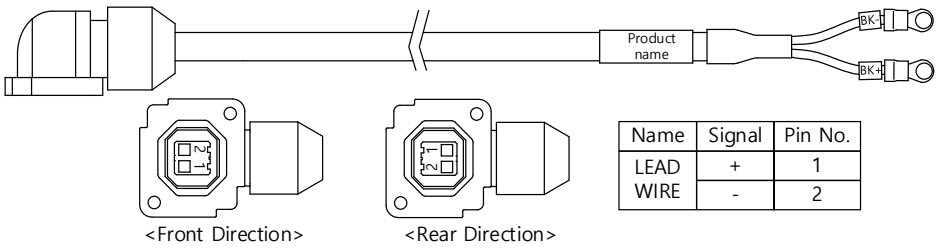
Classification	Power	Product name	Medium capacity MS Type power cable(for 220 Flange)
Product name (*Note 1)	APCS- P□□□VS	Applicable Motors	FG150G
Specification	 Name / Phase / Pin No. LEAD WIRE: U / A; V / B; W / C FG: FG / D **1. Motor connection(MS: Military Standard)** **a. PLUG spec.: MS3108A 32-17S** **2. Drive connection(U,V,W,PE)** **a. U,V,W,FG pin spec.: 14 x 6(Ring Terminal)** **3. Cable spec.: 4Cx25SQ or 4Cx3AWG**		
Classification	Power	Product name	Medium capacity MS Type brake cable(for 220 Flange)
Product name (*Note 1)	APCS- P□□□SB	Applicable Motors	All models of FG Series(Common use of FGP Series)
Specification	 Name / Signal / Pin No. LEAD WIRE: + / A; - / B **1. Motor connection** **a. PLUG spec.: MS3108B 14-7S(MS)** **2. Brake power** **a. Connection terminal spec. : 1.5x3(Ring Terminal)** **3. Cable spec.: 2Cx0.75SQ or 2Cx19AWG**		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

■ [200V] Options spec. (small capacity L Series power cable)

<table>
<tr><td>Classification</td><td>Power</td><td>Product name</td><td>Small capacity L Series power cable</td></tr>
<tr><td>Product name (*Note 1)</td><td>APCS- P□□□LS(Front Direction)/
APCS- P□□□LS-R(Rear Direction)</td><td>Applicable Motors</td><td>All model of APM- FAL/ FBL/FCL Series</td></tr>
<tr><td>Specification</td><td colspan="3">Motor Side Connector Drive Side Connector

<table>
<tr><th>Name</th><th>Phase</th><th>Pin No.</th></tr>
<tr><td rowspan="3">LEAD WIRE</td><td>U</td><td>1</td></tr>
<tr><td>V</td><td>2</td></tr>
<tr><td>W</td><td>3</td></tr>
<tr><td>FG</td><td>FG</td><td>4</td></tr>
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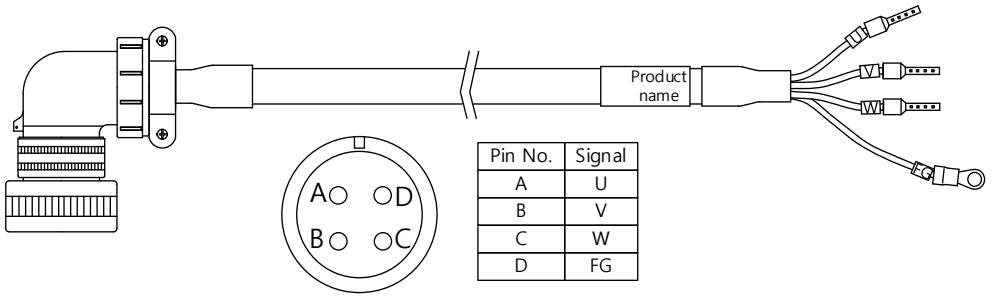
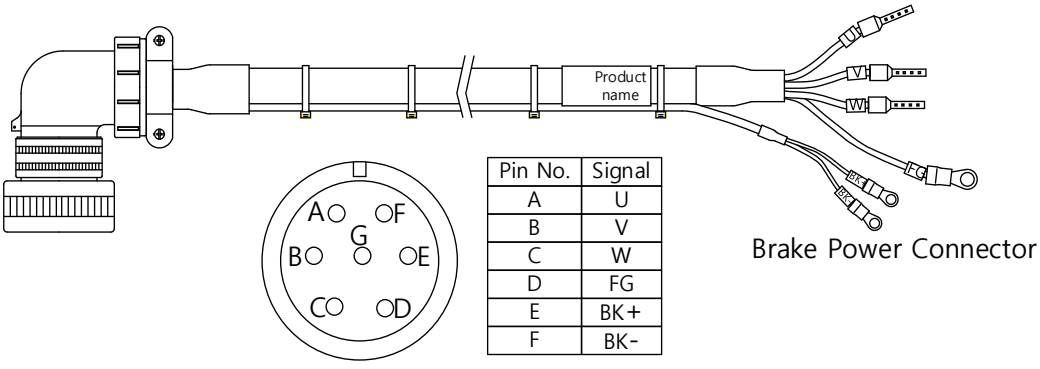
<Front Direction> <Rear Direction>
1. Motor connection
a. PLUG spec.: SM-JN8FT04 (Suntone)
b. SOCKET spec.: SMS-201 (Suntone)
2. Drive connection(U,V,W,PE)
a. U,V,W pin spec.: 1512
b. FG pin spec.: 1.5x4 (Ring Terminal)
3. Cable spec.: 4Cx0.75SQ or 4Cx18AWG
4. Others: In case of FAL products, it is necessary to install Encoder Cable after installing Power Cable.</td></tr>
<tr><td>Classification</td><td>Brake</td><td>Product name</td><td>Small capacity L Series brake cable</td></tr>
<tr><td>Product name (*Note 1)</td><td>APCS- B□□□QS(Front Direction)/
APCS- B□□□QS-R(Rear Direction)</td><td>Applicable Motors</td><td>All model of APM- FAL/ FBL/FCL Series</td></tr>
<tr><td>Specification</td><td colspan="3">Motor Side Connector Brake Power Connector

<table>
<tr><th>Name</th><th>Signal</th><th>Pin No.</th></tr>
<tr><td rowspan="2">LEAD WIRE</td><td>+</td><td>1</td></tr>
<tr><td>-</td><td>2</td></tr>
</table>

<Front Direction> <Rear Direction>
1. Motor connection
a. PLUG spec.: KN5FT02SJ1(JAE)
b. SOCKET spec.: ST-KN-S-C1B-3500(JAE)
2. Brake power
a. Connection terminal spec. : 1.5x3(Ring Terminal)
3. Cable spec.: 2Cx0.5SQ or 2Cx20AWG</td></tr>
</table>

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20
Regular cable	N03	N05	N10	N20

■ [400V] Option (Standard power cable)

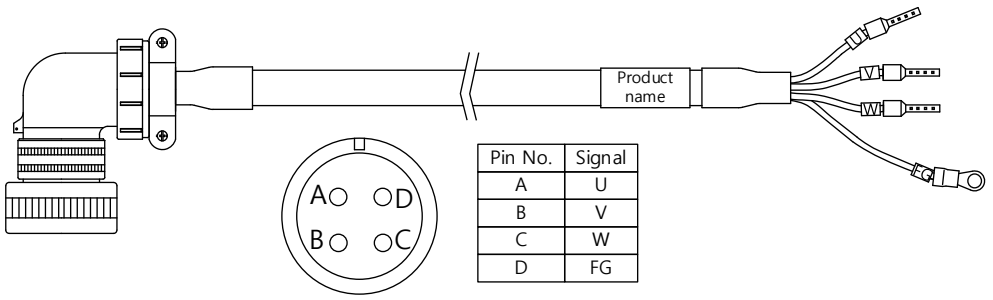
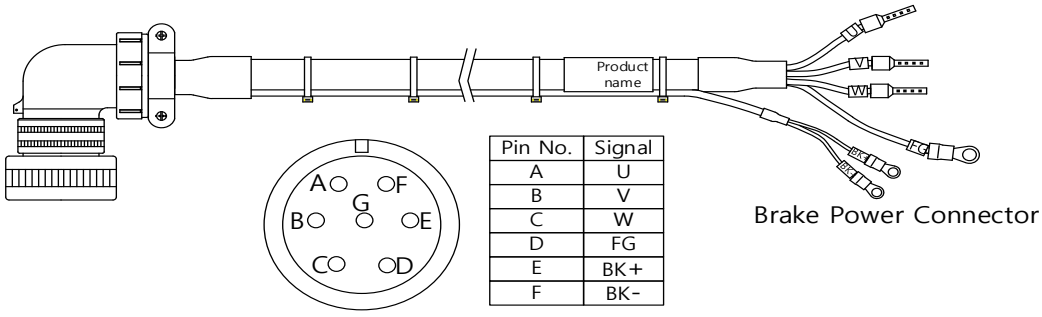
Classification	Power	Product name	Medium capacity MS Type power cable(for 130 Flange)
Product name (*Note 1)	APCF- P□□□HS	Applicable Motors	All model of APM-FEP SERIES
Specification	Motor Side Connector / Drive Side Connector  Pin No. / Signal: A–U, B–V, C–W, D–FG **1. Motor connection(MS: Military Standard)** **a. PLUG spec.: MS3108B 20-4S** **2. Drive connection(U,V,W,PE)** **a. U,V,W pin spec.: 1512** **b. FG pin spec.: 1.5x4(Ring Terminal)** **3. Cable spec.: 4Cx1.5SQ or 4Cx15AWG**		
Classification	Power and Brake	Product name	Medium capacity MS Type power/brake cable(for 130 Flange)
Product name (*Note 1)	APCF- P□□□NB	Applicable Motors	All model of APM-FEP SERIES
Specification	Motor Side Connector / Drive Side Connector  Pin No. / Signal: A–U, B–V, C–W, D–FG, E–BK+, F–BK- **1. Motor connection** **a. PLUG spec. : MS3108B 20-15S(MS)** **2. Drive connection** **a. U, V, W pin spec: 1512** **b. FG pin spec.: 1.5 x 4(Ring Terminal)** **3. Power Cable spec.: 4Cx1.5SQ or 4Cx15AWG** **4. Brake power connection** **a. Connection terminal spec. : 1.5 x 3(Ring Terminal)** **5. Brake Cable spec.: 2Cx0.75SQ or 2Cx18AWG**		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Note2) 400V products are not provided for general use.

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20

■ [400V] Option (Standard power cable)

Classification	Power	Product name	Medium capacity MS Type power cable(180/ 220 Flange)
Product name (*Note 1)	APCF- P□□□IS	Applicable Motors	FFP30A, FFP22D, FFP35D, FFP20G, FFP30G, FFP12M, FFP20M, FGP22D, FGP35D, FGP20G, FGP30G FGP12M, FGP20M
Specification	Motor Side Connector / Drive Side Connector  Pin No. / Signal A / U B / V C / W D / FG 1. Motor connection(MS:Military Standard) a. PLUG spec. : MS3108B 22-22S 2. Drive connection(U,V,W,PE) a. U,V,W pin spec.: 2512 b. FG pin spec. : 2.5x4 (Ring Terminal) 3. Cable spec.: 4Cx1.5SQ or 4Cx15AWG		
Classification	Power and Brake	Product name	Medium capacity MS Type power/brake cable(for 180 Flange)
Product name (*Note 1)	APCF- P□□□PB	Applicable Motors	FFP30A, FFP22D, FFP35D, FFP20G, FFP30G, FFP12M, FFP20M
Specification	Motor Side Connector / Drive Side Connector  Pin No. / Signal A / U B / V C / W D / FG E / BK+ F / BK- 1. Motor connection a. PLUG spec.: MS3108B 24-10S(MS) 2. Drive connection a. U, V, W pin spec: 2512 b. FG pin spec.: 1.5 x 3(Ring Terminal) 3. Power Cable spec.: 4Cx1.5SQ or 4Cx15AWG 4. Brake power connection a. Connection terminal spec. : 1.5 x 3(Ring Terminal) 5. Brake Cable spec.: 2Cx0.75SQ or 2Cx18AWG		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Note2) 400V products are not provided for general use.

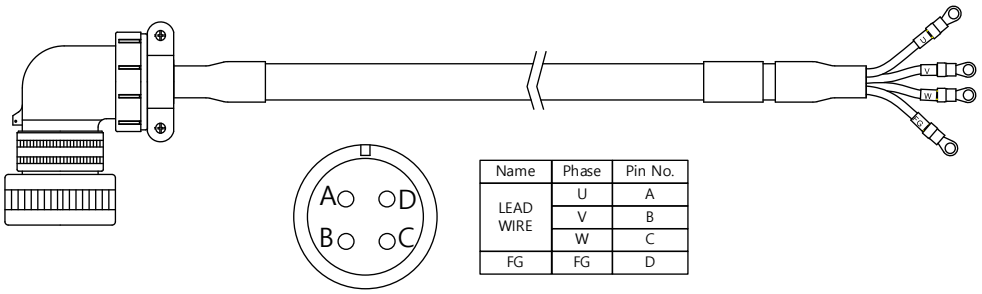
Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20

■ [400V] Option (Standard power cable)

Classification	Power	Product name	Medium capacity MS Type power cable(180/ 220 Flange)
Product name (*Note 1)	APCF- P□□□JS	Applicable Motors	FFP50A, FFP55D, FFP75D, FFP44G, FFP60G, FFP30M, FFP44M, FGP55D, FGP75D, FGP44G, FGP60G, FGP30M, FGP44M

Specification

Motor Side Connector — Drive Side Connector



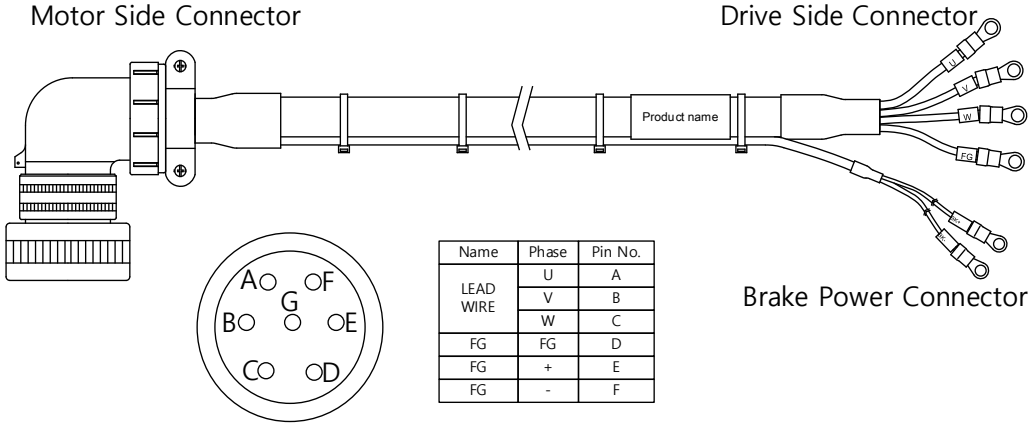
Name	Phase	Pin No.
LEAD WIRE	U	A
	V	B
	W	C
FG	FG	D

1. Motor connection(MS: Military Standard)
   a. PLUG spec.: MS3108B 22-22S
2. Drive connection(U,V,W,PE)
   a. U,V,W,FG pin spec.: 4.0x 5(Ring Terminal)
3. Cable spec.: 4Cx4.0SQ or 4Cx11AWG

Classification	Power and Brake	Product name	Medium capacity MS Type power/brake cable(for 180 Flange)
Product name (*Note 1)	APCF- P□□□LB	Applicable Motors	FFP50A, FFP55D, FFP75D, FFP44G, FFP60G, FFP30M, FFP44M

Specification

Motor Side Connector — Drive Side Connector



Name	Phase	Pin No.
LEAD WIRE	U	A
	V	B
	W	C
FG	FG	D
FG	+	E
FG	-	F

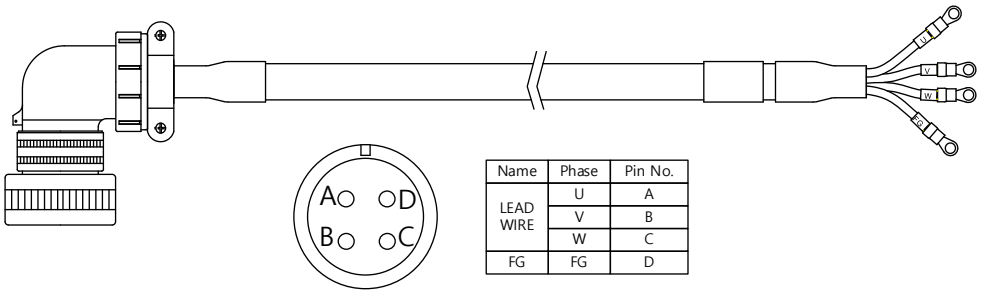
1. Motor connection(MS: Military Standard)
   a. PLUG spec. : MS3108B 24-10S
2. Drive connection(U,V,W,PE)
   a. U,V,W,FG pin spec.: 4.0x 5(Ring Terminal)
3. Power Cable spec.: 4Cx4.0SQ or 4Cx11AWG
4. Brake power connection
   a. Connection terminal spec. : 1.5 x 3(Ring Terminal)
5. Brake Cable spec.: 2Cx0.75SQ or 2Cx18AWG

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Note2) 400V products are not provided for general use.

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20

■ [400V] Option (Standard power cable)

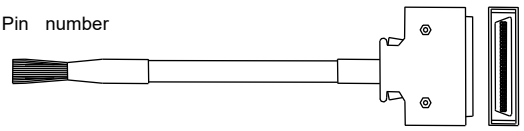
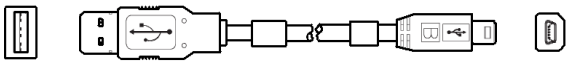
Classification	Power	Product name	Medium capacity MS Type power cable(for 220 Flange)
Product name (*Note 1)	APCF- P□□□MS	Applicable Motors	FFP75G, FGP110D, FGP85G, FGP110G, FGP150G, FGP60M
Specification	Motor Side Connector / Drive Side Connector  **1. Motor connection(MS: Military Standard)** **a. PLUG spec.: MS3108A 32-17S** **2. Drive connection(U,V,W,PE)** **a. U,V,W,FG pin spec.: 10 x 5(Ring Terminal)** **3. Cable spec.: 4Cx10SQ or 4Cx7AWG**		

Note1) The □□□in the name indicates the type and length of each cable. Refer to the following table for this information

Note2) 400V products are not provided for general use.

Cable length (m)	3	5	10	20
Robot cable	F03	F05	F10	F20

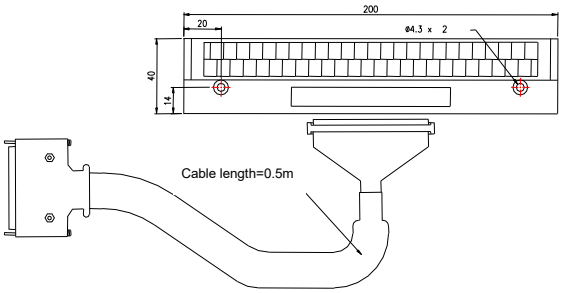
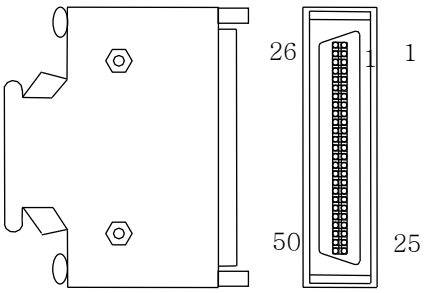
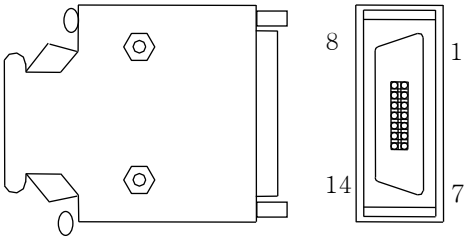
■ **Options spec. (cable)**

<table>
<tr><th>Classification</th><th>Product name</th><th>Product name (*Note 1)</th><th>Applicable drive</th><th>Specification</th></tr>
<tr><td>For signal</td><td>I/O cable</td><td>APCS-CN1□□A</td><td>L7 SERIES</td><td>
[Upper level [Drive connection I/O]
Pin number

1. Drive connection(I/O)
a. Case spec.: 10350-52A0-008(3M)
b. CONNECTOR spec.: 10150-3000VE(3M)
c. CABLE spec.: ROW-SB0.1Cx50C(AWG 28)
<table>
<tr><th>CN1</th><th>wire color</th><th>CN1</th><th>wire color</th><th>CN1</th><th>wire color</th><th>CN1</th><th>wire color</th><th>CN1</th><th>wire color</th></tr>
<tr><td>1</td><td>Orange/Black 1</td><td>11</td><td>Orange/Black 2</td><td>21</td><td>Orange/Black 3</td><td>31</td><td>Orange/Black 4</td><td>41</td><td>Orange/Black 5</td></tr>
<tr><td>2</td><td>Orange/Red 1</td><td>12</td><td>Orange/Red 2</td><td>22</td><td>Orange/Red 3</td><td>32</td><td>Orange/Red 4</td><td>42</td><td>Orange/Red 5</td></tr>
<tr><td>3</td><td>Yellow/Black 1</td><td>13</td><td>Yellow/Black 2</td><td>23</td><td>Yellow/Black 3</td><td>33</td><td>Yellow/Black 4</td><td>43</td><td>Yellow/Black 5</td></tr>
<tr><td>4</td><td>Yellow/Red 1</td><td>14</td><td>Yellow/Red 2</td><td>24</td><td>Yellow/Red 3</td><td>34</td><td>Yellow/Red 4</td><td>44</td><td>Yellow/Red 5</td></tr>
<tr><td>5</td><td>White/Black 1</td><td>15</td><td>White/Black 2</td><td>25</td><td>White/Black 3</td><td>35</td><td>White/Black 4</td><td>45</td><td>White/Black 4</td></tr>
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<tr><td>9</td><td>Pink/Black 1</td><td>19</td><td>Pink/Black 2</td><td>29</td><td>Pink/Black 3</td><td>39</td><td>Pink/Black 4</td><td>49</td><td>Pink/Black 5</td></tr>
<tr><td>10</td><td>Pink/Red 1</td><td>20</td><td>Pink/Red 2</td><td>30</td><td>Pink/Red 3</td><td>40</td><td>Pink/Red 4</td><td>50</td><td>Pink/Red 5</td></tr>
</table>
- Same as APC-VSCN1T
</td></tr>
<tr><td>For signal</td><td>Communication cable</td><td>APCS-CN5L7U</td><td>L7 SERIES</td><td>
[PC - USB Port] [Servo drive – USB]

2. PC connection: USB A Plug
a. Drive connection (USB): Mini USB 5P Plug
b. Electrical requirement spec. :
Double shielding, Twisted Pair, EMI filter attached
(Reference product SANWA KU-AMB518)
</td></tr>
</table>

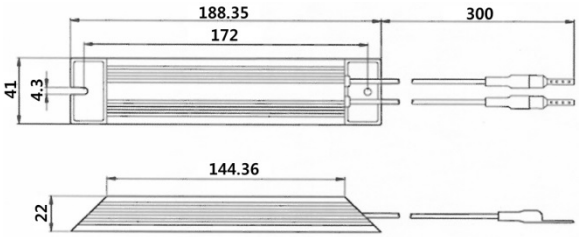
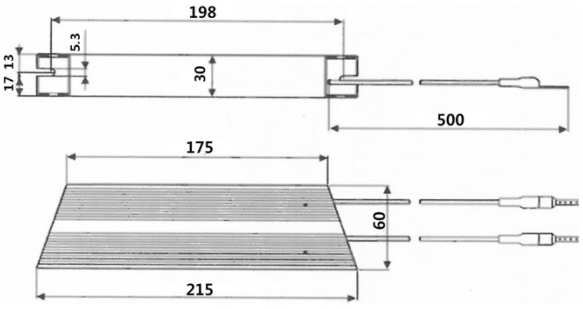
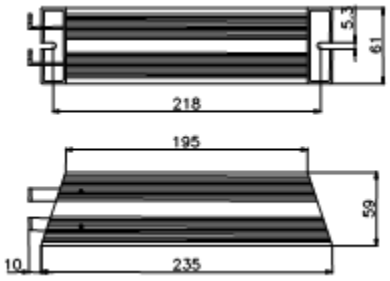
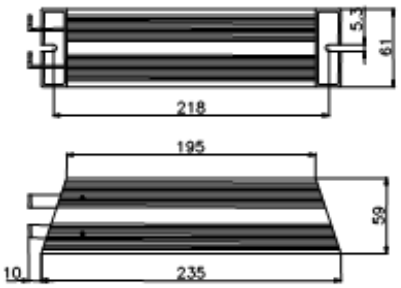
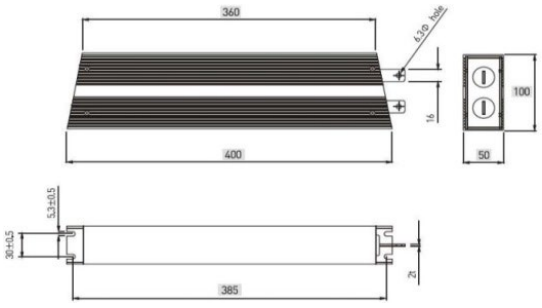
Note 1) The □□□in the name indicates length of each cable. Refer to the following table for this information

Cable length (m)	1	2	3	5
Notation	01	02	03	05

■ **Option spec. (connector)**

Classification	Product name	Model name	Applicable drive	Specification
T/B	For I/O T/B	APC-VSCN1T APC-VPCN1T	L7 SERIES	 **1.** APC-VSCN1T: CN1 T/B extended type of APD-VS **a.** APC-VPCN1T: CN1 T/B extended type of APD-VP **b.** Cable length can be changed **c.** Standard Cable length: 0.5[m])
CN	I/O Connector	APC-CN1NNA	L7 SERIES	 **2.** Case spec.: 10350-52A0-008(3M) **a.** CONNECTOR spec.: 10150-3000VE(3M)
CN	ENCODER Connector	APC-CN3NNA	L7 SERIES	 **3.** Case spec.: 10314-52A0-008(3M) **a.** CONNECTOR spec.: 10114-3000VE(3M)

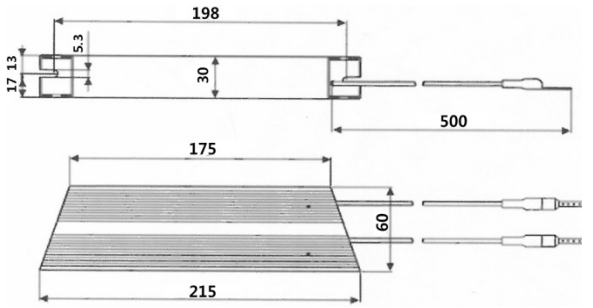
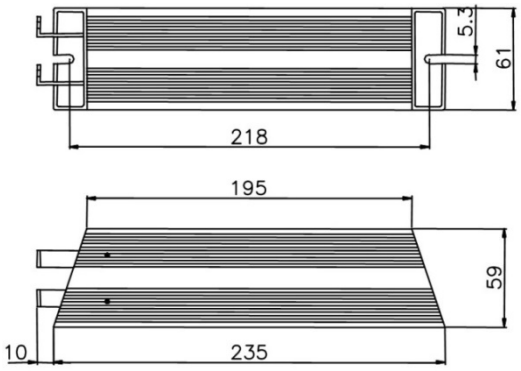
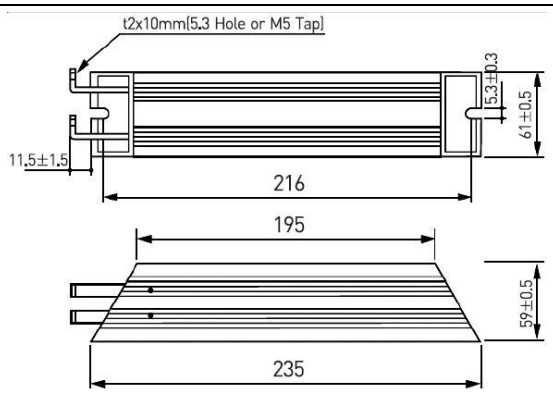
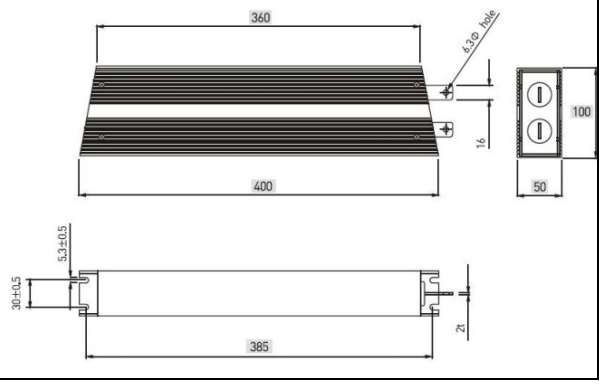
Option spec.(Braking resistance) / 200[V]

Classification	Product name	Model name	Applicable drive	Specification
resistance	Brake resistance	APCS-140R50	L7□A001□ L7□A002□ L7□A004□	
resistance	Brake resistance	APCS-300R30	L7□A008□ L7□A010□	
resistance	Brake resistance	APC-600R30	L7□A020□ (2P) L7□A035□ (3P)	
resistance	Brake resistance	APC-600R28	L7□A050□ L7□A075□ (4P)	
resistance	Brake resistance	APCS-2000R3R3 3.3[Ω] (2000W)	L7□A150□	

Note 1) The P mark on the applicable drive is the number of resistors connected in parallel.

The number of resistors connected in parallel	2EA	3EA	4EA
Notation	2P	3P	4P

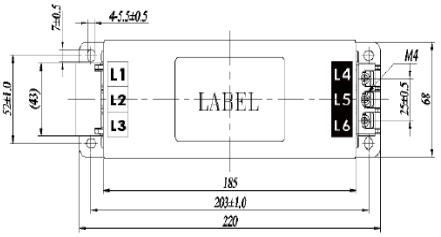
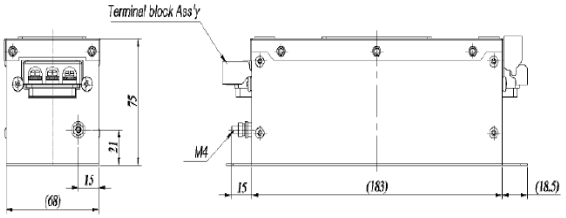
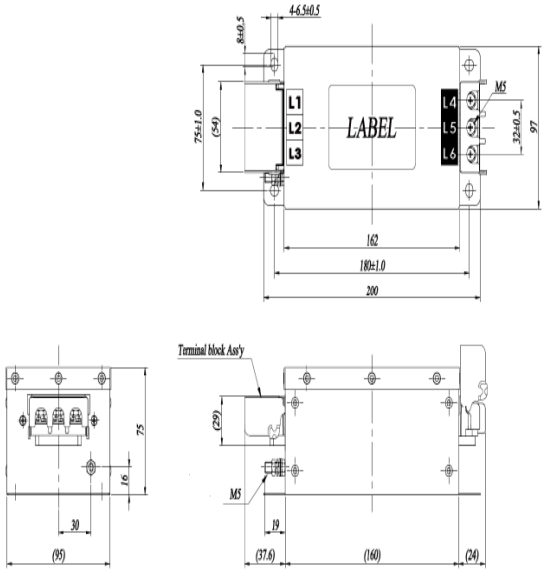
Option (Braking resistance) / 400[V]

Classification	Product Name	Model name	Applicable drive	Specification
resistance	Brake resistance	APCS-300R82	L7□B010□	
resistance	Brake resistance	APCS-600R140 (600W x 2P)	L7□B020□ /L□PB035□ (2P)	
resistance	Brake resistance	APCS-600R75 (600W x 3P)	L7□B050□ /L7□B075□ (3P)	
resistance	Brake resistance	APCS-2000R13R4	L7□B150□	

Note 1) The P mark on the applicable drive is the number of resistors connected in parallel.

The number of resistors connected in parallel	2EA	3EA	4EA
Notation	2P	3P	4P

■ **Option (Noise filter)**

Classification	Product name	Model name	Applicable drive	Specification
resistance	Noise filter	APCS-TB6-B010LBEI	L7□A 001□ L7□A 002□ L7□A 004□ L7□A 008□ L7□A 010□ L7□B 010□	
		APCS-TB6-B020NBDC	L7□B 020□ L7□B 035□	
		APCS-TB6-B030NBDC	L7□A 020□ L7□A 035□ L7□B010□	
		APCS-TB6-B040AS	L7□A 050□ L7□B 075□	

3. Wiring and Connection

3.1 Installation of Servo Motor

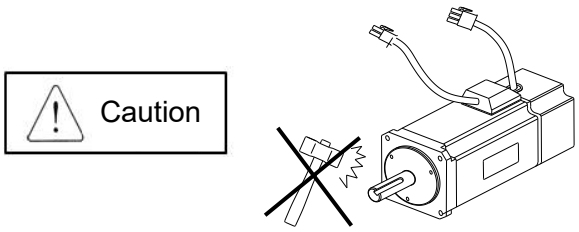
⚠ Caution
▪ If the encoder loses multi-turn data, there is a risk of equipment malfunction or accident. Therefore, be sure to operate after homing. ▪ When using an absolute encoder, the multi-turn data of the encoder is lost in the following process. • When replacing motor and encoder cables. • When replacing the battery while the power of the servo is OFF.

3.1.1 Operating Environment

Item	Environment condition	Remarks
Operating ambient temperature	0~40[℃]	Consult with our technical support team to customize the product if temperatures in the installation environment are outside this range.
Ambient humidity	80% RH or lower	Do not operate this device in an environment with steam.
External vibration	Vibration acceleration 49 ㎨ or less on both the X and Y axis.	Excessive vibrations reduce the lifespan of the bearings.

3.1.2 Preventing Impact

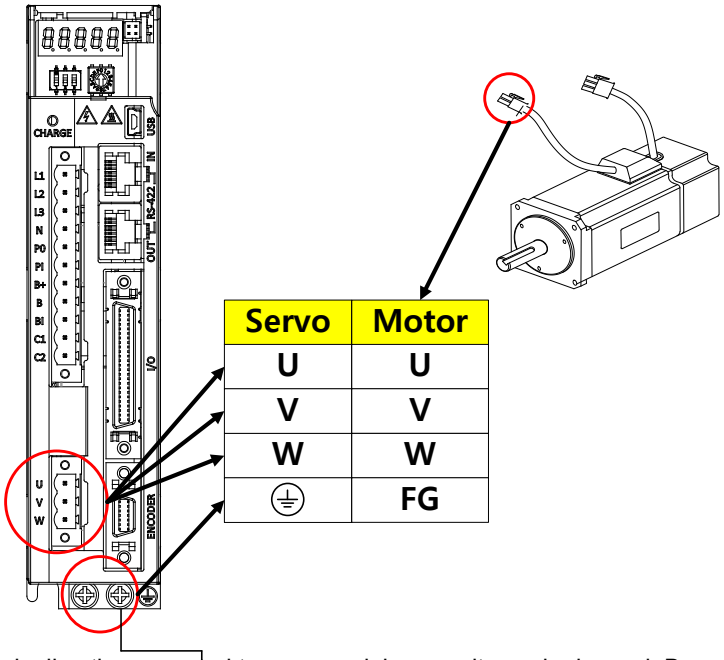
Impact to the motor during installation or handling may damage the encoder.



When assembling a coupling or other mechanical parts to the motor shaft, do not apply direct impact to the shaft with a hammer or other tool. (This may damage the encoder on the anti-load side and cause bearing noise.)



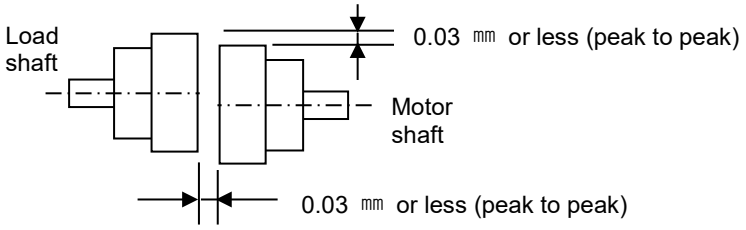
3.1.3 Motor Connection



- If the motor is directly connected to commercial power, it may be burned. Be sure to connect with the specified drive before using it.
- Connect the ground terminals of the motor to either of the two ground terminals inside the drive, and attach the remaining terminal to the type-3 ground.
- Connect the U, V, and W terminals of the motor in the same way as the U, V, and W terminals of the drive.
- Ensure that the pins on the motor connector are securely attached.
- In order to protect against moisture or condensation in the motor, make sure that insulation resistance is 10 MΩ (500 V) or higher before installation.
- Sometimes, when the FG terminal of the motor and the FG terminal of the drive are not wired, it is difficult to connect the Drive CM when Servo is on. Please be careful.

3.1.4 The Load Device Connection

For coupling connections: Install the motor shaft and the load shaft so that they match within the allowable range.

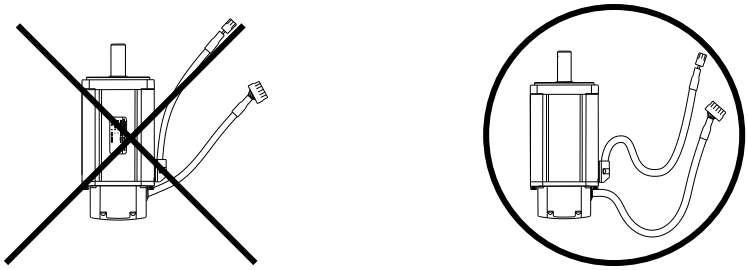


■ **For pulley connections:**

Flange	Lateral Load		Axial Load		Notes
	N	kgf	N	kgf	
40	148	15	39	4	Nr: 30 ㎜ or less Lateral load Axial load
60	206	21	69	7	
80	255	26	98	10	
130	725	74	362	37	
180	1548	158	519	53	
220	1850	189	781	90	

3.1.5 Cable Installation

- For vertical installations, make sure that no oil or water flows into the connecting parts.



- Do not apply pressure to or damage the cables. Use robot cables to prevent swaying when the motor moves.

3.2 Installation of the Servo Drive

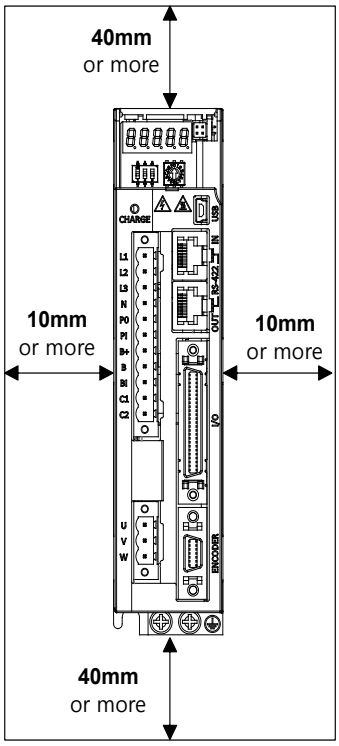
3.2.1 Installation and Usage Environment

Item	Environmental conditions	Remarks
Operating ambient temperature	0~50[℃]	⚠ **Caution** Install a cooling fan on the control panel to maintain an appropriate temperature.
Ambient humidity	90% RH or lower	⚠ **Caution** Condensation or moisture may develop inside the drive during prolonged periods of inactivity and damage it. Remove all moisture before operating the drive after a prolonged period of inactivity.
External vibration	Vibration acceleration 4.9 ㎨ or less	Excessive vibration reduces the lifespan of the machine and may cause malfunctions.
Ambient conditions	▪ Do not expose the device to direct sunlight. ▪ Do not expose the device to corrosive or combustible gases. ▪ Do not expose the device to oil or dust. ▪ Ensure that the device receives sufficient ventilation.	

3.2.2 Installation in the Control panel

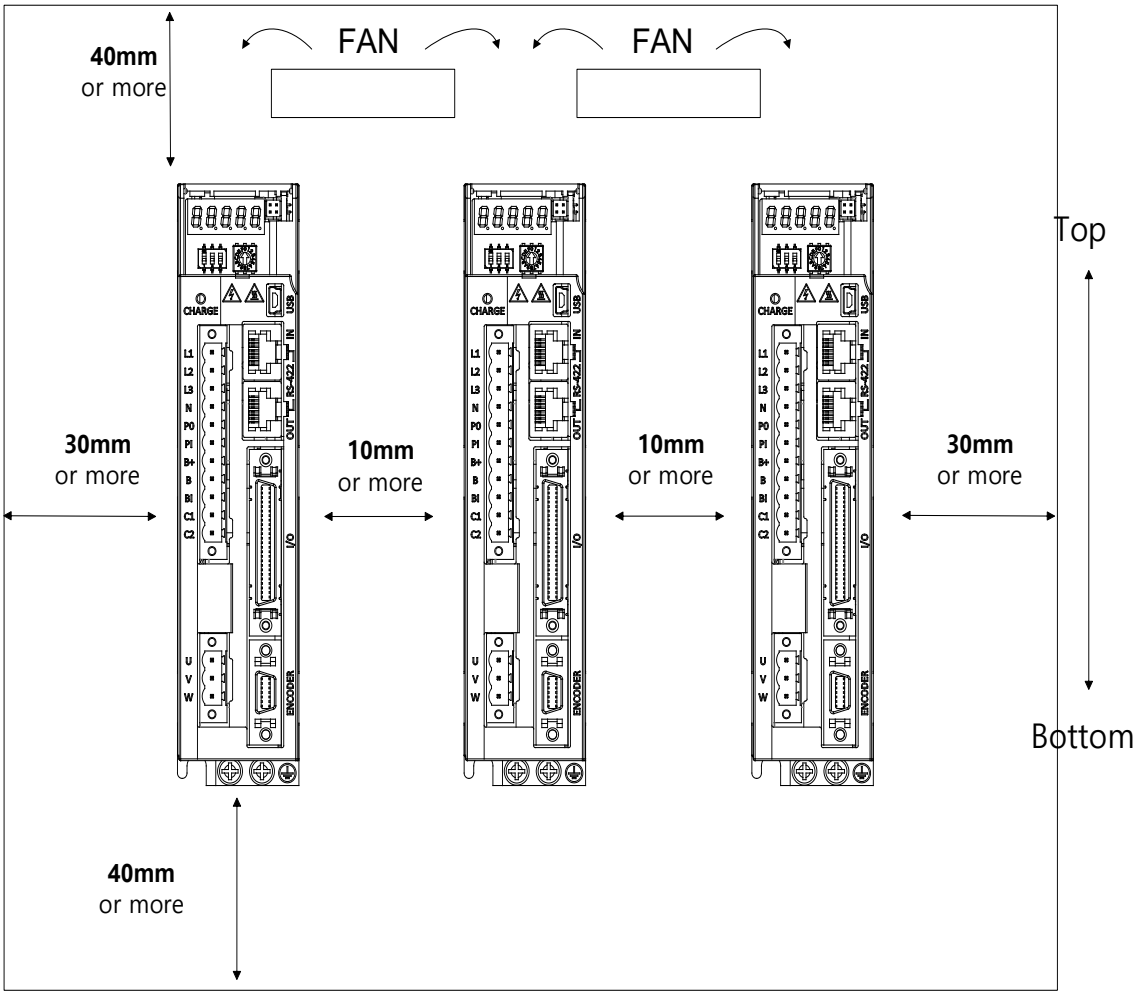
The installation interval in the control panel is as shown in the figure below.

- In case of 1 unit installation



■ In case of installation of 2 or more units

Install a cooling fan on the top of the servo drive to prevent the internal temperature of the control panel from exceeding the environmental conditions of the servo drive. Also, leave enough space while referring to the figure below to allow cooling by heat convection within the fan and control panel.

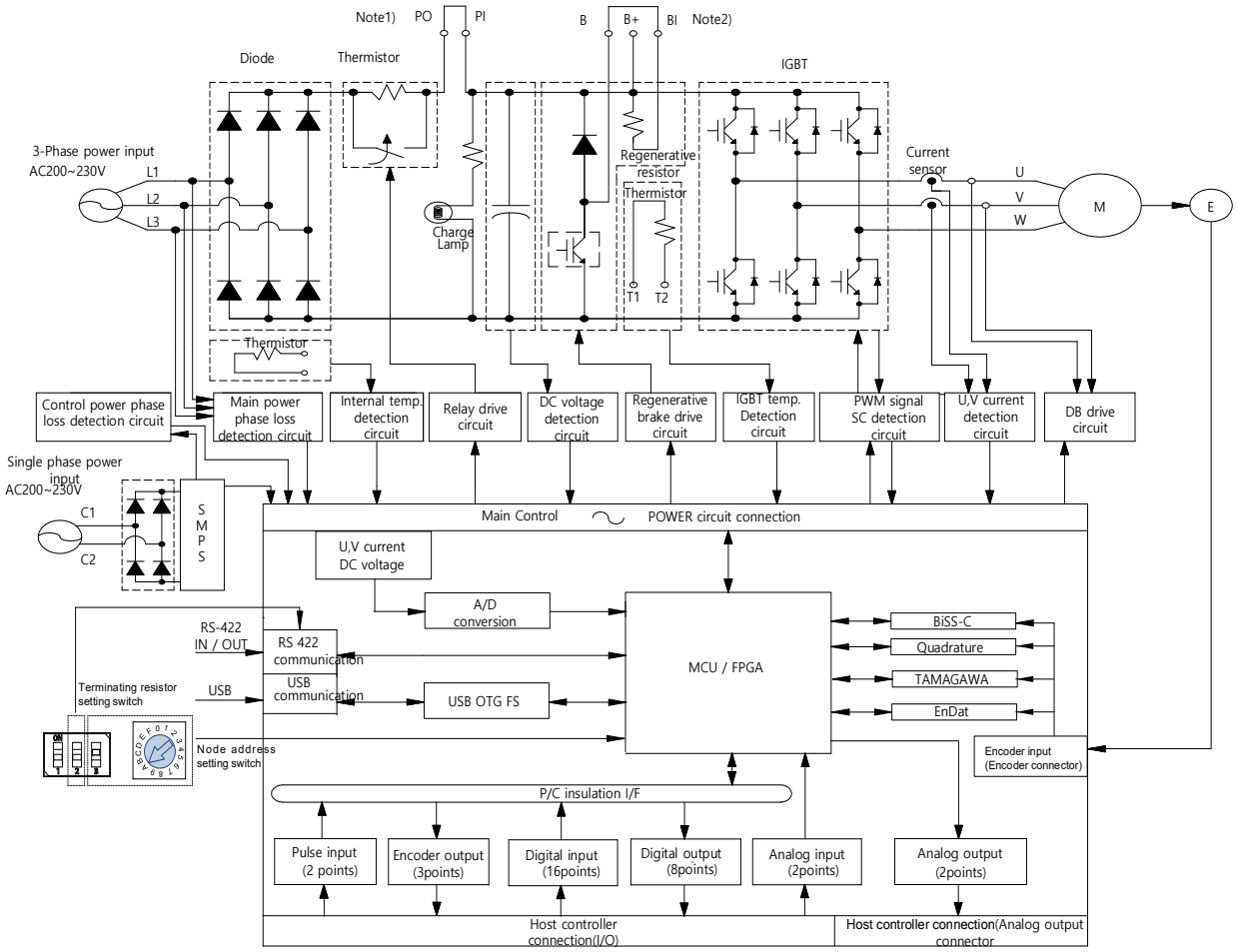


⚠ Caution

- When installing an external regenerative resistor, install it so that it does not affect the drive due to heat.
- When assembling the control panel of the servo drive, make sure to assemble it in close contact with the wall.
- When assembling the control panel, make sure that metal powder generated by drilling, etc. does not enter the drive.
- Take into consideration that oil, water, and other metallic dust do not enter from the control panel gap or ceiling.
- Protect the control panel with an air purge when used in a place with a lot of harmful gas and dust.

3.3 Internal Block Diagram of Drive

3.3.1 Block Diagram of Drive (100W~400W/200[V])

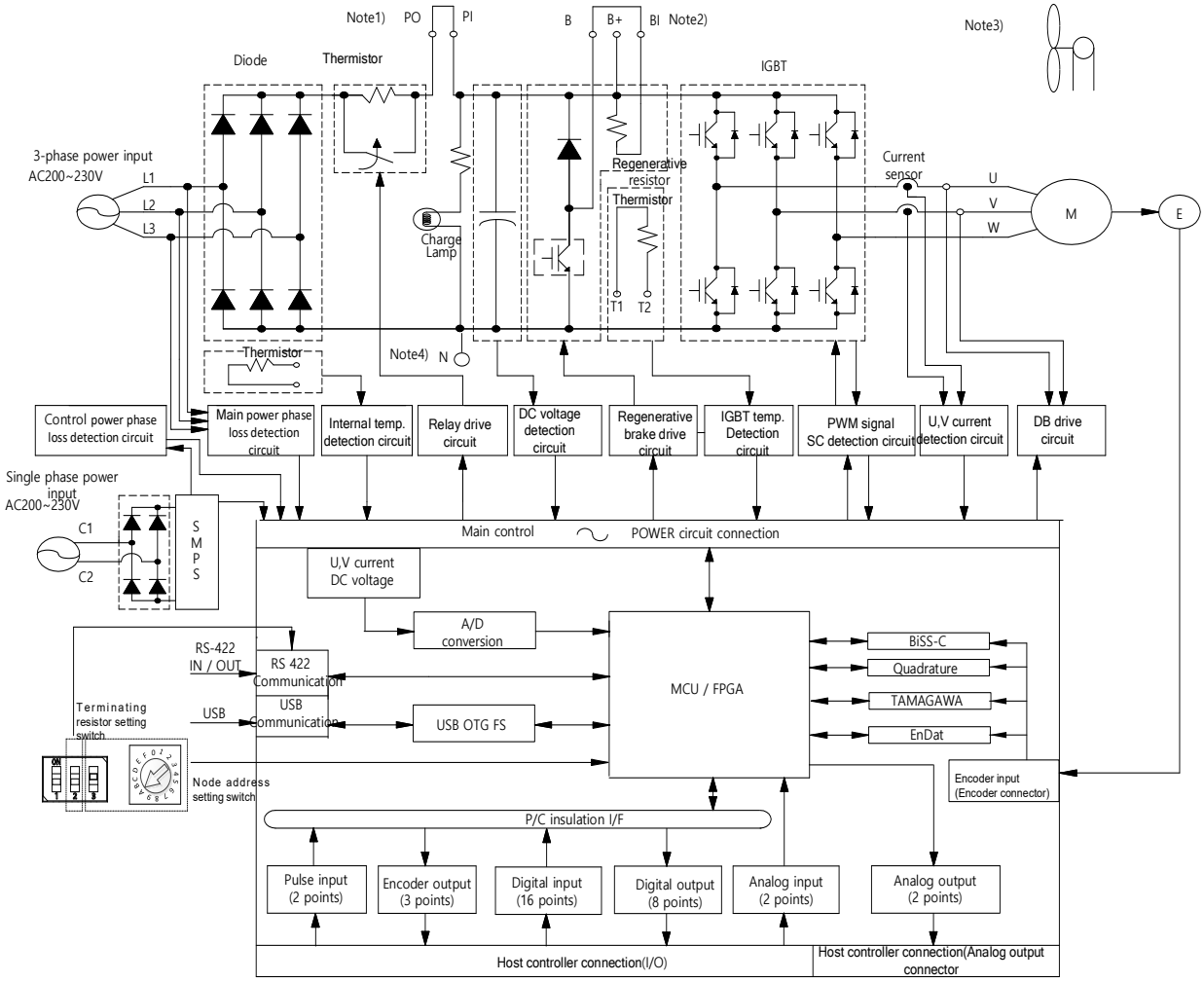


Note1) If using a DC reactor, connect the PO and PI pins.

Note2) If using an external regenerative resistor, remove the B and BI short-circuit pins and connect the B+ and B pins.

Note3) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.3.2 Block Diagram of Drive (800W~3.5kW/200[V])



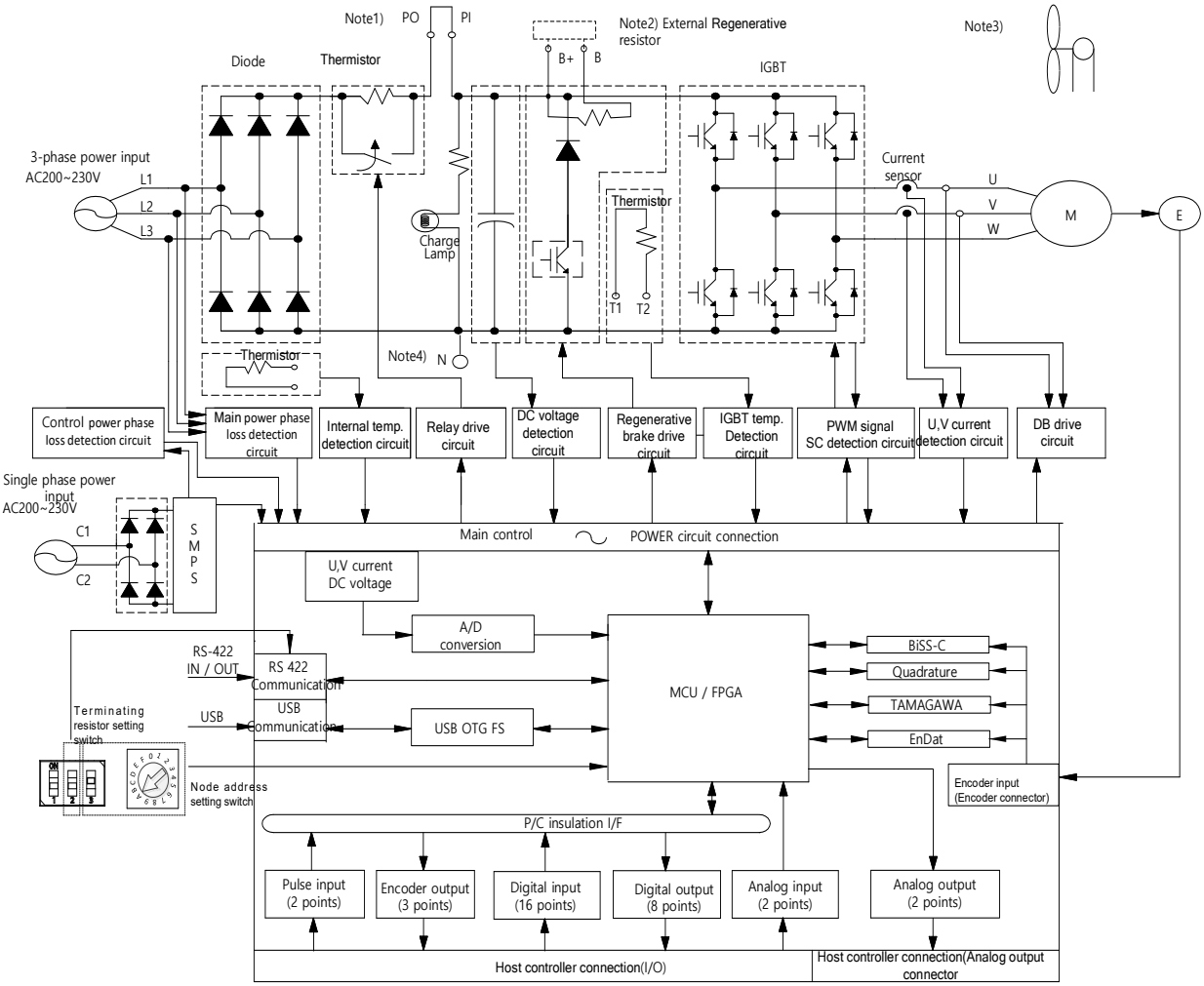
Note1) If using a DC reactor, connect the PO and PI pins.

Note2) If using an external regenerative resistor, remove the B and BI short-circuit pins and connect the B+ and B pins.

Note3) 800W ~ 3.5KW are cooled by a DC 24V cooling fan.

Note4) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.3.3 Block Diagram of Drive (5kW~7.5kW/200[V])



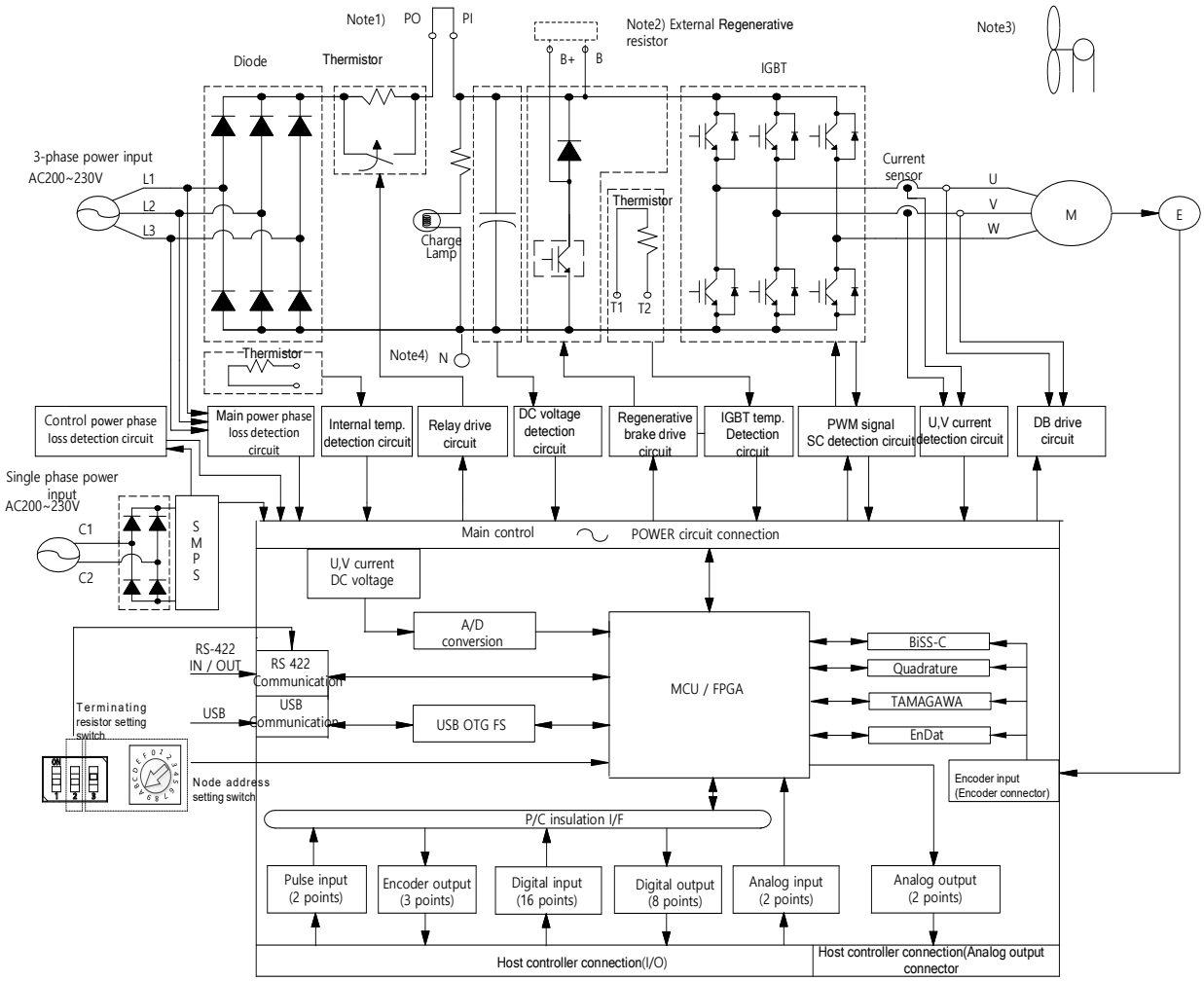
Note1) If using a DC reactor, connect the PO and PI pins.

Note2) When using an external regenerative resistor, connect the external regenerative resistor to the B+ and B terminals after attaching the wiring of the internal regenerative resistor to the internal resistance fixing hole “NC” of the case.

Note3) 5kW ~ 7.5KW are cooled by a DC 24V cooling fan.

Note4) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.3.4 Block Diagram of drive (15kW / 200[V])



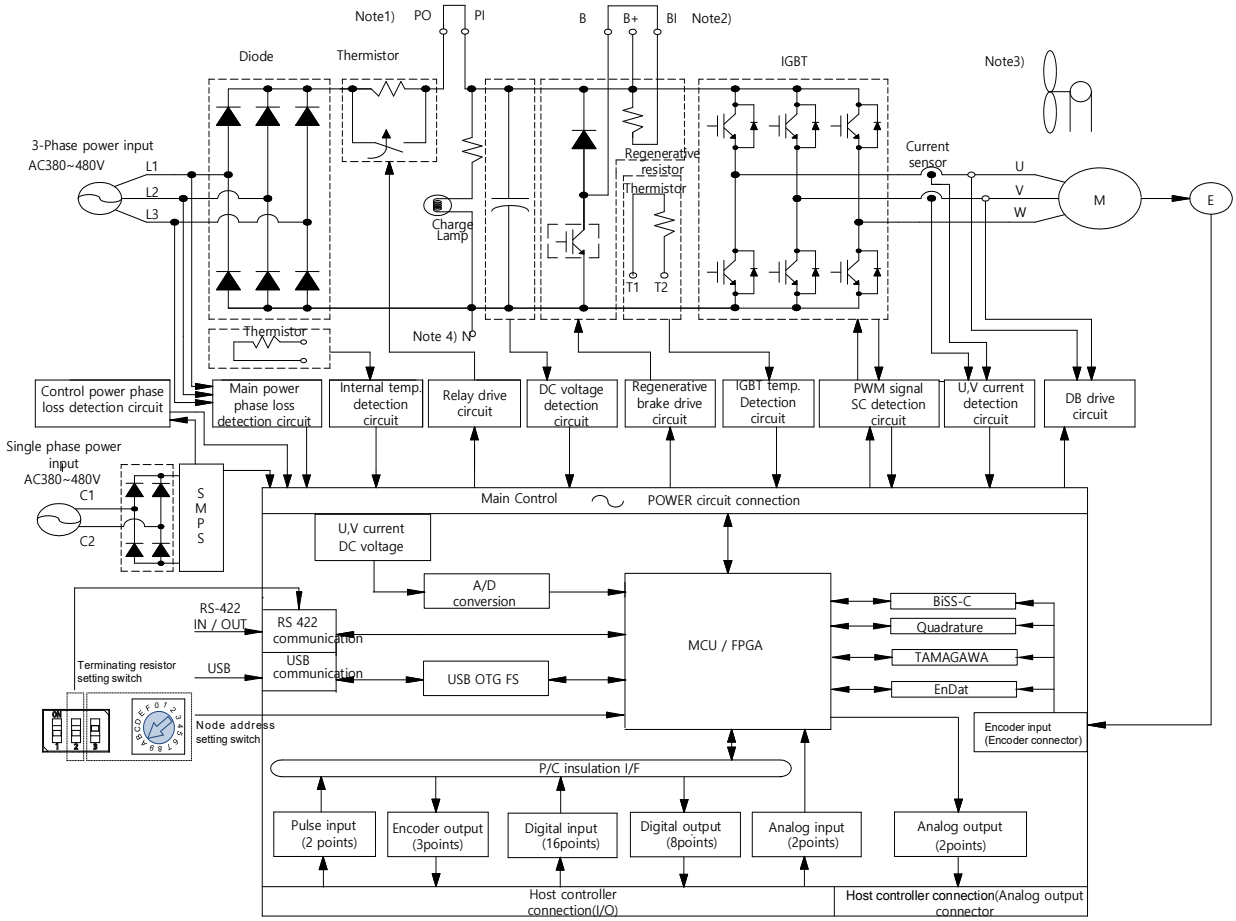
Note1) If using a DC reactor, connect the PO and PI pins.

Note2) L7PA150U model does not have an internal regenerative resistor. Use of an external regenerative resistor It is basic, and when installing, connect to B+, B terminals.

Note3) 15kW model is cooled by a DC 24V cooling fan.

Note4) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.3.5 Block Diagram of Drive (1kW~3.5kW/400[V])



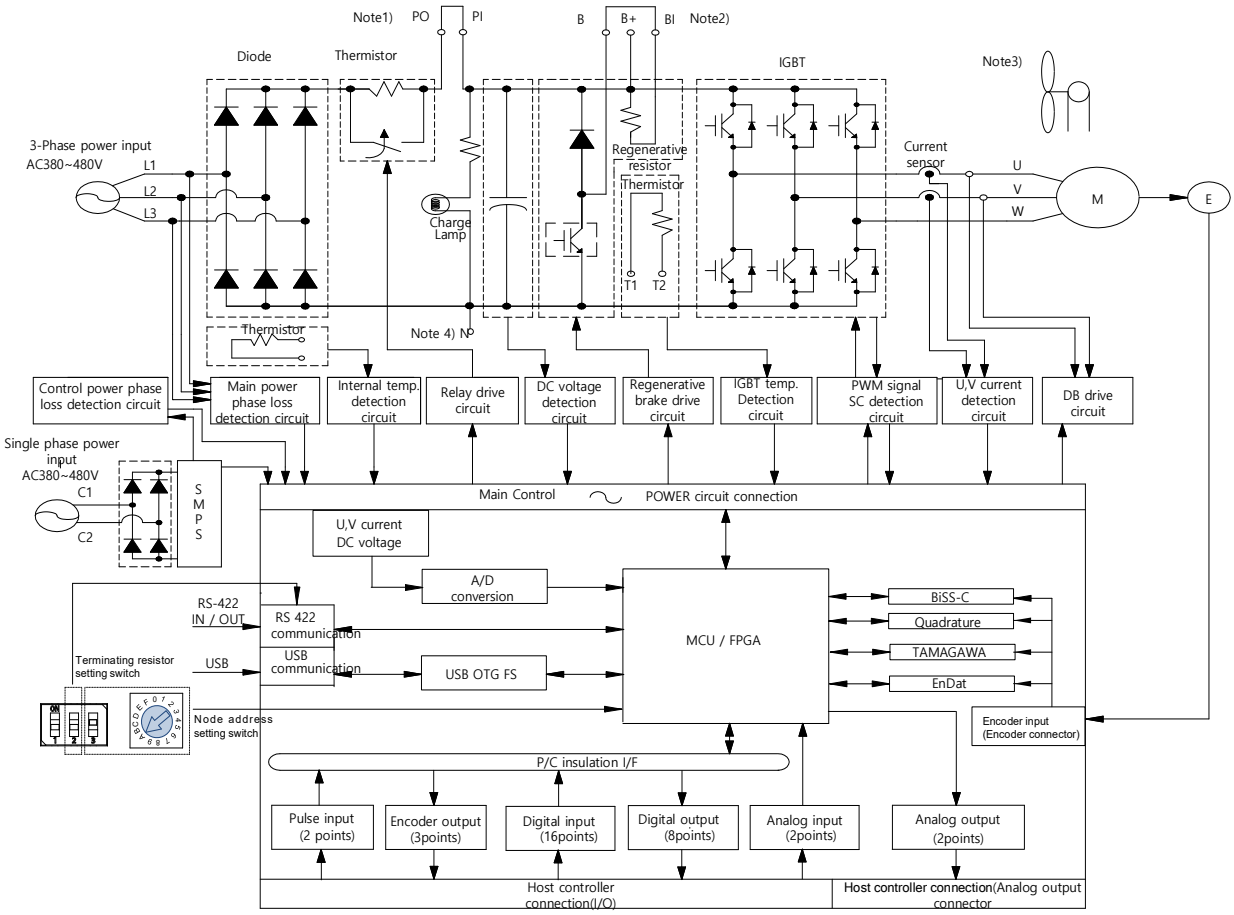
Note1) If using a DC reactor, connect the PO and PI pins.

Note2) If using an external regenerative resistor, remove the B and BI short-circuit pins and connect the B+ and B pins.

Note3) 1.0kW ~ 3.5KW are cooled by a DC 24 V cooling fan.

Note4) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.3.6 Block Diagram of Drive (5kW~7.5kW/400[V])



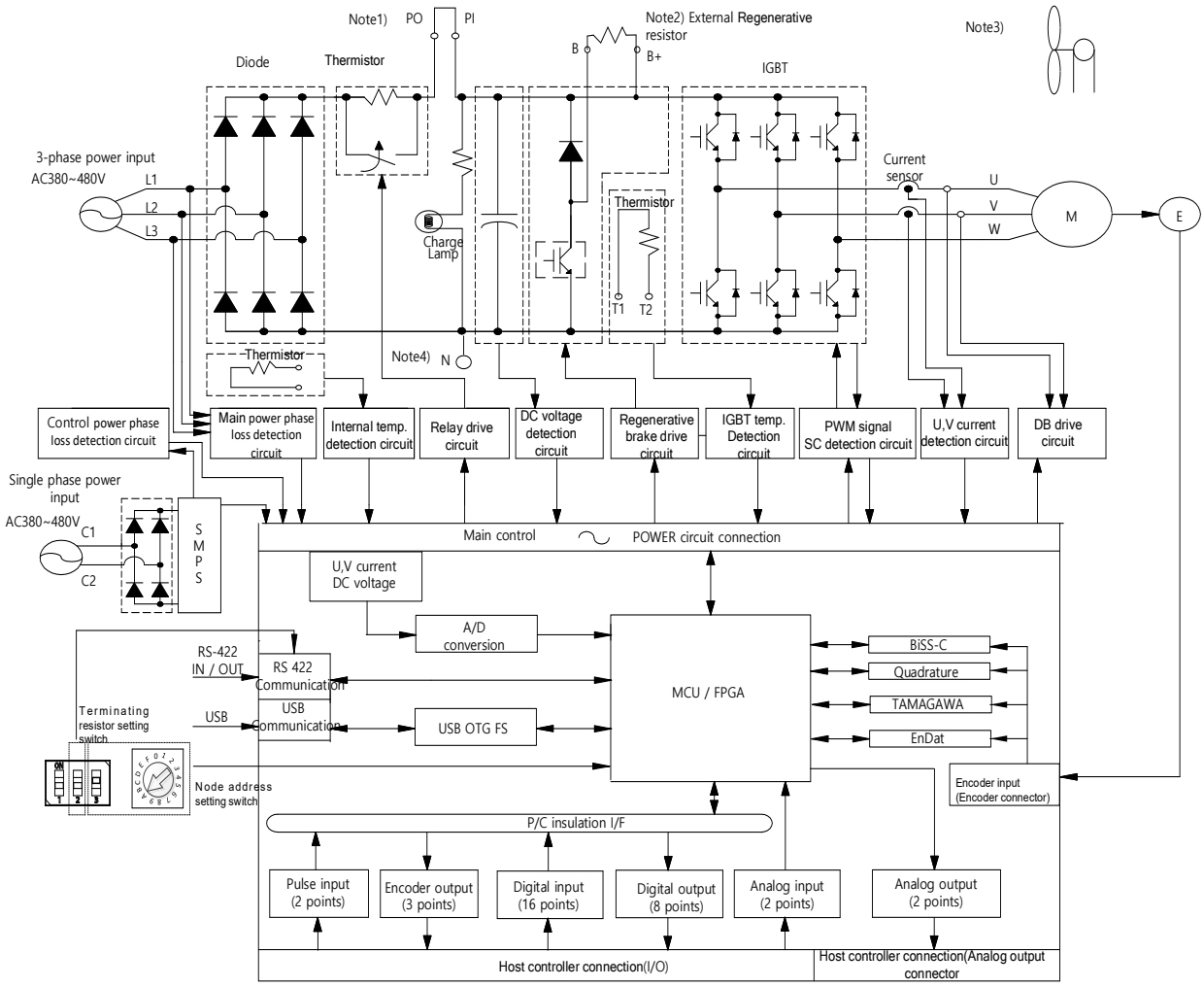
Note1) If using a DC reactor, connect the PO and PI pins.

Note2) If using an external regenerative resistor, remove the B and BI short-circuit pins and connect the B+ and B pins.

Note3) 5kW ~ 7.5KW are cooled by a DC 24V cooling fan.

Note4) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.3.7 Block Diagram of Drive (15kW/400[V])



Note 1) If using a DC reactor, connect the PO and PI pins.

Note 2) L7PB150U model does not have an internal regenerative resistor. Use of an external regenerative resistor It is basic, and when installing, connect to B+, B terminals.

Note 3) 15kW model is cooled by a DC 24V cooling

Note 4) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.4 Power Supply Wiring

- Ensure that the input power voltage is within the acceptable range.

⚠Caution
Overvoltages can damage the drive.

- If commercial power is connected to U, V, W terminals of Drive, they may be damaged. Be sure to connect power to L1, L2, L3 terminals.
- Connect short-circuit pins to the B and BI terminals. For external regenerative resistors, remove the short-circuit pins and use standard resistors for the B+ and B terminals.

Voltage	Type	Resistance	Standard capacity	* Notes
200[V]	L7PA001U~L7PA004U	100[Ω]	Built-in 50[W]	⚠ **Caution** For information about resistance during regenerative capacity expansion, refer to Section 16.3, "Options and peripheral device."
	L7PA008U~L7PA010U	40[Ω]	Built-in 100[W]	
	L7PA020U~L7PA035U	13[Ω]	Built-in 150[W]	
	L7PA050U	6.8[Ω]	Built-in 120[W]	
	L7PA075U	6.8[Ω]	Built-in 240[W]	
	L7PA150U	3.3[Ω]	External 2000[W]	
400[V]	L7PB010U	100[Ω]	Built-in 100[W]	
	L7PB020U~L7PB035U	40[Ω]	Built-in 150[W]	
	L7PB050U	27[Ω]	Built-in 120[W]	
	L7PB075U	27[Ω]	Built-in 240[W]	
	L7PB150U	13.4[Ω]	External 2000[W]	

- Configure the system so that the main power (L1, L2, L3) is supplied after the control power (C1, C2). (Refer to section 3.4.1, “Power Supply Wiring Diagram.”)
- High voltages may remain in the device for sometime even after the main power is disconnected. Please be careful.

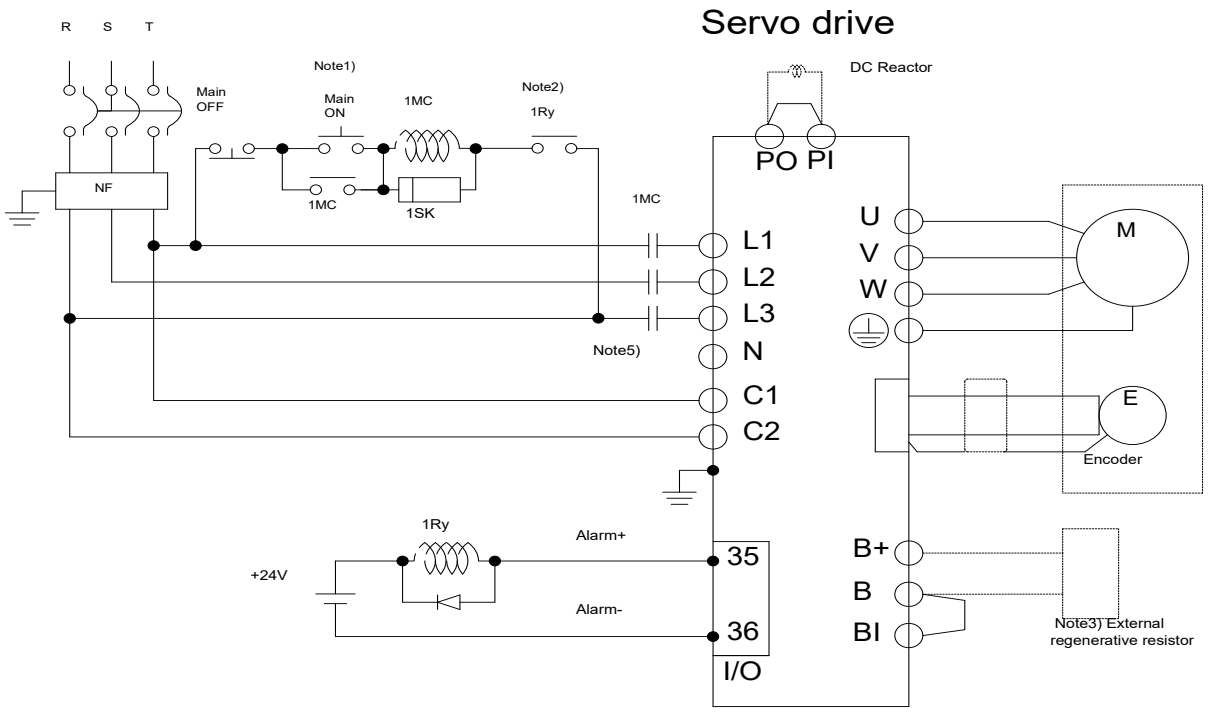
⚠Warnings
After disconnecting the main power, ensure that the charge lamp is off before you start wiring. Failure to do so may result in electric shock.

- Always ground the device over the shortest possible distance. Long ground wires are susceptible to noise, which may cause the device to malfunction.

3.4.1 Power Supply Wiring

[100W~3.5kW](200/400[V])

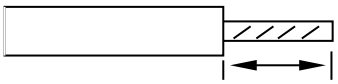
200[V]:AC 220~230[V]
400[V]:AC 380~480[V]



Note1) It takes approximately one to two seconds until alarm signal is output after you turn on the main power. Accordingly, push and hold the main power ON switch for at least two seconds.

Note2) Short-circuit B and BI terminals before use, because 200[V]/100[W]~3.5[kW] and 400[V]/1[kW]~3.5[kW] have internal regenerative resistance. If the regenerative capacity is high because of frequent acceleration and deceleration, open the short-circuit pins (B , BI) and connect an external regenerative resistor to B and B+.

Note3) Remove approximately 7-10 ㎜ of the sheathing from the cables for the main circuit power and attach crimp terminals. (Refer to “3.4.2 Specifications of Power Circuit Electrical Components”).



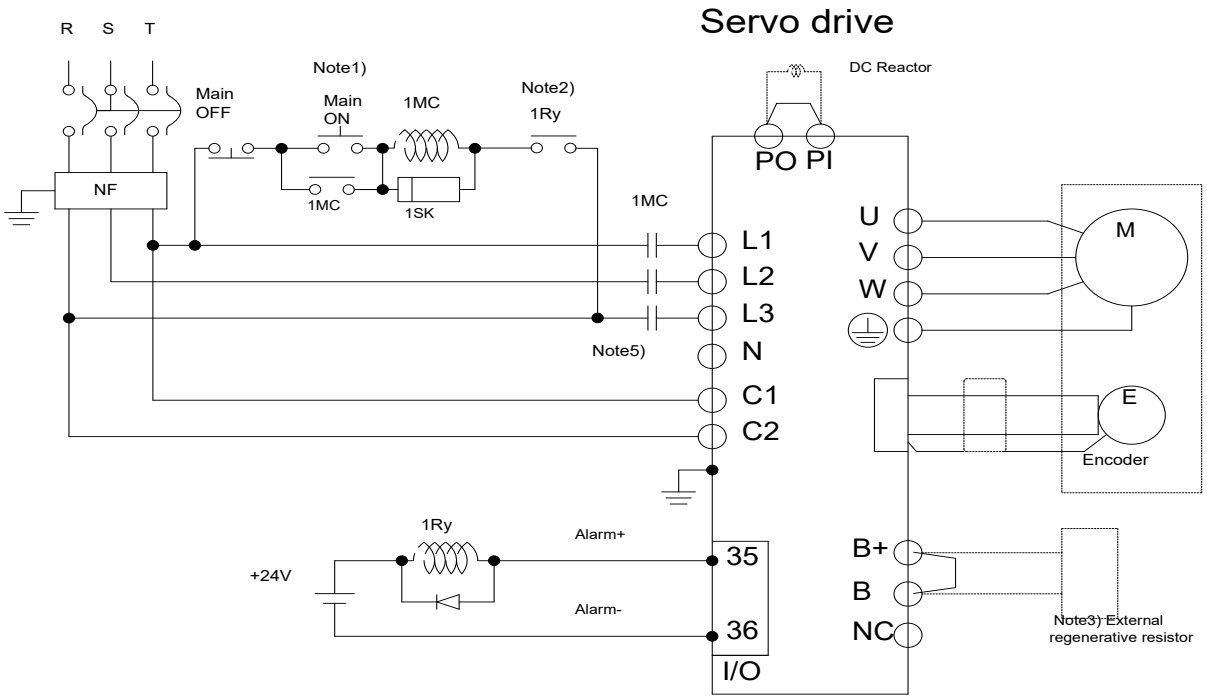
Note4) To remove the wiring of the main circuit power supply unit, connect or remove the 200[V]/100[W]~1[kW] drive after pressing the button on the drive terminal block.Use a (-) flathead screwdriver to connect or remove the main circuit power unit wiring.

Note5) In the case of 200[V]/2[kW]~3.5[kW] and 400[V]/1[kW]~3.5[kW] drives, connect or remove them using a (-) screwdriver after pressing.

Note6) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

[5kW~7.5kW](200/400[V])

200[V]:AC 220~230[V]
400[V]:AC 380~480[V]



Note1) It takes approximately one to two seconds until alarm signal is output after you turn on the main power. Accordingly, push and hold the main power ON switch for at least two seconds.

Note 2) Short-circuit B and BI terminals before use, because 200[V]/5[kW] and 400[V]/5[kW] ~7.5[kW], 40[Ω]) have internal regenerative resistance. If the regenerative capacity is large due to frequent acceleration/deceleration, connect the wires of the internal regenerative resistor connected to B+ and B to the internal resistor fixing hole “NC” of the case, and then connect the external regenerative resistor to the B and B+ terminals.

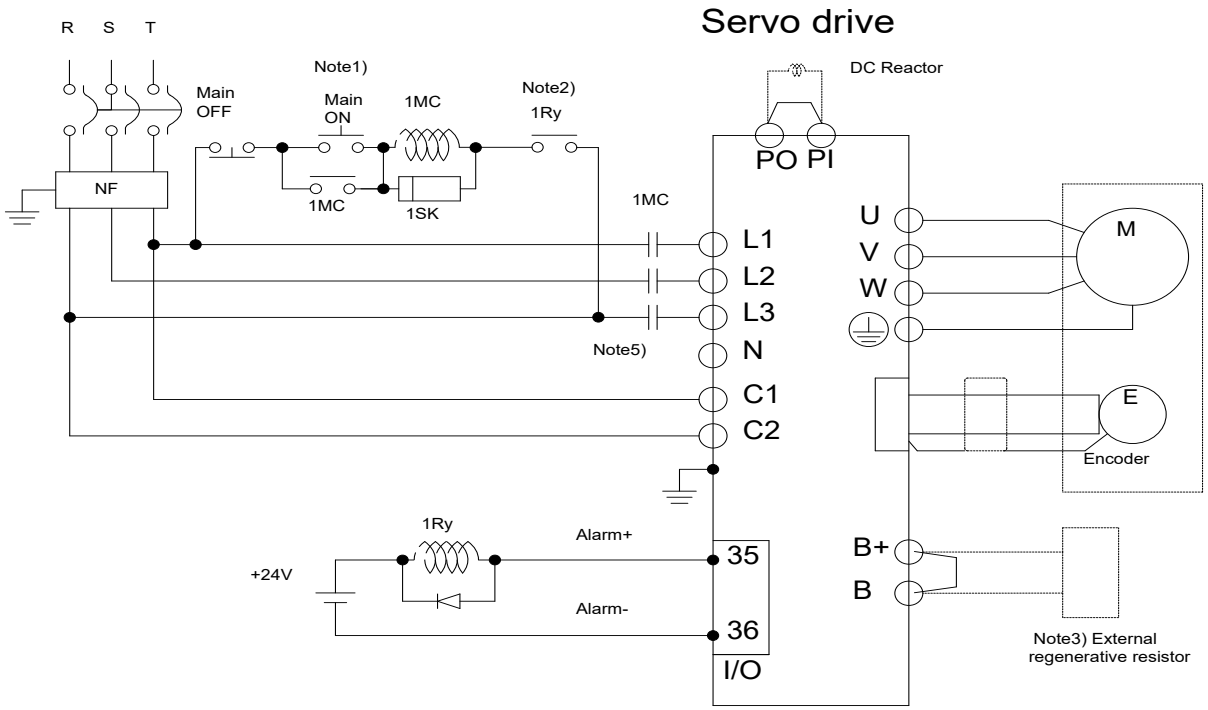
Note3) For 400[V]/5[kW]~7.5[kW] drives, be sure to use crimp terminals (GP110028_KET) within the electrical product standard (Refer to ‘3.4.3 Power Circuit Electrical Product Specification’)

Note4) In the case of 400[V]/5[kW]~7.5[kW], use a (+) and (-) driver to connect or remove the terminal block

Note 5) The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

[15kW](200/400[V])

200[V]:AC 220~230[V]
400[V]:AC 380~480[V]



Note1) It takes approximately two to three seconds until alarm signal is output after you turn on the main power. Accordingly, push and hold the main power ON switch for at least three seconds.

Note2) For 15[kW], external regenerative resistors for each operating voltage are used as a basis, and please connect the external regenerative resistor to terminals B+ and B.

Note3) Be sure to use crimp terminals (200[V]: JOPR 25 - S6W_JEONO || 400[V]: GP110732_KET) within the electric product standard for the wires to be used for the main circuit and control power supply. (Refer to “3.4.3 Specifications of Power Circuit Electrical Components”).

Note4) In the case of 15[kW], use a (+) and (-) driver to connect or remove the terminal block

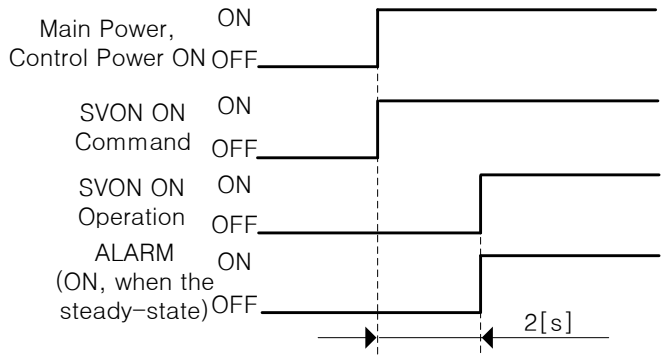
Note **5)** The N terminal is used to connect an external capacitor. Connecting the power used to the N terminal will damage the product. If you need to connect an external capacitor, be sure to contact the customer service center or dealer.

3.4.2 Power supply sequence

■ Power supply sequence

- For power wiring, use a magnetic contactor for the main circuit power as shown in 2.4.1 Power Supply Wiring Diagram. Configure the magnetic contactor to turn off at the same time an alarm occurs in an external sequence.
- Turn on the control power (C1, C2) at the same time as the main power (L1, L2, L3) or first. Also, when power is shut off, shut off the control power at the same time or after turning off the main power.
- The alarm signal turns on (normal state) after about 2 to 2.5 seconds after power is supplied, and then the servo on command signal is recognized. Therefore, if the Servo On command signal is On at the same time as the power is supplied, the actual Servo On will operate after about 2 to 2.5 second. Please consider this when designing the power-on sequence.

■ Timing chart



3.4.3 Power circuit Electrical Components

200[V]

Model name		L7PA001U~L7PA010U		L7PA020U~L7PA035U	L7PA050U	L7PA075U	L7PA150U
MCCB(NFB)		30A Frame 15A (ABE33C/15)		30A Frame 30A (ABE33C/30)	50A Frame 40A (ABE53b/40)	50A Frame 50A (ABE53b/50)	100A Frame 100A (ABS103/100)
Noise Filter (NF)		TB6-B010LBEI(10A)		TB6-B030NBDC(30A)	TB6-B040A (40A)	TB6-B060LA(60A)	TB6 B080LA(80A)
DC reactor		HFN-10 (10A)	HFN-15 (15A)	HFN-30 (30A)	HFN-40 (40A)	HFN-50 (50A)	HFN-80 (80A)
MC		11A / 240V (GM□-9)	18A / 240V (GM□-18)	32A / 240V (GM□-32)	50A / 240V (GM□-50)	50A / 240V (GM□-50)	105A / 240V GM□-100)
Wire Note) 1	L1,L2,L3 PO,PI,N B+,B,BI U,V,W	AWG16 (1.5 ㎟)	AWG14 (2.5 ㎟)	AWG12 (4.0 ㎟)	AWG10 (6.0 ㎟)	AWG8 (8.0 ㎟)	AWG4 (21.1 ㎟)
	C1 C2	AWG16 (1.5 ㎟)	AWG16 (1.5 ㎟)	AWG16 (1.5 ㎟)	AWG16 (1.5 ㎟)	AWG16 (1.5 ㎟)	AWG16 (1.5 ㎟)
Crimp terminals		UA-F1510, SEOIL (10mm Strip & Twist)	UA-F2010, SEOIL (10mm Strip & Twist)	UA-F4010, SEOIL (10mm Strip & Twist)	GP110028 KET	GP110732 KET	JOPR25 – 6W JEONO
Regenerative Resistor (Default)		50[W] 100Ω	100[W] 40Ω	150[W] 13Ω	120[W] 6.8Ω	240[W] 6.8Ω	Option
Connector		• BLF 5.08/03/180F SN BK BX • BLF 5.08/11/180F SN BK BX		•BLZ7.62HP/03/180LR SN BK BX SO •BLZ7.62HP/11/180LR SN BK BX SO			

400[V]

Model name		L7PB010U	L7PB020U~L7PB035U	L7PB050U	L7PB075U	L7PB150U
MCCB		30A Frame 10A (ABE33b/10)	30A Frame 20A (ABE33b/20)	30A Frame 30A (ABE33b/30)	30A Frame 30A (ABE33b/30)	50A Frame 50A (ABE53b/50)
Noise Filter (NF)		TB6-B010LBEI (10A)	TB6-B020NBDC (20A)	TB6-B030NBDC (30A)	TB6-B040A (40A)	TB6-B060LA (60A)
DC reactor		10[A]	20[A]	30[A]	30[A]	50[A]
MC		9A / 550V (GM□-12)	18A / 550V (GM□-22)	26A / 550V (GM□-40)	26A / 550V (GM□-40)	38A / 550V (GM□-50)
Wire Note 1)	L1, L2 ,L3, PO, PI, N B+, B, U, V, W	AWG14 (2.08 ㎟)		AWG10 (5.5 ㎟)	AWG10 (5.5 ㎟)	AWG8 (8.0 ㎟)
	C1, C2	AWG14 (2.08 ㎟)				
Crimp terminals		UA-F4010, SEOIL (10mm Strip & Twist)		GP110028 KET	GP110028 KET	GP110732 KET
Regenerative Resistor (Default)		100[W] 100Ω	150[W] 40Ω	120[W] 27Ω	240[W] 27Ω	
Connector (Default)		BLZ 7.62HP/3/180LR SN OR BX SO BLZ 7.62HP/11/180LR SN OR BX SO				

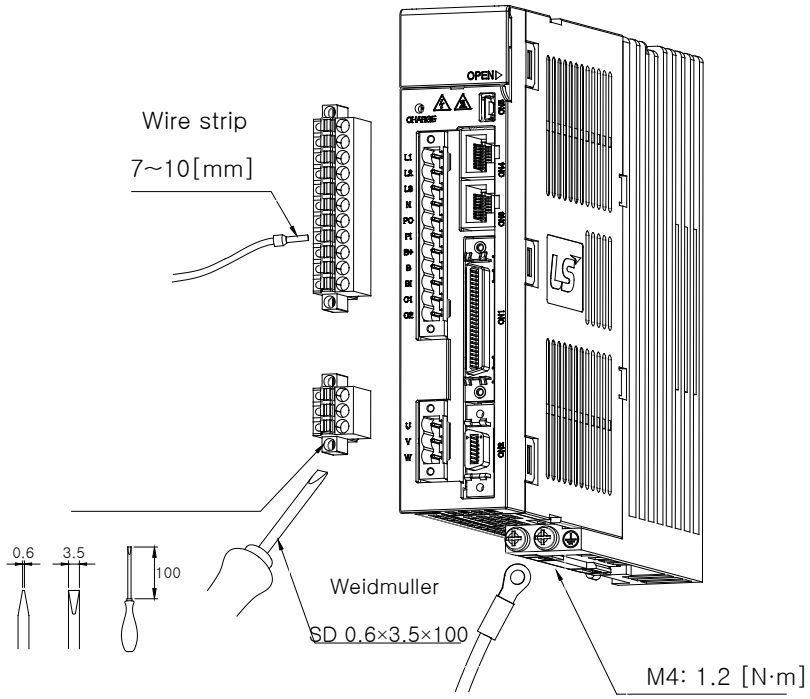
Note1) When you select a wire, please use 600V, PVC-insulated wire.

To comply with UL (CSA) standards, use UL-certified wire (heat resistant temperature 75℃ or above).

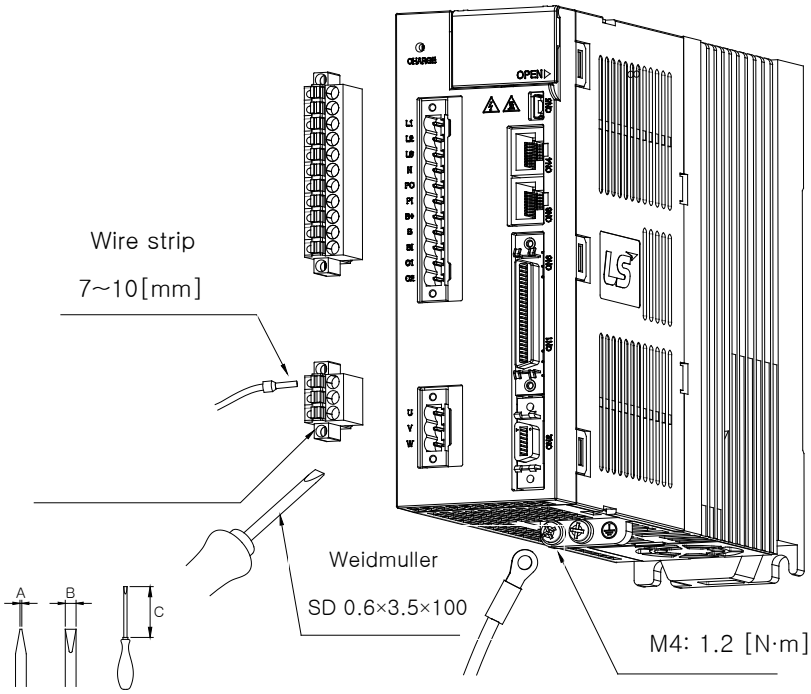
To comply with other standards, use proper wires that meet applicable standards.

For other special specifications, use wires equivalent or superior to those in this section.

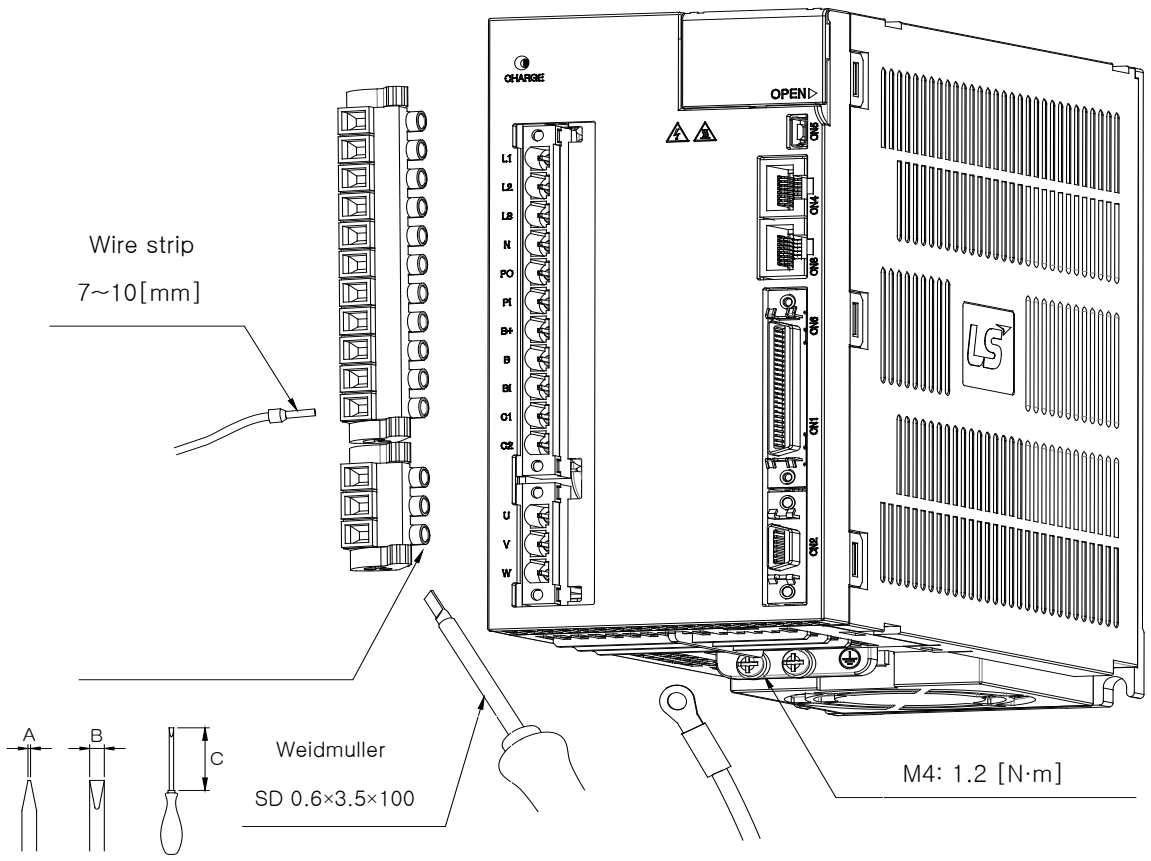
■ L7NHA004U or lower



■ L7NHA008U ~ L7NHA010U



■ L7NHA020U ~ L7NHA035U



1) For information on wiring to BLZ 7.62HP Series connector, refer to the above procedures.

2) Insert electric wire into insert hole with upper locking screw loosened, and use applicable flathead (-) driver for each model to fully tighten screw to 0.4-0.5 N·m.

3) Otherwise, insufficient torque of locking screw may cause vibration-induced disconnection, system malfunction and contact-induced fire accident.

4) After you connect a wire to connector, place the connector as closely to servo drive as possible and use both locking hooks to fully lock it.

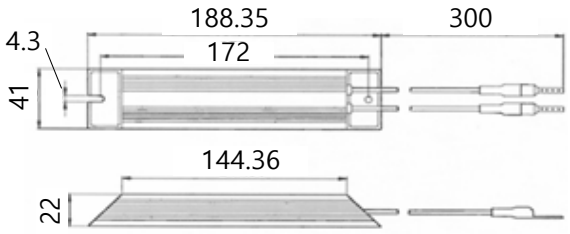
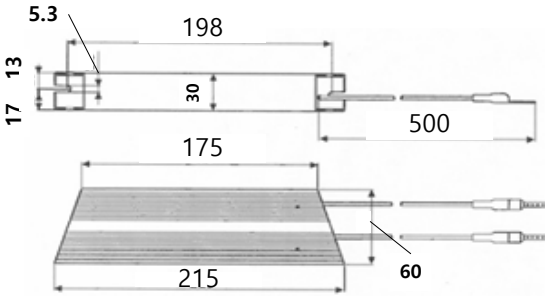
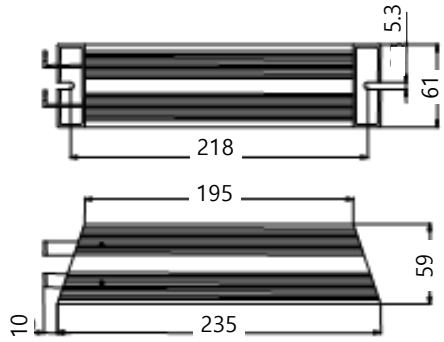
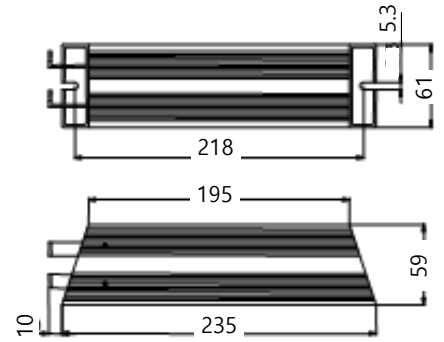
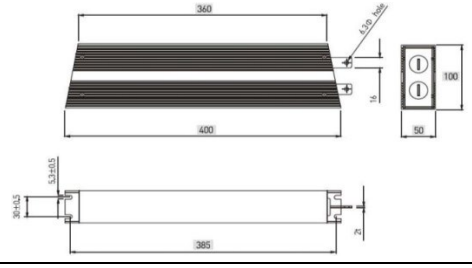
5) Use FG locking screw of M4 size (shown in bottom of product) to tighten it to 1.2 N·m.

6) Insufficient torque of locking screw may cause FG contact failure and even malfunctioning drive.

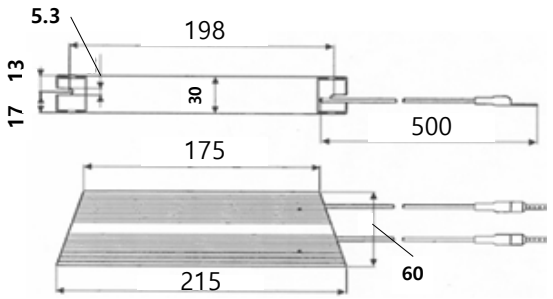
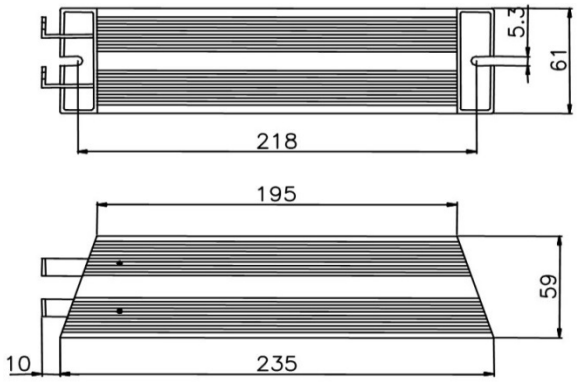
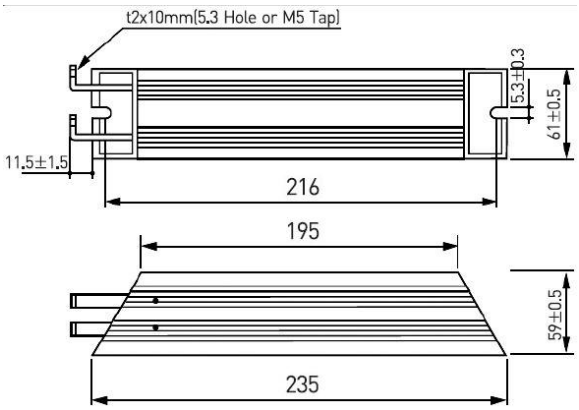
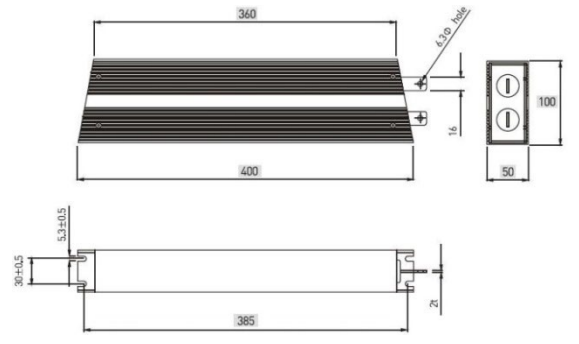
7) Recommended (-) driver: Use Weidmuller flathead driver (SD 0.6×3.5×100).

3.4.4 Regenerative resistance option spec.

Option (Braking resistance) / 200[V]

Classification	Product Name	Model name	Applicable drive	Specification
resistance	Brake resistance	APCS-140R50	L7□A001□ L7□A002□ L7□A004□	
resistance	Brake resistance	APCS-300R30	L7□A008□ L7□A010□	
resistance	Brake resistance	APC-600R30	L7□A020□ (2P) L7□A035□ (3P)	
resistance	Brake resistance	APC-600R28	L7□A050□ L7□B010□ (4P)	
resistance	Brake resistance	APCS-2000R3R3 3.3[Ω] (2000W)	L7□A150□	

Option (Braking resistance) / 400[V]

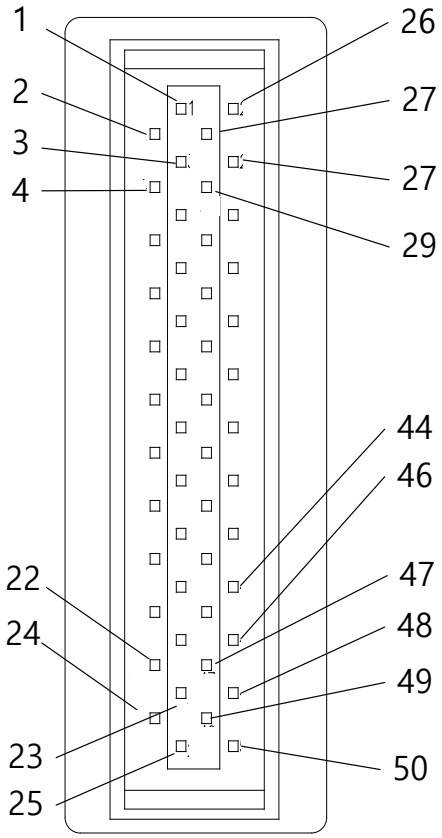
Classification	Product Name	Model name	Applicable drive	Specification
resistance	Brake resistance	APCS-300R82	L7□B010□	
resistance	Brake resistance	APCS-600R140 (600W x 2P)	L7□B020□ /L□PB035□ (2P)	
resistance	Brake resistance	APCS-600R75 (600W x 3P)	L7□B050□ /L7□B075□ (3P)	
resistance	Brake resistance	APCS-2000R13R4	L7□B150□	

Note 1) The P mark on the applicable drive is the number of resistors connected in parallel.

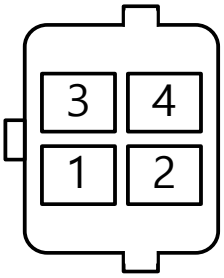
the number of resistors connected in parallel	2EA	3EA	4EA
Notation	2P	3P	4P

3.5 Wiring for Input/Output Signals

■ **I/O Connector Specification : 10150-3000PE (3M)**



■ **Analog Monitoring Connector Specification : DF-11-4DS-2C(HIROSE)**



3.5.1 Names and Functions of Digital Input/Output Signals

■ Names and Functions of Digital Input Signals (I/O Connector)

Pin No.	Name	Assignment	Content	Details Function
21,11	+24V	DC 24V	DC 24V input	Common
12	DI 1	SVON	Servo On	When the SVON signal is turned ON, it becomes an operable state. (Servo On Status) When OFF, the motor will be free-run.
13	DI 2	POT	Forward (CCW) Prohibited	The motor is stopped to prevent the actuator from moving beyond the range of motion in the forward direction and how to stop changes by [0x2013] setting Value.
14	DI 3	NOT	Reverse (CW) Prohibited	The motor is stopped to prevent the actuator from moving beyond the range of motion in the reverse direction and how to stop changes by [0x2013] setting Value.
15	DI 4	A-RST	Alarm reset	Release the servo alarm status.
16	DI 5	START	Operation start	Index position operation starts.
17	DI 6	STOP	Servo stop	Stop operation.
18	DI 7	REGT	Operation after sensor	When the index type is Registration Absolute or Registration Relative, when the REGT signal turns ON, it operates by changing the set driving speed and moving distance.
19	DI 8	EMG	Emergency stop	When the EMG signal is ON, the servo makes an emergency stop and generates ‘W-80’. At this time, the stopping method differs according to the set value of [0x2013].
22	DI 9	HOME	Origin sensor	This is the HOME sensor input signal used for homing.
23	DI 10	HSTART	Origin operation start	Start homing operation.
24	DI 11	ISEL0	Index selection 0	Select the index for operation among the indexes from 0 to 63.
25	DI 12	ISEL1	Index selection 1	
26	DI 13	ISEL2	Index selection 2	
27	DI 14	ISEL3	Index selection 3	
28	DI 15	ISEL4	Index selection 4	
29	DI 16	ISEL5	Index selection 5	
** PCON			P control action	When the PCON signal is turned ON, it is converted from PI control to P control.
** GAIN2			Switch from Gain 1 to 2	When GAIN2 signal is ON, speed control gain 1 is converted to gain 2.
** PCL			Forward torque limit	When the PCL signal is ON, forward torque is limited. The operation is set by [0x2110] setting, and the torque limit value is determined by [0x2111].

<table>
<tr><td>** NCL</td><td>Negative torque limit</td><td>When the NCL signal is ON, reverse torque is limited. The operation is set by [0x2110] setting, and the torque limit value is determined by [0x2112].</td></tr>
<tr><td>** PAUSE</td><td>Pause</td><td>If the PAUSE signal is input during index operation, it decelerates to a stop. If the PAUSE signal is input again in the paused state, the operation of the original index is restarted.</td></tr>
<tr><td>** ABSRQ</td><td>Absolute position data request</td><td>When absolute value data is requested from the absolute encoder, the absolute encoder data is transmitted to the host controller in the form of quadrature pulses through the output of AO and BO, which are encoder output signals.</td></tr>
<tr><td>** JSTART</td><td>Jog Operation</td><td>When the contact is ON, jog operation starts at the speed set in [0x2300].</td></tr>
<tr><td>** JDIR</td><td>Jog rotation direction selection</td><td>Changes the direction of rotation during jog operation.</td></tr>
<tr><td>** PCLR</td><td>Input pulse clear</td><td>When the contact is ON, it does not receive a power pulse and makes the position error 0.
Operation mode can be set in [0x3005].</td></tr>
<tr><td>** AOVR</td><td>Speed override Select</td><td>When the AOVR signal is ON, the index operation speed is overridden according to the voltage input to A-OVR (AI2).
The override value is applied by the analog speed override mode [0x221E]</td></tr>
<tr><td>** SPD1</td><td>multi-speed 1</td><td rowspan="3">Select the command rotation speed for speed control operation. Depending on the state of the contact, the speed command changes as follows.
<table>
<tr><td colspan="3">Input device</td><td rowspan="2">Speed</td></tr>
<tr><td>SPD1</td><td>SPD2</td><td>SPD3</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>multi-step speed command1
(Parameter 0x2312)</td></tr>
<tr><td>O</td><td>X</td><td>X</td><td>multi-step speed command2
(Parameter 0x2313)</td></tr>
<tr><td>X</td><td>O</td><td>X</td><td>multi-step speed command3
(Parameter 0x2314)</td></tr>
<tr><td>O</td><td>O</td><td>X</td><td>multi-step speed command4
(Parameter 0x2315)</td></tr>
<tr><td>X</td><td>X</td><td>O</td><td>multi-step speed command5
(Parameter 0x2316)</td></tr>
<tr><td>O</td><td>X</td><td>O</td><td>multi-step speed command6
(Parameter 0x2317)</td></tr>
<tr><td>X</td><td>O</td><td>O</td><td>multi-step speed command7
(Parameter 0x2318)</td></tr>
<tr><td>O</td><td>O</td><td>O</td><td>multi-step speed command8
(Parameter 0x2319)</td></tr>
</table></td></tr>
<tr><td>** SPD2</td><td>multi-speed 2</td></tr>
<tr><td>** SPD3</td><td>multi-speed 3</td></tr>
</table>

** MODE	Operation mode switching	Convert driving mode while in use.
** INHIBIT	Block command pulse	Input pulses are not counted as command pulses.
** PROBE1	Touch probe 1	The probe signal to rapidly store the position value 1
** PROBE2	Touch probe 2	The probe signal to rapidly store the position value 2
** LVSF1	Vibration Suppression Filter 1	This is the vibration control filter signal 1 according to the vibration control filter function setting (0x2515). When assigned, it is the same as the SPD1 setting value.
** LVSF2	Vibration Suppression Filter 2	This is the vibration control filter signal 2 according to the vibration control filter function setting (0x2515). When assigned, it is the same as the SPD2 setting value.
** ABS_Reset	Absolute value encoder reset	Initialize multiturn and singleton values.
**PJOG	Positive JOG	During jog operation, it operates in the positive direction. Function can be set at [0x300A].
**NJOG	Negative JOG	During jog operation, it operates in the negative direction. Function can be set at [0x300A].

Note1) **Signals not assigned by default as factory setting. You can change their allocation by setting parameters. For more information, refer to「11.2 Input/Output Signals Setting.」

Note2) Wiring can be also done by using COMMON (DC 24 V) of the input signal as the GND.

Note3) SPD1 and LVSF1, SPD2 and LVSF2 signals use the same set value when allocated, and the function is different according to the operation mode. (Speed operation: SPD1, SPD2 / Position operation: LVSF1, LVSF2)

■ Names and Functions of Digital output Signals (I/O Connector)

Pin No.	Name	Assignment	Content	Details Function
35	DO 1+	ALARM+	Servo alarm	Outputs when a servo alarm occurs.
36	DO 1-	ALARM-		
37	DO 2+	RDY+	Servo ready	This signal is output when the main power is established and the preparations for servo operation are complete. It turns OFF when an alarm occurs.
38	DO 2-	RDY-		
39	DO 3+	BRAKE+	Brake	As a brake control signal installed inside or outside the motor, the signal is output when the SVON contact is OFF.
40	DO 3-	BRAKE-		
41	DO 4+	INPOS1+	Position reached 1	As a signal output when the command position is reached, the output condition can be set by the set values of [0x2401] and [0x2402].
42	DO 4-	INPOS1-		
43	DO 5+	ORG+	Origin operation completed	When origin operation is completed, a signal is output.
44	DO 5-	ORG-		
45	DO 6+	EOS+	Operation completed	When Index operation is completed, a signal is output.
46	DO 6-	EOS-		
47	DO 7+	TGON+	Rotation detection	It is output when the motor is rotating beyond the [0x2405] set value.
48	DO 7-	TGON-		
49	DO 8+	TLMT+	Torque Limit	A signal is output when the output of the drive is limited to the torque limit setting value.
50	DO 8-	TLMT-		
** VLMT			Speed limit	When the motor reaches the limited speed, a signal is output, and the limited speed can be adjusted by setting [0x230D] and [0x230E].
** INSPD			Speed reached	When the difference between the command speed and the current speed is less than the set value of [0x2406], a signal is output.
** WARN			Servo warning	When a warning occurs, a signal is output.
** INPOS2			Position reached Completion 2	As a signal output when the command position is reached, the output condition can be set by the set values of [0x2403].
** IOUT0			Index output 0	Outputs the number of the index currently being executed from 0 to 63.
** IOUT1			Index output 1	
** IOUT2			Index output 2	
** IOUT3			Index output 3	
** IOUT4			Index output 4	
** IOUT5			Index output 5	

** Unassigned signals. You can change their allocation by setting parameters. For more information, refer to 「11.2 Input/Output Signals Setting.」

3.5.2 Names and Functions of Analog Input/Output Signals

■ Names and Functions of Analog Input Signals (I/O Connector)

Pin No.	Name	Content	Details Function
7	A-TLMT	Analog torque input(Command/ limit)	Index Operation mode: It applies -10~+10V between A-TLMT (AI1) and AGND to limit motor output torque. The relationship between input voltage and limit torque depends on the set value of [0x221C]. Torque Operation mode: analog torque command is applied by applying -10~+10V between A-TLMT (AI1) and AGND. The relationship between input voltage and command torque depends on the set value of [0x221C].
9	A-OVR	Analog speed input (Command/Override)	Index Operation mode: Override the index operation speed by applying -10~+10V / 0~+10[V] between A-OVR (AI2) and AGND. The override value is applied by the analog speed override mode [0x221E]. In addition, it is possible to select whether or not to use the function by AOVR contact input. Speed operation mode: Analog speed control is performed by applying -10 to +10V between A-OVR(AI2) and AGND. The relationship between input voltage and command speed depends on the set value of [0x2229].
8	AGND	AGND (0V)	Analog ground
10	AGND	AGND (0V)	Analog ground

■ Names and Functions of Analog Output Signals (Analog Monitoring Connector)

Pin No.	Name	Content	Details Function
1	AMON1	Analog Monitor 1	Analog monitor output(-10V ~ +10V)
2	AMON2	Analog Monitor 2	Analog monitor output(-10V ~ +10V)
3	AGND	AGND (0V)	Analog ground
4	AGND	AGND (0V)	Analog ground

Note1) You can change the output variables to be monitored with analog monitor output by parameter setting.

For more information, refer to 「12.5 Analog Monitor.」

3.5.3 Pulse string input signalnames and functions

■ Pulse string input signal (I/O connector)

Pin No.	Name	Content	Details Function
30	PULCOM	+24[V] power Input	Enter the command pulse string. Input forward pulse string between PF+ and PF-, and input reverse pulse string between PR+ and PR-. It operates when Pulse Input Position is selected in [0x3000], and the position input pulse logic setting can be changed in [0x3003] and the pulse input pulse setting in [0x3004]. The maximum input frequency is 1Mpps for the line drive method, and the maximum input frequency is 200kpps for the open collector method. In case of line drive method, PULCOM is not used
31	PF+		
32	PF-		
33	PR+		
34	PR-		

3.5.4 Names and Functions of Encoder Output Signals

■ Encoder Output Signal (I/O connector)

Pin No.	Name	Content	Details Function
1	AO	Encoder signal A	Outputs the A, B, and Z phases of the encoder signals that have been divided and processed in the form of a line drive. The number of output pulses can be set in [0x3006].
2	/AO		
3	BO	Encoder signal B	
4	/BO		
5	ZO	Encoder signal Z	
6	/ZO		

Note1) When using open collector output, set the value of encoder output mode [0x3007] to 1 and wire to digital output signals DO06(A0), DO07(B0), DO08(Z0).

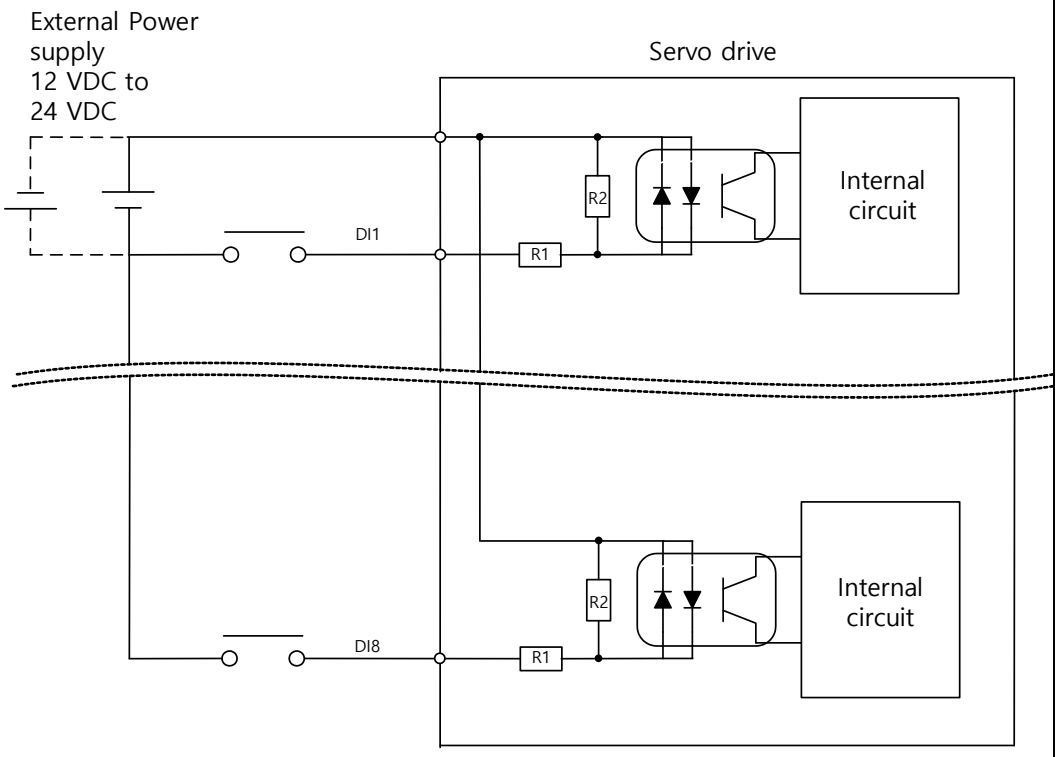
Note2) When using open collector output, overlapping assignment of digital output signals is not allowed.

3.5.5 Examples of Connecting Input/Output Signals

■ Examples of Connecting Digital Input Signals

⚠Caution

1. The input contact can be set to the contact A or the contact B, based on the characteristics of individual signal.
2. Each input contact can be assigned to 38 functions.
3. For more information on signal assignment and contact change of the input contact, refer to 11.2 Input/Output Signals Setting.
4. The rated voltage is DC 12 V to DC 24 V.

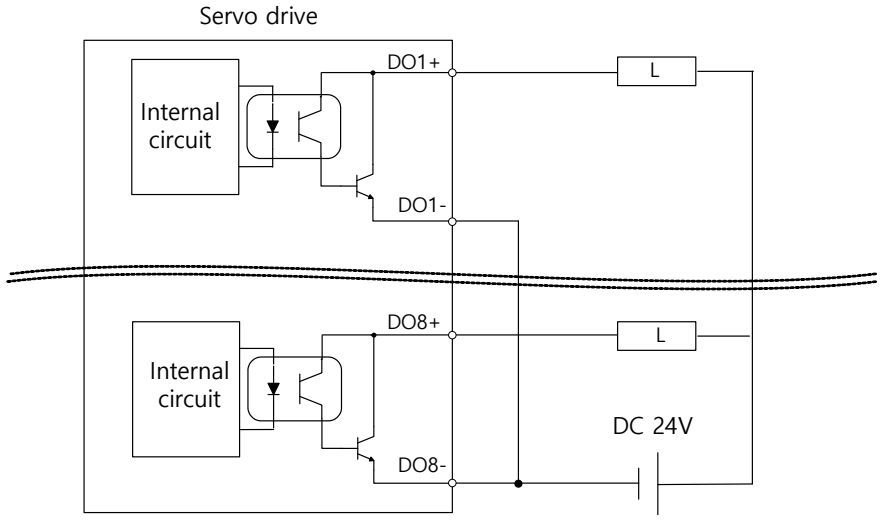


R1: 3.3KΩ, R2 : 680Ω

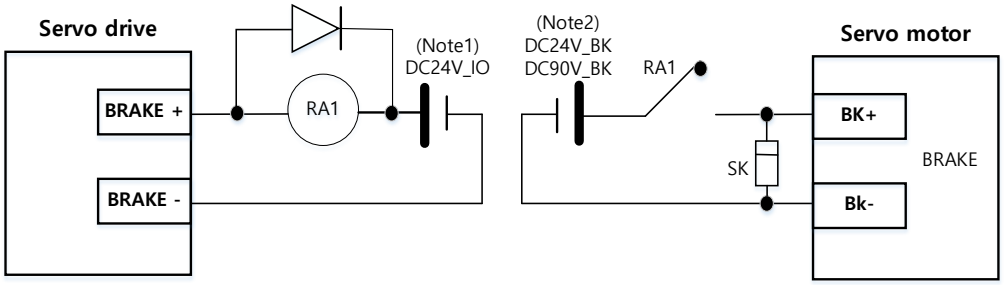
■ Example of wiringDigital Output Signals

⚠Caution

1. The output contact can be set to the contact A or the contact B, based on the characteristics of individual signal.
2. Each output contact can be assigned to 19 output functions.
3. For more information on signal assignment and contact change of the output contact, refer to 11.2 Input/Output Signals Setting.
4. Overvoltage or overcurrent may damage the device because it uses an internal transistor switch.
5. The rated voltage and current are DC 24 V ± 10% and 120 [㎃].



6. When using an electronic brake, refer to the wiring diagram below for configuration.



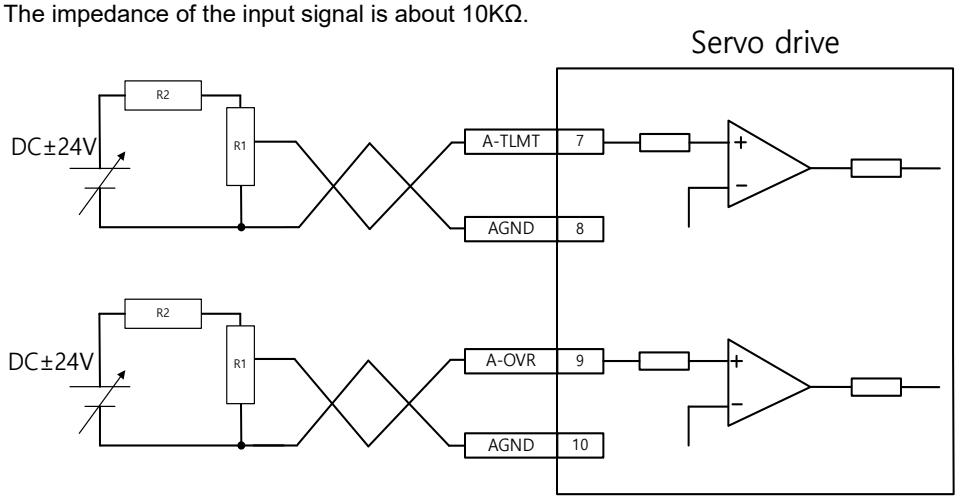
Note1) Configure the control power supply separately from the electronic brake power supply.
Note2) Configure it using the voltage that meets the specifications of the electronic brake.
(Refer to 1.2 Product specifications)

Note1) For DO1~ DO8 output signals, the GND24 terminal is separated.

■ Examples of wiring analog input signals

⚠Caution

1. Please refer to 「5.4 Analog Speed Override」 and 「11.8 Torque Limit Function」 for the operation method of analog input signal.
2. The range of analog input signals is -10V to 10V.
3. The impedance of the input signal is about 10KΩ.



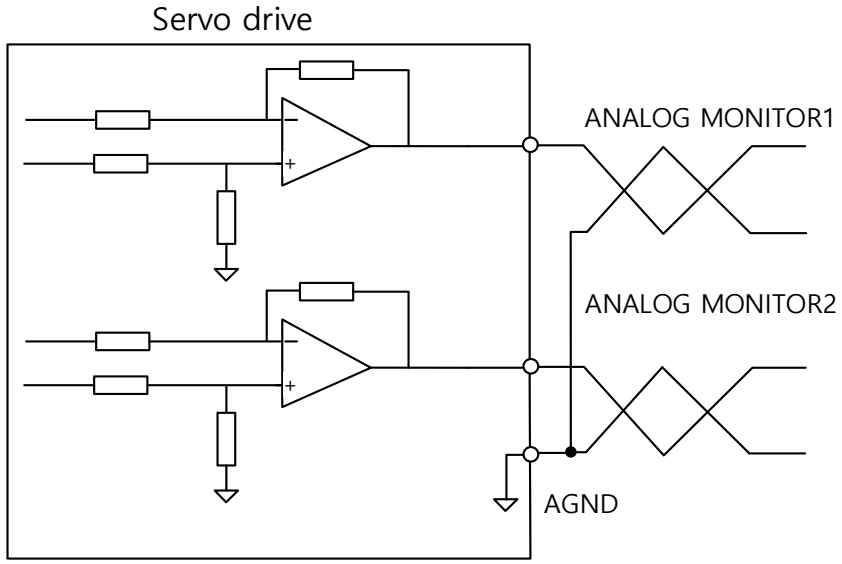
4. Example of resistance selection when using 24V input voltage

No	R1	R2
1	5KΩ	6KΩ
2	10KΩ	12KΩ

■ Example of wiring ofAnalogOutput Signals

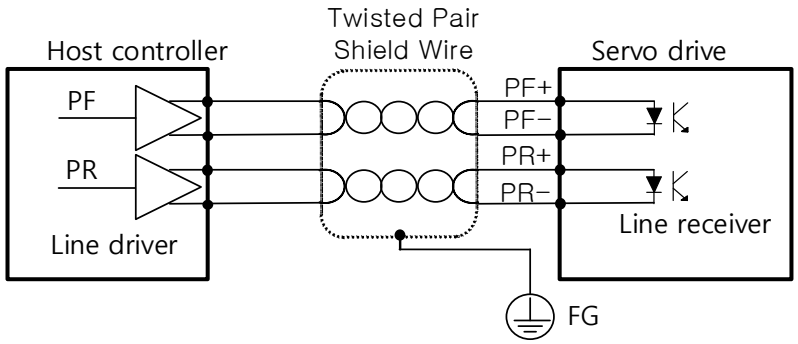
⚠Caution

1. For monitoring signal setting and scale adjustment, refer to 「12.5 Analog Monitor」.
2. The range of analog output signals is -10V to 10V.
3. The resolution of analog output signal is 12 bits.
4. The maximum load current allowed is 2.5 [mA].
5. The stabilization time is 15 [us].

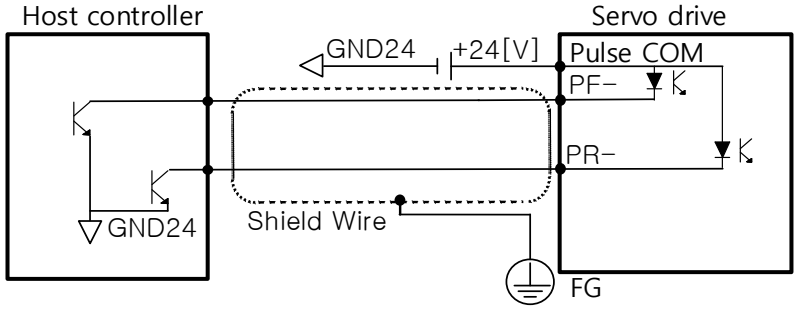


3.5.6 Pulse string input signal

■ Line drive(5[V]) Pulse input

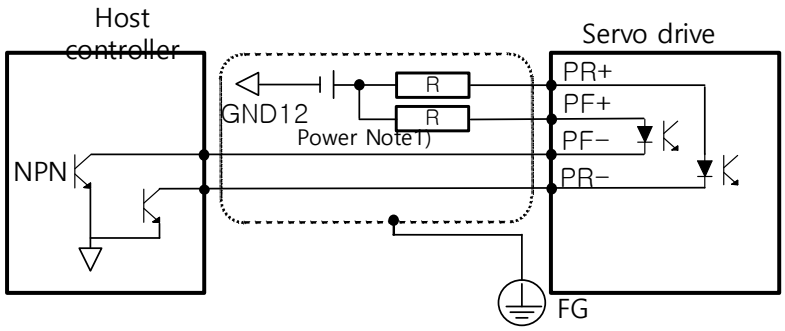


■ Open collector (24[V]) Pulse input



PF+ and PF- are not used.

■ 12[V] or 5[V] NPN open collector pulse command

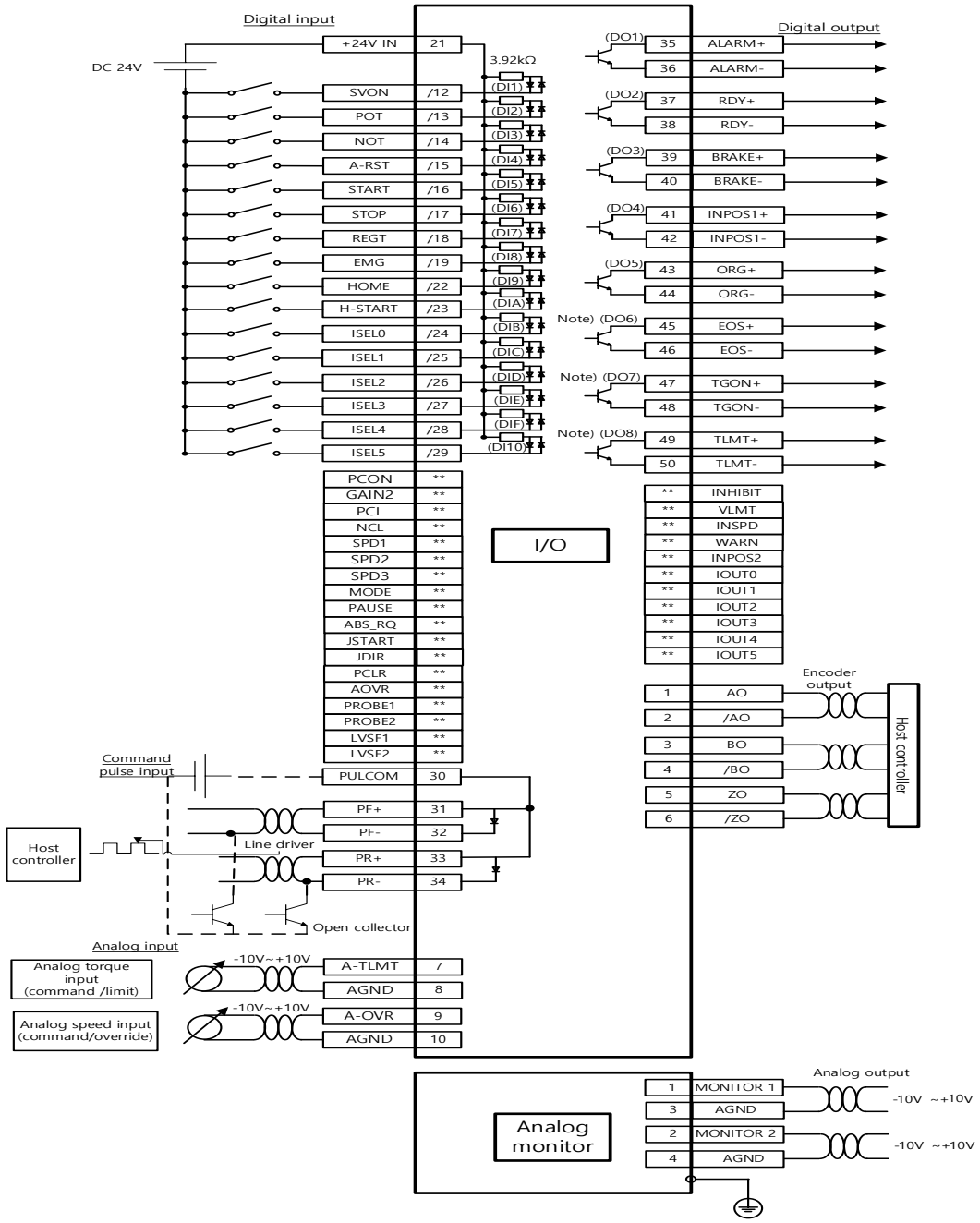


Note1) When using power supply 5[V]: R=100~150[Ω], 1/2[W]

When using power supply 12[V] : R=560~680[Ω], 1/2[W]

When using power supply 24[V] R=1.5[kΩ], 1/2[W]

3.5.7 Connection diagram of I/O Signal

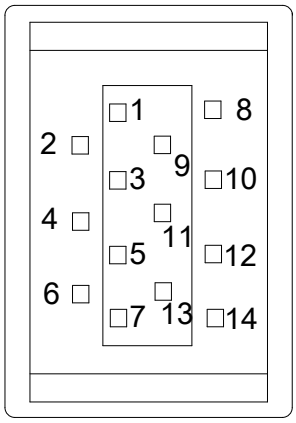


Note1) The input signals DI1 - DI10 and output signals DO1 - DO8 are the factory default signals.

Note 2) DO06, DO07, and DO08, which are digital output signals, cannot be duplicated when the encoder output mode [0x3007] is set as line drive + open collector. Also, since the output current is weak when used as an open collector, there is a possibility of non-operation if a mechanical relay is applied. Please use a digital switch. Please be careful.

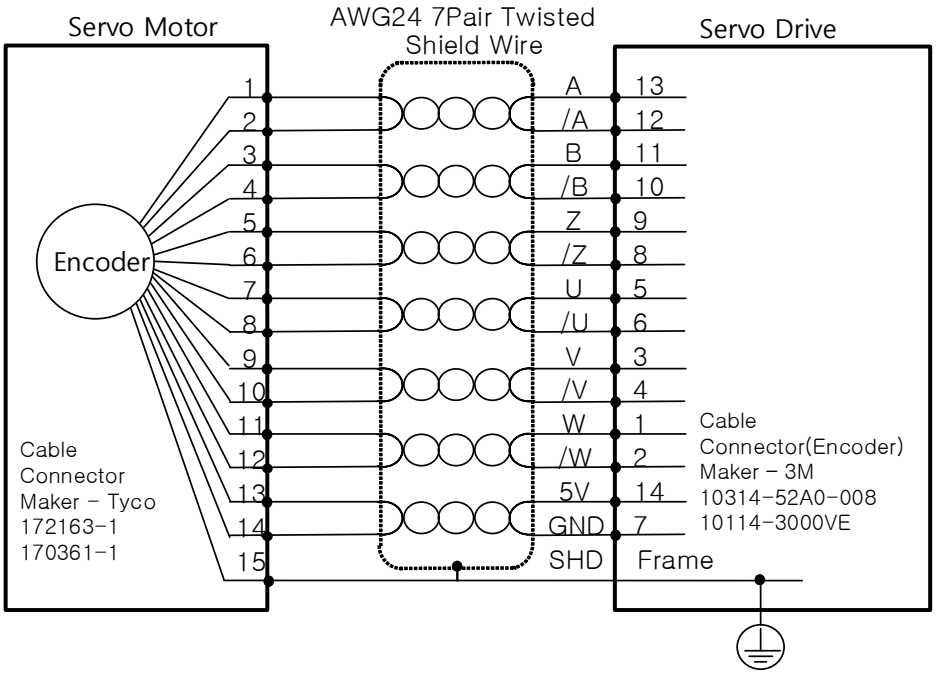
3.6 Encoder signal (ENCODER connector) wiring

■ **ENCODER Connector Specification: 10114-3000VE (3M)**

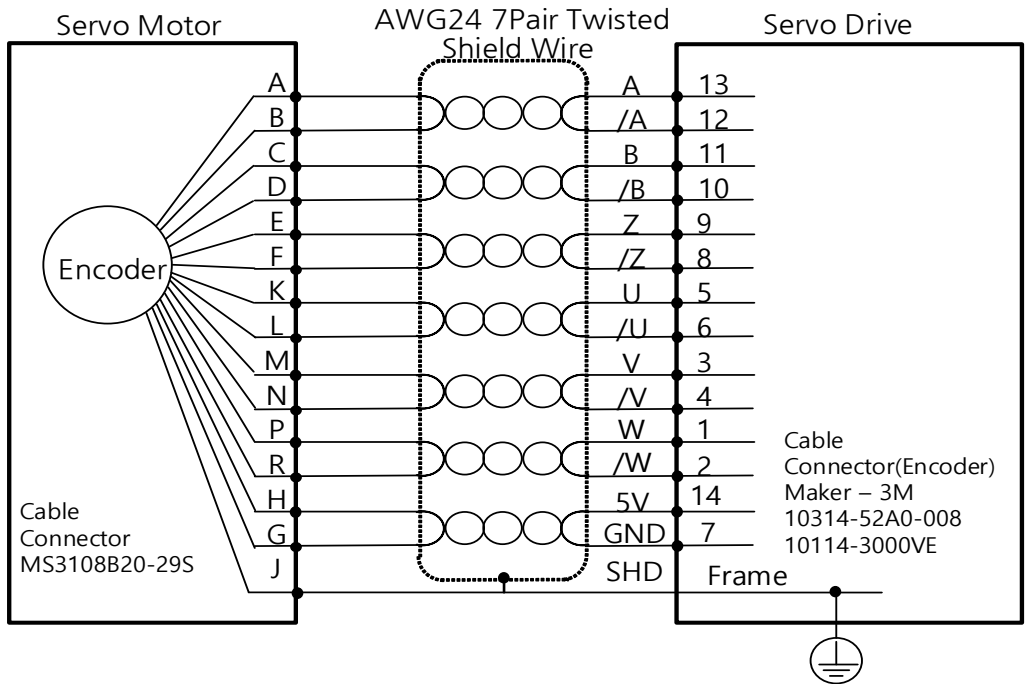


3.6.1 Option cable connection example

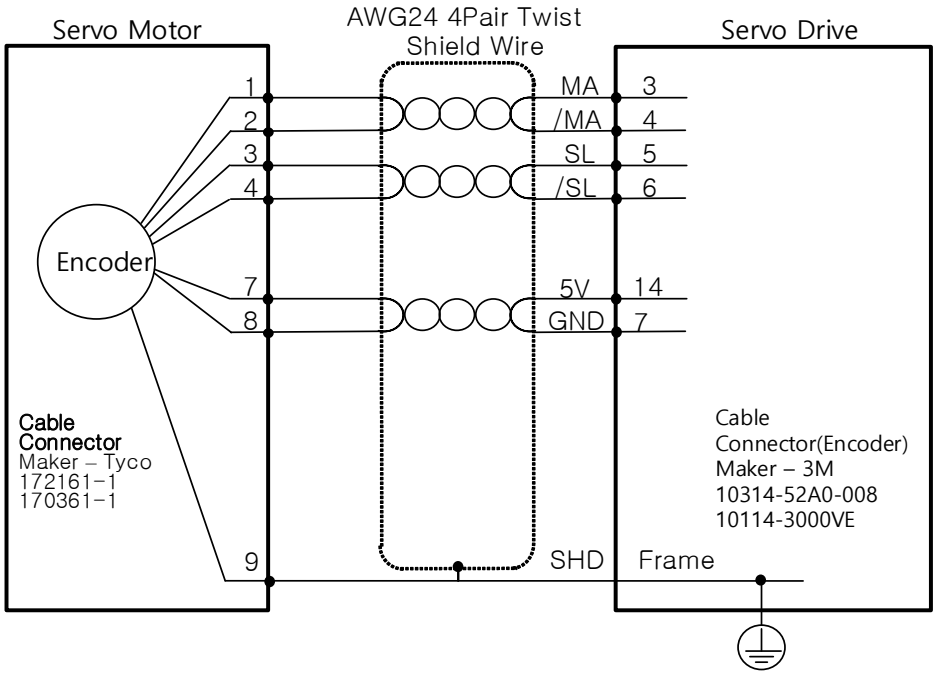
■ **APCS-E□□□AS cable (Quadrature Type)**



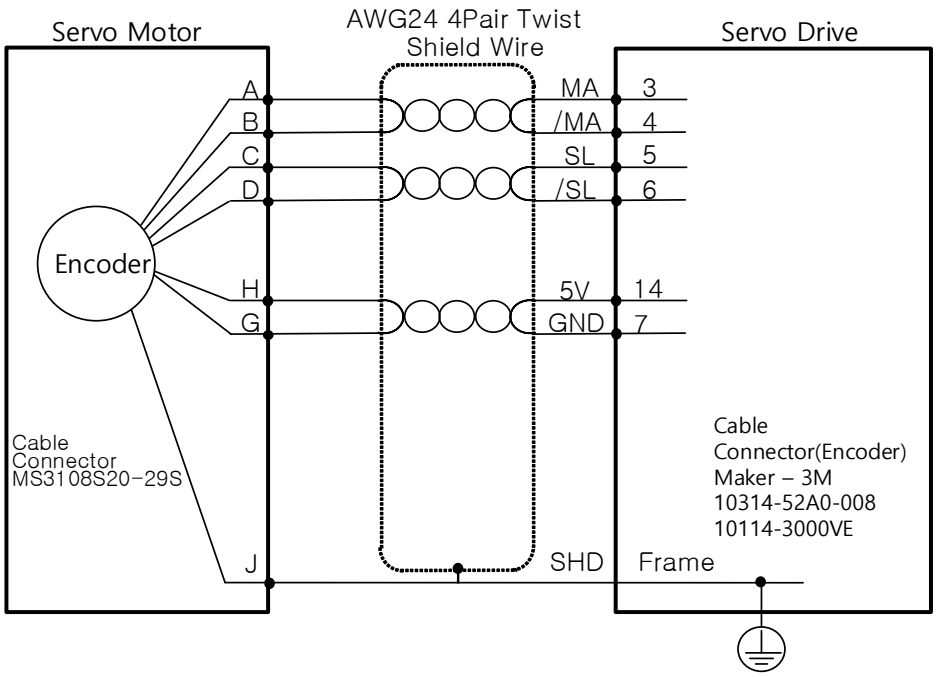
■ APCS-E□□□BS cable (Quadrature Type)



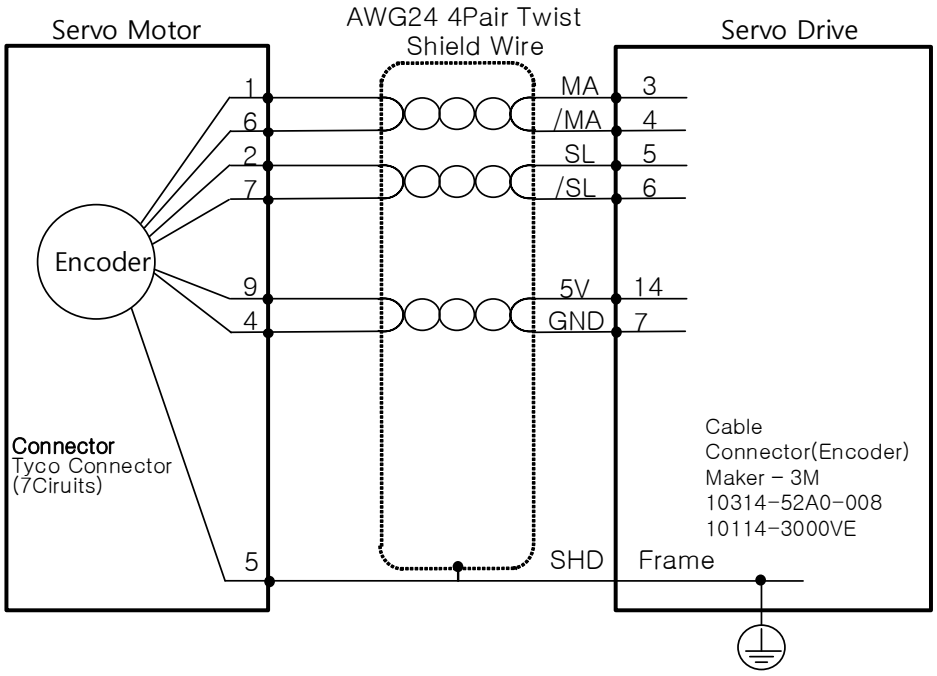
■ APCS-E□□□CS cable (Serial-singleturn Type)



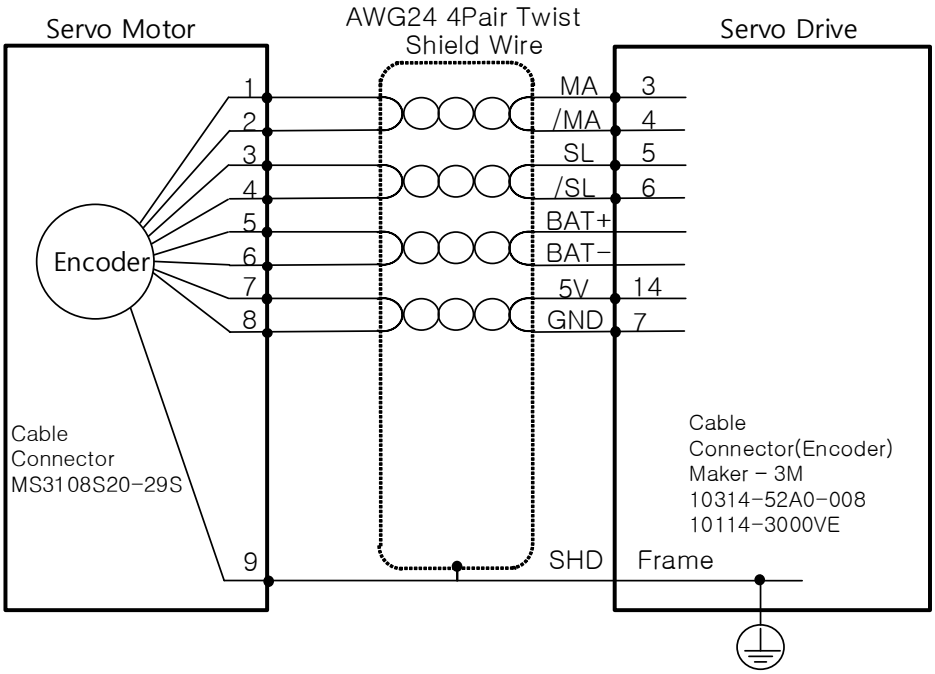
■ APCS-E□□□DS cable (Serial-singleturn Type)



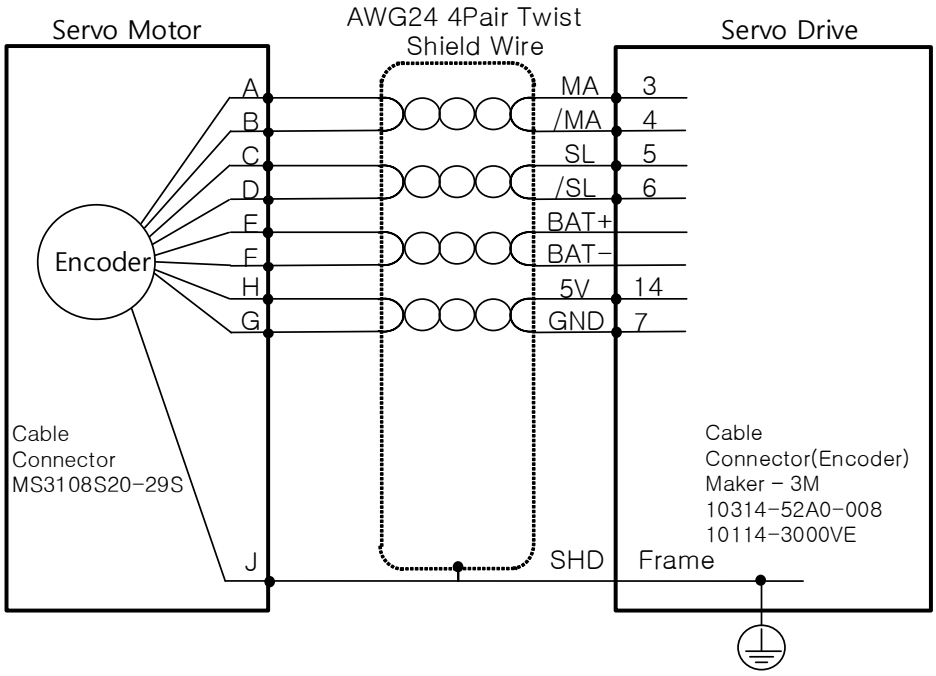
■ APCS-E□□□ES cable (Serial-singleturn Type)



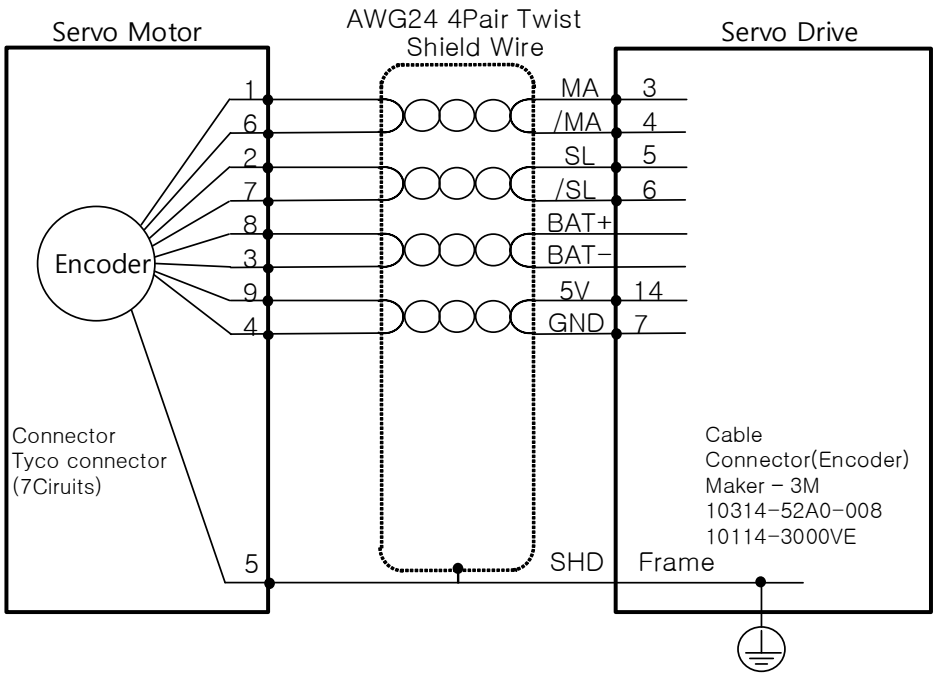
■ APCS-E□□□CS1 cable(Serial-Multiturn Type)



■ APCS-E□□□DS1 cable(Serial-Multiturn Type)

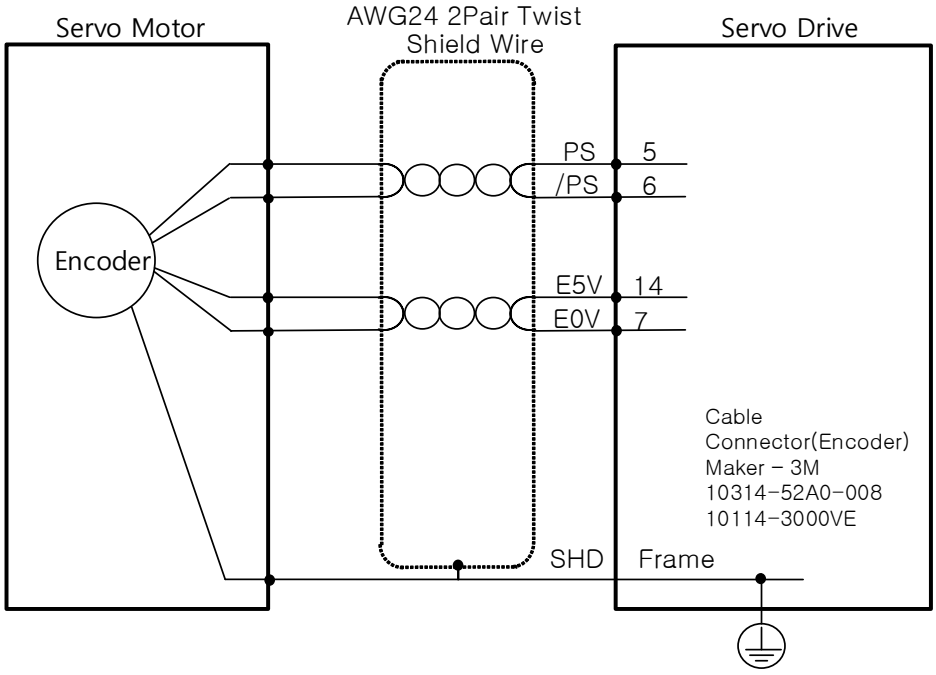


■ APCS-E□□□ES1 cable(Serial-Multiturn Type)

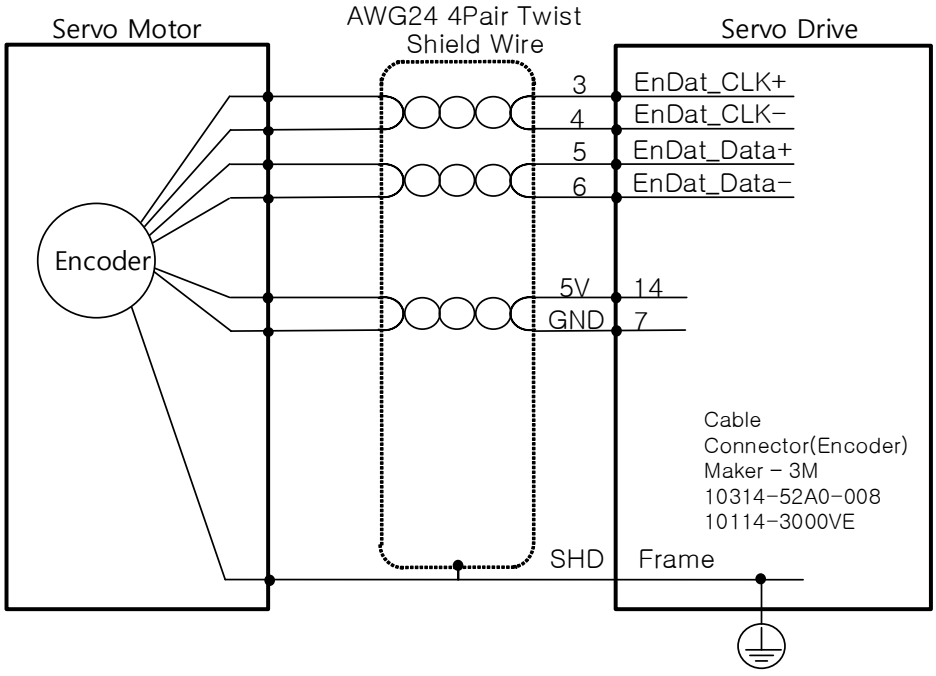


3.6.2 Linear scale and third party encoder connection example

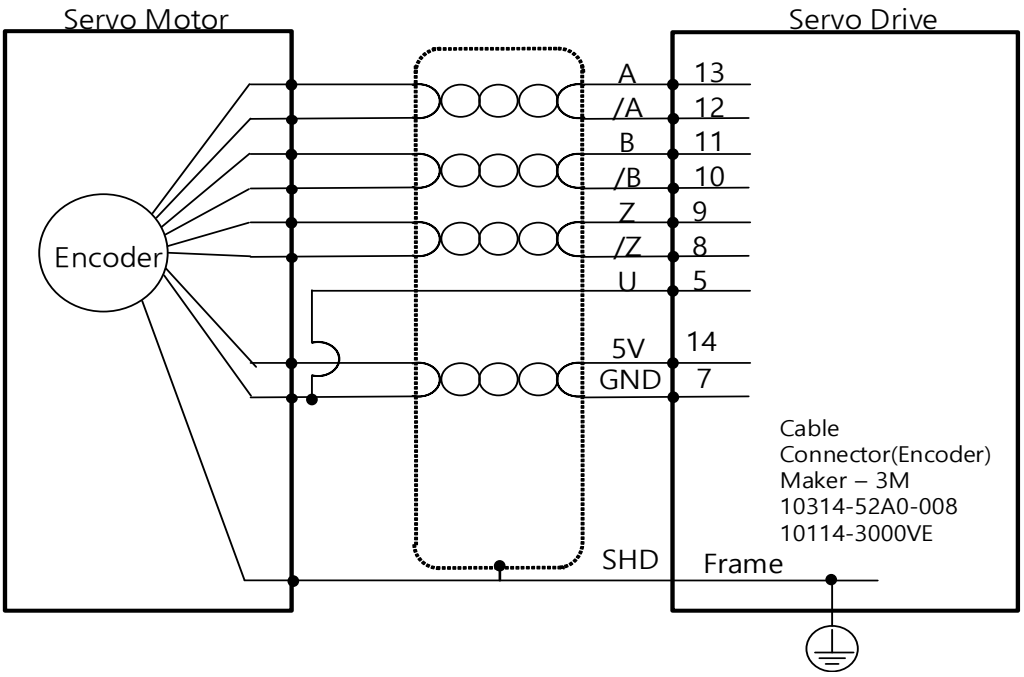
■ **Connection diagram when applying Tamagawa Encoder (17bit incremental)**



■ **Connection diagram when applying EnDat 2.2 Encoder**



■ In case there is no Quadrature Type Hall sensor



4. L7P Indexer overview

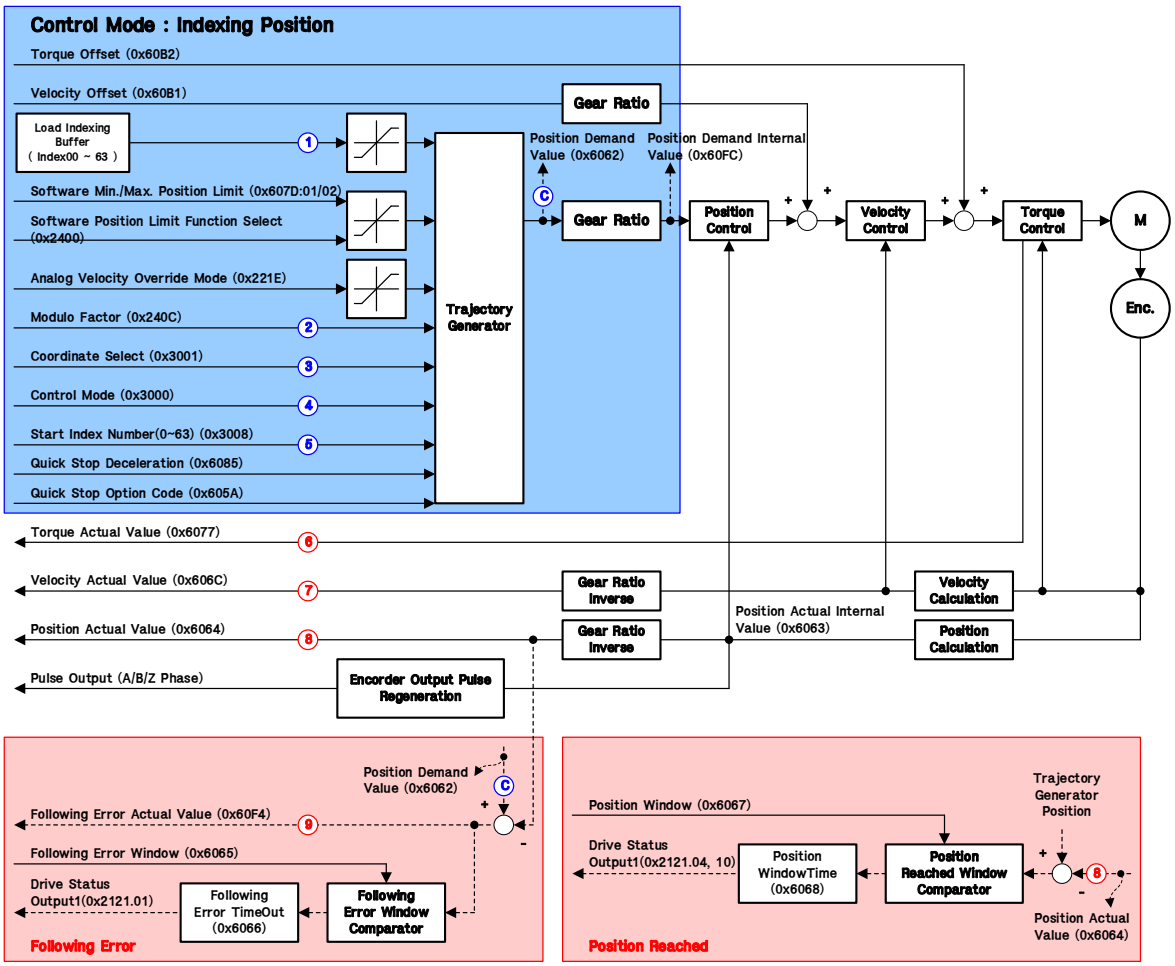
4.1 Control method

The L7P drive supports the Indexing Position method, which generates and controls position commands internally for positioning, and the Pulse Input Position method, which controls by receiving pulse string from the outside. Speed operation that controls speed with external analog voltage and internal parameters. , It supports torque operation that controls torque with an external analog voltage.

4.2 Indexing Position operation

Indexing Position mode is a position control mode that drives to the target position by creating a position profile inside the drive without an external upper controller. To use the index function, set the control mode (0x3000) to ‘index mode’ 0.

The block diagram of Indexing Position mode is shown below.

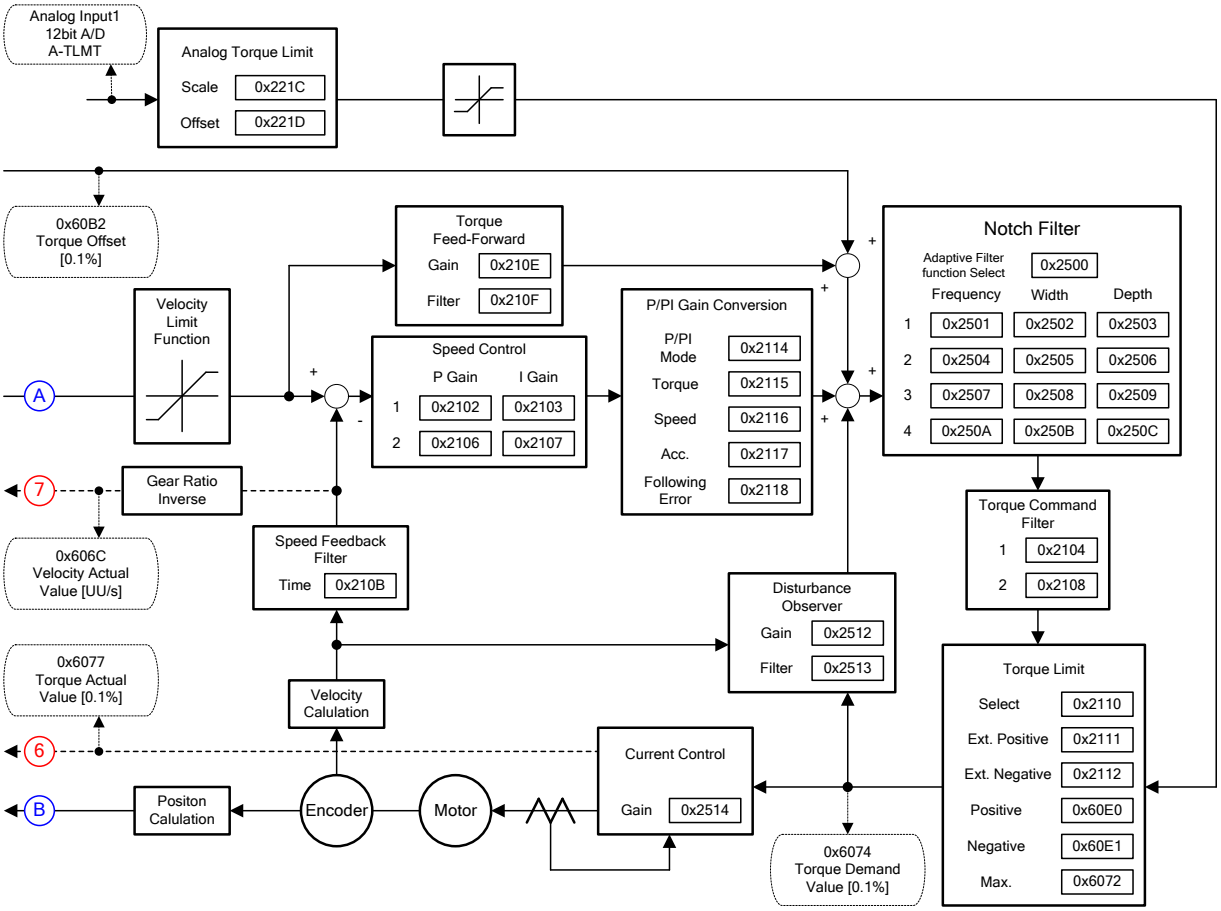


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2121	-	Drive Status Output 1	UINT	RO	Yes	-
0x2122	-	Drive Status Output 2	UINT	RO	Yes	-
0x6062	-	Position Demand Value	DINT	RO	Yes	UU
0x60FC	-	Position Demand Internal Value	DINT	RO	Yes	pulse
0x6063	-	Position Actual Internal Value	DINT	RO	Yes	pulse
0x6064	-	Position Actual Value	DINT	RO	Yes	UU
0x607D	-	Software Position Limit	-	-	-	-
	0	Number of entries	USINT	RO	No	-
	1	Min position limit	DINT	RW	No	UU
	2	Max position limit	DINT	RW	No	UU
0x6085	-	Quick Stop Deceleration	UDINT	RW	No	UU/s^2
0x605A	-	Quick Stop Option Code	INT	RW	No	-
0x60B1	-	Velocity Offset	DINT	RW	Yes	UU/s
0x60B2	-	Torque Offset	INT	RW	Yes	0.1%
0x606C	-	Velocity Actual Value	DINT	RO	Yes	UU/s
0x6077	-	Torque Actual Value	INT	RO	Yes	0.1%
0x6065	-	Following Error Window	UDINT	RW	No	UU
0x6066	-	Following Error Timeout	UINT	RW	No	ms
0x6067	-	Position Window	UDINT	RW	No	UU
0x6068	-	Position Window Time	UINT	RW	No	ms
0x6091	-	Gear Ratio	-	-	-	-
	0	Number of entries	USINT	RO	No	-
	1	Motor Revolutions	UDINT	RW	No	-
	2	Shaft Revolutions	UDINT	RW	No	-
0x240C	-	Modulo Factor	DINT	RW	No	UU
0x3000	-	Control mode	UINT	RW	No	-
0x3001	-	Coordinate Select	UINT	RW	No	-
0x3002	-	Coordinate Select	UINT	RW	No	-

0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	
0x3008	-	Start Index Number(0~63)	UINT	RW	No	-
0x3009	-	Index buffer mode	UINT	RW	No	-
0x300A	-	IOUT Configuration	UINT	RW	No	-
0x3100	-	Index 00	-	-	-	-
	0	Number of entries	USINT	RO	No	-
	1	Index type	UINT	RW	No	-
	2	Distance	DINT	RW	No	UU
	3	Velocity	DINT	RW	No	UU/s
	4	Acceleration	DINT	RW	No	UU/s^2
	5	Deceleration	DINT	RW	No	UU/s^2
	6	Registration Distance	DINT	RW	No	UU
	7	Registration Velocity	DINT	RW	No	UU/s
	8	Repeat Count	UINT	RW	No	-
	9	Dwell Time	UINT	RW	No	ms
	10	Next Index	UINT	RW	No	-
	11	Action	UINT	RW	No	-
~		~	-	-	-	-
0x313F	-	Index 63	-	-	-	-
-	-	-	-	-	-	-
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	Yes	0.1%/V
0x221D	-	Analog Torque Input(command/limit) Offset	INT	RW	Yes	mV
0x221E	-	Analog Velocity Override Mode	UINT	RW	Yes	-
0x221F	-	Analog Velocity Input(command/Override) Offset	INT	RW	Yes	mV

■ Internal block diagram of Indexing Position mode

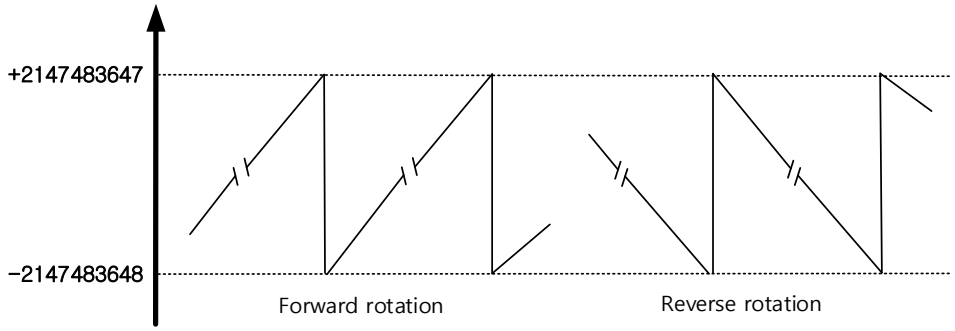


4.2.1 Coordinate system setting

In the case of indexing mode, the following two coordinate system methods can be used.

■ Linear coordinate system

A linear coordinate system displays position values in the range of –2147483648 to +2147483647. If the value exceeds +2147483647 while rotating in the forward direction, the smallest value, -2147483648, is displayed. If the value exceeds -2147483648 while rotating in the reverse direction, the largest value, +2147483647, is displayed.



When controlling the following 6 types of PTP positions, the control mode (0x3000) must be set to the linear coordinate system.

- Absolute Move

  In absolute value movement, the final movement distance is operated as much as the difference between the target movement distances (Distance) from the current position.

- Relative Move

  When moving the relative value, the final movement distance is operated as much as the value of the target movement distance (Distance).

- Registration Absolute Move

  While driving to the target position, it is changed to the registration speed and distance by the REGT signal input from the outside, and continues to operate to the new target position (absolute value) continuously during the operation of the existing target position.

- Registration Relative Move

  While driving to the target position, it is changed to the registration speed and distance by the REGT signal input from the outside, and continues to operate to the new target position (relative value) continuously during the operation of the existing target position.

- Blending Absolute Move

  After receiving a new position command while driving to the target position, it subsequently drives to the new target position after driving to the existing target position(absolute value).

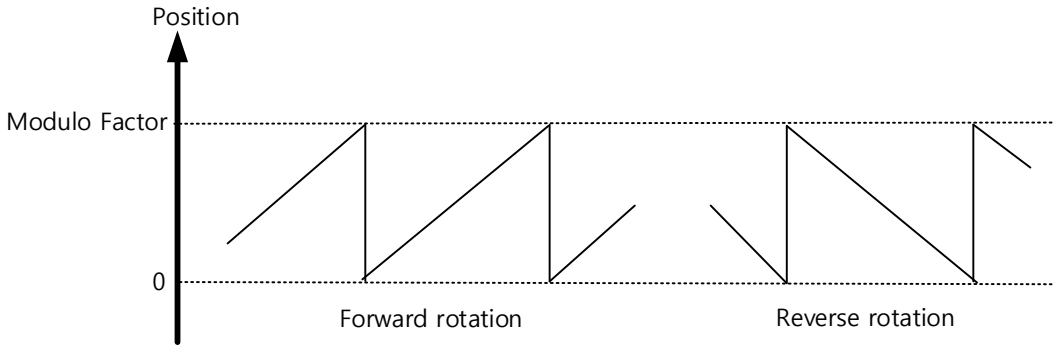
- Blending Relative Move

  After receiving a new position command while driving to the target position, it subsequently drives to the new target position after driving to the existing target position(relative value).

■ Rotation coordinate system

A rotating coordinate system only displays position values as positive values. The displayed range depends on the setting value of Modulo Factor and is displayed in the range of 0 to (Modulo Factor-1).

If the value of (Modulo Factor-1) is exceeded while rotating in the forward direction, the smallest value, 0, is displayed. Conversely, if it rotates in the reverse direction and exceeds the value of 0, it is displayed as the largest value (Modulo Factor-1).



When controlling the following 5 types of PTP positions, the control mode (0x3000) must be set to the rotation coordinate system. At this time, the setting of the Modulo Factor must be correct.

- Rotary Absolute Move

  The operation direction is determined according to the relationship between the current position and the distance value, and position operation is performed. It doesn't necessarily travel short distances. Depending on the distance value, rotation is possible only within one turn (the value set in Modulo Factor).

- Rotary Relative Move

  If the distance value is (+), the position operation is in the positive direction, and if (-), the position operation is in the negative direction. Depending on the distance value, it can rotate more than one turn (the value set in Modulo Factor).

- Rotary Shortest Move

  Based on the current position, the driving direction is determined according to a short distance, and position driving is performed. Depending on the distance value, rotation is possible only within one turn (the value set in Modulo Factor). Distance values are treated as absolute values.

- Rotary Positive Move

  It always performs position operation in the (+) direction. Depending on the distance value, rotation is possible only within one turn (the value set in Modulo Factor). Distance values are treated as absolute values.

- Rotary Negative Move

  It always performs position operation in the (-) direction. Depending on the distance value, rotation is possible only within one turn (the value set in Modulo Factor). Distance values are treated as absolute values.

4.2.2 Index structure

The structure of the index is as follows.

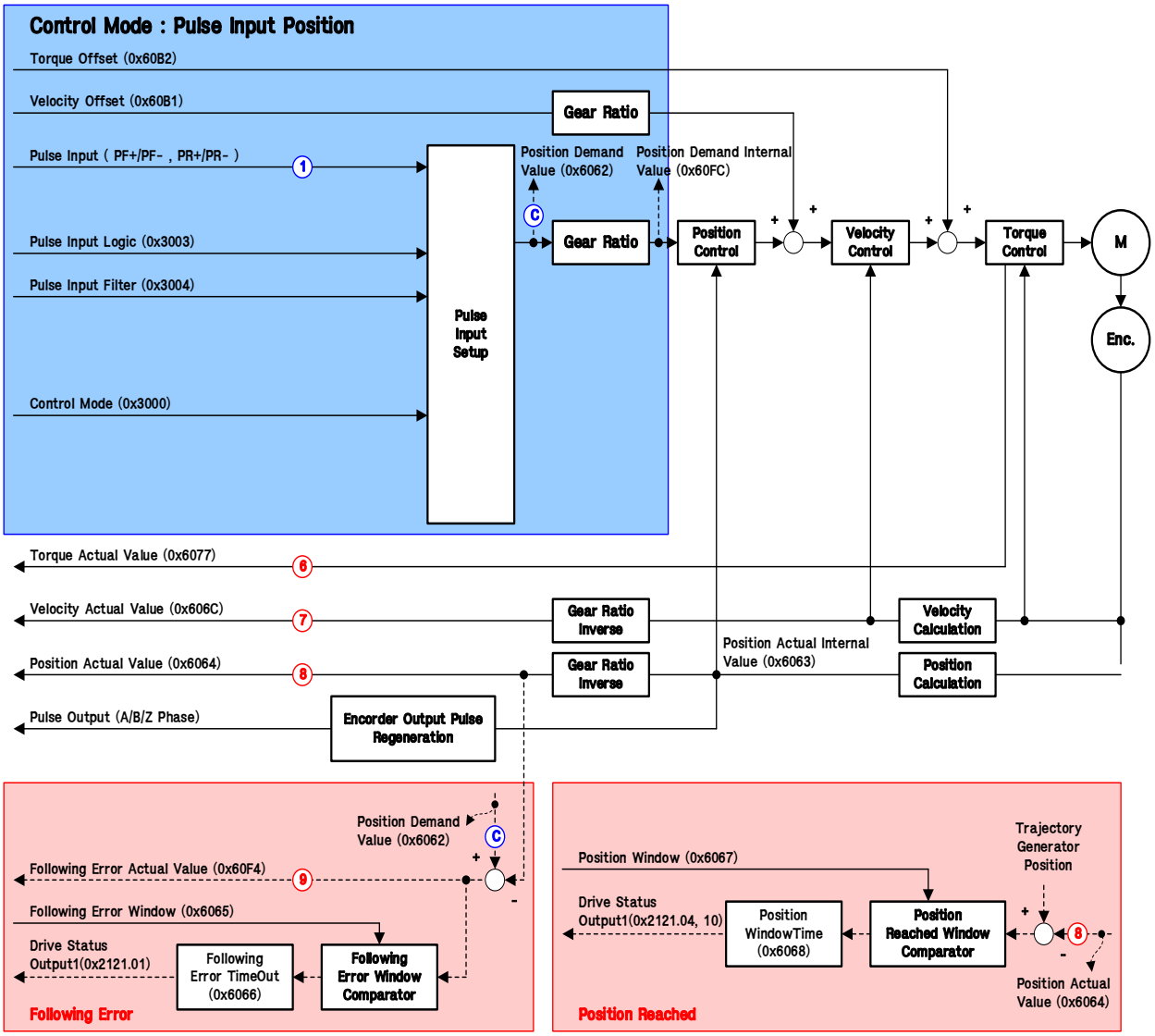
Item		Details
Index Type	Linear Coordinate	0 : Absolute Move
		1 : Relative Move
		2 : Registration Absolute Move
		3 : Registration Relative Move
		4 : Blending Absolute Move
		5 : Blending Relative Move
	Rotary Coordinate	6 : Rotary Absolute Move
		7 : Rotary Relative Move
		8 : Rotary Shortest Move
		9 : Rotary Positive Move
		10 : Rotary Negative Move
Distance		-2147483648 ~ +2147483647(Unit: UU*)
Velocity		1 ~ 2147483647(Unit: UU/s)
Acceleration		1 ~ 2147483647(Unit: UU/s^2)
Deceleration		1 ~ 2147483647(Unit: UU/s^2)
Registration Distance		-2147483648 ~ 2147483647(Unit: UU)
Registration Velocity		1 ~ 2147483647(Unit: UU/s)
Repeat Count		1 ~ 65535
Dwell Time		0 ~ 65535(Unit: ms)
Next Index		0 ~ 63
Action		0 : Stop 1 : Wait for Start 2 : Next Index

*UU: User Unit

4.3 Pulse Input Position Operation

The L7P servo drive provides a mode for positioning using pulse train input from an external controller. To use the pulse input type position control mode, the control mode (0x3000) must be set to 1, 'pulse input type position control mode'.

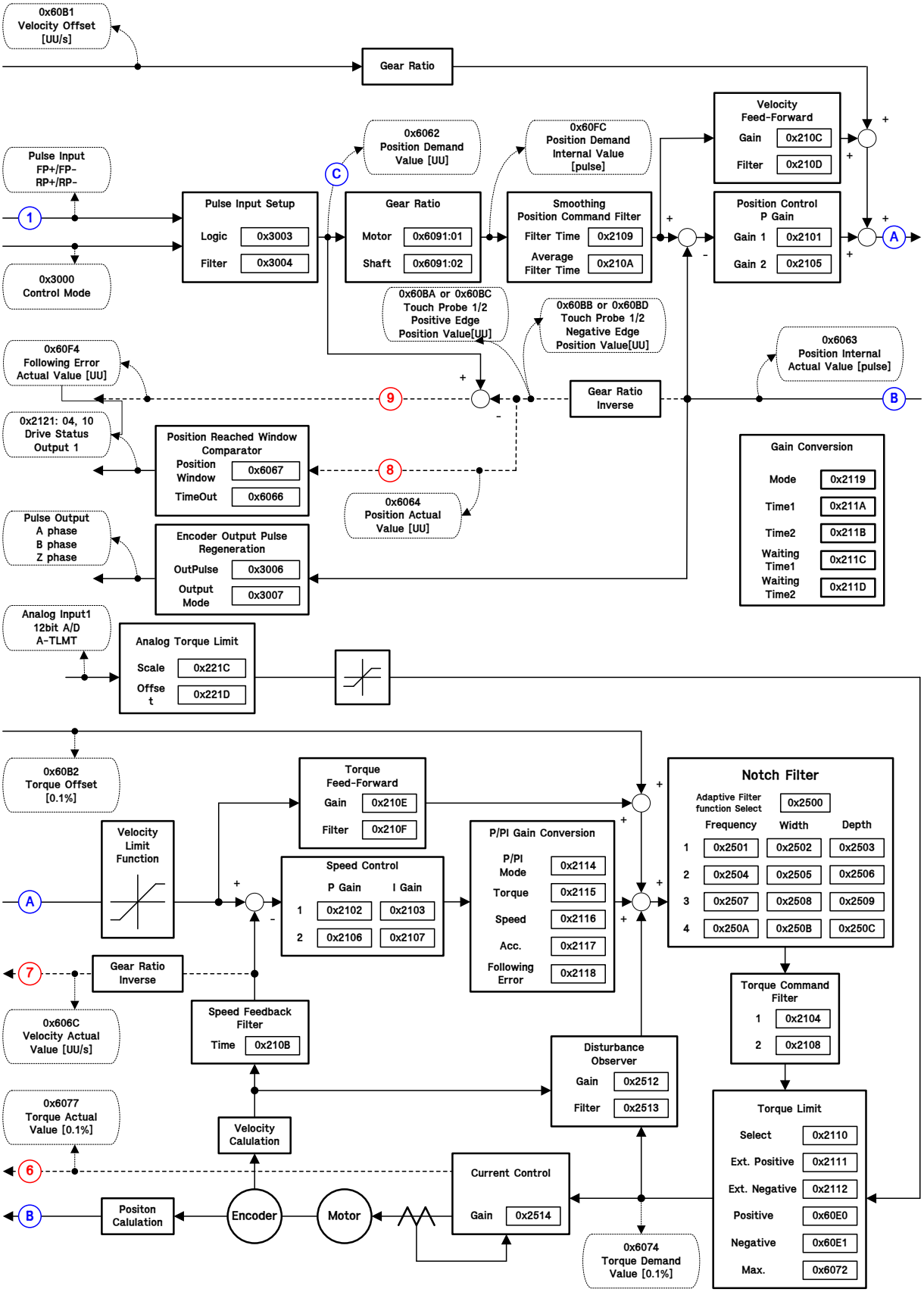
The block diagram of Pulse input position mode is shown below.



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2121	-	Drive Status Output 1	UINT	RO	Yes	-
0x2122	-	Drive Status Output 2	UINT	RO	Yes	-
0x6062	-	Position Demand Value	DINT	RO	Yes	UU
0x60FC	-	Position Demand Internal Value	DINT	RO	Yes	pulse
0x6063	-	Position Actual Internal Value	DINT	RO	Yes	pulse
0x6064	-	Position Actual Value	DINT	RO	Yes	UU
0x60B1	-	Velocity Offset	DINT	RW	Yes	UU/s
0x60B2	-	Torque Offset	INT	RW	Yes	0.1%
0x606C	-	Velocity Actual Value	DINT	RO	Yes	UU/s
0x6077	-	Torque Actual Value	INT	RO	Yes	0.1%
0x6065	-	Following Error Window	UDINT	RW	No	UU
0x6066	-	Following Error Timeout	UINT	RW	No	ms
0x6067	-	Position Window	UDINT	RW	No	UU
0x6068	-	Position Window Time	UINT	RW	No	ms
0x6091	-	Gear Ratio	-	-	-	-
	0	Number of entries	USINT	RO	No	-
	1	Motor Revolutions	UDINT	RW	No	-
	2	Shaft Revolutions	UDINT	RW	No	-
0x240C	-	Modulo Factor	DINT	RW	No	UU
0x3000	-	Control mode	UINT	RW	No	-
0x3001	-	Coordinate Select	UINT	RW	No	-
0x3002	-	Baud Rate Select	UINT	RW	No	-
0x3003	-	Pulse Input Logic Select	UINT	RW	No	-
0x3004	-	Pulse Input Filter Select	UINT	RW	No	-
0x3005	-	PCLEAR Mode Select	UINT	RW	No	-
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	Yes	0.1%/V
0x221D	-	Analog Torque Input(command/limit) Offset	INT	RW	Yes	mV

■ Internal block diagram of Pulse Input Position mode

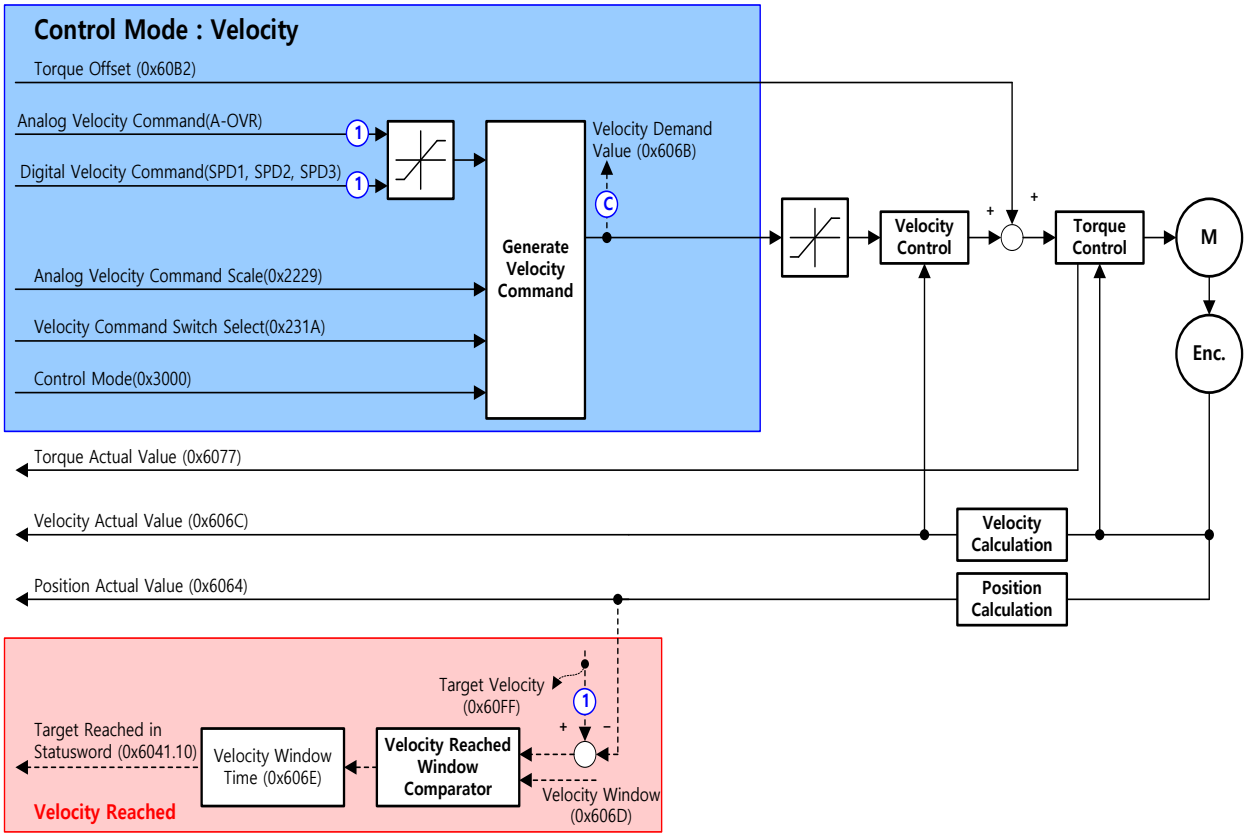


4.4 Speed operation

The speed operation mode is used to control the speed by applying the speed command in the form of digital input to the servo drive using the speed command in the form of analog voltage output from the host controller and the parameter set value inside the servo drive.

Set the control mode [0x3000] to 2 and select the speed command switch selection [0x231A] according to the way you want to command the servo drive.

The block diagram of the speed operation mode is as follows:

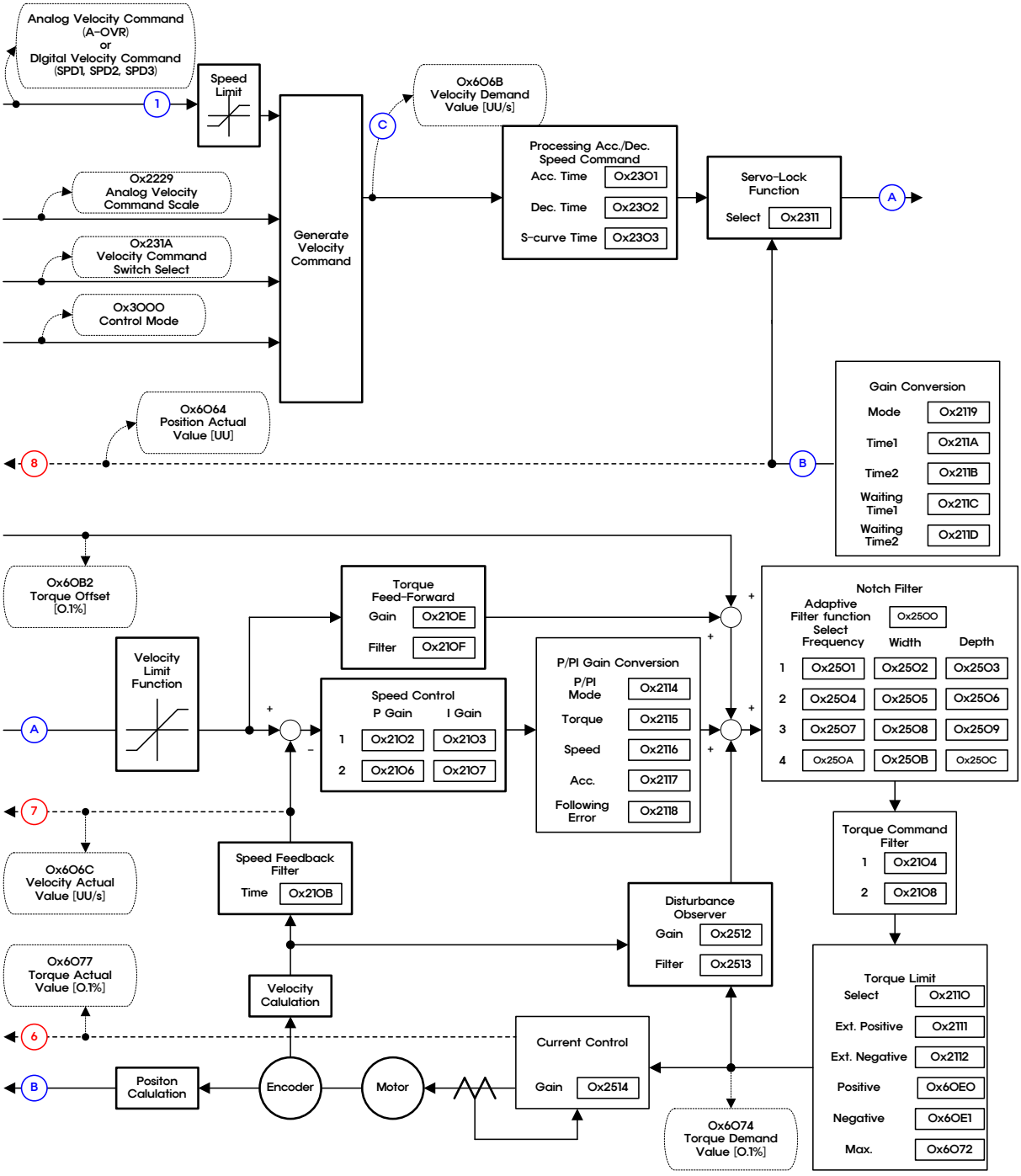


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2121	-	Drive Status Output 1	UINT	RO	Yes	-
0x2122	-	Drive Status Output 2	UINT	RO	Yes	-
0x6062	-	Position Demand Value	DINT	RO	Yes	UU
0x60FC	-	Position Demand Internal Value	DINT	RO	Yes	pulse
0x6063	-	Position Actual Internal Value	DINT	RO	Yes	pulse
0x6064	-	Position Actual Value	DINT	RO	Yes	UU
0x60B1	-	Velocity Offset	DINT	RW	Yes	UU/s
0x60B2	-	Torque Offset	INT	RW	Yes	0.1%
0x606C	-	Velocity Actual Value	DINT	RO	Yes	UU/s
0x6077	-	Torque Actual Value	INT	RO	Yes	0.1%
0x6065	-	Following Error Window	UDINT	RW	No	UU
0x6066	-	Following Error Timeout	UINT	RW	No	ms
0x6067	-	Position Window	UDINT	RW	No	UU
0x6068	-	Position Window Time	UINT	RW	No	ms
0x3000	-	Control mode	UINT	RW	No	-
0x3002	-	Baud Rate Select	UINT	RW	No	-
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	
0x2200	-	Digital Input Signal 1 Selection	UINT	RW	No	-
0x2201	-	Digital Input Signal 2 Selection	UINT	RW	No	-
0x2202	-	Digital Input Signal 3 Selection	UINT	RW	No	-
0x2203	-	Digital Input Signal 4 Selection	UINT	RW	No	-
0x2204	-	Digital Input Signal 5 Selection	UINT	RW	No	-
0x2205	-	Digital Input Signal 6 Selection	UINT	RW	No	-
0x2206	-	Digital Input Signal 7 Selection	UINT	RW	No	-
0x2207	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x2208	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x2209	-	Digital Input Signal 10 Selection	UINT	RW	No	-
0x220A	-	Digital Input Signal 11 Selection	UINT	RW	No	-

0x220B	-	Digital Input Signal 12 Selection	UINT	RW	No	-
0x220C	-	Digital Input Signal 13 Selection	UINT	RW	No	-
0x220D	-	Digital Input Signal 14 Selection	UINT	RW	No	-
0x220E	-	Digital Input Signal 15 Selection	UINT	RW	No	-
0x220F	-	Digital Input Signal 16 Selection	UINT	RW	No	-
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	Yes	0.1%/V
0x221D	-	Analog Torque Input(command/limit) Offset	INT	RW	Yes	mV
0x221F	-	Analog Velocity Input (command/Override) Offset	INT	RW	Yes	mV
0x2227	-	Analog Velocity Command Filter Time Constant	UINT	RW	No	-
0x2229	-	Analog Velocity Command Scale	INT	RW	No	-
0x222A	-	Analog Velocity Command Clamp Level	UINT	RW	No	-
0x2312	-	Multi-Step Operation Speed 1	INT	RW	No	-
0x2313	-	Multi-Step Operation Speed 2	INT	RW	No	-
0x2314	-	Multi-Step Operation Speed 3	INT	RW	No	-
0x2315	-	Multi-Step Operation Speed 4	INT	RW	No	-
0x2316	-	Multi-Step Operation Speed 5	INT	RW	No	-
0x2317	-	Multi-Step Operation Speed 6	INT	RW	No	-
0x2318	-	Multi-Step Operation Speed 7	INT	RW	No	-
0x2319	-	Multi-Step Operation Speed 8	INT	RW	No	-
0x231A	-	Velocity Command Switch Select	UINT	RW	No	-
0x2227	-	Analog Velocity Command Filter Time Constant	UINT	RW	No	-

■ Internal block diagram of speed operation mode



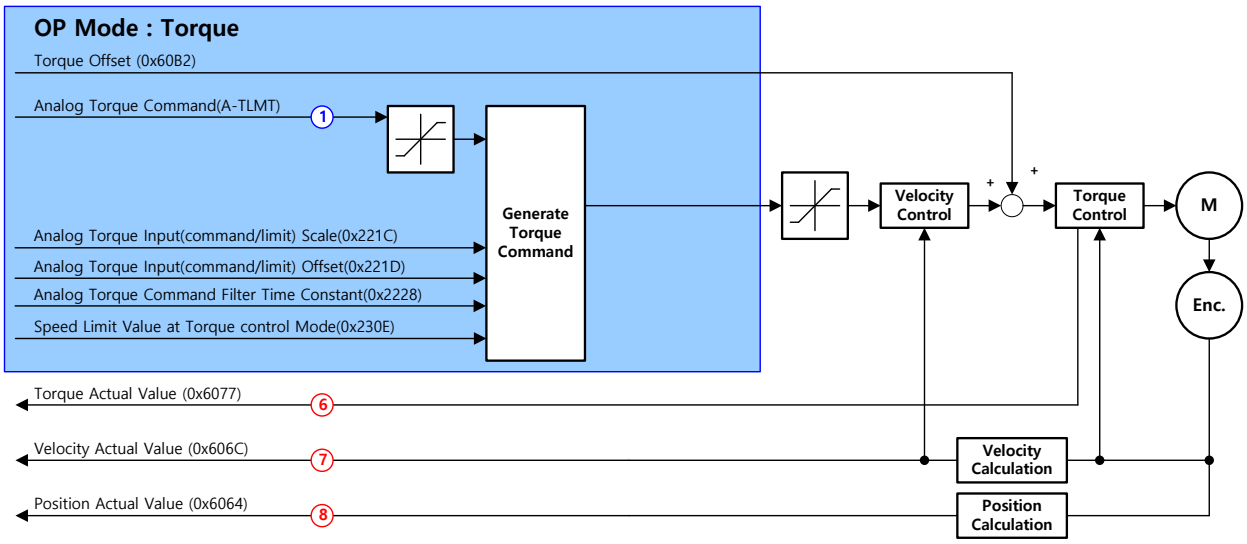
4.5 Torque operation

In the torque operation mode, the servo drive receives the voltage corresponding to the desired torque from the host controller and uses it to control the tension or pressure of the machine mechanism.

Please set the control mode [0x3000] to 3.

To input commands, apply -10[V] to +10[V] voltage to pins 7 and 8 of the I/O connector.

The block diagram of the torque operation mode is as follows:

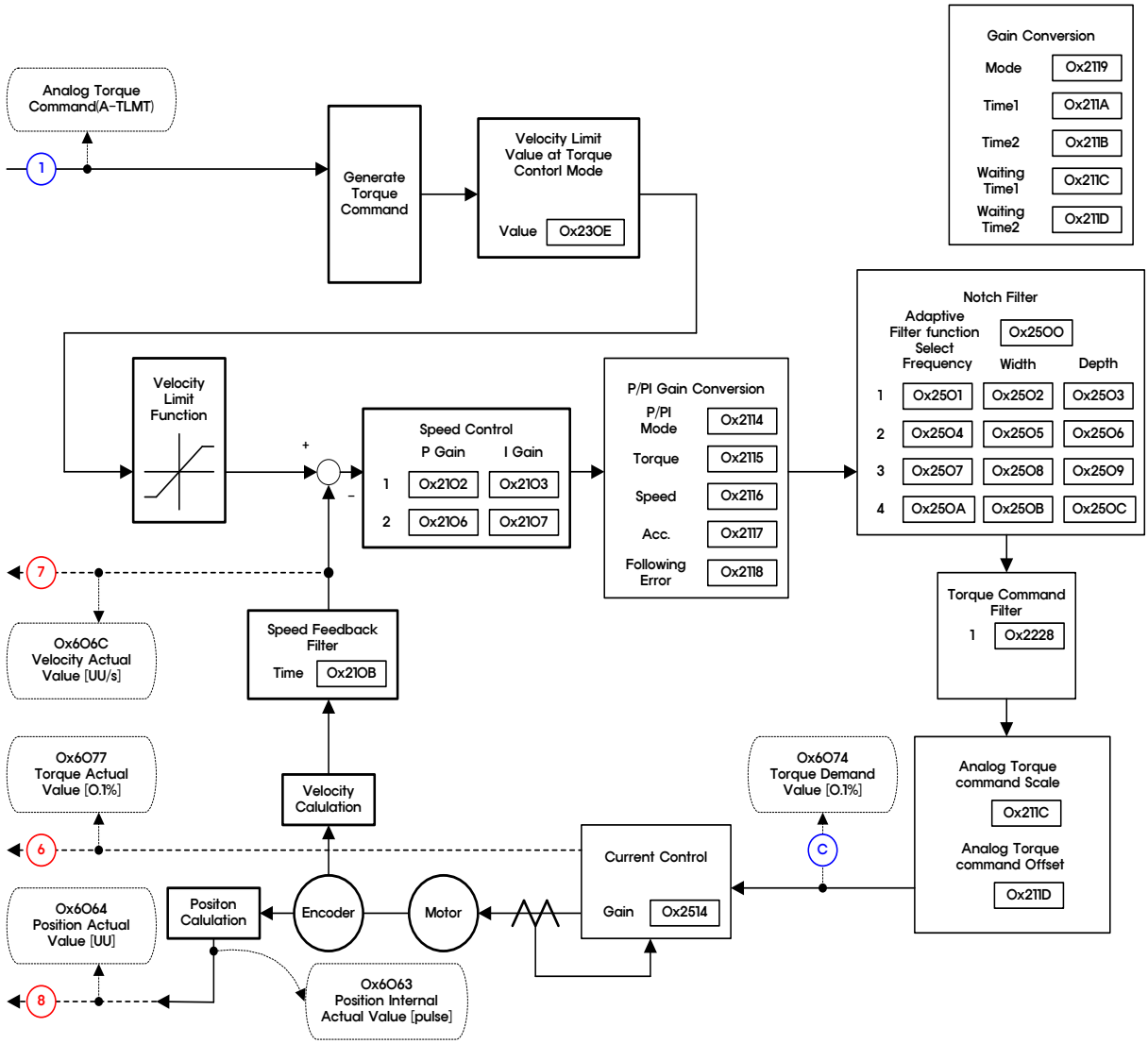


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2121	-	Drive Status Output 1	UINT	RO	Yes	-
0x2122	-	Drive Status Output 2	UINT	RO	Yes	-
0x6062	-	Position Demand Value	DINT	RO	Yes	UU
0x60FC	-	Position Demand Internal Value	DINT	RO	Yes	pulse
0x6063	-	Position Actual Internal Value	DINT	RO	Yes	pulse
0x6064	-	Position Actual Value	DINT	RO	Yes	UU
0x60B1	-	Velocity Offset	DINT	RW	Yes	UU/s
0x60B2	-	Torque Offset	INT	RW	Yes	0.1%
0x606C	-	Velocity Actual Value	DINT	RO	Yes	UU/s
0x6077	-	Torque Actual Value	INT	RO	Yes	0.1%
0x6065	-	Following Error Window	UDINT	RW	No	UU
0x6066	-	Following Error Timeout	UINT	RW	No	ms
0x6067	-	Position Window	UDINT	RW	No	UU

0x6068	-	Position Window Time	UINT	RW	No	ms
0x3000	-	Control Mode	UINT	RW	No	-
0x3002	-	Baud Rate Select	UINT	RW	No	-
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	-
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	No	-
0x221D	-	Analog Torque Input(command/limit) Offset	INT	RW	No	-
0x2228	-	Analog torque Command Filter Time Constant	UINT	RW	No	-
0x230E	-	Speed Limit Value at Torque Control Mode	UINT	RW	No	-

■ Internal block diagram of torque operation mode



5. Indexing Position operation

Index concept

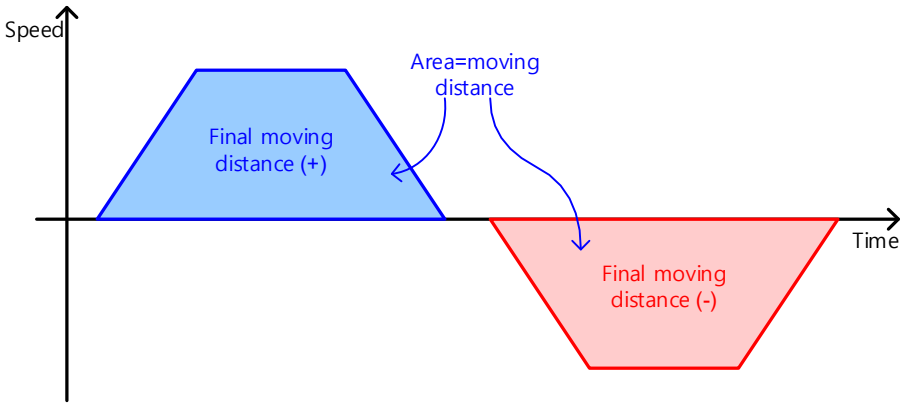
The elements that make up one index are as follows: Distance, Velocity, Acceleration, Deceleration, Registration Distance, Registration Velocity, Repeat Count, Dwell Time, Next Index, and Action. See below for a description of each element.

■ Distance

It means the movement distance of each index (unit: UU), and you can set the absolute and relative movement distance. .

The final movement distance in case of absolute value movement is the difference between the movement distance and the current position, and the final movement distance in case of relative value movement becomes the movement distance.

The final moving distance means the area in the case of the velocity/acceleration pattern shown below.

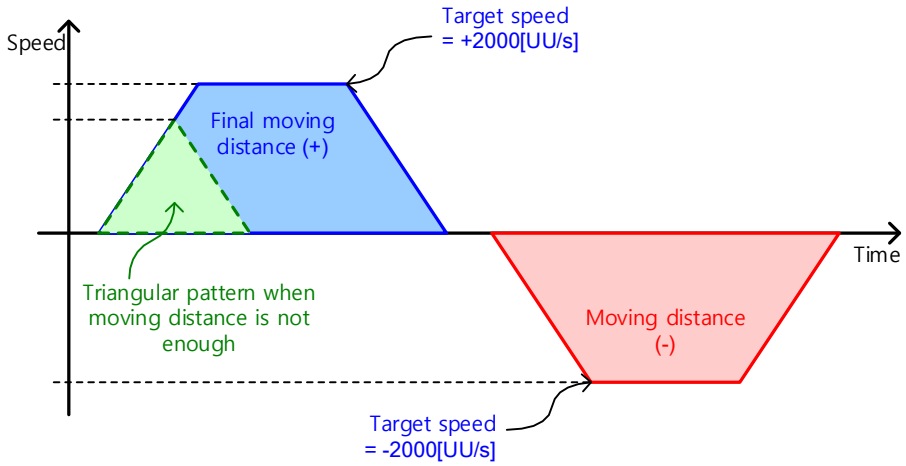


■ Velocity

Set the target speed (unit: UU/s) during index operation. .

The speed is set as a positive (+) value regardless of the travel distance, and the sign of the target speed is determined according to the sign of the travel distance.

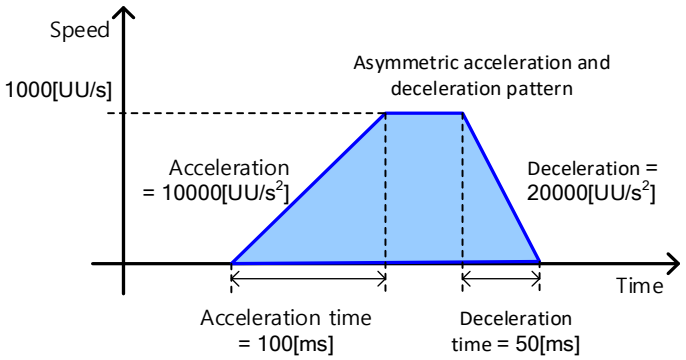
If the moving distance is not sufficient compared to the set values of speed and acceleration/deceleration, a triangular pattern that does not reach the target speed may be displayed.



■ Acceleration, Deceleration

Set the acceleration and deceleration for index operation. It supports asymmetric acceleration/deceleration operation in which acceleration and deceleration are set differently.

As shown in the figure below, if Velocity = 1000[UU/s], Acceleration = 10000[UU/s2], Deceleration = 20000[UU/s2] are set, the acceleration time to reach the target speed is 100[ms] (=1000[UU/s]/10000[UU/s2]), deceleration time becomes 50[ms] = (1000[UU/s] / 20000[UU/s2]).



■ Registration Distance, Registration Velocity

If the index type is Registration Absolute or Registration Relative, the operation speed and moving distance can be changed by the REGT signal input from the outside.

The movement distance after REGT signal input is determined by Registration Distance.

The meaning of Registration Distance and Registration Velocity is as follows.

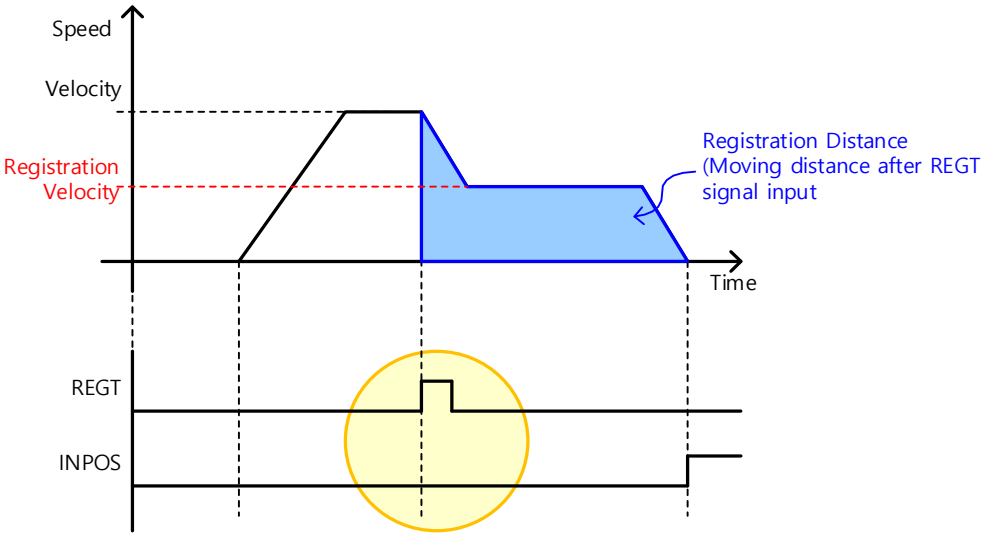
- Registration Distance

  It means the moving distance (unit: UU) after inputting the external REGT signal. .

- Registration Velocity

  It means the moving distance (unit: UU/s) after inputting the external REGT signal. .

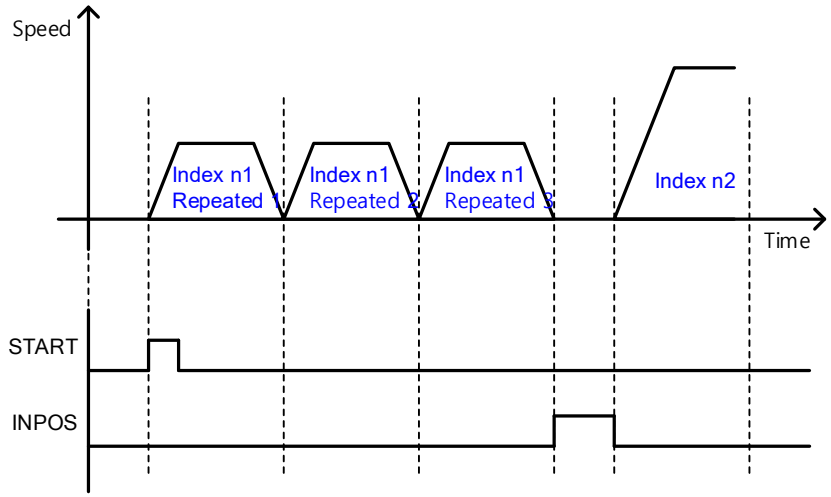
When the speed changes during registration, the acceleration/deceleration operates according to the originally set acceleration/deceleration.



■ Repeat Count

The index operates repeatedly as much as the value set in the number of repetitions.

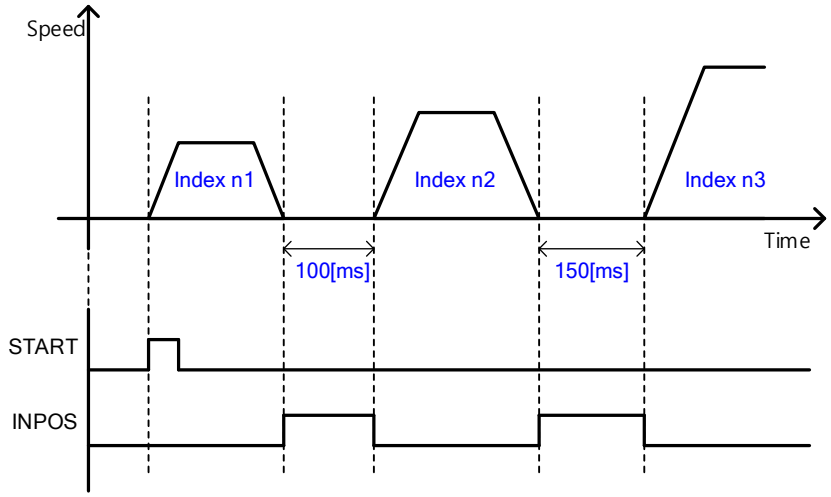
During index repetition operation, the value set in Dwell Time (waiting time) is not applied.



■ Dwell Time

Set the waiting time between index operations (unit: ms). .

The set Dwell Time applies after the operation pattern creation of the index completes as shown in the figure below.



■ Next Index

If the action of the index is set to Next Index (setting value 2), set the number of the next index to be automatically performed after the index is closed.

For details, please refer to the description of Action's Next Index.

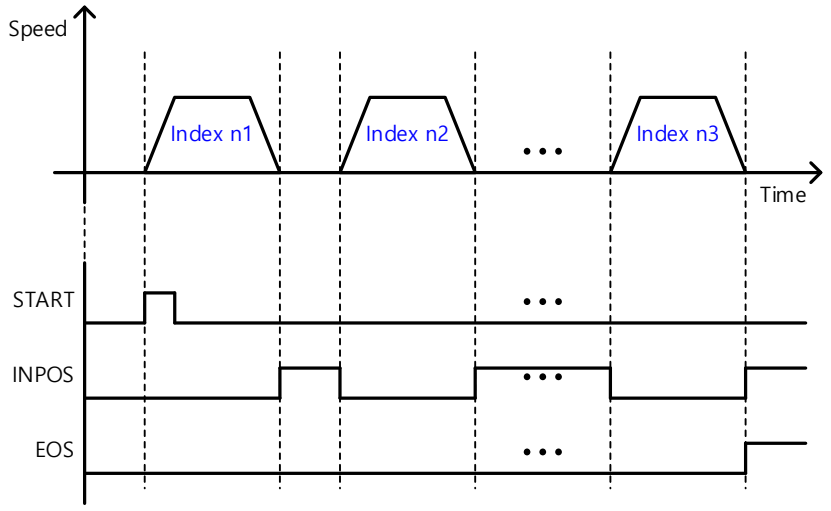
■ Action

In the case of Indexing Position mode, the following three methods can be used according to the indexing action.

- STOP

  If the action of an index is set to Stop (setting value 0), the entire sequence ends after the index is finished.

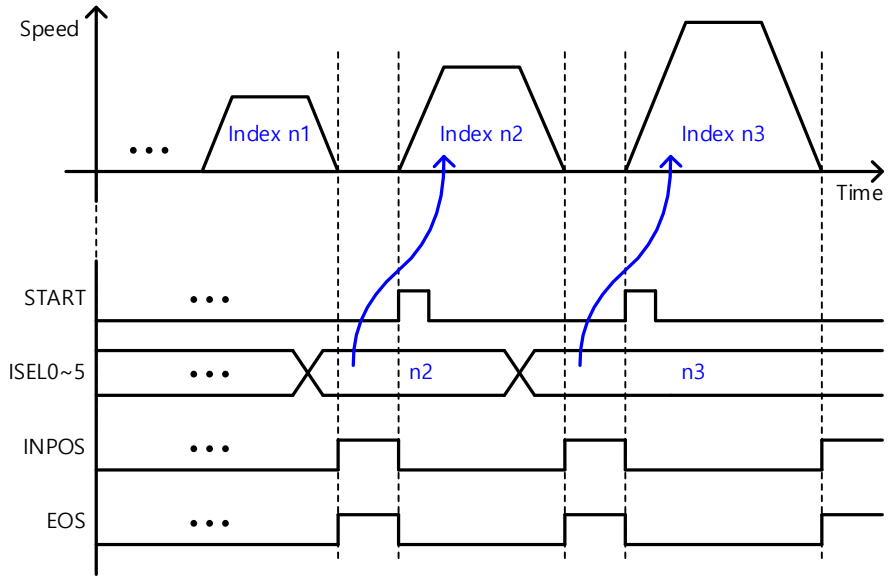
  When START signal is input from outside, indexing position operation starts from the index (0~63) set in Start Index (0x3008).



- Wait for Start

  If the action of the index is set to Wait for Start (setting value 1), the next index is performed according to the START signal input after the index is finished.

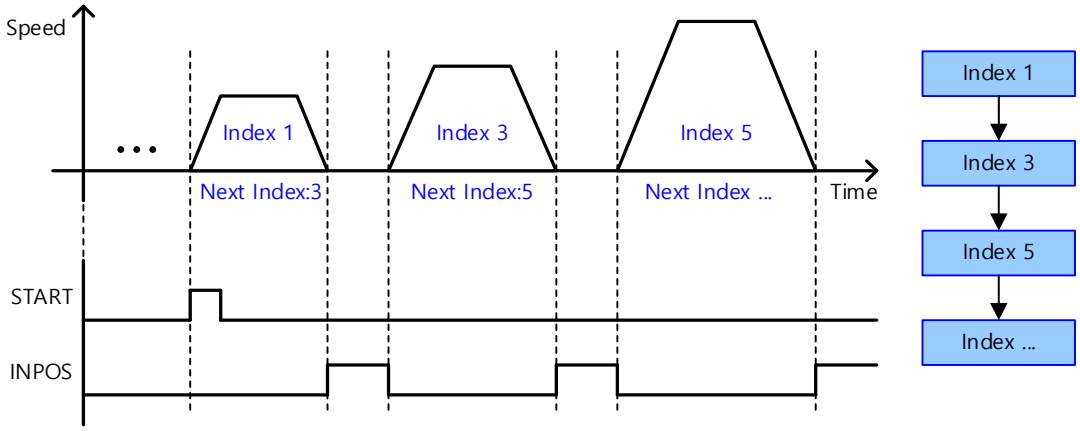
  The index performed when START signal is input is determined by ISEL0 ~ 5 (Index Select) signals. In this case, the value set for Next Index is irrelevant.



- Next Index

  If the action of the index is set to Next Index (setting value 2), the index set to Next Index is automatically executed after the index is closed.

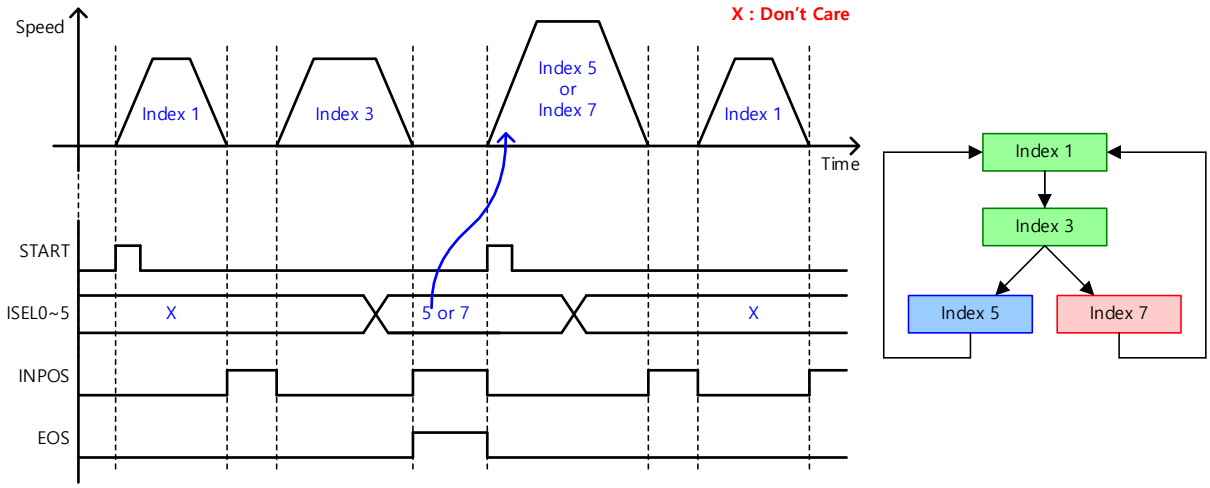
  It can operate automatically with pre-entered indexes without inputting digital input signals (START, ISEL0 ~ 5).



- Action setting example

  If you set Wait for Start and Next Index in combination, you can compose a branch structure sequence as shown in the figure below.

  At this time, Action of Index 3 should be set to Wait for Start.



5.1 Index Type

The L7P drive supports index types for indexing position mode.

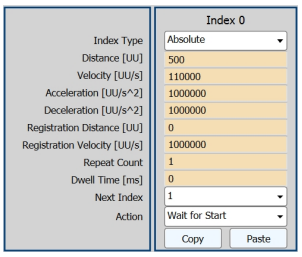
5.1.1 Absolute / Relative Move

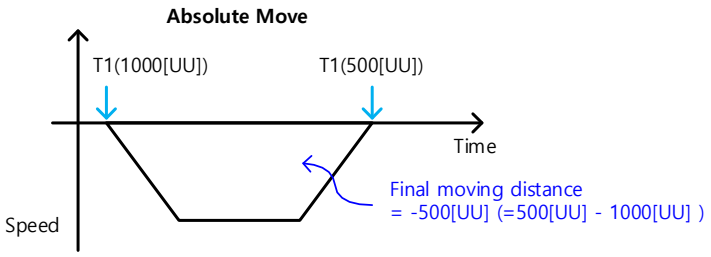
Point-to-point (PTP) operation method that moves to an absolute or relative position according to the set speed and acceleration values is the more basic.

■ Absolute Move

The final moving distance will be the Distance input value minus the current position. (= Distance – current position)

Example) If the current position is 1000[UU] and the distance is 500[UU], the moving distance when performing Absolute Move is -500[UU] and the final position is 500[UU]. That is, the final position always matches the Distance [UU] value entered by the user in Index.

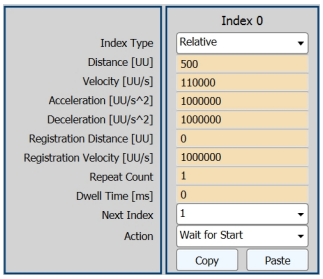


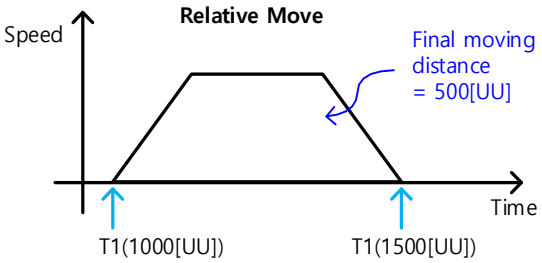


■ Relative Move

The final moving distance becomes the Distance input value.

Example) When Current Position Value = 1000 and Distance = 500, when Relative Move is performed, the moving distance is 500[UU] and the final position is 1500[UU]. That is, the final position is the sum of the distance value input by the user and the current position value before moving.





5.1.2 Registration Absolute / Relative Move

Operation speed and movement distance can be changed by REGT signal input from outside.

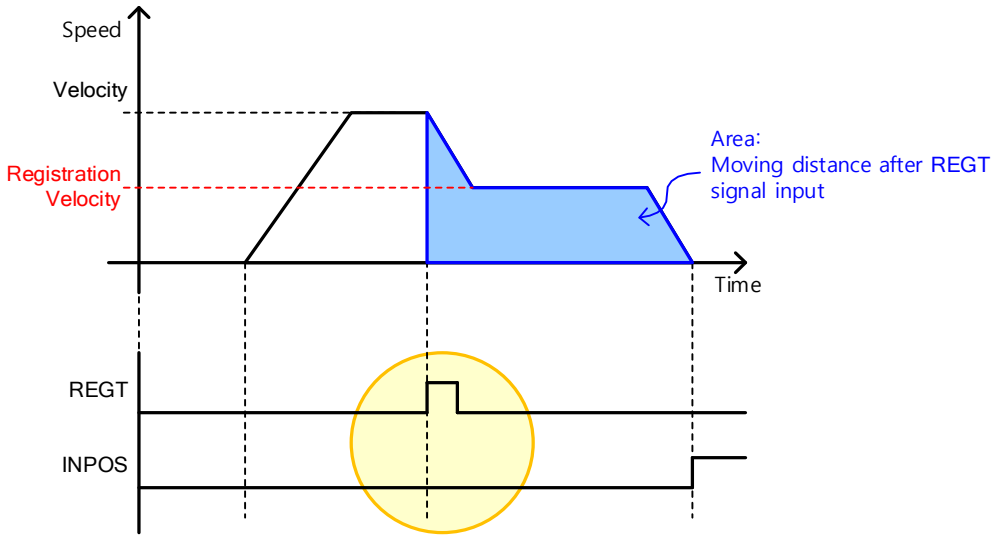
This function is similar to the motion pattern generation of our previous model VP-3 (position operation type after feeder and sensor).

■ Registration Absolute Move

Absolute movement is performed with the value set in Distance. After inputting the REGT signal while moving, it drives at the position and speed set in Registration Distance/Velocity. The movement distance after REGT signal input is setting by Registration Distance.

■ Registration Relative Move

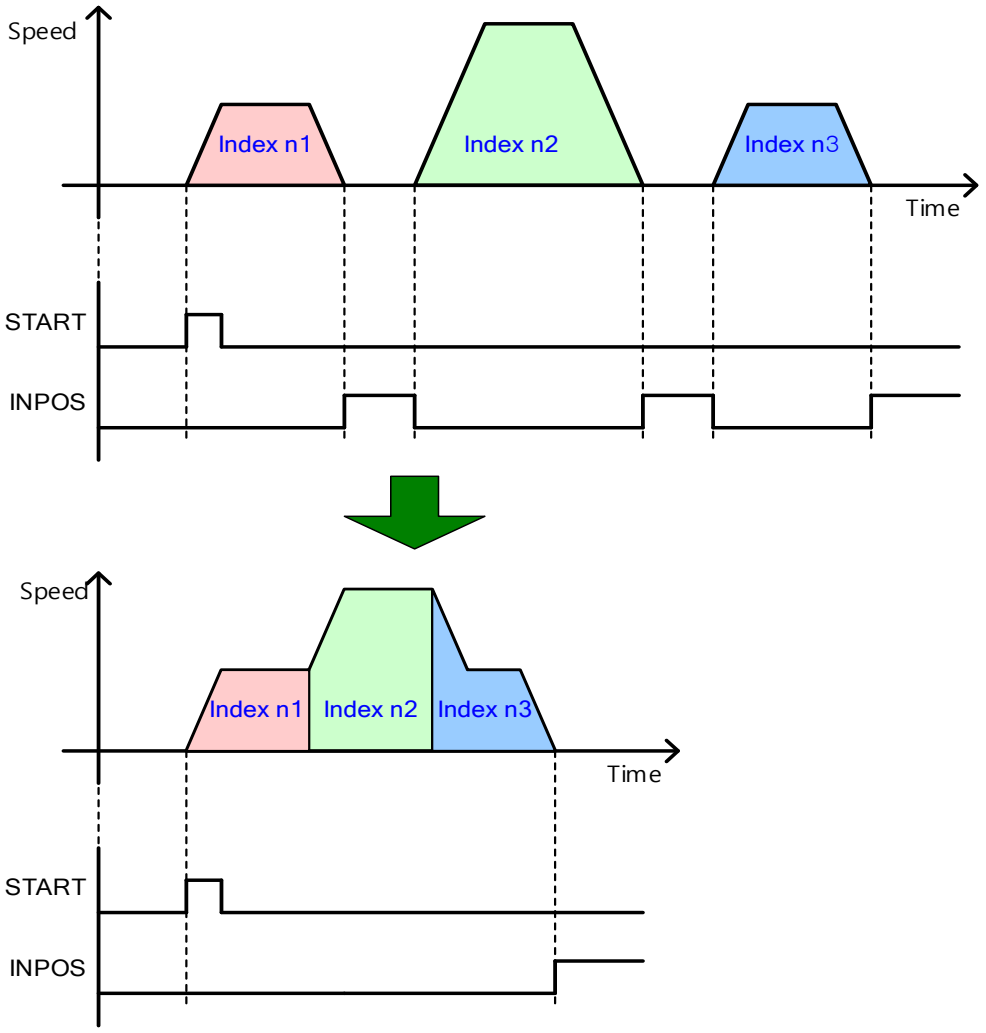
It moves relative to the value set in Distance. After inputting the REGT signal while moving, it drives at the position and speed set in Registration Distance/Velocity. The movement distance after REGT signal input is setting by Registration Distance.



5.1.3 Blending Absolute / Relative Move

It is a method of driving with one driving pattern by binding consecutive indexes.

When each index ends, it does not stop at 0 speed and operates to the next index.



5.1.4 Rotary Absolute / Relative Move

■ Rotary Absolute Move

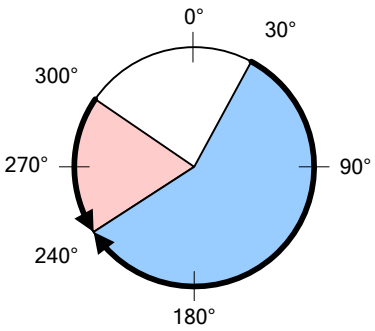
Available only when Coordinate System Settings is set to Rotation Coordinate System.

The direction of rotation is determined by the relationship between the starting position and the command position. If the starting position is smaller than the command position, it rotates in the forward direction, and in the opposite case, it rotates in the reverse direction. At this time, It doesn't necessarily move a short distance.

1 turn per distance (Modulo Factor: You can set a value higher than the value set at 0x240C, and you can enter a negative value (if the Modulo Factor is 360º, -90ºand 270º are the same). The final position in this case is processed taking into account the modulo factor. At this time, if you enter a negative value, it is useful to pass the position of 0 while rotating in the reverse direction.

Depending on the command value, it can rotate more than one turn.

The figure below is an example of moving forward from 30º to 240º and moving backward from 300º to 240º.

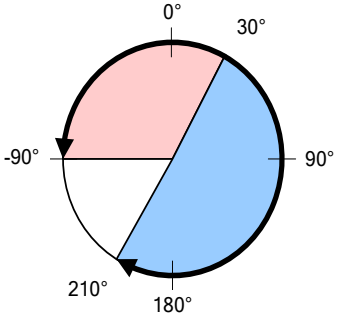


■ Rotary Relative Move

Available only when Coordinate System Settings is set to Rotation Coordinate System.

If the command (Distance) is a positive value (+), it operates in the positive direction, and if it is a negative value (-), it operates in the negative direction. Distance is 1 turn (Modulo Factor: Value set at 0x240C) or more can be set, and depending on the command value, it can rotate more than one turn.

The figure below is an example of moving from 30º by +180º to the position of 210º and by moving by -120º from 30º to the position of -90º.



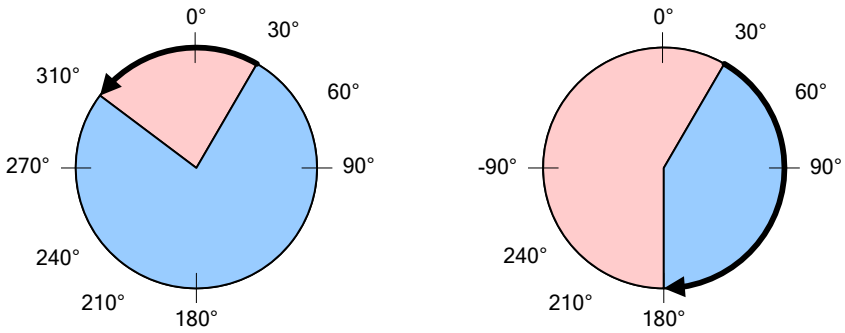
5.1.5 Rotary Shortest Move

Available only when Coordinate System Settings is set to Rotation Coordinate System.

The driving direction is determined in the direction with the shorter moving distance, either forward or reverse.

1 turn (Modulo Factor: It rotates only within the value set at 0x240C). Setting value of distance is treated as absolute values.

The figure below is an example of moving in the reverse direction when moving from 30° to 310° and moving in the forward direction when moving from 30°to 180°.



5.1.6 Rotary Positive / Negative Move

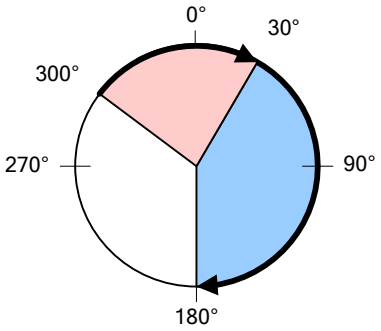
■ Rotary Positive Move

Available only when Coordinate System Settings is set to Rotation Coordinate System.

Regardless of the starting position and command position (Distance), it always operates in the positive (+) direction.

1 turn(Modulo Factor: It rotates only within the value set at 0x240C). Setting value of distance is treated as absolute values.

The figure below is an example of forward movement when moving from 300º to 30º and from 30º to 180º.



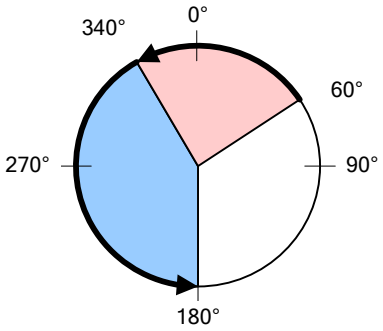
■ Rotary Negative Move

Available only when Coordinate System Settings is set to Rotation Coordinate System.

Regardless of the starting position and command position (Distance), it always operates in the reverse (-) direction.

It rotates only within 1 turn (the value set in Modulo Factor: 0x240C). Setting value of distance is treated as absolute values.

The figure below is an example of moving in the reverse direction when moving from 60º to 340º and from 340º to 180º.



5.2 Functions of INDEX input signals

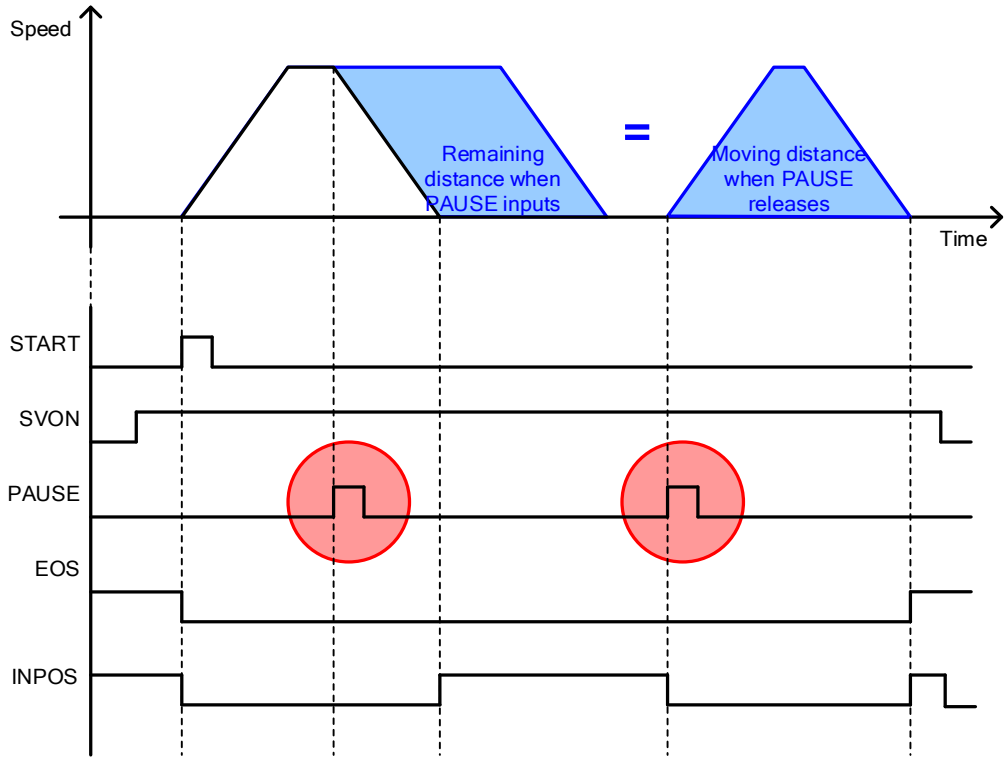
■ PAUSE

During index operation, when PAUSE is input (rising edge), index operation currently being executed is paused.

When re-entering PAUSE (rising edge), the remaining distance is moved.

The Inpos signal outputs a signal when the value of Following Error is smaller than the value of Following Error Window [0x6065].

The EOS signal is output after re-inputting PAUSE and finishing the movement of the remaining amount of the corresponding index.

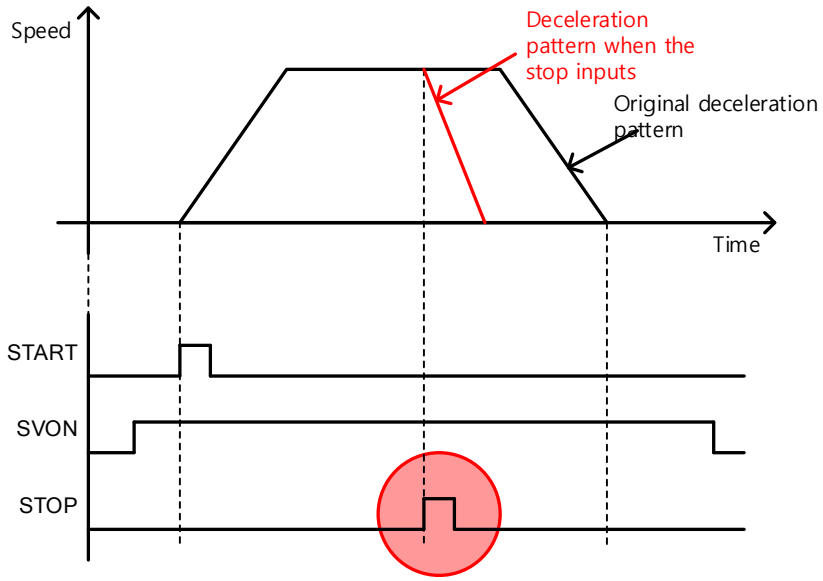


■ STOP

When STOP input (Rising Edge), it stops with stop deceleration (0x6085) and ends the index operation sequence.

When START signal is input, it operates again from the index set in Start Index (0x3008).

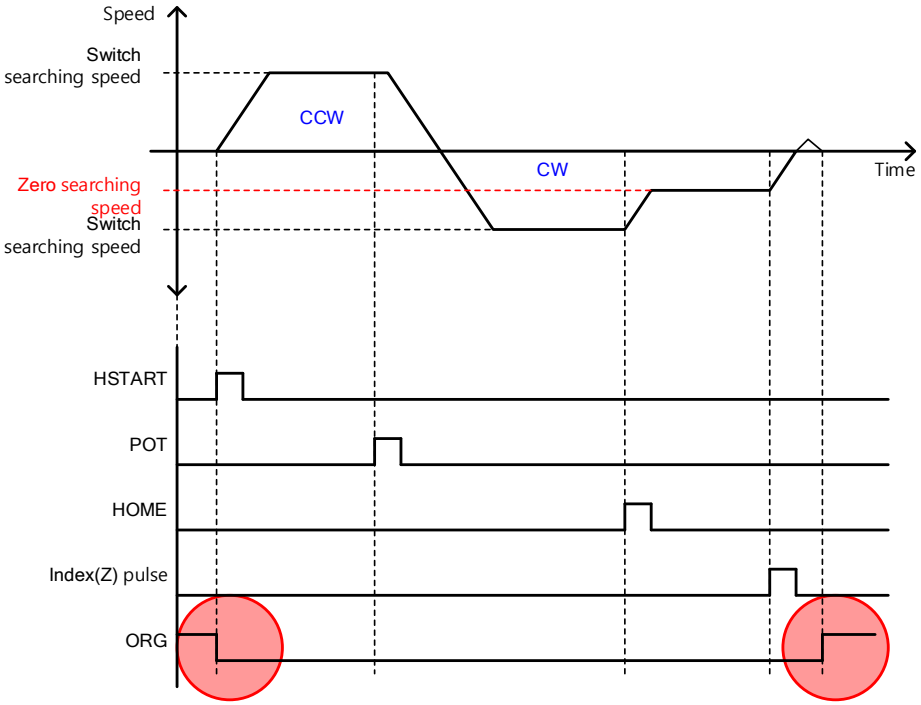
However, if 64 is set to Start Index (0x3008), Start Index is set to the value set in I-SEL0 to 5.



■ HSTART, ORG

When HSTART is input (rising edge), homing operation is performed. The HSTART input signal input during homing operation is ignored.

When origin return is completed, ORG (Origin: origin return completed) signal is output. . At the start of homing, the ORG signal is reset to 0.



After origin operation is completed, the ORG signal can be maintained at 1 (Set) or converted to 0 (Reset) when the servo is off by using the 6th bit of the parameter below.

I/O Signal Configuration [0x300A]

7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
0	0	0	0	0	0	0	0

Setting Value	Setting content
0	ORG maintains output as 1 (Set) when servo is off after completion of origin operation.
1	ORG changes output to 0 (Reset) when servo is off after homing operation is completed.

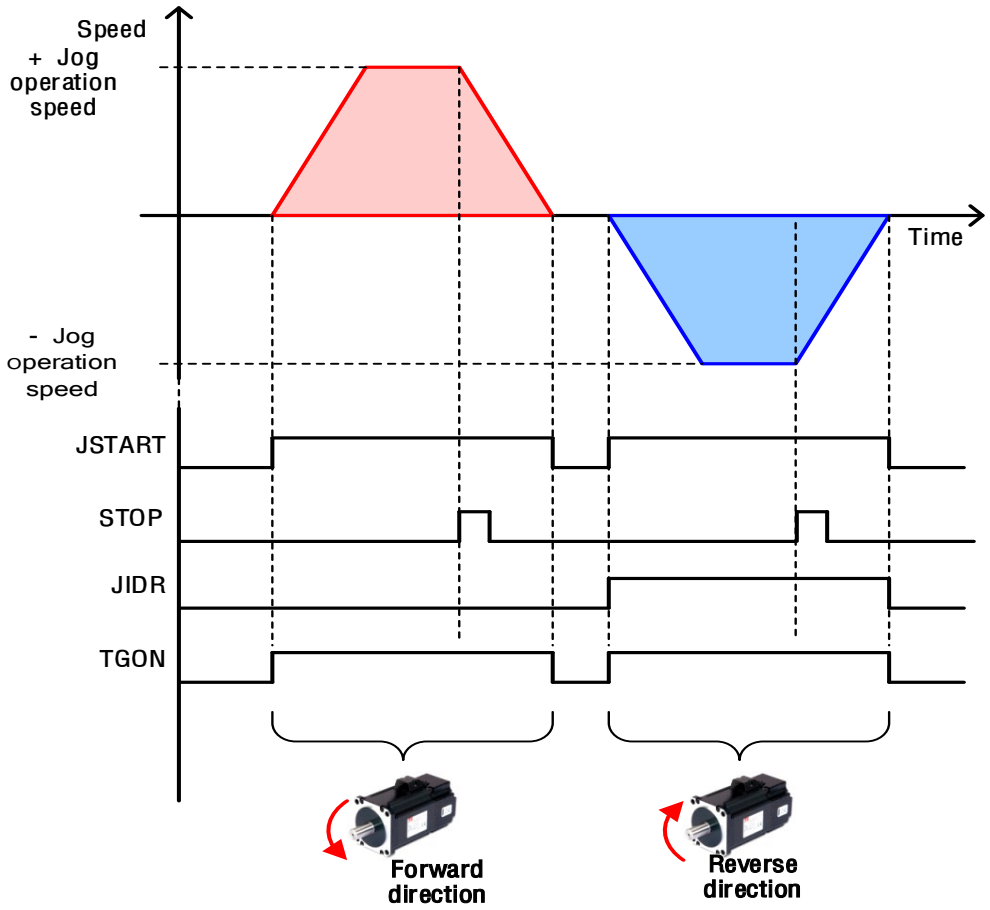
If the above function and the software position limit function are used at the same time, if the servo is turned off, the origin operation must be completed again when the next servo is turned on. When ORG becomes 0 (Reset), the software position limit function does not operate.

■ JSTART / JDIR

It can be moved to an arbitrary position using JOG operation in the case of machine adjustment or origin position alignment. The JSTART signal input from the outside starts JOG operation, and the JDIR signal input from the outside changes the rotation direction to operate the servo motor. When stopping, please stop using the STOP signal input from the outside. When the JSTART signal is ON, it is in speed control mode, and when the JSTART signal is OFF, it is converted to the previous operation mode.

Related object name	Setting content
Jog Operation speed(0x2300)	Refer to Section 10.4 Speed Control Related Settings.
Speed Command Acc. Time(0x2301)	
Speed Command Deceleration Time(0x2301)	
Speed Command S-curve Time(0x2303)	

- Servo motor rotation direction



■ PJOG(Positive Jog)와 NJOG(Negative Jog)

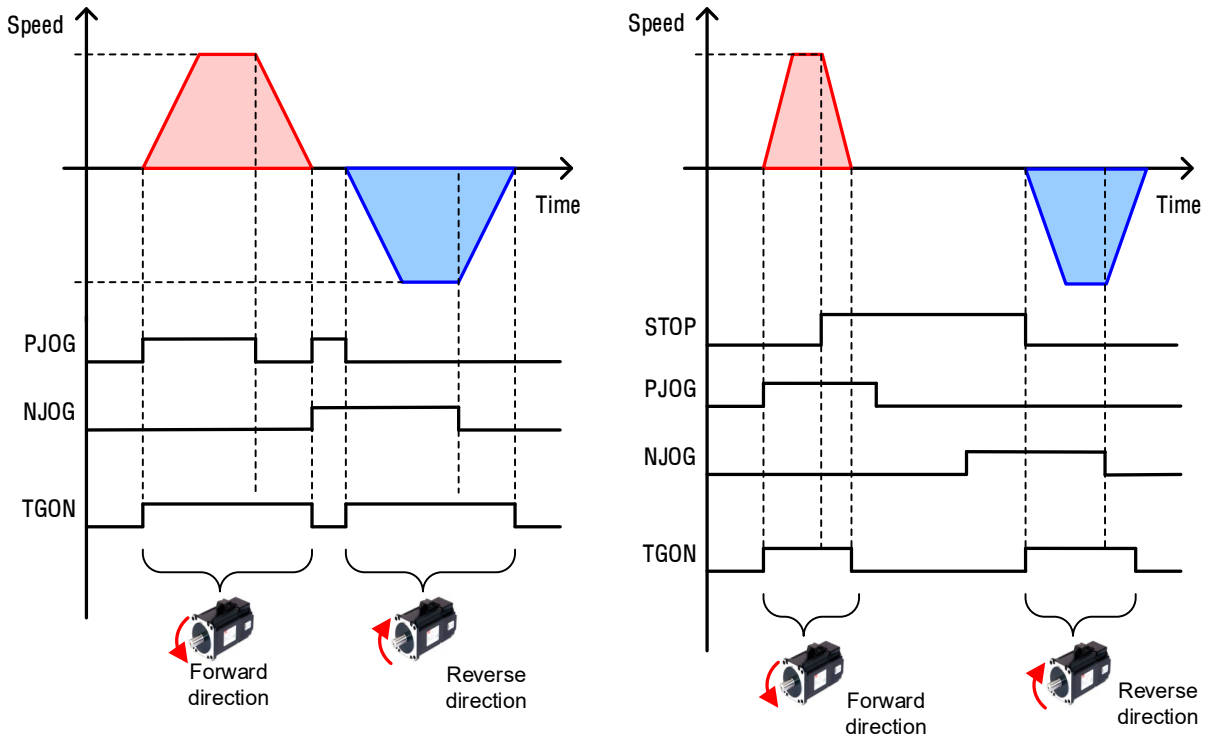
In L7P, P/N Jog operation is also possible with simple parameter setting. When driving P/N Jog, JSTART and JDIR are not used.

I/O Signal Configuration [0x300A]

7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
0	0	0	0	0	1	0	0

JSTART	PJOG
JDIR	NJOG

If the 2nd bit of address 0x300A is set to 1, the function of the existing JSTART is changed to PJOG and JDIR to NJOG. The output contact of JSTART and JDIR of Write Single coi (0x05) of Moderbus communication is also changed to PJOG and NJOG.

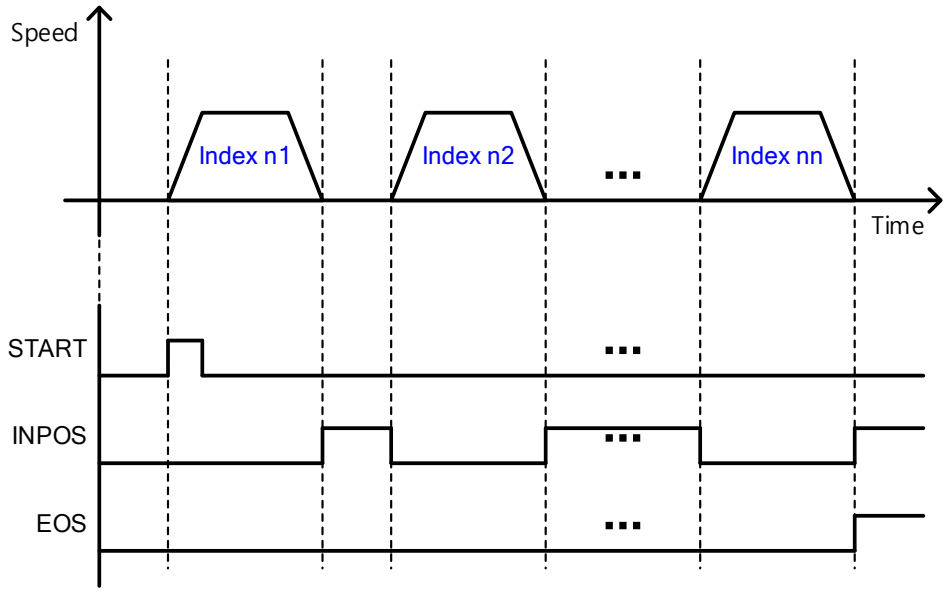


Entering PJOG rotates in the forward direction, and entering NJOG rotates in the reverse direction. And when the signal is turned off, the motor stops. Also, if both signals are input simultaneously, the motor stops. A STOP signal can also be used. If the STOP signal is input while the PJOG or NJOG signal is input, the motor stops.

5.3 Functions of INDEX Output signals

■ EOS

The EOS (End of Sequence) signal is output after the index is completion or finishing.



■ IOUT0~5

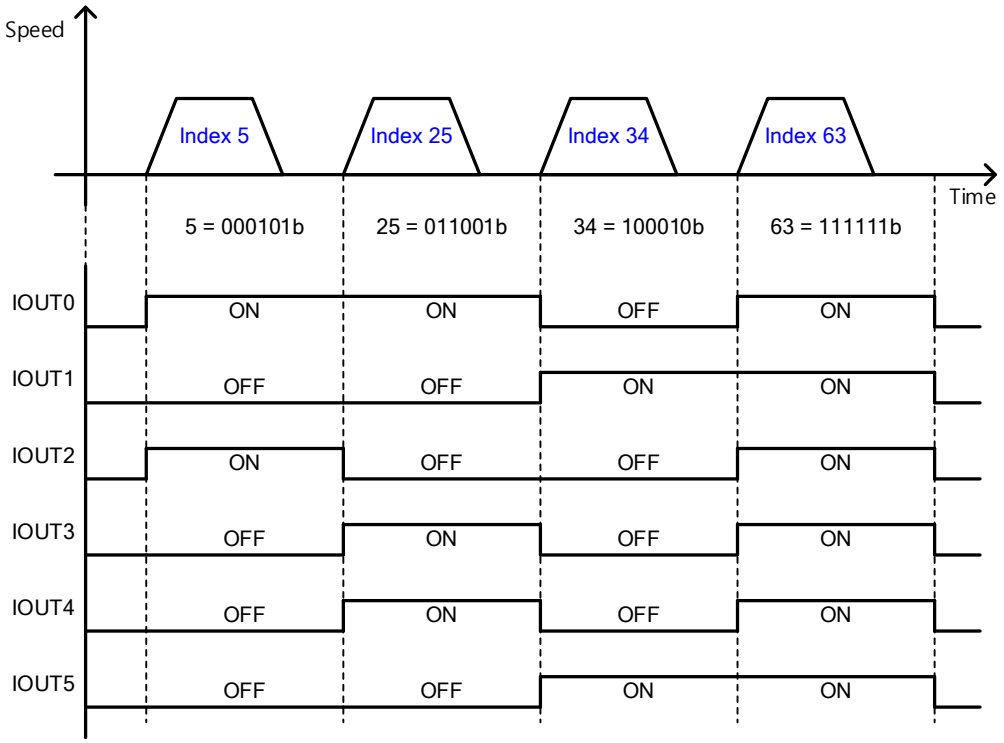
The number of the corresponding index being executed is output through IOUT0~5. The output state operates as follows according to the setting value of the 0th bit of parameter 0x300A.

I/O Signal Configuration [0x300A]

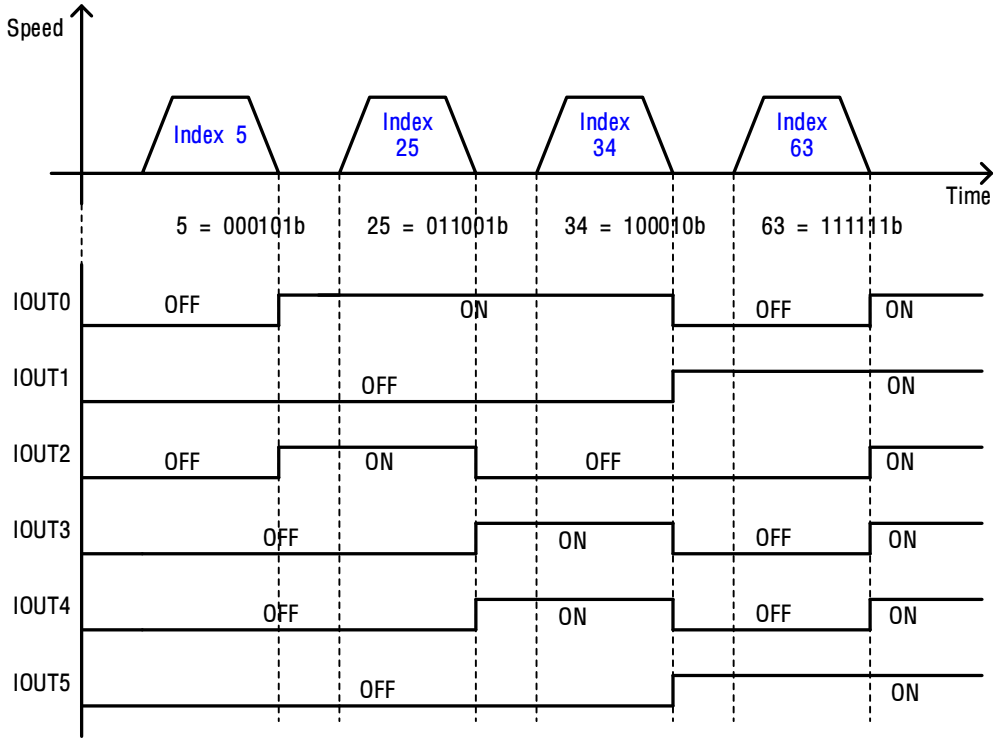
7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
0	0	0	0	0	0	0	1

Setting Value	Setting content
0	The corresponding IOUT signal is output during indexing position operation, and the completed IOUT signal is output after indexing position operation is completed.
1	The previously completed IOUT signal is output during indexing position operation, and the completed IOUT signal is output after indexing position operation is completed.

■ Setting value: 0



■ Setting value: 1



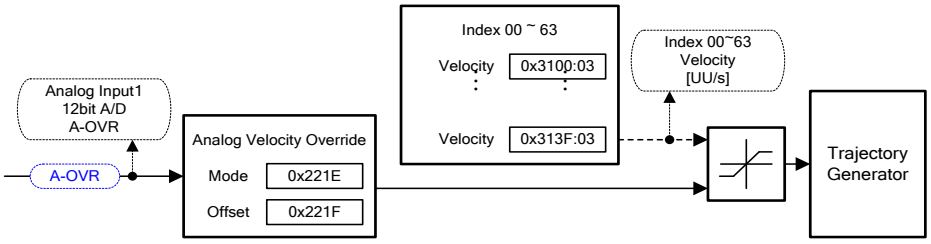
As for the index output, when the operation mode is changed and the SVON signal is OFF (motor free-run state), the current position output signals are initialized. The initialized output state is the same as the operation state output of index number 0 (Index0), so please use it from Index1 if possible.

5.4 Analog Velocity Override

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x221E	-	Analog Velocity Override Mode	UINT	RW	Yes	-
0x221F	-	Analog Velocity Input(command/Override) Offset	INT	RW	Yes	mV

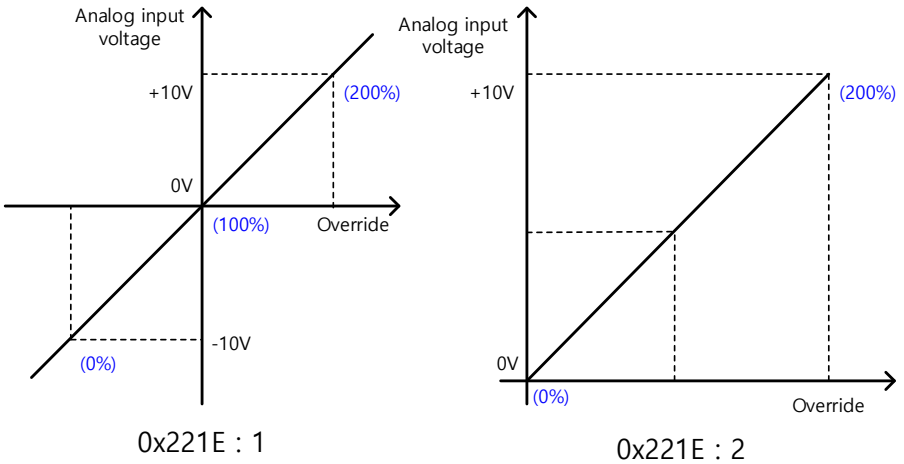
The figure below, the indexing speed can be overridden according to the analog input during indexing position operation. This function is applied when analog speed override mode (0x221E) is set to use. You can adjust the offset of the input voltage by setting the analog speed override offset (0x221F). The unit is [mV].



■ A-OVR

The analog input voltage range is determined according to the setting value of 0x221E for the speed versus analog speed override voltage.

Setting Value	Setting content
0	Analog speed override disabled
1	Analog speed override enabled (-10[V] ~ 10[V])
2	Analog speed override enabled (0[V] ~ 10[V])

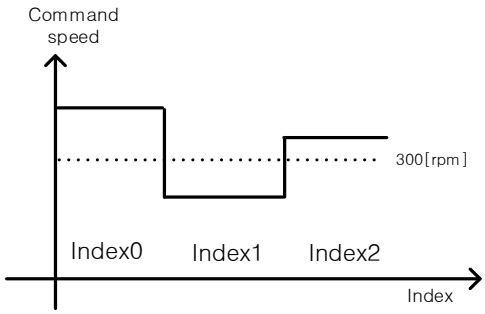


The speed override setting value is applied at any time regardless of index section or index section according to the setting value of the 3rd bit of I/O signal configuration [0x300A].

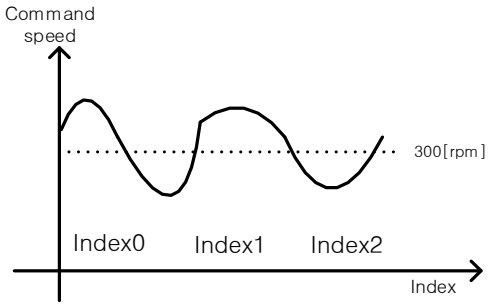
I/O Signal Configuration [0x300A]

7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
0	0	0	0	1	0	0	0

Setting value	Override application method
0	Apply by index section
1	Real time application



<Apply by index section >



<Apply immediately>

For example, if you set the speed of Index 0 to 3 at 300 [rpm] and reset 0x300A to 0, the set override value is applied to the index at the start of each section and reflected in the command speed. If the override value is changed while Index1 is running, the value is reflected in the next Index2

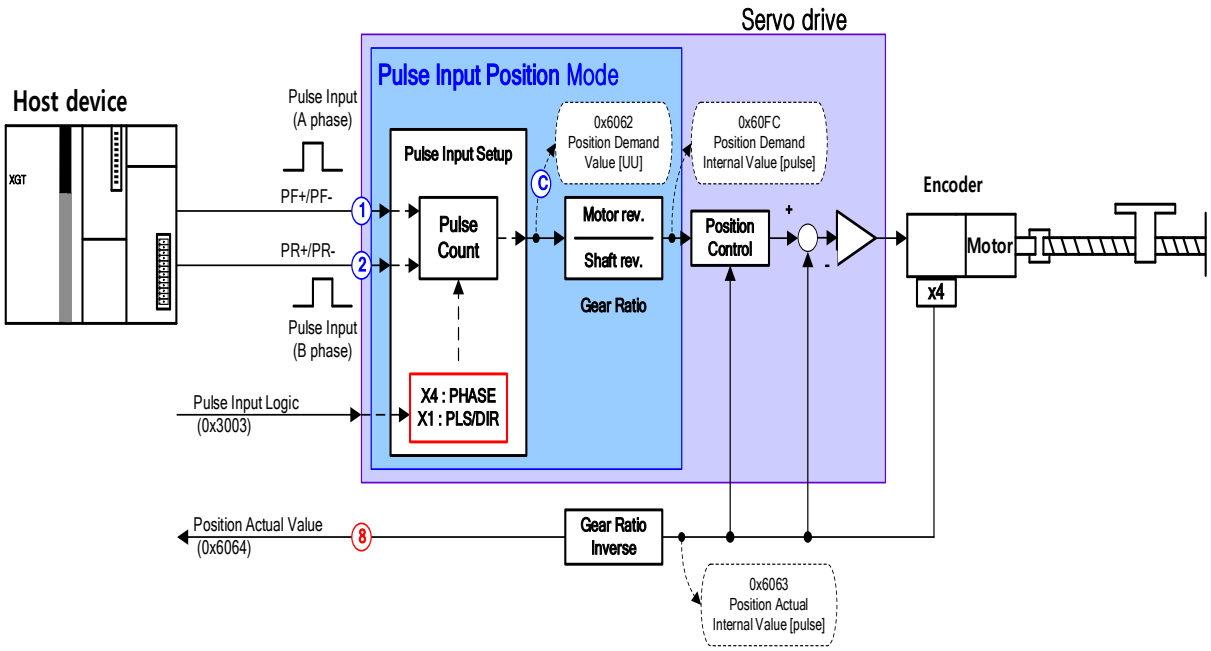
When 0x300A is set to 1, the speed override is applied immediately regardless of the index section. If the user changes the override value while Index1 is running, it is reflected immediately.

6. Pulse Input Position Operation

Pulse input type position control operation can be performed by using a host controller with a positioning function.

For this, the control mode [0x3000] must be set to 1.

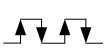
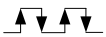
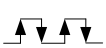
The basic internal block diagram of pulse input type position control mode is as follows.

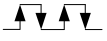
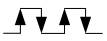
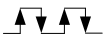


6.1 Function setting of Pulse Input Logic

Set the logic of the pulse train input from the host controller. The shape of the input pulse and the rotation direction for each logic are as follows:

Setting Value	Setting content
0	A phase + B phase, positive logic
1	CW+CCW, positive logic
2	Pulse+sign, positive logic
3	A phase + B phase, negative logic
4	CW+CCW, negative logic
5	Pulse+sign, negative logic

PF + PR		Forward rotation	Reverse rotation
Phase A Phase +B Positive logic	0	PULS (I/O-31)  SIGN (I/O-33) 	PULS (I/O-31)  SIGN (I/O-33) 
CW +CCW Positive logic	1	PULS (I/O-31) L Level SIGN (I/O-33) 	PULS (I/O-31)  SIGN (I/O-33) L Level
Pulse + direction Positive logic	2	PULS (I/O-31)  SIGN (I/O-33) H Level	PULS (I/O-31)  SIGN (I/O-33) L Level

PF + PR		Forward rotation	Reverse rotation
Phase A Phase +B Negative logic	3	PULS (I/O-31)  SIGN (I/O-33) 	PULS (I/O-31)  SIGN (I/O-33) 
CW +CCW Negative logic	4	PULS (I/O-31) H Level SIGN (I/O-33) 	PULS (I/O-31)  SIGN (I/O-33) H Level
Pulse +direction Negative logic	5	PULS (I/O-31)  SIGN (I/O-33) L Level	PULS (I/O-31)  SIGN (I/O-33) H Level

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x3003	-	Pulse Input logic Select	UINT	RW	No	-

6.2 Function setting of Pulse Input Filter

Set the frequency band of the digital filter set in the pulse input part. It can be used for the purpose of reducing wiring noise.

The frequency band was calculated based on the width of the input pulse due to the characteristics of the digital filter.

Setting Value	Setting content
0	No filter used.
1	500Khz (Min)
2	750Khz
3	1Mhz (Default)
4	1.25Mhz

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x3004	-	Pulse Input Filter Select	UINT	RW	No	-

6.3 Features of PCLEAR

Set the operation mode when position pulse clear (PCLR) signal is input. When the PCLR signal is input, the position error inside the drive becomes 0.

Setting Value	Setting content
0	Operates in Edge Mode
1	Operate in level mode (torque: maintain)
2	Operate in level mode (torque: 0)

■ Related Objects

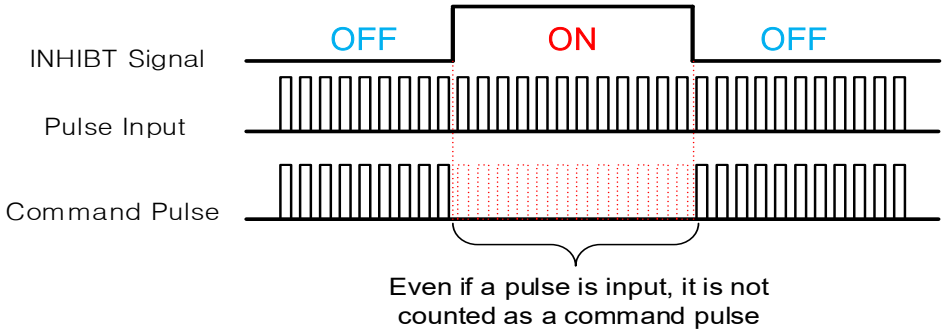
Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x3005	-	PCLEAR Mode Select	UINT	RW	No	-

6.4 Features of INHIBIT

INHIBIT is a function that blocks the count of command pulses.

When the command pulse blocking (INHIB) signal is input, the operation mode is set in I/O Configuration (0x2200~). It is applied only in Pulse Input Position operation, and input pulses after INHIBIT signal input are not counted as command pulses.

Setting Value	Setting content
ON	Turn ON the command pulse blocking function to block the input pulse.
Off	Turn OFF the command pulse cutoff function to count pulses.



7. Speed operation

7.1 Function setting of speed command switch selection

Set the method to command the servo drive during speed operation.

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x231A	-	Velocity Command Switch Select	UINT	RW	No	-

Setting Value	Setting content
0	Analog Velocity Command Use.
1	Using SPD1, SPD2 contact and analog speed command.
2	Using SPD1, SPD1, SPD2 contact and analog speed command
3	Using SPD1, SPD2, SPD3 contact point speed command

If the setting value is 1, when both SDP1 and SPD2 are ON, analog speed command is used.

Input device			Speed
SPD1	SPD2	SPD3	
X	X	Don't care	Multi-step speed command 1 (parameter 0x2312)
O	X	Don't care	Multi-step speed command 2 (parameter 0x2313)
X	O	Don't care	Multi-step speed command 3 (parameter 0x2314)
O	O	Don't care	Analog Velocity Command Use

If the set value is 2, the analog speed command is used when all corresponding contacts are ON.

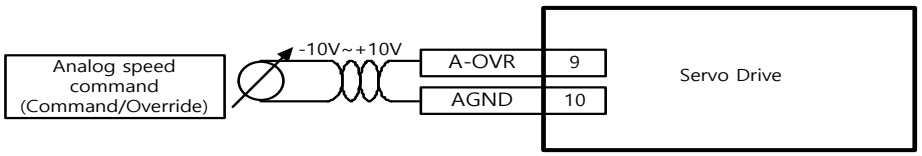
Input device			Speed
SPD1	SPD2	SPD3	
X	X	X	Multi-step speed command 1 (parameter 0x2312)
O	X	X	Multi-step speed command 2 (parameter 0x2313)
X	O	X	Multi-step speed command 3 (parameter 0x2314)
O	O	X	Multi-step speed command 4 (parameter 0x2315)
X	X	O	Multi-step speed command 5 (parameter 0x2316)
O	X	O	Multi-step speed command 6 (parameter 0x2317)
X	O	O	Multi-step speed command 7 (parameter 0x2318)
O	O	O	Analog Velocity Command Use

7.2 Analog Velocity Command

Velocity Command Switch Select [0x231A] If the setting value is 0, the speed can be controlled only with an external analog voltage, and if it is 1 or 2, it can be used with the SPD input.

To input commands, apply -10[V] to +10[V] voltage to pins 9 and 10 of the I/ O connector.

When changing the direction of the motor, it is possible to change the direction by inputting the opposite polarity of the analog input voltage or using JDIR among digital input contacts.

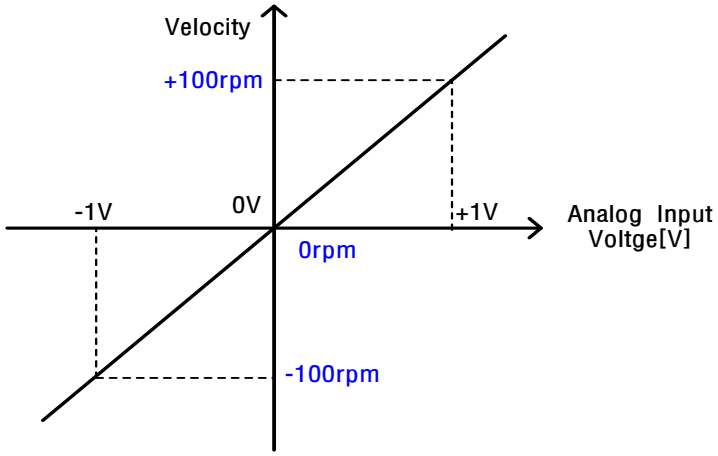


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2227	-	Analog Velocity Command Filter Time Constant	UINT	RW	No	-
0x2229	-	Analog Velocity Command Scale	INT	RW	No	-
0x222A	-	Analog Velocity Command Clamp Level	UINT	RW	No	-

■ Analog Velocity Command Scale

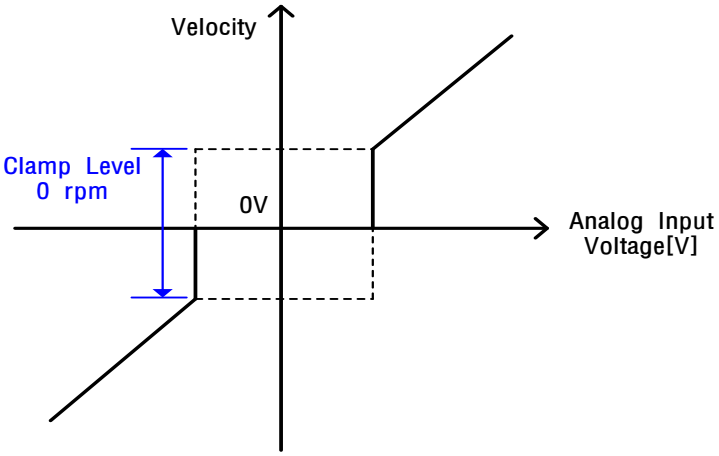
Sets the analog speed command value per 1[V] input in [rpm] unit. When the command voltage is reversed (-), only the rotation direction is changed from the set value and operates.



■ Analog Velocity Command Clamp Level

There are cases where a certain voltage exists even at 0 speed command on the analog signal connection circuit.

At this time, zero speed can be maintained for the voltage command as much as the set speed value.



7.3 Multi-speed command

Velocity Command Switch Select [0x231A], if the setting value is 3, speed control can be performed using only the multi-step speed inside the servo drive, and if it is 1 or 2, it can be used with analog speed command.

To use the digital speed command, assign digital input SPD1, SPD2, SPD3 signals to the I/O connector or control digital input SPD1, SPD2, SPD3 signals through communication.

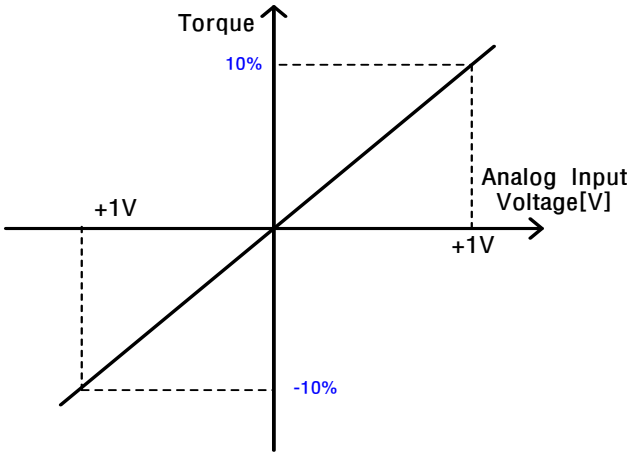
■ Speed setting for each digital input signal

Input device			Speed
SPD1	SPD2	SPD3	
X	X	X	Multi-step speed command 1 (parameter 0x2312)
O	X	X	Multi-step speed command 2 (parameter 0x2313)
X	O	X	Multi-step speed command 3 (parameter 0x2314)
O	O	X	Multi-step speed command 4 (parameter 0x2315)
X	X	O	Multi-step speed command 5 (parameter 0x2316)
O	X	O	Multi-step speed command 6 (parameter 0x2317)
X	O	O	Multi-step speed command 7 (parameter 0x2318)
O	O	O	Multi-step speed command 8 (parameter 0x2319)

8. Torque operation

8.1 Analog torque Command Scale

Sets the analog torque command value per 1[V] input in [0.1%] unit.



The related object is 0x221C analog torque input (command/limit) scale, and the object is divided into two functions.

0x221C	Analog Torque Input(command/limit) Scale						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-1000 to 1000	100	0.1%/V	RW	No	Always	Yes

First, in case of non-torque operation

When the setting value of the torque limit function setting (0x2110) is 4 (analog torque limit), the torque is limited by the analog input torque limit value. At this time, set the scale of the analog input value.

Second, in case of torque operation

In case of torque operation, the parameter is used as an analog torque command scale. The setting value sets the torque command value at the analog input voltage ±10[V] as a percentage of the rated torque.

8.2 Speed setting for torque operation

8.2.1 Speed Limit Function

In the torque control mode, the torque command (analog input) from the upper level controller controls the torque, but does not control the speed; thus, the apparatus might be damaged due to exceedingly increased speed by an excessive torque command. To address this problem, this drive provides a function that limits motor speed based on the parameters set during torque control.

As shown below, the speed during torque operation can be limited according to the set value of the speed limit function setting (0x230D). With the output value of VLMT (speed limit), you can verify if the speed is limited.

Setting Value	Setting content
0	Limited by speed limit value (0x230E)
1	Limited by the maximum motor speed
2	Set the analog speed command as the maximum torque speed limit value
3	Reflects the smaller value between the value of 0x230E and the analog speed command value

The initial value of the speed limit value at torque control, 0x230E, is set to 1000 [rpm].

Please enter the desired speed value before operation.

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	No	-
0x221D	-	Analog Torque Input(command/limit) Offset	INT	RW	No	-
0x2228	-	Analog Torque Command Filter Time Constant	UINT	RW	No	-
0x230D	-	Speed Limit Function Select	UINT	RW	No	-
0x230E	-	Speed Limit Value at Torque Control Mode	UINT	RW	No	-

9. Operation mode Change

This is the setting value of L7P drive control mode (0x3000). After setting, be sure to save the parameters and then reapply the power.

■ **Control mode (0x3000) set value**

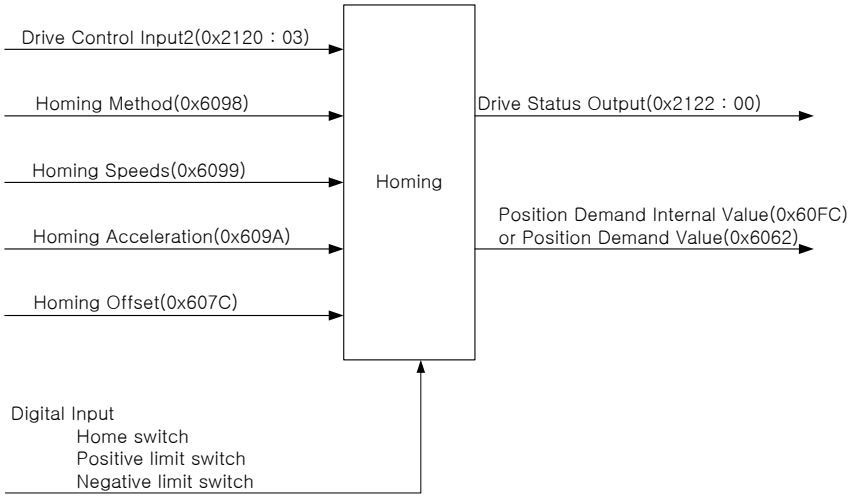
Setting Value	Setting content
0	Indexing Position Mode
1	Pulse Input Position Mode
2	Velocity Mode
3	Torque Mode
4	Pulse Input Position operation or Indexing Position operation
5	Pulse Input Position operation or Velocity operation
6	Pulse Input Position operation or torque operation
7	Velocity mode or torque mode
8	Indexing Position Mode or Velocity mode
9	Indexing Position Mode or torque mode

The operation mode can be switched by using the set value as the MODE signal. For example, if it is set to 7, it is basically driven in speed operation when power is reapplied, and when a signal is input to MODE, it is converted to torque operation and driven.

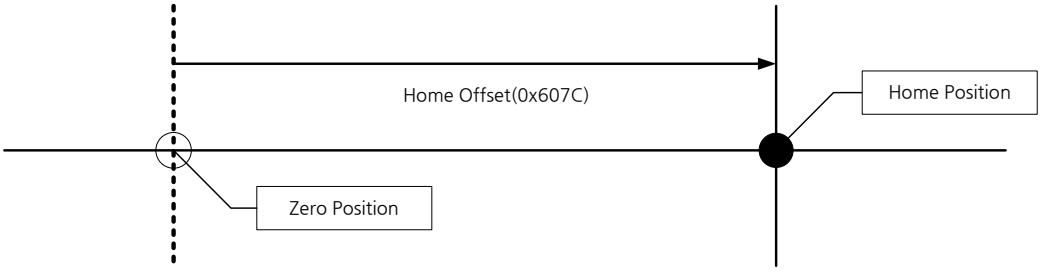
Control mode setting	MODE Signal	
	OFF(Default)	ON
4	Pulse input positioning operation	Index positioning operation
5	Pulse input positioning opeation	Speed operation
6	Pulse input positioning operation	Torque operation
7	Speed operation	Torque operation
8	Index positioning operation	Speed operation
9	Index positioning operation	Torque operation

10. Homing

This drive provides its own homing function. The figure below represents the relationship between the input and output parameters for the homing mode. You can specify the speed, acceleration, offset, and homing method.



As shown in the figure below, you can set the offset between the home position and the zero position of the machine using the home offset. The zero position indicates a point whose Actual Position Value (0x6064) is zero (0).



10.1 Homing Method

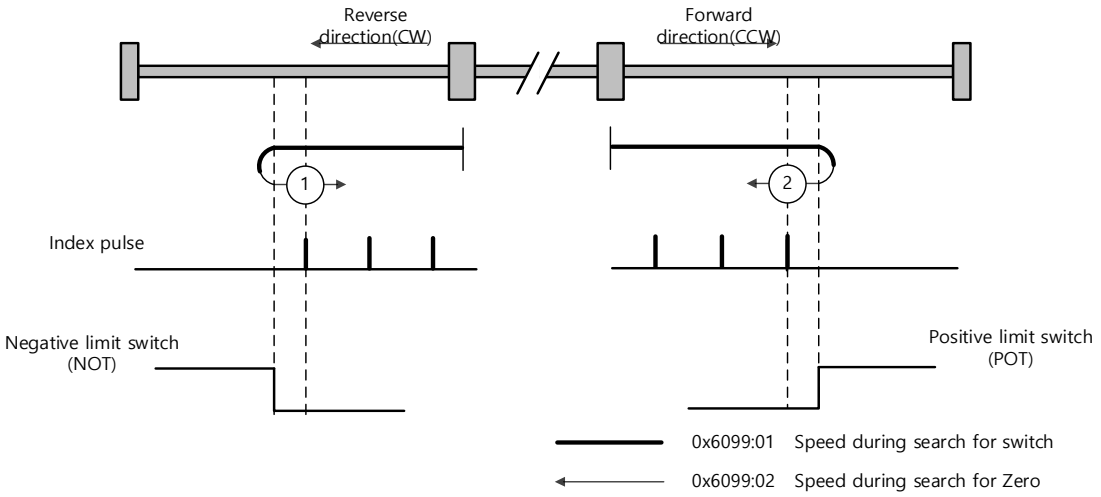
The drive supports the following homing methods (0x6098):

Homing Method(0x6098)	Details
1	The drive returns to the home position with the negative limit switch (NOT) and the Index (Z) pulse while driving in the reverse direction.
2	The drive returns to the home position with the positive limit switch (POT) and the Index (Z) pulse while driving in the forward direction.
7,8,9,10	The drive returns to the home position with the home switch (HOME) and the Index (Z) pulse while driving in the forward direction. When the positive limit switch (POT) is input during homing, the drive will switch its driving direction.
11,12,13,14	The drive returns to the home position with the home switch (HOME) and the Index (Z) pulse while driving in the reverse direction. When the negative limit switch (NOT) is input during homing, the drive will switch its driving direction.
24	The drive returns to the home position with the home switch (HOME) while driving in the forward direction. When the positive limit switch (POT) is input during homing, the drive will switch its driving direction.
28	The drive returns to the home position with the home switch (HOME) while driving in the reverse direction. When the negative limit switch (NOT) is input during homing, the drive will switch its driving direction.
33	The drive returns to the home position with the Index (Z) pulse while driving in the reverse direction.
34	The drive returns to the home position with the Index (Z) pulse while driving in the forward direction.
35	Sets the current position as the origin.
-1	The drive returns to the home position with the negative stopper and the Index (Z) pulse while driving in the reverse direction.
-2	The drive returns to the home position with the positive stopper and the Index (Z) pulse while driving in the forward direction.
-3	The drive only returns to the home position with the negative stopper while driving in the reverse direction.
-4	The drive only returns to the home position with the positive stopper while driving in the forward direction.
-5	It returns to the homing only by the origin switch (HOME) while driving in the reverse direction.
-6	Return to homing only by origin switch (HOME) while driving in the forward direction

■ Related Objects

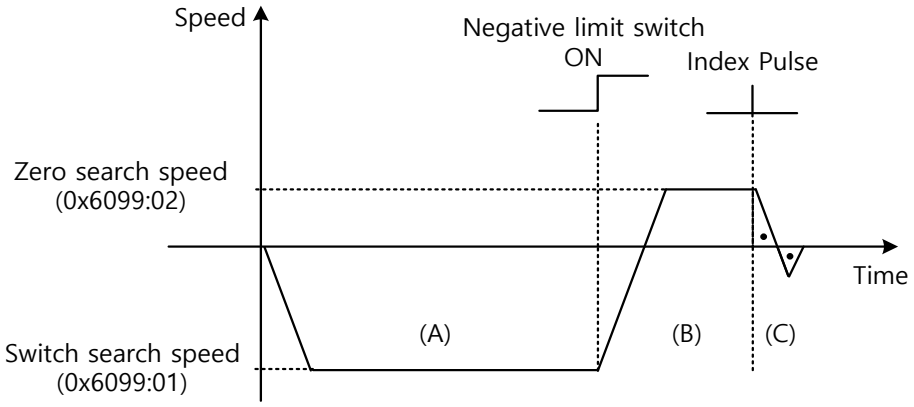
Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2120	-	Drive Control Input2	UINT	RW	Yes	-
0x2122	-	Drive Status Output2	UINT	RO	Yes	-
0x607C	-	Home Offset	DINT	RW	No	UU
0x6098	-	Homing Method	SINT	RW	Yes	-
0x6099	-	Homing Speed	-	-	-	-
	0	Number of entries	USINT	RO	No	-
	1	Speed during search for switch	UDINT	RW	Yes	UU/s
	2	Speed during search for zero	UDINT	RW	Yes	UU/s
0x609A	-	Homing Acceleration	UDINT	RW	Yes	UU/s^2

■ Homing method 1, 2



For homing using the Homing Method 1, the velocity profile according to the sequence is as follows. Please refer to the content below.

Homing Method ①

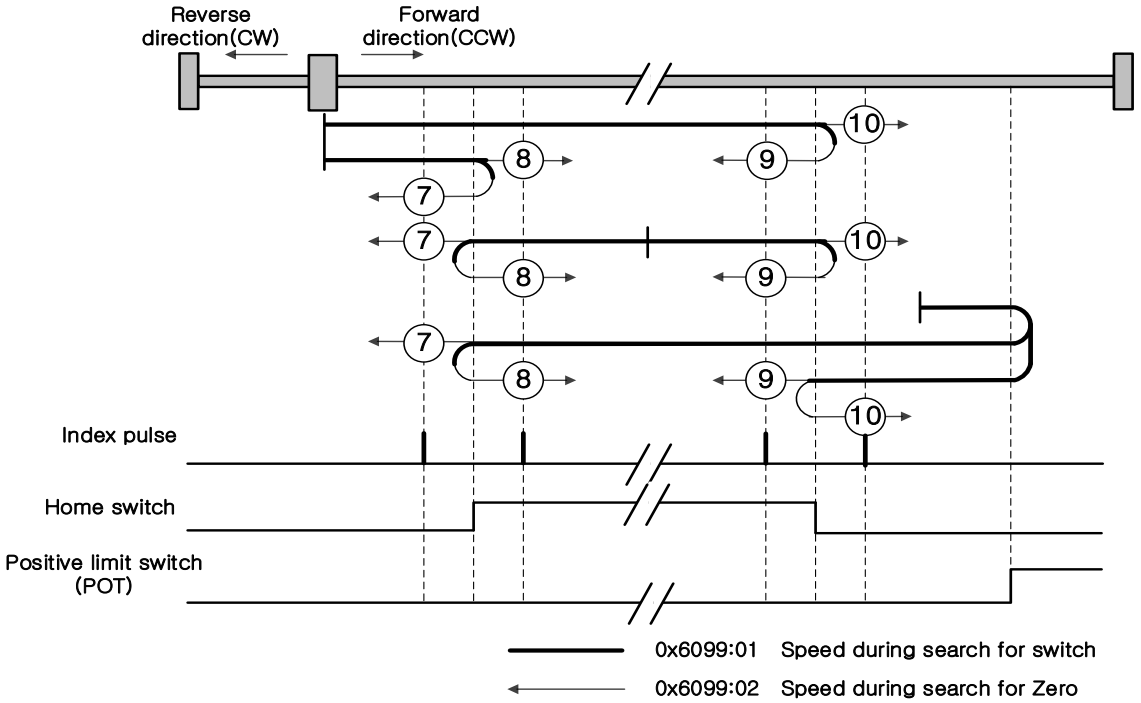


(A) The initial direction is reverse (CW). The motor operates at the switch search speed.

(B) When the negative limit switch (NOT) is turned on, the drive switches its direction to the forward direction (CCW), decelerating to the Zero Search Speed.

(C) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

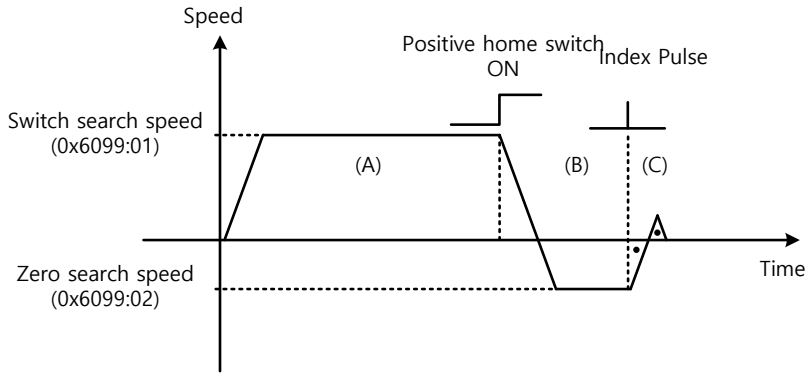
■ Methods 7, 8, 9, and 10



For homing using the Homing Method 7, the velocity profile according to the sequence is as follows. The sequence depends on the relationship between the load position and the Home switch at homing, which is categorized into three cases as below. Please see below for detailed explanation.

(1) Cases where the home witch is off when homing begins, and the limit is not met in the process

Homing Method ⑦



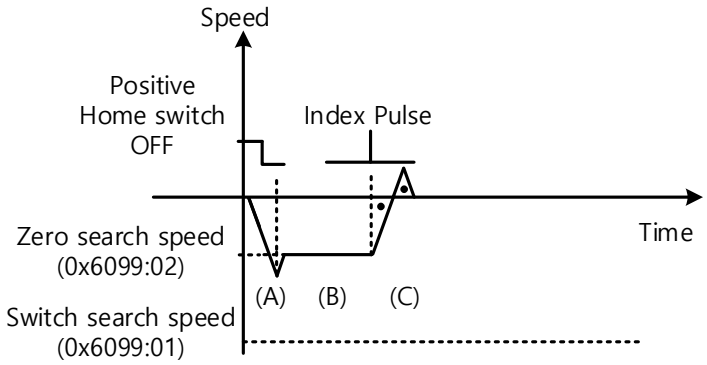
(A) The initial direction is forward (CCW). The motor operates at the switch search speed.

(B) When the Positive Home Switch is turned on, the drive will decelerate to the Zero Search Speed, and then switches its direction to the reverse direction (CW).

(C) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

(2) At the start of homing, when the Home switch is ON

Homing Method ⑦



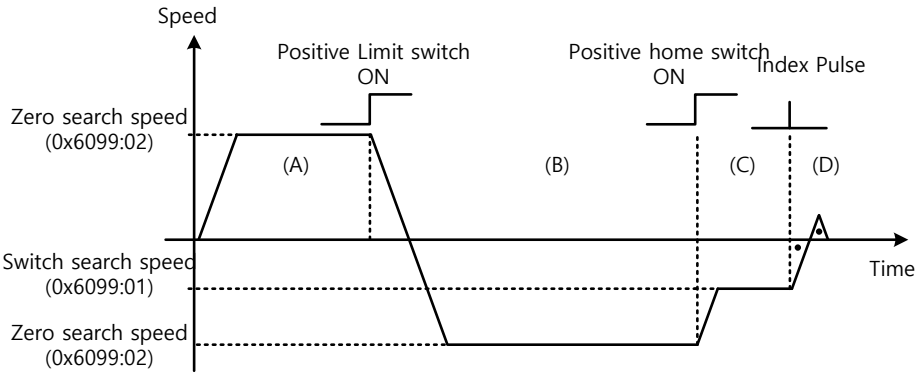
(A) Since the Home signal is on, the drive will operate at the Switch Search Speed in the direction of the Positive Home Switch (CCW). It might not reach the Switch Search Speed depending on the start position of homing.

(B) When the Home switch is turned off, the drive will decelerate to Zero Search Speed, and then continue to operate.

(C) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

(3) Cases where the home witch is off when homing begins, and the limit is met in the process

Homing Method ⑦



(A) The initial direction is forward (CCW). The motor operates at the switch search speed.

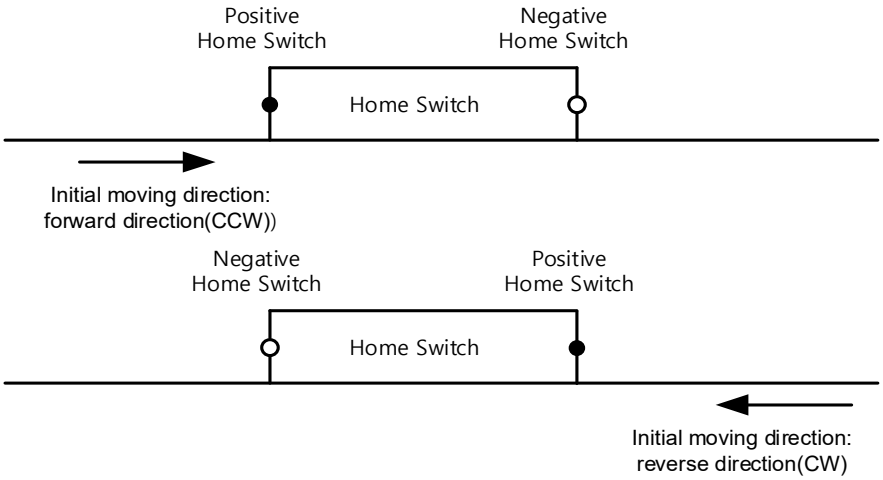
(B) When the positive limit switch (POT) is turned on, the drive will decelerate down to stop, and then operate at the Switch Search Speed in the reverse direction (CW).

(C) When the Positive Home switch is turned off, the drive will decelerate to Zero Search Speed, and then continue to operate.

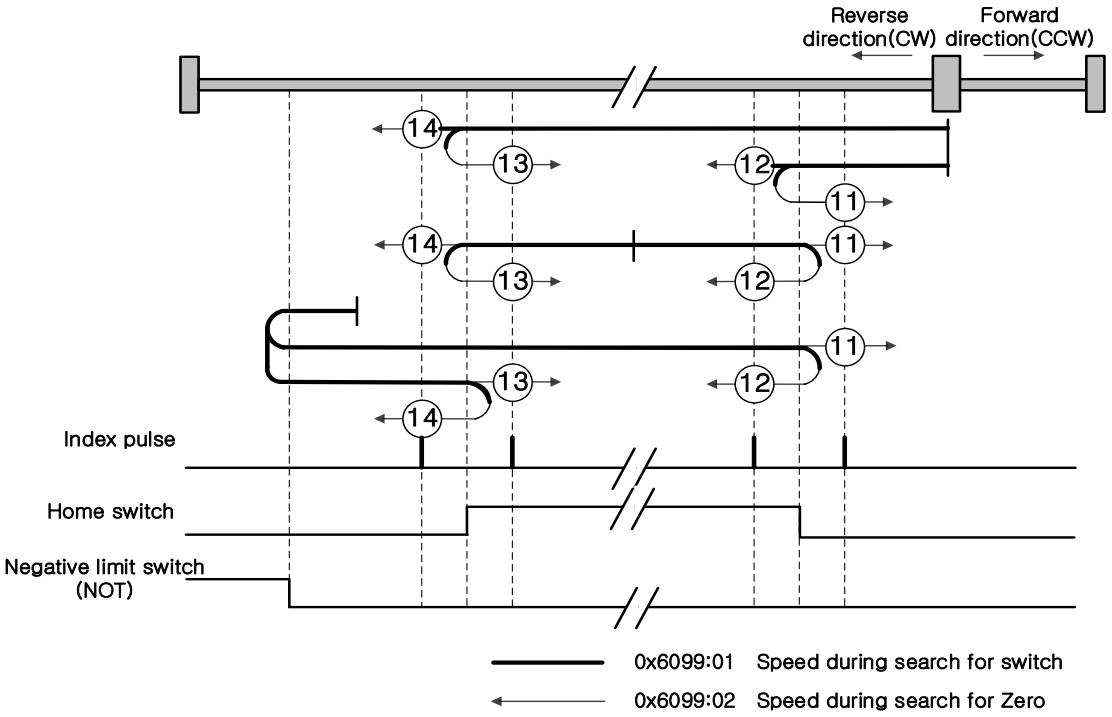
(D) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

The methods from 8 to 10 are nearly identical to the method 7 in terms of the homing sequence. The only differences are the initial driving direction and Home switch polarity.

The Positive Home Switchis determined by the initial driving direction. A Home switch, which is encountered in the initial driving direction, becomes the Positive Home Switch.



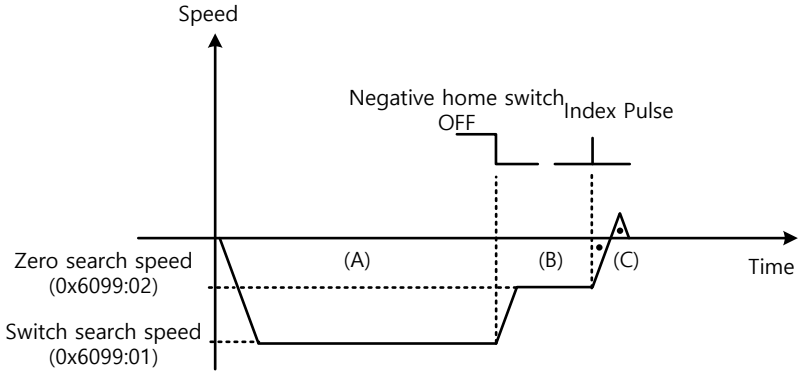
■ Methods 11, 12, 13, and 14



For homing using the Homing Method 14, the velocity profile according to the sequence is as follows. The sequence depends on the relationship between the load position and the Home switch at homing, which is categorized into three cases as below. Please see below for detailed explanation.

(1) Cases where the home witch is off when homing begins, and the limit is not met in the process

Homing Method ⑭



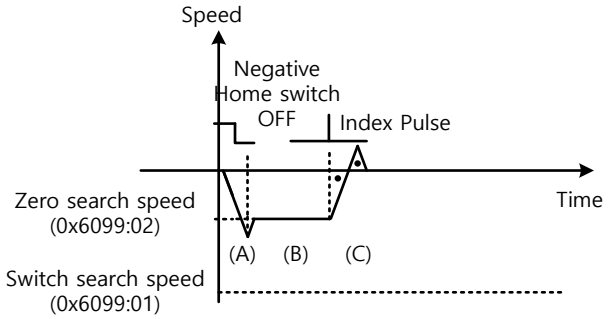
(A) The initial direction is reverse (CW). The motor operates at the switch search speed.

(B) When the Negative Home switch is turned off, the drive will decelerate to Zero Search Speed, and then continue to operate.

(C) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

(2)At the start of homing, when the Home switch is ON,

Homing Method ⑭



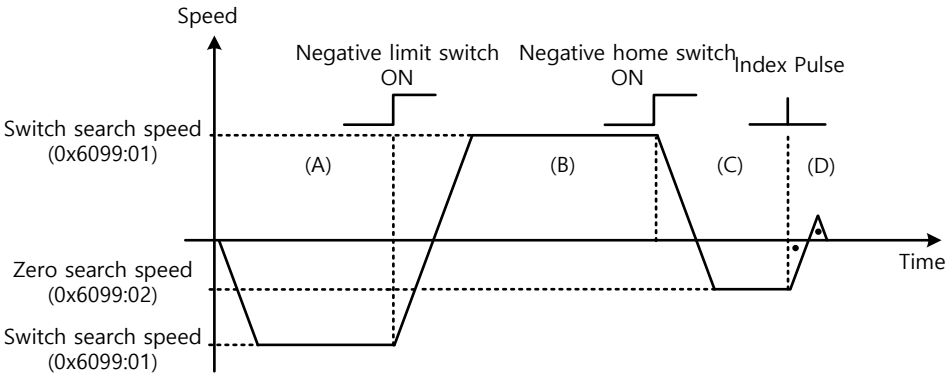
(A) Since the Home signal is on, the drive will operate at the Switch Search Speed in the direction of the Negative Home Switch (CW). It might not reach the Switch Search Speed depending on the start position of homing.

(B) When the Home switch is turned off, the drive will decelerate to Zero Search Speed, and then continue to operate.

(C) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

(3) At the start of homing, when the Home switch is OFF and the limit is met during operation

Homing Method ⑭



(A) The initial direction is reverse (CW). The motor operates at the switch search speed.

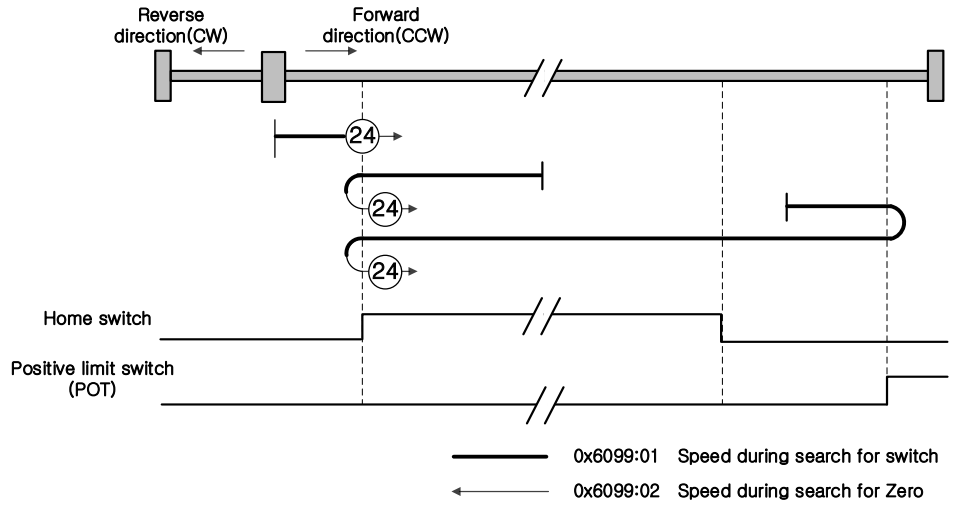
(B) When the negative limit switch (NOT) is turned on, the drive will decelerate down to stop, and then operate at the Switch Search Speed in the forward direction (CCW).

(C) When the Negative Home Switch is turned on, the drive will decelerate to the Zero Search Speed, and then switches its direction to the reverse direction (CW).

(D) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

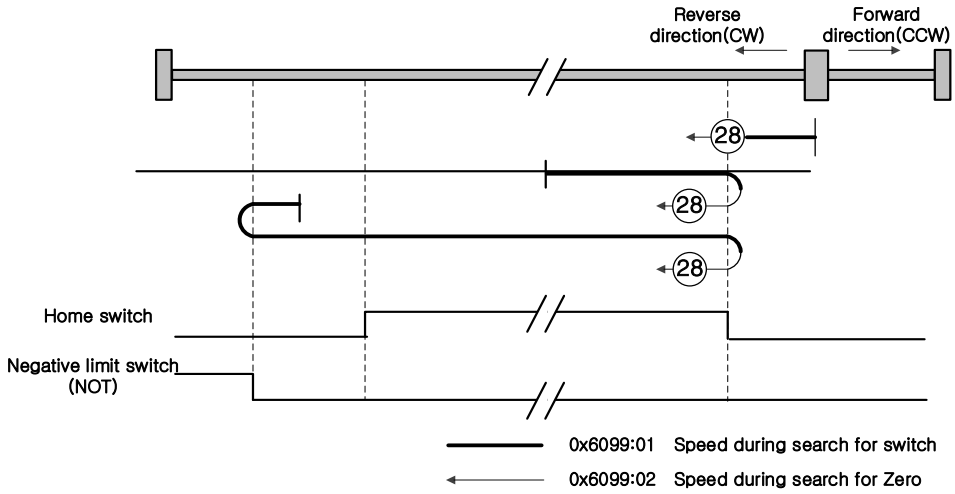
The methods from 11 to 13 are nearly identical to the method 14 in terms of the homing sequence. The only differences are the initial driving direction and Home switch polarity.

■ Method 24



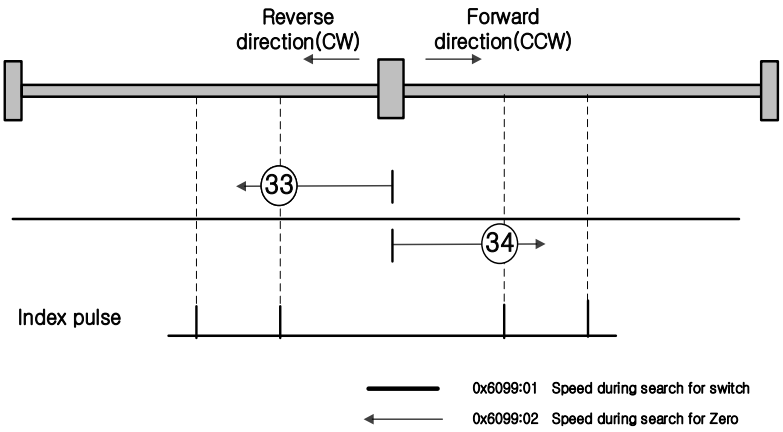
The initial driving direction is forward (CCW), and a point where the Positive Home Switch is turned on becomes the Home position.

■ Method 28



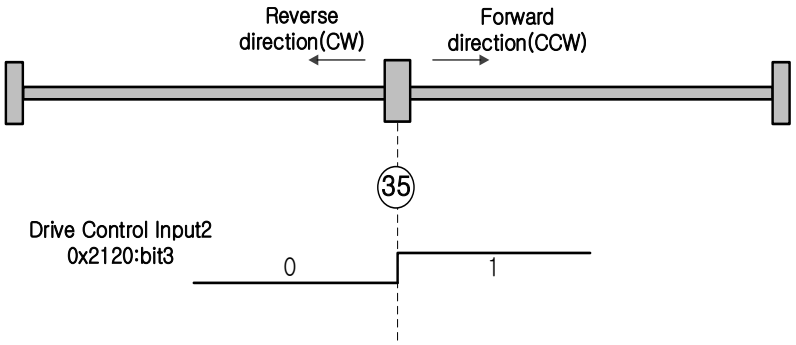
The initial driving direction is reverse (CW), and a point where the Negative Home Switch is turned on becomes the Home position.

■ Methods 33, 34



The initial driving direction is reverse (CW) for the method 33, and forward (CCW) for the method 34. The drive detects the index pulse at the Zero Search Speed.

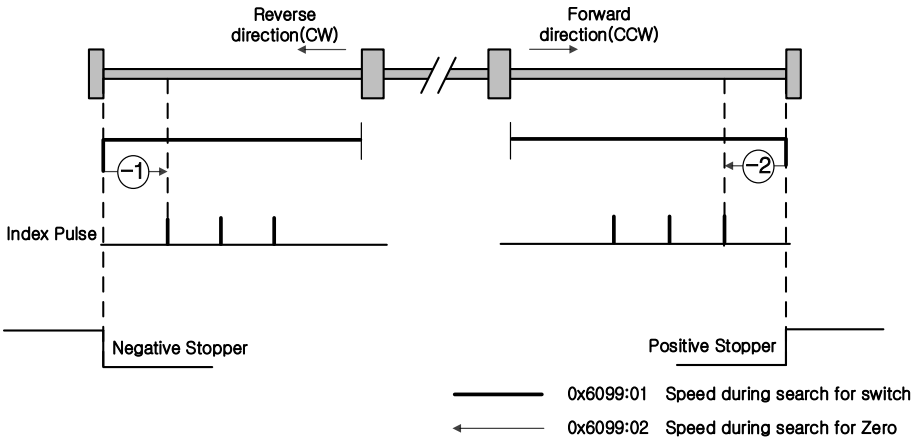
■ Method 35



The current position at startup of homing operation becomes the Home position. This method is used to change the current position to the origin depending on demand of the upper level controller.

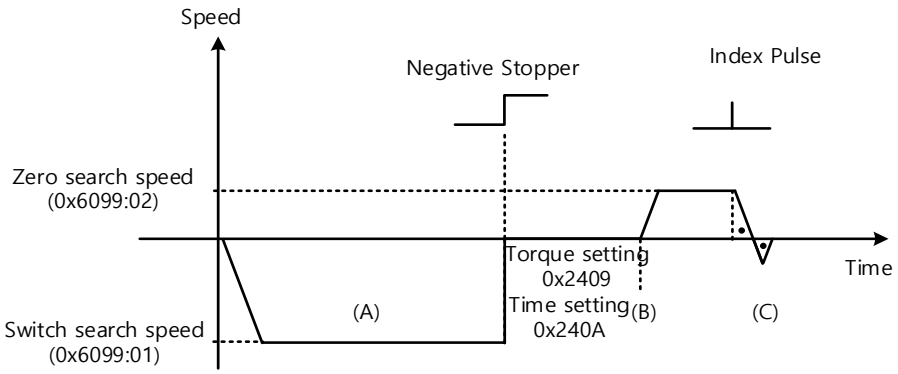
Homing methods -1, -2, -3 and -4 are supported by this drive besides the standard ones. They can be used if the Home switch is not used separately.

■ Methods -1, -2



Homing method -1 and -2 perform homing by using the Stopper and Index (Z) Pulse. The speed profile of each sequence is as follows. Please see below for detailed explanation.

Homing Method ㊀①

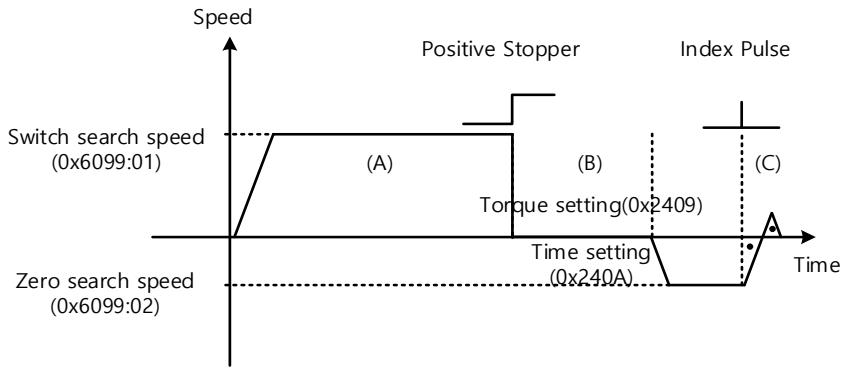


(A) The initial direction is reverse (CW). The motor operates at the switch search speed.

(B) If it collides with a reverse stopper (Negative Stopper), it waits according to the torque limit value (0x2409) when returning to the home using the stopper and the time set value (0x240A) when returning to the home using the stopper, and then changes direction.

(C) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

Homing Method ㊀②

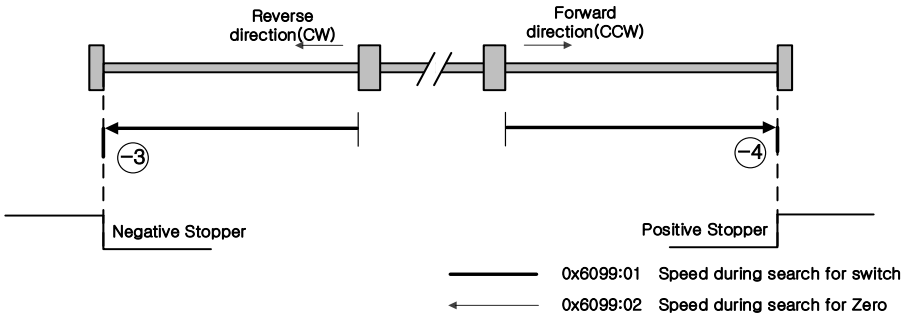


(A) The initial direction is forward (CCW). The motor operates at the switch search speed.

(B) When the drive hits the positive stopper, it will stand by according to the torque limit value (0x2409) and the time setting value (0x240A) at the time of homing using stopper before direction switch.

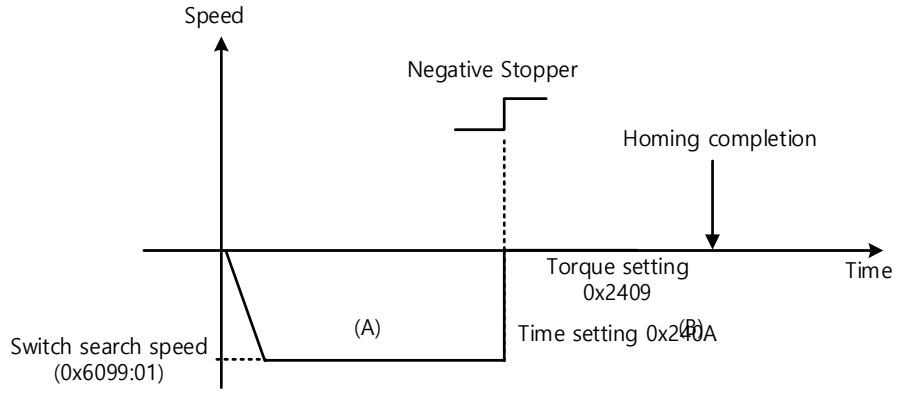
(C) While operating at the Zero Search Speed, the drive detects the first index pulse to move to the index position (Home).

■ Methods -3, -4



Homing method -3 and -4 only perform homing by using the Stopper. The speed profile of each sequence is as follows. Please see below for detailed explanation.

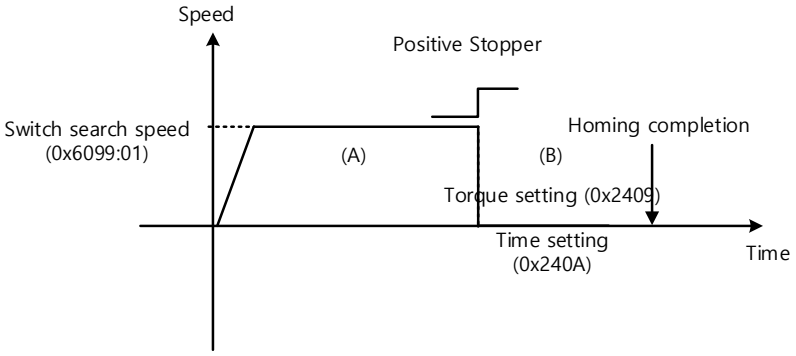
Homing Method ⊖3



(A) The initial direction is reverse (CW). The motor operates at the switch search speed.

(B) If it hits a reverse stopper (Negative Stopper), it waits according to the torque limit value (0x2409) when returning to the origin using the stopper and the time set value (0x240A) when returning to the origin using the stopper, and then the Home Return to the origin is completed.

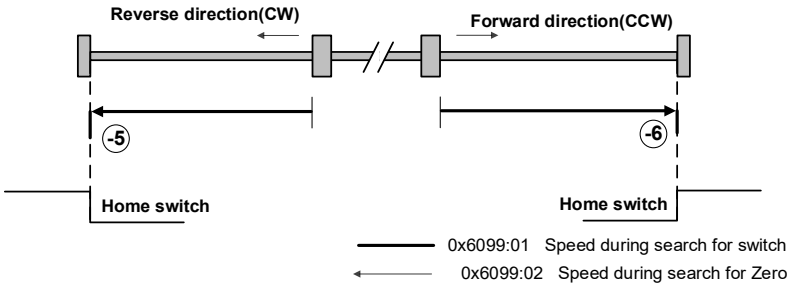
Homing Method ㉔



(A) The initial direction is forward (CCW). The motor operates at the switch search speed.

(B) When the drive hits the positive stopper, it will stand by according to the torque limit value (0x2409) and the time setting value (0x240A) at the time of homing using stopper before homing is complete.

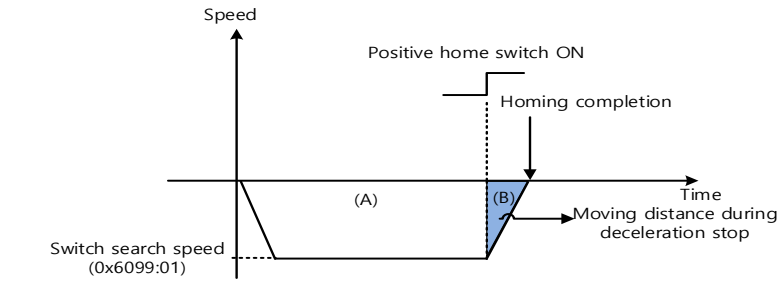
■ Methods -5, -6



Homing Methods -5, -6 uses only Home switch to return to origin. The speed profile of each sequence is as follows. When limit switch is detected, Homing is stopped. Please see the explanations below for further details.

(1) Cases where the home witch is off when homing begins, and the limit is not met in the process

Homing Method ㉕

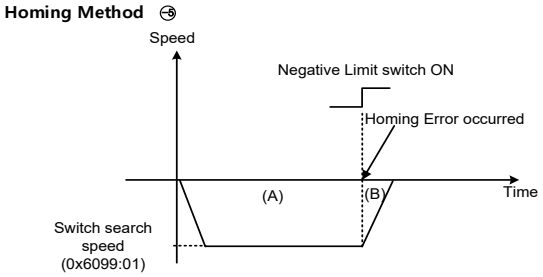


(A) The initial direction is reverse (CW). The motor operates at the switch search speed.

(B) When the positive home switch is on, the motor decelerates and stops. Then, home is Completed

(C) After homing completion, the deceleration stop transfer distance by the Homing Acceleration (0x609A) value is expressed as the current position.

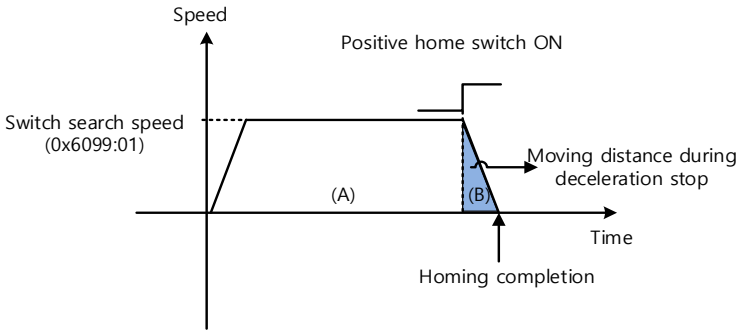
(1) At the start of homing, when the Home switch is OFF and the limit is met during operation



(A) The initial direction is reverse (CW). The motor operates at the switch search speed.

(B) When the negative limit switch is on, Homing Error is generated. And then the motor decelerated and stops

Homing Method ㉘



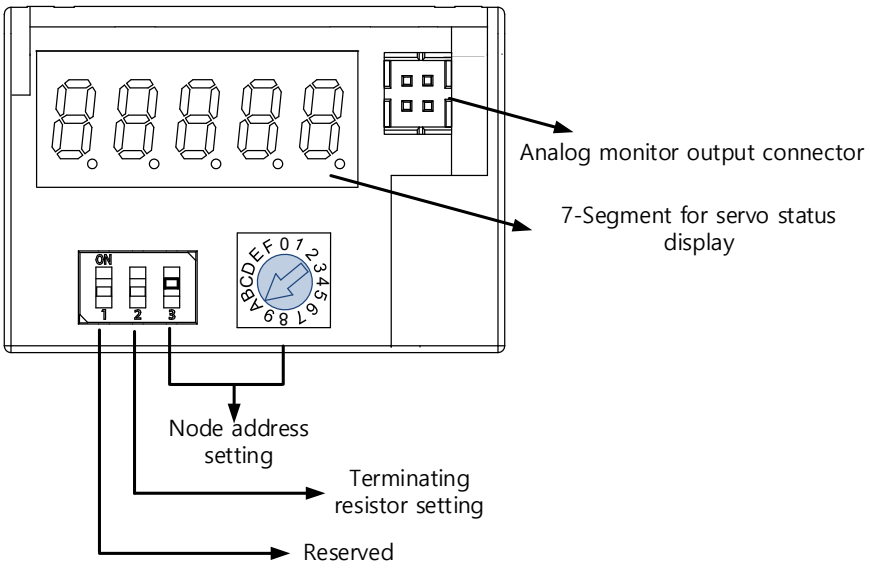
(A) The initial direction is forward (CCW). The motor operates at the switch search speed.

(B) When the positive home switch is on, the motor decelerates and stops. Then, home is Completed

(C) After homing completion, the deceleration stop transfer distance by the Homing Acceleration (0x609A) value is expressed as the current position.

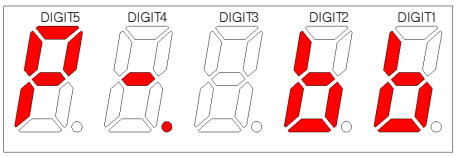
11. Drive Application Function

11.1 Drive Front Panel

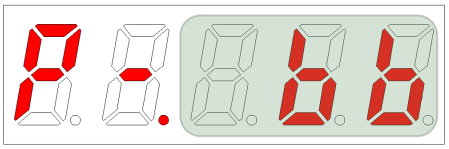
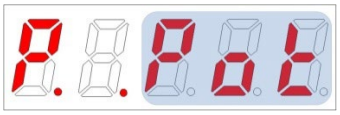
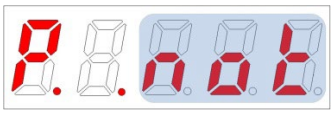
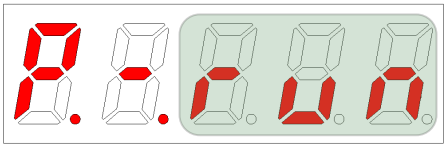
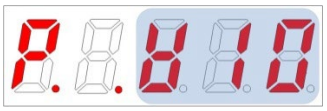


11.1.1 7-Segment for indicating servo status

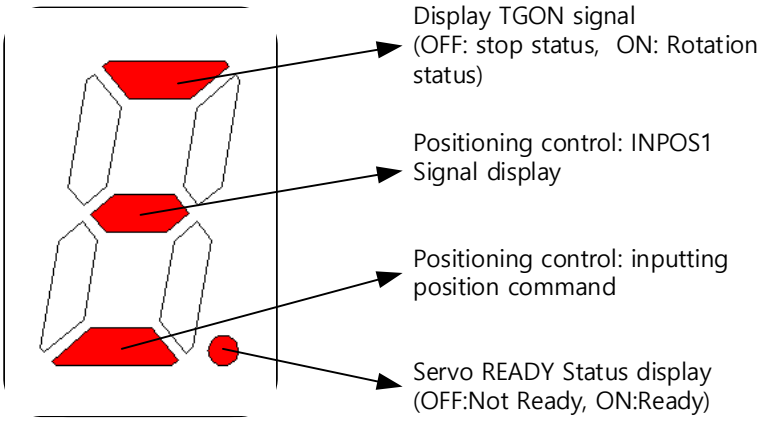
7-Segment for indicating servo status consists of 5 digits as shown below, in the order of Digit1→Digit5 from right to left:



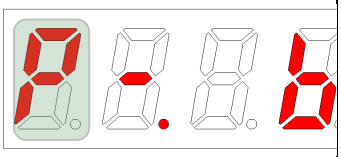
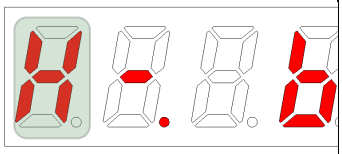
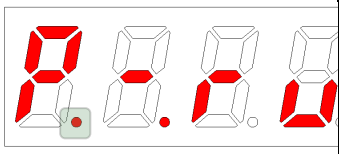
Three digits from Digits 3 to 1 of the 7 -Segment represents the drive status as described below if no servo alarm occurs. In case of servo warning, they will indicate the warning status first, rather than other ones.

Display of Digit 3 - Digit 1	Status details
 Servo OFF	 Positive limit sensor input
 Negative limit sensor input	 Servo ON
 Servo warning W10 occurred (code: 10)	

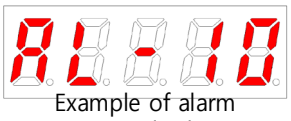
Digit4 indicates the current operation status and servo ready status.



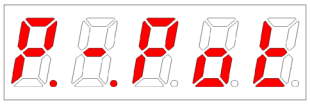
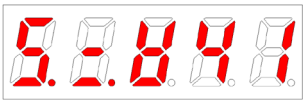
Digit5 displays the current control mode and servo ON status.

Displays operation mode and status		
		
Position control modes: Index, Pulse Input	Homing Mode	(ON: servo ON)

In case of servo alarm, the Digits 5-1 blink and are displayed as below. The Digit 2 and the Digit 1 represent the alarm code. The servo alarm is displayed first, rather than other states.



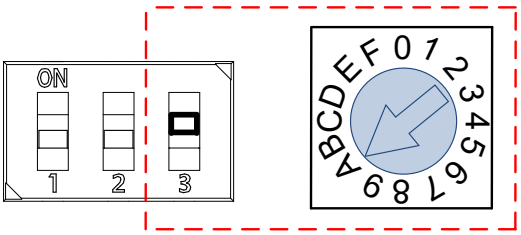
Example of alarm
status display
AL-10 (IPM Fault)

Ex. 1) Limit signal input	Ex. 2) Servo warning triggered
 DIGIT3~1: Forward limit input DIGIT4 : INPOS1, servo READY DIGIT5 : Positioning mode, Servo ON	 DIGIT3~1: W01(Main power fail)+W40(Low-voltage warning) occurred DIGIT4 : INSPD, Inputting Speed command, servo READY DIGIT5 : Speed control mode, servo ON

11.1.2 Configuration of Drive Node Address

Configure the drive node address. You can verify the set address in the node ID (0x2003). The value of the node setting switch is read just once when the power is turned on. Any set value modified subsequently will be in effect only when the power is turned on again.

In the case of this drive, it is composed of one rotary switch that can be set from 0 to 15 (F) and a toggle switch that can be turned ON/OFF as shown below, so node addresses from 0 to 31 can be set.



Rotary Switch setting	0	1	2	3	4	5	6	7	8	9	A
Toggle Switch setting	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Node address	0	1	2	3	4	5	6	7	8	9	10

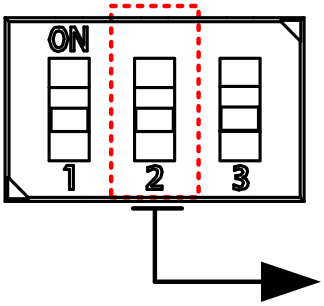
Rotary Switch setting	B	C	D	E	F	0	1	2	3	4	5
Toggle Switch setting	Off	Off	Off	Off	Off	ON	ON	ON	ON	ON	ON
Node address	11	12	13	14	15	16	17	18	19	20	21

Rotary Switch setting	6	7	8	9	A	B	C	D	E	F	-
Toggle Switch setting	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	
Node address	22	23	24	25	26	27	28	29	30	31	

11.1.3 Terminating resistor setting

In case of this drive, the terminating resistor used for RS-422 communication is configured inside the drive.

The value of terminating resistance inside the drive is 120Ω, and if you want to use terminating resistance, turn ON the setting switch in the figure below.

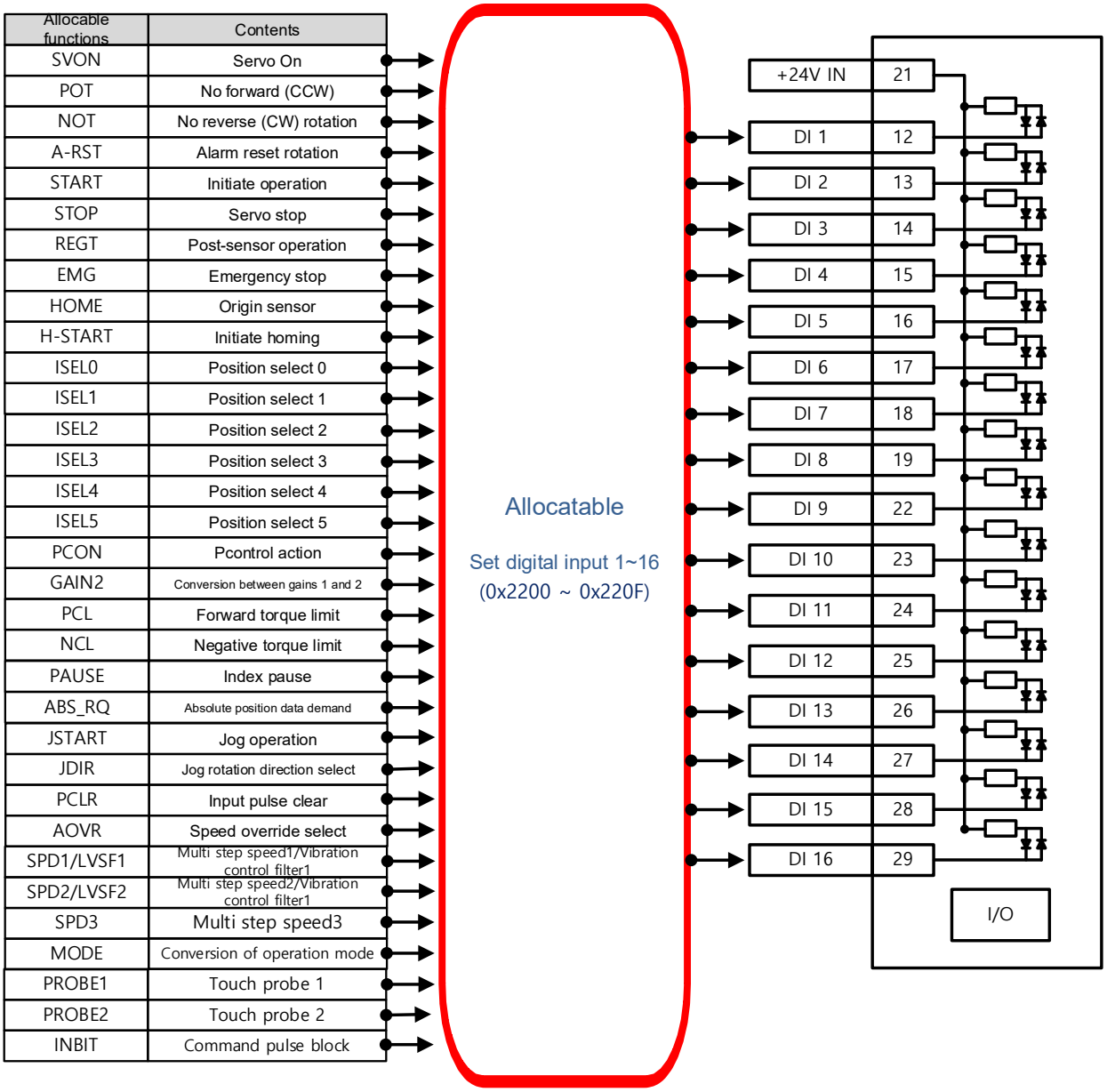


Terminating resistor setting switch
(OFF: not in use, ON: in use)

11.2 Input/Output Signals Setting

11.2.1 Allocation of digital input signals

Set the digital input signal function and input signal level of I/ O. As shown in the figure below, among the 30 input functions, the function to be used can be arbitrarily assigned to digital input signals 1 to 16.



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2200	-	Digital Input Signal 1 Selection	UINT	RW		-
0x2201	-	Digital Input Signal 2 Selection	UINT	RW		-
0x2202	-	Digital Input Signal 3 Selection	UINT	RW		-
0x2203	-	Digital Input Signal 4 Selection	UINT	RW		-
0x2204	-	Digital Input Signal 5 Selection	UINT	RW		-
0x2205	-	Digital Input Signal 6 Selection	UINT	RW		-
0x2206	-	Digital Input Signal 7 Selection	UINT	RW		-
0x2207	-	Digital Input Signal 8 Selection	UINT	RW		-
0x2208	-	Digital Input Signal 9 Selection	UINT	RW		-
0x2209	-	Digital Input Signal 10 Selection	UINT	RW		-
0x220A	-	Digital Input Signal 11 Selection	UINT	RW		-
0x220B	-	Digital Input Signal 12 Selection	UINT	RW		-
0x220C	-	Digital Input Signal 13 Selection	UINT	RW		-
0x220D	-	Digital Input Signal 14 Selection	UINT	RW		-
0x220E	-	Digital Input Signal 15 Selection	UINT	RW		-
0x220F	-	Digital Input Signal 16 Selection	UINT	RW		-

Bit	Setting
15	Signal input level settings (0: contact A, 1: contact B)
14~8	Reserved
7~0	Assign input signal.

Example] If the set value is 0x0006

0	0	0	6
A contact	-	Gain2 allocation	

Contact A: The default status is 0 (Low). Input 1 (High) to actuate it (Active High).

Contact B: The default status is 1 (High). Input 0 (Low) to actuate it (Active Low).

Set the digital input signal function and input signal level of the I/O connector. Select signals to assign with bits 7 - 0, and set the signal level to the bit 15.

Setting Value	Allocation signal
0x00	Do not assignment
0x01	POT
0x02	NOT
0x03	HOME
0x04	STOP
0x05	PCON
0x06	GAIN2
0x07	P_CL
0x08	N_CL
0x09	PROBE1
0x0A	PROBE2
0x0B	EMG
0x0C	A_RST
0x0F	SV_ON
0x10	START
0x11	PAUSE
0x12	REGT
0x13	HSTART
0x14	ISEL0
0x15	ISEL1
0x16	ISEL2
0x17	ISEL3
0x18	ISEL4
0x19	ISEL5
0x1A	ABSRQ
0x1B	JSTART / PJOG
0x1C	JDIR / NJOG
0x1D	PCLR
0x1E	AOVR
0X20	SPD1 / LVSF1
0X21	SPD2 / LVSF2
0X22	SPD3
0X23	MODE

■ Example of Assigning Digital Input Signals

The following table shows an example of assigning input signals. Please check the set value of 0x2200~0x220F.

DI 1	DI 2	DI 3	DI 4	DI 5	DI 6	DI 7	DI 8
SV_ON (Contact A)	POT (Contact A)	NOT (Contact A)	A-RST (Contact A)	START (Contact A)	STOP (Contact A)	REGT (Contact A)	EMG (Contact A)
DI 9	DI 10	DI 11	DI 12	DI 13	DI 14	DI 15	DI 16
HOME (Contact A)	HSTART (Contact A)	ISEL0 (Contact A)	ISEL1 (Contact A)	ISEL2 (Contact A)	ISEL3 (Contact A)	ISEL4 (Contact A)	ISEL5 (Contact A)

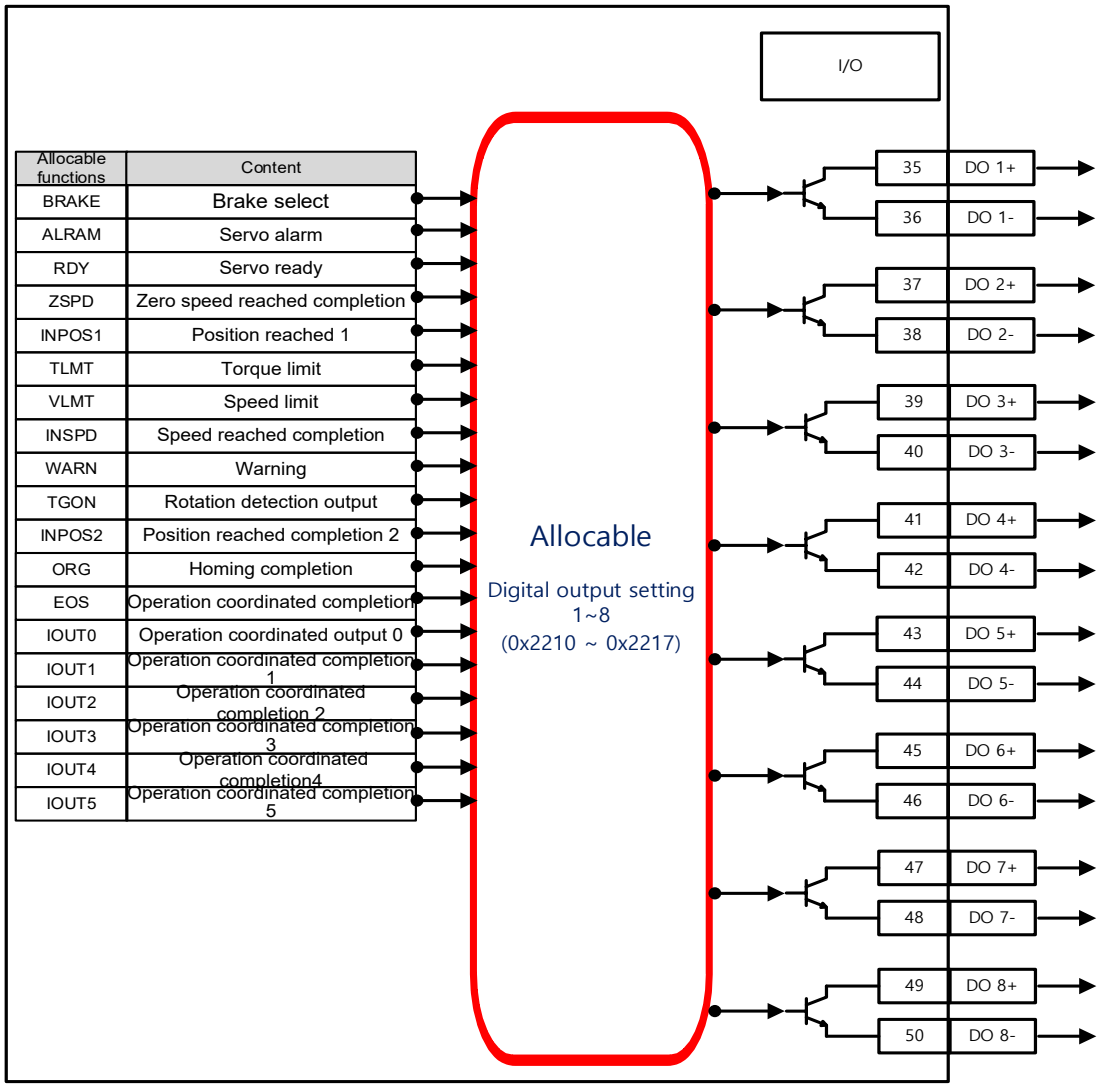
CN1 (Pin number)	Setting parameter	Bit		Setting value	Content
		15	7~0		
DI # 1 (12)	0x2200	0	0x0F	0x000F	SV_ON(A CP)
DI # 2 (13)	0x2201	0	0x01	0x0001	POT(A CP)
DI # 3 (14)	0x2202	0	0x02	0x0002	NOT(A CP)
DI # 4 (15)	0x2203	0	0x0C	0x000C	A-RST(A CP)
DI # 5 (16)	0x2204	0	0x10	0x0010	START(A CP)
DI # 6 (17)	0x2205	0	0x04	0x0004	STOP(A CP)
DI # 7 (18)	0x2206	0	0x12	0x0012	REGT(A CP)
DI # 8 (19)	0x2207	0	0x0B	0x000B	EMG(A CP)
DI # 9 (22)	0x2208	1	0x03	0x8003	HOME(B CP)
DI # A (23)	0x2209	1	0x13	0x8013	HSTART(B CP)
DI # B (24)	0x220A	0	0x14	0x0014	ISELO(A CP)
DI # C (25)	0x220B	0	0x15	0x0015	ISEL1(A CP)
DI # D (26)	0x220C	0	0x16	0x0016	ISEL2(A CP)
DI # E (27)	0x220D	0	0x17	0x0017	ISEL3(A CP)
DI # F (28)	0x220E	0	0x18	0x0018	ISEL4(A CP)
DI # 10 (29)	0x220F	0	0x19	0x0019	ISEL5(A CP)

* **Using B contact example**

CN1 (Pin number)	Setting parameter	Bit		Setting value	Content
		15	7~0		
DI # 1 (12)	0x2200	1	0x0F	0x800F	SV_ON(A CP)
DI # 2 (13)	0x2201	1	0x01	0x8001	POT(A CP)
DI # 3 (14)	0x2202	1	0x02	0x8002	NOT(A CP)

11.2.2 Assignment of Digital Output Signals

Set the digital output signal function and output signal level of the I/ O connector. As shown in the figure below, among the of 19 output functions, the function to be used can be arbitrarily assigned to digital output signals 1 to 8.



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2210	-	Digital output signal 1 selection	UINT	RW		-
0x2211	-	Digital output signal 2 selection	UINT	RW		-
0x2212	-	Digital output signal 3 selection	UINT	RW		-
0x2213	-	Digital output signal 4 selection	UINT	RW		-
0x2214	-	Digital output signal 5 selection	UINT	RW		-
0x2215	-	Digital output signal 6 selection	UINT	RW		-
0x2216	-	Digital output signal 7 selection	UINT	RW		-
0x2217	-	Digital output signal 8 selection	UINT	RW		-

Assign the functions of digital output signal of I/O and set the output signal level. Select signals to assign with bits 7 - 0, and set the signal level to the bit 15.

Bit	Setting content
15	Signal output level settings (0: contact A, 1: contact B)
14~8	Reserved
7~0	Output signal assignment

Setting Value	Assignable output signal
0x00	Do not assignment
0x01	BRAKE
0x02	ALARM
0x03	RDY
0x04	ZSPD
0x05	INPOS1
0x06	TLMT
0x07	VLMT
0x08	INSPD
0x09	WARN
0x0A	TGON
0x0B	INPOS2
0x10	ORG
0x11	EOS
0x12	IOUT0
0x13	IOUT1
0x14	IOUT2
0x15	IOUT3
0x16	IOUT4
0x17	IOUT5

■ Examples of Assigning Digital Output Signals

The following table shows examples of assigning output signals. Please check the set value of 0x2210~0x2217

DO#1	DO#2	DO#3	DO#4	DO#5	DO#6	DO#7	DO#8
ALARM (Contact B)	RDY (Contact A)	BRAKE (Contact B)	INPOS1 (Contact A)	ORG (Contact A)	EOS (Contact A)	TGON (Contact A)	TLMT (Contact A)

CN1 (Pin number)	Setting parameter	Bit		Setting value	Content
		15	7~0		
DO # 1 (35,36)	0x2210	1	0x02	0x8002	ALARM(B contact)
DO # 2 (37,38)	0x2211	0	0x03	0x0003	RDY(A contact)
DO # 3 (39,40)	0x2212	1	0x01	0x8001	BRAKE(B contact)
DO # 4 (41,42)	0x2213	0	0x05	0x0005	INPOS1(A contact)
DO # 5 (43,44)	0x2214	0	0x10	0x0010	ORG(A contact)
DO # 6 (45,46)	0x2215	0	0x11	0x0011	EOS(A contact)
DO # 7 (47,48)	0x2216	0	0x0A	0x000A	TGON(A contact)
DO # 8 (49,50)	0x2217	0	0x06	0x0006	TLMT(A contact)

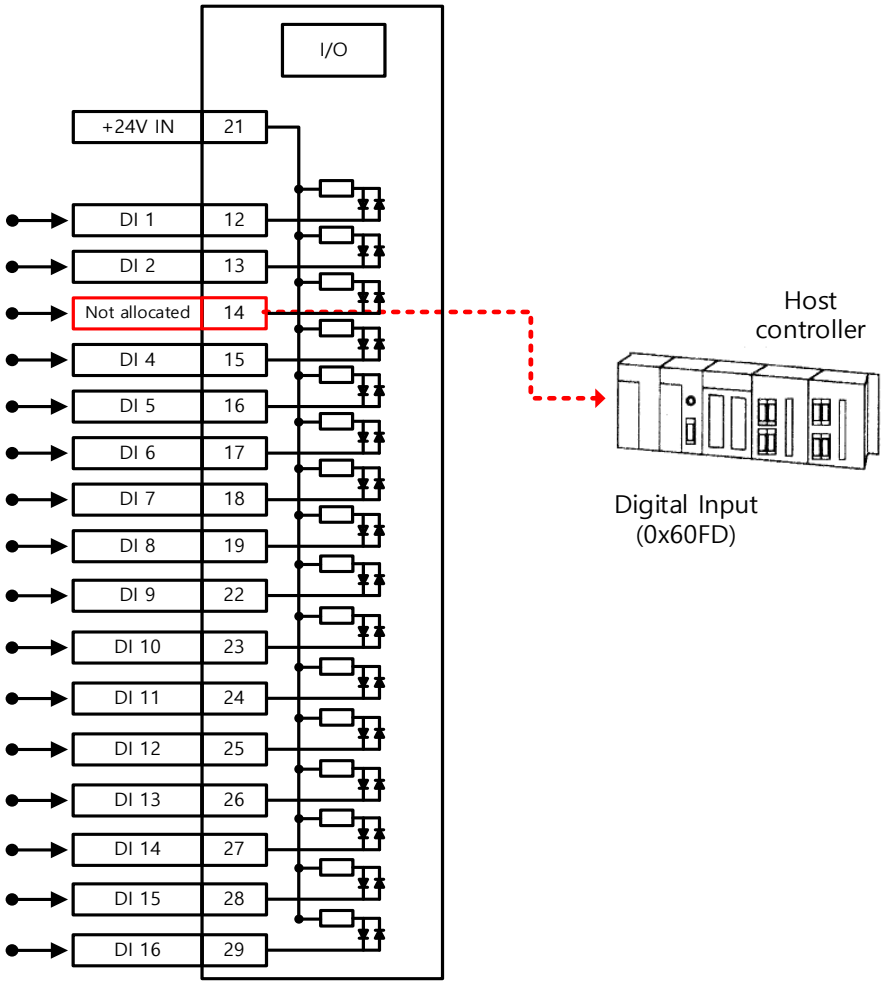
11.2.3 Use of User I/O

User I/O means that some of I/Os provided by the drive are used for individual purpose of the user, in addition to the purpose of controlling the drive itself. All contacts provided by the input/output connector (I/O) can be used as User I/O.

If only a few user I/Os are needed, you can wire the drive with the I/O connector rather than a separate I/O module, reducing the cost.

This drive is available with up to 16 points for input signals and 8 points for output signals as the user I/O.

■ How to Set User Input



1) Set the function of digital input port to be used as the user input to "Not assigned (setting value of 0)." (Refer to Assignment of Input Signals.)

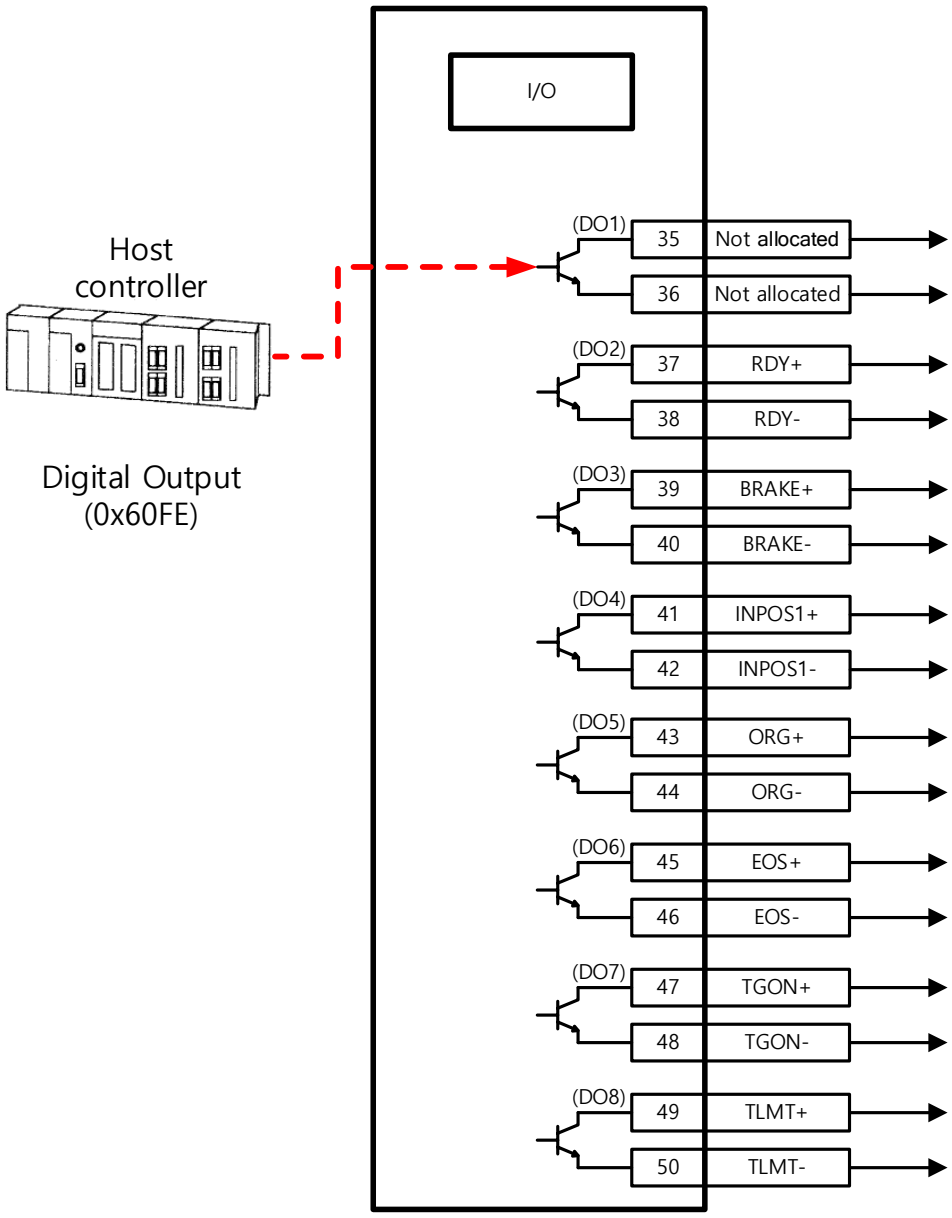
2) Read the values of the corresponding bits (0x60FD.16-31 from the digital input (0x60FD), in order to use them as the user input.

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO Assignment	Unit
0x60FD	-	Digital input	UDINT	RO	Yes	-

Bit	Description
0	NOT (negative limit switch)
1	POT (positive limit switch)
2	HOME (origin sensor input)
3 to 15	Reserved
16	DI #1(I/O pin 12), 0:Open, 1:Close
17	DI #2(I/O pin 13), 0:Open, 1:Close
18	DI #3(I/O pin 14), 0:Open, 1:Close
19	DI #4(I/O pin 15), 0:Open, 1:Close
20	DI #5(I/O pin 16), 0:Open, 1:Close
21	DI #6(I/O pin 17), 0:Open, 1:Close
22	DI #7(I/O pin 18), 0:Open, 1:Close
23	DI #8(I/O pin 19), 0:Open, 1:Close
24	DI #9(I/O pin 22), 0:Open, 1:Close
25	DI #A(I/O pin 23), 0:Open, 1:Close
26	DI #B(I/O pin 24), 0:Open, 1:Close
27	DI #C(I/O pin 25), 0:Open, 1:Close
28	DI #D(I/O pin 26), 0:Open, 1:Close
29	DI #E(I/O pin 27), 0:Open, 1:Close
30	DI #F(I/O pin 28), 0:Open, 1:Close
31	DI #10(I/O pin 29), 0:Open, 1:Close

■ How to Set User Output



1) Set the function of digital output port to be used as the user output to "Not assigned (setting value of 0)." (Refer to Assignment of Output Signals.)

2) Set the bits (bits 16-23) corresponding to the port used as the user output for the bit mask (0x60FE:02) to Forced Output Enabled (setting value: 1)

3) Using physical outputs (0x60FE:01), set the value corresponding to the user output for the relevant port (bits 16-23) to 0 or 1.

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x60FE	-	Digital output	-	-	-	-
	0	Number of entries	USINT	RO	No	
	1	Physical outputs	UDINT	RW	Yes	-
	2	Bit mask	UDINT	RW	No	-

They indicate the status of digital outputs.

- Description of physical outputs

Bit	Description
0 to 15	Reserved
16	Forced output (0: OFF, 1: ON) of DO #1 (I/O pins 35 and 36) When the relevant bit mask (0x60FE:02.16) is set to 1.
17	Forced output (0: OFF, 1: ON) of DO #2 (I/O pins 37 and 38) When the relevant bit mask (0x60FE:02.17) is set to 1.
18	Forced output (0: OFF, 1: ON) of DO #3 (I/O pins 39 and 40) When the relevant bit mask (0x60FE:02.18) is set to 1.
19	Forced output (0: OFF, 1: ON) DO #4 (I/O pins 41 and 42) When the relevant bit mask (0x60FE:02.19) is set to 1.
20	Forced output (0: OFF, 1: ON) of DO #5 (I/O pins 43 and 44) When the relevant bit mask (0x60FE:02.20) is set to 1.
21	Forced output (0: OFF, 1: ON) of DO #6 (I/O pins 45 and 46) When the relevant bit mask (0x60FE:02.21) is set to 1.
22	Forced output (0: OFF, 1: ON) of DO #7 (I/O pins 47 and 48) When the relevant bit mask (0x60FE:02.22) is set to 1.
23	Forced output (0: OFF, 1: ON) of DO #8 (I/O pins 49 and 50) When the relevant bit mask (0x60FE:02.23) is set to 1.
24	Output status of DO #1 (0: OFF, 1: ON)
25	Output status of DO #2(0: OFF, 1: ON)
26	Output status of DO #3(0: OFF, 1: ON)
27	Output status of DO #4(0: OFF, 1: ON)
28	Output status of DO #5(0: OFF, 1: ON)
29	Output status of DO #6(0: OFF, 1: ON)
30	Output status of DO #7(0: OFF, 1: ON)
31	Output status of DO #8(0: OFF, 1: ON)

- Description of bit mask

Bit	Description
0 to 15	Reserved
16	Forced output setting (0: Disable, 1: Enable) of DO #1 (I/O pins 1 and 36)
17	Forced output setting (0: Disable, 1: Enable) of DO #2 (I/O pins 37 and 38)
18	Forced output setting (0: Disable, 1: Enable) of DO #3 (I/O pins 39 and 40)
19	Forced output setting (0: Disable, 1: Enable) of DO #4 (I/O pins 41 and 42)
20	Forced output setting (0: Disable, 1: Enable) of DO #1 (I/O pins 1 and 44)
21	Forced output setting (0: Disable, 1: Enable) of DO #2 (I/O pins 45 and 46)
22	Forced output setting (0: Disable, 1: Enable) of DO #3 (I/O pins 47 and 48)
23	Forced output setting (0: Disable, 1: Enable) of DO #4 (I/O pins 49 and 50)
24 to 31	Reserved

11.3 Electric Gear Setup

11.3.1 Electric Gear

This function sets the electric gear when you want to drive a motor by so-called user unit, the minimum unit in which the user intends to give a command.

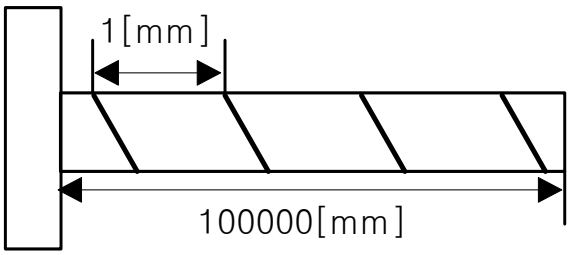
When using the electric gear function of the drive, you cannot utilize the highest resolution of the encoder; thus, in case the upper level controller has the function, please use it if possible.

Set the gear ratio within the range of 1000-1/1000.

Typically, electric gears are used in the following situations:

(1) When Driving Loads Based on User Unit

- Electronic Gear provides convenience by converting User Unit [UU] into the unit desired by the user.



For example, let us assume that there is a ball screw that moves 1 [mm] per motor revolution. At this time, the resolution of the motor is 524288[ppr]. That is, to move 1 [mm], 524288 [Pulses] must be input to the servo If you want to move 27 [mm], you need to do additional calculations and the user must directly input the massive value of 14155776 [Pulse].

However, the inconvenience of command value input can be improved when gear ratio is used.

For example, if you want to move 1[mm] by inputting 1[Pulses] to the servo, try setting the gear ratio as follows.

$$\frac{Motor\ Resolution[0x6091.1]}{Shaft\ Resolution[0x6091.2]} \times \text{User Demand Pulse[UU]}$$

$$= \frac{524288}{1} \times 1[UU] = 524288[UU] = 1[mm]$$

Entering 524288 in the motor resolution and 1 in the shaft resolution internally sets the movement ratio of the ball screw for one revolution of the motor. When moving 1 [mm], the user only needs to input 1, which is the same value as 1 [mm], in User Demand Pulse, so the unit is the same, so it is convenient for command input.

As another example, if you want to move 0.0001 [mm] when you input 1 [UU], the gear ratio calculation formula is as follows.

$$\frac{Motor\ Resolution[0x6091.1]}{Shaft\ Resolution[0x6091.2]} \times \text{User Demand Pluse[UU]}$$

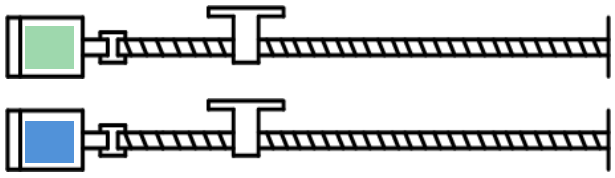
$$= \frac{524288}{10000} \times 1[UU] = \frac{1[mm]}{10000} \times 1[\mathrm{UU}] = 0.0001[\mathrm{mm}]$$

With the above gear ratio setting, it is possible to move by 0.0001 [mm]/1 [UU], and when inputting 10 [UU], it is possible to move by 0.001 [mm], so the user can conveniently input the desired unit [UU].

- You can command the driving based on the user unit, regardless of the encoder (motor) type. For the ball screw type of encoder with a pitch of 10 mm, the comparison is given below for 12 mm of movement:

(A) 5000ppr encoder

(B) 19 bit encoder



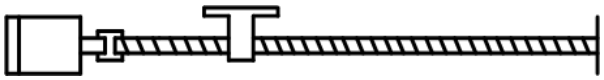
	(A) 5000 ppr encoder	**(B) 19-bit encoder**
Electric Gear Disable	5000*12/10 = 6000	524288*12/10=629145.6
	Different command should be given depending on the encoder (motor) used for the same distance movement.	
For a command given in the minimum user unit of 1 um (0.001 mm)		
Electric gear settings	Motor Revolutions = 5000 Shaft Revolutions = 10000	Motor Revolutions = 524288 Shaft Revolutions = 10000
If the electric gear is used	Can move through the same command of 12000 (12 mm= 12000 * 1 um), regardless of the encoder (motor) used.	

(2) When Driving High-Resolution Encoder at High Speed but Output Frequency of Upper Level Controller or Input Frequency of Drive is Limited

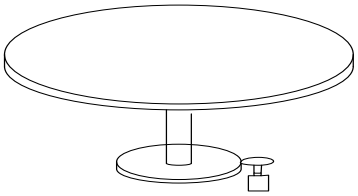
- The output frequency of a general high-speed line drive pulse output unit is approximately 500 Kpps, while the allowed input frequency of the drive is approximately 1-4 Mpps. For this reason, when driving a high-resolution encoder at high speed, be sure to use an electric gear for proper driving due to the limitations of the output frequency of the upper level controller and the input frequency of the drive.

11.3.2 Example of Electric Gear Setup

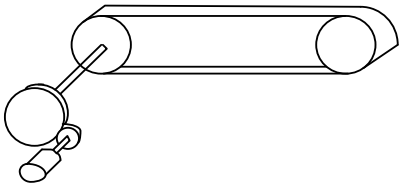
■ Ball Screw Load

Apparatus specification	 **Pitch: 10 mm, Reduction gear ratio: 1/1**
User Unit	1um(0.001mm)
Encoder specification	19-bit (524288 PPR)
Amount of load movement/revolution	10[mm] = 10000[User Unit]
Electric gear settings	Motor Revolutions : 524288 Shaft Revolutions : 10000

■ Turntable Load

Apparatus specification	 **Reduction gear ratio: 100/1**
User Unit	0.001°
Encoder specification	19-bit (524288 PPR)
Amount of load movement/revolution	360/100/0.001=3600
Electric gear settings	Motor Revolutions : 524288 Shaft Revolutions : 3600

■ Belt + Pulley System

Apparatus specification	 **Reduction gear ratio: 10/1, Pulley diameter: 100mm**
User Unit	1um(0.001mm)
Encoder specification	19-bit (524288 PPR)
Amount of load movement/revolution	PI*100/10/0.001=31416
Electric gear settings	Motor Revolutions : 524288 Shaft Revolutions : 31416

11.3.3 Calculation of speed and acceleration/deceleration when using electronic gear

- Index Velocity setting method

The ratio of speed and acceleration/deceleration when the gear ratio is 1:1 is as follows.

$$EncoderPulseperResolution[ppr]:60[rpm] = IndexVelocity[uu/s]:DemandSpeed[rpm]$$

If the user wants to drive a 19-bit motor at a speed of 3000 [rpm], the velocity value of the index is calculated as follows.

$$524288[ppr]:60[rpm] = IndexVelocity[uu/s]:3000[rpm]$$

$$IndexVelocity[uu/s] = 26214400[uu/s]$$

If the gear ratio is not 1:1, the speed will be affected by the gear ratio. Therefore, consider the value of the gear ratio and use the following formula.

$$IndexVelocity[UU/sec] = DemandSpeed[rpm] \times \frac{EncoderPulseperResolution}{MotorResolution} \times \frac{ShaftResolution}{60[rpm]}$$

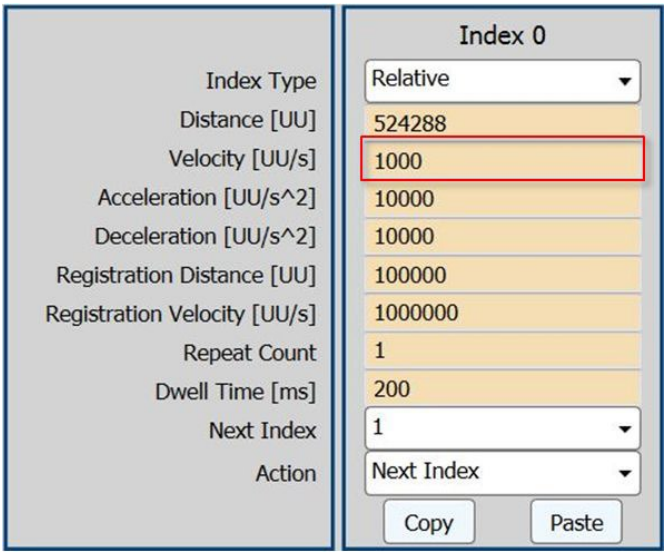
※ Application example

When applying Motor Resolution: 524288 / Shaft Resolution:.

Calculate Index Velocity input value when the user wants to drive at 3000 [rpm]

$$IndexVelocity[UU/sec] = 3000[rpm] \times \frac{524288}{524288} \times \frac{20}{60[rpm]}$$

$$IndexVelocity[uu/s] = 1000[UU/sec]$$



If 1000 [UU/s] is input to Index Velocity, it drives at 3000 [rpm].

- Index Acceleration / Deceleration setting method

Acceleration and Deceleration are set based on the arrival time and set using the index Velocity value.

$$\text{Time of concentration}[\text{sec}] = \frac{Velocity[uu/s]}{Acceleration\ or\ Deceleration[uu/sec^2]}$$

Time of concentration means the time it takes for the Feedback Speed to reach the Velocity registered by the user as the target reaching time.

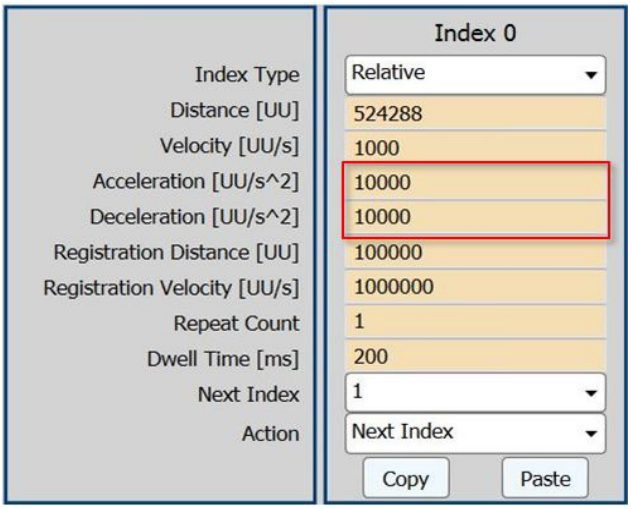
※ Application example

When applying Motor Resolution: 524288 / Shaft Resolution:

20 gear ratio to a 19-bit motor, if you want the feedback speed to reach 3000 [rpm] in 0.1 second

$$0.1[\text{sec}] = \frac{1000[uu/s]}{Acceleration\ or\ Deceleration[uu/sec^2]}$$

$$Acceleration\ or\ Deceleration[uu/sec^2] = 10000[UU/sec]$$



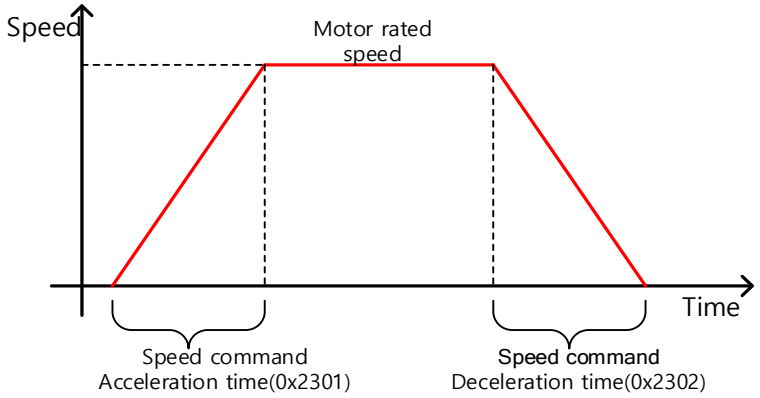
Therefore, the values of Acceleration and Deceleration can be set as above.

11.4 Settings Related to Speed Control

11.4.1 Smooth Acceleration and Deceleration

For smoother acceleration and deceleration during speed control, you can generate an acceleration/deceleration profile with trapezoidal and S-curved shapes for driving. At this moment, S-curve operation is enabled by setting the speed command S-curve time to a value of 1 [ms] or more. Available only in speed operation mode.

The speed command acceleration/deceleration time (0x2301 and 0x2302) is the time needed to accelerate the drive from zero speed to the rated speed or to decelerate it from the rated speed to zero speed.

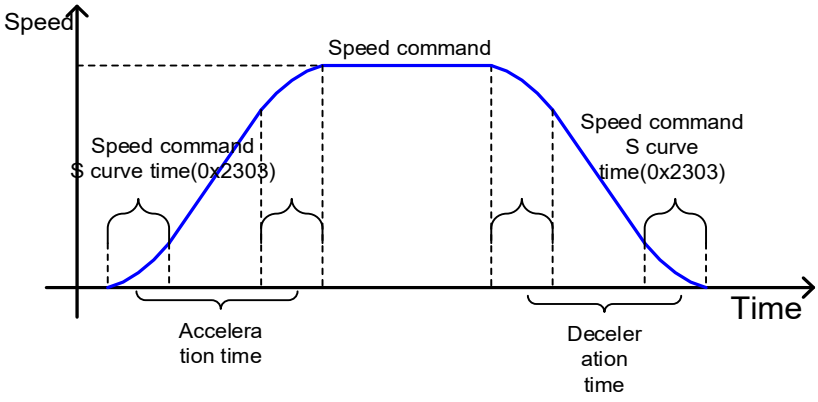


You can calculate the actual acceleration/deceleration time as below:

Acceleration time = speed command / rated speed x speed command acceleration time (0x2301)

Deceleration time = speed command / rated speed x speed command deceleration time (0x2302)

As shown in the figure below, you can generate an S-curve shaped acceleration/deceleration profile for driving by setting the speed command S-curve time (0x2303) at a value of 1 or more. Make sure to verify the relationship between the acceleration/deceleration time and S-curve time.



11.4.2 Servo-lock Function

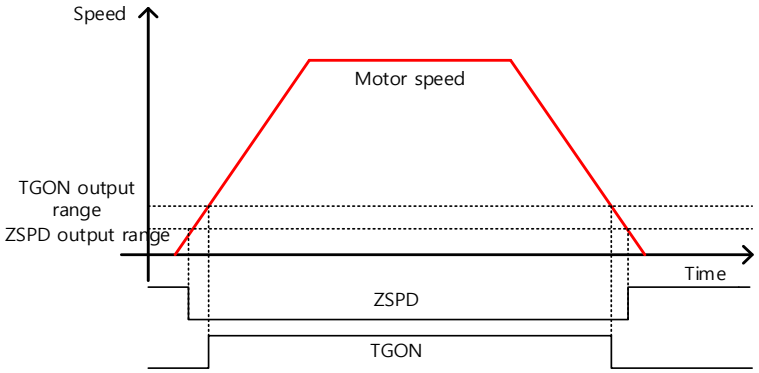
During the speed control operation, the servo position will not be locked even when 0 is entered for a speed command. This is due to the characteristic of speed control; at this moment, you can lock the servo position by enabling the servo-lock function (0x2311).

Setting Value	Setting content
0	Servo-lock function disabled
1	Servo-lock function enabled

Using the servo-lock function, the position is internally controlled relative to the position at the time of inputting 0 as a speed command. When an external force is applied in a certain direction in a stopped state, a larger torque in the opposite direction is immediately generated to return to the input position of 0. If you input a speed command other than 0, the speed control will be switched to the normal mode.

11.4.3 Signals Related to Speed Control

As shown in the figure below, when the value of speed feedback is not more than the ZSPD output range (0x2404), a ZSPD (zero speed) signal will be output; and when it is not less than the TGON output range (0x2405), a TGON (motor rotation) signal will be output.



In addition, if the difference between the command and the speed feedback (i.e., speed error) is not more than the INSPD output range (0x2406), an INSPD (speed match) signal will be output.

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2404	-	ZSPD Output Range	UINT	RW	Yes	rpm
0x2405	-	TGON Output Range	UINT	RW	Yes	rpm
0x2406	-	INSPD Output Range	UINT	RW	Yes	rpm

11.5 Settings Related to Position Control

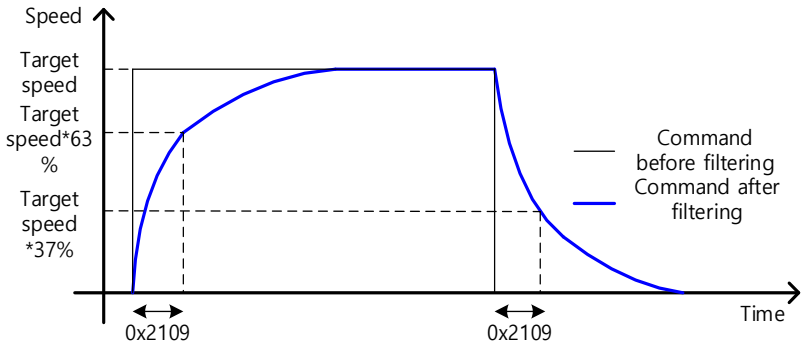
11.5.1 Position Command Filter

This section describes how to operate the drive more smoothly by applying a filter to a position command. For the purpose of filtering, you can set position command filter time constant (0x2109) using the primary low pass filter and position command average filter time constant (0x210A) using the moving average.

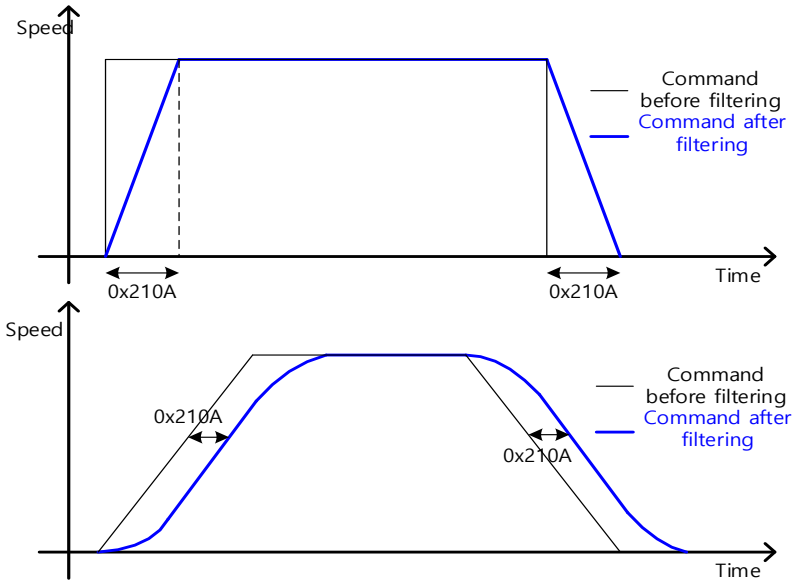
You can use a position command filter if:

(1) If the electric gear ratio is 10 times or above

(2) The acceleration/deceleration profile cannot be generated from the upper level controller.



Position command filter using position command filter time constant (0x2109)



Position command filter using position command average filter time constant (0x210A)

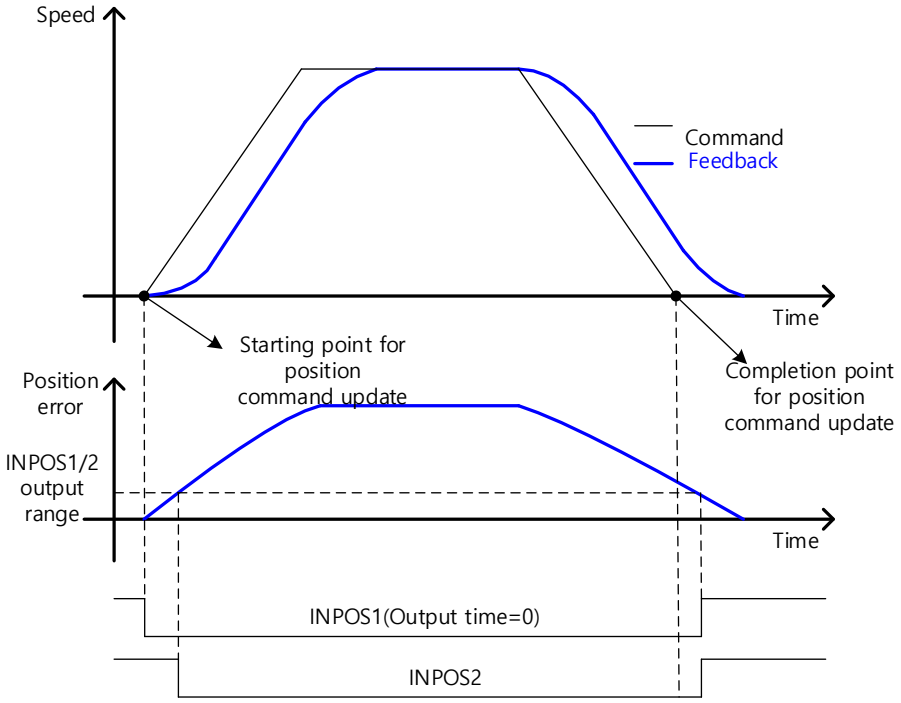
■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2109	-	Position Command Filter Time Constant	UINT	RW	Yes	0.1ms
0x210A	-	Position Command average filter time constant	UINT	RW	Yes	0.1ms

11.5.2 Signals Related to Position Control

As shown in the figure below, if the value of position error (i.e., the difference between the position command value input by the upper level controller and the position feedback value) is not more than the INPOS1 output range (0x2401), and is maintained for the INPOS1 output time (0x2402), the INPOS1 (position completed 1). Signal will be output, when the position command is not renewed.

At this moment, if the position error value is not more than the INPOS2 output range (0x2403), the INPOS2 (position completed 2) signal will be output, regardless of whether the position command has been renewed or not.

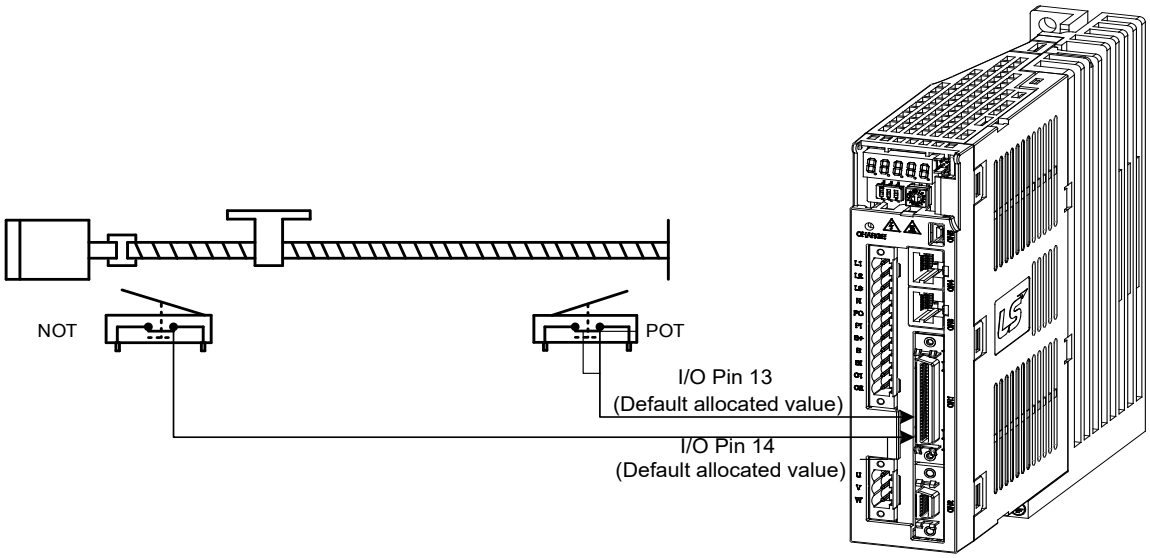


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2401	-	INPOS1 Output Range	UINT	RW	Yes	UU
0x2402	-	INPOS1 Output Time	UINT	RW	Yes	ms
0x2403	-	INPOS2 Output Range	UINT	RW	Yes	UU

11.6 Positive/Negative Limit Settings

This function is to safely operate the drive within the movable range of the apparatus using the positive/negative limit signals of the drive. Be sure to connect and set the limit switch for safe operation. For more information about the settings, refer to 5.2.1 Assignment of Digital Input Signals.



If the positive/negative limit signals are input, the motor will stop according to the emergency stop setting (0x2013).

Setting Value	Description
0	The motor will stop according to the method set in the dynamic brake control mode (0x2012). It will stop using the dynamic brake, and then maintain the torque command at 0.
1	Decelerates to stop using the emergency stop torque (0x2113).

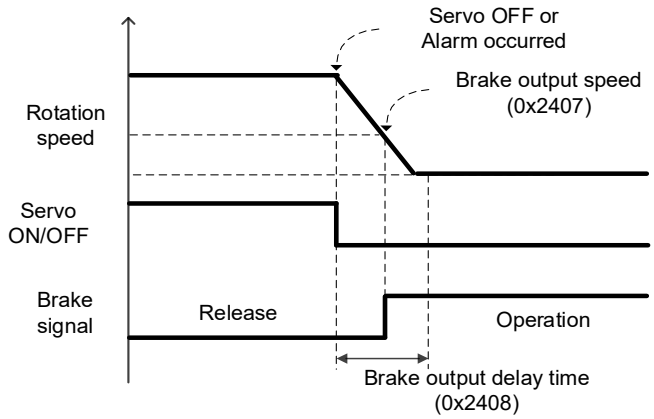
■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2012	-	Dynamic Brake Control Mode	UINT	RW	No	-
0x2013	-	Emergency Stop Configuration	UINT	RW	No	-
0x2113	-	Emergency Stop Torque	UINT	RW	Yes	-

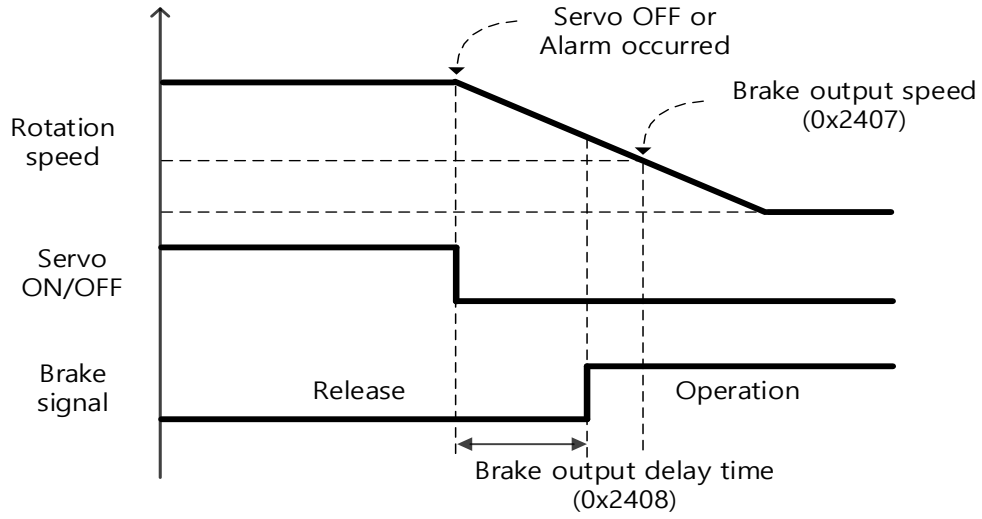
11.7 Setting the Brake Output Signal Function

If the motor stops due to servo OFF or servo alarm during rotation, you can set the speed (0x2407) and delay time (0x2408) for brake signal output, in order to configure the output timing.

The brake signal will be output if the motor rotation speed goes below the set speed (0x2407) or the output delay time (0x2408) has elapsed after the servo OFF command.



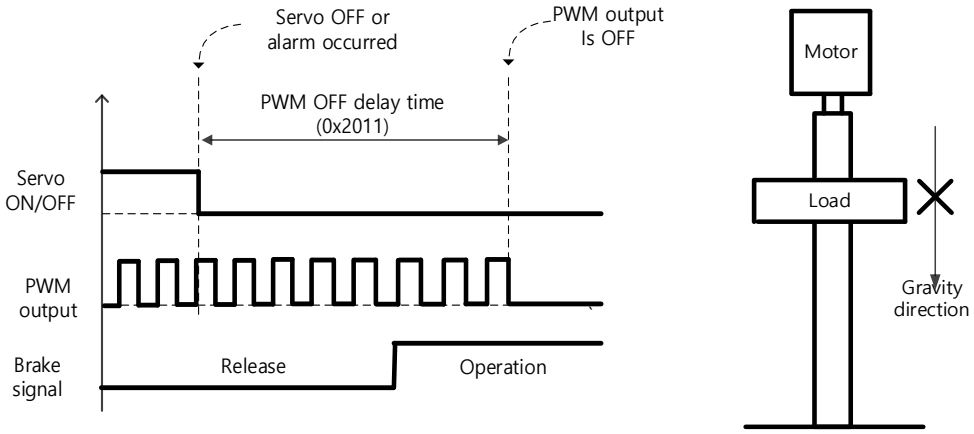
Timing diagram for signal output by the brake output speed (0x2407)



Timing diagram for signal output by the brake output delay time (0x2408)

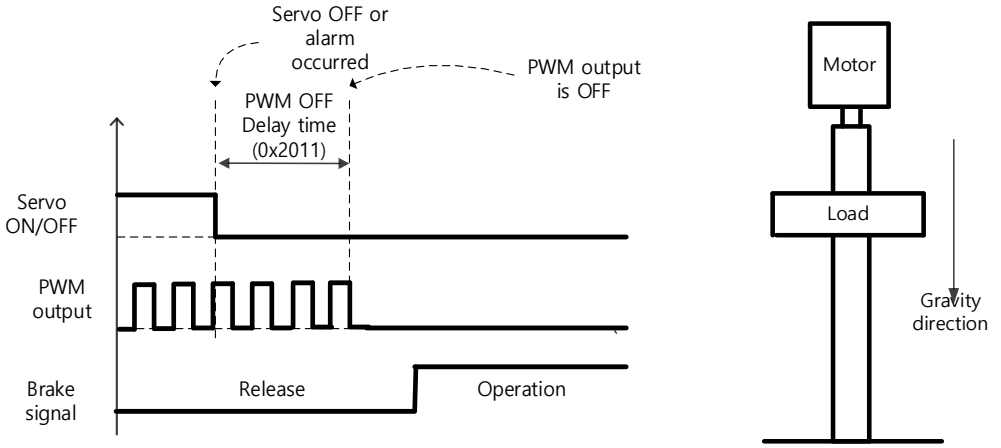
Set the time to delay until the actual PWM output goes off when the servo is turned off or a servo alarm occurs.

When using a motor with a brake installed on the vertical axis, you can output the brake signal first, and then turn off the PWM after this set time, in order to prevent it from running down along the axis.



(1) If Brake Signal Outputs First Before PWM Output Turns off

You can output the brake signal first before the PWM output is turned off, preventing the drop along the vertical axis due to the gravity.



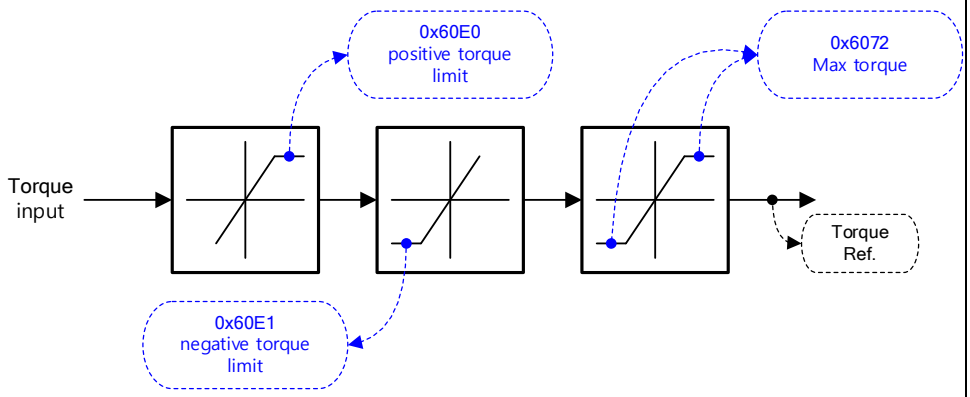
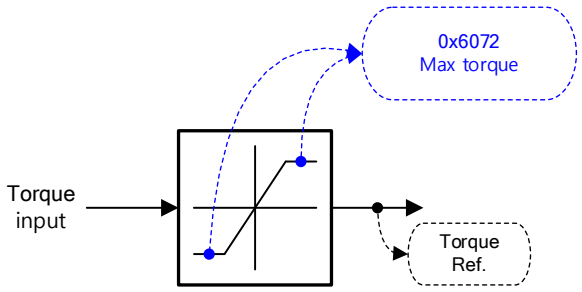
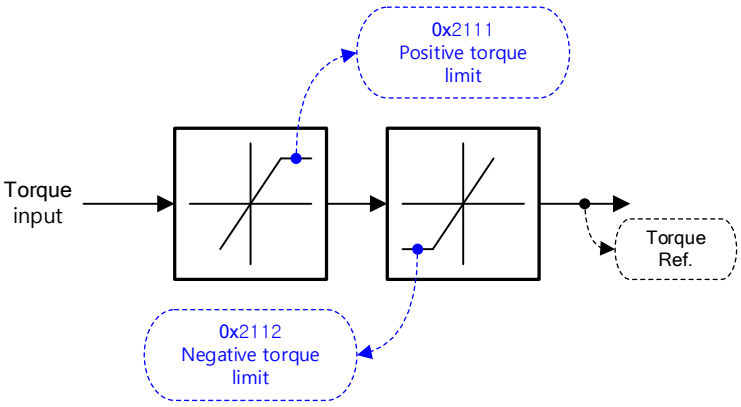
(2) If PWM Output Turns off First Before Brake Signal Outputs

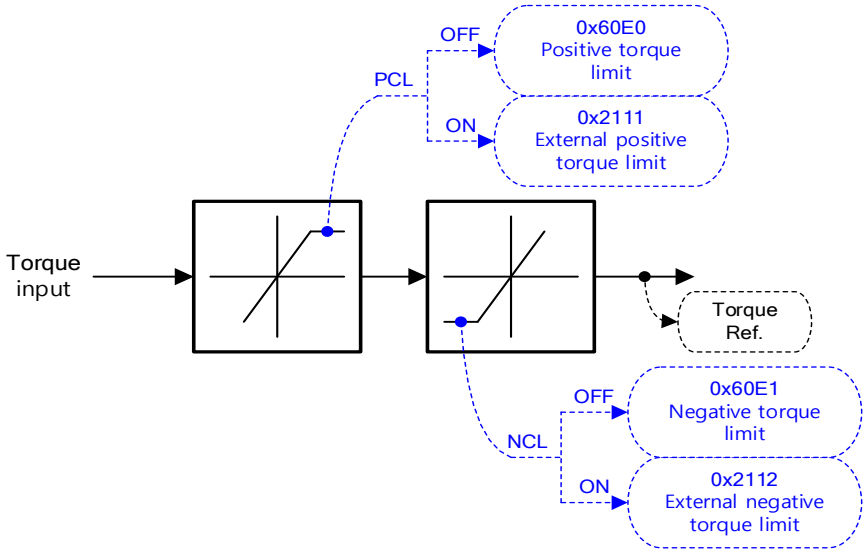
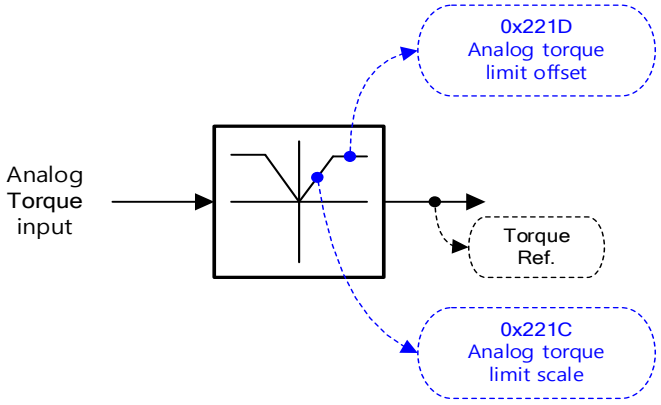
The PWM output is turned off first before the brake signal output, allowing the drop along the vertical axis due to the gravity.

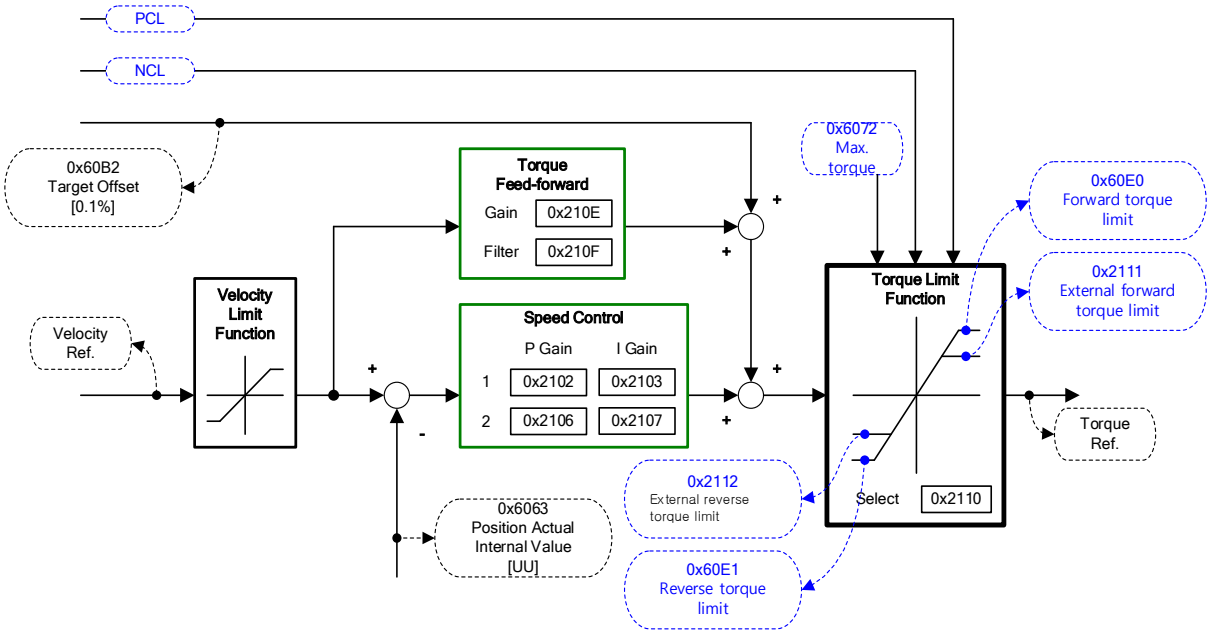
11.8 Torque Limit Function

You can limit the drive output torque to protect the machine. It can be set by the torque limit function (0x2110). The setting unit of torque limit value is 0.1%.

- Description of Torque Limit Function Setting (0x2110)

Limit function	Description
Internal torque limit 1 (set value 0)	 Limits the torque using positive/negative torque limit value according to the driving direction; the maximum value is limited by the maximum torque (0x6072). - Forward: 0x60E0, Reverse: 0x60E1
Internal torque limit 2 (set value 1)	 Limits the torque only by the maximum torque (0x6072) regardless of the driving direction.
External torque limit (set value 2)	 Limits the torque using external positive/negative torque limit value according to the driving direction. - Forward: 0x2111, Reverse: 0x2112

Internal and external torque limits (set value 3)	 Limits the torque using internal and external torque limit value according to the driving direction and the torque limit signal. - Forward: 0x60E0(if PCL signal is not input), 0x2111(if PCL signal is input) - Reverse: 0x60E1(if NCL signal is not input), 0x2112(if NCL signal is input)
Analog torque limit (set value 4)	 - Restricted by torque limited value which in put as analog. - Restricted forward direction / reverse direction torque regardless of +/ - of analog voltage. - The torque limit against the analog input voltage is as follows. - If the torque limit function setting (0x2110) is set to 4, the torque is limited according to the analog input voltage. The limit value is determined by the following formula. $$\text{Torque limit value}[\%] = \left(\frac{\text{Input voltage}[\text{mv}] - \text{Torque input offset}(0\text{x}221\text{C})[\text{mV}]}{1000}\right) \times \frac{\text{Torque command scale}[0\text{x}221\text{D}]}{10}$$ Example 1) If the command scaler is set to 100 and the offset is set to 0 When the input voltage is -10[V] $$\text{Torque limit value}[\%] = \left(\frac{-10000[\text{mv}] - 0[\text{mV}]}{1000}\right) \times \frac{100}{10} = -100[\%]$$ -Torque is limited up to 100[%]. Conversely, if the user inputs the input voltage as 10[V], the torque is limited to 100[%].

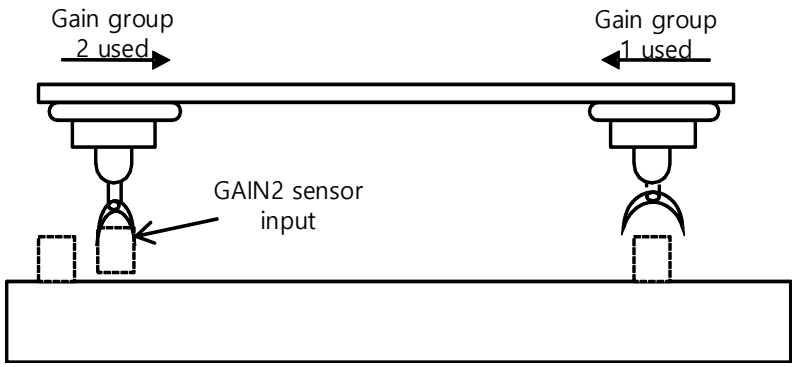


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2110	-	Torque Limit Function Select	UINT	RW	Yes	-
0x2111	-	External Positive Torque Limit Value	UINT	RW	Yes	0.1%
0x2112	-	External Negative Torque Limit Value	UINT	RW	Yes	0.1%
0x6072	-	Maximum torque	UINT	RW	Yes	0.1%
0x60E0	-	Positive Torque Limit Value	UINT	RW	Yes	0.1%
0x60E1	-	Negative Torque Limit Value	UINT	RW	Yes	0.1%

11.9 Gain switching function

11.9.1 Gain group switching



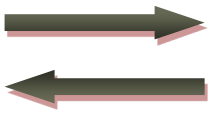
This function is to switch between the gain groups 1 and 2, as one of gain adjustment methods. You can reduce the time required for positioning through switching gains.

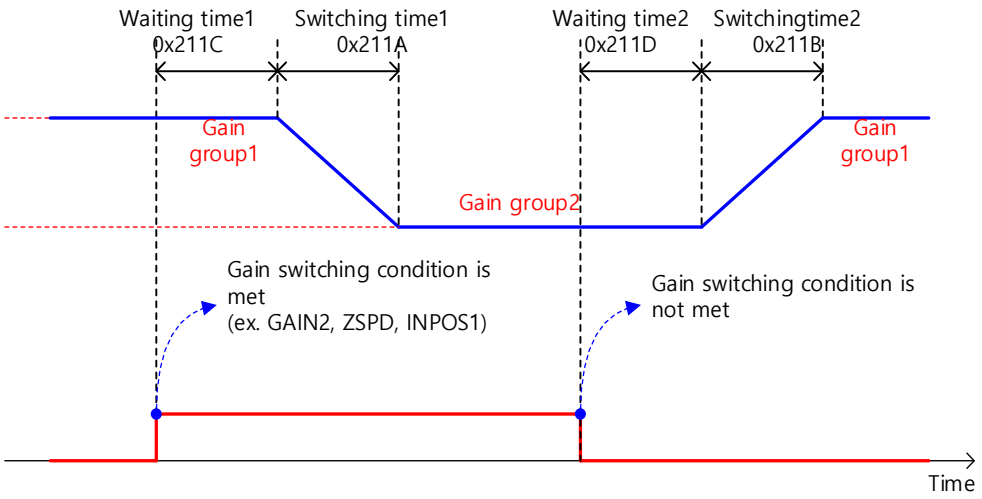
A gain group consists of position loop gain, speed loop gain, speed loop integral time constant, and torque command filter time constant. The gain switching function (0x2119) can be set as follows:

- Description of Gain Switching Function (0x2119)

Setting Value	Setting content
0	Only the gain group 1 is used.
1	Only the gain group 2 is used.
2	Gain is switched according to the GAIN2 input status. - 0: Use gain group 1 - 1: Use gain group 2
3	Reserved
4	Reserved
5	Reserved
6	Gain is switched according to the ZSPD output status. - 0: Use gain group 1 - 1: Use gain group 2
7	Gain is switched according to the INPOS1 output status. - 0: Use gain group 1 - 1: Use gain group 2

Waiting time and switching time for gain switching is as follows:

Gain group 1		Gain group 2
Position loop gain 1 (0x2101)	Gain switching time 1 (0x211A)	Position loop gain 2 (0x2105)
Speed loop gain 1 (0x2102)	Gain switching waiting time 1 (0x211C)	Speed loop gain 2 (0x2106)
Speed loop integral time constant 1 (x2103)		Speed loop integral time constant 2 (x2107)
Torque command filter time constant 1 (0x2104)	Gain switching time 2 (0x211B) Gain switching waiting time 2 (0x211D)	Torque command filter time constant 2 (0x2108)



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2119	-	Gain Conversion Mode	UINT	RW	Yes	-
0x211A	-	Gain Conversion Time 1	UINT	RW	Yes	ms
0x211B	-	Gain Conversion Time 2	UINT	RW	Yes	ms
0x211C	-	Gain Conversion Waiting Time 1	UINT	RW	Yes	ms
0x211D	-	Gain Conversion Waiting Time 2	UINT	RW	Yes	ms

11.9.2 P/PI Control Switching

PI control uses both proportional (P) and integral (I) gains of the speed controller, while P control uses only proportional gain.

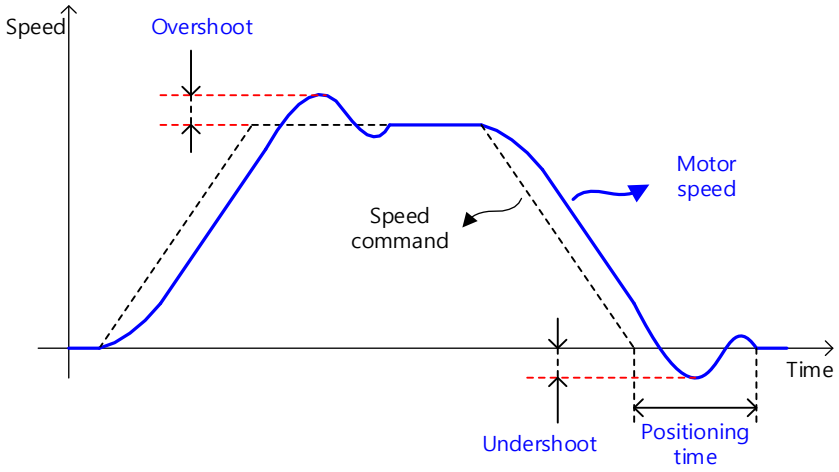
The proportional gain determines the responsiveness of the entire controller, and the integral gain is used to eliminate an error in the steady state. Too high of an integral gain will result in an overshoot during acceleration or deceleration.

The PI/P control switching functions are used to switch between the PI and P controls under the condition of the parameters within the servo (such as torque, speed, acceleration, and position deviation); specifically, they are used under the following situations:

Speed control: To suppress any overshoot or undershoot during acceleration/deceleration.

Position control: To suppress undershoot during positioning, resulting in a reduced positioning time.

You can accomplish similar effect by setting the acceleration/deceleration of the upper level controller, the soft start of the servo drive, the position command filter, or etc.



You can configure these settings in the P/PI control switching mode (0x2114). Please see the details below: Switching to P control by PCON input takes precedence over this setting.

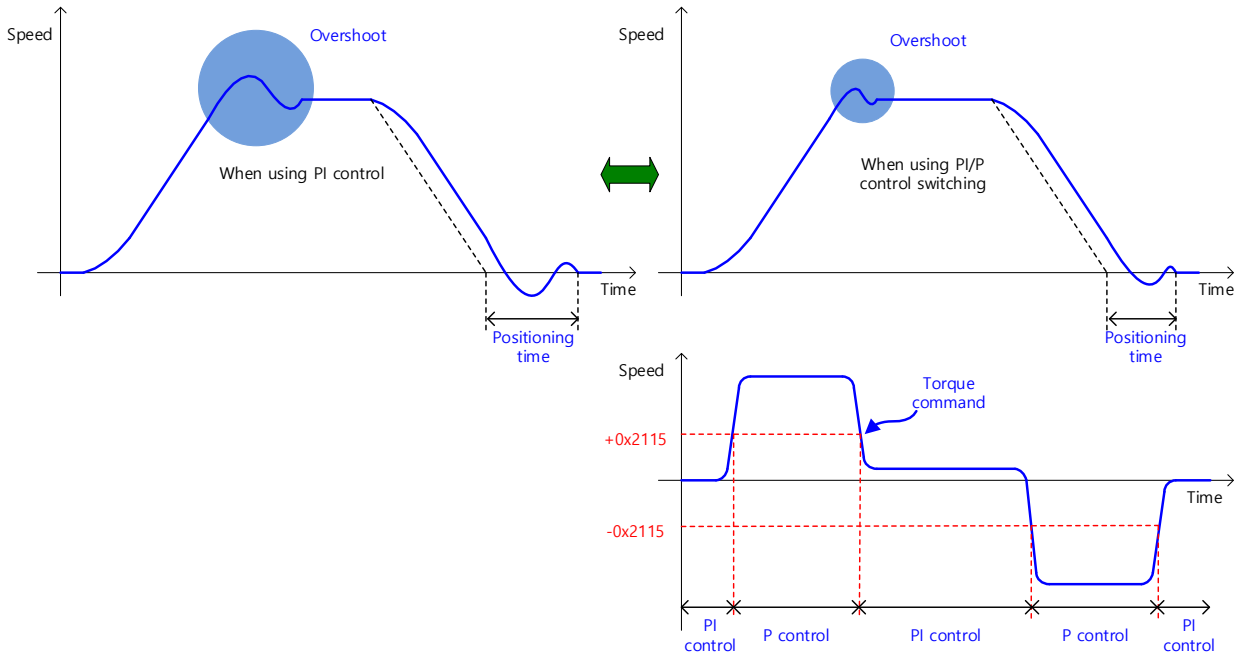
Setting Value	Setting content
0	Always PI controlled
1	Switches to the P control if the command torque is larger than the P control switching torque (0x2115).
2	Switches to the P control if the command speed is larger than the P control switching speed (0x2116).
3	Switches to the P control if the acceleration command is larger than the P control switching acceleration (0x2117).
4	Switches to the P control if the position error is larger than the P control switching position error (0x2118).

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2114	-	P/PI Control Conversion Mode	UINT	RW	Yes	-
0x2115	-	P Control Switch Torque	UINT	RW	Yes	0.1%
0x2116	-	P Control Switch Speed	UINT	RW	Yes	rpm
0x2117	-	P Control Switch Acceleration	UINT	RW	Yes	rpm/s
0x2118	-	P Control Switch Following Error	UINT	RW	Yes	pulse

■ Example of P/PI Switching by Torque Command

When always using the PI Control rather than P/PI control switching for speed control, the integral term of acceleration/deceleration error is accumulated, resulting in an overshoot and an extended positioning time. At this moment, you can reduce the overshoot and the positioning time using an appropriate P/PI switching mode. The figure below shows an example of switching mode by torque command:



11.10 Motor Overload Protection

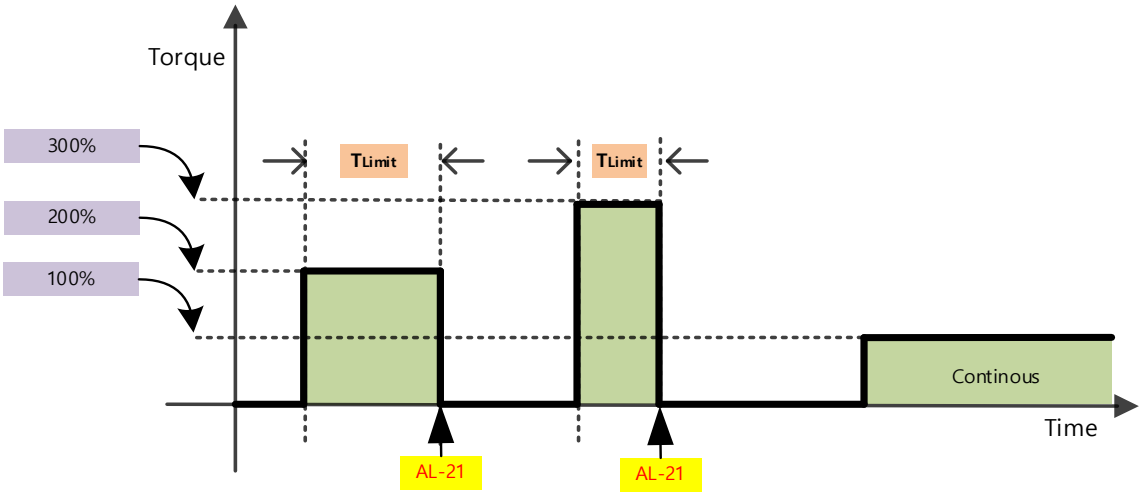
In order to prevent burnout due to overheating of the motor,I^2T it provides a motor overload protection function by an algorithm and a motor overload protection function through a motor thermal time constant.

11.10.1 I^2T Algorithm protection

Provides a function to cut off the motor current output when the estimated motor temperature exceeds the standard by tracking the flow of current output from the drive. Since this function is calculated based on motor parameters [0x2000] or3rdParty Motor parameters [0x2802], [0x2803] and operating time at maximum current [0x2031], it must be set accurately. (This function is available from OS Ver2.00 or higher.)

For example, assuming that the specifications of the motor are as follows,

Motor Rated current: 3[A]
Motor Maximum current: 9[A]
Operating time at maximum current: 1000[ms]
Drive output current (I_{out}) : 6[A]



■ **Related Objects**

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2000	-	Motor ID	UINT	RW	No	-
0x2031	-	Operation Time at Peak Currentt	UINT	RW	No	ms
0x2802	-	[3rd Party Motor] Rated Current	FP32	RW	No	Arms
0x2803	-	[3rd Party Motor] Maximum Current	FP32	RW	No	Arms

11.10.2 Protection by motor thermal time constant

Provides a function to cut off the motor current output when the temperature exceeds the standard by estimating the motor temperature based on the relationship between the winding and ambient of the motor. This function is activated when the motor thermal protection function activation [0x2034] parameter is set to 1, and it is calculated based on the motor thermal time constant [0x280D], so it must be set correctly. (This function is available from OS Ver2.00 or higher.)

The formula to calculate the motor thermal time constant is:

$$\text{Thermal time constant}[\text{sec}] = \text{Thermal resistance}\left[\frac{^{\circ}\text{C}}{\text{watt}}\right] \times \text{Thermal capacitance}[\text{watt} * \frac{\text{sec}}{^{\circ}\text{C}}]$$

■ **Related Objects**

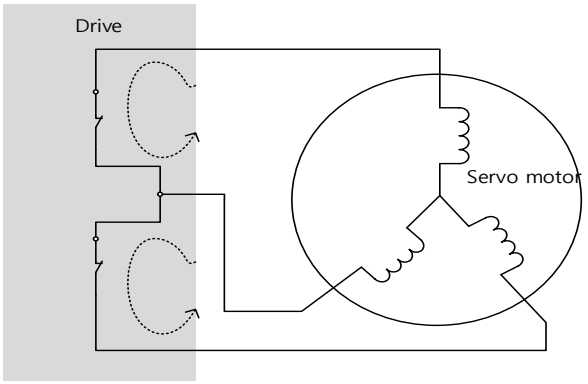
Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2034	-	Motor Thermal Protection Enable	UINT	RW	No	-
0x280D	-	3rd Party Motor Thermal Time Constant	FP32	RW	No	°C /watt

11.11 Dynamic brake

What is Dynamic Brake?

Dynamic brake electrically short-circuits the phase of the servo motor to stop it rapidly. Circuits related to the dynamic brake are integrated into the drive.

The drive short-circuits only two phases or all of three phases depending on the model type.



Precautions when using dynamic brake when main power is off, when SV_Off, protection operation (alarm occurrence, EMG stop) are as follows.

→ Dynamic brake is a function for emergency stop, do not stop the motor with SV_Off signal. The built-in dynamic brake circuit may be damaged due to deterioration of internal elements.

→ Do not drive the motor with an external force. The motor generates electricity by an external force, and when the dynamic brake circuit is damaged, a short-circuit current may be generated and smoke or burn may occur.

→ If the dynamic brake operates while driving at rated speed, you must stop for about 10 minutes. If used under critical operating conditions, the resistor may be damaged and the dynamic brake may not operate.

→ When using the dynamic brake frequently other than in an emergency, be sure to operate the dynamic brake after the servo motor stops.

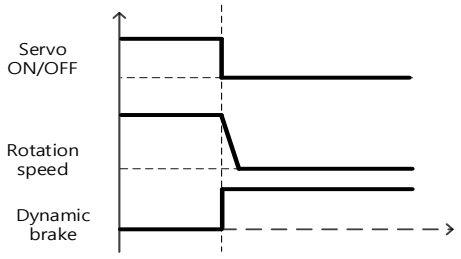
Dynamic brake operation restart time

$$Brake\ restart\ tim(min) = \frac{10[min)}{(\frac{Rated\ speed(rpm)}{Drving\ speed(rpm)})^2}$$

→Ex) n case of operation of dynamic brake during operation of rated speed 2000 [rpm] motor at 3000 [rpm]

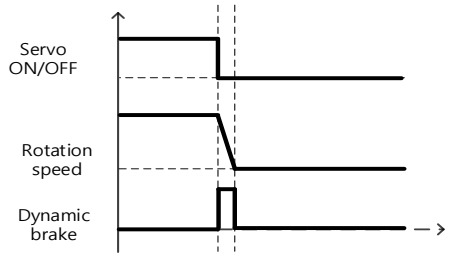
$$Brake\ restart\ tim(min) = \frac{10[min)}{(\frac{2000(rpm)}{3000(rpm)})^2}$$

Brake operation restart time [min] = 22.5min



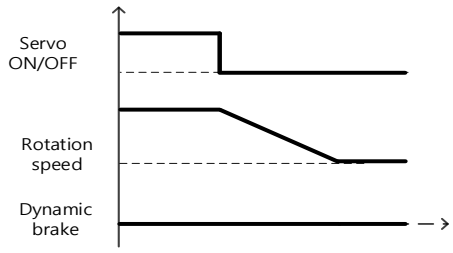
Setting value: 0

Hold the dynamic brake after stopping the motor using the brake



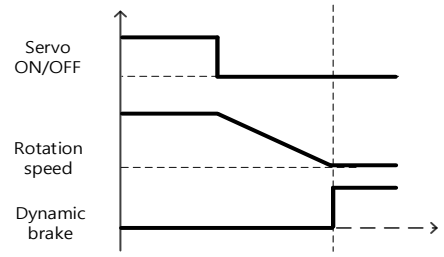
Setting value: 1

Release the dynamic brake after stopping the motor using the brake



Setting value: 2

Release the dynamic brake after free-run stop



Setting value: 3

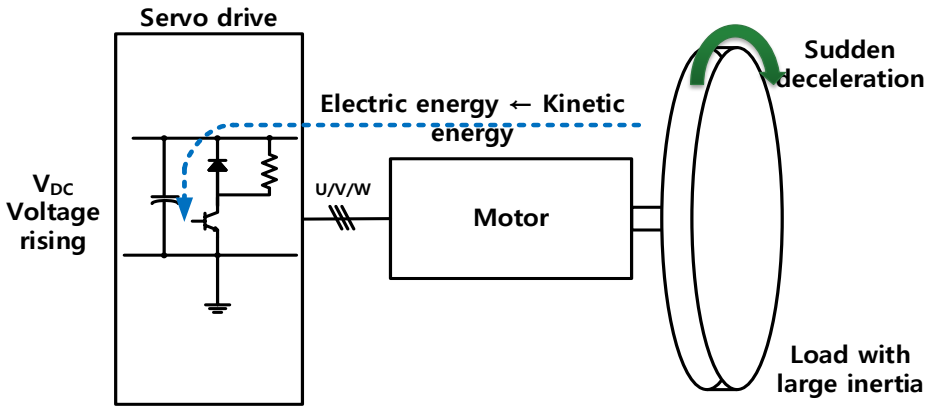
Hold the dynamic brake after free-run stop

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2012	-	Dynamic Brake Control Mode	UINT	RW	No	-
0x2013	-	Emergency Stop Configuration	UINT	RW	No	-

11.12 Regeneration Brake Resistor Configuration

Regeneration refers to a phenomenon where the kinetic energy of the motor is converted to electric energy and input into the drive because of driving a load with large inertia or sudden deceleration. At this moment, regenerative resistor is used to suppress the rise of the drive's internal voltage (V_{DC}) due to the regeneration and prevent the drive burnout.



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2009	-	Regeneration Brake Resistor Configuration	UINT	RW	No	-
0x200A	-	Regeneration Brake Resistor Derating Factor	UINT	RW	No	%
0x200B	-	Regenerative resistance value setting	UINT	RW	No	Ω
0x200C	-	Regenerative resistance capacity setting	UINT	RW	No	Watt
0x200D	-	Regenerative resistance maximum capacity setting	UINT	RW	No	Watt
0x200E	-	Duration Time @ Peak Power of Regeneration Brake Resistor	UINT	RW	No	ms

11.12.1 Use of Internal Regenerative Resistor

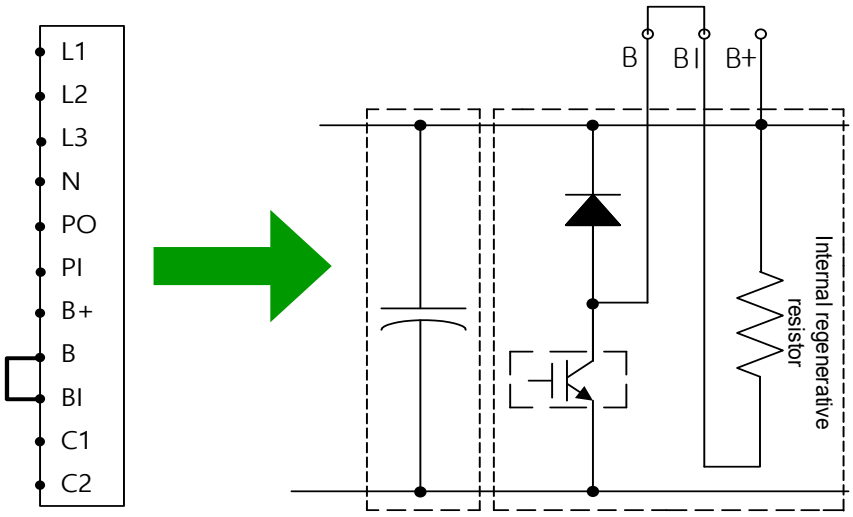
This drive essentially has internal regenerative resistor depending on its capacity. The integrated regenerative resistors depending on the drive capacity are as follows:

Voltage	Type	Resistance	Standard capacity
200[V]	L7PA001U~L7PA004U	100[Ω]	Built-in 50[W]
	L7PA008U~L7PA010U	40[Ω]	Built-in 100[W]
	L7PA020U~L7PA035U	13[Ω]	Built-in 150[W]
	L7PA050U	6.8[Ω]	Built-in 120[W]
	L7PA075U	6.8[Ω]	Built-in 120[W]
	L7PA150U	3.3[Ω]	External 2000[W]
400[V]	L7PB010U	100[Ω]	Built-in 100[W]
	L7PB020U~L7PB035U	40[Ω]	Built-in 150[W]
	L7PB050U	27[Ω]	Built-in 120[W]
	L7PB075U	27[Ω]	Built-in 240[W]
	L7PB150U	13.4[Ω]	External 2000[W]

When using the regenerative resistor installed in the drive, make sure to observe the order below for configuration:

1. Wire the regenerative resistor.

   - Check to see if the terminals B and BI are short-circuited (short-circuited at factory setup, 1 kW or less).



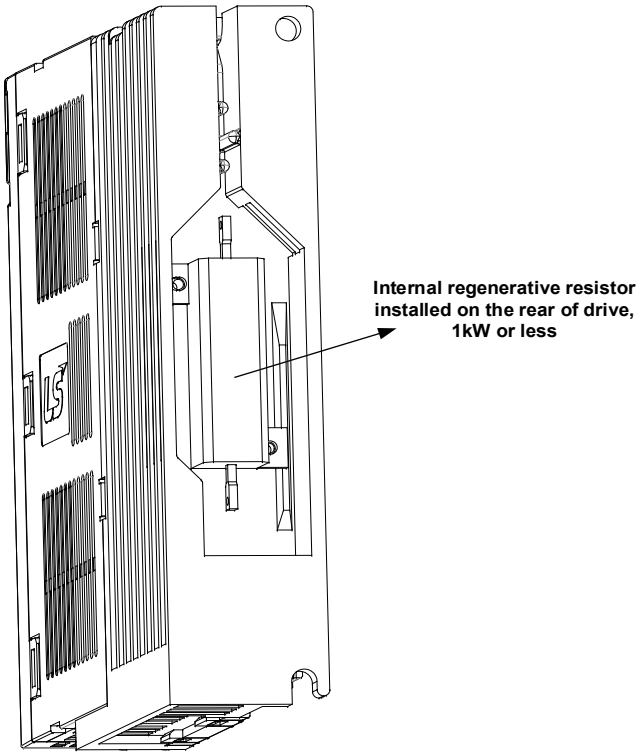
Wiring method when using internal regenerative resistor

2. Set regenerative resistance (0x2009)

   - Configure to use the regenerative resistor integrated into the drive (0x2009 = 0).
   - Basically, the resistor is attached on the rear of the drive heat sink.
   - Initial value: 0

3. Check internal regenerative resistance value and capacity

   - Check the internal regenerative resistance value (0x200B).
   - Check the regenerative resistor capacity (0x200C).
   - 1 KW or less: Basically, the resistor is installed on the rear of the drive heat sink (see the figure below).
   - 3.5 KW to 15kW: It is installed inside the drive.
   - 15 KW or more: Internal regenerative resistance is not installed

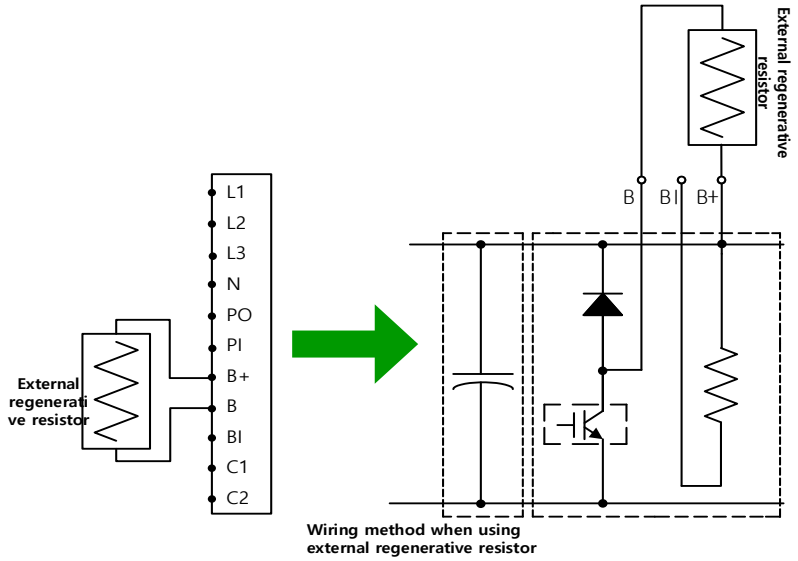


11.12.2 Use of External Regenerative Resistor

When using the external regenerative resistor considering the driving condition, make sure to observe the order below for configuration:

1. Wire the external regenerative resistor.

   - Connect the external regenerative resistance to B and B+ terminals
   - Remove short in B, BI terminal (short-circuited at factory setup, 1 kW or less).



Wiring method when using external regenerative resistor

2. Set regenerative resistance (0x2009)

   - Configure to use the regenerative resistor installed separately outside the drive (0x2009=1).
   - Set if a regenerative resistance is connected of a capacity, which is larger than that of the internal regenerative resistance.

3. Set regenerative resistance value (0x200B)

   - Configure the regenerative resistance of a resistor installed separately outside the drive in the unit of [Ω].
   - Be sure to configure it when you have set the regenerative resistor (0x2009) to 1.
   - Initial value: 0

4. Set the regenerative resistor capacity (0x200C).

   - Configure the capacity of a regenerative resistor installed separately outside the drive in the unit of [W].
   - Be sure to configure it when you have set the regenerative resistor (0x2009) to 1.
   - Initial value: 0

5. Set the maximum capacity and allowed time of the regenerative resistance (0x200D, 0x200E)

   - Set the maximum capacity and use time at the capacity by using the data sheet of the externally installed regenerative resistance

   - If there are no specific values, set the maximum capacity and allowed time to 5 times the regenerative resistance capacity setting (0x200C) and 5000[ms], respectively (It may differ according to general regenerative resistance specification or individual resistors).

   - Be sure to configure it when you have set the regenerative resistor (0x2009) to 1.

LS ELECTRIC provides the following regenerative resistors as options for the purpose of external regenerative resistor (see the specifications as well) R_t: composite resistance value

Voltage	Drive capacity	Built-in		External		
		Resistance	Standard capacity	Resistance	Resistance capacity(option)	Product name
200[V]	100W ~ 400W	100 Ω	50 [W]	50 Ω	140[W]	APCS-140R50 (1P)
	800W ~ 1KW	40 Ω	100 [W]	30 Ω	300[W]	APCS-300R30 (1P)
	2kW	13 Ω	150 [W]	30 Ω R_t :15 Ω	600[W]*2P	APC-600R30 (2P)
	3.5KW	13 Ω	150 [W]	30 Ω R_t :10 Ω	600[W]*3P	APC-600R30 (3P)
	5kW	6.8 Ω	120 [W]	28 Ω R_t :7 Ω	600[W]*4P	APC-600R28 (4P)
	7.5kW	6.8 Ω	240 [W]	28 Ω R_t : 7 Ω	600[W]*4P	APC-600R28 (4P)
	15kW	-	-	3.3 Ω	2000[W]	APCS-2000R3R3 (1P)
400[V]	1KW	100 Ω	100 [W]	82 Ω	300[W]	APCS-300R82 (1P)
	2KW ~ 3.5KW	40 Ω	150 [W]	75 Ω R_t :37.5 Ω	600[W]*2P	APCS-600R75 (2P)
	5KW	27 Ω	120 [W]	75 Ω R_t :25 Ω	600[W]*3P	APCS-600R75 (3P)
	7.5KW	27 Ω	240 [W]	75 Ω R_t :25 Ω	600[W]*3P	APCS-600R75 (3P)
	15KW	-	-	13.4 Ω	2000[W]	APCS-2000R13R4 (1P)

11.12.3 Other Considerations

With the considerations of the ambient environment and heat radiation condition for installing the drive, you can configure the regenerative resistor derating factor (0x200A). In case that the heat radiation condition is poor, please use a derated resistor (less than the capacity).

When it is derated for use (setting the value not larger than 100), the less the set value, the earlier the regeneration overload alarm (AL-23) is triggered.

When you intend to set the derating factor to 100% or higher, be sure to fully consider the heat radiation condition of the drive installed.

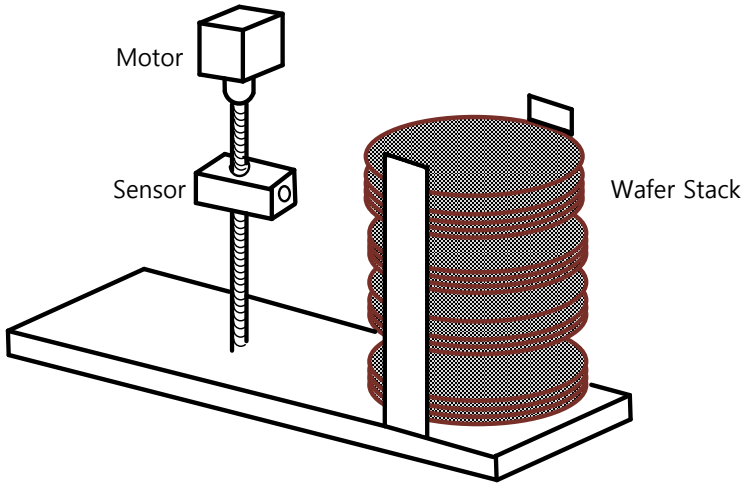
11.13 Touch Probe Function

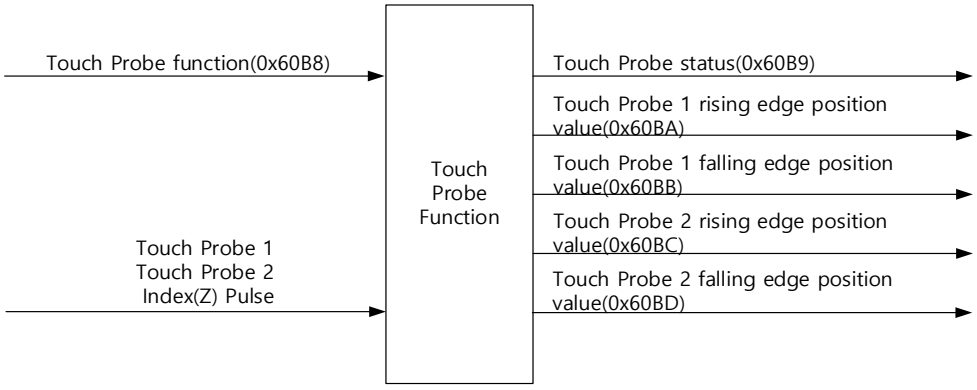
Touch probe is a function to rapidly capture the position value of the encoder with external input (PROBE 1 and 2) signals or the Index (Z) pulse of the encoder.

Example of Touch Probe

Wafer mapper system of wafer transfer robot (WTR)

In the case that wafers are piled up on a wafer stack, the presence of wafer can be determined by scanning the stack once using mapping sensor. At this moment, any unnecessary movement of robot can be prevented by use of the value of wafer loading position captured rapidly.





The position value of the encoder (Position Actual Value, 0x6064) is latched by the following trigger events according to the set value. At the same time, it is possible to latch independently at the rising/falling edge of each input of 2 channels.

- Triggered by the touch probe 1 (I/O, PROBE1)
- Triggered by the touch probe 2 (I/O, PROBE2)
- Triggered by the encoder Index (Z) pulse

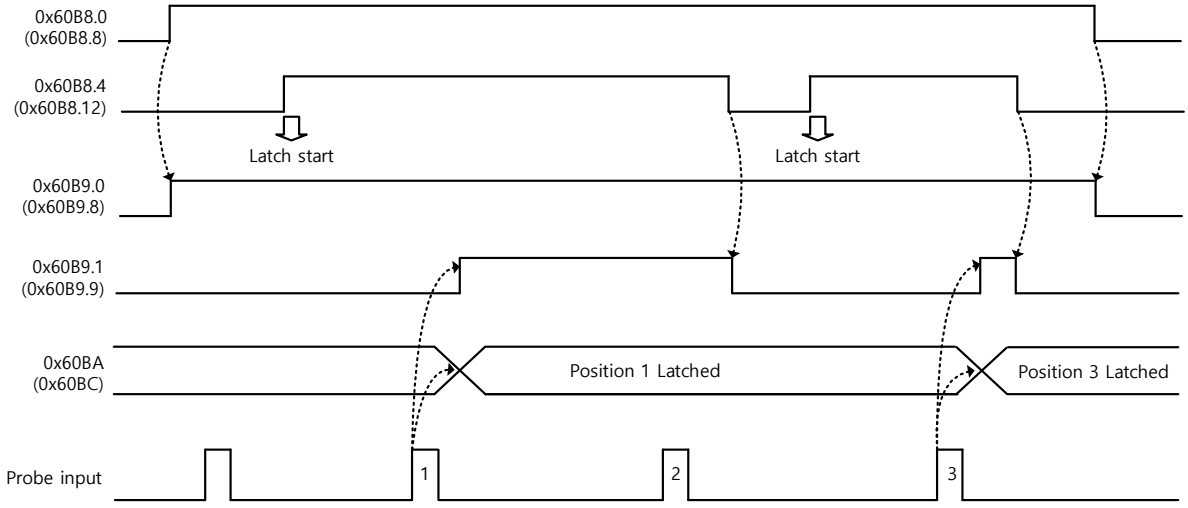
■ **Related Objects**

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x60B8	-	Touch Probe Function	UINT	RW	Yes	-
0x60B9	-	Touch Probe Status	UINT	RO	Yes	-
0x60BA	-	Touch Probe 1 Positive Edge Position Value	DINT	RO	Yes	UU
0x60BB	-	Touch Probe 1 Negative Edge Position Value	DINT	RO	Yes	UU
0x60BC	-	Touch Probe 2 Positive Edge Position Value	DINT	RO	Yes	UU
0x60BD	-	Touch Probe 2 Negative Edge Position Value	DINT	RO	Yes	UU

■ **Touch Probe Timing Diagram**

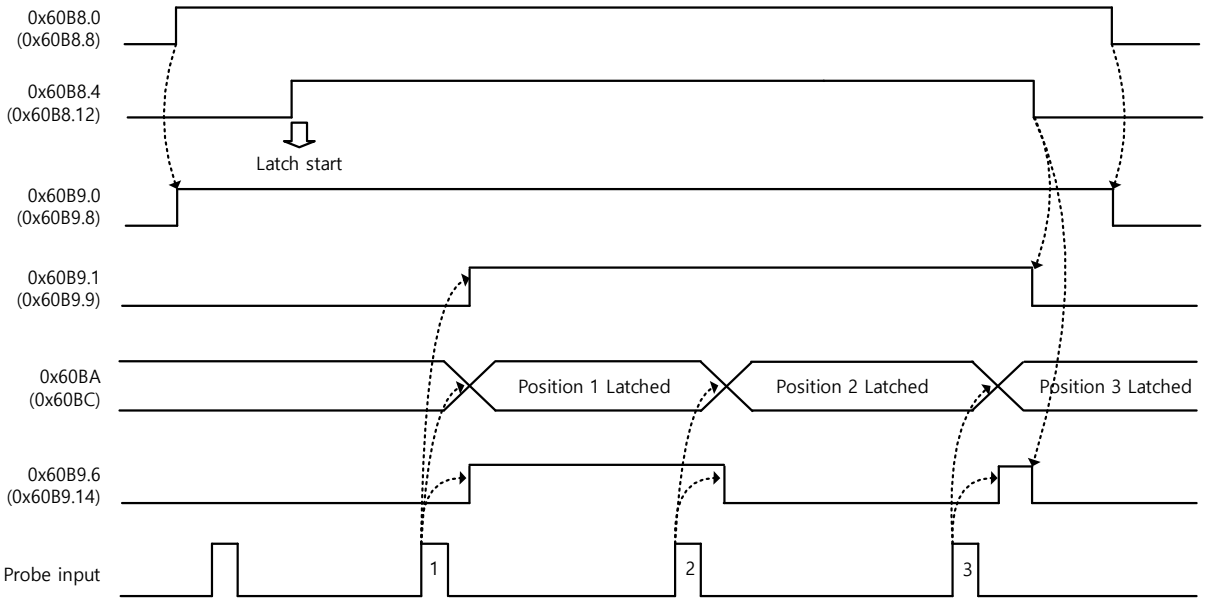
Single Trigger Mode (0x60B8.1=0, 0x60B8.9=0):

To reset the bits 1, 2, 9, and 10 of the touch probe status (0x60B9) in the single trigger mode, set the corresponding bits (4, 5, 12, and 13) of the touch probe function (0x60B8) to 0.

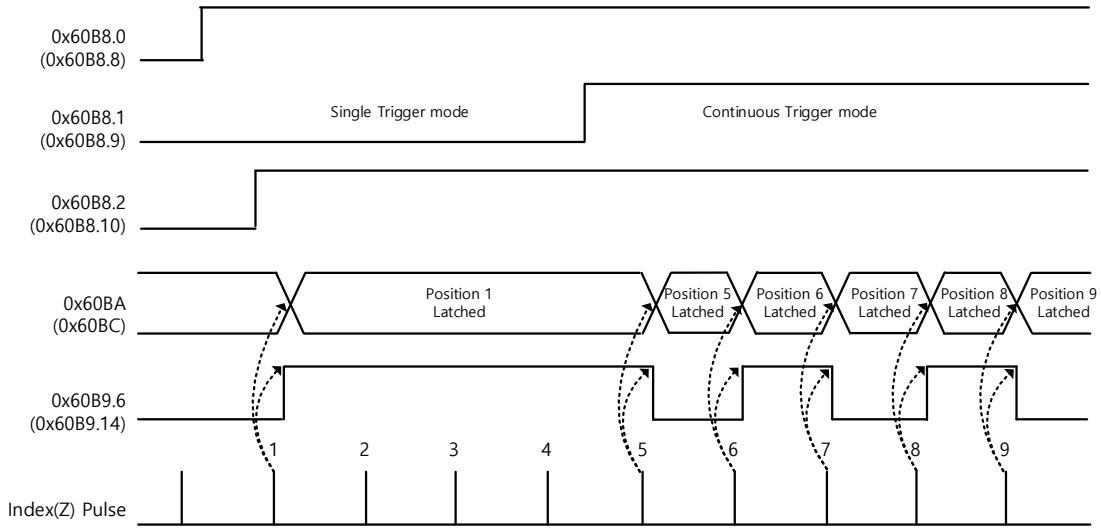


Continuous Trigger Mode (0x60B8.1=1, 0x60B8.9=1):

In the continuous trigger mode, the bits 6, 7, 14, and 15 of the touch probe status (0x60B9) are toggled (0 → 1 or 1 → 0) every time the corresponding input/edge is input.



Continuous Trigger Mode (0x60B8.2=1, 0x60B8.10=1):

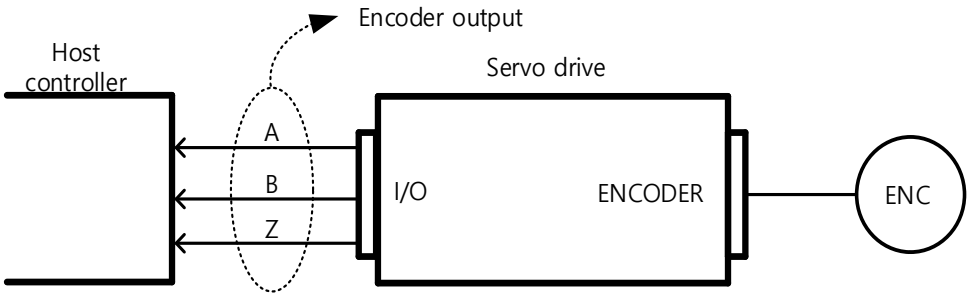


11.14 Encoder signal output

The drive processes the encoder signal internally and outputs it externally in the form of pulses. Basic output is made in the line drive method through pins (1 to 6) basically assigned to the I/O connector, and output can be made in the open collector method according to the setting of the encoder output mode [0x3007].

When outputting in the open collector method, the output function is masked as it outputs using the DO06 (A phase), DO07 (B phase), and DO08 (Z phase) ports that are basically allocated as digital output signals.

At this time, the number of encoder pulses output per motor rotation can be set as the value of encoder output pulse [0x3006].



The encoder signal output frequency from the drive is up to 200 [Kpps] for the open collector method and up to 1.0 [Mpps] for the line drive method.

Depending on the set value of the number of encoder output pulses per rotation, the rotational speed of the motor that can be output is limited, so an appropriate value must be set.

Example) When outputting 50000[ppr] by line drive method, maximum 2400[rpm] operation is possible as shown below.

2400[rpm] = $2*10^6$ / 50000 * 60

■ Encoder output signal of line drive method

Pin No.	Name	Assignment	Content	Details Function
1	AO	-	Encoder signal A	Outputs the A, B, and Z phases of the encoder signals that have been divided and processed in the form of a line drive. Output division can be set in [0x3006].
2	/AO	-		
3	BO	-	Encoder signal B	
4	/BO	-		
5	ZO	-	Encoder signal Z	
6	/ZO	-		

■ Encoder output signal of open collector method

Pin No.	Name	Assignment	Content	Details Function
45	DO06+	AO	Encoder signal A	Outputs the A, B, and Z phases of the encoder signals that have been divided and processed in the form of a open collector. Output division can be set in [0x3006]. In [0x3007], it is possible to set whether to use open collector encoder output.
46	DO06-	/AO		
47	DO07+	BO	Encoder signal B	
48	DO07-	/BO		
49	DO08+	ZO	Encoder signal Z	
50	DO08-	/ZO		

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse/rev.
0x3007	-	Encoder output mode	UINT	RW	No	-

11.15 ABS_RQ

When Data size is requested from the absolute encoder, the absolute encoder data is transmitted to the host controller in the form of quadrature pulses through the output of AO and BO, which are encoder output signals.
At this time, the encoder output pulse is output at a speed of 500 [Kpps].

When the ABSRQ signal is input, the drive first transmits multi-turn data among absolute value data, and then transmits single-turn data.
(At this time, refer to 7.2 I/O Signal Settings for allocation of the sequence input signal ABSRQ signal.)

ABS_RQ can be requested even in Servo Off.

■ Sequence for sending and receiving absolute value data

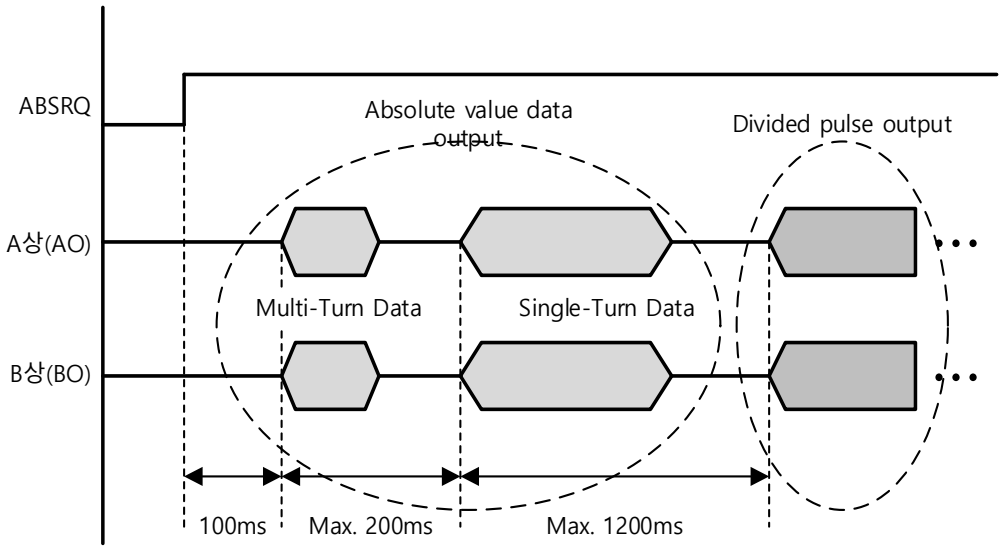
1. When the host controller is ready to receive data, turn on the ABSRQ signal.

At this time, the ABSRQ signal can be input through digital input or the ABSRQ bit of drive control input 2 [0x2120].
(For Modbus RTU communication address, refer to 15.3 L7P Indexer Servo Drive Communication Address Table.)

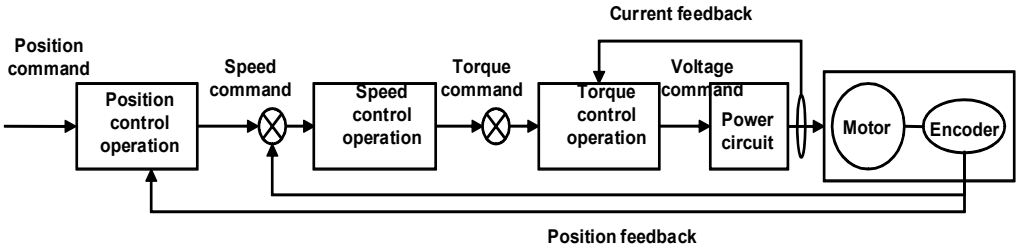
2. When the ABSRQ signal inputs from the drive, it prepares to transmit the encoder data after a delay time of about 100 [ms].

3. The drive transmits multi-turn data for up to 200[ms]. During the elapsed time of 200[ms] from the start of multi-turn data transmission, single-turn data is prepared for transmission.

4. The drive transmits single-turn data for up to 1200 [ms]. At this time, the output data is the value considering the number of encoder output pulses (division ratio). It operates as normal encoder output signal after 1200 [ms] from the time when data transmission within 1 revolution starts.



12. Tuning



The drive is set to the torque control, the speed control, or the position control mode for use, depending on the method to connect with the upper level controller. This drive is structured so that the position control is located at the outermost while the current control at the innermost, forming a cascade style control structure. Depending on the operation mode of the drive, you can tune the operation by setting the gain-related parameters of the torque controller, the speed controller, and the position controller, to satisfy your purpose.

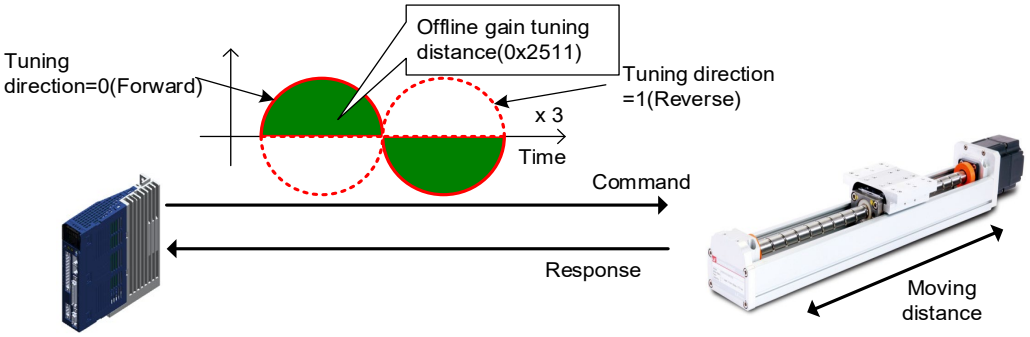
12.1 Off-line Auto Gain Tuning

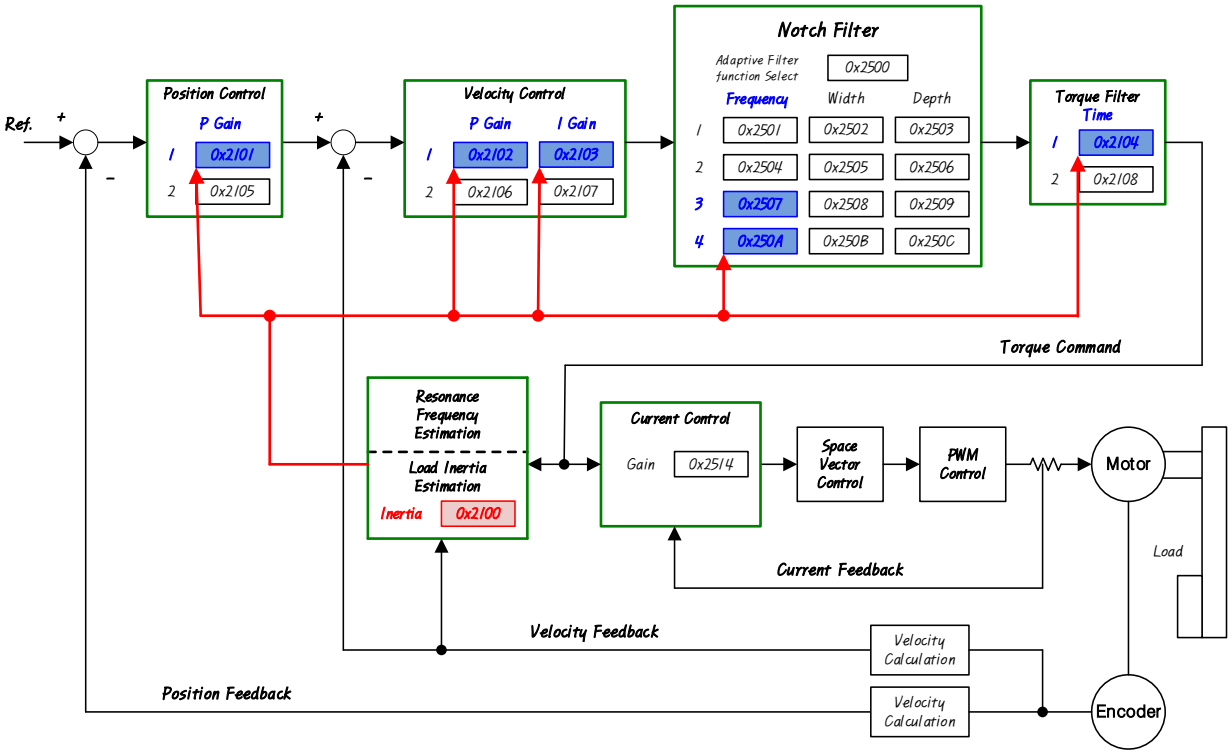
Use the command generated by the drive itself to automatically set the gain according to the load condition. The following gain-related parameters will be changed:

- Inertia ratio, position loop gain, speed loop gain, speed integral time constant, torque command filter time constant, notch filter 3 frequency, and notch filter 4 frequency.

The entire gain is set higher or lower depending on the system rigidity setting (0x250E) during gain tuning. Set the appropriate value depending on the rigidity of the load.

As shown in the figure below, sinusoidal-type command is generated in the forward or reverse direction according to the offline gain tuning direction (0x2510) setting. You can set the movement distance for tuning with the offline gain tuning distance (0x2511). The higher the set value, the longer the moving distance, so set the distance appropriately according to the situation. Make sure to secure enough distance (more than one revolution of motor) prior to gain tuning.





■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x250E		System Rigidity for Gain Tuning	UINT	RW	No	-
0x2510	-	Off-line Gain Tuning Direction	UINT	RW	No	-
0x2511		Off-line Gain Tuning Distance	UINT	RW	No	-

12.2 On-line Auto Gain Tuning

Does not use the off-line auto gain tuning command generated by itself and While operating under the command form host device, it sets parameters related gain automatically base on general rule and the rigidity set by user.

- inertia, position loop gain, speed loop gain, speed integral time, torque command filter time constant

During online tuning, it refers 20 steps of value of gain table by rigidity. The result of tuning is reflected regularly and changed gain is stored in EEPROM every two minutes.

When inertia estimating, estimated result reflected quickly or slowly by set adaption speed value. The setting rigidity parameters can determine the overall responsiveness of system.

In the following cases,it may be inaccurate to estimate the inertia when online auto tuning.

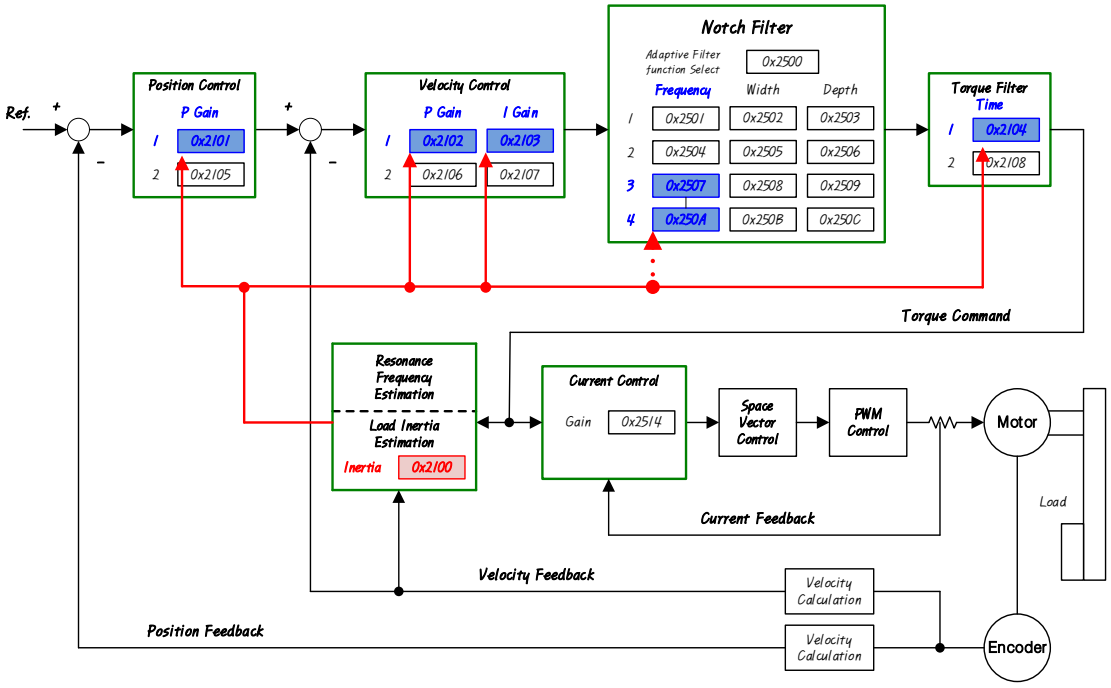
- When a change of the load is too heavy.
- When rigidity of load is too weak or too heavy backlash system.
- When the load is too small(less than 3 times) or too heavy (more than 20 times)
- When acceleration and deceleration is too small for sufficient acceleration and deceleration torque(less than 10% of the rated).
- When the speed of revolution is too slow(less than 10% of the rated).
- When friction torque is too large.

In the case of the above conditions or if the operation is not good even after executing online auto tuning, execute offline gain tuning.

■ Parameters that change after tuning

- Inertia ratio (0x2100), position loop gain 1 (0x2101), speed loop gain 1 (0x2102), speed integral time constant 1 (0x2103), torque command filter time constant 1 (0x2104)

Notch filter 3, 4 frequency (0x2507, 0x250A) → → Refer to the automatic notch setting function



■ On-line Gain Tuning Mode object

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x250D	-	On-line Gain Tuning Mode	UINT	RW	No	-

Setting Value	Setting content
0	On-line Gain Tuning not used
1	On-line Gain Tuning used

The factory setting is 0, and it is selected when online auto tuning is not possible or when the gain values are already known. If the setting value is set to 1, online auto tuning is performed. If the change in load inertia is small and the inertia ratio is not known, please select it. Estimated gain values during online auto tuning are saved in EEPROM approximately every 2 minutes.

■ System rigidity setting during online auto tuning

Index	Sub Index	Name	Variable type	Access ibility	PDO allocati on	Unit
0x250E	-	System Rigidity for Gain Tuning	UINT	RW	No	-

There are 20 system rigidity settings for online auto tuning as follows.

The gains (Position Loop Gain 1, Velocity Loop Gain 2, Velocity Loop Integral Time Constant 1, and Torque Command Filter Time Constant 1) are automatically determined when the system stiffness setpoint is selected. The factory setting for the system rigidity setting is 5.

If the system stiffness setting value is increased, the gains become higher and the positioning time becomes shorter. However, if the set value is too high, vibration may occur depending on the mechanical configuration, so set the system rigidity value from a low value to a high value within a range that does not cause vibration.

[0x250E] System rigidity	1	2	3	4	5	6	7	8	9	10
[0x2101] position loop gain 1	2	5	10	15	22	30	40	50	60	73
[0x2102] speed loop gain 1	3	8	15	23	33	45	60	75	90	110
[0x2103] speed loop integral time constant 1	190	70	50	40	30	22	15	13	10	9
[0x2104] torque command filter time constant 1	80	30	20	10	8	6	4	3	3	2

[0x250E] System rigidity	11	12	13	14	15	16	17	18	19	20
[0x2101] position loop gain 1	87	100	117	133	160	173	200	220	240	267
[0x2102] speed loop gain 1	130	150	175	200	240	260	300	330	360	400
[0x2103] speed loop integral time constant 1	8	7	6	6	5	5	4	4	3	3
[0x2104] torque command filter time constant 1	2	2	2	2	1	1	1	1	1	1

■ Real-time gain tuning reflection speed during online auto tuning

Index	Sub Index	Name	Variable type	Access ibility	PDO allocation	Unit
0x250F	-	On-line Tuning Adaptation Speed	UINT	RW	No	-

Set the speed to reflect the gain change during online auto tuning. The larger the setting value is, the faster the change of gain is reflected.

12.3 Manual Gain Tuning

12.3.1 Gain Tuning Sequence

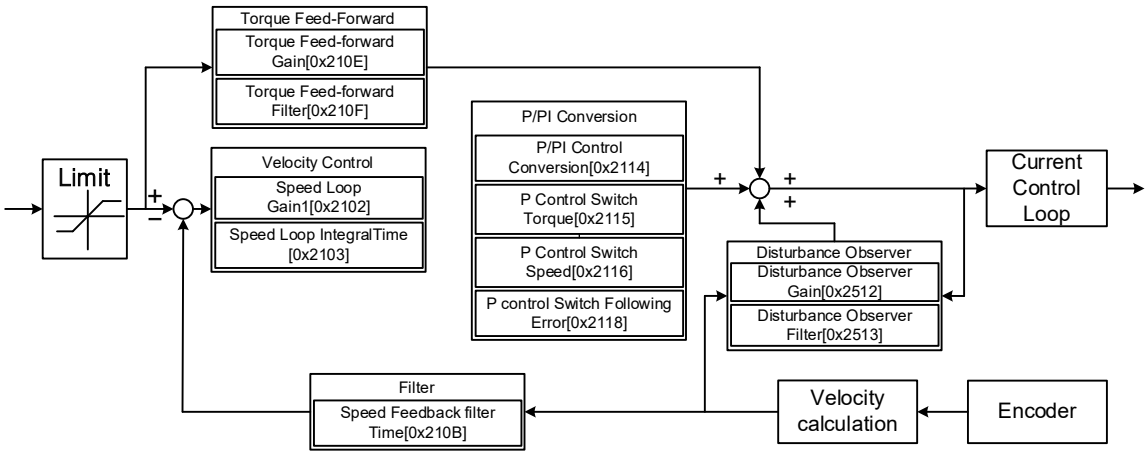
For a cascade-type controller, tune the gain of the speed controller located at an inner position first, and then tune the gain of the position controller located at an outer position.

In other words, tune the gains in the order of proportional gain → integral gain → feedforward gain.

The role of each individual gain is as follows:

- Proportional gain: Determines the controller BW.
- Integral gain: Determines error of steady-state, and generates an overshoot.
- Feedforward gain: Enhances the system lag characteristic.
- Differential gain: Plays a role of damper for the system (not provided)

■ Speed Controller Tuning

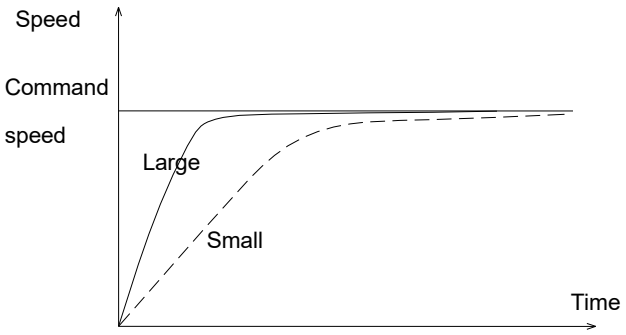


(1) Inertia ratio setting

- Use automatic inertia estimation function or carry out manual setting.

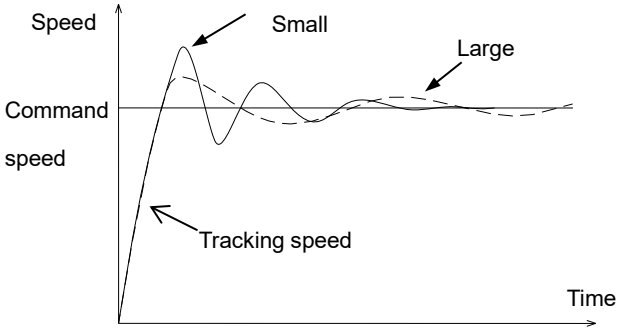
(2) Proportional gain setting

- Monitor torque and noise before any vibration occurs.
- This is the value converted into torque command by multiplying the speed error with the proportional gain. If it is too large, motor noise and vibration may occur and If it is too small, the speed response characteristic becomes slow and the servo operation slows down.



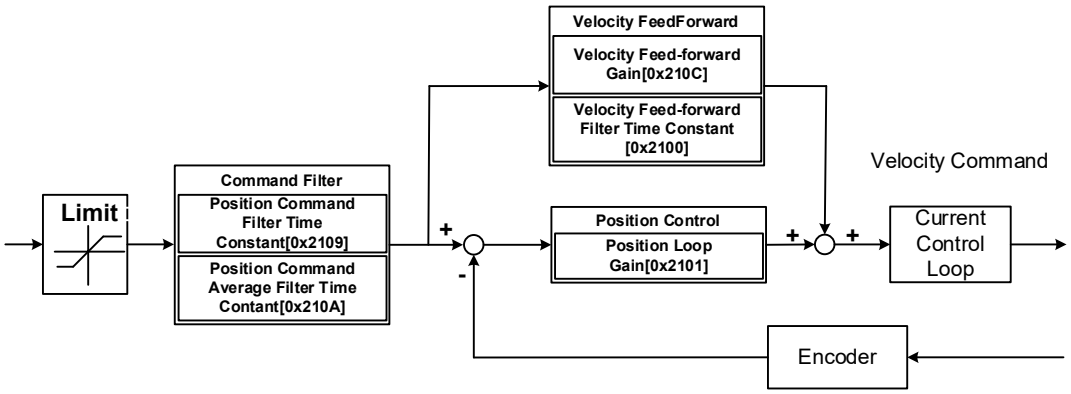
(3) Integral gain setting

- Monitor the speed overshoot and the steady-state error.
- You can use the P/PI switching mode if you want to increase the integral gain but overshoot occurs.
- For this drive, the integral gain is set to the integral time constant.
- It is a value converted into torque command by multiplying the integral value of the speed error by the integral gain, and has an inverse relationship with the speed response characteristics. If the value is too large, it may be operated with proportional control characteristics, and if it is too small, the response characteristics may increase and overshoot may occur.



(4) Speed command filter and speed feedback filter setting

■ Position Controller Tuning



(1) Proportional gain setting

- Monitor torque, positional error, and noise before any vibration occurs.
- The error between the position command and the current position is converted into speed command by multiplying the proportional gain.

(2) Feedforward setting

- Positional error monitoring
- Able to set the feedforward filter.
- Set the filter if you want to increase the feedforward value but noise occurs.
- You can set the feedforward value from 0% to 100%, which is the ratio of the position command value being entered currently and the deviation.

(3) Able to set the position command filter

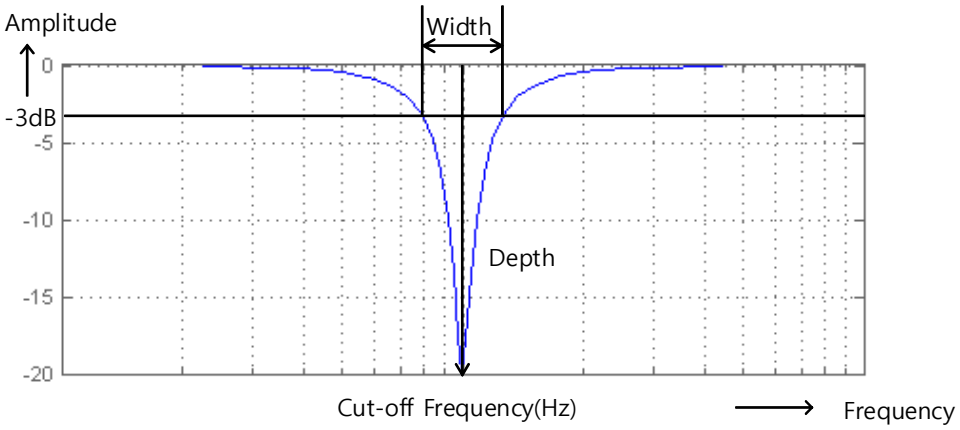
- You can smooth a position command.

12.4 Vibration Control

12.4.1 Notch Filter

Notch filter is a sort of band stop filter to eliminate specific frequency component. You can use a notch filter to eliminate the resonant frequency component of an apparatus, resulting in avoiding vibration while setting a higher gain.

This drive provides notch filters with 4 steps in total, and you can set the frequency, width, and depth for each filter. You can use one or two notch filters as adaptive filter, setting the frequency and the width automatically through real-time frequency analysis (FFT).

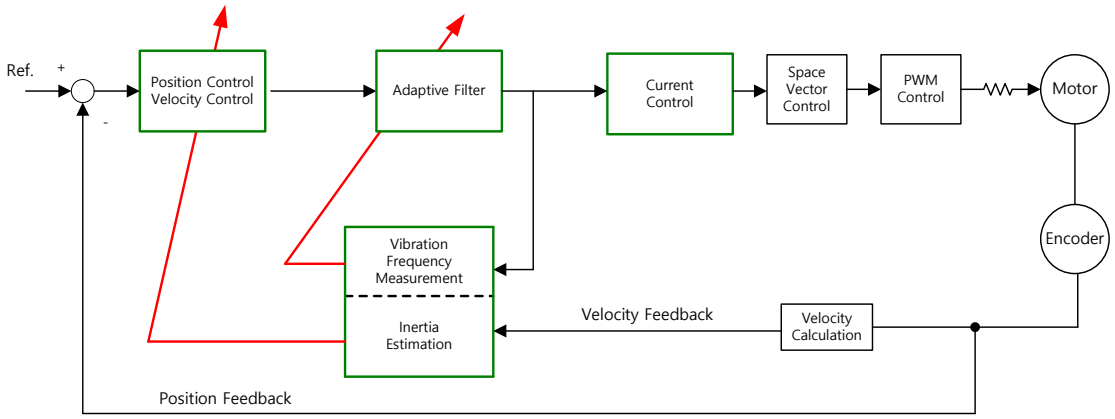


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2501	-	Notch Filter 1 Frequency	UINT	RW	No	Hz
0x2502	-	Notch Filter 1 width	UINT	RW	No	Hz
0x2503	-	Notch Filter 1 Depth	UINT	RW	No	-
0x2504	-	Notch Filter 2 Frequency	UINT	RW	No	Hz
0x2505	-	Notch Filter 2 width	UINT	RW	No	Hz
0x2506	-	Notch Filter 2 Depth	UINT	RW	No	-
0x2507	-	Notch Filter 3 Frequency	UINT	RW	No	Hz
0x2508	-	Notch Filter 3 width	UINT	RW	No	Hz
0x2509	-	Notch Filter 3 Depth	UINT	RW	No	-
0x250A	-	Notch Filter 4 Frequency	UINT	RW	No	Hz
0x250B	-	Notch Filter 4 width	UINT	RW	No	Hz
0x250C	-	Notch Filter 4 Depth	UINT	RW	No	-

12.4.2 Adaptive Filter

Adaptive filter analyzes the real-time frequency of vibration frequency, generated from the load during the drive operation, through the speed feedback signal, and configures a notch filter automatically to reduce vibration. It can detect the vibration frequency through frequency analysis to automatically configure one or two notch filters. On this occasion, the frequency and its width are automatically set and the setting value for the depth is used as it is.



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2500	-	Adaptive Filter Function Setting	UINT	RW	No	-

▪ Adaptive Filter Function Setting (0x2500)

When setting values other than 1 and 2 are applied, they are always initialized to 0.

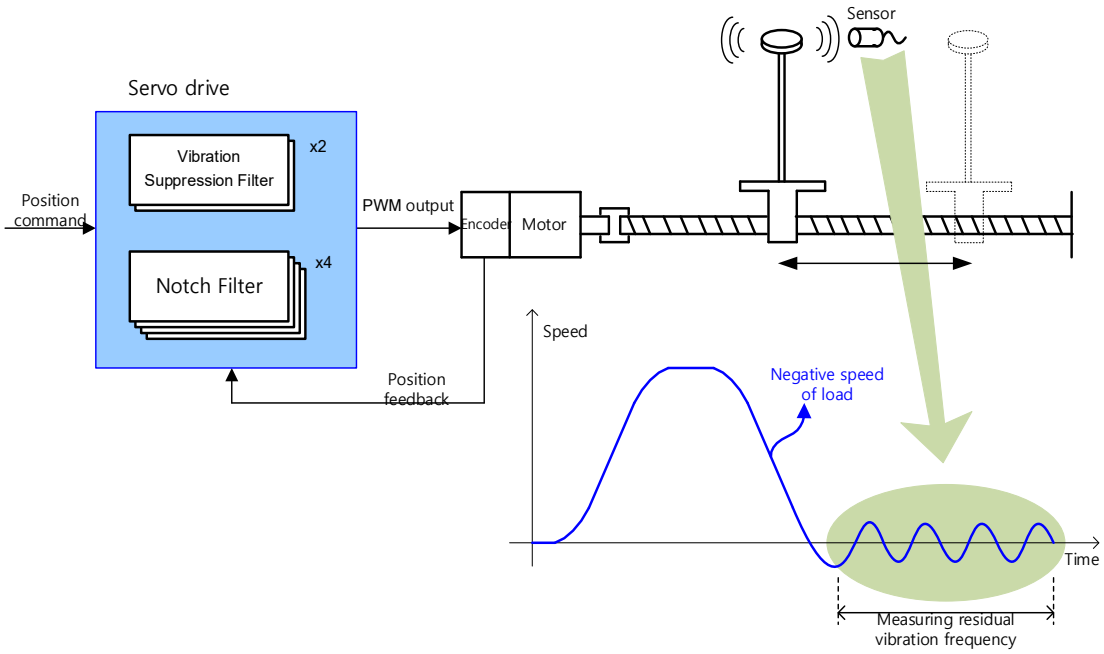
Setting Value	Setting content
0	Adaptive filter is not used.
1	Only one adaptive filter is used. You can check the settings configured automatically in the Notch Filter 4 Settings (0x250A and 0x250B).
2	Only two adaptive filter is used. You can check the settings configured automatically in the Notch Filter 3 (0x2507, 0x2508) and 4 Settings (0x250A, 0x250B).
3	Reserved
4	Settings of Notch Filter 3 (0x2507, 0x2508) and Notch Filter 4 (0x250A, 0x250B, 0x250C) are initialized
5	Reserved

12.4.3 Vibration Control (Damping) Filter

The vibration control (damping) filter is a function that can reduce the vibration generated from the load end.

Measuring vibration frequency occurring in the load through the external sensor, and using measured value as the object data for vibration control (damping) filter. L7P has two vibration control (damping) filter in total. Regarding each filter, it's available to set up the frequency and volume of decreasing vibration.

L7P controls frequency from 1[Hz] to 100[Hz] coming from load or total system. This function is only available on position control mode.



■**Related Objects**

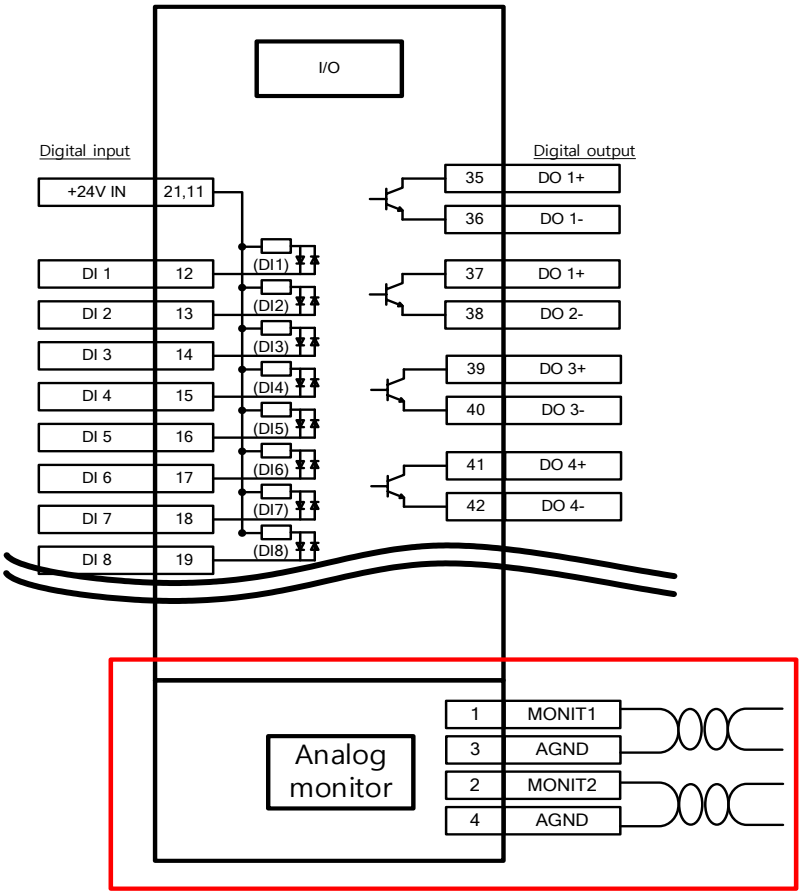
Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2515	-	Vibration Suppression Filter Configuration	UINT	RW	No	-
0x2516	-	Vibration Suppression Filter 1 Frequency	UINT	RW	No	0.1[Hz]
0x2517	-	Vibration Suppression Filter 1 Damping	UINT	RW	No	-
0x2518	-	Vibration Suppression Filter 2 Frequency	UINT	RW	No	0.1[Hz]
0x2519	-	Vibration Suppression Filter 2 Damping	UINT	RW	No	-

- Vibration Suppression Filter Configuration (0x2515)

Setting Value	Setting content
0	No Vibration Control (Damping) Filter
1	Applying Vibration control (damping) filter 1,2
2	Apply vibration control (damping) filters 1 and 2 according to LVSF1 and LVSF2 inputs

12.5 Analog Monitor

Providing 2 channels of Analog monitor to adjust drive gains or to monitor state parameter

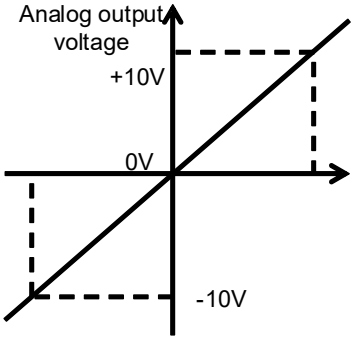
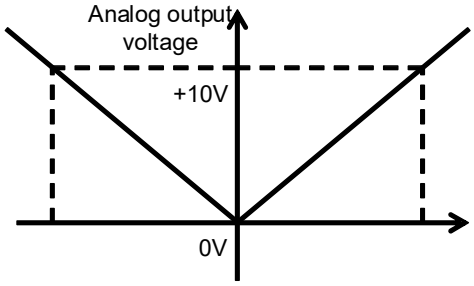


■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2220	-	Analog Monitor Output Mode	UINT	RW	No	-
0x2221	-	Analog Monitor Channel 1 Select	UINT	RW	No	-
0x2222	-	Analog Monitor Channel 2 Select	UINT	RW	No	-
0x2223	-	Analog Monitor Channel 1 Offset	DINT	RW	No	-
0x2224	-	Analog Monitor Channel 2 Offset	DINT	RW	No	-
0x2225	-	Analog Monitor Channel 1 Scale	UDINT	RW	No	-
0x2226	-	Analog Monitor Channel 2 Scale	UDINT	RW	No	-

- Analog monitor output mode (0x2220)

Analog monitor output range is -10~+10V. If setting value is 1, output value is positive value only.

Setting value	Setting content	Detail
0	Negative/Positive value output	
1	Positive value output	

- Analog monitor channel 1 setting (0x2221)

Configure the monitoring variables to be output to the analog monitor output channel 1.

Setting Value	Display item	Unit
0	Speed feedback	rpm
1	Speed command	rpm
2	Speed error	rpm
3	Torque feedback	%
4	Torque error	%
5	Following Error	pulse
6	Accumulated operate overload percentage	%
7	DC link voltage	V
8	Accumulated Regeneration Overload	%
9	Encoder single-turn data	pulse
10	Inertia ratio	%
11	Full-Closed positional error (Reserved)	UU
12	Drive Temperature 1	°C
13	Drive Temperature 2	°C
14	Encoder temperature (Reserved)	°C

15	Hall sensor signal	
16	U phase current	A
17	V phase current	A
18	W phase current	A
19	Position actual value	UU
20	Position demand value	UU
21	Position command speed	rpm
22	Hall U signal	
23	Hall V signal	
24	Hall W signal	

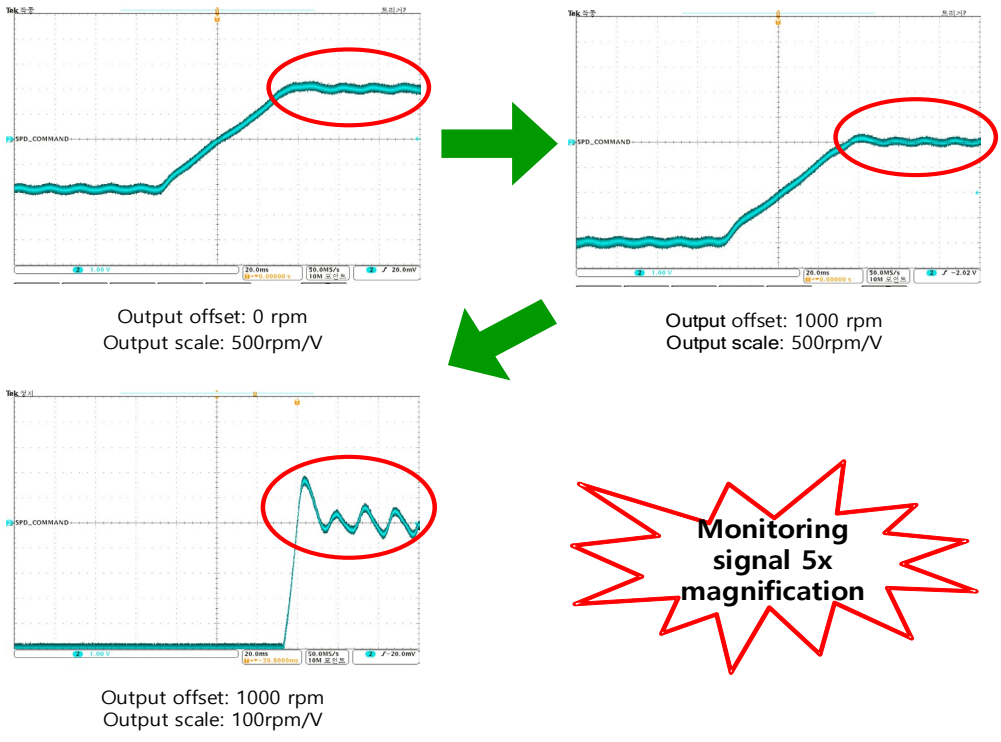
Th voltage is calculated as follow when analog monitor is output

Channel 1 output voltage [V] = [Monitoring signal value (0x2221) – Offset (0x2223)] / Scale(0x2225)

Channel 2 output voltage [V] = [Monitoring signal value (0x2222) – Offset (0x2224)] / Scale (0x2226)

■ Setting example

The following shows an example of monitoring ripple during 1000 rpm operation of speed feedback signal.



13. Procedure Function

Procedure function is an auxiliary function provided by the drive as described below. It can be executed by procedure command code (0x2700) and procedure command factor (0x2701). It can be activated using servo setting tool.

Procedure command	Code	Contents
Manual JOG	0x0001	Manual JOG operation
Program JOG	0x0002	Programs JOG operation
Alarm History Reset	0x0003	Alarm history reset
Off-Line Auto-Tuning	0x0004	Offline auto-tuning
Index Pulse Search	0x0005	Phase Z position search
Absolute Encoder Reset	0x0006	Absolute encoder reset
Max. Load Torque Clear	0x0007	Resets instantaneous maximum operation overload (0x2604) value
Calibrate Phase Current Offset	0x0008	Phase current offset tuning
Software Reset	0x0009	Software reset
Commutation	0x000A	Commutation

13.1 Manual JOG Operation

Jog operation is a function to verify the servo motor operation by the speed control, without an upper level controller.

Before starting the jog operation, make sure that:

- The main power is turned on;
- No alarms go off;
- The servo is turned off;
- The operation speed is set with the consideration of the apparatus state.

■ Related Objects

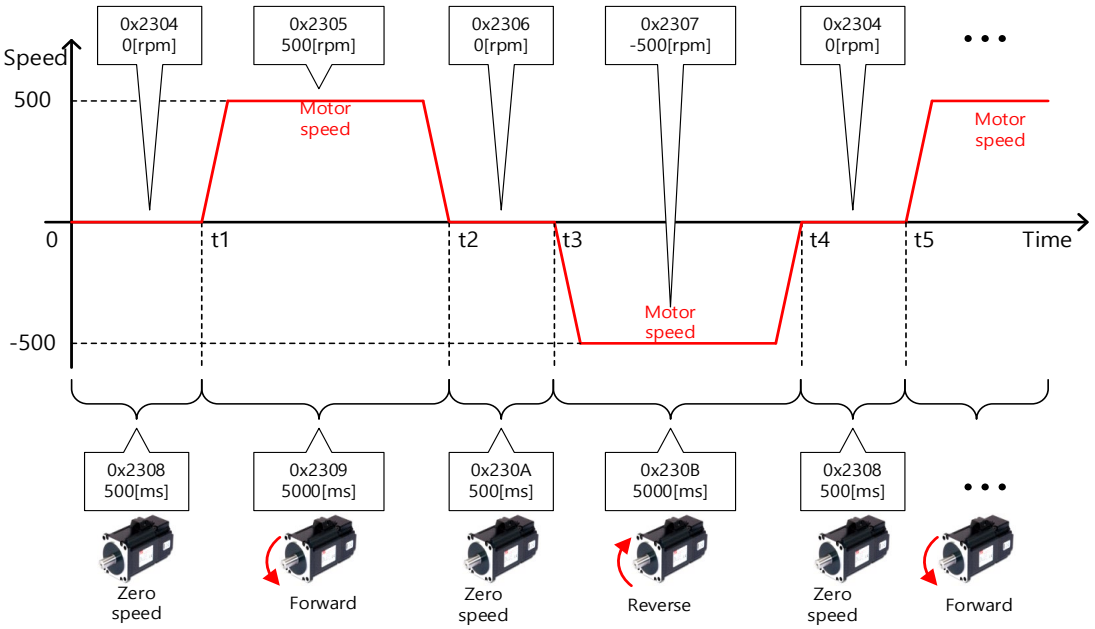
Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2300	-	Jog Operation speed	INT	RW	No	rpm
0x2301	-	Speed Command Acceleration Time	UINT	RW	No	ms
0x2302	-	Speed Command Deceleration Time	UINT	RW	No	ms
0x2303	-	Speed Command S-curve Time	UINT	RW	No	ms

13.2 Programmed Jog Operation

Programmed jog operation is a function to verify the servo motor operation by the speed control at preset operation speed and time, without an upper level controller.

Before starting the jog operation, make sure that:

- The main power is turned on;
- No alarms go off;
- The servo is turned off;
- Speed and time settings should be set in consideration of the state of the instrument and its range of motion.



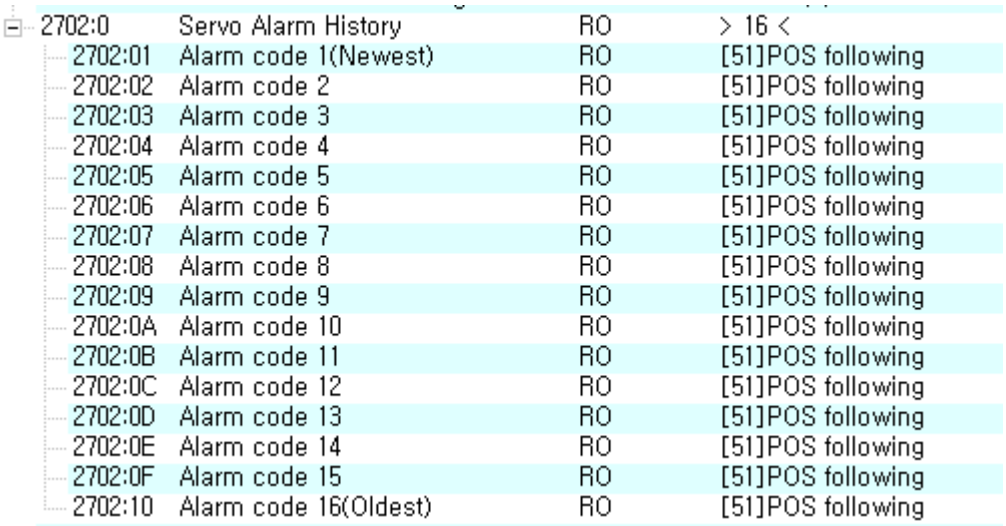
■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2304	-	Program Jog Operation Speed 1	INT	RW	No	rpm
0x2305	-	Program Jog Operation Speed 2	INT	RW	No	rpm
0x2306	-	Program Jog Operation Speed 3	INT	RW	No	rpm
0x2307	-	Program Jog Operation Speed 4	INT	RW	No	rpm
0x2308	-	Program Jog Operation Time 1	UINT	RW	No	ms
0x2309	-	Program Jog Operation Time 2	UINT	RW	No	ms
0x230A	-	Program Jog Operation Time 3	UINT	RW	No	ms
0x230B	-	Program Jog Operation Time 4	UINT	RW	No	ms

13.3 Alarm history reset

This function deletes all of the alarm code history stored in the drive. Alarm history items are stored chronologically starting with the latest alarm up to 16 recent alarms.

You can check them as below (0x2702:01 - 16). The latest alarm is listed in 0x2702:01.



2702:0	Servo Alarm History	RO	> 16 <
2702:01	Alarm code 1(Newest)	RO	[51]POS following
2702:02	Alarm code 2	RO	[51]POS following
2702:03	Alarm code 3	RO	[51]POS following
2702:04	Alarm code 4	RO	[51]POS following
2702:05	Alarm code 5	RO	[51]POS following
2702:06	Alarm code 6	RO	[51]POS following
2702:07	Alarm code 7	RO	[51]POS following
2702:08	Alarm code 8	RO	[51]POS following
2702:09	Alarm code 9	RO	[51]POS following
2702:0A	Alarm code 10	RO	[51]POS following
2702:0B	Alarm code 11	RO	[51]POS following
2702:0C	Alarm code 12	RO	[51]POS following
2702:0D	Alarm code 13	RO	[51]POS following
2702:0E	Alarm code 14	RO	[51]POS following
2702:0F	Alarm code 15	RO	[51]POS following
2702:10	Alarm code 16(Oldest)	RO	[51]POS following

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2702	-	Servo Alarm History	-	-	-	-
	1	Alarm code 1(Newest)	STRING	RO	No	-
	2	Alarm code 2	STRING	RO	No	-
	3	Alarm code 3	STRING	RO	No	-
	4	Alarm code 4	STRING	RO	No	-
	5	Alarm code 5	STRING	RO	No	-
	6	Alarm code 6	STRING	RO	No	-
	7	Alarm code 7	STRING	RO	No	-
	8	Alarm code 8	STRING	RO	No	-
	9	Alarm code 9	STRING	RO	No	-
	10	Alarm code 10	STRING	RO	No	-
	11	Alarm code 11	STRING	RO	No	-
	12	Alarm code 12	STRING	RO	No	-
	13	Alarm code 13	STRING	RO	No	-
	14	Alarm code 14	STRING	RO	No	-
	15	Alarm code 15	STRING	RO	No	-
	16	Alarm code 16	STRING	RO	No	-

13.4 Automatic gain tuning

For further information, please refer to“12.1 Off line Auto gain tuning.

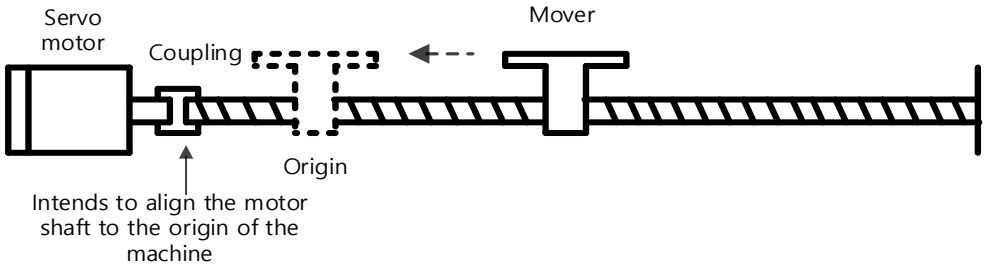
13.5 Index Pulse Search

Index pulse search function is to find the Index (Z) pulse position of the encoder and stop. You can use this function to locate a position roughly since it searches for a position using the speed operation mode. You can locate the exact position of the index pulse using the homing operation.

The speed to search for the index pulse is set in 0x230C [rpm].

Before starting the index pulse search, make sure that:

- The main power is turned on;
- No alarms go off;
- The servo is turned off;
- The operation speed is set with consideration to the operation range of the machine.



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x230C	-	Index Pulse Search Speed	INT	RW	No	rpm

13.6 Absolute encoder reset

This function resets the absolute encoder. You need to reset the absolute encoder if:

- you set up the apparatus for the first time;
- Encoder low voltage alarm occurs
- If you want to set the multi-turn data of an absolute value encoder to 0.

When the absolute encoder reset is completed, multi-turn data (0x260A) and one-turn data (0x2607) are reset to 0. If power is supplied again after reset, Position actual value (0x6064) is changed to the reset position value. .

After turning on the power again, the actual position value (0x6064) is displayed by reading the position of the absolute encoder and applying the home offset (0x607C).
Then, the actual position value (0x6064) will not be changed even if you change the home offset (0x607C) during operation. . .

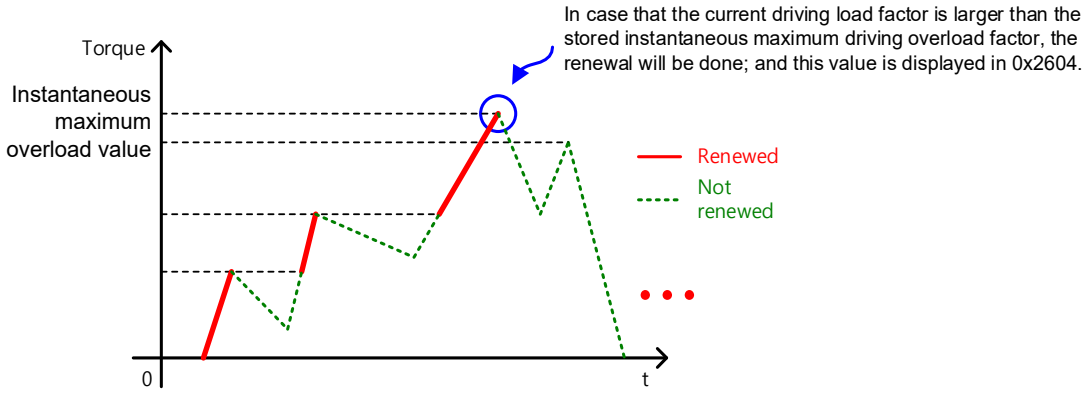
■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2005	-	Absolute encoder setting	UINT	RW	No	-
0x2607		SingleTurn Data	UDINT	RO	Yes	pulse
0x260A		MultiTurn Data	DINT	RO	Yes	rev

13.7 Instantaneous Maximum Torque Initialization

This function initializes the instantaneous maximum overload rate (0x2604) to 0. The instantaneous maximum operation overload rate represents the maximum value of the operation overload rate that is momentarily output from the drive.

Displays the peak load from the time the servo power was turned on to the present as a percentage compared to the rated output. The unit is [0.1%]. Turning on the power again will reset it to 0.



■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2604	-	Instantaneous Maximum Operation Overload	INT	RO	Yes	0.1%

13.8 Phase current offset tuning

This function is to automatically tune the current offset of U/V/W phases. Depending on the environmental condition, you can tune the phase current offset for use. The offset is tuned by factory default setting.

Measured U-/V-/W-phase offsets are individually stored in 0x2015, 0x2016, and 0x2017.

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2015	-	U Phase Current Offset	INT	RW	No	0.1%
0x2016	-	V phase Current Offset	INT	RW	No	0.1%
0x2017	-	W Phase Current Offset	INT	RW	No	0.1%

13.9 Software reset

This function is to reset the servo drive by means of software. Software reset means a restart of the drive program, resulting in an effect similar to recycling the power.

You can use this function if:

- You changed parameter settings which require the power to be recycled; or
- You have to restart the drive due to an alarm, which cannot be reset.

13.10 Commutation

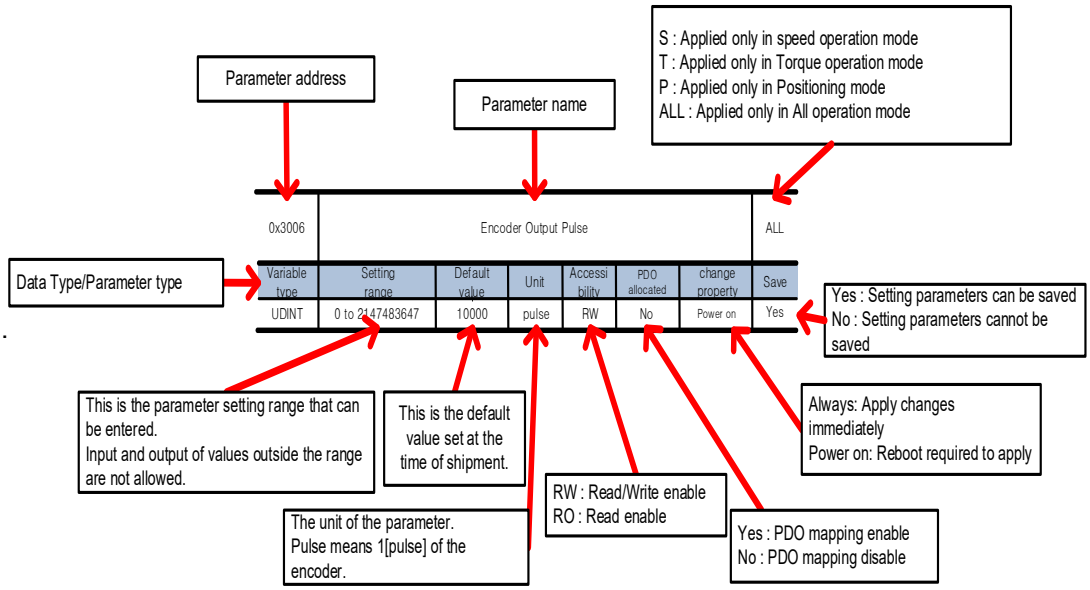
Commutation function is to get the information on the initial angle of motor. In case of using a motor with hall sensor not installed, you have to get the information on the initial angle through commutation prior to operation, in order to carry out normal operation.

■ Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2019	-	Linear Scale Resolution	UINT	RW	No	nm
0x201A	-	Commutation Method	UINT	RW	No	-
0x201B	-	Commutation Current	UINT	RW	No	0.1%
0x201C	-	Commutation Time	UINT	RW	No	ms

14. Object Dictionary

Object is a data structure including parameters, state variables, run commands (procedures), and etcs. within a drive.



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Object is largely composed of General Object (0x1000~), CiA402 Object (0x6000~), Manufacturer Specific Object (0x2000~) and Index Object (0x3000~) that only this drive provides separately.

14.1 Data Type

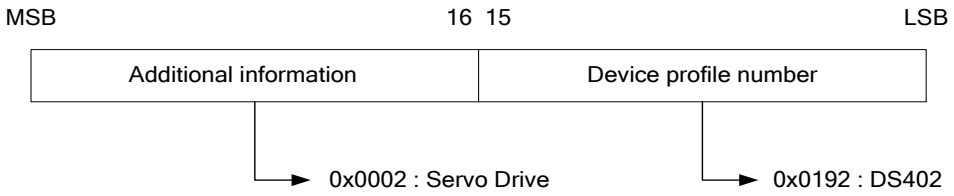
The following table outlines the type and range of the data types used in this manual.

Code	Description	Range
SINT	Signed 8bit	-128 ~ 127
USINT	Unsigned 8bit	0 ~ 255
INT	Signed 16bit	-32768 ~ 32767
UINT	Unsigned 16bit	0 ~ 65535
DINT	Signed 32bit	-21247483648 ~ 21247483647
UDINT	Unsigned 32bit	0 ~ 4294967295
FP32	Float 32bit	Single precision floating point
STRING	String Value	

14.2 General Objects

0x1000	Device type						
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	0x00020192	-	RO	No	-	No

The following table lists device types and their functions.



0x1001	Error Register						
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	0x00	-	RO	No	-	No

The following table shows the error register values for each device. This value is stored in the emergency message.

Bit	Setting content
0	0: No Error
	1: Occurrence of errors
1 to 7	Reserved

0x1008	Device Name						
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No

Indicate the name of the device.

0x1009	Hardware version						
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No

This represents the hardware version of device.

0x100A	Software version						
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No

This represents the software version of device.

0x1010	Store Parameters						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	5	-	RO	No	-	No
SubIndex 1		Store all parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 2		Store communication parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 3		Store CiA402 parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 4		Store drive specific parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 5		Store Index parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No

Store the drive's parameters into the memory. To avoid any mistake, store the parameters if the ASCII code value corresponding to 'save' is written to the relevant SubIndex value.

	MSB		16 15		LSB
	e	v	a	s	
ASCII Code	0x65	0x76	0x61	0x73	

All parameters within the drive are stored when "save" is written to SubIndex 1.

(However, SubIndex 5 is excluded. Please save SubIndex 5 separately.)

Only communication parameters (from 0x1000) are stored when "save" is written to SubIndex 2.

Only CiA402 parameters (from 0x6000) are stored when "save" is written to SubIndex 3.

Only drive-specific parameters (from 0x2000) are stored when "save" is written to SubIndex 4.(SubIndex 4 is stored from 0x2000 to 0x3099.)

Only index parameters (from 0x3100) are stored when "save" is written to SubIndex 5.

0x1011	Restore Default Parameters						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	5	-	RO	No	-	No
SubIndex 1		Restore all parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 2		Restore communication parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 3		Restore CiA402 parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 4		Restore drive specific parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No
SubIndex 5		Restore Index parameters					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	No	-	No

Initialize the drive's parameters. To avoid any mistake, initialize the parameters if the ASCII code value corresponding to 'save' is written to the relevant SubIndex value.

	MSB		16 15	LSB
	d	a	o	l
ASCII Code	0x64	0x61	0x6F	0x6C

All parameters within the drive are initialized when "load" is written to SubIndex 1.

(However, SubIndex 5 is excluded and please load SubIndex 5 separately.)

Only communication parameters (from 0x1000) are initialized when "load" is written to SubIndex 2.

Only CiA402 parameters (from 0x6000) are initialized when "load" is written to SubIndex 3.

Only drive-specific parameters (from 0x2000) are initialized when "load" is written to SubIndex 4.(SubIndex 4 is initialized from 0x2000 to 0x3099.)

Only index parameters (from 0x3100) are initialized when "load" is written to SubIndex 5.

To apply the initialized value, you need to recycle the power of the drive.

0x1018	Identity Object						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	4	-	RO	No	-	No
SubIndex 1		Vendor ID					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	0x00007595	-	RO	No	-	No
SubIndex 2		Product code					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	0x00010001	-	RO	No	-	No
SubIndex 3		Revision number					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	-	-	RO	No	-	No
SubIndex 4		Serial Number					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	-	-	RO	No	-	No

Represents the device information.

14.3 Manufacturer Specific Objects

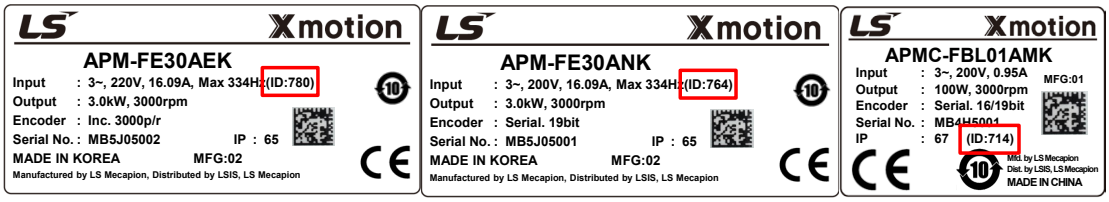
● Basic Setting(0x2000~)

0x2000	Motor ID						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 9999	13	-	RW	No	Power recycling	Yes

Set the motor ID. For the serial encoder provided by LS ELECTRIC, it is automatically set. You can check the automatically set IDs.

Encoder type	Motor ID entry method
Incremental	Direct entry
Absolute Singleturn	Direct entry
Absolute Multiturn	Direct entry

When using our company's motor, it should be read automatically according to the type of attached encoder or the user should directly write the Motor ID in the parameter. The Motor ID is written on a sticker attached to the side of the motor.



Incremental　　Absolute Singleturn　　Absolute Multiturn

Please be careful when using this parameter as it is applied after ID registration and power is applied again. When combining another company's motor, enter 9999 and set it as a 3rd party.

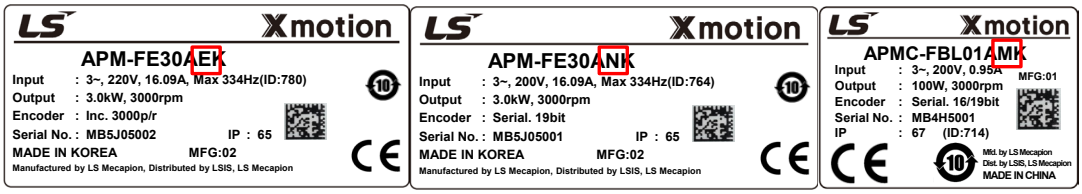
0x2001	Encoder type						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 99	2	-	RW	No	Power recycling	Yes

This parameter sets the encoder type. Refer to the table below and set it correctly. However, the serial encoders supplied by our company (3 based on the table below) are automatically recognized and set regardless of this setting value. At this time, you can check the type of automatically recognized encoder.

This is a parameter to set the encoder type. When using multi-turn encoder's No. 4, the parameter is automatically recognized, so no separate setting is required.

Setting Value	Encoder type	Setting Value	Encoder type
0	Quadrature(incremental, A lead B)	7	Sinusoidal(1Vpp)
1	Quadrature(incremental, B lead A)	8	Analog Hall
2	BiSS-B(Absolute Singleturn)	10	Biss_General
3	-	11	PANASONIC singleturn
4	BiSS-C(Absolute Multiturn)	12	PANASONIC multiturn
5	TAMAGAWA singleturn	13	ENDAT multiturn
6	TAMAGAWA multiturn	14	PANASONIC A6 Series

When using an incremental encoder or an absolute value single-turn encoder, it must be written directly. The encoder type can be checked on the nameplate attached to the motor. Please refer to the servo motor product type in 『1.1 Product Specifications』.

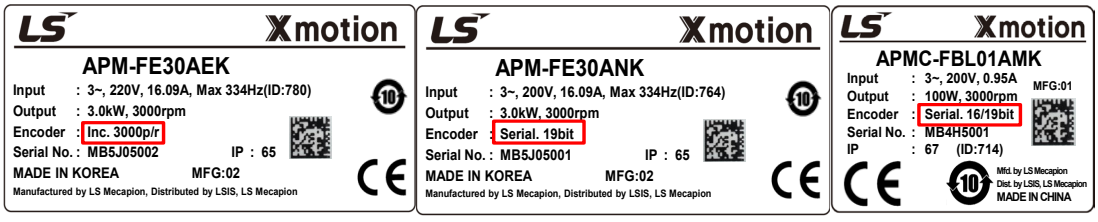


Incremental Absolute Singleturn Absolute Multiturn

For example, if C is listed, it is an incremental encoder and input 0. If N is entered, please input absolute value singleton 2. Since M is an absolute multiturn, 4 is automatically entered.

0x2002	Encoder Pulse per revolution						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 1073741824	524288	pulse	RW	No	Power recycling	Yes

This parameter sets the resolution (resolution) of the encoder. Set the encoder resolution in the unit of pulse (count) based on a multiple of 4. However, the serial encoder provided by LS ELECTRIC is automatically recognized and configured regardless of these settings. However, incremental encoders or absolute single-turn encoders must be entered directly.



Incremental Absolute Singleturn Absolute Multiturn

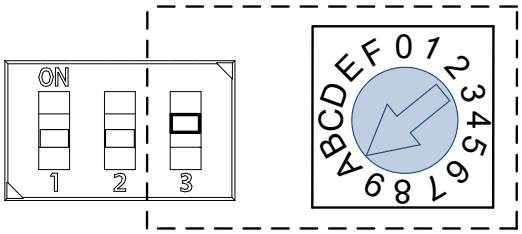
The encoder resolution is also written on the sticker on the side of the motor. Please refer to the picture above.

Encoder type	Entry method	Entry method example
Incremental	Direct entry	Enter 8192 for 2048p/r on the sticker on the side of the motor
Absolute Singleturn	Direct entry	Enter 524288 in case of 19 [bit] on the sticker on the side of the motor
Absolute Multiturn	Direct entry	Automatic recognition, no input required It can be confirmed that 524288 is automatically entered

0x2003	Node ID						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	-	-	RO	No	Power recycling	No

Display the node ID configured for the node setting switch of the drive. The value of the node setting switch is read just once when the power is turned on. Any set value modified subsequently will be in effect only when the power is turned on again. When inputting a value of 16 or more of L7P, please use the 3rd Tap switch.

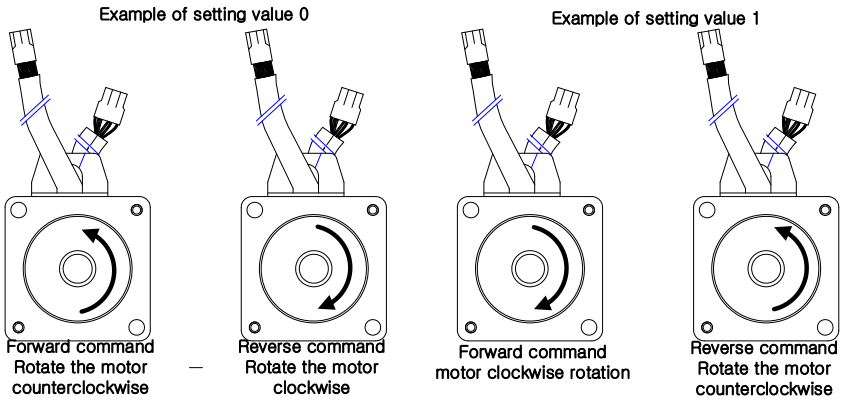
Ex) Example of setting node ID to 26 (0x1A)



0x2004	Rotation direction setting						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Power recycling	Yes

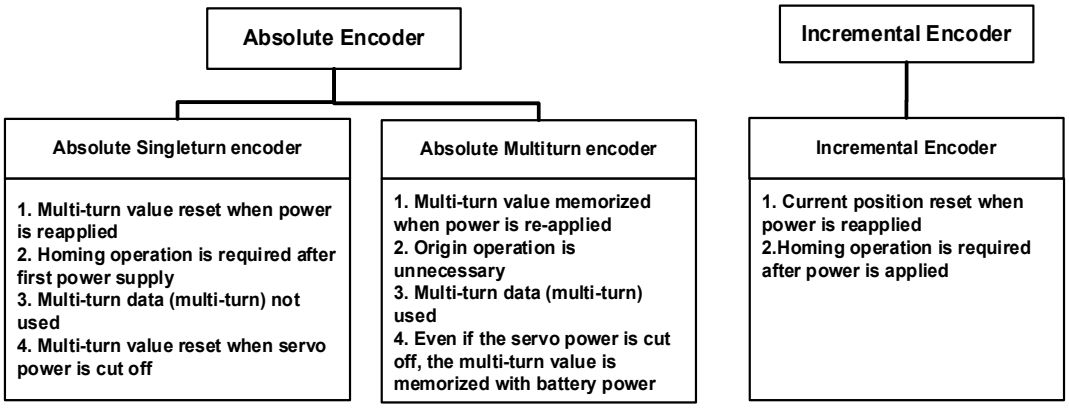
Set the rotation direction of the motor. You can change the rotation direction with this setting when the direction is changed between positive and negative relative to the user at the final apparatus section.

Setting Value	Description
0	With a positive command, the motor rotates counterclockwise. Then, the position feedback value increases.
1	With a positive command, the motor rotates clockwise. Then, the position feedback value increases.



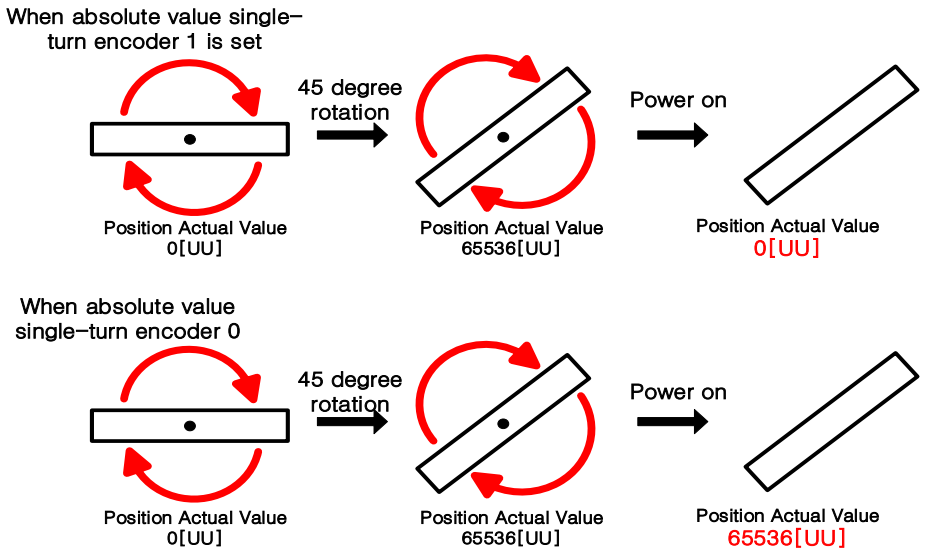
0x2005	Absolute Encoder Configuration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2	1	-	RW	No	Power recycling	Yes

In case of using absolute value multi-turn encoder, this parameter determines whether to use multi-turn data value.



Setting Value	Description
0	It uses the multi-turn data (multi-turn) of the absolute value multi-turn encoder.
1	The multi-turn data (multi-turn) of the absolute multi-turn encoder is not used.
2	When power is applied, the single-turn value of the encoder is used as the current position value.

If the parameter is set to 0, the multi-turn value and current position value are maintained even if the power is turned off and then restarted. However, if set to 1, both the multi-turn value and the current position are initialized when the power is re-applied.



If the set value is set to 2, multi-turn data is initialized to 0 [revolution] when power is re-applied, but the current position is indicated by bringing the single-turn value of the encoder as the current position value.

⚠ Caution

- If you replace the motor and encoder cables while using an incremental encoder, or replace the battery while the servo is turned off, the encoder's multi-turn data will be lost.
- If the encoder loses multi-turn data, there is a risk of equipment malfunction and accident, so be sure to perform home operation before operating.

0x2006	Main Power Fail Check Mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 255	0	-	RW	No	Always	Yes

Set the input mode of the main power and the processing method in case of phase loss.

7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
X	X	X	X	X	X	X	X

Value	Setting content
0	When the main power phase is missing, handles AL-42
1	When the main power phase is missing, handles W-01

Value	Setting content
0	Single-phase power input
1	3-phase power input
2	DC Power input

The upper 4 bits determine the Servo status when the main power phase is missing. And the lower 4 bits are the bits that set the power input method to be used.

Main power fail check mode(0x2006)	Single-Phase input	3-phase input
0x00	Servo On	AL-42
0x01	AL-42	Servo On
0x10	Servo On	W-01
0x11	W-01	Servo On

<Servo status immediately after Servo On>

For example, if '0x01' is entered in the parameter and single-phase power is entered and the Servo On command is given, the servo generates AL-42 immediately. No alarm occurs during Servo Off.

Main Power Fail Check Mode[0x2006]	When the main power is cut off during operation by Servo On
0x00	AL-42
0x01	
0x10	W-01 occurs, but AL-40 (low voltage) occurs after the motor continues to run
0x11	

<Servo status immediately after power off after Servo On>

In addition, if the main power is cut off during Servo On operation, a warning or an alarm is generated according to the set values in the table above.

0x2007	Main Power Fail Check Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	20	ms	RW	No	Always	Yes

This specifies the checking interval for main power phase loss. This function detects instantaneous voltage drop, which may occur depending on the condition of external power input, to check the main power phase loss. Set this function properly according to the condition of external power input.

0x2008	7SEG Display Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 100	0	-	RW	Yes	Always	Yes

This specifies items to display in the 7SEG window.

Setting Value	Display item	Unit	Description
0	Run status	-	
1	Speed feedback	rpm, mm/s	
2	Speed command	rpm, mm/s	
3	Torque feedback	0.1%	
4	Torque command	0.1%	
5	Accumulated operate overload percentage	0.1%	
6	DC link voltage	V	
7	Accumulated Regeneration Overload	0.1%	
8	Mechanical angle	0.1deg	
9	Electrical angle	0.1deg	
10	Inertia ratio	%	
11	Drive Temperature 1	°C	Temperature near the drive power element
12	Drive Temperature 2	°C	Internal temperature of drive
13	Encoder temperature 1	°C	Internal temperature of encoder
14	Node ID	-	
15	Instantaneous maximum load rate	0.1%	Instantaneous maximum load rate for 15 seconds
16	RMS load factor	0.1%	RMS load rate for 15 seconds

0x2009	Regeneration Brake Resistor Configuration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	Yes

Perform regenerative resistance-related setting.

Setting Value	Description
0	Use the regenerative resistance installed in the drive.
1	Uses regenerative resistor separately installed outside the drive. Ensure that the value (0x200B) and capacity (0x200C) of the regenerative resistor are set correctly. For the wiring of the external regenerative resistor, refer to Power Supply Wiring (3.4).

0x200A	Regeneration Brake Resistor Derating Factor						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 200	100	%	RW	No	Always	Yes

This specifies the derating factor which checks for regenerative resistance overloads. When the derating is set to a value no more than 100[%], regeneration overload alarm (AL-23) will be triggered fast. On the other hand, when it is set to a value more than 100[%], the alarm will be triggered slowly. Please change the setting value according to the heat dissipation condition of the regenerative resistor used. When setting to 100% or more, be sure to use it in consideration of heat dissipation conditions.

0x200B	Regeneration Brake Resistor Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	0	Ohm	RW	No	Always	Yes

When using an external regenerative resistor (0x2009=1), set the regenerative resistance in ohm. When using an internal regenerative resistor (0x2009= 0), no setting values will be applied.

0x200C	Regeneration Brake Resistor Power						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 30000	0	Watt	RW	No	Always	Yes

When using an external regenerative resistor (0x2009=1), set the regenerative resistance capacity in watt. When using an internal regenerative resistor (0x2009= 0), no setting values will be applied.

0x200D	Peak Power of Regeneration Brake Resistor						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 50000	100	Watt	RW	No	Always	Yes

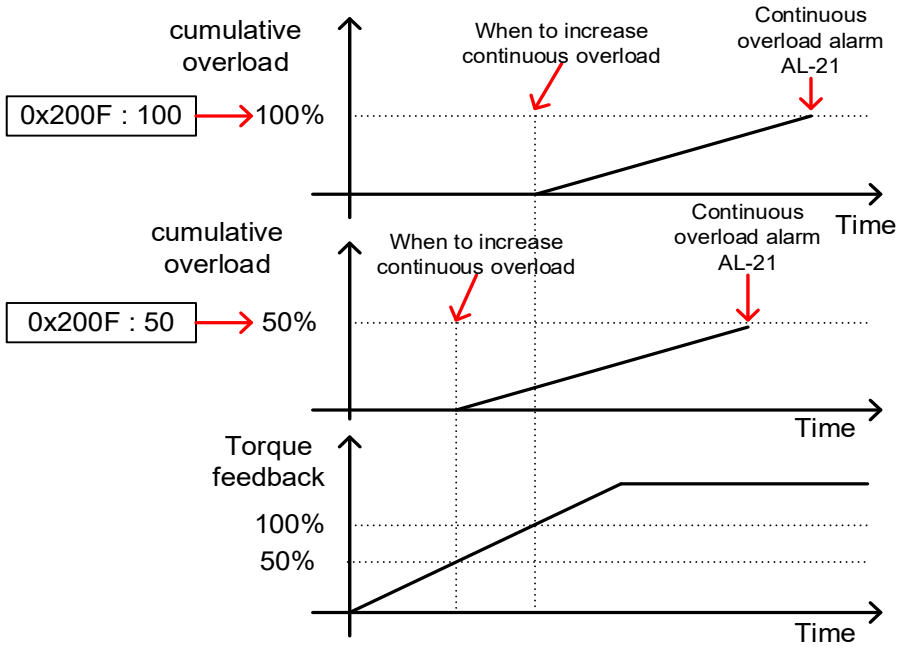
When using an external regenerative resistor (0x2009=1), set the maximum allowable capacity of the regenerative resistance in watt. When using an internal regenerative resistor (0x2009= 0), no setting values will be applied.

0x200E	Duration Time @ Peak Power of Regeneration Brake Resistor						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 50000	5000	Ms	RW	No	Always	Yes

When using an external regenerative resistor (0x2009=1), set the allowed time at the maximum regenerative resistance capacity in watt. When using an internal regenerative resistor (0x2009= 0), no setting values will be applied.

0x200F	Overload Check Base						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	10 to 120	100	%	RW	No	Always	Yes

This parameter controls the load factor at which continuous cumulative overload starts to accumulate.

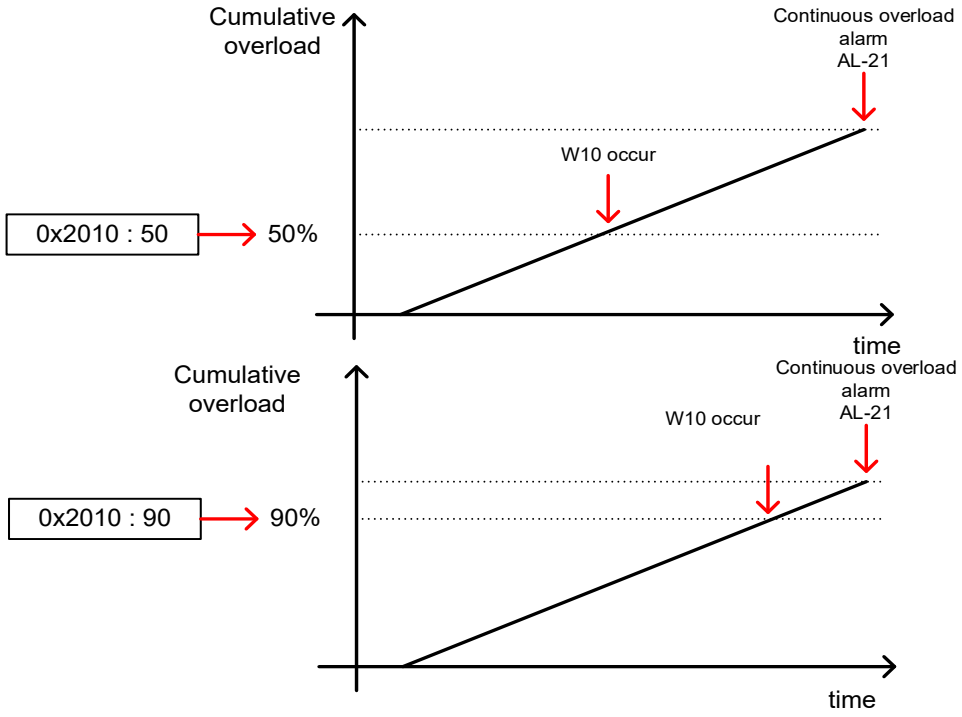


The initial value is 100, and if the torque feedback exceeds 100 [%], the continuous overload alarm (AL-21) occurs due to accumulated overload. If the parameter value is set to 50, accumulated overload will accumulate if the torque feedback exceeds 50 [%], and if it is set to 100, it will accumulate if it exceeds 100 [%]. Therefore, if you set it to 50 at the same time, it accumulates faster than 100, and AL-21 occurs.

If the heat dissipation condition of the drive is not good, set the set value below 100% to generate an overload alarm quickly.

0x2010	Overload Warning Level						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	10 to 100	50	%	RW	No	Always	Yes

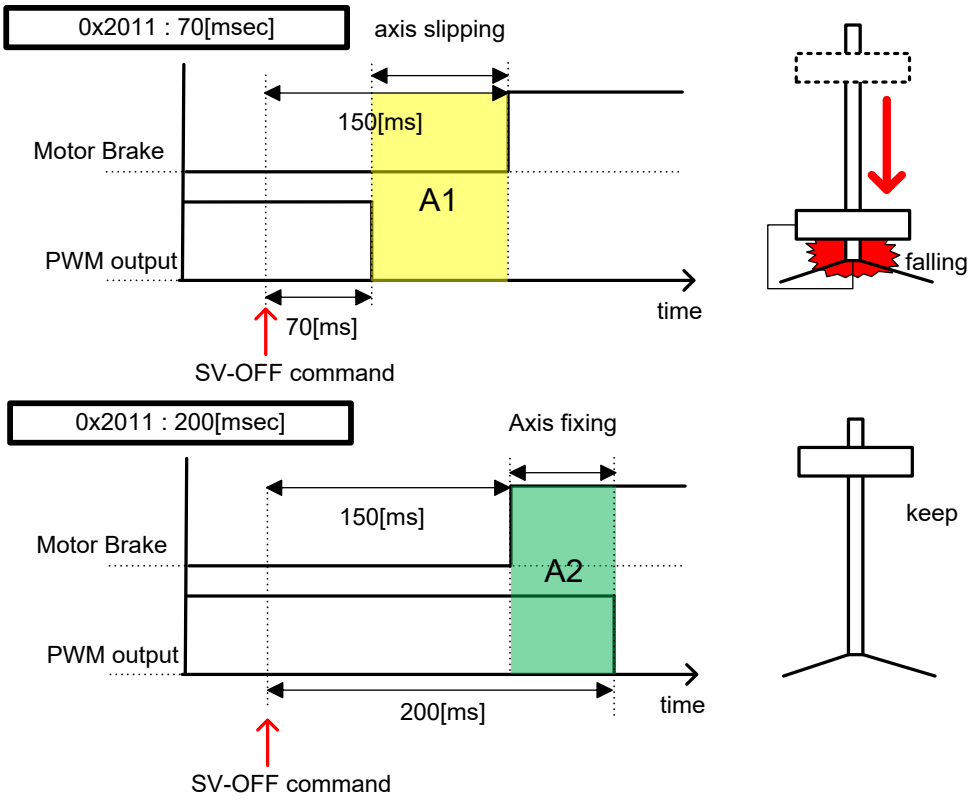
This specifies the output level of accumulated operation overload warning (W10). When the accumulated operation overload rate (0x2603) reaches the set value, a warning will be output. With this setting, you can identify the time when you need to take an appropriate action before an accumulated operation overload alarm occurs.



For example, if you enter 50, W10 occurs from the point when the cumulative overload becomes 50 [%]. If 90 is set, it occurs from the 90[%] point. When cumulative overload reaches 100%, W10 changes to AL-21.

0x2011	PWM Off Delay Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	10	ms	RW	No	Always	Yes

This specifies the delay time until the PWM actually turns off after running servo off command. When using a motor with a brake installed on the vertical axis, you can output the brake signal first, and then turn off the PWM after this set time, in order to prevent it from running down along the axis.

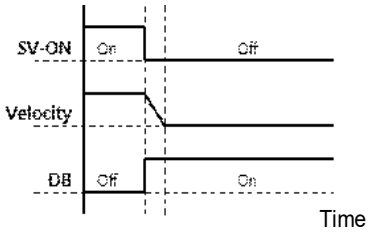


For example, let's assume that the servo off is commanded while using a motor equipped with a brake on the vertical axis, and the brake operates after 150[msec]. If the parameter is set to 50 [msec], the PWM is turned off 50 [msec] after the servo off command, and the area (A1) where the brake is not yet set occurs. Therefore, the shaft slides down due to gravity. However, when set to 200 [msec], the vertical axis is maintained because PWM is output for 50 [msec] and the overlapping section (green) where the brake is taken appears.

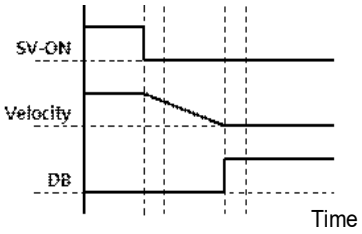
0x2012	Dynamic Brake Control Mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 3	0	-	RW	No	Always	Yes

This specifies the control mode of the dynamic brake on servo off. If the servo is stopped by free run or maintained by release after servo off, the hold is not held by the dynamic brake and continues to rotate by inertia, so please be careful when using it.

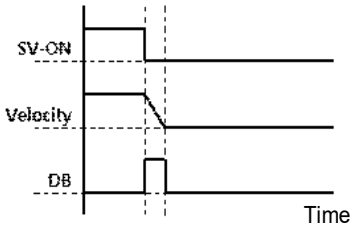
Setting Value	Description
0	Hold the dynamic brake after stopping the motor using the brake
1	Release the dynamic brake after stopping the motor using the brake
2	Release the dynamic brake after free-run stop
3	Hold the dynamic brake after free-run stop



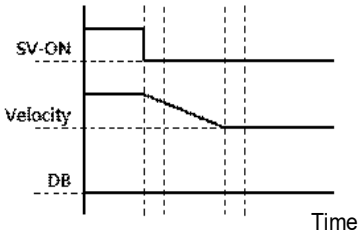
Hold after a DB stop



Hold after a free run stop



Release after a DB stop



Release after a free run stop

0x2013	Emergency Stop Configuration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	1	-	RW	No	Always	Yes

This specifies the method to do an emergency stop (when entering POT, NOT, or ESTOP) on the drive. In the torque control mode, the decelerating to stop mode using the emergency stop torque is not applied.

Setting Value	Description
0	The motor will stop according to the method set in the dynamic brake control mode (0x2012). It will stop using the dynamic brake, and then maintain the torque command at 0.
1	Decelerates to stop using the emergency stop torque (0x2113).

0x2014	Warning Mask Configuration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to $FFFF_{hex}$	0	-	RW	Yes	Always	Yes

When a warning occurs, the warning masked by this setting will not be triggered.

Bit	Warning code	Warning name
0	W01	Main power source loss
1	W02	Low voltage of encoder battery
2	W04	Software Position Limit
3	W08	DB Excessive Current
4	W10	Operation overload
5	W20	Drive / Motor Combination error
6	W40	Low Voltage
7	W80	Emergency signal input

0x2015	U Phase Current Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-1000 to 1000	0	0.1%	RW	No	Always	Yes
0x2016	V phase Current Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-1000 to 1000	0	0.1%	RW	No	Always	Yes
0x2017	W Phase Current Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-1000 to 1000	0	0.1%	RW	No	Always	Yes

Manually set the W phase current offset. The configured offset value is subtracted from the measured current value, and then applied as an actual current value. Do not manually set the offset if you do not know the exact setting value. You can check the automatically-tuned value if you tune the current offset with the procedure function (refer to the description of 0x2700).

Also, from OS Ver2.00 or later, current offset is automatically performed every servo on.

For a drive with small to medium capacity (7.5 KW or less), this parameter is not used since the W phase current is not separately measured.

0x2018	Magnetic Pole Pitch						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 65535	2400	.01mm	RW	No	Power recycling	Yes

This specifies the pitch between the magnetic poles of the linear motor. The pole pitch refers to the distance between the north poles or between the south poles of magnet, corresponding to 360˚ of electrical angle.

0x2019	Linear Scale Resolution						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 65535	1000	Nm	RW	No	Power recycling	Yes

Set Linear Scale Resolution in nm. For a linear scale with the resolution of 1 um, set it to 1000 (= 1 um / 1 nm).

0x201A	Commutation Method						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2	0	-	RW	No	Power recycling	Yes

Set the commutation method to obtain the initial angle information of the motor.

Setting Value	Description
0	Not necessary for separate commutation or carry out commutation using a hall sensor.
1	Carry out commutation when the servo is turned on for the first time.
2	Reserved

0x201B	Commutation Current						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	500	0.1%	RW	No	Always	Yes

Set the commutation current to obtain the initial angle information of the motor.

0x201C	Commutation Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	500 to 5000	1000	ms	RW	No	Always	Yes

Set the commutation current to obtain the initial angle information of the motor

0x201D	Grating Period of Sinusoidal Encoder						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 65535	40	um	RW	No	Power recycling	Yes

Set grid of sinusoidal encoder

0x201E	Move after homing completion Homing Done Behavior						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	Yes

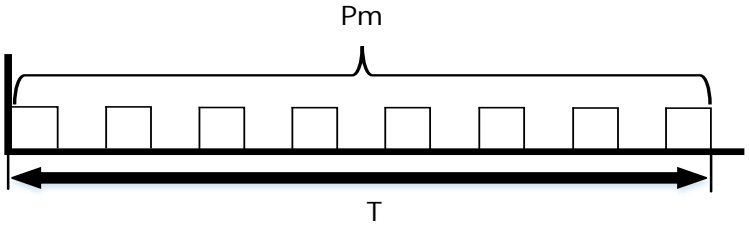
Set movement towards Zero position according to home offset [0x607C].

Setting Value	Description
0	Motor will not move and home offset [0x607C] value will be zero position after homing by homing method [0x6098]
1	Motor will be rotate as much as home offset and zero offset will be 0, after homing by homing method [0x6098]

0x201F	Velocity Function Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2	0	-	RW	No	Always	Yes

Select the method to calculate feedback speed when encoder type is Quadrature.

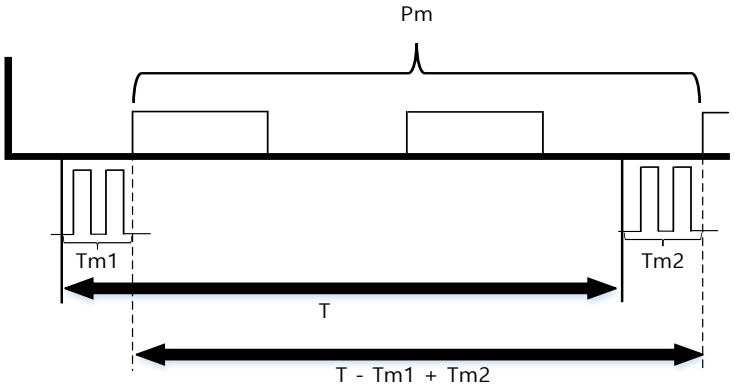
Setting Value	Description
0	MT Method + Speed Observer
1	MT Method
2	M Method



M Method calculates RPM by reading the encoder's counter at regular intervals (T).

If the value of the counter read at regular intervals (T) is Pm, the speed is as follows.

$$Velocity = \frac{p_m}{T}$$



The TM method subtracts the delay time$T_{m1}$for the first encoder pulse input in a certain period (T) and adds the delay time$T_{m2}$for the last encoder pulse input as the final cycle. At this time, the speed calculation is as follows.

$$Velocity = \frac{p_m}{T - T_{m1} + T_{m2}}$$

0x2020	Motor and Hall Phase Correction						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	0	-	RW	No	Power recycling	Yes

Checking the motor wiring and hall sensor wiring in case of 3rd party motor and Setting the sequence of hall sensor UVW, polarity of hall sensor signal and motor rotation direction.

15bit can be set according to the single-phase input or differential input of the hall signal of the encoder. When set to 0, Hall Signal can be input differentially, and when set to 1, Hall Signal can be input single-phase.

Bit	Description
0	Setting direction of rotation of motor (0x2004's setting values and Exclusive OR operation.)
1~7	Reserved
8	Hall U polarity reversal
9	Hall V polarity reversal
10	Hall W polarity reversal
11	Reserved
12	Hall U, Hall V replace
13	Hall V, Hall W replace
14	Hall W, Hall U replace
15	Hall Signal single-phase input setting

0x2031	Operation Time at Peak Current						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 65535	1	ms	RW	No	Power recycling	Yes

Set the operating time at the maximum current of the motor. This setting value is a parameter that protects the motor by I^2T algorithm, so it must be set accurately. (For details on settings, refer to Section 11.10 I^2T Algorithm Protection.).

If an overload alarm occurs or the operating time is adjusted while the motor is connected, be sure to save the data. The initial settings are automatically set for the connected motor.

Flange size	0x2031 Initial setting value
40	1000
60	3000
80 이상	5000
When using a third party	5000

0x2034	Motor Thermal Protection Enable						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	0	-	RW	No	Power recycling	Yes

Activates the protection function by the motor's thermal parameters (Thermal resistance/Capacitance).

Setting Value(bit)	Description(if encoder type is Tamagawa)
0	Activates the protection function based on the thermal parameters (Thermal resistance/Capacitance) of the motor. 0:Disable 1: Enable
1 ~ 13	Reserved
14	0 : Automatic current offset operation when SVON is ON 1 : Automatic current offset not working when SVON is ON
15	0: Motor stops in STO state 1: Motor stops and AL-17 occurs when in STO state.
16	Reserved

• Gain Adjustment(0x2100~)

0x2100	Inertia ratio						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 3000	100	%	RW	No	Always	Yes

This specifies the ratio of the load inertia to the motor's rotor inertia in %.

Inertia ratio = Load inertia / Motor's rotor inertia x 100

The inertia/load ratio is an important control parameter for the operation of the servo. It is crucial to set the correct inertia ratio for optimal servo operation. You can estimate the inertia ratio by auto gain tuning. The ratio will be continuously estimated during operation if you carry out real-time gain tuning.

0x2101	Position loop gain 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 500	50	1/s	RW	Yes	Always	Yes

This specifies the whole responsiveness of the position controller. The larger the setting is configured, the higher the responsiveness is. Too large setting value may cause vibration depending on the load.

0x2102	Speed Loop Gain 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 2000	75	Hz	RW	Yes	Always	Yes

This specifies the whole responsiveness of the speed controller. To make the whole responsiveness of the system higher, you have to set the speed loop gain large as well, along with the position loop gain. Too large setting value may cause vibration depending on the load.

0x2103	Speed loop integral time constant 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 1000	50	ms	RW	Yes	Always	Yes

This specifies the integral time constant of the speed controller. If you set a large value, error will be reduced at a steady state (while stopped or driving at a constant speed), but vibration may occur at a transient state (while accelerating or decelerating).

0x2104	Torque command filter time constant 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	5	0.1ms	RW	Yes	Always	Yes

This applies a low pass filter for torque command. You can improve the system stability by setting an appropriate value to smoothen the torque command. If you set it too large, the delay for the torque command will be longer, reducing the system responsiveness.

0x2105	Position loop gain 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 500	30	1/s	RW	Yes	Always	Yes

This specifies the position loop gain used as gain group 2 for gain switching. For more information, refer to the description of the Position Loop Gain 1 (0x2101).

0x2106	Speed Loop Gain 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 2000	50	Hz	RW	Yes	Always	Yes

This specifies the speed loop gain used as gain group 2 for gain switching. For more information, refer to the description of the Speed Loop Gain 1 (0x2102).

0x2107	Speed loop integral time constant 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 1000	50	Ms	RW	Yes	Always	Yes

This specifies the integral time constant of the speed loop used as gain group 2 for gain switching. For more information, refer to the description of the Speed Loop Integral Time Constant 1 (0x2103).

0x2108	Torque command filter time constant 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	5	0.1ms	RW	Yes	Always	Yes

This specifies the time constant of the torque command filter used as gain group 2 for gain switching. For more information, refer to the description of the Torque Command Filter Time Constant 1 (0x2104).

0x2109	Position Command Filter Time Constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	0	0.1ms	RW	Yes	Always	Yes

This applies a low pass filter for position command to smoothen the position command. Especially, this can be used for setting a higher gear ratio. If the setting value is 0, it is not applied.

0x210A	Position Command average filter time constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	0	0.1ms	RW	Yes	Always	Yes

This applies a moving average filter for position command to smoothen the position command. The position command filter time constant (0x2109) setting value takes precedence and is applied only when the position command filter time constant value is 0.

0x210B	Speed feedback filter time constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	5	0.1ms	RW	Yes	Always	Yes

This applies a low pass filter to the speed feedback signal calculated from the encoder. In case that system vibration occurs or vibration occurs when a gain load with too large of an inertia is applied, you can suppress the vibration by setting appropriate value.

0x210C	Velocity Feed-forward Gain						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 100	0	%	RW	Yes	Always	Yes

This specifies the feed forward gain for the speed command during position control. The larger the setting is, the less the positional error is. If you set a too large value depending on the load, vibration or overshoot may occur. For gain tuning, increase the setting value gradually.

0x210D	Velocity Feed-forward Filter Time Constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	10	0.1ms	RW	Yes	Always	Yes

This applies low pass filter to the compensated amount added to the speed command by the speed feedforward gain. You can enhance the system stability by using it when you set a large speed feedforward gain or when there is excessive change in position command.

0x210E	Torque Feed-forward Gain						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 100	0	%	RW	Yes	Always	Yes

This specifies the feedforward gain for the torque command during speed control.

0x210F	Torque Feed-forward Filter Time Constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	10	0.1ms	RW	Yes	Always	Yes

This applies low pass filter to the compensated amount added to the torque command by the torque feed-forward gain.

0x2110	Torque Limit Function Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 4	2	-	RW	Yes	Always	Yes

This specifies the function to limit the output torque of the drive.

Setting Value	Description
0	Limits the torque using positive/negative torque limit value according to the driving direction; the maximum value is limited by the maximum torque (0x6072). - Forward: 0x60E0, Reverse: 0x60E1
1	Limits the torque only by the maximum torque (0x6072) regardless of the driving direction.
2	Limits the torque using external positive/negative torque limit value according to the driving direction. - Forward: 0x2111, Reverse: 0x2112
3	Limits the torque using internal and external torque limit value according to the driving direction and the torque limit signal. - Forward: 0x60E0(if P_CL signal is not input), 0x2111(if P_CL signal is input) - Reverse: 0x60E1(if N_CL signal is not input), 0x2112(if N_CL signal is input)
4	Limited by the analog input torque limit. - Refer to analog torque limit scale (0x221C) and offset (0x221D)

0x2111	External Positive Torque Limit Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	3000	0.1%	RW	Yes	Always	Yes

This specifies the external positive torque limit value according to the torque limit function setting (0x2110).

0x2112	External Negative Torque Limit Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	3000	0.1%	RW	Yes	Always	Yes

This specifies the external negative torque limit value according to the torque limit function setting (0x2110).

0x2113	Emergency Stop Torque						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	1000	0.1%	RW	Yes	Always	Yes

This specifies the stop torque on emergency stop (when entering POT, NOT, or ESTOP).

0x2114	P/PI Control Conversion Mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 4	0	-	RW	Yes	Always	Yes

This specifies the switch mode between PI control and P control. Using this function, you can improve the speed control characteristic to reduce the overshoot during speed operation and the positioning time during position operation.

Setting Value	Setting content
0	Always PI controlled
1	Switches to the P control if the command torque is larger than the P control switching torque (0x2115).
2	Switches to the P control if the command speed is larger than the P control switching speed (0x2116).
3	Switches to the P control if the acceleration command is larger than the P control switching acceleration (0x2117).
4	Switches to the P control if the position error is larger than the P control switching position error (0x2118).

0x2115	P Control Switch Torque						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	500	0.1%	RW	Yes	Always	Yes

Refer to the description of the P/PI control switching mode (0X2114).

0x2116	P Control Switch Speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 6000	100	Rpm	RW	Yes	Always	Yes

0x2117	P Control Switch Acceleration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 60000	1000	rpm/s	RW	Yes	Always	Yes

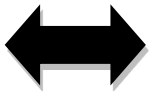
Refer to the description of the P/PI control switching mode (0X2114).

0x2118	P Control Switch Following Error						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 60000	100	pulse	RW	Yes	Always	Yes

Refer to the description of the P/PI control switching mode (0X2114).

0x2119	Gain Conversion Mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 7	0	-	RW	Yes	Always	Yes

You can enhance the performance of the entire system by switching between two gain groups. According to the switching mode, manual switch or automatic switch can be done depending on the external input or output signal, respectively.

Gain group 1		Gain group 2
Position loop gain 1 (0x2101) Speed loop gain 1 (0x2102) Speed loop integral time constant 1 (x2103) Torque command filter time constant 1 (0x2104)		Position loop gain 2 (0x2105) Speed loop gain 2 (0x2106) Speed loop integral time constant 2 (x2107) Torque command filter time constant 2 (0x2108)

Setting Value	Setting content
0	Only the gain group 1 is used.
1	Only the gain group 2 is used.
2	Gain is switched according to the GAIN2 input status. - 0: Use gain group 1 - 1: Use gain group 2
3	Reserved
4	Reserved
5	Reserved
6	Gain is switched according to the ZSPD output status. - 0: Use gain group 1 - 1: Use gain group 2
7	Gain is switched according to the INPOS1 output status. - 0: Use gain group 1 - 1: Use gain group 2

0x211A	Gain Conversion Time 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	2	ms	RW	Yes	Always	Yes

This specifies the waiting time before switching from gain group 2 to gain group 1.

0x211B	Gain Conversion Time 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	2	Ms	RW	Yes	Always	Yes

This specifies the waiting time before switching from gain group 1 to gain group 2.

0x211C	Gain Conversion Waiting Time 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	0	Ms	RW	Yes	Always	Yes

This specifies the waiting time before switching from gain group 2 to gain group 1.

0x211D	Gain Conversion Waiting Time 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	0	Ms	RW	Yes	Always	Yes

This specifies the waiting time before switching from gain group 1 to gain group 2.

0x211E	Dead Band for Position Control						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	0	UU	RW	Yes	Always	Yes

The position controller output is 0 if positional error for position control is below the setting.

0x211F	Drive Control Input 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to $FFFF_{hex}$	0	-	RW	Yes	Always	No

In addition to the signal input through the I/O connector, the signal for the input contact of the drive can be input the same by setting the corresponding bit of the input value through this setting. An applicable function will be performed by logical OR operation of the signal input through I/O connector and the bit value of this setting.

Refer to the table below for the input contact point that can be set.

Bit	Setting content	Bit	Setting content
0	POT	8	MODE
1	NOT	9	Reserved
2	HOME	10	EMG
3	STOP	11	A_RST
4	PCON	12	SV_ON
5	GAIN2	13	SPD1 / LVSF1
6	P_CL	14	SPD2 / LVSF2
7	N_CL	15	SPD3

0x2120	Drive Control Input 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to $FFFF_{hex}$	0	-	RW	Yes	Always	No

It is the same function as [0x211F], and only the contents that can be set are different. Refer to the table below for the input contact point that can be set.

Bit	Setting content	Bit	Setting content
0	START	8	ISEL4
1	PAUSE	9	ISEL5
2	REGT	10	ABSRQ
3	HSTART	11	JSTART
4	ISEL0	12	JDIR
5	ISEL1	13	PCLEAR
6	ISEL2	14	AOVR
7	ISEL3	15	INHIB

0x2121	Drive Status Output 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to $FFFF_{hex}$	0	-	RO	Yes	-	No

You can assign the state of the drive output signal to the I/O output signal, in order to verify the applicable bit of this output value, in addition to actual output.

Bit	Setting content	Bit	Setting content
0	BRAKE	6	VLMT
1	ALARM	7	INSPD
2	READY	8	WARN
3	ZSPD	9	TGON
4	INPOS1	10	INPOS2
5	TLMT	15-11	Reserved

0x2122	Drive Status Output 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to $FFFF_{hex}$	0	-	RO	Yes	-	No

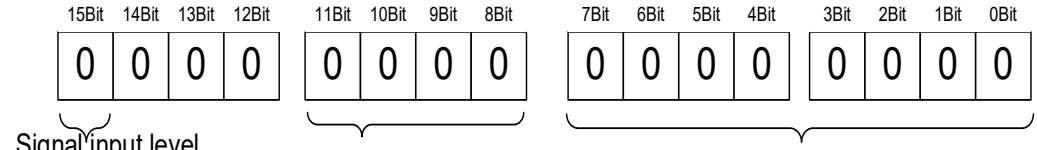
You can assign the state of the drive output signal to the I/O output signal, in order to verify the applicable bit of this output value, in addition to actual output.

Bit	Setting content	Bit	Setting content
0	ORG	5	IOUT3
1	EOS	6	IOUT4
2	IOUT0	7	IOUT5
3	IOUT1	15~8	Reserved
4	IOUT2	-	-

• I/O Configuration(0x2200~)

0x2200	Digital Input Signal 1 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x000F	-	RW	No	Always	Yes

This specifies the functions of digital input signal 1 of the I/O and the input signal level.



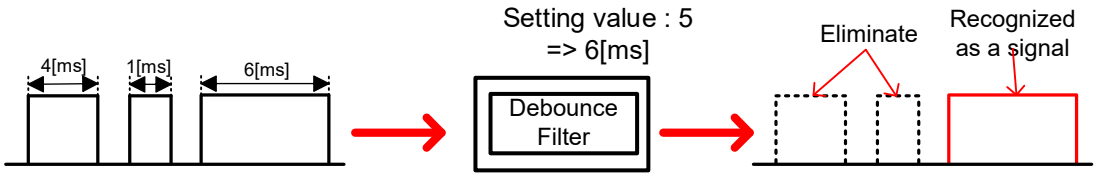
Setting value	status
0	A contact
1	B contact

Setting value	Valid signal filtering time [msec]
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11
11	12
12	13
13	14
14	15
15	16

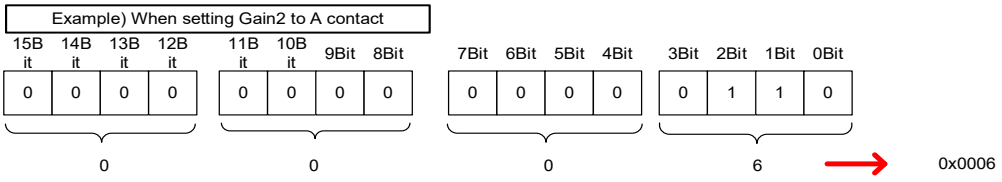
Setting value	Allocation signal
0x00	unassigned
0x01	POT
0x02	NOT
0x03	HOME
0x04	STOP
0x05	PCON
0x06	GAIN2
0x07	PCL
0x08	NCL
0x09	PROBE1
0x0A	PROBE2
0x0B	EMG
0x0C	ARST(Alarm Reset)
0x0F	SV_ON
0x10	START
0x11	PAUSE
0x12	REGT

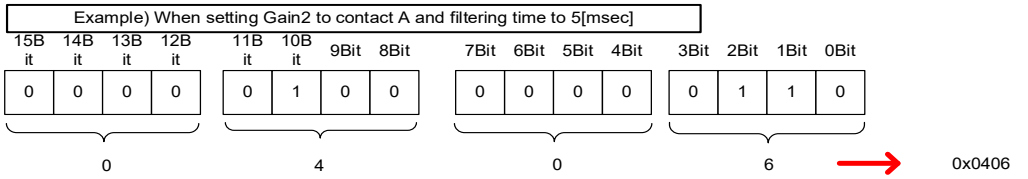
Setting value	Allocation signal
0x13	HSTART
0x14	ISEL0
0x15	ISEL1
0x16	ISEL2
0x17	ISEL3
0x18	ISEL4
0x19	ISEL5
0x1A	ABS RQ
0x1B	JSTART/PJOG
0x1C	JDIR/NJOG
0x1D	PCLR(Pulse clear)
0x1E	AOVR(analog override)
0x1F	INHIBT
0x20	SPD1/LVSF1
0x21	SPD2/LVSF2
0x22	SPD3
0x23	MODE
0x24	ABS RESET

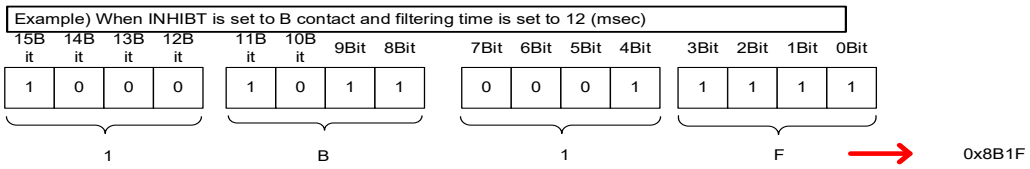
The 15th bit is used to set the contact input status. The debounce filter is applied to block the inflow of chattering component noise.



For example, if the user sets 5, only the high holding time of the input signal longer than 6 [msec] is recognized as a signal, and less than that is filtered out. The figure below is an example of contact input setting.







The setting method is all the same up to the setting of digital input signal 16 [0x220F]

0x2201	Digital Input Signal 2 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0001	-	RW	No	Always	Yes

This specifies the functions of digital input signal 2 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2202	Digital Input Signal 3 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0002	-	RW	No	Always	Yes

This specifies the functions of digital input signal 3 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2203	Digital Input Signal 4 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x000C	-	RW	No	Always	Yes

This specifies the functions of digital input signal 4 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2204	Digital Input Signal 5 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0010	-	RW	No	Always	Yes

This specifies the functions of digital input signal 5 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2205	Digital Input Signal 6 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0004	-	RW	No	Always	Yes

This specifies the functions of digital input signal 6 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2206	Digital Input Signal 7 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0012	-	RW	No	Always	Yes

This specifies the functions of digital input signal 7 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2207	Digital Input Signal 8 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x000B	-	RW	No	Always	Yes

This specifies the functions of digital input signal 8 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2208	Digital Input Signal 9 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0003	-	RW	No	Always	Yes

This specifies the functions of digital input signal 9 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2209	Digital Input Signal 10 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0013	-	RW	No	Always	Yes

This specifies the functions of digital input signal 10 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x220A	Digital Input Signal 11 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0014	-	RW	No	Always	Yes

This specifies the functions of digital input signal 11 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x220B	Digital Input Signal 12 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0015	-	RW	No	Always	Yes

This specifies the functions of digital input signal 12 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x220C	Digital Input Signal 13 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0016	-	RW	No	Always	Yes

This specifies the functions of digital input signal 13 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x220D	Digital Input Signal 14 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0017	-	RW	No	Always	Yes

This specifies the functions of digital input signal 14 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x220E	Digital Input Signal 15 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0018	-	RW	No	Always	Yes

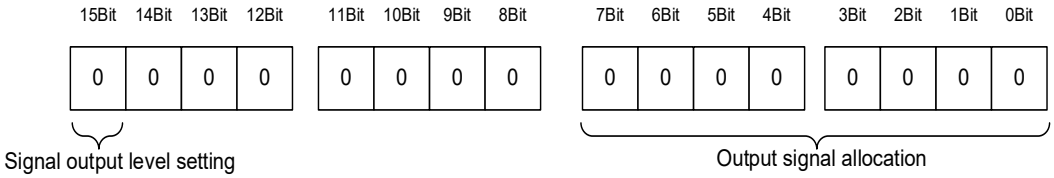
This specifies the functions of digital input signal 15 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x220F	Digital Input Signal 16 Selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0019	-	RW	No	Always	Yes

This specifies the functions of digital input signal 16 of the I/O and the input signal level. For more information, refer to the description of 0x2200.

0x2210	Digital output signal 1 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x8002	-	RW	No	Always	Yes

Assign the functions of digital output signal 1 of I/O and set the output signal level. Output signal setting has no debounce filter function

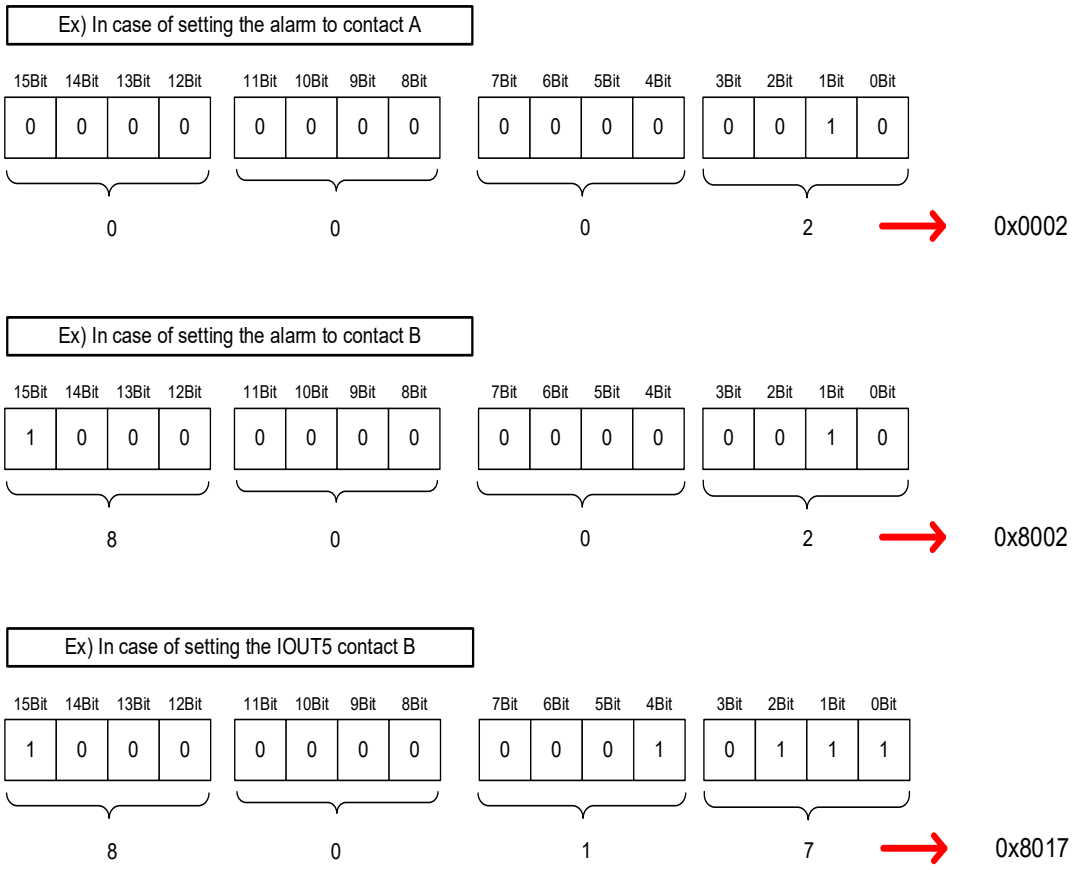


Setting value	status
0	A contact
1	B contact

Setting value	Allocation signal
0x00	unassigned
0x01	BRAKE
0x02	ALARM
0x03	READY
0x04	ZSPD
0x05	INPOS1
0x06	TLMT
0x07	VLMT
0x08	INSPD
0x09	WARN

Setting value	Allocation signal
0x0A	TGON
0x0B	INPOS2
0x10	ORG
0x11	EOS
0x12	IOUT0
0x13	IOUT1
0x14	IOUT2
0x15	IOUT3
0x16	IOUT4
0x17	IOUT5

The method is the same until digital output signal 8 [0x2217] is set.



0x2211	Digital output signal 2 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0003	-	RW	No	Always	Yes

Assign the functions of digital output signal 2 of I/O and set the output signal level. For more information, refer to the description of 0x2210.

0x2212	Digital output signal 3 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	$0x8001_x$	-	RW	No	Always	Yes

Assign the functions of digital output signal 3 of I/O and set the output signal level. For more information, refer to the description of 0x2210.

0x2213	Digital output signal 4 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0005	-	RW	No	Always	Yes

Assign the functions of digital output signal 4 of I/O and set the output signal level. For more information, refer to the description of 0x2210.

0x2214	Digital output signal 5 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0010	-	RW	No	Always	Yes

Assign the functions of digital output signal 5 of I/O and set the output signal level. For more information, refer to the description of 0x2210.

0x2215	Digital output signal 6 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0011	-	RW	No	Always	Yes

Assign the functions of digital output signal 6 of I/O and set the output signal level. For more information, refer to the description of 0x2210.

0x2216	Digital output signal 7 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x000A	-	RW	No	Always	Yes

Assign the functions of digital output signal 7 of I/O and set the output signal level. For more information, refer to the description of 0x2210.

0x2217	Digital output signal 8 selection						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0006	-	RW	No	Always	Yes

Assign the functions of digital output signal 8 of I/O and set the output signal level. For more information, refer to the description of 0x2210.

0x221C	Analog Torque Input(command/limit) Scale						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-1000 to 1000	100	0.1%/V	RW	No	Always	Yes

In case of non-torque operation, when the setting value of the torque limit function setting (0x2110) is 4 (analog torque limit), the torque is limited by the analog input torque limit value. At this time, set the scale of the analog input value.

The calculation formula is:

$$Torque\ limit\ value(\%) = \left(\frac{input\ voltage(mV) - Torque\ input\ offset(ox221C)(mV))}{1000}\right) X \frac{Torque\ command\ scale(ox221D)}{10}$$

Please refer to 10.8 Torque limit function.

In case of torque operation, the parameter is used as an analog torque command scale. The setting value sets the torque command value at the analog input voltage ±10[V] as a percentage of the rated torque.

0x221D	Analog Torque Input(command/limit) Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-1000 to 1000	0	mV	RW	No	Always	Yes

In case of non-torque operation, this specifies the analogue voltage offset controlled by the analogue torque limit

In case of torque operation, the parameter is used as an analog torque command offset.

0x221E	Analog Velocity Override Mode						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2	0	-	RW	No	Always	Yes

Set whether to use the speed override function by analog voltage.

Setting Value	Setting content
0	Analog speed override disabled
1	Analog speed override enabled (-10[V] ~ 10[V])
2	Analog speed override enabled (0[V] ~ 10[V])

0x221F	Analog Velocity Input(command/Override) Offset						P, S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-1000 to 1000	0	mV	RW	No	Always	Yes

In case of indexing position operation, set the offset of analog voltage input as analog speed override, and in case of speed operation, set the offset of analog voltage input as analog speed command.

0x2220	Analog Monitor Output Mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	Yes

Analog monitor output range is -10~+10V. If setting value is 1, output value is positive value only.

Setting Value	Setting content
0	Output as negative/positive values
1	Output only as positive values

0x2221	Analog Monitor Channel 1 Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	0	-	RW	No	Always	Yes

Configure the monitoring variables to be output to the analog monitor output channel 1.

Setting Value	Display item	Unit	Setting Value	Display item	Unit
0	Speed feedback	rpm	12	Drive Temperature 1	°C
1	Speed command	rpm	13	Drive Temperature 2	°C
2	Speed error	rpm	14	Encoder temperature (Reserved)	°C
3	Torque feedback	%	15	Hall sensor signal	
4	Torque command	%	16	U phase current	A
5	Following Error	pulse	17	V phase current	A
6	Accumulated operate overload percentage	%	18	W phase current	A
7	DC link voltage	V	19	Position actual value	UU
8	Accumulated Regeneration Overload	%	20	Position demand value	UU
9	Encoder single-turn data	pulse	21	Position command speed	Rpm
10	Inertia ratio	%	22	Hall U signal	
11	Full-Closed positional error(Reserved)	UU	23	Hall V Value	
			24	Hall W Value	

0x2222	Analog Monitor Channel 2 Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	1	-	RW	No	Always	Yes

Configure the monitoring variables to be output to the analog monitor output channel 2.

0x2223	Analog Monitor Channel 1 Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	0 to 0x40000000	0	-	RW	No	Always	Yes

Subtract the offset value from the monitoring variable of the analog monitor output channel 1 to determine the final output. The unit will be that of the variable configured in the Analog Monitor Channel 1 Setting (0x2221).

0x2224	Analog Monitor Channel 2 Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	0 to 0x40000000	0	-	RW	No	Always	Yes

Subtract the offset value from the monitoring variable of the analog monitor output channel 2 to determine the final output. The unit will be that of the variable configured in the Analog Monitor Channel 2 Setting (0x2222).

0x2225	Analog Monitor Channel 1 Scale						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x40000000	500	-	RW	No	Always	Yes

This specifies the scaling of the variable to be output per 1 V when outputting the monitoring variable configured as the analog output channel 1. The unit will be that of the variable configured in the Analog Monitor Channel 1 Setting (0x2221) per 1 V.

For example, if you set the speed feedback to the channel 1 and the scale to 500, up to +/-5000 rpm can be output as +/-10 V.

0x2226	Analog Monitor Channel 2 Scale						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x40000000	500	-	RW	No	Always	Yes

This specifies the scaling of the variable to be output per 1 V when outputting the monitoring variable configured as the analog output channel 2. The unit will be that of the variable configured in the Analog Monitor Channel 2 Setting (0x2222) per 1 V.

0x2227	Analog Velocity Command Filter Time Constant						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	2	0.1ms	RW	No	Always	Yes

The stability of the command signal can be improved by setting a digital filter for the analog speed command voltage. At this time, if too large a value is set, the response to the speed command will decrease. Therefore, set it to an appropriate value according to the system

0x2228	Analog torque Command Filter Time Constant						T
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	2	0.1ms	RW	No	Always	Yes

The stability of the command signal can be improved by setting a digital filter for the analog torque command voltage. At this time, if too large a value is set, the response to the torque command will decrease. Therefore, set it to an appropriate value according to the system.

0x2229	Analog Velocity Command Scale						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-1000 to 1000	100	rpm/V	RW	No	Always	Yes

When controlling the speed with analog voltage in speed operation, set the analog speed command value at ±10 [V] in [rpm] unit. If the set value is 100, 100 [rpm] per command voltage 1 [V] can be controlled.

0x222A	Analog Velocity Command Clamp Level						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	0	rpm	RW	No	Always	Yes

In speed operation, when speed is controlled with analog voltage, a constant voltage may exist even at 0 speed command on the analog signal connection circuit.

At this time, zero speed can be maintained in the command as much as the set speed value.

• Enhanced Control(0x2300~)

0x2300	Jog Operation speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-6000 to 6000	500	Rpm	RW	No	Always	Yes

This specifies the jog operation speed.

0x2301	Speed Command Acceleration Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	200	Ms	RW	No	Always	Yes

Specifies the time required, in ms, for the motor to reach the rated motor speed from zero speed.

0x2302	Speed Command Deceleration Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	200	Ms	RW	No	Always	Yes

This specifies the time, in ms, required the motor to decelerate from the rated motor speed to the stop.

0x2303	Speed Command S-curve Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	0	Ms	RW	No	Always	Yes

You can configure the speed command in an S-curve pattern for smooth acceleration/deceleration. If it is set to 0, the drive will be operated in a trapezoidal pattern by default. Available only in speed operation mode.

Please refer to 10.4.1 Smooth acceleration/deceleration.

0x2304	Program Jog Operation Speed 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-6000 to 6000	0	Rpm	RW	No	Always	Yes

For programmed jog operation, you can set the operation speed 1 to 4 and the operation time 1 to 4 as follows:

0x2305	Program Jog Operation Speed 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-6000 to 6000	500	rpm	RW	No	Always	Yes

0x2306	Program Jog Operation Speed 3						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-6000 to 6000	0	rpm	RW	No	Always	Yes

Refer to the description of Programm Jog Operation Speed 1 (0x2304).

0x2307	Program Jog Operation Speed 4						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-6000 to 6000	-500	rpm	RW	No	Always	Yes

Refer to the description of Programmed Jog Operation Speed 1 (0x2304).

0x2308	Program Jog Operation Time 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	500	ms	RW	No	Always	Yes

Refer to the description of Programmed Jog Operation Speed 1 (0x2304).

0x2309	Program Jog Operation Time 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	5000	Ms	RW	No	Always	Yes

0x230A	Program Jog Operation Time 3						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	500	Ms	RW	No	Always	Yes

Refer to the description of Programm Jog Operation Speed 1 (0x2304).

0x230B	Program Jog Operation Time 4						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	5000	Ms	RW	No	Always	Yes

Refer to the description of Programm Jog Operation Speed 1 (0x2304).

0x230C	Index Pulse Search Speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-1000 to 1000	20	rpm	RW	No	Always	Yes

This specifies the speed for index pulse search.

0x230D	Speed Limit Function Select						T
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 3	0	-	RW	No	Always	Yes

This specifies the speed limit function for torque control.

Setting Value	Setting content
0	Limited by speed limit value (0x230E)
1	Limited by the maximum motor speed
2	Set the analog speed command as the maximum torque speed limit value
3	Reflects the smaller value between the value of 0x230E and the analog speed command value

0x230E	Speed Limit Value at Torque Control Mode						T
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 6000	1000	rpm	RW	Yes	Always	Yes

This specifies the speed limit value for torque control. This setting is applied only when the Speed Limit Function Setting (0x230D) is set to 0.

0x230F	Over Speed Detection Level						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	6000	rpm	RW	No	Always	Yes

This specifies the level to detect overspeed alarms (AL-50). If the setting is larger than the maximum motor speed, the detection level will be set by the maximum motor speed.

0x2310	Excessive Speed Error Detection Level						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10000	5000	rpm	RW	No	Always	Yes

This specifies the level to detect excessive speed error alarms (AL-53). If the difference between the speed command and the speed feedback exceeds the setting value, an excessive speed error alarm is generated.

0x2311	Servo-Lock Function Select						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	Yes

This specifies the servo-lock function to fix the motor position with a position value when the speed command is input as 0 for speed control.

Setting Value	Setting content
0	Servo-lock function disabled
1	Servo-lock function enabled

0x2312	Multi-Step Operation Speed 1						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	0	Rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 1. This is the speed when the SPD1, SPD2, and SPD3 input contacts are OFF.

0x2313	Multi-Step Operation Speed 2						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	10	Rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 2. This is the speed when the SPD1 input contact point is ON and the SPD2 and SPD3 input contact points are OFF.

0x2314	Multi-Step Operation Speed 3						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	50	Rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 3. This is the speed when the SPD2 input contact point is ON and the SPD1 and SPD3 input contact points are OFF.

0x2315	Multi-Step Operation Speed 4						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	100	Rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 4. This is the speed when the SPD1, SPD2 input contact point is ON and the SPD3 input contact points are OFF.

0x2316	Multi-Step Operation Speed 5						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	200	rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 5. This is the speed when the SPD3 input contact point is ON and the SPD1 and SPD2 input contact points are OFF.

0x2317	Multi-Step Operation Speed 6						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	500	rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 6. This is the speed when the SPD1, SPD3 input contact point is ON and the SPD2 input contact points are OFF.

0x2318	Multi-Step Operation Speed 7						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	1000	rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 7. This is the speed when the SPD2, SPD3 input contact point is ON and the SPD1 input contact points are OFF.

0x2319	Multi-Step Operation Speed 8						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-32768 to 32767	1500	rpm	RW	No	Always	Yes

In speed operation mode, set the speed for multi-step operation speed 8. This is the speed when the SPD1, SPD2, and SPD3 input contacts are ON.

0x231A	Velocity Command Switch Select						S
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 3	0	-	RW	No	Always	Yes

In speed operation mode, select the speed command method.

Setting Value	Setting content
0	Analog Velocity Command Use.
1	Using SPD1, SPD2 contact and analog speed command.
2	Using SPD1, SPD1, SPD2 contact and analog speed command
3	Using SPD1, SPD2, SPD3 contact point speed command

Please refer to chapter 7 Speed operation.

• Miscellaneous Setting(0x2400~)

0x2400	Software Position Limit Function Select						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 3	0	-	RW	No	Always	Yes

This specifies the software position limit function for position control. When using the position limit function, the upper and the lower limit values will be limited to the values configured in (0x670D: 02) and (0x670D:01), respectively

Encoder spec.	Requirements for using the function
Incremental encoder	**1. After power-on, origin operation must be performed once.** **2. When origin operation is completed, the function can be used.**
Absolute singleturn encoder	
Absolute multiturn encoder	**1. An external battery must be connected** **2. Absolute Encoder Configuration [0x2005] must be set to 0.** **3. There is no need to set the origin operation again after power is applied.** **4. Functionality can be used immediately.**

The software position limit function will not be activated prior to the homing operation. Multi-turn encoder does not require origin operation when using multi-turn with Absolute Encoder Configuration [0x2005] set to 0. Also, this function does not work even if the upper limit value is smaller than the lower limit value, so please use it with caution. .

Setting Value	Setting content
0	None of positive and negative software position limits are used.
1	Only positive software position limit value is used. It is not limited for the reverse direction.
2	Only negative software position limit value is used. It is not limited for the forward direction.
3	Both of the positive and the negative software position limits are used.

Position limit function can be limitedly used in JOG operation mode. When index is used, JOG operation mode is used for remaining pulse movement, so the function can be used by setting the 5th bit of the parameter below.

I/O Signal Configuration [0x300A]

7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
0	0	0	0	0	0	0	0

Setting Value	Setting content
0	Software position limit function not used in JOG operation mode
1	Use software position limit in JOG operation mode (bidirectional)

0x2401	INPOS1 Output Range						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 60000	100	UU	RW	Yes	Always	Yes

With the position command not newly updated, if the positional error is retained within the INPOS1 output range for the INPOS1 output time, the INPOS1 signal is output.

0x2402	INPOS1 Output Time						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	0	ms	RW	Yes	Always	Yes

Please refer to the description of 0x2401.

0x2403	INPOS2 Output Range						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 60000	100	UU	RW	Yes	Always	Yes

This outputs the INPOS2 signal where the positional error is less than the setting value. Unlike the INPOS1, the INPOS2 signal is output by calculating only the positional error value.

0x2404	ZSPD Output Range						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 6000	10	Rpm	RW	Yes	Always	Yes

When the current speed is less than the setting value, the ZSPD signal is output.

0x2405	TGON Output Range						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 6000	100	Rpm	RW	Yes	Always	Yes

When the current speed is more than the setting value, the TGON signal is output.

0x2406	INSPD Output Range						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 6000	100	Rpm	RW	Yes	Always	Yes

When the speed error is less than the setting value, the INSPD signal is output.

0x2407	BRAKE output speed						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 6000	100	Rpm	RW	No	Always	Yes

If the motor stops due to servo OFF or servo alarm during rotation, you can set the speed (0x2407) and delay time (0x2408) for brake signal output, in order to configure the output timing. The brake signal will be output if the motor rotation speed goes below the set speed (0x2407) or the output delay time (0x2408) has elapsed after the servo OFF command.

0x2408	BRAKE Output delay time						P
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	100	ms	RW	No	Always	Yes

Refer to the description of 0x2407.

0x2409	Torque Limit for Homing Using Stopper						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2000	250	0.1%	RW	No	Always	Yes

This specifies the torque limit value for homing using a stopper. With too large of a value configured, the machine may collide with the stopper.

0x240A	Duration Time for Homing Using Stopper						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	50	ms	RW	No	Always	Yes

This specifies the time to detect the stopper for homing using a stopper. Set an appropriate value, depending on the machine.

0x240B	Modulo Mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5	0	-	RW	No	Power recycling	Yes

Set whether to use the Modulo function. (L7P is determined by the coordinate axis and index type)

Setting Value	Setting content
0	Does not use the Modulo function.
1	Uses the Modulo function to move forward.
2	Uses the Modulo function to move backward.
3	Uses the Modulo function to move via the possible shortest distance.
4	Uses the Modulo function to move to the absolute position.
5	Uses the Modulo function to move to the relative position.

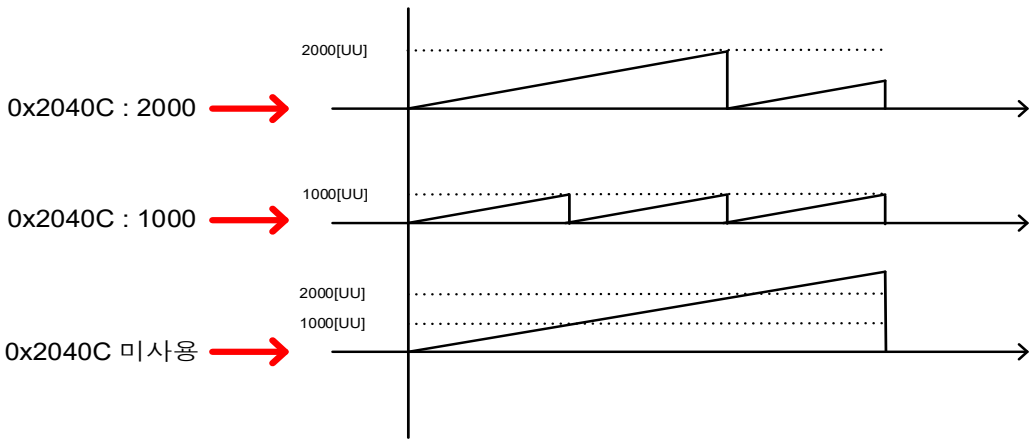
0x240C	Modulo Factor						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	1 to 0x40000000	3600	UU	RW	No	Power recycling	Yes

Set the factor when using the modulo function. The user sets the position value corresponding to one revolution when the motor is driven.

* Modulo Factor concept

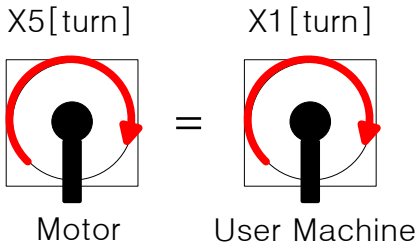
The basic formula is:

$$Position\ Actual\ Value\ using\ Modulo\ factor = Position\ Actual\ Value - (Position\ Actual\ Value\ \div Modulo\ Factor) \times Encoder\ Pulse\ per\ Revolution$$



In general, if the motor rotates in one direction when the modular factor is not used, the current position continues to increase.

If you use the modular factor and enter 1000, the current position (Position Actual Value) increases only up to 1000 [UU] and then resets to 0 [UU]. Likewise, even if you input 2000, it increases only up to 2000 [UU] and is initialized again. That is, the remainder value obtained by dividing the Position Actual Value by the Modulo Factor is reflected.



When the instrument of the equipment makes 1[turn], and the L7 19[bit] motor mounted on the equipment makes 5[turn], the total pulse required for the equipment to make 1[turn] is as follows.

$$524288 \times 5[turn] = 9961472[\mathrm{UU}]$$

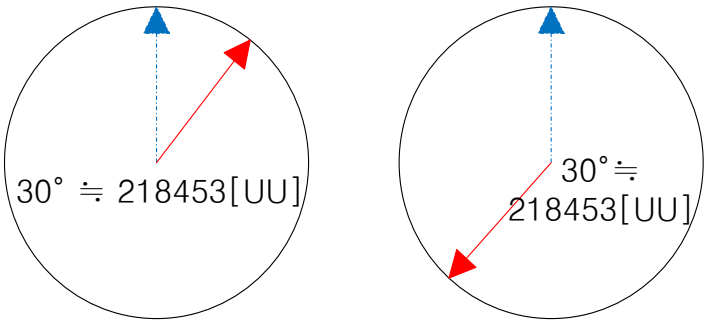
If the user wants to control equipment 1[turn] within 0~9961472[UU], when 9961472[UU] is input to the Modulo Factor, the equipment will appear within 1[turn] to 1~9961472[UU] in the Position Actual value and 1[turn]], it starts again at 1[UU].

Example of using Modulo Factor

L7P is applicable when address 0x3000 is set to index operation mode 0 and address 0x3001 is set to rotation coordinate system 1.

If the user wants to rotate the axis of the equipment to the 30-degree position in index operation mode, input 218453[UU] to the index distance to move to the 30-degree position, and input 1529173[UU] to move to the 210-degree position.

$$9961472[UU] \times \frac{30°}{360°} = 218453[\mathrm{UU}]$$



* Modulo Factor advantage

When a user drives a 19-bit motor 10,000 times in one direction at 60 degrees, in the relative position operation mode of the index, the error value below the decimal point is continuously accumulated, and when operated 10,000 times, it is distorted by about 3 degrees.

$$\frac{60}{360} \times 524288 = \frac{2^2 \times 3 \times 5}{2^3 \times 3^2 \times 5} \times 2^{19} = \frac{2^{18}}{3} = 87381.3333\ldots\ [Pulse]$$

Start count	Pulse no.	Resolution	360°	Real value	Theoretical value
1	87381	524288	360	59.99977112	60
2	174762	524288	360	119.9995422	120
3	262143	524288	360	179.9993134	180
4	349524	524288	360	239.9990845	240
5	436905	524288	360	299.9988556	300
6	524286	524288	360	359.9986267	360
7	611667	524288	360	419.9983978	420
8	699048	524288	360	479.9981689	480
9	786429	524288	360	539.9979401	540
10	873810	524288	360	599.9977112	600

9990	872936190	524288	360	599397.7135	599400
9991	873023571	524288	360	599457.7132	599460
9992	873110952	524288	360	599517.713	599520
9993	873198333	524288	360	599577.7128	599580
9994	873285714	524288	360	599637.7126	599640
9995	873373095	524288	360	599697.7123	599700
9996	873460476	524288	360	599757.7121	599760
9997	873547857	524288	360	599817.7119	599820
9998	873635238	524288	360	599877.7116	599880
9999	873722619	524288	360	599937.7114	599940
10000	873810000	524288	360	599997.7112	600000

When a user drives a 19-bit motor 10,000 times in one direction at 60 degrees, the error value below the decimal point does not accumulate in the absolute operation mode of the index, and the error value does not accumulate even after 10,000 times of operation. .

$$\frac{60}{360} \times 524288 = \frac{2^2 \times 3 \times 5}{2^3 \times 3^2 \times 5} \times 2^{19} = \frac{2^{18}}{3} = 87381.3333\ldots\ [Pulse]$$

Start count	Pulse no.	Resolution	360°	Real value	Theoretical value
1	87381	524288	360	59.99977112	60
2	174762	524288	360	119.9995422	120
3	262143	524288	360	179.9993134	180
4	349524	524288	360	239.9990845	240
5	436905	524288	360	299.9998856	300
6	524286	524288	360	359.9986267	360
7	87381	524288	360	59.99977112	420
8	174762	524288	360	119.9995422	480
9	262143	524288	360	179.9993134	540
10	349524	524288	360	239.9990845	600

9990	524286	524288	360	359.9986267	599400
9991	87381	524288	360	59.99977112	599460
9992	174762	524288	360	119.9995422	599520
9993	262143	524288	360	179.9993134	599580
9994	349524	524288	360	239.9990845	599640
9995	436905	524288	360	299.9998856	599700
9996	524286	524288	360	359.9986267	599760
9997	87381	524288	360	59.99977112	599820
9998	174762	524288	360	119.9995422	599880
9999	262143	524288	360	179.9993134	599940
10000	349524	524288	360	239.9990845	600000

0x240D	User Drive Name						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	'Drive'	-	RW	No	Always	Yes

The user can customize the drive name. Up to 16 characters can be used to define the name.

0x240E	Individual Parameter Save						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	No

This specifies whether to save parameters individually. This parameter is not saved and initialized to 0 during power ON.

Setting Value	Setting content
0	Parameters are not saved individually. For details on storing a parameter, refer to Storing Parameters (0x1010).
1	Save the parameters individually. When a parameter is written, it is immediately stored in the memory.

• Enhanced Control(0x2500~)

0x2500	Adaptive Filter Function Setting						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5	0	-	RW	No	Always	Yes

This specifies the adaptive filter function.

Setting Value	Setting content
0	Adaptive filter is not used.
1	Only one adaptive filter is used. You can check the settings configured automatically in the Notch Filter 4 Settings (0x250A and 0x250B).
2	Only two adaptive filter is used. You can check the settings configured automatically in the Notch Filter 3 (0x2507, 0x2508) and 4 Settings (0x250A, 0x250B).
3	Reserved
4	Settings of Notch Filter 3 (0x2507, 0x2508) and Notch Filter 4 (0x250A, 0x250B, 0x250C) are initialized
5	Reserved

0x2501	Notch Filter 1 Frequency						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	500 to 5000	5000	Hz	RW	No	Always	Yes

This specifies the frequency of the notch filter 1.

0x2502	Notch Filter 1 width						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 100	1	-	RW	No	Always	Yes

This specifies the width of the notch filter 1.

0x2503	Notch Filter 1 Depth						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 5	1	-	RW	No	Always	Yes

This specifies the depth of the notch filter 1.

0x2504	Notch Filter 2 Frequency						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	500 to 5000	5000	Hz	RW	No	Always	Yes

0x2505	Notch Filter 2 width						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 100	1	-	RW	No	Always	Yes

0x2506	Notch Filter 2 Depth						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 5	1	-	RW	No	Always	Yes

0x2507	Notch Filter 3 Frequency						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	500 to 5000	5000	Hz	RW	No	Always	Yes

0x2508	Notch Filter 3 width						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 100	1	-	RW	No	Always	Yes

0x2509	Notch Filter 3 Depth						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 5	1	-	RW	No	Always	Yes

0x250A	Notch Filter 4 Frequency						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	500 to 5000	5000	Hz	RW	No	Always	Yes

0x250B	Notch Filter 4 width						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 100	1	-	RW	No	Always	Yes

0x250C	Notch Filter 4 Depth						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 5	1	-	RW	No	Always	Yes

0x250D	On-line Gain Tuning Mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	Yes

On-line Gain Tuning mode Set

Setting Value	Setting content
0	On-line Gain Tuning not used
1	On-line Gain Tuning used

0x250E	System Rigidity for Gain Tuning						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 20	5	-	RW	No	Always	Yes

This specifies the system rigidity applied for gain tuning. After the gain tuning according to the setting, the overall gain will be set higher or lower. If the gain of the maximum setting value is not enough, carry out the tuning manually. The gain automatically changed after gain tuning is as follows.

Inertia ratio (0x2100), position loop gain 1 (0x2101), speed loop gain 1 (0x2102), speed integral time constant 1 (0x2103), torque command filter time constant 1 (0x2104), notch filter 3 frequency (0x2507, TBD), and notch filter 4 frequency (0x250A, TBD).

0x250F	On-line Gain Tuning Adaptation Speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 5	1	-	RW	No	Always	Yes

This specifies the speed reflecting the change of gain when performing on-line gain tuning. The larger the setting value is, the faster the change of gain is reflected.

0x2510	Off-line Gain Tuning Direction						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	Yes

This specifies the movement direction when performing the Off-line Gain Tuning. Set the function properly according to the condition of the apparatus section.

Setting Value	Setting content
0	Run in forward direction
1	Run in reverse direction

0x2511	Off-line Gain Tuning Distance						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 10	5	-	RW	No	Always	Yes

It specifies the distance when performing the off-line gain tuning. The larger the setting value is, the longer the movement distance becomes. Set the distance properly according to the condition of the apparatus section. Make sure to secure enough distance (more than one revolution of motor) prior to gain tuning.

0x2512	Disturbance Observer Gain						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 100	0	%	RW	No	Always	Yes

(Reserved)

0x2513	Disturbance Observer Filter Time Constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1000	10	0.1ms	RW	No	Always	Yes

(Reserved)

0x2514	Current Controller Gain						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 150	100	%	RW	No	Always	Yes

This specifies the current controller gain. Lowering the setting value will reduce the noise, but the drive's responsiveness decreases as well.

0x2515	Vibration Suppression Filter Configuration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5	0	-	RW	No	Always	Yes

Reserved

0x2516	Vibration Suppression Filter 1 Frequency						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2000	0	0.1Hz	RW	No	Always	Yes

Reserved

0x2517	Vibration Suppression Filter 1 Damping						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5	0	-	RW	No	Always	Yes

Reserved

0x2518	Vibration Suppression Filter 2 Frequency						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2000	0	0.1Hz	RW	No	Always	Yes

Reserved

0x2519	Vibration Suppression Filter 2 Damping						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5	0	-	RW	No	Always	Yes

Reserved

• Monitoring(0x2600~)

0x2600	Feedback Speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	rpm	RO	Yes	-	No

This represents the current rotation speed of the motor.

0x2601	Command speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	rpm	RO	Yes	-	No

This represents the speed command input to the speed control loop of the drive.

0x2602	Following Error						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	pulse	RO	Yes	-	No

This represents the positional error of position control.

0x2603	Accumulated Operation Overload						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	0.1%	RO	No	-	No

This represents the accumulated operation overload rate. When the value of the accumulated operation overload rate reaches the overload warning level setting (0x2010), the operation overload warning (W10) will occur; when it reaches 100%, the operation overload alarm (AL-21) will occur.

0x2604	Instantaneous Maximum Operation Overload						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	0.1%	RO	Yes	-	No

Indicates the maximum value of the operating overload rate shortly output from the drive. This value can be initialized by the initialization of the instantaneous maximum operation overload.

0x2605	DC link voltage						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	Volt	RO	Yes	-	No

This represents the DC link voltage by the main power input.

0x2606	Accumulated Regeneration Overload						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	0.1%	RO	No	-	No

This represents the accumulated overload rate of the regenerative resistor due to regenerative operation. In case that the value of the accumulated regenerative overload rate reaches 100%, a regenerative overload alarm (AL-23) will be generated.

0x2607	SingleTurn Data						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	-	pulse	RO	Yes	-	No

This represents the single-turn data of the motor. Values ranging from 0 to (encoder resolution-1) are displayed.

0x2608	Mechanical Angle						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	0.1deg	RO	Yes	-	No

This represents the single-turn data of the motor, ranging from 0.0 to 359.9.

0x2609	Electrical Angle						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	0.1deg	RO	Yes	-	No

This represents the electrical angle of the motor, ranging from -180.0 to 180.0.

0x260A	MultiTurn Data						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	rev.	RO	Yes	-	No

This represents the multi-turn data of multi-turn encoder.

0x260B	Drive Temperature 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	ºC	RO	No	-	No

It is the temperature measured by the temperature sensor integrated onto the drive power board. If the measurement is higher than 95℃, the drive overheat alarm 1 (AL-22) will be generated.

0x260C	Drive Temperature 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	ºC	RO	No	-	No

This represents the temperature measured by the temperature sensor integrated onto the drive control board. If the measured temperature is higher than 90℃, the drive overheat alarm 2 (AL-25) will be generated.

0x260D	Encoder Temperature						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	ºC	RO	No	-	No

This represents the temperature measured by the temperature sensor integrated into serial encoder provided by LS ELECTRIC (if the setting values of the encoder type (0x2001) is 4). If the measured temperature is higher than 90℃, the encoder overheat alarm (AL-26) will be generated.

0x260E	Motor Rated Speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	rpm	RO	No	-	No

This represents the rated speed of the driving motor.

0x260F	Motor Maximum Speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	rpm	RO	No	-	No

This represents the maximum speed of the driving motor.

0x2610	Drive Rated Current						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	0.1A	RO	No	-	No

This represents the rated current of the drive.

0x2611	FPGA Version						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No

This represents the version of the FPGA within the drive.

0x2612	Hall Signal Display						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	-	RO	No	-	No

This represents the signal of the hall sensor installed in the encoder (or motor). This can be used to verify the connection status of the hall sensor signal or compare the U-/V-/W-phases of the motor with the direction of the hall sensor signal.

The signal value is repeated in the order of 5→4→6→2→3→1 for a forward movement, while it is repeated in the order of 1→3→2→6→4→5 for a reverse movement.

Bit	Setting content
0	W phase hole signal
1	V phase hole signal
2	U phase hole signal

0x2613	Bootloader Version						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No

This represents the bootloader version of the drive.

0x2614	Warning code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	-	RO	Yes	-	No

This represents a warning code which has occurred in the drive.

0x2615	Analog Input Channel 1 Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	mV	RO	Yes	-	No

Indicates the analog torque command input voltage in mV.

0x2616	Analog Input Channel 2 Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	mV	RO	Yes	-	No

Indicates the analog speed override input voltage in mV.

0x2619	RMS Operation Overload						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	0.1%	RO	No	-	No

Displays the effective (RMS) load factor for the last 15 seconds in units of 0.1%.

• Procedure and Alarm history(0x2700~)

0x2700	Procedure Command Code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0	-	RW	No	-	No

You can run various procedures with the following procedure command codes and command arguments. Make sure to enter correct value of command argument prior to entering command code because the drive refers to the command argument at the moment of entering the command code.

Command code	Command argument	Run procedure
Manual Jog (0x0001)	1	Servo On
	2	Servo Off
	3	Positive (+) driving (0x2300)
	4	Negative (-) driving (0x2300)
	5	Stop to zero speed
Programmed Jog (0x0002)	1	Servo On
	2	Servo Off
	3	Starting operation
	4	Stop to zero speed (server on maintained)
Servo Alarm History Initialization(0x0003)	1	-
Off-line Auto Tuning (0x0004)	1	Start auto tuning
Index Pulse Search (0x0005)	1	Servo On
	2	Servo Off
	3	Positive (+) search (0x230C)
	4	Negative (-) search (0x230C)
	5	Stop to zero speed
Absolute encoder reset (0x0006)	1	Absolute encoder reset
Instantaneous Maximum Operation Overload Reset (0x0007)	1	Resets instantaneous maximum operation overload (0x2604) value
Phase current offset tuning(0x0008)	1	Phase current offset tuning (The U-/V-/W-phase offsets are stored in 0x2015 - 0x2017, respectively. If the offset is abnormally large, AL-15 will be generated.)
Software reset(0x0009)	1	Software reset
Commutation (0x000A)	1	Commutation is performed
Tamagawa / Panasonic Encoder Reset(0x000B)	1	Alarm Reset
	2	Multiturn Reset
	3	Warning Reset
Endat2.2 Encoder Reset (0x000C)	4660	Position Reset
	2	Alarm Reset
BISS-C Preset	1	AL-3b Reset

0x2701	Procedure Command Argument						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to $FFFF_{hex}$	0	-	RW	No	-	No

0x2702	Servo Alarm History						ALL
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	16	-	RO	No	-	No
SubIndex 1		Alarm code 1 (most recent)					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 2		Alarm code 2					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 3		Alarm code 3					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 4		Alarm code 4					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 5		Alarm code 5					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 6		Alarm code 6					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 7		Alarm code 7					
Variable	Setting range	Initial value	Unit	Accessi	PDO	Change	Save

type				bility	allocation	attribute	
STRING	-	-	-	RO	No	-	No
SubIndex 8		Alarm code 8					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 9		Alarm code 9					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 10		Alarm code 10					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 11		Alarm code 11					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	(ro:	No	-	No
SubIndex 12		Alarm code 12					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 13		Alarm code 13					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 14		Alarm code 14					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 15		Alarm code 15					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No
SubIndex 16		Alarm code 16 (oldest)					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
STRING	-	-	-	RO	No	-	No

This represents the history of servo alarm generated from the drive. Up to 16 servo alarms recently generated are stored. The SubIndex 1 is the latest alarm while the SubIndex 16 is the oldest one out of the recently generated alarms. The servo alarm history can be reset by procedure command.

• Third Party Motor Support(0x2800~)

The following motor parameters are provided to drive a motor manufactured by a third party in addition to our motor. To drive a third party's motor through our drive, you have to enter correct parameters. In this case, however, our company neither has performed any test for the combination of our drive and the third party motor, nor gives any warranty for the motor characteristic.

0x2800	3rd party motor type						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Power recycling	Yes

This specifies the motor type.

Setting Value	Setting content
0	Rotary motor
1	Linear motor

0x2801	3rd party motor pole number						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	2 to 1000	8	-	RW	No	Power recycling	Yes

This specifies the number of motor poles. For linear motor, set it to 2.

0x2802	3rd party motor rated current						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	2.89	Arms	RW	No	Power recycling	Yes

This specifies the motor rated current.

0x2803	3rd party motor maximum current						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	8.67	Arms	RW	No	Power recycling	Yes

This specifies the motor maximum current.

0x2804	3rd party motor rated speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 60000	3000	rpm	RW	No	Power recycling	Yes

This specifies the rated speed of the motor. For a linear motor, the unit is mm/s.

0x2805	3rd party motor maximum speed						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 60000	5000	rpm	RW	No	Power recycling	Yes

This specifies the maximum speed of the motor. For a linear motor, the unit is mm/s.

0x2806	3rd party motor inertia						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	0.321	$Kg.m^2.10^{-4}$	RW	No	Power recycling	Yes

This specifies the motor inertia. For a linear motor, set the weight of rotor. The unit is Kg.

0x2807	3rd party motor Torque constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	0.46	Nm/A	RW	No	Power recycling	Yes

This specifies the torque constant of a motor. For a linear motor, set the force constant. The unit is N/A.

0x2808	3rd party motor phase resistance [Third Party Motor] Phase Resistance						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	0.82	ohm	RW	No	Power recycling	Yes

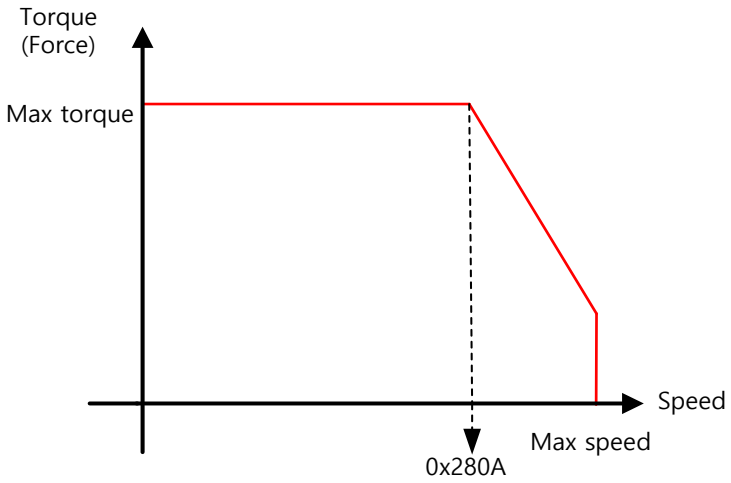
This specifies the phase resistance (= resistance between lines ÷ 2) of the motor.

0x2809	3rd party motor phase inductance						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	3.66	mH	RW	No	Power recycling	Yes

This specifies the phase inductance (= inductance between lines ÷ 2) of the motor.

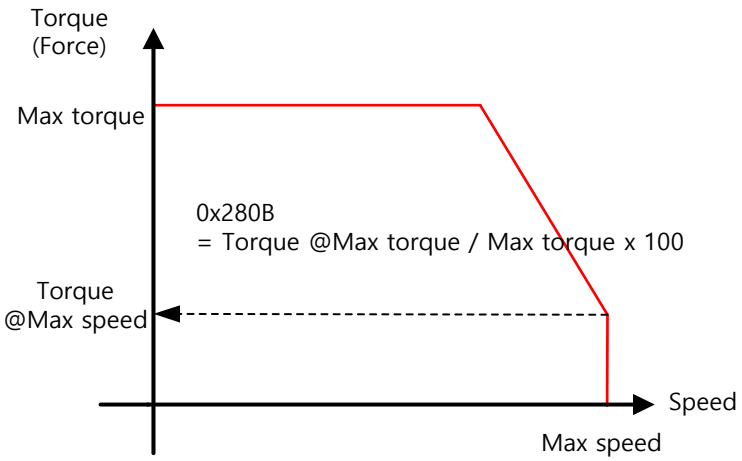
0x280A	3rd party motor TN Curve Data 1						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 60000	3000	rpm	RW	No	Power recycling	Yes

This specifies the data of the motor speed/torque curve. Enter the maximum speed at the time when the maximum torque (for a linear motor, the maximum thrust) is output. For a linear motor, the unit is mm/s.



0x280B	3rd party motor TN Curve Data 2						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	100.0	%	RW	No	Power recycling	Yes

This specifies the data of the motor speed/torque curve. Enter the torque (thrust for a linear motor) which can be output at the maximum speed in percentage (%) relative to the maximum torque.



0x280C	3rd party motor hall Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 360	0	deg	RW	No	Power recycling	Yes

The offset of the hall sensor attached for initial angle of a 3rd party motor may vary depending on manufacturer. For this case, the hall sensor offset must be checked and correctly set.

0x280D	3rd party motor thermal time constant						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
FP32	-	32.77	oC /watt	RW	No	Power recycling	Yes

Set the thermal time constant between motor winding and ambient. When the motor thermal protection function is activated (0x2034 = 1), the motor temperature is estimated and the motor overheat (AL-27) alarm occurs.

Thermal time constant [sec] = Thermal resistance [℃/watt] * Thermal capacitance [watt·sec/℃]

14.4 Index Objects

0x3000	Control mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	Distance	Change attribute	Save
UINT	0 to 9	0	-	RW		Power recycling	Yes

Set the position control mode of the drive.

Setting Value	Setting content
0	Indexing Position Mode
1	Pulse Input Position Mode
2	Velocity Mode
3	Torque Mode
4	Pulse Input Position operation & Indexing Position operation
5	Pulse Input Position operation & Velocity operation
6	Pulse Input Position operation & torque operation
7	Velocity mode & torque mode
8	Indexing Position Mode & Velocity mode
9	Indexing Position Mode & torque mode

0x3001	Coordinate Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	Communication address	Change attribute	Save
UINT	0 to 1	0	-	RW		Power recycling	Yes

Set the coordinate system to be used when controlling the indexing position of the drive.

Setting Value	Setting content
0	Use Linear coordinate system
1	Use Rotation coordinate system

0x3002	Baud Rate Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 3	3	-	RW	No	Power recycling	Yes

Set the RS-422 serial communication speed between the upper controller and the drive.

Setting Value	Setting content
0	9600 [bps]
1	19200 [bps]
2	38400 [bps]
3	57600 [bps]

0x3003	Pulse Input logic Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5	0	-	RW	No	Power recycling	Yes

Set the logic of the pulse train input from the host controller.

Setting Value	Setting content
0	A phase + B phase positive logic
1	CW+CCW positive logic
2	Pulse+sign positive logic
3	A phase + B phase negative logic
4	CW+CCW negative logic
5	Pulse+sign negative logic

0x3004	Pulse Input Filter Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 4	3	-	RW	No	Power recycling	Yes

Set the frequency band of the digital filter set in the pulse input part.

The frequency band was calculated based on the width of the input pulse due to the characteristics of the digital filter.

Setting Value	Setting content
0	No filter used.
1	500Khz (Min)
2	750Khz
3	1Mhz
4	1.25Mhz

0x3005	PCLEAR Mode Select						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2	0	-	RW	No	Always	Yes

Set the operation mode when position pulse clear (PCLR) signal is input.

Setting Value	Setting content
0	Operates in Edge Mode
1	Operate in level mode (torque: maintain)
2	Operate in level mode (torque: 0)

0x3006	Encoder output pulse						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 2147483647	10000	pulse	RW	No	Power recycling	Yes

Set the number of pulses to be output per 1 motor rotation when outputting an encoder signal from the drive to the outside.

The encoder signal output pulse from the drive is a value multiplied by 4, and when the initial value is set to 10000, 2500(Pulse) each of AO, /AO, BO, /BO is output.

Depending on the set value of the number of encoder output pulses per revolution, the rotation speed of the motor that can be output is limited, so an appropriate value must be set.

Since the output pulse frequency is up to1 [MHz], the following formular is used when setting the number of pulses. For example, if the maximum speed of the driving equipment is 2000[rpm], the encoder output pulse can be set up to 30000

$$\text{Encoder output pulse maximum value} = \frac{60 \times 10^6[\text{Hz}]}{\text{Max speed of motor running in the machine[rpm]}} \times \frac{\text{Electronic gear denominator}}{\text{Electronic gear molecule}}$$

0x3007	Encoder output mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Power recycling	Yes

When outputting the encoder signal from the servo to the outside, it sets whether to output the open collector method in addition to the basic line drive method.

Setting Value	Setting content
0	Line driver only
1	Line driver + Open collector

0x3008	Start Index Number						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 64	64	-	RW	No	Always	Yes

Set the index number (0 to 63) to start in Indexing Position operation.

If the setting value is 64, the starting index number is determined by ISEL0~ISEL5 of Digital Input.

Index No	ISEL Input Signal					
	ISEL5	ISEL4	ISEL3	ISEL2	ISEL1	ISEL0
0	X	X	X	X	X	X
1	X	X	X	X	X	O
2	X	X	X	X	O	X
3	X	X	X	X	O	O
4	X	X	X	O	X	X
			...			
60	O	O	O	O	X	X
61	O	O	O	O	X	O
62	O	O	O	O	O	X
63	O	O	O	O	O	O

0x3009	Index buffer mode						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	1	-	RW	No	Always	Yes

It sets how many times START (operation start) signal is memorized during indexing position operation.

Setting Value	Setting content
0	Double buffer set
1	Single buffer set

0x300A	I/O Signal Configuration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 255	0	-	RW	No	Always	Yes

This is the function activation bit of L7P. If you need a separate function, you can set and use it. For details, please refer to the relevant pages in the table below.

Function	Bit	Setting value	Detail	Related page
IOUT Configuration Bit	0	0	The completed index number is outputted	5.3 Function of Index output signal
		1	The progressing index number is outputted	
Index START Bit	1	0	Index Start signal recognizes only positive edge	5.2 Function of Index input signal
		1	Index Start signal recognizes both edges	
Jog Select Bit	2	0	Using JSTART & JDIR	5.2 Function of Index input signal
		1	Using PJOG & NJOG	
Speed override Bit	3	0	Applied by Index section	5.4 Analog speed override
		1	Apply immediately in real time	
Priority setting bit for registration operation	4	0	Absolute/relative operation according to registration type	5.1.2 Registration Absolute/Relative Move
		1	Absolute/relative operation according to value of 0x300B	
Software Position Limit Whether to use speed operation mode bit	5	0	Activated in speed operation mode	14.3 Software position limit function setting[0x2400]
		1	Disable in speed operation	
ORG Signal output selection Bit	6	0	ORG continues to be maintained even in Servo Of	5.2 Function of Index input signal
		1	ORG is OFF when Servo Is Off after origin operation is completed	

0x300B	REGT Configuration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 1	0	-	RW	No	Always	Yes

During Index operation Registration Absolute/Relative operation, determines absolute operation and relative operation.

Setting Value	Setting content
0	When REG signal is input, it moves to relative operation.
1	When REG signal is input, it moves to absolute operation.

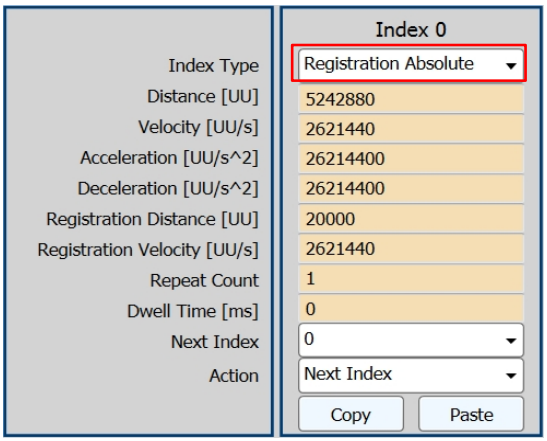
The user can adjust the set value to move to absolute or relative operation when REG signal is input.

I/O Signal Configuration [0x300A]

7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
0	0	0	1	0	0	0	0

Setting Value	Setting content
0	Absolute/relative operation according to index type in registration mode
1	Absolute/relative operation according to the value of 0x300B

This function operates only when the 4th bit of 0x300A is set, so be careful when using it. For example, when the user sets Index Type to Registration Absolute in Index0 and sets the value of 0x300B to 0, if the 4th bit of 0x300A is 1 (Set), it moves as much as 20000 [UU] in relative operation and if it is 0 (Reset) It moves to the absolute operation 20000 [UU] point.



4th bit of 0x300A	Moving result according to set vale
0	Move registration to index type
1	Move according to the set value of 0x300B

0x3100~0x313F	Index 00~index63						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	11	-	RO	No	-	No
SubIndex 1		Index Type					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 10	1	-	RW	No	Always	Yes
SubIndex 2		Distance					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-2147483648 to 2147483647	100000	UU	RW	No	Always	Yes
SubIndex 3		Velocity					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	1 to 2147483647	100000	UU/s	RW	No	Always	Yes
SubIndex 4		Acceleration					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	1 to 2147483647	1000000	UU/s^2	RW	No	Always	Yes
SubIndex 5		Deceleration					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	1 to 2147483647	1000000	UU/s^2	RW	No	Always	Yes
SubIndex 6		Registration Distance					

Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-2147483648 to 2147483647	100000	UU	RW	No	Always	Yes
SubIndex 7		Registration Velocity					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	1 to 2147483647	1000000	UU/s	RW	No	Always	Yes
SubIndex 8		Repeat Count					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	1 to 65535	1	-	RW	No	Always	Yes
SubIndex 9		Dwell Time					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	200	ms	RW	No	Always	Yes
SubIndex 10		Next Index					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 63	1	-	RW	No	Always	Yes
SubIndex 11		Action					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 2	2	-	RW	No	Always	Yes

14.5 CiA402 Objects

0x603F	Error code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	0	-	RO	Yes	-	No

Display the alarm code, which has last occurred in Servo Drive.

0x605A	Quick Stop Option Code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	0 to 4	2	-	RW	No	Always	Yes

This sets the Quick Stop option code. L7P is not used.

0x605B	Shutdown Option Code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	0 to 1	0	-	RW	No	Always	Yes

This specifies the operation to shut down the servo drive (Operation Enabled state -> Ready to Switch On state).

Setting Value	Description
0	No use
1	Decelerates to a stop; enters the Switch On Disabled state; enters the Ready state

0x605C	Disable Operation Option Code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	0 to 1	1	-	RW	No	Always	Yes

This specifies the Disable Operation state (Operation Enabled state → Switched On state) option code.

Setting Value	Description
0	Does not use the drive function
1	Decelerates to a stop; moves to Switch On Disabled state; moves to the Not Ready state

0x605D	Halt Option Code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	0 to 4	0	-	RW	No	Always	Yes

The Halt option code sets the operation method used to move from the Operation Enabled state to the Switched On state.

Setting Value	Description
1	Decelerates to a stop; moves to the Operation Enabled state
2	Decelerates to a stop based on the quick stop deceleration time; move to the Operation Enabled state
3	Decelerates to a stop based on the torque limit; moves to the Operation Enabled state

0x605E	Fault Reaction Option Code						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	0	0	-	RW	No	Always	Yes

This sets the operation method, which protects the drive system during fault reactions.

Setting Value	Description
0	Does not use the servo drive function. The motor will retain the free-run state.

0x6060	Model Of Operation						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
SINT	-1 to 10	-1	-	RW	Yes	Always	No

This sets the servo drive model of operation. The master sets the operation mode when the power is turned on.

This drive provides the following operation modes:

Setting Value	Name	Content
1	-	Indexing Position
2	-	Pulse Input Position
3	-	Velocity
4	-	Toque
5	-	Pulse Input Position & Indexing Position
6	-	Pulse Input Position & Velocity
7	-	Pulse Input Position & Toque
8	-	Velocity & Toque
9	-	Indexing Position & Velocity
10	-	Indexing Position & Toque
Other	-	Reserved

0x6061	Modes of Operation Display						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
SINT	-	-	-	RO	Yes	-	No

Displays the operation mode of the current drive.

0x6062	Position Demand Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU	RO	Yes	-	No

This displays the position demand value in the position units (UU) specified by the user.

0x6063	Position Actual Internal Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	pulse	RO	Yes	-	No

This displays the actual internal position value in encoder pulses.

0x6064	Position Actual Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU	RO	Yes	-	No

This displays the actual position value in user-defined position units (UU).

0x6065	Following Error Window						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x3FFFFFFF	5242880	UU	RW	No	Always	Yes

This specifies the positional error range to check the Positional Error (AL-51).

Before driving the motor, check the encoder resolution of the motor you are using and set an appropriate value.

Ex) If the setting value of the number of encoder pulses per 1 rotation of the parameter [0x2002] is 12000, if 3 rotations of the motor rotation is selected as the position error range, set to 36000.

0x6066	Following Error Timeout						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	0	ms	RW	No	Always	Yes

This specifies the timeout for when checking the Positional Error (AL-51).

0x6067	Position Window						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x3FFFFFFF	100	UU	RW	No	Always	Yes

This specifies the position window for the target. If it is maintained in the position reach range (0x6067) for the position reach time (0x6068), the INPOS signal of Drive Status Output1 is output.

0x6068	Position Window Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	0	ms	RW	No	Always	Yes

This sets the time it takes to reach the target position. If it is maintained in the position reach range (0x6067) for the position reach time (0x6068), the INPOS signal of Drive Status Output1 is output.

0x606B	Velocity Demand Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU/s	RO	Yes	-	No

This displays the output speed of the position controller or the command speed input to the speed controller.

0x606C	Velocity Actual Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU/s	RO	Yes	-	No

This displays the actual velocity value in user-defined position unit.

0x606D	Velocity Window						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	20000	UU/s	RW	No	Always	Yes

This specifies the velocity window. When the error between the target speed and the actual speed is maintained within the speed reach range (0x606D) for the speed reach time (0x606E), the INSPD signal of Drive Status Output 1 is output.

0x606E	Velocity Window Time						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 65535	0	ms	RW	No	Always	Yes

This specifies the velocity window time. When the error between the target speed and the actual speed is maintained within the speed reach range (0x606D) for the speed reach time (0x606E), the INSPD signal of Drive Status Output 1 is output.

0x6071	Target Torque						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-5000 to 5000	0	0.1%	RW	Yes	Always	No

This specifies the target torque for the motor in 0.1% increments of the rated torque during torque control.

0x6072	Maximum torque						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	3000	0.1%	RW	Yes	Always	No

This sets the maximum torque that the motor can output in 0.1% increments of the rated torque.

0x6074	Torque Demand Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	0.1%	RO	Yes	-	No

This displays the current torque demand value in 0.1% increments of the rated torque.

0x6076	Motor Rated torque						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	mNm	RO	Yes	-	No

Displays the rated torque value of the set motor in mNm unit

0x6077	Torque Actual Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-	-	0.1%	RO	Yes	-	No

The actual torque value generated by the drive is displayed in units of 0.1% of the rated torque.

0x607C	Home Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	–536870912 to 536870911	0	UU	RW	No	Always	Yes

This sets the offset value for the origin of the absolute encoder or absolute external scale and the zero position of the actual position value (0x6064).

Home offset input value	Home offset[0x607C] > 0	Home offset[0x607C] < 0
Motor movement direction	CW	CCW

• Incremental Encoder

If it finds the home position or it is at the home position, then the position moved by the home offset value becomes the zero position.

• Absolute Encoder

If the absolute encoder is connected, then the home offset value is added to the absolute position (the actual position value).

0x607D	Software Position Limit						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	2	-	RO	No	-	No
SubIndex 1		Min. position limit					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-1073741824 to 1073741823	-1000000000	UU	RW	No	Always	Yes
SubIndex 2		Max position limit					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-1073741824 to 1073741823	1000000000	UU	RW	No	Always	Yes

This specifies the software position limit value. It limits the range of the position demand value (0x6062) and actual position value (0x6064) and checks the new target positions for the setting value at every cycle.

The minimum software limit value is the reverse rotation limit. The maximum software limit value is the forward rotation limit.

0x6085	Quick Stop Deceleration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x7FFFFFF	26214400	UU/s^2	RW	No	Always	Yes

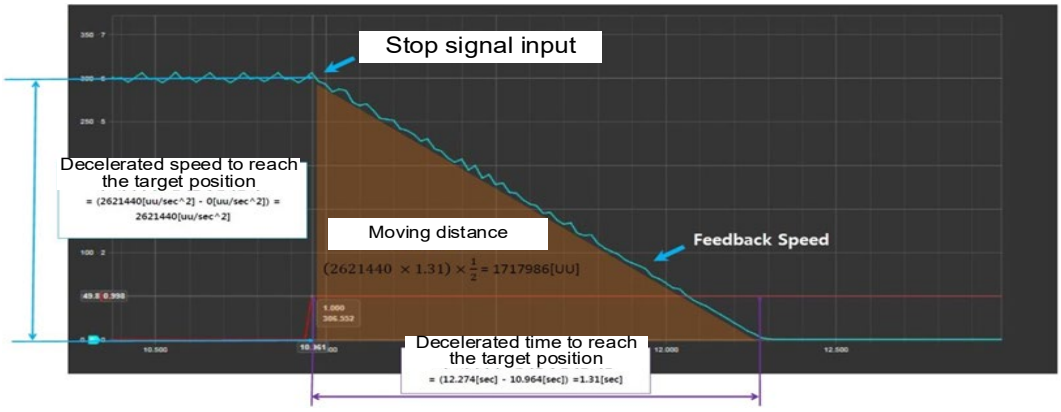
The system uses quick stop deceleration if the quick stop option code (0x605A) is set to 2.

This is the target position calculation formula for Quick Stop deceleration

$$Target\ Position[UU] = \frac{Velocity^2[UU^2/sec^2]}{2 \times Quick\ Stop\ Deceleration[UU/sec^2]}$$

This is the target position value calculation formula when index 0 is driven at 300[rpm], 2000000[UU/sec^2] is input to the value of 0x6085 and the stop signal is input.

$$\text{Target Position[UU]} = \frac{2621440^2}{2\times2000000} = 1717986[UU]$$



Since the target position is the same as the area of the movement distance in the figure, if you want to stop after about 2 seconds by inputting the stop signal while driving at 300[rpm] in index operation mode, you can calculate the deceleration value of Quick Stop as follows.

$$Target\ Position = (2621440[UU/sec] \times 2[sec]) \times \frac{1}{2} = 2621440[UU]$$

$$\frac{2621440^2[UU^2/sec^2]}{2\times2621440[UU]} = 1310720[UU/sec^2]$$

In other words, the user can use the Quick Stop deceleration to designate the desired position or time and accurately stop when the Stop signal is input.

0x6091	Gear Ratio						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	2	-	RO	No	-	No
SubIndex 1		Motor revolutions					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x40000000	1	-	RW	No	Power recycling	Yes
SubIndex 2		Shaft revolutions					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x40000000	1	-	RW	No	Power recycling	Yes

For further information, please refer to“11.3 Electric Gear setup.

0x6098	Homing Method						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
SINT	-128 to 127	34	-	RW	No	Always	Yes

This sets the homing method. For more information, refer to 10.1 Homing Method.

Setting Value	Content
0	Do Not Use
1	Homing using the index pulse and reverse limit contact
2	Homing using the index pulse and forward limit contact
7 to 14	Homing using the index pulse and home contact
24	Same as method 8 (does not use the index pulse)
28	Same as method 12 (does not use the index pulse)
33,34	Homing to the index pulse
35	Homing to the current position
-1	Homing using the negative stopper and index pulse
-2	Homing using the positive stopper and index pulse
-3	Homing using the negative stopper only
-4	Homing using the positive stopper only

0x6099	Homing Speed						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	2	-	RO	No	-	No
SubIndex 1		Speed during search for switch					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	0 to 0x40000000	2621440	UU/s	RW	No	Always	Yes
SubIndex 2		Speed during search for zero					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	0 to 0x40000000	524288	UU/s	RW	No	Always	Yes

This specifies the operation speed for homing.

0x609A	Homing Acceleration						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0x40000000	5242880	UU/s^2	RW	No	Always	Yes

This specifies the operation acceleration for homing.

0x60B1	Velocity Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-2147483648 to 2147483647	0	UU/s	RW	Yes	Always	No

In the position Control mode, this corresponds to the speed feedforward value.

0x60B2	Torque Offset						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
INT	-5000 to 5000	0	0.1%	RW	Yes	Always	No

Corresponds to the torque feed forward value in position control.

0x60B8	Touch Probe Function						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 0xFFFF	0x0033	-	RW	Yes	Always	No

This sets the touch probe function.

Bit	Value	Description
0	0	Does not use the touch probe 1.
	1	Uses the touch probe 1.
1	0	Single trigger mode
	1	Continuous trigger mode
2	0	Triggered by the input of the touch probe 1.
	1	Triggered by the Index pulse signal.
3	–	Reserved
4	0	Does not capture the rising edge position value of the touch probe 1.
	1	Captures the rising edge position value of the touch probe 1.
5	0	Does not capture the falling edge position value of the touch probe 1.
	1	Captures the falling edge position value of the touch probe 1.
6 to 7	–	Reserved
8	0	Does not use the touch probe 2.
	1	Uses the touch probe 2.
9	0	Single trigger mode
	1	Continuous trigger mode
10	0	Triggered by the input of the touch probe 2.
	1	Triggered by the Index pulse signal.
11	–	Reserved
12	0	Does not capture the rising edge position value of the touch probe 2.
	1	Captures the rising edge position value of the touch probe 2.
13	0	Does not capture the falling edge position value of the touch probe 2.
	1	Captures the falling edge position value of the touch probe 2.
14 to 15	–	Reserved

0x60B9	Touch Probe Status						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	-	-	-	RO	Yes	-	No

Displays the status of the touch probe.

Bit	Value	Description
0	0	Does not use the touch probe 1.
	1	Uses the touch probe 1.
1	0	Does not store the rising edge position value of the touch probe 1.
	1	Stores the rising edge position value of the touch probe 1.
2	0	Does not store the falling edge position value of the touch probe 1.
	1	Stores the falling edge position value of the touch probe 1.
3 to 5	–	Reserved
6	0,1	Toggles when the rising edge position value of the touch probe 1 is updated.
7	0,1	Toggles when the falling edge position value of the touch probe 1 is updated.
8	0	Does not use the touch probe 2.
	1	Uses the touch probe 2.
9	0	Does not store the rising edge position value of the touch probe 2.
	1	Stores the rising edge position value of the touch probe 2.
10	0	Does not store the falling edge position value of the touch probe 2.
	1	Stores the falling edge position value of the touch probe 2.
11 to 13	–	Reserved
14	0,1	Toggles when the rising edge position value of the touch probe 2 is updated.
15	0,1	Toggles when the falling edge position value of the touch probe 2 is updated.

In continuous trigger mode, you can toggle whether to save all update values for 6, 7, 14 and 15 bits on the rising/falling edge of the touch probe.

To disable bits 1, 2, 9 and 10 (saving the position values on the rising/falling edges of touch probes 1 and 2) of the touch probe state (0x60B9), disable bits 4, 5, 12 and 13 (using sampling on the rising/falling edges of touch probes 1 and 2) of the touch probe function (0x60B8) and enable them.

0x60BA	Touch Probe 1 Positive Edge Position Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU	RO	Yes	-	No

This represents the rising edge position value of the touch probe 1.

0x60BB	Touch Probe 1 Negative Edge Position Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU	RO	Yes	-	No

This represents the falling edge position value of the touch probe 1.

0x60BC	Touch Probe 2 Positive Edge Position Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU	RO	Yes	-	No

This represents the rising edge position value of the touch probe 2.

0x60BD	Touch Probe 2 Negative Edge Position Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU	RO	Yes	-	No

This represents the falling edge position value of the touch probe 2.

0x60E0	Positive Torque Limit Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	3000	0.1%	RW	Yes	Always	Yes

This sets the limit of positive torque values.

0x60E1	Negative Torque Limit Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UINT	0 to 5000	3000	0.1%	RW	Yes	Always	Yes

This sets the limit of negative torque values.

0x60F4	Following Error Actual Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	UU	RO	Yes	-	No

This displays the actual position error during position control.

0x60FC	Position Demand Internal Value						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	-	-	pulse	RO	Yes	-	No

This represents the value entered as the command during the position control.

0x60FD	Digital input						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	-	-	RO	Yes	-	No

They indicate the status of digital inputs.

Bit	Description
0	NOT (negative limit switch)
1	POT (positive limit switch)
2	HOME (origin sensor input)
3 to 15	Reserved
16	DI #1(I/O pin 12), 0:Open, 1:Close
17	DI #2(I/O pin 13), 0:Open, 1:Close
18	DI #3(I/O pin 14), 0:Open, 1:Close
19	DI #4(I/O pin 15), 0:Open, 1:Close

20	DI #5(I/O pin 16), 0:Open, 1:Close
21	DI #6(I/O pin 17), 0:Open, 1:Close
22	DI #7(I/O pin 18), 0:Open, 1:Close
23	DI #8(I/O pin 19), 0:Open, 1:Close
16	DI #9(I/O pin 22), 0:Open, 1:Close
17	DI #10(I/O pin 23), 0:Open, 1:Close
18	DI #11(I/O pin 24), 0:Open, 1:Close
19	DI #12(I/O pin 25), 0:Open, 1:Close
20	DI #13(I/O pin 26), 0:Open, 1:Close
21	DI #14(I/O pin 27), 0:Open, 1:Close
22	DI #15(I/O pin 28), 0:Open, 1:Close
23	DI #16(I/O pin 29), 0:Open, 1:Close
24~30	Reserved
31	Reserved

0x60FE	Digital output						
SubIndex 0		Number of entries					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
USINT	-	2	-	RO	No	-	No
SubIndex 1		Physical outputs					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	Yes	Always	No
SubIndex 2		Bit mask					
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	0 to 0xFFFFFFFF	0	-	RW	Yes	Always	Yes

They indicate the status of digital outputs.

- Description of physical outputs

Bit	Description
0 to 15	Reserved
16	Forced output (0: OFF, 1: ON) of DO #1 (I/O pins 35 and 36) When the relevant bit mask (0x60FE:02.16) is set to 1.
17	Forced output (0: OFF, 1: ON) of DO #2 (I/O pins 37 and 38) When the relevant bit mask (0x60FE:02.17) is set to 1.

18	Forced output (0: OFF, 1: ON) of DO #3 (I/O pins 39 and 40) When the relevant bit mask (0x60FE:02.18) is set to 1.
19	Forced output (0: OFF, 1: ON) of DO #4 (I/O pins 41 and 42) When the relevant bit mask (0x60FE:02.19) is set to 1.
20	Forced output (0: OFF, 1: ON) of DO #5 (I/O pins 43 and 44) When the relevant bit mask (0x60FE:02.20) is set to 1.
21	Forced output (0: OFF, 1: ON) of DO #6 (I/O pins 45 and 46) When the relevant bit mask (0x60FE:02.21) is set to 1.
22	Forced output (0: OFF, 1: ON) of DO #7 (I/O pins 47 and 48) When the relevant bit mask (0x60FE:02.22) is set to 1.
23	Forced output (0: OFF, 1: ON) of DO #8 (I/O pins 49 and 50) When the relevant bit mask (0x60FE:02.23) is set to 1.
24	Output status of DO #1 (0: OFF, 1: ON)
25	Output status of DO #2 (0: OFF, 1: ON)
26	Output status of DO #3 (0: OFF, 1: ON)
27	Output status of DO #4 (0: OFF, 1: ON)
28	Output status of DO #5 (0: OFF, 1: ON)
29	Output status of DO #6 (0: OFF, 1: ON)
30	Output status of DO #7 (0: OFF, 1: ON)
31	Output status of DO #8 (0: OFF, 1: ON)

- Description of bit mask

Bit	Description
0 to 15	Reserved
16	Forced output setting (0: Disable, 1: Enable) of DO #1 (I/O pins 35 and 36)
17	Forced output setting (0: Disable, 1: Enable) of DO #2 (I/O pins 37 and 38)
18	Forced output setting (0: Disable, 1: Enable) of DO #3 (I/O pins 39 and 40)
19	Forced output setting (0: Disable, 1: Enable) of DO #4 (I/O pins 41 and 42)
20	Forced output setting (0: Disable, 1: Enable) of DO #5 (I/O pins 43 and 44)
21	Forced output setting (0: Disable, 1: Enable) of DO #6 (I/O pins 45 and 46)
22	Forced output setting (0: Disable, 1: Enable) of DO #7 (I/O pins 47 and 48)
23	Forced output setting (0: Disable, 1: Enable) of DO #8 (I/O pins 49 and 50)
24 to 31	Reserved

0x60FF	Target Velocity						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
DINT	–2147483648 to 2147483647	0	UU/s	RW	Yes	Always	No

This specifies the target velocity in the PV mode and the CSV mode.

0x6502	Supported Drive Modes						ALL
Variable type	Setting range	Initial value	Unit	Accessibility	PDO allocation	Change attribute	Save
UDINT	-	0x000003AD	-	RO	No	-	No

This displays the mode(s) supported by the drive.

Bit	Support mode	Content
-1	IP (Indexing Position/Pulse Input Position)	1: Supported
0	PP (Profile Position)	0: Not supported
1	VI (Velocity)	0: Not supported
2	PV (Profile Velocity)	0: Not supported
3	PT (Torque Profile)	0: Not supported
4	Reserved	0
5	HM (Homing)	1: Supported
6	IP (Interpolated Position)	0: Not Supported
7	CSP (Cyclic Synchronous Position)	0: Not supported
8	CSV (Cyclic Synchronous Velocity)	0: Not supported
9	CST (Cyclic Synchronous Torque)	0: Not supported
10 to 31	Reserved	0

15. Maintenance and Inspection

15.1 Diagnosing and Troubleshooting Abnormalities

Alarm or warning will be generated if a problem occurs during operation. If this happens, check the applicable code and take a proper action. If the problem persists, contact our service center.

15.2 Precautions

1. Measuring the motor voltage: The PWM controls the voltage output from the servo to the motor. Because of this, the waves take the form of pulses. Use a rectifier voltmeter for accurate measurements because different meters may produce different results.
2. Measuring the motor current: Use a moving iron ammeter and wait for the motor's reactance to smooth the pulse waveform into sine waves.
3. Measuring the electric power: Use an electro-dynamometer based on the 3 power meter method.
4. Other gauges: When using an oscilloscope or digital voltmeter, do not allow them to touch the ground. Use a 1 mA or less input current gage.

15.3 What to Inspect

Wait at least 10 minutes after turning off the power before beginning the inspection because the condenser can hold enough voltage to cause an electrical accident.

(1) Inspecting the Servo Motor

⚠Caution
1.Wait at least 10 minutes after turning off the power before beginning the inspection because the condenser can hold enough voltage to cause an electrical accident. 2.When inspecting the servo, be sure to wait until the 'CHARGE' light is completely turned off before inspecting the servo because there is still power in the main electrolytic capacitor. 3. When using an absolute encoder, the encoder's multi-turn data will be lost when replacing the motor and encoder cable, so please perform origin operation after inspection.

Check Items	Inspection Period	Inspection and Handling	Notes
Vibration and sound check	Monthly	Touch the motor and listen for sounds.	The feel and sounds should be the same as usual.
Inspect the exterior of the motor	Depends on the amount of contamination or damage. Clean the motor with a cloth or air pressure.	-	-
Measure the insulation resistance	At least once a year	Disconnect the motor from the drive and measure the insulation resistance. A normal resistance level is 10 MΩ or higher. Note 1)	Contact our service center if the resistance is lower than 10 MΩ.
Replace the oil seal	Remove it from the machine and replace it at least once every 5,000 hours.	-	This only applies to motors with an oil seal.
General inspection	At least once every 20,000 hours or after 5 years.	Contact our service center.	Do not disassemble the servo motor yourself.

Note1) Measure the resistance between the FG and one of the U, V, and W power lines on the servo motor.

(2) Inspecting the Servo Drive

Check Items	Inspection Period	Inspection process	What to do if you find an abnormality
Clean the main body and control board	At least once a year	Check if there is any dust or oil	Clean it with air pressure or cloth.
Check for loose screws	At least once a year	Terminal blocks, connector fastening screws, etc. Not to be loosen.	Tighten the screws.
Check for defective parts on the main body or the control board	At least once a year	Check for discoloration, damage, or disconnection caused by heat.	Contact our company.

15.4 Replacing Parts

Mechanical friction and aging may deteriorate the following parts or even cause them to malfunction. This makes it important to conduct regular maintenance checks and replace worn parts.

1. Smoothing condensers: Ripple currents and other factors can cause this part to wear. The lifespan of this part depends on the operating temperature and environment. It normally lasts for 10 years if used continuously in a normal air-conditioned environment. Inspect the condenser at least once each year because it can rapidly age over a short period once it starts to deteriorate (inspect it more frequently as it approaches obsolescence).

※ Visual inspection criteria:

a. The condition of the case: Check for deformations on the sides and bottom.

b. The condition of the lid: Check for notable expansion, severe cracks, or broken parts.

c. The relief valve: Check for notable valve expansion and operation.

d. Also regularly check whether the exterior is cracked, discolored, or leaking and whether there are any broken parts. The condenser is obsolete when its capacity degrades to less than 85% of the rated capacity.

2. The relays: Check for bad connections and wear and tear on the contacts caused by switching currents. A relay is obsolete when its accumulated number of switches reaches 100,000, depending on the power capacity.

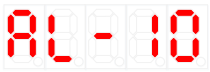
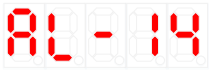
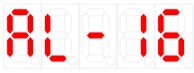
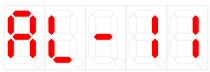
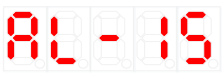
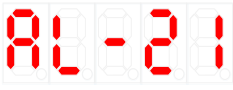
3. Motor bearings: Replace the bearings after 20,000 to 30,000 hours of operation at the rated speed under the rated load. Replace the bearings if abnormal sounds or vibrations are detected during inspection, depending on the operating conditions.

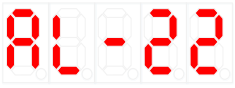
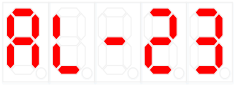
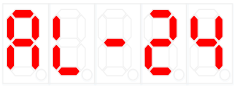
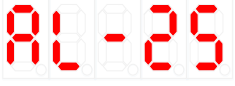
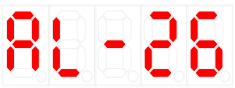
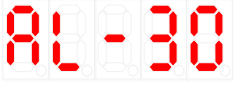
[The Standard Part Replacement Cycle]

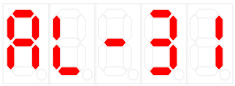
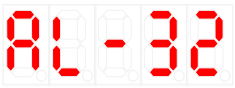
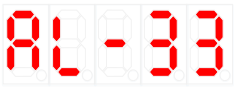
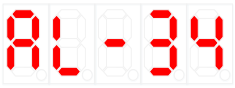
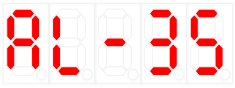
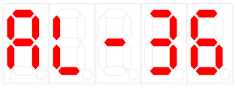
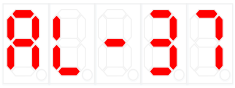
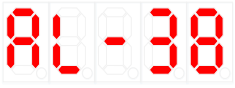
Part Name	Standard Replacement Cycle	Method
Smoothing condenser	7-8 years	Replace (determine after inspection).
Relays	-	Determine after inspection
Fuses	10 years	Replace
Aluminium electrolytic condensers on PCB .	5 years	Replace with new boards (determined after inspection)
Cooling fans	4-5 years	Replace
Motor bearings	-	Determine after inspection
Motor oil seal	5,000 hours	Replace

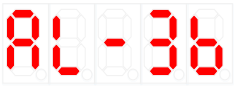
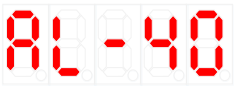
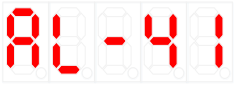
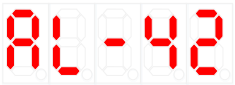
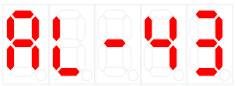
15.5 Servo alarm

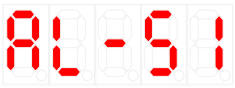
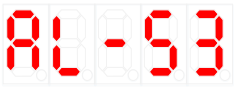
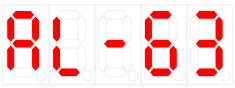
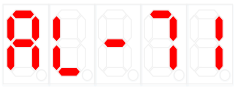
If the drive detects a problem, it will trigger a servo alarm and transition to the servo off state to stop. In this case, the value of the emergency stop setting (0x2013) is used to stop the drive.

Error Name	Cause	Check Items	What to check
 IPM fault (over current(H/W))  Over current (over current(S/W))  Current limit exceeded (over current(H/W))	Motor cable error	Wiring is incorrect and check Short.	Replace motor cable
	Encoder cable error	Wiring is incorrect and check Short.	Replace encoder cable
	Parameter setting error	Motor ID [0x2000], encoder type [0x2001], encoder form [0x2002] setting value should be same with applied to motor label.	Modify the parameter as sames as motor label information.
	Check motor phase resistor	Motor line resistance test (U-V, V-W, W-U several Ω or less).	Replace motor
	Machine part has problem	Determine whether there is a conflict or binding in the equipment.	Check machine part has problem
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
	Error by noise	Check method to improve noise of wiring, install.	Please check condition of wiring for FG. Match wire size of FG with wire size of drive main circuit.
 IPM temperature (IPM overheating)	Ambient temperature	Check whether surrounding temperature is over 50 [℃]	Lower surrounding temperature
	Continuous Overload alarm	Accumulated operate overload percentage [0x2603] Checking the load percentage is under 100%	Change drive and motor capacity, Please tune gain.
	High-frequency operation of regenerative drive or continuous regenerative operation	Check accumulated regenerative overload[0x2606]	Adjust regeneration resistor setting[0x2009] Use external regeneration resistor.
	Drive setting direction	Check drive setting status	Refer to 『2. Wiring and Connection』
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Current offset	Motor U/V/W phase current offset oversetting	Check, whether the U/V/W phase current offset [0x2015~0x2017] are 5% of the rated current or higher.	Rerun adjusting phase current offset
	Drive error	-	If alarm occurs continually after adjusting offset of phase current, please replace new drive because drive has problem.
 Continuous overload	In case of sequent operating that exceed rated load	Check if load which is accumulating driving load rate[0x2603] is below 100% when it is in constant speed section and stop	Change drive and motor capacity, Please tune gain.
	Motor brake error	Checking the motor brake is not holding	Provide supply power to motor brake.

Error Name	Cause	Check Items	What to check
	Parameter setting error	Motor ID[0x2000], Encoder type[0x2001], Check the label of application motor and Encoder form [0x2002] setting value.	Modify the parameter as sames as motor label information.
		Check value of set of overload detecting basic load rate[0x200F]	Set as proper value.
	machine part status Error	There is no problem for running	Check machine part has problem
	Motor cable error	Wiring is incorrect and check Short.	Replace motor cable
	Encoder cable error	Wiring is incorrect and check Short.	Replace encoder cable
 Drive temperature 1	Ambient temperature	Check whether surrounding temperature is over 50[℃]	Lower the surrounding temperature of drive
	Drive error	Check if displayed value 1 [0x260B] of drive temperature is much different with surrounding temperature when it is normal condition.	Replace the drive
 Regeneration overload	Capacity excess by high frequency operating or continue regenerative operating	Checking overload rate accumulated regeneration on 0x2606	Adjust value on 0x2009. Use braking resistor
	Parameter setting error	Check setting value[0x2009] ~ [0x200E]	Set as proper value.
	Main power input voltage error	Check if the main power voltage is over 544 [Vac].	Recheck the power supply.
	Drive error	Checking the temperature of regenerative resistance on Servo-off status	Replace the drive
 Motor cable open	Parameter setting error	Check [0x2015], [0x2015], [0x2015] Check value offset current	Process the Phase current offset control procedure command
	Motor cable error	Check whether cable is disconnected.	Replace motor cable
	Motor error	Check short circuit of U,V,W in Motor (U-V, V-W, W-U)	Replace the motor
	Drive error	-	If specific alarm signal is persistently occurred, It is highly possible to have fault, so Kindly recommend you to change the servo drive.
 Drive temperature 2	Ambient temperature	Check whether surrounding temperature is over 50[℃]	Lower the surrounding temperature of drive
	Drive error	Check if displayed value 2 [0x260C] of drive temperature is much different with surrounding temperature when it is normal condition.	Replace the drive
 Encoder temperature	Reserved	-	-
 Encoder communication	Encoder cable error	Disconnect, wiring is incorrect and check Short.	Replace encoder cable
	Parameter setting Error	Value of [0x2001], [0x2002] is same with application motor label.	Modify the parameter as same as motor label information. If modified value is not applied to

Error Name	Cause	Check Items	What to check
 Encoder cable open			parameter, it is highly possible to have fault, So Kindly recommend you to change the servo motor.
	Encoder error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Encoder data	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Motor setting (Motor ID setting error)	Setting Motor ID	Value of [0x2000] is same with application motor label.	Revise it with motor label information equally. It is possible to release alarm when power off/on after adjusting parameter.
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Z Phase open	Parameter setting error	Check warning mask [0x2014] set value	For motors that do not use phase Z (e.g. step motors), mask AL-34 by setting the 14th bit among warning mask settings. .
	Encoder cable error	Wiring is incorrect and check Short.	Replace encoder cable
	Encoder error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Low battery	Parameter setting Error	Check the absolute value encoder [0x2005] setting value.	When you want to use an absolute value encoder as an incremental encoder, if you set it to 1, no alarm occurs.
	Poor battery contact, not connected	Check the status of battery	Connect battery rightly.
	When battery voltage is low.	Check whether battery voltage is over 3.3V	Replace battery.
 Sinusoidal ENC frequency	Encoder cable error	Disconnect, wiring is incorrect and check Short. Check shield and FG disconnect	Replace encoder cable
	Parameter setting error	Check setting value of encoder type [0x2001]	Check setting encoder type. Check speed command Up to 250kHz.
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Sinusoidal ENC frequency	Converter error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
	Encoder error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Encoder setting error	Drive / Motor combination error	Check brand label code of motor and drive.	Use motor and drive of same brand label.
	Encoder cable error	Wiring is incorrect and check Short	Replace encoder cable
	Encoder error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.

Error Name	Cause	Check Items	What to check
 Preset Error	Parameter setting Error	Check the absolute value encoder [0x2005] setting value.	When you want to use an absolute value encoder as an incremental encoder, if you set it to 1, no alarm occurs.
	Poor battery contact, not connected	Check the status of battery	Connect the battery correctly, reset the alarm, and then reapply the power. Since the current position is reset, please check the mechanical home again.
	When the initial encoder power is supplied	It may occur when power is applied after the first encoder connection.	Reapply power after alarm reset. Since the current position is reset, please check the mechanical home again.
 Under voltage	Main power input voltage error	Check the main power voltage is over 134[Vac]	Recheck the power supply.
		Check [0x2605] value is over 190 [Vdc] when main power is accordingly input	Replace the drive
	Running when power voltage is low	Check wiring status of main power	Use 3 phase as supply voltage
 Over voltage	Main power input voltage error	Check whether the main power voltage is below 286[Vac]	Recheck the power supply.
		Check [0x2605] value is below 405[Vdc] when main power is accordingly input.	Replace the drive
	When braking resistor is high	Check operating condition regenerative resistance.	Review the regenerative resistance consider the operating condition and load.
	Setting value of acceleration/ deceleration	In case of many time for acceleration / deceleration	Set longer acceleration / deceleration time
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Main power fail	Main power input voltage error	Check voltage between phase 200-230[Vac] of L1, L2, L3	Recheck the power supply.
	Parameter setting Error	Check value of main power input mode set [0x2006] according to state of main power input.	Wire or set parameter as input power on(possible 3 phase)
	Momentary power failure	Check setting value [0x2007]	check main power source or reduce value of [0x2007]
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Control power fail	Voltage between phase of C1, C2 error	Voltage between phases of C1, C2 is within 200-230[Vac].	Recheck power supply of drive
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Over speed limit	Motor cable error	Wiring is incorrect and check Short.	Replace motor cable
	Encoder cable error	Wiring is incorrect and check Short.	Replace encoder cable
	Parameter setting Error	Value of [0x2000], [0x2001], [0x2002] is same with application motor label.	Modify the parameter as same as motor label information.
		Check setting value [0x6091]	Set Electronic gear ratio low.
		Check setting value[0x2100] ~ [0x211F]	Readjust gain according to operating condition.
	Encoder error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.

Error Name	Cause	Check Items	What to check
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 POS following	Parameter setting Error	Check setting value [0x6091]	Set Electronic gear ratio low. .
		Check setting value on 0x6066 of position error excess time, 0x6065 of position error range	Set up correct parameter according to operating method.
	Machine part has problem	Checking it was forced by drive part	Check machine part has problem
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Excessive SPD deviation	Motor cable error	Disconnect, wiring is incorrect and check Short.	Replace motor cable
	Encoder cable error	Disconnect, wiring is incorrect and check Short.	Replace encoder cable
	Parameter setting Error	Value of [0x2000], [0x2001], [0x2002] is same with application motor label.	Modify the parameter as same as motor label information.
		Check setting value [0x6091]	Set Electronic gear ratio low.
	Machine part has problem	Checking it was forced by drive part operating condition of limit contact point sensor	Check machine part has problem
	Encoder error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Parameter checksum .	When O/S is changed	Check parameter that parameter setting value was set as maximum value of variable form	Restore initial parameter (0x1011). If you restore it, setting up parameter would be changed into initial value. So set up parameter before operating
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 Factory setting	Parameter setting error	Contact our service center Check [0x1008] DeviceName	Please download OS or set capacity of drive again. If alarm continue after servo on again, Replace drive. Because drive may have problem.

⚠ Caution

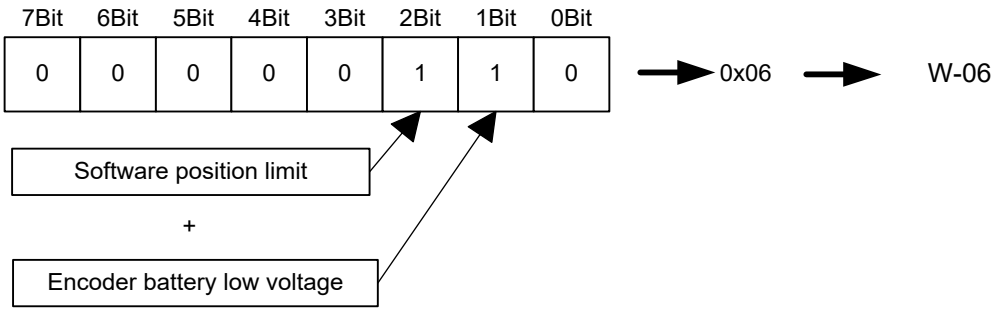
- If you replace the motor and encoder cables while using an incremental encoder, or replace the battery while the servo is turned off, the encoder's multi-turn data will be lost.
- If the encoder loses multi-turn data, there is a risk of equipment malfunction and accident, so be sure to perform home operation before operating.

15.6 Servo Warning

If the drive detects an error classified as a servo warning, it will trigger a warning. In this case, the drive will maintain normal operation condition. After the cause of the warning is eliminated, the warning will be automatically cleared. You can specify if each warning is checked with warning mask configuration (0x2014). Masking warnings does not remove risk factors related to warnings, so there is a risk of drive burnout. Please pay attention to your settings.

Please note that a warning is displayed in the shape of '␣' on the display window of the servo.

Bit	Warning code	Warning name
0	W01	Main power source loss
1	W02	Low voltage of encoder battery
2	W04	Software Position Limit
3	W08	DB Excessive Current
4	W10	Operation overload
5	W20	Drive / Motor Combination error
6	W40	Low Voltage
7	W80	Emergency signal input



If two warnings occur simultaneously, the bit corresponding to each is set to 1. For example, since the 2nd bit is set when a software position limit warning occurs and the 1st bit is set when an encoder battery low voltage warning occurs, the two warnings are combined as '0x06' and the corresponding alarm can be confirmed by displaying 'W06' on the segment window.

Warning status(CODE) Name	Cause	Check Items	What to check
 PWR_FAIL	Main power input Voltage error	Check voltage between phase 200-230[Vac] of L1, L2, L3	Recheck the power supply.
	Parameter setting error	Check the main power input mode setting [0x2006] setting value suitable for the main power input state.	Wire or set parameter as input power on(possible 3 phase)
	Momentary power failure	Check value of main power input mode set [0x2006] according to state of main power input.	Check actual main power or increase value of checking time of loss of main power.
	Drive error	-	If alarm continue after servo on again, Replace drive. Because drive may have problem.
 LOW_BATT	Parameter setting error	Check setting value of absolute encoder [0x2005]	Alarm will be disappeared if you set “1” when using ABS encoder as incremental encoder.
	Bad connection of battery No connected.	Check the status of battery	Connect battery rightly.
	When battery voltage is low.	Check whether battery voltage is over 3.3V	Replace battery.
 SW_POS_LMT	Parameter setting error	Setting function of software restriction on location [0x2400], Check value of software restriction on location[0x607D]	Change value of software position limit function[0x2400] or change the set of limit value of maximum position and minimum position of software position limit[0x607D]
 OV_LOAD	In case of sequent operating that exceed rated load	Check overload warning level setting[0x2010] and constant speed section or accumulated operation overload rate[0x2603]	Change drive and motor capacity, Please tune gain. Adjust the setting value overload warning level [0x2010].
	Motor brake error	Checking the motor brake is not holding	Provide supply power to motor brake.
	Parameter setting error	Motor ID[0x2000], Encoder type[0x2001], Encoder form [0x2002] value is same with motor label.	Modify the parameter as sames as motor label information.
		Check value of set of overload detecting basic load rate[0x200F]	Set as proper value.
	machine part status Error	There is no problem for running	Check machine part has problem
	Motor cable error	Wiring is incorrect and check Short.	Replace motor cable
	Encoder cable error	Wiring is incorrect and check Short.	Replace encoder cable
 SETUP	Drive / Motor Combination error	Check whether capacity of current of motor is bigger than capacity of current of drive or not.	reduce value of torque limit or use the motor which capacity is lower than capacity of current of drive
	IO setting error	Check whether one signal is assigned more than 2 in digital input signal assignment [0x2200] ~ [0x2208] and digital output signal assignment [0x2210]~[0x2213].	Set up correct parameter according to operating method.
 UD_VTG	Main power input voltage error	Check if the main power voltage is over 134 [Vac].	Recheck the power supply.
		Check that DC link voltage [0X2605] is between 190~405 [Vdc] when main power is supplied correctly.	Replace the drive
	Running when power voltage is low	Check wiring status of main power	Use 3 phase as supply voltage
 EMG	EMG contact error	Emergency stop by EMG contact. Wiring or drive parameter (drive control input1[0x211F], digital input signal1 set[0x2200]~digital input. Check signal 16 setting[0x220F]	Set up correct parameter according to operating method.

Warning status(CODE) Name	Cause	Check Items	What to check
	Drive error		If alarm continue after servo on again, Replace drive. Because drive may have problem.

15.7 How to replace the encoder battery

If AL-35 (encoder battery low voltage) or W02 (encoder battery low voltage (LOW_BATT)) occurs, the encoder battery must be replaced.

Please follow the replacement instructions below.

(1) Keep the control power of the drive ON and change the main power to OFF.

(2) Disconnect the battery connector and remove the battery from the battery case.

(3) After inserting the prepared battery into the battery case, connect the battery connector. Please use the following products for the battery used at this time.

- ✓ ER6V, 3.6V 2000mAh, Lithium battery by Toshiba Battery Co., Ltd.

(4) To cancel AL-35 and W02 display after battery replacement, turn OFF the control power and then turn ON the control and main power again.

(5) Check that AL-35 and W02 are released and operate normally.

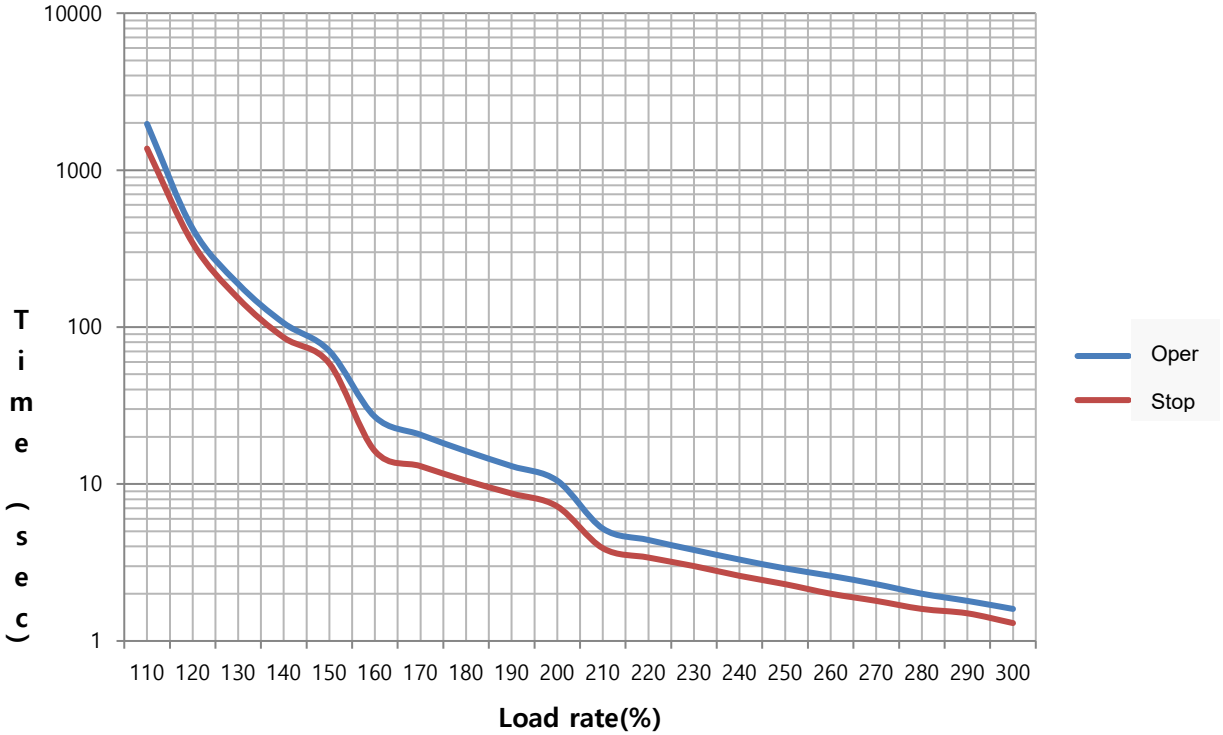
<Caution>
➢ **When replacing the battery, make sure that the control power is ON and the main power is OFF. Multi-turn data will be lost if the battery is replaced when all power of the drive is OFF.** ➢ Before replacing the battery, check that the voltage of the newly prepared battery is normal. ➢ Connect the battery connector after checking the polarity of “+” and “-” of the battery. ➢ Do not disassemble or recharge the battery. ➢ Make sure that the polarities of the batteries do not short-circuit each other. Battery life may be reduced and heat may occur.

15.8 Servo overload characteristic curve

■ Overload Operating Characteristic Curve (SA type 100W)

200[V]/100[W]

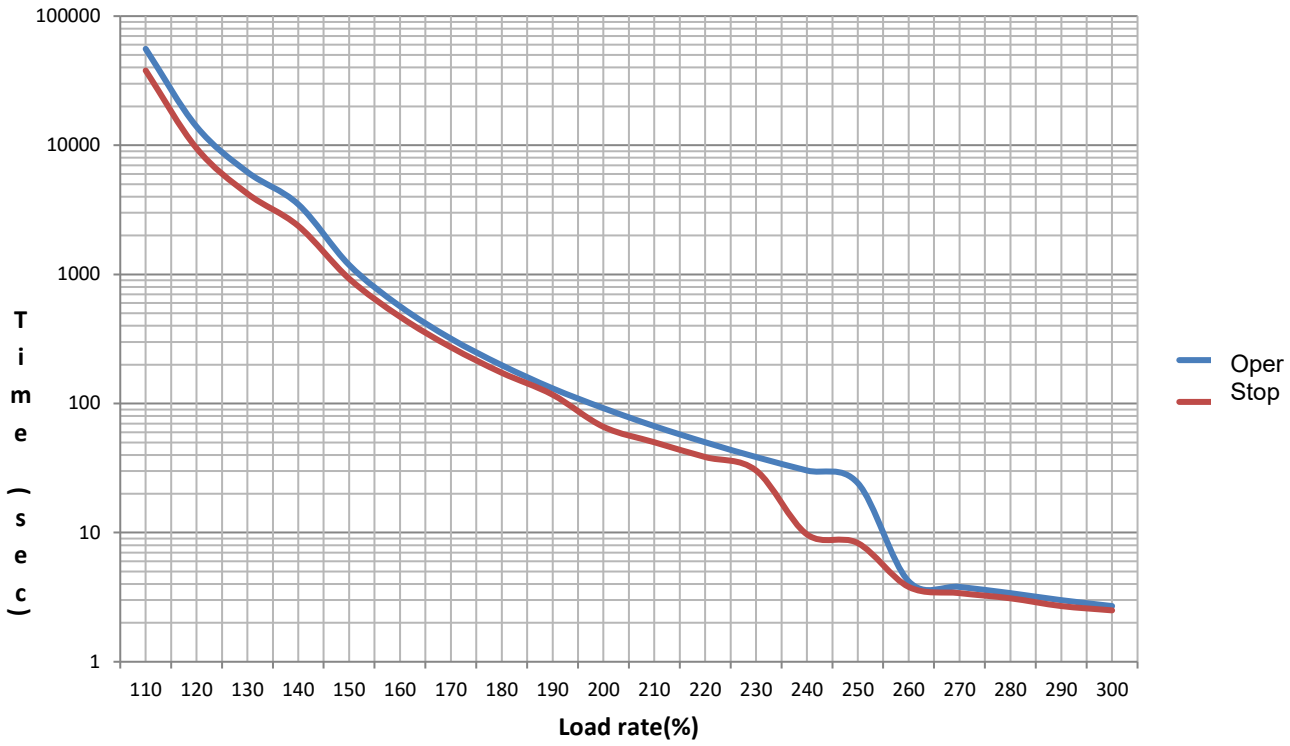
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	1969.0	1372.0	210	5.2	3.9
120	424.0	343.2	220	4.4	3.4
130	188.4	152.5	230	3.8	3.0
140	106.0	85.8	240	3.3	2.6
150	70.4	58.6	250	2.9	2.3
160	26.8	16.2	260	2.6	2.0
170	20.6	13.0	270	2.3	1.8
180	16.2	10.5	280	2.0	1.6
190	13.0	8.7	290	1.8	1.5
200	10.5	7.2	300	1.6	1.3



■ Overload Operating Characteristic Curve (400W)

200[V]/400[W]

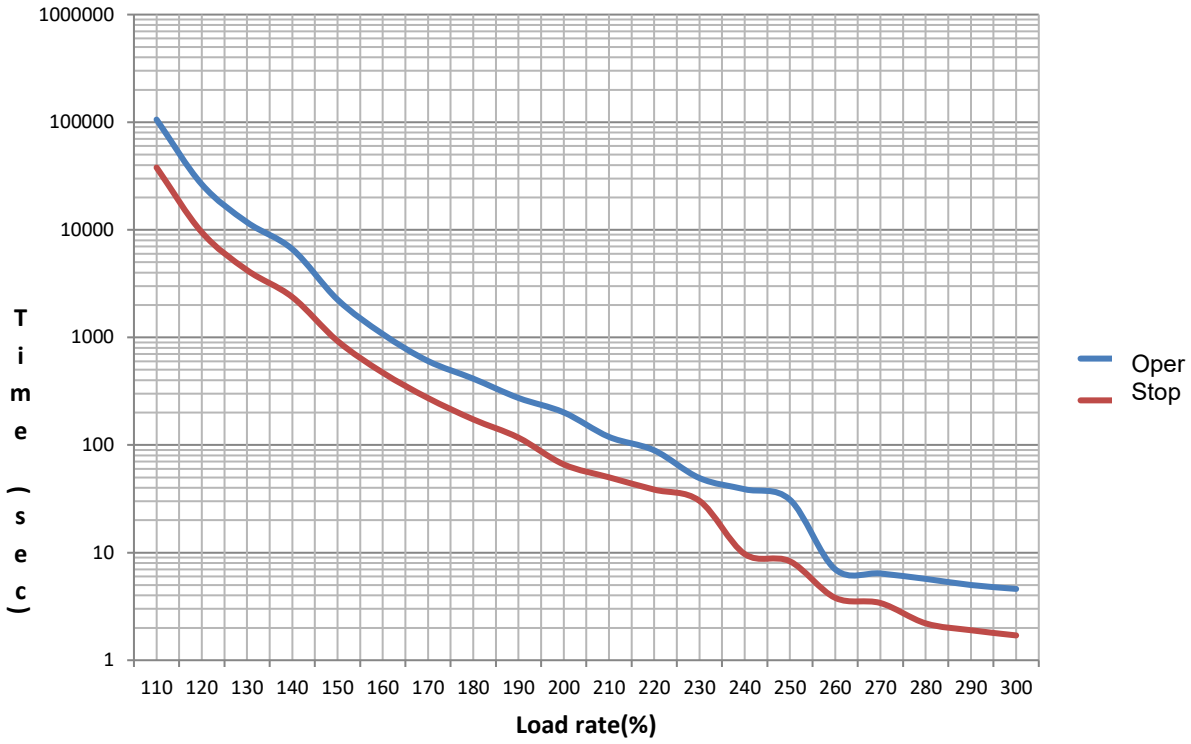
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	55776.0	37935.0	210	66.8	50.1
120	13944.0	9483.0	220	50.1	38.5
130	6197.0	4215.0	230	38.5	30.3
140	3486.0	2371.0	240	30.3	9.7
150	1183.0	926.0	250	24.2	8.3
160	566.0	470.0	260	4.2	3.8
170	318.0	273.0	270	3.8	3.4
180	198.0	173.0	280	3.4	3.1
190	131.0	117.0	290	3.0	2.7
200	92.0	66.0	300	2.7	2.5



■ Overload Operating Characteristic Curve (750W, 1kW)

200[V]/750[W],1.0[kW]

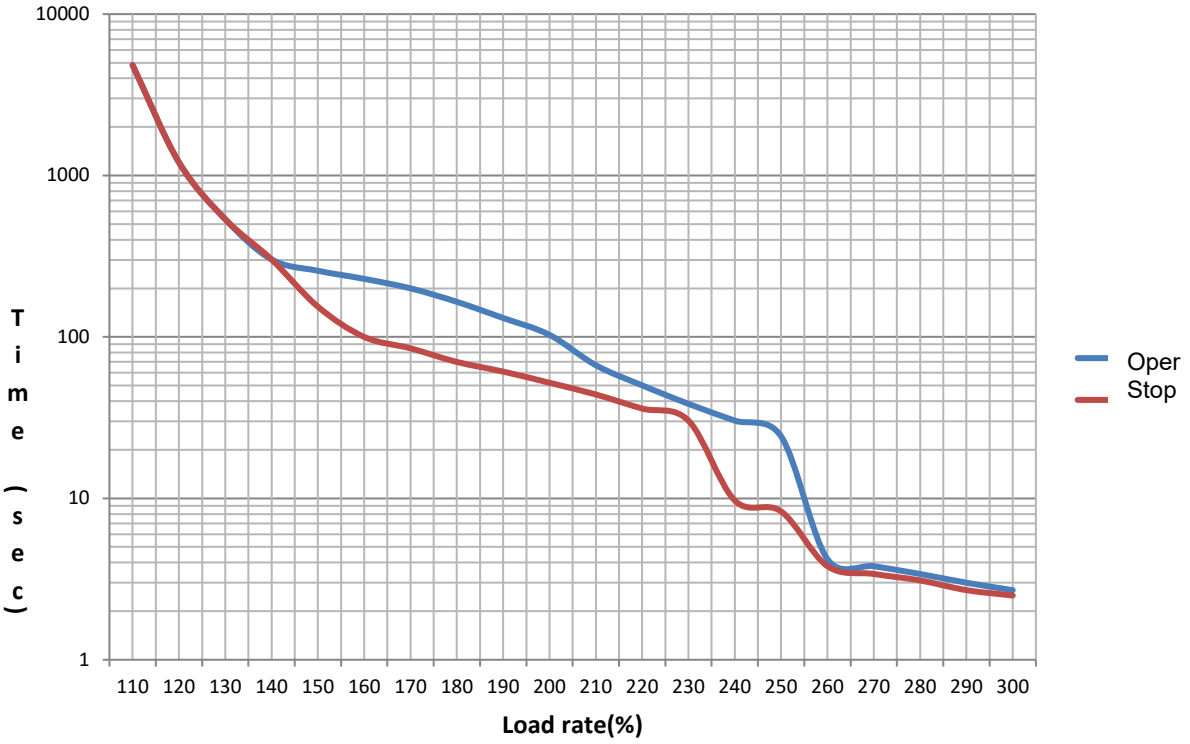
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	105800.0	37935.0	210	119.0	50.1
120	26450.0	9483.0	220	89.2	38.5
130	11755.5	4215.0	230	49.3	30.3
140	6612.5	2371.0	240	38.8	9.7
150	2244.0	926.0	250	31.0	8.3
160	1073.6	470.0	260	7.0	3.8
170	603.2	273.0	270	6.4	3.4
180	413.6	173.0	280	5.7	2.2
190	273.6	117.0	290	5.0	1.9
200	201.0	66.0	300	4.6	1.7



■ Overload Operating Characteristic Curve (2kW, 3.5kW)

200[V]/2[kW],3.5[kW]

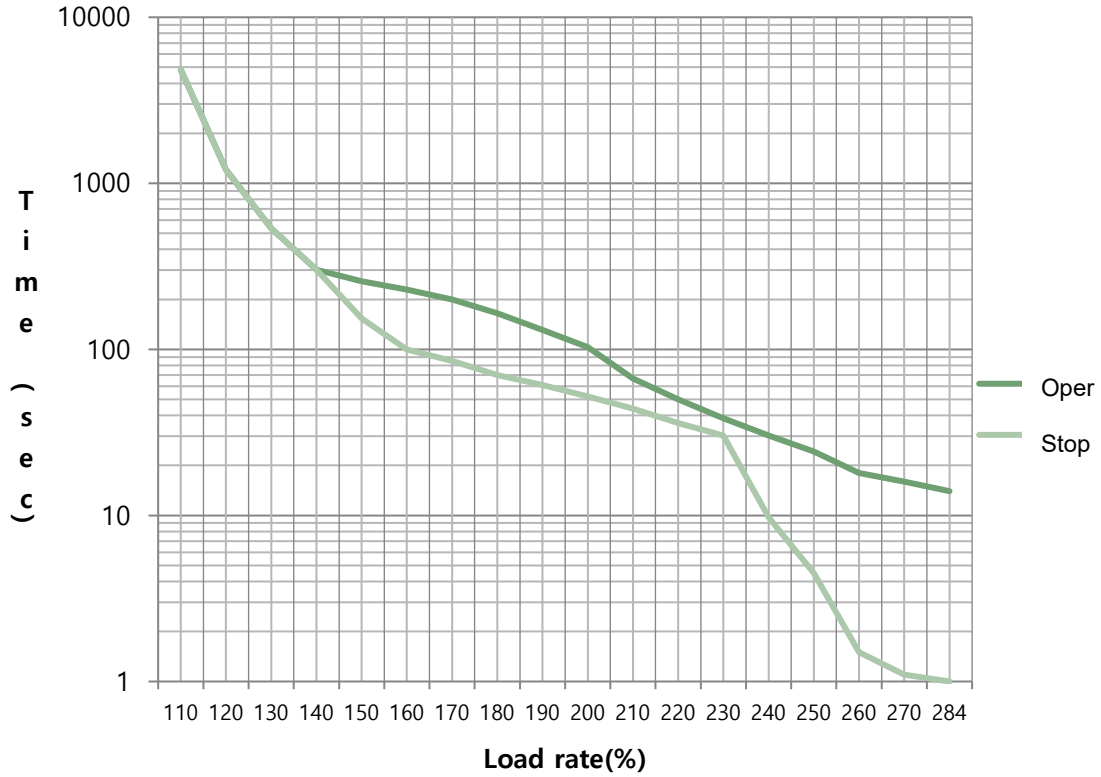
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	4832	4832	210	66.8	44
120	1208	1208	220	50.1	36
130	536	536	230	38.5	30.3
140	302	302	240	30.3	9.7
150	257	154	250	24.2	8.3
160	229	100	260	4.2	3.8
170	200	85	270	3.8	3.4
180	165	70	280	3.4	3.1
190	131	61	290	3.0	2.7
200	103	52	300	2.7	2.5



■ Overload Operating Characteristic Curve (5kW)

200[V]/5[kW]

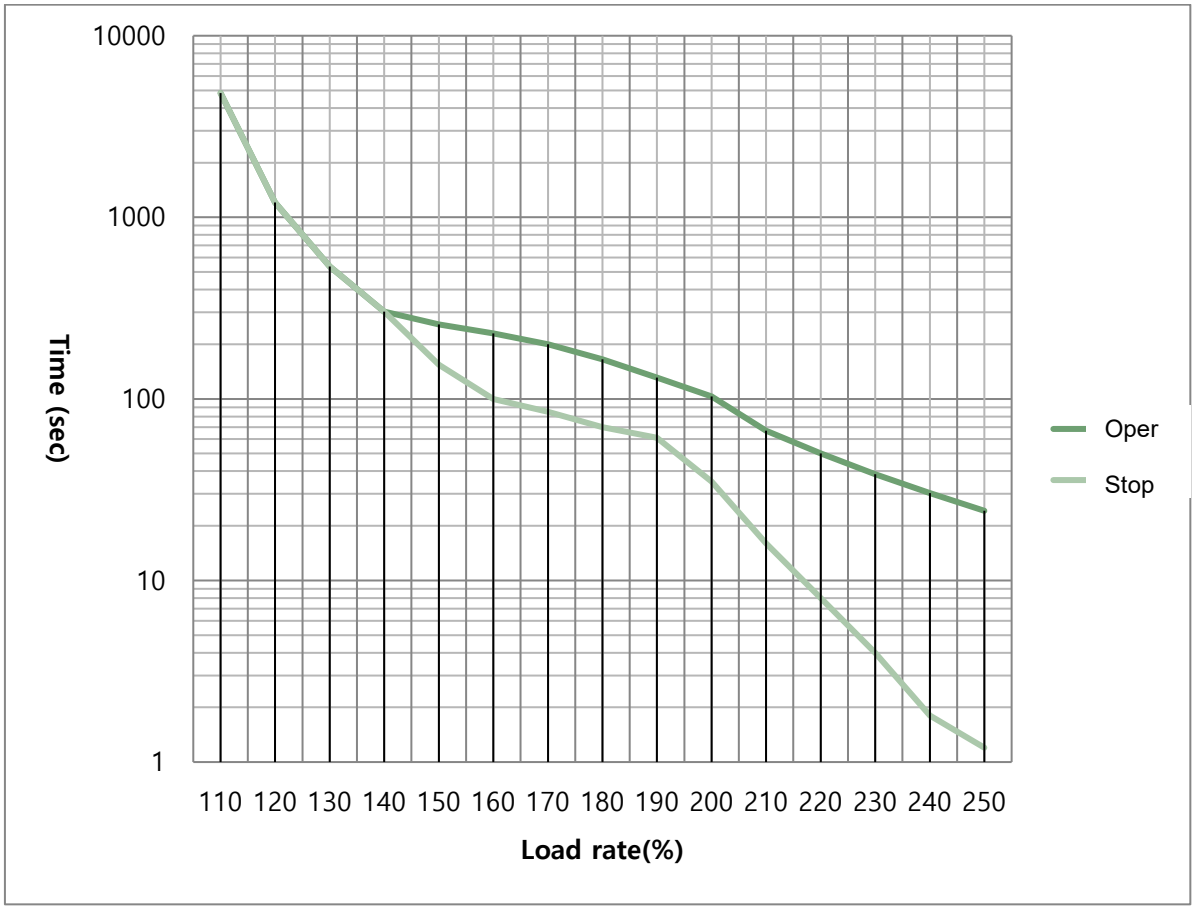
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	4832	4832	210	66.8	44
120	1208	1208	220	50.1	36
130	536	536	230	38.5	30.3
140	302	302	240	30.3	9.7
150	257	154	250	24.2	4.5
160	229	100	260	18	1.5
170	200	85	270	16	1.1
180	165	70	284	14	1
190	131	61	290		
200	103	52	300		



■ Overload Operating Characteristic Curve (7.5kW)

200[V]/7.5[kW]

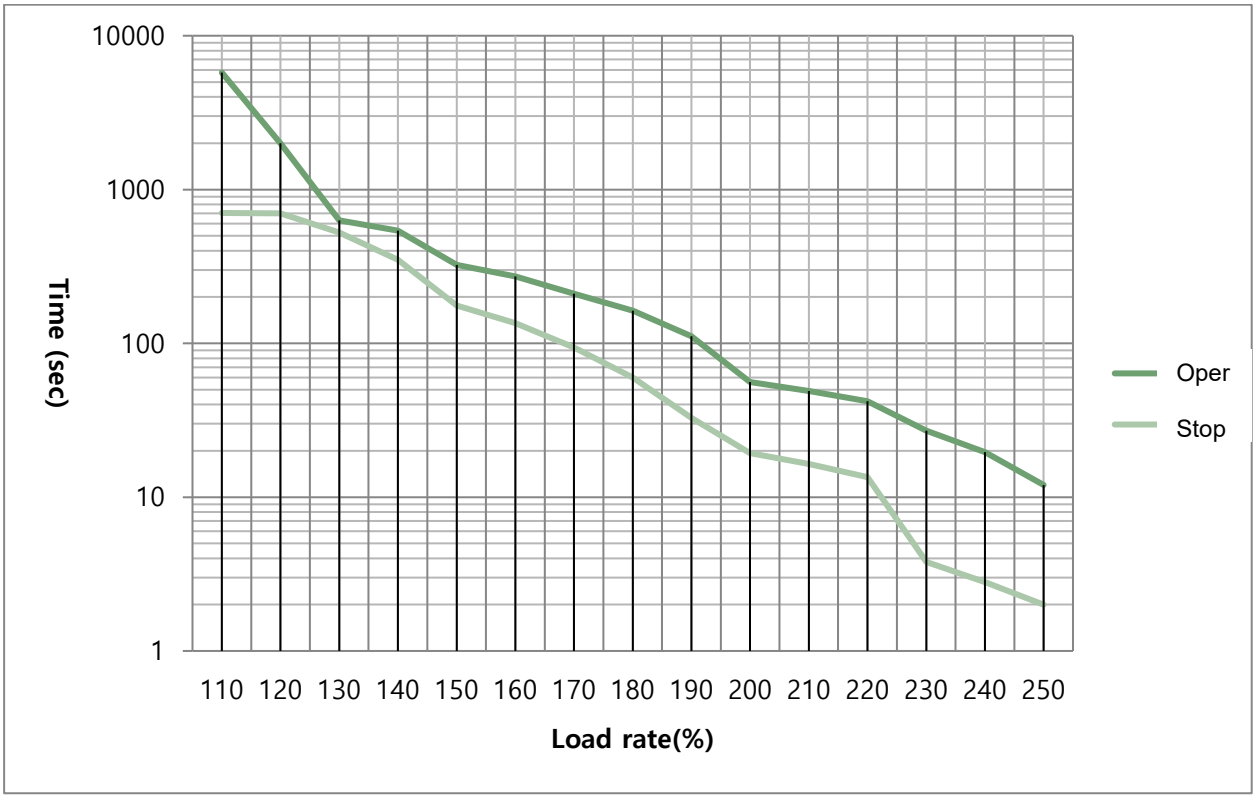
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	4832	4832	210	66.8	16
120	1208	1208	220	50.1	8
130	536	536	230	38.5	4
140	302	302	240	30.3	1.8
150	257	154	250	24.2	1.2
160	229	100	260		
170	200	85	270		
180	165	70	284		
190	131	61	290		
200	103	35	300		



■ Overload Operating Characteristic Curve (15kW)

200[V]/15[kW]

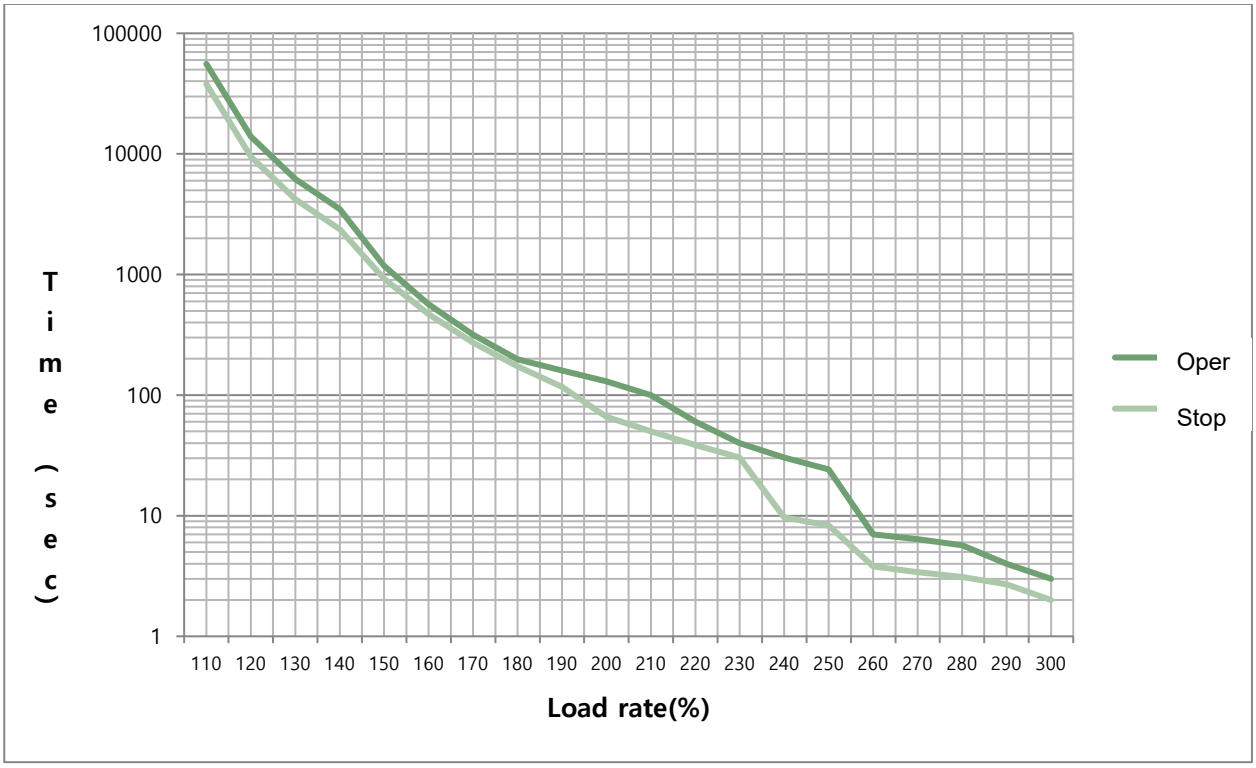
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	4832	4832	210	66.8	44
120	1208	1208	220	50.1	36
130	536	536	230	38.5	30.3
140	302	302	240	30.3	9.7
150	257	154	250	24.2	4.5
160	229	100	260		
170	200	85	270		
180	165	70	284		
190	131	61	290		
200	103	52	300		



■ Overload Operating Characteristic Curve (1.0kW)

400[V]/1.0[kW]

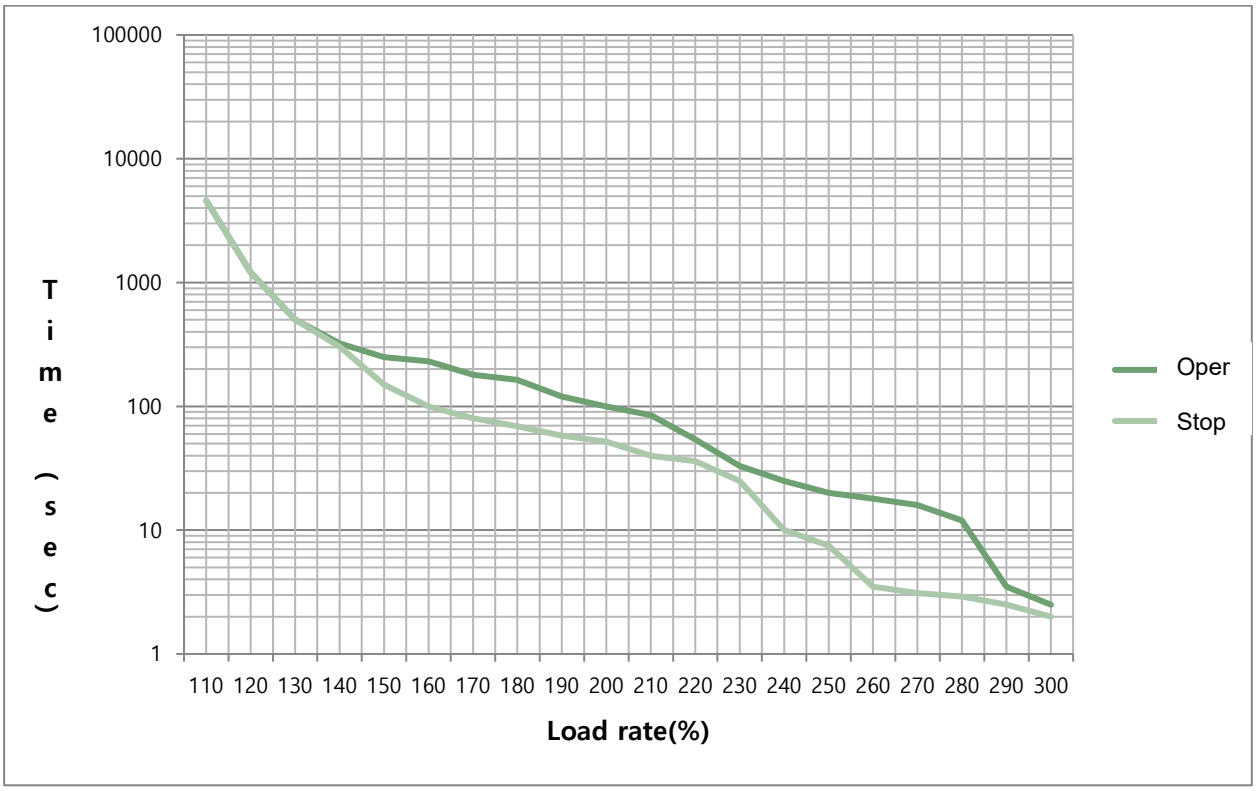
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	55776	37937.7	210	100	50.1
120	13944	9483.9	220	60	38.5
130	6197.3	4215.1	230	40	30.3
140	3486	2371	240	30.3	9.7
150	1183	926	250	24.2	8.3
160	566	470	260	7	3.8
170	318	273	270	6.4	3.4
180	198	173	280	5.7	3.1
190	160	117	290	4	2.7
200	130	66	300	3	2



■ Overload Operating Characteristic Curve (2.0kW, 3.5kW)

400[V]/2.0[kW], 3.5[kW]

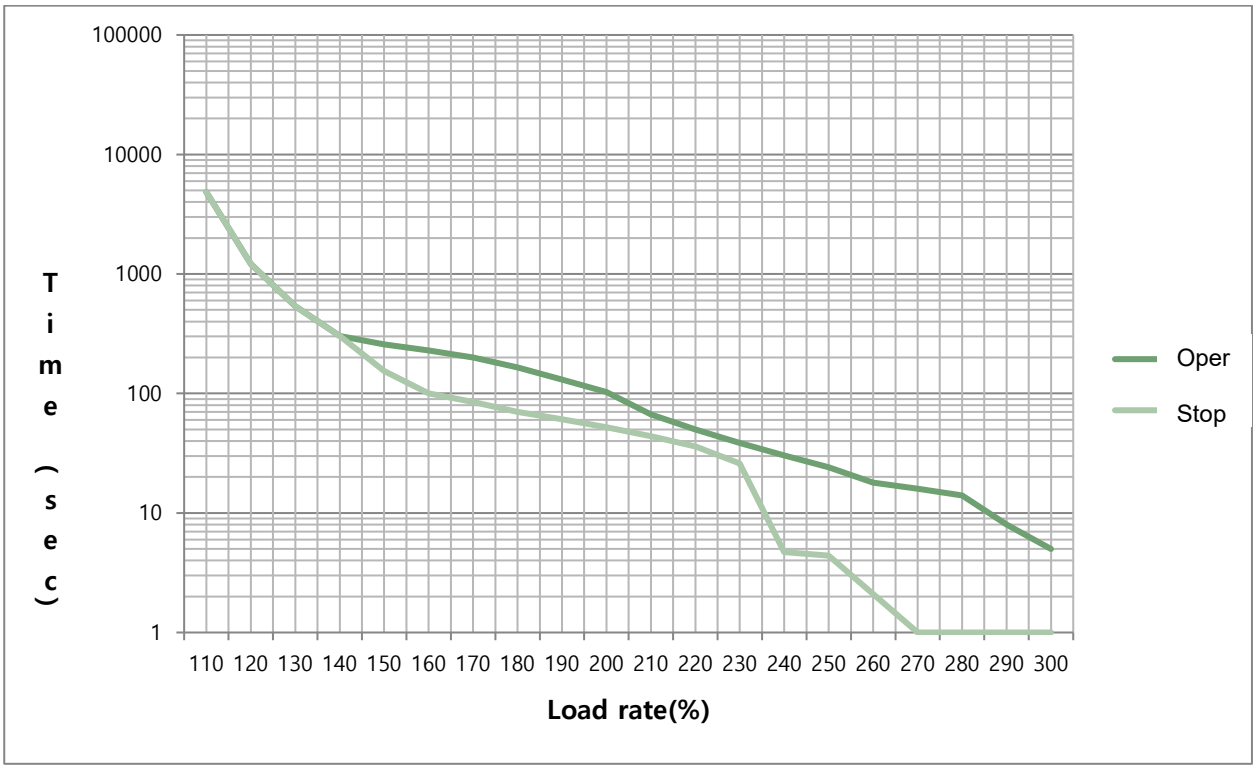
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	4602	4600	210	85	40
120	1208	1208	220	54	36
130	500	500	230	33	25
140	323	303	240	25	10
150	250	150	250	20	7.5
160	231	100	260	18	3.5
170	180	80	270	16	3.1
180	164	69	280	12	2.9
190	120	58	290	3.5	2.5
200	100	52	300	2.5	2



■ Overload Operating Characteristic Curve (5.0kW)

400[V]/5.0[kW]

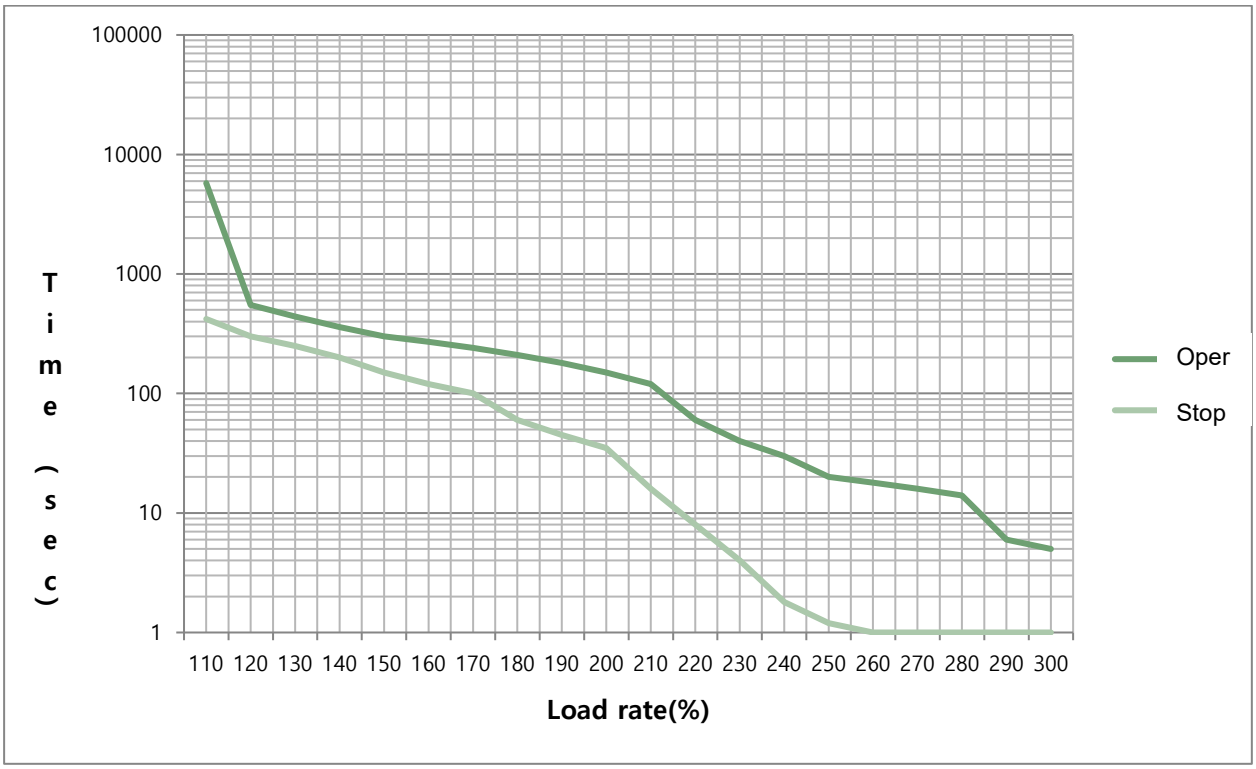
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	4832	4832	210	66.8	44
120	1208	1208	220	50.1	36
130	536	536.8	230	38.5	26
140	302	302	240	30.3	4.7
150	257	154	250	24.2	4.4
160	229	100	260	18	2.1
170	200	85	270	16	1
180	165	70	280	14	1
190	131	61	290	8	1
200	103	52	300	5	1



■ Overload Operating Characteristic Curve (7.5kW)

400[V]/7.5[kW]

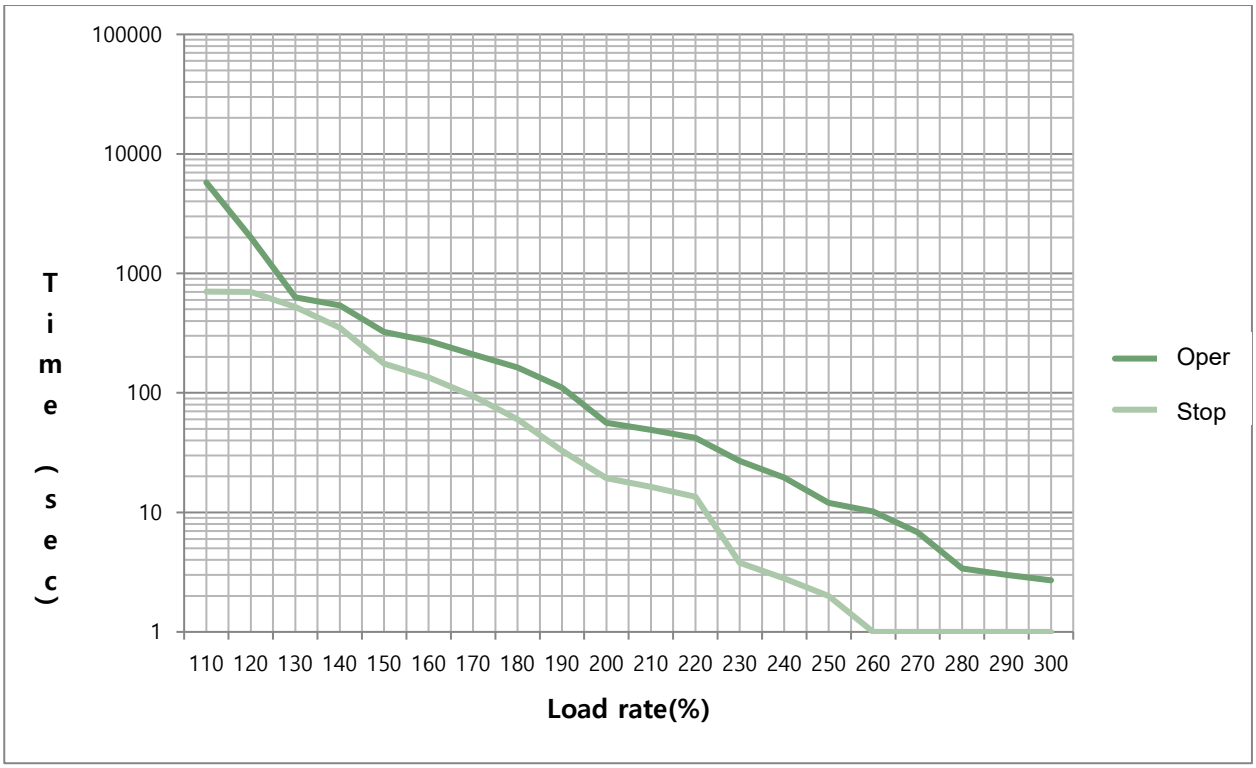
Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	5760	420	210	120	16
120	550	300	220	60	8
130	440	250	230	40	4
140	360	200	240	30	1.8
150	300	150	250	20	1.2
160	270	120	260	18	1
170	240	100	270	16	1
180	210	60	280	14	1
190	180	45	290	6	1
200	150	35	300	5	1



■ Overload Operating Characteristic Curve (15.0kW)

400[V]/15[kW]

Load rate(%)	AL-21 occurred time (sec)		Load rate(%)	AL-21 occurred time (sec)	
	Rotation	Stop		Rotation	Stop
Less than equal to 100	Infinite	Infinite	-	-	-
110	5760	704	210	49	16.4
120	1998	698.4	220	42	13.5
130	630	524.2	230	27	3.8
140	540	350.1	240	19.6	2.8
150	324	176	250	12	2
160	271.8	135	260	10.2	1
170	210.6	94	270	6.8	1
180	162.9	60	280	3.4	1
190	111	32.8	290	3	1
200	56	19.3	300	2.7	1



15.9 Servo overload motor type and ID (continued on next page)

[200V]

Model name	ID	Watt	Note
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
***SA015A**	**6**	**150**	**Mass production after August 2018**
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
HB02A	15	200	Hollow Shaft
HB04A	16	400	Hollow Shaft
-	-	-	
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
-	-	-	
HE09A	77	900	Hollow Shaft
HE15A	78	1500	Hollow Shaft
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	

Model name	ID	Watt	Note
DB03D	601	63	
DB06D	602	126	
DB09D	603	188	
DC06D	611	126	
DC12D	612	251	
DC18D	613	377	
DD12D	621	251	
DD22D	622	461	
DD34D	623	712	
DE40D	632	838	
DE60D	633	1257	
DFA1G	641	1728	
DFA6G	642	2513	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
-	-	-	
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-	-	-	
-	-	-	

*** SA015A: For models produced before August 2018, use ID 5.**

Model name	ID	Watt	Note
FALR5A	702	50	
FAL01A	703	100	
***FAL015A**	**706**	**150**	**Mass production after September 2018**
-	-	-	
FBL01A	714	100	
FBL02A	715	200	
FBL04A	716	400	
-	-	-	
FCL04A	729	400	
FCL06A	730	600	
FCL08A	731	750	
FCL10A	732	1000	
-	-	-	
FCL03D	733	300	
FCL05D	734	450	
FCL06D	735	550	
FCL07D	736	650	
-	-	-	
FE09A	761	900	
FE15A	762	1500	
FE22A	763	2200	
FE30A	764	3000	
FE06D	765	600	
FE11D	766	1100	
FE16D	767	1600	
FE22D	768	2200	
FE03M	769	300	
FE06M	770	600	
FE09M	771	900	
FE12M	772	1200	
FE05G	773	450	
FE09G	774	850	
FE13G	775	1300	
FE17G	776	1700	
-	-	-	

Model name	ID	Watt	Note
FF30A	781	3000	
FF50A	782	5000	
FF22D	785	2200	
FF35D	786	3500	
FF55D	787	5500	
FF75D	788	7500	
FF12M	789	1200	
FF20M	790	2000	
FF30M	791	3000	
FF44M	792	4000	
FF20G	793	1800	
FF30G	794	2900	
FF44G	795	4400	
FF60G	796	6000	
FF75G	804	7500	
-	-	-	
FG22D	811	2200	
FG35D	812	3500	
FG55D	813	5500	
FG75D	814	7500	
FG12M	821	1200	
FG20M	822	2000	
FG30M	823	3000	
FG44M	824	4400	
FG60M	825	6000	
FG20G	831	1800	
FG30G	832	2900	
FG44G	833	4400	
FG60G	834	6000	
FG85G	835	8500	
FG110G	836	11000	
FG150G	837	15000	
-	-	-	
-	-	-	
-	-	-	

*** FAL015A: For models produced before September 2018, use ID 704.**

[400V]

Model name	ID	Watt	Note
FEP09A	261	900	
FEP15A	262	1500	
FEP22A	263	2200	
***FEP22A**	**277**	**2200**	**Mass production after August 2018**
FEP30A	264	3000	
FEP06D	265	600	
FEP11D	266	1100	
FEP16D	267	1600	
FEP22D	268	2200	
FEP03M	269	300	
FEP06M	270	600	
FEP09M	271	900	
FEP12M	272	1200	
FEP05G	273	450	
FEP09G	274	850	
FEP13G	275	1300	
FEP17G	276	1700	
-	-	-	
FFP30A	281	3000	
FFP50A	282	5000	
FFP22D	285	2200	
FFP35D	286	3500	
FFP55D	287	5500	
FFP75D	288	7500	
FFP12M	289	1200	
FFP20M	290	2000	
FFP30M	**298**	**3000**	**Mass production after August 2018**
FFP44M	292	4400	
-	-	-	
FFP20G	29	1800	
FFP30G	294	2900	
-	-	-	

Model name	ID	Watt	Note
FFP44G	295	4400	
FFP60G	296	6000	
FFP75G	297	7500	
-	-	-	
FGP22D	311	2200	
FGP35D	312	3500	
FGP55D	313	5500	
FGP75D	314	7500	
FGP110D	315	11000	
-	-	-	
FGP12M	321	1200	
FGP30M	322	2000	
FGP30M	**338**	**3000**	**Mass production after August 2018**
FGP44M	324	4400	
FGP60M	325	6000	
***FGP60M**	**326**	**6000**	**Mass production after August 2018**
FGP20G	331	1800	
FGP30G	332	2900	
FGP44G	333	4400	
FGP60G	334	6000	
FGP85G	335	8500	
FGP110G	336	11000	
FGP150G	337	15000	
-	-	-	
SCP04A	421	400	
SCP06A	422	600	
SCP08A	423	800	
SCP10A	424	1000	
-	-	-	
-	-	-	
-	-	-	
-	-	-	

*** FEP22A: For models produced before August 2018, use ID 263.**

*** FFP30M: For models produced before August 2018, use ID 291.**

*** FGP30M: For models produced before August 2018, use ID 323.**

*** FGP60M: For models produced before August 2018, use ID 325.**

16. Communication protocol

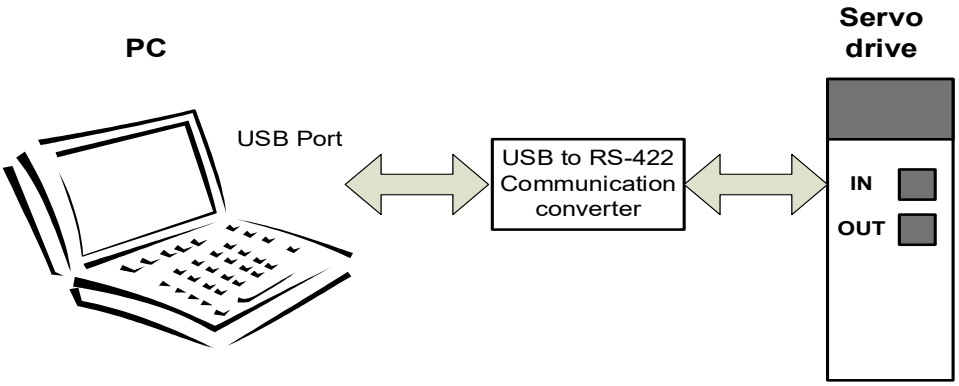
16.1 Overview and Communication spec.

16.1.1 Overview

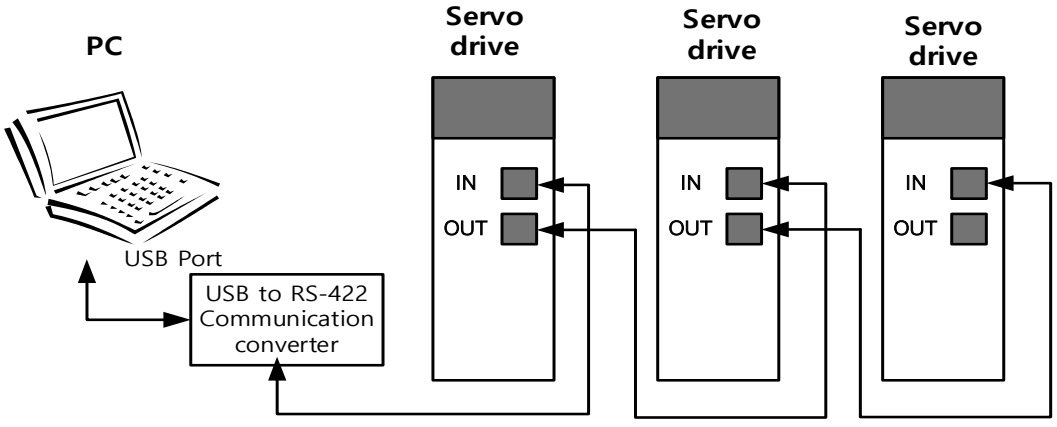
The L7P drive can use functions such as trial run, gain tuning, parameter change, and indexer operation of the drive by connecting it to a host controller such as a handy loader, HMI, PLC, or PC through RS-422 serial communication.

In addition, by connecting several L7P drives in a multi-drop method, up to 31 axes can be operated and operated through communication.

■ **Serial communication connection using RS-422**



■ **Multi-Drop connection using RS-422 (up to 31 units)**



Note1) When using the host controller as a PC, a USB to RS-422 communication converter must be used.

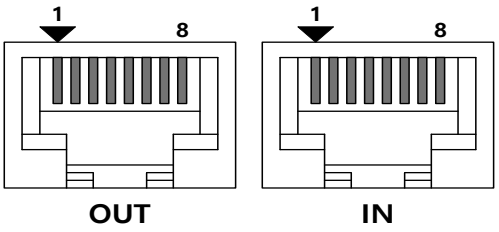
Note2) Servo drive IN/OUT connector pins are internally connected 1:1, designed for convenient multi-drop wiring.

16.1.2 Communication specification and cable connection diagram

■ Communication spec.

Item		Specification
Communication standard		ANSI/TIA/EIA-422 standard
Communication protocol		MODBUS-RTU
Data Type	Data bit	8bit
	Stop bit	1bit
	Parity	None
Synchronization type		Asynchronous type
Transmission speed		9600 /19200/38400/57600 [bps] Selectable in communication speed setting [0x3002]
Transmission distance		Up to 200[m]
Current consumption		100[㎃] or less

■ Connector pin connection for RS-422 communication.



Pin arrangement



Pin arrangement

We recommend STP cables and connectors to improve the stability of our products.

Pin No.	Pin function	Pin No.	Pin function
1	Do Not Use	5	TXD+
2	Do Not Use	6	RXD-
3	RXD+	7	Do Not Use Note 1)
4	TXD-	8	GND

Note1) In the case of the IN connector, 5V power is output to Pin 7 to supply power to the handy loader. **Use other than this purpose is prohibited and do not connect No. 7 Pin when wiring.**

Note2) Connect TXD+ and TXD-, RXD+ and RXD- as a twisted pair.

Note3) Use STP (Shield) cable for communication cable.

Note4) TXD and RXD in the table above are defined based on the servo drive side.

16.2 Communication protocol basic structure

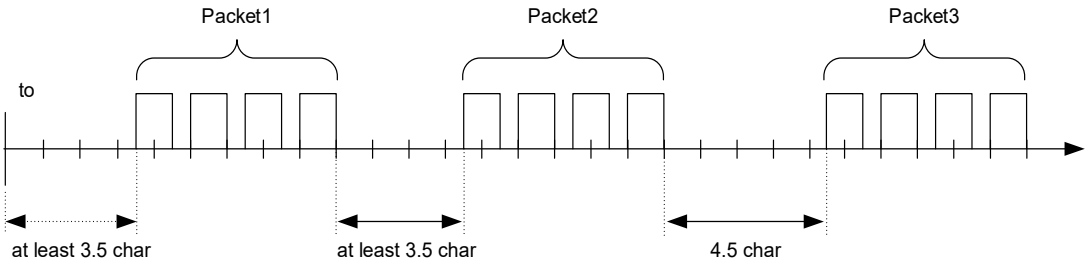
In principle, communication of L7P drive complies with MODBUS-RTU protocol. For matters not mentioned in this manual, refer to the relevant standards below. (Relevant standards: Modbus Application Protocol Specification 1.1b, 2006.12.28).

In addition, the concepts of transmission (Tx) and reception (Rx) in this manual are defined based on the host.

16.2.1 Sending and receiving packet structure

The maximum transmit/receive packet length of MODBUS-RTU protocol is 256 bytes. Therefore, be careful not to exceed the total length of TX/RX packets over 256Byte.

MODBUS-RTU communication mode requires a space of at least 3.5 char between the start and end as shown in the figure below to distinguish packets.



■ Sending packet structure

	Additional Address	Function Code	Data			Error Check	
Byte	**0**	**1**	**2**	**.**	**.**	**n-1**	**n**
Contents	Node ID	Function	Data	.	.	CRC(MSB)	CRC(LSB)

■ Receiving packet structure

[Normal response.]

	Additional Address	Function Code	Data			Error Check	
Byte	**0**	**1**	**2**	**.**	**.**	**n-1**	**n**
Contents	**Node ID**	**Function**	**Data**	**.**	**.**	**CRC(MSB)**	**CRC(LSB)**

[Abnormal response]

	Additional Address	Function Code	Data	Error Check	
Byte	**0**	**1**	**2**	**3**	**4**
Contents	Node ID	Function+ 0x80	Exception code	CRC(MSB)	CRC(LSB)

■ Protocol Packet Code Description

- Node ID

  Indicates the station number of the servo drive to be transmitted.

  An external switch in the Loader window sets the station number of the servo drive. The set station number can be checked in the parameter [0x2003].

- Function Code

  The function codes of the Modbus-RTU standard supported by the L7P drive are as follows.

Category	Command code	Description	Usage	
			Read	Write
PUBLIC Function Code	0x01	Read Coils	○	
	0x02	Read Discrete Inputs	○	
	0x03	Read Holding Registers	○	
	0x04	Read Input Register	○	
	0x05	Write Single Coil		○
	0x06	Write Single Register		○
	0x0F	Write Multiple Coils		○
	0x10	Write Multiple registers		○

- Data

  [Send]: In the case of the Read Register command, the Modbus address, number of registers, and number of bytes are designated, and in the case of the Write Register command, the Modbus address, the number of bytes, and the value to be set are designated.

  [Receive]: In case of Read Register command, normal response is received with Node ID and Function Code as the same value as when transmitted, and data is received according to the order of registers sent when transmitted.

  In the case of the Write Single Register command, the same data as when sending is received. In the case of Write Multi Register, the start address of the register to write data and the number of registers are received with the Write Multi Register command.

  In the case of an error response, it consists of Node ID, Error Code, and Exception Code, and the packet structure of an error response is the same regardless of the function code.

- CRC

  Enter the 16-bit CRC value. The configuration is divided into MSB/LSB and transmitted by 1Byte each.

- Exception Code

  Exception codes for abnormal responses of all function codes supported by the L7P drive are defined as follows.

Exception Code	Description
0x01	Function code not supported
0x02	Wrong register address
0x03	Invalid data value
0x04	Device failure, parameter set value error. Note 1)
0x05	Data not ready
0x06	Parameter lock status

Note 1) If the setting range of the parameter is the same as the data type, if a value outside the setting range is entered, it does not respond with an exception code and is set to the maximum/minimum value.

16.2.2 Protocol Command Code

(1) Read Coils (0x01)

Read the value of single bit output and continuous bit output block.

■ **Request**

Function code	1Byte	0x01
Starting Address	2Byte	0x0000 to 0xFFFF
Quantity of Coils	2Bytes	1 to 2000 (0x7D0)

■ **Request OK**

Function code	1Byte	0x01
Byte count	1Byte	N*
Coil Status	n Bytes	n = N or N+1

*N = Quantity of Outputs/8

■ **Response not OK**

Error code	1Byte	0x81
Exception code	1Byte	0x01 ~ 0x04

Command code Read Coils can read the status of the contacts corresponding to drive status inputs 1 and 2 and drive status outputs 1 and 2. The addresses corresponding to drive status inputs 1 and 2 and drive status outputs 1 and 2 are as follows.

■ Drive status input 1, 2 communication address

Communication address		Output address	Accessibility	Communication address		Output address	Accessibility
Decimal	Hexadecimal			Decimal	Hexadecimal		
0	0x0000	POT	RW	16	0x0010	START	RW
1	0x0001	NOT	RW	17	0x0011	PAUSE	RW
2	0x0002	HOME	RW	18	0x0012	REGT	RW
3	0x0003	STOP	RW	19	0x0013	HSTART	RW
4	0x0004	PCON	RW	20	0x0014	ISEL0	RW
5	0x0005	GAIN2	RW	21	0x0015	ISEL1	RW
6	0x0006	P_CL	RW	22	0x0016	ISEL2	RW
7	0x0007	N_CL	RW	23	0x0017	ISEL3	RW
8	0x0008	MODE	RW	24	0x0018	ISEL4	RW
9	0x0009	Reserved	RW	25	0x0019	ISEL5	RW
10	0x000A	EMG	RW	26	0x001A	ABSRQ	RW
11	0x000B	A_RST	RW	27	0x001B	JSTART	RW
12	0x000C	SV_ON	RW	28	0x001C	JDIR	RW
13	0x000D	SPD1/LVSF1	RW	29	0x001D	PCLEAR	RW
14	0x000E	SPD2/LVSF2	RW	30	0x001E	AOVR	RW
15	0x000F	SPD3	RW	31	0x001F	Reserved	RW

■ Drive status output 1, 2 communication address

Communication address		Output address	Accessibility	Communication address		Output address	Accessibility
Decimal	Hexadecimal			Decimal	Hexadecimal		
32	0x0020	BRAKE	RO	48	0x0030	ORG	RO
33	0x0021	ALARM	RO	49	0x0031	EOS	RO
34	0x0022	READY	RO	50	0x0032	IOUT0	RO
35	0x0023	ZSPD	RO	51	0x0033	IOUT1	RO
36	0x0024	INPOS1	RO	52	0x0034	IOUT2	RO
37	0x0025	TLMT	RO	53	0x0035	IOUT3	RO
38	0x0026	VLMT	RO	54	0x0036	IOUT4	RO
39	0x0027	INSPD	RO	55	0x0037	IOUT5	RO
40	0x0028	WARN	RO	56	0x0038	Reserved	RO
41	0x0029	TGON	RO	57	0x0039	Reserved	RO

42	0x002A	Reserved	RO	58	0x003A	Reserved	RO
43	0x002B	Reserved	RO	59	0x003B	Reserved	RO
44	0x002C	Reserved	RO	60	0x003C	Reserved	RO
45	0x002D	Reserved	RO	61	0x003D	Reserved	RO
46	0x002E	Reserved	RO	62	0x003E	Reserved	RO
47	0x002F	Reserved	RO	63	0x003F	Reserved	RO

Example 1) Read BRAKE output contact status

■ Request

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Outputs Hi.	Quantity of Outputs Lo	CRC Hi	CRC Lo
0x01	0x01	0x00	0x20	0x00	0x01	0xFC	0x00

■ Request OK

Node ID	Function	Byte Count	Outputs status	CRC Hi	CRC Lo
0x01	0x01	0x01	0x01	0x90	0x48

- BRAKE output contact status is High (1).

■ Response not OK

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x81	0x01 ~ 0x04	-	-

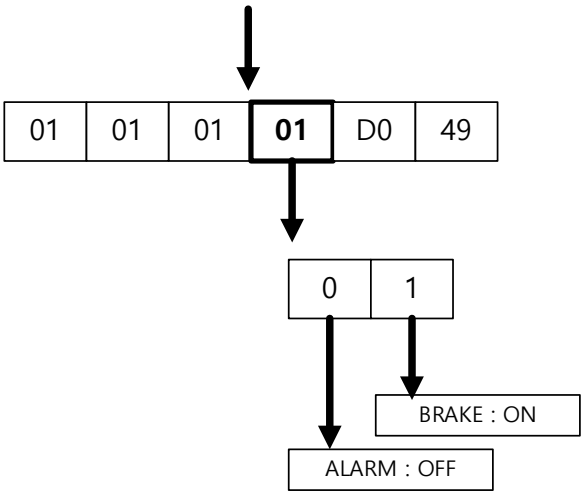
When using the protocol, write the setting of the start address in the Start Address. It is divided into upper and lower parts, so please be careful when filling in. Quantity Of Output is the part that sets how many I/O address statuses are requested from the starting address value. If 01 is entered, 1 status value is returned, and if 03 is entered, 3 consecutive status values are returned.

The following is an example of the protocol that transmits and receives status input/output when Servo Off.

Function	Sending	Receiving	Status
POT	[01][01][00][00][00][01][FD][CA]	[01][01][01][00][51][88]	OFF
NOT	[01][01][00][01][00][01][AC][0A]	[01][01][01][00][51][88]	OFF
HOME	[01][01][00][02][00][01][5C][0A]	[01][01][01][00][51][88]	OFF
STOP	[01][01][00][03][00][01][0D][CA]	[01][01][01][00][51][88]	OFF
PCON	[01][01][00][04][00][01][BC][0B]	[01][01][01][00][51][88]	OFF
GAIN2	[01][01][00][05][00][01][ED][CB]	[01][01][01][00][51][88]	OFF
P_CL	[01][01][00][06][00][01][1D][CB]	[01][01][01][00][51][88]	OFF
N_CL	[01][01][00][07][00][01][4C][0B]	[01][01][01][00][51][88]	OFF
MODE	[01][01][00][08][00][01][7C][08]	[01][01][01][00][51][88]	OFF
EMG	[01][01][00][0A][00][01][DD][C8]	[01][01][01][00][51][88]	OFF
A_RST	[01][01][00][0B][00][01][8C][08]	[01][01][01][00][51][88]	OFF
SV_ON	[01][01][00][0C][00][01][3D][C9]	[01][01][01][00][51][88]	OFF
SPD1/LVSF1	[01][01][00][0D][00][01][6C][09]	[01][01][01][00][51][88]	OFF
SPD2/LVSF2	[01][01][00][0E][00][01][9C][09]	[01][01][01][00][51][88]	OFF
SPD3	[01][01][00][0F][00][01][CD][C9]	[01][01][01][00][51][88]	OFF
START	[01][01][00][10][00][01][FC][0F]	[01][01][01][00][51][88]	OFF
PAUSE	[01][01][00][11][00][01][AD][CF]	[01][01][01][00][51][88]	OFF
REGT	[01][01][00][12][00][01][5D][CF]	[01][01][01][00][51][88]	OFF
HSTART	[01][01][00][13][00][01][0C][0F]	[01][01][01][00][51][88]	OFF
ISEL0	[01][01][00][14][00][01][BD][CE]	[01][01][01][00][51][88]	OFF
ISEL1	[01][01][00][15][00][01][EC][0E]	[01][01][01][00][51][88]	OFF
ISEL2	[01][01][00][16][00][01][1C][0E]	[01][01][01][00][51][88]	OFF
ISEL3	[01][01][00][17][00][01][4D][CE]	[01][01][01][00][51][88]	OFF
ISEL4	[01][01][00][18][00][01][7D][CD]	[01][01][01][00][51][88]	OFF
ISEL5	[01][01][00][19][00][01][2C][0D]	[01][01][01][00][51][88]	OFF
ABSRQ	[01][01][00][1A][00][01][DC][0D]	[01][01][01][00][51][88]	OFF
JSTART	[01][01][00][1B][00][01][8D][CD]	[01][01][01][00][51][88]	OFF
JDIR	[01][01][00][1C][00][01][3C][0C]	[01][01][01][00][51][88]	OFF
PCLEAR	[01][01][00][1D][00][01][6D][CC]	[01][01][01][00][51][88]	OFF
AOVR	[01][01][00][1E][00][01][9D][CC]	[01][01][01][00][51][88]	OFF
BRAKE	[01][01][00][20][00][01][FC][00]	[01][01][01][01][90][48]	ON
ALARM	[01][01][00][21][00][01][AD][C0]	[01][01][01][00][51][88]	OFF
READY	[01][01][00][22][00][01][5D][C0]	[01][01][01][01][90][48]	ON
ZSPD	[01][01][00][23][00][01][0C][00]	[01][01][01][01][90][48]	ON
INPOS1	[01][01][00][24][00][01][BD][C1]	[01][01][01][01][90][48]	ON
TLMT	[01][01][00][25][00][01][EC][01]	[01][01][01][00][51][88]	OFF
VLMT	[01][01][00][26][00][01][1C][01]	[01][01][01][00][51][88]	OFF
INSPD	[01][01][00][27][00][01][4D][C1]	[01][01][01][01][90][48]	ON
WARN	[01][01][00][28][00][01][7D][C2]	[01][01][01][00][51][88]	OFF
TGON	[01][01][00][29][00][01][2C][02]	[01][01][01][00][51][88]	OFF
ORG	[01][01][00][30][00][01][FD][C5]	[01][01][01][00][51][88]	OFF
EOS	[01][01][00][31][00][01][AC][05]	[01][01][01][01][90][48]	ON
IOUT0	[01][01][00][32][00][01][5C][05]	[01][01][01][00][51][88]	OFF
IOUT1	[01][01][00][33][00][01][0D][C5]	[01][01][01][00][51][88]	OFF
IOUT2	[01][01][00][34][00][01][BC][04]	[01][01][01][00][51][88]	OFF
IOUT3	[01][01][00][35][00][01][ED][C4]	[01][01][01][00][51][88]	OFF
IOUT4	[01][01][00][36][00][01][1D][C4]	[01][01][01][00][51][88]	OFF
IOUT5	[01][01][00][37][00][01][4C][04]	[01][01][01][00][51][88]	OFF

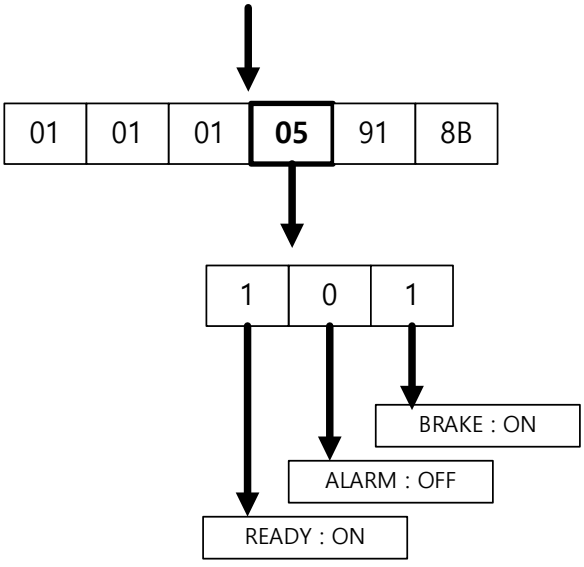
This is an example of checking a total of two status values starting from address 0x2000 in Servo Off state.

Function	Sending	Receiving
BRAKE~ALARM	[01][01][00][20][00]**[02]**[BC][01]	[01][01][01][01][90][48]



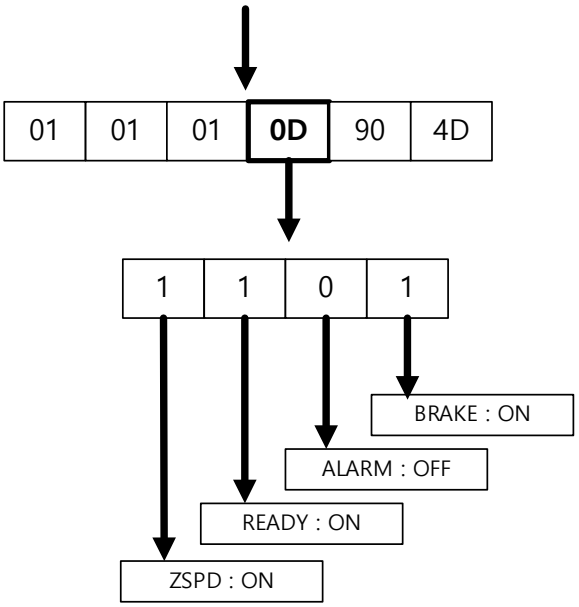
If 0x2000 is the starting address and Quantity of Output is 02 in the transmission protocol, a total of 2 input status values from 2000 to 2001 are requested. Since the Outputs Status Bits of the received protocol are '01', BRAKE is ON and ALARM is OFF.

Function	Sending	Receiving
BRAKE~READY	[01][01][00][20][00]**[03]**[7D][C1]	[01][01][01][05][91][8B]



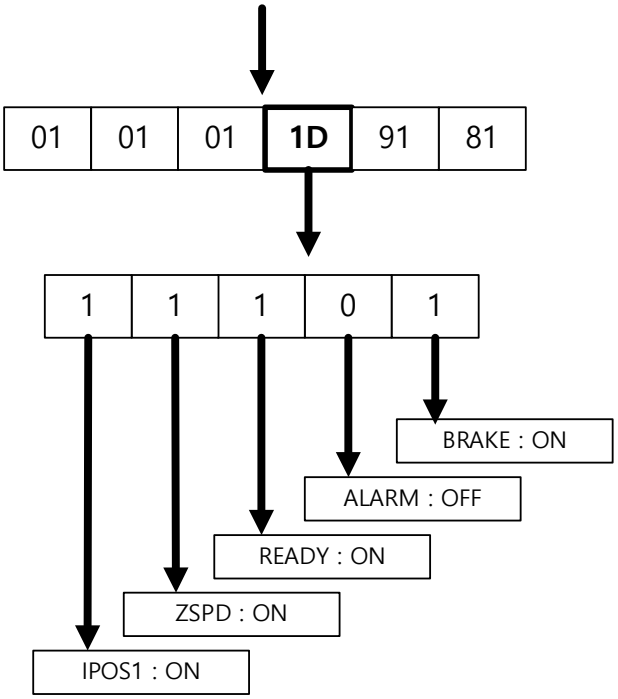
If you set Quantity of Output to 03, you can receive status values from addresses 2000 to 2003.

Function	Sending	Receiving
BRAKE~ZSPD	[01][01][00][20][00]**[04]**[3C][03]	[01][01][01][0D][90][4D]



If you set Quantity of Output to 04, you can receive status values from addresses 2000 to 2004.

Function	Sending	Receiving
BRAKE~INPOS1	[01][01][00][20][00]**[05]**[FD][C3]	[01][01][01][1D][91][81]



If you set Quantity of Output to 05, you can receive status values from addresses 2000 to 2005.

(2) Read Discrete Inputs (0x02)

Read the value of single bit input and continuous bit input block.

■ **Request**

Function code	1Byte	0x02
Starting Address	2Byte	0x0000 to 0xFFFF
Quantity of Inputs	2Bytes	1 to 2000 (0x7D0)

■ **Request OK**

Function code	1Byte	0x02
Starting Address	1Byte	N*
Input Status	N* x 1 Bytes	

*N = Quantity of Inputs/8

■ **Response not OK**

Error code	1Byte	0x82
Exception code	1Byte	0x01 ~ 0x04

Command code Read Discrete input can read the status of the contacts corresponding to drive status inputs 1 and 2 and drive status outputs 1 and 2. The addresses corresponding to drive status inputs 1 and 2 and drive status outputs 1 and 2 are as follows.

■ Drive status Input 1, 2 communication address

Communication address		Output address	Accessibility	Communication address		Output address	Accessibility
Decimal	Hexadecimal			Decimal	Hexadecimal		
0	0x0000	POT	RW	16	0x0010	START	RW
1	0x0001	NOT	RW	17	0x0011	PAUSE	RW
2	0x0002	HOME	RW	18	0x0012	REGT	RW
3	0x0003	STOP	RW	19	0x0013	HSTART	RW
4	0x0004	PCON	RW	20	0x0014	ISEL0	RW
5	0x0005	GAIN2	RW	21	0x0015	ISEL1	RW
6	0x0006	P_CL	RW	22	0x0016	ISEL2	RW
7	0x0007	N_CL	RW	23	0x0017	ISEL3	RW
8	0x0008	MODE	RW	24	0x0018	ISEL4	RW
9	0x0009	Reserved	RW	25	0x0019	ISEL5	RW
10	0x000A	EMG	RW	26	0x001A	ABSRQ	RW
11	0x000B	A_RST	RW	27	0x001B	JSTART	RW
12	0x000C	SV_ON	RW	28	0x001C	JDIR	RW
13	0x000D	SPD1/LVSF1	RW	29	0x001D	PCLEAR	RW
14	0x000E	SPD2/LVSF2	RW	30	0x001E	AOVR	RW
15	0x000F	SPD3	RW	31	0x001F	Reserved	RW

■ Drive status output 1, 2 communication address

Communication address		Output address	Accessibility	Communication address		Output address	Accessibility
Decimal	Hexadecimal			Decimal	Hexadecimal		
32	0x0020	BRAKE	RO	48	0x0030	ORG	RO
33	0x0021	ALARM	RO	49	0x0031	EOS	RO
34	0x0022	READY	RO	50	0x0032	IOUT0	RO
35	0x0023	ZSPD	RO	51	0x0033	IOUT1	RO
36	0x0024	INPOS1	RO	52	0x0034	IOUT2	RO
37	0x0025	TLMT	RO	53	0x0035	IOUT3	RO
38	0x0026	VLMT	RO	54	0x0036	IOUT4	RO
39	0x0027	INSPD	RO	55	0x0037	IOUT5	RO
40	0x0028	WARN	RO	56	0x0038	Reserved	RO
41	0x0029	TGON	RO	57	0x0039	Reserved	RO
42	0x002A	Reserved	RO	58	0x003A	Reserved	RO
43	0x002B	Reserved	RO	59	0x003B	Reserved	RO
44	0x002C	Reserved	RO	60	0x003C	Reserved	RO
45	0x002D	Reserved	RO	61	0x003D	Reserved	RO
46	0x002E	Reserved	RO	62	0x003E	Reserved	RO
47	0x002F	Reserved	RO	63	0x003F	Reserved	RO

Example 1) Read POT Input contact status

■ Request

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Inputs Hi.	Quantity of Inputs Lo	CRC Hi	CRC Lo
0x01	0x02	0x00	0x00	0x00	0x01	0XB9	0xCA

■ Request OK

Node ID	Function	Byte Count	Inputs Status	CRC Hi	CRC Lo
0x01	0x02	0x01	0x00	0xA1	0x88

- POT Input contact status is Low (0).

■ Response not OK

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x82	0x01 ~ 0x04	-	-

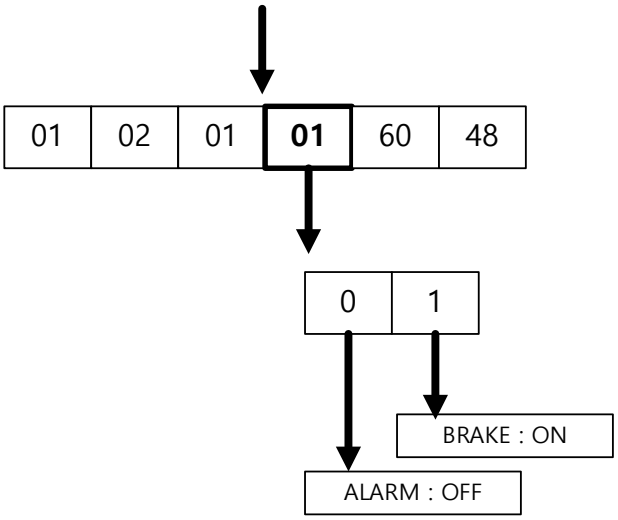
1) Example of Digital I/O input/output status value protocol

Function	Sending	Receiving	Status
POT	[01][02][00][00][00][01][B9][CA]	[01][02][01][00][A1][88]	OFF
NOT	[01][02][00][01][00][01][E8][0A]	[01][02][01][00][A1][88]	OFF
HOME	[01][02][00][02][00][01][18][0A]	[01][02][01][00][A1][88]	OFF
STOP	[01][02][00][03][00][01][49][CA]	[01][02][01][00][A1][88]	OFF
PCON	[01][02][00][04][00][01][F8][0B]	[01][02][01][00][A1][88]	OFF
GAIN2	[01][02][00][05][00][01][A9][CB]	[01][02][01][00][A1][88]	OFF
P_CL	[01][02][00][06][00][01][59][CB]	[01][02][01][00][A1][88]	OFF
N_CL	[01][02][00][07][00][01][08][0B]	[01][02][01][00][A1][88]	OFF
MODE	[01][02][00][08][00][01][38][08]	[01][02][01][00][A1][88]	OFF
EMG	[01][02][00][0A][00][01][99][C8]	[01][02][01][00][A1][88]	OFF
A_RST	[01][02][00][0B][00][01][C8][08]	[01][02][01][00][A1][88]	OFF
SV_ON	[01][02][00][0C][00][01][79][C9]	[01][02][01][00][A1][88]	OFF
SPD1/LVSF1	[01][02][00][0D][00][01][28][09]	[01][02][01][00][A1][88]	OFF
SPD2/LVSF2	[01][02][00][0E][00][01][D8][09]	[01][02][01][00][A1][88]	OFF
SPD3	[01][02][00][0F][00][01][89][C9]	[01][02][01][00][A1][88]	OFF
START	[01][02][00][10][00][01][B8][0F]	[01][02][01][00][A1][88]	OFF
PAUSE	[01][02][00][11][00][01][E9][CF]	[01][02][01][00][A1][88]	OFF
REGT	[01][02][00][12][00][01][19][CF]	[01][02][01][00][A1][88]	OFF
HSTART	[01][02][00][13][00][01][48][0F]	[01][02][01][00][A1][88]	OFF
ISEL0	[01][02][00][14][00][01][F9][CE]	[01][02][01][00][A1][88]	OFF
ISEL1	[01][02][00][15][00][01][A8][0E]	[01][02][01][00][A1][88]	OFF
ISEL2	[01][02][00][16][00][01][58][0E]	[01][02][01][00][A1][88]	OFF
ISEL3	[01][02][00][17][00][01][09][CE]	[01][02][01][00][A1][88]	OFF
ISEL4	[01][02][00][18][00][01][39][CD]	[01][02][01][00][A1][88]	OFF
ISEL5	[01][02][00][19][00][01][68][0D]	[01][02][01][00][A1][88]	OFF
ABSRQ	[01][02][00][1A][00][01][98][0D]	[01][02][01][00][A1][88]	OFF
JSTART	[01][02][00][1B][00][01][C9][CD]	[01][02][01][00][A1][88]	OFF
JDIR	[01][02][00][1C][00][01][78][0C]	[01][02][01][00][A1][88]	OFF
PCLEAR	[01][02][00][1D][00][01][29][CC]	[01][02][01][00][A1][88]	OFF
AOVR	[01][02][00][1E][00][01][D9][CC]	[01][02][01][00][A1][88]	OFF
BRAKE	[01][02][00][20][00][01][B8][00]	[01][02][01][01][60][48]	ON
ALARM	[01][02][00][21][00][01][E9][C0]	[01][02][01][00][A1][88]	OFF
READY	[01][02][00][22][00][01][19][C0]	[01][02][01][01][60][48]	ON
ZSPD	[01][02][00][23][00][01][48][00]	[01][02][01][01][60][48]	ON
INPOS1	[01][02][00][24][00][01][F9][C1]	[01][02][01][01][60][48]	ON
TLMT	[01][02][00][25][00][01][A8][01]	[01][02][01][00][A1][88]	OFF
VLMT	[01][02][00][26][00][01][58][01]	[01][02][01][00][A1][88]	OFF
INSPD	[01][02][00][27][00][01][09][C1]	[01][02][01][01][60][48]	ON
WARN	[01][02][00][28][00][01][39][C2]	[01][02][01][00][A1][88]	OFF
TGON	[01][02][00][29][00][01][68][02]	[01][02][01][00][A1][88]	OFF
ORG	[01][02][00][30][00][01][B9][C5]	[01][02][01][00][A1][88]	OFF
EOS	[01][02][00][31][00][01][E8][05]	[01][02][01][01][60][48]	ON
IOUT0	[01][02][00][32][00][01][18][05]	[01][02][01][00][A1][88]	OFF
IOUT1	[01][02][00][33][00][01][49][C5]	[01][02][01][00][A1][88]	OFF
IOUT2	[01][02][00][34][00][01][F8][04]	[01][02][01][00][A1][88	OFF
IOUT3	[01][02][00][35][00][01][A9][C4]	[01][02][01][00][A1][88]	OFF
IOUT4	[01][02][00][36][00][01][59][C4]	[01][02][01][00][A1][88]	OFF
IOUT5	[01][02][00][37][00][01][08][04]	[01][02][01][00][A1][88]	OFF

The following is a protocol example that requests 2 status values to be returned to address 0x2000 as the start address.

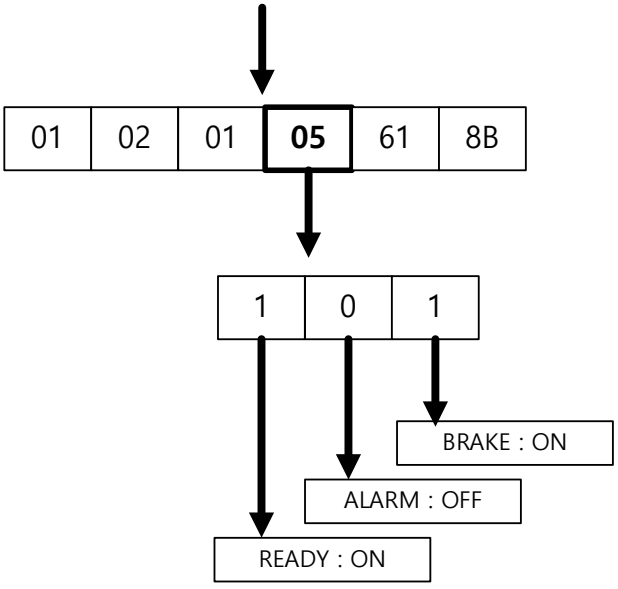
2) 2000~2001 address area parameter read example

Function	Sending	Receiving
BRAKE~ALARM	[01][02][00][20][00]**[02]**[F8][01]	[01][02][01][01][60][48]



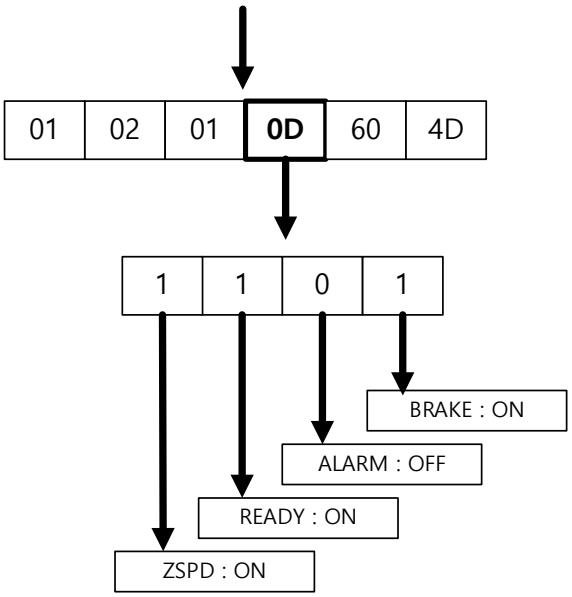
3) 2000~2002 address area parameter read example

Function	Sending	Receiving
BRAKE~READY	[01][02][00][20][00]**[03]**[39][C1]	[01][02][01][05][61][8B]



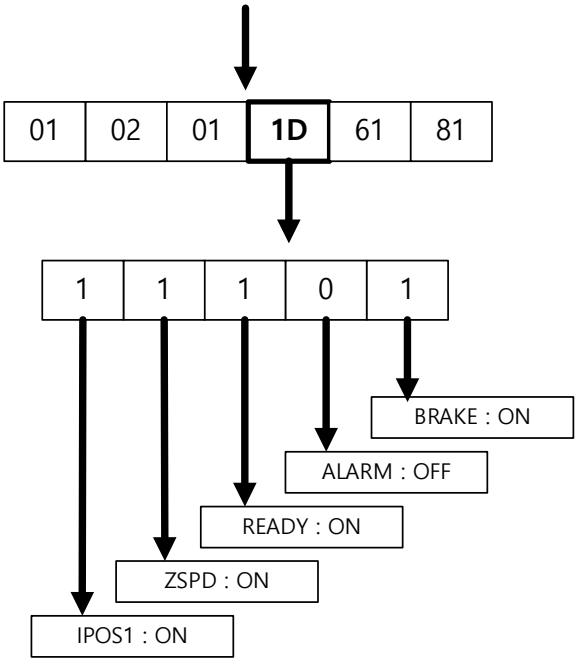
4) 2000~2003 address area parameter read example

Function	Sending	Receiving
BRAKE~ZSPD	[01][02][00][20][00]**[04]**[78][03]	[01][02][01][0D][60][4D]



5) 2000~2004 address area parameter read example

Function	Sending	Receiving
BRAKE~INPOS1	[01][02][00][20][00]**[05]**[B9][C3]	[01][02][01][1D][61][81]



(3) Read Holding Register (0x03)

It reads the value of single register (16bit data) and contiguous register block (16bit data unit).

■ **Request**

Function code	1Byte	0x03
Starting Address	2Byte	0x0000 to 0xFFFF
Quantity of Registers	2 Bytes	1 to 125 (0x7D)

■ **Request OK**

Function code	1Byte	0x03
Starting Address	1Byte	2 x N*
Quantity of Registers	N* x 2 Bytes	

*N = Quantity of Registers

■ **Response not OK**

Error code	1Byte	0x83
Exception code	1Byte	0x01 ~ 0x06

Example1) current Speed (Address: 0x2600) when reading one parameter value

■ **Request**

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Register Hi.	Quantity of Register Lo	CRC Hi	CRC Lo
0x01	0x03	0x26	0x00	0x00	0x01	0x8F	0x42

■ **Request OK**

Node ID	Function	Byte Count	Register Value Hi	Register Value Lo	CRC Hi	CRC Lo
0x01	0x03	0x02	0x00	0x00	0xB8	0x44

- The value of the current speed is 0 (or 0x0000)

■ **Response not OK**

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x83	0x01 ~ 0x06	-	-

Example2) Motor ID (Address: 0x2000), encoder type (Address: 0x2001), Number of encoder pulses per revolution (Address: 0x2002~0x2003)When reading the values of multiple parameters

■ **Request**

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Register Hi.	Quantity of Register Lo	CRC Hi	CRC Lo
0x01	0x03	0x20	0x00	0x00	0x04	0x4F	0XC9

■ Request OK

Node ID	Function	Byte Count	Register Value Hi	Register Value Lo	Register Value Hi	Register Value Lo	Register Value Hi	Register Value Lo
0x01	0x03	0x08	0x00	0x0D	0x00	0x02	0x00	0x00

Register Value Hi	Register Value Lo	CRC Hi	CRC Lo
0x00	0x08	0x31	0X11

The motor ID (Address 0x2000) value represents 13 (or 0x000D), and the encoder type (Address 0x2001) value represents 2 (or 0x0002). . . Since the number of encoder pulses per revolution (Address 0x2002~0x2003) is 32-bit data, the read data must be swapped. . The currently displayed value is 524288 (or 0x00080000).

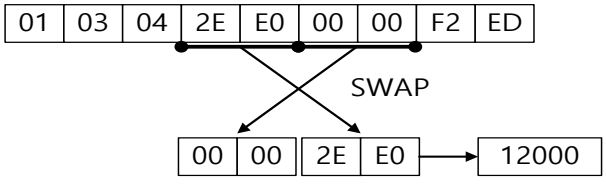
■ Response not OK

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x83	0x01 ~ 0x06	-	-

The following is an example protocol for inputting values for each parameter.

1) 2000 address area parameter read example

Parameter name	Com. Address	Sending	Receiving	Value
Motor ID	0x2000	[01][03][20][00][00][01][8F][CA]	[01][03][02]**[00][0B]**[F9][83]	100
Encoder Type	0x2001	[01][03][20][01][00][01][DE][0A]	[01][03][02]**[00][00]**[B8][44]	0
Encoder Pulse per Revolution	0x2002	[01][03][20][02][00][02][6E][0B]	[01][03][04]**[2E][E0][00][00]**[F2][ED]	12000
Node ID	0x2004	[01][03][20][04][00][01][CE][0B]	[01][03][02]**[00][01]**[79][84]	1
Rotation Direction Select	0x2005	[01][03][20][05][00][01][9F][CB]	[01][03][02]**[00][00]**[B8][44]	0
Absolute Encoder Configuration	0x2006	[01][03][20][06][00][01][6F][CB]	[01][03][02]**[00][01]**[79][84]	1
Main Power Fail Check Mode	0x2007	[01][03][20][07][00][01][3E][0B]	[01][03][02]**[00][00]**[B8][44]	0
Main Power Fail Check Time	0x2008	[01][03][20][08][00][01][0E][08]	[01][03][02]**[00][14]**[B8][4B]	20
7SEG Display Selection	0x2009	[01][03][20][09][00][01][5F][C8]	[01][03][02]**[00][00]**[B8][44]	0
Regeneration Brake Resistor Configuration	0x200A	[01][03][20][0A][00][01][AF][C8]	[01][03][02]**[00][00]**[B8][44]	0
Regeneration Brake Resistor Derating Factor	0x200B	[01][03][20][0B][00][01][FE][08]	[01][03][02]**[00][64]**[B9][AF]	100
Regeneration Brake Resistor Value	0x200C	[01][03][20][0C][00][01][4F][C9]	[01][03][02]**[00][28]**[B8][5A]	40
Regeneration Brake Resistor Power	0x200D	[01][03][20][0D][00][01][1E][09]	[01][03][02]**[00][50]**[B8][78]	80
Peak Power of Regeneration Brake Resistor	0x200E	[01][03][20][0E][00][01][EE][09]	[01][03][02]**[00][64]**[B9][AF]	100
Duration Time Peak Power of Regeneration Brake Resistor	0x200F	[01][03][20][0F][00][01][BF][C9]	[01][03][02]**[13][88]**[B5][12]	5000
Overload Check Base	0x2010	[01][03][20][10][00][01][8E][0F]	[01][03][02]**[00][64]**[B9][AF]	100
Overload Warning Level	0x2011	[01][03][20][11][00][01][DF][CF]	[01][03][02]**[00][32]**[39][91]	50
PWM Off Delay Time	0x2012	[01][03][20][12][00][01][2F][CF]	[01][03][02]**[00][0A]**[38][43]	10
Dynamic Brake Control Mode	0x2013	[01][03][20][13][00][01][7E][0F]	[01][03][02]**[00][00]**[B8][44]	0
Emergency Stop Configuration	0x2014	[01][03][20][14][00][01][CF][CE]	[01][03][02]**[00][01]**[79][84]	1
Warning Mask Configuration	0x2015	[01][03][20][15][00][01][9E][0E]	[01][03][02]**[00][00]**[B8][44]	0
U Phase Current Offset	0x2016	[01][03][20][16][00][01][6E][0E]	[01][03][02]**[00][00]**[B8][44]	0
V Phase Current Offset	0x2017	[01][03][20][17][00][01][3F][CE]	[01][03][02]**[00][00]**[B8][44]	0
W Phase Current Offset	0x2018	[01][03][20][18][00][01][0F][CD]	[01][03][02]**[00][00]**[B8][44]	0
Magnetic Pole Pitch	0x2019	[01][03][20][19][00][01][5E][0D]	[01][03][02]**[09][60]**[BE][3C]	2400
Linear Scale Resolution	0x201A	[01][03][20][1A][00][01][AE][0D]	[01][03][02]**[03][E8]**[B8][FA]	1000
Commutation Method	0x201B	[01][03][20][1B][00][01][FF][CD]	[01][03][02]**[00][00]**[B8][44]	0
Commutation Current	0x201C	[01][03][20][1C][00][01][4E][0C]	[01][03][02]**[01][F4]**[B8][53]	500
Commutation Time	0x201D	[01][03][20][1D][00][01][1F][CC]	[01][03][02]**[03][E8]**[B8][FA]	1000
Grating Period of Sinusoidal Encoder	0x201E	[01][03][20][1E][00][01][EF][CC]	[01][03][02]**[00][28]**[B8][5A]	40
Homing Done Behaviour	0x201F	[01][03][20][1F][00][01][BE][0C]	[01][03][02]**[00][00]**[B8][44]	0
Velocity Function Select	0x2020	[01][03][20][20][00][01][8E][00]	[01][03][02]**[00][00]**[B8][44]	0
Motor Hall Phase Config	0x2021	[01][03][20][21][00][01][DF][C0]	[01][03][02]**[00][00]**[B8][44]	0



In the case of a 2-byte register, 1 byte for each upper and lower register is swapped as above, so be careful when parsing. For example, in the case of '2E E0 00 00', if converted to decimal by SWAP, it becomes 12000.

2) 2100 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Inertia Ratio	0x2100	[01][03][21][00][00][01][8E][36]	[01][03][02]**[00][64]**[B9][AF]	100
Position Loop Gain 1	0x2101	[01][03][21][01][00][01][DF][F6]	[01][03][02]**[00][32]**[39][91]	50
Speed Loop Gain 1	0x2102	[01][03][21][02][00][01][2F][F6]	[01][03][02]**[00][4B]**[F8][73]	75
Speed Loop Integral Time Constant 1	0x2103	[01][03][21][03][00][01][7E][36]	[01][03][02]**[00][32]**[39][91]	50
Torque Command Filter Time Constant 1	0x2104	[01][03][21][04][00][01][CF][F7]	[01][03][02]**[00][05]**[78][47]	5
Position Loop Gain 2	0x2105	[01][03][21][05][00][01][9E][37]	[01][03][02]**[00][1E]**[38][4C]	30
Speed Loop Gain 2	0x2106	[01][03][21][06][00][01][6E][37]	[01][03][02]**[00][32]**[39][91]	50
Speed Loop Integral Time Constant 2	0x2107	[01][03][21][07][00][01][3F][F7]	[01][03][02]**[00][32]**[39][91]	50
Torque Command Filter Time Constant 2	0x2108	[01][03][21][08][00][01][0F][F4]	[01][03][02]**[00][05]**[78][47]	5
Position Command Filter Time Constant	0x2109	[01][03][21][09][00][01][5E][34]	[01][03][02]**[00][00]**[B8][44]	0
Position Command Average Filter Time Constant	0x210A	[01][03][21][0A][00][01][AE][34]	[01][03][02]**[00][00]**[B8][44]	0
Speed Feedback Filter Time Constant	0x210B	[01][03][21][0B][00][01][FF][F4]	[01][03][02]**[00][05]**[78][47]	5
Velocity Feed-forward Gain	0x210C	[01][03][21][0C][00][01][4E][35]	[01][03][02]**[00][00]**[B8][44]	0
Velocity Feed-forward Filter Time Constant	0x210D	[01][03][21][0D][00][01][1F][F5]	[01][03][02]**[00][0A]**[38][43]	10
Torque Feed-forward Gain	0x210E	[01][03][21][0E][00][01][EF][F5]	[01][03][02]**[00][00]**[B8][44]	0
Torque Feed-forward Filter Time Constant	0x210F	[01][03][21][0F][00][01][BE][35]	[01][03][02]**[00][0A]**[38][43]	10
Torque Limit Function Select	0x2110	[01][03][21][10][00][01][8F][F3]	[01][03][02]**[00][02]**[39][85]	2
External Positive Torque Limit Value	0x2111	[01][03][21][11][00][01][DE][33]	[01][03][02]**[0B][B8]**[BF][06]	3000
External Negative Torque Limit Value	0x2112	[01][03][21][12][00][01][2E][33]	[01][03][02]**[0B][B8]**[BF][06]	3000
Emergency Stop Torque	0x2113	[01][03][21][13][00][01][7F][F3]	[01][03][02]**[03][E8]**[B8][FA]	3000
P/PI Control Conversion Mode	0x2114	[01][03][21][14][00][01][CE][32]	[01][03][02]**[00][00]**[B8][44]	0
P Control Switch Torque	0x2115	[01][03][21][15][00][01][9F][F2]	[01][03][02]**[01][F4]**[B8][53]	500
P Control Switch Speed	0x2116	[01][03][21][16][00][01][6F][F2]	[01][03][02]**[00][64]**[B9][AF]	100
P Control Switch Acceleration	0x2117	[01][03][21][17][00][01][3E][32]	[01][03][02]**[03][E8]**[B8][FA]	1000
P Control Switch Following Error	0x2118	[01][03][21][18][00][01][0E][31]	[01][03][02]**[00][64]**[B9][AF]	100
Gain Conversion Mode	0x2119	[01][03][21][19][00][01][5F][F1]	[01][03][02]**[00][00]**[B8][44]	0
Gain Conversion Time 1	0x211A	[01][03][21][1A][00][01][AF][F1]	[01][03][02]**[00][02]**[39][85]	2
Gain Conversion Time 2	0x211B	[01][03][21][1B][00][01][FE][31]	[01][03][02]**[00][02]**[39][85]	2
Gain Conversion Waiting Time 1	0x211C	[01][03][21][1C][00][01][4F][F0]	[01][03][02]**[00][00]**[B8][44]	0
Gain Conversion Waiting Time 2	0x211D	[01][03][21][1D][00][01][1E][30]	[01][03][02]**[00][00]**[B8][44]	0
Dead Band for Position Control	0x211E	[01][03][21][1E][00][01][EE][30]	[01][03][02]**[00][00]**[B8][44]	0
Drive Control Input 1	0x211F	[01][03][21][1F][00][01][BF][F0]	[01][03][02]**[00][00]**[B8][44]	0
Drive Control Input 2	0x2120	[01][03][21][20][00][01][8F][FC]	[01][03][02]**[00][00]**[B8][44]	0
Drive Status Output 1	0x2121	[01][03][21][21][00][01][DE][3C]	[01][03][02]**[04][9D]**[7B][2D]	1181
Drive Status Output 2	0x2122	[01][03][21][22][00][01][2E][3C]	[01][03][02]**[00][02]**[39][85]	2

3) 2200 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Digital Input Signal 1 Selection	0x2200	[01][03][22][00][00][01][8E][72]	[01][03][02]**[00][0F]**[F8][40]	15
Digital Input Signal 2 Selection	0x2201	[01][03][22][01][00][01][DF][B2]	[01][03][02]**[00][01]**[79][84]	1
Digital Input Signal 3 Selection	0x2202	[01][03][22][02][00][01][2F][B2]	[01][03][02]**[00][02]**[39][85]	2
Digital Input Signal 4 Selection	0x2203	[01][03][22][03][00][01][7E][72]	[01][03][02]**[00][0C]**[B8][41]	12
Digital Input Signal 5 Selection	0x2204	[01][03][22][04][00][01][CF][B3]	[01][03][02]**[00][10]**[B9][88]	16
Digital Input Signal 6 Selection	0x2205	[01][03][22][05][00][01][9E][73]	[01][03][02]**[00][04]**[B9][87]	4
Digital Input Signal 7 Selection	0x2206	[01][03][22][06][00][01][6E][73]	[01][03][02]**[00][12]**[38][49]	18
Digital Input Signal 8 Selection	0x2207	[01][03][22][07][00][01][3F][B3]	[01][03][02]**[00][0B]**[F9][83]	11
Digital Input Signal 9 Selection	0x2208	[01][03][22][08][00][01][0F][B0]	[01][03][02]**[00][03]**[F8][45]	3
Digital Input Signal 10 Selection	0x2209	[01][03][22][09][00][01][5E][70]	[01][03][02]**[00][13]**[F9][89]	19
Digital Input Signal 11 Selection	0x220A	[01][03][22][0A][00][01][AE][70]	[01][03][02]**[00][14]**[B8][4B]	20
Digital Input Signal 12 Selection	0x220B	[01][03][22][0B][00][01][FF][B0]	[01][03][02]**[00][15]**[79][8B]	21
Digital Input Signal 13 Selection	0x220C	[01][03][22][0C][00][01][4E][71]	[01][03][02]**[00][16]**[39][8A]	22
Digital Input Signal 14 Selection	0x220D	[01][03][22][0D][00][01][1F][B1]	[01][03][02]**[00][17]**[F8][4A]	23
Digital Input Signal 15 Selection	0x220E	[01][03][22][0E][00][01][EF][B1]	[01][03][02]**[00][18]**[B8][4E]	24
Digital Input Signal 16 Selection	0x220F	[01][03][22][0F][00][01][BE][71]	[01][03][02]**[00][19]**[79][8E]	25
Digital Output Signal 1 Selection	0x2210	[01][03][22][10][00][01][8F][B7]	[01][03][02]**[80][02]**[58][45]	32770
Digital Output Signal 2 Selection	0x2211	[01][03][22][11][00][01][DE][77]	[01][03][02]**[00][03]**[F8][45]	3
Digital Output Signal 3 Selection	0x2212	[01][03][22][12][00][01][2E][77]	[01][03][02]**[80][01]**[18][44]	32769
Digital Output Signal 4 Selection	0x2213	[01][03][22][13][00][01][7F][B7]	[01][03][02]**[00][05]**[78][47]	5
Digital Output Signal 5 Selection	0x2214	[01][03][22][14][00][01][CE][76]	[01][03][02]**[00][10]**[B9][88]	16
Digital Output Signal 6 Selection	0x2215	[01][03][22][15][00][01][9F][B6]	[01][03][02]**[00][11]**[78][48]	17
Digital Output Signal 7 Selection	0x2216	[01][03][22][16][00][01][6F][B6]	[01][03][02]**[00][0A]**[38][43]	10
Digital Output Signal 8 Selection	0x2217	[01][03][22][17][00][01][3E][76]	[01][03][02]**[00][06]**[38][46]	6
Analog Torque Input(command/limit) Scale	0x2218	[01][03][22][18][00][01][0E][75]	[01][03][02]**[00][64]**[B9][AF]	100
Analog Torque Input(command/limit) Offset	0x2219	[01][03][22][19][00][01][5F][B5]	[01][03][02]**[00][00]**[B8][44]	0
Analog Velociity Override Mode	0x221A	[01][03][22][1A][00][01][AF][B5]	[01][03][02]**[00][00]**[B8][44]	0
Analog Velocity Input(command/override) Offset	0x221B	[01][03][22][1B][00][01][FE][75]	[01][03][02]**[00][00]**[B8][44]	0
Analog Monitor Output Mode	0x221C	[01][03][22][1C][00][01][4F][B4]	[01][03][02]**[00][00]**[B8][44]	0
Analog Monitor Channel 1 Select	0x221D	[01][03][22][1D][00][01][1E][74]	[01][03][02]**[00][00]**[B8][44]	0
Analog Monitor Channel 2 Select	0x221E	[01][03][22][1E][00][02][AE][75]	[01][03][02]**[00][01]**[79][84]	1
Analog Monitor Channel 1 Offset	0x2220	[01][03][22][20][00][02][CF][B9]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Analog Monitor Channel 2 Offset	0x2222	[01][03][22][22][00][02][6E][79]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Analog Monitor Channel 1 Scale	0x2224	[01][03][22][24][00][02][8E][78]	[01][03][04]**[01][F4][00][00]**[BA][3D]	500
Analog Monitor Channel 2 Scale	0x2226	[01][03][22][26][00][02][2F][B8]	[01][03][04]**[01][F4][00][00]**[BA][3D]	500
Analog Velocity Command Filter Time Constant	0x2228	[01][03][22][28][00][01][0E][7A]	[01][03][02]**[00][02]**[39][85]	2
Analog Torque Command Filter Time Constant	0x2229	[01][03][22][29][00][01][5F][BA]	[01][03][02]**[00][02]**[39][85]	2
Analog Velocity Command Scale	0x222A	[01][03][22][2A][00][01][AF][BA]	[01][03][02]**[00][64]**[B9][AF]	100
Analog Velocity Command Clamp Level	0x222B	[01][03][22][2B][00][01][FE][7A]	[01][03][02]**[00][00]**[B8][44]	0

4) 2300~2500 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Jog Operation Speed	0x2300	[01][03][23][00][00][01][8F][8E]	[01][03][02]**[01][F4]**[B8][53]	500
Speed Command Acceleration Time	0x2301	[01][03][23][01][00][01][DE][4E]	[01][03][02]**[00][C8]**[B9][D2]	200
Speed Command Deceleration Time	0x2302	[01][03][23][02][00][01][2E][4E]	[01][03][02]**[00][C8]**[B9][D2]	200
Speed Command S-curve Time	0x2303	[01][03][23][03][00][01][7F][8E]	[01][03][02]**[00][00]**[B8][44]	0
Program Jog Operation Speed 1	0x2304	[01][03][23][04][00][01][CE][4F]	[01][03][02]**[00][00]**[B8][44]	0
Program Jog Operation Speed 2	0x2305	[01][03][23][05][00][01][9F][8F]	[01][03][02]**[01][F4]**[B8][53]	500
Program Jog Operation Speed 3	0x2306	[01][03][23][06][00][01][6F][8F]	[01][03][02]**[00][00]**[B8][44]	0
Program Jog Operation Speed 4	0x2307	[01][03][23][07][00][01][3E][4F]	[01][03][02]**[FE][0C]**[F8][21]	65036
Program Jog Operation Time 1	0x2308	[01][03][23][08][00][01][0E][4C]	[01][03][02]**[01][F4]**[B8][53]	500
Program Jog Operation Time 2	0x2309	[01][03][23][09][00][01][5F][8C]	[01][03][02]**[13][88]**[B5][12]	5000
Program Jog Operation Time 3	0x230A	[01][03][23][0A][00][01][AF][8C]	[01][03][02]**[01][F4]**[B8][53]	500
Program Jog Operation Time 4	0x230B	[01][03][23][0B][00][01][FE][4C]	[01][03][02]**[13][88]**[B5][12]	5000
Index Pulse Search Speed	0x230C	[01][03][23][0C][00][01][4F][8D]	[01][03][02]**[00][14]**[B8][4B]	20
Speed Limit Function Select	0x230D	[01][03][23][0D][00][01][1E][4D]	[01][03][02]**[00][00]**[B8][44]	0
Speed Limit Value at Torque Control Mode	0x230E	[01][03][23][0E][00][01][EE][4D]	[01][03][02]**[03][E8]**[B8][FA]	1000
Over Speed Dection Level	0x230F	[01][03][23][0F][00][01][BF][8D]	[01][03][02]**[17][70]**[B6][50]	6000
Excessive Speed Error Detection Level	0x2310	[01][03][23][10][00][01][8E][4B]	[01][03][02]**[13][88]**[B5][12]	5000
Servo-Lock Function Select	0x2311	[01][03][23][11][00][01][DF][8B]	[01][03][02]**[00][00]**[B8][44]	0
Multi-Step Operation Speed 1	0x2312	[01][03][23][12][00][01][2F][8B]	[01][03][02]**[00][00]**[B8][44]	0
Multi-Step Operation Speed 2	0x2313	[01][03][23][13][00][01][7E][4B]	[01][03][02]**[00][0A]**[38][43]	10
Multi-Step Operation Speed 3	0x2314	[01][03][23][14][00][01][CF][8A]	[01][03][02]**[00][32]**[39][91]	50
Multi-Step Operation Speed 4	0x2315	[01][03][23][15][00][01][9E][4A]	[01][03][02]**[00][64]**[B9][AF]	100
Multi-Step Operation Speed 5	0x2316	[01][03][23][16][00][01][6E][4A]	[01][03][02]**[00][C8]**[B9][D2]	200
Multi-Step Operation Speed 6	0x2317	[01][03][23][17][00][01][3F][8A]	[01][03][02]**[01][F4]**[B8][53]	500
Multi-Step Operation Speed 7	0x2318	[01][03][23][18][00][01][0F][89]	[01][03][02]**[03][E8]**[B8][FA]	1000
Multi-Step Operation Speed 8	0x2319	[01][03][23][19][00][01][5E][49]	[01][03][02]**[05][DC]**[BA][8D]	1500
Velocity Command Switch Select	0x231A	[01][03][23][1A][00][01][AE][49]	[01][03][02]**[00][00]**[B8][44]	0
Software Position Limit Function Select	0x2400	[01][03][24][00][00][01][8E][FA]	[01][03][02]**[00][00]**[B8][44]	0
INPOS1 Output Range	0x2401	[01][03][24][01][00][01][DF][3A]	[01][03][02]**[00][64]**[B9][AF]	100
INPOS1 Output Time	0x2402	[01][03][24][02][00][01][2F][3A]	[01][03][02]**[00][00]**[B8][44]	0
INPOS2 Output Range	0x2403	[01][03][24][03][00][01][7E][FA]	[01][03][02]**[00][64]**[B9][AF]	100
ZSPD Output Range	0x2404	[01][03][24][04][00][01][CF][3B]	[01][03][02]**[00][0A]**[38][43]	10
TGON Output Range	0x2405	[01][03][24][05][00][01][9E][FB]	[01][03][02]**[00][64]**[B9][AF]	100
INSPD Output Range	0x2406	[01][03][24][06][00][01][6E][FB]	[01][03][02]**[00][64]**[B9][AF]	100
BRAKE Output Speed	0x2407	[01][03][24][07][00][01][3F][3B]	[01][03][02]**[00][64]**[B9][AF]	100
BRAKE Output Delay Time	0x2408	[01][03][24][08][00][01][0F][38]	[01][03][02]**[00][64]**[B9][AF]	100
Torque Limit at Homing Using Stopper	0x2409	[01][03][24][09][00][01][5E][F8]	[01][03][02]**[00][FA]**[38][07]	250
Duration Time at Homing Using Stopper	0x240A	[01][03][24][0A][00][01][AE][F8]	[01][03][02]**[00][32]**[39][91]	50
Modulo Mode	0x240B	[01][03][24][0B][00][01][FF][38]	[01][03][02]**[00][00]**[B8][44]	0
Modulo Factor	0x240C	[01][03][24][0C][00][02][0E][F8]	[01][03][04]**[0E][10][00][00]**[F9][1E]	3600
User Drive Name	0x240E	[01][03][24][0E][00][01][EF][39]	[01][03][02]**[72][44]**[9C][D7]	29252
Individual Parameter Save	0x2416	[01][03][24][16][00][01][6F][3E]	[01][03][02]**[00][00]**[B8][44]	0
Adaptive Filter Function Select	0x2500	[01][03][25][00][00][01][8F][06]	[01][03][02]**[00][00]**[B8][44]	0
Notch Filter 1 Frequency	0x2501	[01][03][25][01][00][01][DE][C6]	[01][03][02]**[13][88]**[B5][12]	5000
Notch Filter 1 Width	0x2502	[01][03][25][02][00][01][2E][C6]	[01][03][02]**[00][01]**[79][84]	1
Notch Filter 1 Depth	0x2503	[01][03][25][03][00][01][7F][06]	[01][03][02]**[00][01]**[79][84]	1
Notch Filter 2 Frequency	0x2504	[01][03][25][04][00][01][CE][C7]	[01][03][02]**[13][88]**[B5][12]	5000
Notch Filter 2 Width	0x2505	[01][03][25][05][00][01][9F][07]	[01][03][02]**[00][01]**[79][84]	1
Notch Filter 2 Depth	0x2506	[01][03][25][06][00][01][6F][07]	[01][03][02]**[00][01]**[79][84]	1
Notch Filter 3 Frequency	0x2507	[01][03][25][07][00][01][3E][C7]	[01][03][02]**[13][88]**[B5][12]	5000
Notch Filter 3 Width	0x2508	[01][03][25][08][00][01][0E][C4]	[01][03][02]**[00][01]**[79][84]	1
Notch Filter 3 Depth	0x2509	[01][03][25][09][00][01][5F][04]	[01][03][02]**[00][01]**[79][84]	1
Notch Filter 4 Frequency	0x250A	[01][03][25][0A][00][01][AF][04]	[01][03][02]**[13][88]**[B5][12]	5000

5) 2500~2600 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Notch Filter 4 Width	0x250B	[01][03][25][0B][00][01][FE][C4]	[01][03][02]**[00][01]**[79][84]	1
Notch Filter 4 Depth	0x250C	[01][03][25][0C][00][01][4F][05]	[01][03][02]**[00][01]**[79][84]	1
On-line Gain Tuning Mode	0x250D	[01][03][25][0D][00][01][1E][C5]	[01][03][02]**[00][00]**[B8][44]	0
System Rigidity for Gain Tuning	0x250E	[01][03][25][0E][00][01][EE][C5]	[01][03][02]**[00][05]**[78][47]	5
On-line Gain Tuning Adaptation Speed	0x250F	[01][03][25][0F][00][01][BF][05]	[01][03][02]**[00][01]**[79][84]	1
Off-line Gain Tuning Direction	0x2510	[01][03][25][10][00][01][8E][C3]	[01][03][02]**[00][00]**[B8][44]	0
Off-line Gain Tuning Distance	0x2511	[01][03][25][11][00][01][DF][03]	[01][03][02]**[00][05]**[78][47]	5
Disturbance Observer Gain	0x2512	[01][03][25][12][00][01][2F][03]	[01][03][02]**[00][00]**[B8][44]	0
Disturbance Observer Filter Time Constant	0x2513	[01][03][25][13][00][01][7E][C3]	[01][03][02]**[00][0A]**[38][43]	10
Current Controller Gain	0x2514	[01][03][25][14][00][01][CF][02]	[01][03][02]**[00][64]**[B9][AF]	100
Vibration Supression Filter Configuration	0x2515	[01][03][25][15][00][01][9E][C2]	[01][03][02]**[00][00]**[B8][44]	0
Vibration Supression Filter 1 Frequency	0x2516	[01][03][25][16][00][01][6E][C2]	[01][03][02]**[00][00]**[B8][44]	0
Vibration Supression Filter 1 Damping	0x2517	[01][03][25][17][00][01][3F][02]	[01][03][02]**[00][00]**[B8][44]	0
Vibration Supression Filter 2 Frequency	0x2518	[01][03][25][18][00][01][0F][01]	[01][03][02]**[00][00]**[B8][44]	0
Vibration Supression Filter 2 Damping	0x2519	[01][03][25][19][00][01][5E][C1]	[01][03][02]**[00][00]**[B8][44]	0
Feedback Speed	0x2600	[01][03][26][00][00][01][8F][42]	[01][03][02]**[00][00]**[B8][44]	0
Command Speed	0x2601	[01][03][26][01][00][01][DE][82]	[01][03][02]**[00][00]**[B8][44]	0
Following Error	0x2602	[01][03][26][02][00][02][6E][83]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Accumulated Operation Overload	0x2604	[01][03][26][04][00][01][CE][83]	[01][03][02]**[00][00]**[B8][44]	0
Instantaneous Maximum Operation Overload	0x2605	[01][03][26][05][00][01][9F][43]	[01][03][02]**[00][00]**[B8][44]	0
DC-Link Voltage	0x2606	[01][03][26][06][00][01][6F][43]	[01][03][02]**[01][39]**[79][C6]	313
Accumulated Regeneration Overload	0x2607	[01][03][26][07][00][01][3E][83]	[01][03][02]**[00][00]**[B8][44]	0
SingleTurn Data	0x2608	[01][03][26][08][00][02][4E][81]	[01][03][04]**[02][ED][00][00]**[6B][BE]	749
Mechanical Angle	0x260A	[01][03][26][0A][00][01][AF][40]	[01][03][04]**[02][EE][00][00]**[9B][BE]	750
Electrical Angle	0x260B	[01][03][26][0B][00][01][FE][80]	[01][03][04]**[00][00][00][00]**[FA][33]	0
MultiTurn Data	0x260C	[01][03][26][0C][00][02][0F][40]	[01][03][02]**[00][00]**[B8][44]	0
Drive Temperature 1	0x260E	[01][03][26][0E][00][01][EE][81]	[01][03][02]**[00][25]**[79][9F]	37
Drive Temperature 2	0x260F	[01][03][26][0F][00][01][BF][41]	[01][03][02]**[00][28]**[B8][5A]	40
Encoder Temperature	0x2610	[01][03][26][10][00][01][8E][87]	[01][03][02]**[00][00]**[B8][44]	0
Motor Rated Speed	0x2611	[01][03][26][11][00][01][DF][47]	[01][03][02]**[0B][B8]**[BF][06]	3000
Motor Maximum Speed	0x2612	[01][03][26][12][00][01][2F][47]	[01][03][02]**[13][88]**[B5][12]	5000
Drive Rated Current	0x2613	[01][03][26][13][00][01][7E][87]	[01][03][02]**[00][43]**[F9][B5]	67
FPGA Version	0x2614	[01][03][26][14][00][03][4E][87]	[01][03][06]**[2E][30][32][31][00][00]**[38][48]	0.12
Hall Signal Display	0x2617	[01][03][26][17][00][01][3F][46]	[01][03][02]**[00][04]**[B9][87]	4
Bootloader Version	0x2618	[01][03][26][18][00][03][8E][84]	[01][03][06]**[2E][30][36][30][00][00]**[68][B8]	0.06
Warning Code	0x261B	[01][03][26][1B][00][01][FF][45]	[01][03][02]**[00][00]**[B8][44]	0
Analog Input 1 Value	0x261C	[01][03][26][1C][00][01][4E][84]	[01][03][02]**[FF][E0]**[F8][3C]	65504
Analog Input 2 Value	0x261D	[01][03][26][1D][00][01][1F][44]	[01][03][02]**[FF][C0]**[F9][E4]	65472
RMS Operation Overload	0x2623	[01][03][26][23][00][01][7E][88]	[01][03][02]**[00][00]**[B8][44]	0

6) 2700~2800 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Procedure Command Code	0x2700	[01][03][27][00][00][01][8E][BE]	[01][03][02]**[00][00]**[B8][44]	0
Procedure Command Argument	0x2701	[01][03][27][01][00][01][DF][7E]	[01][03][02]**[00][00]**[B8][44]	0
[Third Party Motor] Type	0x2800	[01][03][28][00][00][01][8D][AA]	[01][03][02]**[00][00]**[B8][44]	0
[Third Party Motor] Number of Poles	0x2801	[01][03][28][01][00][01][DC][6A]	[01][03][02]**[00][08]**[B9][82]	8
[Third Party Motor] Rated Current	0x2802	[01][03][28][02][00][02][6C][6B]	[01][03][04]**[F5][C3][40][38]**[09][D1]	2.89
[Third Party Motor] Maximum Current	0x2804	[01][03][28][04][00][02][8C][6A]	[01][03][04]**[B8][52][41][0A]**[CF][15]	8.67
[Third Party Motor] Rated Speed	0x2806	[01][03][28][06][00][01][6D][AB]	[01][03][02]**[0B][B8]**[BF][06]	3000
[Third Party Motor] Maximum Speed	0x2807	[01][03][28][07][00][01][3C][6B]	[01][03][02]**[13][88]**[B5][12]	5000
[Third Party Motor] Inertia	0x2808	[01][03][28][08][00][02][4C][69]	[01][03][04]**[5A][1D][3E][A4]**[69][36]	0.321
[Third Party Motor] Torque Constant	0x280A	[01][03][28][0A][00][02][ED][A9]	[01][03][04]**[85][1F][3E][EB]**[B2][D6]	0.46
[Third Party Motor] Phase Resistance	0x280C	[01][03][28][0C][00][02][0D][A8]	[01][03][04]**[EB][85][3F][51]**[0E][32]	0.82
[Third Party Motor] Phase Inductance	0x280E	[01][03][28][0E][00][02][AC][68]	[01][03][04]**[3D][71][40][6A]**[16][6B]	3.66
[Third Party Motor] TN Curve Data 1	0x2810	[01][03][28][10][00][01][8C][6F]	[01][03][02]**[0B][B8]**[BF][06]	3000
[Third Party Motor] TN Curve Data 2	0x2812	[01][03][28][12][00][02][6D][AE]	[01][03][04]**[00][00][42][C8]**[CB][05]	100
[Third Party Motor] Hall Offset	0x2814	[01][03][28][14][00][01][CD][AE]	[01][03][02]**[00][00]**[B8][44]	0

7) 3000~3100 address area parameter read example

Parameter name	com. address	Sending	Receiving	Value
Control Mode	0x3000	[01][03][30][00][00][01][8B][0A]	[01][03][02]**[00][00]**[B8][44]	0
Coordinate Select	0x3001	[01][03][30][01][00][01][DA][CA]	[01][03][02]**[00][00]**[B8][44]	0
Baud Rate Select	0x3002	[01][03][30][02][00][01][2A][CA]	[01][03][02]**[00][03]**[F8][45]	3
Pulse Input Logic Select	0x3003	[01][03][30][03][00][01][7B][0A]	[01][03][02]**[00][00]**[B8][44]	0
Pulse Input Filter Select	0x3004	[01][03][30][04][00][01][CA][CB]	[01][03][02]**[00][00]**[B8][44]	0
PCLEAR Mode Select	0x3005	[01][03][30][05][00][01][9B][0B]	[01][03][02]**[00][00]**[B8][44]	0
Encoder Ouptput Pulse	0x3006	[01][03][30][06][00][02][2B][0A]	[01][03][04]**[27][10][00][00]**[F1][42]	10000
Encoder Output Mode	0x3008	[01][03][30][08][00][01][0A][C8]	[01][03][02]**[00][00]**[B8][44]	0
Start Index Number(0~63)	0x3009	[01][03][30][09][00][01][5B][08]	[01][03][02]**[00][40]**[B9][B4]	64
Index Buffer Mode	0x300A	[01][03][30][0A][00][01][AB][08]	[01][03][02]**[00][01]**[79][84]	1
I/O Configuration	0x300B	[01][03][30][0B][00][01][FA][C8]	[01][03][02]**[00][00]**[B8][44]	0
Index0.IndexType	0x3101	[01][03][31][01][00][01][DB][36]	[01][03][02]**[00][00]**[B8][44]	0
Index0.Distance	0x3102	[01][03][31][02][00][02][6B][37]	[01][03][04]**[0D][40][00][03]**[B9][4A]	51200000
Index0.Velocity	0x3104	[01][03][31][04][00][02][8B][36]	[01][03][04]**[55][55][00][01]**[3A][2F]	87381
Index0.Acceleration	0x3106	[01][03][31][06][00][02][2A][F6]	[01][03][04]**[00][00][01][90]**[FB][CF]	26214400
Index0.Deceleration	0x3108	[01][03][31][08][00][02][4B][35]	[01][03][04]**[00][00][01][90]**[FB][CF]	26214400
Index0.RegDistance	0x310A	[01][03][31][0A][00][02][EA][F5]	[01][03][04]**[86][A0][00][01]**[12][99]	100000
Index0.RegVelocity	0x310C	[01][03][31][0C][00][02][0A][F4]	[01][03][04]**[42][40][00][0F]**[AF][9B]	1000000
Index0.RepeatCount	0x310E	[01][03][31][0E][00][01][EB][35]	[01][03][02]**[00][01]**[79][84]	1
Index0.DwellTime	0x310F	[01][03][31][0F][00][01][BA][F5]	[01][03][02]**[07][D0]**[BB][E8]	2000
Index0.Next Index	0x3110	[01][03][31][10][00][01][8B][33]	[01][03][02]**[00][00]**[B8][44]	0
Index0.Action	0x3111	[01][03][31][11][00][01][DA][F3]	[01][03][02]**[00][02]**[39][85]	2

8) 6000 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Quick Stop Option Code	0x6003	[01][03][60][03][00][01][6A][0A]	[01][03][02]**[00][02]**[39][85]	2
Shutdown Option Code	0x6004	[01][03][60][04][00][01][DB][CB]	[01][03][02]**[00][00]**[B8][44]	0
Disable Operation Option Code	0x6005	[01][03][60][05][00][01][8A][0B]	[01][03][02]**[00][01]**[79][84]	1
Halt Option Code	0x6006	[01][03][60][06][00][01][7A][0B]	[01][03][02]**[00][00]**[B8][44]	0
Fault Reaction Option Coed	0x6007	[01][03][60][07][00][01][2B][CB]	[01][03][02]**[00][00]**[B8][44]	0
Modes of Operation	0x6008	[01][03][60][08][00][01][1B][C8]	[01][03][02]**[00][FF]**[F8][04]	255
Modes of Operation Display	0x6009	[01][03][60][09][00][01][4A][08]	[01][03][02]**[00][FF]**[F8][04]	255
Position Demand Valude	0x600A	[01][03][60][0A][00][02][FA][09]	[01][03][04]**[FF][FF][FF][FF]**[FB][A7]	-1
Position Actual Internal Value	0x600C	[01][03][60][0C][00][02][1A][08]	[01][03][04]**[FF][FF][FF][FF]**[FB][A7]	-1
Position Actual Value	0x600E	[01][03][60][0E][00][02][BB][C8]	[01][03][04]**[FF][FF][FF][FF]**[FB][A7]	-1
Following Error Window	0x6010	[01][03][60][10][00][02][DB][CE]	[01][03][04]**[27][C0][00][09]**[30][BD]	600000
Following Error Timeout	0x6012	[01][03][60][12][00][01][3A][0F]	[01][03][02]**[00][00]**[B8][44]	0
Position Window	0x6013	[01][03][60][13][00][02][2B][CE]	[01][03][04]**[00][64][00][00]**[BB][EC]	100
Position Window Time	0x6015	[01][03][60][15][00][01][8B][CE]	[01][03][02]**[00][00]**[B8][44]	0
Velocity Demand Value	0x6016	[01][03][60][16][00][02][3B][CF]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Velocity Actual Value	0x6018	[01][03][60][18][00][02][5A][0C]	[01][03][04]**[FF][FF][FF][FF]**[FB][A7]	-1
Velocity Window	0x601A	[01][03][60][1A][00][01][BB][CD]	[01][03][02]**[4E][20]**[8C][3C]	20000
Velocity Window Time	0x601B	[01][03][60][1B][00][01][EA][0D]	[01][03][02]**[00][00]**[B8][44]	0
Target Torque	0x601C	[01][03][60][1C][00][01][5B][CC]	[01][03][02]**[00][00]**[B8][44]	0
Maximum Torque	0x601D	[01][03][60][1D][00][01][0A][0C]	[01][03][02]**[0B][B8]**[BF][06]	3000
Torque Demand Value	0x601E	[01][03][60][1E][00][01][FA][0C]	[01][03][02]**[00][00]**[B8][44]	0
Motor Rated Torque	0x601F	[01][03][60][1F][00][02][EB][CD]	[01][03][04]**[01][52][00][00]**[5A][1E]	338
Torque Actual Value	0x6021	[01][03][60][21][00][01][CA][00]	[01][03][02]**[00][00]**[B8][44]	0
Home Offset	0x6024	[01][03][60][24][00][02][9A][00]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Software Position Limit (Min)	0x6028	[01][03][60][28][00][02][5A][03]	[01][03][04]**[36][00][C4][65]**[67][50]	-1000000000
Software Position Limit (Max)	0x602A	[01][03][60][2A][00][02][FB][C3]	[01][03][04]**[CA][00][3B][9A]**[56][B0]	1000000000
Quick Stop Deceleration	0x6034	[01][03][60][34][00][02][9B][C5]	[01][03][04]**[0D][40][00][03]**[B9][4A]	200000
Gear Ratio (Motor revolutions)	0x603A	[01][03][60][3A][00][02][FA][06]	[01][03][04]**[00][01][00][00]**[AB][F3]	1
Gear Ratio (Shaft revolutions)	0x603C	[01][03][60][3C][00][02][1A][07]	[01][03][04]**[00][01][00][00]**[AB][F3]	1
Homing Method	0x603E	[01][03][60][3E][00][01][FB][C6]	[01][03][02]**[00][22]**[38][5D]	34
Homing Speed (switch)	0x6041	[01][03][60][41][00][02][8A][1F]	[01][03][04]**[A1][20][00][07]**[99][C7]	128000000
Homing Speed (zero)	0x6043	[01][03][60][43][00][02][2B][DF]	[01][03][04]**[86][A0][00][01]**[12][99]	100000
Homing Acceleration	0x6045	[01][03][60][45][00][02][CB][DE]	[01][03][04]**[0D][40][00][03]**[B9][4A]	200000
Velocity Offset	0x6049	[01][03][60][49][00][02][0B][DD]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Torque Offset	0x604B	[01][03][60][4B][00][01][EA][1C]	[01][03][02]**[00][00]**[B8][44]	0
Touch Probe Function	0x604C	[01][03][60][4C][00][01][5B][DD]	[01][03][02]**[00][33]**[F8][51]	51
Touch Probe Status	0x604D	[01][03][60][4D][00][01][0A][1D]	[01][03][02]**[00][01]**[79][84]	1
Touch Prove 1 Positive Edge Position Value	0x604E	[01][03][60][4E][00][02][BA][1C]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Touch Prove 1 Negative Edge Position Value	0x6050	[01][03][60][50][00][02][DA][1A]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Touch Prove 2 Positive Edge Position Value	0x6052	[01][03][60][52][00][02][7B][DA]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Touch Prove 2 Negative Edge Position Value	0x6054	[01][03][60][54][00][02][9B][DB]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Positive Torque Limit Value	0x605C	[01][03][60][5C][00][01][5A][18]	[01][03][02]**[0B][B8]**[BF][06]	3000
Negative Torque Limit Value	0x605D	[01][03][60][5D][00][01][0B][D8]	[01][03][02]**[0B][B8]**[BF][06]	3000
Following Error Actual Value	0x605E	[01][03][60][5E][00][02][BB][D9]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Position Demand Internal Value	0x6060	[01][03][60][60][00][02][DA][15]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Digital Inputs	0x6062	[01][03][60][62][00][02][7B][D5]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Digital Outputs (Physical)	0x6066	[01][03][60][66][00][02][3A][14]	[01][03][04]**[00][00][2E][00]**[E7][93]	771751936
Digital Outputs (Bit mask)	0x6068	[01][03][60][68][00][02][5B][D7]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Target Velocity	0x606A	[01][03][60][6A][00][02][FA][17]	[01][03][04]**[00][00][00][00]**[FA][33]	0
Supported Drive Modes	0x606C	[01][03][60][6C][00][02][1A][16]	[01][03][04]**[03][ED][00][00]**[6A][42]	1005

(4) Read Input Register (0x04)

Read binary values of single register (16bit data) and continuous registers (16bit data unit).

■ Request

Function code	1Byte	0x04
Starting Address	2Byte	0x0000 to 0xFFFF
Quantity of Registers	2 Bytes	0x0000 to 0x007D

■ Request OK

Function code	1Byte	0x04
Starting Address	1Byte	2 x N*
Quantity of Registers	N* x 2 Bytes	

*N = Quantity of Input Registers

■ Response not OK

Error code	1Byte	0x84
Exception code	1Byte	0x01 ~ 0x06

Example 1) In case of reading the parameter value of drive status output 1 (Address: 0x2121) .

■ Request

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Register Hi.	Quantity of Register Lo	CRC Hi	CRC Lo
0x01	0x04	0x21	0x21	0x00	0x01	0x6B	0xFC

■ Request OK

Node ID	Function	Byte Count	Register Value Hi	Register Value Lo	CRC Hi	CRC Lo
0x01	0x04	0x02	0x04	0x99	0x7B	0x9A

- Drive status output 1 (Address: 0x2121) is 0b10010011001 (0x0499), and BRAKE, ZSPD, INPOS1, INSPD, INPOS2 contacts are outputting high (state 1). .

■ Response not OK

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x84	0x01 ~ 0x06	-	-

1) 2000 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Motor ID	0x2000	[01][04][20][00][00][01][3A][0A]	[01][04][02]**[00][0B]**[F8][F7]	100
Encoder Type	0x2001	[01][04][20][01][00][01][6B][CA]	[01][04][02]**[00][00]**[B9][30]	0
Encoder Pulse per Revolution	0x2002	[01][04][20][02][00][02][DB][CB]	[01][04][04]**[2E][E0][00][00]**[F3][5A]	12000
Node ID	0x2004	[01][04][20][04][00][01][7B][CB]	[01][04][02]**[00][01]**[78][F0]	1
Rotation Direction Select	0x2005	[01][04][20][05][00][01][2A][0B]	[01][04][02]**[00][00]**[B9][30]	0
Absolute Encoder Configuration	0x2006	[01][04][20][06][00][01][DA][0B]	[01][04][02]**[00][01]**[78][F0]	1
Main Power Fail Check Mode	0x2007	[01][04][20][07][00][01][8B][CB]	[01][04][02]**[00][00]**[B9][30]	0
Main Power Fail Check Time	0x2008	[01][04][20][08][00][01][BB][C8]	[01][04][02]**[00][14]**[B9][3F]	20
7SEG Display Selection	0x2009	[01][04][20][09][00][01][EA][08]	[01][04][02]**[00][00]**[B9][30]	0
Regeneration Brake Resistor Configuration	0x200A	[01][04][20][0A][00][01][1A][08]	[01][04][02]**[00][00]**[B9][30]	0
Regeneration Brake Resistor Derating Factor	0x200B	[01][04][20][0B][00][01][4B][C8]	[01][04][02]**[00][64]**[B8][DB]	100
Regeneration Brake Resistor Value	0x200C	[01][04][20][0C][00][01][FA][09]	[01][04][02]**[00][28]**[B9][2E]	40
Regeneration Brake Resistor Power	0x200D	[01][04][20][0D][00][01][AB][C9]	[01][04][02]**[00][50]**[B9][0C]	80
Peak Power of Regeneration Brake Resistor	0x200E	[01][04][20][0E][00][01][5B][C9]	[01][04][02]**[00][64]**[B8][DB]	100
Duration Time Peak Power of Regeneration Brake Resistor	0x200F	[01][04][20][0F][00][01][0A][09]	[01][04][02]**[13][88]**[B4][66]	5000
Overload Check Base	0x2010	[01][04][20][10][00][01][3B][CF]	[01][04][02]**[00][64]**[B8][DB]	100
Overload Warning Level	0x2011	[01][04][20][11][00][01][6A][0F]	[01][04][02]**[00][32]**[38][E5]	50
PWM Off Delay Time	0x2012	[01][04][20][12][00][01][9A][0F]	[01][04][02]**[00][0A]**[39][37]	10
Dynamic Brake Control Mode	0x2013	[01][04][20][13][00][01][CB][CF]	[01][04][02]**[00][00]**[B9][30]	0
Emergency Stop Configuration	0x2014	[01][04][20][14][00][01][7A][0E]	[01][04][02]**[00][01]**[78][F0]	1
Warning Mask Configuration	0x2015	[01][04][20][15][00][01][2B][CE]	[01][04][02]**[00][00]**[B9][30]	0
U Phase Current Offset	0x2016	[01][04][20][16][00][01][DB][CE]	[01][04][02]**[00][00]**[B9][30]	0
V Phase Current Offset	0x2017	[01][04][20][17][00][01][8A][0E]	[01][04][02]**[00][00]**[B9][30]	0
W Phase Current Offset	0x2018	[01][04][20][18][00][01][BA][0D]	[01][04][02]**[00][00**][B9][30]	0
Magnetic Pole Pitch	0x2019	[01][04][20][19][00][01][EB][CD]	[01][04][02]**[09][60]**[BF][48]	2400
Linear Scale Resolution	0x201A	[01][04][20][1A][00][01][1B][CD]	[01][04][02]**[03][E8]**[B9][8E]	1000
Commutation Method	0x201B	[01][04][20][1B][00][01][4A][0D]	[01][04][02]**[00][00]**[B9][30]	0
Commutation Current	0x201C	[01][04][20][1C][00][01][FB][CC]	[01][04][02]**[01][F4]**[B9][27]	500
Commutation Time	0x201D	[01][04][20][1D][00][01][AA][0C]	[01][04][02]**[03][E8]**[B9][8E]	1000
Grating Period of Sinusoidal Encoder	0x201E	[01][04][20][1E][00][01][5A][0C]	[01][04][02]**[00][28]**[B9][2E]	40
Homing Done Behaviour	0x201F	[01][04][20][1F][00][01][0B][CC]	[01][04][02]**[00][00]**[B9][30]	0
Velocity Function Select	0x2020	[01][04][20][20][00][01][3B][C0]	[01][04][02]**[00][00]**[B9][30]	0
Motor Hall Phase Config	0x2021	[01][04][20][21][00][01][6A][00]	[01][04][02]**[00][00]**[B9][30]	0

2) 2100 address area parameter read example

Parameter name	com. address	Sending	Receiving	Value
Inertia Ratio	0x2100	[01][04][21][00][00][01][3B][F6]	[01][04][02]**[00][64]**[B8][DB]	100
Position Loop Gain 1	0x2101	[01][04][21][01][00][01][6A][36]	[01][04][02]**[00][32]**[38][E5]	50
Speed Loop Gain 1	0x2102	[01][04][21][02][00][01][9A][36]	[01][04][02]**[00][4B]**[F9][07]	75
Speed Loop Integral Time Constant 1	0x2103	[01][04][21][03][00][01][CB][F6]	[01][04][02]**[00][32]**[38][E5]	50
Torque Command Filter Time Constant 1	0x2104	[01][04][21][04][00][01][7A][37]	[01][04][02]**[00][05]**[79][33]	5
Position Loop Gain 2	0x2105	[01][04][21][05][00][01][2B][F7]	[01][04][02]**[00][1E]**[39][38]	30
Speed Loop Gain 2	0x2106	[01][04][21][06][00][01][DB][F7]	[01][04][02]**[00][32]**[38][E5]	50
Speed Loop Integral Time Constant 2	0x2107	[01][04][21][07][00][01][8A][37]	[01][04][02]**[00][32]**[38][E5]	50
Torque Command Filter Time Constant 2	0x2108	[01][04][21][08][00][01][BA][34]	[01][04][02]**[00][05]**[79][33]	5
Position Command Filter Time Constant	0x2109	[01][04][21][09][00][01][EB][F4]	[01][04][02]**[00][00]**[B9][30]	0
Position Command Average Filter Time Constant	0x210A	[01][04][21][0A][00][01][1B][F4]	[01][04][02]**[00][00]**[B9][30]	0
Speed Feedback Filter Time Constant	0x210B	[01][04][21][0B][00][01][4A][34]	[01][04][02]**[00][05]**[79][33]	5
Velocity Feed-forward Gain	0x210C	[01][04][21][0C][00][01][FB][F5]	[01][04][02]**[00][00]**[B9][30]	0
Velocity Feed-forward Filter Time Constant	0x210D	[01][04][21][0D][00][01][AA][35]	[01][04][02]**[00][0A]**[39][37]	10
Torque Feed-forward Gain	0x210E	[01][04][21][0E][00][01][5A][35]	[01][04][02]**[00][00]**[B9][30]	0
Torque Feed-forward Filter Time Constant	0x210F	[01][04][21][0F][00][01][0B][F5]	[01][04][02]**[00][0A]**[39][37]	10
Torque Limit Function Select	0x2110	[01][04][21][10][00][01][3A][33]	[01][04][02]**[00][02]**[38][F1]	2
External Positive Torque Limit Value	0x2111	[01][04][21][11][00][01][6B][F3]	[01][04][02]**[0B][B8]**[BE][72]	3000
External Negative Torque Limit Value	0x2112	[01][04][21][12][00][01][9B][F3]	[01][04][02]**[0B][B8]**[BE][72]	3000
Emergency Stop Torque	0x2113	[01][04][21][13][00][01][CA][33]	[01][04][02]**[03][E8]**[B9][8E]	3000
P/PI Control Conversion Mode	0x2114	[01][04][21][14][00][01][7B][F2]	[01][04][02]**[00][00]**[B9][30]	0
P Control Switch Torque	0x2115	[01][04][21][15][00][01][2A][32]	[01][04][02]**[01][F4]**[B9][27]	500
P Control Switch Speed	0x2116	[01][04][21][16][00][01][DA][32]	[01][04][02]**[00][64]**[B8][DB]	100
P Control Switch Acceleration	0x2117	[01][04][21][17][00][01][8B][F2]	[01][04][02]**[03][E8]**[B9][8E]	1000
P Control Switch Following Error	0x2118	[01][04][21][18][00][01][BB][F1]	[01][04][02]**[00][64]**[B8][DB]	100
Gain Conversion Mode	0x2119	[01][04][21][19][00][01][EA][31]	[01][04][02]**[00][00]**[B9][30]	0
Gain Conversion Time 1	0x211A	[01][04][21][1A][00][01][1A][31]	[01][04][02]**[00][02]**[38][F1]	2
Gain Conversion Time 2	0x211B	[01][04][21][1B][00][01][4B][F1]	[01][04][02]**[00][02]**[38][F1]	2
Gain Conversion Waiting Time 1	0x211C	[01][04][21][1C][00][01][FA][30]	[01][04][02]**[00][00]**[B9][30]	0
Gain Conversion Waiting Time 2	0x211D	[01][04][21][1D][00][01][AB][F0]	[01][04][02]**[00][00]**[B9][30]	0
Dead Band for Position Control	0x211E	[01][04][21][1E][00][01][5B][F0]	[01][04][02]**[00][00]**[B9][30]	0
Drive Control Input 1	0x211F	[01][04][21][1F][00][01][0A][30]	[01][04][02]**[00][00]**[B9][30]	0
Drive Control Input 2	0x2120	[01][04][21][20][00][01][3A][3C]	[01][04][02]**[00][00]**[B9][30]	0
Drive Status Output 1	0x2121	[01][04][21][21][00][01][6B][FC]	[01][04][02]**[04][9D]**[7A][59]	1181
Drive Status Output 2	0x2122	[01][04][21][22][00][01][9B][FC]	[01][04][02]**[00][02]**[38][F1]	2

3) 2200 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Digital Input Signal 1 Selection	0x2200	[01][04][22][00][00][01][3B][B2]	[01][04][02]**[00][0F]**[F9][34]	15
Digital Input Signal 2 Selection	0x2201	[01][04][22][01][00][01][6A][72]	[01][04][02]**[00][01]**[78][F0]	1
Digital Input Signal 3 Selection	0x2202	[01][04][22][02][00][01][9A][72]	[01][04][02]**[00][02]**[38][F1]	2
Digital Input Signal 4 Selection	0x2203	[01][04][22][03][00][01][CB][B2]	[01][04][02]**[00][0C]**[B9][35]	12
Digital Input Signal 5 Selection	0x2204	[01][04][22][04][00][01][7A][73]	[01][04][02]**[00][10]**[B8][FC]	16
Digital Input Signal 6 Selection	0x2205	[01][04][22][05][00][01][2B][B3]	[01][04][02]**[00][04]**[B8][F3]	4
Digital Input Signal 7 Selection	0x2206	[01][04][22][06][00][01][DB][B3]	[01][04][02]**[00][12]**[39][3D]	18
Digital Input Signal 8 Selection	0x2207	[01][04][22][07][00][01][8A][73]	[01][04][02]**[00][0B]**[F8][F7]	11
Digital Input Signal 9 Selection	0x2208	[01][04][22][08][00][01][BA][70]	[01][04][02]**[00][03]**[F9][31]	3
Digital Input Signal 10 Selection	0x2209	[01][04][22][09][00][01][EB][B0]	[01][04][02]**[00][13]**[F8][FD]	19
Digital Input Signal 11 Selection	0x220A	[01][04][22][0A][00][01][1B][B0]	[01][04][02]**[00][14]**[B9][3F]	20
Digital Input Signal 12 Selection	0x220B	[01][04][22][0B][00][01][4A][70]	[01][04][02]**[00][15]**[78][FF]	21
Digital Input Signal 13 Selection	0x220C	[01][04][22][0C][00][01][FB][B1]	[01][04][02]**[00][16]**[38][FE]	22
Digital Input Signal 14 Selection	0x220D	[01][04][22][0D][00][01][AA][71]	[01][04][02]**[00][17]**[F9][3E]	23
Digital Input Signal 15 Selection	0x220E	[01][04][22][0E][00][01][5A][71]	[01][04][02]**[00][18]**[B9][3A]	24
Digital Input Signal 16 Selection	0x220F	[01][04][22][0F][00][01][0B][B1]	[01][04][02]**[00][19]**[78][FA]	25
Digital Output Signal 1 Selection	0x2210	[01][04][22][10][00][01][3A][77]	[01][04][02]**[80][02]**[59][31]	32770
Digital Output Signal 2 Selection	0x2211	[01][04][22][11][00][01][6B][B7]	[01][04][02]**[00][03]**[F9][31]	3
Digital Output Signal 3 Selection	0x2212	[01][04][22][12][00][01][9B][B7]	[01][04][02]**[80][01]**[19][30]	32769
Digital Output Signal 4 Selection	0x2213	[01][04][22][13][00][01][CA][77]	[01][04][02]**[00][05]**[79][33]	5
Digital Output Signal 5 Selection	0x2214	[01][04][22][14][00][01][7B][B6]	[01][04][02]**[00][10]**[B8][FC]	16
Digital Output Signal 6 Selection	0x2215	[01][04][22][15][00][01][2A][76]	[01][04][02]**[00][11]**[79][3C]	17
Digital Output Signal 7 Selection	0x2216	[01][04][22][16][00][01][DA][76]	[01][04][02]**[00][0A]**[39][37]	10
Digital Output Signal 8 Selection	0x2217	[01][04][22][17][00][01][8B][B6]	[01][04][02]**[00][06]**[39][32]	6
Analog Torque Input(command/limit) Scale	0x2218	[01][04][22][18][00][01][BB][B5]	[01][04][02]**[00][64]**[B8][DB]	100
Analog Torque Input(command/limit) Offset	0x2219	[01][04][22][19][00][01][EA][75]	[01][04][02]**[00][00]**[B9][30]	0
Analog Velociity Override Mode	0x221A	[01][04][22][1A][00][01][1A][75]	[01][04][02]**[00][00]**[B9][30]	0
Analog Velocity Input(command/override) Offset	0x221B	[01][04][22][1B][00][01][4B][B5]	[01][04][02]**[00][00]**[B9][30]	0
Analog Monitor Output Mode	0x221C	[01][04][22][1C][00][01][FA][74]	[01][04][02]**[00][00]**[B9][30]	0
Analog Monitor Channel 1 Select	0x221D	[01][04][22][1D][00][01][AB][B4]	[01][04][02]**[00][00]**[B9][30]	0
Analog Monitor Channel 2 Select	0x221E	[01][04][22][1E][00][02][1B][B5]	[01][04][04]**[00][01][00][01]**[6B][84]	1
Analog Monitor Channel 1 Offset	0x2220	[01][04][22][20][00][02][7A][79]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Analog Monitor Channel 2 Offset	0x2222	[01][04][22][22][00][02][DB][B9]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Analog Monitor Channel 1 Scale	0x2224	[01][04][22][24][00][02][3B][B8]	[01][04][04]**[01][F4][00][00]**[BB][8A]	500
Analog Monitor Channel 2 Scale	0x2226	[01][04][22][26][00][02][9A][78]	[01][04][04]**[01][F4][00][00]**[BB][8A]	500
Analog Velocity Command Filter Time Constant	0x2228	[01][04][22][28][00][01][BB][BA]	[01][04][02]**[00][02]**[38][F1]	2
Analog Torque Command Filter Time Constant	0x2229	[01][04][22][29][00][01][EA][7A]	[01][04][02]**[00][02]**[38][F1]	2
Analog Velocity Command Scale	0x222A	[01][04][22][2A][00][01][1A][7A]	[01][04][02]**[00][64]**[B8][DB]	100
Analog Velocity Command Clamp Level	0x222B	[01][04][22][2B][00][01][4B][BA]	[01][04][02]**[00][00]**[B9][30]	0

4) 2300~2500 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Jog Operation Speed	0x2300	[01][04][23][00][00][01][3A][4E]	[01][04][02]**[01][F4]**[B9][27]	500
Speed Command Acceleration Time	0x2301	[01][04][23][01][00][01][6B][8E]	[01][04][02]**[00][C8]**[B8][A6]	200
Speed Command Deceleration Time	0x2302	[01][04][23][02][00][01][9B][8E]	[01][04][02]**[00][C8]**[B8][A6]	200
Speed Command S-curve Time	0x2303	[01][04][23][03][00][01][CA][4E]	[01][04][02]**[00][00]**[B9][30]	0
Program Jog Operation Speed 1	0x2304	[01][04][23][04][00][01][7B][8F]	[01][04][02]**[00][00]**[B9][30]	0
Program Jog Operation Speed 2	0x2305	[01][04][23][05][00][01][2A][4F]	[01][04][02]**[01][F4]**[B9][27]	500
Program Jog Operation Speed 3	0x2306	[01][04][23][06][00][01][DA][4F]	[01][04][02]**[00][00]**[B9][30]	0
Program Jog Operation Speed 4	0x2307	[01][04][23][07][00][01][8B][8F]	[01][04][02]**[FE][0C]**[F9][55]	65036
Program Jog Operation Time 1	0x2308	[01][04][23][08][00][01][BB][8C]	[01][04][02]**[01][F4]**[B9][27]	500
Program Jog Operation Time 2	0x2309	[01][04][23][09][00][01][EA][4C]	[01][04][02]**[13][88]**[B4][66]	5000
Program Jog Operation Time 3	0x230A	[01][04][23][0A][00][01][1A][4C]	[01][04][02]**[01][F4]**[B9][27]	500
Program Jog Operation Time 4	0x230B	[01][04][23][0B][00][01][4B][8C]	[01][04][02]**[13][88]**[B4][66]	5000
Index Pulse Search Speed	0x230C	[01][04][23][0C][00][01][FA][4D]	[01][04][02]**[00][14]**[B9][3F]	20
Speed Limit Function Select	0x230D	[01][04][23][0D][00][01][AB][8D]	[01][04][02]**[00][00]**[B9][30]	0
Speed Limit Value at Torque Control Mode	0x230E	[01][04][23][0E][00][01][5B][8D]	[01][04][02]**[03][E8]**[B9][8E]	1000
Over Speed Dection Level	0x230F	[01][04][23][0F][00][01][0A][4D]	[01][04][02]**[17][70]**[B7][24]	6000
Excessive Speed Error Detection Level	0x2310	[01][04][23][10][00][01][3B][8B]	[01][04][02]**[13][88]**[B4][66]	5000
Servo-Lock Function Select	0x2311	[01][04][23][11][00][01][6A][4B]	[01][04][02]**[00][00]**[B9][30]	0
Multi-Step Operation Speed 1	0x2312	[01][04][23][12][00][01][9A][4B]	[01][04][02]**[00][00]**[B9][30]	0
Multi-Step Operation Speed 2	0x2313	[01][04][23][13][00][01][CB][8B]	[01][04][02]**[00][0A]**[39][37]	10
Multi-Step Operation Speed 3	0x2314	[01][04][23][14][00][01][7A][4A]	[01][04][02]**[00][32]**[38][E5]	50
Multi-Step Operation Speed 4	0x2315	[01][04][23][15][00][01][2B][8A]	[01][04][02]**[00][64]**[B8][DB]	100
Multi-Step Operation Speed 5	0x2316	[01][04][23][16][00][01][DB][8A]	[01][04][02]**[00][C8]**[B8][A6]	200
Multi-Step Operation Speed 6	0x2317	[01][04][23][17][00][01][8A][4A]	[01][04][02]**[01][F4]**[B9][27]	500
Multi-Step Operation Speed 7	0x2318	[01][04][23][18][00][01][BA][49]	[01][04][02]**[03][E8]**[B9][8E]	1000
Multi-Step Operation Speed 8	0x2319	[01][04][23][19][00][01][EB][89]	[01][04][02]**[05][DC]**[BB][F9]	1500
Velocity Command Switch Select	0x231A	[01][04][23][1A][00][01][1B][89]	[01][04][02]**[00][00]**[B9][30]	0
Software Position Limit Function Select	0x2400	[01][04][24][00][00][01][3B][3A]	[01][04][02]**[00][00]**[B9][30]	0
INPOS1 Output Range	0x2401	[01][04][24][01][00][01][6A][FA]	[01][04][02]**[00][64]**[B8][DB]	100
INPOS1 Output Time	0x2402	[01][04][24][02][00][01][9A][FA]	[01][04][02]**[00][00]**[B9][30]	0
INPOS2 Output Range	0x2403	[01][04][24][04][00][01][7A][FB]	[01][04][02]**[00][64]**[B8][DB	100
ZSPD Output Range	0x2404	[01][04][24][04][00][01][7A][FB]	[01][04][02]**[00][0A]**[39][37]	10
TGON Output Range	0x2405	[01][04][24][05][00][01][2B][3B]	[01][04][02]**[00][64]**[B8][DB]	100
INSPD Output Range	0x2406	[01][04][24][06][00][01][DB][3B]	[01][04][02]**[00][64]**[B8][DB]	100
BRAKE Output Speed	0x2407	[01][04][24][07][00][01][8A][FB]	[01][04][02]**[00][64]**[B8][DB]	100
BRAKE Output Delay Time	0x2408	[01][04][24][08][00][01][BA][F8]	[01][04][02]**[00][64]**[B8][DB]	100
Torque Limit at Homing Using Stopper	0x2409	[01][04][24][09][00][01][EB][38]	[01][04][02]**[00][FA]**[39][73]	250
Duration Time at Homing Using Stopper	0x240A	[01][04][24][0A][00][01][1B][38]	[01][04][02]**[00][32]**[38][E5]	50
Modulo Mode	0x240B	[01][04][24][0B][00][01][4A][F8]	[01][04][02]**[00][00]**[B9][30]	0
Modulo Factor	0x240C	[01][04][24][0C][00][02][BB][38]	[01][04][04]**[0E][10][00][00]**[F8][A9]	3600
User Drive Name	0x240E	[01][04][24][0E][00][01][5A][F9]	[01][04][02]**[72][44]**[9D][A3]	29252
Individual Parameter Save	0x2416	[01][04][24][16][00][01][DA][FE]	[01][04][02]**[00][00]**[B9][30]	0
Adaptive Filter Function Select	0x2500	[01][04][25][00][00][01][3A][C6]	[01][04][02]**[00][00]**[B9][30]	0
Notch Filter 1 Frequency	0x2501	[01][04][25][01][00][01][6B][06]	[01][04][02]**[13][88]**[B4][66]	5000
Notch Filter 1 Width	0x2502	[01][04][25][02][00][01][9B][06]	[01][04][02]**[00][01]**[78][F0]	1
Notch Filter 1 Depth	0x2503	[01][04][25][03][00][01][CA][C6]	[01][04][02]**[00][01]**[78][F0]	1
Notch Filter 2 Frequency	0x2504	[01][04][25][04][00][01][7B][07]	[01][04][02]**[13][88]**[B4][66]	5000
Notch Filter 2 Width	0x2505	[01][04][25][05][00][01][2A][C7]	[01][04][02]**[00][01]**[78][F0]	1
Notch Filter 2 Depth	0x2506	[01][04][25][06][00][01][DA][C7]	[01][04][02]**[00][01]**[78][F0]	1
Notch Filter 3 Frequency	0x2507	[01][04][25][07][00][01][8B][07]	[01][04][02]**[13][88]**[B4][66]	5000
Notch Filter 3 Width	0x2508	[01][04][25][08][00][01][BB][04]	[01][04][02]**[00][01]**[78][F0]	1
Notch Filter 3 Depth	0x2509	[01][04][25][09][00][01][EA][C4]	[01][04][02]**[00][01]**[78][F0]	1
Notch Filter 4 Frequency	0x250A	[01][04][25][0A][00][01][1A][C4]	[01][04][02]**[13][88]**[B4][66]	5000

5) 2500~2600 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Notch Filter 4 Width	0x250B	[01][04][25][0B][00][01][4B][04]	[01][04][02]**[00][01]**[78][F0]	1
Notch Filter 4 Depth	0x250C	[01][04][25][0C][00][01][FA][C5]	[01][04][02]**[00][01]**[78][F0]	1
On-line Gain Tuning Mode	0x250D	[01][04][25][0D][00][01][AB][05]	[01][04][02]**[00][00]**[B9][30]	0
System Rigidity for Gain Tuning	0x250E	[01][04][25][0E][00][01][5B][05]	[01][04][02]**[00][05]**[79][33]	5
On-line Gain Tuning Adaptation Speed	0x250F	[01][04][25][0F][00][01][0A][C5]	[01][04][02]**[00][01]**[78][F0]	1
Off-line Gain Tuning Direction	0x2510	[01][04][25][10][00][01][3B][03]	[01][04][02]**[00][00]**[B9][30]	0
Off-line Gain Tuning Distance	0x2511	[01][04][25][11][00][01][6A][C3]	[01][04][02]**[00][05]**[79][33]	5
Disturbance Observer Gain	0x2512	[01][04][25][12][00][01][9A][C3]	[01][04][02]**[00][00]**[B9][30]	0
Disturbance Observer Filter Time Constant	0x2513	[01][04][25][13][00][01][CB][03]	[01][04][02]**[00][0A]**[39][37]	10
Current Controller Gain	0x2514	[01][04][25][14][00][01][7A][C2]	[01][04][02]**[00][64]**[B8][DB]	100
Vibration Supression Filter Configuration	0x2515	[01][04][25][15][00][01][2B][02]	[01][04][02]**[00][00]**[B9][30]	0
Vibration Supression Filter 1 Frequency	0x2516	[01][04][25][16][00][01][DB][02]	[01][04][02]**[00][00]**[B9][30]	0
Vibration Supression Filter 1 Damping	0x2517	[01][04][25][17][00][01][8A][C2]	[01][04][02]**[00][00]**[B9][30]	0
Vibration Supression Filter 2 Frequency	0x2518	[01][04][25][18][00][01][BA][C1]	[01][04][02]**[00][00]**[B9][30]	0
Vibration Supression Filter 2 Damping	0x2519	[01][04][25][19][00][01][EB][01]	[01][04][02]**[00][00]**[B9][30]	0
Feedback Speed	0x2600	[01][04][26][00][00][01][3A][82]	[01][04][02]**[00][00]**[B9][30]	0
Command Speed	0x2601	[01][04][26][01][00][01][6B][42]	[01][04][02]**[00][00]**[B9][30]	0
Following Error	0x2602	[01][04][26][02][00][02][DB][43]	[01][04]**[04][00][00][00]**[00][FB][84]	0
Accumulated Operation Overload	0x2604	[01][04][26][04][00][01][7B][43]	[01][04][02]**[00][00]**[B9][30]	0
Instantaneous Maximum Operation Overload	0x2605	[01][04][26][05][00][01][2A][83]	[01][04][02]**[00][00]**[B9][30]	0
DC-Link Voltage	0x2606	[01][04][26][06][00][01][DA][83]	[01][04][02]**[01][39]**[78][B2]	313
Accumulated Regeneration Overload	0x2607	[01][04][26][07][00][01][8B][43]	[01][04][02]**[00][00]**[B9][30]	0
SingleTurn Data	0x2608	[01][04][26][08][00][02][FB][41]	[01][04][04]**[02][EE][00][00]**[9A][09]	749
Mechanical Angle	0x260A	[01][04][26][0A][00][01][1A][80]	[01][04][02]**[00][E1]**[79][78]	750
Electrical Angle	0x260B	[01][04][26][0B][00][01][4B][40]	[01][04][02]**[FC][7C]**[F9][D1]	0
MultiTurn Data	0x260C	[01][04][26][0C][00][02][BA][80]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Drive Temperature 1	0x260E	[01][04][26][0E][00][01][5B][41]	[01][04][02]**[00][27]**[F9][2A]	37
Drive Temperature 2	0x260F	[01][04][26][0F][00][01][0A][81]	[01][04][02]**[00][29]**[78][EE]	40
Encoder Temperature	0x2610	[01][04][26][10][00][01][3B][47]	[01][04][02]**[00][00]**[B9][30]	0
Motor Rated Speed	0x2611	[01][04][26][11][00][01][6A][87]	[01][04][02]**[0B][B8]**[BE][72]	3000
Motor Maximum Speed	0x2612	[01][04][26][12][00][01][9A][87]	[01][04][02]**[13][88]**[B4][66]	5000
Drive Rated Current	0x2613	[01][04][26][13][00][01][CB][47]	[01][04][02]**[00][43]**[F8][C1]	67
FPGA Version	0x2614	[01][04][26][14][00][03][FB][47]	[01][04][06]**[2E][30][32][31][00][00]**[79][AE]	0.12
Hall Signal Display	0x2617	[01][04][26][17][00][01][8A][86]	[01][04][02]**[00][04]**[B8][F3]	4
Bootloader Version	0x2618	[01][04][26][18][00][03][3B][44]	[01][04][06]**[2E][30][36][30][00][00]**[29][5E]	0.06
Warning Code	0x261B	[01][04][26][1B][00][01][4A][85]	[01][04][02]**[00][00]**[B9][30]	0
Analog Input 1 Value	0x261C	[01][04][26][1C][00][01][FB][44]	[01][04][02]**[FF][E6]**[79][4A]	65504
Analog Input 2 Value	0x261D	[01][04][26][1D][00][01][AA][84]	[01][04][02]**[FF][C0]**[F8][90]	65472
RMS Operation Overload	0x2623	[01][04][26][23][00][01][CB][48]	[01][04][02]**[00][00]**[B9][30]	0

6) 2700~2800 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Procedure Command Code	0x2700	[01][04][27][00][00][01][3B][7E]	[01][04][02]**[00][00]**[B9][30]	0
Procedure Command Argument	0x2701	[01][04][27][01][00][01][6A][BE]	[01][04][02]**[00][00]**[B9][30]	0
[Third Party Motor] Type	0x2800	[01][04][28][00][00][01][38][6A]	[01][04][02]**[00][00]**[B9][30]	0
[Third Party Motor] Number of Poles	0x2801	[01][04][28][01][00][01][69][AA]	[01][04][02]**[00][08]**[B8][F6]	8
[Third Party Motor] Rated Current	0x2802	[01][04][28][02][00][02][D9][AB]	[01][04][04]**[F5][C3][40][38]**[08][66]	2.89
[Third Party Motor] Maximum Current	0x2804	[01][04][28][04][00][02][39][AA]	[01][04][04]**[B8][52][41][0A]**[CE][A2]	8.67
[Third Party Motor] Rated Speed	0x2806	[01][04][28][06][00][01][D8][6B]	[01][04][02]**[0B][B8]**[BE][72]	3000
[Third Party Motor] Maximum Speed	0x2807	[01][04][28][07][00][01][89][AB]	[01][04][02]**[13][88]**[B4][66]	5000
[Third Party Motor] Inertia	0x2808	[01][04][28][08][00][02][F9][A9]	[01][04][04]**[5A][1D][3E][A4]**[68][81]	0.321
[Third Party Motor] Torque Constant	0x280A	[01][04][28][0A][00][02][58][69]	[01][04][04]**[85][1F][3E][EB]**[B3][61]	0.46
[Third Party Motor] Phase Resistance	0x280C	[01][04][28][0C][00][02][B8][68]	[01][04][04]**[EB][85][3F][51]**[0F][85]	0.82
[Third Party Motor] Phase Inductance	0x280E	[01][04][28][0E][00][02][19][A8]	[01][04][04]**[3D][71][40][6A]**[17][DC]	3.66
[Third Party Motor] TN Curve Data 1	0x2810	[01][04][28][10][00][01][39][AF]	[01][04][02]**[0B][B8]**[BE][72]	3000
[Third Party Motor] TN Curve Data 2	0x2812	[01][04][28][12][00][02][D8][6E]	[01][04][04]**[00][00][42][C8]**[CA][B2]	100
[Third Party Motor] Hall Offset	0x2814	[01][04][28][14][00][01][78][6E]	[01][04][02]**[00][00]**[B9][30]	0

7) 3000~3100 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Control Mode	0x3000	[01][04][30][00][00][01][3E][CA]	[01][04][02]**[00][00]**[B9][30]	0
Coordinate Select	0x3001	[01][04][30][01][00][01][6F][0A]	[01][04][02]**[00][00]**[B9][30]	0
Baud Rate Select	0x3002	[01][04][30][02][00][01][9F][0A]	[01][04][02]**[00][03]**[F9][31]	3
Pulse Input Logic Select	0x3003	[01][04][30][03][00][01][CE][CA]	[01][04][02]**[00][00]**[B9][30]	0
Pulse Input Filter Select	0x3004	[01][04][30][04][00][01][7F][0B]	[01][04][02]**[00][00]**[B9][30]	0
PCLEAR Mode Select	0x3005	[01][04][30][05][00][01][2E][CB]	[01][04][02]**[00][00]**[B9][30]	0
Encoder Ouptput Pulse	0x3006	[01][04][30][06][00][02][9E][CA]	[01][04][04]**[27][10][00][00]**[F0][F5]	10000
Encoder Output Mode	0x3008	[01][04][30][08][00][01][BF][08]	[01][04][02]**[00][00]**[B9][30]	0
Start Index Number(0~63)	0x3009	[01][04][30][09][00][01][EE][C8]	[01][04][02]**[00][40]**[B8][C0]	64
Index Buffer Mode	0x300A	[01][04][30][0A][00][01][1E][C8]	[01][04][02]**[00][01]**[78][F0]	1
I/O Configuration	0x300B	[01][04][30][0B][00][01][4F][08]	[01][04][02]**[00][00]**[B9][30]	0
Index0.IndexType	0x3101	[01][04][31][01][00][01][6E][F6]	[01][04][02]**[00][00]**[B9][30]	0
Index0.Distance	0x3102	[01][04][31][02][00][02][DE][F7]	[01][04][04]**[0D][40][00][03]**[B8][FD]	51200000
Index0.Velocity	0x3104	[01][04][31][04][00][02][3E][F6]	[01][04][04]**[55][55][00][01]**[3B][98]	87381
Index0.Acceleration	0x3106	[01][04][31][06][00][02][9F][36]	[01][04][04]**[00][00][01][90]**[FA][78]	26214400
Index0.Deceleration	0x3108	[01][04][31][08][00][02][FE][F5]	[01][04][04]**[00][00][01][90]**[FA][78]	26214400
Index0.RegDistance	0x310A	[01][04][31][0A][00][02][5F][35]	[01][04][04]**[86][A0][00][01]**[13][2E]	100000
Index0.RegVelocity	0x310C	[01][04][31][0C][00][02][BF][34]	[01][04][04]**[42][40][00][0F]**[AE][2C]	1000000
Index0.RepeatCount	0x310E	[01][04][31][0E][00][01][5E][F5]	[01][04][02]**[00][01]**[78][F0]	1
Index0.DwellTime	0x310F	[01][04][31][0F][00][01][0F][35]	[01][04][02]**[07][D0]**[BA][9C]	2000
Index0.Next Index	0x3110	[01][04][31][10][00][01][3E][F3]	[01][04][02]**[00][00]**[B9][30]	0
Index0.Action	0x3111	[01][04][31][11][00][01][6F][33]	[01][04][02]**[00][02]**[38][F1]	2

8) 6000 address area parameter read example

Parameter name	Com. address	Sending	Receiving	Value
Quick Stop Option Code	0x6003	[01][04][60][03][00][01][DF][CA]	[01][04][02]**[00][02]**[38][F1]	2
Shutdown Option Code	0x6004	[01][04][60][04][00][01][6E][0B]	[01][04][02]**[00][00]**[B9][30]	0
Disable Operation Option Code	0x6005	[01][04][60][05][00][01][3F][CB]	[01][04][02]**[00][01]**[78][F0]	1
Halt Option Code	0x6006	[01][04][60][06][00][01][CF][CB]	[01][04][02]**[00][00][**B9][30]	0
Fault Reaction Option Coed	0x6007	[01][04][60][07][00][01][9E][0B]	[01][04][02]**[00][00]**[B9][30]	0
Modes of Operation	0x6008	[01][04][60][08][00][01][AE][08]	[01][04][02]**[00][FF]**[F9][70]	255
Modes of Operation Display	0x6009	[01][04][60][09][00][01][FF][C8]	[01][04][02]**[00][FF]**[F9][70]	255
Position Demand Valude	0x600A	[01][04][60][0A][00][02][4F][C9]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Position Actual Internal Value	0x600C	[01][04][60][0C][00][02][AF][C8]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Position Actual Value	0x600E	[01][04][60][0E][00][02][0E][08]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Following Error Window	0x6010	[01][04][60][10][00][02][6E][0E]	[01][04][04]**[27][C0][00][09]**[31][0A]	600000
Following Error Timeout	0x6012	[01][04][60][12][00][01][8F][CF]	[01][04][02]**[00][00]**[B9][30]	0
Position Window	0x6013	[01][04][60][13][00][02][9E][0E]	[01][04][04]**[00][64][00][00]**[BA][5B]	100
Position Window Time	0x6015	[01][04][60][15][00][01][3E][0E]	[01][04][02]**[00][00]**[B9][30]	0
Velocity Demand Value	0x6016	[01][04][60][16][00][02][8E][0F]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Velocity Actual Value	0x6018	[01][04][60][18][00][02][EF][CC]	[01][04][04]**[00][01][00][00]**[AA][44]	1
Velocity Window	0x601A	[01][04][60][1A][00][01][0E][0D]	[01][04][02]**[4E][20]**[8D][48]	20000
Velocity Window Time	0x601B	[01][04][60][1B][00][01][5F][CD]	[01][04][02]**[00][00]**[B9][30]	0
Target Torque	0x601C	[01][04][60][1C][00][01][EE][0C]	[01][04][02]**[00][00]**[B9][30]	0
Maximum Torque	0x601D	[01][04][60][1D][00][01][BF][CC]	[01][04][02]**[0B][B8]**[BE][72]	3000
Torque Demand Value	0x601E	[01][04][60][1E][00][01][4F][CC]	[01][04][02]**[00][00]**[B9][30]	0
Motor Rated Torque	0x601F	[01][04][60][1F][00][02][5E][0D]	[01][04][04]**[01][52][00][00]**[5B][A9]	338
Torque Actual Value	0x6021	[01][04][60][21][00][01][7F][C0]	[01][04][02]**[00][00]**[B9][30]	0
Home Offset	0x6024	[01][04][60][24][00][02][2F][C0]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Software Position Limit (Min)	0x6028	[01][04][60][28][00][02][EF][C3]	[01][04][04]**[36][00][C4][65]**[66][E7]	-1000000000
Software Position Limit (Max)	0x602A	[01][04][60][2A][00][02][4E][03]	[01][04][04]**[CA][00][3B][9A]**[57][07]	1000000000
Quick Stop Deceleration	0x6034	[01][04][60][34][00][02][2E][05]	[01][04][04]**[0D][40][00][03]**[B8][FD]	200000
Gear Ratio (Motor revolutions)	0x603A	[01][04][60][3A][00][02][4F][C6]	[01][04][04]**[00][01][00][00]**[AA][44]	1
Gear Ratio (Shaft revolutions)	0x603C	[01][04][60][3C][00][02][AF][C7]	[01][04][04]**[00][01][00][00]**[AA][44]	1
Homing Method	0x603E	[01][04][60][3E][00][01][4E][06]	[01][04][02]**[00][22]**[39][29]	34
Homing Speed (switch)	0x6041	[01][04][60][41][00][02][3F][DF]	[01][04][04]**[A1][20][00][07]**[98][70]	128000000
Homing Speed (zero)	0x6043	[01][04][60][43][00][02][9E][1F]	[01][04][04]**[86][A0][00][01]**[13][2E]	100000
Homing Acceleration	0x6045	[01][04][60][49][00][02][BE][1D]	[01][04][04]**[00][00][00][00]**[FB][84]	200000
Velocity Offset	0x6049	[01][04][60][49][00][02][BE][1D]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Torque Offset	0x604B	[01][04][60][4B][00][01][5F][DC]	[01][04][02]**[00][00]**[B9][30]	0
Touch Probe Function	0x604C	[01][04][60][4C][00][01][EE][1D]	[01][04][02]**[00][33]**[F9][25]	51
Touch Probe Status	0x604D	[01][04][60][4D][00][01][BF][DD]	[01][04][02]**[00][01]**[78][F0]	1
Touch Prove 1 Positive Edge Position Value	0x604E	[01][04][60][4E][00][02][0F][DC]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Touch Prove 1 Negative Edge Position Value	0x6050	[01][04][60][50][00][02][6F][DA]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Touch Prove 2 Positive Edge Position Value	0x6052	[01][04][60][52][00][02][CE][1A]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Touch Prove 2 Negative Edge Position Value	0x6054	[01][04][60][54][00][02][2E][1B]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Positive Torque Limit Value	0x605C	[01][04][60][5C][00][01][EF][D8]	[01][04][02]**[0B][B8]**[BE][72]	3000
Negative Torque Limit Value	0x605D	[01][04][60][5D][00][01][BE][18]	[01][04][02]**[0B][B8]**[BE][72]	3000
Following Error Actual Value	0x605E	[01][04][60][5E][00][02][0E][19]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Position Demand Internal Value	0x6060	[01][04][60][60][00][02][6F][D5]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Digital Inputs	0x6062	[01][04][60][62][00][02][CE][15]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Digital Outputs (Physical)	0x6066	[01][04][60][66][00][02][8F][D4]	[01][04][04]**[00][00][2E][00]**[E6][24]	771751936
Digital Outputs (Bit mask)	0x6068	[01][04][60][68][00][02][EE][17]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Target Velocity	0x606A	[01][04][60][6A][00][02][4F][D7]	[01][04][04]**[00][00][00][00]**[FB][84]	0
Supported Drive Modes	0x606C	[01][04][60][6C][00][02][AF][D6]	[01][04][04]**[03][ED][00][00]**[6B][F5]	1005

(5) Write Single Coil (0x05)

Turns ON or OFF the value of a single bit input.

■ **Request**

Function code	1Byte	0x05
Output Address	2Byte	0x0000 to 0xFFFF
Output Value	2Bytes	0x0000 or 0xFF00

■ **Request OK**

Function code	1Byte	0x05
Output Address	2Byte	0x0000 to 0xFFFF
Output Value	2Byte	0x0000 or 0xFF00

■ **Response not OK**

Error code	1Byte	0x85
Exception code	1Byte	0x01 ~ 0x04

Command code Write Single Coil can control single bit input corresponding to drive status inputs 1 and 2. The addresses corresponding to drive status inputs 1 and 2 are as follows.

■ Drive status Input 1, 2 communication address

Communication address		Output address	Accessibility	Communication address		Output address	Accessibility
Decimal	Hexadecimal			Decimal	Hexadecimal		
0	0x0000	POT	RW	16	0x0010	START	RW
1	0x0001	NOT	RW	17	0x0011	PAUSE	RW
2	0x0002	HOME	RW	18	0x0012	REGT	RW
3	0x0003	STOP	RW	19	0x0013	HSTART	RW
4	0x0004	PCON	RW	20	0x0014	ISEL0	RW
5	0x0005	GAIN2	RW	21	0x0015	ISEL1	RW
6	0x0006	P_CL	RW	22	0x0016	ISEL2	RW
7	0x0007	N_CL	RW	23	0x0017	ISEL3	RW
8	0x0008	MODE	RW	24	0x0018	ISEL4	RW
9	0x0009	Reserved	RW	25	0x0019	ISEL5	RW
10	0x000A	EMG	RW	26	0x001A	ABSRQ	RW
11	0x000B	A_RST	RW	27	0x001B	JSTART	RW
12	0x000C	SV_ON	RW	28	0x001C	JDIR	RW
13	0x000D	SPD1/LVSF1	RW	29	0x001D	PCLEAR	RW
14	0x000E	SPD2/LVSF2	RW	30	0x001E	AOVR	RW
15	0x000F	SPD3	RW	31	0x001F	Reserved	RW

Example 1) ON writing POT Input contact status

■ **Request**

Node ID	Function	Output Address Hi	Output Address Lo	Output Value Hi.	Output Value Lo	CRC Hi	CRC Lo
0x01	0x05	0x00	0x00	0xFF	0x00	0X8C	0x3A

■ **Request OK**

Node ID	Function	Output Address Hi	Output Address Lo	Output Value Hi.	Output Value Lo	CRC Hi	CRC Lo
0x01	0x05	0x00	0x00	0xFF	0x00	0X8C	0x3A

■ **Response not OK**

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x85	0x01 ~ 0x04	-	-

Example 2) OFF writing POT Input contact status

■ **Request**

Node ID	Function	Output Address Hi	Output Address Lo	Output Value Hi.	Output Value Lo	CRC Hi	CRC Lo
0x01	0x05	0x00	0x00	0x00	0x00	0xCD	0xCA

■ **Request OK**

Node ID	Function	Output Address Hi	Output Address Lo	Output Value Hi.	Output Value Lo	CRC Hi	CRC Lo
0x01	0x05	0x00	0x00	0x00	0x00	0XCD	0xCA

■ Response not OK

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x85	0x01 ~ 0x04	-	-

1) Example of Digital I/O input/output status value protocol

Function	Contact status ON writing	Contact status OFF writing
POT	[01][05][00][00][FF][00][8C][3A]	[01][05][00][00][00][00][CD][CA]
NOT	[01][05][00][01][FF][00][DD][FA]	[01][05][00][01][00][00][9C][0A]
HOME	[01][05][00][02][FF][00][2D][FA]	[01][05][00][02][00][00][6C][0A]
STOP	[01][05][00][03][FF][00][7C][3A]	[01][05][00][03][00][00][3D][CA]
PCON	[01][05][00][04][FF][00][CD][FB]	[01][05][00][04][00][00][8C][0B]
GAIN2	[01][05][00][05][FF][00][9C][3B]	[01][05][00][05][00][00][DD][CB]
P_CL	[01][05][00][06][FF][00][6C][3B]	[01][05][00][06][00][00][2D][CB]
N_CL	[01][05][00][07][FF][00][3D][FB]	[01][05][00][07][00][00][7C][0B]
MODE	[01][05][00][08][FF][00][0D][F8]	[01][05][00][08][00][00][4C][08]
EMG	[01][05][00][0A][FF][00][AC][38]	[01][05][00][0A][00][00][ED][C8]
A_RST	[01][05][00][0B][FF][00][FD][F8]	[01][05][00][0B][00][00][BC][08]
SV_ON	[01][05][00][0C][FF][00][4C][39]	[01][05][00][0C][00][00][0D][C9]
SPD1/LVSF1	[01][05][00][0D][FF][00][1D][F9]	[01][05][00][0D][00][00][5C][09]
SPD2/LVSF2	[01][05][00][0E][FF][00][ED][F9]	[01][05][00][0E][00][00][AC][09]
SPD3	[01][05][00][0F][FF][00][BC][39]	[01][05][00][0F][00][00][FD][C9]
START	[01][05][00][10][FF][00][8D][FF]	[01][05][00][10][00][00][CC][0F]
PAUSE	[01][05][00][11][FF][00][DC][3F]	[01][05][00][11][00][00][9D][CF]
REGT	[01][05][00][12][FF][00][2C][3F]	[01][05][00][12][00][00][6D][CF]
HSTART	[01][05][00][13][FF][00][7D][FF]	[01][05][00][13][00][00][3C][0F]
ISEL0	[01][05][00][14][FF][00][CC][3E]	[01][05][00][14][00][00][8D][CE]
ISEL1	[01][05][00][15][FF][00][9D][FE]	[01][05][00][15][00][00][DC][0E]
ISEL2	[01][05][00][16][FF][00][6D][FE]	[01][05][00][16][00][00][2C][0E]
ISEL3	[01][05][00][17][FF][00][3C][3E]	[01][05][00][17][00][00][7D][CE]
ISEL4	[01][05][00][18][FF][00][0C][3D]	[01][05][00][18][00][00][4D][CD]
ISEL5	[01][05][00][19][FF][00][5D][FD]	[01][05][00][19][00][00][1C][0D]
ABSRQ	[01][05][00][1A][FF][00][AD][FD]	[01][05][00][1A][00][00][EC][0D]
JSTART	[01][05][00][1B][FF][00][FC][3D]	[01][05][00][1B][00][00][BD][CD]
JDIR	[01][05][00][1C][FF][00][4D][FC]	[01][05][00][1C][00][00][0C][0C]
PCLEAR	[01][05][00][1D][FF][00][1C][3C]	[01][05][00][1D][00][00][5D][CC]
AOVR	[01][05][00][1E][FF][00][EC][3C]	[01][05][00][1E][00][00][AD][CC]

(6) Write Single Register (0x06)

Writes a value to a single register (16 bit data).

■ **Request**

Function code	1Byte	0x06
Starting Address	2Bytes	0x0000 to 0xFFFF
Quantity of Registers	2Bytes	0x0000 to 0xFFFF

■ **Request OK**

Function code	1Byte	0x06
Starting Address	2Bytes	0x0000 to 0xFFFF
Quantity of Registers	2Bytes	0x0000 to 0xFFFF

■ **Response not OK**

Error code	1Byte	0x86
Exception code	1Byte	0x01 ~ 0x06

Example 1) In case of changing the value of inertia ratio (Address: 0x2100) to 200.

■ **Request**

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Register Hi.	Quantity of Register Lo	CRC Hi	CRC Lo
0x01	0x06	0x21	0x00	0x00	0xC8	0x82	0x60

■ **Request OK**

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Register Hi.	Quantity of Register Lo	CRC Hi	CRC Lo
0x01	0x06	0x21	0x00	0x00	0xC8	0x82	0x60

Change the value of inertia ratio (Address: 0x2100) to 200 (or 0x00C8). .

■ **Response not OK**

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x86	0x01 ~ 0x06	-	-

1) 2000 address area parameter read example

Parameter name	Com. address	Sending	Value
Motor ID	0x2000	[01][06][20][00]**[00][64]**[83][E1]	100
Encoder Type	0x2001	[01][06][20][01]**[00][00]**[12][0A]	0
Encoder Pulse per Revolution	0x2002	-	12000
Node ID	0x2004	[01][06][20][01]**[00][01]**[12][0A]	1
Rotation Direction Select	0x2005	[01][06][20][05]**[00][00]**[92][0B]	0
Absolute Encoder Configuration	0x2006	[01][06][20][06]**[00][01]**[A3][CB]	1
Main Power Fail Check Mode	0x2007	[01][06][20][07]**[00][00]**[33][CB]	0
Main Power Fail Check Time	0x2008	[01][06][20][08]**[00][14]**[03][C7]	20
7SEG Display Selection	0x2009	[01][06][20][09]**[00][00]**[52][08]	0
Regeneration Brake Resistor Configuration	0x200A	[01][06][20][0A]**[00][00]**[A2][08]	0
Regeneration Brake Resistor Derating Factor	0x200B	[01][06][20][0B]**[00][64]**[F2][23]	100
Regeneration Brake Resistor Value	0x200C	[01][06][20][0C]**[00][28]**[42][17]	40
Regeneration Brake Resistor Power	0x200D	[01][06][20][0D]**[00][50]**[13][F5]	80
Peak Power of Regeneration Brake Resistor	0x200E	[01][06][20][0E]**[00][64]**[EE][09]	100
Duration Time Peak Power of Regeneration Brake Resistor	0x200F	[01][06][20][0F]**[13][88]**[BF][5F]	5000
Overload Check Base	0x2010	[01][06][20][10]**[00][64]**[82][24]	100
Overload Warning Level	0x2011	[01][06][20][11]**[00][32]**[53][DA]	50
PWM Off Delay Time	0x2012	[01][06][20][12]**[00][0A]**[A2][08]	10
Dynamic Brake Control Mode	0x2013	[01][06][20][13]**[00][00]**[73][CF]	0
Emergency Stop Configuration	0x2014	[01][06][20][14]**[00][01]**[03][CE]	1
Warning Mask Configuration	0x2015	[01][06][20][15]**[00][00]**[93][CE]	0
U Phase Current Offset	0x2016	[01][06][20][16]**[00][00]**[63][CE]	0
V Phase Current Offset	0x2017	[01][06][20][17]**[00][00]**[32][0E]	0
W Phase Current Offset	0x2018	[01][06][20][18]**[00][00]**[02][0D]	0
Magnetic Pole Pitch	0x2019	[01][06][20][19]**[09][60]**[55][B5]	2400
Linear Scale Resolution	0x201A	[01][06][20][1A]**[03][E8]**[A3][73]	1000
Commutation Method	0x201B	[01][06][20][1B]**[00][00]**[F2][0D]	0
Commutation Current	0x201C	[01][06][20][1C]**[01][F4]**[43][DB]	500
Commutation Time	0x201D	[01][06][20][1D]**[03][E8]**[12][B2]	1000
Grating Period of Sinusoidal Encoder	0x201E	[01][06][20][1E]**[00][28]**[E2][12]	40
Homing Done Behaviour	0x201F	[01][06][20][1F]**[00][00]**[B3][CC]	0
Velocity Function Select	0x2020	[01][06][20][20]**[00][00]**[83][C0]	0
Motor Hall Phase Config	0x2021	[01][06][20][21]**[00][00]**[D2][00]	0

2) 2100 address area parameter read example

Parameter name	Com. address	Sending	Value
Inertia Ratio	0x2100	[01][06][21][00]**[00][64]**[82][1D]	100
Position Loop Gain 1	0x2101	[01][06][21][01]**[00][32]**[53][E3]	50
Speed Loop Gain 1	0x2102	[01][06][21][02]**[00][4B]**[62][01]	75
Speed Loop Integral Time Constant 1	0x2103	[01][06][21][03]**[00][32]**[F2][23]	50
Torque Command Filter Time Constant 1	0x2104	[01][06][21][04]**[00][05]**[02][34]	5
Position Loop Gain 2	0x2105	[01][06][21][05]**[00][1E]**[13][FF]	30
Speed Loop Gain 2	0x2106	[01][06][21][06]**[00][32]**[E2][22]	50
Speed Loop Integral Time Constant 2	0x2107	[01][06][21][07]**[00][32]**[B3][E2]	50
Torque Command Filter Time Constant 2	0x2108	[01][06][21][08]**[00][05]**[C2][37]	5
Position Command Filter Time Constant	0x2109	[01][06][21][09]**[00][00]**[53][F4]	0
Position Command Average Filter Time Constant	0x210A	[01][06][21][0A]**[00][00]**[A3][F4]	0
Speed Feedback Filter Time Constant	0x210B	[01][06][21][0B]**[00][05]**[32][37]	5
Velocity Feed-forward Gain	0x210C	[01][06][21][0C]**[00][00]**[43][F5]	0
Velocity Feed-forward Filter Time Constant	0x210D	[01][06][21][0D]**[00][0A]**[92][32]	10
Torque Feed-forward Gain	0x210E	[01][06][21][0E]**[00][00]**[E2][35]	0
Torque Feed-forward Filter Time Constant	0x210F	[01][06][21][0F]**[00][0A]**[33][F2]	10
Torque Limit Function Select	0x2110	[01][06][21][10]**[00][02]**[03][F2]	2
External Positive Torque Limit Value	0x2111	[01][06][21][11]**[0B][B8]**[D4][B1]	3000
External Negative Torque Limit Value	0x2112	[01][06][21][12]**[0B][B8]**[24][B1]	3000
Emergency Stop Torque	0x2113	[01][06][21][13]**[03][E8]**[72][8D]	3000
P/PI Control Conversion Mode	0x2114	[01][06][21][14]**[00][00]**[C3][F2]	0
P Control Switch Torque	0x2115	[01][06][21][15]**[01][F4]**[92][25]	500
P Control Switch Speed	0x2116	[01][06][21][16]**[00][64]**[63][D9]	100
P Control Switch Acceleration	0x2117	[01][06][21][17]**[03][E8]**[33][4C]	1000
P Control Switch Following Error	0x2118	[01][06][21][18]**[00][64]**[BB][F1]	100
Gain Conversion Mode	0x2119	[01][06][21][18]**[00][64]**[02][1A]	0
Gain Conversion Time 1	0x211A	[01][06][21][1A]**[00][02]**[23][F0]	2
Gain Conversion Time 2	0x211B	[01][06][21][1B]**[00][02]**[72][30]	2
Gain Conversion Waiting Time 1	0x211C	[01][06][21][1C]**[00][00]**[42][30]	0
Gain Conversion Waiting Time 2	0x211D	[01][06][21][1D]**[00][00]**[13][F0]	0
Dead Band for Position Control	0x211E	[01][06][21][1E]**[00][00]**[E3][F0]	0
Drive Control Input 1	0x211F	[01][06][21][1F]**[00][00]**[B2][30]	0
Drive Control Input 2	0x2120	[01][06][21][20]**[00][00]**[82][3C]	0
Drive Status Output 1	0x2121	-	-
Drive Status Output 2	0x2122	-	-

3) 2200 address area parameter read example

Parameter name	Com. address	Sending	Value
Digital Input Signal 1 Selection	0x2200	[01][06][22][00]**[00][0F]**[C3][B6]	15
Digital Input Signal 2 Selection	0x2201	[01][06][22][01]**[00][01]**[13][B2]	1
Digital Input Signal 3 Selection	0x2202	[01][06][22][02]**[00][02]**[A3][B3]	2
Digital Input Signal 4 Selection	0x2203	[01][06][22][03]**[00][0C]**[73][B7]	12
Digital Input Signal 5 Selection	0x2204	[01][06][22][04]**[00][10]**[C3][BF]	16
Digital Input Signal 6 Selection	0x2205	[01][06][22][05]**[00][04]**[92][70]	4
Digital Input Signal 7 Selection	0x2206	[01][06][22][06]**[00][12]**[E3][BE]	18
Digital Input Signal 8 Selection	0x2207	[01][06][22][07]**[00][0B]**[73][B4]	11
Digital Input Signal 9 Selection	0x2208	[01][06][22][08]**[00][03]**[42][71]	3
Digital Input Signal 10 Selection	0x2209	[01][06][22][09]**[00][13]**[12][7D]	19
Digital Input Signal 11 Selection	0x220A	[01][06][22][0A]**[00][14]**[A3][BF]	20
Digital Input Signal 12 Selection	0x220B	[01][06][22][0B]**[00][15]**[33][BF]	21
Digital Input Signal 13 Selection	0x220C	[01][06][22][0C]**[00][16]**[C2][7F]	22
Digital Input Signal 14 Selection	0x220D	[01][06][22][0D]**[00][17]**[52][7F]	23
Digital Input Signal 15 Selection	0x220E	[01][06][22][0E]**[00][18]**[E2][7B]	24
Digital Input Signal 16 Selection	0x220F	[01][06][22][0F]**[00][19]**[72][7B]	25
Digital Output Signal 1 Selection	0x2210	[01][06][22][10]**[00][02]**[03][B6]	32770
Digital Output Signal 2 Selection	0x2211	[01][06][22][11]**[00][03]**[93][B6]	3
Digital Output Signal 3 Selection	0x2212	[01][06][22][12]**[00][01]**[E2][77]	32769
Digital Output Signal 4 Selection	0x2213	[01][06][22][13]**[00][05]**[B2][74]	5
Digital Output Signal 5 Selection	0x2214	[01][06][22][14]**[00][10]**[C2][7A]	16
Digital Output Signal 6 Selection	0x2215	[01][06][22][15]**[00][11]**[52][7A]	17
Digital Output Signal 7 Selection	0x2216	[01][06][22][16]**[00][0A]**[E2][71]	10
Digital Output Signal 8 Selection	0x2217	[01][06][22][17]**[00][06]**[B3][B4]	6
Analog Torque Input(command/limit) Scale	0x2218	[01][06][22][18]**[00][64]**[02][5E]	100
Analog Torque Input(command/limit) Offset	0x2219	[01][06][22][19]**[00][00]**[52][75]	0
Analog Velociity Override Mode	0x221A	[01][06][22][1A]**[00][00]**[A2][75]	0
Analog Velocity Input(command/override) Offset	0x221B	[01][06][22][1B]**[00][00]**[F3][B5]	0
Analog Monitor Output Mode	0x221C	[01][06][22][1C]**[00][00]**[42][74]	0
Analog Monitor Channel 1 Select	0x221D	[01][06][22][1D]**[00][00]**[13][B4]	0
Analog Monitor Channel 2 Select	0x221E	-	-
Analog Monitor Channel 1 Offset	0x2220	-	-
Analog Monitor Channel 2 Offset	0x2222	-	-
Analog Monitor Channel 1 Scale	0x2224	-	-
Analog Monitor Channel 2 Scale	0x2226	-	-
Analog Velocity Command Filter Time Constant	0x2228	[01][06][22][28]**[00][02]**[82][7B]	2
Analog Torque Command Filter Time Constant	0x2229	[01][06][22][29]**[00][02]**[D3][BB]	2
Analog Velocity Command Scale	0x222A	[01][06][22][2A]**[00][64]**[A3][91]	100
Analog Velocity Command Clamp Level	0x222B	[01][06][22][2B]**[00][00]**[F3][BA]	0

4) 2300~2500 address area parameter read example

Parameter name	Com. address	Sending	Value
Jog Operation Speed	0x2300	[01][06][23][00]**[01][F4]**[82][59]	500
Speed Command Acceleration Time	0x2301	[01][06][23][01]**[00][C8]**[D2][18]	200
Speed Command Deceleration Time	0x2302	[01][06][23][02]**[00][C8]**[22][18]	200
Speed Command S-curve Time	0x2303	[01][06][23][03]**[00][00]**[72][4E]	0
Program Jog Operation Speed 1	0x2304	[01][06][23][04]**[00][00]**[C3][8F]	0
Program Jog Operation Speed 2	0x2305	[01][06][23][05]**[01][F4]**[92][58]	500
Program Jog Operation Speed 3	0x2306	[01][06][23][06]**[00][00]**[62][4F]	0
Program Jog Operation Speed 4	0x2307	[01][06][23][07]**[FE][0C]**[73][EA]	65036
Program Jog Operation Time 1	0x2308	[01][06][23][08]**[01][F4]**[03][9B]	500
Program Jog Operation Time 2	0x2309	[01][06][23][09]**[13][88]**[5F][1A]	5000
Program Jog Operation Time 3	0x230A	[01][06][23][0A]**[01][F4]**[A2][5B]	500
Program Jog Operation Time 4	0x230B	[01][06][23][0B]**[13][88]**[FE][DA]	5000
Index Pulse Search Speed	0x230C	[01][06][23][0C]**[00][14]**[42][42]	20
Speed Limit Function Select	0x230D	[01][06][23][0D]**[00][00]**[13][8D]	0
Speed Limit Value at Torque Control Mode	0x230E	[01][06][23][0E]**[03][E8]**[E3][33]	1000
Over Speed Dection Level	0x230F	[01][06][23][0F]**[17][70]**[BC][59]	6000
Excessive Speed Error Detection Level	0x2310	[01][06][23][10]**[13][88]**[8E][DD]	5000
Servo-Lock Function Select	0x2311	[01][06][23][11]**[00][00]**[D2][4B]	0
Multi-Step Operation Speed 1	0x2312	[01][06][23][12]**[00][00]**[22][4B]	0
Multi-Step Operation Speed 2	0x2313	[01][06][23][13]**[00][0A]**[F3][8C]	10
Multi-Step Operation Speed 3	0x2314	[01][06][23][14]**[00][32]**[43][9F]	50
Multi-Step Operation Speed 4	0x2315	[01][06][23][15]**[00][64]**[92][61]	100
Multi-Step Operation Speed 5	0x2316	[01][06][23][16]**[00][C8]**[62][1C]	200
Multi-Step Operation Speed 6	0x2317	[01][06][23][17]**[01][F4]**[32][5D]	500
Multi-Step Operation Speed 7	0x2318	[01][06][23][18]**[03][E8]**[02][F7]	1000
Multi-Step Operation Speed 8	0x2319	[01][06][23][19]**[05][DC]**[51][40]	1500
Velocity Command Switch Select	0x231A	[01][06][23][1A]**[00][00]**[A3][89]	0
Software Position Limit Function Select	0x2400	[01][06][24][00]**[00][00]**[83][3A]	0
INPOS1 Output Range	0x2401	[01][06][24][01]**[00][64]**[D3][11]	100
INPOS1 Output Time	0x2402	[01][06][24][02]**[00][00]**[9A][FA]	0
INPOS2 Output Range	0x2403	[01][06][24][04]**[00][64]**[C3][10]	100
ZSPD Output Range	0x2404	[01][06][24][04]**[00][0A]**[42][FC]	10
TGON Output Range	0x2405	[01][06][24][05]**[00][64]**[92][D0]	100
INSPD Output Range	0x2406	[01][06][24][06]**[00][64]**[62][D0]	100
BRAKE Output Speed	0x2407	[01][06][24][07]**[00][64]**[33][10]	100
BRAKE Output Delay Time	0x2408	[01][06][24][08]**[00][64]**[03][13]	100
Torque Limit at Homing Using Stopper	0x2409	[01][06][24][09]**[00][FA]**[D3][7B]	250
Duration Time at Homing Using Stopper	0x240A	[01][06][24][0A]**[00][32]**[22][ED]	50
Modulo Mode	0x240B	[01][06][24][0B]**[00][00]**[F2][F8]	0
Modulo Factor	0x240C	-	3600
User Drive Name	0x240E	[01][06][24][0E]**[72][44]**[C6][6A]	29252
Individual Parameter Save	0x2416	[01][06][24][16]**[00][00]**[62][FE]	0
Adaptive Filter Function Select	0x2500	[01][06][25][00]**[00][00]**[82][C6]	0
Notch Filter 1 Frequency	0x2501	[01][06][25][01]**[13][88]**[DE][50]	5000
Notch Filter 1 Width	0x2502	[01][06][25][02]**[00][01]**[E2][C6]	1
Notch Filter 1 Depth	0x2503	[01][06][25][03]**[00][01]**[B3][06]	1
Notch Filter 2 Frequency	0x2504	[01][06][25][04]**[13][88]**[CE][51]	5000
Notch Filter 2 Width	0x2505	[01][06][25][05]**[00][01]**[53][07]	1
Notch Filter 2 Depth	0x2506	[01][06][25][06]**[00][01]**[A3][07]	1
Notch Filter 3 Frequency	0x2507	[01][06][25][07]**[13][88]**[3E][51]	5000
Notch Filter 3 Width	0x2508	[01][06][25][08]**[00][01]**[C2][C4]	1
Notch Filter 3 Depth	0x2509	[01][06][25][09]**[00][01]**[93][04]	1
Notch Filter 4 Frequency	0x250A	[01][06][25][0A]**[13][88]**[AF][92]	5000

5) 2500~2600 address area parameter read example

Parameter name	Com. address	Sending	Value
Notch Filter 4 Width	0x250B	[01][06][25][0B]**[00][01]**[32][C4]	-
Notch Filter 4 Depth	0x250C	[01][06][25][0C]**[00][01]**[83][05]	-
On-line Gain Tuning Mode	0x250D	[01][06][25][0D]**[00][01]**[D2][C5]	-
System Rigidity for Gain Tuning	0x250E	[01][06][25][0E]**[00][05]**[23][06]	-
On-line Gain Tuning Adaptation Speed	0x250F	[01][06][25][0F]**[00][01]**[73][05]	-
Off-line Gain Tuning Direction	0x2510	[01][06][25][10]**[00][01]**[42][C3]	-
Off-line Gain Tuning Distance	0x2511	[01][06][25][11]**[00][05]**[12][C0]	-
Disturbance Observer Gain	0x2512	[01][06][25][12]**[00][01]**[E3][03]	-
Disturbance Observer Filter Time Constant	0x2513	[01][06][25][13]**[00][0A]**[F3][04]	-
Current Controller Gain	0x2514	[01][06][25][14]**[00][64]**[C3][29]	-
Vibration Supression Filter Configuration	0x2515	[01][06][25][15]**[00][00]**[93][02]	-
Vibration Supression Filter 1 Frequency	0x2516	[01][06][25][16]**[00][00]**[63][02]	-
Vibration Supression Filter 1 Damping	0x2517	[01][06][25][17]**[00][00]**[32][C2]	-
Vibration Supression Filter 2 Frequency	0x2518	[01][06][25][18]**[00][00]**[02][C1]	-
Vibration Supression Filter 2 Damping	0x2519	[01][06][25][19]**[00][00]**[53][01]	-
Feedback Speed	0x2600	[01][06][26][00]**[00][00]**[82][82]	-
Command Speed	0x2601	-	-
Following Error	0x2602	-	-
Accumulated Operation Overload	0x2604	-	-
Instantaneous Maximum Operation Overload	0x2605	-	-
DC-Link Voltage	0x2606	-	-
Accumulated Regeneration Overload	0x2607	-	-
SingleTurn Data	0x2608	-	-
Mechanical Angle	0x260A	-	-
Electrical Angle	0x260B	-	-
MultiTurn Data	0x260C	-	-
Drive Temperature 1	0x260E	-	-
Drive Temperature 2	0x260F	-	-
Encoder Temperature	0x2610	-	-
Motor Rated Speed	0x2611	-	-
Motor Maximum Speed	0x2612	-	-
Drive Rated Current	0x2613	-	-
FPGA Version	0x2614	-	-
Hall Signal Display	0x2617	-	-
Bootloader Version	0x2618	-	-
Warning Code	0x261B	-	-
Analog Input 1 Value	0x261C	-	-
Analog Input 2 Value	0x261D	-	-
RMS Operation Overload	0x2623	-	-

6) 2700~2800 address area parameter read example

Parameter name	Com. address	Sending	Value
Procedure Command Code	0x2700	[01][06][27][00][00][00][83][7E]	0
Procedure Command Argument	0x2701	[01][06][27][01][00][00][D2][BE]	0
[Third Party Motor] Type	0x2800	[01][06][28][00][00][00][80][6A]	0
[Third Party Motor] Number of Poles	0x2801	[01][06][28][01][00][08][D0][6C]	8
[Third Party Motor] Rated Current	0x2802	-	-
[Third Party Motor] Maximum Current	0x2804	-	-
[Third Party Motor] Rated Speed	0x2806	[01][06][28][06][0B][B8][67][29]	3000
[Third Party Motor] Maximum Speed	0x2807	[01][06][28][07][13][88][3C][FD]	5000
[Third Party Motor] Inertia	0x2808	-	-
[Third Party Motor] Torque Constant	0x280A	-	-
[Third Party Motor] Phase Resistance	0x280C	-	-
[Third Party Motor] Phase Inductance	0x280E	-	-
[Third Party Motor] TN Curve Data 1	0x2810	[01][06][28][10][0B][B8][86][ED]	3000
[Third Party Motor] TN Curve Data 2	0x2812	-	-
[Third Party Motor] Hall Offset	0x2814	[01][06][28][14][00][00][C0][6E]	0

7) 3000~3100 address area parameter read example

Parameter name	Com. address	Sending	Value
Control Mode	0x3000	[01][06][30][00][00][01][47][0A]	0
Coordinate Select	0x3001	[01][06][30][01][00][00][D7][0A]	0
Baud Rate Select	0x3002	[01][06][30][02][00][03][67][0B]	3
Pulse Input Logic Select	0x3003	[01][06][30][03][00][00][76][CA]	0
Pulse Input Filter Select	0x3004	[01][06][30][04][00][00][C7][0B]	0
PCLEAR Mode Select	0x3005	[01][06][30][05][00][00][96][CB]	0
Encoder Ouptput Pulse	0x3006	-	-
Encoder Output Mode	0x3008	[01][06][30][08][00][00][07][08]	0
Start Index Number(0~63)	0x3009	[01][06][30][09][00][40][57][38]	64
Index Buffer Mode	0x300A	[01][06][30][0A][00][01][67][08]	1
I/O Configuration	0x300B	[01][06][30][0B][00][00][F7][08]	0
Index0.IndexType	0x3101	[01][06][31][01][00][00][D6][F6]	0
Index0.Distance	0x3102	-	-
Index0.Velocity	0x3104	-	-
Index0.Acceleration	0x3106	-	-
Index0.Deceleration	0x3108	-	-
Index0.RegDistance	0x310A	-	-
Index0.RegVelocity	0x310C	-	-
Index0.RepeatCount	0x310E	[01][06][31][0E][00][01][27][35]	1
Index0.DwellTime	0x310F	[01][06][31][0F][07][D0][B4][99]	2000
Index0.Next Index	0x3110	[01][06][31][10][00][00][86][F3]	0
Index0.Action	0x3111	[01][06][31][11][00][02][56][F2]	2

8) 6000 address area parameter read example

Parameter name	Com. address	Sending	Value
Quick Stop Option Code	0x6003	[01][06][60][03][00][02][DF][CA]	2
Shutdown Option Code	0x6004	[01][06][60][04][00][00][6E][0B]	0
Disable Operation Option Code	0x6005	[01][06][60][05][00][01][3F][CB]	1
Halt Option Code	0x6006	[01][06][60][06][00][00][CF][CB]	0
Fault Reaction Option Coed	0x6007	[01][06][60][07][00][00][9E][0B]	0
Modes of Operation	0x6008	[01][06][60][08][00][FF][AE][08]	255
Modes of Operation Display	0x6009	[01][06][60][09][00][FF][FF][C8]	255
Position Demand Valude	0x600A	-	-
Position Actual Internal Value	0x600C	-	-
Position Actual Value	0x600E	-	-
Following Error Window	0x6010	-	-
Following Error Timeout	0x6012	[01][06][60][12][00][00][8F][CF]	0
Position Window	0x6013	-	-
Position Window Time	0x6015	[01][06][60][15][00][00][3E][0E]	0
Velocity Demand Value	0x6016	-	-
Velocity Actual Value	0x6018	-	-
Velocity Window	0x601A	[01][06][60][1A][4E][20][0E][0D]	20000
Velocity Window Time	0x601B	[01][06][60][1B][00][00][5F][CD]	0
Target Torque	0x601C	[01][06][60][1C][00][00][EE][0C]	0
Maximum Torque	0x601D	[01][06][60][1D][0B][B8][BF][CC]	3000
Torque Demand Value	0x601E	[01][06][60][1E][00][00][4F][CC]	0
Motor Rated Torque	0x601F	-	-
Torque Actual Value	0x6021	[01][06][60][21][00][00][7F][C0]	0
Home Offset	0x6024	-	-
Software Position Limit (Min)	0x6028	-	-
Software Position Limit (Max)	0x602A	-	-
Quick Stop Deceleration	0x6034	-	-
Gear Ratio (Motor revolutions)	0x603A	-	-
Gear Ratio (Shaft revolutions)	0x603C	-	-
Homing Method	0x603E	[01][06][60][3E][00][22][4E][06]	34
Homing Speed (switch)	0x6041	-	-
Homing Speed (zero)	0x6043	-	-
Homing Acceleration	0x6045	-	-
Velocity Offset	0x6049	-	-
Torque Offset	0x604B	[01][06][60][4B][00][00][5F][DC]	0
Touch Probe Function	0x604C	[01][06][60][4C][00][33][EE][1D]	51
Touch Probe Status	0x604D	[01][06][60][4D][00][01][BF][DD]	1
Touch Prove 1 Positive Edge Position Value	0x604E	-	-
Touch Prove 1 Negative Edge Position Value	0x6050	-	-
Touch Prove 2 Positive Edge Position Value	0x6052	-	-
Touch Prove 2 Negative Edge Position Value	0x6054	-	-
Positive Torque Limit Value	0x605C	[01][06][60][5C][0B][B8][EF][D8]	3000
Negative Torque Limit Value	0x605D	[01][06][60][5D][0B][B8][BE][18]	3000
Following Error Actual Value	0x605E	-	-
Position Demand Internal Value	0x6060	-	-
Digital Inputs	0x6062	-	-
Digital Outputs (Physical)	0x6066	-	-
Digital Outputs (Bit mask)	0x6068	-	-
Target Velocity	0x606A	-	-
Supported Drive Modes	0x606C	-	-

(7) Write Multiple Coils (0x0F)

Turns ON or OFF the value of a continuous bit input.

■ **Request**

Function code	1Byte	0x0F
Starting Address	2Byte	0x0000 to 0xFFFF
Quantity of Outputs	2Bytes	0x0000 or 0xFF00
Byte Count	1Bytes	N*
Outputs Value	N* x 1 Byte	

*N = Quantity of Outputs / 8

■ **Request OK**

Function code	1Byte	0x0F
Starting Address	2Byte	0x0000 to 0xFFFF
Quantity of Outputs	2Byte	0x0001 or 0x07B0

■ **Response not OK**

Error code	1Byte	0x8F
Exception code	1Byte	0x01 ~ 0x04

Command code Write Multiple Coil can control single bit input corresponding to drive status inputs 1 and 2. The addresses corresponding to drive status inputs 1 and 2 are as follows.

■ Drive status Input 1, 2 communication address

Communication address		Output address	Accessibility	Communication address		Output address	Accessibility
Decimal	Hexadecimal			Decimal	Hexadecimal		
0	0x0000	POT	RW	16	0x0010	START	RW
1	0x0001	NOT	RW	17	0x0011	PAUSE	RW
2	0x0002	HOME	RW	18	0x0012	REGT	RW
3	0x0003	STOP	RW	19	0x0013	HSTART	RW
4	0x0004	PCON	RW	20	0x0014	ISEL0	RW
5	0x0005	GAIN2	RW	21	0x0015	ISEL1	RW
6	0x0006	P_CL	RW	22	0x0016	ISEL2	RW
7	0x0007	N_CL	RW	23	0x0017	ISEL3	RW
8	0x0008	MODE	RW	24	0x0018	ISEL4	RW
9	0x0009	Reserved	RW	25	0x0019	ISEL5	RW
10	0x000A	EMG	RW	26	0x001A	ABSRQ	RW
11	0x000B	A_RST	RW	27	0x001B	JSTART	RW
12	0x000C	SV_ON	RW	28	0x001C	JDIR	RW
13	0x000D	SPD1/LVSF1	RW	29	0x001D	PCLEAR	RW
14	0x000E	SPD2/LVSF2	RW	30	0x001E	AOVR	RW
15	0x000F	SPD3	RW	31	0x001F	Reserved	RW

Example 1) writing POT, EMG Input contact status ON

■ Request

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Outputs Hi.	Quantity of Outputs Lo	Byte Count
0x01	0x0F	0x00	0x00	0x00	0x0B	0x02

Outputs Value Hi	Outputs Value Lo	CRC Hi	CRC Lo
0X01	0x04	0xE4	0x97

■ Request OK

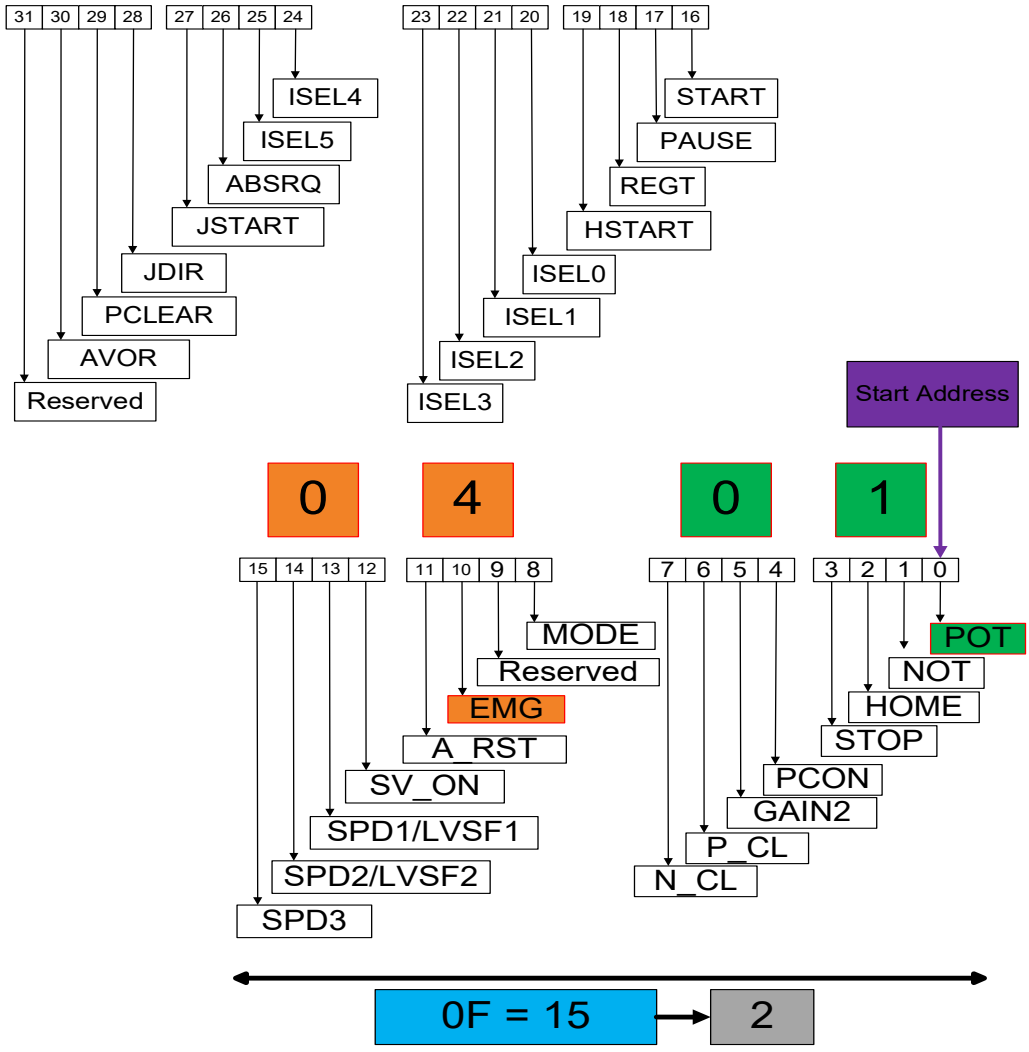
Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Outputs Hi.	Quantity of Outputs Lo	CRC Hi	CRC Lo
0x01	0x0F	0x00	0x00	0x00	0x0B	0X14	0x0C

■ Response not OK

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x8F	0x01 ~ 0x04	-	-

Turn ON the POT and EMG signal

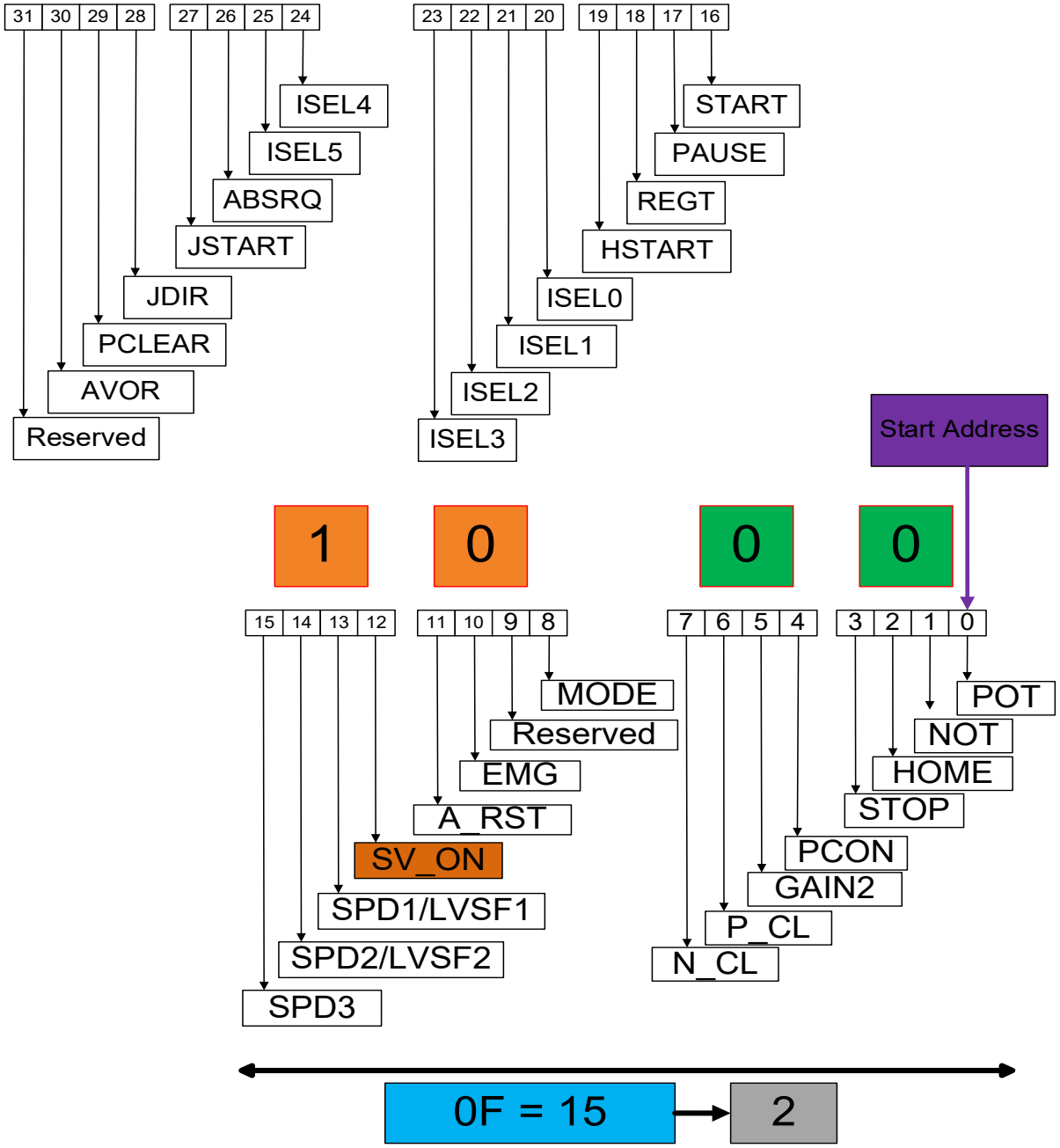
ID	Function	Start Address		Quantity of Outputs		Byte Count	Output Value		CRC	
01	0F	00	00	00	0F	02	01	04	E4	97



If you designate Quantity of Output as 15 with the start address starting from 0x00, input control is possible up to address 0x14. The upper and lower parts of the Output Value become SWAP, so be careful when entering them For example, if ’01 04’ is input, it becomes SWAP and becomes ’04 01’, 04 turns on EMG, the 10th bit, and ‘01’ turns on POT, the 0th bit.

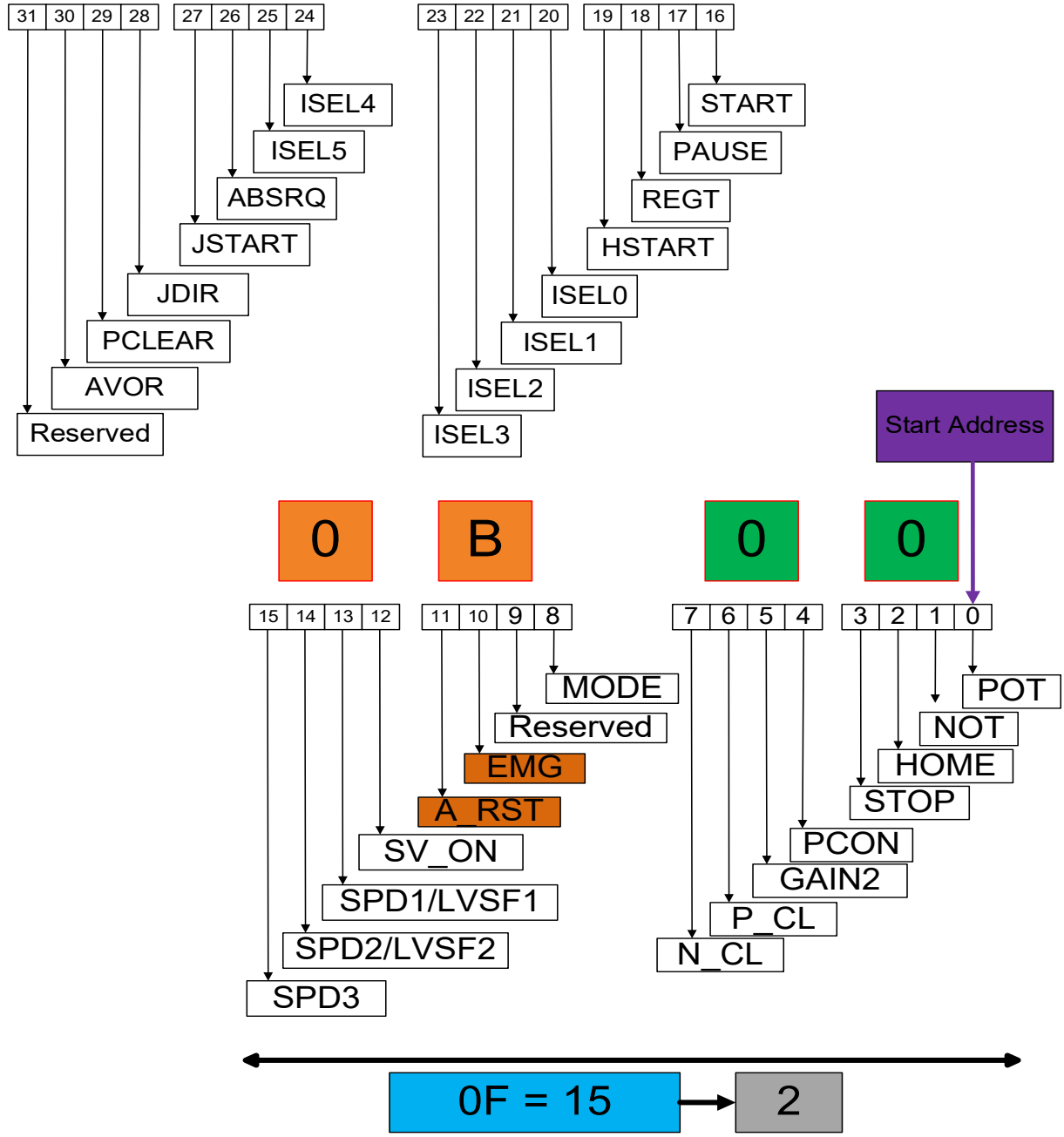
Turn ON the SV_ON signal

ID	Function	Start Address		Quantity of Outputs		Byte Count	Output Value		CRC	
01	0F	00	00	00	0F	02	00	10	E4	38



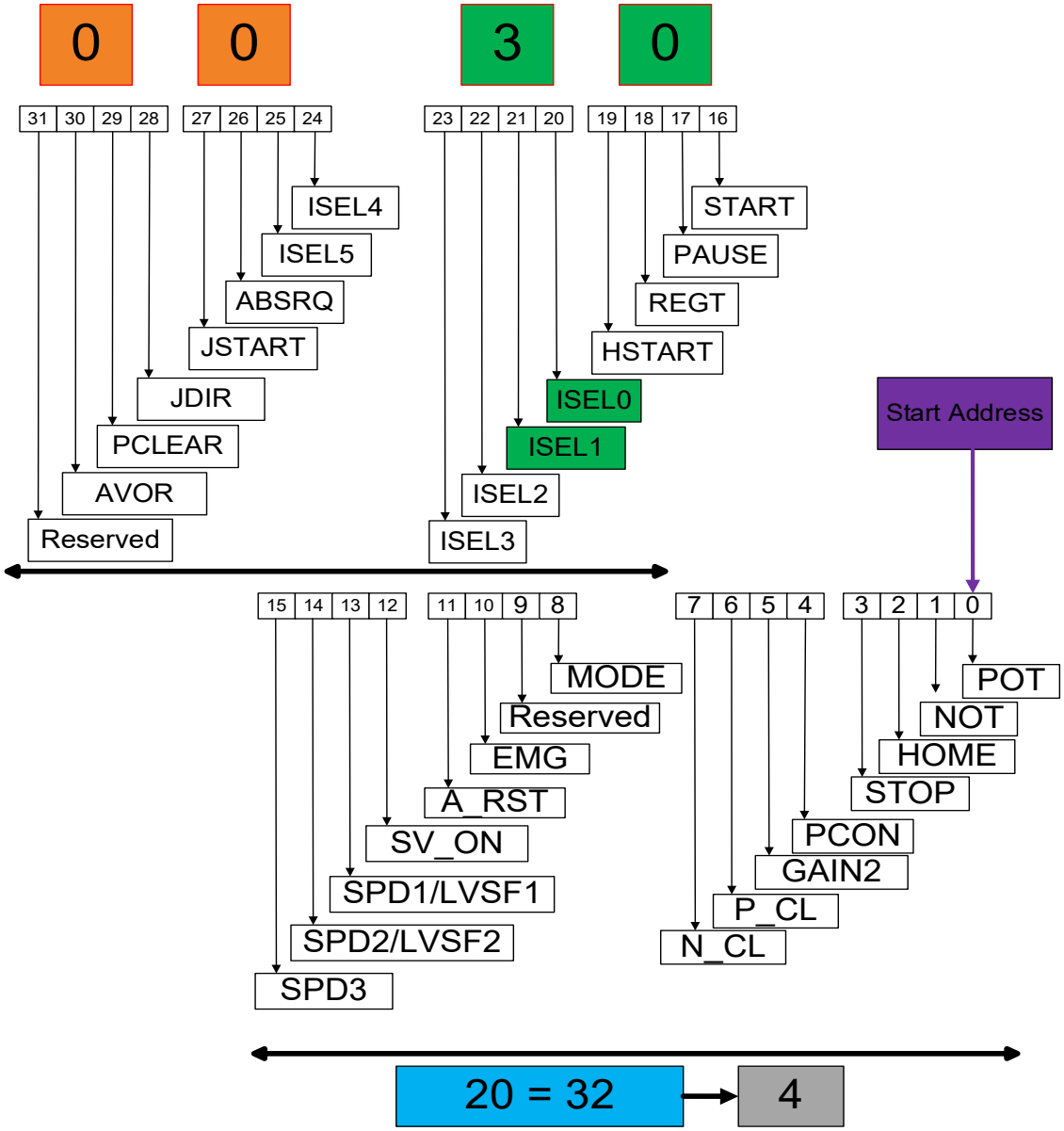
Turn ON the Alarm Reset and EMG signal

ID	Function	Start Address		Quantity of Outputs		Byte Count	Output Value		CRC	
01	0F	00	00	00	0F	02	00	0B	A4	33



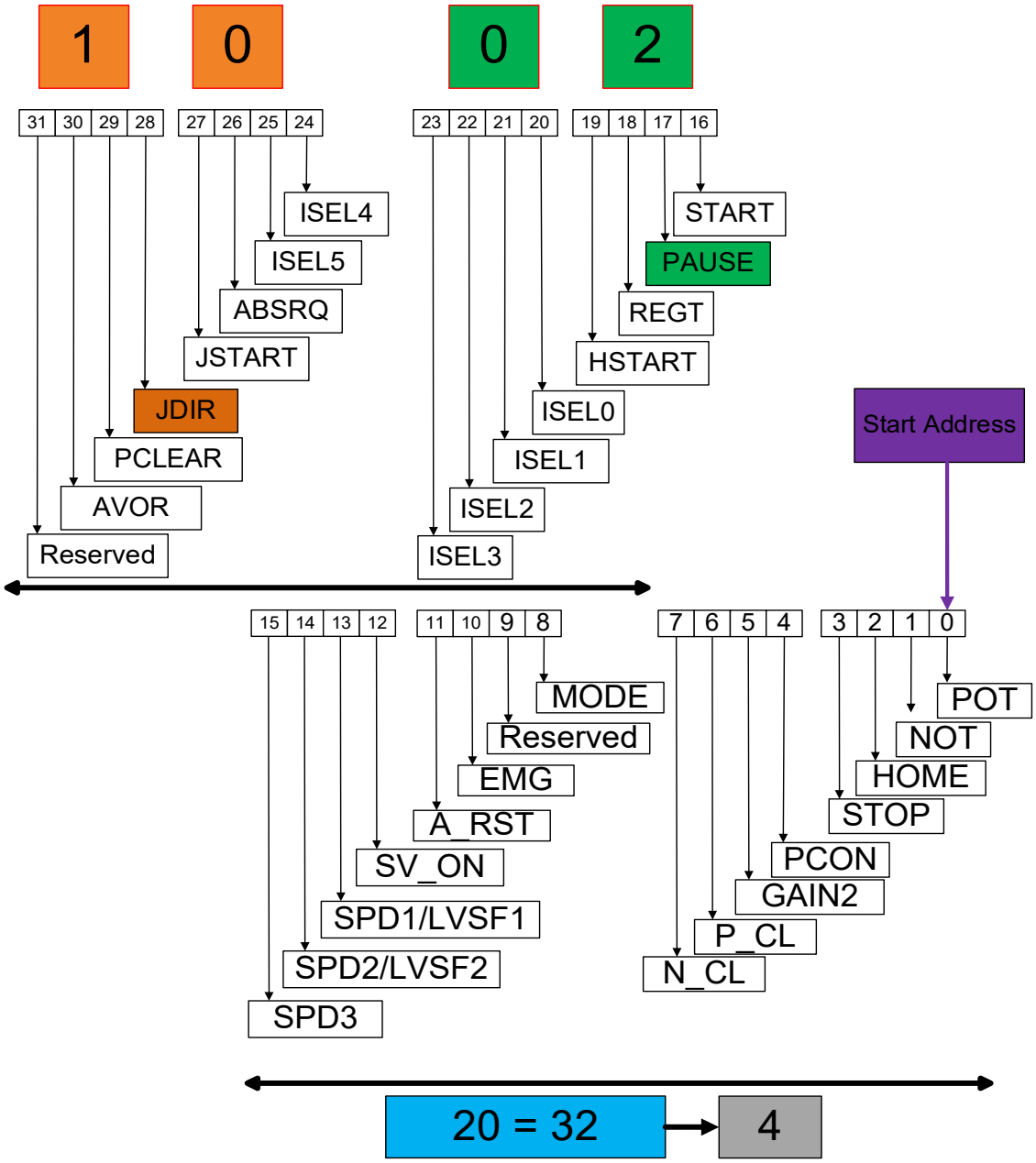
Turn ON the ISEL0 and ISEL1 signal

ID	Function	Start Address		Quantity of Outputs		Byte Count	Output Value				CRC	
01	0F	00	00	00	20	04	30	00	30	00	D0	88



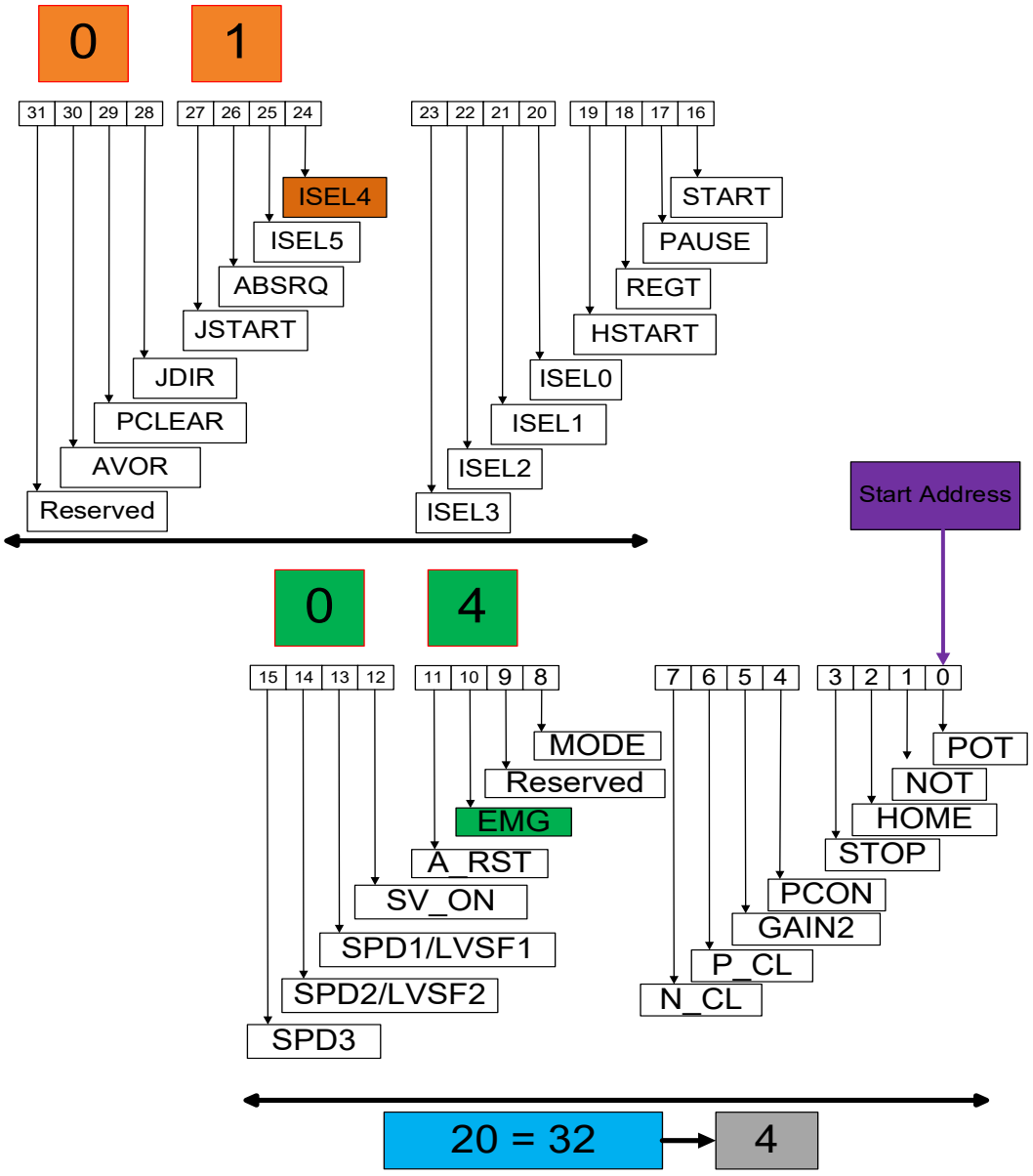
Turn ON the JDIR and PAUSE signal

ID	Function	Start Address		Quantity of Outputs		Byte Count	Output Value				CRC	
01	0F	00	00	00	20	04	00	00	02	10	C4	24



Turn ON the ISEL4 and EMG signal

ID	Function	Start Address		Quantity of Outputs		Byte Count	Output Value				CRC	
01	0F	00	00	00	20	04	00	04	00	01	44	89



(8) Write Multi Register (0x10)

Writes a value to a contiguous register block (16-bit data unit).

■ **Request**

Function code	1Byte	0x10
Starting Address	2Bytes	0x0000 to 0xFFFF
Quantity of Registers	2Bytes	0x0001 to 0x007B
Byte Count	1Byte	2 x N*
Registers Value	N* x 2 Bytes	value

*N = Quantity of Registers

■ **Request OK**

Function code	1Byte	0x10
Starting Address	2Byte	0x0000 to 0xFFFF
Quantity of Registers	2Byte	1 to 123 (0x7B)

■ **Response not OK**

Error code	1Byte	0x90
Exception code	1Byte	0x01 ~ 0x06

Example 1) When writing values to multiple parameters of jog speed (Address: 0x2300), speed command acceleration time (Address: 0x2301), and speed command deceleration time (Address: 0x2302) . . .

■ **Request**

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Register Hi.	Quantity of Register Lo	Byte Count
0x01	0x10	0x23	0x00	0x00	0x03	0x06

Registers Value Hi	Registers Value Lo	Registers Value Hi	Registers Value Lo	Registers Value Hi	Registers Value Lo	CRC Hi	CRC Lo
0xF4	0x48	0x00	0x64	0x00	0x64	0XF7	0x4A

The value of jog speed (Address: 0x2300) is changed to -3000 (or 0xF448), and the values of speed command acceleration time (Address: 0x2301) and speed command deceleration time (Address: 0x2302) are changed to 100 (or 0x0064). . . .

■ **Request OK**

Node ID	Function	Starting Address Hi	Starting Address Lo	Quantity of Register Hi.	Quantity of Register Lo	CRC Hi	CRC Lo
0x01	0x10	0x23	0x00	0x00	0x03	0X8B	0X8C

■ Response not OK

Node ID	Error Code	Exception Code	CRC Hi	CRC Lo
0x01	0x90	0x01 ~ 0x06	-	-

Protocol example

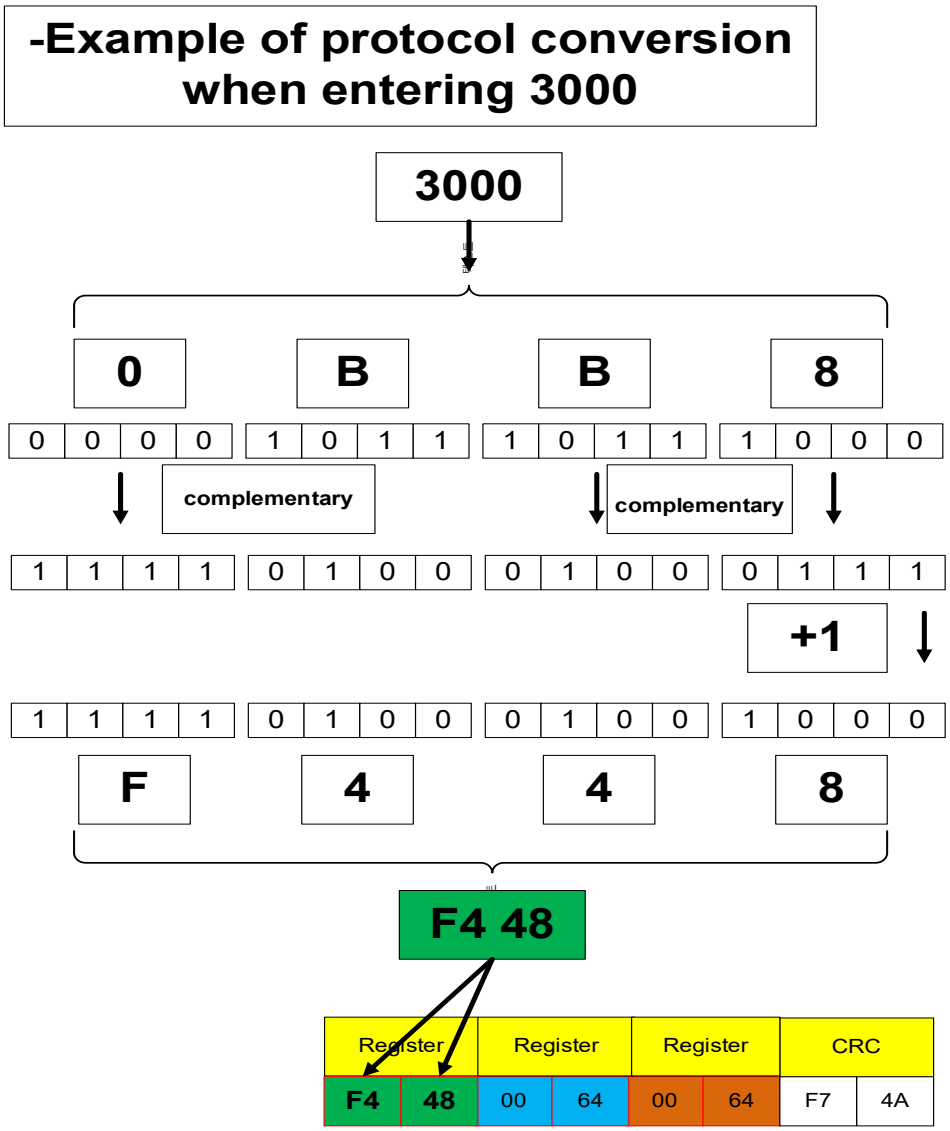
Jog Operation Speed[0x2300] : -3000
Speed Command Acceleration Time[0x2301] : 100
Speed Command Deceleration Time[0x2302] : 100

ID	Function	Start Address		Quantity of Register		Byte Count
01	10	23	00	00	03	06

Parameter name	Com. address	Value	Register number
Jog Operation Speed	0x2300	-3000	1
Speed Command Acceleration Time	0x2301	100	1
Speed Command Deceleration Time	0x2302	100	1

Register		Register		Register		CRC	
F4	48	00	64	00	64	F7	4A

- When entering 3000, ‘F4 48’ was entered in Register, and the conversion process is shown in the following example. Please note.



- When entering 3000, first change 3000 to hexadecimal. Take the complement and add 1 to the 0th bit.

If you take the complement, it becomes F4 48, and if you enter it in the Register, -3000 is entered. When using the Read method, you can check the value by following the reverse order.

Protocol example

Position Loop Gain 1[0x2101] : 25
Speed Loop Gain 1[0x2102] : 65
Speed Loop Integral Time Constant 1[0x2103] : 150

ID	Function	Start Address		Quantity of Register		Byte Count
01	10	21	01	00	03	06

Parameter name	Com. address	Value	Register number
Position Loop Gain 1	0x2101	25	1
Speed Loop Gain 1	0x2102	65	1
Speed Loop Integral Time Constant 1	0x2103	150	1

Register		Register		Register		CRC	
00	19	00	41	00	96	D5	C1

Protocol example

Index0.IndexType[0x3101] : 0
Index0.Distance[0x3102] : 51200000
Index0.Velocity[0x3104] : 87381

ID	Function	Start Address		Quantity of Register		Byte Count
01	10	31	01	00	05	0A

Parameter name	Com. address	Value	Register number
Index0.IndexType	0x3101	0	1
Index0.Distance	0x3102	51200000	2
Index0.Velocity	0x3104	87381	2

Register		Register				Register				CRC	
00	00	40	00	03	0D	55	55	00	01	19	F3

Each parameter also has a different number of registers. When setting the value of Quantity Of Register, check the variable format of the communication address table, check the number of registers as 1 for 16[bit] and 2 for 32[Bit], and enter the sum of all of them. Byte Count is entered as twice the Quantity of register.

16.3 L7P Indexer Servo Drive Communication Address Table

16.3.1 General Objects

Communication address		Parameter name	Parameter number	Variable type	Initial value	Minimum value	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
4096	0x1000	Device Type	0x1000	UDINT	0x00020192	-	-	-	RO
4098	0x1002	Error Register	0x1001	USINT	0x00	-	-	-	RO
-	-	-	-	-	-	-	-	-	-
4100	0x1004	Device Name	0x1008	STRING	-	-	-		RO
4106	0x100A	Hardware Version	0x1009	STRING	-	-	-	-	RO
4109	0x100D	Software Version	0x100A	STRING	-	-	-	-	RO
4112	0x1010	Note1) Store Parameters	0x1010:1	UDINT	0	0	0xFFFFFFFF	-	RW
4114	0x1012	Note1)Store Parameters	0x1010:2	UDINT	0	0	0xFFFFFFFF	-	RW
4116	0x1014	Note1) Store Parameters	0x1010:3	UDINT	0	0	0xFFFFFFFF	-	RW
4118	0x1016	Note1) Store Parameters	0x1010:4	UDINT	0	0	0xFFFFFFFF	-	RW
4120	0x1018	Note1) Store Parameters	0x1010:5	UDINT	0	0	0xFFFFFFFF	-	RW
4122	0x101A	Restore Default Parameters	0x1011:1	UDINT	0	0	0xFFFFFFFF	-	RW
4124	0x101C	Restore Default Parameters	0x1011:2	UDINT	0	0	0xFFFFFFFF	-	RW
4126	0x101E	Restore Default Parameters	0x1011:3	UDINT	0	0	0xFFFFFFFF	-	RW
4128	0x1020	Restore Default Parameters	0x1011:4	UDINT	0	0	0xFFFFFFFF	-	RW
4130	0x1022	Restore Default Parameters	0x1011:5	UDINT	0	0	0xFFFFFFFF	-	RW
4132	0x1024	Identity Object	0x1018:1	UDINT	-	-	-	-	RO
4134	0x1026	Identity Object	0x1018:2	UDINT	-	-	-	-	RO
4136	0x1028	Identity Object	0x1018:3	UDINT	-	-	-	-	RO
4138	0x102A	Identity Object	0x1018:4	UDINT	-	-	-	-	RO

Note1) Please note that the communication address has changed from OS 3.02 Ver.

Parameter No	Communication address OS 3.00 or less		Communication address OS 3.02 or higer	
	Decimal	Hexadecimal	Decimal	Hexadecimal
0x1010:1	4112	0x1010	4112	0x1010
0x1010:2	4113	0x1011	4114	0x1012
0x1010:3	4114	0x1012	4116	0x1014
0x1010:4	4115	0x1013	4118	0x1016
0x1010:5	4116	0x1014	4120	0x1018

16.3.2 System Configuration Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
8192	0x2000	Motor ID	0x2000	UINT	13	1	9999	-	RW
8193	0x2001	Encoder Type	0x2001	UINT	1	0	99	-	RW
8194	0x2002	Encoder Pulse per Revolution	0x2002	UDINT	524288	0	1073741824	pulse	RW
8196	0x2004	Node ID	0x2003	UINT	-	0	65535		RO
8197	0x2005	Rotation Direction Select	0x2004	UINT	0	0	1	-	RW
8198	0x2006	Absolute Encoder Configuration	0x2005	UINT	1	0	1	-	RW
8199	0x2007	Main Power Fail Check Mode	0x2006	UINT	0	0	255	-	RW
8200	0x2008	Main Power Fail Check Time	0x2007	UINT	20	0	5000	ms	RW
8201	0x2009	7SEG Display Selection	0x2008	UINT	0	0	100	-	RW
8202	0x200A	Regeneration Brake Resistor Configuration	0x2009	UINT	0	0	1	-	RW
8203	0x200B	Regeneration Brake Resistor Derating Factor	0x200A	UINT	100	0	200	%	RW
8204	0x200C	Regeneration Brake Resistor Value	0x200B	UINT	0	0	1000	ohm	RW
8205	0x200D	Regeneration Brake Resistor Power	0x200C	UINT	0	0	30000	Watt	RW
8206	0x200E	Peak Power of Regeneration Brake Resistor	0x200D	UINT	100	1	50000	Watt	RW
8207	0x200F	Duration Time @ Peak Power of Regeneration Brake Resistor	0x200E	UINT	5000	1	50000	ms	RW
8208	0x2010	Overload Check Base	0x200F	UINT	100	10	120	%	RW

8209	0x2011	Overload Warning Level	0x2010	UINT	50	10	100	%	RW
8210	0x2012	PWM Off Delay Time	0x2011	UINT	10	0	1000	ms	RW
8211	0x2013	Dynamic Brake Control Mode	0x2012	UINT	0	0	3	-	RW
8212	0x2014	Emergency Stop Configuration	0x2013	UINT	1	0	1	-	RW
8213	0x2015	Warning Mask Configuration	0x2014	UINT	0	0	0xFFFF	-	RW
8214	0x2016	U Phase Current Offset	0x2015	INT	0	-1000	1000	0.10%	RW
8215	0x2017	V Phase Current Offset	0x2016	INT	0	-1000	1000	0.10%	RW
8216	0x2018	W Phase Current Offset	0x2017	INT	0	-1000	1000	0.10%	RW
8217	0x2019	Magnetic Pole Pitch	0x2018	UINT	2400	1	65535	0.01mm	RW
8218	0x201A	Linear Scale Resolution	0x2019	UINT	1000	1	65535	nm	RW
8219	0x201B	Commutation Method	0x201A	UINT	0	0	2	-	RW
8220	0x201C	Commutation Current	0x201B	UINT	500	0	1000	0.10%	RW
8221	0x201D	Commutation Time	0x201C	UINT	1000	500	5000	ms	RW
8222	0x201E	Grating Period of Sinusoidal Encoder	0x201D	UINT	40	1	65535	Um	RW
8223	0x201F	Homing Done Behavior	0x201E	UINT	0	0	1	-	RW
8224	0x2020	Velocity Function Select	0x201F	UINT	0	0	2	-	RW
8225	0x2021	Motor Hall Phase Config	0x2020	UINT	0	0	65535	-	RW

16.3.3 Control Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
8448	0x2100	Inertia Ratio	0x2100	UINT	100	0	3000	%	RW
8449	0x2101	Position Loop Gain 1	0x2101	UINT	50	1	500	1/s	RW
8450	0x2102	Speed Loop Gain 1	0x2102	UINT	75	1	2000	Hz	RW
8451	0x2103	Speed Loop Integral Time Constant 1	0x2103	UINT	50	1	1000	ms	RW
8452	0x2104	Torque Command Filter Time Constant 1	0x2104	UINT	5	0	1000	0.1ms	RW
8453	0x2105	Position Loop Gain 2	0x2105	UINT	30	1	500	1/s	RW
8454	0x2106	Speed Loop Gain 2	0x2106	UINT	50	1	2000	Hz	RW
8455	0x2107	Speed Loop Integral Time Constant 2	0x2107	UINT	50	1	1000	ms	RW
8456	0x2108	Torque Command Filter Time Constant 2	0x2108	UINT	5	0	1000	0.1ms	RW
8457	0x2109	Position Command Filter Time Constant	0x2109	UINT	0	0	10000	0.1ms	RW
8458	0x210A	Position Command Average Filter Time Constant	0x210A	UINT	0	0	10000	0.1ms	RW
8459	0x210B	Speed Feedback Filter Time Constant	0x210B	UINT	5	0	10000	0.1ms	RW
8460	0x210C	Velocity Feed-forward Gain	0x210C	UINT	0	0	100	%	RW
8461	0x210D	Velocity Feed-forward Filter Time Constant	0x210D	UINT	10	0	1000	0.1ms	RW
8462	0x210E	Torque Feed-forward Gain	0x210E	UINT	0	0	100	%	RW
8463	0x210F	Torque Feed-forward Filter Time Constant	0x210F	UINT	10	0	1000	0.1ms	RW
8464	0x2110	Torque Limit Function Select	0x2110	UINT	2	0	4	-	RW
8465	0x2111	External Positive Torque Limit Value	0x2111	UINT	3000	0	5000	0.1%	RW
8466	0x2112	External Negative Torque Limit Value	0x2112	UINT	3000	0	5000	0.1%	RW
8467	0x2113	Emergency Stop Torque	0x2113	UINT	1000	0	5000	0.1%	RW
8468	0x2114	P/PI Control Conversion Mode	0x2114	UINT	0	0	4	-	RW
8469	0x2115	P Control Switch Torque	0x2115	UINT	500	0	5000	0.1%	RW
8470	0x2116	P Control Switch Speed	0x2116	UINT	100	0	6000	rpm	RW
8471	0x2117	P Control Switch Acceleration	0x2117	UINT	1000	0	60000	rpm/s	RW
8472	0x2118	P Control Switch Following Error	0x2118	UINT	100	0	60000	pulse	RW
8473	0x2119	Gain Conversion Mode	0x2119	UINT	0	0	7	-	RW

8474	0x211A	Gain Conversion Time 1	0x211A	UINT	2	0	1000	ms	RW
8475	0x211B	Gain Conversion Time 2	0x211B	UINT	2	0	1000	ms	RW
8476	0x211C	Gain Conversion Waiting Time 1	0x211C	UINT	0	0	1000	ms	RW
8477	0x211D	Gain Conversion Waiting Time 2	0x211D	UINT	0	0	1000	ms	RW
8478	0x211E	Dead Band for Position Control	0x211E	UINT	0	0	1000	UU	RW
8479	0x211F	Drive Control Input 1	0x211F	UINT	0	0	0xFFFF	-	RW
8480	0x2120	Drive Control Input 2	0x2120	UINT	0	0	0xFFFF	-	RW
8481	0x2121	Drive Status Output 1	0x2121	UINT	0	0	0xFFFF	-	RO
8482	0x2122	Drive Status Output 2	0x2122	UINT	0	0	0xFFFF	-	RO
-	-	-	-	-	-	-	-	-	-

16.3.4 Input and Output Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
8704	0x2200	Digital Input Signal 1 Selection	0x2200	UINT	0x000F	0	0xFFFF	-	RW
8705	0x2201	Digital Input Signal 2 Selection	0x2201	UINT	0x0001	0	0xFFFF	-	RW
8706	0x2202	Digital Input Signal 3 Selection	0x2202	UINT	0x0002	0	0xFFFF	-	RW
8707	0x2203	Digital Input Signal 4 Selection	0x2203	UINT	0x000C	0	0xFFFF	-	RW
8708	0x2204	Digital Input Signal 5 Selection	0x2204	UINT	0x0010	0	0xFFFF	-	RW
8709	0x2205	Digital Input Signal 6 Selection	0x2205	UINT	0x0004	0	0xFFFF	-	RW
8710	0x2206	Digital Input Signal 7 Selection	0x2206	UINT	0x0012	0	0xFFFF	-	RW
8711	0x2207	Digital Input Signal 8 Selection	0x2207	UINT	0x000B	0	0xFFFF	-	RW
8712	0x2208	Digital Input Signal 9 Selection	0x2208	UINT	0x0003	0	0xFFFF	-	RW
8713	0x2209	Digital Input Signal 10 Selection	0x2209	UINT	0x0013	0	0xFFFF	-	RW
8714	0x220A	Digital Input Signal 11 Selection	0x220A	UINT	0x0014	0	0xFFFF	-	RW
8715	0x220B	Digital Input Signal 12 Selection	0x220B	UINT	0x0015	0	0xFFFF	-	RW
8716	0x220C	Digital Input Signal 13 Selection	0x220C	UINT	0x0016	0	0xFFFF	-	RW
8717	0x220D	Digital Input Signal 14 Selection	0x220D	UINT	0x0017	0	0xFFFF	-	RW
8718	0x220E	Digital Input Signal 15 Selection	0x220E	UINT	0x0018	0	0xFFFF	-	RW
8719	0x220F	Digital Input Signal 16 Selection	0x220F	UINT	0x0019	0	0xFFFF	-	RW
8720	0x2210	Digital Output Signal 1 Selection	0x2210	UINT	0x8002	0	0xFFFF	-	RW
8721	0x2211	Digital Output Signal 2 Selection	0x2211	UINT	0x0003	0	0xFFFF	-	RW
8722	0x2212	Digital Output Signal 3 Selection	0x2212	UINT	0x8001	0	0xFFFF	-	RW
8723	0x2213	Digital Output Signal 4 Selection	0x2213	UINT	0x0005	0	0xFFFF	-	RW
8724	0x2214	Digital Output Signal 5 Selection	0x2214	UINT	0x0010	0	0xFFFF	-	RW

8725	0x2215	Digital Output Signal 6 Selection	0x2215	UINT	0x0011	0	0xFFFF	-	RW
8726	0x2216	Digital Output Signal 7 Selection	0x2216	UINT	0x000A	0	0xFFFF	-	RW
8727	0x2217	Digital Output Signal 8 Selection	0x2217	UINT	0x0006	0	0xFFFF	-	RW
-	-	-	-	-	-	-	-	-	-
8728	0x2218	Analog Torque Input(command/limit) Scale	0x221C	UINT	100	-1000	1000	0.1%/V	RW
8729	0x2219	Analog Torque Input(command/limit) Offset	0x221D	INT	0	-1000	1000	mV	RW
8730	0x221A	Analog Velocity Override Mode	0x221E	UINT	0	0	1	-	RW
8731	0x221B	Analog Velocity Input(command/override) Offset	0x221F	INT	0	-1000	1000	mV	RW
8732	0x221C	Analog Monitor Output Mode	0x2220	UINT	0	0	1	-	RW
8733	0x221D	Analog Monitor Channel 1 Select	0x2221	UINT	0	0	65535	-	RW
8734	0x221E	Analog Monitor Channel 2 Select	0x2222	UINT	1	0	65535	-	RW
8736	0x2220	Analog Monitor Channel 1 Offset	0x2223	DINT	0	0	0x40000000	-	RW
8738	0x2222	Analog Monitor Channel 2 Offset	0x2224	DINT	0	0	0x40000000	-	RW
8740	0x2224	Analog Monitor Channel 1 Scale	0x2225	UDINT	500	0	0x40000000	-	RW
8742	0x2226	Analog Monitor Channel 2 Scale	0x2226	UDINT	500	0	0x40000000	-	RW
8744	0x2228	Analog Velocity Command Filter Time Constant	0x2227	UINT	2	0	1000	-	RW
8745	0x2229	Analog Torque Command Filter Time Constant	0x2228	UINT	2	0	1000	-	RW
8746	0x222A	Analog Velocity Command Scale	0x2229	INT	100	-1000	1000	-	RW
8747	0x222B	Analog Velocity Command Clamp Level	0x222A	UINT	0	0	1000	-	RW
-	-	-	-	-	-	-	-	-	-

16.3.5 Velocity Operation Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
8960	0x2300	Jog Operation Speed	0x2300	INT	500	-6000	6000	rpm	RW
8961	0x2301	Speed Command Acceleration Time	0x2301	UINT	200	0	10000	ms	RW
8962	0x2302	Speed Command Deceleration Time	0x2302	UINT	200	0	10000	ms	RW
8963	0x2303	Speed Command S-curve Time	0x2303	UINT	0	0	1000	ms	RW
8964	0x2304	Program Jog Operation Speed 1	0x2304	INT	0	-6000	6000	rpm	RW
8965	0x2305	Program Jog Operation Speed 2	0x2305	INT	500	-6000	6000	rpm	RW
8966	0x2306	Program Jog Operation Speed 3	0x2306	INT	0	-6000	6000	rpm	RW
8967	0x2307	Program Jog Operation Speed 4	0x2307	INT	-500	-6000	6000	rpm	RW
8968	0x2308	Program Jog Operation Time 1	0x2308	UINT	500	0	10000	ms	RW
8969	0x2309	Program Jog Operation Time 2	0x2309	UINT	5000	0	10000	ms	RW
8970	0x230A	Program Jog Operation Time 3	0x230A	UINT	500	0	10000	ms	RW
8971	0x230B	Program Jog Operation Time 4	0x230B	UINT	5000	0	10000	ms	RW
8972	0x230C	Index Pulse Search Speed	0x230C	INT	20	-1000	1000	rpm	RW
8973	0x230D	Speed Limit Function Select	0x230D	UINT	0	0	3	-	RW
8974	0x230E	Speed Limit Value at Torque Control Mode	0x230E	UINT	1000	0	6000	rpm	RW
8975	0x230F	Over Speed Detection Level	0x230F	UINT	6000	0	10000	rpm	RW
8976	0x2310	Excessive Speed Error Detection Level	0x2310	UINT	5000	0	10000	rpm	RW
8977	0x2311	Servo-Lock Function Select	0x2311	UINT	0	0	1	-	RW
8978	0x2312	Multi-Step Operation Speed 1	0x2312	INT	0	-32768	32767	rpm	RW
8979	0x2313	Multi-Step Operation Speed 2	0x2313	INT	10	-32768	32767	rpm	RW
8980	0x2314	Multi-Step Operation Speed 3	0x2314	INT	50	-32768	32767	rpm	RW
8981	0x2315	Multi-Step Operation Speed 4	0x2315	INT	100	-32768	32767	rpm	RW
8982	0x2316	Multi-Step Operation Speed 5	0x2316	INT	200	-32768	32767	rpm	RW
8983	0x2317	Multi-Step Operation Speed 6	0x2317	INT	500	-32768	32767	rpm	RW
8984	0x2318	Multi-Step Operation Speed 7	0x2318	INT	1000	-32768	32767	rpm	RW
8985	0x2319	Multi-Step Operation Speed 8	0x2319	INT	1500	-32768	32767	rpm	RW
8986	0x231A	Velocity Command Switch Select	0x231A	UINT	0	0	3	-	RW
-	-	-	-	-	-	-	-	-	-

16.3.6 Miscellaneous Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
9216	0x2400	Software Position Limit Function Select	0x2400	UINT	0	0	3	-	RW
9217	0x2401	INPOS1 Output Range	0x2401	UINT	100	0	60000	UU	RW
9218	0x2402	INPOS1 Output Time	0x2402	UINT	0	0	1000	ms	RW
9219	0x2403	INPOS2 Output Range	0x2403	UINT	100	0	60000	UU	RW
9220	0x2404	ZSPD Output Range	0x2404	UINT	10	0	6000	rpm	RW
9221	0x2405	TGON Output Range	0x2405	UINT	100	0	6000	rpm	RW
9222	0x2406	INSPD Output Range	0x2406	UINT	100	0	6000	rpm	RW
9223	0x2407	BRAKE Output Speed	0x2407	UINT	100	0	6000	rpm	RW
9224	0x2408	BRAKE Output Delay Time	0x2408	UINT	100	0	1000	ms	RW
9225	0x2409	Torque Limit at Homing Using Stopper	0x2409	UINT	250	0	2000	0.10%	RW
9226	0x240A	Duration Time at Homing Using Stopper	0x240A	UINT	50	0	1000	ms	RW
9227	0x240B	Modulo Mode	0x240B	UINT	0	0	5	-	RW
9228	0x240C	Modulo Factor	0x240C	DINT	3600	1	0x40000000	UU	RW
9230	0x240E	User Drive Name	0x240D	STRING	Drive	-	-	-	RW
9238	0x2416	Individual Parameter Save	0x240E	UINT	0	0	1	-	RW
-	-	-	-	-	-	-	-	-	-

16.3.7 Advanced Control Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
9472	0x2500	Adaptive Filter Function Select	0x2500	UINT	0	0	5	-	RW
9473	0x2501	Notch Filter 1 Frequency	0x2501	UINT	5000	50	5000	Hz	RW
9474	0x2502	Notch Filter 1 Width	0x2502	UINT	1	1	100		RW
9475	0x2503	Notch Filter 1 Depth	0x2503	UINT	1	1	5	-	RW
9476	0x2504	Notch Filter 2 Frequency	0x2504	UINT	5000	50	5000	Hz	RW
9477	0x2505	Notch Filter 2 Width	0x2505	UINT	1	1	100		RW
9478	0x2506	Notch Filter 2 Depth	0x2506	UINT	1	1	5	-	RW
9479	0x2507	Notch Filter 3 Frequency	0x2507	UINT	5000	50	5000	Hz	RW
9480	0x2508	Notch Filter 3 Width	0x2508	UINT	1	1	100		RW
9481	0x2509	Notch Filter 3 Depth	0x2509	UINT	1	1	5	-	RW
9482	0x250A	Notch Filter 4 Frequency	0x250A	UINT	5000	50	5000	Hz	RW
9483	0x250B	Notch Filter 4 Width	0x250B	UINT	1	1	100		RW
9484	0x250C	Notch Filter 4 Depth	0x250C	UINT	1	1	5	-	RW
9485	0x250D	On-line Gain Tuning Mode	0x250D	UINT	0	0	1	-	RW
9486	0x250E	System Rigidity for Gain Tuning	0x250E	UINT	5	1	20	-	RW
9487	0x250F	On-line Gain Tuning Adaptation Speed	0x250F	UINT	1	1	5	-	RW
9488	0x2510	Off-line Gain Tuning Direction	0x2510	UINT	0	0	1	-	RW
9489	0x2511	Off-line Gain Tuning Distance	0x2511	UINT	5	1	10	-	RW
9490	0x2512	Disturbance Observer Gain	0x2512	UINT	0	0	100	%	RW
9491	0x2513	Disturbance Observer Filter Time Constant	0x2513	UINT	10	0	1000	0.1ms	RW
9492	0x2514	Current Controller Gain	0x2514	UINT	100	1	150	%	RW
9493	0x2515	Vibration Suppression Filter Configuration	0x2515	UINT	0	0	5	-	RW
9494	0x2516	Vibration Suppression Filter 1 Frequency	0x2516	UINT	0	0	2000	0.1Hz	RW
9495	0x2517	Vibration Suppression Filter 1 Damping	0x2517	UINT	0	0	5	-	RW
9496	0x2518	Vibration Suppression Filter 2 Frequency	0x2518	UINT	0	0	2000	0.1Hz	RW
9497	0x2519	Vibration Suppression Filter 2 Damping	0x2519	UINT	0	0	5	-	RW

16.3.8 Monitoring Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
9728	0x2600	Feedback Speed	0x2600	INT	-	-	-	rpm	RO
9729	0x2601	Command Speed	0x2601	INT	-	-	-	rpm	RO
9730	0x2602	Following Error	0x2602	DINT	-	-	-	pulse	RO
9732	0x2604	Accumulated Operation Overload	0x2603	INT	-	-	-	0.10%	RO
9733	0x2605	Instantaneous Maximum Operation Overload	0x2604	INT	-	-	-	0.10%	RO
9734	0x2606	DC-Link Voltage	0x2605	UINT	-	-	-	Volt	RO
9735	0x2607	Accumulated Regeneration Overload	0x2606	INT	-	-	-	0.10%	RO
9736	0x2608	SingleTurn Data	0x2607	UDINT	-	-	-	pulse	RO
9738	0x260A	Mechanical Angle	0x2608	UINT	-	-	-	0.1deg	RO
9739	0x260B	Electrical Angle	0x2609	INT	-	-	-	0.1deg	RO
9740	0x260C	MultiTurn Data	0x260A	DINT	-	-	-	rev	RO
9742	0x260E	Drive Temperature 1	0x260B	INT	-	-	-	℃	RO
9743	0x260F	Drive temperature 2	0x260C	INT	-	-	-	℃	RO
9744	0x2610	Encoder Temperature	0x260D	INT	-	-	-	℃	RO
9745	0x2611	Motor Rated Speed	0x260E	UINT	-	-	-	rpm	RO
9746	0x2612	Motor Maximum Speed	0x260F	UINT	-	-	-	rpm	RO
9747	0x2613	Drive Rated Current	0x2610	UINT	-	-	-	0.1A	RO
9748	0x2614	FPGA Version	0x2611	STRING	-	-	-	-	RO
9751	0x2617	Hall Signal Display	0x2612	UINT	-	-	-	-	RO
9752	0x2618	Bootloader Version	0x2613	STRING	-	-	-	-	RO
9755	0x261B	Warning Code	0x2614	UINT	-	-	-	-	RO
9756	0x261C	Analog Input 1 Value	0x2615	INT	-	-	-	mV	RO
9757	0x261D	Analog Input 2 Value	0x2616	INT	-	-	-	mV	RO
9763	0x2623	RMS Operation Overload	0x2619	INT	-	-	-	0.1%	RO

16.3.9 Procedures and Alarm History

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
9984	0x2700	Procedure Command Code	0x2700	UINT	0	0	0xFFFF	-	RW
9985	0x2701	Procedure Command Argument	0x2701	UINT	0	0	0xFFFF	-	RW

16.3.10 3rd Party Motor Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
10240	0x2800	[Third Party Motor] Type	0x2800	UINT	0	0	1	-	RW
10241	0x2801	[Third Party Motor] Number of Poles	0x2801	UINT	8	2	1000	-	RW
10242	0x2802	[Third Party Motor] Rated Current	0x2802	FP32	2.89	-	-	Arms	RW
10244	0x2804	[Third Party Motor] Maximum Current	0x2803	FP32	8.67	-	-	Arms	RW
10246	0x2806	[Third Party Motor] Rated Speed	0x2804	UINT	3000	1	60000	rpm	RW
10247	0x2807	[Third Party Motor] Maximum Speed	0x2805	UINT	5000	1	60000	rpm	RW
10248	0x2808	[Third Party Motor] Inertia	0x2806	FP32	0.321	-	-	Kg	RW
10250	0x280A	[Third Party Motor] Torque Constant	0x2807	FP32	0.46	-	-	Kg.m2.10-4	RW
10252	0x280C	[Third Party Motor] Phase Resistance	0x2808	FP32	0.82	-	-	ohm	RW
10254	0x280E	[Third Party Motor] Phase Inductance	0x2809	FP32	3.66	-	-	mH	RW
10256	0x2810	[Third Party Motor] TN Curve Data 1	0x280A	UINT	3000	1	60000	rpm	RW
10258	0x2812	[Third Party Motor] TN Curve Data 2	0x280B	FP32	100	-	-	%	RW
10260	0x2814	[Third Party Motor] Hall Offset	0x280C	UINT	0	0	360	deg	RW

16.3.11 CiA402 parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
24576	0x6000	Reserved	0x603F	UINT	0	-	-	-	RO
24577	0x6001	Reserved	0x6040	UINT	-	-	-	-	-
24578	0x6002	Reserved	0x6041	UINT	-	-	-	-	-
24579	0x6003	Quick Stop Option Code	0x605A	INT	2	0	4	-	RW
24580	0x6004	Shutdown Option Code	0x605B	INT	0	1	1	-	RW
24581	0x6005	Disable Operation Option Code	0x605C	INT	1	0	1	-	RW
24582	0x6006	Halt Option Code	0x605D	INT	0	0	4	-	RW
24583	0x6007	Fault Reaction Option Coed	0x605E	INT	0	0	0	-	RW
24584	0x6008	Model Of Operation	0x6060	SINT	-1	-1	10	-	RW
24585	0x6009	Modes of Operation Display	0x6061	SINT	-	-	-	-	RO
24586	0x600A	Position Demand Value	0x6062	DINT	-	-	-	UU	RO
24588	0x600C	Position Actual Internal Value	0x6063	DINT	-	-	-	Pulse	RO
24590	0x600E	Position Actual Value	0x6064	DINT	-	-	-	UU	RO
24592	0x6010	Following Error Window	0x6065	UDINT	600000	0	1073741823	UU	RW
24594	0x6012	Following Error Timeout	0x6066	UINT	0	0	65535	ms	RW
24595	0x6013	Position Window	0x6067	UDINT	100	0	1073741823	UU	RW
24597	0x6015	Position Window Time	0x6068	UINT	0	0-	65535	ms	RW
24598	0x6016	Velocity Demand Value	0x606B	DINT	-	-	-	UU/s	RO
24600	0x6018	Velocity Actual Value	0x606C	DINT	-	-	-	UU/s	RO
24602	0x601A	Velocity Window	0x606D	UINT	20000	0	65535	UU/s	RW
24603	0x601B	Velocity Window Time	0x606E	UINT	0	0	65535	ms	RW
24604	0x601C	Target Torque	0x6071	INT	0	-5000	5000	0.1%	RW
24605	0x601D	Maximum Torque	0x6072	UINT	3000	0	5000	0.1%	RW
24606	0x601E	Torque Demand Value	0x6074	INT	-	-	-	0.1%	RO
24607	0x601F	Motor Rated Torque	0x6076	UDINT	-	-	-	mNm	RO
24609	0x6021	Torque Actual Value	0x6077	INT	-	-	-	0.1%	RO
24610	0x6022	Reserved	0x607A	DINT	-	--	-	-	-
24612	0x6024	Home Offset	0x607C	DINT	0	-536870912	536870911	UU	RW
24616	0x6028	Software Position Limit (Min)	0x607D:01	DINT	-10000000000	-1073741824	1073741824	UU	RW
24618	0x602A	Software Position Limit (Max)	0x607D:02	DINT	10000000000	-1073741824	1073741824	UU	RW
24620	0x602C	Reserved	0x607F	DINT	-	--	-	-	-

24622	0x602E	Reserved	0x6081	DINT	-	--	-	-	-
24624	0x6030	Reserved	0x6083	DINT	-	--	-	-	-
24626	0x6032	Reserved	0x6084	DINT	-	--	-	-	-
24628	0x6034	Quick Stop Deceleration	0x6085	DINT	200000	0	0x7FFFFFFF	UU/s2	RW
24630	0x6038	Reserved	0x6087	DINT	-	--	-	-	-
24634	0x603A	Gear Ratio (Motor revolutions)	0x6091:01	UDINT	1	0	0x40000000	-	RW
24636	0x603C	Gear Ratio (Shaft revolutions)	0x6091:02	UDINT	1	0	0x40000000	-	RW
24638	0x603E	Homing Method	0x6098	INT	34	-128	127	-	RW
24641	0x6041	Homing Speed (switch)	0x6099:01	DINT	500000	0	0x40000000	UU/s	RW
24643	0x6043	Homing Speed (zero)	0x6099:02	DINT	100000	0	0x40000000	UU/s	RW
24645	0x6045	Homing Acceleration	0x609A	UDINT	200000	0	0x40000000	UU/s2	RW
24647	0x6047	Reserved	0x60B0	DINT	-	-	-	-	-
24649	0x6049	Velocity Offset	0x60B1	DINT	0	-2147483648	2147483648	UU/s	RW
24651	0x604B	Torque Offset	0x60B2	INT	0	-5000	5000	0.1%	RW
24652	0x604C	Touch Probe Function	0x60B8	UINT	0x0033	0	0Xffff	-	RW
24653	0x604D	Touch Probe Status	0x60B9	UINT	-	-	-	-	RO
24654	0x604E	Touch Prove 1 Positive Edge Position Value	0x60BA	DINT	-	-	-	UU	RO
24656	0x6050	Touch Prove 1 Negative Edge Position Value	0x60BB	DINT	-	-	-	UU	RO
24658	0x6052	Touch Prove 2 Positive Edge Position Value	0x60BC	DINT	-	-	-	UU	RO
24660	0x6054	Touch Prove 2 Negative Edge Position Value	0x60BD	DINT	-	-	-	UU	RO
24668	0x605C	Positive Torque Limit Value	0x60E0	UINT	1000	0	5000	0.1%	RW
24669	0x605D	Negative Torque Limit Value	0x60E1	UINT	1000	0	5000	0.1%	RW
24670	0x605E	Following Error Actual Value	0x60F4	DINT	-	-	-	UU	RO
24672	0x6060	Position Demand Internal Value	0x60FC	DINT	-	-	-	Pulse	RO
24674	0x6062	Digital Inputs	0x60FD	UDINT	-	-	-	-	RO
24678	0x6066	Digital Outputs (Physical)	0x60FE:01	DINT	0	0	0xFFFFFFFF	-	RW
24680	0x6068	Digital Outputs (Bit mask)	0x60FE:02	DINT	0	0	0xFFFFFFFF	-	RW
24682	0x606A	Target Velocity	0x60FF	DINT	0	-2147483648	2147483648	UU/s	RW
24684	0x606C	Supported Drive Modes	0x6502	UDINT	0x000003AD	-	-	-	RO

16.3.12 Index Related Parameters

Communication address		Parameter name	Parameter number	Variable type	Initial value	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal								
12288	0x3000	Control Mode	0x3000	UINT	1	0	9	-	RW
12289	0x3001	Coordinate Select	0x3001	UINT	0	0	1	-	RW
12290	0x3002	Baud Rate Select	0x3002	UINT	3	0	3	-	RW
12291	0x3003	Pulse Input Logic Select	0x3003	UINT	0	0	5	-	RW
12292	0x3004	Pulse Input Filter Select	0x3004	UINT	0	0	4	-	RW
12293	0x3005	PCLEAR Mode Select	0x3005	UINT	0	0	2	-	RW
12294	0x3006	Encoder Output Pulse	0x3006	UDINT	10000	0	2147483647	-	RW
12296	0x3008	Encoder Output Mode	0x3007	UINT	0	0	1	-	RW
12297	0x3009	Start Index Number(0~63)	0x3008	UINT	0	0	64	-	RW
12298	0x300A	Index Buffer Mode	0x3009	UINT	0	0	1	-	RW
12299	0x300B	IOUT Configuration	0x300A	UINT	0	0	5	-	RW
12544	0x3100	Index00	0x3100	-	-	-	-	-	RW
erii12562	0x3112	Index01	0x3101	-	-	-	-	-	RW
12580	0x3124	Index02	0x3102	-	-	-	-	-	RW
12598	0x3136	Index03	0x3103	-	-	-	-	-	RW
12616	0x3148	Index04	0x3104	-	-	-	-	-	RW
12634	0x315A	Index05	0x3105	-	-	-	-	-	RW
12652	0x316C	Index06	0x3106	-	-	-	-	-	RW
12670	0x317E	Index07	0x3107	-	-	-	-	-	RW
12688	0x3190	Index08	0x3108	-	-	-	-	-	RW
12706	0x31A2	Index09	0x3109	-	-	-	-	-	RW
12724	0x31B4	Index10	0x310A	-	-	-	-	-	RW
12742	0x31C6	Index11	0x310B	-	-	-	-	-	RW
12760	0x31D8	Index12	0x310C	-	-	-	-	-	RW
12778	0x31EA	Index13	0x310D	-	-	-	-	-	RW
12796	0x31FC	Index14	0x310E	-	-	-	-	-	RW
12814	0x320E	Index15	0x310F	-	-	-	-	-	RW
12832	0x3220	Index16	0x3110	-	-	-	-	-	RW
12850	0x3232	Index17	0x3111	-	-	-	-	-	RW
12868	0x3244	Index18	0x3112	-	-	-	-	-	RW
12886	0x3256	Index19	0x3113	-	-	-	-	-	RW
12904	0x3268	Index20	0x3114	-	-	-	-	-	RW
12922	0x327A	Index21	0x3115	-	-	-	-	-	RW

12940	0x328C	Index22	0x3116	-	-	-	-	-	RW
12958	0x329E	Index23	0x3117	-	-	-	-	-	RW
12976	0x32B0	Index24	0x3118	-	-	-	-	-	RW
12994	0x32C2	Index25	0x3119	-	-	-	-	-	RW
13012	0x32D4	Index26	0x311A	-	-	-	-	-	RW
13030	0x32E6	Index27	0x311B	-	-	-	-	-	RW
13048	0x32F8	Index28	0x311C	-	-	-	-	-	RW
13066	0x330A	Index29	0x311D	-	-	-	-	-	RW
13084	0x331C	Index30	0x311E	-	-	-	-	-	RW
13102	0x332E	Index31	0x311F	-	-	-	-	-	RW
13120	0x3340	Index32	0x3120	-	-	-	-	-	RW
13138	0x3352	Index33	0x3121	-	-	-	-	-	RW
13156	0x3364	Index34	0x3122	-	-	-	-	-	RW
13174	0x3376	Index35	0x3123	-	-	-	-	-	RW
13192	0x3388	Index36	0x3124	-	-	-	-	-	RW
13210	0x339A	Index37	0x3125	-	-	-	-	-	RW
13228	0x33AC	Index38	0x3126	-	-	-	-	-	RW
13246	0x33BE	Index39	0x3127	-	-	-	-	-	RW
13264	0x33D0	Index40	0x3128	-	-	-	-	-	RW
13282	0x33E2	Index41	0x3129	-	-	-	-	-	RW
13300	0x33F4	Index42	0x312A	-	-	-	-	-	RW
13318	0x3406	Index43	0x312B	-	-	-	-	-	RW
13336	0x3418	Index44	0x312C	-	-	-	-	-	RW
13354	0x342A	Index45	0x312D	-	-	-	-	-	RW
13372	0x343C	Index46	0x312E	-	-	-	-	-	RW
13390	0x344E	Index47	0x312F	-	-	-	-	-	RW
13408	0x3471	Index48	0x3130	-	-	-	-	-	RW
13426	0x3472	Index49	0x3131	-	-	-	-	-	RW
13444	0x3484	Index50	0x3132	-	-	-	-	-	RW
13462	0x3496	Index51	0x3133	-	-	-	-	-	RW
13480	0x34A8	Index52	0x3134	-	-	-	-	-	RW
13498	0x34BA	Index53	0x3135	-	-	-	-	-	RW
13516	0x34CC	Index54	0x3136	-	-	-	-	-	RW
13534	0x34DE	Index55	0x3137	-	-	-	-	-	RW
13552	0x34F0	Index56	0x3138	-	-	-	-	-	RW
13570	0x3502	Index57	0x3139	-	-	-	-	-	RW
13588	0x3514	Index58	0x313A	-	-	-	-	-	RW

13606	0x3526	Index59	0x313B	-	-	-	-	-	RW
13624	0x3538	Index60	0x313C	-	-	-	-	-	RW
13642	0x354A	Index61	0x313D	-	-	-	-	-	RW
13660	0x355C	Index62	0x313E	-	-	-	-	-	RW
13678	0x356E	Index63	0x313F	-	-	-	-	-	RW

16.3.13 Index00 ~Index63 internal variable communication address

Index00~Index63 has internal variables such as IndexType, Distance, Velocity, Acceleration, Deceleration, RegDistance, RegVelocity, RepeatCount, DwellTime, Next Index, and Action. The internal communication address has an increased address based on the index communication address as shown below.

Communication address		Parameter name	Variable type	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal						
Index	Index	Number of entries	UINT16	-	-	-	RW
Index+1	Index+0x01	IndexType	UINT16	0	10	-	RW
Index+2	Index+0x02	Distance	INT32	-2147483648	2147483647	UU	RW
Index+4	Index+0x04	Velocity	INT32	1	2147483647	UU/s	RW
Index+6	Index+0x06	Acceleration	INT32	1	2147483647	UU/s2	RW
Index+8	Index+0x08	Deceleration	INT32	1	2147483647	UU/s2	RW
Index+10	Index+0x0A	RegDistance	INT32	-2147483648	2147483647	UU	RW
Index+12	Index+0x0C	RegVelocity	INT32	1	2147483647	UU/s2	RW
Index+14	Index+0x0E	RepeatCount	UINT16	1	65535	-	RW
Index+15	Index+0x0F	DwellTime	UINT16	0	65535	ms	RW
Index+16	Index+0x10	Next Index	UINT16	0	63	-	RW
Index+17	Index+0x11	Action	UINT16	0	2	-	RW

Example) Internal variable of Index00

Communication address		Parameter name	Variable type	Output Min. value setting	Maximum value	Unit	Accessibility
Decimal	Hexadecimal						
12544	0x3100	Number of entries	UINT16	-	-	-	RW
12545	0x3101	IndexType	UINT16	0	10	-	RW
12546	0x3102	Distance	INT32	-2147483648	2147483647	UU	RW
12548	0x3104	Velocity	INT32	1	2147483647	UU/s	RW
12550	0x3106	Acceleration	INT32	1	2147483647	UU/s2	RW
12552	0x3108	Deceleration	INT32	1	2147483647	UU/s2	RW
12554	0x310A	RegDistance	INT32	-2147483648	2147483647	UU	RW
12556	0x310C	RegVelocity	INT32	1	2147483647	UU/s2	RW
12558	0x310E	RepeatCount	UINT16	1	65535	-	RW
12559	0x310F	DwellTime	UINT16	0	65535	ms	RW
12560	0x3110	Next Index	UINT16	0	63	-	RW
12561	0x3111	Actio	UINT16	0	2	-	RW

17. Test operation

For safe and proper test drive, make sure to check the following prior to test drive. If there is a problem, take an appropriate measure before the test drive.

■ Servo Motor State

Is the motor correctly installed and wired?

Is each connecting part correctly tightened without loosening?

For a motor with oil seal fitted, is there any damage on the oil seal?

Is oil properly applied?

If you perform test drive of a servo motor having been stored for an extended period, make sure to check the motor according to the maintenance and inspection method for servo motor. For maintenance and inspection, refer to「14. Maintenance and inspection」.

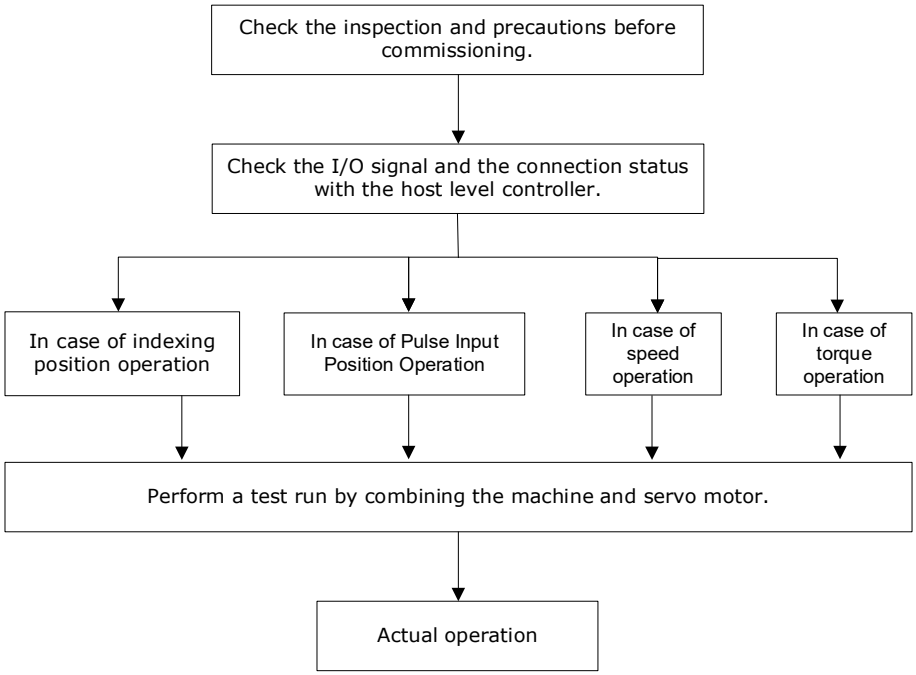
■ Maintenance and Inspection. Servo Drive State

Is the drive correctly installed, wired, and connected?

Is the supply voltage for the servo drive correct?

17.1 Preparation for Operation

Carry out test drive in the following order:



Verify that, before the test drive, the upper level controller and the servo drive are correctly wired, and the parameter of the servo drive are correctly configured.

When using a quadrature (incremental) type motor and another company's motor, set the parameters motor ID [0x2000], encoder type [0x2001], number of encoder pulses per revolution [0x2002], and position error range [0x6065] before trial operation.

17.1.1 Indexing Position operation

Sequence	Handling	Reference
1	Check the power supply and input signal circuit again, and turn on the control power of the servo drive.	
2	Set the values of Index00~Index63 according to the index you want to drive.	4.2 Indexing Position operation
3	For safety, Velocity and Registration Velocity are set to 1/10 of the value to be set.	
4	Set the gear ratio [0x6091] according to the electronic gear ratio of the device to the upper device.	11.3 Electronic gear setup
5	Turn on the main circuit power of the servo drive.	
6	Turn on the SVON input signal.	
7	Turn on-> off the START input signal.	
8	[0x6062] Confirm that the Distance and Registration Distance values set through the requested position value are displayed.	
9	[0x6064] Check the actual rotation amount of the motor through the actual position value.	
10	Check if the values of steps 8 and 9 satisfy the expression below. [0x6062] = [0x6064] x [0x6091]	
11	Check if the servo motor has operated in the commanded direction and index.	
12	Turn off the SVON input signal, change Velocity and Registration Velocity to the values you want to set, and repeat steps 6 to 11.	
13	Turn off the SVON input signal.	

Inspection object before test operation

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2000	-	Motor ID	UINT	RW	No	-
0x2001	-	Encoder type	UINT	RW	No	-
0x2002	-	Encoder Pulse per revolution	UDINT	RW	No	pulse
0x2003	-	Node ID	UINT	RO	No	-
0x2004	-	Rotation direction setting	UINT	RW	No	-
0x2013	-	Emergency Stop Configuration	UINT	RW	No	-
0x2110	-	Torque Limit Function Select	UINT	RW	No	-
0x2111	-	External Positive Torque Limit Value	UINT	RW	No	-
0x2112	-	External Negative Torque Limit Value	UINT	RW	No	-
0x2113	-	Emergency Stop Torque	UINT	RW	No	0.1%
0x211F	-	Drive Control Input 1	UINT	RW	No	-
0x2120	-	Drive Control Input 2	UINT	RW	No	-
0x2121	-	Drive Status Output 1	UINT	RW	No	-
0x2121	-	Drive Status Output 2	UINT	RW	No	-
0x2200	-	Digital Input Signal 1 Selection	UINT	RW	No	-
0x2201	-	Digital Input Signal 2 Selection	UINT	RW	No	-
0x2202	-	Digital Input Signal 3 Selection	UINT	RW	No	-
0x2203	-	Digital Input Signal 4 Selection	UINT	RW	No	-
0x2204	-	Digital Input Signal 5 Selection	UINT	RW	No	-
0x2205	-	Digital Input Signal 6 Selection	UINT	RW	No	-
0x2206	-	Digital Input Signal 7 Selection	UINT	RW	No	-
0x2207	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x2208	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x2209	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x220A	-	Digital Input Signal 10 Selection	UINT	RW	No	-
0x220B	-	Digital Input Signal 11 Selection	UINT	RW	No	-
0x220C	-	Digital Input Signal 12 Selection	UINT	RW	No	-

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x220D	-	Digital Input Signal 13 Selection	UINT	RW	No	-
0x220E	-	Digital Input Signal 14 Selection	UINT	RW	No	-
0x220F	-	Digital Input Signal 15 Selection	UINT	RW	No	-
0x2210	-	Digital output signal 1 selection	UINT	RW	No	-
0x2211	-	Digital output signal 2 selection	UINT	RW	No	-
0x2212	-	Digital output signal 3 selection	UINT	RW	No	-
0x2213	-	Digital output signal 4 selection	UINT	RW	No	-
0x2214	-	Digital output signal 5 selection	UINT	RW	No	-
0x2215	-	Digital output signal 6 selection	UINT	RW	No	-
0x2216	-	Digital output signal 7 selection	UINT	RW	No	-
0x2217	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	No	0.1%/V
0x221D	-	Analog Torque Input(command/limit) Scale	INT	RW	No	mV
0x221E	-	Analog Velocity Override Mode	UINT	RW	No	-
0x221F	-	Analog Velocity Input(command/Override) Offset	INT	RW	No	mV
0x240C	-	Modulo Factor	DINT	RW	No	-
0x3000	-	Control mode	UINT	RW	No	-
0x3001	-	Coordinate Select	UINT	RW	No	-
0x3002	-	Baud Rate Select	UINT	RW	No	-
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	
0x3008	-	Start Index Number	UINT	RW	No	-
0x3009	-	Index buffer mode	UINT	RW	No	-
0x300A	-	IOUT Configuration	UINT	RW	No	-

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x3100	-	Index 00	-	-	-	-
	0	Number of entries	USINT	RO	No	-
	1	Index type	UINT	RW	No	-
	2	Distance	DINT	RW	No	UU
	3	Speed	DINT	RW	No	UU/s
	4	Acceleration	DINT	RW	No	UU/s^2
	5	Deceleration speed	DINT	RW	No	UU/s^2
	6	Registration Distance	DINT	RW	No	UU
	7	Registration Velocity	DINT	RW	No	UU/s
	8	Repeat Count	UINT	RW	No	-
	9	Dwell Time	UINT	RW	No	ms
	10	Next Index	UINT	RW	No	-
	11	Action	UINT	RW	No	-
0x3101	-	Index 01	-	-	-	-
~						
0x313F	-	Index 63	-	-	-	-

17.1.2 Pulse Input Position Operation

■ Test Procedure

Sequence	Handling	Reference
1	Check the power supply and input signal circuit again, and turn on the control power of the servo drive.	
2	Set the logic of [0x3003] input pulse according to the pulse output type of the host device.	6.1 Function setting of Pulse Input Logic
3	Set the command unit and set the gear ratio [0x6091] by matching the electronic gear ratio to the upper device.	11.3 Electronic gear setup
4	Turn on the main circuit power of the servo drive.	
5	Turn on the SVON input signal.	
6	The host device outputs a low-speed pulse command with the motor rotation amount that is easy to check. For the command pulse speed, set the motor speed below 100 [rpm] for safety.	
7	[0x6062] Check the input command pulse number through the request position value.	
8	[0x6064] Check the actual rotation amount of the motor through the actual position value.	
9	Check if the values of steps 7 and 8 satisfy the expression below. [0x6062] = [0x6064] x [0x6091]	
10	Check if the servo motor rotates in the commanded direction.	
11	The upper device outputs the pulse command at the speed required by the equipment.	
12	Check the servo motor speed, required position value, and actual position value.	
13	Stop the pulse command and turn the SVON input signal OFF.	

■ Inspection object before test operation

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2000	-	Motor ID	UINT	RW	No	-
0x2001	-	Encoder type	UINT	RW	No	-
0x2002	-	Encoder Pulse per revolution	UDINT	RW	No	pulse
0x2003	-	Node ID	UINT	RO	No	-
0x2004	-	Rotation direction setting	UINT	RW	No	-
0x2013	-	Emergency Stop Configuration	UINT	RW	No	-
0x2110	-	Torque Limit Function Select	UINT	RW	No	-
0x2111	-	External Positive Torque Limit Value	UINT	RW	No	-

0x2112	-	External Negative Torque Limit Value	UINT	RW	No	-
0x2113	-	Emergency Stop Torque	UINT	RW	No	0.1%
0x211F	-	Drive Control Input 1	UINT	RW	No	-
0x2120	-	Drive Control Input 2	UINT	RW	No	-
0x2121	-	Drive Status Output 1	UINT	RW	No	-
0x2121	-	Drive Status Output 2	UINT	RW	No	-
0x2200	-	Digital Input Signal 1 Selection	UINT	RW	No	-
0x2201	-	Digital Input Signal 2 Selection	UINT	RW	No	-
0x2202	-	Digital Input Signal 3 Selection	UINT	RW	No	-
0x2203	-	Digital Input Signal 4 Selection	UINT	RW	No	-
0x2204	-	Digital Input Signal 5 Selection	UINT	RW	No	-
0x2205	-	Digital Input Signal 6 Selection	UINT	RW	No	-
0x2206	-	Digital Input Signal 7 Selection	UINT	RW	No	-
0x2207	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x2208	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x2209	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x220A	-	Digital Input Signal 10 Selection	UINT	RW	No	-
0x220B	-	Digital Input Signal 11 Selection	UINT	RW	No	-
0x220C	-	Digital Input Signal 12 Selection	UINT	RW	No	-

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x220D	-	Digital Input Signal 13 Selection	UINT	RW	No	-
0x220E	-	Digital Input Signal 14 Selection	UINT	RW	No	-
0x220F	-	Digital Input Signal 15 Selection	UINT	RW	No	-
0x2210	-	Digital output signal 1 selection	UINT	RW	No	-
0x2211	-	Digital output signal 2 selection	UINT	RW	No	-
0x2212	-	Digital output signal 3 selection	UINT	RW	No	-
0x2213	-	Digital output signal 4 selection	UINT	RW	No	-
0x2214	-	Digital output signal 5 selection	UINT	RW	No	-
0x2215	-	Digital output signal 6 selection	UINT	RW	No	-
0x2216	-	Digital output signal 7 selection	UINT	RW	No	-
0x2217	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x3000	-	Control mode	UINT	RW	No	-
0x3001	-	Coordinate Select	UINT	RW	No	-
0x3002	-	Baud Rate Select	UINT	RW	No	-
0x3003	-	Pulse Input Logic Select	UINT	RW	No	-
0x3004	-	Pulse Input Filter Select	UINT	RW	No	-
0x3005	-	PCLEAR Mode Select	UINT	RW	No	-
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	

17.1.3 Speed operation

■ Test Procedure

Sequence	Handling	Reference
1	Check the power supply and input signal circuit again, and turn on the control power of the servo drive.	
2	Depending on the control method, [0x231A] sets the function of speed command switch selection.	14.3 Manufacturer Specific Objects
3	When controlling with a digital input signal, set the multi-step operation speed and digital input signal setting parameters. During analog speed operation, set [0x2229] analog speed command scale and [0x222A] analog speed command clamp level parameters. The setting value is set to 1/10 lower than the actual operating speed.	
4	Turn on the main circuit power of the servo drive.	
5	Turn on the SVON input signal.	
6	Give a command signal to the servo drive and check the actual driving speed and command speed.	
7	Check if the servo motor rotates in the commanded direction.	
8	The upper device outputs at the speed required by the device.	
9	Check the servo motor speed.	
10	Stop the instruction and turn the SVON input signal OFF.	

■ Inspection object before commissioning

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2000	-	Motor ID	UINT	RW	No	-
0x2001	-	Encoder type	UINT	RW	No	-
0x2002	-	Encoder Pulse per revolution	UDINT	RW	No	pulse
0x2003	-	Node ID	UINT	RO	No	-
0x2004	-	Rotation direction setting	UINT	RW	No	-
0x2013	-	Emergency Stop Configuration	UINT	RW	No	-
0x2110	-	Torque Limit Function Select	UINT	RW	No	-
0x2111	-	External Positive Torque Limit Value	UINT	RW	No	-
0x2112	-	External Negative Torque Limit Value	UINT	RW	No	-
0x2113	-	Emergency Stop Torque	UINT	RW	No	0.1%
0x211F	-	Drive Control Input 1	UINT	RW	No	-
0x2120	-	Drive Control Input 2	UINT	RW	No	-

0x2121	-	Drive Status Output 1	UINT	RW	No	-
0x2121	-	Drive Status Output 2	UINT	RW	No	-
0x2200	-	Digital Input Signal 1 Selection	UINT	RW	No	-
0x2201	-	Digital Input Signal 2 Selection	UINT	RW	No	-
0x2202	-	Digital Input Signal 3 Selection	UINT	RW	No	-
0x2203	-	Digital Input Signal 4 Selection	UINT	RW	No	-
0x2204	-	Digital Input Signal 5 Selection	UINT	RW	No	-
0x2205	-	Digital Input Signal 6 Selection	UINT	RW	No	-
0x2206	-	Digital Input Signal 7 Selection	UINT	RW	No	-
0x2207	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x2208	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x2209	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x220A	-	Digital Input Signal 10 Selection	UINT	RW	No	-
0x220B	-	Digital Input Signal 11 Selection	UINT	RW	No	-
0x220C	-	Digital Input Signal 12 Selection	UINT	RW	No	-

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x220D	-	Digital Input Signal 13 Selection	UINT	RW	No	-
0x220E	-	Digital Input Signal 14 Selection	UINT	RW	No	-
0x220F	-	Digital Input Signal 15 Selection	UINT	RW	No	-
0x2210	-	Digital output signal 1 selection	UINT	RW	No	-
0x2211	-	Digital output signal 2 selection	UINT	RW	No	-
0x2212	-	Digital output signal 3 selection	UINT	RW	No	-
0x2213	-	Digital output signal 4 selection	UINT	RW	No	-
0x2214	-	Digital output signal 5 selection	UINT	RW	No	-
0x2215	-	Digital output signal 6 selection	UINT	RW	No	-
0x2216	-	Digital output signal 7 selection	UINT	RW	No	-
0x2217	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	No	0.1%/V
0x221D	-	Analog Torque Input(command/limit) Scale	INT	RW	No	mV
0x221E	-	Analog Velocity Override Mode	UINT	RW	No	-
0x221F	-	Analog Velocity Input(command/Override) Offset	INT	RW	No	mV
0x2227	-	Analog Velocity Command Filter Time Constant	UINT	RW	No	0.1ms
0x222A	-	Analog Velocity Command Clamp Level	UINT	RW	No	rpm
0x2301	-	Speed Command Acceleration Time	UINT	RW	No	ms
0x2302	-	Speed Command Deceleration Time	UINT	RW	No	ms
0x2303	-	Speed Command S-curve Time	UINT	RW	No	ms
0x230D	-	Speed Limit Function Select	UINT	RW	No	-
0x2312	-	Multi-Step Operation Speed 1	INT	RW	No	rpm
0x2313	-	Multi-Step Operation Speed 2	INT	RW	No	rpm
0x2314	-	Multi-Step Operation Speed 3	INT	RW	No	rpm
0x2316	-	Multi-Step Operation Speed 5	INT	RW	No	rpm
0x2317	-	Multi-Step Operation Speed 6	INT	RW	No	rpm
0x2318	-	Multi-Step Operation Speed 7	INT	RW	No	rpm

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2319	-	Multi-Step Operation Speed 8	INT	RW	No	rpm
0x231A	-	Velocity Command Switch Select	UINT	RW	No	-
0x3000	-	Control mode	UINT	RW	No	-
0x3002	-	Baud Rate Select	UINT	RW	No	-
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	

17.1.4 Torque operation

■ Test Procedure

Sequence	Handling	Reference
1	Check the power supply and input signal circuit again, and turn on the control power of the servo drive.	
2	[0x221C] Sets analog torque command scale.	
3	[0x230E] Sets the speed limit value for torque control. The setting value is set to 1/10 of the actual driving voltage.	
4	Turn on the main circuit power of the servo drive.	
5	Turn on the SVON input signal.	
6	Apply the analog voltage to the servo drive to check the speed and command torque value.	
7	Check if the servo motor rotates in the commanded direction.	
8	The upper device outputs at the speed required by the device.	
9	Check the servo motor speed and command torque value.	
10	Stop the instruction and turn the SVON input signal OFF.	

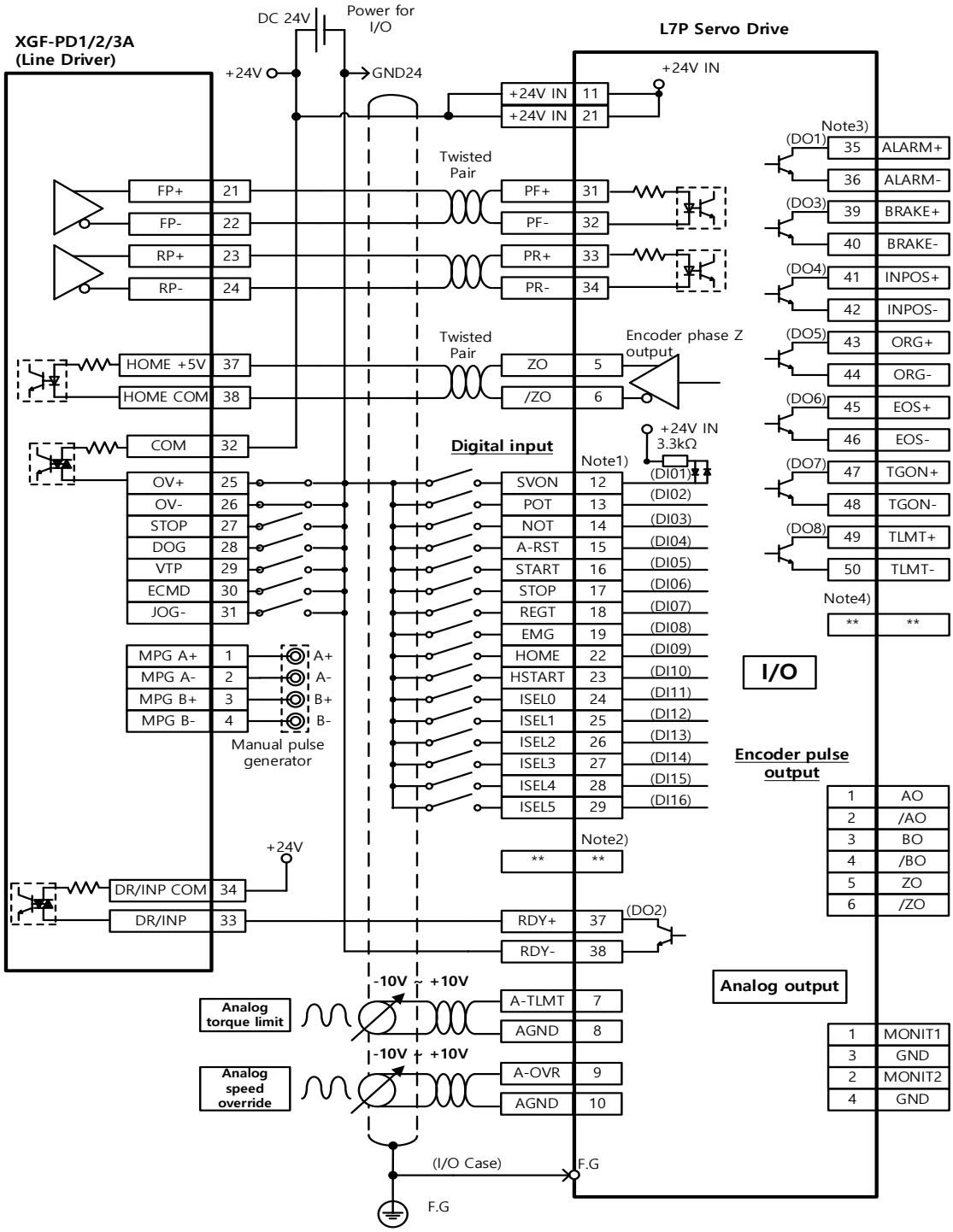
■ Inspection object before test operation

Index	Sub Index	Name	Variable type	Access ibility	PDO allocatio n	Unit
0x2000	-	Motor ID	UINT	RW	No	-
0x2001	-	Encoder type	UINT	RW	No	-
0x2002	-	Encoder Pulse per revolution	UDINT	RW	No	pulse
0x2003	-	Node ID	UINT	RO	No	-
0x2004	-	Rotation direction setting	UINT	RW	No	-
0x2013	-	Emergency Stop Configuration	UINT	RW	No	-
0x2110	index-	Torque Limit Function Select	UINT	RW	No	-
0x2111	index-	External Positive Torque Limit Value	UINT	RW	No	-
0x2112	index-	External Negative Torque Limit Value	UINT	RW	No	-
0x2113	index-	Emergency Stop Torque	UINT	RW	No	0.1%
0x211F	-	Drive Control Input 1	UINT	RW	No	-
0x2120	-	Drive Control Input 2	UINT	RW	No	-
0x2121	-	Drive Status Output 1	UINT	RW	No	-
0x2121	-	Drive Status Output 2	UINT	RW	No	-
0x2200	-	Digital Input Signal 1 Selection	UINT	RW	No	-
0x2201	-	Digital Input Signal 2 Selection	UINT	RW	No	-

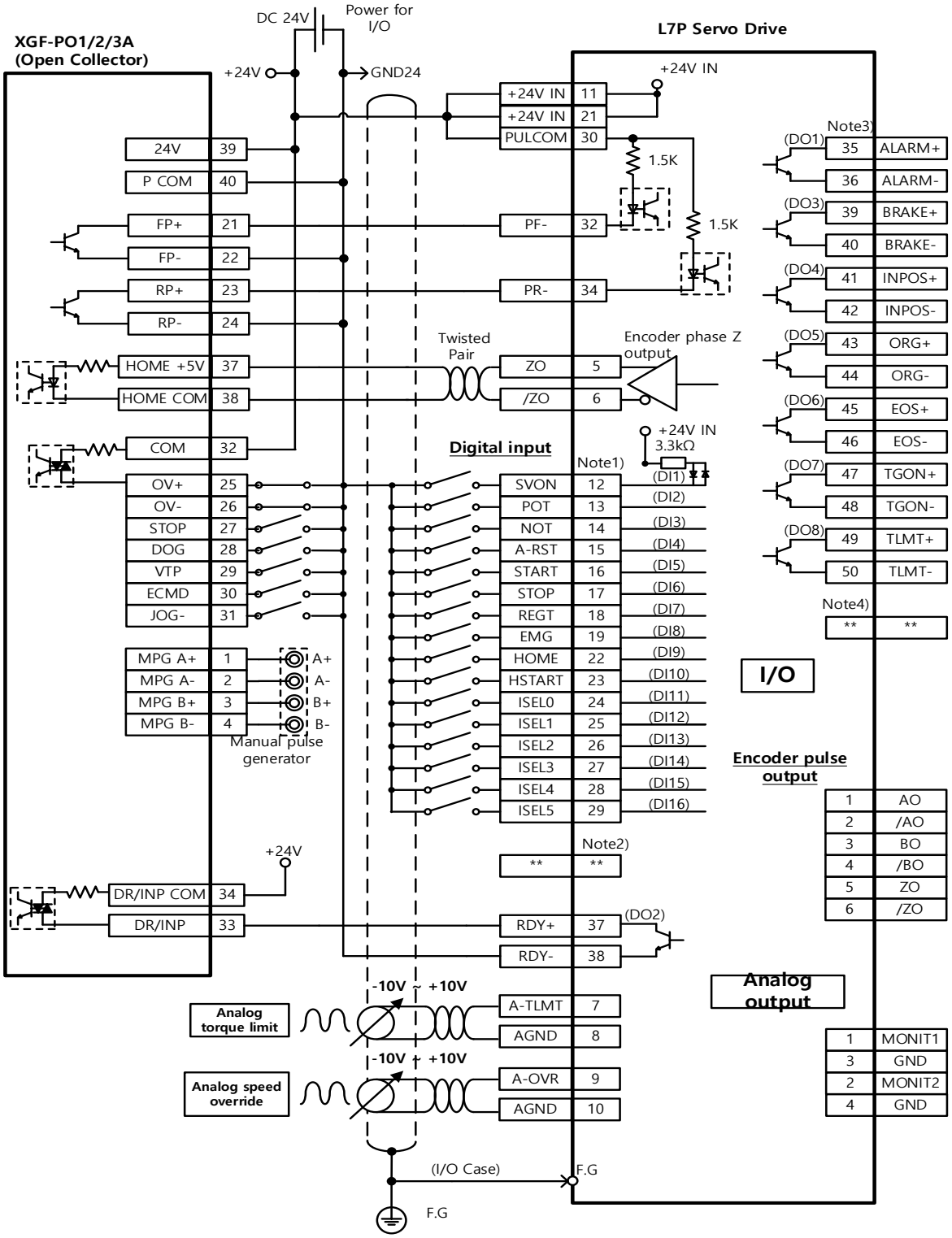
0x2202	-	Digital Input Signal 3 Selection	UINT	RW	No	-
0x2203	-	Digital Input Signal 4 Selection	UINT	RW	No	-
0x2204	-	Digital Input Signal 5 Selection	UINT	RW	No	-
0x2205	-	Digital Input Signal 6 Selection	UINT	RW	No	-
0x2206	-	Digital Input Signal 7 Selection	UINT	RW	No	-
0x2207	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x2208	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x2209	-	Digital Input Signal 9 Selection	UINT	RW	No	-
0x220A	-	Digital Input Signal 10 Selection	UINT	RW	No	-
0x220B	-	Digital Input Signal 11 Selection	UINT	RW	No	-
0x220C	-	Digital Input Signal 12 Selection	UINT	RW	No	-
0x220D	-	Digital Input Signal 13 Selection	UINT	RW	No	-
0x220E	-	Digital Input Signal 14 Selection	UINT	RW	No	-
0x220F	-	Digital Input Signal 15 Selection	UINT	RW	No	-
0x2210	-	Digital output signal 1 selection	UINT	RW	No	-
0x2211	-	Digital output signal 2 selection	UINT	RW	No	-
0x2212	-	Digital output signal 3 selection	UINT	RW	No	-
0x2213	-	Digital output signal 4 selection	UINT	RW	No	-
0x2214	-	Digital output signal 5 selection	UINT	RW	No	-
0x2215	-	Digital output signal 6 selection	UINT	RW	No	-
0x2216	-	Digital output signal 7 selection	UINT	RW	No	-
0x2217	-	Digital Input Signal 8 Selection	UINT	RW	No	-
0x221C	-	Analog Torque Input(command/limit) Scale	UINT	RW	No	0.1%/V
0x221D	-	Analog Torque Input(command/limit) Offset	INT	RW	No	mV
0x2228	-	Analog torque Command Filter Time Constant	UINT	RW	No	0.1ms
0x2301	-	Speed Command Acceleration Time	UINT	RW	No	ms
0x2302	-	Speed Command Deceleration Time	UINT	RW	No	ms
0x2228	-	Analog torque Command Filter Time Constant	UINT	RW	No	0.1ms
0x230E	-	Speed Limit Value at Torque Control Mode	UINT	RW	No	-
0x3000	-	Control mode	UINT	RW	No	-
0x3002	-	Baud Rate Select	UINT	RW	No	-
0x3006	-	Encoder output pulse	UDINT	RW	No	Pulse
0x3007	-	Encoder output mode	UINT	RW	No	

17.2 Example of connection with upper level device (Pulse Input Position)

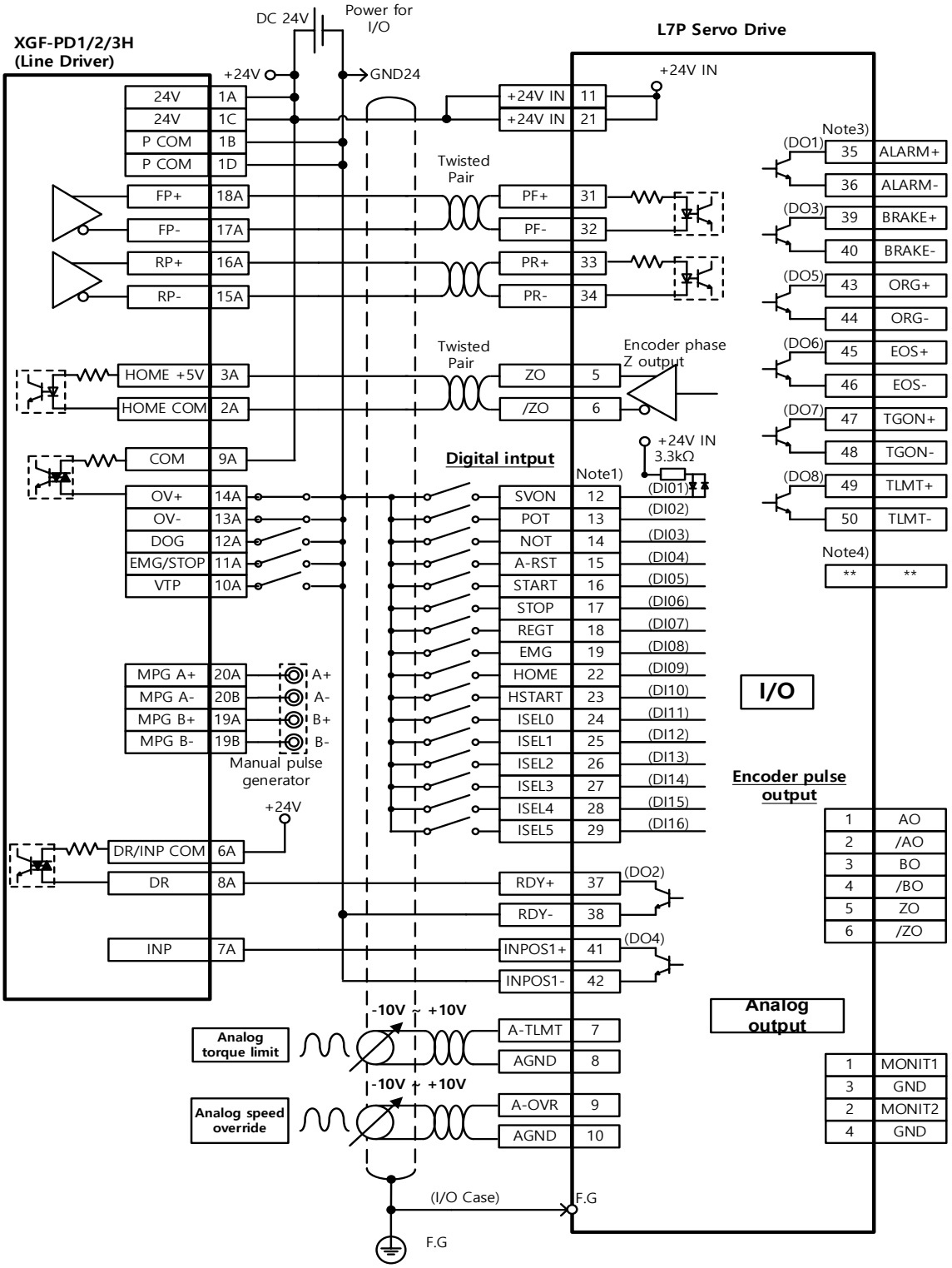
17.2.1 Example of connection with LSELECTRIC XGF-PD1/2/3A



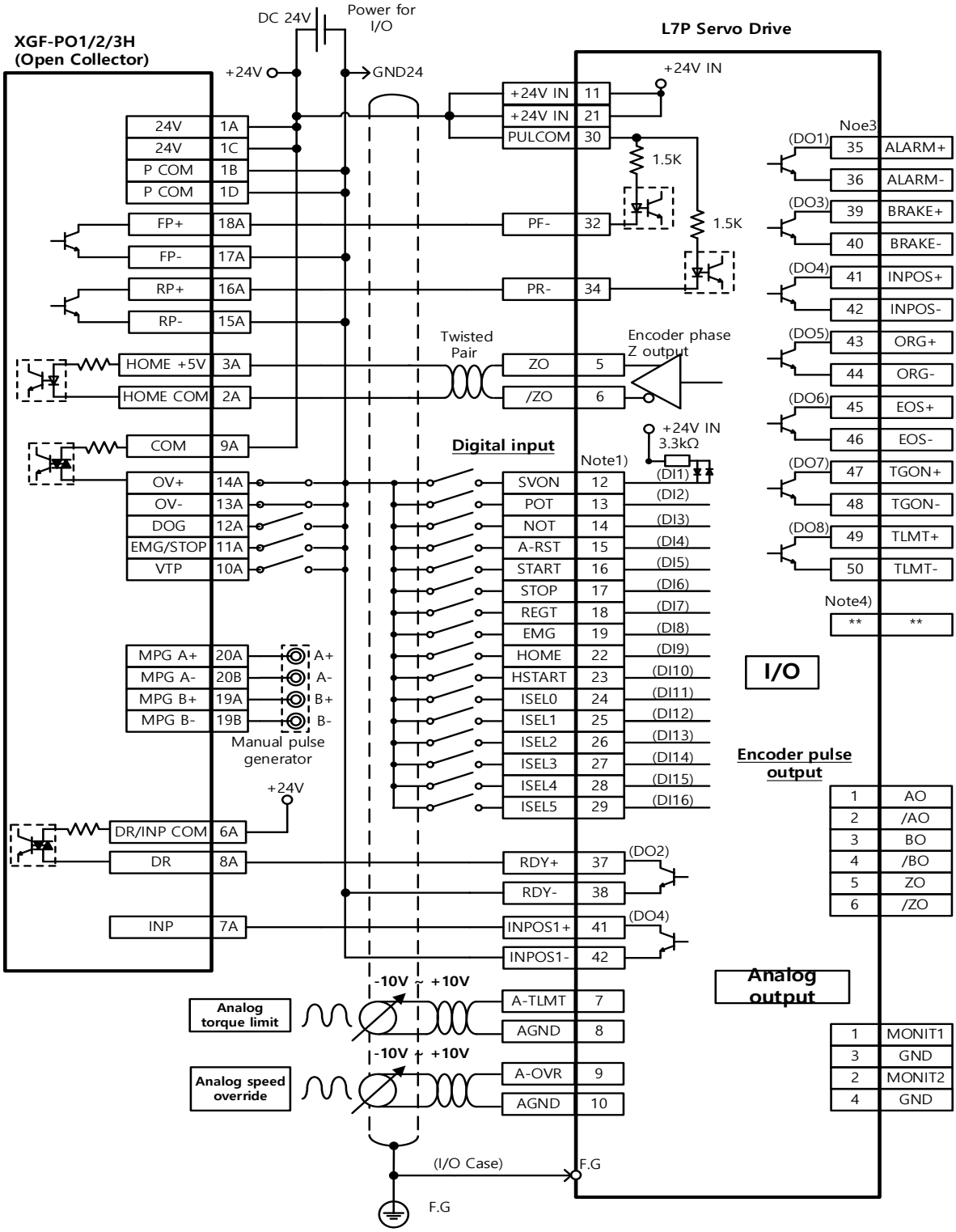
17.2.2 Example of connection with LSELECTRIC XGF-PO1/2/3A



17.2.3 Example of connection with LSELECTRIC XGF-PD1/2/ 3H



17.2.4 Example of connection with LSELECTRIC XGF-PO1/2/ 3H



Related Objects

Index	Sub Index	Name	Variable type	Accessibility	PDO allocation	Unit
0x2018	-	Magnetic Pole Pitch	UINT	RW	No	0.01mm
0x2019	-	Linear Scale Resolution	UINT	RW	No	nm
0x201A	-	Commutation Method	UINT	RW	No	-
0x201A	-	Commutation Method	UINT	RW	No	-
0x201B	-	Commutation Current	UINT	RW	No	0.1%
0x201C	-	Commutation Time	UINT	RW	No	ms
0x2020	-	Motor Hall Phase Config	UINT	RW	No	-
0x2800	-	3rd party motor type	UINT	RW	No	-
0x2801	-	3rd party motor pole number	UINT	RW	No	-
0x2802	-	3rd party motor rated current	FP32	RW	No	Arms
0x2803	-	3rd party motor maximum current	FP32	RW	No	Arms
0x2804	-	3rd party motor rated speed	UINT	RW	No	rpm
0x2805	-	3rd party motor maximum speed	FP32	RW	No	rpm
0x2806	-	3rd party motor inertia	FP32	RW	No	$Kg.m^2.10^{-4}$
0x2807	-	3rd party motor Torque constant	FP32	RW	No	Nm/A
0x2808	-	3rd party motor phase resistance	FP32	RW	No	ohm
0x2809	-	3rd party motor phase inductance	FP32	RW	No	mH
0x280A	-	3rd party motor TN Curve Data 1	UINT	RW	No	rpm
0x280B	-	3rd party motor TN Curve Data 2	FP32	RW	No	%
0x280C	-	3rd party motor hall Offset	UINT	RW	No	deg

18. Appendix

18.1 Firmware Update

18.1.1 Use of USB OTG

The drive performs USB host function to search for firmware files in the USB memory and download them to flash memory inside the drive. You can easily update the firmware using the USB memory and OTG cable without a PC. The update procedure is as follows:

(1) Prepare a download cable (USB OTG cable) and a USB memory.

Use a USB OTG cable, consisting of USB Female Plug Type A and USB Mini B 5 pins, as the download cable.

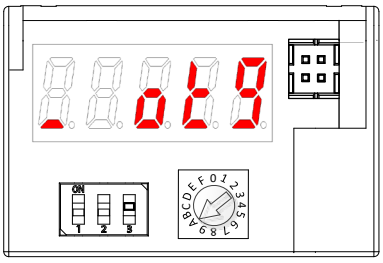


(2) Copy the firmware file (L7P_FW.bin) to update to the USB memory.

***Caution USB memory must be formatted as “FAT32”. Also, L7P_FW.bin file should be placed in the root directory of the USB memory, and the full file name including the extension should match. (However, case is not distinguished in file names.)**

(3) After connecting the USB memory to the USB OTG cable, connect it to the USB terminal and power on the drive.

(4) If 'otg' is displayed after 'boot' is displayed on the 7-Segment for servo status display, the firmware is being updated. If 3 bars to the left of 'otg' are displayed, the download is complete. Remove USB OTG cable and USB memory.



(7-segments display a message when downloading the firmware using the OTG)

(5) Turn on the power again, and verify if the firmware is updated.

18.1.2 Use of Drive CM

Drive CM allows the firmware upgrade through the PC's USB port. The transmission time depends on the PC performance, but it usually takes from scores of seconds to several minutes.

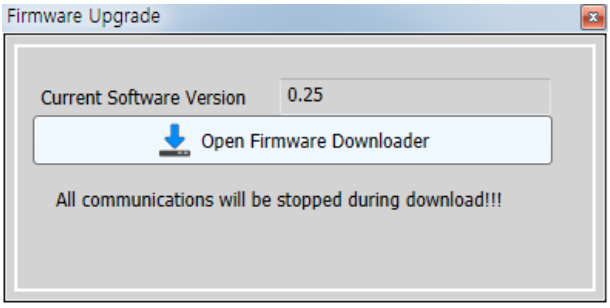


From the top menu, click ‘Setup’ -> ‘FIRMWARE UPGRADE’→ ‘OS Download’ button.

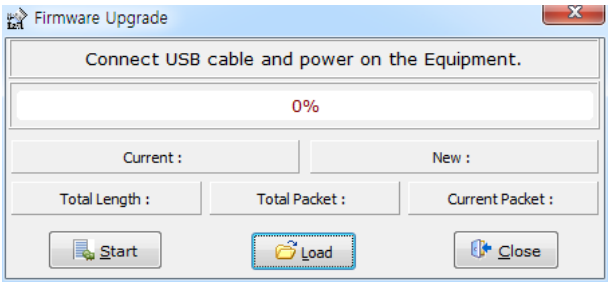
■ Precautions for Firmware Upgrade

- Do not turn off the PC or drive during transmission.
- Do not unplug the USB cable or close the firmware program during transmission.
- Do not run other applications on the PC during transmission.
- Before upgrade drive’s parameter (object), Please same predetermined value since the value can be re-set.

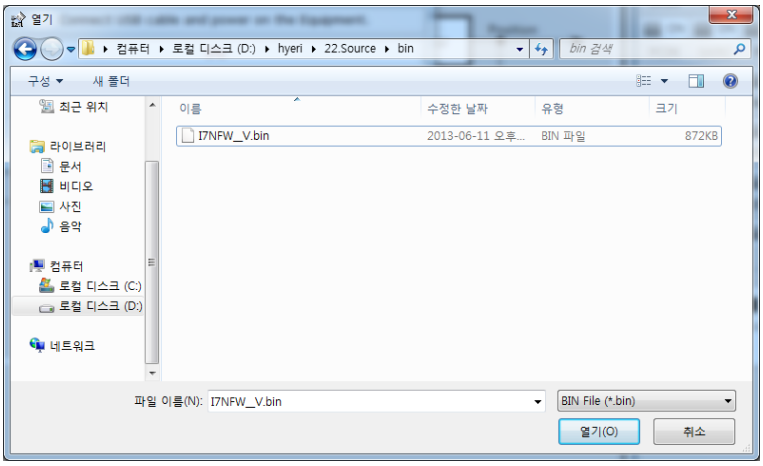
■ Firmware download operation



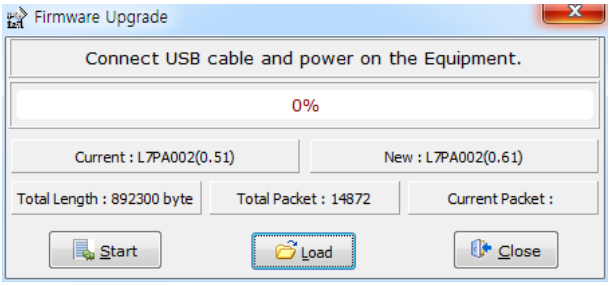
(1) Click the “Open Firmware Downloader” button



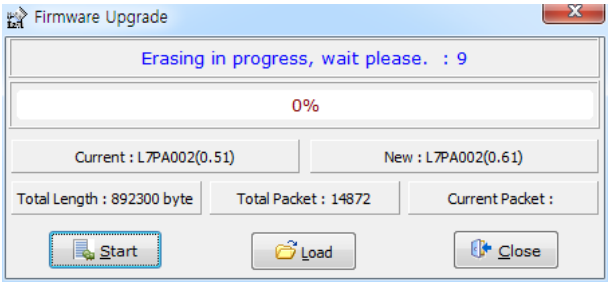
(2) To load the appropriate firmware file, click the "Load" button..



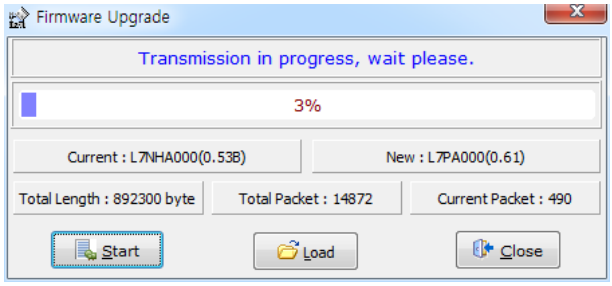
(3) Select the BIN file of the firmware to transmit and press the Open button.



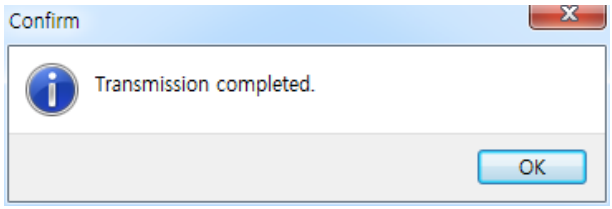
(4) “Total Length" and "Total Packet" of the loaded firmware are displayed. Compare the current name with the new name to check the drive type, capacity, and firmware version.



(5) Press the "Start" button to start transmission. 10 seconds are counted down to clear the internal memory in the drive. (For L7NH and L7P, the segment 7 should display "USB". For PEGASUS, a red "ERR" LED should be illuminated.)

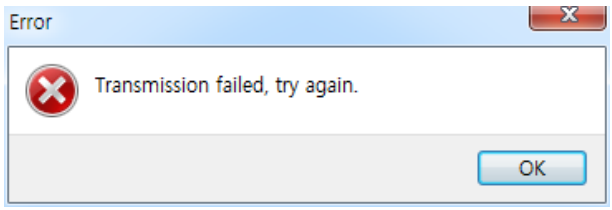


(6) After clearing, the firmware is transmitted automatically and the progress bar and "Current Packet" display the current transmission status. (The transmission time depends on the PC performance, but it usually takes from scores of seconds to several minutes.)

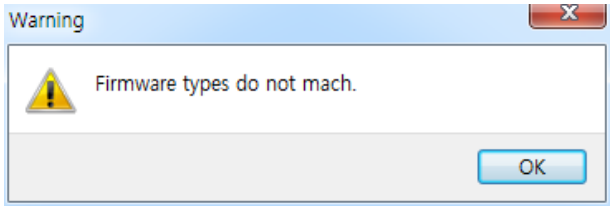


(7) When transmission is completed, a pop up saying "Transmission completed" is displayed. (When transmission to the PC is completed, turn off and on the drive for rebooting.)

■ An Error Occurs During Transmission



(1) Turn off and on the drive and repeat the above process from (2) to (7)



(1) Check firmware drive type and capacity to transmit.

Product warranty

Product name	Servo Drive		**Installation date**	
Model name	**L7PA/B Series**		**Warranty**	
Customer	**Name**			
	Address			
	Phone			
Distributor	**Name**			
	Address			
	Phone			

This product is made through strict quality control and inspection process by our technical staff.
The product warranty period is normally 12 months from the installation date, and 18 months from the manufacturing date if the installation date is not written. However, it may change according to the terms of the contract.

Free service information
If a drive malfunctions within the product warranty period under normal use, contact our dealer or designated service center. We will repair it free of charge.

Paid service information
Paid service information ▪ **When a failure occurs due to the consumer's intention or negligence** ▪ **When a failure occurs due to an abnormality in the power supply or a defect in the connected device** ▪ **When a breakdown occurs due to a natural disaster (fire, flood, gas damage, earthquake, etc.)** ▪ **When the product is modified or repaired at a place other than our dealer or service center** ▪ **When our nameplate is not attached** ▪ **When the free warranty period has expired** **※ After installing the servo, please fill out this quality assurance form and send it to our quality assurance department (service manager).**

Warranty

This product is made through strict quality control and inspection process by our technical staff.

The product warranty period for this product is normally 12 months from the installation date, and 18 months from the manufacturing date if the installation date is not written. However, it may change according to the terms of the contract. The product described in this user's manual may be discontinued or modified without notice. Be sure to check when you purchase this product.

Free service information

If a drive malfunctions within the product warranty period under normal use, contact our dealer or designated service center. We will repair it free of charge.

Paid service information

Paid service information

- **When a failure occurs due to the consumer's intention or negligence**
- **When a failure occurs due to an abnormality in the power supply or a defect in the connected device**
- **When a breakdown occurs due to a natural disaster (fire, flood, gas damage, earthquake, etc.)**
- **When the product is modified or repaired at a place other than our dealer or service center**
- **When our nameplate is not attached**
- **When the free warranty period has expired**

※ After installing the servo, please fill out this quality assurance form and send it to our quality assurance department (service manager).

Environmental Policy

LS ELECTRIC Co., Ltd supports and observes the environmental policy as below.

Environmental Management

LS ELECTRIC considers the environmental preservation as the preferential management subject and every staff of LS ELECTRIC use the reasonable endeavors for the pleasurably environmental preservation of the earth.

About Disposal

LS ELECTRIC' PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product, as they are reusable.

User Manual Revision History

No.	Issue year month	Change contents	Version number	Notes
1	2017.10.14	200 / 400[V] integrated Add function description and insert picture	1.0	
2	2018.07. 31	LSIS & LSM brand integration and function description added	1.1	
3	2020.07. 16	Mark modified according to company name change	1.2	
4	2020.10. 26	N terminal related precautions and figure correction	1.3	
5	2021.09. 24	Add new features and add descriptions	1.4	
6	2023.08.03	Integratie 7PA_200V and L7PA_400V manual Add notices and modify installation items in the control panel (panel)	1.5	
7	2025.12.24	Modified 0x2001 in chapter 14.3 Add regenerative resistor terminal description for 5~15KW in chapter 1.3.1	1.6	



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