



### **IABU Headquarters**

**Delta Electronics, Inc.**  
Taoyuan3  
No.18, Xinglong Rd., Taoyuan City,  
Taoyuan County 330, Taiwan, R.O.C.  
TEL: 886-3-362-6301 / FAX: 886-3-371-6301

### **Asia**

**Delta Electronics (Jiangsu) Ltd.**  
Wujiang Plant3  
1688 Jiangxing East Road,  
Wujiang Economic Development Zone  
Wujiang City, Jiang Su Province,  
People's Republic of China (Post code: 215200)  
TEL: 86-512-6340-3008 / FAX: 86-769-6340-7290

**Delta Greentech (China) Co., Ltd.**  
238 Min-Xia Road, Cao-Lu Industry Zone, Pudong, Shanghai,  
People's Republic of China  
Post code : 201209  
TEL: 021-58635678 / FAX: 021-58630003

**Delta Electronics (Japan), Inc.**  
Tokyo Office  
2-1-14 Minato-ku Shibadaimon,  
Tokyo 105-0012, Japan  
TEL: 81-3-5733-1111 / FAX: 81-3-5733-1211

**Delta Electronics (Korea), Inc.**  
234-9, Duck Soo Building 7F, Nonhyun-Dong,  
Kangnam-Gu, Seoul, Korea 135-010  
TEL: 82-2-515-5305 / FAX: 82-2-515-5302

**Delta Electronics Int'l (S) Pte Ltd**  
4 Kaki Bukit Ave 1, #05-05, Singapore 417939  
TEL: 65-6747-5155 / FAX: 65-6744-9228

**Delta Electronics (India) Pvt. Ltd.**  
Plot No. 43, Sector – 35, HSIIDC,  
Gurgaon122001, Haryana, India  
TEL: 1-919-767-3800 / FAX: 91-124-403-6045

### **Americas**

**Delta Products Corporation (USA)**  
Raleigh Office  
P.O. Box 12173, 5101 Davis Drive,  
Research Triangle Park, NC 27709, U.S.A.  
TEL: 1-919-767-3813 / FAX: 1-919-767-3969

**Delta Greentech (Brasil) S.A**  
Sao Paulo Office  
Rua Itapeva, 26-30 Andar Edificio Itapeva One-Bela Vista  
01332-000-Sao Paulo-SP-Brazil  
TEL: +55 11 3568-3850/FAX: +55 11 3568-3865

### **Europe**

**Deltronics (The Netherlands) B.V.**  
Eindhoven Office  
De Witbogt 15, 5652 AG Eindhoven, The Netherlands  
TEL: 31-40-2592850 / FAX: 31-40-2592851

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\*We reserve the right to change the information in this manual without prior notice.

Delta High Resolution AC Servo Drive for Network Communication Applications ASDA-A2 Series User Manual



## **Delta High Resolution AC Servo Drive for Network Communication Applications ASDA-A2 Series User Manual**

[www.delta.com.tw/ia](http://www.delta.com.tw/ia)



# Preface

---

Thank you very much for purchasing DELTA's AC servo products.

This manual will be helpful in the installation, wiring, inspection, and operation of Delta AC servo drive and motor. Before using the product, please read this user manual to ensure correct use.

You should thoroughly understand all safety precautions (DANGERS, WARNINGS and STOPS) before proceeding with the installation, wiring and operation. If you do not understand please contact your local Delta sales representative. Place this user manual in a safe location for future reference.

## Using This Manual

### ■ Contents of this manual

This manual is a user guide that provides the information on how to install, operate and maintain ASDA-A2 series AC servo drives and ECMA series AC servo motors.

The contents of this manual are including the following topics:

- Installation of AC servo drives and motors
- Configuration and wiring
- Trial run steps
- Control functions and adjusting methods of AC servo drives
- Parameter settings
- Communication protocol
- Inspection and maintenance
- Troubleshooting
- Application examples

### ■ Who should use this manual

This user manual is intended for the following users:

- Those who are responsible for designing.
- Those who are responsible for installing or wiring.
- Those who are responsible for operating or programming.
- Those who are responsible for maintaining or troubleshooting.

### ■ Important precautions

Before using the product, please read this user manual thoroughly to ensure correct use and store this manual in a safe and handy place for quick reference whenever necessary. Besides, please observe the following precautions:

- Do not use the product in a potentially explosive environment.

- Install the product in a clean and dry location free from corrosive and inflammable gases or liquids.
- Do not connect a commercial power supply to the U, V, W terminals of motor. Failure to observe this precaution will damage either the Servo motor or drive.
- Ensure that the motor and drive are correctly connected to a ground. The grounding method must comply with the electrical standard of the country (Please refer to NFPA 70: National Electrical Code, 2005 Ed.).
- Do not disconnect the AC servo drive and motor while the power is ON.
- Do not attach, modify and remove wiring when power is applied to the AC servo drive and motor.
- Before starting the operation with a mechanical system connected, make sure the emergency stop equipment can be energized and work at any time.
- Do not touch the drive heat sink or the servo motor during operation. Otherwise, it may result in serious personnel injury.

***PLEASE READ PRIOR TO INSTALLATION FOR SAFETY.***

Carefully note and observe the following safety precautions when receiving, inspecting, installing, operating, maintaining and troubleshooting. The following words, DANGER, WARNING and STOP are used to mark safety precautions when using the Delta's servo product. **Failure to observe these precautions may void the warranty!**

ASDA-A2 series drives are high-resolution, open type servo drives and must be installed in an NEMA enclosure such as a protection control panel during operation to comply with the requirements of the international safety standards. They are provided with precise feedback control and high-speed calculation function incorporating DSP (Digital Signal Processor) technology, and intended to drive three-phase permanent magnet synchronous motors (PMSM) to achieve precise positioning by means of accurate current output generated by IGBT (Insulated Gate Bipolar Transistor).

ASDA-A2 series drives can be used in industrial applications and for installation in an end-use enclosure that do not exceed the specifications defined in the ASDA-A2 series user manual (Drives, cables and motors are for use in a suitable enclosure with a minimum of a UL50 type 1 or NEMA 250 Type 1 rating).

The words, DANGER, WARNING and STOP, have the following meaning:



Indicates a potentially hazardous situation and if not avoided, may result in serious injury or death.



Indicates a potentially hazardous situation and if not avoided, may result in minor to moderate injury or serious damage to the product.



Indicates an improper action that it is not recommended to do and if doing it may cause damage, malfunction and inability.

### Unpacking Check



- *Please ensure that both the servo drive and motor are correctly matched for size (power rating). Failure to observe this precaution may cause fire, seriously damage the drive / motor or cause personal injury.*

### Installation



- *Do not install the product in a location that is outside the stated specification for the drive and motor. Failure to observe this caution may result in electric shock, fire, or personal injury.*

### Wiring



- *Connect the ground terminals to a class-3 ground (Ground resistance should not exceed 100 Ω). Improper grounding may result in electric shock or fire.*
- *Do not connect any power supplies to the U, V, W terminals. Failure to observe this precaution may result in serious injury, damage to the drive or fire.*
- *Ensure that all screws, connectors and wire terminations are secure on the power supply, servo drive and motor. Failure to observe this caution may result in damage, fire or personal injury.*
- *In order to prevent fire hazard and accidents, please form the wiring by the cable specifications outlined in this user manual.*

### Operation



- *Before starting the operation with a mechanical system connected, change the drive parameters to match the user-defined parameters of the mechanical system. Starting the operation without matching the correct parameters may result in servo drive or motor damage, or damage to the mechanical system.*
- *Ensure that the emergency stop equipment or device is connected and working correctly before operating the motor that is connected to a mechanical system.*
- *When applying to the power, please make sure the shaft of the motor stands still and will not operate because of the inertia of the mechanism or other reasons.*



- *Do not approach or touch any rotating parts (e.g. shaft) while the motor is running. Failure to observe this precaution may cause serious personal injury.*





- ***In order to prevent accidents, the initial trial run for servo motor should be conducted under no load conditions (separate the motor from its couplings and belts).***
- ***For the initial trial run, do not operate the servo motor while it is connected to its mechanical system. Connecting the motor to its mechanical system may cause damage or result in personal injury during the trial run. Connect the servo motor once it has successfully completed a trial run.***
- ***Caution: Please perform trial run without load first and then perform trial run with load connected. After the servo motor is running normally and regularly without load, then run servo motor with load connected. Ensure to perform trial run in this order to prevent unnecessary danger.***
- ***Do not touch either the drive heat sink or the motor during operation as they may become hot and personal injury may result.***

### Maintenance and Inspection



- ***Do not touch any internal or exposed parts of servo drive and servo motor as electrical shock may result.***
- ***Do not remove the operation panel while the drive is connected to an electrical power source otherwise electrical shock may result.***
- ***Wait at least 10 minutes after power has been removed before touching any drive or motor terminals or performing any wiring and/or inspection as an electrical charge may still remain in the servo drive and servo motor with hazardous voltages even after power has been removed.***
- ***Do not disassemble the servo drive or motor as electric shock may result.***
- ***Do not connect or disconnect wires or connectors while power is applied to the drive and motor.***
- ***Only qualified personnel who have electrical knowledge should conduct maintenance and inspection.***
- ***Ensure that the “Charge” indicator ceases when performing any maintenance, inspection or repairing.***

### Main Circuit Wiring



- ***Install the encoder cables in a separate conduit from the motor power cables to avoid signal noise. Separate the conduits by 30cm (11.8inches) above.***
- ***Use multi-stranded twisted-pair wires or multi-core shielded-pair wires for signal, encoder (PG) feedback cables. The maximum length of command input cable is 3m (9.84ft.) and the maximum length of encoder (PG) feedback cables is 20m (65.62ft.).***
- ***As a charge may still remain in the drive with hazardous voltages even after power has been removed, be sure to wait at least 10 minutes after power has been removed before performing any wiring and/or inspection.***



- ***It is not recommended to frequently power the drive on and off. Do not turn the drive off and on more than once per minute as high charging currents within the internal capacitors may cause damage.***

## Main Circuit Terminal Wiring



- ***Please perform the wiring after the terminal blocks are all removed from the drive.***
- ***Insert only one wire into one terminal on the terminal block.***
- ***When inserting wires, please ensure that the conductors are not shorted to adjacent terminals or wires.***
- ***Ensure to double check the wiring before applying power to the drive.***



### NOTE

- 1) In this manual, actual measured values are in metric units. Dimensions in (imperial units) are for reference only. Please use metric for precise measurements.
- 2) The content of this manual may be revised without prior notice. Please consult our distributors or download the most updated version at <http://www.delta.com.tw/ia>.

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## About this Manual...

### User Information

Be sure to store this manual in a safe place.

Due to constantly growing product range, technical improvement and alteration or changed texts, figures and diagrams, we reserve the right of this manual contained information change without prior notice.

Coping or reproducing any part of this manual, without written consent of Delta Electronics Inc. is prohibited.

### Technical Support and Service

Welcome to contact us or visit our web site (<http://www.delta.com.tw/ia/>) if you need any technical support, service and information, or, if you have any question in using the product. We are looking forward to serve you needs and willing to offer our best support and service to you. Reach us by the following ways.

#### ASIA

DELTA ELECTRONICS, INC.  
Taoyuan Plant 1  
31-1, XINGBANG ROAD,  
GUISHAN INDUSTRIAL ZONE,  
TAOYUAN COUNTY 33370, TAIWAN, R.O.C.  
TEL: 886-3-362-6301  
FAX: 886-3-362-7267

#### JAPAN

DELTA ELECTRONICS (JAPAN), INC.  
Tokyo Office  
DELTA SHIBADAIMON BUILDING  
2-1-14 SHIBADAIMON, MINATO-KU,  
TOKYO, 105-0012, JAPAN  
TEL: 81-3-5733-1111  
FAX: 81-3-5733-1211

#### NORTH/SOUTH AMERICA

DELTA PRODUCTS CORPORATION (USA)  
Raleigh Office  
P.O. BOX 12173  
5101 DAVIS DRIVE,  
RESEARCH TRIANGLE PARK, NC  
27709, U.S.A.  
TEL: 1-919-767-3813  
FAX: 1-919-767-3969

#### EUROPE

DELTRONICS (THE NETHERLANDS) B.V.  
Eindhoven Office  
DE WITBOGT 15, 5652 AG EINDHOVEN,  
THE NETHERLANDS  
TEL: 31-40-259-2850  
FAX: 31-40-259-2851

# Chapter 1 Unpacking Check and Model Explanation

---

## 1.1 Unpacking Check

After receiving the AC servo drive, please check for the following:

- **Ensure that the product is what you have ordered.**

Verify the part number indicated on the nameplate corresponds with the part number of your order (Please refer to Section 1.2 for details about the model explanation).

- **Ensure that the servo motor shaft rotates freely.**

Rotate the motor shaft by hand; a smooth rotation will indicate a good motor. However, a servo motor with an electromagnetic brake can not be rotated manually.

- **Check for damage.**

Inspect the unit to insure it was not damaged during shipment.

- **Check for loose screws.**

Ensure that all necessary screws are tight and secure.

If any items are damaged or incorrect, please inform the distributor whom you purchased the product from or your local Delta sales representative.

A complete and workable AC servo system should include the following parts:

Part I : Delta standard supplied parts

### **220V series**

- (1) Servo drive
- (2) Servo motor
- (3) 6 PIN Terminal Block (for L1c, L2c,  $\ominus$ , R, S, T)
- (4) 3 PIN Terminal Block (for R, S, T)
- (5) 3 PIN Terminal Block (for L1c, L2c,  $\ominus$ )
- (6) 6 PIN Terminal Block (for L1c, L2c,  $\ominus$ , R, S, T)

- (7) 3 PIN Quick Connector (for U, V, W)
- (8) 3 PIN Quick Connector (for P<sup>+</sup>, D, C)
- (9) One operating lever (for wire to terminal block insertion)
- (10) One jumper bar (installed at pins P<sup>+</sup> and D of the 3 PIN Terminal Block for P<sup>+</sup>, D, C)
- (11) Instruction Sheets (Multilingual version)

### **400V series**

- (1) Servo drive
- (2) Servo motor
- (3) 3 PIN Terminal Block (for R, S, T)
- (4) 3 PIN Terminal Block (for DC24V, DC0V, <sup>+</sup>)
- (5) Terminal Block (for DC24V, DC0V, R, S, T)
- (6) 3 PIN Quick Connector (for U, V, W)
- (7) 3 PIN Quick Connector (for P<sup>+</sup>, D, C)
- (8) One operating lever (for wire to terminal block insertion, available for 220V series 100W ~ 3kW models and 400V series 750W ~ 1.5kW models)
- (9) One jumper bar (installed at pins P<sup>+</sup> and D of the 3 PIN Terminal Block for P<sup>+</sup>, D, C, available for 220V series 100W ~ 4.5kW models and 400V series 750W ~ 1.5kW models)
- (10) Instruction Sheets (Multilingual version)

### **220V series and 400V series**

Part II : Optional parts (Refer to Appendix A)

- (1) One power cable, which is used to connect servo motor to U, V, W terminals of servo drive. This power cable includes a green grounding cable. Please connect the green grounding cable to the ground terminal of the servo drive.
- (2) One encoder cable, which is used to connect the encoder of servo motor to the CN2 terminal of servo drive.
- (3) CN1 Connector: 50 PIN Connector (3M type analog product)
- (4) CN2 Connector: 20 PIN Connector (3M type analog product)
- (5) CN3 Connector: 6 PIN Connector (IEEE1394 analog product) for general communication (RS-485)
- (6) CN4 Connector: 4 PIN Connector (USB Type B product)
- (7) CN6 Connector: RJ45 Connector for high-speed communication (CANopen)
- (8) CN7 Connector: 7 PIN Connector for extension digital inputs (-U models only)

## ■ Power Input of Servo Drive

### 220V series

	Power of Control Circuit	Power of Main Circuit
100W~3kW	L1c, L2C, ⊖ Quick Connector	R, S, T Quick Connector
4.5kW~15kW	L1c, L2C, ⊖ Terminal Block	R, S, T Terminal Block

### 400V series

	Power of Control Circuit	Power of Main Circuit
750W~1.5kW	DC24V, DC0V, ⊖ Quick Connector	R, S, T Quick Connector
2kW~15kW	DC24V, DC0V, ⊖ Terminal Block	R, S, T Terminal Block

## 1.2 Model Explanation

### 1.2.1 Nameplate Information

#### ASDA-A2 Series Servo Drive

■ Nameplate Explanation

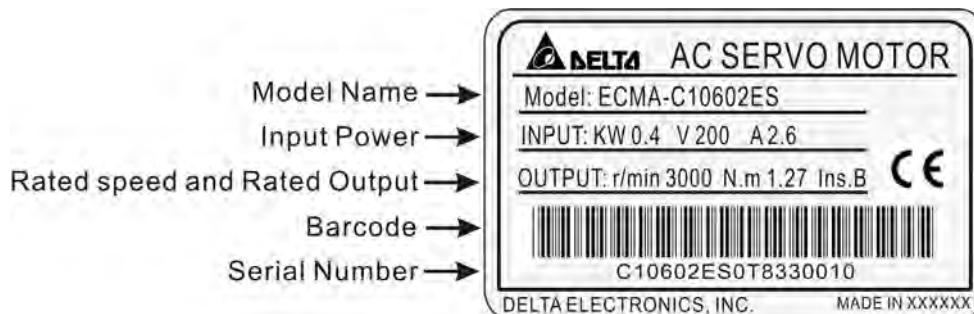


■ Serial Number Explanation

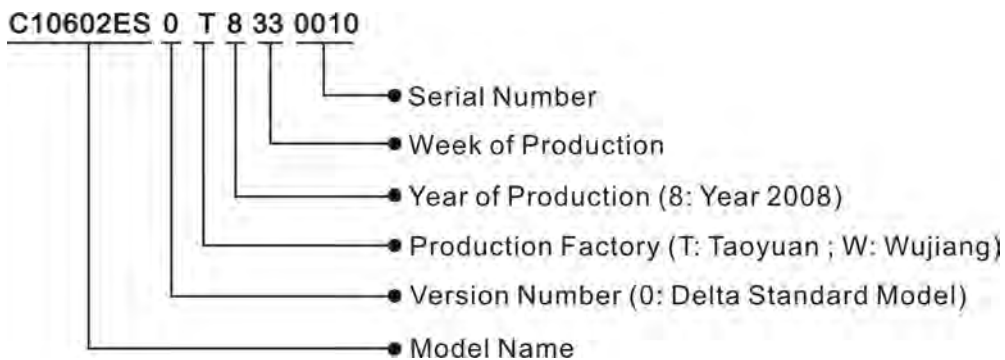


#### ECMA Series Servo Motor

■ Nameplate Explanation



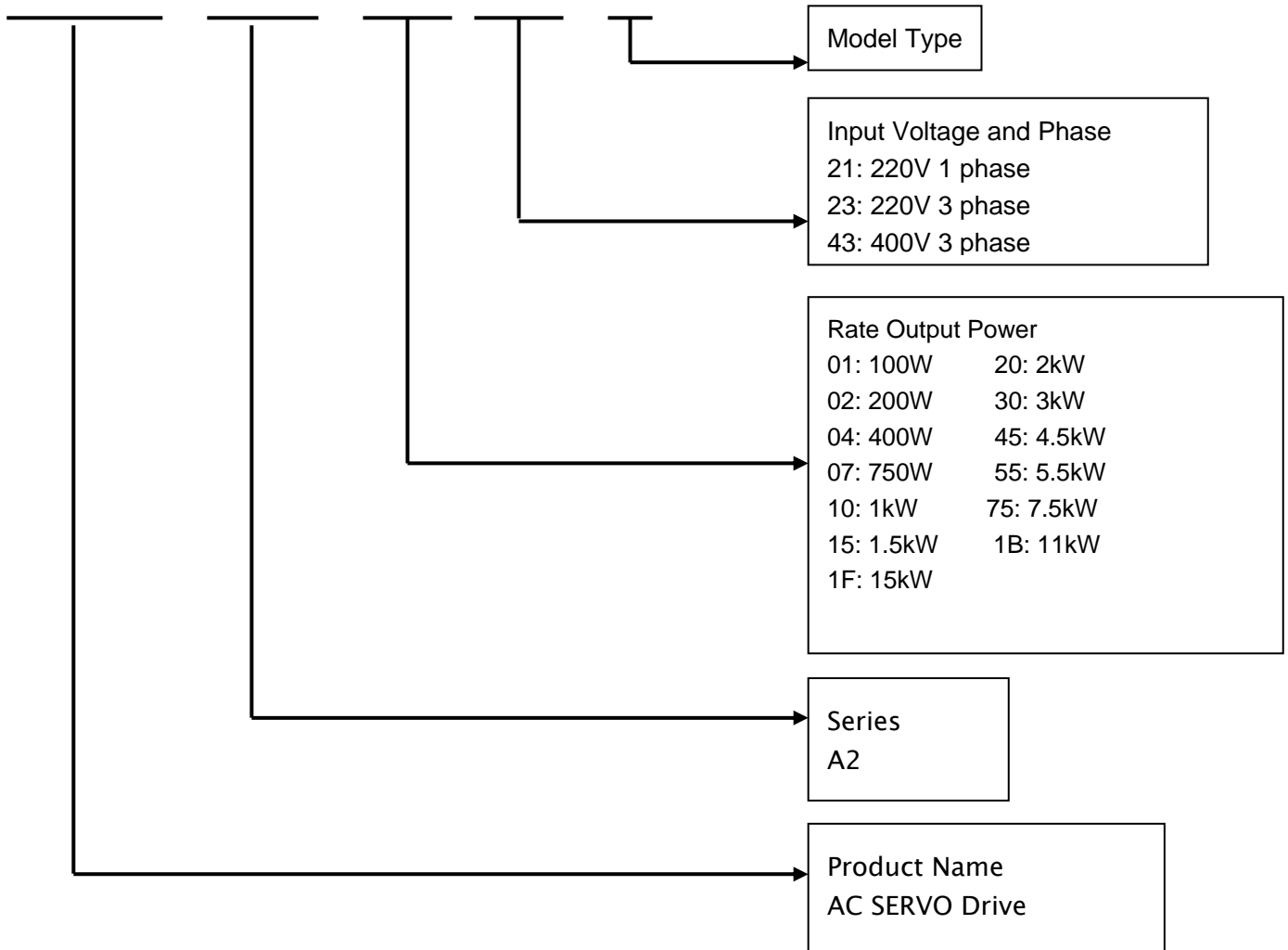
■ Serial Number Explanation



### 1.2.2 Model Name Explanation

#### ASDA-A2 Series Servo Drive

**A S D - A 2 - 0 7 4 3 - U**



#### Model Type

Type	Full-Closed Control	EtherCAT	CANopen	DMCNET	E-CAM	Extension Port for Digital Input
<b>M</b>	○	×	○	×	○	×
<b>U</b>	○	×	×	×	○	○
<b>F</b>	○	×	×	○	×	×
<b>L</b>	○	×	×	×	×	×
<b>E</b>	○	○	×	×	○	×



ECMA Series Servo Motor

**E C M A - C 1 0 6 0 2 E S**

Standard Shaft Diameter: S  
 Specific Shaft Diameter: 3=42mm,  
 7=14mm

Type of Shaft Diameter and Oil Seal	w/o Brake, w/o Oil Seal	with Brake, w/o Oil Seal	w/o Brake, with Oil Seal	With Brake, w/o Oil Seal
Round Shaft (with fixed screw holes)	A	B	C	D
Keyway	E	F	G	H
Keyway (with fixed screw holes)	P	Q	R	S

Rated Power Output

0F:50W	09:900W	50:5.0kW
01:100W	10:1.0kW	55:5.5kW
02:200W	13:1.3kW	75:7.5kW
03:300W	15:1.5kW	1B:11kW
04:400W	18:1.8kW	1F:15kW
05:500W	20:2.0kW	
06:600W	30:3.0kW	
07:700W	35:3.5kW	
08:850W	45:4.5kW	

Motor Frame Size

04:40mm	09:86mm	18:180mm
06:60mm	10:100mm	22:220mm
08:80mm	13:130mm	

Name of the Series  
 Rated Voltage and Rated Speed  
**C** = 220V/3,000 rpm; **E** = 220V/2,000 rpm;  
**F** = 220V/1,500 rpm; **G** = 220V/1,000 rpm;  
**J** = 400V/3,000 rpm; **K** = 400V/2,000 rpm;  
**L** = 400V/1,500 rpm; **M** = 400V/1,000 rpm

Encoder Type  
 1: Incremental, 20-bit  
 2: Incremental, 17-bit  
 A: Absolute (Resolution of single cycle: 17-bit; Resolution of multi-cycle: 16-bit )

Servo Type  
 A:AC Servo

Product Name  
 ECM: Electronic Commutation Motor

## 1.3 Servo Drive and Servo Motor Combinations

The table below shows the possible combination of Delta ASDA-A2 series servo drives and ECMA series servo motors. (Please refer to Section 1.2 for model explanation)

### 1.3.1 220V Series

Power	Servo Drive	Servo Motor
100W	ASD-A2-0121-□	ECMA-C△0401□S (S=8mm) ECMA-C1040F□S (S=8mm)
200W	ASD-A2-0221-□	ECMA-C△0602□S (S=14mm)
400W	ASD-A2-0421-□	ECMA-C△0604□S (S=14mm) ECMA-C△0804□7 (7=14mm) ECMA-E△1305□S (S=22mm) ECMA-G△1303□S (S=22mm)
750W	ASD-A2-0721-□	ECMA-F11305□S (S=22mm) ECMA-C△0807□S (S=19mm) ECMA-C△0907□S (S=16mm) ECMA-G△1306□S (S=22mm)
1000W	ASD-A2-1021-□	ECMA-C△0910□S (S=16mm) ECMA-C△1010□S (S=22mm) ECMA-E△1310□S (S=22mm) ECMA-F△1308□S (S=22mm) ECMA-G△1309□S (S=22mm)
1500W	ASD-A2-1521-□	ECMA-E△1315□S (S=22mm)
2000W	ASD-A2-2023-□	ECMA-C△1020□S (S=22mm) ECMA-E△1320□S (S=22mm) ECMA-E△1820□S (S=35mm) ECMA-F11313□S (S=22mm) ECMA-F11318□S (S=22mm)
3000W	ASD-A2-3023-□	ECMA-C△1330□4 (4=24mm) ECMA-E△1830□S (S=35mm) ECMA-E△1835□S (S=35mm) ECMA-F△1830□S (S=35mm)
4500W	ASD-A2-4523-□	ECMA-F△1845□S (S=35mm)
5500W	ASD-A2-5523-□	ECMA-F△1855□3 (3=42mm)
7500W	ASD-A2-7523-□	ECMA-F△1875□3 (3=42mm)
*11kW	ASD-A2-1B23-□	ECMA-F1221B□3 (3=42mm)
*15kW	ASD-A2-1F23-□	ECMA-F1221F□S (S=55mm)

 **NOTE**

- 1) The boxes (□) at the ends of the servo drive model names are for optional configurations (Full-closed Control, CANopen, DMCNET, Extension Port for Digital Input and Electronic Cam). For the actual model name, please refer to the ordering information of the actual purchased product.
- 2) The boxes (△) in the model names are for encoder resolution types. △=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit; △=A: Absolute type).
- 3) The boxes (□) in the model names are for optional configurations (keyway, brake and oil seal).
- 4) \*11kw and 15kW will be available soon.

The drives shown in the above table are designed according to the three multiple of rated current of motors shown in the above table. If the drives which are designed according to the six multiple of rated current of motors are needed, please contact our distributors or your local Delta sales representative.

### 1.3.2 400V Series

Power	Servo Drive	Servo Motor
750W	ASD-A2-0743-□	ECMA-J10604□S (S=14mm) ECMA-J10807□S (S=19mm)
1000W	ASD-A2-1043-□	ECMA-K11310□S (S=22mm) ECMA-L11308□S (S=22mm)
1500W	ASD-A2-1543-□	ECMA-J11010□S (S=22mm) ECMA-K11315□S (S=22mm) ECMA-M11309□S (S=22mm)
2000W	ASD-A2-2043-□	ECMA-J11020□S (S=22mm) ECMA-K11320□S (S=22mm) ECMA-K11820□S (S=35mm)
3000W	ASD-A2-3043-□	ECMA-L△1830□S (S=35mm) ECMA-J11330□4 (4=24mm)
4500W	ASD-A2-4543-□	ECMA-L11845□S (S=35mm)
5500W	ASD-A2-5543-□	ECMA-L11855□3 (3=42mm)
7500W	ASD-A2-7543-□	ECMA-L11875□3 (3=42mm)

 **NOTE**

- 1) The boxes (□) at the ends of the servo drive model names are for optional configurations (Full-closed Control, CANopen, DMCNET, Extension Port for Digital Input and Electronic Cam). For the actual model name, please refer to the ordering information of the actual purchased product.
- 2) The boxes (△) in the model names are for encoder resolution types. △=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit; △=A: Absolute type).
- 3) The boxes (□) in the model names are for optional configurations (keyway, brake and oil seal).

The drives shown in the above table are designed according to the three multiple of rated current of motors shown in the above table.

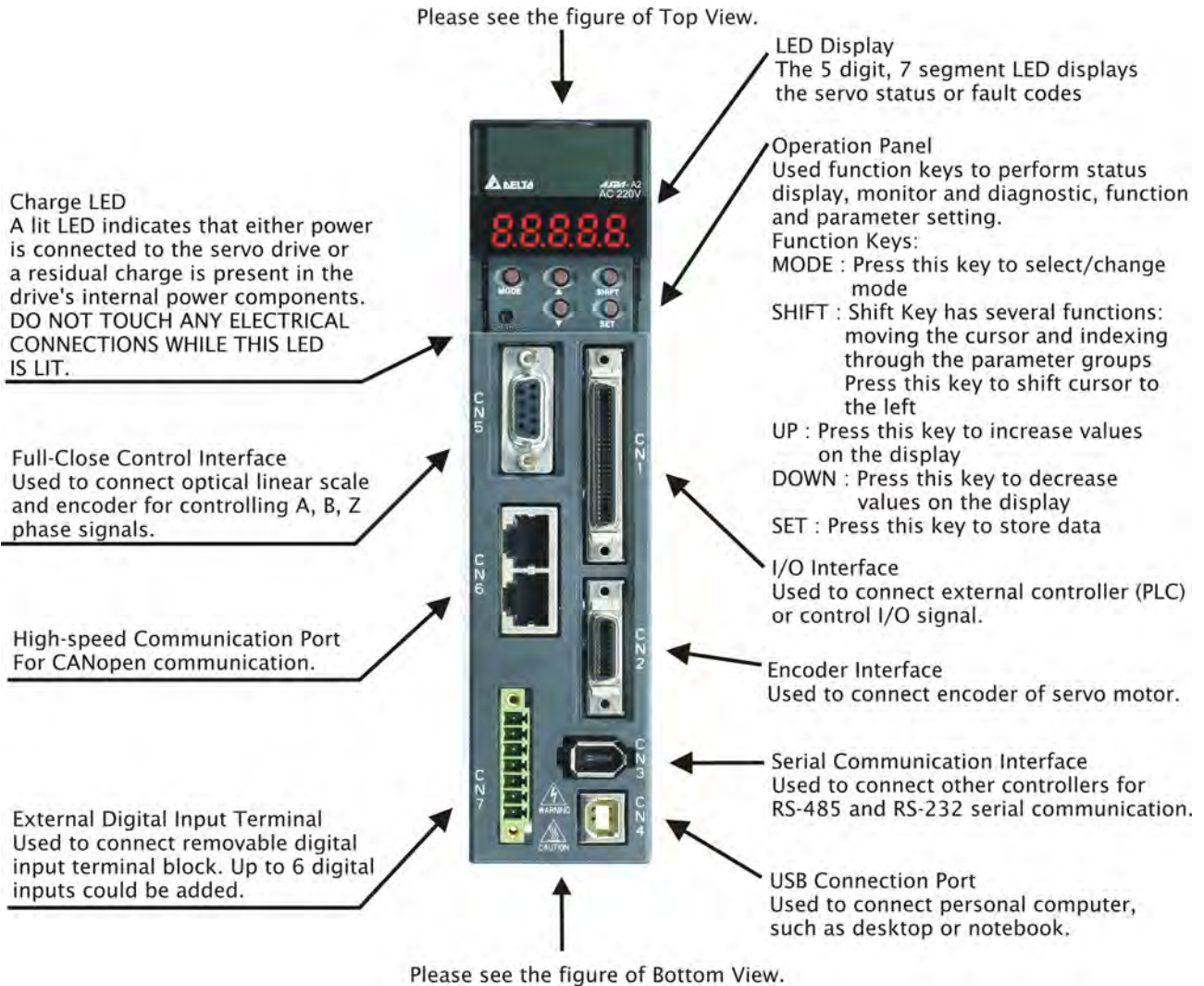
The servo drives shown in the above two tables are designed for use in combination with the specific servo motors. Check the specifications of the drives and motors you want to use.

Also, please ensure that both the servo drive and motor are correctly matched for size (power rating). If the power of motor and drive is not within the specifications, the drive and motor may overheat and servo alarm would be activated. For the detail specifications of servo drives and motors, please refer to Chapter 11 “Specifications”.

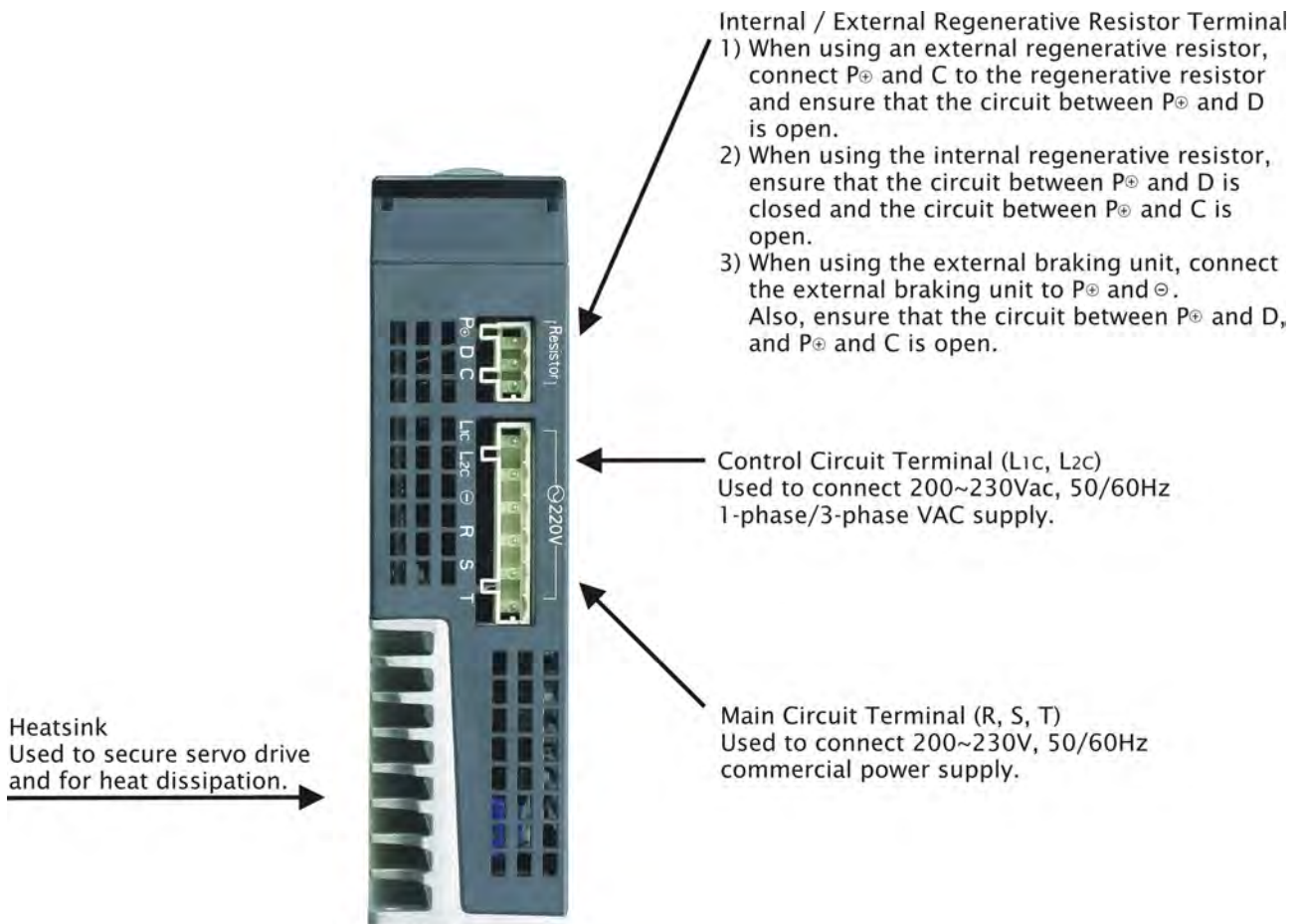
# 1.4 Servo Drive Features

## 1.4.1 220V Series

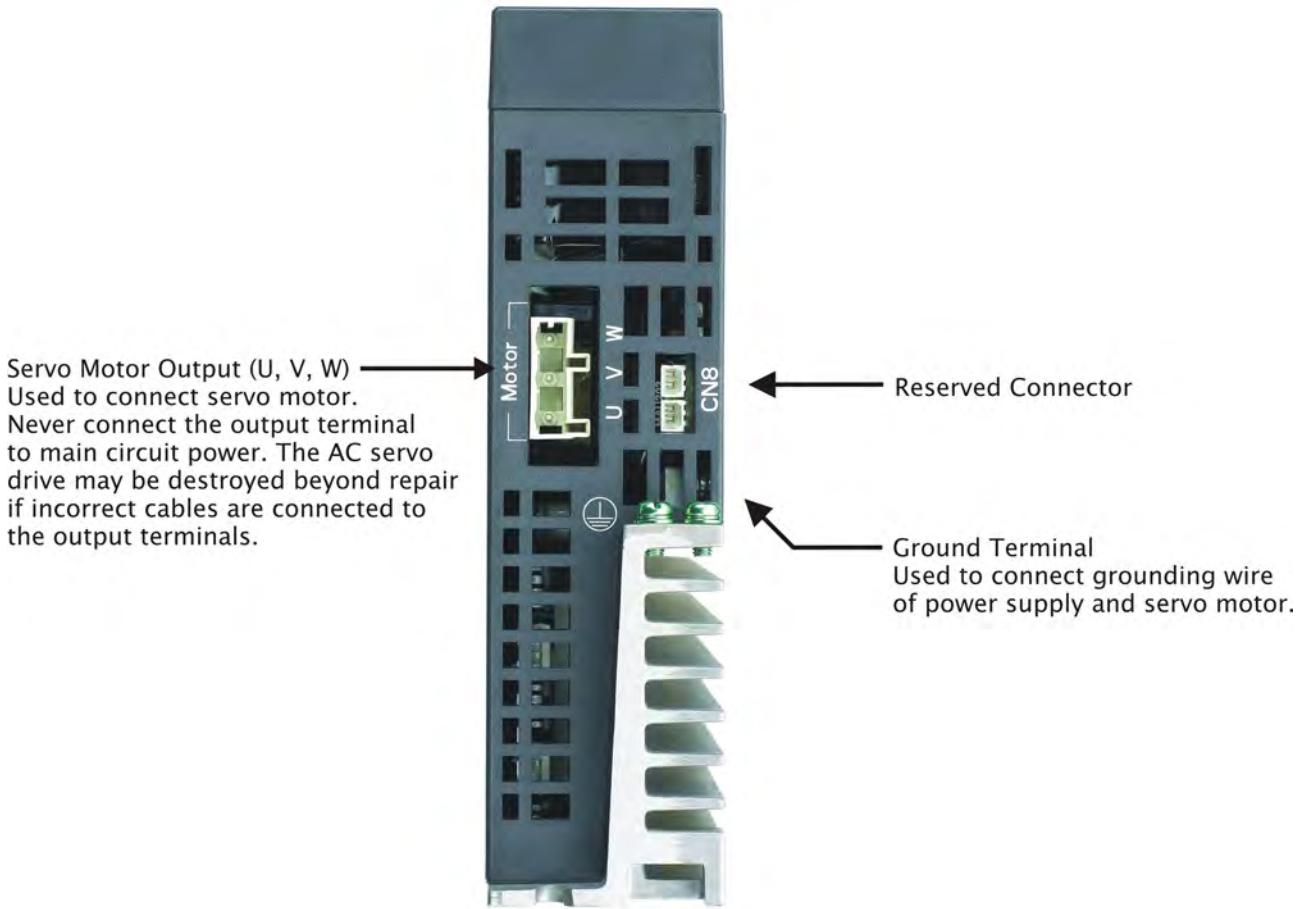
### 220V Series - Front View



## 220V Series - Top View

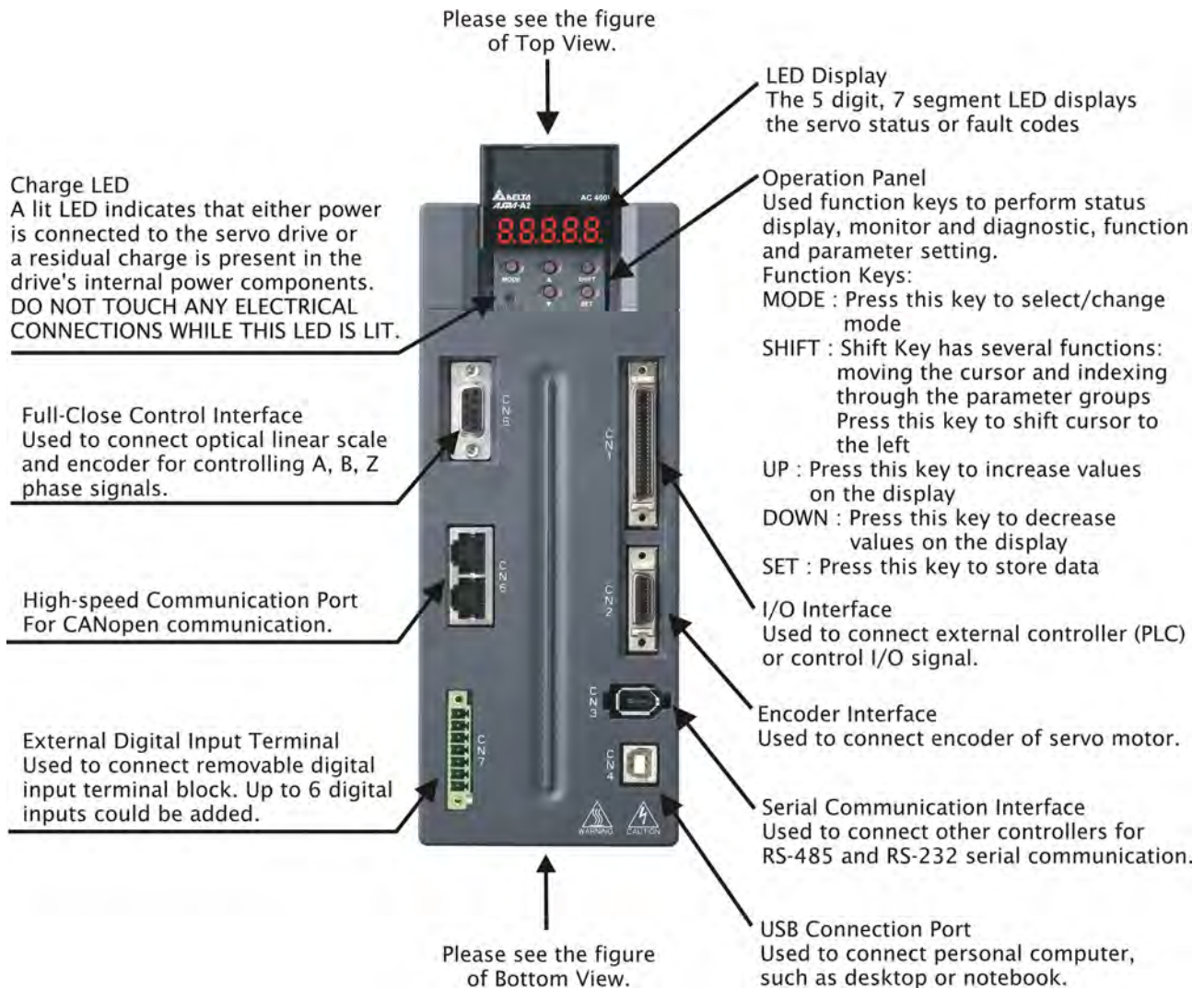


### 220V Series - Bottom View



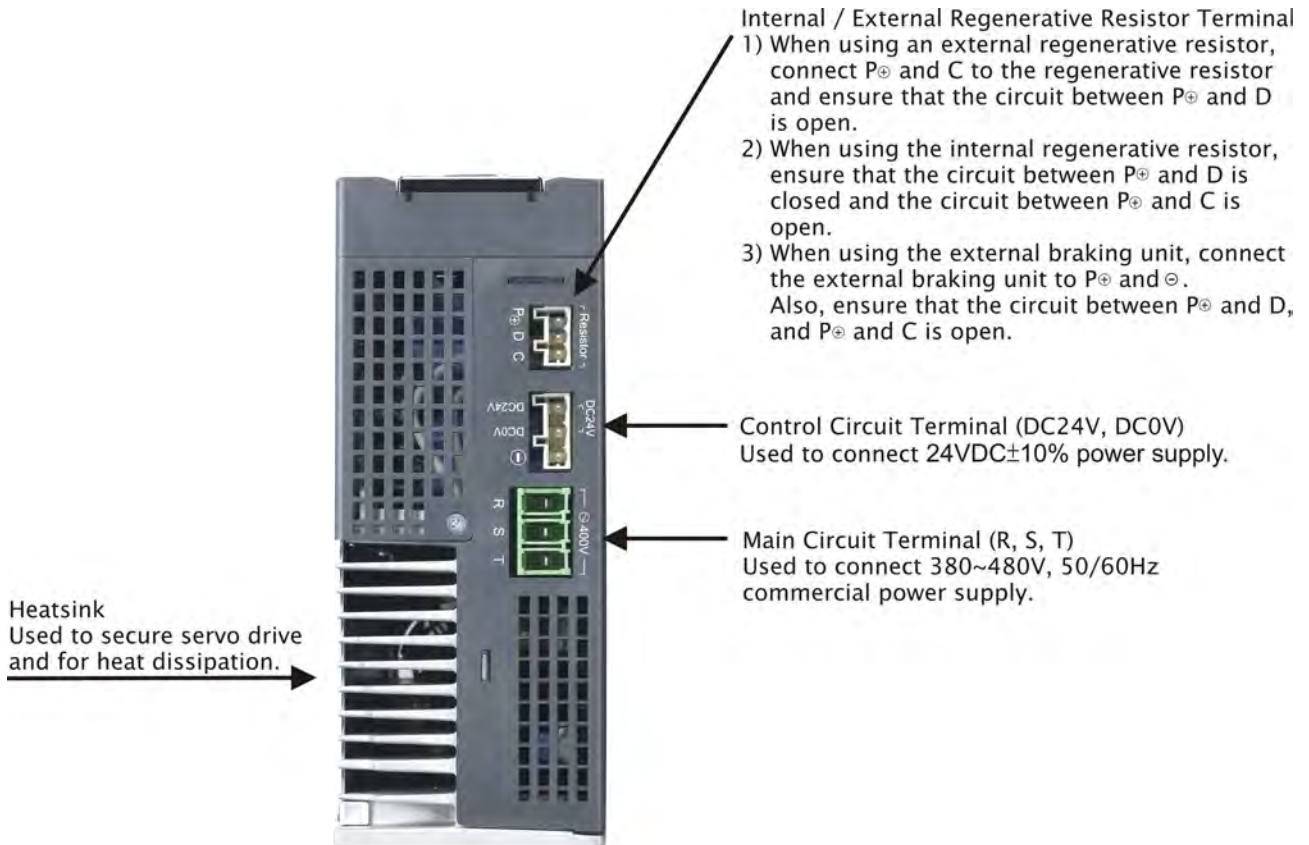


## 1.4.2 420V Series 400V Series - Front View

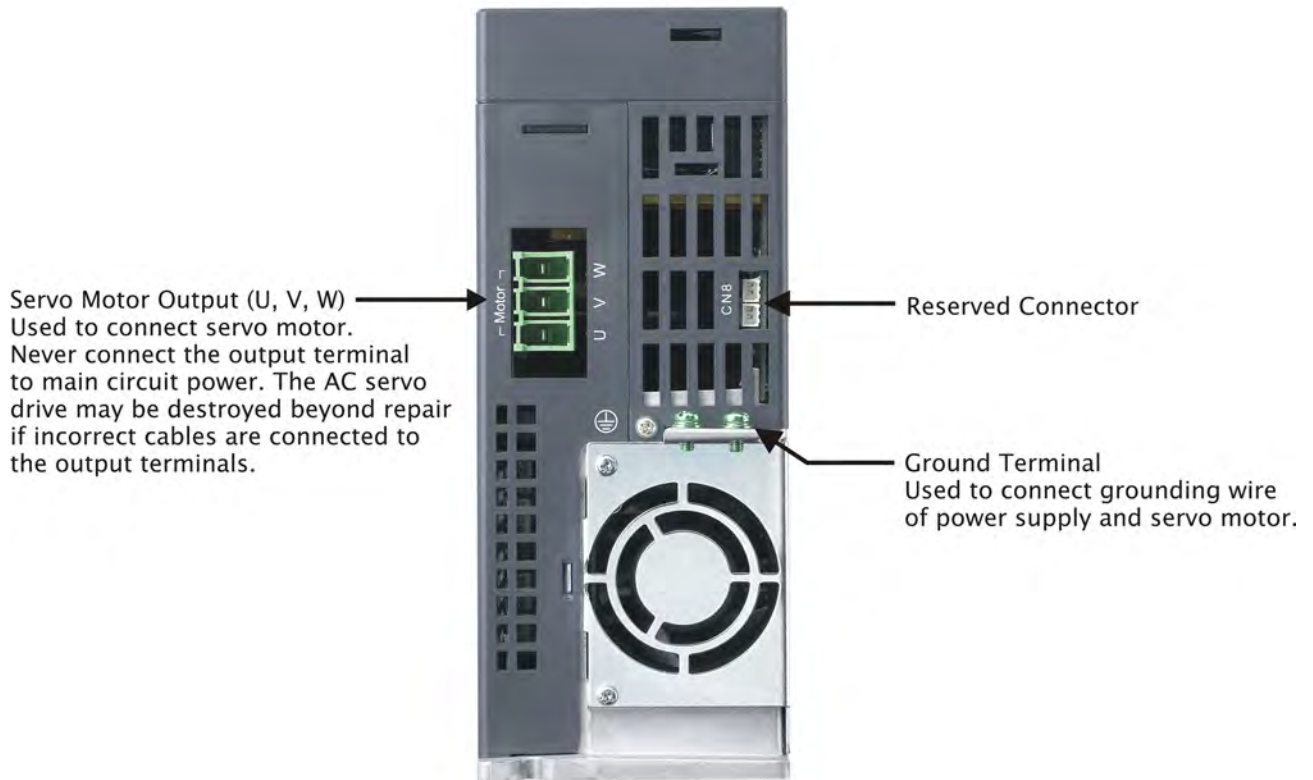




### 400V Series - Top View



## 400V Series - Bottom View



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# Chapter 2 Installation and Storage

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## 2.1 Installation Notes

Please pay close attention on the following installation notes:

- Do not bend or strain the connection cables between servo drive and motor.
- When mounting the servo drive, make sure to tighten all screws to secure the drive in place.
- If the servo motor shaft is coupled directly to a rotating device ensure that the alignment specifications of the servo motor, coupling, and device are followed. Failure to do so may cause unnecessary loads or premature failure to the servo motor.
- If the length of cable connected between servo drive and motor is more than 20m, please increase the wire gauge of the encoder cable and motor connection cable (connected to U, V, W terminals).
- Make sure to tighten the screws for securing motor.

## 2.2 Storage Conditions

The product should be kept in the shipping carton before installation. In order to retain the warranty coverage, the AC servo drive should be stored properly when it is not to be used for an extended period of time. Some storage suggestions are:

- Store in a clean and dry location free from direct sunlight.
- Store within an ambient temperature range of -20°C to +65°C (-4°F to 149°F).
- Store within a relative humidity range of 0% to 90% and non-condensing.
- Do not store in a place subjected to corrosive gases and liquids.
- Correctly packaged and placed on a solid surface.

## 2.3 Installation Conditions

### Operating Temperature

ASDA-A2 Series Servo Drive: 0°C to 55°C (32°F to 131°F)

ECMA Series Servo Motor: 0°C to 40°C (32°F to 104°F)

**The ambient temperature of servo drive for long-term reliability should be under 45°C (113°F).**

If the ambient temperature of servo drive is greater than 45°C (113°F), please install the drive in a well-ventilated location and do not obstruct the airflow for the cooling fan.

### Caution

The servo drive and motor will generate heat. If they are installed in a control panel, please ensure sufficient space around the units for heat dissipation.

Pay particular attention to vibration of the units and check if the vibration has impacted the electric devices in the control panel. Please observe the following precautions when selecting a mounting location. ***Failure to observe the following precautions may void the warranty!***

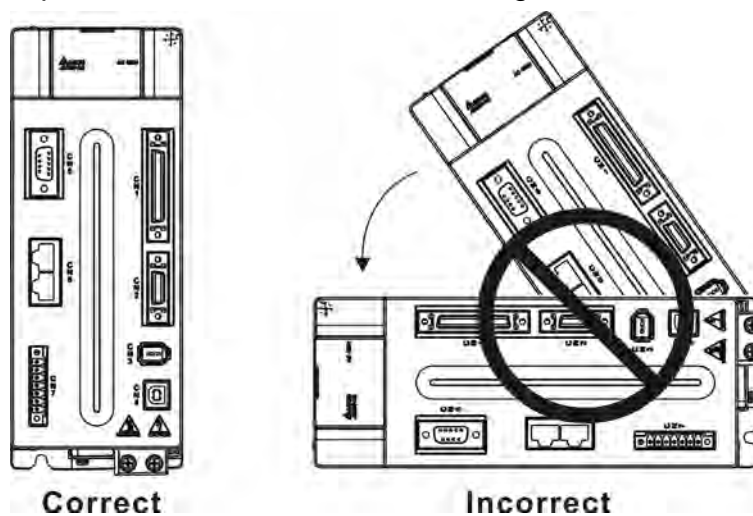
- Do not mount the servo drive or motor adjacent to heat-radiating elements or in direct sunlight.
- Do not mount the servo drive or motor in a location subjected to corrosive gases, liquids, or airborne dust or metallic particles.
- Do not mount the servo drive or motor in a location where temperatures and humidity will exceed specification.
- Do not mount the servo drive or motor in a location where vibration and shock will exceed specification.
- Do not mount the servo drive or motor in a location where it will be subjected to high levels of electromagnetic radiation.

## 2.4 Installation Procedure and Minimum Clearances

### Installation Procedure

Incorrect installation may result in a drive malfunction or premature failure of the drive and or motor. Please follow the guidelines in this manual when installing the servo drive and motor.

The ASDA-A2 servo drive should be mounted perpendicular to the wall or in the control panel. In order to ensure the drive is well ventilated, ensure that the all ventilation holes are not obstructed and sufficient free space is given to the servo drive. Do not install the drive in a horizontal position or malfunction and damage will occur.



### Drive Mounting

The ASDA-A2 Servo drives must be back mounted vertically on a dry and solid surface such as a NEMA enclosure. A minimum spacing of two inches must be maintained above and below the drive for ventilation and heat dissipation. Additional space may be necessary for wiring and cable connections. Also, as the drive conducts heat away via the mounting, the mounting plane or surface should not conduct heat into the drive from external sources

### Motor Mounting

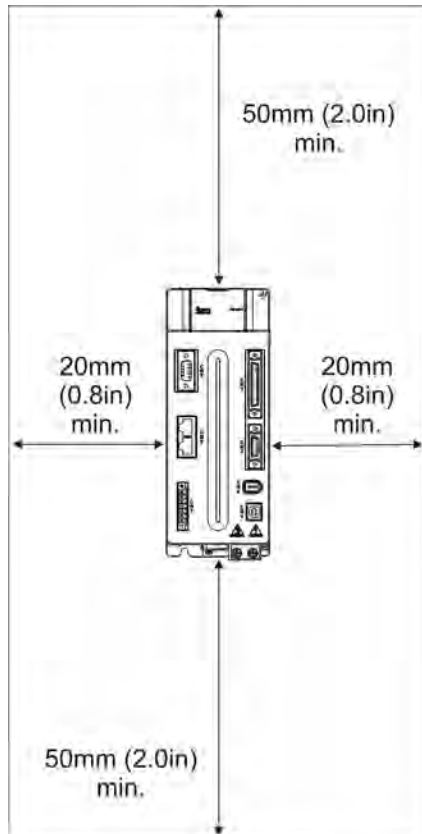
The ECMA Servo motors should be mounted firmly to a dry and solid mounting surface to ensure maximum heat transfer for maximum power output and to provide a good ground. For the dimensions and weights specifications of servo drive or motor, please refer to Chapter 11 "Specifications".

## Minimum Clearances

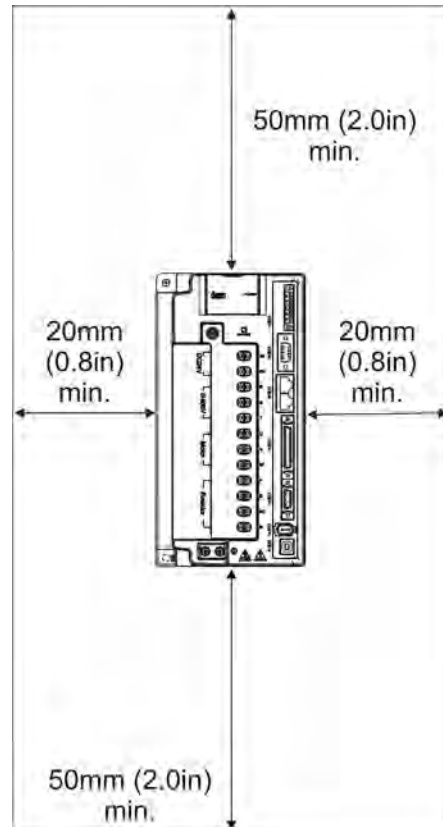
Install a fan to increase ventilation to avoid ambient temperatures that exceed the specification. When installing two or more drives adjacent to each other please follow the clearances as shown in the following diagram.

### ■ Minimum Clearances

750W ~ 1.5kW models:



2kW ~ 5.5kW models:

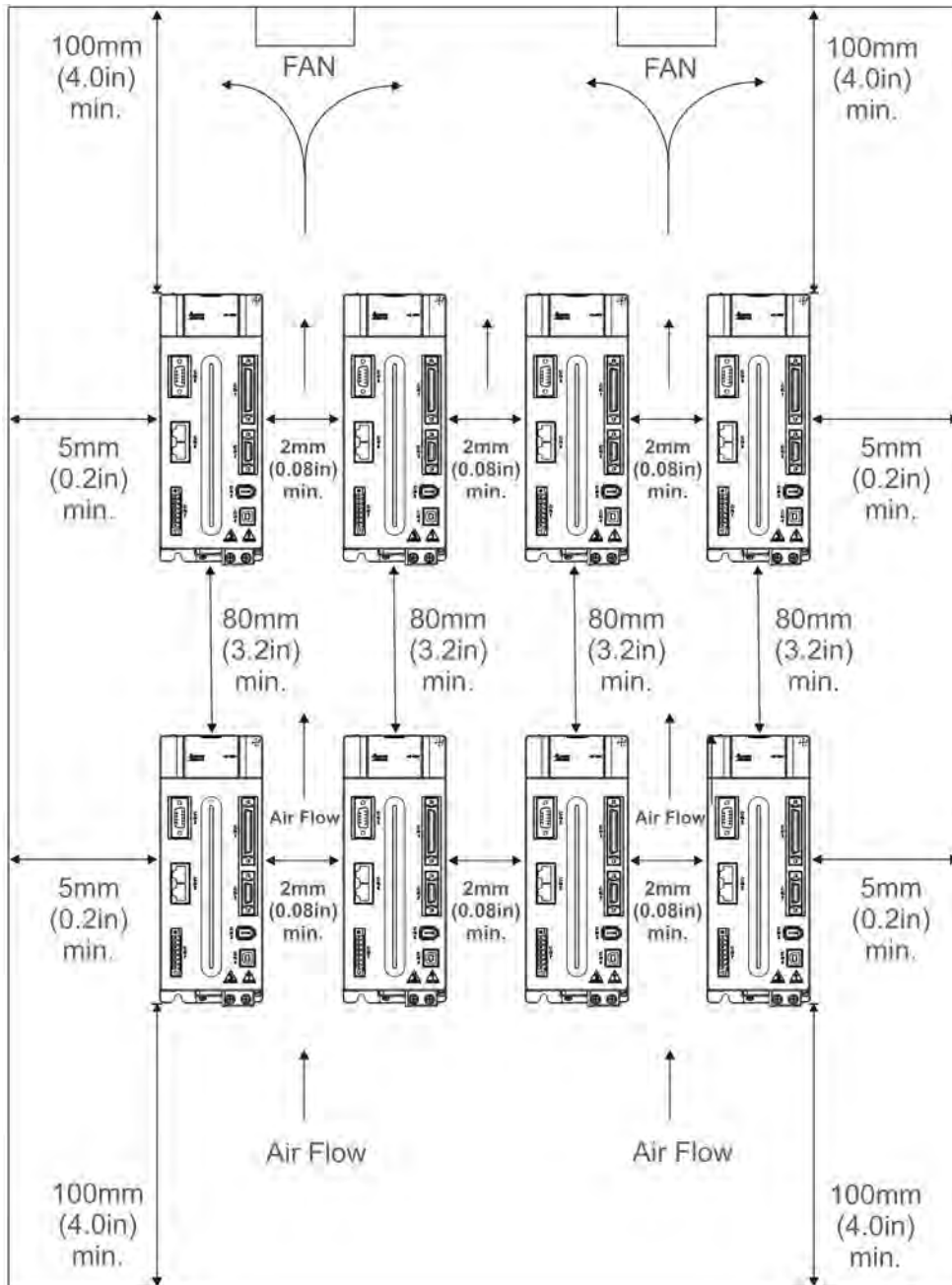


### NOTE

The scale of the clearances does not match the dimensions as shown in the drawing above. In the event of any discrepancy between the clearances and the dimensions, the dimensions shall prevail.

■ Side by Side Installation

750W ~ 1.5kW models:

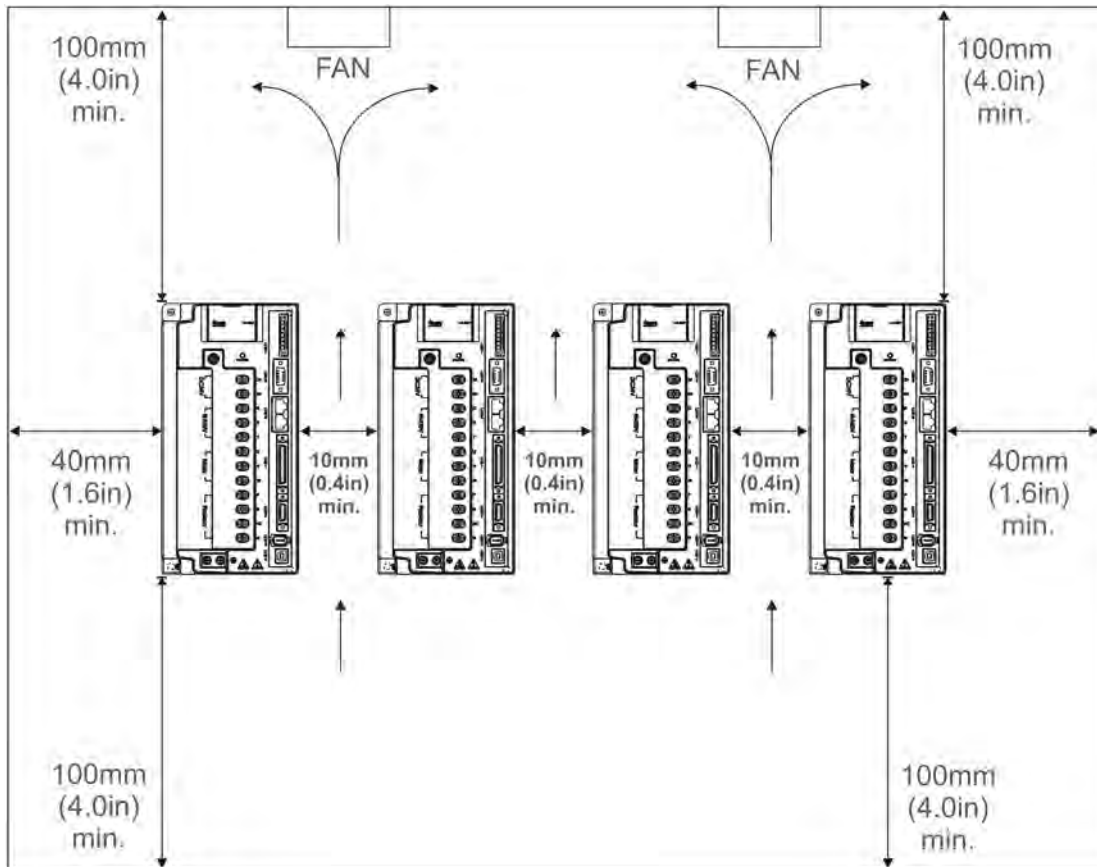


 **NOTE**

The scale of the clearances does not match the dimensions as shown in the drawing above. In the event of any discrepancy between the clearances and the dimensions, the dimensions shall prevail.



2kW ~ 5.5kW models:



 **NOTE**

The scale of the clearances does not match the dimensions as shown in the drawing above. In the event of any discrepancy between the clearances and the dimensions, the dimensions shall prevail.

## 2.5 Circuit Interrupter and Fuse Current Recommended Value



➤ **Caution:** Please use circuit interrupter and fuse which are recognized by and comply with the UL or CSA standards.

### 220V Series

Servo Drive Model	Recommended Breaker	Recommended Fuse (Class T)
Operation Mode	General	General
ASD-A2-0121-□	5A	5A
ASD-A2-0221-□	5A	5A
ASD-A2-0421-□	10A	10A
ASD-A2-0721-□	10A	20A
ASD-A2-1021-□	15A	25A
ASD-A2-1521-□	20A	40A
ASD-A2-2023-□	30A	50A
ASD-A2-3023-□	30A	70A
ASD-A2-4523-□	70A	140A
ASD-A2-5523-□	75A	150A
ASD-A2-7523-□	95A	175A
ASD-A2-1B23-□	-	-
ASD-A2-1F23-□	-	-

### 400V Series

Servo Drive Model	Recommended Breaker	Recommended Fuse (Class T)
Operation Mode	General	General
ASD-A2-0743-□	10A	20A
ASD-A2-1043-□	15A	25A
ASD-A2-1543-□	20A	40A
ASD-A2-2043-□	30A	50A
ASD-A2-3043-□	30A	70A
ASD-A2-4543-□	70A	140A
ASD-A2-5543-□	75A	150A
ASD-A2-7543-□	95A	175A

### NOTE

When using a GFCI (Ground Fault Circuit Interrupter), select a current sensor with sensitivity of equal to or more than 200mA, and not less than 0.1-second detection time to avoid nuisance tripping.

## 2.6 EMI Filter Selection

### AC Servo Drive - EMI Filter Cross Reference

#### 220V Series

Item	Power	Servo Drive Model	Recommended EMI Filter		FootPrint
			1PH	3PH	
1	100W	ASD-A2-0121-□	RF007S21AA	RF022B43AA	N
2	200W	ASD-A2-0221-□	RF007S21AA	RF022B43AA	N
3	400W	ASD-A2-0421-□	RF007S21AA	RF022B43AA	N
4	750W	ASD-A2-0721-□	RF007S21AA	RF037B43BA	N
5	1.0kW	ASD-A2-1021-□	RF007S21AA	RF037B43BA	N
6	1.5kW	ASD-A2-1521-□	RF007S21AA	RF037B43BA	N
7	2.0kW	ASD-A2-2023-□	-	RF037B43BA	N
8	3.0kW	ASD-A2-3023-□	-	RF037B43BA	N
9	4.5kW	ASD-A2-4523-□	-	RF075M43BA	N
10	5.5kW	ASD-A2-5523-□	-	RF075M43BA	Y
11	7.5kW	ASD-A2-7523-□	-	30TDRT1W4	Y
12	11.0kW	ASD-A2-1B23-□	-	50TDS4W4C	-
13	15.0kW	ASD-A2-1F23-□	-	50TDS4W4C	-

#### 400V Series

Item	Power	Servo Drive Model	Recommended EMI Filter	FootPrint
1	750W	ASD-A2-0743-□	RF007S43AA	N
2	1000W	ASD-A2-1043-□	RF007S43AA	N
3	1500W	ASD-A2-1543-□	RF022B43AA	N
4	2000W	ASD-A2-2043-□	RF037B43BA	N
5	3000W	ASD-A2-3043-□	RF037B43BA	N
6	4500W	ASD-A2-4543-□	RF075M43BA	N
7	5500W	ASD-A2-5543-□	RF075M43BA	Y
8	7500W	ASD-A2-7543-□	RF075M43BA	Y

#### NOTE

The boxes (□) in the model names are for optional configurations. (Please refer to section 1.2 for model explanation.)

## Installation

All electrical equipment, including AC servo drives, will generate high-frequency/low-frequency noise and will interfere with peripheral equipment by radiation or conduction when in operation. By using an EMI filter with correct installation, much of the interference can be eliminated. It is recommended to use Delta's EMI filter to have the best interference elimination performance.

We assure that it can comply with following rules when AC servo drive and EMI filter are installed and wired according to user manual:

- EN61000-6-4 (2001)
- EN61800-3 (2004) PDS of category C2
- EN55011+A2 (2007) Class A Group 1

## General Precaution

To ensure the best interference elimination performance when using Delta's EMI filter, please follow the guidelines in this user manual to perform wiring and/or installation. In addition, please also observe the following precautions:

- EMI filter and AC servo drive should be installed on the same metal plate.
- Please install AC servo drive on same footprint with EMI filter or install EMI filter as close as possible to the AC servo drive.
- All wiring should be as short as possible.
- Metal plate should be grounded.
- The cover of EMI filter and AC servo drive or grounding should be fixed on the metal plate and the contact area should be as large as possible.

## Choose Suitable Motor Cable and Precautions

Improper installation and choice of motor cable will affect the performance of EMI filter. Be sure to observe the following precautions when selecting motor cable.

- Use the cable with shielding (double shielding is the best).
- The shielding on both ends of the motor cable should be grounded with the minimum length and maximum contact area.
- Remove any paint on metal saddle for good ground contact with the plate and shielding (Please refer to Figure 1 on page B-3).
- The connection between the metal saddle and the shielding on both ends of the motor cable should be correct and well installed. Please refer to Figure 2 on page B-3 for correct wiring method.

Remove any paint on metal saddle for good ground contact with the plate and shielding.

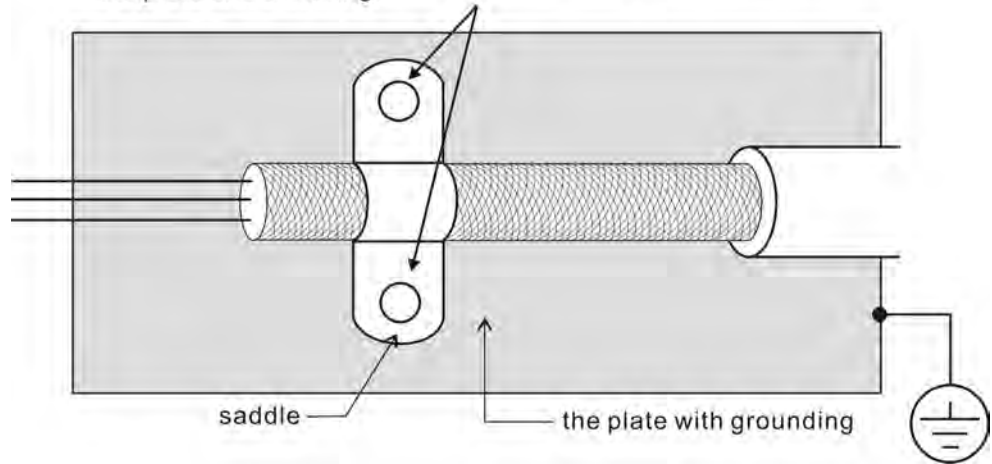
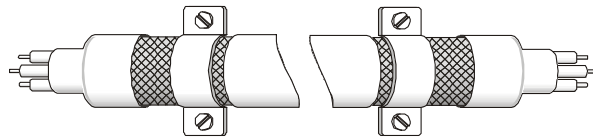
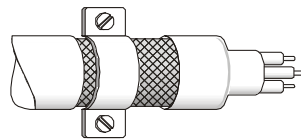


Figure 1



Saddle on both ends

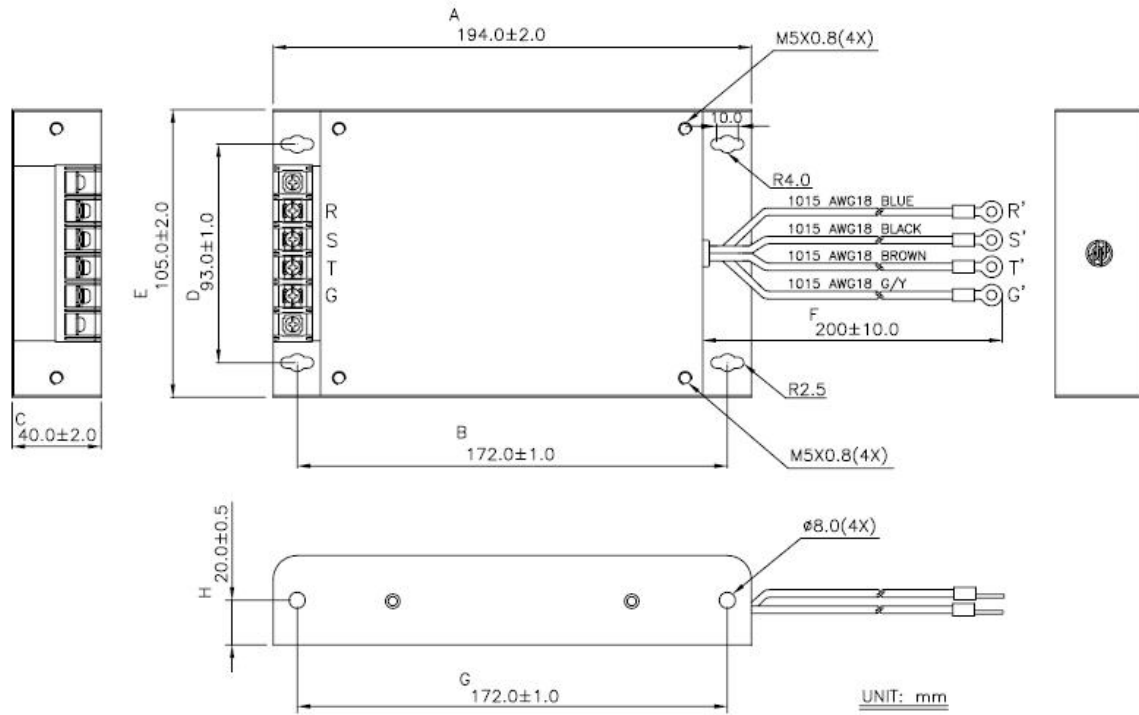


Saddle on one end

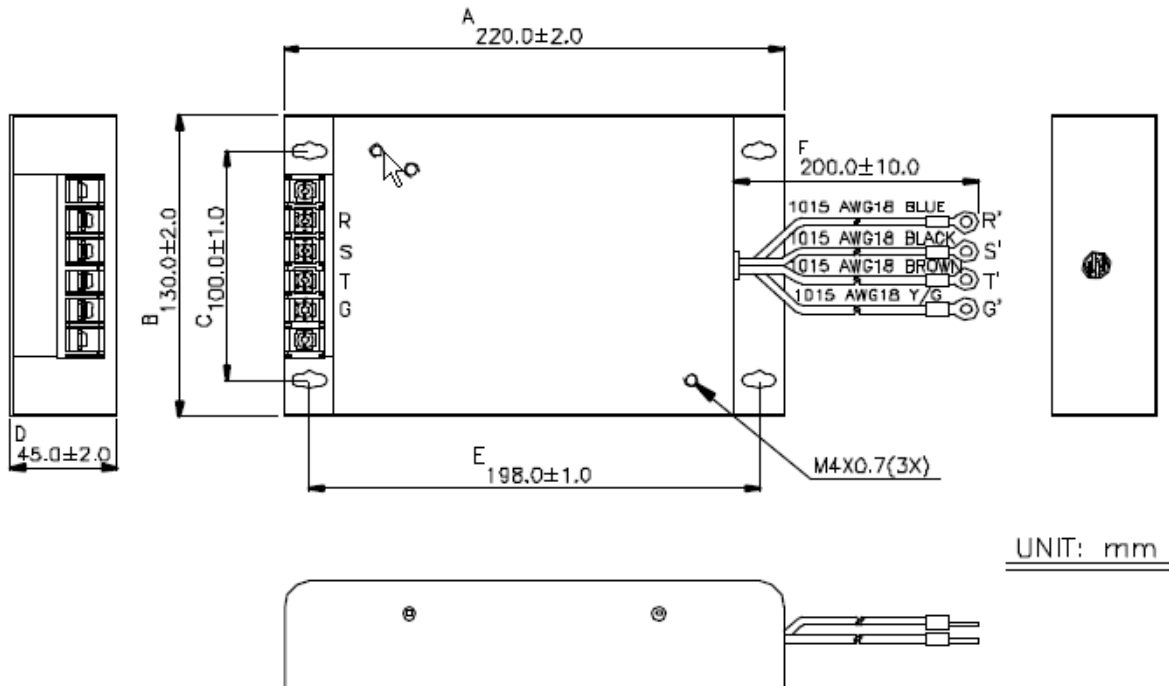
Figure 2

### Dimensions

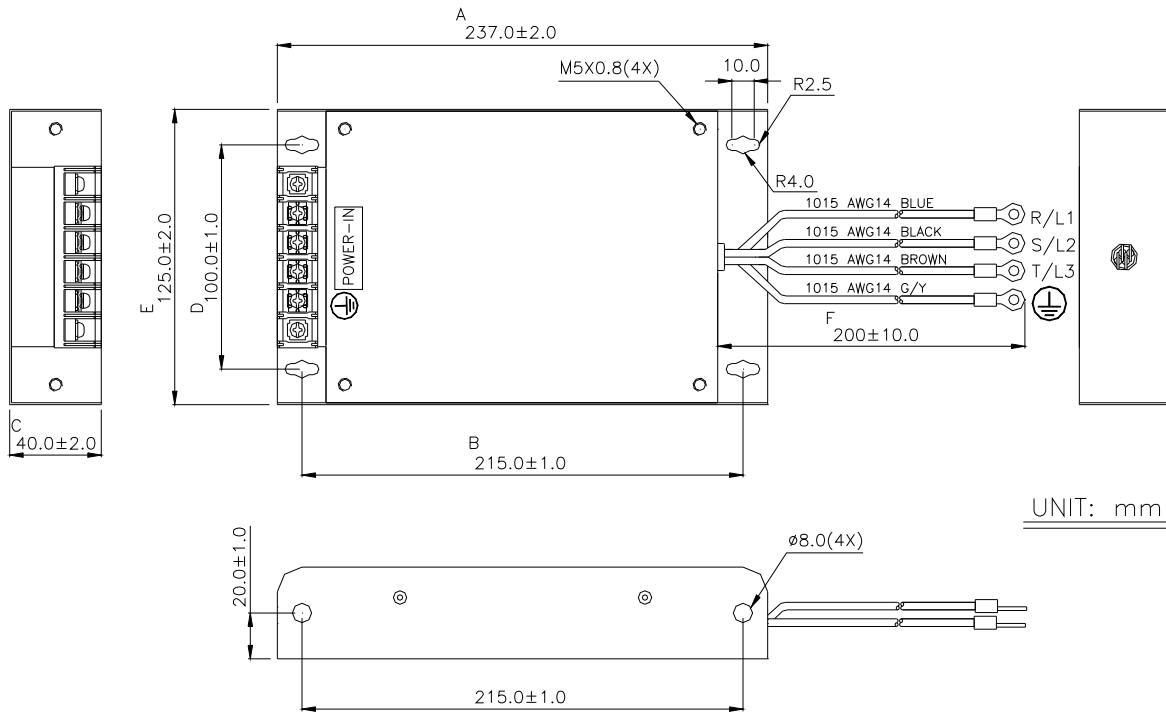
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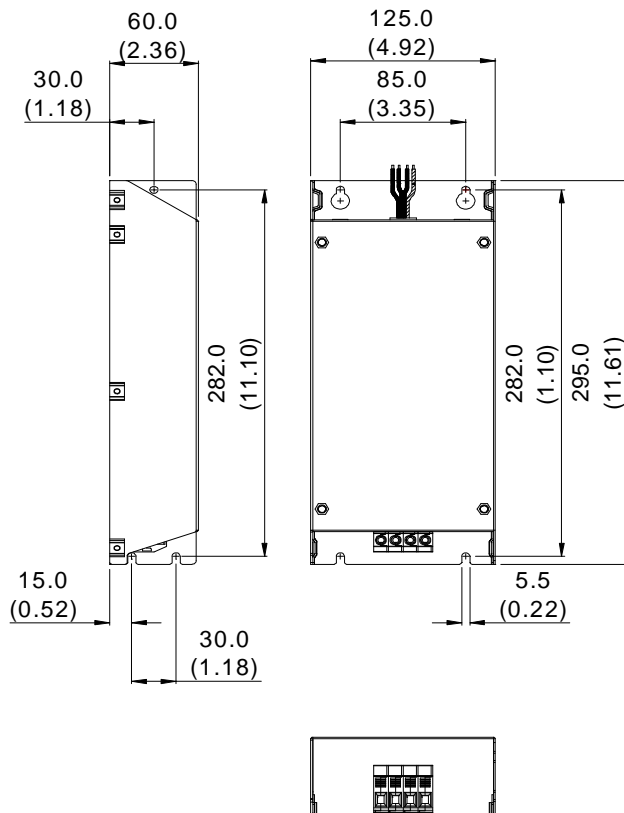
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Delta Part Number: 20TDT1W4D



Delta Part Number: RF075M43BA



## 2.7 Regenerative Resistors

### ■ Built-in Regenerative Resistor

When the output torque of servo motor in reverse direction of motor rotation speed, it indicates that regenerative power has returned from the load to the servo drive. This power will be transmitted into the capacitance of the DC Bus and result in rising voltage. When the voltage rises too high, the servo system need to dissipate the extra energy by using a regenerative resistor. The ASDA-A2 series servo drive provides a built-in regenerative resistor which is equipped as standard (400W~4.5kW models only). Users can also connect an external regenerative resistor if more regenerative capacity is needed.

The following table shows the specifications of the servo drive's built-in regenerative resistor and the amount of regenerative power (average value) that it can process.

### 220V Series

Specifications of Built-in Regenerative Resistors				
Servo Drive (kW)	Resistance (Ohm) (Parameter P1-52)	Capacity (Watt) (Parameter P1-53)	Regenerative Power processed by built-in regenerative resistor (Watt) *1	Min. Allowable Resistance (Ohm)
0.1	-	-	-	30
0.2	-	-	-	30
0.4	40	40	-	30
0.75	40	60	30	20
1.0	40	60	30	20
1.5	40	60	30	20
2.0	20	100	50	10
3.0	20	100	50	10
4.5	20	100	50	10
5.5	-	-	-	8
7.5	-	-	-	5
11.0	-	-	-	5
15.0	-	-	-	3

### 400V Series

Specifications of Built-in Regenerative Resistors			
Servo Drive (kW)	Resistance (Ohm) (Parameter P1-52)	Capacity (Watt) (Parameter P1-53)	Min. Allowable Resistance (Ohm)
0.75	80	100	60
1.0	80	100	60
1.5	80	100	40



Specifications of Built-in Regenerative Resistors			
Servo Drive (kW)	Resistance (Ohm) (Parameter P1-52)	Capacity (Watt) (Parameter P1-53)	Min. Allowable Resistance (Ohm)
2.0	-	-	40
3.0	-	-	30
4.5	-	-	20
5.5	-	-	20
7.5	-	-	15

When the regenerative power exceeds the processing capacity of the servo drive, install an external regenerative resistor. Please pay close attention to the following notes when using a regenerative resistor.

1. Make sure the settings of resistance (parameter P1-52) and capacity (parameter P1-53) are set correctly.
2. When installing an external regenerative resistor, make sure that its resistance value is the same as the resistance of the built-in regenerative resistor. If combining multiple small-capacity regenerative resistors in parallel to increase the regenerative resistor capacity, make sure that the resistance value of the regenerative resistor complies with the specifications listed in the table above.
3. In general, when the amount of regenerative power (average value) that can be processed is used at or below the rated load ratio, the resistance temperature will increase to 120°C or higher (when the regeneration occurs continuously). For safety reasons, forced air cooling is a good way to reduce the temperature of the regenerative resistors. We also recommend using regenerative resistors with thermal switches. As for the load characteristics of the regenerative resistors, please check with the manufacturer.

### ■ External Regenerative Resistor

When using an external regenerative resistor, connect it to P<sup>+</sup> and C, and make sure the circuit between P<sup>+</sup> and D is open. We recommend using external regenerative resistors with resistance values that follow the table above (Specifications of Built-in Regenerative Resistors). We ignore the dissipative power of IGBT (Insulated Gate Bipolar Transistor) in order to let the users easily calculate the capacity of regenerative resistor. In the following sections, we will describe Regenerative Power Calculation Method and Simple Calculation Method for calculating the regenerative power capacity of external regenerative resistors.

## ■ Regenerative Power Calculation Method

### (1) Without Load

When there is no external load torque, if the servo motor repeats operation, the returned regenerative power generated when braking will be transmitted into the capacitance of DC bus. After the capacitance voltage exceeds some high value, regenerative resistor can dissipate the remained regenerative power. Use the table and procedure described below to calculate the regenerative power.

### 220V Series

Servo Drive (kW)	Servo Motor	Rotor Inertia J ( $\times 10^{-4}\text{kg}\cdot\text{m}^2$ )	Regenerative power from empty load 3000r/min to stop Eo (joule)	Max. regenerative power of capacitance Ec (joule)	
Low Inertia	0.05	ECMA-C1040F□□	0.021	0.10	4.21
	0.1	ECMA-C10401□□	0.037	0.18	4.21
	0.2	ECMA-C10602□□	0.177	0.87	5.62
	0.4	ECMA-C10604□□	0.277	1.37	8.42
		ECMA-C10804□□	0.68	3.36	
	0.75	ECMA-C10807□□	1.13	5.59	17.47
	1.0	ECMA-C11010□□	2.65	13.10	21.22
	2.0	ECMA-C11020□□	4.45	22.0	25.58
3.0	ECMA-C11330□□	12.7	62.80	25.58	
Medium Inertia	0.4	ECMA-E11305□□	8.17	40.40	8.42
	1.0	ECMA-E11310□□	8.41	41.59	21.22
	1.5	ECMA-E11315□□	11.18	55.29	25.58
	2.0	ECMA-E11320□□	14.59	72.15	25.58
		ECMA-E11820□□	34.68	171.49	
	3.0	ECMA-F11830□□	54.95	271.7	31.20
3.5	ECMA-E11835□□	54.95	271.7	31.20	
Medium-High Inertia	0.85	ECMA-F11308□□	14.1	69.73	21.22
	2.0	ECMA-F11313□□	20.0	98.90	25.58
		ECMA-F11318□□	24.9	123.13	31.20
	3.0	ECMA-F11830□□	54.95	217.73	28
	4.5	ECMA-F11845□□	77.75	384.48	25
	5.5	ECMA-F11855□□	99.78	493.42	27
	7.5	ECMA-F11875□□	142.7	705.66	93
	11.0	ECMA-F1221B□□	329.0	723.08	117
15.0	ECMA-F1221F□□	553.0	1215.38	156	
High Inertia	0.4	ECMA-G11303□□	8.17	17.96	8.42
	0.75	ECMA-F11305□□	10.3	22.64	17.47
		ECMA-G11306□□	8.41	18.48	17.47

	1.0	ECMA-G11309□□	11.18	24.57	21.22
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$$E_o = J \times \omega r^2 / 182 \text{ (joule)} \quad , \quad \omega r : \text{r/min}$$

### 400V Series

Servo Drive (kW)		Servo Motor	Rotor Inertia J ( $\times 10^{-4} \text{kg.m}^2$ )	Regenerative power from empty load 3000r/min to stop $E_o$ (joule)	Max. regenerative power of capacitance $E_c$ (joule)
Low Inertia	0.4	ECMA-J10604□□	0.277	1.37	42.43
	0.75	ECMA-J10807□□	1.13	5.59	42.43
	1.0	ECMA-J11010□□	2.65	13.10	42.43
	2.0	ECMA-J11020□□	4.45	22.01	42.43
Medium Inertia	1.0	ECMA-K11310□□	8.41	41.59	51.17
	1.5	ECMA-K11315□□	11.18	55.29	57.41
	2.0	ECMA-K11320□□	14.59	72.15	34.94
		ECMA-K11820□□	34.68	171.49	34.94
Medium-High Inertia	3.0	ECMA-L11830□□	54.95	67.93	42.43
	3.0	ECMA-J11330□□	12.7	15.70	42.43
	4.5	ECMA-L11845□□	77.75	96.12	51.17
	5.5	ECMA-L11855□□	99.78	123.35	57.41
	7.5	ECMA-L11875□□	142.7	176.41	62.40
High Inertia	0.85	ECMA-L11308□□	17.1	84.56	42.43
	1.5	ECMA-M11309□□	11.18	55.29	57.41

$$E_o = J \times \omega r^2 / 182 \text{ (joule)} \quad , \quad \omega r : \text{r/min}$$

If the load inertia is  $N \times$  motor inertia, the regenerative power will be  $(N+1) \times E_0$  when servo motor brakes from 3000r/min to 0. Then, the regenerative resistor can dissipate:  $(N+1) \times E_0 - E_c$  (joule). If the time of repeat operation cycle is T sec, then the regenerative power =  $2 \times ((N+1) \times E_0 - E_c) / T$ . The calculating procedure is as follows:

Step	Procedure	Equation and Setting Method
1	Set the capacity of regenerative resistor to the maximum	Change the value of P1-53 to maximum
2	Set the operation cycle T	Input by the users
3	Set motor speed $\omega r$	Input by the users or read via P0-02 Drive State Display
4	Set load/motor inertia ratio N	Input by the users or read via P0-02 Drive State Display
5	Calculate the max. regenerative power $E_o$	$E_o = J \times \omega r^2 / 182$

6	Set the regenerative power $E_c$ that can be absorbed	Refer to the table above
7	Calculate the required regenerative power capacity	$2 \times (N+1) \times E_o - E_c / T$

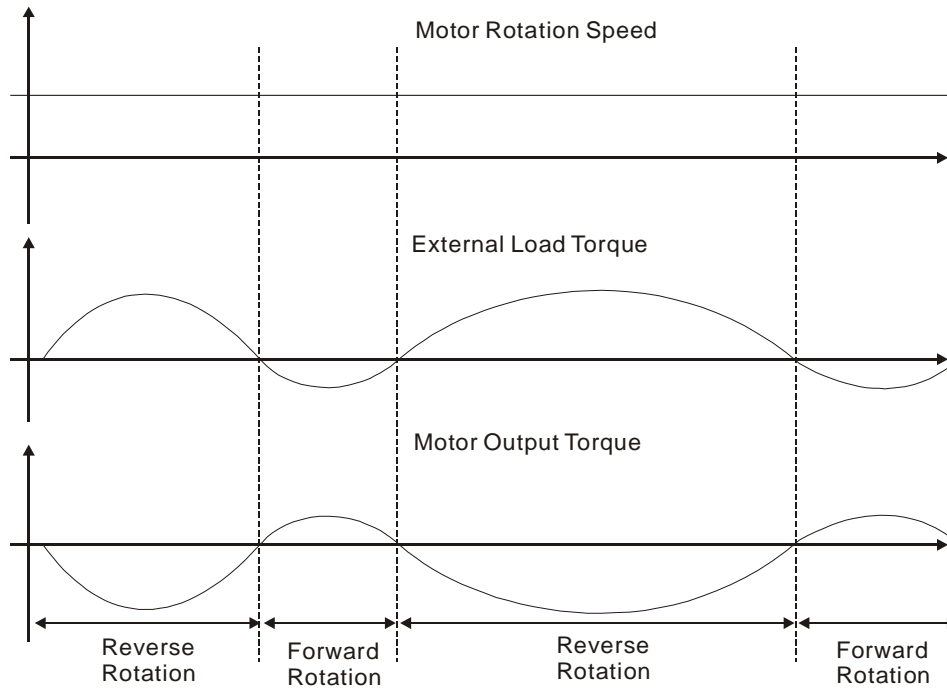
For example:

If we use 400W servo drive, the time of repeat operation cycle is  $T = 0.4$  sec, max. motor speed is 3000r/min, the load inertia =  $7 \times$  motor inertia, then the necessary the power of regenerative resistor =  $2 \times (7+1) \times 1.37 - 8 / 0.4 = 14.8W$ . If the calculation result is smaller than regenerative power, we recommend the users to use the built-in 60W regenerative resistor. Usually the built-in regenerative resistor provided by ASDA-A2 series servo drives can meet the requirement of general application when the external load inertia is not excessive.

The users can see when the capacity of regenerative resistor is too small, the accumulated power will be larger and the temperature will also increase. The fault, AL005 may occur if the temperature is over high. The following figure shows the actual operation of regenerative resistor.

## (2) With Load

When there is an external load torque, servo motor is in reverse rotation when external load greater than motor torque. Servo motor is usually in forward rotation and the motor torque output direction is the same as the rotation direction. However, there is still some special condition. If the motor output torque is in the reverse direction of rotation, the servo motor is also in the reverse direction of rotation. The external power is input into the servo drive through servo motor. The Figure 6.21 below is an example. The users can see the motor is in forward rotation at constant speed when a sudden external load torque change and great power is transmitted to regenerative resistor rapidly.



External load torque in reverse direction:  $T_L \times W_r$   $T_L$  : External load torque

For the safety, we strongly recommend the users should select the proper resistance value according to the load.

For example:

When external load torque is a +70% rated torque and rotation speed reaches 3000r/min, if using 400W servo drive (rated torque: 1.27Nt-m), then the users need to connect a external regenerative resistor which power is  $2 \times (0.7 \times 1.27) \times (3000 \times 2 \times \pi / 60) = 560W, 40\Omega$ .

■ Simple Calculation Method

The users can select the adequate regenerative resistors according to the allowable frequency required by actual operation and the allowable frequency when the servo motor runs without load. The allowable frequency when the servo motor run without load is the maximum frequency that can be operated during continuous operation when servo motor accelerate from 0r/min to rated speed and decelerate from rated speed down to 0r/min. The allowable frequencies when the servo motor run without load are summarized in the following table.

Allowable frequency when the servo motor runs without load (times/min) and uses a built-in regenerative resistor													
Motor Capacity	600W	750W	900W	1.0 kW	1.5 kW	2.0 kW	2.0 kW	3.0 kW	4.5 kW	5.5 kW	7.5 kW	11.0 kW	15.0 kW
Servo Motor	06	07	09	10	15	20	20	30	45	55	75	1B	1F
ECMA□□C	-	312	-	137	-	83 (F100)	-	-	-	-	-	-	-

Allowable frequency when the servo motor runs without load (times/min) and uses a built-in regenerative resistor													
Motor Capacity Servo Motor	600W	750W	900W	1.0 kW	1.5 kW	2.0 kW	2.0 kW	3.0 kW	4.5 kW	5.5 kW	7.5 kW	11.0 kW	15.0 kW
	06	07	09	10	15	20	20	30	45	55	75	1B	1F
ECMA□□E	-	-	-	42	32	24 (F130)	10 (F180)	11	-	-	-	-	-
ECMA□□F	-	-	-	-	-	-	-	11	8	-	-	-	-
ECMA□□G	42	-	31	-	-	-	-	-	-	-	-	-	-
ECMA□□J	-	537	-	-	-	-	-	-	-	-	-	-	-
ECMA□□K	-	-	-	162	122	-	-	-	-	-	-	-	-
ECMA□□L	-	-	-	-	-	-	-	-	-	-	-	-	-

When the servo motor runs with load, the allowable frequency will change according to the changes of the load inertia and rotation speed. Use the following equation to calculate the allowable frequency.

$$\text{Allowable frequency} = \frac{\text{Allowable frequency when servo motor run without load}}{m + 1} \times \left( \frac{\text{Rated speed}}{\text{Operating speed}} \right)^2 \frac{\text{times}}{\text{min.}}$$

m = load/motor inertia ratio

The users can select the adequate external regenerative resistors according to the allowable frequency by referring to the table below:

Allowable frequency when the servo motor run without load (times/min) and uses external regenerative resistor							
Motor Capacity Recommended Regenerative Resistor Specifications	ECMA□□C						
	100W	200W	400W (F60)	400W (F80)	750W	1.0kW	2.0kW
	01	02	04	04	07	10	20
BR400W040 (400W 40Ω)	-	-	8608	3506	2110	925	562
BR1K0W020 (1kW 20Ω)	-	-	-	8765	5274	2312	1406

Motor Capacity Recommended Regenerative Resistor Specifications	ECMA□□E					
	0.5kW	1kW	1.5kW	2.0kW (F130)	2.0kW (F180)	3.0kW
	05	1.0	15	20	20	30
BR400W040 (400W 40Ω)	291	283	213	163	68	-
BR1K0W020 (1kW 20Ω)	729	708	533	408	171	-
BR1K5W005*2 (3kW 10Ω)	-	-	-	-	-	331

Motor Capacity Recommended Regenerative Resistor Specifications	ECMA□□F					
	3.0kW	4.5kW	5.5kW	7.5kW	11.0kW	15.0kW
	30	45	55	75	1B	1F
BR1K5W005*2 (3kW 10Ω)	331	234	182	127	124	74

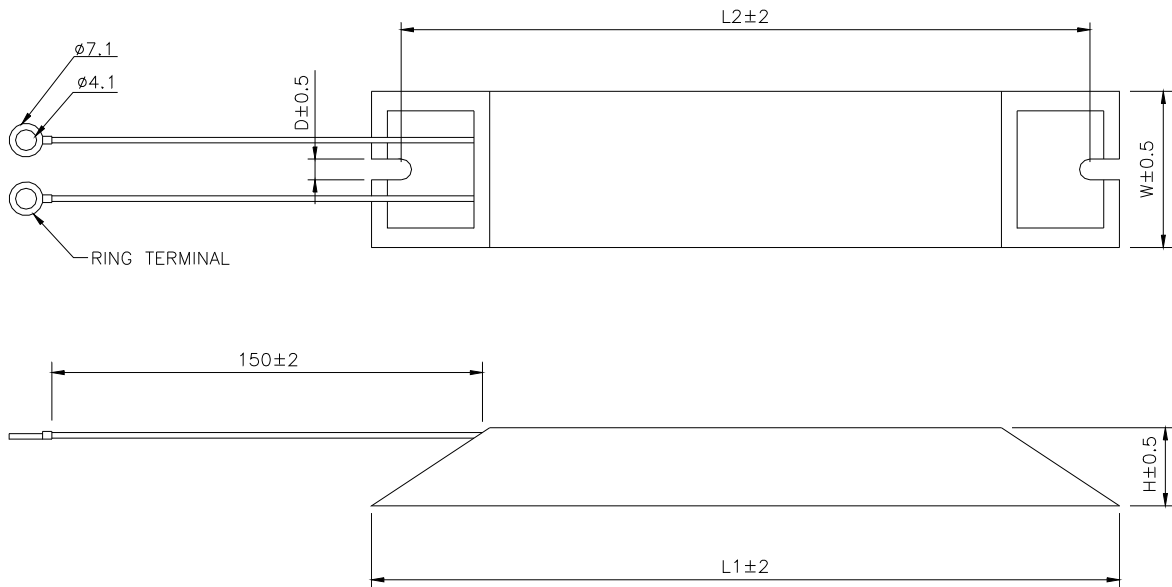
Allowable frequency when the servo motor run without load (times/min) and uses external regenerative resistor					
Recommended Regenerative Resistor Specifications	Motor Capacity	ECMA□□G			
		0.3kW	0.6kW	0.9kW	
		03	06	09	
	BR400W040 (400W 40Ω)	292	283	213	
	BR1K0W020 (1kW 20Ω)	729	708	533	
Recommended Regenerative Resistor Specifications	Motor Capacity	ECMA□□K			
		1.0kW	1.5kW	2.0kW	
		10	15	20	
	BR400W040 (400W 40Ω)	-	488	665	
	Recommended Regenerative Resistor Specifications	Motor Capacity	ECMA□□L		
		3.0KW	4.5KW	5.5KW	7.5kW
		30	45	55	75
BR400W040 (400W 40Ω)		177	-	-	-
BR1K0W020 (1kW 20Ω)		-	312	243	170

When the regenerative resistor capacity is not enough, the users can connect to multiple the same capacity regenerative resistors in parallel to increase it.

**Dimensions**

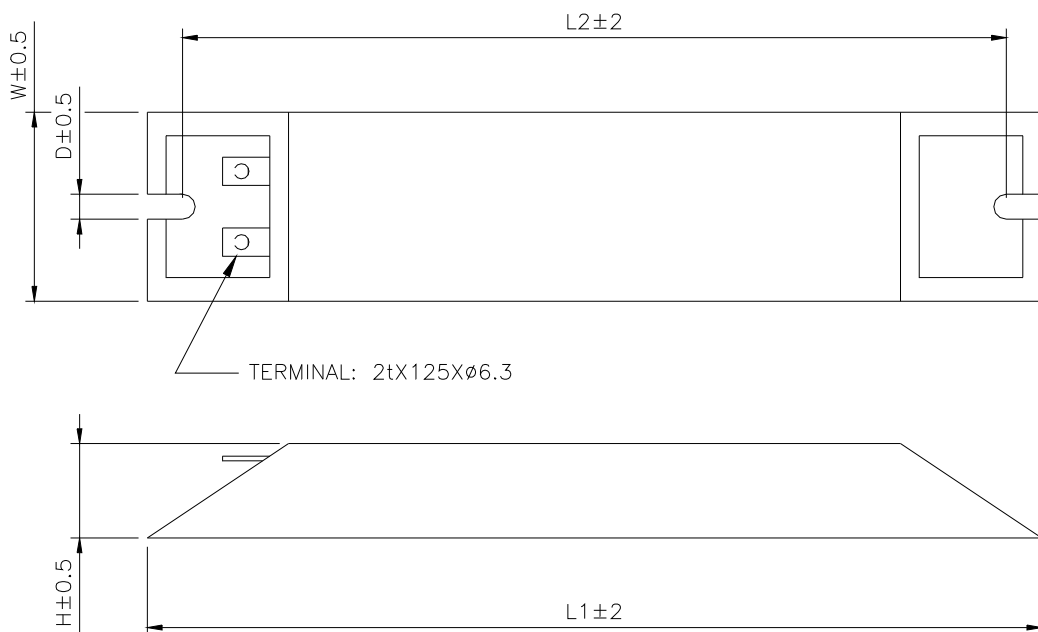
Delta Part Number : BR400W040 (400W 40Ω)

L1	L2	H	D	W	MAX. WEIGHT(g)
265	250	30	5.3	60	930



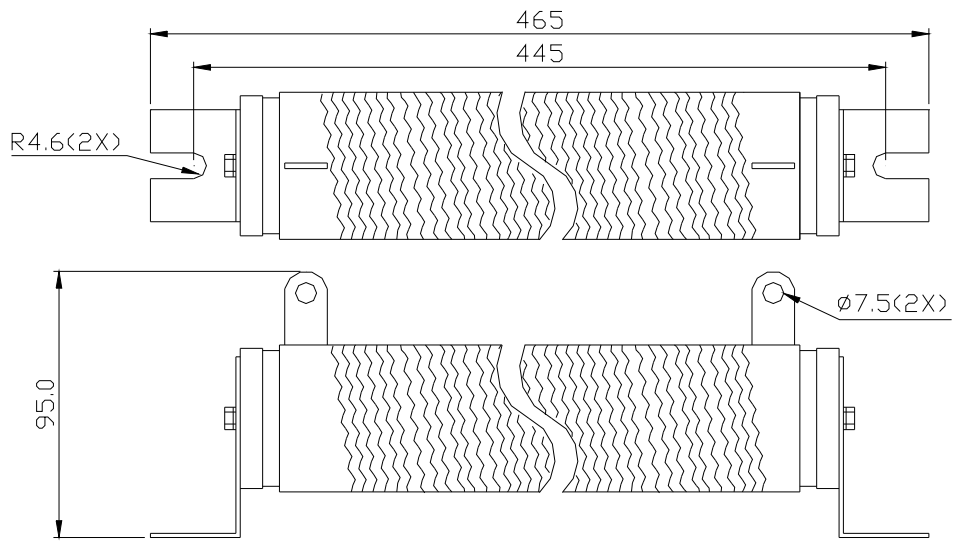
Delta Part Number : BR1K0W020 (1kW 20Ω)

L1	L2	H	D	W	MAX. WEIGHT(g)
400	385	50	5.3	100	2800





Delta Part Number : BR1K5W005 (3kW 10Ω)



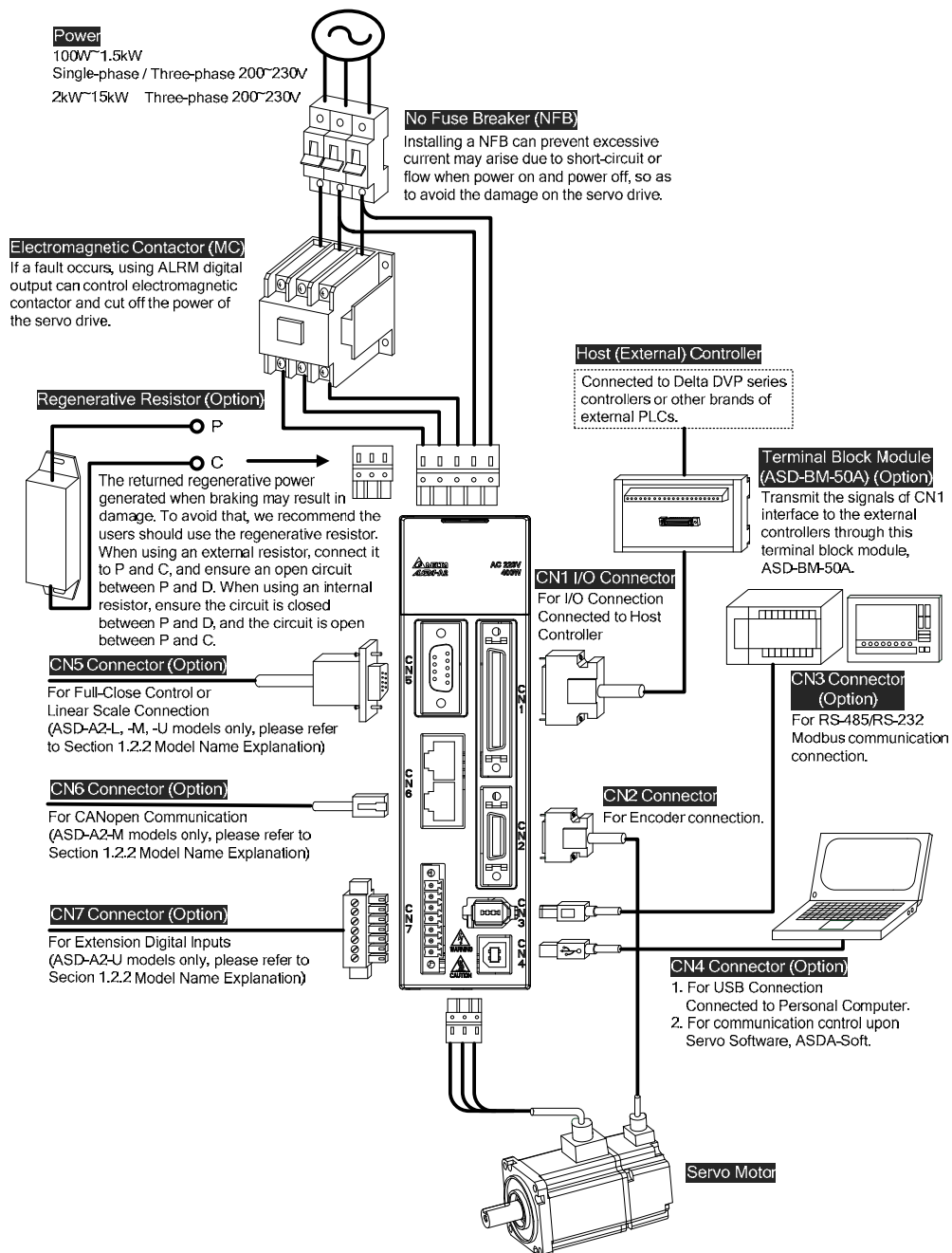
# Chapter 3 Connections and Wiring

This chapter provides information on wiring ASDA-A2 series products, the descriptions of I/O signals and gives typical examples of wiring diagrams.

## 3.1 Connections - 220V series

### 3.1.1 Connecting to Peripheral Devices

Figure 3.1 Configuration



### 3.1.2 Servo Drive Connectors and Terminals


Terminal Identification	Terminal Description	Notes		
<b>L1c, L2c</b>	Control circuit terminal	Used to connect single-phase AC control circuit power depending on connecting servo drive model.		
<b>R, S, T</b>	Main circuit terminal	Used to connect three-phase AC main circuit power depending on connecting servo drive model.		
<b>U, V, W</b> <b>FG</b> (⊕)	Servo motor output	Used to connect servo motor		
		Terminal Symbol	Wire Color	Description
		U	Red	Connecting to three-phase motor main circuit cable.
		V	White	
		W	Black	
FG(⊕)	Green	Connecting to ground terminal (⊕) of the servo drive.		
<b>P<sup>+</sup>, D, C, ⊖</b>	Regenerative resistor terminal or braking unit	Internal resistor	Ensure the circuit is closed between P <sup>+</sup> and D, and the circuit is open between P <sup>+</sup> and C.	
		External resistor	Connect regenerative resistor to P <sup>+</sup> and C, and ensure an open circuit between P <sup>+</sup> and D.	
		External braking unit	Connect P <sup>+</sup> and ⊖ of braking unit to P <sup>+</sup> and ⊖ of servo drive, and ensure an open circuit between P <sup>+</sup> and D, and P <sup>+</sup> and C. (N terminal is built in L1C, L2C, ⊖, and R, S, T.) P <sup>+</sup> : Connecting to (+) terminal of V_BUS voltage. ⊖ : Connecting to (-) terminal of V_BUS voltage.	
<b>⊕ two places</b>	Ground terminal	Used to connect grounding wire of power supply and servo motor.		
<b>CN1</b>	I/O connector (Option)	Used to connect external controllers. Please refer to section 3.3 for details.		
<b>CN2</b>	Encoder connector (Option)	Used to connect encoder of servo motor. Please refer to section 3.4 for details.		
		Terminal Symbol	Wire Color	Pin No.
		T+	Blue	5

		T-	Blue/Black	4
		Reserved	-	-
		Reserved	-	-
		+5V	Red & Red/White	14, 16
		GND	Black & Black/White	13, 15
<b>CN3</b>	Communication connector (Option)	Used for RS-485 or RS-232 communication connection. Please refer to section 3.6 for details.		
<b>CN4</b>	USB connector (Type B) (Option)	Used to connect personal computer (PC or notebook). Please refer to section 3.7 for details.		
<b>CN5</b>	Position feedback signal connector (for full-closed loop) (Option)	Used to connect to linear scale or encoder to constitute a full-closed loop. Please refer to section 3.8 for details.		
<b>CN6</b>	CANopen communication port (Option)	RJ45 connector, used for CANopen communication. Please refer to section 3.9 for details.		
<b>CN7</b>	Extension digital input terminal (Option)	Used to connect to extension digital inputs. Please refer to section 3.10 for details.		
<b>CN8</b>	Reserved connector	Reserved		
<b>CN9</b>	Communication extension connector (Option)	Used to connect to other extension cards (will be available soon).		

### Wiring Notes

Please observe the following wiring notes while performing wiring and touching any electrical connections on the servo drive or servo motor.

1. Ensure to check if the power supply and wiring of the "power" terminals (R, S, T, L1C, L2C, U, V, & W) is correct.
2. Please use shielded twisted-pair cables for wiring to prevent voltage coupling and eliminate electrical noise and interference.
3. As a residual hazardous voltage may remain inside the drive, please do not immediately touch any of the "power" terminals (R, S, T, L1C, L2C, U, V, & W) and/or the cables connected to them after the power has been turned off and the charge LED is lit. (Please refer to the Safety Precautions on page ii).
4. The cables connected to R, S, T and U, V, W terminals should be placed in separate conduits from the encoder or other signal cables. Separate them by at least 30cm (11.8 inches).

5. If the encoder cable (CN2) or the cable for position feedback signal connector (CN5) is too short, please use a twisted-shield signal wire with grounding conductor. The wire length should be 20m (65.62ft.) or less. For lengths greater than 20m (65.62ft.), the wire gauge should be doubled in order to lessen any signal attenuation. For the encoder cable specification, please use AWG26 wire size and the Metal braided shield twisted-pair cable which meets the UL2464 specification.
6. When using CANopen communication, please use the shielded twisted-pair cables to ensure the communication quality.
7. The shield of shielded twisted-pair cables should be connected to the SHIELD end (terminal marked ) of the servo drive.
8. For the connectors and cables specifications, please refer to section 3.1.6 for details.

### 3.1.3 Wiring Methods

For servo drives from 200W to 1.5kW the input power can be either single or three-phase. However, single-phase connections are for servo drives 1.5kW and below only.

In the wiring diagram figures 3.2 & 3.3:

Power ON : contact “a” (normally open)

Power OFF /ALRM\_RY : contact “b” (normally closed)

MC : coil of electromagnetic contactor, self-holding power, contact of main circuit power

Figure 3.2 Single-Phase Power Supply Connection (for 1.5kW and below models)

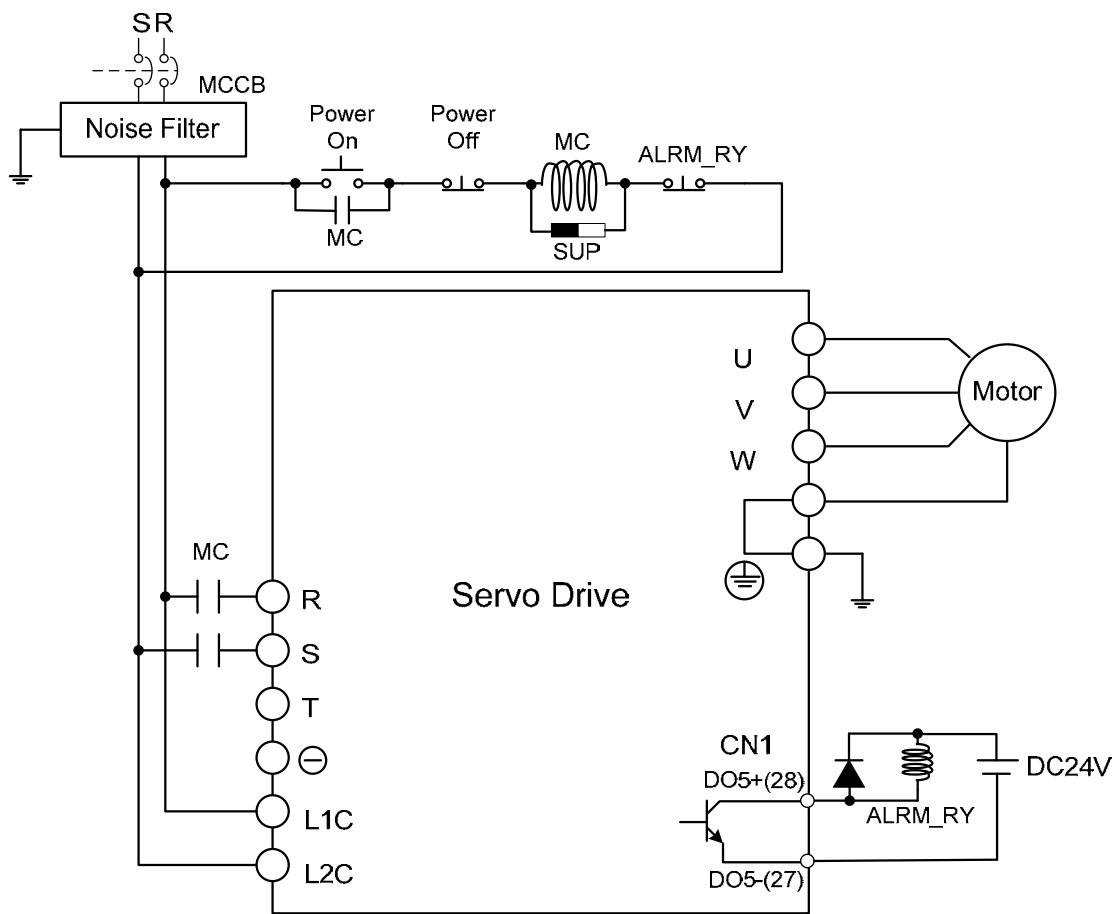
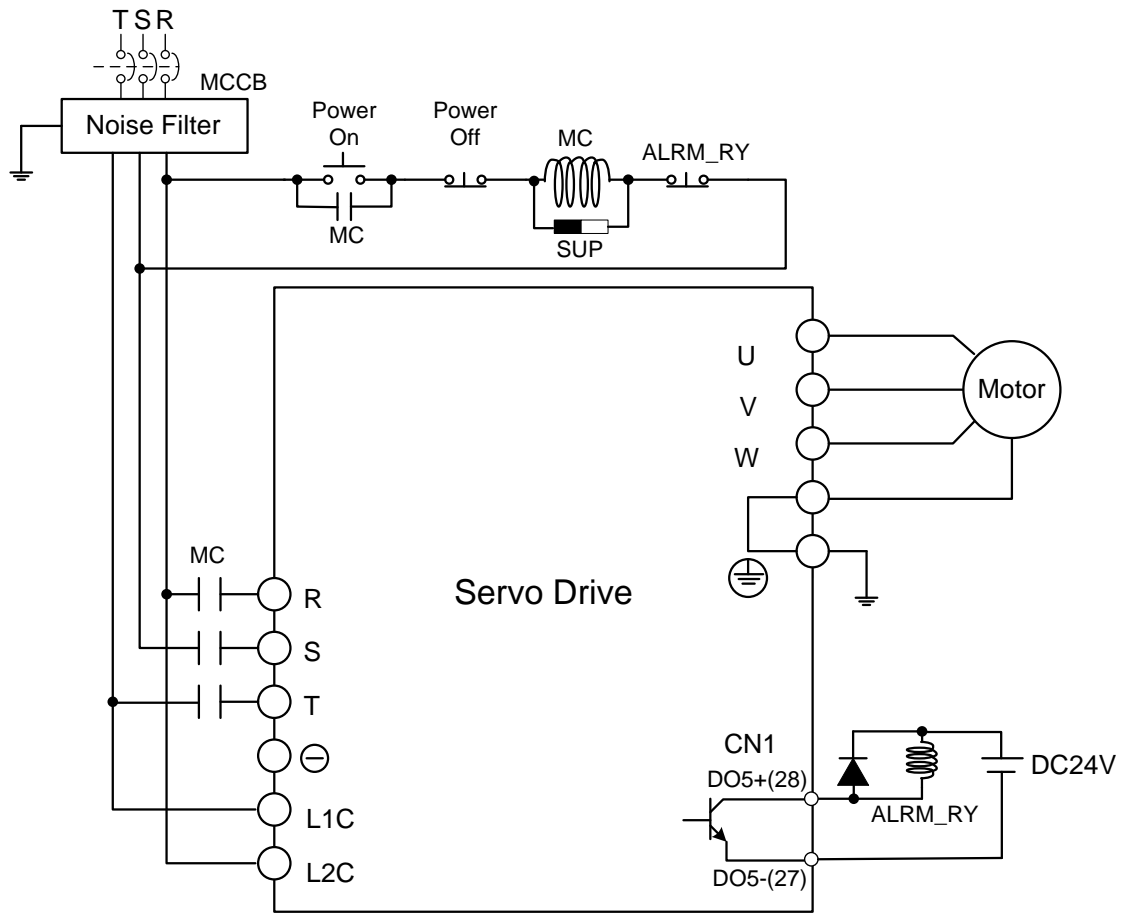
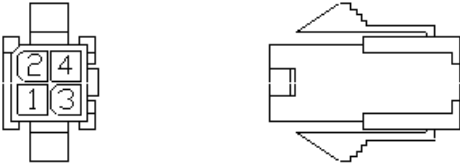
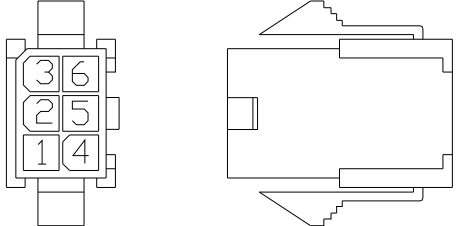
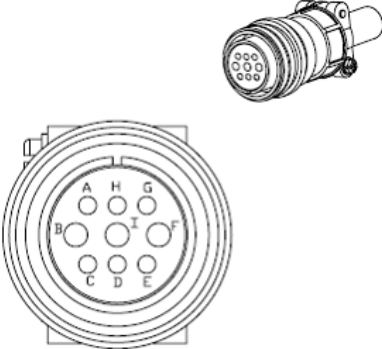
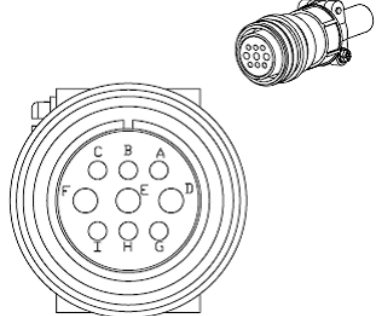


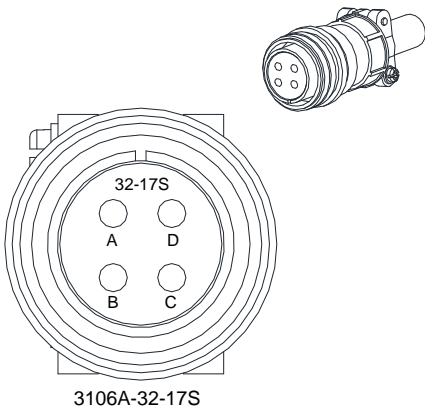
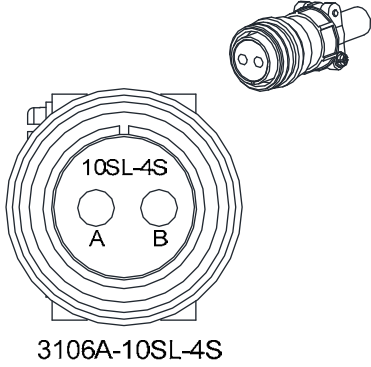
Figure 3.3 Three-Phase Power Supply Connection (for all models)



### 3.1.4 Motor Power Cable Connector Specifications

Motor Model Name	U, V, W / Electromagnetic Brake Connector	Terminal Identification
ECMA-C1040F□S (50W) ECMA-C△0401□S (100W) ECMA-C△0602□S (200W) ECMA-C△0604□S (400W) ECMA-C△0804□7 (400W) ECMA-C△0807□S (750W) ECMA-C△0907□S (750W) ECMA-C△0910□S (1000W)	 <p>HOUSING : JOWLE (C4201H00-2*2PA)</p>	A
ECMA-C1040F□S (50W) ECMA-C△0401□S (100W) ECMA-C△0602□S (200W) ECMA-C△0604□S (400W) ECMA-C△0804□7 (400W) ECMA-C△0807□S (750W) ECMA-C△0907□S (750W) ECMA-C△0910□S (1000W) *□ : with brake	 <p>HOUSING : JOWLE (C4201H00-2*3PA)</p>	B
ECMA-G△1303□S (300W) ECMA-E△1305□S (500W) ECMA-F11305□S (500W) ECMA-G△1306□S (600W) ECMA-F△1308□S (850W) ECMA-G△1309□S (900W) ECMA-C△1010□S (1000W) ECMA-E△1310□S (1000W) ECMA-F11313□S (1300W) ECMA-E△1315□S (1500W) ECMA-C△1020□S (2000W) ECMA-E△1320□S (2000W) ECMA-C△1330□4 (3000W)	 <p>3106A-20-18S</p>	C
ECMA-E△1820□S (2000W) ECMA-E△1830□S (3000W) ECMA-F△1830□S (3000W) ECMA-E△1835□S (3500W) ECMA-F△1845□S (4500W)	 <p>3106A-24-11S</p>	D



Motor Model Name	U, V, W / Electromagnetic Brake Connector	Terminal Identification
ECMA-F11855□3 (5500W) ECMA-F11875□3 (7500W) ECMA-F1221B□3 (11kW) ECMA-F1221F□S (15kW)	 <p>3106A-32-17S</p>	E
ECMA-F21855□3(5500W) ECMA-F21875□3(7500W)	 <p>3106A-10SL-4S</p>	F

Terminal Identification	U (Red)	V (White)	W (Black)	CASE GROUND (Green)	BRAKE1 (Yellow)	BRAKE2 (Blue)
A	1	2	3	4	-	-
B	1	2	4	5	3	6
C	F	I	B	E	G	H
D	D	E	F	G	A	B
E	A	B	C	D	-	-

Terminal Identification	BRAKE1	BRAKE2
F	A	B

When selecting the wire rod, please choose 600V PVC cable and the length should not longer than 30m. If the length exceeds 30m, please take the received voltage into consideration when selecting the wire size. Please refer to Section 3.1.6 for wire rod selection.

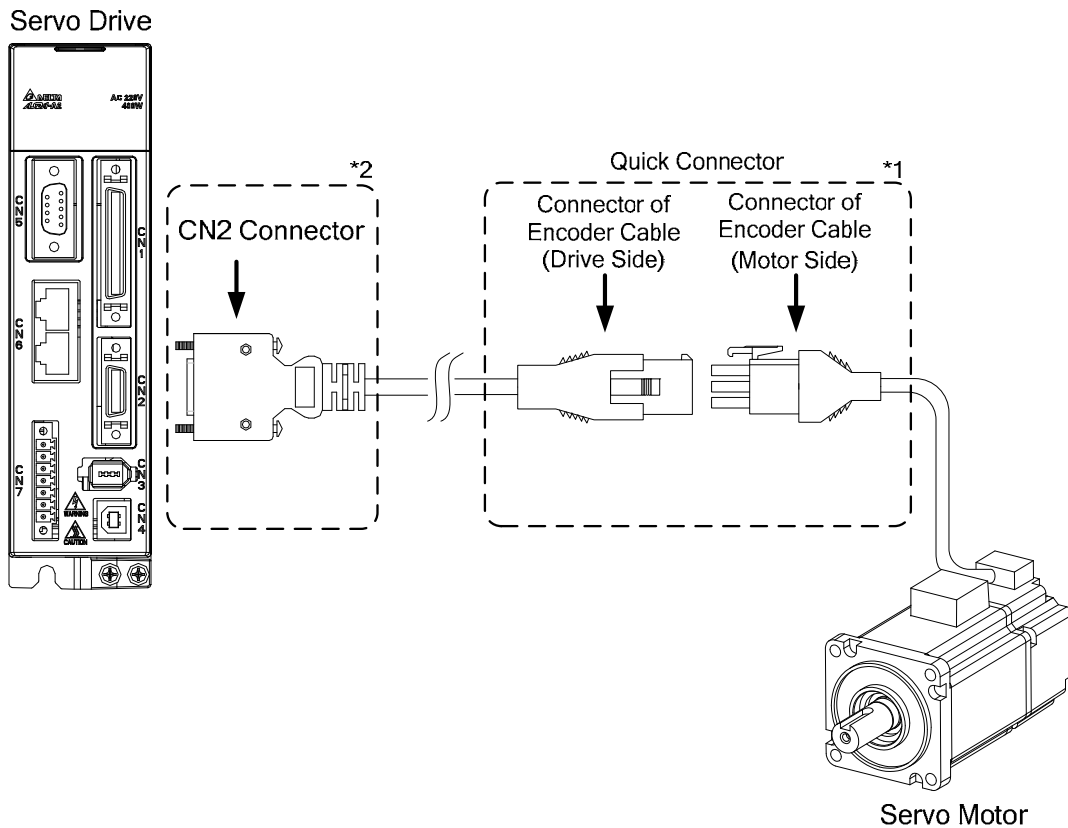
 **NOTE**


- 1) The coil of brake has no polarity. The names of terminal identification are BRAKE1 (Yellow) and BRAKE2 (Blue).

- 2) The power supply for brake is DC24V. Never use it for VDD, the +24V source voltage.
- 3) The boxes ( $\Delta$ ) in the model names are for encoder resolution types.  $\Delta=1$ : Incremental encoder, 20-bit;  $\Delta=2$ : Incremental encoder, 17-bit;  $\Delta=2$ : Absolute type
- 4) The box ( $\square$ ) in the model names represents brake or keyway / oil seal.

### 3.1.5 Encoder Connector Specifications

#### Encoder Cable Connection (Diagram 1)

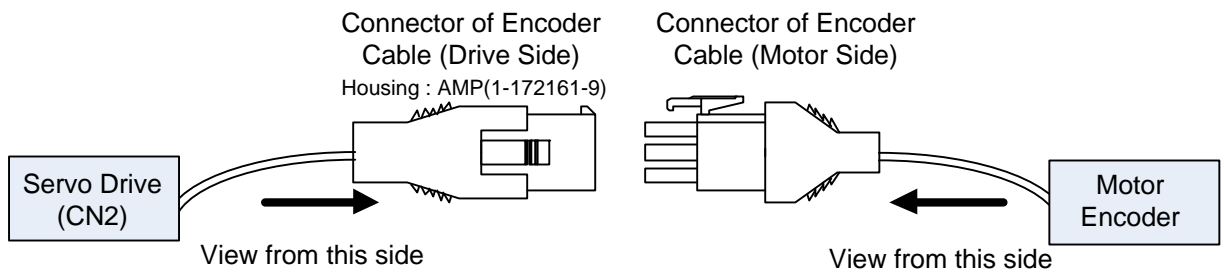


 **NOTE** The scale of the objects does not match the dimensions as shown in the drawing above. For different models of AC servo drives and motors, the connection cables may differ.

- 1) Please refer to the descriptions of "Terminal Identification of Encoder Connector" on page 3-9.
- 2) Please refer to section 3.4 for the descriptions of "Encoder Connector CN2".

Motor Model Name	Encoder Connector
ECMA-C1040F□ (50W)	<p>HOUSING AMP (1-172161-9)</p>
ECMA-C△0401□S (100W)	
ECMA-C△0602□S (200W)	
ECMA-C△0604□S (400W)	
ECMA-C△0804□7 (400W)	
ECMA-C△0807□S (750W)	
ECMA-C△0907□S (750W)	
ECMA-C△0910□S (1000W)	

Terminal Identification of Encoder Connector



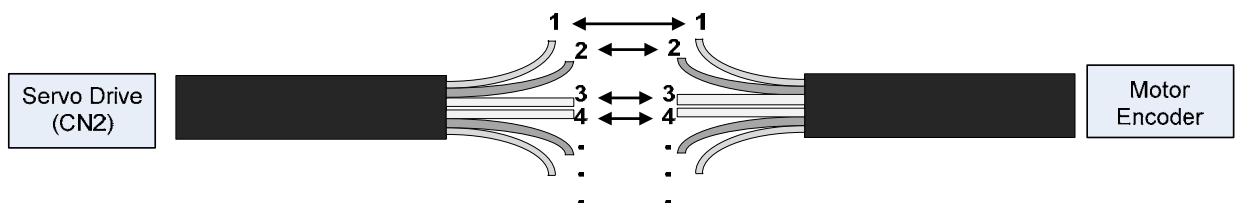
View from this side

<b>1</b> Blue T+	<b>2</b> Green (Reserved)	<b>3</b> (Reserved)
<b>4</b> Blue & Black T-	<b>5</b> Green & Black (Reserved)	<b>6</b> (Reserved)
<b>7</b> Red/ Red&White DC+5V	<b>8</b> Black/Black &White GND	<b>9</b> Shield

View from this side

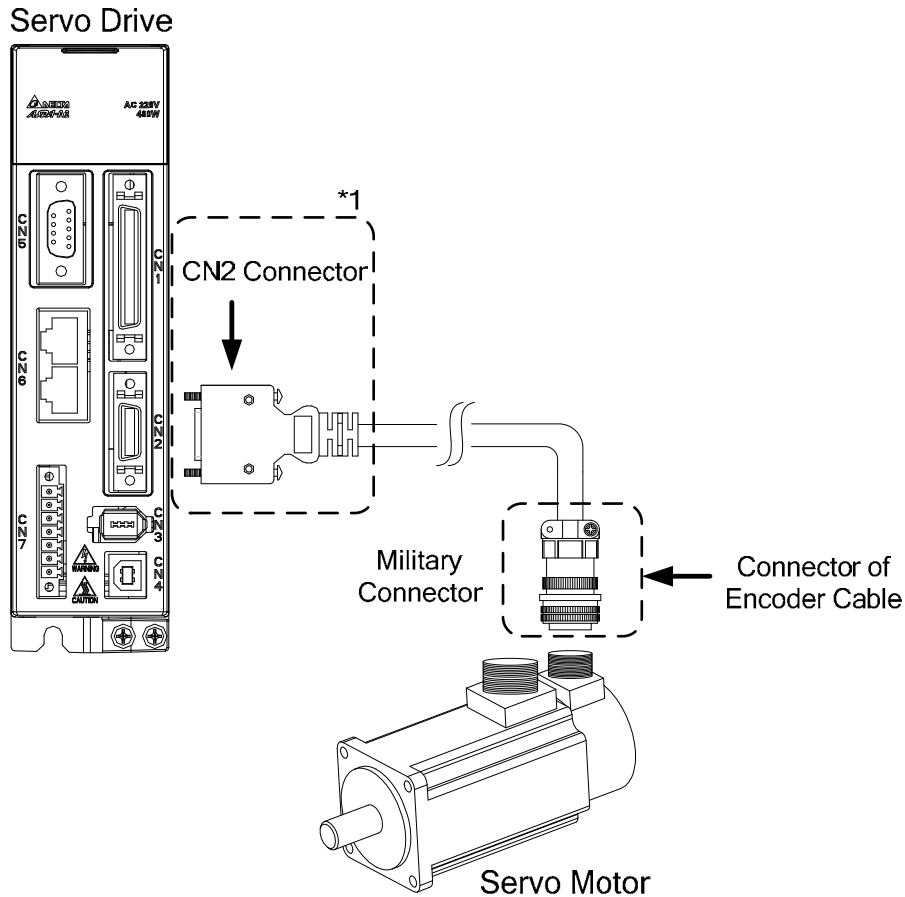
<b>3</b> (Reserved)	<b>2</b> Black (Reserved)	<b>1</b> White T+
<b>6</b> (Reserved)	<b>5</b> Red & Black (Reserved)	<b>4</b> White & Red T-
<b>9</b> Shield	<b>8</b> Blue GND	<b>7</b> Brown DC+5V

(The core color of the drive encoder connector is for reference only. For the actual core color, please refer to the actual purchased product.)



If the users do not use the connector (without housing) and connect the cores from the cable for wiring, please follow the terminal identification and core number of encoder connector shown in the above table to complete the wiring. The users need to connect core #1 to core #1, core #2 to core #2 and so on. To ease connection and to avoid wiring error, it is recommended to number the cores first in accordance with the terminal identification and then conducting the wiring.

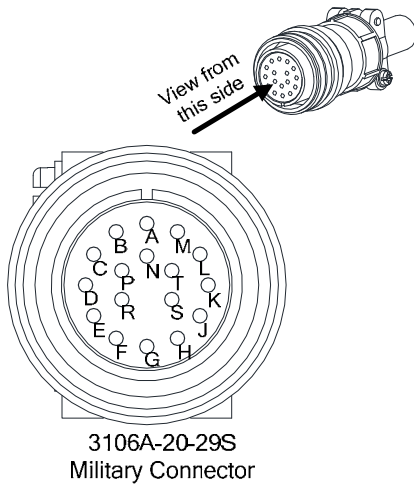
### Encoder Cable Connection (Diagram 2)



#### NOTE

The scale of the objects does not match the dimensions as shown in the drawing above. For different models of AC servo drives and motors, the connection cables may differ.

- 1) Please refer to section 3.4 for the descriptions of "Encoder Connector CN2".

Motor Model Name	Encoder Connector																			
ECMA-G△1303□S (300W)	 <p>3106A-20-29S Military Connector</p>	<table border="1"> <thead> <tr> <th>Pin No.</th> <th>Terminal Identification</th> <th>Color</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>T+</td> <td>Blue</td> </tr> <tr> <td>B</td> <td>T-</td> <td>Blue &amp; Black</td> </tr> <tr> <td>S</td> <td>DC+5V</td> <td>Red/Red &amp; White</td> </tr> <tr> <td>R</td> <td>GND</td> <td>Black/Black &amp; White</td> </tr> <tr> <td>L</td> <td>BRAID SHIELD</td> <td>-</td> </tr> </tbody> </table>	Pin No.	Terminal Identification	Color	A	T+	Blue	B	T-	Blue & Black	S	DC+5V	Red/Red & White	R	GND	Black/Black & White	L	BRAID SHIELD	-
Pin No.			Terminal Identification	Color																
A			T+	Blue																
B			T-	Blue & Black																
S			DC+5V	Red/Red & White																
R			GND	Black/Black & White																
L		BRAID SHIELD	-																	
ECMA-E△1305□S (500W)																				
ECMA-F11305□S (500W)																				
ECMA-G△1306□S (600W)																				
ECMA-F△1308□S (850W)																				
ECMA-G△1309□S (900W)																				
ECMA-C△1010□S (1000W)																				
ECMA-E△1310□S (1000W)																				
ECMA-F11313□S (1300W)																				
ECMA-E△1315□S (1500W)																				
ECMA-F11318□S (1800W)																				
ECMA-C△1020□S (2000W)																				
ECMA-E△1320□S (2000W)																				
ECMA-E△1820□S (2000W)																				
ECMA-C△1330□4 (3000W)																				
ECMA-E△1830□S (3000W)																				
ECMA-F△1830□S (3000W)																				
ECMA-E△1835□S (3500W)																				
ECMA-F△1845□S (4500W)																				
ECMA-F△1855□3 (5500W)																				
ECMA-F△1875□3 (7500W)																				
ECMA-F1221B□3 (11kW)																				
ECMA-F1221F□S (15kW)																				

When selecting the wire rod, please choose 600V PVC cable and the length should not longer than 30m. If the length exceeds 30m, please take the received voltage into consideration when selecting the wire size. Please refer to Section 3.1.6 for wire rod selection.

Please note:

1. The boxes (△) in the model names are for encoder resolution types. △=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit; △=2: Absolute type
2. The box (□) in the model names represents brake or keyway / oil seal.

### 3.1.6 Cable Specifications for Servo Drive

#### Power Cable

Servo Drive and Servo Motor		Power Cable - Wire Gauge AWG (mm <sup>2</sup> )			
		L1c, L2c	R, S, T	U, V, W	P <sup>⊕</sup> , C
ASD-A2-0121-□	ECMA-C1040F□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-C△0401□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-A2-0221-□	ECMA-C△0602□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-A2-0421-□	ECMA-C△0604□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-C△0804□7	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-E△1305□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-G△1303□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-A2-0721-□	ECMA-F11305□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-C△0807□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-C△0907□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-G△1306□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-A2-1021-□	ECMA-C△0910□S	1.3 (AWG16)	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-C△1010□S	1.3 (AWG16)	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-E△1310□S	1.3 (AWG16)	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-F△1308□S	1.3 (AWG16)	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-G△1309□S	1.3 (AWG16)	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
ASD-A2-1521-□	ECMA-E△1315□S	1.3 (AWG16)	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
ASD-A2-2023-□	ECMA-C△1020□S	1.3 (AWG16)	2.1 (AWG14)	2.1 (AWG14)	2.1 (AWG14)
	ECMA-E△1320□S	1.3 (AWG16)	2.1 (AWG14)	2.1 (AWG14)	2.1 (AWG14)
	ECMA-E△1820□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)
	ECMA-F11313□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)
	ECMA-F11318□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)
ASD-A2-3023-□	ECMA-C△1330□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)
	ECMA-E△1830□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)
	ECMA-E△1835□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)
	ECMA-F△1830□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)
ASD-A2-4523-□	ECMA-F△1845□S	1.3 (AWG16)	3.3 (AWG12)	8.4 (AWG8)	3.3 (AWG12)
ASD-A2-5523-□	ECMA-F△1855□3	1.3 (AWG16)	3.3 (AWG12)	13.3 (AWG6)	3.3 (AWG12)
ASD-A2-7523-□	ECMA-F△1875□3	1.3 (AWG16)	5.3 (AWG10)	13.3 (AWG6)	3.3 (AWG12)
ASD-A2-1B23-□	ECMA-F1221B□3	1.3 (AWG16)	8.4 (AWG8)	13.3 (AWG6)	8.4 (AWG8)
ASD-A2-1F23-□	ECMA-F1221F□S	1.3 (AWG16)	13.3 (AWG6)	21.2 (AWG4)	13.3 (AWG6)

## Encoder Cable

Servo Drive	Encoder Cable - Wire Gauge AWG (mm <sup>2</sup> )			
	Wire Size	Core Number	UL Rating	Standard Wire Length
ASD-A2-0121-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-0221-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-0421-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-0721-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-1021-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-1521-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-2023-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-3023-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-4523-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-5523-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-7523-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-1B23-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-1F23-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)

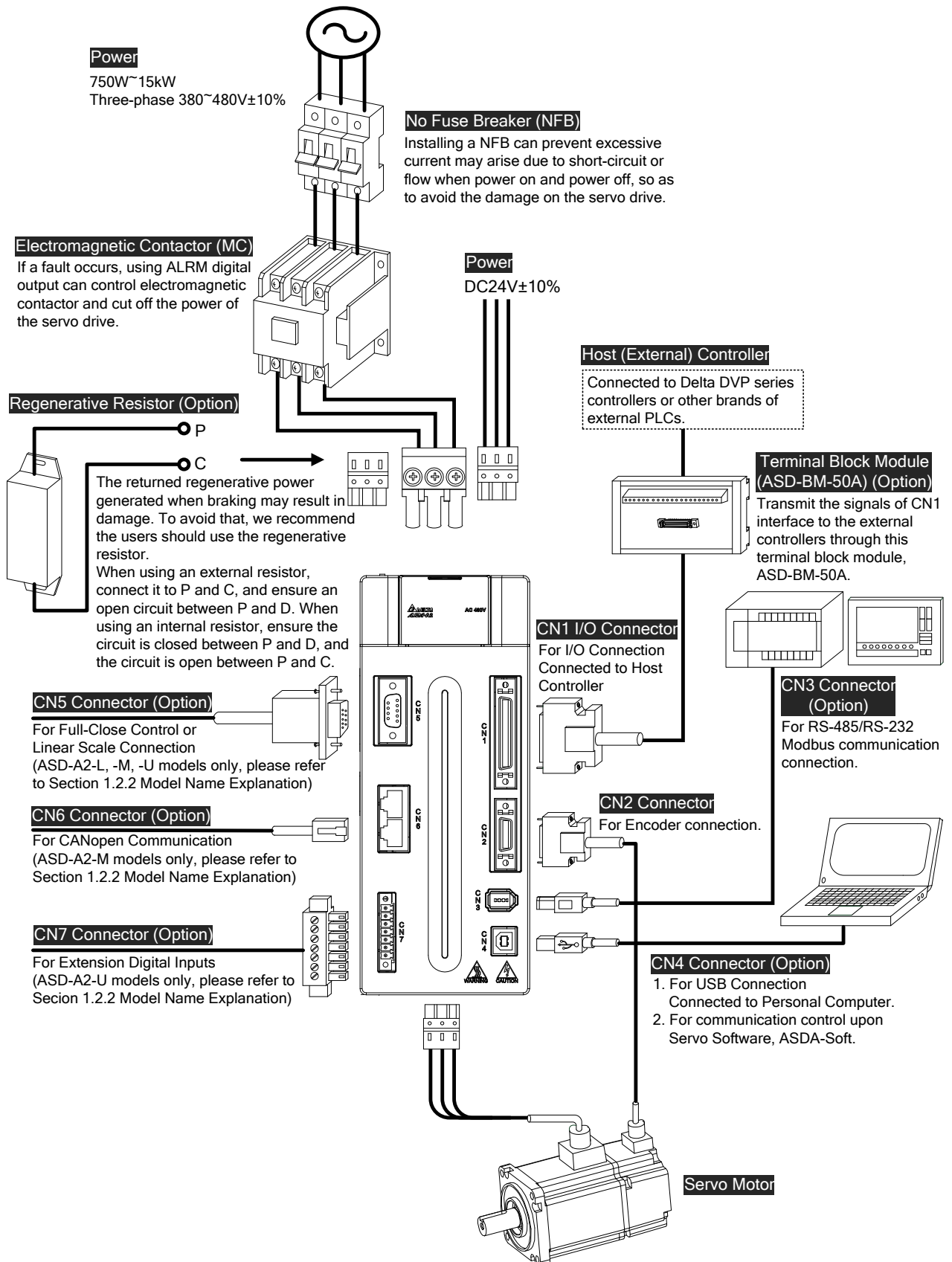
**NOTE**

- 1) Please use shielded twisted-pair cables for wiring to prevent voltage coupling and eliminate electrical noise and interference.
- 2) The shield of shielded twisted-pair cables should be connected to the SHIELD end (terminal marked ⊕) of the servo drive.
- 3) In order to prevent fire hazard and accidents, please form the wiring by following the cable specifications outlined above.
- 4) The boxes (□) at the ends of the servo drive model names represent the model type of ASDA-A2 series. For the actual model name, please refer to the ordering information of the actual purchased product.
- 5) The boxes (Δ) in the servo motor model names are for encoder resolution types. Δ=1: Incremental encoder, 20-bit; Δ=2: Incremental encoder, 17-bit; Δ=2: Absolute type.
- 6) The boxes (□) in the model names represents brake or keyway / oil seal.

## 3.2 Connections - 400V series

### 3.2.1 Connecting to Peripheral Devices

Figure 3.4 Configuration





**NOTE**

## Installation Notes:

- 1) Check if the power and wiring among R, S, T and DC24V, DC0V are correct.
- 2) Check if the output terminal U, V, W of the servo motor is correctly wired. The incorrect wiring may disable the operation of the motor or cause the malfunction.
- 3) When applying to the external regenerative resistor, the contact between P<sup>+</sup> and D should be opened and the external regenerative resistor should connect to terminal P<sup>+</sup> and C. When applying to the internal regenerative resistor, the contact between P<sup>+</sup> and D should be closed and the contact between P<sup>+</sup> and C should be opened.
- 4) When an alarm occurs or the system is in emergency stop status, use ALARM or WARN to output and disconnect the power of magnetic contactor in order to disconnect the power of servo drive.

### 3.2.2 Servo Drive Connectors and Terminals

Terminal Identification	Terminal Description	Notes		
<b>DC24V, DC0V</b>	Control circuit terminal	Used to connect DC control circuit power depending on connecting servo drive model.		
<b>R, S, T</b>	Main circuit terminal	Used to connect three-phase AC main circuit power depending on connecting servo drive model.		
<b>U, V, W FG (⊕)</b>	Servo motor output	Used to connect servo motor		
		Terminal Symbol	Wire Color	Description
		U	Red	Connecting to three-phase motor main circuit cable.
		V	White	
		W	Black	
FG(⊕)	Green	Connecting to ground terminal (⊕) of the servo drive.		
<b>P<sup>+</sup>, D, C, ⊖</b>	Regenerative resistor terminal or braking unit	Internal resistor	Ensure the circuit is closed between P <sup>+</sup> and D, and the circuit is open between P <sup>+</sup> and C.	
		External resistor	Connect regenerative resistor to P <sup>+</sup> and C, and ensure an open circuit between P <sup>+</sup> and D.	
		External braking unit	Connect P <sup>+</sup> and ⊖ of braking unit to P <sup>+</sup> and ⊖ of servo drive, and ensure an open circuit between P <sup>+</sup> and D, and P <sup>+</sup> and C. (N terminal is built in L1C, L2C, ⊖, and R, S, T.) P <sup>+</sup> : Connecting to (+) terminal of V_BUS voltage. ⊖ : Connecting to (-) terminal of V_BUS voltage.	
<b>⊕ two places</b>	Ground terminal	Used to connect grounding wire of power supply and servo motor.		
<b>CN1</b>	I/O connector (Option)	Used to connect external controllers. Please refer to section 3.3 for details.		
<b>CN2</b>	Encoder connector (Option)	Used to connect encoder of servo motor. Please refer to section 3.4 for details.		
		Terminal Symbol	Wire Color	Pin No.
		T+	Blue	5

		T-	Blue/Black	4
		Reserved	-	-
		Reserved	-	-
		+5V	Red & Red/White	14, 16
		GND	Black & Black/White	13, 15
<b>CN3</b>	Communication connector (Option)	Used for RS-485 or RS-232 communication connection. Please refer to section 3.6 for details.		
<b>CN4</b>	USB connector (Type B) (Option)	Used to connect personal computer (PC or notebook). Please refer to section 3.7 for details.		
<b>CN5</b>	Position feedback signal connector (for full-closed loop) (Option)	Used to connect to linear scale or encoder to constitute a full-closed loop. Please refer to section 3.8 for details.		
<b>CN6</b>	CANopen communication port (Option)	RJ45 connector, used for CANopen communication. Please refer to section 3.9 for details.		
<b>CN7</b>	Extension digital input terminal (Option)	Used to connect to extension digital inputs. Please refer to section 3.10 for details.		
<b>CN8</b>	Reserved connector	Reserved		
<b>CN9</b>	Communication extension connector (Option)	Used to connect to other extension cards (will be available soon).		

## Wiring Notes

Pay special attention to the followings when wiring:

- 1) When the power is cutoff, do not touch R, S, T and U, V, W since the capacitance inside the servo drive still contains huge amount of electric charge. Wait until the charging light is off.
- 2) Separate R, S, T and U, V, W from the other wires. The interval should be at least 30 cm (11.8 inches).
- 3) If the wire of encoder CN2 or CN5 connector is not long enough, please use shielded twisted-pair cable which cannot exceed 20 meters (65.62 inches). If it exceeds 20 meters, please choose the bigger wire diameter of signal cable to ensure it will not cause signal fading. As for the encoder wiring specification of 20-meter-long cable, please use AWG26 of wire size and Metal braided shield twisted-pair cable which complies with the standard of UL 2464.
- 4) When using CANopen, please use the standard shielded twisted-pair cables to ensure the communication quality.
- 5) When selecting the wire rod, please refer to Section 3.1.6.

### 3.2.3 Wiring Methods

For 400V series servo drives from 750W to 7.5kW the input power can be three-phase only. Single -phase connections are for 200V series servo drives 1.5kW and below only.

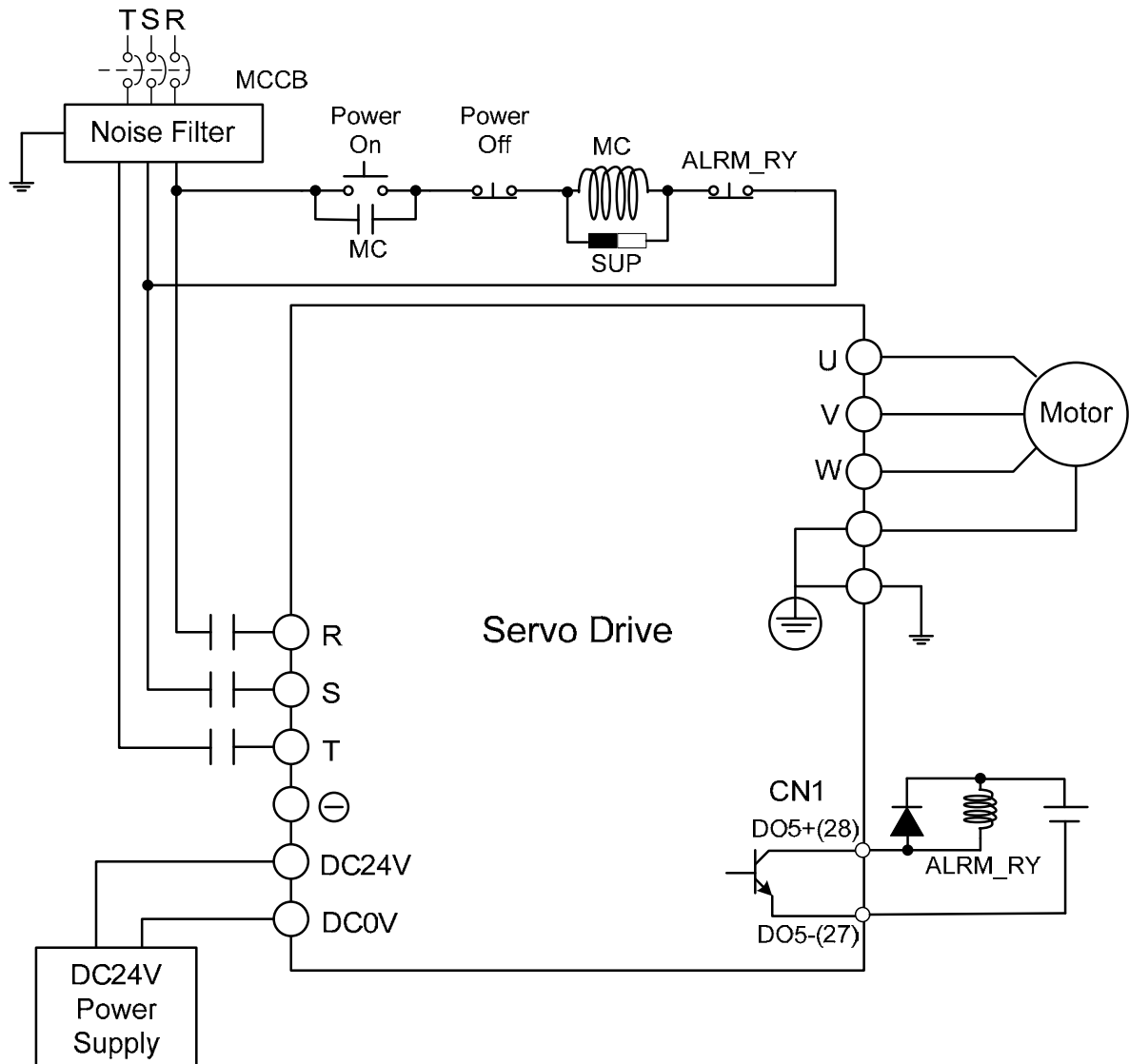
In the wiring diagram figures 3.5:

Power ON : contact “a” (normally open)

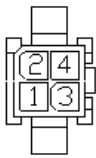
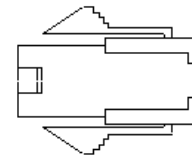
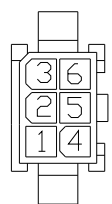
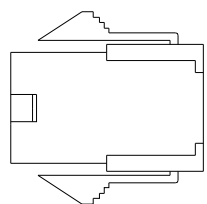
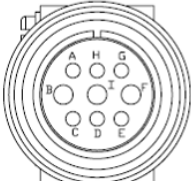

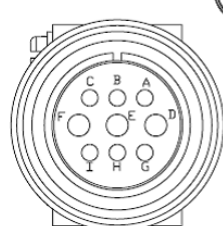

Power OFF /ALRM\_RY : contact “b” (normally closed)

MC : coil of electromagnetic contactor, self-holding power, contact of main circuit power

Figure 3.5 Three-Phase Power Supply Connection (for all models)



### 3.2.4 Motor Power Cable Connector Specifications

Motor Model Name	U, V, W / Electromagnetic Brake Connector	Terminal Identification
ECMA-J10604□S (400W) ECMA-J10807□S (750W)	  <p>HOUSING: MOLEX (39-01-2041)</p>	A
ECMA-J10604□S (400W) ECMA-J10807□S (750W)  *□ : with brake	  <p>HOUSING : MOLEX (39-01-2061)</p>	B
ECMA-L11308□S (850W) ECMA-M11309□S (900W) ECMA-J11010□S (1000W) ECMA-K11310□S (1000W) ECMA-K11315□S (1500W) EMCA-J11020□S (2000W) ECMA-K11320□S (2000W) ECMA-J11330□4 (3000W)	  <p>3106A-20-18S</p>	C
ECMA-L△1830□S (3000W) ECMA-L11845□S (4500W) ECMA-L11855□3 (5500W) ECMA-L11875□3 (7500W) ECMA-K11820□S (2000W)	  <p>3106A-24-11S</p>	D

Terminal Identification	U (Red)	V (White)	W (Black)	CASE GROUND (Green)	BRAKE1 (Yellow)	BRAKE2 (Blue)
A	1	2	3	4	-	-
B	1	2	4	5	3	6
C	F	I	B	E	G	H
D	D	E	F	G	A	B

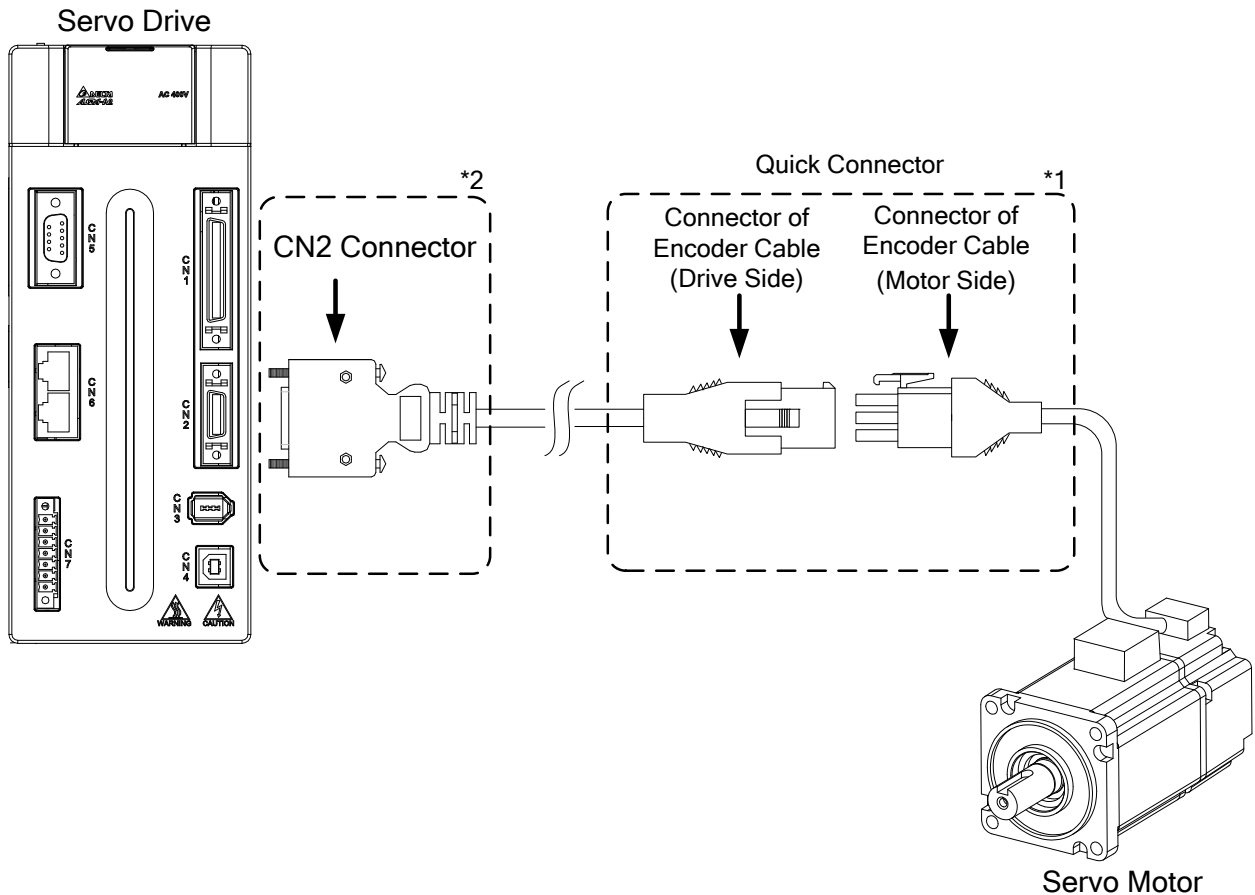
When selecting the wire rod, please choose 600V PVC cable and the length should not longer than 30m. If the length exceeds 30m, please take the received voltage into consideration when selecting the wire size. Please refer to Section 3.1.6 for wire rod selection.

 **NOTE**

- 1) The coil of brake has no polarity. The names of terminal identification are BRAKE1 and BRAKE2.
- 2) The power supply for brake is DC24V. Never use it for VDD, the +24V source voltage.
- 3) The boxes ( $\Delta$ ) in the model names are for encoder resolution types.  $\Delta=1$ : Incremental encoder, 20-bit;  $\Delta=2$ : Incremental encoder, 17-bit;  $\Delta=2$ : Absolute type.
- 4) The box ( $\square$ ) in the model names represents brake or keyway / oil seal.

### 3.2.5 Encoder Connector Specifications

Encoder Cable Connection (Diagram 1)

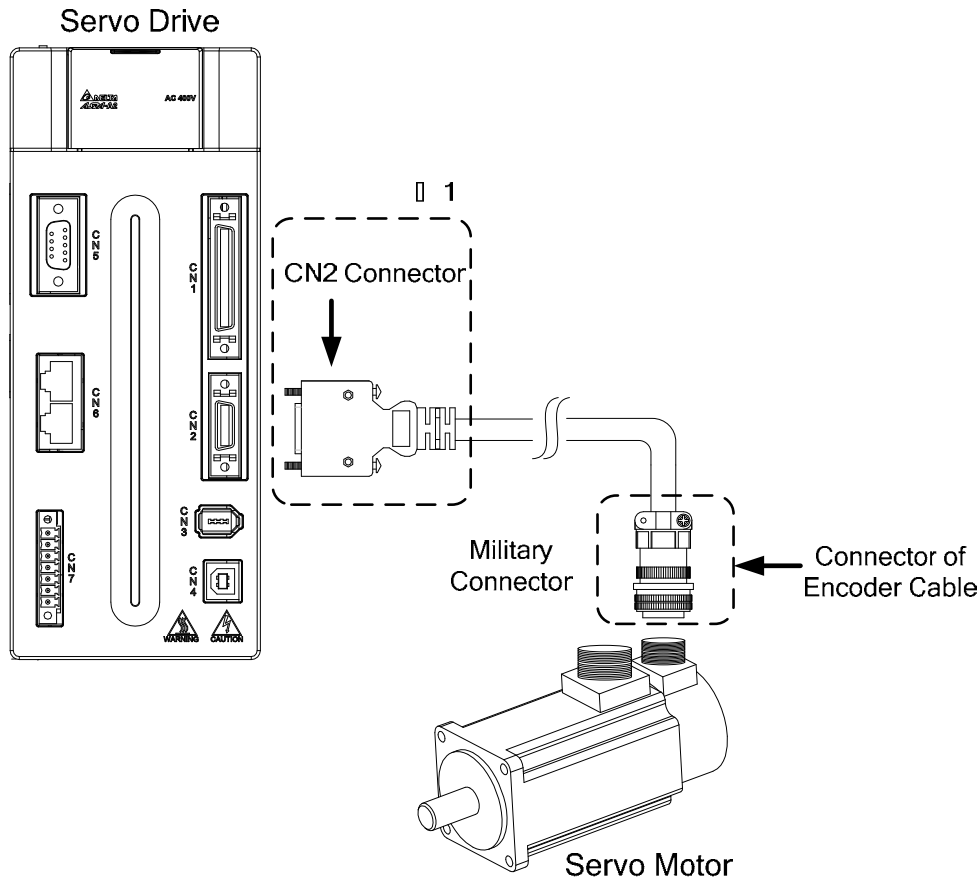


**NOTE** The scale of the objects does not match the dimensions as shown in the drawing above. For different models of AC servo drives and motors, the connection cables may differ.

- 1) Please refer to Section 3.1.5 for the descriptions of “Terminal Identification of Encoder Connector”.
- 2) Please refer to section 3.5 for the descriptions of “Encoder Connector CN2”.

Motor Model Name	Encoder Connector
ECMA-J10604□S (400W) ECMA-J10807□S (750W)	<p>HOUSING AMP (1-172161-9)</p>

**Encoder Cable Connection (Diagram 2)**



**NOTE** The scale of the objects does not match the dimensions as shown in the drawing above. For different models of AC servo drives and motors, the connection cables may differ.

- 1) Please refer to section 3.5 for the descriptions of “Encoder Connector CN2”.

Motor Model Name	Encoder Connector			
ECMA-L11308□S (850W)	<p>3106A-20-29S Military Connector</p>	Pin No.	Terminal Identification	Color
ECMA-M11309□S (900W)		A	T+	Blue
ECMA-J11010□S (1000W)		B	T-	Blue & Black
ECMA-K11310□S (1000W)		S	DC+5V	Red/Red & White
ECMA-K11315□S (1500W)		R	GND	Black/Black & White
ECMA-J11020□S (2000W)		L	BRAID SHIELD	-
ECMA-K11320□S (2000W)				
ECMA-K11820□S (2000W)				
ECMA-J11330□4 (3000W)				
ECMA-L△1830□S (3000W)				
ECMA-L11845□S (4500W)				
ECMA-L11855□3 (5500W)				
ECMA-L11875□3 (7500W)				



Please select shielded multi-core and the shielded cable should connect to the SHIELD end.  
Please refer to the description of Section 3.1.6.

**NOTE**

- The boxes ( $\Delta$ ) in the model names are for encoder resolution types.  
 $\Delta=1$ : Incremental encoder, 20-bit;  $\Delta=2$ : Incremental encoder, 17-bit;  
 $\Delta=2$ : Absolute type.
- The box ( $\square$ ) in the model names represents brake or keyway / oil seal.

### 3.2.6 Cable Specifications for Servo Drive

#### Power Cable

Servo Drive and Servo Motor		Power Cable - Wire Gauge AWG (mm <sup>2</sup> )			
		DC24V, DC0V	R, S, T	U, V, W	P $\oplus$ , C
ASD-A2-0743- $\square$	ECMA-J10604 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-J10807 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	0.82 (AWG18)	2.1 (AWG14)
ASD-A2-1043- $\square$	ECMA-K11310 $\square$ S	1.3 (AWG16)	0.82(AWG18)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-L11308 $\square$ S				
ASD-A2-1543- $\square$	ECMA-J11010 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-K11315 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-M11309 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	1.3 (AWG16)	2.1 (AWG14)
ASD-A2-2043- $\square$	ECMA-J11020 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-K11320 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-K11820 $\square$ S	1.3 (AWG16)	0.82 (AWG18)	1.3 (AWG16)	2.1 (AWG14)
ASD-A2-3043- $\square$	ECMA-L $\Delta$ 1830 $\square$ S	1.3 (AWG16)	1.3 (AWG16)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-J11330 $\square$ 4				
ASD-A2-4543- $\square$	ECMA-L11845 $\square$ S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	3.3 (AWG12)
ASD-A2-5543- $\square$	ECMA-L11855 $\square$ 3	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	3.3 (AWG12)
ASD-A2-7543- $\square$	ECMA-L11875 $\square$ 3	1.3 (AWG16)	3.3 (AWG12)	5.3 (AWG10)	3.3 (AWG12)

#### Encoder Cable

Servo Drive	Encoder Cable - Wire Gauge AWG (mm <sup>2</sup> )			
	Wire Size	Core Number	UL Rating	Standard Wire Length
ASD-A2-0743- $\square$	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-1043- $\square$	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-1543- $\square$	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-2043- $\square$	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-3043- $\square$	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)

ASD-A2-4543-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-5543-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-A2-7543-□	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)

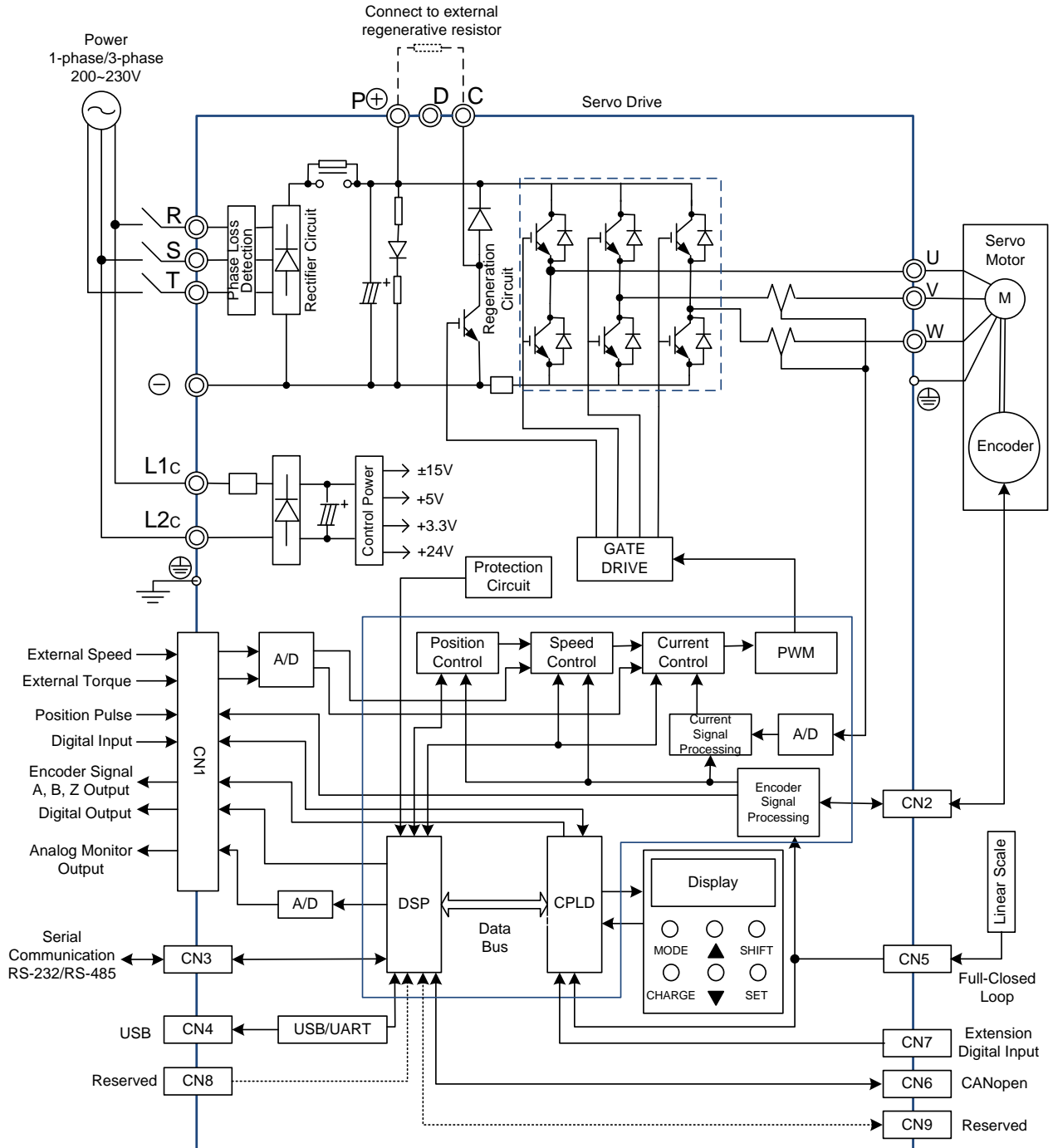
 **NOTE**

- 1) The boxes (□) at the ends of the servo drive model names represent the model type of ASDA-A2 series. For the actual model name, please refer to the ordering information of the actual purchased product.
- 2) The boxes (Δ) in the servo motor model names are for encoder resolution types. Δ=1: Incremental encoder, 20-bit; Δ=2: Incremental encoder, 17-bit; Δ=2: Absolute type.
- 3) The boxes (□) in the model names represents brake or keyway / oil seal.
- 4) Please use shielded twisted-pair cables for wiring to prevent voltage coupling and eliminate electrical noise and interference.
- 5) The shield of shielded twisted-pair cables should be connected to the SHIELD end (terminal marked ⊕) of the servo drive.
- 6) In order to prevent fire hazard and accidents, please form the wiring by following the cable specifications outlined above.

### 3.3 Basic Wiring

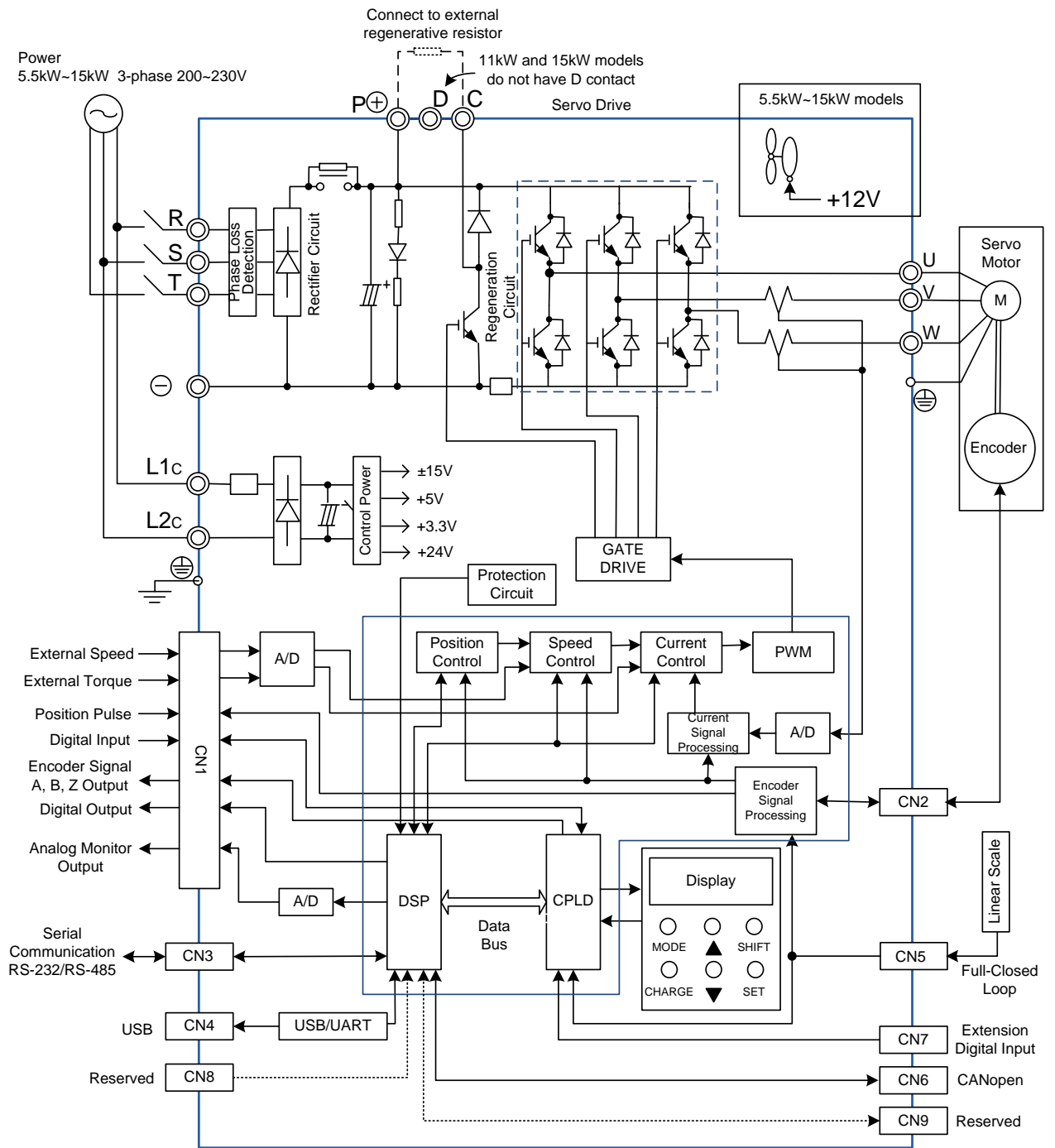
#### 3.3.1 220V series

- 200W or models below (without built-in regenerative resistor), 400W models (with built-in regenerative resistor)



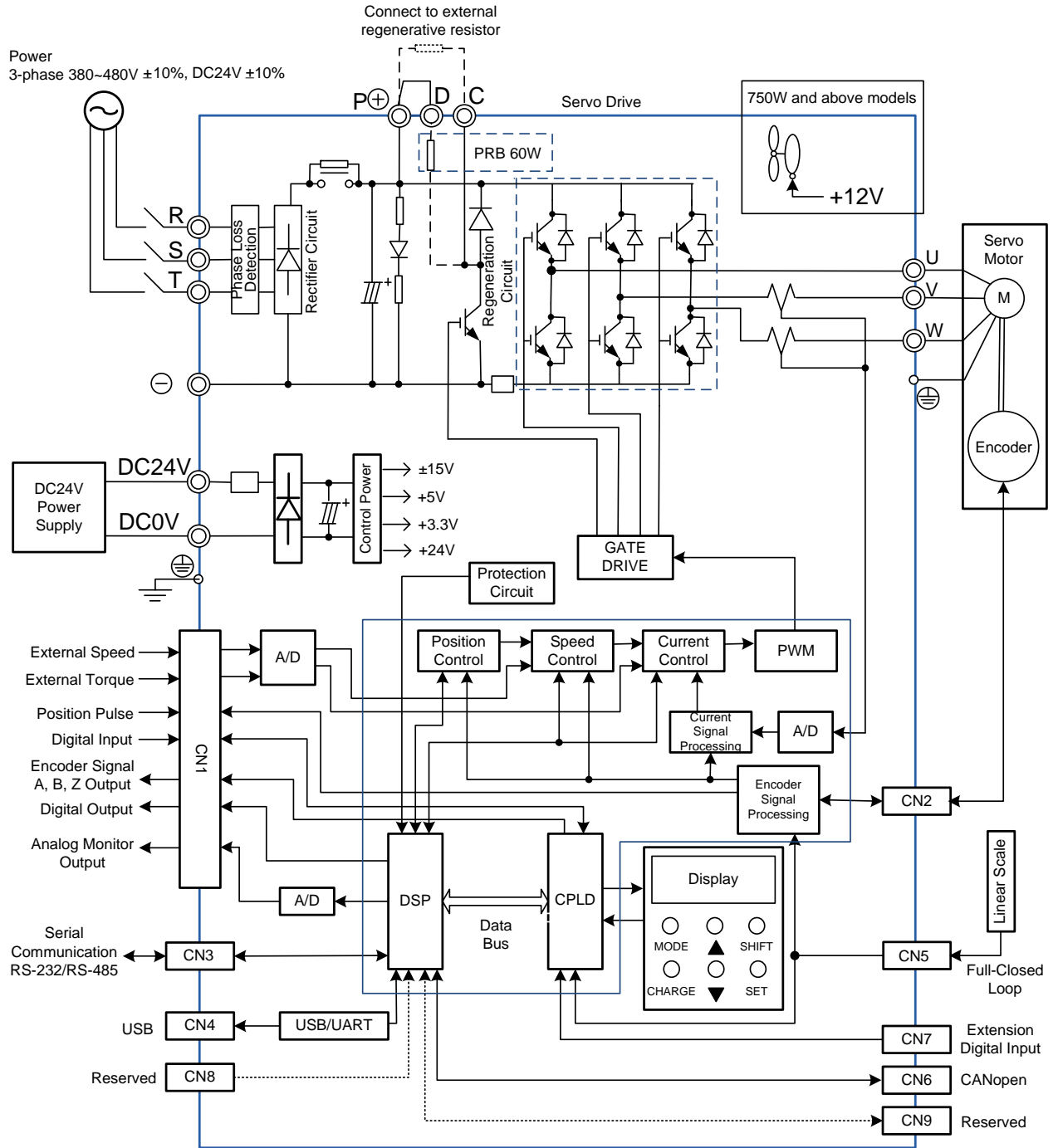


■ 5.5kW to 15kW models (with built-in fan but no regenerative resistor)

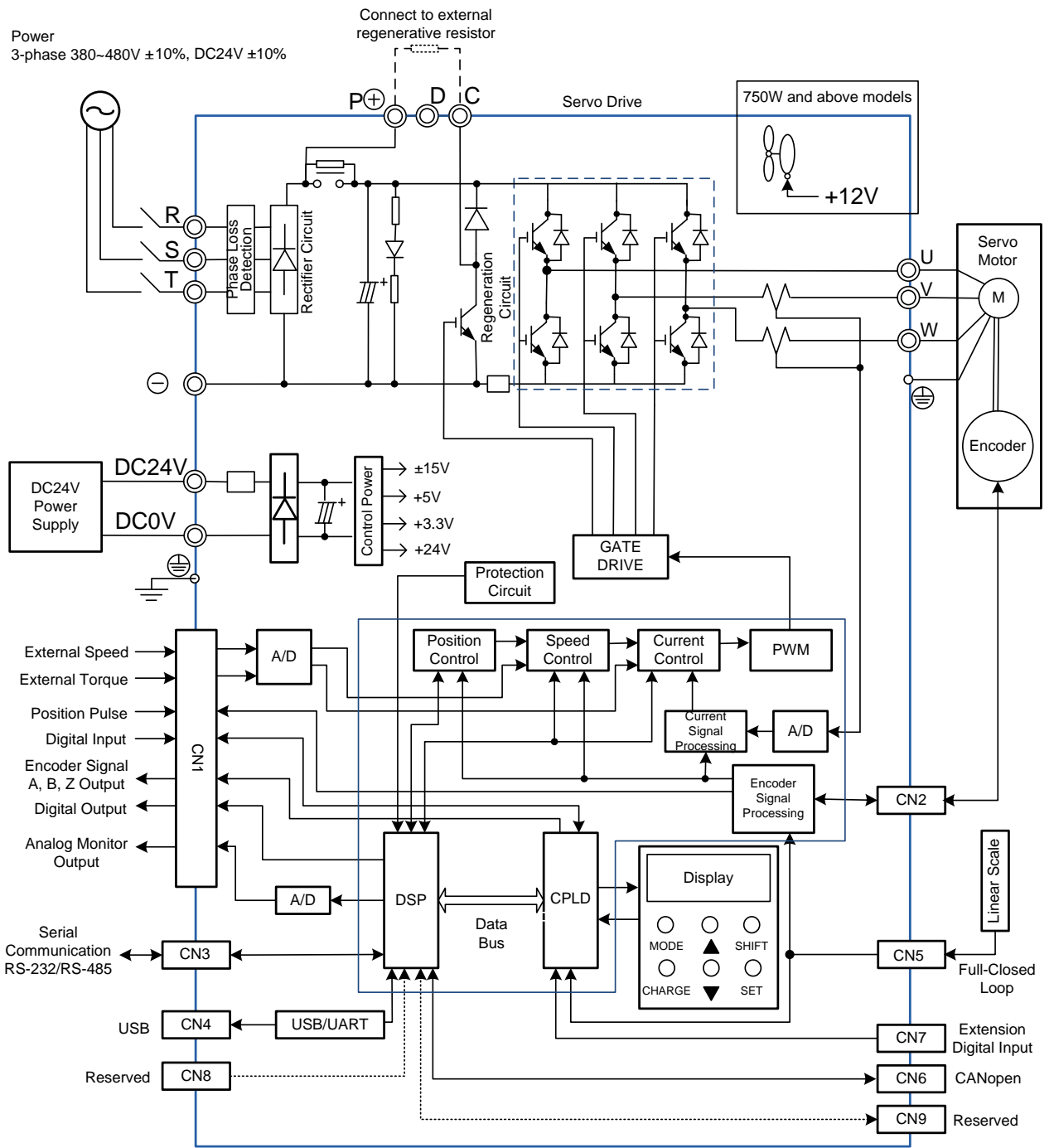


### 3.3.2 400V series

- 750W to 1.5kW models (with built-in regenerative resistor and fan)



■ 2kW to 7.5kW models (with built-in fan but no regenerative resistor)



### 3.4 Input / Output Interface Connector -CN1

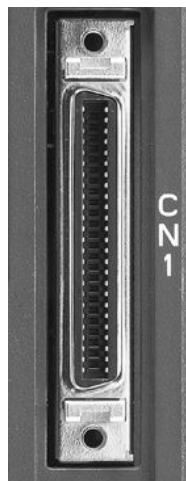
The CN1 Interface Connector provides access to three signal groups:

- i General interface for the analog speed and torque control, encoder reference signal from the motor, pulse / direction inputs, and reference voltages.
- ii 8 programmable Digital Inputs (DI), can be set via parameters P2-10 ~ P2-17
- iii 5 programmable Digital Outputs (DO), can be set via parameters P2-18 ~ P2-22

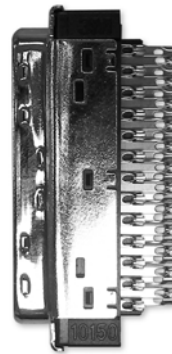
A detailed explanation of each group is available in Section 3.3.2, Tables 3.A, 3.B & 3.C.

#### 3.4.1 CN1 Terminal Identification

The Layout of CN1 Drive Connector



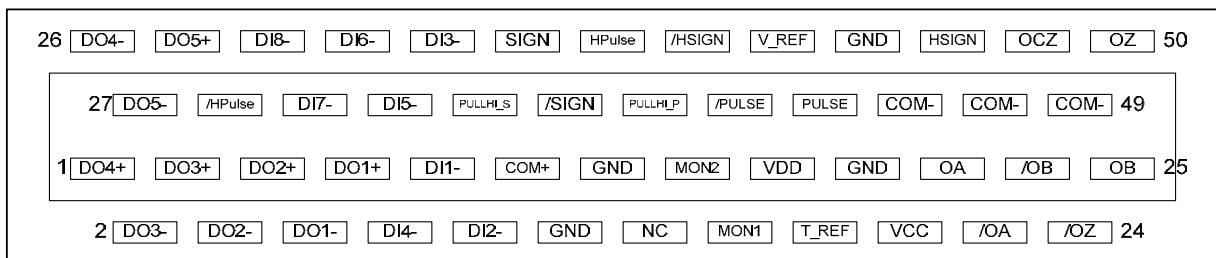
CN1 Drive Connector



Side View



Rear View



Layout of CN1





### 3.4.2 Signals Explanation of Connector CN1

The listed signal in previous section are described here.

#### General Signals

Signal		Pin No	Details	Wiring Diagram (Refer to 3.4.4)
Analog Signal Input	V_REF	42	1. Motor speed command: -10V to +10V, corresponds to -3000 ~ +3000 r/min speed command (Factory default setting). 2. Motor speed command: -10V to +10V, corresponds to -3 ~ +3 rotations position command (Factory default setting).	C1
	T_REF	18	Motor torque command: -10V to +10V, corresponds to -100% to +100% rated torque command.	C1
Analog Monitor Output	MON1 MON2	16 15	Monitor operation status: Motor characteristics such as speed and current can be represented by analog voltages. The drive provides two channels which can be configured with the parameter P0-03 to output the desired characteristics. Please reference the parameter P0-03 for monitoring commands and P1-04 / P1-05 for scaling factors. Output voltage is reference to the power ground.	C2
Position Pulse Input	PULSE	43	The drive can accept two different types of pulse inputs: Line-driver input (max. input frequency is 500Kpps) and Open-collector input (max. input frequency is 200Kpps). Three different pulse commands can be selected via parameter P1-00. They are A phase + B phase (Quadrature), CW pulse + CCW pulse, and Pulse + Direction. When an Open-collector type of pulse is used, this terminal must be connected to a pull-up power supply.	C3/C4
	/PULSE	41		C3/C4
	SIGN	36		
	/SIGN	37		
	PULL	39		
HI_P	35			
High- speed Position Pulse Input	HPULSE	38	The drive can accept two different types of high-speed pulse inputs: +5V input and Line-driver input. The max. input frequency is 4MHz. Three different pulse commands can be selected via parameter P1-00. They are A phase + B phase (Quadrature), CW pulse + CCW pulse, and Pulse + Direction.	C4-2
	/HPULSE	29		
	HSIGN	46		
	/HSIGN	40		
Position Pulse Output	OA	21	Encoder signal output A, B, Z (Line-driver output). The motor encoder signals are available through these terminals.	C13/C14
	/OA	22		
	OB	25		
	/OB	23		

	OZ	50		
	/OZ	24		
	OCZ	48	Encoder signal output Z (Open-collector output).	-
Power	VDD	17	VDD is the +24V source voltage provided by the drive. Maximum permissible current 500mA.	-
	COM+	11	COM+ is the common voltage rail of the Digital Input (DI) and Digital Output (DO) signals. When using VDD, VDD should be connected to COM+. If not using VDD, the users should add an external applied power (+12V to +24V). The positive end of this applied power should be connected to COM+ and the negative end of this applied power should be connected to COM-.	
	COM-	45		
		47 49		
	VCC	20	VCC is a +12V power rail provided by the drive. It is used for providing simple analog command (analog speed or analog torque command). Maximum permissible current 100mA.	
	GND	12,13, 19,44	The polarity of VCC is with respect to Ground (GND).	
Other	NC	14	See previous note for NC terminal description of CN1 connector on page 3-13.	

The Digital Input (DI) and Digital Output (DO) have factory default settings which correspond to the various servo drive control modes. (See section 6.1). However, both the DI's and DO's can be programmed independently to meet the requirements of the users.

Detailed in Tables 3.B and 3.C are the DO and DI functions with their corresponding signal name and wiring schematic. The factory default settings of the DI and DO signals are detailed in Table 3.G and 3.H.

All of the DI's and DO's and their corresponding pin numbers are factory set and non-changeable, however, all of the assigned signals and control modes are user changeable. For Example, the factory default setting of DO5 (pins 28/27) can be assigned to DO1 (pins 7/6) and vice versa.

The following tables detail the functions, applicable operational modes, signal name and relevant wiring schematic of the default DI and DO signals.

### DO Signals

DO Signal	Assigned Control Mode	Pin No. (Default)		Details	Wiring Diagram (Refer to 3.4.4)
		+	-		
SRDY	ALL	7	6	SRDY is activated when the servo drive is ready to run. All fault and alarm conditions, if present, have been cleared.	C5/C6/C7/C8
SON	Not assigned	-	-	SON is activated when control power is applied the servo drive. The drive may or may not be ready to run as a fault / alarm condition may exist. Servo ON (SON) is "ON" with control power applied to the servo drive, there may be a fault condition or not. The servo is not ready to run. Servo ready (SRDY) is "ON" where the servo is ready to run, NO fault / alarm exists.	
ZSPD	ALL	5	4	ZSPD is activated when the drive senses the motor is equal to or below the Zero Speed Range setting as defined in parameter P1-38. For Example, at factory default ZSPD will be activated when the drive detects the motor rotating at speed at or below 10 r/min, ZSPD will remain activated until the motor speed increases above 10 r/min.	
TSPD	ALL (except PT, PR)	-	-	TSPD is activated once the drive has detected the motor has reached the Target Rotation Speed setting as defined in parameter P1-39. TSPD will remain activated until the motor speed drops below the Target Rotation Speed.	
TPOS	PT, PR, PT-S, PT-T, PR-S, PR-T	1	26	1. When the drive is in PT mode, TPOS will be activated when the position error is equal and below the setting value of P1-54. 2. When the drive is in PR mode, TPOS will be activated when the drive detects that the position of the motor is in a -P1-54 to +P1-54 band of the current command position. For Example, at factory default TPOS will activate once the motor is in -99 pulses range of the current command position, then deactivate after it reaches +99 pulses range of the desired position.	
TQL	Not assigned	-	-	TQL is activated when the drive has detected that the motor has reached the torques limits set by either the parameters P1-12 ~ P1-14 of via an external analog voltage.	

ALRM	ALL	28	27	ALRM is activated when the drive has detected a fault condition. (However, when Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault occur, WARN is activated first.)	
BRKR	ALL	-	-	BRKR is activated actuation of motor brake.	
HOME	ALL	3	2	HOME is activated when the servo drive has detected that the "HOME" sensor (ORGP, digital input 0x24) has been detected.	
OLW	ALL	-	-	OLW is activated when the servo drive has detected that the motor has reached the output overload level set by the parameter P1-56.	
WARN	ALL	-	-	Servo warning output. WARN is activated when the drive has detected Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault conditions.	
OVF	ALL	-	-	Position command overflow. OVF is activated when the servo drive has detected that a position command overflows.	
SNL (SCWL)	PR	-	-	Reverse software limit. SNL is activated when the servo drive has detected that reverse software limit is reached.	
SPL (SCCWL)	PR	-	-	Forward software limit. SPL is activated when the servo drive has detected that forward software limit is reached.	C5/C6/C7/C8
Cmd_OK	PR	-	-	Internal position command completed output. Cmd_OK is activated when the servo drive has detected that the internal position command has been completed.	
CAP_OK	PR	-	-	Capture operation completed output. CAP_OK is activated when the servo drive has detected that capture operation has been completed.	
MC_OK	PR	-	-	Motion control completed output. MC_OK is activated when CMD_OK and TPOS are both ON. It indicates MC_OK is activated only when the servo drive has detected that the position command has been given and the positioning has been completed also. If only CMD_OK or TPOS is ON, MC_OK will not be activated.	
CAM_AR EA	PR	-	-	CAM_AREA is activated when the servo drive has detected the master position of E-CAM (electronic CAM) is within the setting area.	

S_CMP	S, Sz	-	-	S_CMP will be activated when the speed error is equal or below the setting value of P1-47.	
SDO_0	ALL	-	-	Output the status of bit00 of P4-06.	
SDO_1	ALL	-	-	Output the status of bit01 of P4-06.	
SDO_2	ALL	-	-	Output the status of bit02 of P4-06.	
SDO_3	ALL	-	-	Output the status of bit03 of P4-06.	
SDO_4	ALL	-	-	Output the status of bit04 of P4-06.	C5/C6/C7/C8
SDO_5	ALL	-	-	Output the status of bit05 of P4-06.	
SDO_6	ALL	-	-	Output the status of bit06 of P4-06.	
SDO_7	ALL	-	-	Output the status of bit07 of P4-06.	
SDO_8	ALL	-	-	Output the status of bit08 of P4-06.	
SDO_9	ALL	-	-	Output the status of bit09 of P4-06.	
SDO_A	ALL	-	-	Output the status of bit10 of P4-06.	
SDO_B	ALL	-	-	Output the status of bit11 of P4-06.	
SDO_C	ALL	-	-	Output the status of bit12 of P4-06.	
SDO_D	ALL	-	-	Output the status of bit13 of P4-06.	
SDO_E	ALL	-	-	Output the status of bit14 of P4-06.	
SDO_F	ALL	-	-	Output the status of bit15 of P4-06.	

 **NOTE**

- 1) PINS 3 & 2 can either be TSPD or HOME dependent upon control mode selected.
- 2) The DO signals that do not have pin numbers in Tables 3.B are not default DO signals. If the users want to use these non-default DO signals, the users need to change the settings of parameters P2-18 ~ P2-22. The “state” of the output function may be turned ON or OFF as it will be dependant on the settings of parameters P2-18 ~ P2-22. Please refer to section 3.4.4 for details.

DI Signals

DI Signal	Assigned Control Mode	Pin No. (Default)	Details	Wiring Diagram (Refer to 3.4.4)																																																																								
SON	ALL	9	Servo On. Switch servo to "Servo Ready".	C9/C10/C11 /C12																																																																								
ARST	ALL	33	A number of Faults (Alarms) can be cleared by activating ARST. Please see table 10-3 for applicable faults that can be cleared with the ARST command. However, please investigate Fault or Alarm if it does not clear or the fault description warrants closer inspection of the drive system.																																																																									
GAINUP	ALL	-	Gain switching																																																																									
CCLR	PT, PR	10	When CCLR is activated, the setting parameter P2-50 Pulse Clear Mode is executed.																																																																									
ZCLAMP	ALL	-	When this signal is On and the motor speed value is lower than the setting value of P1-38, it is used to lock the motor in the instant position while ZCLAMP is On.																																																																									
CMDINV	PR, T, S	-	When this signal is On, the motor is in reverse rotation.																																																																									
CTRG	PR, PR-S, PR-T	10	When the drive is in PR mode and CTRG is activated, the drive will command the motor to move the stored position which correspond the POS 0 ~ POS 5 settings. Activation is triggered on the rising edge of the pulse.																																																																									
TRQLM	S, Sz	10	ON indicates the torque limit command is valid.																																																																									
SPDLM	T, Tz	10	ON indicates the speed limit command is valid.																																																																									
POS0	P, PR, PR-S, PR-T	34	Please select the source of position command in PR mode,																																																																									
POS1		8	<table border="1"> <thead> <tr> <th>Position command</th> <th>POS5</th> <th>POS4</th> <th>POS3</th> <th>POS2</th> <th>POS1</th> <th>POS0</th> <th>CTRG</th> <th>Corresponding parameter</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>↑</td> <td>P6-00 P6-01</td> </tr> <tr> <td>P2</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>↑</td> <td>P6-02 P6-03</td> </tr> <tr> <td>~</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>~</td> </tr> <tr> <td>P50</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>↑</td> <td>P6-98 P6-99</td> </tr> <tr> <td>P51</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>↑</td> <td>P7-00 P7-01</td> </tr> <tr> <td>~</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>~</td> </tr> <tr> <td>P64</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>↑</td> <td>P7-26 P7-27</td> </tr> </tbody> </table>		Position command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Corresponding parameter	P1	0	0	0	0	0	0	↑	P6-00 P6-01	P2	0	0	0	0	0	1	↑	P6-02 P6-03	~								~	P50	1	1	0	0	1	0	↑	P6-98 P6-99	P51	1	1	0	0	1	1	↑	P7-00 P7-01	~								~	P64	1	1	1	1	1	1	↑	P7-26 P7-27
Position command		POS5	POS4		POS3	POS2	POS1	POS0	CTRG	Corresponding parameter																																																																		
P1		0	0		0	0	0	0	↑	P6-00 P6-01																																																																		
P2		0	0		0	0	0	1	↑	P6-02 P6-03																																																																		
~										~																																																																		
P50		1	1		0	0	1	0	↑	P6-98 P6-99																																																																		
P51		1	1		0	0	1	1	↑	P7-00 P7-01																																																																		
~									~																																																																			
P64		1	1	1	1	1	1	↑	P7-26 P7-27																																																																			
POS2	-																																																																											
POS3	-																																																																											
POS4	-																																																																											
POS5	-																																																																											
STOP	-	-	Motor stop.																																																																									
SPD0	S, Sz, PT-S, PR-S, S-T	34	Select the source of speed command:																																																																									
SPD1		8	<table border="1"> <thead> <tr> <th>SPD1</th> <th>SPD0</th> <th>Command source</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>S mode is analog input; Sz mode is 0</td> </tr> <tr> <td>0</td> <td>1</td> <td>P1-09</td> </tr> <tr> <td>1</td> <td>0</td> <td>P1-10</td> </tr> <tr> <td>1</td> <td>1</td> <td>P1-11</td> </tr> </tbody> </table>	SPD1	SPD0	Command source	0	0	S mode is analog input; Sz mode is 0	0	1	P1-09	1	0	P1-10	1	1	P1-11																																																										
SPD1		SPD0	Command source																																																																									
0		0	S mode is analog input; Sz mode is 0																																																																									
0		1	P1-09																																																																									
1	0	P1-10																																																																										
1	1	P1-11																																																																										

TCM0		34	Select the source of torque command:	C9/C10/C11 /C12															
TCM1	PT, T, Tz, PT-T, PR-T, S- T	8	<table border="1"> <thead> <tr> <th>TCM1</th> <th>TCM0</th> <th>Command source</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>T mode is analog input; Tz mode is 0</td> </tr> <tr> <td>0</td> <td>1</td> <td>P1-12</td> </tr> <tr> <td>1</td> <td>0</td> <td>P1-13</td> </tr> <tr> <td>1</td> <td>1</td> <td>P1-14</td> </tr> </tbody> </table>		TCM1	TCM0	Command source	0	0	T mode is analog input; Tz mode is 0	0	1	P1-12	1	0	P1-13	1	1	P1-14
			TCM1		TCM0	Command source													
			0		0	T mode is analog input; Tz mode is 0													
			0		1	P1-12													
1	0	P1-13																	
1	1	P1-14																	
S-P	PT-S, PR-S	31	Speed / Position mode switching OFF: Speed, ON: Position																
S-T	S-T	31	Speed / Torque mode switching OFF: Speed, ON: Torque																
T-P	PT-T, PR-T	31	Torque / Position mode switching OFF: Torque, ON: Position																
PT-PR	PT, PR	-	Internal position (PR) and external pulse (PT) mode switching. OFF: PT, ON: PR	C9/C10/C11 /C12															
PTAS	PT	-	External command source selection: pulse and analog voltage switching. OFF: The command source is external pulse. ON: The command source is external analog voltage.																
PTCMS	PT	-	External command source selection: high-speed / low-speed pulse switching OFF: The command source is low-speed pulse (PULSE, /PULSE, SIGN, /SIGN). ON: The command source is high-speed pulse (HPULSE, /HPULSE, HSIGN, /HSIGN). When high-speed pulse is selected, the users can add an external manual pulse generator and use this DI signal to switch the command source.																
EMGS	ALL	30	It should be contact "b" and normally ON or a fault (AL013) will display.																
NL(CWL )	PT, PR, S, T, Sz, Tz	32	Reverse inhibit limit. It should be contact "b" and normally ON or a fault (AL014) will display.																
PL(CCW L)	PT, PR, S, T, Sz, Tz	31	Forward inhibit limit. It should be contact "b" and normally ON or a fault (AL015) will display.	C9/C10/C11 /C12															
ORGP	PR	-	When ORGP is activated, the drive will command the motor to start to search the reference "Home" sensor.																
SHOM	PR	-	When SHOM is activated, the drive will command the motor to move to "Home".																
CAM	PR	-	Electronic cam engaging control. [see P5-88]																
JOGU	ALL	-	Forward JOG input. When JOGU is activated, the motor will JOG in forward direction. [see P4-05]																
JOGD	ALL	-	Reverse JOG input. When JOGD is activated, the motor will JOG in reverse direction. [see P4-05]	C9/C10/C11 /C12															
EV1	PR	-	Event trigger command 1.																
EV2	PR	-	Event trigger command 2.																



EV3	PR	-	Event trigger command 3. (available for ASDA-A2 firmware version V1.008 sub04 or later)
EV4	PR	-	Event trigger command 4. (available for ASDA-A2 firmware version V1.008 sub04 or later)
GNUM0	PT, PR, PT-S, PR-S	-	Electronic gear ratio (Numerator) selection 0. [See P2-60~P2-62]
GNUM1	PT, PR, PT-S, PR-S	-	Electronic gear ratio (Numerator) selection 1. [See P2-60~P2-62]
INHP	PT, PT-S	-	Pulse inhibit input. When the drive is in position mode, if INHP is activated, the external pulse input command is not valid.

**NOTE**

- 1) The DI signals that do not have pin numbers in Tables 3.C are not default DI signals. If the users want to use these non-default DI signals, the users need to change the settings of parameters P2-10 ~ P2-17. The "state" of the output function may be turned ON or OFF as it will be dependant on the settings of parameters P2-10 ~ P2-17. Please refer to section 3.3.3 for details.

The default DI and DO signals in different control mode are listed in the following table 3.G and table 3.H. Although the content of the table 3.G and table 3.H do not provide more information than the table 3.B and table 3.C above, as each control mode is separated and listed in different row, it is easy for user to view and can avoid confusion. However, the Pin number of each signal can not be displayed in the table 3.G and table 3.H.

### Default DI signals and Control modes

Signal	DI Code	Function	PT	PR	S	T	Sz	Tz	PT-S	PT-T	PR-S	PR-T	S-T
SON	0x01	Servo On	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1
ARST	0x02	Reset	DI5	DI5	DI5	DI5	DI5	DI5					
GAINUP	0x03	Gain switching											
CCLR	0x04	Pulse clear	DI2						DI2	DI2			
ZCLAMP	0x05	Low speed CLAMP											
CMDINV	0x06	Command input reverse control											
Reserved	0x07	Reserved											
CTRG	0x08	Command triggered		DI2							DI2	DI2	
TRQLM	0x09	Torque limit enabled			DI2		DI2						
SPDLM	0x10	Speed limit enabled				DI2		DI2					
POS0	0x11	Position command selection 0 (1~64)		DI3							DI3	DI3	
POS1	0x12	Position command selection 1 (1~64)		DI4							DI4	DI4	
POS2	0x13	Position command selection 2 (1~64)											
POS3	0x1A	Position command selection 3 (1~64)											
POS4	0x1B	Position command selection 4 (1~64)											
POS5	0x1C	Position command selection 5 (1~64)											
STOP	0x46	Motor stop											
SPD0	0x14	Speed command selection 0 (1~4)			DI3		DI3		DI3		DI5		DI3
SPD1	0x15	Speed command selection 1 (1~4)			DI4		DI4		DI4		DI6		DI4
TCM0	0x16	Torque command selection 0 (1~4)	DI3			DI3		DI3		DI3		DI5	DI5
TCM1	0x17	Torque command selection 1 (1~4)	DI4			DI4		DI4		DI4		DI6	DI6
S-P	0x18	Position / Speed mode switching (OFF: Speed,							DI7		DI7		

Signal	DI Code	Function	PT	PR	S	T	Sz	Tz	PT-S	PT-T	PR-S	PR-T	S-T
		ON: Position)											
S-T	0x19	Speed / Torque mode switching (OFF: Speed, ON: Torque)											DI7
T-P	0x20	Torque / Position mode switching (OFF: Torque, ON: Position)								DI7		DI7	
PT-PR	0x2B	Internal position (PR) and external pulse (PT) mode switching (OFF: PT, ON: PR)											
PTAS	0x2C	External command source selection: pulse and analog voltage switching (in PT mode only)											
PTCMS	0x2D	External command source selection: high-speed / low-speed pulse switching (in PT mode only)											
EMGS	0x21	Emergency stop	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8
NL(CWL)	0x22	Reverse inhibit limit	DI6	DI6	DI6	DI6	DI6	DI6					
PL(CCWL)	0x23	Forward inhibit limit	DI7	DI7	DI7	DI7	DI7	DI7					
ORGP	0x24	Reference "Home" sensor											
SHOM	0x27	Move to "Home"											
CAM	0x36	Electronic cam engaging control											
JOGU	0x37	Forward JOG input											
JOGD	0x38	Reverse JOG input											
EV1	0x39	Event trigger command 1 [see P5-98, P5-99]											
EV2	0x3A	Event trigger command 2 [see P5-98, P5-99]											
EV3	0x3B	Event trigger command 1 (available for ASDA-A2 firmware version V1.008 sub04 or later)											
EV4	0x3C	Event trigger command 2 (available for ASDA-A2 firmware version V1.008 sub04 or later)											
GNUM0	0x43	Electronic gear ratio (Numerator) selection 0											
GNUM1	0x44	Electronic gear ratio											

Signal	DI Code	Function	PT	PR	S	T	Sz	Tz	PT-S	PT-T	PR-S	PR-T	S-T
		(Numerator) selection 1											
INHP	0x45	Pulse inhibit input											



- 1) For Pin numbers of DI1~DI8 signals, please refer to section 3.3.1.

#### Default DO signals and Control modes

Signal	DO Code	Function	PT	PR	S	T	Sz	Tz	PT-S	PT-T	PR-S	PR-T	S-T
SRDY	0x01	Servo ready	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1
SON	0x02	Servo On											
ZSPD	0x03	At Zero speed	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2
TSPD	0x04	At Speed reached			DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3
TPOS	0x05	At Positioning completed	DO4	DO4					DO4	DO4	DO4	DO4	DO4
TQL	0x06	At Torques limit											
ALRM	0x07	Servo alarm (Servo fault) activated	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5
BRKR	0x08	Electromagnetic brake control			DO4	DO4	DO4	DO4					
HOME	0x09	Homing completed	DO3	DO3									
OLW	0x10	Output overload warning											
WARN	0x11	Servo warning activated											
OVF	0x12	Position command overflow											
SNL (SCWL)	0x13	Reverse software limit											
SPL (SCCWL)	0x14	Forward software limit											
Cmd_OK	0x15	Internal position command completed output											
CAP_OK	0x16	Capture operation completed output											
MC_OK	0x17	Motion control completed output											
CAM_AREA	0x18	Master position of E-CAM (electronic CAM)											
SP_OK	0x19	Speed reached output											
SDO_0	0x30	Output the status of bit00 of P4-06.											

Signal	DO Code	Function	PT	PR	S	T	Sz	Tz	PT-S	PT-T	PR-S	PR-T	S-T
SDO_1	0x31	Output the status of bit01 of P4-06.											
SDO_2	0x32	Output the status of bit02 of P4-06.											
SDO_3	0x33	Output the status of bit03 of P4-06.											
SDO_4	0x34	Output the status of bit04 of P4-06.											
SDO_5	0x35	Output the status of bit05 of P4-06.											
SDO_6	0x36	Output the status of bit06 of P4-06.											
SDO_7	0x37	Output the status of bit07 of P4-06.											
SDO_8	0x38	Output the status of bit08 of P4-06.											
SDO_9	0x39	Output the status of bit09 of P4-06.											
SDO_A	0x3A	Output the status of bit10 of P4-06.											
SDO_B	0x3B	Output the status of bit11 of P4-06.											
SDO_C	0x3C	Output the status of bit12 of P4-06.											
SDO_D	0x3D	Output the status of bit13 of P4-06.											
SDO_E	0x3E	Output the status of bit14 of P4-06.											
SDO_F	0x3F	Output the status of bit15 of P4-06.											

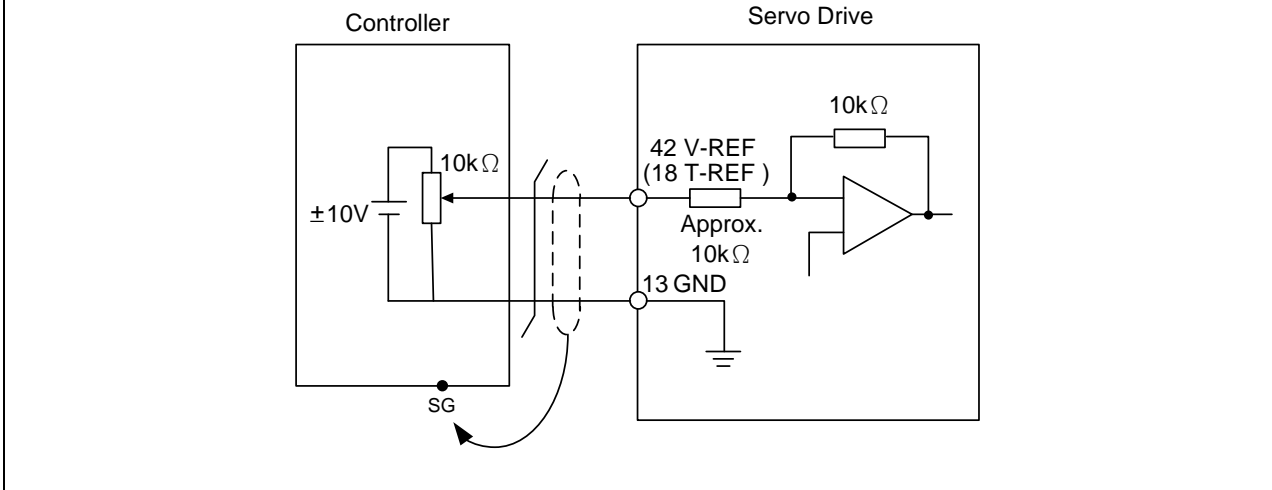
 **NOTE**

- 1) For Pin numbers of DO1~DO5 signals, please refer to section 3.3.1.

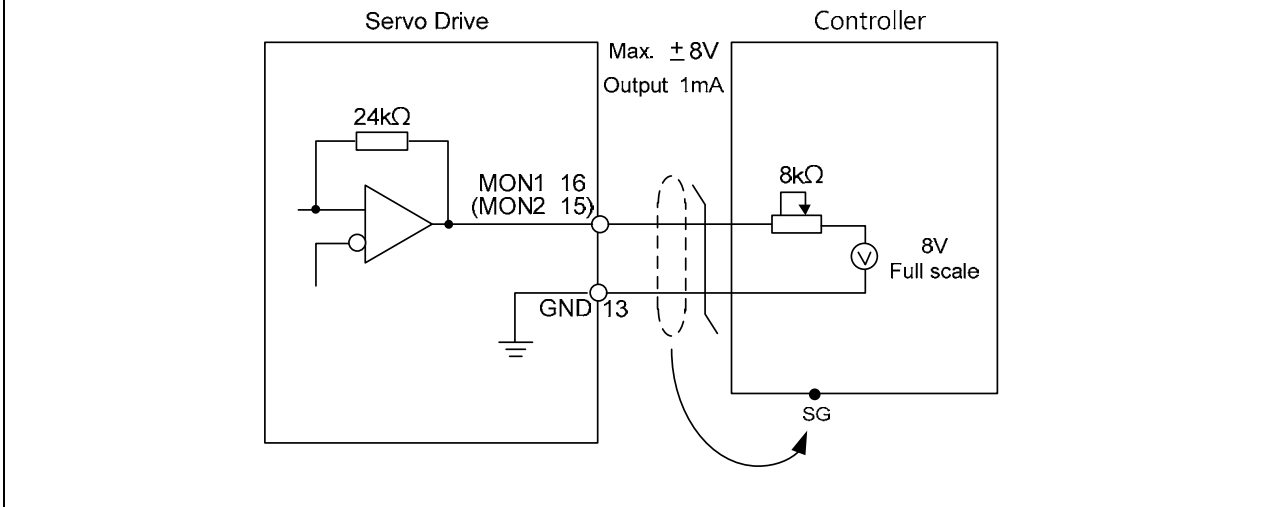
### 3.4.3 Wiring Diagrams of I/O Signals (CN1)

The valid voltage range of analog input command in speed and torque mode is -10V ~ +10V. The command value can be set via relevant parameters. The value of input impedance is 10kΩ.

**C1:** Speed / Torque analog signal input

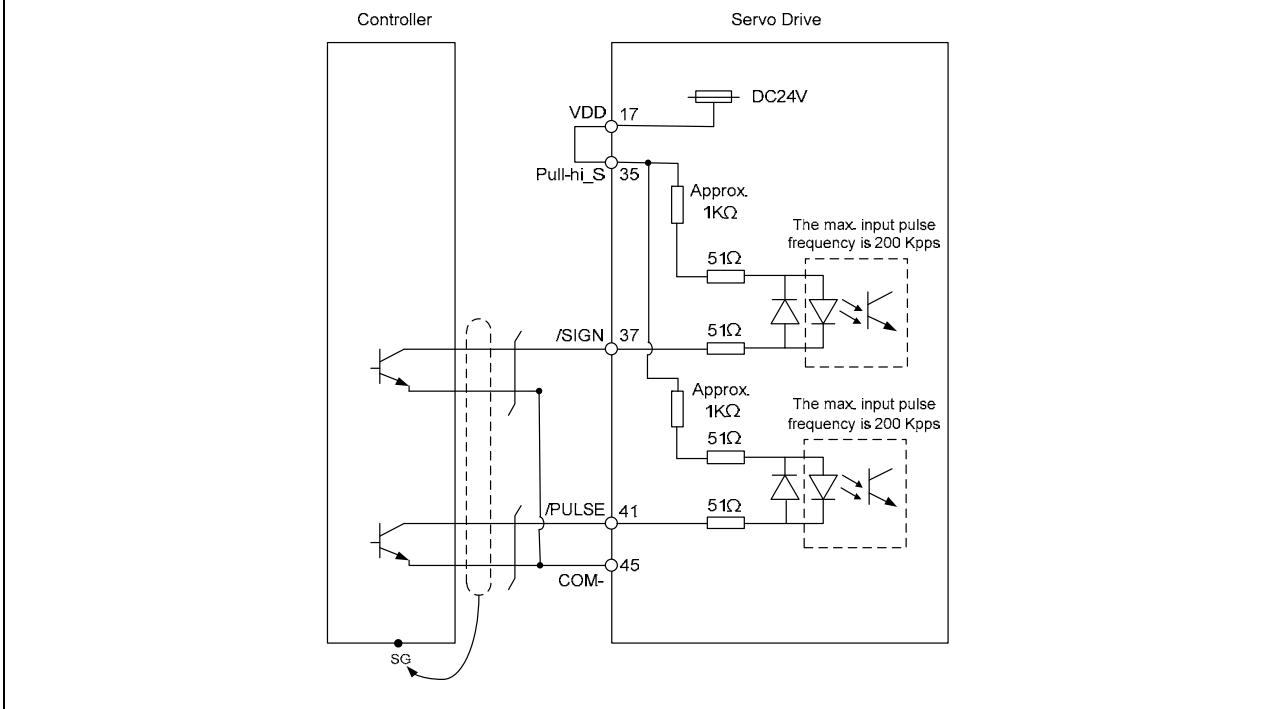


**C2:** Analog monitor output (MON1, MON2)

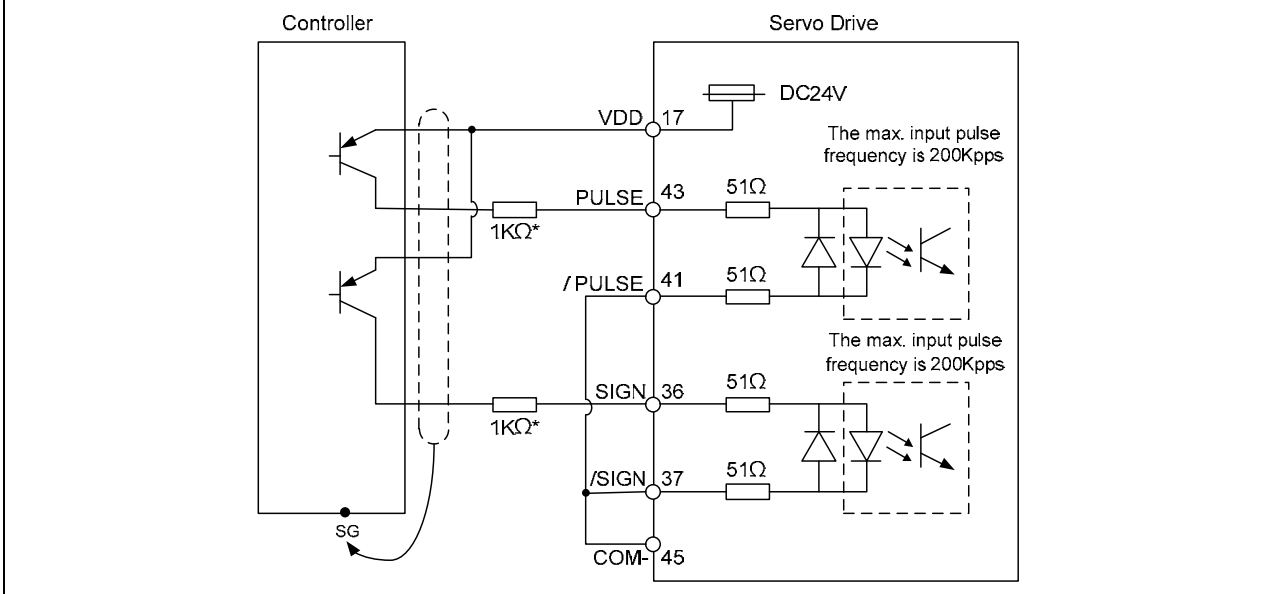


There are two kinds of pulse inputs, Line driver input and Open-collector input. Max. input pulse frequency of Line-driver input is 500kpps and max. input pulse frequency of Open-collector input is 200kpps.

**C3-1:** The source of pulse input is from the open collector NPN equipment and use the internal power of the drive.

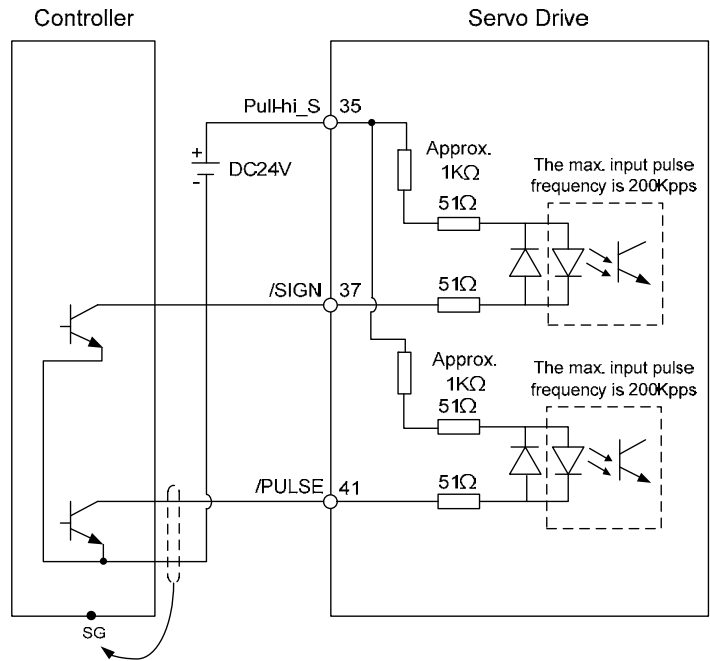


**C3-2:** The source of pulse input is from the open collector PNP equipment and use the internal power.



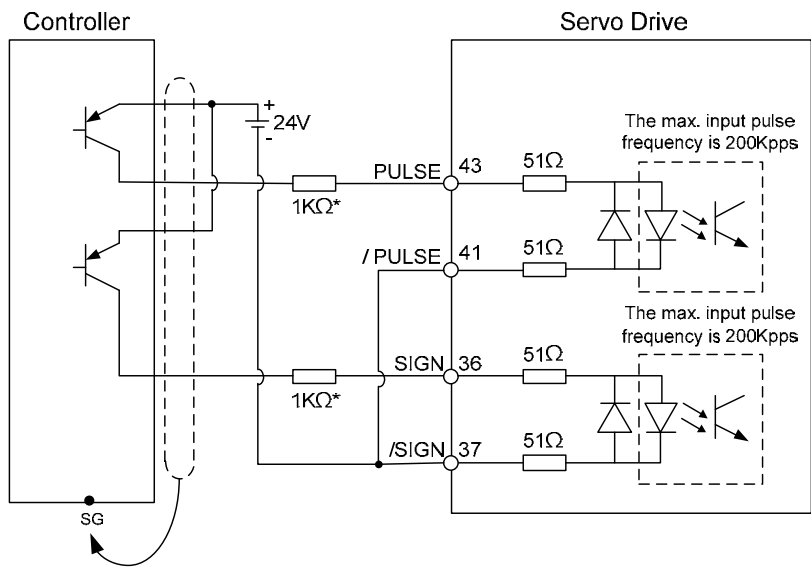
➤ **Caution:** Do not use dual power supply. Failure to observe this caution may result in damage to the servo drive and servo motor.

C3-3: The source of pulse input is from the open collector NPN equipment and use the external power.



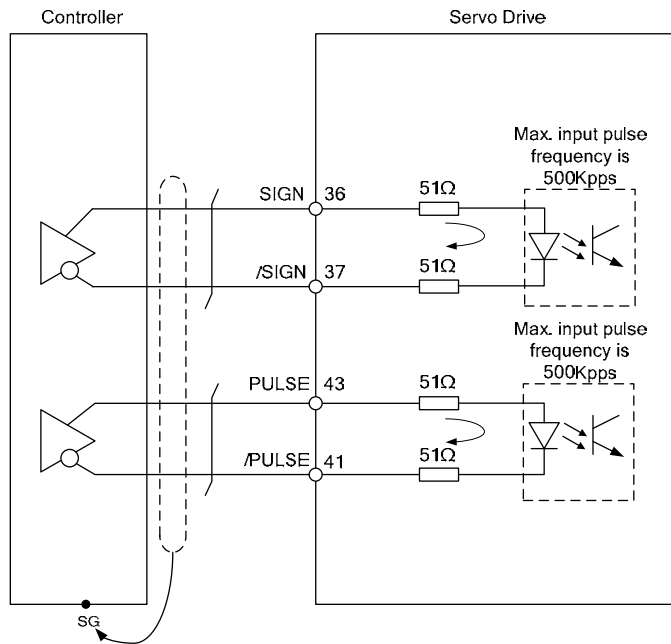
➤ **Do not use dual power supply. Failure to observe this caution may result in damage to the servo drive and servo motor.**

C3-4: The source of pulse input is from the open collector PNP equipment and use the external power.

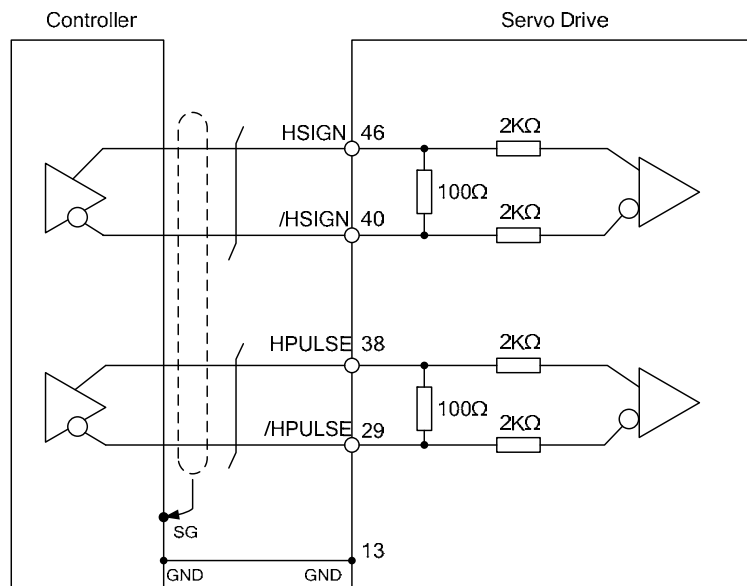




**C4-1:** Pulse input (Line driver input). It requires 5V power supply only. Never apply a 24V power supply.



**C4-2:** High-speed pulse input (Line driver). It requires 5V power supply only. Never apply a 24V power supply.

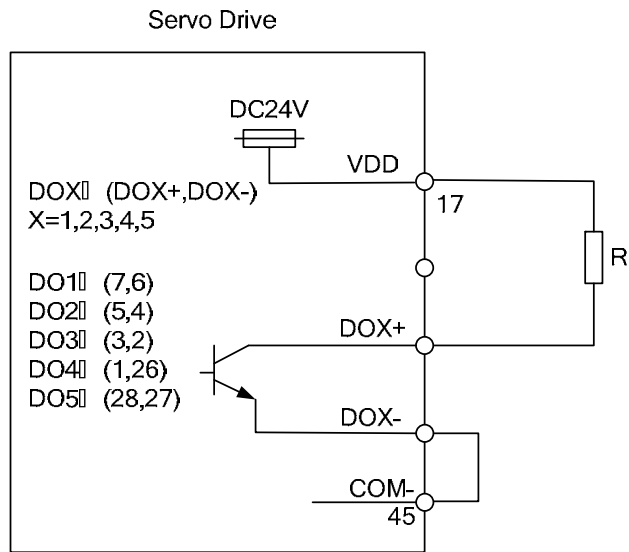


➤ **Caution:** Ensure that the ground terminal of the controller and the servo drive should be connected to each other.

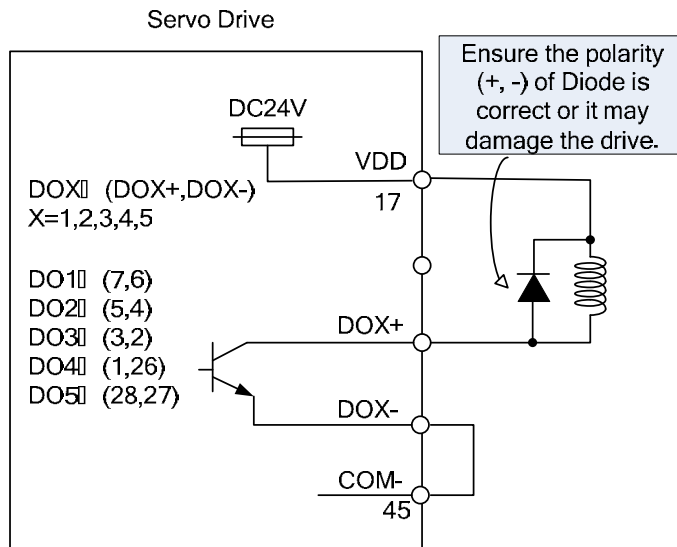
Be sure to connect a diode when the drive is applied to inductive load.

(Permissible current: 40mA, Instantaneous peak current: max. 100mA)

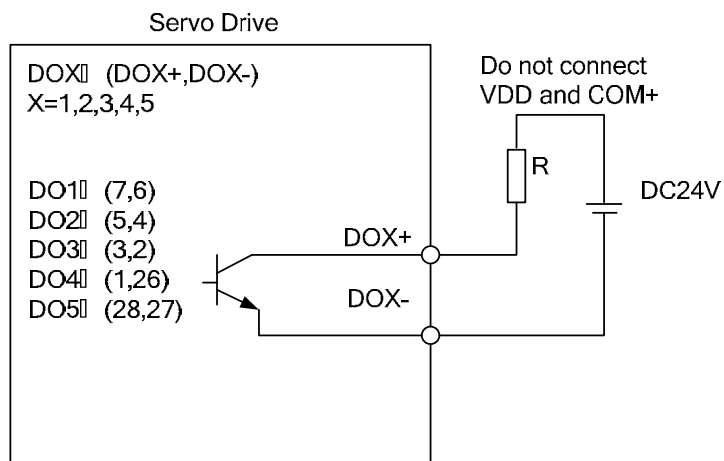
**C5:** Wiring of DO signal, for the use of internal power supply, general load



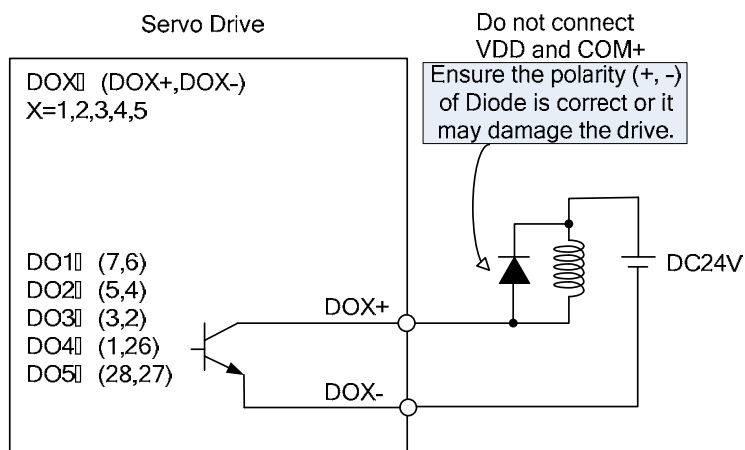
**C6:** Wiring of DO signal, for the use of internal power supply, inductive load



**C7:** Wiring of DO signal, for the use of external power supply, general load



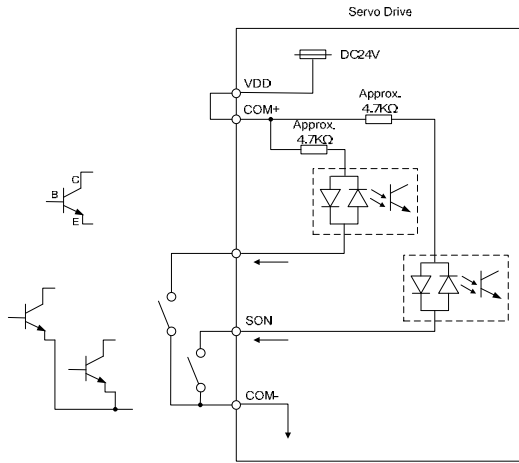
**C8:** Wiring of DO signal, for the use of external power supply, inductive load



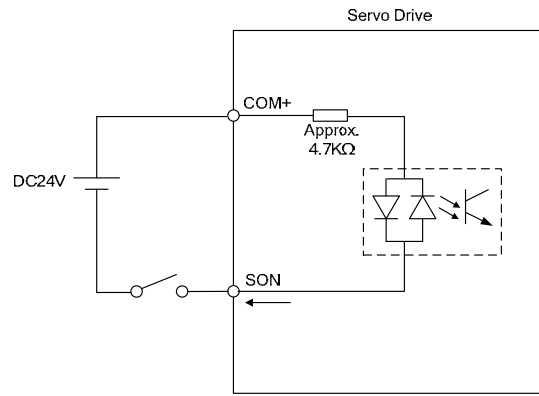
Use a relay or open-collector transistor to input signal.

NPN transistor with multiple emitter fingers (SINK Mode)

**C9:** Wiring of DI signal, for the use of internal power supply

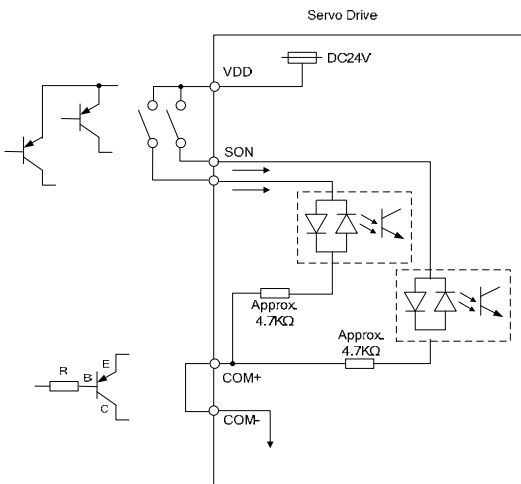


**C10:** Wiring of DI signal, for the use of external power supply

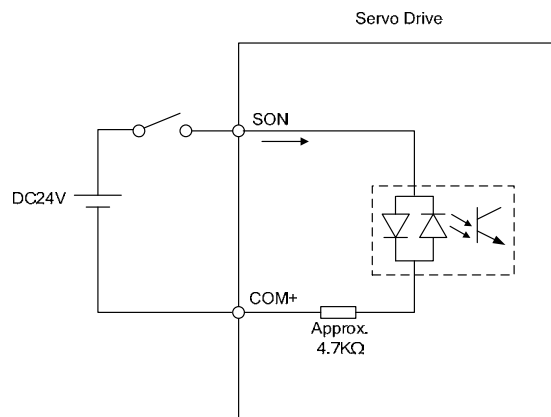


PNP transistor with multiple emitter fingers (SOURCE Mode)

**C11:** Wiring of DI signal, for the use of internal power supply

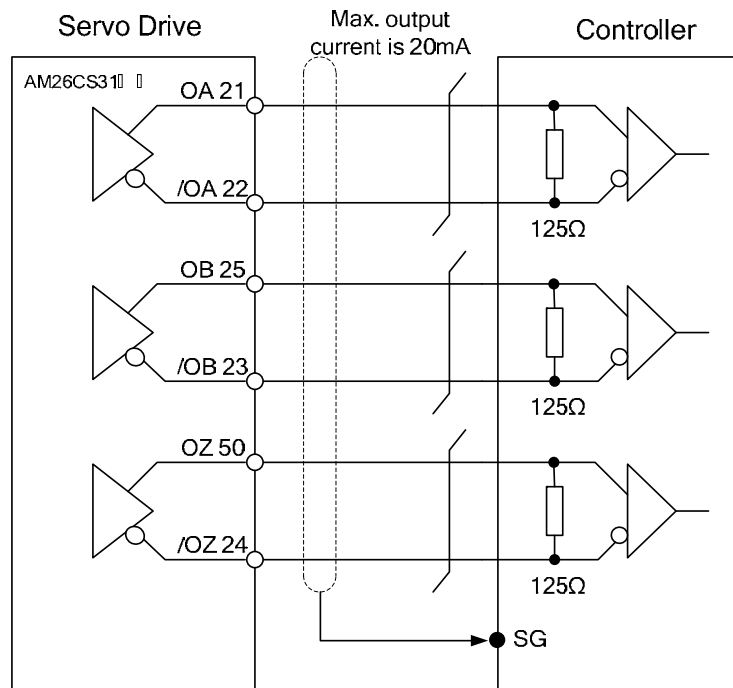


**C12:** Wiring of DI signal, for the use of external power supply

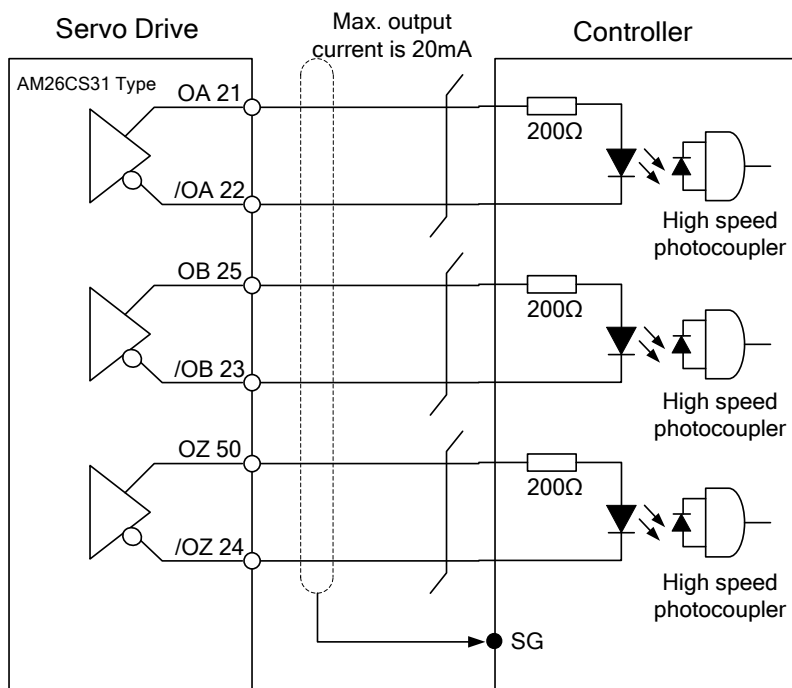


➤ **Caution:** Do not use dual power supply. Failure to observe this caution may result in damage to the servo drive and servo motor.

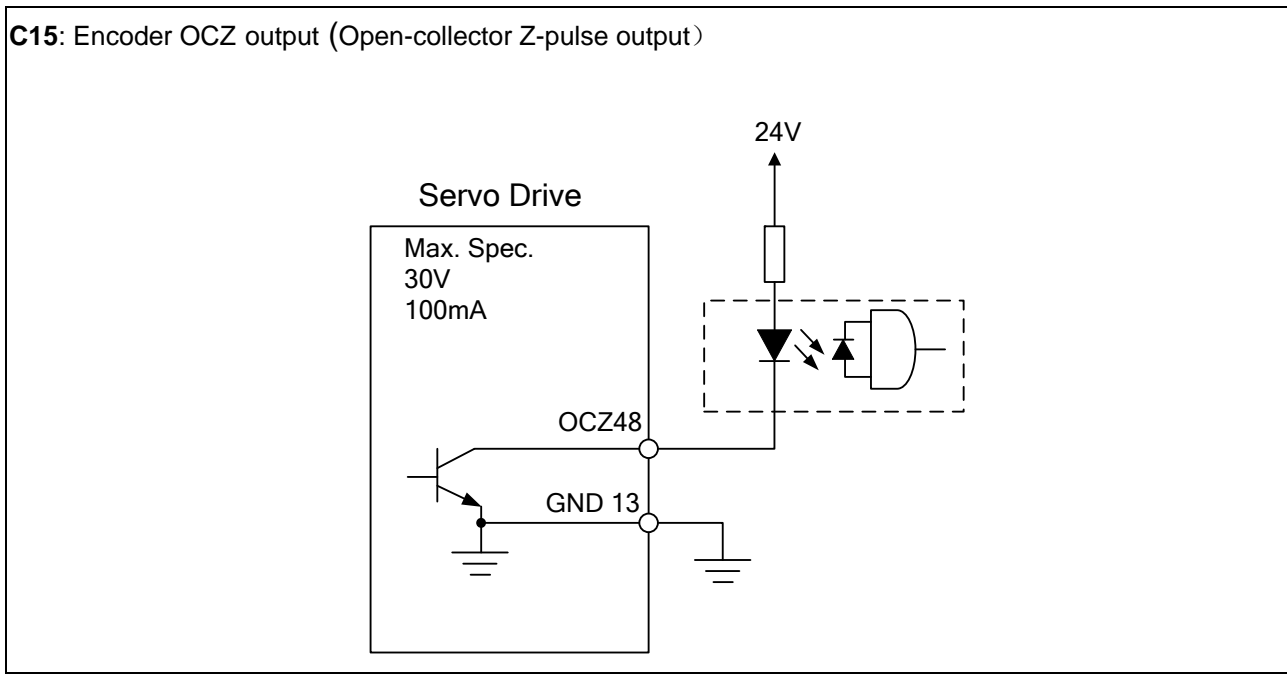
**C13:** Encoder output signal (Line driver)



**C14:** Encoder output signal (Photocoupler)



**C15:** Encoder OCZ output (Open-collector Z-pulse output)



### 3.4.4 DI and DO signal specified by users

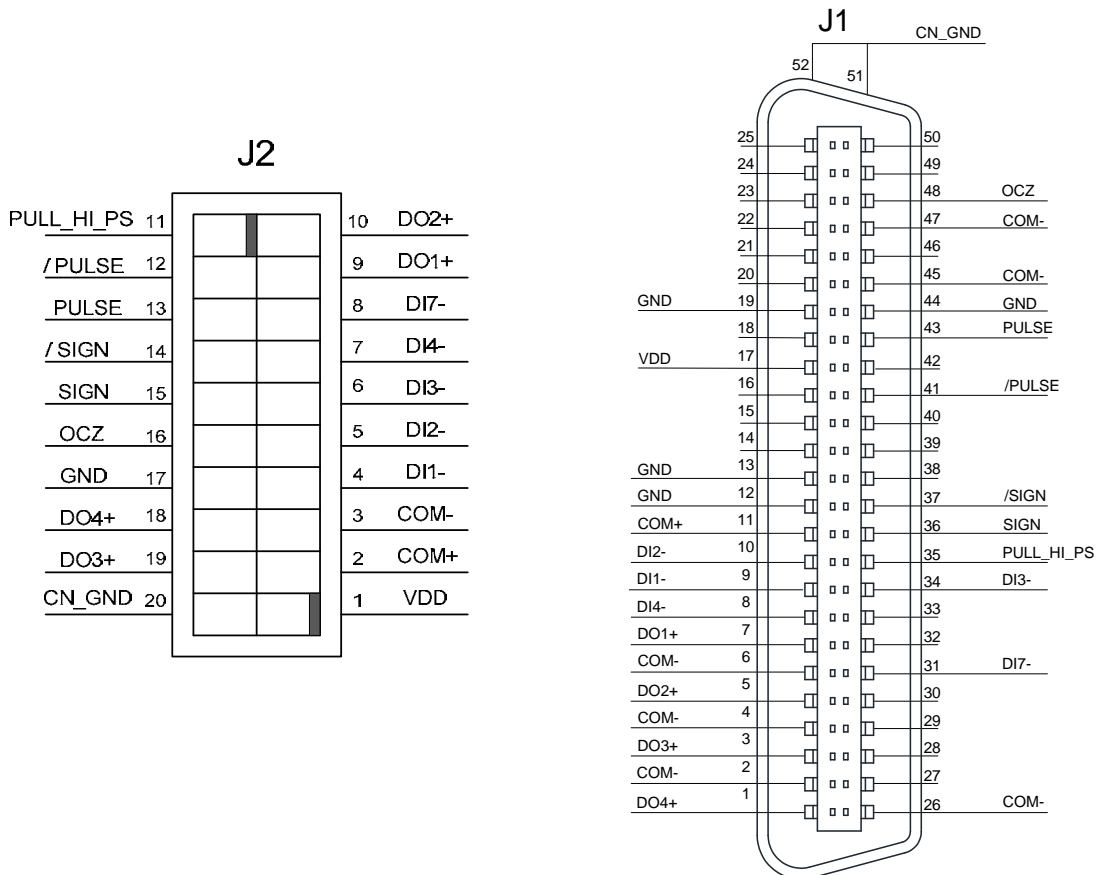
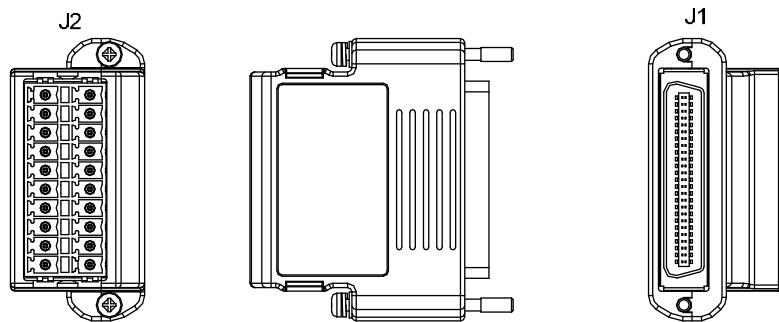
If the default setting of DI/DO signal cannot satisfy the need, self-set the DI/DO signal will do and easy. The signal function of DI1 ~ 8 , DI9 ~ DI13 and DO1 ~ 5 is determined by parameter P2-10 ~ P2-17 and parameter P2-18 ~ P2-22 respectively. Please refer to Chapter 7.2, which shown as the following table. Enter DI or DO code in the corresponding parameter to setup DI/DO.

Signal Name	Pin No	Corresponding Parameter	
Standard DI	DI1-	CN1-9	P2-10
	DI2-	CN1-10	P2-11
	DI3-	CN1-34	P2-12
	DI4-	CN1-8	P2-13
	DI5-	CN1-33	P2-14
	DI6-	CN1-32	P2-15
	DI7-	CN1-31	P2-16
	DI8-	CN1-30	P2-17
Extension DI (optional)	EDI9	CN7-2	P2-36
	EDI10	CN7-3	P2-37
	EDI11	CN7-4	P2-38
	EDI12	CN7-5	P2-39
	EDI13	CN7-6	P2-40
	EDI14	CN7-7	P2-41

Signal Name	Pin No	Corresponding Parameter	
Standard DO	DO1+	CN1-7	P2-18
	DO1-	CN1-6	
	DO2+	CN1-5	P2-19
	DO2-	CN1-4	
	DO3+	CN1-3	P2-20
	DO3-	CN1-2	
	DO4+	CN1-1	P2-21
	DO4-	CN1-26	
	DO5+	CN1-28	P2-22
	DO5-	CN1-27	

### 3.4.5 Application: Using CN1 Convenient Connector for Wiring

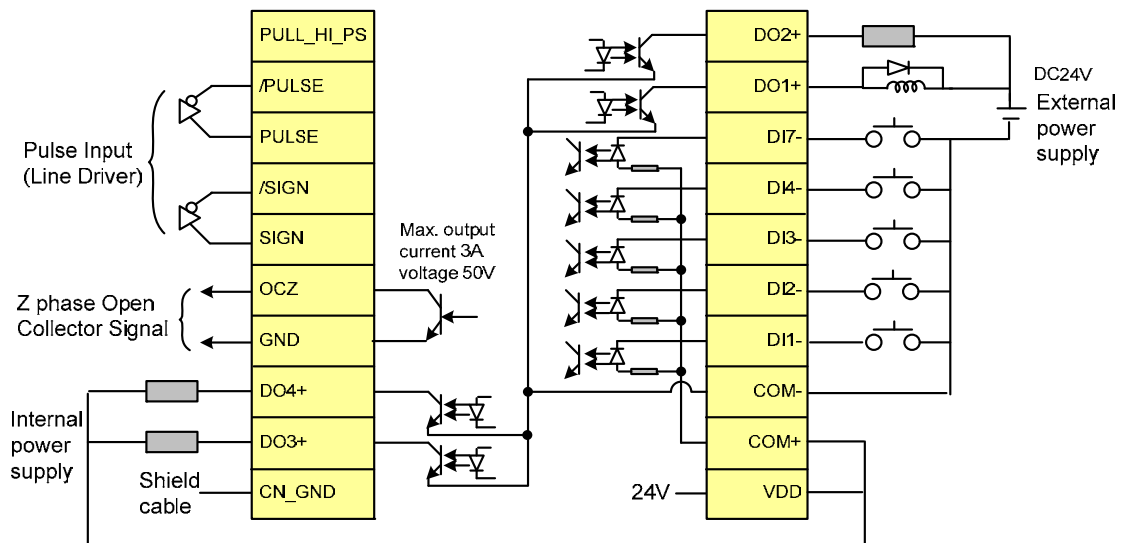
The CN1 convenient connector (ASD-IF-SC5020) is designed for quick and easy wiring, and especially suitable for the applications with limited DI/O requests. It's applicable to ASDA-A2, ASDA-A2R and similar series AC servo drives. Its spring clamp terminals are convenient for wiring because that users do not need to solder a wire to the connector and the spring can hold a wire tightly even due to vibration. There are 5 digital inputs, 4 digital outputs, pulse command inputs, and an open collector type Z phase output on the connector. Please refer to the following table for the pin definition of the connector.

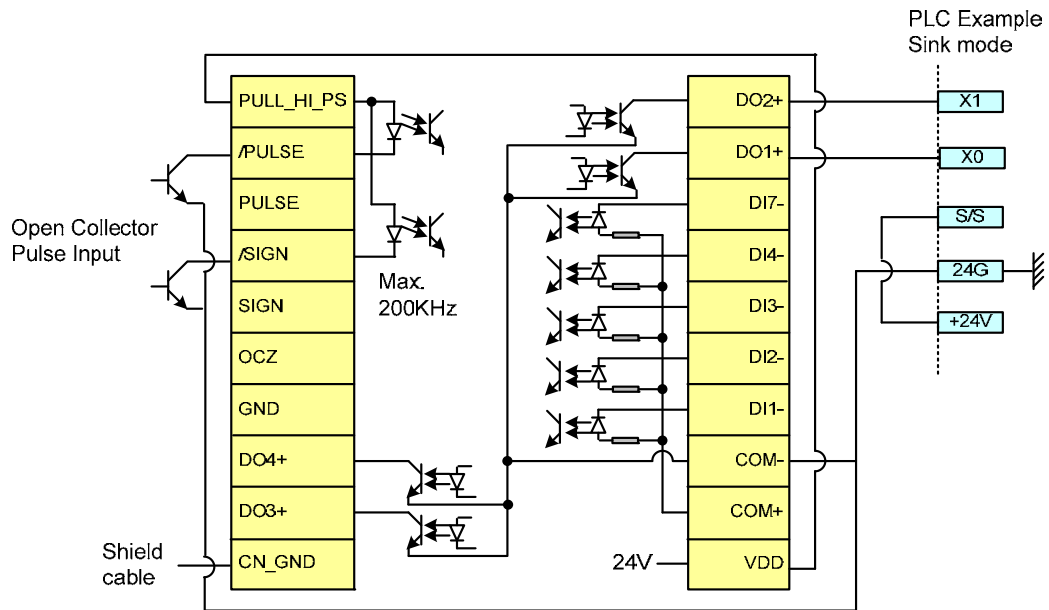




J2		J1	
PIN	Description	PIN	Description
1	VDD	17	VDD
2	COM+	11	COM+
3	COM-	2,4,6,26,45,47	COM-
4	DI1-	9	DI1-
5	DI2-	10	DI2-
6	DI3-	34	DI3-
7	DI4-	8	DI4-
8	DI7-	31	DI7-
9	DO1+	7	DO1+
10	DO2+	5	DO2+
11	PULL_HI_PS	35	PULL_HI_PS
12	/PULSE	41	/PULSE
13	PULSE	43	PULSE
14	/SIGN	37	/SIGN
15	SIGN	36	SIGN
16	OCZ	48	OCZ
17	GND	12,13,19,44	GND
18	DO4+	1	DO4+
19	DO3+	3	DO3+
20	CN_GND	51,52	CN_GND

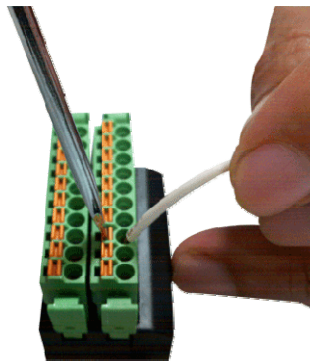
**Application Example**



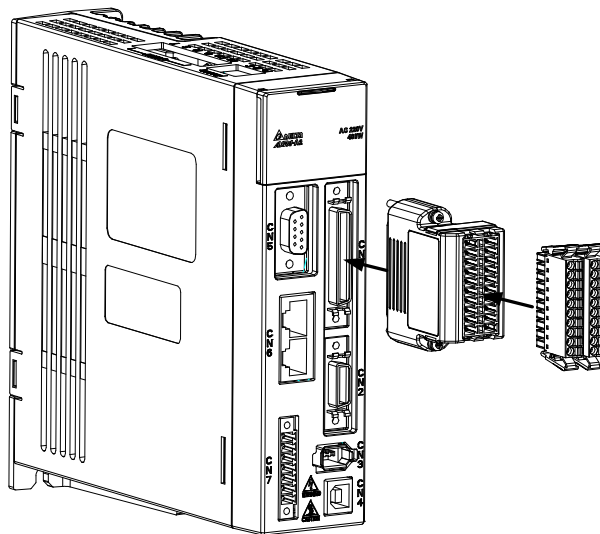


Use Flat-Head screw driver to press down the spring clamp, and then insert the wire.

Wiring Method



Installation Method

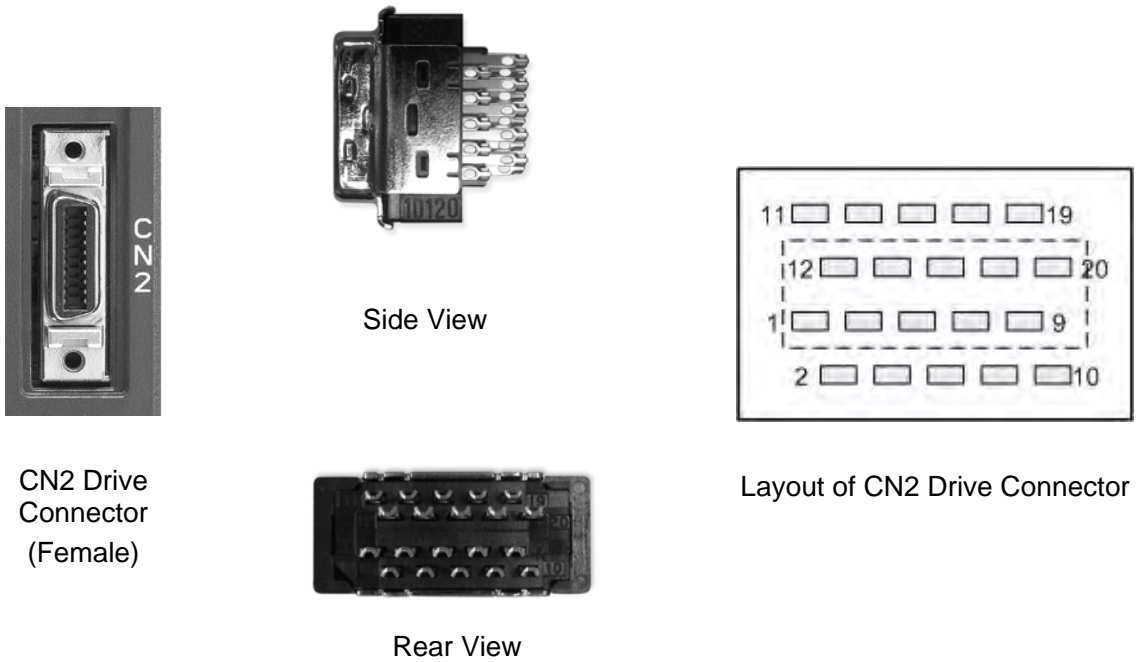


### 3.5 Encoder Connector CN2

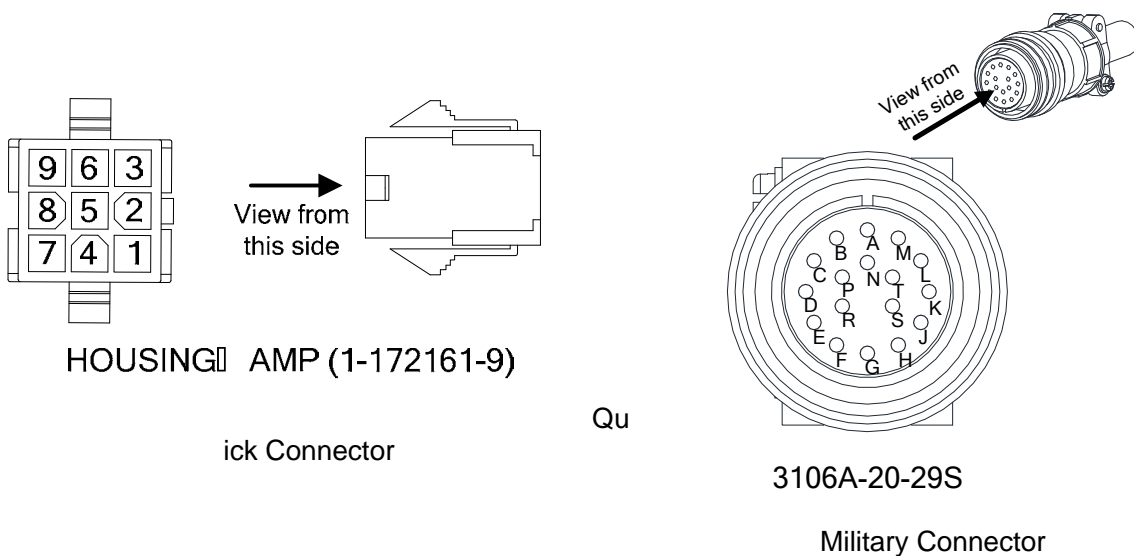
Feedback to the amplifier of the UVW signals for commutation is via the ABZ encoder signal wires. Following rotor position sensing the amplifier automatically switches to encoding for commutation control.

The 20-bit encoder is automatically multiplied to 1280000ppr for increased control accuracy.

The layout of CN2 Drive Connector



The layout of CN2 Motor Connector



## Signal Identification

Drive Connector			Motor Connector		
PIN No.	Terminal Identification	Description	Military Connector	Quick Connector	Color
5	T+	Serial communication signal input / output (+)	A	1	Blue
4	T-	Serial communication signal input / output (-)	B	4	Blue & Black
-	-	Reserved	-	-	-
-	-	Reserved	-	-	-
14,16	+5V	+5V power supply	S	7	Red / Red & White
13,15	GND	Ground	R	8	Black / Black & White
Shell	Shielding-	Shielding	L	9	-

### About shielding and ground

The both sides of CN2 encoder cable are CN2 connector and encoder connector. Shielding and ground conductor should be correctly connected to the corresponding pins so as to effectively shield and ground.

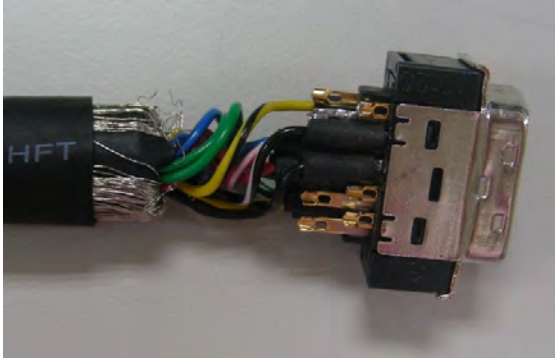
The shielding procedures of CN2 encoder connector are as followings:



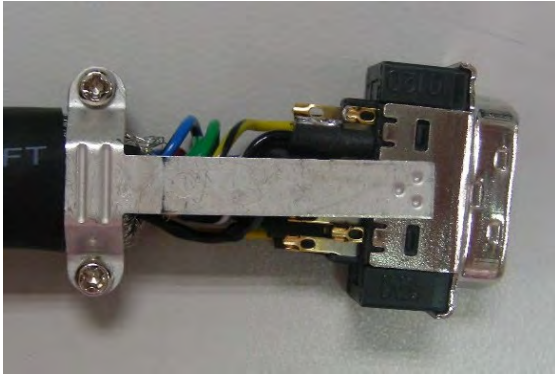
- (1) Cut through the cable and expose the core wire which covers the metal core wires with shielding. The reserved core wire length should be 20~30mm. Then, cover a 45mm heat shrink tube on the cable.



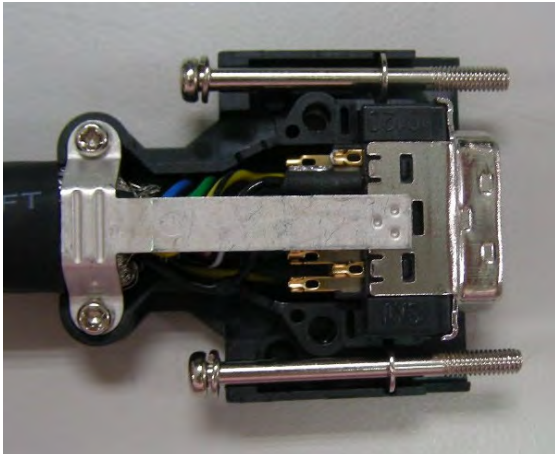
- (2) Spread the metal core wires with shielding and turn it upside down in downward direction. Ensure to follow the above table of CN2 Terminal Signal Identification to connect the pins one by one.



- (3) Leave a length of 5~10mm metal core wires with shielding outside of the cable. The length is about the width of the metal saddle. The other unexposed wires of the cable should be protected by heat shrink tube for good ground contact.



- (4) Install a metal saddle to fix the exposed metal core wires. The metal saddle must completely cover all the exposed metal core wires. The extended sheet metal should be connected to the metal part of the connector.



- (5) Install the connector with shielding into the plastic case as shown in the figure.



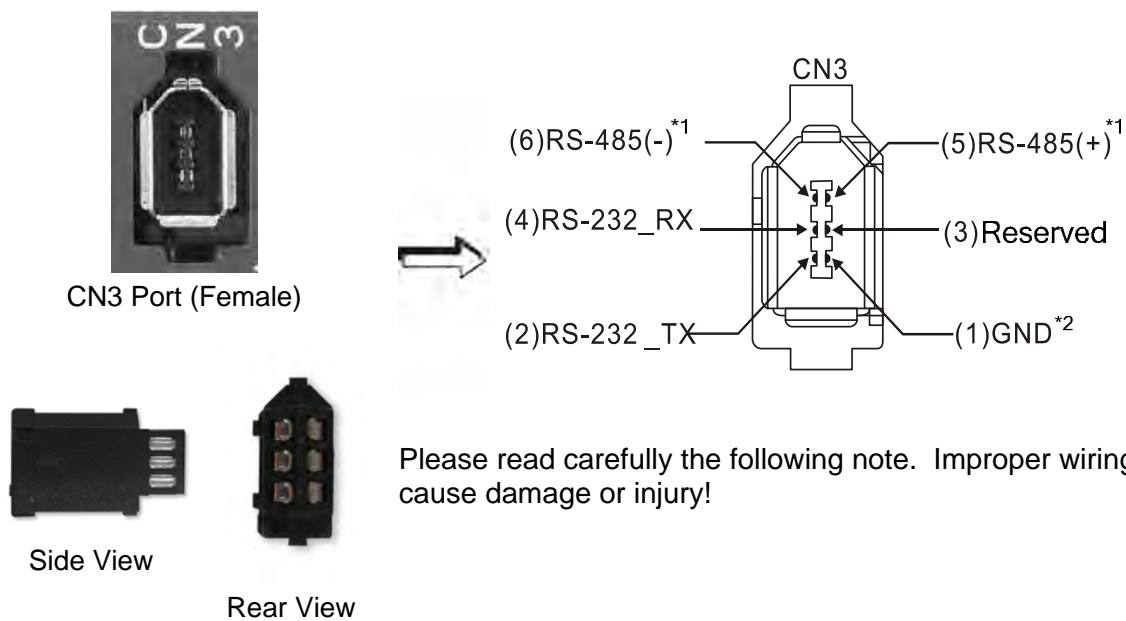
- (6) Tighten the screws to complete a shielded CN2 connector.

### 3.6 Serial Communication Connector CN3

#### 3.6.1 CN3 Terminal Layout and Identification

The servo drive can be connected to a PC or controller via this serial communication connector CN3. Users can operate the servo drive through PC software supplied by Delta. The communication connector/port of Delta servo drive can provide two common serial communication interfaces: RS-232 and RS-485 connection. RS-232 is mostly be used but is somewhat limited. The maximum cable length for an RS-232 connection is 15 meters (50 feet). Using RS-485 interface can allow longer distance for transmission and support multiple drives to be connected simultaneously.

The layout of CN3 Drive Connector

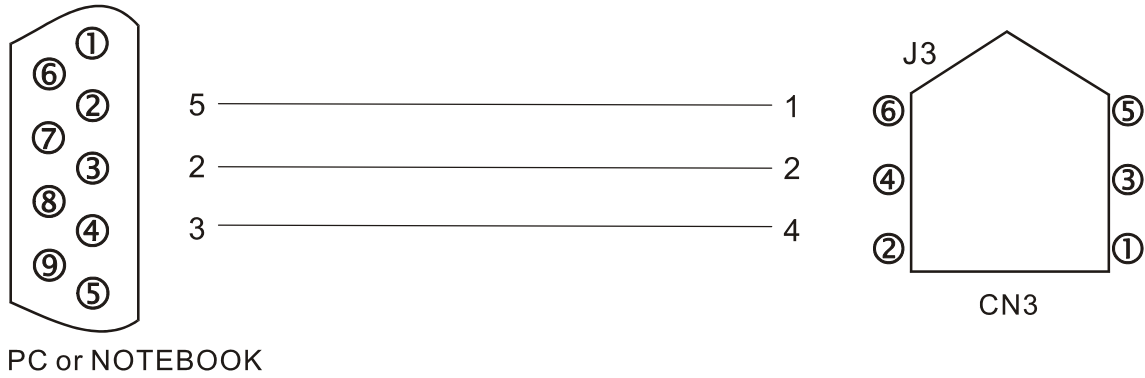


PIN No.	Signal Name	Terminal Identification	Description
1	Grounding	GND	Ground
2	RS-232 data transmission	RS-232_TX	For data transmission of the servo drive. Connected to the RS-232 interface of PC.
3	-	-	Reserved
4	RS-232 data receiving	RS-232_RX	For data receiving of the servo drive. Connected to the RS-232 interface of PC.
5	RS-485 data transmission	RS-485(+)	For data transmission of the servo drive (differential line driver + end)
6	RS-485 data transmission	RS-485(-)	For data transmission of the servo drive (differential line driver - end)

 **NOTE**

- 1) For the connection of RS-485, please refer to page 9.3.
- 2) There are two kinds of IEEE1394 communication cables available on the market. If the user uses one kind of cable, which its GND terminal (Pin 1) and its shielding is short-circuited, the communication may be damaged. Never connect the case of the terminal to the ground of this kind of communication cable.

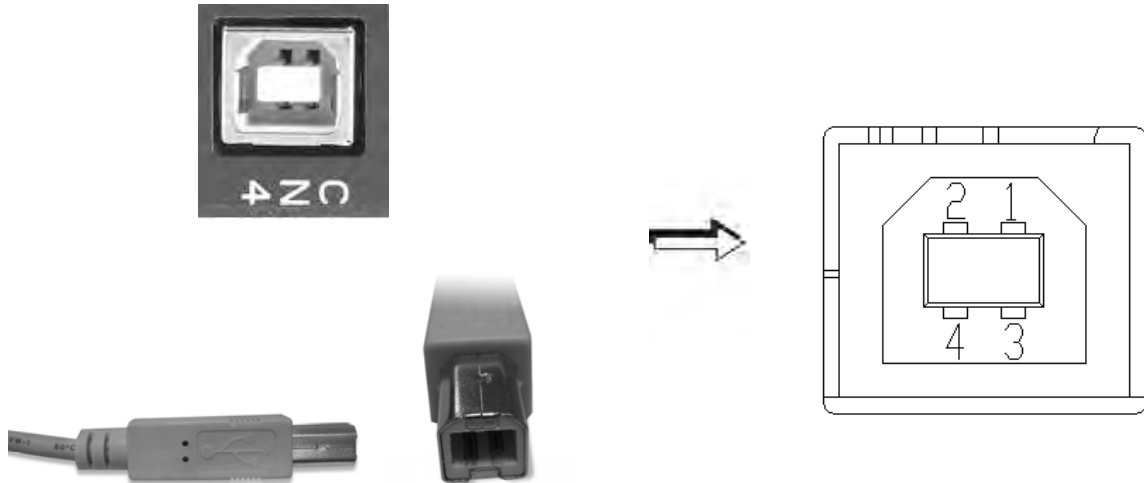
### 3.6.2 Connection between PC and Connector CN3



### 3.7 Serial Communication Connector CN4 (USB)

The servo drive can be connected to a PC via this serial communication connector CN4. Users can operate the servo drive through PC software supplied by Delta. The USB transmission speed can reach up to 1MB. Therefore, the users can easily monitor the servo drive data in real time by using Data Scope function provided by Delta PC software.

The layout of CN4 Drive Connector



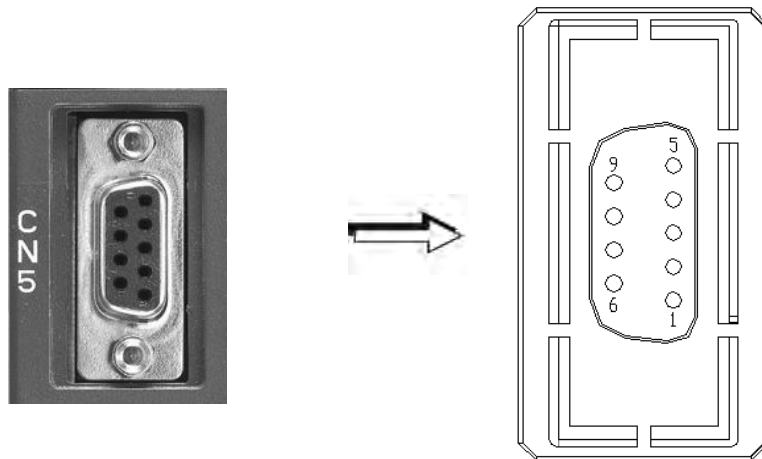
PIN No.	Signal Name	Description
1	V bus	DC +5V (external power supply)
2	D-	Data-
3	D+	Data+
4	GND	Ground



### 3.8 Position Feedback Signal Connector CN5 (for Full-closed Control)

The servo drive can be connected to a linear scale or external encoder to constitute a full-closed loop via this position feedback signal connector CN5. In position mode, the pulse position commands given by the external controller just refer to the control loop structure of the external linear scale. Please refer to Chapter 6 for more descriptions.

The layout of CN5 Drive Connector



CN5 Connector (female)

PIN No.	Signal Name	Terminal Identification	Description
1	/Z phase input	Opt_/Z	Linear scale /Z phase output
2	/B phase input	Opt_/B	Linear scale /B phase output
3	B phase input	Opt_B	Linear scale B phase output
4	A phase input	Opt_A	Linear scale A phase output
5	/A phase input	Opt_/A	Linear scale /A phase output
6	Encoder grounding	GND	Ground
7	Encoder grounding	GND	Ground
8	Encoder power	+5V	Linear scale 5V power
9	Z phase input	Opt_Z	Linear scale Z phase output

#### NOTE

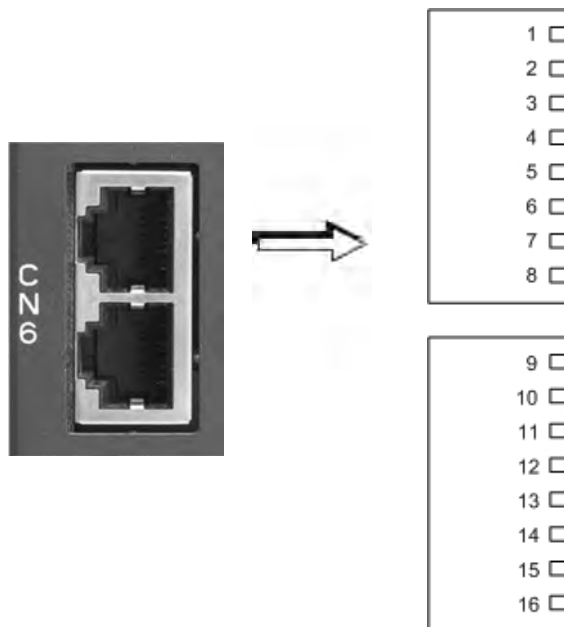
- 1) Only for the connection of encoders/linear scales that support AB phase signals and require a voltage of 5V.
- 2) Supports up to 1280000 pulse/rev superior encoder/linear scale resolution (A pulse number per motor revolution for a full-closed loop that corresponds to an optical signal with AB (Quadrature) phase pulses (4x).). Please refer to the settings of parameter P1-72 in Chapter 8.

### 3.9 CANopen Communication Connector CN6

CANopen Communication Connector CN6 is designed in accordance with CANopen DS301 and DS402 implementation. With this connector CN6, the servo drive can be connected to a CAN device so as to perform position, speed and torque control, or read and monitor the status of the servo drive through CANopen communication.

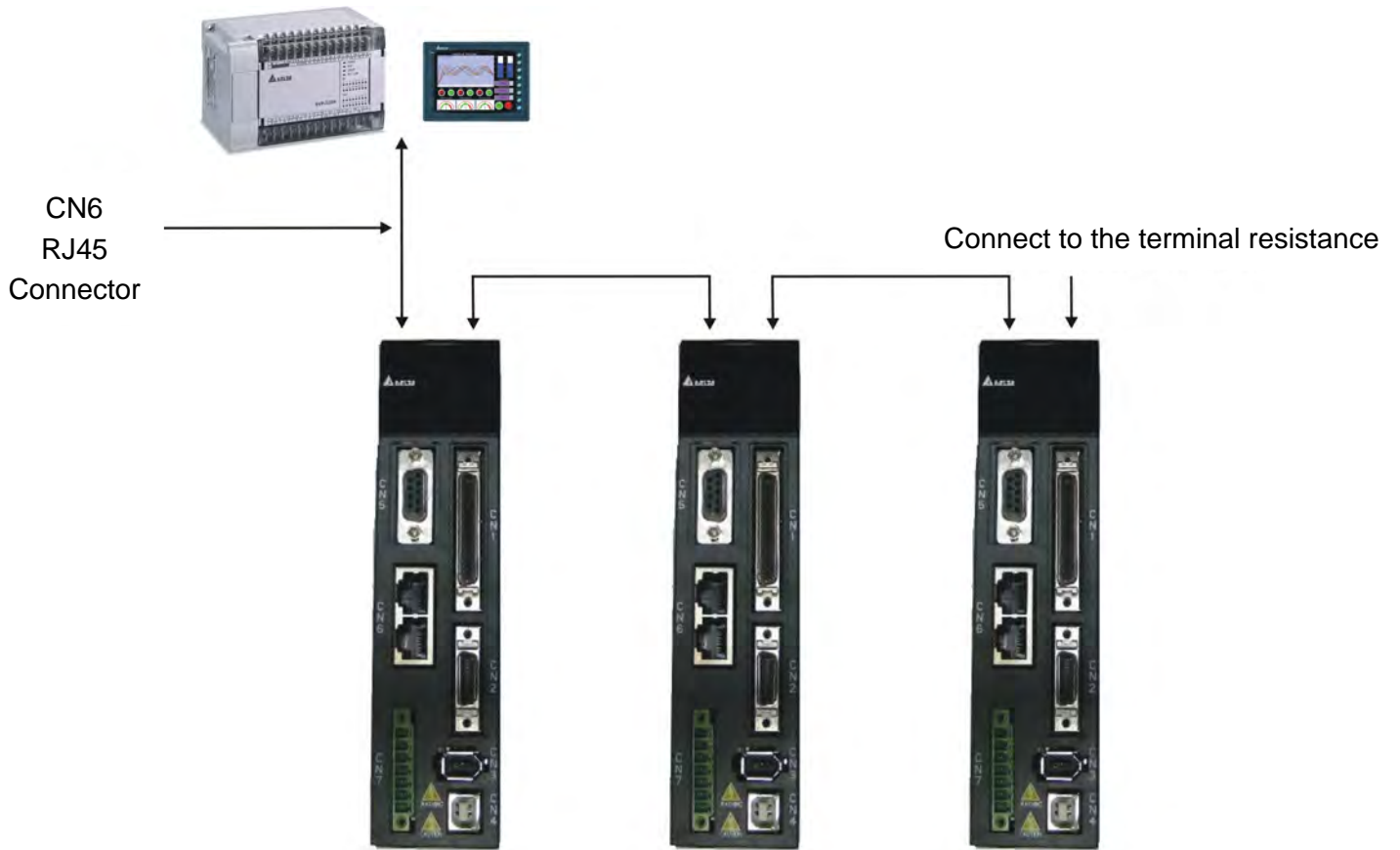
The station numbers of CANopen communication are the same as RS-232 and RS-485 communication and all be determined by parameter P3-00. The transmission speed can be reached up to 1Mbps. There are two communication ports of connector CN6, one is for transmission and the other is for receiving, convenient for connecting to more than one servo drives in serial. Ensure to connect a termination resistor to the last connected servo drive.

The layout of CN6 Drive Connector



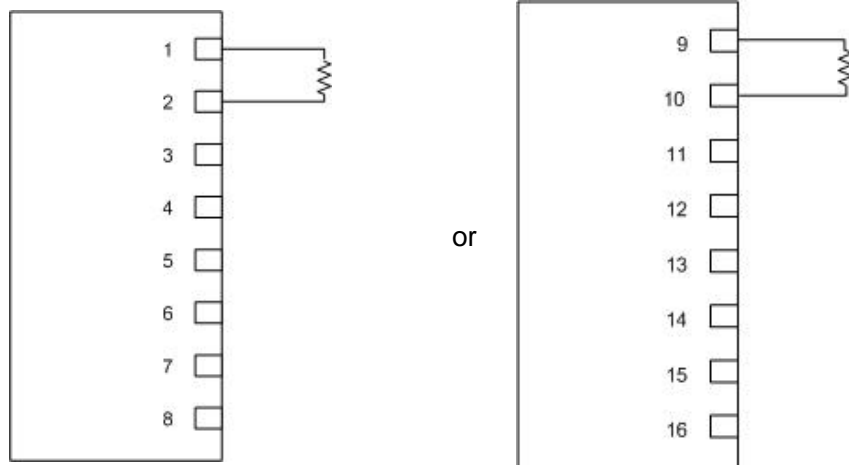
CN6 Connector (female)

PIN No.	Signal Name	Description
1, 9	CAN_H	CAN_H bus line (dominant high)
2, 10	CAN_L	CAN_H bus line (dominant low)
3, 11	CAN_GND	Ground / 0 V / V -
4, 12	-	Reserved
5, 13	-	Reserved
6, 14	-	Reserved
7, 15	CAN_GND	Ground / 0 V / V -
8, 16	-	Reserved



**NOTE**

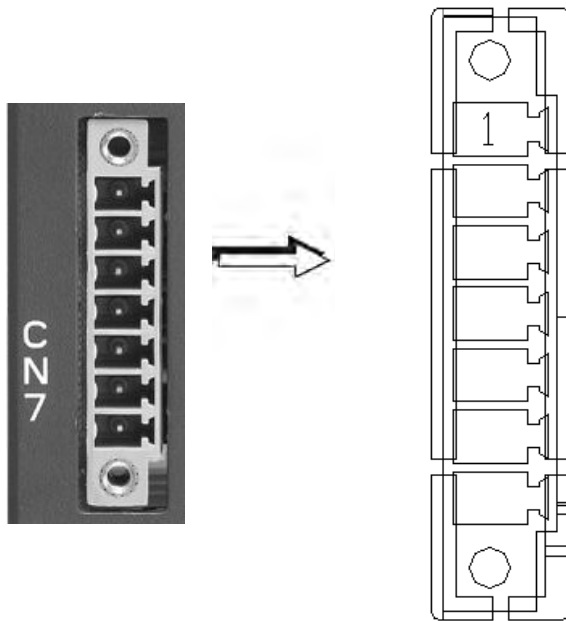
- 1 ) It is recommended to use a terminal resistor of 120Ω (Ohm), 0.25W and above.
- 2 ) The multiple servo drives are connected in serial by connector CN6 via CANopen communication. There are two communication ports of connector CN6, one is for transmission and the other is for receiving, convenient for connecting to more than one servo drives in serial. Ensure to connect a termination resistor to the last connected servo drive. Please refer to the following figures for the wiring diagrams of terminal resistors.



### 3.10 Extension digital input connector CN7

ASDA-A2 series provides single-axis point-to-point position control function and the position numbers can be up to 64 points. When internal 8 programmable Digital Inputs (DI) which can be set via parameters P2-10 ~ P2-17 can not satisfied, the users can use this extension digital input connector CN7 to increase more digital inputs. Up to 6 programmable external Digital Inputs (DI) could be added.

The layout of CN7 Drive Connector



CN7 Connector (female)

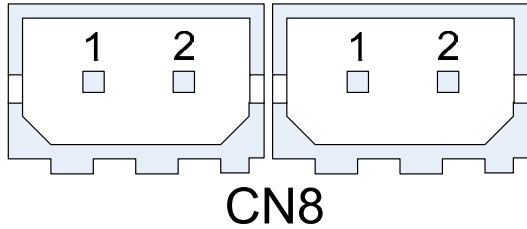
PIN No.	Signal Name	Terminal Identification	Description
1 (NOTE)	VDD 24V power	COM+	VDD (24V) power supply, same as Pin 11 of CN1
2	Extension DI9	EDI 9-	Digital input DI9-
3	Extension DI10	EDI 10-	Digital input DI10-
4	Extension DI11	EDI 11-	Digital input DI11-
5	Extension DI12	EDI 12-	Digital input DI12-
6	Extension DI13	EDI 13-	Digital input DI13-
7	Extension DI14	EDI 14-	Digital input DI14-



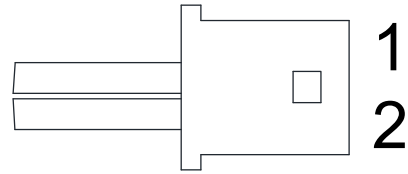
➤ **Caution:** Do not use dual power supply. Failure to observe this caution may result in damage to the servo drive and servo motor.

### 3.11 CN8 Connector of Battery Box

CN8 connector on servo drive is the power supply for absolute battery box. Please refer to Chapter 12 for related introduction.



CN8 Connector of Battery Box



Connector

Pin Definition:

Pin No	Connector1	Connector2
1	BAT+	BAT+
2	BAT-	BAT-

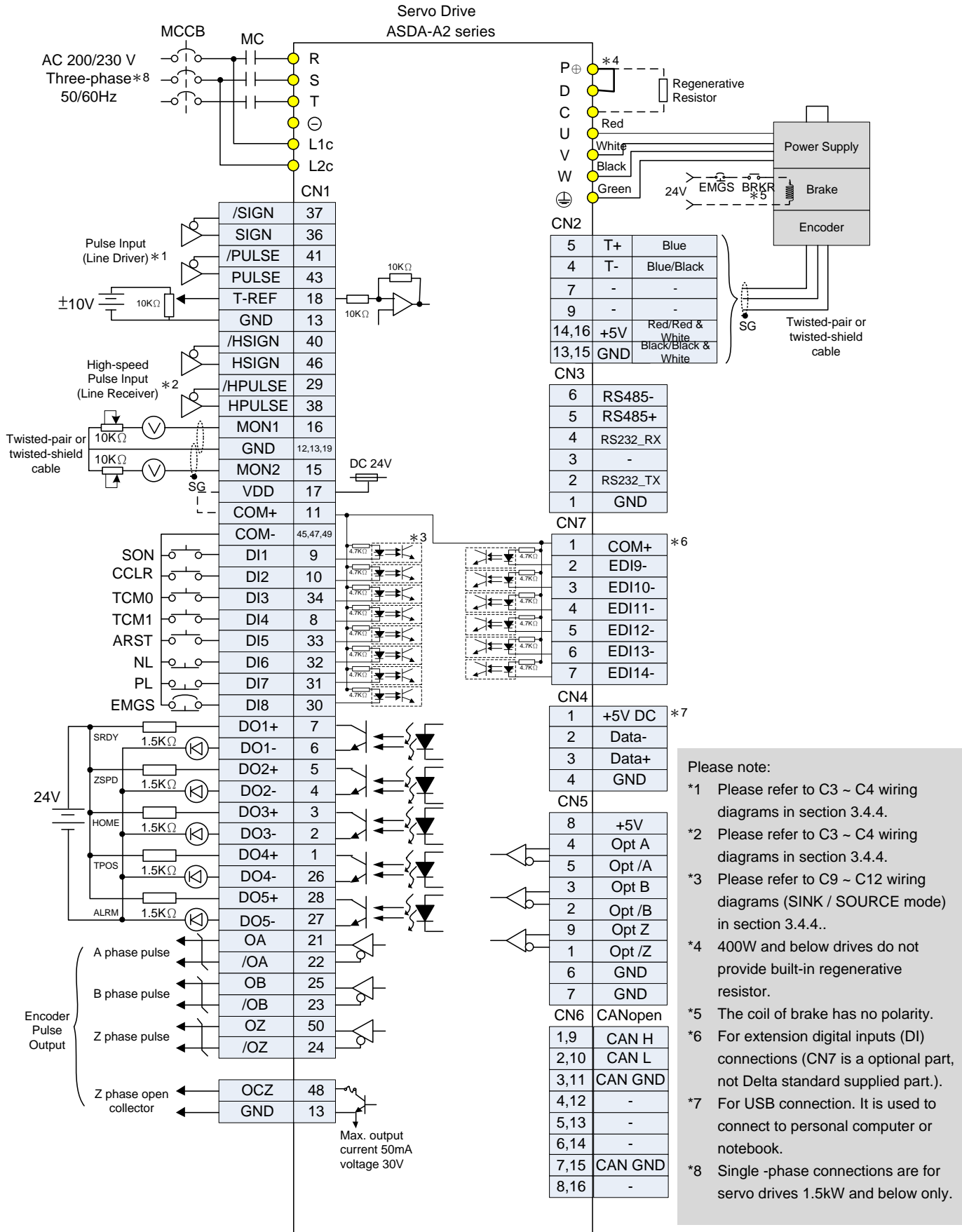


**NOTE**

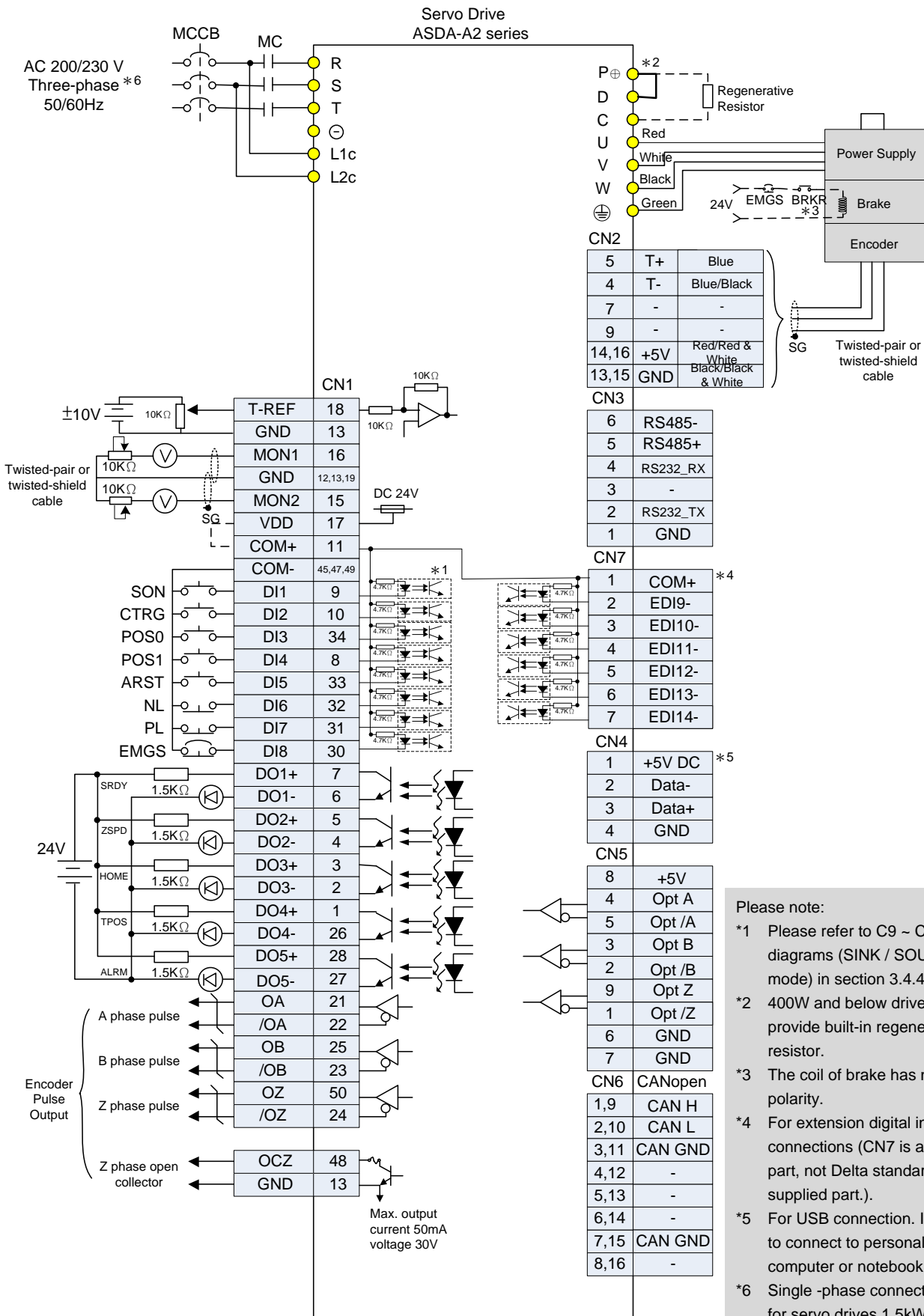
Due to the different design of servo drive model, CN8 might have one or connectors, which however has the same pin definition.

# 3.12 Standard Connection Example – 220V series

## 3.12.1 Position (PT) Control Mode



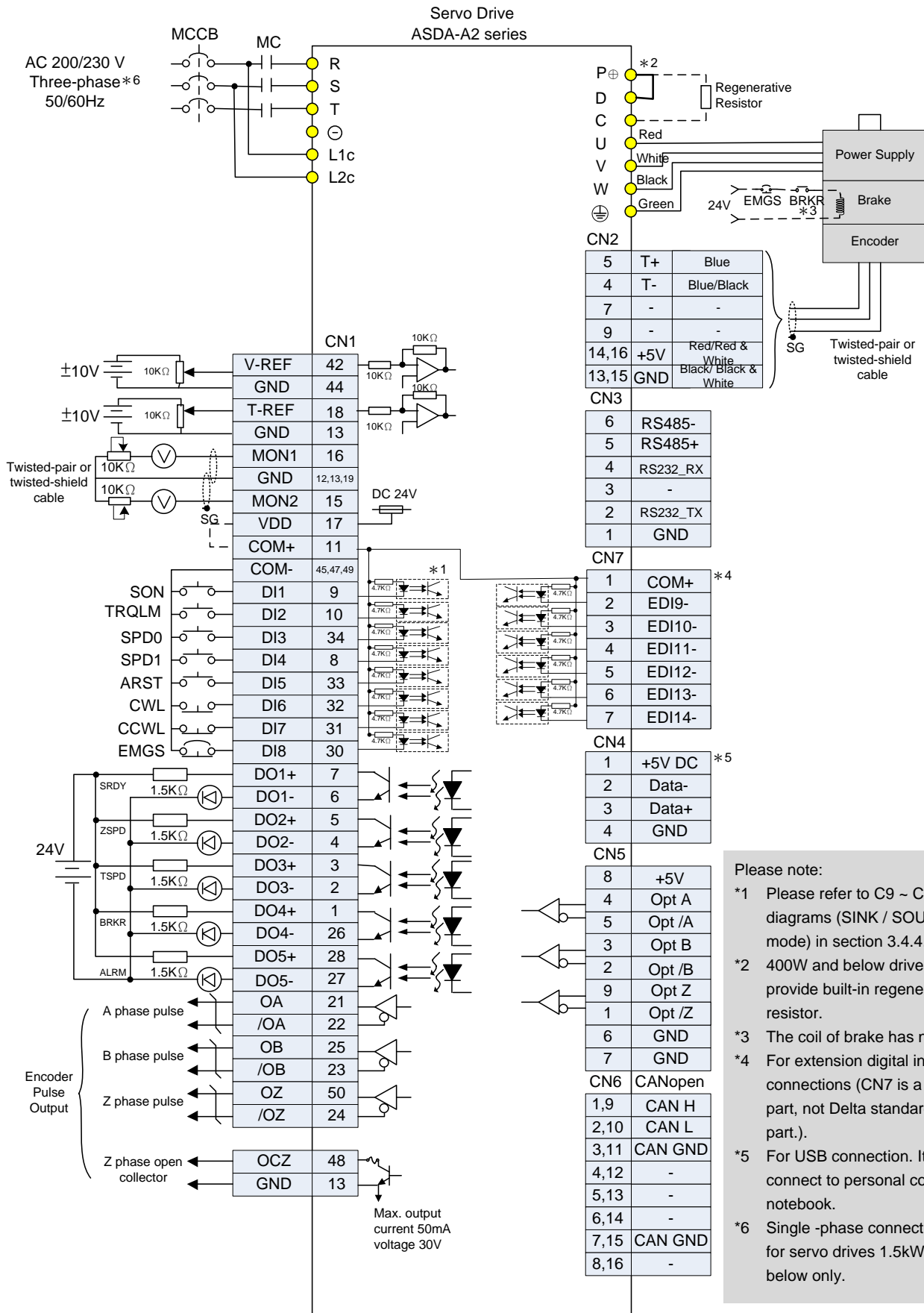
### 3.12.2 Position (PR) Control Mode



**Please note:**

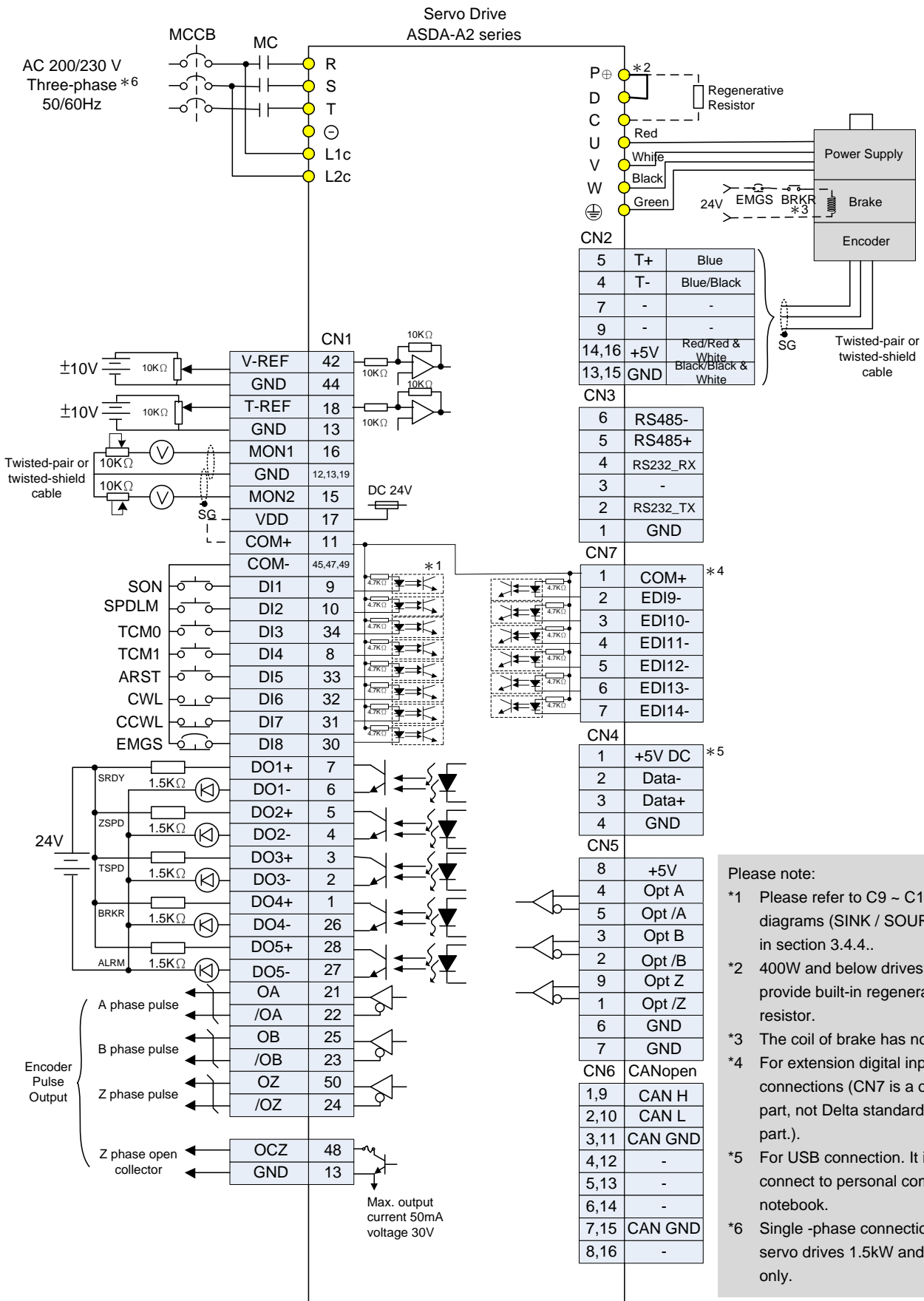
- \*1 Please refer to C9 ~ C12 wiring diagrams (SINK / SOURCE mode) in section 3.4.4..
- \*2 400W and below drives do not provide built-in regenerative resistor.
- \*3 The coil of brake has no polarity.
- \*4 For extension digital inputs (DI) connections (CN7 is a optional part, not Delta standard supplied part.).
- \*5 For USB connection. It is used to connect to personal computer or notebook.
- \*6 Single -phase connections are for servo drives 1.5kW and below only.

### 3.12.3 Speed Control Mode





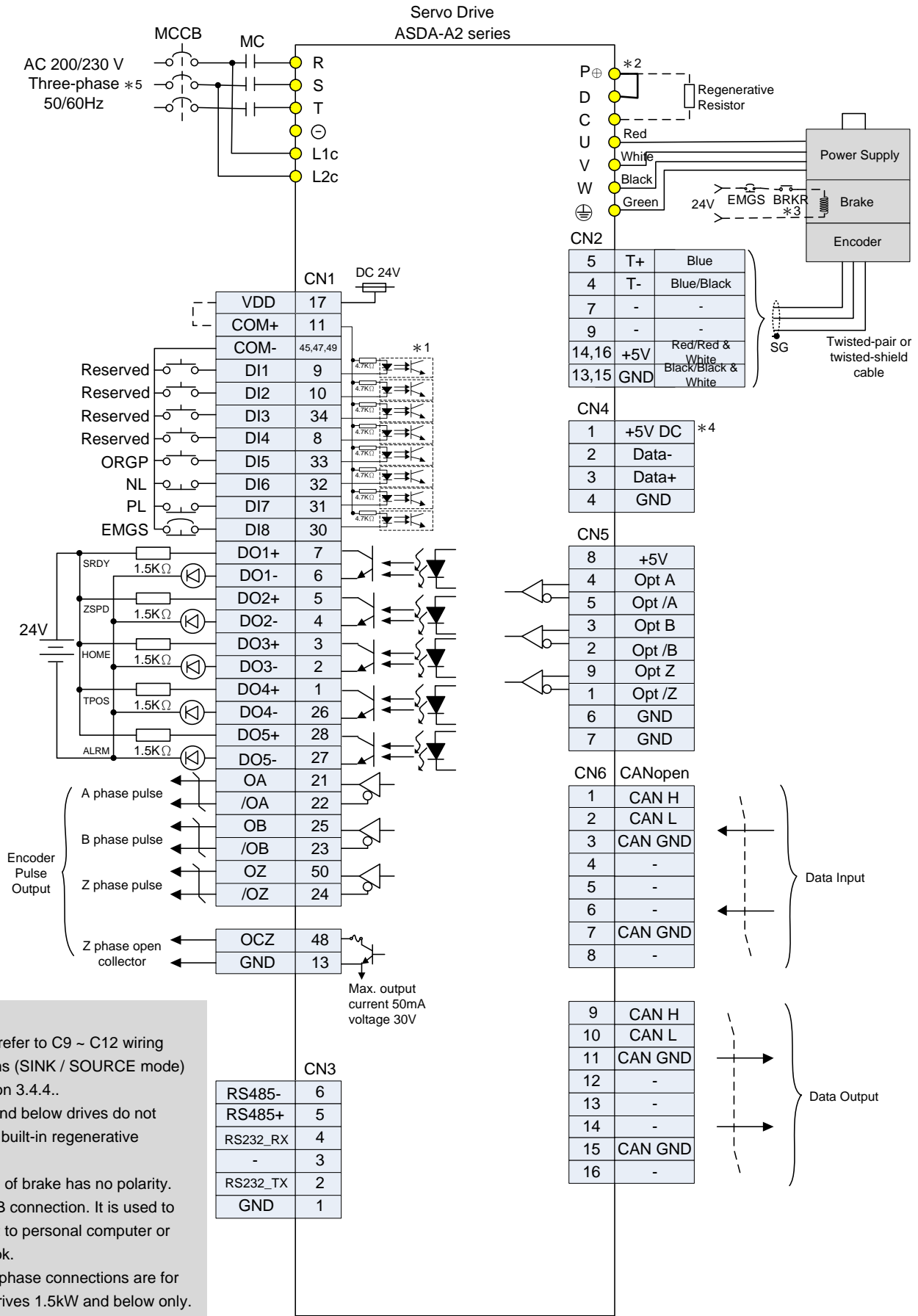
### 3.12.4 Torque Control Mode



Please note:

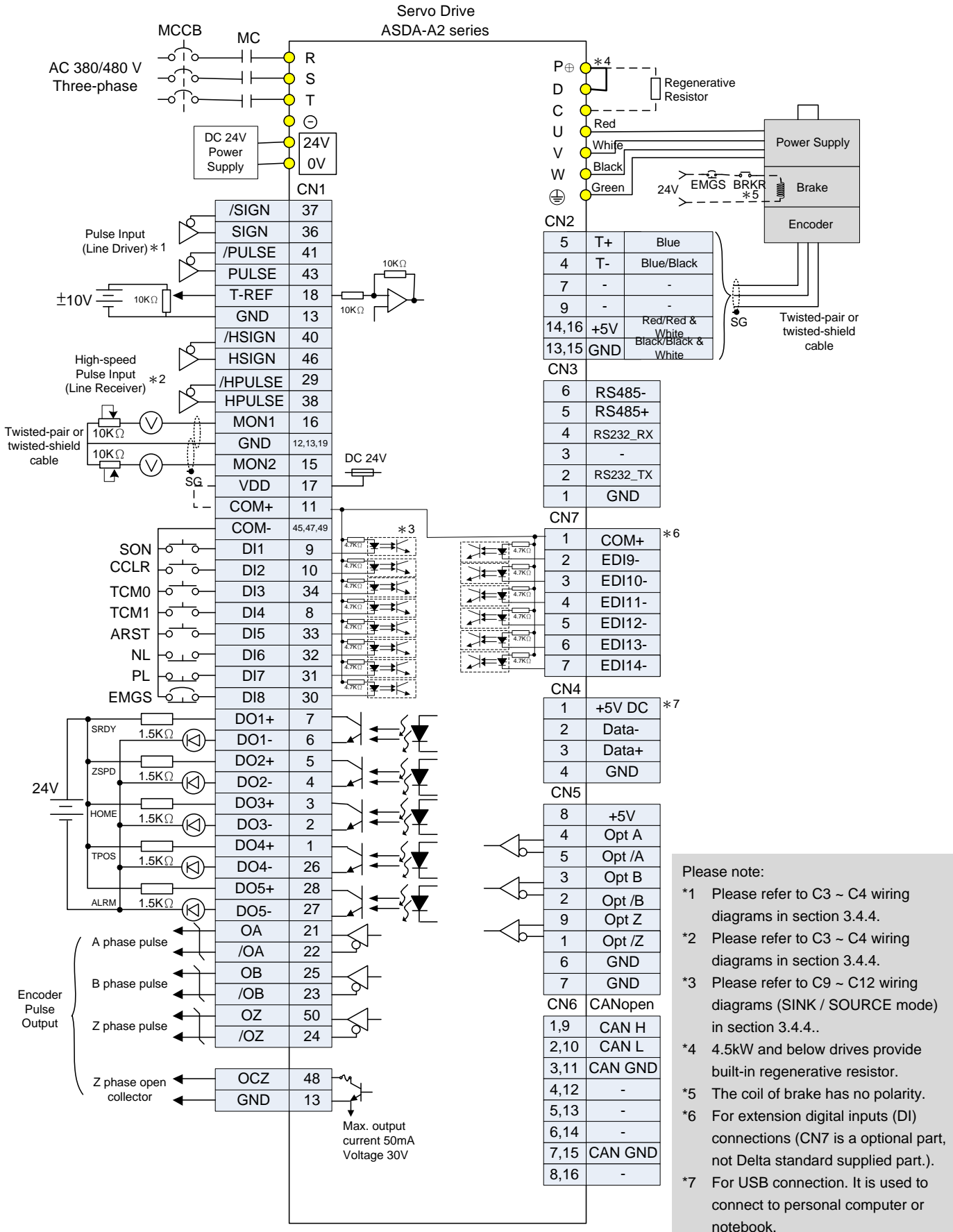
- \*1 Please refer to C9 ~ C12 wiring diagrams (SINK / SOURCE mode) in section 3.4.4..
- \*2 400W and below drives do not provide built-in regenerative resistor.
- \*3 The coil of brake has no polarity.
- \*4 For extension digital inputs (DI) connections (CN7 is a optional part, not Delta standard supplied part.).
- \*5 For USB connection. It is used to connect to personal computer or notebook.
- \*6 Single -phase connections are for servo drives 1.5kW and below only.

### 3.12.5 CANopen Communication Mode



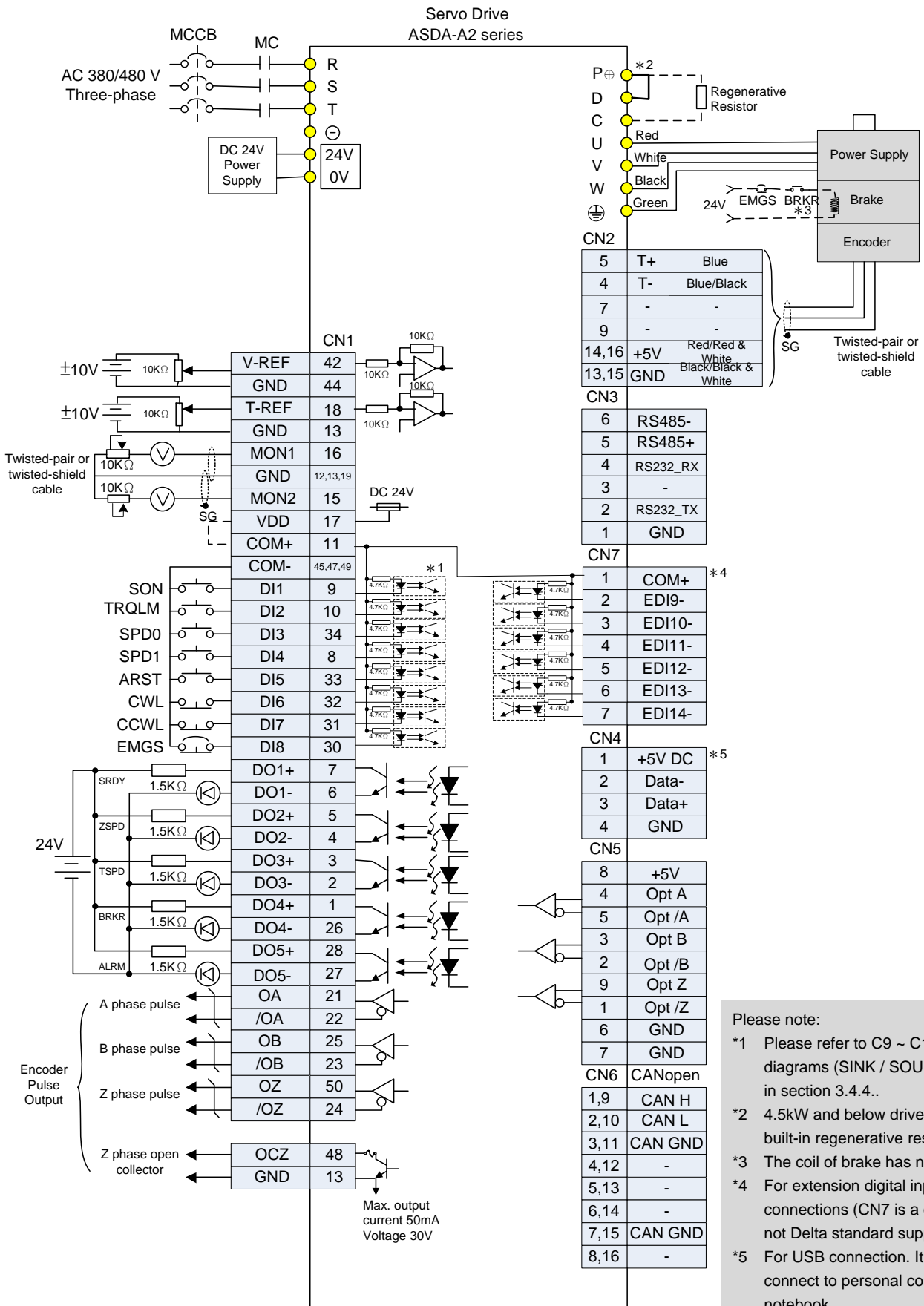
# 3.13 Standard Connection Example – 400V series

## 3.13.1 Position (PT) Control Mode





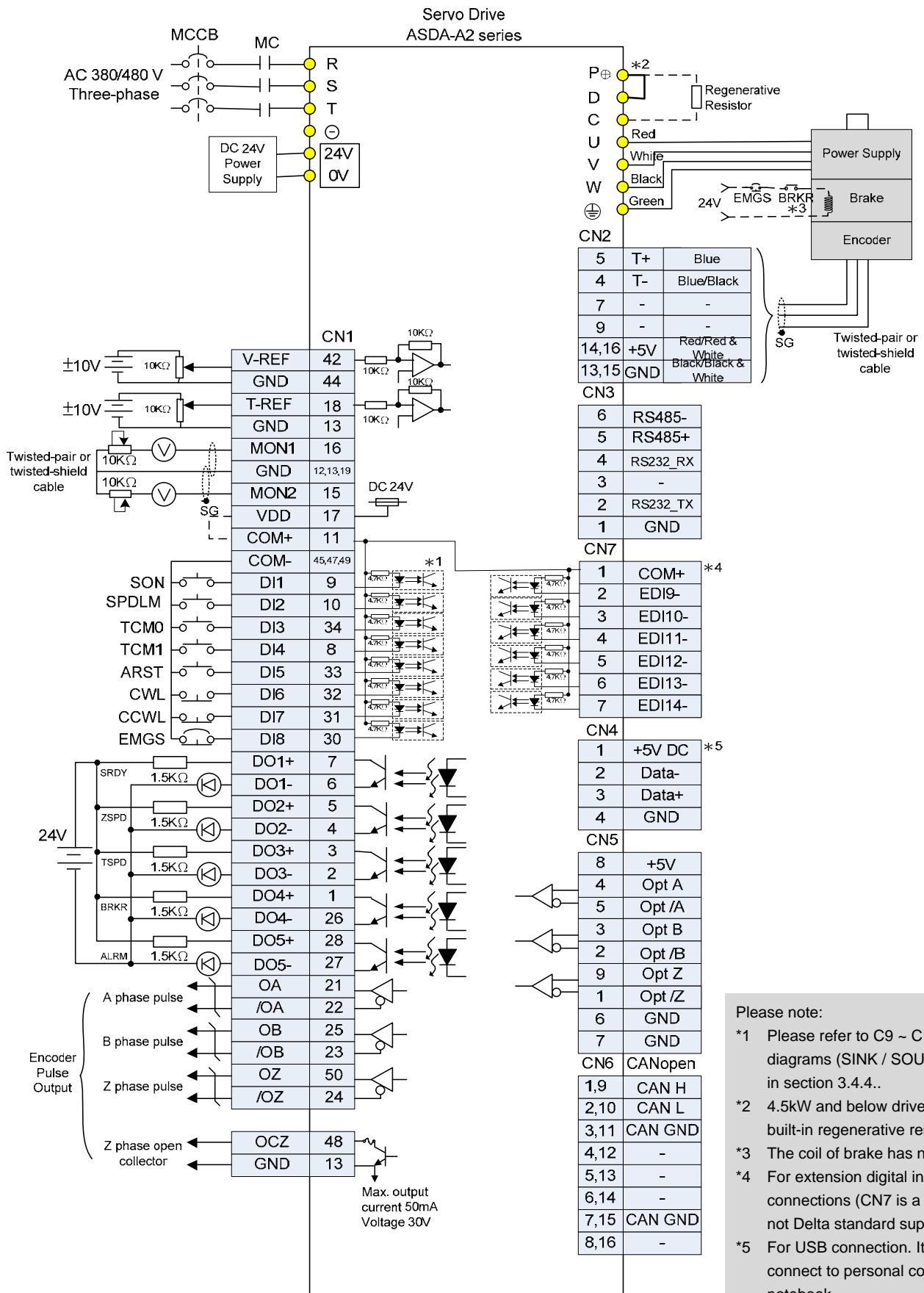
### 3.13.3 Speed Control Mode



Please note:

- \*1 Please refer to C9 ~ C12 wiring diagrams (SINK / SOURCE mode) in section 3.4.4..
- \*2 4.5kW and below drives provide built-in regenerative resistor.
- \*3 The coil of brake has no polarity.
- \*4 For extension digital inputs (DI) connections (CN7 is a optional part, not Delta standard supplied part.).
- \*5 For USB connection. It is used to connect to personal computer or notebook.

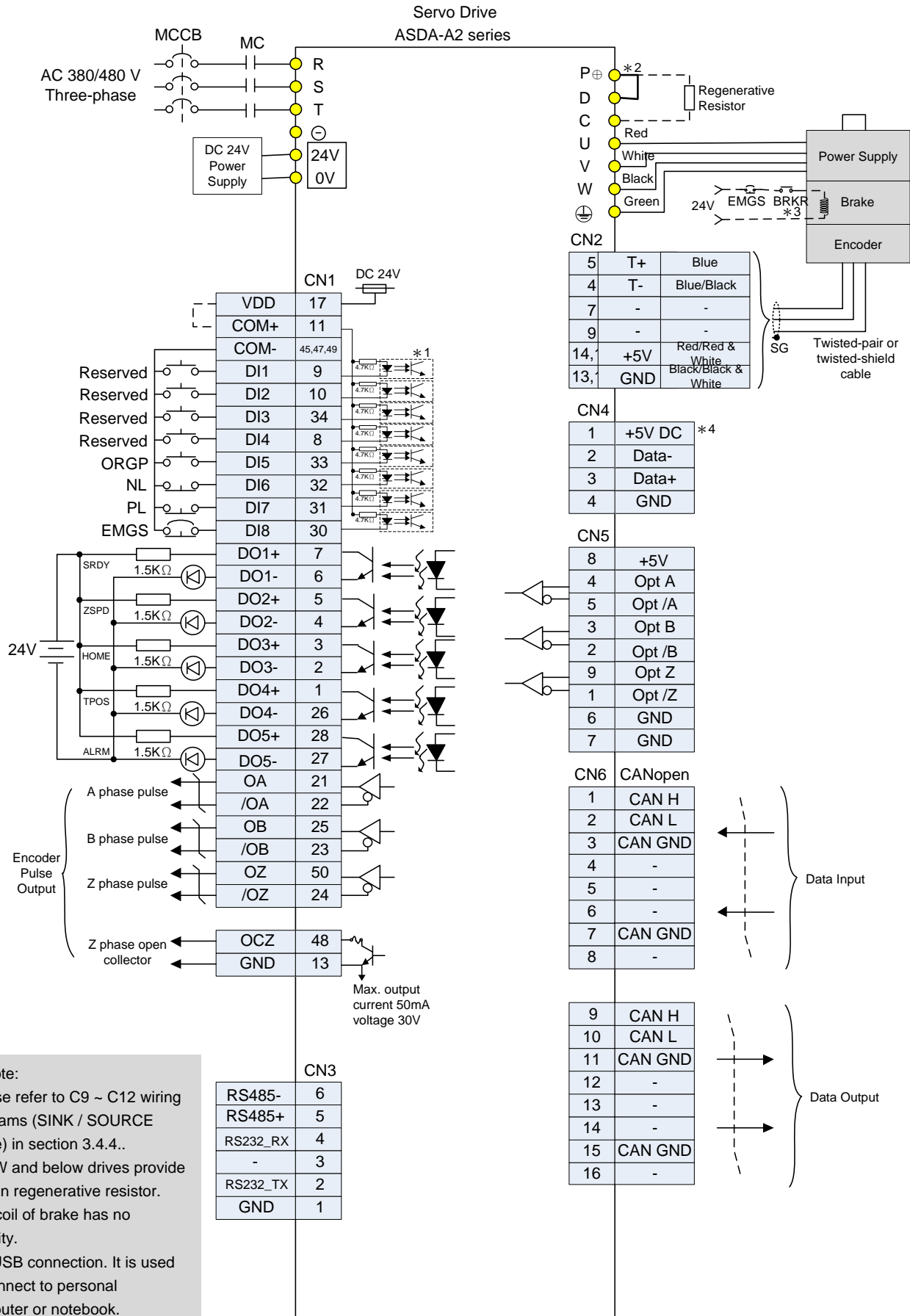
### 3.13.4 Torque Control Mode



Please note:

- \*1 Please refer to C9 ~ C12 wiring diagrams (SINK / SOURCE mode) in section 3.4.4..
- \*2 4.5kW and below drives provide built-in regenerative resistor.
- \*3 The coil of brake has no polarity.
- \*4 For extension digital inputs (DI) connections (CN7 is a optional part, not Delta standard supplied part.).
- \*5 For USB connection. It is used to connect to personal computer or notebook.

### 3.13.5 CANopen Communication Mode



Please note:

- \*1 Please refer to C9 ~ C12 wiring diagrams (SINK / SOURCE mode) in section 3.4.4..
- \*2 4.5kW and below drives provide built-in regenerative resistor.
- \*3 The coil of brake has no polarity.
- \*4 For USB connection. It is used to connect to personal computer or notebook.



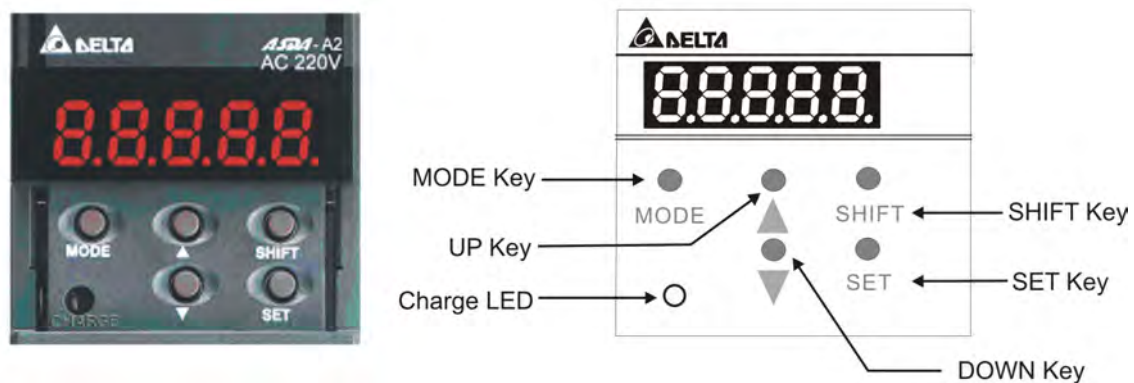
# Chapter 4 Display and Operation

This chapter describes the basic operation of the digital keypad and the features it offers.

## 4.1 Description of the Digital Keypad

The digital keypad includes the display panel and function keys. The Figure 4.1 shows all of the features of the digital keypad and an overview of their functions.

**Figure 4.1 Keypad Features**

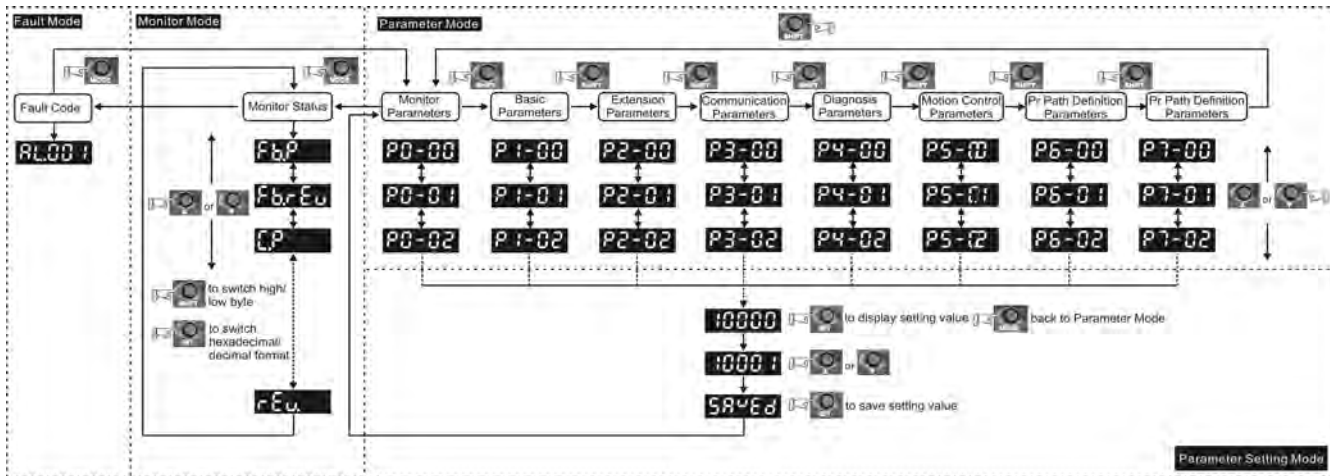


Name	Function
LCD Display	The LCD Display (5-digit, 7-step display panel) shows the monitor codes, parameter settings and operation values of the AC servo drive.
Charge LED	The Charge LED lights to indicate the power is applied to the circuit.
MODE Key	MODE Key. Pressing MODE key can enter or exit different parameter groups, and switch between Monitor mode and Parameter mode.
SHIFT Key	SHIFT Key. Pressing SHIFT key can scrolls through parameter groups. After a parameter is selected and its value displayed, pressing SHIFT key can move the cursor to the left and then change parameter settings (blinking digits) by using arrow keys.
UP and DOWN Key	UP and DOWN Key. Pressing the UP and DOWN key can scroll through and change monitor codes, parameter groups and various parameter settings.
SET Key	SET Key. Pressing the SET key can display and save the parameter groups, the various parameter settings. In monitor mode, pressing SET key can switch decimal or hexadecimal display. In parameter mode, pressing SET key can enter into parameter setting mode. During diagnosis operation, pressing SET key can execute the function in the last step. (The parameter settings changes are not effective until the SET key is pressed.)



## 4.2 Display Flowchart

Figure 4.2 Keypad Operation







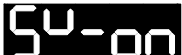

1. When the power is applied to the AC servo drive, the LCD display will show the monitor function codes for approximately one second, then enter into the monitor mode.
2. In monitor mode, pressing MODE key can enter into parameter mode. In parameter mode, pressing MODE key can return to monitor mode.
3. No matter working in which mode, when an alarm occurs, the system will enter into fault mode immediately. In fault mode, pressing MODE key can switch to other modes. In other modes, if no key is pressed for over 20 seconds, the system will return to fault mode automatically.
4. In monitor mode, pressing UP or DOWN arrow key can switch monitor parameter code. At this time, monitor display symbol will display for approximately one second.
5. In monitor mode, pressing MODE key can enter into parameter mode. In parameter mode, pressing SHIFT key can switch parameter group and pressing UP or DOWN arrow key can change parameter group code.
6. In parameter mode, the system will enter into the setting mode immediately after the Set key is pressed. The LCD display will display the corresponding setting value of this parameter simultaneously. Then, users can use UP or DOWN arrow key to change parameter value or press MODE key to exit and return back to the parameter mode.
7. In parameter setting mode, the users can move the cursor to left by pressing SHIFT key and change the parameter settings (blinking digits) by pressing the UP or DOWN arrow key.
8. After the setting value change is completed, press SET key to save parameter settings or execute command.

9. When the parameter setting is completed, LCD display will show the end code "SAVED" and automatically return back to parameter mode.


## 4.3 Status Display

### 4.3.1 Save Setting Display


After the SET key is pressed, LCD display will show the following display messages for approx. one second according to different status.

Display Message	Description
	The setting value is saved correctly. [Saved)
	This parameter is read only. Write-protected. (Read-Only)
	Invalid password or no password was input. (Locked)
	The setting value is error or invalid. (Out of Range)
	The servo system is running and it is unable to accept this setting value to be changed. (Servo On)
	This parameter is valid after restarting the drive. (Power On)



### 4.3.2 Decimal Point Display

Display Message	Description
	<p>High/Low byte display. When the data is a decimal 32-bit data, these two digits are used to show if the display is high byte or low byte.</p> <p>Negative value display. When the data is displayed in decimal format, the most left two digits represent negative sign no matter it is a 16-bit or 32-bit data. If the data is displayed in hexadecimal format, it is a positive value always and no negative sign is displayed.</p>

### 4.3.3 Fault Message Display









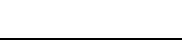
Display Message	Description
	When the AC servo drive has a fault, LCD display will display "ALnnn". "AL" indicates the alarm and "nnn" indicates the drive fault code. For the list of drive fault code, please refer to parameter P0-01 in Chapter 8 (Servo Parameters) or refer to Chapter 11 (Troubleshooting).











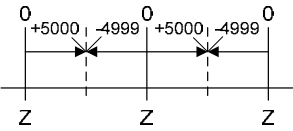


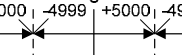
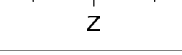

### 4.3.4 Polarity Setting Display




Display Message	Description
	Positive value display. When entering into parameter setting mode, pressing UP or DOWN arrow key can increase or decrease the display value. SHIFT key is used to change the selected digit (The selected digit will blink).
	Negative value display. Continuously press SHIFT key for two seconds and then the positive(+) or negative(-) sign can be switched. When the setting value exceeds its setting range, the positive(+) and negative(-) sign can not be switched. (The negative value display is for a decimal negative value only. There is no negative value display for a hexadecimal negative value.)

### 4.3.5 Monitor Setting Display








When the AC servo drive is applied to power, the LCD display will show the monitor function codes for approximately one second and then enter into the monitor mode. In monitor mode, in order to change the monitor status, the users can press UP or DOWN arrow key or change parameter P0-02 directly to specify the monitor status. When the power is applied, the monitor status depends on the setting value of P0-02. For example, if the setting value of P0-02 is 4 when the power is applied, the monitor function will be input pulse number of pulse command, the C-PLS monitor codes will first display and then the pulse number will display after.

P0-02 Setting	Display Message	Description	Unit
0		Motor feedback pulse number (after electronic gear ratio is set)	[user unit]
1		Input pulse number of pulse command (after electronic gear ratio is set)	[user unit]
2		Position error counts between control command pulse and feedback pulse	[user unit]
3		Motor feedback pulse number (encoder unit, 1280000 pulse/rev)	[pulse]
4		Input pulse number of pulse command (before electronic gear ratio is set)	[pulse]
5		Position error counts	[pulse]
6		Input frequency of pulse command	[Kpps]
7		Motor rotation speed	[r/min]
8		Speed input command	[Volt]

P0-02 Setting	Display Message	Description	Unit
9		Speed input command	[r/min]
10		Torque input command	[Volt]
11		Torque input command	[%]
12		Average load	[%]
13		Peak load	[%]
14		Main circuit voltage	[Volt]
15		Ratio of load inertia to Motor inertia (Please note that if the display is 13.0, it indicates that the actual inertia is 13)	[1times]
16		IGBT temperature	[°C]
17		Resonance frequency (The low byte is the first resonance point and the high byte is the second resonance point.)	[Hz]
18	 	Absolute pulse number relative to encoder (use Z phase as home). The value of Z phase home point is 0, and it can be the value from -5000 to +5000 pulses.	-
19		Mapping Parameter 1: Display the content of parameter P0-25 (mapping target is specified by parameter P0-35)	-
20		Mapping Parameter 2: Display the content of parameter P0-26 (mapping target is specified by parameter P0-36)	-
21		Mapping Parameter 3: Display the content of parameter P0-27 (mapping target is specified by parameter P0-37)	-
22		Mapping Parameter 4: Display the content of parameter P0-28 (mapping target is specified by parameter P0-38)	-
23		Status Monitor 1: Display the content of parameter P0-09 (the monitor status is specified by parameter P0-17)	-

P0-02 Setting	Display Message	Description	Unit
24		Status Monitor 2: Display the content of parameter P0-10 (the monitor status is specified by parameter P0-18)	-
25		Status Monitor 3: Display the content of parameter P0-11 (the monitor status is specified by parameter P0-19)	-
26		Status Monitor 4: Display the content of parameter P0-12 (the monitor status is specified by parameter P0-20)	-

The following table lists the display examples of monitor value:

Display Message	Description	
	16-bit Data	Decimal display. When the actual value is 1234, the display is 01234.
		Hexadecimal display. When the actual value is 0x1234, the display is 1234.
 	32-bit Data	Decimal display. When the actual value is 1234567890, the display of high byte is 1234.5 and the display of low byte is 67890.
 		Hexadecimal display. When the actual value is 0x12345678, the display of high byte is h1234 and the display of low byte is L5678.
	Negative value display. When the actual value is -12345, the display is 1.2.345. (The negative value display is displayed to indicate a decimal negative value. There is no negative value display for a hexadecimal negative value.)	

#### NOTE

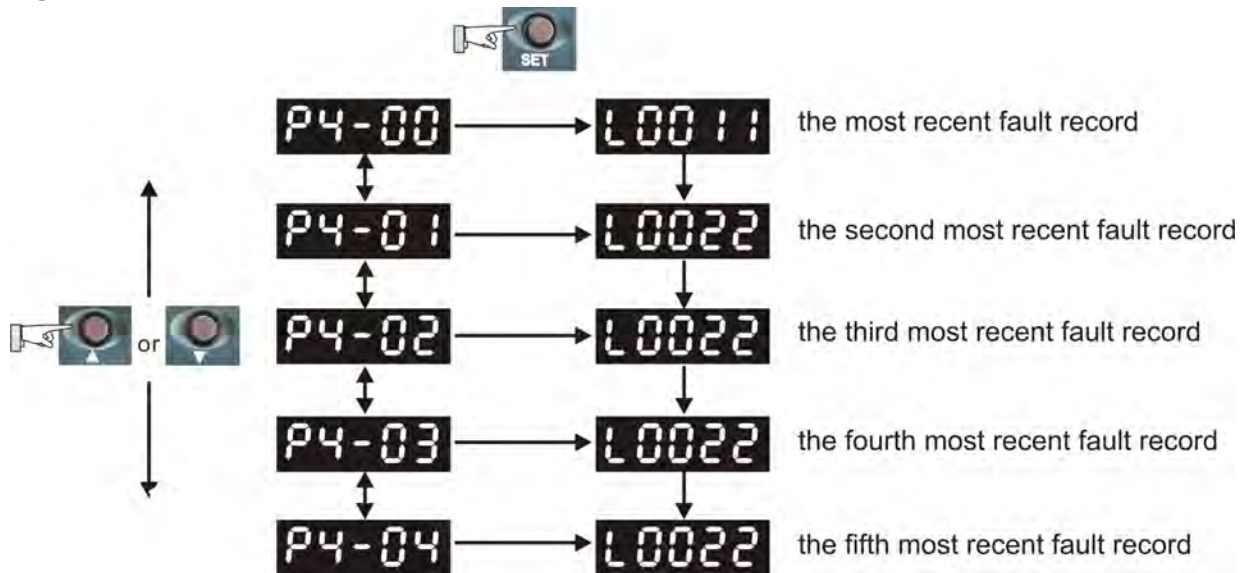
- 1) Dec. represents Decimal display and Hex. represents Hexadecimal display.
- 2) The above display methods are both available in monitor mode and parameter setting mode.
- 3) All monitor variables are 32-bit data. The users can switch to high byte or low byte and display format (Dec. or Hex.) freely. Regarding the parameters listed in Chapter 8, for each parameter, only one kind of display format is available and cannot be changed.

## 4.4 General Function Operation

### 4.4.1 Fault Code Display Operation

After entering the parameter mode P4-00 to P4-04 (Fault Record), press SET key to display the corresponding fault code history for the parameter. Please refer to the Figure 4.3.

Figure 4.3



### 4.4.2 JOG Operation

After entering parameter mode P4-05, the users can follow the following steps to perform JOG operation. (Please also refer to Figure 4.4).

- Step1. Press the SET key to display the JOG r/min speed. (The default value is 20 r/min).
- Step2. Press the UP or DOWN arrow keys to increase or decrease the desired JOG speed. (This also can be undertaken by using the SHIFT key to move the cursor to the desired unit column (the effected number will blink) then changed using the UP and DOWN arrow keys. The example display in Figure 4.4 is adjusted as 100 r/min.)
- Step3. Press the SET key when the desired JOG speed is set. The Servo Drive will display "JOG".
- Step4. Press the UP or DOWN arrow keys to jog the motor either N(CW) and P(CCW) direction. The motor will only rotate while the arrow key is activated.
- Step5. To change JOG speed again, press the MODE key. The servo Drive will display "P4 - 05". Press the SET key and the JOG r/min speed will displayed again. Refer back to #2 and #3 to change speed.

 **NOTE**

- 1) JOG operation is effective only when Servo On (when the servo drive is enabled).

**Figure 4.4**



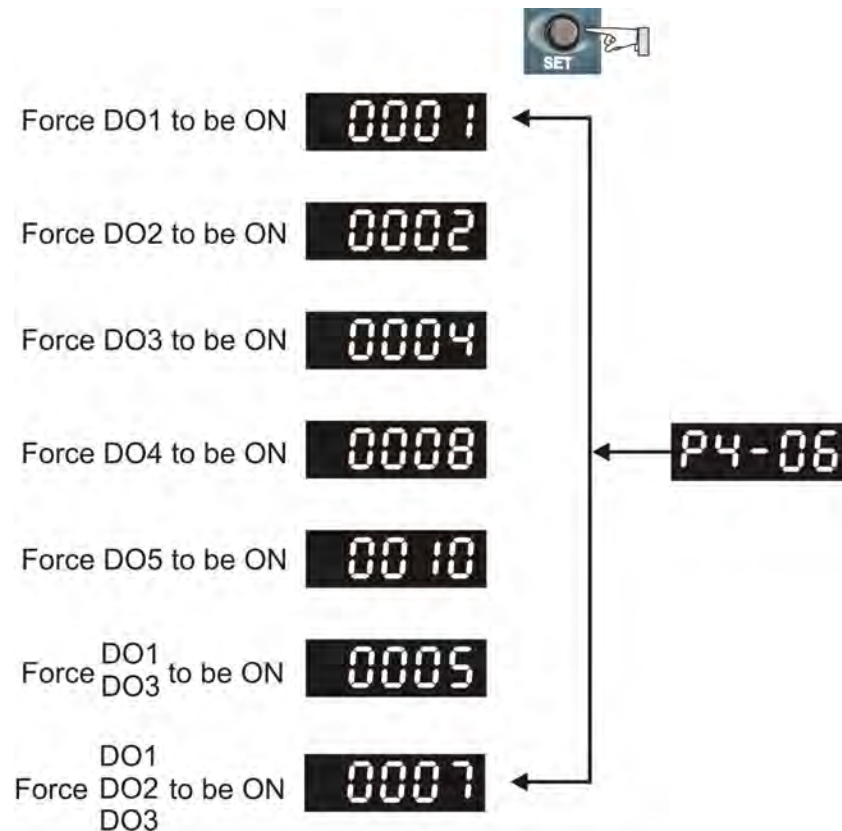
### 4.4.3 Force Output Control Operation

For testing, the digital outputs can be forced to be activated (ON) or inactivated (OFF) by using parameter P2-08 and P4-06. First, set P2-08 to 406 to enable the force output control function and then using P4-06 to force the digital outputs to be activated. Follow the setting method in Figure 4.6 to enter into Force Output Control operation mode. When P4-06 is set to 2, the digital output, DO2 is activated. When P4-06 is set to 5, the digital outputs, DO1 and DO3 are both activated. The parameter setting value of P4-06 is not retained when power is off. After re-power the servo drive, all digital outputs will return to the normal status. If P2-08 is set to 400, it also can switch the Force Output Control operation mode to normal Digital Output (DO) Control operation mode.

1The DO function and status is determined by P2-18 to P2-22. This function is enabled only when Servo Off (the servo drive is disabled).



Figure 4.6


 **NOTE**

1) As the display of P4-06 is hexadecimal, 0(zero) of the fifth digit will not show on the LED display.

#### 4.4.4 DI Diagnosis Operation

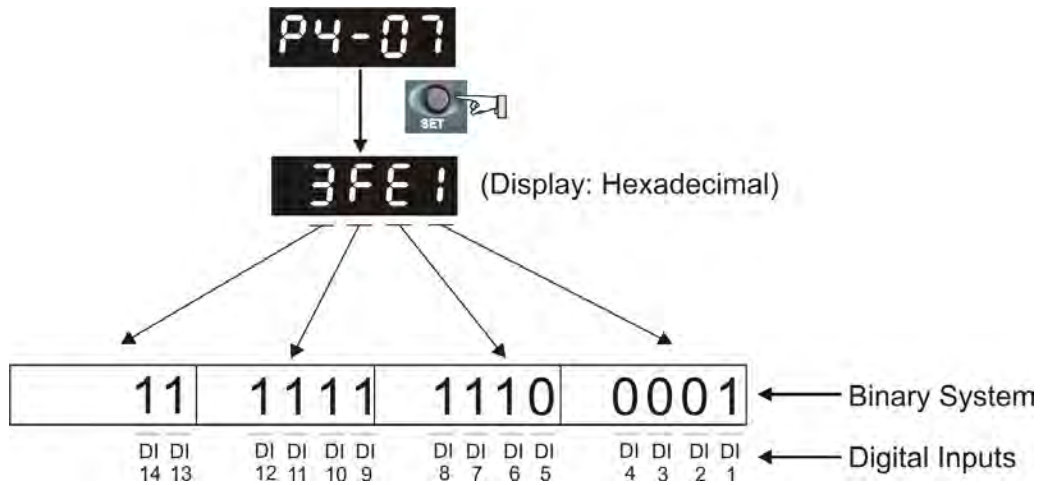
Following the setting method in Figure 4.7 can perform DI diagnosis operation (parameter P4-07, Input Status). According to the ON and OFF status of the digital inputs DI1 to DI8, the corresponding status will display on the servo drive LED display. When the Bit is set to "1", it means that the corresponding digital input signal is ON. (Please also refer to Figure 4.7)

For example:

Suppose that the servo drive LED display is "3FE1".

"E" is hexadecimal, which is equal to "1110" in binary system, and it means that the digital inputs DI6 ~ DI8 are ON.

Figure 4.7



### 4.4.5 DO Diagnosis Operation

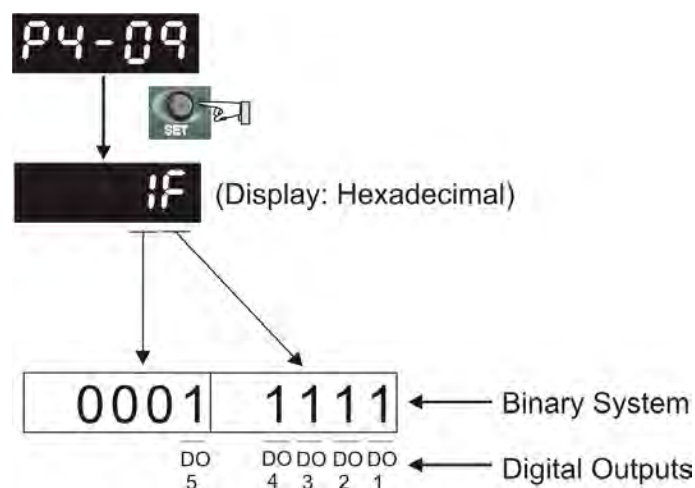
Following the setting method in Figure 4.8 can perform DO diagnosis operation (parameter P4-09, Output Status Display). According to the ON and OFF status of the digital outputs DO1 to DO5, the corresponding status will display on the servo drive LED display. When the Bit is set to “1”, it means that the corresponding digital output signal is ON. (Please also refer to Figure 4.8)

For example:

Suppose that the servo drive LED display is “1F”.

“F” is hexadecimal, which is equal to “1111” in binary system, and it means that the digital outputs DO1 ~ DO4 are ON.

Figure 4.8



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# Chapter 5 Trial Run and Tuning

## Procedure

This chapter, which is divided into two parts, describes trial run for servo drive and motor. One part is to introduce the trial run without load, and the other part is to introduce trial run with load. Ensure to complete the trial run without load first before performing the trial run with load.

### 5.1 Inspection without Load

In order to prevent accidents and avoid damaging the servo drive and mechanical system, the trial run should be performed under no load condition (no load connected, including disconnecting all couplings and belts). Do not run servo motor while it is connected to load or mechanical system because the unassembled parts on motor shaft may easily disassemble during running and it may damage mechanical system or even result in personnel injury. After removing the load or mechanical system from the servo motor, if the servo motor can run normally following up the normal operation procedure (when trial run without load is completed), then the users can connect to the load and mechanical system to run the servo motor.



- *In order to prevent accidents, the initial trial run for servo motor should be conducted under no load conditions (separate the motor from its couplings and belts).*
- *Caution: Please perform trial run without load first and then perform trial run with load connected. After the servo motor is running normally and regularly without load, then run servo motor with load connected. Ensure to perform trial run in this order to prevent unnecessary danger.*

After power is connected to AC servo drive, the charge LED will light and it indicates that AC servo drive is ready. Please check the followings before trial run:

1. Inspection before operation (Control power is not applied)
  - Inspect the servo drive and servo motor to insure they were not damaged.
  - Ensure that all wiring terminals are correctly insulated.
  - Ensure that all wiring is correct or damage and or malfunction may result.
  - Visually check to ensure that there are not any unused screws, metal strips, or any conductive or inflammable materials inside the drive.
  - Make sure control switch is OFF.

- Never put inflammable objects on servo drive or close to the external regenerative resistor.
- If the electromagnetic brake is being used, ensure that it is correctly wired.
- If required, use an appropriate electrical filter to eliminate noise to the servo drive.
- Ensure that the external applied voltage to the drive is correct and matched to the controller.

## 2. Inspection during operation (Control power is applied)

- Ensure that the cables are not damaged, stressed excessively or loaded heavily. When the motor is running, pay close attention on the connection of the cables and notice that if they are damaged, frayed or over extended.
- Check for abnormal vibrations and sounds during operation. If the servo motor is vibrating or there are unusual noises while the motor is running, please contact the dealer or manufacturer for assistance.
- Ensure that all user-defined parameters are set correctly. Since the characteristics of different machinery equipment are not the same, in order to avoid accident or cause damage, do not adjust the parameter abnormally and ensure the parameter setting is not an excessive value.
- Ensure to reset some parameters when the servo drive is off (Please refer to Chapter 8). Otherwise, it may result in malfunction.
- If there is no contact sound or there be any unusual noises when the relay of the servo drive is operating, please contact your distributor for assistance or contact with Delta.
- Check for abnormal conditions of the power indicators and LED display. If there is any abnormal condition of the power indicators and LED display, please contact your distributor for assistance or contact with Delta.

## 5.2 Applying Power to the Drive

The users please observe the following steps when applying power supply to the servo drive.

1. Please check and confirm the wiring connection between the drive and motor is correct.
  - 1) Terminal U, V, W and FG (frame ground) must connect to Red, White, Black and Green cables separately (U: Red, V: White, W: Black, FG: Green). If not connect to the specified cable and terminal, then the drive cannot control motor. The motor grounding lead, FG must connect to grounding terminal. For more information of cables, please refer to section 3.1.
  - 2) Ensure to connect encoder cable to CN2 connector correctly. If the users only desire to execute JOG operation, it is not necessary to make any connection to CN1 and CN3 connector. For more information of the connection of CN2 connector, please refer to Section 3.1 and 3.4.



➤ **Do not connect the AC input power (R, S, T) to the (U, V, W) output terminals. This will damage the AC servo drive.**

### 2. Main circuit wiring

Connect power to the AC servo. For three-phase input power connection and single-phase input power connection, please refer to Section 3.1.3.

### 3. Turn the Power On

The Power includes control circuit power (L1c, L2c) and main circuit power (R, S, T). When the power is on, the normal display should be shown as the following figure:

AL014

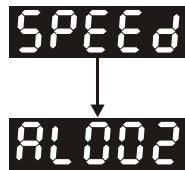
As the default settings of digital input signal, DI6, DI7 and DI8 are Reverse Inhibit Limit (NL), Forward Inhibit Limit (PL) and Emergency Stop (EMGS) respectively, if the users do not want to use the default settings of DI6 ~ DI8, the users can change their settings by using parameters P2-15 to P2-17 freely. When the setting value of parameters P2-15 to P2-17 is 0, it indicates the function of this DI signal is disabled. For more information of parameters P2-15 to P2-17, please refer to Chapter 8 "Parameters".

If the parameter P0-02 is set as motor speed (06), the normal display should be shown as the following figure:

SPEED  
↓  
00000

If there is no text or character displayed on the LED display, please check if the voltage of the control circuit terminal ((L1c, L2c) is over low.

1) When display shows:



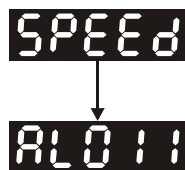
**Overvoltage:**

The main circuit voltage has exceeded its maximum allowable value or input power is error (Incorrect power input).

Corrective Actions:

- Use voltmeter to check whether the main circuit input voltage falls within the rated input voltage.
- Use voltmeter to check whether the input voltage is within the specified limit.

2) When display shows:



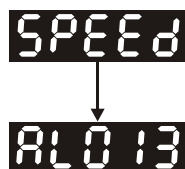
**Encoder error:**

Check if the wiring is correct. Check if the encoder wiring (CN2) of servo motor is loose or incorrect.

Corrective Actions:

- Check if the users perform wiring recommended in the user manual.
- Examine the encoder connector and cable.
- Inspect whether wire is loose or not.
- Check if the encoder is damaged.

3) When display shows:



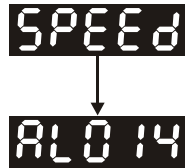
**Emergency stop activated:**

Please check if any of digital inputs DI1 ~ DI8 signal is set to "Emergency Stop" (EMGS).

Corrective Actions:

- If it does not need to use “Emergency Stop (EMGS)” as input signal, the users only need to confirm that if all of the digital inputs DI1 ~ DI8 are not set to “Emergency Stop (EMGS)”. (The setting value of parameter P2-10 to P2-17 is not set to 21.)
- If it is necessary to use “Emergency Stop (EMGS)” as input signal, the users only need to confirm that which of digital inputs DI1 ~ DI8 is set to “Emergency Stop (EMGS)” and check if the digital input signal is ON (It should be activated).

4) When display shows:



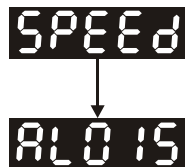
**Reverse limit switch error:**

Please check if any of digital inputs DI1 ~ DI8 signal is set to “Reverse inhibit limit (NL)” and check if the signal is ON or not.

Corrective Actions:

- If it does not need to use “Reverse inhibit limit (NL)” as input signal, the users only need to confirm that if all of the digital inputs DI1 ~ DI8 are not set to “Reverse inhibit limit (NL)”. (The setting value of parameter P2-10 to P2-17 is not set to 22.)
- If it is necessary to use “Reverse inhibit limit (NL)” as input signal, the users only need to confirm that which of digital inputs DI1 ~ DI8 is set to “Reverse inhibit limit (NL)” and check if the digital input signal is ON (It should be activated).

5) When display shows:



**Forward limit switch error:**

Please check if any of digital inputs DI1 ~ DI8 signal is set to “Forward inhibit limit (PL)” and check if the signal is ON or not.

Corrective Actions:

- If it is no need to use “Forward inhibit limit (PL)” as input signal, the users only need to confirm that if all of the digital inputs DI1 ~ DI8 are not set to “Forward inhibit limit (PL)”. (The setting value of parameter P2-10 to P2-17 is not set to 23.)



- If it is necessary to use “Forward inhibit limit (PL)” as input signal, the users only need to confirm that which of digital inputs DI1 ~ DI8 is set to “Forward inhibit limit (PL)” and check if the digital input signal is ON (It should be activated).

**When “Digital Input 1 (DI1)” is set to Servo On (SON), if DI1 is set to ON (it indicates that Servo On (SON) function is enabled) and the following fault message shows on the display:**

6) When display shows:

**AL001**

**Overcurrent:**

Corrective Actions:

- Check the wiring connections between the servo drive and motor.
- Check if the circuit of the wiring is closed.
- Remove the short-circuited condition and avoid metal conductor being exposed.

7) When display shows:

**AL003**

**Undervoltage:**

Corrective Actions:

- Check whether the wiring of main circuit input voltage is normal.
- Use voltmeter to check whether input voltage of main circuit is normal.
- Use voltmeter to check whether the input voltage is within the specified limit.

 **NOTE**

- 1) If there are any unknown fault codes and abnormal display when applying power to the drive or servo on is activated (without giving any command), please inform the distributor or contact with Delta for assistance.

### 5.3 JOG Trial Run without Load

It is very convenient to use JOG trial run without load to test the servo drive and motor as it can save the wiring. The external wiring is not necessary and the users only need to connect the digital keypad to the servo drive. For safety, it is recommended to set JOG speed at low speed. Please refer to the following steps to perform JOG trial run without load.

STEP 1: Turn the drive ON through software. Ensure that the setting value of parameter P2-30 should be set to 1 (Servo On).

STEP 2: Set parameter P4-05 as JOG speed (unit: r/min). After the desired JOG speed is set, and then press SET key, the drive will enter into JOG operation mode automatically

STEP 3: The users can press UP and DOWN key to change JOG speed and press SHIFT key to adjust the digit number of the displayed value.

STEP 4: Pressing SET key can determine the speed of JOG operation.

STEP 5: Pressing UP key and the servo motor will run in P(CCW) direction. After releasing UP key, the motor will stop running.

STEP 6: Pressing DOWN key and the servo motor will run in N(CW) direction. After releasing DOWN key, the motor will stop running.

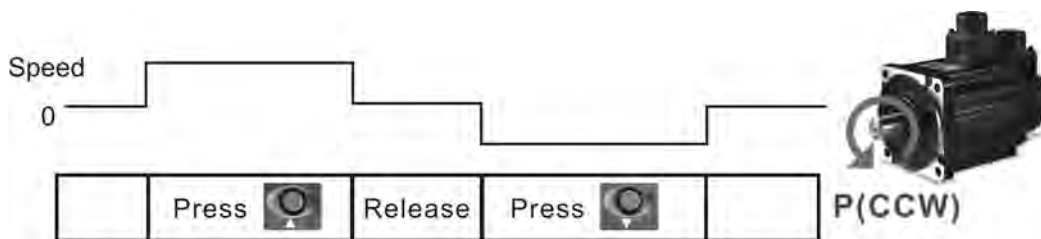
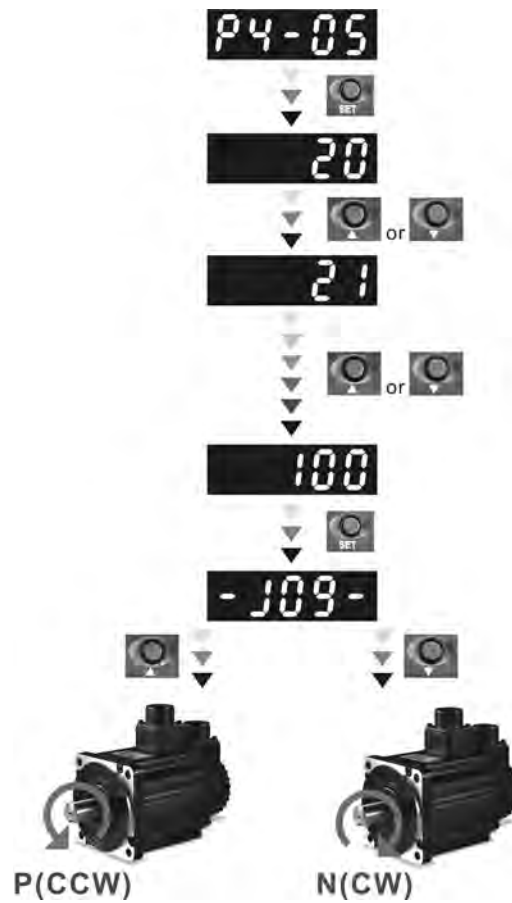
N(CW) and P(CCW) Definition:

P(CCW, Counterclockwise): when facing the servo motor shaft, P is running in counterclockwise direction.

N(CW, Clockwise): when facing the servo motor shaft, N is running in clockwise direction.

STEP 7: When pressing MODE key, it can exit JOG operation mode.

In the example below, the JOG speed is adjusted from 20r/min (Default setting) to 100r/min.



If the servo motor does not rotate, please check if the wiring of U, V, W terminals and encoder is correct or not.

If the servo motor does not rotate properly, please check if the phase of U, V, W cables is connected correctly.

## 5.4 Speed Trial Run without Load

**Before speed trial run, fix and secure the motor as possible to avoid the danger from the reacting force when motor speed changes.**

### STEP 1:

Set the value of parameter P1-01 to 02 and it is speed (S) control mode. After selecting the operation mode as speed (S) control mode, please restart the drive as P1-01 is effective only after the servo drive is restarted (after switching power off and on).

### STEP 2:

In speed control mode, the necessary Digital Inputs are listed as follows:

Digital Input	Parameter Setting Value	Sign	Function Description	CN1 PIN No.
DI1	P2-10=101	SON	Servo On	DI1=9
DI2	P2-11=109	TRQLM	Torque limit enabled	DI2=10
DI3	P2-12=114	SPD0	Speed command selection	DI3=34
DI4	P2-13=115	SPD1	Speed command selection	DI4=8
DI5	P2-14=102	ARST	Reset	DI5=33
DI6	P2-15=0	Disabled	This DI function is disabled	-
DI7	P2-16=0	Disabled	This DI function is disabled	-
DI8	P2-17=0	Disabled	This DI function is disabled	-
EDI9	P2-36=0	Disabled	This DI function is disabled	CN7=2
EDI10	P2-37=0	Disabled	This DI function is disabled	CN7=3
EDI11	P2-38=0	Disabled	This DI function is disabled	CN7=4
EDI12	P2-39=0	Disabled	This DI function is disabled	CN7=5
EDI13	P2-40=0	Disabled	This DI function is disabled	CN7=6
EDI14	P2-41=0	Disabled	This DI function is disabled	CN7=7

By default, DI6 is the function of reverse inhibit limit, DI7 is the function of forward inhibit limit and DI8 is the function of emergency stop (DI8), if the users do not set the setting value of parameters P2-15 to P2-17 and P2-36 to P2-41 to 0 (Disabled), the faults (AL013, 14 and 15) will occur (For the information of fault messages, please refer to Chapter 11). Therefore, if the users do not need to use these three digit inputs, please set the setting value of parameters P2-15 to P2-17 and P2-36 to P2-41 to 0 (Disabled) in advance.

All the digital inputs of Delta ASDA-A2 series are user-defined, and the users can set the DI signals freely. Ensure to refer to the definitions of DI signals before defining them (For the description of DI signals, please refer to Table 8.A in Chapter 8). If any alarm code displays after the setting is completed, the users can restart the drive or set DI5 to be activated to clear the fault. Please refer to section 5.2.

The speed command is selected by SPD0, SPD1. Please refer to the following table:

Speed Command No.	DI signal of CN1		Command Source	Content	Range
	SPD1	SPD0			
S1	0	0	External analog command	Voltage between V-REF and GND	-10V ~ +10V
S2	0	1	Internal parameter	P1-09	-60000 ~ 60000
S3	1	0		P1-10	-60000 ~ 60000
S4	1	1		P1-11	-60000 ~ 60000

0: indicates OFF (Normally Open); 1: indicates ON (Normally Closed)

The range of internal parameter is from -60000 to 60000.

Setting value of speed command = Setting range x unit (0.1 r/min).

For example:

If P1-09 is set to +30000, the setting value of speed command = +30000 x 0.1 r/min = +3000 r/min.

The settings of speed command:

P1-09 is set to +30000

P1-10 is set to +1000

P1-11 is set to -30000

Input value command	Rotation direction
+	N(CW)
-	P(CCW)

### STEP 3:

1. The users can use DI1 to enable the servo drive (Servo On).
2. If DI3 (SPD0) and DI4 (SPD1) are OFF both, it indicates S1 command is selected. At this time, the motor is operating according to external analog command.
3. If only DI3 is ON (SPD0), it indicates S2 command (P1-09 is set to +30000) is selected, and the motor speed is 3000r/min at this time.
4. If only DI4 is ON (SPD1), it indicates S3 command (P1-10 is set to +1000) is selected, and the motor speed is 100r/min at this time.
5. If DI3 (SPD0) and DI4 (SPD1) are ON both, it indicates S4 command (P1-11 is set to -30000) is selected, and the motor speed is -3000r/min at this time.
6. Repeat the action of (3), (4), (5) freely.
7. When the users want to stop the speed trial run, use DI1 to disable the servo drive (Servo Off).

## 5.5 Position Trial Run without Load

Before position trial run, fix and secure the motor as possible to avoid the danger from the reacting force when the motor speed changes.

### STEP 1:

Set the value of parameter P1-01 to 01 and it is position (PR) control mode. After selecting the operation mode as position (PR) control mode, please restart the drive and the setting would be valid.

### STEP 2:

In position control mode, the necessary DI setting is listed as follows:

Digital Input	Parameter Setting Value	Sign	Function Description	CN1 PIN No.
DI1	P2-10=101	SON	Servo On	DI1=9
DI2	P2-11=108	CTRG	Command triggered	DI2=10
DI3	P2-12=111	POS0	Position command selection	DI3=34
DI4	P2-13=112	POS1	Position command selection	DI4=8
DI5	P2-14=102	ARST	Reset	DI5=33
DI6	P2-15=0	Disabled	This DI function is disabled	-
DI7	P2-16=0	Disabled	This DI function is disabled	-
DI8	P2-17=0	Disabled	This DI function is disabled	-
EDI9	P2-36=0	Disabled	This DI function is disabled	CN7=2
EDI10	P2-37=0	Disabled	This DI function is disabled	CN7=3
EDI11	P2-38=0	Disabled	This DI function is disabled	CN7=4
EDI12	P2-39=0	Disabled	This DI function is disabled	CN7=5
EDI13	P2-40=0	Disabled	This DI function is disabled	CN7=6
EDI14	P2-41=0	Disabled	This DI function is disabled	CN7=7

By default, DI6 is the function of reverse inhibit limit, DI7 is the function of forward inhibit limit and DI8 is the function of emergency stop (DI8), if the users do not set the setting value of parameters P2-15 to P2-17 and P2-36 to P2-41 to 0 (Disabled), the faults (AL013, 14 and 15) will occur (For the information of fault messages, please refer to Chapter 11). Therefore, if the users do not need to use these three digit inputs, please set the setting value of parameters P2-15 to P2-17 and P2-36 to P2-41 to 0 (Disabled) in advance.

All the digital inputs of Delta ASDA-A2 series are user-defined, and the users can set the DI signals freely. Ensure to refer to the definitions of DI signals before defining them (For the description of DI signals, please refer to Table 8.A in Chapter 8). If any alarm code displays after the setting is completed, the users can restart the drive or set DI5 to be activated to clear the fault. Please refer to section 5.2. For the information of wiring diagrams, please refer to Section 3.10.2 (Wiring of position (PR) control mode). Because POS2 is not the default DI, the users need to change the value of parameter P2-14 to 113.

Please refer to the following table for 64 groups of position commands and position command selection from POS0 to POS5.
















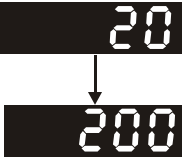

Position Command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Parameters
P1	0	0	0	0	0	0	↑	P6-00
								P6-01
P2	0	0	0	0	0	1	↑	P6-02
								P6-03
~								~
P50	1	1	0	0	1	0	↑	P6-98
								P6-99
P51	1	1	0	0	1	1	↑	P7-00
								P7-01
~								~
P64	1	1	1	1	1	1	↑	P7-26
								P7-27

0: indicates OFF (Normally Open); 1: indicates ON (Normally Closed)

The users can set the value of these 64 groups of commands (P6-00 ~ P7-27) freely. The command can be absolute position command as well.

## 5.6 Tuning Procedure

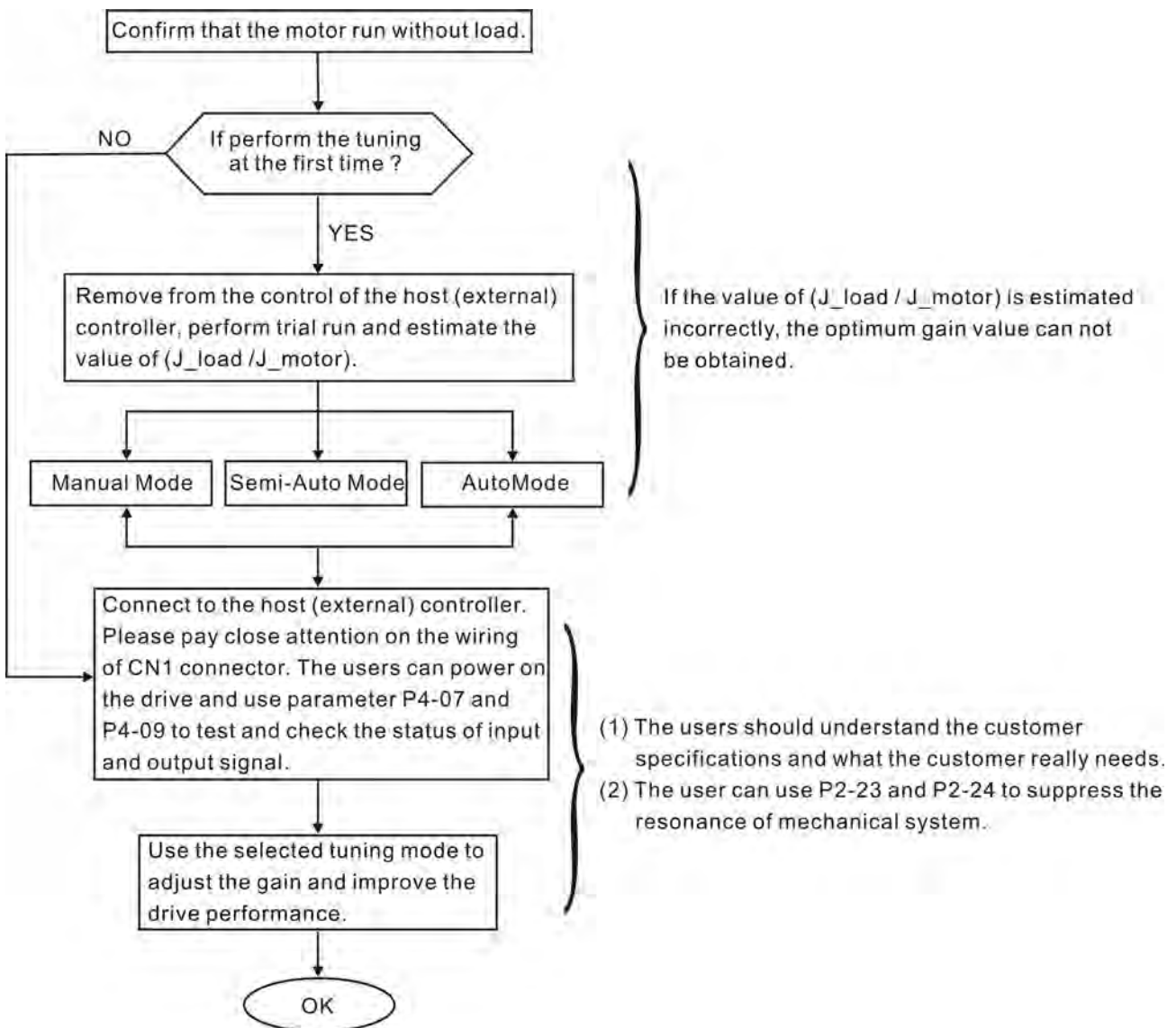
Table 5.A Estimate the ratio of Load Inertia to Servo Motor Inertia ( $J_{load} / J_{motor}$ ): JOG Mode

Tuning Procedure	Display
1. After wiring is completed, when power is connected to the AC servo drive, the right side display will show on the LCD display.	
2. Press MODE key to enter into parameter mode.	
3. Press SHIFT key twice to select parameter group.	
4. Press UP key to view each parameter and select parameter P2-17.	
5. Press SET key to display the parameter value as shown on the right side.	
6. Press SHIFT key twice to change the parameter values. Use UP key to cycle through the available settings and then press SET key to determine the parameter settings.	
7. Press UP key to view each parameter and select parameter P2-30.	
8. Press SET key to display the parameter value as shown on the right side.	
9. Select parameter value 1. Use UP key to cycle through the available settings.	
10. At this time, the servo drive is ON and the right side display will appear next.	
11. Press DOWN key three times to select the ratio of Load Inertia to Servo Motor Inertia ( $J_{load} / J_{motor}$ ).	
12. Display the current ratio of Load Inertia to Servo Motor Inertia ( $J_{load} / J_{motor}$ ). (5.0 is default setting.)	
13. Press MODE key to select parameter mode.	
14. Press SHIFT key twice to select parameter group.	
15. Press UP key to select user parameter P4-05.	
16. Press SET key and JOG speed 20 r/min will be displayed. Press UP and DOWN key to increase and decrease JOG speed. To press SHIFT key one time can add one digit number.	
17. Select desired JOG speed, press SET key and it will show the right side display.	
18. Pressing UP key is forward rotation and pressing DOWN key is reverse rotation.	
19. Execute JOG operation in low speed first. After the machine is running smoothly, then execute JOG operation in high speed.	

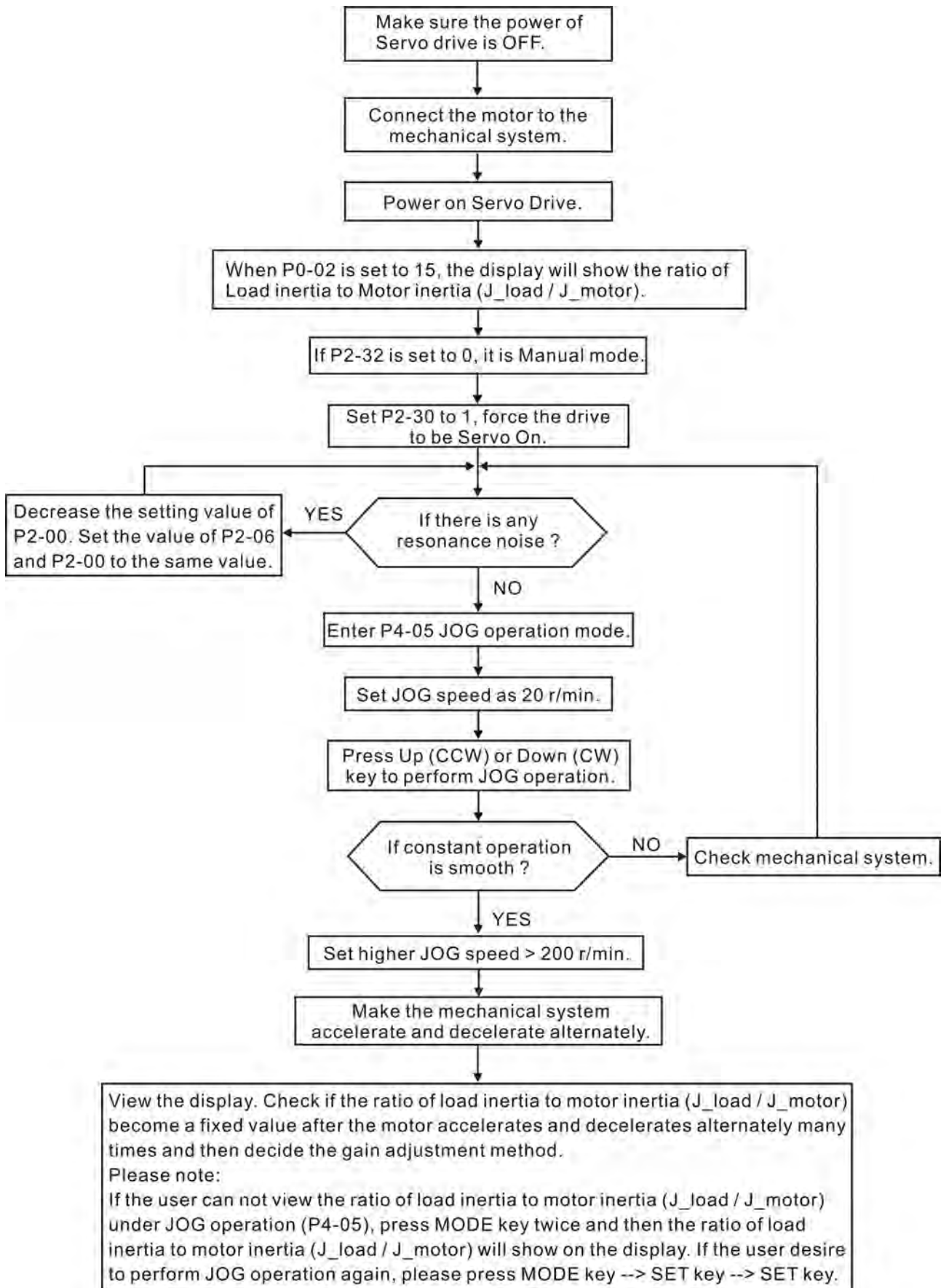


20. The ratio of Load Inertia to Servo Motor Inertia ( $J_{load} / J_{motor}$ ) cannot be shown in the display of JOG parameter P4-05 operation. Please press MODE key twice continuously and the users can see the ratio of Load Inertia to Servo Motor Inertia ( $J_{load} / J_{motor}$ ). Then, execute JOG operation again, press MODE key once and press SET key twice to view the display on the keypad. Check if the value of  $J_{load} / J_{motor}$  is adjusted to a fixed value and displayed on the keypad after acceleration and deceleration repeatedly.

### 5.6.1 Tuning Flowchart



### 5.6.2 Load Inertia Estimation Flowchart



### 5.6.3 Auto Mode Tuning Flowchart

Set P2-32 to 1 (1: Auto Mode [Continuous adjustment] )

The servo drive will continuously estimate the system inertia, save the measured load inertia value automatically and memorized in P1-37 every 30 minutes by referring to the frequency response settings of P2-31.

P2-31 : Auto Mode Stiffness Setting (Default setting: 80)

In Auto mode and Semi-Auto mode, the speed loop frequency response settings are as follows:

1 ~ 50Hz : Low stiffness and low frequency response

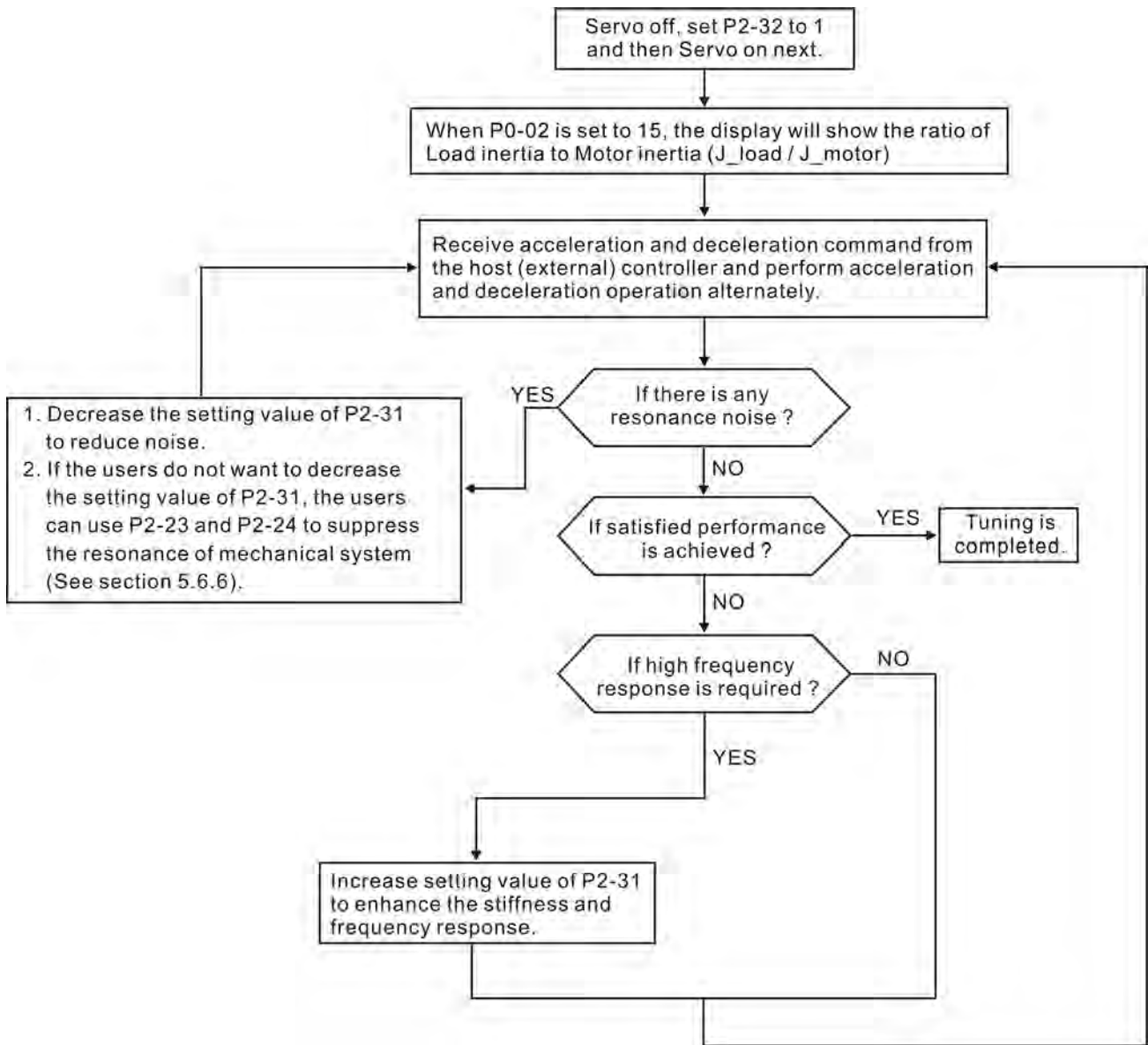
51 ~ 250Hz : Medium stiffness and medium frequency response

251 ~ 850Hz : High stiffness and high frequency response

851 ~ 1000Hz : Extremely high stiffness and extremely high frequency response

Adjust P2-31: Increase the setting value of P2-31 to enhance the stiffness or reduce the noise.

Continuously perform the adjustment until the satisfactory performance is achieved.



## 5.6.4 Semi-Auto Mode Tuning Flowchart

Set P2-32 to 2 (2: Semi-Auto Mode [Non-continuous adjustment] )

The servo drive will continuously perform the adjustment for a period of time. After the system inertia becomes stable, it will stop estimating the system inertia, save the measured load inertia value automatically, and memorized in P1-37. When switching from other modes, such as Manual Mode or Auto Mode, to Semi-Auto Mode, the servo drive will perform continuous adjustment for estimating the load inertia (P1-37) again. The servo drive will refer to the frequency response settings of P2-31 when estimating the system inertia.

P2-31 : Auto Mode Stiffness Setting (Default setting: 80)

In Auto mode and Semi-Auto mode, the speed loop frequency response settings are as follows:

1 ~ 50Hz : Low stiffness and low frequency response

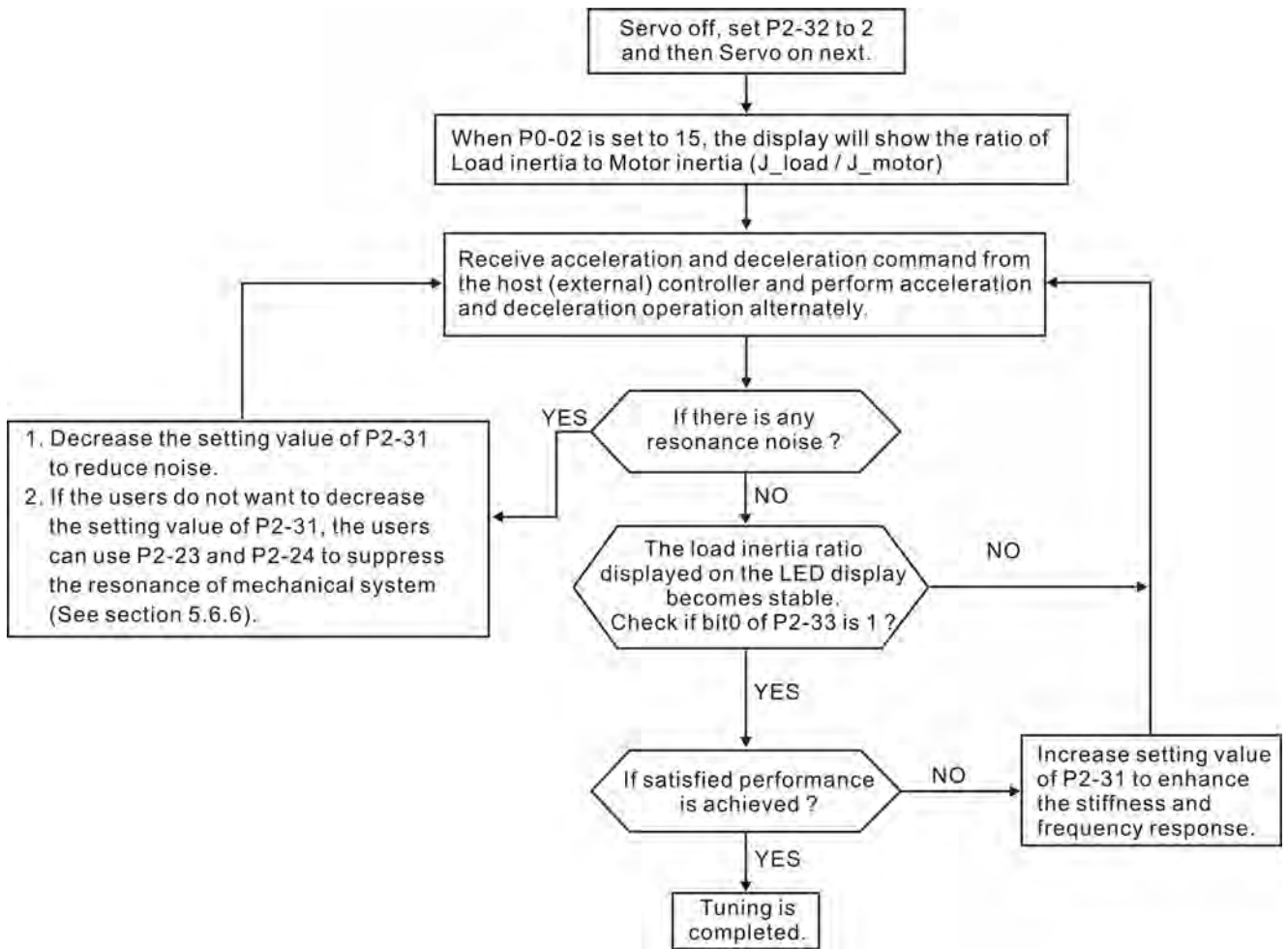
51 ~ 250Hz : Medium stiffness and medium frequency response

251 ~ 850Hz : High stiffness and high frequency response

851 ~ 1000Hz : Extremely high stiffness and extremely high frequency response

Adjust P2-31: Increase the setting value of P2-31 to enhance the frequency response or reduce the noise.

Continuously perform the adjustment until the satisfactory performance is achieved.

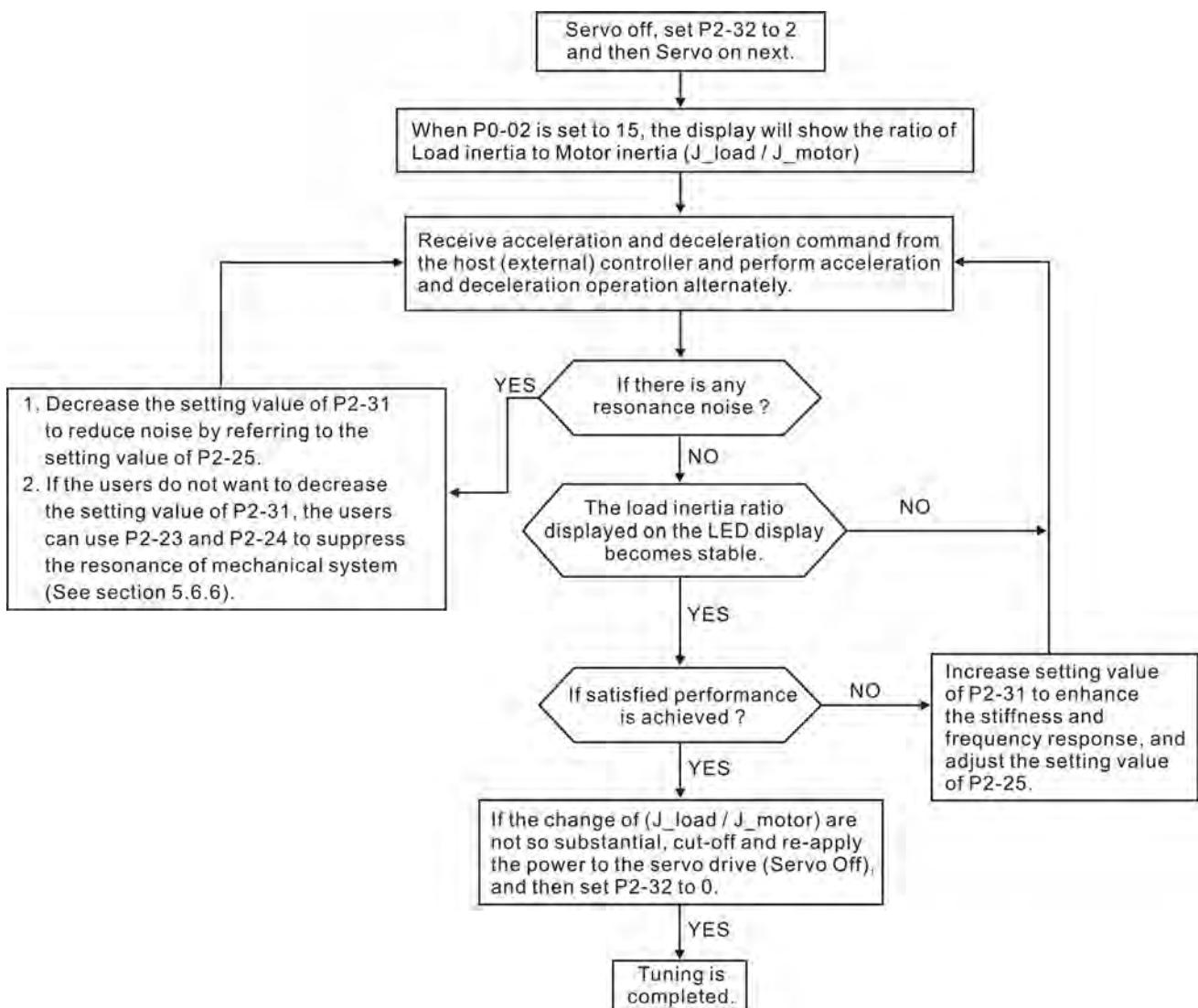


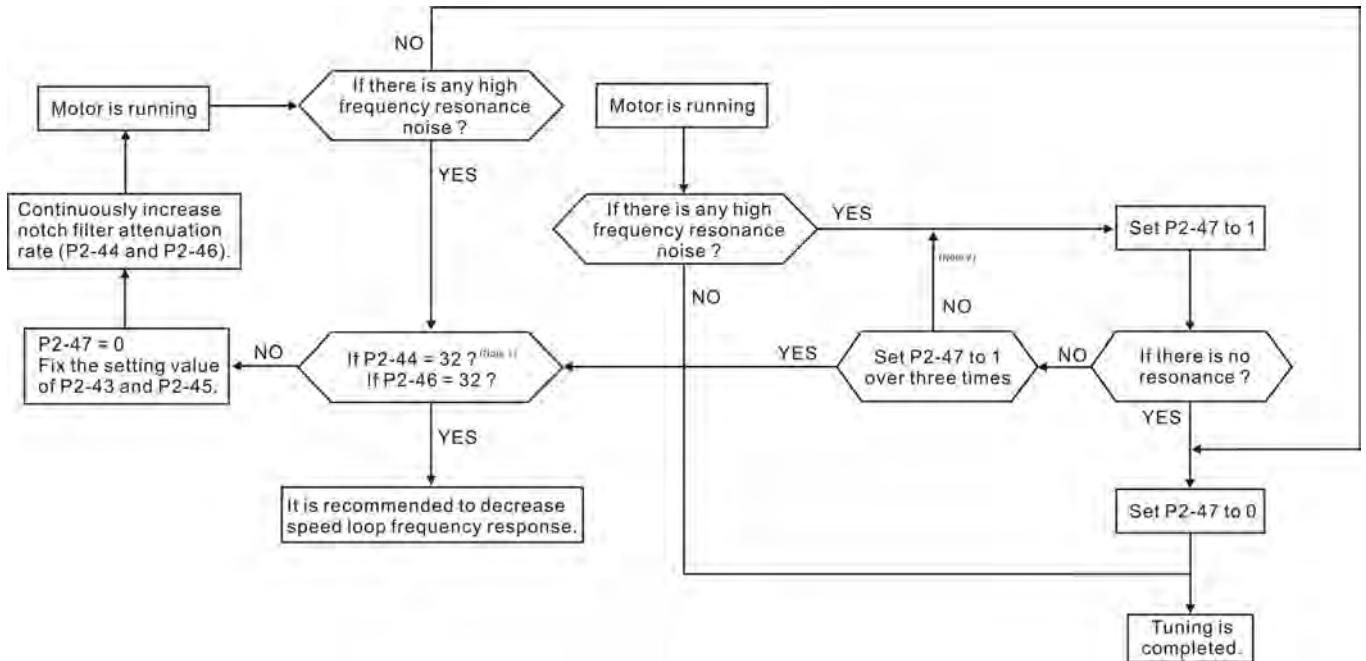
### NOTE

- 1) When bit0 of P2-33 is set to 1, it indicates that the system inertia estimation of semi-auto mode has been completed and the measured load inertia value is saved and memorized in P1-37 automatically.
- 2) If reset bit0 of P2-33 to 0, it will start estimating the system inertia again.

### 5.6.5 Limit of Load Inertia Estimation

The accel. / decel. time for reaching 2000r/min must be below 1 second. The rotation speed must be above 200 r/min. The load inertia must be 100 multiple or less of motor inertia. The change of external force and the inertia ratio can not be too much. In Auto Mode (P2-32 is set to 1), the measured load inertia value will be saved automatically and memorized in P1-37 every 30 minutes. In Semi-Auto Mode, it will stop estimating the load inertia after a period of continuous adjustment time when the system inertia becomes stable. The measured load inertia value will be saved automatically and memorized in P1-37 when load inertia estimation is stopped.





### NOTE

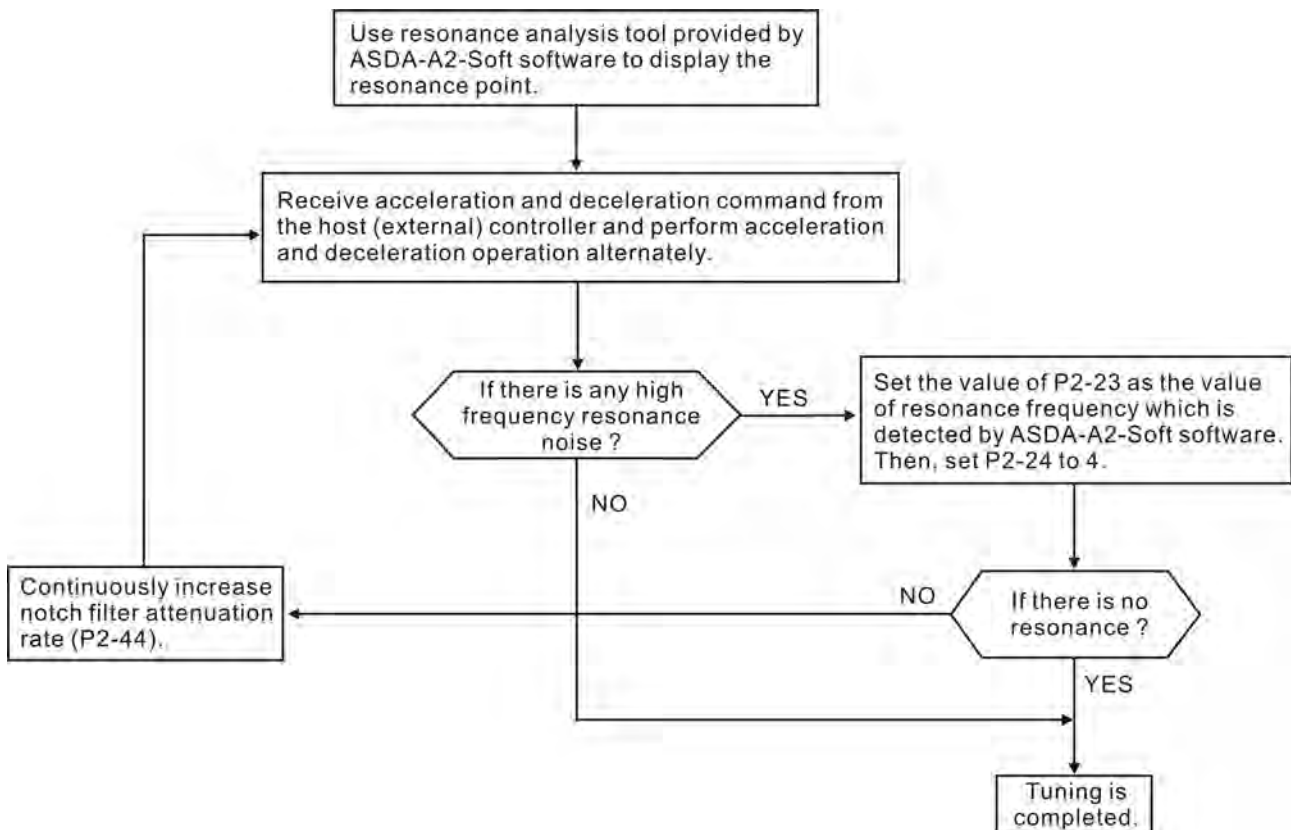
- 1) Parameters P2-44 and P2-46 are used to set notch filter attenuation rate. If the resonance can not be suppressed when the setting values of P2-44 and P2-46 are set to 32bB (the maximum value), please decrease the speed loop frequency response. After setting P2-47, the users can check the setting values of P2-44 and P2-46. If the setting value of P2-44 is not 0, it indicates that one resonance frequency exists in the system and then the users can read P2-43, i.e. the frequency (unit is Hz) of the resonance point. When there is any resonance point in the system, its information will be shown in P2-45 and P2-46 as P2-43 and P2-44.
- 2) If the resonance conditions are not improved when P2-47 is set to 1 for over three times, please adjust notch filters (resonance suppression parameters) manually to or eliminate the resonance.



### 5.6.6 Mechanical Resonance Suppression Method

In order to suppress the high frequency resonance of the mechanical system, ASDA-A2 series servo drive provides three notch filters (resonance suppression parameters) for resonance suppression. Two notch filters can be set to suppress the resonance automatically. If the users do not want to suppress the resonance automatically, these two notch filter can also be set to or eliminate the resonance manually.

Please refer to the following flowchart for manual adjustment.



### 5.6.7 Relationship between Tuning Modes and Parameters

Tuning Mode	P2-32	AutoSet Parameter	User-defined Parameter	Gain Value
Manual Mode	0 (Default setting)	None	P1-37 (Ratio of Load Inertia to Servo Motor Inertia [J_load / J_motor]) P2-00 (Proportional Position Loop Gain) P2-04 (Proportional Speed Loop Gain) P2-06 (Speed Integral Compensation) P2-25 (Low-pass Filter Time Constant of Resonance Suppression) P2-26 (External Anti-Interference Gain)	Fixed
Auto Mode [Continuous Adjustment]	1	P1-37 P2-00 P2-02 P2-04 P2-06 P2-25 P2-26 P2-49	P2-31 (Auto Stiffness and Frequency response Level)	Continuous Adjusting (every 30 minutes)
Semi-Auto Mode [Non-continuous Adjustment]	2	P1-37 P2-00 P2-02 P2-04 P2-06 P2-25 P2-26 P2-49	P2-31 (Auto Stiffness and Frequency response Level)	Non-continuous Adjusting (stop after a period of time)

When switching mode #1 to #0, the setting value of P2-00, P2-02, P2-04, P2-06, P2-25, P2-26 and P2-49 will change to the value that measured in #1 auto-tuning mode.

When switching mode #2 to #0, the setting value of P2-00, P2-02, P2-04, P2-06, P2-25, P2-26 and P2-49 will change to the value that measured in #2 semi-auto tuning mode.

### 5.6.8 Gain Adjustment in Manual Mode

The position and speed frequency response selection is depending on and determined by the the control stiffness of machinery and conditions of applications. Generally, high reponsiveness is essential for the high frequency positioning control of mechanical facilities and the applications of high precision process system. However, the higher frequency response may easily result in the resonance of machinery system. Therefore, for the applications of high frequency response, the machinery system with control stiffness is needed to avoid the resonance. Especially when adjusting the frequency response of unfamiliar machinery system, the users can gradually increase the gain setting value to improve frequency response untill the resonance occurs, and then decrease the gain setting value. The relevant parameters and gain adjusting methods are described as follows:

- KPP, Parameter P2-00 Proportional Position Loop Gain

This parameter is used to determine the frequency response of position loop (position loop gain). It could be used to increase stiffness, expedite position loop response and reduce position error. When the setting value of KPP is higher, the response to the position command is quicker, the position error is less and the settling time is also shorter. However, if the setting value is over high, the machinery system may generate vibration or noise, or even overshoot during positioning. The position loop frequency response is calculated as follows:

$$\text{Position Loop Frequency Response (Hz)} = \frac{KPP}{2\pi}$$

- KVP, Parameter P2-04 Proportional Speed Loop Gain

This parameter is used to determine the frequency response of speed loop (speed loop gain). It could be used to expedite speed loop response. When the setting value of KVP is higher, the response to the speed command is quicker. However, if the setting value is over high, it may result in the resonance of machinery system. The frequency response of speed loop must be higher than the 4~6 times of the frequency response of position loop. If frequency response of position loop is higher than the frequency response of speed loop, the machinery system may generate vibration or noise, or even overshoot during positioning. The speed loop frequency response is calculated as follows:

$$\text{Speed Loop Frequency Response } f_v = \left( \frac{KVP}{2\pi} \right) \times \left[ \frac{(1+P1-37/10)}{(1+JL/JM)} \right] \text{Hz}$$

JM: Motor Inertia  
JL: Load Inertia  
P1-37: 0.1 times

When the value of P1-37 (no matter it is the measured load inertia value or the set load inertia value) is equal to the actual load inertia value, the actual speed loop frequency response will be:

$$f_v = \frac{KVP}{2\pi} \text{ Hz}$$

- KVI, Parameter P2-06 Speed Integral Compensation

If the setting value of KVI is higher, the capability of decreasing the speed control deviation is better. However, if the setting value is over high, it may easily result in the vibration of machinery system. The recommended setting value is as follows:

$$KVI \text{ (Parameter P2-06)} \leq 1.5 \times \text{Speed Loop Frequency Response}$$

- NLP, Parameter P2-25 Low-pass Filter Time Constant of Resonance Suppression

When the value of (J\_load / J\_motor) is high, the frequency response of speed loop may decrease. At this time, the users can increase the setting value of KVP (P2-04) to keep the frequency response of speed loop. However, when increasing the setting value of KVP (P2-04), it may easily result in the vibration of machinery system. Please use this parameter to suppress or eliminate the noise of resonance. If the setting value of NLP is higher, the capability of improving the noise of resonance is better. However, if the setting value is over high, it may easily lead to the instability of speed loop and overshoot of machinery system.

The recommended setting value is as follows:

$$NLP \text{ (Parameter P2-25)} \leq \frac{1000}{6 \times \text{Speed Loop Frequency Response (Hz)}}$$

- DST, Parameter P2-26 External Anti-Interference Gain

This parameter is used to enhance the anti-interference capability and reduce the occurrence of overshoot. The default setting is 0 (Disabled). It is not recommended to use it in manual mode only when performing a few tuning on the value gotten through P2-32 Auto Mode.

- PFG, Parameter P2-02 Position Feed Forward Gain

This parameter is used to reduce position error and shorten the positioning settling time. However, if the setting value is over high, it may easily lead to the overshoot of machinery system. If the value of electronic gear ratio (1-44/1-45) is over than 10, the machinery system may also easily generate vibration or noise.

# Chapter 6 Control Modes of Operation

## 6.1 Control Modes of Operation

The Delta ASDA-A2 series can be programmed to provide six single, eight dual modes and two multiple modes of operation. Their operation and description is listed in the following table.

	Mode	Mode	Code	Description
Single Mode	External Position Control	PT	00	Position control for the servo motor is achieved via an external pulse command.
	Internal Position Control	PR	01	Position control for the servo motor is achieved via by internal position commands stored within the servo controller. Execution of the 64 positions is via Digital Input (DI) signals.
	Speed Control	S	02	Speed control for the servo motor can be achieved via parameters set within the controller or from an external analog -10 ~ +10 Vdc command. Control of the internal speed parameters is via the Digital Inputs (DI). (A maximum of three speeds can be stored internally).
	Internal Speed Control	Sz	04	Speed control for the servo motor is only achieved via parameters set within the controller. Control of the internal speed parameters is via the Digital Inputs (DI). (A maximum of three speeds can be stored internally).
	Torque Control	T	03	Torque control for the servo motor can be achieved via parameters set within the controller or from an external analog -10 ~ +10 Vdc command. Control of the internal torque parameters is via the Digital Inputs (DI). (A maximum of three torque levels can be stored internally).
	Internal Torque Control	Tz	05	Torque control for the servo motor is only achieved via parameters set within the controller. Control of the internal torque parameters is via the Digital Inputs (DI). (A maximum of three torque levels can be stored internally).

Mode	Mode	Code	Description
Dual Mode	PT-S	06	Either PT or S control mode can be selected via the Digital Inputs (DI)
	PT-T	07	Either PT or T control mode can be selected via the Digital Inputs (DI).
	PR-S	08	Either PR or S control mode can be selected via the Digital Inputs (DI).
	PR-T	09	Either PR or T control mode can be selected via the Digital Inputs (DI).
	S-T	0A	Either S or T control mode can be selected via the Digital Inputs (DI).
	CANopen	0B	CANopen communication control is achieved via the commands from the host (external) controller.
	Reserved	0C	Reserved
	PT-PR	0D	Either PT or PR control mode can be selected via the Digital Inputs (DI).
Multiple Mode	PT-PR-S	0E	Either PT or PR or S control mode can be selected via the Digital Inputs (DI).
	PT-PR-T	0F	Either PT or PR or T control mode can be selected via the Digital Inputs (DI).

The steps of changing mode:

- (1) Switching the servo drive to Servo Off status. Turning SON signal of digit input to be off can complete this action.
- (2) Using parameter P1-01. (Refer to chapter 8).
- (3) After the setting is completed, cut the power off and restart the drive again.

The following sections describe the operation of each control mode, including control structure, command source and loop gain adjustment, etc.

## 6.2 Position Control Mode

The position control mode (PT or PR mode) is usually used for the applications requiring precision positioning, such as industry positioning machine, indexing table etc. Delta ASDA-A2 series servo drives support two kinds of command sources in position control mode. One is an external pulse train (PT: Position Terminals, External Position Control) and the other is internal parameter (PR: Position Register, i.e. internal parameters P6-00 to P7-27, Internal Position Control). The external pulse train with direction which can control the rotation angle of servo motor. The max. input frequency for the external pulse command is 4MKpps.

In order to provide a convenient position control function, Delta servo drive provides 64 internal preset parameters for position control. There are two setting methods of internal parameters, one is to set different position command into these 64 internal parameters before operation and then use POS0~POS5 of DI signals of CN1 to perform positioning control. The other setting method is to use serial communication to change the setting value of these eight internal parameters.

To make the servo motor and load operate more smoothly, Delta servo drive also provide complete Position Spine Line (P-curve) profile for position control mode. For the closed-loop positioning, speed control loop is the principal part and the auxiliary parameters are position loop gain and feed forward compensation. The users can also select two kinds of tuning mode (Manual/Auto modes) to perform gain adjustment. This Section 6.2 mainly describes the applicability of loop gain adjustment and feed forward compensation of Delta servo system.



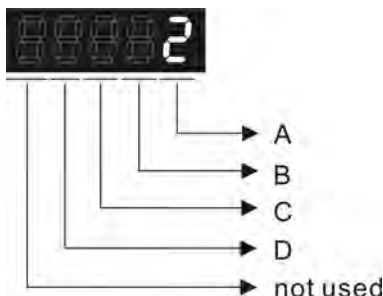
### 6.2.1 Command Source of Position (PT) Control Mode

The command source of P mode is external pulse train input form terminals. There are three types of pulse input and each pulse type is with-logic type (positive (+), negative (-)). They all can be set in parameter P1-00. Please refer to the following relevant parameters:

Relevant Parameter:

<b>P1-00 ▲</b>	<b>PTT</b>	<b>External Pulse Input Type</b>		<b>Address: 0100H 0101H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.1
	Default:	0x2		
	Control Mode:	PT		
	Unit:	-		
	Range:	0 ~ 1132		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:



- A: Input pulse type
- 0: AB phase pulse (4x) (Quadrature Input)
- 1: Clockwise (CW) + Counterclockwise(CCW) pulse
- 2: Pulse + Direction
- 3: Other settings: Reserved

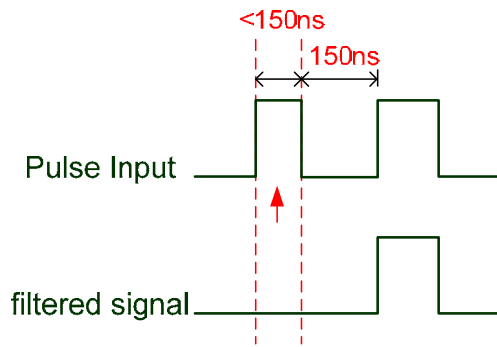
#### B: Input pulse filter

This setting is used to suppress or reduce the chatter caused by the noise, etc. However, if the instant input pulse filter frequency is over high, the frequency that exceeds the setting value will be regarded as noise and filtered.

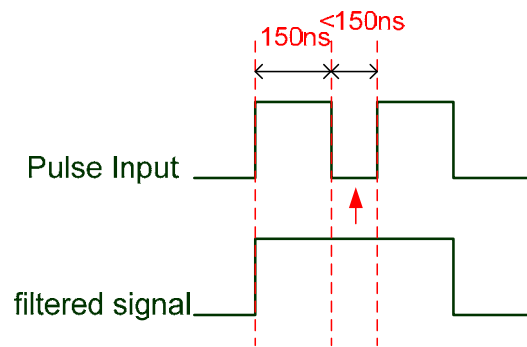
Setting Value	Low-speed Filter Frequency (Min. Filter Frequency <sup>(see note 1)</sup> )	Setting Value	High-speed Filter Frequency (Min. Filter Frequency <sup>(see note 1)</sup> )
0	0.83Mpps (600ns)	0	3.33Mpps (150ns)
1	208Kpps (2.4us)	1	0.83Mpps (600ns)
2	104Kpps (4.8us)	2	416Kpps (1.2us)
3	52Kpps (9.6us)	3	208Kpps (2.4us)
4	No Filter Function	4	No Filter Function

Please note:

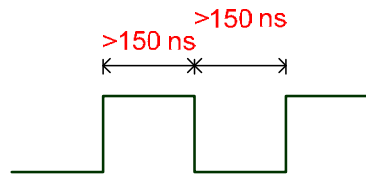
1. When the source of pulse command is the high-speed linear driver signal and the setting value B is set to 0 (High-speed Filter Frequency is 3.33Mpps):



When this pulse frequency is less than 150 ns, this signal will be regarded as a low-level pulse and two input pulses will be regarded as one input pulse.



When this pulse frequency is less than 150 ns, this signal will be regarded as a high-level pulse and two input pulses will be regarded as one input pulse.

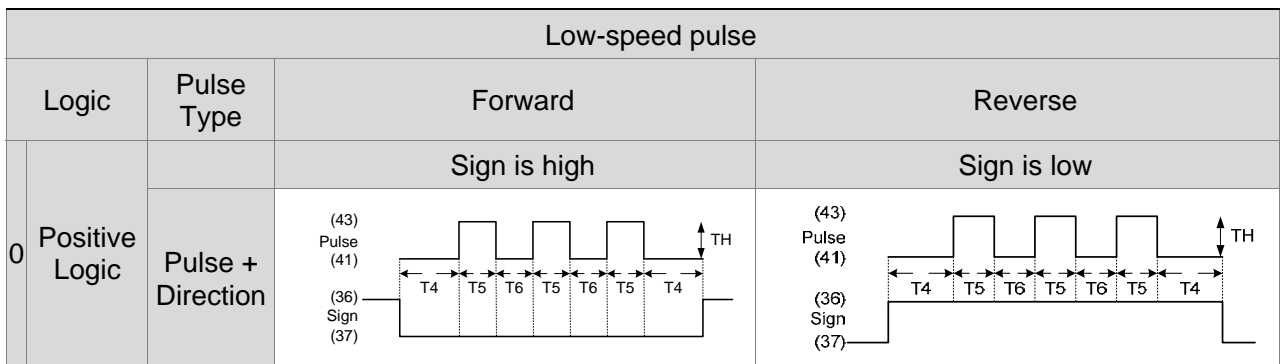
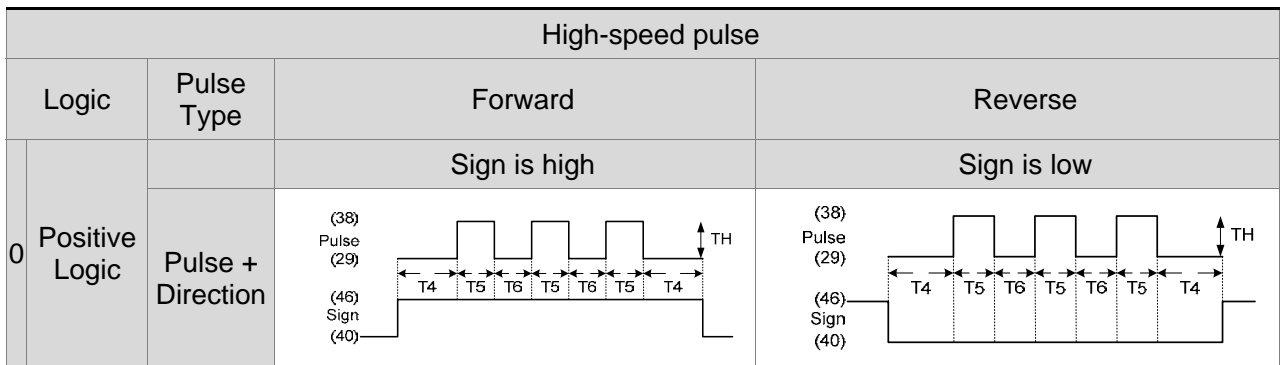
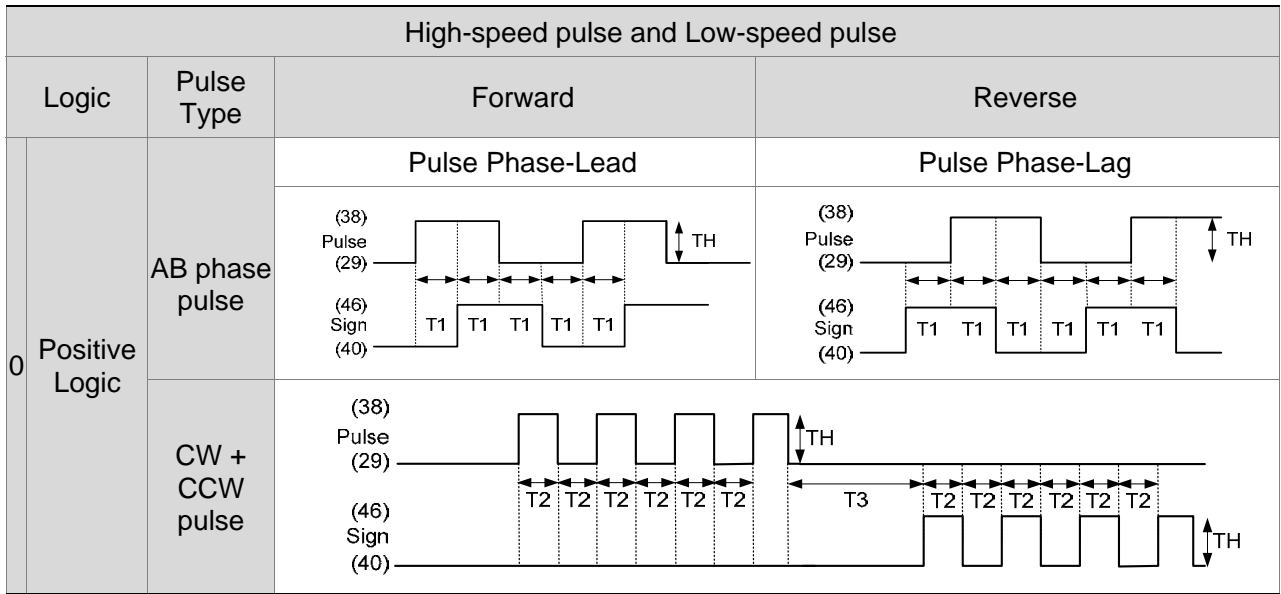


When the pulse frequencies of high-level duty and low-level duty both are greater than 150 ns, the signal will not be filtered (that is, the pulse command will pass through).

If an input pulse of 2~4MHz is used, it is recommended to change the setting value B (Input pulse filter) and set this setting value to 4. Please note that this function is available for DSP version V1.036 sub05, CPLD version V10 and later models only.

Note: If the signal is a 4Mpps high input pulse, setting the value B to 4 is able to ensure that the signal will not be filtered and will be certainly delivered.

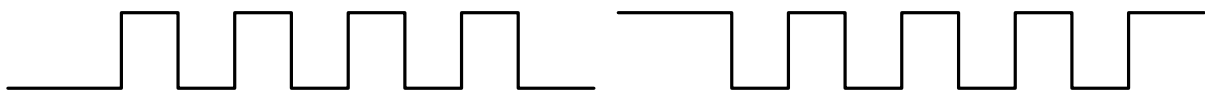
C: Input polarity



In digital electronics, logic circuits are generally divided into two classes according to their polarity - positive logic and negative logic. With reference to positive logic, logical 1 state represents the high voltage level and logic 0 represents the low voltage level. With reference to negative logic, logical 1 state represents the low voltage level and logic 0 state represents the high voltage level.

Positive Logic Circuit

Negative Logic Circuit



Pulse specification		Max. input pulse frequency	Min. time width					
			T1	T2	T3	T4	T5	T6
High-speed pulse	Line driver	4Mpps	62.5ns	125ns	250ns	200ns	125ns	125ns
Low-speed pulse	Line driver	500Kpps	0.5 $\mu$ s	1 $\mu$ s	2 $\mu$ s	2 $\mu$ s	1 $\mu$ s	1 $\mu$ s
	Open collector	200Kpps	1.25 $\mu$ s	2.5 $\mu$ s	5 $\mu$ s	5 $\mu$ s	2.5 $\mu$ s	2.5 $\mu$ s

Pulse specification		Max. input pulse frequency	Voltage specification	Forward specification
High-speed pulse	Line driver	4Mpps	5V	< 25mA
Low-speed pulse	Line driver	500Kpps	2.8V ~ 3.7V	< 25mA
	Open collector	200Kpps	24V (Max.)	< 25mA

#### D: Source of pulse command

Setting value	Input pulse interface	Remark
0	Open collector for low-speed pulse	CN1 Terminal Identification: PULSE, SIGN
1	Line driver for high-speed pulse	CN1 Terminal Identification: HPULSE, HSIGN

Position pulse can be input from these terminals, /PULSE (41), PULSE (43), HPULSE (38), /HPULSE (29), /SIGN (37), SIGN (36) and HSIGN (46), /HSIGN (40). It can be an open-collector circuit or line driver circuit. For the detail wiring, please refer to 3.10.1.

## 6.2.2 Command Source of Position (PR) Control Mode

The command sources of PR mode are (P6-00, P6-01) ~ (P7-26, P7-27) these 64 built-in parameters. Using with external I/O signals (CN1, POS 0 to POS 5 and CTRG) can select one of the 64 built-in parameters to be position command. Please refer to the table below:

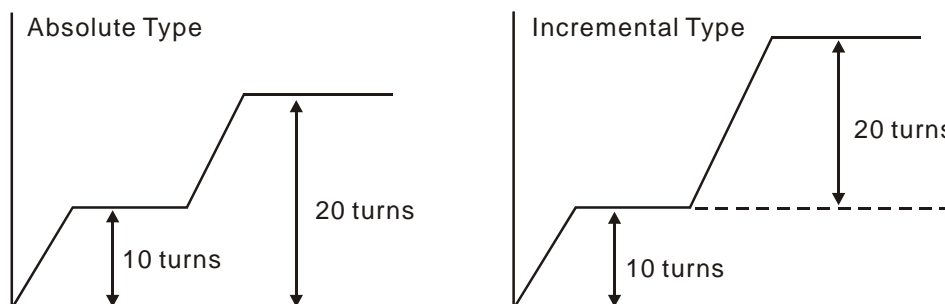
Position Command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Parameters
P1	ON	ON	ON	ON	ON	ON	↑	P6-00
								P6-01
P2	ON	ON	ON	ON	ON	OFF	↑	P6-02
								P6-03
~								~
P50	OFF	OFF	ON	ON	OFF	ON	↑	P6-98
								P6-99
P51	OFF	OFF	ON	ON	OFF	OFF	↑	P7-00
								P7-01
~								~
P64	OFF	OFF	OFF	OFF	OFF	OFF	↑	P7-26
								P7-27

State of POS0~5: 0 indicates the contact is OFF (Normally Open)

1 indicates the contact is ON (Normally Closed)

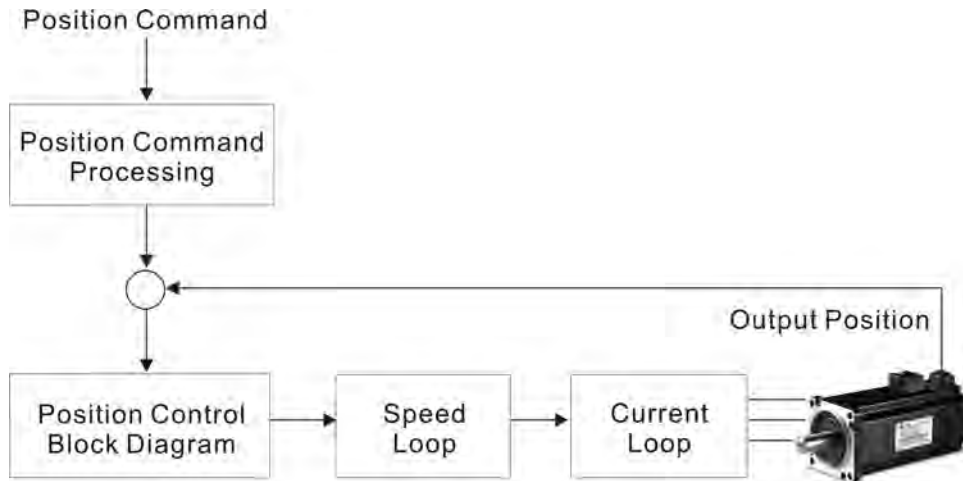
CTRG↑: the instant time when the contact changes from 0 (open) to 1 (closed).

The application of absolute and incremental position control is various and multiple. This kind of position control is equal to a simple sequence control. Users can easily complete the cycle running by using the above table. For example, the position command, P1 is 10 turns and P2 is 20 turns. Give the position command P1 first and then give the position command P2. The difference between absolute and incremental position control is shown as the figure below:



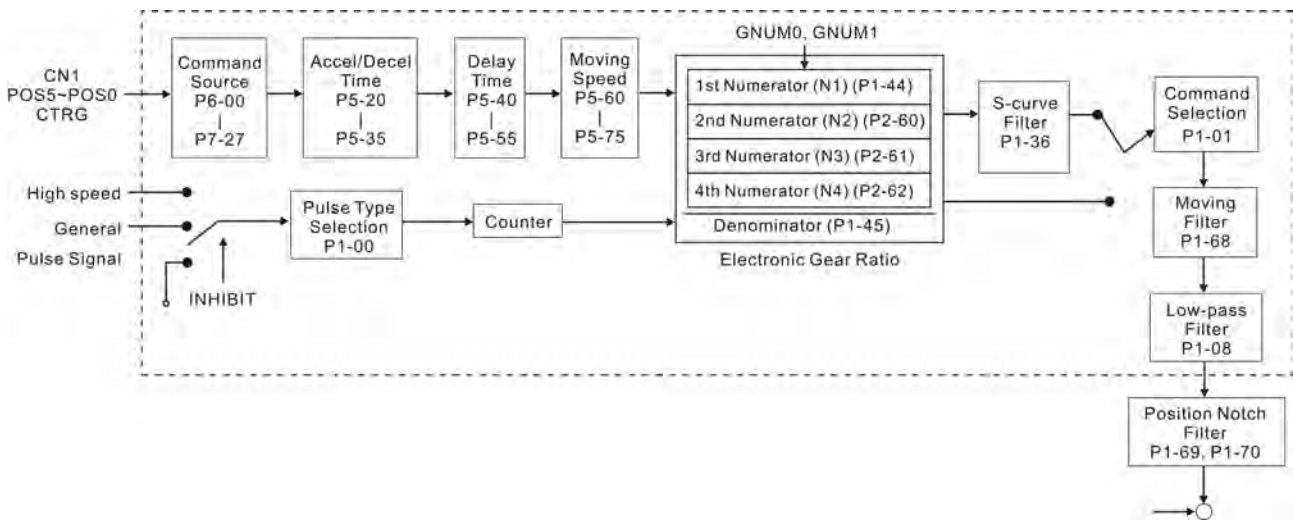
### 6.2.3 Structure of Position Control Mode

Basic Structure:



In order to pursue the goal of perfection in position control, the pulse signal should be modified through position command processing and the structure is shown as the figure below:

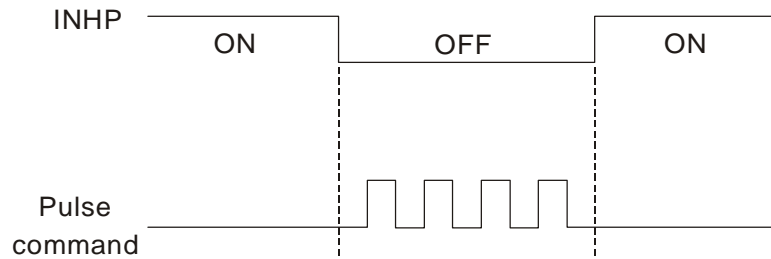
ASDA-A2 Series:



Using parameter can select PR mode and PT mode. Electronic gear ratio can be set in both two modes to set proper position revolution. ASDA-A2 series servo drives also provide S-curve and low-pass filter, which are used whenever the motor and load need to be operated more smoothly. As for the information of electronic gear ratio, S-curve and low-pass filter, please refer to the following sections 6.2.4, 6.2.5 and 6.2.6.

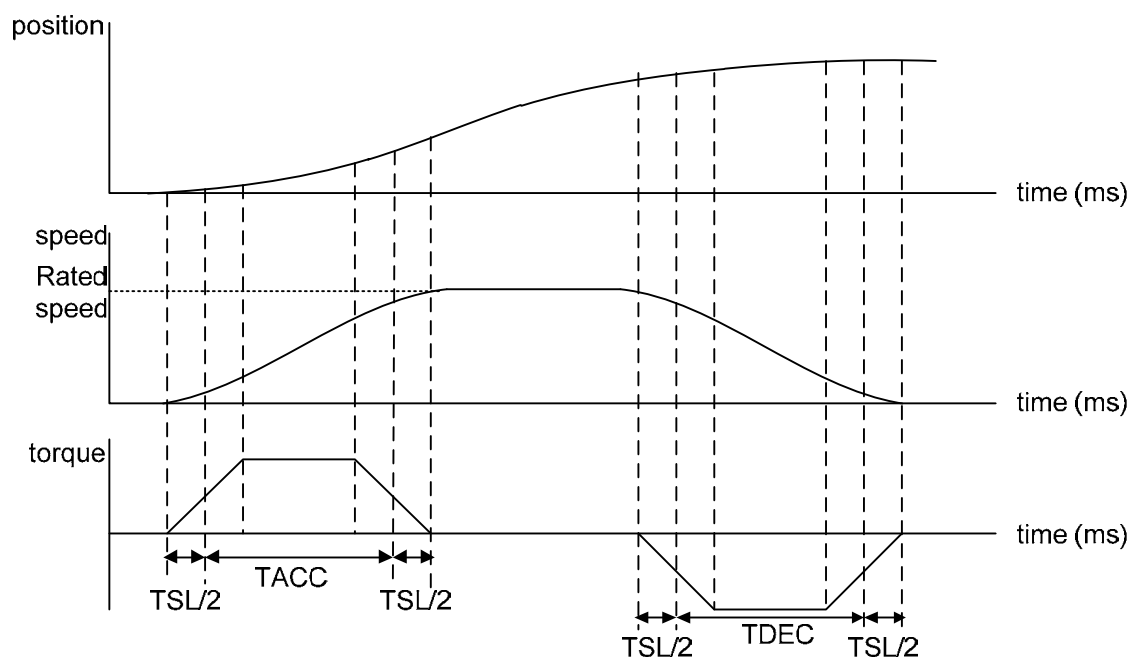
### Pulse Inhibit Input Function (INHIBIT)

This function is activated via digital inputs (Please refer to parameter P2-10 ~ P2-17 and DI INHP in Table 8.A). When the drive is in position mode, if INHP is activated, the external pulse input command is not valid and the motor will stop (Please note that only DI8 supports this function).

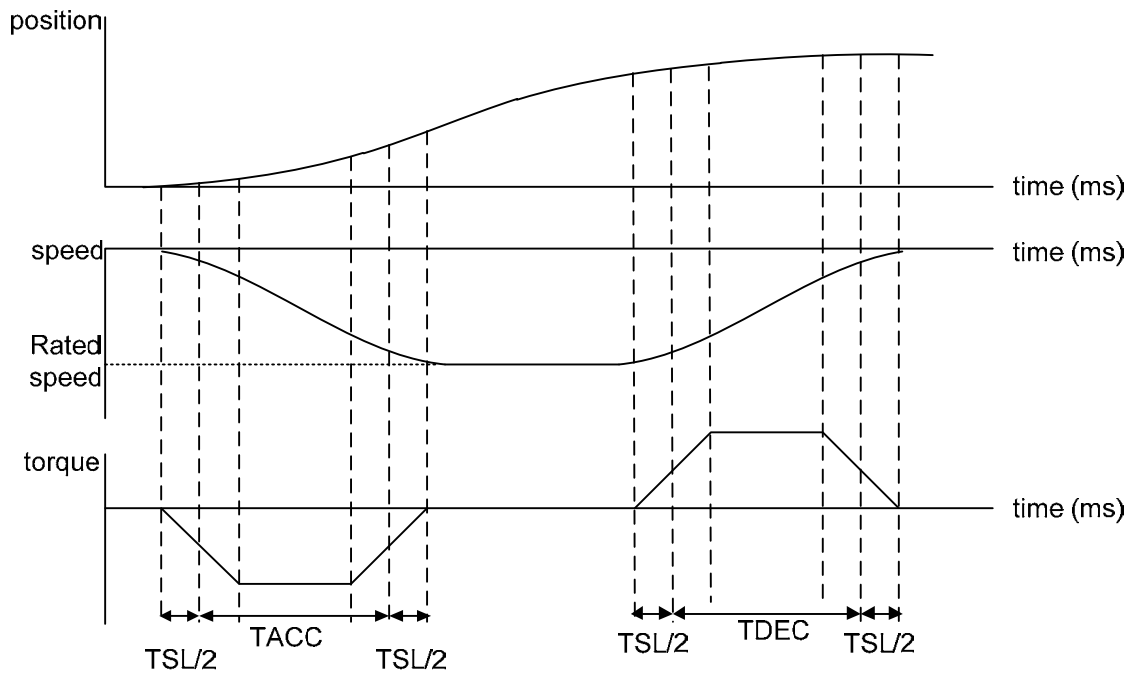


### 6.2.4 S-curve Filter for Position Control

The S-curve filter is for the position smoothing of motion command. Using S-curve filter can run the servo motor more smoothly in response to a sudden position command. Since the speed and acceleration curve are both continuous and the time for the servo motor to accelerate is short, using S-curve filter not only can improve the performance when servo motor accelerate or decelerate but also can make motor to operate more smoothly (from mechanical view). When the load is change, the motor usually run not smoothly when starts to run and stop due to the friction and inertia change. At this moment, users can increase Accel/Decel S-curve constant (TSL), Accel time constant (TACC) and Decel time constant (TDEC) to improve the performance. Because the speed and angle acceleration are continuous when position command is changed to pulse signal input, so it is not needed to use S-curve filter.



Position and speed S-curve and time setting  
(acceleration for position command)



Position and speed S-curve and time setting (deceleration for position command)

Relevant Parameters:

<b>P1-34</b>	<b>TACC</b>	<b>Acceleration Time</b>		<b>Address: 0144H 0145H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.3
	Default:	200		
	Control Mode:	S		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to determine the acceleration time to accelerate from 0 to its rated motor speed. The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Please note:

1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-34 is limited to 20000 automatically.



<b>P1-35</b>	<b>TDEC</b>	<b>Deceleration Time</b>		<b>Address: 0146H 0147H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.3
	Default:	200		
	Control Mode:	S		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to determine the deceleration time to decelerate from its rated motor speed to 0. The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Please note:

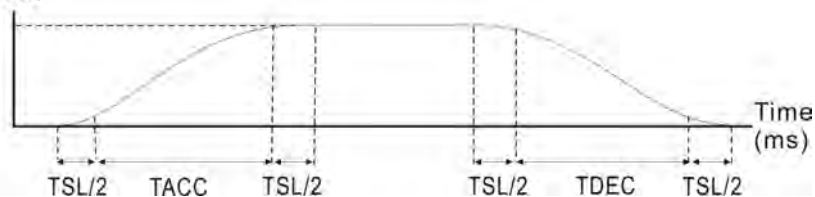
1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-35 is limited to 20000 automatically.

<b>P1-36</b>	<b>TSL</b>	<b>Accel /Decel S-curve</b>		<b>Address: 0148H 0149H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.3
	Default:	0		
	Control Mode:	S, PR		
	Unit:	ms		
	Range:	0 ~ 65500 (0: Disabled)		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to make the motor run more smoothly when startup and windup. Using this parameter can improve the motor running stability.

Speed



TACC: P1-34, Acceleration time

TDEC: P1-35, Deceleration time

TSL: P1-36, Accel /Decel S-curve

Total acceleration time = TACC + TSL

Total deceleration time = TDEC + TSL

The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Tracking error compensation function:

This function is available in firmware version V1.036 sub00 and later models only.

Function	P1-36 = 0	P1-36 = 1	P1-36 > 1
Accel /Decel S-curve	Disabled	Disabled	Enabled
Track error compensation	Disabled	Enabled	Determined by P2-68 X settings

Please note:

1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-36 is limited to 10000 automatically.

## 6.2.5 Electronic Gear Ratio

Relevant parameters:

P1-44 ▲	GR1	Electronic Gear Ratio (1st Numerator) (N1)	Address: 0158H 0159H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.5
Default:	128		
Control Mode:	PT, PR		
Unit:	pulse		
Range:	1 ~ (2 <sup>29</sup> -1)		
Data Size:	32-bit		
Display Format:	Decimal		

Settings:

This parameter is used to set the numerator of the electronic gear ratio. The denominator of the electronic gear ratio is set by P1-45. P2-60 ~ P2-62 are used to set the additional numberators.

1) Please note:

1. In PT mode, the setting value of P1-44 can be changed only when the servo drive is enabled (Servo On).
2. In PR mode, the setting value of P1-44 can be changed only when the servo drive is disabled (Servo Off).

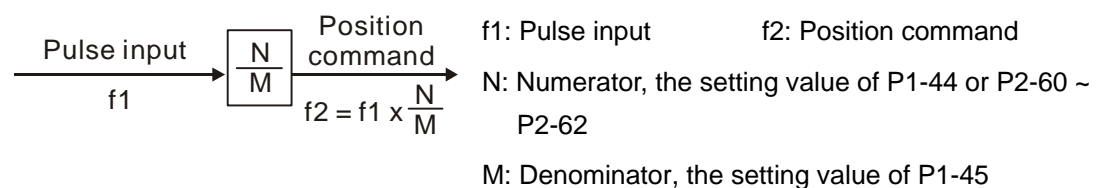
P1-45	GR2	Electronic Gear Ratio (Denominator) (M)	Address: 015AH 015BH
	Operation Interface:	Keypad/Software	Communication
	Default:	10	
	Control Mode:	PT, PR	
	Unit:	pulse	
	Range:	1 ~ (2 <sup>31</sup> -1)	
	Data Size:	32-bit	
	Display Format:	Decimal	

#### Settings:

This parameter is used to set the denominator of the electronic gear ratio. The numerator of the electronic gear ratio is set by P1-44. P2-60 ~ P2-62 are used to set the additional numerators.

As the wrong setting may cause motor to run chaotically (out of control) and it may lead to personnel injury, therefore, ensure to observe the following rule when setting P1-44, P1-45.

The electronic gear ratio setting (Please also see P1-44, P2-60 ~ P2-62):



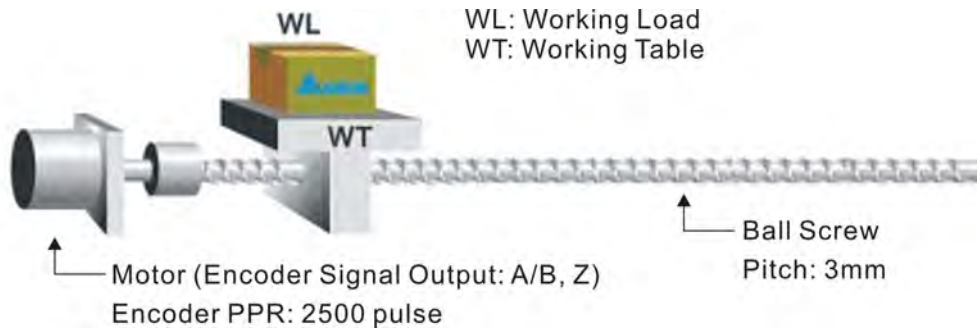
The electronic gear ratio setting range must be within:  $1/50 < N/M < 25600$ .

2) Please note:

1. In PT and PR mode, the setting value of P1-45 can not be changed when the servo drive is enabled (Servo On).

The electronic gear function provides easy travel distance ratio change. However, the over high electronic gear ratio will command the motor to move not smoothly. At this time, the users can use low-pass filter parameter to improve this kind of situation. For example, assume that the electronic gear ratio is equal to 1 and the encoder pulse per revolution is 10000ppr, if the electronic gear ratio is changed to 0.5, then the motor will rotate one pulse when the command from external controller is two pulses.

For example, after the proper electronic gear ratio is set, the reference travel distance is 1  $\mu\text{m}$ /pulse, the machinery will become easier to be used.



	Electronic Gear Ratio	Corresponding travel distance per pulse
When the electronic gear ratio is not used	$= \frac{1}{1}$	$= \frac{3 \times 1000}{4 \times 2500} = \frac{3000}{10000} \mu\text{m}$
When the electronic gear ratio is used	$= \frac{10000}{3000}$	$= 1 \mu\text{m}$

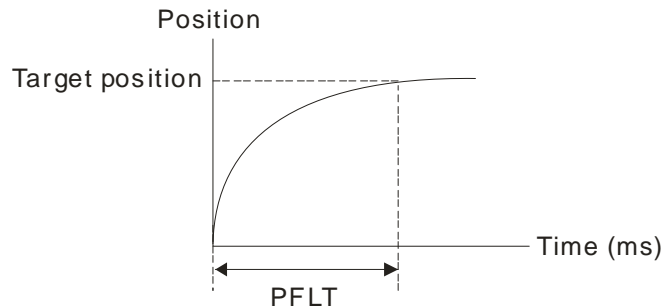
### 6.2.6 Low-pass Filter

Relevant parameters:

P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	Address: 0110H 0111H
	Operation Interface:	Keypad/Software	Communication
	Default:	0	
	Control Mode:	PT, PR	
	Unit:	10ms	
	Range:	0 ~ 1000	
	Data Size:	16-bit	
	Display Format:	Decimal	

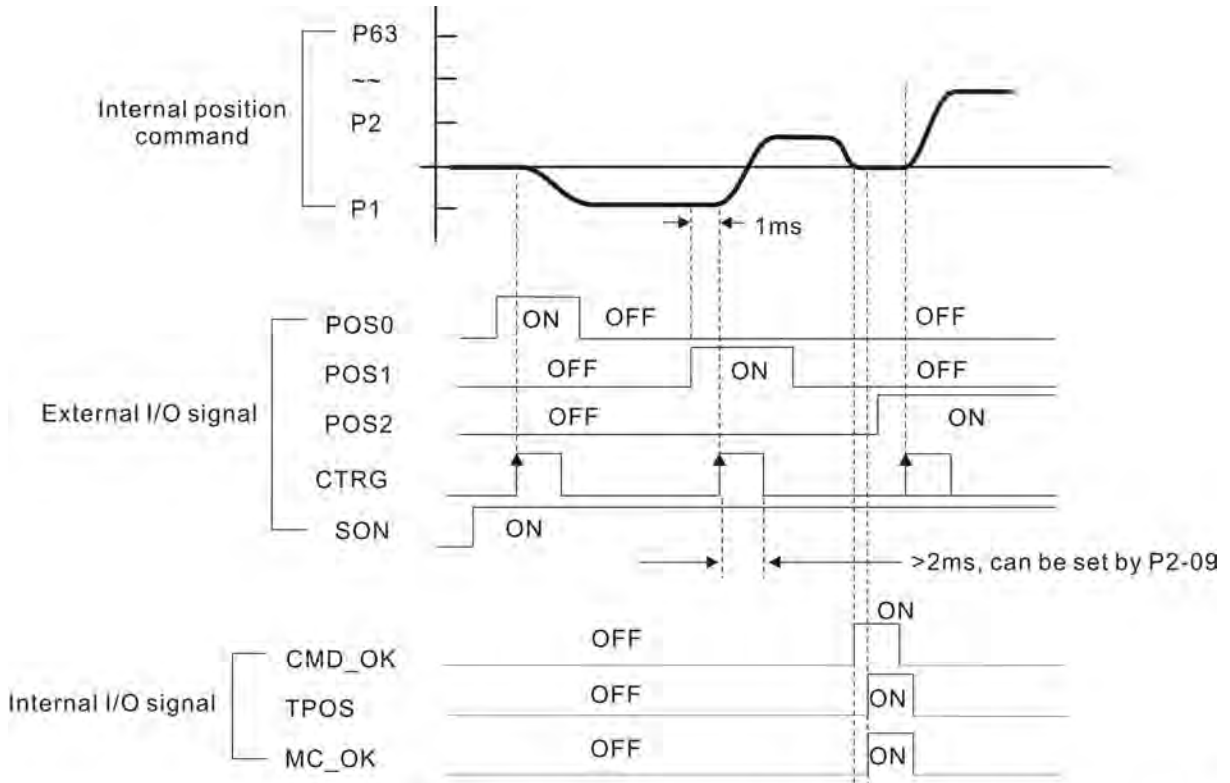
Settings: 0: Disabled

For example: 11=110 msec



### 6.2.7 Timing Chart of Position (PR) Control Mode

In PR mode, position command source is DI signal from CN1, i.e. selected by POS0~POS5 and CTRG. Please refer to 6-2-2 to see the relationship between DI signals and parameters. The following figure is shown the timing chart of PR mode:



**CMD\_OK :** CMD\_OK is activated when the servo drive has detected that Pr command has been completed

**TPOS :** TPOS will be activated when the drive detects that the position of the motor is in a -P1-54 to +P1-54 band of the target position.

**MC\_OK :** MC\_OK is activated when CMD\_OK and TPOS are both ON.

### 6.2.8 Position Loop Gain Adjustment

Before performing position control (setting position control block diagram), the users should complete the speed control setting by using Manual mode (parameter P-32) since the position loop contains speed loop. Then, adjust the Proportional Position Loop Gain, KPP (parameter P2-00) and Position Feed Forward Gain, PFG (parameter P2-02). Or use Auto mode to adjust the gain of speed and position control block diagram automatically.

- 1) Proportional Position Loop Gain: To increase this gain can enhance the position loop responsiveness.
- 2) Position Feed Forward Gain: To increase this gain can reduce the position track error during operation.

The position loop responsiveness cannot exceed the speed loop responsiveness, and it is recommended that the speed loop responsiveness should be at least four times faster than the position loop responsiveness. This also means that the setting value of Proportional Speed Loop Gain, KVP should be at least four times faster than Proportional Position Loop Gain, KPP.

The equation is shown as follows:

$$f_p \leq \frac{f_v}{4}, \text{ } f_v : \text{Speed Loop Responsiveness (Hz)}, \text{ } f_p : \text{Position Loop Responsiveness (Hz)}$$

$$KPP = 2 \times \pi \times f_p.$$

For example, the desired position loop responsiveness is equal to 20 Hz.

Then,  $KPP = 2 \times \pi \times 20 = 125 \text{ rad/s}$ .

Relevant parameters:

P2-00	KPP	Proportional Position Loop Gain	Address: 0200H 0201H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.2.8
	Default:	35	
	Control Mode:	PT, PR	
	Unit:	rad/s	
	Range:	0 ~ 2047	
	Data Size:	16-bit	
	Display Format:	Decimal	

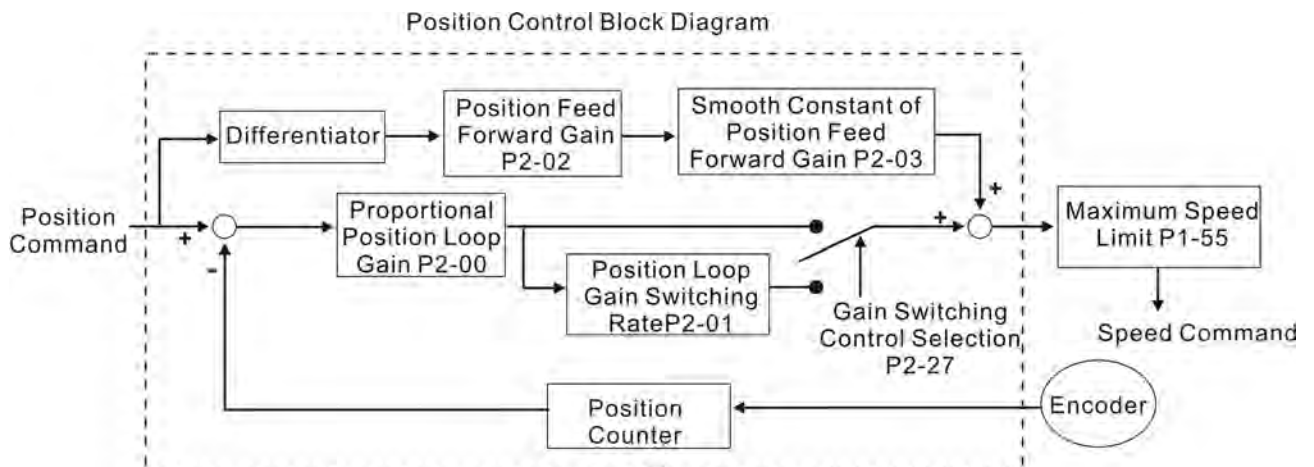
Settings:

This parameter is used to set the position loop gain. It can increase stiffness, expedite position loop response and reduce position error. However, if the setting value is over high, it may generate vibration or noise.

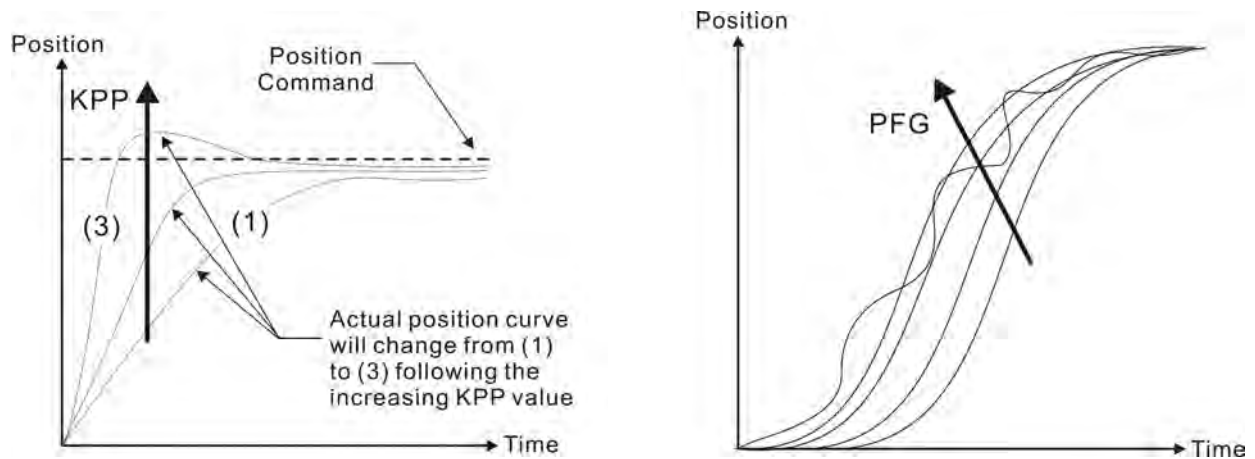
P2-02	PFG	Position Feed Forward Gain	Address: 0204H 0205H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.2.8
	Default:	50	
	Control Mode:	PT, PR	
	Unit:	%	
	Range:	0 ~ 100	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to set the feed forward gain when executing position control command. When using position smooth command, increase gain can improve position track deviation. When not using position smooth command, decrease gain can improve the resonance condition of mechanical system.



When the value of Proportional Position Loop Gain, KPP is too great, the position loop responsiveness will be increased and it will result in small phase margin. If this happens, the rotor of motor will oscillate. At this time, the users have to decrease the value of KPP until the rotor of motor stop oscillating. When there is an external torque command interrupted, over low KPP value will let the motor cannot overcome the external strength and fail to meet the requirement of reasonable position track error demand. Adjust feed forward gain, PFG (P2-02) to efficiently reduce the dynamic position track error.



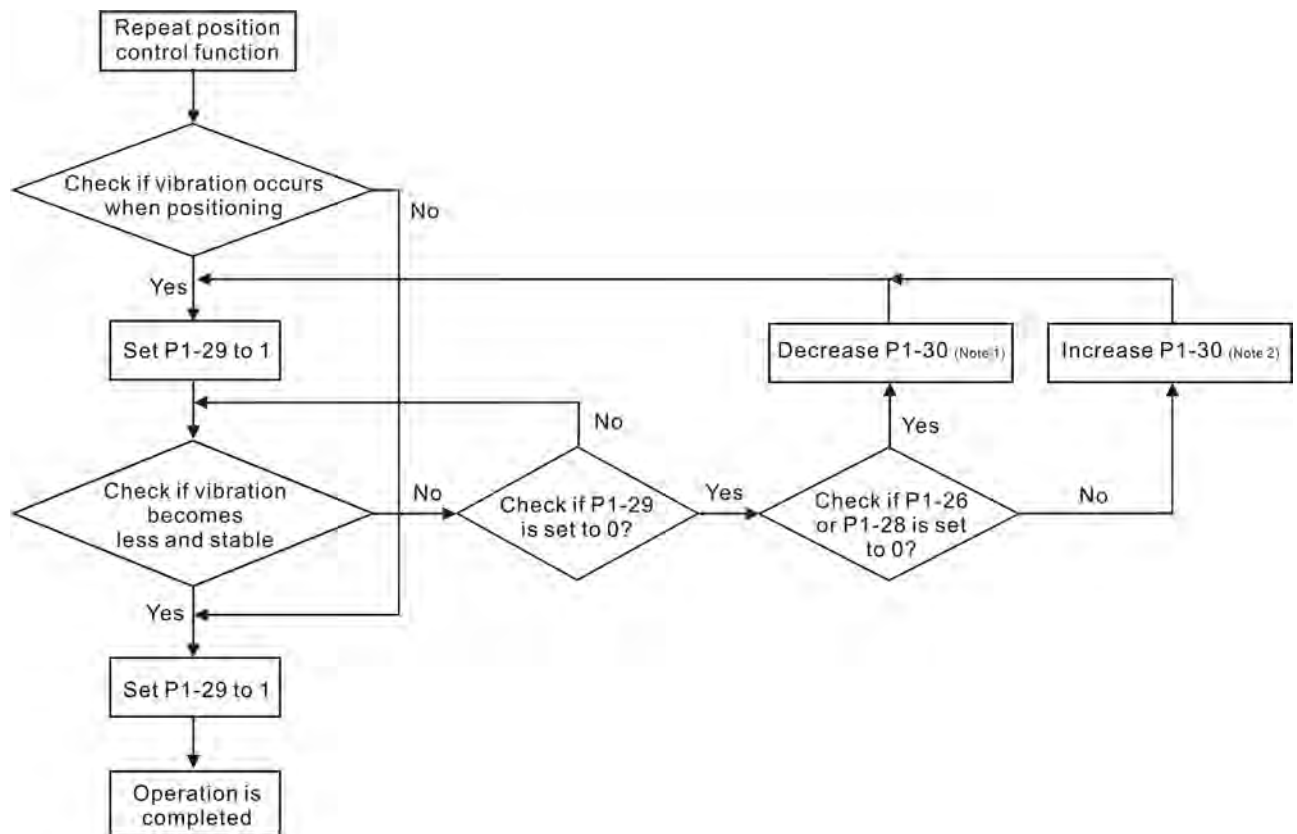
### 6.2.9 Low-frequency Vibration Suppression

If the stiffness of the mechanical system is not sufficient, after the positioning command has completed, continuous vibration of the mechanical system may occur still even when the motor has almost stopped. At this time, using low-frequency vibration suppression function can suppress the low-frequency vibration of mechanical system. The range of frequency setting is from 1.0 to 100.0Hz. Besides, two modes (Manual/Auto) of low-frequency vibration suppression function are available for the users to select.

#### ■ Auto Mode

If the users know the point where the low-frequency occurs, we recommend the users can use this mode to find the low-frequency of the mechanical vibration automatically. When P1-29 is set to 1, the system will disable the filter function and find the vibration frequency of low-frequency automatically. After the detected frequency becomes fixed and stable, the system will set P1-29 to 0, save the first measured low-frequency value automatically into P1-25 and set P1-26 to 1; then save the second measured low-frequency value automatically into P1-27 and set P1-28 to 1. If any low-frequency vibration occurs after P1-29 is set to 0 automatically, please examine if the function of P1-26 or P1-28 is enabled or not. When the setting value of P1-26 or P1-28 is 0, it indicates that there is no frequency is detected. Please decrease the setting value of P1-30 (Low-frequency Vibration Detection Level) and set P1-29 to 1 to find the low-frequency again. Please pay close attention on the setting value of P1-30 as if the setting value of P1-30 is too low, it is easy to regard the interference as the low-frequency and results in erroneous measurement.





Please note:

1. When P1-26 and P1-28 are both set to 0, it indicates that the system could not find the frequency. Please check the setting value of P1-30 because when the setting value of P1-30 is too high, it may causes that the frequency becomes difficult to be found.
2. When P1-26 and P1-28 are both set to a non-zero value, if the vibration condition can not be improved, please check the setting value of P1-30 as the low setting value of P1-30 may result in erroneous measurement. The system may regard the interference as a low-frequency.
3. When the vibration still exists and can not be suppressed after using auto low-frequency vibration suppression function, if the users know the vibration frequency, please set P1-25 and P1-27 manually to improve the vibration condition.

Relevant parameters:

<b>P1-29</b>	<b>AVSM</b>	<b>Auto Low-frequency Vibration Suppression Mode Selection</b>	<b>Address: 013AH 013BH</b>
Operation Interface:		Keypad/Software	Communication
Default:		0	
Control Mode:		PT, PR	
Unit:		-	
Range:		0 ~ 1	
			Related Section: Section 6.2.9

Data Size:	16-bit
Display Format:	Decimal

Settings:

0: Normal mode (Disable Auto Low-frequency Vibration Suppression Mode).

1: Auto mode (Enable Auto Low-frequency Vibration Suppression Mode).

Explanation:

If P1-29 is set to 0, the setting of low-frequency vibration suppression is fixed and will not change automatically.

If P1-29 is set to 1, when there is no low-frequency vibration or the low-frequency vibration becomes less and stable, the system will set P1-29 to 0, save the measured low-frequency value automatically and memorize it in P1-25.

<b>P1-30</b>	<b>VCL</b>	<b>Low-frequency Vibration Detection Level</b>		<b>Address: 013CH 013DH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.9
	Default:	500		
	Control Mode:	PT, PR		
	Unit:	pulse		
	Range:	0 ~ 8000		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

When P1-29 is set to 1, the system will find this detection level automatically. If the setting value of P1-30 is too low, the detection of frequency will become sensitive and result in erroneous measurement. If the setting value of P1-30 is too high, although the probability of erroneous measurement will decrease, the frequency will become difficult to be found especially when the vibration of mechanical system is less.

■ **Manual Mode**

There are two groups of low-frequency vibration suppression parameters. The first group is P1-25 and P1-26 and the second group is P1-27 and P1-28. Using these two groups of parameters can improve the vibration condition of two different low frequencies. P1-25 and P1-26 are used to set the occurred vibration frequency and P1-27 and P1-28 are used to set the frequency response after filter function is used. When the setting values of P1-26 and P1-28 are higher, the performance of frequency response will be better. However, if the setting value is over high, it may affect the motor operation. The default setting of P1-26 and P1-28 are both 0, and it indicates that the low-frequency vibration suppression function is disabled.

Relevant parameters:

P1-25	VSF1	Low-frequency Vibration Suppression (1)	Address: 0132H 0133H
Operation Interface:		Keypad/Software	Communication
Default:		0	
Control Mode:		PT, PR	
Unit:		0.1Hz	
Range:		10 ~ 100	
Data Size:		16-bit	
Display Format:		Decimal	
Input Value Example:		150 = 15Hz	
Related Section: Section 6.2.9			

Settings:

This parameter is used to set the first group of the low-frequency of mechanical system. It can be used to suppress the low-frequency vibration of mechanical system. If P1-26 is set to 0, this parameter is disabled.

P1-26	VSG1	Low-frequency Vibration Suppression Gain (1)	Address: 0134H 0135H
Operation Interface:		Keypad/Software	Communication
Default:		0	
Control Mode:		PT, PR	
Unit:		-	
Range:		0 ~ 9 (0: Disable the function of P1-25)	
Data Size:		16-bit	
Display Format:		Decimal	
Related Section: Section 6.2.9			

Settings:

This parameter is used to set the vibration suppression gain for P1-25. When the setting value is higher, the position response is quicker. However, if the setting value is over high, it may affect the normal operation of servo motor. It is recommended to set P1-26 as 1.

P1-27	VSF2	Low-frequency Vibration Suppression (2)	Address: 0136H 0137H
Operation Interface:		Keypad/Software	Communication
Default:		1000	
Control Mode:		PT, PR	
Unit:		0.1Hz	
Related Section: Section 6.2.9			

Range:	10 ~ 1000
Data Size:	16-bit
Display Format:	Decimal
Input Value Example:	150 = 15Hz

## Settings:

This parameter is used to set the second group of the low-frequency of mechanical system. It can be used to suppress the low-frequency vibration of mechanical system. If P1-28 is set to 0, this parameter is disabled.

P1-28	VSG2	Low-frequency Vibration Suppression Gain (2)	Address: 0138H 0139H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.9
Default:	0		
Control Mode:	PT, PR		
Unit:	-		
Range:	0 ~ 9 (0: Disable the function of P1-27)		
Data Size:	16-bit		
Display Format:	Decimal		

## Settings:

This parameter is used to set the vibration suppression gain for P1-27. When the setting value is higher, the position response is quicker. However, if the setting value is over high, it may affect the normal operation of servo motor. It is recommended to set P1-28 as 1.

## Please note:

1. After the low-frequency vibration is suppressed, the changes of the response may become excessive. Therefore, please ensure that the machine is able to stop any time and ensure the safety of personnel working with the machine when execute low-frequency vibration suppression function.
2. The low-frequency vibration suppression function can be enabled only in position control mode (PT, PR or PR-PT mode).
3. When the users use resonance suppression function, the resonance condition can be improved immediately after the correct resonance frequency is found. However, when the users use low-frequency vibration suppression function, the vibration of the mechanical system will not be eliminated immediately. The vibration condition is improved gradually after the correct frequency is found. This is because the low-frequency vibration suppression function is not effective for the vibration caused by external force and the vibration occurred before using suppression function.
4. After the low-frequency vibration suppression function is enabled, it will certainly affect the original response performance. When the value of the low-frequency is lower, the effect

upon the response performance is greater. At this time, the users can adjust the setting value of P1-26 to increase the position response. But, please do not set P1-26 to a higher value. If the setting value of P1-26 is too high, it will affect the motor operation.

5. In order to avoid that the vibration frequency may not easily to be found when the commanding time is too fast in Auto mode, we recommend the users can set a longer command delay time. The command can be given after the vibration frequency is found.

## 6.3 Speed Control Mode

The speed control mode (S or Sz) is usually used on the applications of precision speed control, such as CNC machine, etc. ASDA-A2 series servo drives support two kinds of command sources in speed control mode. One is external analog signal and the other is internal parameter. The external analog signal is from external voltage input and it can control the speed of servo motor. There are two usage of internal parameter, one is set different speed command in three speed control parameters before operation and then using SPD0 and SPD1 of CN1 DI signal perform switching. The other usage is using serial communication to change the setting value of parameter.

Beside, in order to make the speed command switch more smoothly, ASDA-A2 series servo drives also provide complete S-curve profile for speed control mode. For the closed-loop speed control, ASDA-A2 series servo drives provide gain adjustment function and an integrated PI or PDFF controller. Besides, two modes of tuning technology (Manual/Auto) are also provided for the users to select (parameter P2-32).

**There are two turning modes for gain adjustment: Manual and Auto modes.**

- **Manual Mode:** User-defined loop gain adjustment. When using this mode, all auto and auxiliary function will be disabled.
- **Auto Mode:** Continuous adjustment of loop gains according to measured inertia, with ten levels of system bandwidth. The parameter set by user is default value.

### 6.3.1 Command Source of Speed Control Mode

Speed command Sources:

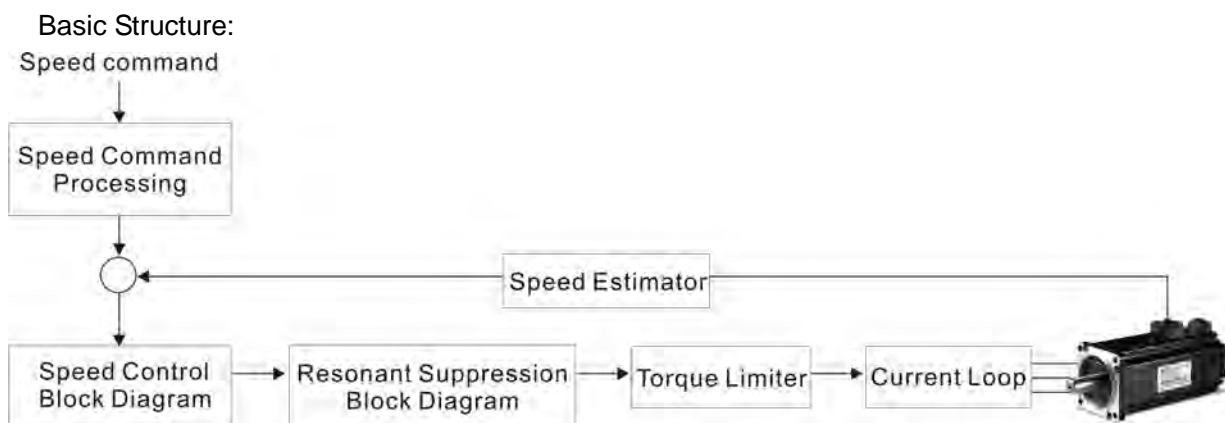
- 1) External analog signal: External analog voltage input, -10V to +10V
- 2) Internal parameter: P1-09 to P1-11

Speed Command	CN1 DI signal		Command Source		Content	Range
	SPD1	SPD0				
S1	0	0	Mode	S	Voltage between V-REF-GND	-10 V ~ +10V
				Sz	N/A	Speed command is 0
S2	0	1	Internal parameter		P1-09	-60000 ~ +60000 r/min
S3	1	0			P1-10	
S4	1	1			P1-11	

- State of SPD0~1: 0: indicates OFF (Normally Open); 1: indicates ON (Normally Closed)
- When SPD0 and SPD1 are both = 0 (OFF), if the control mode of operation is Sz, then the speed command is 0. Therefore, if the users do not use analog voltage as speed command, the users can choose Sz mode and avoid the zero point drift problem of analog voltage signal. If the speed control mode is S mode, then the command is the analog voltage between V-REF and GND. The setting range of the input voltage is from -10V to +10V and the corresponding motor speed is adjustable (Please see parameter P1-40).
- When at least one of SPD0 and SPD1 is not 0 (OFF), the speed command is internal parameter (P1-09 to P1-11). The command is valid (enabled) after either SPD0 or SPD1 is changed.
- The range of internal parameters is within -60000 ~ +60000 r/min. Setting value = Range x Unit (0.1 r/min). For example, if P1-09 is set to +30000, the setting value = +30000 x 0.1 r/min = +3000 r/min.

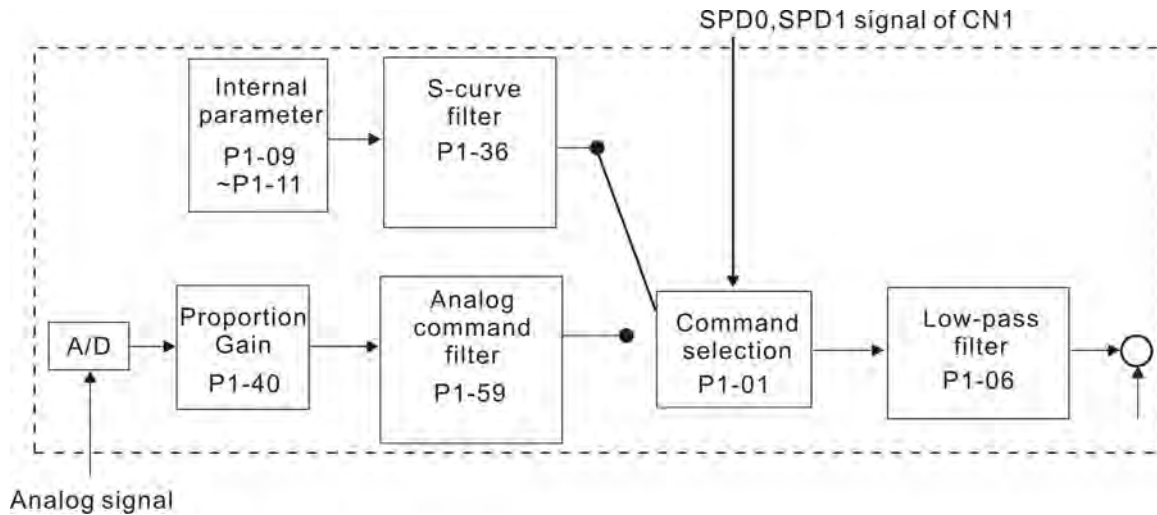
The speed command that is described in this section not only can be taken as speed command in speed control mode (S or Sz mode) but also can be the speed limit input command in torque control mode (T or Tz mode).

### 6.3.2 Structure of Speed Control Mode



In the figure above, the speed command processing is used to select the command source of speed control according to chapter 6.3.1, including proportional gain (P1-40) and S-curve filter smoothing strategy of speed control. The speed control block diagram is used to manage the gain parameters of the servo drive and calculate the current input provided to motor instantaneously. The resonance suppression block diagram is used to suppress the resonance of mechanical system.

The function and structure of speed command processing is shown as the figure below:



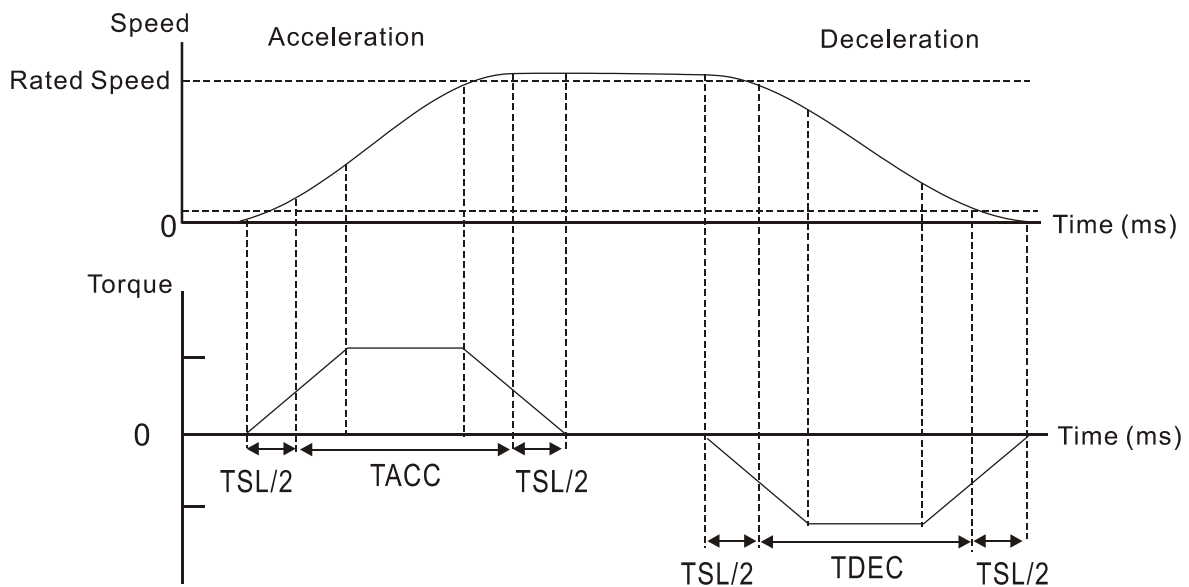
The command source is selected according to the state of SPD0, SPD1 and parameter P1-01 (S or Sz). Whenever the command signal needs to be more smoothly, we recommend the users to use S-curve and low-pass filter.

### 6.3.3 Smoothing Strategy of Speed Control Mode

#### S-curve Filter

The S-curve filter is a speed smoothing command which provides 3 steps accel / decel S-curve to smooth the speed command change of the motor during acceleration and deceleration. Using S-curve filter can let the servo motor run more smoothly in response to a sudden speed command change. Since the speed and acceleration curve are both continuous, in order to avoid the mechanical resonance and noise may occur due to a sudden speed command (differentiation of acceleration), using S-curve filter not only can improve the performance when servo motor accelerate or decelerate but also can make the motor run more smoothly. S-curve filter parameters include P1-34 Acceleration Time (TACC), P1-35 Deceleration Time (TDEC) and Accel /Decel S-curve (TSL), and the users can use these three parameters to improve the motor performance during acceleration, deceleration and operation. ASDA-A2 series servo drives also support the time calculation of completing speed command. T (ms) is the operation (running) time. S (r/min) is absolute speed command, i.e. the absolute value (the result) after starting speed subtracts the final speed.





S-curve characteristics and Time relationship

Relevant parameters:

<b>P1-34</b>	<b>TACC</b>	<b>Acceleration Time</b>	<b>Address: 0144H 0145H</b>
Operation Interface:		Keypad/Software	Communication
Default:		200	
Control Mode:		S	
Unit:		ms	
Range:		1 ~ 65500	
Data Size:		16-bit	
Display Format:		Decimal	

Settings:

This parameter is used to determine the acceleration time to accelerate from 0 to its rated motor speed. The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Please note:

1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-34 is limited to 20000 automatically.

<b>P1-35</b>	<b>TDEC</b>	<b>Deceleration Time</b>		<b>Address: 0146H 0147H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.3
	Default:	200		
	Control Mode:	S		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
Display Format:	Decimal			

**Settings:**

This parameter is used to determine the deceleration time to decelerate from its rated motor speed to 0. The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

**Please note:**

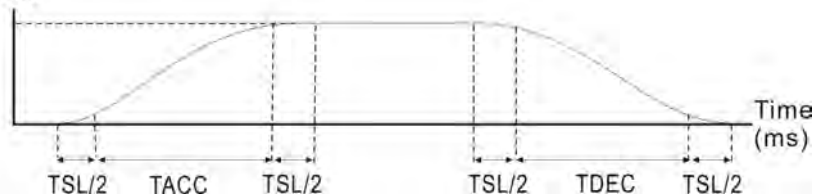
1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-35 is limited to 20000 automatically.

<b>P1-36</b>	<b>TSL</b>	<b>Accel /Decel S-curve</b>		<b>Address: 0148H 0149H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.3
	Default:	0		
	Control Mode:	S, PR		
	Unit:	ms		
	Range:	0 ~ 65500 (0: Disabled)		
	Data Size:	16-bit		
Display Format:	Decimal			

**Settings:**

This parameter is used to make the motor run more smoothly when startup and windup. Using this parameter can improve the motor running stability.

Speed



TACC: P1-34, Acceleration time

TDEC: P1-35, Deceleration time

TSL: P1-36, Accel /Decel S-curve

Total acceleration time = TACC + TSL

Total deceleration time = TDEC + TSL

The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Tracking error compensation function:

This function is available in firmware version V1.036 sub00 and later models only.

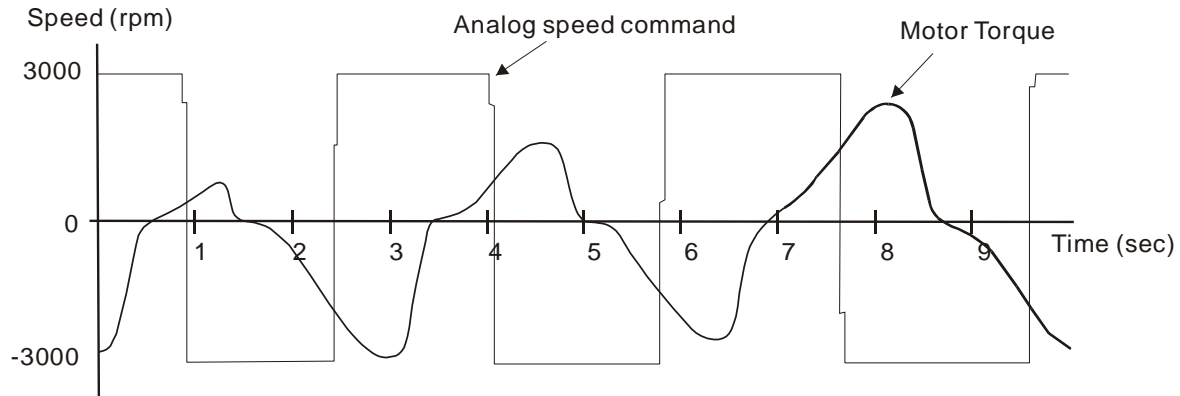
Function	P1-36 = 0	P1-36 = 1	P1-36 > 1
Accel /Decel S-curve	Disabled	Disabled	Enabled
Track error compensation	Disabled	Enabled	Determined by P2-68 X settings

Please note:

1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-36 is limited to 10000 automatically.

### Analog Speed Command S-curve Filter

ASDA-A2 series servo drives also provide Analog Speed Command S-curve Filter for the smoothing in response to a sudden analog input signal.



The analog speed command S-curve filter is for the smoothing of analog input signal and its function is the same as the S-curve filter. The speed and acceleration curve of analog speed command S-curve filter are both continuous. The above figure shows the curve of analog speed command S-curve filter and the users can see the ramp of speed command is different during acceleration and deceleration. Also, the users can see the difference of input command tracking and can adjust time setting by using parameter P1-34, P1-35, P1-36 to improve the actual motor performance according to actual condition.

### Analog Speed Command Low-pass Filter

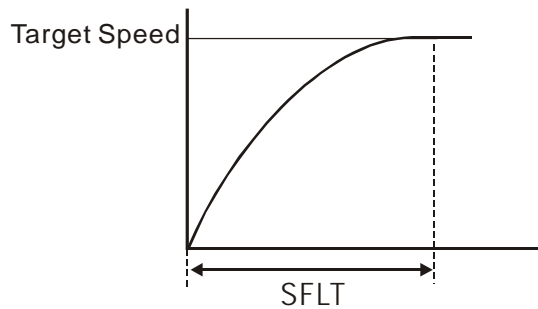
Analog Speed Command Low-pass Filter is used to eliminate high frequency response and electrical interference from an analog speed command and it is also with

smoothing function.

Relevant parameters:

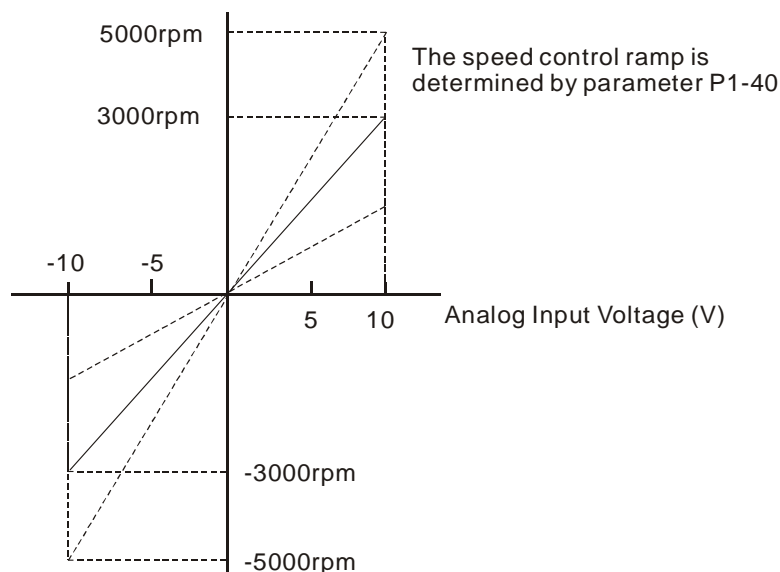
<b>P1-06</b>	<b>SFLT</b>	<b>Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)</b>	<b>Address: 010CH 010DH</b>
Operation Interface:		Keypad/Software	Communication
Default:		0	
Control Mode:		S	
Unit:		ms	
Range:		0 ~ 1000 (0: Disabled)	
Data Size:		16-bit	
Display Format:		Decimal	

Settings: 0: Disabled



### 6.3.4 Analog Speed Input Scaling

The analog voltage between **V\_REF** and **GND** determines the motor speed command. Using with parameter P1-40 (Max. Analog Speed Command) can adjust the speed control ramp and its range.



Relevant parameters:

<b>P1-40 ▲</b>	<b>VCM</b>	<b>Max. Analog Speed Command or Limit 1</b>	<b>Address: 0150H 0151H</b>
Operation Interface:		Keypad/Software	Communication
Default:		rated speed of connected model	
Control Mode:		S, T	
Unit:		r/min	
Range:		0 ~ 50000	
Data Size:		16-bit	
Display Format:		Decimal	

Settings:

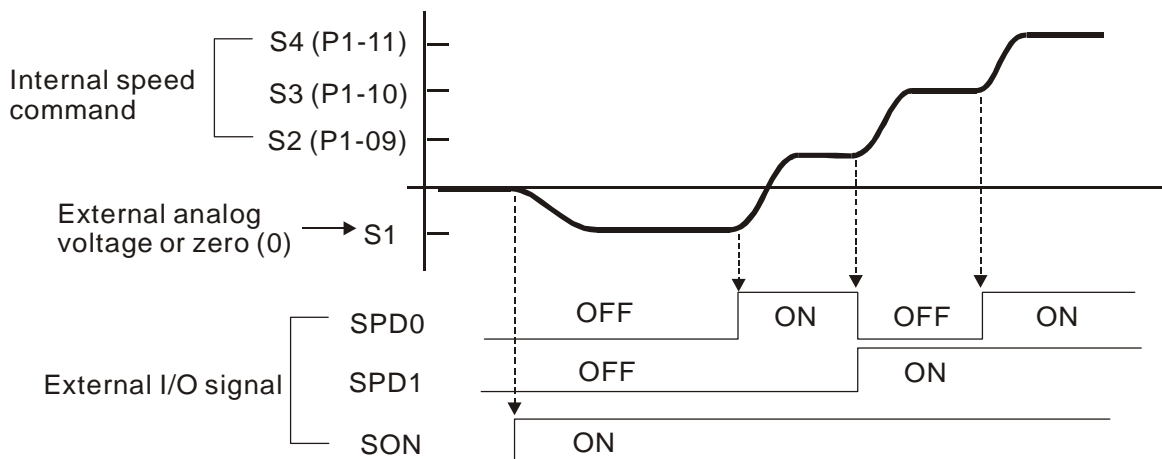
In **Speed mode**, this parameter is used to set the maximum analog speed command based on the maximum input voltage (10V).

In **Torque mode**, this parameter is used to set the maximum analog speed limit based on the maximum input voltage (10V).

For example, in speed mode, if P1-40 is set to 3000 and the input voltage is 10V, it indicates that the speed command is 3000r/min. If P1-40 is set to 3000, but the input voltage is changed to 5V, then the speed command is changed to 1500r/min.

$$\text{Speed Command / Limit} = \text{Input Voltage Value} \times \text{Setting value of P1-40} / 10$$

### 6.3.5 Timing Chart of Speed Control Mode

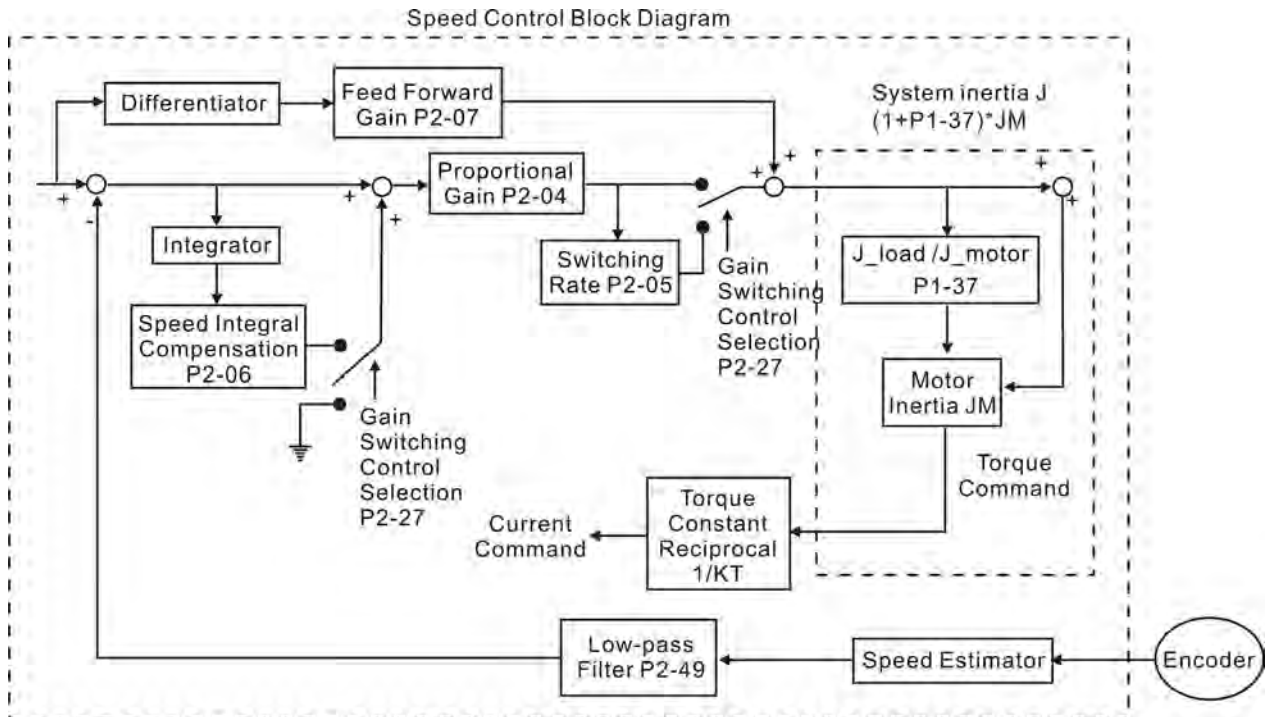


**NOTE**

- 1) OFF indicates normally open and ON indicates normally closed.
- 2) When speed control mode is Sz, the speed command S1=0; when speed control mode is S, the speed command S1 is external analog voltage input (Please refer to P1-01).
- 3) After Servo ON, the users can select command according to the state of SPD0~1.

### 6.3.6 Speed Loop Gain Adjustment

The function and structure of **speed control mode** is shown as the figure below:



There are two tuning modes of gain adjustment: Manual and Auto modes. The gain of ASDA-A2 series servo drives can be adjusted by using any one of two tuning modes.

- **Manual Mode:** User-defined loop gain adjustment. When using this mode, all auto and auxiliary function will be disabled.
- **Auto Mode:** Continuous adjustment of loop gains according to measured inertia, with ten levels of system bandwidth. The parameter set by user is default value.

The mode of gain adjustment can be selected by parameter P2-32:

Relevant Parameter:

P2-32 ▲	AUT2	Tuning Mode Selection	Address: 0240H 0241H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 5.6, Section 6.3.6
Default:	0		
Control Mode:	ALL		
Unit:	N/A		
Range:	0 ~ 2		
Data Size:	16-bit		
Display Format:	Hexadecimal		

Settings:

0: Manual mode

1: Auto Mode [Continuous adjustment]

2: Semi-Auto Mode [Non-continuous adjustment]

Explanation of manual mode:

1. When P2-32 is set to mode#0, the setting value of P2-00, P2-02, P2-04, P2-06, P2-07, P2-25 and P2-26 can be user-defined. When switching mode #1 or #2 to #0, the setting value of P2-00, P2-02, P2-04, P2-06, P2-07, P2-25 and P2-26 will change to the value that measured in #1 auto-tuning mode or #2 semi-auto tuning mode.

Explanation of auto-tuning mode:

The servo drive will continuously estimate the system inertia, save the measured load inertia value automatically and memorized in P1-37 every 30 minutes by referring to the frequency response settings of P2-31.

1. When switching mode #1 or #2 to #0, the servo drive will continuously estimate the system inertia, save the measured load inertia value automatically and memorized in P1-37. Then, set the corresponding parameters according to this measured load inertia value.
2. When switching mode#0 or #1 to #2, enter the appropriate load inertia value in P1-37.
3. When switching mode#1 to #0, the setting value of P2-00, P2-04 and P2-06 will change to the value that measured in #1 auto-tuning mode.

Explanation of semi-auto tuning mode:

1. When switching mode #2 to #0, the setting value of P2-00, P2-04, P2-06, P2-25 and P2-26 will change to the value that measured in #1 auto-tuning mode.
2. After the system inertia becomes stable (The display of P2-33 will show 1), it will stop estimating the system inertia, save the measured load inertia value automatically, and memorized in P1-37. However, when P2-32 is set to mode#1 or #2, the servo drive will continuously perform the adjustment for a period of time.
3. When the value of the system inertia becomes over high, the display of P2-33 will show 0 and the servo drive will start to adjust the load inertia value continuously.

## Manual Mode

When Tuning Mode Settings of P2-32 is set to 0, the users can define the proportional speed loop gain (P2-04), speed integral gain (P2-06) feed forward gain (P2-07) and ratio of load inertia to servo motor Inertia (1-37). Please refer to the following description:

- Proportional gain: Adjust this gain can increase the position loop responsiveness.
- Integral gain: Adjust this gain can enhance the low-frequency stiffness of speed loop and eliminate the steady error. Also, reduce the value of phase margin. Over high integral gain will result in the unstable servo system.
- Feed forward gain: Adjust this gain can decrease the phase delay error

Relevant parameters:

P2-04	KVP	Proportional Speed Loop Gain	Address: 0208H 0209H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.3.6
	Default:	500	
	Control Mode:	ALL	
	Unit:	rad/s	
	Range:	0 ~ 8191	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to set the speed loop gain. When the value of proportional speed loop gain is increased, it can expedite speed loop response. However, if the setting value is over high, it may generate vibration or noise.

P2-06	KVI	Speed Integral Compensation	Address: 020CH 020DH
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.3.6
	Default:	100	
	Control Mode:	ALL	
	Unit:	rad/s	
	Range:	0 ~ 1023	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to set the integral time of speed loop. When the value of speed integral compensation is increased, it can improve the speed response ability and decrease the speed control deviation. However, if the setting value is over high, it may generate vibration or noise.

P2-07	KVF	Speed Feed Forward Gain	Address: 020EH 020FH
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.3.6
	Default:	0	
	Control Mode:	ALL	
	Unit:	%	
	Range:	0 ~ 100	
	Data Size:	16-bit	



Display: Decimal  
 Format: Decimal

**Settings:**

This parameter is used to set the feed forward gain when executing speed control command.

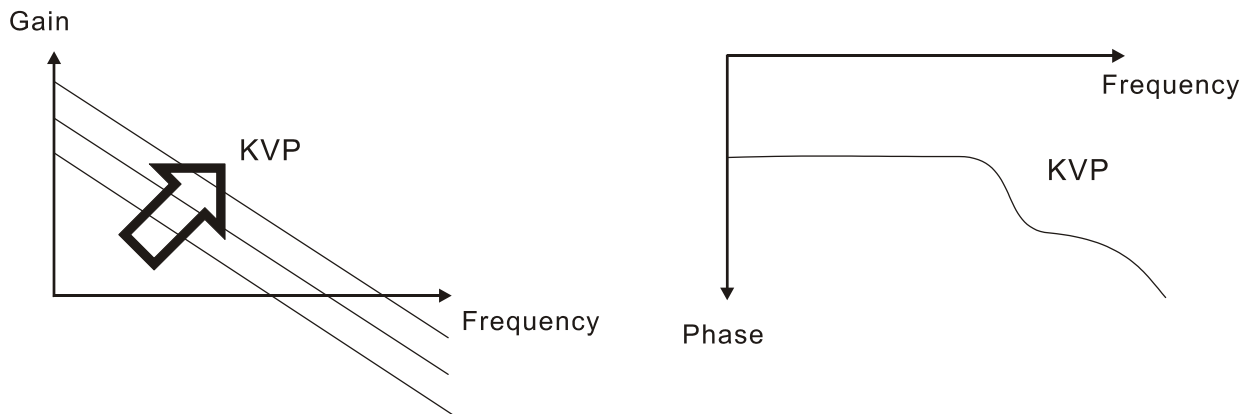
When using speed smooth command, increase gain can improve speed track deviation.

When not using speed smooth command, decrease gain can improve the resonance condition of mechanical system.

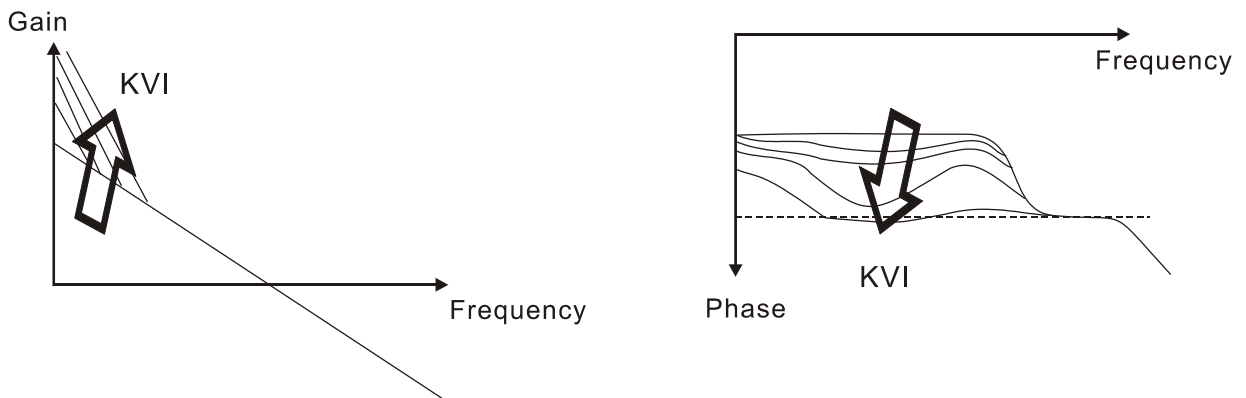
In theory, stepping response can be used to explain proportional gain (KVP), integral gain (KVI) and feed forward gain (KVF). Now we use frequency area and time area respectively to explain the logic.

**Frequency Domain**

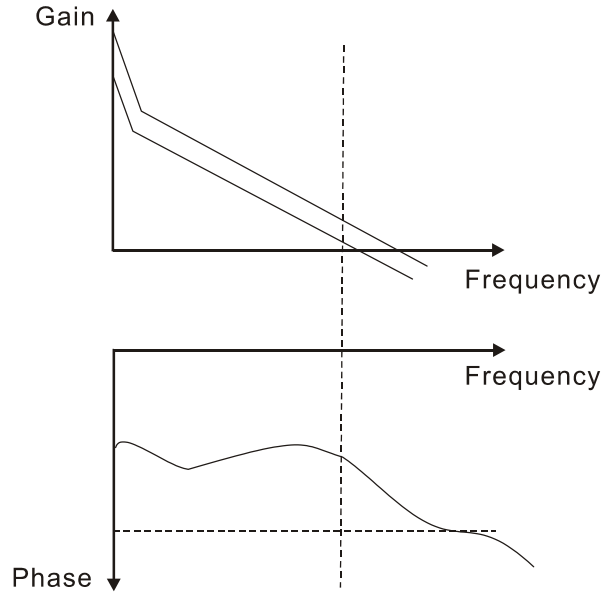
STEP 1: Set the value of KVI=0, the value of KVF=0 and adjust the value of KVP.



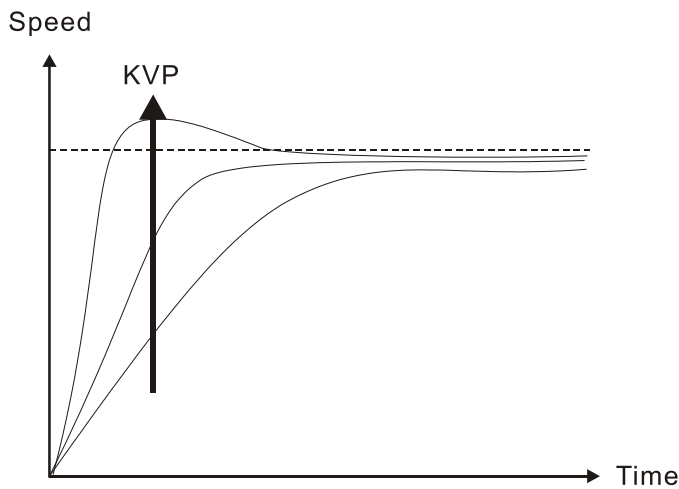
STEP 2 : Fix the value of KVP and adjust the value of KVI.



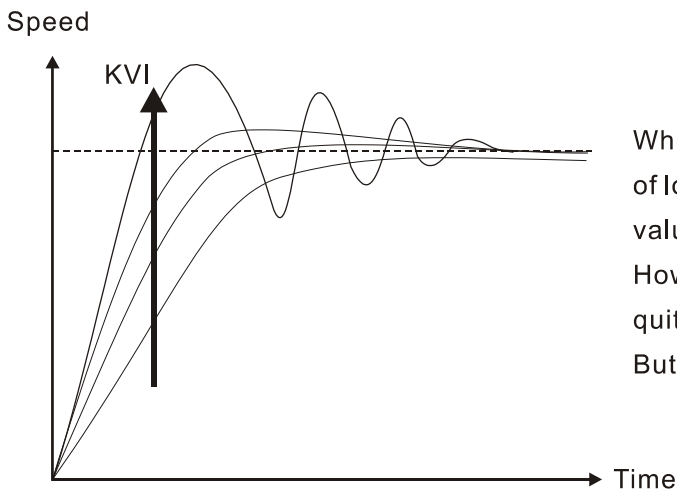
STEP 3 : Select the value of KVI, if the value of phase margin is too small, re-adjust the value of KVP again to obtain the value, 45deg of phase margin.



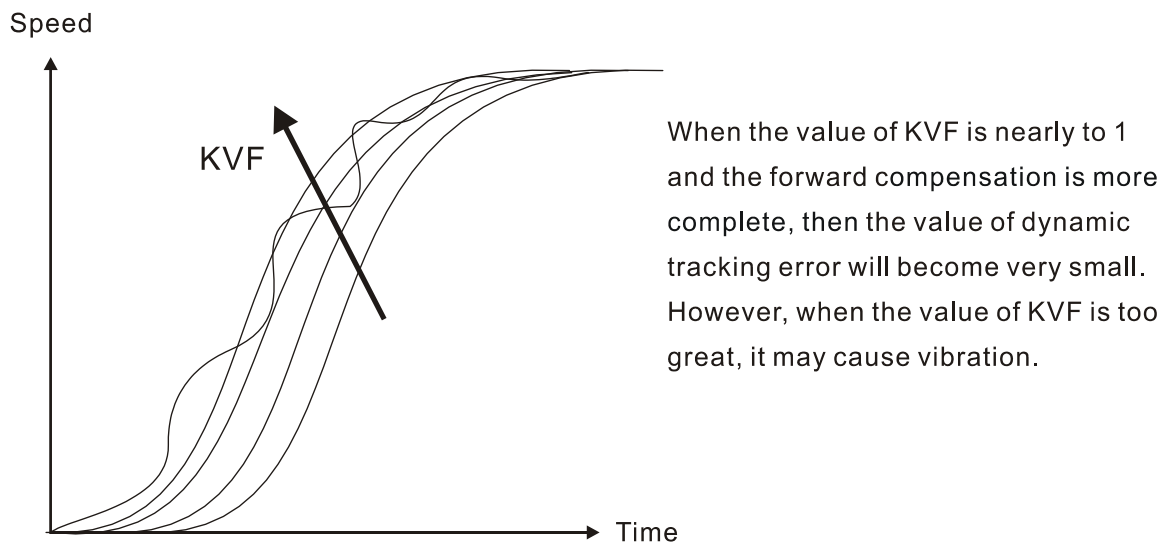
**Time Domain**



When the value of KVP is greater, the value of the responsiveness is also greater and the raising time is shorter. However, when the value of phase margin is over low, it is not helpful to steady error. But it is helpful to dynamic tracking error.



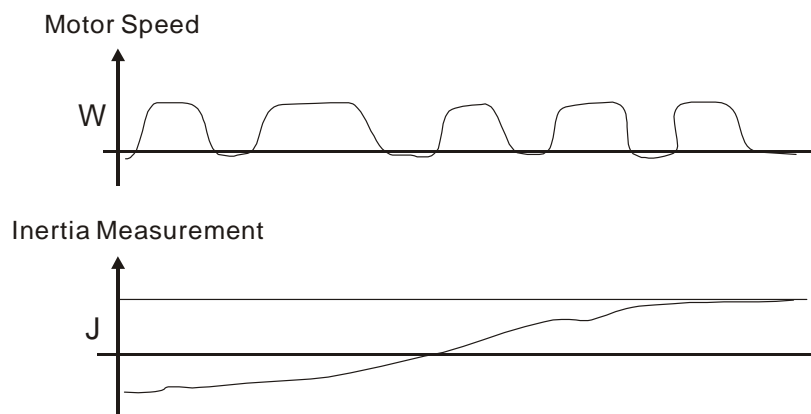
When the value of KVI is greater, the value of low-frequency gain is also greater and the value of steady error is nearly zero (0). However, the value of phase margin will reduce quite substantially. It is helpful to steady error. But it is not helpful to dynamic tracking error.



In general, the equipment, such as spectrum analyzer is needed and used to analyze when using frequency domain method and the users also should have this kind of analysis technology. However, when using time domain method, the users only need to prepare an oscilloscope. Therefore, the general users usually use time domain method with the analog DI/DO terminal provided by the servo drive to adjust what is called as PI (Proportional and Integral) type controller. As for the performance of torque shaft load, input command tracking and torque shaft load have the same responsiveness when using frequency domain method and time domain method. The users can reduce the responsiveness of input command tracking by using input command low-pass filter.

### Auto Mode (Continuous adjustment)

This Auto Mode provides continuous adjustment of loop gains according to measured inertia automatically. It is suitable when the load inertia is fixed or the load inertia change is small and is not suitable for wide range of load inertia change. The period of adjustment time is different depending on the acceleration and deceleration of servo motor. To change the stiffness and responsiveness, please use parameter P2-31.



### 6.3.7 Resonance Suppression

The resonance of mechanical system may occur due to excessive system stiffness or frequency response. However, this kind of resonance condition can be improved, suppressed, even can be eliminated by using low-pass filter (parameter P2-25) and notch filter (parameter P2-23, P2-24) without changing control parameter.

Relevant parameters:

<b>P2-23</b>	<b>NCF1</b>	<b>Notch Filter 1 (Resonance Suppression)</b>		<b>Address: 022EH 022FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	1000		
	Control Mode:	ALL		
	Unit:	Hz		
	Range:	50 ~ 1000		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to set first resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system and reduce the vibration of mechanical system.

If P2-24 is set to 0, this parameter is disabled.

The parameters P2-23 and P2-24 are the first group of notch filter parameters and the parameters P2-43 and P2-44 are the second group of notch filter parameters.

<b>P2-24</b>	<b>DPH1</b>	<b>Notch Filter Attenuation Rate 1 (Resonance Suppression)</b>		<b>Address: 0230H 0231H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	0		
	Control Mode:	ALL		
	Unit:	dB		
	Range:	0 ~ 32 (0: Disabled)		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to set magnitude of the resonance suppression that is set by parameter P2-23. If P2-24 is set to 0, the parameters P2-23 and P2-24 are both disabled.

The parameters P2-23 and P2-24 are the first group of notch filter parameters and the parameters P2-43 and P2-44 are the second group of notch filter parameters.

P2-43	NCF2	Notch Filter 2 (Resonance Suppression)		Address: 0256H 0257H
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	1000		
	Control Mode:	ALL		
	Unit:	Hz		
	Range:	50 ~ 2000		
	Data Size:	16-bit		
	Display Format:	Decimal		

**Settings:**

This parameter is used to set second resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system and reduce the vibration of mechanical system.

If P2-44 is set to 0, this parameter is disabled.

The parameters P2-23 and P2-24 are the first group of notch filter parameters and the parameters P2-43 and P2-44 are the second group of notch filter parameters.

P2-44	DPH2	Notch Filter Attenuation Rate 2 (Resonance Suppression)		Address: 0258H 0259H
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	0		
	Control Mode:	ALL		
	Unit:	dB		
	Range:	0 ~ 32		
	Data Size:	16-bit		
	Display Format:	Decimal		

**Settings:**

This parameter is used to set magnitude of the resonance suppression that is set by parameter P2-43. If P2-44 is set to 0, the parameters P2-43 and P2-44 are both disabled.

P2-45	NCF3	Notch Filter 3 (Resonance Suppression)		Address: 025AH 025BH
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	1000		
	Control Mode:	ALL		
	Unit:	Hz		
	Range:	50 ~ 2000		

Data Size:	16-bit
Display Format:	Decimal

Settings:

This parameter is used to set third resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system and reduce the vibration of mechanical system.

If P2-46 is set to 0, this parameter is disabled.

<b>P2-46</b>	<b>DPH3</b>	<b>Notch Filter Attenuation Rate 3 (Resonance Suppression)</b>		<b>Address: 025CH 025DH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	0		
	Control Mode:	ALL		
	Unit:	dB		
	Range:	0 ~ 32		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set magnitude of the resonance suppression that is set by parameter P2-45. If P2-46 is set to 0, the parameters P2-45 and P2-46 are both disabled.

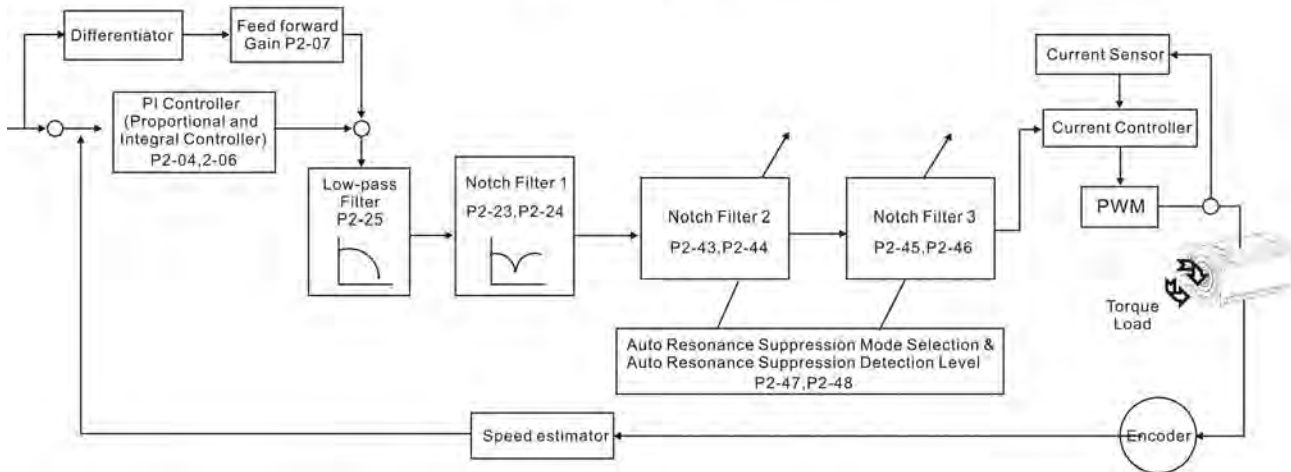
<b>P2-25</b>	<b>NLP</b>	<b>Low-pass Filter Time Constant (Resonance Suppression)</b>		<b>Address: 0232H 0233H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	0.2 (1kW and below models) or 0.5 (other models)	2 (1kW and below models) or 5 (other models)	
	Control Mode:	ALL		
	Unit:	1ms	0.1ms	
	Range:	0.0 ~ 100.0	0 ~ 1000	
	Data Size:	16-bit		
	Display Format:	One-digit	Decimal	
Input Value Example:	1.5 = 1.5 ms	15 = 1.5 ms		

Settings:

This parameter is used to set low-pass filter time constant of resonance suppression.

If P2-25 is set to 0, this parameter is disabled.

Speed Control Block Diagram



There are two groups of notch filters provided by ASDA-A2 series. The first group of notch filter is P2-43 and P2-44, and the second group of notch filter is P2-45 and P2-46. When there is resonance, please set P2-47 to 1 or 2 (Auto mode), and then the servo drive will find resonance frequency and suppress the resonance automatically. After suppressing the resonance point, the system will memorize the notch filter frequency into P2-43 and P-45, and memorize the notch filter attenuation rate into P2-44 and P2-46.

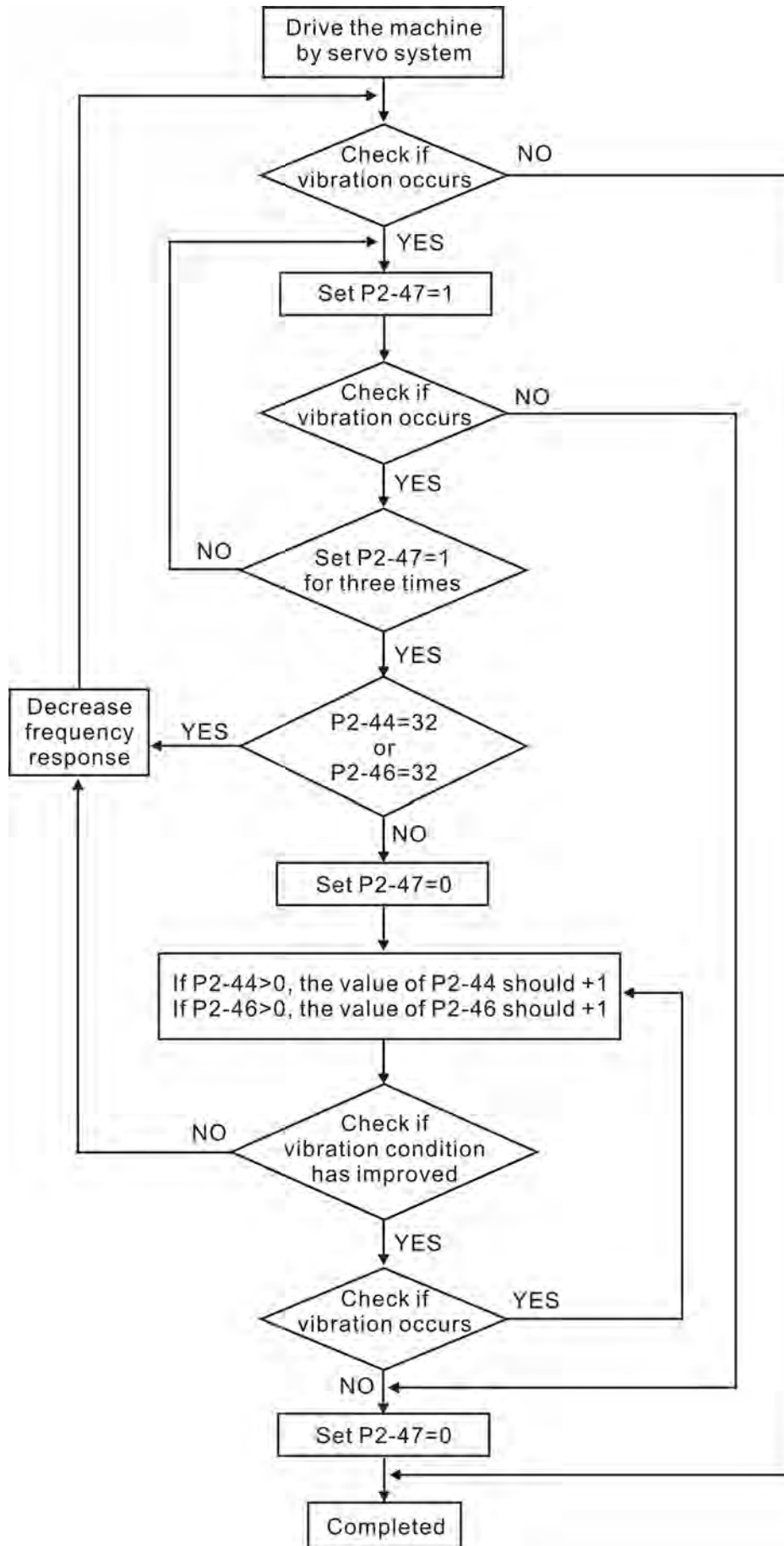
When P2-47 is set to 1, the resonance suppression will be enabled automatically. After the mechanical system becomes stable (approximate 20 minutes), the setting value of P2-47 will return to 0 (Disable auto resonance suppression function). When P2-47 is set to 2, the system will find the resonance point continuously even after the mechanical system becomes stable.

When P2-47 is set to 1 or 2, if the resonance conditions can not be eliminated, we recommend the users to check the settings of P2-44 and P2-46. If either of the setting value of P2-44 and P2-46 is set to 32, please decrease the speed frequency response and estimate the resonance point again. If the resonance conditions can not be eliminated when the setting values of P2-44 and P2-46 are both less than 32, please set P2-47 to 0 first, and increase the setting value of P2-44 and P2-46 manually. If the resonance exists still after increasing the setting value of P2-44 and P2-46, please decrease the value of speed frequency response again and then use the resonance suppression function again.

When increasing the setting value of P2-44 and P2-46 manually, ensure to pay close attention on the setting value of P2-44 and P2-46. If the value of P2-44 and P2-46 is greater than 0, it indicates that the corresponding resonance frequency of P2-43 and P2-45 is found through auto resonance suppression function. If the value of P2-44 and P2-46 is equal to 0, it indicates that the value of P2-43 and P2-45 will be the default value 1000 and this is not the frequency found by auto resonance suppression function. At this time, if the users increase the value of notch filter attenuation rate which does not exist, the performance of the current mechanical system may deteriorate.

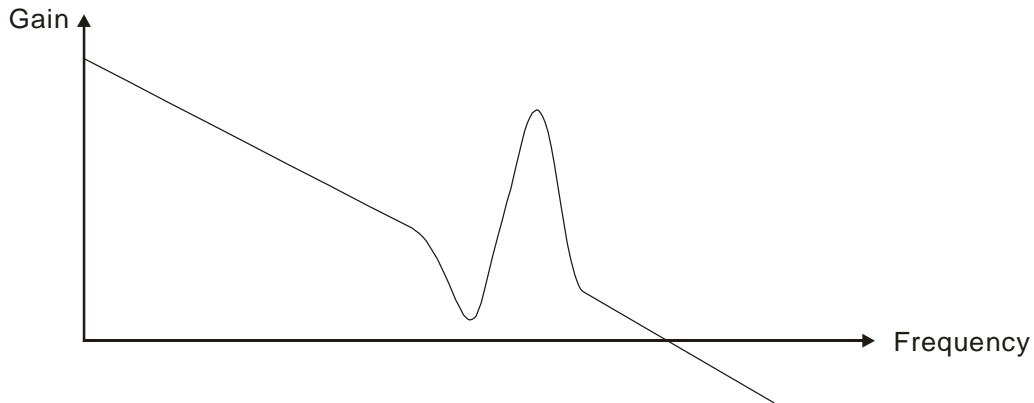
Settings of P2-47		
Current Value	Desired Value	Function
0	1	Clear the setting value of P2-43 ~ P2-46 and enable auto resonance suppression function.
0	2	Clear the setting value of P2-43 ~ P2-46 and enable auto resonance suppression function.
1	0	Save the setting value of P2-43 ~ P2-46 and disable auto resonance suppression function.
1	1	Clear the setting value of P2-43 ~ P2-46 and enable auto resonance suppression function.
1	2	Do not clear the setting value of P2-43 ~ P2-46 and enable auto resonance suppression function continuously.
2	0	Save the setting value of P2-43 ~ P2-46 and disable auto resonance suppression function.
2	1	Clear the setting value of P2-43 ~ P2-46 and enable auto resonance suppression function.
2	2	Do not clear the setting value of P2-43 ~ P2-46 and enable auto resonance suppression function continuously.



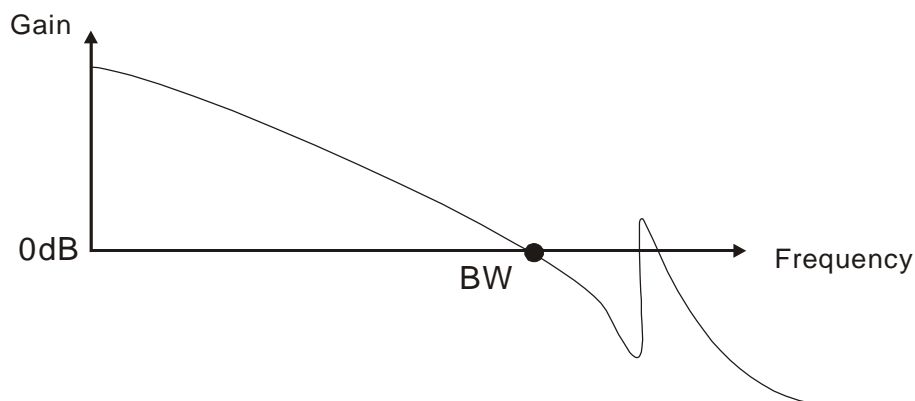


### Low-pass filter

Please use parameter P2-25. The figure below shows the resonant open-loop gain.



When the low-pass filter (parameter P2-25) is adjusted from 0 to high value, the value of Low-pass frequency (BW) will become smaller (see the figure below). The resonant condition is improved and the frequency response and phase margin will also decrease.

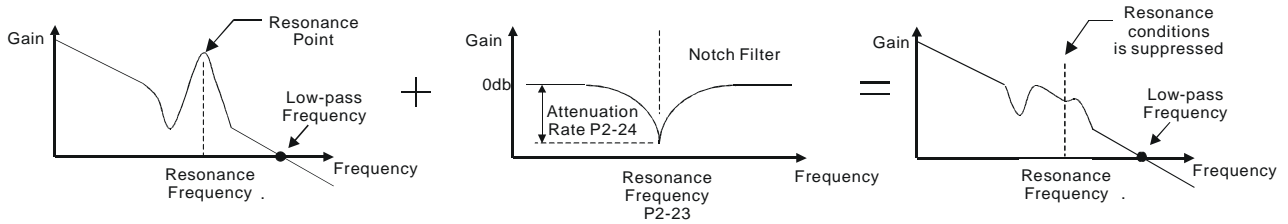


### Notch Filter

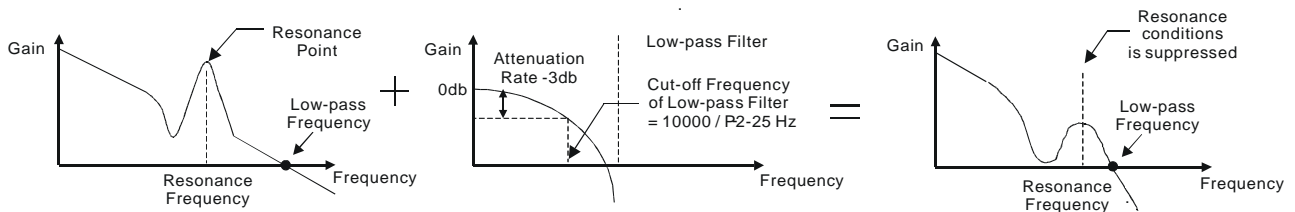
Usually, if the users know the resonance frequency, we recommend the users can eliminate the resonance conditions directly by using notch filter (parameter P2-23, P2-24). However, the range of frequency setting is from 50 to 1000Hz only and the range of resonant attenuation is 0~32 dB only. Therefore, if the resonant frequency is out of this range, we recommend the users to use low-pass filter (parameter P2-25) to improve resonant condition.

Please refer to the following figures and explanation to know how to use notch filter and low-pass filter to improve resonant condition.

## Use Notch Filter to suppress resonance



## Use Low-pass Filter to suppress resonance



When the low-pass filter (parameter P2-25) is adjusted from 0 to high value, the value of Low-pass frequency will become smaller (see the figure on page 6-26). The resonant condition is improved but the frequency response and phase margin will also decrease and the system may become unstable. Therefore, if the users know the resonance frequency, the users can eliminate the resonance conditions directly by using notch filter (parameter P2-23, P2-24). Usually, if the resonant frequency can be recognized, we recommend the users can directly use notch filter (parameter P2-23, P2-24) to eliminate the resonance. However, if the resonant frequency will drift or drift out of the notch filter range, we recommend the users not to use notch filter and use low-pass filter to improve resonant conditions.

## 6.4 Torque Control Mode

The torque control mode (T or Tz) is usually used on the applications of torque control, such as printing machine, spinning machine, twister, etc. Delta ASDA-A2 series servo drives support two kinds of command sources in torque control mode. One is external analog signal and the other is internal parameter. The external analog signal is from external voltage input and it can control the torque of servo motor. The internal parameters are from P1-12 to P1-14 which are used to be the torque command in torque control mode.

### 6.4.1 Command Source of Torque Control Mode

Torque command Sources:

- 1) External analog signal: External analog voltage input, -10V to +10V
- 2) Internal parameter: P1-12 to P1-14

The command source selection is determined by the DI signal of CN1 connector.

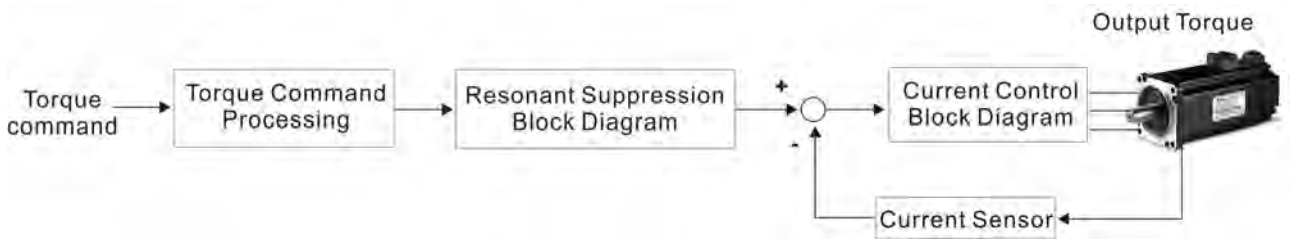
Torque Command	DI signal of CN1		Command Source		Content	Range	
	TCM1	TCM0					
T1	0	0	Mode	T	External analog signal	Voltage between T-REF-GND	-10V ~ +10V
				Tz	None	Torque command is 0	0
T2	0	1	Internal parameter		P1-12	-300% ~ 300%	
T3	1	0			P1-13		
T4	1	1			P1-14		

- State of TCM0~1: 0: indicates OFF (Normally Open); 1: indicates ON (Normally Closed)
- When TCM0 and TCM1 are both 0 (OFF), if the control mode of operation is Tz, then the command is 0. Therefore, if the users do not use analog voltage as torque command, the users can choose Tz mode to operation torque control to avoid the zero point drift problem of analog voltage. If the control mode of operation is T, then the command is the analog voltage between T-REF and GND. The setting range of the input voltage is from -10V to +10V and the corresponding torque is adjustable (see parameter P1-41).
- When at least one of TCM0 and TCM1 is not 0 (OFF), the torque command is internal parameter. The command is valid (enabled) after either TCM0 or TCM1 is changed.

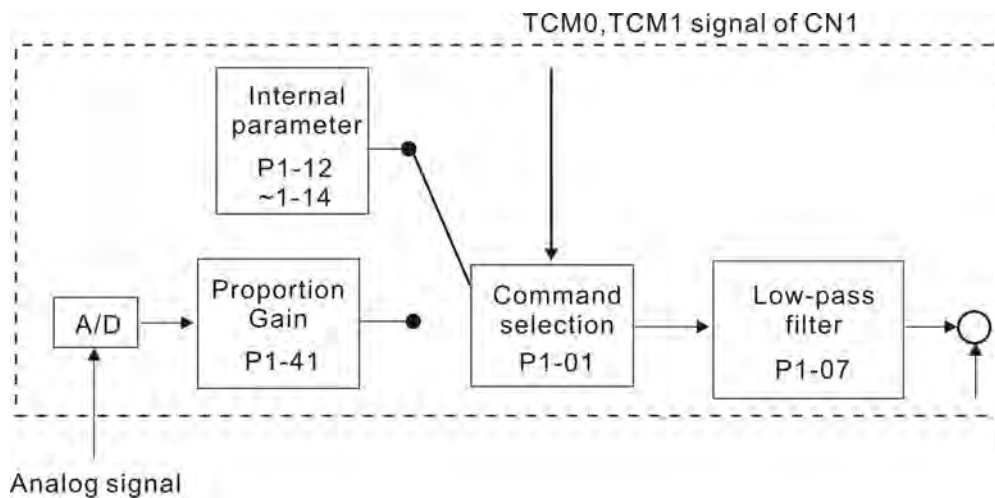
The torque command that is described in this section not only can be taken as torque command in torque control mode (T or Tz mode) but also can be the torque limit input command in position mode (P mode) and speed control mode (S or Sz mode).

### 6.4.2 Structure of Torque Control Mode

Basic Structure:



The torque command processing is used to select the command source of torque control according to chapter 6.4.1, including max. analog torque command (parameter P1-41) and smoothing strategy of torque control mode. The current control block diagram is used to manage the gain parameters of the servo drive and calculate the current input provided to motor instantaneously. As the current control block diagram is too complicated, setting the parameters of current control block diagram is not allowed. The function and structure of torque command processing is shown as the figure below:



The command source is selected according to the state of TCM0, TCM1 and parameter P1-01 (T or Tz). Whenever the command signal needs to be more smoothly, we recommend the users to use proportional gain (scalar) and low-pass filter to adjust torque.

### 6.4.3 Smoothing Strategy of Torque Control Mode

Relevant parameters:

<b>P1-07</b>	<b>TFLT</b>	<b>Smooth Constant of Analog Torque Command (Low-pass Filter)</b>	<b>Address: 010EH 010FH</b>
Operation Interface:		Keypad/Software	Communication
Default:		0	
Control Mode:		T	
Unit:		ms	
Range:		0 ~ 1000 (0: Disabled)	
Data Size:		16-bit	
Display Format:		Decimal	

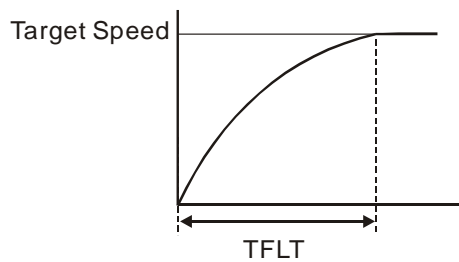
Related Section:  
Section 6.4.3

Settings:

0: Disabled

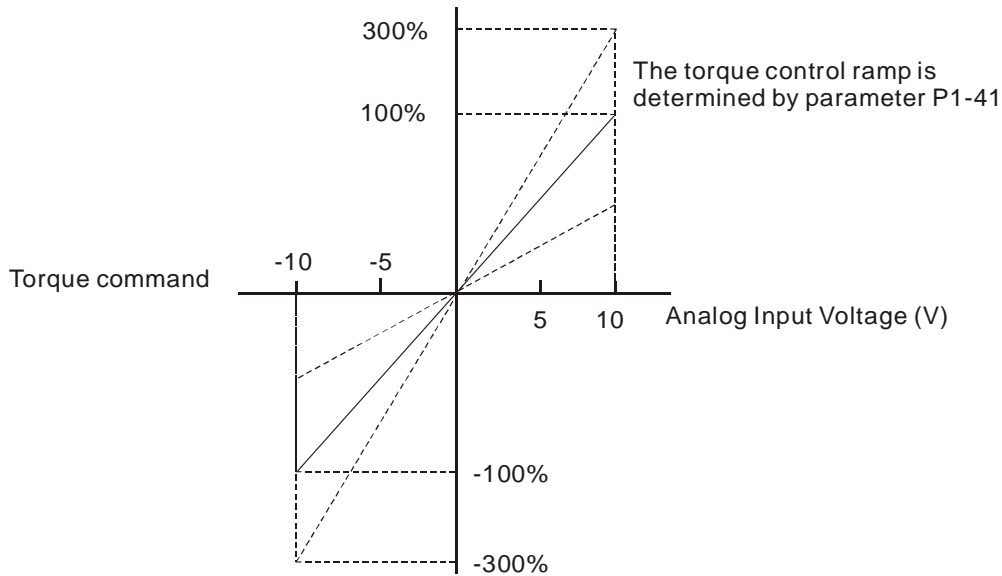
 **NOTE**

- 1) If the setting value of parameter P1-07 is set to 0, it indicates the function of this parameter is disabled and the command is just By-Pass.



### 6.4.4 Analog Torque Input Scaling

The analog voltage between T\_REF and GND controls the motor torque command. Using with parameter P1-41 can adjust the torque control ramp and its range.



Relevant parameters:

P1-41 ▲	TCM	Max. Analog Torque Command or Limit	Address: 0152H 0153H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.4.4
Default:	100		
Control Mode:	ALL		
Unit:	%		
Range:	0 ~ 1000		
Data Size:	16-bit		
Display Format:	Decimal		

Settings:

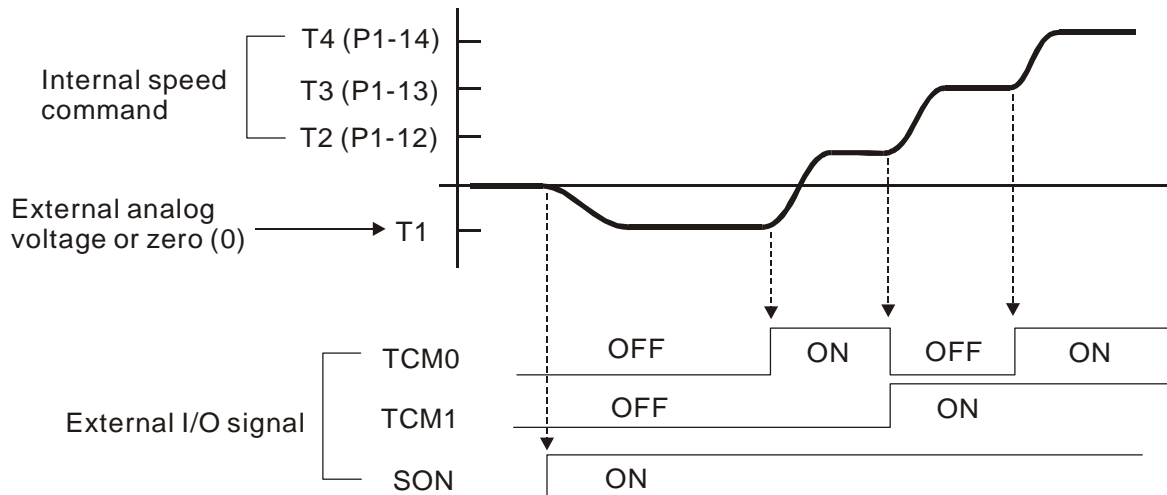
In **Torque mode**, this parameter is used to set the maximum analog torque command based on the maximum input voltage (10V).

In **Position (PT, PR)** and **Speed mode**, this parameter is used to set the maximum analog torque limit based on the maximum input voltage (10V).

For example, in torque mode, if P1-41 is set to 100 and the input voltage is 10V, it indicates that the torque command is 100% rated torque. If P1-41 is set to 100, but the input voltage is changed to 5V, then the torque command is changed to 50% rated torque.

$$\text{Torque Command / Limit} = \text{Input Voltage Value} \times \text{Setting value of P1-41} / 10$$

### 6.4.5 Timing Chart of Torque Control Mode



#### NOTE

- 1) OFF indicates normally open and ON indicates normally closed.
- 2) When torque control mode is Tz, the torque command T1=0; when torque control mode is T, the speed command T1 is external analog voltage input (Please refer to P1-01).
- 3) After Servo ON, the users can select command according to the state of TCM0~1.



## 6.5 Control Modes Selection

Except signal control mode operation, ASDA-A2 series servo drives also provide many dual and multiple modes for the users to select.

- 1) Speed / Position mode selection: PT-S, PR-S, PT-PR
- 2) Speed / Torque mode selection: S-T
- 3) Torque / Position mode selection: PT-T, PR-T
- 4) Position / Speed multiple mode selection: PT-PR-S
- 5) Position / Torque multiple mode selection: PT-PR-T

Mode	Name	Code	Description
Dual Mode	PT-S	06	Either PT or S control mode can be selected via the Digital Inputs (DI)
	PT-T	07	Either PT or T control mode can be selected via the Digital Inputs (DI)
	PR-S	08	Either PR or S control mode can be selected via the Digital Inputs (DI)
	PR-T	09	Either PR or T control mode can be selected via the Digital Inputs (DI)
	S-T	0A	Either S or T control mode can be selected via the Digital Inputs (DI)
	PT-PR	0D	Either PT or PR control mode can be selected via the Digital Inputs (DI).
Multiple Mode	PT-PR-S	0E	Either PT or PR or S control mode can be selected via the Digital Inputs (DI).
	PT-PR-T	0F	Either PT or PR or T control mode can be selected via the Digital Inputs (DI).

Sz and Tz mode selection is not provided. In order to avoid using too much DI inputs, we recommend that the users can use external analog signal as input command in speed and torque mode to reduce the use of DI inputs (SPD0~1 or TCM0~1). In position mode, we recommend that the users can use PT mode to input pulse to reduce the use of DI inputs (POS0~5).

Please refer to table 3.B and table 3.C in section 3.3.2 to see the default pin number of DI/DO signal.

### 6.5.1 Speed / Position Control Mode Selection

#### PT-S Mode / PR-S Mode:

The command source of PT-S mode is from external input pulse. The command source of PR-S mode is from internal parameters (P6-00 to P7-27). The speed command can be the external analog voltage or internal parameters (P1-09 to P1-11). The speed and position mode switching is controlled by the S-P signal. The selection will be more complicated when the position of PR-S mode and speed command are both selected through DI signal.

The timing chart of speed / position control mode selection is shown as the figure below:

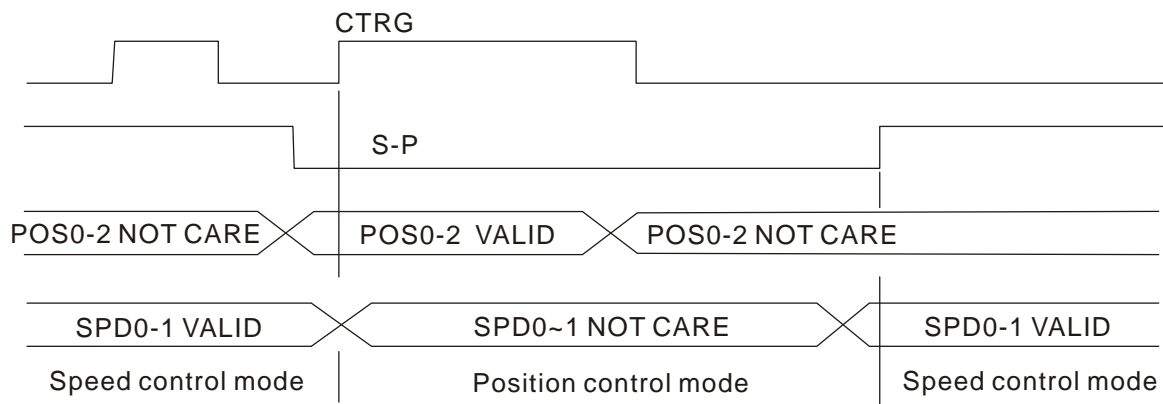


Figure 1. : Speed / Position Control Mode Selection

In speed mode (when S-P is ON), speed command is selected by SPD0~1 and CTRG is disabled at this time. When switching to the position mode (when S-P is OFF), the position command is not determined (it needs to wait that CTRG is on the rising edge), so the motor stop running. Once CTRG is on the rising edge, position command will be selected according to POS0~5 and the motor will immediately move to the determined position. After S-P is ON, it will immediately return to speed mode.

For the relationship between DI signal and selected command in each mode, please refer to the introduction of single mode.

## 6.5.2 Speed / Torque Control Mode Selection

### S-T Mode:

The speed command can be the external analog voltage or internal parameters (P1-09 to P1-11) and SPD0~1 is used to select speed command. The same as speed command, the torque command can be the external analog voltage or internal parameters (P1-12 to P1-14) and TCM0~1 is used to select torque command. The speed and torque mode switching is controlled by the S-T signal.

The timing chart of speed / torque control mode selection is shown as the figure below:

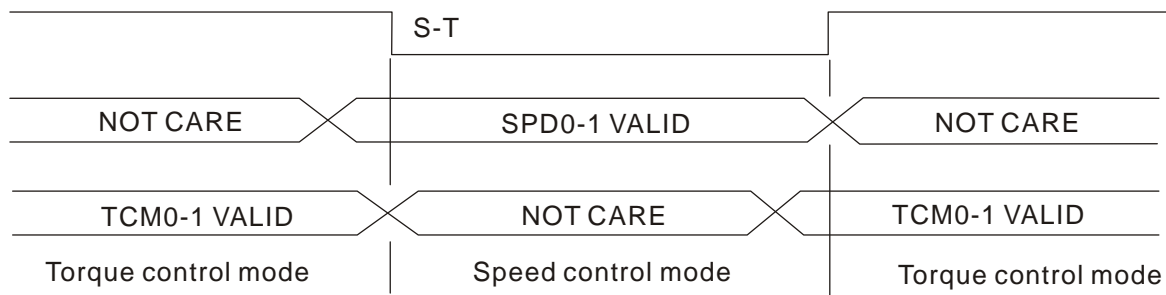


Figure 2. : Speed / Torque Control Mode Selection

In torque mode (when S-T is ON), torque command is selected by TCM0~1. When switching to the speed mode (when S-T is OFF), the speed command is selected by SPD0~1, and then the motor will immediately rotate following the command. After S-T is ON again, it will immediately return to torque mode.

### 6.5.3 Torque / Position Control Mode Selection

#### PT-T Mode / PR-T Mode:

The command source of PT-T mode is from external input pulse. The command source of PR-T mode is from internal parameters (P6-00 to P7-27). The torque command can be the external input pulse or internal parameters (P1-12 to P1-14). The torque and position mode switching is controlled by T-P signal. The selection will be more complicated when the position of PR-T mode and torque command are both selected through DI signal.

The timing chart of speed / position control mode selection is shown as the figure below:

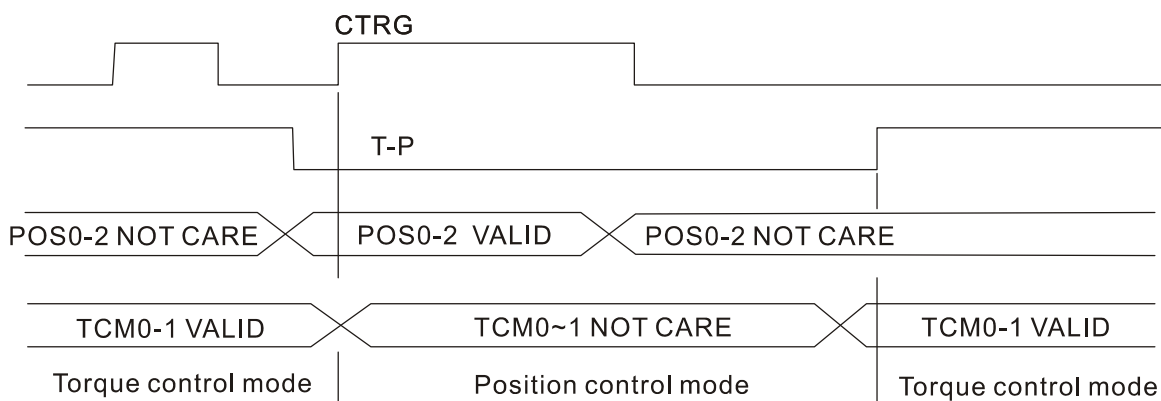


Figure 3. : Torque / Position Control Mode Selection

In torque mode (when T-P is ON), torque command is selected by TCM0~1 and CTRG is disabled at this time. When switching to the position mode (when T-P is OFF), the position command is not determined (it needs to wait that CTRG is on the rising edge), so the motor stop running. Once CTRG is on the rising edge, position command will be selected according to POS0~5 and the motor will immediately move to the determined position. After T-P is ON, it will immediately return to torque mode.

For the relationship between DI signal and selected command in each mode, please refer to the introduction of single mode.

## 6.6 Others

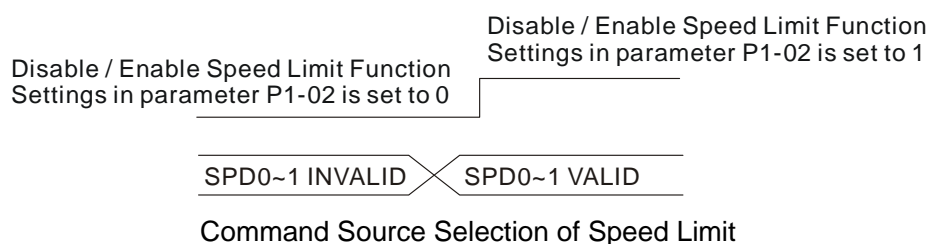
### 6.6.1 Speed Limit

The max. servo motor speed can be limited by using parameter P1-55 no matter in position, speed or torque control mode.

The command source of speed limit command is the same as speed command. It can be the external analog voltage but also can be internal parameters (P1-09 to P1-11). For more information of speed command source, please refer to chapter 6.3.1.

The speed limit only can be used in torque mode (T mode) to limit the servo motor speed. When the torque command is the external analog voltage, there should be surplus DI signal that can be treated as SPD0~1 and be used to select speed limit command (internal parameter). If there is not enough DI signal, the external voltage input can be used as speed limit command. When the Disable / Enable Speed Limit Function Settings in parameter P1-02 is set to 1, the speed limit function is activated.

The timing chart of speed limit is shown as the figure below:

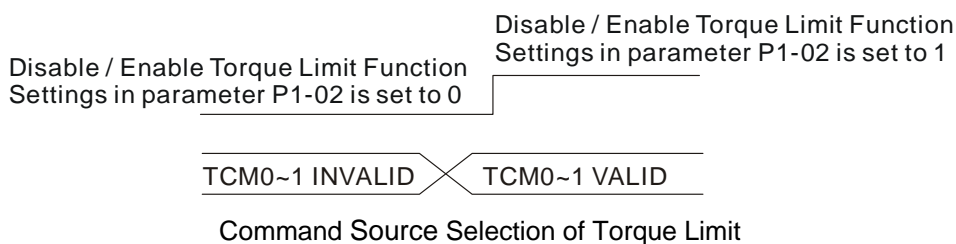


### 6.6.2 Torque Limit

The command source of torque limit command is the same as torque command. It can be the external analog voltage but also can be internal parameters (P1-12 to P1-14). For more information of torque command source, please refer to chapter 6.4.1.

The torque limit only can be used in position mode (PT and PR mode) and speed mode (S mode) to limit the output torque of servo motor. When the position command is the external pulse and speed command is the external analog voltage, there should be surplus DI signal that can be treated as TCM0~1 used to select torque limit command (internal parameter). If there is not enough DI signal, the external voltage input can be used as torque limit command. When the Disable / Enable Torque Limit Function Settings in parameter P1-02 is set to 1, the torque limit function is activated.

The timing chart of torque limit is shown as the figure below:



### 6.6.3 Analog Monitor

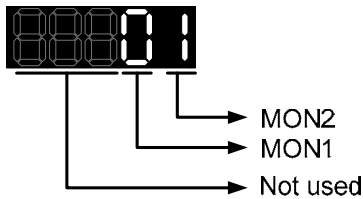
Users can use analog monitor to observe the required analog voltage signals. ASDA-A2 series servo drives provide two analog channels, they are PIN No. 15 and 16 of CN1 connector. The parameters relative to analog monitor are shown below.

Relevant parameters:

<b>P0-03</b>	<b>MON</b>	<b>Analog Monitor Output</b>	<b>Address: 0006H 0007H</b>
Operation Interface: Keypad/Software		Communication	Related Section: Section 6.6.4
Default: 00			
Control Mode: ALL			
Unit: -			
Range: 00 ~ 77			
Data Size: 16-bit			
Display Format: Hexadecimal			

Settings:

This parameter determines the functions of the analog monitor outputs.



MON1, MON2 Settings:

- 0: Motor speed (+/-8V / maximum motor speed)
- 1: Motor torque (+/-8V / maximum torque)
- 2: Pulse command frequency (+8Volts / 4.5Mpps)
- 3: Speed command (+/-8Volts / maximum speed command)
- 4: Torque command (+/-8Volts / maximum torque command)
- 5: V\_BUS voltage (+/-8Volts / 450V)
- 6: Reserved
- 7: Reserved

Please note:

For the setting of analog output voltage proportion, refer to the P1-04 and P1-05.

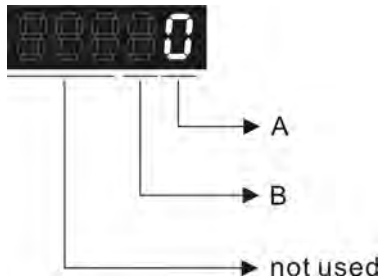
Example: P0-03 = 01 (MON1 is motor speed analog output, MON2 is motor torque analog output)

$$\text{MON1 output voltage} = 8 \times \frac{\text{Motor speed}}{\left(\text{Max. motor speed} \times \frac{\text{P1-04}}{100}\right)} \quad (\text{unit: Volts})$$

$$\text{MON2 output voltage} = 8 \times \frac{\text{Motor torque}}{(\text{Max. motor torque} \times \frac{\text{P1-05}}{100})} \quad (\text{unit: Volts})$$

<b>P1-03</b>	<b>AOUT</b>	<b>Pulse Output Polarity Setting</b>		<b>Address: 0106H 0107H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 3.3.3
	Default:	0		
	Control Mode:	ALL		
	Unit:	-		
	Range:	0 ~ 13		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:



- A: Analog monitor outputs polarity  
 0: MON1(+), MON2(+)  
 1: MON1(+), MON2(-)  
 2: MON1(-), MON2(+)  
 3: MON1(-), MON2(-)

- B: Position pulse outputs polarity  
 0: Forward output  
 1: Reverse output

<b>P1-04</b>	<b>MON1</b>	<b>Analog Monitor Output Proportion 1 (MON1)</b>		<b>Address: 0108H 0109H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.4.4
	Default:	100		
	Control Mode:	ALL		
	Unit:	% (full scale)		
	Range:	0 ~ 100		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

Please note: For the settings of analog monitor output, refer to the P0-03.

Example: P0-03 = 01 (MON1 is motor speed analog output, MON2 is motor torque)

analog output)

$$\text{MON1 output voltage} = 8 \times \frac{\text{Motor speed}}{\left( \text{Max. motor speed} \times \frac{\text{P1-04}}{100} \right)} \quad (\text{unit: Volts})$$

$$\text{MON2 output voltage} = 8 \times \frac{\text{Motor torque}}{\left( \text{Max. motor torque} \times \frac{\text{P1-05}}{100} \right)} \quad (\text{unit: Volts})$$

<b>P1-05</b>	<b>MON2</b>	<b>Analog Monitor Output Proportion 2 (MON2)</b>	<b>Address: 010AH 010BH</b>
Operation Interface: Keypad/Software		Communication	Related Section: Section 6.4.4
Default: 100			
Control Mode: ALL			
Unit: % (full scale)			
Range: 0 ~ 100			
Data Size: 16-bit			
Display Format: Decimal			

Settings:

Please note:

For the settings of analog monitor output, refer to the P0-03.

Example: P0-03 = 01 (MON1 is motor speed analog output, MON2 is motor torque analog output)

$$\text{MON1 output voltage} = 8 \times \frac{\text{Motor speed}}{\left( \text{Max. motor speed} \times \frac{\text{P1-04}}{100} \right)} \quad (\text{unit: Volts})$$

$$\text{MON2 output voltage} = 8 \times \frac{\text{Motor torque}}{\left( \text{Max. motor torque} \times \frac{\text{P1-05}}{100} \right)} \quad (\text{unit: Volts})$$

<b>P4-20</b>	<b>DOF1</b>	<b>Analog Monitor Output Drift Adjustment (MON1)</b>	<b>Address: 0428H 0429H</b>
Operation Interface: Keypad / Software		Communication	Related Section: Section 6.4.4
Default: Factory setting			



Control Mode:	ALL
Unit:	mV
Range:	-800 ~ 800
Data Size:	16-bit
Display Format:	Decimal

Settings:

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

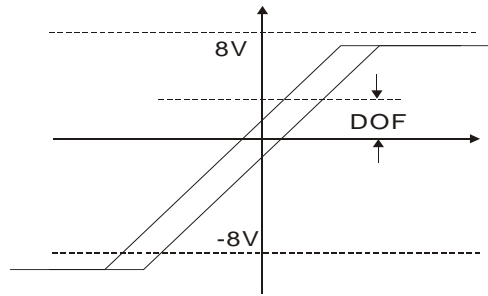
P4-21	DOF2	Analog Monitor Output Drift Adjustment (MON2)	Address: 042AH 042BH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 6.4.4
	Default:	0	
	Control Mode:	ALL	
	Unit:	mV	
	Range:	-800 ~ 800	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

For example, when the users want to observe the analog voltage signal of channel 1, if the monitor output setting range is 8V per 325Kpps, then it is needed to change the setting value of parameter P1-04 (Analog Monitor Output Proportion 1) to 50 (=325Kpps/Max. input frequency). Other related parameters setting include parameter P0-03 (A=3) and P1-03 (A=0~3, output polarity setting). In general, when output voltage value of Ch1 is V1, the pulse command frequency is equal to (Max. input frequency × V1/8) × P1-04/100.

Because there is an offset value of analog monitor output voltage, the zero voltage level of analog monitor output does not match to the zero point of setting value. We recommend the users can use Analog Monitor Output Drift Adjustment, DOF1 (parameter P4-20) and DOF2 (parameter P4-21) to improve this condition. The maximum output voltage range of analog monitor output is ±8V. If the output voltage exceeds its limit, it is still limited within the range of ±8V. The resolution provided by ASDA-A2 series servo drives is 10bit, approximated to 13mv/LSB.



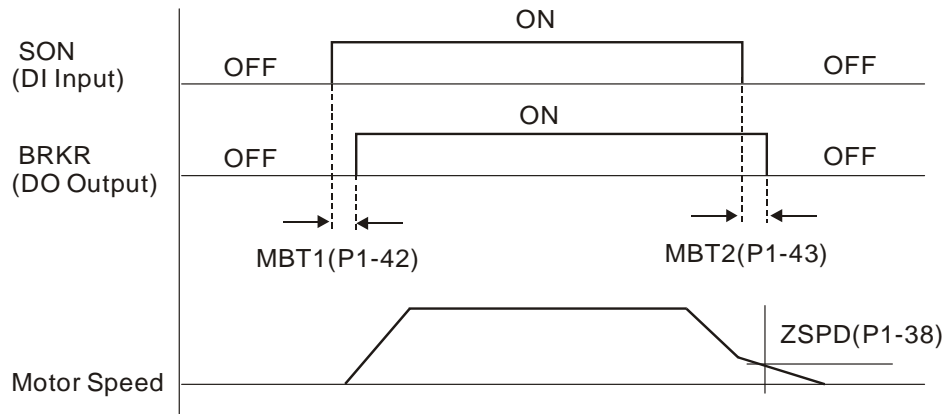
#### 6.6.4 Electromagnetic Brake

When the servo drive is operating, if the digital output BRKR is set to Off, it indicates the electromagnetic brake is disabled and motor is stop running and locked. If the digital output BRKR is set to ON, it indicates electromagnetic brake is enabled and motor can run freely.

There are two parameters that affect the electromagnetic brake. One is parameter P1-42 (MBT1) and the other is parameter P1-43 (MBT2). The users can use these two parameters to set the On and Off delay time of electromagnetic brake. The electromagnetic brake is usually used in perpendicular axis (Z-axis) direction to reduce the large energy generated from servo motor. Using electromagnetic brake can avoid the load may slip since there is no motor holding torque when power is off. Without using electromagnetic brake may reduce the life of servo motor. To avoid malfunction, the electromagnetic brake should be activated after servo system is off (Servo Off).

If the users desire to control electromagnetic brake via external controller, not by the servo drive, the users must execute the function of electromagnetic brake during the period of time when servo motor is braking. The braking strength of motor and electromagnetic brake must be in the same direction when servo motor is braking. Then, the servo drive will operate normally. However, the servo drive may generate larger current during acceleration or at constant speed and it may the cause of overload (servo fault).

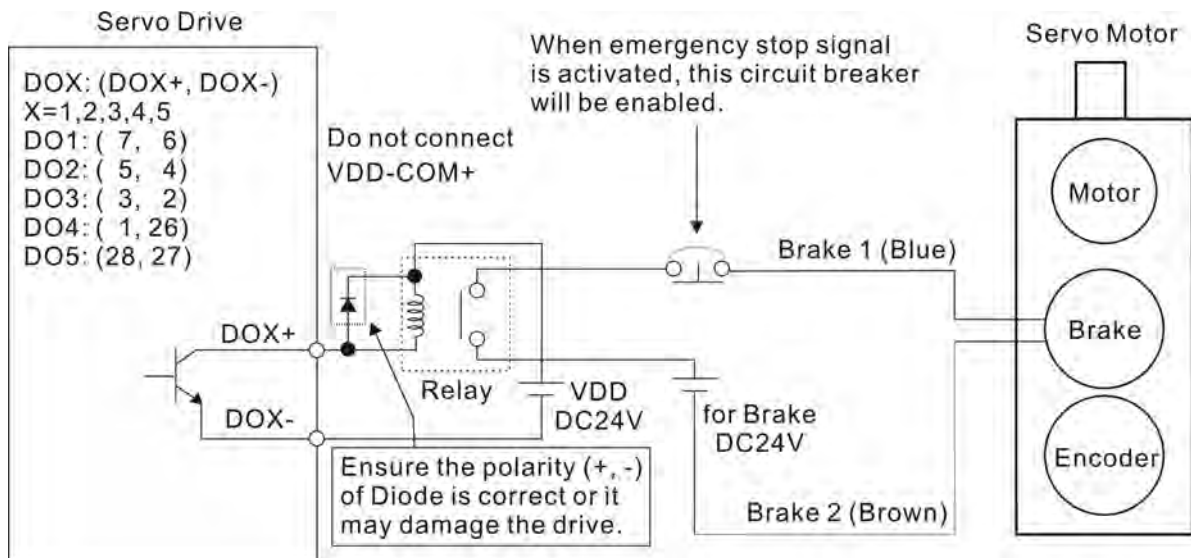
Timing chart for using servo motor with electromagnetic brake:



BRKR output timing explanation:

1. When Servo Off (when DI SON is not activated), the BRKR output goes Off (electromagnetic brake is locked) after the delay time set by P1-43 is reached and the motor speed is still higher than the setting value of P1-38.
2. When Servo Off (when DI SON is not activated), the BRKR output goes Off (electromagnetic brake is locked) if the delay time set by P1-43 is not reached and the motor speed is still lower than the setting value of P1-38.

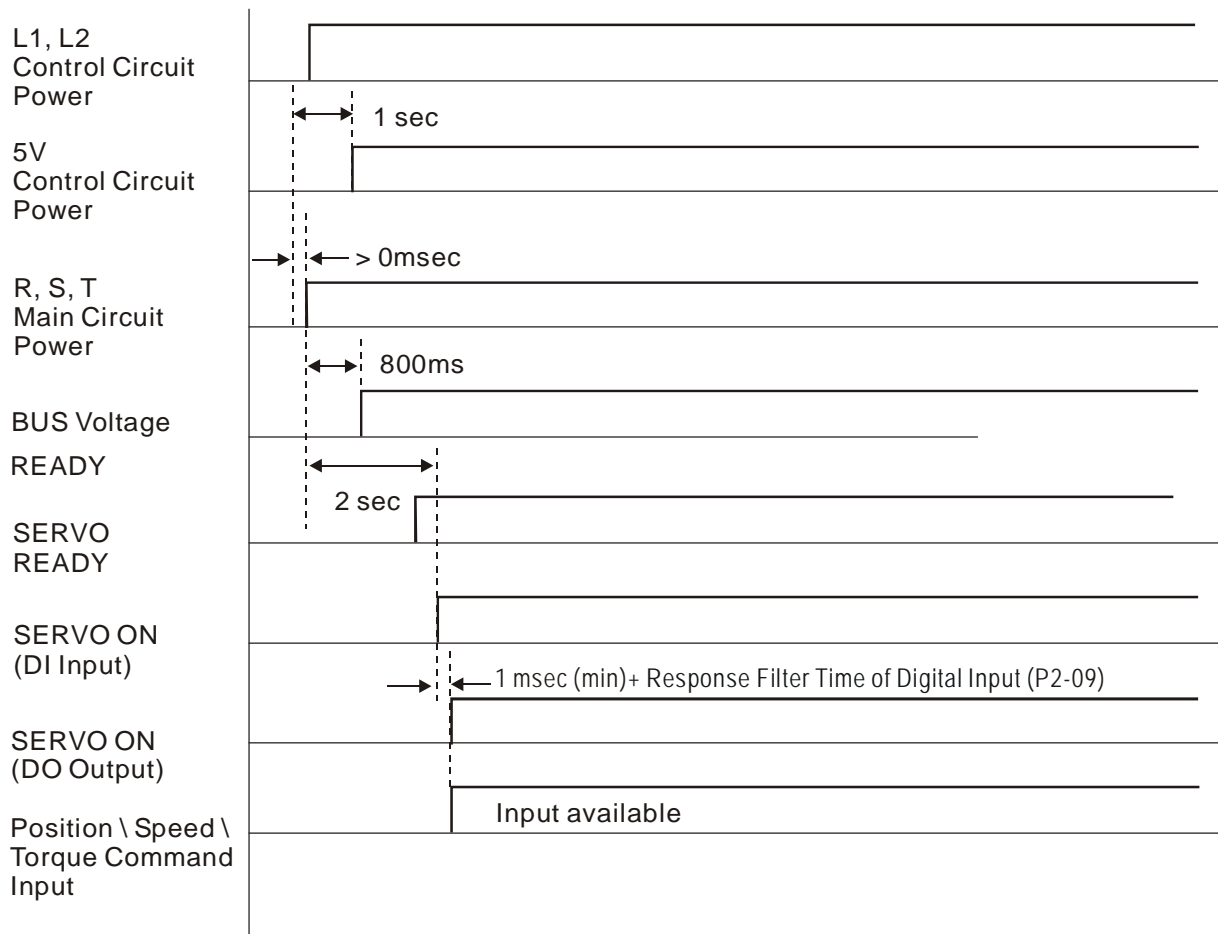
### Electromagnetic Brake Wiring Diagram



### NOTE

- 1) Please refer to Chapter 3 Connections and Wiring for more wiring information.
- 2) The BRKR signal is used to control the brake operation. The VDD DC24V power supply of the servo drive can be used to power the relay coil (Relay). When BRKR signal is ON, the motor brake will be activated.
- 3) Please note that the coil of brake has no polarity.
- 4) The power supply for brake is DC24V. Never use it for VDD, the +24V source voltage.

The timing charts of control circuit power and main circuit power:



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# Chapter 7 Motion Control Functions

## 7.1 Motion Control Functions

ASDA-A2 series provides the following motion control functions:

- 1) Innovative PR mode
- 2) Capture (Position Latch) / Compare (Position Detection) functions
- 3) Electronic Cam (E-Cam) function (ASDA-A2 series L type models do not provide this function.)

## 7.2 System Information

The system information of the servo drive includes:

1. System Parameters; 2. Monitor Parameters; 3. Data Array

Please refer to the following table below.

	System Parameters	Monitor Parameters
Usage	Applied to function settings or commands, for example, position/speed/torque control modes, position/speed loop gain and other settings.	For monitoring status of servo operating, for example, speed, position, torque and other settings.
Display Method	LED Display: display PX-XX on the display for example P1-01. Press the SET key to display the setting value of parameters. For the operation of the digital keypad, please refer to Chapter 4.	Set P0-02 directly to enter into monitor mode and specify the monitor status. The monitor status depends on the setting value of P0-02. Press MODE key on the keypad is to enter into monitor mode directly. For the operation of the digital keypad, please refer to Chapter 4.
Access Method	There are 16-bit and 32-bit parameters which can be read/written via several ways.	Read only
Data Length	16-bit or 32-bit (depends on the settings of parameters)	32-bit integer
Communication	Support MODBUS/CANopen/USB Read & Write, each parameter occupies two MODBUS addresses.	<ul style="list-style-type: none"> <li>● Monitoring is accomplished through USB (upon PC software)</li> <li>● Do not support MODBUS/CANopen Read &amp; Write directly unless users use mapping function to monitor the specified monitor parameters via the corresponding system parameters.</li> </ul>

Mapping Parameters	P0-25 ~ P0-32, total 8 parameters (Determined by P0-35 ~ P0-42)	P0-09 ~ P0-13, total 5 parameters (Determined by P0-17 ~ P0-21)
Remark	-	In monitor mode, users can press UP or DOWN arrow key to change the monitoring variables (monitor item settings) in common use (code 0 ~ 26). Please note that not all monitoring variables can be displayed (total 150 kinds of monitor parameters).

## 7.2.1 Monitoring Variables

Please refer to the following table for the explanation of monitoring variables:

Item	Explanation
Code	Each monitoring variable has one corresponding code. Using the parameter P0-02 is able to set this code and perform status monitoring.
Format	Each monitoring variable is saved in 32-bit (long integer) in the servo drive.
Type	There are two types of monitoring variables, basic monitoring variables and extension monitoring variables: <ol style="list-style-type: none"> <li>1. Basic monitoring variables: Enter into the monitor mode by pressing MODE key on the digital keypad. In monitor mode, press <b>UP/DOWN</b> arrow keys to find the available basic monitoring variables (P0-02=0~26).</li> <li>2. Extension monitoring variables: Other monitoring variables are called extension monitoring variables except basic monitoring variables (P0-02=27~127).</li> </ol>
Monitor Method	There are two methods for status monitoring. One is through LED display of the digital keypad and the other is via the mapping parameters: <ol style="list-style-type: none"> <li>1. LED display of digital keypad: Status monitoring through the LED display of the digital keypad directly.</li> <li>2. Mapping parameters: The settings of the monitoring variables will be reflected on the setting value of the mapping parameters. Users can know the settings of the monitoring variables through the corresponding parameters.</li> </ol>
Display	<ol style="list-style-type: none"> <li>1. Press <b>MODE</b> key to switch the monitor mode and then press <b>UP/DOWN</b> arrow keys to select the desired monitoring variables.</li> <li>2. Set P0-02 directly and then display the settings of the desired monitoring variables.</li> </ol> Press <b>SHIFT</b> key to switch high/low byte display; Press <b>SET</b> key to switch decimal/hexadecimal display.
Mapping Function	<ol style="list-style-type: none"> <li>1. The parameters which support mapping function includes: P0-09 ~ P0-13. (Please refer to section 8.3 “Detailed Parameter Listings” of Chapter 8.</li> <li>2. Using mapping parameters and read &amp; write monitor parameters through communication.</li> <li>3. The setting values of P0-09 ~ P0-13 (Status Monitor 1 ~ 5) are the content of basic monitoring variables (17h,18h,19h,1Ah). When users want to monitor P0-09, set P0-17 first to read the status value (see P0-02). When reading the drive status through Modbus communication, the system will read the monitor status which specified by P0-17. When reading the drive status through the keypad, if P0-02 is set to 23, VAR-1 will quickly show for about two seconds and then the value of P0-09 will display on the display.</li> </ol>

Attribute of monitoring variables:

Attribute	Explanation
<b>B</b>	Basic monitoring variable. Pressing <b>UP/DOWN</b> keys can change the status shown on LED display.
<b>Dn</b>	Decimal place display. <b>D1</b> indicates one decimal place, <b>D2</b> indicates two decimal places.
<b>Dec</b>	Decimal display only. When pressing <b>SET</b> key on the keypad, the system can not switch to hexadecimal display.
<b>Hex</b>	Hexadecimal display only. When pressing <b>SET</b> key on the keypad, the system can not switch to decimal display.

Explanation of monitoring variables:

Code	Monitoring Variables / Attribute	Explanation
000 (00h)	Feedback position (PUU) <b>B</b>	Motor feedback – current position. Unit is user unit, PUU.
001 (01h)	Position command (PUU) <b>B</b>	Position command – current position. Unit is user unit, PUU. PT mode: it indicates the pulse command received by the servo drive. PR mode: it indicates the absolute position command. It is equal to the pulse number sent by the host (external) controller.
002 (02h)	Position error (PUU) <b>B</b>	Position error counts between position command pulse and feedback pulse. Unit is user unit, PUU.
003 (03h)	Feedback position (pulse) <b>B</b>	Motor feedback – current position. Unit is encoder unit, pulse.
004 (04h)	Position command (pulse) <b>B</b>	Position command – current position. Unit is encoder unit, pulse. It is also the position command after electronic gear ratio is set.
005 (05h)	Position error (pulse) <b>B</b>	Position error counts between position command pulse and feedback pulse. Unit is encoder unit, pulse.
006 (06h)	Input frequency of pulse command <b>B</b>	Input frequency of pulse command received by the servo drive. Unit is Kpps. Applicable for PT and PR mode.
007 (07h)	Feedback speed <b>B D1 Dec</b>	Actual motor speed. Unit is 0.1r/min. The low-pass filter function is used so the value is more stable.
008 (08h)	Speed input command (Analog) <b>B D2 Dec</b>	Analog speed input command. Unit is 0.01Volt.
009 (09h)	Speed command (Integrated) <b>B</b>	Integrated speed input command. Unit is 1r/min. The command source may be from analog command / internal parameter / position loop.



Code	Monitoring Variables / Attribute	Explanation
010 (0Ah)	Torque command (Analog) <b>B</b> <b>D2</b> <b>Dec</b>	Analog torque input command. Unit is 0.01Volt.
011 (0Bh)	Torque command (Integrated) <b>B</b>	Integrated torque input command. Unit is Percent (%). The command source may be from analog command / internal parameter / position loop.
012 (0Ch)	Average load <b>B</b>	Average load output by the servo drive. Unit is Percent (%).
013 (0Dh)	Peak load <b>B</b>	Peak load output by the servo drive. Unit is Percent (%) °
014 (0Eh)	DC Bus voltage <b>B</b>	Main circuit voltage after rectification. Unit is Volt.
015 (0Fh)	Ratio of load inertia to motor inertia <b>B</b> <b>D1</b> <b>Dec</b>	Ratio of load inertia to motor inertia. Unit is 0.1times.
016 (10h)	IGBT temperature <b>B</b>	IGBT temperature. Unit is °C.
017 (11h)	Resonance frequency <b>B</b> <b>Dec</b>	Resonance frequency of the mechanical system. There are two groups of resonance frequency: F1 and F2 When reading the drive status through the keypad, pressing SHIFT key can switch the display of F1 and F2. F2: no decimal point; F1: display one decimal point When reading the drive status through the communication, Low 16-bit (Low Byte) will display frequency F2 High 16-bit (High Byte) will display frequency F1
018 (12h)	Absolute pulse number relative to encoder (use Z phase as home) <b>B</b> <b>Dec</b>	Absolute pulse number relative to encoder (use Z phase as home). The value of Z phase home point is 0, and it can be the value from -5000 to +5000 pulses. When the value is higher, the deviation pulse number is higher too.
019 (13h)	Mapping parameter #1 <b>B</b>	Display the content of parameter P0-25 (mapping target is specified by parameter P0-35).
020 (14h)	Mapping parameter #2 <b>B</b>	Display the content of parameter P0-26 (mapping target is specified by parameter P0-36).
021 (15h)	Mapping parameter #3 <b>B</b>	Display the content of parameter P0-27 (mapping target is specified by parameter P0-37).
022 (16h)	Mapping parameter #4 <b>B</b>	Display the content of parameter P0-28 (mapping target is specified by parameter P0-38).
023 (17h)	Status monitor #1 <b>B</b>	Display the content of parameter P0-09 (the monitor status is specified by parameter P0-17).
024 (18h)	Status monitor #2 <b>B</b>	Display the content of parameter P0-10 (the monitor status is specified by parameter P0-18).
025 (19h)	Status monitor #3 <b>B</b>	Display the content of parameter P0-11 (the monitor status is specified by parameter P0-19).

Code	Monitoring Variables / Attribute	Explanation
026 (1Ah)	Status monitor #4 <b>B</b>	Display the content of parameter P0-12 (the monitor status is specified by parameter P0-20).
035 (23h)	Indexing coordinate command	The current command of the indexing coordinate. The unit is PUU (user unit).
037 (25h)	Compare data of COMPARE	Display the compare data. This actual compare data is a compare value plus an offset value via P1-23 and P1-24. CMP_DATA = DATA_ARRAY[*] + P1-23 + P1-24
038 (26h)	Voltage level of battery	The voltage level of battery for an absolute encoder.
039 (27h)	DI status (Integrated) <b>Hex</b>	Integrated DI status. Each bit corresponds to one channel of digital input. The command source may be from DI signal or communication control (upon software). P3-06 can determine how digital inputs accept commands.
040 (28h)	DO status (Hardware) <b>Hex</b>	Actual DO output status. Each bit corresponds to one channel of digital output.
041 (29h)	Drive Status	The drive status will display via P0-46. Please refer to P0-46 for explanation.
043 (2Bh)	Capture data	The latest captured data by using Capture function. Note: Using Capture function is able to capture many positions.
048 (30h)	Auxiliary encoder CNT	Pulse counts input by auxiliary encoder (CN5).
049 (31h)	Pulse command CNT	Pulse counts input by pulse command (CN1).
050 (32h)	Speed command (Integrated) <b>D1 Dec</b>	Integrated speed input command. Unit is 0.1r/min. The command source may be from analog command / internal parameter / position loop.
051 (33h)	Feedback speed (Instant) <b>D1 Dec</b>	Actual motor speed. Unit is 0.1r/min.
052 (34h)	Feedback speed (Filter) <b>D1 Dec</b>	Actual motor speed. Unit is 0.1r/min. (The low-pass filter function is used.)
053 (35h)	Torque command (Integrated) <b>D1 Dec</b>	Integrated torque command. Unit is 0.1Percent (%). The command source may be from analog command / internal parameter / speed loop.
054 (36h)	Feedback Torque <b>D1 Dec</b>	Actual motor torque. Unit is 0.1Percent (%).
055 (37h)	Feedback current <b>D2 Dec</b>	Actual motor current. Unit is 0.01ampere (Amp).
056 (38h)	DC Bus voltage <b>D1 Dec</b>	Main circuit voltage after rectification. Unit is 0.1Volt.

059 (3Bh)	Pulse number of E-Cam master axis (Accumulated)	The accumulated pulse numbers of master axis of electronic cam. Please refer to P5-86. (ASDA-A2 series L type models do not provide this function.)
060 (3Ch)	Pulse number of E-Cam master axis (Incremental)	The incremental pulse numbers of master axis of electronic cam every 1msec. (ASDA-A2 series L type models do not provide this function.)
061 (3Dh)	Pulse number of E-Cam master axis (Lead Pulse Number)	Lead pulse number of E-Cam master axis which is used to decide the engage condition. <ol style="list-style-type: none"> <li>Before the electronic gear engaged: Lead pulse number is determined by P5-87 or P5-92. The electronic cam engaged when the setting value is 0.</li> <li>After the electronic gear engaged: Lead pulse number is determined by P5-89. The electronic cam disengaged when the setting value is 0.</li> </ol> (ASDA-A2 series L type models do not provide this function.)
062 (3Eh)	Position of E-Cam axis	The position of E-Cam axis. The input of E-Cam curve. Unit: It is the same as the pulse number of master axis. After receiving the pulse number P of master axis, E-Cam axis will operate M cycles. It indicates that there are M cycles of the E-Cam curve (P5-83=M, P5-84=P). (ASDA-A2 series L type models do not provide this function.)
063 (3Fh)	Position of E-Cam slave axis	The position of slave axis of E-Cam. The output of E-Cam curve. Unit: It is the data unit of E-Cam curve. (ASDA-A2 series L type models do not provide this function.)
064 (40h)	End register of PR command.	In PR mode, it is the end of the position command (Cmd_E).
065 (41h)	Output register of PR command.	In PR mode, it is the accumulated outputs of position command.
067 (43h)	Target speed of PR command.	It is target speed of PR path command. Unit is PPS (Pulse Per Second).
068 (44h)	S-curve filter (Input)	Input data of S-curve filter which is used to create the effect of S-curve filter. In PR mode, it is valid for both E-Cam and internal speed command. (ASDA-A2 series L type models do not provide this function.)
069 (45h)	S-curve filter (Output)	Output data of S-curve filter which is used to create the effect of S-curve filter. In PR mode, it is valid for both E-Cam and internal speed command. (ASDA-A2 series L type models do not provide this function.)
076 (4Ch)	Speed command of PR mode	In PR mode, it is the terraced speed curve drawn up according to target speed / accel & decel time / position move (before using S-curve filter). Unit is PPS (Pulse Per Second).

Code	Monitoring Variables / Attribute	Explanation
081 (51h)	Synchronous Capture Axis – Pulse input increment	When Synchronous Capture Axis is enabled, it is the received pulses between two capture operation and it can be used to measure the actual mark distance.
084 (54h)	Synchronous Capture Axis – Synchronous error pulse number	When Synchronous Capture Axis is enabled, it is the accumulated errors between actual output pulse and target pulse. After the synchronization operation is completed, this value will be near to zero (0).
091 (5Bh)	The feedback of indexing coordinate	The immediate feedback position of indexing coordinate. The unit is PUU (user unit).
096 (60h)	Firmware version of servo drive <b>Dec</b>	Includes 2 versions: DSP and CPLD When reading the firmware version through the keypad, pressing SHIFT key can switch the version display of DSP and CPLD. DSP: no decimal place; CPLD: it will display one decimal place. When reading the firmware version through the communication (using mapping parameters): Low 16-bit (Low Word) will display DSP firmware version. High 16-bit (High Word) will display CPLD firmware version.
098 (62h)	PLC scan time	It is regarded as the refresh time of digital inputs and outputs. Unit is 0.5msec.
109 (6Dh)	Data array capacity	Display the capacity of data array. Unit is DWORD (32-bit).
111 (6Fh)	Servo fault code	Display servo fault code. But it only displays the servo drive fault code. The fault code for motion control will not be displayed.
112 (70h)	CANopen synchronous time (Low-pass filter is not used)	Display the time when the servo drive receives synchronous signal (TimeStamp). Unit is usec.
113 (71h)	CANopen synchronous time (Low-pass filter is used)	Display the time when the servo drive receives synchronous signal and low-pass filter is used. Unit is usec.
114 (72h)	CANopen synchronous timing correction	When CANopen communication is enabled, display the timing correction value which is synchronized with the host (external) controller. Unit is usec.
123 (7Bh)	Keypad monitor value	When reading the monitor value through the keypad, it is used to read the monitor value displayed on the keypad.

## 7.2.2 Data Array

ASDA-A2 series provides many motion control functions, such as E-Cam (ASDA-A2 series L type models do not provide this function.), Capture function, and Compare function. The data array can keep data for E-Cam, Capture function, and Compare function with maximum to 800 records (all together to max. 800 records). Please refer to the following table for the introduction of data array.

Data Array	
Usage	<ul style="list-style-type: none"> <li>● Save Capture data.</li> <li>● Save Compare data.</li> <li>● Save E-Cam curve.</li> </ul> <p>Note:</p> <ol style="list-style-type: none"> <li>1. The data array is user-defined and the system will not partition off the data array for Capture, Compare and E-Cam function respectively. Therefore, the memory blocks of the data array may be overlapped. Please pay close attention when defining the data array.</li> <li>2. ASDA-A2 series L type models do not provide this function.</li> </ol>
Array Size	<ul style="list-style-type: none"> <li>● 32-bit integer x 800 records (the data address when reading and writing data array is determined by P5-10).</li> <li>● Each data should have a corresponding address. This address should be specified when reading and writing data array.</li> <li>● The address is within the range of 0 ~ 799.</li> </ul>
Backup Data Into EEPROM	<ul style="list-style-type: none"> <li>● Set P2-08 to 30 first and set to 35 next. Then, the content of the data array will be saved in EEPROM when power is off.</li> <li>● Please save data when Servo Off.</li> <li>● After re-power the servo drive, the content of the data array will be written automatically.</li> </ul>
Read/Write Window	<ul style="list-style-type: none"> <li>● Perform read and write operation through P5-10 ~ P5-13.</li> </ul>

The content of the data array can not be read and written via external commands. It only can be read and written through the settings of P5-10 ~ P5-13. Please refer to the following table for explanation:

Relevant Parameters for Data Array		
Parameter	Name	Explanation
P5-10	Data Amount (N x 32 bits)	This parameter is used to set the data amount of data array (N x 32 bits). N is the capacity of the data array (Read only).
P5-11	Read / Write Address	This parameter is used to set the data address when reading and writing data array.

Relevant Parameters for Data Array		
Parameter	Name	Explanation
P5-12	Read / Write Window #1	Panel Read: P5-11 unchanged Panel Write: P5-11=P5-11+1 When reading data through the panel (keypad): Read the content specified by P5-11. After read operation is completed, the address of P5-11 will not change. When writing data through the panel (keypad): Write the content specified by P5-11. After write operation is completed, the address of P5-11 will increase 1 automatically.
		Communication Read: P5-11=P5-11+1 Communication Write: P5-11=P5-11+1 When reading data through the communication: Read the content specified by P5-11. After read operation is completed, the address of P5-11 will increase 1 automatically. When writing data through the communication: Write the content specified by P5-11. After write operation is completed, the address of P5-11 will increase 1 automatically.
P5-13	Read / Write Window #2	Panel Read: P5-11=P5-11+1 Panel Write: Inhibition When reading data through the panel (keypad): Read the content specified by P5-11. After read operation is completed, the address of P5-11 will increase 1 automatically. When writing data through the panel (keypad): This parameter can not be written through the keypad.
		Communication Read: P5-11=P5-11+1 Communication Write: P5-11=P5-11+1 When reading data through the communication: Read the content specified by P5-11. After read operation is completed, the address of P5-11 will increase 1 automatically. When writing data through the communication: Write the content specified by P5-11. After write operation is completed, the address of P5-11 will increase 1 automatically.

### Access to Data Array

There is one index working along with two read/write windows for accessing data array. For some hosts resending data several times while communication, it had better to put the index P5-11 every time before read/write.

In brief, users need to set the desired read & write address by using P5-11 and then read and write the data through P5-12 or P5-13.

For example, suppose that users want to write three consecutive numbers of data (100th, 200th, 300th), and save them into the address 11, 12, 13 of data array, the operation steps are described as follows:

1. When writing data through the keypad:

Use P5-12 because P5-13 does not provide this function.

1) Set first address:

Set P5-11=11 (the first address)

2) Write data:

Set P5-12=100. (This is the first written data, 100th data and it will be saved in address 11, i.e. P5-11. After write operation is completed, the address of P5-11 will increase 1 automatically, i.e. address 12.)

Set P5-12=200 (This is the secondary written data, 200th data and it will be saved in address 12, i.e. P5-11. After write operation is completed, the address of P5-11 will increase 1 automatically, i.e. address 13.)

Set P5-12=300 (This is the third written data, 300th data and it will be saved in address 13, i.e. P5-11. After write operation is completed, the address of P5-11 will increase 1 automatically, i.e. address 14.)

Then, users can read the address 11, 12, and 13 and check the written values.

2. When reading data through the keypad:

Use P5-13 to read consecutive data.

1) Set first address:

Set P5-11=11 (the first address)

2) Read data:

When display shows P5-13:

Press SET key at the first time, the display will show the 100th data saved in address 11. Pressing MODE key can exit P5-13.

Press SET key at the second time, the display will show the 200th data saved in address 12. Pressing MODE key can exit P5-13.

Press SET key at the first time, the display will show the 300th data saved in address 13. Pressing MODE key can exit P5-13.

Please note that when use P5-13 to read data every time, the address of P5-11 will increase 1 automatically so using P5-13 can read the consecutive data. However, if users use P5-12 to read the data, the address of P5-11 will remain the same, so using P5-12 can not read the consecutive data.

The operation steps for reading or writing data through the communication are similar to the steps when using keypad. The functions of P5-12 and P5-13 are also the same. For example, suppose that users want to write 6 consecutive data (100th, 200th, 300th, 400th, 500th, 600th data) through Modbus communication continuously, set the communication command by referring to the table below.

Communication command: write data into data array									
No.	Command	Starting Data Address	Data Amount	P5-11		P5-12		P5-13	
				Low Word	High Word	Low Word	High Word	Low Word	High Word
1	0x10	P5-11	6 (Word)	11	0	100	0	200	0
				First Address		First Data		Second Data	
2	0x10	P5-11	6 (Word)	13	0	300	0	400	0
				Third Address		Third Data		Fourth Data	
3	0x10	P5-11	6 (Word)	15	0	500	0	600	0
				Fifth Address		Fifth Data		Sixth Data	

Please check if the above written data is correct when reading the data of data array. Users can use Modbus communication command 0x06(write one data) to set P5-11 and write the desired read data. For the settings of the communication command, please refer to the table below.

Communication command: read data from data array			
No.	Command	Starting Data Address	Written Data
4	0x06	P5-11	11

Then, read the data of the specified address by using communication command 0x03. Please refer to the table below to set communication command.

Communication command: Read data array				Response Data					
No.	Command	Starting Data Address	Data Amount	P5-11		P5-12		P5-13	
				Low Word	High Word	Low Word	High Word	Low Word	High Word
5	0x03	P5-11	6 (Word)	11	0	100	0	200	0
				Read Address		Data of address 11		Data of address 12	
6	0x03	P5-11	6 (Word)	13	0	300	0	400	0
				Read Address		Data of address 13		Data of address 14	
7	0x03	P5-11	6 (Word)	15	0	500	0	600	0
				Read Address		Data of address 15		Data of address 16	



## 7.3 Motion Axes

Motion axis is a counter within the servo drive which is used to count the data of absolute position (32-bit integer). The available motion axes are introduced in the following table.

Axis Name	Description	Read (R) / Write (W)	Attribute
1. Motor Encoder Axis (P5-16)	It indicates the motor absolute feedback position and the user unit is PUU.	R	Physical Axis
2. Auxiliary Encoder Axis (P5-17)	It is the pulse counts of the auxiliary encoder (linear scale) input by CN5. The pulse type is AB phase pulse only.	R/W	Physical Axis
3. Pulse Command Axis (P5-18)	It is the pulse counts of the host (external) controller input from CN1. The pulse type can be defined by P1-00.	R/W	Physical Axis
4. Capture Axis (P5-37)	It is the motion axis which is used to enable Capture function. The command source could be from motor encoder axis, auxiliary encoder axis and pulse command axis. Position offset exists between output axis and physical axis. After the first point is captured, the axis position can be defined again.	R/W	Output Axis
5. Compare Axis (P5-57)	It is the motion axis which is used to enable Compare function. The command source could be from motor encoder axis, auxiliary encoder axis, pulse command axis and Capture axis. Position offset exists between output axis and physical axis.	R/W	Output Axis
6. E-Cam Master Axis (P5-86)	It is the master axis of electronic cam. The command source could be from auxiliary encoder axis, pulse command axis, Capture axis and PR command axis. Position offset exists between output axis and physical axis. (ASDA-A2 series L type models do not provide this function.)	R/W	Output Axis
7. PR Command Axis	Command position defined by PR.	R	Virtual Axis
8. Internal Time Axis	Internal timer. The value will increase 1 every 1msec.	R	Virtual Axis
9. Synchronous Capture Axis (P5-77)	The function is similar to Capture axis (P5-37). But, it will correct the offset value of this synchronous axis (P5-78) when capture operation is activated every two times. (This function is available only in firmware version V1.009 and later models).	R/W	Virtual Axis

Please note:

1. Physical axis: Position value is obtained from the actual terminal signal counts.
2. Output axis: It is the axis output by the physical axis. The value will not be the same as the source of physical axis, but the increasing value will be the same as the increasing value of physical axis.

3. Virtual axis: It is the axis generated by the servo firmware, e.g. PR command axis. It is unable to command in real time so it could not be regarded as the command axis for Capture and Compare function. But it could be regarded as the command source of the master axis of electronic cam.

## 7.4 PR Mode

PR mode could be composed of one position command or multiple position commands, and triggered by DI signal, CTRG. DI signals, POS0 ~ POS5 are used to specify the desired trigger position.

In PR mode, electronic cam (E-Cam) is provided. Users can enable electronic cam function by PRs (Position Registers). After the electronic cam is disengaged, the system can command the motor to return to the specified position as well. The PR cannot be interpreted as “Point to Point” control. It does beyond that. The servo is capable to change its working profile under PR mode instantaneously. There are 64 PRs available.

## 7.5 Comparison

	Old PR mode	PR Mode of ASDA-A2
Position settings	8 position settings	64 position registers (64PRs)
Command Type	Position command	Homing mode, constant speed mode, position control mode, jump mode, write parameter mode are available.
Parameters for Position Commands	<ul style="list-style-type: none"> <li>● Either Absolute command or Incremental command</li> <li>● Accel / Decel time x 1</li> <li>● Motion speed x 8</li> <li>● Delay time x 8</li> </ul>	<ul style="list-style-type: none"> <li>● Absolute command / Incremental command can be set individually.</li> <li>● Accel / Decel time x 16</li> <li>● Motion speed x 16</li> <li>● Delay time x 16</li> </ul>
Command Trigger Timing	It is enabled when DO signal, ZSPD is On.	It can be enabled at any time. Users can specify the command connection method (sequential command / insertion command / overlap command).
Trigger Method	<ul style="list-style-type: none"> <li>● DI signals: CTRG + POSn (n: number)</li> </ul>	<ul style="list-style-type: none"> <li>● DI signals: CTRG + POSn (n: number)</li> <li>● Event trigger function: DI signals EV1 ~ 4 + CAP_OK</li> <li>● P5-07 (Trigger Position Command)</li> </ul>
Position Command Profile	<ul style="list-style-type: none"> <li>● Accel / Decel S-curve (When S-curve function (P1-36) is disabled, the acceleration and deceleration function are also disable.)</li> </ul>	<ul style="list-style-type: none"> <li>● Accel / Decel S-curve (When S-curve function (P1-36) is disabled, the acceleration and deceleration function can be enabled still.)</li> </ul>
Format	<ul style="list-style-type: none"> <li>● Rotation or Pulse</li> </ul>	<ul style="list-style-type: none"> <li>● 32-bit data (user unit)</li> </ul>

	Old PR mode	PR Mode of ASDA-A2
Homing Function	<ul style="list-style-type: none"> <li>● Execute homing function automatically when power is applied to the servo drive (Servo On at the first time)</li> <li>● DI signal, SHOM</li> </ul>	<ul style="list-style-type: none"> <li>● Execute homing function automatically when power is applied to the servo drive (Servo On at the first time)</li> <li>● DI signal, SHOM</li> <li>● When PR path is set to 0, it is homing mode. Users also can use DI signal, CTRG to trigger PR path 0.</li> <li>● After homing operation is completed, it can execute the specified PR path.</li> </ul>
Software Limit Function	This function is not provided.	This function is provided.

## 7.6 Pulse of User Unit

The position command unit of PR mode is presented by PUU (Pulse of User Unit). It also indicates the ratio of position command unit of host (external) controller to internal position command unit of servo drive, i.e. electronic gear ratio of servo drive.

The PUU is a unit which is scaled by the electronic gear. This will bring out an advantage, and that is "YOU SEE WHAT YOU COMMAND". For example, if you send 10000 PUU for command and you can read from the feedback 10000 PUU and ignore the electronic gear ratio.

- 1) Position command unit of servo drive (pulse): encoder unit, 1280000pulses per revolution (pulse/rev).
- 2) User unit (PUU): unit of host (external) controller. If the pulse number per revolution is P pulses (PUU/rev), then the electronic gear ratio should be set to:

$$\text{GEAR\_NUM(P1-44)} / \text{GEAR\_DEN(P1-45)} = 1280000 / P$$

## 7.7 Position Registers

- 1) The unit of position register of PR mode: They are indicates as PUU (Pulse of User Unit).
- 2) Cmd\_E (Monitoring Variable 064): The target position of command.
- 3) Cmd\_O (Monitoring Variable 001): The intermediate command
- 4) Fb\_PUU (Monitoring Variable 000): The current (feedback) position of motor.
- 5) Err\_PUU (Monitoring Variable 002): The position error = (Cmd\_O – Fb\_PUU).
- 6) In PR mode, at any time (no matter during operation or at stop):  
Err\_PUU = Cmd\_O - Fb\_PUU.

## Position Commands and Position Registers:

Five different types of position commands: Absolute, Incremental, Stop, Homing and Speed commands.

Type	After position command accepted =>	=> When position command being executed =>	=> When position command is completed
Absolute position command	Cmd_E = command data (absolute) Cmd_O: unchanged DO signal: CMD_OK is OFF	Cmd_E: unchanged Cmd_O continuously output ...	Cmd_E: unchanged Cmd_O = Cmd_E DO signal: CMD_OK is ON
Incremental position command	Cmd_E+= command data (incremental) Cmd_O: unchanged DO signal: CMD_OK is OFF	Cmd_E: unchanged Cmd_O continuously output ...	Cmd_E: unchanged Cmd_O = Cmd_E DO signal: CMD_OK is ON
Stop command DI signal, STP	Cmd_E: unchanged Cmd_O continuously output DO: CMD_OK output unchanged	Cmd_E: unchanged Cmd_O stop in accordance with deceleration curve	Cmd_E: unchanged Cmd_O = position at stop DO signal: CMD_OK is ON
Homing command	Cmd_E: unchanged Cmd_O: unchanged DO signal: CMD_OK is OFF DO signal: HOME is OFF	Cmd_E continuously output Cmd_O continuously output ... ...	Cmd_E = Z pulse (absolute position) Cmd_O = position at stop DO signal: CMD_OK is ON DO signal: HOME is ON
Speed command	Cmd_E continuously output Cmd_O continuously output. After speed command is completed, it indicates that the speed reaches the setting value and the motor will not stop. DO signal: CMD_OK is OFF		
Enter PR at the first time ( Servo Off-> Servo On or other mode for entering PR mode)		Cmd_O = Cmd_E = current motor feedback position	
Note: The incremental position command performs accumulation according to the end of the position command (Cmd_E). It is irrelevant to current motor position and command timing as well.			

## 7.8 Homing Function

The homing function determines the homing characteristics of servo motors. The purpose of homing function is used to connect the position of Z pulse of motor encoder to the internal coordinate of the servo drive. The coordinate value corresponds to Z pulse can be specified.

After homing operation is completed, the stop position will not locate at the position of Z pulse. This is because the motor must accelerate to stop when Z pulse is found. Generally, the motor stop position will be a little ahead of the position of Z pulse. At this time, Z pulse is set correctly so it will not affect the position precision.

For example:

If the coordinate corresponds to Z pulse is set to 100, after homing operation is completed,  $Cmd=300$ . It indicates that the acceleration distance is equal to  $300-100=200(PUU)$ . Since  $Cmd\_E=100$  (absolute position of Z pulse), if users want to command the motor to return to the position of Z pulse, just set absolute position command to 100 or incremental position command to 0.

In PR mode of ASDA-A2 series, after homing operation, it can execute the specified path and command the motor to return to the position of Z pulse automatically.

When homing function is executed, the software limit function is disabled.

## 7.9 Triggering PRs

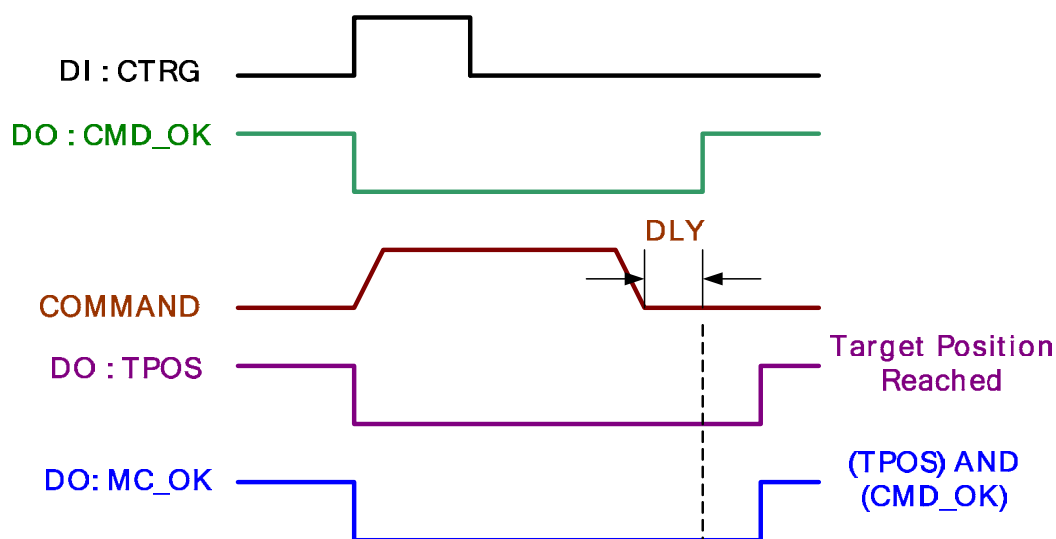
There are several methods to call a PR.

1. Standard  
CTRГ: Trigger the PR selected by DIs (POS0 ~ POS5).
2. Special  
STP: Terminate the running PR.  
SHOM: Start to run homing procedure (PR0).
3. Event  
EV1 ~ 4 (rising edge): Event can be used to call a PR.  
EV1 ~ 4 (falling edge): Event can be used to call a PR.
4. Software  
P5-07: Use PR identification to call a PR.
5. Others  
PR#50 is called when Capture function finished, and a specific PR can be assigned after E-Cam disengaging.

DI signals: CTRГ, SHOM, STP, POS0 ~ POS5, ORG, PL(CCWL), NL(CWL), EV1~4

DO signals: CMD\_OK, MC\_OK, TPOS, ALRM, CAP\_OK, CAM\_AREA

Timing chart:



## The Ways to Call a PR

There are 64 position settings in PR mode. PR 0 is homing mode and the others (PR 1 ~ 63) can be user-defined. For the ways to call a PR, please refer to the table below:

	Command Source	Explanation
Standard	DI signals: CTRG + POS0 ~ 5	Use DI signals, POS0 ~ 5 to specify the desired trigger procedure number (PR), and then use the rising-edge of DI signal, CTRG to trigger a PR. Suitable application: PC or PLC commands the servo drive by using DI signals
Special	DI signals: STP, SHM	DI signal: Set STP from OFF to be ON, and the command will stop. DI signal: Set SHOM from OFF to be ON, and the servo drive will start to perform homing operation.
Event	DI signals: EV1 ~ 4	There are 4 events with rising and falling edges can be set to trigger a specific PR. DI signals: Trigger the command by changing the status of EV1 ~ 4 P5-98: Event Rising-edge Trigger Command (OFF → ON) P5-99: Event Falling-edge Trigger Command (ON → OFF) Suitable application: sensor, preset trigger procedure
Software	P5-07	Set P5-07 to the desired trigger procedure number (PR) and it will trigger the dedicated position command immediately. P5-07 can be set through the keypad / communication (RS-232/485 and CANopen). Suitable application: PC or PLC commands the servo drive by using the communication. The number from 0 to 63 can be put into P5-07 to call a PR respectively. PR#0 is defined as homing procedure. The P5-07 will reply appropriate message about the result of executing PR.
Others	Trigger the command after Capture operation. Trigger the command after E-Cam is disengaged.	After Capture operation is completed, it will trigger PR 50. This function is enabled by the Bit3 setting of P5-39. After the electronic cam is disengaged, it will return to PR mode and trigger the specified PR designated by BA setting of P5-88. (ASDA-A2 series L type models do not provide this function.)

## 7.10 Parameter Settings

- 1) Target speed: P5-60 ~ P5-75 (Moving Speed Setting of Position 0 ~ 15), total 16 groups

Bit	15 ~ 0
W0	TARGET_SPEED : 0.1 ~ 6000.0(r/min)

- 2) Accel / Decel time: P5-20 ~ P5-35 (Accel / Decel Time 0 ~ 15), total 16 parameters

Bit	15 ~ 0
W0	T_ACC / T_DEC : 1 ~ 65500(msec)

Note: The acceleration time is used for DO signals, STP/EMS/NL(CWL)/PL(CCWL) when users want to stop the motor. The function of P5-07 will refer to this setting when perform stop positioning as well.

- 3) Delay time: P5-40 ~ P5-55 (Delay Time 0 ~ 15), total 16 groups.

Bit	15 ~ 0
W0	IDLE : 0 ~ 32767(msec)

- 4) PR parameters: P5-00 ~ P5-09, P6-00 ~ P6-01, total 12 DWORD.

	32 BIT
P5-00	Reserved
P5-01	Reserved (for internal testing, do not use it)
P5-02	Reserved (for internal testing, do not use it)
P5-03	Deceleration Time of Protection Function
P5-04	Homing Mode
P5-05	1st Speed Setting of High Speed Homing
P5-06	2nd Speed Setting of Low Speed Homing
P5-07	Trigger Position Command (PR mode only)
P5-08	Forward Software Limit
P5-09	Reverse Software Limit
P6-00	Homing Definition
P6-01	Homing Definition Value (Z pulse position)



## 5) PR Definition: P6-02 ~ P7-27, (64 BIT), total 63 groups (2N)

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
DW0	...	...	...	...	...	...	...	TYPE
DW1	DATA (32 bit)							

Each PR occupies two parameters. TYPE determines the PR type or function. DATA indicates PR data and the others are auxiliary information.

## 6) Constant Speed Control: TYPE = 1

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
DW0	-	-	DLY	-	DEC	ACC	OPT	1
DW1	DATA (32 bit): Target speed. Unit: Defined by OPT.UNIT							

When executing this command, the motor will accelerate or decelerate from current speed (the value does not necessarily have to be 0.). Once the motor reach the target speed, it indicates that this command is completed and the motor will continue running in this target speed and will not stop.

## OPT:

OPT			
Bit 7	Bit 6	Bit 5	Bit 4
-	UNIT	AUTO	INS

※ When the TYPE is set to 1 ~ 3, it can accept DO signals, STP (Motor Stop), SNL(SCWL, Reverse Software Limit), SPL(SCCWL, Forward Software Limit).

INS: Insertion command on PR

AUTO: When the motor speed reaches the constant speed area, the motor moves to the next dedicated PR automatically.

UNIT: 0 ~ 1. 0: Unit is 0.1r/min 1: Unit is PPS(Pulse Per Second)

## ACC / DEC: 0 ~ F. Accel / Decel time number (4 bits)

ACC / DEC (4)
---------------

Index P5-20 ~ P5-35

## SPD: 0 ~ F. Target speed (4 bits)

SPD (4)
---------

Index P5-60 ~ P5-75

DLY: 0 ~ F. Delay time number (4 bits). The digital output of this PR activates after the delay time. External INS is not valid. The delay time number settings correspond with the parameter P5-40 ~ P5-55.

DLY (4)
---------

Index P5-40 ~ P5-55

- 7) Position Control: (TYPE = 2, Single positioning control. Motor stops when positioning is completed. TYPE = 3: Auto positioning control. Motor goes to next dedicated PR when positioning is completed.)

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
DW0	-	-	DLY	SPD	DEC	ACC	OPT	2 or 3
DW1	DATA (32 bit): Target position, Unit: Pulse of User Unit							

OPT:

OPT				
Bit 7	Bit 6	Bit 5	Bit 4	Explanation
CMD		OVLP	INS	
0	0	-	-	Absolute position command: Cmd_E = DATA (Note 1)
1	0			Incremental position command: Cmd_E = Cmd_E + DATA (Note 2)
0	1			Relative position command: Cmd_E = Current feedback position + DATA (Note 3)
1	1			Capture position command: Cmd_E = Capture position + DATA (Note 4)

※ When the TYPE is set to 1 ~ 3, it can accept DO signals, STP (Motor Stop), SNL(SCWL, Reverse Software Limit), SPL(SCCWL, Forward Software Limit).

INS: Insertion command on PR.

OVLP: Overlap the next PR. When OVLP is enabled, please set DLY to 0. This function is not available in speed mode. In position mode, DLY becomes disabled.

CMD: The calculation method for Cmd\_E (End of position command) is described in the notes below:

Note 1: The end of position command is an absolute position command which is equal to DATA directly.

Note 2: The end of the position command is an incremental position command which is equal to the end of the position command (Cmd\_E, monitor variable 40h) plus a designated DATA.

Note 3: The end of the position command is a relative position command which is equal to current feedback position (monitor variable 00h) plus a designated DATA.

Note 4: The end of the position command is a capture position command which is equal to capture position (monitor variable 2Bh) plus a designated DATA.

8) Special Function: TYPE = 7. Jump to the dedicated PR.

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
DW0	-	-	DLY	-	FUNC_CODE	-	OPT	7
DW1	PR Number ( 0 ~ 63 )							

OPT:

OPT			
Bit 7	Bit 6	Bit 5	Bit 4
-	-	-	INS

PR Number: Dedicated jump PR

FUNC\_CODE: Reserved

DLY: Delay time after jump

9) Special Function: TYPE = 8, Write the specified parameter.

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
DW0	0	S_D	DLY	DESTINATION			OPT	8
DW1	SOURCE							

DLY: Delay time after writing the parameters

If Bit 28 ~ Bit 31 is not set to 0x0, the fault AL213 (Write parameter error) will occur.

S\_D: Data resource and write destination

S_D					
Bit 27	Bit 26	Bit 25	Bit 24	Explanation	
SOUR		Rsvd	DEST	Data Source	Write Destination
0	0	0	0	Constant	Parameter Px-xx
0	1		0	Parameter Px-xx	Parameter Px-xx
1	0		0	Data Array	Parameter Px-xx
1	1		0	Monitor Variable	Parameter Px-xx
0	0		1	Constant	Data Array
0	1		1	Parameter Px-xx	Data Array
1	0		1	Data Array	Data Array
1	1		1	Monitor Variable	Data Array

If Rsvd is not set to 0x0, a fault, AL213 will occur (see Chapter 11 Troubleshooting).

OPT:

OPT			
Bit 7	Bit 6	Bit 5	Bit 4
-	-	AUTO	INS

Para\_Data: Write data

INS: Insertion command on PR.

AUTO: When current positioning is completed, the motor moves to the next dedicated PR automatically.

ROM: 1 indicates that the specified parameter is written into EEPROM simultaneously. (The specified parameter is written into EEPROM simultaneously when the write destination is Parameter Px-xx. If the write destination is Data Array, the specified parameter will not be written into EEPROM simultaneously.)

DESTINATION: Write destination

	DESTINATION		
	Bit 19 ~ 16	Bit 15 ~ 12	Bit 11 ~ 8
When DEST = 0, the write destination is Parameter Px-xx	P_Grp	P_Idx	
When DEST = 1, the write destination is data array.	Array_Addr		

P\_Grp, P\_Idx: Specified parameter group and number

Array\_Addr: Position of the specified data array.

SOURCE: Data source settings

Bit	SOURCE							
	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
When SOUR = 00, the data source is constant	Para_Data							
When SOUR = 01, the data source is parameter Px-xx	Rsvd (0x0000 0)					P_Grp	P_Idx	
When SOUR = 10, the data source is data array	Rsvd (0x0000 0)					Array_Addr		
When SOUR = 11, the data source is monitor variable	Rsvd (0x0000 00)						Sys_Var	

P\_Grp, P\_Idx: The specified parameter group and number.

Array\_Addr: The position of the specified data array.

Para\_Data: The written constant data.

Sys\_Var: Monitor parameter code. Please refer to the settings of parameter P0-02.

Rsvd: If Rsvd is not set to 0x0, the fault AL213 will occur.

P\_Grp: When the value of P\_Grp exceeds the setting range, the fault AL217 will occur.

P\_Idx: When the value of P\_Idx exceeds the setting range, the fault AL209 will occur.

Array\_Addr: When the value of Array\_Addr exceeds the setting range, the fault AL213 will occur.

Sys\_Var: When the value of Sys\_Var exceeds the setting range, the fault AL231 will occur.

For more descriptions of the faults AL213, AL217, AL209 and AL231, please see Chapter 11 Troubleshooting.

Please note:

1. For the firmware version V1.013 and earlier models:

If the values of the parameters can be retained when power is off, the new setting values will be written into EEPROM. Please note that do not frequently write data into EEPROM as doing this may damage EEPROM.

2. For the firmware version V1.013 including models that will be released afterwards:

The new parameter value will not be written into EEPROM when using PR (TYPE=8). Thus, it will not shorten the life of EEPROM.

Note:

Using PR procedure to write parameter is for turning ON/OFF or adjusting some functions (e.g. adjust P2-00, Proportional Position Loop Gain according to different PR command.) Usually, this procedure repeats during operation. If parameters are all written into EEPROM, EEPROM will easily be damaged.

3. If the operation of writing parameter to the dedicated PR is failed, the fault AL213 ~ AL219 will occur (see Chapter 11 Troubleshooting). If any fault occurs, the motor will not move to the next dedicated PR automatically when current positioning is completed.

10) Special Function: TYPE = 0xA, Indexing command.

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
DW0	-	OPT2	DLY	SPD	DEC	ACC	OPT	0xA
DW1	DATA (32 bit): Indexing Coordinate Command, Unit: Pulse of User Unit							

OPT:

OPT					
Bit 7		Bit 6		Bit 5	Bit 4
DIR					
00: Always move forward (Forward Rotation) 01: Always move reverse (Reverse Rotation) 10: Shortest distance (Judging by the current position and target position) 11: Reserved					
				OVLP	INS

INS: Insertion command on PR.

OVLP: Overlap the next PR. When OVLP is enabled, please set DLY to 0. This function is not available in speed mode. In position mode, DLY becomes disabled.

OPT2:

OPT2			
Bit 27	Bit 26	Bit 25	Bit 24
-	AUTO	-	S_LOW

AUTO: When current positioning is completed, the motor moves to the next dedicated PR automatically.

S\_LOW: 0 ~ 1, speed unit selection. 0: Unit is 0.1r/min 1: U Unit is 0.01r/min

DATA (DW1): Data format

DW1: DATA (32 bits)
PUU: 0~ (P2-52-1)

P2-52: Indexing Coordinate Command

11) Homing Definition: P6-00 ~ P6-01, (64 bits), total 1 group.

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
DW0	BOOT	-	DLY	-	DEC1	ACC	PATH	BOOT
DW1	ORG_DEF (32 bit)							

PATH (PR): 0 ~ 3F. (6 bits)

00: Stop mode. Motor stops after homing is completed.

1~63 (01 ~ 3F): Auto mode. Motor goes the dedicated PR 1 ~ 63 after homing is completed.

ACC: Acceleration time

DEC1: 1st deceleration time / 2nd deceleration time..

DLY: Delay time

BOOT: Boot mode. Disable or enable homing function when the servo drive is applied to power (power on).

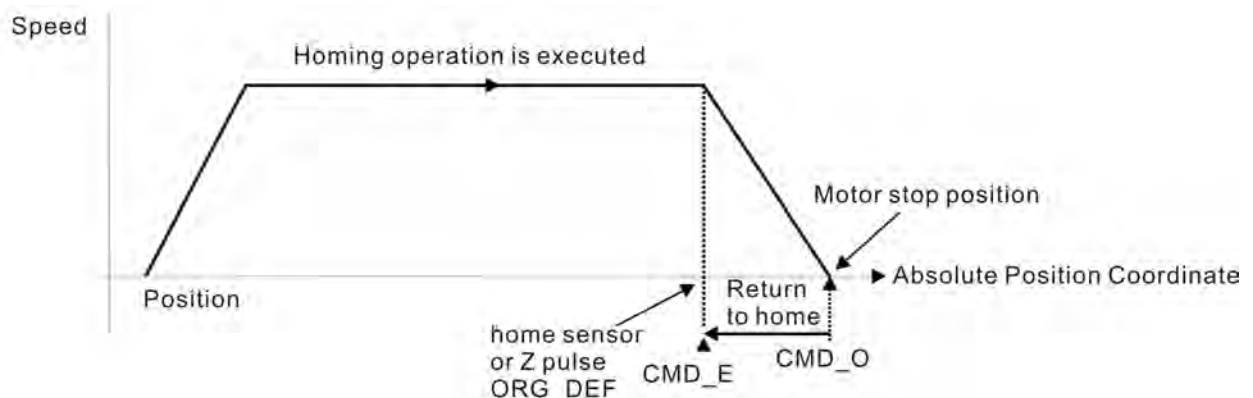
0: Disable homing function

1: Enable homing function (when the servo drive is applied to power, first time Servo On)

ORG\_DEF: Homing definition value which is determined by the parameter P6-01. The homing definition value does not necessarily have to be 0.

1) ASDA-A2 series does not provide the functions that find Z pulse and regard Z pulse as “Home”. Therefore, it needs to decide if the motor return to Z pulse position when homing operation is completed.

After home sensor or Z pulse is found, the motor must accelerate to stop. Generally, the motor stop position will be a little ahead of the position of Z pulse.



Do not return to Z pulse: Set PR=0

Return to Z pulse: Set PR=a non-zero value and set absolute position command = ORG\_DEF.

CMD\_O : Command Output Position

CMD\_E : Command End Position

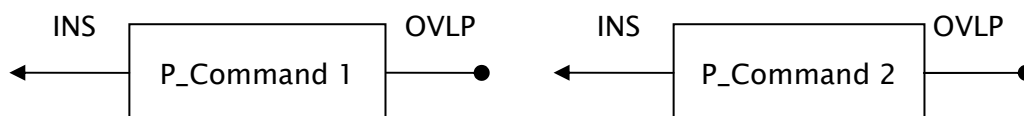
- 2) Position offset values are not defined when performing homing operation. After homing operation, the position offset values can be set as a dedicated PR.

For example, if users want the motor to move a distance S (relative to home sensor or Z pulse), and defined the position coordinate as P, set PR as a non-zero value and set ORG\_DEF=P - S.

(P is the absolute position command and S is the incremental position command)

### 7.10.1 Motion Commands

- 1) Each motion command can be inserted (INS) or overlapped (OVLP).



- 2) The priority of INS is higher than OVLP.

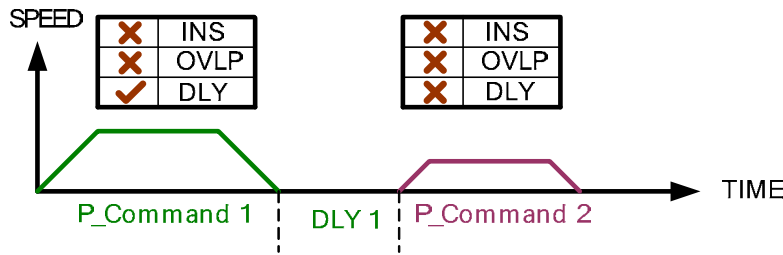
P_Command 1	P_Command 2	Sequence	Output	Note
OVLP=0	INS=0	Sequential Command	DLY 1	P_Command 1 and P_Command 2 can be speed or position command.
OVLP=1	INS=0	Overlap Command	NO DLY	When P_Command 2 is a speed command, OVLP function is disabled.
OVLP=0	INS=1	Insertion Command	N/A	P_Command 1 and P_Command 2 can be speed or position command.
OVLP=1				



### 7.10.2 Sequence

#### 1) Sequential Command on PR

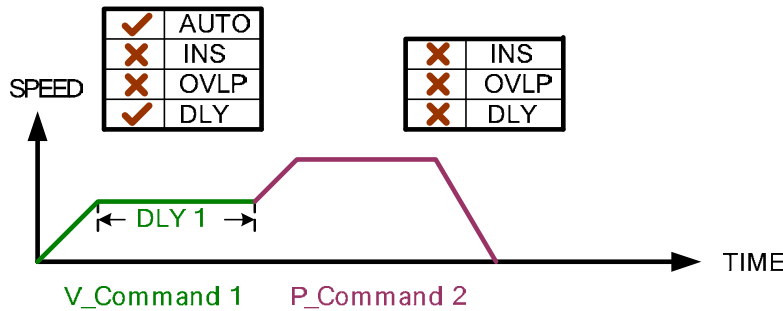
A command will be executed only when the previous command completed.



P\_Command 1: DLY is set

P\_Command 2: INS is not set

(DLY: Delay time is calculated from the time when the position command is completed)



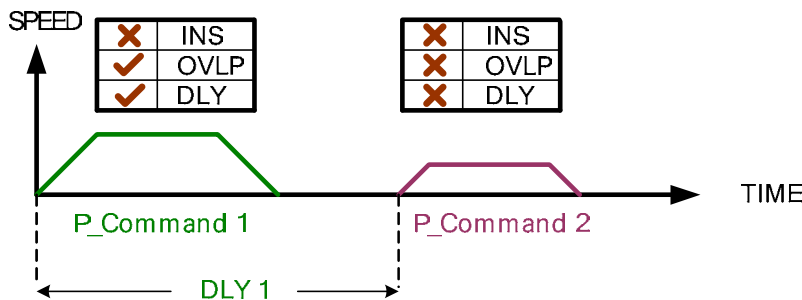
V\_Command 1: Speed command. DLY is set

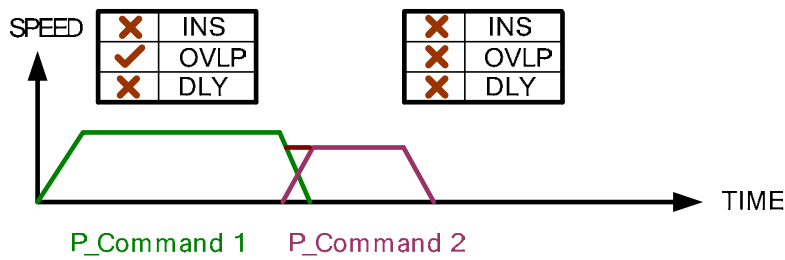
P\_Command 2: Position command.

(DLY: Delay time is calculated from the time when the position command is completed)

#### 2) Overlap Command

The second command will be executed after delay time or during deceleration period. A long delay time at the first command will affect the timing of second command. Zero delay is recommended for overlap application.



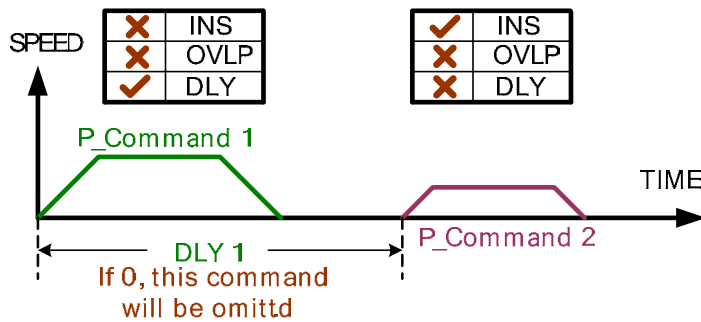


P\_Command 1: OVLP is set, DLY can not be set.

P\_Command 2: INS is not set

### 3) Internal Insertion Command

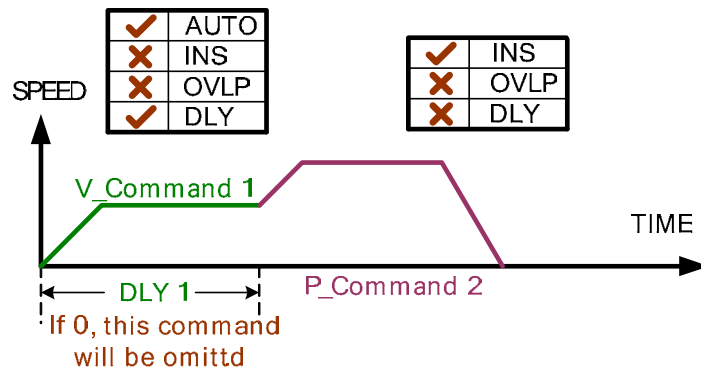
The second command will insert the first command to be a new command. The final result depends on the types of commands. The delay time gets function.



The final destination :

Absolute :  $Cmd\_E = command$

Relative, Incremental:  
 $Cmd\_E = last\ Cmd\_E + command$



The final destination :

Absolute :  $Cmd\_E = command$

Relative, Incremental:  
 $Cmd\_E = last\ Cmd\_E + command$

V\_Command 1: Speed Command. DLY is set

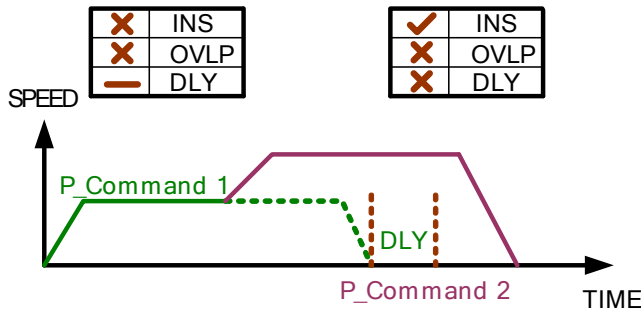
P\_Command 2: Position Command. INS is set

(DLY is valid for internal insertion command)

This procedure can be used to create complicated position profile.

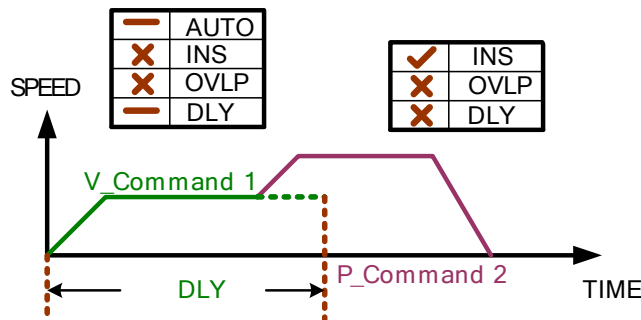
#### 4) External Insertion Command

The external insertion will change the command being executed at the moment it inserted. The delay time is not a matter for external insertion.



The final destination :

- Absolute :  $Cmd\_E = command$
- Relative :  $Cmd\_E = Fb\_PUU + command$
- Incremental :  $Cmd\_E = last\ Cmd\_E + command$
- Cap. Relative :  $Data\ captured + command$



The final destination :

- Absolute :  $Cmd\_E = command$
- Relative :  $Cmd\_E = Fb\_PUU + command$
- Incremental :  $Cmd\_E = last\ Cmd\_E + command$
- Cap. Relative :  $Data\ captured + command$

V\_Command 1: Speed Command. The delay time is not a matter for external insertion.

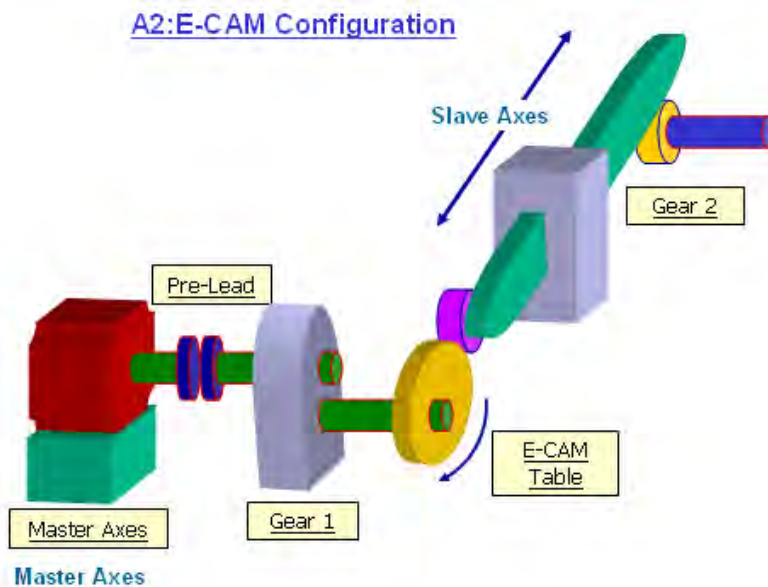
P\_Command 2: Position Command. INS is set (DLY is not valid for external insertion command)

This procedure can be used to change position profile freely.

## 7.11 Electronic Cam (E-Cam) (ASDA-A2 series L type models do not provide this function)

From Machine Cam to Electronic Cam

The concept of electronic cam (E-Cam) is to use the software settings to determine the position relationship between master axis (Master) and slave axis (Slave), almost like a virtual electronic cam exists between both of them. Please refer to the figure below.



In PT mode, the external input pulse number (from master axis) is the reference of the position command (from slave axis). It indicates the slave axis follows the master axis. The relationship between master axis and slave axis is a linear relationship (The ratio is electronic gear ratio). When the electronic cam function is enabled, the relationship between master axis and slave axis is no longer a linear relationship only. It will become a cyclic curve relationship, just like the profile of the electronic cam. In the traditional mechanical system, a machine cam (physical cam) can convert the simple constant speed motion to variable speed motion, reciprocating motion and intermittent motion, etc. a wide range of motion control operation. The electronic cam can provide the same function and make the system to be used for a variety of motion control applications as well.

Please refer to the table below to know the differences between a machine cam (physical cam) and an electronic cam (virtual cam).

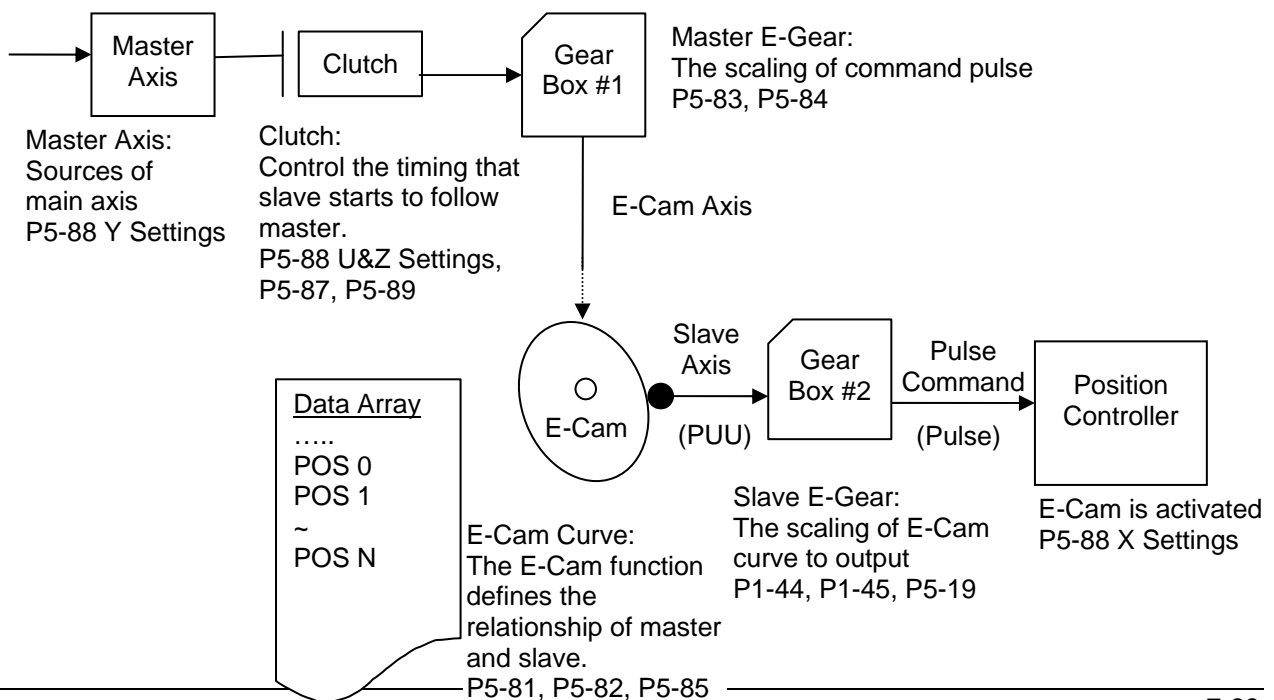
	Machine Cam (Physical Cam)	Electronic Cam
Structure	Return to the original position after one rotation.	After E-Cam rotates 360 degrees (one revolution), it can return to the original position and also can display by spiral form like mosquito coil incense.
Smooth Performance	Determined by actual process precision	Three curves can be interpolated between two positions upon software.
Position Accuracy	The position accuracy is very precise (under the condition of no vibration)	The position accuracy is very precise, but the actual motor position will be a little deviated due to the delay time.
Long Distance Motion	When the motion distance is longer, the system needs bigger machine cam. Making a big machine cam is not easy.	Only need to change the values of E-Cam curve. It is applicable for the application of long motion distance.
If master axis can be eliminated	Master axis can not be eliminated	Master axis can be eliminated for constant speed motion application. Users can use the signals that generated by the servo drive.
Replacement	Need of replacement or repair. It will cost money.	No need of replacement or repair. Users only need to reset the parameter settings.
Maintenance	Machine will wear. Maintenance is necessary.	Maintenance is not necessary.
Other	Master axis will occupy the space and consume the power.	Space and energy saving. Good for environmental protection.

#### ■ Characteristics of E-Cam:

Characteristics of E-Cam	
Control Mode	E-Cam function is available only in PR mode.
Enable E-Cam Function (P5-88 X Settings)	X=0: Disable E-Cam function (Default). If E-Cam has been engaged already, setting X=0 will force E-Cam to be disengaged. X=1 : Enable E-Cam function.
States of E-Cam	There are three statuses: <b>Stop / Lead Pulse / Engaged</b>
Sources of Master Axis (P5-88 Y Settings)	<ul style="list-style-type: none"> <li>● Physical axes: <ul style="list-style-type: none"> <li>■ P5-88 Y=1. Linear Encoder (CN5)</li> <li>■ P5-88 Y=2. Pulse Command (CN1)</li> </ul> </li> <li>● Output axis: <ul style="list-style-type: none"> <li>■ P5-88 Y=0. Capture source setting. (Defined by Capture function, P5-39 B settings)</li> </ul> </li> <li>● Virtual axes: <ul style="list-style-type: none"> <li>■ P5-88 Y=3. PR command (Internal signal)</li> <li>■ P5-88 Y=4. 1ms clock (Internal signal)</li> <li>■ P5-88 Y=5. Synchronous Capture Axis (P5-77)</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>■ P5-88 Y=6. Analog channel 1</li> </ul>
Servo Drive Command	<p>Servo drive command = E-Cam command + PR command</p> <ul style="list-style-type: none"> <li>● The command will be sent only when E-Cam is engaged.</li> <li>● No matter E-Cam is <b>engaged</b> or not, PR command is valid. Only when E-Cam is engaged, the source of master axis is PR command and PR command is set to 0.</li> </ul> <p>When E-Cam operates, users can adjust E-Cam position through PR command still (usually using incremental position command).</p>
Data Storage Location	<ul style="list-style-type: none"> <li>● Data array. The E-Cam curve is stored in the data array. P5-81 notes its start point where P5-82 +1 (720+1, maximum items of one E-Cam curve) is for its length. P5-85 is the initial point where the E-Cam engaged.</li> </ul>
E-Cam Curve Division	<ul style="list-style-type: none"> <li>● It is set by P5-82. Range: 5 ~ 720</li> </ul>
Data Format	<ul style="list-style-type: none"> <li>● 32-bit data with polarity</li> </ul>
Data Content	<ul style="list-style-type: none"> <li>● Save the position of slave axis (user unit: PUU)</li> </ul>
Calculation Method of E-Cam Position	<ul style="list-style-type: none"> <li>● Pulses of E-Cam master axis output incrementally → E-Cam Axis</li> <li>● Pulses of E-Cam slave axis output incrementally → Position Command</li> <li>● After E-Cam rotates one revolution, the slave axis may not return to the original position definitely. The position of the slave axis is determined by the content of E-Cam curve.</li> <li>● Three curves can be interpolated between two positions upon software. The adjacent curves at the ends continue quadratic differential equation and make the torque of the ends to be smooth.</li> </ul>
DO signal: CAM_AREA (DO=0x18)	<ul style="list-style-type: none"> <li>● DO signal : CAM_AREA. When CAM_AREA is activated, it indicates that the servo drive has detected the E-Cam master position is within the setting area.</li> </ul>

The function block diagram of E-Cam is shown as the figure below:

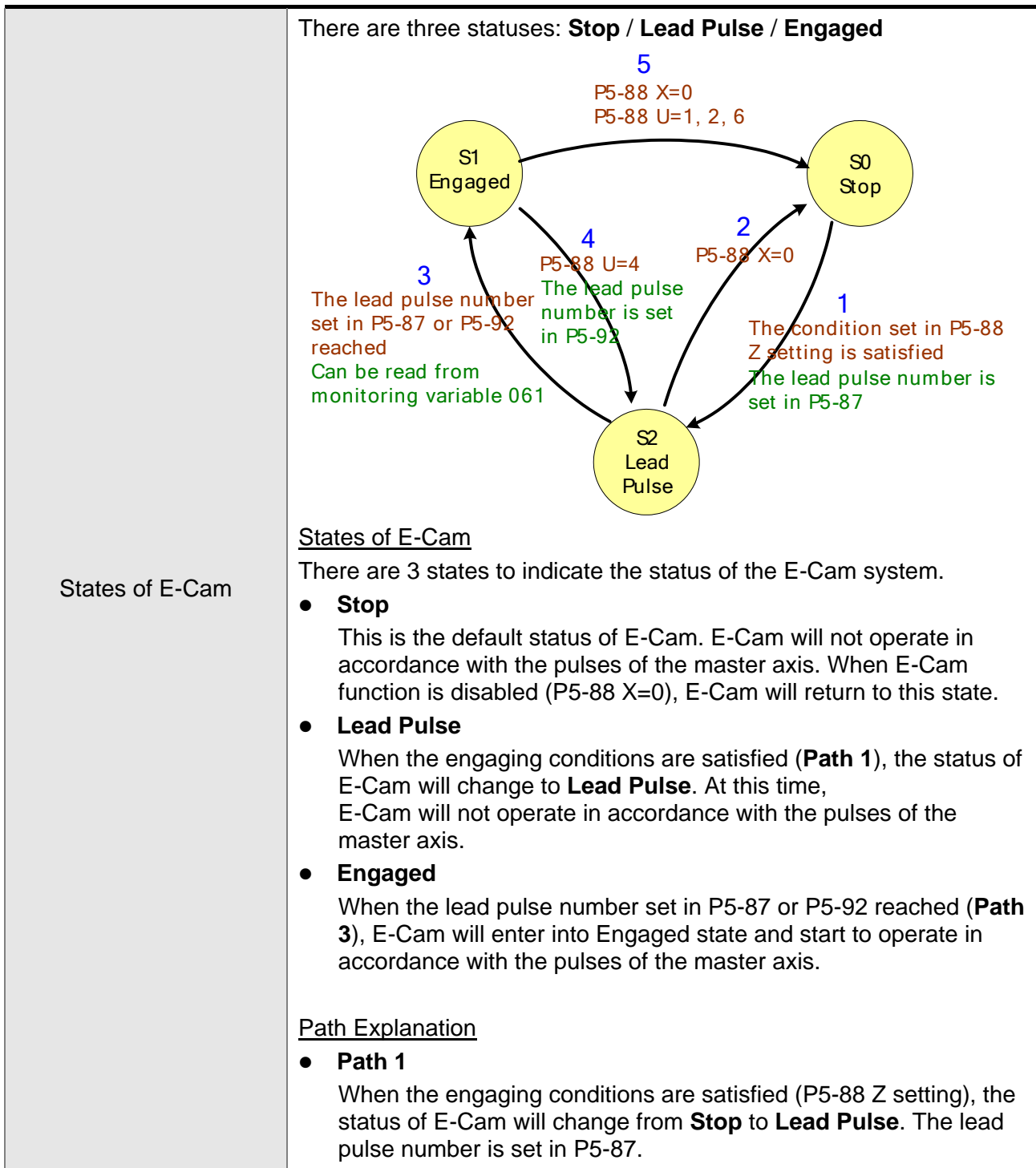


## ■ Function of Master Axis

Function of Master Axis	
Descriptions	The movement of the master axis is the signal which enables E-Cam operation of the servo drive.
Source of Master Axis (P5-88 Y Settings)	<p>The command source of the master axis is determined by P5-88 Y settings.</p> <ul style="list-style-type: none"> <li>● Physical axes: <ul style="list-style-type: none"> <li>■ P5-88 Y=1. Linear Encoder (CN5)</li> <li>■ P5-88 Y=2. Pulse Command (CN1)</li> </ul> </li> <li>● Output axis: <ul style="list-style-type: none"> <li>■ P5-88 Y=0. Capture source setting. (Defined by Capture function, P5-39 B settings)</li> </ul> </li> <li>● Virtual axes: <ul style="list-style-type: none"> <li>■ P5-88 Y=3. PR command (Internal signal)</li> <li>■ P5-88 Y=4. 1ms clock (Internal signal)</li> <li>■ P5-88 Y=5. Synchronous Capture Axis (P5-77)</li> <li>■ P5-88 Y=6. Analog channel 1</li> </ul> </li> </ul>
Position of Master Axis (P5-86)	<p>Using P5-86 can monitor the position of the master axis. Before E-Cam is engaged, P5-86 can be set and changed still. Doing this will not affect the position of the slave axis because the movement of the master axis does not change as well.</p> <p>When the E-Cam is activated (P5-88 X=1), the pulse will be counted in P5-86. The P5-86 should be an increasing number. If not, reverse the pulse direction (not motor direction).</p>

## ■ Function of Clutch

Function of Clutch	
Descriptions	<p>This function is used to determine the engaging and disengaging state of the master axis and gear box # 1.</p> <p>After E-Cam is engaged, then the movement of the master axis is able to rotate E-Cam of the servo drive.</p>
Enable E-Cam Function (P5-88 X Settings)	<p>X=0: Disable E-Cam function (Default). If E-Cam has been engaged already, setting X=0 will force E-Cam to be disengaged.</p> <p>X=1: Enable E-Cam function.</p>





Function of Clutch	
States of E-Cam	<ul style="list-style-type: none"> <li>● <b>Path 2</b> When E-Cam function is disabled (P5-88 X=0), the status of E-Cam will return to <b>Stop</b>.</li> <li>● <b>Path 3</b> When the lead pulse number set in P5-87 or P5-92 reached, , the status of E-Cam will change from <b>Lead Pulse</b> to <b>Engaged</b>.</li> <li>● <b>Path 4</b> When disengaging conditions are satisfied (P5-88 U=4), the status of E-Cam will change from <b>Engaged</b> to <b>Lead Pulse</b>. When the electronic gear is disengaged, the status of E-Cam will not change to <b>Stop</b>. It will change to <b>Lead Pulse</b> and the lead pulse number at this time is set in P5-92 (this function is only available for the firmware version V1.006sub04 and later models).</li> <li>● <b>Path 5</b> When disengaging conditions are satisfied (P5-88 U=1, 2, 6), or when E-Cam function is disabled (P5-88 X=0), the status of E-Cam will change from <b>Engaged</b> to <b>Stop</b>.</li> </ul>
Engaging Conditions (P5-88 Z Settings)	<p>When E-Cam is in the status of <b>Stop</b>, this function is used to determine the engaging timing (<b>Path 1</b>).</p> <p>Three conditions to engage the clutch:</p> <p>Z=0: Engage immediately when E-Cam function is enabled (When P5-88 X=1)</p> <p>Z=1: Engage when DI signal, CAM (DI=0x36) is ON.</p> <p>Z=2: Any action of Capture function. E-Cam engaged after the next position is captured.</p> <p>The Capture function is designed to activate E-Cam because of its high speed input. When the Capture function fetches the position, it will bring the E-Cam function enforcement simultaneously. Because the Capture operation is controlled by external control command (hardware), and no delay occurs, this setting is suitable for the application requires real time such as the master axis is already operating before E-Cam is engaged.</p>
Lead Pulse Number (Monitoring Variable 061)	<ul style="list-style-type: none"> <li>● When E-Cam is in the status of <b>Lead Pulse</b>, the master axis needs to move for a certain distance and then E-Cam is able to be engaged (<b>Path 3</b>). This movement is called as <b>Lead Pulse Number</b> and it can be monitored by the <b>monitoring variable 061</b>. The value of lead pulse number will descend according to the input pulses of the master axis. When the value of lead pulse number becomes 0, the status of E-Cam will change to <b>Engaged</b>.</li> <li>● When the status of E-Cam changes to <b>Lead Pulse</b> by <b>Path 1</b>, the lead pulse number is set in <b>P5-87</b>.</li> <li>● When the status of E-Cam changes to <b>Lead Pulse</b> by <b>Path 4</b>, the lead pulse number is set in <b>P5-92</b>.</li> <li>● If the setting value of P5-87 and P-92 is 0, it indicates that there is no lead pulse number and the status of E-Cam will change to <b>Engaged</b> immediately.</li> </ul> <p>+ / - signs indicates the direction of lead pulse. Please note that if the polarity of the direction of lead pulse is set incorrectly, E-Cam will not be engaged.</p>

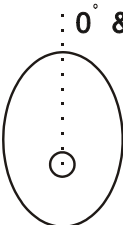
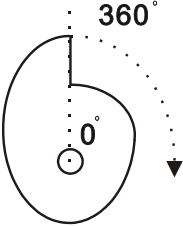
Function of Clutch																						
Lead Pulse Number (Monitoring Variable 061)	When the direction of lead pulse is not set correctly, it will cause that the value of the <b>monitoring variable 061</b> becomes higher and higher and finally lead to overflow. At this time, E-Cam function will be disabled (P5-88 X=0) and the status of E-Cam will be forced to be changed to <b>Stop</b> .																					
Disengaging Timing (P5-88 U Settings)	<p>This option is used to determine the disengaging timing when the status of E-Cam is <b>Engaged</b>.</p> <p>Please note that the condition 2, 4, and 6 are mutually exclusive; that is, only one of them can be selected.</p> <table border="1"> <thead> <tr> <th>U</th> <th>Disengaging Conditions</th> <th>States of E-Cam when disengaging</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Do not disengage. When P5-88 X=0, E-Cam disengaged.</td> <td><b>(Path 5)</b> Change to the status of <b>Stop</b></td> </tr> <tr> <td>1</td> <td>Disengage when DI signal, CAM (DI=0x36) is OFF.</td> <td><b>(Path 5)</b> Change to the status of <b>Stop</b></td> </tr> <tr> <td>2</td> <td>Fixed number of master pulses (P5-89) to disengage. (The polarity sign indicates the direction)</td> <td><b>(Path 5)</b> Change to the status of <b>Stop</b></td> </tr> <tr> <td>6</td> <td>(This setting is only available in firmware V1.009 and later models) Fixed number of master pulses (P5-89) to disengage for smooth speed. The function is the same as the setting of U=2. The difference is that the speed will not change when disengaging and the engaging length will exceed the setting value of P5-89 a little. This setting is suitable for the application which needs to use PR command immediately when disengaging.</td> <td><b>(Path 5)</b> Change to the status of <b>Stop</b></td> </tr> <tr> <td>4</td> <td>(This setting is only available in firmware V1.009 and later models) Fixed number of master pulses (P5-89) to disengage with cycle function. (The polarity sign indicates the direction)</td> <td><b>(Path 4)</b> Return to the status of <b>Lead Pulse</b> (before engaging) (The lead pulse number is set in P5-92).</td> </tr> <tr> <td>8</td> <td>Shut down E-Cam when disengaging.</td> <td>P5-88 X=0</td> </tr> </tbody> </table>	U	Disengaging Conditions	States of E-Cam when disengaging	0	Do not disengage. When P5-88 X=0, E-Cam disengaged.	<b>(Path 5)</b> Change to the status of <b>Stop</b>	1	Disengage when DI signal, CAM (DI=0x36) is OFF.	<b>(Path 5)</b> Change to the status of <b>Stop</b>	2	Fixed number of master pulses (P5-89) to disengage. (The polarity sign indicates the direction)	<b>(Path 5)</b> Change to the status of <b>Stop</b>	6	(This setting is only available in firmware V1.009 and later models) Fixed number of master pulses (P5-89) to disengage for smooth speed. The function is the same as the setting of U=2. The difference is that the speed will not change when disengaging and the engaging length will exceed the setting value of P5-89 a little. This setting is suitable for the application which needs to use PR command immediately when disengaging.	<b>(Path 5)</b> Change to the status of <b>Stop</b>	4	(This setting is only available in firmware V1.009 and later models) Fixed number of master pulses (P5-89) to disengage with cycle function. (The polarity sign indicates the direction)	<b>(Path 4)</b> Return to the status of <b>Lead Pulse</b> (before engaging) (The lead pulse number is set in P5-92).	8	Shut down E-Cam when disengaging.	P5-88 X=0
	U	Disengaging Conditions	States of E-Cam when disengaging																			
	0	Do not disengage. When P5-88 X=0, E-Cam disengaged.	<b>(Path 5)</b> Change to the status of <b>Stop</b>																			
	1	Disengage when DI signal, CAM (DI=0x36) is OFF.	<b>(Path 5)</b> Change to the status of <b>Stop</b>																			
	2	Fixed number of master pulses (P5-89) to disengage. (The polarity sign indicates the direction)	<b>(Path 5)</b> Change to the status of <b>Stop</b>																			
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	4	(This setting is only available in firmware V1.009 and later models) Fixed number of master pulses (P5-89) to disengage with cycle function. (The polarity sign indicates the direction)	<b>(Path 4)</b> Return to the status of <b>Lead Pulse</b> (before engaging) (The lead pulse number is set in P5-92).																			
8	Shut down E-Cam when disengaging.	P5-88 X=0																				
Auxiliary Function (P5-88 BA Settings)	Call PR defined in P5-88 BA settings when disengaging (only when P5-88 U=2, 4, or 6 is selected). When E-Cam returns to the status of <b>Stop</b> , the designated PR defined in P5-88 BA settings will be executed immediately.																					

### ■ Function of Gear Box #1 (Master E-Gear)

Function of Gear Box #1 (Master E-Gear)	
Function	<ul style="list-style-type: none"> <li>● This function defines the relationship of the master axis and E-Cam axis. When the master axis rotates one revolution, it does not mean that E-Cam must rotate one revolution as well. The master E-Gear can be set.</li> <li>● The master E-Gear (electronic gear) will change the resolution of master pulse command.</li> </ul>
Explanation	<ul style="list-style-type: none"> <li>● E-Cam axis is a virtual axis.</li> <li>● When E-Cam axis rotates 360 degrees, it indicates that E-Cam rotates one revolution also and the slave axis operates one cycle as well.</li> <li>● The moving unit of the master axis is pulse number. The resolution is determined by the command source.</li> </ul>
Setting Method P5-83 : M P5-84 : P	<ul style="list-style-type: none"> <li>● P5-83 and P5-84 is used to set the scaling of command pulse. After receiving the pulse number P of master axis, the axis of E-Cam will rotate M cycles. P5-83=M, P5-84=P</li> <li>● P5-83 can be adjusted while engaging.</li> </ul>

### ■ Function of E-Cam Curve

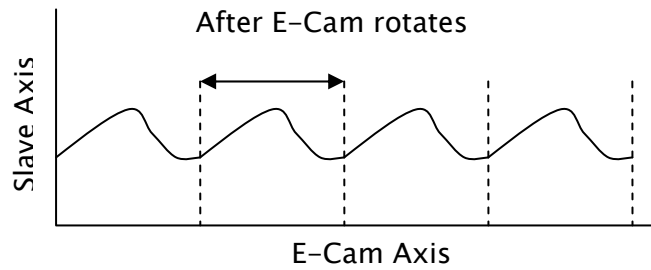
Function of E-Cam Curve	
Function	<ul style="list-style-type: none"> <li>● The E-Cam function defines the relationship of master and slave axes. The related settings are saved in E-Cam curve. When E-Cam rotates one revolution, the slave axis operates one cycle.</li> </ul>
Data Storage Location	<ul style="list-style-type: none"> <li>● Data array. The E-Cam curve is stored in the data array. P5-81 notes its start point where P5-82 +1 (720+1, maximum items of one E-Cam curve) is for its length. P5-85 is the initial point where the E-Cam engaged.</li> </ul>
Data Format	<ul style="list-style-type: none"> <li>● 32-bit data with polarity (user unit is PUU)</li> </ul>
E-Cam Curve Scaling P5-19 (-2147.000000 ~ 2147.000000)	<ul style="list-style-type: none"> <li>● It is used to magnify or minify E-Cam curve without changing the setting value of the E-Cam curve.</li> <li>● Each data in E-Cam curve can be multiplied by this parameter.</li> <li>● Range of P5-19 is:-2147.000000 ~ 2147.000000 with minimum scale of 0.000001. The change of P5-19 will be put into enforcement when the E-Cam re-engaged.</li> <li>● E-Cam curve can be a negative scaling. If P5-19 is set to negative, the result will have a upside down curve compared to P5-19 is a positive value.</li> <li>● When it is set to 0, E-Cam command will not output (always be 0).</li> </ul>
E-Cam Curve Division N	<ul style="list-style-type: none"> <li>● E-Cam curve can be divided into certain equal N parts (set by P5-82, N&gt;=5). For example, if N=5, there will be 6 points recorded in the data array. Each division has 360/N degrees.</li> <li>● 720 divisions are maximum number for one curve.</li> </ul>

Function of E-Cam Curve	
E-Cam Curve Content	<ul style="list-style-type: none"><li>● E-Cam curve saves the position data of slave axis (user unit is PUU).</li><li>● If E-Cam is divided into N parts, it means that total N+1 points are recorded in the data array. This is because the position of the first point (<math>0^\circ</math>) and the position of the last point (<math>360^\circ</math>) are not the same.<ol style="list-style-type: none"><li>1. When the positions of <math>0^\circ</math> and <math>360^\circ</math> are the same: </li><li>2. When the positions of <math>0^\circ</math> and <math>360^\circ</math> are not the same: </li></ol></li></ul>

- Suppose that:

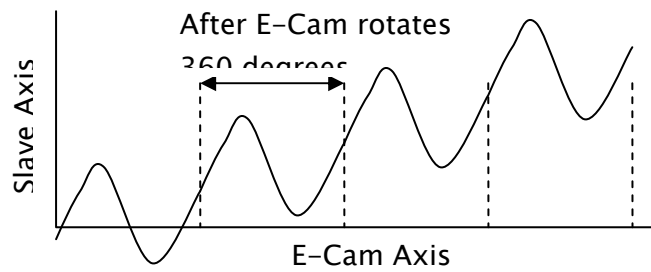
1. When the positions of  $0^\circ$  and  $360^\circ$  are the same:

It indicates that the position of slave axis will return to home after E-Cam rotates  $360^\circ$  (one revolution).



2. When the positions of  $0^\circ$  and  $360^\circ$  are not the same:

It indicates that the position of slave axis will not return to home after E-Cam rotates  $360^\circ$  (one revolution).



Function of E-Cam Curve	
Operation	<ul style="list-style-type: none"> <li>● Slave axis is a virtual axis (user unit is PUU).</li> <li>● P5-85 is the first point where the E-Cam engaged. When E-Cam engaged, the position of E-Cam axis will move to the point set by P5-85. The position of slave axis will move to the position which corresponds to P5-85.</li> <li>● After E-Cam engaged, if E-Cam axis does not move, the slave axis will not move either. After E-Cam engaged, if E-Cam moves, the position changes of E-Cam axis represent the output pulses of the slave axis.</li> <li>● When E-Cam rotates 360 degrees (one revolution), the slave axis operates one cycle.</li> <li>● E-Cam axis can rotate in either forward or reverse direction.</li> <li>● If the position of E-Cam axis is between two points of E-Cam curve, the position of the slave axis can be interpolated by cubic curves and the adjacent curves at the ends will continue quadratic differential equation and make the torque of the ends to be smooth. The point number of E-Cam curve will not affect the smooth operation of E-Cam either.</li> </ul>

#### ■ Function of Gear Box #2 (Slave E-Gear)

Function of Gear Box #2 (Slave E-Gear)	
Function	<ul style="list-style-type: none"> <li>● This function defines the relationship of slave axes and pulse command.</li> <li>● When the slave axis rotates one revolution, it does not mean that pulse command must rotate one revolution as well. The slave E-Gear can be set.</li> </ul>
Explanation	<ul style="list-style-type: none"> <li>● Slave axis is a virtual axis (user unit is PUU).</li> <li>● The unit of pulse command is encoder unit, pulse (1280000 pulse/rev)</li> <li>● When E-Cam axis rotates one revolution, the slave axis operates one cycle as well.</li> </ul>
Setting Method P1-44: Numerator of Electronic Gear Ratio P1-45: Denominator of Electronic Gear Ratio	<ul style="list-style-type: none"> <li>● When the pulse command of slave axis is L and motor runs R rotation, the electronic gear ratio will be equal to <math>P1-44/P1-45 = 1280000 \times R/L</math></li> <li>● The function is the same as the electronic gear ratio in PT and PR mode.</li> </ul>

#### ■ Digital Outputs for E-Cam Function

Digital Outputs for E-Cam Function	
Digital Outputs	<ul style="list-style-type: none"> <li>● DO signal: CAM_AREA (DO=0x18)</li> </ul>
Function	<ul style="list-style-type: none"> <li>● When DO signal, CAM_AREA is ON, it indicates that the position of E-Cam axis is within the specified angle range.</li> </ul>
When E-Cam engaged	<ul style="list-style-type: none"> <li>● Degree when P5-90 and P5-91 is set to ON</li> <li>● See Table 1 &amp; 2 below.</li> </ul>
When E-Cam disengaged	<ul style="list-style-type: none"> <li>● DO signal: CAM_AREA are OFF</li> </ul>

Table 1 P5-90 ≤ P5-91:

E-Cam Degree	0°	~	P5-90	~	P5-91	~	360°
DO:CAM_AREA	OFF	OFF	ON	ON	ON	OFF	OFF

Table 2 P5-90 &gt; P5-91:

E-Cam Angle	0°	~	P5-91	~	P5-90	~	360°
DO:CAM_AREA	ON	ON	OFF	OFF	OFF	ON	ON

### 7.11.1 Capture Function

The Capture function can be applied to latch a reference position which could be the signal of main encoder, linear encoder, or pulse train. It is possible to record 800 items with max. length of data array.

The DI7 is the only one high speed digital input in ASDA-A2. The Capture function needs DI7 to admit the signal changed in real time. The signal to DI7 for Capture function is a physical signal and cannot be simulated from software. It can complete precise Capture function for high-speed motion axis.

The characteristics of Capture function is described as follows:

Characteristics of Capture function	
Sources	<p>Three sources of Capture function:</p> <ul style="list-style-type: none"> <li>● Main encoder: Motor encoder</li> <li>● Auxiliary encoder: Linear scale</li> <li>● Pulse command: Pulse train</li> </ul> <p>The selected source axis will be displayed by P5-37. Before executing Capture function, please set P5-37 first.</p> <p>Please note: The capture source setting can not be changed when the compare source is the capture axis.</p>
Trigger Signal	<ul style="list-style-type: none"> <li>● It is triggered by DI7 and the response time is 5 usec.</li> </ul> <p>Please note: DI7 signal is a physical signal used to control Capture function directly. No matter what the setting value of P2-16 is, when DI7 is triggered, Capture function will be enabled always. After Capture function is enabled, in order to avoid the malfunction of the other DI signals, the system will force the other DI signals to be disabled, i.e. set P2-16=0x0100 automatically. Please note that the setting value of P2-16 will not be written into EEPROM when power is off. After re-power the servo drive, the setting value of P2-16 will be restored to its default setting automatically.</p>
Trigger Method	<ul style="list-style-type: none"> <li>● By edge triggered. A or B contact can be selectable.</li> <li>● It is able to capture multiple positions continuously.</li> <li>● The interval time can be set also. (It can determine how long it will take when accepting the next trigger command)</li> </ul>

Characteristics of Capture function	
Data Storage Location	<ul style="list-style-type: none"> <li>● Data array. The starting point is set in P5-36.</li> </ul>
Amount	<ul style="list-style-type: none"> <li>● The amount is determined by P5-38. But, the total amount can not exceed the limit of data array.</li> </ul>
Data Format	<ul style="list-style-type: none"> <li>● 32-bit pulse number (with polarity)</li> </ul>
Auxiliary Function	<ul style="list-style-type: none"> <li>● If Bit 1 of P5-39 X setting is set, P5-37=P5-76 after the first point is captured.</li> <li>● If Bit 2 of P5-39 X setting is set, the servo system will initiate Compare function automatically after the first point is captured.</li> <li>● If Bit 3 of P5-39 X setting is set, the servo system will call PR#50 automatically when all data in P5-38 captured completely.</li> </ul>
DO Signal: CAP_OK	<ul style="list-style-type: none"> <li>● The default setting is OFF.</li> <li>● It will be ON when the last position is captured.</li> <li>● When Bit0 of P5-39 is set to 1 (P5-39 X0=1), it will be OFF after the capture function is enabled.</li> </ul>
Remark	<ul style="list-style-type: none"> <li>● If P5-38=0 and Bit0 of P5-39 is set to 1 (P5-39 X0=1), Capture function will be disabled. At this time, Bit0 of P5-39 will be reset to 0 (P5-39 X0=0) and the DO signal, CAP_OK will be inactivated (OFF) as well.</li> <li>● The data format of Capture axis is 32-bit data. Do not calculate the capture data repeatedly; otherwise the overflow may occur and result in error or invalid result.</li> </ul>

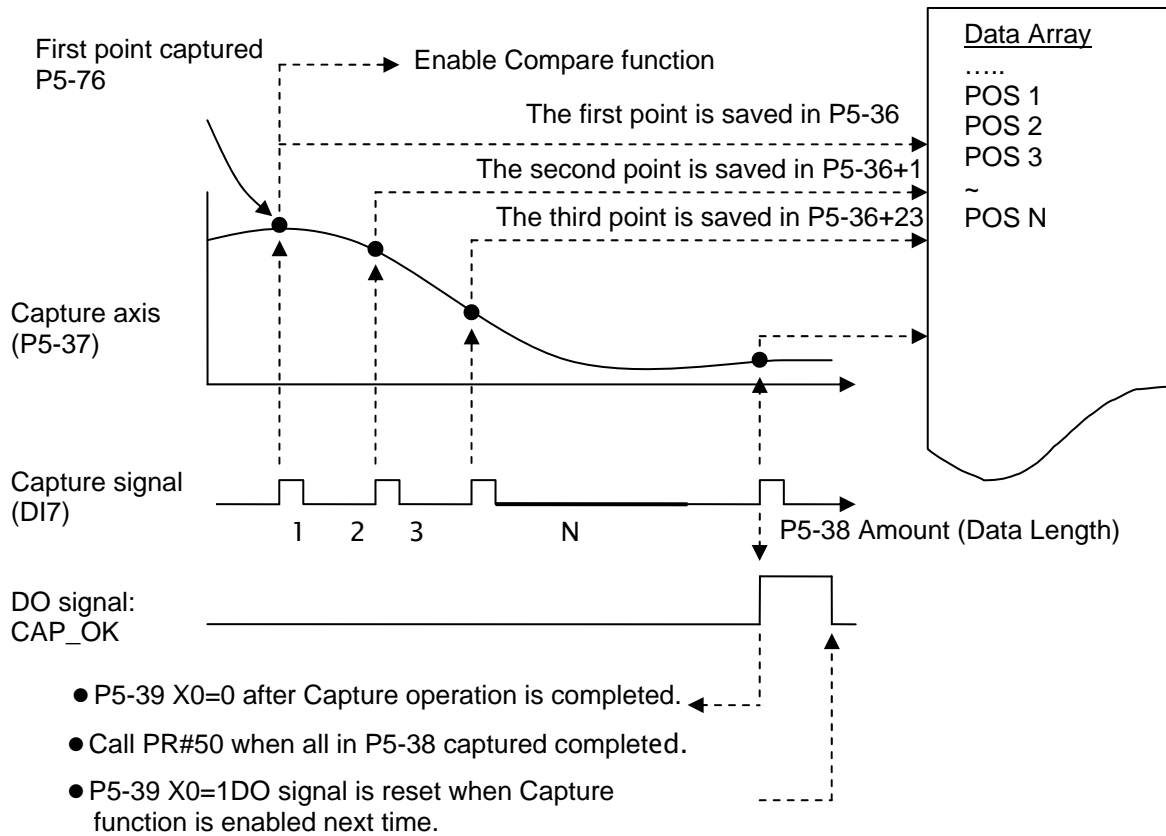
The data captured by Capture function are all stored in data array. The first captured point is stored in data array (P5-36), the capture amount is determined by P5-38 and the last captured point is stored in data array (P5-36+P5-38-1). When Bit0=1 (P5-39 X setting value), the Capture function is enabled. Once DI7 is triggered every time, one position data will be captured and stored into data array. At this time, the setting value of P5-38 will decrease 1 automatically until the capture amount is reached, i.e. the setting value of P5-38 becomes 0. When capture function has finished, the value of Bit0 (P5-39 X setting value) will be reset to 0 automatically, and DO signal, CAP\_OK will be activated.

When the first point is captured, users can choose to reset the position of Capture axis. Then, the value of the first capture point must be the value of P5-76 and the captured value after the second captured point will be the movement relative to the first captured point. This kind of Capture is called "Relative Capture". However, if users choose not to reset the first captured point, the capture method is called "Absolute Capture".

When capturing the first point, users can select to enable Compare function as well



Capture Operation:



### 7.11.2 Compare Function

The Compare function is a reverse process of the Capture function. The items stored in data array will be compared to the signal of a physical axis (main encoder, linear encoder, or pulse train).

The Compare function uses the instant position of motion axis to compare with the value which store in data array. When the compare conditions are satisfied, DO4 signal will output immediately for motion control.

The signal to DO4 for Compare function is a physical signal and cannot be simulated from software. It can complete precise Compare function for high-speed motion axis. The characteristics of Compare function is described as follows:

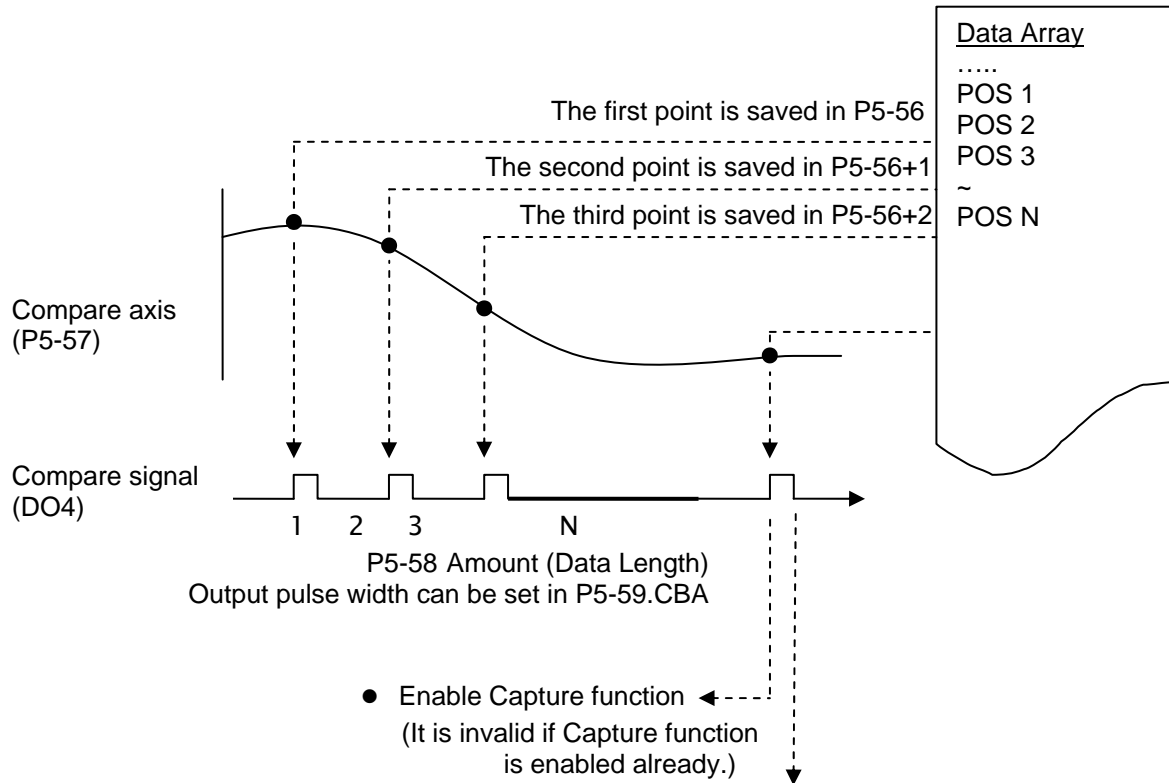
Characteristics of Compare function	
Sources	<p>Three sources of Compare function:</p> <ul style="list-style-type: none"> <li>● Main encoder: Motor encoder</li> <li>● Auxiliary encoder: Linear scale</li> <li>● Pulse command: Pulse train</li> <li>● Capture axis (When the source is the capture axis, the capture source setting can not be changed.)</li> </ul> <p>The selected source axis will be displayed by P5-57. Before executing Capture function, please set P5-57 first.</p>
Trigger Signal	<ul style="list-style-type: none"> <li>● It is output by DO4 and the response time is 5 usec.</li> </ul> <p>Please note:</p> <p>DO4 signal is a physical signal used to control Compare function directly. No matter what the setting value of P2-21 is, when DO4 is triggered, Compare function will be enabled always. After Compare function is enabled, in order to avoid the malfunction of the other DO signals, the system will force the other DO signals to be disabled, i.e. set P2-21=0x0100 automatically. Please note that the setting value of P2-21 will not be written into EEPROM when power is off. After re-power the servo drive, the setting value of P2-21 will be restored to its default setting automatically.</p>
Output Method	<ul style="list-style-type: none"> <li>● Pulse output. A or B contact can be selectable.</li> <li>● It is able to compare multiple positions continuously.</li> <li>● The output pulse width can be set also.</li> </ul>
Data Storage Location	<ul style="list-style-type: none"> <li>● Data array. The starting point is set in P5-56.</li> </ul>
Amount	<ul style="list-style-type: none"> <li>● The amount is determined by P5-58. But, the total amount can not exceed the limit of data array.</li> </ul>
Data Format	<ul style="list-style-type: none"> <li>● 32-bit pulse number (with polarity)</li> </ul>
Compare Condition	<ul style="list-style-type: none"> <li>● It is triggered when the position of source axis pass through the compare value.</li> </ul>
Auxiliary Function	<ul style="list-style-type: none"> <li>● Continuous Mode: When the last point is compared, the servo system will return to the first point and start Compare operation again.</li> <li>● After the last point is compared, the servo system will enable Capture function automatically.</li> </ul>
Remark	<ul style="list-style-type: none"> <li>● If P5-58=0 and Bit0 of P5-59 is set to 1 (P5-59 X0=1), Compare function will be disabled. At this time, Bit0 of P5-59 will be reset to 0 (P5-59 X0=0).</li> <li>● The data format of Compare axis is 32-bit data. Do not calculate the compare data repeatedly; otherwise the overflow may occur and result in error or invalid result.</li> </ul>

The data compared by Compare function are all stored in data array. The first compared point is stored in data array (P5-56), the compare amount is determined by P5-58 and the last compared point is stored in data array (P5-56+P5-58-1). When Bit0=1 (P5-59 X setting value), the Compare function is enabled and start to compare the data of the first point. Every time when one position is compared, the

pulse signal will output one time. At this time, the setting value of P5-58 will decrease 1 automatically until the compare amount is reached, i.e. the setting value of P5-58 becomes 0. When compare function has finished, the value of Bit0 (P5-59 X setting value) will be reset to 0 automatically.

When the last point is compared, users can choose to compare from the first point again and again, and it is called "Continuous Mode". Or users can choose to enable Capture function automatically after the last point is compared.

Compare Operation:



After the last pulse outputs completely:

- Non-continuous mode: P5-59 X0=0 after Compare operation is completed.
- Continuous mode: The servo system keeps repeating the Compare function, P5-59 X0=1

# Chapter 8 Servo Parameters

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## 8.1 Definition

There are following eight groups for drive parameters:

Group 0: Monitor parameters	(example: P0-xx)
Group 1: Basic parameters	(example: P1-xx)
Group 2: Extension parameters	(example: P2-xx)
Group 3: Communication parameters	(example: P3-xx)
Group 4: Diagnosis parameters	(example: P4-xx)
Group 5: Motion control parameters	(example: P5-xx)
Group 6: PR path definition parameters	(example: P6-xx)
Group 7: PR path definition parameters	(example: P7-xx)

### Abbreviation of control modes:

PT	:	Position control mode (command from external signal)
PR	:	Position control mode (command from internal signal)
S	:	Speed control mode
T	:	Torque control mode

### Explanation of symbols (marked after parameter)

- (★) Read-only register, such as P0-00, P0-01, P4-00.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled), such as P1-00, P1-46 and P2-33.
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on), such as P1-01 and P3-00.
- (■) Parameter setting values are not retained when power is off, such as P2-31 and P3-06.

## 8.2 Parameters Summary

### 8.2.1 Parameters List by Group

#### Group 0: P0-xx

Monitor Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					PT	PR	S	T
P0-00★	VER	Firmware Version	Factory setting	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-01■	ALE	Drive Fault Code	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-02	STS	Drive Status (Front Panel Display)	00	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-03	MON	Analog Monitor Output	01	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-04 ~ P0-07	Reserved (Do Not Use)							
P0-08★	TSON	Servo Startup Time	0	Hour	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-09★	CM1	Status Monitor 1	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-10★	CM2	Status Monitor 2	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-11★	CM3	Status Monitor 3	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-12★	CM4	Status Monitor 4	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-13★	CM5	Status Monitor 5	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-14 ~ P0-16	Reserved (Do Not Use)							
P0-17	CM1A	Status Monitor Selection 1	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-18	CM2A	Status Monitor Selection 2	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-19	CM3A	Status Monitor Selection 3	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-20	CM4A	Status Monitor Selection 4	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-21	CM5A	Status Monitor Selection 5	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-22 ~ P0-24	Reserved (Do Not Use)							
P0-25	MAP0	Mapping Parameter 1	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-26	MAP1	Mapping Parameter 2	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-27	MAP2	Mapping Parameter 3	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-28	MAP3	Mapping Parameter 4	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-29	MAP4	Mapping Parameter 5	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-30	MAP5	Mapping Parameter 6	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-31	MAP6	Mapping Parameter 7	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-32	MAP7	Mapping Parameter 8	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Monitor Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					PT	PR	S	T
P0-33 ~ P0-34	Reserved (Do Not Use)							
P0-35	MAP1A	Block Data Read / Write Register 1 (for P0-25)	0x0	N/A	○	○	○	○
P0-36	MAP2A	Block Data Read / Write Register 2 (for P0-26)	0x0	N/A	○	○	○	○
P0-37	MAP3A	Block Data Read / Write Register 3 (for P0-27)	0x0	N/A	○	○	○	○
P0-38	MAP4A	Block Data Read / Write Register 4 (for P0-28)	0x0	N/A	○	○	○	○
P0-39	MAP5A	Block Data Read / Write Register 5 (for P0-29)	0x0	N/A	○	○	○	○
P0-40	MAP6A	Block Data Read / Write Register 6 (for P0-30)	0x0	N/A	○	○	○	○
P0-41	MAP7A	Block Data Read / Write Register 7 (for P0-31)	0x0	N/A	○	○	○	○
P0-42	MAP8A	Block Data Read / Write Register 8 (for P0-32)	0x0	N/A	○	○	○	○
P0-43	Reserved (Do Not Use)							
P0-44	PCMN	Status Monitor Register (PC Software Setting)	0x0	N/A	○	○	○	○
P0-45	PCMNA	Status Monitor Register Selection (PC Software Setting)	0x0	N/A	○	○	○	○
P0-46★	SVSTS	Servo Output Status Display	0	N/A	○	○	○	○
P0-47 ~ P0-48	Reserved (Do Not Use)							
P0-49■	UAP	Renew Encoder Absolute Position	0x0	N/A	○	○	○	○
P0-50★	APSTS	Absolute Coordinate System Status	0x0	N/A	○	○	○	○
P0-51★	APR	Encoder Absolute Position (Multiturn)	0x0	rev	○	○	○	○
P0-52★	APP	Encoder Absolute Position (Pulse number within Singleturn or PUU)	0x0	pulse or PUU	○	○	○	○
P0-53	ZDRT	General Range Compare Digital Output – Filtering Time	0x0000	ms	○	○	○	○
P0-54	ZON1L	General Range Compare Digital Output – Lower Limit of 1st Monitoring Variable	0	ms	○	○	○	○

Monitor Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					PT	PR	S	T
P0-55	ZON1H	General Range Compare Digital Output – Upper Limit of 1st Monitoring Variable	0	ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P0-56 ~ P0-61	Reserved (Do Not Use)							

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

## Group 1: P1-xx

Basic Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P1-00▲	PTT	External Pulse Input Type	0x2	N/A	<input type="radio"/>			
P1-01●	CTL	Control Mode and Output Direction	0	pulse r/min N-m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-03	AOUT	Pulse Output Polarity Setting	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-04	MON1	Analog Monitor Output Proportion 1 (MON1)	100	% (full scale)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-05	MON2	Analog Monitor Output Proportion 2 (MON2)	100	% (full scale)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-06	SFLT	Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)	0	ms			<input type="radio"/>	
P1-07	TFLT	Smooth Constant of Analog Torque Command (Low-pass Filter)	0	ms				<input type="radio"/>
P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	0	ms	<input type="radio"/>			
P1-09 ~ P1-11	SP1 ~ 3	1st ~ 3rd Speed Command 1st ~ 3rd Speed Limit	1000 ~ 3000	r/min			<input type="radio"/>	<input type="radio"/>
P1-12 ~ P1-14	TQ1 ~ 3	1st ~ 3rd Torque Command 1st ~ 3rd Torque Limit	100	%	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>
P1-15	CXFT	CAPTURE SYNC AXIS – Threshold of Correction	0000h	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-16	CSOF	CAPTURE SYNC AXIS – Offset Compensation	0	The Pulse Unit of Master Axis		<input type="radio"/>		
P1-17	TEET	Tracking Error Compensation – Additional Time Setting	0	ms with fraction down to usec	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-18	CPCT	Electronic Cam (E-Cam) Pulse Phase Compensation – Time Setting	0	ms with fraction down to usec		<input type="radio"/>		
P1-19	CPEX	Capture / Compare – Additional Function Settings	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Basic Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P1-20	CPMK	CAPTURE – Masking Range Setting	0	The Pulse Unit of Capture Axis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-21	CPCL	Electronic Cam (E-Cam) Pulse Phase Compensation – Min. Frequency Setting of Master Axis	0	Kpps		<input type="radio"/>		
P1-22	SPF1	PR Special Filter Settings	0000h	N/A		<input type="radio"/>		
P1-23	CMOF	COMPARE – Compare data offset (Value of P1-23 are remain unchanged)	0	The Pulse Unit of Capture Axis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-24	CMOF	COMPARE – Compare data offset (Automatically set P1-24 to 0)	0	The Pulse Unit of Capture Axis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-25	VSF1	Low-frequency Vibration Suppression (1)	100.0	Hz	<input type="radio"/>	<input type="radio"/>		
P1-26	VSG1	Low-frequency Vibration Suppression Gain (1)	0	N/A	<input type="radio"/>	<input type="radio"/>		
P1-27	VSF2	Low-frequency Vibration Suppression (2)	100.0	Hz	<input type="radio"/>	<input type="radio"/>		
P1-28	VSG2	Low-frequency Vibration Suppression Gain (2)	0	N/A	<input type="radio"/>	<input type="radio"/>		
P1-29	AVSM	Auto Low-frequency Vibration Suppression Mode Selection	0	N/A	<input type="radio"/>	<input type="radio"/>		
P1-30	VCL	Low-frequency Vibration Detection Level	500	pulse	<input type="radio"/>	<input type="radio"/>		
P1-31	Reserved (Do Not Use)							
P1-32	LSTP	Motor Stop Mode Selection	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-33	Reserved (Do Not Use)							
P1-34	TACC	Acceleration Time	200	ms			<input type="radio"/>	
P1-35	TDEC	Deceleration Time	200	ms			<input type="radio"/>	
P1-36	TSL	Accel /Decel S-curve	0	ms		<input type="radio"/>	<input type="radio"/>	
P1-37	GDR	Ratio of Load Inertia to Servo Motor Inertia	10	0.1 times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P1-38	ZSPD	Zero Speed Range Setting	100	0.1 r/min	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Basic Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P1-39	SSPD	Target Motor Speed	3000	r/min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-40▲	VCM	Max. Analog Speed Command or Limit 1	rated speed	r/min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-41▲	TCM	Max. Analog Torque Command or Limit	100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-42	MBT1	On Delay Time of Electromagnetic Brake	0	ms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-43	MBT2	OFF Delay Time of Electromagnetic Brake	-1000 ~ 1000	ms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-44▲	GR1	Electronic Gear Ratio (1st Numerator) (N1)	128	pulse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-45	GR2	Electronic Gear Ratio (Denominator) (M)	10	pulse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-46▲	GR3	Encoder Output Pulse Number	2500	pulse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-47	SPOK	Speed Reached Output Range	10	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-48	MCOK	Motion Control Completed Output Selection	0x0000	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-49 ~ P1-51	Reserved (Do Not Use)							
P1-52	RES1	Regenerative Resistor Value	-	Ohm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-53	RES2	Regenerative Resistor Capacity	-	Watt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-54	PER	Positioning Completed Width	12800	pulse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-55	MSPD	Maximum Speed Limit	rated speed	r/min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-56	OVW	Output Overload Warning Time	120	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-57	CRSHA	Motor Protection Percentage	0	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-58	CRSHT	Motor Protection Time	1	ms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-59	MFLT	Analog Speed Linear Filter (Moving Average Filter)	0	0.1 ms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-60 ~ P1-61	Reserved (Do Not Use)							
P1-62	FRCL	Friction Compensation Percentage	0	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-63	FRCT	Friction Compensation Smooth Constant	0	ms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P1-64 ~ P1-65	Reserved (Do Not Use)							

Basic Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P1-66	PCM	Max. Rotation Number of Analog Position Command (will be available soon)	30	0.1 rotation	<input type="radio"/>			
P1-67	Reserved (Do Not Use)							
P1-68	PFLT2	Position Command Moving Average Filter	4	ms	<input type="radio"/>	<input type="radio"/>		
P1-69 ~ P1-71	Reserved (Do Not Use)							
P1-72	FRES	Full-closed Control Resolution of Linear Scale	5000	pulse/rev	<input type="radio"/>	<input type="radio"/>		
P1-73	FERR	Full-closed Loop Excessive Position Error Range	30000	pulse	<input type="radio"/>	<input type="radio"/>		
P1-74▲	FCON	Full-closed Loop Control Function Selection	000h	N/A	<input type="radio"/>	<input type="radio"/>		
P1-75	FELP	Full-closed Loop Low-pass Filter Time Constant	100	ms	<input type="radio"/>	<input type="radio"/>		
P1-76	AMSPD	Max. Rotation Speed of Encoder Output	5500	r/min	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

## Group 2: P2-xx

Extension Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P2-00	KPP	Proportional Position Loop Gain	35	rad/s	<input type="radio"/>	<input type="radio"/>		
P2-01	PPR	Position Loop Gain Switching Rate	100	%	<input type="radio"/>	<input type="radio"/>		
P2-02	PFG	Position Feed Forward Gain	50	%	<input type="radio"/>	<input type="radio"/>		
P2-03	PFF	Smooth Constant of Position Feed Forward Gain	5	ms	<input type="radio"/>	<input type="radio"/>		
P2-04	KVP	Proportional Speed Loop Gain	500	rad/s	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-05	SPR	Speed Loop Gain Switching Rate	100	%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-06	KVI	Speed Integral Compensation	100	rad/s	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-07	KVF	Speed Feed Forward Gain	0	%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-08■	PCTL	Special Factory Setting	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-09	DRT	DI Debouncing Time	2	2ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-10	DI1	Digital Input Terminal 1 (DI1)	101	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-11	DI2	Digital Input Terminal 2 (DI2)	104	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-12	DI3	Digital Input Terminal 3 (DI3)	116	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-13	DI4	Digital Input Terminal 4 (DI4)	117	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-14	DI5	Digital Input Terminal 5 (DI5)	102	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-15	DI6	Digital Input Terminal 6 (DI6)	22	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-16	DI7	Digital Input Terminal 7 (DI7)	23	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-17	DI8	Digital Input Terminal 8 (DI8)	21	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-18	DO1	Digital Output Terminal 1 (DO1)	101	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-19	DO2	Digital Output Terminal 2 (DO2)	103	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-20	DO3	Digital Output Terminal 3 (DO3)	109	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-21	DO4	Digital Output Terminal 4 (DO4)	105	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-22	DO5	Digital Output Terminal 5 (DO5)	7	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-23	NCF	Notch Filter 1 (Resonance Suppression)	1000	Hz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-24	DPH	Notch Filter Attenuation Rate 1 (Resonance Suppression)	0	dB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-25	NLP	Low-pass Filter Time Constant (Resonance Suppression)	2 or 5	0.1ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-26	DST	External Anti-Interference Gain	0	0.001	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-27	GCC	Gain Switching Control Selection	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-28	GUT	Gain Switching Time Constant	10	10ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Extension Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P2-29	GPE	Gain Switching Condition	1280000	pulse Kpps r/min	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-30■	INH	Auxiliary Function	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-31	AUT1	Speed Frequency Response Level in Auto and Semi-Auto Mode	80	Hz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-32▲	AUT2	Tuning Mode Selection	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-33▲	AUT3	Semi-Auto Mode Inertia Adjustment Selection	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-34	SDEV	Overspeed Warning Condition	5000	r/min			<input type="radio"/>	
P2-35	PDEV	Excessive Error Warning Condition	3840000	pulse	<input type="radio"/>	<input type="radio"/>		
P2-36	EDI9	External Digital Input Terminal 9 (EDI9)	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-37	EDI10	External Digital Input Terminal 10 (EDI10)	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-38	EDI11	External Digital Input Terminal 11 (EDI11)	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-39	EDI12	External Digital Input Terminal 12 (EDI12)	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-40	EDI13	External Digital Input Terminal 13 (EDI13)	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-41	EDI14	External Digital Input Terminal 14 (EDI14)	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-42	Reserved (Do Not Use)							
P2-43	NCF2	Notch Filter 2 (Resonance Suppression)	1000	Hz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-44	DPH2	Notch Filter Attenuation Rate 2 (Resonance Suppression)	0	dB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-45	DOD	Notch Filter 3 (Resonance Suppression)	1000	Hz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-46	FSN	Notch Filter Attenuation Rate 3 (Resonance Suppression)	0	dB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-47	PED	Auto Resonance Suppression Mode Selection	1	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-48	BLAS	Auto Resonance Suppression Detection Level	100	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-49	SJIT	Speed Detection Filter and Jitter Suppression	0	sec	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-50	DCLR	Pulse Deviation Clear Mode	0	N/A	<input type="radio"/>	<input type="radio"/>		

Extension Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P2-51	Reserved (Do Not Use)							
P2-52	IDXS	Indexing Coordinates Scale	100000000 0	PUU	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-53	KPI	Position Integral Compensation	0	rad/s	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-54	SVP	Synchronous Speed Loop Gain	0	rad/s	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-55	SVI	Synchronous Speed Integral Compensation	0	rad/s	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-56	SPI	Synchronous Position Integral Compensation	0	rad/s	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-57	SBW	Synchronous Speed Frequency Response	0	Hz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-58	SVL	Low-pass Filter Time Constant of Synchronous Speed Error	0	0.1ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-59	Reserved (Do Not Use)							
P2-60	GR4	Electronic Gear Ratio (2nd Numerator) (N2)	128	pulse	<input type="radio"/>			
P2-61	GR5	Electronic Gear Ratio (3rd Numerator) (N3)	128	pulse	<input type="radio"/>			
P2-62	GR6	Electronic Gear Ratio (4th Numerator) (N4)	128	pulse	<input type="radio"/>			
P2-63 ~ P2-64	Reserved (Do Not Use)							
P2-65	GBIT	Special Function 1	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
P2-66	GBIT2	Special Function 2	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
P2-67	JSL	Stable Inertia Estimating Time	1.5	0.1 times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-68	TEP	Tracking Error Compensation Selection	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-69	ABS	Absolute Encoder Setting	0x0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-70	MRS	Read Data Format Selection	0x0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-71	CAP	Absolute Position Homing	0x0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P2-72	Reserved (Do Not Use)							
P2-73	ALOP	E-Cam Alignment - Operation Setting	00000000h	N/A		<input type="radio"/>		
P2-74	ALDY	E-Cam Alignment - DI Delay Time Compensation	0.000	ms		<input type="radio"/>		

Extension Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P2-75	ALTG	E-Cam Alignment - Alignment Target Position	0	The Pulse Unit of Capture Axis		○		
P2-76	ALCT	E-Cam Alignment - Source Setting	0000h	N/A		○		
P2-77	CMSK	E-Cam Master Axis – Pulse Masking Setting	0000h	N/A		○		
P2-78	CMAP		270	degree		○		
P2-79	CMAP		360	degree	○	○	○	○

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

## Group 3: P3-xx

Communication Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P3-00●	ADR	Communication Address Setting	0x7F	N/A	○	○	○	○
P3-01	BRT	Transmission Speed	0x0203	bps	○	○	○	○
P3-02	PTL	Communication Protocol	6	N/A	○	○	○	○
P3-03	FLT	Transmission Fault Treatment	0	N/A	○	○	○	○
P3-04	CWD	Communication Time Out Detection	0	sec	○	○	○	○
P3-05	CMM	Communication Selection	0	N/A	○	○	○	○
P3-06■	SDI	Digital Input Communication Function	0	N/A	○	○	○	○
P3-07	CDT	Communication Response Delay Time	0	1ms	○	○	○	○
P3-08■	MNS	Monitor Mode	0000	N/A	○	○	○	○
P3-09	SYC	CANopen Synchronization Setting	0x57A1	N/A	CANopen mode			
P3-10 ~ P3-11	Reserved (Do Not Use)							

## Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.



## Group 4: P4-xx

Diagnosis Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P4-00★	ASH1	Fault Record (N)	0	N/A	○	○	○	○
P4-01★	ASH2	Fault Record (N-1)	0	N/A	○	○	○	○
P4-02★	ASH3	Fault Record (N-2)	0	N/A	○	○	○	○
P4-03★	ASH4	Fault Record (N-3)	0	N/A	○	○	○	○
P4-04★	ASH5	Fault Record (N-4)	0	N/A	○	○	○	○
P4-05	JOG	JOG Operation	20	r/min	○	○	○	○
P4-06▲■	FOT	Force Output Contact Control	0	N/A	○	○	○	○
P4-07■	ITST	Input Status	0	N/A	○	○	○	○
P4-08★	PKEY	Digital Keypad Input of Servo Drive	N/A	N/A	○	○	○	○
P4-09★	MOT	Output Status	N/A	N/A	○	○	○	○
P4-10■	CEN	Adjustment Function	0	N/A	○	○	○	○
P4-11	SOF1	Analog Speed Input Drift Adjustment 1	Factory setting	N/A	○	○	○	○
P4-12	SOF2	Analog Speed Input Drift Adjustment 2	Factory setting	N/A	○	○	○	○
P4-13	TOF1	Analog Torque Drift Adjustment 1	Factory setting	N/A	○	○	○	○
P4-14	TOF2	Analog Torque Drift Adjustment 2	Factory setting	N/A	○	○	○	○
P4-15	COF1	Current Detector Drift Adjustment (V1 phase)	Factory setting	N/A	○	○	○	○
P4-16	COF2	Current Detector Drift Adjustment (V2 phase)	Factory setting	N/A	○	○	○	○
P4-17	COF3	Current Detector Drift Adjustment (W1 phase)	Factory setting	N/A	○	○	○	○
P4-18	COF4	Current Detector Drift Adjustment (W2 phase)	Factory setting	N/A	○	○	○	○
P4-19	TIGB	IGBT NTC Calibration	Factory setting	N/A	○	○	○	○
P4-20	DOF1	Analog Monitor Output Drift Adjustment (CH1)	0	mV	○	○	○	○
P4-21	DOF2	Analog Monitor Output Drift Adjustment (CH2)	0	mV	○	○	○	○
P4-22	SAO	Analog Speed Input Offset	0	mV			○	
P4-23	TAO	Analog Torque Input Offset	0	mV				○

Diagnosis Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P4-24	LVL	Undervoltage Error Level	160	V(rms)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Group 5: P5-xx

Motion Control Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P5-00 ~ P5-02	Reserved (Do Not Use)							
P5-03	PDEC	Deceleration Time of Protectin Function	0XE0EFEEFF	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-04	HMOV	Homing Mode	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-05	HSPD1	1st Speed Setting of High Speed Homing	100.0	0.1 r/min	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-06	HSPD2	2nd Speed Setting of Low Speed Homing	20.0	0.1 r/min	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-07■	PRCM	Trigger Position Command (PR mode only)	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-08	SWLP	Forward Software Limit	2147483647	PUU	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-09	SWLN	Reverse Software Limit	-2147483648	PUU	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-10★	AYSZ	Data Array: Data Amount (N x 32 bits)	N/A	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-11■	AYID	Data Array: Read / Write Address	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-12■	AYD0	Data Array: Read / Write Data Block 1	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-13■	AYD1	Data Array: Read / Write Data Block 2	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-14	Reserved (Do Not Use)							
P5-15■	PMEM	PATH 1 ~ PATH 2 Data Not Retained Setting	0x0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-16■	AXEN	Axis Position: Motor Encoder	0	PUU	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-17	AXAU	Axis Position: Auxiliary Encoder (Pulse Command Feedback)	N/A	pulse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-18	AXPC	Axis Position: Pulse Command	N/A	pulse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-19	TBS	E-Cam Curve Scaling	1.000000	1/(10 <sup>6</sup> )	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-20 ~ P5-33	AC0 ~ AC13	Accel / Decel Time 0 ~ 13	200 ~ 8000	ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-34	AC14	Accel / Decel Time 14	50	ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-35	AC15	Accel / Decel Time 15	30	ms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P5-36	CAST	CAPTURE: Start Address of Data Array	0	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Motion Control Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P5-37■	CAAX	CAPTURE: Axis Position CNT	0	N/A	○	○	○	○
P5-38■	CANO	CAPTURE: Capture Amount	1	N/A	○	○	○	○
P5-39■	CACT	CAPTURE: Capture Source Setting	0x2010	N/A	○	○	○	○
P5-40 ~ P5-55	DLY0 ~ DLY15	Delay Time 0 ~ 15	0 ~ 5500	ms		○		
P5-56	CMST	COMPARE: Start Address of Data Array	0	N/A	○	○	○	○
P5-57■	CMAX	COMPARE: Axis Position	0	N/A	○	○	○	○
P5-58■	CMNO	COMPARE: Compare Amount	1	N/A	○	○	○	○
P5-59	CMCT	COMPARE: Compare Source Setting	00640010h	N/A	○	○	○	○
P5-60 ~ P5-75	POV0 ~ POV15	Moving Speed Setting of Position 0 ~ 15	20.0 ~ 3000.0	0.1 r/min		○		
P5-76★	CPRS	Capture 1st Position Reset Data	0	N/A	○	○	○	○
P5-77■	CSAX	Position of CAPTURE SYNC AXIS	0	N/A	○	○	○	○
P5-78	CSDS	Interval Pulse Number of CAPTURE SYNC AXIS	100	pulse	○	○	○	○
P5-79■	CSDS	Error Pulse Number of CAPTURE SYNC AXIS	0	pulse	○	○	○	○
P5-80	CSDS	Max. Correction Rate of CAPTURE SYNC AXIS	10	%	○	○	○	○
P5-81	ECHD	E-Cam: Start Address of Data Array	100	N/A	○	○	○	○
P5-82	ECMN	E-Cam: E-Cam Area Number N (at least >=5)	5	N/A		○		
P5-83	ECMM	E-Cam: E-Cam Cycle Number (M)	1	N/A		○		
P5-84	ECMP	E-Cam: Pulse Number of Master Axis (P)	3600	N/A		○		
P5-85	ECME	E-Cam: Engage Area Number	0	N/A		○		
P5-86■	ECAX	E-Cam: Position of Master Axis	0	N/A		○		
P5-87	PLED	E-Cam: Lead Command Length	0	N/A		○		
P5-88■	ECON	E-Cam: E-Cam Setting	00000000h	N/A		○		
P5-89	ECRD	E-Cam: Disengage Timing Data	0	N/A		○		
P5-90	CMAP	E-Cam: Area Number + (Polarity is Positive)	0	N/A		○		

Motion Control Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P5-91	CMAN	E-Cam: Area Number - (Polarity is Negative)	0	N/A		○		
P5-92	PLED	E-Cam: Cyclic Lead Command Length	0	N/A		○		
P5-93	CSDS	Motion Control: Macro Parameter 4	0	N/A		○		
P5-94	CSDS	Motion Control: Macro Parameter 3	0	N/A		○		
P5-95	CSDS	Motion Control: Macro Parameter 2	0	N/A		○		
P5-96	CSDS	Motion Control: Macro Parameter 1	0	N/A		○		
P5-97■	CSDS	Motion Control: Macro Command	100	pulse	○	○	○	○
P5-98	EVON	Event Rising-edge Trigger Command (OFF → ON)	0	N/A		○		
P5-99	EVOF	Event Falling-edge Trigger Command (ON → OFF)	0	N/A		○		

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

**Group 6: P6-xx**

PR Path Definition Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P6-00	PDEC	Homing Definition	0x00000000	N/A		○		
P6-01	ODAT	Homing Definition Value	0	N/A		○		
P6-02 ~ P6-98	PDEF1 ~ PDEF49	Definition of Path 1 ~ 49	0x00000000	N/A		○		
P6-03 ~ P6-99	PDAT1 ~ PDEF49	Data of Path 1 ~ 49	0	N/A		○		

**Explanation of symbols (marked after parameter)**

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

## Group 7: P7-xx

PR Path Definition Parameters								
Parameter	Name	Function	Default	Unit	Control Mode			
					P T	P R	S	T
P7-00 ~ P7-26	PDEF50 ~ PDEF63	Definition of Path 50 ~ 63	0x00000000	N/A		○		
P7-01 ~ P7-27	PDAT50 ~ PDEF63	Data of Path 50 ~ 49	0	N/A		○		

**Explanation of symbols (marked after parameter)**

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

## 8.2.2 Parameters List by Function

Monitor and General Use									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P0-00★	VER	Firmware Version	Factory Setting	N/A	○	○	○	○	-
P0-01■	ALE	Drive Fault Code	N/A	N/A	○	○	○	○	11.1 11.2 11.3
P0-02	STS	Drive Status (Front Panel Display)	00	N/A	○	○	○	○	7.2
P0-03	MON	Analog Monitor Output	01	N/A	○	○	○	○	4.3.5
P0-08★	TSON	Servo Startup Time	0	Hour					-
P0-09★	CM1	Status Monitor 1	N/A	N/A	○	○	○	○	4.3.5
P0-10★	CM2	Status Monitor 2	N/A	N/A	○	○	○	○	4.3.5
P0-11★	CM3	Status Monitor 3	N/A	N/A	○	○	○	○	4.3.5
P0-12★	CM4	Status Monitor 4	N/A	N/A	○	○	○	○	4.3.5
P0-13★	CM5	Status Monitor 5	N/A	N/A	○	○	○	○	4.3.5
P0-17	CM1A	Status Monitor Selection 1	0	N/A					-
P0-18	CM2A	Status Monitor Selection 2	0	N/A					-
P0-19	CM3A	Status Monitor Selection 3	0	N/A					-
P0-20	CM4A	Status Monitor Selection 4	0	N/A					-
P0-21	CM5A	Status Monitor Selection 5	0	N/A					-
P0-25	MAP1	Mapping Parameter 1	N/A	N/A	○	○	○	○	4.3.5
P0-26	MAP2	Mapping Parameter 2	N/A	N/A	○	○	○	○	4.3.5
P0-27	MAP3	Mapping Parameter 3	N/A	N/A	○	○	○	○	4.3.5
P0-28	MAP4	Mapping Parameter 4	N/A	N/A	○	○	○	○	4.3.5
P0-29	MAP5	Mapping Parameter 5	N/A	N/A	○	○	○	○	4.3.5
P0-30	MAP6	Mapping Parameter 6	N/A	N/A	○	○	○	○	4.3.5
P0-31	MAP7	Mapping Parameter 7	N/A	N/A	○	○	○	○	4.3.5
P0-32	MAP8	Mapping Parameter 8	N/A	N/A	○	○	○	○	4.3.5
P0-35	MAP1A	Block Data Read / Write Register 1 (for P0-25)	0x0	N/A	○	○	○	○	4.3.5
P0-36	MAP2A	Block Data Read / Write Register 2 (for P0-26)	0x0	N/A	○	○	○	○	4.3.5
P0-37	MAP3A	Block Data Read / Write Register 3 (for P0-27)	0x0	N/A	○	○	○	○	4.3.5
P0-38	MAP4A	Block Data Read / Write Register 4 (for P0-28)	0x0	N/A	○	○	○	○	4.3.5



Monitor and General Use									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P0-39	MAP5A	Block Data Read / Write Register 5 (for P0-29)	0x0	N/A	O	O	O	O	4.3.5
P0-40	MAP6A	Block Data Read / Write Register 6 (for P0-30)	0x0	N/A	O	O	O	O	4.3.5
P0-41	MAP7A	Block Data Read / Write Register 7 (for P0-31)	0x0	N/A	O	O	O	O	4.3.5
P0-42	MAP8A	Block Data Read / Write Register 8 (for P0-32)	0x0	N/A	O	O	O	O	4.3.5
P0-46★	SVSTS	Servo Output Status Display	0	N/A	O	O	O	O	-
P1-04	MON1	Analog Monitor Output Proportion 1 (MON1)	100	% (full scale)	O	O	O	O	6.4.4
P1-05	MON2	Analog Monitor Output Proportion 2 (MON2)	100	% (full scale)	O	O	O	O	6.4.4

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

Smooth Filter and Resonance Suppression									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-06	SFLT	Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)	0	ms			O		6.3.3
P1-07	TFLT	Smooth Constant of Analog Torque Command (Low-pass Filter)	0	ms				O	6.4.3
P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	0	10ms	O	O			6.2.6
P1-25	VSF1	Low-frequency Vibration Suppression (1)	100.0	0.1Hz	O	O			6.2.9
P1-26	VSG1	Low-frequency Vibration Suppression Gain (1)	0	N/A	O	O			6.2.9

Smooth Filter and Resonance Suppression									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-27	VSF2	Low-frequency Vibration Suppression (2)	100.0	0.1Hz	O	O			6.2.9
P1-28	VSG2	Low-frequency Vibration Suppression Gain (2)	0	N/A	O	O			6.2.9
P1-29	AVSM	Auto Low-frequency Vibration Suppression Mode Selection	0	N/A	O	O			6.2.9
P1-30	VCL	Low-frequency Vibration Detection Level	500	pulse	O	O			6.2.9
P1-34	TACC	Acceleration Time	200	ms		O	O		6.3.3
P1-35	TDEC	Deceleration Time	200	ms		O	O		6.3.3
P1-36	TSL	Accel /Decel S-curve	0	ms		O	O		6.3.3
P1-59	MFLT	Analog Speed Linear Filter (Moving Average Filter)	0	0.1ms			O		-
P1-62	FRCL	Friction Compensation Percentage	0	%	O	O	O	O	-
P1-63	FRCT	Friction Compensation Smooth Constant	0	ms	O	O	O	O	-
P1-68	PFLT2	Position Command Moving Average Filter	0	ms	O	O			-
P1-75	FELP	Full-closed Loop Low-pass Filter Time Constant	100	ms	O	O			-
P2-23	NCF1	Notch Filter 1 (Resonance Suppression)	1000	Hz	O	O	O	O	6.3.7
P2-24	DPH1	Notch Filter Attenuation Rate 1 (Resonance Suppression)	0	dB	O	O	O	O	6.3.7
P2-43	NCF2	Notch Filter 2 (Resonance Suppression)	1000	Hz	O	O	O	O	6.3.7
P2-44	DPH2	Notch Filter Attenuation Rate 2 (Resonance Suppression)	0	dB	O	O	O	O	6.3.7
P2-45	NCF3	Notch Filter 3 (Resonance Suppression)	1000	Hz	O	O	O	O	6.3.7
P2-46	DPH3	Notch Filter Attenuation Rate 3 (Resonance Suppression)	0	dB	O	O	O	O	6.3.7
P2-47	ANCF	Auto Resonance Suppression Mode Selection	1	N/A	O	O	O	O	-
P2-48	ANCL	Auto Resonance Suppression Detection Level	100	N/A	O	O	O	O	-
P2-25	NLP	Low-pass Filter Time Constant (Resonance Suppression)	2 or 5	ms	O	O	O	O	6.3.7

### Smooth Filter and Resonance Suppression

Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P2-33▲	INF	Semi-Auto Mode Inertia Adjustment Selection	0	N/A	O	O	O	O	6.3.6
P2-49	SJIT	Speed Detection Filter and Jitter Suppression	0	sec	O	O	O	O	-

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

### Gain and Switch

Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P2-00	KPP	Proportional Position Loop Gain	35	rad/s	O	O			6.2.8
P2-01	PPR	Position Loop Gain Switching Rate	100	%	O	O			6.2.8
P2-02	PFG	Position Feed Forward Gain	50	%	O	O			6.2.8
P2-03	PFF	Smooth Constant of Position Feed Forward Gain	5	ms	O	O			-
P2-04	KVP	Proportional Speed Loop Gain	500	rad/s	O	O	O	O	6.3.6
P2-05	SPR	Speed Loop Gain Switching Rate	100	%	O	O	O	O	-
P2-06	KVI	Speed Integral Compensation	100	rad/s	O	O	O	O	6.3.6
P2-07	KVF	Speed Feed Forward Gain	0	%	O	O	O	O	6.3.6
P2-26	DST	External Anti-Interference Gain	0	0.001	O	O	O	O	-
P2-27	GCC	Gain Switching Control Selection	0	N/A	O	O	O	O	-
P2-28	GUT	Gain Switching Time Constant	10	10ms	O	O	O	O	-
P2-29	GPE	Gain Switching Condition	128000 0	pulse Kpps r/min	O	O	O	O	-
P2-31■	AUT1	Speed Frequency Response Level in Auto and Semi-Auto Mode	80	Hz	O	O	O	O	5.6
									6.3.6

P2-32▲	AUT2	Speed Frequency Response Level in Auto and Semi-Auto Mode	0	N/A	O	O	O	O	5.6
									6.3.6

### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

Position Control									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-01●	CTL	Control Mode and Output Direction	0	pulse r/min N-M	O	O	O	O	6.1
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	O	O	O	O	6.6
P1-12 ~ P1-14	TQ1 ~ 3	1st ~ 3rd Torque Limit	100	%	O	O	O	O	6.4.1
P1-46▲	GR3	Encoder Output Pulse Number	2500	pulse	O	O	O	O	-
P1-55	MSPD	Maximum Speed Limit	rated	r/min	O	O	O	O	-
P1-72	FRES	Full-closed Control Resolution of Linear Scale	5000	Pulse/rev	O	O			-
P1-73	FERR	Full-closed Loop Excessive Position Error Range	30000	pulse	O	O			-
P1-74	FCON	Full-closed Loop Excessive Position Error Range	000h	-	O	O			-
P2-50	DCLR	Pulse Deviation Clear Mode	0	N/A	O	O			-
External Pulse Control Command (PT mode)									
P1-00▲	PTT	External Pulse Input Type	0x2	N/A	O				6.2.1
P1-44▲	GR1	Electronic Gear Ratio (1st Numerator) (N1)	1	pulse	O	O			6.2.5
P1-45▲	GR2	Electronic Gear Ratio (Denominator) (M)	1	pulse	O	O			6.2.5
P2-60▲	GR4	Electronic Gear Ratio (2nd Numerator) (N2)	1	pulse	O	O			-
P2-61▲	GR5	Electronic Gear Ratio (3rd Numerator) (N3)	1	pulse	O	O			-

Position Control									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P2-62▲	GR6	Electronic Gear Ratio (4th Numerator) (N4)	1	pulse	O	O			-
<b>Internal Pulse Control Command (PR mode)</b>									
P6-02 ~ P7-27	PO1 ~ PO63	Definition of Path 1 ~ 63 Data of Path 1 ~ 63	0	N/A		O			7.10
P5-60 ~ P5-75	POV1 ~ POV15	Moving Speed Setting of Position 0 ~ 15	20 ~ 3000	0.1 r/min		O			7.10
P5-03	PDEC	Deceleration Time of Protectin Function	0XF00F FFFF	N/A	O	O	O	O	-
P5-04	HMOV	Homing Mode	0	N/A	O	O			-
P5-05	HSPD1	1st Speed Setting of High Speed Homing	100	0.1 r/min	O	O	O	O	-
P5-06	HSPD2	2nd Speed Setting of Low Speed Homing	20	0.1 r/min	O	O	O	O	-
P5-07■	PRCM	Trigger Position Command (PR mode only)	0	N/A		O			-
P5-20 ~ P5-35	AC0 ~ AC15	Accel / Decel Time 0 ~ 13	200 ~ 30	ms		O			7.10
P5-40 ~ P5-55	DLY0 ~ DLY15	Delay Time 0 ~ 15	0 ~ 5500	ms		O			7.10
P5-98	EVON	Event Rising-edge Trigger Command (OFF → ON)	0	N/A		O			-
P5-99	EVOF	Event Falling-edge Trigger Command (ON → OFF)	0	N/A		O			-
P5-15■	PMEM	PATH 1 ~ PATH 2 Data Not Retained Setting	0x0	N/A	O	O	O	O	-
P5-16■	AXEN	Axis Position: Motor Encoder	N/A	N/A	O	O	O	O	7.3
P5-17	AXAU	Axis Position: Auxiliary Encoder (Pulse Command Feedback)	N/A	N/A	O	O	O	O	7.3
P5-18	AXPC	Axis Position: Pulse Command	N/A	N/A	O	O	O	O	7.3
P5-08	SWLP	Forward Software Limit	+2 <sup>31</sup>	PUU		O			-
P5-09	SWLN	Reverse Software Limit	-2 <sup>31</sup>	PUU		O			-

### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

- (■) Parameter setting values are not retained when power is off.

Speed Control									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-01●	CTL	Control Mode and Output Direction	0	pulse r/min N-M	O	O	O	O	6.1
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	O	O	O	O	6.6
P1-46▲	GR3	Encoder Output Pulse Number	1	pulse	O	O	O	O	-
P1-55	MSPD	Maximum Speed Limit	rated	r/min	O	O	O	O	-
P1-09 ~ P1-11	SP1 ~ 3	1st ~ 3rd Speed Command	1000 ~ 3000	0.1 r/min			O	O	6.3.1
P1-12 ~ P1-14	TQ1 ~ 3	1st ~ 3rd Torque Limit	100	%	O	O	O	O	6.6.2
P1-40▲	VCM	Max. Analog Speed Command or Limit 1	rated	r/min			O	O	6.3.4
P1-41▲	TCM	Max. Analog Torque Command or Limit	100	%	O	O	O	O	-
P1-76	AMSPD	Max. Rotation Speed of Encoder Output	5500	r/min	O	O	O	O	-

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.  
 (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).  
 (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).  
 (■) Parameter setting values are not retained when power is off.

Torque Control									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-01●	CTL	Control Mode and Output Direction	0	pulse r/min N-M	O	O	O	O	6.1
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	O	O	O	O	6.6
P1-46▲	GR3	Encoder Output Pulse Number	1	pulse	O	O	O	O	-
P1-55	MSPD	Maximum Speed Limit	rated	r/min	O	O	O	O	-

Torque Control									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-09 ~ P1-11	SP1~3	1st ~ 3rd Speed Limit	100 ~ 300	r/min			O	O	6.6.1
P1-12 ~ P1-14	TQ1~3	1st ~ 3rd Torque Command	100	%	O	O	O	O	6.4.1
P1-40▲	VCM	Max. Analog Speed Command or Limit 1	rated	r/min			O	O	-
P1-41▲	TCM	Max. Analog Torque Command or Limit	100	%	O	O	O	O	6.4.4

#### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

Digital I/O and Relative Input Output Setting									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P2-09	DRT	DI Debouncing Time	2	2ms	O	O	O	O	-
P2-10	DI1	Digital Input Terminal 1 (DI1)	101	N/A	O	O	O	O	Table 8.A
P2-11	DI2	Digital Input Terminal 2 (DI2)	104	N/A	O	O	O	O	Table 8.A
P2-12	DI3	Digital Input Terminal 3 (DI3)	116	N/A	O	O	O	O	Table 8.A
P2-13	DI4	Digital Input Terminal 4 (DI4)	117	N/A	O	O	O	O	Table 8.A
P2-14	DI5	Digital Input Terminal 5 (DI5)	102	N/A	O	O	O	O	Table 8.A
P2-15	DI6	Digital Input Terminal 6 (DI6)	22	N/A	O	O	O	O	Table 8.A
P2-16	DI7	Digital Input Terminal 7 (DI7)	23	N/A	O	O	O	O	Table 8.A
P2-17	DI8	Digital Input Terminal 8 (DI8)	21	N/A	O	O	O	O	Table 8.A
P2-36	EDI9	External Digital Input Terminal 9 (EDI9)	0	N/A	O	O	O	O	Table 8.A

P2-37	EDI10	External Digital Input Terminal 10 (EDI10)	0	N/A	0	0	0	0	Table 8.A
P2-38	EDI11	External Digital Input Terminal 11 (EDI11)	0	N/A	0	0	0	0	Table 8.A
P2-39	EDI12	External Digital Input Terminal 12 (EDI12)	0	N/A	0	0	0	0	Table 8.A
P2-40	EDI13	External Digital Input Terminal 13 (EDI13)	0	N/A	0	0	0	0	Table 8.A
P2-41	EDI14	External Digital Input Terminal 14 (EDI14)	0	N/A	0	0	0	0	Table 8.A
P2-18	DO1	Digital Output Terminal 1 (DO1)	101	N/A	0	0	0	0	Table 8.B
P2-19	DO2	Digital Output Terminal 2 (DO2)	103	N/A	0	0	0	0	Table 8.B
P2-20	DO3	Digital Output Terminal 3 (DO3)	109	N/A	0	0	0	0	Table 8.B
P2-21	DO4	Digital Output Terminal 4 (DO4)	105	N/A	0	0	0	0	Table 8.B
P2-22	DO5	Digital Output Terminal 5 (DO5)	7	N/A	0	0	0	0	Table 8.B
P1-38	ZSPD	Zero Speed Range Setting	100	0.1 r/min	0	0	0	0	Table 8.B
P1-39	SSPD	Target Motor Speed	3000	r/min	0	0	0	0	Table 8.B
P1-42	MBT1	On Delay Time of Electromagnetic Brake	0	ms	0	0	0	0	6.5.5

### Digital I/O and Relative Input Output Setting

Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-43	MBT2	OFF Delay Time of Electromagnetic Brake	0	ms	0	0	0	0	6.5.5
P1-47	SCPD	Speed Reached Output Range	10	r/min			0		Table 8.B
P1-54	PER	Positioning Completed Width	12800	pulse	0	0			Table 8.B
P1-56	OVW	Output Overload Warning Time	120	%	0	0	0	0	Table 8.B



Communication									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P3-00●	ADR	Communication Address Setting	0x7F	N/A	O	O	O	O	9.2
P3-01	BRT	Transmission Speed	0x0203	bps	O	O	O	O	9.2
P3-02	PTL	Communication Protocol	6	N/A	O	O	O	O	9.2
P3-03	FLT	Transmission Fault Treatment	0	N/A	O	O	O	O	9.2
P3-04	CWD	Communication Time Out Detection	0	sec	O	O	O	O	9.2
P3-05	CMM	Communication Selection	0	N/A	O	O	O	O	9.2
P3-06■	SDI	Digital Input Communication Function	0	N/A	O	O	O	O	9.2
P3-07	CDT	Communication Response Delay Time	0	1ms	O	O	O	O	9.2
P3-08■	MNS	Monitor Mode	0000	N/A	O	O	O	O	9.2
P3-09	SYC	CANopen Synchronization Setting	0x57A1	N/A	O	O	O	O	9.2

### Explanation of symbols (marked after parameter)

- (★) Read-only register.
- (▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

Diagnosis									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P4-00★	ASH1	Fault Record (N)	0	N/A	O	O	O	O	4.4.1
P4-01★	ASH2	Fault Record (N-1)	0	N/A	O	O	O	O	4.4.1
P4-02★	ASH3	Fault Record (N-2)	0	N/A	O	O	O	O	4.4.1
P4-03★	ASH4	Fault Record (N-3)	0	N/A	O	O	O	O	4.4.1
P4-04★	ASH5	Fault Record (N-4)	0	N/A	O	O	O	O	4.4.1
P4-05	JOG	JOG Operation	20	r/min	O	O	O	O	4.4.2
P4-06▲■	FOT	Force Output Contact Control	0	N/A	O	O	O	O	4.4.4
P4-07	ITST	Input Status	0	N/A	O	O	O	O	4.4.5 9.2

Diagnosis									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P4-08★	PKEY	Digital Keypad Input of Servo Drive	N/A	N/A	○	○	○	○	-
P4-09★	MOT	Output Status	N/A	N/A	○	○	○	○	4.4.6
P4-10▲	CEN	Adjustment Function	0	N/A	○	○	○	○	-
P4-11	SOF1	Analog Speed Input Drift Adjustment 1	Factory Setting	N/A	○	○	○	○	-
P4-12	SOF2	Analog Speed Input Drift Adjustment 2	Factory Setting	N/A	○	○	○	○	-
P4-13	TOF1	Analog Torque Drift Adjustment 1	Factory Setting	N/A	○	○	○	○	-
P4-14	TOF2	Analog Torque Drift Adjustment 2	Factory Setting	N/A	○	○	○	○	-
P4-15	COF1	Current Detector Drift Adjustment (V1 phase)	Factory Setting	N/A	○	○	○	○	-
P4-16	COF2	Current Detector Drift Adjustment (V2 phase)	Factory Setting	N/A	○	○	○	○	-
P4-17	COF3	Current Detector Drift Adjustment (W1 phase)	Factory Setting	N/A	○	○	○	○	-
P4-18	COF4	Current Detector Drift Adjustment (W2 phase)	Factory Setting	N/A	○	○	○	○	-
P4-19	TIGB	IGBT NTC Calibration	Factory Setting	N/A	○	○	○	○	-
P4-20	DOF1	Analog Monitor Output Drift Adjustment (CH1)	0	mV	○	○	○	○	6.4.4
P4-21	DOF2	Analog Monitor Output Drift Adjustment (CH2)	0	mV	○	○	○	○	6.4.4
P4-22	SAO	Analog Speed Input Offset	0	mV			○		-
P4-23	TAO	Analog Torque Input Offset	0	mV				○	-
P4-24	LVL	Undervoltage Error Level	160	V(rms)	○	○	○	○	-

E-Cam Function									
Parameter	Name	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P5-81	ECHD	E-Cam: Start Address of Data Array	100	N/A	O	O	O	O	7.10
P5-82	ECMN	E-Cam: E-Cam Area Number N (at least >=5)	5	N/A		O			7.10
P5-83	ECMM	E-Cam: E-Cam Cycle Number (M)	1	N/A		O			7.10
P5-84	ECMP	E-Cam: Pulse Number of Master Axis (P)	3600	N/A		O			7.10
P5-85	ECME	E-Cam: Engage Area Number	0	N/A		O			7.10
P5-86■	ECAX	E-Cam: Position of Master Axis	0	N/A		O			7.10
P5-87	PLED	E-Cam: Lead Command Length	0	N/A		O			7.10
P5-88■	ECON	E-Cam: E-Cam Setting	000000 00h	N/A		O			7.10
P5-89	ECRD	E-Cam: Disengage Timing Data	0	N/A		O			7.10
P5-90	CMAP	E-Cam: Area Number + (Polarity is Positive)	0	N/A		O			7.10
P5-91	CMAN	E-Cam: Area Number - (Polarity is Negative)	0	N/A		O			7.10
P5-92	PLED	E-Cam: Cyclic Lead Command Length	0	N/A		O			7.10

#### Explanation of symbols (marked after parameter)

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- (●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
- (■) Parameter setting values are not retained when power is off.

## 8.3 Detailed Parameter Listings

### Group 0: P0-xx Monitor Parameters

P0-00★	VER	Firmware Version	Address: 0000H 0001H
	Operation Interface:	Keypad/Software	Communication
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	-	
	Range:	-	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter displays the firmware version of the servo drive.

P0-01■	ALE	Drive Fault Code	Address: 0002H 0003H
	Operation Interface:	Keypad/Software	Communication
	Default:	-	
	Control Mode:	ALL	
	Unit:	-	
	Range:	0x0000~0xFFFF	
		It only can be set to 0 to clear the alarm. (Same as DI.ARST)	
	Data Size:	16-bit	
	Display Format:	HEX	

Settings: Hexadecimal format: displays the alarm code

#### Alarm of Servo Drive

001: Over current

002: Over voltage

003: Under voltage (In default setting, the alarm occurs only when the voltage is not enough in Servo ON status; In Servo ON status, when it applies to power R, S, T, the alarm still will not be cleared. Please refer to P2-66.)

004: Motor combination error (The drive corresponds to the wrong motor).

005: Regeneration error

006: Over load

007: Over speed

008: Abnormal pulse command

- 009: Excessive deviation of position command
- 010: Reserved
- 011: Encoder error (The servo drive cannot connect to the encoder because of disconnection or abnormal wiring.)
- 012: Adjustment error
- 013: Emergency stop
- 014: Reverse limit error
- 015: Forward limit error
- 016: IGBT overheat
- 017: Abnormal EEPROM
- 018: Abnormal signal output
- 019: Serial communication error
- 020: Serial communication time out
- 021: Reserved
- 022: Abnormal main circuit power
- 023: Early warning for overload
- 024: Encoder initial magnetic field error
- 025: The internal of the encoder is in error
- 026: Unreliable internal data of the encoder
- 027: Encoder reset error
- 028: The encoder is over voltage or the internal of the encoder is in error
- 029: Gray code error
- 030: Motor crash error
- 031: Incorrect wiring of the motor power line U, V, W (Incorrect wiring of the motor power line U, V, W, GND)
- 034: Internal communication of the encoder is in error
- 040: Excessive deviation of full closed-loop position control
- 041: Communication of linear scale is breakdown
- 042: Analog input voltage error
- 044: Warning of servo drive function overload
- 060: The absolute position is lost
- 061: Encoder under voltage
- 062: The multi-turn of absolute encoder overflows
- 068: Absolute data transmitted via I/O is in error
- 069: Wrong motor type
- 099: DSP firmware upgrade

#### **Alarm of CANopen Communication**

- 111: CANopen SDO receives buffer overflow
- 112: CANopen PDO receives buffer overflow
- 121: Index error occurs when accessing CANopen PDO

- 122: Sub-index error occurs when accessing CANopen PDO
- 123: Data size error occurs when accessing CANopen PDO
- 124: Data range error occurs when accessing CANopen PDO
- 125: CANopen PDO mapping object is read-only and write-protected
- 126: CANopen PDO mapping object is not allowed in PDO.
- 127: CANopen PDO mapping object is write-protected when Servo On.
- 128: Error occurs when reading CANopen PDO mapping object via EEPROM.
- 129: Error occurs when writing CANopen PDO mapping object via EEPROM.
- 130: The accessing address of EEPROM is out of range when using CANopen PDO mapping object
- 131: CRC of EEPROM calculation error occurs when using CANopen PDO mapping object
- 132: Enter the incorrect password when using CANopen PDO mapping object
- 185: Abnormal CAN Bus hardware

### **Alarm of Motion Control**

- 201: An error occurs when loading CANopen data
- 207: Parameter group of PR#8 is out of range
- 209: Parameter number of PR#8 is out of range
- 213~219: An error occurs when writing parameter via PR procedure. Please refer to Chapter 10 for further information
- 231: The setting of monitor item of PR#8 is out of range
- 235: PR command overflows
- 237: Indexing coordinate is undefined
- 245: PR positioning is over time
- 249: The number of PR command exceeds the range
- 261: Index error occurs when accessing CANopen object
- 263: Sub-index error occurs when accessing CANopen object
- 265: Data size error occurs when accessing CANopen object
- 267: Data range error occurs when accessing CANopen object
- 269: CANopen object is read-only and write-protected
- 26b: CANopen object is not allowed in PDO
- 26d: CANopen object is write-protected when Servo ON
- 26F: Error occurs when reading CANopen object via EEPROM
- 271: Error occurs when writing CANopen object via EEPROM.
- 273: The accessing address of EEPROM is out of range when using CANopen object
- 275: CRC of EEPROM calculation error occurs when using CANopen object
- 277: Enter the incorrect password when using CANopen object
- 283: Forward software limit
- 285: Reverse software limit
- 289: Feedback position counter overflows
- 291: Servo OFF error

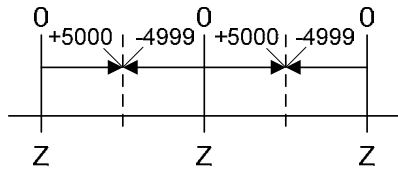
- 301: CANopen fails to synchronize
- 302: The synchronized signal of CANopen is sent too fast
- 303: The synchronized signal of CANopen is sent too slow
- 304: CANopen IP command is failed
- 305: SYNC period is in error
- 380: Position deviation alarm for DO.MC\_OK (Please refer to P1-48.)

<b>P0-02</b>	<b>STS</b>	<b>Drive Status (Front Panel Display)</b>		<b>Address: 0004H 0005H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 7.2
	Default:	00		
	Control Mode:	ALL		
	Unit:	-		
	Range:	00 ~ 127		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter shows the servo drive status.

- 00: Motor feedback pulse number (after electronic gear ratio is set) [PUU]
- 01: Input pulse number of pulse command (after electronic gear ratio is set) [PUU]
- 02: Position error counts between control command pulse and feedback pulse [PUU]
- 03: Motor feedback pulse number (encoder unit, 1280000 pulse/rev) [pulse]
- 04: Input pulse number of pulse command (before electronic gear ratio is set) [pulse]
- 05: Position error counts [pulse]
- 06: Input frequency of pulse command [Kpps]
- 07: Motor rotation speed [r/min]
- 08: Speed input command [Volt]
- 09: Speed input command [r/min]
- 10: Torque input command [Volt]
- 11: Torque input command [%]
- 12: Average load [%]
- 13: Peak load [%]
- 14: Main circuit voltage [Volt]
- 15: Ratio of load inertia to Motor inertia [0.1times]
- 16: IGBT temperature
- 17: Resonance frequency [Hz]
- 18: Absolute pulse number relative to encoder (use Z phase as home). The value of Z phase home point is 0, and it can be the value from -5000 to +5000 pulses.



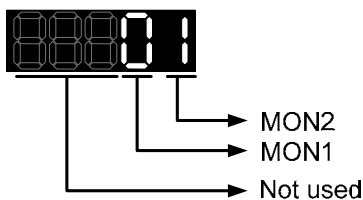
The interval of two Z phase pulse command is 10000 pulses.

- 19: Mapping Parameter 1: Display the content of parameter P0-25 (mapping target is specified by parameter P0-35)
- 20: Mapping Parameter 2: Display the content of parameter P0-26 (mapping target is specified by parameter P0-36)
- 21: Mapping Parameter 3: Display the content of parameter P0-27 (mapping target is specified by parameter P0-37)
- 22: Mapping Parameter 4: Display the content of parameter P0-28 (mapping target is specified by parameter P0-38)
- 23: Status Monitor 1: Display the content of parameter P0-09 (the monitor status is specified by parameter P0-17)
- 24: Status Monitor 2: Display the content of parameter P0-10 (the monitor status is specified by parameter P0-18)
- 25: Status Monitor 3: Display the content of parameter P0-11 (the monitor status is specified by parameter P0-19)
- 26: Status Monitor 4: Display the content of parameter P0-12 (the monitor status is specified by parameter P0-20)
- 37: Compare data offset [PUU].  $CMP\_DATA = DATA\_ARRAY[*] + P1-23 + P1-24$
- 38: Voltage level of battery [0.1 Volt]. For example, when the display value is 36, it indicates that the voltage level of the battery is 3.6V.

P0-03	MON Analog Monitor Output		Address: 0006H 0007H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.6.4
Default:	00		
Control Mode:	ALL		
Unit:	-		
Range:	00 ~ 0x77		
Data Size:	16-bit		
Display Format:	Hexadecimal		

Settings:

This parameter determines the functions of the analog monitor outputs.





MON1, MON2 Settings:

- 0: Motor speed (+/-8V / maximum motor speed)
- 1: Motor torque (+/-8V / maximum torque)
- 2: Pulse command frequency (+8Volts / 4.5Mpps)
- 3: Speed command (+/-8Volts / maximum speed command)
- 4: Torque command (+/-8Volts / maximum torque command)
- 5: V\_BUS voltage (+/-8Volts / 450V)
- 6: Reserved
- 7: Reserved

Please note:

For the setting of analog output voltage proportion, refer to the P1-04 and P1-05.

Example: P0-03 = 01 (MON1 is motor speed analog output, MON2 is motor torque analog output)

$$\text{MON1 output voltage} = 8 \times \frac{\text{Motor speed}}{\left(\text{Max. motor speed} \times \frac{\text{P1-04}}{100}\right)} \quad (\text{unit: Volts})$$

$$\text{MON2 output voltage} = 8 \times \frac{\text{Motor torque}}{\left(\text{Max. motor torque} \times \frac{\text{P1-05}}{100}\right)} \quad (\text{unit: Volts})$$

<b>P0-04</b> ■	<b>Reserved (Do Not Use)</b>		<b>Address: 0008H 0009H</b>
<b>P0-05</b> ■	<b>Reserved (Do Not Use)</b>		<b>Address: 000AH 000BH</b>
<b>P0-06</b> ■	<b>Reserved (Do Not Use)</b>		<b>Address: 000CH 000DH</b>
<b>P0-07</b> ■	<b>Reserved (Do Not Use)</b>		<b>Address: 000EH 000FH</b>
<b>P0-08</b> ★	<b>TSON</b>	<b>Servo Startup Time</b>	<b>Address: 0010H 0011H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	-	
	Unit:	Hour	
	Range:	0 ~ 65535	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter shows the total startup time of the servo drive.

P0-09★	CM1	Status Monitor 1	Address: 0012H 0013H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5
	Default:	-	
	Control Mode:	ALL	
	Unit:	-	
	Range:	-	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to provide the value of one of the status monitoring functions found in P0-02. Please refer to section 7.2.1 Monitoring Variables.

The value of P0-09 is determined by P0-17 (desired drive status) through communication setting or the keypad. The drive status can be read from the communication address of this parameter via communication port.

For example:

Set P0-17 to 3, then all consequent reads of P0-09 will return the motor feedback pulse number in pulse.

When reading the drive status through Modbus communication, the system should read two 16-bit data stored in the addresses of 0012H and 0013H to form a 32-bit data.

(0013H : 0012H) = (High Word : Low Word)

When reading the drive status through the keypad, if P0-02 is set to 23, VAR-1 will quickly show for about two seconds and then the value of P0-09 will display on the display.

P0-10★	CM2	Status Monitor 2	Address: 0014H 0015H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5
	Default:	-	
	Control Mode:	ALL	
	Unit:	-	
	Range:	-	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to provide the value of one of the status monitoring functions found in P0-02. Please refer to section 7.2.1 Monitoring Variables.

The value of P0-10 is determined by P0-18 (desired drive status) through communication setting or the keypad. The drive status can be read from the communication address of this parameter via communication port.

When reading the drive status through the keypad, if P0-02 is set to 24, VAR-2 will quickly show for about two seconds and then the value of P0-10 will display on the display.

<b>P0-11★</b>	<b>CM3</b>	<b>Status Monitor 3</b>		<b>Address: 0016H 0017H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
	Default:	-		
	Control Mode:	ALL		
	Unit:	-		
	Range:	-		
	Data Size:	32-bit		
Display Format:	Decimal			

Settings:

This parameter is used to provide the value of one of the status monitoring functions found in P0-02. Please refer to section 7.2.1 Monitoring Variables.

The value of P0-11 is determined by P0-19 (desired drive status) through communication setting or the keypad. The drive status can be read from the communication address of this parameter via communication port.

When reading the drive status through the keypad, if P0-02 is set to 25, VAR-3 will quickly show for about two seconds and then the value of P0-11 will display on the display.

<b>P0-12★</b>	<b>CM4</b>	<b>Status Monitor 4</b>		<b>Address: 0018H 0019H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
	Default:	-		
	Control Mode:	ALL		
	Unit:	-		
	Range:	-		
	Data Size:	32-bit		
Display Format:	Decimal			

Settings:

This parameter is used to provide the value of one of the status monitoring functions found in P0-02. Please refer to section 7.2.1 Monitoring Variables.

The value of P0-12 is determined by P0-20 (desired drive status) through communication setting or the keypad. The drive status can be read from the communication address of

this parameter via communication port.

When reading the drive status through the keypad, if P0-02 is set to 26, VAR-4 will quickly show for about two seconds and then the value of P0-12 will display on the display.

P0-13★	CM5	Status Monitor 5	Address: 001AH 001BH
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5
	Default:	-	
	Control Mode:	ALL	
	Unit:	-	
	Range:	-	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to provide the value of one of the status monitoring functions found in P0-02. Please refer to section 7.2.1 Monitoring Variables.

The value of P0-12 is determined by P0-20 (desired drive status) through communication setting or the keypad. The drive status can be read from the communication address of this parameter via communication port.

P0-14	Reserved (Do Not Use)	Address: 001CH 001DH
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P0-15	Reserved (Do Not Use)	Address: 001EH 001FH
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P0-16	Reserved (Do Not Use)	Address: 0020H 0021H
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P0-17	CM1A	Status Monitor Selection 1	Address: 0022H 0023H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	-	
	Unit:	-	
	Range:	0 ~ 127	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to determine the drive status found in P0-02. For the setting

values, please refer to section 7.2.1 Monitoring Variables. The selected drive status will be displayed by P0-09.

For example:

Set P0-17 to 7, then all consequent reads of P0-09 will return the motor rotation speed in r/min.

<b>P0-18</b>	<b>CM2A</b>	<b>Status Monitor Selection 2</b>		<b>Address: 0024H 0025H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	-		
	Unit:	-		
	Range:	0 ~ 127		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to determine the drive status found in P0-02. For the setting values, please refer to section 7.2.1 Monitoring Variables. The selected drive status will be displayed by P0-10. Refer to P0-17 for explanation.

<b>P0-19</b>	<b>CM3A</b>	<b>Status Monitor Selection 3</b>		<b>Address: 0026H 0027H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	-		
	Unit:	-		
	Range:	0 ~ 127		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to determine the drive status found in P0-02. For the setting values, please refer to section 7.2.1 Monitoring Variables. The selected drive status will be displayed by P0-11. Refer to P0-17 for explanation.

<b>P0-20</b>	<b>CM4A</b>	<b>Status Monitor Selection 4</b>		<b>Address: 0028H 0029H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
Control Mode:	-			

Unit:-
Range: 0 ~ 127
Data Size: 16-bit
Display Format: Decimal

**Settings:**

This parameter is used to determine the drive status found in P0-02. For the setting values, please refer to section 7.2.1 Monitoring Variables. The selected drive status will be displayed by P0-12. Refer to P0-17 for explanation.

<b>P0-21</b>	<b>CM5A</b>	<b>Status Monitor Selection 5</b>		<b>Address: 002AH 002BH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	-		
	Unit:-	-		
	Range:	0 ~ 127		
	Data Size:	16-bit		
	Display Format:	Decimal		

**Settings:**

This parameter is used to determine the drive status found in P0-02. For the setting values, please refer to section 7.2.1 Monitoring Variables. The selected drive status will be displayed by P0-13. Refer to P0-17 for explanation.

<b>P0-22</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 002CH 002DH</b>
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<b>P0-23</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 002EH 002FH</b>
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<b>P0-24</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0030H 0031H</b>
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<b>P0-25</b>	<b>MAP1</b>	<b>Mapping Parameter 1</b>		<b>Address: 0032H 0033H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
	Default:	N/A, initialization is not required		
	Control Mode:	ALL		
	Unit:-	-		
	Range:	determined by the parameter specified by P0-35		
Data Size:	32-bit			

Display Format:	Hexadecimal
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Settings:

The parameters from P0-25 to P0-32 are used to read and write the values of the parameters those communication addresses are not consecutive. The users can set P0-35 ~ P0-42 as the desired read and write mapping parameter numbers through communication setting or the keypad.

When reading or writing P0-25 ~ P0-32, the read or write values are equivalent to the values of the parameters specified by P0-35 ~ P0-42, and vice versa.

Refer to P0-35 for explanation.

<b>P0-26</b>	<b>MAP2</b>	<b>Mapping Parameter 2</b>	<b>Address: 0034H 0035H</b>	
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5	
	Default:	N/A, initialization is not required		
	Control Mode:	ALL		
	Unit:	-		
	Range:	determined by the parameter specified by P0-36		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		

Settings:

Refer to P0-25 and P0-36 for explanation.

<b>P0-27</b>	<b>MAP3</b>	<b>Mapping Parameter 3</b>	<b>Address: 0036H 0037H</b>	
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5	
	Default:	N/A, initialization is not required		
	Control Mode:	ALL		
	Unit:	-		
	Range:	determined by the parameter specified by P0-37		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		

Settings:

Refer to P0-25 and P0-37 for explanation.

P0-28	MAP4	Mapping Parameter 4	Address: 0038H 0039H
Operation Interface:		Keypad/Software	Communication
Related Section: Section 4.3.5			
Default: N/A, initialization is not required			
Control Mode:		ALL	
Unit: -			
Range: determined by the parameter specified by P0-38			
Data Size: 32-bit			
Display Format:		Hexadecimal	

Settings:

Refer to P0-25 and P0-38 for explanation.

P0-29	MAP5	Mapping Parameter 5	Address: 003AH 003BH
Operation Interface:		Keypad/Software	Communication
Related Section: Section 4.3.5			
Default: N/A, initialization is not required			
Control Mode:		ALL	
Unit: -			
Range: determined by the parameter specified by P0-39			
Data Size: 32-bit			
Display Format:		Hexadecimal	

Settings:

Refer to P0-25 and P0-39 for explanation.

P0-30	MAP6	Mapping Parameter 6	Address: 003CH 003DH
Operation Interface:		Keypad/Software	Communication
Related Section: Section 4.3.5			
Default: N/A, initialization is not required			
Control Mode:		ALL	
Unit: -			
Range: determined by the parameter specified by P0-40			
Data Size: 32-bit			
Display Format:		Hexadecimal	

Settings:

Refer to P0-25 and P0-40 for explanation.



<b>P0-31</b>	<b>MAP7</b>	<b>Mapping Parameter 7</b>		<b>Address: 003EH 003FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
	Default:	N/A, initialization is not required		
	Control Mode:	ALL		
	Unit:	-		
	Range:	determined by the parameter specified by P0-41		
	Data Size:	32-bit		
Display Format:	Hexadecimal			

Settings:  
Refer to P0-25 and P0-41 for explanation.

<b>P0-32</b>	<b>MAP8</b>	<b>Mapping Parameter 8</b>		<b>Address: 0040H 0041H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
	Default:	N/A, initialization is not required		
	Control Mode:	ALL		
	Unit:	-		
	Range:	determined by the parameter specified by P0-42		
	Data Size:	32-bit		
Display Format:	Hexadecimal			

Settings:  
Refer to P0-25 and P0-42 for explanation.

<b>P0-33</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0042H 0043H</b>
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<b>P0-34</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0044H 0045H</b>
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<b>P0-35</b>	<b>MAP1A</b>	<b>Block Data Read / Write Register 1 (for P0-25)</b>		<b>Address: 0046H 0047H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
	Default:	0x0		
	Control Mode:	ALL		
	Unit:	-		
Range:	determined by the communication address of the designated parameter			

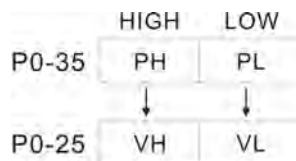
Data Size:	32-bit
Display Format:	Hexadecimal

#### Settings:

The parameters from P0-35 to P0-42 are used to designate the desired read and write parameter numbers for P0-25 to P0-32, and read and write the values of the parameters those communication addresses are not consecutive through communication setting or the keypad more efficiently.

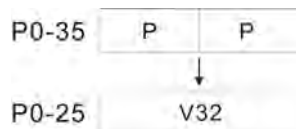
The read / write parameter could be one 32-bit parameter or two 16-bit parameters.

The operation of parameter P0-35 is described as follows:



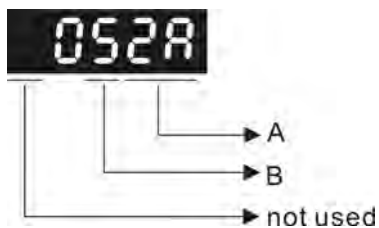
When PH≠PL, it indicates that P0-25 includes two 16-bit parameters.

VH = \*(PH), VL = \*(PL)



When PH = PL = P, it indicates that the content of P0-25 is one 32-bit parameter.

V32 = \*(P). If P = 060Ah (parameter P6-10), the value of V32 is the value of P6-10.



A: Parameter group code in hexadecimal format

B: Parameter number in hexadecimal format

For example:

If the desired read and write parameter number is P2-06, please set P0-35 to 0206. If the desired read and write parameter number is P5-42, please set P0-35 to 052A, and vice versa.

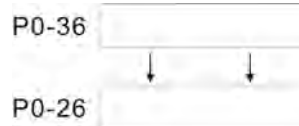
When the users want to read and write the value of the parameter P1-44 (32-bit parameter) via P0-25, please set P0-35 to 0x012C012C through communication setting or the keypad. The the value of the parameter P1-44 will be displayed by P0-25.

When the users want to read and write the values of the parameters P2-02 (Position Feed Forward Gain, 16-bit parameter) and P2-04 (Proportional Speed Loop Gain, 16-bit parameter) via P0-25, please set P0-35 to 0x02040202 through communication setting or the keypad. The the values of the parameters P2-02 and P2-04 will be displayed by P0-25.

<b>P0-36</b>	<b>MAP2A</b>	<b>Block Data Read / Write Register 2 (for P0-26)</b>	<b>Address: 0048H 0049H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5
	Default:	0x0	
	Control Mode:	ALL	
	Unit:	-	
	Range:	determined by the communication address of the designated parameter	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	

Settings:

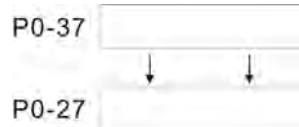
Refer to P0-35 for explanation.



<b>P0-37</b>	<b>MAP3A</b>	<b>Block Data Read / Write Register 3 (for P0-27)</b>	<b>Address: 004AH 004BH</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5
	Default:	0x0	
	Control Mode:	ALL	
	Unit:	-	
	Range:	determined by the communication address of the designated parameter	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	

Settings:

Refer to P0-35 for explanation.

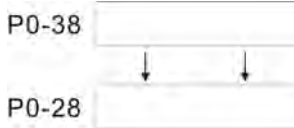


<b>P0-38</b>	<b>MAP4A</b>	<b>Block Data Read / Write Register 4 (for P0-28)</b>	<b>Address: 004CH 004DH</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 4.3.5
	Default:	0x0	
	Control Mode:	ALL	

Unit:-	
Range:	determined by the communication address of the designated parameter
Data Size:	32-bit
Display Format:	Hexadecimal

Settings:

Refer to P0-35 for explanation.

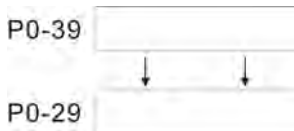


<b>P0-39</b>	<b>MAP5A</b>	<b>Block Data Read / Write Register 5 (for P0-29)</b>	<b>Address: 004EH 004FH</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
Default:	0x0		
Control Mode:	ALL		
Unit:-			
Range:	determined by the communication address of the designated parameter		
Data Size:	32-bit		
Display Format:	Hexadecimal		

Settings:

Refer to P0-35 for explanation.

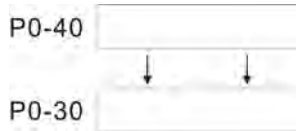


<b>P0-40</b>	<b>MAP6A</b>	<b>Block Data Read / Write Register 6 (for P0-30)</b>	<b>Address: 0050H 0051H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
Default:	0x0		
Control Mode:	ALL		
Unit:-			
Range:	determined by the communication address of the designated parameter		
Data Size:	32-bit		
Display Format:	Hexadecimal		

Settings:

Refer to P0-35 for explanation.

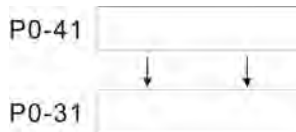


<b>P0-41</b>	<b>MAP7A</b>	<b>Block Data Read / Write Register 7 (for P0-31)</b>	<b>Address: 0052H 0053H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
Default:	0x0		
Control Mode:	ALL		
Unit:	-		
Range:	determined by the communication address of the designated parameter		
Data Size:	32-bit		
Display Format:	Hexadecimal		

Settings:

Refer to P0-35 for explanation.

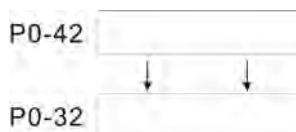


<b>P0-42</b>	<b>MAP8A</b>	<b>Block Data Read / Write Register 8 (for P0-32)</b>	<b>Address: 0054H 0055H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 4.3.5
Default:	0x0		
Control Mode:	ALL		
Unit:	-		
Range:	determined by the communication address of the designated parameter		
Data Size:	32-bit		
Display Format:	Hexadecimal		

Settings:

Refer to P0-35 for explanation.



<b>P0-43</b>	<b>Reserved (Do Not Use)</b>		<b>Address: 0056H 0057H</b>
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P0-44★	PCMN	Status Monitor Register (PC Software Setting)	Address: 0058H 0059H
	Operation Interface:	Keypad/Software	Communication
	Default:	0x0	
	Control Mode:	ALL	
	Unit:	-	
	Range:	determined by the communication address of the designated parameter	
	Data Size:	32-bit	
	Display Format:	Decimal	

## Settings:

The function of this parameter is the same as P0-09 (Please refer to P0-09). Please note that this parameter can be set through communication setting only.

P0-45■	PCMNA	Status Monitor Register Selection (PC Software Setting)	Address: 005AH 005BH
	Operation Interface:	Keypad/Software	Communication
	Default:	0x0	
	Control Mode:	ALL	
	Unit:	-	
	Range:	0~127	
	Data Size:	16-bit	
	Display Format:	Decimal	

## Settings:

The function of this parameter is the same as P0-17 (Please refer to P0-17). Please note that this parameter can be set through communication setting only.

P0-46★	SVSTS	Servo Output Status Display	Address: 005CH 005DH
	Operation Interface:	Keypad/Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	-	
	Range:	0x00 ~ 0xFF	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

## Settings:

This parameter is used to display the digital output signal of the servo drive. The servo output status display will show in hexadecimal format.

Bit0: SRDY (Servo ready)

Bit1: SON (Servo On)

Bit2: ZSPD (At Zero speed)

Bit3: TSPD (At Speed reached)

Bit4: TPOS (At Positioning completed)

Bit5: TQL (At Torque limit)

Bit6: ALRM (Servo alarm activated)

Bit7: BRKR (Electromagnetic brake control)

Bit9: OLW (Output overload warning)

Bit10: WARN (Servo warning activated. WARN is activated when the drive has detected reverse limit error; forward limit error, emergency stop, serial communication error, and undervoltage these fault conditions.)

Bit11: Reserved

Bit12: Reserved

Bit13: Reserved

Bit14: Reserved

Bit15: Reserved

The servo output status display can be monitored through communication also.

<b>P0-47</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 005EH 005FH</b>
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<b>P0-48</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0060H 0061H</b>
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<b>P0-49</b>	<b>UAP</b>	<b>Renew Encoder Absolute Position</b>	<b>Address: 0062H 0063H</b>
--------------	------------	--	---------------------------------

Operation Interface:	Keypad / Software	Communication	Related Section: N/A
Default:	0x0		
Control Mode:	ALL		
Unit:	N/A		
Range:	0x00 ~ 0x02		
Data Size:	16-bit		
Display Format:	Hexadecimal		

Settings:

This parameter is used to renew the absolute position data of the encoder.



Parameter Renew Setting:

- 1: Renew the encoder data to parameters P0-50~P0-52 only.
- 2: Renew the parameters P0-50~P0-52, and clear the position error as well. While this setting is activated, the current position of the motor will be reset as the target position of position command (same function as CCLR).

<b>P0-50★</b>	<b>APSTS</b>	<b>Absolute Coordinate System Status</b>		<b>Address: 0064H 0065H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0x0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0x00 ~ 0x1F		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8

Bit0: Absolute position status

- Bit0=0: Normal
- Bit0=1: Absolute position is lost

Bit1: Voltage level of battery

- Bit0=0: Normal
- Bit0=1: Low battery

Bit2: Status of encoder multiturn

- Bit0=0: Normal
- Bit0=1: Overflow

Bit3: Status of PUU

- Bit0=0: Normal
- Bit0=1: Overflow

Bit4: Absolute coordinate system status

- Bit0=0: Normal
- Bit0=1: Absolute coordinate system has not been set

Bit5 ~ Bit15: Reserved. Must be set to 0.



<b>P0-51★</b>	<b>APR</b>	<b>Encoder Absolute Position (Multiturn)</b>		<b>Address: 0066H 0067H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:0x0		
	Control Mode:	:ALL		
	Unit:	:rev		
	Range:	:-32768 ~ +32767		
	Data Size:	:32-bit		
Display Format:	:Decimal			

Settings:

While the Bit 1 of P2-70 is set to read the encoder pulse number, this parameter represents the turns of encoder absolute position. While the Bit 1 of P2-70 is set to read the PUU number, this parameter becomes disabled and the setting value of this parameter is 0.

<b>P0-52★</b>	<b>APP</b>	<b>Encoder Absolute Position (Pulse number within Singleturn or PUU)</b>		<b>Address: 0068H 0069H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:0x0		
	Control Mode:	:ALL		
	Unit:	:Pulse or PUU		
	Range:	:0~1280000-1 (Pulse Number); -2147483648 ~ 2147483647 (PUU)		
	Data Size:	:32-bit		
Display Format:	:Decimal			

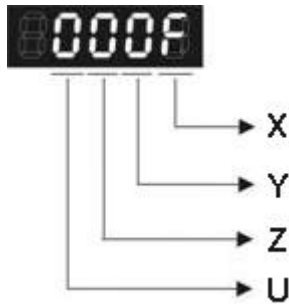
Settings:

While the Bit 1 of P2-70 is set to read the pulse number, this parameter represents the pulse number of encoder absolute position. While the Bit 1 of P2-70 is set to read the PUU number, this parameter represents PUU number of motor absolute position.

<b>P0-53</b>	<b>ZDRT</b>	<b>General Range Compare Digital Output – Filtering Time</b>		<b>Address: 006AH 006BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:0x0000		
	Control Mode:	:ALL		
	Unit:	:ms		
Range:	:0x0000 ~ 0x000F			

Data Size:	16-bit
Display Format:	Hexadecimal

Settings:

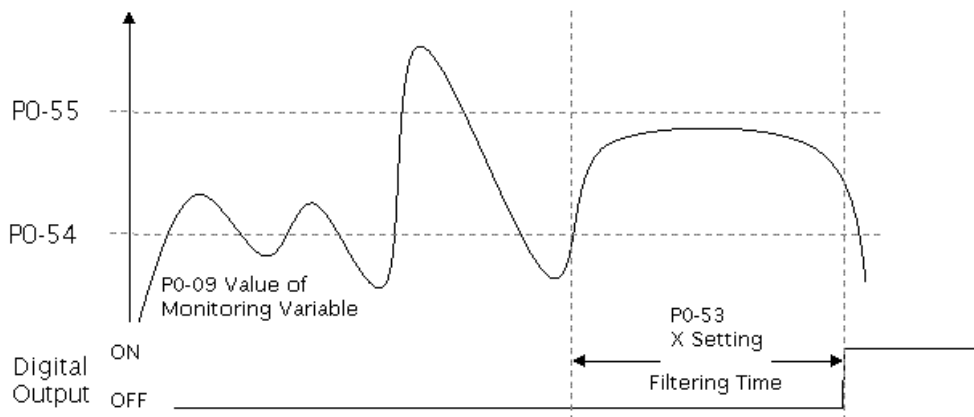


X: Filtering time for 1st monitoring variable

UYZ: Reserved

While the value of the monitoring variable is changed within the range between the setting values of P0-54 and P0-55, this parameter is used to set the filter timing for the monitoring variable. The value of monitoring variable will output after the filtering time determined by parameter P0-53.

For example: when P0-09 is used



<b>P0-54</b>	<b>ZON1L</b>	<b>General Range Compare Digital Output –Lower Limit of 1st Monitoring Variable</b>		<b>Address: 006CH 006DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	-		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

The value of parameter P0-09 will change within the range between P0-54 and P0-55 and then output after the filtering time determined by parameter P0-53.

<b>P0-55</b>	<b>ZON1H</b>	<b>General Range Compare Digital Output –Upper Limit of 1st Monitoring Variable</b>		<b>Address: 006EH 006FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	-		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

## Settings:

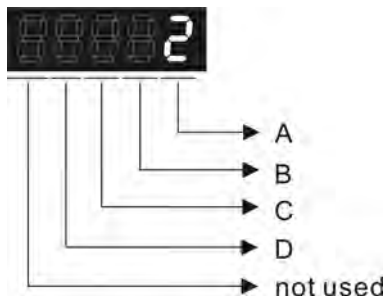
The value of parameter P0-09 will change within the range between P0-54 and P0-55 and then output after the filtering time determined by parameter P0-53.

<b>P0-56</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0070H 0071H</b>
<b>P0-57</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0072H 0073H</b>
<b>P0-58</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0074H 0075H</b>
<b>P0-59</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0076H 0077H</b>
<b>P0-60</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0078H 0079H</b>
<b>P0-61</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 007AH 007BH</b>

## Group 1: P1-xx Basic Parameters

P1-00 ▲	PTT	External Pulse Input Type	Address: 0100H 0101H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.2.1
	Default:	0x2	
	Control Mode:	PT	
	Unit:	-	
	Range:	0 ~ 0x1132	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:



A: Input pulse type

0: AB phase pulse (4x) (Quadrature Input)

1: Clockwise (CW) + Counterclockwise(CCW) pulse

2: Pulse + Direction

3: Other settings: Reserved

B: Input pulse filter

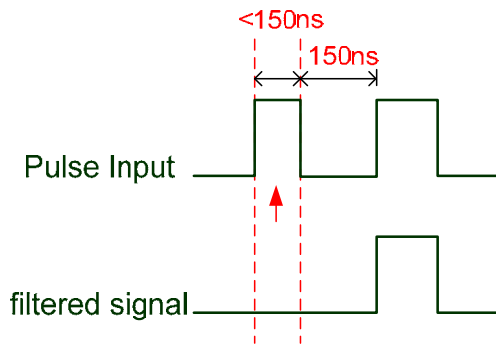
This setting is used to suppress or reduce the chatter caused by the noise, etc.

However, if the instant input pulse filter frequency is over high, the frequency that exceeds the setting value will be regarded as noise and filtered.

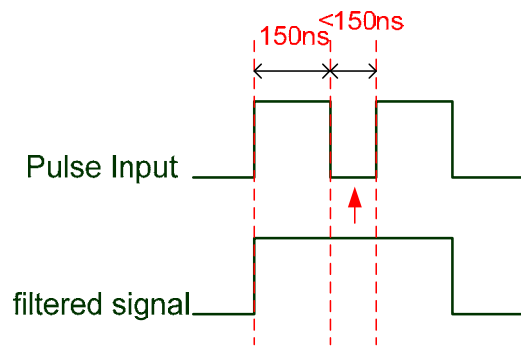
Setting Value	Low-speed Filter Frequency (Min. Filter Frequency <sup>(see note 1)</sup> )	Setting Value	High-speed Filter Frequency (Min. Filter Frequency <sup>(see note 1)</sup> )
0	0.83Mpps (600ns)	0	3.33Mpps (150ns)
1	208Kpps (2.4us)	1	0.83Mpps (600ns)
2	104Kpps (4.8us)	2	416Kpps (1.2us)
3	52Kpps (9.6us)	3	208Kpps (2.4us)
4	No Filter Function	4	No Filter Function

Please note:

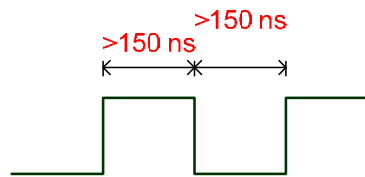
1. When the source of pulse command is the high-speed linear driver signal and the setting value B is set to 0 (High-speed Filter Frequency is 3.33Mpps):



When this pulse frequency is less than 150 ns, this signal will be regarded as a low-level pulse and two input pulses will be regarded as one input pulse.



When this pulse frequency is less than 150 ns, this signal will be regarded as a high-level pulse and two input pulses will be regarded as one input pulse.

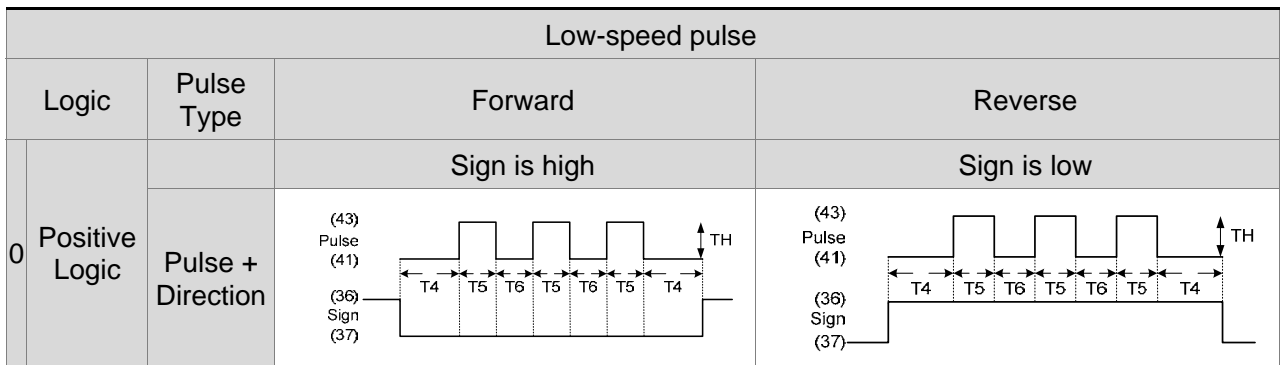
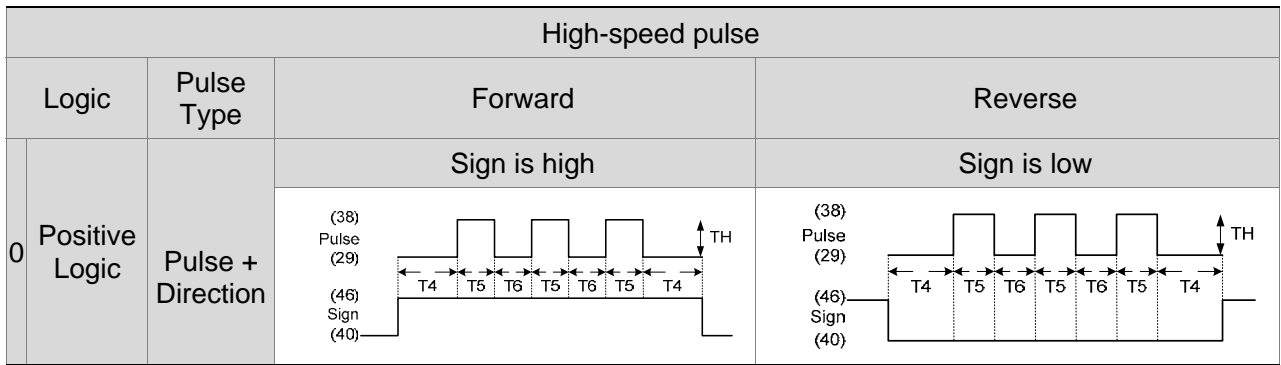
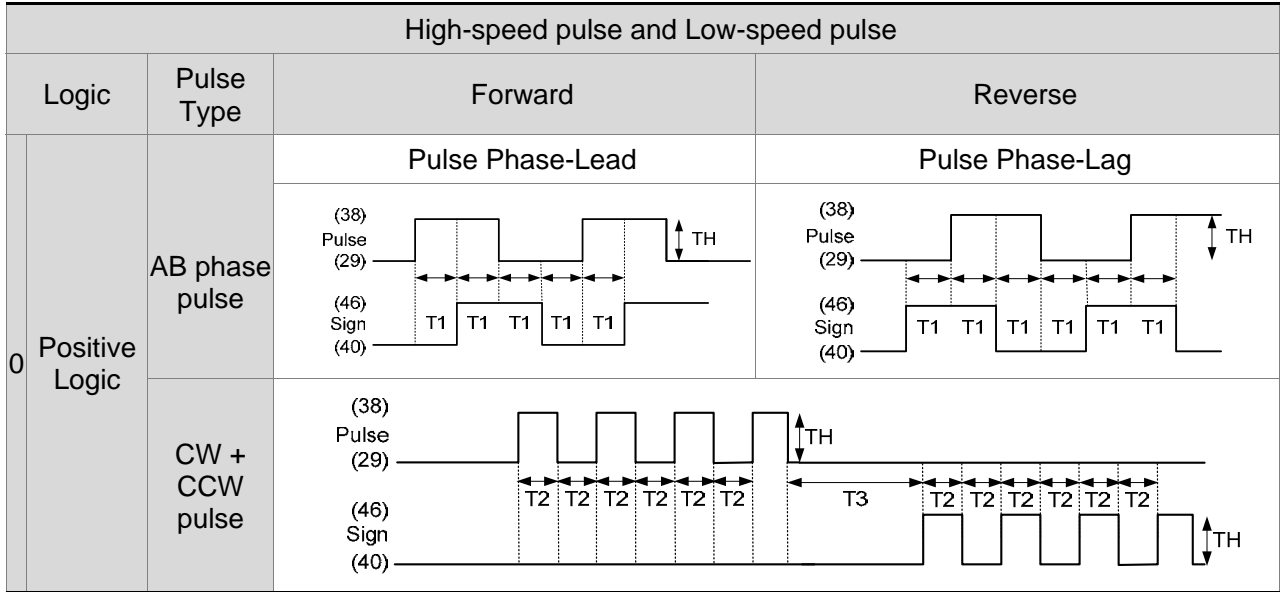


When the pulse frequencies of high-level duty and low-level duty both are greater than 150 ns, the signal will not be filtered (that is, the pulse command will pass through).

If an input pulse of 2~4MHz is used, it is recommended to change the setting value B (Input pulse filter) and set this setting value to 4. Please note that this function is available for DSP version V1.036 sub05, CPLD version V10 and later models only.

Note: If the signal is a 4Mpps high input pulse, setting the value B to 4 is able to ensure that the signal will not be filtered and will be certainly delivered.

C: Input polarity



In digital electronics, logic circuits are generally divided into two classes according to their polarity - positive logic and negative logic. With reference to positive logic, logical 1 state represents the high voltage level and logic 0 represents the low voltage level. With reference to negative logic, logical 1 state represents the low voltage level and logic 0 state represents the high voltage level.

Positive Logic Circuit

Negative Logic Circuit



Pulse specification		Max. input pulse frequency	Min. time width					
			T1	T2	T3	T4	T5	T6
High-speed pulse	Line driver	4Mpps	62.5ns	125ns	250ns	200ns	125ns	125ns
Low-speed pulse	Line driver	500Kpps	0.5µs	1µs	2µs	2µs	1µs	1µs
	Open collector	200Kpps	1.25µs	2.5µs	5µs	5µs	2.5µs	2.5µs

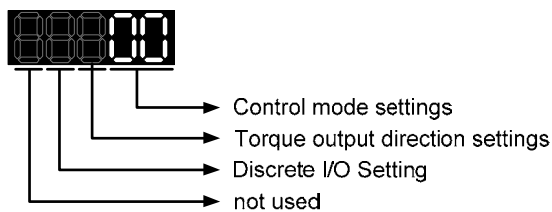
Pulse specification		Max. input pulse frequency	Voltage specification	Forward specification
High-speed pulse	Line driver	4Mpps	5V	< 25mA
Low-speed pulse	Line driver	500Kpps	2.8V ~ 3.7V	< 25mA
	Open collector	200Kpps	24V (Max.)	< 25mA

D: Source of pulse command

Setting value	Input pulse interface	Remark
0	Open collector for low-speed pulse	CN1 Terminal Identification: PULSE, SIGN
1	Line driver for high-speed pulse	CN1 Terminal Identification: HPULSE, HSIGN

P1-01	CTL	Control Mode and Output Direction	Address: 0102H 0103H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.1, Table 8.A
	Default:	0	
	Control Mode:	ALL	
	Unit:	pulse (P mode), r/min (S mode), N-m (T mode)	
	Range:	00 ~ 0x110F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:



Control mode settings

	PT	PR	S	T	Sz	Tz
Single Mode						
00	▲					
01		▲				
02			▲			
03				▲		
04					▲	
05						▲
Multiple Mode						
0E	▲	▲	▲			
0F	▲	▲		▲		

	PT	PR	S	T	Sz	Tz
Dual Mode						
06	▲		▲			
07	▲			▲		
08		▲	▲			
09		▲		▲		
0A			▲	▲		
0B	CANopen Mode (Half)					
0C	CANopen Mode (Full)					
0D	▲	▲				

PT: Position control mode. The command is from external pulse or analog voltage (external analog voltage will be available soon).

PR: Position control mode. The command is from internal signal. Execution of 64 positions is via DI signals (POS0 ~ POS5). A variety of homing control is also provided.

S: Speed control mode. The command is from external signal or internal signal. Execution of the command selection is via DI signals, SPD0 and SPD1.

T: Torque control mode. The command is from external signal or internal signal. Execution of the command selection is via DI signals, TCM0 and TCM1.

Sz: Zero speed / internal speed command

Tz: Zero torque / internal torque command

Dual Mode: Control of the mode selection is via DI signals. For example, either PT or S control mode can be selected via DI signal, S-P (see Table 8.A).

Multiple Mode: Control of the mode selection is via DI signals. For example, either PT or PR or S control mode can be selected via DI signals, S-P and PT-PR (see Table 8.A).

Torque output direction settings

Direction	0	1
Forward		
Reverse		

Discrete I/O Setting

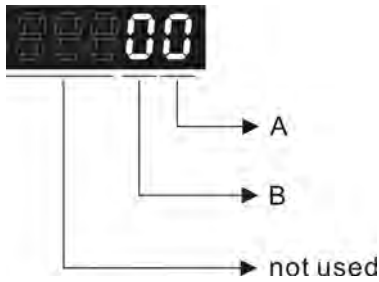
1: When switching to different mode, digital inputs/outputs (P2-10 ~ P2-22) can be reset to be the default value of the mode you switch to.

0: When switching to different mode, the setting value of digital inputs/outputs (P2-10 ~ P2-22) will remain the same and will not be changed.



<b>P1-02 ▲</b>	<b>PSTL</b>	<b>Speed and Torque Limit</b>	<b>Address: 0104H 0105H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.6, Table 8.A
	Default:	0	
	Control Mode:	ALL	
	Unit:	-	
	Range:	00 ~ 0x11	
	Data Size:	16-bit	
Display Format:	Hexadecimal		

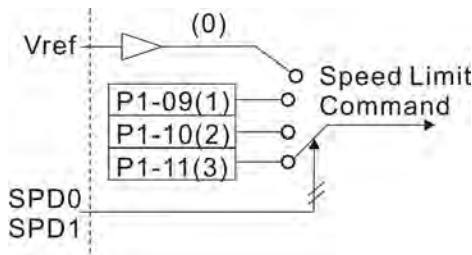
Settings:



A: Disable or Enable speed limit function

0: Disable speed limit function

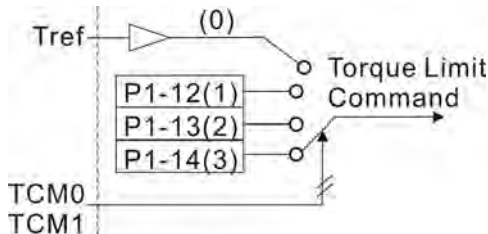
1: Enable speed limit function (It is available in torque mode)



B: Disable or Enable torque limit function

0: Disable torque limit function

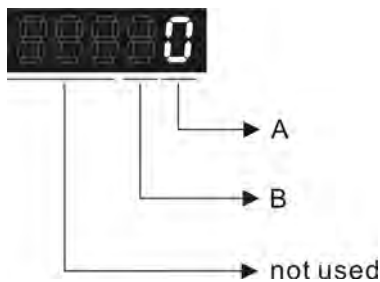
1: Enable torque limit function (It is available in position and speed mode)



When users want to use torque limit functions, Bit1 can always enable limit functions through this parameter. There is no need to do another DI setting. Users can also enable or disable the limit functions through DI : TRQLM. It is a more flexible way but need to do another DI setting. Parameters and DI are the operational ways of OR. DI : TCM0 and TCM1 are used to select the limit source.

<b>P1-03</b>	<b>AOUT</b>	<b>Pulse Output Polarity Setting</b>		<b>Address: 0106H 0107H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 3.3.3
	Default:	0		
	Control Mode:	ALL		
	Unit:	-		
	Range:	0 ~ 0x13		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings:



- A: Analog monitor outputs polarity  
 0: MON1(+), MON2(+)  
 1: MON1(+), MON2(-)  
 2: MON1(-), MON2(+)  
 3: MON1(-), MON2(-)

- B: Position pulse outputs polarity  
 0: Forward output  
 1: Reverse output

<b>P1-04</b>	<b>MON1</b>	<b>Analog Monitor Output Proportion 1 (MON1)</b>		<b>Address: 0108H 0109H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.4.4
	Default:	100		
	Control Mode:	ALL		
	Unit:	% (full scale)		
	Range:	0 ~ 100		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

Please refer to parameter P0-03 for the setting of analog output selection.

For example:

P0-03 = x0 (MON1 is the motor speed analog output)

When the output voltage value of MON1 is V1:

$$\text{Motor speed} = \text{Max. speed} \times \frac{V1}{8} \times \frac{P1 - 04}{100}$$

<b>P1-05</b>	<b>MON2</b>	<b>Analog Monitor Output Proportion 2 (MON2)</b>		<b>Address: 010AH 010BH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.4.4
	Default:	100		
	Control Mode:	ALL		
	Unit:	% (full scale)		
	Range:	0 ~ 100		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

Please refer to parameter P0-03 for the setting of analog output selection.

For example:

P0-03 = 0x (MON2 is the motor speed analog output)

When the output voltage value of MON2 is V2:

$$\text{Motor speed} = \text{Max. speed} \times \frac{V2}{8} \times \frac{P1 - 05}{100}$$

<b>P1-06</b>	<b>SFLT</b>	<b>Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)</b>		<b>Address: 010CH 010DH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.3
	Default:	0		
	Control Mode:	S		
	Unit:	ms		
	Range:	0 ~ 1000 (0: Disabled)		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings: 0: Disabled

<b>P1-07</b>	<b>TFLT</b>	<b>Smooth Constant of Analog Torque Command (Low-pass Filter)</b>		<b>Address: 010EH 010FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.4.3
	Default:	0		
	Control Mode:	T		
	Unit:	ms		
	Range:	0 ~ 1000 (0: Disabled)		
	Data Size:	16-bit		

Display Format:	Decimal
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Settings: 0: Disabled

<b>P1-08</b>	<b>PFLT</b>	<b>Smooth Constant of Position Command (Low-pass Filter)</b>	<b>Address: 0110H 0111H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.6
Default:	0		
Control Mode:	PT, PR		
Unit:	10ms		
Range:	0 ~ 1000		
Data Size:	16-bit		
Display Format:	Decimal		

Settings: 0: Disabled

For example: 11=110 msec

<b>P1-09</b>	<b>SP1</b>	<b>1st Speed Command or Limit</b>	<b>Address: 0112H 0113H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.1
Default:	1000		
Control Mode:	S, T		
Unit:	0.1r/min		
Range:	-60000 ~ +60000		
Data Size:	32-bit		
Display Format:	Decimal		
Input Value:	Speed Command: 120=12 r/min Example: Speed Limit: Please refer to the table below.		

Settings:

**1st Speed Command**

In Speed mode, this parameter is used to set speed 1 of internal speed command.

**1st Speed Limit**

In Torque mode, this parameter is used to set speed limit 1 of internal speed command.

Speed Limit Setting Value of P1-09	Allowable Speed Range	Speed Limit of Forward Direction	Speed Limit of Reverse Direction
1000	-100 ~ 100 r/min	100 r/min	-100 r/min
-1000			

<b>P1-10</b>	<b>SP2</b>	<b>2nd Speed Command or Limit</b>		<b>Address: 0114H 0115H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.1
	Default:	2000		
	Control Mode:	S, T		
	Unit:	0.1r/min		
	Range:	-60000 ~ +60000		
	Data Size:	32-bit		
	Display Format:	Decimal		
Input Value Example:	Speed Command: 120=12 r/min Speed Limit: Please refer to the table below.			

Settings:

**2nd Speed Command**

In Speed mode, this parameter is used to set speed 2 of internal speed command.

**2nd Speed Limit**

In Torque mode, this parameter is used to set speed limit 2 of internal speed command.

Speed Limit Setting Value of P1-10	Allowable Speed Range	Speed Limit of Forward Direction	Speed Limit of Reverse Direction
1000	-100 ~ 100 r/min	100 r/min	-100 r/min
-1000			

<b>P1-11</b>	<b>SP3</b>	<b>3rd Speed Command or Limit</b>		<b>Address: 0116H 0117H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.1
	Default:	3000		
	Control Mode:	S, T		
	Unit:	0.1r/min		
	Range:	-60000 ~ +60000		
	Data Size:	32-bit		
	Display Format:	Decimal		
Input Value Example:	Speed Command: 120=12 r/min Speed Limit: Please refer to the table below.			

Settings:

**3rd Speed Command**

In Speed mode, this parameter is used to set speed 3 of internal speed command.

**3rd Speed Limit**

In Torque mode, this parameter is used to set speed limit 3 of internal speed command.

Speed Limit Setting Value of P1-11	Allowable Speed Range	Speed Limit of Forward Direction	Speed Limit of Reverse Direction
1000	-100 ~ 100 r/min	100 r/min	-100 r/min
-1000			

P1-12	TQ1	1st Torque Command or Limit		Address: 0118H 0119H
Operation Interface:		Keypad/Software	Communication	Related Section: Section 6.4.1
Default:		100		
Control Mode:		T, P&S		
Unit:		%		
Range:		-300 ~ +300		
Data Size:		16-bit		
Display Format:		Decimal		
Input Value Example:		Torque Command: 30=30% Torque Limit: Please refer to the table below.		

Settings:

#### 1st Torque Command

In Torque mode, this parameter is used to set torque 1 of internal torque command.

#### 1st Torque Limit

In Position and Speed mode, this parameter is used to set torque limit 1 of internal torque command.

Torque Limit Setting Value of P1-12	Allowable Torque Range	Torque Limit of Forward Direction	Torque Limit of Reverse Direction
30	-30 ~ 30 %	30 %	-30 %
-30			

Digital output signal TQL is activated when the drive has detected that the motor has reached the torques limits set by either the parameters P1-12 ~ P1-14 or via an external analog voltage.

P1-13	TQ2	2nd Torque Command or Limit		Address: 011AH 011BH
Operation Interface:		Keypad/Software	Communication	Related Section: Section 6.4.1
Default:		100		
Control Mode:		T, P&S		
Unit:		%		
Range:		-300 ~ +300		
Data Size:		16-bit		

Display Format:	Decimal
Input Value:	Torque Command: 30=30%
Example:	Torque Limit: Please refer to the table below.

Settings:

**2nd Torque Command**

In Torque mode, this parameter is used to set torque 2 of internal torque command.

**2nd Torque Limit**

In Position and Speed mode, this parameter is used to set torque limit 2 of internal torque command.

Torque Limit Setting Value of P1-13	Allowable Torque Range	Torque Limit of Forward Direction	Torque Limit of Reverse Direction
30	-30 ~ 30 %	30 %	-30 %
-30			

Digital output signal TQL is activated when the drive has detected that the motor has reached the torques limits set by either the parameters P1-12 ~ P1-14 or via an external analog voltage.

<b>P1-14</b>	<b>TQ3</b>	<b>3rd Torque Command or Limit</b>	<b>Address: 011CH 011DH</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.4.1
	Default:	100	
	Control Mode:	T, P&S	
	Unit:	%	
	Range:	-300 ~ +300	
	Data Size:	16-bit	
	Display Format:	Decimal	
Input Value:	Torque Command: 30=30%		
Example:	Torque Limit: Please refer to the table below.		

Settings:

**3rd Torque Command**

In Torque mode, this parameter is used to set torque 3 of internal torque command.

**3rd Torque Limit**

In Position and Speed mode, this parameter is used to set torque limit 3 of internal torque command.

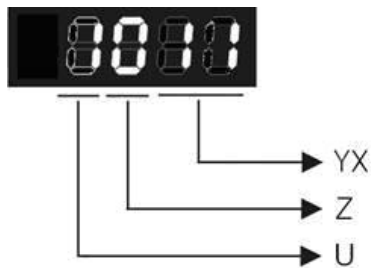
Torque Limit Setting Value of P1-14	Allowable Torque Range	Torque Limit of Forward Direction	Torque Limit of Reverse Direction
30	-30 ~ 30 %	30 %	-30 %
-30			

Digital output signal TQL is activated when the drive has detected that the motor has reached

the torques limits set by either the parameters P1-12 ~ P1-14 of via an external analog voltage.

<b>P1-15</b>	<b>CXFT</b>	<b>CAPTURE SYNC AXIS – Threshold of Correction</b>		<b>Address: 011EH 011FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0000h		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0000h ~ 0x1F5F		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:



This parameter is used to set the threshold of correction of CAPTURE SYNC AXIS operation. Setting either of YX and Z to 0 is to disable the filter function.

YX: Threshold of correction (%)

When SYNC axis operates after the data is captured, the system will calculate the errors. The function of this parameter is enabled only when the error value is less than this setting range. Otherwise, the system will use the new threshold of correction to perform the CAPTURE SYNC AXIS operation.

YX	00	01 ~ 5F
Function	Disabled	Error   <= (1~YX) % : Enabled

Z: Filter intensity

Z	0	1 ~ F
Function	Disabled	Average of 2^Z: Enabled

When the value of Z is increased, the change of correction is getting slow and it can expedite the performance of the filter function.

U: Display filter function (Read-only)

(This function is available in firmware version V1.038 sub15 and later models only)

U=0: Filter function is disabled. It indicates that the error value is greater than the setting range of (1~YX) %.

U=1: Filter function is enabled. It indicates that the error value is less than the setting range



of (1~YX) %.

<b>P1-16</b>	<b>CSOF</b>	<b>CAPTURE SYNC AXIS – Offset Compensation</b>		<b>Address: 0120H 0121H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PR		
	Unit:	The Pulse Unit of Capture Axis		
	Range:	-32768 ~ +32767		
	Data Size:	16-bit		
	Display Format:	Decimal		

**Settings:**

This parameter is used to set the offset compensation value to adjust the error pulse number of CAPTURE SYNC AXIS operation.

When SYNC axis operates after the data is captured, if the users want to change the SYNC error pulse number, i.e. parameter P5-79, using this parameter can change the error pulse number immediately.

Write P1-16:  $P5-79 = P5-79 + P1-16$

Read P1-16: Read value = P5-79

**Please note:**

1. The setting value of this parameter is an accumulative value. It will not be affected by the current error value.
2. The setting value of P5-79 can be monitored by the monitoring variable code 084 (54h), Synchronous Capture Axis – Synchronous error pulse number.

<b>P1-17</b>	<b>TEET</b>	<b>Tracking Error Compensation – Additional Time Setting</b>		<b>Address: 0122H 0123H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PR		
	Unit:	ms with fraction down to usec		
	Range:	-20.000 ~ +20.000 (Three decimal point)		
	Data Size:	16-bit		
	Display Format:	Decimal		
Input Value Example:	1.5 = Motor speed x 1.5 ms (PUU)			

**Settings:**

(This function is available in firmware version V1.038 sub15 and later models only)

When the function of tracking error compensation is enable (P1-36=1), the system will calculate the compensation value according to the input command automatically and make the position error (PUU) to be close to 0. However, as the time delay caused by other reasons cannot be predicted in advance. The users can set the additional time to compensate the positioning time delay.

Additional compensation distance = P1-17 x Motor Speed

Please note:

1. The setting value of this parameter is proportioned to the value of the motor speed.
2. This parameter is enabled only when P1-36 is set to 1.

P1-18	CPCT	Electronic Cam (E-Cam) Pulse Phase Compensation – Time Setting	Address: 0124H 0125H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	PR	
	Unit:	ms with fraction down to usec	
	Range:	-20.000 ~ +20.000 (Three decimal point)	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

(This function is available in firmware version V1.038 sub48 and later models only)

This parameter is used to compensate the delay pulse phase when the electronic cam function is enabled during operation. Please use this parameter with P1-21.

Compensated Pulse Phase (pls) = P1-18 x (Pulse Frequency of E-Cam Master Axis (Kpps) – P1-21)

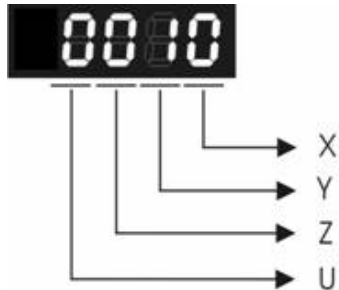
Please note:

1. The setting value of this parameter is proportioned to the value of the pulse frequency of E-Cam master axis.
2. The pulse phase compensation function is enabled only when the setting value of parameter P1-18 is higher than 0.
3. The pulse phase compensation function is enabled only when the value of the pulse frequency of E-Cam master axis (monitoring variable is 060 (3Ch) Pulse number of E-Cam master axis (Incremental)) is higher than the setting value of parameter P1-21.

P1-19	CPEX	CAPTURE / COMPARE – Additional Function Settings	Address: 0126H 0127H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	ALL	

Unit:	N/A
Range:	0x0000 ~ 0x0101
Data Size:	16-bit
Display Format:	Hexadecimal

Settings:



X: Bit settings of Capture additional function settings

Y: Reserved.

Z: Bit settings of Compare additional function settings

U: Reserved.

X: Bit settings of Capture additional function settings:

Please refer to the following table and descriptions:

Bit	3	2	1	0
Function	-	-	-	Repeating Mode
Explanation	-	-	-	Enable the repeating mode. After the last position is captured, the system will automatically repeat this CAPTURE function. The captured data is still stored in the data array that the starting address is specified by P5-36! (This function is available in firmware version V1.038 sub19 and later models only)

Z: Bit settings of Compare additional function settings:

Please refer to the following table and descriptions:

Bit	3	2	1	0
Function	-	-	-	Automatically set P1-24 to 0.
Explanation	-	-	-	When Bit0 is set to 1, P1-24 will only be effective once and reset to 0 automatically! Otherwise, the value of P1-24 will remain unchanged. (This function is available in firmware version V1.038 sub19 and later models only)

<b>P1-20</b>	<b>CPMK</b>	<b>CAPTURE – Masking Range Setting</b>		<b>Address: 0128H 0129H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	The Pulse Unit of Capture Axis		

Range:	0 ~ +100000000
Data Size:	32-bit
Display Format:	Decimal

**Settings:**

When multiple points are required to be captured, after each point is captured, the masking range can be set in this parameter. In the masking area, the CAPTURE function will not work. The masking range is defined as follows:

$$(CAP\_DATA-P1-20 \cdot CAP\_DATA+P1-20)$$

Please note:

1. When the setting value of this parameter is set to 0, the masking function is disabled.

<b>P1-21</b>	<b>CPCL</b>	<b>Electronic Cam (E-Cam) Pulse Phase Compensation – Min. Frequency Setting of Master Axis</b>		<b>Address: 012AH 012BH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PR		
	Unit:	Kpps (Kpulse/sec)		
	Range:	-32768 ~ +32767		
	Data Size:	16-bit		
	Display Format:	Decimal		

**Settings:**

(This function is available in firmware version V1.038 sub48 and later models only)

This parameter is used to compensate the delay pulse phase when the electronic cam function is enabled during operation. Please use this parameter with P1-18.

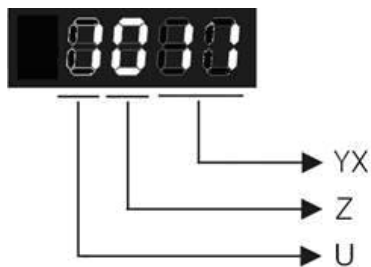
Compensated Pulse Phase (pls) = P1-18 x (Pulse Frequency of E-Cam Master Axis (Kpps) – P1-21)

Please note:

1. The setting value of this parameter is proportioned to the value of the pulse frequency of E-Cam master axis.
2. The pulse phase compensation function is enabled only when the setting value of parameter P1-18 is higher than 0.
3. The pulse phase compensation function is enabled only when the value of the pulse frequency of E-Cam master axis (monitoring variable is 060 (3Ch) Pulse number of E-Cam master axis (Incremental)) is higher than the setting value of parameter P1-21.

<b>P1-22</b>	<b>SPF1</b>	<b>PR Special Filter Settings</b>		<b>Address: 012CH 012DH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	000h		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0000h ~ 0x107F		
	Data Size:	16-bit format = UZYX		
Display Format:	Hexadecimal			

Settings:



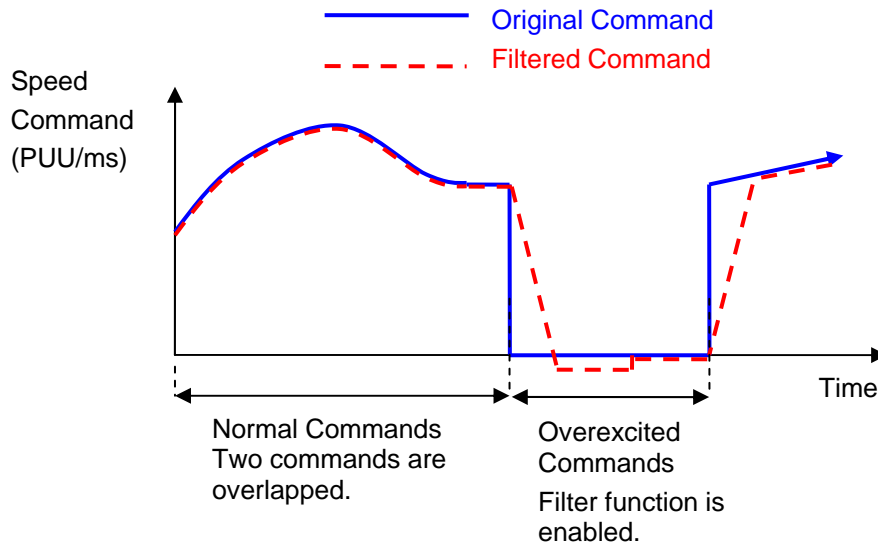
YX: Acceleration time limit (0: Disabled, [1~127] x 10ms), Units: 10ms

When the changes of PR (or E-Cam) commands are too fast, it will cause the vibration of the mechanical system and affect the system performance. Using this function is able to control the acceleration (deceleration) speed not to exceed thw limit to smooth the operation, reduce the noise and extend the system life.

This function has different meaning than general filter function. The traditional filter function will perform filter the commands no matter the changes of the commands are fast or slow. This always makes the commands be delivered with time delay and lower the efficiency of the system. This function can help to disable the filter function when the changes of the commands are not fast. Then, the commands can be delievered with no time delay. The definition of this setting is the required acceleration time when the motor runs from 0 to 3000 r/min. The required time is longer, the effect of the filter function is better and the acceleration / deceleration will become smoother.

Please note:

1. The unit of acceleration time limit is 10ms. For example, if YX=12h, the acceleration time limit is 180ms. It means the filter function is enabled when the acceleration or deceleration time is faster than 180ms. Otherwise, the command will remain unchanged.



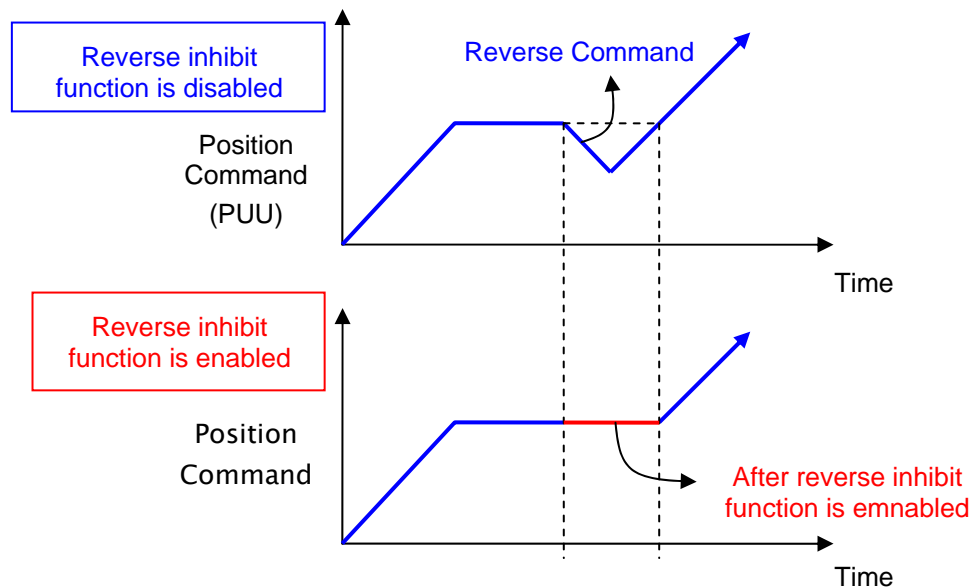
2. When this filter function is enabled, it may cause the motor goes beyond the original position. Usually, the motor will return to the original position after the command becomes stable. However, if the command does not become stable, the internal position errors may be accumulated and result in AL404.
3. The setting value of the acceleration time limit must be less than the acceleration time of the normal command and higher than the overexcited command.
4. If the users do not want to see that the reverse operation occurs after using this function, please enable the following reverse inhibit function (when U is set to 1).

U: Reverse Inhibit Function

U=0: Reverse inhibit function is disabled.

U=1: Reverse inhibit function is enabled.

When this reverse inhibit function is enabled, the reverse command will be inhibited and cannot be output. The reverse command will be reserved and output after the received forward command exceeds the reserved reverse command.



<b>P1-23</b>	<b>CMOF</b>	<b>Compare data offset (Value of P1-23 are remain unchanged)</b>		<b>Address: 012EH 012FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	The Pulse Unit of Capture Axis		
	Range:	-10000000 ~ +10000000		
	Data Size:	32-bit format		
	Display Format:	Decimal		

**Settings:**

The users can use this parameter to add an offset value to compare data as actual compare data.

$$CMP\_DATA = DATA\_ARRAY[*] + P1-23 + P1-24$$

Please note:

1. P1-23: The value of P1-23 will always remain unchanged.
2. P1-24: When P1-24 is set, if Bit 0 of P1-19 Z setting is set to 1, P1-24 will only be effective once and reset to 0 automatically.
3. The compare data (CMP\_DATA) can be displayed and monitored via monitor variable code V25h (037).

<b>P1-24</b>	<b>CMOF</b>	<b>COMPARE – Compare data offset (Automatically set P1-24 to 0)</b>		<b>Address: 0130H 0131H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	The Pulse Unit of Capture Axis		
	Range:	-32768 ~ +32767		
	Data Size:	16-bit format		
	Display Format:	Decimal		

**Settings:**

The users can use this parameter to add an offset value to compare data as actual compare data.

$$CMP\_DATA = DATA\_ARRAY[*] + P1-23 + P1-24$$

Please note:

1. The parameter setting value of P1-24 will not be retained when power is off.
2. P1-24: When P1-24 is set, if Bit 0 of P1-19 Z setting is set to 1, P1-24 will only be effective once and reset to 0 automatically.
3. CMP\_DATA can be monitored by monitor variable V25h(037).

P1-25	VSF1	Low-frequency Vibration Suppression (1)	Address: 0132H 0133H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.2.9
	Default:	0	
	Control Mode:	PT, PR	
	Unit:	0.1Hz	
	Range:	10 ~ 100	
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	150 = 15Hz	

**Settings:**

This parameter is used to set the first group of the low-frequency of mechanical system. It can be used to suppress the low-frequency vibration of mechanical system. If P1-26 is set to 0, this parameter is disabled.

P1-26	VSG1	Low-frequency Vibration Suppression Gain (1)	Address: 0134H 0135H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.2.9
	Default:	0	
	Control Mode:	PT, PR	
	Unit:	-	
	Range:	0 ~ 9 (0: Disable the function of P1-25)	
	Data Size:	16-bit	
	Display Format:	Decimal	

**Settings:**

This parameter is used to set the vibration suppression gain for P1-25. When the setting value is higher, the position response is quicker. However, if the setting value is over high, it may affect the normal operation of servo motor. It is recommended to set P1-26 as 1.

P1-27	VSF2	Low-frequency Vibration Suppression (2)	Address: 0136H 0137H
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.2.9
	Default:	1000	
	Control Mode:	PT, PR	
	Unit:	0.1Hz	
	Range:	10 ~ 1000	
	Data Size:	16-bit	



Display Format:	Decimal
Input Value Example:	150 = 15Hz

Settings:

This parameter is used to set the second group of the low-frequency of mechanical system. It can be used to suppress the low-frequency vibration of mechanical system. If P1-28 is set to 0, this parameter is disabled.

<b>P1-28</b>	<b>VSG2</b>	<b>Low-frequency Vibration Suppression Gain (2)</b>		<b>Address: 0138H 0139H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.9
	Default:	0		
	Control Mode:	PT, PR		
	Unit:	-		
	Range:	0 ~ 9 (0: Disable the function of P1-27)		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set the vibration suppression gain for P1-27. When the setting value is higher, the position response is quicker. However, if the setting value is over high, it may affect the normal operation of servo motor. It is recommended to set P1-28 as 1.

<b>P1-29</b>	<b>AVSM</b>	<b>Auto Low-frequency Vibration Suppression Mode Selection</b>		<b>Address: 013AH 013BH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.9
	Default:	0		
	Control Mode:	PT, PR		
	Unit:	-		
	Range:	0 ~ 1		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

- 0: Normal mode (Disable Auto Low-frequency Vibration Suppression Mode).
- 1: Auto mode (Enable Auto Low-frequency Vibration Suppression Mode).

Explanation:

If P1-29 is set to 0, the setting of low-frequency vibration suppression is fixed and will not change automatically.

If P1-29 is set to 1, when there is no low-frequency vibration or the low-frequency

vibration becomes less and stable, the system will set P1-29 to 0, save the measured low-frequency value automatically and memorize it in P1-25.

<b>P1-30</b>	<b>VCL</b>	<b>Low-frequency Vibration Detection Level</b>		<b>Address: 013CH 013DH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.9
	Default:	500		
	Control Mode:	PT, PR		
	Unit:	pulse		
	Range:	0 ~ 8000		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

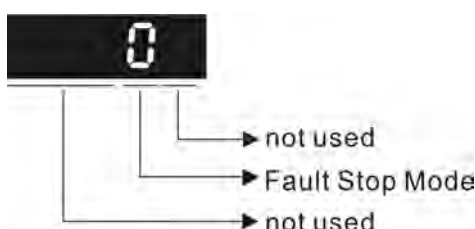
When P1-29 is set to 1, the system will find this detection level automatically. If the setting value of P1-30 is too low, the detection of frequency will become sensitive and result in erroneous measurement. If the setting value of P1-30 is too high, although the probability of erroneous measurement will decrease, the frequency will become difficult to be found especially when the vibration of mechanical system is less.

<b>P1-31</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 013EH 013FH</b>
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<b>P1-32</b>	<b>LSTP</b>	<b>Motor Stop Mode Selection</b>		<b>Address: 0140H 0141H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0x20		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings:

This parameter is used to select servo motor stop mode when Servo Off or a fault (servo alarm, includes EMGS (Emergency stop)) occurs.



Fault Stop Mode

0: Use dynamic brake

1: Allow servo motor to coast to stop

2: Use dynamic brake first, after the motor speed is below than P1-38, allow servo motor to coast to stop

When the fault NL(CWL) or PL(CCWL) occurs, please refer to the settings of parameter P5-03 to determine the deceleration time. If the deceleration time is set to 1ms, the motor will stop instantly.

<b>P1-33</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0142H 0143H</b>
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<b>P1-34</b>	<b>TACC</b>	<b>Acceleration Time</b>	<b>Address: 0144H 0145H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.3.3
	Default:	200	
	Control Mode:	S	
	Unit:	ms	
	Range:	1 ~ 65500	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to determine the acceleration time to accelerate from 0 to its rated motor speed. The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Please note:

1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-34 is limited to 20000 automatically.

<b>P1-35</b>	<b>TDEC</b>	<b>Deceleration Time</b>	<b>Address: 0146H 0147H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.3.3
	Default:	200	
	Control Mode:	S	
	Unit:	ms	
	Range:	1 ~ 65500	
	Data Size:	16-bit	

Display Format:	Decimal
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Settings:

This parameter is used to determine the acceleration time to accelerate from 0 to its rated motor speed. The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Please note:

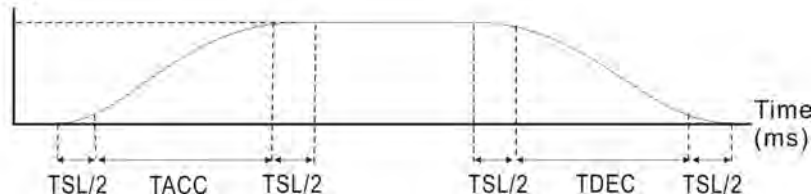
1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-35 is limited to 20000 automatically.

<b>P1-36</b>	<b>TSL</b>	<b>Accel /Decel S-curve</b>	<b>Address: 0148H 0149H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.3.3
	Default:	0	
	Control Mode:	S, PR	
	Unit:	ms	
	Range:	0 ~ 65500 (0: Disabled)	
	Data Size:	16-bit	
Display Format:	Decimal		

Settings:

This parameter is used to make the motor run more smoothly when startup and windup. Using this parameter can improve the motor running stability.

Speed



TACC: P1-34, Acceleration time

TDEC: P1-35, Deceleration time

TSL: P1-36, Accel /Decel S-curve

Total acceleration time = TACC + TSL

Total deceleration time = TDEC + TSL

The functions of parameters P1-34, P1-35 and P1-36 are each individual. When P1-36 is set to 0 (Disabled), the settings of P1-34, P1-35 are still effective. It indicates that the parameters P1-34 and P1-35 will not become disabled even when P1-36 is disabled.

Tracking error compensation function:

This function is available in firmware version V1.036 sub00 and later models only.

Function	P1-36 = 0	P1-36 = 1	P1-36 > 1
Accel /Decel S-curve	Disabled	Disabled	Enabled
Track error compensation	Disabled	Enabled	Determined by P2-68 X settings

Please note:

1. When the source of speed command is analog command, the maximum setting value of P1-36 is set to 0, the acceleration and deceleration function will be disabled.
2. When the source of speed command is analog command, the maximum setting value of P1-36 is limited to 10000 automatically.

P1-37	GDR	Ratio of Load Inertia to Servo Motor Inertia		Address: 014AH 014BH
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	1.0	10	
	Control Mode:	ALL		
	Unit:	1 times	0.1 times	
	Range:	0.0 ~ 200.0	0 ~ 2000	
	Data Size:	16-bit		
	Display Format:	One-digit	Decimal	
	Input Value Example:	1.5 = 1.5 times	15 = 1.5 times	

Settings:

**Ratio of load inertia to servo motor inertia (for Rotation Motor): (J\_load / J\_motor)**

J\_load: Total equivalent moment of inertia of external mechanical load

J\_motor: Moment of inertia of servo motor

**Ratio of load weight to servo motor weight (for Linear Motor): (M\_load / M\_motor)  
(not available now but will be available soon)**

M\_load: Total equivalent weight of external mechanical load

M\_motor: Weight of servo motor

P1-38	ZSPD	Zero Speed Range Setting		Address: 014CH 014DH
	Operation Interface:	Keypad/Software	Communication	Related Section: Table 8.A
	Default:	10	100	
	Control Mode:	ALL		
	Unit:	1 r/min	0.1 r/min	
	Range:	0.0 ~ 200.0	0 ~ 2000	
	Data Size:	16-bit		

Display Format:	One-digit	Decimal
Input Value Example:	1.5 = 1.5 r/min	15 = 1.5 r/min

Settings:

This parameter is used to set output range of zero speed signal (ZSPD) and determine when zero speed signal (ZSPD) becomes activated. ZSPD is activated when the drive senses the motor is equal to or below the Zero Speed Range setting as defined in parameter P1-38.

For example, at default ZSPD will be activated when the drive detects the motor rotating at speed at or below 100r/min. ZSPD will remain activated until the motor speed increases above 100r/min.

<b>P1-39</b>	<b>SSPD</b>	<b>Target Motor Speed</b>		<b>Address: 014EH 014FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Table 8.A
	Default:	3000		
	Control Mode:	ALL		
	Unit:	r/min		
	Range:	0 ~ 5000		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

When target motor speed reaches its preset value, digital output (TSPD) is enabled. When the forward and reverse speed of servo motor is equal and higher than the setting value, the motor will reach the target motor speed, and then TSPD signal will output.

TSPD is activated once the drive has detected the motor has reached the Target Motor Speed setting as defined in parameter P1-39. TSPD will remain activated until the motor speed drops below the Target Motor Speed.

<b>P1-40</b>	<b>VCM</b>	<b>Max. Analog Speed Command or Limit 1</b>		<b>Address: 0150H 0151H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.4
	Default:	rated speed of connected model		
	Control Mode:	S, T		
	Unit:	r/min		
	Range:	0 ~ 50000		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

In **Speed mode**, this parameter is used to set the maximum analog speed command based on the maximum input voltage (10V).

In **Torque mode**, this parameter is used to set the maximum analog speed limit based on the maximum input voltage (10V).

For example, in speed mode, if P1-40 is set to 3000 and the input voltage is 10V, it indicates that the speed command is 3000r/min. If P1-40 is set to 3000, but the input voltage is changed to 5V, then the speed command is changed to 1500r/min.

$$\text{Speed Command / Limit} = \text{Input Voltage Value} \times \text{Setting value of P1-40} / 10$$

<b>P1-41 ▲</b>	<b>TCM</b>	<b>Max. Analog Torque Command or Limit</b>		<b>Address: 0152H 0153H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.4.4
	Default:	100		
	Control Mode:	ALL		
	Unit:	%		
	Range:	0 ~ 1000		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

In **Torque mode**, this parameter is used to set the maximum analog torque command based on the maximum input voltage (10V).

In **Position (PT, PR)** and **Speed mode**, this parameter is used to set the maximum analog torque limit based on the maximum input voltage (10V).

For example, in torque mode, if P1-41 is set to 100 and the input voltage is 10V, it indicates that the torque command is 100% rated torque. If P1-41 is set to 100, but the input voltage is changed to 5V, then the torque command is changed to 50% rated torque.

$$\text{Torque Command / Limit} = \text{Input Voltage Value} \times \text{Setting value of P1-41} / 10$$

<b>P1-42</b>	<b>MBT1</b>	<b>On Delay Time of Electromagnetic Brake</b>		<b>Address: 0154H 0155H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.5.5, Table 8.B
	Default:	0		
	Control Mode:	ALL		
	Unit:	ms		
	Range:	0 ~ 1000		
	Data Size:	16-bit		
Display Format:	Decimal			

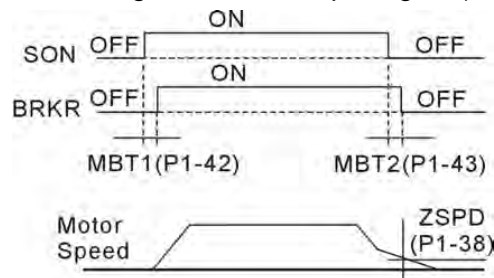
Settings:

Used to set the period of time between when the servo drive is On (Servo On) and when electromagnetic brake output signal (BRKR) is activated.

<b>P1-43</b>	<b>MBT2</b>	<b>OFF Delay Time of Electromagnetic Brake</b>	<b>Address: 0156H 0157H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.5.5, Table 8.B
	Default:	0	
	Control Mode:	ALL	
	Unit:	ms	
	Range:	-1000 ~ +1000	
	Data Size:	16-bit	
Display Format:	Decimal		

**Settings:**

Used to set the period of time between when the servo drive is Off (Servo Off) and when electromagnetic brake output signal (BRKR) is inactivated.



**Please note:**

1. When servo is commanded off and the off delay time set by P1-43 has not elapsed, if the motor speed is lower than the setting value of P1-38, the electromagnetic brake will be engaged regardless of the off delay time set by P1-43.
2. When servo is commanded off and the off delay time set by P1-43 has elapsed, if the motor speed is higher than the setting value of P1-38, electromagnetic brake will be engaged regardless of the current motor speed.
3. When the servo drive is disabled (Servo Off) due to a fault (except AL022) or by EMGS (Emergency stop) being activated, if the off delay time set by P1-43 is a negative value, it will not affect the operation of the motor. A negative value of the off delay time is equivalent to one with a zero value.

<b>P1-44 ▲</b>	<b>GR1</b>	<b>Electronic Gear Ratio (1st Numerator) (N1)</b>	<b>Address: 0158H 0159H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: Section 6.2.5
	Default:	128	
Control Mode:	PT, PR		



Unit:	pulse
Range:	1 ~ (2 <sup>29</sup> -1)
Data Size:	32-bit
Display Format:	Decimal

Settings:

This parameter is used to set the numerator of the electronic gear ratio. The denominator of the electronic gear ratio is set by P1-45. P2-60 ~ P2-62 are used to set the additional numerators.

Please note:

1. In PT mode, the setting value of P1-44 can be changed only when the servo drive is enabled (Servo On).
2. In PR mode, the setting value of P1-44 can be changed only when the servo drive is disabled (Servo Off).

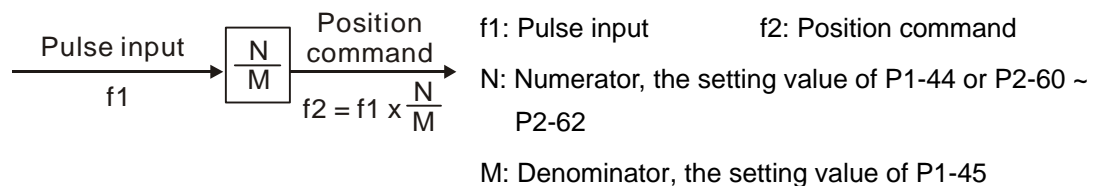
<b>P1-45</b>	<b>GR2</b>	<b>Electronic Gear Ratio (Denominator) (M)</b>		<b>Address: 015AH 015BH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.5
	Default:	10		
	Control Mode:	PT, PR		
	Unit:	pulse		
	Range:	1 ~ (2 <sup>31</sup> -1)		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set the denominator of the electronic gear ratio. The numerator of the electronic gear ratio is set by P1-44. P2-60 ~ P2-62 are used to set the additional numerators.

As the wrong setting may cause motor to run chaotically (out of control) and it may lead to personnel injury, therefore, ensure to observe the following rule when setting P1-44, P1-45.

The electronic gear ratio setting (Please also see P1-44, P2-60 ~ P2-62):



The electronic gear ratio setting range must be within: 1/50 < N/M < 25600.

Please note:

1. In PT and PR mode, the setting value of P1-45 can not be changed when the servo drive is enabled (Servo On).

P1-46 ▲	GR3	Encoder Output Pulse Number	Address: 015CH 015DH
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	2500	
	Control Mode:	ALL	
	Unit:	pulse	
	Range:	20 ~ 320000	
	Data Size:	32-bit	
	Display Format:	Decimal	

**Settings:**

This parameter is used to set the pulse numbers of encoder outputs per motor revolution.

Setting range: 20 ~ 320000

The maximum frequency output of the hardware is 19.8 MHz.

Please note:

When the following conditions occur, the output frequency for pulse output may exceed the specification and cause that the servo drive fault AL018 (Encoder Output Error) is activated.

Condition 1: Encoder error.

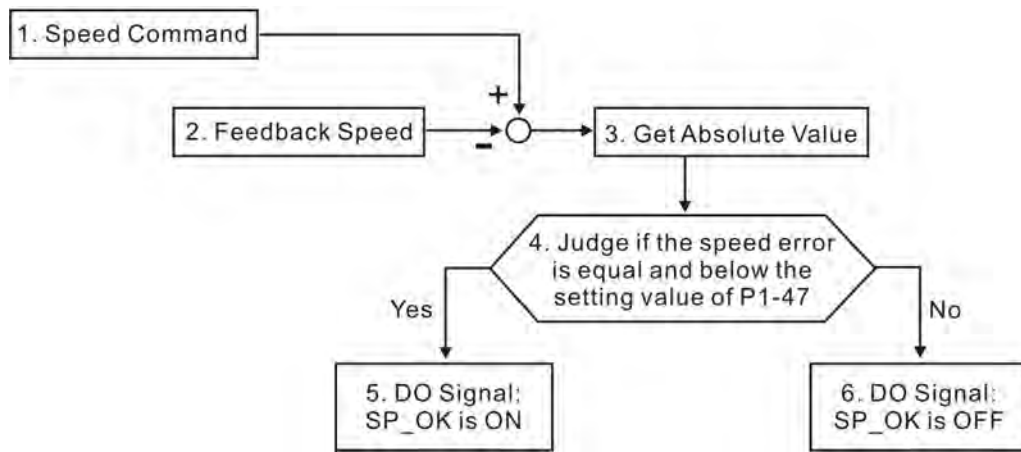
Condition 2: Motor speed is above the value set by parameter P1-76.

Condition 3:  $\frac{\text{Motor Speed}}{60} \times P1 - 46 \times 4 > 19.8 \times 10^6$

P1-47	SPOK	Speed Reached Output Range	Address: 015EH 015FH
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	10	
	Control Mode:	S, Sz	
	Unit:	r/min	
	Range:	0 ~ 300	
	Data Size:	32-bit	
	Display Format:	Decimal	

**Settings:**

This parameter is used to set the speed reached output range. The DO signal, SP\_OK will be activated when the speed error is equal and below the setting value of P1-47.



1. Speed Command: It is the speed command input by the users (no Accel/Decel), not the frond-end command of speed control loop. The source of this command includes analog voltage and registers.
2. Feedback Speed: It is the actual motor speed which is filtered.
3. Get Absolute Value
4. Judge if the speed error is equal and below the setting value of P1-47: When P1-47 is set to 0, this digital output will be always off.
5. ON or OFF: When the speed error is equal and below the setting value of P1-47, SP\_OK will be ON; otherwise, SP\_OK will be OFF.

<b>P1-48</b>	<b>MCOK</b>	<b>Operation Selection of Motion Reached</b>		<b>Address: 0160H 0161H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0x0000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x0000 ~ 0x0011		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings:

Settings: (for firmware version V1.003 sub08 and later models only)

This parameter is used to determine the operation after digital output signal, MC\_OK (DO code is 0x17) is activated.

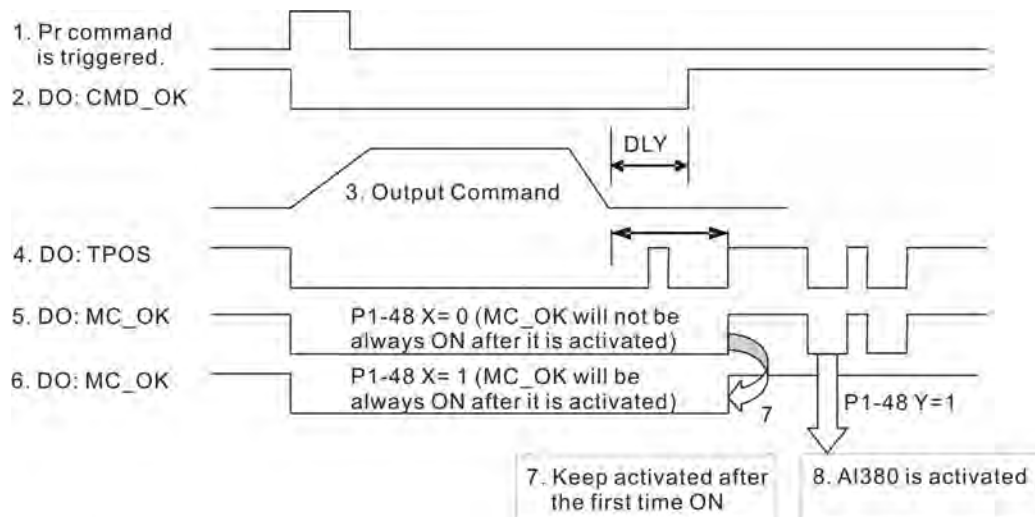
Display	0	0	Y	X
Range	-	-	0 ~ 1	0 ~ 1

X=0: MC\_OK will not be always ON after it is activated.

X=1: MC\_OK will be always ON after it is activated.

Y=0: Servo fault AL380 will not be activated.

Y=1: Servo fault AL380 will be activated.



1. PR command is triggered: It indicates that the new PR command becomes effective. When the signal 3 starts to output the command, the signals 2, 4 and 5 will be clear simultaneously.
2. CMD\_OK: CMD\_OK is used to detect if the internal position command, signal 3 has been completed. DLY delay time can also be set.
3. Output Command: Output the internal position command according to desired acceleration and deceleration.
4. TPOS: It is activated when the position error is equal and below the setting value of P1-54.
5. MC\_OK (P1-48 X=0): It is activated when the position command has output and the positioning is completed also, i.e. CMD\_OK and TPOS are both ON. However, once TPOS becomes OFF, it will become OFF as well.
6. MC\_OK (P1-48 X=1): It is activated when the position command has output and the positioning is completed also, i.e. CMD\_OK and TPOS are both ON. However, when TPOS becomes OFF, it will not become OFF. It will be always ON
7. The signal 5 and signal 6 cannot be selected simultaneously. This function is determined by X setting of P1-48.
8. Position deviation alarm (AL380): After signal 7 occurs, if signal 4 or 5 becomes off, it indicates a position deviation alarm is detected and AL380 can be activated to provide an alarm signal. This function is determined by Y setting of P1-48.

<b>P1-49</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0162H 0163H</b>
<b>P1-50</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0164H 0165H</b>
<b>P1-51</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0166H 0167H</b>

<b>P1-52</b>	<b>RES1</b>	<b>Regenerative Resistor Value</b>		<b>Address: 0168H 0169H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 2.7
	Default:	See the table below		
	Control Mode:	ALL		
	Unit:	Ohm		
	Range:	5 ~ 750		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set the resistance of the applicable regenerative resistor.

Model	Default
For 1.5kW and below models	40Ω
For 2kW to 4.5kW models	20Ω
For 5.5kW	15Ω
For 7.5kW	15Ω

<b>P1-53</b>	<b>RES2</b>	<b>Regenerative Resistor Capacity</b>		<b>Address: 016AH 016BH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 2.7
	Default:	See the table below		
	Control Mode:	ALL		
	Unit:	Watt		
	Range:	0 ~ 3000		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set the capacity of the applicable regenerative resistor.

Model	Default
For 1.5kW and below models	60W
For 2kW to 4.5kW models	100W
For 5.5kW	0W
For 7.5kW	0W

P1-54	PER	Positioning Completed Width	Address: 016CH 016DH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	12800	
	Control Mode:	PT, PR	
	Unit:	pulse	
	Range:	0 ~ 1280000	
	Data Size:	32-bit	
	Display Format:	Decimal	

## Settings:

In PT mode, when the error pulse numbers is less than the setting value of parameter P1-54, TPOS (At positioning completed signal) will be activated.

In PR mode, when the difference in pulse number between the target position and the actual position is less than the setting value of parameter P1-54, TPOS (At positioning completed signal) will be activated.

P1-55	MSPD	Maximum Speed Limit	Address: 016EH 016FH
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	Rated speed of connected model	
	Control Mode:	ALL	
	Unit:	r/min	
	Range:	0 ~ Max. speed	
	Data Size:	16-bit	
	Display Format:	Decimal	

## Settings:

This parameter is used to set maximum motor speed. The default setting is rated speed.

P1-56	OVW	Output Overload Warning Time	Address: 0170H 0171H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	120	
	Control Mode:	ALL	
	Unit:	%	
	Range:	0 ~ 120	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to set output overload time. If the setting value of parameter P1-56 is set to 0 ~ 100, the function of parameter P1-56 is enabled. When the motor has reached the output overload time set by parameter P1-56, the motor will send a warning to the drive. After the drive has detected the warning, the DO signal OLW will be activated. If the setting value of parameter P1-56 exceeds 100, the function of parameter P1-56 is disabled.

**t<sub>OL</sub>** = Permissible Time for Overload x the setting value of parameter P1-56

When overload accumulated time (continuously overload time) exceeds the value of **t<sub>OL</sub>**, the overload warning signal will output, i.e. DO signal, OLW will be ON. However, if the accumulated overload time (continuous overload time) exceeds the permissible time for overload, the overload alarm (AL006) will occur.

For example:

If the setting value of parameter P1-56 (Output Overload Warning Time) is 60%, when the permissible time for overload exceeds 8 seconds at 200% rated output, the overload fault (AL006) will be detected and shown on the LED display.

At this time, **t<sub>OL</sub>** = 8 x 60% = 4.8 seconds

Result:

When the drive output is at 200% rated output and the drive is continuously overloaded for 4.8 seconds, the overload warning signal will be ON, i.e. DO signal OLW will be activated. If the drive is continuously overloaded for 8 seconds, the overload alarm will be detected and shown on the LED display (AL006). Then, Servo Fault signal will be ON (DO signal ALRM will be activated).

<b>P1-57</b>	<b>CRSHA</b>	<b>Motor Protection Percentage</b>		<b>Address: 0172H 0173H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	%		
	Range:	0 ~ 300		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to protect the motor in case the motor touches the mechanical equipment. If P1-57 is set to 0, the function of P1-57 is disabled. The function of P1-57 is enabled when the setting value of P1-57 is set to 1 or more. The fault AL030 will be activated when the setting value of P1-57 is reached after a period of time set by P1-58.

P1-58	CRSHT	Motor Protection Time	Address: 0174H 0175H
Operation Interface:	Keypad/Software	Communication	Related Section: N/A
Default:	1		
Control Mode:	ALL		
Unit:	ms		
Range:	0 ~ 1000		
Data Size:	16-bit		
Display Format:	Decimal		

## Settings:

This parameter is used to protect the motor in case the motor touches the mechanical equipment. The fault AL030 will be activated when the setting value of P1-57 is reached after a period of time set by P1-58.

Please note that this function is applicable for non-contact applications, such as electric discharge machines only (P1-37 must be set correctly).

P1-59	MFLT	Analog Speed Linear Filter (Moving Average Filter)	Address: 0176H 0177H
Operation Interface:	Keypad/Software	Communication	Related Section: N/A
Default:	0.0	0	
Control Mode:	S		
Unit:	1 ms	0.1 ms	
Range:	0.0 ~ 4.0	0 ~ 40	
Data Size:	16-bit		
Display Format:	One-digit	Decimal	
Input Value Example:	1.5 = 1.5 times	15 = 1.5 times	

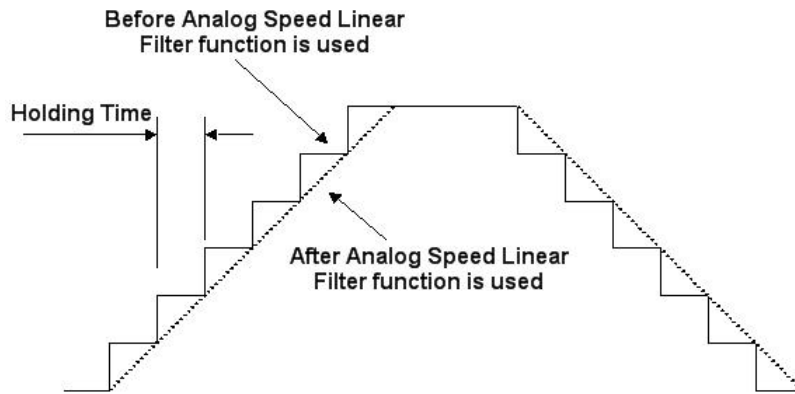
## Settings: (0: Disabled)

This parameter is used to eliminate the noise generated during the operation when the host (external) controller sends the step analog voltage speed command.

The parameter P1-06 is Low-pass Filter and parameter P1-59 is Moving Average Filter. The differences are that Low-pass Filter is usually used to smooth the end of the command but Moving Average Filter can be used to smooth the start and the end of step analog voltage speed command. Using Moving Average Filter can facilitate the smooth operation of the motor very effectively.

Therefore, it is recommended to use P1-06 Low-pass Filter when the speed command from the external controller is applied for position control loop. If the command is for speed control only, using Moving Average Filter P1-59 can achieve better (smooth) performance.





<b>P1-60</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0178H 0179H</b>
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<b>P1-61</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 017AH 017BH</b>
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<b>P1-62</b>	<b>FRCL</b>	<b>Friction Compensation Percentage</b>	<b>Address: 017CH 017DH</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	PT, PR, S	
	Unit:	%	
	Range:	0 ~ 100	
	Data Size:	16-bit	
	Display Format:	Decimal	

**Settings:**

This parameter is used to set the torque percentage for friction compensation. If P1-62 is set to 0, the function of P1-62 is disabled. The function of P1-62 is enabled when the setting value of P1-62 is set to 1 or more.

<b>P1-63</b>	<b>FRCT</b>	<b>Friction Compensation Smooth Constant</b>	<b>Address: 017EH 017FH</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	PT, PR, S	
	Unit:	ms	
	Range:	0 ~ 1000	
	Data Size:	16-bit	
	Display Format:	Decimal	

**Settings:**

This parameter is used to set the smooth constant of friction compensation.

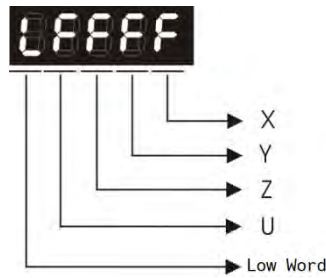
Settings: The smooth constant of analog position command is only effective to analog position command.



**NOTE** Version after v1.031 sub8 supports this function

<b>P1-64</b>	<b>PCCT</b>	<b>Analog Position Command: Activation Control</b>		<b>Address: 0180H 0181H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0x00		
	Control Mode:	PT		
	Unit:	--		
	Range:	0 x00~ 0x11		
	Data Size:	32 bit		
	Display Format:	HEX		

Settings:



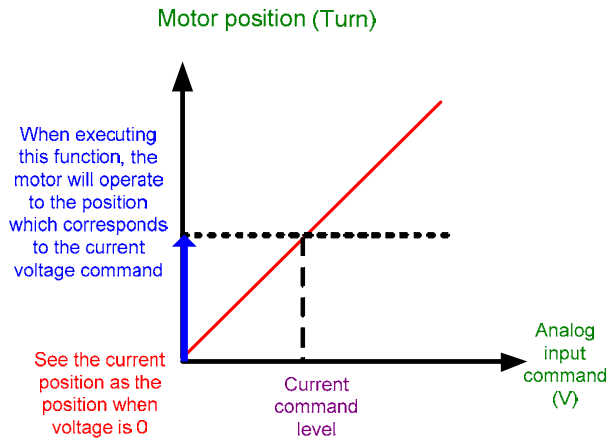
X:

- 0: Disable the function of position command which is issued by analog
- 1: Enable the function of position command which is issued by analog

Y: Initial position setting

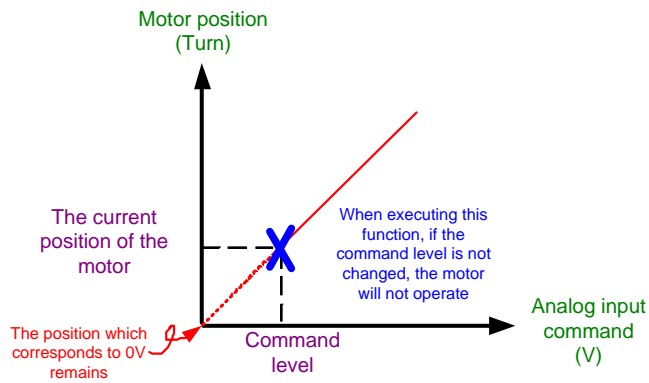
P1-64.Y=0:

After SERVO ON, the motor will see the current position as the position when the voltage is 0. Then the motor will operate to the position according to the command issued by analog input.



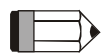
P1-64.Y=1:

After SERVO ON, if the command level is not changed, the motor will not operate. The position the motor stops is the position that corresponds to the current command level.



Z: Reserved

U: Reserved



**NOTE**

Version after firmware v1.031 sub8 supports this function.

P1-65	Smooth Constant of Analog Position Command	Address: 0182H 0183H
Operation Interface:	Keypad/Software      Communication	Related Section: N/A
Default:	1	
Control Mode:	PT	
Unit:	10 ms	
Range:	1 ~ 1000	
Data Size:	16-bit	
Display Format:	Decimal	

Settings: The smooth constant of analog position command is only effective to analog position command.

<b>P1-66</b>	<b>PCM</b>	<b>Max. Rotation Number of Analog Position Command</b>		<b>Address: 0184H 0185H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	1.0		
	Control Mode:	PT		
	Unit:	0.1 rotation		
	Range:	0 ~ 2000		
	Data Size:	16-bit		
	Display Format:	Decimal		
Input Value Example:	15 = 1.5 rotation			

Settings:

1~4000: At PT mode, when entering the parameter of P1-64, the maximum rotation number of analog position command is enabled.

This parameter is used to set the maximum rotation number of analog position command based on the maximum input voltage (10V).

For example, if P1-66 is set to 30 and the input voltage is 10V, it indicates that the position command is +3 rotations. If P1-66 is set to 30, but the input voltage is changed to 5V, then the position command is +1.5 rotations..

Position Command = Input Voltage Value x Setting value of P1-66 / 10

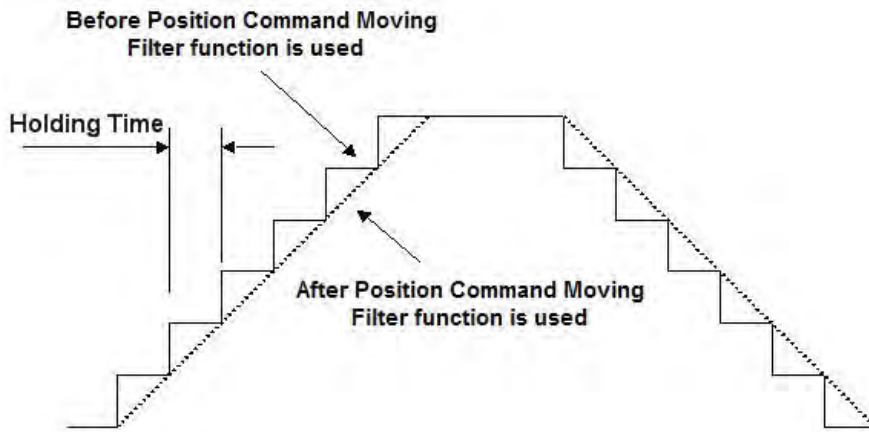
<b>P1-67</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0186H 0187H</b>
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<b>P1-68</b>	<b>PFLT2</b>	<b>Position Command Moving Average Filter</b>		<b>Address: 0188H 0189H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	4		
	Control Mode:	PT, PR		
	Unit:	ms		
	Range:	0 ~ 100		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

Moving Average Filter can be used to smooth the start and the end of step position command. Using Moving Average Filter can facilitate the smooth operation of the motor

very effectively, but it will cause command delay.



<b>P1-69</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 018AH 018BH</b>
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<b>P1-70</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 018CH 018DH</b>
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<b>P1-71</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 018EH 018FH</b>
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<b>P1-72</b>	<b>FRES</b>	<b>Full-closed Control Resolution of Linear Scale</b>	<b>Address: 0190H 0191H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: N/A
Default:	5000		
Control Mode:	PT, PR		
Unit:	pulse (PT mode), rev (PR mode)		
Range:	200 ~ 1280000		
Data Size:	32-bit		
Display Format:	Decimal		

Settings:

This parameter is used to set the corresponding AB (Quadrature) phase pulses (4x) for full-closed control per motor revolution.

<b>P1-73</b>	<b>FERR</b>	<b>Full-closed Loop Excessive Position Error Range</b>	<b>Address: 0192H 0193H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: P2-34
Default:	30000		
Control Mode:	PT, PR		

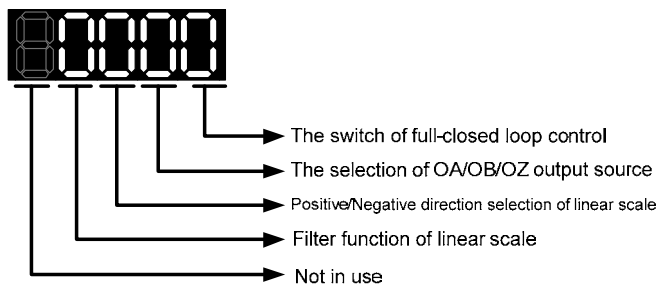
Unit:	pulse (based on full-closed loop)
Range:	1 ~ (2 <sup>31</sup> -1)
Data Size:	32-bit
Display Format:	Decimal

Settings:

When the position of A/B counter feedbacked by full-closed loop is too far from the position feedbacked by the encoder of the servo motor, it indicates that the encoder connector may loose or there is some problem occurred on connected mechanical system.

<b>P1-74 ▲</b>	<b>FCON</b>	<b>Full-closed Loop Control Function of Linear Scale</b>		<b>Address: 0194H 0195H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: P1-46
	Default:	0000h		
	Control Mode:	PT, PR		
	Unit:	N/A		
	Range:	0000h ~ 0x4122		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:



- The switch of full-closed loop control
  - 0: Function of full-closed loop control is not used
  - 1: Function of full-closed loop control is used
  - 2: Use the function of synchronous control

- The selection of OA/OB/OZ output source
  - 0: The output source of OA/OB/OZ is motor encoder
  - 1: The output source of OA/OB/OZ is the encoder of full-closed loop  
Firmware DSP V1.016 + CPLD 0.07 (and the version after it) provides:
  - 2: The output source of OA/OB/OZ is CN1 pulse command
- Positive/negative direction selection of linear scale feedback
  - 0: It is in positive direction when A phase leads B phase of the linear scale.
  - 1: It is in positive direction when B phase leads A phase of the linear scale.
- Filter of linear scale
  - 0: Bypass
  - 1: 6.66M
  - 2: 1.66M
  - 3: 833K
  - 4: 416K

<b>P1-75</b>	<b>FELP</b>	<b>Full-closed Loop Low-pass Filter Time Constant</b>		<b>Address: 0196H 0197H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	100		
	Control Mode:	PT, PR		
	Unit:	ms		
	Range:	0 ~ 1000		
	Data Size:	16-bit		
Display Format:	Decimal			

**Settings:**

When the stiffness of the mechanical system between full-closed loop and half-closed loop is insufficient, the users can use this parameter to enhance the stability of the mechanical system.

When P1-75 is set to 0, the low-pass filter function is disabled.

The stiffness of the mechanical system ↑, the setting value of P1-75 ↓.

The stiffness of the mechanical system ↓, the setting value of P1-75 ↑.

<b>P1-76</b>	<b>AMSPD</b>	<b>Max. Rotation Speed of Encoder Output</b>		<b>Address: 0198H 0199H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: P1-46
	Default:	5500		
	Control Mode:	ALL		
	Unit:	r/min		
Range:	0 ~ 6000 (0: Disabled)			

Data Size:	16-bit
Display Format:	Decimal

## Settings:

This parameter is used to optimize the encoder outputs (OA, OB). When the users set the actual reached maximum motor speed, the servo drive will equalize the encoder outputs automatically. When P1-76 is set to 0, it indicates that equalizing function is not available.

<b>P1-77</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 019AH 019BH</b>
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<b>P1-78</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 019CH 019DH</b>
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<b>P1-79</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 019EH 019FH</b>
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<b>P1-80</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 01A0H 01A1H</b>
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<b>P1-81</b>	<b>VCM2</b>	<b>Max. Analog Speed Command or Limit 1</b>	<b>Address: 01A2H 01A3H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: P1-40
Default:	rated speed		
Control Mode:	S, T		
Unit:	r/min, 10V		
Range:	0 ~ 50000		
Data Size:	32-bit		
Display Format:	Decimal		

## Settings:

Refer to P1-40 for explanation.

<b>P1-82</b>	<b>VCMLPF</b>	<b>Switching Filter Time between P1-40 and P1-81</b>	<b>Address: 01A4H 01A5H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: P1-40, P1-81
Default:	0		
Control Mode:	S		
Unit:	ms		
Range:	0 ~ 1000		
Data Size:	16-bit		



Display Format: Decimal
-------------------------

Settings: (0: Disabled)

<b>P1-83</b>	<b>VCMLPF</b>	<b>Abnormal Analog Input Voltage Level</b>		<b>Address: 01A6H 01A7H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: P1-40
	Default:	0		
	Control Mode:	S		
	Unit:	mV		
	Range:	0 ~ 12000		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings: (0: Disabled)

When analog input voltage is higher than the value of P1-83 over 50ms, the fault, AL042 (Analog input voltage error) will occur. The compare level for this parameter is the original analog input voltage which has not been added by an offset value via parameter P4-22, Analog Speed Input Offset.

## Group 2: P2-xx Extension Parameters

P2-00	KPP	Proportional Position Loop Gain	Address: 0200H 0201H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.8
Default:	35		
Control Mode:	PT, PR		
Unit:	rad/s		
Range:	0 ~ 2047		
Data Size:	16-bit		
Display Format:	Decimal		

## Settings:

This parameter is used to set the position loop gain. It can increase stiffness, expedite position loop response and reduce position error. However, if the setting value is over high, it may generate vibration or noise.

P2-01	PPR	Position Loop Gain Switching Rate	Address: 0202H 0203H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.8
Default:	100		
Control Mode:	PT, PR		
Unit:	%		
Range:	10 ~ 500		
Data Size:	16-bit		
Display Format:	Decimal		

## Settings:

This parameter is used to set the position gain switching rate when the gain switching condition is satisfied. Please refer to P2-27 for gain switching control selection settings and refer to P2-29 for gain switching condition settings.

P2-02	PFG	Position Feed Forward Gain	Address: 0204H 0205H
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.8
Default:	50		
Control Mode:	PT, PR		
Unit:	%		
Range:	0 ~ 100		
Data Size:	16-bit		

Display Format:	Decimal
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Settings:

This parameter is used to set the feed forward gain when executing position control command. When using position smooth command, increase gain can improve position track deviation. When not using position smooth command, decrease gain can improve the resonance condition of mechanical system.

<b>P2-03</b>	<b>PFF</b>	<b>Smooth Constant of Position Feed Forward Gain</b>		<b>Address: 0206H 0207H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	5		
	Control Mode:	PT, PR		
	Unit:	ms		
	Range:	2 ~ 100		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

When using position smooth command, increase gain can improve position track deviation. When not using position smooth command, decrease gain can improve the resonance condition of mechanical system.

<b>P2-04</b>	<b>KVP</b>	<b>Proportional Speed Loop Gain</b>		<b>Address: 0208H 0209H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.6
	Default:	500		
	Control Mode:	ALL		
	Unit:	rad/s		
	Range:	0 ~ 8191		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set the speed loop gain. When the value of proportional speed loop gain is increased, it can expedite speed loop response. However, if the setting value is over high, it may generate vibration or noise.

P2-05	SPR	Speed Loop Gain Switching Rate		Address: 020AH 020BH
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	100		
	Control Mode:	ALL		
	Unit:	%		
	Range:	10 ~ 500		
	Data Size:	16-bit		
	Display Format:	Decimal		

## Settings:

This parameter is used to set the speed gain switching rate when the gain switching condition is satisfied. Please refer to P2-27 for gain switching control selection settings and refer to P2-29 for gain switching condition settings.

P2-06	KVI	Speed Integral Compensation		Address: 020CH 020DH
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.6
	Default:	100		
	Control Mode:	ALL		
	Unit:	rad/s		
	Range:	0 ~ 1023		
	Data Size:	16-bit		
	Display Format:	Decimal		

## Settings:

This parameter is used to set the integral time of speed loop. When the value of speed integral compensation is increased, it can improve the speed response ability and decrease the speed control deviation. However, if the setting value is over high, it may generate vibration or noise.

P2-07	KVF	Speed Feed Forward Gain		Address: 020EH 020FH
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.6
	Default:	0		
	Control Mode:	ALL		
	Unit:	%		
	Range:	0 ~ 100		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set the feed forward gain when executing speed control command.


When using speed smooth command, increase gain can improve speed track deviation.

When not using speed smooth command, decrease gain can improve the resonance condition of mechanical system.

<b>P2-08</b>	<b>PCTL</b>	<b>Special Factory Setting</b>		<b>Address: 0210H 0211H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 65535		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings: Special parameters setting:

Parameter number	Function
10	Parameters reset (Please re-power on the servo drive after resetting the parameters)
20	P4-10 is enabled.
22	P4-11~P4-21 are enabled.
30, 35	Save the data of COMPARE, CAPTURE and E-Cam
406	Enable forced DO mode
400	In forced DO mode, it can switch back to the normal DO mode.

 **NOTE** ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P2-09</b>	<b>DRT</b>	<b>DI Debouncing Time</b>		<b>Address: 0212H 0213H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	2		
	Control Mode:	ALL		
	Unit:	2ms		
	Range:	0 ~ 20		
	Data Size:	16-bit		
	Display Format:	Decimal		

Input Value Example: 4 = 8 ms

Settings:

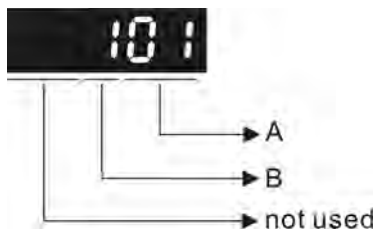
For example, if P2-09 is set to 4, the bounce filter time is 4 x 2ms = 8ms.

When there are too much vibration or noises around environment, increasing this setting value (bounce filter time) can improve reliability. However, if the time is too long, it may affect the response time.

P2-10	DI1	Digital Input Terminal 1 (DI1)	Address: 0214H 0215H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	101	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:

The parameters from P2-10 to P2-17 and P2-36 are used to determine the functions and statuses of DI1 ~ DI8.



A: DI (Digital Input) Function Settings:

For the setting value of P2- 10 ~ P2-17 and P2-36, please refer to Table 8.A.

B: DI (Digital Input) Enabled Status Settings:

0: Normally closed (contact b)

1: Normally open (contact a)

For example, when P2-10 is set to 101, it indicates that the function of DI1 is SON (Servo On, setting value is 0x01) and it requires a normally open contact to be connected to it.

Please re-start the servo drive after parameters have been changed.

Please note:

The parameter P3-06 is used to set how the Digital Inputs (DI) accept commands and signals through the external terminals or via the communication which is determined by parameter P4-07.

P2-11	DI2	Digital Input Terminal 2 (DI2)	Address: 0216H 0217H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	104	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-10 for explanation.

P2-12	DI3	Digital Input Terminal 3 (DI3)	Address: 0218H 0219H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	116	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-10 for explanation.

P2-13	DI4	Digital Input Terminal 4 (DI4)	Address: 021AH 021BH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	117	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-10 for explanation.

P2-14	DI5	Digital Input Terminal 5 (DI5)	Address: 021CH 021DH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	102	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-10 for explanation.

P2-15	DI6	Digital Input Terminal 6 (DI6)	Address: 021EH 021FH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	22	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-10 for explanation.

P2-16	DI7	Digital Input Terminal 7 (DI7)	Address: 0220H 0221H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	23	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-10 for explanation.



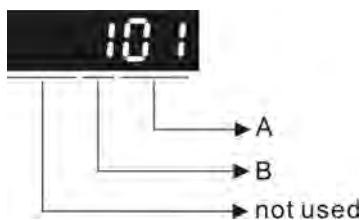
<b>P2-17</b>	<b>DI8</b>	<b>Digital Input Terminal 8 (DI8)</b>		<b>Address: 0222H 0223H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Table 8.A
	Default:	21		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0x015F		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings: Refer to P2-10 for explanation.

<b>P2-18</b>	<b>DO1</b>	<b>Digital Output Terminal 1 (DO1)</b>		<b>Address: 0224H 0225H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Table 8.B
	Default:	101		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0x013F		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings:

The parameters from P2-18 to P2-22 and P2-37 are used to determine the functions and statuses of DO1 ~ DO5.



A: DO Function Settings:

For the setting value of P2- 18 ~ P2-22 and P2-37, please refer to Table 8.B.

B: DO Enabled Status Settings:

0: Normally closed (contact b)

1: Normally open (contact a)

For example, when P2-18 is set to 101, it indicates that the function of DO1 is SRDY (Servo ready, setting value is 0x01) and it requires a normally open contact to be connected to it.

Please re-start the servo drive after parameters have been changed.

P2-19	DO2	Digital Output Terminal 2 (DO2)	Address: 0226H 0227H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.B
	Default:	103	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x013F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-18 for explanation.

P2-20	DO3	Digital Output Terminal 3 (DO3)	Address: 0228H 0229H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.B
	Default:	109	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 013Fh	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-18 for explanation.

P2-21	DO4	Digital Output Terminal 4 (DO4)	Address: 022AH 022BH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.B
	Default:	105	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x013F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P2-18 for explanation.

<b>P2-22</b>	<b>DO5</b>	<b>Digital Output Terminal 5 (DO5)</b>		<b>Address: 022CH 022DH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Table 8.B
	Default:	7		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0x013F		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings: Refer to P2-18 for explanation.

<b>P2-23</b>	<b>NCF1</b>	<b>Notch Filter 1 (Resonance Suppression)</b>		<b>Address: 022EH 022FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	1000		
	Control Mode:	ALL		
	Unit:	Hz		
	Range:	50 ~ 1000		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to set first resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system and reduce the vibration of mechanical system.

If P2-24 is set to 0, this parameter is disabled.

The parameters P2-23 and P2-24 are the first group of notch filter parameters and the parameters P2-43 and P2-44 are the second group of notch filter parameters.

<b>P2-24</b>	<b>DPH1</b>	<b>Notch Filter Attenuation Rate 1 (Resonance Suppression)</b>		<b>Address: 0230H 0231H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
	Default:	0		
	Control Mode:	ALL		
	Unit:	-dB		
	Range:	0 ~ 32 (0: Disabled)		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings: The first group of notch filter attenuation rate. When it is set to 0, it disables the function of Notch filter.

**NOTE**

If the value of attenuation rate is set to 5, then, it would be -5dB.

P2-25	NLP	Low-pass Filter Time Constant (Resonance Suppression)	Address: 0232H 0233H
Operation Interface:		Keypad/Software	Communication
Default:		0.2 (1kW and below models) or 0.5 (other models)	2 (1kW and below models) or 5 (other models)
Control Mode:		ALL	
Unit:		1ms	0.1ms
Range:		0.0 ~ 100.0	0 ~ 1000
Data Size:		16-bit	
Display Format:		One-digit	Decimal
Input Value Example:		1.5 = 1.5 ms	15 = 1.5 ms

Settings:

This parameter is used to set low-pass filter time constant of resonance suppression.

If P2-25 is set to 0, this parameter is disabled.

P2-26	DST	External Anti-Interference Gain	Address: 0234H 0235H
Operation Interface:		Keypad/Software	Communication
Default:		0	
Control Mode:		ALL	
Unit:		rad/s	
Range:		0 ~ 1023 (0: Disabled)	
Data Size:		16-bit	
Display Format:		Decimal	

Settings:

If P2-26 is set to 0, this parameter is disabled.

This parameter is used to increase the damping factor of speed loop. It is recommended to set the setting value of P2-26 to be equal to the setting value of P2-06.

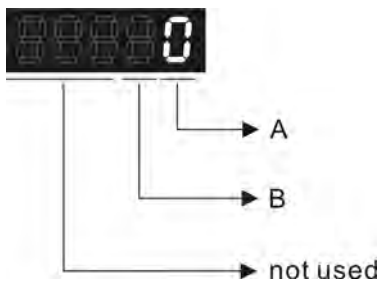
Please note:

1. In speed mode, increasing the parameter value of P2-26 can reduce speed overshoot.
2. In position mode, decreasing the parameter value of P2-26 can reduce position overshoot.

<b>P2-27</b>	<b>GCC</b>	<b>Gain Switching Control Selection</b>		<b>Address: 0236H 0237H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0000h~0x0018		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:

Gain Switching Condition Settings:



A: Gain Switching Condition Settings:

- 0: Disabled
- 1: Gain switching DI (Digital Input) signal (GAINUP) is On. (see Table 8.A)
- 2: In position mode, position deviation is higher than the setting value of P2-29.
- 3: Position command frequency is higher than the setting value of P2-29.
- 4: Servo motor speed is higher than the setting value of P2-29.
- 5: Gain switching DI (Digital Input) signal (GAINUP) is Off. (see Table 8.A)
- 6: In position mode, position deviation is lower than the setting value of P2-29.
- 7: Position command frequency is lower than the setting value of P2-29.
- 8: Servo motor speed is lower than the setting value of P2-29.

B: Gain Switching Control Settings:

- 0: Gain multiple switching
- 1: P → PI switching

Setting	P mode	S mode	Status
0	P2-00 x 100% P2-04 x 100%	P2-04 x 100%	Before switching
	P2-00 x P2-01 P2-04 x P2-05	P2-04 x P2-05	After switching
1	P2-06 x 0% P2-26 x 0%		Before switching
	P2-06 x 100% P2-26 x 100%		After switching

P2-28	GUT	Gain Switching Time Constant	Address: 0238H 0239H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	10	
	Control Mode:	ALL	
	Unit:	10ms	
	Range:	0 ~ 1000 (0: Disabled)	
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	15 = 150 ms	

**Settings:**

This parameter is used to set the time constant when switching the smooth gain.

P2-29	GPE	Gain Switching Condition	Address: 023AH 023BH
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	1280000	
	Control Mode:	ALL	
	Unit:	pulse, Kpps, r/min	
	Range:	0 ~ 3840000	
	Data Size:	32-bit	
	Display Format:	Decimal	

**Settings:**

This parameter is used to set the value of gain switching condition (pulse error, Kpps, r/min) selected in P2-27. The setting value will be different depending on the different gain switching condition.

P2-30	INH	Auxiliary Function	Address: 023CH 023DH
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	-8 ~ +8	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

0: Disabled all functions described below.

1: Force the servo drive to be Servo On (upon software)

2~4: Reserved

5: After setting P2-30 to 5, the setting values of all parameters will lost (not remain in the EEPROM) at power-down. When the parameters data are no more needed, using this mode can allows users not to save parameters data into the EEPROM without damaging the EEPROM. P2-30 should be set to 5 when using communication control function.

6: After setting P2-30 to 6, the servo drive will enter into Simulation mode. At this time, DO signal SON (Servo on) will be disabled, and the value of DSP Error (0x6F) will be regarded as zero. The servo drive can accept commands in each mode and monitor the commands via Data Scope function provided by ASDA-Soft software program. But, the servo motor will not run when the servo drive in Simulation mode. This setting is only used to check and ensure the command is correct. It indicates the external Servo On signal is disabled in this mode, and therefore the motor fault messages such as overcurrent, overload, or overspeed, etc. will not display. The parameter P0-01 displays external fault messages such as reverse inhibit limit, forward inhibit limit, or emergency stop, etc. only.

7: (available in firmware version V1.013 and later models only)

After setting P2-30 to 7, the servo drive will enter into high-speed oscilloscope function. At this time, time out function will be disabled (this setting is for the usage of PC Software).

8: (available in firmware version V1.013 and later models only)

After setting P2-30 to 8, the setting values of all parameters (current setting values) can be backed up into the EEPROM. At this time, LCD display will display "to.rom". The setting values of all parameters will not be lost (remain in the EEPROM) at power-down. When repower the servo drive, the setting values of all parameters are retained. This function can be executed when Servo On.

-1: Diable the function of setting P2-30 to 1(available in firmware version V1.013 and later models only).

-5: Diable the function of setting P2-30 to 5 (available in firmware version V1.013 and later models only).

-6: Diable the function of setting P2-30 to 6 (available in firmware version V1.013 and later models only).

-7: Diable the function of setting P2-30 to 7 (available in firmware version V1.013 and later models only).

-2, -4, -8: Reserved

Please note:

1. Please set P2-30 to 0 during normal operation.
2. The setting value of P2-30 will return to 0 automatically after re-power the servo drive.

<b>P2-31</b>	<b>AUT1</b>	<b>Speed Frequency Response Level in Auto and Semi-Auto Mode</b>		<b>Address: 023EH 023FH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 5.6,
	Default:	80		

Control Mode:	ALL	Section 6.3.6
Unit:	Hz	
Range:	1 ~ 0x1000	
Data Size:	16-bit	
Display Format:	Hexadecimal	

**Settings:**

This parameter allows the users to set the speed frequency response level of auto-tuning and semi-auto tuning mode. The speed frequency response settings are as follows:

1 ~ 50Hz : Low stiffness and low frequency response

51 ~ 250Hz : Medium stiffness and medium frequency response

251 ~ 850Hz : High stiffness and high frequency response

850 ~ 1000Hz : Extremely High stiffness and extremely high frequency response

**Please note:**

1. The servo drive will set the position frequency response according to the setting value of P2-31.
2. This parameter is activated by P2-32. Please refer to Section 5.6 for the tuning procedure and the related settings.

P2-32 ▲	AUT2	Tuning Mode Selection		Address: 0240H 0241H
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 5.6, Section 6.3.6
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0x2		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

0: Manual mode

1: Auto Mode [Continuous adjustment]

2: Semi-Auto Mode [Non-continuous adjustment]

**Explanation of manual mode:**

1. When P2-32 is set to mode#0, the setting value of P2-00, P2-02, P2-04, P2-06, P2-07, P2-25 and P2-26 can be user-defined. When switching mode #1 or #2 to #0, the setting value of P2-00, P2-02, P2-04, P2-06, P2-07, P2-25 and P2-26 will change to the value that measured in #1 auto-tuning mode or #2 semi-auto tuning mode.

**Explanation of auto-tuning mode:**

The servo drive will continuously estimate the system inertia, save the measured load



inertia value automatically and memorized in P1-37 every 30 minutes by referring to the frequency response settings of P2-31.

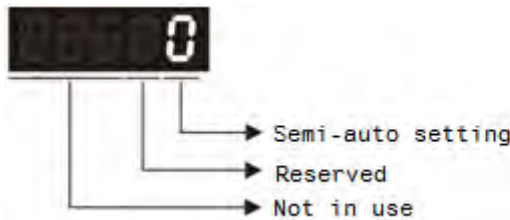
1. When switching mode #1 or #2 to #0, the servo drive will continuously estimate the system inertia, save the measured load inertia value automatically and memorized in P1-37. Then, set the corresponding parameters according to this measured load inertia value.
2. When switching mode#0 or #1 to #2, enter the appropriate load inertia value in P1-37.
3. When switching mode#1 to #0, the setting value of P2-00, P2-04 and P2-06 will change to the value that measured in #1 auto-tuning mode.

Explanation of semi-auto tuning mode:

1. When switching mode #2 to #0, the setting value of P2-00, P2-04, P2-06, P2-25 and P2-26 will change to the value that measured in #1 auto-tuning mode.
2. After the system inertia becomes stable (The display of P2-33 will show 1), it will stop estimating the system inertia, save the measured load inertia value automatically, and memorized in P1-37. However, when P2-32 is set to mode#1 or #2, the servo drive will continuously perform the adjustment for a period of time.
3. When the value of the system inertia becomes over high, the display of P2-33 will show 0 and the servo drive will start to adjust the load inertia value continuously.

<b>P2-33 ▲</b>	<b>AUT3</b>	<b>Semi-Auto Mode Inertia Adjustment Selection</b>	<b>Address: 0242H 0243H</b>
Operation Interface:		Keypad/Software	Communication
Default: 0			
Control Mode:		ALL	
Unit: N/A			
Range: 0 ~ 1			
Data Size: 16-bit			
Display Format:		Decimal	

Settings:



- Semi-auto setting
  - 1: It means the inertia estimation in semi-auto mode is completed. The inertia value can be accessed via P1-37.
  - 0:
    1. When the display is 0, it means the inertia adjustment is not completed and is adjusting.
    2. When the setting is 0, it means the inertia adjustment is not completed and is adjusting.

P2-34	SDEV	Overspeed Warning Condition	Address: 0244H 0245H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	5000	
	Control Mode:	S	
	Unit:	r/min	
	Range:	1 ~ 5000	
	Data Size:	16-bit	
	Display Format:	Decimal	

Display Format: Decimal

Settings:

This parameter is used to set the over speed threshold that is used to determine the over speed fault condition. When the difference in speed between the desired speed and actual motor speed is over than the setting value of parameter P2-34, the servo fault, Overspeed (AL007) will be activated.

P2-35	PDEV	Excessive Error Warning Condition	Address: 0246H 0247H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	480000	
	Control Mode:	PT	
	Unit:	pulse	
	Range:	1 ~ 16000000	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings:

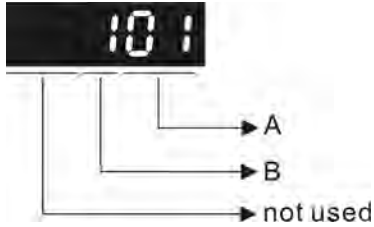
This parameter is used to set the position deviation excessive error threshold that is used to determine the excessive deviation fault condition. When the difference in pulse number between the desired position and actual motor position is over than the setting value of parameter P2-35, the servo fault, Excessive Deviation (AL009) will be activated.

P2-36	EDI9	External Digital Input Terminal 9 (EDI9)	Address: 0248H 0249H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	

Data Size:	16-bit
Display Format:	Hexadecimal

Settings:

The parameters from P2-36 to P2-41 are used to determine the functions and statuses of external EDI9 ~ EDI14.



A: DI (Digital Input) Function Settings:

For the setting value of P2- 36 ~ P2-41, please refer to Table 8.A.

B: External DI (Digital Input) Enabled Status Settings:

- 0: Normally closed (contact b)
- 1: Normally open (contact a)

For example, when P2-36 is set to 101, it indicates that the function of EDI9 is SON (Servo On, setting value is 0x01) and it requires a normally open contact to be connected to it.

Please re-start the servo drive after parameters have been changed.

P2-37	EDI10	External Digital Input Terminal 10 (EDI10)	Address: 024AH 024BH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:

Refer to P2-36 for explanation.

P2-38	EDI11	External Digital Input Terminal 11 (EDI11)	Address: 024CH 024DH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	

Range:	0 ~ 0x015F
Data Size:	16-bit
Display Format:	Hexadecimal

Settings:

Refer to P2-36 for explanation.

P2-39	EDI12	External Digital Input Terminal 12 (EDI12)	Address: 024EH 024FH
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	N/A	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:

Refer to P2-36 for explanation.

P2-40	EDI13	External Digital Input Terminal 13 (EDI13)	Address: 0250H 0251H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	N/A	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x015F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:

Refer to P2-36 for explanation.

P2-41	EDI14	External Digital Input Terminal 14 (EDI14)	Address: 0252H 0253H
	Operation Interface:	Keypad/Software      Communication	Related Section: Table 8.A
	Default:	N/A	
	Control Mode:	ALL	
	Unit:	N/A	

Range:	0 ~ 0x015F
Data Size:	16-bit
Display Format:	Hexadecimal

Settings:

Refer to P2-36 for explanation.

<b>P2-42</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0254H 0255H</b>
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<b>P2-43</b>	<b>NCF2</b>	<b>Notch Filter 2 (Resonance Suppression)</b>	<b>Address: 0256H 0257H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
Default:	1000		
Control Mode:	ALL		
Unit:	Hz		
Range:	50 ~ 2000		
Data Size:	16-bit		
Display Format:	Decimal		

Settings:

This parameter is used to set second resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system and reduce the vibration of mechanical system.

If P2-44 is set to 0, this parameter is disabled.

The parameters P2-23 and P2-24 are the first group of notch filter parameters and the parameters P2-43 and P2-44 are the second group of notch filter parameters.

<b>P2-44</b>	<b>DPH2</b>	<b>Notch Filter Attenuation Rate 2 (Resonance Suppression)</b>	<b>Address: 0258H 0259H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.7
Default:	0		
Control Mode:	ALL		
Unit:	-dB		
Range:	0 ~ 32 (0: disable the function of Notch filter)		
Data Size:	16bit		
Display Format:	Decimal		

Settings: The second group of notch filter attenuation rate. If it is set to 0, it disables the function of Notch filter.



**NOTE** If the value of attenuation rate is set to 5, then it would be -5dB.

P2-45	NCF3	Notch Filter 3 (Resonance Suppression)	Address: 025AH 025BH
Operation Interface:		Keypad/Software	Communication
Default:		1000	
Control Mode:		ALL	
Unit:		Hz	
Range:		50 ~ 2000	
Data Size:		16-bit	
Display Format:		Decimal	

## Settings:

This parameter is used to set third resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system and reduce the vibration of mechanical system.

If P2-46 is set to 0, this parameter is disabled.

P2-46	DPH3	Notch Filter Attenuation Rate 3 (Resonance Suppression)	Address: 025CH 025DH
Operation Interface:		Keypad/Software	Communication
Default:		0	
Control Mode:		ALL	
Unit:		-dB	
Range:		0 ~ 32	
Data Size:		16-bit	
Display Format:		Decimal	

Settings: The third group of notch filter attenuation rate. If it is set to 0, it disables the function of Notch filter.



**NOTE** If the value of attenuation rate is set to 5, then it would be -5dB.

P2-47	ANCF	Auto Resonance Suppression Mode Selection	Address: 025EH 025FH
Operation Interface:		Keypad/Software	Communication
Default:		1	
Control Mode:		ALL	
Unit:		N/A	
Range:		0 ~ 2	
Data Size:		16-bit	

Display Format:	Decimal
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Settings:

0: Disable Auto Resonance Suppression Mode.

The setting value of P2-23~P2-24 and P2-43~P2-46 will be fixed and will not be changed.

1: Auto Resonance Suppression Mode 1 [Non-continuous adjustment]

After the resonance is suppressed, the setting value of P2-23, P2-24, P2-43, P2-44, P2-45 and P2-46 will be fixed and will not be changed.

2: Auto Resonance Suppression Mode 2 [Continuous adjustment]

The servo drive will perform the resonance suppression continuously (will not stop). The setting value of P2-23, P2-24, P2-43, P2-44, P2-45 and P2-46 will not be fixed.

When P2-47 is set to 1, the resonance suppression will be enabled automatically. After the mechanical system becomes stable, the setting value of P2-47 will return to 0. When the mechanical system is stable, the resonance suppression point will be memorized. When the mechanical system is not stable, if the servo drive is restarted or P2-47 is set to 1, the servo drive will estimate the resonance suppression point again.

When P2-47 is set to 2, the servo drive will perform the resonance suppression continuously. When the mechanical system becomes stable, the resonance suppression point will be memorized. When the mechanical system is not stable, if the servo drive is restarted, the servo drive will estimate the resonance suppression point again.

When switching the mode#1 or #2 to #0, the setting values of P2-43, P2-44, P2-45 and P2-46 will be saved automatically.

<b>P2-48</b>	<b>ANCL</b>	<b>Auto Resonance Suppression Detection Level</b>		<b>Address: 0260H 0261H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	100		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	1 ~ 300%		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

When the setting value is smaller, the system will become more sensitive to detect and find the resonance.

When the value of ↑

The setting value of P2-48 ↑, the sensitivity of detecting resonance ↓.

The setting value of P2-48 ↓, the sensitivity of detecting resonance ↑.

<b>P2-49</b>	<b>SJIT</b>	<b>Speed Detection Filter and Jitter Suppression</b>		<b>Address: 0262H 0263H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.2.5
	Default:	0		
	Control Mode:	ALL		
	Unit:	sec		
	Range:	0x00 ~ 0x1F		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

## Settings:

Setting Value	Speed estimation bandwidth (Hz)
00	2500
01	2250
02	2100
03	2000
04	1800
05	1600
06	1500
07	1400
08	1300
09	1200
0A	1100
0B	1000
0C	950
0D	900
0E	850
0F	800
10	750
11	700
12	650
13	600
14	550
15	500
16	450
17	400
18	350
19	300



Setting Value	Speed estimation bandwidth (Hz)
1A	250
1B	200
1C	175
1D	150
1E	125
1F	100

<b>P2-50</b>	<b>DCLR</b>	<b>Pulse Deviation Clear Mode</b>		<b>Address: 0264H 0265H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PT		
	Unit:	N/A		
	Range:	0 ~ 0x1		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings:

For digital input function (DI function), please refer to Table 8.A.

This pulse deviation clear function is enabled when a digital input is set to pulse clear function (CCLR mode, DI (Digital Input) setting value is 0x04). When this input is triggered, the position accumulated pulse number will be clear to 0. (available in PT and PR mode only)

0: CCLR is triggered by rising-edge

1: CCLR is triggered bu level

<b>P2-51</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0266H 0267H</b>
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<b>P2-52 ▲</b>	<b>IDXS</b>	<b>Indexing Coordinates Scale</b>		<b>Address: 0268H 0269H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section:
	Default:	1000000000		
	Control Mode:	ALL		
	Unit:	PUU		
	Range:	0 ~ 1000000000		
Data Size:	32-bit			

Display Format: Decimal

Settings:

This parameter is used to set the scale of the indexing coordinates, indexing command position and indexing feedback position. If the setting value is too low, it may cause the indexing coordinates is in error.

The range of setting value of P2-52 is defined as follows:

$$P2-52 > 1.05 \times \text{Max. Motor Speed (r/min)} \times \frac{1280000}{60000} \times \frac{P1-45}{P1-44}$$

$$> 22.4 \times \text{Max. Motor Speed (r/min)} \times \frac{P1-45}{P1-44}$$

P2-53	KPI	Position Integral Compensation	Address: 026AH 026BH
Operation Interface:	Keypad/Software	Communication	Related Section: Section 6.3.6
Default:	0		
Control Mode:	ALL		
Unit:	rad/s		
Range:	0 ~ 1023		
Data Size:	16-bit		
Display Format:	Decimal		

Settings:

This parameter is used to set the integral time of position loop. When the value of position integral compensation is increased, it can decrease the position control deviation. However, if the setting value is over high, it may generate position overshoot or noise.

P2-54 ▲	SVP	Synchronous Speed Loop Gain	Address: 026CH 026DH
Operation Interface:	Keypad/Software	Communication	Related Section: N/A
Default:	0		
Control Mode:	ALL		
Unit:	rad/s		
Range:	0 ~ 8191		
Data Size:	16-bit		
Display Format:	Decimal		

Settings:

This parameter is used to set the synchronous speed loop gain. When the value of synchronous speed loop gain is increased, it can expedite speed loop response of two motors. However, if the setting value is over high, it may generate vibration or noise.

P2-55 ▲	SVI	Synchronous Speed Integral Compensation	Address: 026EH 026FH
	Operation Interface:	Keypad/Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	rad/s	
	Range:	0 ~ 1023	
	Data Size:	16-bit	
	Display Format:	Decimal	

## Settings:

This parameter is used to set the synchronous integral time of speed loop. When the value of synchronous speed integral compensation is increased, it can improve the speed response ability and decrease the speed control deviation of two motors. However, if the setting value is over high, it may generate vibration or noise.

P2-56 ▲	SPI	Synchronous Position Integral Compensation	Address: 0270H 0271H
	Operation Interface:	Keypad/Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	rad/s	
	Range:	0 ~ 1023	
	Data Size:	16-bit	
	Display Format:	Decimal	

## Settings:

This parameter is used to set the synchronous integral time of position loop. When the value of synchronous position integral compensation is increased, it can improve the position response ability and decrease the position control deviation of two motors. However, if the setting value is over high, it may generate vibration or noise. It is recommended to set P2-56 and P2-06 to the same values.

P2-57 ▲	SBW	Synchronous Speed Frequency Response	Address: 0272H 0273H
	Operation Interface:	Keypad/Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	Hz	
	Range:	0 ~ 1023	
	Data Size:	16-bit	

Display Format:	Decimal
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## Settings:

When the users do not know how to determine the setting values of parameters P2-54~P2-56, it is recommended to use this parameter to set synchronous speed frequency response. The setting value of this parameter corresponds to setting values of parameters P2-54~P2-56. If the value of synchronous speed frequency response is higher than the value of servo frequency response, the performance of synchronous response ability is better. However, if the speed frequency response plus synchronous speed frequency response is higher than system allowable frequency response, it may generate system resonance. Thus when increasing the setting values of speed frequency response and synchronous speed frequency response, the setting value of P2-25 should be faster than the setting values of these two frequency responses.

<b>P2-58</b>	<b>SVL</b>	<b>Low-pass Filter Time Constant of Synchronous Speed Error</b>		<b>Address: 0274H 0275H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	0.1ms		
	Range:	0 ~ 1000		
	Data Size:	16-bit		
	Display Format:	Decimal		
Input Value Example:	15 = 1.5 ms			

## Settings:

When synchronous speed is affected due to low resolution and generates noises (not a high-pitched but a rough sound), the users can use this parameter to set low-pass filter time constant to solve the problem. Please note that the the frequency response of low-pass filter must be faster than synchronous speed frequency response.

<b>P2-59</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0276H 0277H</b>
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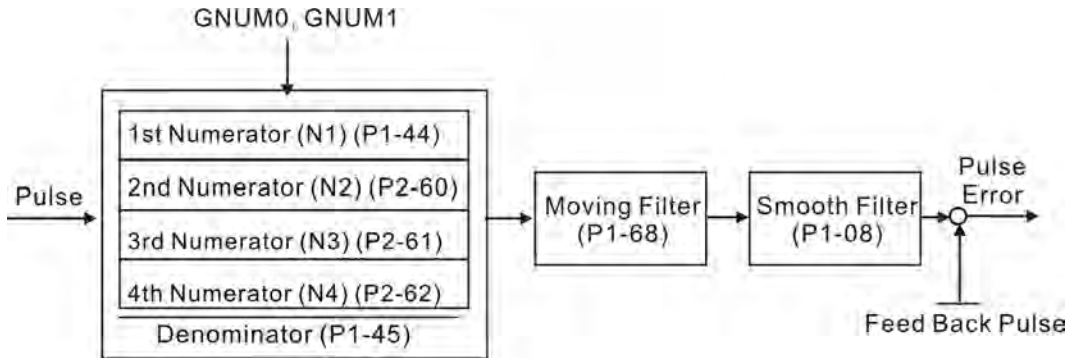
<b>P2-60</b>	<b>GR4</b>	<b>Electronic Gear Ratio (2nd Numerator) (N2)</b>		<b>Address: 0278H 0279H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	128		
	Control Mode:	PT		
	Unit:	pulse		
	Range:	1 ~ (2 <sup>29</sup> -1)		
Data Size:	32-bit			

Display Format: Decimal

Settings:

The electronic gear numerator value can be set via GNUM0, GNUM1 (refer to Table 7.A). When the GNUM0, GNUM1 are not defined, the default of gear numerator value is set by P1-44.

When the users wish to set the gear numerator value by using GNUM0, GNUM1, please set P2-60 ~ P2-62 after the servo motor has been stopped to prevent the mechanical system vibration.



<b>P2-61</b>	<b>GR5</b>	<b>Electronic Gear Ratio (3rd Numerator) (N3)</b>		<b>Address: 027AH 027BH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	16		
	Control Mode:	PT		
	Unit:	pulse		
	Range:	1 ~ (2 <sup>29</sup> -1)		
	Data Size:	32-bit		
Display Format:	Decimal			

Settings:

Refer to P2-60 for explanation.

<b>P2-62</b>	<b>GR6</b>	<b>Electronic Gear Ratio (4th Numerator) (N4)</b>		<b>Address: 027CH 027DH</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	128		
	Control Mode:	PT		
	Unit:	pulse		
	Range:	1 ~ (2 <sup>29</sup> -1)		
	Data Size:	32-bit		

Display Format:	Decimal
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Settings:

Refer to P2-60 for explanation.

<b>P2-63</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 027EH 027FH</b>
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<b>P2-64</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0280H 0281H</b>
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<b>P2-65</b>	<b>GBIT</b>	<b>Special Function 1</b>	<b>Address: 0282H 0283H</b>
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Operation Interface:	Keypad/Software	Communication	Related Section: N/A
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Default: 0

Control Mode: PT, PR, S

Unit: N/A

Range: 0x0000 ~ 0xFFFF

Data Size: N/A

Display Format: N/A

Settings:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
------	------	------	------	------	------	------	------

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
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- **Bit2 ~ Bit5, Bit7 and Bit14: Reserved. Must be set to 0.**
- **Bit0~Bit1: Reserved.**
- **Bit6: Abnormal pulse command protection**

Bit6

0: enable abnormal pulse command protection

1: disable abnormal pulse command protection

- **Bit 8: U, V, W wiring error protection**

Bit8

1: enable U, V, W wiring error detection

- **Bit9: U, V, W wiring cut-off detection**

Bit9

1: enable U, V, W wiring cut-off detection

- **Bit10: DI ZCLAMP function selection**

Bit10

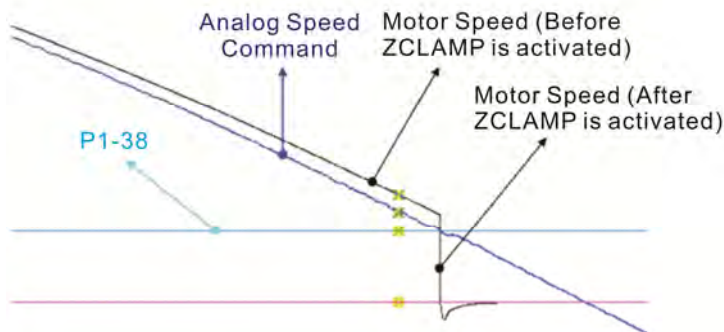
When the following conditions are all met, ZCLAMP function will be activated.

Condition1: Speed mode

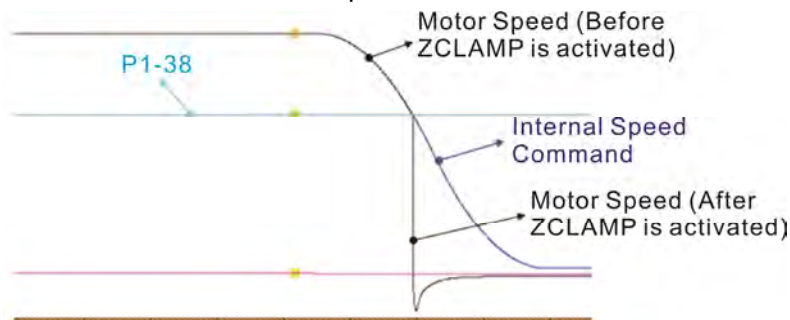
Condition2: DI ZCLAMP is activated.

Condition3: External analog speed command or internal registers speed command is less than parameter P1-38.

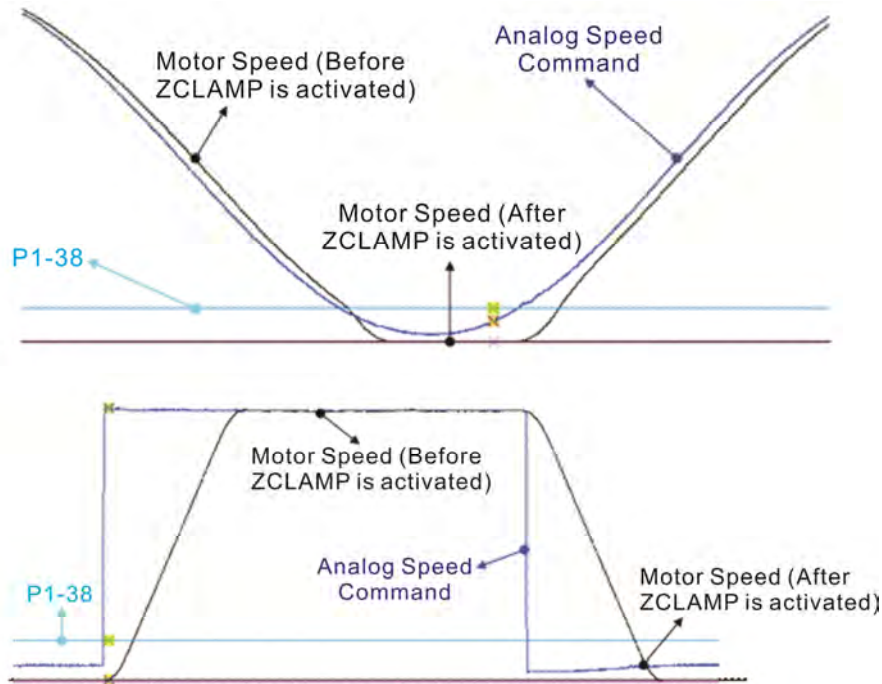
0: When the command source is an analog speed command, the users can use ZCLAMP DI signal to stop the motor at the desire position and do not care the acceleration and deceleration speed curve of the analog speed command. The motor will be locked at the position when ZCLAMP conditions are satisfied.



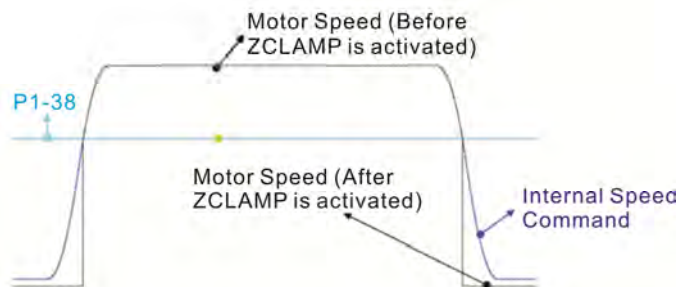
0: When the command source is an internal speed command, the users can use ZCLAMP DI signal to stop the motor at the desire position and keep the the acceleration and deceleration speed curve of the internal speed command. The motor will be locked at the position when ZCLAMP conditions are satisfied.



1: When the command source is an analog speed command, the users can use ZCLAMP DI signal to stop the motor at the desire position and do not care the acceleration and deceleration speed curve of the internal speed command. When ZCLAMP conditions are satisfied, the speed command is decreased to 0 r/min. When ZCLAMP conditions are not satisfied, the speed command will follow the analog speed command through Accel/Decel S-curve.



- 1: When the command source is an internal speed command, the users can use ZCLAMP DI signal to stop the motor at the desire position and keep the acceleration and deceleration speed curve of the analog speed command. When ZCLAMP conditions are satisfied, the speed command is forced to 0 r/min directly.



● **Bit11: Single pulse inhibit function**

**B11**

- 0: Disable NL(CWL)/PL(CCWL) pulse input inhibit function. In PT mode, no matter NL or PL exists or not, external position pulse command will be input into the servo drive.
- 1: Enable NL(CWL)/PL(CCWL) pulse input inhibit function. In PT mode, if NL exists, the external NL pulse input into the servo drive will be inhibited and PL pulse input will be accepted. On the one hand, in PT mode, if PL exists, the external PL pulse input into the servo drive will be inhibited and PL pulse input will be accepted.

Please note:

If NL and PL both exist, NL and PL pulse input into the servo drive will be both inhibited.

● **Bit12: Input power phase loss detection function**

**Bit12**

- 0: Enable Input power phase loss (AL022) detection function
- 1: Disable Input power phase loss (AL022) detection function



● **Bit13: Encoder output error detection function**

Bit13

- 0: Enable encoder output error (AL018) detection function
- 1: Disable encoder output error (AL018) detection function

● **Bit15: Friction compensation mode selection**

Bit15

- 0: If the speed is slower than the value of P1-38, the compensation value remains.
- 1: If the speed is slower than the value of P1-38, the compensation will become 0 according to the smoothing time of P1-63.

<b>P2-66</b>	<b>GBIT2</b>	<b>Special Function 2</b>		<b>Address: 0284H 0285H</b>
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PT, PR, S		
	Unit:	N/A		
	Range:	0 ~ 0x083F		
	Data Size:	16bit		
Display Format:	Hexadecimal			

Settings: Special function 2:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
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Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
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B0~B1: reserved

B2: Cancel the low voltage alarm latch function

0: Low voltage alarm latch function : Low voltage alarm will not be cleared automatically

1: Cancel the low voltage alarm latch function : Low voltage alarm will be cleared automatically

B3: reserved

B4: Cancel the detection of AL.044

0: AL.044 will occur

1: AL.044 will be ignored

B5: The disconnection detection of linear scale (only when the full-closed loop control function is activated)

0: AL.041 will be ignored

1: AL.041 will occur

B6~B8: reserved

B9: When AL.003 occurs, switch ON DO. ALM or DO.WARN

0: When AL.003 occurs, switch ON DO.WARN

1: When AL.003 occurs, switch ON DO. ALM

B10~B15: reserved

P2-67	JSL	Stable Inertia Estimating Time	Address: 0286H 0287H
	Operation Interface:	Keypad/Software	Communication
	Default:	1.5	15
	Control Mode:	ALL	
	Unit:	1 times	0.1 times
	Range:	0 ~ 200.0	0 ~ 2000
	Data Size:	16-bit	
	Display Format:	One-digit	Decimal
	Input Value Example:	1.5 = 1.5 times	15 = 1.5 times

**Settings:**

In semi-auto tuning mode, after the servo drive continuously perform the adjustment for a period of time which is determined by P2-67, the system will consider that the system inertia has become stable and complete the inertia estimation.

P2-68	TEP	Tracking Error Compensation Selection	Address: 0288H 0289H
	Operation Interface:	Keypad/Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0000h ~ 0x0101	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

**Settings:**

X =0: When P1-36>1, tracking error compensation is disabled.

1: When P1-36>1, tracking error compensation is enabled.

(This function is available in firmware version V1.036 sub00 and later models only)

Y=0: When E-Cam is engaged, JOG function cannot work.

1: When E-Cam is engaged, JOG function can work.

(This function is not available now, will be available soon)

Z =0: DI.STP is triggered by rising-edge

1: DI.STP is level trigger

(This function is available in firmware version V1.042 sub00 and later models only)

<b>P2-69●</b>	<b>ABS</b>	<b>Absolute Encoder Setting</b>		<b>Address: 028AH 028BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0x0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0x1		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

This parameter should be set when the servo motor with absolute encoder need to be operated as an incremental motor.

0: Incremental mode. Servo motor with absolute encoder can be operated as incremental motor.

1: Absolute mode. (This setting is only available for the servo motor with absolute encoder. When an incremental servo motor is connected, if P2-69 is set to 1, a fault will be detected and the fault code, AL069 will be displayed on the drive's LCD display.)

**Please note:**

This parameter is effective only after the servo drive is restarted (after switching power off and on).

<b>P2-70</b>	<b>MRS</b>	<b>Read Data Format Selection</b>		<b>Address: 028CH 028DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0x0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0x00 ~ 0x07		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8

Bit0: Data unit setting of digital input/output (DI/DO)

Bit0=0: PUU

Bit0=1: Pulse

Bit1: Communication data unit setting

Bit0=0: PUU

Bit0=1: Pulse

Bit2: Overflow warning

Bit0=0: With overflow warning AL289 (for PUU counting), AL062 (for Pulse counting)

Bit0=1: Without overflow warning

Bit3 ~ Bit15: Reserved. Must be set to 0.

P2-71	CAP	Absolute Position Homing	Address: 028EH 028FH
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	0x0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x1	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:

When P2-71 is set to 1, the current position will be set as home position. This function is the same as the digital input, ABSC. This function can be enabled only when parameter P2-08 is set to 271.

P2-72	Reserved (Do Not Use)	Address: 0290H 0291H

P2-73	ALOP	E-Cam Alignment - Operation Setting	Address: 0292H 0293H
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	00000000h	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	00000000h ~ 0x5F3F6F5F	
	Data Size:	32-bit format = DCBA : UZYX	
	Display Format:	Hexadecimal	

Settings:

(This function is available in firmware version V1.038 sub26 and later models only)

YX: Range of filter (0 ~ 95%)

UZ: Max. allowable correction rate (0 ~ 100%)

BA: PR number (0 ~ 63)

DC: Masking range setting (0 ~ 95%)

## YX: Range of filter (0 ~ 95%)

When digital input, ALGN is triggered, E-Cam alignment function is enabled. The system will detect the current E-Cam position. When the error between current E-Cam position and the last alignment position is less than this setting range (%), filter function is enabled and the system will average the errors before correction to avoid noise. If the error is bigger than filter threshold, the system will use the new position to do the correction.

YX	00	01 ~ 05F
Function	Disabled	$  \text{Error}   \leq (1 - \text{YX}) \% : \text{Enabled}$

Please note: Using filter will allow the alignment action to be more stable and reduce position error caused by digital input noise.

## UZ: Max. Max. allowable correction rate (0 ~ 100%)

When alignment correction is enabled, the limitation of max. correction rate (C) for each correction is defined as follows:

$$| C | \leq (P5-84/P5-83) \times P2-73 \text{ UZ} \%$$

Please note:

When the alignment error is too big, to correct this error with one time may cause the motor vibration or overloading. Using this parameter will break the alignment correction into several smaller actions to smooth the correction action. But it may need more time to finish the alignment correction.

## BA: PR number (0 ~ 63)

After each alignment action is done, the shortage of pulse numbers of slave axis will be stored in this specified PR. Using this PR can compensate the slave position at appropriate timing.

Please note:

If BA is set to 0, it will not store the shortage of pulse numbers to PR.

## DC: Masking range setting (0 ~ 95%)

When digital input, ALGN is triggered, no another alignment action is allowed before the increasing pulse numbers of master axis exceeds the masking distance (M). After the increasing pulse numbers of master axis is greater than the distance (M) masking, the next alignment action is allowed.

The masking distance (M) is defined as follows:

$$M \geq (P5-84/P5-83) \times P2-73 \text{ DC} \%$$

Please note:

This masking function only allows increasing pulse input. This function will not work for decreasing pulse input.

P2-74	ALDY	E-Cam Alignment - DI Delay Time Compensation	Address: 0294H 0295H
Operation Interface:		Keypad/Software	Communication
Related Section: N/A			
Default: 0.000			
Control Mode:		PR	
Unit: ms with fraction down to usec			
Range: -25.000 ~ +25.000, with 3 fraction digits			
Data Size: 16-bit			
Display Format:		Decimal	

## Settings:

(This function is available in firmware version V1.038 sub26 and later models only)

This parameter is used to set for the compensation of delay time from digital input.

P2-75	ALTG	E-Cam Alignment - Alignment Target Position	Address: 0296H 0297H
Operation Interface:		Keypad/Software	Communication
Related Section: N/A			
Default: 0			
Control Mode:		PR	
Unit: The pulse unit of Master axis			
Range: 0 ~ (P5-84 /P5-83)-1			
Data Size: 32-bit			
Display Format:		Decimal	

## Settings:

(This function is available in firmware version V1.038 sub26 and later models only)

Note : When the input value is over the setting range, an error will occur and display on LCD display. Then, the user cannot input the setting value.

Note : When a correct value is already set in P2-75 and does not exceed the setting range, if a change on P5-84 or P5-83 cause the value to exceed the setting range, this parameter will be reset to 0 automatically.

$$\text{New value of P2-75} = 0 \quad \text{if } P2-75 \geq (P5-84 / P5-83)$$

P2-76	ALCT	E-Cam Alignment - Source Setting	Address: 0298H 0299H
Operation Interface:		Keypad/Software	Communication
Related Section: N/A			
Default: 0000h			
Control Mode:		PR	

Unit:	N/A
Range:	0000h ~ 0x6FF7
Data Size:	16-bit
Display Format:	Hexadecimal

Settings:

(This function is available in firmware version V1.038 sub26 and later models only)

Format=UZYX. The functions are listed below.

X: E-CAM Alignment Control

Bit	Bit 3	Bit 2	Bit 1	Bit 0
Function	Reserved	Phase Alignment Category	Trigger PR immediately	Enable Alignment
Explanation	-	Set 0 to cutter-like control. Set 1 to film-like control. What kind of application to make alignment should be selected here. Cutter control only has affection to current cycle when phase of cutter shifted where the film will has affection for the following cycles after when a distance on file is pulled.	Set 1 to enable. When the alignment DI is triggered, the error for correcting will be calculated and stored in the PR specified by P2-73. If this bit is set to 1, trigger the correction PR immediately after DI activated, otherwise the user should trigger the correction PR manually or can use P5-88.BA to call the PR when E-Cam disengaged, for example.	Set 0 to disable. Set 1 to enable. If enable, the E-CAM alignment correction will be executed when DI:ALGN ON.

Y: Filter intensity

Y	0	1 ~ F
Function	Disabled	Average of 2^Z: Enabled

When the value of Y is increased, the change of correction is getting slow and it can expedite the performance of the filter function. This can avoid the disturbance caused by a sensor noise and a big error to be corrected within one time. Setting P2-76 too big will cause the alignment not able to work properly. The recommendatory value is 3.

UZ: Alignment path definition. Forward direction as setting reference here (0 ~ 100%)

- 0 : Backward alignment only
- 30 : Forward 30%, Backward 70%
- 50 : Alignment with the shortest distance
- 80 : Forward 80%, Backward 20%
- >=100 : Forward alignment only

P2-77	CMSK	E-Cam Master Axis – Pulse Masking Setting		Address: 029AH 029BH
	Operation Interface:	Keypad/Software	Communication	Related Section: N/A
	Default:	0000h		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0000h ~ 0xFF7D		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

(This function is available in firmware version V1.038 sub54 and later models only)

Format= UZYX. The functions are listed below.

X: Pulse masking function of master axis / JOG function of master axis / INCH function of master axis

Y: Correction of lead command length (P5-87) for pulse masking

Y3	Y2	Y1	Y0
-	Extra 1 Cycle	Write to ROM	CALC
-	Calculate the value of P5-87 and plus a cycle of a resolution of pulse command, i.e. (P5-84/P5-83).	Calculate the value of P5-87 and write the value of P5-87 into EEPROM at the same time to ensure the correct position of E-Cam after the servo drive is restarted (after switching power off and on).	Calculate the value of P5-87.

Y=0 → 1: Calculate the value of P5-87 correctly according to actual masking pulse number and additional virtual pulse number.

Y=0 → 2: Calculate the value of P5-87 correctly according to actual masking pulse number and additional virtual pulse number. Then, write the revised value of P5-87 into EEPROM to keep the same phase after the servo drive is restarted.

Y=0 → 7: Calculate the value of P5-87 correctly according to actual masking pulse number and additional virtual pulse number. But, the revised value of P5-87 will plus a value of (P5-84/P5-83) to make lead pulse wait for an E-Cam cycle.

UZ: Pulse data when the master axis performs JOG or INCH function

For example:

Start masking → UZYX = 0x0001  
 JOG +3Kpps → UZYX = 0x0302  
 JOG +20Kpps → UZYX = 0x1402  
 JOG -32Kpps → UZYX = 0x2003



INCH +255 PLS → UZYX = 0xFF04

INCH -18 PLS → UZYX = 0x1205

Complete and correct lead pulse → UZYX = 0x0020 (Write into EEPROM)

Disable this function → UZYX = 0x0000 (This step can be ignored)

<b>P2-78</b>	<b>CMAP</b>	<b>E-Cam: Area Number #2 + (Polarity is Positive)</b>	<b>Address: 029CH 029DH</b>
	Operation Interface:	Keypad/Software	Communication
	Default:	270	
	Control Mode:	PR	
	Unit:	degree (it becomes degree in firmware version V1.038 sub25 and later models)	
	Range:	0 ~ 360	
	Data Size:	16-bit	
Display Format:	Decimal		Related Section: N/A

Settings:

P2-78 <= P2-79:

E-Cam degree	0°	~	P2-78	~	P2-79	~	360°
DO: CAM_AREA2	OFF	OFF	ON	ON	ON	OFF	OFF

P2-78 > P2-79:

E-Cam degree	0°	~	P2-79	~	P2-78	~	360°
DO: CAM_AREA2	ON	ON	OFF	OFF	OFF	ON	ON

Please note:

When the Electronic Cam (E-Cam) is not engaged, the status of digital output, CAM\_AREA2 is always OFF.

<b>P2-79</b>	<b>CMAP</b>	<b>E-Cam: Area Number #2 - (Polarity is Negative)</b>	<b>Address: 029EH 029FH</b>
	Operation Interface:	Keypad/Software	Communication
	Default:	360	
	Control Mode:	PR	
	Unit:	degree (it becomes degree in firmware version V1.038 sub25 and later models)	
	Range:	0 ~ 360	
	Data Size:	16-bit	

Display Format: Decimal

Settings:

P2-78 <= P2-79:

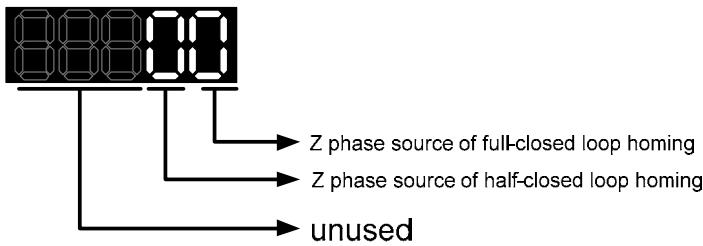
E-Cam degree	0°	~	P2-78	~	P2-79	~	360°
DO: CAM_AREA2	OFF	OFF	ON	ON	ON	OFF	OFF

P2-78 > P2-79:

E-Cam degree	0°	~	P2-79	~	P2-78	~	360°
DO: CAM_AREA2	ON	ON	OFF	OFF	OFF	ON	ON

Please note:

When the Electronic Cam (E-Cam) is not engaged, the status of digital output, CAM\_AREA2 is always OFF.

<b>P2-80</b>	<b>Z Phase Source of Homing</b>		<b>Address: 02A0H 02A1H</b>
	Operation Interface:	Keypad/Software      Communication	Related Section: N/A
	Default:	0x0010	
	Control Mode:	PR	
	Unit:	-	
	Range:	0x0000 ~ 0x0011	
	Data Size:	16bit	
	Display Format:	HEX	
Setting:			

- Z phase source of full-closed loop homing  
0: Auxiliary encoder  
1: Motor
- Z phase source of half-closed loop homing  
0: Auxiliary encoder  
1: Motor

**Group 3: P3-xx Communication Parameters**

<b>P3-00●</b>	<b>ADR</b>	<b>Communication Address Setting</b>		<b>Address: 0300H 0301H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 9.2
	Default:	0x7F		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0x01 ~ 0x7F		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

**Settings:**

This parameter is used to set the communication slave address in hexadecimal format.

Display	0	0	Y	X
Range	-	-	0 ~ 7	0 ~ F

X: Axis number which indicates the value must be within the range from 0 through F.

Y: Group number which indicates the value must be within the range from 0 to through 7

When using RS-232/485 communication, this parameter is used set the communication address in hexadecimal format. If the AC servo drive is controlled by RS-232/485 communication, each drive (or device) must be uniquely identified. One servo drive only can set one address. If the address is duplicated, there will be a communication fault. This address is an absolute address which represents the servo drive on a RS-232/485 and CANbus network.

**Please note:**

1. When the address of host (external) controller is set to 0xFF, it is with auto-respond function. Then, the servo drive will receive from and respond to host (external) controller both no matter the address is matching or not. However, the parameter P3-00 cannot be set to 0xFF.

<b>P3-01</b>	<b>BRT</b>	<b>Transmission Speed</b>		<b>Address: 0302H 0303H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 9.2
	Default:	0x0203		
	Control Mode:	ALL		
	Unit:	bps		
	Range:	0x0000 ~ 0x0405		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

**Settings:**

This parameter is used to set the baud rate and data transmission speed of the communications.

	0	Z	Y	X
COM Port	-	CANopen	-	RS-232/485
Range	0	0 ~ 4	0	0 ~ 5

Settings:

X: Baud rate setting

- 0: Baud rate 4800
- 1: Baud rate 9600
- 2: Baud rate 19200
- 3: Baud rate 38400
- 4: Baud rate 57600
- 5: Baud rate 115200

Y: Reserved. Must be set to 0.

Z: Data transmission speed setting.

- 0: 125K bits / second
- 1: 250K bits / second
- 2: 500K bits / second
- 3: 750K bits / second
- 4: 1.0M bits / second

Please note:

1. When setting this parameter via CANopen communication, only the setting of Z (data transmission speed setting) can be configured and other settings.
2. The communication transmission speed for USB can be set to 1.0M bits / second only and cannot be changed.

P3-02	PTL	Communication Protocol	Address: 0304H 0305H
	Operation Interface:	Keypad / Software	Communication
	Default:	6	Related Section: Section 9.2
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x8	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:

This parameter is used to set the communication protocol. The alphanumeric characters represent the following: 7 or 8 is the number of data bits; N, E or O refers to the parity bit,

Non, Even or Odd; the 1 or 2 is the numbers of stop bits.

- 0: Modbus ASCII mode, <7,N,2>
- 1: Modbus ASCII mode, <7,E,1>
- 2: Modbus ASCII mode, <7,O,1>
- 3: Modbus ASCII mode, <8,N,2>
- 4: Modbus ASCII mode, <8,E,1>
- 5: Modbus ASCII mode, <8,O,1>
- 6: Modbus RTU mode, <8,N,2>
- 7: Modbus RTU mode, <8,E,1>
- 8: Modbus RTU mode, <8,O,1>

<b>P3-03</b>	<b>FLT</b>	<b>Transmission Fault Treatment</b>		<b>Address: 0306H 0307H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 9.2
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0x1		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:

This parameter is used to determine the operating sequence once a communication fault has been detected. If '1' is selected, the drive will stop operating upon detection the communication fault. The mode of stopping is set by parameter P1-32.

- 0: Display fault and continue operating
- 1: Display fault and decelerate to stop operating (deceleration time is determined by parameter P5-03)

<b>P3-04</b>	<b>CWD</b>	<b>Communication Time Out Detection</b>		<b>Address: 0308H 0309H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 9.2
	Default:	0		
	Control Mode:	ALL		
	Unit:	sec		
	Range:	0 ~ 20		
	Data Size:	16-bit		
	Display Format:	Decimal		

## Settings:

This parameter is used to set the maximum permissible time before detecting a fault due to communication time out. When P3-04 is set to a value over than 0, it indicates this parameter is enabled. However, if not communicating with the servo in this period of time, the servo drive will assume the communication has failed and show the communication error fault message.

When P3-04 is set to 0, this parameter is disabled.

P3-05	CMM	Communication Selection	Address: 030AH 030BH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0x00 ~ 0x01	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	
			Related Section: Section 9.2

## Settings:

Communication interface selection

0: RS-232

1: RS-485

Multiple communication modes RS232 and RS-485 cannot be used within one communication ring. Point-to-point connection or multidrop connection can be selected.

P3-06	SDI	Digital Input Communication Function	Address: 030CH 030DH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0x0000 ~ 0x3FFF	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	
			Related Section: Section 9.2

## Settings:

The setting of this parameter determines how the Digital Inputs (DI) accept commands and signals.

The setting of this parameter determines how the Digital Inputs (DI) accept commands and signals.

Bit0 ~ Bit 7 corresponds with DI1 ~ DI8. The least significant bit (Bit0) shows DI1 status

and the most significant bit (Bit7) shows DI8 status.

Bit8 ~ Bit14 corresponds with EDI9 ~ EDI14.

Bit settings:

0: Digital input is controlled by external command (via CN1)

1: Digital input is controlled by parameter P4-07

For the settings of DI1 ~ DI8, please refer to P2-10 ~ P2-17.

For the settings of EDI9 ~ EDI14, please refer to P2-36 ~ P2-41.

This parameter P3-06 also works in conjunction with the parameter P4-07 which has several functions. Please see section 9.2 for details.

<b>P3-07</b>	<b>CDT</b>	<b>Communication Response Delay Time</b>		<b>Address: 030EH 030FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 9.2
	Default:	0		
	Control Mode:	ALL		
	Unit:	0.5ms		
	Range:	0 ~ 1000		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings:

This parameter is used to delay the communication time that servo drive responds to host controller (external controller).

<b>P3-08</b>	<b>MNS</b>	<b>Monitor Mode</b>		<b>Address: 0310H 0311H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 9.2
	Default:	0000		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	refer to the description of Settings		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings:

Monitor mode is divided into L and H (hexadecimal):

Word	-	-	Low	High
Function	-	-	Monitor time at low speed	Monitor mode
Range	0	0	0 ~ F	0 ~ 3

The status of the main axis or multi-axis can be monitored via USB. The followings are the definition of the setting value:

The setting value of H

- 0: Disable the monitor function.
- 1: Low-speed monitor mode. The sampling time is determined by the setting value of L and 4 channels can be monitored.
- 2: High-speed monitor mode. The sampling time is 8000 times per second and 4 channels can be monitored.
- 3: High-speed monitor mode. The sampling time is 16000 times per second and 2 channels can be monitored.

L: Sampling time in low-speed monitor mode (units: millisecond)

When the setting value of L is set (more than 0), the system will send a monitor message via USB device every L milliseconds to host controller so as to monitor the status of the servo drive. Each monitor message includes the data of 4 channels (16 bits x 4).

If the setting value of L is set to 0, it indicates that low-speed monitor function is disabled. Low-speed monitor function is enabled only when the setting value of H is set to 1.

P3-09	SYC	CANopen Synchronization Setting	Address: 0312H 0313H
Operation Interface:		Keypad / Software	Communication
Default:		0x5055 (for -B, -L, -M, -U type) 0x3511 (for -F type)	
Control Mode:		CANopen	
Unit:		N/A	
Range:		refer to the description of Settings	
Data Size:		16-bit	
Display Format:		Hexadecimal	

Settings:

The setting of CANopen synchronization is divided into E, T, D, M (Hexadecimal):

Display	E	T	D	M
Function	SYNC error range	Target value	Dead zone range	Clock correction setting
Range	1 ~ 9	0 ~ 9	0 ~ F	1 ~ F

This parameter is used to set the CANopen slave to be synchronized with the CANopen master through synchronization signal. Followings are the definitions:

M: When setting the CANopen slave to be synchronized with the CANopen master, the clock of the servo drive must be corrected. This function is used to set the maximum correction everytime.

D: When the difference between actual value and target value of SYNC signal reach time



does not exceed the dead zone range, the clock correction does not need to be changed.

T: Target value of SYNC signal reach time, the value must be within the range from 0 through 9, and the standard value of SYNC signal reach time is 500 usec.

Target reach time of synchronization signal = 400 + 10 x setting value of T.

For example:

When T is set to 5, the target reach time of synchronization signal = 400 + 10 x 5 = 450

E: SYNC error range, the value must be within the range from 1 through 9, and the unit is 10 usec.

When the difference between actual value and target value of SYNC signal reach time is below this range, it indicates that the CANopen slave synchronize with the CANopen master through synchronization signal.

<b>P3-10</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0314H 0315H</b>
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<b>P3-11</b>	<b>Reserved (Do Not Use)</b>	<b>Address: 0316H 0317H</b>
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<b>P3-12</b>	<b>QSTPO</b>	<b>CANopen support setting</b>	<b>Address: 0318H 0319H</b>
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Operation Interface:	Keypad / Software	Communication	Related section: Section 9.2
Default:	0x0000		
Control Mode:	CANopen		
Unit:	-		
Range:	0x0000 ~ 0x0111		
Data Size:	16bit		
Display format:	Hexadecimal		

Settings: Synchronous setting of CANopen is divided into X, Y, Z and U (hexadecimal):

Item	U	Z	Y	X
Function	-	The parameter loads in the CANopen value	If the drive enters Quick Stop mode when in auto protection	If OD-6040 supports Quick Stop
Range	0~1	0~1	0 ~ 1	0 ~ 1

The definition is as follows:

X=0: Servo ON the drive by setting OD-6040 Bit3 (Enable Operation) to ON

X=1: Servo ON the drive by setting OD-6040 Bit0, Bit1 and Bit3 to ON (comply with the standard of CANopen DS402), and enter the Quick Stop mode via OD-6040 Bit2 (Quick Stop).

Y=0: The servo drive will not enter Quick Stop mode when the motor decelerates to stop due to auto protection.

Y=1: The servo drive enters Quick Stop mode when the motor decelerates to stop due to auto protection. Only by issuing the command of Fault Reset can the servo drive exit the Quick Stop mode.

Z=0: The value will be loaded in as the default value of CANopen after re-power on or reset the communication.

Z=1: The value will not be modified after re-power on or reset the communication.

CANopen Object		Parameter	
Index	Default	Parameter	Default
605Bh	0	P1-32	P1-32.Y=0, Dynamic break enable(605Bh= -1) P1-32.Y=1, Dynamic break disable(605Bh= 0)
6065h	3840000	P2-35	3840000
606Dh	100(0.1rpm)	P1-47	10 (1rpm)
606Eh	0	P1-49	0
606Fh	100	P1-38	100
6083h	200	P1-34	200
6084h	200	P1-34	200
6087h	200	P1-34	200
6093h	1:1	P1-44 P1-45	128:10
607Fh	60000	P1-55	Rated (determined by the model)
6080h	6000	P1-55	Rated (determined by the model)

## Group 4: P4-xx Diagnosis Parameters

P4-00★	ASH1	Fault Record (N)	Address: 0400H 0401H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.1
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	N/A	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	

## Settings:

This parameter is used to set the most recent fault record.

Display of Low Word: LXXXX: It indicates the fault code, i.e. alarm code

Display of High Word: hYYYY: It indicates the corresponding CANopen error code.

P4-01★	ASH2	Fault Record (N-1)	Address: 0402H 0403H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.1
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	N/A	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	

## Settings:

This parameter is used to set the second most recent fault record.

Display of Low Word: LXXXX: It indicates the fault code, i.e. alarm code.

Display of High Word: hYYYY: It indicates the corresponding CANopen error code.

P4-02★	ASH3	Fault Record (N-2)	Address: 0404H 0405H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.1
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	N/A	

Data Size:	32-bit
Display Format:	Hexadecimal

Settings:

This parameter is used to set the third most recent fault record.

Display of Low Word: LXXXX: It indicates the fault code, i.e. alarm code.

Display of High Word: hYYYY: It indicates the corresponding CANopen error code.

**P4-03★**

ASH4	Fault Record (N-3)	Address: 0406H 0407H
Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.1
Default:	0	
Control Mode:	ALL	
Unit:	N/A	
Range:	N/A	
Data Size:	32-bit	
Display Format:	Hexadecimal	

Settings:

This parameter is used to set the fourth most recent fault record.

Display of Low Word: LXXXX: It indicates the fault code, i.e. alarm code.

Display of High Word: hYYYY: It indicates the corresponding CANopen error code.

**P4-04★**

ASH5	Fault Record (N-4)	Address: 0408H 0409H
Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.1
Default:	0	
Control Mode:	ALL	
Unit:	N/A	
Range:	N/A	
Data Size:	32-bit	
Display Format:	Hexadecimal	

Settings:

This parameter is used to set the fifth most recent fault record.

Display of Low Word: LXXXX: It indicates the fault code, i.e. alarm code.

Display of High Word: hYYYY: It indicates the corresponding CANopen error code.

P4-05	JOG	JOG Operation	Address: 040AH 040BH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.2
	Default:	20	
	Control Mode:	ALL	
	Unit:	r/min	
	Range:	0 ~ 5000	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

JOG operation command:

#### 1. Operation Test

- (1) Press the SET key to display the JOG speed. (The default value is 20 r/min).
- (2) Press the UP or DOWN arrow keys to increase or decrease the desired JOG speed. (This also can be undertaken by using the SHIFT key to move the cursor to the desired unit column (the effected number will flash) then changed using the UP and DOWN arrow keys).
- (3) Press the SET when the desired JOG speed is displayed. The Servo Drive will display "JOG".
- (4) Press the UP or DOWN arrow keys to jog the motor either P(CCW) or N(CW) direction. The motor will only rotation while the arrow key is activated.
- (5) To change JOG speed again, press the MODE key. The servo Drive will display "P4 - 05". Press the SET key and the JOG speed will displayed again. Refer back to #(2) and #(3) to change speed.
- (6) In JOG operation mode, if any fault occurs, the motor will stop running. The maximum JOG speed is the rated speed of the servo motor.

#### 2. DI Signal Control

Set the value of DI signal as JOGU and JOGD (refer to Table 8.A).

Users can perform JOG run forward and run reverse control.

#### 3. Communication Control

To perform a JOG Operation via communication command, use communication addresses 040AH and 040BH.

- (1) Enter 1 ~ 5000 for the desired JOG speed
- (2) Enter 4998 to JOG in the P(CCW) direction
- (3) Enter 4999 to JOG in the N(CW) direction
- (4) Enter 0 to stop the JOG operation

Please note that when using communication control, please set P2-30 to 5 to avoid that there are excessive writes to the system flash memory.

<b>P4-06</b> ▲ ■	<b>FOT</b>	<b>Force Output Contact Control</b>		<b>Address: 040CH 040DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 4.4.3
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 0xFF		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

#### Settings:

The function of Digital Outout (DO) is determined by the DO setting value. The user can set DO setting value (0x30 ~ 0x3F) via communication and then write the values into P4-06 to complete the settings.

- Bit00 corresponds with DO setting value 0x30
- Bit01 corresponds with DO setting value 0x31
- Bit02 corresponds with DO setting value 0x32
- Bit03 corresponds with DO setting value 0x33
- Bit04 corresponds with DO setting value 0x34
- Bit05 corresponds with DO setting value 0x35
- Bit06 corresponds with DO setting value 0x36
- Bit07 corresponds with DO setting value 0x37
- Bit08 corresponds with DO setting value 0x38
- Bit09 corresponds with DO setting value 0x39
- Bit10 corresponds with DO setting value 0x3A
- Bit11 corresponds with DO setting value 0x3B
- Bit12 corresponds with DO setting value 0x3C
- Bit13 corresponds with DO setting value 0x3D
- Bit14 corresponds with DO setting value 0x3E
- Bit15 corresponds with DO setting value 0x3F

For example:

When P2-18 is set to 0x0130, it indicates that the state of DO1 is the Bit00 state of P4-06.

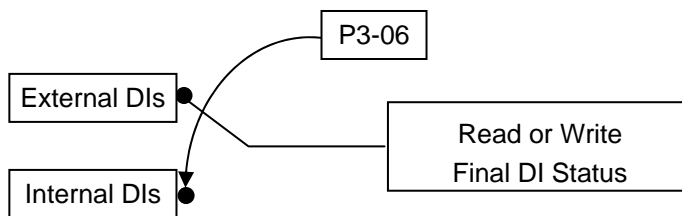
This parameter can also be used to force the state of DO signal. Please refer to P2-18 ~ P2-22 to assign the functions of digital outouts (DO signals) and section 4.4.3 for the Force Outputs Operation.

<b>P4-07</b>	<b>ITST</b>	<b>Input Status</b>	<b>Address: 040EH 040FH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.4 Section 9.2
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x3fFF	
	Data Size:	16-bit	
Display Format:	Hexadecimal		

**Settings:**

The control of digital inputs can be determined by the external terminals (DI1 ~ DI8, EDI9 ~ EDI14) or by the internal software digital inputs SDI1 ~ SDI14 (corresponds to Bit0 ~ Bit13 of P4-07) via communication (upon software).

Please refer to P3-06 and section 9.2 for the setting method.



Read P4-07: Display the final status of DI input signal.

Write P4-07: Write the status of software digital inputs SDI1 ~ SDI14

(No matter the servo drive is controller through digital keypad or communication control, the function of this parameter is the same.)

For example:

External Control: Display the final status of DI input signal

When the read value of P4-07 is 0x0011, it indicates that DI1 and DI5 are ON.

Communication Control (Internal DIs): Read the status of input signal (upon software).

For example:

When the write value of P4-07 is 0x0011, it indicates that software digital inputs SDI1 and SDI5 are ON.

Bit0 ~ Bit7 corresponds with DI1 ~ DI8. Bit8 ~ Bit14 corresponds with EDI9 ~ EDI14.

For the settings of DI1 ~ DI8, please refer to P2-10 ~ P2-17. For the settings of EDI9 ~ EDI14, please refer to P2-36 ~ P2-41.

<b>P4-08</b> ★	<b>PKEY</b>	<b>Digital Keypad Input of Servo Drive</b>	<b>Address: 0410H 0411H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
Default:	N/A		

Control Mode:	ALL
Unit:	N/A
Range:	Read only
Data Size:	16-bit
Display Format:	Hexadecimal

Settings:

This parameter is used to check if MODE, UP, DOWN, SHIFT, and SET keys on the drive keypad being pressed or not. It is used to examine if these five keys work normally via communication during production.

<b>P4-09★</b>	<b>MOT</b>	<b>Output Status</b>	<b>Address: 0412H 0413H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 4.4.5
	Default:	N/A	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 0x1F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings:

There is no difference when reading DO output signal via the drive keypad or the communication. For the status of DO output signal, please refer to P2-18 ~ P2-22.

<b>P4-10■</b>	<b>CEN</b>	<b>Adjustment Function</b>	<b>Address: 0414H 0415H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 6	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

- 0: Reserved
- 1: Execute analog speed input drift adjustment
- 2: Execute analog torque input drift adjustment
- 3: Execute current detector (V phase) drift adjustment



- 4: Execute current detector (W phase) drift adjustment
- 5: Execute drift adjustment of the above 1~4
- 6: Execute IGBT NTC calibration

Please note:

- 1. This adjustment function is enabled after parameter P2-08 is set to 20.
- 2. When executing any adjustment, the external wiring connected to analog speed or torque must be removed and the servo system should be off (Servo off).

<b>P4-11</b>	<b>SOF1</b>	<b>Analog Speed Input Drift Adjustment 1</b>	<b>Address: 0416H 0417H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

The adjustment functions from P4-11 through P4-19 are enabled after parameter P2-08 is set to 22. Although these parameters allow the users to execute manual adjustment, we still do not recommend the users to change the default setting value of these parameters (P4-11 ~ P4-19) manually.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

<b>P4-12</b>	<b>SOF2</b>	<b>Analog Speed Input Drift Adjustment 2</b>	<b>Address: 0418H 0419H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

Refer to P4-11 for explanation.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

P4-13	TOF1	Analog Torque Drift Adjustment 1	Address: 041AH 041BH
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

Refer to P4-11 for explanation.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

P4-14	TOF2	Analog Torque Drift Adjustment 2	Address: 041CH 041DH
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

Refer to P4-11 for explanation.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

P4-15	COF1	Current Detector Drift Adjustment (V1 phase)	Address: 041EH 041FH
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

Refer to P4-11 for explanation.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

<b>P4-16</b>	<b>COF2</b>	<b>Current Detector Drift Adjustment (V2 phase)</b>	<b>Address: 0420H 0421H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

Refer to P4-11 for explanation.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

<b>P4-17</b>	<b>COF3</b>	<b>Current Detector Drift Adjustment (W1 phase)</b>	<b>Address: 0422H 0423H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

Refer to P4-11 for explanation.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

<b>P4-18</b>	<b>COF4</b>	<b>Current Detector Drift Adjustment (W2 phase)</b>	<b>Address: 0424H 0425H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	Factory setting	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 32767	

Data Size:	16-bit
Display Format:	Decimal

Settings:

Refer to P4-11 for explanation.

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

P4-19	TIGB	IGBT NTC Calibration	Address: 0426H 0427H
Operation Interface:	Keypad / Software	Communication	Related Section: N/A
Default:	Factory setting		
Control Mode:	ALL		
Unit:	N/A		
Range:	1 ~ 3		
Data Size:	16-bit		
Display Format:	Decimal		

Settings:

Refer to P4-11 for explanation.

When executing this auto adjustment, please ensure to cool the servo drive to 25°C.

P4-20	DOF1	Analog Monitor Output Drift Adjustment (MON1)	Address: 0428H 0429H
Operation Interface:	Keypad / Software	Communication	Related Section: Section 6.4.4
Default:	Factory setting		
Control Mode:	ALL		
Unit:	mV		
Range:	-800 ~ 800		
Data Size:	16-bit		
Display Format:	Decimal		

Settings:

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

P4-21	DOF2	Analog Monitor Output Drift Adjustment (MON2)	Address: 042AH 042BH
Operation Interface:	Keypad / Software	Communication	Related Section: Section 6.4.4
Default:	0		
Control Mode:	ALL		

Unit:	mV
Range:	-800 ~ 800
Data Size:	16-bit
Display Format:	Decimal

Settings:

Please note that when P2-08 is set to 10, the users cannot reset this parameter.

<b>P4-22</b>	<b>SAO</b>	<b>Analog Speed Input Offset</b>	<b>Address: 042CH 042DH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	S	
	Unit:	mV	
	Range:	-5000 ~ 5000	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In speed mode, the users can use this parameter to add an offset value to analog speed input.

<b>P4-23</b>	<b>TAO</b>	<b>Analog Torque Input Offset</b>	<b>Address: 042EH 042FH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	T	
	Unit:	mV	
	Range:	-5000 ~ 5000	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In speed mode, the users can use this parameter to add an offset value to analog speed input.

**220V Series**

P4-24	LVL	Undervoltage Error Level	Address: 0430H 0431H
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	160	
	Control Mode:	ALL	
	Unit:	V (rms)	
	Range:	140 ~ 190	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

When DC Bus voltage is lower than the value of  $P4-24 \times \sqrt{2}$ , the fault, Undervoltage will occur.

**400V Series**

P4-24	LVL	Undervoltage Error Level	Address: 0430H 0431H
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	320	
	Control Mode:	ALL	
	Unit:	V (rms)	
	Range:	140 ~ 380	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

When DC Bus voltage is lower than the value of  $P4-24 \times \sqrt{2}$ , the fault, Undervoltage will occur.

## Group 5: P5-xx Motion Control Parameters

<b>P5-00</b>	Reserved (Do Not Use)	Address: 0500H 0501H
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<b>P5-01</b>	Reserved (Do Not Use)	Address: 0502H 0503H
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<b>P5-02</b>	Reserved (Do Not Use)	Address: 0504H 0505H
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<b>P5-03</b>	<b>PDEC</b>	<b>Deceleration Time of Protectin Function</b>	Address: 0506H 0507H
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Operation Interface:	Keypad / Software	Communication	Related Section: N/A
Default:	0XE0EFEEFF		
Control Mode:	ALL		
Unit:	N/A		
Range:	0x00000000 ~ 0xF0FFFFFF		
Data Size:	32-bit		
Display Format:	Hexadecimal		

Settings:

Display	High Word				Low Word			
	D	C	B	A	W	Z	Y	X
Function	STP	Reserved	CTO	OVF	SNL	SPL	NL	PL
Range	0 ~ F	-	0 ~ F	0 ~ F	0 ~ F	0 ~ F	0 ~ F	0 ~ F

This parameter is used to set motor deceleration when protection functions, such as STOP (Motor stop), OVF (Position command overflow), SNL (Reverse software limit), SPL (Forward software limit), NL (Reverse inhibit limit) or PL (Forward inhibit limit), etc. are activated.

- Deceleration time of protection functions include: OVF, CTO(AL020), SPL, SNL, PL, NL
- Deceleration time of motor stop command: STP

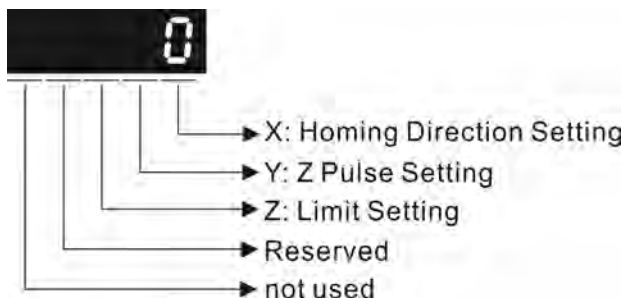
When entering P5-03, Lower Word display will show first. After pressing SHIFT key on the drive keypad, the High Word display will show next.

The values from 0 through F correspond with the setting values from P5-20 through P5-35.

For example, when the setting value X is set to A, it indicates that the motor PL deceleration time is determined by parameter P5-30.

<b>P5-04</b>	<b>HMOV</b>	<b>Homing Mode</b>		<b>Address: 0508H 0509H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0 ~ 0x128		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings:



This parameter is used to determine the homing characteristics of the servo motor.

Display	W	Z	Y	X
Function	Reserved	Limit setting	Z pulse setting	Homing direction setting
Range	-	0 ~ 1	0 ~ 2	0 ~ 8
Settings		-	Y=0: Stop and return to Z pulse. Y=1: Go forward to Z pulse.	X=0: Move forward to PL(CCWL) used as home.
		-	Y=2: Ignore Z pulse	X=1: Move reverse to NL(CWL) used as home.
		When there is a limit: Z=0: After reaching the limit, activate the limit signal. Z=1: After reaching the limit, the motor will run in the reverse direction.		X=2: Move forward to dedicated home sensor (ORGP: OFF → ON)
				X=3: Move reverse to dedicated home sensor (ORGP: OFF → ON)
			-	X=4: Move forward and regard Z pulse as home sensor. X=5: Move reverse and regard Z pulse as home sensor.
		Y=0: Stop and return	X=6: Move forward to	



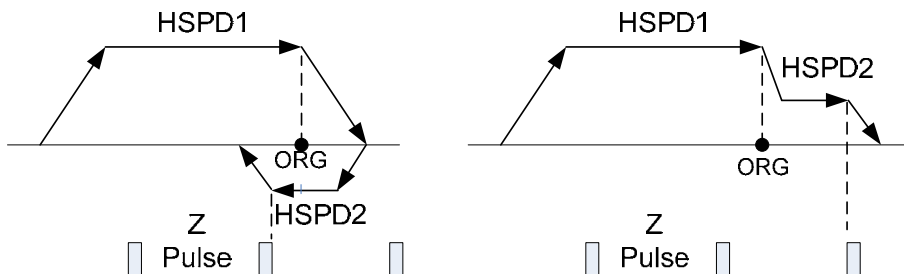
Display	W	Z	Y	X
Function	Reserved	Limit setting	Z pulse setting	Homing direction setting
Range	-	0 ~ 1	0 ~ 2	0 ~ 8
			to Z pulse. Y=1: Go forward to Z pulse. Y=2: Ignore Z pulse	dedicated home sensor (ORGP: ON → OFF) X=7: Move reverse to dedicated home sensor (ORGP: ON → OFF)
		-	-	X=8: Regard current position as home sensor

P5-05	HSPD1	1st Speed Setting of High Speed Homing	Address: 050AH 050BH
Operation Interface:	Keypad / Software	Communication	Related Section: N/A
Default:	100.0	1000	
Control Mode:	ALL		
Unit:	1 r/min	0.1 r/min	
Range:	0.1 ~ 2000.0	1 ~ 20000	
Data Size:	16-bit		
Display Format:	Decimal		
Input Value Example:	1.5 = 1.5 r/min	15 = 1.5 r/min	

**Settings:**

This parameter is used to set the initial (high speed) homing speed.

The homing operation of the servo motor involves two homing speed settings. When homing is triggered, the servo motor will proceed at a high speed until a home sensor is detected. The servo motor will then move reverse at a low speed until off of the home sensor, and finally will stop at the next Z pulse.



P5-06	HSPD2	2nd Speed Setting of Low Speed Homing	Address: 050CH 050DH
Operation Interface:	Keypad / Software	Communication	Related Section: N/A
Default:	20.0	200	

Control Mode:	ALL	
Unit:	1 r/min	0.1 r/min
Range:	0.1 ~ 500.0	10 ~ 5000
Data Size:	16-bit	
Display Format:	Decimal	
Input Value Example:	15 = 15 r/min	150 = 1.5 r/min

**Settings:**

This parameter is used to set the secondary (low speed) homing speed.

Refer to P5-05 for explanation.

<b>P5-07</b>	<b>PRCM</b>	<b>Trigger Position Command (PR mode only)</b>		<b>Address: 050EH 050FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0 ~ 1000		
	Data Size:	16-bit		
	Display Format:	Decimal		

**Settings:**

There are 64 stored positions can be programmed via a combination of the POS0 ~ POS5 commands. This parameter is used to trigger the dedicated position command in PR mode and command the motor to move to the dedicated position instead of using DI (Digital Input) CTRG and POS0 ~ POS5.

0: Start homing function.

When entering P5-07, the default setting value 0 will display. Pressing SET key on the drive keypad, the servo motor will start homing operation.

1 ~ 63: Trigger Position Command (This function is equivalent to the function of DI CTRG signal + POSn signal).

When P5-07 is set to 1 ~ 63, the dedicated position command can be triggered and the servo drive will command the motor move to the the dedicated position. For example, when P5-07 is set to 1, the position command P1 is triggered and the servo drive will command the motor to move to the position which correspond the position command P1.

64 ~ 9999: Write inhibit (Invalid setting value)

1000: Stop positioning.

When P5-07 is set to 1000, the motor stop command will be activated. This function is equivalent to the function of DI STOP signal.

The display value of P5-07:

1. When the motor does not receive the drive command (the motor is not running), if the users read P5-07 at this time, the display value of P5-07 will be the setting value of P5-07
2. When the position command is triggered and the motor start runningbut does not reach the dedicated position (during positioning, the motor is running), if the users read P5-07 at this time, the display value of P5-07 will be setting value of P5-07 plus 10000.
3. When the position command is triggered and the motor reaches the dedicated position (the positioning is completed and the motor stop running), if the users read P5-07 at this time, the display value of P5-07 will be setting value of P5-07 plus 20000.

For example, when P5-07 is set to 3, it indicates that the position command P3 will be triggered.

1. If the display value of P5-07 is 3, it indicates that the motor does not receive the drive command and the motor is not running.
2. If the display value of P5-07 is 100003, it indicates that the position command is triggered but the positioning is not completed.
3. If the display value of P5-07 is 200003, it indicates that the position command is triggered and the positioning is completed.

<b>P5-08</b>	<b>SWLP</b>	<b>Forward Software Limit</b>		<b>Address: 0510H 0511H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	2147483647		
	Control Mode:	PR		
	Unit:	PUU		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
Display Format:	Decimal			

Settings:

In PR mode, this parameter is used to set the threshold of forward software limit. When the motor operates in forward direction, if the position command is equal to or more than this parameter, i.e. the setting value of P5-08 is reached, the fault AL283 (forward software limit) will be activated.

<b>P5-09</b>	<b>SWLN</b>	<b>Reverse Software Limit</b>		<b>Address: 0512H 0513H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	-2147483648		
Control Mode:	PR			

Unit:	PUU
Range:	-2147483648 ~ +2147483647
Data Size:	32-bit
Display Format:	Decimal

## Settings:

In PR mode, this parameter is used to set the threshold of reverse software limit. When the motor operates in reverse direction, if the position command is equal to or more than this parameter, i.e. the setting value of P5-09 is reached, the fault AL285 (reverse software limit) will be activated.

<b>P5-10★</b>	<b>AYSZ</b>	<b>Data Array: Data Amount (N x 32 bits)</b>	<b>Address: 0514H 0515H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.2
	Default:	N/A	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	Read only	
	Data Size:	16-bit	
	Display Format:	Decimal	

## Settings:

This parameter is used to set the data amount of data array (N x 32 bits). N is the capacity of the data array.

<b>P5-11■</b>	<b>AYID</b>	<b>Data Array: Read / Write Address</b>	<b>Address: 0516H 0517H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.2
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ (P5-10-1)	
	Data Size:	16-bit	
	Display Format:	Decimal	

## Settings:

This parameter is used to set the data address when reading and writing data array.

<b>P5-12</b>	<b>AYD0</b>	<b>Data Array: Read / Write Data Block 1</b>		<b>Address: 0518H 0519H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.2
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

## Settings:

This parameter is used to read the data block 0 of data array (Array[P5-11++]).

For example, when P5-11 is set to 100, the first read data displayed by P5-12 is the 100th data, the secondary read data is 101+1=102th data, the third read data is 102+1 = 103th data and vice versa. By the same logic, when P5-11 is set to 100, the first written data displayed by P5-12 is the 100th data, the secondary written data is 101+1=102th data, the third written data is 102+1 = 103th data and vice versa. However, if P5-12 is read via the drive keypad, only the 101th data will be read.

<b>P5-13</b>	<b>AYD1</b>	<b>Data Array: Read / Write Data Block 2</b>		<b>Address: 051AH 051BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.2
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

## Settings:

This parameter is used to read the data block 2 of data array (Array[P5-11++]).

The usage of this parameter is the same as the parameter P5-12. Only one function is different. When P5-12 is read via the drive keypad, the first read data displayed by P5-12 is the 100th data, the secondary read data is 101+1=102th data, the third read data is 102+1 = 103th data and vice versa. It indicates that using P5-13 can read more than one data via the drive keypad. Please note that using P5-13 can not write data via the drive keypad.

<b>P5-14</b>	<b>Reserved (Do Not Use)</b>		<b>Address: 051CH 051DH</b>
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P5-15 ■	PMEM	PATH 1 ~ PATH 2 Data Not Retained Setting		Address: 051EH 051FH
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0x0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0x0 ~ 0x0011		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

## Settings:

This parameter is designed for the users who need to change the positioning point frequently via communication.

Display	0	0	Y	X
Range	-	-	0 ~ 1	0 ~ 1

X=0: The data of PATH 1 (P6-02 ~P6-03) will be retained (memorized) when the power goes off.

X=1: The data of PATH 1 (P6-02 ~P6-03) will not be retained (memorized) when the power goes off.

Y=0: The data of PATH 2 (P6-04 ~P6-05) will be retained (memorized) when the power goes off.

Y=1: The data of PATH 2 (P6-04 ~P6-05) will not be retained (memorized) when the power goes off.

Other settings: Reserved

P5-16 ■	AXEN	Axis Position: Motor Encoder		Address: 0520H 0521H
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.3
	Default:	0		
	Control Mode:	ALL		
	Unit:	PUU (user unit)		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

## Settings:

Read function: This parameter is used to read the actual position of the motor encoder, i.e. the monitor variable V000 + deviation value.

Write function (available in firmware version V1.015 and later models only):

The users can write any value and doing this will no change the value of monitor variable V000 and will not affect the position coordinate either.

<b>P5-17</b>	<b>AXAU</b>	<b>Axis Position: Auxiliary Encoder (Pulse Command Feedback)</b>	<b>Address: 0522H 0523H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.3
	Default:	0	
	Control Mode:	ALL	
	Unit:	pulse	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	

## Settings:

This parameter is used to send back the pulse counts of the auxiliary encoder (linear scale).

<b>P5-18</b>	<b>AXPC</b>	<b>Axis Position: Pulse Command</b>	<b>Address: 0524H 0525H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.3
	Default:	0	
	Control Mode:	ALL	
	Unit:	pulse	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	

## Settings:

This parameter is used to send back the pulse counts of pulse command.

<b>P5-19</b>	<b>TBS</b>	<b>E-Cam Curve Scaling</b>	<b>Address: 0526H 0527H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.3
	Default:	1.000000	
	Control Mode:	PR	
	Unit:	0.000001 times, i.e. 1/ (10 <sup>6</sup> )	
	Range:	-2147.000000 ~ +2147.000000	
	Data Size:	32-bit	
	Display Format:	Decimal	
Input Value Example:	1100000 = 1.1 times		

Settings: (available in firmware version V1.017 and later models only)

This parameter is used to magnify or minify the E-Cam table without changing the setting value of the E-Cam table.

For example:

When the data of the table is 0,10,20,30,40,20, if the magnification is set to 2.000000, it is equal to the data 0,20,40,60,80,40 which the magnification is set to 1.000000.

When using the same pulse frequency of master axis to drive E-Cam operation, increasing the setting value of P5-19 will magnify the route of E-Cam operation and increase the operation speed as well.

Please note:

1. This parameter can be set any time. However, it is effective only when the electronic gear is engaged.
2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-20	AC0	Accel / Decel Time 0	Address: 0528H 0529H
Operation Interface:		Keypad / Software	Communication
Default:		200	
Control Mode:		PR	
Unit:		ms	
Range:		1 ~ 65500	
Data Size:		16-bit	
Display Format:		Decimal	
Related Section: Section 7.10			

Settings:

In PR mode, this parameter is used to set the acceleration and deceleration time, i.e. the necessary time when the motor reaches the speed of 3000 r/min from 0.

P5-21	AC1	Accel / Decel Time 1	Address: 052AH 052BH
Operation Interface:		Keypad / Software	Communication
Default:		300	
Control Mode:		PR	
Unit:		ms	
Range:		1 ~ 65500	
Data Size:		16-bit	
Display Format:		Decimal	
Related Section: Section 7.10			

Settings: Refer to P5-20 for explanation.



<b>P5-22</b>	<b>AC2</b>	<b>Accel / Decel Time 2</b>		<b>Address: 052CH 052DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	500		
	Control Mode:	PR		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings: Refer to P5-20 for explanation.

<b>P5-23</b>	<b>AC3</b>	<b>Accel / Decel Time 3</b>		<b>Address: 052EH 052FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	600		
	Control Mode:	PR		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings: Refer to P5-20 for explanation.

<b>P5-24</b>	<b>AC4</b>	<b>Accel / Decel Time 4</b>		<b>Address: 0530H 0531H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	800		
	Control Mode:	PR		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings: Refer to P5-20 for explanation.

P5-25	AC5	Accel / Decel Time 5	Address: 0532H 0533H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	900	
	Control Mode:	PR	
	Unit:	ms	
	Range:	1 ~ 65500	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings: Refer to P5-20 for explanation.

P5-26	AC6	Accel / Decel Time 6	Address: 0534H 0535H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	1000	
	Control Mode:	PR	
	Unit:	ms	
	Range:	1 ~ 65500	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings: Refer to P5-20 for explanation.

P5-27	AC7	Accel / Decel Time 7	Address: 0536H 0537H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	1200	
	Control Mode:	PR	
	Unit:	ms	
	Range:	1 ~ 65500	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings: Refer to P5-20 for explanation.

<b>P5-28</b>	<b>AC8</b>	<b>Accel / Decel Time 8</b>		<b>Address: 0538H 0539H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	1500		
	Control Mode:	PR		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings: Refer to P5-20 for explanation.

<b>P5-29</b>	<b>AC9</b>	<b>Accel / Decel Time 9</b>		<b>Address: 053AH 053BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	2000		
	Control Mode:	PR		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings: Refer to P5-20 for explanation.

<b>P5-30</b>	<b>AC10</b>	<b>Accel / Decel Time 10</b>		<b>Address: 053CH 053DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	2500		
	Control Mode:	PR		
	Unit:	ms		
	Range:	1 ~ 65500		
	Data Size:	16-bit		
Display Format:	Decimal			

Settings: Refer to P5-20 for explanation.

P5-31	AC11	Accel / Decel Time 11	Address: 053EH 053FH
Operation Interface:		Keypad / Software	Communication
Default:		3000	
Control Mode:		PR	
Unit:		ms	
Range:		1 ~ 65500	
Data Size:		16-bit	
Display Format:		Decimal	

Settings: Refer to P5-20 for explanation.

P5-32	AC12	Accel / Decel Time 12	Address: 0540H 0541H
Operation Interface:		Keypad / Software	Communication
Default:		5000	
Control Mode:		PR	
Unit:		ms	
Range:		1 ~ 65500	
Data Size:		16-bit	
Display Format:		Decimal	

Settings: Refer to P5-20 for explanation.

P5-33	AC13	Accel / Decel Time 13	Address: 0542H 0543H
Operation Interface:		Keypad / Software	Communication
Default:		8000	
Control Mode:		PR	
Unit:		ms	
Range:		1 ~ 65500	
Data Size:		16-bit	
Display Format:		Decimal	

Settings: Refer to P5-20 for explanation.

<b>P5-34</b>	<b>AC14</b>	<b>Accel / Decel Time 14</b>	<b>Address: 0544H 0545H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	50	
	Control Mode:	PR	
	Unit:	ms	
	Range:	1 ~ 1500	
	Data Size:	16-bit	
Display Format:	Decimal		

Settings: Refer to P5-20 for explanation.

The default setting value of this parameter is smaller and it is for the deceleration setting when protection function is activated.

<b>P5-35</b>	<b>AC15</b>	<b>Accel / Decel Time 15</b>	<b>Address: 0546H 0547H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	30	
	Control Mode:	PR	
	Unit:	ms	
	Range:	1 ~ 1200	
	Data Size:	16-bit	
Display Format:	Decimal		

Settings: Refer to P5-20 for explanation.

The default setting value of this parameter is smaller and it is for the deceleration setting when the motor stops in high speed.

<b>P5-36</b>	<b>CAST</b>	<b>CAPTURE: Start Address of Data Array</b>	<b>Address: 0548H 0549H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11.1
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ (P5-10-1)	
	Data Size:	16-bit	
Display Format:	Decimal		

Settings:

This parameter is used to specify the start address which captures the first point data and save it into data array.

Please note:

This parameter can be set only when capture operation is stopped (Refer to P5-39).

P5-37 ■	CAAX	CAPTURE: Axis Position CNT		Address: 054AH 054BH
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11.1
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

This parameter can be set only when capture operation is stopped (Refer to P5-39).

Please note:

1. Do not change this parameter when the capture source is the motor encoder.
2. When the capture source is the motor encoder, the value of this parameter is reset to the motor encoder feedback position (monitor variable is 00h).

P5-38 ■	CANO	CAPTURE: Capture Amount		Address: 054CH 054DH
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11.1
	Default:	1		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	1 ~ (P5-10 – P5-36)		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

When the compare function is not enabled, using this parameter can set the estimated capture amount (able to read and write).

Once the capture function is enabled, everytime when one position is captured, the setting value of P5-38 will decrease 1. When the setting value of P5-38 is equal to 0, it indicates that the capture operation has finished.

Please note:

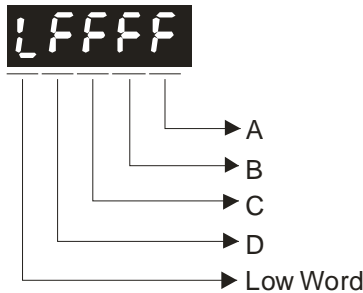
1. The total amount of COMPARE, CAPTURE and E-Cam data can not exceed the number of 800.

2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-39</b>	<b>CACT</b>	<b>CAPTURE: Capture Source Setting</b>		<b>Address: 054EH 054FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11.1
	Default:	0x2010		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0x0000 ~ 0xF13F		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

Settings:

This parameter is used to determine the capture source and enable the capture function.



A: Capture function settings:

Please refer to the following table and descriptions:

Bit	3	2	1	0
Function	Execute PR command when capture function has finished.	After first position is captured, the system will enable the compare function	After first position is captured, the position will be reset.	Start capture function
Explanation	After capture function has finished, execute PR # 50 command.	The compare function is enabled already, and this setting will become ineffective.	When the first point is captured, the position coordinate will be reset.	Setting Bit0 to 1 will enable the capture function. When capture function has finished, the value of Bit0 will be reset to 0 automatically.

Bit0: When the value of P5-38 is higher than 0, setting Bit0 to 1 will enable the capture function and the DO signal, CAP\_OK is inactivated. Once the capture function is enabled, everytime when one position is captured, the setting value of P5-38 will decrease 1. When the setting value of P5-38 is equal to 0, it indicates that the capture operation has finished. Then, DO signal, CAP\_OK will be activated and the value of Bit0 will be reset to 0 automatically.

When the value of P5-38 is equal to 0, setting Bit0 to 1 will not enable the capture

function, the DO signal, CAP\_OK will be inactivated and then the value of Bit0 will be reset to 0 automatically. If Bit0 is set to 1 already, the new setting value cannot be 1. The users only can set Bit0 to 0 to disable the capture function.

Bit1: When Bit1 is set to 1, after first position is captured, the system will set the value of the current position as the value of the parameter P5-76.

Bit2: When Bit2 is set to 1, after first position is captured, the system will enable the compare function (Bit0 of P5-59 is set to 1 and the value of P5-58 is set to the last compare amount). If the compare function is enabled already, this setting will become ineffective.

Bit3: When Bit3 is set to 1, after capture operation is completed (all positions has been captured), the position command P50 will be triggered immediately.

B: Capture source settings

0: Capture function is disabled.

1: Auxiliary encoder (linear scale).

2: Pulse command.

3: Motor encoder

C: Activate state settings

0: Normally open (use N.O. contact)

1: Normally closed (use N.C. contact)

D: Trigger time settings (unit: ms)

P5-40	DLY0	Delay Time 0	Address: 0550H 0551H
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		ms	
Range:		0 ~ 32767	
Data Size:		16-bit	
Display Format:		Decimal	
Related Section: Section 7.10			

Settings:

In PR mode, this parameter is used to set the delay time for the first position.

P5-41	DLY1	Delay Time 1	Address: 0552H 0553H
Operation Interface:		Keypad / Software	Communication
Default:		100	
Control Mode:		PR	
Unit:		ms	
Range:		0 ~ 32767	
Related Section: Section 7.10			



Data Size:	16-bit
Display Format:	Decimal

Settings:

In PR mode, this parameter is used to set the delay time for the second position.

<b>P5-42</b>	<b>DLY2</b>	<b>Delay Time 2</b>	<b>Address: 0554H 0555H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	200	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the third position.

<b>P5-43</b>	<b>DLY3</b>	<b>Delay Time 3</b>	<b>Address: 0556H 0557H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	400	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the fourth position.

<b>P5-44</b>	<b>DLY4</b>	<b>Delay Time 4</b>	<b>Address: 0558H 0559H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	500	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	

Data Size:	16-bit
Display Format:	Decimal

Settings:

In PR mode, this parameter is used to set the delay time for the fifth position.

<b>P5-45</b>	<b>DLY5</b>	<b>Delay Time 5</b>	<b>Address: 055AH 055BH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	800	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the sixth position.

<b>P5-46</b>	<b>DLY6</b>	<b>Delay Time 6</b>	<b>Address: 055CH 055DH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	1000	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the seventh position.

<b>P5-47</b>	<b>DLY7</b>	<b>Delay Time 7</b>	<b>Address: 055EH 055FH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	1500	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	

Data Size:	16-bit
Display Format:	Decimal

Settings:

In PR mode, this parameter is used to set the delay time for the eighth position.

<b>P5-48</b>	<b>DLY8</b>	<b>Delay Time 8</b>	<b>Address: 0560H 0561H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	2000	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the ninth position.

<b>P5-49</b>	<b>DLY9</b>	<b>Delay Time 9</b>	<b>Address: 0562H 0563H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	2500	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the tenth position.

<b>P5-50</b>	<b>DLY10</b>	<b>Delay Time 10</b>	<b>Address: 0564H 0565H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	3000	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	

Data Size:	16-bit
Display Format:	Decimal

Settings:

In PR mode, this parameter is used to set the delay time for the eleventh position.

<b>P5-51</b>	<b>DLY11</b>	<b>Delay Time 11</b>	<b>Address: 0566H 0567H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	3500	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the twelfth position.

<b>P5-52</b>	<b>DLY12</b>	<b>Delay Time 12</b>	<b>Address: 0568H 0569H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	4000	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the thirteenth position.

<b>P5-53</b>	<b>DLY13</b>	<b>Delay Time 13</b>	<b>Address: 056AH 056BH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	4500	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	

Data Size:	16-bit
Display Format:	Decimal

Settings:

In PR mode, this parameter is used to set the delay time for the fourteenth position.

<b>P5-54</b>	<b>DLY14</b>	<b>Delay Time 14</b>	<b>Address: 056CH 056DH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	5000	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the fifteenth position.

<b>P5-55</b>	<b>DLY15</b>	<b>Delay Time 15</b>	<b>Address: 056EH 056FH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	5500	
	Control Mode:	PR	
	Unit:	ms	
	Range:	0 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

In PR mode, this parameter is used to set the delay time for the sixteenth position.

<b>P5-56</b>	<b>CMST</b>	<b>COMPARE: Start Address of Data Array</b>	<b>Address: 0570H 0571H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11.2
	Default:	50	
	Control Mode:	ALL	
	Unit:	N/A	
Range:	0 ~ (P5-10-1)		

Data Size:	16-bit
Display Format:	Decimal

Settings:

This parameter is used to specify the start address which compares the first point data and save it into data array.

Please note:

This parameter can be set only when COMPARE function is disabled (Refer to P5-59).

<b>P5-57</b>	<b>CMAx</b>	<b>COMPARE: Axis Position</b>	<b>Address: 0572H 0573H</b>
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
			Related Section: Section 7.11.2

Settings:

This parameter can be set only when COMPARE function is disabled (Refer to P5-59).

Please note:

1. Do not change this parameter when the compare source is the capture axis and motor encoder.
2. The pulse resolution is determined by the parameter P1-46.
3. When the setting value Y of the parameter P5-59 is set to 3, i.e. the compare source is the motor encoder, the value of this parameter is reset to the motor encoder feedback position (monitor variable is 00h). If the motor encoder feedback position is different from this parameter because homing operation is enabled or the capture function setting is changed, the users can set the setting value Y of P5-59 to 3 to make this parameter to be equivalent to the motor encoder feedback position.

<b>P5-58</b>	<b>CMNO</b>	<b>COMPARE: Compare Amount</b>	<b>Address: 0574H 0575H</b>
	Operation Interface:	Keypad / Software	Communication
	Default:	1	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	1 ~ (P5-10 – P5-56)	
	Data Size:	16-bit	

Display Format:	Decimal
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Settings:

When the compare function is not enabled, using this parameter can set the estimated compare amount (able to read and write).

When the compare function is enabled, using this parameter can set the rest compare amount (read-only). When the setting value of P5-58 is equal to 0, it indicates that the compare operation has finished.

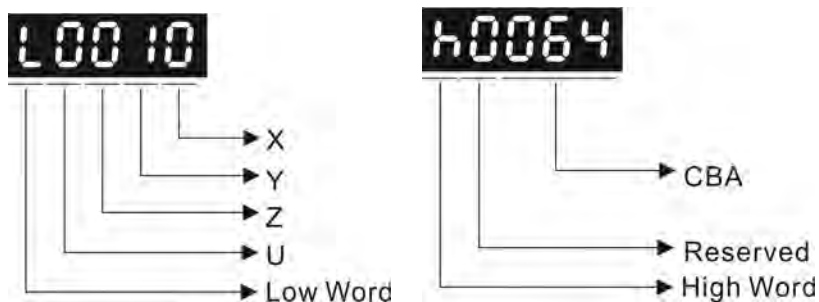
Please note:

The total amount of COMPARE, CAPTURE and E-Cam data can not exceed the number of 800.

<b>P5-59</b>	<b>CMCT</b>	<b>COMPARE: Compare Source Setting</b>	<b>Address: 0576H 0577H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11.2
	Default:	00640010h	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	00010000h ~ 0x0FFF313F	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	

Settings:

This parameter is used to determine the compare source and enable the compare function.



- X: Please refer to the following table.
- Y: Compare source settings
- 0: Capture axis.
- 1: Auxiliary encoder (linear scale).
- 2: Pulse command.
- 3: Motor encoder
- Z: Activate state settings
- 0: Normally open (use N.O. contact)
- 1: Normally closed (use N.C. contact)

U: The definition of each bit is as follows.

Bit	15	14	13	12
Function	-	-	-	Trigger PR command
Explanation	-	-	-	Setting Bit12 to 1 will trigger PR command #45 after after the last position is compared This function is available in firmware version V1.038 sub09 and later models only.

CBA: Length of output pulse (unit: 1ms)

bit	3	2	1	0
X Function	The counter goes back to zero when it ends.	CMP is activated when it ends.	Cycle mode	CMP is activated
Explanation	When compare to the last point, set P5-57 to 0.	It is invalid when CAP is activated.	Never end	Set it to 1 and starts to compare. The value will be cleared when it is completed.

Bit0: When the value of P5-58 is higher than 0, setting Bit0 to 1 will enable the compare function. Once the compare function is enabled, everytime when one position is compared, the setting value of P5-58 will decrease 1. When the setting value of P5-58 is equal to 0, it indicates that the compare operation has finished and the value of Bit0 will be reset to 0 automatically.

When the value of P5-58 is equal to 0, setting Bit0 to 1 will not enable the compare function, and then the value of Bit0 will be reset to 0 automatically. If Bit0 is set to 1 already, the new setting value cannot be 1. The users only can set Bit0 to 0 to disable the compare function.

Bit1: When Bit1 is set to 1, after the last position is compared, the setting value of P5-58 will be reset and start the compare operation from the first position again. The compare operation will not stop and the value of Bit0 will be retained as 1.

Bit2: When Bit2 is set to 1, after the last position is compared, the system will enable the capture function (Bit0 of P5-39 is set to 1 and the value of P5-38 is set to the last capture amount). If the capture function is enabled already, this setting will become ineffective.

Bit3: When Bit3 is set to 1, after the last position is compared, the counter, i.e. the setting value of parameter P5-57 will be reset to 0. For example, when the compare data is set to 3000 pulses (total one compare data only) and the default value of P5-57 is 0, if the input command is 4000 pulses, the compare operation will stop after the input command reaches 3000 pulses. At this time, P5-57 will be clear to 0. When input command reaches 4000 pulses, the setting value of P5-57 will become 1000 (no accumulated error).



P5-60	POV0	Moving Speed Setting of Position 0	Address: 0578H 0579H
Operation Interface:		Keypad / Software	Communication
Default:		20.0	200
Control Mode:		PR	
Unit:		1 r/min	0.1 r/min
Range:		0.1 ~ 6000.0	1 ~ 60000
Data Size:		16-bit	
Display Format:		Decimal	
Input Value Example:		15 = 15 r/min	150 = 15 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the first position.

P5-61	POV1	Moving Speed Setting of Position 1	Address: 057AH 057BH
Operation Interface:		Keypad / Software	Communication
Default:		50.0	500
Control Mode:		PR	
Unit:		1 r/min	0.1 r/min
Range:		0.1 ~ 6000.0	1 ~ 60000
Data Size:		16-bit	
Display Format:		Decimal	
Input Value Example:		1 = 1 r/min	10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the second position.

P5-62	POV2	Moving Speed Setting of Position 2	Address: 057CH 057DH
Operation Interface:		Keypad / Software	Communication
Default:		100.0	1000
Control Mode:		PR	
Unit:		1 r/min	0.1 r/min
Range:		0.1 ~ 6000.0	1 ~ 60000
Data Size:		16-bit	
Display Format:		Decimal	

Input Value Example:	1 = 1 r/min	10 = 1 r/min
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Settings:

In PR mode, this parameter is used to set the moving speed for the third position.

P5-63	POV3	Moving Speed Setting of Position 3	Address: 057EH 057FH
	Operation Interface:	Keypad / Software	Communication
	Default:	200.0	2000
	Control Mode:	PR	
	Unit:	1 r/min	0.1 r/min
	Range:	0.1 ~ 6000.0	1 ~ 60000
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	1 = 1 r/min	10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the fourth position.

P5-64	POV4	Moving Speed Setting of Position 4	Address: 0580H 0581H
	Operation Interface:	Keypad / Software	Communication
	Default:	300.0	3000
	Control Mode:	PR	
	Unit:	1 r/min	0.1 r/min
	Range:	0.1 ~ 6000.0	1 ~ 60000
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	1 = 1 r/min	10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the fifth position.

P5-65	POV5	Moving Speed Setting of Position 5	Address: 0582H 0583H
	Operation Interface:	Keypad / Software	Communication
	Default:	500.0	5000
	Control Mode:	PR	

Unit:	1 r/min	:0.1 r/min
Range:	0.1 ~ 6000.0	:1 ~ 60000
Data Size:	16-bit	
Display Format:	Decimal	
Input Value Example:	1 = 1 r/min	:10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the sixth position.

P5-66	POV6	Moving Speed Setting of Position 6	Address: 0584H 0585H
	Operation Interface:	Keypad / Software	Communication
	Default:	600.0	:6000
	Control Mode:	PR	
	Unit:	1 r/min	:0.1 r/min
	Range:	0.1 ~ 6000.0	:1 ~ 60000
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	1 = 1 r/min	:10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the seventh position.

P5-67	POV7	Moving Speed Setting of Position 7	Address: 0586H 0587H
	Operation Interface:	Keypad / Software	Communication
	Default:	800.0	:8000
	Control Mode:	PR	
	Unit:	1 r/min	:0.1 r/min
	Range:	0.1 ~ 6000.0	:1 ~ 60000
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	1 = 1 r/min	:10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the eighth position.

P5-68	POV8	Moving Speed Setting of Position 8	Address: 0588H 0589H
	Operation Interface:	Keypad / Software	Communication
	Default:	1000.0	10000
	Control Mode:	PR	
	Unit:	1 r/min	0.1 r/min
	Range:	0.1 ~ 6000.0	1 ~ 60000
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	1 = 1 r/min	10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the ninth position.

P5-69	POV9	Moving Speed Setting of Position 9	Address: 058AH 058BH
	Operation Interface:	Keypad / Software	Communication
	Default:	1300.0	13000
	Control Mode:	PR	
	Unit:	1 r/min	0.1 r/min
	Range:	0.1 ~ 6000.0	1 ~ 60000
	Data Size:	16-bit	
	Display Format:	Decimal	
	Input Value Example:	1 = 1 r/min	10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the tenth position.

P5-70	POV10	Moving Speed Setting of Position 10	Address: 058CH 058DH
	Operation Interface:	Keypad / Software	Communication
	Default:	1500.0	15000
	Control Mode:	PR	
	Unit:	1 r/min	0.1 r/min
	Range:	0.1 ~ 6000.0	1 ~ 60000
	Data Size:	16-bit	
	Display Format:	Decimal	

Input Value Example:	1 = 1 r/min	10 = 1 r/min
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Settings:

In PR mode, this parameter is used to set the moving speed for the eleventh position.

P5-71	POV11	Moving Speed Setting of Position 11	Address: 058EH 058FH
Operation Interface:		Keypad / Software	Communication
Default:		1800.0	18000
Control Mode:		PR	
Unit:		1 r/min	0.1 r/min
Range:		0.1 ~ 6000.0	1 ~ 60000
Data Size:		16-bit	
Display Format:		Decimal	
Input Value Example:		1 = 1 r/min	10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the twelfth position.

P5-72	POV12	Moving Speed Setting of Position 12	Address: 0590H 0591H
Operation Interface:		Keypad / Software	Communication
Default:		2000.0	20000
Control Mode:		PR	
Unit:		1 r/min	0.1 r/min
Range:		0.1 ~ 6000.0	1 ~ 60000
Data Size:		16-bit	
Display Format:		Decimal	
Input Value Example:		1 = 1 r/min	10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the thirteenth position.

P5-73	POV13	Moving Speed Setting of Position 13	Address: 0592H 0593H
Operation Interface:		Keypad / Software	Communication
Default:		2300.0	23000
Control Mode:		PR	

Unit:	1 r/min	:0.1 r/min
Range:	0.1 ~ 6000.0	:1 ~ 60000
Data Size:	16-bit	
Display Format:	Decimal	
Input Value Example:	1 = 1 r/min	:10 = 1 r/min

Settings:

In PR mode, this parameter is used to set the moving speed for the fourteenth position.

P5-74	POV14	Moving Speed Setting of Position 14	Address: 0594H 0595H
Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
Default:	2500.0	:25000	
Control Mode:	PR		
Unit:	1 r/min	:0.1 r/min	
Range:	0.1 ~ 6000.0	:1 ~ 60000	
Data Size:	16-bit		
Display Format:	Decimal		
Input Value Example:	1 = 1 r/min	:10 = 1 r/min	

Settings:

In PR mode, this parameter is used to set the moving speed for the fifteenth position.

P5-75	POV15	Moving Speed Setting of Position 15	Address: 0596H 0597H
Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
Default:	3000.0	:30000	
Control Mode:	PR		
Unit:	1 r/min	:0.1 r/min	
Range:	0.1 ~ 6000.0	:1 ~ 60000	
Data Size:	16-bit		
Display Format:	Decimal		
Input Value Example:	1 = 1 r/min	:10 = 1 r/min	

Settings:

In PR mode, this parameter is used to set the moving speed for the sixteenth position.

<b>P5-76★</b>	<b>CPRS</b>	<b>Capture 1st Position Reset Data</b>	<b>Address: 0598H 0599H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	-1073741824 ~ +1073741823	
	Data Size:	32-bit	
Display Format:	Decimal		

Settings: Refer to P5-39 for explanation.

<b>P5-77■</b>	<b>CSAX</b>	<b>Position of CAPTURE SYNC AXIS</b>	<b>Address: 059AH 059BH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
Display Format:	Decimal		

Settings:

This position will be synchronized with the capture signal. When capture operation is activated every two times, the offset value of this SYNC axis will be equal to the value of P5-78 (no accumulation errors, for single direction operation only).

This parameter can be used as the position source of E-Cam master axis.

Please note:

ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-78</b>	<b>CSDS</b>	<b>Interval Pulse Number of CAPTURE SYNC AXIS</b>	<b>Address: 059CH 059DH</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	100	
	Control Mode:	ALL	
	Unit:	pulse	
	Range:	10 ~ +100000000	
	Data Size:	32-bit	
Display Format:	Decimal		

Settings:

This parameter is used to set the offset value of this SYNC axis when capture operation is activated every two times.

Please note:

1. This parameter can be set only when capture operation is stopped (Refer to P5-39).
2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-79	CSDS	Error Pulse Number of CAPTURE SYNC AXIS	Address: 059EH 059FH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	ALL	
	Unit:	pulse	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
			Related Section: N/A

Settings:

This parameter is used to display the error pulse number of CAPTURE SYNC AXIS operation.

$$\text{SYNC error pulse number} = \text{output value of SYNC axis} - \text{ideal value of SYNC axis} \\ = \text{P5-77 accumulation amount} - (\text{P5-78} \times \text{capture times})$$

When SYNC axis operates after the data is captured, the system will update this parameter once.

This parameter can be set to indicate the offset amount of specified SYNC axis. When the servo system is regarded as the master axis for rotary cutoff application, modifying this parameter is able to shift the cutoff position to left or right every time.

Please note:

1. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-80	CSDS	Max. Correction Rate of CAPTURE SYNC AXIS	Address: 05A0H 05A1H
	Operation Interface:	Keypad / Software	Communication
	Default:	10	
	Control Mode:	ALL	
	Unit:	%	
	Range:	0 ~ 90	
	Data Size:	16-bit	
	Display Format:	Decimal	
			Related Section: N/A

Settings:



This parameter is used to limit the correction rate of CAPTURE SYNC AXIS.

Correction rate = output pulses of SYNC axis – input pulses of SYNC axis

$$(100 - P5-80) \% < \text{Correction Rate} < (100 + P5-80) \%$$

When the value of the correction rate is higher, the SYNC error value will go towards 0 quickly, i.e. attain the desired position more easily, but the changes of the speed are very fast.

When the value of the correction rate is lower, the SYNC error value will go towards 0 slowly, i.e. attain the desired position more difficultly, but the changes of the speed are very smooth.

For rotary cutoff application, after adjusting P5-79, if the setting value of P5-80 is higher, the system can attain the desired rotary cutoff position quickly but the desired speed can not be easily reached.

Please note:

- ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-81</b>	<b>ECHD</b>	<b>E-Cam: Start Address of Data Array</b>		<b>Address: 05A2H 05A3H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11
	Default:	100		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0 ~ (800 – P5-82)		
	Data Size:	16-bit		
	Display Format:	Decimal		

Settings:

This parameter is used to set the start address which specifies the first point data of E-Cam table and save it into data array.

Please note:

- The firmware version V1.015 and earlier models:  
This parameter can not be changed when E-Cam function is enabled (Refer to P5-88).
- The firmware version V1.015 and later models:  
This parameter can be set any time. However, it is effective only when the electronic gear is engaged.
- ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-82</b>	<b>ECHN</b>	<b>E-Cam: E-Cam Area Number N (at least &gt;=5)</b>		<b>Address: 05A4H 05A5H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11
	Default:	5		
	Control Mode:	PR		

Unit:	N/A
Range:	5 ~ 720, must be $\leq (P5-10 - P5-81)$ and $(P5-82 \times P5-84) \leq 2147483647$
Data Size:	16-bit
Display Format:	Decimal

## Settings:

The E-Cam graph is divided into N areas. The E-Cam table should include N+1 data.

Please note:

1. This parameter can be set only when E-Cam function is stopped (Refer to P5-88).
2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-83	ECMM	E-Cam: E-Cam Cycle Number (M)	Address: 05A6H 05A7H
	Operation Interface:	Keypad / Software	Communication
	Default:	1	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	1 ~ 32767	
	Data Size:	16-bit	
	Display Format:	Decimal	
			Related Section: Section 7.11

## Settings:

After receiving the pulse number P of master axis, the shaft of E-Cam will rotate M cycles. It indicates that there are M cycles of the E-Cam table.

Please note:

1. This parameter can be set only when E-Cam function is stopped (Refer to P5-88).
2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-84	ECMP	E-Cam: Pulse Number (P) of Master Axis	Address: 05A8H 05A9H
	Operation Interface:	Keypad / Software	Communication
	Default:	3600	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	10 ~ 1073741823, $(P5-82 \times P5-83) \leq P5-84$ and $(P5-82 \times P5-84) \leq 2147483647$	
	Data Size:	32-bit	
	Display Format:	Decimal	
			Related Section: Section 7.11

## Settings:

After receiving the pulse number P of master axis, the shaft of E-Cam will rotate M cycles. It indicates that there are M cycles of the E-Cam table.

Please note:

1. This parameter can be set only when E-Cam function is stopped (Refer to P5-88).
2. The firmware version V1.018 and later models: This parameter can be set any time.
3. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-85	ECME	E-Cam: Engage Area Number	Address: 05AAH 05ABH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0 ~ ( P5-82 -1 )	
	Data Size:	16-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to set the E-Cam area number when the electronic gear is engaged.

Please note:

ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-86	ECAX	E-Cam: Position of Master Axis	Address: 05ACH 05ADH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings:

This parameter is used to set the position of E-Cam master axis.

Please note:

1. This parameter can be set only when E-Cam function is stopped (Refer to P5-88).
2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-87</b>	<b>PLED</b>	<b>E-Cam: Lead Command Length</b>		<b>Address: 05AEH 05AFH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-1073741824 ~ +1073741823		
	Data Size:	32-bit		
	Display Format:	Decimal		

**Settings:**

This parameter is used to set the length of the lead command before the electronic gear is engaged. Once E-Cam engage conditions are satisfied (see the Z settings of P5-88), the electronic gear will be engaged truly when the pulse number sent by master axis is higher than the setting value of P5-87. In other words, the electronic gear will be engaged only after the lead command specified by P5-87 is ignored.

Please note:

1. If this parameter is a positive value, it indicates that the forward pulses are regarded as lead command. If this parameter is a negative value, it indicates that the reverse pulses are regarded as lead command.
2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-88</b>	<b>ECON</b>	<b>E-Cam: E-Cam Settings</b>		<b>Address: 05B0H 05B1H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11
	Default:	00000000h		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0 ~ 0x203FF257		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		

**Settings:**

Display	High Word			Low Word			
	S	0	BA	U	Z	Y	X
Range	0 ~ 2	-	00 ~ 3F	0 ~ 8	0 ~ 2	0 ~ 5	0 ~ 1

The bit definition is listed below:

BA: Disengage method. The setting value is 00 ~ 3F (00: Disabled).

When the disengage conditions are satisfied (U= 2, 4 and 6 of P5-88), the system will execute PR path (hexadecimal) automatically

S: Engage status display (read-only)

- 0: Stop state
- 1: Engaged state
- 2: Lead state (before the electronic gear is engaged)

X: Disable or Enable E-Cam Function. Please see the table below

Bit	3	2	1	0
Function	-	P5-19 is effective immediately	E-Cam does not disengage while Servo OFF	Enable E-Cam function
Explanation	-	For the firmware version V1.038 sub48 and later models only. 0: After modification, the new P5-19 will be enforced after E-Cam re-engage. 1: P5-19 is enforced immediately after modification.	For firmware version V1.038 sub29 and later models only. 0: Disabled 1: After the E-Cam is engaged, if the system stopped due to ALARM or SERVO OFF, the E-Cam remains working. The position of E-Cam is being counted all the time. When re-SERVO ON, the Macro instruction #D can be use to move the slave back to the position before SERVO OFF.	0: Disable E-Cam function 1: Enable E-Cam function (E-Cam is enabled, other functions can not be modified.)

Y: Sources of Master Axis

- Y=0: Capture source setting. (Defined by Capture function, P5-39 B settings)
- Y=1: Linear Encoder (CN5)
- Y=2: Pulse Command (CN1)
- Y=3: PR command (Internal signal)
- Y=4: 1ms clock (Internal signal)
- Y=5: Synchronous Capture Axis (P5-77)
- Y=6: Analog channel 1 (Virtual axis, unit: each 10V corresponds to frequency 1Mpulse/s)

Z: Engage timing (only one option can be selected)

- 0: Immediately
- 1: DI signal: CAM ON
- 2. Any point of Capture Axis

U: Disengage timing (the setting value can be added up, but the setting value 2, 4 and 6 can not be selected simultaneously.)

U	Disengage Conditions	State after the electronic gear is disengaged.
0	Do not disengage	-

1	DI signal: CAM OFF	Enter into the state of <b>Stop</b>
2	Master axis reaches the setting value of P5-89. (The polarity sign indicates the direction)	Enter into the state of <b>Stop</b>
6	(available in firmware version V1.009 and later models) The function is the same as the function of U=2, but the differences are that the speed will not change when electronic gear is disengaged and the engage length will exceed the setting value of P5-89 a little. This option is suitable for the application which needs to use PR command immediately after the electronic gear is disengaged.	
4	(available in firmware version V1.009 and later models) Master axis exceeds the setting value of P5-89. (The polarity sign indicates the direction)	Return to the <b>Lead</b> state (before the electronic gear is engaged) (The lead command length is set by P5-92).
8	Disable E-Cam function after the electronic gear is disengaged with condition 1, 2, and 6.	Set X=0
	Setting with U=4: To avoid the jittering when the status switched back to Lead status.	None

When Servo Off, if a servo fault occurs, or there is a forward/reverse limit, or PR command is moving to home, the electronic gear will be disengaged (X=0 of P5-88).

Please note:

ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-89</b>	<b>ECRD</b>	<b>E-Cam: Disengage Timing Data</b>		<b>Address: 05B2H 05B3H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.11
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-1073741824 ~ +1073741823		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

Refer to the U settings of P5-88 for explanation.

Please note:

ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-90</b>	<b>CMAP</b>	<b>E-Cam: Area Number + (Polarity is Positive)</b>	<b>Address: 05B4H 05B5H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11
	Default:	270	
	Control Mode:	PR	
	Unit:	degree (it becomes degree in firmware version V1.009 and later models)	
	Range:	0 ~ 360	
	Data Size:	16-bit	
Display Format:	Decimal		

Settings:

This parameter is used to set the start degree of digital output, CAM\_AREA (DO code is 0x18) when Electronic Cam (E-Cam) is engaged.

Please note:

ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-91</b>	<b>CMAN</b>	<b>E-Cam: Area Number - (Polarity is Negative)</b>	<b>Address: 05B6H 05B7H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11
	Default:	360	
	Control Mode:	PR	
	Unit:	degree (it becomes degree in firmware version V1.009 and later models)	
	Range:	0 ~ 360	
	Data Size:	16-bit	
Display Format:	Decimal		

Settings:

This parameter is used to set the end degree of digital output, CAM\_AREA (DO code is 0x18) when Electronic Cam (E-Cam) is engaged.

Please note:

ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-92</b>	<b>PLED</b>	<b>E-Cam: Cyclic Lead Command Length</b>	<b>Address: 05B8H 05B9H</b>
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.11
	Default:	0	
	Control Mode:	PR	
Unit:	N/A		

Range:	-2147483648 ~ +2147483647
Data Size:	32-bit
Display Format:	Decimal

Settings: (available in firmware version V1.006 sub04 and later models only)

This parameter works in conjunction with the function of U=4 set in parameter P5-88.

When the electronic gear is disengaged, it will not enter into Stop state. It will enter into the lead state (before the electronic gear is engaged) and the lead command length at this time is determined by the setting of P5-92.

The electronic gear will be engaged again when the pulse number sent by master axis is higher than the setting value of P5-92. In other words, the electronic gear will be engaged only after the lead command specified by P5-92 is ignored.

Please note:

1. If this parameter is a positive value, it indicates that the forward pulses are regarded as lead command. If this parameter is a negative value, it indicates that the reverse pulses are regarded as lead command.
2. ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

P5-93	CSDS	Motion Control: Macro Parameter 4	Address: 05BAH 05BBH
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings:

The definition of this parameter is determined by macro command P5-97. Please refer to P5-97 for explanation.

P5-94	CSDS	Motion Control: Macro Parameter 3	Address: 05BCH 05BDH
	Operation Interface:	Keypad / Software      Communication	Related Section: N/A
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	



Settings:

The definition of this parameter is determined by macro command P5-97. Please refer to P5-97 for explanation.

<b>P5-95</b>	<b>CSDS</b>	<b>Motion Control: Macro Parameter 2</b>		<b>Address: 05BEH 05BFH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

The definition of this parameter is determined by macro command P5-97. Please refer to P5-97 for explanation.

<b>P5-96</b>	<b>CSDS</b>	<b>Motion Control: Macro Parameter 1</b>		<b>Address: 05C0H 05C1H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

The definition of this parameter is determined by macro command P5-97. Please refer to P5-97 for explanation.

<b>P5-97</b>	<b>CSDS</b>	<b>Motion Control: Macro Command</b>		<b>Address: 05C2H 05C3H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	ALL		
	Unit:	-		
	Range:	0 ~ 0x099F		
	Data Size:	16-bit		

Display: Format:	Hexadecimal
---------------------	-------------

**Settings:**

Write function: This parameter can be used to set macro command (0CBAh)

Read function: This parameter can be used to display the execution result of macro command (If the command has succeeded, 1CBAh will be sent back).

When the macro command code is set to 0001, if the command has succeeded, 1001h will be sent back. If the command has failed, Fxxh will be sent back.

When setting illegal command code, the failure code, F001h will be sent back.

The legal macro commands are listed in the table below:

- The firmware version V1.027 and later models provide the following macro command:

Command code: 0003h	Motion parameter protection function: Set password. Enable parameter protection function.
Macro Parameters	P5-94: Protection degree of data array (0 ~ 7) P5-95: Set the new password (1 ~ 16777215) P5-96: Confirm the new password (1 ~ 16777215) Please note: The setting value of P5-95 should be equal to the setting value of P5-96 and the setting value should be set correctly within the specifications of P5-95 and P5-96. Otherwise, the password function cannot be enabled.
This macro command should be executed before the parameter protection function is enabled. When parameter protection function is enabled, if this macro command is executed again, the failure code will be sent back.	
Failure code: F031h	The protection function is enabled. Do not execute this macro command again.
Failure code: F032h	Password setting error. The setting value of P5-95 is not equal to the setting value of P5-96.
Failure code: F033h	The setting value of password has exceeded the allowable range (1 ~ 16777215).
Failure code: F034h	The setting value of P5-94 has exceeded the specification (0 ~ 7).
Success code: 1003h	-

- The firmware version V1.026 and later models provide the following macro command:

Command code: 0004h	Motion parameter protection function: Disable parameter protection function.
Macro Parameters	P5-96: Input the password (1 ~ 16777215)
This macro command should be executed after the parameter protection function is enabled. When parameter protection function is disabled, if this macro command is executed again, the failure code will be sent back. If input the incorrect password, the failure code, Ennn will be sent back. The number nnn represents the retry times for password input. The number nnn will decrease 1 every time after inputting the incorrect password. When the number nnn cannot be decreased, it means the password is locked and cannot be removed anymore.	
Failure code: F041h	The protection function is disabled. Do not execute this macro command again.
Failure code: F043h	The input value of password has exceeded the allowable range (1 ~ 16777215).
Failure code: F044h	The retry times for password input have exceeded the limit. The password is locked and cannot be removed anymore.

Command code: 0004h	Motion parameter protection function: Disable parameter protection function.
Failure code: Ennnh	The input password is not correct. The protection cannot be disabled. The number nnn represents the retry times for password input. The number nnn will decrease 1 every time after inputting the incorrect password. When the number nnn cannot be decreased, it means the password is locked and cannot be removed anymore.
Success code: 1004h	-

- The firmware version V1.024 and later models provide the following macro commands:

Command code: 0006h	Create E-Cam table: for rotary cutoff application, including sealing zone (7 areas)
General Parameters	P5-81: Start Address of Data Array for E-Cam table. P5-82: E-Cam Area Number. Set P5-82 to 7 (7 areas, 8 points). P1-44, P1-45: Electronic Gear Ratio (must be set first)
Macro Parameters	P5-94=A (Deceleration Ratio: Numerator) x C (Knife Number) P5-95=B (Deceleration Ratio: Denominator) P5-96= 1000000 x R x V $R$ (Cut Ratio) = $L$ (Cut Length) / $l$ (Knife Circumference) The normal cut ratio is the multiple of 0.3 ~ 2.5. $V$ (Speed Compensation) = (Target Cut Speed) / (Product Speed) When $V=1.0$ , the speed of knife is the same as the product during cutting operation. When $V=1.1$ , the speed of knife will be increased 10%. When $V=0.9$ , the speed of knife will be decreased 10% and so on.
<p>Using this macro command is able to calculate the data of E-Cam table automatically and saved the settings in the data array specified by P5-81.</p> <p>The above parameters are all essential for E-Cam table. Please complete the settings of these parameters first correctly before executing this macro command. After this macro command is executed, if the settings of the above parameters are changed, please execute this macro command again so as to create the new E-Cam table again.</p> <p>The data of E-Cam table will be changed after executing this macro command, therefore, do not to execute this macro command when the electronic gear is engaged.</p> <p>There are many E-Cam parameters, such as P5-83 and P5-84, etc. which are not used for this macro commands.</p> <p>For more E-Cam parameters and functions, please refer to Chapter 7.</p> <p>When the execution of this macro command is completed, the data of E-Cam table will not be memorized in EEPROM automatically.</p>	
Failure code: F061h	The electronic gear is engaged when creating E-Cam table.
Failure code: F062h	The setting value of P5-94 has exceeded the specification (1 ~ 65535)
Failure code: F063h	The setting value of P5-95 has exceeded the specification (1 ~ 65535)
Failure code: F064h	The setting value of P5-96 has exceeded the specification (300000 ~ 2500000)
Failure code: F065h	The address specified by P5-81 is too big. The space of the data array is not sufficient.
Failure code: F066h	The setting value of P5-82 should be set to 7; otherwise this macro command can not be executed.
Failure code: F067h	Data calculation error. Please decrease the setting value of P1-44

	and P1-45.
Command code: 0007h	Create E-Cam table: for rotary cutoff application (free degree)
General Parameters	P5-81: Start Address of Data Array for E-Cam table. P5-82: E-Cam Area Number N (30 ~ 72). P1-44, P1-45: Electronic Gear Ratio (must be set first)
Macro Parameters	<p>P5-93. H16 (High 16-bit)= S P5-93. L16 (Low 16-bit)= W S (Curve Level): 1 ~ 4 levels W (Waiting Area Degree): -1 ~ 170 degrees (W= -1 : available in firmware version V1.038 sub29 and later models)</p> <p>P5-94=Y (Sealing Zone Degree)= 0 ~ 330 degrees</p> <p>P5-95. H16 (High 16-bit)= A x C P5-95. L16 (Low 16-bit)= B A (Deceleration Ratio: Numerator), C (Knife Number) B (Deceleration Ratio: Denominator)</p> <p>P5-96= 1000000 x R x V R (Cut Ratio) = L (Cut Length) / ℓ (Knife Circumference) The normal cut ratio is the multiple of 0.05 ~ 5.0. V (Speed Compensation) = (Target Cut Speed) / (Product Speed) When V=1.0, the speed of knife is the same as the product during cutting operation. When V=1.1, the speed of knife will be increased 10%. When V=0.9, the speed of knife will be decreased 10% and so on.</p>
	<p>Note: <math>W' = 180 + 360/N - 360/R + Y/2</math> When</p> <ol style="list-style-type: none"> <li>1. P5-93.L16 &lt; W' , the E-Cam table is <b>in error</b> (Failure code is F07Ah).</li> <li>2. P5-93.L16 = W' , the <b>initial speed is 0</b> in the E-Cam table.</li> <li>3. P5-93.L16 &gt; W' , the <b>initial speed &gt; 0</b> in the E-Cam table.</li> </ol>
<p>Using this macro command is able to calculate the data of E-Cam table automatically and saved the settings in the data array specified by P5-81.</p> <p>The above parameters are all essential for E-Cam table. Please complete the settings of these parameters first correctly before executing this macro command. After this macro command is executed, if the settings of the above parameters are changed, please execute this macro command again so as to create the new E-Cam table again.</p> <p>The data of E-Cam table will be changed after executing this macro command, therefore, do not to execute this macro command when the electronic gear is engaged.</p> <p>There are many E-Cam parameters, such as P5-83 and P5-84, etc. which are not used for this macro commands.</p> <p>For more E-Cam parameters and functions, please refer to Chapter 7.</p> <p>When the execution of this macro command is completed, the data of E-Cam table will not be</p>	

Command code: 0007h	Create E-Cam table: for rotary cutoff application (free degree) memorized in EEPROM automatically.
Failure code: F071h	The electronic gear is engaged when creating E-Cam table.
Failure code: F072h	The setting value of P5-94 has exceeded the specification (0 ~ 330)
Failure code: F073h	The setting value of P5-93. H16 has exceeded the specification (1 ~ 4)
Failure code: F074h	The setting value of P5-93. L16 has exceeded the specification (0 ~ 170)
Failure code: F075h	The setting value of P5-96 has exceeded the specification (50000 ~ 5000000)
Failure code: F076h	The setting value of P5-82 should be set within 30 ~ 72; otherwise this macro command can not be executed.
Failure code: F077h	The address specified by P5-81 is too big. The space of the data array is not sufficient.
Failure code: F078h	Data calculation error. Please decrease the setting value of P1-44 and P1-45.
Failure code: F079h	Acceleration degree is not enough. Please decrease the setting value of W (Waiting Area Degree), Y (Sealing Zone Degree), or S (Curve Level).
Failure code: F07Ah	Waiting area is too small. Please increase the setting value of W (Waiting Area Degree), or decrease the setting value of Y (Sealing Zone Degree).

- The firmware version V1.042 sub09 and later models provide the following macro command:

Command code: 0008h	P5-19 (E-Cam Curve Scaling) is effective once again immediately.
Macro Parameters	N/A

Using this macro command is able to enable P5-19 once again when E-Cam is engaged. Usually, P5-19 is effective only when the status of E-Cam is changed from S2 (Lead Pulse) to S1 (Engaged), i.e. path 3 as shown as below. P5-19 cannot be changed when E-Cam is engaged. The E-Cam curve scaling can be changed only after E-Cam rotates one cycle. This is used to ensure that E-Cam is able to return the original position and will not accumulate the position errors.

```

    graph TD
      S1((S1 Engaged))
      S0((S0 Stop))
      S2((S2 Lead Pulse))
      S0 -- 1 --> S2
      S2 -- 2 --> S0
      S2 -- 3 --> S1
      S1 -- 4 --> S2
      S1 -- 5 --> S0
      style S3 stroke:#f00
  
```

However, if it is needs to change E-Cam curve scaling immediate for the requirement of the application, there are two methods for changing the setting of E-Cam curve scaling, i.e. P5-19.

1. P5-88 X2=1:  
If P5-88 X2=1 is set, P5-19 will be enforced immediately after modification when E-Cam is engaged.
2. Using this 0008h macro command:  
Everytime when this macro command is triggered, P5-19 will be enabled. But, if the setting value of P5-19 is changed and this macro command is not triggered, the new setting value of P5-19 will not be enabled. This macro command must be triggered again. Otherwise, the new setting value of P5-19 will not be enabled.

Failure code	N/A
--------------	-----

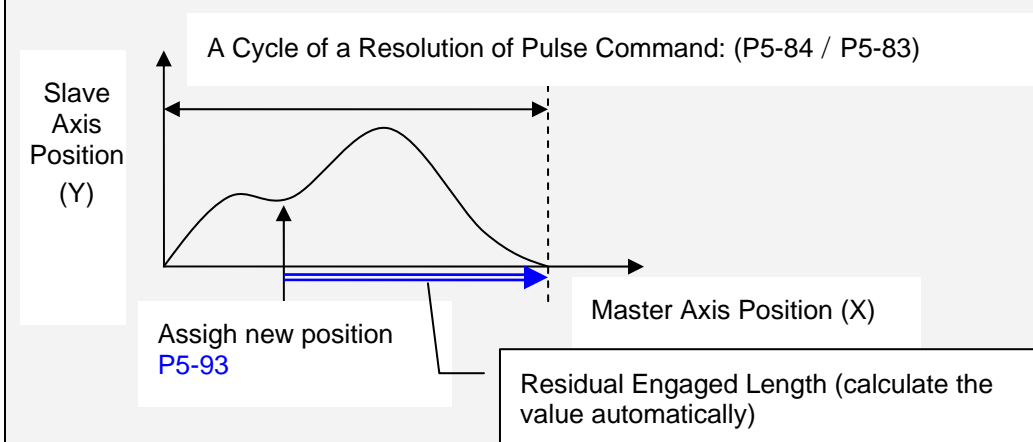
- The firmware version V1.035 sub00 and later models provide the following macro command:

Command code: 000Ch	Change E-Cam engaged X position: disengage after one forward rotation.
General Parameters	N/A
Macro Parameters	P5-53= New engaged position X. Unit is pulse number of master axis. Monitor variable 062(3Eh): Display the engaged position X of master axis

Using this macro command is able to change engaged position, calculate residual engaged length and make E-Cam be disengaged after one forward rotation (at 360°) when E-Cam is engaged. However, please note that E-Cam can be disengaged only when P5-88 U=2, 4, or 6. Ensure P5-88 U=2, 4, or 6 is selected; otherwise E-Cam cannot be disengaged.

When a fault occurs on the servo drive or the power of the servo drive is shut down, E-Cam will be disengaged. If the system needs that the E-Cam is re-engaged from the disengaged position and continue a cycle of E-Cam movement, it is recommended to record the position X first and use this macro command to change the engaged position. However, the servo position may shift a little distance when E-Cam is disengaged. Please note that a position error may occur when E-Cam is re-engaged.

Engaged direction is in forward direction (forward rotation of master axis):

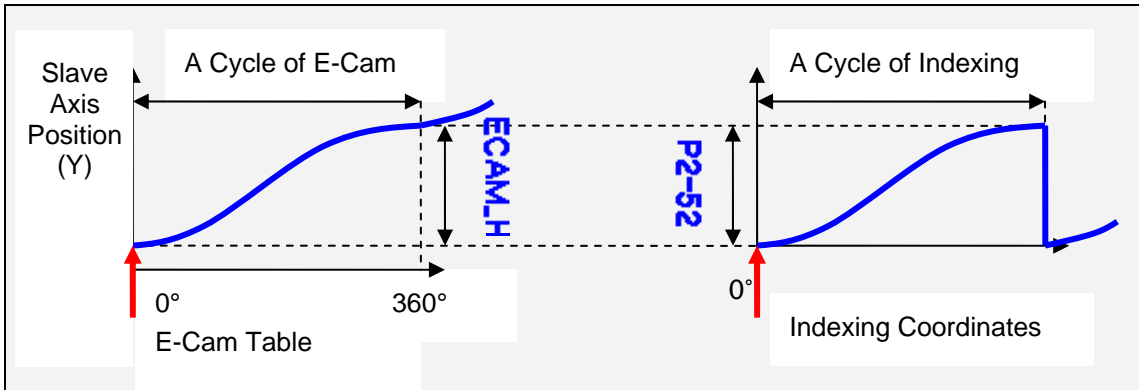


Note: When using this macro command, it would be proper to execute this macro command first and then operate the master axis. It is not recommended to enable the master axis operation before executing this macro command.

Failure code: F0C1h	The E-Cam is not engaged when executing this marco command. The E-Cam should be engaged before modifying the engaged position.
Failure code: F0C2h	The setting value of P5-93 is in error. It cannot less than 0. It should be equal to or higher than 0.
Failure code: F0C3h	The setting value of P5-93 is in error. It should be less than (P5-84 / P5-83).

- The firmware version V1.038 sub48 and later models provide the following macro command:

Command code: 000Dh	Calculate the errors between E-Cam and indexing coordinates for positioning control of PR command.
General Parameters	N/A
Macro Parameters	<p>P5-93 Low_Word = DCBA : UZYX (8 digits, Hexadecimal)          YX: PR number = 0 ~0X3F (0: Disabled)          UZ: Must be set to 0.          BA: Function of P5-95              0: Use prohibition zone              1: Use for forward rotation allowable rate              (1: In firmware version V1.038 sub53 and later models)          DC: Inhibit reverse rotation              0: Disabled              1: Reverse rotation is not allowed              (1: In firmware version V1.038 sub53 and later models)          P5-95: Prohibition zone (the area cannot walk across)          = (0 ~ 100)% of a cycle or (0 ~ 100)% of forward rotation allowable rate</p>
Monitor Variable	091(5Bh): display the position of indexing coordinate position (PUU).
<p>When E-Cam is engaged, the servo motor may stop due to Servo Off or a fault (Alarm) and cause the actual position is out of the E-Cam position. After Sevo On, this macro command is able to calculate the correction value automatically and write the correction value into the specified PR for incremental positioning to let the motor return to the perfect E-Cam position.</p> <p>When using this macro command :</p> <ol style="list-style-type: none"> <li>1. P5-88. X1=1 must be selected to let the E-Cam is engaged and continue to calculate the E-Cam position even when Servo Off.</li> <li>2. The height of E-Cam and indexing coordinates should be the same. P2-52=ECAM_H (Moving distance of one cycle of E-Cam)</li> <li>3. P5-19 must be set to 1.0 (magnification is set to 1.0 times)</li> <li>4. When E-Cam is engaged at the first time, 0° position of E-Cam table should correspond to 0° position of indexing coordinates.</li> <li>5. This macro command only can be applied in cyclic operation and starts from the same position every cycle.</li> </ol>	






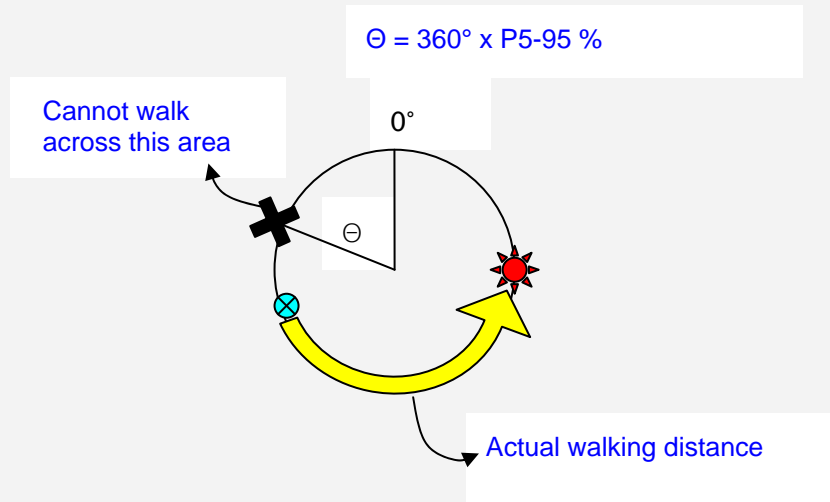
Please note:

1. ECAM\_H (Height of E-Cam Table) = E-Cam Table (Last point – First point)
2. Indexing coordinates = (Absolute coordinates / P2-52) take remainder
3. Use PR command for incremental positioning control

When the servo motor moves from current position to target position, two kinds of rotations, forward and reverse are available for selection. However, the rotation of the E-Cam is a kind of cyclic motion movement. No matter forward or reverse rotation is selected, the motor will reach the target position. The only difference is that the moving distance is not the same. Using the function of prohibition zone is able to plan the timing for forward and reverse rotation and let the system know when the motor rotates in forward direction and when the motor rotates in reverse direction.

\* Prohibition zone: In PR mode, it is the area that cannot walk across.

-  : E-Cam Current Position
-  : E-Cam Target Position
-  : E-Cam Prohibition Zone  $\Theta$ , set by P5-95



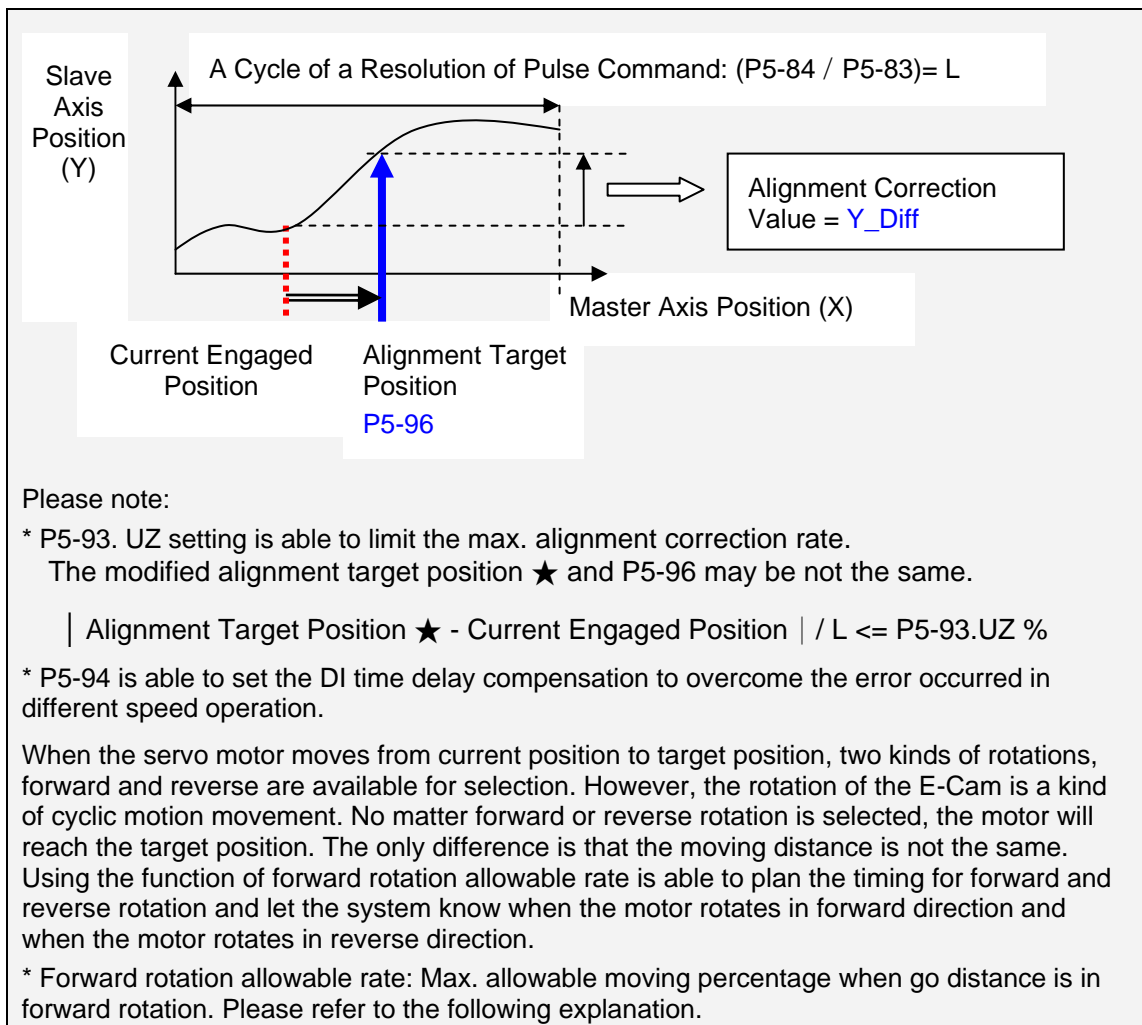
Failure code: F0D1h	The E-Cam is not engaged when executing this marco command. The E-Cam should be engaged.
Failure code: F0D2h	The setting value of P5-93. YX (PR number) is not within its allowable range. It should be within the range of 1 ~ 0x3F.
Failure code: F0D3h	The setting value of P5-95 (forward rotation allowable rate) is not within its allowable range. It should be within the range of 0 ~ 100%.

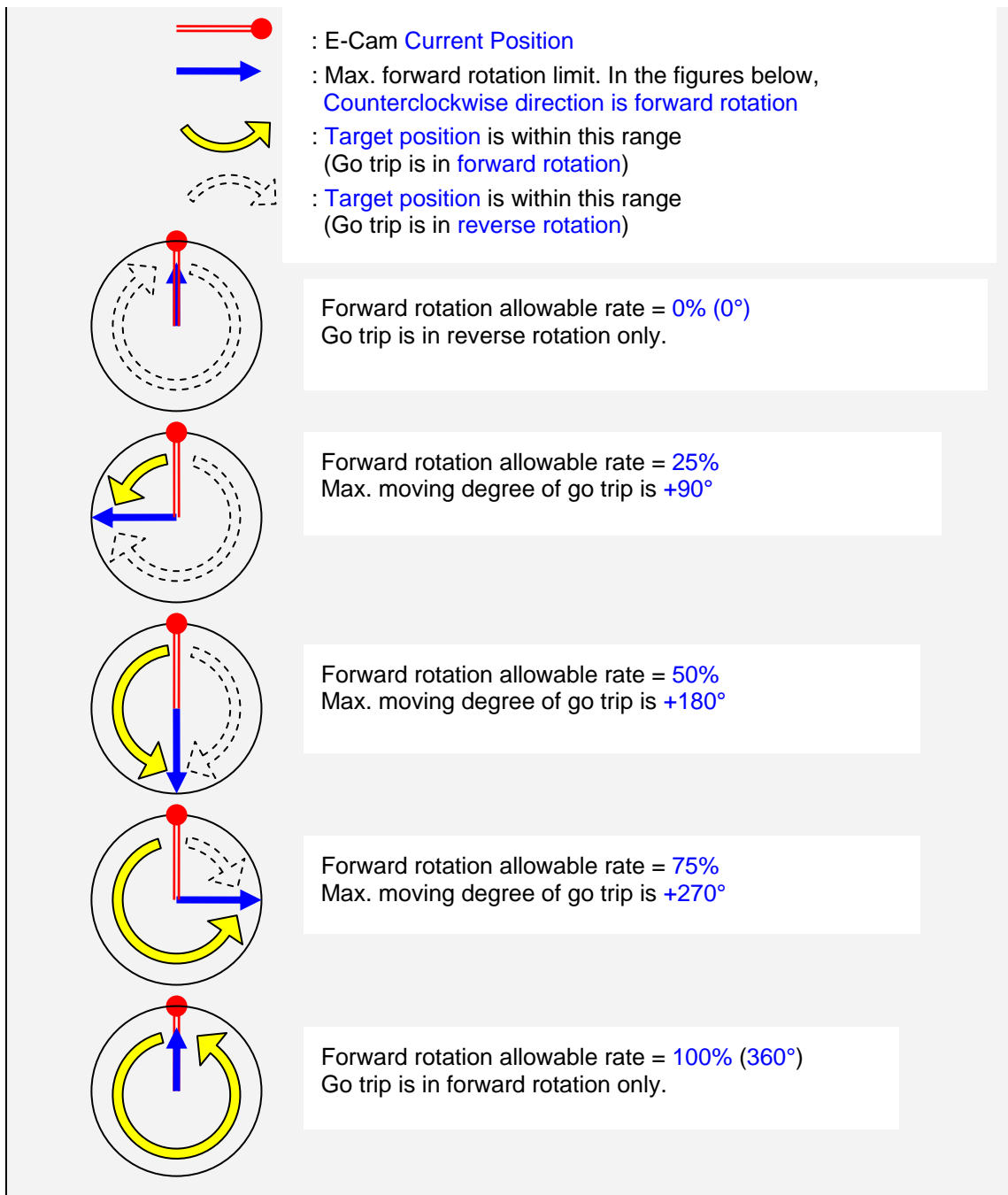


Failure code: F0D5h	The position correction value does not exist. This macro command may be triggered twice.
Failure code: F0D6h	The E-Cam is not engaged at the moment of Servo On.
Failure code: F0D7h	The height (Y Axis) of E-Cam table is not equal to P2-52.
Failure code: F0D8h	The setting value of P5-19 is not equal to 1.0.
Failure code: F0D9h	The setting values of P5-93. BA and P5-95 have exceeded the allowable range. The setting values of P5-93. BA and P5-95 should be within the range of 0 ~ 1.
Failure code: F0DAh	The setting values of P5-93. DC has exceeded the allowable range. The setting values of P5-93. DC should be within the range of 0 ~ 1.
Failure code: F0DBh	The function of Inhibiting reverse rotation has failed. Do not use macro command 000Dh and 0010h consecutively.

- The firmware version V1.038 sub26 and later models provide the following macro command:

Command code: 000Eh	Perform E-Cam alignment immediately and write the correction value into the specified PR.
General Parameters	N/A
Macro Parameters	<p>P5-93 = DCBA : UZYX (8 digits, Hexadecimal)            YX: PR number = 0 ~0X3F (0: Disabled)            UZ: Max. alignment correction rate = 0 ~ 0x64 (%)            A: Trigger the specified PR                0: ON                1: OFF            DCB: Must be set to 0            P5-94: DI delay time compensation                  = -25000 ~ +25000 (unit: usec)            P5-95: Forward rotation allowable rate = (0 ~ 100)%            P5-96: Alignment target position (X) = 0 ~ (P5-84/P5-83)-1                  (unit: pulse number of master axis)</p>
Monitor Variable	062(3Eh): display the current engaged position (X) of master axis.
<p>When E-Cam is engaged, this macro command is able to move the engaged position to the alignment target position (X) and write the E-Cam alignment correction value into the specified PR.</p> <p>During E-Cam operation (when E-Cam is engaged), if quickly aligning the E-Cam position and the mechanical reference point is required, using this macro command is able to meet the requirement of this kind of application. The users can use sensor to trigger the digital input, EVx to execute this macro command.</p> <p>After E-Cam alignment is completed, the engaged position will move to the new position. The alignment correction value is the excess or not enough distance after one cycle of E-Cam operation. This alignment correction value will be written into the PR specified by the setting value of P5-93. YX. The users can use PR incremental command to compensate this correction value and make the final position of E-Cam slave axis remain unchanged. In some applications, there is no need to use PR to do the compensation. At this time. the users can set the setting value of P5-93. YX to 0.</p> <p>Please note that PR command must be triggered by the host. After completing all the settings of this macro command, it is needed to trigger the PR command again.</p>	





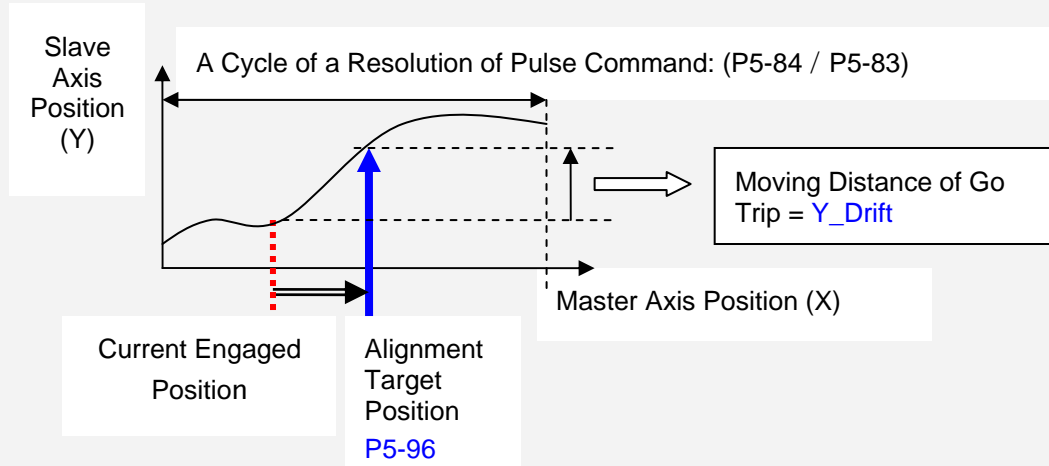
Failure code: F0E1h	The E-Cam is not engaged when executing this marco command. The E-Cam should be engaged. Otherwise, the alignment correction cannot be executed.
Failure code: F0E2h	The setting value of P5-93. YX (PR number) is not within its allowable range. It should be within the range of 1 ~ 0x3F.
Failure code: F0E3h	The setting value of P5-93. UZ (Max. alignment correction rate) is not within its allowable range. It should be within the range of 0 ~ 0x64 (%).
Failure code: F0E4h	The setting value of P5-94 (DI delay time compensation) is not within the range of -10000 ~ +10000.
Failure code: F0E5h	The setting value of P5-95 (forward rotation allowable rate) is not within its allowable range. It should be within the range of 0 ~ 100%.
Failure code: F0E6h	The setting value of P5-96 (alignment target position) is not within its allowable range. It should be within the range of 0 ~ (P5-84/P5-83)-1.

Command code: 000Fh	Calculate the moving distance between E-Cam and target position for positioning control of PR command.
General Parameters	N/A
Macro Parameters	P5-93. Low_Word = UZYX (4 digits, Hexadecimal) YX: PR number of Go trip = 0 ~0X3F (0: Disabled) UZ: PR number of Return trip = 0 ~0X3F (0: Disabled) P5-93. High_Word : Must be set to 0 P5-95: Forward rotation allowable rate = (0 ~ 100)% P5-96: Target position (X) = 0 ~ (P5-84/P5-83)-1 (unit: pulse number of master axis)
Monitor Variable	062(3Eh): display the current engaged position (X) of master axis.

When E-Cam is engaged, this macro command is able to calculate moving distance between the current position and target position (X). Then, write the moving distance value into the specified PR.

During E-Cam operation (E-Cam is engaged), when the master axis stops and is under the engage status, if the users want to move the master axis to the specified E-Cam position, using this macro command is able to meet the requirement of this kind of application. The users can use this macro command to calculate the correct Go moving distance value (Y\_Drift) for incremental positioning control of PR command.

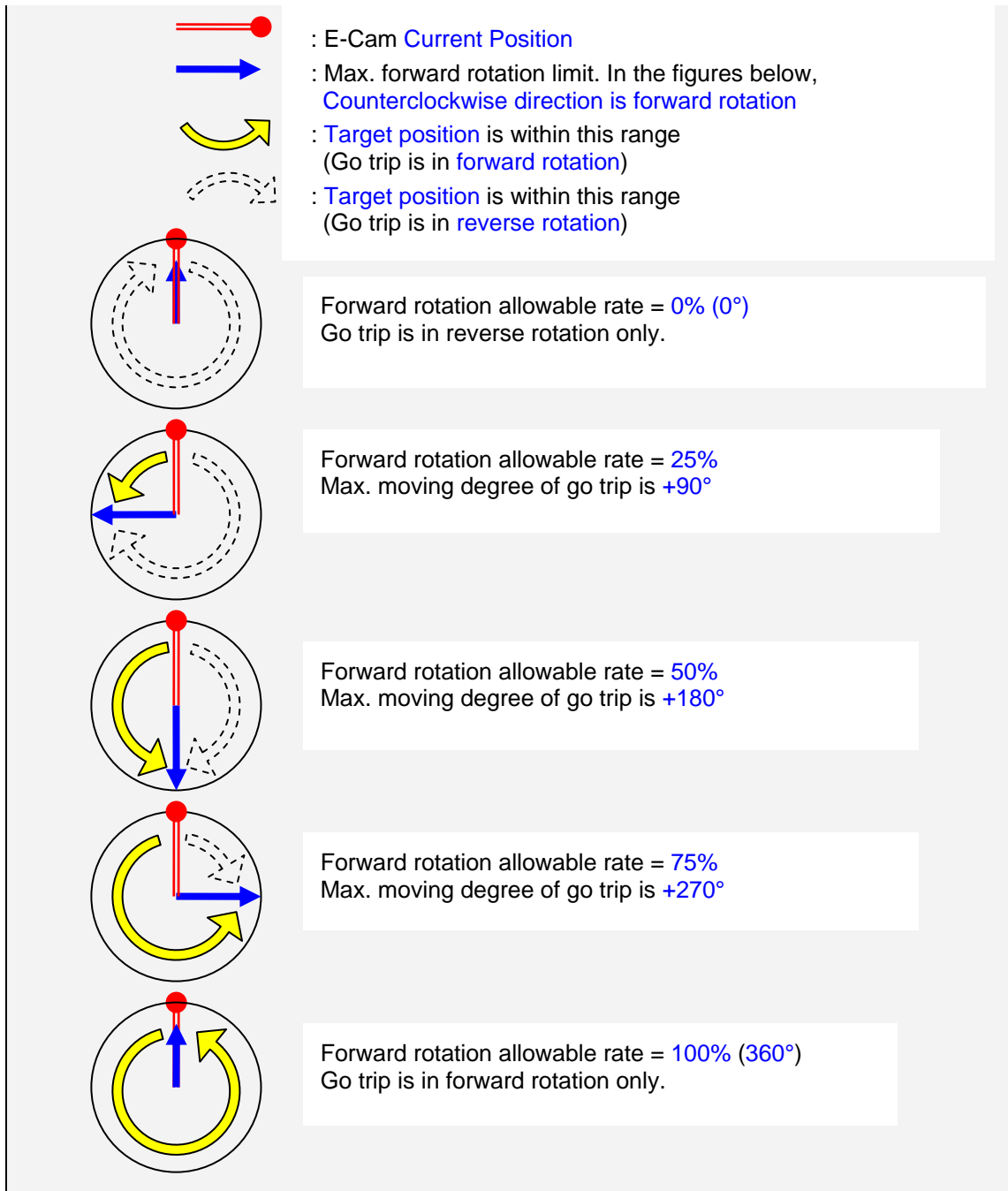
If moving the master axis back to the original position is required, the users can execute another PR command to run the Return moving distance (-Y\_Drift). The E-Cam position can remain unchanged.



Please note:

When using PR command, no matter Go trip or Return trip, it must be an incremental command.

\* Forward rotation allowable rate: Max. allowable moving percentage when go distance is in forward rotation. Please refer to the following explanation.



Failure code: F0F1h	The E-Cam is not engaged when executing this marco command. The E-Cam should be engaged. Otherwise, the engaged position cannot be changed.
Failure code: F0F2h	The setting value of P5-93. YX (PR number of Go trip) is not within its allowable range. It should be within the range of 1 ~ 0x3F.
Failure code: F0F3h	The setting value of P5-93. UZ (PR number of Return trip) is not within its allowable range. It should be within the range of 1 ~ 0x3F.

Failure code: F0F5h	The setting value of P5-95 (forward rotation allowable rate) is not within its allowable range. It should be within the range of 0 ~ 100%.
Failure code: F0F6h	The setting value of P5-96 (target position) is not within its allowable range. It should be within the range of 0 ~ (P5-84/P5-83)-1.

- The firmware version V1.042 sub09 and later models provide the following macro command:

Command code: 0010h	Stop one cycle of E-Cam operation. E-Cam will pause and start to operate from next cycle.
General Parameters	N/A
Macro Parameters	P5-93 = Must be set to 0

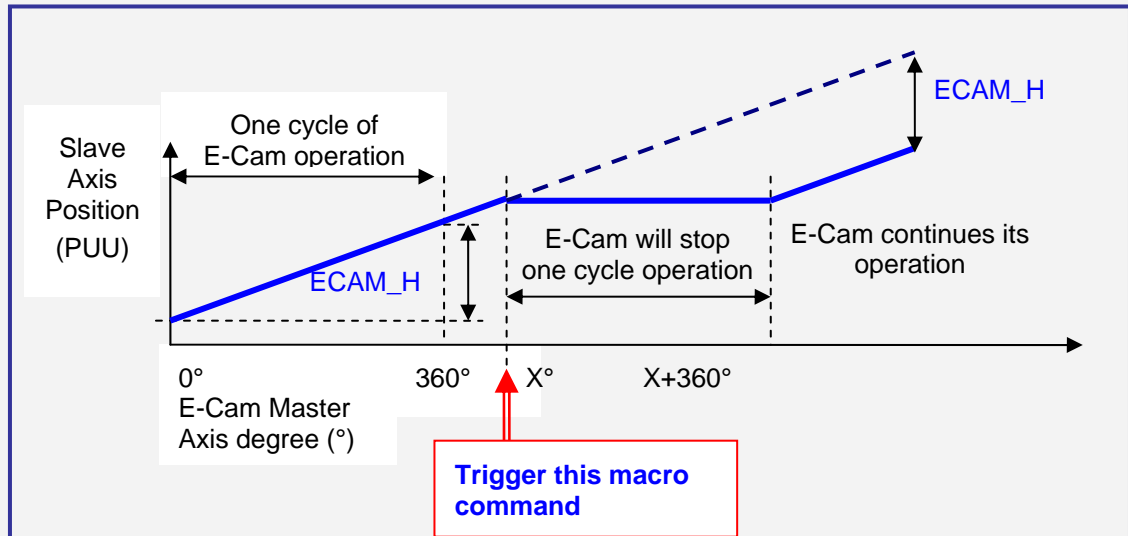
After E-Cam is engaged, no matter what the degree of E-Cam is, using this macro command is able to stop one cycle operation of slave axis.

When the following conditions are all met, the function of this macro command will be activated.

Condition 1: The E-Cam must be engaged.

Condition 2: The E-Cam curve must be a forward operation curve (including straight line)

Please refer to the figure below. No matter what the degree of E-Cam is, only triggering this macro command, E-Cam will stop one cycle operation.



Please note:

1.  $ECAM\_H$  (E-Cam Pause Distance) = E-Cam Table (Last Point – First Point) x P5-19 (E-Cam Curve Scaling).
2. The users can stop E-Cam operation for many times. When triggering this macro commands for N times, the E-Cam operation will be stopped for N cycles. Please note that the **accumulated pause distance cannot exceed  $2^{31}$** . If accumulated pause distance  $>2^{31}$ , this macro command will become disabled.
3. After E-Cam stops one cycle operation, it will start to operate for next cycle. At this time, the accumulated pause distance will be clear to 0.

Failure code: F101h	The E-Cam is not engaged when executing this marco command. The E-Cam should be engaged when using this macro command.
Failure code: F102h	The setting value of P5-93 is not correct. It must be set to 0.
Failure code: F103h	The E-Cam operation should be in forward direction. Please check the E-Cam table and ensure that the setting value of P5-19 should be higher than 0 ( $P5-19 > 0$ ).
Failure code: F104h	The <b>accumulated pause distance</b> cannot exceed $2^{31}$ . If accumulated pause distance $>2^{31}$ , this macro command will become disabled. Do not execute this macro command continuously.

Please note:

ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.

<b>P5-98</b>	<b>EVON</b>	<b>Event Rising-edge Trigger Command (OFF → ON)</b>		<b>Address: 05C4H 05C5H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0000 ~ 0xDDDD		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

This parameter is used to trigger the position command when DI signals, EV1 ~ EV4 (Event trigger command 1 ~ 4) are ON (activated).

Display	U	Z	Y	X
Range	0 ~ D	0 ~ D	0 ~ D	0 ~ D

**X: EV1 settings**

0: When EV1 is ON, no position command is triggered.

1 ~ D: When EV1 is ON, position command P51 ~ P63 is triggered.

For example, when the setting value of X is set to 1 while EV1 is ON, the position command P51 is triggered. When the setting value of X is set to 2, the position command P52 is triggered, and so on.

**Y: EV2 settings**

0: When EV2 is ON, no position command is triggered.

1 ~ D: When EV2 is ON, position command P51 ~ P63 is triggered.

Please note:

The DI signals, EV3 and EV4 are available for the firmware version V1.009 and later models.

**Z: EV3 settings**

0: When EV3 is ON, no position command is triggered.

1 ~ D: When EV3 is ON, position command P51 ~ P63 is triggered.

**U: EV4 settings**

0: When EV4 is ON, no position command is triggered.

1 ~ D: When EV4 is ON, position command P51 ~ P63 is triggered.

<b>P5-99</b>	<b>EVOF</b>	<b>Event Falling-edge Trigger Command (ON → OFF)</b>		<b>Address: 05C6H 05C7H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0000 ~ 0xDDDD		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

This parameter is used to trigger the position command when DI signal, EV1 ~ EV4 (Event trigger command 1 ~ 4) are OFF (inactivated).

Display	U	Z	Y	X
Range	0 ~ D	0 ~ D	0 ~ D	0 ~ D

**X: EV1 settings**

0: When EV1 is OFF, no position command is triggered.

1 ~ D: When EV1 is OFF, position command P51 ~ P63 is triggered.

For example, when the setting value of X is set to 1 while EV1 is OFF, the position command P51 is triggered. When the setting value of X is set to 2, the position command P52 is triggered, and so on.

**Y: EV2 settings**

0: When EV2 is OFF, no position command is triggered.

1 ~ D: When EV2 is OFF, position command P51 ~ P63 is triggered.

Please note:

The DI signals, EV3 and EV4 are available for the firmware version V1.009 and later models.

**Z: EV3 settings**

0: When EV3 is OFF, no position command is triggered.

1 ~ D: When EV3 is OFF, position command P51 ~ P63 is triggered.

**U: EV4 settings**

0: When EV4 is OFF, no position command is triggered.

1 ~ D: When EV4 is OFF, position command P51 ~ P63 is triggered.



## Group 6: P6-xx PR Path Definition Parameters (Refer to Chapter 7)

<b>P6-00</b>	<b>ODEF</b>	<b>Homing Definition</b>		<b>Address: 0600H 0601H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0x10FFFF3F		
	Data Size:	32-bit		
Display Format:	Hexadecimal			

## Settings:

## Homing definition:

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
Function	BOOT	-	DLY	DEC2	DEC1	ACC	PATH	

- PATH: Path style (4 bits)
  - 0: Stop mode. Motor stops after homing is completed.
  - 1~63: Auto mode. Motor goes the dedicated path after homing is completed.
- ACC: Acceleration time 0 ~ F, corresponds to P5-20 ~ P5-35.
- DEC1: 1st deceleration time 0 ~ F, corresponds to P5-20 ~ P5-35.
- DLY: Delay time 0 ~ F, corresponds to P5-40 ~ P5-55.
- BOOT: Boot mode. Disable or enable homing function when the servo drive is applied to power (power on).
  - 0: Disable homing function
  - 1: Enable homing function (when the servo drive is applied to power)
- Other parameters relevant to homing function:
  1. P5-04 (Homing mode)
  2. P5-05 (1st Speed Setting of High Speed Homing) and P5-06 (2nd Speed Setting of Low Speed Homing)
  3. P6-01: ORG\_DEF (Homing definition value). P6-01 is used to set the coordinate value of the current home position for the movement of the coordinate system. The coordinate value could be a non-zero value.

In ASDA-A2 series, after detecting “Home” (home sensor or Z pulse), the motor will decelerate to stop the operation.

If the motor does not return to “Home”, just set path number to 0.

If the motor must return to “Home”, set path number to a non-zero value and set the route PABS = ORG\_DEF.

When detecting “Home” (home sensor or Z pulse), if the motor has to go forward for a while (offset value S) and reach the position P, set the path number to a non-zero value and set ORG\_DEF = P – S (the absolute position command of this route is P).

P6-01	ODAT	Homing Definition Value		Address: 0602H 0603H
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		

Settings:

Homing definition value:

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
Function	ORG_DEF (32-bit)							

ORG\_DEF: Homing definition value which is determined by the parameter P6-01. The homing definition value does not necessarily have to be 0.

P6-02	PDEF1	Definition of Path 1		Address: 0604H 0605H
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		

Settings:

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
P6-02	-	-	DLY	-	-	-	OPT	TYPE
P6-03	DATA (32-bit)							

TYPE, OPT:

OPT				TYPE
Bit7	Bit6	Bit5	Bit4	Bit3 ~ Bit0
-	UNIT	AUTO	INS	1: Constant speed control
CMD		OVL	INS	2: Single positioning control. Motor stops when positioning is completed.
CMD		OVL	INS	3: Auto positioning control. Motor goes to next dedicated path when positioning is completed.

OPT				TYPE
-	-	-	INS	7: Jump to the dedicated path.
-	-	AUTO	INS	8: Write the specified parameter to the dedicated path.

※ When the TYPE is set to 1 ~ 3, it can accept DO signals, STP (Motor Stop), SNL(SCWL, Reverse Software Limit), SPL(SCCWL, Forward Software Limit).

INS: Insertion command on PR.

OVLP: Overlap the next PR. This function is not available in speed mode. In position mode, DLY becomes disabled.

AUTO: When current positioning is completed, the motor moves to the next dedicated PR automatically.

CMD: Refer to Section 7.10 in Chapter 7.

DLY: 0 ~ F. Delay time number (4 bits). The digital output of this PR activates after the delay time. External INS is not valid. The delay time number settings correspond with the parameter P5-40 ~ P5-55.

DLY (4)          Index P5-40 ~ P5-55

P6-03	PDAT1	Data of Path 1	Address: 0606H 0607H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings:

Data of path 1:

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
Function	DATA (32-bit)							

The parameter P6-02 is used to determine the attributes of definition of Path 1 and parameter P6-03 is used to set the data (target position or jump path number) corresponding to P6-02.

P6-04	PDEF2	Definition of Path 2	Address: 0608H 0609H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	

Unit:	N/A
Range:	0x00000000 ~ 0xFFFFFFFF
Data Size:	32-bit
Display Format:	Hexadecimal

Settings: Refer to P6-02 for explanation.

P6-05	PDAT2	Data of Path 2	Address: 060AH 060BH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	

Settings: Refer to P6-03 for explanation.

P6-06	PDEF3	Definition of Path 3	Address: 060CH 060DH
Operation Interface:		Keypad / Software	Communication
Default:		0x00000000	
Control Mode:		PR	
Unit:		N/A	
Range:		0x00000000 ~ 0xFFFFFFFF	
Data Size:		32-bit	
Display Format:		Hexadecimal	

Settings: Refer to P6-02 for explanation.

P6-07	PDAT3	Data of Path 3	Address: 060EH 060FH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	

Display: Format:	Decimal
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Settings: Refer to P6-03 for explanation.

<b>P6-08</b>	<b>PDEF4</b>	<b>Definition of Path 4</b>	<b>Address: 0610H 0611H</b>
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Operation: Interface:	Keypad / Software	Communication	Related Section: Section 7.10
Default:	0x00000000		
Control: Mode:	PR		
Unit:	N/A		
Range:	0x00000000 ~ 0xFFFFFFFF		
Data Size:	32-bit		
Display: Format:	Hexadecimal		

Settings: Refer to P6-02 for explanation.

<b>P6-09</b>	<b>PDAT4</b>	<b>Data of Path 4</b>	<b>Address: 0612H 0613H</b>
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Operation: Interface:	Keypad / Software	Communication	Related Section: Section 7.10
Default:	0		
Control: Mode:	PR		
Unit:	N/A		
Range:	-2147483648 ~ +2147483647		
Data Size:	32-bit		
Display: Format:	Decimal		

Settings: Refer to P6-03 for explanation.

<b>P6-10</b>	<b>PDEF5</b>	<b>Definition of Path 5</b>	<b>Address: 0614H 0615H</b>
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Operation: Interface:	Keypad / Software	Communication	Related Section: Section 7.10
Default:	0x00000000		
Control: Mode:	PR		
Unit:	N/A		
Range:	0x00000000 ~ 0xFFFFFFFF		
Data Size:	32-bit		
Display: Format:	Hexadecimal		

Settings: Refer to P6-02 for explanation.

P6-11	PDAT5	Data of Path 5	Address: 0616H 0617H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P6-12	PDEF6	Definition of Path 6	Address: 0618H 0619H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-13	PDAT6	Data of Path 6	Address: 061AH 061BH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P6-14	PDEF7	Definition of Path 7	Address: 061CH 061DH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-15	PDAT7	Data of Path 7	Address: 061EH 061FH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P6-16	PDEF8	Definition of Path 8	Address: 0620H 0621H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-17	PDAT8	Data of Path 8	Address: 0622H 0623H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P6-18	PDEF9	Definition of Path 9	Address: 0624H 0625H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-19	PDAT9	Data of Path 9	Address: 0626H 0627H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			



<b>P6-20</b>	<b>PDEF10</b>	<b>Definition of Path 10</b>		<b>Address: 0628H 0629H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-21</b>	<b>PDAT10</b>	<b>Data of Path 10</b>		<b>Address: 062AH 062BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-22</b>	<b>PDEF11</b>	<b>Definition of Path 11</b>		<b>Address: 062CH 062DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-23	PDAT11	Data of Path 11	Address: 062EH 062FH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-22	PDEF11	Definition of Path 11	Address: 062CH 062DH
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-23	PDAT11	Data of Path 11	Address: 062EH 062FH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

<b>P6-24</b>	<b>PDEF12</b>	<b>Definition of Path 12</b>		<b>Address: 0630H 0631H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
Display Format:	Hexadecimal			

Settings: Refer to P6-02 for explanation.

<b>P6-25</b>	<b>PDAT12</b>	<b>Data of Path 12</b>		<b>Address: 0632H 0633H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
Display Format:	Decimal			

Settings: Refer to P6-03 for explanation.

<b>P6-24</b>	<b>PDEF12</b>	<b>Definition of Path 12</b>		<b>Address: 0630H 0631H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
Display Format:	Hexadecimal			

Settings: Refer to P6-02 for explanation.

P6-25	PDAT12	Data of Path 12	Address: 0632H 0633H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-26	PDEF13	Definition of Path 13	Address: 0634H 0635H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-27	PDAT13	Data of Path 13	Address: 0636H 0637H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

<b>P6-28</b>	<b>PDEF14</b>	<b>Definition of Path 14</b>		<b>Address: 0638H 0639H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-29</b>	<b>PDAT14</b>	<b>Data of Path 14</b>		<b>Address: 063AH 063BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-30</b>	<b>PDEF15</b>	<b>Definition of Path 15</b>		<b>Address: 063CH 063DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-31	PDAT15	Data of Path 15	Address: 063EH 063FH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	

Settings: Refer to P6-03 for explanation.

P6-32	PDEF16	Definition of Path 16	Address: 0640H 0641H
Operation Interface:		Keypad / Software	Communication
Default:		0x00000000	
Control Mode:		PR	
Unit:		N/A	
Range:		0x00000000 ~ 0xFFFFFFFF	
Data Size:		32-bit	
Display Format:		Hexadecimal	

Settings: Refer to P6-02 for explanation.

P6-33	PDAT16	Data of Path 16	Address: 0642H 0643H
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	

Settings: Refer to P6-03 for explanation.

<b>P6-34</b>	<b>PDEF17</b>	<b>Definition of Path 17</b>		<b>Address: 0644H 0645H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
Display Format:	Hexadecimal			
Settings: Refer to P6-02 for explanation.				

<b>P6-35</b>	<b>PDAT17</b>	<b>Data of Path 17</b>		<b>Address: 0646H 0647H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
Display Format:	Decimal			
Settings: Refer to P6-03 for explanation.				

<b>P6-36</b>	<b>PDEF18</b>	<b>Definition of Path 18</b>		<b>Address: 0648H 0649H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
Display Format:	Hexadecimal			
Settings: Refer to P6-02 for explanation.				

P6-37	PDAT18	Data of Path 18	Address: 064AH 064BH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			

P6-38	PDEF19	Definition of Path 19	Address: 064CH 064DH
Operation Interface:		Keypad / Software	Communication
Default:		0x00000000	
Control Mode:		PR	
Unit:		N/A	
Range:		0x00000000 ~ 0xFFFFFFFF	
Data Size:		32-bit	
Display Format:		Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-39	PDAT19	Data of Path 19	Address: 064EH 064FH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			



<b>P6-40</b>	<b>PDEF20</b>	<b>Definition of Path 20</b>		<b>Address: 0650H 0651H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-41</b>	<b>PDAT20</b>	<b>Data of Path 20</b>		<b>Address: 0652H 0653H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-42</b>	<b>PDEF21</b>	<b>Definition of Path 21</b>		<b>Address: 0654H 0655H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-43	PDAT21	Data of Path 21	Address: 0656H 0657H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-44	PDEF22	Definition of Path 22	Address: 0658H 0659H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-45	PDAT22	Data of Path 22	Address: 065AH 065BH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

<b>P6-46</b>	<b>PDEF23</b>	<b>Definition of Path 23</b>		<b>Address: 065CH 065DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-47</b>	<b>PDAT23</b>	<b>Data of Path 23</b>		<b>Address: 065EH 065FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-48</b>	<b>PDEF24</b>	<b>Definition of Path 24</b>		<b>Address: 0660H 0661H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-49	PDAT24	Data of Path 24	Address: 0662H 0663H
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			

P6-50	PDEF25	Definition of Path 25	Address: 0664H 0665H
Operation Interface:		Keypad / Software	Communication
Default:		0x00000000	
Control Mode:		PR	
Unit:		N/A	
Range:		0x00000000 ~ 0xFFFFFFFF	
Data Size:		32-bit	
Display Format:		Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-51	PDAT25	Data of Path 25	Address: 0666H 0667H
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			

P6-52	PDEF26	Definition of Path 26	Address: 0668H 0669H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-53	PDAT26	Data of Path 26	Address: 066AH 066BH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P6-54	PDEF27	Definition of Path 27	Address: 066CH 066DH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-55	PDAT27	Data of Path 27	Address: 066EH 066FH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-56	PDEF28	Definition of Path 28	Address: 0670H 0671H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-57	PDAT28	Data of Path 28	Address: 0672H 0673H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-58	PDEF29	Definition of Path 29	Address: 0674H 0675H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P6-02 for explanation.

P6-59	PDAT29	Data of Path 29	Address: 0676H 0677H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	

Settings: Refer to P6-03 for explanation.

P6-60	PDEF30	Definition of Path 30	Address: 0678H 0679H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	

Settings: Refer to P6-02 for explanation.

P6-61	PDAT30	Data of Path 30	Address: 067AH 067BH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			

P6-62	PDEF31	Definition of Path 31	Address: 067CH 067DH
Operation Interface:		Keypad / Software	Communication
Default:		0x00000000	
Control Mode:		PR	
Unit:		N/A	
Range:		0x00000000 ~ 0xFFFFFFFF	
Data Size:		32-bit	
Display Format:		Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-63	PDAT31	Data of Path 31	Address: 067EH 067FH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			



<b>P6-64</b>	<b>PDEF32</b>	<b>Definition of Path 32</b>		<b>Address: 0680H 0681H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-65</b>	<b>PDAT32</b>	<b>Data of Path 32</b>		<b>Address: 0682H 0683H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-66</b>	<b>PDEF33</b>	<b>Definition of Path 33</b>		<b>Address: 0684H 0685H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-67	PDAT33	Data of Path 33	Address: 0686H 0687H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-68	PDEF34	Definition of Path 34	Address: 0688H 0689H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-69	PDAT34	Data of Path 34	Address: 068AH 068BH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

<b>P6-70</b>	<b>PDEF35</b>	<b>Definition of Path 35</b>		<b>Address: 068CH 068DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-71</b>	<b>PDAT35</b>	<b>Data of Path 35</b>		<b>Address: 068EH 068FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-72</b>	<b>PDEF36</b>	<b>Definition of Path 36</b>		<b>Address: 0690H 0691H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-73	PDAT36	Data of Path 36	Address: 0692H 0693H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-74	PDEF37	Definition of Path 37	Address: 0694H 0695H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-75	PDAT37	Data of Path 37	Address: 0696H 0697H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

<b>P6-76</b>	<b>PDEF38</b>	<b>Definition of Path 38</b>		<b>Address: 0698H 0699H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-77</b>	<b>PDAT38</b>	<b>Data of Path 38</b>		<b>Address: 069AH 069BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-78</b>	<b>PDEF39</b>	<b>Definition of Path 39</b>		<b>Address: 069CH 069DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-79	PDAT39	Data of Path 39	Address: 069EH 069FH
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			

P6-80	PDEF40	Definition of Path 40	Address: 06A0H 06A1H
Operation Interface:		Keypad / Software	Communication
Default:		0x00000000	
Control Mode:		PR	
Unit:		N/A	
Range:		0x00000000 ~ 0xFFFFFFFF	
Data Size:		32-bit	
Display Format:		Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-81	PDAT40	Data of Path 40	Address: 06A2H 06A3H
Operation Interface:		Keypad / Software	Communication
Default:		0	
Control Mode:		PR	
Unit:		N/A	
Range:		-2147483648 ~ +2147483647	
Data Size:		32-bit	
Display Format:		Decimal	
Settings: Refer to P6-03 for explanation.			

<b>P6-82</b>	<b>PDEF41</b>	<b>Definition of Path 41</b>		<b>Address: 06A4H 06A5H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-83</b>	<b>PDAT41</b>	<b>Data of Path 41</b>		<b>Address: 06A6H 06A7H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-84</b>	<b>PDEF42</b>	<b>Definition of Path 42</b>		<b>Address: 06A8H 06A9H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-85	PDAT42	Data of Path 42	Address: 06AAH 06ABH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-86	PDEF43	Definition of Path 43	Address: 06ACH 06ADH
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-87	PDAT43	Data of Path 43	Address: 06AEH 06AFH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		



<b>P6-88</b>	<b>PDEF44</b>	<b>Definition of Path 44</b>		<b>Address: 06B0H 06B1H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P6-89</b>	<b>PDAT44</b>	<b>Data of Path 44</b>		<b>Address: 06B2H 06B3H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P6-90</b>	<b>PDEF45</b>	<b>Definition of Path 45</b>		<b>Address: 06B4H 06B5H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P6-91	PDAT45	Data of Path 45	Address: 06B6H 06B7H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-92	PDEF46	Definition of Path 46	Address: 06B8H 06B9H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-93	PDAT46	Data of Path 46	Address: 06BAH 06BBH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-94	PDEF47	Definition of Path 47	Address: 06BCH 06BDH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-95	PDAT47	Data of Path 47	Address: 06BEH 06BFH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P6-96	PDEF48	Definition of Path 48	Address: 06C0H 06C1H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P6-97	PDAT48	Data of Path 48	Address: 06C2H 06C3H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P6-98	PDEF49	Definition of Path 49	Address: 06C4H 06C5H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P6-99	PDAT49	Data of Path 49	Address: 06C6H 06C7H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

## Group 7: P7-xx PR Path Definition Parameters

P7-00	PDEF50	Definition of Path 50	Address: 0700H 0701H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-01	PDAT50	Data of Path 50	Address: 0702H 0703H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P7-02	PDEF51	Definition of Path 51	Address: 0704H 0705H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-03	PDAT51	Data of Path 51	Address: 0706H 0707H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P7-04	PDEF52	Definition of Path 52	Address: 0708H 0709H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P7-05	PDAT52	Data of Path 52	Address: 070AH 070BH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

<b>P7-06</b>	<b>PDEF53</b>	<b>Definition of Path 53</b>		<b>Address: 070CH 070DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

<b>P7-07</b>	<b>PDAT53</b>	<b>Data of Path 53</b>		<b>Address: 070EH 070FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
Settings: Refer to P6-03 for explanation.				

<b>P7-08</b>	<b>PDEF54</b>	<b>Definition of Path 54</b>		<b>Address: 0710H 0711H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0x00000000		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	0x00000000 ~ 0xFFFFFFFF		
	Data Size:	32-bit		
	Display Format:	Hexadecimal		
Settings: Refer to P6-02 for explanation.				

P7-09	PDAT54	Data of Path 54	Address: 0712H 0713H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P7-10	PDEF55	Definition of Path 55	Address: 0714H 0715H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-11	PDAT55	Data of Path 55	Address: 0716H 0717H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			



P7-12	PDEF56	Definition of Path 56	Address: 0718H 0719H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-13	PDAT56	Data of Path 56	Address: 071AH 071BH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P7-14	PDEF57	Definition of Path 57	Address: 071CH 071DH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-15	PDAT57	Data of Path 57	Address: 071EH 071FH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P7-16	PDEF58	Definition of Path 58	Address: 0720H 0721H
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P7-17	PDAT58	Data of Path 58	Address: 0722H 0723H
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P7-18	PDEF59	Definition of Path 59	Address: 0724H 0725H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-19	PDAT59	Data of Path 59	Address: 0726H 0727H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P7-20	PDEF60	Definition of Path 60	Address: 0728H 0729H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-21	PDAT60	Data of Path 60	Address: 072AH 072BH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P7-22	PDEF61	Definition of Path 61	Address: 072CH 072DH
	Operation Interface:	Keypad / Software	Communication
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
	Settings: Refer to P6-02 for explanation.		

P7-23	PDAT61	Data of Path 61	Address: 072EH 072FH
	Operation Interface:	Keypad / Software	Communication
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
	Settings: Refer to P6-03 for explanation.		

P7-24	PDEF62	Definition of Path 62	Address: 0730H 0731H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

P7-25	PDAT62	Data of Path 62	Address: 0732H 0733H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	-2147483648 ~ +2147483647	
	Data Size:	32-bit	
	Display Format:	Decimal	
Settings: Refer to P6-03 for explanation.			

P7-26	PDEF63	Definition of Path 63	Address: 0734H 0735H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 7.10
	Default:	0x00000000	
	Control Mode:	PR	
	Unit:	N/A	
	Range:	0x00000000 ~ 0xFFFFFFFF	
	Data Size:	32-bit	
	Display Format:	Hexadecimal	
Settings: Refer to P6-02 for explanation.			

<b>P7-27</b>	<b>PDAT63</b>	<b>Data of Path 63</b>		<b>Address: 0736H 0737H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 7.10
	Default:	0		
	Control Mode:	PR		
	Unit:	N/A		
	Range:	-2147483648 ~ +2147483647		
	Data Size:	32-bit		
	Display Format:	Decimal		
	Settings: Refer to P6-03 for explanation.			

**Table A Input Function Definition**

<b>Setting value: 0x01</b>			
DI Name	DI Function Description	Trigger Method	Control Mode
SON	Servo On. When this DI is activated, it indicates the servo drive is enabled.	Level Triggered	All

<b>Setting value: 0x02</b>			
DI Name	DI Function Description	Trigger Method	Control Mode
ARST	A number of Faults (Alarms) can be cleared by activating ARST. Please see table 10-3 for applicable faults that can be cleared with the ARST command. However, please investigate Fault or Alarm if it does not clear or the fault description warrants closer inspection of the drive system.	Rising-edge Triggered	All

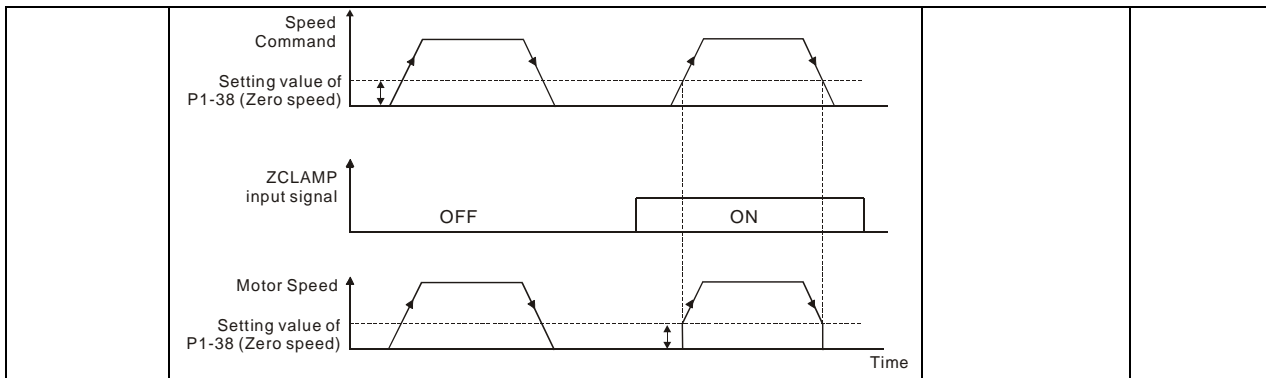
<b>Setting value: 0x03</b>			
DI Name	DI Function Description	Trigger Method	Control Mode
GAINUP	Gain switching in speed and position mode. When GAINUP is activated (P2-27 is set to 1), the gain is switched to the gain multiplied by gain switching rate.	Level Triggered	PT, PR, S

<b>Setting value: 0x04</b>			
DI Name	DI Function Description	Trigger Method	Control Mode
CCLR	When CCLR is activated, the setting parameter P2-50 Pulse Clear Mode is executed. 0: After CCLR is activated (ON), the position accumulated pulse number will be cleared continuously.	Rising-edge Triggered, Level Triggered	PT

<b>Setting value: 0x05</b>			
DI Name	DI Function Description	Trigger Method	Control Mode
ZCLAMP	When this signal is On and the motor speed value is lower than the setting value of P1-38, it is used to lock the motor in the instant position while ZCLAMP is On.	Level Triggered	S



**Setting value: 0x06**

DI Name	DI Function Description	Trigger Method	Control Mode
CMDINV	Command input reverse control. When the drive is in Speed and Torque mode, and CMDINV is activated, the motor is in reverse rotation.	Level Triggered	S, T

**Setting value: 0x07**

DI Name	DI Function Description	Trigger Method	Control Mode
Reserved			

**Setting value: 0x08**

DI Name	DI Function Description	Trigger Method	Control Mode
CTRG	Command triggered (available in PR mode only). When the drive is in PR mode and CTRG is activated, the drive will command the motor to move the stored position which correspond the POS 0 ~ POS 5 settings. Activation is triggered on the rising edge of the pulse.	Rising-edge Triggered	PR

**Setting value: 0x09**

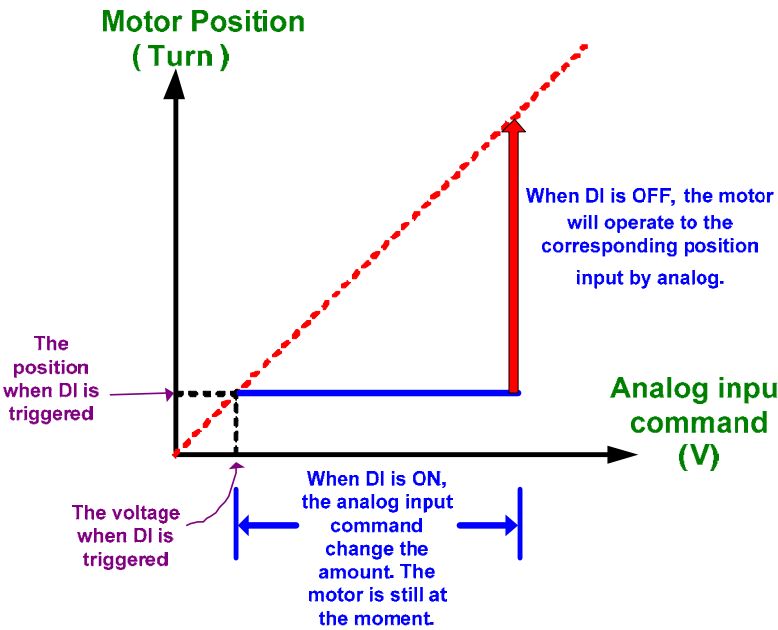
DI Name	DI Function Description	Trigger Method	Control Mode
TRQLM	Torque limit enabled. When the drive is in speed and position mode, and TRQLM is activated, it indicates the torque limit command is valid. The torque limit command source is internal parameter or analog voltage.	Level Triggered	PT, PR, S

**Setting value: 0x0A**

DI Name	DI Function Description	Trigger Method	Control Mode
GTRY	Gantry control function.	Rising-edge Triggered	PT

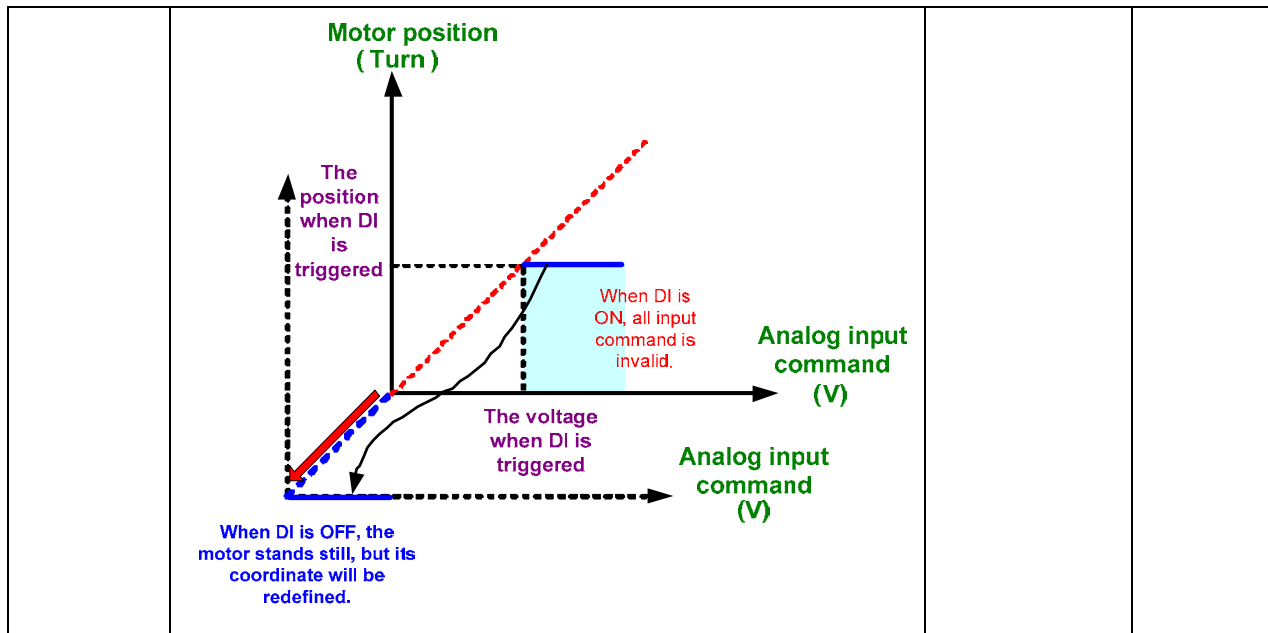


**Setting value: 0x0C**

DI Name	DI Function Description	Trigger Method	Control Mode
VPL	<p>Latch function of analog position command.                      When this DI is ON, the motor will be held on the current position.                      During the time of DI ON, the motor will not operate even when there is any change of analog command. When this DI is OFF, the motor will complete the command during the time the DI is triggered.</p>  <p>Note: The above graph is the commands that haven't gone through P1-65 filter.</p>	Level Triggered	PT, PR, Full-closed control mode

**Setting value: 0x0D**

DI Name	DI Function Description	Trigger Method	Control Mode
VPRS	<p>Clear function of analog position command                      When this DI is ON, the motor will be held in the current position.                      Despite the change of analog command during the time of DI ON, the motor will still stay in the current position even when the DI is OFF. However, the position the motor stays will corresponds to the new analog command. Thus, the coordinate system of the motor will be redefined.</p>	Rising-edge Triggered	PT, PR, Full-closed control mode



**Setting value: 0x0E**

DI Name	DI Function Description	Trigger Method	Control Mode
FEC	Clear the errors of linear scale and motor encoder for full-closed control.	Level Triggered	PT, PR, Full-closed control mode

**Setting value: 0x10**

DI Name	DI Function Description	Trigger Method	Control Mode
SPDLM	Speed limit enabled. When the drive is in torque mode and SPDLM is activated, it indicates the speed limit command is valid. The speed limit command source is internal parameter or analog voltage.	Level Triggered	T

**Setting value: 0x11, 0x12, 0x13, 0x1A, 0x1B, 0x1C**

DI Name	DI Function Description	Trigger Method	Control Mode																											
POS0 POS1 POS2 POS3 POS4 POS5	Position command selection POS0 ~ POS5 (64 positions) When the PR Control Mode is selected, the 64 stored positions are programmed via a combination of the POS 0 ~ POS 5 commands.	Level Triggered	PR																											
	<table border="1"> <thead> <tr> <th>Position Command</th> <th>POS5</th> <th>POS4</th> <th>POS3</th> <th>POS2</th> <th>POS1</th> <th>POS0</th> <th>CTRG</th> <th>Parameters</th> </tr> </thead> <tbody> <tr> <td>PR1</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>↑</td> <td>P6-00 P6-01</td> </tr> <tr> <td>PR2</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>↑</td> <td>P6-02 P6-03</td> </tr> </tbody> </table>			Position Command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Parameters	PR1	ON	ON	ON	ON	ON	ON	↑	P6-00 P6-01	PR2	ON	ON	ON	ON	ON	OFF	↑	P6-02 P6-03
Position Command	POS5			POS4	POS3	POS2	POS1	POS0	CTRG	Parameters																				
PR1	ON			ON	ON	ON	ON	ON	↑	P6-00 P6-01																				
PR2	ON	ON	ON	ON	ON	OFF	↑	P6-02 P6-03																						

~								~		
PR50	OFF	OFF	ON	ON	OFF	ON	↑	P6-98		
								P6-99		
PR51	OFF	OFF	ON	ON	OFF	OFF	↑	P7-00		
								P7-01		
~								~		
PR63	OFF	OFF	OFF	OFF	OFF	OFF	↑	P7-26		
								P7-27		

**Setting value: 0x1D**

DI Name	DI Function Description	Trigger Method	Control Mode
ABSE	<p>When ABSE is activated (ON), it can initialize an Absolute System and enable ABSQ, ABSC, ABSR, and ABSD as well. Please refer to Figure 12.3 and 12.4 for timing diagram.</p> <p>No matter what the original functions of DI4, DO2, and DO3 are, they will be switched to the function of ABSQ, ABSR, and ABSD respectively. DI4 will be changed to ASDQ, DO2 will be changed to ABSR, and DO3 will be changed to ABSD. The ABSC can be set via the parameter setting (DI function setting). When ABSE is ON, the setting value of parameter P2-13 cannot be changed.</p>	Level Triggered	ALL

**Setting value: 0x1F**

DI Name	DI Function Description	Trigger Method	Control Mode
ABSC	<p>When ABSC is activated (ON), the pulse number of absolute encoder will be reset to zero, and PUU number will be reset to the setting value of P6-01. ABSC is effective only when the digital input, ABSE is ON. Please refer to Figure 12.3 for timing diagram.</p>	Rising-edge Triggered	ALL

**Setting Value: When ABSE is activated (ON), DI4 is switched to the function of ABSQ to replace the DI function set by parameter P2-13.**

DI Name	DI Function Description	Trigger Method	Control Mode
ABSQ is controlled by DI4	<p>When ABSQ is activated (ON), it indicates that the host controller has read and put its data at ABSD for next bit communication. When ABSQ is OFF, the host controller will send the command for requesting next bit communication. This function is for communication handshaking during digital I/O signal transmission. ABSQ is effective only when the digital input, ABSE is ON. Please refer to Figure 12.4 for timing diagram.</p>	Rising / Falling- edged Triggered	ALL

**Setting value: 0x14 ~ 0x15**

DI Name	DI Function Description						Trigger Method	Control Mode		
SPD0 SPD1	Speed command selection 0 ~ 1 (Command S1 ~ S4)							Level Triggered	S	
	Command No.	DI signal of CN1		Command Source		Content	Range			
		SPD1	SPD0							
	S1	OFF	OFF	Mode	S	External analog command	Voltage between V-REF and GND			+/-10 V
					Sz	None	Speed command is 0			0
	S2	OFF	ON	Internal parameter		P1-09	-60000			
S3	ON	OFF	P1-10			~				
S4	ON	ON	P1-11			+60000 r/min				

**Setting value: 0x16 ~ 0x17**

DI Name	DI Function Description						Trigger Method	Control Mode		
TCM0 TCM1	Torque command selection 0 ~ 1 (Command T1 ~ T4)							Level Triggered	T	
	Command No.	DI signal of CN1		Command Source		Content	Range			
		TCM1	TCM0							
	T1	OFF	OFF	Mode	T	Analog command	Voltage between V-REF and GND			+/-10 V
					Tz	None	Torque command is 0			0
	T2	OFF	ON	Internal parameter		P1-12	-300 ~			
T3	ON	OFF	P1-13			+300				
T4	ON	ON	P1-14			%				

**Setting value: 0x18**

DI Name	DI Function Description	Trigger Method	Control Mode
S-P	Speed / Position mode switching. OFF: Speed mode, ON: Position mode	Level Triggered	P, S

**Setting value: 0x19**

DI Name	DI Function Description	Trigger Method	Control Mode
S-T	Speed / Torque mode switching. OFF: Speed mode, ON: Torque mode	Level Triggered	S, T

**Setting value: 0x20**

DI Name	DI Function Description	Trigger Method	Control Mode
T-P	Torque / Position mode switching. OFF: Torque mode, ON: Position mode	Level Triggered	P, T

**Setting value: 0x21**

DI Name	DI Function Description	Trigger Method	Control Mode
EMGS	Emergency stop. It should be contact “b” and normally ON or a fault (AL013) will display.	Level Triggered	All

**Setting value: 0x22**

DI Name	DI Function Description	Trigger Method	Control Mode
NL(CWL)	Reverse inhibit limit. It should be contact “b” and normally ON or a fault (AL014) will display.	Level Triggered	All

**Setting value: 0x23**

DI Name	DI Function Description	Trigger Method	Control Mode
PL(CCWL)	Forward inhibit limit. It should be contact “b” and normally ON or a fault (AL015) will display.	Level Triggered	All

**Setting value: 0x24**

DI Name	DI Function Description	Trigger Method	Control Mode
ORGP	Reference “Home” sensor. When ORGP is activated, the drive will command the motor to start to search the reference “Home” sensor. [see P5-04]	Rising-edge/ Falling-edge Triggered	PR

**Setting value: 0x27**

DI Name	DI Function Description	Trigger Method	Control Mode
SHOM	Move to “Home”. When SHOM is activated, the drive will command the motor to move to “Home”. [see P5-04]	Rising-edge Triggered	PR

**Setting value: 0x2B**

DI Name	DI Function Description	Trigger Method	Control Mode
PT-PR	Internal position (PR) and external pulse (PT) mode switching. OFF: PT, ON: PR	Level Triggered	PT, PR

**Setting value: 0x36**

DI Name	DI Function Description	Trigger Method	Control Mode
CAM	Electronic CAM function control [see P5-88] Please note: ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.	Rising-edge/ Falling-edge Triggered	PR

**Setting value: 0x37**

DI Name	DI Function Description	Trigger Method	Control Mode
JOGU	Forward JOG input. When JOGU is activated, the motor will JOG in forward direction. [see P4-05]	Level Triggered	All

**Setting value: 0x38**

DI Name	DI Function Description	Trigger Method	Control Mode
JOGD	Reverse JOG input. When JOGD is activated, the motor will JOG in reverse direction. [see P4-05]	Level Triggered	All

**Setting value: 0x39**

DI Name	DI Function Description	Trigger Method	Control Mode
EV1	Event trigger command 1 [see P5-98, P5-99]	Rising-edge/ Falling-edge Triggered	PR

**Setting value: 0x3A**

DI Name	DI Function Description	Trigger Method	Control Mode
EV2	Event trigger command 2 [see P5-98, P5-99]	Rising-edge/ Falling-edge Triggered	PR

**Setting value: 0x3B**

DI Name	DI Function Description	Trigger Method	Control Mode
EV3	Event trigger command 3 [see P5-98, P5-99]	Rising-edge/	PR

	(available in firmware version V1.009 and later models)	Falling-edge Triggered	
--	---	------------------------	--

**Setting value: 0x3C**

DI Name	DI Function Description	Trigger Method	Control Mode
EV4	Event trigger command 4 [see P5-98, P5-99] (available in firmware version V1.009 and later models)	Rising-edge/ Falling-edge Triggered	PR

**Setting value: 0x43, 0x44**

DI Name	DI Function Description	Trigger Method	Control Mode
GNUM0 GNUM1	Electronic gear ratio (Numerator) selection 0 ~ 1 [see P2-60 ~ P2-62]  	Level Triggered	PT

**Setting value: 0x45**

DI Name	DI Function Description	Trigger Method	Control Mode
INHP	Pulse inhibit input. When the drive is in position mode, if INHP is activated, the external pulse input command is not valid. (Please use DI8 for INHP signal to ensure the real-time operation of INHP function.)	Level Triggered	PT

**Setting value: 0x46**

DI Name	DI Function Description	Trigger Method	Control Mode
STOP	Motor stop.	Rising-edge Triggered	PR

**NOTE**

- 1) 11 ~ 17: Single control mode, 18 ~ 20: Dual control mode
- 2) When P2-10 to P2-17 is set to 0, it indicates input function is disabled.

**Table B Output Function Definition**

**Setting value: 0x01**

DO Name	DO Function Description	Trigger Method	Control Mode
SRDY	Servo ready. SRDY is activated when the servo drive is ready to run. All fault and alarm conditions, if present, have been cleared.	Level Triggered	All

**Setting value: 0x02**

DO Name	DO Function Description	Trigger Method	Control Mode
SON	<p>When it is Servo On, this DO is ON if there is no alarm occurs.</p> <p>As soon as it applies to the power, when it is automatically Servo On, the time difference between DO:SRDY and DO:SON</p> <p>Approx. 300 ns</p>	Level Triggered	All

**Setting value: 0x03**

DO Name	DO Function Description	Trigger Method	Control Mode
ZSPD	<p>ZSPD is activated when the drive senses the motor is equal to or below the Zero Speed Range setting as defined in parameter P1-38.</p> <p>For Example, at factory default ZSPD will be activated when the drive detects the motor rotating at speed at or below 10 r/min, ZSPD will remain activated until the motor speed increases above 10 r/min.</p>	Level Triggered	All

**Setting value: 0x04**

DO Name	DO Function Description	Trigger Method	Control Mode
TSPD	TSPD is activated once the drive has detected the motor has reached the Target Rotation Speed setting as defined in parameter P1-39. TSPD will remain activated until the motor speed drops below the Target Rotation Speed.	Level Triggered	All



**Setting value: 0x05**

DO Name	DO Function Description	Trigger Method	Control Mode
TPOS	1. When the drive is in PT mode, TPOS will be activated when the position error is equal and below the setting value of P1-54. 2. When the drive is in PR mode, TPOS will be activated when the drive detects that the position of the motor is in a -P1-54 to +P1-54 band of the current command position.	Level Triggered	PT, PR

**Setting value: 0x06**

DO Name	DO Function Description	Trigger Method	Control Mode
TQL	TQL is activated when the drive has detected that the motor has reached the torques limits set by either the parameters P1-12 ~ P1-14 of via an external analog voltage.	Level Triggered	All, except T, Tz

**Setting value: 0x07**

DO Name	DO Function Description	Trigger Method	Control Mode
ALRM	ALRM is activated when the drive has detected a fault condition. (However, when Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault occur, WARN is activated first.)	Level Triggered	All

**Setting value: 0x08**

DO Name	DO Function Description	Trigger Method	Control Mode
BRKR	Electromagnetic brake control. BRKR is activated (Actuation of motor brake). (Please refer to parameters P1-42 ~ P1-43) 	Level Triggered	All

**Setting value: 0x09**

DO Name	DO Function Description	Trigger Method	Control Mode
HOME	<p>Homing completed. HOME is activated when the servo drive has detected that the "HOME" sensor (ORGP, digital input 0x24) has been detected.</p> <p>When power to the servo drive at the first time, this DO signal is OFF. After homing operation is completed, thi DO signal will be ON and continue being ON when the motor is running. It becomes OFF until the sytem detect that a position overflow occurs.</p> <p>When using PR command to trigger homing command, this DI signal will be OFF immediately. After homeing operation is completed, it becomes ON again.</p>	Level Triggered	PR

**Setting value: 0x0D**

DO Name	DO Function Description	Control Mode
ABSW	The fault messages regarding the absolute encoder will be output via ABSW. Please refer to Figure 12.4 for timing diagram.	ALL

**Setting value: 0x0E**

DO Name	DO Function Description	Control Mode
IDXD	The definitions of indexing coordinates are defined.	ALL

**Setting value: 0x10**

DO Name	DO Function Description	Trigger Method	Control Mode
OLW	<p>Output overload warning. OLW is activated when the servo drive has detected that the motor has reached the output overload time set by parameter P1-56.</p> <p><math>t_{OL}</math> = Permissible Time for Overload x setting value of P1-56</p> <p>When overload accumulated time (continuously overload time) exceeds the value of <math>t_{OL}</math>, the overload warning signal will output, i.e. DO signal, OLW will be ON. However, if the accumulated overload time (continuous overload time) exceeds the permissible time for overload, the overload alarm (AL006) will occur.</p> <p>For example:</p> <p>If the setting value of parameter P1-56 (Output Overload Warning Time) is 60%, when the permissible time for overload exceeds 8 seconds at 200% rated output, the overload fault (AL006) will be detected and shown on the LED display.</p> <p>At this time, <math>t_{OL} = 8 \times 60\% = 4.8</math> seconds</p> <p>Result:</p> <p>When the drive output is at 200% rated output and the drive is continuously overloaded for 4.8 seconds, the</p>	Level Triggered	PR

DO Name	DO Function Description	Trigger Method	Control Mode
	overload warning signal will be ON (DO code is 0x10, i.e. DO signal OLW will be activated). If the drive is continuously overloaded for 8 seconds, the overload alarm will be detected and shown on the LED display (AL006). Then, Servo Fault signal will be ON (DO signal ALRM will be activated).		

**Setting value: 0x11**

DO Name	DO Function Description	Trigger Method	Control Mode
WARN	Servo warning activated. WARN is activated when the drive has detected Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault conditions.	Level Triggered	All

**Setting value: 0x12**

DO Name	DO Function Description	Trigger Method	Control Mode
OVF	Position command overflow. OVF is activated when the servo drive has detected that a position command overflows.	Level Triggered	All

**Setting value: 0x13**

DO Name	DO Function Description	Trigger Method	Control Mode
SNL (SCWL)	Reverse software limit. SNL is activated when the servo drive has detected that reverse software limit is reached.	Level Triggered	All

**Setting value: 0x14**

DO Name	DO Function Description	Trigger Method	Control Mode
SPL (SCCWL)	Forward software limit. SPL is activated when the servo drive has detected that forward software limit is reached.	Level Triggered	All

**Setting value: 0x15**

DO Name	DO Function Description	Trigger Method	Control Mode
CMD_OK	<p>Internal position command completed output. CMD_OK is activated when the servo drive has detected that the internal position command has been completed.</p> <p>When executing PR command, this DI signal is OFF. After the execution of PR command is completed, this DI signal is ON.</p> <p>The output is used to indicate the internal position command has been completed and it does not indicate that the motor positioning is completed. For the signal of motor positioning completed, please refer to DO signal, TPOS.</p>	Level Triggered	PR

**Setting value: 0x16**

DO Name	DO Function Description	Trigger Method	Control Mode
CAP_OK	Capture operation completed output. CAP_OK is activated when the servo drive has detected that capture operation has been completed.	Level Triggered	PR

**Setting value: 0x17**

DO Name	DO Function Description	Trigger Method	Control Mode
MC_OK	Motion control completed output. MC_OK is activated when CMD_OK and TPOS are both ON. It indicates MC_OK is activated only when the servo drive has detected that the position command has been given and the positioning has been completed also. If only CMD_OK or TPOS is ON, MC_OK will not be activated.	Level Triggered	PR

**Setting value: 0x18**

DO Name	DO Function Description	Trigger Method	Control Mode
CAM_AREA	<p>CAM_AREA is activated when the servo drive has detected the master position of E-Cam (electronic CAM) is within the setting area.</p> <p>Please note: ASDA-A2 series L type models do not provide Electronic Cam (E-Cam) function.</p>	Level Triggered	PR

**Setting value: 0x19**

DO Name	DO Function Description	Trigger Method	Control Mode
SP_OK	Speed reached output. SP_OK will be activated when the speed error is equal and below the setting value of P1-47.	Level Triggered	S, Sz

**Setting value: 0x2C**

DO Name	DO Function Description	Control Mode
Zon1	Zon1 will be activated when the value of P0-09 is within the range between the setting values of P0-54 ~ P0-55.	ALL

**Setting Value: When ABSE is activated (ON), DO2 is switched to the function of ABSR to replace the DO function set by parameter P2-19.**

DO Name	DO Function Description	Trigger Method	Control Mode
ABSR is controlled by DO2	When ABSR is OFF, it indicates that the host controller is ready for accessing next bit communication. When ABSR is activated (ON), it indicates that the host controller has read and fetched the data. ABSR is effective only when the digital input, ABSE is ON. Please refer to Figure 12.4 for timing diagram.	Level Triggered	ALL

**Setting Value: When ABSE is activated (ON), DO3 is switched to the function of ABSD to replace the DO function set by parameter P2-20.**

DO Name	DO Function Description	Trigger Method	Control Mode
ABSD is controlled by DO3	After data read, the absolute position data will be output and put at ABSD. The data is guaranteed correct when ABSR is ON. ABSD is effective only when the digital input, ABSE is ON. Please refer to Figure 12.4 for timing diagram.	Level Triggered	ALL

**Setting value: 0x30**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_0	Output the status of bit00 of P4-06.	Level Triggered	All

**Setting value: 0x31**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_1	Output the status of bit01 of P4-06.	Level Triggered	All

**Setting value: 0x32**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_2	Output the status of bit02 of P4-06.	Level Triggered	All

**Setting value: 0x33**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_3	Output the status of bit03 of P4-06.	Level Triggered	All

**Setting value: 0x34**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_4	Output the status of bit04 of P4-06.	Level Triggered	All

**Setting value: 0x35**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_5	Output the status of bit05 of P4-06.	Level Triggered	All

**Setting value: 0x36**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_6	Output the status of bit06 of P4-06.	Level Triggered	All

**Setting value: 0x37**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_7	Output the status of bit07 of P4-06.	Level Triggered	All

**Setting value: 0x38**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_8	Output the status of bit08 of P4-06.	Level Triggered	All

**Setting value: 0x39**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_9	Output the status of bit09 of P4-06.	Level Triggered	All

**Setting value: 0x3A**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_A	Output the status of bit10 of P4-06.	Level Triggered	All

**Setting value: 0x3B**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_B	Output the status of bit11 of P4-06.	Level Triggered	All

**Setting value: 0x3C**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_C	Output the status of bit12 of P4-06.	Level Triggered	All

**Setting value: 0x3D**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_D	Output the status of bit13 of P4-06.	Level Triggered	All

**Setting value: 0x3E**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_E	Output the status of bit14 of P4-06.	Level Triggered	All

**Setting value: 0x3F**

DO Name	DO Function Description	Trigger Method	Control Mode
SDO_F	Output the status of bit15 of P4-06.	Level Triggered	All

 **NOTE**

- 1) When P2-18 to P2-22 is set to 0, it indicates output function is disabled.

# Chapter 9 Communications

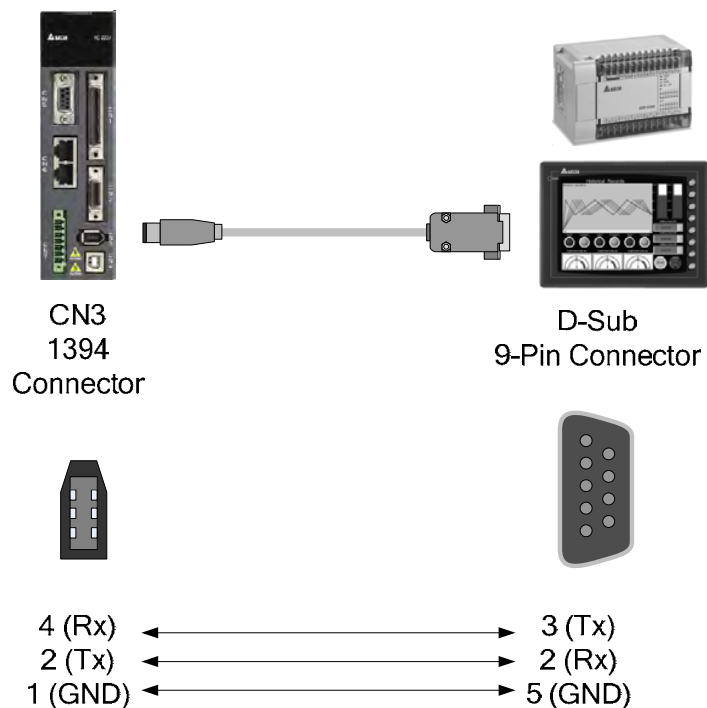
## 9.1 RS-485 & RS-232 Communication Hardware Interface

The ASDA-A2 series servo drives support RS-485 and RS-232 serial communication. All aspects of control, operation and monitoring as well as programming of the controller can be achieved via communication. However, only one communication mode can be used at a time. Users can select the desired communication mode via parameter P3-05.

Please refer to the following sections for connections and limitations.

### RS-232

#### ■ Configuration



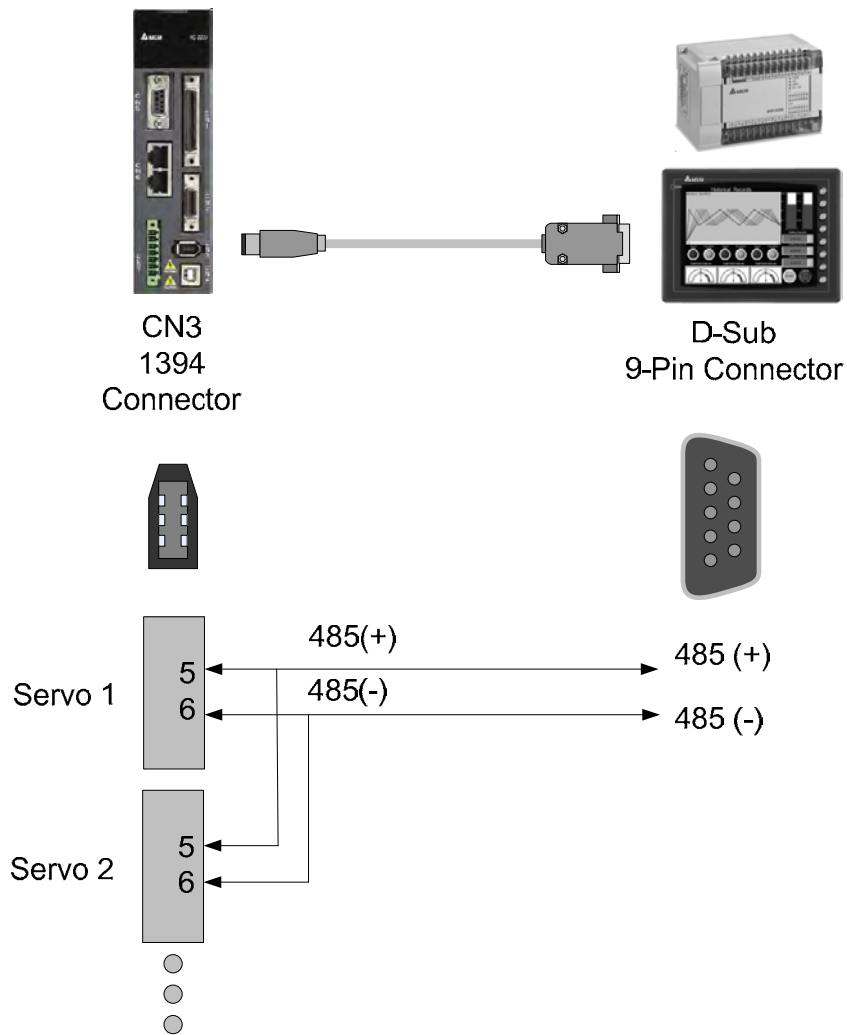
#### NOTE

- 1) Recommended maximum cable length is 15m (50ft.). Please note, RFI / EME noise should be kept to a minimum, communication cable should be kept apart from high voltage wires. If a transmission speed of 38400 bps or greater is required, the maximum length of the communication cable is 3m (9.84ft.) which will ensure the correct and desired baud rate.
- 2) The number shown in the previous figure indicates the terminal number of each connector.



## RS-485

### ■ Configuration



### NOTE

- 1) The maximum cable length is 100m (39.37inches) when the servo drive is installed in a location where there are only a few interferences. Please note, RFI / EME noise should be kept to a minimum, communication cable should kept apart from high voltage wires. If a transmission speed of 38400 bps or greater is required, the maximum length of the communication cable is 15m (50ft.) which will ensure the correct and desired baud rate.
- 2) The number shown in the pervious figure indicates the terminal number of each connector.
- 3) The power supply should provide a +12V and higher DC voltage.
- 4) Please use a REPEATER if more than 32 synchronous axes are required. Maximum 127 servo drives can be connected.
- 5) For the terminal identification of CN3, please refer to Section 3.6.

## 9.2 Communication Parameters

The following four communication parameters, P3-00 (Communication Address Setting), P3-01 (Transmission Speed), P3-02 (Communication Protocol) and P3-05 (Communication Mode) are essential and must be set for the communication between the master (PC, etc.) and the AC servo drive. The other communication parameters, such as P3-03 (Transmission Fault Treatment), P3-04 (Communication Time Out Detection), P3-06 (Digital Input Communication Function), P3-07 (Communication Response Delay Time) and P3-08 (Monitor Mode) are for advanced communication settings. For the descriptions of all communication parameters, please refer to the Chapter 8.

P3-00●	ADR	Communication Address Setting	Address: 040EH 040FH
	Operation Interface:	Keypad / Software	Communication
	Default:	0x7F	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0x01 ~ 0x7F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

Settings: This parameter is used to set the communication slave address in hexadecimal format.

Display	0	0	Y	X
Range	-	-	0 ~ 7	0 ~ F

X: Axis number which indicates the value must be within the range from 0 through F.

Y: Group number which indicates the value must be within the range from 0 to through 7

When using RS-232/485 communication, this parameter is used set the communication address in hexadecimal format. If the AC servo drive is controlled by RS-232/485 communication, each drive (or device) must be uniquely identified. One servo drive only can set one address. If the address is duplicated, there will be a communication fault. This address is an absolute address which represents the servo drive on a RS-232/485 or CANbus network.

Please note:

1. When the address of host (external) controller is set to 0xFF, it is with auto-respond function. Then, the servo drive will receive from and respond to host (external) controller both no matter the address is matching or not. However, the parameter P3-00 cannot be set to 0xFF.

<b>P3-01</b>	<b>BRT</b>	<b>Transmission Speed</b>		<b>Address: 0302H 0303H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: Section 9.2
	Default:	0x0203		
	Control Mode:	ALL		
	Unit:	bps		
	Range:	0x0000 ~ 0x0405		
	Data Size:	16-bit		
Display Format:	Hexadecimal			

Settings: This parameter is used to set the baud rate and data transmission speed of the communications.

	0	Z	Y	X
COM Port	-	CAN	-	RS-232/485
Range	0	0 ~ 4	0	0 ~ 5

Settings:

Setting value of X: Baud rate setting

- 0: Baud rate 4800 (data transmission speed: bits / second)
- 1: Baud rate 9600 (data transmission speed: bits / second)
- 2: Baud rate 19200 (data transmission speed: bits / second)
- 3: Baud rate 38400 (data transmission speed: bits / second)
- 4: Baud rate 57600 (data transmission speed: bits / second)
- 5: Baud rate 115200 (data transmission speed: bits / second)

Setting value of Y: Reserved. Must be set to 0.

Setting value of Z: Data transmission speed setting

- 0: 125K bits / second
- 1: 250K bits / second
- 2: 500K bits / second
- 3: 750K bits / second
- 4: 1.0M bits / second

Please note:

1. When setting this parameter via CANopen communication, only the setting of Z (data transmission speed setting) can be configured and other settings.
2. The communication transmission speed for USB can be set to 1.0M bits / second only and cannot be changed.

P3-02	PTL	Communication Protocol	Address: 0304H 0305H
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 9.2
	Default:	6	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0 ~ 8	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	

**Settings:** This parameter is used to set the communication protocol. The alphanumeric characters represent the following: 7 or 8 is the number of data bits; N, E or O refers to the parity bit, Non, Even or Odd; the 1 or 2 is the numbers of stop bits.

- 0: Modbus ASCII mode, <7,N,2>
- 1: Modbus ASCII mode, <7,E,1>
- 2: Modbus ASCII mode, <7,O,1>
- 3: Modbus ASCII mode, <8,N,2>
- 4: Modbus ASCII mode, <8,E,1>
- 5: Modbus ASCII mode, <8,O,1>
- 6: Modbus RTU mode, <8,N,2>
- 7: Modbus RTU mode, <8,E,1>
- 8: Modbus RTU mode, <8,O,1>

P3-05	CMM	Communication Selection	Address: 030AH 030BH
	Operation Interface:	Keypad / Software      Communication	Related Section: Section 9.2
	Default:	0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0x00 ~ 0x01	
	Data Size:	16-bit	

Display  
Format: Hexadecimal

Settings: Communication interface selection

0: RS-232

1: RS-485

Multiple communication modes RS232 and RS-485 cannot be used within one communication ring.

## 9.3 MODBUS Communication Protocol

When using RS-232/485 serial communication interface, each ASDA-A2 series AC servo drive has a pre-assigned communication address specified by parameter “P3-00”. The computer then controls each AC servo drive according to its communication address. ASDA-A2 series AC servo drives can be set up to communicate on a MODBUS network using one of the following modes: ASCII (American Standard Code for Information Interchange) or RTU (Remote Terminal Unit). Users can select the desired mode along with the serial port communication protocol in parameter “P3-02”.

### ■ Code Description

#### ASCII Mode:

When AC servo drives are set up to communicate on a MODBUS network using ASCII (American Standard Code for Information Interchange) mode, each 8-bit data in a message is sent as two ASCII characters between the master and the slave. For example, a 1-byte data: 64 Hex, shown as ‘64’ in ASCII, consists of ‘6’ (36Hex) and ‘4’ (34Hex).

ASCII Characters:

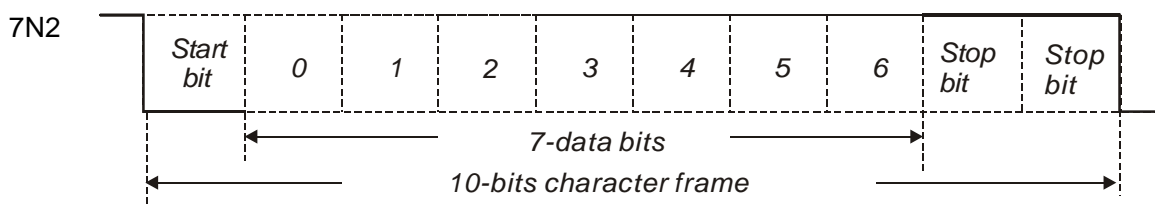
Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

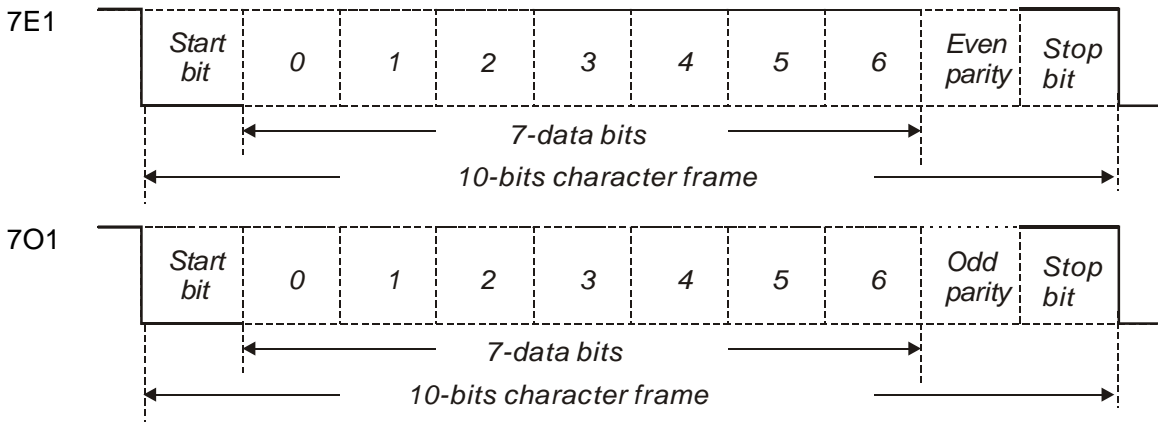
#### RTU Mode:

When AC servo drives are set up to communicate on a MODBUS network using RTU (Remote Terminal Unit) mode, each 8-bit data is the combination of two 4-bit hexadecimal characters. For example, a 1-byte data: 64 Hex. Comparing to ASCII mode, the transmission speed of RTU mode is better.

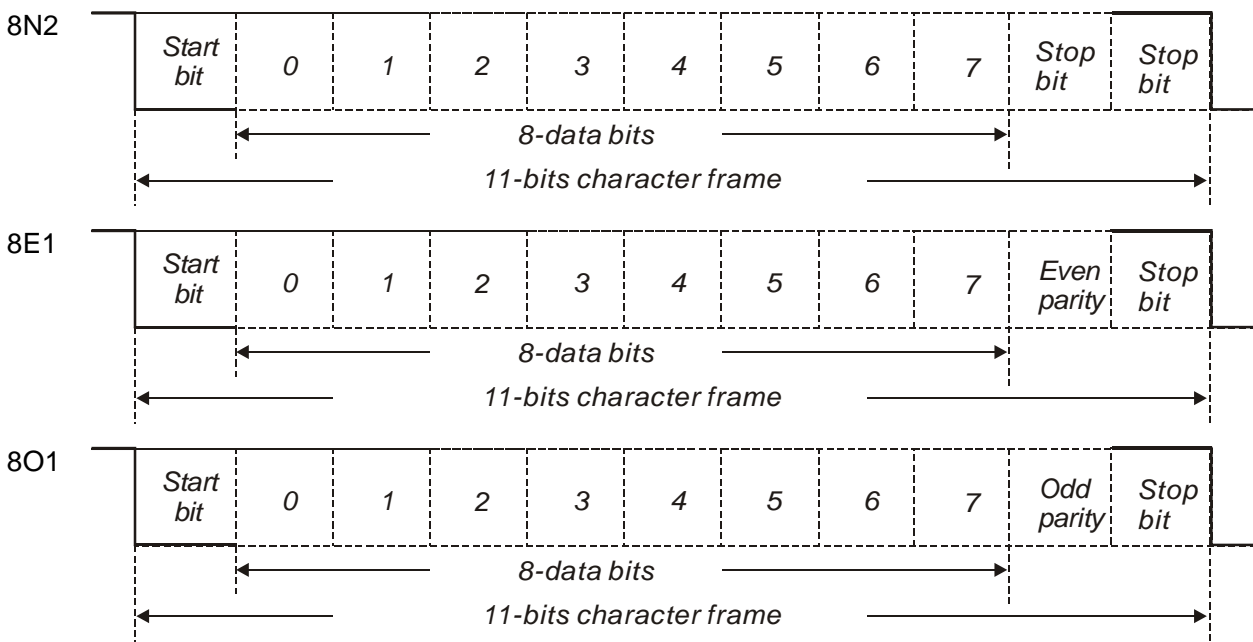
### ■ Data Format

10-bit character frame (For 7-bit character)





11-bit character frame (For 8-bit character)



■ Communication Protocol

ASCII Mode:

Start	Start character ': ' (3AH)
Slave Address	Communication address: 1-byte consists of 2 ASCII codes
Function	Function code: 1-byte consists of 2 ASCII codes
Data (n-1)	Contents of data: n word = n x 2-byte consists of n x 4 ASCII codes n≤10
.....	
Data (0)	
LRC	Error checking: 1-byte consists of 2 ASCII codes
End 1	End code 1: (0DH)(CR)

End 0	End code 0: (0AH)(LF)
-------	-----------------------

The communication protocol of ASCII mode starts from a start character ':' (3AH). ADR is 1-byte consists of 2 ASCII codes. CR (Carriage Return) and LF (Line Feed) is a special sequence of characters signifying the end. There are communication address, function code, contents of data and LRC (Longitudinal Redundancy Check) between Start and End.

### RTU Mode:

Start	A silent interval of more than 10ms
Slave Address	Communication address: 1-byte
Function	Function code: 1-byte
Data (n-1)	Contents of data: n word = n x 2-byte, n≤12
.....	
Data (0)	
CRC	Error checking: 1-byte
End 1	A silent interval of more than 10ms

The communication protocol of RTU mode starts from a signal of silent interval and ends at a signal of silent interval as well. There are communication address, function code, contents of data and CRC (Cyclical Redundancy Check) between Start and End.



The format of data characters depends on the function code. The available function codes and examples for AC servo drive are described as follows:

**Example 1:**

**Function code: 03H, read N words (The maximum value of N is 10)**

For example, reading continuous 2 words from starting address 0200H of AC servo drive. In the response message (Slave), the content of starting data address 0200H is 00B1H and the content of second data address 0201H is 1F40H.

**ASCII Mode:**

**Command message (Master):**

Start	‘.’
Slave Address	‘0’
	‘1’
Function	‘0’
	‘3’
Starting data address	‘0’
	‘2’
	‘0’
	‘0’
Number of data (In Word)	‘0’
	‘0’
	‘0’
	‘2’
LRC Check	‘F’
	‘8’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

**Response message (Slave):**

Start	‘.’
Slave Address	‘0’
	‘1’
Function	‘0’
	‘3’
Number of data (In Byte)	‘0’
	‘4’
Content of starting data address 0200H	‘0’
	‘0’
	‘B’
Content of second data address 0201H	‘1’
	‘F’
	‘4’
	‘0’
LRC Check	‘E’
	‘8’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

**RTU Mode:****Command message (Master):**

Slave Address	01H
Function	03H
Starting data address	02H (High)
	00H (Low)
Number of data (In Word)	00H
	02H
CRC Check Low	C5H (Low)
CRC Check High	B3H (High)

**Response message (Slave):**

Slave Address	01H
Function	03H
Number of data (In Byte)	04H
Content of starting data address 0200H	00H (High)
	B1H (Low)
Content of second data address 0201H	1FH (High)
	40H (Low)
CRC Check Low	A3H (Low)
CRC Check High	D4H (High)

Please note:

In RTU mode, a silent interval of more than 10ms is needed before and after transmission.

**Example 2:****Function code: 06H, write 1 word**

For example, writing 100 (0064H) to starting data address 0200H. The slave will send the response message to the master after writing operation is completed.

**ASCII Mode:****Command message (Master):**

Start	‘.’
Slave Address	‘0’
	‘1’
Function	‘0’
	‘6’
Starting data address	‘0’
	‘2’
	‘0’
	‘0’
Content of data	‘0’
	‘0’
	‘6’
	‘4’
LRC Check	‘9’
	‘3’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

**Response message (Slave):**

Start	‘.’
Slave Address	‘0’
	‘1’
Function	‘0’
	‘6’
Starting data address	‘0’
	‘2’
	‘0’
	‘0’
Content of data	‘0’
	‘0’
	‘6’
	‘4’
LRC Check	‘9’
	‘3’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

**RTU Mode:****Command message (Master):**

Address	01H
Slave Function	06H
Starting data address	02H (High)
	00H (Low)
Content of data	00H (High)
	64H (Low)
CRC Check Low	89H (Low)
CRC Check High	99H (High)

**Response message (Slave):**

Address	01H
Slave Function	06H
Starting data address	02H (High)
	00H (Low)
Content of data	00H (High)
	64H (Low)
CRC Check Low	89H (Low)
CRC Check High	99H (High)

Please note:

In RTU mode, a silent interval of more than 10ms is needed before and after transmission.

**Example 3:****Function code: 10H, write N words (The maximum value of N is 10)**

For example, writing continuous 2 words into starting address 0112H of AC servo drive. The content of first data address is 0BB8H and the content of second data address is 0000H.

**ASCII Mode:****Command message (Master):**

Start	‘:’
Slave Address	‘0’
	‘1’
Function	‘1’
	‘0’
Starting data address	‘0’
	‘1’
	‘1’
	‘2’
Number of data (In Word)	‘0’
	‘0’
	‘0’
	‘2’
Number of data (In Byte)	‘0’
	‘4’
Content of first data address	‘0’
	‘B’
	‘B’
Content of second data address	‘8’
	‘0’
	‘0’
	‘0’
LRC Check	‘1’
	‘3’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

**Response message (Slave):**

Start	‘:’
Slave Address	‘0’
	‘1’
Function	‘1’
	‘0’
Starting data address	‘0’
	‘1’
	‘1’
	‘2’
Number of data	‘0’
	‘0’
	‘0’
	‘2’
LRC Check	‘D’
	‘A’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

**RTU Mode:****Command message (Master):**

Slave Address	01H
Function	10H
Starting data address	01H (High)
	12H (Low)
Number of data (In Word)	00H (High)
	02H (Low)
Number of data (In Byte)	04H
Content of first data address	0BH (High)
	B8H (Low)
Content of second data address	00H (High)
	00H (Low)
CRC Check Low	FCH (Low)
CRC Check High	EBH (High)

**Response message (Slave):**

Slave Address	01H
Function	10H
Starting data address	01H (High)
	12H (Low)
Number of data (In Word)	00H (High)
	02H (Low)
CRC Check Low	E0H (Low)
CRC Check High	31H (High)

Please note:

In RTU mode, a silent interval of more than 10ms is needed before and after transmission.

## ■ LRC and CRC Error Checking

ASCII mode adopts LRC (Longitudinal Redundancy Check) and RTU mode adopts CRC (Cyclical Redundancy Check)

### LRC (ASCII Mode):

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, the values of the bytes from Slave address to last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum.

For example, reading 1 word from address 05C4H of the AC servo drive with address 7FH.

Start	'.'
Slave address	'7'
	'F'
Function	'0'
	'3'
Starting data address	'0'
	'5'
	'C'
	'4'
Number of data	'0'
	'0'
	'0'
	'1'
LRC Check	'B'
	'4'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

$7FH + 03H + 05H + C4H + 00H + 01H = 14CH$ , take 4CH only, the 2's complement negation of 4CH is B4H.

Hence, we can know that LRC CHK is 'B', '4'.

**CRC (RTU Mode):**

CRC (Cyclical Redundancy Check) is calculated by the following steps:

Step 1: Load a 16-bit register (called CRC register) with FFFFH.

Step 2: Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register, putting the result in the CRC register.

Step 3: Extract and examine the LSB. If the LSB of CRC register is 0, shift the CRC register one bit to the right. If the LSB of CRC register is 1, shift the CRC register one bit to the right, then Exclusive OR the CRC register with the polynomial value A001H.

Step 4: Repeat step 3 until eight shifts have been performed. When this is done, a complete 8-bit byte will have been processed, then perform step 5.

Step 5: Repeat step 2 to step 4 for the next 8-bit byte of the command message.

Continue doing this until all bytes have been processed. The final contents of the CRC register are the CRC value.

For example, reading 2 words from address 0101H of the AC servo drive with address 01H. The final content of the CRC register from ADR to last data character is 3794H, then the command message is shown as follows. What should be noticed is that 94H have to be transmitted before 37H.

Command Message	
ADR	01H
CMD	03H
Starting data address	01H (High)
	01H (Low)
Number of data (In Word)	00H (High)
	02H (Low)
CRC Check Low	94H (Low)
CRC Check High	37H (High)

**Example**

The following is an example of CRC generation using C language. The function takes two arguments:

```
unsigned char* data;
```

```
unsigned char length
```

The function returns the CRC value as a type of unsigned integer.

```
unsigned int crc_chk(unsigned char* data, unsigned char length) {
    int j;
    unsigned int reg_crc=0xFFFF;

    while( length-- ) {
        reg_crc^= *data++;
        for (j=0; j<8; j++ ) {
            if( reg_crc & 0x01 ) { /*LSB(bit 0) = 1 */
                reg_crc = (reg_crc >> 1)^0xA001;
            } else {
                reg_crc = (reg_crc>>1);
            }
        }
    }
    return reg_crc;
}
```

PC communication program example:

```
#include<stdio.h>
#include<dos.h>
#include<conio.h>
#include<process.h>
#define PORT 0x03F8 /* the address of COM 1 */
#define THR 0x0000
#define RDR 0x0000
#define BRDL 0x0000
#define IER 0x0001
#define BRDH 0x0001
#define LCR 0x0003
#define MCR 0x0004
#define LSR 0x0005
#define MSR 0x0006
unsigned char rdat[60];
/* read 2 data from address 0200H of ASD with address 1 */
```



```

unsigned char tdat[60]={'.', '0', '1', '0', '3', '0', '2', '0', '0', '0', '0', '2', 'F', '8', '\r', '\n'};
void main() {
int I;
outportb(PORT+MCR,0x08);          /* interrupt enable */
outportb(PORT+IER,0x01);          /* interrupt as data in */
outportb(PORT+LCR,( inportb(PORT+LCR) | 0x80 ) );
/* the BRDL/BRDH can be access as LCR.b7 == 1 */
outportb(PORT+BRDL,12);
outportb(PORT+BRDH,0x00);
outportb(PORT+LCR,0x06);          /* set prorocol
                                   <7,E,1> = 1AH,          <7,O,1> = 0AH
                                   <8,N,2> = 07H          <8,E,1> = 1BH
                                   <8,O,1> = 0BH          */

for( I = 0; I<=16; I++ ) {
    while( !(inportb(PORT+LSR) & 0x20) ); /* wait until THR empty */
    outportb(PORT+THR,tdat[I]);          /* send data to THR */
}
I = 0;
while( !kbhit() ) {
    if( inportb(PORT+LSR)&0x01 ) { /* b0==1, read data ready */
        rdat[I++] = inportb(PORT+RDR); /* read data from RDR */
    }
}
}

```

## 9.4 Communication Parameter Write-in and Read-out

There are following 8 groups for parameters:

Group 1: Basic parameters	(example: P1-xx)
Group 2: Extension parameters	(example: P2-xx)
Group 3: Communication parameters	(example: P3-xx)
Group 4: Diagnosis parameters	(example: P4-xx)
Group 5: Motion control parameters	(example: P5-xx)
Group 6: PR definition parameters	(example: P6-xx)
Group 7: PR definition parameters	(example: P7-xx)

For a complete listing and description of all parameters, refer to Chapter 8.

**Communication write-in parameters for ASDA-A2 series are including:**

Group 0: All parameters except P0-00 ~ P0-01, P0-08 ~ P0-13 and P0-46

Group 1: P1-00 ~ P1-76

Group 2: P2-00 ~ P2-67

Group 3: P3-00 ~ P3-11

Group 4: All parameters except P4-00 ~ P4-04 and P4-08 ~ P4-09

Group 5: All parameters except P5-10, P5-16 and P5-76

Group 6: P6-00 ~ P6-99

Group 7: P7-00 ~ P7-27

### NOTE

- 1) P3-01: After the new transmission speed is set, the next data will be written in new transmission speed.
- 2) P3-02: After the new communication protocol is set, the next data will be written in new communication protocol.
- 3) P4-05: JOG control of servo motor. For the description, refer to Chapter 8.
- 4) P4-06: Force output contact control. This parameter is for the users to test if DO (Digit output) is normal. User can set 1, 2, 4, 8, 16 to test DO1, DO2, DO3, DO4, DO5, respectively. After the test has been completed, please set this parameter to 0 to inform the drive that the test has been completed.
- 5) P4-10: Adjustment function selection. If user desires to change the settings of this parameter, user has to set the value of the parameter P2-08 to 20 (hexadecimal: 14H) first and then restart. After restarting, the settings of parameter P4-10 can become modified.

- 6) P4-11 ~ P4-21: These parameters are for offset adjustment. Do not change the factory default setting if not necessary. If the user desires to change the settings of these parameters, the user has to set the value of the parameter P2-08 to 22 (hexadecimal: 16H) first and then restart. After restarting, the settings of parameters P4-11 to P4-21 can become modified.

**Communication read-out parameters for ASDA-A2 series are including:**

Group 0: P0-00 ~ P0-46

Group 1: P1-00 ~ P1-76

Group 2: P2-00 ~ P2-67

Group 3: P3-00 ~ P3-11

Group 4: P4-00 ~ P4-23

Group 5: P5-00 ~ P5-99

Group 6: P6-00 ~ P6-99

Group 7: P7-00 ~ P7-27















# Chapter 10 Troubleshooting


If a fault is detected on the servo motor or drive, a corresponding fault code will be shown on the drive's LED display. Fault codes can also be transmitted via communication, see P0-01 and P4-00 ~ P4-04 for display on controller or HMI.

## 10.1 Servo Drive Fault Messages Table

Fault Messages				
Display	Fault Name	Fault Description	Corresponding Digital Output	Servo Status
AL001	Over current	Main circuit current is higher than 1.5 multiple of motor's instantaneous maximum current value.	ALRM (DO code: 0x07)	Servo Off
AL002	Over voltage	Main circuit voltage has exceeded its maximum allowable value.	ALRM (DO code: 0x07)	Servo Off
AL003	Under voltage	Main circuit voltage is below its minimum specified value.	WARN (DO code: 0x11)	Servo Off
AL004	Motor combination error	The motor does not match the drive. They are not correctly matched for size (power rating).	ALRM (DO code: 0x07)	Servo Off
AL005	Regeneration error	Regeneration control operation is in error.	ALRM (DO code: 0x07)	Servo Off
AL006	Over load	Servo motor and drive is overload.	ALRM (DO code: 0x07)	Servo Off
AL007	Over speed	Motor's control speed exceeds the limit of normal speed.	ALRM (DO code: 0x07)	Servo Off
AL008	Abnormal pulse command	Input frequency of pulse command exceeds the limit of its allowable setting value.	ALRM (DO code: 0x07)	Servo Off
AL009	Excessive deviation of position control	Position control deviation value exceeds the limit of its allowable setting value.	ALRM (DO code: 0x07)	Servo Off
AL011	Encoder error	Pulse signal is in error.	ALRM (DO code: 0x07)	Servo Off
AL012	Adjustment error	Adjusted value exceeds the limit of its allowable setting value when perform electrical adjustment.	ALRM (DO code: 0x07)	Servo Off
AL013	Emergency stop	Emergency stop switch is activated.	WARN (DO code: 0x11)	Servo Off

Fault Messages				
Display	Fault Name	Fault Description	Corresponding Digital Output	Servo Status
AL014	Reverse limit error	Reverse limit switch is activated.	WARN (DO code: 0x11)	Servo On
AL015	Forward limit error	Forward limit switch is activated.	WARN (DO code: 0x11)	Servo On
AL016	IGBT overheat	The temperature of IGBT is over high.	ALRM (DO code: 0x07)	Servo Off
AL017	Abnormal EEPROM	EEPROM write-in and read-out is in error.	ALRM (DO code: 0x07)	Servo Off
AL018	Abnormal signal output	The encoder output exceeds the rated output frequency.	ALRM (DO code: 0x07)	Servo Off
AL019	Serial communication error	RS-232/485 communication is in error.	ALRM (DO code: 0x07)	Servo Off
AL020	Serial communication time out	RS-232/485 communication time out.	WARN (DO code: 0x11)	Servo On
AL021	Reserved			
AL022	Abnormal main circuit power	RST power cable of main circuit power might loose or has no power supply	WARN (DO code: 0x11)	Servo Off
AL023	Early warning for overload	To warn that the servo motor and drive is going to overload. This alarm will display before ALM06. When the servo motor reach the setting value of P1-56, the motor will send a warning to the drive. After the drive has detected the warning, the DO signal OLW will be activated and this fault message will display.	WARN (DO code: 0x11)	Servo On
AL024	Encoder initial magnetic field error	The magnetic field of the encoder U, V, W signal is in error.	ALRM (DO code: 0x07)	Servo Off
AL025	The internal of the encoder is in error	The internal memory of the encoder is in error. An internal counter error is detected.	ALRM (DO code: 0x07)	Servo Off
AL026	Unreliable internal data of the encoder	An encoder data error is detected for three times.	ALRM (DO code: 0x07)	Servo Off
AL027	Encoder reset error	Abnormal reset of encoder chip	ALM	Servo Off






	The encoder is over voltage or the internal of the encoder is in error	The charge circuit of the servo drive has been removed and the voltage is higher than the specification (> 3.8V) or the signal of the encoder is in error.	ALM	Servo Off
	Gray code error	Absolute position is in error	ALM	Servo Off
	Motor crash error	In order to protect the motor, this alarm will be activated when the setting value of P1-57 is reached after a period of time set by P1-58.	ALRM (DO code: 0x07)	Servo Off
	Incorrect wiring of the motor power line U, V, W	The wiring connections of U, V, W (for servo motor output) and GND (for grounding) are in error.	ALRM (DO code: 0x07)	Servo Off
	Internal communication of the encoder is in error	1. Internal communication error of the absolute encoder 2. Internal error of other type of encoder	ALRM (DO code: 0x07)	Servo Off
	Excessive deviation of full closed-loop position control	The position control deviation value of full closed-loop exceeds the specified limit.	ALRM (DO code: 0x07)	Servo Off
	Communication of linear scale is breakdown	Communication of linear scale is breakdown	ALRM (DO code: 0x07)	Servo Off
	Analog input voltage error	The analog input voltage is higher than the value of P1-83 over 50ms.	ALRM (DO code: 0x07)	Servo Off
	Warning of servo drive function overload	The function of the servo drive is overload	WARN	Servo On
	The absolute position is lost	Due to battery undervoltage or the failure of power supply, the encoder lost the internal record.	WARN	Servo On
	Encoder under voltage	The voltage of the absolute encoder is lower than the specification	WARN	Servo On
	The multi-turn of absolute encoder overflows	The multi-turn of absolute encoder exceeds the maximum range: -32768 ~ +32767	WARN	Servo On
	Absolute data transmitted via I/O is in error	The sequence is wrong when reading the absolute position via DIO.	WARN	Servo On
	Wrong motor type	Incremental motor is not allowed to activate the absolute function.	ALM	Servo Off

	DSP firmware upgrade	EE-PROM is not reset after the firmware version is upgraded. This fault can be cleared after setting P2-08 to 30 first, and then setting P2-08 to 28 next and restarting the servo drive.	ALM (DO code: 0x07)	Servo Off
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## 10.2 CANopen Communication Fault Messages Table







Fault Messages				
Display	Fault Name	Fault Description	Corresponding Digital Output	Servo Status
AL 111	CANopen SDO receives buffer overflow	SDO Rx buffer overflow is detected (receive two or more SDO packets in 1ms).	ALRM (DO code: 0x07)	Servo On
AL 112	CANopen PDO receives buffer overflow	PDO Rx buffer overflow is detected (receive two or more PDO (same COBID) packets in 1ms).	ALRM (DO code: 0x07)	Servo On
AL 121	Index error occurs when accessing CANopen PDO	The specified Index in the message does not exist.	ALRM (DO code: 0x07)	Servo On
AL 122	Sub-index error occurs when accessing CANopen PDO	The specified Sub-index in the message does not exist.	ALRM (DO code: 0x07)	Servo On
AL 123	Data size error occurs when accessing CANopen PDO	The data length in the message does not match the specified object.	ALRM (DO code: 0x07)	Servo On
AL 124	Data range error occurs when accessing CANopen PDO	The data in the message has exceeded the data range of the specified object.	ALRM (DO code: 0x07)	Servo On
AL 125	CANopen PDO mapping object is read-only and write-protected	The specified object in the message is read-only and write-protected (cannot be changed).	ALRM (DO code: 0x07)	Servo On
AL 126	CANopen PDO mapping object is not allowed in PDO	The specified object in the message does not support PDO.	ALRM (DO code: 0x07)	Servo On
AL 127	CANopen PDO mapping object is write-protected when Servo On.	The specified object in the message is write-protected (cannot be changed) when Servo On.	ALRM (DO code: 0x07)	Servo On
AL 128	Error occurs when reading CANopen PDO mapping object via EEPROM.	An error occurs when loading the default settings from EEPROM at start-up. All CANopen objects return to their default settings automatically.	ALRM (DO code: 0x07)	Servo On



















Fault Messages				
Display	Fault Name	Fault Description	Corresponding Digital Output	Servo Status
	Error occurs when writing CANopen PDO mapping object via EEPROM.	An error occurs when writing the current settings into EEPROM.	ALRM (DO code: 0x07)	Servo On
	The accessing address of EEPROM is out of range when using CANopen PDO mapping object	The amount of the data saved in EEPROM has exceeded the space determined by the firmware. Maybe the firmware version has been upgraded, and it causes that the data of old firmware version saved in EEPROM cannot be used.	ALRM (DO code: 0x07)	Servo On
	CRC of EEPROM calculation error occurs when using CANopen PDO mapping object	The data saved in EEPROM has been damaged and all CANopen objects return to their default settings automatically.	ALRM (DO code: 0x07)	Servo On
	Enter the incorrect password when using CANopen PDO mapping object	The parameter is password protected when using CANopen communication to access the parameter. The users must enter the valid password to unlock the parameter.	ALRM (DO code: 0x07)	Servo On
	Abnormal CAN Bus hardware	CAN Bus off or Error Rx/Tx Counter exceeds 128.	ALRM (DO code: 0x07)	Servo On

## 10.3 Motion Control Fault Messages Table

Fault Messages					
Display	Fault Name	Fault Description	Troubleshooting	Corresponding Digital Output	Servo Status
	An error occurs when loading CANopen data	An error occurs when loading data from EEPROM.	DI:ARST · CANopen 0x1011 Restore default parameter	WARN (DO code: 0x11)	Servo On
	Parameter group of PR#8 is out of range	The group of PR#8 command source, P_Grp exceeds the range.	DI:ARST · CANopen 0x1011 Restore default parameter	WARN (DO code: 0x11)	Servo On
	The parameter number of PR#8 is out of range	The parameter number P_Idx of PR#8 command exceeds the range.	DI:ARST · CANopen 0x1011 Restore default parameter	WARN (DO code: 0x11)	Servo On
	Write parameter error: exceeds the limit of normal range.	Write parameter error occurs in PR mode: the setting value exceeds the limit of normal range.	DI:ARST · CANopen 0x1011 Restore default parameter	WARN (DO code: 0x11)	Servo On
	Write parameter error: read only.	Write parameter error occurs in PR mode: the parameter is read only.	DI:Alm Reset or write 0 into P0-01	WARN (DO code: 0x11)	Servo On
	Write parameter error: parameter lock	Write parameter error occurs in PR mode: the parameter is write-protected (cannot be changed) when Servo On or the setting value is invalid.	Correct PR command and parameters again	WARN (DO code: 0x11)	Servo On
	The setting of monitor item of PR#8 is out of range	The setting of monitor item of PR#8, Sys_Var exceeds the range.	DI:ARST · CANopen 0x1011 Restore default parameter	WARN (DO code: 0x11)	Servo On
	PR command overflows	Executing absolute positioning command right after the position command counter overflows.	NMT:Reset node or 0x6040.Fault Reset	WARN (DO code: 0x11)	Servo On
	Indexing coordinate is	When executing indexing function, if the index positioning	DI:Alm Reset or write 0 into P0-01	WARN (DO code: 0x11)	Servo On

	undefined	command is directly executing before defining the start point of index coordinate, the alarm will therefore occur.			
	PR positioning is over time	In PR mode, the execution time of positioning command exceeds its time limit.	Same as above	WARN (DO code: 0x11)	Servo On
	The number of PR command exceeds the range	In PR mode, the valid range of PR path number is within 0~63. The path number is not within this range.	Same as above	WARN (DO code: 0x11)	Servo On
	Index error occurs when accessing CANopen object	The specified Index in the message does not exist.	DI:ARST NMT : Reset node or 0x6040.Fault Reset	WARN (DO code: 0x11)	Servo On
	Sub-index error occurs when accessing CANopen object	The specified Sub-index in the message does not exist.	Same as above	WARN (DO code: 0x11)	Servo On
	Data size error occurs when accessing CANopen object	The data length in the message does not match the specified object.	Same as above	WARN (DO code: 0x11)	Servo On
	Data range error occurs when accessing CANopen object	The data in the message has exceeded the data range of the specified object.	Same as above	WARN (DO code: 0x11)	Servo On
	CANopen object is read-only and write-protected	The specified object in the message is read-only and write-protected (cannot be changed).	Same as above	WARN (DO code: 0x11)	Servo On
	CANopen object is not allowed in PDO	The specified object in the message does not support PDO.	Same as above	WARN (DO code: 0x11)	Servo On

	CANopen object is write-protected when Servo On	The specified object in the message is write-protected (cannot be changed) when Servo On.	Same as above	WARN (DO code: 0x11)	Servo On
	Error occurs when reading CANopen object via EEPROM	An error occurs when loading the default settings from EEPROM at start-up. All CANopen objects return to their default settings automatically.	Same as above	WARN (DO code: 0x11)	Servo On
	Error occurs when writing CANopen object via EEPROM	An error occurs when writing the current settings into EEPROM.	Same as above	WARN (DO code: 0x11)	Servo On
	The accessing address of EEPROM is out of range when using CANopen object	The amount of the data saved in EEPROM has exceeded the space determined by the firmware. Maybe the firmware version has been upgraded, and it causes that the data of old firmware version saved in EEPROM cannot be used.	Same as above	WARN (DO code: 0x11)	Servo On
	CRC of EEPROM calculation error occurs when using CANopen object	The data saved in EEPROM has been damaged and all CANopen objects return to their default settings automatically.	Same as above	WARN (DO code: 0x11)	Servo On
	Enter the incorrect password when using CANopen object	The parameter is password protected when using CANopen communication to access the parameter. The users must enter the valid password to unlock the parameter.	Same as above	WARN (DO code: 0x11)	Servo On
	Forward software limit	Position command is equal to or more than forward software limit.	The alarm will be cleared after the motor rotates backwards.	WARN (DO code: 0x11)	Servo On

	Reverse software limit	Position command is equal to or less than reverse software limit.	The alarm will be cleared after the motor rotates backwards.	WARN (DO code: 0x11)	Servo On
	Feedback position counter overflows	Position counter overflow occurs.	NMT:Reset node or 0x6040.Fault Reset	WARN (DO code: 0x11)	Servo On
	Servo Off error	Servo Off occurs during positioning (when the drive and motor are both running).	Same as above	WARN (DO code: 0x11)	Servo On
	CANopen fails to synchronize	The synchronous communication with the external controller has failed.	Same as above	WARN (DO code: 0x11)	Servo On
	The synchronized signal of CANopen is sent too fast	The CANopen SYNC signal is received too early.	Same as above	WARN (DO code: 0x11)	Servo On
	The synchronized signal of CANopen is sent too slow	The CANopen SYNC signal is not received within the specified time.	Same as above	WARN (DO code: 0x11)	Servo On
	CANopen IP command is failed	Internal command of CANopen IP mode cannot be sent and received.	Same as above	WARN (DO code: 0x11)	Servo On
	SYNC period is in error	Object 0x1006 data error. SYNC period 1006h value is invalid.	Same as above	WARN (DO code: 0x11)	Servo On
	Position deviation alarm for DO.MC_OK	After MC_OK is activated, when the digital output, TPOS is Off, DO.MC_OK becomes Off. For more detailed explanation, please refer to parameter P1-48 in Chapter 8.	DI:Alm Reset or write 0 into P0-01	WARN (DO code: 0x11)	Servo On

**NOTE**

If the alarm occurs and is different from the above mentioned ones, such as Servo Drive Fault Messages Table, CANopen communication Fault Messages

Table and Motion Control Fault Messages Table, please contact with the local distributors or technical staffs.

## 10.4 Potential Cause and Corrective Actions

### Servo Drive Fault Messages

**AL001**

: Over current

Potential Cause	Checking Method	Corrective Actions
Short-circuit at drive output (U, V, W)	1. Check the wiring connections between drive and motor. 2. Check if the wire is short-circuited.	Repair the short-circuited and avoid metal conductor being exposed.
Motor wiring error	Check if the wiring steps are all correct when connecting motor to drive.	Follow the wiring steps in the user manual to reconnect wiring.
IGBT error	Heat sink overheated	Please contact your distributor for assistance or contact with Delta.
Control parameter setting error	Check if the setting value exceeds the factory default setting.	Set the setting back to factory default setting and then reset and adjust the parameter setting again.
Control command setting error	Check if the control input command is unstable (too much fluctuation).	1. Ensure that input command frequency is stable (too much fluctuation). 2. Activate filter function.

**AL002**

: Over voltage

Potential Cause	Checking Method	Corrective Actions
The main circuit voltage has exceeded its maximum allowable value.	Use voltmeter to check whether the input voltage falls within the rated input voltage. (For voltage specification, please refer to section 12.1 in Chapter12.)	Use correct power supply or stabilizing power or using series transformer.
Input power error (Incorrect power input)	Use voltmeter to check whether the input voltage is within the specified limit.	Use correct power supply or stabilizing power or using series transformer.
The hardware of the servo drive is damaged.	Use voltmeter to ensure that the main circuit input voltage falls within the specified limit,	If the error does not clear even if the main circuit input voltage falls within the specified limit, please contact your distributor for assistance or contact with Delta.

**AL003**

: Under voltage

Potential Cause	Checking Method	Corrective Actions
The main circuit voltage is below its minimum specified value.	Check whether the wiring of main circuit input voltage is normal.	Reconfirm voltage wiring.
No input voltage at main circuit.	Use voltmeter to check whether input voltage at main circuit is normal.	Reconfirm power switch.
Input power error (Incorrect power input)	Use voltmeter to check whether the input voltage is within the specified limit.	Use correct power supply or stabilizing power or using series transformer.

**AL004** : Motor Combination error

Potential Cause	Checking Method	Corrective Actions
Encoder is damaged.	Check the encoder for the damage.	Replace the motor.
Encoder is loose.	Examine the encoder connector.	Install the motor again.
The type of the servo motor is incorrect.	Check if the servo drive and servo motor are not correctly matched for size (power rating).	Replace the motor.

**AL005** : Regeneration error

Potential Cause	Checking Method	Corrective Actions
Regenerative resistor is not connected or the value of the regenerative resistor is too low.	Check the wiring connection of regenerative resistor.	Reconnect regenerative resistor or calculate the value of the regenerative resistor.
The parameter P1-53 is not set to zero when the regenerative resistor is not in use.	Ensure the parameter P1-53 is set to zero.	Set the parameter P1-53 to zero when the regenerative resistor is not in use.
Parameter setting is in error	Confirm the parameter settings of P1-52 and P1-53, and specifications of regenerative resistor.	Correctly reset parameter settings and the specifications of regenerative resistor again.

**AL006** : Over load

Potential Cause	Checking Method	Corrective Actions
The drive has exceeded its rated load during continuous operation.	Check if the drive is overloaded. The users can set parameter P0-02 (Drive Fault Code) to 11 and monitor if the value of the average torque [%] exceeds 100% always.	Increase motor capacity or reduce load.
Control system parameter setting is incorrect.	1. Check if there is mechanical vibration 2. Accel/Decel time setting is too fast.	1. Adjust gain value of control circuit. 2. Decrease Accel/Decel time setting.
The wiring of drive and encoder is in error.	Check the wiring of U, V, W and encoder.	Ensure all wiring is correct.
The encoder of the motor is damaged.	Please contact your distributor for assistance or contact with Delta.	

**AL007** : Over speed

Potential Cause	Checking Method	Corrective Actions
Speed input command is not stable (too much fluctuation).	Use signal detector to detect if input signal is abnormal.	Ensure that input command frequency is stable (not fluctuate too much) and activate filter function.
Over-speed parameter setting is defective.	Check if over-speed parameter setting value is too low.	Correctly set over-speed parameter setting (P2-34).



**AL008****: Abnormal pulse command**

Potential Cause	Checking Method	Corrective Actions
Pulse command frequency is higher than rated input frequency.	Use pulse frequency detector to measure input frequency.	Correctly set the input pulse frequency.

**AL009****: Excessive deviation of position command**

Potential Cause	Checking Method	Corrective Actions
Maximum deviation parameter setting is too small.	Check the maximum deviation parameter setting and observe the position error value when the motor is running.	Increases the parameter setting value of P2-35.
Gain value is too small.	Check for proper gain value.	Correctly adjust gain value.
Torque limit is too low.	Check torque limit value.	Correctly adjust torque limit value.
There is an overload.	Check for overload condition.	Reduce external applied load or re-estimate the motor capacity.
Improper setting of electronic gear ratio	Check if the proportion of P1-44 and P1-45 is appropriate	Correctly setup electronic gear ratio

**AL011****: Encoder error (Position detector fault)**

Potential Cause	Checking Method	Corrective Actions
The wiring of encoder is in error.	1. Check if all wiring is correct. 2. Check if the users conduct the wiring by the wiring information in the user manual.	Ensure all wiring is correct.
Encoder is loose	Examine the encoder connector (CN2).	Install the motor again.
The wiring of encoder is defective.	Check if all connections are tight.	Conduct the wiring again.
Encoder is damage	Check the motor for the damage.	Replace the motor.

**AL012****: Adjustment error**

Potential Cause	Checking Method	Corrective Actions
The analog input contact does not go back to zero.	Measure if the voltage of the analog input contact is the same as the voltage of the ground.	Correctly ground the analog input contact.
The detection device is damaged.	Reset the power supply.	If the error does not clear after resetting the power supply, please contact your distributor for assistance or contact with Delta.

**AL013****: Emergency stop**

Potential Cause	Checking Method	Corrective Actions
Emergency stop switch is activated.	Check if emergency stop switch is On or Off.	Activate emergency stop switch.

### AL014 : Reverse (CWL) limit error

Potential Cause	Checking Method	Corrective Actions
Reverse limit switch is activated.	Check if reverse limit switch is On or Off.	Activate reverse limit switch.
Servo system is not stable.	Check the value of control parameter setting and load inertia.	Modify parameter setting and re-estimate motor capacity.

### AL015 : Forward (CCWL) limit error

Potential Cause	Checking Method	Corrective Actions
Forward limit switch is activated.	Check if forward limit switch is On or Off.	Activate forward limit switch.
Servo system is not stable.	Check the value of control parameter setting and load inertia.	Modify parameter setting and re-estimate motor capacity.

### AL016 : IGBT overheat

Potential Cause	Checking Method	Corrective Actions
The drive has exceeded its rated load during continuous operation.	Check if there is overload or the motor current is too high.	Increase motor capacity or reduce load.
Short-circuit at drive output.	Check the drive input wiring.	Ensure all wiring is correct.

### AL017 : Abnormal EEPROM

Potential Cause	Checking Method	Corrective Actions
Parameter data error when writing into EEPROM.	Examine the parameter settings. Please do the following steps: 1. Press SHIFT key on the drive keypad, and examine the parameter shown on LED display. 2. If E320A is displayed (in hexadecimal format), it indicates it is parameter P2-10. Please examine the parameter settings of P2-10. 3. If E3610 is displayed (in hexadecimal format), it indicates it is parameter P6-16. Please examine the parameter settings of P6-16.	1. If this fault occurs when power is applied to the drive, it indicates that the setting value of one parameter has exceeded the specified range. Correct the setting value of the parameter to clear the fault and restart the servo drive. 2. If this fault occurs during normal operation, it indicates that the error occurs when writing data into EE-PROM. Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
The setting value of hidden parameter is in error.	Press SHIFT key on the drive keypad and examine if E100X is displayed on LED display.	If this fault occurs when resetting the parameter settings, it indicates that the servo drive type is not set correctly. Correctly set the servo drive type again.
Data in EEPROM is damaged.	Press SHIFT key on the drive keypad and examine if E0001 is displayed on LED display.	If this fault occurs when power is applied to the drive, it indicates that the data in EEPROM is damaged or there is no data in

		EEPROM. Please contact your distributor for assistance or contact with Delta.
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### **AL018** : Abnormal signal output

Potential Cause	Checking Method	Corrective Actions
Encoder itself or the wiring of encoder is in error.	Check if the recent fault records (P4-00 ~ P4-05) display on the drive keypad in accordance with the fault codes AL011, AL024, AL025 and AL026.	Perform the corrective actions as described in AL011, AL024, AL025 and AL026.
The output frequency for pulse output may exceed the limit of its allowable setting value.	Check if the following conditions occur: Condition 1: Motor speed is above the value set by P1-76. Condition 2: $\frac{\text{Motor Speed}}{60} \times P1-46 \times 4 > 19.8 \times 10^6$	Correctly set P1-76 and P1-46. 1. Ensure that the motor speed is below the value set by P1-76. 2. $\frac{\text{Motor Speed}}{60} \times P1-46 \times 4 < 19.8 \times 10^6$

### **AL019** : Serial communication error

Potential Cause	Checking Method	Corrective Actions
Communication parameter setting is defective.	Check the communication parameter setting.	Correctly set parameter setting.
Communication address is incorrect.	Check the communication address.	Correctly set communication address.
Communication value is incorrect.	Check the communication value.	Correctly set communication value.

### **AL020** : Serial communication time out

Potential Cause	Checking Method	Corrective Actions
Setting value in time out parameter is not correct.	Check communication time out parameter setting.	Correctly set P3-07.
Not receiving communication command for a long time.	Check whether communication cable is loose or broken.	Tighten the communication cable, make sure the communication cable is not damaged and ensure all wiring is correct.

### **AL021** : Reserved

### **AL022** : Abnormal main circuit power

Potential Cause	Checking Method	Corrective Actions
Abnormal main circuit power	Check if RST power cable of main circuit power is loose or has no power supply. The alarm occurs when three phase of 1.5kW (or under) servo drive has no power supply and when single phase of 2kW (or above) servo drive has no power supply.	Firmly connect to the power. If the alarm still cannot be cleared, please contact your distributor for assistance or contact with Delta.

**AL023****: Early warning for overload**

Potential Cause	Checking Method	Corrective Actions
The drive is going to overload.	<ol style="list-style-type: none"> <li>1. Check the load condition of the servo motor and drive.</li> <li>2. Check the setting value of P1-56. Check whether the setting value of P1-56 is too small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Please refer to the correction actions of AL006.</li> <li>2. Increase the setting value of P1-56 or set P1-56 to 100 and above.</li> </ol>

**AL024****: Encoder initial magnetic field error**

Potential Cause	Checking Method	Corrective Actions
The magnetic field of the encoder U, V, W signal is in error.	<ol style="list-style-type: none"> <li>1. Check if the servo motor is properly grounded.</li> <li>2. Check if the encoder signal cables are placed in separate conduits from the cables connected to R, S, T and U, V, W terminals to prevent the interference.</li> <li>3. Check if the shielded cables are used when performing encoder wiring.</li> </ol>	If the error does not clear after each checking is done, please contact your distributor for assistance or contact with Delta.

**AL025****: The internal of the encoder is in error**

Potential Cause	Checking Method	Corrective Actions
The internal memory of the encoder is in error. An encoder counter error occurs.	<ol style="list-style-type: none"> <li>1. Check if the servo motor is properly grounded.</li> <li>2. Check if the encoder signal cables are placed in separate conduits from the cables connected to R, S, T and U, V, W terminals to prevent the interference.</li> <li>3. Check if the shielded cables are used when performing encoder wiring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Please connect the grounding (green color) of U, V, W terminal to the heatsink of the servo drive.</li> <li>2. Ensure that the encoder signal cables are placed in separate conduits from the cables connected to R, S, T and U, V, W terminals to prevent the interference.</li> <li>3. Please use shielded cables for Encoder wiring.</li> <li>4. If the error does not clear after all the above actions are done, please contact your distributor for assistance or contact with Delta.</li> </ol>
When applying to the power, the motor operates because of mechanism inertia or other reason.	Make sure the shaft of the motor is still when applying to the power.	Make sure the shaft of the motor is still when applying to the power.

**AL026****: Unreliable internal data of the encoder**

Potential Cause	Checking Method	Corrective Actions
An encoder data error	1. Check if the servo motor is properly grounded.	1. Please connect the grounding (green color) of U, V, W

occurs for three times.	<ol style="list-style-type: none"> <li>2. Check if the encoder signal cables are placed in separate conduits from the cables connected to R, S, T and U, V, W terminals to prevent the interference.</li> <li>3. Check if the shielded cables are used when performing encoder wiring.</li> </ol>	<p>terminal to the heatsink of the servo drive.</p> <ol style="list-style-type: none"> <li>2. Ensure that the encoder signal cables are placed in separate conduits from the cables connected to R, S, T and U, V, W terminals to prevent the interference.</li> <li>3. Please use shielded cables for Encoder wiring.</li> <li>4. If the error does not clear after all the above actions are done, please contact your distributor for assistance or contact with Delta.</li> </ol>
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**AL027 : Encoder reset error**

Potential Cause	Checking Method	Corrective Actions
Reset the encoder chip	<ol style="list-style-type: none"> <li>1. Check if the signal cable of the encoder is poor contact</li> <li>2. Check if the encoder power is stable</li> <li>3. If the operation temperature of encoder is higher than 95 °C</li> </ol>	<ol style="list-style-type: none"> <li>1. Please make sure if the encoder signal cable is normal.</li> <li>2. Please use shielding mesh.</li> <li>3. If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> </ol>



**AL028 : The encoder is over voltage or the internal of the encoder is in error**

Potential Cause	Checking Method	Corrective Actions
Overvoltage of the battery	<ol style="list-style-type: none"> <li>1. Check if the servo drive has the charge circuit.</li> <li>2. Check if the installation of the battery is correct. (the voltage is higher than 3.8V)</li> </ol>	Please check it by following the instruction of checking overvoltage. AL028 will be cleared after doing all the corrective actions.
Internal error of the encoder	<ol style="list-style-type: none"> <li>1. Check if it is the absolute encoder.</li> <li>2. Check the ground terminal of the motor is connected correctly.</li> <li>3. Check if the encoder cable is apart from the power cable or main power cable in order to prevent the interference.</li> <li>4. Check if the encoder cable is equipped with the shield.</li> </ol>	<ol style="list-style-type: none"> <li>1. If the alarm still occurs after doing all corrective actions, please send the servo drive back to Delta or distributors.</li> <li>2. Please connect the connector of ground terminal (green), UVW to the heat sink of the servo drive.</li> <li>3. Please separate the encoder cable with the power cable or main power cable.</li> <li>4. Please use the shield. If the situation has not been improved, please send the servo drive back to the distributors or Delta.</li> </ol>

**AL029****: Gray code error**

Potential Cause	Checking Method	Corrective Actions
Absolute position is in error	Re-power on to operate the motor and check if the alarm will occur again.	If the alarm occurs again, please change the encoder.

**AL030****: Motor crash error**

Potential Cause	Checking Method	Corrective Actions
The setting value of parameter P1-57 is reached after a period of time set by parameter P1-58.	<ol style="list-style-type: none"> <li>1. Check if P1-57 is enabled.</li> <li>2. Check if the setting values of P1-57 and P1-58 are both too small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set P1-57 to 0.</li> <li>2. Correctly set P1-57 and P1-58. Please note that the over-low setting may results in malfunction, but over-high setting may let the motor protection function not operate.</li> </ol>

**AL031****: Incorrect wiring of the motor power line U, V, W**

Potential Cause	Checking Method	Corrective Actions
The wiring connections of U, V, W (for servo motor output) and GND (for grounding) are in error.	Check if wiring connections of U, V, W are not correct.	Follow the wiring steps in the user manual to reconnect the wiring and ground the servo drive and motor properly.

**AL034****: Internal communication of the encoder is in error**

Potential Cause	Checking Method	Corrective Actions
Internal communication of the encoder is in error	<ol style="list-style-type: none"> <li>3. Internal communication error of the absolute encoder</li> <li>4. Internal error of other type of encoder</li> </ol>	Conduct the wiring of the battery again and re-power on after that.

**AL040****: Excessive deviation of full closed-loop position control**

Potential Cause	Checking Method	Corrective Actions
The position control deviation value of full-closed loop exceeds the specified limit. Maximum deviation parameter setting is too small.	<ol style="list-style-type: none"> <li>1. Check if the setting value of P1-73 is too small.</li> <li>2. Check if all connections are tight and well-connected to the mechanical equipment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Increases the parameter setting value of P1-73.</li> <li>2. Ensure all connections are tight and well-connected to the mechanical equipment.</li> </ol>

**AL041****: Communication of linear scale is breakdown**

Potential Cause	Checking Method	Corrective Actions
Communication of linear scale is breakdown	Check if communication circuit and wiring connections of linear scale are correct.	Check all wiring connections of linear scale and reconnect the wiring if necessary.

**AL043** : Analog input voltage error

Potential Cause	Checking Method	Corrective Actions
The analog input voltage is higher than the value of P1-83 over 50ms.	Check if analog input voltage is too high.	Check all analog input voltages. Check if there is any question about the sources of analog speed commands.

**AL044** : Warning of servo drive function overload

Potential Cause	Checking Method	Corrective Actions
Warning of servo drive function overload	N/A	Set P2-66 Bit4 to 1 can disable the display of this alarm.

**AL050** : The absolute position is lost

Potential Cause	Checking Method	Corrective Actions
Battery undervoltage	Check if the voltage of the battery is lower than 2.8V.	After change the battery, conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.
Change the battery when the power is OFF which is controlled by the servo drive	Do no change or remove the battery when the power is OFF which is controlled by the servo drive.	Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.
After activating the absolute function, the absolute coordinate initialization has not been completed.	<ol style="list-style-type: none"> <li>1. Install the battery.</li> <li>2. Check the wiring between the battery pack and the power cable of the servo drive.</li> <li>3. Check the wiring of the encoder.</li> </ol>	Conduct homing procedure. Please refer to the description of absolute coordinate initialization in Chapter 12.
Bad connection of the battery power circuit	<ol style="list-style-type: none"> <li>1. Check the wiring of the encoder.</li> <li>2. Check the wiring between the battery pack and the power cable of the servo drive.</li> </ol>	Connect or repair the wiring of the battery so as to supply the power to the encoder. Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.

**AL061** : Encoder under voltage

Potential Cause	Checking Method	Corrective Actions
Battery under voltage	<ol style="list-style-type: none"> <li>1. Check if the voltage of the battery on the panel is lower than 3.1 V (tentative specification).</li> <li>2. Measure if the voltage of the battery is lower than 3.1 V (tentative specification).</li> </ol>	Do not change the battery when the power is ON which is controlled by the servo drive. After change the battery, AL061 will be cleared automatically.

**AL062****: The multi-turn of absolute encoder overflows**

Potential Cause	Checking Method	Corrective Actions
The operation distance exceeds the range the absolute encoder is able to record	Check if the operation distance exceeds the range, -32768 ~ +32767, the absolute encoder is able to record.	Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.

**AL068****: Absolute data transmitted via I/O is in error**

Potential Cause	Checking Method	Corrective Actions
Sequence error	<ol style="list-style-type: none"> <li>Switch OFF DI ABSQ should wait until DO ABSR is OFF.</li> <li>Switch ON ABSQ should wait until DO ABSR is ON.</li> </ol>	Correct the reading sequence of I/O
Reading time out	Check if the time between switching ON DO ABSR and switching ON ABSQ exceeds 200ms.	After switching ON DO ABSR (the absolute position data is ready), read DO ABSD and switch ON DI ABSQ within 200ms so that to inform the servo drive data reading is completed.

**AL069****: Wrong motor type**

Potential Cause	Checking Method	Corrective Actions
Incremental motor is not allowed to activate the absolute function	<ol style="list-style-type: none"> <li>Check if the motor is incremental or absolute encoder.</li> <li>Check parameter P2-69.</li> </ol>	If the user desires to use absolute function, please choose absolute motor. If not, please set parameter P2-69 to 0.

**AL099****: DSP firmware upgrade**

Potential Cause	Checking Method	Corrective Actions
EEPROM is not reset after the firmware version is upgraded.	Check if EEPROM is reset after the firmware version is upgraded.	Set P2-08 to 30 first, and then 28 next, and restart the servo drive.

**AL111****: CANopen SDO receives buffer overflow**

Potential Cause	Checking Method	Corrective Actions
SDO Rx buffer overflow is detected (receive two or more SDO packets in 1ms).	Check if the servo drive (Master) receives two or more SDO packets in 1ms.	NMT: Reset node or 0x6040. Fault Reset

**AL112****: CANopen PDO receives buffer overflow**

Potential Cause	Checking Method	Corrective Actions
PDO Rx buffer overflow is detected (receive two or more	Check if the servo drive (Master) receives two or more PDO (same COB-ID) packets in 1ms.	NMT: Reset node or 0x6040. Fault Reset



PDO packets in 1ms).

**AL 121****: Index error occurs when accessing CANopen PDO**

Potential Cause	Checking Method	Corrective Actions
The specified Index in the message does not exist.	Check if the Entry index value in PDO mapping is changed when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 122****: Sub-index error occurs when accessing CANopen PDO**

Potential Cause	Checking Method	Corrective Actions
The specified Sub-index in the message does not exist.	Check if the Entry Sub-index value in PDO mapping is changed when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 123****: Data size error occurs when accessing CANopen PDO**

Potential Cause	Checking Method	Corrective Actions
The data length in the message does not match the specified object.	Check if the Entry data length in PDO mapping is changed when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 124****: Data range error occurs when accessing CANopenPDO**

Potential Cause	Checking Method	Corrective Actions
The data in the message has exceeded the data range of the specified object.	Check if the write-in data range in PDO mapping is not correct when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 125****: CANopen PDO mapping object is read-only and write-protected**

Potential Cause	Checking Method	Corrective Actions
The specified object in the message is read-only and write-protected (cannot be changed).	Check if the specified object is set to read-only write-protected (cannot be changed) when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 126****: CANopen PDO object does not support PDO**

Potential Cause	Checking Method	Corrective Actions
The specified object in the message cannot support PDO.	Check if the specified object cannot support PDO when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 127****: CANopen PDO object is write-protected when Servo On**

Potential Cause	Checking Method	Corrective Actions
The specified object in the message is write-protected (cannot be changed) when Servo On.	Check if the specified object in the message is write-protected (cannot be changed) while the servo drive is enabled (Servo On) when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 128****: Error occurs when reading CANopen PDO mapping object via EEPROM**

Potential Cause	Checking Method	Corrective Actions
An error occurs when loading the default settings from EEPROM at start-up. All CANopen objects return to their default settings automatically.	Check if it causes an error when the specified object reads EEPROM when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 129****: Error occurs when writing CANopen PDO mapping object via EEPROM**

Potential Cause	Checking Method	Corrective Actions
An error occurs when writing the current settings into EEPROM.	Check if it causes an error when the specified object writes EEPROM when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 130****: The accessing address of EEPROM is out of range when using CANopen PDO mapping object**

Potential Cause	Checking Method	Corrective Actions
The amount of the data saved in EEPROM has exceeded the space determined by the firmware. Maybe the firmware version has been upgraded, and it causes that the data of old firmware version saved in EEPROM cannot be used.	Check if the specified object lets the address range of EEPROM exceed the specification when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 131****: CRC of EEPROM calculation error occurs when using CANopen PDO mapping object**

Potential Cause	Checking Method	Corrective Actions
The data saved in EEPROM has been	Check if the specified object results in the checksum error of EEPROM when accessing	NMT: Reset node or 0x6040.

damaged and all CANopen objects return to their default settings automatically.	PDO object.	Fault Reset
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**AL 132****: Enter the incorrect password when using CANopen PDO mapping object**

Potential Cause	Checking Method	Corrective Actions
The parameter is password protected when using CANopen communication to access the parameter.	Check if the password for the specified object is invalid when accessing PDO object.	NMT: Reset node or 0x6040. Fault Reset

**AL 185****: Abnormal CAN Bus hardware**

Potential Cause	Checking Method	Corrective Actions
Abnormal CAN Bus hardware	1. Examine CAN Bus communication cable. 2. Check if the communication quality is good quality state. (It is recommended to use shielded cables and use common grounding.)	NMT: Reset node or re-power on

**AL 201****: An error occurs when loading CANopen data**

Potential Cause	Checking Method	Corrective Actions
An error occurs when loading data from EEPROM.	1. Restart the servo drive to check if the error can be cleared. 2. If the error cannot be cleared after restarting the servo drive, it indicates that the data in EEPROM is damaged and the users must do the following actions: a. If the users want to write default setting values, set P2-08 to 30 first and then 28 next, or use CANopen "0x1011" object to restore parameters from non-volatile memory. b. If the users want to write current setting values, use CANopen "0x1010" object to save parameters in non-volatile memory.	DI:ARST · CANopen 0x1011 Restore default parameter

**AL 207****: Parameter group is out of the range**

Potential Cause	Checking Method	Corrective Actions
The parameter group of command source exceeds the range	Writing parameter via PR procedure: The parameter group of command source exceeds the range	DI:Alm Reset or write 0 into P0-01

**AL209** : Parameter number is out of the range

Potential Cause	Checking Method	Corrective Actions
The parameter number of command source exceeds the range	Writing parameter via PR procedure: The parameter number of command source exceeds the range	DI:Alm Reset or write 0 into P0-01

**AL213 ~ AL217** : An error occurs when writing parameter via PR

Potential Cause	Checking Method	Corrective Actions
In PR mode, error occurs when using PR command TYPE=8 (write specified parameter)	<b>AL213</b> : Check if the parameter setting value exceeds the limit of normal range.	1. Turn ARST (DI signal) ON to clear the fault. 2. Set P0-01 to 0.
	<b>AL215</b> : Check if the parameter is read only.	
	<b>AL217</b> : Check if the parameter is write-protected when Servo On or the setting value is invalid.	Correct the PR command and parameter setting value.

**AL231** : The setting of monitor item is out of the range

Potential Cause	Checking Method	Corrective Actions
The monitor item of the command source exceeds the range	Writing parameter via PR procedure: The monitor item number of command source exceeds the range	DI:Alm Reset or write 0 into P0-01

**AL235** : PR command overflows

Potential Cause	Checking Method	Corrective Actions
In PR mode, this fault occurs when position command counter register overflowed and at this time an absolute position command is executed.	<p>Incremental system: In PR mode, the motor operates in one direction continuously and causes the overflow of feedback register (FB_PUU). The coordinate system cannot map the correct position as well. The alarm will occur when issuing PR absolute positioning command at this time.</p> <p>Absolute system: The alarm occurs when issuing absolute positioning command under the following situations:</p> <ol style="list-style-type: none"> <li>1. The feedback register (FB_PUU) overflows</li> <li>2. The motor does not return to the origin after change P1.01.Z and does not execute homing procedure.</li> <li>3. The servo drive does not execute homing</li> </ol>	Conduct homing procedure.

	procedure after change the electronic gear ratio (P1-44, P1-45). 4. Returns to the origin when the origin procedure has not finished yet. 5. Al.060 and AL.062 occur.	
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**AL237****: Indexing coordinate is undefined**

Potential Cause	Checking Method	Corrective Actions
When executing indexing function, if the index positioning command is directly executing before defining the start point of index coordinate, the alarm will therefore occur.	Indexing coordinate is undefined and then execute index positioning command.	1. Before executing indexing function, please conduct homing first so as to avoid this alarm. 2. When the alarm occurs, please use DI:Alm Reset or write 0 into P0-01 to clear the alarm. 3. The alarm can be cleared when it is Servo ON.

**AL245****: PR positioning is over time**

Potential Cause	Checking Method	Corrective Actions
In PR mode, the execution time of positioning command exceeds its time limit.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL249****: The number of PR command exceeds the range**

Potential Cause	Checking Method	Corrective Actions
In PR mode, the valid range of PR path number is within 0~63. The path number is not within this range.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL261****: Index error occurs when accessing CANopen object**

Potential Cause	Checking Method	Corrective Actions
The specified Index in the message does not exist.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL263****: Sub-index error occurs when accessing CANopen object**

Potential Cause	Checking Method	Corrective Actions
The specified Sub-index in the message does not exist.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL265****: Data size error occurs when accessing CANopen object**

Potential Cause	Checking Method	Corrective Actions
The data length in the message does not match the specified object.	NMT: Reset node or 0x0640. Fault Reset	NMT: Reset node or 0x6040. Fault Reset

**AL267****: Data range error occurs when accessing CANopen object**

Potential Cause	Checking Method	Corrective Actions
The data in the message has exceeded the data range of the specified object.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL269****: CANopen object is read-only and write-protected**

Potential Cause	Checking Method	Corrective Actions
The specified object in the message is read-only and write-protected (cannot be changed).	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL266****: CANopen object is not allowed in PDO**

Potential Cause	Checking Method	Corrective Actions
The specified object in the message does not support PDO.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL268****: CANopen Object is write-protected when Servo On**

Potential Cause	Checking Method	Corrective Actions
The specified object in the message is write-protected (cannot be changed) when Servo On.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL26F****: Error occurs when reading CANopen object via EEPROM**

Potential Cause	Checking Method	Corrective Actions
An error occurs when loading the default settings from EEPROM at start-up. All CANopen objects return to their default settings automatically.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL271****: Error occurs when writing CANopen object via EEPROM**

Potential Cause	Checking Method	Corrective Actions
An error occurs when writing the current settings into EEPROM.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL273****: The accessing address of EEPROM is out of range when using CANopen object**

Potential Cause	Checking Method	Corrective Actions
The amount of the data saved in EEPROM has exceeded the space determined by the firmware. Maybe the firmware version has been upgraded, and it causes that the data of old firmware version saved in EEPROM cannot be used.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL275****: CRC of EEPROM calculation error occurs when using CANopen object**

Potential Cause	Checking Method	Corrective Actions
The data saved in EEPROM has been damaged and all CANopen objects return to their default settings automatically.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL277****: Enter the incorrect password when using CANopen object**

Potential Cause	Checking Method	Corrective Actions
The parameter is password protected when using CANopen communication to access the parameter.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL283****: Forward software limit**

Potential Cause	Checking Method	Corrective Actions
Position command is equal to or more than forward software limit.	This software limit is determined according to position command, not actual feedback position. It indicates that when this fault is activated, the actual position may not exceed the limit. Setting the proper deceleration time is able to solve this problem. For the setting of deceleration time, please refer to	NMT: Reset node or 0x6040. Fault Reset

parameter P5-03.

**AL285****: Reverse software limit**

Potential Cause	Checking Method	Corrective Actions
Position command is equal to or less than reverse software limit.	This software limit is determined according to position command, not actual feedback position. It indicates that when this fault is activated, the actual position may not exceed the limit. Setting the proper deceleration time is able to solve this problem. For the setting of deceleration time, please refer to parameter P5-03.	NMT: Reset node or 0x6040. Fault Reset

**AL289****: Feedback position counter overflows**

Potential Cause	Checking Method	Corrective Actions
Feedback position counter overflows	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT: Reset node or 0x6040. Fault Reset

**AL291****: Servo Off error**

Potential Cause	Checking Method	Corrective Actions
Servo Off occurs during positioning (when the drive and motor are both running).	<ol style="list-style-type: none"> <li>1. Examine if the wiring of digital input for Servo On is correct.</li> <li>2. Check if the host (external) controller disables the function of Servo On too early.</li> </ol>	NMT: Reset node or 0x6040. Fault Reset

**AL301****: CANopen fails to synchronize**

Potential Cause	Checking Method	Corrective Actions
CAN IP mode error. The synchronous communication with the external controller has failed.	<ol style="list-style-type: none"> <li>1. Check if the communication quality is good quality state.</li> <li>2. Check if the host (external) controller has sent SYNC signal.</li> <li>3. Check if the setting value of parameter P3-09 is a proper value (It is recommended to use default setting).</li> </ol>	NMT: Reset node or 0x6040. Fault Reset

**AL302****: The synchronized signal of CANopen is sent too fast**

Potential Cause	Checking Method	Corrective Actions
CAN IP mode error. The SYNC signal is received too early.	<ol style="list-style-type: none"> <li>1. Check if the setting of 0x1006 (communication cycle period) is the same as the setting in host (external) controller.</li> <li>2. Check if the setting value of parameter P3-09 is a proper value (It is recommended to use default setting).</li> <li>3. Check if the procedure of host (external) controller is not correct.</li> </ol>	NMT: Reset node or 0x6040. Fault Reset



**AL 303****: The synchronized signal of CANopen is sent too slow**

Potential Cause	Checking Method	Corrective Actions
CAN IP mode error. The SYNC signal is not received with the specified time.	<ol style="list-style-type: none"> <li>1. Check if the communication quality is good quality state.</li> <li>2. Check if the setting of 0x1006 (communication cycle period) is the same as the setting in host (external) controller.</li> <li>3. Check if the setting value of parameter P3-09 is a proper value (It is recommended to use default setting).</li> <li>4. Check if the procedure of host (external) controller is not correct.</li> </ol>	NMT: Reset node or 0x6040. Fault Reset

**AL 304****: CANopen IP command is failed**

Potential Cause	Checking Method	Corrective Actions
CAN IP mode error. Internal command cannot be sent and received.	The calculation time of IP mode is too long. Please disable USB monitor function.	NMT: Reset node or 0x6040. Fault Reset



















**AL 305****: SYNC period is in error**








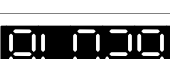












Potential Cause	Checking Method	Corrective Actions
Object 0x1006 Data Error. SYNC period 1006h value is invalid.	Examine the data of 0x1006. The SYNC period 1006h value should not be equal to or less than 0 or this fault will occur.	NMT: Reset node or 0x6040. Fault Reset









**AL 380****: Position deviation alarm for DO.MC\_OK**








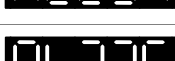





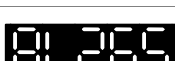

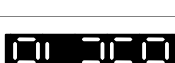
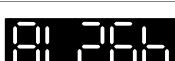

Potential Cause	Checking Method	Corrective Actions
After MC_OK is activated, when the digital output, TPOS is Off, DO.MC_OK turns Off.	<p>Check if the motor position changes by external force after the positioning is completed.</p> <p>This alarm can be disabled by the setting of P1-48. Please refer to the descriptions of parameter P1-48 for more detailed explanation.</p>	<ol style="list-style-type: none"> <li>1. Turn ARST (DI signal) ON to clear the fault.</li> <li>2. Set P0-01 to 0.</li> </ol>

## 10.5 Clearing Faults

Display	Fault Name	Clearing Method
	Over current	Turn ARST (DI signal) ON to clear the fault.
	Over voltage	Turn ARST (DI signal) ON to clear the fault.
	Under voltage	This fault message can be removed automatically after the voltage has returned within its specification.
	Motor combination error	The alarm can be cleared after re-power on.
	Regeneration error	Turn ARST (DI signal) ON to clear the fault.
	Over load	Turn ARST (DI signal) ON to clear the fault.
	Over speed	Turn ARST (DI signal) ON to clear the fault.
	Abnormal pulse command	Turn ARST (DI signal) ON to clear the fault.
	Excessive deviation of position command	Turn ARST (DI signal) ON to clear the fault.
	Encoder error	The alarm can be cleared after re-power on.
	Adjustment error	This fault message can be removed after the wiring of CN1 connector (I/O signal connector) is removed and auto adjustment function is executed.
	Emergency stop	This fault message can be removed automatically by turning off EMGS (DI signal).
	Reverse limit error	Turn DI.ARST on or Servo Off to clear the alarm. The alarm also can be cleared when the motor operates backwards.
	Forward limit error	Turn DI.ARST on or Servo Off to clear the alarm. The alarm also can be cleared when the motor operates backwards.
	IGBT overheat	Turn ARST (DI signal) ON to clear the fault.
	Abnormal EEPROM	<ol style="list-style-type: none"> <li>1. If this fault occurs when power is applied to the drive, correct the setting value of the parameter to clear the fault and restart the servo drive.</li> <li>2. If this fault occurs during normal operation, turn ARST (DI signal) ON to clear the fault.</li> </ol>
	Abnormal signal output	Turn ARST (DI signal) ON to clear the fault.
	Serial communication error	Turn ARST (DI signal) ON to clear the fault.

Display	Fault Name	Clearing Method
	Serial communication time out	Turn ARST (DI signal) ON to clear the fault.
	Abnormal main circuit power	Turn ARST (DI signal) ON to clear the fault.
	Early warning for overload	Turn ARST (DI signal) ON to clear the fault.
	Encoder initial magnetic field error	The alarm can be cleared after re-power on.
	The internal of the encoder is in error	The alarm can be cleared after re-power on.
	Unreliable internal data of the encoder	The alarm can be cleared after re-power on.
	Encoder reset error	The alarm can be cleared after re-power on.
	The encoder is over voltage or the internal of the encoder is in error	The alarm can be cleared after re-power on.
	Gray code error	The alarm can be cleared after re-power on.
	Motor crash error	Turn ARST (DI signal) ON to clear the fault.
	Incorrect wiring of the motor power line U, V, W, GND	The alarm can be cleared after re-power on.
	Internal communication of the encoder is in error	The alarm can be cleared after re-power on.
	Excessive deviation of full closed-loop control	Turn ARST (DI signal) ON to clear the fault.
	Communication of linear scale is breakdown	Turn ARST (DI signal) ON to clear the fault.
	Analog input voltage error	Turn ARST (DI signal) ON to clear the fault.
	Warning of servo drive function overload	Set P2-66 Bit4 to 1 and then re-power on the servo drive.
	The absolute position is lost	The alarm can be cleared after re-power on.
	Encoder under voltage	Change the battery and AL061 will be cleared automatically.
	The multi-turn if absolute encoder overflows	The alarm can be cleared after re-power on.
	Absolute data transmitted via I/O is in error	The alarm can be cleared after re-power on.
	Wrong motor type	Set P2-69 to 0 and then re-power on the servo drive.

Display	Fault Name	Clearing Method
	DSP firmware upgrade	This fault message can be removed after setting P2-08 to 30 first, and then 28 next and restarting the servo drive.
	CANopen SDO receives buffer overflow	NMT: Reset node or 0x6040.Fault Reset
	CANopen PDO receives buffer overflow	NMT: Reset node or 0x6040.Fault Reset
	Index error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
	Sub-index error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
	Data size error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
	Data range error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
	CANopen PDO mapping object is read-only and write-protected	NMT: Reset node or 0x6040.Fault Reset
	CANopen PDO mapping object is not allowed in PDO	NMT: Reset node or 0x6040.Fault Reset
	CANopen PDO mapping object is write-protected when Servo On	NMT: Reset node or 0x6040.Fault Reset
	Error occurs when reading CANopen PDO mapping object via EEPROM	NMT: Reset node or 0x6040.Fault Reset
	Error occurs when writing CANopen PDO mapping object via EEPROM.	NMT: Reset node or 0x6040.Fault Reset
	The accessing address of EEPROM is out of range when using CANopen PDO mapping object	NMT: Reset node or 0x6040.Fault Reset
	CRC of EEPROM calculation error occurs when using CANopen PDO mapping object	NMT: Reset node or 0x6040.Fault Reset
	Enter the incorrect password when using CANopen PDO mapping object	NMT: Reset node or 0x6040.Fault Reset

Display	Fault Name	Clearing Method
	Abnormal CAN Bus hardware	NMT: Reset node or 0x6040.Fault Reset
	An error occurs when loading CANopen data	1. Turn ARST (DI signal) ON to clear the fault. 2. Use CANopen "0x1011" object to restore default parameters.
	Parameter group is out of range	1. Turn ARST (DI signal) ON to clear the fault. 2. Set P0-01 to 0.
	Parameter number is out of range	1. Turn ARST (DI signal) ON to clear the fault. 2. Set P0-01 to 0.
	Write parameter error: exceeds the limit of normal range.	3. Turn ARST (DI signal) ON to clear the fault. 4. Set P0-01 to 0.
	Write parameter error: read only.	1. Turn ARST (DI signal) ON to clear the fault. 2. Set P0-01 to 0.
	Write parameter error: parameter lock	Correct the PR command and parameter setting value.
	The setting of monitor item is out of range	1. Turn ARST (DI signal) ON to clear the fault. 2. Set P0-01 to 0.
	PR command overflows	Conduct homing procedure
	Indexing coordinate is undefined	1. Turn ARST (DI signal) ON to clear the fault. 2. Set P0-01 to 0.
	PR Positioning is over time	NMT: Reset node or 0x6040.Fault Reset
	The number of PR command exceeds the range	NMT: Reset node or 0x6040.Fault Reset
	Index error occurs when accessing CANopen object	NMT: Reset node or 0x6040.Fault Reset
	Sub-index error occurs when accessing CANopen object	NMT: Reset node or 0x6040.Fault Reset
	Data size error occurs when accessing CANopen object	NMT: Reset node or 0x6040.Fault Reset
	Data range error occurs when accessing CANopen object	NMT: Reset node or 0x6040.Fault Reset
	CANopen object is read-only and write-protected	NMT: Reset node or 0x6040.Fault Reset
	CANopen object is not allowed in PDO	NMT: Reset node or 0x6040.Fault Reset

Display	Fault Name	Clearing Method
AL26D	CANopen object is write-protected when Servo On	NMT: Reset node or 0x6040.Fault Reset
AL26F	Error occurs when reading CANopen object via EEPROM.	NMT: Reset node or 0x6040.Fault Reset
AL271	Error occurs when writing CANopen object via EEPROM.	NMT: Reset node or 0x6040.Fault Reset
AL273	The accessing address of EEPROM is out of range when using CANopen object	NMT: Reset node or 0x6040.Fault Reset
AL275	CRC of EEPROM calculation error occurs when using CANopen object	NMT: Reset node or 0x6040.Fault Reset
AL277	Enter the incorrect password when using CANopen object	NMT: Reset node or 0x6040.Fault Reset
AL283	Forward software limit	NMT: Reset node or 0x6040.Fault Reset
AL285	Reverse software limit	NMT: Reset node or 0x6040.Fault Reset
AL289	Feedback position counter overflows	NMT: Reset node or 0x6040.Fault Reset
AL291	Servo Off error	NMT: Reset node or 0x6040.Fault Reset
AL301	CANopen fails to synchronize	NMT: Reset node or 0x6040.Fault Reset
AL302	The synchronized signal of CANopen is sent too fast	NMT: Reset node or 0x6040.Fault Reset
AL303	The synchronized signal of CANopen is sent too slow	NMT: Reset node or 0x6040.Fault Reset
AL304	CANopen IP command is failed	NMT: Reset node or 0x6040.Fault Reset
AL305	SYNC period is inerror	NMT: Reset node or 0x6040.Fault Reset
AL3A0	Position deviation alarm	1. Turn ARST (DI signal) ON to clear the fault. 2. Set P0-01 to 0.

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# Chapter 11 Specifications




## 11.1 Specifications of Servo Drives (ASDA-A2 Series)

### 11.1.1 ASDA-A2 220 V Series

ASDA-A2 Series		100 W	200 W	400 W	750 W	1 kW	1.5 kW	2 kW	3k W	4.5 kW	5.5 kW	7.5 kW	11 kW	15 kW	
		01	02	04	07	10	15	20	30	45	55	75	1B	1F	
Power supply	Phase / Voltage	Three-phase / Single-phase 220 VAC						Three-phase 220 VAC							
	Permissible Voltage Range	Three-phase / Single-phase 200 ~ 230 VAC, -15% ~ 10%						Three-phase 200 ~ 230 VAC, -15% ~ 10%							
	Continuous Output Current	0.9 Arms	1.55 Arms	2.6 Arms	5.1 Arms	7.3 Arms	8.3 Arms	13.4 Arms	19.4 Arms	32.5 Arms	40 Arms	47.5 Arms	54.4 Arms	70 Arms	
Cooling System		Natural Air Circulation				Fan Cooling									
Encoder Resolution (Servo Drive Resolution)		Incremental type: 20-bit (1280000 p/rev) ; Absolute type: 17-bit (1280000 p/rev)													
Control of Main Circuit		SVPWM (Space Vector Pulse Width Modulation) Control													
Tuning Modes		Auto / Manual													
Dynamic Brake		None				Built-in					External				
Position Control Mode	Max. Input Pulse Frequency	Max. 500Kpps / 4Mpps (Line driver), Max. 200Kpps (Open collector)													
	Pulse Type	Pulse + Direction, A phase + B phase, CCW pulse + CW pulse													
	Command Source	External pulse train / Internal parameters													
	Smoothing Strategy	Low-pass and P-curve filter													
	Electronic Gear	Electronic gear N/M multiple N: 1~32767, M: 1:32767 (1/50 < N/M < 25600)													
	Torque Limit Operation	Set by parameters													
Speed Control Mode	Feed Forward Compensation	Set by parameters													
	Analog Input Command	Voltage Range	0 ~ ±10 V <sub>DC</sub>												
		Input Resistance	10 KΩ												
		Time Constant	2.2 us												
	Speed Control Range <sup>*1</sup>	1 : 5000					1 : 3000					1 : 2000			
Command Source	External analog signal / Internal parameters														
Smoothing Strategy	Low-pass and S-curve filter														
Torque Limit Operation	Set by parameters or via analog input														



		Frequency Response Characteristic	Maximum 1 kHz	
		Speed Accuracy *2 (at rated rotation speed)	0.01% or less at 0 to 100% load fluctuation	
			0.01% or less at $\pm 10\%$ power fluctuation	
			0.01% or less at 0°C to 50°C ambient temperature fluctuation	
Torque Control Mode	Analog Input Command	Voltage Range	0 ~ $\pm 10$ V <sub>DC</sub>	
		Input Resistance	10 K $\Omega$	
		Time Constant	2.2 $\mu$ s	
	Command Source		External analog signal / Internal parameters	
	Smoothing Strategy		Low-pass filter	
	Speed Limit Operation		Set by parameters or via analog input	
	Analog Monitor Output		Monitor signal can set by parameters (Output voltage range: $\pm 8$ V)	
Digital Inputs/Outputs	Inputs		Servo on, Reset, Gain switching, Pulse clear, Zero speed CLAMP, Command input reverse control, Command triggered, Speed/Torque limit enabled, Position command selection, Motor stop, Speed position selection, Position / Speed mode switching, Speed / Torque mode switching, Torque / Position mode switching, PT / PR command switching, Emergency stop, Forward / Reverse inhibit limit, Reference "Home" sensor, Forward / Reverse operation torque limit, Move to "Home", Electronic Cam (E-Cam), Forward / Reverse JOG input, Event trigger PR command, Electronic gear ratio (Numerator) selection and Pulse inhibit input	
	Outputs		Encoder signal output (A, B, Z Line Driver and Z Open Collector )	
			Servo ready, Servo on, At Zero speed, At Speed reached, At Positioning completed, At Torques limit, Servo alarm (Servo fault) activated, Electromagnetic brake control, Homing completed, Output overload warning, Servo warning activated, Position command overflow, Forward / Reverse software limit, Internal position command completed, Capture operation completed output., Motion control completed output., Master position of E-Cam (Electronic Cam)	
Protective Functions		Overcurrent, Overvoltage, Undervoltage, Motor overheated, Regeneration error, Overload, Overspeed, Abnormal pulse control command, Excessive deviation, Encoder error, Adjustment error, Emergency stop activated, Reverse/ Forward limit switch error, Position excessive deviation of full-close control loop, Serial communication error, Input power phase loss, Serial communication time out, short circuit protection of U, V, W, and CN1, CN2, CN3 terminals		
Communication Interface		RS-232 / RS-485 / CANopen / USB		
Environment	Installation Site	Indoor location (free from direct sunlight), no corrosive liquid and gas (far away from oil mist, flammable gas, dust)		
	Altitude	Altitude 1000m or lower above sea level		
	Atmospheric pressure	86 kPa to 106 kPa		
	Operating Temperature	0°C ~ 55°C (If operating temperature is above 45°C, forced cooling will be required)		
	Storage Temperature	-20°C to 65°C (-4°F to 149°F)		
	Humidity	0 to 90% (non-condensing)		
	Vibration	9.80665m/s <sup>2</sup> (1 G) less than 20 Hz, 5.88m/ s <sup>2</sup> (0.6 G) 20 to 50 Hz		

	IP Rating	IP20
	Power System	TN System <sup>*3</sup>
	Approvals	IEC/EN 61800-5-1, UL 508C, C-tick   

## Footnote:

- \*1 Rated rotation speed: When full load, speed ratio is defined as the minimum speed (the motor will not pause).
- \*2 When command is rated rotation speed, the speed fluctuation rate is defined as:  
(Empty load rotation speed – Full load rotation speed) / Rated rotation speed
- \*3 Please refer to “Chart of load and operating time” in section 11.4 “Overload Characteristics”.
- \*4 TN system: A power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that points by protective earth conductor.

### 11.1.2 ASDA-A2 400 V Series

ASDA-A2 Series		750 W	1 kW	1.5 kW	2 kW	3 kW	4.5 kW	5.5 kW	7.5 kW
		07	10	15	20	30	45	55	75
Control Power	Input Voltage	24 VDC, $\pm 10\%$							
	Input Current	0.89 A			1.18 A			1.66 A	
	Input Power	21.4 W			28.2 W			39.85 W	
Main Circuit Power		Three-phase, 380 ~ 480 VAC, $\pm 10\%$							
Continuous Output Current		3.07 Arms	3.52 Arms	5.02 Arms	6.66 Arms	11.9 Arms	20 Arms	22.37 Arms	30 Arms
Cooling System		Fan Cooling							
Encoder Resolution (Servo Drive Resolution)		Incremental type: 20-bit (1280000 p/rev) ; Absolute type: 17-bit (1280000 p/rev)							
Control of Main Circuit		SVPWM (Space Vector Pulse Width Modulation) Control							
Tuning Modes		Auto / Manual							
Dynamic Brake		Built-in			External				
Position Control Mode	Max. Input Pulse Frequency	Max. 500Kpps / 4Mpps (Line driver), Max. 200Kpps (Open collector)							
	Pulse Type	Pulse + Direction, A phase + B phase, CCW pulse + CW pulse							
	Command Source	External pulse train / Internal parameters							
	Smoothing Strategy	Low-pass and P-curve filter							
	Electronic Gear	Electronic gear N/M multiple N: 1~32767, M: 1:32767 ( $1/50 < N/M < 25600$ )							
	Torque Limit Operation	Set by parameters							
	Feed Forward Compensation	Set by parameters							
Speed Control Mode	Analog Input Command	Voltage Range	0 ~ $\pm 10$ V <sub>DC</sub>						
		Input Resistance	10 K $\Omega$						
		Time Constant	2.2 $\mu$ s						
	Speed Control Range <sup>*1</sup>	1 : 5000					1 : 3000		
	Command Source	External analog signal / Internal parameters							
	Smoothing Strategy	Low-pass and S-curve filter							
	Torque Limit Operation	Set by parameters or via analog input							
	Frequency Response Characteristic	Maximum 1 kHz							
	Speed Accuracy <sup>*2</sup> (at rated rotation speed)	0.01% or less at 0 to 100% load fluctuation							
		0.01% or less at $\pm 10\%$ power fluctuation							
0.01% or less at 0°C to 50°C ambient temperature fluctuation									

Torque Control Mode	Analog Input Command	Voltage Range	0 ~ ± 10 V <sub>DC</sub>
		Input Resistance	10 KΩ
		Time Constant	2.2 us
	Command Source	External analog signal / Internal parameters	
	Smoothing Strategy	Low-pass filter	
	Speed Limit Operation	Set by parameters or via analog input	
Analog Monitor Output		Monitor signal can set by parameters (Output voltage range: ± 8 V)	
Digital Inputs/Outputs	Inputs	Servo on, Reset, Gain switching, Pulse clear, Zero speed CLAMP, Command input reverse control, Command triggered, Speed/Torque limit enabled, Position command selection, Motor stop, Speed position selection, Position / Speed mode switching, Speed / Torque mode switching, Torque / Position mode switching, PT / PR command switching, Emergency stop, Forward / Reverse inhibit limit, Reference "Home" sensor, Forward / Reverse operation torque limit, Move to "Home", Electronic cam, Forward / Reverse JOG input, Event trigger PR command, Electronic gear ratio (Numerator) selection and Pulse inhibit input	
		Encoder signal output (A, B, Z Line Driver and Z Open Collector)	
	Outputs	Servo ready, Servo on, At Zero speed, At Speed reached, At Positioning completed, At Torques limit, Servo alarm (Servo fault) activated, Electromagnetic brake control, Homing completed, Output overload warning, Servo warning activated, Position command overflow, Forward / Reverse software limit, Internal position command completed, Capture operation completed output., Motion control completed output., Master position of E-Cam (Electronic Cam)	
Protective Functions		Overcurrent, Overvoltage, Undervoltage, Motor overheated, Regeneration error, Overload, Overspeed, Abnormal pulse control command, Excessive deviation, Encoder error, Adjustment error, Emergency stop activated, Reverse/ Forward limit switch error, Position excessive deviation of full-close control loop, Serial communication error, Input power phase loss, Serial communication time out, short circuit protection of U, V, W, and CN1, CN2, CN3 terminals	
Communication Interface		RS-232 / RS-485 / CANopen / USB	
Environment	Installation Site	Indoor location (free from direct sunlight), no corrosive liquid and gas (far away from oil mist, flammable gas, dust)	
	Altitude	Altitude 1000m or lower above sea level	
	Atmospheric pressure	86kPa to 106kPa	
	Operating Temperature	0°C ~ 55°C (If operating temperature is above 45°C, forced cooling will be required)	
	Storage Temperature	-20°C to 65°C (-4°F to 149°F)	
	Humidity	0 to 90% (non-condensing)	
	Vibration	9.80665m/s <sup>2</sup> (1 G) less than 20 Hz, 5.88m/ s <sup>2</sup> (0.6 G) 20 to 50 Hz	
	IP Rating	IP20	
	Power System	TN System <sup>*3</sup>	

Approvals	IEC/EN 61800-5-1, UL 508C, C-tick   <b>US LISTED</b> 
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## Footnote:


- \*1 Rated rotation speed: When full load, speed ratio is defined as the minimum speed (the motor will not pause).
- \*2 When command is rated rotation speed, the speed fluctuation rate is defined as:  
(Empty load rotation speed – Full load rotation speed) / Rated rotation speed
- \*3 Please refer to “Chart of load and operating time” in section 11.4 “Overload Characteristics”.
- \*4 TN system: A power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that points by protective earth conductor.

## 11.2 Specifications of Servo Motors (ECMA Series)

### 11.2.1 ECMA 220 V Series

#### Low Inertia Series – **220 V series**

ECMA Series	C104	C△04	C△06		C△08		C△09	
	0F	01	02	04	04	07	07	10
Rated output power (kW)	0.05	0.1	0.2	0.4	0.4	0.75	0.75	1.0
Rated torque (N-m) *1	0.159	0.32	0.64	1.27	1.27	2.39	2.39	3.18
Maximum torque (N-m)	0.477	0.96	1.92	3.82	3.82	7.16	7.14	8.78
Rated speed (r/min)	3000						3000	
Maximum speed (r/min)	5000						3000	
Rated current (A)	0.66	0.90	1.55	2.60	2.60	5.10	3.66	4.25
Max. instant current (A)	2	2.70	4.65	7.80	7.80	15.3	11	12.37
Power rating (kW/s)	12.27	27.7	22.4	57.6	24.0	50.4	29.6	38.6
Rotor moment of inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> )	0.0206	0.037	0.177	0.277	0.68	1.13	1.93	2.62
Mechanical constant (ms)	1.14	0.75	0.80	0.53	0.74	0.63	1.72	1.20
Torque constant-KT (N-m/A)	0.24	0.36	0.41	0.49	0.49	0.47	0.65	0.75
Voltage constant-KE (mV/(r/min))	10	13.6	16.0	17.4	18.5	17.2	24.2	27.5
Armature resistance (Ohm)	12.7	9.30	2.79	1.55	0.93	0.42	1.34	0.897
Armature inductance (mH)	26	24.0	12.07	6.71	7.39	3.53	7.55	5.7
Electric constant (ms)	2.05	2.58	4.30	4.30	7.96	8.36	5.66	6.35
Insulation class	Class A (UL), Class B (CE)							
Insulation resistance	> 100 MΩ, DC 500 V							
Insulation strength	1.8k Vac, 1 sec							
Weight (kg) (without brake)	0.42	0.5	1.2	1.6	2.1	3.0	2.9	3.8
Weight (kg) (with brake)	--	0.8	1.5	2.0	2.9	3.8	3.69	5.5
Max. radial shaft load (N)	78.4	78.4	196	196	245	245	245	245
Max. thrust shaft load (N)	39.2	39.2	68	68	98	98	98	98
Power rating (kW/s) (with brake)	--	25.6	21.3	53.8	22.1	48.4	29.3	37.9

ECMA Series	C104	C△04	C△06		C△08		C△09	
	0F	01	02	04	04	07	07	10
Rotor moment of inertia ( $\times 10^{-4}\text{kg}\cdot\text{m}^2$ ) (with brake)	--	0.04	0.19	0.30	0.73	1.18	1.95	2.67
Mechanical constant (ms) (with brake)	--	0.81	0.85	0.57	0.78	0.65	1.74	1.22
Brake holding torque [Nt-m (min)] <sup>*2</sup>	--	0.3	1.3	1.3	2.5	2.5	2.5	2.5
Brake power consumption (at 20°C) [W]	--	7.3	6.5	6.5	8.2	8.2	8.2	8.2
Brake release time [ms (Max)]	--	5	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	--	25	70	70	70	70	70	70
Vibration grade ( $\mu\text{m}$ )	15							
Operating temperature	0°C to 40°C (32°F to 104°F)							
Storage temperature	-10°C to 80°C (-14°F to 176°F)							
Operating humidity	20% to 90% RH (non-condensing)							
Storage humidity	20% to 90% RH (non-condensing)							
Vibration capacity	2.5 G							
IP Rating	IP65 (when waterproof connectors are used, or when an oil seal is used to be fitted to the rotating shaft (an oil seal model is used))							
Approvals								

## Footnote:

\*1 Rate torque values are continuous permissible values at 0 ~ 40°C ambient temperature when attaching with the sizes of heatsinks listed below:

ECMA-\_\_04 / 06 / 08 : 250mm x 250mm x 6mm

ECMA-\_\_10 : 300mm x 300mm x 12mm

ECMA-\_\_13 : 400mm x 400mm x 20mm



ECMA-\_\_18 : 550mm x 550mm x 30mm

Material type : Aluminum – F40, F60, F80, F100, F130, F180

\*2 The holding brake is used to hold the motor shaft, not for braking the rotation. Never use it for decelerating or stopping the machine.

ECMA Series	CΔ10		CΔ13
	10	20	30
Rated output power (kW)	1.0	2.0	3.0
Rated torque (N-m) <sup>*1</sup>	3.18	6.37	9.55
Maximum torque (N-m)	9.54	19.1	28.65
Rated speed (r/min)	3000		3000
Maximum speed (r/min)	5000		4500
Rated current (A)	7.30	12.05	17.2
Max. instant current (A)	21.9	36.15	47.5
Power rating (kW/s)	38.1	90.6	71.8
Rotor moment of inertia ( $\times 10^{-4}\text{kg}\cdot\text{m}^2$ )	2.65	4.45	12.7
Mechanical constant (ms)	0.74	0.61	1.11
Torque constant-KT (N-m/A)	0.44	0.53	0.557
Voltage constant-KE (mV/(r/min))	16.8	19.2	20.98
Armature resistance (Ohm)	0.20	0.13	0.0976
Armature inductance (mH)	1.81	1.50	1.21
Electric constant (ms)	9.30	11.4	12.4
Insulation class	Class A (UL), Class B (CE)		
Insulation resistance	>100MΩ, DC 500V		
Insulation strength	1.8k Vac, 1 sec		
Weight (kg) (without brake)	4.3	6.2	7.8
Weight (kg) (with brake)	4.7	7.2	9.2
Max. radial shaft load (N)	490	490	490
Max. thrust shaft load (N)	98	98	98
Power rating (kW/s) (with brake)	30.4	82.0	65.1



ECMA Series	CΔ10		CΔ13
	10	20	30
Rotor moment of inertia ( $\times 10^{-4}\text{kg.m}^2$ ) (with brake)	3.33	4.95	14.0
Mechanical constant (ms) (with brake)	0.93	0.66	1.22
Brake holding torque [Nt-m (min)] <sup>*2</sup>	8.0	8.0	10.0
Brake power consumption (at 20°C) [W]	19.4	19.4	19.0
Brake release time [ms (Max)]	10	10	10
Brake pull-in time [ms (Max)]	70	70	70
Vibration grade ( $\mu\text{m}$ )	15		
Operating temperature	0°C to 40°C (32°F to 104°F)		
Storage temperature	-10°C to 80°C (-14°F to 176°F)		
Operating humidity	20% to 90% RH (non-condensing)		
Storage humidity	20% to 90% RH (non-condensing)		
Vibration capacity	2.5 G		
IP Rating	IP65 (when waterproof connectors are used, or when an oil seal is used to be fitted to the rotating shaft (an oil seal model is used))		
Approvals	 		

## Footnote:

\*1 Rate torque values are continuous permissible values at 0 ~ 40°C ambient temperature when attaching with the sizes of heatsinks listed below:

ECMA-\_\_04 / 06 / 08 : 250mm x 250mm x 6mm

ECMA-\_\_10 : 300mm x 300mm x 12mm

ECMA-\_\_13 : 400mm x 400mm x 20mm



ECMA-\_\_18 : 550mm x 550mm x 30mm

Material type : Aluminum – F40, F60, F80, F100, F130, F180

\*2 The holding brake is used to hold the motor shaft, not for braking the rotation. Never use it for decelerating or stopping the machine.

**Medium / High Inertia Series – 220 V series**

ECMA Series	E△13				E△18			G△13		
	05	10	15	20	20	30	35	03	06	09
Rated output power (kW)	0.5	1.0	1.5	2.0	2.0	3.0	3.5	0.3	0.6	0.9
Rated torque (N-m) *1	2.39	4.77	7.16	9.55	9.55	14.32	16.71	2.86	5.73	8.59
Maximum torque (N-m)	7.16	14.3	21.48	28.65	28.65	42.97	50.13	8.59	17.19	21.48
Rated speed (r/min)	2000							1000		
Maximum speed (r/min)	3000							2000		
Rated current (A)	2.9	5.6	8.3	11.01	11.22	16.1	19.2	2.5	4.8	7.5
Max. instant current (A)	8.7	16.8	24.9	33.03	33.66	48.3	57.6	7.5	14.4	22.5
Power rating (kW/s)	7.0	27.1	45.9	62.5	26.3	37.3	50.8	10.0	39.0	66.0
Rotor moment of inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> )	8.17	8.41	11.18	14.59	34.68	54.95	54.95	8.17	8.41	11.18
Mechanical constant (ms)	1.91	1.51	1.10	0.96	1.62	1.06	1.08	1.84	1.40	1.06
Torque constant-KT (N-m/A)	0.83	0.85	0.87	0.87	0.85	0.89	0.87	1.15	1.19	1.15
Voltage constant-KE (mV/(r/min))	30.9	31.9	31.8	31.8	31.4	32.0	32	42.5	43.8	41.6
Armature resistance (Ohm)	0.57	0.47	0.26	0.174	0.119	0.052	0.052	1.06	0.82	0.43
Armature inductance (mH)	7.39	5.99	4.01	2.76	2.84	1.38	1.38	14.29	11.12	6.97
Electric constant (ms)	12.96	$\frac{12.8}{8}$	15.31	15.86	23.87	26.39	26.39	13.55	13.50	16.06
Insulation class	Class A (UL), Class B (CE)									
Insulation resistance	>100 MΩ, DC 500 V									
Insulation strength	1.8k Vac, 1 sec									
Weight (kg) (without brake)	6.8	7.0	7.5	7.8	13.5	18.5	18.5	6.8	7.0	7.5
Weight (kg) (with brake)	8.2	8.4	8.9	9.2	17.5	22.5	22.5	8.2	8.4	8.9
Max. radial shaft load (N)	490	490	490	490	1176	1470	490	490	490	490
Max. thrust shaft load (N)	98	98	98	98	490	490	98	98	98	98
Power rating (kW/s) (with brake)	6.4	24.9	43.1	59.7	24.1	35.9	48.9	9.2	35.9	62.1

ECMA Series	E△13				E△18			G△13		
	05	10	15	20	20	30	35	03	06	09
Rotor moment of inertia ( $\times 10^{-4}\text{kg.m}^2$ ) (with brake)	8.94	9.14	11.90	15.88	37.86	57.06	57.06	8.94	9.14	11.9
Mechanical constant (ms) (with brake)	2.07	1.64	1.19	1.05	1.77	1.10	1.12	2.0	1.51	1.13
Brake holding torque [Nt-m (min)] <sup>*2</sup>	10.0	10.0	10.0	10.0	25.0	25.0	10.0	10.0	10.0	10.0
Brake power consumption (at 20°C) [W]	19.0	19.0	19.0	19.0	20.4	20.4	19.0	19.0	19.0	19.0
Brake release time [ms (Max)]	10	10	10	10	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70	70	70	70	70	70	70
Vibration grade ( $\mu\text{m}$ )	15									
Operating temperature	0°C to 40°C (32°F to 104°F)									
Storage temperature	-10°C to 80°C (-14°F to 176°F)									
Operating humidity	20% to 90% RH (non-condensing)									
Storage humidity	20% to 90% RH (non-condensing)									
Vibration capacity	2.5 G									
IP Rating	IP65 (when waterproof connectors are used, or when an oil seal is used to be fitted to the rotating shaft (an oil seal model is used))									
Approvals	 									

## Footnote:

- \*1 Rate torque values are continuous permissible values at 0 ~ 40°C ambient temperature when attaching with the sizes of heatsinks listed below:

ECMA-\_\_04 / 06 / 08 : 250mm x 250mm x 6mm

ECMA-\_\_10 : 300mm x 300mm x 12mm

ECMA-\_\_13 : 400mm x 400mm x 20mm



ECMA-\_\_18 : 550mm x 550mm x 30mm

Material type : Aluminum – F40, F60, F80, F100, F130, F180

- \*2 The holding brake is used to hold the motor shaft, not for braking the rotation. Never use it for decelerating or stopping the machine.

**Medium / Medium-High Inertia Series – 220 V series**

ECMA Series	F113	F△13	F113		F△18				F122	
	05	08	13	18	30	45	55	75	1B	1F
Rated output power (kW)	0.5	0.85	1.3	1.8	3.0	4.5	5.5	7.5	11	15
Rated torque (N-m) <sup>*1</sup>	3.18	5.41	8.34	11.48	19.10	28.65	35.01	47.74	70	95.4
Maximum torque (N-m)	8.92	13.8	23.3	28.7	57.29	71.62	87.53	119.36	175	224.0
Rated speed (r/min)	1500									
Maximum speed (r/min)	3000								2000	
Rated current (A)	3.9	7.1	12.6	13	19.4	32.5	40.0	47.5	51.8	61.5
Max. instant current (A)	12.1	19.4	38.6	36	58.2	81.3 <sup>*3</sup>	100.0	118.8	129.5	145.7
Power rating (kW/s)	9.8	21.52	34.78	52.93	66.4	105.5	122.9	159.7	148.9	164.6
Rotor moment of inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	10.3	13.6	20	24.9	54.95	77.75	99.78	142.7	329	553
Mechanical constant (ms)	2.8	2.43	1.62	1.7	1.28	0.92	0.96	0.63	1.36	1.23
Torque constant-KT (N-m/A)	0.82	0.76	0.66	0.88	0.98	0.88	0.88	1.01	1.35	1.55
Voltage constant-KE (mV/(r/min))	29.5	29.2	24.2	32.2	35.0	32.0	31.0	35.5	49	55.65
Motor resistance (Ohm)	0.624	0.38	0.124	0.185	0.077	0.032	0.025	0.015	0.026	0.018
Motor inductance (mH)	7	4.77	1.7	2.6	1.27	0.89	0.60	0.40	0.64	0.45
Motor constant (ms)	11.22	12.55	13.71	14.05	16.5	27.8	24.0	26.7	24.77	24.51
Insulation class	Class A (UL), Class B (CE)									
Insulation resistance	>100 MΩ, DC 500 V									
Insulation strength	1.8k Vac, 1 sec									
Weight (kg) (without brake)	6.3	8.6	9.4	10.5	18.5	23.5	30.5	37.0	56.4	86.4
Weight (kg) (with brake)	--	10.0	--	--	22.5	29	36	53	-	-
Max. radial shaft load (N)	490	490	490	490	1470	1470	1764	1764	3300	3300
Max. thrust shaft load (N)	98	98	98	98	490	490	588	588	1100	1100
Power rating (kW/s) (with brake)	8.8	19.78	32.66	50.3	63.9	101.8	119.4	156.6	-	-
Rotor moment of inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (with brake)	11.5	14.8	21.3	26.2	57.06	80.65	102.70	145.55	-	-
Mechanical constant (ms) (with brake)	3.12	2.65	1.73	1.79	1.33	0.96	0.99	0.64	-	-
Brake holding torque [Nt-m (min)] <sup>*2</sup>	10	10.0	10.0	10.0	25.0	25.0	25.0	25.0	115	115

ECMA Series	F113	F△13	F113		F△18				F122	
	05	08	13	18	30	45	55	75	1B	1F
Brake power consumption (at 20°C) [W]	19	19.0	19.0	19.0	20.4	20.4	20.4	20.4	28.8	28.8
Brake release time [ms (Max)]	10	10	10	10	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70	70	70	70	70	70	70
Vibration grade (µm)	15									
Operating temperature	0°C to 40°C (32°F to 104°F)									
Storage temperature	-10°C to 80°C (-14°F to 176°F)									
Operating humidity	20% to 90% RH (non-condensing)									
Storage humidity	20% to 90% RH (non-condensing)									
Vibration capacity	2.5 G									
IP Rating	IP65 (when waterproof connectors are used, or when an oil seal is used to be fitted to the rotating shaft (an oil seal model is used))									
Approvals	 									



## Footnote:

- \*1 Rate torque values are continuous permissible values at 0 ~ 40°C ambient temperature when attaching with the sizes of heatsinks listed below:  
 ECMA-\_\_04 / 06 / 08 : 250mm x 250mm x 6mm  
 ECMA-\_\_10 : 300mm x 300mm x 12mm  
 ECMA-\_\_13 : 400mm x 400mm x 20mm  
 ECMA-\_\_18 : 550mm x 550mm x 30mm  
 Material type : Aluminum – F40, F60, F80, F100, F130, F180
- \*2 The holding brake is used to hold the motor shaft, not for braking the rotation. Never use it for decelerating or stopping the machine.
- \*3 If reaching motor maximum torque limit of 250% is required, it is recommended to use the servo drives that the rated output power is higher than the connected servo motors.
- \*4 Models of ECMA-F11305, ECMA-F11308, ECMA-F11313 and ECMA-F11318 are applying for UL approval.

## 11.2.2 ECMA 400V Series

### Low / Medium Inertia Series – 400 V series

ECMA Series	J106	J108	J110		J113	K113			K118
	400 W	750 W	1 kW	2 kW	3 kW	1 kW	1.5 kW	2 kW	2 kW
	04	07	10	20	30	10	15	20	20
Rated output power (kW)	0.4	0.75	1.0	2.0	3.0	1.0	1.5	2.0	2.0
Rated torque (N-m) <sup>*1</sup>	1.27	2.39	3.18	6.37	9.55	4.77	7.16	9.55	9.55
Maximum torque (N-m)	3.82	7.16	9.54	19.1	28.65	14.32	21.48	28.65	28.65
Rated speed (r/min)	3000				3000	2000			
Maximum speed (r/min)	5000				4500	3000			
Rated current (A)	1.62	3.07	4.15	7.09	9.8	3.52	5.02	6.66	6.6
Max. instant current (A)	4.85	9.5	12.46	21.28	29.99	10.56	15.06	19.98	19.88
Power rating (kW/s)	58.2	50.4	38.2	91.2	71.8	27.1	45.9	62.5	26.3
Rotor moment of inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> )	0.277	1.13	2.65	4.45	12.7	8.41	11.18	14.59	34.68
Mechanical constant (ms)	0.47	0.66	0.77	0.58	0.99	1.80	1.24	1.04	1.74
Torque constant-KT (N-m/A)	0.79	0.78	0.77	0.9	0.97	1.35	1.43	1.43	1.45
Voltage constant-KE (mV/(r/min))	30.6	28.24	29.0	34.4	37.3	53.2	55	55	54.0
Armature resistance (Ohm)	3.95	1.22	0.617	0.388	0.269	1.47	0.83	0.57	0.376
Armature inductance (mH)	21.3	10.68	6.03	4.62	3.55	17.79	11.67	8.29	7.87
Electric constant (ms)	5.39	8.75	9.77	11.8	13.2	12.04	14.04	14.39	20.9
Insulation class	Class A (UL), Class B (CE)								
Insulation resistance	>100 M $\Omega$ , DC 500 V								
Insulation strength	2.3k Vac, 1 sec								
Weight (kg) (without brake)	1.6	3.0	4.3	6.2	7.8	7.0	7.5	7.8	13.5
Weight (kg) (with brake)	2	3.8	4.7	7.2	9.2	8.4	8.9	9.2	17.5
Max. radial shaft load (N)	53.8	245	490	490	490	490	490	490	1176
Max. thrust shaft load (N)	0.3	98	98	98	98	98	98	98	490
Power rating (kW/s) (with brake)	0.51	48.4	30.4	82	65.1	24.9	43.1	59.7	24.1
Rotor moment of inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> ) (with brake)	1.3	1.18	3.33	4.95	14.0	9.14	11.90	15.88	37.86

ECMA Series	J106	J108	J110		J113	K113			K118
	400 W	750 W	1 kW	2 kW	3 kW	1 kW	1.5 kW	2 kW	2 kW
	04	07	10	20	30	10	15	20	20
Mechanical constant (ms) (with brake)	6.5	0.65	0.96	0.65	1.09	1.96	1.32	1.13	1.9
Brake holding torque [Nt-m (min)] <sup>*2</sup>	10.0	2.5	8	8	10.0	10.0	10.0	10.0	25.0
Brake power consumption (at 20°C) [W]	18.5	8.5	18.5	18.5	19.0	19.0	19.0	19.0	20.4
Brake release time [ms (Max)]	10	10	10	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70	70	70	70	70	70
Vibration grade (µm)	15								
Operating temperature	0°C to 40°C (32°F to 104°F)								
Storage temperature	-10°C to 80°C (-14°F to 176°F)								
Operating humidity	20% to 90% RH (non-condensing)								
Storage humidity	20% to 90% RH (non-condensing)								
Vibration capacity	2.5 G								
IP Rating	IP65 (when waterproof connectors are used, or when an oil seal is used to be fitted to the rotating shaft (an oil seal model is used))								
Approvals	 								



## Footnote:

- \*1 Rate torque values are continuous permissible values at 0 ~ 40°C ambient temperature when attaching with the sizes of heatsinks listed below:  
 ECMA-\_\_08 : 250mm x 250mm x 6mm  
 ECMA-\_\_13 : 400mm x 400mm x 20mm  
 ECMA-\_\_18 : 550mm x 550mm x 30mm  
 Material type : Aluminum – F80, F130, F180
- \*2 The holding brake is used to hold the motor shaft, not for braking the rotation. Never use it for decelerating or stopping the machine.

**Medium-High Inertia Series – 400 V series**

ECMA Series	L△18		L118	
	30	45	55	75
Rated output power (kW)	3.0	4.5	5.5	7.5
Rated torque (N-m) *1	19.10	28.65	35.0	47.74
Maximum torque (N-m)	57.29	71.62	87.53	119.36
Rated speed (r/min)	1500			
Maximum speed (r/min)	3000			
Rated current (A)	11.53	20.8	22.37	27.3
Max. instant current (A)	34.6	52	56	68.3
Power rating (kW/s)	66.4	105.5	122.9	159.7
Rotor moment of inertia ( $\times 10^{-4}\text{kg.m}^2$ )	54.95	77.75	99.78	142.7
Mechanical constant (ms)	1.11	0.94	0.88	0.77
Torque constant-KT (N-m/A)	1.66	1.38	1.56	1.75
Voltage constant-KE (mV/(r/min))	64.4	53	58.9	66.4
Motor resistance (Ohm)	0.21	0.09	0.07	0.06
Motor inductance (mH)	4.94	2.36	2.2	1.7
Motor constant (ms)	23.97	28.07	27.6	28.29
Insulation class	-			
Insulation resistance	>100 MΩ, DC 500 V			
Insulation strength	2.3k Vac, 1 sec			
Weight (kg) (without brake)	18.5	23.5	30.5	40.5
Weight (kg) (with brake)	22.5	29	36	46
Max. radial shaft load (N)	1470	1470	1764	1764
Max. thrust shaft load (N)	490	490	588	588
Power rating (kW/s) (with brake)	63.9	101.8	119.4	156.6
Rotor moment of inertia ( $\times 10^{-4}\text{kg.m}^2$ ) (with brake)	57.06	80.65	102.70	145.5
Mechanical constant (ms) (with brake)	1.16	0.95	0.91	0.79
Brake holding torque [Nt-m (min)]	25.0	40.0	55.0	55.0
Brake power consumption (at 20°C) [W]	20.4	15.1	21	21




ECMA Series	L△18	L118		
	30	45	55	75
Brake release time [ms (Max)]	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70
Vibration grade (μm)	15			
Operating temperature	0°C to 40°C (32°F to 104°F)			
Storage temperature	-10°C to 80°C (-14°F to 176°F)			
Operating humidity	20% to 90% RH (non-condensing)			
Storage humidity	20% to 90% RH (non-condensing)			
Vibration capacity	2.5 G			
IP Rating	IP65 (when waterproof connectors are used, or when an oil seal is used to be fitted to the rotating shaft (an oil seal model is used))			
Approvals	 			

## Footnote:

- \*1 Rate torque values are continuous permissible values at 0 ~ 40°C ambient temperature when attaching with the sizes of heatsinks listed below:  
 ECMA-\_\_08 : 250mm x 250mm x 6mm  
 ECMA-\_\_13 : 400mm x 400mm x 20mm  
 ECMA-\_\_18 : 550mm x 550mm x 30mm  
 Material type : Aluminum – F80, F130, F180
- \*2 The holding brake is used to hold the motor shaft, not for braking the rotation. Never use it for decelerating or stopping the machine.

## High Inertia Series

ECMA Series	L113	M113
	850 W	900 W
	08	09
Rated output power (kW)	0.85	0.9
Rated torque (N-m) <sup>*1</sup>	5.39	8.59
Maximum torque (N-m)	13.8	21.48
Rated speed (r/min)	1500	1000
Maximum speed (r/min)	3000	2000
Rated current (A)	3.57	4.4
Max. constant current (A)	9.5	13.1
Power rating (kW/s)	17.0	66
Rotor moment of inertia ( $\times 10^{-4}\text{kg.m}^2$ )	17.1	11.18
Mechanical constant (ms)	1.91	1.21
Torque constant-KT (N-m/A)	1.51	1.95
Voltage constant-KE (mV/(r/min))	56.9	71.7
Armature resistance (Ohm)	0.914	1.45
Armature inductance (mH)	13.7	23.3
Electrical constant (ms)	15.0	16.07
Insulation class	Class A (UL), Class B (CE)	
Insulation resistance	> 100 M $\Omega$ , DC 500 V	
Insulation strength	2.3k Vac, 1 sec	
Weight (kg) (without brake)	8.6	7.5
Weight (kg) (with brake)	10	8.9
Max. radial shaft load (N)	490	490
Max. thrust shaft load (N)	98	98
Power rating (kW/s) (with brake)	15.0	--
Rotor moment of inertia ( $\times 10^{-4}\text{kg.m}^2$ ) (with brake)	19.4	--
Mechanical time constant (ms) (with brake)	2.16	--
Brake holding torque [Nt-m (min)] <sup>*2</sup>	10.0	--
Brake power consumption (at 20°C)[W]	19.0	--
Brake release time [ms (Max)]	10	--
Brake pull-in time [ms (Max)]	70	--

ECMA Series	L113	M113
	850 W	900 W
	08	09
Vibration grade ( $\mu\text{m}$ )	15	
Operating temperature ( $^{\circ}\text{C}$ )	0 ~ 40	
Storage temperature ( $^{\circ}\text{C}$ )	-10 ~ 80	
Operating humidity	20 ~ 90%RH (non-condensing)	
Storage humidity	20 ~ 90%RH (non-condensing)	
Vibration capacity	2.5 G	
IP Rating	IP65 (when waterproof connectors are used, or when an oil seal is used to be fitted to the rotating shaft (an oil seal model is used))	
Approvals		

Note:

\*1 Rate torque values are continuous permissible values at 0 ~ 40 $^{\circ}\text{C}$  ambient temperature when attaching with the sizes of heatsinks listed below:

ECMA-\_\_ 08 : 250mm x 250mm x 6mm

ECMA-\_\_ 13 : 400mm x 400mm x 20mm

ECMA-\_\_ 18 : 550mm x 550mm x 30mm

ECMA-\_\_ 22 : 650mm x 650mm x 35mm

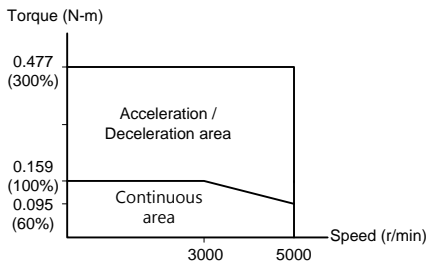
Material type: Aluminum –F80, F130, F180, F220

\*2 The holding brake is used to hold the motor shaft, not for braking the rotation. Never use it for decelerating or stopping the machine.

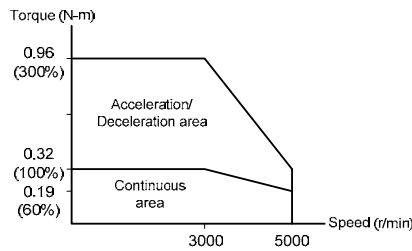
\*3 Model of ECMA-L11308 is applying for UL approval.

# 11.3 Servo Motor Speed-Torque Curves (T-N Curves)

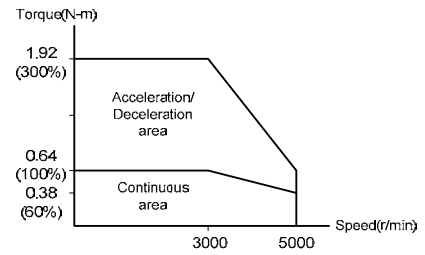
## 11.3.1 220 V Series



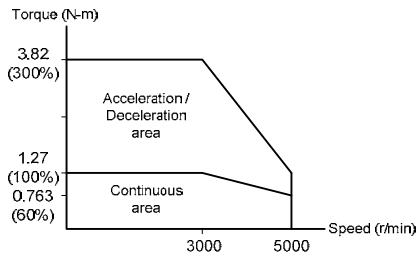
ECMA-C1040F□S



ECMA-C10401□S

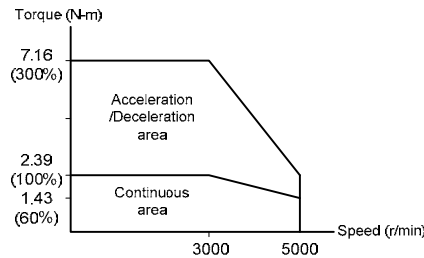


ECMA-C10602□S

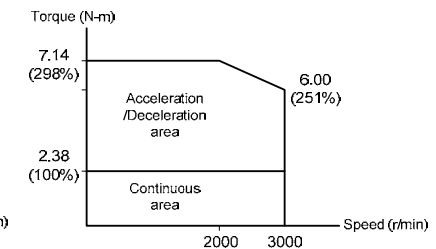


ECMA-C10604□S

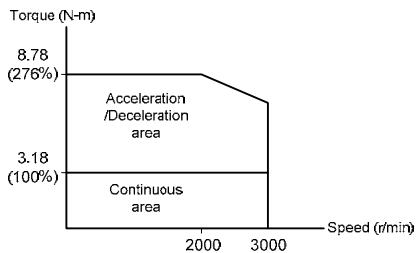
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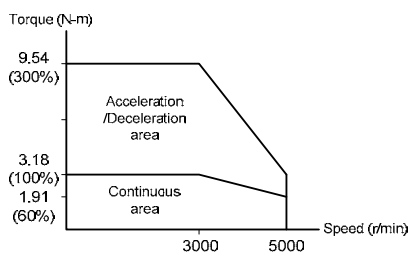
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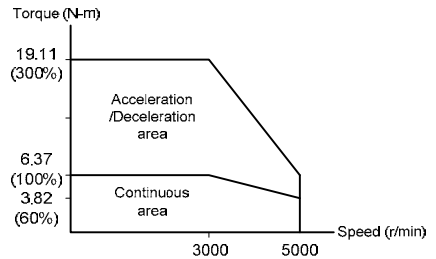
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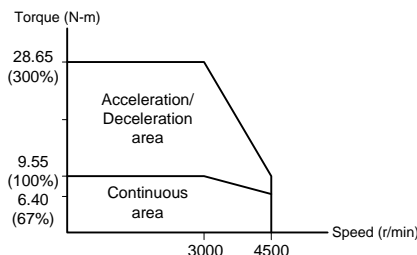
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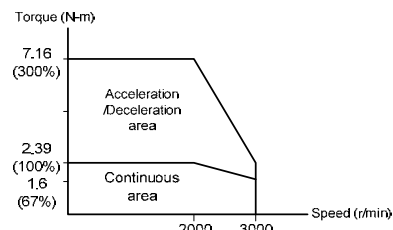
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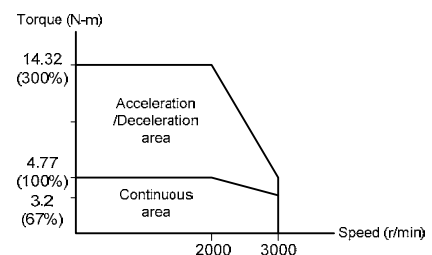
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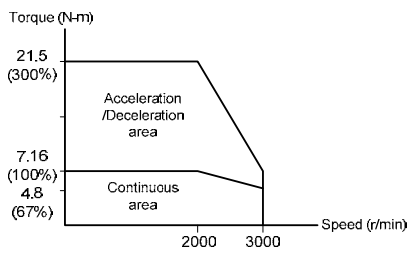
ECMA-C11330□4



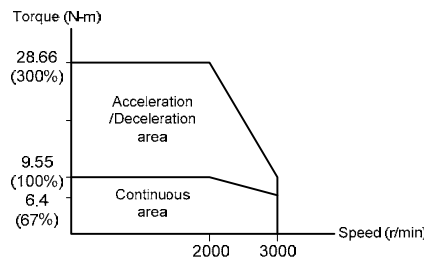
ECMA-E11305□S



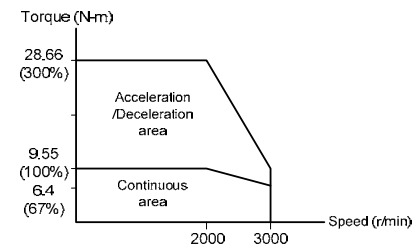
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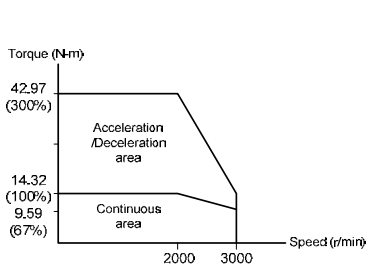
ECMA-E11315□S



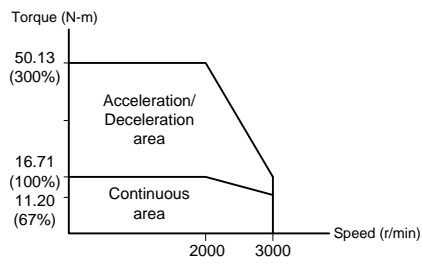
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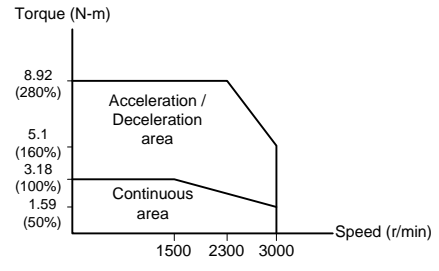
ECMA-E11820□S



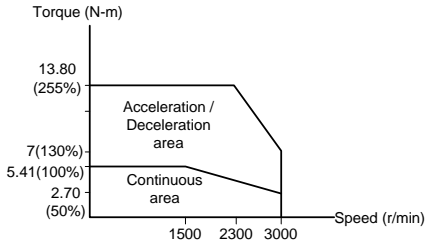
ECMA-E11830 S



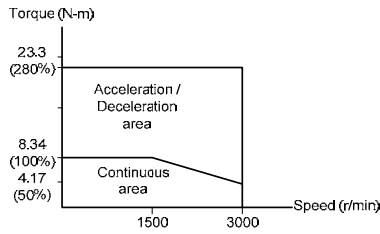
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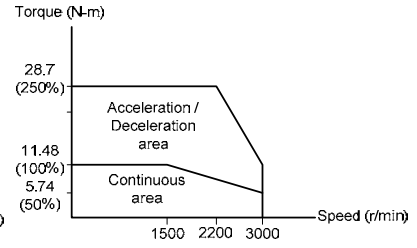
ECMA-F11305 S



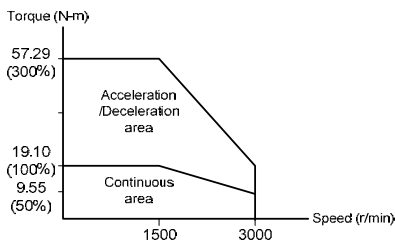
ECMA-F11308 S



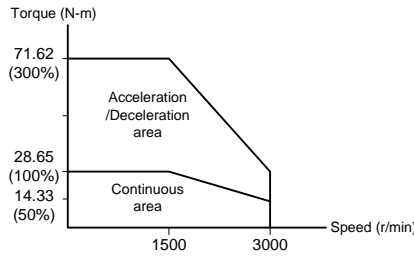
ECMA-F11313 S



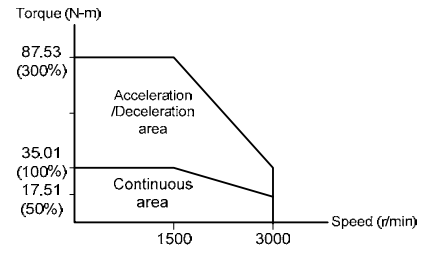
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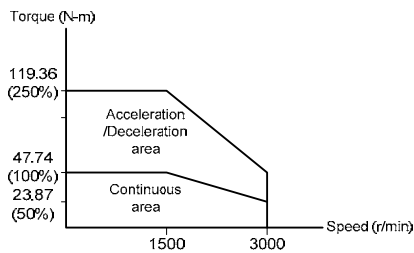
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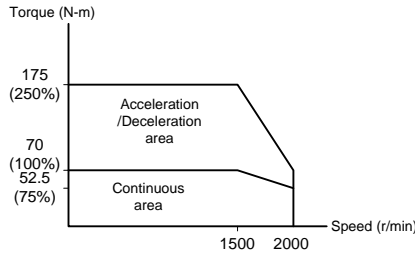
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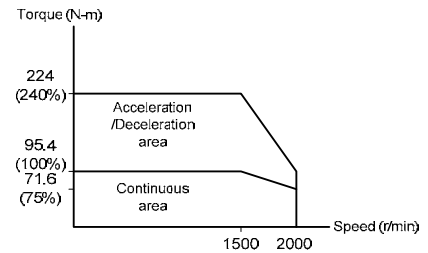
ECMA-F11855 S



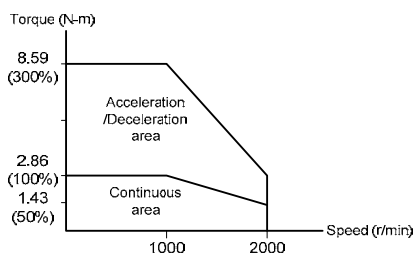
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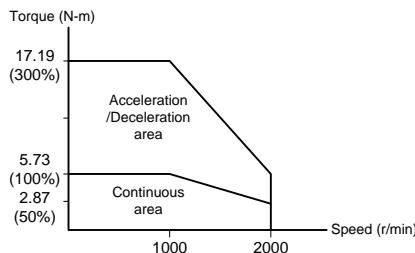
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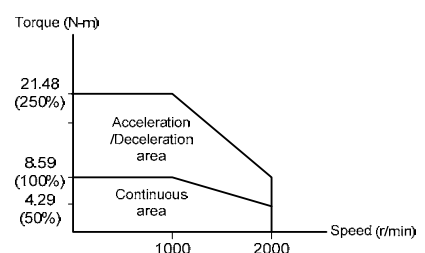
ECMA-F1221F S



ECMA-G11303 S

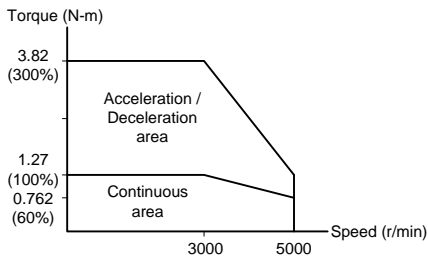


ECMA-G11306 S

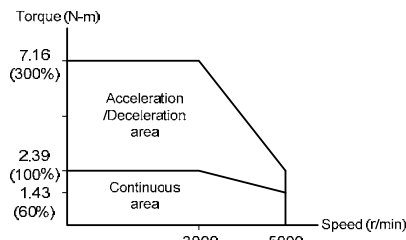


ECMA-G11309 S

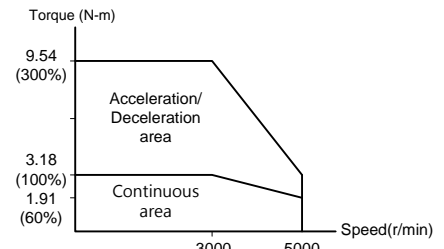
### 11.3.2 400 V Series



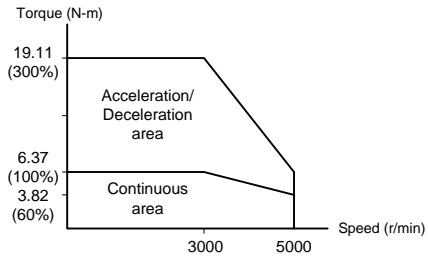
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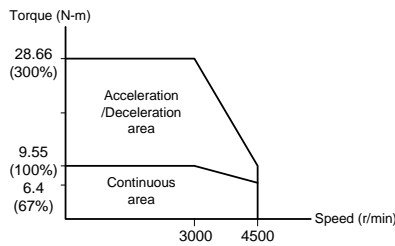
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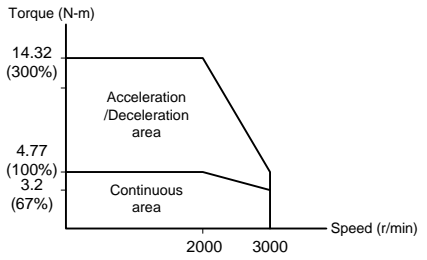
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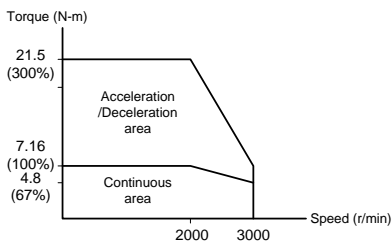
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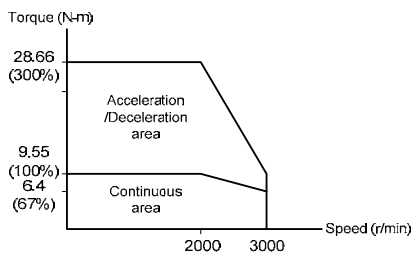
ECMA-J11330 □ 4



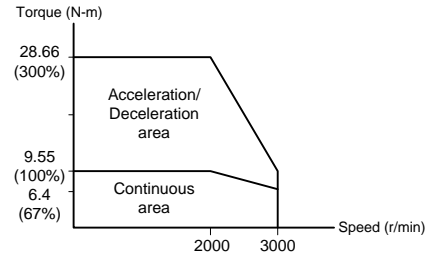
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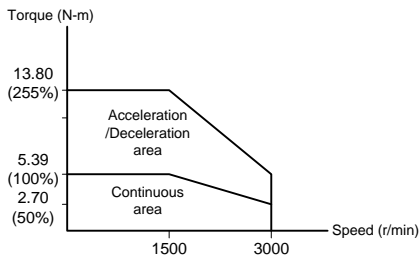
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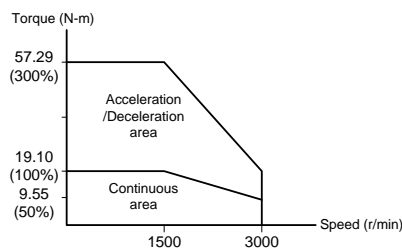
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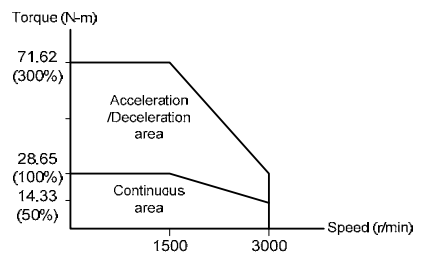
ECMA-K11820 □ S



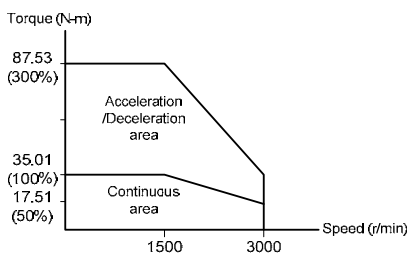
ECMA-L11308 □ S



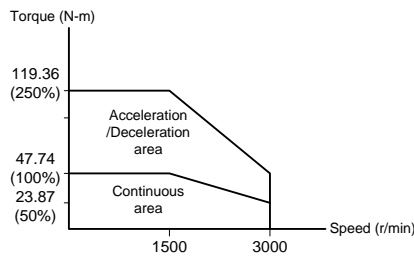
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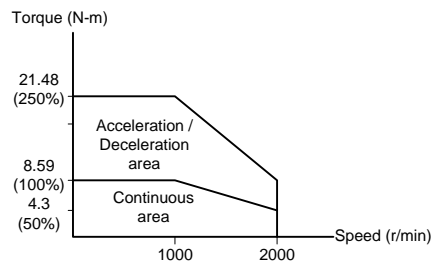
ECMA-L11845 □ S



ECMA-L11855 □ S



ECMA-L11875 □ S



ECMA-M11309 □ S

## 11.4 Overload Characteristics

### ■ Overload Protection Function

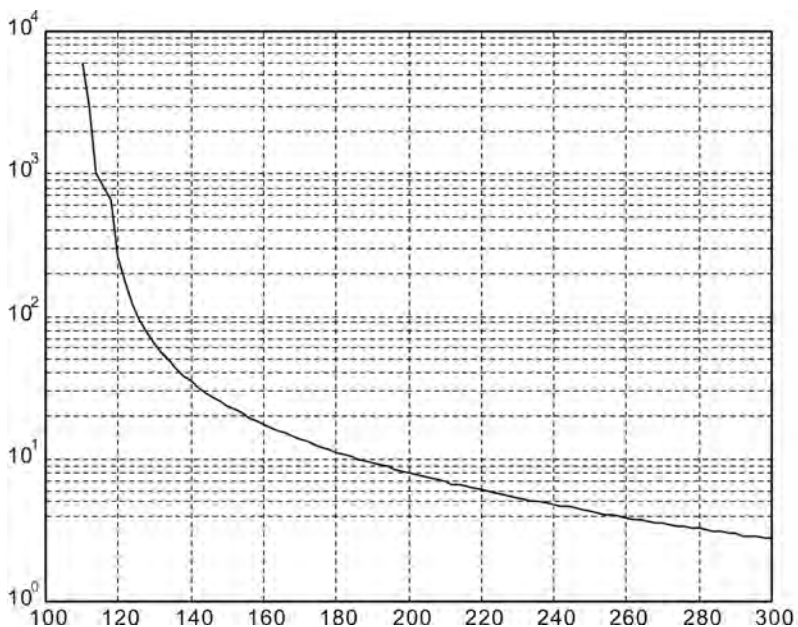
Overload protection is a built-in protective function to prevent a motor from overheating.

### ■ Occasion of Overload

1. Motor was operated for several seconds under a torque exceeding 100% torque.
2. Motor had driven high inertia machine and had accelerated and decelerated at high frequency.
3. Motor UVW cable or encoder cable was not connected correctly.
4. Servo gain was not set properly and caused motor hunting.
5. Motor holding brake was not released.

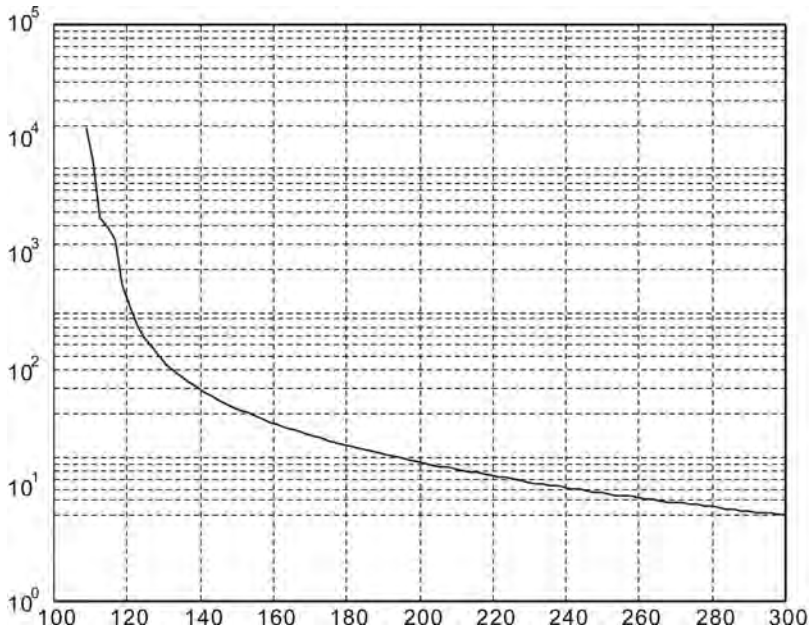
### ■ Chart of load and operating time

#### Low Inertia Series (ECMA C1, J1 Series)



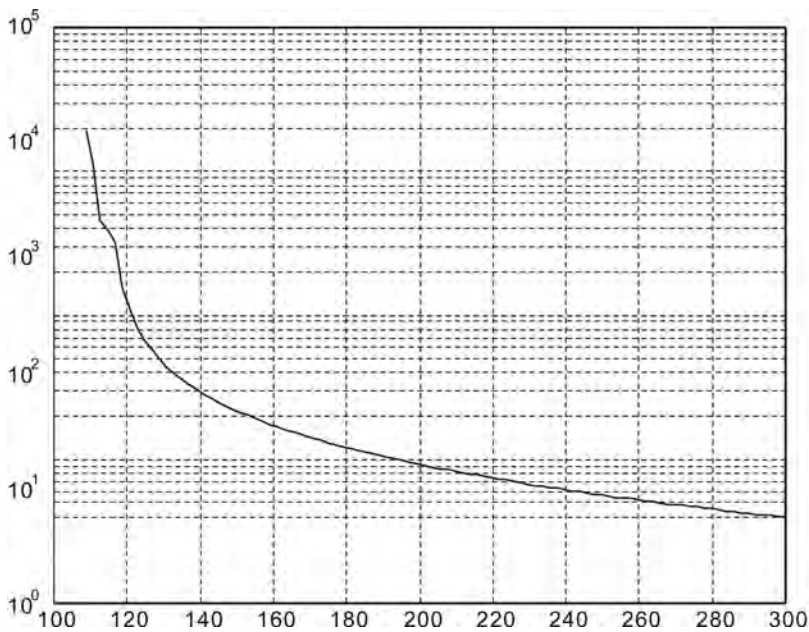
Load	Operating Time
120%	263.8s
140%	35.2s
160%	17.6s
180%	11.2s
200%	8s
220%	6.1s
240%	4.8s
260%	3.9s
280%	3.3s
300%	2.8s

**Medium and Medium-High Inertia Series (ECMA E1, F1, K1 and L1 Series)**



Load	Operating Time
120%	527.6s
140%	70.4s
160%	35.2s
180%	22.4s
200%	16s
220%	12.2s
240%	9.6s
260%	7.8s
280%	6.6s
300%	5.6s

**High Inertia Series (ECMA G1 Series)**



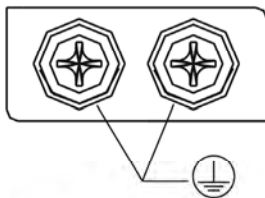
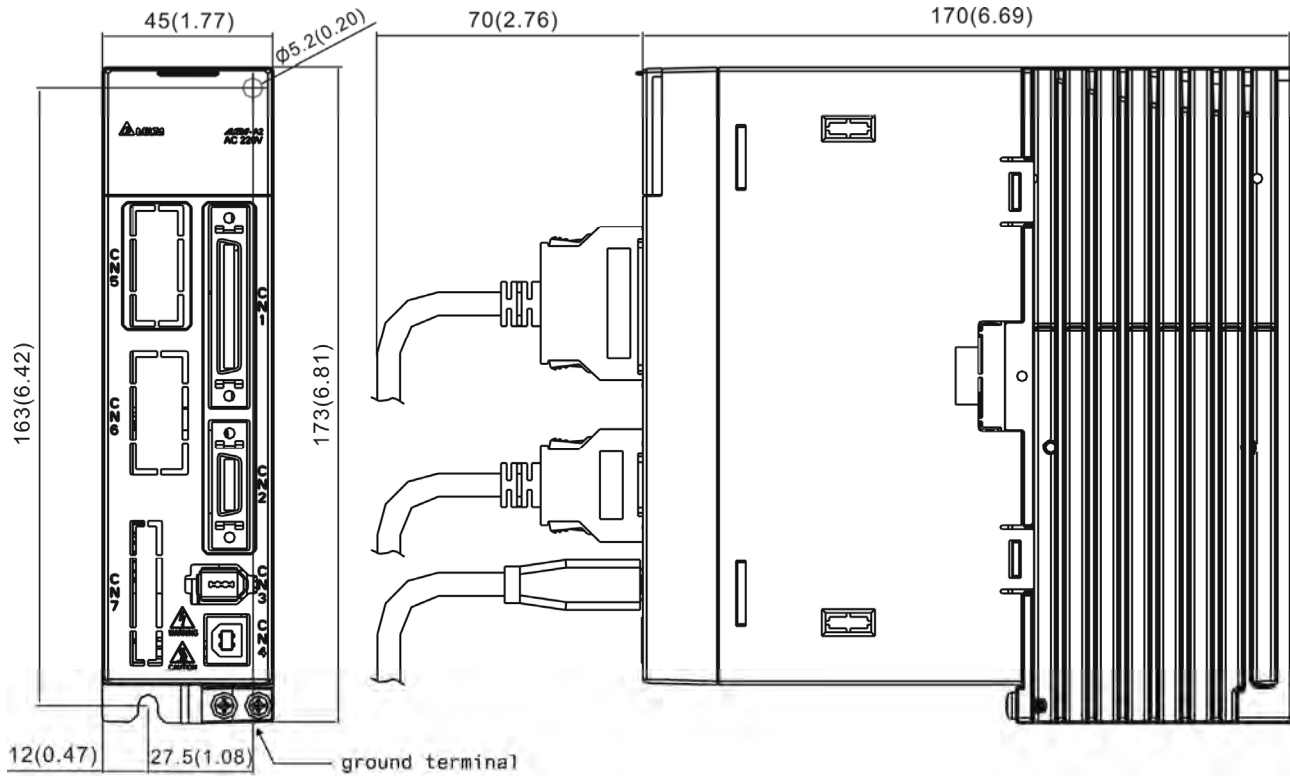
Load	Operating Time
120%	527.6s
140%	70.4s
160%	35.2s
180%	22.4s
200%	16s
220%	12.2s
240%	9.6s
260%	7.8s
280%	6.6s
300%	5.6s



# 11.5 Dimensions of Servo Drive

## 11.5.1 220 V Series

ASD-A2-0121; ASD-A2-0221; ASD-A2-0421 (100 W ~ 400 W)



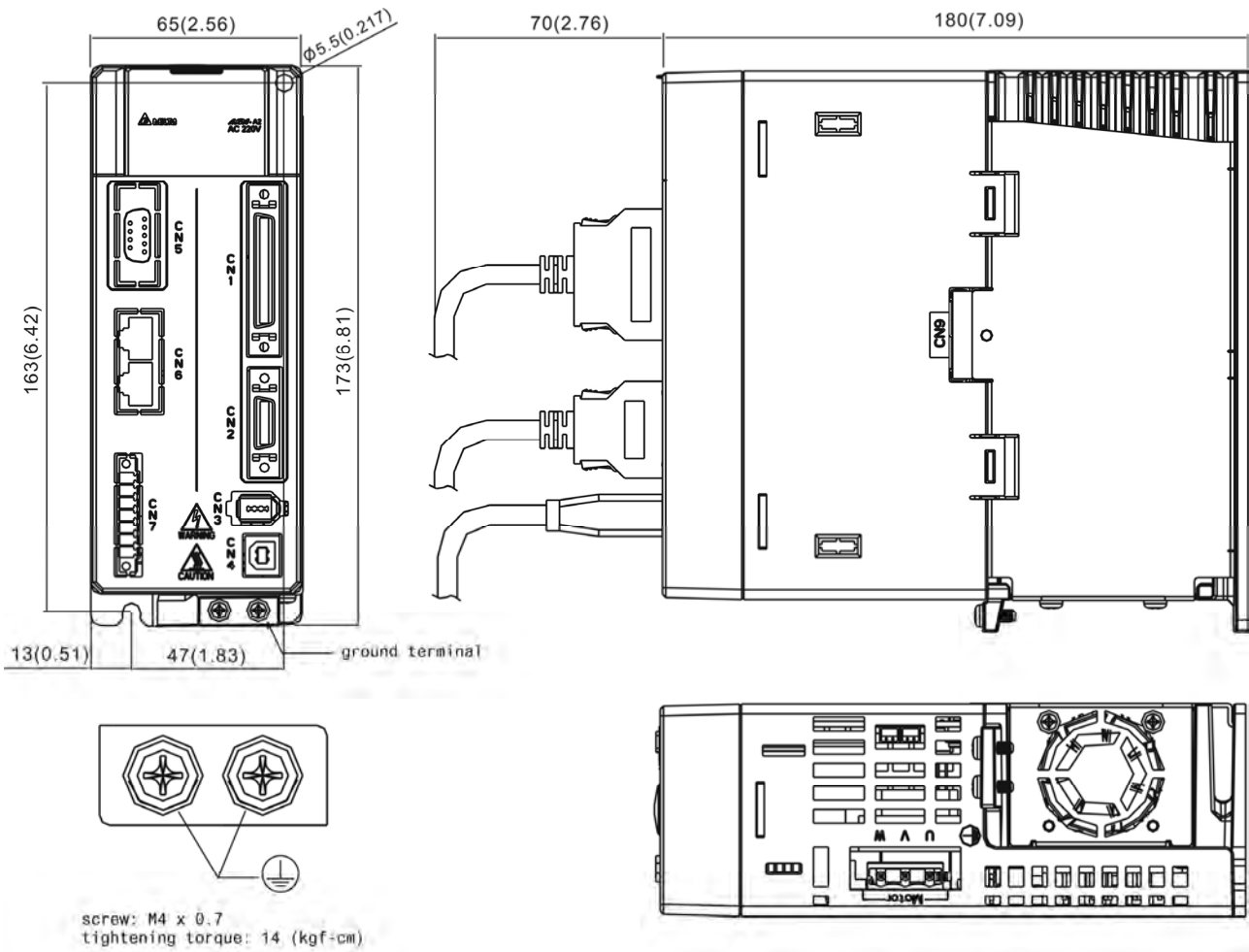
screw: M4 x 0.7  
tightening torque: 14 (kgf-cm)

<b>WEIGHT</b>
1.5 (3.3)

 **NOTE**

- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

**ASD-A2-0721; ASD-A2-1021; ASD-A2-1521 (750 W ~ 1.5 kW)**



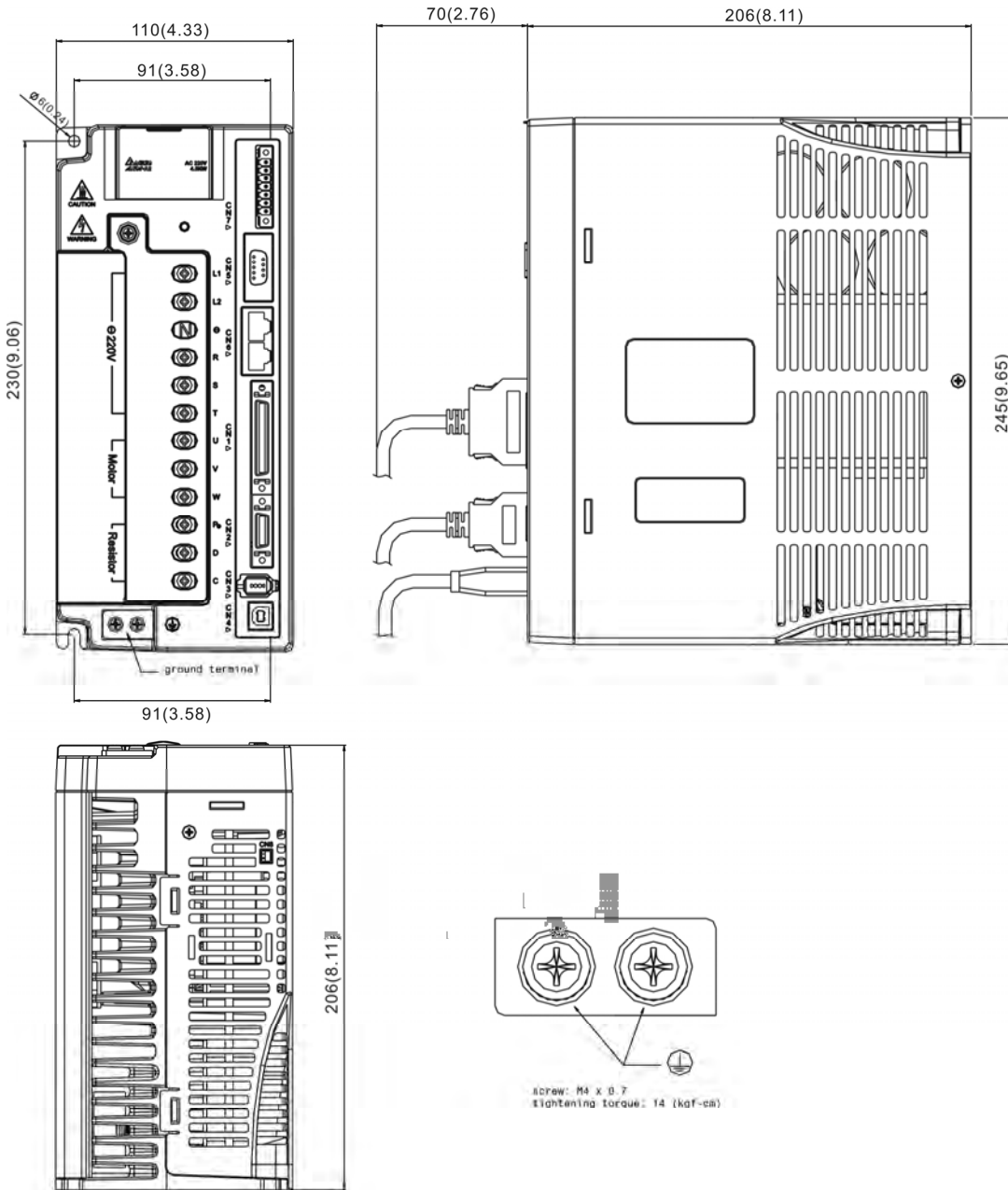
<b>WEIGHT</b>
2.0 (4.4)

 **NOTE**

- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.



**ASD-A2-4523 (4.5 kW)**

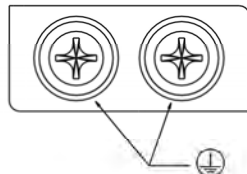
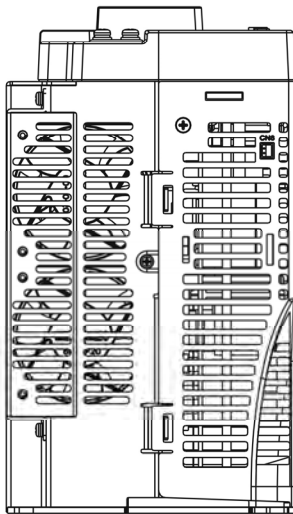
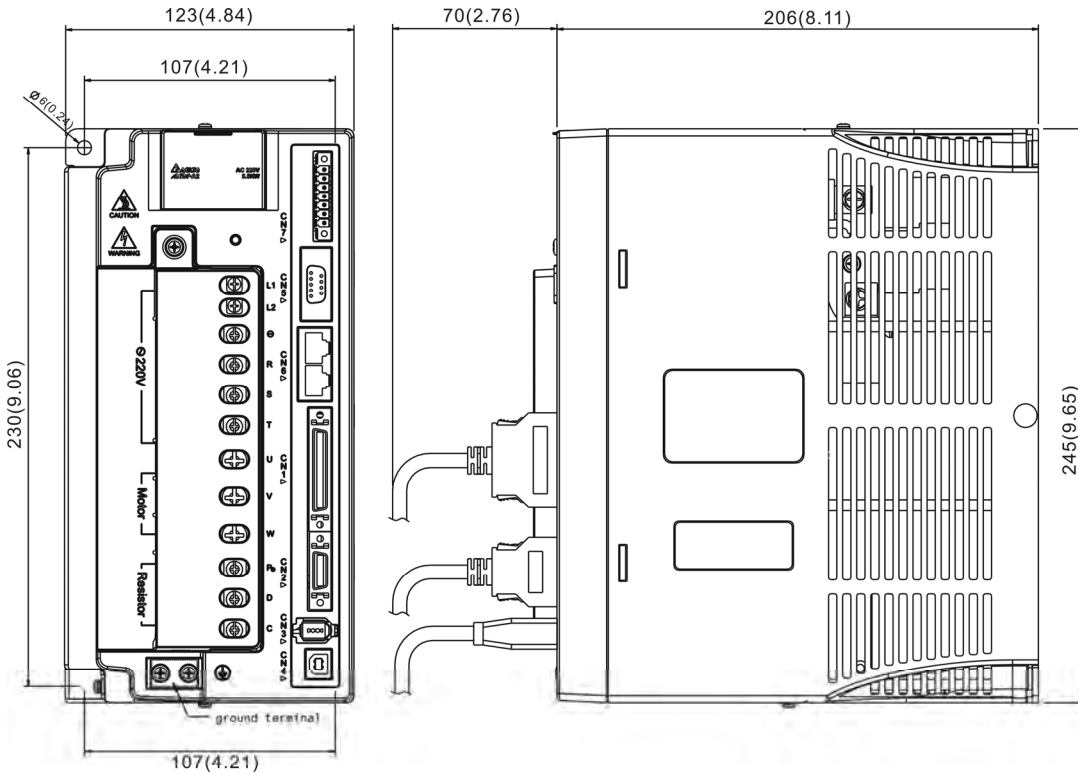


<b>WEIGHT</b>
4.4 (10.0)

**NOTE**

- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

**ASD-A2-5523 (5.5 kW)**



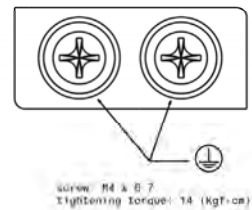
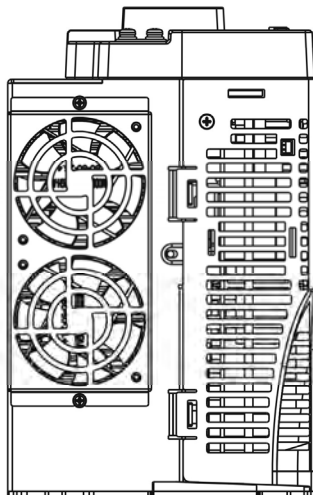
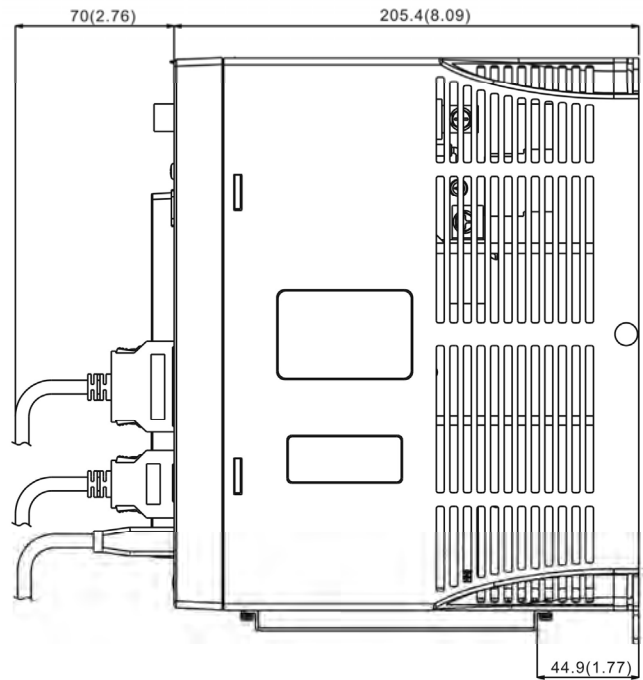
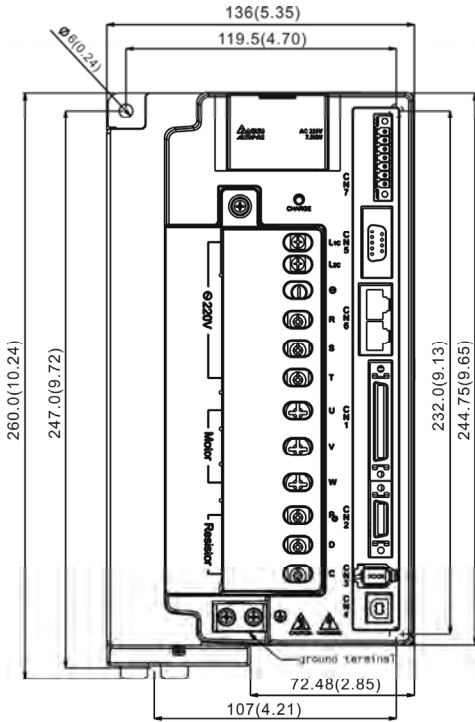
screw: M4 x 0.7  
tightening torque: 14 (kgf-cm)

<b>WEIGHT</b>
5.5 (12.1)

**NOTE**

- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

ASD-A2-7523 (7.5 kW)

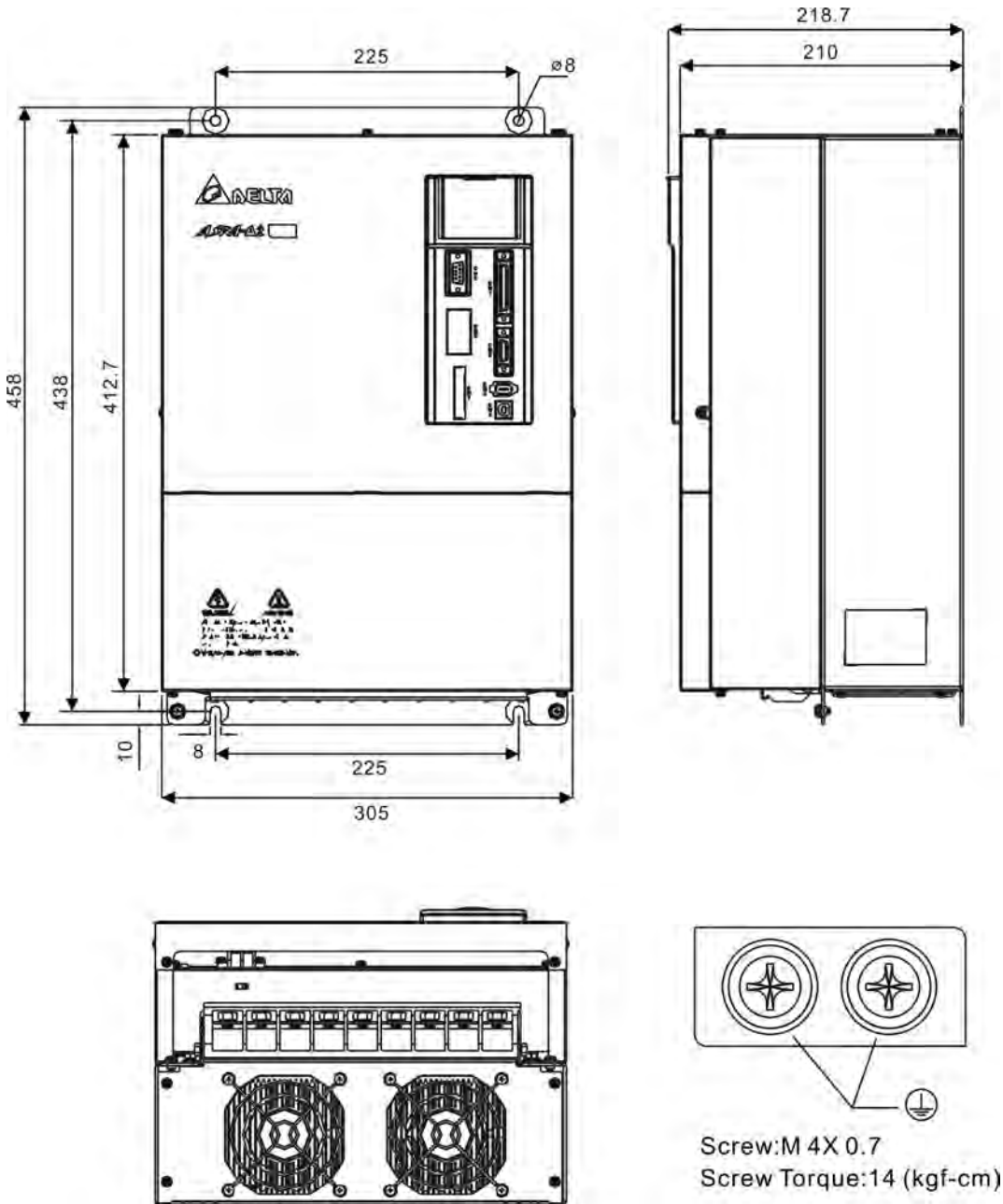


WEIGHT
5.9 (13)

 **NOTE**

- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

ASD-A2-1B23 (11 kW); ASD-A2-1F23 (15 kW)



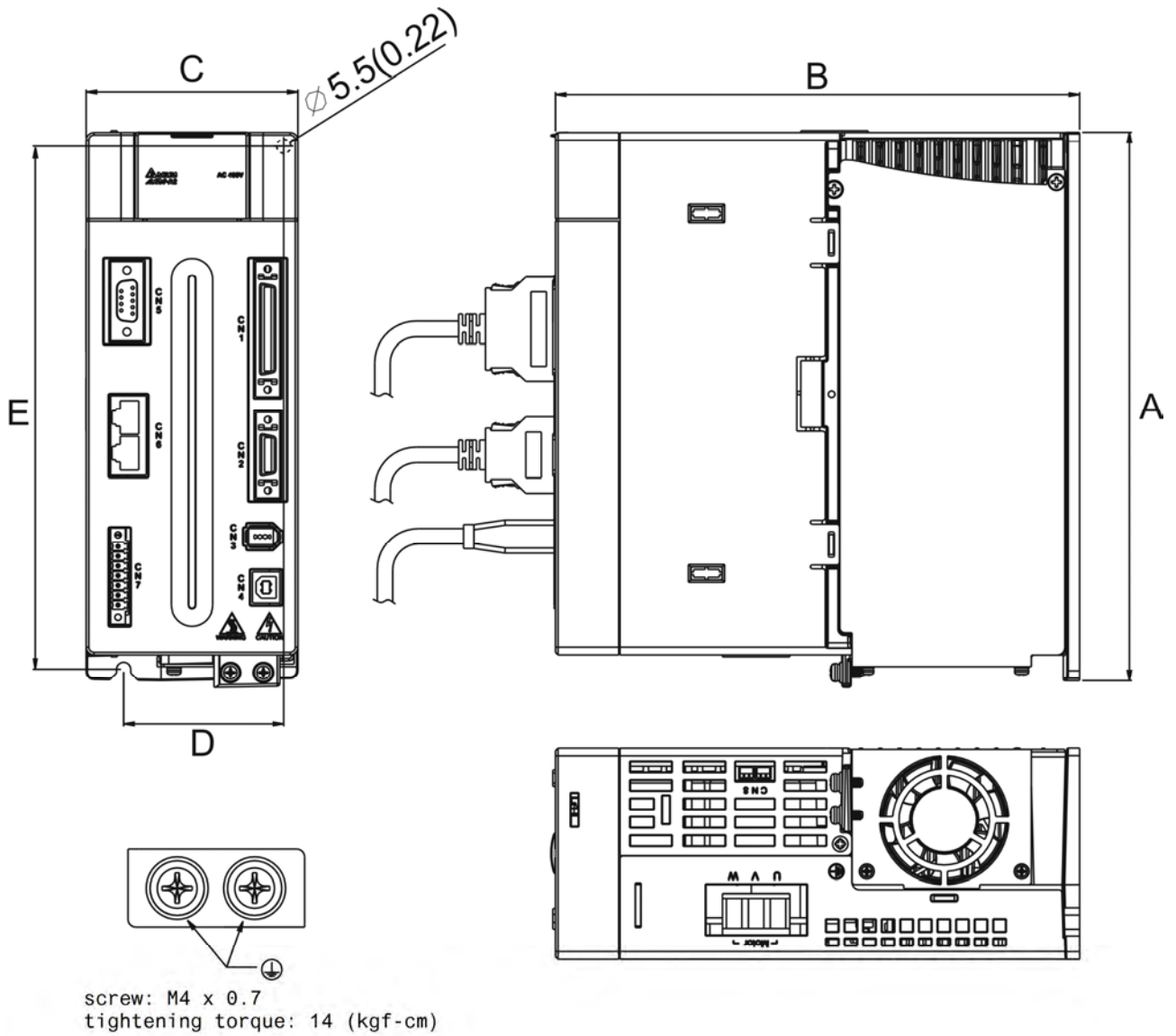
WEIGHT
20 (44)

 **NOTE**

- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

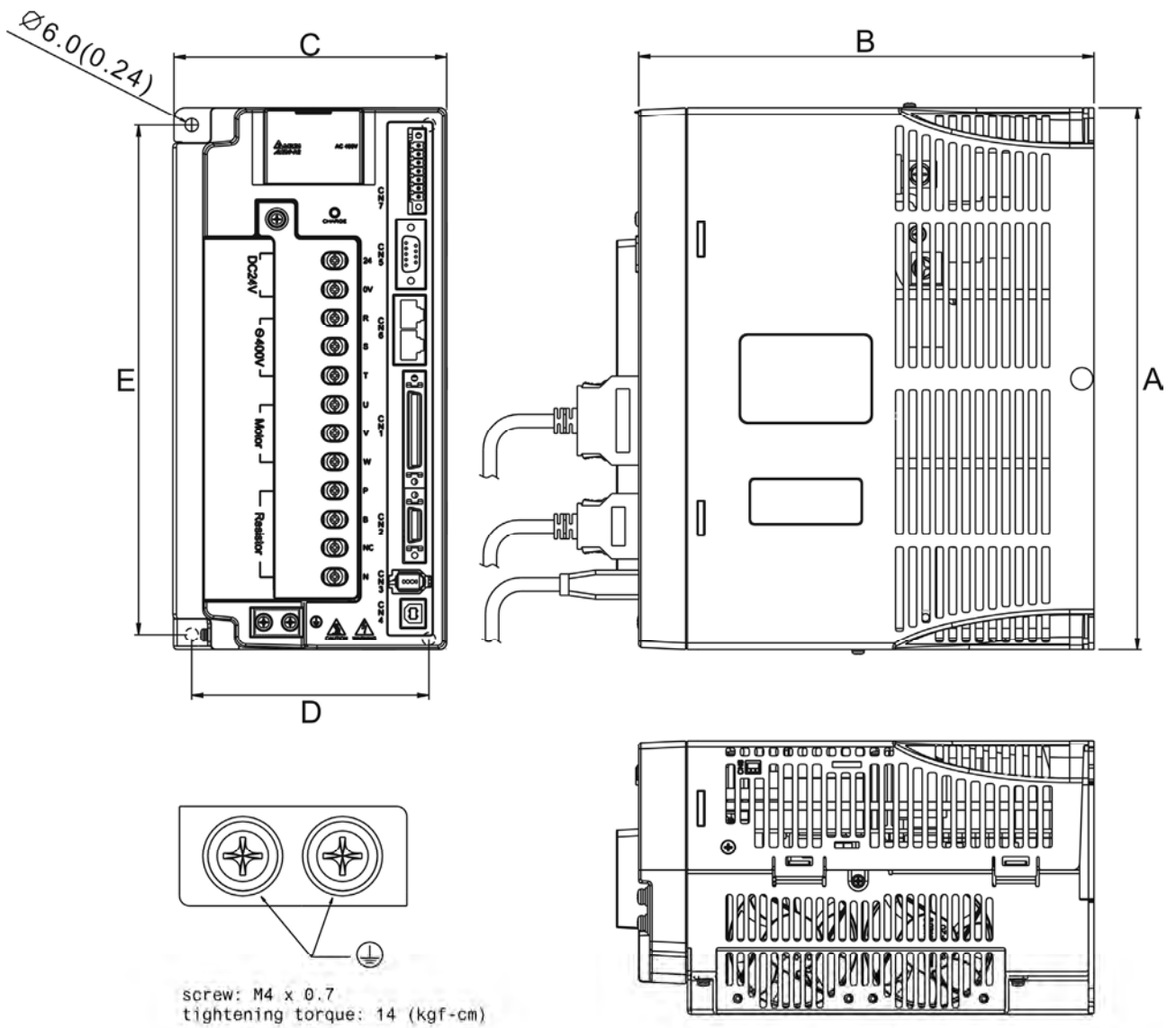
### 11.5.2 400 V Series

ASD-A2-0743; ASD-A2-1043; ASD-A2-1543 (750 W ~ 1.5 kW)



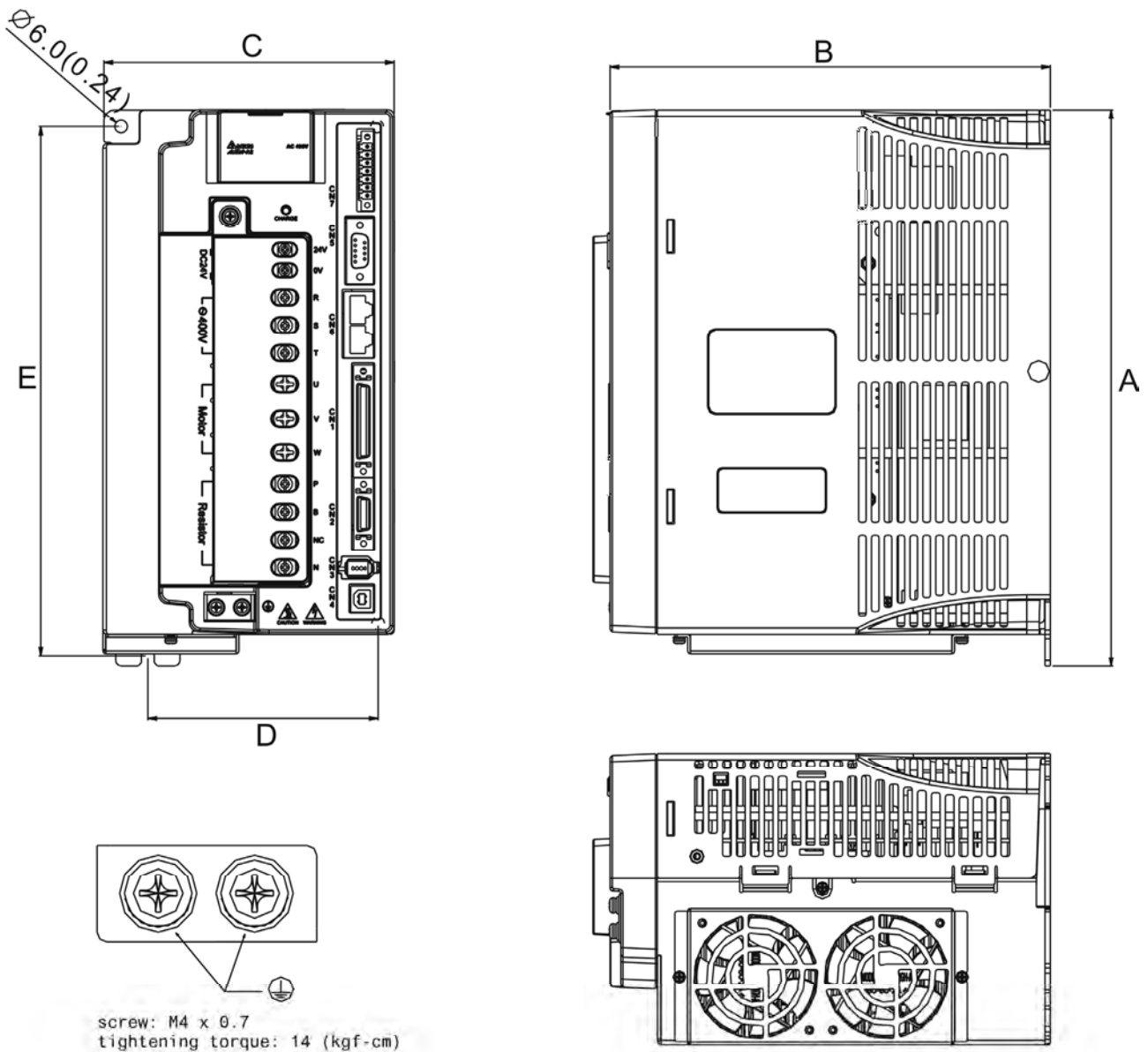


**ASD-A2-2043; ASD-A2-3043, ASD-A2-4543; ASD-A2-5543 (2 kW ~ 5.5 kW)**



Power	A	B	C	D	E	Weight
750 W~ 1.5 kW	216 ( 8.50 )	203 ( 7.99 )	82 ( 3.23 )	62 ( 2.44 )	203 ( 7.99 )	2.89 ( 6.36 )
2 kW ~ 5.5 kW	245 ( 9.65 )	205.4 ( 8.09 )	123 ( 4.88 )	107 ( 4.21 )	230 ( 9.06 )	5.5 ( 12.1 )

ASD-A2-7543 (7.5 kW)



Power	A	B	C	D	E	Weight
7.5 kW	254.2 (10.01)	205.5 (8.09)	136 (5.35)	107 (4.21)	247 (9.72)	5.5 (12.1)

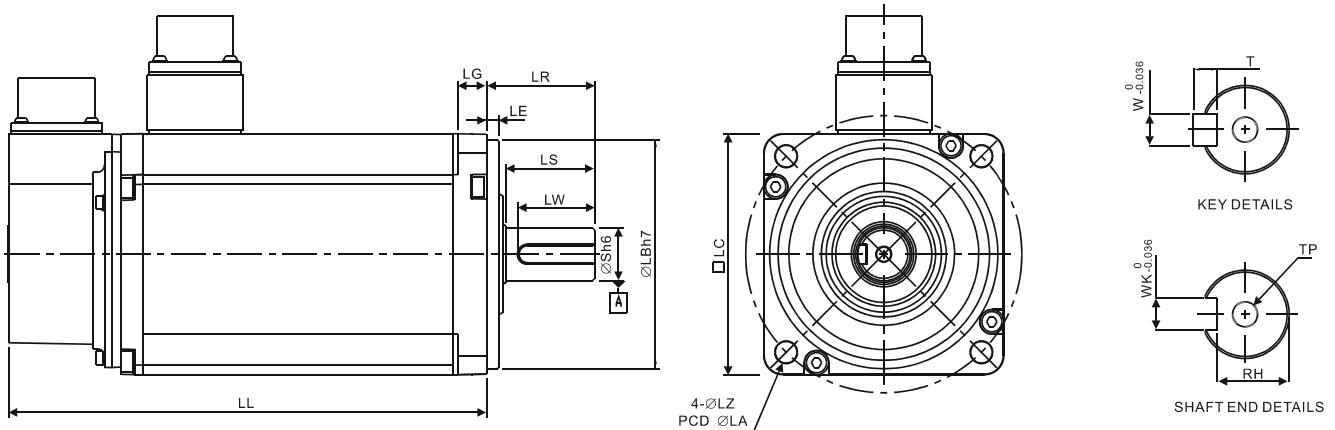
 **NOTE**

- 1) Dimensions are in millimeters (inches)
- 2) Weights are in kilograms (kg) and (pounds (lbs)).
- 3) The servo drive images shown here may differ from actual product appearance. Please refer to actual product appearance.
- 4) Actual measured values are in metric units. Dimensions and weights in (imperial units) are for reference only.



- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number of oil seal.
- 4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

**Motor Frame Size: 100 mm ~ 130 mm Models (Units: mm)**



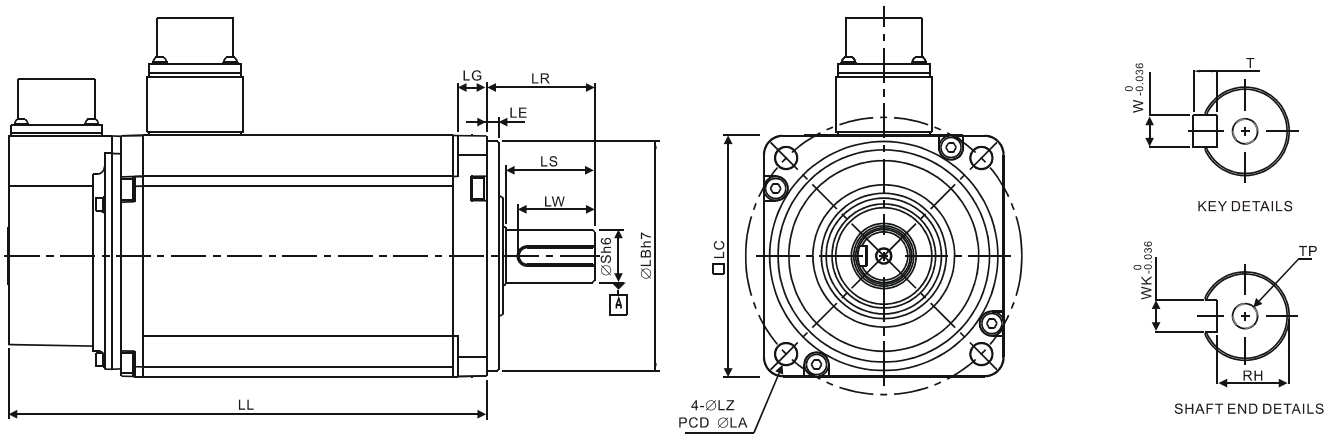
Model	C△1010□S	C△1020□S	C△1330□4	E△1305□S	E△1310□S	E△1315□S	E△1320□S
LC	100	100	130	130	130	130	130
LZ	9	9	9	9	9	9	9
LA	115	115	145	145	145	145	145
S	22 <sup>+0</sup> <sub>-0.013</sub>	22 <sup>+0</sup> <sub>-0.013</sub>	24 <sup>+0</sup> <sub>-0.013</sub>	22 <sup>+0</sup> <sub>-0.013</sub>	22 <sup>+0</sup> <sub>-0.013</sub>	22 <sup>+0</sup> <sub>-0.013</sub>	22 <sup>+0</sup> <sub>-0.013</sub>
LB	95 <sup>+0</sup> <sub>-0.035</sub>	95 <sup>+0</sup> <sub>-0.035</sub>	110 <sup>+0</sup> <sub>-0.035</sub>	110 <sup>+0</sup> <sub>-0.035</sub>	110 <sup>+0</sup> <sub>-0.035</sub>	110 <sup>+0</sup> <sub>-0.035</sub>	110 <sup>+0</sup> <sub>-0.035</sub>
LL (without brake)	153.3	199	187.5	147.5	147.5	167.5	187.5
LL (with brake)	192.5	226	216.0	183.5	183.5	202	216
LS	37	37	47	47	47	47	47
LR	45	45	55	55	55	55	55
LE	5	5	6	6	6	6	6
LG	12	12	11.5	11.5	11.5	11.5	11.5
LW	32	32	36	36	36	36	36
RH	18	18	20	18	18	18	18
WK	8	8	8	8	8	8	8
W	8	8	8	8	8	8	8
T	7	7	7	7	7	7	7
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20

**NOTE**

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.

- 3) The boxes ( $\square$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) The boxes ( $\Delta$ ) in the model names are for encoder resolution types ( $\Delta=1$ : Incremental encoder, 20-bit;  $\Delta=2$ : Incremental encoder, 17-bit).

**Motor Frame Size: 100 mm ~ 130 mm Models (Units: mm)**

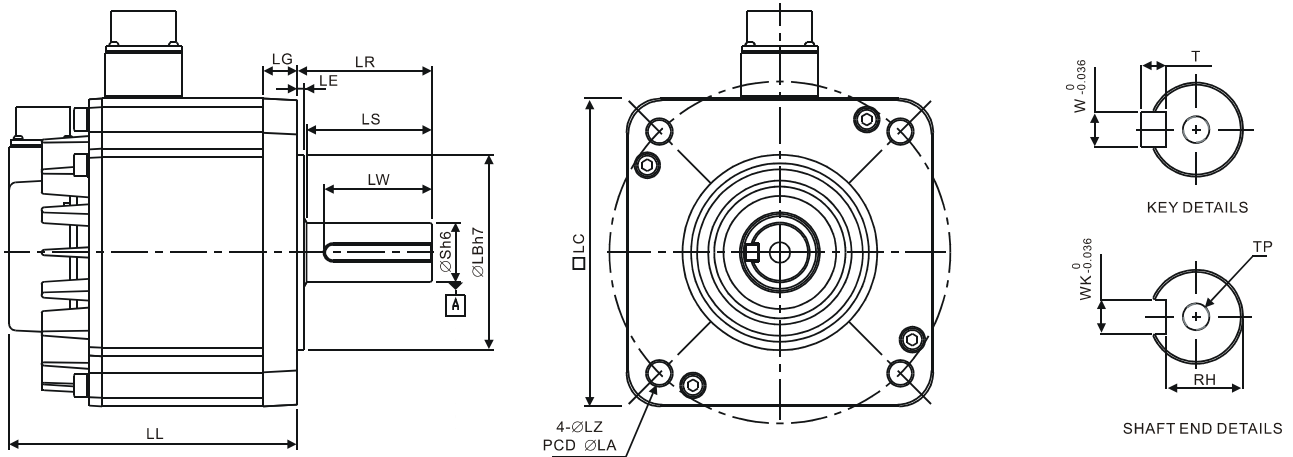


Model	F11305□S	F△1308□S	F11313□S	F11318□S	G△1303□S	G△1306□S	G△1309□S
LC	130	130	130	130	130	130	130
LZ	9	9	9	9	9	9	9
LA	145	145	145	145	145	145	145
S	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>
LB	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>
LL (without brake)	139.5	152.5	187.5	202	147.5	147.5	163.5
LL (with brake)	168	181	--	--	183.5	183.5	198
LS	47	47	47	47	47	47	47
LR	55	55	55	55	55	55	55
LE	6	6	6	6	6	6	6
LG	11.5	11.5	11.5	11.5	11.5	11.5	11.5
LW	36	36	36	36	36	36	36
RH	18	18	18	18	18	18	18
WK	8	8	8	8	8	8	8
W	8	8	8	8	8	8	8
T	7	7	7	7	7	7	7
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20

**NOTE**

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number of oil seal.
- 3) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

### Motor Frame Size: 180 mm and above Models (Units: mm)

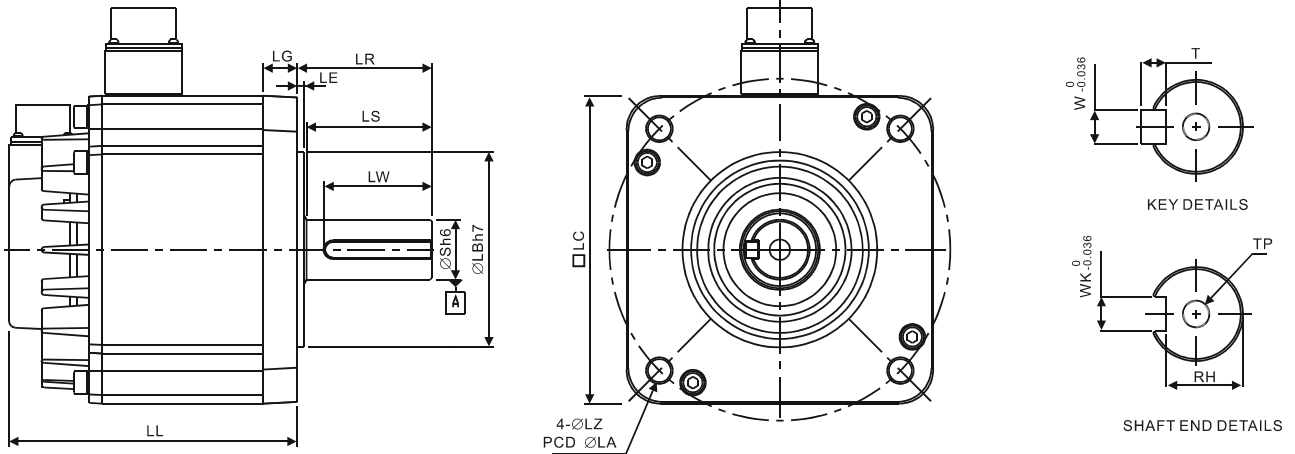


Model	E $\triangle$ 1820 $\square$ S	E $\triangle$ 1830 $\square$ S	E $\triangle$ 1835 $\square$ S	F $\triangle$ 1830 $\square$ S
LC	180	180	180	180
LZ	13.5	13.5	13.5	13.5
LA	200	200	200	200
S	35 <sup>(+0)</sup> <sub>(-0.016)</sub>	35 <sup>(+0)</sup> <sub>(-0.016)</sub>	35 <sup>(+0)</sup> <sub>(-0.016)</sub>	35 <sup>(+0)</sup> <sub>(-0.016)</sub>
LB	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>
LL (without brake)	169	202.1	202.1	202.1
LL (with brake)	203.1	235.3	235.3	235.3
LS	73	73	73	73
LR	79	79	79	79
LE	4	4	4	4
LG	20	20	20	20
LW	63	63	63	63
RH	30	30	30	30
WK	10	10	10	10
W	10	10	10	10
T	8	8	8	8
TP	M12 Depth 25	M12 Depth 25	M12 Depth 25	M12 Depth 25

#### NOTE

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes ( $\square$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) The boxes ( $\triangle$ ) in the model names are for encoder resolution types ( $\triangle=1$ : Incremental encoder, 20-bit;  $\triangle=2$ : Incremental encoder, 17-bit).

Motor Frame Size: 180 mm Models (Units: mm)



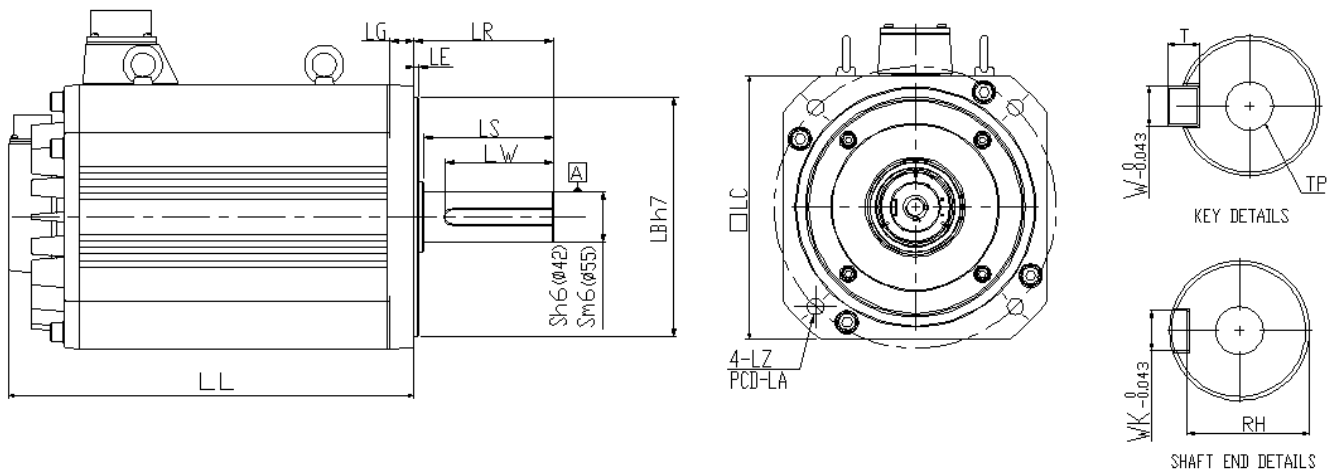
Model	F△1845□S	F△1855□3	F△1875□3
LC	180	180	180
LZ	13.5	13.5	13.5
LA	200	200	200
S	35 <sup>(+0/-0.016)</sup>	42 <sup>(+0/-0.016)</sup>	42 <sup>(+0/-0.016)</sup>
LB	114.3 <sup>(+0/-0.035)</sup>	114.3 <sup>(+0/-0.035)</sup>	114.3
LL (without brake)	235.3	279.7	342.0
LL (with brake)	279.3	311.7	376.1
LS	73	108.5	108.5
LR	79	113	113
LE	4	4	4
LG	20	20	20
LW	63	90	90
RH	30	37	37
WK	10	12	12
W	10	12	12
T	8	8	8
TP	M12 Depth25	M16 Depth32	M16 Depth32

**NOTE**

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number of oil seal.
- 4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).



### Motor Frame Size: 220 mm and above Models (Units: mm)



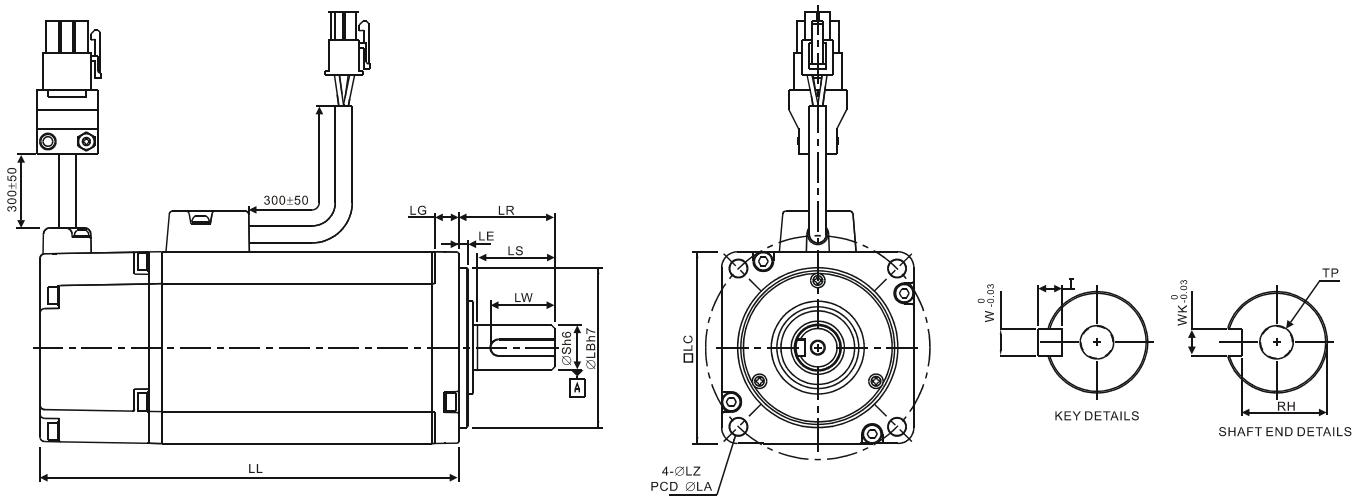
Model	F1221B□3	F1221F□S
LC	220	220
LZ	13.5	13.5
LA	235	235
S	42 <sup>(+0/-0.016)</sup>	55 <sup>(+0.03/+0.011)</sup>
LB	200 <sup>(+0/-0.046)</sup>	200 <sup>(+0/-0.046)</sup>
LL (without brake)	338	457
LL (with brake)	-	-
LS	108	108
LR	116	116
LE	4	4
LG	20	20
LW	90	90
RH	37	49
WK	12	16
W	12	16
T	8	10
TP	M16 Depth 32	M20 Depth 40

#### NOTE

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number of oil seal.

### 11.6.2 400 V Series

#### Motor Frame Size: 80 mm and below Models (Units: mm)

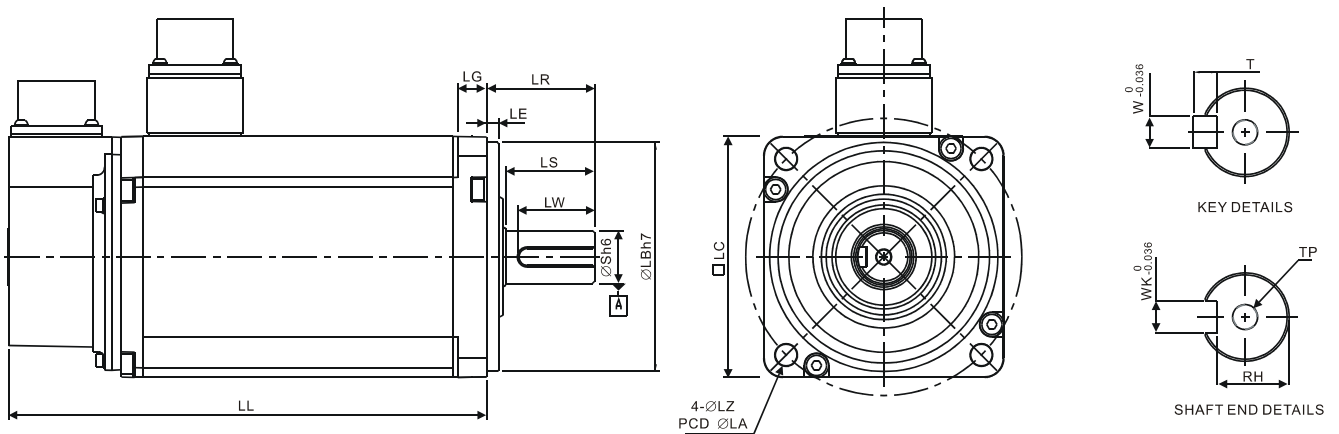


Model	J10604□S	J10807□S
LC	60	80
LZ	5.5	6.6
LA	70	90
S	$14^{+0}_{-0.011}$	$19^{+0}_{(-0.013)}$
LB	$50^{+0}_{-0.025}$	$70^{+0}_{(-0.030)}$
LL (without brake)	130.7	138.3
LL (with brake)	166.8	178
LS (without oil seal)	27	32
LS (with oil seal)	--	29.5
LR	30	35
LE	3	3
LG	7.5	8
LW	20	25
RH	11	15.5
WK	5	6
W	5	6
T	5	6
TP	M4 Depth15	M6 Depth 20

**NOTE**

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number of oil seal.

### Motor Frame Size: 100 mm Models (Units: mm)

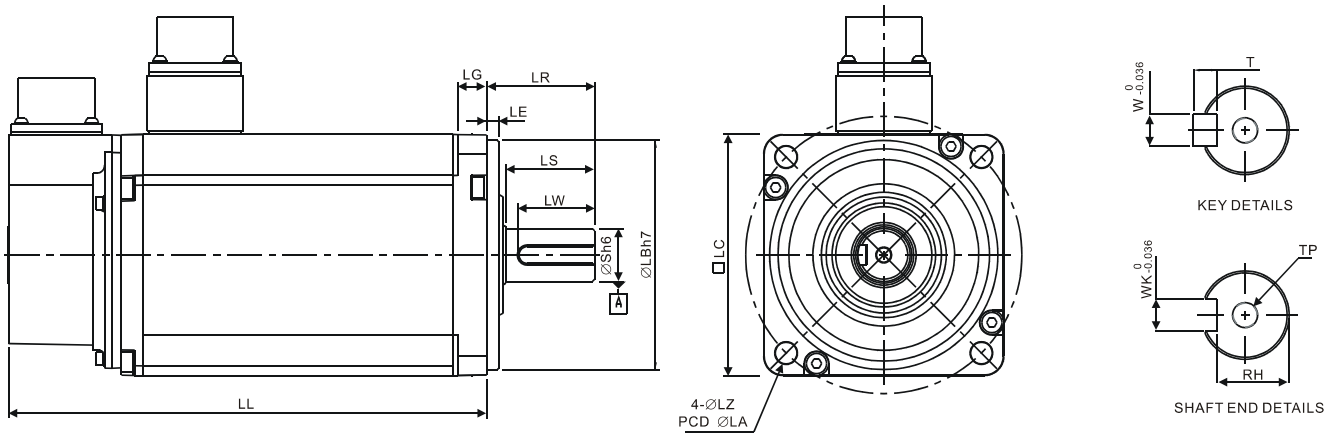


Model	J11010□S	J11020□S
LC	100	100
LZ	9	9
LA	115	115
S	22 <sup>(+0)</sup> <sub>(-0.013)</sub>	22 <sup>(+0)</sup> <sub>(-0.013)</sub>
LB	95 <sup>(+0)</sup> <sub>(-0.035)</sub>	95 <sup>(+0)</sup> <sub>(-0.035)</sub>
LL (without brake)	153.3	199
LL (with brake)	192.5	226
LS	37	37
LR	45	45
LE	5	5
LG	12	12
LW	32	32
RH	18	18
WK	8	8
W	8	8
T	7	7
TP	M6 Depth 20	M6 Depth 20

#### NOTE

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number of oil seal.
- 4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

**Motor Frame Size: 130 mm Models (Units: mm)**

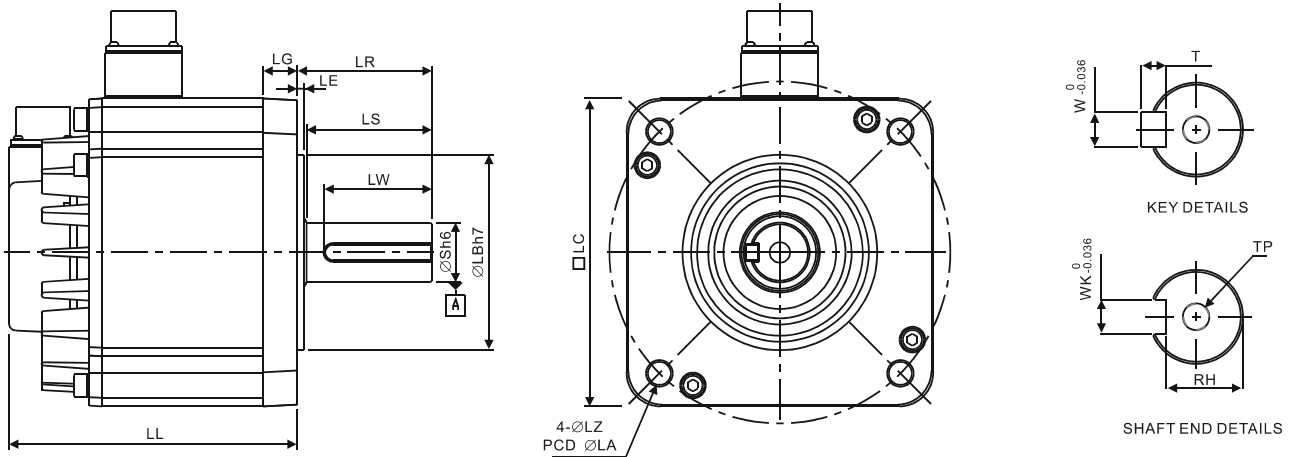


Model	J11330□4	K11310□S	K11315□S	K11320□S	L11308□S	M11309□S
LC	130	130	130	130	130	130
LZ	9	9	9	9	9	9
LA	145	145	145	145	145	145
S	24 <sup>(+0 -0.013)</sup>	22 <sup>(+0 -0.013)</sup>	22 <sup>(+0 -0.013)</sup>	22 <sup>(+0 -0.013)</sup>	22 <sup>(+0 -0.013)</sup>	22 <sup>(+0 -0.013)</sup>
LB	110 <sup>(+0 -0.035)</sup>	110 <sup>(+0 -0.035)</sup>	110 <sup>(+0 -0.035)</sup>	110 <sup>(+0 -0.035)</sup>	110 <sup>(+0 -0.035)</sup>	110 <sup>(+0 -0.035)</sup>
LL (without brake)	187.5	147.5	167.5	187.5	163.5	163.5
LL (with brake)	216.0	183.5	202	216	198.0	198
LS	47	47	47	47	47	47
LR	55	55	55	55	55	55
LE	6	6	6	6	6	6
LG	11.5	11.5	11.5	11.5	11.5	11.5
LW	36	36	36	36	47	36
RH	20	18	18	18	18	18
WK	8	8	8	8	8	8
W	8	8	8	8	8	8
T	7	7	7	7	7	7
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20

**NOTE**

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number of oil seal.

### Motor Frame Size: 180 mm and above Models (Units: mm)



Model	L△1830□S	L11845□S	L11855□S	L11875□S	K11820□S
LC	180	180	180	180	180
LZ	13.5	13.5	13.5	13.5	13.5
LA	200	200	200	200	200
S	35 <sup>(+0)</sup> <sub>(-0.016)</sub>	35 <sup>(+0)</sup> <sub>(-0.016)</sub>	42 <sup>(+0)</sup> <sub>(-0.016)</sub>	42 <sup>(+0)</sup> <sub>(-0.016)</sub>	35 <sup>(+0)</sup> <sub>(-0.016)</sub>
LB	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>	114.3 <sup>(+0)</sup> <sub>(-0.035)</sub>
LL (without brake)	202.1	235.3	279.7	342.0	169
LL (with brake)	235.3	279.3	311.7	376.1	203.1
LS	73	73	108.5	108.5	73
LR	79	79	113	113	79
LE	4	4	4	4	4
LG	20	20	20	20	20
LW	63	63	90	90	63
RH	30	30	37	37	30
WK	10	10	12	12	10
W	10	10	12	12	10
T	8	8	8	8	8
TP	M12 Depth 25	M12 Depth 25	M16 Depth 32	M16 Depth 32	M12 Depth 25

#### NOTE

- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes (□) in the model names represent shaft end/brake or the number.
- 4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

# Chapter 12 Absolute System

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## Introduction

Usually, an absolute system is used in industrial applications which require knowing the actual position and continuing the operation at any time even if the power is turned off. To prevent errors in operation, an absolute system is necessary.

Delta's absolute system includes at least an ASDA-A2 series servo drive, an ECMA series servo motor with an absolute encoder and a backup battery box for an absolute encoder.

An ECMA series servo motor with an absolute encoder has an encoder which is able to rotate and tell the servo motor the actual position when the power is turned on. An absolute encoder in an ECMA series servo motor will constantly record the actual positions by its built-in coordinate system at any time. So the real position of the servo motor will be measured and recorded even if the motor shaft rotates after the power is turned off.

An ECMA series servo motor with an absolute encoder is essential and must be connected with an ASDA-A2 series servo drive for a Delta's absolute system. When an ECMA series servo motor with an incremental encoder is connected to an ASDA-A2 series servo drive, if the users enable the servo parameters for absolute system, a fault code, AL069 will be shown on the drive's LCD display to alert that an error occurs. When AL069 is displayed, please examine if the connected servo motor is a servo motor with an absolute encoder. While using absolute motor, as soon as it applies to the power, the motor speed cannot lower than 250rpm. When operating in battery mode, make sure the maximum speed does not exceed 200rpm. The model name of a servo motor with an absolute encoder is shown as below

ECMA- □A□□□□□□

└─ A: Servo Motor with Absolute Encoder

(The boxes (□) in the servo motor model names are for rated voltage and rated speed, please refer to the ordering information of the actual purchased products.)

An absolute system needs one or more backup battery boxes for operation. When the backup battery boxes are connected, the servo motors will continue working with the batteries after a power interruption. One servo drive uses one single battery box. Two servo drives can share a dual battery box. We recommend the users to choose Delta's

backup battery boxes and Delta's encoder connection cables for Delta's absolute systems for wiring and connection. Please perform the installation in order as specified in the quick start and user manual when connecting to an absolute system. Regarding the descriptions and specifications of battery boxes and corresponding accessories, please refer to the contents in the following sections.

## 12.1 Backup Battery Boxes

### 12.1.1 Specifications

#### Precautions

Please thoroughly understand and observe the following safety precautions. Failure to observe these precautions may void warranty! In order to prevent damage and danger, please use batteries in accordance with the specified specification.



- **Do not use the product in a potentially explosive environment. Install the product in a clean and dry location free from corrosive and inflammable gases or liquids.**
- **Do not place the battery dispersedly to prevent short circuiting and accidents.**
- **Do not short circuit the positive pole and the negative pole of the batteries or install batteries in reverse polarity.**
- **To prevent electric energy loss and lifetime reduction, it is recommended to use new batteries only.**



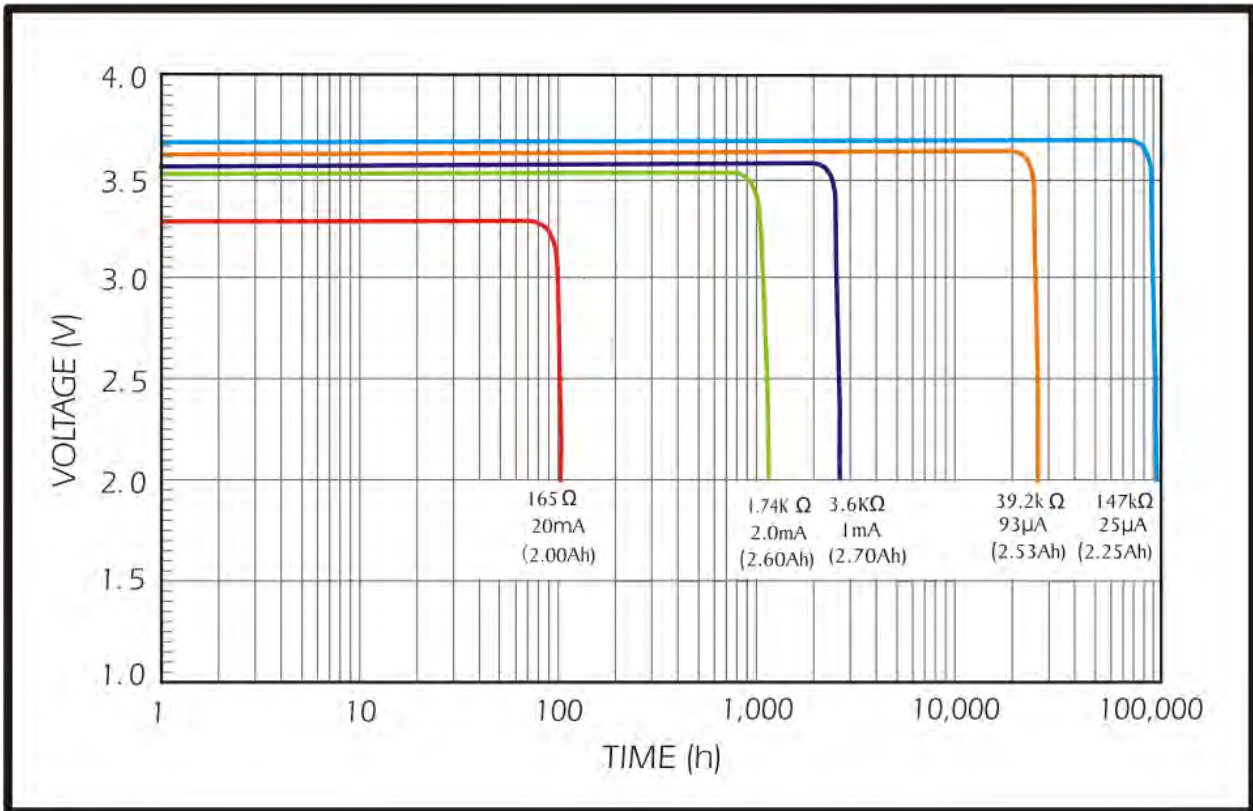
- **Do not store batteries within an ambient temperature above +100°C. Failure to observe this precaution may cause fire or explosion.**
- **The batteries are non-rechargeable. Do not charge the batteries or explosion may result.**
- **Do not directly solder the battery surface.**

#### Battery Specifications

Items	Li/SOCI2 Cylindrical Battery
Type	ER14505
Delta Model Number	ASD-CLBT0100
International Standard Size	AA
Nominal Voltage	3.6 V
Nominal Capacity	2700 mAh
Maximum Continuous Operating Current	100 mA
Maximum Pulse Current	200 mA
Dimensions (D x H)	14.5 x 50.5 mm
Weight	Approx. 19 g
Operating Temperature	-40 ~ +85°C



### Battery Life



- (1) The battery life changes depending on many factors. The graph above shows how the performance of the battery deteriorates on different current at the same temperature. The graph above illustrates four discharge curves on different current and the effects. According to the testing result shown on the graph above, when the power consumption of an absolute encoder is 65uA or lower, if the voltage of the battery keeps 3V or higher, the expected battery life is about 21900hr, approximately 2.5 years <sup>(Note 1)</sup>. Therefore, the lowest voltage level of battery for an absolute encoder is set to 3.1V.
  
- (2) The battery life expectancy is about 5 years and is able to provide 3.6V or higher voltage under normal temperature and humidity conditions.



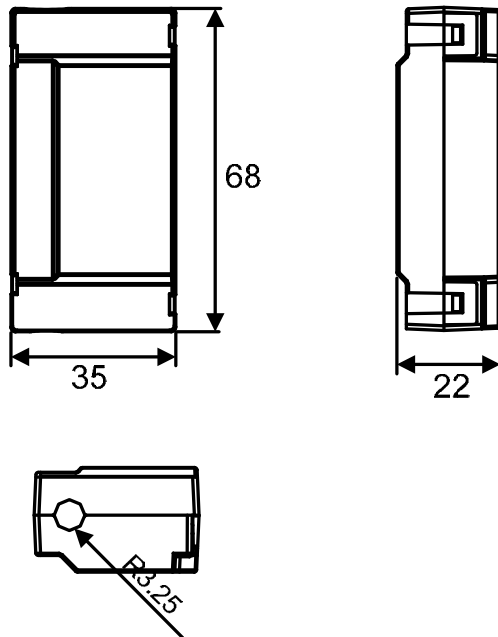
**NOTE**

The battery life was measured when one single battery box is connecting to one servo drive and one servo motor.

### 12.1.2 Battery Box Dimensions

#### Single Battery Box

Delta Model Number: ASD-MDBT0100

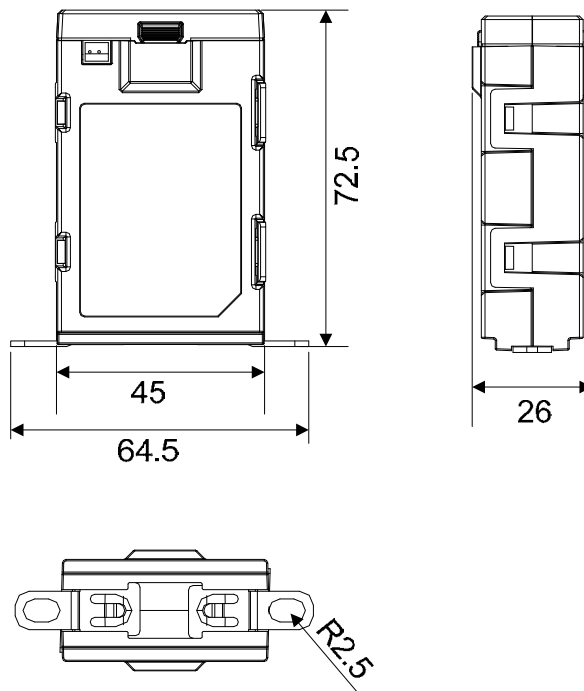


Weight
44 g

Units: mm

#### Dual Battery Box

Delta Model Number: ASD-MDBT0200



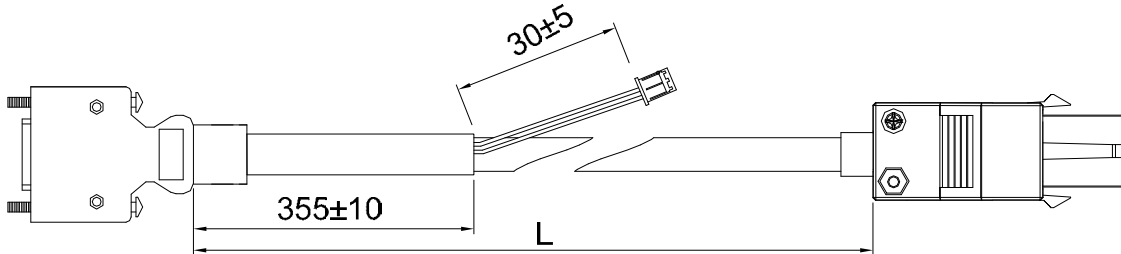
Weight
80 g

Units: mm

### 12.1.3 Connection Cables for Absolute Encoder

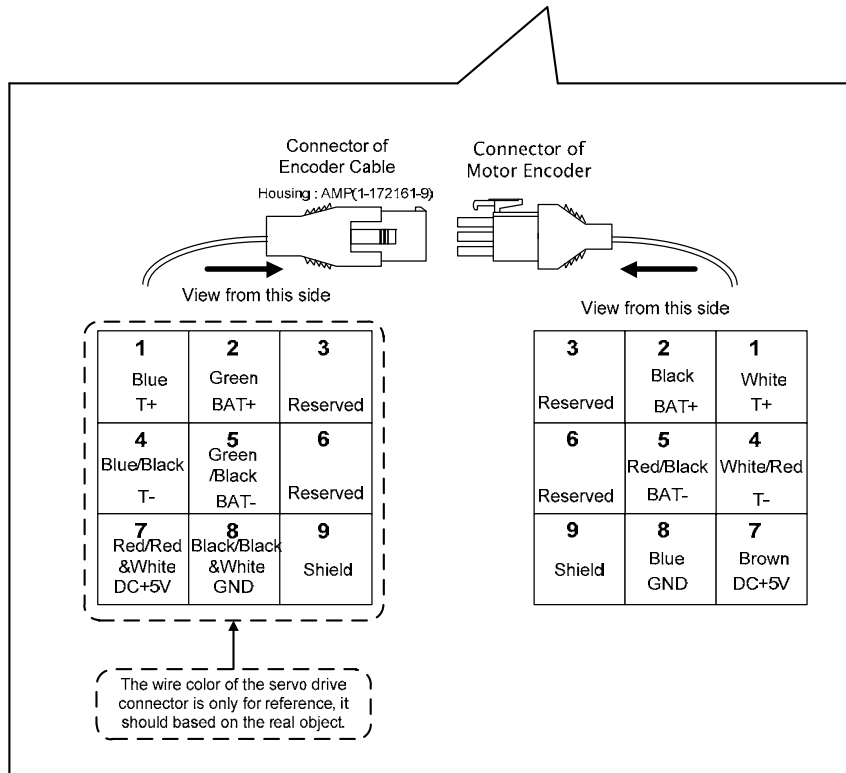
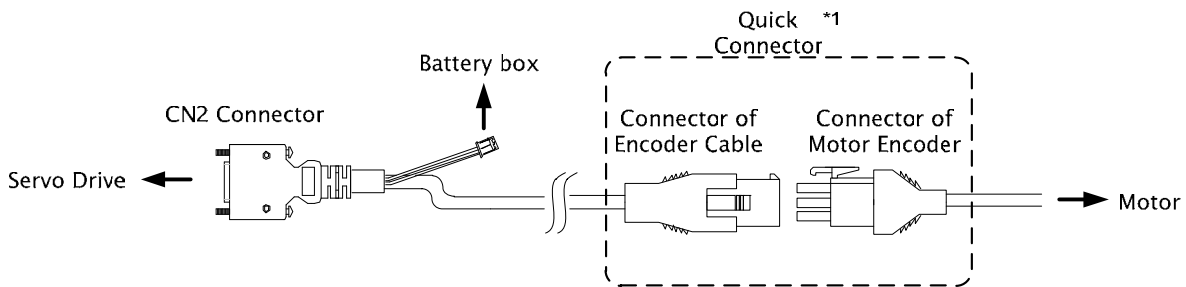
#### A. Quick Connector

Delta part number: ASD-A2EB0003, ASD-A2EB0005



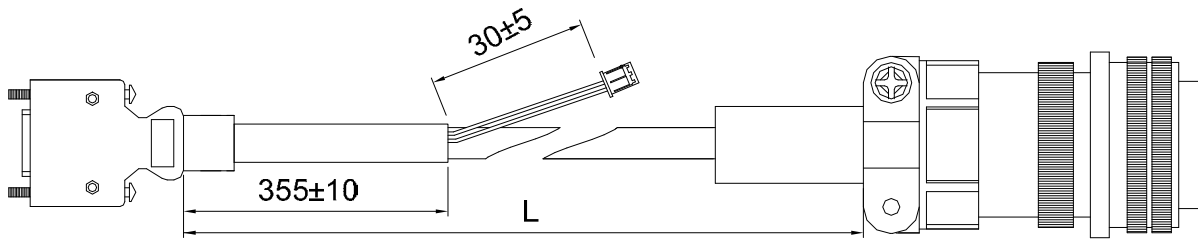
Title	Model Name	L	
		mm	inch
1	ASD-A2EB0003	3000 ± 100	118 ± 4
2	ASD-A2EB0005	5000 ± 100	197 ± 4

#### Connection method:



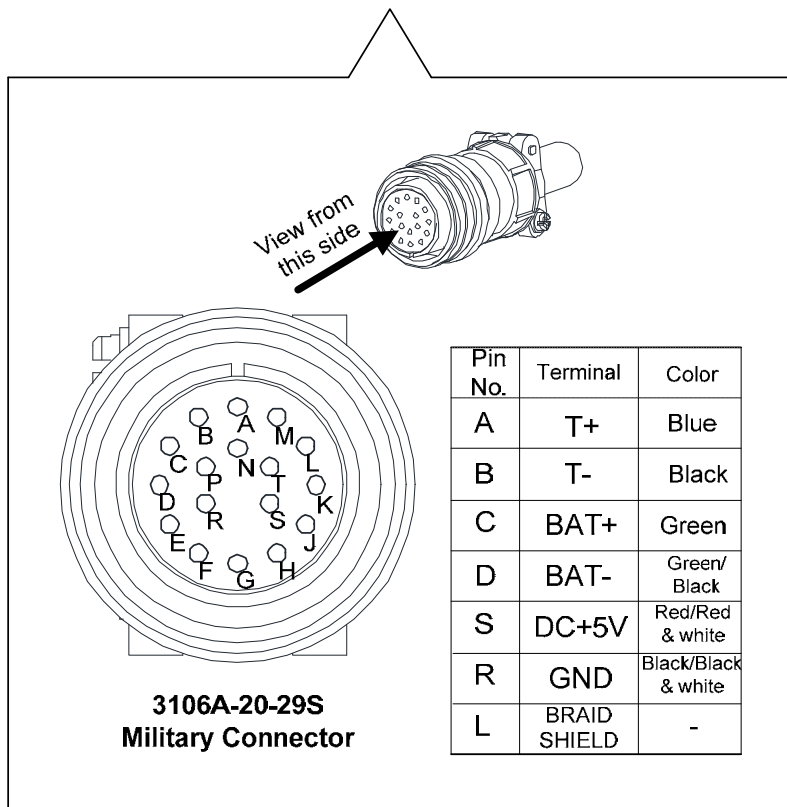
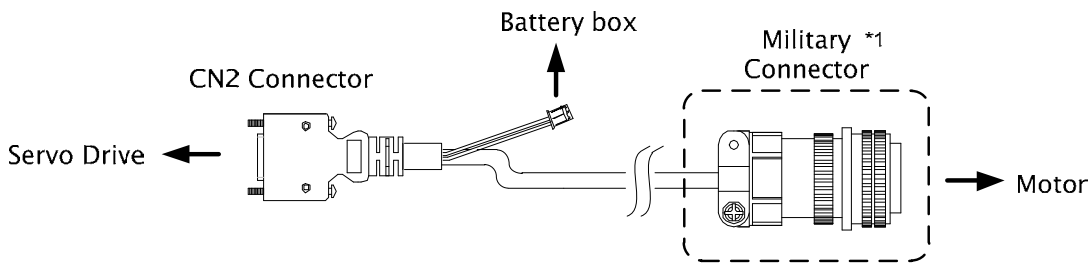
### B. Military Connector

Delta part number: **ASD-A2EB1003, ASD-A2EB1005**



Title	Model Name	L	
		mm	inch
1	ASD-A2EB1003	3000 ± 100	118 ± 4
2	ASD-A2EB1005	5000 ± 100	197 ± 4

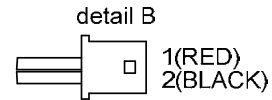
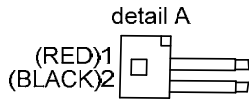
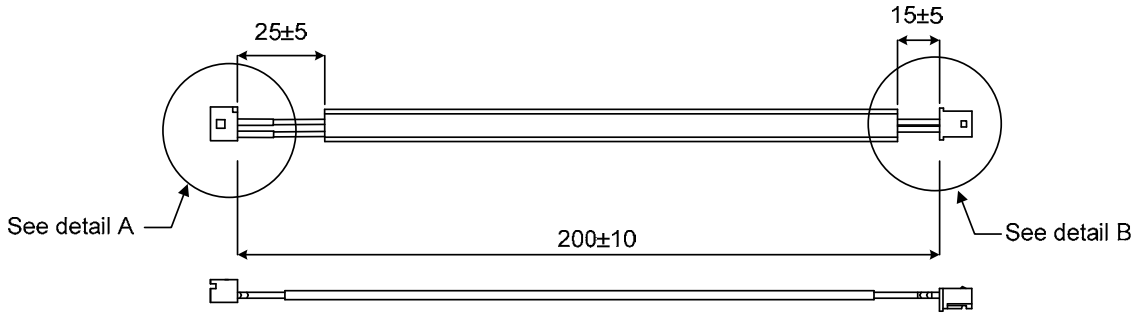
#### Connection method:



### 12.1.4 Battery Box Cords

#### Battery Box Cord AW

Delta Part Number: 3864573700



#### Detail A

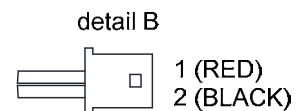
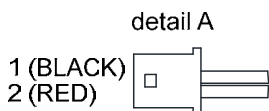
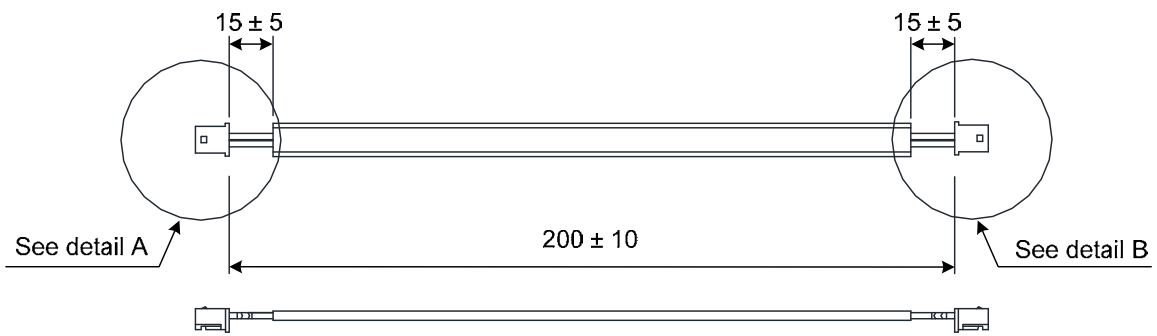
Title	Part No.	Manufacturer
Housing	A2004H00-2P	JWT
Terminal	A2004WV0-2P	JWT

#### Detail B

Title	Part No.	Manufacturer
Housing	A2004H00-2P	JWT
Terminal	A2004TOP-2	JWT

#### Battery Box Cord IW

Delta Part Number: 3864811900



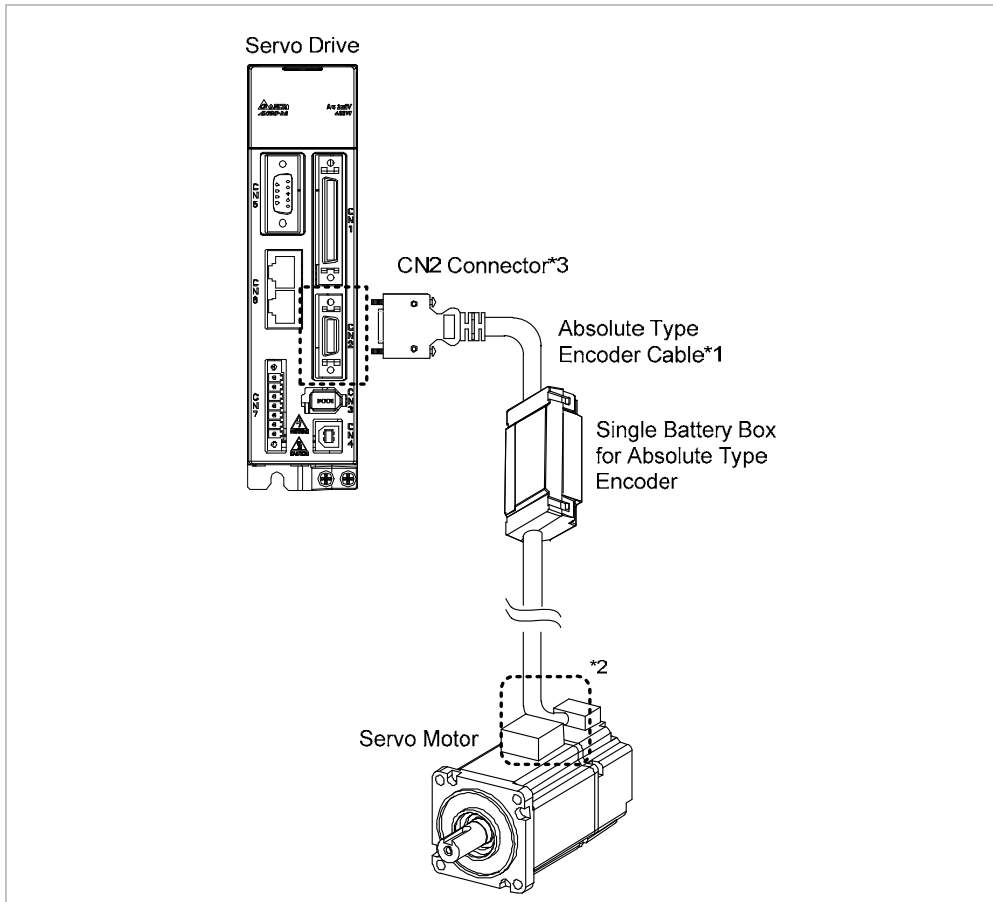
#### Detail A, B

Title	Part No.	Manufacturer
Housing	A2004H00-2P	JWT
Terminal	A2004TOP-2	JWT

## 12.2 Installation

### 12.2.1 Connection Examples

#### Single Battery Box



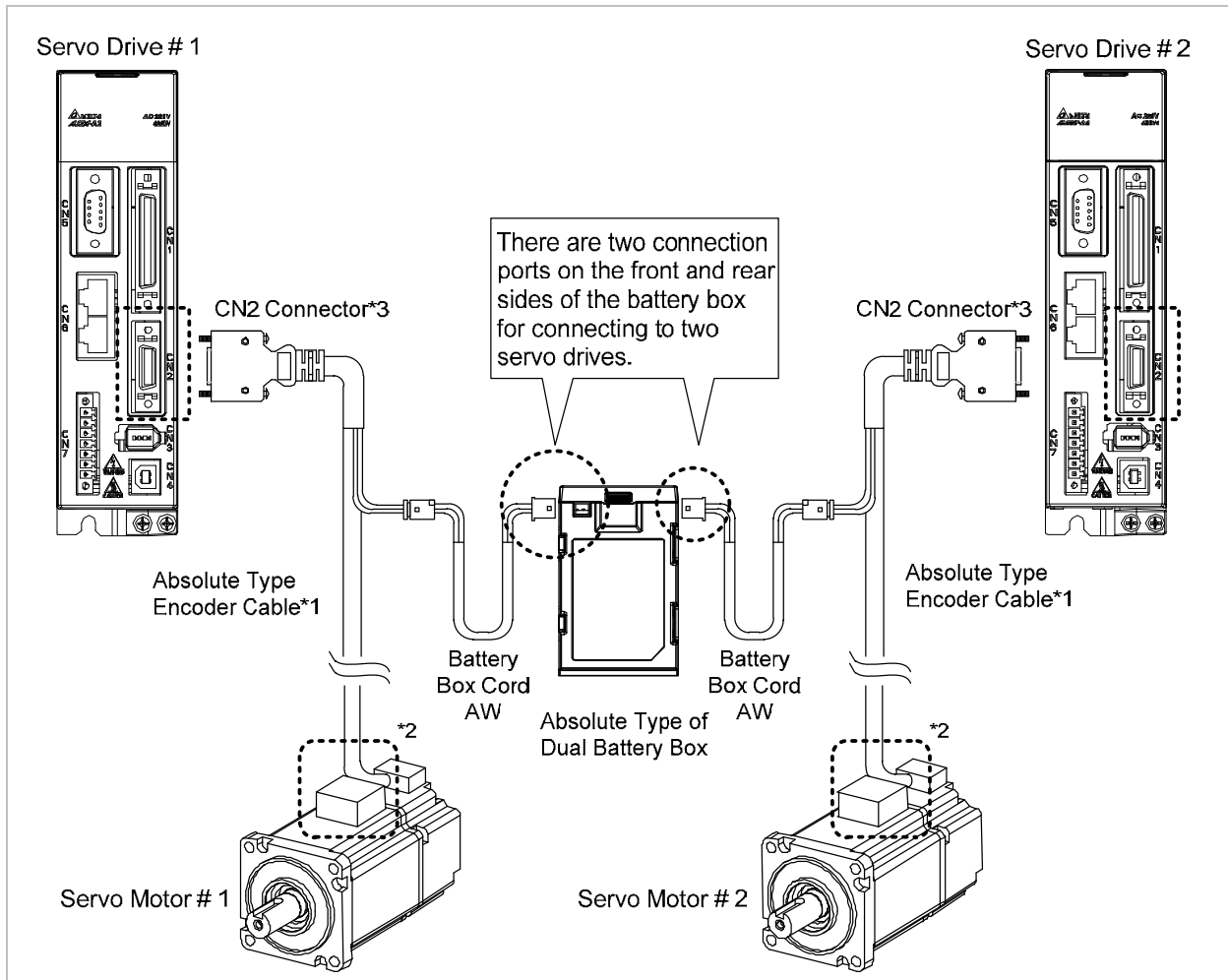
**NOTE**

This is the wiring diagram for connecting to a single battery box. The scale of the objects does not match the dimensions as shown in the drawing above. For different models of AC servo drives and motors, the connection cables may differ.

- 1) and 2) Please refer to section 12.1.3.
- 3) Definition of CN2 connector

CN2 Connector			Motor Connector	
Pin No	Terminal Symbol	Function and Description	Military Connector	Quick Connector
5	T+	Serial communication signal input/output (+)	A	1
4	T-	Serial communication signal input/output (-)	B	4
7	BAT+	Battery 3.6V	C	2
9	BAT-	Battery ground	D	5
14, 16	+5V	Power+5V	S	7
13, 15	GND	Power ground	R	8
-	Shield	Shield	L	9

### Dual Battery Box (Connect to CN2)



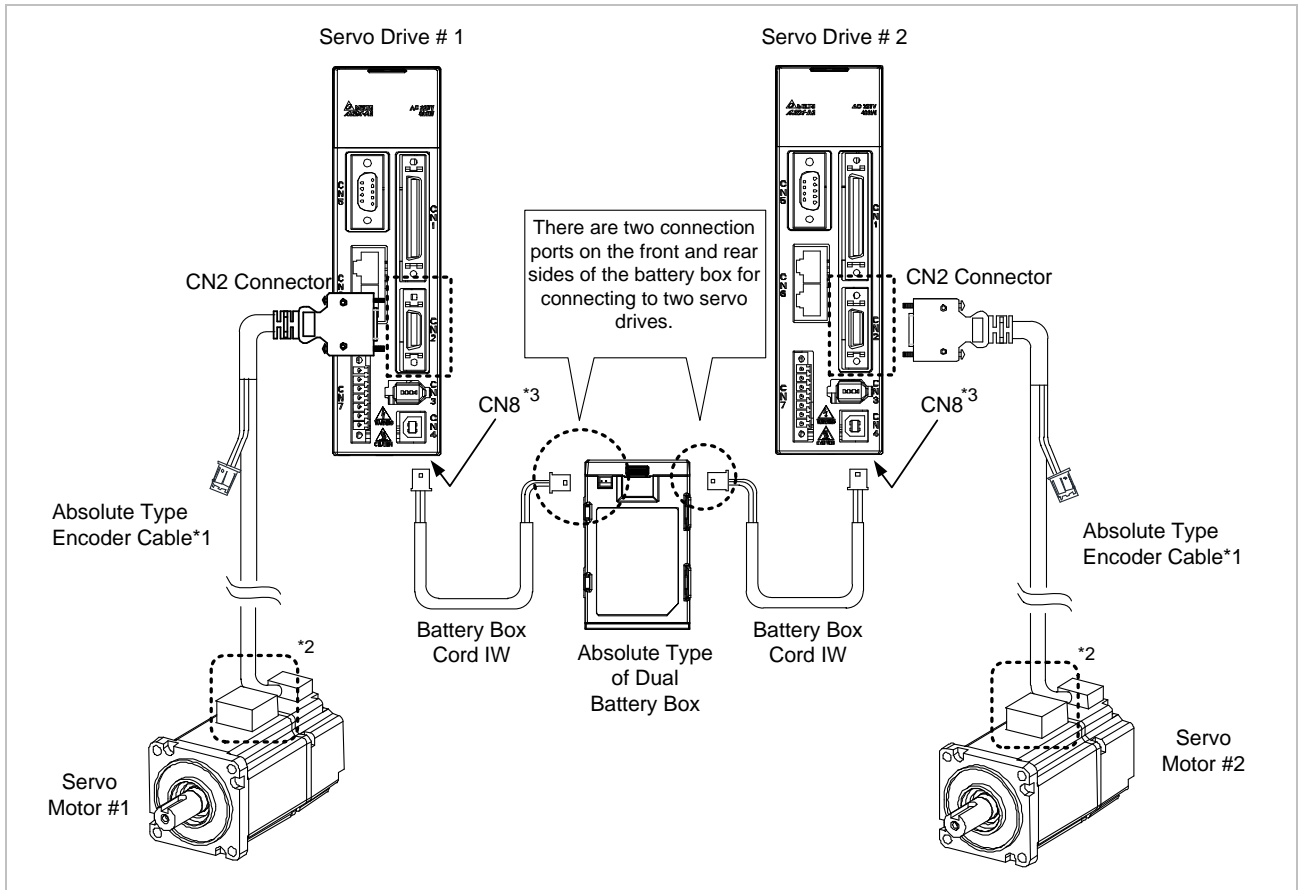
**NOTE**

This is the wiring diagram for connecting to a single battery box. The scale of the objects does not match the dimensions as shown in the drawing above. For different models of AC servo drives and motors, the connection cables may differ.

- 1) and 2) Please refer to section 12.1.3.
- 3) Definition of CN2 connector

CN2 Connector			Motor Connector	
Pin No	Terminal Symbol	Function and Description	Military Connector	Quick Connector
5	T+	Serial communication signal input/output (+)	A	1
4	T-	Serial communication signal input/output (-)	B	4
7	BAT+	Battery 3.6V	C	2
9	BAT-	Battery ground	D	5
14, 16	+5V	Power+5V	S	7
13, 15	GND	Power ground	R	8
-	Shield	Shield	L	9

### Dual Battery Box (Connect to CN8)



**NOTE**

This is the wiring diagram for connecting to a single battery box. The scale of the objects does not match the dimensions as shown in the drawing above. For different models of AC servo drives and motors, the connection cables may differ.

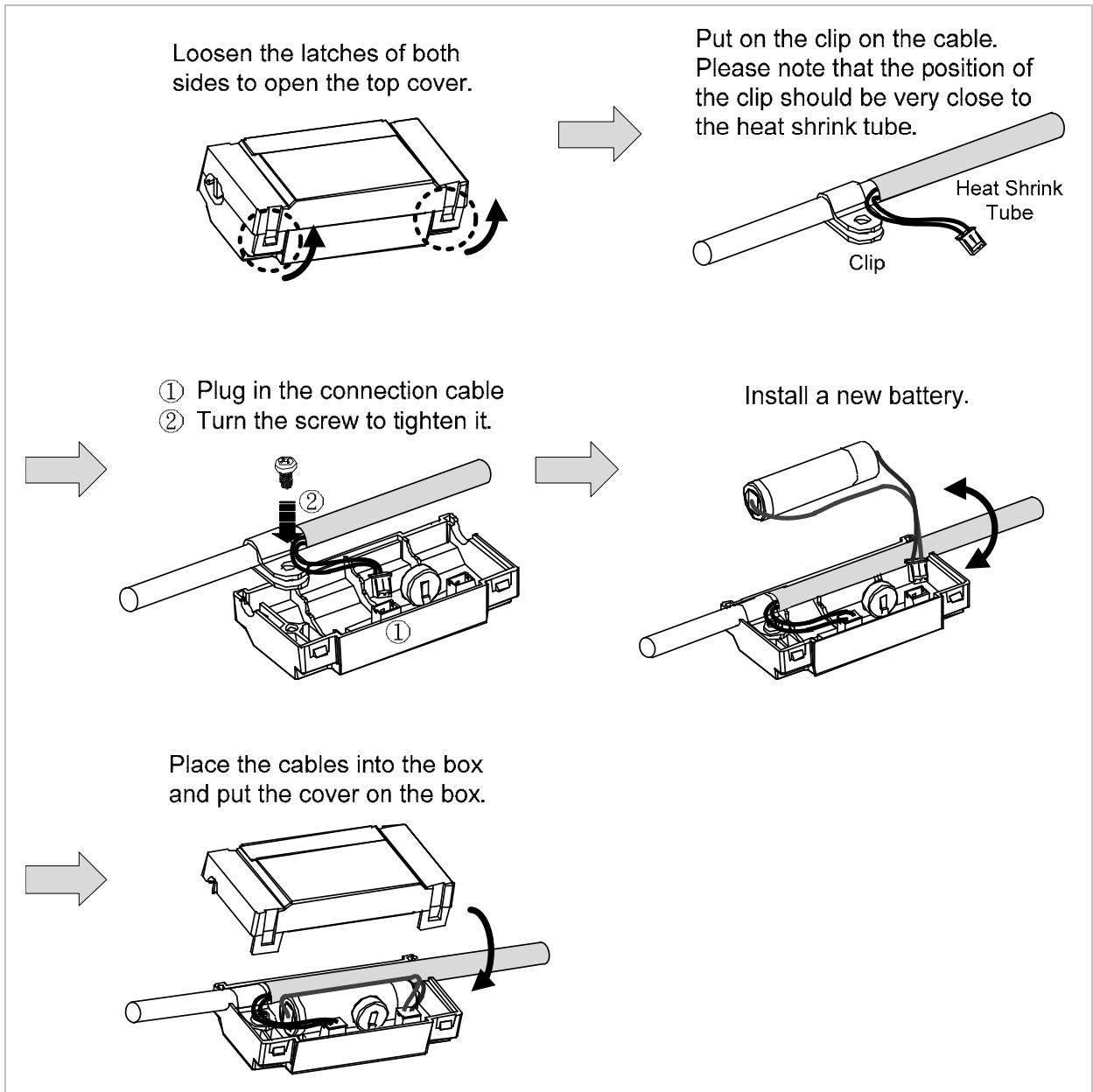
- 1) and 2) Please refer to section 12.1.3.
- 3) Definition of CN8 connector

Pin No	Terminal Symbol
1	BAT+
2	BAT-



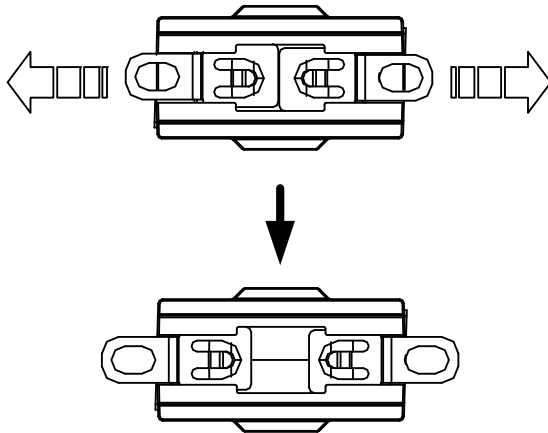
## 12.2.2 How To Install A Battery

### Single Battery Box

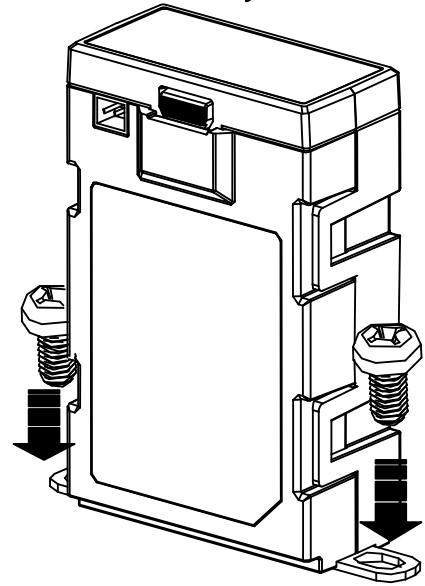


### Dual Battery Box

Pull the latches located on the bottom side as shown in the figure below.



Tighten the mounting screws to secure the battery box.



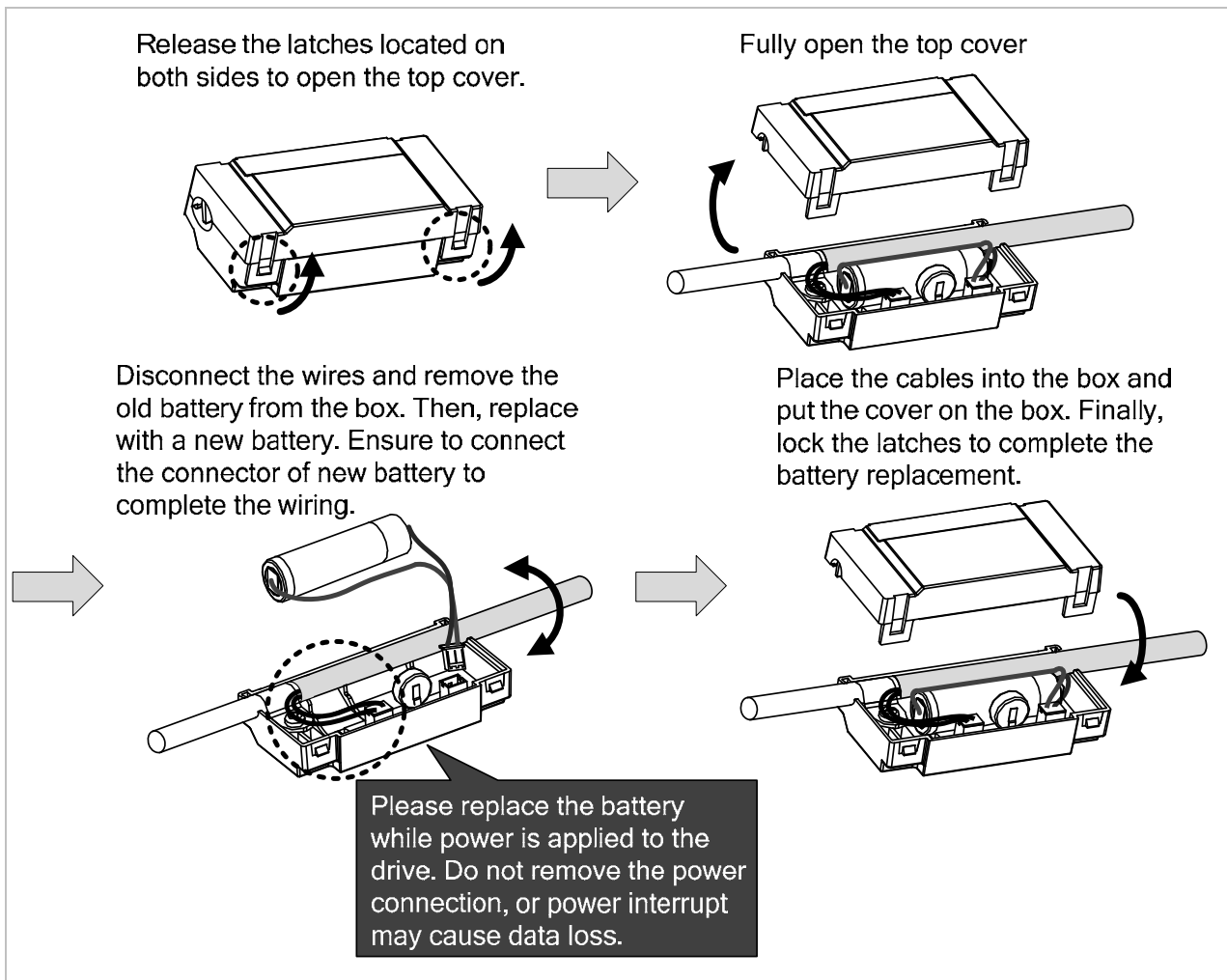
### 12.2.3 How to Replace A Battery

Please replace with a new battery if AL061 occurs, it means the battery is under voltage (Please refer to section 12.7.1 for detailed description). Or when accessing P0-02 for showing the battery power and it displays 31, which means the voltage is under 31V, so as to avoid data lost.

When the voltage is under 2.7V, it might lose the record of motor's position. Please conduct homing after replacing with a new battery. Please refer to 12.7.1 for detailed description

Please replace the battery while the power is applied to the servo drive in order to prevent the absolute position data lose.

#### Single Battery Box

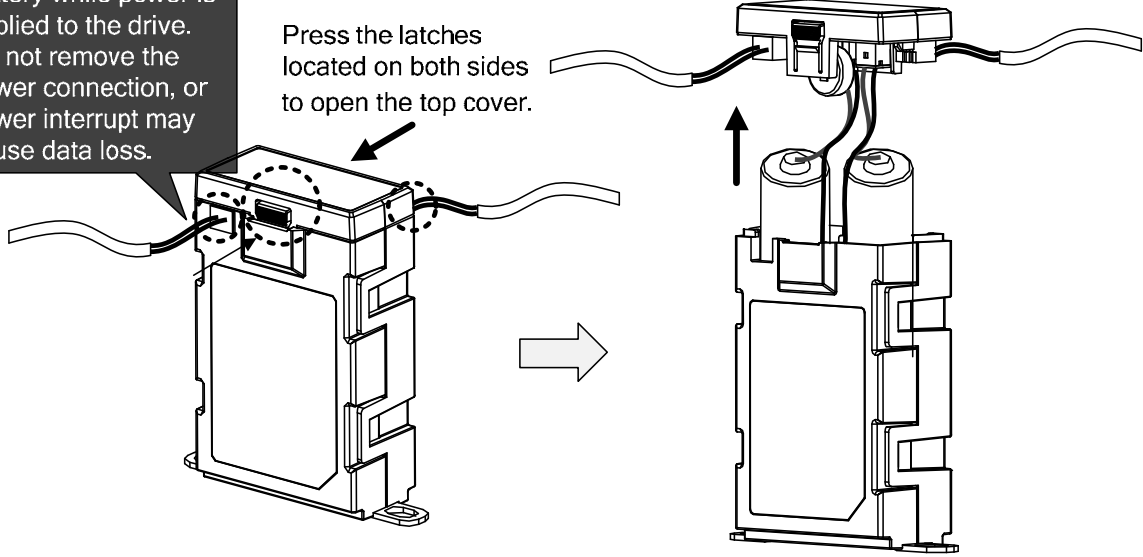


### Dual Battery Box

Please replace the battery while power is applied to the drive. Do not remove the power connection, or power interrupt may cause data loss.

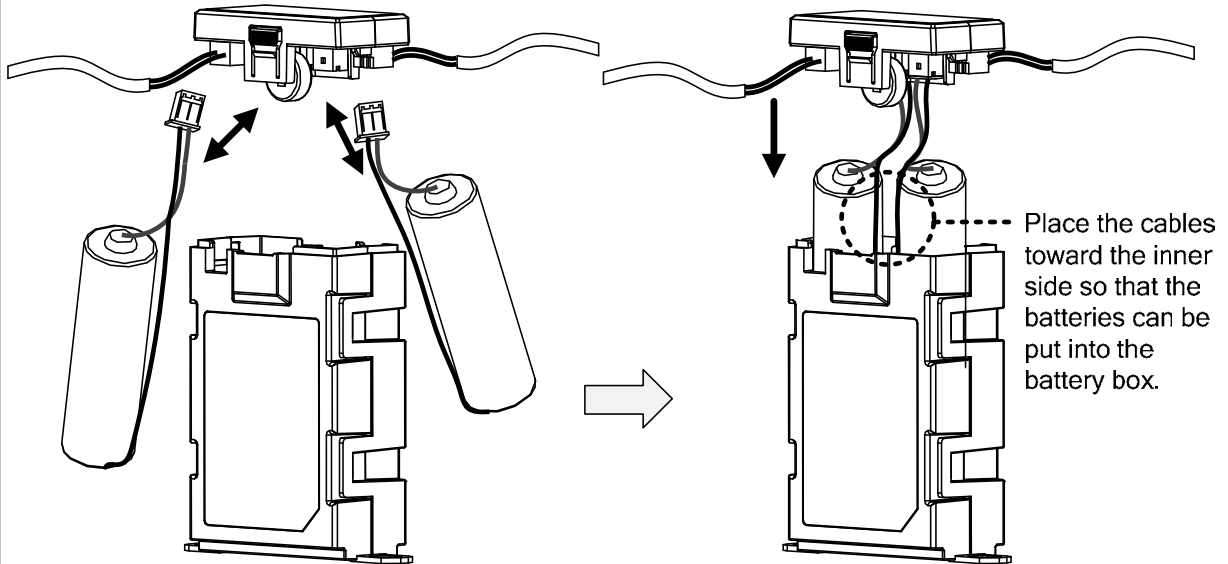
Press the latches located on both sides to open the top cover.

Lifting the top cover is able to pull out the batteries.



Disconnect the wires and remove the old batteries. Then, replace with new batteries. Ensure to connect the connectors of new batteries to complete the wiring. To prevent the data loss, please replace the batteries in 10 minutes.

Push down the cover until they lock.



Place the cables toward the inner side so that the batteries can be put into the battery box.

## 12.3 System Initialization Procedure and Operation

### 12.3.1 System Initialization Procedure

When the servo system is power on, the host controller can get the motor coordinate position via communication with RS-485 or DI/O. There are two data in different units can be read, and they are in PULSE and PUU.

At the very first time to operate absolute system, there will be a fault code, AL060 shown when power on because the initialization procedure still not yet be done. The fault will be kept until the initialization procedure is finished. Besides, the AL060 will be displayed when the power from the servo and battery is discontinued that will lead to the coordinate system lost. There is a fault code, AL062 which is used to indicate when the motor position is exceeding the design range where -32768~32767 for motor turns. But from the view of PUU, the coordinate value must fall into the range -2147483648 ~ 2147483647 to avoid triggering the fault AL289.

For some applications which will rotate motor in one direction, the fault AL062 for checking turns number within -32763~32768 and the fault AL289 for detecting PUU within -2147483648~2147483647 can be turned off by parameter P2-70.

Parameter Settings:

1. The AL060 will be cleared when the coordinate system has been initialized.

PR mode: The absolute coordinate system will be reset after any homing operation under PR mode.

Other modes: Two methods can be used to initialize the coordinated system. One is via digital inputs described in section 12.3.4, and another one is applying parameters in section 12.3.5.

2. For an initialized system when every time the power is turned on, the host controller can read the absolute coordinate data via digital inputs and digital outputs (see section 12.3.6) or parameters with communication (see section 12.2.6). Through the settings of parameter P2-70, the host controller can read the coordinated data in PUU (see section 12.3.3) or in number of turn plus the number of pulse within one turn (see section 12.3.2).

### 12.3.2 Pulse Counting

When the motor is running in clockwise direction, the counting number of turns will be minus where the counter clockwise rotating is plus. The number range for turns is from -32768 to 32767. The fault code, AL062 will appear when exceeding this counting range and it can be cleared by resetting the coordinate system. If parameter P2-70 has been set to ignore the over range alarming, the AL062 is disabled even exceeding the counting range. When the value reaches its largest number, it will rewind. For the counter clockwise counting, the sequence of the number is ...32767, -32768, -32767, -32766 .... and the clockwise will have a sequence like ...-32768, 23767, 32766 ....

In addition, there are 1280000 pulses (0~1279999) in one rotation. Please pay attention on its direction. The communication or digital inputs/digital outputs can be used to read it.

$$\text{Pulse number for the distance} = m \text{ (turn)} \times 1280000 + \text{pulse number within one turn (0~1279999)}$$

The conversion between Pulse and PUU:

When the rotating direction is CCW defined in P1-01.

$$\text{PUU number} = \text{pulse number} \times \frac{(P1-45)}{(P1-44)} + (P6-01)$$

When the rotating direction is CW defined in P1-01.

$$\text{PUU number} = (-1) \times \text{pulse number} \times \frac{(P1-45)}{(P1-44)} + (P6-01)$$

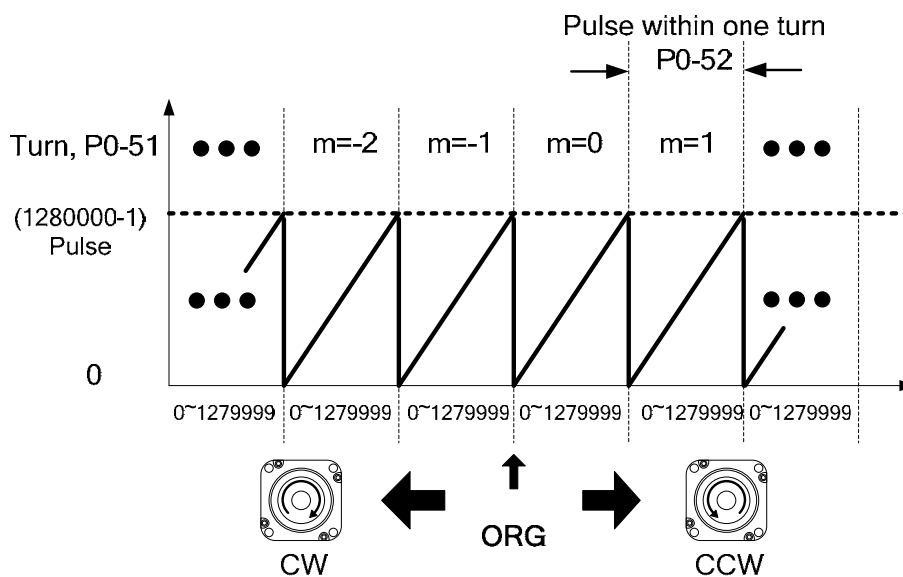


Figure 12.1 Pulse counting in absolute coordinate system

### 12.3.3 PUU Counting

A 32 bits number with sign is used to denote PUU number in an absolute system. The PUU number is increasing when motor is in positive rotating direction and decreasing for a negative running direction. The motor's rotating direction is defined in P1-01 Z setting.

In a word, the encoder feedback number is an easy way to distinguish the motor's rotating direction. Increasing number sequence is for positive direction and decreasing number sequence is for negative direction.

If the motor keeps rotating in one direction, the AL062 will be shown when exceeding the number range -32768 to 32767 for turns, and the AL289 is for PUU out of the range -2147483648 to 22147483647. Both of these fault codes can be cleared by homing.

And the parameter P2-70 can be used to take the range restrictions away in order to avoid occurring AL062 and AL289. When the counting number reaches the maximum number, the PUU pulse number sequence for forward rotation is ... 2147483647, -2147483648, -2147483647...where the number sequence -2147483648, 2147483647, 2147483646... is for reverse rotation.

Two examples for evaluating the timing of overflow are as below:

Example 1:

When P1-44=128 and P1-45=10, there are 100000 PUU for motor to rotate one turn.  
 $2147483647 \div 100000 \approx 21474.8$ .

The limit to trigger the fault AL289 is 21474.8 (< 32767).

Example 2:

When P1-44=128 and P1-45=1, there are 10000 PUU for motor to rotate one turn.  
 $2147483647 \div 10000 \approx 214748.3$ .

The limit to trigger the fault AL062 is 32767 (< 214748.3).

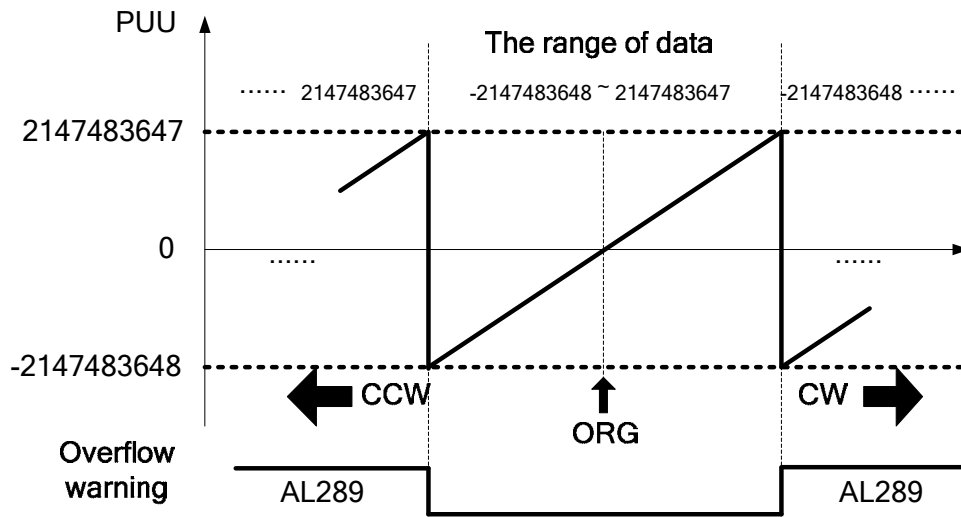


Figure 12.2 PUU counting in absolute coordinate system



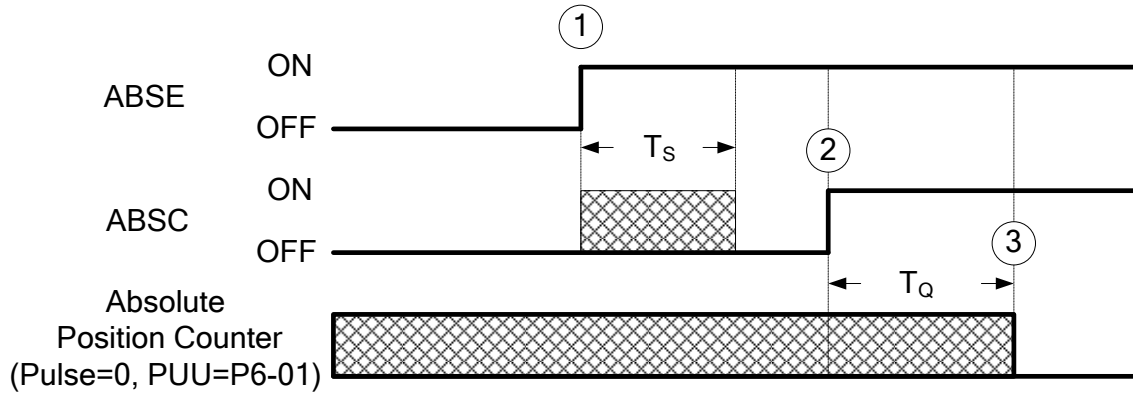
**NOTE**

When an absolute system has been initialized, if the parameter P1-01 Z setting, P1-44, and P1-45 be changed, the absolute coordinate system will be destroyed. A homing procedure is necessary at that moment.



### 12.3.4 Use Digital Inputs/Outputs to Initialize an Absolute System

Except PR mode, the digital inputs and outputs can be used for a driver to do homing when other modes are selected. Move the motor to home place, enable digital input, ABSE, then enable digital input, ABSC from OFF to ON, and the system will start to initialization. The pulse number will be set to zero and the number in P6-01 is for PUU to reference. Please refer to Figure 12.3 below for the signal controlling chart.



	$T_s(ms)$	$T_q(ms)$
Min.	P2-09+2	
Max.	P2-09+10	

Figure 12.3 The controlling chart for initializing an absolute system via digital inputs/outputs

The descriptions for the timing:

1. When the host controller switches ABSE from OFF to ON, a period of time  $T_s$  have to be waited for the next step to process.
2. After waiting time  $T_s$ , the host controller now can enable the ABSC from OFF to ON and hold the signal for  $T_q$  to reset the coordinate system where pulse number will be zero and PUU number is defined in P6-01.

### 12.3.5 Use Parameters to Initialize an Absolute System

When the parameter P2-71 is set to 1(one) via digital keypad or communication, the system starts to initialization. In order to protect from accidentally writing on P2-71 to reset an absolute system, the number 271 should be written to P2-08 to unlock the writing of 1(one) to P2-71. The procedure is P2-08=271 and then P2-71=1. This mode is only for the other modes except PR mode that already has its homing procedure to apply.

### 12.3.6 Use Digital Inputs/Outputs to Read the Absolute Coordinate Data

When Bit 0 is 0 in P2-70, the PUU number can be read by using digital inputs and outputs. The frame is as below.

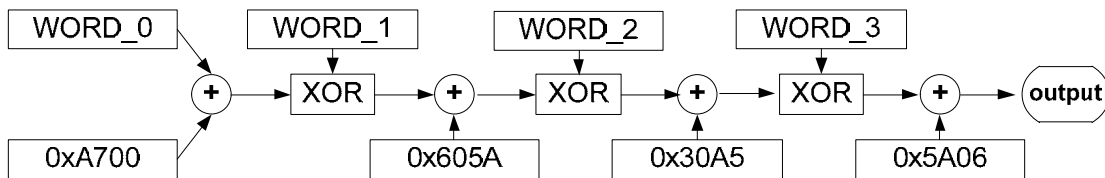
Bit 79 ~ Bit 64	Bit 63 ~ Bit 32	Bit 31 ~ Bit 16	Bit 15 ~ Bit 0
Check Sum	Encoder PUU -2147483648 - 2147483647	0	Encoder status, P0-50

When Bit 0 is 1 in P2-70, the PULSE number can be read by using digital inputs and outputs. The frame is as below.

Bit 79 ~ Bit 64	Bit 63 ~ Bit 32	Bit 31 ~ Bit 16	Bit 15 ~ Bit 0
Check Sum	Pulse within one turn 0 ~ 1279999 (= 1280000-1)	Encoder turn -32768 ~ +32767	Encoder status, P0-50

Explanation:

$$\text{Check Sum} = ((((((\text{WORD}_0 + 0xA700) \text{ XOR } \text{WORD}_1) + 0x605A) \text{ XOR } \text{WORD}_2) + 0x30A5) \text{ XOR } \text{WORD}_3) + 0x5A06)$$



Note:

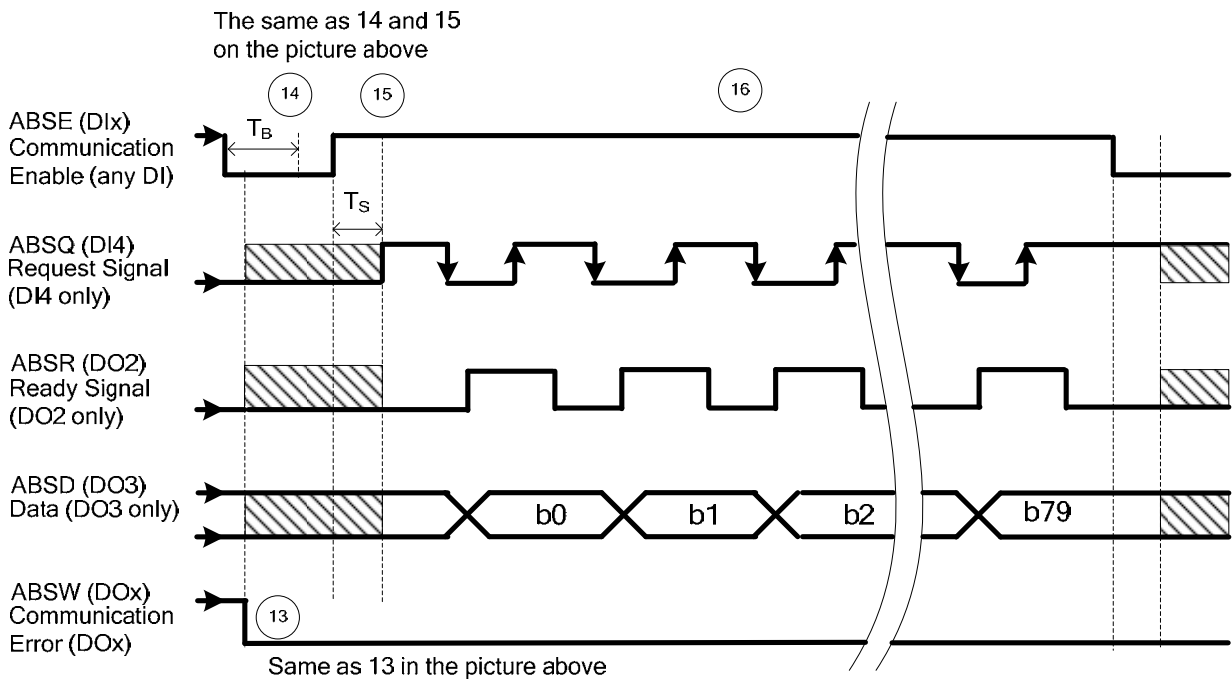
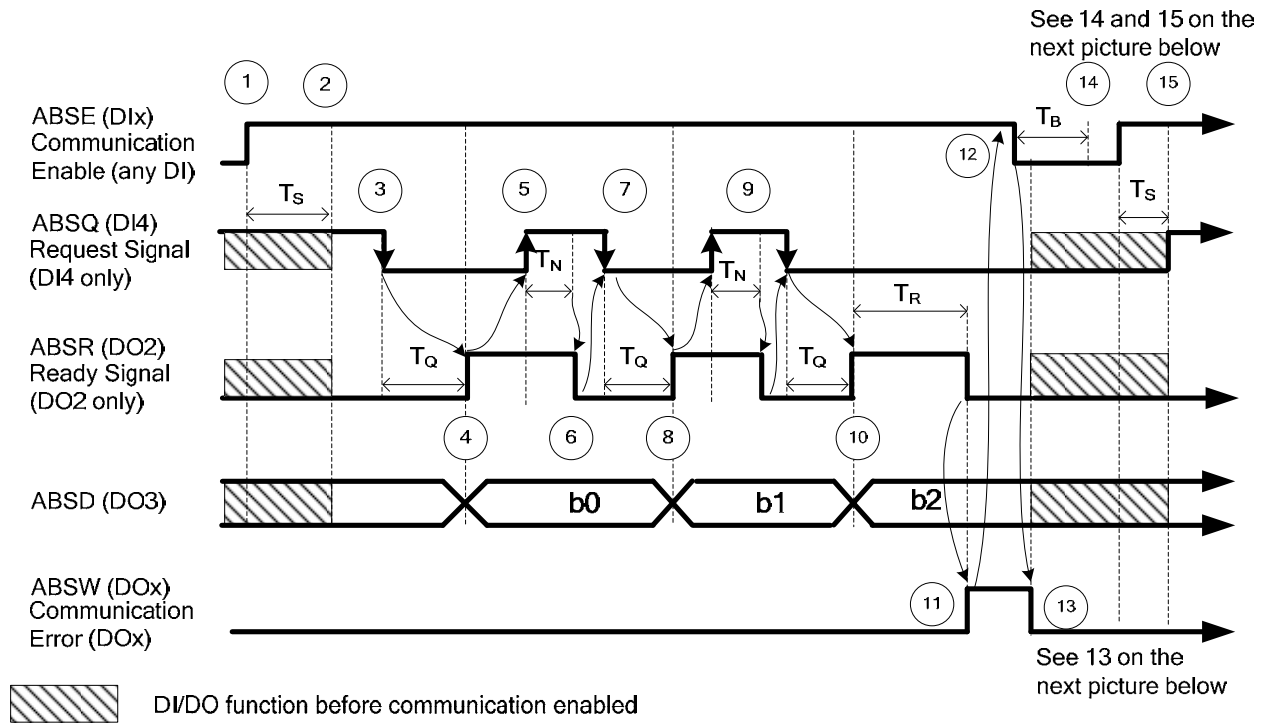
1. This algorithm has no plus or minus sign.
2. 0xA700, 0x605A, 0x30A5 and 0x5A06 are the constants of hexadecimal.
3. WORD\_0: encoder status (Bit 15~0)

WORD\_1: encoder turn (Bit 31~16)

WORD\_2: encoder pulse (Bit 47~32)

WORD\_3: encoder pulse (Bit 63~48)

The setting in P2-70 with digital inputs/outputs communication can be used to read PULSE number or PUU data with below signal communication sequence.



	$T_R(ms)$	$T_S(ms)$	$T_Q(ms)$	$T_N(ms)$	$T_B(ms)$
Min	-	P2-09+2			
Max	200	P2-09+10			

Figure 12.4 Timing of using digital inputs/outputs to read absolute data

The step explanation for the communication:

- ① At the very beginning of communication, the host controller must enable ABSE and all the communication starts from here.
- ② A threshold time  $T_s$  for confirming the signal ABSE is necessary. After the signal has been recognized, the DI4, DO2, and DO3 (no matter what their functions are), will be switched to the function of ABSQ, ABSR, and ABSD respectively. At the moment of the communication function enabled, if the signal of ABSQ is in high level, it will keep high level for its original function and also will be high level signal for ABSQ. DI4, DO2, and DO3 are multiple functions pins, please be noted especially at the moment of communication function switching on and off. For the purpose of simplifying the application, the functions of these three digital inputs and outputs could be set to 0 for communication use only.
- ③ When ABSE is at high level and retaining  $T_s$  long, the function of DI4 will be switched to ABSQ. If the host controller switches ABSQ to low after it is defined, the servo drive will recognize that the host controller wants to read data from it.
- ④ After confirming time  $T_Q$ , the data for communication is already well prepared on ABSD and the signal ABSR is enabled for signaling the host controller to get data from the servo drive side. If the longest possible waiting time of  $T_Q$  (see Figure 12.4) expired, the host controller still cannot get the signal ABSR from low to high which could be a problem of wiring disconnection.
- ⑤ After the host controller detects that ABSR is high, the data is fetched. The ABSQ will be set to signal high to inform the drive after data read.
- ⑥ After confirming time  $T_N$  for ABSQ kept high, the servo drive will maintain ABSR to low for signaling the host controller to be ready for accessing next bit.
- ⑦ The host will set ABSQ to low when it detects that ABSR is low for requesting the next bit from drive.
- ⑧ The servo drive will repeat the steps 3 to 4 to put its data at ABSD for next bit communication.
- ⑨ By repeating steps 5 to 7, the host controller will get the data, bit, and have an acknowledgement to the servo drive.
- ⑩ The third bit data is ready on the servo drive side.
- ⑪ After the data is ready and has been held for time  $T_R$ , the servo drive still does not see the signal ABSQ controlled by the host controller, and then the servo drive will have a communication error flag ABSW raise to terminate the communication procedure.
- ⑫ The host controller will set the ABSE to low for restart the communication cycle after getting the communication error message from the servo drive.

- ⑬ The communication error flag on servo drive side will be reset after detecting a low signal ABSE from the host controller.
- ⑭ A new communication cycle on host controller will be restarted after the buffering time  $T_B$ .
- ⑮ Repeat the step 1 for the host controller to start a new communication cycle.
- ⑯ If there doesn't have any error occurred during communication course for the host controller to finish bit 0 to bit 79 (80 bits data), the functions of DI4, DO2, DO3 will be changed back to their original functions before communication cycle started.

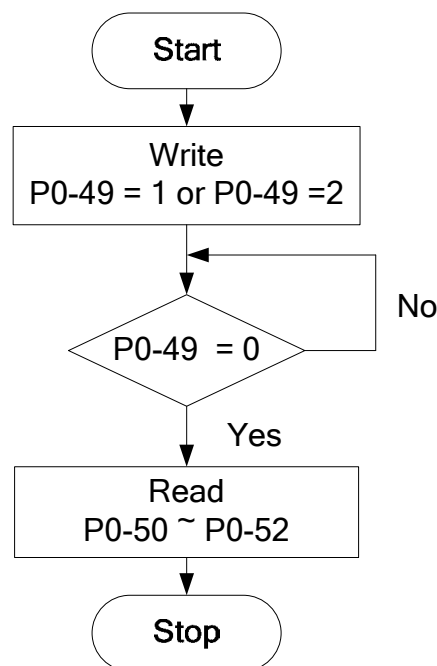
**NOTE**

If ABSW does not go back to high level signal after the changing of ABSE for signal low to high that is a sign of error occurring, there must be some other errors existing. Please check if the coordinate data still there, the voltage level of battery, or overflowing on the coordinate value.

A new communication cycle can be started only all of these errors been removed.

### 12.3.7 Use Parameter to Read the Absolute Coordinate Data

The servo drive will update its encoder status to P0-50 and encoder position to P0-51 and P0-52 when the parameter P0-49 is set. The Bit 1 of P2-70 is used to select which type of the data will be read, PULSE or PUU. While the servo motor is stalling, it is always maintaining its position with a very tiny forward and backward movement. At the moment the encoder data read, the coordinate data in servo drive side will be reset to the current position of motor if P0-49=2 where it is just read without changing any from the servo motor when P0-49=1. For example of P0-49=2, if the motor is positioning at the place of 20000, it will move around position from 19999 to 20001 normally. The command for reading the encoder data is put when the motor is at the place 20001, and the data 20001 will be read and the coordinate data in servo drive will be revised to 20001. There will avoid the error from the data at encoder side and the data at drive side. The P0-49 will be reset to 0 when all the encoder data put in P0-50 to P0-52 is ready, and it means that the host controller can get the data now. When the status already signals absolute coordinate data lost or overflow of number for turns in P0-50, the values in P0-51 to P0-52 are not correct. A homing or system reset procedure is necessary now.



## 12.4 Related Parameters for Absolute System

<b>P2-69</b>	<b>ABS</b>	<b>Absolute Encoder Setting</b>		<b>Address: 028AH 028BH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0x0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0 ~ 1		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

This parameter should be set when the servo motor with absolute encoder need to be operated as an incremental motor.

0: Incremental mode. Servo motor with absolute encoder can be operated as incremental motor.

1: Absolute mode. (This setting is only available for the servo motor with absolute encoder. When an incremental servo motor is connected, if P2-69 is set to 1, a fault will be detected and the fault code, AL069 will be displayed on the drive's LCD display.)

**Please note:**

This parameter is effective only after the servo drive is restarted (after switching power off and on).

<b>P2-70</b>	<b>MRS</b>	<b>Read Data Format Selection</b>		<b>Address: 028CH 028DH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	0x0		
	Control Mode:	ALL		
	Unit:	N/A		
	Range:	0x00 ~ 0x07		
	Data Size:	16-bit		
	Display Format:	Hexadecimal		

**Settings:**

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8

Bit0: Data unit setting of digital input/output (DI/DO)



Bit0=0: PUU  
 Bit0=1: Pulse  
 Bit1: Communication data unit setting  
 Bit0=0: PUU  
 Bit0=1: Pulse  
 Bit2: Overflow warning  
 Bit0=0: Without overflow warning  
 Bit0=1: With overflow warning AL289 (for PUU counting), AL062 (for Pulse counting)  
 Bit3 ~ Bit15: Reserved. Must be set to 0.

<b>P2-71</b>	<b>CAP</b>	<b>Absolute Position Homing</b>		<b>Address: 028EH 028FH</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:0x0		
	Control Mode:	:ALL		
	Unit:	:N/A		
	Range:	:0 ~ 1		
	Data Size:	:16-bit		
	Display Format:	:Hexadecimal		

**Settings:**

When P2-71 is set to 1, the current position will be set as home position. This function is the same as the digital input, ABSC. This function can be enabled only when parameter P2-08 is set to 271.

<b>P0-49</b>	<b>UAP</b>	<b>Renew Encoder Absolute Position</b>		<b>Address: 0062H 0063H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:0x0		
	Control Mode:	:ALL		
	Unit:	:N/A		
	Range:	:0x00 ~ 0x02		
	Data Size:	:16-bit		
	Display Format:	:Hexadecimal		

**Settings:**

This parameter is used to renew the absolute position data of the encoder.



Parameter Renew Setting:

- 1: Renew the encoder data to parameters P0-50~P0-52 only.
- 2: Renew the parameters P0-50~P0-52, and clear the position error as well. While this setting is activated, the current position of the motor will be reset as the target position of position command (same function as CCLR).

<b>P0-50★</b>	<b>APSTS</b>	<b>Absolute Coordinate System Status</b>	<b>Address: 0064H 0065H</b>
	Operation Interface:	Keypad / Software	Communication
	Default:	0x0	
	Control Mode:	ALL	
	Unit:	N/A	
	Range:	0x00 ~ 0x1F	
	Data Size:	16-bit	
	Display Format:	Hexadecimal	
			Related Section: N/A

Settings:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8

Bit0: Absolute position status

Bit0=0: Normal

Bit0=1: Absolute position is lost

Bit1: Voltage level of battery

Bit0=0: Normal

Bit0=1: Low battery

Bit2: Status of encoder multiturn

Bit0=0: Normal

Bit0=1: Overflow

Bit3: Status of PUU

Bit0=0: Normal

Bit0=1: Overflow

Bit4: Absolute coordinate system status

Bit0=0: Normal

Bit0=1: Absolute coordinate system has not been set

Bit5 ~ Bit15: Reserved. Must be set to 0.

<b>P0-51★</b>	<b>APR</b>	<b>Encoder Absolute Position (Multiturn)</b>		<b>Address: 0066H 0067H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:0x0		
	Control Mode:	:ALL		
	Unit:	:rev		
	Range:	:-32768~+32767		
	Data Size:	:32-bit		
	Display Format:	:Decimal		

Settings:

While the Bit 1 of P2-70 is set to read the encoder pulse number, this parameter represents the turns of encoder absolute position. While the Bit 1 of P2-70 is set to read the PUU number, the setting value of this parameter is 0.

<b>P0-52★</b>	<b>APP</b>	<b>Encoder Absolute Position (Pulse number within Singleturn or PUU)</b>		<b>Address: 0068H 0069H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:0x0		
	Control Mode:	:ALL		
	Unit:	:Pulse or PUU		
	Range:	:0~1280000-1 (Pulse Number); -2147483648 ~ 2147483647 (PUU)		
	Data Size:	:32-bit		
	Display Format:	:Decimal		

Settings:

While the Bit 1 of P2-70 is set to read the pulse number, this parameter represents the pulse number of encoder absolute position. While the Bit 1 of P2-70 is set to read the PUU number, this parameter represents PUU number of motor absolute position.

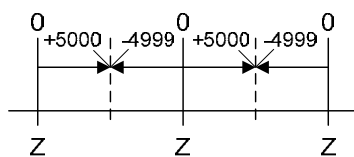
<b>P0-02</b>	<b>STS</b>	<b>Drive Status (Front Keypad Display)</b>		<b>Address: 0004H 0005H</b>
	Operation Interface:	Keypad / Software	Communication	Related Section: N/A
	Default:	:00		

Control Mode:	ALL
Unit:	N/A
Range:	0 ~ 127
Data Size:	16-bit
Display Format:	Decimal

## Settings:

This parameter shows the servo drive status.

- 00: Motor feedback pulse number (after electronic gear ratio is set) [user unit]
- 01: Input pulse number of pulse command (after electronic gear ratio is set) [user unit]
- 02: Position error counts between control command pulse and feedback pulse [user unit]
- 03: Motor feedback pulse number (encoder unit, 1280000 pulse/rev) [pulse]
- 04: Input pulse number of pulse command (before electronic gear ratio is set) [pulse]
- 05: Position error counts [pulse]
- 06: Input frequency of pulse command [Kpps]
- 07: Motor rotation speed [r/min]
- 08: Speed input command [Volt]
- 09: Speed input command [r/min]
- 10: Torque input command [Volt]
- 11: Torque input command [%]
- 12: Average load [%]
- 13: Peak load [%]
- 14: Main circuit voltage [Volt]
- 15: Ratio of load inertia to Motor inertia [0.1times]
- 16: IGBT temperature
- 17: Resonance frequency [Hz]
- 18: Absolute pulse number relative to encoder (use Z phase as home). The value of Z phase home point is 0, and it can be the value from -5000 to +5000 pulses.



The interval of two Z phase pulse command is 10000 pulses.

- 19: Mapping Parameter 1: Display the content of parameter P0-25 (mapping target is specified by parameter P0-35)
- 20: Mapping Parameter 2: Display the content of parameter P0-26 (mapping target is specified by parameter P0-36)
- 21: Mapping Parameter 3: Display the content of parameter P0-27 (mapping target is specified by parameter P0-37)
- 22: Mapping Parameter 4: Display the content of parameter P0-28 (mapping target is specified by parameter P0-38)
- 23: Status Monitor 1: Display the content of parameter P0-09 (the monitor status is

specified by parameter P0-17)

- 24: Status Monitor 2: Display the content of parameter P0-10 (the monitor status is specified by parameter P0-18)
- 25: Status Monitor 3: Display the content of parameter P0-11 (the monitor status is specified by parameter P0-19)
- 26: Status Monitor 4: Display the content of parameter P0-12 (the monitor status is specified by parameter P0-20)
- 38: Voltage level of battery [0.1 Volt]. For example, when the display value is 36, it indicates that the voltage level of the battery is 3.6V.

## 12.5 Digital Input (DI) Function Definition (for Absolute System)

### Setting Value: 0x1D

DI Name	DI Function Definition	Trigger Method	Control Mode
ABSE	<p>When ABSE is activated (ON), it can initialize an Absolute System and enable ABSQ, ABSC, ABSR, and ABSD as well. Please refer to Figure 12.3 and 12.4 for timing diagram.</p> <p>No matter what the original functions of DI4, DO2, and DO3 are, they will be switched to the function of ABSQ, ABSR, and ABSD respectively. DI4 will be changed to ASDQ, DO2 will be changed to ABSR, and DO3 will be changed to ABSD. The ABSC can be set via the parameter setting (DI function setting). When ABSE is ON, the setting value of parameter P2-13 cannot be changed.</p>	Level Triggered	ALL

### Setting Value: When ABSE is activated (ON), DI4 is switched to the function of ABSQ to replace the DI function set by parameter P2-13.

DI Name	DI Function Definition	Trigger Method	Control Mode
ABSQ is controlled by DI4	<p>When ABSQ is activated (ON), it indicates that the host controller has read and put its data at ABSD for next bit communication. When ABSQ is OFF, the host controller will send the command for requesting next bit communication. This function is for communication handshaking during digital I/O signal transmission. ABSQ is effective only when the digital input, ABSE is ON. Please refer to Figure 12.4 for timing diagram.</p>	Rising / Falling-edged Triggered	ALL

### Setting Value: 0x1F

DI Name	DI Function Definition	Trigger Method	Control Mode
ABSC	<p>When ABSC is activated (ON), the pulse number of absolute encoder will be reset to zero, and PUU number will be reset to the setting value of P6-01. ABSC is effective only when the digital input, ABSE is ON. Please refer to Figure 12.3 for timing diagram.</p>	Rising-edge Triggered	ALL

## 12.6 Digital Output (DO) Function Definition (for Absolute System)

**Setting Value: When ABSE is activated (ON), DO2 is switched to the function of ABSR to replace the DO function set by parameter P2-19.**

DO Name	DO Function Definition	Trigger Method	Control Mode
ABSR is controlled by DO2	When ABSR is OFF, it indicates that the host controller is ready for accessing next bit communication. When ABSR is activated (ON), it indicates that the host controller has read and fetched the data. ABSR is effective only when the digital input, ABSE is ON. Please refer to Figure 12.4 for timing diagram.	Level Triggered	ALL

**Setting Value: When ABSE is activated (ON), DO3 is switched to the function of ABSD to replace the DO function set by parameter P2-20.**

DO Name	DO Function Definition	Trigger Method	Control Mode
ABSD is controlled by DO3	After data read, the absolute position data will be output and put at ABSD. The data is guaranteed correct when ABSR is ON. ABSD is effective only when the digital input, ABSE is ON. Please refer to Figure 12.4 for timing diagram.	Level Triggered	ALL

**Setting Value : 0x0D**

DO Name	DO Function Definition	Trigger Method	Control Mode
ABSW	The fault messages regarding the absolute encoder will be output via ABSW. Please refer to Figure 12.4 for timing diagram.	Level Triggered	ALL

## 12.7 Fault Messages for Absolute System

Display	Fault Name	Description
<b>AL028</b>	The encoder is over-voltage or the internal error of the encoder	The charge circuit of the drive is not removed and the voltage of the battery is higher than the specification (> 3.8V). It also might be the signal error of the encoder.
<b>AL029</b>	Gray Code Error	An absolute position error within one turn.
<b>AL060</b>	Absolute Position Lost	The recorded turn numbers are lost as the voltage level of battery is too low or after a power interruption.
<b>AL061</b>	An error of the low voltage of the encoder	The voltage level of the absolute encoder battery is lower than the specified voltage or there is an error of the battery voltage.
<b>AL062</b>	Overflow Warning of Absolute Position	The normal range of turn numbers of absolute position is -32768~+32767.
<b>AL068</b>	I/O Data Transmission Error of Absolute Position	A timing error occurs when reading the data of absolute position via the digital inputs and outputs.
<b>AL069</b>	Motor Type Error	Possible an incremental type motor is connected. Possible the setting value of P2-69 is not set to 0.
<b>AL289</b>	Position counter overflow	Position counter overflow occurs.



## 12.7.1 Potential Cause and Corrective Actions

### **AL028** : Voltage Level Above Specification

Potential Cause	Checking Method	Corrective Actions
The voltage level of the battery is higher than the specified voltage (> 3.8V).	<ol style="list-style-type: none"> <li>1. Check if an electrical charge still remains in the servo drive.</li> <li>2. Examine the installation of the battery.</li> </ol>	This fault message can be removed automatically after the voltage level has returned within its specification.

### **AL029** : Gray Code Error

Potential Cause	Checking Method	Corrective Actions
An absolute position error within one turn.	Power ON the drive and turn the connected motor again to check if this fault message will disappear.	If this fault message cannot be clear by restarting the servo system, replace the encoder.

### **AL060** : Absolute Position Lost

Potential Cause	Checking Method	Corrective Actions
The voltage level of the battery is too low.	Check if the voltage level of the battery is lower than 2.7V.	Replace the battery and execute the homing procedure again. Please refer to section 12.3.4 to 12.3.5 for initialization procedure of an absolute system.
The initialization procedure of an absolute system has not finished after enabling the absolute function.	<ol style="list-style-type: none"> <li>1. Install a battery box.</li> <li>2. Check the wiring connection between the battery box and the servo drive.</li> <li>3. Check if the wiring is correct of the encoder.</li> </ol>	Execute the homing procedure again. Please refer to section 12.3.4 to 12.3.5 for initialization procedure of an absolute system.
Bad connection or an open circuit occurred in the wiring between the battery box and the servo drive.	<ol style="list-style-type: none"> <li>1. Check the wiring connection between the battery box and the servo drive.</li> <li>2. Check if the wiring is correct of the encoder.</li> </ol>	Conduct the wiring again. Then, execute the homing procedure again. Please refer to section 12.3.4 to 12.3.5 for initialization procedure of an absolute system.

### **AL061** : Voltage Level Below Specification

Potential Cause	Checking Method	Corrective Actions
The voltage level of the battery is too low.	<ol style="list-style-type: none"> <li>1. Check if the voltage level of the battery that is displayed on the keypad is lower than 3.1 V.</li> <li>2. Measure if the voltage level of the battery is lower than 3.1 V.</li> </ol>	Replace the battery when the control power is applied to the servo drive. This fault message can be removed automatically after conducting battery replacement.
There is an error of battery voltage.	The battery polarity is incorrect.	Check if the battery polarity is reversed.

### **AL062** : Overflow Warning of Absolute Position

Potential Cause	Checking Method	Corrective Actions
The motor traveling distance is out of the specified range.	Check if the motor turn numbers are within the range of -32768 to +32767.	Execute the homing procedure again. Please refer to section 12.2.3 to 12.2.4 for initialization

procedure of an absolute system.

### **AL068** : I/O Data Transmission Error of Absolute Position

Potential Cause	Checking Method	Corrective Actions
Timing error	<ol style="list-style-type: none"> <li>1. The digital input, ABSQ cannot be turned OFF before the digital output, ABSR is set to be OFF.</li> <li>2. The digital input, ABSQ cannot be turned ON before the digital output, ABSR is set to be ON.</li> </ol>	Correct the read/write timing of ABSQ and ABSR.
Reading timeout	Check if the period of time from enabling ASBR to be ON to ABSQ kept high has exceeded 200ms.	When ASBR is activated to be ON, it indicates that the absolute position data is ready. The host controller will read and put the data at ABSD in 200ms and enable ABSQ to be ON to inform the servo drive the bit reading procedure has been done.
The wiring is disconnected.	Examine if the wiring is disconnected.	Reconnect the wiring.

### **AL069** : Motor Type Error

Potential Cause	Checking Method	Corrective Actions
<ol style="list-style-type: none"> <li>1. Possible an incremental type motor is connected.</li> <li>2. Possible the setting value of P2-69 is not set to 0.</li> </ol>	<ol style="list-style-type: none"> <li>1. Examine the connected motor is an absolute type or an incremental type motor.</li> <li>2. Check the setting value of P2-69</li> </ol>	<ol style="list-style-type: none"> <li>1. Please choose an absolute type motor.</li> <li>2. Please set the setting value of P2-69 to 0.</li> </ol>

### **AL289** : Position counter overflow

Potential Cause	Checking Method	Corrective Actions
Position counter overflow occurs.	If this fault occurs, please contact your distributor for assistance or contact with Delta.	NMT Maser send "Reset node" command to its slave or reset the fault by sending the control word (0x6040) through CAN communication (the value of CANopen object 0x6040 should be reset)

## 12.8 Related Monitoring Variables

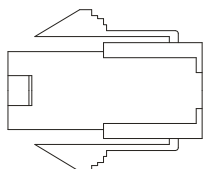
Code	Monitoring Variables / Attribute	Explanation
038 (26h)	Voltage level of battery	The voltage level of battery for an absolute encoder.

# Appendix A Accessories

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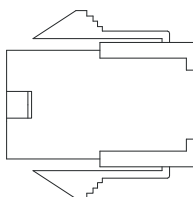
## ■ Power Connectors

Delta Part Number: ASDBCAPW0000



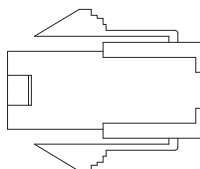
Title	Part No.	Manufacturer
Housing	C4201H00-2*2PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: ASDBCAPW0100



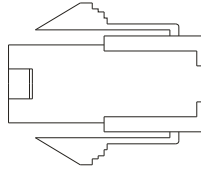
Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: ASD-CAPW5400



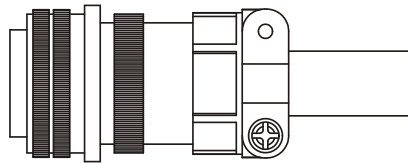
Title	Part No.	Manufacturer
Housing	39-01-2041	MOLEX
Terminal	39-00-0040	MOLEX

**Delta Part Number: ASD-CAPW5100**



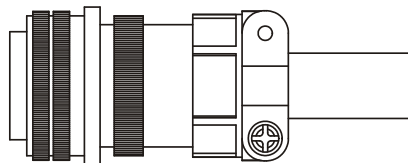
Title	Part No.	Manufacturer
Housing	39-01-2061	MOLEX
Terminal	39-00-0040	MOLEX

**Delta Part Number: ASD-CAPW1000**



3106A-20-18S

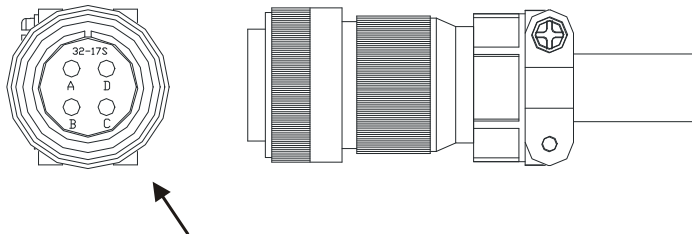
**Delta Part Number: ASD-CAPW2000**



3106A-24-11S

**Delta Part Number: ASD-CAPW4000**

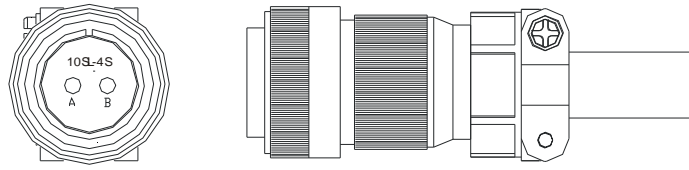
**CLAMP: WPS3057-20A**



↖ Straight Plug WPS3106A-32-17S

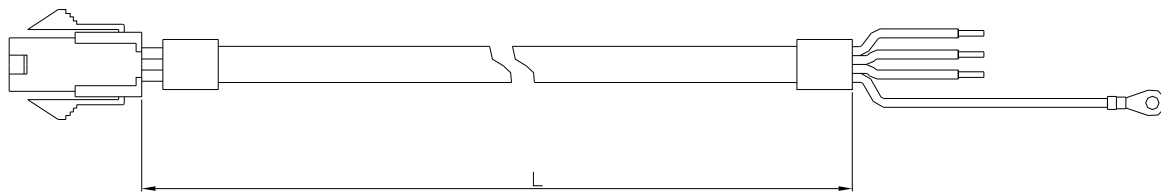
**Motor Brake Connector: ASD-CNBR1000**

**CLAMP: WPS3106A 10SL-4S-R**



■ **Power Cables**

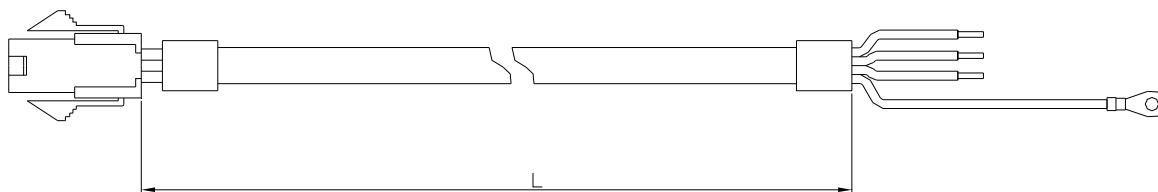
**Delta Part Number: ASD-ABPW0003, ASD-ABPW0005**



Title	Part No.	Manufacturer
Housing	39-01-2041	JOWLE
Terminal	39-00-0040	JOWLE

Title	Part No.	L	
		mm	inch
1	ASD-ABPW0003	3000 ± 100	118 ± 4
2	ASD-ABPW0005	5000 ± 100	197 ± 4

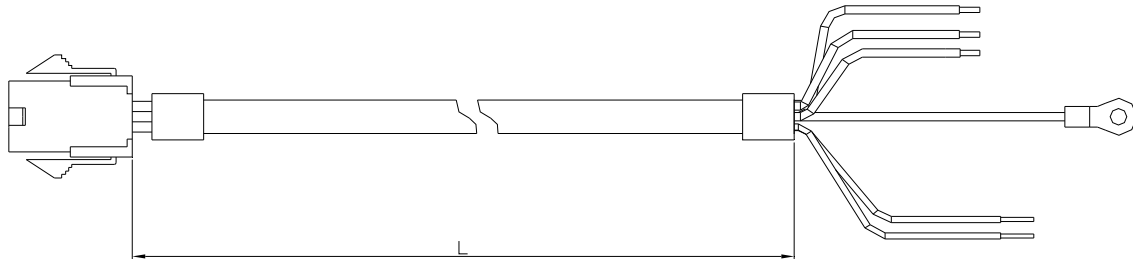
**Delta Part Number: ASD-CAPW5403, ASD-CAPW5405**



Title	Part No.	Manufacturer
Housing	39-01-2041	MOLEX
Terminal	39-00-0040	MOLEX

Title	Part No.	L	
		mm	inch
1	ASD-CAPW5403	3000 ± 100	118 ± 4
2	ASD-CAPW5405	5000 ± 100	197 ± 4

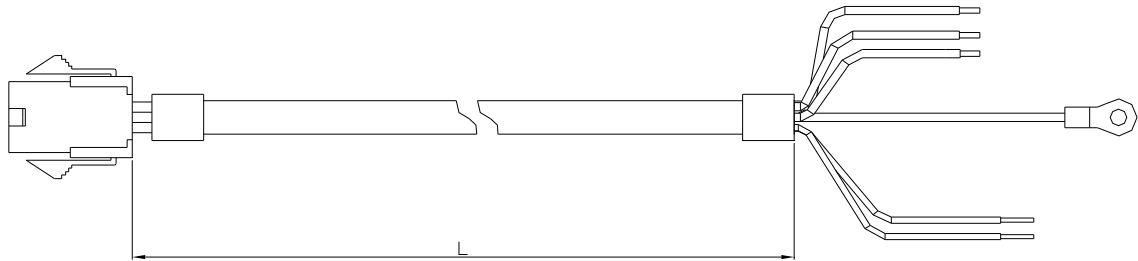
**Delta Part Number: ASD-ABPW0103, ASD-ABPW0105**



Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Title	Part No.	L	
		mm	inch
1	ASD-ABPW0103	3000 ± 100	118 ± 4
2	ASD-ABPW0105	5000 ± 100	197 ± 4

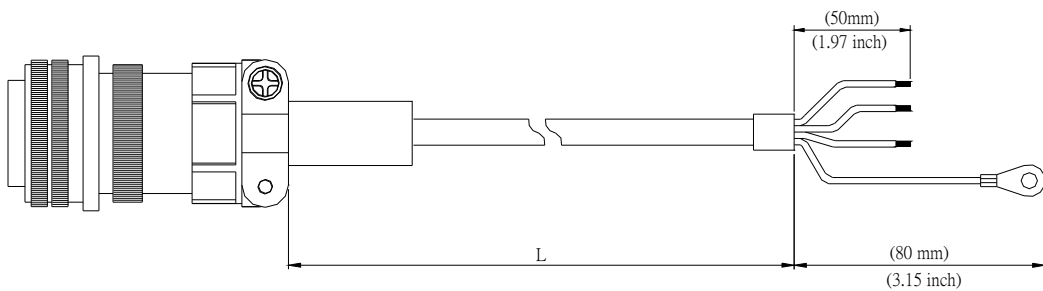
**Delta Part Number: ASD-CAPW5103, ASD-CAPW5105**



Title	Part No.	Manufacturer
Housing	39-01-2061	MOLEX
Terminal	39-00-0040	MOLEX

Title	Part No.	L	
		mm	inch
1	ASD-CAPW5103	3000 ± 100	118 ± 4
2	ASD-CAPW5105	5000 ± 100	197 ± 4

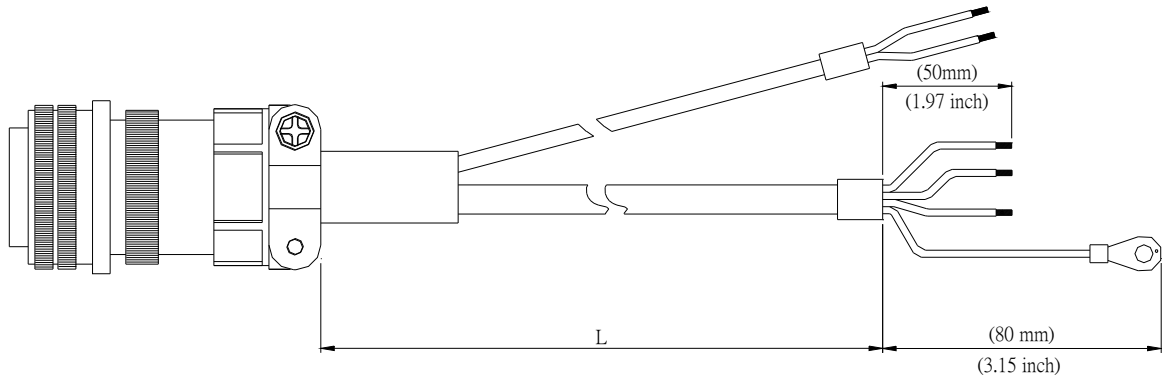
**Delta Part Number: ASD-CAPW1003, ASD-CAPW1005**



Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1003	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-CAPW1005	3106A-20-18S	5000 ± 100	197 ± 4

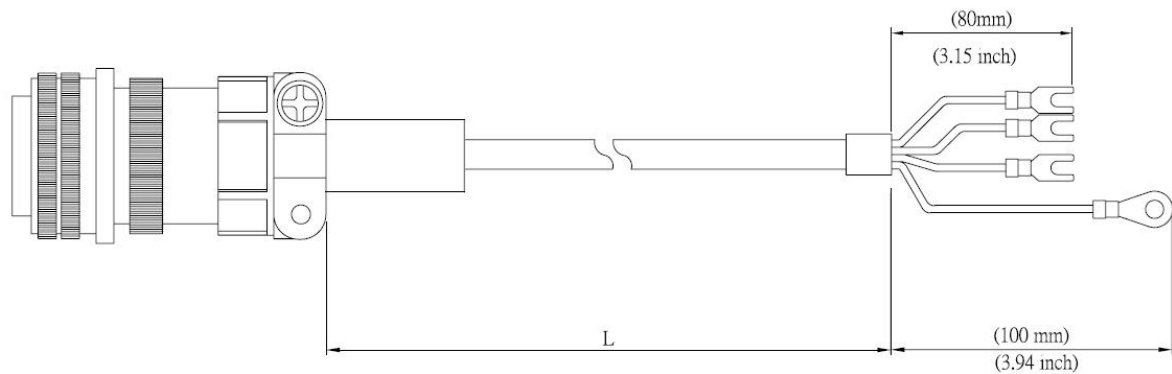


**Delta Part Number: ASD-CAPW1103, ASD-CAPW1105**



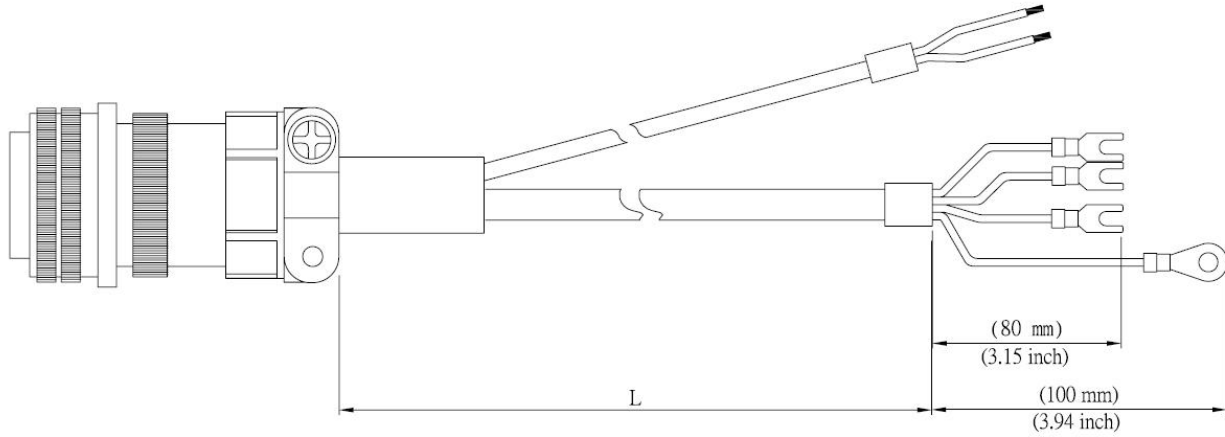
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1103	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-CAPW1105	3106A-20-18S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-CAPW1203, ASD-CAPW1205**



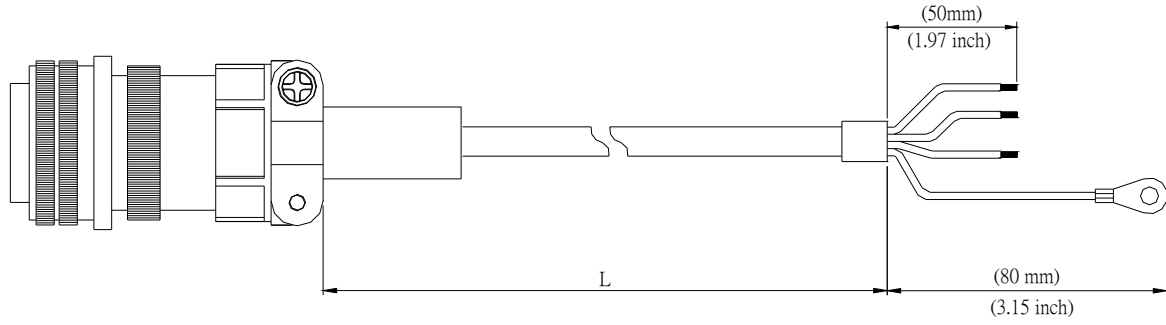
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1203	3106A-20-18S	3000 ± 100	118 ± 4
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**Delta Part Number: ASD-CAPW1303, ASD-CAPW1305**



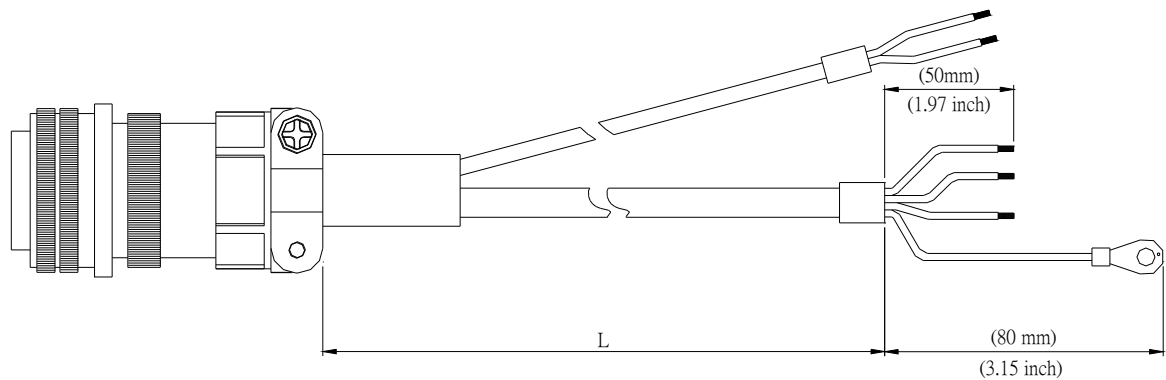
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1303	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-CAPW1305	3106A-20-18S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-A2PW1003, ASD-A2PW1005**



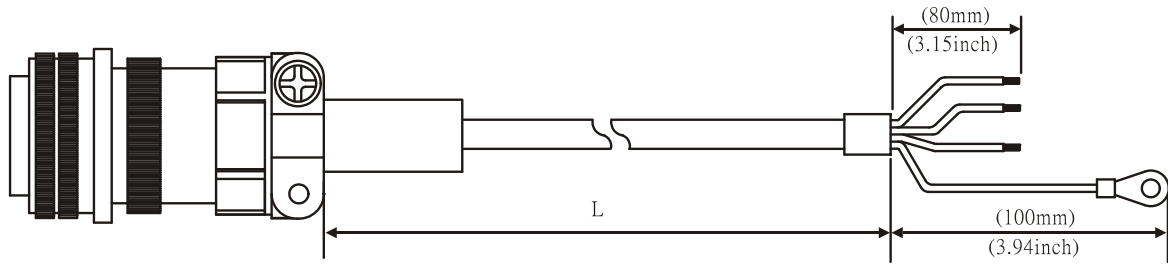
Title	Part No.	Straight	L	
			mm	inch
1	ASD-A2PW1003	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-A2PW1005	3106A-20-18S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-A2PW1103, ASD-A2PW1105**



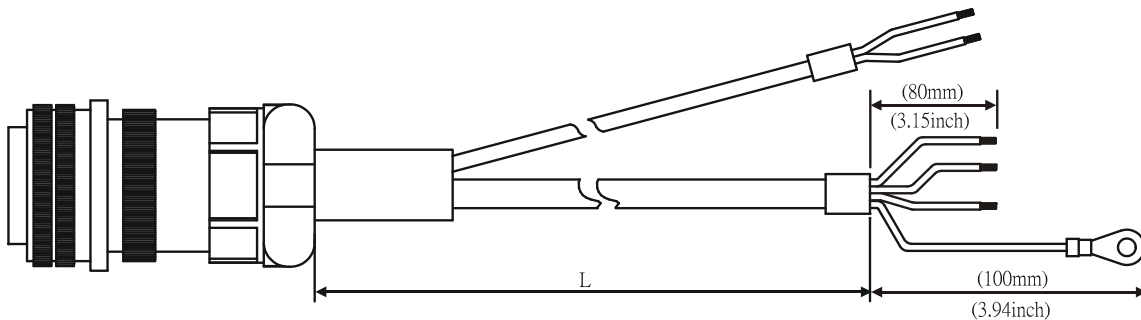
Title	Part No.	Straight	L	
			mm	inch
1	ASD-A2PW1103	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-A2PW1105	3106A-20-18S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-CAPW2003, ASD-CAPW2005**



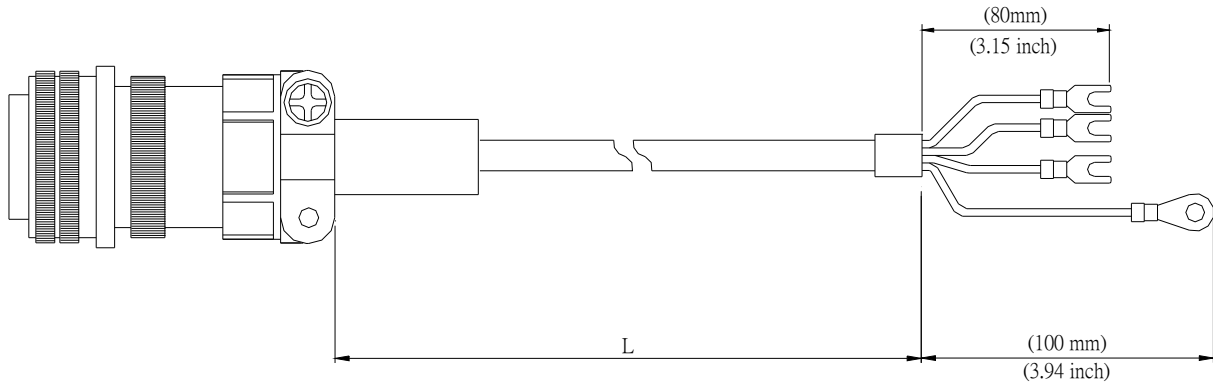
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2003	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2005	3106A-24-11S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-CAPW2103, ASD-CAPW2105**



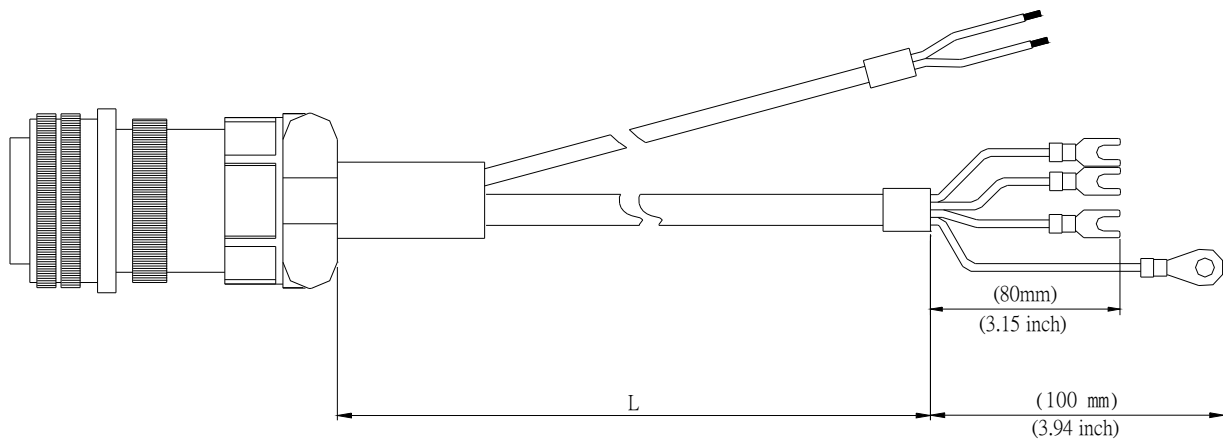
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2103	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2105	3106A-24-11S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-CAPW2203, ASD-CAPW2205**



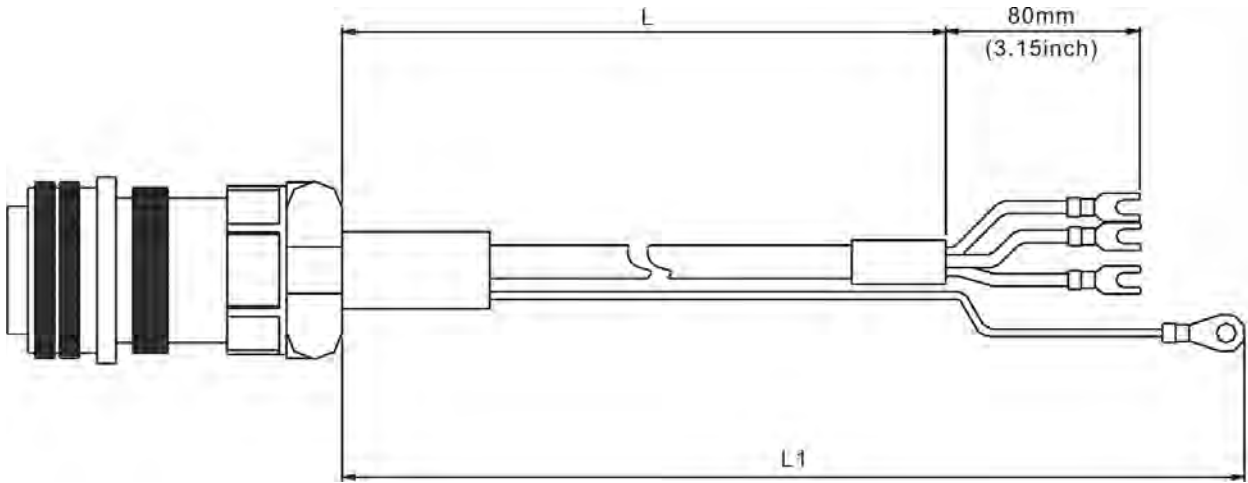
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2203	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2205	3106A-24-11S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-CAPW2303, ASD-CAPW2305 (for motors with brake)**



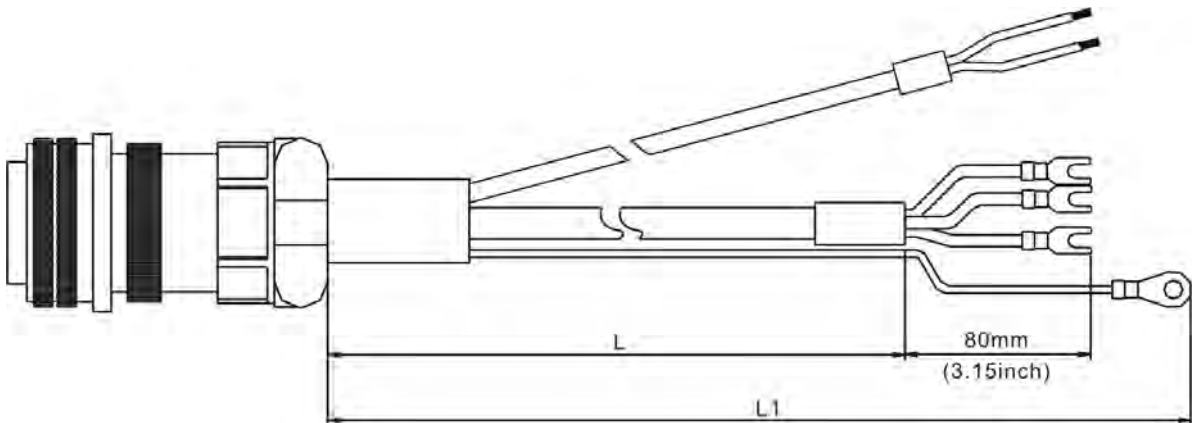
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2303	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2305	3106A-24-11S	5000 ± 100	197 ± 4

**Delta Part Number: ASD-CAPW3203, ASD-CAPW3205 (for 4.5kW models)**



Item	Part No.	Straight	L		L1	
			mm	inch	mm	inch
1	ASD-CAPW3203	MS 3106-24-11S	3000 ± 100	118 ± 4	3100 ± 100	122 ± 4
2	ASD-CAPW3205	MS 3106-24-11S	5000 ± 100	197 ± 4	5100 ± 100	201 ± 4

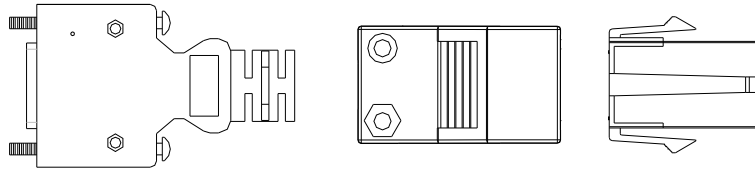
**Delta Part Number: ASD-CAPW3303, ASD-CAPW3305 (for motors with brake)  
(for 4.5kW models)**



Item	Part No.	Straight	L		L1	
			mm	inch	mm	inch
1	ASD-CAPW3303	MS 3106-24-11S	3000 ± 100	118 ± 4	3100 ± 100	122 ± 4
2	ASD-CAPW3305	MS 3106-24-11S	5000 ± 100	197 ± 4	5100 ± 100	201 ± 4

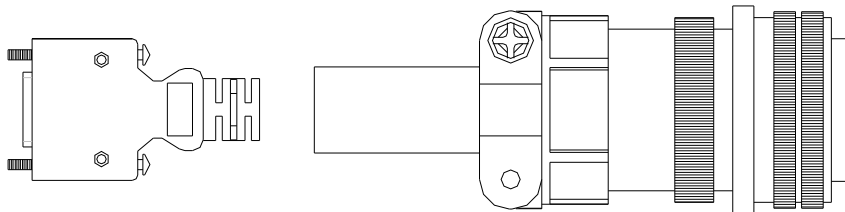
■ Encoder Connectors

Delta Part Number: ASD-ABEN0000



Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

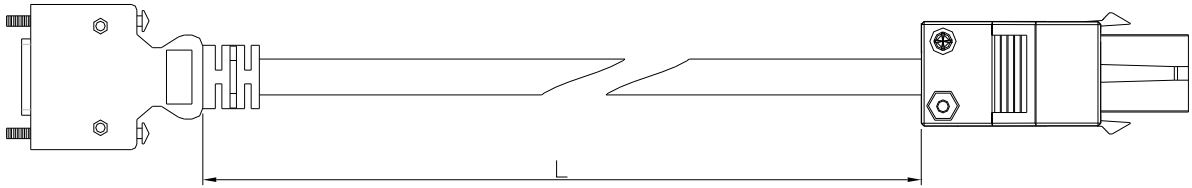
Delta Part Number: ASD-CAEN1000



Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

■ Incremental Type Encoder Cables

Delta Part Number: ASD-ABEN0003, ASD-ABEN0005

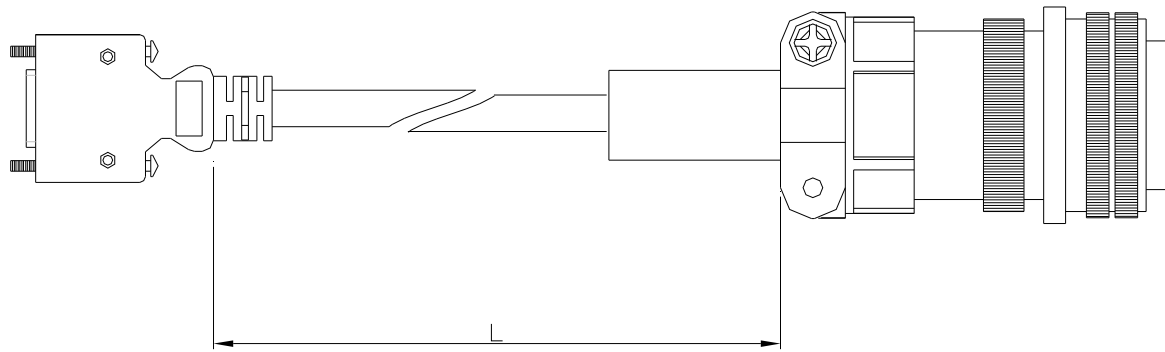


Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	L	
		mm	inch
1	ASD-ABEN0003	3000 ± 100	118 ± 4
2	ASD-ABEN0005	5000 ± 100	197 ± 4



**Delta Part Number: ASD-CAEN1003, ASD-CAEN1005**

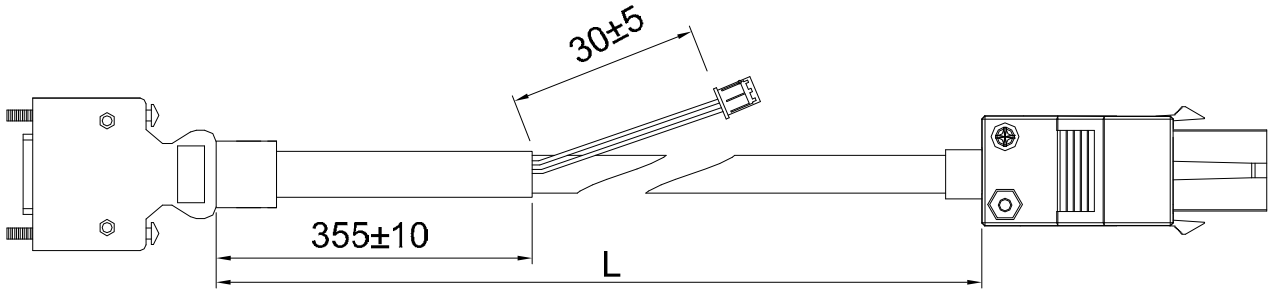


Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAEN1003	3106A-20-29S	3000 ± 100	118 ± 4
2	ASD-CAEN1005	3106A-20-29S	5000 ± 100	197 ± 4

### ■ Absolute Type Encoder Cables

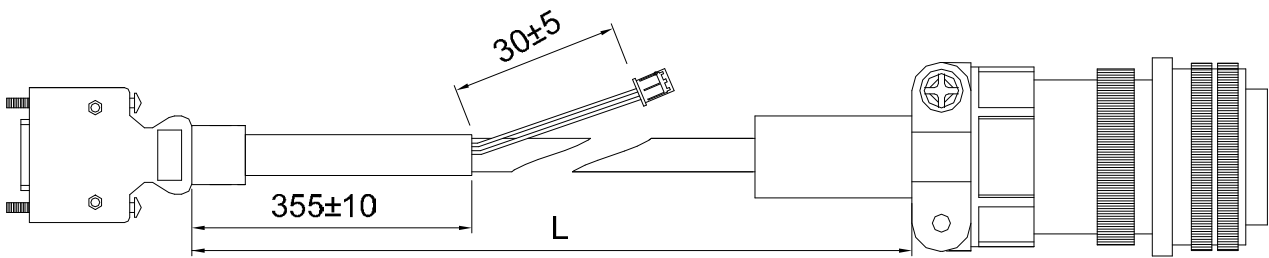
Delta Part Number: ASD-A2EB0003, ASD-A2EB0005



Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	L	
		mm	inch
1	ASD-A2EB0003	3000 ± 100	118 ± 4
2	ASD-A2EB0005	5000 ± 100	197 ± 4

**Delta Part Number: ASD-A2EB1003, ASD-A2EB1005**

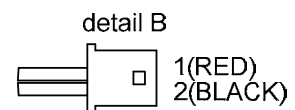
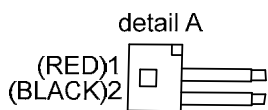
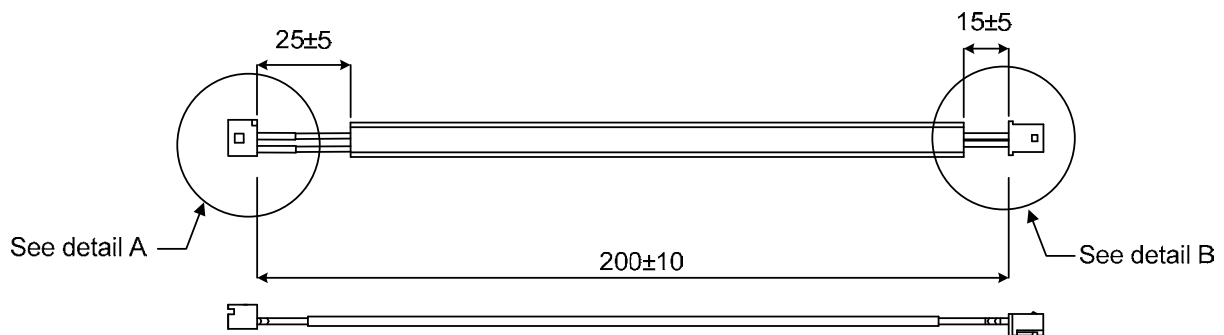


Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	L	
		mm	inch
1	ASD-A2EB1003	3000 ± 100	118 ± 4
2	ASD-A2EB1005	5000 ± 100	197 ± 4

■ **Battery Box Cord AW**

**Delta Part Number: 3864573700**



**Detail A**

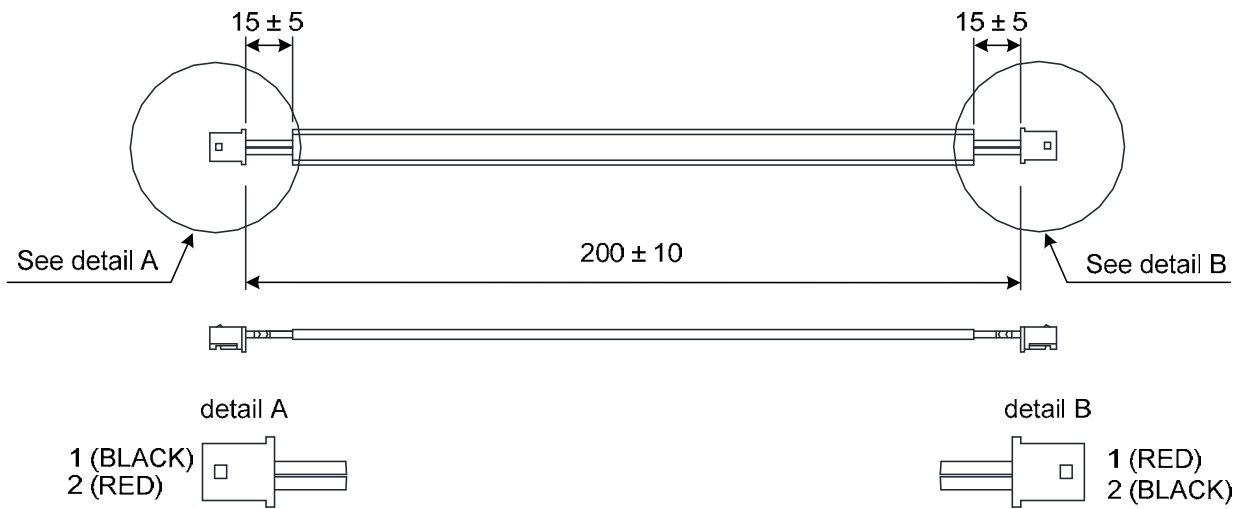
Title	Part No.	Manufacturer
Terminal	A2004WV0-2P	JWT

**Detail B**

Title	Part No.	Manufacturer
Housing	A2004H00-2P	JWT
Terminal	A2004TOP-2	JWT

■ **Battery Box Cord IW**

**Delta Part Number: 3864811900**



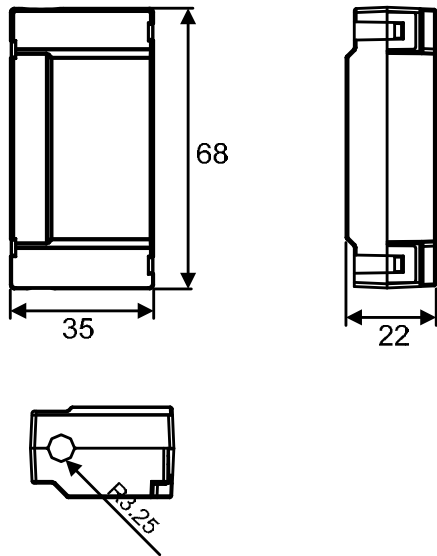
**Detail A, B**

Title	Part No.	Manufacturer
Housing	A2004H00-2P	JWT
Terminal	A2004TOP-2	JWT

### ■ Battery Boxes

#### Single Battery Box

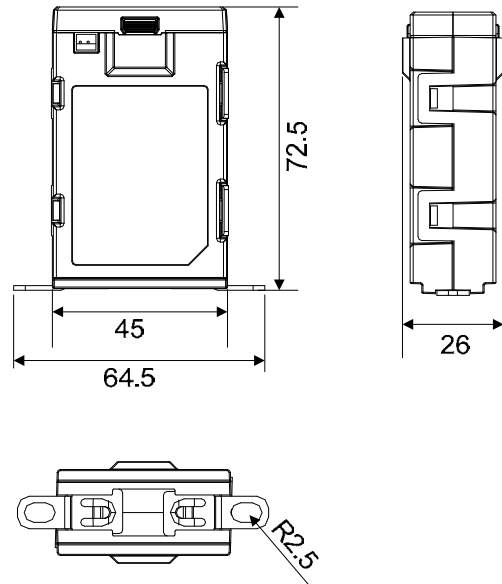
Delta Part Number: ASD-MDBT0100



Units: mm

#### Dual Battery Box

Delta Part Number: ASD-MDBT0200

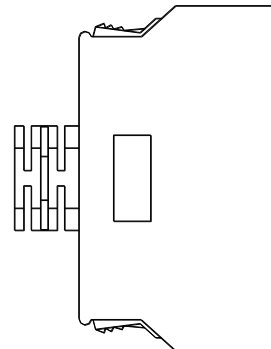


Units: mm

### ■ I/O Signal Connector (CN1)

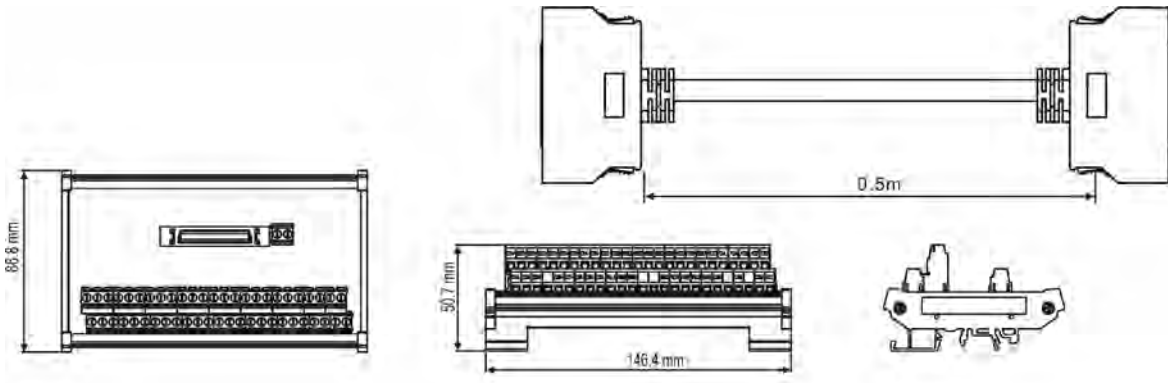
Delta Part Number: ASD-CNSC0050

Vendor Name	Vendor P/N
3M TAIWAN LTD	10150-3000PE
3M TAIWAN LTD	10350-52A0-008



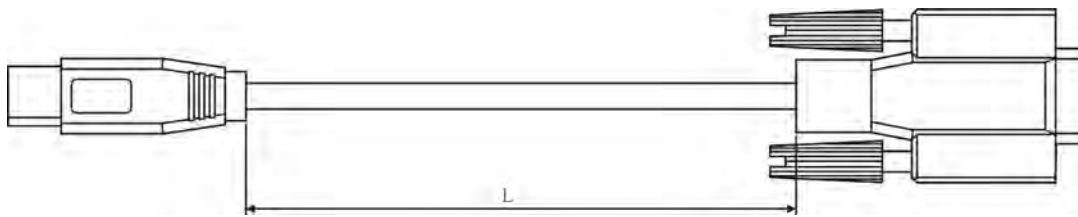
■ Terminal Block Module

Delta Part Number: ASD-BM-50A



■ RS-232 Communication Cable

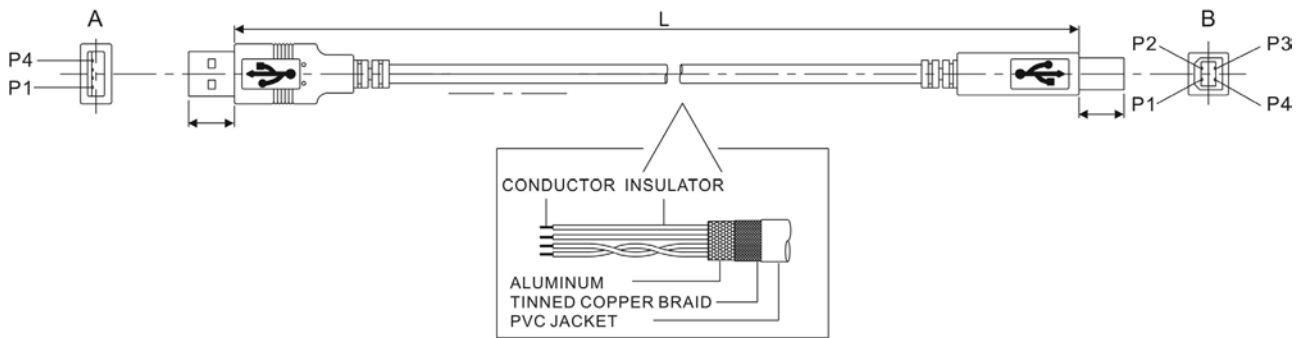
Delta Part Number: ASD-CARS0003



Title	Part No.	L	
		mm	inch
1	ASD-CARS0003	3000 ± 100	118 ±4

■ **Communication Cable between Drive and Computer (for PC)**

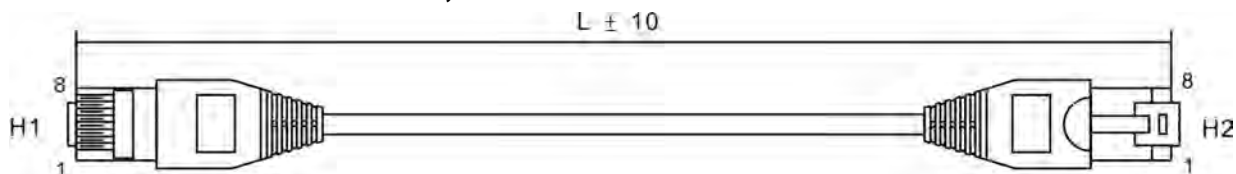
Delta Part Number: DOP-CAUSBAB



Title	Part No.	L	
		mm	inch
1	DOP-CAUSBAB	1400 ± 30	55 ± 1.2

■ **CANopen Communication Cable**

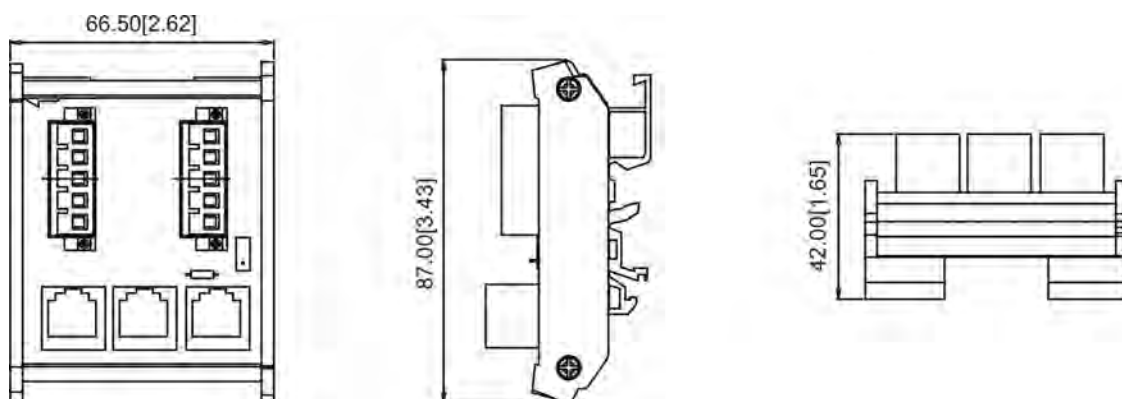
Delta Part Number: TAP-CB03, TAP-CB04



Title	Part No.	L	
		mm	inch
1	TAP-CB03	500 ± 10	19 ± 0.4
2	TAP-CB04	1000 ± 10	39 ± 0.4

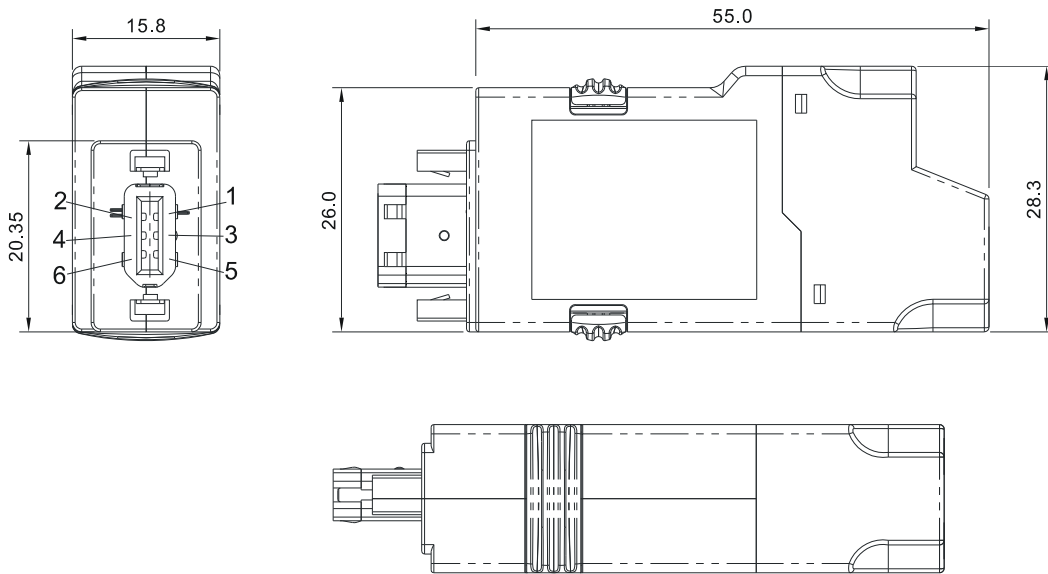
■ **CANopen Distribution Box**

Delta Part Number: TAP-CN03



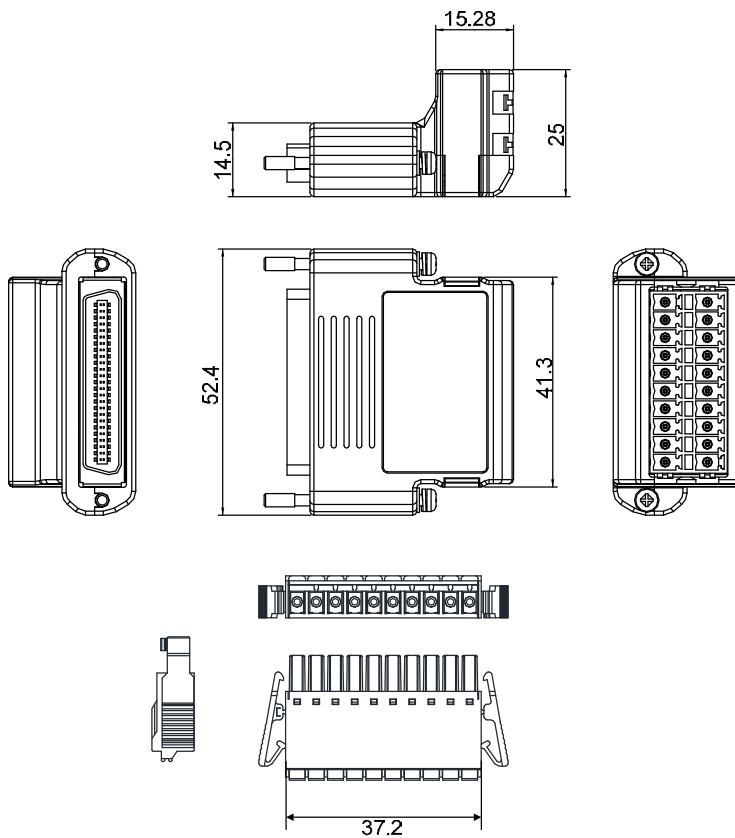
### ■ RS-485 Connector

Delta Part Number: ASD-CNIE0B06



### ■ CN1 Convenient Connector

Delta Part Number: ASD-IF-SC5020





## ■ Servo Drive, Servo Motor and Accessories Combinations - 220V

### Series

#### 100W Servo Drive and 50W Low Inertia Servo Motor

Servo Drive	ASD-A2-0121-□
Low Inertia Servo Motor	ECMA-C△040F□S
Motor Power Cable (Without Brake)	ASD-ABPW000X
Power Connector (Without Brake)	ASDBCAPW0000
Motor Power Cable (With Brake)	ASD-ABPW010X
Power Connector (With Brake)	ASDBCAPW0100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

#### 100W Servo Drive and 100W Low Inertia Servo Motor

Servo Drive	ASD-A2-0121-□
Low Inertia Servo Motor	ECMA-C△0401□S
Motor Power Cable (Without Brake)	ASD-ABPW000X
Power Connector (Without Brake)	ASDBCAPW0000
Motor Power Cable (With Brake)	ASD-ABPW010X
Power Connector (With Brake)	ASDBCAPW0100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**200W Servo Drive and 200W Low Inertia Servo Motor**

Servo Drive	ASD-A2-0221-□
Low Inertia Servo Motor	ECMA-C△0602□S
Motor Power Cable (Without Brake)	ASD-ABPW000X
Power Connector (Without Brake)	ASDBCAPW0000
Motor Power Cable (With Brake)	ASD-ABPW010X
Power Connector (With Brake)	ASDBCAPW0100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**400W Servo Drive and 400W Low Inertia Servo Motor**

Servo Drive	ASD-A2-0421-□
Low Inertia Servo Motor	ECMA-C△0604□S ECMA-C△0804□7
Motor Power Cable (Without Brake)	ASD-ABPW000X
Power Connector (Without Brake)	ASDBCAPW0000
Motor Power Cable (With Brake)	ASD-ABPW010X
Power Connector (With Brake)	ASDBCAPW0100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**400W Servo Drive and 500W Medium Inertia Servo Motor**

Servo Drive	ASD-A2-0421-□
Medium Inertia Servo Motor	ECMA-E△1305□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**400W Servo Drive and 300W High Inertia Servo Motor**

Servo Drive	ASD-A2-0421-□
High Inertia Servo Motor	ECMA-G△1303□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**750W Servo Drive and 750W Low Inertia Servo Motor**

Servo Drive	ASD-A2-0721-□
Low Inertia Servo Motor	ECMA-C△0807□S ECMA-C△0907□S
Motor Power Cable (Without Brake)	ASD-ABPW000X
Power Connector (Without Brake)	ASDBCAPW0000
Motor Power Cable (With Brake)	ASD-ABPW010X
Power Connector (With Brake)	ASDBCAPW0100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**750W Servo Drive and 500W High Inertia Servo Motor**

Servo Drive	ASD-A2-0721-□
High Inertia Servo Motor	ECMA-F11305□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**750W Servo Drive and 600W High Inertia Servo Motor**

Servo Drive	ASD-A2-0721-□
High Inertia Servo Motor	ECMA-G△1306□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1kW Servo Drive and 1kW Low Inertia Servo Motor**

Servo Drive	ASD-A2-1021-□
Low Inertia Servo Motor	ECMA-C△1010□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1Kw Servo Drive and 1kW Low Inertia Servo Motor**

Servo Drive	ASD-A2-1021-□
Low Inertia Servo Motor	ECMA-C△0910□S
Motor Power Cable (Without Brake)	ASD-ABPW000X
Power Connector (Without Brake)	ASDBCAPW0000
Motor Power Cable (With Brake)	ASD-ABPW010X
Power Connector (With Brake)	ASDBCAPW0100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1kW Servo Drive and 1kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-1021-□
Medium Inertia Servo Motor	ECMA-E△1310□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1kW Servo Drive and 850W Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-1021-□
Medium-High Inertia Servo Motor	ECMA-F△1308□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1kW Servo Drive and 900W High Inertia Servo Motor**

Servo Drive	ASD-A2-1021-□
High Inertia Servo Motor	ECMA-G△1309□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1.5kW Servo Drive and 1.5kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-1521-□
Medium Inertia Servo Motor	ECMA-E△1315□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**2kW Servo Drive and 2kW Low Inertia Servo Motor**

Servo Drive	ASD-A2-2023-□
Low Inertia Servo Motor	ECMA-C△1020□S
Motor Power Cable (Without Brake)	ASD-A2PW100X
Motor Power Cable (With Brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)



**2kW Servo Drive and 2kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-2023-□
Medium Inertia Servo Motor	ECMA-E△1320□S
Motor Power Cable (Without Brake)	ASD-A2PW100X
Motor Power Cable (With Brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**2kW Servo Drive and 2kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-2023-□
Medium Inertia Servo Motor	ECMA-E△1820□S
Motor Power Cable (Without Brake)	ASD-CAPW200X
Motor Power Cable (With Brake)	ASD-CAPW210X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**2kW Servo Drive and 1.3kW Medium High Inertia Servo Motor**

Servo Drive	ASD-A2-3023-□
Medium High Inertia Servo Motor	ECMA-F11313□3
Motor Power Cable (Without Brake)	ASD-A2PW100X
Motor Power Cable (With Brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**2kW Servo Drive and 1.8kW Medium High Inertia Servo Motor**

Servo Drive	ASD-A2-3023-□
Medium High Inertia Servo Motor	ECMA-F11318□S
Motor Power Cable (Without Brake)	ASD-A2PW100X
Motor Power Cable (With Brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**3kW Servo Drive and 3kW Low Inertia Servo Motor**

Servo Drive	ASD-A2-3023-□
Low Inertia Servo Motor	ECMA-C△1330□4
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**3kW Servo Drive and 3kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-3023-□
Medium Inertia Servo Motor	ECMA-E△1830□S
Motor Power Cable (Without Brake)	ASD-CAPW200X
Motor Power Cable (With Brake)	ASD-CAPW210X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**3kW Servo Drive and 3.5kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-3023-□
Medium Inertia Servo Motor	ECMA-E△1835□S
Motor Power Cable (Without Brake)	ASD-CAPW200X
Motor Power Cable (With Brake)	ASD-CAPW210X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**3kW Servo Drive and 3kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-3023-□
Medium-High Inertia Servo Motor	ECMA-F△1830□S
Motor Power Cable (Without Brake)	ASD-CAPW200X
Motor Power Cable (With Brake)	ASD-CAPW210X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**4.5kW Servo Drive and 4.5kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-4523-□
Medium-High Inertia Servo Motor	ECMA-F△1845□S
Motor Power Cable (Without Brake)	ASD-CAPW320X
Motor Power Cable (With Brake)	ASD-CAPW330X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**5.5kW Servo Drive and 5.5kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-5523-□
Medium-High Inertia Servo Motor	ECMA-F△1855□3
Motor Power Cable (Without Brake)	-
Motor Power Cable (With Brake)	-
Power Connector	ASD-CAPW4000
Brake Connector	ASD-CNBR1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**7.5kW Servo Drive and 7.5kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-7523-□
Medium-High Inertia Servo Motor	ECMA-F△1875□3
Motor Power Cable (Without Brake)	-
Motor Power Cable (With Brake)	-
Power Connector	ASD-CAPW4000
Brake Connector	ASD-CNBR1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**11kW Servo Drive and 11kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-1B23-□
Medium-High Inertia Servo Motor	ECMA-F1221B□3
Motor Power Cable (Without Brake)	-
Motor Power Cable (With Brake)	-
Power Connector	ASD-CAPW4000
Brake Connector	ASD-CNBR1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**15kW Servo Drive and 15kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-1F23-□
Medium-High Inertia Servo Motor	ECMA-F1221F□S
Motor Power Cable (Without Brake)	-
Motor Power Cable (With Brake)	-
Power Connector	ASD-CAPW4000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

 **NOTE**

- 1) The boxes (□) at the ends of the servo drive model names are for optional configurations (Full-close control, CANopen, DMCNET and extension port for digital input). For the actual model name, please refer to the ordering information of the actual purchased product.
- 2) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).
- 3) The boxes (□) in the model names are for optional configurations (keyway, brake and oil seal). (Please refer to section 1.2 for model explanation.)

## ■ Servo Drive, Servo Motor and Accessories Combinations - 400V

### Series

#### 750W Servo Drive and 400W Low Inertia Servo Motor

Servo Drive	ASD-A2-0743-□
Low Inertia Servo Motor	ECMA-J10604□S
Motor Power Cable (Without Brake)	ASD-CAPW540X
Power Connector (Without Brake)	ASD-CAPW5400
Motor Power Cable (With Brake)	ASD-CAPW510X
Power Connector (With Brake)	ASD-CAPW5100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

#### 750W Servo Drive and 750W Low Inertia Servo Motor

Servo Drive	ASD-A2-0743-□
Low Inertia Servo Motor	ECMA-J10807□S
Motor Power Cable (Without Brake)	ASD-CAPW540X
Power Connector (Without Brake)	ASD-CAPW5400
Motor Power Cable (With Brake)	ASD-CAPW510X
Power Connector (With Brake)	ASD-CAPW5100
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)



**1kW Servo Drive and 850W High Inertia Servo Motor**

Servo Drive	ASD-A2-1043-□
High Inertia Servo Motor	ECMA-L11308□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1kW Servo Drive and 1kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-1043-□
Medium Inertia Servo Motor	ECMA-K11310□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1.5kW Servo Drive and 900W High Inertia Servo Motor**

Servo Drive	ASD-A2-1043-□
High Inertia Servo Motor	ECMA-M11309□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1.5kW Servo Drive and 1kW Low Inertia Servo Motor**

Servo Drive	ASD-A2-1543-□
Low Inertia Servo Motor	ECMA-J11010□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**1.5kW Servo Drive and 1.5kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-1543-□
Medium Inertia Servo Motor	ECMA-K11315□S
Motor Power Cable (Without Brake)	ASD-CAPW100X
Motor Power Cable (With Brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**2kW Servo Drive and 2kW Low Inertia Motor**

Servo Drive	ASD-A2-1543-□
Low Inertia Servo Motor	ECMA-J11020□S
Motor Power Cable (Without Brake)	ASD-CAPW120X
Motor Power Cable (With Brake)	ASD-CAPW130X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**2kW Servo Drive and 2kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-2043-□
Medium Inertia Servo Motor	ECMA-K11320□S
Motor Power Cable (Without Brake)	ASD-CAPW120X
Motor Power Cable (With Brake)	ASD-CAPW130X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**2kW Servo Drive and 2kW Medium Inertia Servo Motor**

Servo Drive	ASD-A2-2043-□
Medium Inertia Servo Motor	ECMA-K11820□S
Motor Power Cable (Without Brake)	ASD-CAPW220X
Motor Power Cable (With Brake)	ASD-CAPW230X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**3kW Servo Drive and 3kW Medium-Low Inertia Servo Motor**

Servo Drive	ASD-A2-3043-□
Medium-Low Inertia Servo Motor	ECMA-J11330□4
Motor Power Cable (Without Brake)	ASD-CAPW120X
Motor Power Cable (With Brake)	ASD-CAPW130X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**3kW Servo Drive and 3kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-3043-□
Medium-High Inertia Servo Motor	ECMA- L $\Delta$ 11830□S
Motor Power Cable (Without Brake)	ASD-CAPW220X
Motor Power Cable (With Brake)	ASD-CAPW230X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**4.5kW Servo Drive and 4.5kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-4543-□
Medium-High Inertia Servo Motor	ECMA-L11845□S
Motor Power Cable (Without Brake)	ASD-CAPW220X
Motor Power Cable (With Brake)	ASD-CAPW230X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

**5.5kW Servo Drive and 5.5kW Medium-High Inertia Servo Motor**

Servo Drive	ASD-A2-5543-□
Medium-High Inertia Servo Motor	ECMA-L11855□3
Motor Power Cable (Without Brake)	ASD-CAPW220X
Motor Power Cable (With Brake)	ASD-CAPW230X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

### 7.5kW Servo Drive and 7.5kW Medium-High Inertia Servo Motor

Servo Drive	ASD-A2-7543-□
Medium-High Inertia Servo Motor	ECMA-L11875□3
Motor Power Cable (Without Brake)	ASD-CAPW320X
Motor Power Cable (With Brake)	ASD-CAPW330X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Cable	ASD-CAEN100X
Absolute Type Encoder Cable	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

#### NOTE

- 1) The boxes (□) at the ends of the servo drive model names are for optional configurations (Full-close control, CANopen, DMCNET and extension port for digital input). For the actual model name, please refer to the ordering information of the actual purchased product.
- 2) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).
- 3) The boxes (□) in the model names are for optional configurations (keyway, brake and oil seal). (Please refer to section 1.2 for model explanation.)

**Other Accessories**

Other Accessories (for ASDA-A2 series all models)	
Description	Delta Part Number
50Pin I/O signal connector (CN1)	ASD-CN5C0050
Terminal Block Module	ASD-BM-50A
RS-232 Communication Cable	ASD-CARS0003
Communication Cable between Drive and Computer (for PC)	DOP-CAUSBAB
CANopen Communication Cable	TAP-CB03/TAP-CB04
CANopen Distribution Box	TAP-CN03
RS-485 Connector	ASD-CNIE0B06
Regenerative Resistor 400W 40Ω	BR400W040
Regenerative Resistor 1kW 20Ω	BR1K0W020
Regenerative Resistor 3kW 10Ω	BR1K5W005



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# Appendix B Maintenance and Inspection

Delta AC servo drives are based on solid state electronics technology. Preventive maintenance is required to operate this AC servo drives in its optimal condition, and to ensure a long life. It is recommended to perform a periodic maintenance and inspection of the AC servo drive by a qualified technician. Before any maintenance and inspection, always turn off the AC input power to the unit.



➤ ***Be sure to disconnect AC power and ensure that the internal capacitors have fully discharged before performing the maintenance and inspection!***

## Basic Inspection

After power is in connected to the AC servo drive, the charge LED will be lit which indicates that the AC servo drive is ready.

Item	Content
General Inspection	<ul style="list-style-type: none"> <li>● Periodically inspect the screws of the servo drive, motor shaft, terminal block and the connection to mechanical system. Tighten screws as necessary as they may loosen due to vibration and varying temperatures.</li> <li>● Ensure that oil, water, metallic particles or any foreign objects do not fall inside the servo drive, motor, control panel or ventilation slots and holes. As these will cause damage.</li> <li>● Ensure the correct installation and the control panel. It should be free from airborne dust, harmful gases or liquids.</li> <li>● Ensure that all wiring instructions and recommendations are followed; otherwise damage to the drive and or motor may result.</li> </ul>
Inspection before operation (Control power is not applied)	<ul style="list-style-type: none"> <li>● Inspect the servo drive and servo motor to insure they were not damaged.</li> <li>● To avoid an electric shock, be sure to connect the ground terminal of servo drive to the ground terminal of control panel.</li> <li>● Before making any connection, wait 10 minutes for capacitors to discharge after the power is disconnected, alternatively, use an appropriate discharge device to discharge.</li> <li>● Ensure that all wiring terminals are correctly insulated.</li> <li>● Ensure that all wiring is correct or damage and or malfunction may result.</li> <li>● Visually check to ensure that there are not any unused screws, metal strips, or any conductive or inflammable materials inside the drive.</li> </ul>

Item	Content
	<ul style="list-style-type: none"> <li>● Never put inflammable objects on servo drive or close to the external regenerative resistor.</li> <li>● Make sure control switch is OFF.</li> <li>● If the electromagnetic brake is being used, ensure that it is correctly wired.</li> </ul>
Inspection before operation (Control power is not applied)	<ul style="list-style-type: none"> <li>● If required, use an appropriate electrical filter to eliminate noise to the servo drive.</li> <li>● Ensure that the external applied voltage to the drive is correct and matched to the controller.</li> </ul>
Inspection during operation (Control power is applied)	<ul style="list-style-type: none"> <li>● Ensure that the cables are not damaged, stressed excessively or loaded heavily. When the motor is running, pay close attention on the connection of the cables and notice that if they are damaged, frayed or over extended.</li> <li>● Check for abnormal vibrations and sounds during operation. If the servo motor is vibrating or there are unusual noises while the motor is running, please contact the dealer or manufacturer for assistance.</li> <li>● Ensure that all user-defined parameters are set correctly. Since the characteristics of various machinery are different, in order to avoid accident or cause damage, do not adjust the parameter abnormally and ensure the parameter setting is not an excessive value.</li> <li>● Ensure to reset some parameters when the servo drive is off (Please refer to Chapter 7). Otherwise, it may result in malfunction.</li> <li>● If there is no contact sound or there be any unusual noises when the relay of the servo drive is operating, please contact your distributor for assistance or contact with Delta.</li> <li>● Check for abnormal conditions of the power indicators and LED display. If there is any abnormal condition of the power indicators and LED display, please contact your distributor for assistance or contact with Delta.</li> </ul>

## Maintenance

- Use and store the product in a proper and normal environment.
- Periodically clean the surface and panel of servo drive and motor.
- Make sure the conductors or insulators are corroded and/or damaged.
- Do not disassemble or damage any mechanical part when performing maintenance.
- Clean off any dust and dirt with a vacuum cleaner. Place special emphasis on cleaning the ventilation ports and PCBs. Always keep these areas clean, as accumulation of dust and dirt can cause unforeseen failures.

## Life of Replacement Components

### ■ Smooth capacitor

The characteristics of smooth capacitor would be deteriorated by ripple current affection. The life of smooth capacitor varies according to ambient temperature and operating conditions. The common guaranteed life of smooth capacitor is ten years when it is properly used in normal air-conditioned environment.

### ■ Relay

The contacts will wear and result in malfunction due to switching current. The life of relay varies according to power supply capacity. Therefore, the common guaranteed life of relay is cumulative 100,000 times of power on and power off.

### ■ Cooling fan

The cooling fan life is limited and should be changed periodically. The cooling fan will reach the end of its life in 2~3 years when it is in continuous operation. However, it also must be replaced if the cooling fan is vibrating or there are unusual noises.

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