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Delta High Re 3 olution AC S ervo Drive for Network C ommunication Application S S DA-A 3 ິ erie 0 S er Manual



**Network Communication Applications** ASDA-A2 Series User Manual

# **Delta High Resolution AC Servo Drive for**

## NELT

## Preface

Thank you for purchasing ASDA-A2. This user manual provides the related information of ASDA-A2R series servo drive and ECMA series servo motors. This manual includes:

- Installation and inspection of servo drive and servo motor
- The configuration of servo drive
- Procedures of trial run
- Control function and adjustment methods of servo drive
- Parameters
- Communication protocol
- Maintenance and inspections
- Troubleshooting

This manual addresses personnel with the following qualifications:

- Servo system designers
- Installation or wiring personnel
- Trial and tuning personnel
- Maintenance and inspection personnel

Before using the product, please read through this manual carefully in order to ensure the correct use of the product. In addition, please place this manual safely for quick reference whenever is needed. Please follow the rules below if you have not finished reading this manual yet.

- No water, corrosive gas and inflammable gas are allowed in installation environment.
- Three-phase power is prohibited to connect to U, V and W connector when wiring. It is
  possible to damage the servo drive.
- Ground is a must.
- Do not disconnect the servo drive, motor or change the wiring when connecting to the power.
- Be ensured that the emergency stop can be activated anytime before connecting to the power and operation.
- Do not touch the heat sink to avoid scald before connecting to the power and operation.

If you have any enquiry, please contact the distributors or DEALTA customer service center.

#### Safety Precautions

ASDA-A2 series is the high resolution and open type servo drive. It should be installed in a shielded control box during operation. This servo drive uses precise feedback control and the digital signal processor with high-speed calculation function to control the current output which generated by IGBT so as to operate three-phase permanent magnet synchronous motors (PMSM) and to achieve precise positioning.

ASDA-A2 is applicable on industrial application and is suggested to be installed in the panel-board of the user manual. (Servo drives, wire rod and motors all should be installed in the environment which complies with the minimum requirement of UL Level 1.)

Pay special attention to the following safety precautions anytime during inspection, installation, wiring, operation and examination.

The symbol of danger, warning and stop represent:



It indicates the potential hazards. It is possible to cause severe injury or fatal harm if not follow the instructions.



It indicates the potential hazards. It is possible to cause minor injury or lead to serious damage of the product or even malfunction if not follow the instructions.



It indicates the absolute prohibited activity. It is possible to damage the product or cannot be used due to malfunction if not follow the instructions.

#### Inspection



Please follow the instruction when using servo drive and servo motor, or it is possible to cause fire or malfunction.

#### Installation



It is prohibited to expose the product with the environment which containing water, corrosive gas, inflammable gas, etc. Or it is possible to cause electric shock or fire.

#### Wiring

- > Please connect the ground terminal to class-3 ground system (under 100  $\Omega$ ); poor grounding may result in electric shock or fire.
- DANGER
- Do not connect the three-phase source to the motor output terminal U, V and W. Or it is possible to cause personnel injury or fire.
- > Please tighten the screws of the power and motor output terminal. Or it is possible to cause fire.
- > Please connect wiring according to the wire rod in order to prevent any danger.



- Before the operation, please change the parameter setting value according to the needs. If it is not adjusted to the correct setting value, it is possible to lead to malfunction of the machine or the operation might out of control.
- > Before the machine starts to operate, please be ensured the emergency stop can be activated anytime.
- > When power on, please make sure the motor shaft stands still and will not operate because of mechanical inertia or other causes.



During the operation, it is prohibited to touch any rotating motor parts. Or it is possible to cause personnel injury.

- > In order to prevent any accident, please separate the couplings and belts of the machine and isolate them. Then conduct the initial trial run.
- If users fail to operate the machine properly after the servo motor connects to the equipment, it would cause the damage of the equipment and lead to the personnel injury.
- > In order to prevent the danger, it is strongly recommended to check if the motor can operate normally without load first. Then, operate the motor with load.
- Do not touch the heat sink of the servo drive. Or it is possible to cause scald due to the high temperature.

#### Maintenance and Inspection

- > It is prohibited to touch the internal parts of the servo drive and servo motor. Or it is possible to cause electric shock.
- > It is prohibited to disassemble the panel of the servo drive when turning on the power. Or it is possible to cause electric shock.
- > Do not touch the ground terminal within 10 minutes after turning off the power. Or the residual voltage may cause electric shock.
- > Do not disassemble the motor. Or it is possible to cause electric shock or personnel injury.
- > Do not change the wiring when the power is on. Or it is possible to cause electric shock or personnel injury.
- Only the qualified electrical and electronics professionals can install, wire and maintain the servo drive and servo motor.



#### **Main Circuit Wiring**

Do not put the power cable and the encoder cable in the same channel and bond them together. Please separate the power cable and the encoder cable for at least 30 centimeters (= 11.8 inches) when wiring.



- Please use stranded wires and multi-core shielded-pair wires for the encoder cables and encoder feedback cables. The maximum length of command input cable is 3 meters (= 9.84 feet) and the maximum length of feedback cable is 20 meters (= 65.62 feet).
- The high voltage might remain in the servo motor even when the power is off. Do not touch the power terminal temporally (at least 10 minutes). Please conduct the inspection not until the indicator light, CHARGE is off.



> Do not turn the power on and off too often. If continuous power on and off is needed, please be ensured the interval is one minute at most.

#### **Terminal Wiring of the Main Circuit**

- > When wiring, please disassemble the terminal socket from the servo drive.
- > One terminal of the terminal socket for one electric wire only.
- > When inserting the electric wires, do not connect the conductor to the adjacent wire.
- > Before connecting to the power, please inspect and be ensured the wiring is correct.



If there is any difference of each version, please refer to DELTA's website (<u>http://www.delta.com.tw/industrialautomation/</u>) for the latest information.

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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.

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## **Chapter 1 Inspection and Model**

### **Explanation**

#### 1.1 Inspection

In order to prevent the negligence during purchasing and delivery, please inspect the following items carefully.

- Please check if the product is what you have purchased: check the part number of the motor and the servo drive on the nameplate. Refer to the next page for the model explanation.
- Check if the motor shaft can rotate smoothly: Rotate the motor shaft by hand. If it can be rotated smoothly, it means the motor shaft is normal. However, it cannot be rotated by hand if the motor has an electromagnetic brake.
- Check if there is any damage shown on its appearance: visually check if there is any damage or scrape of the appearance.
- Check if there is any loose screw: If the screws are un-tightened or fall off.

If any of the above situations happens, please contact the distributors to solve the problems.

A complete and workable servo set should include:

- (1) A Servo drive and a servo motor
- (2) A UVW motor power cable, the U, V and W wires can connect to the socket attached by the servo drive and another side is the plug which could connect to the socket of the motor. And a green ground wire which should be locked to the ground terminal of the servo drive. (selective purchase)
- (3) An encoder cable which connects to the socket of the encoder. One side of it connects to CN2 servo drive and another side is the plug. (selective purchase)
- (4) 50-PIN connector which is used in CN1 (selective purchase)
- (5) 20-PIN connector which is used in CN2 (selective purchase)
- (6) 6-PIN connector which is used in CN3 and is for general communication (RS-485) (selective purchase)
- (7) 4-PIN connector which used in CN4 (USB Type B product) (selective purchase)
- (8) RJ45 connector which used in CN6 and is for high-speed communication (selective purchase)
- (9) 7-PIN connector which used in CN7, for extension DI. (-U model) (selective purchase)

#### (10) Servo drive power input:

220V:

	Control circuit power	Main circuit power
100 W ~ 3 kW	L1c, L2C, $\bigcirc$ fast connector	R, S, T fast connector
405 kW ~ 15 kW	L1c, L2C,	R, S, T terminal block

400V:

	Control circuit power	Main circuit power
750 W ~ 1.5 kW	DC24V, DC0V, $\bigcirc$ fast connector	R, S, T fast connector
2 kW ~ 7.5 kW	DC24V, DC0V, $\bigcirc$ terminal block	R, S, T terminal block

(11) 3-PIN fast connector (U, V, W)

(12) 3-PIN fast connector ( $P \oplus$ , D, C)

(13) A plastic lever (for 220V 100 W ~ 3 kW and 400V 750 W ~ 1.5 kW)

(14) A metal short-circuit chip (for 220 V 100 W ~ 4.5 kW and 400 V 750 W ~ 1.5 kW)

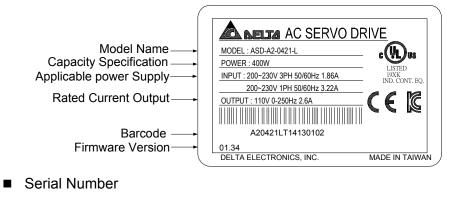
(15) An installation manual

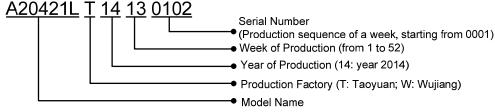
#### 1.2 Product Model

#### 1.2.1 Nameplate Information

#### **ASDA-A2 Series Servo Drive**

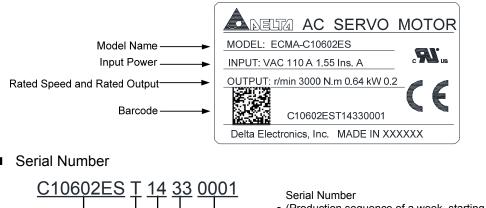
Nameplate Information





#### **ECMA Series Servo Motor**

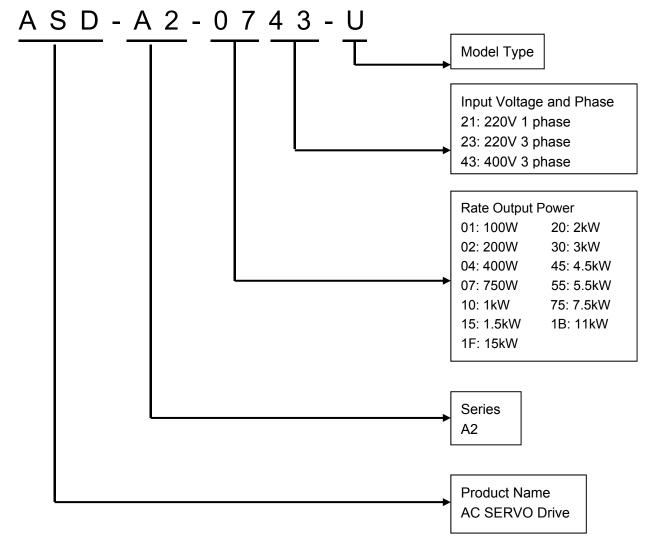
Nameplate Information



Serial Number (Production sequence of a week, starting from 0001) Week of Production (from 1 to 52) Year of Production (14: year 2014) Production Factory (T: Taoyuan; W: Wujiang) Model Name

#### 1.2.2 Model Explanation

**ASDA-A2 Series Servo Drive** 

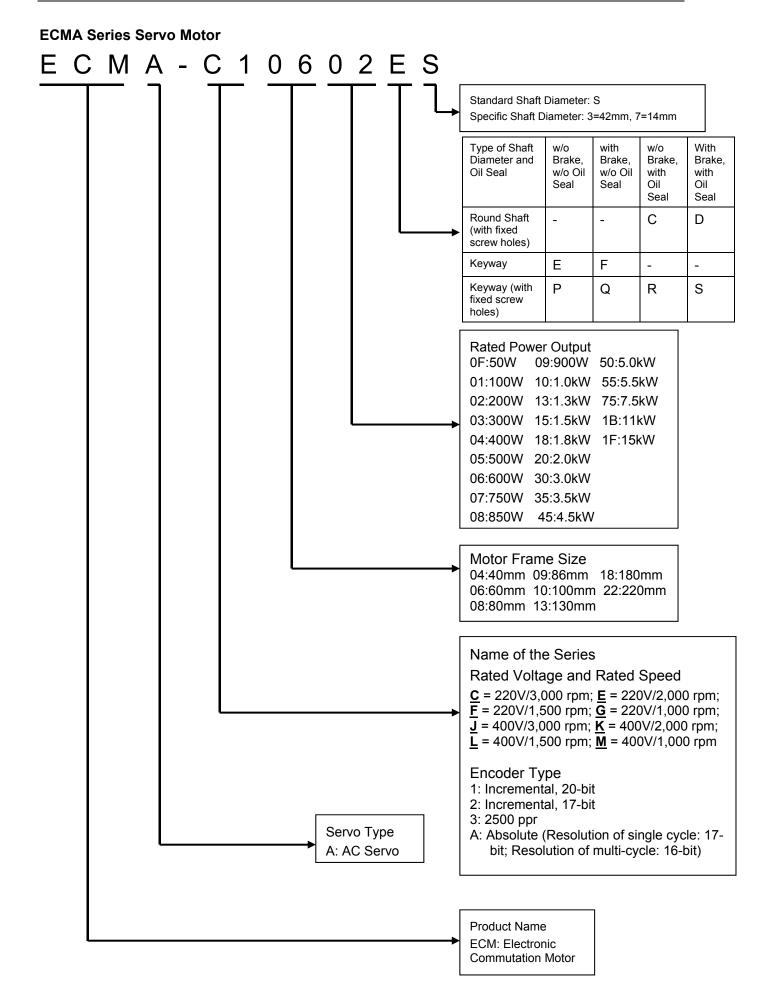


#### Model Type

	Туре	RS-485 (CN3)	Full-closed control (CN5)*1	Extension Port for Digital Input (CN7)	EtherCAT	CANopen	DMCNET	Analog Voltage Control	Pulse Input Port	PR Mode*2	E-Cam*3
Standard	L	0	0	х	х	х	х	0	0	0	х
Model	U	0	0	0	х	х	х	0	0	0	0
Network	E	х	0	0	0	х	х	х	Х	0	0
Model	F	0	0	Х	Х	х	0	х	Х	0	х
	М	0	0	х	Х	0	х	0	0	0	0

#### 

- 1. In PR mode, only A2-F supports full-closed control function.
- 2. PR parameters can be read and written through communication by DMCNET only.
- 3. E-cam function can only be used in PR mode.



#### **1.3 Servo Drive and Corresponding Servo Motor**

#### 1.3.1 220V Series

				Motor	Servo Drive				
	otor ries	Power Output (W)		Model Number	Rated Current (Arms)	Max. Instantaneous current (A)	Model Number	Continuous Output Current (Arms)	Max. Instantaneous output current (A)
			50	ECMA-C1040F□S	0.69	2.05	ASD-A2-0121-□	0.90	2.70
			100	ECMA-C∆0401□S	0.90	2.70		0.90	2.70
			200	ECMA-C∆0602□S	1.55	4.65	ASD-A2-0221-□	1.55	4.65
	nin		400	ECMA-C∆0604□S	2.60	7.80	ASD-A2-0421-□	2.60	7.80
rtia	3000 r/min	Single-	400	ECMA-C∆0804□7	2.60	7.80	ASD-A2-0421-1	2.00	7.00
Low Inertia		/Three-	750	ECMA-C∆0807□S	5.10	15.30		E 10	15.30
Lov	ECMA-C	phase	750	ECMA-C∆0907□S	3.66	11.00	ASD-A2-0721-□	5.10	15.30
	EC		1000	ECMA-C∆0910□S	4.25	12.37	ASD-A2-1021-□ ASD-A2-2023-□	7.00	21.90
			1000	ECMA-C∆1010□S	7.30	21.90		7.30	
			2000	ECMA-C∆1020□S	12.05	36.15		13.40	40.20
			3000	ECMA-C∆1330□4	17.2	47.5	ASD-A2-3023-□	19.40	58.20
	ECMA-E 2000 r/min	Single- /Three- phase	500	ECMA-E∆1305□S	2.90	8.70	ASD-A2-0421-□	2.60	7.80
			1000	ECMA-E∆1310□S	5.60	16.80	ASD-A2-1021-□	7.30	21.90
Medium Inertia			1500	ECMA-E∆1315□S	8.30	24.90	ASD-A2-1521-□	8.30	24.90
			2000	ECMA-E∆1320□S	11.01	33.03	ASD-A2-2023-□ ASD-A2-3023-□	13.40	40.00
Medi			2000	ECMA-E∆1820□S	11.22	33.66			40.20
			3000	ECMA-E∆1830□S	16.10	48.30		19.40	58.20
			3500	ECMA-E∆1835□S	19.20	57.60			
			500	ECMA-F∆1305□S	3.90	12.10	ASD-A2-0721-□	5.10	15.30
			850	ECMA-F∆1308□S	7.10	19.40	ASD-A2-1021-□	7.30	21.90
			1300	ECMA-F∆1313□S	12.60	38.60		40.40	40.00
iertia	1500 r/min		1800	ECMA-F∆1318□S	13.00	36.00	ASD-A2-2023-□	13.40	40.20
igh in	500	Single-	3000	ECMA-F∆1830□S	19.40	58.20	ASD-A2-3023-□	19.40	58.20
Medium-high inertia		/Three- phase	4500	ECMA-F∆1845□S	32.50	81.30	ASD-A2-4523-□	32.50	
Medi	ECMA-F		5500	ECMA-F∆1855□3	40.00	100.00	ASD-A2-5523-□	40.00	
			7500	ECMA-F∆1875□3	47.50	118.80	ASD-A2-7523-□	47.50	
			11000	ECMA-F1221B□3	51.80	129.50	ASD-A2-1B23-□	54.40	
			15000	ECMA-F1221F□S	61.50	145.70	ASD-A2-1F23-□	70.00	

				Servo Drive					
-	otor ries	Power	Output (W)	Model Number	Rated Current (Arms)	Max. Instantaneous current (A)	Model Number	Continuou s Output Current (Arms)	Max. Instanta neous output current (A)
	ECMA-C/G 3000 r/min	Single- /Three-	400	ECMA-C∆0604□H	2.60	7.80	ASD-A2-0421-□	2.60	7.80
rtia			750	ECMA-C∆0807□H	5.10	15.30	ASD-A2-0721-□	5.10	15.30
High Inertia			300	ECMA-G∆1303□S	2.50	7.50	ASD-A2-0421-□	2.60	7.80
		phase	600	ECMA-G∆1306□S	4.80	14.40	ASD-A2-0721-□	5.10	15.30
			900	ECMA-G∆1309□S	7.50	22.50	ASD-A2-1021-□	7.30	21.90



- 1. The boxes (□) at the ends of the servo drive model names are for optional configurations. 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 type, 20-bit; △= 2: Incremental type, 17-bit; △= 3: 2500 ppr; △= A: Absolute type). The listed motor model name is for information searching, please contact to your local distributors for actual purchased product.
- 3. The boxes  $(\Box)$  in the model names represents brake or keyway oil seal.
- 4 \*11kw and 15kW will be available soon.

The above table shows the specification of servo drive which has triple rated current. For detailed specification of the servo motor and servo drive, please refer to Chapter 11.

#### 1.3.2 400V Series

				Motor	Servo Drive				
	Motor series		Output (W)	Model Number	Rated Current (Arms)	Max. Instantaneous current (A)	Model Number	Continuous Output Current (Arms)	Max. Instantaneous output current (A)
			400	ECMA-J∆0604 S	1.62	4.85	ASD-A2-0743-□	3.07	9.21
	nin		750	ECMA-J∆0807 S	3.07	9.5	ASD-A2-0743-□	3.07	9.21
rtia	ECMA-J 3000 r/min		750	ECMA-J∆0907 S	2.16	6.37	ASD-A2-0743-□	3.07	9.21
Low Inertia	300	Three- phase	1000	ECMA-J∆0910 S	2.4	7.17	ASD-A2-1043-□	3.52	9.86
Lov	MA-J		1000	ECMA-J△1010 S	4.15	12.46	ASD-A2-1543-□	5.02	10.04
	EC		2000	ECMA-J△1020 S	7.09	21.28	ASD-A2-2043-□	6.66	18.65
			3000	ECMA-J∆1330 4	9.8	29.99	ASD-A2-3043-□	11.9	33.32
	nin		750	ECMA-K∆1305 S	1.7	5.2	ASD-A2-0743-□	3.07	9.21
iertia	ECMA-K 2000 r/min		1000	ECMA-K∆1310 S	3.52	10.56	ASD-A2-1043-□	3.52	9.86
Medium Inertia		Three- phase	1500	ECMA-K∆1315 S	5.02	15.06	ASD-A2-1543-□	5.02	10.04
Mediu			2000	ECMA-K∆1320 S	6.66	19.98	ASD-A2-2043-□	6.66	18.65
~			2000	ECMA-K∆1820 S	6.6	19.88	ASD-A2-2043-□	6.66	18.65
			750	ECMA-La1305 S	2.1	6.1	ASD-A2-0743-□	3.07	9.21
tia	nin		850	850 ECMA-La1308 S 3.4 8.85 ASD-A2-	ASD-A2-1043-□	3.52	9.86		
Medium-high Inertia	ECMA-L 1500 r/min	1300 ECMA-Lo1313 S 5.02 15	ASD-A2-1543-□	5.02	10.04				
-high	. 150	Three- phase	3000	ECMA-L△1830 S	11.53	34.6	ASD-A2-3043-□	11.9	33.32
dium	MA-L		4500	ECMA-L△1845 S	20.8	52	ASD-A2-4543-□	20	44
Me	ECI		5500	ECMA-L∆1855 3	22.37	56	ASD-A2-5543-□	22.04	48.49
			7500	ECMA-L△1875 3	27.3	68.3	ASD-A2-7543-□	28.39	62.46
High Inertia	3000 r/min ECMA-G 1000	Three- phase	900	ECMA-M∆1309 S	4.4	13.1	ASD-A2-1543-□	5.02	10.04



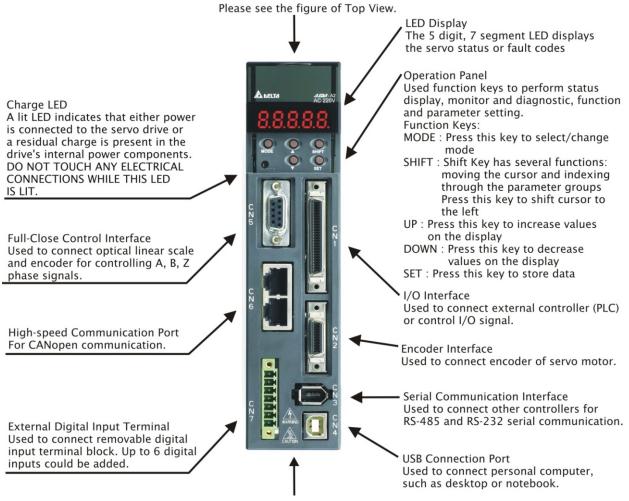
- 1. The boxes (□) at the ends of the servo drive model names are for optional configurations. For the actual model name, please refer to the ordering information of the actual purchased product.
- The boxes (△) in the model names are for encoder resolution types. △= 1: Incremental type, 20-bit; △= 2: Incremental type, 17-bit; △= 3: 2500 ppr; △= A: Absolute type). The listed motor model name is for information searching, please contact to your local distributors for actual purchased product.
- 3. The boxes ( $\Box$ ) in the model names represents brake or keyway oil seal.

The above table shows the specification of servo drive which has triple rated current. For detailed specification of the servo motor and servo drive, please refer to Chapter 11.

#### 1.4 Each Part of the Servo Drive

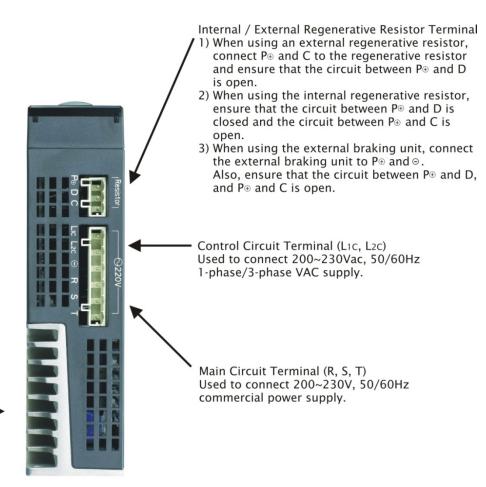
#### 1.4.1 220V Series

#### 220V Series - Front View



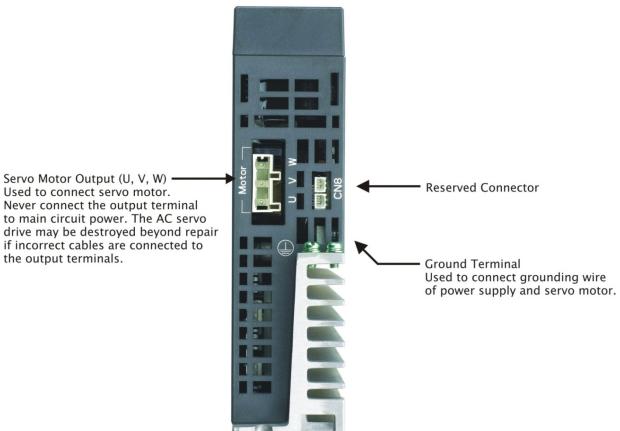
Please see the figure of Bottom View.

#### 220V Series - Top View



Heatsink Used to secure servo drive and for heat dissipation.

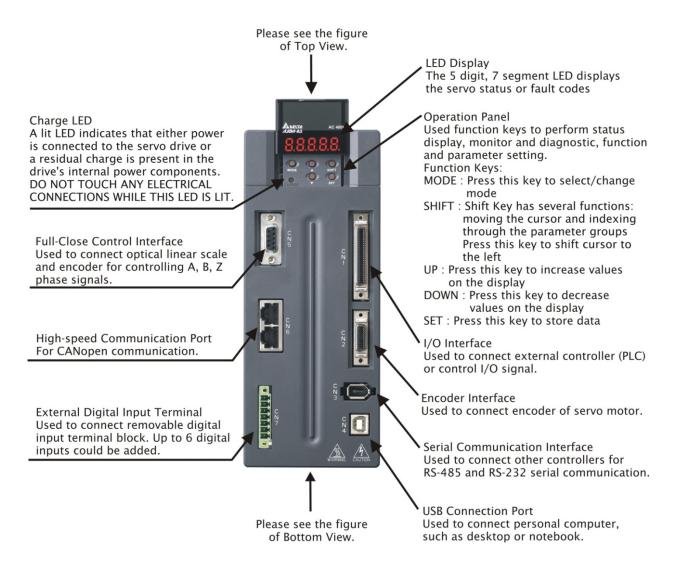
#### 220V Series - Bottom View



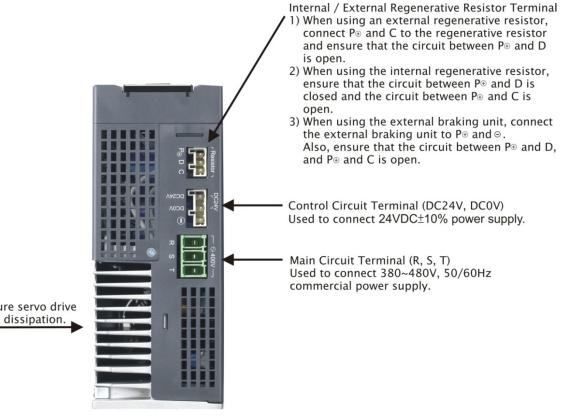
Servo Motor Output (U, V, W) -Used to connect servo motor. Never connect the output terminal to main circuit power. The AC servo

#### 1.4.2 400V Series

#### 400V Series - Front View

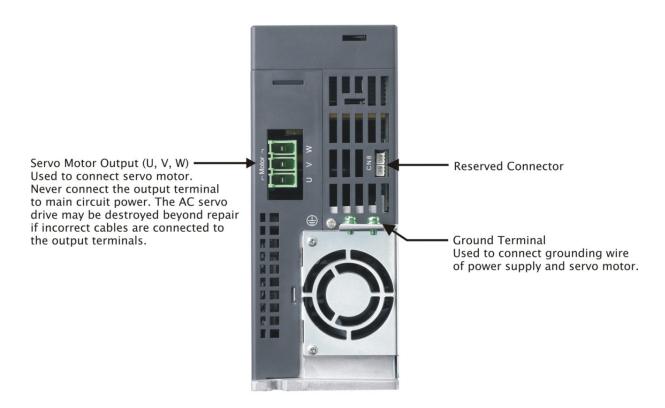


#### 400V Series - Top View



Heatsink Used to secure servo drive and for heat dissipation.

#### 400V Series - Bottom View



## **Chapter 2 Installation**

#### 2.1 Notes

Please pay special attention to the followings:

If the connection between the servo drive and the servo motor is over 20 meters, please thicken the connecting wire, UVW as well as the encoder cable. Please refer to section 3.1.6 for further information.

#### 2.2 Ambient Conditions of Storage

Before the installation, this product has to be kept in shipping carton. In order to retain the warranty coverage and for the maintenance, please follow the instructions below when storage, if the product is not in use temporally:

- Store the product within an ambient temperature range of -20 °C to +65 °C.
- Store the product within a relative humidity range of 0% to 90% and a non-condensing environment.
- Avoid storing the product in the environment of corrosive gas and liquid.

#### 2.3 Ambient Conditions of Installation

The ambient conditions of installing and operating the servo drive:

Location has no over-heat device, no water drop, vapor, dust and oily dust, no corrosive and inflammable gas and liquid, no airborne dust and metal particles, no interference of electromagnetic noise and has solid foundation and no vibration.

The ambient conditions of operating the servo motor:

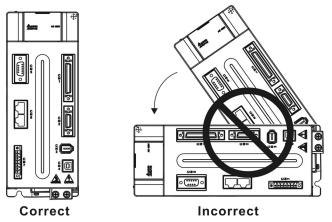
The ambient temperature is between 0  $^{\circ}$ C and 40  $^{\circ}$ C. And the ambient location shall has no overheat device, no water drop, vapor, dust and oily dust, no corrosive and inflammable gas and liquid, no airborne dust and metal particles.

The best temperature of this servo drive is between 0  $^{\circ}$ C and 55  $^{\circ}$ C. If the temperature is over 45  $^{\circ}$ C, please place the product in a well-ventilated environment so as to ensure its reliability performance. If the product is installed in an electric box, make sure the size of the electric box and its ventilation condition will not overheat and endanger the internal electronic device. Also, pay attention to the vibration of the machine. Check if the vibration will influence the electronic device of the electric box.

#### 2.4 Installation Direction and Space

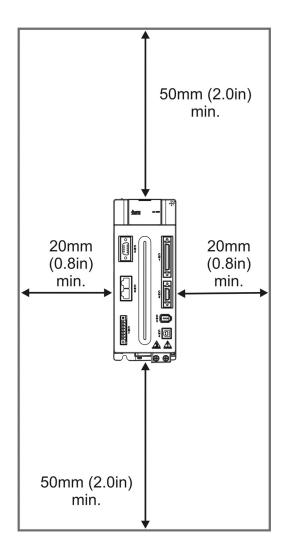
#### Notes:

- Incorrect installation may result in a drive malfunction or premature failure of the 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.
- Do not parallel connect the servo drive, or it might burn out the soft-start resistance or the commutator and danger will occur.



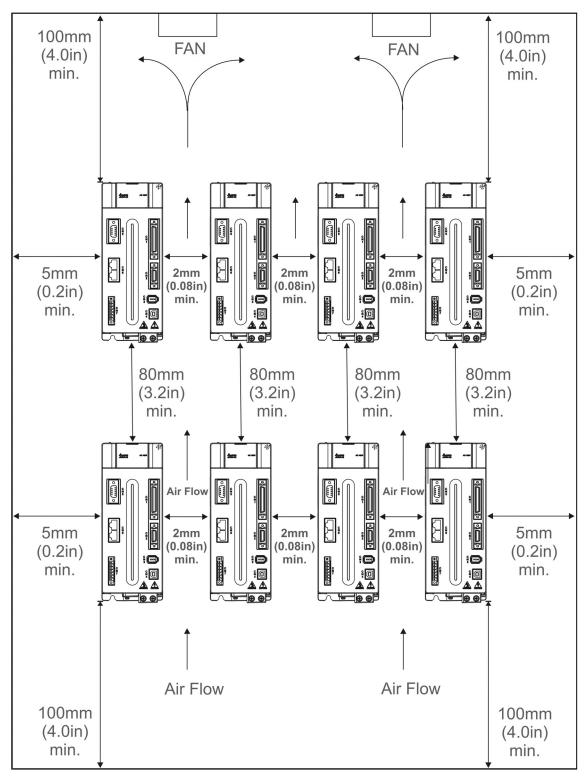
#### Scheme of Installation:

In order to have smaller wind resistance of the fan and increase the ventilation, please follow the suggested clearance value when installing one or more than one servo drives. (Refer to the following diagrams)





The above diagrams are not in equal proportion. Please refer to the annotation.





The above diagrams are not in equal proportion. Please refer to the annotation.

#### 2.5 Specification of Circuit Breaker and Fuse

#### 220V Series

#### Caution: Please use the fuse and circuit breaker that is recognized by UL/CSA.

Servo Drive Model	Circuit Breaker	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-□	-	-



If the servo drive equips with earth leakage circuit breaker for avoiding electric leakage, please choose the current sensitivity which is over 200 mA and can continue up to 0.1 seconds.

#### 400V Series

#### Caution: Please use the fuse and circuit breaker that is recognized by UL/CSA.

Servo Drive Model	Circuit Breaker	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



If the servo drive equips with earth leakage circuit breaker for avoiding electric leakage, please choose the current sensitivity which is over 200 mA and can continue up to 0.1 seconds.

#### 2.6 EMI Filter Selection

#### 220V Series

Itom	Power	Servo Drive Model	Recommende	FootPrint	
Item		Servo Drive Moder	1PH	3PH	FUULFIIII
1	100W	ASD-A2-0121-□	RF007S21AA	RF022B43AA	Ν
2	200W	ASD-A2-0221-□	RF007S21AA	RF022B43AA	Ν
3	400W	ASD-A2-0421-□	RF007S21AA	RF022B43AA	Ν
4	750W	ASD-A2-0721-□	RF007S21AA	RF037B43BA	Ν
5	1.0kW	ASD-A2-1021-□	RF007S21AA	RF037B43BA	Ν
6	1.5kW	ASD-A2-1521-□	RF007S21AA	RF037B43BA	Ν
7	2.0kW	ASD-A2-2023-□	-	RF037B43BA	Ν
8	3.0kW	ASD-A2-3023-□	-	RF037B43BA	Ν
9	4.5kW	ASD-A2-4523-□	-	RF075M43BA	Ν
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

#### **EMI Filter Installation**

All electronic equipment (including servo drive) generates high or low frequency noise during operation and interfere the peripheral equipments via conduction or radiation. With EMI Filter and the correct installation, much interference can be eliminated. It is suggested to use Delta's EMI Filter to suppress the interference better.

When installing servo drive and EMI Filter, please follow the instructions of the user manual and make sure it meets the following specification:

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

#### **General Precaution**

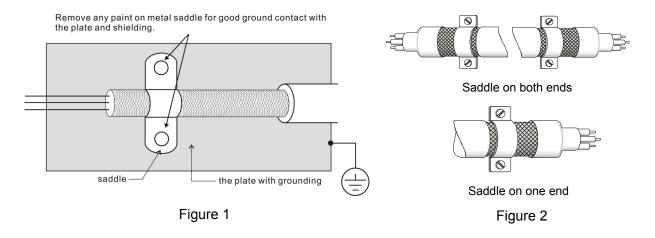
In order to ensure the best performance of EMI Filter, apart from the instructions of servo drive installation and wiring, please follow the precautions mention below:

- 1. The servo drive and EMI Filter should be installed on the same metal plate.
- 2. When installing servo drive and EMI Filter, the servo drive should be installed above the EMI Filter.
- 3. The wiring should be as short as possible.
- 4. The metal plate should be well grounded.
- 5. The metal cover of the servo drive and EMI Filter or grounding should be firmly fixed on the metal plate. Also, the contact area should be as large as possible.

#### Motor Cable Selection and Installation Precautions

The selection of motor cables and installation affect the performance of EMI Filter. Please follow the precautions mention below.

- 1. Use the cable that has braid shielding (The effect of double shielding is better)
- 2. The shield on both sides of the motor cable should be grounded in the shortest distance and the largest contact area.
- 3. The protective paint of the U-shape saddle and metal plate should be removed in order to ensure the good contact. Please see figure 1.
- 4. It should have correct connection between the braid shielding of the motor cable and the metal plate. The braid shielding on both sides of the motor cable should be fixed by the U-shape saddle and metal plate. Please see figure 2 for the correct connection.



# 2.7 Selection of Regenerative Resistor

When the direction of pull-out torque is different from the rotation, it means the electricity is sent back to the servo drive from the load-end. It becomes the capacitance of DC Bus and increases the voltage. When the voltage increases to a specific value, the come-back eletricity can only be consumed by regenerative resistor. There is a built-in regenerative resistor in the servo drive. Users can also use the external regenerative resistor if needed.

Servo Drive		uilt-in regenerative stor	* <sup>1</sup> The capacity of built-		
(kW)	Resistance (P1-52) (Ohm)	Capacity (P1-53) (Watt)	in regenerative resistor (Watt)	resistance (Ohm)	
0.1	-	-	-	30	
0.2	-	-	-	30	
0.4	40	40	20	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	-	-	-	8	
15	-	-	-	5	

#### Specification of built-in regenerative resistor provided by ASDA-A2 220V Series

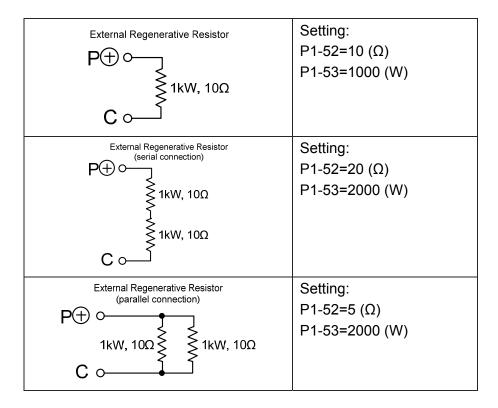
#### Specification of built-in regenerative resistor provided by ASDA-A2 400V Series

Servo Drive	Specification of burresi	Minimum allowable		
(kW)	Resistance (P1-52) (Ohm)	Capacity (P1-53) (Watt)	resistance (Ohm)	
0.75	80	100	60	
1.0	80	100	60	
1.5	80	100	40	
2.0	-	-	40	
3.0	-	-	30	
4.5	-	-	20	
5.5	-	-	20	
7.5	-	-	15	

When the regenerative resistor exceeds the capacity of built-in regenerative resistor, the external regenerative resistor should be applied. Please pay special attention to the followings when using the regenerative resistor.

- 1. Please correctly set up the resistance (P1-52) and capacity (P1-53) of regenerative resistor. Or it might influence the performance of this function.
- 2. If users desire to use the external regenerative resistor, please make sure the applied value should not smaller than the built-in regenerative resistor. In general application, more than one resistor will be serial connected. If the value (from serial connected resistors) exceeds the setting range, users can reduce the value by parallel connecting the resistor. If users desire to connect it in parallel to increase the power of regenerative resistor, please make sure the capacitance meets the requirements.

Please refer to the followings for the calculation when serial / parallel connecting regenerative resistors:



3. In natural environment, if the capacity of regenerative resistor (the average value) is within the rated capacity, the temperature of the capacitance will increase to 120°C or even higher (under the condition of regenerative energy keeps existing). For safety concerns, please apply the method of forced cooling in order to reduce the temperature of regenerative resistor. Or, it is suggested to use the regenerative resistor which is equipped with thermal switches. Please contact the distributors for load characteristics of the regenerative resistor.

When using the external regenerative resistor, the resistor should connect to P, C terminal and the contact of P, D terminal should be opened. It is recommended to choose the above mentioned capacitance. For easy calculation of regenerative resistor capacity, except the energy consumed by IGBT, two ways are provided to select the capacity of external regenerative resistor according to the selected linear motor or rotary motor.

#### (1) Regenerative Power Selection

(a) When the external load on torque does not exist

If the motor operates back and forth, the energy generated by the brake will go into the capacitance of DC bus. When the voltage of the capacitance exceeds a specific value, the redundant energy will be consumed by regenerative resistor. Two ways of selecting regenerative resistor are provided here. The table below provides the energy calculation method. Users can refer to it and calculate the selected regenerative resistor.

#### 220V

Servo D (kW)		Motor	Rotor Inertia J (× 10- 4kg.m2)	Regenerative power from empty load 3000r/min to stop Eo (joule)	The maximum regenerative power of capacitance Ec (joule)
	0.1	ECMA-C∆040F□□	0.021	0.10	4.21
	0.1	ECMA-C∆0401□□	0.037	0.18	4.21
	0.2	ECMA-C∆0602□□	0.177	0.87	5.62
	0.4	ECMA-C∆0604□□	0.277	1.37	8.42
Low	0.4	ECMA-C∆0804□□	0.68	3.36	8.42
Inertia		1.13	5.59	17.47	
	1.0	ECMA-C∆1010□□	2.65	13.10	21.22
	1.0	ECMC-C∆0910□□	2.62	12.96	21.22
2.0     ECMA-C△1020□□		4.45	22.0	25.58	
	3.0	ECMA-C∆1330□□	12.7	62.80	25.58
	0.4	ECMA-E△1305□□	8.17	40.40	8.42
	1.0	ECMA-E∆1310□□	8.41	41.59	21.22
	1.5	ECMA-E△1315□□	11.18	55.29	25.58
Medium Inertia	2.0	ECMA-E∆1320□□	14.59	72.15	25.58
	2.0	ECMA-E∆1820□□	34.68	171.49	25.58
	3.0	ECMA-E∆1830□□	54.95	271.73	31.20
	3.0	ECMA-E△1835□□	54.95	271.73	31.20
	1.0	ECMA-F∆1308□□	13.6	67.25	21.22
	2.0	ECMA-F△1313□□	20.0	98.90	25.58
Medium	2.0	ECMA-F△1318□□	24.9	123.13	31.20
–High	3.0	ECMA-F∆1830□□	54.95	271.73	28
Inertia	4.5	ECMA-F△1845□□	77.75	384.48	25
	5.5	ECMA-F△1855□□	99.78	493.42	27
	7.5	ECMA-F△1875□□	142.7	705.66	93

	ervo Drive (kW) Motor		Rotor Inertia J (× 10- 4kg.m2)	Regenerative power from empty load 3000r/min to stop Eo (joule)	The maximum regenerative power of capacitance Ec (joule)
Medium –High	11.0	ECMA- F∆221B□□	329.0	723.08	117
Inertia			553.0	1215.38	156
	0.4	ECMA-G∆1303□□	8.17	17.96	8.42
High	0.75	ECMA-F∆1305□□	10.3	22.64	17.47
Inertia	0.75	ECMA-G∆1306□□	8.41	18.48	17.47
	1.0	ECMA-G∆1309□□	11.18	24.57	21.22

Eo= J \*wr<sup>2</sup>/182 (joule), Wr: r/min

# 400V

Servo D (kW)	-	Motor	Rotor Inertia J (× 10- 4kg.m2)	Regenerative power from empty load 3000r/min to stop Eo (joule)	The maximum regenerative power of capacitance Ec (joule)
	0.75	ECMA-J∆0604□□	0.277	1.37	42.43
	0.75	ECMA-J∆0807□□	1.13	5.59	42.43
Low	0.75	ECMA-J∆0907□□	1.93	9.54	42.46
Inertia		2.65	13.10	42.43	
		ECMA-J∆1010□□	2.65	13.10	42.43
	2.0	ECMA-J∆1020□□	4.45	22.01	42.43
	0.75	ECMA-K∆1305□□	8.17	40.40	51.17
	1.0	ECMA-K∆1310□□	8.41	41.59	51.17
Medium Inertia	1.5	ECMA-K∆1315□□	11.18	55.29	57.41
	2.0	ECMA-K∆1320□□	14.59	72.15	34.94
	2.0	ECMA-K∆1820□□	34.68	171.49	34.94

Servo E (kW	-	Motor	Rotor Inertia J (× 10- 4kg.m2)	Regenerative power from empty load 3000r/min to stop Eo (joule)	The maximum regenerative power of capacitance Ec (joule)
	0.75	ECMA-L∆1305□□	13.1	16.20	42.43
	1.5	ECMA-L∆1313□□	23.6	29.18	42.43
Medium	Medium 3.0 EC	ECMA-L∆1830□□	54.95	67.93	42.43
–High	3.0	ECMA-J∆1330□□	12.7	15.70	42.43
Inertia	4.5	ECMA-L∆1845□□	77.75	96.12	51.17
	5.5	ECMA-L∆1855□□	99.78	123.35	57.41
	7.5	ECMA-L∆1875□□	142.7	176.41	62.40
High	1.0	ECMA-L∆1308□□	17.1	84.56	42.43
Inertia	1.5	ECMA-M∆1309□□	11.18	55.29	57.41

Eo= J \*wr<sup>2</sup>/182 (joule), Wr: r/min

Assume that the load inertia is N times to the motor inertia and the motor decelerates from 3000r/min to 0, its regenerative energy is (N+1) x Eo. The consumed regenerative resistor is (N+1) × Eo - Ec joule. If the cycle of back and forth operation is T sec, then the power of regenerative resistor it needs is  $2 \times ((N+1) \times Eo - Ec) / T$ .

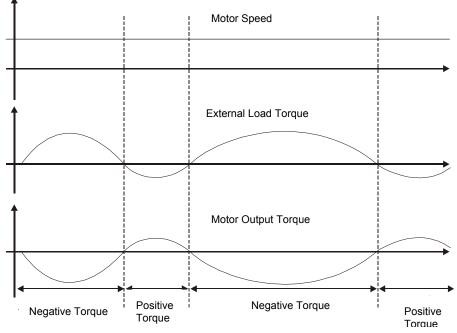
Followings are the calculation procedure:

Steps	Item	Calculation and Setting Method
1	Set the capacity of regenerative resistor to the maximum	Set P1-53 to the maximum value
2	Set T cycle of back and forth operation	Enter by the user
3	Set the rotational speed wr	Enter by the user or read via P0-02
4	Set the load/motor inertia ratio N	Enter by the user or read via P0-02
5	Calculate the maximum regenerative energy Eo	Eo= J *wr <sup>2</sup> /182
6	Set the absorbable regenerative energy Ec	Refer to the above table
7	Calculate the needful capacitance of regenerative resistor	2 x((N+1)xEo – Ec) / T

Take 400W as the example, the cycle of back and forth operation is T = 0.4sec, the maximum speed is 3000r/min and the load inertia is 7 times to the motor inertia. Then, the needful power of regenerative resistor is  $2 \times ((7+1) \times 1.68 - 8) / 0.4 = 27.2$  W. If it is smaller than the built-in capacity of regenerative resistor, the built-in 60W regenerative resistor will do. Generally speaking, when the need of the external load inertia is not much, the built-in regenerative resistor it is, the diagram below describes the actual operation. The smaller power of the regenerative resistor it is, the more energy it accumulates and the higher temperature it will be. When the temperature is higher than a specific value, ALE05 occurs.

(b) If the external load torque exists, the motor is in reverse rotation.

Usually, the motor is in forward rotation, which means the torque output direction of the motor is the same as the rotation direction. However, in some applications, the direction of torque output is different from the rotation. In this situation, the motor is in reverse rotation. The external energy goes into the servo drive through the motor. The diagram below is one example. When the external force direction is the same as the moving direction, the servo system has to use the force of the opposite direction to keep the speed and stability. Huge amount of energy will return to the servo drive at the moment. When DC-BUS is full and unable to store the regenerative energy, the energy will be leaded to regenerative resistor and consumed.



Negative torque: TL × Wr TL: external load torque

For safety reasons, please calculate it by considering the safest situation.

For example, when the external load torque is the +70% rated torque and the rotation reaches 3000 r/min, then take 400 W (the rated torque is 1.27 Nt-m) as the example, the user has to connect the regenerative resistor of  $40\Omega$ , which is  $2 \times (0.7 \times 1.27) \times (3000 \times 2 \times \pi / 60) = 560W$ .

### (2) Simple Selection

Choose the appropriate regenerative resistor according to the allowable frequency and empty load frequency in actual operation. The so-called empty allowable frequency is the frequency of continuous operation when the servo motor runs from 0r/min to the rated speed and then decelerates from the rated speed to 0r/min within the shortest time. The following table lists the allowable frequency when the servo drive runs without load (times/min).

Allow	Allowable frequency when the servo motor runs without load (times/min)												
and uses a built-in regenerative resistor													
Motor Capacity	600W	750W	໑∩∩៶៷៸	1.0	1.5	2.0	2.0	3.0	4.5	5.5	7.5	11.0	15.0
	00000	10011	50000	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
Servo Motor	06	07	09	10	15	20	20	30	45	55	75	1B	1F
ECMA□□C	_	312	-	137	-	83	-	-	-	-	-	-	-
						(F100)							
	_	_	_	42	32	24	10	11	_	_	_	_	-
					02	(F130)	(F180)	•••					
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 be different according to different load inertia or speed. The following is the calculation method.

m represents load / motor inertia ratio.

				2	
Allowable frequency = -	Allowable frequency when servo motor run without load		Rated speed	ti ti	imes
Allowable frequency –	m + 1	х	Operating speed	<b>/</b>	nin.

The comparison table of external regenerative resistor is provided below. Please choose the appropriate regenerative resistor according to the allowable frequency.

The table below describes the suggested allowable frequency (times/min) of regenerative resistor when the servo drive runs without load.

Allowable frequency of regenerative resistor when the servo drive runs without load (times/min)										
Motor Capacity		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			

Mater Oan aite		ECMA□□E								
Motor Capacity Corresponding Motor	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		ECMA□□F							
	3.0KW	4.5KW	5.5KW	7.5kW	11.0kW	15.0kW			
Corresponding Motor	30	45	55	75	1B	1F			
BR1K5W005*2 (3kW 10Ω)	331	234	182	127	124	74			

Allowable frequency of regenerative resistor when the servo drive runs without load (times/min)					
Motor Capacity	ECMA□□G				
	0.3kW	0.6kW	0.9kW		
Corresponding Motor	03	06	09		
BR400W040 (400W 40Ω)	292	283	213		
BR1K0W020 (1kW 20Ω)	729	708	533		

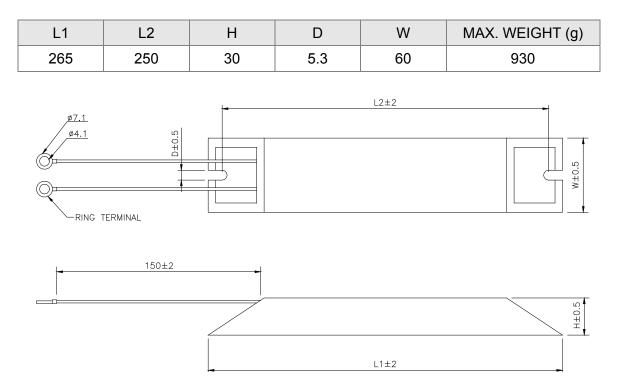
Mater Oan aite		ECMA□□K	
Motor Capacity Corresponding Motor	1.0kW	1.5kW	2.0kW
Corresponding Motor	10	15	20
BR400W040 (400W 40Ω)	-	488	665

Motor Capacity	ECMA□□L				
	3.0KW	4.5KW	5.5KW	7.5kW	
Corresponding Motor	30	45	55	75	
BR400W040 (400W 40Ω)	177	-	-	-	
BR1K0W020 (1kW 20Ω)	-	312	243	170	

If watt is not enough when using regenerative resistor, connecting the same regenerative resistor in parallel can increase the power.

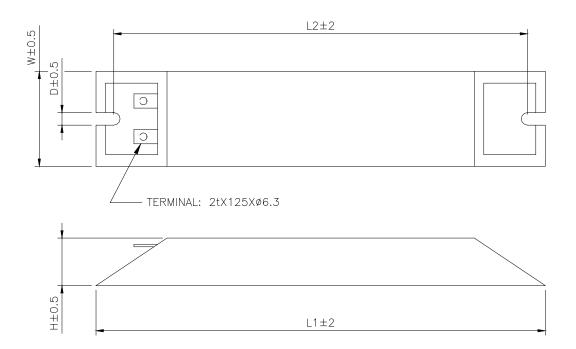
#### **Dimensions of Regenerative Resistor**

## Delta Part Number : BR400W040 (400W 40Ω)

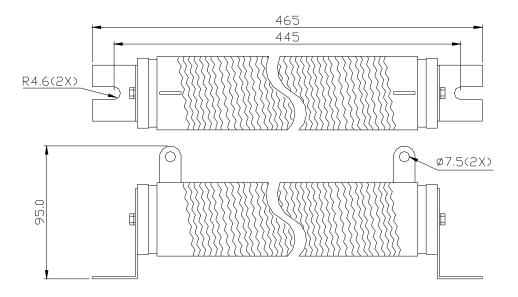


#### Delta Part Number : BR1K0W020 (1kW 20Ω)

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



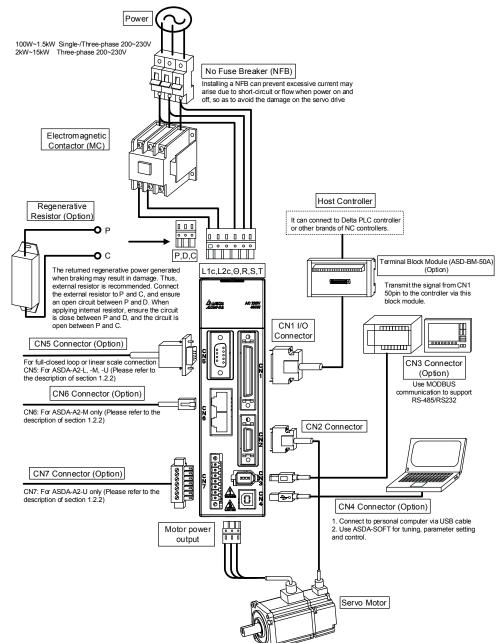
# Delta Part Number : BR1K5W005 (3kW 10Ω)



# **Chapter 3 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



Installation notes:

1. Check if the power and wiring among R, S, T and L1c, L2c are correct.

Please refer to Chapter 11 for Specifications. Make sure the input voltage is correct, or it might damage the servo drive or danger may occur.

- 2. Please 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 malfunction.
- When applying to the external regenerative resistor, the contact between P ⊕ and D should be opened and the external regenerative resistor should connect to terminal P ⊕ and C. When applying to the internal regenerative resistor, the contact between P ⊕ and D should be closed and the contact between P ⊕ 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.

Terminal Signal	Name	Description				
L1c, L2c	Power input of the control circuit		Connect to single-phase AC power (select the appropriate voltage specification according to the product )			
R, S, T	Power input of the main circuit	Connect to three appropriate volta product)		ower (select the ion according to the		
		Connect to the se	ervo motor			
		Terminal Symbol	Wire Color	Description		
II V W	J, V, W FG	U	Red	Three-phase main		
		V	White	power cable of the		
FG		W	Black	motor.		
		FG	Green	Connect to ground terminal (⊕) of the servo drive.		
		Internal resistor	end should	t between P⊕ and D be closed; contact ⊕ and C end should		
P⊕, D, C, ⊖	Regenerative resistor terminal or braking unit	External resistor	Connect $P \oplus$ , C ends to the resist and the contact between $P \oplus$ and end should be opened.			
		External braking unit	P $\oplus$ and P $\bigcirc$ of the brake unit should connect to P $\oplus$ and P $\bigcirc$ respectively. The contact betwee P $\oplus$ and D and P $\oplus$ and C should be opened.			

## 3.1.2 Connectors and Terminals of Servo Drive

	Ground terminal	Connect to the ground wire of power and servo motor.
CN1	I/O connector (Option)	Connect to the host controller. Please refer to section 3.4.
CN2	Connector (Option)	Connect encoder of the motor. Please refer to section 3.5.
CN3	Connector Option)	Connect to RS-485 or RS-232. Please refer to section 3.6.
CN4	USB connector (Type B) (Option)	Connect to personal computer (PC or notebook). Please refer to section 3.7.
CN5	Connector (Option)	Connect to linear scale or encoder for full-closed loop and motor feedback. Please refer to section 3.8.
CN6	CANopen connector (Option)	RJ45 connector. Please refer to section 3.9.
CN7	Extension digital input connector (Option)	Extension DI connector. Please refer to section 3.10.
CN8	Battery connector	Connector for absolute type of battery box

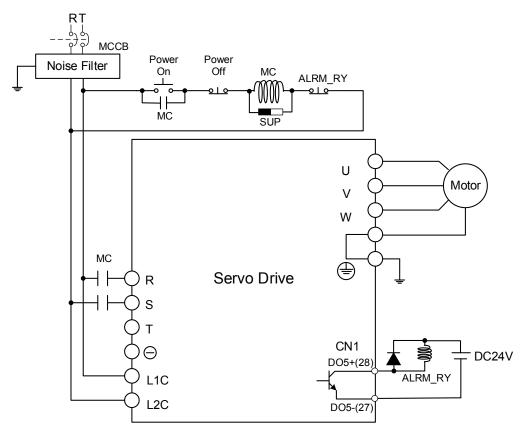
Pay special attention to the followings when wiring:

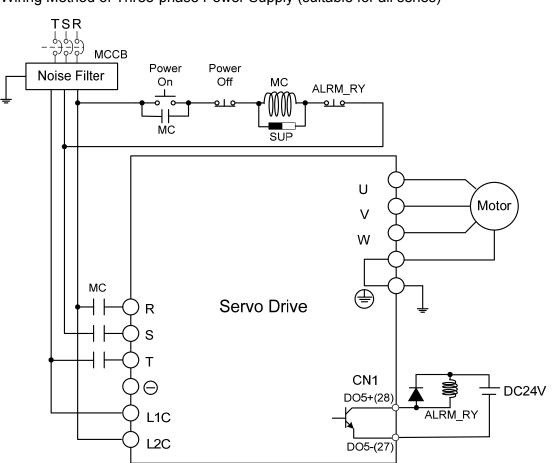
- 1. When the power is cutoff, do not touch R, S, T and U, V, W since the capacitance inside the servo drive still contains huge amount of electric charge. Wait until the charging light is off.
- 2. Separate R, S, T and U, V, W from the other wires. The interval should be at least 30 cm (11.8 inches).
- 3. If the wire of encoder CN2 or CN5 connecter 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.
- 6. Do not install the plug-in capacitance in servo drive. It might burn out the soft-start resistance and danger will occur.

## 3.1.3 Wiring Method

The wiring method of 220V servo drive is divided into single-phase and three-phase. In the diagram below, Power On is contact **a**, Power Off and ALRM\_RY are contact **b**. MC is the coil of magnetic contactor and self-remaining power and is the contact of main power circuit.

Wiring Method of Single-phase Power Supply (suitable for 1.5 kW and models below 1.5 kW)





■ Wiring Method of Three-phase Power Supply (suitable for all series)

# 3.1.4 Specification of Motor Power Cable

Motor Model	U, V, W / Connector of Brake	Terminal Definition
ECMA-C1040F $\Box$ S (50W)         ECMA-C $\triangle$ 0401 $\Box$ S (100W)         ECMA-C $\triangle$ 0602 $\Box$ S (200W)         ECMA-C $\triangle$ 0604 $\Box$ S (400W)         ECMA-C $\triangle$ 0604 $\Box$ H (400W)         ECMA-C $\triangle$ 0804 $\Box$ 7 (400W)         ECMA-C $\triangle$ 0807 $\Box$ S (750W)         ECMA-C $\triangle$ 0907 $\Box$ S (750W)         ECMA-C $\triangle$ 0910 $\Box$ S (1000W)		A
ECMA-C1040F $\Box$ S (50W)ECMA-C $\triangle$ 0401 $\Box$ S (100W)ECMA-C $\triangle$ 0602 $\Box$ S (200W)ECMA-C $\triangle$ 0604 $\Box$ S (400W)ECMA-C $\triangle$ 0804 $\Box$ 7 (400W)ECMA-C $\triangle$ 0807 $\Box$ S (750W)ECMA-C $\triangle$ 0907 $\Box$ S (750W)ECMA-C $\triangle$ 0910 $\Box$ S (1000W)* $\Box$ : with brake		В
ECMA-G $ 1303 \square S (300W)$ ECMA-E $ 1305 \square S (500W)$ ECMA-F $ 1305 \square S (500W)$ ECMA-G $ 1306 \square S (600W)$ ECMA-G $ 1306 \square S (600W)$ ECMA-G $ 1308 \square S (850W)$ ECMA-G $ 1309 \square S (900W)$ ECMA-G $ 1309 \square S (900W)$ ECMA-C $ 1010 \square S (1000W)$ ECMA-E $ 1310 \square S (1000W)$ ECMA-F $ 1313 \square S (1300W)$ ECMA-F $ 1315 \square S (1500W)$ ECMA-F $ 1318 \square S (1800W)$ ECMA-C $ 1020 \square S (2000W)$ ECMA-E $ 1320 \square S (2000W)$ ECMA-C $ 1330 \square 4 (3000W)$	A H G BOOTOF BOOTOF C D C 3106A-20-18S	С
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)		D

Motor Model	U, V, W / Connector of Brake	Terminal Definition
ECMA-F△1855□3 (5500W) ECMA-F△1875□3 (7500W) ECMA-F1221B□3 (11kW) ECMA-F1221F□S (15kW)	32-175 A D B C 3106A-32-17S	E
ECMA-F21855□3(5500W) ECMA-F21875□3(7500W)	10SL-4S A B 3106A-10SL-4S	F

Wiring Name	U (Red)	V (White)	W (Black)	CASE GROUND (Green)	BRAKE1 (Yellow)	BRAKE2 (Blue)
А	1	2	3	4	-	-
В	1	2	4	5	3	6
С	F	I	В	E	G	Н
D	D	Е	F	G	А	В
E	Α	В	С	D	-	-

Wiring Name	BRAKE1	BRAKE2
F	A	В

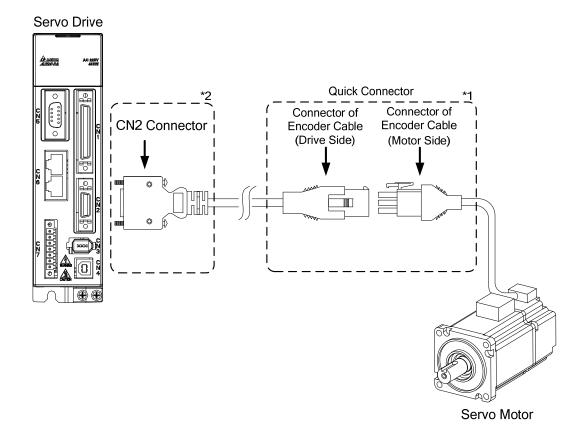
When selecting the wire rod, please choose 600V PVC cable and the length should not longer than 30m. If the length exceeds 30m, please take the received voltage into consideration when selecting the wire size. Please refer to Section 3.1.6 for wire rod selection.

# 

- 1) No polarity for brake coil, the wiring name is BRAKE1 & BRAKE2.
- 2) Power for brake is DC24 V. Never share it with the power of control signal VDD.
- Box, (△) in servo motor model represents encoder type. △= 1: incremental, 20-bit; △= 2: incremental, 17-bit; △ = 3: 33-bit; △= A: absolute.
- 4) Box,  $(\Box)$  in servo motor model represents brake or keyway / oil seal.

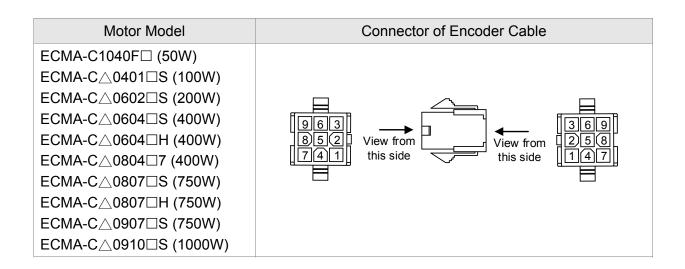
## 3.1.5 Specification of Encoder Cable Connector

Encoder Connection (Diagram 1)

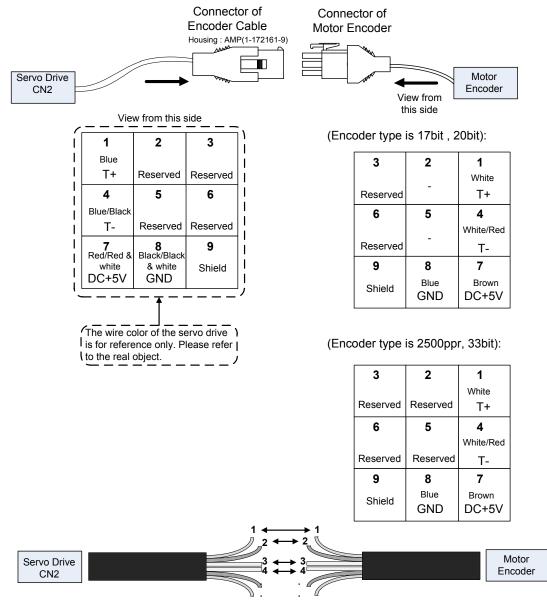


This diagram shows the connection between the servo drive and the motor encoder. It is not drawn by the practical scale and specification will be different according to the selected servo drive and motor model.

- 1) Please refer to the Section of Specification and Definition of Encoder Connector.
- 2) Please refer to Section 3.5 CN2 Connector.

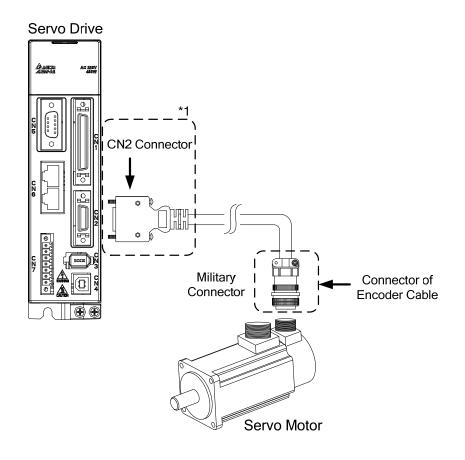


#### Specification and Definition of Encoder Connector:



If not using housing and directly wire the cores, please follow the corresponding core number for wiring. For example, core number 1 from the servo drive CN2 should connect to core number 1 from the motor encoder; core number 2 from the servo drive CN2 should connect to core number 2 from the motor encoder and so on. Please number the cores from the servo drive in order and then connect it to the encoder.

#### Encoder Connection (Diagram 2):



This diagram shows the connection between the servo drive and the motor encoder. It is not drawn by the practical scale and specification will be different according to the selected servo drive and motor model.

Please refer to Section 3.5, CN2 Connector.

Motor Model	Connector of En	code	r Cable	
ECMA-G△1303□S (300W) ECMA-E△1305□S (500W)				
ECMA-F△1305□S (500W) ECMA-G△1306□S (600W) ECMA-F△1308□S (850W)	View from	Pin No.	Terminal Identification	Color
ECMA-G△1309□S (900W)	4	Α	T+	Blue
ECMA-C∆1010⊡S (1000W)		В	Т-	Blue& Black
ECMA-E△1310□S (1000W) ECMA-F△1313□S (1300W)		S	DC+5V	Red/Red &White
ECMA-E△1315□S (1500W) ECMA-F△1318□S (1800W) ECMA-C△1020□S (2000W)		R	GND	Black/ Black& White
ECMA-E△1320□S (2000W) ECMA-E△1820□S (2000W)	3106A-20-29S Military Connector	L	BRAID SHIELD	-
ECMA-E△1320□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)	

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.



 Box, (△) in servo motor model represents encoder type. △= 1: incremental, 20-bit; △= 2: incremental, 17-bit; △ = 3: 2500ppr; △ = A: absolute.

2) Box, ( $\Box$ ) in servo motor model represents brake or keyway / oil seal.

# 3.1.6 Selection of Wiring Rod

The recommended wire rods are shown as the following table.

Servo Drive and corresponding Servo Motor		Power Wiring - Wire Diameter mm <sup>2</sup> (AWG)				
	responding Servo wolor	L1c, L2c	R, S, T	U, V, W	P⊕, C	
ASD-A2-0121-□	ECMA-C1040F□S					
A3D-A2-0121-L	ECMA-C∆0401□S					
ASD-A2-0221-□	ECMA-C∆0602□S					
	ECMA-C∆0604□S					
	ECMA-C∆0604□H					
ASD-A2-0421-□	ECMA-C∆0804□7	4.0			<b>.</b>	
	ECMA-E∆1305□S	1.3 (AWG16)	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)	
	ECMA-G∆1303□S	(70010)	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(,	(/	
	ECMA-F∆1305□S					
	ECMA-C∆0807⊡S					
ASD-A2-0721-□	ECMA-C∆0807□H					
	ECMA-C∆0907□S	-				
	ECMA-G∆1306□S					
	ECMA-C∆0910□S	1.3 (AWG16)	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)	
	ECMA-C∆1010□S					
ASD-A2-1021-□	ECMA-E∆1310□S					
	ECMA-F∆1308□S					
	ECMA-G∆1309□S					
ASD-A2-1521-□	ECMA-E∆1315□S					
	ECMA-C∆1020□S	1.3	2.1 (AWG14)	2.1	2.1	
	ECMA-E∆1320□S	(AWG16)		(AWG14)	(AWG14)	
ASD-A2-2023-□	ECMA-E∆1820□S					
	ECMA-F∆1313□S					
	ECMA-F∆1318□S	1.0	<b>0</b> (		<b>.</b> (	
	ECMA-C∆1330□S	1.3 (AWG16)	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)	
ASD-A2-3023-□	ECMA-E∆1830□S	(/ (/ (0 / 0))	( - /	<b>x</b> - <i>y</i>		
	ECMA-E∆1835⊡S					
	ECMA-F∆1830□S					
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)

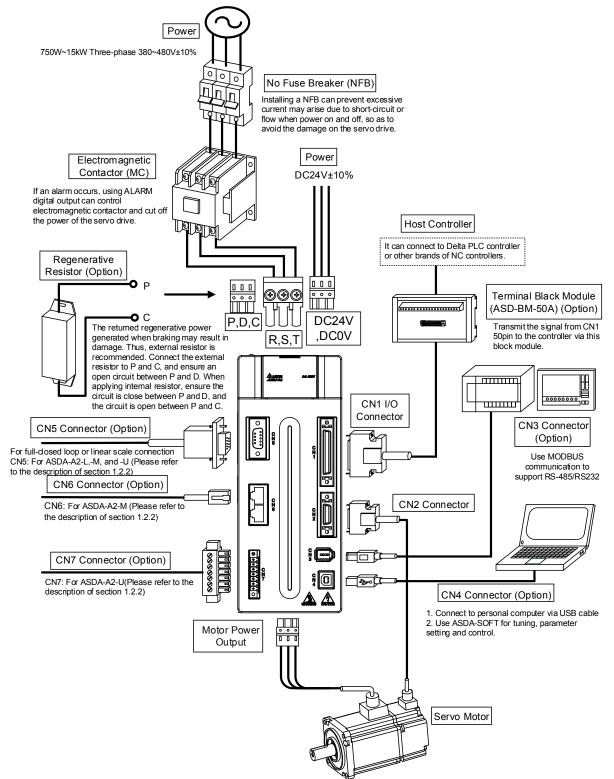
Servo Drive Model	Enc	Encoder Wiring - Wire Diameter mm <sup>2</sup> (AWG)					
Servo Drive woder	Size	Number	Specification	Standard Length			
ASD-A2-0121-□							
ASD-A2-0221-□							
ASD-A2-0421-□							
ASD-A2-0721-□			UL2464	3m (9.84ft.)			
ASD-A2-1021-□							
ASD-A2-1521-□							
ASD-A2-2023-□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

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- 1) Please use shielded twisted-pair cable for encoder wiring so as to reduce the interference of the noise.
- 2) The shield should connect to the 😑 phase of SHIELD.
- 3) Please follow the Selection of Wire Rod when wiring in order to avoid the danger it may occur.
- 4) Box,  $(\Box)$  at the end of the servo drive model represents the model code of ASDA-A2. Please refer to the model information of the product you purchased.
- 5) ( $\triangle$ ), in servo motor model represents encoder type.  $\triangle$ = 1: incremental type, 20-bit;  $\triangle$ = 2: incremental type, 17, bit;  $\triangle$  = 3: 2500 ppr;  $\triangle$ = A: absolute type.
- 6) Box,  $(\Box)$  in servo motor model represents brake or keyway / oil seal.

# 3.2 Connections - 400V series

## 3.2.1 Connecting to Peripheral Devices



Installation Notes:

1. Check if the power and wiring among R, S, T and DC24V, DC0V are correct.

Please refer to Chapter 11 for Specifications. Make sure the input voltage is correct, or it might damage the servo drive or danger may occur.

- 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⊕ and D should be opened and the external regenerative resistor should connect to terminal P⊕ and C. When applying to the internal regenerative resistor, the contact between P⊕ and D should be closed and the contact between P⊕ 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 Connectors and Terminals of the Servo Drive

Terminal Signal	Name		Description	ı			
DC24V, DC0V	Power input of the control circuit	Connect to sin appropriate volt product )	ngle-phase AC				
R, S, T	Power input of the main circuit	Connect to three-phase AC power (select the appropriate voltage specification according to the product)					
		Connect to servo motor					
		Terminal Symbol	Wire Color	Description			
U, V, W		U	Red	Three-phase main			
5, 1, ₩ FG (⊕)	Motor cable	V	White	power cable of the motor			
FG(©)		W	Black				
		FG(🕀)	Green	Connect to the grounding Generation of the servo drive.			
	Regenerative resistor terminal or braking unit	Internal resistor		etween $P \oplus$ and D end ed; contact between $P \oplus$ Ild be opened.			
		External resistor Connect P ⊕, C ends to and the contact between end should be opened.		t between $P \oplus$ and $D$			
P⊕, D, C, ⊝		External braking unit	connect to P⊕ The contact be P⊕ and C sho	the brake unit should and P☉ respectively. tween P⊕ and D and uld be opened. (N t in L1C, L2C, ☉ and			
			P⊕: Connect (+ voltage.	<ul> <li>+) terminal of V_BUS</li> </ul>			
			•	o (-) terminal of tage.			
	Ground terminal	Connect to the g motor.	round wire of th	e power and the servo			
CN1	I/O connector (Option)	Connect to the host controller, please refer to Section 3.4.					
CN2	Connector (Option)	Connect to the encoder of the motor, please refer to Section 3.5.					
CN3	Connector (Option)	Connect to RS-485 or RS-232, please refer to Section 3.6					
CN4	USB connector (Type B) (Option)	Connect to personal computer (PC or NOTEBOOK), please refer to Section 3.7					
CN5	Connector (Option)	Connect to linea and motor feedba		der for full-closed loop to Section 3.8.			

CN6	CANopen connector (Option)	RJ45 connector, please refer to Section 3.9
CN7	Extension DI connector (Option)	Extension DI connector. Please refer to 3.10.
CN8	Battery connector	Connector for absolute type of battery box

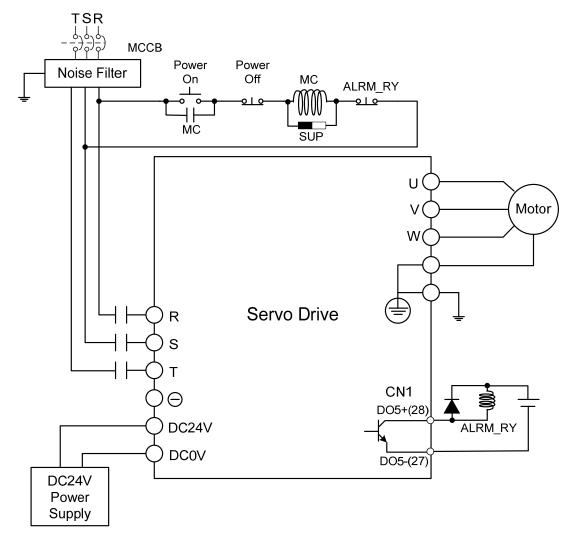
Pay special attention to the followings when wiring:

- 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 connecter is not long enough, please use shielded twistedpair 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 3.2.6.
- 6. Do not install the plug-in capacitance in servo drive. It might burn out the soft-start resistance and danger will occur.

## 3.2.3 Wiring Method

The wiring method of 400V servo drive is divided into single-phase and three-phase. In the diagram below, Power On is contact **a**, Power Off and ALRM\_RY are contact **b**. MC is the coil of magnetic contactor and self-remaining power and is the contact of main power circuit.

■ Wiring Method of Three-phase Power Supply (suitable for all series of 400 V servo drive)



3.2.4 Specification of Motor Power Cable

Motor Model	U, V, W / Connector of Brake	Terminal Definition
ECMA-J△0604□S (400W) ECMA-J△0807□S (750W) ECMA-J△0907□S (750W) ECMA-J△0910□S (1000W)		A
ECMA-J△0604□S (400W) ECMA-J△0807□S (750W) ECMA-J△0907□S (750W) ECMA-J△0910□S (1000W) *□ : with brake		В
ECMA-K△1305□S (500W) ECMA-L△1305□S (500W) ECMA-L△1308□S (850W) ECMA-M△1309□S (900W) ECMA-J△1010□S (1000W) ECMA-K△1310□S (1000W) ECMA-L△1313□S (1300W) ECMA-K△1315□S (1500W) ECMA-J△1020□S (2000W) ECMA-K△1320□S (2000W)	С С С С С С С С С С С С С С С С С С С	С
ECMA-L△1830□S (3000W) ECMA-L△1845□S (4500W) ECMA-L△1855□3 (5500W) ECMA-L△1875□3 (7500W) ECMA-K△1820□S (2000W)	T C C C C C C C C C C C C C C C C C C C	D

Wiring Name	U (Red)	V (White)	W (Black)	CASE GROUND (Green)	BRAKE1 (Yellow)	BRAKE2 (Blue)
Α	1	2	3	4	-	-
В	1	2	4	5	3	6
С	F	I	В	E	G	Н
D	D	E	F	G	А	В

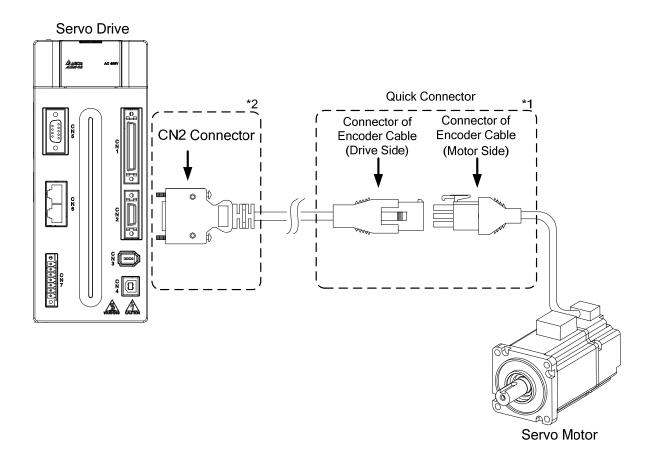
When selecting the wire rod, please choose 600V PVC cable and the length should not longer than 30m. If the length exceeds 30m, please take the received voltage into consideration when selecting the wire size. Please refer to Section 3.1.6 for wire rod selection.

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- 1) No polarity for brake coil, the wiring name is BRAKE1 & BRAKE2.
- 2) Power for brake is DC24 V. Never share it with the power of control signal VDD.
- Box, (△) in servo motor model represents encoder type. △= 1: incremental, 20-bit; △= 2: incremental, 17-bit; △= 3: 2500 ppr; △= A: absolute.
- 4) Box,  $(\Box)$  in servo motor model represents brake or keyway / oil seal.

## 3.2.5 Specification of Encoder Connector

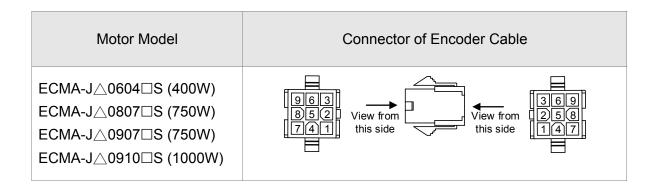
Encoder Connection (Diagram 1):



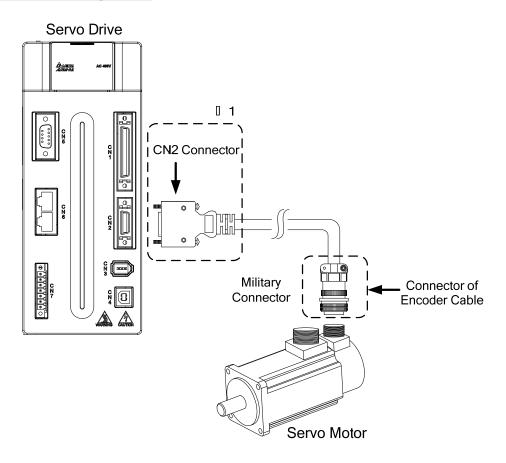


This diagram shows the connection between the servo drive and the motor encoder. It is not drawn by the practical scale and specification will be different according to the selected servo drive and motor model.

- 1) Please refer to the Section of Specification and Definition of Encoder Connector.
- 2) Please refer to Section 3.5 CN2 Connector.



### Encoder Connection (Diagram 2):



This diagram shows the connection between the servo drive and the motor encoder. It is not drawn by the practical scale and specification will be different according to the selected servo drive and motor model.

Please refer to Section 3.5, CN2 Connector.

Motor Model	Connector of Encoder Cable				
ECMA-K∆1305⊡S (500W) ECMA-L∆1305⊡S (500W)	View from the side	Pin No.	Terminal Identification	Color	
ECMA-L∆1308□S (850W)		Α	T+	Blue	
ECMA-M△1309□S (900W) ECMA-J△1010□S (1000W)	B A Mo	В	Τ-	Blue& Black	
ECMA-K△1310□S (1000W) ECMA-L△1313□S (1300W)		S	DC+5V	Red/Red &White	
ECMA-K△1315□S (1500W) ECMA-J△1020□S (2000W)	Ϋ́ <sub>F</sub> G H	R	GND	Black/ Black& White	
ECMA-K∆1320⊡S (2000W) ECMA-J∆1330⊡4 (3000W)	3106A-20-29S Military Connector	L	BRAID SHIELD	_	

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.



- Box, (△) in servo motor model represents encoder type. △= 1: incremental, 20-bit; △= 2: incremental, 17-bit; △= 3: 2500 ppr; △= A: absolute
- 2) Box, ( $\Box$ ) in servo motor model represents brake or keyway / oil seal.

## 3.2.6 Selection of Wiring Rod

Servo Drive and corresponding Servo		Power Wiring - Wire Diameter mm <sup>2</sup> (AWG)				
M	otor	DC24V, DC0V	R, S, T	U, V, W	P⊕, C	
	ECMA-J∆0604⊡S			0.82 (AWG18)	2.1 (AWG14)	
	ECMA-J∆0807⊡S		0.82 (AWG18)			
ASD-A2-0743-□	ECMA-J∆0907⊡S	1.3 (AWG16)				
	ECMA-K∆1305⊡S	(	(	(,	(	
	ECMA-L∆1305□S					
	ECMA-J∆0910□S					
ASD-A2-1043-□	ECMA-K∆1310□S		0.82 (AWG18)	1.3 (AWG16)	2.1 (AWG14)	
	ECMA-L∆1308□S					
	ECMA-J∆1010□S	1.3 (AWG16)				
	ECMA-K∆1315⊡S					
ASD-A2-1543-□	ECMA-M∆1309⊡S					
	ECMA-L∆1313□S					
	ECMA-J∆1020□S					
ASD-A2-2043-□	ECMA-K∆1320□S					
	ECMA-K∆1820□S					
	ECMA-L∆1830□S	1.3	1.3	1.3	2.1	
ASD-A2-3043-□	ECMA-J∆1330□4	(AWG16)	(AWG16)	(AWG16)	(AWG14)	
ASD-A2-4543-□	ECMA-L∆1845□S	1.3	2.1	3.3	3.3	
ASD-A2-5543-□	ECMA-L△1855□3	(AWG16)	(AWG14)	(AWG12)	(AWG12)	
ASD-A2-7543-□	ECMA-L∆1875⊡3	1.3 (AWG16)	3.3 (AWG12)	5.3 (AWG10)	3.3 (AWG12)	

Servo Drive Model	Encoder Wiring - Wire Diameter mm <sup>2</sup> (AWG)					
Servo Drive woder	Size	Number	Specification	Standard Length		
ASD-A2-0743-□						
ASD-A2-1043-□						
ASD-A2-1543-□						
ASD-A2-2043-□		10 core (4 pair)	UL2464	2m(0.94ft)		
ASD-A2-3043-□	0.13 (AWG26)		012404	3m (9.84ft.)		
ASD-A2-4543-□						
ASD-A2-5543-□						
ASD-A2-7543-						

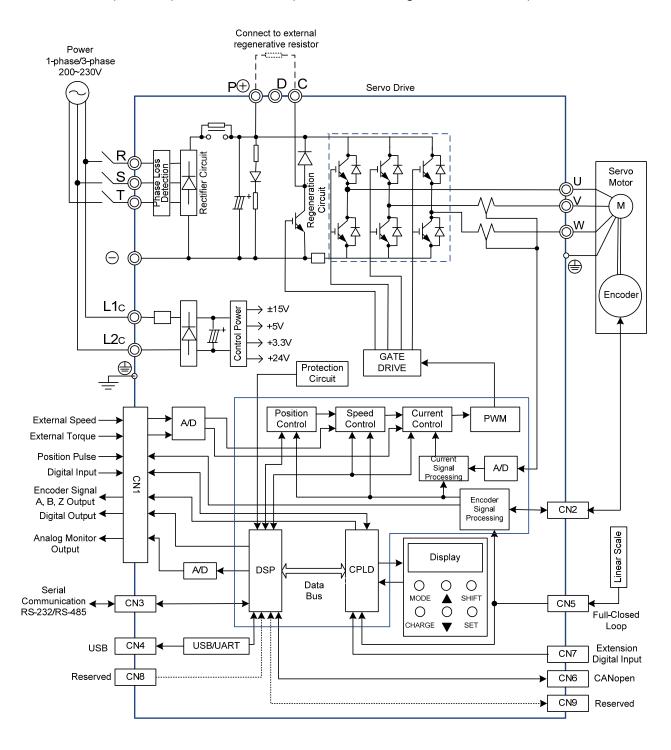
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- 1) Box, (□) at the end of the servo drive model represents the model code of ASDA-A2. Please refer to the model information of the product you purchased.
- 2) (△), in servo motor model represents encoder type. △= 1: incremental type, 20-bit; △= 2: incremental type, 17, bit; △= 3: 2500 ppr; △= A: absolute type.
- 3) Box, ( $\Box$ ) in servo motor model represents brake or keyway / oil seal.
- 4) Please use shielded twisted-pair cable for encoder wiring so as to reduce the interference of the noise.
- 5) The shield should connect to the  $\oplus$  phase of SHIELD.
- 6) Please follow the Selection of Wire Rod when wiring in order to avoid the danger it may occur.

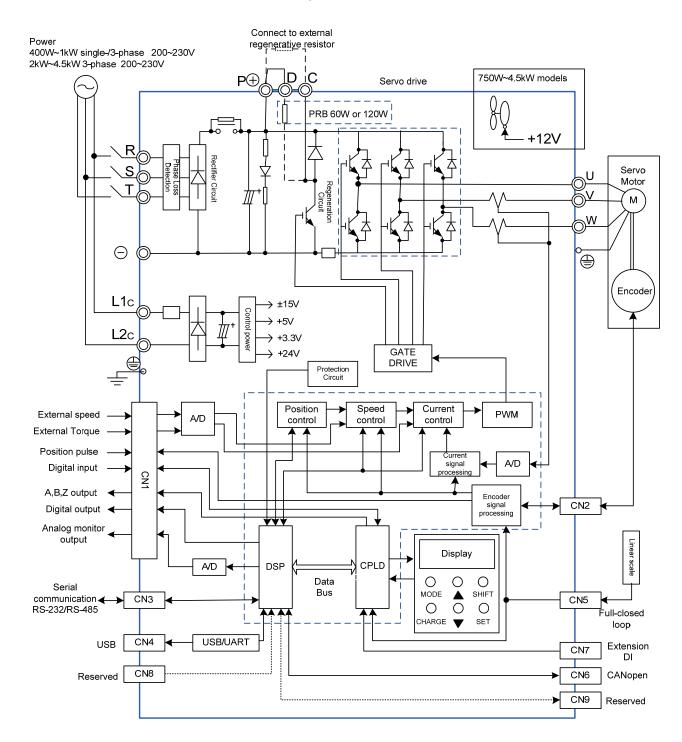
# 3.3 Basic Wiring

# 3.3.1 220V series

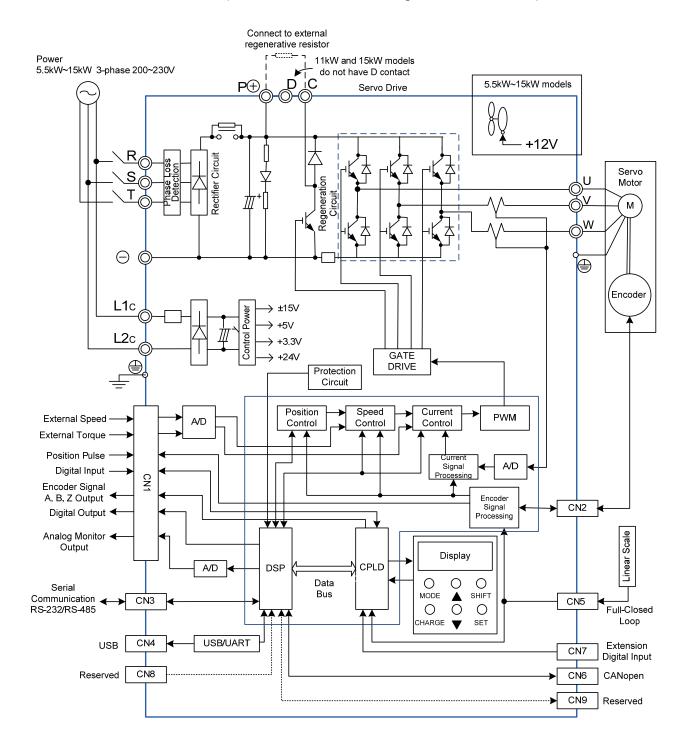
■ 200W (included) or models below (without built-in regenerative resistor)



#### ■ 400W ~ 4.5 kW models (with built-in regenerative resistor)

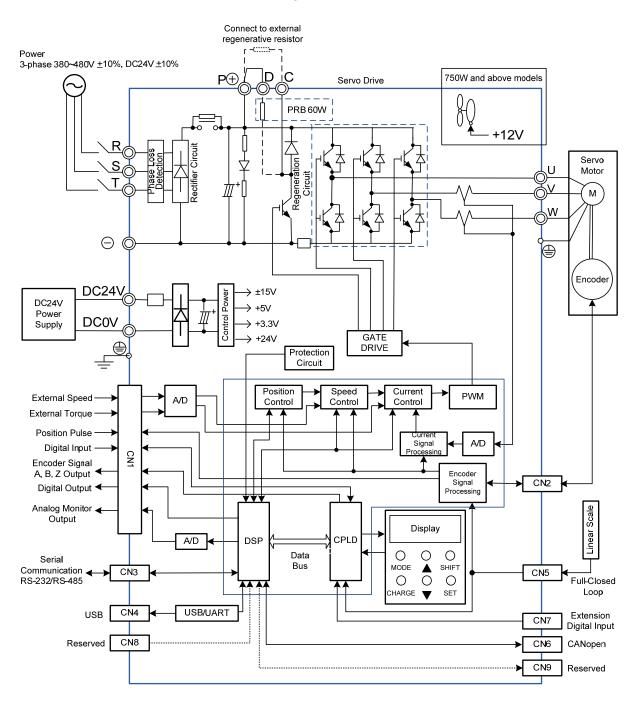


### ■ 5.5kW to 15kW models (with built-in fan but no regenerative resistor)

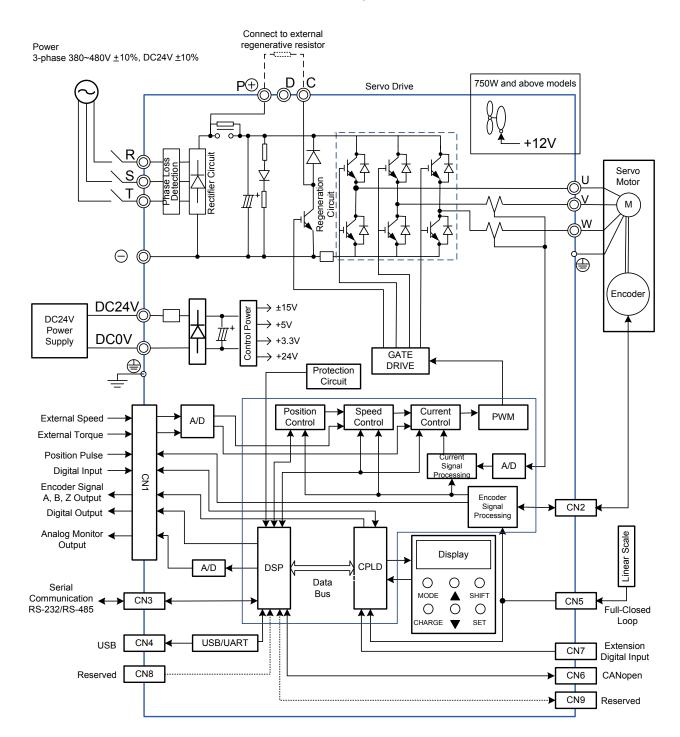


#### 3.3.2 400V series

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



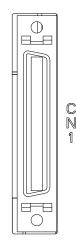
#### ■ 2kW to 7.5kW models (with built-in fan but no regenerative resistor)



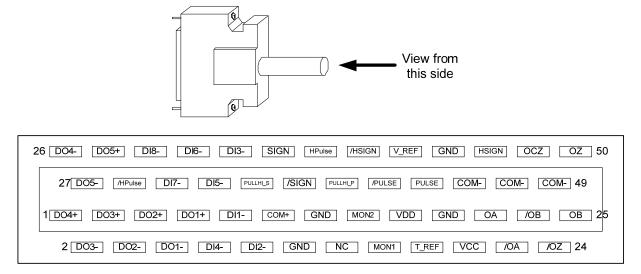
# 3.4 I/O Signal (CN1) Connection

### 3.4.1 I/O Signal (CN1) Connector Terminal Layout

In order to have a more flexible communication with the master, 5 programmable Digital Outputs (DO) and 8 programmable Digital Inputs (DI) are provided. The setting of 8 digital inputs and 5 digital outputs of each axis are parameter P2-10~P2-17 and parameter P2-18~P2-22 respectively. In addition, the differential output encoder signal, A+, A-, B+, B-, Z+ and Z-, input of analog torque command, analog speed/position command and pulse position command are also provided. The followings are the pin diagrams.



CN1 Connector (female)



The rear wiring terminal of CN1 connector

			1	DO4+	Digital output				26	DO4-	Digital output
2	DO3-	Digital output				27	DO5-	Digital output			<b>-</b>
4	DO2-	Digital output	3	DO3+	Digital output	29		High-speed	28	DO5+	Digital output
-	002-		5	DO2+	Digital output	23		position pulse (-)	30	DI8-	Digital input
6	DO1-	Digital output				31	DI7-	Digital input			
			7	DO1+	Digital output				32	DI6-	Digital input
8	DI4-	Digital input			<b>.</b>	33	DI5-	Digital input		<b></b>	<b>-</b>
10	DI2-	Digital input	9	DI1-	Digital input	35	PULL	Pulse applied	34	DI3-	Digital input
10			11	COM+	Power input (12~24V)		HI_S (SIGN)	power (SIGN)	36	SIGN	Position sign (+)
12	GND	Analog input signal ground				37	/SIGN	Position sign (-)			
14	NC	No Connection	13	GND	Analog input signal ground	39	PULL	Pulse applied	38	HPULSE	High-speed position pulse
14	NC					39	HI_P	Power			(+)
			15	MON2	Analog monitor		(PULSE)	(PULSE)	40	/HSIGN	High-speed position sign
16	MON1	Analog monitor output 1			output 2	41	/PULSE	Pulse input (-)			(-)
		-	17	VDD	+24V power				42	V_REF	Analog speed
18	T_REF	Analog torque Input			output (for external I/O)	43	PULSE	Pulse input (+)			input (+)
			19	GND	Analog input				44	GND	Analog input
20	VCC	+12V power output		~	signal ground	45	COM-	VDD(24V) power			signal ground
		(for analog command)	21	OA	Encoder A pulse			ground	46	HSIGN	High-speed position sign (+)
22	/OA	Encoder			output	47	COM-	VDD(24V)			(')
		/A pulse output	23	/OB	Encoder /B pulse			power ground	48	ocz	Encoder Z pulse open-
24	/OZ	Encoder /Z pulse			output	49	COM-	VDD(24V)			collector output
		output	25	ОВ	Encoder B pulse output			power ground	50	OZ	Encoder Z pulse line- driver output



NC means NO CONNECTION. This terminal is for internal use only. Do not connect it, or it may damage the servo drive.

### 3.4.2 Signals Explanation of Connector CN1

The following details the signals listed in previous section:

#### **General Signals**

S	ignal	Pin No	Function	Wiring Method (Refer to 3.4.3)
Analog Command (input)	V_REF	42	<ol> <li>The speed command of the motor is -10 V ~ +10 V which means the speed command is - 3000 ~ +3000 r/min (default). It can change the corresponding range via parameters.</li> <li>The position command of the motor is -10 V ~ +10 V which means the position command is -3 cycles ~ +3 cycles (default).</li> </ol>	C1
	T_REF	18	The torque command of the motor is $-10 \text{ V} \sim +10 \text{ V}$ which means the rated torque command of $-100 \% \sim +100 \%$ .	C1
Analog Monitor (output)	MON1 MON2	16 15	The operating state of the motor can be shown by analog voltage, such as speed and current. This drive provides two channel outputs. Users can select the desired monitoring data via parameter P0-03. This signal is based on the power ground.	C2
Position Pulse (input)	PULSE /PULSE SIGN /SIGN PULL HI_P PULL HI_S	43 41 36 37 39 35	Position pulse can be inputted by Line Driver (single phase max. frequency 500KHz) or open- collector (single phase max. frequency 200 KHz). Three kinds of command type can be selected via P1-00, CW pulse + CCW pulse, pulse + direction, A pulse + B pulse. When position pulse uses open-collector, the terminal should be connected to an external applied power in order to pull high.	C3/C4 C3/C4
High- speed Position Pulse (input)	HPULSE /HPULSE HSIGN /HSIGN	38 29 46 40	Position pulse can be inputted by Line Driver (single phase max. frequency 500KHz) or open- collector (single phase max. frequency 200 KHz). Three kinds of command type can be selected via P1-00, CW pulse + CCW pulse, pulse + direction, A pulse + B pulse. When position pulse uses open-collector, the terminal should be connected to an external applied power in order to pull high.	C4-2
	OA /OA	21 22		
Position Pulse	OB /OB	25 23	Encoder signal output A, B, Z (Line Drive output)	C13/C14
(output)	OZ /OZ	50 24		
	OCZ	48	Encoder signal output Z (Open-collector output)	-

	VDD	17	VDD is the +24 V power provided by the drive and is for Digital Input (DI) and Digital Output (DO) signal. The maximum current is 500 mA.
Power	COM+ COM-	11 45 47 49	COM+ is the common input of Digital Input (DI) and Digital Output (DO) voltage. When using VDD, VDD should be connected to COM+. If not using, it needs to apply the external power (+12 V $\sim$ + 24 V). Its positive end should connect to COM+ and the negative end should connect to COM
	VCC	20	VCC is the +12V power provided by the drive. It is used for providing the simple analog command (speed or torque command). The maximum current is 100 mA.
	GND	12, 13, 19, 44	VCC voltage is based on GND.
Other	NC	14	NO CONNECTION. This terminal is for internal use only. Do not connect it, or it may damage the servo drive.

There are numerous operation mode of this servo drive (please refer to Chapter 6.1). Each operation mode needs different I/O signal. In order to use the terminal in a more efficient way, the selection of I/O signal has to be programmable. That is to say, users can choose the desired DI/DO signal to meet the demand. Basically, the default setting of DI/DO signal has already have the appropriate function which can satisfy the demand of normal application.

Users have to select the operation mode based on the needs first (please refer to Chapter 6.1 for the introduction of each mode) and refer to the following DI/DO table to know the corresponding default setting of DI/DO signal and Pin No of the selected mode in order to conduct the wiring.

The table below lists the default setting of DI/DO signal function and pin No:

#### The explanation of DO signal default setting is as the followings.

DO Signal Name	Operation Mode	e		Details	Wiring Method (Refer to
		+	-		3.4.3)
SRDY	ALL	7	6	When the servo drive applies to the power and no alarm (ALRM) occurs in control circuit and motor power circuit, this DO is ON.	
SON	N/A	-	-	When the DI.SON is ON and the motor servo circuit can operate smoothly, this DO is ON.	C5/C6/C7/
		4	When the motor speed is slower than the setting value of parameter P1-38, this DO is ON.	C8	
TSPD	ALL (except PT, PR)	-	-	When the motor actual speed (r/min) is faster than the setting value of parameter P1-39, this DO is ON.	

DO Signal Name	Operation Mode		in o. -	Details	Wiring Method (Refer to 3.4.3)
TPOS	PT, PR, PT-S, PT-T, PR-S, PR-T	1	26	When the deviation between the motor command and actual position (PULSE) is smaller than the setting value of parameter P1-54, this DO is ON.	
TQL	N/A	-	-	When torque is limiting, this DO is ON.	
ALRM	ALL	28	27	When the alarm occurs (except forward/reverse limit, emergency stop, communication error, under voltage), this DO is ON.	
BRKR	ALL	-	-	Control contact of brake.	
HOME	ALL	3	2	When homing is completed, this DO is ON.	
OLW	ALL	-	-	When the overload level is reached, this DO is ON.	
WARN ALL -		-	A warning occurs. When it is in the status of forward/reverse limit, emergency stop, communication error, under voltage, this DO is ON.		
OVF	PT, PR	-	-	Position command /feedback overflows	
SNL (SCWL)	PR	-	-	Reverse software limit	*
SPL (SCCWL)	PR	-	-	Forward software limit	C5/C6/C7/
Cmd_OK	PR	-	-	The output of internal position command is completed.	C8
CAP_OK	PR	-	-	CAPTURE procedure is completed.	
MC_OK	PR	-	-	When DO.Cmd_OK and TPOS are ON, this DO is ON.	
CAM_AREA	PR	-	-	The master position of E-CAM is inside the setting area.	
S_CMP	S_CMP S, Sz -		-	When the deviation between the speed command and the feedback speed of the motor is smaller than the setting value of parameter P1-47, this DO is ON.	
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	
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	

DO Signal Name	Operation Mode	N	in o.	Details	Wiring Method (Refer to 3.4.3)
		+	-		0.1.0)
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	C5/C6/C7/ C8
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	

## 

- 1) For example, if the user selects PR mode, pin 3 and 2 are HOME. If the user selects S mode, pin 3 and 2 are TSPD.
- 2) The unlisted Pin No means the signal is not the preset one. If users want to use it, parameters need to be changed and set as the desired ones. Please refer to Section 3.4.4 for further details.

DI Signal Name	Operation Mode	Pin No.	Function	Wiring Method (Refer to 3.4.3)
SON	ALL	9	When DI is ON, the servo circuit will be activated and the motor coil will generate current.	
ARST	ALL	33	When the alarm (ALRM) occurs, this signal is used to reset the servo drive and output the signal, Ready (SRDY) again.	
GAINUP	ALL	-	It is for switching the controller gain.	
CCLR	PT, PR	10	It is for clearing the deviation counter.	
ZCLAMP	MP ALL -		When this DI is ON and the motor speed is slower than the setting of P1-38, the motor position will be locked when the signal is triggered.	C9/C10/C 11 /C12
CMDINV	PR, T, S	-	When this DI is ON, the motor will operate in the opposite direction.	
CTRG	CTRG PR, PR-S, 10 PR-T		In PR mode, the moment CTRG is ON (rising edge), save the position command selected by POS0~2 into the controller and then trigger the command.	
TRQLM	S, Sz	10	ON means the torque limit command is effective.	

### The explanation of DI signal default setting is as the followings

DI Signal Name	Operation Mode	Pin No.		Eunction								Wiring Method (Refer to 3.4.3)	
SPDLM	T, Tz	10	ON mear	N means the speed limit command is effective.									
POS0		34	In PR mo	PR mode, the source of position command:									
POS1		8	Position command	POS 5	POS 4	POS 3	POS 2	POS 1	POS0	CTRG	Corresponding parameter		
POS2		-	P1	0	0	0	0	0	0	<b>↑</b>	P6-00		
POS3		_								l	P6-01		
POS4			P2	0	0	0	0	0	1		P6-02 P6-03		
FU34	P, PR,	-	~							· ·	~		
	PR-S, PR-T		DEO							<b>↑</b>	P6-98		
	PR-I		P50	1	1	0	0	1	0		P6-99		
DOOF			P51	1	1	0	0	1	1	1	P7-00		
POS5		-	~								P7-01		
										•	P7-26		
			P64	1	1	1	1	1	1		P7-27		
						1				1	·	_	
STOP	-	-	Stop									_	
SPD0		34	The sour		sele	cting	spee	ed co	mma	nd:			
	S, Sz,		SPD1	SPD0				source				C9/C10/ C11/C12	
0004	PT-S,	0	0         0         S mode is analog input; Sz mode is 0           0         1         P1-09						IS U	C11/C12			
SPD1	PR-S, S-T	8	1										
			1	1		P1-11							
ТСМ0		34	The sour	ce of	sele	cting	torqu	le co	mma	nd:		_	
			TCM1	TCM0				source					
	PT, T, Tz, PT-T,		0	0		T mo	de is a	inalog	input; T	z mode	is 0		
TCM1	PR-T, S-T	8	0	1		P1-12	2						
			1	0		P1-1							
			1	1		P1-14	1					_	
S-P	PT-S, PR-S	31	Mode sw	Iode switching. OFF: Speed; ON: Position									
S-T	S-T	31	Mode sw	itchin	g. Ol	FF: S	peed	d; ON	I: Tor	que			
T-P	PT-T, PR-T	31	Mode sw	Node switching. OFF: Torque; ON: Position									
PT-PR	PT, PR	-	users ca	n sel	ect t	he so	ource	e via	this	DI. W	ode, PT-PR-S hen this DI is N, it is in PR	s	

DI Signal Name	Operation Mode	Pin No.	Function	Wiring Method (Refer to 3.4.3)
EMGS	ALL	30	It is contact <b>B</b> and has to be ON frequently; otherwise the alarm (ALRM) will occur.	
NL(CWL)	PT, PR, S, T, Sz, Tz	32	Reverse inhibit limit (contact <b>B</b> ) and has to be ON frequently; or the alarm (ALRM) will occur.	
PL (CCWL)	PT, PR, S, T, Sz, Tz	31	Forward inhibit limit (contact <b>B</b> ) and has to be ON frequently; or the alarm (ALRM) will occur.	
ORGP	PR	-	When DI is ON, the drive will start homing.	
SHOM	PR	-	In PR mode, it needs to search the origin. When this DI is ON, the origin searching function is activated. (Please refer to the setting of parameter P1-47.)	
CAM	PR	-	E-cam engaging control (please refer to the setting of value U and Z of P5-88.)	
JOGU	ALL	-	When this DI is ON, the motor JOG operates in forward direction.	C9/C10/C
JOGD	ALL	-	When this DI is ON, the motor JOG operates in reverse direction.	11 /C12
EV1	PR	-	Event trigger PR command	
EV2	PR	-	Event trigger PR command	
EV3	PR	-	Event trigger PR command	
EV4	PR	-	Event trigger PR command	
GNUM0	GNUM0 PT, PR, PR-S -		Electronic gear ratio (numerator) selection 0 (Please refer to P2-60~P2-62 for gear ratio selection (numerator).)	
GNUM1	PT, PR, PT-S, PR-S-Electronic gear ratio (numerator) selection 1 (Please refer to P2-60~P2-62 for gear ratio selection (numerator).)			
INHP	PT, PT-S	-	In position mode, when this DI is ON, the external pulse input command is not working.	

The default setting of DI and DO in each operation mode is shown as the followings. Please note that the following table neither detail the information as the previous one nor show the Pin number of each signal. However, each operation mode is separated in different columns in order to avoid the confusion.

### Table 3.1 Default Value of DI Input Function

Symbol	DI Code	Input Function	PT	PR	S	Т	Sz	Tz	PT- S	PT- T	PR- S	PR- T	S-T
SON	0x01	Servo On	DI1	DI1	DI1	DI1	DI1						
ARST	0x02	Alarm Reset	DI5	DI5	DI5	DI5	DI5	DI5					
GAINUP	0x03	Gain switch											
CCLR	0x04	Pulse clear	DI2						DI2	DI2			
ZCLAMP	0x05	Zero speed CLAMP											
CMDINV	0x06	The input command will be in reverse direction.											
Reserved	0x07	Reserved											
CTRG	0x08	Internal position command triggered		DI2							DI2	DI2	
TRQLM	0x09	Torque limit			DI2		DI2						
SPDLM	0x10	Speed limit				DI2		DI2					
POS0	0x11	Internal position command selection 0		DI3							DI3	DI3	
POS1	0x12	Internal position command selection 1		DI4							DI4	DI4	
POS2	0x13	Internal position command selection 2											
POS3	0x1A	Internal position command selection 3											
POS4	0x1B	Internal position command selection 4											
POS5	0x1C	Internal position command selection 5											
STOP	0x46	Motor stops											
SPD0	0x14	Speed command selection 0			DI3		DI3		DI3		DI5		DI3
SPD1	0x15	Speed command selection 1			DI4		DI4		DI4		DI6		DI4
TCM0	0x16	Torque command selection 0	DI3			DI3		DI3		DI3		DI5	DI5
TCM1	0x17	Torque command selection 1	DI4			DI4		DI4		DI4		DI6	DI6
S-P	0x18	Mode switch between speed and position command							DI7		DI7		
S-T	0x19	Mode switch between speed and torque command											DI7
T-P	0x20	Mode switch between								DI7		DI7	

PT-PR 0x2 EMGS 0x2 NL(CWL) 0x2 PL(CCWL) 0x2 ORGP 0x2 SHOM 0x2	and PR command 21 Emergency stop 22 Reverse inhibit limit 23 Forward inhibit limit 24 Original point of homing	D18 D16 D17	DI8 DI6 DI7	DI8 DI6	DI8	DI8	DI8	DI8				
EMGS 0x2 NL(CWL) 0x2 PL(CCWL) 0x2 ORGP 0x2	<ul> <li>and PR command</li> <li>Emergency stop</li> <li>Reverse inhibit limit</li> <li>Forward inhibit limit</li> <li>Original point of homing</li> </ul>	DI6	DI6			DI8	8וח	פוח				
NL(CWL)0x2PL(CCWL)0x2ORGP0x2	<ul> <li>22 Reverse inhibit limit</li> <li>23 Forward inhibit limit</li> <li>24 Original point of homing</li> </ul>	DI6	DI6			DI8	810	פוח				
PL(CCWL) 0x2 ORGP 0x2	<ul> <li>23 Forward inhibit limit</li> <li>24 Original point of homing</li> </ul>			DI6			010	DIO	DI8	DI8	DI8	DI8
ORGP 0x2	24 Original point of homing	DI7	DI7		DI6	DI6	DI6					
	homing			DI7	DI7	DI7	DI7					
SHOM 0x2	7 Homing is activated											
CAM 0x3	36 E-Cam engaged											
JOGU 0x3	Forward JOG input											
JOGD 0x3	38 Reverse JOG input											
EV1 0x3	Event trigger PR command #1(refer to the setting of P5-98, P5-99)											
EV2 0x3	Event trigger PR command #2 (refer to the setting of P5-98, P5-99)											
EV3 0x3	BB BB Event trigger PR command #3 firmware V1.008 sub04 will be provided afterwards)	;										
EV4 0x3	Event trigger PR command #4 (firmwar V1.008 sub04 will be provided afterwards)	e										
GNUM0 0x4	13 Electronic gear ratio (numerator) selection	0										
GNUM1 0x4	HA Electronic gear ratio (numerator) selection	1										
INHP 0x4	15 Pulse input inhibit											

**NOTE** Please refer to Section 3.4.1 for corresponding pin from DI1 ~ 8.

Table 3.2	Default V	alue of DO	Output	Function
-----------	-----------	------------	--------	----------

Symbol	DO Code	Output Function	PT	PR	S	т	Sz	Tz	PT- S	PT- T	PR- S	PR- T	S-T
SRDY	0x01	Servo is ready	DO1	DO1	DO1	DO1	DO1						
SON	0x02	Servo is On.											
ZSPD	0x03	Zero-speed reached	DO2	DO2	DO2	DO2	DO2						
TSPD	0x04	Reach the target speed			DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3
TPOS	0x05	Reach the target position	DO4	DO4					DO4	DO4	DO4	DO4	DO4
TQL	0x06	Torque limit											
ALRM	0x07	Servo alarm	DO5	DO5	DO5	DO5	DO5						
BRKR	0x08	Brake			DO4	DO4	DO4	DO4					
HOME	0x09	Homing complete	DO3	DO3									
OLW	0x10	Early warning for overload											
WARN	0x11	Servo warning											
OVF	0x12	Position command /feedback overflows											
SNL (SCWL)	0x13	Reverse software limit											
SPL (SCCWL)	0x14	Forward software limit											
Cmd_OK	0x15	Internal position command is completed											
CAP_OK	0x16	Capture procedure is completed											
MC_OK	0x17	Servo procedure is completed											
CAM_AREA	0x18	Master position area of E-CAM											
SP_OK	0x19	Target speed reached											
SDO_0	0x30	Output the status of bit00 of P4-06											
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											

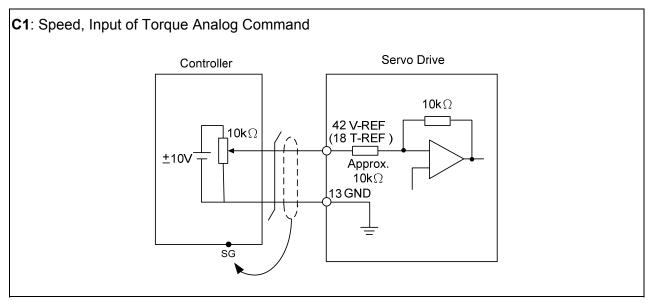
Symbol	DO Code	Output Function	PT	PR	S	Т	Sz	Tz	PT- S	PT- T	PR- S	PR- T	S-T
SDO_5	0x35	Output the status of bit05 of P4-06											
SDO_6	0x36	Output the status of bit06 of P4-06											
SDO_7	0x37	Output the status of bit07 of P4-06											
SDO_8	0x38	Output the status of bit08 of P4-06											
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											

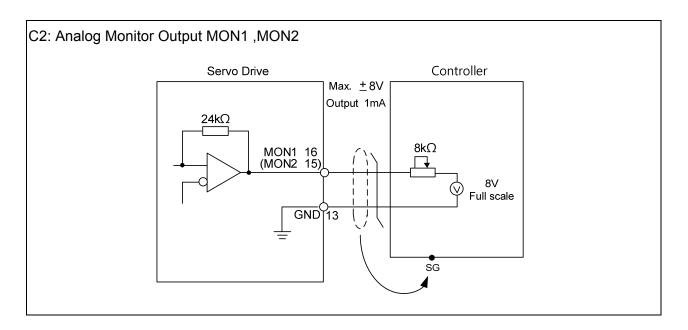


**NOTE** Please refer to Section 3.4.1 for corresponding pin from DO1 to 5.

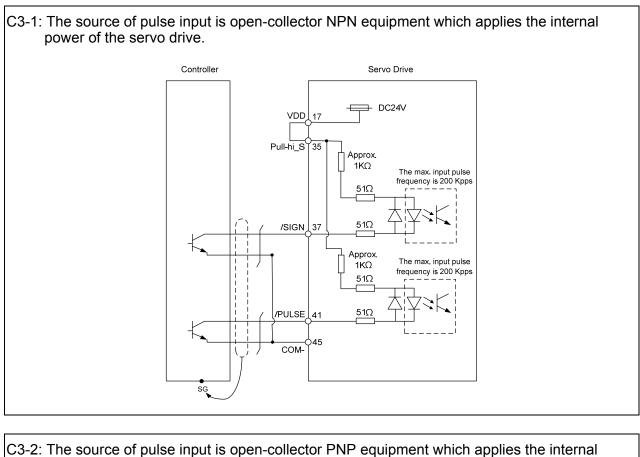
### 3.4.3 Wiring Diagrams (CN1)

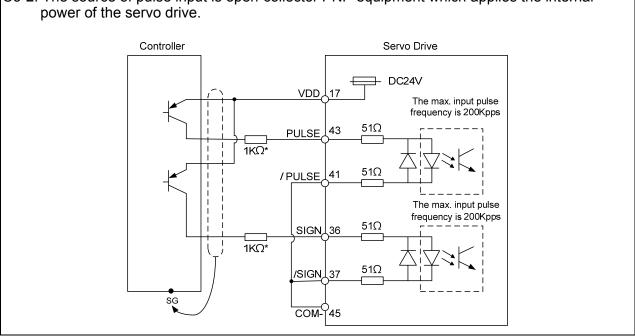
The valid voltage of speed analog command and torque analog command is between -10V and +10V. The command value can be set via relevant parameters. The input impedance is  $10K\Omega$ .



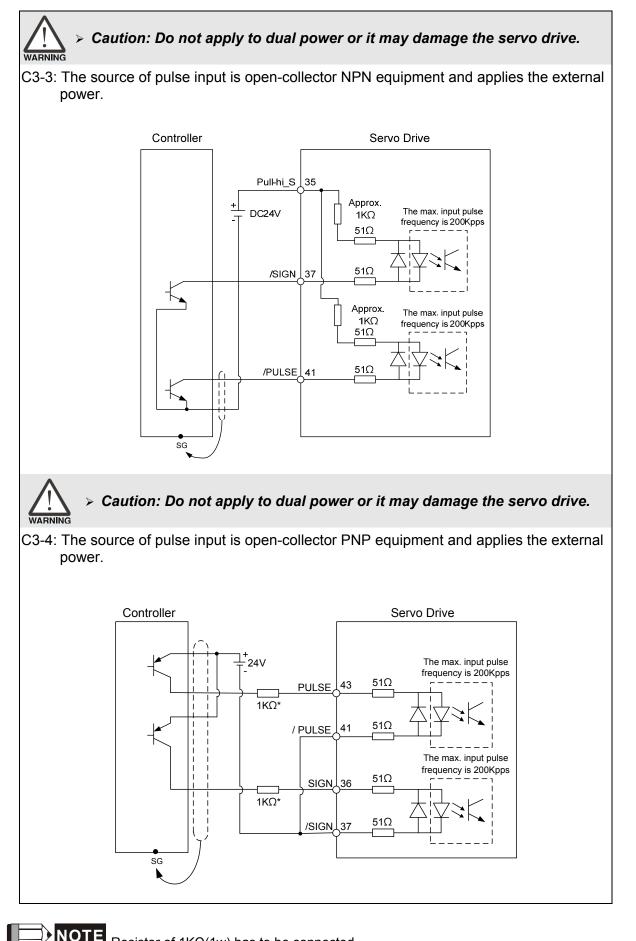


Pulse command can be input by the way of open-collector or Line driver. The maximum input pulse of Line driver is 500 kpps and 200 kpps for open-collector.

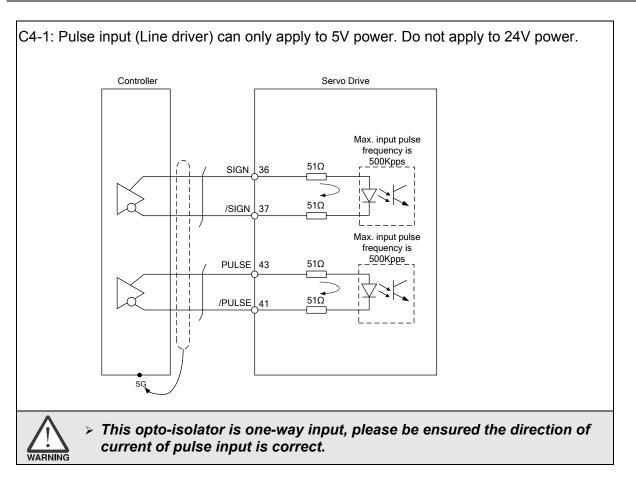


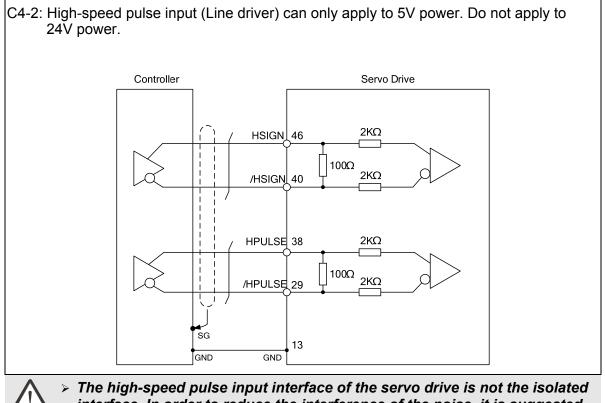


**NOTE** Resistor of  $1K\Omega(1w)$  has to be connected.



**NOTE** Resistor of  $1K\Omega(1w)$  has to be connected.

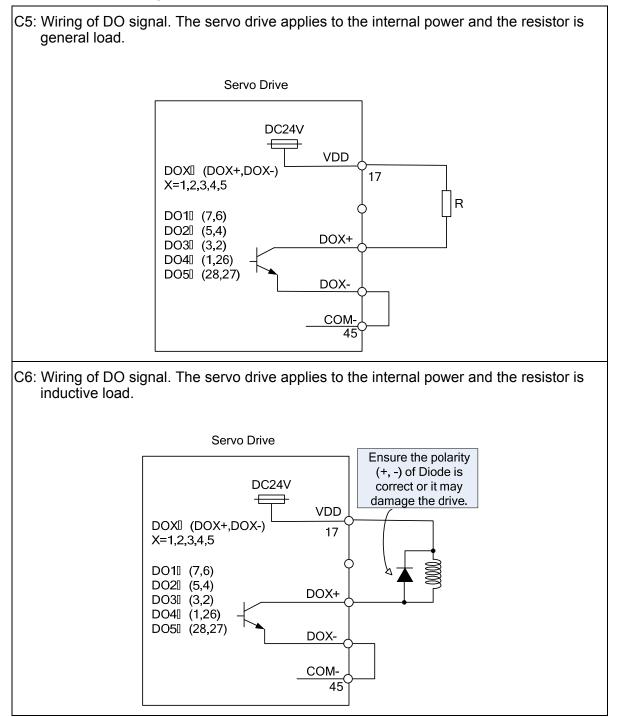


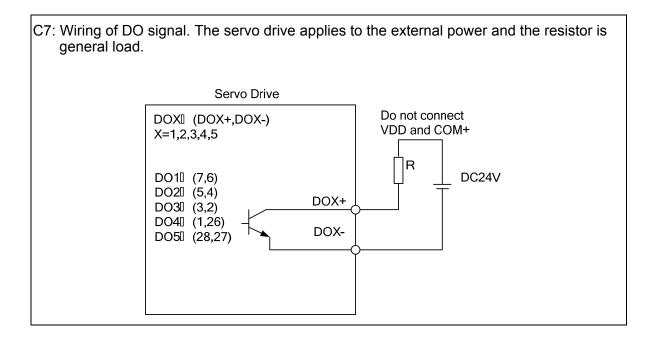


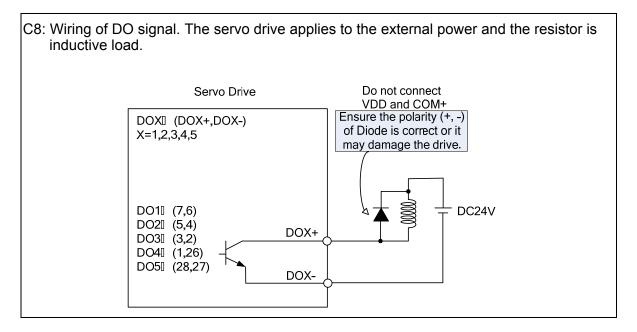
The high-speed pulse input interface of the servo drive is not the isolated interface. In order to reduce the interference of the noise, it is suggested that the terminal ground of the controller and the servo drive should be connected to each other.

WARNING

When the drive connects to inductive load, the diode has to be installed. (The permissible current is under 40mA. The surge current is under 100mA.)

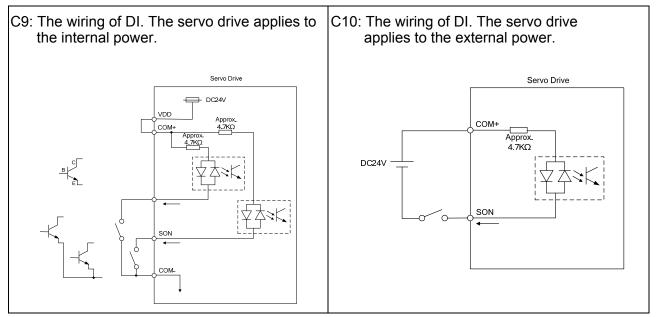




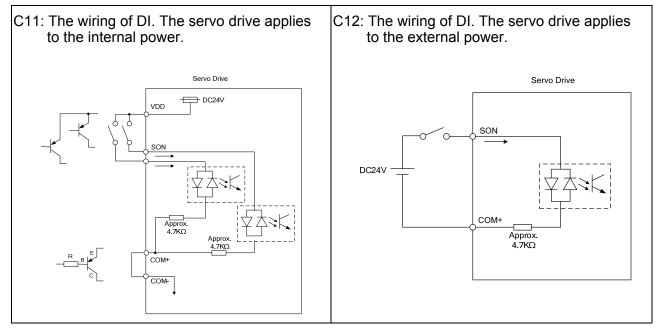


Input signal via relay or open-collector transistor

NPN transistor, common emitter (E) mode (SINK mode)

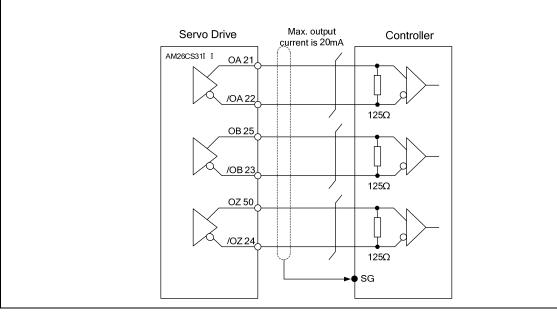


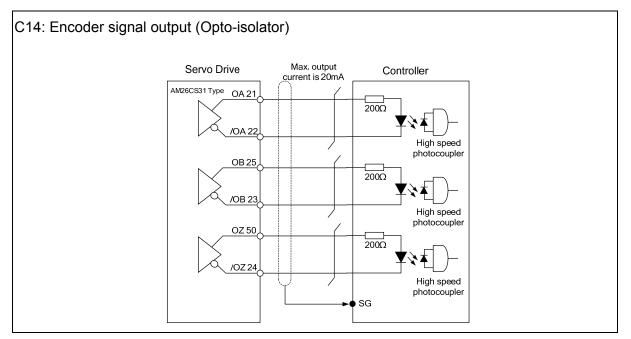
#### PNP transistor, common emitter (E) mode (SOURCE mode)

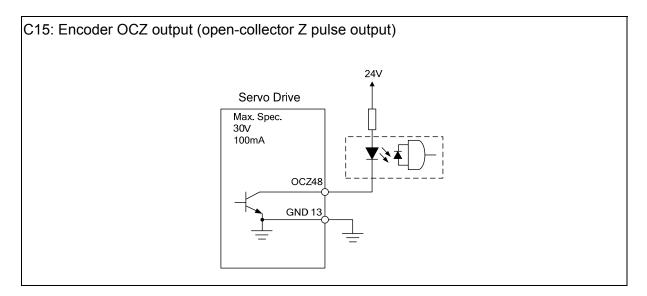




#### C13: Encoder signal output (Line driver)







### 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.

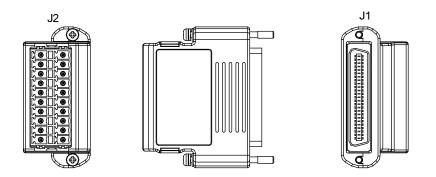
Signal Name		Pin No	Corresponding Parameter
	DI1-	CN1-9	P2-10
	DI2-	CN1-10	P2-11
	DI3-	CN1-34	P2-12
Standard	DI4-	CN1-8	P2-13
DI	DI5-	CN1-33	P2-14
	DI6-	CN1-32	P2-15
	DI7-	CN1-31	P2-16
	DI8-	CN1-30	P2-17
	EDI9	CN7-2	P2-36
	EDI10	CN7-3	P2-37
Extension DI	EDI11	CN7-4	P2-38
(optional)	EDI12	CN7-5	P2-39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

Signal	Signal Name		Corresponding Parameter
	DO1+	CN1-7	P2-18
	DO1-	CN1-6	F2-10
	DO2+	CN1-5	P2-19
	DO2-	CN1-4	FZ-19
Standard	DO3+	CN1-3	P2-20
DO	DO3-	CN1-2	F2-20
	DO4+	CN1-1	P2-21
	DO4-	CN1-26	P2-21
	DO5+	CN1-28	P2-22
	DO5-	CN1-27	Γ2-22

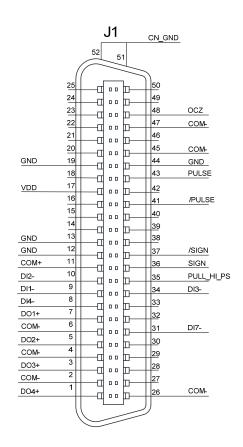
### 3.4.5 Application: Using CN1 Quick Connector for Wiring

ASD-IF-SC5020 CN1 quick connector is designed for easy wiring. It is applicable to ASDA-A2 and ASDA-A2R series servo drive and can satisfy the demand of different DI/O application. It will be a good choice for those who do not want to self-weld the wiring rods. The vibration will not lose the leading wire due to the design of spring terminal blocks. It is rather convenient and fast when wiring and under construction. 5 digital inputs, 4 digital outputs, pulse command inputs and Z phase open-collector outputs are included.

Pin definition is as the following:



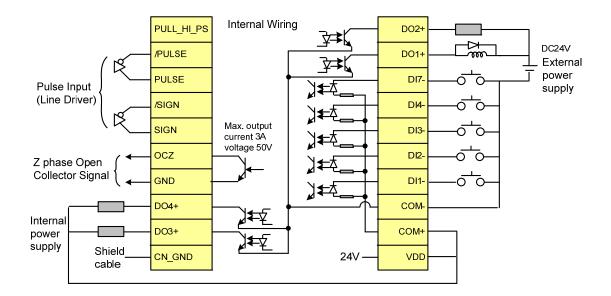
	J	2		
PULL_HI_PS 11			10	DO2+
/ PULSE 12			9	DO1+
PULSE 13			8	D17-
<u>/ SIGN 14</u>			7	DI4-
SIGN 15			6	DI3-
OCZ 16			5	DI2-
GND 17			4	DI1-
DO4+ 18			3	COM-
DO3+ 19			2	COM+
CN_GND 20	<u> </u>		1	VDD

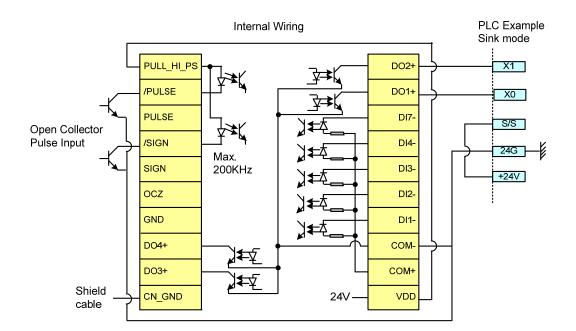


	J2	J1		
PIN	Description	PIN	Description	
1	VDD	17	VDD	
2	COM+	11	COM+	
3	COM-	2,4,6,26,45,47	COM-	
4	DI1-	9	DI1-	
5	DI2-	10	DI2-	
6	DI3-	34	DI3-	
7	DI4-	8	DI4-	
8	DI7-	31	DI7-	
9	DO1+	7	DO1+	
10	DO2+	5	DO2+	
11	PULL_HI_PS	35	PULL_HI_PS	
12	/PULSE	41	/PULSE	
13	PULSE	43	PULSE	
14	/SIGN	37	/SIGN	
15	SIGN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

	J2	J1		
PIN	Description	PIN	Description	
18	DO4+	1	DO4+	
19	DO3+	3	DO3+	
20	CN_GND	51,52	CN_GND	

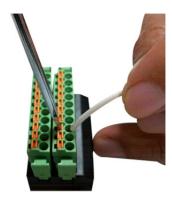
#### Example of wiring:



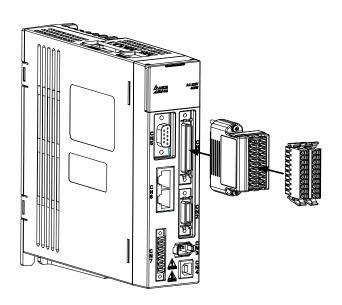


### Wiring and installation of CN1 quick connector:

Wiring:

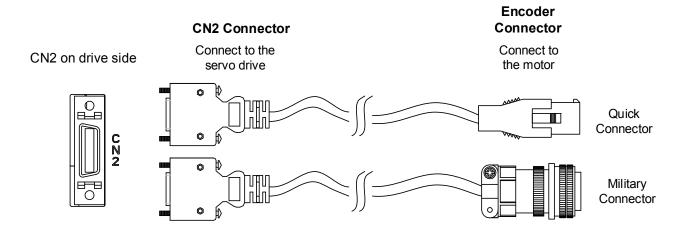


Installation:

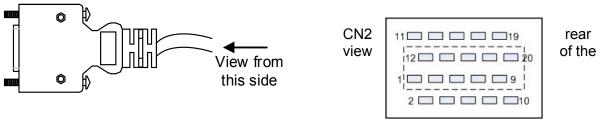


## 3.5 CN2 Connector

The terminal block of the connector and pin number are as follows:

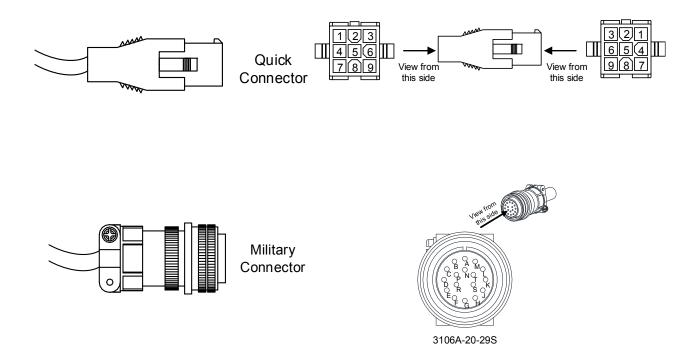


### (A) CN2 Connector



terminal block

(B) Encoder Connector



	Drive Co	nnector	Encoder Connector			
PIN No.	Terminal Symbol	Function and Description	Military Connector	Quick Connector	Color	
5	T+	Serial communication signal input / output (+)	А	1	Blue	
4	T-	Serial communication signal input / output (-)	В	4	Blue & Black	
14,16	+5V	+5V power supply	S	7	Red / Red & White	
13,15	GND	Power ground	R	8	Black / Black & White	
Shell	Shielding-	Shielding	L	9	-	

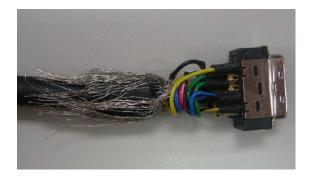
#### About shielding and ground

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.

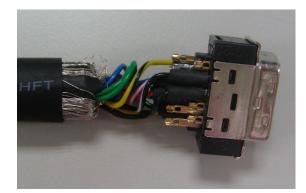
The shielding procedures of CN2 encoder connector are as followings:

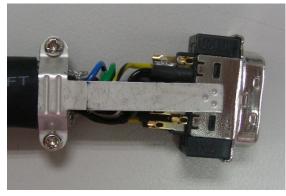


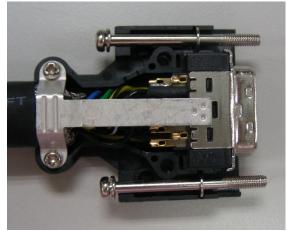
 Cut through the cable and expose the core wire which covers the metal core wires with shielding. The reserved core wire length should be 20~30mm. Then, cover a 45mm heat shrink tube on the cable.



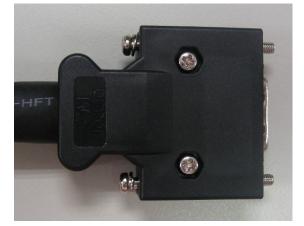
(2) Spread the metal core wires with shielding and turn it upside down in downward direction. Ensure to follow the above table of CN2 Terminal Signal Identification to connect the pins one by one.







- (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.

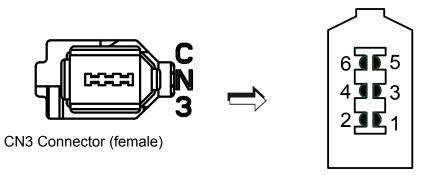


(6) Tighten the screws to complete a shielded CN2 connector.

### 3.6 Wiring of CN3 Connector

### 3.6.1 Layout of CN3 Connector

The servo drive connects to the personal computer via communication connector. The user can operate the servo drive via MODBUS, PLC or HMI. There are two common communication interfaces, RS-232 and RS-485. Both can be set via parameter P3-05. Among them, RS-232 is more common. Its communication distance is about 15 meter. If the user selects RS-485, its transmission distance is longer and supports more than one servo drives for connection.

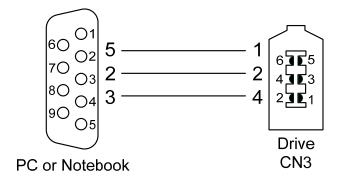


PIN No.	Signal Name	Terminal Symbol	Function and Description
1	Grounding	GND	+ 5 V connects to the signal terminal
2	RS-232 data transmission	RS-232_TX	The drive transmits the data The connector connects to RS-232 of PC
3	-	-	Reserved
4	RS-232 data receiving	RS-232_RX	The drive receives the data The connector connects to RS-232 of PC
5	RS-485 data transmission	RS-485(+)	The drive transmits the date to differential terminal (+)
6	RS-485 data transmission	RS-485(-)	The drive transmits the date to differential terminal (-)



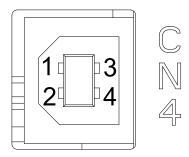
- 1) Please refer to Chapter 9, page 2 for the wiring of RS-485.
- Two kinds of communication wire of IEEE1394 are commercially available. One of the internal ground terminals (Pin 1) will short circuit with the shielding and will damage the drive. Do not connect GND to the shielding.

### 3.6.2 Connection between PC and Connector CN3



## 3.7 CN4 Serial Connector (USB)

CN4 is a serial connector which used to connect PC software and enhance the efficiency. The transmission speed of USB can up to 1MB, that is to say PC Data Scope can obtain the correct data in time.

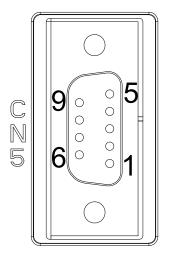


CN4 Connector (female)

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

## 3.8 CN5 Connector (Full-closed loop)

Connect to the external linear scale or encoder (A, B, Z) and form a full-closed loop with the servo. In position mode, the pulse position command issued by the controller is based on the control loop of the external linear scale. Please refer to Chapter 6.



CN5 Connector (female)

Pin No.	Signal Name	Terminal Symbol	Function and 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

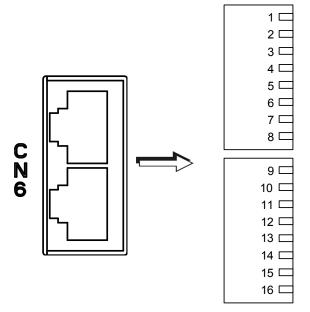
#### 

- 1) It only supports AB phase signal and the encoder with 5 V.
- Application of full-closed loop: It supports the encoder with highest resolution, 1280000 pulse rev (Full-closed loop corresponds to the resolution of quadruple frequency when motor runs a cycle.).

### 3.9 CN6 Connector (CANopen)

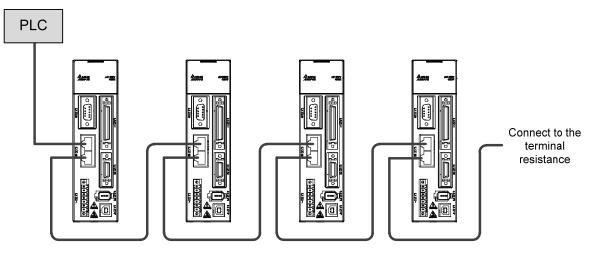
Based on the standard of CANopen DS301 and DS402, CN6 uses the standard CAN interface to implement position, torque and speed mode. It also can read or monitor the drive status.

The station number of CANopen is the same as RS-232/RS-485. All are set via parameter P3-00 and the transmission rate can up to 1 Mbps. It provides two sets of communication connectors, one is for receiving and another one is for transmission, in order to connect more than one drives. The last servo drive connects to termination resistor.



CN6 Connector (female)

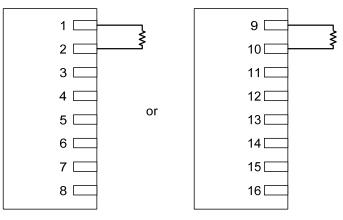
PIN No.	Signal Name	Function and Description
1, 9	CAN_H	CAN_H bus line (dominant high)
2, 10	CAN_L	CAN_H bus line (dominant low)
3, 11	CAN_GND	Ground / 0 V / V -
4, 12	-	Reserved
5, 13	-	Reserved
6, 14	-	Reserved
7, 15	CAN_GND	Ground / 0 V / V -
8, 16	-	Reserved



It can support up to 127 axes

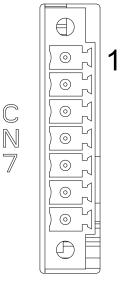


- 1) The termination resistor is suggested to use 120  $\Omega$  (Ohm) 0.25W or above.
- 2) The wiring method of concatenate more than one drives is based on two terminals of CANopen. One is for receiving and another one is for transmission. And the servo drive connects to the termination resistor. The wiring diagram of the termination resistor is shown as the followings:



# 3.10 Extension Digital Input Connector of CN7

A2 series servo drive provides additional extension DI on CN7 port. The function of this DI is similar to the one on CN1. Users can define and program it according to the demand.



CN7 Connector (female)

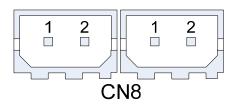
PIN No.	Signal Name	Terminal Symbol	Function Description
*1	VDD 24V power COM+		VDD (24V) power supply, same as Pin 11 of CN1
2	Extension DI9	EDI 9-	Digital input DI9-
3	Extension DI10	EDI 10-	Digital input DI10-
4	Extension DI11	EDI 11-	Digital input DI11-
5	Extension DI12	EDI 12-	Digital input DI12-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

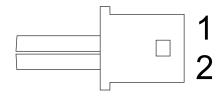


> \*1 Caution: Do not use dual power supply or it might damage the servo drive.

# 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 further information.





CN8 Connector of Battery Box



Pin Definition:

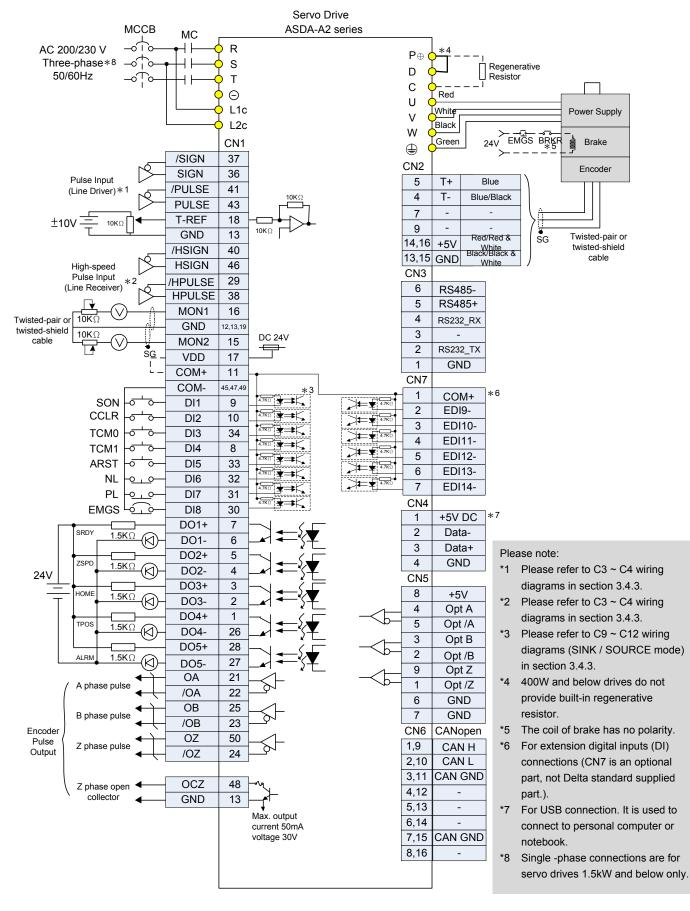
Pin No	Connector1	Connector2
1	BAT+	BAT+
2	BAT-	BAT-



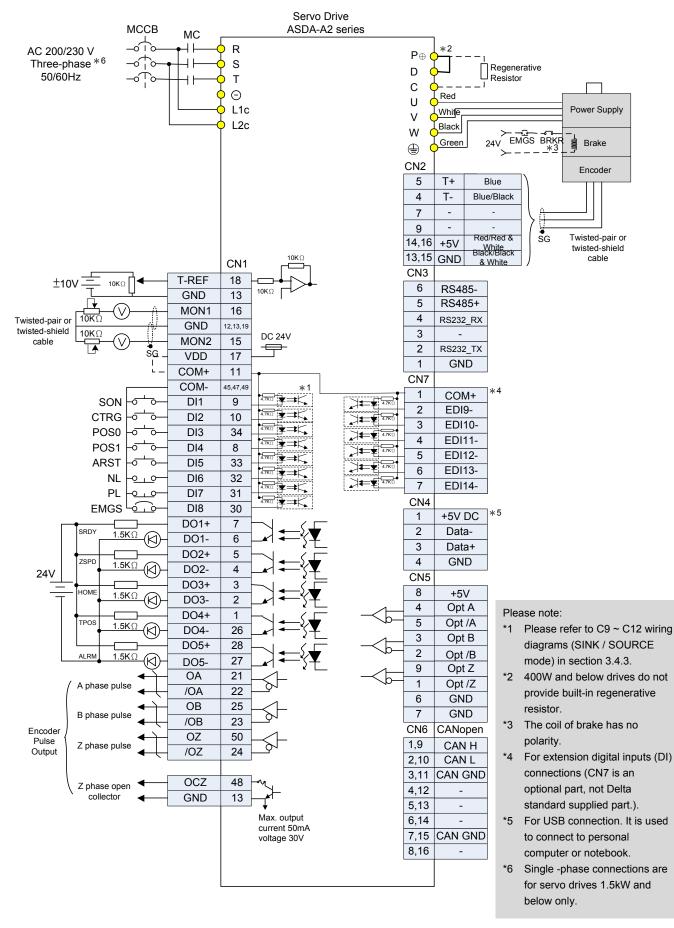
Due to the different design of servo drive model, CN8 might have one or two connectors, which however has the same pin definition.

# 3.12 Standard Connection Example – 220V series

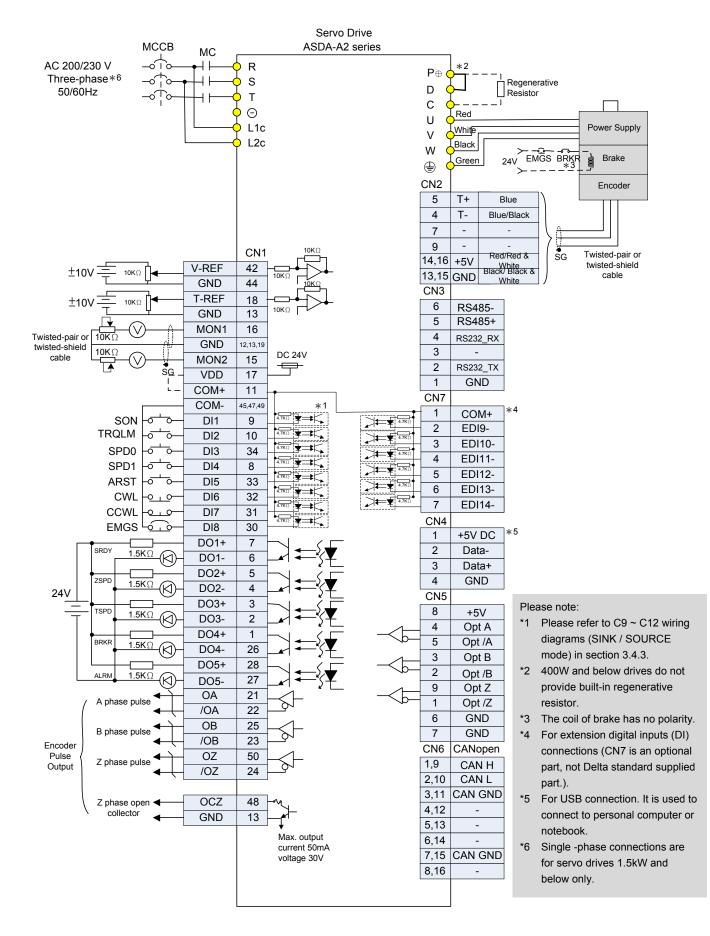
# 3.12.1 Position (PT) Control Mode



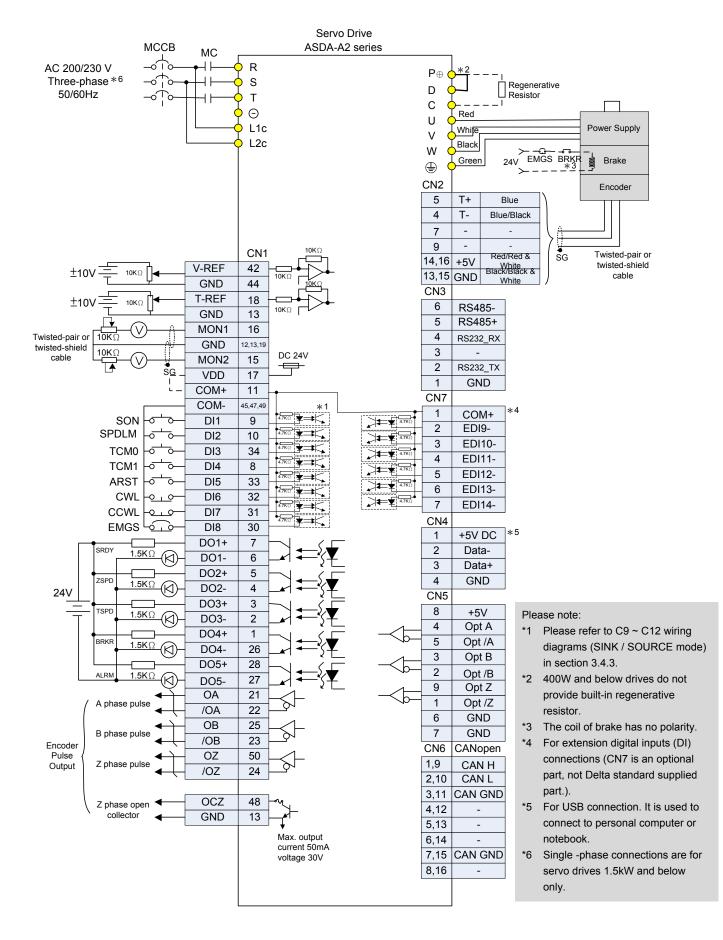
# 3.12.2 Position (PR) Control Mode



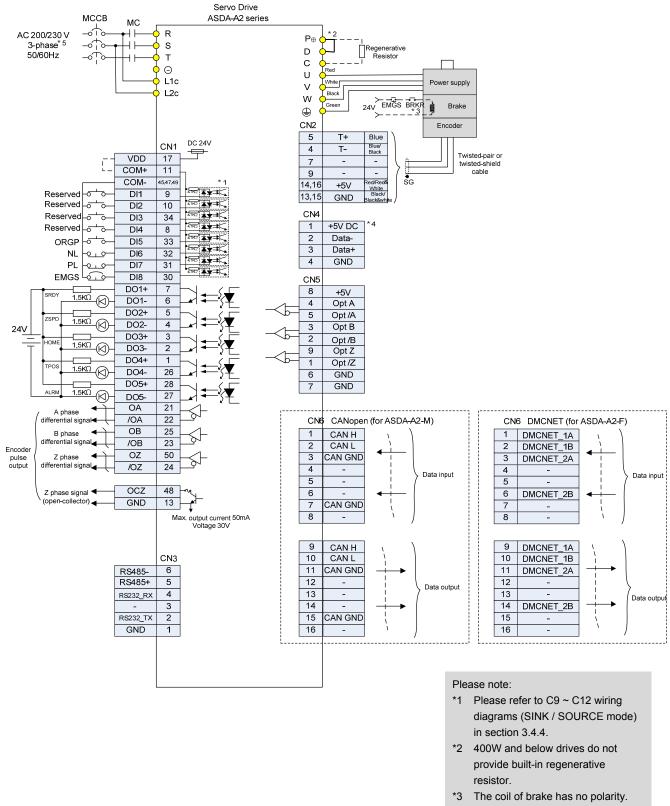
## 3.12.3 Speed Control Mode



# 3.12.4 Torque Control Mode



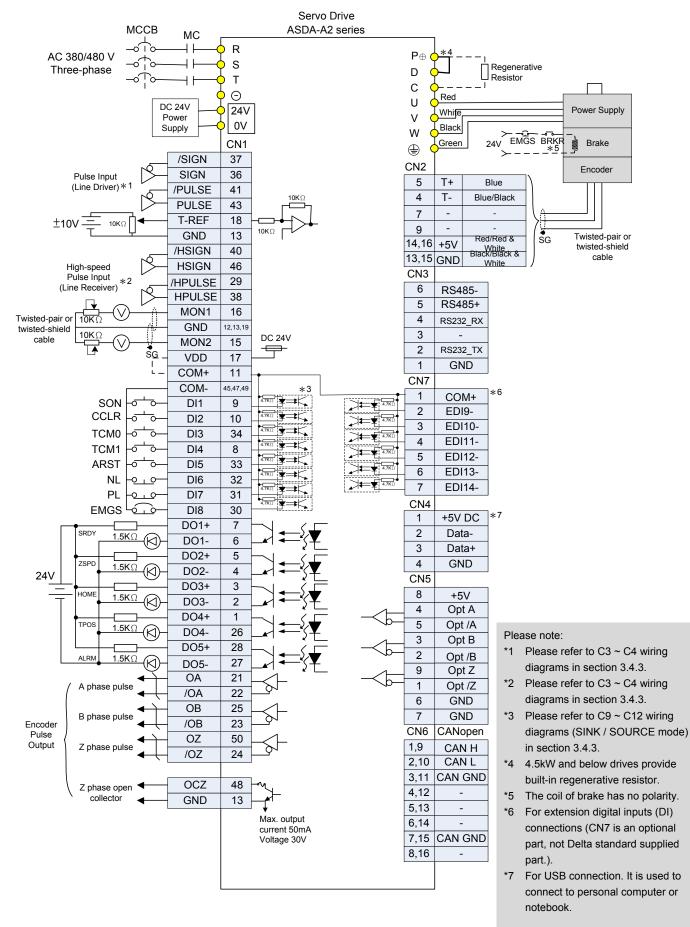
#### 3.12.5 Communication Mode



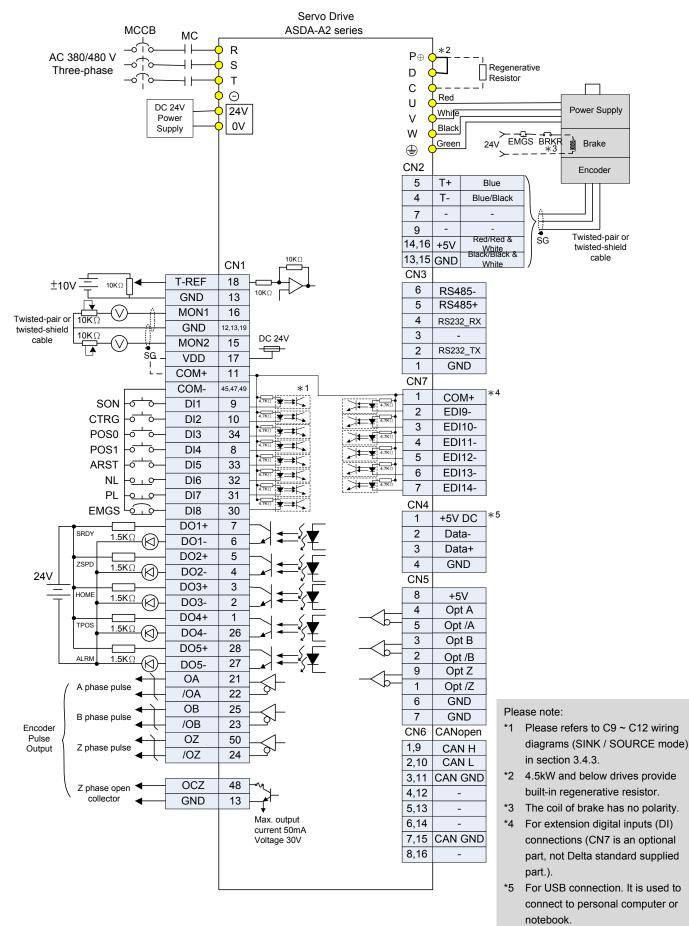
- \*4 For USB connection. It is used to connect to personal computer or notebook.
- \*5 Single -phase connections are for servo drives 1.5kW and below only.
- \*6 A2-F only supports DMCNET mode.

# 3.13 Standard Connection Example – 400V series

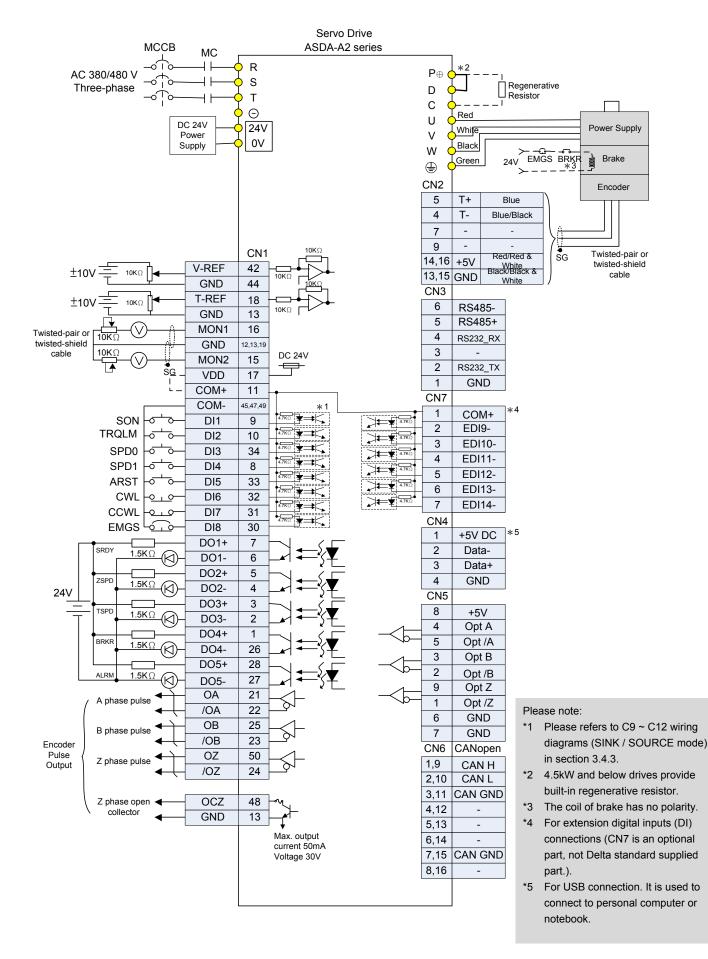
# 3.13.1 Position (PT) Control Mode



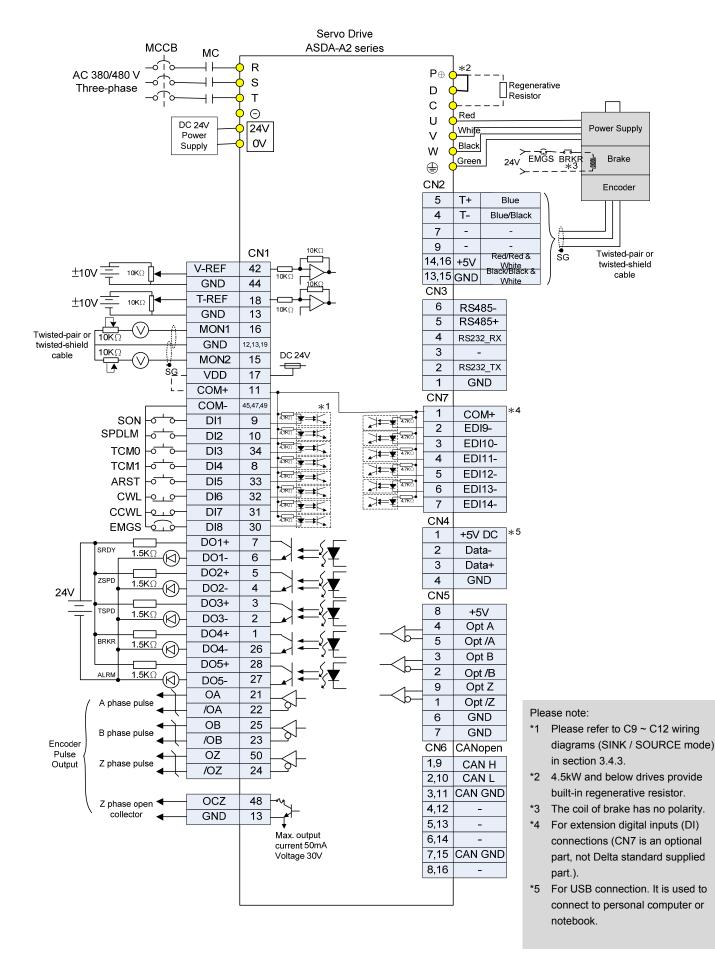
#### 3.13.2 Position (PR) Control Mode



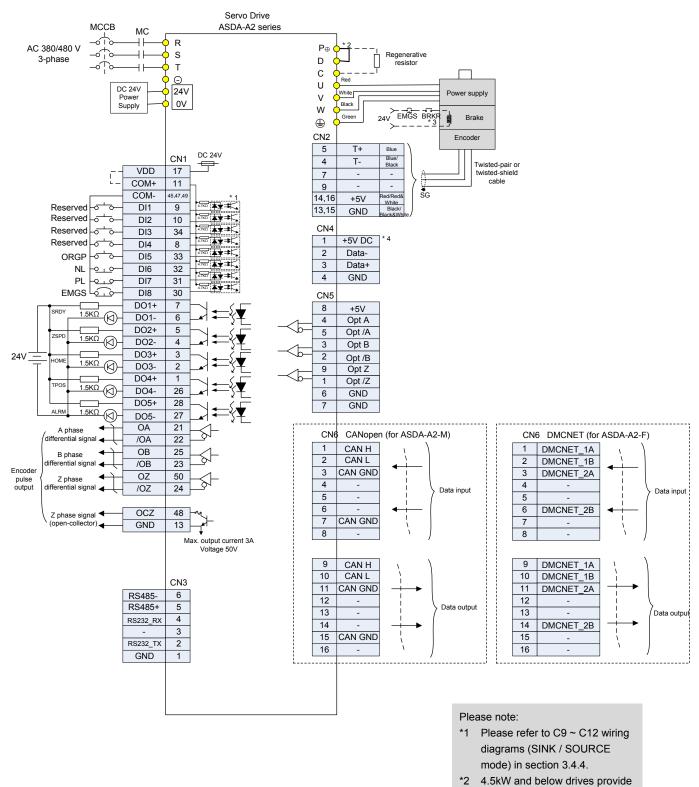
# 3.13.3 Speed Control Mode



#### 3.13.4 Torque Control Mode



#### 3.13.5 Communication Mode



Revision February, 2017

built-in regenerative resistor.

\*4 For USB connection. It is used to connect to personal computer or notebook.
\*5 A2-F only supports DMCNET

\*3 The coil of brake has no

polarity.

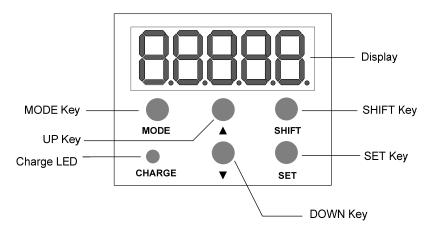
mode.

# Chapter 4 Panel Display and

# Operation

This chapter details the panel status and operation of ADSA-A2 series servo drive.

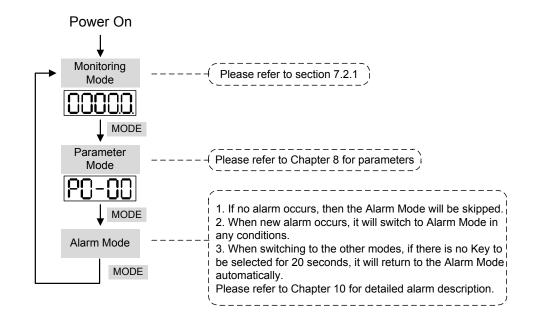
# 4.1 Panel Description



Name	Function
Display	Five-/Seven-segment display is for displaying the monitoring values, parameter values and setting values.
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 by using arrow keys.
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.
DOWN Key	Pressing the DOWN key can scroll through and change monitor codes, parameter groups and various parameter settings.
MODE Key	Pressing MODE key can enter or exit different parameter groups, and switch between Monitor mode and Parameter mode.
UP Key	Pressing the UP key can scroll through and change monitor codes, parameter groups and various parameter settings.
Charge LED	The Charge LED lights to indicate the power is applied to the circuit.

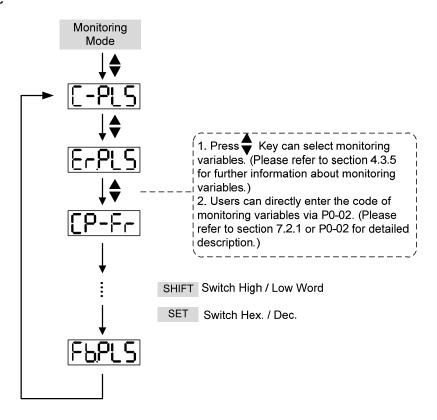
# 4.2 Parameter Setting Procedure

Switch the mode:

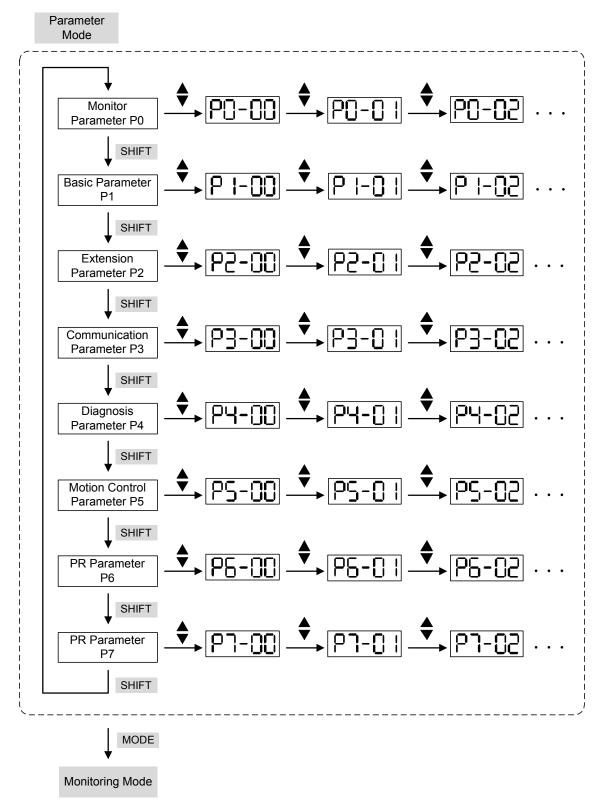


Operate in each mode:

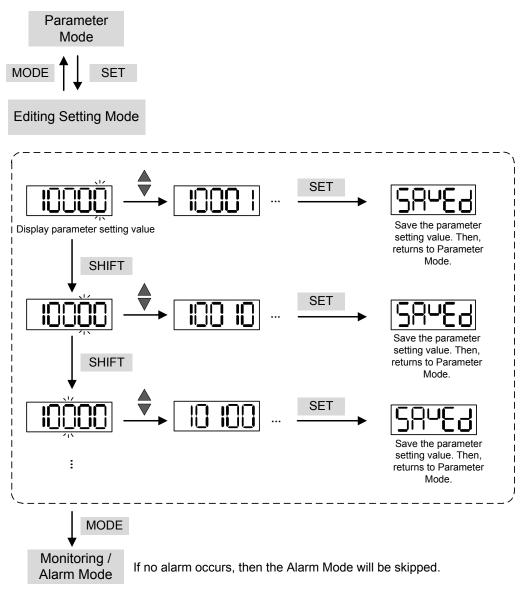
Monitoring mode



#### Parameter Mode



#### Edit Setting Mode



# 4.3 Status Display

# 4.3.1 Save Setting Display

When finishing editing parameter, press the SET Key to save the setting. The panel will display the setting status according to the setting for a second.

Displayed Symbol	Description
SRued	The setting value is saved correctly. (Saved)
r-OLY	Read-only parameter. Write-protected. (Read-Only)
Lochd	Enter the wrong password or no password has been entered. (Locked)
006-0	Incorrect setting value or enter the reserved setting value. (Out of Range)
S <sup>u</sup> -on	No entering is allowed when it is Servo ON. (Servo On)
Po-On	Parameter will be effective after the servo drive is re-powered on. (Power On)

# 4.3.2 Decimal Point

Display Symbol	Description
High Byte High Byte No Function Negative Sign	High byte / low byte indication: When the data is displayed in decimal 32 bits, it is for indicating the current high or low byte. Negative sign: When the data is displayed in decimal format, the two decimal points in the left represents the negative sign, no matter it is showed in 16 or 32 bits. When it is showed in hexadecimal format, it only shows positive sign.

## 4.3.3 Alarm Message

Displayed Symbol	Description
<u> Alnon</u>	When there is an error of the drive, it will show 'AL' as the alarm sign and 'nnn' as the alarm code. For further explanation, please refer to Chapter 8, P0-01, parameter description, or Chapter 10, Troubleshooting.

## 4.3.4 Positive and Negative Sign Setting

Displayed Symbol	Description		
83250	When entering into the Editing Setting Mode, pressing UP / DOWN Key can increase or decrease the displayed content. The SHIFT Key can change the desired adjusted carry value. (The carry value is blinking at the moment.)		
24680	Pressing the SHIFT Key for two seconds can switch the positive (+) and negative (-) sign. If the parameter is over the range after switching the positive or negative sign, then it cannot be switched.		

#### 4.3.5 Monitor Display

When the drive is applied to the power, the display will show the monitor displayed symbol for a second, and then enter into the Monitor Mode. In Monitor Mode, the UP / DOWN Key can change the desired monitor variable. Or, the user can directly change parameter P0-02 to set the monitor code. When applying to the power, the system will pre-set the monitor code according to the setting value of P0-02. For example, the setting value of P0-02 is 4. Every time when applying to the power, it will display C-PLS monitor sign first, and then shows the input pulse number of pulse command.

P0-02 Setting Value	Monitor Displayed Symbol	Description	Unit
0	FbPUU	Motor feedback pulse number (after the scaling of electronic gear ratio) (User unit)	[user unit]
1	[-PUU	Input pulse number of pulse command (after the scaling of electronic gear ratio) (User unit)	[user unit]
2	8-PUU	The difference of error pulse number between control command pulse and feedback pulse number (User unit)	[user unit]
3	FbPLS	Motor feedback pulse number (encoder unit) (1.28 millions Pulse/rev)	[pulse]
4	[-PLS	Input pulse number of pulse command (before the scaling of electronic gear ratio) (encoder unit)	[pulse]
5	8-965	Error pulse number (after the scaling of electronic gear ratio) (encoder unit)	[pulse]
6	[P-Fr	Input frequency of pulse command	[Kpps]
7	SPEEd	Motor speed	[r/min]
8	[593]	Speed input command	[Volt]
9	[5695]	Speed input command	[r/min]
10	[-29]	Torque input command	[Volt]
11	[-292]	Torque input command	[%]
12	800-6	Average torque	[%]
13	PE-L	Peak torque	[%]
14	ს ხან	Main circuit voltage	[Volt]
15	]-[	Load / Motor inertia ratio (Note: If it shows 13.0, it means the actual inertia is 13)	[1 times]
16	10977	IGBT temperature	[°C]

P0-02 Setting Value	Monitor Displayed Symbol	Description	Unit
17		Resonance frequency (Low byte is the first resonance and high byte is the second one).	[Hz]
18		The absolute pulse number of encoder Z phase equals to the homing value, 0. It will be +5000 or - 5000 pulse when rotating in forward or reverse direction.	-
19	INRP I	Mapping parameter #1: shows the content of parameter P0-25 (specify the mapping target by P0-35)	-
20	29800	Mapping parameter #2: shows the content of parameter P0-26 (specify the mapping target by P0-36)	-
21	NN823	Mapping parameter #3: shows the content of parameter P0-27 (specify the mapping target by P0-37)	-
22	<b>NNRP4</b>	Mapping parameter #4: shows the content of parameter P0-28 (specify the mapping target by P0-38)	-
23	<u>191</u>	Monitor variable #1: shows the content of parameter P0-09 (specify the monitor variable code by P0-17)	-
24	<u> 182</u>	Monitor variable #2: shows the content of parameter P0-10 (specify the monitor variable code by P0-18)	-
25	UR3	Monitor variable #3: shows the content of parameter P0-11 (specify the monitor variable code by P0-19)	-
26	<u> 184</u>	Monitor variable #4: shows the content of parameter P0-12 (specify the monitor variable code by P0-20)	-

Example of the displayed value	Status Description		
[] 1234 (Dec)	16 hito	If the value is 1234, it displays 01234 (shows in decimal format).	
(Hex)	16 bits	If the value is 0x1234, it displays 1234 (shows in hexadecimal format; the first digit does not show any).	
[2345] (Dec high) [6]890. (Dec low)	32 bits	If the value is 1234567890, the display of the high byte is 1234.5 and displays 67890 as the low byte (shows in decimal format).	

H 1234 (Hex high)	If the value is 0x12345678, the display of the high byte is h1234 and displays L5678 as the low byte (shows in hexadecimal format).
12345	Negative display. If the value is -12345, it displays 1.2.345 (only shows in decimal format; there is no positive or negative sign for hexadecimal format display).

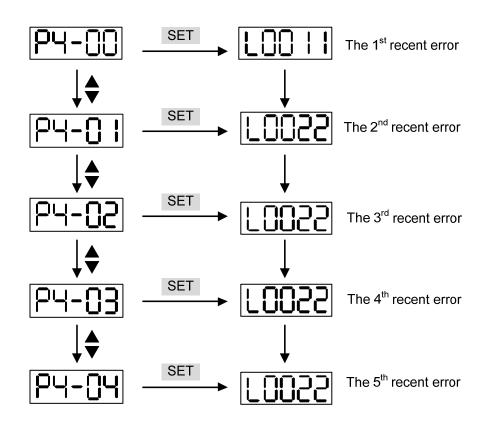


- 1) Dec means it is displayed in decimal format. Hex means it is displayed in hexadecimal format.
- 2) The above display methods can be applied in Monitor Mode and Editing Setting Mode.
- 3) When all monitor variables is 32 bits, high / low bit and the display (Dec/Hex) can be switched. According to the definition in Chapter 8, each parameter only supports one displaying method and cannot be switched.

# 4.4 General Function

# 4.4.1 Operation of Fault Record Display

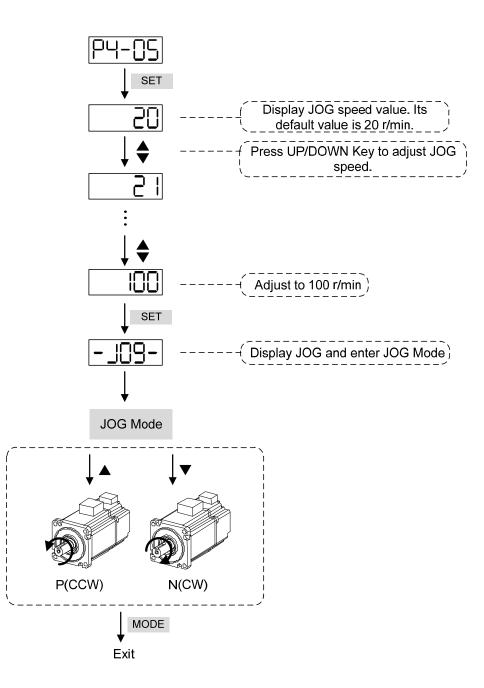
When it is in Parameter Mode, select P4-00~P4-04 and press the SET Key, the corresponding fault record will be shown.



#### 4.4.2 JOG Mode

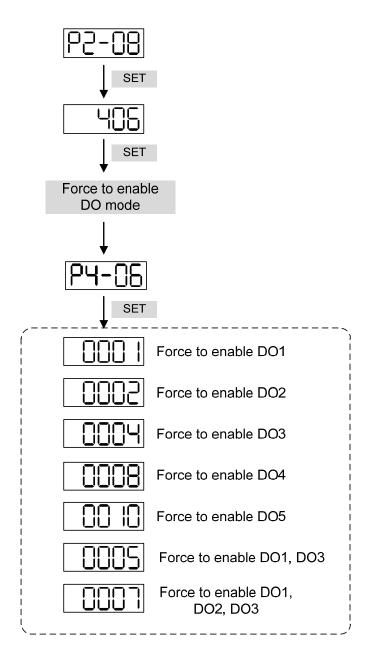
When it is in Parameter Mode, select P4-05 and follow the setting method below for JOG operation.

- (1) Press the SET Key to display the speed value of JOG. The default value is 20r/min.
- (2) Press UP or DOWN Key to adjust the desired speed value of JOG. It is adjusted to 100r/min in the example.
- (3) Press the SET Key to display JOG and enter JOG mode.
- (4) When it is in JOG Mode, press UP or DOWN Key to enable the servo motor in forward or reverse direction. The servo motor stops running as soon as the user stops pressing the key. JOG operation is working only when it is Servo ON.



#### 4.4.3 Force DO Output

Enter into the Output Diagnosis Mode by the following settings. Set P2-08 to 406 and enable the function of force DO output. Then, set the force DO output by binary method via P4-06. When the setting value is 2, DO2 will be forced to enable. When the setting value is 5, DO1 and DO3 will be forced to enable. No data is retained in this mode. It returns to the normal DO mode when repower on the drive or set P2-08 to 400.



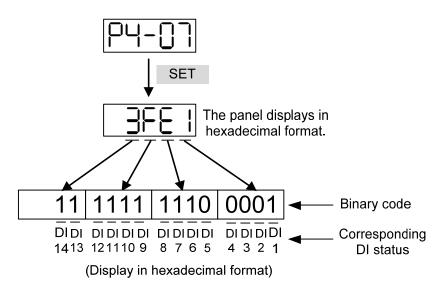
# 

P4-06 is displayed in hexadecimal format. Therefore, it will not show the fifth 0.

## 4.4.4 Digital Input Diagnosis Operation

Enter into the Digital Input Diagnosis Mode by the following setting methods. When the external output signal DI1~DI8 is ON, the corresponding signal will be shown on the panel. It is displayed by bit. When it shows bit, it means it is ON.

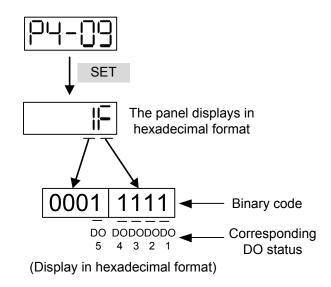
For example, if it shows **3FE1**, **E** is in hexadecimal format, it will be **1100** when it transfers to binary format. Then, DI6~DI8 is ON.



#### 4.4.5 Digital Output Diagnosis Operation

Enter into the Digital Output Diagnosis Mode by the following setting methods. The output signal DO1~DO5 is ON and the corresponding signal will be shown on the panel. It is displayed by bit. When it shows bit, it means it is ON.

For example, if it shows **1F**, **F** is in hexadecimal format, it will be **1111** when it transfers to binary format. Then, DO1~DO4 is ON.



# Chapter 5 Trial Operation and Tuning

This chapter is divided into two parts to describe the trial operation. The first one is the inspection without load and another one is the inspection with load. For safety reasons, please conduct the first inspection.

# 5.1 Inspection without Load

Please remove the load of the servo motor, including coupling on the shaft and accessories so as to avoid any damage on servo drive or mechanism. This is aiming to avoid the falling off of the disassembled parts of the motor shaft and indirectly causing the personnel injury or equipment damage during operation. Running the motor without load, if the servo motor can run during normal operation, then it can connect to load for operation.

Caution: Please operate the servo motor without load first. If the servo motor runs normally, connect the load afterwards in order to avoid any danger.

#### Please check the following items before operation.

Inspection before operation (has not applied to the power yet)

- Check if there is any obvious damage shown on its appearance.
- The splicing parts of the wiring terminal should be isolated.
- Make sure the wiring is correct so as to avoid the damage or any abnormity.
- Check if the electric conductivity objects including sheetmetal (such as screws) or inflammable objects are not inside the servo drive.
- Check if the control switch is in OFF status.
- Do not place the servo drive or external regenerative resistor on inflammable objects.
- To avoid the electromagnetic brake losing efficacy, please check if stop function and circuit break function can work normally.
- If the peripheral devices are interfered by the electronic instruments, please reduce electromagnetic interference with devices.
- Please make sure the external voltage level of the servo drive is correct.

Inspection before running the servo drive (has already applied to the power)

The encoder cable should avoid excessive stress. When the motor is running, make sure the cable is not frayed or over extended.

- Please contact with Delta if there is any vibration of the servo motor or unusual noise during the operation.
- Make sure the setting of the parameters is correct. Different machinery has different characteristic, please adjust the parameter according to the characteristic of each machinery.
- Please reset the parameter when the servo drive is in SERVO OFF status, or it may cause malfunction.
- When the relay is operating, make sure it can work properly.
- Check if the power indicator and LED display works normally.
- PWM is used to control 7.5 kW. Thus, when the temperature is lower than 40°C, the fan does not work.

# 5.2 Applying Power to the Servo Drive

Please follow the instructions below.

- A. Make sure the wiring between the motor and servo drive is correct.
  - 1) U, V, W and FG have to connect to cable red, white, black and green respectively. If the wiring is incorrect, the motor cannot work normally. The ground wire FG of the motor must be connected to the ground terminal of the servo drive. Please refer to Chapter 3.1 and 3.2 for wiring.
  - The encoder cable of the motor has correctly connected to CN2: If users only desire to execute JOG function, it is unnecessary to connect CN1 and CN3 (Please refer to Chapter 5.3). Refer to Chapter 3.1 and 3.5 for the wiring of CN2.

# Caution: Do not connect the power terminal (R, S, T) to the output terminal (U, V, W) of the servo drive. Or it might damage the servo drive.

**B.** Power circuit of the servo drive:

# Caution: Wiring of 220 V servo drive is different from 400 V. Make sure the wiring is correct, or it might damage the servo drive.

220V Servo Drive: Apply power to the servo drive. Please refer to Chapter 3.1.3 for power wiring.400V Servo Drive: Apply power to the servo drive. Please refer to Chapter 3.2.3 for power wiring.

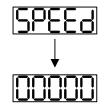
- C. Power on:
  - **220V Servo Drive:** Power of the servo drive: including control circuit (L1c, L2c) and main circuit (R, S, T) power.
  - **400V Servo Drive:** Power of the servo drive: including control circuit (DC24V, DC0V) and main circuit (R, S, T) power.

When the power is on, the display of the servo drive will be:

The digital input (DI6~DI8) of the default value is the signal of reverse limit error (NL), forward limit error (PL) and emergency stop (EMGS), if not using the default setting of DI6~DI8, adjusting the setting of P2-15~P2-17 is a must. Parameters could be set to 0 (disable this DI

function) or modified to another function.

From the last setting, the servo drive status displays parameter P0-02 setting as the motor speed (07), then the screen display will be:



When the screen displays no text, please check if the power of control circuit is under voltage.

1) When the screen displays:



Warning of overvoltage:

It means the voltage input by the main circuit is higher than the rated voltage or power input error (incorrect power system).

Corrective action:

- Use the voltmeter to measure if the input voltage from the main circuit is within the range of rated voltage value.
- Use the voltmeter to measure if the power system complies with the specification.
- 2) When the screen displays:



Warning of encoder error:

Check if the motor encoder is securely connected or the wiring is correct.

Corrective action:

- Check if the wiring is the same as the instruction of the user manual.
- Check the encoder connector.
- Check if the wiring is loose.
- Encoder is damaged.

3) When the screen displays:



Warning of emergency stop:

Please check if any of the digital input DI1~DI8 is set to emergency stop (EMGS). Corrective action:

- If not desire to set emergency stop (EMGS) as one of the digital input, make sure no digital input is set to emergency stop (EMGS) among DI1~DI8. (That is to say none of the parameters, P2-10~P2-17 is set to 21.)
- If the function of emergency stop (EMGS) is needed and this DI is set as normally close (function code: 0x0021), please make sure this DI is always normally close. If not, please set this DI as normally open (function code: 0x0121).
- 4) When the screen displays:



Warning of negative limit error:

Please check if any of the digital input DI1~DI8 is set to negative limit (NL) and that DI is ON.

Corrective action:

- If not desire to set negative limit (NL) as one of the digital input, make sure no digital input is set to negative limit (NL) among DI1~DI8. (That is to say none of the parameters, P2-10~P2-17 is set to 22.)
- If the function of negative limit (NL) is needed and this DI is set as normally close (function code: 0x0022), please make sure this DI is always normally close. If not, please set this DI as normally open (function code: 0x0122).
- 5) When the screen displays:



Warning of positive limit error:

Please check if any of the digital input DI1~DI8 is set positive limit (PL) and that DI is ON.

Corrective action:

- If not desire to set positive limit (PL) as one of the digital input, make sure no digital input is set to positive limit (PL) among DI1~DI8. (That is to say none of the parameters, P2-10~P2-17 is set to 23.)
- If the function of positive limit (PL) is needed and this DI is set as normally close (function code: 0x0023), please make sure this DI is always normally close. If not, please set this DI as normally open (function code: 0x0123).

6) When the screen displays:

Warning of over current:

Corrective Action:

- Check the connection between the motor and servo drive.
- Check if the conducting wire is short circuited.

Exclude short circuit and avoid metal conductors being exposed.

7) When the screen displays:

Warning of under voltage:

Corrective action:

- Check if the wiring of main circuit input voltage is correct.
- Use voltmeter to measure if the main circuit voltage is normal.
- Use voltmeter to measure if the power system complies with the specification.



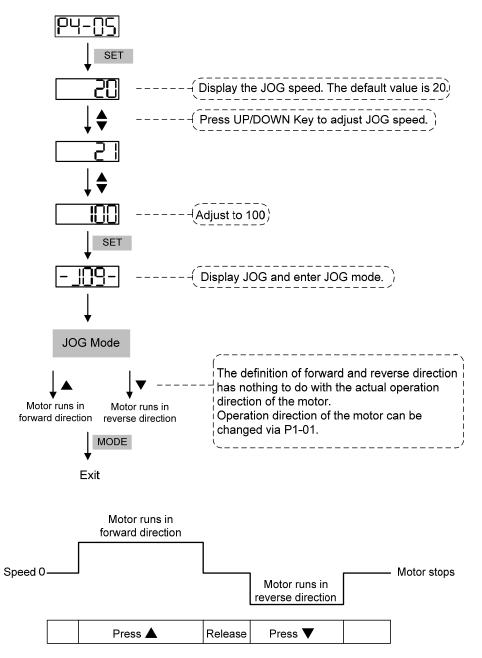
During the process of power on or servo on, if an alarm occurs or shows any abnormal display, please contact the distributors.

# 5.3 JOG Trial Run without Load

It is very convenient to test the motor and servo drive with the method of JOG trial run without load since the extra wiring is unnecessary. For safety reasons, it is recommended to set JOG at low speed. Please see the following descriptions.

- Step 1: Use software setting to Servo ON. Set parameter P2-30 to 1. This setting is to force the servo ON through software.
- Step 2: Set P4-05 as JOG speed (Unit: r/min). After setting the desired JOG speed, press the SET Key, the servo drive will enter JOG mode.

Step 3: Press the MODE Key to exist JOG mode.



If the motor does not run, please check if the wiring between UVW and encoder cable is correct. If the motor run abnormally, please check if the UVW phase sequence is correct.

# 5.4 Trial Run without Load (Speed Mode)

Before the trial run without load, firmly secure the motor base so as to avoid the danger cause by the reaction of motor operation.

#### Step 1:

Set the control mode of the servo drive to speed mode. Set P1-01 to 2 as speed mode. Then, repower on the servo drive.

#### Step 2:

-				
Digital Input	Parameter Setting Value	Symbol	Function Description	CN1 Pin No
DI1	P2-10 = 101	SON	Servo ON	DI1- = 9
DI2	P2-11 = 109	TRQLM	Torque limit	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	Alarm reset	DI5- = 33
DI6	P2-15 = 0	Disabled	Invalid DI function	-
DI7	P2-16 = 0	Disabled	Invalid DI function	-
DI8	P2-17 = 0	Disabled	Invalid DI function	-
EDI9	P2-36 = 0	Disabled	Invalid DI function	CN7 = 2
EDI10	P2-37 = 0	Disabled	Invalid DI function	CN7 = 3
EDI11	P2-38 = 0	Disabled	Invalid DI function	CN7 = 4
EDI12	P2-39 = 0	Disabled	Invalid DI function	CN7 = 5
EDI13	P2-40 = 0	Disabled	Invalid DI function	CN7 = 6
EDI14	P2-41 = 0	Disabled	Invalid DI function	CN7 = 7

In speed control mode, the digital input settings of trial run are as follows:

The above table disables the function of negative limit (DI6), positive limit (DI7) and emergency stop (DI8). Thus, the value of parameter P2-15  $\sim$  P2-17 and P2-36  $\sim$  P2-41 are set to 0 (Disabled). The digital input of Delta' s servo drive can be programmed by users. When programming digital input, please refer to the description of DI code.

The default setting includes the function of negative limit, positive limit and emergency stop, therefore, after the setting is completed, if there is any alarm occurs, please re-power on the servo drive or switch ON DI5 to clear the alarm. Please refer to Chapter 5.2.

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

The speed command selection is determined by SPD0 and SPD1. See the table below.

0: means DI is OFF; 1: means DI is ON

#### Register parameter

The parameter setting range is from -60000 to 60000. Setting speed = Setting range x unit (0.1 r/min).

For example: P1-09 = +30000; Setting speed = +30000 x 0.1 r/min = +3000 r/min

Command setting of speed register

Set parameter P1-09 to 30000.	Input command	Rotation direction
Set parameter P1-10 to 1000.	+	CW
Set parameter P1-11 to -30000.	-	CCW

#### Step 3:

- (1) Users switch ON DI1 and Servo ON.
- (2) Both DI3 (SPD0) and DI4 (SPD1), the speed command, are OFF, which means it currently executes S1 command. The motor rotates according to analog voltage command.
- (3) When DI3 (SPD0) is ON, it means it currently executes S2 command (3000 r/min). The rotation speed is 3000 r/min for rotary motor and 0.03 m/s for linear motor at the moment.
- (4) When DI4 (SPD1) is ON, it means it currently executes S3 command (100 r/min). The rotation speed is 100 r/min.
- (5) When both DI3 (SPD0) and DI4 (SPD1) are ON, it means S4 command (-3000 r/min) is executed at the moment. The rotation speed is -3000 r/min.
- (6) Step (3), (4) and (5) can be repeatedly executed.
- (7) If users desire to stop the motor, switch OFF DI1 (Servo OFF).

# 5.5 Trial Run without Load (Position Mode)

Before the trial run without load, firmly secure the motor base so as to avoid the danger cause by the reaction of motor operation.

#### Step 1:

Set the control mode of the servo drive to position mode.

Set parameter P1-01 to 1, which is the position mode. Then, re-power on the servo drive.

Digital Input	Parameter Setting Value	Symbol	Function Description	CN1 Pin No
DI1	P2-10 = 101 SON Servo ON		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	Alarm reset	DI5- = 33
DI6	P2-15 = 0	Disabled	Invalid DI function	-
DI7	P2-16 = 0	Disabled	Invalid DI function	-
DI8	P2-17 = 0	Disabled	Invalid DI function	-
EDI9	P2-36 = 0	Disabled	Invalid DI function	CN7 = 2
EDI10	P2-37 = 0	Disabled	Invalid DI function	CN7 = 3
EDI11	P2-38 = 0	Disabled	Invalid DI function	CN7 = 4
EDI12	P2-39 = 0	Disabled	Invalid DI function	CN7 = 5
EDI13	P2-40 = 0	Disabled	Invalid DI function	CN7 = 6
EDI14	P2-41 = 0	Disabled	Invalid DI function	CN7 = 7

**Step 2:** In position mode, the digital input settings of trial run are as follows:

The above table disables the function of negative limit (DI6), positive limit (DI7) and emergency stop (DI8), thus, set P2-15 ~ P2-17 and P2-36 ~ P2-41 to 0 (Disabled). The digital input of Delta's servo drive can be programmed by users. When programming digital input, please refer to the description of DI code.

The default setting includes the function of negative limit, positive limit and emergency stop, therefore, after the setting is completed, if there is any alarm occurs, please re-power on the servo drive or switch ON DI5 to clear the alarm. Please refer to Chapter 5.2.

Please refer to Chapter 3.12.2, Position (PR) Mode Standard Wiring for wiring diagram. However, since POS2 is not the default digital input, set P2-14 to 113. Please refer to the table below for 64 sets of register command, POS0~POS5 and the relative parameters.

Position Command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Corresponding Parameter
PR0	0	0	0	0	0	0	1	P6-00
FRU	U	0	0	0	0	0		P6-01
	•	0	0	0	0	1	1	P6-02
PR1	0	0	0	0	0	1		P6-03
~								~
DD50	4	4	0	0	4	0	Î	P6-98
PR50	1	1	0	0	1	0		P6-99
	4	4	0	0	4	4	1	P7-00
PR51	1	1	0	0	1	1		P7-01
~								~
	2R64 1 1 1	4	4	4	4	<b>↑</b>	P7-26	
PR64	1	1	1	I	1	1		P7-27

0: means DI is OFF; 1: means DI is ON

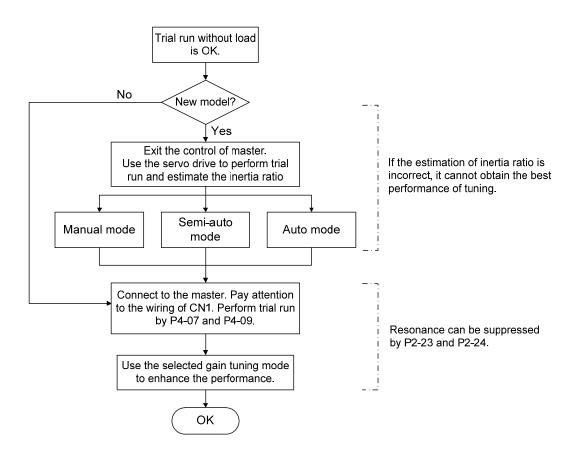
Users can set the 64-set of command value (P6-00~P7-27). The value can be set as the absolute position command.

# 5.6 Tuning Procedure

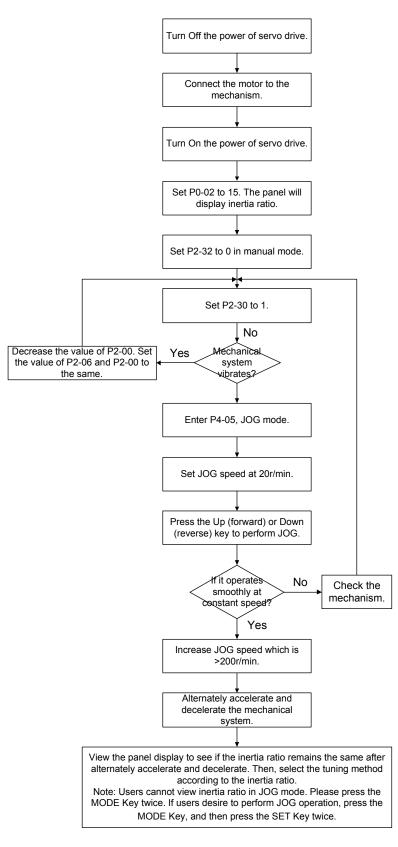
Estimate the inertia ratio: JOG Mode

	Tuning Procedure	Display
1.	After completing wiring, when applying to the power, the servo drive will display:	RL() 13
2.	Press the <b>MODE</b> Key to select the mode of parameter function.	P0-00
3.	Press the <b>SHIFT</b> Key twice to select the mode of parameter group.	65-00
4.	Press the <b>UP</b> Key to select parameter P2-17.	65- 11
5.	Press the <b>SET</b> Key to display parameter value, which is shown as the content on the right.	15
6.	Press the <b>SHIFT</b> Key twice, then press the <b>UP</b> Key and then press the <b>SET</b> Key.	1.21
7.	Press the <b>UP</b> Key to select parameter P2-30.	<u> 95-30</u>
8.	Press the <b>SET</b> Key to display the parameter value.	
9.	Press the <b>UP</b> Key and select the parameter value 1.	ŀ
10.	Then, the servo drive is ON and will show:	
11.	Press the <b>MODE</b> Key and then press the <b>DOWN</b> Key to select the value of inertia ratio.	JL
12.	The panel displays the current value of inertia ratio / total weight of movable section and load (kg) (default value).	50
13.	Press the <b>MODE</b> Key to select the mode of parameter function.	P2-30
14.	Press the <b>SHIFT</b> Key twice to select the mode of parameter group.	P4-00
15.	Press the <b>UP</b> Key twice to select parameter P4-05.	P4-05
16.	Press the <b>SET</b> Key to show the content, which is 20r/min at JOG speed. Press the <b>UP</b> or <b>DOWN</b> Key to increase or decrease the JOG speed. Press the <b>SHIFT</b> Key to move to the next digit of the left.	
		200
17.	Set the desired JOG speed and press the <b>SET</b> Key which is shown as the figure on the right.	- 309-
18.	Press the <b>UP</b> Key to rotate the motor in forward direction while press the <b>D</b> motor will rotate in reverse direction.	OWN Key the
19.	Execute JOG operation at low speed first. With the constant speed, if the m smoothly in forward and reverse direction, users can execute JOG operatio	•
20.	In P4-05, the servo drive cannot display inertia ratio. Please press the <b>MOD</b> view the value of inertia ratio. If users desire to execute JOG operation again <b>MODE</b> Key, and then press the <b>SET</b> Key twice. Observe the panel display to inertia ratio / total weight of movable section and load remain at the same value acceleration and deceleration.	in, press the to see if the load

## 5.6.1 Flowchart of Tuning Procedure



## 5.6.2 Inertia Estimation Flowchart (with Mechanism)



## 5.6.3 Flowchart of Auto Tuning

Set P2-32 to 1 (auto mode, continuous tuning)

Continue to estimate the system inertia. Automatically save the value in P1-37 every 30 minutes and refer the stiffness and bandwidth setting of P2-31.

P2-31 Stiffness setting in auto tuning mode (The default value is 80)

In auto and semi-auto mode, the bandwidth setting of speed circuit is:

1 ~ 50 Hz: low-stiffness, low-response

51 ~ 250 Hz: medium-stiffness, medium-response

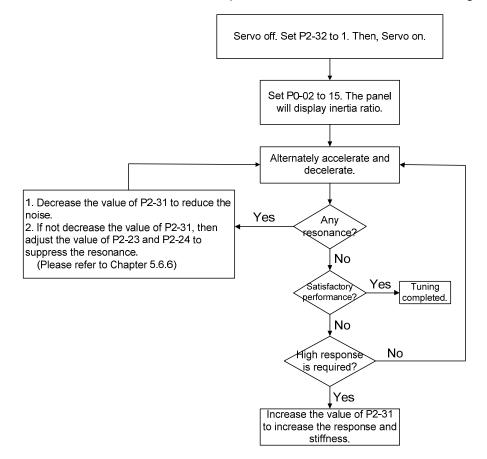
251 ~ 850 Hz: high-stiffness, high-response

851 ~ 1000 Hz: extremely high-stiffness, extremely high-response

Stiffness setting in auto tuning mode: the bigger the value is, the stronger the stiffness will be.

Adjust the value of P2-31: Increase the value of P2-31 to increase stiffness or decrease to reduce

the noise. Continue to tune until the performance is satisfied. Then, tuning is completed.



## 5.6.4 Flowchart of Semi-Auto Tuning

Set P2-32 to 2 (semi-auto mode, non-continuous tuning)

After tuning for a while and wait until the system inertia is stable, it stops estimating. The estimated inertia ratio will be saved to P1-37. When switching mode from manual or auto to semi auto, the system starts tuning again. During the process of estimation, the system will refer the stiffness and bandwidth setting of P2-31.

P2-31 Response setting in auto mode (The default value is 80)

In auto and semi-auto mode, the bandwidth setting of speed circuit is:

1 ~ 50 Hz: low-stiffness, low-response

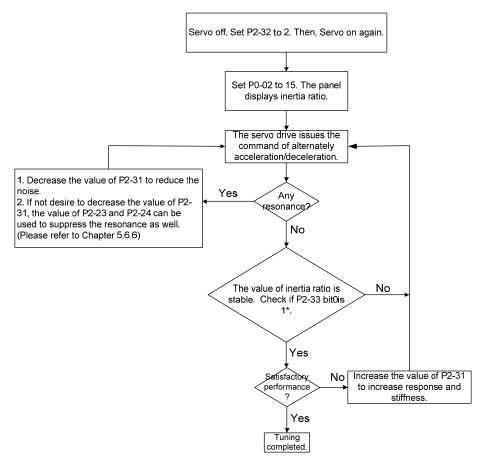
51 ~ 250 Hz: medium-stiffness, medium-response

251 ~ 850 Hz: high-stiffness, high-response

851 ~ 1000 Hz: extremely high-stiffness, extremely high-response

Response setting in semi-auto tuning mode: the bigger the value is, the better the response will be.

Adjust the value of P2-31: Increase the value of P2-31 to increase the response or decrease to reduce the noise. Continue to tune until the performance is satisfied. Then, tuning is completed.





- 1. If P2-33 bit 0 is set to 1, it means the inertia estimation in semi-auto mode is completed. The result can be accessed by P1-37.
- 2. If the value of P2-33 bit 0 is cleared to 0, the system will start to estimate again.

## 5.6.5 Limit of Inertia Ratio

Acceleration / Deceleration time of reaching 2000 r/min should be less than 1 second.

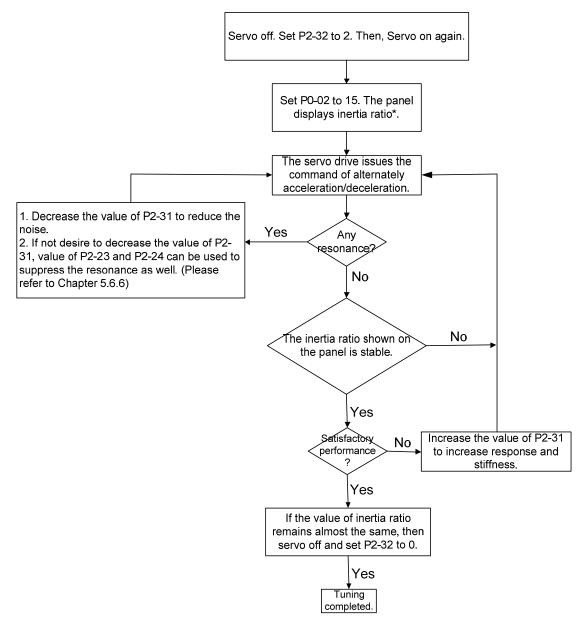
The speed in forward and reverse direction should be higher than 200 r/min.

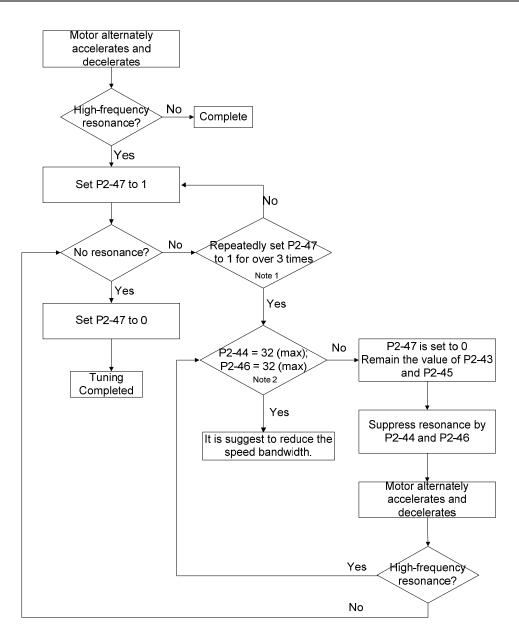
The load inertia should be under 100 times of motor inertia.

The change of external force of inertia ratio cannot be too severe.

In auto mode, the inertia value will be saved to P1-37 every 30 minutes; while in semi-auto mode,

the inertia value will be saved to P1-37 only until the system inertia is stable and stops the estimation of load inertia.



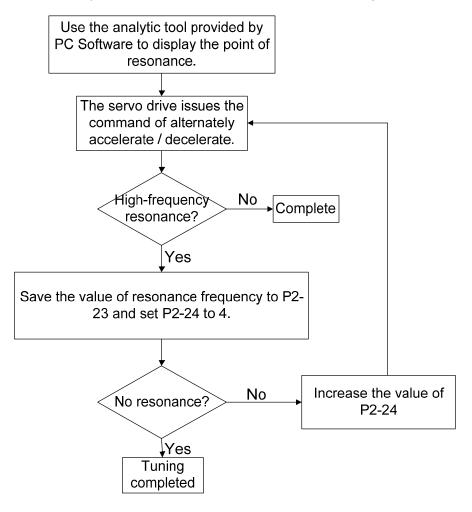


- Parameter P2-44 and P2-46 are the setting value of resonance suppression. If the value has been set to the maximum (32dB), and still cannot suppress the resonance, please reduce the speed bandwidth. After setting P2-47, users can check the value of P2-44 and P2-46. If the value of P2-44 is not 0, it means the resonance frequency exists in the system. Then, users can access P2-43 to see the resonance frequency (Hz). When there is another resonance frequency, the information will be shown in P2-45 and p2-46.
- 2. If resonance still exists, repeatedly set P2-47 to 1 for 3 times and manually adjust the setting of resonance.

## 5.6.6 Mechanical Resonance Suppression Method

Three groups of Notch filter are provided to suppress mechanical resonance. Two of them can be set to the auto resonance suppression and manual adjustment.

The procedure of manually suppress the resonance is as the followings:



## 5.6.7 Tuning Mode and Parameters

Tuning mode	P2-32	Auto-set parameters	User-defined parameters	Inertia adjustment
Manual mode	0 (default setting)	N/A	<ul> <li>P1-37 (Inertia ratio of the motor)</li> <li>P2-00 (Position control gain)</li> <li>P2-04 (Speed control gain)</li> <li>P2-06 (Speed integral compensation)</li> <li>P2-25 (Low-pass filter of resonance suppression)</li> <li>P2-26 (Anti-interference gain)</li> </ul>	The value remains
Auto mode (continuous estimation)	1	P1-37 P2-00 P2-04 P2-06 P2-25 P2-26 P2-26 P2-49	P2-31 Frequency response of speed loop setting in auto mode (response level)	Continuous tuning (update the inertia every 30 minutes)
Semi-auto mode (non-continuous estimation)	2	P1-37 P2-00 P2-04 P2-06 P2-25 P2-26 P2-49	P2-31 Frequency response of speed loop setting in semi-auto mode (response level)	Non-continuous tuning (stop updating the inertia after operating for a while)

When switching mode from auto mode 1 to manual mode 0, the value of P1-37, P2-00, P2-04, P2-06, P2-25, P2-26 and P2-49 will be modified to the one in auto mode.

When switching mode from semi-auto mode 2 to manual mode 0, the value of P1-37, P2-00, P2-04, P2-06, P2-25, P2-26 and P2-49 will be modified to the one in semi-auto mode.

#### 5.6.8 Tuning in Manual Mode

The selection of position / speed response frequency should be determined by the machinary stiffness and application. General speaking, the high-frequency machinary or the one requries precise processing needs the higher response frequency. However, it might easily cause the resonance. And the stronger stiffness machinary is needed to avoid the resonance. When using the unknown resonse frequency machinary, users could gradually increase the gain setting value to increase the resonse frequency. Then, decrease the gain setting value until the resonance exists. The followings are the related descriptions of gain adjustment.

Position control gain (KPP, parameter P2-00)

This parameter determines the response of position loop. The bigger KPP value will cause the higher response frequency of position loop. And it will cause better following error, smaller position error, and shorter settling time. However, if the value is set too big, the machinery will vibrate or overshoot when positioning. The calculation of position loop frequency response is as the following:

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

#### Speed control gain (KVP, parameter P2-04)

This parameter determines the response of speed loop. The bigger KVP value will cause the higher response frequency of speed loop and better following error. However, if the value is set too big, it would easily cause machinery resonance. The response frequency of speed loop must be 4~6 times higher than the response frequency of position loop. Otherwise, the machinery might vibrate or overshoot when positioning. The calculation of speed loop frequency response is as the following:

Speed Loop Frequency Response fv =  $\left(\frac{\text{KVP}}{2\pi}\right) \times \left[\frac{(1+P1-37/10)}{(1+JL/JM)}\right]$  Hz JM: Motor Inertia; JL: Load Inertia; P1-37: 0.1 times

When P1-37 (estimation or setting) equals the real inertia ratio (JL/JM), the real speed loop frequency response will be: fv =  $\frac{KVP}{2\pi}$  Hz

■ Speed integral compensation (KVI, parameter P2-06)

The higher the KVI value is, the better capability of eliminating the deviation will be. However, if the value is set too big, it might easily cause the vibration of machinery. It is suggested to set the value as the following:

KVI (P2 – 06)  $\leq$  1.5 × Speed Loop Frequency Response

■ Low-pass filter of resonance suppression (NLP, parameter P2-25)

The high value of inertia ratio will reduce the frequency response of speed loop. Therefore, the KVP value must be increased to maintain the response frequency. During the process of increasing KVP value, it might cause machinary resonance. Please use this parameter to elimiate the noise of resonance. The bigger the value is, the better the capability of improving high-frequency noise will be. However, if the value is set too big, it would cause the unstability of speed loop and overshoot. It is suggested to set the value as the following:

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

Anti-interference gain (DST, parameter P2-26)

This parameter is used to strengthen the ability of resisting external force and gradually eliminate overshoot during acceleration / deceleration. Its default value is 0. It is suggested not to adjust the value in manual mode, unless it is for fine-tuning.

■ Position feed forward gain (PFG, parameter P2-02)

It can reduce the position error and shorten the settling time. However, if the value is set too big, it might cause overshoot. If the setting of e-gear ratio is bigger than 10, it might cause the noise as well.

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# **Chapter 6 Control Mode of**

# Operation

# 6.1 Selection of Operation Mode

Three basic operation modes are provided in this servo drive, position, speed and torque. Users can use single mode (only in one-mode control) and dual mode to control. The following table lists all operation mode and description.

	Mode Name		Setting Code	Description
	Position mode (Terminal input)	PT	00	The servo drive receives position command and commands the motor to the target position. The position command is input via terminal block and receives pulse signal.
	Position mode (Register input)	PR	01	The servo drive receives position command and commands the motor to the target position. The position command is issued by register (64 sets of register in total) and uses DI signal to select the register.
	Speed Mode	S	02	The servo drive receives speed command and commands the motor to the target speed. The speed command can be issued by register (3 sets of registers in total) or the external analog voltage (-10V $\sim$ +10V). DI signal is used to select the command source.
Single Mode	Speed mode (No analog input)	Sz	04	The servo drive receives speed command and commands the motor to the target speed. The speed command is issued by register (3 sets of registers in total) and cannot be issued by the external terminal block. DI signal is used to select the command source.
	Torque mode	Т	03	The servo drive receives torque command and commands the motor to the target torque. The torque command can be issued by register (3 sets of registers in total) or the external analog voltage (-10V $\sim$ +10V). DI signal is used to select the command source.
	Torque mode (No analog input)	Tz	05	The servo drive receives torque command and commands the motor to the target torque. The torque command can be issued by register (3 sets of registers in total) and cannot be issued by the external terminal block. DI signal is used to select the command source.

Mode Name	Short Name	Setting Code	Description
	PT-S	06	Switch the mode of PT and S via DI signal.
	PT-T	07	Switch the mode of PT and T via DI signal.
	PR-S	08	Switch the mode of PR and S via DI signal.
Dual Mode	PR-T	09	Switch the mode of PR and T via DI signal.
Dual Mode	S-T	0A	Switch the mode of S and T via DI signal.
	CANopen	0B	Control by the master
	Reserved	0C	Reserved
	PT-PR	0D	Switch the mode of PT and PR via DI signal.
Multi Mode	PT-PR-S	0E	Switch the mode of PT, PR and S via DI signal.
	PT-PR-T	0F	Switch the mode of PT, PR and T via DI signal.

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 Mode

The followings describe the related information and settings of position mode.

## 6.2.1 Position Command in PT Mode

PT, position command is the pulse input from terminal block. There are three types of pulse and each type has positive/negative logic which can be set in parameter P1-00. See as the followings.

P1-00▲	РТТ	External Pulse Input	Туре	Address: 0100H 0101H
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.1
	Operational Interface :	Panel / Software Communication		
	Default :	0x2		
	Control Mode :	PT		
	Unit :	-		
	Range :	0~1132		
	Data Size :	16-bit		
	Format :	Hexadecimal		
	Settings :	lse type lter width ogic type ternal pulse input son ot in use	urce	
	1: Clock	vpe hase pulse (4x) wise (CW) and Counter + symbol	clockwise (CCW) pulse	2

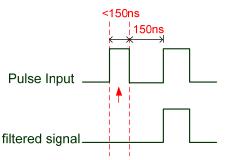
Other settings: reserved

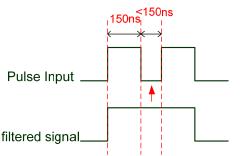
#### Filter Width

If the received frequency is much higher than the setting, it will be regarded as the noise and filtered out.

Setting Value	Min. pulse width*note1 (Low-speed filter frequency)	Setting Value	Min. pulse width*note1 (High-speed filter frequency)
0	600 ns (0.83 Mpps)	0	150 ns (3.33 Mpps)
1	2.4 us (208 Kpps)	1	600 ns (0.83 Mpps)
2	4.8 us (104 Kpps)	2	1.2 us (416 Kpps)
3	9.6 us (52 Kpps)	3	2.4 us (208 Kpps)
4	No filter function	4	No filter function

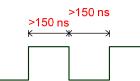
1) When the source of external pulse is from the high-speed differential signal and the setting value is 0 (the high-speed filter frequency is 3.33Mpps at the moment), then:





When this pulse width is shorter than 150 ns, it will be seen as low level. Two input pulse will be seen as one.

When this pulse width is shorter than 150 ns, it will be seen as high level. Two input pulse will be seen as one.

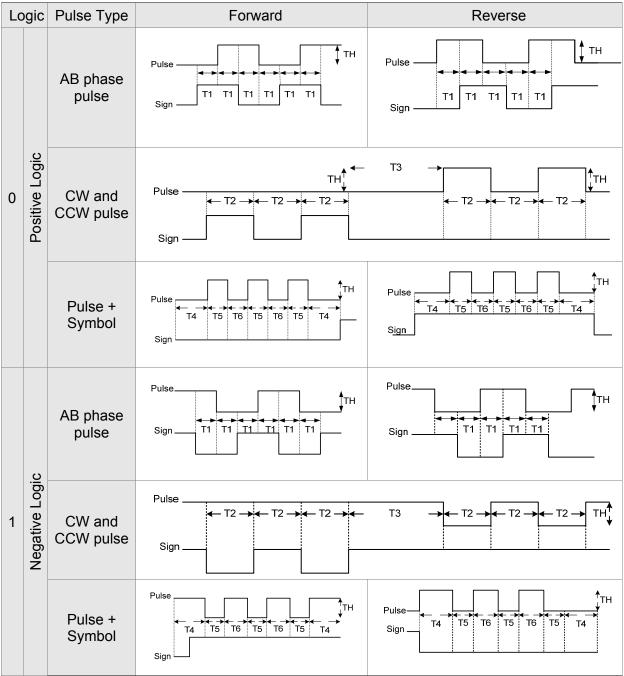


When High, Low duty of the pulse width are longer than 150 ns, it can ensure the pulse command will not be filtered.

If the user uses 2~4MHz input pulse, it is suggested to set the filter value to 4.

Note: When the signal is the high-speed pulse specification of 4 Mpps and the settings value of the filter is 4, then the pulse will not be filtered.

#### • Logic Type



Pulse S	pecification	Max. Input Frequency	Minimum time width						
		ricqueriey	T1	T2	Т3	T4	Т5	Т6	
High-speed pulse	Differential Signal	4 Mpps	62.5ns	125ns	250ns	200ns	125ns	125ns	
Low-speed pulse	Differential Signal	500 Kpps	0.5µs	1µs	2µs	2µs	1µs	1µs	
	Open-collector	200 Kpps	1.25µs	2.5µs	5µs	5µs	2.5µs	2.5µs	

Pulse Spe	ecification	Max. Input Frequency	Voltage Specification	Forward Current
High-speed pulse	Differential Signal	4 Mpps	5V	< 25 mA
Low-speed pulse	Differential Signal	500 Kpps	2.8V ~ 3.7V	< 25 mA
	Open-collector	200 Kpps	24V (Max.)	< 25 mA

- The Source of External Pulse:
  - 0: Low-speed optical coupler (CN1 Pin: PULSE, SIGN)
  - 1: High-speed differential (CN1 Pin: HPULSE, HSIGN)

Position pulse can be input from CN1 terminal, PULSE (43), /PULSE (41), HPULSE (38), /HPULSE (29) and SIGN (36), /SIGN (37), HSIGN (46), /HSIGN (40). It could be open-collector or Line Driver. Please refer to Chapter 3.9.1 for wiring method.

## 6.2.2 Position Command in PR Mode

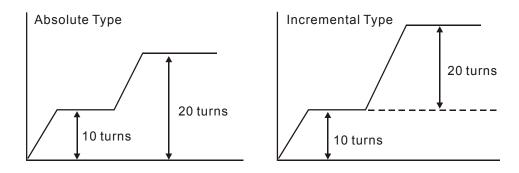
PR position command source of each axis is from the 64-set of register which constituted by parameters (P6-00, P6-01) ~ (P7-26, P7-27). Through communication, one of the 99-set of register can be used as the position command. When going with the external DI/DO (CN1, POS0 ~POS5 and CTRG), one of the previous 64 sets of register can be selected as the position command. See as the following table:

Position Command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Parameters
P1	ON	ON	ON	ON	ON	ON	<b>↑</b>	P6-00
								P6-01
<b>D</b> 2							<b>↑</b>	P6-02
P2	ON	ON	ON	ON	ON	OFF		P6-03
~								~
DEO	OFF	OFF		ON	OFF	ON	<b>↑</b>	P6-98
P50	UFF	UFF	ON	UN	OFF	ON		P6-99
DE1	OFF	OFF			OFF	OFF	<b>↑</b>	P7-00
P51	UFF	UFF	ON	ON	OFF	UFF		P7-01
~								~
	OFF	OFF	OFF	OFF	OFF	OFF	<b>↑</b>	P7-26
P64					OFF			P7-27

Status of POS0 ~ POS5: 0 means the DI is OFF; 1 means the DI is ON.

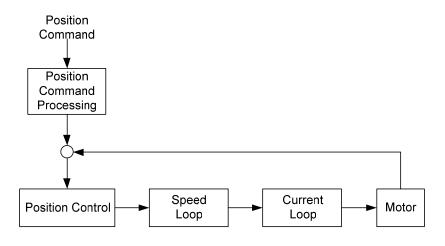
CTRG<sup>↑</sup>: the moment DI is OFF to ON.

The application of absolute type and incremental type register is rather extensive. It is more like a simple procedure control. Users can complete the cyclic operation by referring to the above table. For example, position command P1 is 10 turns and P2 is 20 turns. P1 is issued first and P2 comes after. The following diagram shows the difference of both.

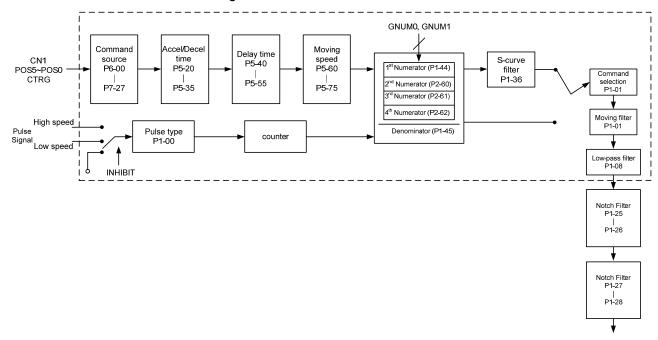


## 6.2.3 Control Structure of Position Mode

The basic control structure is as the following diagram:



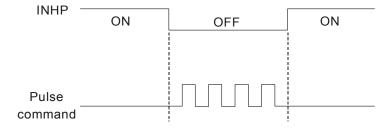
For a better control, the pulse signal should be processed and modified through position command unit. Structure is shown as the diagram below.



The upper path of the above diagram is PR mode and the lower one is PT mode which could be selected via P1-01. Both modes can set E-gear ratio for the proper position resolution. Moreover, either S-curve filter or low-pass filter can be used to smooth the command. See the description in later parts.

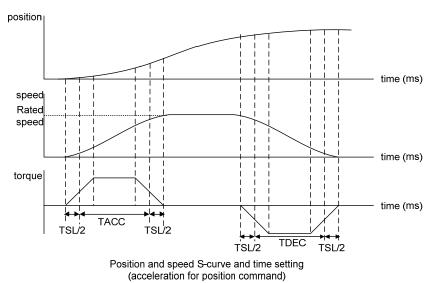
#### Pulse Command Inhibit Input Function (INHP)

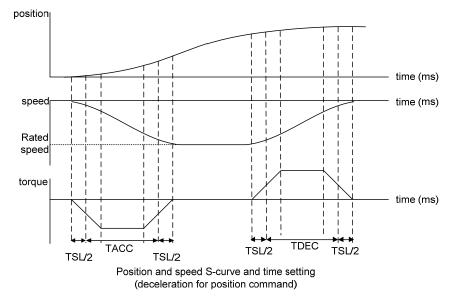
Use DI to select INHP (Refer to P2-10~17 and table 8.1 INHP (45)) before using this function. If not, this function will be unable to use. When DI (INHP) is ON, the pulse command will be cleared in position control mode and the motor will stop running. (Only DI 8 supports this function.)



## 6.2.4 S-curve Filter (Position)

S-curve filter smoothes the motion command. With S-curve filter, the process of acceleration becomes more continuous and the jerk will be smaller. It not only improves the performance when motor accelerates / decelerates, but also smoothes the operation of mechanical structure. When the load inertia increases, the operation of the motor will be influenced by friction and inertia during the time of activation and stop. However, the situation can be improved by increasing the value of Acceleration / Deceleration Constant of S-Curve (TSL), Acceleration Constant of S-Curve (TACC) and Deceleration Constant of S-Curve (TDEC). When the position command source is pulse, its speed and angular acceleration is continuous, thus, S-curve filter is not a must.





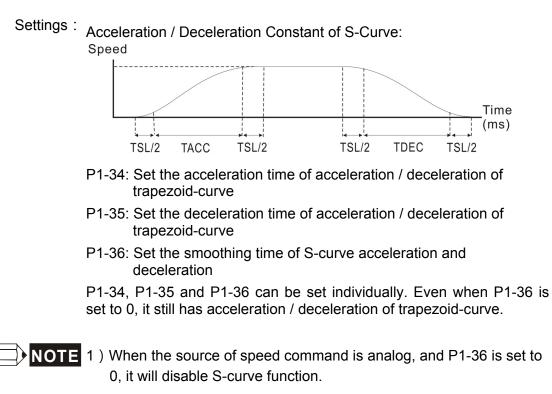
#### **Relevant Parameters:**

P1-34	TACC	Ac	celeration Constant c	Address: 0144H 0145H			
	Operatio Interfac		Panel / Software	Communication	Related Section: 6.3.3		
	Defau	lt :	200				
	Con Mod		S				
	Un	it :	ms				
	Range: Data Size:		1 ~ 65500	-			
			16-bit				
,	Forma	at :	Decimal	-			
Settings			Acceleration Constant of Rotary Motor: The time that speed command accelerates from 0 to the rated speed. Acceleration Constant of Linear Motor The time that speed command accelerates from 0 to 5m/s. P1-34, P1-35 and P1-36, the acceleration time of speed command from zero to the rated speed, all can be set individually. Even when P1 36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.				
			<ol> <li>When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.</li> </ol>				
			2) When the source of speed command is analog, the max. range o P1-34 will be set within 20000 automatically.				

P1-35	TDEC	De	celeration Constant o	Address: 0146H 0147H	
	Operational Interface :		Panel / Software	Communication	Related Section: 6.3.3
	Defau	lt :	200		
	Contro Mode: Unit:		S		
			ms		
	Range :		1 ~ 65500		
	Data Size :		16-bit		
	Forma	at :	Decimal		
	Setting	om the rated speed to 0. om 5m/s to 0. e of speed command dividually. Even when P1- ation of trapezoid-curve.			
<b>NOTE</b> 1 ) When the source of speed comma 0, it will disable S-curve function.				-	alog, and P1-36 is set to

2 ) When the source of speed command is analog, the max. range of P1-35 will be set within 20000 automatically.

P1-36	ISI	Aco Cui	celeration / Deceler rve	Address: 0148H 0149H	
	Operational Interface : Default :		Panel / Software	Communication	Related Section: 6.3.3
			0		
	Con Mod	ntrol e:	s, PR		
	Un	it :	ms		
	Range: 0 Data Size: 1		0 ~ 65500 (0: disable this function)		
			16-bit		
	Forma	at :	Decimal		



2) When the source of speed command is analog, the max. range of P1-36 will be set within 10000 automatically.

## 6.2.5 Electronic Gear Ratio

#### Related parameters:

P1-44▲	GR1	Ge	ar Ratio (Numerator) (	Address: 0158H 0159H	
	Operational Interface : Default :		Panel / Software	Communication	Related Section: 6.2.5
			1		
	Contro Mode:		PT / PR		
	Un	it :	Pulse		
	Range :		1 ~ (2 <sup>29</sup> -1)		
	Data Siz	e :	32-bit		
	Forma	at :	Decimal		
	Settings : Please refer to P2-60~P2-62 for the settin (numerator).				tting of multiple gear ratio
		nanged when Servo ON. hanged when Servo OFF.			

P1-45	GR2 C	Gear Ratio (Denomina	ar Ratio (Denominator) (M)	
	Operatior Interface	nal : Panel / Software	Communication	Related Section: 6.2.5
	Default	: 1	1	
	Conti Mode	rol : PT / PR		
	Unit	: Pulse		
	Range	: 1 ~ (2 <sup>31</sup> -1)		
	Data Size	: 32-bit		
	Format	: Decimal		
	·····	If the setting is w	rong the serve motor y	will oasily have sudden

Settings : If the setting is wrong, the servo motor will easily have sudden unintended acceleration.

Please follow the rules for setting:

The setting of pulse input:

Pulse input N command  $f2 = f1 \times M$ f1 M f2 M

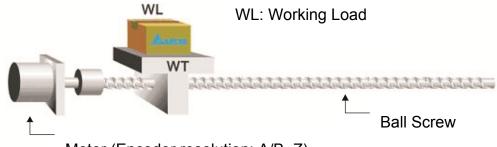
Range of command pulse input: 1 / 50 < Nx / M < 25600

1) The setting value cannot be changed when Servo ON neither in PT nor in PR mode.

$$\frac{\text{E-Gear}}{\text{ratio}} = \left(\frac{N}{M}\right) = \frac{P1-44}{P1-45} \text{, has to match } \frac{1}{50} \le \left(\frac{N}{M}\right) \le 5000$$

Electronic gear provides simple ratio change of travel distance. The high electronic gear ratio would cause the position command to be the stepped command. S-curve or low-pass filter can be used to improve the situation. When electronic gear ratio is set to 1, the motor will turn one cycle for every 10000PUU. When electronic gear ratio is changed to 0.5, then every two pulses from the command will be refer to one PUU of motor encoder.

For example (rotary motor): after setting the electronic gear ratio properly, the moving distance of the object is  $1\mu$ m/pulse, which is easier to use.



Motor (Encoder resolution: A/B, Z)

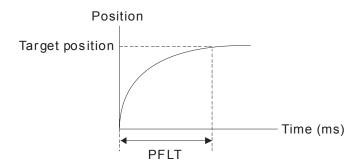
	Gear Ratio	Moving distance of each pulse command
Electronic gear is unapplied.	$=\frac{1}{1}$	$=\frac{3\times1000}{4\times2500}=\frac{3000}{10000}=\mu m$
Electronic gear is applied.	$=\frac{10000}{3000}$	$=1\mu m$

## 6.2.6 Low-pass Filter

Related parameters:

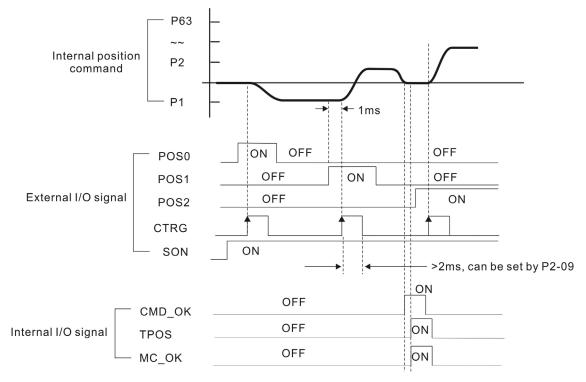
P1-08		Smooth Constant pass Filter)	of Position Command (Low-	Address: 0110H 0111H
	Operatio Interfac	Donal / Sattward	e Communication	Related Section: 6.2.6
	Defau	lt : 0		
	Con Mode	trol e:PT / PR		
	Un	it:10 ms		
	Range	e:0~1000		
	Data Siz	e : 16-bit		
	Forma	it : Decimal		
	Example	e:11 = 110 ms		
	0-#:			2

## Settings : 0: Disabled



## 6.2.7 Timing Diagram in Position Mode (PR)

In PR mode, the position command is selected by either DI signal (POS0~POS5 and CTRG) of CN1 or communication. Please refer to Section 6.2.2 for the information about DI signal and its selected register. Followings are the timing diagrams.



 $\mathsf{CMD\_OK}:\mathsf{CMD\_OK}$  is activated when the servo drive has detected that  $\mathsf{Pr}$  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 Gain Adjustment of Position Loop

Before setting the position control unit, users have to manually (P2-32) complete the setting of speed control unit since the speed loop is included in position loop. Then, set the proportional gain (parameter P2-00) and feed forward gain (parameter P2-02) of position loop. Users also can use the auto mode to set the gain of speed and position control unit automatically.

1) Proportional gain: Increase the gain so as to enhance the response bandwidth of position loop.

2) Feed forward gain: Minimize the deviation of phase delay

The position loop bandwidth cannot exceed the speed loop bandwidth. It is suggested that  $fp \le \frac{fv}{4}$ .

fv: response bandwidth of speed loop (Hz).

KPP =  $2 \times \pi \times \text{fp.}$  fp: response bandwidth of position loop (Hz).

For example, the desired position bandwidth is 20 Hz  $\rightarrow$  KPP = 2× $\pi$ ×20= 125.

P2-00	KPP Po	sition Loop Gain		Address: 0200H 0201H	
	Operationa Interface :	l Panel / Software	Communication	Related Section: 6.2.8	
	Default :	35			
	Contro Mode :	<sup>) </sup> PT / PR			
	Unit :	rad/s			
	Range :	0 ~ 2047			
	Data Size :	16-bit			
	Format :	Decimal			
	Sottings :	When the value	of position loop gain is	increased, the position	

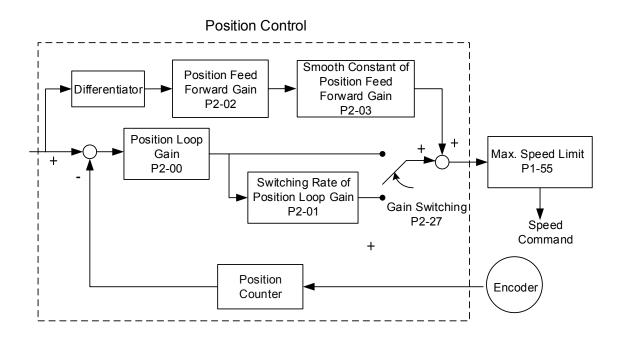
Settings : When the value of position loop gain is increased, the position response can be enhanced and the position error can be reduced. If the value is set too big, it may easily cause vibration and noise.

P2-02		Position Feed Forward Gain		Address: 0204H 0205H
	Operatio Interfac	e : Panel / Software	Communication	Related Section: 6.2.8
	Defau	lt : 50		
	Con Mod	trol e: <sup>PT/PR</sup>		
	Un	it : %		

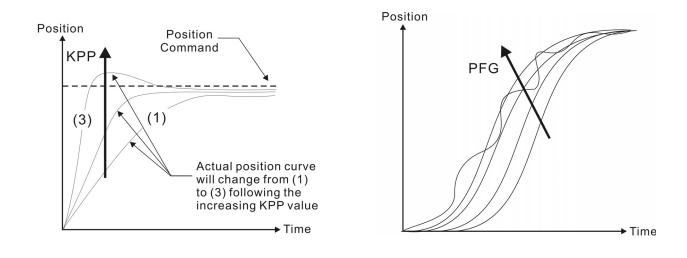
Range :	0 ~ 100	
Data Size :	16-bit	
Format :	Decimal	-

Settings : If the position command is changed smoothly, increasing the gain value can reduce the position error.

If the position command is not changed smoothly, decreasing the gain value can tackle the problem of mechanical vibration.



When the value of proportional gain, KPP is set too big, the response bandwidth of position loop will be increased and diminish the phase margin. And the motor rotor rotates vibrantly in forward and reverse direction at the moment. Thus, KPP has to be decreased until the rotor stops vibrating. When the external torque interrupts, the over-low KPP cannot meet the demand of position deviation. In this situation, parameter P2-02 can effectively reduce the position error.



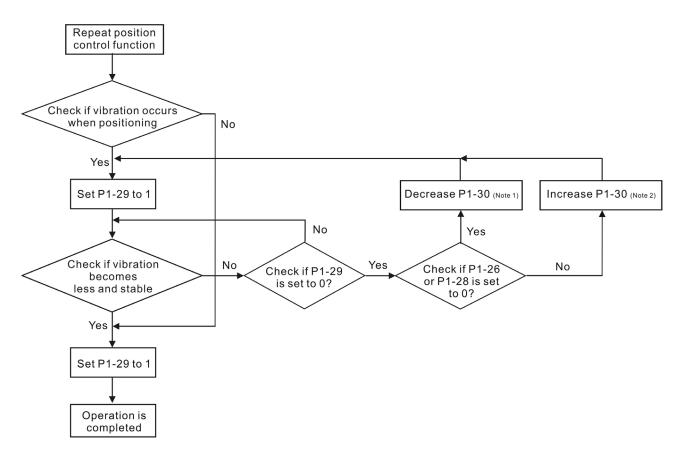
## 6.2.9 Low-frequency Vibration Suppression in Position Mode

If the stiffness is not enough, the mechanical transmission will continue to vibrate even when the motor stops after completing the positioning command. The function of low-frequency vibration suppression can eliminate the vibration of mechanical transmission. The range is between 1.0Hz and 100.0HZ. Both manual setting and auto setting are provided.

#### Auto setting:

If the frequency is hard to find, it can enable the function of auto low-frequency vibration suppression. This function automatically searches the frequency of low-frequency vibration. If P1-29 is set to 1, the system will disable the function of low-frequency vibration suppression automatically and starts to search the vibration frequency. When the detected frequency remains at the same level, P1-29 will be set to 0 automatically and set the first frequency in P1-25 and set P1-26 to 1. The second frequency will be set in P1-27 and then set P1-28 to 1. If P1-29 is automatically set back to 0 and still has low-frequency vibration, please check if the function of P1-26 or P1-28 is enabled. If the value of P1-26 and P1-28 is 0, it means no frequency has been detected. Please decrease the value of P1-30 and set P1-29 to 1 so as to search the vibration frequency again. Please note that when the detection level is set too small, the noise will be regarded as the low-frequency.

Flowchart of auto low-frequency vibration suppression:



Note 1: When the value of P1-26 and P1-28 is 0, it means it is unable to search the frequency. It is probably because the detection level is set too high and is unable to detect the low-frequency vibration.

Note 2: When the value of P1-26 or P1-28 is not set to 0 and still cannot eliminate the vibration, it is probably because the detection level is set too low, the system regards the noise or other non-primary frequency as the low-frequency vibration.

Note 3: When the process of auto vibration suppression is completed and the vibration still cannot be diminished, P1-25 or P1-27 can be manually set to suppress the vibration if the frequency (Hz) of the low-frequency is identified.

#### Related parameters:

P1-29		Auto Low-frequency Setting	Vibration Supression	Address: 013AH 013BH
	Operatio Interface	nal Panel / Software e :	Communication	Related Section: 6.2.9
	Defau	lt : 0		
	Con Mode	DT / DR		
	Un	it : -		
	Range	e: 0~1		
	Data Size	e:16-bit		
	Forma	t : Decimal		
	Setting	s : 0: The function is di	sabled.	

1: The value will set back to 0 after vibration suppression.

Description of Auto Mode Setting:

When the parameter is set to 1, it is in auto suppression. When the vibration frequency is not being detected or the value of searched frequency is stable, the parameter will set to 0 and save the low-frequency vibration suppression to P1-25 automatically.

P1-30	VCL	Low-frequency Vibration Detection		Address: 013CH 013DH
	Operatio	nal Panel / Software e :		Related Section:
	Interface	Panel / Software Communication	6.2.9	
	Defaul	t : 500		
	Con Mode	ntrol e: PT / PR		

Unit :	Pulse	
Range :	1 ~ 8000	
Data Size :	16-bit	
Format :	Decimal	

Settings : When enabling the auto suppression (P1-29 = 1), it will automatically search the detection level. The lower the value is, the more sensitive the detection will be. However, it is easy to misjudge the noise or regard the other low-frequency vibration as the suppression frequency. If the value is bigger, it will make more precise judgment. However, if the vibration of the mechanism is smaller, it might not detect the frequency of low-frequency vibration.

P1-30 is to set the range to detect the magnitude of low-frequency vibration. When the frequency is not being detected, it is probably because the value of P1-30 is set too big which exceeds the range of vibration. It is suggested to decrease the value of P1-30. Please note that if the value is too small, the system might regard the noise as the vibration frequency. If the SCOPE is available, it can be used to observe the range of position error (pulse) between upper and lower magnitude of the curve and set up the appropriate value of P1-30.

## Manual Setting:

There are two sets of low-frequency vibration suppression. One is parameter P1-25~P1-26 and another one is parameter P1-27~P1-28. These two sets of low-frequency vibration suppression can be used to eliminate two different frequency vibrations. Parameter P1-25 and P1-27 are used to suppress the low-frequency vibration. The function is working only when the parameter setting value of low-frequency vibration close to the real vibration frequency. Parameter P1-26 and P1-28 are used to set the response after filter. The bigger the setting value of P1-26 and P1-28 is, the better response will be. However, if the value is set too big, the motor might not operate smoothly. The default value of parameter P1-26 and P1-28 is 0, which means the function is disabled. Followings are the related parameters:

P1-25	VSF1	Low-frequency Vibration Suppression (1)		Address: 0132H 0133H
	Operatio Interface	nal Panel / Software e :	Communication	Related Section: 6.2.9
	Defaul	t: 1000		
		rrol PT / PR		

Unit :	0.1 Hz	
Range :	10 ~ 1000	
Data Size :	16-bit	
Format :	Decimal	
Example :	150= 15 Hz	

Settings : The setting value of the first low-frequency vibration suppression. If P1-26 is set to 0, then it will disable the first low-frequency filter.

P1-26	VSG1 La		on Suppression Gain	Address: 0134H 0135H
	Operationa Interface :		Communication	Related Section: 6.2.9
	Default :	0		
	Contro Mode :	PT / PR		
	Unit :	-		
	Range :	$0 \sim 9$ (0: Disable the first low-frequency filter)		
	Data Size :	16-bit		
	Format :	Decimal		
	Settings :		gain. The bigger value it wever, if the value is set	

is, the better the position response will be. However, if the value is set too big, the motor will not be able to smoothly operate. It is suggested to set the value to 1.

P1-27	VSF2 Lo	ow-frequency Vibrati	Address: 0136H 0137H	
	Operational Interface :	Panel / Software	Communication	Related Section: 6.2.9
	Default :	1000		
	Contro Mode :			
	Unit :	0.1 Hz		
	Range :	10 ~ 1000		
	Data Size : 16-bit			
	Format :	Decimal		
	Example :	150 = 15 Hz		

Settings : The setting value of the second low-frequency vibration suppression. If P1-28 is set to 0, then it will disable the second low-frequency filter.

P1-28	VSG2 L	ow-frequency Vibration	Address: 0138H 0139H	
	Operation Interface		ommunication	Related Section: 6.2.9
	Default	: 0		
	Contro Mode	PT / PR		
	Unit	:: -		
	Range	0 ~ 9 (0: Disable the second low-frequency filter)		
	Data Size	16-bit		
	Format : Decimal			
	Settings	it is, the better the posi	ency vibration suppression tion response will be. Ho not be able to smoothly o	wever, if the value is set

set the value to 1.

## 6.3 Speed Mode

Speed control mode (S or Sz) is applicable in precision speed control, such as CNC machine tools. This servo drive includes two types of command input, analog and register. Analog command input can use external voltage to control the motor speed. There are two methods in register input. One is used before operation. Users set different value of speed command in three registers, and then use SP0, SP1 of CN1 DI signal for switching. Another method is to change the value of register by communication. In order to deal with the problem of non-continuous speed command when switching register, a complete S-curve program is provided. In close-loop system, this servo drive adopts gain adjustment and integrated PI controller and two modes (manual and auto) for selection. Users can set all parameters and all auto or auxiliary function will be disabled in manual mode. While in auto mode, it provides the function of load inertia estimation and parameter adjustment. In auto mode, parameters which set by users will be regarded as the default value.

## 6.3.1 Selection of Speed Mode

There are two types of speed command source, analog voltage and internal parameters. The selection is determined by CN1 DI signal. See as the followings.

Speed	CN1 DI signal		Command Source		and Source	Content	Range
Command	SPD1	SPD0					J
S1	0	0	Mode	S	External analog signal	Voltage between V- REF-GND	-10 V ~ +10V
				Sz	N/A	Speed command is 0	0
S2	0	1	Register parameters			P1-09	
S3	1	0			arameters	P1-10	-60000 ~ 60000
S4	1	1				P1-11	

- Status of SPD0 ~ SPD1: 0 means DI OFF, 1 means DI ON.
- When both SPD0 and SPD1 are 0, if it is in Sz mode, the command will be 0. Thus, if there is no need to use analog voltage as the speed command, Sz mode can be applied to tackle the problem of zero-drift. If it is in S mode, the command will be the voltage deviation between V-REF and GND. The range of input voltage is between -10V and +10V and its corresponding speed is adjustable (P1-40).
- When one of SPD0 and SPD1 is not 0, the speed command is from the internal parameter. The command is activated after changing the status of SPD0~SPD1. There is no need to use CTRG for triggering.

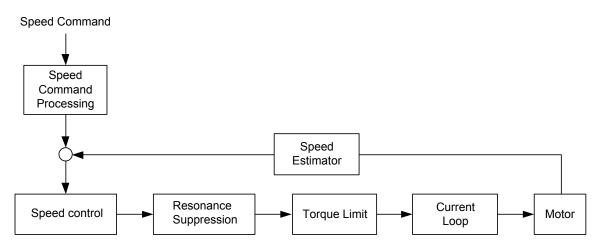
The setting range of internal parameters is between -60000 and 60000. Setting value = setting range x unit (0.1r/min).

For example: P1-09 = +30000, setting value = +30000 x 0.1r/min = +3000r/min

The speed command not only can be issued in speed mode (S or Sz), but also in torque mode (T or Tz) as the speed limit.

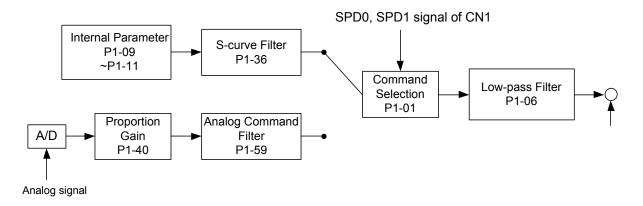
## 6.3.2 Control Structure of Speed Mode

The basic control structure is shown as the following diagram:



The speed command unit is to select speed command source according to Section 6.3.1, including the scaling (P1-40) setting and S-curve setting. The speed control unit manages the gain parameters of the servo drive and calculates the current command for servo motor in time. The resonance suppression unit is to suppress the resonance of mechanism. Detailed descriptions are shown as the following:

Here firstly introduces the function of speed command unit. Its structure is as the following diagram.

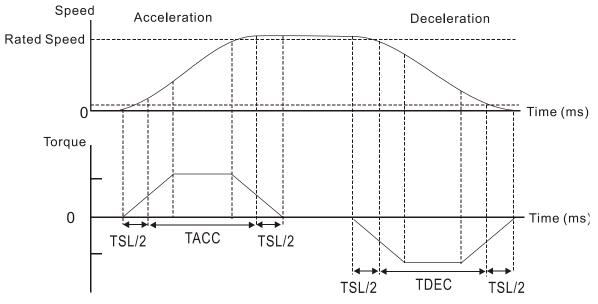


The upper path is the command from register while the lower one is external analog command. The command is selected according to the status of SPD0, SPD1 and P1-01(S or Sz). Usually, S-curve and low-pass filter are applied for having a smooth resonance of command.

## 6.3.3 Smooth Speed Command

#### S-curve Filter

During the process of acceleration or deceleration, S-curve filter applies the program of three-stage acceleration curve for smoothing the motion command, which generates the continuous acceleration. It is for avoiding the jerk (the differentiation of acceleration) came from the sudden command change and indirectly causes the resonance and noise. Users can use acceleration constant of S-curve (TACC) to adjust the slope changed by acceleration, deceleration constant of S-curve (TDEC) to adjust the slope changed by deceleration and acceleration / deceleration constant of S-curve (TSL) to improve the status of motor activation and stop. The calculation of the time to complete the command is provided.



S-curve characteristics and Time relationship

## Related parameters:

P1-34	TACC Ac	celeration Constan	t of S-Curve	Address: 0144H 0145H
	Operationa Interface :	l Panel / Software	Communication	Related Section: 6.3.3
	Default :	200		
	Contro Mode :	S		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16-bit		
	Format :	Decimal		

Acceleration Constant of Rotary Motor: Settings :

> The time that speed command accelerates from 0 to the rated speed. Acceleration Constant of Linear Motor

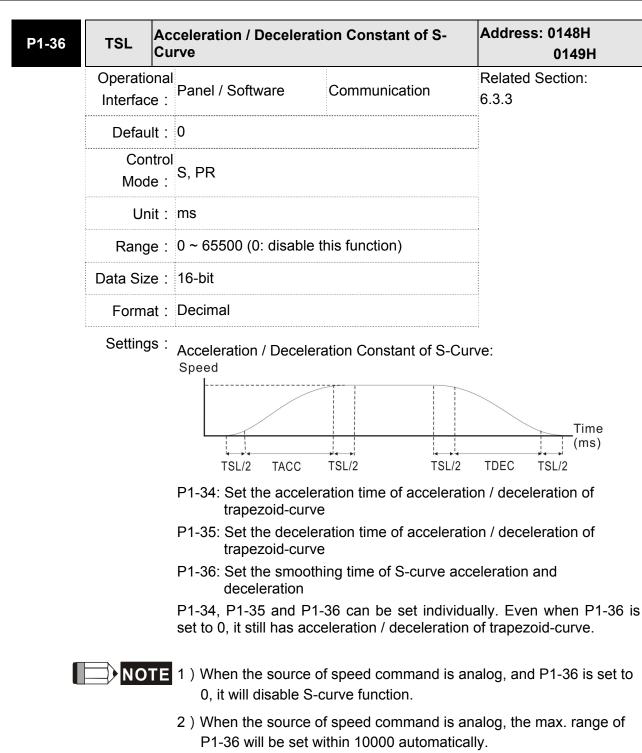
The time that speed command accelerates from 0 to 5m/s.

P1-34, P1-35 and P1-36, the acceleration time of speed command from zero to the rated speed, all can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.



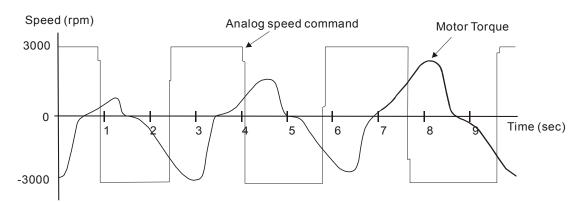
- **NOTE** 1 ) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
  - 2) When the source of speed command is analog, the max. range of P1-34 will be set within 20000 automatically.

P1-35	TDEC	De	celeration Constant o	eleration Constant of S-Curve		
	Operational Interface : Default : Control Mode :		Panel / Software	Communication	Related Section: 6.3.3	
			200			
			S			
	Un	it :	ms			
	Range: Data Size: Format:		1 ~ 65500			
			16-bit			
			Decimal			
Settings :		s :	<ul> <li>Deceleration Constant of Rotary Motor:</li> <li>The time that speed command decelerates from the rated speed to 0.</li> <li>Deceleration Constant of Linear Motor:</li> <li>The time that speed command decelerates from 5m/s to 0.</li> <li>P1-34, P1-35 and P1-36, the deceleration time of speed command from the rated speed to zero, all can be set individually. Even when P1 36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.</li> </ul>			
			1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.			
			2) When the source of speed command is analog, the max. range of P1-35 will be set within 20000 automatically.			



#### **Analog Speed Command Filter**

Analog speed command filter is provided especially for ASDA-A2 series users. It mainly helps with buffer when the analog input signal changes too fast.



Analog speed command filter smooth the analog input command. Its time program is the same as S-curve filter in normal speed. Also, the speed curve and the acceleration curve are both continuous. The above is the diagram of analog speed command filter. The slope of speed command in acceleration and deceleration is different. Users could adjust the time setting (P1-34, P1-35 and P1-36) according to the actual situation to improve the performance.

## **Command End Low-pass Filter**

It is usually used to eliminate the unwanted high-frequency response or noise. It also can smooth the command.

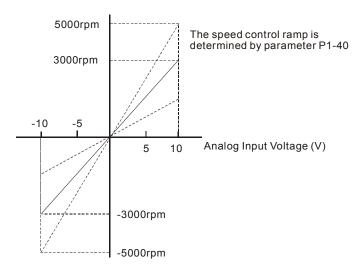
Related parameters:

P1-06	SFLT	Analog Speed Comman	d (Low-pass Filter)	Address: 010CH 010DH
	Operatior Interface	Donal / Softwara	Communication	Related Section: 6.3.3
	Default	::0		
	Cont Mode	S		
	Unit	ms		
	Range	: 0 ~ 1000 (0: disable th	0 ~ 1000 (0: disable this function) 16-bit	
	Data Size	:16-bit		
	Format	: Decimal		
	Settings	: 0: Disabled		
		Target Speed		

SFLT

## 6.3.4 The Scaling of Analog Command

The motor speed command is controlled by the analog voltage deviation between V\_REF and VGND. Use parameter P1-40 to adjust the speed-control slope and its range.



#### Related parameters:

P1-40▲	VCM	Max	kimum Speed of Analog Speed Command		Address: 0150H 0151H
	Operatio Interfac		Panel / Software	Communication	Related Section: 6.3.4
	Default :		Same as the rated speed of each model		
	Con Mode	ntrol le :	S/T		
	Un	nit :	r/min		
	Range : Data Size :		0 ~ 5000 16-bit		
	Forma	at :	Decimal		
	Setting		Maximum Speed of An In speed mode, the an setting of the max. volta	nalog speed command	inputs the swing speed

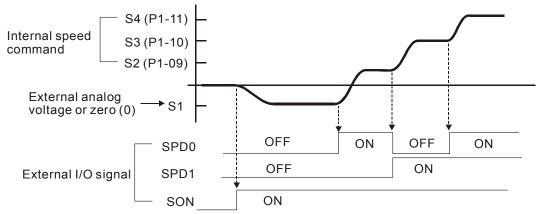
For example, if the setting is 3000, when the external voltage input is 10V, it means the speed control command is 3000r/min. If the external voltage input is 5V, then the speed control command is 1500r/min.

Speed control command = input voltage value x setting value / 10

In position or torque (force) mode, analog speed limit inputs the swing speed limit setting of the max. voltage (10V).

Speed limit command = input voltage value x setting value / 10

## 6.3.5 Timing Diagram in Speed Mode

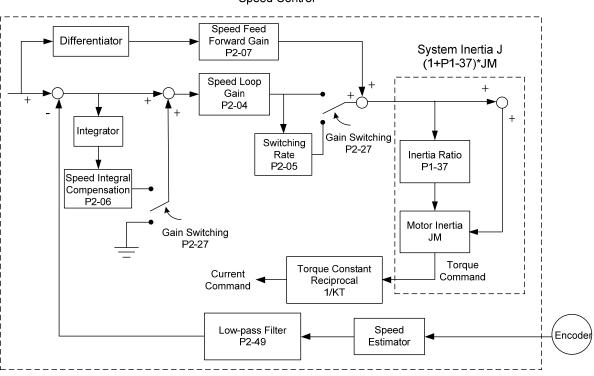




- 1) OFF means the contact point is open while ON means the contact point is close.
- 2) When it is in Sz mode, the speed command S1 = 0; When it is in S mode, the speed command S1 is the external analog voltage input.
- When the servo drive is On, please select the command according to SPD0~SPD1 status.

# 6.3.6 Gain Adjustment of Speed Loop

Here introduces the function of speed control unit. The following shows its structure.



Many kinds of gain in speed control unit are adjustable. Two ways, manual and auto, are provided for selection.

Speed Control

Manual: All parameters are set by users and the auto or auxiliary function will be disabled in this mode.

Auto: General load inertia estimation is provided. It adjusts the parameter automatically. Its framework is divided into PI auto gain adjustment and PDFF auto gain adjustment.

P2-32▲	AUT2	Tun	ing Mode Selection		Address: 0240H 0241H	
	Operation Interfact	· · [	Panel / Software	Communication	Related Section: 5.6 and 6.3.6	
	Defau	ılt : (				
	Control Mode :		· A L L			
	Ur	nit : -				
	Rang	le : (	0~0x2			
	Data Siz	:e :	16-bit			
	Form	at:I	Hexadecimal			
-	Setting		Relevant description of When P2-32 is set to 00, P2-02, P2-04, P2 the user.	on- continuous adjustme of manual mode setting: 0, parameters related to 2-06, P2-07, P2-25 and e from auto or semi-auto ated automatically.	gain control, such as P2- P2-26, all can be set by	
		e	Continue to estimate the system inertia, save the inertia ratio to P1-37 every 30 minutes automatically and refer to the stiffness and bandwidth setting of P2-31.			
			system will save th	manual mode 0 from au ne estimated inertia valu ponding parameters.	to 1 or semi-auto 2, the e to P1-37 automatically	
		<ol> <li>Set the system to auto mode 1 or semi-auto mode 2 from manual mode 0, please set P1-37 to the appropriate value.</li> </ol>				
			<ol> <li>Set the system to manual mode 0 from auto mode 1, P2-00, P2- P2-06, P2-25, P2-26 and P2-49 will be modified to the corresponding parameters of auto mode.</li> </ol>			
		2	4. Set the system to P2-04, P2-06, P2-	manual mode 0 from se 25, P2-26 and P2-49 wi ameters of semi-auto m	I be modified to the	
		I	Relevant description of	of semi-auto mode settin	g:	

Parameter P2-32 can be used to adjust the gain.

Relevant description of semi-auto mode setting:

- When the system inertia is stable, the value of P2-33 will be 1 and the system stops estimating. The inertia value will be saved to P1-37 automatically. When switching mode to semi-auto mode (from manual or auto mode), the system starts to estimate again.
- 2. When the system inertia is over the range, the value of P2-33 will be 0 and the system starts to estimate and adjust again.

## Manual Mode

When P2-32 is set to 0, users can define Speed Loop Gain (P2-04), Speed Integral Compensation (P2-06) and Speed Feed Forward Gain (P2-07). Influence of each parameter is as the followings.

Proportional gain: To increase proportional gain can enhance the response frequency of speed loop.

Integral gain: To increase the integral gain could increase the low-frequency stiffness of speed loop, reduce the steady-state error and sacrifice the phase margin. The over high integral gain will cause the instability of the system.

Feed forward gain: Diminish the deviation of phase delay.

#### Relevant parameters:

P2-04	KVP Sp	eed Loop Gain	Address: 0208H 0209H
	Operationa Interface :	Panel / Software Communication	Related Section: 6.3.6
	Default :	500	
	Contro Mode :		
	Unit :	rad/s	
	Range :	0 ~ 8191	
	Data Size :	16-bit	
	Format :	Decimal	
	Settings :	Increase the value of speed loop gain	can enhance the speed

Settings : Increase the value of speed loop gain can enhance the speed response. However, if the value is set too big, it would easily cause resonance and noise.

P2-06	KVI	Speed Integral Compe	nsation	Address: 020CH 020DH
	Operatio Interfac		Communication	Related Section: 6.3.6
		lt : 100		

Control Mode :	ALL	
Unit :	rad/s	
Range :	0 ~ 1023	
Data Size :	16-bit	
Format :	Decimal	

Settings : Increasing the value of speed integral compensation can enhance speed response and diminish the deviation of speed control. However, if the value is set too big, it would easily cause resonance and noise.

P2-07	KVF Sp	eed Feed Forward	Address: 020EH 020FH	
	Operational Interface :	Panel / Software	Communication	Related Section: 6.3.6
	Default :	0		
	Control Mode :	ALL		
	Unit :	%		
	Range :	0 ~ 100		
	Data Size :	16-bit		
	Format :	Decimal		
	Settings :	When the speed co	ontrol command runs smo the speed command error.	othly, increasing the gain

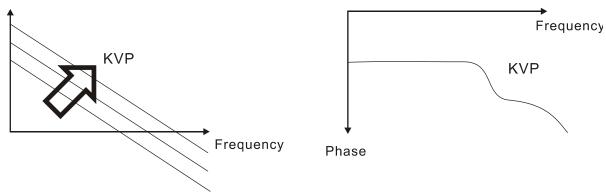
Settings : When the speed control command runs smoothly, increasing the gain value can reduce the speed command error. If the command does not run smoothly, decreasing the gain value can reduce the mechanical vibration during operation.

Theoretically, stepping response can be used to explain proportional gain (KVP), integral gain (KVI) and feed forward gain (KVF). Here, the frequency domain and time domain are used to illustrate the basic principle.

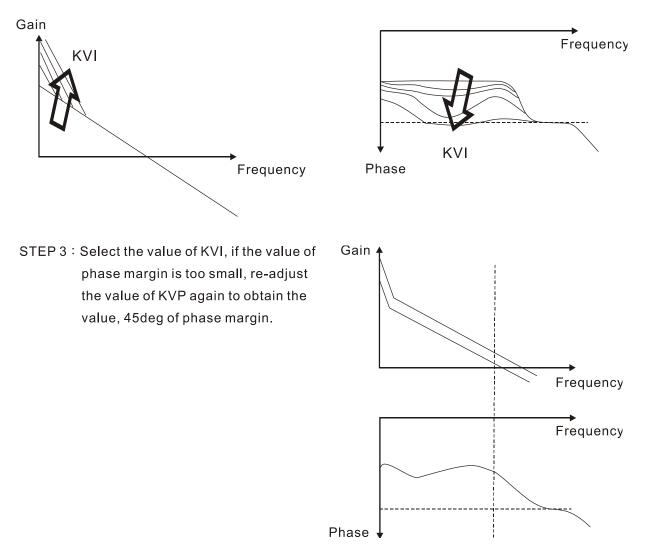
## **Frequency Domain**

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.

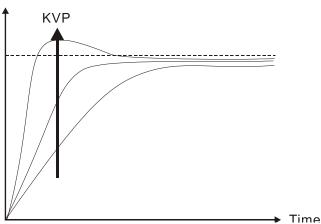


#### Time Domain

Speed

KVI



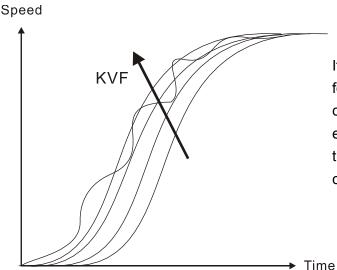


The bigger KVP value cause higher bandwidth and shorten the rising time. However, if the value is set too big, the phase margin will be too small.

To steady-state error, the result is not as good as KVI. But it helps to reduce the dynamic following error.

The bigger KVI value cause greater lowfrequency gain and shorten the time the steady-state error returns to zero. However, the phase margin will dramatically decrease as well.

To steady-state error, it is very helpful but shows no benefit to dynamic following error.



If the KVF value closes to 1, the feed forward compensation will be more complete and the dynamic following error will become smaller. However, if the KVF value is set too big, it would cause vibration.

Generally, instrument is needed when applying frequency domain for measurement. Users are required to adopt the measurement techniques; while time domain only needs a scope and goes with the analog input / output terminal provided by the servo drive. Thus, time domain is frequently

► Time

#### Revision February, 2017

used to adjust PI controller. The abilities of PI controller to deal with the resistance of torque load and the following command are the same.

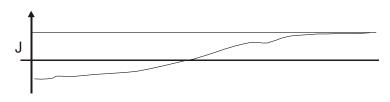
That is to say, the following command and resistance of torque load have the same performance in frequency domain and time domain. Users can reduce the bandwidth by setting the low-pass filter in command end.

#### Auto Mode

Auto mode adopts adaptive principle. The servo drive automatically adjusts the parameters according to the external load. Since the adaptive principle takes longer time, it will be unsuitable if the load changes too fast. It would be better to wait until the load inertia is steady or changes slowly. Depending on the speed of signal input, the adaptive time will be different from one another.



Inertia Estimation



## 6.3.7 Resonance Suppression

When resonance occurs, it is probably because the stiffness of the control system is too strong or the response is too fast. Eliminating these two factors might improve the situation. In addition, low-pass filter (parameter P2-25) and notch filter (parameter P2-23 and P2-24) are provided to suppress the resonance if not changing the control parameters.

Related parameters:

P2-23	NCF1 Re	esonance Suppress	ion (Notch filter) (1)	Address: 022EH 022FH
	Operationa Interface :		Communication	Related Section: 6.3.7
	Default :	1000		
	Contro Mode :	ALL		
	Unit :	Hz		
	Range :	50 ~ 1000		
	Data Size :	16-bit		
	Format :	Decimal		-
	Settings ·	The first setting valu	ue of resonance frequency	. If P2-24 is set to 0, this

Settings : The first setting value of resonance frequency. If P2-24 is set to 0, in function is disabled. P2-43 and P2-44 are the second Notch filter.

P2-24		esonance Suppressi ttenuation Rate (1)	sonance Suppression (Notch filter) enuation Rate (1)		
	Operationa Interface		Communication	Related Section: 6.3.7	
	Default	: 0	)		
	Contro Mode	ALL			
	Unit	dB			
	Range	: 0 ~ 32 (0: disable th	0 ~ 32 (0: disable the function of Notch filter)		
	Data Size	: 16-bit			
	Format	Decimal			
	Settinas	The first resonance	e suppression (notch filter	) attenuation rate. When	

this parameter is set to 0, the function of Notch filter is disabled.

**NOTE** If the value of attenuation rate is set to 5, then, it would be -5dB.

P2-43	NCF2 R	esonance Suppress	ion (Notch filter) (2)	Address: 0256H 0257H
	Operation Interface		Communication	Related Section: 6.3.7
	Default	: 1000		
	Contro Mode	ol ALL		
	Unit	: Hz		
	Range	: 50 ~ 2000		
	Data Size	: 16-bit		
	Format	: Decimal		
	Settings	The second setting	value of resonance freque	ency. If P2-44 is set to 0,

Settings : The second setting value of resonance frequency. If P2-44 is set to 0, this function is disabled. P2-23 and P2-24 are the first Notch filter.

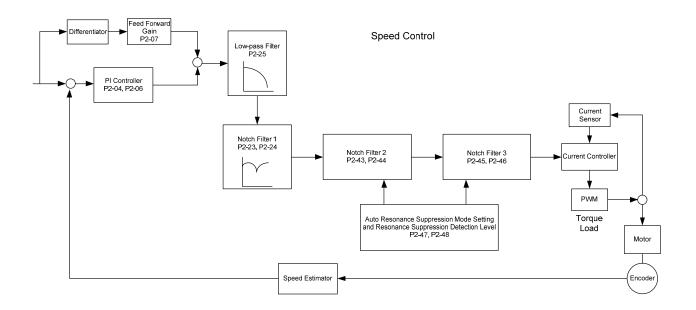
P2-44	DPH2		sonance Suppression enuation Rate (2)	Address: 0258H 0259H		
	Operatio Interfac		Panel / Software	Related Section: 6.3.7		
	Defau	lt :	0			
	Con Mod		ALL			
	Un	it :	dB			
	Rang	e :	0 ~ 32 (0: disable Notc			
	Data Siz	e :	16-bit			
	Forma	at :	Decimal			
	Setting	s:		filter) attenuation rate of Notch filter is disabled.		
	NO.	ΓE	If the value of attenua	tion rate is set to 5, ther	i it would be -5dB.	
P2-46	DPH3		sonance Suppression enuation Rate (3)	(Notch filter)	Address: 025CH 025DH	
	Operational Interface :		Panel / Software Communication		Related Section: 6.3.7	
	Defau	lt :	0			
	Con Mod		ALL			

Unit :	dB
Range :	0 ~ 32
Data Size :	16-bit
Format :	Decimal

Settings : The third group of resonance suppression (Notch filter) attenuation rate. Set the value to 0 to disable the function of Notch filter.

P2-25	NLP Lo	w-pass Filter of Reso	Address: 0232H 0233H	
	Operationa Interface :		Communication	Related Section: 6.3.7
	Default :	0.2 (under 1kW) or 0.5 (other model)	2 (under 1kW) or 0.5 (other model)	
	Contro Mode :	ALL		
	Unit :	1 ms	0.1 ms	
	Range :	0.0 ~ 100.0	0 ~ 1000	
	Data Size :	16-bit		
	Format :	One decimal	Decimal	
	Example :	1.5 = 1.5 ms	15 = 1.5 ms	

Settings : Set the low-pass filter of resonance suppression. When the value is set to 0, the function of low-pass filter is disabled.

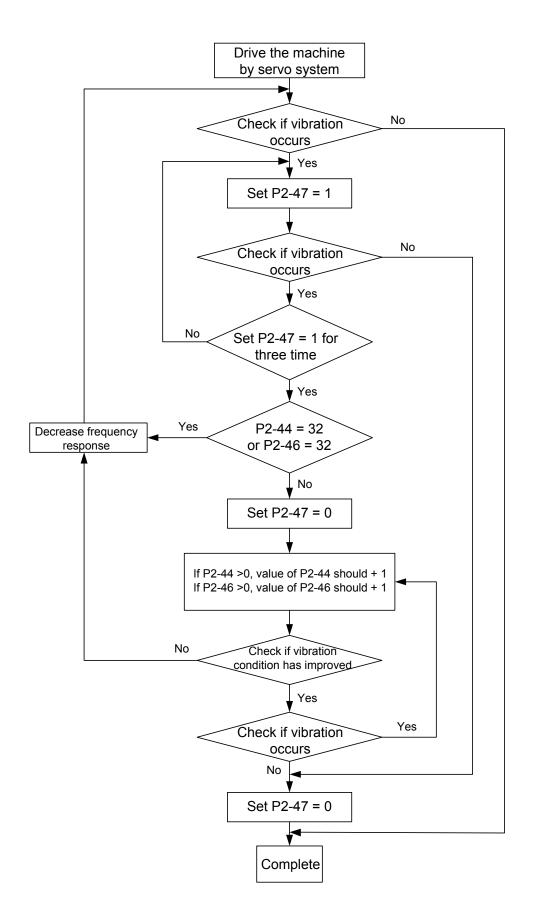


There are two sets of auto resonance suppression, one is P2-43 and P2-44 and another one is P2-45 and P2-46. When the resonance occurs, set P2-47 to 1 or 2 (enable the function of resonance suppression), the servo drive searches the point of resonance frequency and suppresses the resonance automatically. Write the point of frequency into P2-43 and P2-45 and write the attenuation rate into P2-44 and P2-46. When P2-47 is set to 1, the system will set P2-47 to 0 (disable the function of auto suppression) automatically after completing resonance suppression and the system is stable for 20 minutes. When P2-47 is set to 2, the system will keep searching the point of resonance.

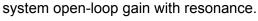
When P2-47 is set to 1 or 2, but resonance still exists, please confirm the value of parameter P2-44 and P2-46. If one of them is 32, it is suggested to reduce the speed bandwidth first and then start to estimate again. If the value of both is smaller than 32 and resonance still exists, please set P2-47 to 0 first and then manually increase the value of P2-44 and P2-46. It is suggested to reduce the bandwidth if the resonance has not been improved. Then use the function of auto resonance suppression.

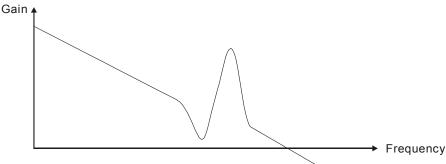
When manually increase the value of P2-44 and P2-46, please check if the value of both is bigger than 0. If yes, it means the frequency point of P2-43 and P2-45 is the one searched by auto resonance suppression. If the value of both is 0, it means the default, 1000 of P2-43 and P2-45 is not the one searched by auto resonance suppression. Deepen the resonance suppression attenuation rate might worsen the situation.

	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.					

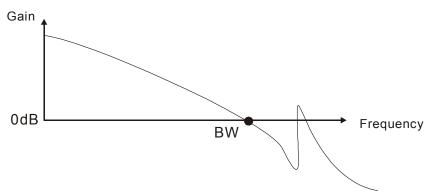


Here illustrates the effect via low-pass filter (parameter P2-25). The following diagram is the





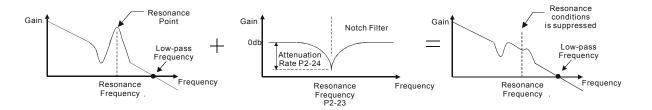
When the value of P2-25 is increased from 0, BW becomes smaller (See as the following diagram). Although it solves the problem of resonance frequency, the response bandwidth and phase margin is reduced.



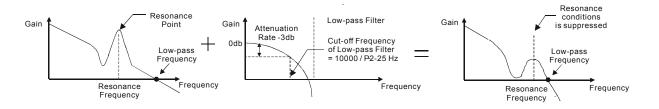
If users know the resonance frequency, notch filter (parameter P2-23 and P2-24) can directly eliminate the resonance. The frequency setting range of notch filter is merely from 50 to 1000Hz. The suppression strength is from 0 to 32dB. If the resonance frequency is not within the range, it is suggested to use low-pass filter (parameter P2-25).

Here firstly illustrates the influence brought by notch filter (P2-23 and P2-24) and low-pass filter (P2-25). The following diagrams are the system of open-loop gain with resonance.

Resonance suppression with notch filter



Resonance suppression with low-pass filter



When the value of P2-25 is increased from 0, BW becomes smaller. Although it solves the problem of resonance frequency, the response bandwidth and phase margin is reduced. Also, the system becomes unstable.

If users know the resonance frequency, notch filter (parameter P2-23 and P2-24) can directly eliminate the resonance. In this case, notch filter will be more helpful than low-pass filter. However, if the resonance frequency drifts because of time or other factors, notch filter will not do.

# 6.4 Torque Mode

Torque control mode (T or Tz) is appropriate in torque control application, such as printing machine, winding machine, etc. There are two kinds of command source, analog input and register. Analog command input uses external voltage to control the torque of the motor while register uses the internal parameters (P1-12~P1-14) as the torque command.

## 6.4.1 Selection of Torque Command

Torque command source are external analog voltage and parameters. It uses CN1 DI signal for selection. See as below.

Torque DI signal of Command			Com	mand Source	Content	Range			
Commanu	TCM1	TCM0					-		
T1	0	0 0		0 0		Т	External analog command	Voltage between T-REF-GND	-10V ~ +10V
	U	0	Mode	Tz	None	Torque command is 0	0		
T2	0	1				P1-12	0000/		
Т3	1	0	Parameters			P1-13	-300% ~ 300%		
T4	1	1				P1-14	00070		

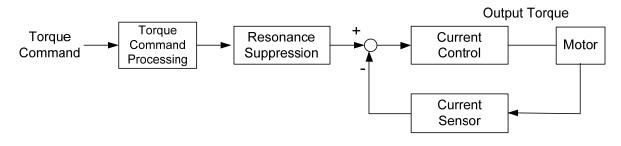
■ The status of TCM0 ~ TCM1: 0 means DI OFF and 1 means DI ON.

- When TCM0 = TCM1 = 0, if it is in Tz mode, then the command is 0. Thus, if there is no need to use analog voltage as torque command, Tz mode is applicable and can avoid the problem of zero drift. If it is in T mode, the command will be the voltage deviation between T-REF and GND. Its input voltage range is -10V ~ +10V, which mean the corresponding torque is adjustable (P1-41).
- When neither TCM0 nor TCM1 is 0, parameters become the source of torque command. The command will be executed after TCM0 ~ TCM1 are changed. There is no need to use CTRG for triggering.

The torque command can be used in torque mode (T or Tz) and speed mode (S or Sz). When it is in speed mode, it can be regarded as the command input of torque limit.

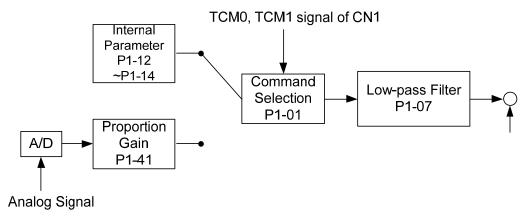
## 6.4.2 Control Structure of Torque Mode

The basic control structure is as the following diagram:



The torque command unit is to select torque command source according to Section 6.4.1, including the scaling (P1-41) setting and S-curve setting. The current control unit manages the gain parameters of the servo drive and calculates the current for servo motor in time. Since the current control unit is very complicated, and is not relevant to the application. There is no need to adjust parameters. Only command end setting is provided.

The structure of torque command unit is as the following diagram.



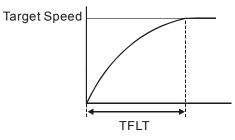
The upper path is the command from register while the lower one is external analog command. The command is selected according to the status of TCM0, TCM1 and P1-01 (T or Tz). The torque represented by analog voltage command can be adjusted via the scaling and can obtain a smoother response via low-pass filter.

# 6.4.3 Smooth Torque Command

## Related parameters:

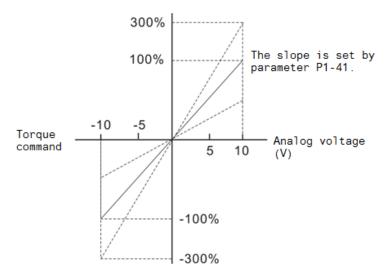
P1-07	TFLT A	nalog Torque Comm	Address: 010EH 010FH	
	Operationa Interface :		Communication	Related Section: 6.4.3
	Default :	0		
	Contro Mode :	Т		
	Unit :	ms		
	Range :	0 ~ 1000 (0: disable		
	Data Size :	16-bit		
	Format :	Decimal		
	Cattinga			i

Settings : 0: Disabled



# 6.4.4 The Scaling of Analog Command

The motor torque command is controlled by the analog voltage deviation between T\_REF and GND and goes with parameter P1-41 to adjust the torque slope and its range.



#### Related parameters:

P1-41▲		-	ximum Output of Analog Torque Command				
	Operationa Interface	al Panel / Software	Communication	Related Section: 6.4.4			
	Default	: 100					
	Contro Mode :						
	Unit	: %					
Range		: 0~1000	-				
	Data Size	: 16-bit					
	Format	Decimal					
		Maximum Output of					

Settings : Maximum Output of Analog Torque Command:

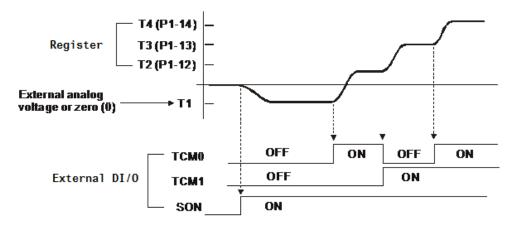
In torque mode, the analog torque command inputs the torque setting of the max. voltage (10V). When the default setting is 100, if the external voltage inputs 10V, it means the torque control command is 100% rated torque. If the external voltage inputs 5V, then the torque control command is 50% rated torque.

Torque control command = input voltage value x setting value / 10 (%)

In speed, PT and PR mode, the analog torque limit inputs the torque limit setting of the max. voltage (10V).

Torque limit command = input voltage value x setting value / 10 (%)

## 6.4.5 Timing Diagram in Torque Mode



**I**DITE 1. OFF means the contact point is open while ON means the contact point is close.

- 2. When it is in Tz mode, the torque command T1 = 0; When it is in T mode, the torque command T1 is the external analog voltage input.
- 3. When it is Servo On, please select the command according to TCM0~TCM1 status.

# 6.5 Dual Mode

Apart from single mode, dual mode is also provided for operation. According to Section 6.1, dual modes are as followings:

- 1. Speed/position dual mode (PT-S, PR-S, PT-PR)
- 2. Speed/torque dual mode (S-T)
- 3. Torque/position dual mode (PT-T, PR-T)
- 4. Position speed multi mode (PT-PR-S)
- 5. Position torque multi mode (PT-PR-T)

Mode Name	Short Name	Setting Code	Description
	PT-S	06	PT and S can be switched via DI signal, S_P.
	PT-T	07	PT and T can be switched via DI signal, T_P.
Dual Mada	PR-S	08	PR and S can be switched via DI signal, S_P.
Dual Mode	PR-T	09	PR and T can be switched via DI signal, T_P.
	S-T	0A	S and T can be switched via DI signal, S_T.
	PT-PR	0D	PT and PR can be switched via DI signal, PT_PR.
Multiple Mede	PT-PR-S	0E	PT , PR and S can be switched via DI signal, S_P and PT_PR.
Multiple Mode	PT-PR-T	0F	PT , PR and T can be switched via DI signal, T_P and PT_PR.

Sz and Tz dual mode is not provided here. For avoiding occupying too many digital inputs in dual mode, speed and torque mode can use external analog voltage as the command source so as to reduce digital input (SPD0, SPD1 or TCM0, TCM1). Please refer to Chapter 3.3.2, table 3.1, Default Value of DI Input Function and table 3.2, Default Value of DO Output Function for the default DI/DO of each mode.

The relationship between DI/DO signals and PIN define are set after the mode is selected. If users desire to change the setting, please refer to Chapter 3.3.4.

## 6.5.1 Speed / Position Dual Mode

There are PT-S and PR-S in speed/position dual mode. The command source of the former one comes from external pulse while the latter one comes from internal parameters (P6-00~P7-27). Speed command could be issued by external analog voltage or internal parameters (P1-09~P1-11). The switch of speed/position mode is controlled by S-P signal and the switch of PR-S mode is controlled by DI signal, which is more complicated. The timing diagram is shown as below.

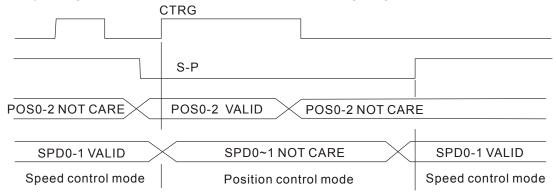


Figure 1. : Speed / Position Control Mode Selection

In speed mode (S-P is ON), the speed command is selected via SPD0 and SPD1. CTRG is not working at the moment. When switching to position mode (S-P is OFF), since position command has not been issued (needs to wait the rising edge of CTRG), the motor stops. The position command is determined by POS0~POS5 and triggered by rising edge of CTRG. When S-P is ON, it goes back to speed mode again. Please refer to the introduction of single mode for DI signal and the selected command of each mode.

## 6.5.2 Speed / Torque Dual Mode

S-T is the only mode. The speed command comes from the external analog voltage and internal parameters (P1-09 ~P1-11), which is selected via SPD0~SPD1. Similarly, the source of torque command could be external analog voltage and internal parameters (P1-12 ~ P1-14) and is selected via TCM0~TCM1. The switch of speed/torque mode is controlled by S-T signal. The timing diagram is shown as below.

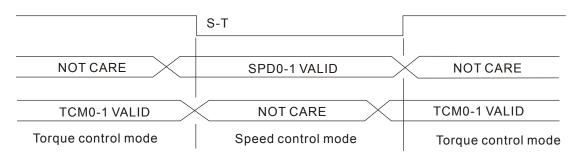


Figure 2. : Speed / Torque Control Mode Selection

In torque mode (S-T is ON), the torque command is selected via TCM0 and TCM1. When switching to speed mode (S-T is OFF), the torque command is selected via SPD0 and SPD 1. The

motor operates according to the speed command. When S-T is ON, it goes back to the torque mode again. Please refer to the introduction of single mode for DI signal and the selected command of each mode.

## 6.5.3 Torque / Position Dual Mode

There are PT-T and PR-T in speed/position dual mode. The command source of the former one comes from external pulse while the latter one comes from internal parameters (P6-00~P7-27). Torque command could be issued by external analog voltage or internal parameters (P1-12~P1-14). The switch of torque/position mode is controlled by T-P signal and the switch of PR-T mode is controlled by DI signal, which is more complicated. The timing diagram is shown as below.

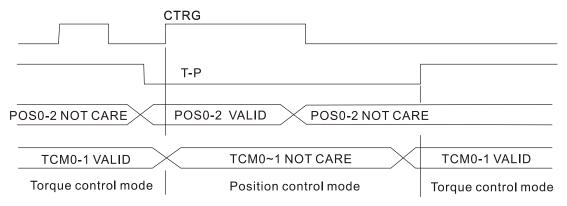


Figure 3. : Torque / Position Control Mode Selection

In torque mode (T-P is ON), the torque command is selected via TCM0 and TCM1. CTRG is not working at the moment. When switching to position mode (T-P is OFF), since position command has not been issued (needs to wait the rising edge of CTRG), the motor stops. The position command is determined by POS0~POS5 and triggered by rising edge of CTRG. When T-P is ON, it goes back to torque mode again. Please refer to the introduction of single mode for DI signal and the selected command of each mode.

# 6.6 Others

## 6.6.1 The Use of Speed Limit

The maximum speed in each mode is limited by internal parameters (P1-55), not matter it is in position, speed or torque mode.

The issuing method of speed limit command and speed command is the same. The command source could be external analog voltage or internal parameter (P1-09  $\sim$  P1-11). Please refer to Section 6.3.1 for descriptions.

Speed limit can be used in torque mode (T) only. It is used for limiting the motor speed. When the command in torque mode is issued by external analog voltage, DI signal is enough and can be regarded as SPD0~SPD1 which is used to determine the speed limit command (internal parameters). If the DI signal is not enough, speed limit command can be issued by analog voltage. When the function of disable/enable limit function in P1-02 is set to 1, the speed limit function is enabled. See the timing diagram as below.

Disable the speed limit function of P1-02	Enable	the	speed	limit	function	of	P1-02
SPD0~1 INVALID	SPD0~	1 VA	LID				

## 6.6.2 The Use of Torque Limit

The issuing method of torque limit command and torque command is the same. The command source could be external analog voltage or internal parameter (P1-12  $\sim$  P1-14). Please refer to Chapter 6.4.1 for descriptions.

Torque limit can be used in position mode (PT, PR) or speed mode (S). It is used for limiting the motor torque output. When the command in position mode is issued by external analog voltage, DI signal is enough and can be regarded as TCM0~TCM1, which is used to determine torque limit command (internal parameters). If the DI signal is not enough, torque limit command can be issued by analog voltage. When the function of disable/enable torque limit function in P1-02 is set to 1, the torque limit function is enabled. See the timing diagram as below.

	Enable	the	torque	limit	function	of	P1-02
Disable the torque limit function of P1-02							
TCM0~1 INVALID	ГСМ0~	1 VA	LID				
Command source selection	n of to	orqu	e spee	d limi	it		

Command source selection of speed limit

## 6.6.3 Analog Monitor

Users could observe the needed voltage signal via analog monitor. Two analog channels are provided by the servo drive and locate in terminal 15 and 16 of CN1. The related parameter settings are as the followings.

P0-03	MON	Analog Outpu	t Monit	Address: 0006H 0007H		
	Operatic Interfac		ware	Related Section: 6.6.4		
	Defau	lt: 00				
	Control Mod	e:ALL				
	Un	it : -				
	Rang	e: 00~0x77				
	Data Siz	e : 16-bit				
	Forma	at : Hecimal				
		MON1, MON2 Sotting		<ul> <li>MON2</li> <li>MON1</li> <li>Not used</li> <li>Descr</li> </ul>	iption	
		Setting Value				
		0	Motor	speed (+/-8 Volts/Ma	x. speed)	
		1	Motor	torque (force) (+/-8 V	olts/Max. torque (force))	
		2	Pulse	command frequency	(+8 Volts / 4.5Mpps)	
		3	Speed	command (+/-8 Volts	s/ Max. speed command)	
		4		e (force) command (+ command)	/-8 Volts/Max. torque	
		5	VBUS	voltage (+/-8 Volts /	450V)	
		6	Reser	ved		
		7	Reser			

Please refer to parameter P1-04, P1-05 for proportional setting of analog output voltage.

For example: P0-03 = 01 (MON1 is the analog output of motor speed; MON2 is the analog output of motor torque (force))

MON1 output voltage = 8  $\times \frac{\text{Motor speed}}{(\text{Max. speed} \times \frac{P_1 - 04}{100})}$  (unit : Volts) MON2 output voltage = 8  $\times \frac{\text{Motor torque}}{(\text{Max. torque (force)} \times \frac{P_1 - 05}{100})}$ (unit: Volts)

P1-03	AOUT Po	larity Setting of Enc	oder Pulse Output	Address: 0106H 0107H
	Operational Interface :	Panel / Software	Communication	Related Section: 3.3.3
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x13		
	Data Size :	16-bit		
	Format :	Hecimal		
	Settings :	<ul> <li>Polarity of mon 0: MON1(+), MO 1: MON1(+), MO 2: MON1(-), MO 3: MON1(-), MO</li> <li>Polarity of enco 0: Forward outp 1: Reverse outp</li> </ul>		

ASDA-A2

P1-04	MON1 MON1 Analog Monitor Output Proportion			Address: 0108H 0109H	
	Operational Interface :		Panel / Software	Communication	Related Section: 6.4.4
	Defau	lt:	100		
	Mode :		ALL		
			% (full scale)		
			Decimal		
Settings :		Please refer to parameter P0-03 for the setting of analog output selection. For example: P0-03 = 0x00 (MON1 is the speed analog output) When the output voltage value of MON1 is V1:		put)	

Motor speed = (Max. speed ×V1/8)×P1-04/100

P1-05	MON2	MON2 Analog Monitor Output Proportion			Address: 0108H 0109H
	Operational Interface :		Panel / Software	Communication	Related Section: 6.4.4
	Default :		100		
	Control Mode :		ALL		
	Unit: Range: Data Size:		% (full scale)		
			0 ~ 100		
			16-bit		
	Format :		Decimal		
	Settings :		selection. For example: P0-03 = 0x00 (MON2	neter P0-03 for the settir 2 is the speed analog ou age value of MON2 is V ×V2/8)×P1-05/100	tput)

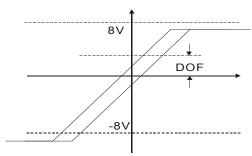
P4-20			set Adjustment Valı tput (Ch1)	ue of Analog Monitor	Address: 0428H 0429H
	Operatio Interface		Panel / Software	Communication	Related Section: 6.4.4
	Data Size : Format :		0		
			ALL		
			-800 ~ 800		
			Decimal		
			Offset adjustment va	lue (cannot reset)	

P4-21		fset Adjustment Value utput (Ch2)	e of Analog Monitor	Address: 042AH 042BH
	Operationa Interface :	l Panel / Software	Communication	Related Section: 6.4.4
	Default :	0		
	Contro Mode :	ALL		
	Unit :	mV -800 ~ 800		
	Range :			
	Data Size :	16-bit		
	Format :	Decimal		
	Settings :	Offset adjustment valu	ue (cannot reset)	

For example, if users desire to observe the voltage signal in channel 1 and set this channel for observing the pulse command frequency, when the pulse command frequency 2.25M corresponds to 8V output voltage, users need to adjust the monitor output proportion of P1-04 to 50 (= 2.25M/Max. input frequency). Other related settings include P0-03 (X= 3) and P1-03 (The polarity setting range of monitor analog output is between 0 and 3, and it can set positive/negative polarity output). Generally speaking, the output voltage of Ch1 is V<sub>1</sub>; the pulse command frequency is (Max. input frequency ×V<sub>1</sub>/8) ×P1-04/100.

Because of the offset value, the zero voltage level of analog monitor output does not match to the zero point of the setting. This can be improved via the setting of offset adjustment value of analog

monitor output, DOF1 (4-20) and DOF2 (P4-21). The voltage level of analog monitor output is  $\pm$ 8V, if the output voltage exceeds the range, it will be limited within  $\pm$ 8V. The provided resolution is about 10bits, which equals to 13mV/LSB.

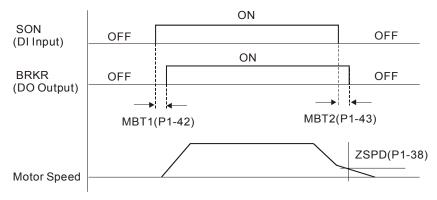


## 6.6.4 The Use of Brake

When operating brake via servo drive, if the DO signal, BRKR is set to OFF, it means the brake is not working and the motor will be locked. If BRKR is set to ON, it means the brake is working and the motor can operate. The operation of brake has two kinds. Users can set the relevant dealy via regiser MBT1 (P1-42) and MBT2 (P1-43). It is usually applied in Z axis in order to reduce the heat generated when servo motor puts up resistance and shorten its lifetime. In order to avoid the error of brake, it must be worked when the servo drive is off. To operate the brake, the brake has to be activated before the motor stops running (Servo OFF). The brake has to be released after Servo ON. Otherwise, it would become the loading of the motor and might damage the brake.

If it works during the process of acceleration or constant speed, the servo drive needs to generate more current to resist the brakeforce of brake and it might cause the alarm of overload warning.

Timing diagram of brake control:

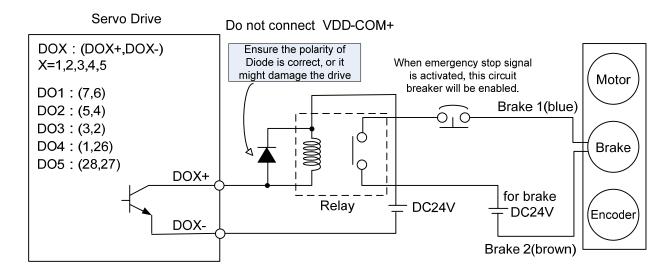


## The output timing of BRKR:

1. When Servo OFF, go through the time set by P1-43 and the motor speed is faster than the setting in P1-38, DO.BRKR is OFF (the brake is locked).

2. When Servo Off, has not reached the time set by P1-43 but the motor speed is slower than the setting in P1-38, DO.BRKR is OFF (the brake is locked.).

The wiring diagram of using mechanical brake:



- 1) Please refer to Chapter 3, Wiring.
- 2) The brake signal controls the solenoid valve, provides power to the brake and enables the brake.
- 3) Please note that there is no polarity in coil brake.
- 4 ) Do not use brake power and control power (VDD) at the same time.

Timing diagram of control power and main power:

L1, L2 Control Circuit Power 5V Control Circuit Power	▲→ 1 sec
R, S, T Main Circuit Power	→
BUS Voltage	
READY	<b>←</b> →
SERVO READY	2 sec
SERVO ON (DI Input)	1 msec (min)+ Response Filter Time of Digital Input (P2-09)
SERVO ON (DO Output)	
Position \ Speed \	Input available
Torque Command Input	

# **Chapter 7 Motion Control**

# 7.1 Motion Control Functions of ASDA-A2

- 1) Single-axis motion controller of PR (Procedure) control
- 2) Function of Capture (data capture) / Compare (data compare)
- 3) Electronic Cam (E-Cam) function (ASDA-A2 series L type models do not provide this function.)

# 7.2 System Information

The information of the servo drive can be divided into three parts: System parameters, Monitoring variables and Data array.

Descriptions are as follows:

	System Parameters	Monitoring variables
Functional Description	It is used to be the reference mode, important data or operation condition when the servo drive is operating, e.g. Control Mode, Servo Loop Gain, etc.	The status of the servo drive or motor, e.g. motor position, speed, electric current, etc.
Display Format	Panel displays PX-XX. Pressing the <b>SET</b> Key to display parameters and start setting. Please refer to Chapter 4 for Panel Display and Operation.	Set P0-02 to Monitoring variables code and enter into Monitor Mode. The panel will display the value of the variable. Or pressing the <b>MODE</b> Key on the panel to switch to Monitor Mode. Please refer to Chapter 4 for Panel Display and Operation.
Access Method	Readable and writable (depends on parameters)	Read-only
Data Size	16-bit or 32-bit (depends on parameters)	32-bit integers only
Communication	Access via MODBUS / CANopen / USB Each parameter occupies two MODBUS addresses	<ul> <li>It only can be monitored via PC software by connecting USB</li> <li>It does not directly support MODBUS / CANopen access, unless mapping is for corresponding the specified monitoring variables to system parameters.</li> </ul>
Mapping Support	8 groups of parameter, P0-25 ~ P0- 32 (set by P0-35 ~ P0-42)	5 groups of parameter, P0-09 ~ P0-13 (set by P0-17 ~ P0-21)
Note		In Monitor Mode, pressing <b>UP/DOWN</b> Key on the panel to switch the commonly used monitoring variables

(code 0~26); however, it cannot display
all (about 150 in total)

# 7.2.1 Description of Monitoring Variables

Description of monitoring variables:

Item	Descriptions		
Variable Code	Each monitoring variable has a code. Set the code via P0-02 so that the users can monitor the variable.		
Format	Every monitoring variable is saved with the format of 32-bit (long integer) in the servo drive.		
Classification	<ul> <li>It is divided into basic variables and extension variables:</li> <li>Basic variables: Use the Monitor Mode on the panel to find the variable (variables in the cycle) by pressing UP/ DOWN Key (P0-02 = 0~26)</li> <li>Extension variables: Variables other than the basic ones (P0-02 = 27~127)</li> </ul>		
Monitor Method	<ol> <li>Two methods, Panel display and Mapping:</li> <li>Panel display: View through the panel directly</li> <li>Mapping: Correspond the variables to the system parameters and view the variables via parameters.</li> </ol>		
Panel Display	<ol> <li>Switch to the Monitor Mode by pressing the MODE Key and select the desired monitoring variables via UP/DOWN Key.</li> <li>Directly enter the desired monitoring code via P0-02 for viewing. Pressing the SHF Key on the panel can switch the display of high / low word; Pressing the SET Key on the panel can switch the display of decimal / hexadecimal format.</li> </ol>		
Mapping	<ol> <li>Mapping parameters that support monitoring variable are P0-09 ~ P0-13. Please refer to Chapter 8.3 for parameter description.</li> <li>Monitoring variables can be read via communication by mapping parameters.</li> <li>The value of mapping parameters (P0-09~P0-13) is the content of basic variables (17h, 18h, 19h, 1Ah). The setting value which is set by P0-17 should be monitored via p0-09 (refer to p0-02). When accessing data via communication, the value of P0-17 can be read or monitored via panel (Set P0-02 to 23). When the panel shows 「VAR-1」, it means it is the value of P0-09.</li> </ol>		

The descriptions of monitoring variables attribute are as the following.

Attribute	Descriptions
В	BASE: basic variables. Variables that can be viewed by UP/DOWN Key on the panel.
Dn	When the panel displays, the position of the decimal point will be D1 which means it only shows one decimal point; D2 means it shows two decimal points.
Dec	When the panel displays, the information only can be shown in decimal format. Pressing the SET Key on the panel cannot switch it to hexadecimal format.
Hex	When the panel displays, the information only can be shown in hexadecimal format. Pressing the SET Key on the panel cannot switch it to decimal format.

Explanation of monitoring variables:

Code	Name of Variables / Attribute	Descriptions
000 (00h)	Feedback position (PUU)	The current feedback position of the motor encoder. The unit is PUU (user unit).
001 (01h)	Position command (PUU) B	The current coordinate of position command. The unit is PUU (user unit). PT mode: it represents the pulse number the servo drive received. PR mode: the value of absolute coordinate from position command Equals to the pulse number sent by the controller.
002 (02h)	Position deviation (PUU)	The deviation between the position command and feedback position. The unit is PUU (user unit).
003 (03h)	Feedback position (pulse)	Current feedback position of the motor encoder. The unit is pulse (encoder unit).
004 (04h)	Position command (pulse)	The current coordinate of the position command. The unit is pulse (encoder unit). The command that had gone through E-gear.
005 (05h)	Position deviation (pulse)	The deviation between the position command and feedback position. The unit is pulse (encoder unit).
006 (06h)	Pulse command frequency	Frequency of pulse command received by the servo drive. The unit is Kpps. It is suitable in PT/PR mode.
007 (07h)	Speed feedback B D1 Dec	Current speed of the motor. The unit of rotary motor is 0.1 r/min. The value is more stable since it has been though low-pass filter.
008 (08h)	Speed command (analog) B D2 Dec	The speed command is issued by analog. The unit is 0.01 Volt.
009 (09h)	Speed command (processed)	The processed speed command. The source might be analog, register or position loop.
010 (0Ah)	Torque command (analog) B D2 Dec	The torque command is issued by analog. The unit is 0.01 Volt.
011 (0Bh)	Torque command (processed)	The processed torque command. The unit is percentage (%). The source might be analog, register or speed loop.
012 (0Ch)	Average load	Average load output by the servo drive. The unit is percentage (%).
013 (0Dh)	Peak load B	The maximum load output by the servo drive. The unit is percentage (%).
014 (0Eh)	DC Bus voltage	Capacitor voltage after rectification. The unit is Volt.

Code	Monitoring Variables / Attribute	Explanation
015 (0Fh)	Inertia ratio B D1 Dec	Ratio of load inertia and motor inertia. The unit is 0.1 times.
016 (10h)	IGBT temperature	IGBT temperature. Unit is °C.
017 (11h)	Resonance frequency	Resonance frequency of the system, including 2 groups of frequency, F1 and F2. When monitoring via panel, pressing <b>SHF</b> can switch the display of both: F2 shows no decimal point while F1 shows one. When reading through communication (mapping parameter): Low-16 Bit (Low WORD) returns frequency F2. High-16 Bit (High WORD) returns frequency F1.
018 (12h)	Z phase offset B Dec	The offset between the motor position and Z phase. The range is from -5000 to +5000. If the position is the same as Z phase, its value is 0. The bigger the value is, the more the offset will be.
019 (13h)	Mapping parameter #1 B	Return the value of parameter P0-25 which is mapped by P0-35.
020 (14h)	Mapping parameter #2 B	Return the value of parameter P0-26 which is mapped by P0-36.
021 (15h)	Mapping parameter #3 B	Return the value of parameter P0-27 which is mapped by P0-37.
022 (16h)	Mapping parameter # 4 B	Return the value of parameter P0-28 which is mapped by P0-38.
023 (17h)	Mapping monitoring variable #1 B	Return the value of parameter P0-09 which is the monitoring variables mapped by P0-17.
024 (18h)	Mapping monitoring variable #2 B	Return the value of parameter P0-20 which is the monitoring variables mapped by P0-18.
025 (19h)	Mapping monitoring variable #3 B	Return the value of parameter P0-11 which is the monitoring variables mapped by P0-19
026 (1Ah)	Mapping monitoring variable #4	Return the value of parameter P0-12 which is the monitoring variables mapped by P0-20.
028 (1Ch)	Alarm codes	Alarm codes of DMCNET mode (It is applicable to A2-F, A2-N, A2-M/U/L)
029 (1Dh)	Feedback of auxiliary encoder (PUU)	The position feedback from auxiliary encoder (CN5) (It is applicable to A2-F)
030 (1Eh)	Position error of auxiliary encoder (PUU)	Position deviation between position feedback (from CN5) and command (It is applicable to A2-F)
031 (1Fh)	Position error or main/auxiliary encoder (PUU)	Feedback position deviation between main encoder and auxiliary encoder (It is applicable to A2-F)

Code	Name of Variables / Attribute	Description
035 (23h)	Indexing coordinate command	The current command of the indexing coordinates. 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) Hex	The processed DI status of the servo drive. Each bit corresponds to one DI channel. The source includes hardware channel / software P4-07 which is determined by P3-06.
040 (28h)	DO status (Hardware) Hex	The real status of Digital Output hardware. Each bit corresponds to one DI channel.
041 (29h)	Drive Status	Return the value of P0-46. Please refer to the description of the parameter.
043 (2Bh)	CAP, data capturing	The Data captured by CAP hardware from the latest time Note: CAP could continuously capture many points.
048 (30h)	Auxiliary encoder CNT	The value of pulse counter from auxiliary encoder (CN5)
049 (31h)	Pulse command CNT	The value of pulse counter from pulse command (CN1)
050 (32h)	Speed command (processed) D1 Dec	The processed speed command. The unit is 0.1 r/min. The source might be analog, register or position loop.
051 (33h)	Speed feedback (immediate) D1 Dec	Current actual speed of the motor. The unit is 0.1 r/min.
052 (34h)	Speed feedback (filter) D1 Dec	Current actual speed of the motor. The unit is 0.1 r/min.
053 (35h)	Torque command (processed) D1 Dec	The processed torque command. The unit is 0.1 percent (%). The source might be analog, register or speed loop.
054 (36h)	Torque feedback D1 Dec	Current actual torque (force) of the motor. The unit is 0.1 percent (%).
055 (37h)	Electric current feedback D2 Dec	Current actual electric current of the motor. The unit is 0.01 ampere (Amp).
056 (38h)	DC Bus voltage D1 Dec	Capacitor voltage after rectification. The unit is 0.1 volt.
059 (3Bh)	Pulse from E-Cam master axis (accumulation)	The accumulative pulse number of E-Cam master axis. It is the same as P5-86. A2L does not support this function.

Code	Monitoring Variables / Attribute	Explanation
060 (3Ch)	Pulse from E-Cam master axis (increment)	The incremental pulse number from master axis. The unit is pulse number per msec. A2L does not support this function.
061 (3Dh)	Pulse from E-Cam mast axis (lead pulse)	The lead pulse of E-Cam master axis which is used to judge the engaging condition. When it is disengaged: lead pulse = P5-87 or P5-92. When it is engaged: lead pulse = P5-89. When the value is 0, it will be disengaged. A2L does not support this function.
062 (3Eh)	The position of E-Cam axis	The position of E-Cam axis. Unit: The pulse is from the master axis. When the incremental pulse from master axis is P, the axis rotates M cycle (P5-83 = M, P5-84 = P). A2L does not support this function.
063 (3Fh)	Position of E-Cam slave axis	The position of E-Cam slave axis. Unit: PUU A2L does not support this function.
064 (40h)	Terminal register of PR command	In PR mode, the termination of position command (Cmd_E)
065 (41h)	Output register of PR command	In PR mode, the accumulative output of position command
067 (43h)	PR target speed	The target speed of path command in PR mode. The unit is PPS (Pulse Per Second)
068 (44h)	S-curve filter (input)	The input commands of S-curve filter which is used to smooth the input command. It is effective in PR mode, E-Cam and speed command. A2L does not support this function.
069 (45h)	S-curve filter (output)	The output commands of S-curve filter which is used to smooth the output command. It is effective in PR mode, E-Cam and speed command. A2L does not support this function.
072 (48h)	Speed command (analog) B D1 Dec	The speed command is issued via analog. The unit is 0.1 r/min. This function is supported by A2-M/U/L.
076 (4Ch)	Speed command of PR contour	In PR mode, the programmed trapezoid speed curve is determined by the target speed, acceleration, deceleration and moving distance (before S-curve filter). The unit is PPS (Pulse Per Second).
081 (51h)	Synchronous capture axis Incremental input pulse	When synchronous capture axis is enabled, the received pulse number between two captures can be used to measure the real distance of Mark.
082 (52h)	PR number that is currently executed	To inform HMC the PR number that is being executed (It is applicable to A2-F)
084 (54h)	Synchronous capture axis Deviation pulse number	The deviation between the real output pulse and the target pulse when synchronous capture axis is enabled. If it reaches the synchronization, the value will close to 0.

Code	Name of Variables / Attribute	Description
091 (5Bh)	The feedback of indexing coordinate	The immediate feedback position of indexing coordinates. The unit is PUU (user unit).
096 (60h)	Firmware version Dec	It includes two versions, DSP and CPLD. When monitoring via panel, pressing the <b>SHF</b> Key can switch the display of both: DSP shows no decimal point while CPLD shows one. When reading through communication (parameter mapping): Low-16 Bit (Low WORD) returns DSP version number. High-16 Bit (High WORD) returns CPLD version number.
098 (62h)	PLC scan time	The update time of DI/DO. The unit is 0.5 msec.
109 (6Dh)	The amount of data array	Returns the amount of data array. The unit is DWORD (32 Bits)
111 (6Fh)	Error code of the servo drive	Error code of the servo drive: only for the control loop, not including the motion controller.
112 (70h)	CANopen SYNC TS (hasn't been through the filter)	The time the servo drive receives SYNC signal (TimeStamp) The unit is usec.
113 (71h)	CANopen SYNC TS (has been through the filter)	The time the servo drive receives SYNC signal and has been through the filter. The unit is usec.
114 (72h)	CANopen timing synchronization	To synchronize the device timing with the controller during the operation. The unit is usec.
116 (74h)	The differential between position and Z phase of auxiliary encoder (pulse)	The differential between the current position and Z phase position of auxiliary encoder (It is applicable to A2-F)
120 (78h)	DMCNET connection status	DMCNET connection status (It is applicable to A2-F, A2-N)
121 (79h)	The PDO packet of DMCNET is lost during transmission	Accumulative number of the lost DMCNET PDO packet (It is applicable to A2-F, A2-N) Format: chAchB   chB   chA For example, 459010 = $0x070102$ chAchB <sub>error</sub> = 7, chB <sub>error</sub> = 1, chA <sub>error</sub> = 2
123 (7Bh)	The returned value when monitoring via panel	The returned value when monitoring via panel

## 7.2.2 Description of Data Array

Many functions of motion control, such as CAPTURE, COMPARE and E-Cam (A2L does not support E-Cam function) are the data that needs to be saved in large amount of memory space, therefore, the servo drive reserves a continuous internal space to satisfy the need. The main feature of the data array is as the followings:

	Feature Introduction of Data Array				
	<ul> <li>Save the captured data of CAPTURE</li> <li>Save the compared value of COMPARE</li> <li>Save the contour table of E-Cam</li> </ul>				
Usage	<ul> <li>Note:</li> <li>1. The system does not partition off the data array into the individual space of CAP, CMP and E-Cam. The user could program it according to the demand. Therefore, the space might be overlapped. Please pay close attention to it when using.</li> </ul>				
	2. A2L does not support E-Cam function.				
Size of Data Array	<ul> <li>32-bit integer x 800 (refer to P5-10)</li> <li>Each data has its corresponding address. Specify the address is a must when reading or writing the data.</li> <li>The 800 data is from 0 to 799.</li> </ul>				
Data Retained	<ul> <li>Manually set up the saving (P2-08 = 30, 35) is a must and the data should be saved in EEPROM of the servo drive.</li> <li>Save the data when it is Servo Off.</li> <li>The data will be loaded into data array automatically when it is Servo On.</li> </ul>				
Accessing Window	• Should be access via parameter P5-10 ~ P5-13.				

The content of the data array cannot be read or wrote directly, reading or writing the data must via parameter  $P5-10 \sim P5-13$ . The description of the parameters is as the followings:

	Description of Related Parameter about Data Array					
Parameter	Name	Description				
P5-10	Size of data array	Return the size of data array (read-only)				
P5-11	Reading / writing address	Set the desired address of reading and writing				
P5-12	Reading / writing window #1	Read via panel: After reading the content of P5-11, the value of P5-11 will not change. Write via panel: After writing the content of P5-11, the value of P5-11 will increase 1 automatically.  Read via communication: After reading the content of P5-11, the value of P5-11 will increase 1 automatically. Write via communication: After writing the content of P5-11, the value of P5-11 will increase 1 automatically.				

	Reading / writing window #2	Read via panel: After reading the content of P5-11, the value of P5-11 will increase 1 automatically. Write via panel: It cannot be written via panel.			
P5-13		Read via communication: After reading the content of P5-11, the value of P5-11 will increase 1 automatically.			
		Write via communication: After writing the content of P5-11, the value of P5-11 will increase 1 automatically.			

Set the desired reading / writing address via P5-11 first. Then, read / write P5-12 or P5-13 in order to access the content of data array. If users desire to continuously write 3 data, 100, 200, 300 into the address of data array, 11, 12 and 13, the operation step is as follows:

**A**. Write via panel: Use P5-12 (reading / writing window #1), since P5-13 does not support writing via panel:

- 1. Set address: Set P5-11 to 11 (The first written address)
- 2. Write into data: Set P5-12 to 100 (After writing 100 into address 11 in data array, the value of P5-11 will increase 1 automatically.)

Set P5-12 to 200 (After writing 200 into address 12 in data array, the value of P5-11 will increase 1 automatically.)

Set P5-12 to 300 (After writing 300 into address 13 in data array, the value of P5-11 will increase 1 automatically.)

The last step is to read address 11, 12 and 13 and check if the content is the value that just wrote into.

- **B**. Read via panel: Use P5-13 (reading / writing window #2) so as to continuously read the content.
  - 1. Set address: Set P5-11 to 11 (The first read address)
  - 2. Read the data: When the panel displays P5-13,

Press the **SET** Key for the first time and show the content of address 11. Then, press the **MODE** Key to exit.

Press the **SE**T Key for the second time and show the content of address 12. Then, press the **MODE** Key to exit.

Press the **SET** Key for the second time and show the content of address

13. Then, press the **MODE** Key to exit.

Note: Every time when reading the data via P5-13, the value of P5-11 will increase 1

automatically. Thus the user could continuously read the data.

If reading the data via P5-12, then the value of P5-11 will not change. The user is unable to read the next data automatically.

If users desire to read / write the data array via communication, the operation procedure is similar to panel. Moreover, the function of P5-12 and P5-13 is the same. If users desire to write 6 data, 100, 200, 300, 400, 500 and 600 into the address of data array via Modbus communication command 0x10 (continuous writing), the content of the issued command is as the followings:

	Content of Communication Command: Write into Data Array								
		Start	Written	P5-11		P5-12		P5-13	
No.	Command	Add.	Amount	Low Word	High Word	Low Word	High Word	Low Word	High Word
			6	11	0	100	0	200	0
1	0x10	P5-11	(Word)	The first address		The first data		The second data	
0	010		6	13	0	300	0	400	0
2	0x10	P5-11	(Word)	The third	address	The thi	rd data	The four	th data
3	2 0.40		6	15	0	500	0	600	0
3	0x10	P5-11	(Word)	The fifth	address	The fif	th data	The sixt	h data

If users desire to read the value of data array in order to check the previous written content, users can write the desired reading start address into P5-11 via MODBUS communication command 0x06 (write 1 data). The issuing communication command is as the following:

Content of Communication Command: Set the Reading Address of Data Array						
No. Command Start Add. Written Data						
4	0x06	P5-11	11			

Then, read the content of specified address by communication command 0x03 (continuous reading). The issuing communication command is as follows:

Conte	Content of Communication Command: Read Data Array			Return Data					
		Stort	Dood	P5-	11	P5	-12	P5-13	
No.	Command	Start Add.	Read Amount	Low Word	High Word	Low Word	High Word	Low Word	High Word
			6	11	0	100	0	200	0
5	0x03	P5-11	(Word)	-		Data of address 11		Data of address 12	
			6	13	0	300	0	400	0
6	0x03	P5-11	(Word)	Read a	ddress		a of ess 13		a of ess 14
			6	15	0	500	0	600	0
7	0x03	P5-11	6 (Word)	Read a	ddress		a of ess 15		a of ess 16

The return value on the right-hand side of the above table represents the read parameter, P5-11, P5-12 and P5-13, which is also the content of address 11~16 in data array.

# 7.3 Description of Motion Axes

The motion axis is an internal counter of the servo drive. It is used for counting the absolute position of the axis (32-bit integer). The following motion axes are included in this servo drive:

Ν	ame of the Axis	Description	Access	Attribute
1.	Main Encoder (P5-16)	It represents the absolute feedback position of the motor. The unit is PUU (user unit).	R	Physical Axis
2.	Auxiliary Encoder (P5-17)	It is counted by the pulse signal from CN5 and usually connects to the second encoder or linear scale. Its pulse is A/B type.	R/W	Physical Axis
3.	Pulse Command (P5-18)	It is counted by the pulse signal from CN1 and usually connects to the pulse command of the controller. The pulse type could be set by P1-00.	R/W	Physical Axis
4.	Capture Axis (P5-37)	It is the axis which has CAP function. Its command source could be the above mentioned axis 1~3, which can write the new value into it and has an offset from the physical axis. Moreover, after capturing the first point, the axis position can be redefined.	R/W	Functional Axis
5.	Compare Axis (P5-57)	It is the axis which has CMP function. Its command source could be the above mentioned axis 1~4, which can write the new value into it and has an offset from the physical axis.	R/W	Functional Axis
6.	Master Axis (P5-86)	It is the master axis of E-Cam. Its command source could be the above mentioned axis 2, 3, 4 and 7, which can write the new value into it and has an offset from the physical axis.	R/W	Functional Axis
7.	Command Axis in PR Mode	The command position is from the path generator in PR mode.	R	Virtual Axis
8.	Internal Time Axis	It is the internal accumulative time counter of the servo drive. The value increases 1 every 1ms.	R	Virtual Axis
9.	Synchronous Capture Axis (P5-77)	It is similar to Capture Axis (P5-37); however, it automatically adjusts the incremental pulse between two CAPs to the setting value of P5-78.	R/W	Virtual Axis
Nc	Functional Axis	The position value is counted from the actual hardware s: It is the virtual axis which has been processed by the might not be the same as the source of physical incremental value is the same as the one in physical a The axis position comes from the internal firmware of	ne physica al axis. H axis.	owever, the

Virtual Axis: The axis position comes from the internal firmware of the servo drive. The command axis of PR mode is not instantaneous; therefore, it cannot be the command source axis of CAP and CMP function. However, it could be the command source of master axis of E-Cam.

# 7.4 Description of PR Mode

PR Procedure: It is the smallest unit of command. Command could be one or many procedures to constitute.

Procedure is triggered by DI.CTRG. POS0~POS5 is used to specify the triggered procedure number.

The triggered procedure is completed and will trigger the next one automatically. The procedure number can be set and the delay time between procedures as well.

The E-Cam function is provided in PR mode. It can be enabled via PR procedure. After it is

disabled, it can return to the specified PR procedure.

## 7.5 The Difference between General PR Mode and the One in ASDA-A2

	General PR Mode	PR Mode in A2R
Command Number	8	64
Command Type	Positioning Command	Positioning / Constant speed Command PR jump, write in parameters
Position Command Parameter	<ul> <li>Absolute or incremental</li> <li>Acceleration/Deceleration time x 1 set</li> <li>Motion speed x 8 sets</li> <li>Delay time x 8 sets</li> </ul>	<ul> <li>Absolute / incremental can be set individually</li> <li>Acceleration/Deceleration time x 16 sets</li> <li>Motion speed x 16 sets</li> <li>Delay time x 16 sets</li> </ul>
Command Triggering Time	It has to wait until DO.ZSPD is ON	Anytime will do. It could specify the next command issuing method (in sequence / interrupt / overlap)
Command Triggering Method	<ul> <li>Use DI.CTRG + POSn</li> </ul>	<ul> <li>Use DI.CTRG + POSn</li> <li>Event trigger: DI.Event + CAP complete</li> <li>P5-07, fill in PR number to trigger.</li> </ul>
Position Command PROFILE	<ul> <li>Trapezoid curve with S- curve filter</li> <li>(If S-curve is not enabled, then it has no function of acceleration / deceleration)</li> </ul>	<ul> <li>Trapezoid curve with S-curve filter (Trapezoid curve and S-curve can be set individually.</li> </ul>
Format of Position Command	<ul> <li>Two register for turns and pulse within one turn respectively.</li> </ul>	<ul> <li>PUU (32bit)</li> </ul>
Homing Function	<ul> <li>The function is enabled automatically when the power is On. (Servo ON for the first time)</li> <li>Use DI.SHOM to trigger</li> </ul>	<ul> <li>The function is enabled automatically when the power is On. (Servo ON for the first time)</li> <li>Use DI.SHOM to trigger</li> <li>PR 0 = Homing</li> <li>After homing is completed, the specified PR will be executed automatically.</li> </ul>
Software limit protection	No	Yes

# 7.6 The Position Unit of PR Mode

The position data of PR mode is represented by PUU (Pulse of User Unit). It is also the proportion between the controller position unit and the internal position unit of the servo drive, which is the so-called electronic gear ratio of the servo drive.

- 1. The position unit of the servo drive (pulse): Encoder unit: 1280000 (pulse/rev), which will not change.
- User unit (PUU): The unit of the controller.
   P pulse per revolution (PUU/rev), the gear ratio should set as:
   GEAR NUM (P1-44) / GEAR DEN (P1-45) = 1280000 / P

# 7.7 Description of Register in PR Mode

- 1. Position register of PR mode: All is represented in PUU (Pulse of User Unit).
- 2. Command register (monitoring variable 064): Command termination register Cmd\_E. It represents the absolute terminal coordinate of position command.
- 3. Command output register (monitoring variable001): Cmd\_O; it represents the absolute coordinate from the current output command.
- 4. Feedback register (monitoring variable 000): Fb\_PUU; it shows the absolute feedback position of the motor.
- 5. Deviation register (monitoring variable 002): Err\_PUU; it is the deviation between the register from command output and feedback register.
- 6. In PR mode, either in operation or stop status, it satisfies the condition of Err\_PUU = Cmd\_O Fb\_PUU.

Type of Command	When issuing the command = >	= > When command is executing = >	= > Command is completed
Absolute Positioning Command	Cmd_E = command data (absolute) Cmd_O does not change. DO.CMD_OK is OFF	Cmd_E does not change. Cmd_O continuously output 	Cmd_E does not change. Cmd_O = Cmd_E DO.CMD_OK is ON
Incremental Positioning Command	Cmd_E+= command data (incremental) Cmd_O does not change. DO.CMD_OK is OFF	Cmd_E does not change. Cmd_O continuously output	Cmd_E does not change. Cmd_O = Cmd_E DO.CMD_OK is ON
Issue the command of DI : STP to stop the command	Cmd_E does not change. Cmd_O continuously output DO.CMD_OK is unchangeable	Cmd_Edoesnotchange.Cmd_Ostopsaccordingtothedeceleration curve	Cmd_E does not change. Cmd_O = position after stop DO.CMD_OK is ON

Influence brought by position command:

Type of Command	When issuing the command = >	= > When command is executing = >		= > Command is completed		
anytime						
	Cmd_E does not change.	Cmd_E output	continuously	Cmd_E = the absolute position of Z		
Homing Command	Cmd_O does not change. DO.CMD_OK is OFF	Cmd_O output	continuously	Cmd_O = position after stop		
	DO.HOME is OFF			DO.CMD_OK is ON		
				DO.HOME is ON		
	Cmd_E continuously output.					
Speed Command	Cmd_O continuously output. We the speed reaches the setting		·	d is completed, it means		
	DO.CMD_OK is OFF	1				
Enter PR (Servo Off->On or switch the mode and enter into PR mode) Cmd_O = Cmd_E = current feedback position						
Note: The incremental positioning command is accumulated by command termination Cmd_E. It is neither related to the current position of the motor nor the command time.						

# 7.8 Homing Description of PR Mode

The purpose of homing is to connect the Z pulse position of motor encoder to the internal coordinate of the servo drive. The coordinate value corresponded by Z pulse can be specified.

After homing is completed, the stopped position will not be the Z pulse. It is because it has to decelerate to stop when finding the Z pulse. It might therefore exceed a bit. However, since the position of Z pulse has correctly setup, it would not influence the accuracy of positioning. For example, when specifying the coordinate value corresponded by Z pulse is 100 and it is Cmd\_O = 300 after homing, it means the deceleration distance is 300 - 100 = 200 (PUU). Since Cmd\_E = 100 (Z's absolute coordinate), if desire to return to Z pulse position, issuing the positioning command will do, absolute 100 command or incremental 0 command.

After homing is completed, it will execute the specified PR automatically, which can move a distance of offset after homing.

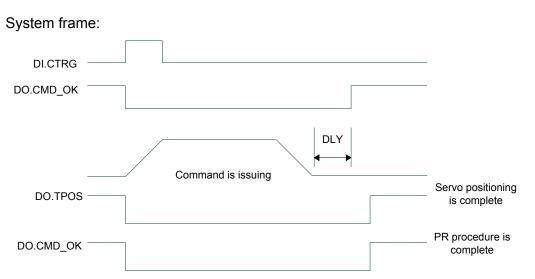
When it is executing homing, software limit is disabled.

# 7.9 DI / DO Provided by PR Mode and Diagrams

DI signal: CTRG, SHOM, STP, POS 0~5, ORG, PL (CCWL), NL (CWL), EV1~4

DO signal:

CMD OK, MC\_OK, TPOS, ALM, CAP\_OK, CAM\_AREA



Description of command triggered method in PR mode:

64 command procedures are in each axis of PR mode. Procedure #0 is homing and the others (#1~#63) are the procedures that users can self-define. The command triggered method is concluded as the followings:

	Command Source	Description
Standard trigger	DI.CTRG + POS0 ~ 5	Use DI.POS0 ~ 5 to trigger the desired procedure number. Then, use the rising edge of DI.CTRG to trigger PR command. Application: PC or PLC that issues command via DI
Functional trigger	DI.STP, SHM	When DI.STP is from OFF $\rightarrow$ ON, the command stops in half way. When DI.SHOM is from OFF $\rightarrow$ ON, it starts homing.
Event trigger	DI.EV1~4	The change status of DI.EV1 ~ 4 can be the triggered event. Set the triggered procedure number from OFF $\rightarrow$ ON by parameter P5-98. Set the triggered procedure number from ON $\rightarrow$ OFF by parameter P5-99. Application: connect to the sensor and trigger the preset procedure.
Software trigger	P5-07	Directly write the procedure number into P5-07 and trigger command. Both panel and communication (RS-232/485 / CANopen) can do. Application: PC or PLC that issues command via

		communication.
Other	CAP trigger E-CAM disengage trigger	After the capture is completed, procedure #50 can be triggered and activated by the setting value Bit3 of P5-39 X. When E-cam is disengaged and returns to PR mode, the procedure specified by P5-88 BA setting value can be triggered. A2L does not support E-Cam function.

## 7.10 Parameter Settings

1) Target speed: P5-60 ~ P5-75, 16 PR in total

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

2) Accel / Decel time: P5-20 ~ P5-35, 16 PR in total

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

Note: The deceleration time used by DI: STP/EMS/NL(CWL)PL(CCWL) is defined via P5-07.

### 3) Pause time: P5-40 ~ P5-55, total 16 PR in total

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

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

	32-bit
P5-00	Reserved
P5-01	Reserved (It is for testing only, do not use)
P5-02	Reserved (It is for testing only, do not use)
P5-03	Deceleration time of auto protection
P5-04	Homing mode
P5-05	1 <sup>st</sup> Speed setting of high speed homing
P5-06	2 <sup>nd</sup> Speed setting of low speed homing
P5-07	PR command register
P5-08	Forward software limit
P5-09	Reverse software limit
P6-00	Homing setting
P6-01	Origin definition

Note: Path (procedure)

5) PR Definition: P6-02 ~ P7-27, (64-bit), 63 sets of PR in total (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 has two parameters; the PR function is determined by TYPE. DATA represents position or speed data while the others are the additional information.

### 6) SPEED, 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 this command is executing, the motor accelerates or decelerates from the current speed until it reaches the target speed. After the command is completed, the motor will remain at the same speed and never stop.

OPT:

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

XDI.STP stop and software limit are acceptable.

INS: When this PR is executing, it will interrupt the previous PR.

AUTO: When the speed reaches the constant speed area, the next PR will be loaded automatically.

UNIT: 0 unit is  $0.1r/min (10^{-6} m/s \text{ for linear motor})$ ; 1 unit is PPS (Pulse Per Second)

ACC / DEC: 0 ~ F, Accel / Decel number

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

Index P5-20 ~ P5-35

SPD: 0 ~ F, target speed number

SPD (4-bit)

Index P5-60 ~ P5-75

DLY: 0 ~ F, delay time number. The delay after executing this PR. The external INS is invalid.

DLY (4-bit)

Index P5-40 ~ P5-55

7) POSITION, Positioning control: (TYPE = 2, PR is completed and stopped), (TYPE = 3, the next PR is executed automatically after the PR 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	DW1 DATA (32 bit): Target position, Unit: Pulse of User Unit							

OPT:

	OPT								
Bit 7	Bit 6	Bit 5	Bit 4	Evaluation					
CN	/ID	OVLP	INS	Explanation					
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)					

XDI.STP stop and software limit are acceptable.

INS: When this PR is executing, it will interrupt the previous PR

OVLP: It is allowed to overlap the next PR. When overlapping, please set DLY to 0.

- CMD: The calculation of the position terminal command (Cmd\_E) is as the followings:
- Note 1: Position terminal command is determined by DATA.
- Note 2: Position terminal command is determined by the previous terminal command (Monitoring variable 40h) plus DATA.
- Note 3: Position terminal command is determined by the current feedback position (Monitoring variable 00h) plus DATA.
- Note 4: Position terminal command is determined by the position latched by CAP (Monitoring variable 2Bh) plus DATA.

## 8) Special code: TYPE = 7, jump to the specified 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								
-	-	-	INS					

PATH\_NO: The jump target procedure number FUNC\_CODE: Reserved

DLY: The delay time after jump

## 9) Special code: TYPE = 8, write the specified parameter.

Bit	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0		
DWC	0	S_D	DLY	DI	ESTINATIC	)N	OPT	8		
DW1		SOURCE								

DLY: Delay time after writing the parameters

Bit28 ~ Bit31are not 0x0, then AL213 occurs.

S\_D: Specified data source and written target.

	S_D										
Bit 27	Bit 26	Bit 25	Bit 24	E	Explanation						
SO	UR	Rsvd	DEST	Data Source	Write Destination						
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	0	Monitoring variable	Parameter Px-xx						
0	0	0	1	Constant	Data Array						
0	1		1	Parameter Px-xx	Data Array						
1	0		1	Data Array	Data Array						
1	1		1	Monitoring variable	Data Array						

Rsvd is not 0, then AL213 occurs.

OPT:

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

Para\_Data: the written data

INS: When executing this PR, it interrupts the previous one.

AUTO: When this PR is completed, it will execute the next PR automatically.

ROM: 1 means to write into EEPROM at the same time. (The supported written target is parameter, if the target is data array, then it will not be written into EEPROM.)

## DESTINATION: Setting of the written target

	DESTINATION				
	Bit 19 ~ 16	Bit 15 ~ 12	Bit 11 ~ 8		
When DEST = 0, it represents parameter, Px- xx	P_Grp	P_	ldx		
When DEST = 1, it represents data array.		Array_Addr			

P\_Grp, P\_Idx: Specified parameter group and number

Array\_Addr: Position of the specified data array.

#### SOURCE: Settings of data source

				SOU	RCE				
Bit	31 ~ 28	31 ~ 28 27 ~ 24 23 ~ 20 19 ~ 16 15 ~ 12 11 ~ 8						7~4 3~0	
SOUR = 00 means constant		Para_Data							
SOUR = 01 means parameter Px-xx		Rsv	/d (0x000	0 0)		P_Grp	P_ldx		
SOUR = 10 means data array		Rsvd (0x0000 0) Array_Addr							
SOUR = 11 means monitoring variable		Rsvd (0x0000 00) Sys_Var							

P\_Grp, P\_Idx: specified parameter group and number

Array\_Addr: specified the position of data array

Para\_Data: the written constant

Sys\_Var: monitor parameter code. Refer to P0-02 for its setting.

When Rsvd is not 0, it will display AL.213. When P\_Grp exceeds the range, it will display AL.207. When displaying AL.209, it means P\_Idx exceeds the range.

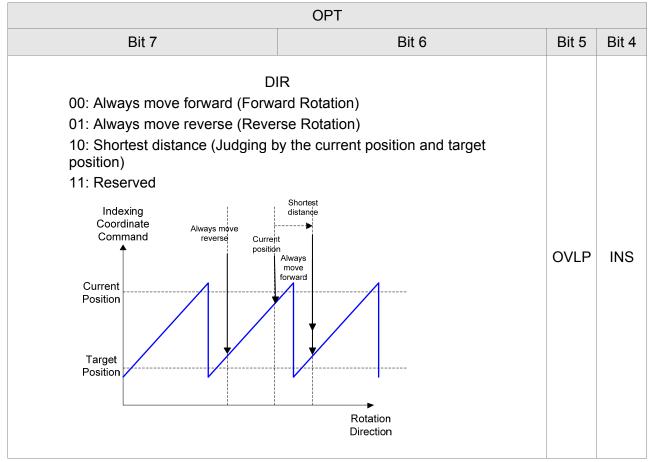
When Array\_Addr exceeds the range, it will display AL.213. And AL.231 is for Sys\_Var exceeding the range.

- Note: 1. Even when the written parameter is retained, the new value will not be written into EEPROM. Too frequent written will not shorten the lifetime of EEPROM.
  - Note: The aim of writing parameters via PR procedure is for turning ON/OFF or adjusting some functions. (E.g. according to different positioning command to adjust P2-00, Position Loop Gain.) This procedure will continuously repeat during the operation. If the data is all written into EEPROM, it will shorten the lifetime of EEPROM. In addition, if P2-30 is set to 5, the modified parameters (either from panel or communication) will not be saved and is inconvenient to use. Thus, this new function is added.
- 3. If writing parameters fails, alarm AL.213~219 will occur (Refer to Chapter 11 of the manual) and the next PR which is enabled by AUTO function will not be executed.

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): Inc	lexing Cool	dinate Con	nmand, Uni	t: PUU	

10) Special Function: TYPE = 0xA, Indexing command.

#### OPT:



INS: When this PR is executing, it interrupts the previous one.

OVLP: It is allowed to overlap the next PR. When overlapping, please set DLY to 0.

### OPT2:

OPT2								
Bit 27	Bit 26	Bit 25	Bit 24					
-	AUTO	-	S_LOW					

AUTO: Position reached and the next PR is loaded automatically.

S\_LOW: Selection of speed unit. 0 means the unit is 0.1r/min; while 1 means 0.01r/min

## DATA (DW1): Data format

DW1: DATA (32 bits)	
PUU: 0~ (P2-52-1)	

P2-52: Size of indexing coordinates

11) Homing Definition: P6-00 ~ P6-01, (64 bits) one set of PR.

Bi	t	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0			
DW	/0	BOOT	-	DLY	DEC2	DEC1	ACC	PA	TH			
DW	/1		ORG_DEF (32-bit)									

PATH (PR): 0 ~ 3F. (6 bits)

00 (Stop): Homing completed and stops

01 ~ 3F (Auto): Homing completed and executes the specified PR: 1 ~ 63.

Note: PATH (procedure)

ACC: Acceleration time

DEC1/DEC2: The first / second deceleration time

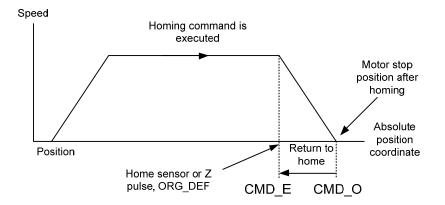
DLY: Delay time

BOOT: Activation mode. When the POWER is ON:

- 0: will not do homing
- 1: start homing (Servo ON for the first time)

ORG\_DEF: the coordinate value of the origin definition which might not be 0

 After finding the origin (Sensor or Z), the motor has to decelerate to stop. The stop position will slightly exceed the origin. After the positioning is completed, users can determine and setup the motor position:



If not returning to the original point, set PATH to 0.

If desire to return to the original point, set PATH to non-zero value and setup that PR: absolute positioning command = ORG\_DEF.

CMD\_O: Command Output Position

CMD\_E: Command End Position

2) Homing does not define the offset value but uses PATH to specify a path as the offset value.

After finding the origin, if the user desires to move a short distance of offset S (the related home Sensor or Z) and set the coordinate to P after moving: (incremental positioning command = S will do)

## 7.10.1 The Relation between the Previous Path and the Next Path

1) Interrupt (the previous path) and overlap (the next path) can be set in every path



Note: Path (procedure)

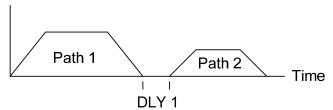
## 2) The priority of interrupt command is higher than overlap

PATH 1	PATH 2	Relation	Output	Note
OVLP = 0	INS = 0	In sequence	DLY 1	PATH 1/2 which could be the combination of speed/position
OVLP = 1	INS = 0	Overlap	NO DLY	PATH 2 is SPEED and does not support overlap
OVLP = 0	INS = 1	Interrupt	N/A	PATH 1/2 which could be the
OVLP = 1	1100 - 1	Interrupt	IN/A	combination of speed/position

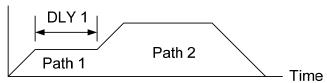
## 7.10.2 Programming the Path in PR Mode

1) Sequence command

## Speed

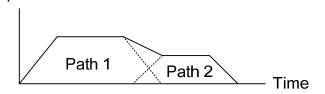


Speed



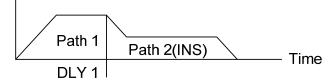
## 2) Overlap

Speed



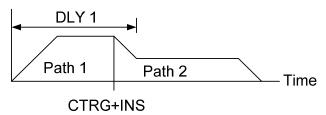
3) Internal Interrupt

Speed



4) External Interrupt

Speed



Path 1: is AUTO and has set DLY Path 2: does not set INS (DLY starts to count after completing the command)

Path 1: speed command and has set DLY

Path 2: position command

(DLY starts to count after completing the command)

Path 1: has set OVLP but cannot set DLY Path 2: does not set INS

Path 1: AUTO and has set DLY Path 2: has set INS

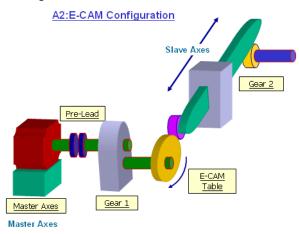
(DLY is effective to the internal interrupt)

It can be used to pre-constitute complicated Profile

Path 1: AUTO or SINGLE Regardless the setting of DLY Path 2: has set INS (DLY is ineffective to the external interrupt) Profile can be changed from external any time

# 7.11 The Description of E-Cam Function

E-Cam is a virtual cam which is implemented by software. It includes Master axis and Slave axis. The illustration is as the following:



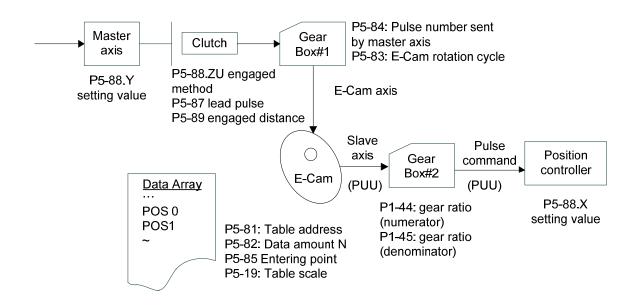
In PT mode, the position command (slave) is issued by the external pulse input (master). The two is merely the linear scaling relation (its scaling equals to e-gear ratio). However, instead of linear scaling, E-Cam is defined by cyclic curve profile, just like the cam shape. In physical machine cam, slave axis can operate as variable speed motion, alternating motion, intermittent motion, etc by master axis with the constant speed motion. It is very extensive in application. Using E-Cam could have similar effect. The following table describes the differences between E-Cam and Machine Cam.

	Machine Cam	E-Cam			
Structure	Return to the original position after rotating a cycle.	It might not return to the original position after rotating a cycle. The structure could be in spiral shape like mosquito coil incense.			
Smooth Performance	It is determined by the fineness of the real process.	It is interpolated by cubic curve via software			
Position Accuracy	Very precise (when it has no vibration)	The command is very precise, but the actual position might have deviation due to the servo delay.			
Long Distance Motion	The longer the slave axis is, the bigger the cam will be. It is not easy to make.	Change the value of the table will do. It is easy to realize.			
The Necessity of Master Axis	The master axis is necessary.	The master axis is unnecessary when it is applied to constant speed motion. It will do by using the internal signal of the servo drive.			
Flexibility	It is inconvenient to change and modify and it is expensive as well.	It will do by re-setting the parameter.			
Maintenance	Machine will wear and the maintenance is necessary.	No need to maintain.			
Others	The master axis needs space and it consumes energy as well.	Save the space and energy which protects the environment.			

The main feature of E-Cam is as the followings:

Features of E-Cam					
Operation	Operate the E-cam in PR mode only.				
Active the E-Cam Function P5-88.X	<ul><li>0: disable E-cam function and force to disengage (default).</li><li>1: enable E-cam function and starts to judge the engaged condition.</li></ul>				
E-Cam Status	Stop / Pre-engage / Engage				
Source of Master Axis	<ul> <li>Auxiliary encoder (linear scale)</li> <li>Pulse command</li> <li>CAP axis (defined by CAP function)</li> <li>PR command</li> <li>Time axis</li> <li>Synchronous capture axis</li> </ul>				
	The overlap motion command issued by PR and E-Cam				
Motion Command of the Servo Drive	<ul> <li>Command of the Servo Drive = E-Cam command + PR command</li> <li>The command will be issued only in Engaged status</li> <li>PR command is effective regardless to the E-Cam status. Except when E-cam is engaging and the source of master axis is PR command, PR command is 0.</li> <li>When E-Cam is operating, its position still can be adjusted by PR command (incremental command in general).</li> </ul>				
Data Storage Address of E-Cam table	• It is stored in Data array and the start address is set by P5-81.				
Data Size of E-Cam table	<ul> <li>It is set by P5-82. 720 points is the maximum and 5 points is the minimum.</li> </ul>				
Data Format of E-Cam table	• 32-bit signed value.				
Data Content of E-Cam table	<ul> <li>Save the position of slave axis (User unit, PUU)</li> </ul>				
<ul> <li>The operation of E-Cam position</li> <li>The slave axis issues position command incremental The slave axis issues position command incremental The start and the end of E-Cam curve profile could r be the same. It depends on the value of E-Cam table</li> <li>The command is interpolated by cubic curve. The each point will be smoothly connected because of differential operation.</li> </ul>					

#### E-Cam provided by this servo drive and below is its functional diagram:

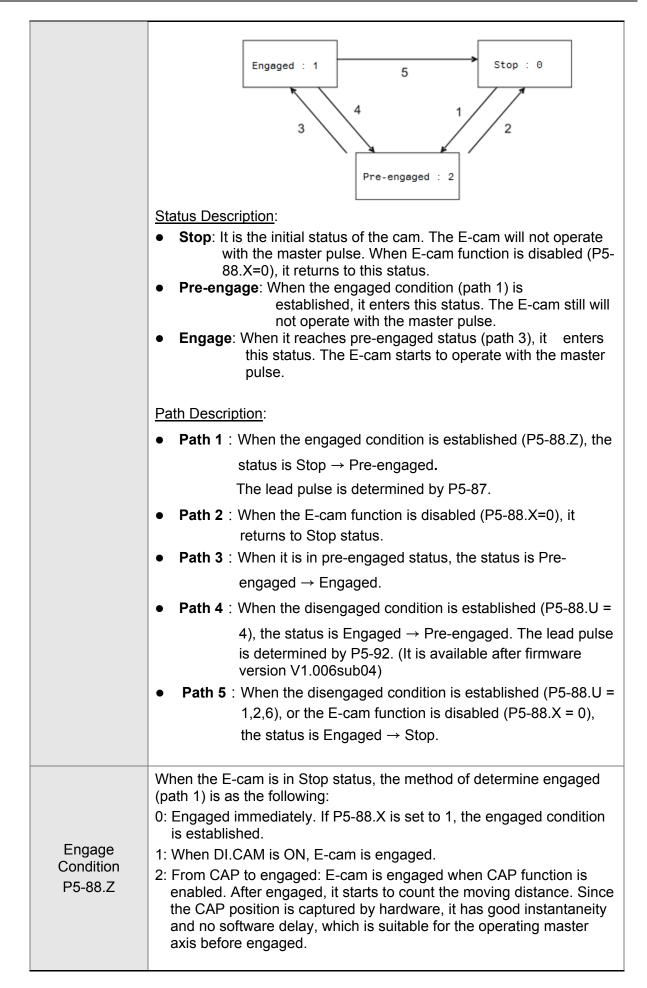


Master Axis, the description is as follows:

Function	The moving distance of the master axis is the source which could drive the E-Cam		
Source of Master Axis The Setting Value of P5-88 Y	<ul> <li>Source selected by P5-88.Y:</li> <li>Auxiliary encoder (linear scale)</li> <li>Pulse command</li> <li>PR command</li> <li>Time axis</li> <li>Synchronous capture axis</li> <li>CAP axis (defined by CAP function)</li> </ul>		
Position of Master Axis P5-86	The position of master axis can be monitored via P5-86. It also can be written before the E-cam engaged. To change this parameter will not influence the position of the slave. It is because the movin distance of master axis remains.		

Clutch, the description is as follows:

Function	It is used to determine the status of engaged / disengaged between the master axis and gear box # 1. The moving distance of the master axis can drive the E-Cam not until the cam is engaged.
Activate E-cam function P5-88.X	<ul><li>0: disable E-cam function (default value). If the cam is engaged, the cam will be forced to disengage.</li><li>1: enable E-cam function and starts to judge the engaged condition</li></ul>
E-Cam Status	Status can be known via parameter P5-88.S: 0 – Stop; 1 – Engage; 2 – Pre-engage



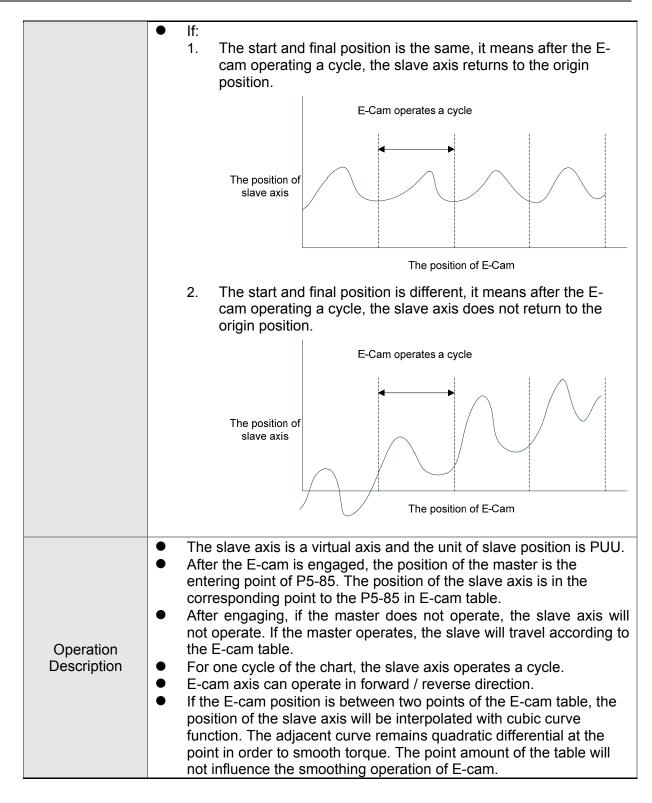
Lead Pulse Monitoring Variables (061)	<ul> <li>In pre-engaged status, the lead pulse is the moving distance of master axis before the E-cam is engaged (path 3). Its value decreases when input the master pulse. When the value is 0, it enters Engaged status.</li> <li>Enter Pre-engaged status via path 1, the lead pulse is determined by the value of P5-87.</li> <li>Enter Pre-engaged status via path 4, the lead pulse is determined by the value of P5-92.</li> <li>If the setting is 0, it means no lead pulse and will enter Engaged status immediately.</li> <li>Symbol +/ - represents the direction of lead pulse. Please note that the E-cam will be unable to engage if setting the wrong direction.</li> <li>If setting the wrong direction, the value of monitoring variable (061) will increase, which is far from 0 and causes overflow at the end. If it overflows, the E-cam function will be disabled (P5-88.X=0) and the E-cam will be forced to return to Stop status.</li> </ul>				
	disenga	he E-cam is in Engaged status, the meth aged is as the following: , 4 and 6 cannot be selected at the same			
	U	Disengage Condition	After Disengaged		
	0	Never disengaged. It will be forced to disengage until P5-88.X is set to 0.	( <b>Path 5</b> ) Enter <b>Stop</b> Status		
	1	DI.CAM is OFF	( <b>Path 5</b> ) Enter <b>Stop</b> Status		
Disengage Condition P5-88.U	2	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)	( <b>Path 5</b> ) Enter <b>Stop</b> Status		
	6	Same as 2, the E-cam starts to decelerate when disengaging. It is suitable for the application of calling the next PR position command right after disengaged.			
	4	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)	( <b>Path 4</b> ) Returns to <b>Pre-</b> <b>engage</b> Status The lead pulse is P5-92		
	8	Disable the E-cam after disengaging	Set P5-88.X = 0		
Auxiliary Selection P5-88.BA	When the E-cam disengaged, if it is in the setting distance (P5- 88.U=2), it returns to Stop status and can determine the execution PR number.				

## ■ Gear # 1, the description is as follows:

Func	tion	• Set the relativity of master axis and E-cam axis.
		E.g. The master axis operates one cycle; the E-cam axis is no need to operate one cycle.
Descri	iption	<ul> <li>E-cam axis is a virtual axis.</li> </ul>
		<ul> <li>The E-cam axis operates one cycle (360 degrees) means the cam operates one cycle and the slave axis operates one cycle.</li> </ul>
		<ul> <li>The pulse number is the unit of moving distance of the master axis. Its resolution is determined by the source.</li> </ul>
Setting I	Vethod	<ul> <li>If the pulse number of master axis is P, the E-cam axis</li> </ul>
P5-83	3: M	operates M cycle.
P5-84	4: P	Then, the setting of gear ratio is P5-83 = M, P5-84 = P

## Cam, the description is as follows:

Function	<ul> <li>Set the relation between E-cam axis and slave axis and define it in the E-cam table.</li> </ul>				
Function	E-cam axis operates one cycle and the slave axis operates one cycle.				
Data Storage Address of E- Cam table	<ul> <li>Data array, the start address is set by P5-81</li> </ul>				
Data Format	<ul> <li>32-bit (It has positive and negative, user unit: PUU)</li> </ul>				
E-Cam Curve	<ul> <li>It is used to magnify (minify) the E-cam shape.</li> <li>It equals to the value of data multiplies P5-19.</li> </ul>				
Scaling P5-19	<ul> <li>Switch the symbol, + / - will change the operation direction of slave axis.</li> </ul>				
0 ~ +/- 32.700	<ul> <li>If P5-19 is set to 0, the E-cam command will not be outputted. (The setting will be 0 for good).</li> </ul>				
Data Size	<ul> <li>It is divided into N parts via P5-82 (&gt; = 5) and does not exceed the limit of data array. It means 360 degrees a cycle of E-cam are divided into N areas. Each area is (360/N) degrees.</li> </ul>				
	<ul> <li>The position data of slave axis is saved in E-cam table. (User unit: PUU).</li> <li>If E-cam is divided into N areas, the position of each area must be included in the table. It must set N + 1 points in total. It is because the position of the first point (0 degree) and the final point (360 degree) might not be the same.</li> </ul>				
Data Content	1.0° and 360° 2.0° and 360° is identical is different				



Gear # 2, the description is as follows:

Function	<ul> <li>Set the relation between slave axis and pulse command</li> <li>The slave axis operates a cycle, but the pulse command might not operate a cycle.</li> </ul>
Description	<ul> <li>The slave axis is a virtual axis and the unit of slave position is PUU.</li> <li>The pulse command is the encoder unit (pulse). The resolution is 1280000 pulse/rev.</li> <li>For one cycle of the chart, the slave axis operates a cycle.</li> </ul>

Setting Method P1-44: numerator	•	If the pulse number of slave axis is L, the motor axis operates R cycle.
P1-45:		Then, the setting of gear ratio is P1-44/P1-45 = 1280000 x R /
denominator		L
		The gear ratio of PT and PR is the same.

Digital Output of E-cam, the description is as follows:

DO Name and Number	• DO.CAM_AREA (DO no.= 0x18)
Function	<ul> <li>If DO.CAM_AREA is ON, it means the position of E-cam axis is in the setting range.</li> </ul>
When the E-cam is engaging	<ul> <li>Set the angle range of DO ON by P5-90 and P5-91.</li> <li>Please refer to table 1 and 2 below</li> </ul>
When the E-cam is disengaging	• DO.CAM_AREA is OFF.

Table 1 P5-90 <= P5-91:

E-Cam angle	0°	~	P5-90	~	P5-91	~	360°
DO:CAM_AREA	OFF	OFF	ON	ON	ON	OFF	OFF

Table 2 P5-90 > P5-91:

E-Cam angle	0°	0° ~ P5-91 ~		~	P5-90	~	360°
DO:CAM_AREA	ON	ON	OFF	OFF	OFF	ON	ON

## 7.11.1 Function Description of CAPTURE (Data Capture)

The concept of CAPTURE is to capture the position of motion axis instantaneously by using the external trigger signal DI7. Then save it in data array so as to be used for motion control afterwards. Since CAPTURE is finished by hardware, there is no problem of software delay. It also can accurately capture the high-speed motion axis. The CAPTURE features provided by this servo drive is as follows.

CAPTURE Features		
	<ul> <li>Main encoder of the motor</li> <li>Auxiliary encoder (linear scale)</li> <li>Pulse command</li> </ul>	
Pulse Source	The selected axis will be displayed in P5-37, the default value can be written in before capture.	
	Note: When the source of COMPARE is CAP axis, the CAP source cannot be changed.	
	<ul> <li>Triggered by DI7, the response time is 5 usec.</li> </ul>	
Trigger signal	Note: DI7 directly connects to CAPTURE hardware. Thus, regardless the setting value of P2-16 (DI Code), CAPTURE can work. When using CAPTURE, in order to avoid DI error, system will force to disable DI function, which means the setting will be P2-16 = 0x0100 automatically. Since the value is not written into EEPROM, P2-16 will return to the default value after re-power on.	

CAPTURE Features		
Trigger method	<ul> <li>Edge trigger can select contact A/B</li> <li>It is capable to continuously capture more than one point.</li> <li>It can set the trigger interval. (The interval between this trigger and the next one.)</li> </ul>	
Data storage position	<ul> <li>Data array. The start address is set by P5-36.</li> </ul>	
Capture number	<ul> <li>It is set via P5-38 and will not exceed the limit of data array.</li> </ul>	
Capture format	• 32-bit (It has positive and negative.)	
Auxiliary selection	<ul> <li>After capturing the first data, the CAP axis coordinate system will be set to the value the same as P5-76.</li> <li>After capturing the first data, the COMPARE function is enabled automatically.</li> <li>After capturing all points, PR procedure # 50 is triggered automatically.</li> </ul>	
DO.CAP_OK	<ul> <li>The default value is OFF.</li> <li>After capturing the last point, this DO is ON.</li> <li>Set P5-39.X0 to 1 so as to activate CAPTURE function and this DO is OFF.</li> </ul>	
Note	<ul> <li>If P5-38=0, set the value of P5-39 X, Bit0 to 1 will disable the CAPTURE function. Clear the setting value of P5-39 X, Bit0 to 0 and set DO.CAP_OK to OFF.</li> <li>Since the capture axis is 32-bit wide, the accumulation will cause overflow. Please avoid this.</li> </ul>	

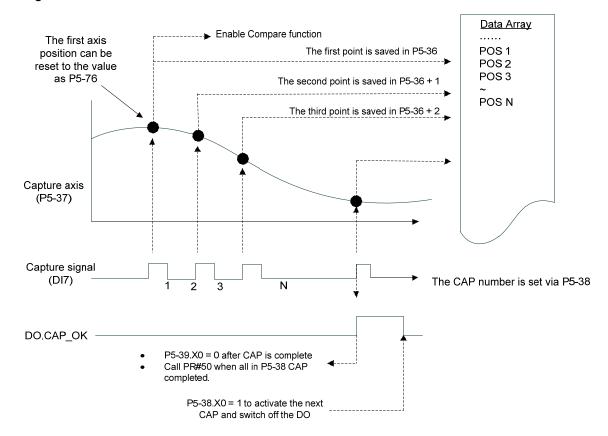
The CAP data is saved in data array and the first CAP data locates in P5-36. The CAP number

has no limit, thus it can be set via P5-38. The last CAP data is saved in P5-36 + P5-38 - 1. Set the value of P5-39 X, Bit0 to 1 so as to activate CAP function. Every time when DI7 is triggered, one data will be captured and saved in data array. Then, the value of P5-38 will decrease one automatically until the CAP number reaches the setting value (P5-38 = 0). The CAP procedure is completed, the setting value of P5-39 X, Bit0 will be cleared to 0 and DO.CAP\_OK is ON.

When capturing the first data, the position of CAP axis can be reset. The first CAP value will be the value set by P5-76. And the value of the second CAP data will be the incremental value from the first data. This method is called Relative Capture. If not selecting the first data reset, it is called Absolute Capture.

When capturing the first data, it automatically activates COMPARE function, which means the COMPARE function, is activated via DI5.

#### The diagram of CAP:



## 7.11.2 Function Description of COMPARE (Data Compare)

The concept of COMPARE is to compare the instant position of motion axis with the value which is saved in data array. Then output DO3 after the COMPARE condition is established for motion control. Since COMPARE is finished by hardware, there is no problem of software delay. It also can accurately compare the high-speed motion axis. The COMPARE features provided by this servo drive is as follows.

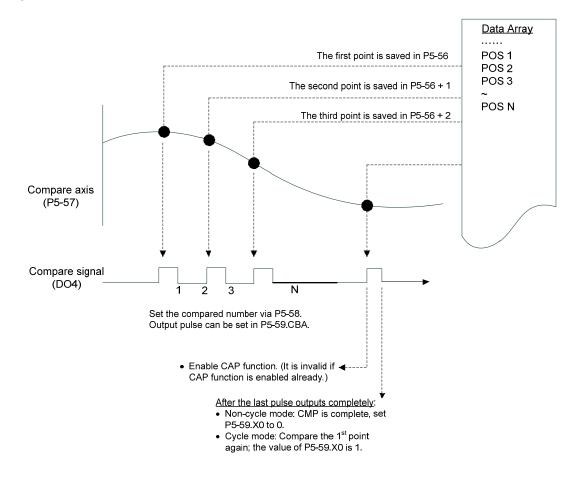
COMPARE Features		
Pulse Source	<ul> <li>Main Encoder of the Motor</li> <li>Auxiliary Encoder (linear scale)</li> <li>Pulse Command</li> <li>CAP Axis (set by CAPTURE). When selecting this axis, CAP source cannot be changed.</li> <li>The selected axis is displayed in P5-57. Before compare, the default value can be written in.</li> </ul>	
Output Signal	<ul> <li>Output by DO4 and the response time is 5 usec.</li> <li>Note: DO3 directly connects to COMPARE hardware, thus, regardless the setting value of P2-20 (DO Code), the function can work. When using COMPARE, in order to avoid DO error, the system will force to disable DO function, which means the setting will be P2-21 = 0x0100 automatically. Since the value is not written into EEPROM, P2-21 will return to the default value after re-power on.</li> </ul>	
Output Method	<ul> <li>Pulse output can select contact A/B.</li> <li>It is capable to continuously output more than one point.</li> <li>It can set the pulse output time.</li> </ul>	

Data Storage Position	• Data array. The start address is set by P5-56.
Compare Number	<ul> <li>It is set via P5-58 and will not exceed the limit of data array.</li> </ul>
Compare Format	• 32-bit (It has positive and negative.)
Compare Condition	<ul> <li>It will be triggered when the source of compare axis pass through the compare value.</li> </ul>
Auxiliary Selection	<ul> <li>Cycle mode: When comparing to the last point, it automatically returns to the first point and starts to compare.</li> <li>When the last compare is completed, the CAPTURE function is activated automatically.</li> </ul>
Note	<ul> <li>If P5-58 is set to 0, set the value of P5-59 X, Bit0 to1 will be unable to compare. Set the value of P5-59 X, Bit0 to 0.</li> <li>Since the capture axis is 32-bit wide, the accumulation will cause overflow. Please avoid this.</li> </ul>

The value of COMPARE is saved in data array and the first compare data locates in P5-56. The CMP number has no limit, thus it can be set via P5-58. The last CMP data is saved in P5-56 + P5-58 - 1. Set the value of P5-59 X, Bit0 to 1 so as to activate CMP function and start to compare the first data of data array. Every time when a position saved in data array is compared, the compare DO will be outputted. Then, the value of P5-58 will decrease one automatically and compare the next value until the CMP number reaches the setting value (P5-58 = 0). When the CMP procedure is completed, the setting value of P5-59 X, Bit0 will be cleared to 0.

When comparing to the last point, it can select if it returns to the first data for comparing. This is called cycle mode. Or it can activate CAPTURE function and wait DI7 for triggering CAP/CMP procedure.

#### The diagram of COMPARE:



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# **Chapter 8 Parameters**

## 8.1 Parameter Definition

Parameters are divided into eight groups which are shown as follows. The first character after the start code P is the group character and the second character is the parameter character. As for the communication address, it is the combination of group number along with two digit number in hexadecimal. The definition of parameter groups is as the followings:

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 parameters	(example: P6-xx)
Group 7: PR parameters	(example: P7-xx)

## **Control Mode Description:**

PT	:	Position control mode (Input the position command via the terminal block)
PR	:	Position control mode (The internal register issues the position command)
S	:	Speed control mode
Т	:	Torque control mode
DMC	:	DMCNET control mode

## **Special Symbol Description**

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

Monitor and General Output Parameter											
Deremeter	Abbr	Function	Defeult	المنا	Co	ontro	l Mo	de	Related		
Parameter	Abbr.	Function	Default	Unit	PT	PR	S	Т	Section		
P0-00★	VER	Firmware Version	Factory Setting	N/A	0	0	0	0	-		
P0-01∎	ALE	Alarm Code Display of Drive (Seven-segment Display)	N/A	N/A	0	0	0	0	11.1 11.2 11.3		
P0-02	STS	Drive Status	00	N/A	0	0	0	0	7.2		
P0-03	MON	Analog Output Monitor	01	N/A	0	0	0	0	4.3.5		
P0-08★	TSON	Servo On Time	0	Hour					-		
P0-09★	CM1	Status Monitor Register 1	N/A	N/A	0	0	0	0	4.3.5		
P0-10★	CM2	Status Monitor Register 2	N/A	N/A	0	0	0	0	4.3.5		
P0-11★	CM3	Status Monitor Register 3	N/A	N/A	0	0	0	0	4.3.5		
P0-12★	CM4	Status Monitor Register 4	N/A	N/A	0	0	0	0	4.3.5		
P0-13★	CM5	Status Monitor Register 5	N/A	N/A	0	0	0	0	4.3.5		
P0-17	CM1A	Status Monitor Register 1 Selection	0	N/A					-		
P0-18	CM2A	Status Monitor Register 2 Selection	0	N/A					-		
P0-19	СМЗА	Status Monitor Register 3 Selection	0	N/A					-		
P0-20	CM4A	Status Monitor Register 4 Selection	0	N/A					-		
P0-21	CM5A	Status Monitor Register 5 Selection	0	N/A					-		
P0-25	MAP1	Mapping Parameter # 1	No need to initialize	N/A	0	0	0	0	4.3.5		
P0-26	MAP2	Mapping Parameter # 2	No need to initialize	N/A	0	0	0	0	4.3.5		
P0-27	MAP3	Mapping Parameter # 3	No need to initialize	N/A	0	0	0	0	4.3.5		
P0-28	MAP4	Mapping Parameter # 4	No need to initialize	N/A	0	0	0	0	4.3.5		
P0-29	MAP5	Mapping Parameter # 5	No need to initialize	N/A	0	0	0	0	4.3.5		
P0-30	MAP6	Mapping Parameter # 6	No need to initialize	N/A	0	0	0	0	4.3.5		
P0-31	MAP7	Mapping Parameter # 7	No need to initialize	N/A	0	0	0	0	4.3.5		
P0-32	MAP8	Mapping Parameter # 8	No need to initialize	N/A	0	0	0	0	4.3.5		

Parameter	Abbr.	Function	Default	Unit	Сс	ontro	l Mo	de	Related
	7,661.	T unouon	Deldalt	Onit	PT	PR	S	Т	Section
P0-35	MAP1A	Target Setting of Mapping Parameter P0-25	0x0	N/A	0	0	0	0	4.3.5
P0-36	MAP2A	Target Setting of Mapping Parameter P0-26	0x0	N/A	0	0	0	0	4.3.5
P0-37	MAP3A	Target Setting of Mapping Parameter P0-27	0x0	N/A	0	0	0	0	4.3.5
P0-38	MAP4A	Target Setting of Mapping Parameter P0-28	0x0	N/A	0	0	0	0	4.3.5
P0-39	MAP5A	Target Setting of Mapping Parameter P0-29	0x0	N/A	0	0	0	0	4.3.5
P0-40	MAP6A	Target Setting of Mapping Parameter P0-30	0x0	N/A	0	0	0	0	4.3.5
P0-41	MAP7A	Target Setting of Mapping Parameter P0-31	0x0	N/A	0	0	0	0	4.3.5
P0-42	MAP8A	Target Setting of Mapping Parameter P0-32	0x0	N/A	0	0	0	0	4.3.5
P0-46★	SVSTS	Servo Digital Output Status Display	0	N/A	0	0	0	0	-
P1-04	MON1	MON1 Analog Monitor Output Proportion	100	%(full scale)	0	0	0	0	6.4.4
P1-05	MON2	MON2 Analog Monitor Output Proportion	100	%(full scale)	0	0	0	0	6.4.4

### **Monitor and General Output Parameter**

 $(\bigstar)$  Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is invalid when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.

(■) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

Filter and Resonance Suppression Parameter											
Deventer	A la la v	Function	Defeuilt	1.1:4	Co	ontro	l Mo	de	Related		
Parameter	Abbr.	Function	Default	Unit	PT	PR	S	Т	Section		
P1-06	SFLT	Analog Speed Command (Low-pass Filter)	0	ms			0		6.3.3		
P1-07	TFLT	Analog Torque Command (Low-pass Filter)	0	ms				0	6.4.3		
P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	0	10 ms	0	0			6.2.6		
P1-25	VSF1	Low-frequency Vibration Suppression (1)	100.0	0.1Hz	0	0			6.2.9		
P1-26	VSG1	Low-frequency Vibration Suppression Gain (1)	0	N/A	0	0			6.2.9		
P1-27	VSF2	Low-frequency Vibration Suppression (2)	100.0	0.1Hz	0	0			6.2.9		
P1-28	VSG2	Low-frequency Vibration Suppression Gain (2)	0	N/A	0	0			6.2.9		
P1-29	AVSM	Auto Low-frequency Vibration Supression Setting	0	N/A	0	0			6.2.9		
P1-30	VCL	Low-frequency Vibration Detection	500	pulse	0	0			6.2.9		
P1-34	TACC	Acceleration Constant of S- Curve	200	ms		0	0		6.3.3		
P1-35	TDEC	Deceleration Constant of S- Curve	200	ms		0	0		6.3.3		
P1-36	TSL	Acceleration / Deceleration Constant of S-Curve	0	ms		0	0		6.3.3		
P1-59	MFLT	Analog Speed Command	0	0.1ms			0		-		
P1-62	FRCL	Friction Compensation	0	%	0	0	0	0	-		
P1-63	FRCT	Friction Compensation	0	ms	0	0	0	0	-		
P1-68	PFLT2	Position Command Moving Filter	0	ms	0	0			-		
P1-75	FELP	Low-pass Filter Time Constant of Full-closed Loop control	100	ms	0	0			-		
P2-23	NCF1	Resonance suppression (Notch filter) (1)	1000	Hz	0	0	0	0	6.3.7		
P2-24	DPH1	Resonance Suppression (Notch filter) Attenuation Rate (1)	0	dB	0	0	0	0	6.3.7		
P2-43	NCF2	Resonance suppression (Notch filter) (2)	1000	Hz	0	0	0	0	6.3.7		
P2-44	DPH2	Resonance Suppression (Notch filter) Attenuation Rate (2)	0	dB	0	0	0	0	6.3.7		
P2-45	NCF3	Resonance suppression (Notch filter) (3)	1000	Hz	0	0	0	0	6.3.7		

P2-46	DPH3	Resonance Suppression (Notch filter) Attenuation Rate (3)	0	dB	0	0	0	0	6.3.7
P2-47	ANCF	Auto Resonance Suppression Mode Setting	1	N/A	0	0	0	0	-
P2-48	ANCL	Resonance Suppression Detection Level	100	N/A	0	0	0	0	-
P2-25	NLP	Low-pass Filter of Resonance Suppression	2 or 5	0.1ms	0	0	0	0	6.3.7
P2-33▲	INF	Semi-auto Inertia Adjustment	0	N/A	0	0	0	0	6.3.6
P2-49	SJIT	Speed Detection Filter	0	-	0	0	0	0	-

 $(\bigstar)$  Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.

(**■**) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

	Gain and Switch Parameter										
Parameter	Abbr.	Function	Default	Unit	Сс	ontro	l Mo	de	Related		
Falametei	ADDI.	FUNCTION	Delault	Unit	PT	PR	S	Т	Section		
P2-00	KPP	Position Loop Gain	35	rad/s	0	0			6.2.8		
P2-01	PPR	Switching Rate of Position Loop Gain	100	%	0	0			6.2.8		
P2-02	PFG	Position Feed Forward Gain	50	%	0	0			6.2.8		
P2-03	PFF	Smooth Constant of Position Feed Forward Gain	5	ms	0	0			-		
P2-04	KVP	Speed Loop Gain	500	rad/s	0	0	0	0	6.3.6		
P2-05	SPR	Switching Rate of Speed Loop Gain	100	%	0	0	0	0	-		
P2-06	KVI	Speed Integral Compensation	100	rad/s	0	0	0	0	6.3.6		
P2-07	KVF	Speed Feed Forward Gain	0	%	0	0	0	0	6.3.6		
P2-26	DST	Anti-interference Gain	0	0.001	0	0	0	0	-		
P2-27	GCC	Gain Switching and Switching Selection	0	N/A	0	0	0	0	-		
P2-28	GUT	Gain Switching Time Constant	10	10 ms	0	0	0	0	-		
P2-29	GPE	Gain Switching	1280000	pulse Kpps r/min (rotary motor) $10^{-3}$ m/s (linear	0	0	0	0	-		
		Speed Loop Frequency		motor)					5.6		
P2-31∎	AUT1	Response Setting in Auto and Semi-auto Mode	80	Hz	0	0	0	0	6.3.6		

P2-32▲	AUT2	Tuning Mode Selection	0	N/A	0	0	0	0	5.6
F 2-32 🛋	AUTZ		0	IN/A	0	0	0	0	6.3.6

 $(\bigstar)$  Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

- (•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

Position Control Parameter										
Parameter	Abbr.	Function	Default	Unit	Co PT	ontrol PR	Moo S	de T	Related Section	
P1-01•	CTL	Input Setting of Control Mode and Control Command	0	pulse r/min N-M	0	0	0	0	6.1	
P1-02▲	PSTL	Speed and Torque Limit Setting	0	N/A	0	0	0	0	6.6	
P1-12 ~ P1-14	TQ1 ~ 3	Internal Torque Limit 1 ~ 3	100	%	0	0	0	0	6.4.1	
P1-46▲	GR3	Pulse Number of Encoder Output	2500	pulse	0	0	0	0	-	
P1-55	MSPD	Maximum Speed Setting	rated	r/min	0	0	0	0	-	
P1-72	FRES	Resolution of Linear Scale for full-closed loop control	5000	Pulse/ rev	0	0			-	
P1-73	FERR	Error Protection Range for Full-closed Loop Control	30000	pulse	0	0			-	
P1-74	FCON	Full-closed Loop Control of Linear Scale	000h	-	0	0			-	
P2-50	DCLR	Pulse Clear Mode	0	N/A	0	0			-	
		External Pulse Com	mand (PT n	node)						
P1-00▲	PTT	External Pulse Input Type	0x2	N/A	0				6.2.1	
P1-44▲	GR1	Gear Ratio (Numerator) (N1)	1	pulse	0	0			6.2.5	
P1-45▲	GR2	Gear Ratio (Denominator) (M)	1	pulse	0	0			6.2.5	
P2-60	GR4	Gear Ratio (Numerator) (N2)	1	pulse	0				-	
P2-61	GR5	Gear Ratio (Numerator) (N3)	1	pulse	0				-	
P2-62	GR6	Gear Ratio (Numerator) (N4)	1	pulse	0				-	
		Register Control Corr	nmand (PR	mode)		1				
P6-02 ~ P7-27	PO1 ~ PO63	Internal Position Command 1 ~ 63	0	N/A		0			7.10	
P5-60 ~ P5-75	POV1 ~ POV15	Target Speed Setting#0 ~ 15	20 ~ 3000	0.1r/min		0			7.10	
P5-03	PDEC	Deceleration Time of Auto Protection	0XF00FF FFF	N/A	0	0	0	0	-	

rosition control raidilleter											
Devenenter	Abba	Function	Defeuit	L Locit	Со	ontrol	Мо	de	Related		
Parameter	Abbr.	Function	Default	Unit	PT	PR	S	Т	Section		
P5-04	HMOV	Homing Mode	0	N/A	0	0			-		
P5-05	HSPD1	1 <sup>st</sup> Speed Setting of High Speed Homing	100	0.1r/min	0	0	0	0	-		
P5-06	HSPD2	2 <sup>nd</sup> Speed Setting of Low Speed Homing	20	0.1r/min	0	0	0	0	-		
P5-07	PRCM	Trigger Position Command (PR mode only)	0	N/A		0			-		
P5-20 ~ P5-35	AC0 ~ AC15	Acceleration/Deceleration Time	200 ~ 30	ms		0			7.10		
P5-40 ~ P5-55	DLY0 ~ DLY15	Delay Time after Position Completed	0 ~ 5500	ms		0			7.10		
P5-98	EVON	Position Command of Event Rising-edge Trigger	0	N/A		0			-		
P5-99	EVOF	Position Command of Event Falling-edge Trigger	0	N/A		0			-		
P5-15	PMEM	PATH#1 ~ PATH#2 No Data Retained Setting	0x0	N/A	0	0	0	0	-		
P5-16	AXEN	Axis Position - Motor Encoder	N/A	N/A	0	0	0	0	7.3		
P5-17	AXAU	Axis Position - Auxiliary Encoder	N/A	N/A	0	0	0	0	7.3		
P5-18	AXPC	Axis Position - Pulse Command	N/A	N/A	0	0	0	0	7.3		
P5-08	SWLP	Forward Software Limit	+2 <sup>31</sup>	PUU		0			-		
P5-09	SWLN	Reverse Software Limit	-2 <sup>31</sup>	PUU		0			-		

### **Position Control Parameter**

 $(\bigstar)$  Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.

(■) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

Speed Control Parameter										
Parameter	Abbr.	Function	Function Default Unit		ontro	l Mo	de	Related		
Farameter	ADDI.	Function	Delault	Unit	PT	PR	S	Т	Section	
P1-01●	CTL	Input Setting of Control Mode and Control Command	0	pulse r/min N-M	0	0	0	0	6.1	
P1-02▲	PSTL	Speed and Torque Limit Setting	0	N/A	0	0	0	0	6.6	
P1-46▲	GR3	Output Pulse Counts Per One Motor Revolution	1	pulse	0	0	0	0	-	
P1-55	MSPD	Maximum Speed Limit	rated	r/min	0	0	0	0	-	

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#### **Chapter 8 Parameters**

P1-09 ~ P1-11	SP1 ~ 3	Internal Speed Command 1 ~ 3	1000 ~ 3000	0.1 r/min			0	0	6.3.1
P1-12 ~ P1-14	TQ1 ~ 3	Internal Torque Limit 1 ~ 3	100	%	0	0	0	0	6.6.2
P1-40▲	VCM	Maximum Speed of Analog Speed Command	rated	r/min			0	0	6.3.4
P1-41▲	ТСМ	Maximum Output of Analog Torque Speed	100	%	0	0	0	0	-
P1-76	AMSPD	Maximum Rotation Setting of Encoder Setting (OA, OB)	5500	r/min	0	0	0	0	-

 $(\bigstar)$  Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.

(**■**) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

	Torque Control Parameter											
Doromotor	Abbr.	Function	Default	Unit	С	ontro	l Mo	de	Related			
Parameter	ADDI.	Function	Default	Unit	PT	PR	S	Т	Section			
P1-01●	CTL	Input Setting of Control Mode and Control Command	0	pulse r/min N-M	0	0	0	0	6.1			
P1-02▲	PSTL	Speed and Torque Limit Setting	0	N/A	0	0	0	0	6.6			
P1-46▲	GR3	Output Pulse Counts Per One Motor Revolution	1	pulse	0	0	0	0	-			
P1-55	MSPD	Maximum Speed Limit	rated	r/min	0	0	0	0	-			
P1-09 ~ P1-11	SP1~3	Internal Speed Limit 1~3	100 ~ 300	0.1 r/min			0	0	6.6.1			
P1-12 ~ P1-14	TQ1~3	Internal Torque Command 1~3	100	%	0	0	0	0	6.4.1			
P1-40▲	VCM	Maximum Speed of Analog Speed Command	rated	r/min			0	0	-			
P1-41▲	ТСМ	Maximum Output of Analog Torque Limit	100	%	0	0	0	0	6.4.4			

 $(\bigstar)$  Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**△**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.

(**■**) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

Planning of Digital Input / Output Pin and Output Setting Parameter											
Parameter	Abbr.	Function	Default	Unit	С	ontro	l Mo	de	Related		
	71001.		Delaan	Onit	PT	PR	S	Т	Section		
P2-09	DRT	DI Debouncing Time	2	ms	0	0	0	0	-		
P2-10	DI1	DI1 Functional Planning	101	N/A	0	0	0	0	Table 8.1		
P2-11	DI2	DI2 Functional Planning	104	N/A	0	0	0	0	Table 8.1		
P2-12	DI3	DI3 Functional Planning	116	N/A	0	0	0	0	Table 8.1		
P2-13	DI4	DI4 Functional Planning	117	N/A	0	0	0	0	Table 8.1		
P2-14	DI5	DI5 Functional Planning	102	N/A	0	0	0	0	Table 8.1		
P2-15	DI6	DI6 Functional Planning	22	N/A	0	0	0	0	Table 8.1		
P2-16	DI7	DI7 Functional Planning	23	N/A	0	0	0	0	Table 8.1		
P2-17	DI8	DI8 Functional Planning	21	N/A	0	0	0	0	Table 8.1		
P2-36	EDI9	DI9 Functional Planning	0	N/A	0	0	0	0	Table 8.1		
P2-37	EDI10	DI10 Functional Planning	0	N/A	0	0	0	0	Table 8.1		
P2-38	EDI11	DI11 Functional Planning	0	N/A	0	0	0	0	Table 8.1		
P2-39	EDI12	DI12 Functional Planning	0	N/A	0	0	0	0	Table 8.1		
P2-40	EDI13	DI13 Functional Planning	0	N/A	0	0	0	0	Table 8.1		
P2-41	EDI14	DI14 Functional Planning	0	N/A	0	0	0	0	Table 8.1		
P2-18	DO1	DO1 Functional Planning	101	N/A	0	0	0	0	Table 8.2		
P2-19	DO2	DO2 Functional Planning	103	N/A	0	0	0	0	Table 8.2		
P2-20	DO3	DO3 Functional Planning	109	N/A	0	0	0	0	Table 8.2		
P2-21	DO4	DO4 Functional Planning	105	N/A	0	0	0	0	Table 8.2		
P2-22	DO5	DO5 Functional Planning	7	N/A	0	0	0	0	Table 8.2		
P1-38	ZSPD	Zero Speed Range Setting	100	0.1 r/min	0	0	0	0	Table 8.2		
P1-39	SSPD	Target Motor Detection Level	3000	r/min	0	0	0	0	Table 8.2		
P1-42	MBT1	Enable Delay Time of Brake	0	ms	0	0	0	0	6.5.5		

#### **Chapter 8 Parameters**

P1-43	MBT2	Disable Delay Time of Brake	0	ms	0	0	0	0	6.5.5
P1-47	SCPD	Speed Reached (DO : SP_OK) Range	10	r/min			0		Table 8.2
P1-54	PER	Position Completed Range	12800	pulse	0	0			Table 8.2
P1-56	OVW	Output Overload Warning Level	120	%	0	0	0	0	Table 8.2

 $(\bigstar)$  Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.

(**■**) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

Communication Parameter									
Deveneter	Abba	Function	Defeult	1.1 14	Control Mode				Related
Parameter	Abbr.	Function	Default	Unit	PT	PR	S	Т	Section
P3-00●	ADR	Address Setting	0x01	N/A	0	0	0	0	9.2
P3-01	BRT	Transmission Speed	0x3203	bps	0	0	0	0	9.2
P3-02	PTL	Communication Protocol	6	N/A	0	0	0	0	9.2
P3-03	FLT	Communication Error Disposal	0	N/A	0	0	0	0	9.2
P3-04	CWD	Communication Timeout	0	sec	0	0	0	0	9.2
P3-05	CMM	Communication Mechanism	0	N/A	0	0	0	0	9.2
P3-06∎	SDI	Control Switch of Digital Input (DI)	0	N/A	0	0	0	0	9.2
P3-07	CDT	Communication Response Delay Time	0	1ms	0	0	0	0	9.2
P3-08	MNS	Monitor Mode	0000	N/A	0	0	0	0	9.2
D0.00	0)/0	CANopen Synchronize Setting	0x57A1	N1/A					
P3-09	SYC	DMCNET Synchornize Setting	0x3511	N/A					
D2 40		CANopen Protocol Setting	0x0000	N1/A					
P3-10	CANEN	DMCNET Protocol Setting	1	N/A					
D2 44		CANopen Selection	0	N1/A					
P3-11	CANOP	DMCNET Selection	0	N/A					
D2 40		CANopen Support Setting	0	N1/A					
P3-12	QSTPO	DMCNET Support Setting	0	N/A					

(★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.

(**■**) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

#### **Diagnosis Parameter** Control Mode Related Parameter Abbr. Function Default Unit Section PT PR S Т ASH1 0 N/A 0 0 0 0 4.4.1 P4-00★ Fault Record (N) 4.4.1 Fault Record (N-1) ASH2 0 N/A Ο 0 Ο Ο P4-01★ 4.4.1 P4-02★ ASH3 Fault Record (N-2) 0 N/A Ο 0 Ο 0 4.4.1 Ο 0 0 Ο P4-03★ ASH4 Fault Record (N-3) 0 N/A 4.4.1 0 Ο 0 0 0 P4-04★ ASH5 Fault Record (N-4) N/A P4-05 JOG 20 Ο 0 0 Ο 4.4.2 Servo Motor Jog Control r/min Digital Output Register P4-06▲∎ FOT 0 N/A 0 0 0 0 4.4.4 (Readable and Writable) 4.4.5 P4-07 ITST Multi-function of Digital Input 0 N/A Ο 0 Ο Ο 9.2 PKEY Input Status of the Drive Keypad N/A N/A Ο 0 0 Ο P4-08★ 0 P4-09★ MOT **Digital Output Status** N/A N/A 0 0 0 4.4.6 P4-10▲ CEN Adjustment Selection 0 N/A 0 0 0 Ο -Analog Speed Input Offset Factory P4-11 SOF1 N/A Ο Ο 0 0 \_ Adjustment 1 Setting Analog Speed Input Offset Factory P4-12 SOF2 N/A 0 0 0 Ο Adjustment 2 Setting Analog Torque Input Offset Factory P4-13 TOF1 N/A 0 0 0 Ο Adjustment 1 Setting Analog Torque Input Offset Factory P4-14 TOF2 N/A 0 0 0 0 \_ Adjustment 2 Setting Current Detector (V1 Phase) Factory P4-15 COF1 N/A 0 0 0 0 Offset Adjustment Setting Current Detector (V2 Phase) Factory COF2 P4-16 N/A 0 0 0 0 \_ Offset Adjustment Setting Current Detector (W1 Phase) Factory P4-17 COF3 N/A Ο Ο 0 0 \_ Offset Adjustment Setting Current Detector (W2 Phase) Factory COF4 P4-18 N/A 0 0 0 Ο \_ Offset Adjustment Setting **IGBT NTC Adjustment Detection** Factory P4-19 TIGB N/A 0 0 Ο Ο Level Setting Offset Adjustment Value of P4-20 DOF1 0 Ο 0 Ο Ο 6.4.4 mV Analog Monitor Output (Ch1) Offset Adjustment Value of P4-21 0 0 DOF2 0 mV 0 0 6.4.4 Analog Monitor Output (Ch2) P4-22 SAO Analog Speed Input OFFSET 0 mV Ο \_ P4-23 TAO Analog Torque Input OFFSET 0 mV Ο

(★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(**▲**) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

- (•) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-31 and P3-06.

# 8.3 Parameter Description

## **P0-xx Monitor Parameters**

P0-00★	VER	Firmware Version		Address: 0000H 0001H
	Operatio Interfac		Communication	Related Section: -
	Defau	It: Factory Setting		
	Con Mode	trol e:		
	Un	it : -		
	Rang	e : -		
	Data Siz	e : 16-bit		
	Forma	at : Decimal		

Settings : This parameter shows the firmware version of the servo drive.

P0-01∎			arm Code Display of D splay)	Address: 0002H 0003H	
	Operatio Interfac		Panel / Software	Communication	Related Section: 11.1, 11.2, 11.3
	Default :		-		
	Con Mod		ALL		
	Un	it :	-	-	
	Rang	e :	0x0000~0xFFFF: It or clear the alarm (Same	nly can be set to 0 to as DI.ARST).	
	Data Size : 16-bit				
	Forma	at :	BCD		7 2 2 2 2 2
	Setting	s:	Hexadecimal format: d	isplays 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 : Main circuit power lack phase
- 023 : Early warning for overload
- 024 : Encoder initial magnetic field error (The magnetic field of the encoder U,V, W signal is in error)
- 025 : The internal of the encoder is in error. (The internal memory of the encoder and the internal counter are 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 CN5 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 writeprotected.
- 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

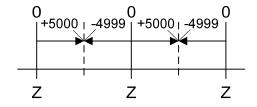
Alarm of Motion

- 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 11 of the manual 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 ~ 277 : Reserved
- 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 of DO.MC\_OK. Please refer to parameter P1-48.

P0-02	STS	Dri	ve Status	Address: 0004H 0005H			
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.2		
	Defau	lt :	00	·····			
	Contro Mode:		ALL				
	Un	it :	-				
	Rang	e :	00 ~ 127				
	Data Siz	e :	16-bit				
	Forma	at :	Decimal				
	Settings :		00 : Motor feedback p gear ratio) [PUU]	ulse number (after tł	ne scaling of electronic		
			01 : Input pulse numb electronic gear ra	•	d (after the scaling of		
			02 : Deviation betwee number[PUU]	n control command ا	oulse and feedback pulse		
			03:The number of mo Pulse/rev]	[Encoder unit, 1,280,000			
			04 : Distance to command terminal (Encoder unit) [Pulse]				
			05 : Error pulse numb (Encoder unit) [P		of electronic gear ratio)		
			06 : The frequency of	pulse command inpu	ut [Kpps]		
			07 : Motor speed [r/mi	n]			
			08 : Speed command	input [Volt]			
			09 : Speed command	input [r/min]			
			10 : Torque command	input [Volt]			
			11 : Torque command	input [%]			
			12 : Average torque [%	6]			
			13 : Peak torque [%]				

- 14 : Main circuit voltage (BUS voltage) [Volt]
- 15 : Load/motor inertia ratio [0.1times]
- 16 : IGBT temperature
- 17 : The frequency of resonance suppression
- 18 : The distance from the current position to Z. The range of the value is between -5000 and +5000;



The interval of the two Z-phase pulse command if 10000 Pulse.

- 19 : Mapping Parameter #1 : P0 25
- 20 : Mapping Parameter #2 : P0 26
- 21 : Mapping Parameter #3 : P0 27
- 22 : Mapping Parameter #4 : P0 28
- 23 : Monitoring variable #1 : P0 09
- 24 : Monitoring variable #2 : P0 10
- 25 : Monitoring variable #3 : P0 11
- 26 : Monitoring variable #4 : P0 12
- 38 : It display the battery voltage [0.1 Volt]. For example, if it displays 36, it means the battery voltage is 3.6 V.
- 72 : Analog speed command [0.1 r/min] (This is supported by A2-M/-U/-L.)

P0-03	MON	Analog Output Monit	nalog Output Monitor		
	Operatio Interface	nal Panel / Software e:	Communication	Related Section: 6.6.4	
	Defaul	lt : 00			
	Control Mode	e: ALL		1 1 2 2 3 3	
	Uni	it : -		· · · ·	
	Range	e : 00 ~ 0x77		• • • •	

----

Data Size :	16-bit								
Format :	Hexadecimal								
Settings : MON2 MON1 Not used									
	MON1, MON2 Setting Value	Description							
	0	Motor speed (+/-8 Volts/Max. speed)							
	1	Motor torque (+/-8 Volts/Max. torque)							
	2	Pulse command frequency (+8 Volts / 4.5Mpps)							
	3	Speed command (+/-8 Volts/ Max. speed command)							
	4	Torque command (+/-8 Volts/Max. torque command)							
	5	VBUS voltage (+/-8 Volts / 450V)							
	6	Reserved							
	7	Reserved							

**NOTE** Please refer to parameter P1-04, P1-05 for proportional setting of analog output voltage.

For example: P0-03 = 01 (MON1 is the analog output of motor speed; MON2 is the analog output of motor torque)

MON1 output voltage = 8  $\times \frac{\text{Motor speed}}{(\text{Max. speed} \times \frac{P1-04}{100})}$  (unit : Volts) MON2 output voltage = 8  $\times \frac{\text{Motor torque}}{(\text{Max. torque} \times \frac{P1-05}{100})}$  (unit: Volts)



P0-08★	TSON	Ρο	wer On Time	Address: 0010H 0011H	
	Operational Interface : Default :		Panel / Software	Communication	Related Section : -
			0		
	Con Mode		-		
	Uni	it :	Hour		
	Range : Data Size :		0 ~ 65535		
			16-bit		
	Forma	ıt :	Decimal		

Settings : It shows the total startup time of the servo drive.

P0-09★	CM1	Status Monitor Regist	us Monitor Register 1		
	Operatio Interfac	nal Panel / Software e :	Communication	Related Section: 4.3.5	
	Defau	lt : -			
	Con Mode	trol e:	ALL		
	Un	it : -			
	Range	e:-			
	Data Sizo	e : 32-bit			
	Forma	t : Decimal			

Settings : The setting value which is set by P0-17 should be monitored via P0-09. (Please refer to Chapter 7.2.1, Description of Monitoring Variable for the setting value.)

For example, if P0-17 is set to 3, when accessing P0-09, it obtains the total feedback pulse number of motor encoder. For MODBUS communication, two 16-bit data, 0012H and 0013H will be read as a 32-bit data; (0013H : 0012H) = (Hi-word : Low-word).

Set P0-02 to 23, the panel displays **VAR-1** first, and then shows the content of P0-09.

P0-10★	CM2 St	atus Monitor Regist	er 2	Address: 0014H 0015H
	Operationa Interface :		Communication	Related Section: 4.3.5
	Default :	-		
	Contro Mode :			
	Unit :	-		
	Range :	-		
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	The setting value w	hich is set by P0-18 should	be monitored via P0-10.

Settings : The setting value which is set by P0-18 should be monitored via P0-10. (Please refer to Chapter 7.2.1, Description of Monitoring variable for the setting value.) Set P0-02 to 24, the panel displays **VAR-2** first, and then shows the content of P0-10.

P0-11★		Status Monitor Regist	ter 3	Address: 0016H 0017H
	Operation Interface	nal Panel / Software	Communication	Related Section: 4.3.5
	Defaul	t:-		
	Cont Mode	ALL		
	Uni	t : -		
	Range	9:-		
	Data Size	e : 32-bit		
	Forma	t : Decimal		

Settings : The setting value which is set by P0-19 should be monitored via P0-11. (Please refer to Chapter 7.2.1, Description of Monitoring Variable for the setting value.) Set P0-02 to 25, the panel displays **VAR-3** first, and then shows the content of P0-11.

P0-12★	CM4	Status Monitor Regist	tus Monitor Register 4			
	Operation Interface		Communication	Related Section: 4.3.5		
	Default	t : -				
	Cont Mode	ALL	ALL			
	Unit	t:-			:-	
	Range	): -				
	Data Size	e : 32-bit				
	Format	t : Decimal	Decimal			
	Settings			Ild be monitored via P0-12.		

Settings : The setting value which is set by P0-20 should be monitored via P0-12. (Please refer to Chapter 7.2.1, Description of Monitoring Variable for the setting value.) Set P0-02 to 26, the panel displays **VAR-4** first, and then shows the content of P0-12.

P0-13★	CM5	Sta	tus Monitor Register	Address: 001AH 001BH	
	Default : Control		Panel / Software	Communication	Related Section: 4.3.5
			-		
			-		
			-		
			32-bit		
			Decimal		
	Setting		The setting value which is set by P0-21 should be monitored via P0-13 (Please refer to Chapter 7.2.1, Description of Monitoring Variable fo the setting value.)		

P0-14 ~ P0-16 Reserved

P0-17	CM1A	Sta	tus Monitor Registe	Address: 0022H 0023H	
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Defau	lt :	0		
	Con Mode		_		4
	Un	it :	-		
	Range	e :	0 ~ 127		
	Data Size	e :	16-bit		
	Forma	at :	Decimal		
	Setting	s :	setting value.	is set to 07, then reading	onitoring Variable for the gP0-09 means reading

P0-18	CM2A	Status Monitor Regist	tus Monitor Register 2 Selection		
	Operatior Interface	Donal / Software	Communication	Related Section: -	
	Default	: 0	0		
	Conti Mode	1_			
	Unit	: -			
	Range	: 0~127			
	Data Size	: 16-bit			
	Format	: Decimal			
	Settings	Please refer to Chap setting value.	oter 7.2.1, Description of N	Ionitoring Variable for the	

P0-19	CM3A S	Status Monitor Regist	er 3 Selection	Address:0026H 0027H
	Operation Interface		Communication	Related Section: -
	Default	: 0		
	Contr Mode	_		
	Unit	: -		
	Range	: 0~127	0 ~ 127	
	Data Size	: 16-bit		
	Format	: Decimal		
	Settings	· Please refer to Cha	pter 7.2.1, Description of N	Ionitoring Variable for the

Settings : Please refer to Chapter 7.2.1, Description of Monitoring Variable for the setting value.

P0-20	CM4A	Status Monitor Regis	tus Monitor Register 4 Selection		
	Operatic Interfac		Communication	Related Section: -	
	Defau	ilt: O			
	Con Mod	_	-		
	Un	it : -	-		
	Rang	e:0~127	0 ~ 127		
	Data Siz	e:16-bit	16-bit		
Format :		at : Decimal	Decimal		
	Setting	s : Please refer to Cha setting value.	pter 7.2.1, Description of N	Ionitoring Variable for the	

P0-21		atus Monitor Registe	Address: 002AH 002BH	
	Operationa Interface :	ll Panel / Software	Communication	Related Section: -
	Default :			
	Contro Mode :	bl		
	Unit :			

Range :	0 ~ 127	
Data Size :	16-bit	
Format :	Decimal	
	Disease astronte Objection 7.0.4 Description of N	

Settings : Please refer to Chapter 7.2.1, Description of Monitoring Variable for the setting value.

P0-22 ~ P0-24

Reserved

P0-25	MAP1	Марр	pping Parameter # 1		Address: 0032H 0033H
	Operatio Interface	· D	anel / Software	Communication	Related Section: 4.3.5
	Defaul	lt:N	No need to initialize		
	Con Mode		ALL		
	Uni	it : -	-		
	Range: deten of P0		etermined by the corresponding parameter f P0-35		
	Data Size	e: 32	2-bit		
	Forma	at:H	lexadecimal		
	Settings				parameters that are not

in the same group. The content of parameter that is specified by P0-35 will be shown in P0-25.

Please refer to the description of P0-35 for parameter setting.

P0-26	MAP2	Ма	pping Parameter #	2	Address: 0034H 0035H
	Interface :		Panel / Software	Communication	Related Section: 4.3.5
			No need to initialize		
	Con Mode		ALL		
	Un	it :	-		
	Range :		determined by the corresponding parameter of P0-36		
	Data Siz	e :	32-bit		
	Forma	at :	Hexadecimal		-

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-36.

P0-27	MAP3 Ma	pping Parameter #	3	Address: 0036H 0037H
	Operational Interface :	Panel / Software	Communication	Related Section: 4.3.5
	Default :	No need to initialize		
	Control Mode :			
	Unit :	-		
	Range :	determined by the corresponding parameter of P0-37		
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Cottingo :	The using method i	is the same as P0-25. The	mapping target is set by

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-37.

P0-28	MAP4	Ма	pping Parameter # 4	Address: 0038H 0039H	
	Default : Control Mode : Unit : Range : Data Size : Format : Settings :		Panel / Software	Communication	Related Section: 4.3.5
			No need to initialize		
			ALL		
			determined by the corresponding parameter of P0-38		
			Hexadecimal		
			The using method is the same as P0-25. The parameter P0-38.		mapping target is set by

P0-29	MAP5 Ma	pping Parameter #	Address: 003AH 003BH	
	Operational Interface :	Panel / Software	Communication	Related Section: 4.3.5
	Default :	No need to initialize		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the corresponding parameter of P0-39		
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	The using method i	s the same as P0-25. The	mapping target is set by

Settings : parameter P0-39.

P0-30	MAP6 Ma	apping Parameter #	Address: 003CH 003DH		
	Operationa Interface :		Related Section: 4.3.5		
	Default :	No need to initialize	No need to initialize		
	Contro Mode :	ALL			
	Unit :	_			
	Range :	determined by the corresponding parameter of P0-40			
	Data Size :	32-bit			
	Format :	Hexadecimal			
	Settings :	The using method i parameter P0-40.	s the same as P0-25. The	mapping target is set by	

P0-31		Mapping Parameter # 7	Address: 003EH 003FH	
	Operatio Interfac	onal e:Panel / Software	Communication	Related Section: 4.3.5
	Defau	It: No need to initialize		
	Con Mod	ntrol e :		

Unit :	-
Range :	determined by the corresponding parameter of P0-41
Data Size :	32-bit
Format :	Hexadecimal

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-41.

P0-32	MAP8	Мар	pping Parameter # 8	Address: 0040H 0041H	
	Default : Control Mode : Unit :		Panel / Software	Communication	Related Section: 4.3.5
			No need to initialize		
			ALL		
			determined by the corresponding parameter of P0-42 32-bit		
	Forma	at:⊦	Hexadecimal		
	Setting		The using method is the barameter P0-42.	ne same as P0-25. The	mapping target is set by

P0-33 ~ P0-3<u>4</u>

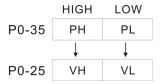
Reserved

P0-35	MAP1A Ta	arget Setting of Mappi	ng Parameter P0-25	Address: 0046H 0047H
	Operationa Interface :		Communication	Related Section: 4.3.5
	Default :	0×0		
	Control Mode :			
	Unit :	-		
	Range :	determined by the cor the parameter group	nmunication address of	
	Data Size: 32-bit			
	Format : Hexadecimal			

Settings : Select the data block to access the parameter corresponded by register 1.

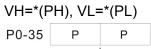
The mapping content is 32 bits wide and can map to two 16-bit parameters or one 32-bit parameter.

P0-35:



Mapping parameter: P0-35; Mapping content: P0-25.

When  $PH \neq PL$ , it means the content of P0-25 includes two 16-bit parameters.



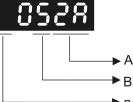
↓ P0-25 V32

Mapping parameter: P0-35; Mapping content: P0-25.

When PH=PL=P, it means the content of P0-25 includes one 32-bit parameter.

If P=060Ah (parameter P6-10), then V32 is P6-10.

The setting format of PH, PL is:



→ not used

A: The hexadecimal of parameter indexing

B: The hexadecimal of parameter group

For example:

If the mapping target is P2-06, set P0-35 to 0206.

If the mapping target is P5-42, set P0-35 to 052A.

For example:

If users desire to read / write P1-44 (32-bit) through P0-25, set P0-35 to 0x012C012C via panel or communication. Then, when reading / writing P0-25, it also reads / writes P1-44.

Moreover, users can also access the value of P2-02 and P2-04 through P0-25.

P2-02 Position feed forward gain (16-bit)

P2-04 Speed control gin (16-bit)

Users only need to set P0-35 to 0x02040202. Then, when reading / writing P0-25, it also reads / writes the value of P2-02 and P2-04.

P0-36	MAP2A	arget Setting of Mapping Parameter P0-26	Address: 0048H 0049H
	Operation Interface	Panel / Software Communication	Related Section: 4.3.5
	Default	: 0x0	
	Contr Mode		
	Unit	: -	
	Range	determined by the communication address of the parameter group	
	Data Size	: 32-bit	
	Format	: Hexadecimal	
	Settings	: P0-36 ↓ ↓ P0-26	

P0-37	МАРЗА	Target S	etting of Ma	Address: 004AH 004BH		
	Operatio Interface	·Dana	I / Software		Communication	Related Section: 4.3.5
	Defaul	t: 0x0				
	Con Mode		ALL			
	Uni	t:-				
	Range		determined by the communication address of the parameter group			
	Data Size	e : 32-bi	t			
	Forma	t : Hexa	decimal			
	Settings	s: P0-3 P0-2	Ļ	Ļ		

P0-38	MAP4A T	arget Setting of Mappi	get Setting of Mapping Parameter P0-28				
	Operationa Interface	Donal / Coffusora	Communication	Related Section: 4.3.5			
	Default	: 0x0					
	Contro Mode	AT 1					
	Unit	: -					
	Range	determined by the column the parameter group					
	Data Size	: 32-bit					
	Format : Hexadecimal						
	Settings	P0-38 ↓ ↓ P0-28					

P0-39	MAP5A	Target Setting of Mapping Parameter P0-29					Address: 004EH 004FH
	Operatio Interface		Panel /	Software	9	Communication	Related Section: 4.3.5
	Defaul	t :	0x0				
	Cont Mode		ALL				
	Uni	t :	-				
	Range		determined by the communication address of the parameter group				
	Data Size	e :	32-bit				
	Forma	t :	Hexade	ecimal			-
	Settings	5:	P0-39 P0-29	Ļ	Ļ		

P0-40	MAP6A	Farget Setting of Mapping	g Parameter P0-30	Address: 0050H 0051H	
	Operatior Interface	Danal / Softwara	Communication	Related Section: 4.3.5	
	Default	: 0x0			
	Cont Mode	ΔΙΙ			
	Unit	: -			
	Range	: determined by the com the parameter group	determined by the communication address of the parameter group		
	Data Size	: 32-bit			
	Format	: Hexadecimal			
	Settings	: P0-40 ↓ ↓ ↓ P0-30			

P0-41	MAP7A Ta	rget Setting of Mapp	Address: 0052H 0053H	
	Operationa Interface :	Panel / Software	Communication	Related Section: 4.3.5
	Default :	0x0		
	Contro Mode :	ALL		
	Unit :	-		
	Range :	determined by the co the parameter group		
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	P0-41 ↓ ↓ ↓ P0-31		·

P0-42	МАР8А	arget Se	tting of Map	Address: 0054H 0055H	
	Operatior Interface	Donal /	Software	Communication	Related Section: 4.3.5
	Default	: 0x0			
	Conti Mode				
	Unit	: -			
	Range	: determ the par	ined by the o ameter grou		
	Data Size	: 32-bit			
	Format	: Hexade	ecimal		
	Settings	: P0-42 P0-32	↓ ↓		

P0-43 Reser

Reserved

P0-44★	PCMN Sta	atus Monitor Registe	Address: 0058H 0059H	
	Operational Interface :	Panel / Software	Related Section: 4.3.5	
	Default :	0x0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the communication address of the parameter group		
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Same as parameter	P0-09.	

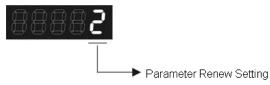
P0-45∎		atus Monitor Regist or PC software)	Address: 005AH 005BH	
	Operationa Interface :	ll Panel / Software	Communication	Related Section: 4.3.5
	Default :	0x0		
	Contro Mode:			
Unit :		-		
	Range :	0~127		
	Data Size :	16-bit		
	Format :	Decimal		4

Settings : Same as parameter P0-17

P0-46★	SVSTS S	ervo Digital Output St	o Digital Output Status Display			
	Operationa Interface :	ll Panel / Software	Communication	Related Section: -		
	Default :	0				
	Contro Mode :					
	Unit :	-				
	Range :	0x00 ~ 0xFF				
	Data Size :	16-bit				
	Format :	Hexadecimal				
	Settings :	Bit 1: SON (Servo ON Bit 2: ZSPD (Zero spe Bit 3: TSPD (Target s Bit 4: TPOS (Target p Bit 5: TQL (Torque lin Bit 6: ALRM (Servo a Bit 7: BRKR (Brake ca Bit 8: HOME (Homing Bit 9: OLW (Early wan Bit 10: WARN (When	I) eed detection) peed reached) oosition reached) niting) larm) ontrol output) (finished) rning for overload) Servo warning, CW, G ion error, etc., occurs,			

P0-49∎	UAP	Renew Encoder Abso	lute Position	Address: 0062H 0063H
	Operatio Interface	·Danal / Softwara	Communication	Related Section: N/A
2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Defaul	lt : 0x0	· · · · · · · · · · · · · · · · · · ·	
	Con Mode			
	Uni	it : N/A		
	Range : 0x00 ~ 0x02 Data Size : 16-bit			
	Forma	t: Hexadecimaladecin	nal	

# 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).

P0-50 <del>★</del>	APSTS	Abs	solute Coordinate System Status						Address: 0064H 0065H	
	Operational Interface :		Panel / S	oftware	Co	mmunica	tion	Relate	ed Sectio	n: N/A
	Defau	lt:	0x0				-	12 2 2 2 2 2 2 2 2 2		
	Control Mode:					4 • • • • •				
	Unit : N/A									
	Range	e: 0x00~0x1F					• • • •			
	Data Size : 16-bit					7 - - -				
	Forma	ıt :	Hexadec	imal						
	Settings :									
			Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
			Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8

- Bit 0: Absolute position status
- 0: Normal
- 1: Absolute position is lost
- Bit 1: Voltage level of battery
- 0: Normal
- 1: Low battery
- Bit 2: Status of encoder multiturn
- 0: Normal
- 1: Overflow
- Bit 3: Status of PUU
- 0: Normal
- 1: Overflow
- Bit 4: Absolute coordinate system status
- 0: Normal
- 1: Absolute coordinate system has not been set
- Bit 5 ~ Bit 15: Reserved. Must be set to 0.

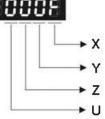
P0-51★	APR E	ncoder Absolute Po	coder Absolute Position (Multiturn)		
	Operation Interface		Communication	Related Section: N/A	
	Default	: 0x0	0x0		
	Contr Mode				
	Unit	: rev			
	Range	: -32768 ~ +32767	<b>7</b> 2 2 2 2 2 2 2 2		
	Data Size: 32-bit				
	Format	: Decimal		- - -	

Settings : While the Bit 1 of P2-70 is set to 1 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 0 to read the PUU number, this parameter becomes disabled and the setting value of this parameter is 0.

P0-52★		ncoder Absolute Pos Pulse number within	Address: 0068H 0069H	
- - - - - - - - - - - - - - - - - - -	Operationa Interface :	l Panel / Software	Communication	Related Section: N/A
	Default :	0x0		
	Contro Mode :			
Un		Pulse or PUU		
	Range :	0~1280000-1 (Pulse -2147483648 ~ 214		
	Data Size :	32-bit		
	Format :	Decimal		

Settings : While the Bit 1 of P2-70 is set to 1 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 0 to read the PUU number, this parameter represents PUU number of motor absolute position.

P0-53			neral Range Compare ering Time	Address: 006AH 006BH	
	Operatio Interfac		Panel / Software	Communication	Related Section: N/A
	Defau	lt:	0x0000		2 2 2 2 2 2
	Control Mode : Unit : Range :		ALL		
			ms		
			0x0000 ~ 0x000F	- - - -	
	Data Siz	e :			
	Format : Hexadecimal				2 4 5 6 7 7
	Settings	5 :	0005		



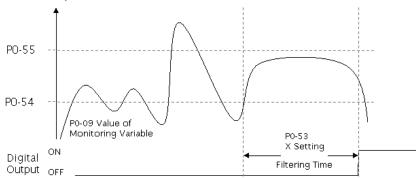
X: Filtering time for 1st monitoring variable

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



P0-54	<b>ZI IN</b> 11	General Range Comp Lower Limit of 1st Mo	Address: 006CH 006DH	
	Operatio Interface	Donal / Softwara	Communication	Related Section: N/A
	Defau	lt : 0		~ · ·
	Con Mode	· A I I	· A I I	
	Un	it : -	-	
	Range	e:-2147483648~+21	47483647	
	Data Size	e : 32-bit	32-bit	
	Forma	it : 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.

P0-55		eneral Range Compare pper Limit of 1st Monit	<b>J · · · · ·</b>	Address: 006EH 006FH
	Operationa Interface :	Donal / Cofficience	Communication	Related Section: N/A
	Default :	0		
		Control ALL Mode :		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32-bit		- - - - - - - -

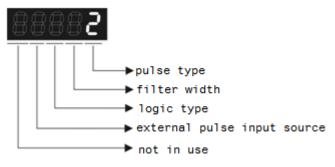
	Format	:	Decimal			
	Settings : The value of parameter P0-09 will change within the range betwee 54 and P0-55 and then output after the filtering time determined by parameter P0-53.					
56 ~ -62	Reserved					
63	VGT	The	e Time when Voltag	ge Exceeding 400V	Address: 007EH 007FH	
	Operation Interface		Panel / Software	Communication	Related Section: N/A	
	Defaul	t :	0x0			
Con Mode Uni			ALL			
		t :	ms			
	Range :		0x00000000 ~ 0x7FFFFFF			
	Data Size	e :	32-bit			
	Format	t :	Decimal			
	0 - 44 :		Record the accumul	ative time when the driv		

Settings : Record the accumulative time when the drive's voltage exceeding 400V.

# **P1-xx Basic Parameters**

P1-00▲	PTT	The Type of External	Address: 0100H 0101H	
	Operatio Interface		Communication	Related Section: 6.2.1
	Defaul	t : 0x2	0x2	
	Con Mode	DT		
	Uni	t:-	-	
	Range	e: 0~0x1132	0 ~ 0x1132	
	Data Size	e : 16-bit	16-bit	
	Forma	t: Hexadecimal	Hexadecimal	

Settings :



- Pulse Type
  - 0: AB phase pulse (4x)
  - 1: Clockwise (CW) and Counterclockwise (CCW) pulse
  - 2: Pulse + symbol

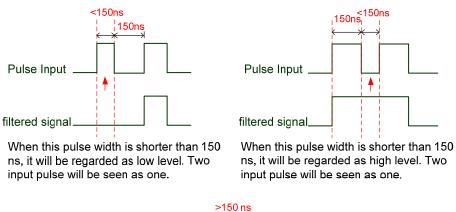
Other setting: reserved

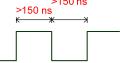
• Filter Width

If the received frequency is much higher than the setting, it will be regarded as the noise and filtered out.

Setting Value	Min. pulse width* <sub>note1</sub> (Low-speed filter frequency)	Setting Value	Min. pulse width* <sub>note1</sub> (High-speed filter frequency)
0	600ns (0.83Mpps)	0	150ns (3.33Mpps)
1	2.4us (208Kpps)	1	600ns (0.83Mpps)
2	4.8us (104Kpps)	2	1.2us (416Kpps)
3	9.6us (52Kpps)	3	2.4us (208Kpps)
4	No filter function	4	No filter function

Note: When the source of external pulse is from the high-speed differential signal and the setting value is 0 (the high-speed filter frequency is 3.33Mpps at the moment), then:

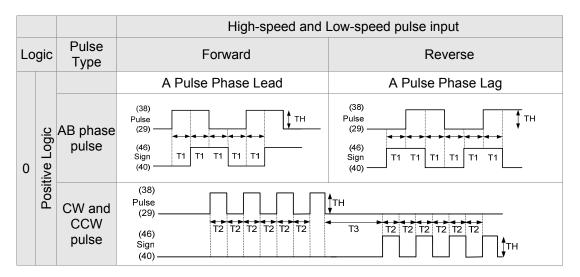




When High, Low duty of the pulse width are longer than 150 ns, it can ensure the pulse command will not be filtered.

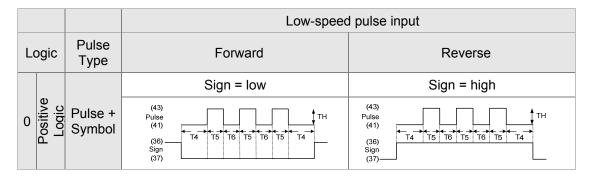
If the user uses  $2\sim4$  MHz input pulse, it is suggested to set the filter value to 4. Please note that the applicable version is: DSP version 1.036 sub05 and CPLD version above 10.

Note: When the signal is the high-speed pulse specification of 4 Mpps and the settings value of the filter is 4, then pulse will not be filtered.



• Logic Type

			High-speed pulse input				
Logic Pulse Type			Forward	Reverse			
	gic		Sign = high	Sign = low			
0	Positive Logic	Pulse + Symbol	(38) Pulse (29) (46) Sign (40)	(38) Pulse (29) (46) (46) (40) (40) (40)			



For digital circuit, it uses 0 and 1 represents two status, which is high voltage and low voltage. In Positive Logic, 1 represents high voltage and 0 represents low voltage and vice versa in Negative Logic.

For example:



Negative Logic



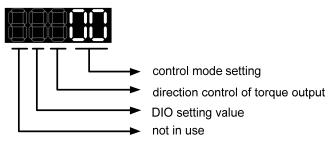
	Pulse		Minimum time width					
Specification		Frequency	T1	T2	Т3	T4	T5	T6
High-speed pulse	Differential Signal	4Mpps	62.5ns	125ns	250ns	200ns	125ns	125ns
Low-speed	Differential Signal	500Kpps	0.5µs	1µs	2µs	2µs	1µs	1µs
pulse	Open- collector	200Kpps	1.25µs	2.5µs	5µs	5µs	2.5µs	2.5µs

Pulse S	pecification	Max. Input Frequency	Voltage Specification	Forward Current
High-speed pulse	Differential Signal	4Mpps	5V	< 25mA
Low-speed	Differential Signal	500Kpps	2.8V ~ 3.7V	< 25mA
pulse	Open-collector	200Kpps	24V (Max.)	< 25mA

- The Source of External Pulse:
  - 0: Low-speed optical coupler (CN1 Pin: PULSE, SIGN)
  - 1: High-speed differential (CN1 Pin: HPULSE, HSIGN)

P1-01●			out Setting of Control mmand	Address : 0102H 0103H	
	Default : Control Mode : Unit :		Panel / Software	Communication	Related Section: Section 6.1
			0	Table 8.1	
			ALL		
			P (pulse); S (r/min, m/s); T (N-M) 00 ~ 0x110F		
			16-bit		
	Forma	t:	Hexadecimal		

Settings :



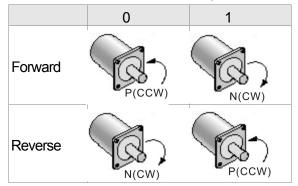
## • Control Mode Settings

Mode	PT	PR	S	Т	Sz	Tz	
Single Mode							
00							
01							
02							
03							
04							
05							
		Dual	Mode	9			
06							
07							
08							
09							
0A							
0B	C	ANope [	en Mo Delta's	de (w s PLC	ork wi )	th	
		DI	MCNE	Т Мо	de		
		CA	۹Nope	en Mo	de		
0C	EtherCAT Mode						
0D							
	I	Multip	le Mo	de			
0E							
0F					0F		

Dual Mode: It can switch mode via the external Digital Input (DI). For example, if it is set to the dual mode of PT/S (Control mode setting: 06), the mode can be switched via DI. S-P (Please refer to table 8.1).

Multiple Mode: It can switch mode via the external Digital Input (DI). For example, if it is set to multiple mode of PT/PR/S (Control Mode Setting: 12), the mode can be switched via DI. S-P, PT-PR (Please refer to table 8.1).

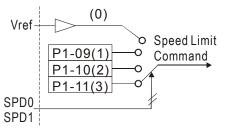
### **Torque Output Direction Settings**



- Digital Input / Digital Output (DIO) Setting
  - 0: When switching mode, DIO (P2-10 ~ P2-22) remains the original setting value and will not be changed.
  - 1: When switching mode, DIO (P2-10 ~ P2-22) can be reset to the default value of each operational mode automatically.

P1-02▲	PSTL	Spe	ed and Torque Limit	Address: 0104H 0105H	
	Operatio Interfac		Panel / Software	Communication	Related Section: Section 6.6
	Defau	It:C	)		Table 8.1
	Con Mode	trol e:	ALL		
	Un	it : -			
	Rang	e:C	00 ~ 0x11		
	Data Size :		16-bit		
	Forma	at:⊦	Hexadecimal		
	Setting	s :	0: Disable speed		

Block diagram of speed limit setting:

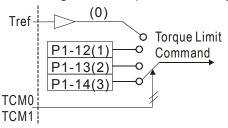


• Disable / enable torque limit function

0: Disable torque limit function

1: Enable torque limit function (it is effective in P / S / Sz mode) Other: Reserved

Block diagram of torque limit setting:

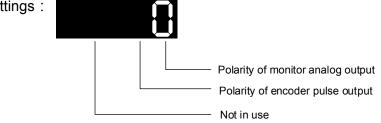


When desiring to use torque limit function, users could use parameter to set this value to 1 and limit the torque for good. Thus, the user can save one DI setting. Also, users could enable or disable the limit function via DI.TRQLM, which is a more flexible way but would need to take one DI setting. Torque limit can be enabled by P1-02 or DI.

DI.TCM0 and DI.TCM1 are for selecting the limiting source.

P1-03	AOUT	Polarity Setting of En	arity Setting of Encoder Pulse Output		
	Operatio Interface	nal Panel / Software e :	Communication	Related Section: 3.3.3	
	Defaul	lt : 0			
	Con Mode	trol ə :	ALL		
	Uni	it : -	-		
	Range	e: 0~0x13	0 ~ 0x13		
	Data Size	e : 16-bit	16-bit		
	Forma	t : Hexadecimal			

Settings :



Polarity of monitor analog output

0: MON1(+), MON2(+)	2: MON1(-), MON2(+)
1: MON1(+), MON2(-)	3: MON1(-), MON2(-)

Polarity of encoder pulse output

0: Forward output	1: Reverse output
-------------------	-------------------

P1-04	MON1	мо	N1 Analog Monitor C	Output Proportion	Address: 0108H 0109H
	Operational Interface :		Panel / Software	Communication	Related Section: 6.4.4
	Default :		100		
Control Mode:			ALL		
	Unit: Range: Data Size:		% (full scale)		
			0 ~ 100		
			16-bit		
	Forma	at :	Decimal		
Settings :			Please refer to parameter P0-03 for the setting selection. For example: P0-03 = 0x00 (MON1 is the speed analog outp When the output voltage value of MON1 is V1: Motor speed = (Max. speed ×V1/8) ×P1-04/100		put)

P1-05	MON2	MON2 Analog Monitor	Address: 0108H 0109H	
	Operatio	onal e:Panel / Software		Related Section:
	Interfac	e :	Communication	6.4.4
	Default : 100			
		trol e:		

Unit :	% (full scale)
Range :	0 ~ 100
Data Size :	16-bit
Format :	Decimal
Settings :	Please refer to parameter P0-03 for the setting of analog output selection. For example: P0-03 = $0x00$ (MON2 is the speed analog output)

For example: P0-03 = 0x00 (MON2 is the speed analog output) When the output voltage value of MON2 is V2: Motor speed = (Max. × V2/8) ×P1-05/100

P1-06	SFLT	Analog Speed Comm	log Speed Command (Low-pass Filter)			
	Operatio Interfac	nal e : Panel / Software	Communication	Related Section: 6.3.3		
	Defau	lt : 0				
	Con Mode	C	S			
	Un	it:ms	ms			
Range: Data Size:		e: 0~1000 (0: disable	0 ~ 1000 (0: disable this function)			
		e:16-bit	16-bit			
	Forma	it : Decimal				

Settings : 0: Disabled

P1-07	TFLT	Analog Torque Comm	alog Torque Command (Low-pass Filter)		
	Operatio Interfac	Danal / Sattwara	Communication	Related Section: 6.4.3	
	Defau	lt : 0			
	Con Mode	Т	Т		
	Un	it:ms			
	Range	e: 0~1000 (0: disable	e this function)		
	Data Size	e : 16-bit			
	Forma	t : Decimal			
	0 - 44	- · 0· Dia ablad			

Settings : 0: Disabled

P1-08			ooth Constant of Po ss Filter)	Address: 0110H 0111H	
	Default: Control Mode:		Panel / Software	Communication	Related Section: 6.2.6
			0		
			PT / PR		
			10 ms		
			0 ~ 1000		
			16-bit		
			Decimal		
	Example	e :	11 = 110 ms		

Settings : 0: Disabled

P1-09	361		ernal Speed Comman	d 1 / Internal Speed	Address: 0112H 0113H	
	Operational Interface :		Panel / Software	Communication	Related Section: 6.3.1	
	Defau	lt :	1000			
	Contro Mode:		S/T			
	Unit :		0.1rpm			
	Range :		-60000 ~ +60000			
	Data Size :		32-bit			
	Format : Example :		Decimal			
			Internal speed command: 120 = 12 r/min Internal Speed Limit: Positive value and negative value is the same. Please refer to the following description.			

Settings : Internal Speed Command 1: The setting of the first internal speed command

Internal Speed Limit 1: The setting of the first internal speed limit Example of inputting internal speed limit:

Speed limit setting value of P1-09	Allowable Speed Range	Forward Speed Limit	Reverse Speed Limit
1000	-100 ~ 100	100 r/min	-100 r/min
-1000	r/min		100 11111

P1-10	SP2		ternal Speed Command 2 / Internal Speed mit 2		Address: 0114H 0115H
	Operational Interface :		Panel / Software	Communication	Related Section: 6.3.1
	Defau	lt :	2000		
	Contro Mode:		S/T		
	Un	it :	0.1rpm		
	Range: Data Size:		-60000 ~ +60000		
			32-bit		
	Forma	at :	Decimal		
		0.	Internal speed command: 120 = 12 r/min Internal Speed limit: Positive value and negative value is the same. Please refer to the following description.		
		s :	Internal Speed Comma command Internal Speed Limit 2:		

Example of inputting internal speed limit:

Speed limit setting value of P1-10	Allowable Speed Range	Forward Speed Limit	Reverse Speed Limit
1000	-100 ~ 100 r/min	100 r/min	-100 r/min
-1000			

P1-11	SP3 Inte	Address	: 0116H 0117H					
	Operational Interface :	-	Communicatio	n	Related 6.3.1			
	Default :	3000	i.					
	Control Mode :	S/T						
	Unit :	0.1rpm		No. 				
	Range :	-60000 ~ +60000						
	Data Size :	32-bit						
	Format :	Decimal						
	Example .	Internal Speed Cor 120 = 12 r/min Internal Speed I negative value is the following descr						
	Settings :	Internal Speed Co command						
		·	nternal Speed Limit 3: The setting of the third i Example of inputting internal speed limit:					
		Speed limit setting of P1-11	Allowable Speed Range	Forward Limit	Speed	Reverse Speed Limit		
		1000 -1000	-100 ~ 100 r/min	100	r/min	-100 r/min		
P1-12		ernal Torque Com nit 1	Address	s: 0118H 0119H				
	Operational Interface :	Panel / Software	Communicatio	n	Related 6.4.1	Section:		
	Default :	100						
	Control Mode :	T / P, S						
	Unit :	%						
	Range :	-300 ~ +300						

Data Size : 16-bit

Format : Decimal

Internal Torque Command: 30 = 30 %
Internal Torque Limit: Positive value and negative value is the same. Please refer to the following description.
Internal Torque Command 1: The setting of the first internal torque command

Internal Torque Limit 1: The setting of the first internal torque limit

Example of inputting internal torque limit:

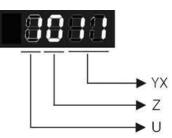
Torque limit setting value of P1-12	Allowable Torque Range	Forward Torque Limit	Reverse Torque Limit	
30	-30 ~ 30 %	30 %	-30 %	
-30				

P1-13			rnal Torque Comman it 2	Address	: 011AH 011BH		
	Operatior Interface		Panel / Software	Communication		Related \$ 6.4.1	Section:
	Default	•	100				
	Conti Mode	rol :	T / P, S				
	Unit	: (	%				
	Range	÷	-300 ~ +300				
	Data Size	•	16-bit				
	Format	:	Decimal				
	Example	•	Internal Torque Comma Internal Torque Limit negative value is the the following descriptio				
	Settings	•	Internal Torque Comm command	and 2: The setting	) of the	e secono	d internal torque
		secor	nd intern	al torque limit			
		I	Example of inputting in				
	Torque limit setting value of P1-13			Allowable Torque Range	Forwa Torqu	ird e Limit	Reverse Torque Limit
			30	-30 ~ 30 %	30	) %	-30 %
			-30			-	

P1-14	103	ernal Torque Comma nit 3	Address	: 011CH 011DH					
	Operational Interface :	Panel / Software	Communication		Related \$ 6.4.1	Section:			
	Default :	100							
	Control Mode :	T / P, S							
	Unit :								
	Range :	-300 ~ +300							
	Data Size :	16-bit	16-bit						
	Format :	Decimal							
	Example :	Internal Torque Comm Internal Torque Lim negative value is the the following description							
	Settings :	Internal Torque Com command	mand 3: The set	ting of	the third	internal torque			
		Internal Torque Limit	3: The setting of th	ne third	internal t	orque limit			
		Example of inputting in	Example of inputting internal torque limit:						
		Torque limit setting value of P1-14Allowable Torque RangeForwa Torque			-	Reverse Torque Limit			
		30 -30	0 %	-30 %					
	Ca	pture Synchronous A	vie - Threehold	of	Address	: 011EH			

P1-15		Capture Synchronous Correction	pture Synchronous Axis – Threshold of rrection			
	Operation Interface	Demol / Cofficience	Communication	Related Section:		
	Default	t : 0000h				
	Cont Mode					
	Unit	t: -				
	Range	e:0000h~0x1F5F				
	Data Size	e : 16-bit				
	Format	t: Hexadecimal				

Settings :



YX: Threshold of correction (%)

Z: Filter intensity

U: Filter is functioning (read-only)

(It will be provided after the version of V1.0.38 sub15)

YX: When synchronous axis captures the signal, the system will calculate the error. This function is enabled only when the error is less than the setting range. Otherwise, the system will use the new threshold of correction to perform the operation.

YX	00	01~05F
Function	Disabled	It will be enabled when error is between 1% and YX%.

Z	0	1~F
Function	Disabled	Average of 2 <sup>^</sup> Z: Enabled

Z: The setting of filter intensity (Bigger value brings less severe change and better filter effect)

U: Value Definition (read-only):

0: Filter function is disabled. It means the error is greater than Y & X Range.

1: Filter function is enabled. It means the error is within Y & X range. If value Z or YX is 0, filter function is disabled.

P1-16	COUL	Capture Synchronous A Compensation	oture Synchronous Axis – Offset			
	Operation Interface	nal Panel / Software	Communication	Related Section:		
	Defaul	t: 0				
	Cont Mode	PR				
	Uni	t: Pulse unit of Capture				
	Range	e:-32768~+32767				

Data Size :	16-bit	
Format :	Decimal	
Settings :	When capture synchronous axis is enabled, synchronous error (P5-79), setting this parameters	if desire to change the eter will do.

Write P1-16: P5-79 = P5-79 + writing value

Read P1-16: Read value = P5-79

The	setting	value	of	this	parameter	is	the	accumulative	value,
whic	h will no	t be inf	flue	nced	by current	erre	or va	lue.	

2) The value of P5-79 can be monitored by monitoring variable 0x54.

P1-17	TEET		mpensation of Follow ne Setting	Address: 0122H 0123H		
	Operational Interface : Default :		Panel / Software	Communication	Related Section:	
			0			
	Cor Mod		ALL			
	Un	it :	Ms; the smallest unit is	SUSEC		
	Rang	e :	-20.000 ~ +20.000 (th			
	Data Siz	e :	16-bit			
	Forma	at :	Decimal			
	Exampl	e :	1.5 = Motor speed x 1.	1.5 = Motor speed x 1.5 ms (PUU)		
	Setting	s:	position error (PUU) c of command. If the tim	lose to 0 according to the delay is caused by ot	he system will make the ne compensation amount her reasons, users could compensate the position	

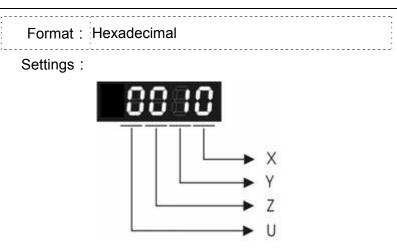
Additional compensation distance =  $P1-17 \times Motor \text{ speed}$ 

**NOTE** 1) Value of P1-36 has to set to 1.

error.

P1-18		Electronic Car Compensatio			Address: 0124H 0125H
	Operatio Interface	Danal /Soft	ware	Related Section: N/A	
	Defaul	t: 0			
	Con Mode	DD			
	Uni	t: ms with frac	ction down	to usec	
	Range	e:-20.000~+	-20.000 (T		
	Data Size	e : 16-bit			• • •
	Forma	t : Decimal			
	Setting	s : (This function models only		ble in firmware version V	/1.038 sub48 and later
		-	am functio	n is enabled during oper	ay pulse phase when the ration. Please use this
		Compensat Master Axis		. ,	ulse Frequency of E-Cam
		Please note:			
			•	f this parameter is propo of E-Cam master axis.	rtioned to the value of
		•	•	empensation function is e ameter P1-18 is not equa	•
		value of t variable is	he pulse fr s 060) Puls	empensation function is e requency of E-Cam mast se number of E-Cam ma etting value of parameter	er axis (monitoring ster axis (Incremental))

P1-19		CAPTURE / COMPARI Settings	APTURE / COMPARE – Additional Function ettings			
	Operation Interface	nal Panel/Software	Communication	Related Section: N/A		
	Default	t: 0				
	Cont Mode	· <b>Δ</b>				
	Unit	t : N/A		1 2 2 4 4		
	Range	e : 0x0000 ~ 0x0101				
-	Data Size	e : 16-bit				



X: Bit settings of Capture additional function settings:

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)

Y: Reserved

Z: Bit settings of Compare additional function settings:

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)

U: Reserved

P1-20	СРМК	CA	PTURE – Masking Ra	Address: 0128H 0129H	
	Operatio Interface		Panel/Software	Communication	Related Section: N/A
	Mode : Unit : T		0		
			ALL		
			The Pulse Unit of Cap		
			0 ~ +100000000		
	Da Size		32-bit		

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 , CAP\_DATA+P1-20)

Please note:

When the setting value of this parameter is set to 0, the masking function is disabled.

P1-21			Cam Pulse Phase Compensation – Min. equency Setting of Master Axis			
	Operatio Interface	<sup>•</sup> Danal/Softwara	Communication	Related Section: N/A		
	Defaul	t: 0				
	Cont Mode					
	Uni	t: Kpps (Kpulse/sec)	)			
	Range	e : -32768 ~ +32767				
	Da Size	:16_hit				
	Forma	t : 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 not equal to 0.
- The pulse phase compensation function is enabled only when the value of the pulse frequency of E-Cam master axis (monitoring variable is 060) Pulse number of E-Cam master axis (Incremental)) is higher than the setting value of parameter P1-21.

P1-22	SPF1	PR Specia	I Filter Sett	Address: 012CH 012DH	
	Operationa Interface :		Software	Communication	Related Section: N/A
	Defaul	lt: 000h			2 2 2 2 2
	Con Mode	:PR			
-	Uni	it:N/A	N/A		
	Range	e: 0000h	~ 0x107F		• • •
	Data Size :		16-bit format = UZYX		
-	Forma	t: Hexade	ecimal		

Settings : YX: Acceleration time limit (0: Disabled, [1~127] x 10ms), Units: 10ms

### Z: Reserved

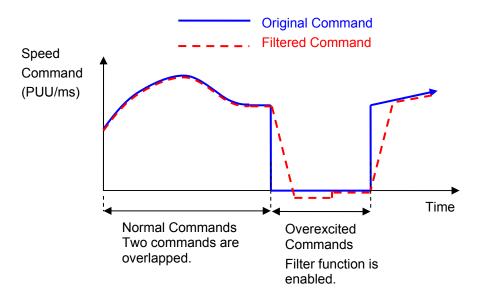
U: Reverse inhibit (0: Disabled; 1: Enabled)

YX: The acceleration time limit is 0 ~ 1270 ms. 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. This function can be used to control the acceleration (deceleration) speed without exceeding the limit and can smooth the operation, reduce the noise and extend the system life.

This function is different from the general filter. The traditional one filter the command regardless the command change. This causes the delay of command delivered and reduces the efficiency of the system. This function can help to disable the filter function when the command changes within the limit. Then, the commands can be delivered without any 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.

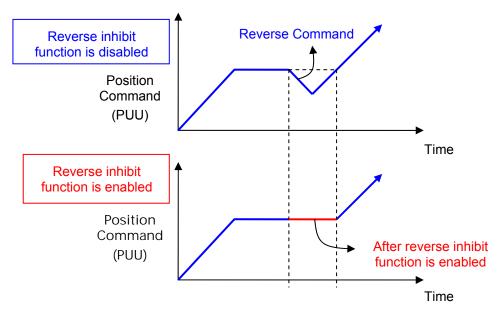
### Please note:

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.



- Note: 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 AL.404.
- Note: The filter time has to be set properly. It should be shorter than the acceleration time and longer than the abnormal command.
- Note: The function of U item can be used to avoid the reverse operation.

U: Reverse Inhibit Function (0: Disable the function; 1: enable the function) When this reverse inhibit function is enabled, the reverse command will be inhibited. The reverse command will be reserved and output after the received forward command exceeds the reserved reverse command.



P1-23	CMOF	со	MPARE - Offset Data	Address: 012EH 012FH	
	Default: Control Mode: Unit:		Panel / Software	Communication	Related Section :
			0		
			ALL		
			Pulse unit of compare		
			-10000000 ~ +1000000		
	Data Size	e :	32-bit		
	Forma	at :	Decimal		

Settings : The real compared data is offset by this value.

CMP\_DATA = DATA\_ARRAY[\*] + P1-23 + P1-24

- **NOTE** 1 ) P1-23: Non-volatile parameter
  - 2) P1-24: After setting, if P1-19.Z0 = 1, the value will be 0 automatically.
  - 3) CMP\_DATA can be monitored via monitoring variable 0x25.

P1-24∎		COMPARE - Offset Data 0 automatically)	OMPARE - Offset Data of CMP (can reset to automatically)		
	Operation Interface	nal Panel / Software	Communication	Related Section:	
	Default	t: 0			
	Cont Mode	ΔΙΙ			
	Unit	t: Pulse unit of compare	Pulse unit of compare source		
	Range	e : −32768 ~ +32767			
	Data Size	e : 16-bit	16-bit		
	Format	t : Decimal			
	Settings	<u>.</u> .			

ettings . The real compared data is offset by this value. CMP\_DATA = DATA\_ARRAY[\*] + P1-23 + P1-24

**NOTE** 1 ) P1-24: volatile parameter.

2) After setting, if P1-19.Z0 = 1, the value will be 0 automatically.

P1-25	VSF1 L	ow-frequency Vibratio	n Suppression (1)	Address: 0132H 0133H	
	Operationa Interface :	Danal / Softwara	Communication	Related Section: 6.2.9	
	Default :	1000	1000		
	Contro Mode :	DT / DD			
	Unit :	0.1 Hz			
	Range :	10 ~ 1000			
	Data Size :	16-bit			
	Format :	Decimal	Decimal		
	Example :	150= 15 Hz			
	Settings :	-	ne first low-frequency vi vill disable the first low-f	bration suppression. If P1-	

26 is set to 0, then it will disable the first low-frequency filter.

P1-26	VSG1	Lo <sup>.</sup> (1)	w-frequency Vibratio	n Suppression Gain	Address: 0134H 0135H
	Interrace :Default :0Control Mode :PUnit :-Range :0Data Size :16Format :DSettings :Th is to		Panel / Software	Related Section: 6.2.9	
			0		
			PT / PR		
			-		
			$0 \sim 9$ (0: Disable the fir		
			16-bit		
			Decimal		
			The first low-frequency vibration suppression gain. The bigger value it is, the better the position response will be. However, if the value is set too big, the motor will not be able to smoothly operate. It is suggested to set the value to 1.		

P1-27	VSF2	Low-frequency Vibrat	ion Suppression (2)	Address: 0136H 0137H	
	Operatior Interface	Danol / Softwara	Communication	Related Section: 6.2.9	
	Default	: 1000	1000		
	Conti Mode				
	Unit	: 0.1 Hz			
	Range	: 10 ~ 1000			
	Data Size	: 16-bit			
	Format	: Decimal	Decimal		
	Example	: 150 = 15 Hz			
	Settinas	• The setting value of	the second low-frequenc	y vibration suppression. If	

Settings : The setting value of the second low-frequency vibration suppression. If P1-28 is set to 0, then it will disable the second low-frequency filter.

P1-28	VSG2 L	ow-frequency Vibra	w-frequency Vibration Suppression Gain (2)	
	Operationa Interface :		Communication	Related Section: 6.2.9
	Default :	: 0	0	
	Contro Mode :	PT / PR		
	Unit :	-		
Range :		0 ~ 9 (0: Disable the second low-frequency filter)		4
	Data Size :	16-bit		
	Format :	: Decimal		
		<b>T</b> I II (		

Settings : The second low-frequency vibration suppression gain. The bigger value it is, the better the position response will be. However, if the value is set too big, the motor will not be able to smoothly operate. It is suggested to set the value to 1.

P1-29		Auto Low-frequency \ Setting	to Low-frequency Vibration Supression ting		
	Operation Interface		Communication	Related Section: 6.2.9	
	Default	t: 0			
	Cont Mode	DT / DD	PT / PR		
	Unit	t:-			
	Range	e : 0 ~ 1			
	Data Size	e : 16-bit			
	Format	t:DEC			
	Catting	$\sim 0$ : The function is di	sabled		

Settings : 0: The function is disabled.

1: The value will set back to 0 after vibration suppression.

Description of Auto Mode Setting:

When the parameter is set to 1, it is in auto suppression. When the vibration frequency is not being detected or the value of searched frequency is stable, the parameter will set to 0 and save the low-frequency vibration suppression to P1-25 automatically.

P1-30	VCL	ow-frequency Vibrat	v-frequency Vibration Detection		
	Operationa Interface		Communication	Related Section: 6.2.9	
	Default				
	Contro Mode				
	Unit	Pulse			
	Range	1 ~ 8000 16-bit			
	Data Size				
	Format	Decimal	Decimal		
	Settings	When enabling the auto suppression (P1-29 = 1 search the detection level. The lower the value the detection will be. However, it is easy to misj regard the other low-frequency vibration as the		e is, the more sensitive sjudge the noise or e suppression frequency.	

### P1-31 Reserved

P1-32	LSTP	Мо	tor Stop Mode	Address: 0140H 0141H	
	Operational Interface : Default : Control Mode :		Panel / Software	Communication	Related Section: -
			0		
			ALL		
	Un	nit :	-		
	Rang	e :	0 ~ 0x20		
	Data Siz	e:	16-bit		
	Format :		Hexadecimal		
	Setting	js :	;	Not in use Selection of executing dynamic bra Not in use	ike

Selection of executing dynamic brake: Stop Mode when Servo Off or Alarm (including EMGS) occurs.

- 0: Execute dynamic brake
- 1: Motor free run
- 2: Execute dynamic brake first, then execute free run until it stops (The motor speed is slower than P1-38).

When PL and NL occur, please refer to event time setting value of P5-03 for determining the deceleration time. If the setting is 1 ms, it can stop instantaneously.

# P1-33 Reserved

P1-34	TACC	Acceleration Constan	celeration Constant of S-Curve		
		nal Panel / Software	Communication	Related Section: 6.3.3	
	Defaul	t : 200			
	Cont Mode	trol s : S			
	Uni	t:ms			

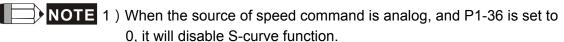
Range :	1 ~ 65500	
Data Size :	16-bit	
Format :	Decimal	

Settings : Acceleration Constant of Rotary Motor:

The time that speed command accelerates from 0 to the rated speed. Acceleration Constant of Linear Motor

The time that speed command accelerates from 0 to 5m/s.

P1-34, P1-35 and P1-36, the acceleration time of speed command from zero to the rated speed, all can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.



2) When the source of speed command is analog, the max. range of P1-34 will be set within 20000 automatically.

P1-35	TDEC	De	celeration Constant o	Address: 0146H 0147H	
	Operatic Interfac		Panel / Software	Communication	Related Section: 6.3.3
	Defau	lt :	200		
	Contro Mode :		S		
	Un	it :	ms		
	Range: Data Size: Format:		1 ~ 65500		
			16-bit		
			Decimal		
	Setting	s :	Deceleration Constant of Rotary Motor:		
ootanigo .			The time that speed command decelerates from the rated speed to 0. Deceleration Constant of Linear Motor: The time that speed command decelerates from 5m/s to 0. P1-34, P1-35 and P1-36, the deceleration time of speed command from the rated speed to zero, all can be set individually. Even when P1- 36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.		
ſ			1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.		
		2) When the source of speed command is analog, the max. range of P1-35 will be set within 20000 automatically.			

P1-36	TSL	Acc Cur				Address: 0148H 0149H
	Operationa Interface :		Panel / Software	Communicatio	n	Related Section: 6.3.3
	Defau	lt :	0			
	Contro Mode :		I S, PR			
	Un	it :	ms			
	Data Size :		0 ~ 65500 (0: disable this function) 16-bit Decimal			
			Acceleration / Deceleration Constant of S-Curve: Speed			Time (ms)
			P1-34: Set the accele trapezoid-curv		celeratio	on / deceleration of
			P1-35: Set the decele trapezoid-curv		celeratio	on / deceleration of

P1-36: Set the smoothing time of S-curve acceleration and deceleration

P1-34, P1-35 and P1-36 can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.

Version after V1.036 sub00 provides the compensation function of following error.

	P1-36 = 0	P1-36 = 1	P1-36 > 1
Smoothing function of S-curve	Disable	Disable	Enable
Compensation function of following error	Disable	Enable	Determine by P2-68.X



**NOTE** 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.

> 2) When the source of speed command is analog, the max. range of P1-36 will be set within 10000 automatically.

P1-37	GDR Ine Mo	ertia Ratio and Load V tor	Address: 014AH 014BH	
	Operational Interface :	Panel / Software	Communication	Related Section: -
	Default :	1.0	10	
	Control Mode :	ALL		
	Unit :	1times	0.1times	
	Range :	0.0 ~ 200.0	0 ~ 2000	
	Data Size :	16-bit		
	Format :	One decimal	DEC	
	Example :	1.5 = 1.5 times	15 = 1.5 times	
	Settings :	Inertia ratio to servo m		
		(J_load / J_motor) Among them: J_motor: Rotor inertia J_load: Total equivaler	of the servo motor nt of inertia of external m	nechanical load.

Total weight of movable section and load (linear motor) (will be available soon):

(M\_load+M\_motor)

Among them:

M\_motor: the weight of servo motor

M\_load: Total equivalent weight of mechanical loading

P1-38	ZSPD Ze	ro Speed Range Se	Address: 014CH 014DH	
	Operational Interface :		Communication	Related Section: Table 8.2
	Default :	10.0	100	
	Control Mode :	ALL		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.0 ~ 200.0	0 ~ 2000	
	Data Size :	16-bit		
	Format :	One decimal	DEC	
	Example :	1.5 = 1.5 r/min	15 = 1.5 r/min	

Settings : Setting the output range of zero-speed signal (ZSPD). When the forward / reverse speed of the motor is slower than the setting value, the digital output will be enabled.

#### P1-39

9	SSPD	Tar	get Motor Detectio	Address: 014EH 014FH	
	Operatio Interface		Panel / Software	Communication	Related Section: Table 8.2
	Defau	lt:	3000		
	Control Mode :		ALL		
	Unit :		r/min		
	Range :		) ~ 5000		
	Data Size :		16-bit		
	Format :		Decimal		
:	Sotting	<u>.</u>	When the target sp	eed is reached. DO (TSF	PD) is enabled. It means

Settings : When the target speed is reached, DO (TSPD) is enabled. It means when the motor speed in forward / reverse direction is higher than the setting value, the target speed is reached and enables DO.

P1-40▲	VCM	Maximum Output o	f Analog Speed Command	Address: 0150H 0151H
	Operation Interface		Panel / Software Communication	
	Defaul	t: Same as the rate	ed speed of each model	
-	Cont Mode	trol S / T		
	Uni	t:r/min		
	Range	e : 0 ~ 5000		
	Data Size	e : 16-bit		
F	Forma	t : Decimal		
	Settings	<sub>3 :</sub> Maximum Speed	of Analog Speed Command:	-:

In speed mode, the analog speed command inputs the swing speed setting of the max. voltage (10V).

For example, if the setting is 3000, when the external voltage input is 10V, it means the speed control command is 3000r/min. If the external voltage input is 5V, then the speed control command is 1500r/min.

Speed control command = input voltage value x setting value / 10

In position or torque mode, analog speed limit inputs the swing speed limit setting of the max. voltage (10V).

Speed limit command = input voltage value x setting value / 10

P1-41▲	тсм	Maximum Output of A	ximum Output of Analog Torque Speed					
	Operatior Interface	nal Panel / Software	Communication	Related Section: 6.4.4				
Default :		: 100	100					
	Cont Mode	rol : ALL	ALL					
	Unit	: %	%					
Range: Data Size:		: 0 ~ 1000	0 ~ 1000					
		: 16-bit	16-bit					
	Format	: Decimal						

Settings : Maximum Output of Analog Torque Speed:

In torque mode, the analog torque command inputs the torque setting of the max. voltage (10V). When the default setting is 100, if the external voltage inputs 10V, it means the torque control command is 100% rated torque. If the external voltage inputs 5V, then the torque control command is 50% rated torque.

Torque control command = input voltage value x setting value / 10 (%)

In speed, PT and PR mode, the analog torque limit inputs the torque limit setting of the max. voltage (10V).

Torque limit command = input voltage value x setting value / 10 (%)

P1-42	MBT1 En	able Delay Time of	Address: 0154H 0155H	
	Operational Interface :	Panel / Software Communication		Related Section: 6.5.5
	Default :	0		
	Control Mode :	ALL		
	Unit :	0 ~ 1000		
	Range :			
	Data Size :			
	Format :			

Set the delay time from servo ON to activate the signal of mechanical brake (BRKR). Settings :

P1-43	MBT2	Dis	able Delay Time of B	Address: 0156H 0157H		
	Operational Interface :		Panel / Software Communication		Related Section: 6.5.5	
	Defau	lt :	0			
	Control Mode :		ALL			
	Un	it :	ms			
	Range	e:	-1000 ~ 1000			
	Data Siz	e:	16-bit			
	Forma	at :	Decimal			
	Setting		<ul> <li>(BRKR).</li> <li>SON OFF ON BRKR OFF ON MBT1(P1-42)</li> <li>Motor Speed</li> <li>1) If the delay time of is slower than P1-3</li> <li>2) If the delay time of P1-38, the signal o</li> <li>3) When Servo OFF</li> </ul>	OFF OFF MBT2(P1-43) ZSPD (P1-38) P1-43 has not finished 88, the signal of brake (BP1-43 is up and the mo f brake (BRKR) will be o	tor speed is higher than disabled. L022) or emergency, the is set to a negative	
P1-44▲	GR1	Ge	ar Ratio (Numerator) (	Address: 0158H 0159H		
	Operational Interface :		Panel / Software Communication		Related Section: 6.2.5	
	Default :		1			
	Control Mode :		PT / PR			
	Un	it :	Pulse			
	Range	e :	1 ~ (2 <sup>29</sup> -1)			

Data Size :	32-bit
Format :	Decimal
Settings :	Please refer to P2-60~P2-62 for the setting of multiple gear ratio (numerator).
	1. In PT mode, the setting value can be changed when Servo ON.

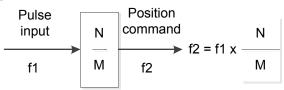
2. In PR mode, the setting value can be changed when Servo OFF.

P1-45	GR2 G	ear Ratio (Denomina	ar Ratio (Denominator) (M)			
	Operation Interface	al Panel / Software	Communication	Related Section: 6.2.5		
	Default	: 1				
	Contr Mode	ol : PT / PR				
	Unit	Pulse				
	Range	: 1 ~ (2 <sup>31</sup> -1)				
	Data Size	: 32-bit				
	Format	: Decimal	Decimal			
		If the estimation	many the come motor	will easily have audden		

If the setting is wrong, the servo motor will easily have sudden Settings : unintended acceleration.

Please follow the rules for setting:

The setting of pulse input:



Range of command pulse input: 1 / 50 < Nx / M < 25600



**NOTE** 1) The setting value cannot be changed when Servo ON neither in PT nor in PR mode.

P1-46▲		Pulse Number of Enco	Address: 015CH 015DH	
	Operation Interface	nal Panel / Software	Communication	Related Section: -
	Default	: 2500		
	Conti Mode	rol : ALL		
	Unit	: Pulse		

Range :	20 ~ 320000
Data Size :	32-bit
Format :	Decimal
	The number of single phase pulse output per r

Settings : The number of single-phase pulse output per revolution.

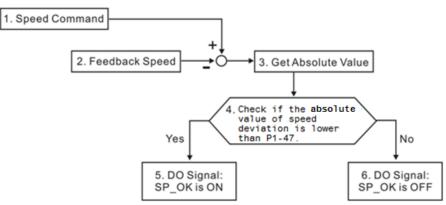
The following	circumstances	might	exceed	the	max.	allowable	input
pulse frequence	cy and occurs A	L018:					

- 1. Abnormal encoder
- 2. The motor speed is faster than the setting of P1-76.
- $3. \quad \frac{Motor \ Speed}{60} \times P1 46 \times 4 > 19.8 \times 10^6$

P1-47	SPOK S	speed Reached (DO :	eed Reached (DO:SP_OK) Range				
	Operation Interface	al : Panel / Software	Communication	Related Section: -			
	Default	: 10	100				
Co Mo	Contr Mode	ol : S / Sz	S / Sz				
	Unit	: r/min	0.1 r/min				
	Range	: 0 ~ 300	0 ~ 3000				
	Data Size	: 16-bit	16-bit				
	Format	: Decimal	Decimal				

Settings : When the deviation between speed command and motor feedback speed is smaller than this parameter, then the digital output DO.SP\_OK (DO code is 0x19) is ON.

Block diagram:



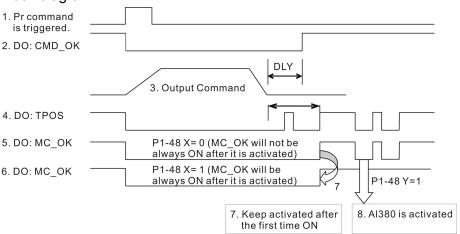
1. Speed command: It is the command issued by the user (without acceleration / deceleration), not the one of front end speed circuit.

Source: Analog voltage and register

- 2. Feedback speed: The actual speed of the motor and have gone through the filter.
- 3. Obtain the absolute value.
- DO.SP\_OK will be ON when the absolute value of speed error is smaller than P1-47, or it will be OFF. If P1-47 is 0, DO.SP\_OK is always OFF.

P1-48		eration Selection of Motion Reached D.MC_OK)	Address: 0160H 0161H
	Operational Interface :	Panel / Software Communication	Related Section: -
	Default :	0x0000	
	Control Mode:	PR	
	Unit :	-	
	Range :	0x0000 ~ 0x0011	
	Data Size :	16-bit	
	Format :	Hexadecimal	
	Settings :	Control selection of digital output DO.MC_OK (It will be available after firmware version V1.0) The format of this parameter: 00YX	
		X = 0: It will not remain the digital output status	i
		Y = 0: AL.380 (position deviation) is not workin	g
		1: AL.380 (position deviation) is working	

#### Block diagram:



Description:

- 1. Command triggered: It means the new PR command is effective. Position command starts to output and clear signal 2, 4, 5, 6 at the same time.
- 2. CMD\_OK: It means the position command is completely outputted and can set the delay time (DLY).
- 3. Command output: Output the profile of position command according to the setting acceleration / deceleration.
- 4. TPOS: It means the position error of the servo drive is smaller than the value of P1-54.
- 5. MC\_OK: It means the position command is completely outputted and the position error of the servo drive is smaller than P1-54.
- 6. MC\_OK (remains the digital output status): It is the same as 5. However, once this DO is ON, its status will be remained regardless signal 4 is OFF or not.
- 7. The output profile is determined by parameter P1-48.X.
- 8. Position Deviation: When number 7 happens, if 4 (or 5) is OFF, it means the position is deviated and AL380 can be triggered. Set this alarm via parameter P1-48.Y.

P1-49		cumulative Time of	Address: 0162H 0163H	
	Operational Interface :	Panel / Software	Communication	Related Section: Table 8.2
	Default :	0		
	Control Mode :	S/Sz		
	Unit :	ms		
	Range :	0 ~ 65535		
	Data Size :	16-bit		

## Format : DEC

Settings : In speed mode, when the deviation value between speed command and motor feedback speed is smaller than the range set by P1-47 and reaches the time set by P1-79, DO.SP\_OK will be On. If the deviation value exceeds the range set by P1-47, it has to reclock the time.

### P1-50 ~ P1-51 Reserved

P1-52	RES1	Re	generative Resistor	Value		Address: 0168H 0169H
	Operation Interface		Panel / Software	Communication		Related Section: 2.7
	Defaul		Determined by the m following table.	odel. Please refer	to the	
	Cont Mode		ALL			
	Uni	t :	Ohm			
	Range	:	220V			
	-		Model	Setting Range		
			400W (included) or below	30 ~ 750		
			750W ~ 1.5kW	20 ~ 750		
			2kW ~ 4.5kW	10 ~ 750		
			5.5 W	8 ~ 750		
			7.5kW	5 ~ 750		
			11kW	8 ~ 750		
			15 kW	5 ~ 750		
			400V			
			Model	Setting Range		
			750W ~ 1.5kW	60 ~ 750		
			1.5kW ~ 2kW	40 ~ 750		
			3 W	30 ~ 750		
			4.5kW ~ 5.5kW	20 ~ 750		
			7.5kW	15 ~ 750		
	Data Size	:	16-bit			
	Forma	t :	Decimal			

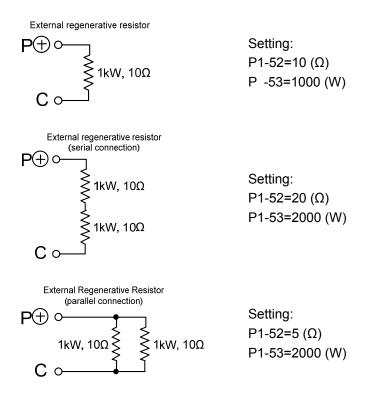
# Settings : 220V:

Model	Default
1.5 kW (included) or below	40Ω
2 kW ~ 4.5 kW (included)	20Ω
5.5 kW	15Ω
7.5 kW	15Ω
400V:	
Model	Default
750W ~ 7.5kW	80Ω

Please refer to the description of P1-53 for the setting value when connecting regenerative resistor with different method.

RES2 Re	generative Resistor C	enerative Resistor Capacity			
Operational Interface :	Panel / Software	Communicati	on	Related Section: 2.7	
Default :	Determined by the mod following table.	del. Please ref	er to the	-	
Contro Mode :	ALL				
Unit :	Watt				
Range :	0 ~ 6000 (for 11kW, 15kW, the setting range is from 0 to 15000)				
Data Size :	Data Size:16-bit Format:Decimal				
Format :					
Settings :	220V				
-	Model		Default		
	200W (included) or belo	w	0W		
	400W		40W		
	750W ~ 1.5kW		60W		
	2 kW ~ 4.5 kW (include	d)	100W		
	5.5 kW		0W		
	7.5 kW		0W		
	400V				
	Model		Default		
	750W ~ 1.5kW		100W		
	2 kW ~ 4.5 kW		0W		

Following describes the setting value when connecting regenerative resistor with different method:



P1-54	PER	Position Comple	ted Range	Address: 016CH 016DH
	Operation Interface		are Communication	Related Section: Table 8.2
	Defaul	t : 12800		
	Cont Mode	rol e : PT / PR		
	Uni	t: Pulse		
	Range	e : 0 ~ 1280000		
	Data Size	e : 32-bit		
	Forma	t: Decimal		
	Settings	; In position mo setting range (	lse number is smaller than the eter P1-54), DO.TPOS is ON.	

In position register (PR) mode, if the deviation between the target position and the actual motor position is smaller than the setting range (the setting value of parameter P1-54), DO.TPOS is ON.

P1-55	MSPD	Ma	ximum Speed Limit		Address: 016EH 016FH
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Defau	lt :	Same as the rated spe	eed of each model	
	Con Mode		ALL		
	Un	it :	r/min		
	Range	e:	0 ~ max.speed		
	Data Sizo	e:	16-bit		
	Forma	at :	Decimal		

Settings : The default of the max. speed of servo motor is set to the rated speed.

P1-56	ovw	Ou	tput Overload Warning Level		Address: 0170H 0171H
	Operational Interface :		Panel / Software	Communication	Related Section: -
	Defau	lt :	120		
	Contro Mode :		ALL		
	Unit: Range: Data Size:		0 ~ 120		
	Forma	at :	Decimal		
	Settings :			$s 0 \sim 100$ , if the servo me	otor continuously outputs

Settings : The setting value is 0 ~ 100, if the serve motor continuously outputs the load and is higher than the setting proportion (P1-56), the early warning for overload (DO is set to 10, OLW) will occur.

If the setting value is over 100, it will disable this function.

P1-57	CRSHA	Motor Crash Protectic	Address: 0172H 0173H	
	Operatior Interface	nal Panel / Software	Communication	Related Section: -
	Default	: 0		
	Cont Mode	rol : ALL		

Unit :	%	
Range :	0 ~ 300	
Data Size :	16-bit	
Format :	Decimal	

Settings : Setup protection level (for the percentage of rated torque, set the value to 0 means to disable the function, set the value to 1 or number above means to enable the function)

P1-58	CRSHT	Motor Crash Protectio	n Time	Address: 0174H 0175H
	Operatio Interface		Communication	Related Section: -
	Defaul	lt:1		
	Con Mode	· A I I		
	Uni	it:ms		
	Range	e : 0 ~ 1000		
	Data Size	e : 16-bit		
	Forma	t : Decimal		
	Setting		time: the level, AL.030 occu	urs after exceeding the

This function is only suitable for non-contactable application, such as electric discharge machines. (Please setup P1-37 correctly).

P1-59	MFLT An	alog Speed Comma	Address: 0176H 0177H	
	Operational Interface :	Panel / Software	Communication	Related Section: -
	Default :	0.0	0	
	Contro Mode :	S		
	Unit :	1 ms	0.1 ms	
	Range :	0.0 ~ 4.0	0 ~ 40	
	Data Size :	16-bit		
	Format :	One decimal	DEC	

	-	
Example : 1.5 = 1.5 ms	15 = 1.5 ms	

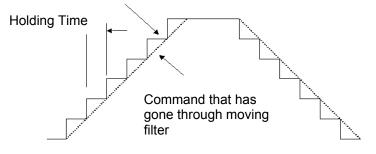
Settings : (Moving Filter)

0: Disabled

P1-06 is low-pass filter and P1-59 is moving filter. The difference between both is that moving filter can smooth the command in the beginning and end of the step command; while the low-pass filter brings better smooth effect to command end.

Therefore, it is suggested that if the speed loop receives the command from the controller for forming the position control loop, then low-pass filter can be used. If it is only for the speed control, then it should use Moving Filter for better smoothing.

Original step analog speed command



P1-60 ~ P1-61 Reserved

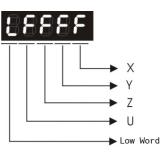
P1-62	FRCL	Fri	ction Compensatior	1	Address: 017CH 017DH
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Defau	ılt :	0		
	Control Mode : Unit : Range : Data Size : Format :		PT / PR / S		
			%		
			0 ~ 100		
			16-bit		
			Decimal		
	Setting			ns to disable the function	ntage of rated torque. Set on; set the value to 1 or

P1-63			ction Compensation		Address: 017EH 017FH
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: -
	Defau	lt:	0		
	Contro Mode :		PT/PR/S		
	Un	it :	ms		
	Rang	e :	0 ~ 1000		
	Data Siz	e :	16-bit		
	Forma	at :	Decimal		

Settings : Setup smoothing constant of friction compensation.

Analog Position Command: Activation Address: 0180H P1-64 PCCT Control 0181H Related Section: N/A Operational Panel/Software Communication Interface : Default : 0x00 Control PT Mode : Unit : --Range : 0 x00~ 0x11 Data Size : 32-bit Format : Hexadecimal

Settings :

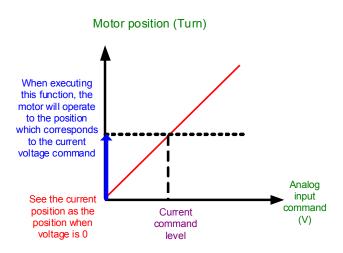


X:

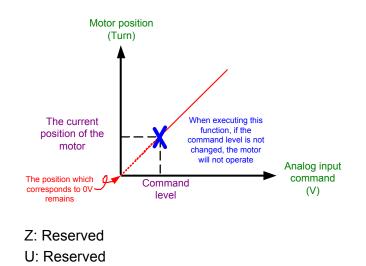
- 0: Disable the function of position command which is issued by analog
- 1: Enable the function of position command which is issued by analog

Y: Initial position setting

0: After servo on, the motor will regard 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.



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.



**NOTE** Version after firmware v1.031 sub8 supports this function.

P1-65	Smooth Con	Address: 0182H 0183H		
	Operational Interface :	Panel/Software	Communication	Related Section: N/A
	Default :	1		
	Control Mode :	PT		
	Unit :	10 ms		

Range :	1 ~ 1000	
Data Size :	16-bit	
Format :	Decimal	

Settings : The smooth constant of analog position command is only effective to analog position command.

P1-66		Max. Rotation Numbe Command	er of Analog Position	Address: 0184H 0185H
	Operation Interface	Danal / Softwara	Communication	Related Section: -
	Default	t: 1.0	10	
	Control Mode	e: PT		
	Unit	t:1 cycle	0.1 cycle	
	Range	e : 0.0 ~ 200.0	0 ~ 2000	
	Data Size	e:16-bit		
	Format	t: One decimal	DEC	
	Example	e:1.5 = 1.5 cycles	15 = 1.5 cycles	
	Settings	inputs the max. vo	oltage (10V). If it is se	analog speed command et to 30 and the external

tings : It is the rotation number setting when analog speed command inputs the max. voltage (10V). If it is set to 30 and the external voltage inputs 10V, it means the position command is +3 cycles. 5V means the speed control command is 1.5 cycles.

-10V means the position command is -3 cycles.

Position control command = Input voltage value x Setting value / 10

**NOTE** It will be available after firmware version v1.031 sub8.

## P1-67 R

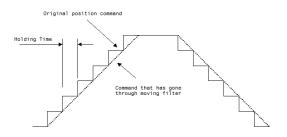
Reserved

P1-68	PFLT2	Position Command M	oving Filter	Address: 0188H 0189H
	Operatior Interface	nal Panel / Software	Communication	Related Section: -
	Default	: 4		
	Cont Mode	rol : PT / PR		
		: ms		
		: 0 ~ 100		

Data Size :	16-bit	
Format :	Decimal	
	0. Dischlad	

Settings : 0: Disabled

Moving Filter can activate smooth function in the beginning and the end of step command, but it will delay the command.



Ρ1	-(	69	2	
Ρ	1	-7′	1	

Reserved

P1-72		Resolution of Linear Loop Control	Scale for Full-closed	Address: 0190H 0191H
	Operation Interface	Donal / Cothyora	Communication	Related Section: -
	Defaul	t : 5000		
	Cont Mode	PT		
	Uni	t:pulse / rev		
	Range	e:200~1280000		
	Data Size	e : 32-bit		
	Forma	t : Decimal		
	Settings	A/B pulse correspond	led by full-closed loop v ency)	when motor runs a cycle

P1-73	FERR		or Protection Range	for Full-closed Loop	Address: 0192H 0193H
	Operatio Interfac		Panel / Software	Communication	Related Section: P2-34
	Default :		30000		
	Control Mode :		PT		
	Unit :		Pulse (based on the feedback of full-closed loop)		
	Range : Data Size : Format : Settings :		1 ~ (2 <sup>31</sup> -1) 32-bit		
			Decimal		
			linear scale and the er		veen feedback position of tion is excessive, it might chanism problems.

P1-74▲	FCON	Full-closed Loop Control of Linear Scale		Address: 0194H 0195H
	Operational Interface :	Panel / Software	Communication	Related Section: P1-46
	Default :	1000h		
	Control Mode :	PT		
	Unit :	-		
	Range :	0000h ~ 0x4122		
	Data Size :	16-bit		
	Format :	Hexadecimal		
	Settings :		Switch of full-closed loop Selection of OA/OB/OZ output source Positive/negative direction selection of linear scale feedback Filter setting of linear scale Not in use	

- Switch of full-closed loop control
  - 0: Function of full-closed loop is not used
  - 1: Function of full-closed loop is used
  - 2: Use the function of synchronous control
  - Selection of OA/OB/OZ output source
    - 0: Motor encoder is the output source
    - 1: Encoder of linear scale is the output source

Firmware version DSP V1.016 + CPLD 0.07(or the later version) will provide:

- 2: Pulse command of CN1 is the output source
- Positive / negative direction selection of linear scale feedback:
  - 0: It is in positive direction when A phase leads B phase of linear scale
  - 1: It is in negative direction when B phase leads A phase of linear scale
- Filter setting of linear scale
  - 0: BYPASS
  - 1: 20Mhz
  - 2: 10Mhz
  - 3: 6.66Mhz
  - 4: 1.66Mhz
  - 5: 833K
  - 6: 416K

P1-75	FELP		w-pass Filter Time Co op control	Address: 0196H 0197H	
	Operational Interface : Default : Control Mode :		Panel / Software	Communication	Related Section: -
			100		
			PT		
	Un	it :	ms		
	Range :		0 ~ 1000		
	Data Siz	e:	16-bit		
	Format : D		Decimal		
	Setting	s :		veen full- and half-closed ropriate time constant to	
			Set the value to 0 to di	sable the function of low	/-pass filter (Bypass)

The stiffness of mechanical system  $\uparrow$ , the setting value of P1-75  $\downarrow$ The stiffness of mechanical system  $\downarrow$ , the setting value of P1-75  $\uparrow$ 

Revision February, 2017

P1-76	AMSPD		kimum Rotation of En A, OB)	coder Output Setting	Address: 0198H 0199H
	Default : Control Mode : Unit :		Panel / Software	Communication	Related Section: P1-46
			5500		
			ALL		
			r/min		
			0 ~ 6000		
			16-bit		
	Forma	Format : Decimal			
	Setting	U .	According to the real application, this parameters speed and the servo drive will generate smoot for encoder output signals.		

When the value is set to 0, the function is disabled.

P1-77 ~ P1-80

Reserved

P1-81	VCM2 Ma	x. Speed of 2 <sup>nd</sup> Ana	Address: 01A2H 01A3H	
	Operational Interface :	Panel / Software	Communication	Related Section: P1-40
	Default :	Motor rated speed		
	Control Mode :	S/T		
	Unit :	rpm/10V		
	Range :	0 ~ 50000		
	Data Size :	32-bit		
	Format :	Decimal		

P1-82	VCMLPF	ter Switching Time b	Address: 01A4H 01A5H		
	Operational Interface :	Panel / Software	Communication	Related Section:	
	Default :	0	0		
	Control Mode:	S			
	Unit :	msec			
	Range :	0 ~ 1000 (0: disable t	0 ~ 1000 (0: disable this function)		
	Data Size :	16-bit			
	Format :	Decimal		4 	

Settings : 0: Disabled

P1-83		Abnormal Analog Inp	normal Analog Input Voltage Level		
	Operation Interface	Danal/Softwara	Communication	Related Section:	
	Default:0				
	Contr Mode	2			
	Unit	: mV	mV		
	Range	: 0 ~ 12000 (0: disal	0 ~ 12000 (0: disable this function)		
	Data Size	: 16-bit		-	
	Format	: Decimal			
	0.11	\A/I I · · · /			

Settings : When analog input voltage is over 50ms, AL.042 will occur. The compared 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.

P1-87		orque Limit Setting		Address:	01A8H 01A9H
	Operationa Interface :	ll Panel/Software	Communication	Related Se	ection:
	Default :	1			
	Contro Mode :	DD			
	Unit :	%			
	Range :	1~300			
	Data Size :	16-bit			
	Format :	Decimal			

Settings : Torque limit setting in torque limit homing mode.

P1-88			que Limit Time Setti	ng	Address:	01AAH 01ABH
	Operatio Interface	onal e :	Panel/Software	Communication	Related Se	ection:
	Defau	lt:	2000			
	Con Mode	PR				
	Uni	it :	ms			
	Range	e:	2~2000			
	Data Size	e:	16-bit			
	Forma	nt :	Decimal			

Settings : Torque limit time setting in torque limit homing mode.

# **P2-xx** Extension Parameters

P2-00	KPP Po	sition Loop Gain	Address: 0200H 0201H	
	Operational Interface :	Panel / Software Communication		Related Section: 6.2.8
	Default :	35		
	Control Mode :	PT / PR	PT / PR	
	Unit :	rad/s		-
	Range :	0 ~ 2047		
	Data Size :	16-bit		••
	Format :	Decimal		
	Settings :	When the value of	of position loop gain is	increased, the position

9 response can be enhanced and the position error can be reduced. If the value is set too big, it may easily cause vibration and noise.

P2-01	PPR Sw	itching Rate of Pos	Address: 0202H 0203H	
	Operational Interface :	Panel / Software	Communication	Related Section: 6.2.8
	Default :	100		
	Control Mode :	PT / PR		
	Unit :	%	%	
	Range :	10 ~ 500		
	Data Size :	16-bit		
	Format :	Decimal		
	Settings :	Switch the changin	g rate of position loop g	ain according to the gain-

switching condition.

P2-02	PFG	Po	sition Feed Forward	Gain	Address: 0204H 0205H
	Operational Interface :		Panel / Software	Communication	Related Section: 6.2.8
	Defau	ılt :	50		
	Control Mode: Unit:		PT / PR		
			%		
	Rang	le :	0 ~ 100		
	Data Size : Format :		16-bit		
			Decimal		
	Setting		If the position comma value can reduce the If the position comma	increasing the gain hly, decreasing the gain	

value can tackle the problem of mechanical vibration.

P2-03	PFF	Smooth Constant of P Gain	nooth Constant of Position Feed Forward in	
	Operatio Interfac	Danal / Softwara	Communication	Related Section: -
	Defau	lt : 5		
	Con Mod	e : PT / PR	PT / PR	
	Un	it:ms		
	Rang	e:2~100		
	Data Siz	e:16-bit		
	Forma	at : Decimal		
	Sotting	s . If the position comr	nand is changed smooth	ly, decreasing the value

Settings : If the position command is changed smoothly, decreasing the value can reduce the position error. If the position command is not changed smoothly, increasing the value can tackle the problem of mechanical vibration.

P2-04	KVP Sp	eed Loop Gain	Address: 0208H 0209H	
	Operationa Interface :		Communication	Related Section: 6.3.6
	Default :	500		
	Contro Mode :			
	Unit :	rad/s		
	Range :	0 ~ 8191		
	Data Size :	16-bit		
	Format :	Decimal		
	Settings :	Increase the value	e of speed loop gain o	can enhance the speed

Settings : Increase the value of speed loop gain can enhance the speed response. However, if the value is set too big, it would easily cause resonance and noise.

P2-05	SPR S	witching Rate of Spe	tching Rate of Speed Loop Gain			
	Operation Interface		Communication	Related Section: -		
	Default	: 100				
	Contr Mode					
	Unit	: %	%			
	Range	: 10 ~ 500				
	Data Size	: 16-bit				
	Format	: Decimal				
	Settings	: Switch the changir switching condition.	ng rate of speed loop ga	in according to the gain		

P2-06	KVI	Speed Integral Com	eed Integral Compensation		
	Operatio Interface		Communication	Related Section: 6.3.6	
	Defau	lt: 100			
	Con Mode	trol e: <sup>ALL</sup>	ALL		
	Uni	it:rad/s	rad/s		
	Range	e:0~1023	0~1023		
	Data Size	e : 16-bit	16-bit		
	Forma	t : Decimal	Decimal		
	Setting	s: Increasing the v	value of speed integral con	npensation can enhance	

Settings : Increasing the value of speed integral compensation can enhance speed response and diminish the deviation of speed control. However, if the value is set too big, it would easily cause resonance and noise.

P2-07	KVF S	peed Feed Forward	eed Feed Forward Gain		
	Operation Interface	al : Panel / Software	Communication	Related Section: 6.3.6	
	Default	: 0			
	Contr Mode	ΔΙΙ			
	Unit	: %	%		
	Range	: 0~100			
	Data Size	: 16-bit	16-bit		
	Format	: Decimal			
	Sottingo	• When the speed co	ontrol command runs sm	noothly, increasing the gain	

Settings : When the speed control command runs smoothly, increasing the gain value can reduce the speed command error. If the command does not run smoothly, decreasing the gain value can reduce the mechanical vibration during operation.

	PCTL	Sp	ecial Parameter Write-in			Address: 0210H 0211H	
	Operational Interface : Default :		Panel / Soft	ware	Communication	Related Section: -	
			0				
-	Con Mode	trol ə :	ALL				
	Un	t:	-				
-	Range	e :	0 ~ 65535				
	Data Size	e :	16-bit				
	Forma	t :	Decimal				
	Setting	s :	Special para	ameter writ			
			Parameter code		Function		
			10	Reset the parameter (Apply to the power again after re-			
			20	P4-10 is w	vritable		
			22	P4-11~P4	P4-11~P4-21are writable		
			30,35	Save the o	data of COMPARE, CAP	PTURE, E-Cam	
		406		Enable forced DO mode			
	400			When forced DO mode is enabled, it can switch back to the normal DO mode.			

P2-09	DRT	DI	Debouncing Time	Address: 0212H 0213H	
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Defau	ılt :	2		
	Con Mod		ALL		
	Unit :		ms		
	Rang	e :	0 ~ 20		
	Data Size :		16-bit		
	Forma	at :	Decimal		
	Setting	IS :		stability. However, if the	ing the setting value can value is set too big, the

P2-10	DI1	DI1	Functional Planning	Address: 0214H 0215H			
	Operatio Interfac		Panel / Software	Communication	Related Section: Table 8.1		
	Defau	lt :	101				
	Con Mode	trol e:	ALL				
	Un	it :	-				
	Range	e :	0 ~ 0x015F (the last tw				
	Data Siz	e:	16-bit				
	Forma	Format : Hexadecimal					
	Setting	s :		Input function selection Input contact Not in use			
			<ul> <li>Input contact: a or</li> <li>0: Set the input co</li> </ul>	ection: Please refer to ta <b>b</b> contact ntact as normally close ntact as normally opene	d ( <b>b</b> contact)		
			•	he setting value of func			
			When parameters are modified, please re-start the servo drive to ensure it can work normally.				
			Note: Parameter P3-06 is used to set how digital inputs (DI) accepts commands, through external terminal or the communication				

P2-11	DI2		actional Planni		Address: 0216H
F2-11	DIZ		nctional Planni	ig	0217H
	Operatio Interface	· D o o	el / Software	Communication	Related Section: Table 8.1
	Defaul	t: 104	104		
	Con Mode				
	Unit :				
	Range : $0 \sim 0x015F$ (the last two codes are DI code)				
	Data Size	e: 16-b	bit		-

which determined by P4-07.

Format : Hexadecimal

Settings : Please refer to the description of P2-10

P2-12	DI3 I	DI3 Functional Plannir	Ig	Address: 0218H 0219H
	Operatior Interface		Communication	Related Section: Table 8.1
	Default	:: 116		
	Cont Mode	AT 1		
	Unit	::-	-	
	Range	: 0 ~ 0x015F (the last	two codes are DI code)	
	Data Size	: 16-bit		
	Format	: Hexadecimal		
		. Diagon refer to the d	eneriation of D2 10	

Settings : Please refer to the description of P2-10

P2-13	DI4 D	4 Functional Planni	ng	Address: 021AH 021BH
	Operationa Interface	al Panel / Software	Communication	Related Section: Table 8.1
	Default	: 117		
	Contro Mode	ALL.		
	Unit	-	-	
	Range	: 0 ~ 0x015F (the last	two codes are DI code)	
	Data Size	: 16-bit		
	Format	Hexadecimal		
	L			

P2-14	DI5 D	15 Functional Plannii	ng	Address: 021CH 021DH
	Operation Interface		Communication	Related Section: Table 8.1
	Default	: 102		
	Contr Mode	AT 1		
	Unit	-		
	Range	: 0 ~ 0x015F (the last	0 ~ 0x015F (the last two codes are DI code)	
	Data Size	: 16-bit		
	Format	: Hexadecimal		
				-1

Settings :	Ple	ease	refer t	o the	description	of P2-10
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P2-15	DI6 [	DI6 Functional Planni	Functional Planning		
	Operatior Interface	Donal / Coffwara	Communication	Related Section: Table 8.1	
	Default	: 22			
	Conti Mode	÷ A I I			
	Unit	: -			
	Range	: 0 ~ 0x015F (the las	t two codes are DI code)		
	Data Size	: 16-bit			
	Format	: Hexadecimal			
	0	· Diagon refer to the	departmention of D2 10		

P2-16	DI7 I	DI7 Functional Plannin	g	Address: 0220H 0221H
	Operation Interface	nal Panel / Software	Communication	Related Section: Table 8.1
	Default	t: 23		
	Cont Mode			
	Unit	t:-		
	Range	e: 0~0x015F (the last	two codes are DI code)	

Data Size :	16-bit
Format :	Hexadecimal

Settings : Please refer to the description of P2-10

P2-17	DI8	DI8 Functiona	I Planning		Address: 0222H 0223H
	Operatio Interface	Danal / Sat	tware	Communication	Related Section: Table 8.1
	Defaul	t: 21			
	Con Mode				
	Uni	t:-			
	Range	e: 0~0x015F	(the last tw	vo codes are DI code)	
	Data Size	e : 16-bit			
	Forma	t : Hexadecim	al		

P2-18	D01	DO	1 Functional Planning	]	Address: 0224H 0225H
	Operatio Interface		Panel / Software	Communication	Related Section: Table 8.2
	Default :		101		
	Con Mode		ALL		
	Data Size :		-		
			0 ~ 0x013F (the last two codes are DO code)		
			16-bit		
			Hexadecimal		
	Setting	s :		<ul> <li>Output function selection</li> <li>Output contact</li> <li>Not in use</li> </ul>	

- Output function selection: Please refer to table 8.2
- Output contact: **a** or **b** contact
  - 0: Set the output contact as normally closed (b contact)
  - 1: Set the output contact as normally opened (a contact)
  - (P2-18 ~ P2-22) The setting value of function programmed

When parameters are modified, please re-start the servo drive to ensure it can work normally.

P2-19	DO2 D	O2 Functional Plannir	ng	Address: 0226H 0227H
	Operationa Interface	al Panel / Software	Panel / Software Communication	
	Default	ALL		
	Contro Mode			
	Unit			
	Range	$_{\odot}$ 0 ~ 0x013F (the last t	wo codes are DO code)	
	Data Size	: 16-bit		
	Format	Hexadecimal		
	<u> </u>			- :

P2-20	DO3	DO	3 Functional Planni	ng	Address: 0228H 0229H
	Operatio Interfac		Panel / Software	Communication	Related Section: Table 8.2
	Defau	lt :	109		
	Con Mode		ALL		
	Un	it :	-		
	Rang	e :	0 ~ 0x013F (the last	two codes are DO code)	
	Data Siz	e :	16-bit		
	Forma	at :	Hexadecimal		
	Setting	s:	Please refer to the d	escription of P2-18	

P2-21			4 Functional Plann	ing	Address: 022AH 022BH
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: Table 8.2
	Mode : Unit :		105		
			ALL		
			- 0 ~ 0x013F (the last two codes are DO code)		
	Data Siz	e :	16-bit		
	Forma	at :	Hexadecimal		

Settings : I	Please refer to the description of P2-18
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P2-22	DO5	005 Functional Plann	ing	Address: 022CH 022DH
	Operatior Interface	Donal / Coffwara	Communication	Related Section: Table 8.2
	Default	: 7		
	Conti Mode			
	Unit	-		
	Range	: 0 ~ 0x013F (the las	t two codes are DO code)	
	Data Size	: 16-bit		
	Format	: Hexadecimal		
	Settings	· Please refer to the (	description of P2-18	

Settings :	Please	refer to	the	description	of P2-18
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P2-23	NCF1 F	Resonance Suppress	ion (Notch filter) (1)	Address: 022EH 022FH
	Operation Interface	al : Panel / Software	Communication	Related Section: 6.3.7
	Default	: 1000		
	Contr Mode	OI ALL		
	Unit	: Hz		
	Range	: 50 ~ 1000		

Data Size :	16-bit	
Format :	Decimal	

Settings : The first setting value of resonance frequency. If P2-24 is set to 0, this function is disabled. P2-43 and P2-44 are the second Notch filter.

P2-24		Resonance Suppress Attenuation Rate (1)	sonance Suppression (Notch filter) enuation Rate (1)		
	Operation Interface	Donal / Coffwora	Communication	Related Section: 6.3.7	
	Default	t: 0	)		
	Cont Mode				
	Uni	t:dB			
	Range	e: 0~32 (0: disable th	e function of Notch filter)		
	Data Size	e:16-bit			
	Format : Decimal				
	Sattinas	. The first resonance	e suppression (notch filter)	) attenuation rate. When	

Settings : The first resonance suppression (notch filter) attenuation rate. When this parameter is set to 0, the function of Notch filter is disabled.

**NOTE** If the value of attenuation rate is set to 5, then, it would be -5dB.

P2-25	NLP Lo	ow-pass Filter of Reso	v-pass Filter of Resonance Suppression		
	Operationa Interface :		Communication	Related Section: 6.3.7	
	Default :	0.2 (under 1kW) or 0.5 (other model)	2 (under 1kW) or 0.5 (other model)		
	Contro Mode :	ALL			
	Unit :	1 ms	0.1 ms		
	Range :	0.0 ~ 100.0	0 ~ 1000		
	Data Size :	16-bit			
	Format :	One decimal	DEC		
	Example :	1.5 = 1.5 ms	15 = 1.5 ms		
	0.11	Set the low-pass filter	of resonance suppressi	on When the value is set	

Settings : Set the low-pass filter of resonance suppression. When the value is set to 0, the function of low-pass filter is disabled.

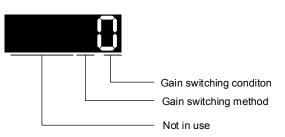
P2-26	DST A	nti-interference Gai	n	Address: 0234H 0235H
	Operationa Interface	al Panel / Software	Communication	Related Section: -
	Default	: 0		
	Contro Mode :			
	Unit	: 1		
	Range	: 0 ~ 1023 (0: disable		
	Data Size	16-bit		
	Format	Decimal		

Settings : Increasing the value of this parameter can increase the damping of speed loop. It is suggested to set P2-26 equals to the value of P2-06. If users desire to adjust P2-26, please follow the rules below.

- 1. In speed mode, increase the value of this parameter can reduce speed overshoot.
- 2. In position mode, decrease the value of this parameter can reduce position overshoot.

P2-27	GCC	Gain Switching and S	in Switching and Switching Selection		
	Operation Interface		Communication	Related Section: -	
	Default	: 0			
	Contr Mode				
	Unit	: -			
	Range	: 0x0000 ~ 0x0018			
	Data Size : 16-bit				
	Format	: Hexadecimal			

Settings :



- Gain switching condition:
  - 0: Disable gain switching function.
  - 1: The signal of gain switching (GAINUP) is ON.
  - 2: In position control mode, the position error is bigger than the value of P2-29.
  - 3: The frequency of position command is bigger than the value of P2-29.
  - 4: When the speed of servo motor is faster than the value of P2-29.
  - 5: The signal of gain switching (GAINUP) is OFF.
  - 6: In position control mode, the position error is smaller than the value of P2-29.
  - 7: When the frequency of position command is smaller than the value of P2-29.
  - 8: When the speed of servo motor is slower than the value of P2-29.
- Gain switching method:
  - 0: Gain switching

### 1: Integrator switching, P -> PI

-			
Setting Value	Control Mode P	Control Mode S	
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
I	P2-06 x P2-26 x		After switching

P2-28		-	in Switching Time Constant		
	Operation Interface	nal Panel / Software	Communication	Related Section: -	
	Default	t: 10			
	Cont Mode	ALL			
	Uni	t : 10ms			
	Range	e : 0 ~ 1000			

Data Size :	16-bit	
Format :	Decimal	
Example :	15 = 150 ms	

Settings : It is for switching the smooth gain. (0: disable this function)

P2-29		ain Switching	n Switching		
	Operationa Interface	al Panel / Software	Communication	Related Section: -	
	Default	1280000	1280000		
	Contro Mode	ALL Pulse, Kpps, r/min			
	Unit				
	Range	0 ~ 3840000			
	Data Size	: 32-bit			
	Format	Decimal			
		The estting of goin	owitching (Dulco orror K	inna r(min) in datarminad	

Settings : The setting of gain switching (Pulse error, Kpps, r/min) is determined by the selection of gain switching (P2-27).

P2-30∎		Auxiliary Function		Address: 023CH 023DH
	Operatio Interface	nal e: <sup>Panel / Software</sup>	Communication	Related Section: -
	Defaul	lt : 0		
	Con Mode			
	Uni	it : -	_	
	Range	e: -8~+8		
	Data Size	e : 16-bit		
	Forma	t : Decimal		

Parameters	ASDA-A2
Settings :	0: Disable all functions described below
	1: Force to Servo On the software
	2~4: (reserved)
	5: This setting allows the written parameters not retain after power off. When the data is no need to save, it can avoid the parameters continuously writing into EEPROM and shortening the lifetime of EEPROM.
	<ul> <li>Setting this parameter is a must when using communication control.</li> <li>6: In simulation mode (command simulation), the external Servo On signal cannot work and DSP Error (variable 0x6F) is regarded as 0. Parameter P0-01 only shows the external Error (positive/negative limit, emergency stop, etc)</li> </ul>
	In this status, DO.SRDY is ON. Command is accepted in each mode and can be observed via scope software. However, the motor will not operate. The aim is to examine the command accuracy.
	<ul> <li>7: (It will be available after firmware version V1.013)</li> <li>High-speed oscilloscope, disable Time-Out function (It is for PC software)</li> </ul>
	<ol> <li>8: (It will be available after firmware version V1.013)</li> <li>Back up all parameters (current value) and save in EEPROM. The value still exists when re-power on.</li> </ol>
	The panel displays 'to.rom' during execution. (It can be executed when Servo ON.)
	-1,-5,-6,-7: (It will be available after firmware version V1.013) Individually disable the function of 1,5,6,7 -2~-4, -8: (Reserved)
NOTE	Please set the value to 0 in normal operation. The value returns to 0 automatically after re-power on.

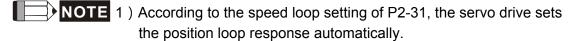
P2-31			eed Loop Frequency Response Setting in to and Semi-auto Mode		
	Operation Interface		Communication	Related Section: 5.6 and 6.3.6	
	Defaul	t: 80			
	Cont Mode	ΔΙΙ	ALL		
	Uni	t:Hz			
	Range	e:1~1000			
	Data Size	e:16-bit			
	Forma	t : Decimal			

Settings : 1~50Hz: Low stiffness, low response

51~250Hz: Medium stiffness, medium response

251~850Hz: High stiffness, high response

851~1000Hz: Extremely high stiffness, extremely high response



2) The function is enabled via parameter P2-32. Please refer to Chapter 5.6 for corresponding bandwidth size of the setting value.

P2-32▲	AUT2	Tui	ning Mode Selection		Address: 0240H 0241H
	Operational Interface :		Panel / Software	Communication	Related Section: 5.6 and 6.3.6
	Defau	lt :	0		
	Mode : Unit : Range : Data Size :		ALL		
			-		
			0 ~ 0x2		
			16-bit		
			Hexadecimal		
	Setting	<b>S</b> :	0: Manual Mode 1: Auto Mode (conti	nuous adjustment)	

2: Semi-auto Mode (non- continuous adjustment)

Relevant description of manual mode setting:

When P2-32 is set to 0, parameters related to gain control, such as P2-00, P2-04, P2-06, P2-25 and P2-26, all can be set by the user.

When switching mode from auto or semi-auto to manual, parameters about gain will be updated automatically.

Relevant description of auto mode setting:

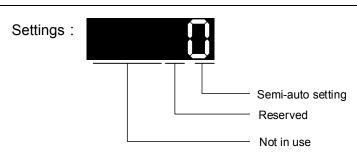
Continue to estimate the system inertia, save the inertia ratio to P1-37 every 30 minutes automatically and refer to the stiffness and bandwidth setting of P2-31.

- 1. Set the system to manual mode 0 from auto 1 or semi-auto 2, the system will save the estimated inertia value to P1-37 automatically and set the corresponding parameters.
- 2. Set the system to auto mode 1 or semi-auto mode 2 from manual mode 0, please set P1-37 to the appropriate value.
- 3. Set the system to manual mode 0 from auto mode 1, P2-00, P2-04, P2-06, P2-25, P2-26 and P2-49 will be modified to the corresponding parameters of auto mode.
- 4. Set the system to manual mode 0 from semi-auto mode 2, P2-00, P2-04, P2-06, P2-25, P2-26 and P2-49 will be modified to the corresponding parameters of semi-auto mode.

Relevant description of semi-auto mode setting:

- When the system inertia is stable, the value of P2-33 will be 1 and the system stops estimating. The inertia value will be saved to P1-37 automatically. When switching mode to semi-auto mode (from manual or auto mode), the system starts to estimate again.
- 2. When the system inertia is over the range, the value of P2-33 will be 0 and the system starts to estimate and adjust again.

P2-33▲	AUT3	Semi-auto Inertia Adji	mi-auto Inertia Adjustment		
	Operatio Interfac	onal e: <sup>Panel / Software</sup>	Communication	Related Section: -	
	Defau	lt : 0	0		
	Con Mode	trol e:	ALL		
	Un	it : -			
	Range: 0 ~ 0x1				
	Data Size : 16-bit				
	Format : Hexadecimal				



- 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	The	e Condition of Over	Address: 0244H 0245H	
	Operatio Interface	nal e :	Panel / Software	Communication	Related Section: -
	Default :		5000		
	Control Mode :		S		
	Uni	it :	r/min		
	Range : 1 ~ 5000				
	Data Size : 16-bit				
	Forma	ıt :	Decimal		

Settings : The setting of over speed warning in servo drive error display (P0-01)

P2-35	PDEV	Condition of Excessiv Deviation Warning	Address: 0246H 0247H	
	Operation Interface	Donal / Softwara	Communication	Related Section: -
	Default	t : 3840000	3840000	
	Cont Mode	rol PT / PR	PT / PR	
	Unit	t : pulse	pulse	
	Range:1~128000000			
	Data Size	e : 32-bit		
	Format	t : Decimal		

Settings : The setting of excessive position control deviation warning in servo drive error display (P0-01)

P2-36	EDI9 E	Extended EDI9 Function	onal Planning	Address: 0248H 0249H
	Operatior Interface	Danal / Softwara	Communication	Related Section: Table 8.1
	Default	:: 0		
	Cont Mode			
	Unit	::-		
	Range	: 0 ~ 0x015F (the last	two codes are EDI code)	
	Data Size	: 16-bit		
	Format	: Hexadecimal	Hexadecimal	
	Settings : Input function selection Input contact Not in use Input function selection: Please refer to ta Input contact: <b>a</b> or <b>b</b> contact 0: Set the input contact as normally close 1: Set the input contact as normally open (P2-36 ~ P2-41) The setting value of func When parameters are modified, please re-state ensure it can work normally.			d ( <b>b</b> contact) ed ( <b>a</b> contact) tion programmed
P2-37	EDI10	Extended EDI10 Funct	tional Planning	Address: 024AH 024BH
	Operatior Interface	Danal / Softwara	Communication	Related Section: Table 8.1
	Default	:: 0		

Control

Unit : -

Data Size : 16-bit

Mode :

ALL

Range :  $0 \sim 0x015F$  (the last two codes are EDI code)

Format : Hexadecimal

Settings : Please refer to the description of P2-36

P2-38	EDI11	Ext	ended EDI11 Funct	Address: 024CH 024DH	
	Default : Control		Panel / Software	Communication	Related Section: Table 8.1
			0		
	Uni	it :	-		
	Range	e:	0 ~ 0x015F (the last two codes are EDI code)		
	Data Size	ize:16-bit			
	Format : Hexadecimal				

Settings : Please refer to the description of P2-36

P2-39	EDI12 E	xtended EDI12 Func	ended EDI12 Functional Planning		
	Operationa Interface		Communication	Related Section Table: 8.1	
	Default	-	-		
	Contro Mode	ALL - 0 ~ 0x015F (the last two codes are EDI code)			
	Unit				
	Range				
	Data Size				
	Format	Hexadecimal			

Settings : Please refer to the description of P2-36

P2-40			tended EDI13 Functi	Address: 0250H 0251H	
	Operatio Interface	nal e :	Panel / Software	Communication	Related Section: Table 8.1
	Defaul	lt :	-		
	Control Mode : Unit : Range : Data Size :		ALL - 0 ~ 0x015F (the last two codes are EDI code)		
	Forma	ıt :	Hexadecimal		
					÷

Settings : Please refer to the description of P2-36

P2-41	EDI14	Ext	tended EDI14 Functional Planning		Address: 0252H 0253H
	Operatio Interfac		Panel / Software	Communication	Related Section: Table 8.1
	Defau	lt :	-		
	Con Mode		ΔΙΙ		
	Unit: Range: Data Size:		-		
			0 ~ 0x015F (the last	two codes are EDI code)	
			16-bit		
	Forma	at :	Hexadecimal		
	Setting	s :	Please refer to the o	lescription of P2-36	

### P2-42 Reserved

P2-43	NCF2 R	esonance Suppress	ion (Notch filter) (2)	Address: 0256H 0257H
	Operationa Interface		Communication	Related Section: 6.3.7
	Default	: 1000	1000	
	Contro Mode	ALL		
	Unit	Hz		
	Range	: 50 ~ 2000	16-bit	
	Data Size	: 16-bit		
	Format	: Decimal		
	Settings	The second setting	value of resonance freque	ncy. If P2-44 is set to 0,

Settings : The second setting value of resonance frequency. If P2-44 is set to 0, this function is disabled. P2-23 and P2-24 are the first Notch filter.

P2-44	DPH2		sonance Suppression (Notch filter)		Address: 0258H 0259H
	Operatic Interfac		Panel / Software	Communication	Related Section: 6.3.7
	Default :		0		
	Control Mode:		ALL		
	Unit :		dB		
	Range :		0 ~ 32 (0: disable Notch filter)		
	Data Siz	e :	16-bit		
			Decimal		
					filter) attenuation rate. f Notch filter is disabled.
	NO <sup>-</sup>	ΤE	If the value of attenuat	ion rate is set to 5, ther	n it would be -5dB.

P2-45	NCF3 R	esonance Suppress	ion (Notch filter) (3)	Address: 025AH 025BH
	Operationa Interface		Communication	Related Section: 6.3.7
	Default	1000		
	Contro Mode	ALL		
	Unit	Hz 50 ~ 2000		
	Range			
	Data Size	16-bit		
	Format	Decimal		
	Settings			equency setting value. If ed. P2-23 and P2-24 are

the first group of resonance suppression (Notch filter).

P2-46		esonance Suppress ttenuation Rate (3)	sonance Suppression (Notch filter) enuation Rate (3)	
	Operationa Interface	al Panel / Software	Communication	Related Section: 6.3.7
	Default	0		
	Contro Mode	ALL dB		
	Unit			
	Range			
	Data Size	16-bit		
	Format	Decimal		
	Settings :	The third group of	resonance suppression	(Notch filter) attenuation

settings : The till group of resonance suppression (recon mor) and rate. Set the value to 0 to disable the function of Notch filter.

P2-47	ANCF	Auto Resonance Sup	pression Mode Setting	Address: 025EH 025FH
	Operatio Interfac	nal Panel / Software e:	Communication	Related Section: -
	Defau	lt : 1		
	Con Mode	trol e:		

Unit :	-	
Range :	0~2	
Data Size :	16-bit	
Format :	Decimal	

Settings : 0: The value of P2-43, P2-44 and P2-45, P2-46 will retain.

- 1: The value of P2-43, P2-44 and P2-45, P2-46 will retain after resonance suppression.
- 2: Continuous resonance suppression

Description of Auto Mode Setting:

- When it is set to 1: Auto resonance, the value returns to 0 automatically and saves the point of resonance suppression when it is stable. If it is unstable, repower on or set back to 1 for re-estimation again.
- When it is set to 2: Continuous suppression automatically. When it is stable, the point of resonance suppression will be saved. If it is unstable, re-power on for re-estimation.

When switching to mode 0 from mode 2 or 1, the setting of P2-43, P2-44, P2-45 and P2-46 will be saved automatically.

P2-48	ANCL	Re	sonance Suppression Detection Level		Address: 0260H 0261H
	Default : Control Mode : Unit :		Panel / Software	Communication	Related Section: -
			100		
			ALL		
			-		
			1 ~ 300%		
			16-bit		
			Decimal		
			(The smaller the setting value is, the more sensitive the resonance be.) P2-48↑, resonance sensitiveness↓		nsitive the resonance will

P2-48↓, resonance sensitiveness↑

P2-49		-	eed Detection Filter	Address: 0262H 0263H	
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: -
	Default : Control Mode : Unit : Range :		0		
			ALL		
			-		
			0x00 ~ 0x1F		
	Data Siz	e:	16-bit		
	Forma	at :	Decimal		

# Settings : The filter of speed estimation

Setting Value	Speed Estimation Bandwidth (Hz)
00	2500
01	2250
02	2100
03	2000
04	1800
05	1600
06	1500
Setting Value	Speed Estimation Bandwidth (Hz)
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
1A	250
1B	200
1C	175
1D	150
1E	125
1F	100

P2-50	DCLR	Pu	lse Clear Mode	Address: 0264H 0265H	
	Operatic Interfac		Panel / Software	Communication	Related Section: -
	When set effective.				
			-		
			0x0 ~ 0x1		
			16-bit		
			Hexadecimal		
			Please refer to table 8.	1 for digital input setting	· ].
			<b>U</b>	DI) as CCLR, the functi ition error (It is applicat	•
			If this DI is ON, the acc	umulative position erro	r will be cleared to 0.
			0: The triggering metho	od of CCLR is rising-edg	je.

1: The triggering method of CCLR is level.

#### P2-51 Reserved Address: 0268H P2-52 🛦 IDXS Indexing Coordinates Scale 0269H Operational Related Section: Panel/Software Communication Interface : Default : 100000000 ----. Control Mode : ALL Unit : PUU

Range :	0 ~ 100000000	
Data Size :	32-bit	-1
Format :	Decimal	
Settings :	This parameter is used to set the scale of the in	

ng coordinates, indexing command position and indexing feedback position. If the setting value is too small, it may cause the error of indexing coordinates.

Range of setting value of P2-52:

 $P2-52>1.05\times$ Max. Motor Speed  $(r/min) \times \frac{1280000}{60000} \times \frac{P1-45}{P1-44}$ 

>22.4×Max. Motor Speed (r/min)× $\frac{P1-45}{P1-44}$ 

P2-53	KPI Po	osition Integral Com	Address: 026AH 026BH	
	Operationa Interface :	Panel / Software	Communication	Related Section: 6.3.6
	Default :	0		
	Contro Mode :			
	Unit :	rad/s		
	Range :	0 ~ 1023		
	Data Size :	16-bit		
	Format :	Decimal		
	Settings :	When increasing th	ne value of position cor	ntrol integral, reducing the

Settings . position steady-state error, it may easily cause position overshoot and noise if the value is set too big.

P2-54	SVP	The Gain of Synchro	nous Speed Control	Address: 026CH 026DH
	Operatio Interface	nal e:Panel / Software	Communication	Related Section: -
	Defaul	t: 0		
	Cont Mode	trol ə :		
	Uni	t∶ Rad/s		
	Range	≥∶0~8191		
	Data Size	e∶ 16-bit		
	Forma	t : Decimal		

Settings: When increasing the value of synchronous speed control, it can enhance the speed following of two motors. However, if the value is set too big, it may easily cause vibration and noise.

P2-55	5VI S	peed			
	Operation Interface	al : Panel / Software	Communication	Related Section: -	
	Default	: 0			
	Contro Mode	ALL			
	Unit	: Rad/s			
	Range	: 0~1023			
	Data Size	: 16-bit			
	Format	: Decimal			
	Settings	: When increasing i	ntegral compensation to	synchronous speed two	

Settings : When increasing integral compensation to synchronous speed, two motors speed following can be enhanced and the speed error between two motors can be reduced. However, if the value is set too big, it may easily cause vibration and noise.

P2-56	SPL	Integral Compensatio Position	egral Compensation to Synchronous		
	Operation Interface	nal e : Panel / Software	Communication	Related Section: -	
	Default	t: 0			
	Cont Mode	ALL	Rad 0~1023		
	Unit	t: Rad			
	Range	9∶0~1023			
	Data Size	e∶ 16-bit			
	Format	t : Decimal			
	Settings	: When increasing in	tegral compensation to s	which rongues position two	

Settings : When increasing integral compensation to synchronous position, two motors speed following can be enhanced and the speed error between two motors can be reduced. However, if the value is set too big, it may easily cause vibration and noise It is suggested to set the value the same as P2-06.

P2-57	SBW TI	ne Bandwidth of Syr	Bandwidth of Synchronous Control		
	Operationa Interface	<sup>al</sup> Panel / Software	Communication	Related Section: -	
	Default	0			
	Contro Mode	Hz 0~1023			
	Unit				
	Range				
	Data Size				
	Format	Decimal			
	Settings	If users do not know	w how to set P2-54~P2-56	, setting the bandwidth of	

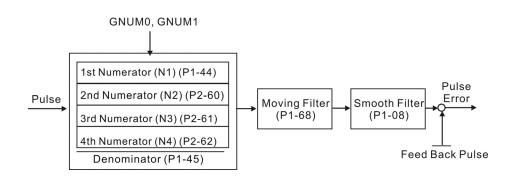
ettings : If users do not know how to set P2-54~P2-56, setting the bandwidth of synchronous control value will do since the value will correspond to P2-54~P2-56. The bigger the bandwidth of synchronous control value is, the better the synchronous effect will be. When increasing the bandwidth of speed loop and synchronous control, pay special attention to the response of P2-25 which should be faster than the setting of the both bandwidth.

P2-58	SVL	Lov	w-pass Filter of Synch	Address: 0274H 0275H		
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: -	
	Defau	lt :	0			
	Contro Mode:		ALL			
	Un	it :	0.1ms			
	Range :0~1000Data Size :16-bitFormat :DecimalExample :15 = 1.5 msSettings :If the synchronous control is influenced by I noise (not a high-pitched but rough sound), le to solve this problem. Please note that banc control should be set as large as possible a bandwidth of speed-loop.		0~1000			
			16-bit			
			Decimal			
			w-pass filter can be used width of the synchronous			

### P2-59 Reserved

P2-60	GR4	Gear Ratio (Numerato	ar Ratio (Numerator) (N2)		
	Operatio Interfac	nal e: Panel / Software	Communication	Related Section: -	
	Defau	lt : 128			
	Con Mode	PT			
	Un	it : pulse			
	Range	e : 1 ~ (2 <sup>29</sup> -1)			
	Data Sizo	e : 32-bit			
	Forma	it : Decimal			

Settings : The numerator of electronic gear ratio can be selected via DI.GNUM0 and DI.GNUM1 (Please refer to table 8.1). If DI.GNUM0 and DI.GNUM1 are not set, P1-44 will automatically be the numerator of electronic gear ratio. Please switch GNUM0 and GNUM1 in stop status to avoid the mechanical vibration.



P2-61	GR5	Gea	ar Ratio (Numerator)	(N3)	Address: 027AH 027BH
	Operatio Interface		Panel / Software	Communication	Related Section: -
	Default :		128		
	Con Mode		PT		
	Uni	it :	pulse		
	Range	e :	1 ~ (2 <sup>29</sup> -1)		
	Data Size	e :	32-bit		
	Forma	at :	Decimal		4 
	Setting	s:	Please refer to the de	scription of P2-60.	4

P2-62	GR6	Gear Ratio (Numerato	or) (N4)	Address: 027CH 027DH
	Operatio Interface	nal Panel / Software	Communication	Related Section: -
	Defaul	t : 128		
	Cont Mode	DT		
	Uni	t : pulse		
	Range	e:1~(2 <sup>29</sup> -1)		
	Data Size	e : 32-bit		
	Forma	t : Decimal		
	Settings	s: Please refer to the	description of P2-60.	•

P2-63 ~ P2-64

Reserved

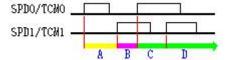
P2-65	GBIT	Spo	ecial-bit	ecial-bit Register					ess: 028 02	82H 283H
	Operatio Interface		Panel / Software Communication					Relat	ed Secti	ion: -
	Defau	lt :	0							
	Con Mode		PT / PR	PT / PR / S						
	Un	it :	-							
	Range	e:	0 ~ 0xFF	FF						
	Data Siz	e :	-							
	Forma	at :	-							
	Setting	s :								
			Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
					1		1	1		
			Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8

• Bit 3, 4, 5, 7 and Bit14: Reserved, please set to 0.

Bit 0 ~ Bit1

- Bit 0: SPD0/SPD1 speed trigger mode
- (0: level triggered; 1: rising-edge triggered)
- Bit 1: TCM0/TCM1 torque trigger mode
- (0: level triggered; 1: rising-edge triggered)

When rising-edge is triggered, refer to the following for the setting of register command:



- A: Execute internal register command 1
- B: Execute internal register command 2
- C: Execute internal register command 3
- D: Execute internal register command 3
- Bit 2: IGBT software protection
  - 0: Enable the function of IGBT software protection
  - 1: Disable the function of IGBT software protection
- Bit 6: In PT mode, the switch of pulse error protection function (pulse frequency is over high)
  - 0: Normally use the function of pulse error protection
  - 1: Disable the function of pulse error protection
- Bit 8 : U, V, W wiring error protection

1: Enable U, V, W wiring error protection

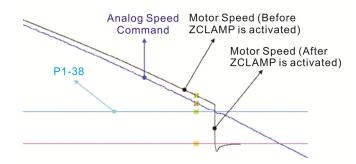
- Bit 9 : U, V, W wiring cut-off detection
  - 1: Enable U, V, W wiring cut-off detection
- Bit 10: DI.ZCLAMP function selection
   When the following conditions are all established, the function of ZCLAMP is enabled.

Condition 1: speed mode

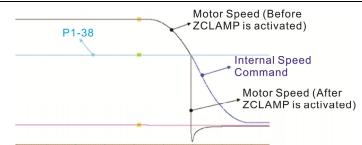
Condition 2: DI. ZCLAMP is on.

Condition 3: Motor speed is slower than the value of P1-38.

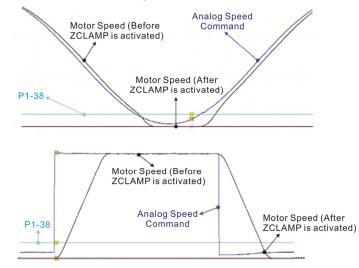
0: The command source is analog, ZCLAMP function will use the analog speed command without acceleration / deceleration processing to judge if this function should be enabled. The motor will be locked at the position where ZCALMP conditions are established.



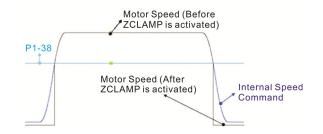
0: The command source is register. ZCLAMP function will use the register speed command with acceleration / deceleration processing to judge if this function is enabled. The motor will be locked at the position where ZCALMP conditions are established.



1: The command source is analog speed command. ZCLAMP function will use the analog speed command without acceleration / deceleration processing to judge if this function is enabled. When ZCALMP conditions are established, the motor speed decelerates to 0 through S-curve. If not, the motor follow the analog speed command through S-curve.



1: The command source is register. ZCLAMP function will use the register with acceleration / deceleration processing to judge if this function is enabled. When ZCLAMP conditions are established, the motor speed will be set to 0.



- Bit 11: Pulse inhibit function
  - 0: Disable NL / PL pulse input inhibit function. In PT mode, the external position pulse command will be input into the servo drive in any condition.
  - 1: Enable NL / PL pulse input inhibit function. In PT mode, if NL exists, the external NL pulse will be inhibited to input to the servo. PL pulse input will be accepted. In PT mode, if PL exists, the external PL pulse will be inhibited to input to the servo. NL pulse will be accepted.

Please note: In PT mode, if NL and PL both exist, both of them will be inhibited to input to the servo.

• Bit12: Lack phase detection

- 0: Enable lack phase (AL022) detection
- 1: Disable lack phase (AL022) detection
- Bit13: Encoder output error detection function
  - 0: Enable encoder output error (AL018) detection function
  - 1: Disable encoder output error (AL018) detection function
- Bit15: Friction compensation mode selection
  - 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.

P2-66	GBIT2	Special-bit Register 2	Address: 0284H 0285H	
	Operation Interface	nal Panel / Software	Communication	Related Section: -
	Defaul	t: 0		*
	Cont Mode	rol PT / PR / S	PT / PR / S	
	Uni	t:-		
	Range	e: 0~0x000F		
	Data Size	e:16-bit	16-bit	
		t : Hexadecimal		

Settings :	Special-bit Register 2:

B7	B6	B5	B4	B3	B2	B1	B0
-	-	-	-	-	-	-	-

B0~B1: Reserved

B2: Cancel latch function of low-voltage error

- 0: Latch function of low-voltage error: the error will not be cleared automatically.
- 1: Cancel latch function of low-voltage error: the error 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: Enable disconnection detection of linear scale (only when the fullclosed loop control function is enabled)
- 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 Th	e Stable Level of In	e Stable Level of Inertia Estimation		
	Operationa Interface :	Panel / Software	Communication	Related Section: -	
	Default :	1.5	15		
Contro Mode:		ALL			
	Unit :	1times	0.1times		
	Range :	0 ~ 200.0	0 ~ 2000		
	Data Size :	16-bit			
	Format :	One decimal	Decimal		
	Example :	1.5 = 1.5 times	15 = 1.5 times		
	0 - 443	In semi-auto mode	if the value of inertia es	timation is smaller than P2-	

Settings : In semi-auto mode, if the value of inertia estimation is smaller than P2-67 and the status remains for a while, the system will regard the inertia estimation as completed.

P2-68	TEP	Sw	itch of Following Erro	or Compensation	Address: 0288H 0289H
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Defau	lt :	0		
	Con Mode		ALL		
	Un	it :	-		
	Rang	e :	0x00000000 ~ 0x0000	2101	
	Data Siz	e :	16-bit		
	Forma	at :	Hexadecimal		
	Setting	s :	X = 0: P1-36 > 1, follow	ring error compensation	

1: P1-36 > 1, following error compensation is enabled.

(The function is available after V1.036 sub00)

- Y = 0: When E-CAM is engaged, JOG cannot work. 1: When E-CAM is engaged, JOG can work. (This function is not available now.)
- Z = 0: DI.STP is triggered by rising edge.
  - 1: DI.STP is level triggered.
  - (The function is available after V1.042 sub00)
- U = 0: unit is 0.1 rpm in speed mode
  - 1: unit is 0.01 rpm in speed mode
  - 2: unit is 0.05 rpm in speed mode

P2-69●	ABS	Absolute Encoder Set	ting	Address: 028AH 028BH
	Operation Interface		Communication	Related Section: N/A
	Defaul	t: 0		- - - - -
	Cont Mode	· A I I		4 • • • • •
	Uni	t : N/A		
	Range	e : 0x0000 ~ 0x0011		
	Data Size	e:16-bit		- - - -
	Forma	t : Hexadecimal		<b>2</b> 5 6 6 6 7
	Settings	: Format: U Z Y X X: Setup the operation	on mode	

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, AL069 will occur.)
- Y: Setup the pulse command when absolute position is lost
  - 0: When AL060 or AL06A occurs, it cannot accept pulse command
  - 1: When AL060 or AL06A occurs, it can accept pulse command
- Z: Function setting when index coordinates overflow
  - 0: Index coordinates is lost when overflows
  - 1: Index coordinates will not overflow, but absolute coordinates will not remain
- U: Reserved

**NOTE** This parameter is effective only after the servo drive is re-powered on.

P2-70	MRS	Read Data Format Se	Address: 028CH 028DH	
	Operatio Interface	Donal / Softwara	Communication	Related Section: N/A
	Defau	lt : 0x0		
	Con Mode	trol ALL e :		
	Un	it:N/A		
	Range	e : 0x00 ~ 0x07		- - - - -
	Data Size	e : 16-bit		* • •
	Forma	at : Hexadecimal		<b>4</b> 5 5 6 4 4 4 4

#### Settings :

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8

Bit 0: Data unit setting of digital input/output (DI/DO);

1: Pulse, 0: PUU

- Bit 1: Communication data unit setting; 1: Pulse, 0: PUU
- Bit 2: Overflow warning; 1: No overflow warning, 0: Overflow warning, AL.289 (PUU), AL.062 (pulse).
- Bit 3 ~ Bit15: Reserved. Must be set to 0.

1∎	САР	Absolute Position Ho	osolute Position Homing		
	Operatio Interfac	Donal / Softwara	Communication	Related Section: N/A	
	Defau	lt: 0x0			
	Con Mode	trol ALL e :			
	Un	it:N/A			
	Rang	e:0x0~0x1			
	Data Siz	e:16-bit		- "1 	
	Forma	at : Hexadecimal			
	Settings		o 1, the current position wi same as the digital input, A	•	

be enabled only when parameter P2-08 is set to 271.

# P2-72 Reserved

P2-73	ALOP	E-C	Cam Alignment - Ope	ration Setting	Address: 0292H 0293H		
	Operatio Interfac		Panel / Software	Communication	Related Section: N/A		
	Defau	lt :	0x0000000				
	Control Mode : Unit :		PR				
			N/A				
	Range	e:	0x00000000 ~ 0x5F3	F6F5F			
-			32-bit format = DCBA				
			Hexadecimal				
	Setting		(This function is availa models)	r V1.038 sub26 and later			
		`	YX: Range of filter (0 -				
		l	UZ: Max. allowable co	b)			
		I	BA: PR number (0 ~ 6				
		I	DC: Masking range setting (0 ~ 95%)				
			YX: Range of filter (%)				
			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	Error   <= (1~YX) % : Enabled

\*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 (%)

When alignment correction is enabled, the limitation of max. correction rate (C) for each correction is defined as follows:

| C | <= (P5-84/P5-83) x P2-73 UZ %

\*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

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.

\*If BA is set to 0, it will not store the shortage of pulse numbers to PR.

DC: Masking range setting (%)

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 >= (P5-84/P5-83) x P2-73 DC %

\*This masking function only allows increasing pulse input. This function will not work for decreasing pulse input.

P2-74		E-Cam Alignment - DI Compensation	Delay Time	Address: 0294H 0295H
	Operation Interface		Communication	Related Section: N/A
	Default	t: 0.000	0.000	
	Cont Mode	PR		
	Unit	t:ms with fraction dow		
	Range	e:-25.000~+25.000, v	with 3 fraction digits	

Data Size :	16-bit	
Format :	Decimal	: : : :

Settings : (This function is available in firmware version V1.038 sub26 and later models)

This parameter is used to set for the compensation of delay time from digital input.

P2-75∎	ALTG E	-Cam Alignment - Al	ignment Target Position	Address: 0296H 0297H
	Operationa Interface	al Panel / Software	Communication	Related Section: N/A
	Default	: 0		•• 5 5 6 4 4
	Contro Mode	·PR		
	Unit	: The pulse unit of M		
	Range	: 0 ~ (P5-84 /P5-83)-	0 ~ (P5-84 /P5-83)-1	
	Data Size	: 32-bit		9 2 2 2 2 2 2 2
	Format	Decimal	Decimal	
	Sottingo :	(This function is ava	ilable in firmware version )	1 029 aub26 and latar

Settings : (This function is available in firmware version V1.038 sub26 and later models)

Note: When the input value is over the setting range, an error will occur. 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.

New value of P2-75 = 0 if P2-75 >=(P5-84 /P5-83)

P2-76∎	ALCT E-	Cam Alignment - Sc	ource Setting	Address: 0298H 0299H		
	Operationa Interface :	l Panel / Software	Communication	Related Section: N/A		
	Default :	0x0000		2 2 2 2 2 2		
	Contro Mode :	·PR				
	Unit :	N/A		7 7 8 8 9 9		
	Range :	0x0000 ~ 0x6FF7				
	Data Size :	16-bit				

Format : Hexadecimal

Settings : (This function is available in firmware version V1.038 sub26 and later models)

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
Description	-	Set 0 to disable the function. Set 1 to enable the function. This function is applicable to film delivery control of reverse flying shear.	Set 1 to enable. When the alignment DI is triggered, the correcting error will be calculated and stored in PR specified by P2- 73. If this bit is set to 1, trigger the PR immediately after DI activated, otherwise the user should trigger the PR manually or use P5-88.BA to call the PR when E-Cam disengaged.	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 <sup>^</sup> 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  $(0 \sim 100\%)$ 

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-0	Cam Master Axis – F	Pulse Masking Setting	Address: 029AH 029BH
	Operational Interface :		Communication	Related Section: N/A
	Default :	0000h		
	Control Mode :	PR	R	

Unit :	N/A	
Range :	0000h ~ 0xFF7D	1
Data Size :	16-bit	¥ · · · · ·
Format :	Hexadecimal	

Settings : (This function is available in firmware version V1.038 sub54 and later models)

X: Pulse masking function of master axis / JOG function of master axis / INCH function of master axis

Y: Correction of lead command length 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.

 $Y=0 \rightarrow 1$ : 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  $\rightarrow$  UZYX = 0x0001
- $JOG + 3Kpps \rightarrow UZYX = 0x0302$
- JOG +20Kpps  $\rightarrow$  UZYX = 0x1402
- JOG -32Kpps  $\rightarrow$  UZYX = 0x2003
- INCH +255 PLS → UZYX = 0xFF04
- INCH -18 PLS  $\rightarrow$  UZYX = 0x1205

Complete and correct lead pulse  $\rightarrow$  UZYX = 0x0020 (Write into EEPROM)

Disable this function  $\rightarrow$  UZYX = 0x0000 (This step can be ignored)

P2-78	СМАР		E-Cam: Area Number #2 + (Polarity is Positive)					Address: 029CH 029DH		
	Operational Interface :		Panel / Software Communication			Related Section: N/A				
	Defau	ılt :	270					-		
	Cor Moc	ntrol le :	PR							
	Ur	nit :	degree (it becomes degree in firmware version V1.038 sub25 and later models)				-			
	Rang	je :	0 ~ 360				-			
	Data Siz	ze :	16-bit				-			
	Form	at :	Decimal							
	Setting	∣s∶l	P2-78 <= P2-79:					-		
			E-Cam degree	0°	~	P2-78	~	P2-79	~	360°
	D		D:CAM_AREA2	OFF	OFF	ON	ON	ON	OFF	OFF
			P2-78 > P2-79:							
		E	E-Cam degree	0°	~	P2-79	~	P2-78	~	360°
		D	D:CAM_AREA2	ON	ON	OFF	OFF	OFF	ON	ON

When the E-Cam is disengaged, the status of digital output, CAM\_AREA2 is always OFF.

P2-79		E-Cam: Area Number : Negative)	#2 - (Polar	ity is	Addres	s: 029EH 029FH
	Operation Interface		Commu	nication	Related	Section: N/A
	Default	: 360				
	Contr Mode	·DD				
	Unit : degree (it becomes degree in firmware version V1.038 sub25 and later models)					
	Range	: 0~360			-	2 2 2 2 2 2
	Data Size : 16-bit					
	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

When the E-Cam is not engaged, the status of digital output, CAM\_AREA2 is always OFF.

P2-80		Z Phase Source of Homing		Address: 02A0H 02A1H
	Operational Interface :	Panel / Software	Communication	Related Section: N/A
	Default :	0x0000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x0000 ~ 0x0011		
	Data Size :	16-bit		
	Format :	Hexadecimal		
	Setting :	<ul> <li>Z phase Not in us</li> <li>Z phase source of 0: Auxiliary encode 1: Motor</li> </ul>	full-closed loop homing er half-closed loop homing	

### **P3-xx** Communication Parameters

P3-00●	ADR	Address Setting	dress Setting		
	Operatio Interface		Communication	Related Section: 9.2	
	Defaul	t:0x7F			
	Con Mode				
	Uni	t : -			
	Range	e:0x01~0x7F	16-bit		
	Data Size	e : 16-bit			
	Forma	t : Hexadecimal			
	0 - 44	The communication	address setting is divided	 Linto Y X (bexadecimal):	

Settings : The communication address setting is divided into Y, X (hexadecimal):

	0	0	Y	Х
Range	-	-	0 ~ 7	0 ~ F

When using RS-232/RS-485 to communicate, one servo drive can only set one address. The duplicate address setting will cause abnormal communication.

This address represents the absolute address of the servo drive in communication network. It is also applicable to RS-232, RS-485, CANopen and DMCENT.

When the communication address setting of MODBUS is set to 0xFF, the servo drive will automatically reply and receive data regardless of the address. However, P3-00 cannot be set to 0xFF.

P3-01	BRT	Transmission Speed	ansmission Speed		
	Operatio Interface	nal Panel / Software	Communication	Related Section: 9.2	
	Defaul	t : 0x0203			
	Con Mode	trol ALL e :	ALL		
	Uni	t : bps			
	Range	e : 0x0000 ~ 0x0405			
	Data Size	e:16-bit			
	Forma	t : Hexadecimal			

Settings : The setting of transmission speed is divided into Z, Y, X (hexadecimal):

	U	Z	Y	Х
Communication Port	DMC	CAN / DMC	-	RS-232/485
Range	0/3	0~4	0	0~5

- Definition of X setting value
  - 0: 4800
  - 1: 9600
  - 2: 19200
  - 3: 38400
  - 4: 57600
  - 5: 115200
- Definition of Z setting value
  - 0: 125 Kbit/s
  - 1: 250 Kbit/s
  - 2: 500 Kbit/s
  - 3: 750 Kbit/s
  - 4: 1.0 Mbit/s
- Definition of Z setting value
  - 0: Use Delta's controller, such as PLC and HMI
  - 3: Use Delta's motion card
- **NOTE** 1 ) If this parameter is set via CAN, only Z can be set and the others remain.
  - 2) The communication speed of USB is 1.0 Mbit/s only and is unchangeable.

P3-02	PTL	Co	mmunication Protoco	I	Address: 0304H 0305H
	Operational Interface :		Panel / Software	Communication	Related Section: 9.2
	Default :		6		
	Contro Mode :		ALL		
	Un	it :	-		
	Range :		0 ~ 0x8		
	Data Size :		16-bit		
	Format :		Hexadecimal		
	Settings :		The definition of the setting value is as the fol 0: 7, N, 2 (MODBUS, ASCII) 1: 7, E, 1 (MODBUS, ASCII) 2: 7, O,1 (MODBUS, ASCII) 3: 8, N, 2 (MODBUS, ASCII) 4: 8, E, 1 (MODBUS, ASCII) 5: 8, O, 1 (MODBUS, ASCII) 6: 8, N, 2 (MODBUS, RTU) 7: 8, E, 1 (MODBUS, RTU) 8: 8, O, 1 (MODBUS, RTU)		owings:

P3-03	FLT	Co	mmunication Error Di	Address: 0306H 0307H		
	Operational Interface : Default : Control Mode :		Panel / Software	Communication	Related Section: 9.2	
			0			
			ALL			
	Un	it :	-			
	Range :		0 ~ 0x1			
	Data Siz	e:	: 16-bit			
	Format :		Hexadecimal			
	Setting		<ul><li>The definition of the setting value is as the following:</li><li>0: Warning and keeps running</li><li>1: Warning and stops deceleration (The deceleration time is set to</li></ul>			
			parameter P5-03.B)			

P3-04	CWD	Communication Time	nmunication Timeout			
	Operatio Interface		Communication	Related Section: 9.2		
	Defau	lt : 0				
	Con Mode	AT 1				
	Uni	it:sec				
	Range	e : 0~20				
	Data Size	e : 16-bit				
	Forma	at : DEC				
	Setting	s: If the setting value	is not 0, enable communica	ation timeout		

Settings : If the setting value is not 0, enable communication immediately. If it is set to 0, disable the function.

P3-05	СММ	Communication Mech	mmunication Mechanism		
	Operatior Interface		Communication	Related Section: 9.2	
	Default	: 0			
	Cont Mode	ΔΙΙ			
	Unit	t: -	0x00 ~ 0x01		
	Range	e : 0x00 ~ 0x01			
	Data Size	e : 16-bit			
	Format	: Hexadecimal			
	Settings	<ul> <li>Communication por</li> <li>Communication</li> <li>0: RS232</li> </ul>	t can select one or more th n Interface	nan one communications.	

0: RS232

1: RS485

P3-06∎	SDI	Control Switch of Digital Input (DI)	Address: 030CH 030DH
	Operation Interface	Panel / Software Communication	Related Section: 9.2
	Defaul	: 0	
	Cont Mode		
	Uni	: -	
	Range	: 0x0000 ~ 0x3FFF	
	Data Size	: 16-bit	
	Forma	: Hexadecimal	
	Settings	<ul> <li>The source of DI controls the switch.</li> <li>Each bit of this parameter decides one input Bit0 ~ Bit7 correspond to DI1 ~ DI8.</li> <li>Bit8 ~ Bit13 correspond to extended DI EDI9 The setting of bit is as the followings:</li> <li>0: The input status is controlled by the exter</li> <li>1: The input status is controlled by P4-07.</li> <li>For the functional planning of digital input, p DI1 ~ DI8: P2-10 ~ P2-17</li> <li>EDI9 ~ EDI14: P2-36 ~ P2-41</li> </ul>	9 ~ EDI14; nal hardware.

P3-07	CDT	Co	mmunication Response Delay Time			Addres	s: 030E 030I		
	Operatio Interfac	onal æ:	Panel / Software	Communicatio	n	Related 9.2	Sectior	1:	
	Defau	ılt :	0						
	Con Mode		ALL						
	Un	it :	1ms						
	Range	e :	0 ~ 1000						
	Data Sizo	e :	16-bit						
	Forma	at :	Decimal						
	Setting	IS :	Delay the time of controller	communication	respons	se from	servo	drive	to

P3-08∎		Monitor Mode	Address: 0310H 0311H
	Operatio Interface	nal Panel / Software Communication	Related Section: 9.2
	Defaul	t: 0000	
	Con Mode		
	Uni	t:-	
	Range	e: Shown as below	
	Data Size	e : 16-bit	
	Forma	t : Hexadecimal	

Settings : The setting of monitor mode is divided into L and H. (hexadecimal):

Item	_	_	L	Н
Function	-	-	Low-speed monitoring time	Monitor Mode
Range	0	0	0 ~ F	0 ~ 3

The status of this axis or multi-axis can be monitored by USB. The definition of setting value is as follows:

- The definition of H setting value
  - 3: USB is high-speed monitor. The sampling frequency is 16K and can only monitor 2CH.
  - 2: USB is high-speed monitor. The sampling frequency is 8K and can monitor 4CH.
  - 1: USB is low-speed monitor. The sampling time is set by L and can monitor 4CH.
  - 0: disable the monitor function
- L: the sampling time of USB low-speed monitor. Its unit is ms.
- It means the axial status will be set via USB every L ms. So the controller can monitor the axial status. Each monitoring message includes 4 CH data (16 bit x 4). If L is set to 0, this function is disabled. L is enabled when H is set to 1.

P3-09		ANopen / DMCNET S	ynchronize Setting	Address: 0312H 0313H
	Operation Interface	al Panel / Software	Communication	Related Section: 9.2
	Default	: 0x5055 (for -B, -L, -N 0x3511 (for -F type)	И, -U type)	
	Contr Mode	CANODOD / DMCNET	Г	
	Unit	: -		
	Range	: Shown as below		
	Data Size	: 16-bit		
	Format	: Hexadecimal		

Settings : The synchronous setting of CANopen / DMCNET is divided into E, T, D and M (hexadecimal):

Item	E	Т	D	М
Function	Range of Synchronous error	Target Value	Deadband	Adjusting amount
Range	1~9	0~9	0 ~ F	1 ~ F

The slave of CANopen / DMCNET synchronizes with the master via SYNC. See as the followings:

- M: If the slave needs to synchronize with the master, correct the clock is a must. This parameter sets the maximum correction value per time. (Unit: usec)
- D: Set the size of deadband (Unite: usec). If the deviation between the SYNC reaching time and the target value does not exceed the deadband, correction is no need.
- T: SYNC arrival time. The standard value is 500usec but it might be different from the target value. Thus, the buffer is necessary.

Target value =  $400 + 10 \times T$ .

For instance, if T=5, the target value will be 450.

E: If the deviation between SYNC reaching time and the target value is smaller than the range, it means the synchronization is successful. (Unit: 10 usec)

P3-10	CANENC	ANopen / DMCNET P	rotocol Setting	Address: 0314H 0315H
	Operation Interface		Communication	Related Section: Section 9.2
	Default	: 0x0000		
	Contro Mode		Т	
	Unit	: -		
	Range	: Shown as below		
	Data Size	: 16-bit		
	Format	: Hexadecimal		

Settings : CANopen / DMCNET synchronization setting is divided into X, Y, Z, U (hexadecimal):

Item	U	Z	Y	Х
Function	If PDO alarm will be cleared automatically	Reserved	If motor will servo off when CAN Bus / DMCNET error occurs	Reserved
Range	0~1	0 ~ F	0 ~ 1	0 ~ 1

Definition:

X: Reserved

Y: 0: The motor keeps running when communication error occurs;

1: The motor servo Off when communication error occurs.

Z: Reserved

U: 0: If PDO error occurs, it must be cleared by Alarm Rest

1: If PDO error occurs, it will be cleared automatically.

Note:

For A2-M, X bit is invalid.

For A2-F, it is suggested to set X to 1.

P3-11	CANOP C	Address: 0316H 0317H						
	Operationa Interface :	Danal / Sof	ftware	Communica	ation	Related Section: Section 9.2		
	Default :	0x0000						
	Contro Mode :	CANopop	DMCNET					
	Unit :	-						
	Range :	Shown as	below					
	Data Size :	16-bit						
	Format :	Hexadecim	nal					
	Settings :	Synchrono U (hexade		T setting of	CANopen i	s divided into X, Y, Z and		
		Item	U	Z	Y	X		
		Function	Undefined	Undefined	Undefined	Whether the parameter is saved into EEPROM		
		Range	-0 ~ 1	0 ~ F	0 ~ F	0~1		
		The definit	ion is as follo	WS:				
			en writing pa PROM.	arameters vi	a PDO, par	ameters will be saved in		
			en writing pa EPROM.	rameters via	a PDO, para	ameters will not be saved		
		Y, Z, U : U						
		If X is set shorten the	t to 1 and the lifetime of E	write param EPROM.	neters by F	DO continuously, it will		
P3-12	QSTPO C	ANopen / DI	MCNET Sup	port Setting	g	Address: 0318H 0319H		
	Operationa Interface :	Danal / Sof	ftware	Communica	ation	Related Section: Section 9.2		
	Default :	0x0000						
	Contro Mode :	CANopon	DMCNET		CANopen / DMCNET			

Unit : -

Data Size: 16-bit

Range : 0x0000 ~ 0x0111

Format : Hexadecimal

Settings : CANopen / DMCNET synchronization setting is divided into X, Y, Z, U (hexadecimal):

	,			
Item	U	Z	Y	Х
Function	None	CANopen / DMCNET value will be loaded in	If the motor will enter Quick Stop mode when in auto protection.	lf OD-6040 supports Quick Stop
Range	None	0~1	0 ~ 1	0 ~ 1

Aiming to CANopen Quick Stop mode, we have X and Y setting (Hexadecimal.) which is showed as below. It is only suitable in CAN mode: oxb mode selection (P1-01 = b).

X: Trigger Servo ON sequence and Quick Stop support setting

- X = 0: Servo On the servo drive by turning On OD-6040 Bit 3 (Enable Operation). OD-6040 Bit 2 enters Quick Stop mode is not supported.
- X = 1: The servo drive can be Servo ON only when OD-6040 Bit 0, Bit
   1, Bit 3 are ON. And will enter Quick Stop mode via OD-6040 Bit
   2 (Quick Stop)
- Y: When warning alarms (positive / negative limit, communication error, under voltage, abnormal fan) occur, it can determine if Quick Stop mode can be triggered.
- Y = 0: When warning alarms occur, if motor decelerates to stop because of auto protection function, it will not enter Quick Stop mode. Users only need to troubleshoot the alarm and clear the alarm message from the servo drive, the servo drive status will resume.
- Y = 1: When warning alarms occur, if motor decelerates to stop because of auto protection function, OD-6040 will enter Quick Stop mode. Users have to issue Fault Reset to continue other commands and clear the alarm message from the servo drive.

The following table shows P parameters and its corresponding CANopen OD or DMCNET parameter. The setting of Z (Hexadecimal.) can determine if it should be modified. This function is applicable in CAN mode: 0xB or 0xC (P1-01 = b or c) or DMC mode: 0xB (P1-01 = b).

- Z: Determine if the value of OBJECT will overlap parameters from P groups.
- Z = 0: When re-servo on the servo drive or reset the communiation, P parameters that mentioned in the following table will load in the default value in CANopen /DMCNET mode.
- Z = 1: When re-servo on the servo drive or reset the communiation, P parameters that mentioned in the following table will keep the value that before power off.

CANopen mode:

Related variables during initialization	P3-12.Z = 0	P3-12.Z = 1	Note
P1-32	0x0010	EEPROM	
P2-35	3840000	EEPROM	

P1-47	10	EEPROM	
P1-49	0	EEPROM	
P1-38	100	EEPROM	
Home offset	0	EEPROM	Used in HM mode
P1-44	1	EEPROM	
P1-45	1	EEPROM	

#### DMCNET mode:

Related variables during initialization	P3-12.Z = 0	P3-12.Z = 1	Note
P1-32	0x0010	EEPROM	
P2-35	3840000	EEPROM	
P1-47	100	EEPROM	
P1-49	0	EEPROM	
P1-38	100	EEPROM	
Home offset	0	Undefined	Used in HM mode
Acc	200	Undefined	Used in PV, PP mode
Dec	200	Undefined	Used in PV, PP mode
P1-44	1	EEPROM	
P1-45	1	EEPROM	

Methods that save parameters in EEPROM (even when the power is off):

SDO: When setting parmeters, parameters will be stored in EEPROM.

PDO: Please refer to the setting of P3-11.X

X = 1: When setting parameters via PDO, parameters will be stored in EEPROM.

X = 0: When setting parameters via PDO, parameters will not be stored in EEPROM.

Note: In CANopen mode, when using the funciton of OD 1010 Store Parameter and P3-12.Z = 0, the default value will be different from the value that showed above. Please refer to CANopen Standard for further information.

# P4-xx Diagnosis Parameters

P4-00★	ASH1	Fau	ult Record (N)		Address: 0400H 0401H
	Operatic Interfac		Panel / Software	Communication	Related Section: 4.4.1
	Defau	lt :	0		
	Con Mod	ntrol e :	ALL		
	Un	it :	-		
	Rang	e :	-		
	Data Siz	e :	32-bit		
	Forma	at :	Hexadecimal		
	Setting	s :	The last abnormal status record		
			Low word: LXXXX: dis	play ALM number	
			High word: hYYYY: di DMCNET.	splay the error code co	prresponds to CANopen /

P4-01★	ASH2	Fault Record (N-1)	ılt Record (N-1)		
	Operatior Interface	Donal / Softwara	Communication	Related Section: 4.4.1	
	Default	Default: 0			
	Cont Mode				
	Unit	: -			
	Range	: -			
	Data Size	: 32-bit			
	Format	: Hexadecimal			
	Settings	Low word: LXXXX:	display ALM number	corresponds to CANopen /	

P4-02★	ASH3	Fau	ult Record (N-2)	Address: 0404H 0405H	
	Operational Interface :		Panel / Software	Communication	Related Section: 4.4.1
	Defau	lt :	0		
	Contro Mode :		ALL		
	Un	it :	-		
	Range :		-		
	Data Siz	e :	32-bit		
	Forma	at :	Hexadecimal		
	Settings : The last third abnormal status record Low word: LXXXX: display ALM number High word: hYYYY: display the error coo DMCNET		play ALM number	prresponds to CANopen /	

P4-03★	ASH4	Fau	ult Record (N-3)	Address: 0406H 0407H	
	Operatio Interfac		Panel / Software	Communication	Related Section: 4.4.1
	Defau	lt :	0		
	Con Mode		ALL		
	Un	it :	-		
	Rang	e :	-		
	Data Siz	e :	32-bit		
	Forma	at :	Hexadecimal		4
	Setting		The last fourth abnorm Low word: LXXXX: dis High word: hYYYY: di DMCNET	play ALM number	prresponds to CANopen /

P4-04★	ASH5	Fault Record (N-4)		Address: 0408H 0409H
	Operation Interface	Donal / Coffigero	Communication	Related Section: 4.4.1
	Defaul	Default : 0		
	Cont Mode	- A I I	ALL	
	Uni	t:-		
	Range	ə: -		
	Data Size	e : 32-bit		
	Forma	t: Hexadecimal		
	Settings : The last fifth abnormal status record Low word: LXXXX: display ALM number			

High word: hYYYY: display the error code corresponds to CANopen /  $\ensuremath{\mathsf{DMCNET}}$ 

P4-05		rvo Motor Jog Cont	Address: 040AH 040BH	
	Operationa Interface :	Panel / Software	Communication	Related Section: 4.4.2
	Default :	20	20	
	Contro Mode :	ALL		4
	Unit :	r/min	r/min	
	Range :	0 ~ 5000		
	Data Size :	16-bit		
	Format :	Decimal		4
	Cattinga	Three control metho		

Settings : Three control methods are as follows:

1. Operation Test

After the JOG speed is set by P4-05 via panel, the panel will display the symbol of JOG. Pressing the UP Key can control JOG operation in positive direction, pressing the DOWN Key can control negative direction. Stop pressing to stop the JOG operation. If there is any error in this setting, then the motor cannot operate. The maximum JOG speed is the maximum speed of the servo motor.

2. DI Control

If the DI is set to JOGU and JOGD (refer to table 8.1), then the JOG operation in positive or negative direction can be controlled via this DI.

- 3. Communication Control
  - 1 ~ 5000: JOG speed

4998: JOG operation in positive direction

4999: JOG operation in negative direction

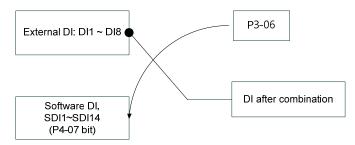
0: Stop operation

When writing via communication, if the frequency is high, please set P2-30 to 5.

P4-06▲∎		gital Output Regis itable)	ter (Readable and	Address: 040CH 040DH
	Operational Interface :	Panel / Software	Communication	Related Section: 4.4.3
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0xFF		
	Data Size :	16-bit		
	Format :	Hexadecimal		
	Format : Settings :	bit 00: correspond to D bit 01: correspond to D bit 02: correspond to D bit 02: correspond to D bit 03: correspond to D bit 04: correspond to D bit 05: correspond to D bit 06: correspond to D bit 07: correspond to D bit 08: correspond to D bit 09: correspond to D bit 10: correspond to D bit 10: correspond to D	O code=0x31 O code=0x32 O code=0x33 O code=0x34 O code=0x35 O code=0x36 O code=0x37 O code=0x38 O code=0x39 O code=0x3A	
		bit 12: correspond to D bit 13: correspond to D bit 14: correspond to D bit 15: correspond to D lf P2-18 is set to 0x013	O code=0x3C O code=0x3D O code=0x3E O code=0x3F 60, then the DO#1is bit 0	) status of P4-06. nunication DO, and then

P4-07∎	ITST	Mult	ti-function of Digita	Address: 040EH 040FH	
	Operatio Interface		Panel / Software	Communication	Related Section: Section 4.4.4
	Defau	ılt : C	)		Table 9.2
	Con Mode		ALL		
	Uni	it:-			
	Range	e: (	) ~ 0x3FFF		
	Data Size	e : 7	16-bit		
	Forma	at: H	Hexadecimal		

Settings : The DI input signal can come from external terminal (DI1 ~ DI8; EDI9 ~ EDI14) or software SDI1 ~ 14 (Bit 0 ~ 13 of corresponding parameter P4-07) and is determined by P3-06. The corresponding bit of P3-06 is 1, which means the source is software SDI (P4-07). If the corresponding bit is 0, then the source is hardware DI. See the following graph:



Read parameters: shows the DI status after combination

Write parameters: writes the software SDI status

For example:

The value of reading P4-07 is 0x0011, which means DI1 and DI5 is ON after combination.

The value of writing P4-07 is 0x0011, which means software SDI1 and SDI5 is ON.

Please refer to P2-10 ~ P2-17 for the function program of digital input pin DI (DI1~DI8) and P2-36 ~ P2-41 for extended DI (EDI9 ~ EDI14).

P4-08★	PKEY Ir	put Status of the Dr	ive Keypad (Read-only)	Address: 0410H 0411H
	Operation Interface		Communication	Related Section: -
	Default	: -		
	Contr Mode			
	Unit	: -		
	Range	: (read-only)		
	Data Size	: 16-bit		
	Format	: Hexadecimal		
	Settings	• The aim is to chec	k if the five Keys, MODE,	UP, DOWN, SHIFT an

Settings : The aim is to check if the five Keys, MODE, UP, DOWN, SHIFT and SET can work normally. This parameter is also used to check if the Keys are all functional when producing servo drives.

P4-09★	мот D	igital Output Status	ital Output Status (Read-only)		
	Operationa Interface	al Panel / Software	Communication	Related Section: 4.4.5	
	Default	: -			
	Contro Mode	ALL			
	Unit	: -			
	Range	: 0~0x1F			
	Data Size	16-bit			
	Format	Hexadecimal	Hexadecimal		
		Note: There is no di	fference whether read b	av panel or communication	

Settings : Note: There is no difference whether read by panel or communication.

P4-10∎	CEN	Adjustment Selection		Address: 0414H 0415H
	Operation Interface	nal Panel / Software e :	Communication	Related Section: -
	Defaul	t: 0		
	Contro Mode :	trol ALL		
	Uni	••		

Range : 0 ~ 6 Data Size : 16-bit Format : Decimal

#### 0: reserved Settings :

- 1: Execute the adjustment of analog speed input offset
- 2: Execute the adjustment of analog torque input offset
- 3: Execute the adjustment of current detector (V phase) hardware offset
- 4: Execute the adjustment of current detector (W phase) hardware offset
- 5: Execute the adjustment of 1~4 hardware offset
- 6: Execute the adjustment of IGBT ADC

**NOTE** The adjustment function needs to be enabled by the setting of parameter P2-08. When adjusting, the external wiring which connects to analog speed or torque needs to be removed completely and must be in Servo Off status.

P4-11	SOF1	An	alog Speed Input O	Address: 0416H 0417H	
	Interface :		Panel / Software	Communication	Related Section: -
			Factory default		
	Control Mode :		ALL		
	Unit :		-		
	Rang	e:	0 ~ 32767		
	Data Size:1 Format:D		16-bit		
			Decimal		
	Setting	s :		hardware offset. The adju	

be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-12	SOF2	Analog Speed Input O	ffset Adjustment 2	Address: 0418H 0419H
	Operation Interface		Communication	Related Section: -
	Default	t: Factory default		
	Control Mode:			4
	Uni	t : -		
	Range	e: 0~32767		
	Data Size	e : 16-bit		
	Format	t : Decimal		-
	Settings	Manually adjust the	hardware offset. The adju	ustment function needs to

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-13	TOF1 Ar	nalog Torque Input (	log Torque Input Offset Adjustment 1		
	Operationa Interface :		Communication	Related Section: -	
	Default :	Factory default			
	Contro Mode :	ALL			
	Unit :	_			
	Range :	0 ~ 32767			
	Data Size :	16-bit			
	Format :	Decimal			
	Settings :			djustment function needs to	

ttings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-14	TOF2	Ana	alog Torque Input (	Address: 041CH 041DH	
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Default :		Factory default		
	Con Mod				4
	Un	nit :	-		
	Rang	le :	0 ~ 32767		
	Data Siz	e :	16-bit		
	Forma	at :	Decimal		
	Setting	js :		hardware offset. The adjustment	

be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-15		Current Detector (V1 F Adjustment	rrent Detector (V1 Phase) Offset justment		
	Operation Interface		Communication	Related Section: -	
	Default	: Factory default			
	Contr Mode	AT 1			
	Unit	: -			
	Range	: 0~32767			
	Data Size	: 16-bit	16-bit		
	Format	: Decimal		•	
	C attin are	. Manually adjust the	hardware offset. The adju	istment function needs to	

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-16			rrent Detector (V2 I justment	Address: 0420H 0421H	
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Default :		Factory default		
	Control Mode :		ALL		
	Unit :		-		
	Rang	e :	0 ~ 32767		
	Data Size : Format :		16-bit		
			Decimal		
	Setting	s:	Manually adjust the	hardware offset. The adju	istment function needs to

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-17	LUES	Current Detector (W1 Adjustment	rrent Detector (W1 Phase) Offset ustment		
	Operatio Interface	Demal / Cafferrana	Communication	Related Section: -	
	Defau	It : Factory default			
	Con Mode	trol e:	ALL		
	Uni	it : -			
	Range	e: 0~32767			
	Data Size	e:16-bit	16-bit		
	Forma	it : Decimal			
	Setting		e hardware offset. The adju		

be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-18	(.()F4	Current Detector (W2 Adjustment	Phase) Offset	Address: 0424H 0425H
	Operation Interface	Danal / Softwara	Communication	Related Section: -
	Defaul	t: Factory default		
	Cont Mode	AT 1		
	Uni	t : -		
	Range	e: 0~32767		
	Data Size	e : 16-bit		
	Forma	t : Decimal		
	Settings	S: Manually adjust the	hardware offset. The adju	stment function needs to

ettings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-19			BT NTC Adjustment Detection Level		Address: 0426H 0427H
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Default :		Factory default		
	Con Mode		ALL		
	Unit :		-		
	Range :		1 ~ 4		
	Data Size :		16-bit		
	Format : Decimal				
·	Setting	s:	Please cool down th	ne drive to 25 Celsius degre	ee when adjusting

P4-20			set Adjustment Val tput (Ch1)	Address: 0428H 0429H	
	Operatic Interfac		Panel / Software	Communication	Related Section: 6.4.4
	Default :		0		
	Contro Mode :		ALL		
	Unit :		mV		
	Range: Data Size: Format:		-800 ~ 800		
			16-bit		
			Decimal		
	Setting	s:	Offset adjustment va	alue (cannot reset)	

P4-21			set Adjustment Val tput (Ch2)	Address: 042AH 042BH	
	Operational Interface : Default :		Panel / Software	Communication	Related Section: 6.4.4
			0		
	Control Mode :		ALL		
	Unit :		mV		
	Range	e :	-800 ~ 800		
	Data Size :		16-bit		
	Format :		Decimal		
	Setting	s:	Offset adjustment va	alue (cannot reset)	1

P4-22		Analog Speed Input O	Address: 042CH 042DH	
		nal Panel / Software	Communication	Related Section: -
	Default	:: 0		
	Cont Mode	rol S		
		: mV		

Range :	-5000 ~ 5000
Data Size :	16-bit
Format :	Decimal

Settings : Users manually adjust the OFFSET

DA	-23
	-20

23	ΤΑΟ	Ana	alog Torque Input OF	FSET	Address: 042EH 042FH
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Defau	lt :	0		
	Con Mode		т		
	Un	it :	mV		
	Range	e:	-5000 ~ 5000		
	Data Siz	e:	16-bit		
	Forma	at :	Decimal		
	Setting	s :	Users manually adjust	t the OFFSET	:

# 220V Series

P4-24	LVL	Level of Under voltag	vel of Under voltage Error	
	Operatio Interface		Communication	Related Section: -
	Defaul	t : 160	160	
	Con Mode		AT 1	
	Uni	t: V (rms)	V (rms)	
	Range	e : 140~190		
	Data Size	e:16-bit		
	Forma	t : Decimal		
	Settings	s: When the voltage	of DC BUS is lower that	n P4-24* $\sqrt{2}$ , the under

voltage alarm occurs.

P4-24		vel of Under voltag	Address: 0430H 0431H	
	Operationa Interface :	Panel / Software	Communication	Related Section: -
	Default :	320		
	Contro Mode :	ALL		
	Unit :	Unit : V (rms) Range : 140~380		
	Range :			
	Data Size :	16-bit		
	Format :	Decimal		
	0 - 443	When the voltage	of DC RUS is lower the	$\sim$ D4 24* $\sqrt{2}$ the under

Settings : When the voltage of DC BUS is lower than P4-24\*  $\sqrt{2}$  , the under voltage alarm occurs.

### P5-xx Motion Setting Parameters



D5_	03
	UU

PDEC	Deceleration Time of Auto Prote	Address: 0506H 0507H
Operatio Interface		Related Section: -
Defau	t: 0XEEEFEEFF	
Con Mode	ΔΙΙ	
Uni	t : -	
Range	e:0x00000000~0xFFFFFFF	
Data Size : 32-bit		
Forma	t: Hexadecimal	

Settings : The parameter setting is divided into D, C, B, A, W, Z, Y, X (hexadecimal), including:

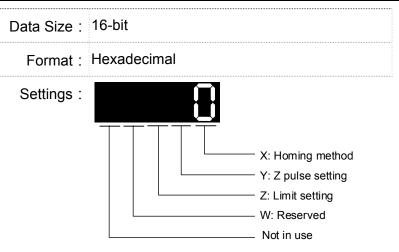
- 1. The deceleration time when activating the auto-protection function: OVF (DO.0x11, poisiiton command / feedback overflows), CTO (communication timeout AL020), SPL, SNL, PL, NL
- 2. Deceleration time of Stop Command: STP

Item	D	С	В	А	W	Z	Y	Х
Function	STP	PFQS	СТО	OVF	SNL	SPL	NL	PL
Range	0~F	0~F	0~F	0~F	0~F	0~F	0~F	0~F

 $0 \sim F$  is used to indexing the deceleration time of P5-20 $\sim$ P5-35.

For example: If X is set to A, then the deceleration time of PL is determined by P5-30.

P5-04	нмоу	Homing Mode	ming Mode		
	Operation Interface	nal Panel / Software	Communication	Related Section: -	
	Default	t: 0			
	Cont Mode	rol PR			
	Uni	t: -			
	-	e : 0 ~ 0x128			

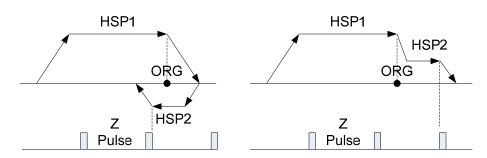


The definition of the setting value is as the followings:

W	Z	Y	Х
Reserved	Limit Setting	Z pulse Setting	Homing Method
-	0 ~ 1	0 ~ 2	0~8
		Y = 0: Stop and return to Z pulse	X = 0: Homing in forward direction and regard PL as the homing origin.
		Y = 1: Go forward to Z pulse Y = 2: Do not look	X = 1: Homing in reverse direction and regard NL as the homing origin.
	When encounter limit:	for Z pulse	X = 2: Homing in forward direction
	Z = 0: shows error		ORGP: OFF > ON, as the homing origin
	Z = 1: rotates backwards		X = 3: Homing in reverse direction
			ORGP: OFF > ON, as the homing origin
			X = 4: Look for Z pulse in forward direction and regard it as the homing origin
			X = 5: Look for Z pulse in reverse direction and regard it as the homing origin
			X = 6: Homing in forward direction ORGP: ON >OFF, as the
			homing origin
			X = 7: Homing in reverse direction ORGP: ON > OFF, as the homing origin

W	Z	Y	Х
Reserved	Limit Setting	Z pulse Setting	Homing Method
-	0~1	0 ~ 2	0~8
	When encounter limit: Z = 0: shows error Z = 1: rotates backwards	Y = 0: Stop and return to Z pulse Y = 1: Go forward to Z pulse Y = 2: Do not look for Z pulse	X = 7: Homing in reverse direction ORGP: ON > OFF, as the homing origin X = 8: directly define the current position as the origin
		Y = 0: Return to Z pulse Y = 1: Do not look	X = 9: Regard the collision point as the original point in forward direction
		for Z pulse	X = A: Regard the collision point as the original point in reverse direction

P5-05	HSPD1	1 <sup>st</sup> Sj	peed Setting of High	Speed Homing	Address: 050AH 050BH
	Operation Interface		Panel / Software	Communication	Related Section: -
	Default	t: 10	00.0	1000	
	Control Mode:		(This has to be set with P5-04)		
	Unit :	t: 1	r/min	0.1 r/min	
	Range	ə: 0	.1 ~ 2000.0	1 ~ 20000	
	Data Size :	ə: 32	2-bit		
	Format : Example :		Decimal		
			.5 = 1.5 r/min	15 = 1.5 r/min	
	Settings	s:T	he 1 <sup>st</sup> speed of high s	peed homing	



P5-06	HSPD2 2 <sup>nc</sup>	<sup>1</sup> Speed Setting of Lov	v Speed Homing	Address: 050CH 050DH
	Operationa Interface :	Panel / Software	Communication	Related Section: -
	Default :	20.0	200	
	Contro Mode :	PR (This has to be set with P5-04)		-
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 2000.0	1 ~ 20000	
	Data Size :	16-bit		
	Format :	Decimal		
	Example :	1.5 = 1.5 r/min	15 = 1.5 r/min	
		The 2 <sup>nd</sup> aread actting	of low an and haming	

Settings : The 2<sup>nd</sup> speed setting of low speed homing

P5-07∎	PRCM	Tri	gger Position Comma	and (PR mode only)	Address: 050EH 050FH
	Operational Interface :		Panel / Software	Communication	Related Section: -
	Defaul	lt:	0		
	Contro Mode :		PR		
	Uni	it :	-		
	Range	ə :	0 ~ 1000		
	Data Size : Format :		16-bit		
			Decimal		
	Settings :		Set P5-07 to 0 to start homing		
	-		Set P5-07 to 1~63 to e DI.CTRG+POSn	execute PR procedure v	which is the same as
			It is prohibited to set F range)	25-07 to 64 ~ 9999 (The	value exceeds the valid
			Set P5-07 to 1000 to e	execute Stop Command	which is the same as
			When reading P5-07:		
	lf th		If the command is incomplete, the drive will read the current command		
			If the command is con + 10000.	npleted, the drive will rea	ad the current command
				npleted and DO.TPOS is read the current comma	-

When PR is triggered by DI, the reading value is the same

For example:

Set P5-07 to 3, PR#3 will be triggered.

If the reading value is 3, it means PR #3 is incomplete.

If the reading value is 10003, it means PR#3 is issued completed, but the motor has not reached the target position yet.

If the reading value is 20003, it means PR#3 is issued completed and the motor has reached the target position.

P5-08	SWLP	For	ward Software Limit	Address: 0510H 0511H	
	Operatio Interface		Panel / Software Communication		Related Section: -
	Default :		2147483647		
	Con Mode		PR		
	Unit :		PUU		
Range :		e : -	-2147483648 ~ +2147483647		
	Data Size : Format :		32-bit		
			Decimal		

Settings : In PR mode, if the motor rotates in forward direction and its command position exceeds the setting value of P5-08, it will trigger AL.283.

P5-09	SWLN	Reverse Software L	verse Software Limit	
	Operatic Interfac		Communication	Related Section: -
	Defau	lt : -2147483648	-2147483648	
	Con Mod	PR		
	Un	it:PUU	PUU	
	Rang	e:-2147483648~+2	-2147483648 ~ +2147483647	
	Data Siz	e : 32-bit	32-bit	
Form		it : Decimal	Decimal	
	Setting		In PR mode, if the motor rotates in reverse dire position exceeds the setting value of P5-09, it	

P5-10★	AYSZ Da	ta Array - Data Size		Address: 0514H 0515H
	Operationa Interface :		Communication	Related Section: 7.2
	Default :	-		
	Contro Mode :	ALL		
	Unit :	-		
	Range :	Read-only		
	Data Size :	16-bit		
	Format :	Decimal		
	Settings :	Data size (N x 32 bit	s) means size N of data a	rray

P5-11∎	AYID	Data Array - Address	a Array - Address of Reading / Writing		
	Operation Interface	nal Panel / Software	Communication	Related Section: 7.2	
	Default	: 0	0		
	Conti Mode				
	Unit	: -	- 0 ~ (value set by P5-10 minus 1)		
	Range	: 0 ~ (value set by P5			
	Data Size	: 16-bit			
	Format	: Decimal			
	Settings	: The address of spe	cified data when reading o	or writing data array.	

P5-12∎	AYD0 D	ata Array - Window #	1 for Reading / Writing	Address: 0518H 0519H
	Operationa Interface	Danal / Softwara	Communication	Related Section: 7.2
	Default	: 0		
	Contro Mode	e: ALL		
	Unit			
	Range	: -2147483648 ~ +214	7483647	
	Data Size	: 32-bit	32-bit	
	Format	: Decimal		
	Settings	: Window #1 (Array[Pt	5-11++])	-1

When reading the parameter via panel, the value set by P5-11 will not add 1, but the others will.

P5-13∎	AYD1	Dat	ta Array - Window #2 1	Address: 051AH 051BH	
	Operational Interface : Default : Control Mode : Unit :		Panel / Software	Communication	Related Section: 7.2
			0		
			ALL		
			-		
	Rang	e:	-2147483648 ~ +2147483647 32-bit		
	Data Siz	e :			
	Format :		Decimal		
	Setting	• •	Window #2 (Array[P5-2 When reading and writ the value set by P5-11	anel or communication, e-protected.	

## P5-14 Reserved

P5-15∎	PMEM PATH#1 ~ PATH#2 No Data Retained Setting			Address: 051EH 051FH	
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Default : Contro Mode : Unit : Range : Data Size :		0x0		
			ALL		
			-		
			0x0 ~ 0x0011		
			16-bit		
	Forma	at :	Hexadecimal		-
	Setting	0.	The parameter is divided into 00YX: X=0: PATH#1 Data retained X=1: PATH#1 No data retained Y=0: PATH#2 Data retained Y=1: PATH#2 No data retained Others are reserved		on into the drive through

Users can continuously write the new position into the drive through communication by P5-05.

P5-16∎	AXEN Ax	is Position - Motor	Encoder	Address: 0520H 0521H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.3
	Default :	0		
	Control Mode :	ALL		
	Unit :	PUU (User position unit)		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :		<pre>&lt; position of the motor e 00 + the offset value. (The offset value)</pre>	ncoder, which is the nis function is supported

after firmware version V1.015)

Write: Any value can be written into the parameter and will neither change V000 nor influence the positioning coordinate system. It is only for observation when adjusting the offset value.

P5-17	AXAU	Axi	s Position - Auxilia	ry Encoder	Address: 0522H 0523H
	Operatio Interface		Panel / Software	Communication	Related Section: 7.3
	Unit :		-		
			ALL		
			Pulse number		
			-2147483648 ~ +2147483647		
			32-bit		
			Decimal		
			Sends back: pulse counts of the auxiliary enco		der (linear scale)

Settings : Sends back: pulse counts of the auxiliary encoder (linear scale)

P5-18	AXPC	Axi	s Position - Pulse Command		Address: 0524H 0525H
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: 7.3
	Defau	lt :	-		
	Con Mode		ALL		
	Un	it :	Pulse number		
	Range	e :	-2147483648 ~ +21	47483647	
	Data Sizo	e :	32-bit		
	Forma	at :	Decimal		4.
	Setting	s :	Sends back: pulse of	counts of pulse command	

P5-19	TBS	E-C	Cam Curve Scaling	am Curve Scaling		
	Operatio Interfac		Panel / Software	Communication	Related Section: -	
	Defau	lt :	1.000000			
	Control Mode :		PR			
	Un	it :	0.000001 times, which is 1 / (10^6)			
	Range :		-2147.000000 ~ +2147.000000			
	Data Siz	e:	32-bit			
	Forma	at :	DEC			
	Example	e:	1100000 = 1.1 times			
	<ul> <li>Settings : (It will be provided after firmware version V1.017) This parameter is used to magnify or minify the E-Cam changing its setting value.</li> <li>For example, the data in the table is 0,10,20,30,40,20, ma 2.000000 equals to the data in the table: 0,20 magnification x 1.000000.</li> <li>Enable the operation of E-Cam by using the same pulse the master axis. Magnify the magnification will enlarge th Cam operation. The speed will be magnified as well.</li> </ul>		the E-Cam table without 30,40,20, magnification x table: 0,20,40,60,80,40, same pulse frequency of Il enlarge the route of E-			
0	NO <sup>-</sup>	ΓE	This parameter can be engaged $\rightarrow$ engaged.	set anytime, but will be	effective only when pre-	

P5-20	AC0 A	cceleration/Decelera	ation Time (Number #0)	Address: 0528H 0529H
	Operationa Interface	Donal / Cofficience	Communication	Related Section: 7.10
	Default	200		
	Contro Mode	ססי		
	Unit	ms		
	Range	1 ~ 65500		
	Data Size	16-bit		
	Format	Decimal		
	Settings	The setting time of	acceleration/deceleration i	n PR mode, which is the

ettings : The setting time of acceleration/deceleration in PR mode, which is the time it needs when accelerating from 0 to 3000r/min

P5-21	AC1	Acceleration/Decelera	tion Time (Number #1)	Address: 052AH 052BH
	Operatior Interface		Communication	Related Section: 7.10
	Default	: 300		
	Conti Mode	DD		
	Unit	: ms		
	Range	: 1 ~ 65500		
	Data Size	: 16-bit		
	Format	: Decimal		
	Settinas	· Please refer to P5-2	0 for the setting of accele	ration/deceleration time in

P5-22	AC2	Acceleration/Decelera	tion Time (Number #2)	Address: 052CH 052DH
	Operation Interface		Communication	Related Section: 7.10
	Defaul	t : 500		
	Cont Mode	PR		
	Uni	t:ms		
	Range	e:1~65500		
	Data Size	e:16-bit		
	Forma	t : Decimal		
	Settings	B : Please refer to P5-2 PR mode.	20 for the setting of accele	ration/deceleration time in

P5-23	AC3	Acceleration/Decelera	ation Time (Number #3)	Address: 052EH 052FH
	Operation Interfact	onal Panel / Software e:	Communication	Related Section: 7.10
	Defau	lt : 600		
	Con Mod	50		
		it:ms		

Range :	1 ~ 65500
Data Size :	16-bit
Format :	Decimal

P5-24	AC4	Acceleration/Decelera	eleration/Deceleration Time (Number #4)		
	Operation Interface		Communication	Related Section: 7.10	
	Default	: 800			
	Conti Mode	DD			
	Unit	: ms			
	Range	: 1~65500			
	Data Size	: 16-bit			
	Format	: Decimal			
	Settings	Please refer to P5-2 PR mode.	20 for the setting of accele	ration/deceleration time in	

P5-25	AC5 Ac	cceleration/Decelera	ation Time (Number #5)	Address: 0532H 0533H
	Operationa Interface :		Communication	Related Section: 7.10
	Default :	900		
	Contro Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16-bit		
	Format :	Decimal		
	Settings ·	Please refer to P5-2	20 for the setting of accele	ration/deceleration time in

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-26	AC6	Aco	celeration/Decelera	tion Time (Number #6)	Address: 0534H 0535H
	Operatio Interface		Panel / Software	Communication	Related Section: 7.10
	Defaul	lt :	1000		
	Con Mode		PR		
	Uni	it :	ms		
	Range	e :	1 ~ 65500		
	Data Size	e :	16-bit		
	Forma	at :	Decimal		
	Setting	s :	Please refer to P5-2 PR mode.	0 for the setting of accele	ration/deceleration time in

Address: 0536H P5-27 AC7 Acceleration/Deceleration Time (Number #7) 0537H Operational Related Section: Panel / Software Communication 7.10 Interface : Default : 1200 Control PR Mode : Unit: ms Range : 1 ~ 65500 Data Size : 16-bit Format : Decimal Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-28			ation Time (Number #8)	Address: 0538H 0539H
	Operatio Interfac	onal Panel / Software e:	Communication	Related Section: 7.10
		lt: 1500		
	Con Mode	trol e: <sup>PR</sup>		
	Un	it:ms		

Range :	1 ~ 65500
Data Size :	16-bit
Format :	Decimal

P5-29	AC9 A	cceleration/Decelera	celeration/Deceleration Time (Number #9)		
	Operationa Interface		Communication	Related Section: 7.10	
	Default	: 2000			
	Contro Mode	PR			
	Unit	ms			
	Range	1 ~ 65500			
	Data Size	: 16-bit	16-bit		
	Format	: Decimal			
	Settings	Please refer to P5-2 PR mode.	20 for the setting of accele	ration/deceleration time in	

P5-30	AC10 Ac	celeration/Decelera	Address: 053CH 053DH	
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	2500		
	Contro Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16-bit		
	Format :	Format : Decimal		
	Settings : Please refer to P5-20 for the setting of accel PR mode.			ation/deceleration time in

P5-31	AC11 A	cceleration/Decelera	celeration/Deceleration Time (Number #11)		
	Operationa Interface		Communication	Related Section: 7.10	
	Default	: 3000			
	Contro Mode	PR			
	Unit	ms 1 ~ 65500			
	Range				
	Data Size	16-bit			
	Format	Decimal			
	Settings · Please refer to P5-20 for the setting of acceleration		ration/deceleration time in		

P5-32	AC12	Ace	celeration/Deceleration Time (Number #12)		Address: 0540H 0541H
	Default : Control		Panel / Software	Communication	Related Section: 7.10
			5000		
			PR		
			ms		
	Rang	e :	1 ~ 65500		
	Data Size : Format : Settings :		16-bit		
			Decimal		
			Please refer to P5-2 PR mode.	0 for the setting of acceler	ation/deceleration time in

P5-33	AC13	Acceleration/Decelera	Acceleration/Deceleration Time (Number #13)		
	Operatio Interface	nal e: <sup>Panel / Software</sup>	Communication	Related Section: 7.10	
	Defaul	lt : 8000			
	Con Mode	e: <sup>PR</sup>			
	Uni	it:ms			

Range :	1 ~ 65500
Data Size :	16-bit
Format :	Decimal

P5-34	AC14 A	cceleration/Decelera	celeration/Deceleration Time (Number #14)		
	Operation Interface	al Panel / Software	Communication	Related Section: 7.10	
	Default	: 50			
	Contr Mode	PR			
	Unit	ms			
	Range	: 1 ~ 1500			
	Data Size	: 16-bit	16-bit		
	Format	: Decimal			
	Settings	The default value of	f this parameter is smaller	(short deceleration time)	

Settings : The default value of this parameter is smaller (short deceleration time) and it is used for deceleration time setting of auto protection.

P5-35	AC15	Aco	celeration/Deceleration Time (Number #15)		Address: 0546H 0547H
	Operational Interface : Default :		Panel / Software	Communication	Related Section: 7.10
			30		
	Con Mode		PR		
	Unit : Range : Data Size : Format :		ms		
			1 ~1200		
			16-bit		
			Decimal		
	Setting	0.		is parameter is smaller ( deceleration time and s	(short deceleration time) tops promptly of auto

P5-36	CAST	CAPTURE - Start Add	PTURE - Start Address of Data Array		
	Operatio Interfac		Communication	Related Section: 7.11.1	
	Defau	lt : 0	0		
	Con Mode				
	Un	it : -	-		
	Rang	e:0~(value set by P	0 ~ (value set by P5-10 minus 1)		
	Data Siz	e : 16-bit			
	Forma	t: Decimal			
	Setting	s:The first data CAP data array.	TURE obtained should be s	aved in the address of	

**NOTE** It is writable only when COMPARE stops (please refer to P5-39)

P5-37∎	CAAX C	APTURE - Axis Posi	PTURE - Axis Position CNT		
	Operation Interface	al Panel / Software	Communication	Related Section: 7.11.1	
	Default	: 0	0		
	Contr Mode	ALI			
	Unit	: -			
	Range	: -2147483648 ~ +21	-2147483648 ~ +2147483647		
	Data Size	: 32-bit			
	Format	: Decimal			

Settings : Shows the axis position of CAPTURE pulse source

**NOTE** 1 ) It is writable only when COMPARE stops (please refer to P5-39)

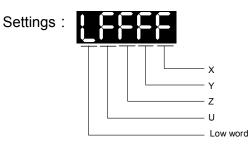
2) If the source is the main encoder, this parameter is write-protected and the content is the feedback position of the motor (monitoring variable 00h).

P5-38∎	CANO	СА	PTURE - The Number	Address: 054CH 054DH	
	Operational Interface :		Panel / Software	Communication	Related Section: 7.11.1
	Mode : Unit :		1		
			ALL		
			-		
			1 ~ (the value set by P5-10 minus the value set by P5-36)		
			16-bit		
			Decimal		
			When CAP stops, it m (readable and writable		ata that expect to capture

When CAP activates, it means the number of data that has not been captured (read-only); Every time, when it captures one data, the value of P5-38 will minus one. When the value is 0, it means the capturing is completed.

- 1. The number of data which is used by COMPARE, CAPTURE and E-Cam cannot exceed 800.
  - 2. A2L does not support E-Cam function.

P5-39∎	САСТ СА	APTURE - Activate (	Address: 054EH 054FH	
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.11.1
	Default :	0x2010		
	Contro Mode :	ALL		
	Unit :	-		
	Range :	0x0000 ~ 0xF13F		
	Data Size :	16-bit		
	Format :	Hexadecimal		



- X: See the following table
- Y: 0 CAPTURE is not working
  - 1 AUX ENC (linear scale) is set as the source
  - 2 PULSE Cmd
  - 3 Main ENC (main encoder)

When the source of CMP is CAP axis, the source Y of CAP cannot be changed.

- Z: 0 NO, 1 NC
- U: trigger the minimum interval (Unit: ms)

bit	3	2	1	0
X function	Execute PR when finishing capturing	After capturing the first data, CMP is activated.	Reset the position of the first data	Activate CAP
Description	Execute PR # 50 after finishing CAP	It is invalid when CMP is activated.	After capturing the first data, reset the position coordinate	Starts to capture when it is set to 1. After finishing capturing, this bit becomes 0 automatically

- bit 0: When the value set by P5-38 is bigger than 0, set bit 0 to 1 will activate CAP function and DO.CAP\_OK is OFF. Every time, when a data is captured, the value of P5-38 will minus one. When the P5-38 is 0, it means the capture function is completed, DO.CAP\_OK is ON and bit 0 will be reset to 0 automatically. If P5-38 equals to 0, set bit 0 to 1 will not activate CAP function. DO.CAP\_OK is OFF and bit 0 will automatically be set to 0. If CAP function is activated, it cannot set 1 to bit 0. It only can be written 0 to disable CAP function.
- bit 1: If this bit is 1, when capturing the first data, the current position of CAP axis will be set to the value of P5-76.
- bit 2: If this bit is 1, when capturing the first data, CMP will be activated. (When bit 0 of P5-59 is set to 1 and P5-58 is set to the previous value.) If CMP has been activated, then this function is invalid.
- bit 3: If this bit is 1, as soon as the CAP finished, PR procedure #50 will be triggered automatically.

P5-40	DLY0 Delay Time After Position Completed (Number #0)			Address: 0550H 0551H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16-bit		
	Format :	Decimal		
				÷

Settings : The 1<sup>st</sup> Delay Time of PR mode

P5-41		De #1)	lay Time After Posi	Address: 0552H 0553H	
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.10
	Defau	lt :	100		
	Control Mode :		PR		
	Unit :		ms		
	Range :		0 ~ 32767		
	Data Siz	e :	16-bit		
	Format :		Decimal		
	Setting	s :	The 2 <sup>nd</sup> Delay Time	of PR mode	1

P5-42	DLY2 D	elay Time After Posi 2)	Address: 0554H 0555H	
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10
	Default	: 200		
	Contro Mode	PR		
	Unit	: ms		
	Range	: 0~32767		
	Data Size	: 16-bit		
	Format	: Decimal		

Settings : The 3<sup>rd</sup> Delay Time of PR mode

P5-43		Del #3)	lay Time After Posi	Address: 0556H 0557H	
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.10
	Defau	ılt :	400		
	Control Mode:		PR		
	Unit :		ms		
	Rang	e :	0 ~ 32767		
	Data Siz	e :	16-bit		
	Format :		Decimal		
	Catting		The 4 <sup>th</sup> Delay Time	of PR mode	a da

Settings : The 4<sup>th</sup> Delay Time of PR mode

P5-44		Delay Time After Posi 4)	Address: 0558H 0559H	
	Operation Interface	al : Panel / Software	Communication	Related Section: 7.10
	Default	: 500		
	Contr Mode	ol PR		
		: ms		

Range :	0 ~ 32767
Data Size :	16-bit
Format :	Decimal

Settings: The 5<sup>th</sup> Delay Time of PR mode

P5-45		Del #5)	ay Time After Positi	on Completed (Number	Address: 055AH 055BH
	Operatio Interface		Panel / Software	Communication	Related Section: 7.10
	Defaul	lt :	800		
	Con Mode		PR		
	Uni	it :	ms		
	Range	e:	0 ~ 32767		
	Data Size	e :	16-bit		
	Forma	at :	Decimal		
			41-		

Settings : The  $6^{th}$  Delay Time of PR mode

P5-46		Del #6)		ion Completed (Number	Address: 055CH 055DH
	Operatic Interfac	onal e :	Panel / Software	Communication	Related Section: 7.10
	Defau	lt :	1000		
	Con Mod		PR		
	Un	it :	ms		
	Rang	e:	0 ~ 32767		
	Data Siz	e:	16-bit		
	Forma	at :	Decimal		

Settings: The 7<sup>th</sup> Delay Time of PR mode

P5-47		7)	ay Time After Position Completed (Number		
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10	
	Default	: 1500			
	Contro Mode	PR			
	Unit	: ms			
	Range	: 0~32767			
	Data Size	: 16-bit			
	Format	: Decimal			

Settings : The 8<sup>th</sup> Delay Time of PR mode

P5-48		Delay Time After Posi <sup>#8</sup> )	tion Completed (Number	Address: 0560H 0561H
	Operatior Interface		Communication	Related Section: 7.10
	Default	t : 2000		
	Cont Mode	PR		
	Unit	t : ms		
	Range	e: 0~32767		
	Data Size	e : 16-bit		
	Format	t : Decimal		
		The state of the s		

Settings: The 9<sup>th</sup> Delay Time of PR mode

P5-49	DLIS	Delay Time After Posi #9)	r Address: 0562H 0563H	
		nal Panel / Software	Communication	Related Section: 7.10
		t : 2500		
	Con	trol e : PR		
		t:ms		

Range :	0 ~ 32767	
Data Size :	16-bit	
Format :	Decimal	

Settings: The10<sup>th</sup> Delay Time of PR mode

P5-50	DLY10 De #10		tion Completed (Number	Address: 0564H 0565H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	3000		
	Control Mode : PR			
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16-bit		
	Format :	Decimal		
	<b>0</b> III	The 11 <sup>th</sup> Delay Time		-

Settings : The  $11^{th}$  Delay Time of PR mode

P5-51		Delay Time After Posi #11)	ition Completed (Number	Address: 0566H 0567H
	Operatio Interface	nal e : Panel / Software	Communication	Related Section: 7.10
	Defaul	lt : 3500		
	Con Mode			
	Uni	it : ms		
	Range	e: 0~32767		
	Data Size	e:16-bit		
	Forma	t : Decimal		

Settings : The 12<sup>th</sup> Delay Time of PR mode

P5-52	DLTIZ	#12		Address: 0568H 0569H	
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: 7.10
	Defau	lt :	4000		
	Con Mode		PR		
	Un	it :	ms		
	Rang	e :	0 ~ 32767		
	Data Siz	e :	16-bit		
	Forma	at :	Decimal		

Settings: The 13<sup>th</sup> Delay Time of PR mode

P5-53	DLY13 De #1		tion Completed (Number	Address: 056AH 056BH
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	4500		
	Contro Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16-bit		
	Format :	Decimal		
	Catting and A	The 14 <sup>th</sup> Delay Time	o of DD mode	

Settings : The 14<sup>th</sup> Delay Time of PR mode

P5-54	#	elay Time After Posi 14)	Address: 056CH 056DH	
		al Panel / Software	Communication	Related Section: 7.10
	Default			
	Contr	ol : PR		
		: ms		

Range :	0 ~ 32767	
Data Size :	16-bit	
Format :	Decimal	

Settings: The 15<sup>th</sup> Delay Time of PR mode

P5-55		elay Time After Posit 15)	ion Completed (Number	Address: 056EH 056FH
	Operation Interface		Communication	Related Section: 7.10
	Default	: 5500		
	Contro Mode	PR		
	Unit	: ms		
	Range	: 0~32767		
	Data Size	: 16-bit		
	Format	: Decimal		

Settings: The 16<sup>th</sup> Delay Time of PR mode

P5-56	CMST	со	MPARE - Start Addre	MPARE - Start Address of Data Array		
	Operatio Interface		Panel / Software	Communication	Related Section: 7.11.2	
	Defau	lt:	0			
	Con Mode	-	ALL			
	Un	it:	-			
	Range	e :	0 ~ (The value of P5-1	0 minus 1)		
	Data Sizo	e :	16-bit			
	Forma	at :	Decimal			
	Setting	s :	The first COMPARE da	ata is saved in the addre	ess of data array.	
1		ΓЕ	It is writable only when	COMPARE stops (plea	se refer to P5-59)	

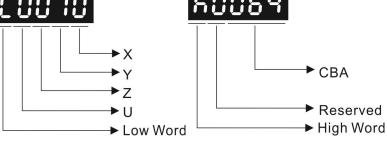
P5-57∎	CMAX	со	MPARE - Axis Positio	'n	Address: 0572H 0573H
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.11.2
	Defau	lt :	0		
	Con Mode		ALL		
	Un	it :	-		
	Range :		-2147483648 ~ +21474		
	Data Size :		32-bit		
	Forma	at :	Decimal		
	Setting	s :	The axis position of CC It is writable only when	MPARE pulse source i COMPARE stops (plea	
	NO <sup>-</sup>	ΓЕ	1) It is write-protected	when the source is Cap	oture axis.
			protected. The puls When P5-59.Y is se the motor feedback parameter is not the homing or reset by	et to the main encoder, position (monitoring va e same as the motor fee CAP function, the user n this way, this paramet	ed by parameter P1-46. this parameter is set to riable 00h). If this edback position due to can set P5-59.Y = 0 and

P5-58∎		OMPARE - Compare	Amount	Address: 0574H 0575H
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.11.2
	Default :	1		
	Contro Mode :	ALL		
	Unit :	-		
	Range :	1 ~ (the value set by P5-10 minus the value set by P5-56)		
	Data Size :	16-bit		
	Format :	Decimal		

Settings : When COMPARE stops, it means the number of data that expect to compare (readable and writable)

When COMPARE activates, it means the number of data that has not been compared (read-only); Every time, when it compares one data, the value of P5-38 will minus one. When the value is 0, it means the comparing is completed.

P5-59	СМСТ	со	MPARE - Activate C	CMP Control	Address: 0576H 0577H
	Operatio Interface		Panel / Software	Communication	Related Section: 7.11.2
	Defau	lt :	00640010h		
	Con Mode		ALL		
	Uni	it :	-		
	Range	e :	00010000h ~ 0x0FF	F313F	
	Data Size	e :	32-bit		
	Forma	at :	Hexadecimal		
	Setting	s:	100 10	<u> </u>	



- X: See the following table.
- Y: 0 When selecting CAPTURE AXES, the source of CAP cannot be changed.
  - 1 AUX ENC (linear scale) is set as the source
  - 2 PULSE Cmd
  - 3 Main ENC (main encoder)
- Z: 0 NO, 1 NC outputs the polarity

U: See	table U	below:
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bit	15	14	13	12
U function	-	-	-	Trigger PR
Description	-	-	-	When this bit is set to 1, PR#45 will be triggered after the last compare is completed. It is provided in V1.038 sub09 (or the later version)

## CBA: Output the pulse length; Unit: 1ms

bit	3	2	1	0
X function	After finishing comparing, the counter returns to 0.	When finishing comparing, CAP is activated.	Cycle mode	CMP is activated
Description	As soon as the last data is compared, P5-57 is set to 0.	It is invalid when CAP is activated.	Never end	Starts to compare when this bit is set to 1. It returns to 0 when finishing comparing.

- bit 0: When the value of P5-58 is more than 0, set bit to 1 will activate CMP. When comparing one data, the value of P5-58 will minus 1. When P5-58 is set to 0, the comparing is completed and returns to 0. If P5-58 is 0, set bit 0 to 1 will not do any comparing and return to 0 automatically. If bit 0 has already been set to 1, it is not allowed to write 1 as the new value into the parameter. But it is ok to write 0 to disable CMP.
- bit 1: If this bit is 1, P5-58 will be reset after comparing the last data. Then, start from the first data again. The cycle will never end and bit 0 is always 1.
- bit 2: If this bit is 1, CAP will be activated after comparing the last data. (Set bit 0 of P5-39 to 1 and reset P5-38 to the previous value) If CAP has already been activated, this function is invalid.
- bit 3: If this bit is 1, set the counter (P5-57) to 0 after comparing the last data. For example, if the comparing data is set to 3000 (one data in total), the default value of the counter (P5-57) is 0. It is expected to input 4000 pulse. When it reaches the 3000<sup>th</sup> pulse, the CMP is completed and P5-57 returns to 0. When the pulse reaches 4000, P5-57=1000. (No accumulative error)

P5-60	POV0	Tar	get Speed Setting	#0	Address: 0578H 0579H
	Operatio Interface		Panel / Software	Communication	Related Section: 7.10
	Defau	lt :	20.0	200	
	Control Mode :		PR		
	Uni	it :	1 r/min	0.1 r/min	
	Range	e:	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :		16-bit		
	Format :		Decimal		
	Example	e :	15 = 15 r/min	150 = 15 r/min	

Settings: The 1<sup>st</sup> target speed of PR mode

P5-61	POV1 Ta	rget Speed Setting	#1	Address: 057AH 057BH
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10
	Default :	50.0	500	
	Contro Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	16-bit		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings : The 2<sup>nd</sup> target speed of PR mode

P5-62	POV2	Target Speed Setting	#2	Address: 057CH 057DH
	Operation Interface		Communication	Related Section: 7.10
	Defaul	t : 100.0	1000	
	Cont Mode	סס		
	Uni	t:1 r/min	0.1 r/min	
	Range	e:0.1~6000.0	1 ~ 60000	
	Data Size	e : 16-bit		
	Forma	t : Decimal		
	Example	e : 1= 1 r/min	10 = 1r/min	

Settings: The 3<sup>rd</sup> target speed of PR mode

P5-63		rget Speed Setting	#3	Address: 057EH 057FH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	200.0	2000	
	Control Mode :			
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	16-bit		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings: The 4<sup>th</sup> target speed of PR mode

P5-64	POV4	Target Speed Setting	#4	Address: 0580H 0581H
	Operatior Interface		Communication	Related Section: 7.10
	Default	: 300.0	3000	
	Cont Mode	חח	PR	
	Unit	: 1 r/min	0.1 r/min	
	Range	: 0.1 ~ 6000.0	1 ~ 60000	
	Data Size	: 16-bit		
	Format	: Decimal		
	Example	: 1= 1 r/min	10 = 1r/min	
		The the		

Settings : The 5<sup>th</sup> target speed of PR mode

P5-65	POV5 Ta	rget Speed Setting	get Speed Setting #5	
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10
	Default :	500.0	5000	
	Contro Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	16-bit		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings: The 6<sup>th</sup> target speed of PR mode

P5-66	POV6 Ta	arget Speed Setting #	get Speed Setting #6		
	Operationa Interface :		Communication	Related Section: 7.10	
	Default :	600.0	6000		
	Contro Mode :	PR			
	Unit :	1 r/min	0.1 r/min		
	Range :	0.1 ~ 6000.0	1 ~ 60000		
	Data Size :	ze : 16-bit at : Decimal			
	Format :				
	Example :	1= 1 r/min	10 = 1r/min		

Settings : The 7<sup>th</sup> target speed of PR mode

P5-67	POV7 Ta	rget Speed Setting	#7	Address: 0586H 0587H
	Operational Interface :		Communication	Related Section: 7.10
	Default :	800.0	8000	
	Contro Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	ze : 16-bit		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings: The 8<sup>th</sup> target speed of PR mode

P5-68	POV8 Ta	rget Speed Setting #8	3	Address: 0588H 0589H
	Operationa Interface :	Danal / Softwara	Communication	Related Section: 7.10
	Default :	1000.0	10000	
	Contro Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	16-bit		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings : The 9<sup>th</sup> target speed of PR mode

P5-69	POV9 Ta	rget Speed Setting	#9	Address: 058AH 058BH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	1300.0	13000	
	Control Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	Data Size : 16-bit Format : Decimal		
	Format :			
	Example :	1= 1 r/min	10 = 1r/min	

Settings : The 10<sup>th</sup> target speed of PR mode

P5-70	POV10 Ta	rget Speed Setting #	10	Address: 058CH 058DH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	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		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings : The 11<sup>th</sup> target speed of PR mode

P5-71	POV11 Tai	rget Speed Setting	get Speed Setting #11		
	Operational Interface :		Communication	Related Section: 7.10	
	Default :	1800.0	18000		
	Control Mode :	Control Mode : PR			
	Unit :	1 r/min	0.1 r/min		
	Range :	0.1 ~ 6000.0	1 ~ 60000		
	Data Size :	16-bit			
	Format :	Decimal			
	Example :	1= 1 r/min	10 = 1r/min		

Settings : The 12<sup>th</sup> target speed of PR mode

P5-72	POV12 Ta	rget Speed Setting	#12	Address: 0590H 0591H
	Operationa Interface :		Communication	Related Section: 7.10
	Default :	2000.0	20000	
	Contro Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	11 ~ 600001	
	Data Size :	Data Size : 16-bit		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings : The 13<sup>th</sup> target speed of PR mode

P5-73	POV13 Tai	rget Speed Setting # <sup>r</sup>	Address: 0592H 0593H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	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		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings : The 14<sup>th</sup> target speed of PR mode

P5-74	POV14 Ta	rget Speed Setting #	<b>#14</b>	Address: 0594H 0595H
	Operational Interface :	Panel / Software	Communication	Related 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		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings: The 15<sup>th</sup> target speed of PR mode

P5-75	POV15 Tai	rget Speed Setting	Address: 0596H 0597H	
	Operational Interface :	Panel / Software	Communication	Related 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 :	32-bit		
	Format :	Decimal		
	Example :	1= 1 r/min	10 = 1r/min	

Settings : The 16<sup>th</sup> target speed of PR mode

P5-76★			PTURE - First Position Reset Data			
	Operation Interface	nal Panel / Software :	Communication	Related Section: 7.10		
	Defaul	t: 0	0			
	Cont Mode	ΔΙΙ				
	Uni	t : -	_			
	Range	e:-1073741824~+10	073741823			
	Data Size	e : 32-bit	32-bit			
	Forma	t : Decimal				

Settings : F	Please refer to the description of P5-39 X 1
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P5-77∎		The Position of Sync (CAP SYNC AXES)	e Position of Synchronous Capture Axis AP SYNC AXES)		
	Operation Interface	Danal / Softwara	Communication	Related Section: -	
	Default	t: 0			
	Cont Mode		ΔΙΙ		
	Unit	t:-			
	Range	e:-2147483648~+214	-2147483648 ~ +2147483647		
	Data Size	e : 32-bit			
	Format	t : Decimal			
	Settinas	The position of this	axis will synchronize wit	h CAP signal. That is to	

ettings : The position of this axis will synchronize with CAP signal. That is to say, when activating CAP every two times, the motor moving distance of this axis is the value of P5-78. (There is no accumulative error and only in single-way operation) The synchronous capture axis can be the source of Master.

P5-78		The Interval Pulse Nu Synchronous Capture A		Address: 059CH 059DH
	Operation Interface		Communication	Related Section: -
	Default	: 100		
	Contr Mode			
	Unit	: Pulse		
	Range	: 10 ~ +100000000		
	Data Size	: 32-bit		
	Format	: Decimal		
	<b>.</b>	It is the moving dista	nce of synchronous ca	nture axis between two

Settings : It is the moving distance of synchronous capture axis between two CAP actions.

The new value can be written into the parameter not until CAP is disabled (P5-39, X0=0).

P5-79∎	LaDa	Err Axi	or Pulse Number of s	Address: 059EH 059FH	
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: -
	Mode : Unit :		0		
			ΔΙΙ		
			Pulse unit of capture axis		
			-2147483648 ~ +214	7483647	
			32-bit		
	Forma	at :	Decimal		

When synchronous capture axis is operating, the synchronous error Settings : should be 0. This parameter shows this error value. The followings are its concept:

> Synchronous Error Output value of synchronous axis - Setting = value of synchronous axis

> > = the accumulative amount of P5-77 - (P5-78 x Capturing number of times)

When capturing the data, the synchronous axis works normally. This parameter updates once.

This parameter can be written into as well. It indicates the offset of synchronous master. When the synchronous capture axis is regarded as the master of flying shear, modify this parameter can deviate the cutting position to the left/right.

NOTE A2L does not support E-Cam function.

P5-80		Max Axi	x. Correction Rate	Address: 05A0H 05A1H	
(	Operational Interface : Default : Control Mode : Unit : Range : Data Size :		Panel / Software	Communication	Related Section: -
			10		
p			ALL		
			%		
			0 ~ 90		
E			16-bit		
	Forma	ıt :	Decimal		

This parameter limits the percentage (%) of synchronous adjustment. Settings : Correction rate

= pulse number output by synchronous axis

/pulse number input by synchronous axis (100 – P5 -80)% < correction rate < (100 + P5 - 80)%

The bigger correction rate, the faster the synchronous error becomes 0. However, the speed changing will be more severe.

The smaller correction rate, the slower the synchronous error becomes 0. However, the speed changing will be smoother.

In the application of flying shear, after adjusting the synchronous error, P5-79: the bigger parameter value will reduce the time the slave axis goes to the desired position. However, the speed is not synchronized.

NOTE A2L does not support E-Cam function.

P5-81 ECH	ID E	-CAM: Start Address	of Data Array	Address: 05A2H 05A3H
	ration rface	Danal / Sattwara	Communication	Related Section: 7.11
D	efault	: 100		
	Contro Mode	PR		
	Unit	: -		
R	ange	: 0 ~ (800 - P5-82)		
Data	i Size	: 16-bit		
Fo	ormat	: Decimal		

Settings : The first data of E-Cam table is saved in the address of data array.

- **NOTE** 1. Version V1.015 (before): This parameter cannot be modified when E-Cam is activated (P5-88, X = 1).
  - 2. Version V1.015 (included or after): This parameter can be set anytime, but will be effective only when pre-engaged  $\rightarrow$  engaged.
  - 3. A2L does not support this function.

P5-82	ECMN	E-C	CAM: Area Number N	Address: 05A4H 05A5H	
	Operational Interface : Default : Control Mode :		Panel / Software	Communication	Related Section: 7.11
			5		
			PR		
	Unit :		-		
	Range :		5 ~ 720, must <  = (P5-10 - P5-81)		
			And P5-82 x P5-84 < = 2147483647		
	Data Sizo	e:	16-bit		
	Format :		Decimal		
			It means the E-Cam curve is divided into N area, and the table should include N+1 data.		
l		ΓE	1. This parameter can toP5-88, X=0).	n be wrote when E-Cam	stops (Please refer
			2. A2L does not support E-Cam function.		

P5-83	ECMM	E-C	CAM: Master Gear Rat	Address: 05A6H 05A7H	
	Operatic Interfac		Panel / Software	Communication	Related Section: 7.11
	Default: Control Mode:		1		
			PR		
	Un	it :	-		
	Range : Data Size :		1 ~ 32767		
			16-bit		
	Forma	at :	Decimal		
	Setting	s:		number P of the Master, e M cycle of the E-Cam	
	■ NO <sup>-</sup>	ΤE	1. This parameter car toP5-88, X=0).	be wrote when E-Cam	stops (Please refer

2. A2L does not support E-Cam function.

P5-84	ECMP	E-C	CAM: Master Gear Rat	Address: 05A8H 05A9H	
	Operatio Interface		Panel / Software	Communication	Related Section: 7.11
	Defaul	t :	3600		
	Control Mode:		PR		
	Unit :		-		
-	Range :		10 ~ 1073741823,		
			and P5-82 x P5-83 < = P5-84		
			and P5-82 x P5-84 < = 2147483647		
	Data Size :		32-bit		
	Forma	t :	Decimal		
	Settings :		When receiving pulse number P of the Master, E-Cam will rota circle, which means the M cycle of the E-Cam table.		E-Cam will rotate M table.
		ΓE	<ol> <li>This parameter car toP5-88, X=0).</li> </ol>	be wrote when E-Cam	stops (Please refer
			2. This parameter car mentioned above.	be modified anytime, a	nd has no limit that
			3. A2L does not support E-Cam function.		

P5-85	ECME	E-CAM: Number of Area	Address: 05AAH 05ABH
	Operation Interface		Related Section: 7.11
	Defaul	t: 0	
	Cont Mode	PR	
	Uni	t : -	
	Range	e: 0~(P5-82 - 1)	
	Data Size	e : 16-bit	
	Forma	t : Decimal	
	Settings	The area number of E-cam when E- <b>NOTE</b> A2L does not suppo	

P5-86∎	ECAX E-	CAM: Master Axis F	Address: 05ACH 05ADH	
	Operationa Interface :	Donal / Cofficience	Communication	Related Section: 7.11
	Default :	0		
	Contro Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	The position counte	r of the E-Cam Master	

- **I** This parameter can be wrote when E-Cam stops (Please refer toP5-88, X=0).
  - 2. A2L does not support E-Cam function.

P5-87	PLED E-	CAM: Lead Pulse		Address: 05AEH 05AFH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.11
	Default :	0		
	Contro Mode :	PR		**
	Unit :	-		
	Range :	-1073741824 ~ +1073741823		
	Data Size :	: 32-bit : Decimal		
	Format :			
	Settings :		aster has to exceed the	am is satisfied, the pulse ne setting value of this

In other words, E-cam engages after neglecting the lead pulse specified by this parameter.

If the symbol of this parameter is +, it means the received forward pulse is regarded as the lead pulse.

If the symbol of this parameter is - , it means the received reverse pulse is regarded as the lead pulse.

**NOTE** A2L does not support E-Cam function.

P5-88∎	ECON	E-CAM: Activate E-Ca	-CAM: Activate E-Cam Control	
	Operation Interface	al Panel / Software	Communication	Related Section: 7.11
	Default	: 00000000h		
	Contro Mode	PR		
	Unit	-		
	Range	e : 0 ~ 0x203FF257 Data re : <sup>32-bit</sup>		
	Dat Size			
	Format	: Hexadecimal		

Settings : The format of this parameter: (High word h) S0BA : (Low word L) UZYX

Definition of each column is as follows:

• X: E-Cam command

Description of each bit:

X3	-	-
X2	P5-19 is effective immediately	It is available after V1.038 sub48: 0: P5-19 is effective after the next engage. 1: P5-19is effective immediately.
X1	E-Cam does not disengage when Servo OFF	<ul> <li>It is available after 1.038 sub29:</li> <li>0: E-Cam does not work</li> <li>1: When E-Cam stops because of alarm or Servo Off, it can keep in engaged status. When reservo on, E-cam can operate directly. It can return to the correct position by macro #D.</li> </ul>
X0	E-Cam is enabled	<ul><li>0: E-Cam is disabled</li><li>1: E-Cam is enabled (E-CAM is enabled while other functions cannot be modified.)</li></ul>

- Y: Command source
  - 0: CAP axis
  - 1: AUX ENC
  - 2: Pulse Cmd
  - 3: PR command
  - 4: Time Axis (1ms)
  - 5: Synchronous Capture Axis (P5-77)
  - 6: Analog channel 1 (virtual axis, Unit: 1M pulse/s /10V)
- Z: Engaging Time (No multiple choice)
  - 0: Immediately
  - 1: DI.CAM ON
  - 2: Any one of the Capture

• U: Disengaging Condition (2, 4 and 6 cannot be selected at the same time)

U	Disengaged Condition	Action after disengaged		
0	Never disengaged	-		
1	DI.CAM is OFF	In STOP status		
2	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)			
6	(It is available after firmware version V1.009)	In STOP status		
	Same as 2, the E-cam starts to decelerate when disengaging. It is suitable for the application of calling the next PR position command right after disengaged.			
4	(It is available after firmware version V1.009)	Back to the pre-engage status		
	Master axis exceeds the setting value of P5-89 (Sign indicates the direction)	The lead pulse is P5- 92		
8	When U = 1, 2 or 6:	Set X to 0		
	Disable E-Cam after it is disengaged.			
	When U = 4:	N/A		
	To avoid jittering when it returns to lead status.			

The servo is Off, when ALM or forward/reverse limit occur or  $\ensuremath{\mathsf{PR}}$ 

is doing homing procedure, it disengages (P5-88, X = 0)

- BA: When disengaging condition is satisfied (P5-88, U = 2, 4, 6), a PR 00~63 (hexadecimal; 00 means no action) will automatically be executed.
- S:Shows the engage status (Read-only, the setting is invalid)
   0: Stop
  - 1: Engage status

L

2: Pre-engage status

P5-89	ECRD	E-C	CAM: Information of D	isengaging Time	Address: 05B2H 05B3H
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.11
	Defau	lt :	0		
	Con Mode		PR		
	Un	it :	-		
	Range	e :	-1073741824 ~ +1073	741823	
	Data Sizo	e:	32-bit		
	Forma	at :	Decimal		
	Setting	s :		finition of P5-88 U settin bes not support E-Cam	

P5-90	СМАР	E-C	CAM: AREA No. + The	Address: 05B4H 05B5H	
	Operatio Interface		Panel / Software	Communication	Related Section: 7.11
	Defau	lt:	0		
	Control Mode:		PR		
	Unit :		Degree (It was changed after firmware V1.009)		
	Range : Data Size : Format :		0 ~ 360		
			16-bit		
			Decimal		
	Setting	σ.	CAM_AREA).	ed, set the start angle of	
				es not support E-Cam f	unction.

P5-91	CMAN	E-C	CAM: AREA No The	Point of DO OFF	Address: 05B6H 05B7H
	Operatio Interface		Panel / Software	Communication	Related Section: 7.11
	Defaul	lt :	0		
	Con Mode		PR		
	Uni	it :	Degree		
	Range	e :	0 ~ 360		
	Data Size	e:	16-bit		
	Forma	at :	Decimal		
	Setting	s:	When E-cam is engag	ed, set the end angle of	DO output (DO.

CAM\_AREA).

Address: 05B8H P5-92 PLED E-CAM: Pre-engaged Time of Each Cycle 05B9H Operational **Related Section:** Panel / Software Communication Interface : 7.11 Default: 0 Control PR Mode : Unit : -Range : -2147483648 ~ +2147483647 Data Size : 32-bit Format : Decimal This parameter goes with the selection of P5-88, U=4 (E-cam will Settings : disengage if it exceeds the moving distance):

After disengaging, it does not enter the Stop status but pre-engaged status. The lead pulse is determined by this parameter.

The pulse number sent by the Master must exceed the setting value of this parameter so that E-cam will engage again.

In other words, E-cam will engage not until the lead pulse is ignored.

If the symbol of this parameter is +, it means the received positive pulse will be regarded as the lead pulse.

If the symbol of this parameter is -, it means the received negative pulse will be regarded as the lead pulse.

P5-93	CSDS	Motion Control Macro Command: Command Parameter # 4	Address: 05BAH 05BBH
	Operation Interface	Banal / Softwara Communication	Related Section: -
	Defaul	t: 0	
	Cont Mode		4
	Uni	t:-	
	Range	e : -100000000 ~ +100000000	
	Data Size	e : 32-bit	
	Forma	t : Decimal	
		Before issuing the macro command, the relev	ont parameters # 1 mus

Settings : Before issuing the macro command, the relevant parameters # 4 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

P5-94	CSDS	Motion Control Macro ( Parameter # 3	tion Control Macro Command: Command		
	Operation Interface	Donal / Cofficience	Communication	Related Section: -	
	Default	t: 0			
	Cont Mode	ΔΙΙ			
	Uni	t: -			
	Range	e:-2147483648~+2147	483647		
	Data Size	e : 32-bit			
	Format	t : Decimal			
		Poforo icquing the me	ore command the relay	ant noromotoro # 2 munt	

Settings : Before issuing the macro command, the relevant parameters # 3 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

P5-95	CSDS		tion Control Macro C rameter # 2	ommand: Command	Address: 05BEH 05BFH
	Operatio Interfac		Panel / Software	Communication	Related Section: -
	Default : Control Mode : Unit : Range : Data Size : Format :		0		
			ALL		
			-2147483648 ~ +2147483647		
			Decimal		
	0		Refore issuing the ma	cro command the relev	/ant narameters # 2 must

Settings : Before issuing the macro command, the relevant parameters # 2 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

P5-96	CSDS	Motion Parame	Control Mac eter # 1	Address: 05C0H 05C1H	
	Operatio Interface	nal e: <sup>Pan</sup>	el / Software	Communication	Related Section: -
	Default :				
	Control Mode :		ΔΤΤ		
	Unit: Range:		-		
			7483648 ~ +2	147483647	
	Data Size	e : 32-b	bit		
	Forma	nt : Dec	imal		

Settings : Before issuing the macro command, the relevant parameters # 1 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

P5-97∎	CSDS	-	tion Control Macro Co mmand / Executing R		Address: 05C2H 05C3H
	Operatio Interfac	onal e :	Panel / Software	Communication	Related Section: -
	Defau	lt :	0		
	Con Mode		ALL		
	Un	it :	-		
	Range	e :	0 ~ 0x99F		
	Data Sizo	e :	16-bit		
	Forma	at :	Hexadecimal		

Settings : Write-in: It is used to issue the macro command (0CBAh)

Read: It is used to examine the execution result of macro command (If success, the result will be sent back to 1CBAh).

If the command issues 0001, 1001h will be sent back when success; and Fxxxh when failed (depending on the command description). If issuing the command that is not supported, the failure code F001h will be sent back.

The provided command code is as the followings.

The following macros are available from Version V1.027 (included):

Command code 0003h	Motion parameter protection: password setting, protection activation	
Macro parameters	P5-93= Parameter write-protected level (0~1) (0 means no protection)	
	P5-94= Protection level of data array (0~7) (-1 means no protection)	
	P5-95= Set new password (1~16777215)	
	P5-96= Confirm new password (1~16777215)	
	Among them:	
	For success setting, the setting of P5-95 must equal to P5-96 and the password must be set within the allowable range.	
This function can be executed before activating the function of parameter protection.		
If the protection function is activated, when repeat execute this function, the failure code will be sent back.		
Failure code F031h	Protection function has been activated and cannot be set repeat.	
Failure code F032h	Wrong password setting: P5-95 not equals to P5-96.	
Failure code F033h	Password setting exceeds the allowable range (1~16777215).	
Failure code F034h	The protection level, P5-94 exceeds the allowable range (-1~7).	

Failure code F035h	The protection level, P5-94 exceeds the allowable range $(0~1)$ .
Success code 1003h	

The following macros are available from version V1.026 (included):

Command code 0004h	Motion parameter protection: unlock the protection		
Macro parameters	P5-96= enter the password (1~16777215)		
If the protection func failure code. If entering the wrong	If entering the wrong password, failure code Ennn will be sent back. nnn means the rest decode number. It will be misused one number after one failure. When the		
	Protection function is unlocked and it cannot repeat unlock.		
Failure code F043h	The password setting exceed the allowable range (1~16777215)		
Failure code F044h	The number of times of entering wrong password exceeds the limit: Lock for good. Reset the parameter (P2-08=10) to unlock it is the only method. However, all parameter will return to the default value.		
Failure code Ennnh	Incorrect password setting: Failed to unlock. nnn: the rest decode number. It will be minuses one number after one failure. When the number is 0, it will be locked for good.		
Success code 1004h			

The following macros are available from version 1.024 (included):

Command code 0006h	Build up E-Cam table: flying shear, including synchronous area (7 areas)
General parameters	P5-81= Address of table (Data array) P5-82 = 7 (This macro is fixed to 7 areas) P1-44, P1-45 = E-gear ratio (it has to be setup in advance)
Macro parameters	<ul> <li>P5-94 = A (Deceleration ratio: numerator) x C (Number of cutter)</li> <li>P5-95= B (Deceleration ratio: denominator)</li> <li>P5-96= 1000000 x R x V</li> <li>Among them:</li> <li>R (cutting ratio) = L (cutting length) / l (Girth of cutter)</li> <li>Allowable cutting ratio: (0.3 ~ 2.5) times</li> <li>V (Speed factor) = target cutting speed / speed of delivered product</li> </ul>

V=1.0: When cutting, the speed of cutter is the same as the		
product		
V=1.1: When cutting, the speed of cutter is 10% faster than the product		
V=0.9: When cutting, the speed of cutter is 10% slower than the product		
This macro will calculate the data of E-Cam table according to the above mentioned parameters, and store in data array which designated by P5-81.Parameters listed above are related to E-Cam table calculation. Please correctly setup those parameters before executing this macro.		
After this macro is executed, if the above parameters have been changed, it has to recreate the E-Cam table and this macro will have to be executed again. Data in E-Cam table will be changed after executing this macro; thus, do not execute it when E-Cam is in engaged status.		
In E-Cam application, parameters, such as P5-83 and P5-84 that are not related to this macro are not listed here. Users could setup parameters according to the real application. Please refer to Chapter 7, sections about E-Cam.		
After executing this macro, E-Cam table will not be saved to EEPROM automatically.		
When creating the table, E-Cam is in engaged status.		
The setting value of P5-94 exceeds the range: $(1 \sim 65535)$		
The setting value of P5-95 exceeds the range: (1 ~ 65535)		
The setting value of P5-96 exceeds the range: (300000 ~ 2500000)		
The address specified by P5-81is too long and the space of data array is not enough.		
The setting value of P5-82 should be set to 7. Otherwise the command cannot be executed.		
Data calculation error. Please decrease the setting value of (P1-44, P1-45) and keep the proportion will do.		

Command code 0007h	Create E-Cam table: Flying cut
General parameters	P5-81 = Address of table (data array) P5-82 = N (30~72) (Area number of E-Cam) P1-44, P1-45 = E-gear ration (has to be setup first)
Macro parameters	P5-93.H16 (high 16-bit) = S P5-93.L16 (low 16-bit) = W Among them: S (curve level) = $1 \sim 4$ levels W (degree of waiting area) = $-1 \sim 170$ degrees W = $-1$ is available in firmware version V1.038 (sub29) (or the later version) P5-94 = Y (degree of synchronous area) = $0 \sim 330$ degrees P5-95.H16 (high 16-bit) = A x C

	<ul> <li>P5-95.L16 (low 16-bit) = B</li> <li>Among them:</li> <li>A (Deceleration ratio: numerator), C (Number of cutter)</li> <li>B (Deceleration ratio: denominator)</li> <li>P5-96 = 1000000 x R x V</li> <li>Among them:</li> <li>R (cutting ratio) = L (target cutting length) / ℓ (Length of cutter)</li> <li>Allowable cutting ratio: (0.05 ~ 5.0) times</li> <li>V (speed factor) = target cutting speed / speed of delivered product</li> <li>V=1.0: When cutting, the speed of cutter is the same as the product</li> <li>V=1.1: When cutting, the speed of cutter is 10% faster than the product</li> </ul>	
	V=0.9: When cutting, the speed of cutter is 10% slower than the product	
Noto:		
Note:		
W' = 180 + 360/N - 1000	30U/K + Y/Z	
When		
	< W', E-cam table is in error (failure code F07Ah)	
	= W <sup>r</sup> , the initial speed is 0 in E-Cam table	
3. P5-93.L16 > W', the initial speed > 0 in E-Cam table This macro will calculate the data of E-Cam table according to the above mentioned parameters, and store in data array which designated by P5- 81.Parameters listed above are related to E-Cam table calculation. Please correctly setup those parameters before executing this macro.		
After this macro is executed, if the above parameters have been changed, it has to recreate the E-Cam table and this macro will have to be executed again. Data in E-Cam table will be changed after executing this macro; thus, do not execute it when E-Cam is in engaged status.		
In E-Cam application, parameters, such as P5-83 and P5-84 that are not related to this macro are not listed here. Users could setup parameters according to the real application. Please refer to Chapter 7, sections about		
After executing this macro, E-Cam table will not be saved to EEPROM automatically.		
Failure code F071h	When creating the table, E-Cam is in engaged status.	
Failure code F072h	P5-94 degree of synchronous area exceeds the range: (0 $\sim$ 330)	
Failure code F073h	P5-93.H16 curve level exceeds the range: (1 ~ 4)	
Failure code F074h	P5-93.L16 degree of waiting area exceeds the range: (0 ~ 170)	
Failure code F075h	The setting value of P5-96 exceeds the range: (50000 ~ 5000000)	
Failure code F076h	P5-82 area number of E-Cam exceeds the range: (30 ~ 72)	

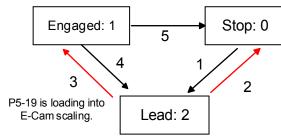
Failure code F077h	The address specified by P5-81is too long and the space of data array is not enough.
Failure code F078h	Data calculation error. Please decrease the setting value of (P1-44, P1-45) and keep the proportion will do.
Failure code F079h	Acceleration degree is too small, and then please decreases the value of waiting area (W), synchronous area (Y) or curve level (S).
Failure code F07Ah	Waiting area is too small, then please increase the value of acceleration area (W) or decrease the value of synchronous area (Y)

The following macros are available from version V1.042 sub09 (included):

Command code 0008h	E-Cam curve scaling (P5-19) is effective immediately
Macro parameters	N/A

This macro can be triggered when E-cam is engaged. P5-19 is effective immediately.

Usually, E-Cam scaling is only changed by P5-19 when it entering the engaged condition (see transition 3). It cannot be changed in engaged condition. E-Cam scaling only can be changed after one E-Cam cycle so as to make sure the E-Cam can return to the original position without accumulative error.



In application, two ways can change the setting of E-Cam curve scaling.

- 1. **P5-88.X2 = 1**: When E-Cam is engaged, setup this bit at the same time. Function of P5-19 will be enabled immediately.
- Use macro#8: Every time when this macro command is triggered, function of P5-19 will be enabled. However, if the value of P5-19 is changed and this macro is not triggered, function of P5-19 will not be enabled. This macro command has to be triggered again.

Failure code	N/A
--------------	-----

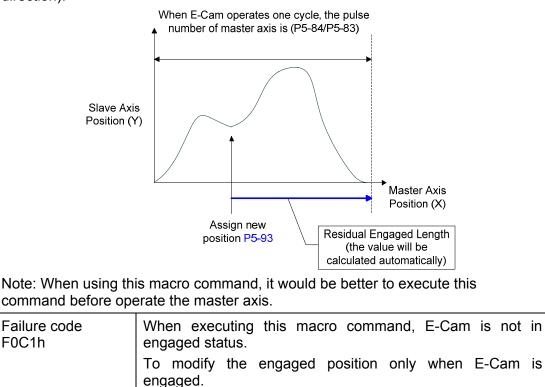
The following macros are available from version V1.035 sub00 (included):

Command code 000Ch	Change position X, where E-Cam is engaged: E-Cam disengages after rotating one cycle at forward direction.
General parameters	N/A
Macro parameters	P5-93 = New engaged position X. Unit: pulse number of master axis.
	Monitoring variable 062(3Eh): It displays the current engaged position (X) of master axis.
This macro command can change the engaged position even when E-Cam is	

engaged. It will automatically calculate the residual engaged length. E-Cam will disengage after rotating one cycle at forward direction. Users have to set P5-88.U to 2, 4, and 6; otherwise, the E-cam will not disengage.

E-Cam will disengage when alarm occurs or the power supply is cut off. If users desire E-Cam to re-engage at the last disengaged position and continue its operation, it is recommended to record the disengaged position (X) and resume the operation by this macro command. Please note that when E-Cam is disengaged, the servo position might slightly shift and therefore cause position error when E-Cam re-engages again.

The Engaged direction is in forward direction (Master axis operates at forward direction):



Failure code F0C2h	The setting value of P5-93 is in error. The value cannot less than 0. It should $> = 0$ .
Failure code F0C3h	The setting value of P5-93 is in error. The value has to less than the value of (P5-84 / P5-83)

The following macros are available from version V1.038 sub48 (included):

Command code 000Dh	Calculate the error between E-Cam and indexing coordinates for PR positioning.
General Parameters	N/A
Macro Parameters	P5-93.Low_Word = DCBA: UZYX (8 digits, HEXADECIMAL) YX (PR number) = 0~0x3F (it is invalid when the value is set to 0) UZ: The value has to be set to 0. BA (Function of P5-95): 0 (Use avoid point) · 1 (Use available forward rate, V1.038 sub53)

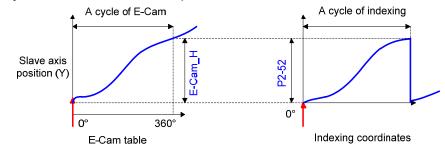
DC (Inhibit reverse rotation):
0 (invalid),
1(Inhibit reverse rotation, V1.038 sub53)
P5-95: Avoid point (cannot pass this point) = $0 \sim 100$ (%) of E-Cam cycle or available forward rate $0 \sim 100$ (%)

Monitoring variable 091(5Bh): It displays the current indexing coordinate position (PUU)

When E-Cam is engaged, and the motor is stopped because of Servo Off or alarm occurs, it would cause position error between the actual position and E-Cam position. After re-servo On, this macro command can be used to calculate the correction value and write the value into the specified PR for incremental positioning. So that the motor can return to the ideal E-Cam position.

When using this macro command:

- 1. P5-88.X1 = 1 to make E-Cam keep engaging when servo off and continue to calculate E-Cam position.
- 2. The height of indexing coordinate and E-Cam coordinate should be the same: P2-52= ECAM\_H (The moving distance when E-cam operates one cycle)
- 3. E-Cam table scaling (P5-19) must be 1.0 time
- 4. When E-Cam is engaged for the first time, 0 degree of E-cam should aim at 0 degree of indexing coordinate.
- 5. This macro command only can be applicable on periodic cycle and when every cycle starts from the same position.



Note 1: ECAM\_H (height of E-Cam table) = E-Cam table (last point - first points)

Note 2: Indexing coordinate = (absolute coordinates / P2-52) take remainder.

Note 3: Use PR command for incremental positioning control.

When motor moves from the current position to the target position, it can operate at forward or reverse direction. Due to the cyclic operation, the motor will travel to the specified position either at forward or reverse direction. However, the moving distance is different between both. Uses avoid point to plan the timing of forward and reverse rotation.

\* Avoid point: the point that cannot be passed by the planned PR.

	Section E-Cam current position							
E-Cam current position								
E-Cam avoid point Θ, which is set by P5-95								
	Cannot pass O <sup>o</sup> O = 360° x P5-95% Actual traveling distance							
Failure code F0D1h	E-Cam is not engaged when executing this macro command. E-Cam should be engaged.							
Failure code F0D2h	The value of P5-93.YX (PR number) exceeds the range: 1 $\sim$ 0x3F							
Failure code F0D3h	The value of P5-95 (available forward rate) exceeds the range: 0 $\sim$ 100 (%)							
Failure code F0D5h	The position correction value does not exist. This macro command might be triggered twice.							
Failure code F0D6h	When re-servo On, E-cam is not engaged.							
Failure code F0D7h	The height (Y axis) of E-Cam table is not equal to the value of P2-52.							
Failure code F0D8h	P5-19 is not equal to 1							
Failure code F0D9h	P5-93.BA, P5-95 exceeds the range: 0 ~ 1							
Failure code F0DAh	The setting value of P5-93.DC (reverse inhibit) exceeds the range: $0 \sim 1$							
Failure code F0DBh	The function of reverse inhibit has failed. Do not use macro command #D, #10h consecutively.							

The following macros are provided after version V1.038 sub26 (included):

Command code 000Eh	Perform E-Cam alignment immediately and write the correction value into the specified PR.
Macro parameters	<ul> <li>P5-93 = DCBA : UZYX (8 digits, HEXADECIMAL)</li> <li>YX (PR number) = 0~0x3F, it is invalid when the value is set to 0.</li> <li>UZ (Max. alignment correction rate) = 0~0x64 (%)</li> <li>A (Trigger the specified PR directly) = 1: On, 0: Off</li> <li>DCB = has to be set to 0</li> <li>P5-94 (DI delay time compensation) = -25000 ~ +25000;</li> <li>Unit: usec.</li> <li>P5-95 (available forward rate) = 0 ~ 100 (%)</li> </ul>

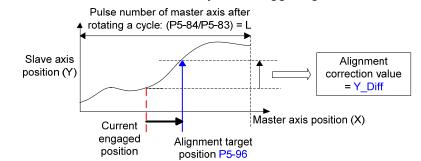
P5-96 (target position of alignment X); Unit: pulse number of
master axis = 0 ~ (P5-84/P5-83) – 1.

Monitoring variable 062(3Eh): It displays the current engaged position of master axis (X)

This macro command can move the engaged position to the alignment target position (X) when E-Cam is engaged. And write the alignment correction value into the specified PR.

During E-Cam operation (When E-Cam is engaged), if desire to quickly align the Ecam position to the mechanical referral point, sensor can be used to trigger DI.EVx to execute this macro command.

After E-Cam alignment is completed, the engaged position will move to the new position. The excess or not enough moving distance after E-Cam operates one cycle is called alignment correction value. It will be written into PR specified by P5-93.YX. PR incremental command can be used to compensate this value so that the slave axis position will remain and offset the phase of E-Cam to align the referral position of machine. For some applications, set value of P5-93.YX to 0 will do. Please note that PR can be executed only when triggering the host controller.



\* P5-93.UZ is able to limit the max. correction rate. The alignment target position

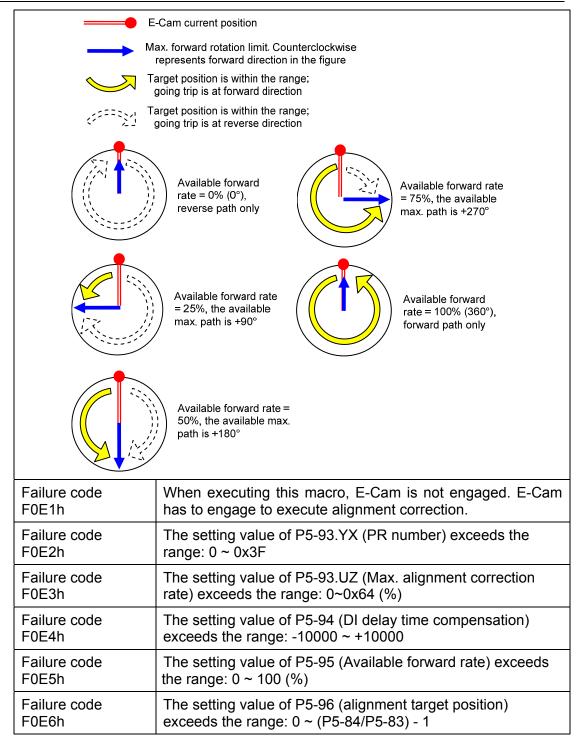
★ will be different from P5-96.

| alignment target position  $\star$  – current engaged position | / L <= P5-93.UZ %

\* DI time delay compensation can be set via P5-94, it can correct the error caused by different speed of motion.

When E-Cam moves from current position to the target one, it can rotate at forward or reverse position. Due to the cyclic operation, it can reach the target position either at forward or reverse direction. However, the moving distance between both is usually different. Use available forward rate to plan the timing of forward and reverse rotation.

\* Available forward rate: The available max. proportion of forward path



The following macros are available from version V1.038 sub26 (included):

Command code 000Fh	Calculate the moving distance between current and target position of E-Cam for PR positioning.					
General parameters	N/A					
Macro parameters	P5-93.Low_Word = UZYX (4 digits, HEXADECIMAL) YX (PR number of going trip) = 0~0x3F, it is invalid if the value is set to 0. UZ (PR number of return trip) = 0~0x3F, it is invalid if the value is set to 0.					

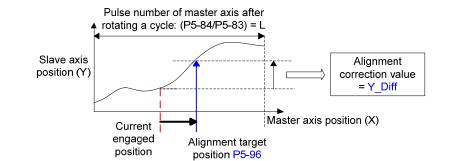
P5-93.Hi_Word = it has to be set to 0 P5-95 (Available forward rate) = 0 ~ 100 (%)
P5-96 (target position X ); Unit: pulse number of master axis = $0 \sim (P5-84/P5-83) - 1$

Monitoring variable 062(3Eh): It displays the current engaged position (X) of master axis (X)

This macro command calculates the moving distance between current and target engaged position (X) and writes into the specified PR.

During E-Cam operation, if users desire to move the slave axis to the specified position when master axis stops and still in engaged status, this macro command can calculates the correct moving distance (Y\_Drift) of going trip for PR positioning.

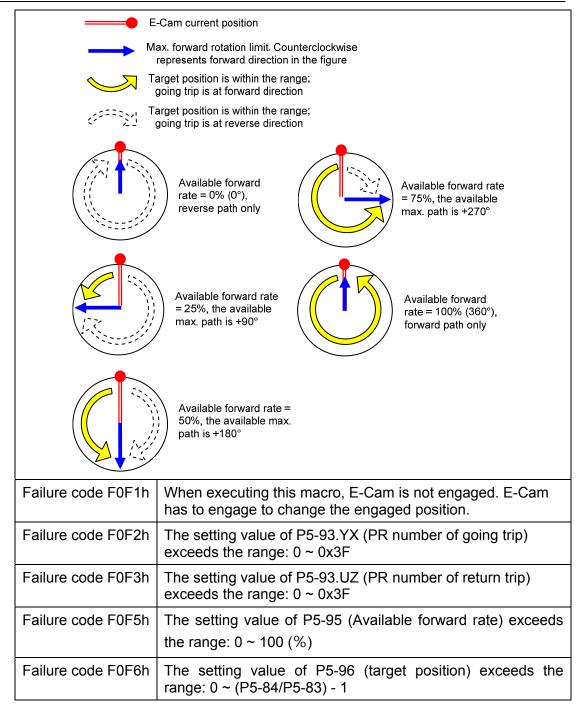
When master axis resumes the operation, use another PR to run the moving distance of return trip (-Y\_Drift), it can back to the original position (moving distance of going trip + moving distance of return trip = 0). E-Cam position remains the same.



Note: PR command must be the incremental command, regardless in going trip or return trip.

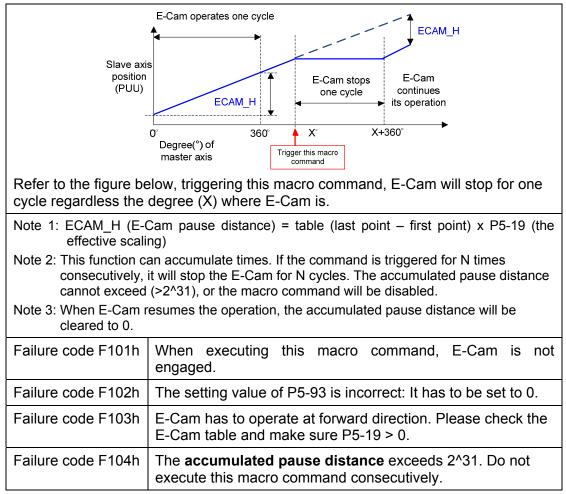
When E-Cam moves from current position to the target one, it can rotate at forward or reverse position. Due to the cyclic operation, it can reach the target position either at forward or reverse direction. However, the moving distance between both is usually different. Use available forward rate to plan the timing of forward and reverse rotation.

\* Available forward rate: The available max. proportion of forward path



#### The following macros are available from version V1.042 sub09 (included):

Command code 0010h	E-Cam stops for one cycle and resumes its operation at next cycle.					
General parameters	N/A					
Macro parameters	Value of P5-93 has to be set to 0.					
After E-Cam is engaged distance regardless f	ged, this macro command can stop the slave axis for a cycle of the E-Cam degree.					
The following conditi	ons have to be established when using this macro command.					
1. E-Cam must be in engaged status.						
2. E-Cam must be th stop temporally.	e forward operation curve (including straight line) so it can					



Note: A2L does not support E-Cam function.

P5-98	EVON	PR#	t Triggered by Eve	Address: 05C4H 05C5H	
	Operatio Interface	nal e :	Panel / Software	Communication	Related Section: -
	Default :		0		
	Con Mode		PR		
	Unit : Range :		-		
			0000 ~ 0xDDDD		
	Data Size	e : '	16-bit		
	Forma	nt:I	Hexadecimal		

# Settings : Four items: UZYX

When EVx is set to ON, the PR# will be executed.

X=0: When EV1 is ON, PR will not be triggered.

X=1~D: When EV1 is ON, execute PR # 51~63.

Y=0: When EV2 is ON, PR will not be triggered.

Y=1~D: When EV2 is ON, execute PR # 51~63.

Note: EV3 and EV4 are supported after firmware V1.009.

- Z=0: When EV3 is ON, PR will not be triggered.
- Z=1~D: When EV3 is ON, execute PR # 51~63.

U=0: When EV3 is ON, PR will not be triggered.

U=1~D: When EV4 is ON, execute PR # 51~63.

EVOF PR	Triggered by Event Falling-Edge	Address: 05C6H 05C7H
Operational Interface :	Panel / Software Communication	Related Section: -
Default :	)	
Control Mode :	PR	
Unit :		
Range :	0000 ~ 0xDDDD	
Data Size :	16-bit	
Format :	Hexadecimal	
Settings :	Four items: UZYX When EVx is set to OFF, the PR# will b X=0: When EV1 is OFF, PR will not be X=1~D: When EV1 is OFF, execute PR Y=0: When EV2 is OFF, PR will not be Y=1~D: When EV2 is OFF, execute PR Note: EV3 and EV4 are supported after Z=0: When EV3 is OFF, PR will not be Z=1~D: When EV3 is OFF, execute PR J=0: When EV4 is OFF, PR will not be	triggered. # 51~63. triggered. # 51~63. firmware V1.009. triggered. # 51~63. triggered.

6-00	ODEF Ho	ming Definition	Address: 0600H 0601H		
	Operational Interface :	Panel / Software	Communication	Related Section; 7.10	
	Default :	0x0000000			
	Control Mode :	PR			
	Unit :	-			
	Range :	0x00000000 ~ 0x10	FFF3F		
	Data Size :	32-bit			
	Format :	Hexadecimal			

### P6-xx PR Parameters (Please refer to Chapter 7 for detailed setting)

Settings : Homing definition:

0							
.31 ~ 28	.27 ~ 24	.23 ~20	.19 ~ 16	.15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0
BOOT	-	DLY	-	DEC1	ACC	PA	TH

### PATH: Path type (64-bit)

- 0: Stop: Homing complete and stop
- 1 ~ 3F: Auto: Homing complete and execute the specified path (Path#1 ~ Path#63)
- ACC: Select 0~F for acceleration time and corresponds to

P5-20~P5-35.

- DEC1: The deceleration time selection of 1<sup>st</sup> homing, the setting value of DEC is 0~F and corresponds to P5-20 ~ P5-35.
- DLY: Select 0~F for the delay time and corresponds to P5-40 ~ P5-55
- BOOT: When the servo drive applies to the power, if it will be executed searching the origin.
  - 0: Do not do homing
  - 1: Execute homing automatically (SRV ON for the first time after applying to power)

Apart from the above mentioned definition, the related setting of homing also includes:

- 1. P5-04 Homing mode
- 2. P5-05 ~ P5-06 Speed setting of searching the origin
- 3. P6-01: ORG\_DEF is the location of the origin. It may not be 0. This function is the offset of coordinate system.
- A. After the origin is found (Sensor or Z); it has to decelerate to stop. The stop position will exceed the origin for a short distance.

If it does not return to the origin, set PATH to 0.

If it needs to return to the origin, set PATH to non-zero value and set PABS = ORG\_DEF.

B. If the origin is found (Sensor or Z), desire to move an offset S and define the coordinate as P after moving, then PATH = non-zero and set ORG\_DEF = P-S. The absolute position command = P.

P6-01	ODAT	Ori	gin Definition						Address: 0602H 0603H			
	Operatio Interface		Panel / So	oftware	Cc	mmunicat	tion	Relate 7.10	d Section	:		
	Defau	ault : 0										
	Control Mode:											
	Uni	it:	-									
	Range	e :	: -2147483648 ~ +2147483647									
	Data Size	e :	32-bit									
	Forma	it :	Decimal	ecimal								
	Setting	s:	Value of origin definition:									
	.31~     .27~     .23     .19~     .15~     12       28     24     ~20     16     12					11 ~ 8	7~4	3~0				

P6-02	PDEF1 PA	TH#1 Definition	Address: 0604H 0605H			
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10		
	Default:	0x0000000	0x0000000			
	Contro Mode :	PR				
	Unit :	Unit : -				
	Range :	0x00000000 ~ 0xFFI	0x00000000 ~ 0xFFFFFFF			
	Data Size :	32-bit				
	Format :	Hexadecimal				

Settings : Properties of PATH# 1:

	.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	
7	6	5	4 BIT	3 ~ 0 BIT	
-	- UNIT 22AUT INS 1: SPEED, Speed setting control		1: SPEED, Speed setting control		
		OVLP	2INS	<ol> <li>SINGLE, Positioning control. It will load in the next path when finished.</li> </ol>	
Cr	CMD			<ol> <li>AUTO positioning control. It will load in the next path when finished.</li> </ol>	
-	-	-	INS	7: JUMP to the specified path	
		AUTO	INS	8: Write the specified parameter to the specified path	

TYPE: 1 ~ 3 accept DO.STP stop and software limit.

INS: When executing this PR, it interrupts the previous one.

OVLP: Allow the overlap of the next path. The overlap is not allowed in speed mode. When overlap happens in position mode, DLY has no function.

AUTO: When PR procedure completes, the next procedure will be loaded in automatically.

CMD: Refer to Chapter 7 for PR command description.

DLY: 0 ~ F, delay time number (4 BIT). The delay after executing this PR. The external INS is invalid.

24DLY (4) Index P5-40 ~ P5-55

P6-03	PDAT1 PA	TH# 1 Data	Address: 0606H 0607H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range : -2147483648 ~ +2147483647			
	Data Size :	32-bit		
	Format :	Decimal		

# Settings : PATH# 1 Data

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

Property of P6-02; P6-03 corresponds to the target position of P6-02 or jump to PATH\_NO.

P6-04	PDEF2 PA	TH# 2 Definition	ΓH# 2 Definition		
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10	
	Default :	0x0000000			
	Contro Mode :	PR			
	Unit :	_	-		
	Range :	0x0000000 ~ 0xFF	FFFFFF	-	
	Data Size :	32-bit			
	Format :	Hexadecimal			
	0	Please refer to the (	description of P6-02		

P6-05	PDAT2	ATH# 2 Data	Address: 060AH 060BH	
	Operationa Interface :		Communication	Related Section: 7.10
	Default :	0		
	Contro Mode:	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Please refer to the o	description of P6-03.	

P6-06	PDEF3	PATH# 3 Definition		Address: 060CH 060DH
	Operatio Interface	Donal / Coffigera	Communication	Related Section: 7.10
	Defaul	t: 0x0000000		
	Con Mode	PR		
	Uni	t:-		
	Range	e:0x00000000~0xFF	FFFFF	
	Data Size	e : 32-bit		
	Forma	t : Hexadecimal		
				-4

P6-07	PDAT3 P	ATH# 3 Data	TH# 3 Data		
	Operationa Interface	Panel / Software Communication		Related Section: 7.10	
	Default	0			
	Contro Mode	PR			
	Unit	-			
	Range	-2147483648 ~ +21	47483647	-	
	Data Size	32-bit			
	Format	Decimal			
	Settings	Please refer to the description of P6-03.			

P6-08	PDEF4 P	ATH# 4 Definition	TH# 4 Definition		
	Operation Interface	al : Panel / Software	Communication	Related Section: 7.10	
		: 0x0000000			
	Contr Mode	ol PR			
	Unit	: -			

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-09	PDAT4 PA	TH# 4 Data	Address: 0612H 0613H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0	)	
	Control Mode :	PR		
	Unit :	-	- -2147483648 ~ +2147483647	
	Range :	-2147483648 ~ +21		
	Data Size :	32-bit		
	Format :	Decimal	Decimal	
		Diagon refer to the	description of P6.03	

P6-10	PDEF5 PA	TH# 5 Definition		Address: 0614H 0615H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the c	lescription of P6-02.	

P6-11	PDAT5	PA	TH# 5 Data		Address: 0616H 0617H
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.10
	Defau	lt :	0		
	Con Mode		PR		
	Un	it :	-		
	Range	e :	-2147483648 ~ +2147	483647	
	Data Size	e :	32-bit		
	Forma	at :	Decimal		
			<b>D (</b> ) () ()		•

P6-12	PDEF6 PA	TH# 6 Definition	Address: 0618H 0619H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode : PR			
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format : Hexadecimal			4
	Settings : Please refer to the description of P6-02.		description of P6-02.	

P6-13	PDAT6	ATH# 6 Data	Address: 061AH 061BH	
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10
	Default:0			
	Contro Mode	: PR		
	Unit	: -		

Range : -2147483648 ~ +2147483647	
Data Size:32-bit	
Format : Decimal	

P6-14	PDEF7 PA	TH# 7 Definition	TH# 7 Definition		
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10	
	Default :	0x0000000			
	Contro Mode :	PR			
	Unit :	; -			
	Range : 0x0000000 ~ 0xFFFFFFFF				
	Data Size :	32-bit			
	Format :	Hexadecimal			
	Settings : Please refer to the description of P6-02.				

P6-15	PDAT7 PA	ATH# 7 Data	ΓH# 7 Data		
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10	
	Default :	0			
	Contro Mode:	PR			
	Unit :	-			
	Range :	-2147483648 ~ +21	47483647		
	Data Size :	32-bit			
	Format :	Decimal			

P6-16	PDEF8	PATH# 8 Definition		Address: 0620H 0621H
	Operatio Interface		Communication	Related Section: 7.10
	Defau	t : 0x0000000		
	Con Mode	PR		~~
	Uni	t : -		
	Range	e:0x00000000~0xFF	FFFFFF	
	Data Size	e : 32-bit		
	Forma	t : Hexadecimal		
	·			

P6-17	PDAT8 PA	TH# 8 Data	Address: 0622H 0623H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Control Mode:	Control Mode : PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format : Decimal			
	0 - 44:	Please refer to the a	description of P6-03	

P6-18		ATH# 9 Definition	Address: 0624H 0625H	
	Operation Interface	al Panel / Software	Communication	Related Section: 7.10
	Default : 0x0000000			
	Contr Mode	: PR		
	Unit			

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-19	PDAT9 PA		Address: 0626H 0627H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Contro Mode :	PR		
	Unit :	-	-	
	Range :	Range : -2147483648 ~ +2147483647		
	Data Size :	32-bit		
	Format :	Decimal		
		Diagon refer to the	deceriation of DC 00	

Settings : Please refer to the description of P6-03.

P6-20	PDEF10 P/	ATH# 10 Definition	FH# 10 Definition		
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10	
	Default :	0x0000000			
	Contro Mode :	PR			
	Unit :	-			
	Range :	0x00000000 ~ 0xFF	00 ~ 0xFFFFFFF		
	Data Size :	32-bit			
	Format : Hexadecimal				
	Cattinana i	Please refer to the	description of P6-02		

P6-21 P	DAT10 P	ATH# 10 Data		Address: 062AH 062BH
(	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10
	Default	: 0		
	Contro Mode	PR		
	Range	: -2147483648 ~ +214	47483647	
C	Data Size	: 32-bit		
	Format	Decimal		

P6-22	PDEF11 PA	TH# 11 Definition		Address: 062CH 062DH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode : PR			
	Unit :	-		
	Range :	0x0000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		

P6-23	PDAT11 P	ATH# 11 Data	TH# 11 Data		
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10	
	Default	: 0	D		
	Contro Mode	DD	PR		
	Unit	: -			
	Range	-2147483648 ~ +2147483647			
	Data Size	: 32-bit			

Format : Decimal

Settings : Please refer to the description of P6-03.

	PDEF12 PATH# 12 Definition		Address: 0630H 0631H
Operatior Interface	al Panel / Software	Communication	Related Section: 7.10
Default	: 0x0000000		
Cont Mode	PR		
Unit	: -		
Range	: 0x0000000 ~ 0xFF	FFFFF	
Data Size	: 32-bit		
Format	: Hexadecimal		
	Please refer to the	description of P6 02	

P6-25	PDAT12 PA	TH# 12 Data	Address: 0632H 0633H	
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0	C	
	Contro Mode:	PR		
	Unit :	-	-	
	Range :	-2147483648 ~ +21	-2147483648 ~ +2147483647	
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Please refer to the	description of P6-03.	

P6-26	PDEF13	PATH# 13 Definition		Address: 0634H 0635H
	Operation Interface	Donal / Cottwara	Communication	Related Section: 7.10
	Defaul	t: 0x0000000		
	Cont Mode	PR		
	Uni	t:-		
	Range	e:0x00000000~0xFF	FFFFFF	
	Data Size	e : 32-bit		
	Forma	t : Hexadecimal		
	L			4

P6-27	PDAT13	ATH# 13 Data		Address: 0636H 0637H
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Contro Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size : 32-bit			
	Format :	Format : Decimal		
	0 - 443	Please refer to the o	description of P6-03	

P6-28	PDEF14 P/	ATH# 14 Definition	Address: 0638H 0639H	
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10
		0x0000000		
	Contro Mode :	<sup>)I</sup> PR		
	Unit :	-		

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-29	PDAT14 PA	TH# 14 Data	Address: 063AH 063BH	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default : 0			
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format :	Decimal		
	·	Diagon refer to the		

P6-30	PDEF15 PA	TH# 15Definition	Address: 063CH 063DH	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the c	lescription of P6-02.	1

P6-31	PDAT15	PATH# 15 Data	TH# 15 Data		
	Operation Interface	Donal / Sattwara	Communication	Related Section: 7.10	
	Default	t: 0			
	Cont Mode	PR			
	Unit	t:-			
Range :		e:-2147483648~+21	-2147483648 ~ +2147483647		
	Data Size	e : 32-bit			
	Format	t : Decimal			

P6-32	PDEF16 PA	TH# 16 Definition	Address: 0640H 0641H	
	Operational Interface : Panel / Software Commun		Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the description of P6-02.		

P6-33		PATH# 16 Data		Address: 0642H 0643H
	Operation Interface	nal Panel / Software	Communication	Related Section: 7.10
	Defaul		0	
	Cont Mode	e: PR		
	Uni			

Range :	-2147483648 ~ +2147483647
Data Size :	32-bit
Format :	Decimal

P6-34		TH# 17 Definition	Address: 0644H 0645H	
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000	0x0000000	
	Contro Mode:	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFI	0x00000000 ~ 0xFFFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
		Diago refer to the	description of D6 02	

Settings : Please refer to the description of P6-02.

P6-35	PDAT17 P	ATH# 17 Data	Address: 0646H 0647H	
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10
	Default	ault : O		
	Contro Mode	PR	PR	
	Unit	: -		
	Range : -2147483648 ~ +2147483647			
	Data Size : 32-bit			
	Format	: Decimal		
	Diagona refer to the description of DC 02			

P6-36	PDEF18	PATH# 18 Definition		Address: 0648H 0649H
	Operatior Interface		Communication	Related Section: 7.10
	Default	: 0x0000000		
	Cont Mode	PR		
	Unit	: -		
	Range	: 0x0000000 ~ 0xFFF	FFFFF	
	Data Size	: 32-bit		
	Format	: Hexadecimal		
			( D0 00	1

P6-37	PDAT18	ATH# 18 Data	TH# 18 Data		
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10	
	Default :	0			
	Contro Mode :	PR			
	Unit :	-	-		
	Range : -2147483648 ~ +2147483647 Data Size : 32-bit				
	Format :	: Decimal			
	0 - 443	Please refer to the o	description of P6-03		

P6-38	PDEF19 P	ATH# 19 Definition	Address: 064CH 064DH	
	Operation Interface	al Panel / Software	Communication	Related Section: 7.10
	Default	: 0x0000000		
	Contro Mode	: PR		
	Unit			

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-39	PDAT19	ATH# 19 Data	TH# 19 Data		
	Operationa Interface :		Communication	Related Section: 7.10	
	Default :	0			
	Contro Mode:	DD			
	Unit :	-			
	Range :	-2147483648 ~ +2147	483647		
	Data Size :	32-bit			
	Format :	Decimal			
		Diagon refer to the day	parintian of DG 02		

P6-40	PDEF20 PA	TH# 20 Definition	Address: 0650H 0651H	
	Operational Interface :	Panel / Software Communication		Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the description of P6-02.		

P6-41	PDAT20	PATH# 20 Data		Address: 0652H 0653H
	Operatio Interface	Danal / Sattwara	Communication	Related Section: 7.10
	Defaul	t: 0		
	Con Mode	PR		
	Uni	t : -		
	Range	e:-2147483648~+214	47483647	
	Data Size	e : 32-bit		
	Forma	t : Decimal		-

P6-42	PDEF21 PA	TH# 21 Definition		Address: 0654H 0655H
	Operational Interface :	Panel / Software Communication		Related Section: 7.10
	Default :	0x0000000		
	Control Mode:	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	-
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the c	Please refer to the description of P6-02.	

P6-43	PDAT21	PATH# 21 Data		Address: 0656H 0657H
	Operatior Interface	al Panel / Software	Communication	Related Section: 7.10
	Default	: 0	0	
	Conti Mode	DD DD		
	Unit			
		: -2147483648 ~ +214	-2147483648 ~ +2147483647	

Data Size	:	32-bit	

Format : Decimal

Settings : Please refer to the description of P6-03.

P6-44		TH# 22 Definition	Address: 0658H 0659H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	Range : 0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32-bit		
	Format :	Hexadecimal		
		Place refer to the	description of P6.02	1

P6-45	PDAT22	PATH# 22Data	TH# 22Data		
	Operation Interface	nal Panel / Software	Communication	Related Section: 7.10	
	Default	:: 0			
	Cont Mode	DD			
	Unit	t: -			
	Range	e:-2147483648~+21	47483647		
	Data Size	e : 32-bit			
	Format	: Decimal			
	Settings	Please refer to the	description of P6-03.		

P6-46	PDEF23	PA	TH# 23Definition		Address: 065CH 065DH
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.10
	Defau	lt :	0x0000000		
	Con Mode		PR		4
	Un	it :	-		
	Rang	e :	0x00000000 ~ 0xFF	FFFFF	
	Data Siz	e :	32-bit		
	Forma	at :	Hexadecimal		-
	L				-1

P6-47	PDAT23	PATH# 23Data	TH# 23Data	
	Operatic Interfac	Donal / Cotturara	Communication	Related Section: 7.10
	Defau	lt : 0		
	Con Mod	PR		
	Un	it : -		
	Rang	e:-2147483648~+21	47483647	
	Data Siz	e : 32-bit	32-bit	
	Forma	at : Decimal	Decimal	
	Setting	s : Please refer to the $c$	Please refer to the description of P6-03.	

P6-48	PDEF24	PATH# 24Definition	Address: 0660H 0661H	
		nal Panel / Software	Communication	Related Section: 7.10
		t: 0x0000000		
	Con Mode	trol PR e :		
	Uni	t:-		

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-49	PDAT24 P	ATH# 24Data	ΓH# 24Data		
	Operationa Interface	Donal / Softwara	Communication	Related Section: 7.10	
	Default	: 0	0		
	Contro Mode	PR			
	Unit	: -	-		
	Range	: -2147483648 ~ +21	47483647		
	Data Size	32-bit			
	Format	Decimal			
	Settings	Please refer to the	description of P6-03.		

P6-50	PDEF25 PA	TH# 25Definition	Address: 0664H 0665H	
	Operational Interface :	Panel / Software Communication		Related Section: 7.10
	Default :	0x0000000	0x0000000	
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	0x00000000 ~ 0xFFFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the c	lescription of P6-02.	

P6-51	PDAT25	PATH	# 25Data		Address: 0666H 0667H
	Operatio Interfac	·Do	nel / Software	Communication	Related Section: 7.10
	Defau	lt : 0			
	Con Mode	- DD	2		
	Un	it : -			
	Range	e : -21	47483648 ~ +214	7483647	
	Data Siz	e : 32-	-bit		
	Forma	at : De	cimal		

P6-52	PDEF26 PA	TH# 26Definition		Address: 0668H 0669H
	Operational Interface :		Communication	Related Section: 7.10
	Default :	t: 0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the o	description of P6-02.	

P6-53		PATH# 26Data		Address: 066AH 066BH
	Operatior Interface	nal Panel / Software	Communication	Related Section: 7.10
	Default	: 0		
	Cont Mode	DD		
	Unit			
		: -2147483648 ~ +214		

Data Size: 32-bit

Format : Decimal

Settings : Please refer to the description of P6-03.

PDEF27 PA	TH# 27Definition		Address: 066CH 066DH
	Donal / Coffwora	Communication	Related Section: 7.10
Default :	0x0000000		
Contro Mode :	PR		
Unit :	-		
Range :	0x0000000 ~ 0xFF	FFFFFF	
Data Size :	32-bit		
Format :	Hexadecimal		
	Operationa Interface : Default : Contro Mode : Unit : Range : Data Size :	Default : 0x0000000 Control Mode : PR Unit : -	Operational Interface :Panel / SoftwareCommunicationDefault :0x00000000CommunicationControl Mode :PRImage: -Unit :-Image: -Data Size :32-bit

Settings : Please refer to the description of P6-02.

P6-55	PDAT27 P	ATH# 27Data	TH# 27Data		
	Operation Interface	al Panel / Software	Communication	Related Section: 7.10	
	Default	: 0			
	Contr Mode	PR			
	Unit	: -			
	Range	: -2147483648 ~ +214	7483647		
	Data Size	: 32-bit			
	Format	: Decimal			
	C attin are	. Please refer to the de	escription of P6-03		

P6-56	PDEF28	ATH# 28Definition		Address: 0670H 0671H
	Operationa Interface :		Communication	Related Section: 7.10
	Default :	0x0000000		
	Contro Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	<u> </u>	Plaze refer to the (	description of P6-02	

P6-57	PDAT28	PATH# 28Data	TH# 28Data	
	Operatio Interfac		Communication	Related Section: 7.10
	Defau	lt : 0	0	
	Con Mode	PR	PR	
	Un	it : -		
	Range	e:-2147483648~+21	47483647	
	Data Sizo	e : 32-bit		
	Forma	it : Decimal		
	Setting	s: Please refer to the o	description of P6-03.	

P6-58		PATH# 29Definition		Address: 0674H 0675H
	Operatio Interface	nal e:Panel / Software	Communication	Related Section: 7.10
		t : 0x0000000		
	Con Mode	trol PR		
	Uni	it : -		

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-59	PDAT29 PA	TH# 29Data		Address: 0676H 0677H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +214	17483647	
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Please refer to the d	escription of P6-03.	

P6-60	PDEF30 PA	TH# 30Definition	Address: 0678H 0679H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the	description of P6-02.	

P6-61		PATH# 30Data		Address: 067AH 067BH
	Operatio Interface	nal Panel / Software e :	Communication	Related Section: 7.10
	Defau	t: 0		
	Con Mode	PR		
	Uni	t : -		
	Range	e:-2147483648~+21474	83647	
	Data Size	e:32-bit		
	Forma	t : Decimal		

P6-62	PDEF31 PA	TH# 31Definition		Address: 067CH 067DH
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Contro Mode :	Control Mode : PR		
	Unit :	-		
	Range :	0x0000000 ~ 0xFFFFFFF		
	Data Size :	Data Size : 32-bit		
	Format :	Hexadecimal		-
	Settings : Please refer to the description of P6-02.			

P6-63		AT31 PATH# 31Data		Address: 067EH 067FH
	:	nal Panel / Software	Communication	Related Section: 7.10
	Default	: 0		
	Cont Mode	rol PR		
	Unit	::-		

Range :	-2147483648 ~ +2147483647
Data Size :	32-bit
Format :	Decimal
L	

P6-64	PDEF32 P	ATH# 32Definition	Address: 0680H 0681H	
	Operation Interface		Communication	Related Section: 7.10
	Default	: 0x0000000	0x0000000	
	Contro Mode	PR		
	Unit	-		
	Range	: 0x00000000 ~ 0xFI	0x00000000 ~ 0xFFFFFFF	
	Data Size	: 32-bit	32-bit	
	Format	Hexadecimal		
	Settings	Please refer to the description of P6-02.		

P6-65	PDAT32 PA	TH# 32Data	Address: 0682H 0683H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	-2147483648 ~ +2147483647	
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Please refer to the o	description of P6-03.	

P6-66	PDEF33	PA <sup>.</sup>	TH# 33Definition		Address: 0684H 0685H
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.10
	Default :		0x0000000		
	Con Mode		PR		
	Un	it :	-		
	Range :		0x00000000 ~ 0xFFFFFFF		
	Data Siz	e :	32-bit		
	Forma	at :	Hexadecimal		
	L			: .:	

P6-67	PDAT33	PATH# 33Data	TH# 33Data	
	Operatio Interface	nal Panel / Software e :	Communication	Related Section: 7.10
	Defaul	t: 0	0	
	Cont Mode	PR		
	Uni	t:-	-	
	Range	e:-2147483648~+21	-2147483648 ~ +2147483647	
	Data Size	e : 32-bit	32-bit	
	Forma	t : Decimal		
	Settings : Please refer to the description of P6-03.			

P6-68	PDEF34	EF34 PATH# 34Definition		Address: 0688H 0689H
		nal Panel / Software	Communication	Related Section: 7.10
		Default : 0x0000000		
	Cont Mode	PR		
	Uni	t:-		-

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-69

69	PDAT34	ΡΑΤ	「H# 34Data	Address: 068AH 068BH	
	Operation Interface		Panel / Software	Communication	Related Section: 7.10
	Defaul	lt : C	)		
	Control Mode : PR				
	Uni	Unit : -			
	Range	e:-	-2147483648 ~ +21474	183647	
	Data Size	e:3	32-bit		
	Forma	at: C	Decimal		
	Settings	s:F	Please refer to the des	cription of P6-03.	•

P6-70	PDEF35 PA	TH# 35Definition		Address: 068CH 068DH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000	)x0000000	
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFf	0x00000000 ~ 0xFFFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		4

P6-71	PDAT35	PATH# 35Data		Address: 068EH 068FH
	Operation Interface	nal Panel / Software	Communication	Related Section: 7.10
	Defaul	t: 0		
	Cont Mode	PR		4 
	Uni	t:-		
	Range	e:-2147483648~+21	47483647	
	Data Size	e : 32-bit		
	Forma	t : Decimal		
		Please refer to the	description of D6 03	

P6-72	PDEF36 PA	TH# 36Definition	Address: 0690H 0691H	
	Operational Interface :	Panel / Software Communication		Related Section: 7.10
	Default :	fault : 0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFF		
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the description of P6-02.		

P6-73		PATH# 36Data	Address: 0692H 0693H	
		nal Panel / Software	Communication	Related Section: 7.10
	Defaul			
	Cont Mode	trol PR e :		
	Uni	t : -		

Range :	-2147483648 ~ +2147483647
Data Size :	32-bit
Format :	Decimal

P6-74	PDEF37 PA	TH# 37Definition	Address: 0694H 0695H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	0x00000000 ~ 0xFFFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the description of P6-02.		

P6-75	PDAT37 P/	ATH# 37Data	TH# 37Data		
	Operationa Interface :	Donal / Coffigera	Communication	Related Section: 7.10	
	Default :	0			
	Contro Mode :	PR	PR		
	Unit :	-			
	Range :	-2147483648 ~ +21	47483647		
	Data Size :	32-bit			
	Format :	ormat : Decimal			
	Settings : Please refer to the description of P6-03.		1		

P6-76	PDEF38	PATH# 3	8Definition		Address: 0698H 0699H
	Operatio Interfac		l / Software	Communication	Related Section: 7.10
	Defau	lt : 0x000	0x0000000		
	Con Mode	PR			
	Un	it : -			
	Range	e: 0x000	000000 ~ 0xFF	FFFFFF	
	Data Size	e: 32-bit	32-bit		
	Forma	t : Hexa	decimal		
			e , ,,		

P6-77	PDAT38	ATH# 38Data		Address: 069AH 069BH
	Operation Interface	Donal / Coffigero	Communication	Related Section: 7.10
	Default	: 0		
	Contr Mode	PR	PR	
	Unit	: -		
	Range	: -2147483648 ~ +21	47483647	
	Data Size	: 32-bit		
	Format	: Decimal		
	Settings	<ul> <li>Please refer to the description of P6-03.</li> </ul>		i

P6-78		PATH# 39Definition	Address: 069CH 069DH	
	Operatior Interface	nal Panel / Software	Communication	Related Section: 7.10
	Default	: 0x0000000		
	Cont Mode	DD		
	Unit	: -		

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-79

9	PDAT39	PA <sup>.</sup>	TH# 39Data		Address: 069EH 069FH
	Operational Interface :		Panel / Software	Communication	Related Section: 7.10
	Defaul	lt:	0		
	Control Mode :		PR		
	Uni	Unit : -			
	Range	e :	-2147483648 ~ +214	7483647	
	Data Size	e:	32-bit		
	Format : Decimal				
	Setting	s:	Please refer to the d	escription of P6-03.	-1

P6-80	PDEF40 PA	ATH# 40Definition		Address: 06A0H 06A1H
	Operationa Interface :	Danal / Sattwara	Communication	Related Section: 7.10
	Default :	0x0000000		
	Contro Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		

P6-81	PDAT40	PATH# 40Data		Address: 06A2H 06A3H
	Operatio Interfac		Communication	Related Section: 7.10
	Defau	lt : 0		
	Con Mode	PR		
	Un	it : -		
	Rang	e:-2147483648~+214	47483647	
	Data Siz	e : 32-bit		
	Forma	t : Decimal		

P6-82	PDEF41 PA	TH# 41Definition		Address: 06A4H 06A5H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode:	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format : Hexadecimal			
	Settings : Please refer to the description of P6-02.			

P6-83	PDAT41	PATH# 41Data	ATH# 41Data		
		nal e : Panel / Software	Communication	Related Section: 7.10	
	Defau	lt : 0			
	Con Mode	trol e:PR			
	Uni	it : -			

Range :	-2147483648 ~ +2147483647
Data Size :	32-bit
Format :	Decimal

P6-84	PDEF42 PA	TH# 42Definition	Address: 06A8H 06A9H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000	0x0000000	
	Control Mode :	PR		
	Unit :	-	-	
	Range :	0x00000000 ~ 0xFF	0x00000000 ~ 0xFFFFFFF	
	Data Size :	32-bit		-
	Format :	Hexadecimal		
	Settings :	Please refer to the c	description of P6-02.	

P6-85	PDAT42	PATH# 42Data		Address: 06AAH 06ABH
	Operatio Interface		Communication	Related Section: 7.10
	Defaul	t: 0		
	Con Mode	DD		
	Uni	t : -		
	Range	e:-2147483648~+21	47483647	
	Data Size	e : 32-bit		
	Forma	t : Decimal		

P6-86	PDEF43	PA	TH# 43Definition		Address: 06ACH 06ADH
	Operatio Interfac		Panel / Software	Communication	Related Section: 7.10
	Default :		0x00000000		
	Con Mode		PR		
	Un	it :	-		
	Rang	e:	0x00000000 ~ 0xFFF	FFFFF	
	Data Siz	e :	32-bit		
	Forma	at :	Hexadecimal		
	L				-1

P6-87	PDAT43	PATH# 43Data		Address: 06AEH 06AFH
	Operatior Interface		Communication	Related Section: 7.10
	Default	::0		
	Cont Mode	DD		
	Unit:-			
	Range	: -2147483648 ~ +21	47483647	
	Data Size : 32-bit			
	Format : Decimal			
	Cattinga	· Please refer to the	description of P6-03	

P6-88	PDEF44 PA	TH# 44Definition	Address: 06B0H 06B1H	
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Contro	PR		
	Unit :	-		

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P6-89

89	PDAT44	PA <sup>.</sup>	TH# 44Data	Address: 06B2H 06B3H	
	Operatio Interface		Panel / Software	Communication	Related Section: 7.10
	Defaul	lt :	0		
	Con Mode		PR		
	Uni	it :	-		
	Range	e :	-2147483648 ~ +21474	483647	
	Data Size	e :	32-bit		
	Forma	at :	Decimal		
	Setting	s:	Please refer to the des	cription of P6-03.	s

P6-90	PDEF45 PA	TH# 45Definition	Address: 06B4H 06B5H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings : Please refer to the description of P6-02.		escription of P6-02.	

P6-91	PDAT45	PATH# 45Data		Address: 06B6H 06B7H
	Operatio Interface	nal Panel / Software e :	Communication	Related Section: 7.10
	Defaul	lt : 0		
	Con Mode	PR		
	Uni	it : -		
	Range	e:-2147483648~+21	47483647	
	Data Size	e : 32-bit		
	Forma	t : Decimal		
		Diagon refer to the	decemination of DC 02	

P6-92	PDEF46	PATH# 46Definition	TH# 46Definition	
		perational Panel / Software Communication		Related Section: 7.10
	Defaul	lt : 0x0000000	)x0000000	
	Con Mode	PR	PR	
	Uni	it : -	-	
	Range	e:0x00000000~0xFF	FFFFF	4 
	Data Size	e : 32-bit	32-bit	
	Forma	t : Hexadecimal	Hexadecimal	
	Setting	s : Please refer to the c	Please refer to the description of P6-02.	

P6-93		PATH# 46Data	Address: 06BAH 06BBH	
	Operation Interfac	nal e:Panel / Software	Communication	Related Section: 7.10
	Default:0			
	Con Mod	e: <sup>PR</sup>		
		it : -		

Range :	-2147483648 ~ +2147483647
Data Size :	32-bit
Format :	Decimal

P6-94	PDEF47 PA	TH# 47Definition	Address: 06BCH 06BDH	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	Default : 0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	0x00000000 ~ 0xFFFFFFF	
	Data Size :	32-bit		-
	Format :	Hexadecimal		
	Settings : Please refer to the description of P6-02.			

P6-95	PDAT47	ATH# 47Data		Address: 06BEH 06BFH
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10
	Default	: 0		
	Contro Mode	PR		
	Unit	: -		
	Range	: -2147483648 ~ +21	47483647	
	Data Size	: 32-bit		
	Format	: Decimal		

P6-96	PDEF48	PATH# 48Definition		Address: 06C0H 06C1H
	Operatio Interfac	Donal / Cottoro	Communication	Related Section: 7.10
	Default : 0x0000000			
	Con Mode	PR		
	Un	it : -		
	Range	Range : 0x00000000 ~ 0xFFFFFFFF		
	Data Size	e : 32-bit	32-bit	
	Forma	t : Hexadecimal		

P6-97	PDAT48	ATH# 48Data	TH# 48Data		
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10	
	Default : 0				
	Contro Mode	PR	PR		
	Unit	Unit : -			
	Range	e : -2147483648 ~ +2147483647			
	Data Size	: 32-bit	32-bit		
	Format	: Decimal	Decimal		
	O attin and	. Please refer to the (	description of P6-03		

P6-98	PDEF49	ATH# 49Definition	Address: 06C4H 06C5H	
	Operationa Interface	al Panel / Software	Communication	Related Section: 7.10
	Default	: 0x0000000		
	Contro Mode	PR		
	Unit	: -		

Data Size: 32-bit	
Format : Hexadecimal	

P6-99	PDAT49	ATH# 49Data	Address: 06C6H 06C7H		
	Operationa Interface :	Denal / Ceffurere	Communication	Related Section: 7.10	
	Default :	0	0		
	Contro Mode :	PR			
	Unit :	-	-		
	Range :	-2147483648 ~ +214	47483647		
	Data Size :	32-bit			
	Format :	Decimal			
	Settings :	Please refer to the d	escription of P6-03.		

P7-00	PDEF50 PA	TH# 50 Definition		Address: 0700H 0701H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :			
	Unit :			
	Range :	0x00000000 ~ 0xFI	FFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the	description of P6-02	············

# P7-xx PR Parameters (Please refer to Chapter 7 for detailed setting)

**NOTE** PATH (procedure)

P7-01	PDAT50 PA	TH# 50 Data	Address: 0702H 0703H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Please refer to the o		

P7-02			TH# 51 Definition	Address: 0704H 0705H		
	Operatio Interfac	Operational Interface : Panel / Software Communication		Communication	Related Section: 7.10	
	Default :		0x0000000			
	Con Mode		PR			
	Unit :		-			
	Range :		0x00000000 ~ 0xFFFFFFF			
	Data Siz	Data Size:32-bit				
	Forma	at :	Hexadecimal	Hexadecimal		

P7-03	PDAT51 P	ATH# 51 Data	TH# 51 Data		
	Operationa Interface :	Donal / Cofficience	Communication	Related Section: 7.10	
	Default :	0			
	Contro Mode :	PR			
	Unit :	-			
	Range :	-2147483648 ~ +21	47483647	-	
	Data Size :	32-bit			
	Format :	Format : Decimal			
	Settings :	Please refer to the	description of P6-03.		

P7-04		ATH# 52 Definition	Address: 0708H 0709H	
	Operation Interface	al Panel / Software	Communication	Related Section: 7.10
	Default: 0x0000000			
	Contr Mode	ol : PR		
	Unit	: -		

Range :	0x00000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	HEXADECIMAL

P7-05	PDAT52 PA	TH# 52 Data		Address: 070AH 070BH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	Default : 0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Please refer to the d	escription of P6-03.	

P7-06	PDEF53 PA	TH# 53 Definition	Address: 070CH 070DH	
	Operational Interface : Panel / Software Communication		Related Section: 7.10	
	Default :	0x0000000		
	Contro Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the o	description of P6-02.	

P7-07		PATH# 53 D		Address: 070EH 070FH	
	Operational Interface : Panel / Software Communication		Communication	Related Section: 7.10	
	Defau	t:0	0		
	Con Mode	PR			
	Un	t:-	-		
	Range	e : -2147483	-2147483648 ~ +2147483647		
	Data Size	e : 32-bit	32-bit		
	Forma	t : Decimal			
	Diagona refer to the departmention of DC 02			aniation of DC 02	

P7-08	PDEF54	PATH# 54 Definition	TH# 54 Definition		
	Operatio Interfac		Communication	Related Section: 7.10	
	Defau	ılt : 0x0000000			
	Con Mode	PR	PR		
	Un	it : -			
	Range	e:0x00000000~0xFF	FFFFFF		
	Data Size	e:32-bit	32-bit		
	Forma	at : Hexadecimal	Hexadecimal		
	Setting	s: Please refer to the o	description of P6-02.		

P7-09		ATH# 54 Data	Address: 0712H 0713H	
	Operationa Interface :	al Panel / Software	Communication	Related Section: 7.10
	Default :			
	Contro Mode :	<sup>) </sup> PR		
	Unit :	-		

	-2147483648 ~ +2147483647
Data Size :	32-bit
Format :	Decimal
	Discourse fronte the subscription of D0.00

P7-10	PDEF55 PA	TH# 55 Definition	Address: 0714H 0715H	
	Operationa Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000	)x0000000	
	Contro Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	0x00000000 ~ 0xFFFFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings :	Please refer to the d	escription of P6-02.	

Address: 0716H PDAT55 PATH# 55 Data P7-11 0717H Operational Related Section: Interface : Panel / Software Communication 7.10 Default: 0 Control Mode : PR Unit : -Range : -2147483648 ~ +2147483647 Data Size : 32-bit Format : Decimal Settings : Please refer to the description of P6-03.

P7-12		TH# 56 Definition		Address: 0718H 0719H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		4
	Unit :	-		
	Range :	0x00000000 ~ 0xFFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		

P7-13	PDAT56 PA	TH# 56 Data	Address: 071AH 071BH	
	Operational Interface :		Communication	Related Section: 7.10
	Default :	0		
	Contro Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format :	Decimal		
		Please refer to the	description of P6-03	

P7-14		PATH# 57 Definition	Address: 071CH 071DH	
	Operatio Interfac	nal e:Panel / Software	Communication	Related Section: 7.10
	-	lt : 0x0000000		
	Con Mode	trol e:PR		
	Un			

Range :	0x0000000 ~ 0xFFFFFFF
Data Size :	32-bit
Format :	Hexadecimal

P7-15	PDAT57 PA	TH# 57 Data		Address: 071EH 071FH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
Default		0		
	Control Mode :	PR		
	Unit :	-	2147483648 ~ +2147483647	
	Range :	-2147483648 ~ +21		
	Data Size :	32-bit		
	Format :	Decimal		
		Diagon refer to the	description of P6 03	

P7-16	PDEF58 PA	TH# 58 Definition	Address: 0720H 0721H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings : Please refer to the desc		description of P6-02.	

P7-17			TH# 58 Data	Address: 0722H 0723H	
	Operatio Interface	nal e :	Panel / Software	Communication	Related Section: 7.10
	Default :		0		
	Con Mode		PR		
	Uni	it :	-		
	Range	e :	-2147483648 ~ +214	7483647	
	Data Size	e :	32-bit		
	Forma	it :	Decimal		-

P7-18	PDEF59 PA	TH# 59 Definition	Address: 0724H 0725H	
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	Range : 0x0000000 ~ 0xFFFFFFF		
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Cottingo :	Please refer to the o	description of P6-02.	

P7-19		PATH# 59 Data	Address: 0726H 0727H	
	Operatio Interface	nal Panel / Software	Communication	Related Section: 7.10
	Defaul			
	Con Mode	PR		
	Uni			

Range :	-2147483648 ~ +2147483647
Data Size :	32-bit
Format :	Decimal

P7-20		TH# 60 Definition		Address: 0728H 0729H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
Default		0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
		Please refer to the c	lescription of P6-02	

Settings : Please refer to the description of P6-02.

P7-21	PDAT60	ATH# 60 Data		Address: 072AH 072BH
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Contro Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format :	Decimal		
		Place refer to the	description of P6 02	

P7-22	PDEF61 F	ATH# 61 Definition		Address: 072CH 072DH
	Operation Interface	Donal / Cottora	Communication	Related Section: 7.10
	Default	: 0x0000000		
	Contr Mode	PR		
	Unit	: -		
	Range	: 0x0000000 ~ 0xFF	FFFFFF	
	Data Size	: 32-bit		
	Format	: Hexadecimal		

P7-23	PDAT61 PA	TH# 61 Data		Address: 072EH 072FH
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Control Mode:			
	Unit :	-		
	Range :	-2147483648 ~ +214	7483647	
	Data Size :	32-bit		
	Format :	Decimal		
	Settings :	Please refer to the de	escription of P6-03.	

P7-24	_	PATH# 62 Definition		Address: 0730H 0731H
		nal Panel / Software	Communication	Related Section: 7.10
		t: 0x0000000		
	Con Mode	PR		
	÷	t : -		

Format :	Hexadecimal
Data Size :	32-bit
Range :	0x00000000 ~ 0xFFFFFFF

P7-25		ATH# 62 Data		Address: 0732H 0733H
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Contro Mode :	DD	۶R	
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	-
	Data Size :	32-bit		
	Format :	Decimal		
		Place refer to the	description of P6 03	

P7-26	PDEF63 PA	TH# 63 Definition		Address: 0734H 0735H
	Operational Interface :	Panel / Software	Communication	Related Section: 7.10
	Default :	: 0x0000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFF	FFFFF	
	Data Size :	32-bit		
	Format :	Hexadecimal		
	Settings : Please refer to the description of P6-02.		lescription of P6-02.	

P7-27		ATH# 63 Data		Address: 0736H 0737H
	Operationa Interface :	l Panel / Software	Communication	Related Section: 7.10
	Default :	0		
	Contro Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +21	47483647	
	Data Size :	32-bit		
	Format :	Decimal		
				1

### Table 8.1 Function Description of Digital Input (DI)

Setting Value: 0x01				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
SON	When this DI is On, servo is activated (Servo On)	Level triggered	ALL	

Setting Va	Setting Value: 0x02				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode		
ARST	After the alarm has been cleared, when the DI is ON the drive will show that the alarm has been cleared.	Rising edge triggered	ALL		

Setting Value: 0x03							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
	In speed and position mode, when the DI is ON (P2-27 should be set to 1), the gain switched to the one multiplies the switching rate.	Level triggered	PT, PR, S				

Setting Value: 0x04							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
CCLR	Clear the pulse counter and the setting of parameter P2-50. 0: clear the position pulse deviation (It is suitable in PT mode). When DI is ON, the accumulative pulse deviation of the drive will be cleared to 0.	Rising edge triggered, Level triggered	PT, PR				

#### Setting Value: 0x05 Trigger Control **DI Name** Function Description of Digital Input (DI) Method Mode ZCLAMP When the speed is slower than the setting of zero speed (P1-38), Level S if the DI is ON, the motor stops running. triggered Speed Command Setting value of P1-38 (Zero speed) ZCLAMP input signal OFF ON Motor Speed Setting value of P1-38 (Zero speed) Time

Setting Value: 0x06							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
	In speed mode, when the DI is ON, the input command will be in reverse direction.	Level triggered	S				

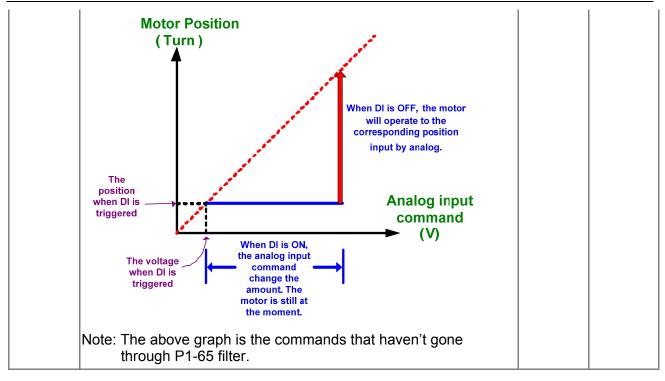
Setting Value: 0x07							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
Reserved							

Setting Value: 0x08							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
	In PR mode, after selecting the PR command (POS0 ~ 5), when the DI is ON, the motor will rotate according to the command issued by the register.	Rising edge triggered	PR				

Setting Value: 0x09							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
TRQLM	In speed and position mode, when the DI is ON, the motor torque will be limited, and the limited torque command will be internal register or analog voltage command.	Level triggered	PT, PR, S				

Setting Va	Setting Value: 0x0A						
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
GTRY	When gantry control function is enabled (P1-74 = 2), if it needs to temporarily disable this function, turn on DI.GTRY will do. And the axis that received the command from DI.GTRY no longer calculates the error between two axes.	Rising edge triggered	PT				

Setting Va	Setting Value: 0x0C								
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode						
VPL	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.	Level triggered	PT/PR Full- closed loop						



Setting Va	lue: 0x0D		
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
VPRS	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 correspond to the new analog command. Thus, the coordinate system of the motor will be redefined. Motor position (Turn) The position (Turn) The voltage when DI is riggered When DI is when DI is ordinate still, but its coordinate still but its coordinate	Rising edge triggered	PT/PR Full- closed loop

Setting Value: 0x10							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
	In torque mode, when the DI is ON, the motor speed will be limited, the limited speed command will be internal register or analog voltage command.	Level triggered	Т				

Setting Value: 0x11, 0x12, 0x13, 0x1A, 0x1B, 0x1C											
DI Name		Function Description of Digital Input (DI)									
POS0	PR Comma	and Se	electior	ו (1~6₄	4)					Level	PR
POS1 POS2	Position Command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Corresponding Parameter	triggered	
POS3 POS4	Homing	0	0	0	0	0	0	1	P6-00 P6-01		
POS5	Procedure1	0	0	0	0	0	1		P6-02 P6-03		
	~										
	Procedure 50	1	1	0	0	1	0	1	P6-98 P6-99		
	Procedure 51	1	1	0	0	1	1	Î	P7-00 P7-01		
	~										
	Procedure 63	1	1	1	1	1	1	1	P7-26 P7-27		

Setting Value: 0x1D							
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode				
ABSE	When DI.ABSE is ON, it is in ABS mode. DI.ABSQ, DI.ABSC, DI.ABSR, DI.ABSD and DI.ABSC are enabled. When DI.ABSE is ON, the function of DI4, DO2, and DO3 will be disabled. Function of DI4 will be ASDQ, DO2 will be ABSR and DO3 will be ABSD.	Level triggered	ALL				

Setting Value: 0x1F				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
ABSC	When DI.ABSC is ON, multi-turn data stored in absolute encoder will be cleared. When DI.ABSE is ON, this function is enabled.	Rising edge triggered	ALL	

Setting Value: When DI.ABSE is ON, DI4 inputs ABSQ signal, function set by P2-13 is disabled.				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
always inputted	During I/O transmission, Handshaking signal will be sent to the servo drive by the controller. When DI.ABSQ is OFF, it means the controller issues Request ; DI.ABSQ is ON means the controller has already recdived ABSD signal. When DI.ABSE is ON, this DI is enabled. Please refer to diagram 12.4 for detailed description.	Rising and Falling edge triggered	ALL	

# Setting Value: 0x14, 0x15

DI Name		F	uncti		Trigger Method	Control Mode				
SPD0	Internal Spe	ed C		Level	S					
SPD1	Speed Command Number	DI sigr of C	nal CN1	Con	nmand	Content	Range	triggered		
	S1	0	0	S	External analog command	Voltage deviation between V-REF and GND	+/- 10V			
				S z	N/A	Speed command is 0	0			
	S2	0	1	-	jister ameter	P1-09	+/-5000 r/min			
	S3	1	0	]		P1-10	+/-5000 r/min			
	S4	1	1			P1-11	+/- 5000 r/min			

Setting	Value: 0x16,	0x1	7																
DI Name		Function Description of Digital Input (DI)							Control Mode										
TCM0	Internal Torque Command Selection (1~4)							Level	Т										
TCM1	Torque Command Number	DI sigr of C		Com	nmand	Content	Range	triggered											
	T1	0	0	Т	External analog command	Voltage deviation between T-REF and GND	+/- 10V												
				Tz	N/A	Torque command is 0	0												
	T2	0	1	Reg		P1-12	+/- 300 %												
	Т3	1	0	Para	ameter	P1-13	+/- 300 %												
	T4	1	1			P1-14	+/- 300 %												
		·																	

Setting Value: 0x18				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
	In position and speed mode, if the DI is OFF, it is in speed mode. And it is in position mode when the DI is ON. (P selects PT or PR via DI.PT-PR (0x2B).)	Level triggered	Dual Mode	

Setting Value: 0x19			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
	In speed and torque mode, if the DI is OFF, it is in speed mode. And it is in torque mode when the DI is ON.	Level triggered	Dual Mode

Setting Value: 0x20				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
T-P	In position and torque mode, if the DI is OFF, it is in torque mode; if the DI is ON, then it is in position mode.	Level triggered	Dual Mode	

Setting Value: 0x21				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
EMGS	When this DI is ON, the motor stops urgently.	Level triggered	ALL	

Setting Value: 0x22				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
NL (CWL)	Reverse inhibit limit (contact b)	Level triggered	ALL	

Setting Value: 0x23				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
PL (CCWL)	Forward inhibit limit (contact b)	Level triggered	ALL	

Setting Va	Setting Value: 0x24				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode		
ORGP	In PR mode, during the process of homing if the DI is ON $\leftarrow \rightarrow$ OFF, the servo will regard this position as the homing origin. (Please refer to the setting of parameter P5-04)	Rising / Falling edge triggered	PR		

Setting Value: 0x27			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
	In PR mode, when searching the origin is needed, it will activate the function of searching the origin when the DI is ON. (Please refer to the setting of parameter P5-04)	Rising edge triggered	PR

Setting Va	Setting Value: 0x2B			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
	When selecting PT-PR dual mode or PT-PR-S multiple mode, source can be selected via this DI. If this DI is OFF, it is in PT mode; If the DI is ON, it is in PR mode.	Level triggered	Dual Mode	

Setting Value: 0x36			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
CAM	E-Cam engaging control (Please refer to the setting of P5-88 U, Z value)	Rising / Falling edge triggered	PR

Setting Value: 0x37			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
JOGU	When this DI is ON, the motor will JOG in forward direction.	Level triggered	ALL

Setting Value: 0x38			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
JOGD	When this DI is on, the motor will JOG in reverse direction.	Level triggered	ALL

Setting Va	Setting Value: 0x39			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
EV1	Event trigger command #1 (Refer to the setting of P5-98, P5-99)	Rising /Falling edge triggered	PR	

Setting Value: 0x3A			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
EV2	Event trigger command #2 (Refer to the setting of P5-98, P5-99)	Rising /Falling edge triggered	PR

Setting Va	Setting Value: 0x3B			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
EV3	Event trigger command #3 (It is provided after firmware version V1.008 sub04.)	Rising /Falling edge triggered	PR	
Setting Va	alue: 0x3C			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
EV4	Event trigger command #4 (It is provided after firmware version V1.008 sub04)	Rising /Falling edge triggered	PR	

Setting Value: 0x43, 0x44				
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
	Gear Ratio Selection 0 (Numerator) Gear Ratio Selection 1 (Numerator) GNUM0, GNUM1	Level triggered	PT	

Setting Value: 0x45			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
	In position mode, when this DI is ON, the external pulse input command is not working. (Note: The function has to be set to DI8 so as to ensure the instantaneity of pulse prohibition)	Level triggered	PT

Setting Value: 0x46			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
STOP	Motor stops	Rising edge triggered	PR

Setting Va	Setting Value: 0x47			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
	This DI can be used to stop the emergency stop of deceleration time. The setting of deceleration time is identical to P5-03. When DI.PFQS is on, AL35F will occur. Then, motor starts to decelerate. When the speed reaches 0, AL3CF occurs and servo is off. Please turn on DI.ARST to servo on the drive again.	Rising edge triggered	PT,PR,T,S	

1 ) 11 ~ 17 Single control modes; 18~20 Dual control mode.

2 ) When P2-10 ~ P2-17 is set to 0, DI has no function.

# Table 8.2 Function Description of Digital Output (DO)

Setting Value: 0x01			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SRDY	When the controlled and main circuit power is applied to the drive, this DO is ON if no alarm occurs.	Level triggered	ALL

Setting Value: 0x02				
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode	
SON	When the servo is ON, this DO is ON if no alarm occurs. As soon as it applies to the power, when it is automatically Servo On, the time difference between DO:SRDY and DO:SON ON ON DO: OFF SRDY OFF ON DO: OFF Approx. 300 ns	Level triggered	ALL	

Setting Value: 0x03			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
	When the motor speed is slower than the setting speed of zero speed (P1-38), this DO is ON.	Level triggered	ALL

Setting Value: 0x04			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
	When the motor speed is faster than the target speed (P1-39), this DO is ON.	Level triggered	ALL

Setting Value: 0x05			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
	In position mode, when the deviation pulse number is smaller than the position range (the setting value of P1-54), this DO is ON. When the drive is in PR mode, this DO is ON when the position error between target position and current position is smaller than the setting value (value of P1-54).	Level triggered	PT, PR

Setting Value: 0x06			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
TQL	When it is in torque limit, this DO is ON.	Level triggered	ALL , except T, Tz

Setting Value: 0x07			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
	When the alarm occurs, this DO is ON. (Except DO: 0x11 (forward / reverse limit, communication error, under voltage))	Level triggered	ALL

Setting Value: 0x08				
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode	
BRKR	When the signal of brake control is output, adjust the setting of parameter P1-42 and P1-43. ON SON OFF OFF OFF BRKR OFF MBT1(P1-42) MBT2(P1-43) Motor Speed Speed Speed	Level triggered	ALL	

Setting Value: 0x09			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
HOME	When homing is completed, it means the position coordinates system is available and this DO is ON.	Level triggered	PR
	When applying to the power, this DO is OFF. When homing is completed, this DO is ON. During the operation, this DO is ON until the counter overflows (including command or feedback) and the DO becomes OFF.		
	When PR triggers homing command, this DO becomes OFF. After homing, this DO becomes ON.		

Setting Value: 0x0D			
DO Name	Function Description of Digital Output (DO)	Control Mode	
ABSW	Warning of absolute encoder.	ALL	

Setting Va	Setting Value: 0x0E		
DO Name	Function Description of Digital Output (DO)	Control Mode	
IDXD	Indexing coordinates is valid.	PR	

Setting Va	alue: 0x10		
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
OLW	When reaching the overload setting, this DO is ON. $t_{oL}$ = Overload allowable time of the servo x Setting value of P1-56, when the overload accumulative time exceeds $t_{oL}$ , it will output pre-overload warning (OLW). However, if the overload accumulative time exceeds the overload allowable time of the servo, it will output pre-overload error (ALRM). For example:	Level triggered	ALL
	The setting value of pre-overload warning is 60% (P1-56=60). When the output average load of the servo drive is 200%, if the output time exceeds 8 seconds, the servo drive will show the overload alarm (AL.006). $t_{OL}$ = The output average load of the servo exceeds 200% for 8		
	seconds x parameter setting value = 8sec x 60% = 4.8sec Result: When the output average load of the servo drive exceeds 200% for 4.8 seconds, this DO is ON. If it exceeds for 8 seconds, then, DO.ALRM is ON.		

Setting Value: 0x11			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
	Warning output (Forward / reverse limit, emergency stop, communication error, under voltage)	Level triggered	ALL

Setting Value: 0x12			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
OVF	Position Command /Feedback Overflows	Level triggered	PR

Setting Value: 0x13			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SNL (SCWL)	Software limit (Reverse limit)	Level triggered	ALL

Setting Value: 0x14			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SPL (SCCWL)	Software limit (Forward limit)	Level triggered	ALL

Setting	Value:	0x15
ocung	value.	

U U			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
Cmd_OK	Complete PR command and enter into PR mode, this DO is ON. When PR command is executing, this DO is OFF. After completing the command, this DO is ON. When the DO is ON, it means the command is completed, but not finishing motor positioning. Please refer to DO.TPOS.	Level triggered	PR

Setting Value: 0x16			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
CAP_OK	CAP procedure completed	Level triggered	ALL

Setting Value: 0x17			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
_	When DO.Cmd_OK and TPOS are both ON, this DO is ON. Refer to P1-48.	Level triggered	PR

Setting Value: 0x18			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
CAM_AREA	Master of E-Cam locates in setting area. A2L does not support E-Cam function.	Level triggered	PR

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SP_OK	Speed completed output: In speed mode, when the deviation between the speed feedback and the command is smaller than the setting value of P1-47, then this DO is ON.	Level triggered	S / Sz

Setting Value: 0x2C			
DO Name Function Description of Digital Output (DO) C		Control Mode	
	When the value which is monitored by P0-09 is between P0-54 $\sim$ P0-55, then this DO is ON.	ALL	

# Setting Value: When DI.ABSE is ON, DO2 outputs ABSR signal, function set by P2-19 is disabled.

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
always outputted	DO.ABSR is OFF means the Request sent by ABSQ has been received. DO.ABSR is ON means the data that is outputted by ABSD is valid. When DI.ABSE is ON, this DO is enabled. Please refer to diagram 12.4 for detailed description.	Level triggered	ALL

# Setting Value: When DI.ABSE is ON, DO3 outputs ABSD signal, function set by P2-20 is disabled.

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
always	Position data of ABS is outputted. The data is valid when ABSR is ON. When DI.ABSE is ON, this DO is enabled. Please refer to diagram 13.4 for detailed description.	Level triggered	ALL

Setting Value: 0x30			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_0	Output the status of bit 00 of P4-06	Level triggered	ALL

# Setting Value: 0x31 DO Name Function Description of Digital Output (DO) Trigger Method Control Mode SDO\_1 Output the status of bit 01 of P4-06 Level triggered ALL

Setting Va	Setting Value: 0x32			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode	
SDO_2	Output the status of bit 02 of P4-06	Level triggered	ALL	

Setting Va	Setting Value: 0x33			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode	
SDO_3	Output the status of bit 03 of P4-06	Level triggered	ALL	

Setting Va	Setting Value: 0x34			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode	
SDO_4	Output the status of bit 04 of P4-06	Level triggered	ALL	

Setting Va	Setting Value: 0x35			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode	
SDO_5	Output the status of bit 05 of P4-06	Level triggered	ALL	

Setting Va	Setting Value: 0x36		
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_6	Output the status of bit 06 of P4-06	Level triggered	ALL

Setting Value: 0x37			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_7	Output the status of bit 07 of P4-06	Level triggered	ALL

Setting Va	Setting Value: 0x38			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode	
SDO_8	Output the status of bit 08 of P4-06	Level triggered	ALL	

Setting Value: 0x39							
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode				
SDO_9	Output the status of bit 09 of P4-06	Level triggered	ALL				

Setting Value: 0x3A							
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode				
SDO_A	Output the status of bit 10 of P4-06	Level triggered	ALL				

Setting Value: 0x3B							
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode				
SDO_B	Output the status of bit 11 of P4-06	Level triggered	ALL				

Setting Value: 0x3C							
	DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode			
	SDO_C	Output the status of bit 12 of P4-06	Level triggered	ALL			

Setting Value: 0x3D							
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode				
SDO_D	Output the status of bit 13 of P4-06	Level triggered	ALL				

Setting Value: 0x3E							
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode				
SDO_E	Output the status of bit 14 of P4-06	Level triggered	ALL				

Setting Value: 0x3F							
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode				
SDO_F	Output the status of bit 15 of P4-06	Level triggered	ALL				



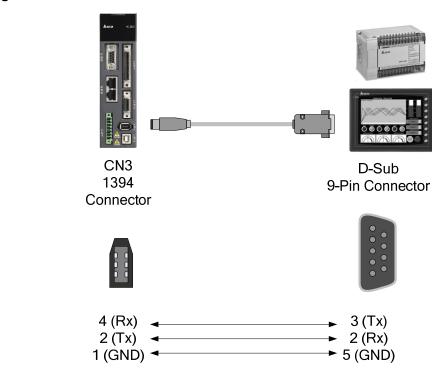
**NOTE** 1 ) When P2-18 ~ P2-22 is set to 0, DO has no function.

# **Chapter 9 Communications**

## 9.1 RS-485 & RS-232 Communication Hardware Interface

This servo drive supports the serial communication of RS-485 and RS-232. Communication function enables the servo drive to access and change parameters inside the system. However, RS-485 and RS-232 cannot be used at the same time. Parameter P3-05 can use RS-485 and RS-232 as the communication protocol. Followings are the wiring description.

#### RS-232



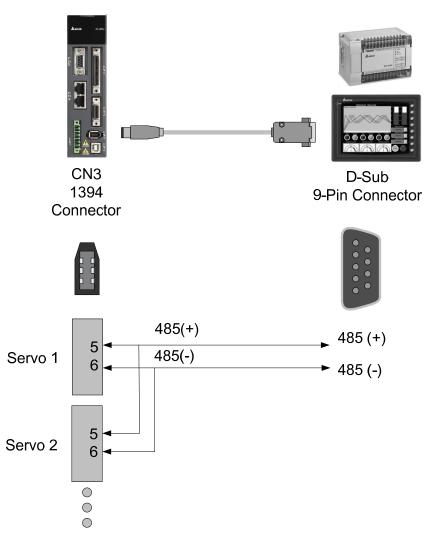
#### Configuration

# 

- 1) 15-meter communication cable is suitable for less interference environment. If the transmission speed is over 38400bps, the length of communication cable should be shorter than 3 meters so as to ensure the accuracy of transmission.
- 2) Numbers shown in the above diagram represent the pin number of each connector.

#### **RS-485**

Configuration





- 100 meters of communication cable is suitable for less interference environment. If the transmission speed is over 38400bps, the length of communication cable should not longer than 15 meters so as to ensure the accuracy of transmission.
- 2) Numbers shown in the above diagram represent the pin number of each connector.
- 3) Please use the power supply unit whose direct current is over 12 volt.
- 4) Using RS-485 can connect up to 32 servo drives at the same time. REPEATER can be used to connect more servo drives. 127 is the maximum.
- 5) Please refer to Chapter 3.6 for CN3 Pin Definition.

## 9.2 RS-485 / RS-232 Communication Parameters Setting

The following four parameters, P3-00 (Address Setting), P3-01 (Transmission Speed), P3-02 (Communication Protocol) and P3-05 (Communication Mechanism), are essential and must be set for the communication of the servo drive. The rest, such as P3-03 (Communication Error Disposal), P3-04 (Communication Timeout), P3-06 (Control Switch of Digital Input), P3-07 (Communication Response Delay Time) and P3-08 (Monitor Mode) is optional. Please refer to Chapter 8 of this user manual.

P3-00●	ADR	Ad	dress Set	ress Setting				00H 301H	
	Operationa Interface :		Panel / Sc	oftware	Communica	ation	Related Sect 9.2	ion:	
	Defau	lt :	0x7F						
	Contro Mode: Unit:			ALL					
	Rang	e :	0x01 ~ 0x7F						
	Data Siz	e :	16-bit						
	Forma	at :	Hexadecir	nal					
	Settings :			The communication address setting is divided into Y, X (hexadecimal):					
				0	0	Y	X		
			Range	-	-	0 ~ 7	0 ~ F		
	When using RS-232/RS-485 to communicate set one address. The duplicate address se communication. This address represents the absolute addre						ting will caus	e abnormal	
			inis addr	ess represe	nts the abso	olute addre	ss of the sei	vo arive in	

communication network. It is also applicable to RS-232/485 and CAN bus.

When the communication address setting of MODBUS is set to 0xFF, the servo drive will automatically reply and receive data regardless of the address. However, P3-00 cannot be set to 0xFF.

P3-01	BRT Tra	ansmission Speed		Address: 0302H 0303H
	Operational Interface :	Panel / Software	Communication	Related Section: 9.2
Default :		0x0203		
	Contro Mode :	ALL		
	Unit :	bps 0x0000 ~ 0x0405		
	Range :			
	Data Size :	16-bit		
	Format :	Hexadecimal		
		The eatting of traper	ningion apond in divided in	to 7 V V (hovedeeimel):

Settings : The setting of transmission speed is divided into Z, Y, X (hexadecimal):

	0	Z	Y	Х
Communication Port	-	CAN	-	RS-232/485
Range	0	0~4	0	0~5

- Definition of X setting value
  - 0: 4800
  - 1: 9600
  - 2: 19200
  - 3: 38400
  - 4: 57600
  - 5: 115200
- Definition of Z setting value
  - 0: 125 Kbit/s
  - 1: 250 Kbit/s
  - 2: 500 Kbit/s
  - 3: 750 Kbit/s
  - 4: 1.0 Mbit/s
- **NOTE** 1 ) If this parameter is set via CAN, only Z can be set and the others remain.
  - 2 ) The communication speed of USB is 1.0 Mbit/s only and is unchangeable.

P3-02	PTL	Co	mmunication Protoco	Address: 0304H 0305H	
	Operational Interface : Default : Control Mode : Unit :		Panel / Software	Communication	Related Section: 9.2
			6		
			ALL		
			-		
	Rang	e :	0 ~ 0x8		
	Data Size :		16-bit		
	Forma	at :	Hexadecimal		
Settings :		S:	The definition of the setting value is as the follo 0: 7, N, 2 (MODBUS, ASCII) 1: 7, E, 1 (MODBUS, ASCII) 2: 7, 0,1 (MODBUS, ASCII) 3: 8, N, 2 (MODBUS, ASCII) 4: 8, E, 1 (MODBUS, ASCII) 5: 8, 0, 1 (MODBUS, ASCII) 6: 8, N, 2 (MODBUS, RTU) 7: 8, E, 1 (MODBUS, RTU) 8: 8, 0, 1 (MODBUS, RTU)		owings:

P3-05	СММ	Co	mmunication Mechan	Address: 030AH 030BH	
	Default : Control Mode : Unit :		Panel / Software	Communication	Related Section: 9.2
			-		
			0x00 ~ 0x01		
	Data Siz	e :	16-bit		
	Format : Settings :		Hexadecimal	lexadecimal	
			Communication port ca Communication Ir 0: RS232 1: RS485		an one communications.

## 9.3 MODBUS Communication Protocol

There are two modes of MODBUS networks communication, ASCII (American Standard Code for information interchange) mode and RTU (Remote Terminal Unit) mode. Users could set the needed communication protocol via parameter P3-02. Apart from these two communication modes, this servo drive also supports function of 03H to access more than one data, 06H to write one character and 10H to write multiple characters. Please refer to the following descriptions.

#### Code Description

#### ASCII Mode:

The so-called ASCII mode is using American Standard Code for Information Interchange (ASCII) to transmit the data. Between two stations (Master and Slave) to transmit data 64H, the master will send '6' which represented by 36H of ASCII code and '4' represented by 34H of ASCII code.

ASCII code of digit 0 to 9 and characters A to F is as follows:

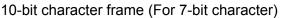
Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	'8'	ʻ9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

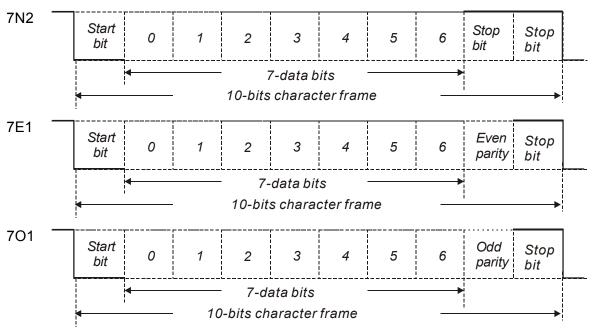
#### **RTU Mode:**

Every 8-bit of data is constituted by two 4-bits hexadecimal characters. If data 64H is transmitted between two stations, it will be transmitted directly, which is more efficient than ASCII mode.

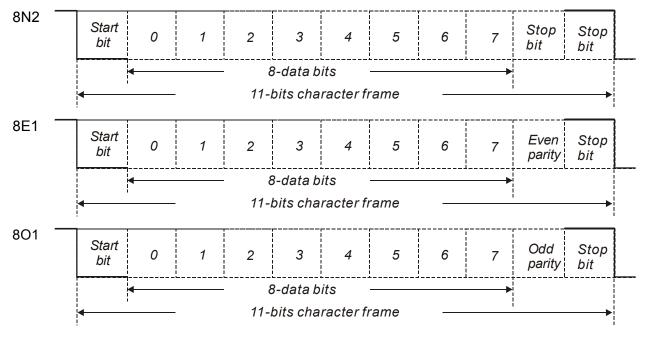
#### Character Structure

Characters will be encoded into the following framing and transmitted in serial. The checking method of different bit is as the following.





11-bit character frame (For 8-bit character)



#### Communication Data Structure

#### 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)	
	Data content: n-word = 2n-byte includes 4n of ASCII code, 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 start character of communication in ASCII mode is colon ': ' (ASCII is 3AH), ADR is the ASCII code of two characters. The end code is CR (Carriage Return) and LF (Line Feed). And the communication address, function code, data content, error checking LRC (Longitudinal Redundancy Check), etc are between the start character and end code.

#### **RTU Mode:**

Start	A silent interval of more than 10ms
Slave Address	Communication address: 1-byte
Function	Function code: 1-byte
Data (n-1)	
	Data content : n-word =2n-byte · n<=10
Data (0)	
CRC	Error checking: 2-byte
End 1	A silent interval of more than 10ms

The start of communication in RTU (Remote Terminal Unit) mode is a silent interval. The end of it is another silent interval. The communication address, function code, data content, error checking CRC (Cyclical Redundancy Check), etc are between the start and the end.

Example 1: function code 03H, access multiple words:

The Master issues the command to the 1<sup>st</sup> Slave and reads the continuous 2 words starting from the start address 0200H. In response message from the Slave, the content of starting address 0200H is 00B1H and the content of the 2<sup>nd</sup> data address 0201H is 1F40H. The maximum allowable data in one single access is 10. The calculation of LRC and CRC will be described in next chapter.

#### ASCII Mode:

#### Command message (Master):

Start	(.)
	·0'
Slave Address	'1'
Function	·0'
Function	'3'
	<b>'</b> 0'
Starting data	'2'
address	<b>'</b> 0'
	<b>'</b> 0'
	<b>'</b> 0'
Number of data	<b>'</b> 0'
(In Word)	<b>'</b> 0'
	'2'
LRC Check	'F'
	'8'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

#### Response message (Slave):

· · · ·				
Start	(.)			
Slave Address	<b>'</b> 0'			
Slave Address	'1'			
E	<b>'</b> 0'			
Function	'3'			
Number of data	<b>'</b> 0'			
(In Byte)	'4'			
	<b>'</b> O'			
Content of	<b>'</b> 0'			
starting data address 0200H	'B'			
	'1'			
	'1'			
Content of second data	'F'			
address 0201H	'4'			
	<b>'</b> 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	02H (High)
address	00H (Low)
Number of data	00H
(In Word)	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	00H (High)	
starting data address 0200H	B1H (Low)	
Content of	1FH (High)	
second data address 0201H	40H (Low)	
CRC Check Low	A3H (Low)	
CRC Check High	D4H (High)	

Please note:

Before and after the transmission in RTU mode, 10ms of silent interval is needed.

Example 2: function code 06H, write single word:

The Master issues command to the 1<sup>st</sup> Slave and writes data 0064H to address 0200H. The Slave sends the response message to the Master after the writing is completed. The calculation of LRC and CRC will be described in next chapter.

#### ASCII Mode:

#### Command message (Master):

Start	(., <b>)</b> •
Slave Address	·0'
Slave Address	'1'
Function	·0'
	<b>'6'</b>
	·0'
Starting data	'2'
address	·0'
	·0'
	<b>'</b> 0'
Data content	·0'
Data content	<b>'6'</b>
	'4'
LRC Check	<b>'</b> 9'
	'3'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

#### Response message (Slave):

Start	(., <b>)</b>
Slave Address	·0'
Slave Address	'1'
Function	·0'
	<b>'6'</b>
	<b>'</b> 0'
Starting data	'2'
address	<b>'</b> 0'
	<b>'</b> 0'
	<b>'</b> 0'
Data content	<b>'</b> 0'
Data content	<b>'6'</b>
	'4'
LRC Check	<b>'</b> 9'
	'3'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

#### **RTU Mode:**

#### Command message (Master):

Address	01H
Slave Function	06H
Starting data	02H (High)
address	00H (Low)
Data content	00H (High)
Data content	64H (Low)
CRC Check Low	89H (Low)
CRC Check High	99H (High)

Please note:

#### Response message (Slave):

Address	01H
Slave Function	06H
Starting data	02H (High)
address	00H (Low)
Data content	00H (High)
Data content	64H (Low)
CRC Check Low	89H (Low)
CRC Check High	99H (High)

Before and after the transmission in RTU mode, 10ms of silent interval is needed.

Example 3: function code 10H, write multiple words:

The Master issues command to the 1<sup>st</sup> Slave and writes 0BB8H and 0000H to the starting address 0112H. That is to say, 0112H is written into 0BB8H and 0113H is written into 0000H. The maximum allowable data in one single access is 10. The Slave sends the response message to the Master after the writing is completed. The calculation of LRC and CRC will be described in next chapter.

#### ASCII Mode:

#### Command message (Master):

Start	(.) ·
	·0'
Slave Address	'1'
E	'1'
Function	·0'
	<b>'</b> 0'
Starting data	'1'
address	'1'
	'2'
	<b>'</b> 0'
Number of data	<b>'</b> 0'
(In Word)	<b>'</b> 0'
	'2'
Number of data	<b>'</b> 0'
(In Byte)	'4'
	<b>'</b> 0'
The first data	'B'
content	'B'
	'8'
	<b>'</b> 0'
The second data	<b>'</b> 0'
content	ʻ0'
	<b>'</b> 0'
LRC Check	'1'
	'3'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

#### Response message (Slave):

Start	(.) ·
Slove Address	·0'
Slave Address	'1'
Function	'1'
FUNCTION	<b>'</b> 0'
	<b>'</b> 0'
Starting data	'1'
address	'1'
	'2'
	<b>'</b> 0'
Number of data	<b>'</b> 0'
Number of data	<b>'</b> 0'
	'2'
LRC Check	'D'
	'A'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

#### **RTU Mode:**

#### Command message (Master):

<b>.</b>	
Slave Address	01H
Function	10H
Starting data address	01H (High)
	12H (Low)
Number of data	00H (High)
(In Word)	02H (Low)
Number of data (In Byte)	04H
The first data	0BH (High)
content	B8H (Low)
The second data	00H (High)
content	00H (Low)
CRC Check Low	FCH (Low)
CRC Check High	EBH (High)

#### Response message (Slave):

Slave Address	01H
Function	10H
Starting data	01H (High)
address	12H (Low)
Number of data	00H (High)
(In Word)	02H (Low)
CRC Check Low	E0H (Low)
CRC Check High	31H (High)

#### Please note:

Before and after the transmission in RTU mode, 10ms of silent interval is needed.

#### ■ LRC and CRC transmission Error Checking

The error checking in ASCII communication mode is LRC (Longitudinal Redundancy Check); CRC (Cyclical Redundancy Check) is for RTU communication mode. The algorithm of both is as the following.

LRC (ASCII mode):

Start	(.,
	'7'
Slave address	'F'
Function	·0'
Function	'3'
	·0'
Starting data address	'5'
	'C'
	'4'
	<b>'</b> 0'
Number of data	<b>'</b> 0'
Number of data	·0'
	'1'
LRC Check	'В'
	'4'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

The LRC algorithm is: add all byte, round down the carry and take 2' s complement. For example, 7FH + 03H + 05H + C4H + 00H + 01H = 14CH, round down carry 1 and take 4CH.

2's complement of 4CH is B4H.

#### CRC (RTU Mode):

The description of CRC is as the followings:

- Step 1: Load a 16-bits register of FFFFH, which is called **CRC** register.
- Step 2: (The low byte of CRC register) XOR (The first byte of command), and save the result in CRC register.
- Step 3: Right move one bit. Check the least significant bit (LSB) of CRC register. If the bit is 1, then (CRC register) XOR (A001H).
- Step 4: Return to Step 3 until Step 3 has been executed for 8 times. Go to Step 5.
- Step 5: Repeat the procedure from Step 2 to Step 4 until all byte is processing. Get the result of CRC value.

Description: After calculating CRC value, fill in the low word of CRC first in command message, and then fill in the high word of CRC. For example, if the result of CRC algorithm is 3794H, fill in 94H in low word and then 37H in high word.

ADR	01H
CMD	03H
Starting data address	01H (High)
Starting data address	01H (Low)
Number of data	00H (High)
(In Word)	02H (Low)
CRC Check Low	94H (Low)
CRC Check High	37H (High)

#### Example of CRC program:

Produce CRC in C language. This function needs two parameters: 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 \*/  $reg\_crc = (reg\_crc >> 1)^{0}xA001;$ } 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','0','2','F','8','\r','\n'};

```
void main() {
int I;
outportb(PORT+MCR,0x08);
                                      /* interrupt enable */
                                              /* interrupt as data in */
outportb(PORT+IER,0x01);
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,
                                                                         <7,0,1> = 0AH
                                              <8,N,2> = 07H
                                                                  <8,E,1> = 1BH
                                                                                     */
                                              <8,0,1> = 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 Write-in and Read-out Communication Parameters

Please refer to Chapter 8, Parameters for all parameter details. And the descriptions of parameters which can be wrote or read through communication are as follows.

Parameters are divided into 8 groups, Group 0: Monitor Parameters, Group 1: Basic Parameters, Group 2: Extension Parameters, Group 3: Communication Parameters, Group 4: Diagnosis Parameters, Group 5: Motion Setting, Group 6 and Group 7: PR Definition.

#### Write parameters via communication:

Parameters which can be written through communication include: Group 0, 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, except (P4-00~P4-04) and (P4-08~P4-09)

Group 5 (P5-00~P5-99), except P5-10, P5-16 and P5-76

Group 6 (P6-00~P6-99)

Group 7 (P7-00~P7-27)

#### Please note that:

- (P3-01) When change to a new communication speed, the next data will be written in a new transmission speed after setting the new value.
- (P3-02) When change to the new communication protocol, the next data will be written with the new communication protocol after setting the new value.
- (P4-05) JOG controls parameters of the servo. Please refer to Chapter 8, Parameters for the description.
- (P4-06) Force to control output contact. This parameter is for DO (Digital Output) testing. Users can write 1, 2, 4, 8 and 16 to test DO1, DO2, DO3, DO4 and DO5 respectively. Please write 0 after the test so as to inform the servo drive that the test has been completed.
- (P4-10) Adjustment function selection. Write 20 (= 14H in hexadecimal format) in parameter P2-08 first to enable the adjustment so as to change the value of P4-10.
- (P4-11 ~ P4-21) This parameter is Offset Adjustment. Do not change the setting unless it is necessary. If it is necessary, please write 22 (= 16H, in hexadecimal format) in parameter P2-08 first to enable the function so as to change the value of (P4-11 ~ P4-21)

#### Read parameters through communication:

Parameters can be read through communication include:

Group 0 (P0-00~P0-46)	Group 4 (P4-00~P4-23)
Group 1 (P1-00~P1-76)	Group 5 (P5-00~P5-99)
Group 2 (P2-00~P2-67)	Group 6 (P6-00~P6-99)
Group 3 (P3-00~P3-11)	Group 7 (P7-00~P7-27)

# **Chapter 10 Troubleshooting**

# 10.1 Alarm of Servo Drive

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
AL001	Over current	The current of the main circuit is 1.5 times more than the instantaneous current of the motor.	ALM	Servo Off
AL002	Over voltage	The voltage of the main circuit is higher than the standard voltage.	ALM	Servo Off
AL003	Under voltage	The voltage of the main circuit is lower than the standard voltage.	WARN	Servo Off
AL004	Motor Combination Error	The drive corresponds to the wrong motor.	ALM	Servo Off
AL005	Regeneration Error	Regeneration control is in error.	ALM	Servo Off
AL006	Overload	The motor and the drive is overload.	ALM	Servo Off
AL007	Over speed	The control speed of the motor exceeds the normal speed.	ALM	Servo Off
AL008	Abnormal Pulse Command	The input frequency of the pulse command is over the allowable value of the hardware interface.	ALM	Servo Off
AL009	Excessive Deviation of Position Command	The deviation of position command exceeds the allowable setting value.	ALM	Servo Off
AL011	Encoder Error	The encoder produces abnormal pulse.	ALM	Servo Off
AL012	Adjustment Error	When executing electrical adjustment, the adjusted value exceeds the allowable value.	ALM	Servo Off
AL013	Emergency Stop	Press the emergency stop button.	WARN	Servo Off
AL014	Reverse Limit Error	Activate the reverse limit switch.	WARN	Servo On
AL015	Forward Limit Error	Activate the forward limit switch.	WARN	Servo On
AL016	IGBT Overheat	The temperature of IGBT is over high	ALM	Servo Off

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
AL017	Abnormal EEPROM	It is in error when DSP accesses EEPROM.	ALM	Servo Off
AL018	Abnormal signal output	The encoder output exceeds the rated output frequency.	ALM	Servo Off
AL019	Serial Communication Error	RS-232/485 communication is in error	ALM	Servo Off
AL020	Serial Communication Time Out	RS-232/485 communication time out	WARN	Servo On
AL022	Main Circuit Power Lack Phase	Only one single phase is inputted in the main circuit power.	WARN	Servo Off
AL023	Early Warning for Overload	Early Warning for Overload	WARN	Servo On
AL024	Encoder initial magnetic field error	The magnetic field of the encoder U, V, W signal is in error.	ALM	Servo Off
AL025	The Internal of the Encoder is in Error	The internal memory of the encoder and the internal counter are in error.	ALM	Servo Off
AL026	Unreliable internal data of the encoder	The error of the internal data has been detected for three times continuously.	ALM	Servo Off
AL027	The Internal of the Motor is in Error	The internal reset of the encoder is in error.	ALM	Servo On
AL028	Encoder voltage error or the internal of the encoder is in error	Charging circuit of the servo drive is not removed and the battery voltage is higher than the specification (>3.8 V) or the encoder signal is in error.	ALM	Servo On
AL029	Gray code error	Absolute position is in error.	ALM	Servo On
AL030	Motor Crash Error	The motor crashes the equipment, reaches the torque of P1-57 and exceeds the time set by P1-58.	ALM	Servo Off
AL031	Incorrect wiring of the motor power line U, V, W, GND	Incorrect wiring of the motor power line U, V, W, GND or the connection between both is breakdown.	ALM	Servo Off
AL034	Internal communication of the encoder is in error	<ol> <li>Internal communication error of the absolute encoder</li> <li>Internal error of other type of encoder</li> </ol>	ALM	Servo Off
AL035	Encoder	Encoder temperature exceeds the	ALM	Servo

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
	temperature exceeds the protective range	protective range		Off
AL040	Excessive Deviation of Full Closed-loop Position Control	Excessive Deviation of Full Closed-loop Position Control	ALM	Servo Off
AL041	Communication of CN5 is breakdown	Communication of CN5 (encoder) is breakdown	ALM	Servo Off
AL042	Analog input voltage error	The analog voltage is over than the setting value of P1-83.	ALM	Servo Off
AL044	Warning of servo drive function overload	When the servo drive function overloads, it might bring the abnormality of motion control, such as PR or E-Cam.	WARN	Servo On
AL045	Wrong setting of E-gear ratio	The setting of E-gear ratio exceeds the range (1/50~25600). Thus, when repower on the servo drive, an alarm occurs.	ALM	Servo off
AL060	The absolute position is lost	Due to battery undervoltage or the failure of power supply, the encoder lost the internal record.	WARN	Servo On
AL061	Encoder under voltage	The voltage of the absolute encoder is lower than the specification	WARN	Servo On
AL062	The multi-turn of absolute encoder overflows	The multi-turn of absolute encoder exceeds the maximum range: -32768 ~ +32767	WARN	Servo On
AL067	Encoder temperature warning	Encoder temperature exceeds the warning level. (But it is still within the protective range.)	WARN	N/A
AL068	Absolute data transmitted via I/O is in error	The sequence is wrong when reading the absolute position via DIO.	WARN	Servo On
AL069	Wrong motor type	Incremental motor is not allowed to activate the absolute function.	ALM	Servo Off
AL06A	The absolute coordinate has not been initialized	The possible causes might be: 1. The motor is used for the first time 2. The battery had run dry but has replaced a new one.	WARN	Servo On
AL070	Encoder does not complete the command which is issued by servo drive	Servo drive has not completely writing barcode into encoder or the encoder does not complete the command issued by servo drive.	WARN	Servo Off
AL083	Servo drive	When the output current from servo	ALM	Servo

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
	outputs excessive current	drive exceeds the setting level, ALE083 will be triggered to protect IGBT. This could avoid IGBT to be burned out because of the excessive current.		Off
AL085	The absolute coordinate has not been initialized	The possible causes might be: 1. The motor is used for the first time 2. The battery had run dry but has replaced a new one.	WARN	Servo On
AL095	The servo drive does not connect to external regenerative resistor	The servo drive does not connect to external regenerative resistor *This alarm is only for 5.5 kW and 7.5 kW.	WARN	Servo On
AL099	DSP Firmware Upgrade	EEPROM has not been reset after upgrading the firmware. The fault can be cleared when firstly set P2-08 to 30. Then set P2-08 to 28. And re-power on the drive.	ALM	Servo Off

# **10.2** Alarm of CANopen Communication

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
AL111	CANopen SDO receives buffer overflow	SDO Rx Buffer overflow (receives more than two SDOs within 1 millisecond)	NMT: Reset node or 0x6040.Fault Reset	ALM	Servo On
AL112	CANopen PDO receives buffer overflow	PDO Rx Buffer overflow (receives more than two same PDOs of the COBID within 1 millisecond)	Same as above	ALM	Servo On
AL121	Index error occurs when accessing CANopen PDO	The specified Index in the message does not exist.	Same as above	ALM	Servo On
AL122	Sub-Index error occurs when accessing CANopen PDO	The specified Sub-Index in the message does not exist.	Same as above	ALM	Servo On
AL123	Data Size error occurs when accessing CANopen PDO	The data length in the message does not match to the specified object.	Same as above	ALM	Servo On
AL124	Data range error occurs when accessing CANopen PDO	The data value in the message is over the range of the specified object.	Same as above	ALM	Servo On
AL125	CANopen PDO is read-only and write-protected	The specified object in the message is write-protected.	Same as above	ALM	Servo On
AL126	CANopen PDO is not allowed in PDO	The specified object in the message does not support PDO	Same as above	ALM	Servo On
AL127	CANopen PDO is write-protected when Servo On	The specified object in the message is write- protected when Servo ON	Same as above	ALM	Servo On
AL128	Error occurs when reading CANopen PDO via EEPROM	An error occurs when loading the default value via ROM at start-up. All objects of CAN returns to the default value automatically.	Same as above	ALM	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
AL129	Error occurs when writing CANopen PDO via EEPROM	An error occurs when saving the current value into ROM.	Same as above	ALM	Servo On
AL130	The accessing address of EEPROM is out of range when using CANopen PDO.	The quantity of the data inside ROM is over the planned space. It is probably because the software has been updated. The data inside ROM is stored by the old version. Thus, it cannot be used.	Same as above	ALM	Servo On
AL131	CRC of EEPROM calculation error occurs when using CANopen PDO	It indicates that the data stored in ROM has been damaged. All objects of CAN will return to the default setting automatically.	Same as above	ALM	Servo On
AL132	Enter the incorrect password when using CANopen PDO	When entering parameters via CAN, the parameters are password-protected. Users have to decode the password first.	Same as above	ALM	Servo On
AL170	Heartbeat or NodeGuarding error	Heartbeat or NodeGuarding error	Same as above	WARN	On
AL180	Heartbeat or NodeGuarding error	Heartbeat or NodeGuarding error	Same as above	ALM	On
AL185	Abnormal CAN Bus hardware	The communication of CAN Bus is breakdown or Error Rx/Tx Counter is over 128.	NMT: Reset node or re- servo on	ALM	Servo On
AL186	CAN Bus off	CAN data transmission error	-	ALM	On
AL130	The accessing address of EEPROM is out of range when using CANopen PDO.	The quantity of the data inside ROM is over the planned space. It is probably because the software has been updated. The data inside ROM is stored by the old version. Thus, it cannot be used.	Same as above	ALM	Servo On

# **10.3 Alarm of Motion Control**

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
AL201	An error occurs when loading CANopen data	An error occurs when loading data via EEPROM.	DI.ARST, CANopen 0x1011 Restore default parameter	WARN	Servo On
AL207	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	Servo On
AL209	The parameter number of PR#8 is out of range	Parameter number P_Idx of PR#8 command exceeds the range.	DI.ARST, CANopen 0x1011 Restore default parameter	WARN	Servo On
AL213	The parameter setting of PR#8 is wrong	Write parameters via PR #8: the value is over the range. Please refer to Chapter 7 for detailed description.	DI.AIm Reset or P0-01= 0	WARN	Servo On
AL215	Write parameters: read-only	Write parameters via PR procedure: the parameter is read-only	DI.Alm Reset or P0-01= 0	WARN	Servo On
AL217	Write parameters: parameter locked	Write parameters via PR procedure: it is write- protected when the servo is ON or the input data is unreasonable.	Correct the PR command and parameter	WARN	Servo On
AL231	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	Servo On
AL235	PR command overflows	Feedback position counter overflows and executes the absolute positioning command.	NMT: Reset node or 0x6040.Fault Reset	WARN	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
AL237	Indexing coordinate is undefined	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.	DI.AIm Reset or write 0 into P0-01	WARN	Servo On
AL261 ~ AL277		Rese	rved		
AL283	Forward Software Limit	The value of position command is bigger than forward software limit (P5-08)	The fault will be cleared automatically when the motor operates backwards.	WARN	Servo On
AL285	Reverse Software Limit	The value of position command is smaller than reverse software limit (P5-09)	The fault will be cleared automatically when the motor operates backwards.	WARN	Servo On
AL289	Feedback position counter overflows	Feedback position counter overflows.	NMT: Reset node or 0x6040.Fault Reset	WARN	Servo On
AL291	Servo OFF error	Servo OFF when the motion path is incomplete.	Same as above	WARN	Servo On
AL301	CANopen fails to synchronize	CANopen IP mode fails to synchronize with the controller.	Same as above	WARN	Servo On
AL302	The synchronized signal of CANopen is sent too fast	The synchronized signal, SYNC of CANopen is sent too fast.	Same as above	WARN	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
AL303	The synchronized signal of CANopen is sent too slow	The synchronized signal, SYNC of CANopen has not been received in time.	Same as above	WARN	Servo On
AL304	CANopen IP command is failed	Command cannot be issued in CANopen IP mode.	Same as above	WARN	Servo On
AL305	SYNC Period is in error	CANopen 301 Obj 0x1006 Data Error !	Same as above	WARN	Servo On
AL380	Position Deviation Alarm	Please refer to the description of parameter P1-48. After DO.MC_OK ON, DO.MC_OK becomes OFF because DO. TPOS turns OFF.	DI.AIm Reset or P0-01= 0	WARN	Servo On
AL400	Index coordinates error	The setting value of P2- 52 is set too small and cause index coordinates error	Adjust the value of P2-52 to the appropriate one	ALM	Off
AL401	NMT Reset command is received when Servo On	NMT Reset command is received when Servo On		ALM	Off
AL404	Value of PR special filter setting is too big	The setting value of P1- 22 causes inner position error overflows	Re-adjust the value of P1-22 until it is appropriate	ALM	Off
AL555	System Failure	DSP processing error	N/A		Do not Switch

If the alarm occurs and is different from the alarm showed in Alarm of Servo Drive, Alarm of CANopen Communication and Alarm of Motion Control, please contact with distributors or technical personnel.

# **10.4 Causes and Corrective Actions**

#### Alarm Display

#### AL001 : Over current

Causes	Checking Method	Corrective Actions
The drive output is short- circuit	Check if the wiring between the motor and the drive is correct and see if the wire is short-circuited.	Eliminate short-circuit and avoid metal conductor being exposed.
The motor wiring is in error.	Check if the wiring steps are correct when connecting the motor to the drive.	Rewiring by following the wiring description from the user manual.
IGBT is abnormal	The temperature of the heat sink is abnormal	Send the drive back to the distributors or contact with Delta
The control parameter setting is in error.	Check if the setting value exceeds the default setting	Setting back to the default setting and then gradually adjust the value.
Unreasonable command	Check if the command doing reasonable acceleration time.	Less steep command used or filter applying to smooth command.

#### AL002 : Over voltage

Causes	Checking Method	Corrective Actions
The input voltage of the main circuit is higher than the rated allowable voltage.	Use the voltmeter to see if the input voltage of the main circuit is within the rated allowable voltage value. (please refer to Chapter 12.1)	Apply to the correct power supply or serial voltage regulator.
Wrong power input (incorrect power system)	Use the voltmeter to see if the power system matches the specification.	Apply to the correct power supply or serial adaptor.
The hardware of the servo drive is damaged.	Use the voltmeter to see if the input voltage of the main circuit is within the rated allowable voltage value but still shows the error.	Send the drive back to the distributors or contact with Delta.

#### AL003 : Under voltage

Causes	Checking Method	Corrective Actions
The input voltage of the main circuit is lower than the rated allowable voltage.	Check if the input voltage wiring of the main circuit is normal.	Re-confirm the voltage wiring.
No power supply for the main circuit.	Use the voltmeter to see if the voltage of the main circuit is normal.	Check the power switch
Wrong power input (incorrect power system)	nower everem marchee the	Apply to the correct power supply or serial adaptor.

#### AL004 : Motor Combination Error

Causes	Checking Method	Corrective Actions
The encoder is damaged.	The encoder is abnormal.	Change the motor
The encoder is loose.	Check the encoder connector.	Install the motor again.
Motor Combination Error	Connect to the right motor.	Change the motor

### AL005 : Regeneration Error

Causes	Checking Method	Corrective Actions
The regenerative resistor is unconnected or too low	Check the connection of regenerative resistor.	Reconnect the regenerative resistor or calculate the value of the regenerative resistor.
Parameter P1-53 is not set to zero when the regenerative resistor is not in use.	Check if parameter P1-53 of regenerative resister is set to zero.	Set parameter P1-53 of regenerative resistor to zero when it is not applying.
Wrong parameter setting	Check the setting value of parameter P1-52 and P1-53.	Correctly reset the setting.

#### AL006 : Overload

Causes	Checking Method	Corrective Actions
Over the rated loading of the drive and continuously excessive using	Set parameter P0-02 to 11 and see if the average torque [%] is over 100% all the time.	Increase the motor capacity or reduce the load.
The setting of the control system parameter is inappropriate.	<ol> <li>Check if there is any mechanical vibration.</li> <li>Check if the acceleration / deceleration constant are set too fast.</li> </ol>	<ol> <li>Adjust the gain value of the control circuit.</li> <li>Slow down the acceleration / deceleration setting time.</li> </ol>
Wrong wiring of the motor and the encoder.	Check the wiring of U, V, W and the encoder.	Correct wiring
The encoder of the motor is defective.	Send the drive back to the distributors or contact with Delta.	

#### AL007 : Overspeed

Causes	Checking Method	Corrective Actions
Unreasonable command		Less steep command used or filter applying to smooth command.
Inappropriate parameter setting		Correctly set parameter P2-34 (the condition of over-speed warning).

Causes	Checking Method	Corrective Actions
The pulse command frequency is higher than the rated input frequency.	Use the scope to check if the input frequency is over the rated input frequency.	Correctly set the input pulse frequency.

#### AL008 : Abnormal Pulse Command

#### AL009 : Excessive Deviation of Position Command

Causes	Checking Method	Corrective Actions
Parameter P2-35 is set too small	Check the setting value of parameter P2-35 (The warning condition of excessive position deviation)	Increase the setting value of P2-35 (The warning condition of excessive position deviation)
The setting of the gain value is too small.	Check if the setting value is appropriate	Correctly adjust the gain value
The torque limit is too low.	Check the torque limit value	Correctly adjust the torque limit value
Excessive external load	Check the external load	Reduce the external load or evaluate the motor capacity again
Improper setting of E- gear ratio	Make sure if the proportion of P1-44 and P1-45 is appropriate.	Correctly setup E-gear ratio

#### AL011 : Encoder Error

Causes	Checking Method	Corrective Actions
Wrong wiring of the encoder	Check if the wiring follows the suggested wiring of the user manual.	Correct wiring
The encoder is loose	Check the drive connector of CN2 and encoder	Install the encoder again
Bad connection of the encoder	Check if the connection between CN2 of the drive and the encoder of the servo motor is loose	Reconnect the wiring
The encoder is damaged	Check if the motor is damaged	Change the motor

#### AL012 : Adjustment Error

Causes	Checking Method	Corrective Actions
The analog input contact is incorrectly set back to zero	Measure if the voltage of the analog input contact is the same as the ground voltage	Correctly ground the analog input contact
The detection device is damaged	Reset the power supply	If the error still occurs after reset, send the drive back to the distributors or contact with Delta.

#### AL013 : Emergency Stop

Causes	Checking Method	Corrective Actions
Press the emergency stop button	Check if the emergency stop button is enabled.	Activate emergency stop

#### AL014 : Reverse Limit Error

Causes	Checking Method	Corrective Actions
Reverse limit switch is activated.	Check if the limit switch is enabled.	Enable the reverse limit switch
The servo system is unstable.		Re-adjust the parameter or evaluate the motor capacity.

#### AL015 : Forward Limit Error

Causes	Checking Method	Corrective Actions
Forward limit switch is activated.	Check if the limit switch is enabled.	Enable the forward limit switch
The servo system is unstable.		Re-adjust the parameter or evaluate the motor capacity.

#### AL016 : IGBT Overheat

Causes	Checking Method	Corrective Actions
Over the rated loading of the drive and continuously excessive using	Check if it is overloading or the motor current is too high.	Increase the motor capacity or reduce the load.
The drive output is short- circuit	Check the drive output wiring	Correct wiring

#### AL017 : Abnormal EEPROM

Causes	Checking Method	Corrective Actions
It is in error when DSP accesses EEPROM.	Press the SHIFT Key on the panel and it shows EXGAB. X = 1, 2, 3 G = group code of the parameter	The fault occurs when applying to the power. It means one of the parameters is over the reasonable range. Please re-power on after adjusting.
	AB = hexadecimal of the parameter	adjusting.
	If it shows E320A, it means it is parameter P2-10; If it shows E3610, it means it is parameter P6-16. Please check the parameter.	The fault occurs in normal operation. It means it is in error when writing the parameter. The alarm can be cleared by DI.ARST.
Abnormal hidden parameter	Press the SHIFT Key on the panel and it shows E100X	The fault occurs in parameter reset. The setting of the drive is wrong. Please set the correct type of the drive.
Data in ROM is damaged.	Press the SHIFT Key on the panel and it shows E0001	The fault occurs when it is servo- on. Usually it is because the data in ROM is damaged or there is no data in ROM. Please send the drive back to the distributors or contact with Delta.

Causes	Checking Method	Corrective Actions
The encoder is in error and cause the abnormal signal output	Check the fault records (P4-00~P4- 05). See if the alarm exists with the encoder error (AL011, AL024, AL025, AL026)	Conduct the corrective actions of AL.011, AL.024, AL.025, AL.026
The output pulse exceeds the hardware allowable range.	Check if the following conditions produce: P1-76 < Motor Speed or $\frac{Motor Speed}{60} \times P1-46 \times 4 > 19.8 \times 10^{6}$	Correctly set parameter P1-76 and P1-46: P1-76 > Motor Speed or $\frac{Motor Speed}{60} \times P1-46 \times 4 < 19.8 \times 10^{6}$

# AL018 : Abnormal Signal Output

# AL019 : Serial Communication Error

Causes	Checking Method	Corrective Actions
Improper setting of the communication parameter	Check the setting value of communication parameter	Correctly set the parameter value
Incorrect communication address	Check the communication address	Correctly set the communication address
Incorrect communication value	Check the accessing value	Correctly set the value

# AL020 : Serial Communication Time Out

Causes	Checking Method	Corrective Actions
Improper setting of the time-out parameter	Check the parameter setting	Correctly set the value
The drive hasn't received the communication command for a long time.	Check if the communication cable is	Correct wiring

# AL022 : Main circuit power leak phase

Causes	Checking Method	Corrective Actions
The main circuit power is abnormal	Check if RST power cable is loose or does not connect to the power. This alarm occurs when no power connects to 3-phase for under 1.5 kW (included) servo drive. No power connects to single phase for 2 kW (included or above) servo drive, this alarm occurs.	Make sure it applies to the power. If issue persists, please send the drive back to the distributors or contact with Delta.

# AL023 : Early warning for overload

Causes	Checking Method	Corrective Actions
Early warning for overload	<ol> <li>Check if it is used in overload condition.</li> <li>Check if the value of parameter P1-56 is set to small.</li> </ol>	<ol> <li>Please refer to the corrective actions of AL006.</li> <li>Please increase the setting value of parameter P1-56. Or set the value over 100 and deactivate the overload warning function.</li> </ol>

# AL024 : Encoder initial magnetic field error

Causes	Checking Method	Corrective Actions
The initial magnetic field of the encoder is in error (Signal, U, V, W of the encoder magnetic field is in error.)	<ol> <li>Check if the servo motor is properly grounded.</li> <li>Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	If issue persists, please send the drive back to the distributors or contact with Delta.

# AL025 : The internal of the encoder is in error

Causes	Checking Method	Corrective Actions
The internal of the encoder is in error. (The internal memory and the internal counter are in error)	<ol> <li>Check if the servo is properly grounded.</li> <li>Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	<ol> <li>Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>Please use shielding mesh.</li> <li>If issue persists, please send the drive back to the distributors or contact with Delta.</li> </ol>
When power on, the motor operates because of mechanical inertia or other causes	When power on, please make sure the motor shaft stands still and will not operate.	When power on, please make sure the motor shaft stands still and will not operate.

# AL026 : Unreliable internal data of the encoder

Causes	Checking Method	Corrective Actions
The encoder is in error. (Errors occur in the internal data for three times continuously)	<ol> <li>Check if the servo is properly grounded.</li> <li>Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	<ol> <li>Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>Please use shielding mesh.</li> <li>If issue persists, please send the drive back to the distributors or contact with Delta.</li> </ol>

# AL027 : The internal of the motor is in error

Causes	Checking Method	Corrective Actions
The internal reset of the encoder is in error.	<ol> <li>Check if the servo is properly grounded.</li> <li>Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	<ol> <li>Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>Please use shielding mesh.</li> <li>If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> </ol>

# AL028 : Encoder voltage error or the internal of the encoder is in error

Causes	Checking Method	Corrective Actions
Battery voltage is too high	<ol> <li>Check if the charging circuit exists in the servo drive.</li> <li>Check if the battery is correctly installed</li> </ol>	According to the procedure of Over voltage to check. When corrective actions are done, AL.028 will be cleared automatically.
The internal encoder is in error.	<ol> <li>Check if it is the absolute type encoder.</li> <li>Check if the servo is properly grounded.</li> <li>Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	<ol> <li>If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> <li>Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>Please use shielding mesh. If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> </ol>

# AL029 : Gray code error

Causes	Checking Method	Corrective Actions
		If the alarm occurs again, please change the encoder.

# AL030 : Motor Crash Error

Causes	Checking Method	Corrective Actions
Motor Crash Error	<ol> <li>Check if P1-57 is enabled.</li> <li>Check if P1-57 is set too small and the time of P1-58 is set too short.</li> </ol>	<ol> <li>If it is enabled by mistake, please set P1-57 to zero.</li> <li>According to the actual torque setting, if the value is set too small, the alarm will be triggered by mistake. However, if the value is set too big, it will lose</li> </ol>

the function of protection.

# AL031 : Incorrect wiring of the motor power line U, V, W

Causes	Checking Method	Corrective Actions
	Check if U, V, W of the motor is incorrect connected or the connection is breakdown.	Follow the user manual to correctly wire U, V, and W and make sure it is grounded.

# AL034 : Internal communication of the encoder is in error

Causes	Checking Method	Corrective Actions
Internal communication of the encoder is in error		Conduct the wiring of the battery again and re-power on after that.

#### AL035 : Encoder temperature exceeds the protective range

Causes	Checking Method	Corrective Actions
Encoder temperature exceeds the protective range, above 105℃	Check the setting: Set the value of P0-02 to 120 to display the temperature.	<ol> <li>Improve heat dissipation or reduce the loading of operation. The temperature should be lower than 100°C.</li> <li>If the encoder's temperature is higher than the motor's (more than 30 degree). Please send the motor back to the distributors.</li> </ol>

## AL040 : Excessive deviation of full closed-loop position control

Causes	Checking Method	Corrective Actions
Excessive deviation of full closed-loop position control	<ol> <li>Check if P1-73 is set too small.</li> <li>Check if the connector is loose or there is any connection problem of other mechanism.</li> </ol>	<ol> <li>Increase the value of P1-73.</li> <li>Check if the connection is well connected.</li> </ol>

# AL041 : Communication of linear scale is breakdown

Causes	Checking Method	Corrective Actions
The communication of	Check the communication of linear	Check the communication of linear
linear scale is breakdown	scale.	scale again.

# AL042 : Analog input voltage error

Causes	Checking Method	Corrective Actions
The analog input voltage is higher than the value of P1-83.	Check if analog input voltage is too high.	Check all analog input voltages. Check if there is any problem about the sources of analog speed commands.

# AL044 : Warning of servo drive function overload

Causes	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.

# AL045 : Wrong setting of E-gear ratio

Causes	Checking Method	Corrective Actions
Setting of E-gear ratio is wrong when power on the servo drive		Modify the range of E-gear ratio and repower on the servo drive.

#### AL060 : The absolute position is lost

Causes	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> <li>Install the battery.</li> <li>Check the wiring between the battery pack and the power cable of the servo drive.</li> <li>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> <li>Check the wiring of the encoder.</li> <li>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

Causes	Checking Method	Corrective Actions
Battery under voltage	<ol> <li>Check if the voltage of the battery on the panel is lower than 3.1 V (tentative specification).</li> <li>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

Causes	Checking Method	Corrective Actions
The operation distance exceeds the range the absolute encoder is able to record	exceeds the range, -32768 ~	Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.

# AL067 : Encoder temperature warning

Causes	Checking Method	Corrective Actions
Encoder temperature exceeds the warning level. (But it is still within the protective range85 ~100℃.)	Check the setting: Set the value of P0-02 to 120 to display the temperature.	<ol> <li>Improve heat dissipation or reduce the loading of operation. The temperature should be lower than 100°C.</li> <li>If the encoder's temperature is higher than the motor's (more than 30 degree). Please send the motor back to the distributors.</li> </ol>

## AL068 : Absolute data transmitted via I/O is in error

Causes	Checking Method	Corrective Actions
Sequence error	<ol> <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

Causes	Checking Method	Corrective Actions
Incremental motor is not allowed to activate the absolute function	incremental or absolute encoder.	If the user desires to use absolute function, please choose absolute motor. If not, please set parameter P2-69 to 0.

#### AL06A : The absolute coordinate has not been initialized

CausesChecking MethodCorrective ActionsThe motor is used for the<br/>first time or the battery<br/>had run dry but has<br/>replaced a new one.Check if the absolute coordinate<br/>has been initialized.Initialize the absolute coordinate.

AL070 : Encoder does not complete the command which is issued b	by servo drive
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Causes	Checking Method	Corrective Actions
	Check if the wiring is correct or there is any loose connection.	Correct the wiring.

#### AL083 : Servo Drive Outputs Excessive Current

Causes	Checking Method	Corrective Actions
UVW cable is short- circuited	Check the configuration of motor power cable and connector cable. See if the metal wire is exposed or AWG is worn and causes short circuit of UVW cable.	Replace by new UVW cable and avoid the metal conductor being exposed so as to eliminate short-circuit.
Wrong motor wiring	<ol> <li>If applying non-standard power cable recommended by Delta, please check if the wiring sequence of UVW cable is correct.</li> <li>Check if there is any problem of lack phase when connecting UVW from servo to motor (unconnected or wrong connection)</li> </ol>	Please refer to the description of wiring in Chapter 3 and conduct the wiring again.
Analog signal (GND) from servo drive is interfered	Check if the GND of analog signal is misconnected to other signal.	Please refer to Chapter 3 and conduct the wiring again. GND of analog signal cannot be grounded with other signals.

# AL085 : Regeneration Error

Causes	Checking Method	Corrective Actions
Choose wrong regenerative resistor or does not connect to external regenerative resistor	Check the connection of regenerative resistor.	Calculate the value of the regenerative resistor again and correctly set the value of P1-52 and P1-53. If issue persists, please send the drive back to the distributors or contact with Delta.
Parameter P1-53 is not set to zero when the regenerative resistor is not in use.	Check if parameter P1-53 of regenerative resister is set to zero.	Set parameter P1-53 of regenerative resistor to zero when it is not applying.
Wrong parameter setting	Check the setting value of parameter P1-52 and P1-53.	Correctly reset the value of P1-52 and P1-53.

## AL095 : The servo drive does not connect to external regenerative resistor

Causes	Checking Method	Corrective Actions
The input of regenerative resistor capacity is over 0 and the servo drive does not connect to external regenerative resistor	<ol> <li>Check if it is connected to regenerative resistor.</li> <li>Check if the setting value of P1- 53 is 0.</li> </ol>	<ol> <li>If wish to apply regenerative brake, please connect to external regenerative resistor. Then, check if the setting of P1- 53 is correct.</li> <li>If not applying to regenerative brake, please set P1-53 to 0.</li> <li>If issue persists after conducting the above two steps, please send the drive back to distributors or contact with Delta.</li> </ol>

# AL099 : DSP firmware upgrade

Causes	Checking Method	Corrective Actions
Upgrade DSP firmware	Check if the firmware is upgraded.	Firstly set P2-08 to 30. Then set P2-08 to 28, the alarm will be cleared when re-power on.

#### AL111 : CANopen SDO receives overflow

Causes	Checking Method	Corrective Actions
	(sends) more than one SDO within	NMT: Reset node or 0x6040.Fault Reset

# AL112 : CANopen PDO receives overflow

Causes	Checking Method	Corrective Actions
PDO Rx Buffer overflow (receives more than two PDOs of COBID within one millisecond)	Check if the servo drive receives (sends) more than one PDO of COBID within 1ms.	NMT: Reset node or 0x6040.Fault Reset

#### AL121 : Index error occurs when accessing CANopen PDO

Causes	Checking Method	Corrective Actions
the message does not	Manning is modified when PDO is	NMT: Reset node or 0x6040.Fault Reset

#### AL122 : Sub-Index error occurs when accessing CANopen PDO

Causes	Checking Method	Corrective Actions
in the message does not	Check if the Entry Sub-index of PDO Mapping is modified when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

# AL123 : Data Size error occurs when accessing CANopen PDO

Causes	Checking Method	Corrective Actions
message does not match	PDO Manning is modified when	NMT: Reset node or 0x6040.Fault Reset

#### AL124 : Data range error occurs when accessing CANopen PDO

Causes	Checking Method	Corrective Actions
	0 0	NMT: Reset node or 0x6040.Fault Reset

#### AL125 : CANopen PDO is read-only and write-protected

Causes	Checking Method	Corrective Actions
and moodage to mile	Check if the specified object is read- only when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

# AL126 : CANopen PDO is not allowed in PDO

Causes	Checking Method	Corrective Actions
the message does not	PDO Mapping when PDO is	NMT: Reset node or 0x6040.Fault Reset

#### AL127 : CANopen PDO is write-protected when Servo On

Causes	Checking Method	Corrective Actions
	Check that when PDO is receiving or sending, if the specified object is write-protected when Servo On.	NMT: Reset node or 0x6040.Fault Reset

# AL128 : Error occurs when reading CANopen PDO via EEPROM

Causes	Checking Method	Corrective Actions
via ROM at start-up. All objects of CAN returns to	When PDO is receiving or sending, check if the error occurs because the specified object reads EEPROM.	NMT: Reset node or 0x6040.Fault Reset

## AL129 : Error occurs when writing CANopen PDO via EEPROM

Causes	Checking Method	Corrective Actions
An error occurs when saving the current value into ROM.	When PDO is receiving or sending, check if the error occurs because the specified object is wrote into EEPROM	NMT: Reset node or 0x6040.Fault Reset

#### AL130 : The accessing address of EEPROM is out of range when using CANopen PDO

Causes	Checking Method	Corrective Actions
The quantity of the data inside ROM is over the planned space. It is probably because the software has been updated. The data inside ROM is stored by the old version. Thus, it cannot be used.	Check that when PDO is receiving or sending, if the specified object enables EEPROM address exceeds the limit.	NMT: Reset node or 0x6040.Fault Reset

#### AL131 : CRC of EEPROM calculation error occurs when using CANopen PDO

Causes	Checking Method	Corrective Actions
It means the data stored in ROM is damaged. All CANopen objects automatically returns to the default value.	Check if the specified object would cause CRC calculation error in EEPROM when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

#### AL132 : Enter the incorrect password when using CANopen PDO

Causes	Checking Method	Corrective Actions
hassword_brotected	Check if the specified object enters the wrong password when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

#### AL170 : CANopen Heartbeat or NodeGuarding error

Causes	Checking Method	Corrective Actions
•	Check if CANopen communication and connection is normal.	NMT:Reset node or 0x6040.Fault Reset

# AL180 : CANopen Heartbeat or NodeGuarding error

Causes	Checking Method	Corrective Actions
	Check if CANopen communication and connection is normal.	NMT:Reset node or 0x6040.Fault Reset

#### AL185 : Abnormal CAN Bus hardware

Causes	Checking Method	Corrective Actions
	1. Check if the communication cable of CAN Bus is good.	
Abnormal CAN Bus hardware	2. Check if the communication quality is good. (It is suggested to use common grounding and shielded cable)	NMT: Reset node or re-servo on

# AL186 : Bus off

Causes	Checking Method	Corrective Actions
	Check if the communication is correctly connected or if there is any interference	Change the communication cable or clear the noise
CAN Bus transfer error	The number of slave station is excessive and the communication cycle period is too short.	Lengthen the communication cycle period

#### AL201 : An error occurs when loading CANopen data

Causes	Checking Method	Corrective Actions
	1. If the alarm is cleared when re- servo on, it means the data error occurs instantaneously when accessing in the previous time.	
An error occurs when loading CANopen data	<ol> <li>If the error still exists after reservo on, it means the data in EEPROM is damaged. It has to enter the correct value again. The method is as the followings:         <ol> <li>a. If the user desires to enter the default value, it can set P2-08 to 30, 28 or CANopen object</li> </ol> </li> </ol>	DI.ARST, CANopen 0x1011 Restore default parameter
	as 0x1011. b. If the user desires to enter the current value, it can set CANopen object to 0x1010. (Please refer to CANopen description.)	

# AL207 : Parameter group of PR#8 is out of the range

Causes	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	DI.Alm Reset or write 0 into P0-01

range

## AL209 : Parameter number of PR#8 is out of the range

Causes	Checking Method	Corrective Actions
approved source	nrocoduro. The parameter humber	DI.Alm Reset or write 0 into P0-01

#### AL213 ~ AL217 : An error occurs when writing parameter via PR

Causes	Checking Method	Corrective Actions
PR commands TYPE 8 Error occurs when writing parameters	AL213 : parameter exceeds the	
	0	DI.Alm Reset or P0-01 = 0
	AL215 : the parameter is read-only	
	AL217 : Servo On or invalid value	Re-adjust PR command and parameters

#### AL231 : The setting of monitor item of PR#8 is out of the range

Causes	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

Causes	Checking Method	Corrective Actions
	Incremental type: PR mode continuously operates in one direction and causes feedback register (FB_PUU) overflows. And the coordinate system cannot reflect the correct position. If issuing the absolute positioning command at this time, the error will occur.	
PR command error	<ul> <li>Absolute type: The error occurs in following situations:</li> <li>1. Feedback register (FB_PUU) overflows</li> <li>2. After P1.01.Z is modified, the system neither returns to the original point nor conducts homing procedure.</li> <li>3. It does not conduct homing procedure after the E-gear ratio is modified (P1-44 and P1-45).</li> <li>4. Returning to the original point is</li> </ul>	Conduct homing procedure

	triggered and the homing procedure is not complete.	
5.	AL.060 and AL.062 occur.	

# AL237 : Indexing coordinate is undefined

Causes	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.	<ol> <li>Before executing indexing function, please conduct homing first so as to avoid this alarm.</li> <li>When the alarm occurs, please use DI:Alm Reset or write 0 into P0-01to clear the alarm.</li> <li>The alarm can be cleared when it is Servo ON.</li> </ol>

# AL283 : Forward Software Limit

Causes	Checking Method	Corrective Actions
Forward software limit	Forward Software Limit is determined by the position command, not the actual feedback position. It is because the command will arrive first and then the feedback. When the protection function is activated, the actual position might not over the limit. Therefore, setting an appropriate decelerating time could satisfy the demand. Please refer to the description of parameter P5-03.	NMT: Reset node or 0x6040.Fault Reset

#### AL285 : Reverse Software Limit

Causes	Checking Method	Corrective Actions
Reverse software limit		NMT: Reset node or 0x6040.Fault Reset

#### AL289 : Feedback position counter overflows

Causes	Checking Method	Corrective Actions
Feedback position	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

#### AL291 : Servo Off error

Causes	Checking Method	Corrective Actions
Servo Off error	<ol> <li>Check if the wiring of DI.SERVO ON is correct</li> <li>Check if the controller servo on the drive too early.</li> </ol>	NMT: Reset node or 0x6040.Fault Reset

## AL301 : CANopen fails to synchronize

Causes	Checking Method	Corrective Actions
	<ol> <li>Check if the communication quality of the circuit is bad.</li> </ol>	
CANopen fails to synchronize	<ol> <li>Check if the controller sends SYNC signal successfully.</li> </ol>	NMT: Reset node or 0x6040.Fault Reset
synchronize	<ol> <li>Check if the setting of P3-09 is reasonable. (It is better to use the default value)</li> </ol>	i i i i i i i i i i i i i i i i i i i

#### AL302 : The synchronized signal of CANopen is sent too fast

Causes	Checking Method	Corrective Actions
The synchronized signal of CANopen is sent too fast	1. Check if synchronized cycle 0x1006 is the same as the setting of controller.	
	<ol> <li>Check if the setting of P3-09 is reasonable. (It is better to use the default value)</li> </ol>	NMT: Reset node or 0x6040.Fault Reset
	<ol><li>Check if the order of controller is incorrect.</li></ol>	

# AL303 : The synchronized signal of CANopen is sent too slow

Causes	Checking Method	Corrective Actions
The synchronized signal of CANopen is sent too slow	<ol> <li>Check if the communication quality of the circuit is bad.</li> <li>Check if synchronized cycle 0x1006 is the same as the setting of controller.</li> <li>Check if the setting of P3-09 is reasonable. (It is better to use the default value)</li> <li>Check if the order of controller is incorrect.</li> </ol>	NMT: Reset node or 0x6040.Fault Reset

# AL304 : CANopen IP command fails

Causes	Checking Method	Corrective Actions
CANopen IP command fails	The calculating time of IP mode takes too long. Please disable USB monitoring function.	NMT: Reset node or 0x6040.Fault Reset

# AL305 : SYNC Period is in error

Causes	Checking Method	Corrective Actions
SYNC Period is in error	it is smaller than or equals to () the	NMT: Reset node or 0x6040.Fault Reset

# AL380 : Position Deviation Alarm

Causes	Checking Method	Corrective Actions
DO.MC_OK is ON and becomes OFF.	Please refer to the description of parameter P1-48. After DO.MC_OK ON, DO.MC_OK becomes OFF because DO.TPOS turns OFF. The position of the motor might be deviated by the external force after positioning. This alarm can be cleared by P1-48.Y=0.	DI.Alm Reset or P0-01= 0

#### AL400 : Index coordinates error

Causes	Checking Method	Corrective Actions
Setting of P2-52 is wrong	Check if the setting of P2-52 is within the range. If the setting value is too small, it would cause index coordinates error.	Re-adjust the value of P5-52 until it is appropriate.

## AL401 : Receives NMT reset command when Servo On

Causes	Checking Method	Corrective Actions
	Check if the servo drive receives NMT reset command when Servo On	NMT:Reset node or 0x6040.Fault Reset

# AL404 : Value of PR special filter setting is too big

(	Causes	Checking Method	Corrective Actions
Inner pos overflows		······································	Re-adjust the value of P1-22 until it is appropriate.

# AL555 : System Failure

Causes	Checking Method	Corrective Actions
DSP processing error	Ν/Δ	If AL555 occurs, do not do any anything and send the drive back to the distributors or contact with Delta.

# **10.5** Corrective Actions after the Alarm Occurs

AL001	: Over current	Turn DI.ARST on to clear the alarm
AL002	: Over voltage	Turn DI.ARST on to clear the alarm
AL003	: Undervoltage	The alarm can be cleared after the voltage returns to normal.
AL004	: The magnetic field of the motor is abnormal	The alarm can be cleared after re- power on.
AL005	: Regeneration error	Turn DI.ARST on to clear the alarm
AL006	: Overload	Turn DI.ARST on to clear the alarm
AL007	: Excessive speed deviation	Turn DI.ARST on to clear the alarm
AL008	: Abnormal pulse command	Turn DI.ARST on to clear the alarm
AL009	: Excessive deviation of position control	Turn DI.ARST on to clear the alarm
AL011	: Encoder error	The alarm can be cleared after re- power on.
AL012	: Adjustment error	The alarm can be cleared when removing CN1 wiring and execute auto adjustment.
AL013	: Emergency stop	The alarm can be cleared automatically after turning DI.EMGS off
AL014	: 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.
AL015	: 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.
AL016	: The temperature of IGBT is abnormal	Turn DI.ARST on to clear the alarm
AL017	: Abnormal EEPROM	If the alarm occurs, then parameter reset is a must. And re-servo on again. If it happens during the operation, please turn DI.ARST on to clear the alarm.
AL018	: Abnormal signal output	Turn DI.ARST on to clear the alarm
AL019	: Serial communication error	Turn DI.ARST on to clear the alarm
AL020	: Serial communication timeout	Turn DI.ARST on to clear the alarm
AL022	: Main circuit power leak phase	Turn DI.ARST on to clear the alarm

AL023	: Early warning for overload	Turn DI.ARST on to clear the alarm
AL024	: Encoder initial magnetic field error	The alarm can be cleared after re- power on.
AL025	: The internal of the encoder is in error	The alarm can be cleared after re- power on.
AL026	: The encoder is in error	The alarm can be cleared after re- power on.
AL027	: Encoder reset error	The alarm can be cleared after re- power on.
AL028	: The encoder is over voltage or the internal of the encoder is in error	The alarm can be cleared after re- power on.
AL029	: Gray code error	The alarm can be cleared after re- power on.
AL030	: Motor crash error	Turn DI.ARST on to clear the alarm
AL031	: Incorrect wiring of the motor power line U, V, W, GND	The alarm can be cleared after re- power on.
AL034	: Internal communication of the encoder is in error	The alarm can be cleared after re- power on.
AL035	: Encoder temperature exceeds the protective range	The temperature sensor of motor shall below 100°C. And the alarm can be cleared after re-power on.
AL040	: Excessive deviation of full closed-loop position control	Turn DI.ARST on to clear the alarm.
AL041	: The communication of linear scale is breakdown	Turn DI.ARST on to clear the alarm.
AL042	: Analog input voltage error	Turn DI.ARST on to clear the alarm.
AL044	: Warning of servo drive function overload	Set P2-66 Bit4 to 1 and then re-power on the servo drive.
AL045	: Wrong setting of E-gear ratio	The alarm can be cleared after correctly setting up the parameter.
AL060	: The absolute position is lost	The alarm can be cleared after re- power on.
AL061	: Encoder under voltage	Change the battery and AL.061 will be cleared automatically.
AL062	: The multi-turn if absolute encoder overflows	The alarm can be cleared after re- power on.
AL067	: Encoder temperature warning	Turn DI.ARST on to clear the alarm.
AL068	: Absolute data transmitted via I/O is in error	The alarm can be cleared after re- power on.
AL069	: Wrong motor type	Set P2-69 to 0 and then re-power on the servo drive.

AL06A	: The absolute coordinate has not been initialized	The alarm can be cleared after initializing the absolute coordinate.
AL070	: Encoder does not complete the command which is issued by servo drive	The alarm can be cleared after re- power on.
AL083	: Servo drive outputs excessive current	Turn DI.ARST on to clear the alarm.
AL085	: The absolute coordinate has not been initialized	Turn DI.ARST on to clear the alarm.
AL095	: The servo drive does not connect to external regenerative resistor	Turn DI.ARST on to clear the alarm.
AL099	: DSP firmware upgrade	Firstly set P2-08 to 30. Then set it to 28. And the alarm will be cleared after re-power on.
AL111	: CANopen SDO receives buffer overflow	NMT: Reset node or 0x6040.Fault Reset
AL112	: CANopen PDO receives buffer overflow	NMT: Reset node or 0x6040.Fault Reset
AL121	: Index error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
AL122	: Sub-Index error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
AL123	: Data Size error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
AL124	: Data range error occurs when accessing CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
AL125	: CANopen PDO is read-only and write- protected.	NMT: Reset node or 0x6040.Fault Reset
AL126	: CANopen PDO is not allowed in PDO	NMT: Reset node or 0x6040.Fault Reset
AL127	: CANopen PDO is write-protected when Servo On	NMT: Reset node or 0x6040.Fault Reset
AL128	: Error occurs when reading CANopen PDO via EEPROM	NMT: Reset node or 0x6040.Fault Reset
AL129	: Error occurs when writing CANopen PDO via EEPROM	NMT: Reset node or 0x6040.Fault Reset
AL130	: The accessing address of EEPROM is out of range when using CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
AL131	: CRC of EEPROM calculation error occurs when using CANopen PDO	NMT: Reset node or 0x6040.Fault Reset

AL132	: Enter the incorrect password when using CANopen PDO	NMT: Reset node or 0x6040.Fault Reset
AL170	: Heartbeat or NodeGuarding error	NMT: Reset node or 0x6040.Fault Reset
AL180	: Heartbeat or NodeGuarding error	NMT: Reset node or 0x6040.Fault Reset
AL185	: Abnormal CAN Bus hardware	NMT: Reset node or re-servo on
AL186	: CAN bus off	NMT: Reset node or 0x6040.Fault Reset
AL201	: An error occurs when loading CANopen data	Turn DI.ARST on to clear the alarm. CANopen 0x1011 Restore default parameter
AL207	: Parameter group of PR#8 is out of range	<ol> <li>Turn DI.ARST on to clear the alarm.</li> <li>Set P0-01 to 0.</li> </ol>
AL209	: Parameter number of PR#8 is out of range	<ol> <li>Turn DI.ARST on to clear the alarm.</li> <li>Set P0-01 to 0.</li> </ol>
AL213	: An error occurs when writing parameter via PR : exceeds the range	DI.Alm Reset or P0-01 = 0
AL215	: An error occurs when writing parameter via PR : read-only	DI.Alm Reset or P0-01 = 0
AL217	: An error occurs when writing parameter via PR : parameter locked	Re-adjust PR command and parameter
AL231	: The setting of monitor item of PR#8 is out of range	<ol> <li>Turn DI.ARST on to clear the alarm.</li> <li>Set P0-01 to 0.</li> </ol>
AL235	: PR command overflows	NMT: Reset node or 0x6040.Fault Reset
AL237	: Indexing coordinate is undefined	<ol> <li>Turn DI.ARST on to clear the alarm.</li> <li>Set P0-01 to 0.</li> </ol>
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 in error	NMT: Reset node or 0x6040.Fault Reset				
AL380	: Position Deviation Alarm	DI.Alm Reset or P0-01 = 0				
AL400	: Index coordinates error	Turn DI.ARST on to clear the alarm.				
AL401	: NMT Reset command is received when Servo On	Turn DI.ARST on to clear the alarm.				
AL404	: Value of PR special filter setting is too big	Turn DI.ARST on to clear the alarm.				
AL555	: System Failure	N/A				

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# **Chapter 11 Specifications**

# **11.1 Specifications of Servo Drives**

# 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
	Phase / Voltage	Sinę	Single-phase / Three-phase 220 VAC Three-phase 220 VAC											
	Permissible Voltage			-phase / 230 VAC					Tł		ase 200 15% ~ 1	~ 230 V. 0%	AC,	
Power	Input Current (3PH) Unit: Arms	0.39	1.11	1.86	3.66	4.68	5.9	8.76	9.83	17.5	19.4	26.3	48	63
<u>م</u>	Unit: ArmS	0.69	1.92	3.22	6.78	8.88	10.3	-	-	-	-	-	-	-
	Continuous Output Current Unit: Arms	0.9	1.55	2.6	5.1	7.3	8.3	13.4	19.4	32.5	40	47.5	54.4	70
	Cooling method	Nat	ural coo	oling					Fan	Cooling				
	Encoder Resolution ervo Drive Resolution)				Incre	ementa	l type: 2	0-bit; A	bsolut	e type: <sup>·</sup>	17-bit			
I	Main Circuit Control			SV	PWM (	Space	Vector F	Pulse V	Vidth N	lodulatio	on) Cont	trol		
	Control Mode		Auto / Manual											
R	egenerative Resistor	No	one	e Built-in External										
	Max. Input Pulse Frequency			Line	e driver	: 500 k	Kpps / 4	Mpps;	Open	collecto	r: 200 Kj	ops		
ode	Pulse Type			Pulse	+ Direc	tion, A	phase +	- B phase, CCW pulse + CW pulse						
	Command Source	External pulse (DMCNET mode is not included) / Register												
Position Control Mode	Smoothing Strategy			Low-pass and P-curve filter										
ition	E-gear ratio		E-g	ear ratic	N/M m	nultiple	ble (1/50 < N/M < 25600) N: 1 ~ 32767, M: 1:32767							
Pos	Torque Limit						Param	neter se	ettings					
	Feed Forward Compensation						Param	eters s	ettings	5				
0	Analog Command						0 ~	- ±10 ∖	DC					
ge	Input (DMCNET Resistance mode is not Time							10 KΩ						
Mo	mode is not included) Time Constant							2.2 us						
Speed Control Mode	Speed Control Range	1:5000     1:3000     1:20							2000					
ped C	Command Source	urce External analog command (DMCNET mode is not included) / Register												
Spe	Smoothing Strategy		Low-pass and S-curve filter											
	Torque Limit		Via parameter settings or analog input											
	Bandwidth						Maxi	mum 1	kHz					

		0.01% or less at 0 to 100% load fluctuation							
Speed	Accuracy *2	0.01% or less at ±10% power fluctuation							
		0.01% or less at 0 $^{\circ}$ C to 50 $^{\circ}$ C ambient temperature fluctuation							
	Voltage Range	0 ~ ±10 V <sub>DC</sub>							
Analog Comma Input		10 ΚΩ							
outro	Time Constant	2.2 us							
ပ မ္ခ Comn	and Source	External analog command (DMCNET mode is not included) / Register							
en Comn bo Smoot	hing Strategy	Low-pass filter							
Sp	eed Limit	Via parameter settings or analog input (DMCNET mode is not included)							
Analog M	onitor Output	Monitor signal can set by parameters (Output voltage range: $\pm 8$ V)							
		Servo on, Fault reset, Gain switch, Pulse clear, Zero clamp, Command input reverse control, Internal position command trigger, Torque limit, Speed limit, Internal position command selection, Motor stop, Speed command selection, Speed / position mode switching, Speed /							
Digital Input/Out	Input	torque mode switching, Torque / position mode switching, PT / PR command switching, Emergency stop, Positive / negative limit, Original point, Forward / reverse operation torque limit, Homing activated, E-CAM engage, Forward / reverse JOG input, Event trigger, E-gea selection, Pulse input prohibition *DMCNET mode is not included for the DI mentioned above. When applying DMCNET mode, it is suggested to u communication for DI input. Its DI only supports emergency stop, forward/reverse limit and homing.							
		A, B, Z Line Driver output							
	Output	Servo on, Servo ready, Zero speed, Target speed reached, Target position reached, torque limiting, Servo alarm, Brake control, Homing completed, Early warning for overload, Servo warning, Position command overflows, Software negative limit (reverse direction), Software positive limit (forward direction), Internal position command completed, Capture procedure completed, Servo procedure completed, Master position area of E-CAM							
Protecti	ve Function	Over current, Overvoltage, Under voltage, Overheat, Regeneration error, Overload, Excessive speed deviation, Excessive position deviation, Encoder error, Adjustment error, Emergency stop, Negative / positive limit error, Excessive deviation of full-closed loop control, Serial communication error, Rst leak phase, Serial communication timeout, Short-circuit protection of terminal U, V, W and CN1, CN2, CN3							
Communic	ation Interface	RS-232 / RS-485 / CANopen / USB / DMCNET							
	Installation Site	Indoors (avoid the direct sunlight), no corrosive fog (avoid fume, flammable gas and dust)							
	Altitude	Altitude 1000 m or lower above sea level							
_	Atmospheric pressure	86 kPa to 106 kPa							
	Operating Temperature	$0^{\circ}$ C ~ 55 $^{\circ}$ C (If operating temperature is above 45 $^{\circ}$ C, forced cooling will be required)							
ent	Storage Temperature	-20°C to 65°C							
mnö	Humidity	Under 0 to 90% (non-condensing)							
Environment	Vibrating	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							

- \*1 When it is in rated load, the speed ratio is: the minimum speed (smooth operation) /rated speed.
- \*2 When the command is the rated speed, the velocity correction ratio is: (rotational speed with no load rotational speed with full load) / rated speed.
- \*3 TN system: The neutral point of the power system connects to the ground directly. The exposed metal components connect to the ground via the protective earth conductor.
- 4 Please refer to section 11.4 for overload features.

# 11.1.2 ASDA-A2 400 V Series

	ASDA-A2 Se	eries	750 W 07	1 kW 10	1.5 kW 15	2 kW 20	3 kW 30	4.5 kW 45	5.5 kW 55	7.5 kW 75	
	Input Vo		24 VDC, ±10%								
Power	Input Cu		0.89 A			1.1	8 A		1.66 A		
Ē.	Input Po	ower		21.4 W			28.	2 W		39.85 W	
	Main Circuit F	ower			Three-p	hase, 38(	) ~ 480 \	/AC, ± 10	%		
	Input Current Unit: Arms	2.22	3.02	4.24	5.65	8.01	11.9	14.1	17.27		
(	Continuous Outpu Unit: Arms	ut Current	3.07	3.52	5.02	6.66	11.9	20	22.37	30	
	Cooling met	hod				Fan	Cooling		1		
	Encoder Reso (Servo Drive Res			Inc	remental	type: 20-	bit; Abso	lute type:	17-bit		
	Main Circuit C	,		SVPWM	I (Space \	/ector Pu	lse Width	n Modulati	ion) Cont	ol	
	Control Mod	des				Auto /	Manual				
	Regenerative R	Resistor		Built-in				Externa	al		
	Max. Input Pulse (DMCNET is no			Line driv	er: 500 K	ops / 4 M	pps; Ope	en collecto	or: 200 Kp	ps	
ode	Pulse T (DMCNET is no	уре	Pulse + Direction, A phase + B phase, CCW pulse + CW pulse								
ol Mc	Command		External pulse train (DMCNET is not included) / Internal parameters								
Contr	Smoothing	Strategy	Low-pass and P-curve filter								
Position Control Mode	E-gear i	ratio	E-gear ratio: N/M multiple (1/50 < N/M < 25600) N: 1 ~ 32767 / M: 1:32767								
Ъö	Torque l	_imit	Parameter settings								
	Feed Forward Co	ompensation		Parameters settings							
		Voltage Range				0~±	±10 V <sub>DC</sub>				
	Analog Command Input	Input Resistance				1(	) ΚΩ				
		Time Constant				2.	2 us				
Speed Control Mode	Speed Co Range	ontrol			1:5	5000			1:	3000	
I lou	Command		Ext	ernal an	alog comr	mand (DN	ICNET is	s not inclu	ided) / Re	gister	
d Cor	Smoothing	Strategy			Lov	v-pass ar	nd S-curv	ve filter			
beed	Torque l			Via para	meter set	tings or a	analog inp	out			
0,	Bandwi				Maxim	um 1 kH:	Z				
				0	.01% or le	ess at 0 to	o 100% lo	oad fluctu	ation		
	Speed Acc	uracy *2		(	0.01% or	ess at ± '	10% pow	er fluctua	ition		
			0.	01% or l	ess at 0°C	to 50°C	ambient	temperatu	ure fluctua	ation	
on tro	Analog Command Input	Voltage Range				0 ~ ±	10 V <sub>DC</sub>				

	(DMCNET is not	Innut								
	included)	Input Resistance	10 ΚΩ							
		Time Constant	2.2 us							
	Command	Source	External analog command (DMCNET is not included) / Register							
	Smoothing	Strategy	Low-pass filter							
	Speed L	_imit	Via parameter settings or analog input (DMCNET is not included)							
	Analog Monitor	Output	Monitor signal can set by parameters (Output voltage range: $\pm$ 8 V)							
Input Digital Input/Output			Servo on, Fault reset, Gain switching, Pulse clear, Zero speed CLAMP, Command input reverse control, Command triggered, Torque limit., Speed limit, Position command selection, Motor stop, Speed command selection, Position / Speed mode switching, Speed / Torque mode switching, Torque / Position mode switching, PT / PR command switching, Emergency stop, Forward / Reverse inhibit limit, Original point for homing, Forward / Reverse operation torque limit, Homing activated, E-Cam engage, Forward / Reverse JOG input, Event trigger PR command, Electronic gear ratio (Numerator) selection and Pulse inhibit input *DMCNET mode is not included for the DI mentioned above. When applying DMCNET mode, it is suggested to use communication for DI input. Its DI only supports emergency stop, forward/reverse limit and homing.							
			A, B, Z Line Driver output							
		Output	Servo on, Servo ready, Zero speed, Target speed reached, Target position reached, torque limiting, Servo alarm, Brake control, Homing completed, Early warning for overload, Servo warning, Position command overflows, Software negative limit (reverse direction), Software positive limit (forward direction), Internal position command completed, Capture procedure completed, Servo procedure completed, Master position area of E-CAM							
	Protective Fu	nction	Over current, Overvoltage, Under voltage, Overheat, Regeneration error, Overload, Excessive speed deviation, Excessive position deviation, Encoder error, Adjustment error, Emergency stop, Negative / positive limit error, Excessive deviation of full-closed loop control, Serial communication error, Rst leak phase, Serial communication timeout, Short-circuit protection of terminal U, V, W and CN1, CN2, CN3							
	Communication	Interface	RS-232 / RS-485 / CANopen / USB							
	Installatio	n Site	Indoor (avoid the direct sunlight), no corrosive fog (avoid fume, flammable gas and dust)							
	Altitud	de	Altitude 1000m or lower above sea level							
	Atmospheric	pressure	86 kPa to 106 kPa							
	Operating Temp	perature (°C)	0°C ~ 55°C (If operating temperature is above 45°C, forced air circulation will be required)							
ent	Storage Tempo	erature (°C)	-20°C to 65°C							
onm	Humic	lity	0 to 90% (non-condensing)							
Environment	Vibrati	ng	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							
ш	IP Rat	ing	IP20							
	Power Sy	/stem	TN System <sup>*3</sup>							
	Approvals									

- \*1 When it is in rated load, the speed ratio is: the minimum speed (smooth operation) /rated speed.
- \*2 When the command is the rated speed, the velocity correction ratio is: (rotational speed with no load rotational speed with full load) / rated speed.
- \*3 TN system: The neutral point of the power system connects to the ground directly. The exposed metal components connect to the ground via the protective earth conductor. 4 Please refer to section 11.6 for overload features.

# 11.2 Specifications of Servo Motors (ECMA Series)

# 11.2.1 ECMA 220 V Series

# Low Inertia Series

	C104 C∆ 04 C∆ 06		C۵	08	C∆ 09			
ECMA Series	0F	01	02	04⊡S	04	07	07	10
Rated power (kW)	0.05	0.1	0.2	0.4	0.4	0.75	0.75	1.0
Rated torque (N-m) <sup>*1</sup>	0.159	0.32	0.64	1.27	1.27	2.39	2.39	3.18
Max. torque (N-m)	0.477	0.96	1.92	3.82	3.82	7.16	7.14	8.78
Rated speed (r/min)			300	00		1	30	000
Max. speed (r/min)			500	00			30	000
Rated current (A)	0.69	0.90	1.55	2.60	2.60	5.10	3.66	4.25
Max. instantaneous current (A)	2.05	2.70	4.65	7.80	7.80	15.3	11.0	12.37
Power rating (kW/s)	12.27	27.7	22.4	57.6	24.0	50.4	29.6	38.6
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	0.0206	0.037	0.177	0.277	0.68	1.13	1.93	2.62
Mechanical constant (ms)	1.2	0.75	0.80	0.53	0.74	0.63	1.72	1.20
Torque constant-KT (N-m/A)	0.23	0.36	0.41	0.49	0.49	0.47	0.65	0.75
Voltage constant-KE (mV/(r/min))	9.8	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)	26.0	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	s A (UL),	Class E	3 (CE)		
Insulation resistance			> `	100 MΩ,	DC 500	) V		
Insulation strength				1.8k Va	c, 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
Radial max. loading (N)	78.4	78.4	196	196	245	245	245	245
Axial max. loading (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
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (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

ECMA Series	C104	C∆ 04	C∆	06	C۵	C∆ 08		∆ 09
ECMA Series	0F	01	02	04⊡S	04	07	07	10
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 (µm)				1	5			
Operating temperature (°C)				0°C to	₀ 40°C			
Storage temperature (°C)				-10°C t	0 <sup>°</sup> 08 o			
Operating humidity		2	20% to 9	0% RH (	non-cor	ndensing	g)	
Storage humidity		2	20% to 9	0% RH (	non-cor	ndensing	g)	
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			C	E c	۶J	® US		

- \*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.
  - ECMA-\_\_04 / 06 / 08 : 250 mm x 250 mm x 6 mm

ECMA-\_\_10 : 300 mm x 300 mm x 12 mm

ECMA-\_\_\_13 : 400 mm x 400 mm x 20 mm

ECMA-\_\_\_18 : 550 mm x 550 mm x 30 mm

ECMA-\_\_22 : 650 mm x 650 mm x 35mm

Material: Aluminum – F40, F60, F80, F100, F130, F180, F220

\*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.

	C∆	10	C∆13		
ECMA Series	10	20	30		
Rated power (kW)	1.0	2.0	3.0		
Rated torque (N-m) *1	3.18	6.37	9.55		
Max. torque (N-m)	9.54	19.11	28.65		
Rated speed (r/min)	30	00	3000		
Max. speed (r/min)	50	00	4500		
Rated current (A)	7.30	12.05	17.2		
Max. instantaneous current (A)	21.9	36.15	47.5		
Power rating (kW/s)	38.1	90.6	71.8		
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	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	s A (UL), Cl	ass B (CE)		
Insulation resistance	>1	100 MΩ, D	C 500 V		
Insulation strength		1.8k Vac,	sec		
Weight (kg) (without brake)	4.3	6.2	7.8		
Weight (kg) (with brake)	4.7	7.2	9.2		
Radial max. loading (N)	490	490	490		
Axial max. loading (N)	98	98	98		
Power rating (kW/s) (with brake)	30.4	82.0	65.1		
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (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)] *2	8.0	8.0	10.0		
Brake power consumption (at 20°C) [W]	18.7	18.7	19.0		
Brake release time [ms (Max)]	10	10	10		
Brake pull-in time [ms (Max)]	70	70	70		
Vibration grade (µm)		15			

ECMA Sovies	C∆	10	C∆13			
ECMA Series	10	20	30			
Operating temperature (°C)		0°C to 4	0°C			
Storage temperature (°C)		-10°C to	80 <sup>°</sup> C			
Operating humidity	20% to 90% RH (non-condensing)					
Storage humidity	20% to 90% RH (non-condensing)					
Vibration capacity	2.5 G					
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)					
Approvals	C	E c	S US			

- \*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.
  - ECMA-\_\_04 / 06 / 08 : 250 mm x 250 mm x 6 mm
  - ECMA-\_\_10 : 300 mm x 300 mm x 12 mm
  - ECMA-\_\_\_13 : 400 mm x 400 mm x 20 mm
  - ECMA-\_\_\_18 : 550 mm x 550 mm x 30 mm
  - ECMA-\_\_22 : 650 mm x 650 mm x 35 mm
  - Material: Aluminum F40, F60, F80, F100, F130, F180, F220
- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.

# Medium / High Inertia Series

	E∆ 13			E∆ 18			G∆ 13				
ECMA Series	05	10	15	20	20	30	35	03	06	09	
Rated 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	
Max. 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			
Max. 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. instantaneous 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 inertia (× 10 <sup>-4</sup> 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	32.0	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	12.88	15.31	15.86	23.87	26.39	26.39	13.50	13.50	16.06	
Insulation class				CI	ass A (U	L), Class	B (CE)				
Insulation resistance					>100 M	Ω, DC 50	00 V				
Insulation strength					1.8k	Vac, 1 se	С				
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	
Radial max. loading (N)	490	490	490	490	1176	1470	490	490	490	490	
Axial max. loading (N)	98	98	98	98	490	490	98	98	98	98	
Power rating (kW/s) (with brake)	6.4	24.9	43.1	57.4	24.1	35.9	48.9	9.2	35.9	62.1	
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (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	25.0	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	20.4	19.0	19.0	19.0	

		E	∆ 13			E∆ 18		G∆ 13			
ECMA Series	05	10	15	20	20	30	35	03	06	09	
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 (°C)	0°C to 40°C										
Storage temperature (°C)	-10°C to 80°C										
Operating humidity	20% to 90% RH (non-condensing)										
Storage humidity	20% to 90% RH (non-condensing)										
Vibration capacity	2.5 G										
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)										
Approvals											

\*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.

ECMA-\_\_04 / 06 / 08 : 250 mm x 250 mm x 6 mm

ECMA-\_\_10 : 300 mm x 300 mm x 12 mm

ECMA-\_\_13 : 400 mm x 400 mm x 20 mm

ECMA-\_\_18 : 550 mm x 550 mm x 30 mm

ECMA-\_\_22 : 650 mm x 650 mm x 35 mm

Material: Aluminum - F40, F60, F80, F100, F130, F180, F220

\*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.

# Medium-High / High Inertia Series

	F∆ 13			F∆ 18				F122		
ECMA Series	05	08	13	18	30	45	55	75	1B	1F
Rated 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
Max. 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)					1	500				
Max. speed (r/min)				3	000				20	00
Rated current (A)	3.9	7.1	12.6	13.0	19.4	32.5	40.0	47.5	51.8	67.0
Max. instantaneous current (A)	12.1	19.4	38.6	36.0	58.2	81.3	100.0	118.8	129.5	162.0
Power rating (kW/s)	9.8	21.52	34.78	52.93	66.4	105.5	122.9	159.7	144.9	201.8
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	10.3	13.6	20.0	24.9	54.95	77.75	99.78	142.7	338	451
Mechanical constant (ms)	2.8	2.43	1.62	1.7	1.28	0.92	0.96	0.63	1.38	1.23
Torque constant-KT (N-m/A)	0.82	0.76	0.66	0.88	0.98	0.88	0.88	1.01	1.37	1.42
Voltage constant-KE (mV/(r/min))	29.5	29.2	24.2	32.2	35.0	32.0	31.0	35.5	49.0	50.0
Motor resistance (Ohm)	0.624	0.38	0.124	0.185	0.077	0.032	0.025	0.015	0.026	0.0184
Motor inductance (mH)	7.0	4.77	1.7	2.6	1.27	0.89	0.60	0.40	0.65	0.48
Electric constant (ms)	11.22	12.55	13.71	14.05	16.5	27.8	24.0	26.7	24.79	26.09
Insulation class				Cla	ss A (UL)	, Class B	(CE)			
Insulation resistance					>100 MΩ	e, DC 500	V			
Insulation strength					1.8k V	ac, 1 sec				
Weight (kg) (without brake)	6.3	8.6	9.4	10.5	18.5	23.5	30.5	40.5	56.4	75.0
Weight (kg) (with brake)	7.7	10.0	10.8	11.9	22.5	29.0	36.0	46.0	68.4	87.0
Radial max. loading (N)	490	490	490	490	1470	1470	1764	1764	3300	3300
Axial max. loading (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	141.4	197.1
Rotor 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	346.5	461.8
Mechanical constant (ms) (with brake)	3.12	2.65	1.73	1.79	1.33	0.96	0.99	0.64	1.41	1.25
Brake holding torque [Nt-m (min)] <sup>*2</sup>	10.0	10.0	10.0	10.0	25.0	55.0	55.0	55.0	115	115
Brake power consumption (at 20°C) [W]	19.0	19.0	19.0	19.0	20.4	19.9	19.9	19.9	28.8	28.8
Brake release time [ms (Max)]	10	10	10	10	10	10	10	10	10	10

ECMA Series	F∆ 13					F	F122			
LOMA Genes	05	08	13	18	30	45	55	75	1B	1F
Brake pull-in time [ms (Max)]	70	70	70	70	70	70	70	70	70	70
Vibration grade (µm)	15									
Operating temperature (°C)	0°C to 40°C									
Storage temperature (°C)	-10°C to 80°C									
Operating humidity	20% to 90% RH (non-condensing)									
Storage humidity	20% to 90% RH (non-condensing)									
Vibration capacity	2.5 G									
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)									
Approvals	CE c RU us									

\*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension. ECMA-\_\_04 / 06 / 08 : 250 mm x 250 mm x 6 mm

ECMA-\_\_\_10 : 300 mm x 300 mm x 12 mm

ECMA-\_\_\_13 : 400 mm x 400 mm x 20 mm

ECMA-\_\_\_18 : 550 mm x 550 mm x 30 mm

ECMA-\_\_22 : 650 mm x 650 mm x 35 mm

Material: Aluminum - F40, F60, F80, F100, F130, F180, F220

- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.
- 3 If desire to reach the max. torque limit of motor 250%, it is suggest to use the servo drive with higher watt.

# **High Inertia Series**

FOMA	C <b>∆</b> 06	C <b>∆08</b>				
ECMA	04 <b>□</b> H	07□H				
Rated power (kW)	0.4	0.75				
Rated torque (N-m) <sup>*1</sup>	1.27	2.39				
Max. torque (N-m)	3.82	7.16				
Rated speed (r/min)	3000	3000				
Max. speed (r/min)	5000	5000				
Rated current (A)	2.6	5.1				
Max. instantaneous current (A)	7.8	15.3				
Max. power per second (kW/s)	21.7	19.63				
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	0.743	2.91				
Mechanical constant (ms)	1.42	1.6				
Torque constant – KT (N-m/A)	0.49	0.47				
Voltage constant – KE (mV/(r/min))	17.4	17.2				
Armature resistance (Ohm)	1.55	0.42				
Armature inductance (mH)	6.71	3.53				
Electric constant (ms)	4.3	8.36				
Insulation class	Class A (UL),	Class B (CE)				
Insulation resistance	> 100MΩ,	DC 500V				
Insulation strength	1.8k Vac,1 sec					
Weight – without brake (kg)	1.8	3.4				
Weight – with brake (kg)	2.2	3.9				
Radial max. loading (N)	196	245				
Axial max. loading (N)	68	98				
Max. power per second (kW/s) (with brake)	21.48	19.3				
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (with brake)	0.751	2.96				
Mechanical constant (ms) (with brake)	1.43	1.62				
Brake holding torque [Nt-m (min)] <sup>*2</sup>	1.3	2.5				
Brake power consumption (at 20°C) [W]	6.5	8.2				
Brake release time [ms (Max)]	10	10				
Brake pull-in time [ms (Max)]	70	70				
Vibration grade (µm)	1	15				
Operating temperature (°C)	0°C ~	40°C				

ЕСМА	C <b>∆</b> 06	C <b>∆08</b>		
ECIMA	04 <b>□</b> H	07 <b>□</b> H		
Storage temperature (°C)	-10°C ~ 80°C			
Operating humidity	20 ~ 90%RH (non-condensing)			
Storage humidity	20 ~ 90%RH (non-condensing)			
Vibration capacity	2.5G			
IP Rating	IP65 (use the waterproof connector and sha seal installation (or oil seal)			
Approvals				

#### Note:

- \*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.
  ECMA-\_\_04 / 06 / 08 : 250 mm x 250 mm x 6 mm
  ECMA-\_\_10 : 300 mm x 300 mm x 12 mm
  ECMA-\_\_13 : 400 mm x 400 mm x 20 mm
  ECMA-\_\_18 : 550 mm x 550 mm x 30 mm
  ECMA-\_\_22 : 650 mm x 650 mm x 35 mm
  Material: Aluminum F40, F60, F80, F100, F130, F180, F220
- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.
- 3 If desire to reach the max. torque limit of motor 250%, it is suggest to use the servo drive with higher watt.

# Low Inertia Series

ECMA Series	J∆06	J∆08	J∆	<b>∑09</b>	J∠	<b>∆10</b>	J∆13
	04	07	07	10	10	20	30
Rated power (kW)	0.4	0.75	0.75	1	1.0	2.0	3.0
Rated torque (N-m) *1	1.27	2.39	2.39	3.18	3.18	6.37	9.55
Max. torque (N-m)	3.82	7.16	7.14	8.78	9.54	19.1	28.65
Rated speed (r/min)	300	00	30	00	30	000	3000
Maximum speed (r/min)	500	00	30	00	50	000	4500
Rated current (A)	1.62	3.07	2.16	2.4	4.15	7.09	9.8
Max. instantaneous current (A)	4.85	9.5	6.37	7.17	12.46	21.28	29.99
Power rating (kW/s)	58.2	50.4	29.6	38.6	38.2	91.2	71.8
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	0.277	1.13	1.93	2.62	2.65	4.45	12.7
Mechanical constant (ms)	0.47	0.66	1.56	1.06	0.77	0.58	0.99
Torque constant-KT (N-m/A)	0.79	0.78	1.12	1.29	0.77	0.9	0.97
Voltage constant-KE (mV/(r/min))	30.6	28.24	42	50.9	29.0	34.4	37.3
Armature resistance (Ohm)	3.95	1.22	3.62	2.58	0.617	0.388	0.269
Armature inductance (mH)	21.3	10.68	21.2	15.28	6.03	4.62	3.55
Electric constant (ms)	5.39	8.75	5.85	5.93	9.77	11.9	13.2
Insulation class			Class A	(UL), Class	B (CE)		
Insulation resistance			>100	MΩ, DC 50	V 00		
Insulation strength			2.3	3k Vac, 1 se	C		
Weight (kg) (without brake)	1.6	3.0	2.9	3.8	4.3	6.2	7.8
Weight (kg) (with brake)	2.0	3.8	-	-	4.7	7.2	9.2
Radial max. loading (N)	19.6	245	245	245	490	490	490
Axial max. loading (N)	68	98	98	98	98	98	98
Power rating (kW/s) (with brake)	53.8	48.4	29.3	37.9	30.4	82	65.1
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (with brake)	0.3	1.18	1.95	2.67	3.33	4.95	14.0
Mechanical constant (ms) (with brake)	0.52	0.65	1.57	1.08	0.96	0.65	1.09
Brake holding torque [Nt-m (min)] <sup>*2</sup>	1.3	2.5	2.5	2.5	8	8	10.0
Brake power consumption (at 20 <sup>°</sup> C) [W]	6.5	8.5	8.2	8.2	18.5	18.5	19.0

ECMA Series	J∆06	J∆08	J∆	<b>∆09</b>	J∠	<b>∖10</b>	J∆13
	04	07	07	10	10	20	30
Brake release time [ms (Max)]	10	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70	70	70	70
Vibration grade (µm)				15			
Operating temperature (°C)	0°C to 40°C						
Storage temperature (°C)	-10°C to 80°C						
Operating humidity	20% to 90% RH (non-condensing)						
Storage humidity		2	20% to 90%	RH (non-c	ondensing	)	
Vibration capacity	2.5 G						
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)						
Approvals	CE c SU <sup>®</sup> us						

#### Note:

- \*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.
  - ECMA-\_\_08 : 250 mm x 250 mm x 6 mm
  - ECMA-\_\_13 : 400 mm x 400 mm x 20 mm
  - ECMA-\_\_\_18 : 550 mm x 550 mm x 30 mm
  - Material: Aluminum F80, F130, F180
- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.

#### **Medium Inertia Series**

ECMA Series	K_13 K_1			K <b>∆1</b> 8	
	05	10	15	20	20
Rated power (kW)	0.5	1.0	1.5	2.0	2.0
Rated torque (N-m) *1	2.39	4.77	7.16	9.55	9.55
Max. torque (N-m)	7.16	14.32	21.48	28.65	28.65
Rated speed (r/min)			2000		
Maximum speed (r/min)			3000		
Rated current (A)	1.7	3.52	5.02	6.66	6.6
Max. instantaneous current (A)	5.2	10.56	15.06	19.98	19.88
Power rating (kW/s)	6.99	27.1	45.9	62.5	26.3
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	8.17	8.41	11.18	14.59	34.68
Mechanical constant (ms)	2.08	1.80	1.24	1.04	1.74
Torque constant-KT (N-m/A)	1.41	1.35	1.43	1.43	1.45
Voltage constant-KE (mV/(r/min))	51.5	53.2	55.0	55.0	54.0
Armature resistance (Ohm)	1.76	1.47	0.83	0.57	0.376
Armature inductance (mH)	22.4	17.79	11.67	8.29	7.87
Electric constant (ms)	12.73	12.04	14.04	14.39	20.9
Insulation class		Class A	(UL), Class	3 B (CE)	
Insulation resistance		>100	) MΩ, DC 5	00 V	
Insulation strength		2.	3k Vac, 1 s	ec	
Weight (kg) (without brake)	6.8	7.0	7.5	7.8	13.5
Weight (kg) (with brake)	8.2	8.4	8.9	9.2	17.5
Radial max. loading (N)	490	490	490	490	1176
Axial max. loading (N)	98	98	98	98	490
Power rating (kW/s) (with brake)	6.39	24.9	43.1	59.7	24.1
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (with brake)	8.94	9.14	11.90	15.88	37.86
Mechanical constant (ms) (with brake)	2.28	1.96	1.32	1.13	1.9
Brake holding torque [Nt-m (min)] <sup>*2</sup>	10.0	10.0	10.0	10.0	25.0
Brake power consumption (at 20°C) [W]	19.0	19.0	19.0	19.0	20.4
Brake release time [ms (Max)]	10	10	10	10	10

ECMA Series	K_13 K			K∆18	
	05	10	15	20	20
Brake pull-in time [ms (Max)]	70	70	70	70	70
Vibration grade (µm)			15		
Operating temperature (°C)	0°C ~ 40°C				
Storage temperature (°C)	-10°C~80°C				
Operating humidity	20% to 90% RH (non-condensing)				
Storage humidity	20% to 90% RH (non-condensing)				
Vibration capacity	2.5G				
IP Rating	IP65(use the waterproof connector and shaft seal installation (or oil seal) model)			naft seal	
Approvals	CE c 🔊 us				

#### Note:

- \*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.
   ECMA-\_\_08 : 250 mm x 250 mm x 6 mm
  - ECMA-\_\_13 : 400 mm x 400 mm x 20 mm ECMA-\_\_18 : 550 mm x 550 mm x 30 mm Material: Aluminum – F80, F130, F180
- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.

# **Medium-High Inertia Series**

		L	∆ 18				
ECMA Series	30	45	55	75			
Rated power (kW)	3.0	4.5	5.5	7.5			
Rated torque (N-m) *1	19.10	28.65	35.0	47.74			
Max. torque (N-m)	57.29	71.62	87.53	119.36			
Rated speed (r/min)		1500					
Max. speed (r/min)		30	000				
Rated current (A)	11.53	20.8	22.37	27.3			
Max. instantaneous current (A)	34.6	52.0	56.0	68.3			
Power rating (kW/s)	66.4	105.5	122.9	159.7			
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	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	53.0	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			
Electric constant (ms)	23.97	28.07	27.6	28.29			
Insulation class			-				
Insulation resistance		>100 MΩ	e, DC 500 V				
Insulation strength		2.3k Va	ac, 1 sec				
Weight (kg) (without brake)	18.5	23.5	30.5	40.5			
Weight (kg) (with brake)	22.5	29	36	46			
Radial max. loading (N)	1470	1470	1764	1764			
Axial max. loading (N)	490	490	588	588			
Power rating (kW/s) (with brake)	63.9	101.8	119.4	156.6			
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (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	55.0	55.0	55.0			
Brake power consumption (at 20 <sup>°</sup> C) [W]	20.4	19.9	19.9	19.9			
Brake release time [ms (Max)]	10	10	10	10			
Brake pull-in time [ms (Max)]	70	70	70	70			
Vibration grade (µm)			15				

ECMA Series		L	<b>18</b>		
ECMA Series	30	45	55	75	
Operating temperature (°C)		0°C t	o 40 <sup>°</sup> C		
Storage temperature (°C)	-10°C to 80°C				
Operating humidity	20% to 90% RH (non-condensing)				
Storage humidity	20% to 90% RH (non-condensing)				
Vibration capacity	2.5 G				
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)				
Approvals	CE c SU us				

#### Note:

\*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.

ECMA-\_\_08 : 250 mm x 250 mm x 6 mm

ECMA-\_\_13 : 400 mm x 400 mm x 20 mm

ECMA-\_\_\_18 : 550 mm x 550 mm x 30 mm

ECMA-\_\_22: 650 mm x 650 mm x 35 mm

Material type: Aluminum – F80, F130, F180, F220

\*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.

# **High Inertia Series**

ECMA Series		L∆ 13		M∆ 13
ECIMA Series	05	08	13	09
Rated power (kW)	0.5	0.85	1.3	0.9
Rated torque (N-m) <sup>*1</sup>	3.18	5.39	8.34	8.59
Max. torque (N-m)	8.92	13.8	23.3	21.48
Rated speed (r/min)		1500		1000
Max. speed (r/min)		3000		2000
Rated current (A)	2.1	3.4	5.02	4.4
Max. constant current (A)	6.1	8.85	15	13.1
Power rating (kW/s)	7.72	17.0	29.47	66
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> )	13.1	17.1	23.6	11.18
Mechanical constant (ms)	2.3	1.76	1.44	1.21
Torque constant-KT (N-m/A)	1.5	1.59	1.66	1.95
Voltage constant-KE (mV/(r/min))	55.5	58.9	61.1	71.7
Armature resistance (Ohm)	1.41	0.92	0.59	1.45
Armature inductance (mH)	20	14.1	9.54	23.3
Electrical constant (ms)	14.1	15.33	16.17	16.07
Insulation class		Class A (UL), (	Class B (CE)	
Insulation resistance		>100 MΩ,	DC 500 V	
Insulation strength		2.3k Vac	, 1 sec	
Weight (kg) (without brake)	6.8	8.6	10.7	7.5
Weight (kg) (with brake)	-	10		8.9
Radial max. loading (N)	490	490	490	490
Axial max. loading (N)	98	98	98	98
Power rating (kW/s) (with brake)	7.02	14.82	27.82	
Rotor inertia (× 10 <sup>-4</sup> kg.m <sup>2</sup> ) (with brake)	14.4	19.6	25	
Mechanical time constant (ms) (with brake)	2.54	2.02	1.52	
Brake holding torque [Nt-m (min)] <sup>*2</sup>	10.0	10.0	10.0	
Brake power consumption (at 20°C)[W]	19.0	19.0	19.0	
Brake release time [ms (Max)]	10	10	10	
Brake pull-in time [ms (Max)]	70	70	70	
Vibration grade (µm)		15	5	
Operating temperature (°C)	0°C ~ 40°C			
Storage temperature (°C)		-10°C~	80 <sup>°</sup> C	

ECMA Series	La 13 Ma			M∆ 13
ECIMA Series	05	08	13	09
Operating humidity	20 ~ 90%RH (non-condensing)			
Storage humidity	20 ~ 90%RH (non-condensing)			
Vibration capacity	2.5 G			
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oi seal) model)			
Approvals				

Note:

\*1 The rated torque is the continuous permissible torque between 0~40°C operating temperature which is suitable for the following heat sink dimension.

ECMA-\_\_08 : 250 mm x 250 mm x 6 mm

ECMA-\_\_13 : 400 mm x 400 mm x 20 mm

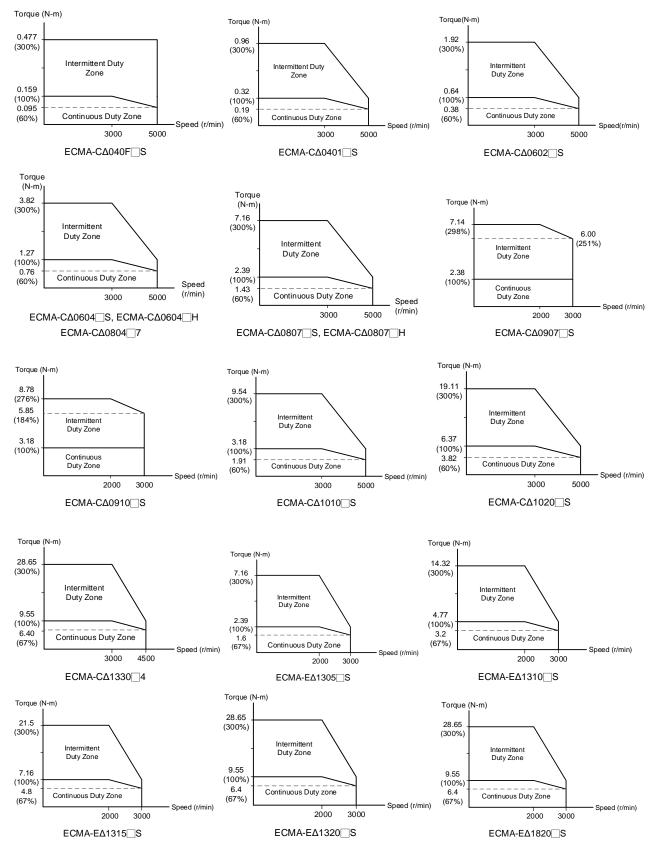
ECMA-\_\_18 : 550 mm x 550 mm x 30 mm

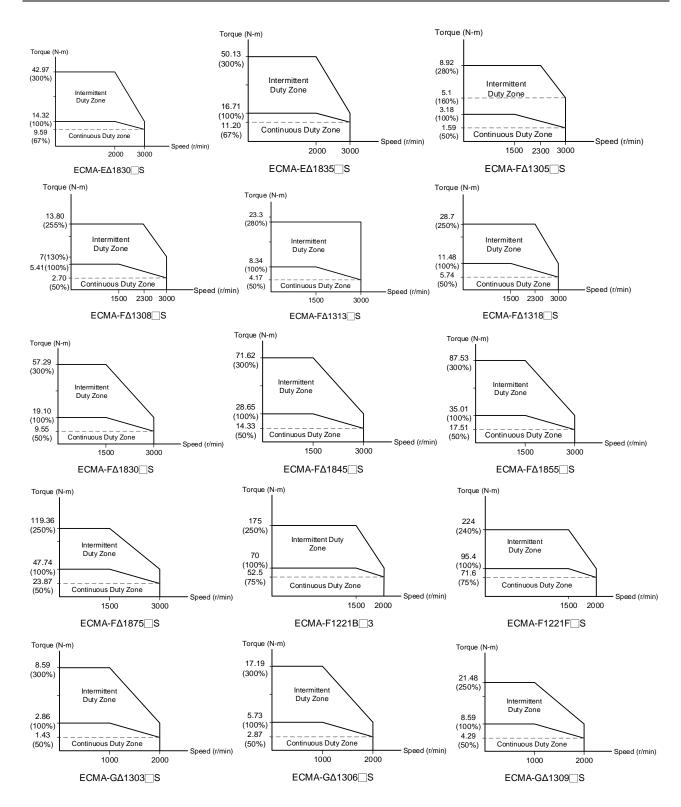
ECMA-\_\_22 : 650 mm x 650 mm x 35 mm Material type: Aluminum –F80, F130, F180, F220

- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.
- 3 Model of ECMA-L11308 is applying for UL approval.

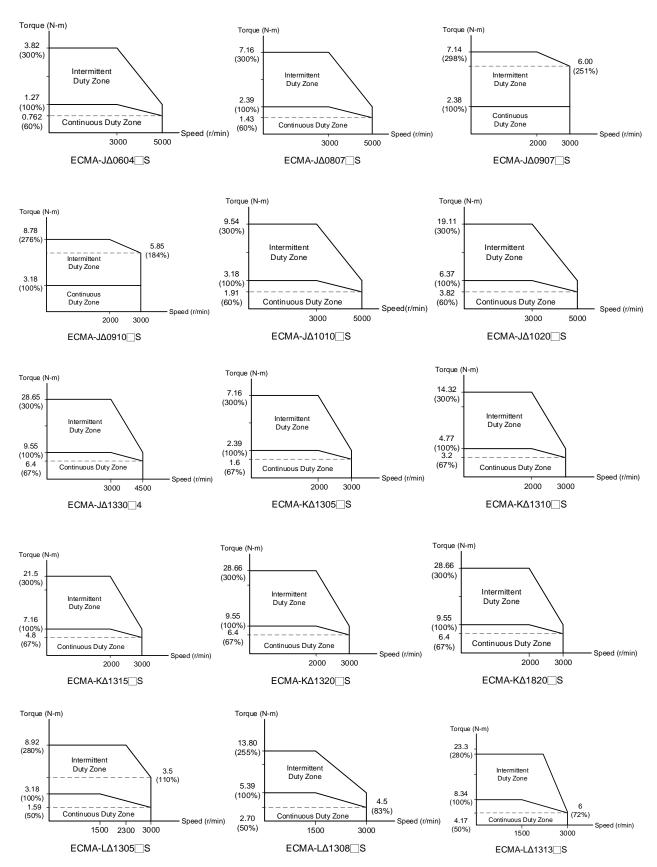
# 11.3 Torque Features (T-N Curves)

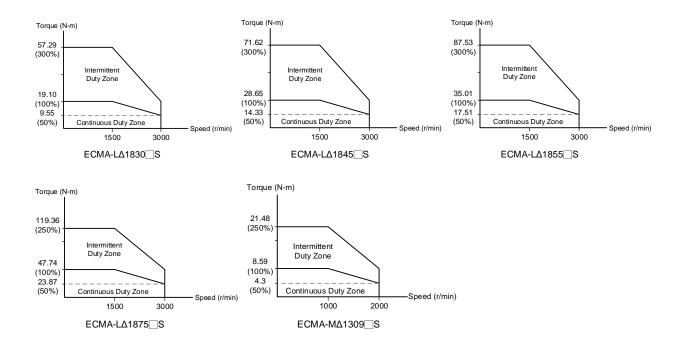
# 11.3.1 220 V Series





## 11.3.2 400 V Series





#### ASDA-A2

# **11.4 Overload Features**

#### Definition of overload protection

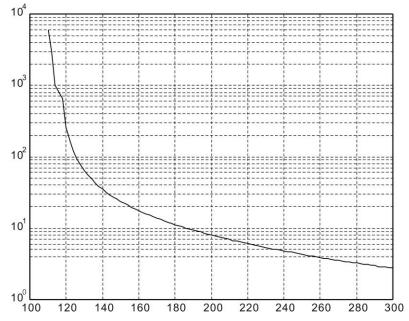
The overload protection is to prevent the motor in overheat status.

#### Cause of overload

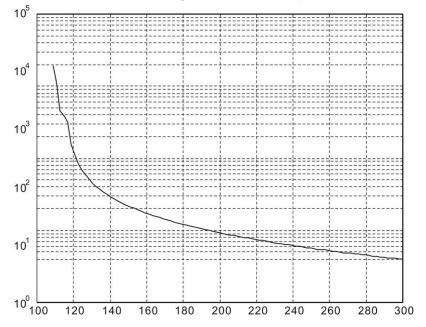
- 1) When the motor operates over the rated torque, the operation time is too long
- 2) The inertia ratio is set too big and frequently accelerate / decelerate
- 3) Connection error between the power cable and encoder wiring
- 4) Servo gain setting error and cause resonance of the motor
- 5) The motor with brake operates without releasing the brake

# The graph of load and operating time

# Low Inertia Series (ECMA C1, J1 Series)



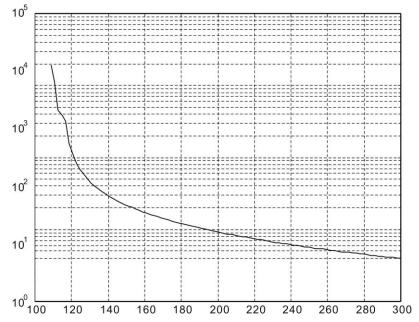
2	
Load	Operating Time
120%	263.8s
140%	35.2s
160%	17.6s
180%	11.2s
200%	8s
220%	6.1s
240%	4.8s
260%	3.9s
280%	3.3s
300%	2.8s



Operating Time
527.6s
70.4s
35.2s
22.4s
16s
12.2s
9.6s
7.8s
6.6s
5.6s

# Medium and Medium-High Inertia Series (ECMA E1, F1, K1 and L1 Series)

High Inertia Series (ECMA G1 Series)

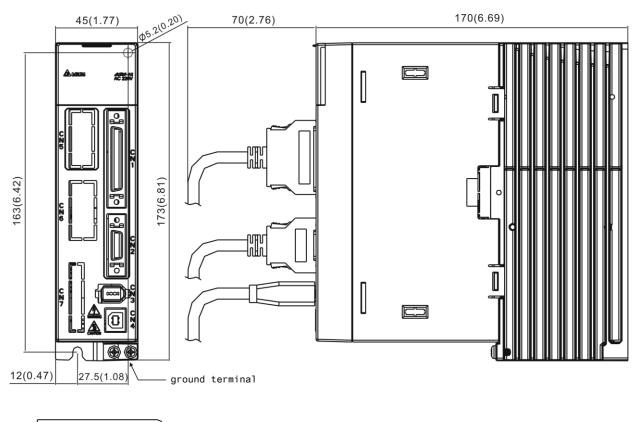


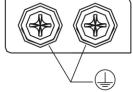
Load	Operating Time
120%	527.6s
140%	70.4s
160%	35.2s
180%	22.4s
200%	16s
220%	12.2s
240%	9.6s
260%	7.8s
280%	6.6s
300%	5.6s

# 11.5 Dimensions of Servo Drive

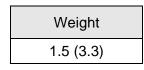
# 11.5.1 220 V Series

# ASD-A2-0121; ASD-A2-0221; ASD-A2-0421 (100 W ~ 400 W)





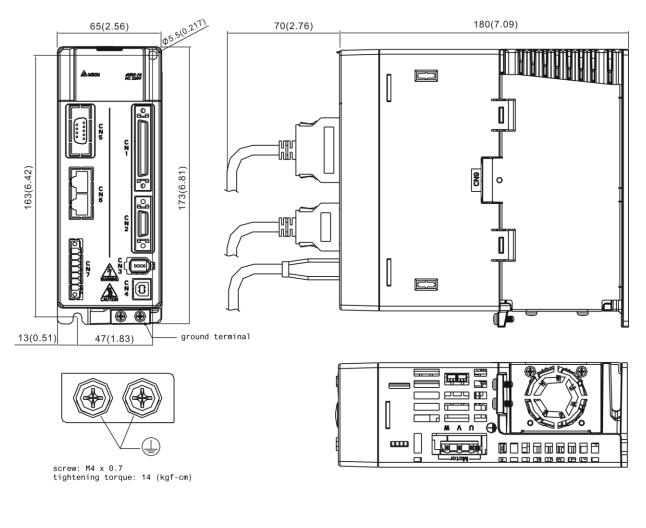
screw: M4 x 0.7 tightening torque: 14 (kgf-cm)





- 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)

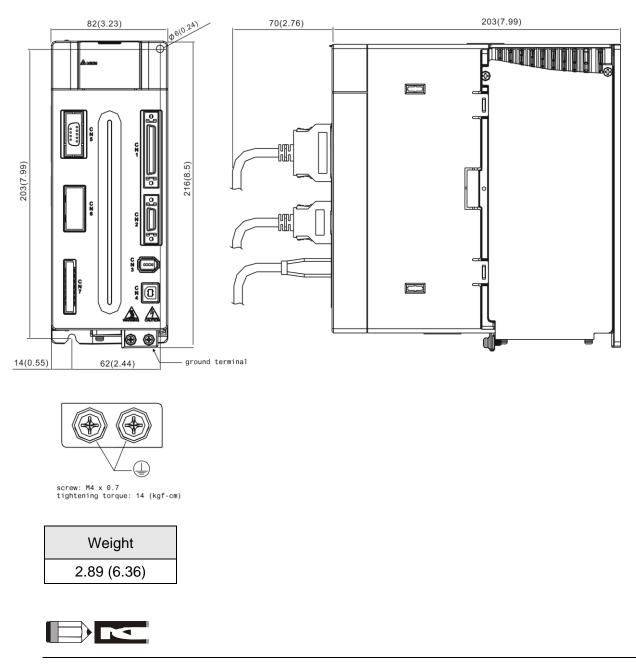


Weight	
2.0 (4.4)	



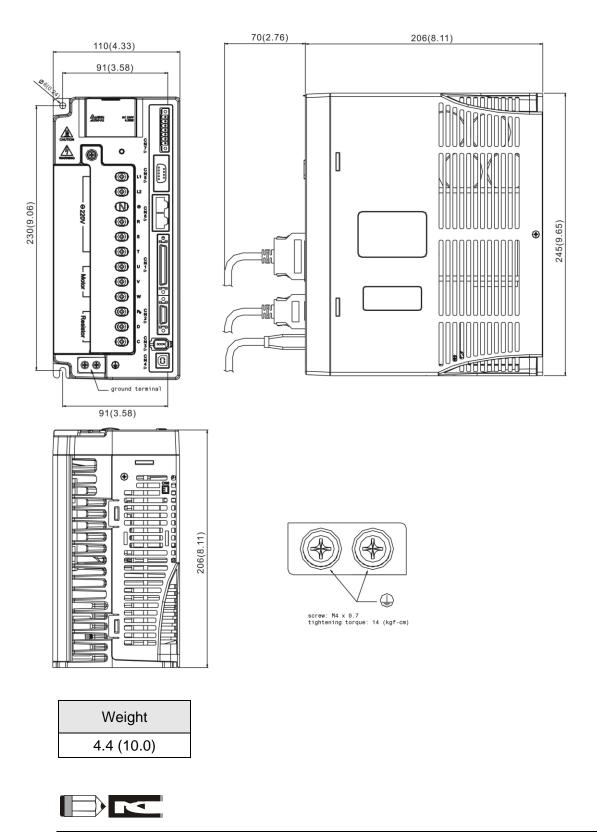
- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

#### ASD-A2-2023; ASD-A2-3023 (2 kW ~ 3 kW)



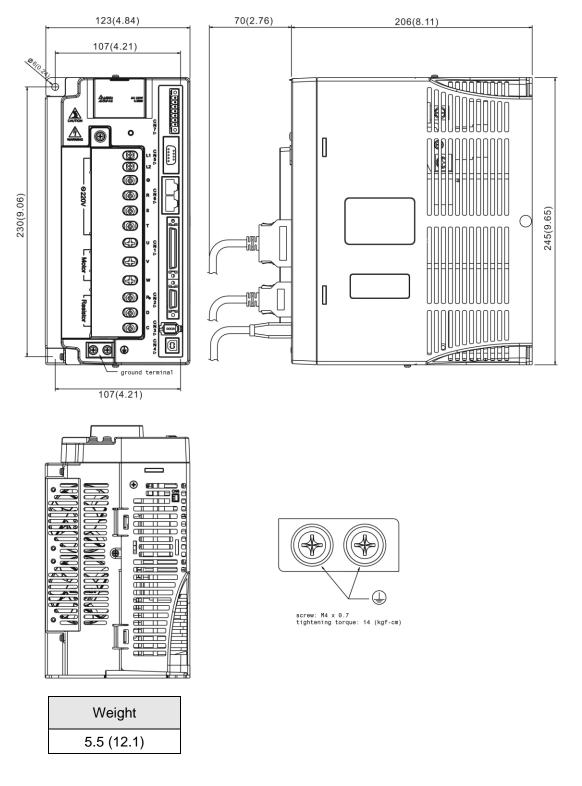
- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

# ASD-A2-4523 (4.5 kW)



- 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.

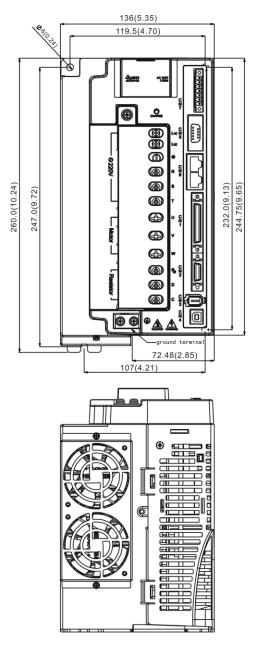
#### ASD-A2-5523 (5.5 kW)

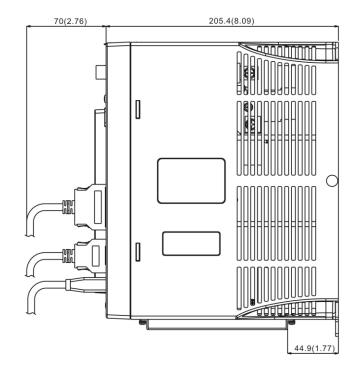


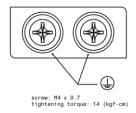


- 1) Dimensions are in millimeters (inches); Weights are in kilograms (kg) and (pounds (lbs)).
- 2) Dimensions and weights of the servo drive may be revised without prior notice.

# ASD-A2-7523 (7.5 kW)





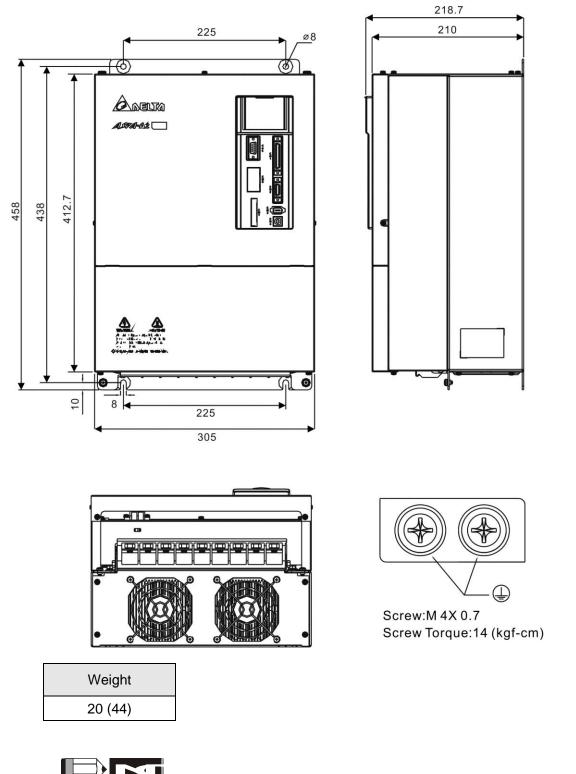


Weight	
5.9 (13)	



- 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.

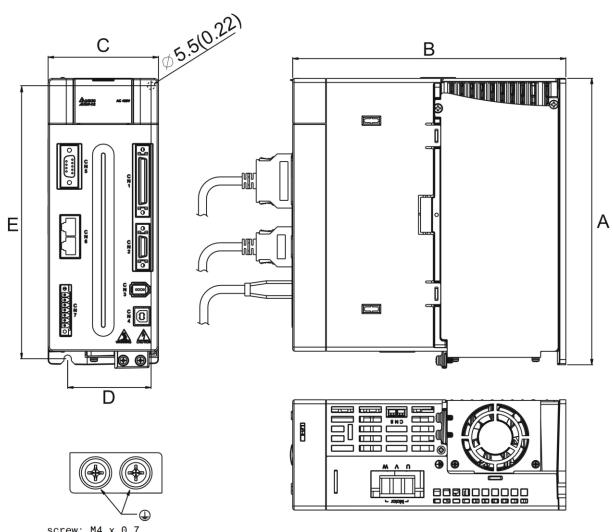
# ASD-A2-1B23 (11 kW); ASD-A2-1F23 (15 kW)



- 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.

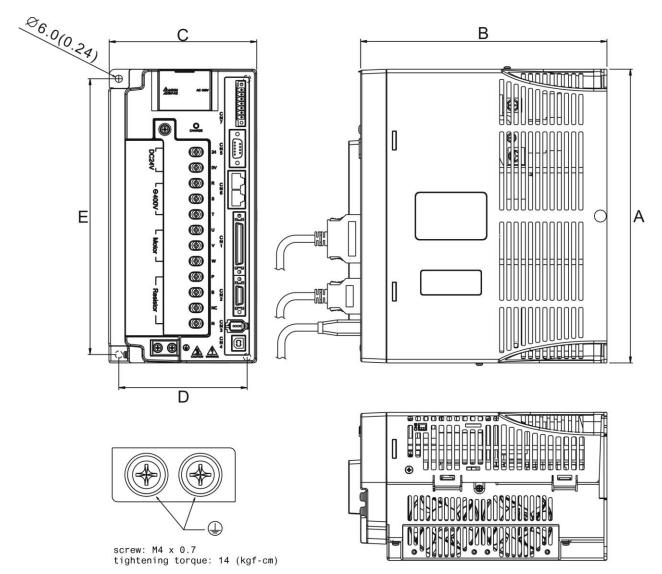
# 11.5.2 400 V Series

ASD-A2-0743; ASD-A2-1043; ASD-A2-1543 (750 W ~ 1.5 kW)



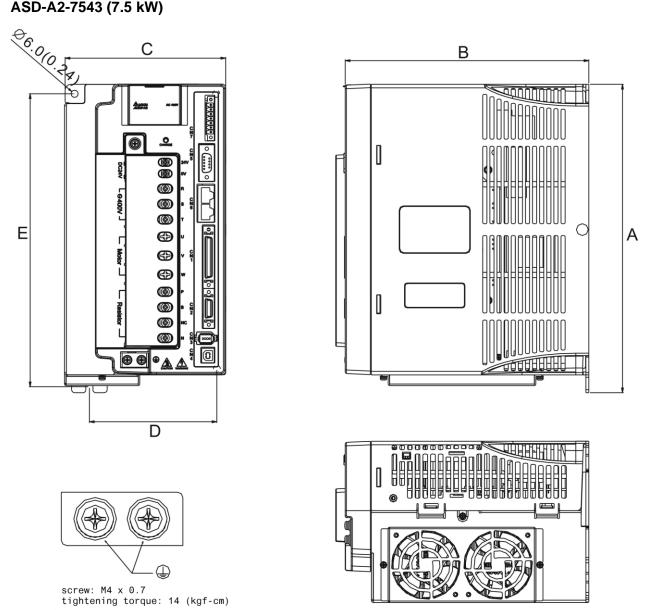
screw: M4 x 0.7 tightening torque: 14 (kgf-cm)

#### ASD-A2-2043; ASD-A2-3043, ASD-A2-4543; ASD-A2-5543 (2 kW ~ 5.5 kW)



Power	А	В	С	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)



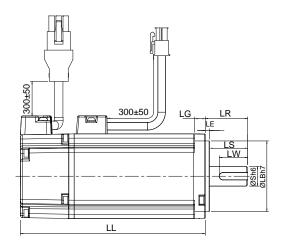
Power	A	В	С	D	E	Weight
7.5 kW	254.2 (10.01)	205.5 (8.09)	136 (5.35)	107 (4.21)	247 (9.72)	5.5 (12.1)

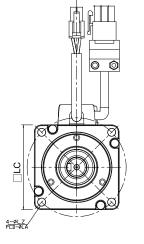


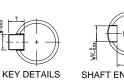
- 1) Dimensions are in millimeters (inches)
- 2) Weights are in kilograms (kg) and (pounds (lbs)).
- 3) The servo drive images shown here may differ from actual product appearance. Please refer to actual product appearance.
- 4) Actual measured values are in metric units. Dimensions and weights in (imperial units) are for reference only.

# 11.6.1 220 V Series

# Motor Frame Size: 86 mm and below Models (Units: mm)









 $C \land 0401 \Box S \land 0602 \Box S \land 0604 \Box S \land 0604 \Box H$ Model C1040F .S LC 40 40 60 60 60 LΖ 4.5 4.5 5.5 5.5 5.5 70 70 70 LA 46 46 8(+0 -0.009) 8(+0 -0.009) 14(+0 -0.011) 14(+0 -0.011) 14(+0 S **30**(<sup>+0</sup><sub>-0.021</sub>)  $50(^{+0}_{-0.025})$ 50(<sup>+0</sup><sub>-0.025</sub>)  $50(^{+0}_{-0.025})$ LB **30**(<sup>+0</sup><sub>-0.021</sub>) LL (without brake) 79.1 100.6 105.5 130.7 145.8 LL (with brake) ---136.8 141.6 166.8 176.37 LS 20 27 27 20 27 LR 25 25 30 30 30 LE 2.5 2.5 3 3 3 LG 5 5 7.5 7.5 7.5 LW 16 16 20 20 20 RH 6.2 6.2 11 11 11 WK 3 3 5 5 5 3 W 3 5 5 5 3 3 5 5 5 Т M3 M3 M4 M4 M4 TΡ Depth 8 Depth 8 Depth 15 Depth 15 Depth 15

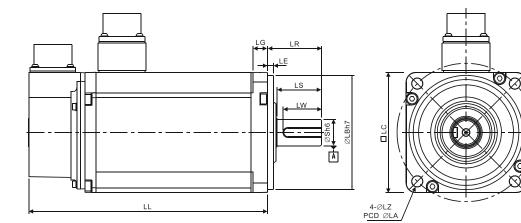
Model	C∆0804□7	C∆0807⊡S	C∆0807⊟H	C∆0907⊡S	C∆0910⊡S
LC	80	80	80	86	86
LZ	6.6	6.6	6.6	6.6	6.6
LA	90	90	90	100	100
S	14( <sup>+0</sup> <sub>-0.011</sub> )	19( <sup>+0</sup> <sub>-0.013</sub> )	19( <sup>+0</sup> <sub>-0.013</sub> )	16( <sup>+0</sup> 0.011)	16( <sup>+0</sup> 0.011 <b>)</b>
LB	70( <sup>+0</sup> <sub>-0.030</sub> )	70( <sup>+0</sup> <sub>-0.030</sub> )	70( <sup>+0</sup> <sub>-0.030</sub> )	80( <sup>+0</sup> <sub>-0.030</sub> )	80( <sup>+0</sup> <sub>-0.030</sub> )
LL (without brake)	112.3	138.3	154.8	130.2	153.2
LL (with brake)	152.8	178	187.8	161.3	184.3
LS	27	32	32	30	30
LR	30	35	35	35	35
LE	3	3	3	3	3
LG	8	8	8	8	8
LW	20	25	25	20	20
RH	11	15.5	15.5	13	13
WK	5	6	6	5	5
W	5	6	6	5	5
Т	5	6	6	5	5
TP	M4 Depth 15	M6 Depth 20	M6 Depth 20	M5 Depth 15	M5 Depth 15

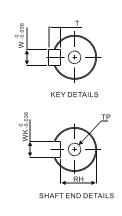


1) Dimensions are in millimeters. Actual measured values are in metric units.

- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes ( $\Box$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

#### 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	$22(^{+0}_{-0.013})$	22( <sup>+0</sup> 0.013)	24( <sup>+0</sup> <sub>-0.013</sub> )	$22(^{+0}_{-0.013})$	22( <sup>+0</sup> <sub>-0.013</sub> )	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$
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> )				
LL (without brake)	153.3	199.0	187.5	147.5	147.5	167.5	187.5
LL (with brake)	192.5	226.0	216.0	183.5	183.5	202.0	216.0
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
Т	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



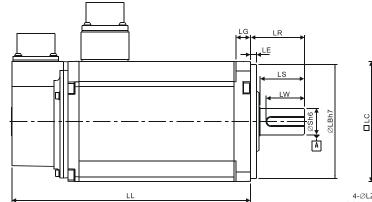
1) Dimensions are in millimeters. Actual measured values are in metric units.

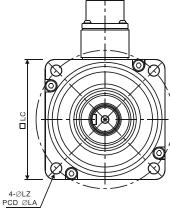
2) Dimensions of the servo motor may be revised without prior notice.

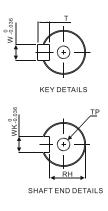
3) The boxes  $(\Box)$  in the model names represent shaft end/brake or the number of oil seal.

4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

# Motor Frame Size: 100 mm ~ 130 mm Models (Units: mm)







Model	F∆1305□S	F∆1308□S	F∆1313□S	F∆1318□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	$22(^{+0}_{-0.013})$	22( <sup>+0</sup> <sub>-0.013</sub> )	22( <sup>+0</sup> <sub>-0.013</sub> )	22( <sup>+0</sup> 0.013)	22( <sup>+0</sup> <sub>-0.013</sub> )	$22(^{+0}_{-0.013})$	22( <sup>+0</sup> <sub>-0.013</sub> )
LB	110( <sup>+0</sup> <sub>-0.035</sub> )	110( <sup>+0</sup> <sub>-0.035</sub> )	$110(^{+0}_{-0.035})$	110( <sup>+0</sup> <sub>-0.035</sub> )	110( <sup>+0</sup> <sub>-0.035</sub> )	110( <sup>+0</sup> <sub>-0.035</sub> )	$110(^{+0}_{-0.035})$
LL (without brake)	139.5	152.5	187.5	202.0	147.5	147.5	163.5
LL (with brake)	168.0	181.0	216.0	230.7	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
Т	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



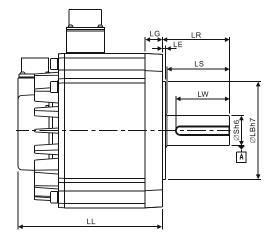
1) Dimensions are in millimeters. Actual measured values are in metric units.

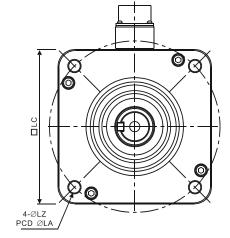
2) Dimensions of the servo motor may be revised without prior notice.

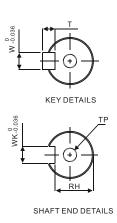
3) The boxes ( $\Box$ ) in the model names represent shaft end/brake or the number of oil seal.

4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

# Motor Frame Size: 180 mm and above Models (Units: mm)







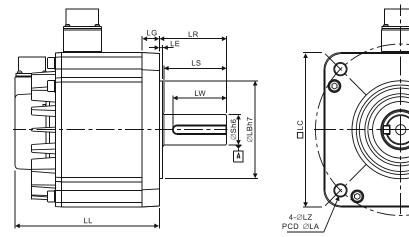
Model	E∆ 1820⊔S	E∆ 1830⊐S	E∆ 1835⊐S	F∆ 1830⊐S
LC	180	180	180	180
LZ	13.5	13.5	13.5	13.5
LA	200	200	200	200
S	$35(^{+0}_{-0.016})$	35( <sup>+0</sup> <sub>-0.016</sub> )	$35(^{+0}_{-0.016})$	$35(^{+0}_{-0.016})$
LB	$114.3(^{+0}_{-0.035})$	114.3( <sup>+0</sup> <sub>-0.035</sub> )	114.3( <sup>+0</sup> <sub>-0.035</sub> )	114.3( <sup>+0</sup> 0.035)
LL (without brake)	169.0	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
Т	8	8	8	8
TP	M12 Depth 25	M12 Depth 25	M12 Depth 25	M12 Depth 25

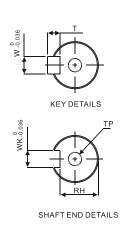
# 

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  $(\Box)$  in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

# Motor Frame Size: 180 mm Models (Units: mm)





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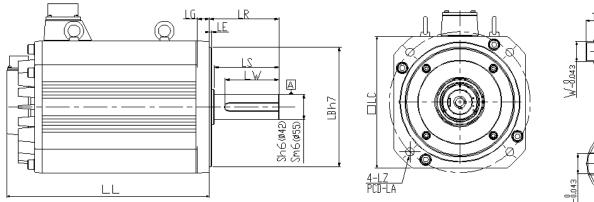
Model	F∆1845□S	F∆1855□3	F∆1875□3
LC	180	180	180
LZ	13.5	13.5	13.5
LA	200	200	200
S	35( <sup>+0</sup> <sub>-0.016</sub> )	42( <sup>+0</sup> -0.016)	42( <sup>+0</sup> <sub>-0.016</sub> )
LB	114.3( <sup>+0</sup> <sub>-0.035</sub> )	114.3( <sup>+0</sup> <sub>-0.035</sub> )	$114.3(^{+0}_{-0.035})$
LL (without 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
Т	8	8	8
TP	M12 Depth25	M16 Depth32	M16 Depth32

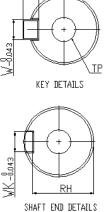


1) Dimensions are in millimeters. Actual measured values are in metric units.

- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes  $(\Box)$  in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

#### Motor Frame Size: 220 mm and above Models (Units: mm)





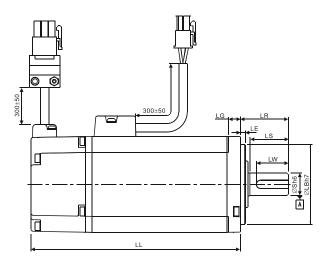
Model	F1221B□3	F1221F□S
LC	220	220
LZ	13.5	13.5
LA	235	235
S	42( <sup>+0</sup> _0.016)	55( <sup>+0.03</sup> <sub>+0.011</sub> )
LB	200( <sup>+0</sup> <sub>-0.046</sub> )	200( <sup>+0</sup> <sub>-0.046</sub> )
LL (without brake)	371.4	453.4
LL (with brake)	434.4	513.4
LS	108	108
LR	116	116
LE	4	4
LG	20	20
LW	90	90
RH	37	49
WK	12	16
W	12	16
Т	8	10
TP	M16 Depth 32	M20 Depth 40

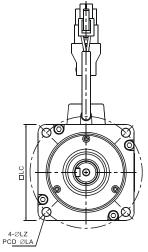


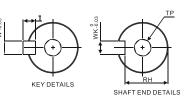
- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes ( $\Box$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes (△) in the model names (which represents encoder type).

# 11.6.2 400 V Series

# Motor Frame Size: 80 mm and below Models (Units: mm)





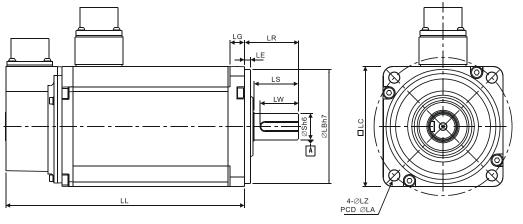


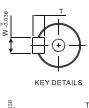
Model	J <b>∆0604</b> □S	J <b>∆0807</b> □S	J <b>∆0907</b> □S	J <b>∆0910</b> □S
LC	60	80	86	86
LZ	5.5	6.6	6.6	6.6
LA	70	90	100	100
S	<b>14</b> <sup>+0</sup> <sub>-0.011</sub>	19( <sup>+0</sup> <sub>-0.013</sub> )	16( <sup>+0</sup> <sub>-0.011</sub> )	16( <sup>+0</sup> <sub>-0.011</sub> )
LB	<b>50</b> <sup>+0</sup> <sub>-0.025</sub>	70( <sup>+0</sup> <sub>-0.030</sub> )	80( <sup>+0</sup> <sub>-0.030</sub> )	80( <sup>+0</sup> <sub>-0.030</sub> )
LL (without brake)	130.7	138.3	130.2	153.2
LL (with brake)	166.8	178.0	161.3	184.3
LS	27	32	30	30
LR	30	35	35	35
LE	3	3	3	3
LG	7.5	8	8	8
LW	20	25	20	20
RH	11	15.5	13	13
WK	5	6	5	5
W	5	6	5	5
Т	5	6	5	5
TP	M4 Depth15	M6 Depth 20	M5 Depth 15	M5 Depth 15



- 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 ( $\Box$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes (△) in the model names (which represents encoder type).

# Motor Frame Size: 100 mm Models (Units: mm)







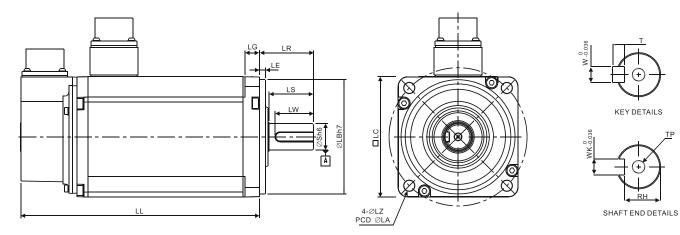
SHAFT END DETAILS

Madal	1010-8	1 \( 1020-8
Model	J∆1010□S	J∆1020□S
LC	100	130
LZ	9	9
LA	115	115
S	$22(^{+0}_{-0.013})$	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	199.0
LL (with brake)	192.5	226.0
LS	37	37
LR	45	45
LE	5	5
LG	12	12
LW	32	32
RH	18	18
WK	8	8
W	8	8
Т	7	7
TP	M6 Depth 20	M6 Depth 20



- 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 ( $\Box$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

# Motor Frame Size: 130 mm Models (Units: mm)



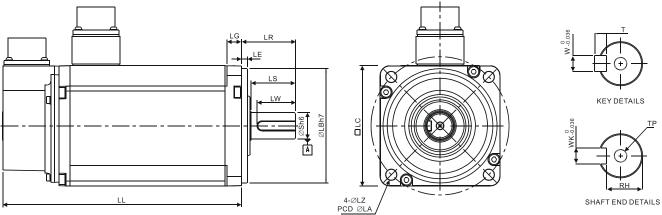
Model	J∆1330□4	K∆1305⊡S	K∆1310□S	K∆1315□S	K∆1320□S
LC	130	130	130	130	130
LZ	9	9	9	9	9
LA	145	145	145	145	145
S	24( <sup>+0</sup> <sub>-0.013</sub> )	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$
LB	110( <sup>+0</sup> <sub>-0.035</sub> )				
LL (without brake)	187.5	139.5	147.5	167.5	187.5
LL (with brake)	216.0	168.0	183.5	202.0	216.0
LS	47	47	47	47	47
LR	55	55	55	55	55
LE	6	6	6	6	6
LG	11.5	11.5	11.5	11.5	11.5
LW	36	36	36	36	36
RH	20	18	18	18	18
WK	8	8	8	8	8
W	8	8	8	8	8
Т	7	7	7	7	7
TP	M6 Depth 20				

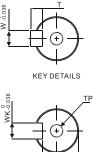


1) Dimensions are in millimeters. Actual measured values are in metric units.

- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes ( $\Box$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

# Motor Frame Size: 130 mm Models (Units: mm)



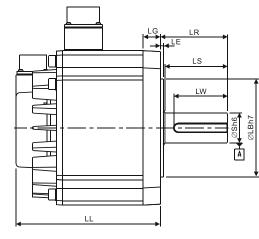


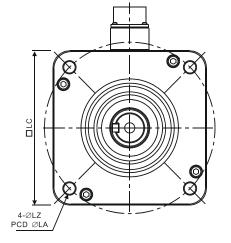
Model	L∆1305⊡S	L∆1313⊡S	L <b>∆1308</b> ⊐S	M∆1309⊐S
LC	130	130	130	130
LZ	9	9	9	9
LA	145	145	145	145
S	22( <sup>+0</sup> <sub>-0.013</sub> )	22( <sup>+0</sup> <sub>-0.013</sub> )	22( <sup>+0</sup> 0.013)	22( <sup>+0</sup> <sub>-0.013</sub> )
LB	110( <sup>+0</sup> <sub>-0.035</sub> )			
LL (without brake)	147.5	194.5	163.5	163.5
LL (with brake)	168.0	223.0	181.0	198.0
LS	47	47	47	47
LR	55	55	55	55
LE	6	6	6	6
LG	11.5	11.5	11.5	11.5
LW	36	36	36	36
RH	18	18	18	18
WK	8	8	8	8
W	8	8	8	8
Т	7	7	7	7
TP	M8 Depth 25	M6 Depth 20	M6 Depth 20	M6 Depth 20

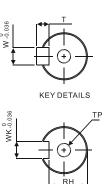


- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes ( $\Box$ ) in the model names represent shaft end/brake or the number of oil seal.
- 4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

#### Motor Frame Size: 180 mm and above Models (Units: mm)







SHAFT END DETAILS

Model	L∆1830⊐S	L∆1845□S	L∆1855⊐S	L∆1875⊐S	K∆1820□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	$35(^{+0}_{-0.016})$	$35(^{+0}_{-0.016})$	$42(^{+0}_{-0.016})$	$42(^{+0}_{-0.016})$	$35(^{+0}_{-0.016})$
LB	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$
LL (without brake)	202.1	235.3	279.7	342.0	169.0
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
Т	8	8	8	8	8
TP	M12 Depth 25	M12 Depth 25	M16 Depth 32	M16 Depth 32	M12 Depth 25



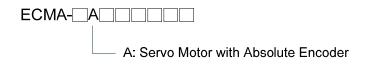
- 1) Dimensions are in millimeters. Actual measured values are in metric units.
- 2) Dimensions of the servo motor may be revised without prior notice.
- 3) The boxes  $(\Box)$  in the model names represent shaft end/brake or the number.
- 4) Please refer to Chapter 1 for the boxes ( $\triangle$ ) in the model names (which represents encoder type).

# **Chapter 12 Absolute System**

#### Introduction

Delta's absolute system includes 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



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.

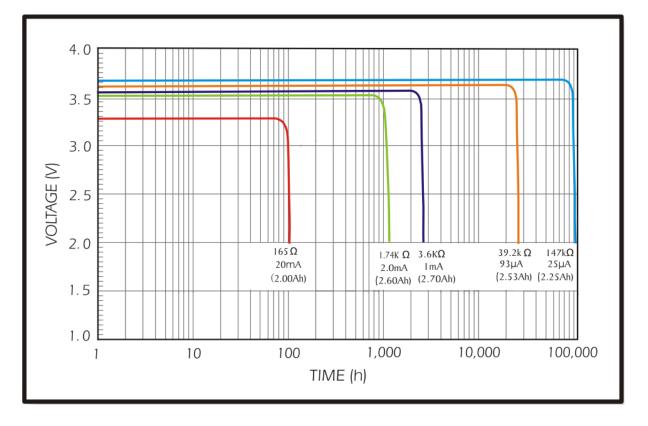


- Do not short circuit the positive pole and the negative pole of the batteries or install batteries in reverse polarity.
- To prevent electric energy loss and lifetime reduction, it is recommended to use new batteries only.
- Do not store batteries within an ambient temperature above +100°C. Failure 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.

Items	Li/SOCI2 Cylindrical Battery
Туре	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 Specifications**

#### **Battery Life**



Above figure comes from EVE Energy Co. ER14505 Discharge Characteristics

- (1) The above figure illustrates the discharge current curve generated by constant current test. 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)</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.

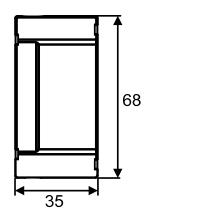


The battery life was measured when one single battery box is connecting to one servo drive and one servo motor.

### 12.1.2 Battery Box Dimensions

Single Battery Box

Delta Model Number: ASD-MDBT0100



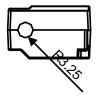
П

П

22

Π

26

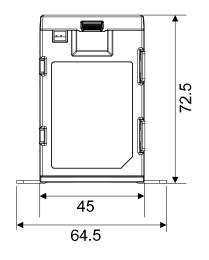


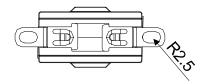
Weight	
44 g	

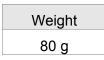


**Dual Battery Box** 

Delta Model Number: ASD-MDBT0200





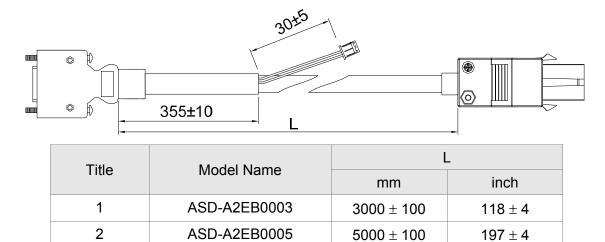


Units: mm

#### 12.1.3 Connection Cables for Absolute Encoder

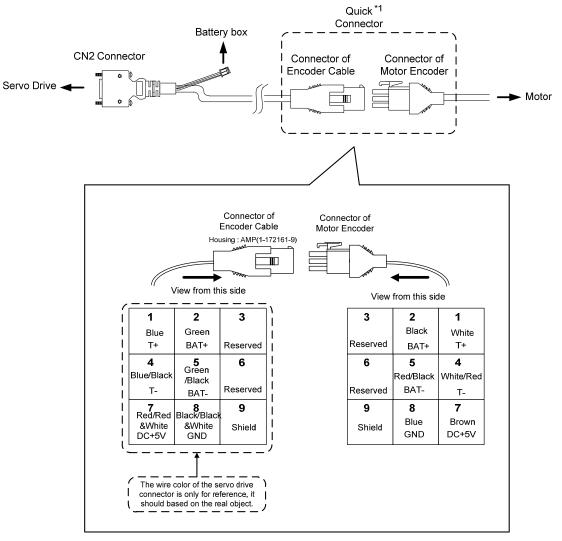
#### A. Quick Connector

Delta part number: ASD-A2EB0003, ASD-A2EB0005



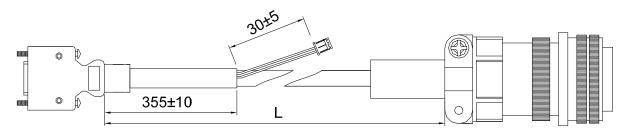
#### **Connection method:**

Please conduct the wiring according to the following instructions. Wrong wiring might cause battery explosion.



#### **B. Military Connector**

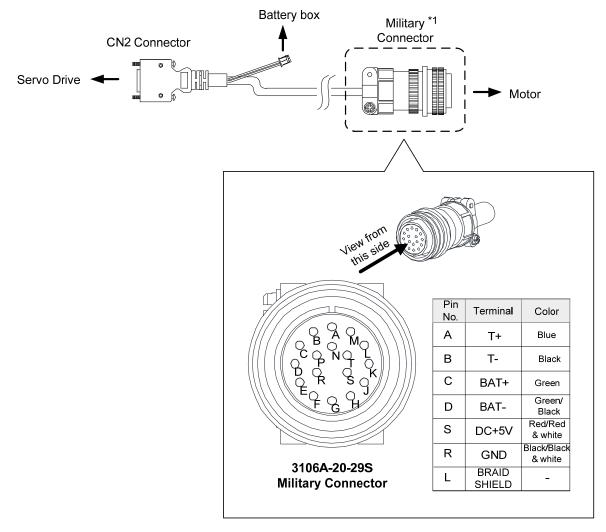
#### Delta part number: ASD-A2EB1003, ASD-A2EB1005



Title	Madal Nama	L		
The	Model Name	mm	inch	
1	ASD-A2EB1003	$3000\pm100$	118 ± 4	
2	ASD-A2EB1005	$5000\pm100$	197 ± 4	

#### Connection method:

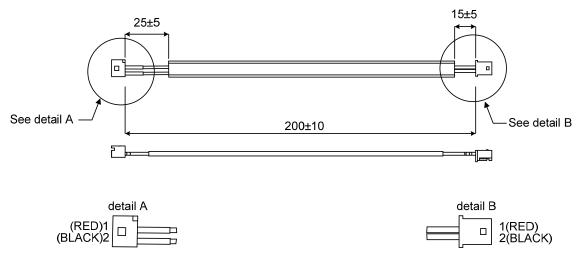
Please conduct the wiring according to the following instructions. Wrong wiring might cause battery explosion.



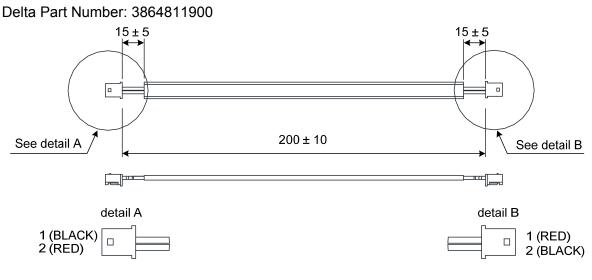
#### 12.1.4 Battery Box Cords

#### Battery Box Cord AW

Delta Part Number: 3864573700



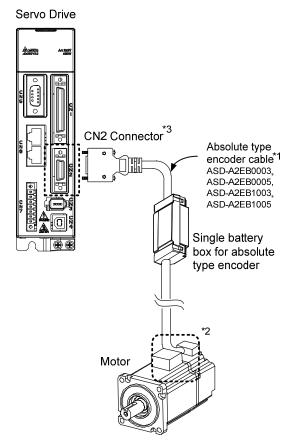
#### Battery Box Cord IW



## 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.

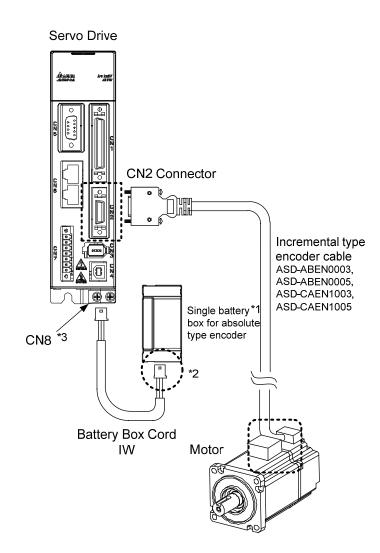
1\* and 2\* Please refer to section 12.1.3.

3\* Definition of CN2 connector

## Please conduct the wiring according to the following instructions. Wrong wiring might cause battery explosion.

CN2 Connector			Motor C	onnector
Pin No	Terminal Symbol	Function and Description	Military Connector	Quick Connector
5	T+	Serial communication signal input/output (+)	А	1
4	T-	Serial communication signal input/output (-)	В	4
7	BAT+	Battery 3.6V	С	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

#### Single 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\* Make sure the battery box is firmly fixed with this connection method.
- 2\* Connect to power base on single battery box, see the descriptions below:

	$\bigcirc$	$\bigcirc$	
ι	1	2	

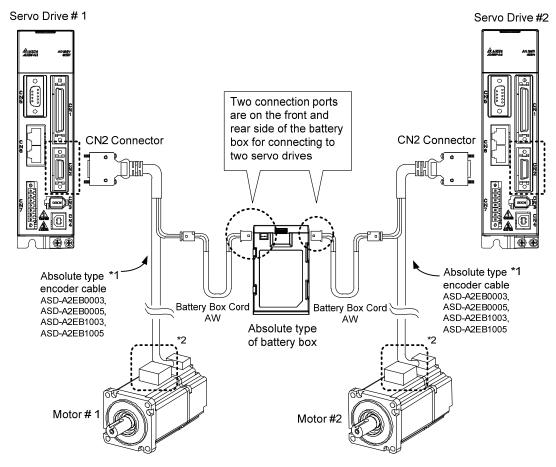
•		•
Pin No Terminal Symbol		Connector Cable
1	BAT+	Red
2	BAT-	Black

#### 3\* Definition of CN8 Connector:

Please conduct the wiring according to the following instructions. Wrong wiring might cause battery explosion.

Pin No	Terminal Symbol
1	BAT+
2	BAT-

#### Dual Battery Box (Connect to CN2)



#### 

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.

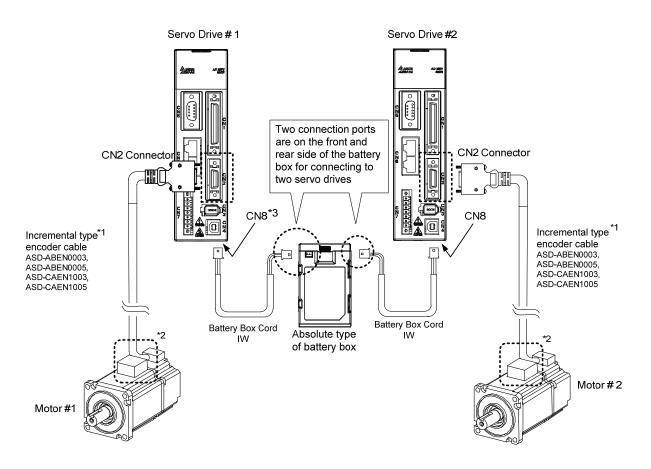
1\* and 2\* Please refer to section 12.1.3.

3\* Definition of CN2 connector

Please conduct the wiring according to the following instructions. Wrong wiring might
cause battery explosion.

CN2 Connector			Motor C	onnector
Pin No	Terminal Symbol	Function and Description	Military Connector	Quick Connector
5	T+	Serial communication signal input/output (+)	А	1
4	T-	Serial communication signal input/output (-)	В	4
7	BAT+	Battery 3.6V	С	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)



#### 

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.

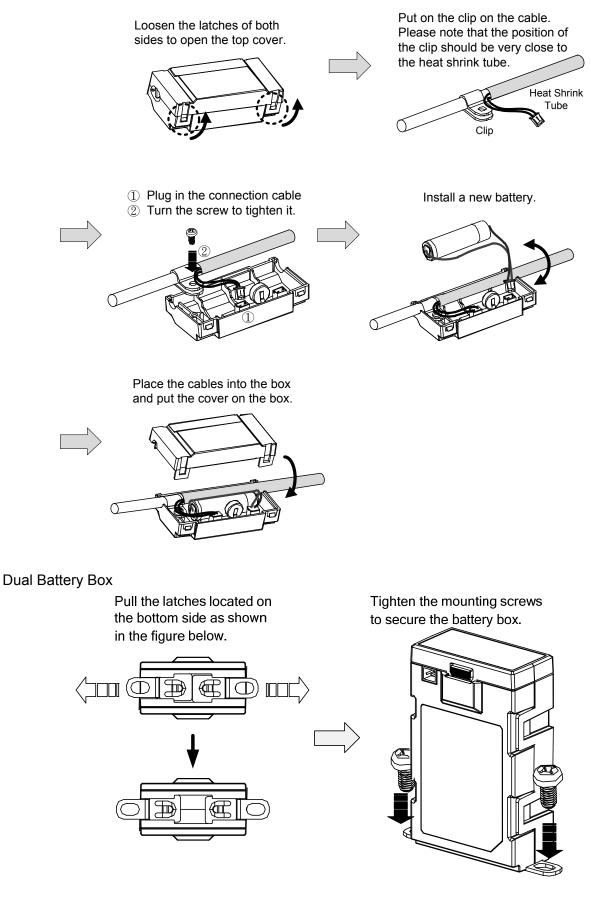
3\* Definition of CN8 connector

Please conduct the wiring according to the following instructions. Wrong wiring might cause battery explosion.

Pin No	Terminal Symbol
1	BAT+
2	BAT-

#### 12.2.2 How to Install a Battery

#### Single 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

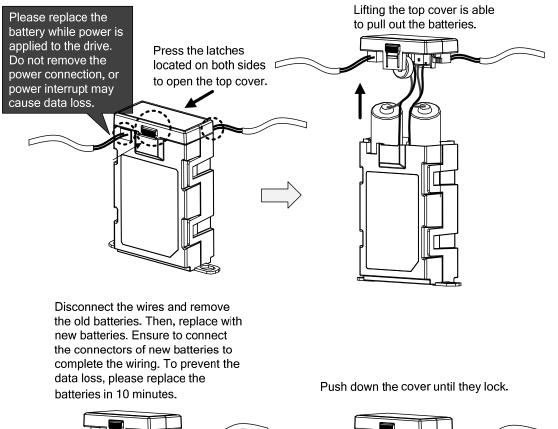
Release the latches located on Fully open the top cover both sides to open the top cover. Disconnect the wires and remove the old battery from the box. Then, replace with a new battery. Ensure to connect the connector of new battery to battery replacement. complete the wiring. Please replace the battery

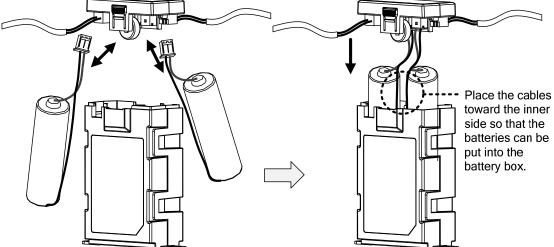
while power is applied to the drive. Do not remove the power connection, or power interrupt may cause data loss.

Place the cables into the box and

put the cover on the box. Finally, lock the latches to complete the

#### **Dual 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.

Pulse number for the distance = m (turn) × 1280000 + pulse number within one turn  $(0\sim1279999)$ 

The conversion between Pulse and PUU:

When the rotating direction is CCW defined in P1-01.

PUU number = pulse number  $\times \frac{(P1-45)}{(P1-44)} + (P6-01)$ 

When the rotating direction is CW defined in P1-01.

PUU number = (-1) × pulse number ×  $\frac{(P1-45)}{(P1-44)}$  + (P6-01)

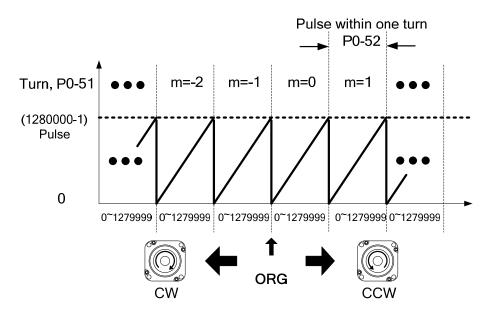


Figure 12.1 Pulse counting in absolute coordinate system

#### 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 ÷ 100000 ≒ 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.  $2147483647 \div 10000 = 214748.3$ . The limit to trigger the fault AL062 is 32767 (< 214748.3).

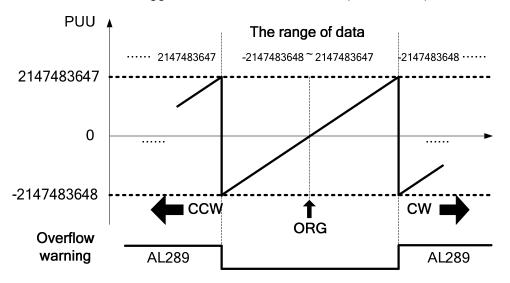


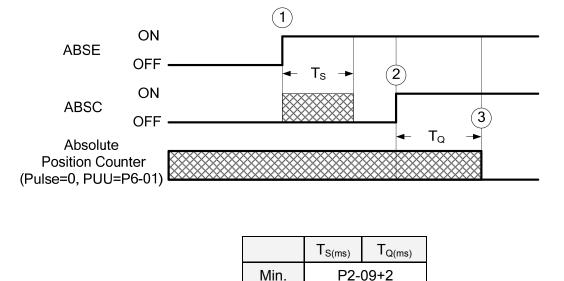
Figure 12.2 PUU counting in absolute coordinate system



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.



Max.

Figure 12.3 The controlling chart for initializing an absolute system via digital inputs/outputs

P2-09+10

The descriptions for the timing:

1. When the host controller switches ABSE from OFF to ON, a period of time Ts have to be waited for the next step to process.

2. After waiting time Ts, 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.

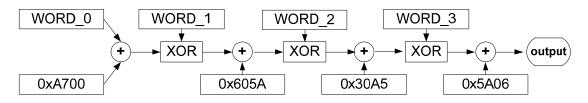
Bit 79 ~ Bit 64	Bit 63 ~ Bit 32	Bit 31 ~ Bit 16	Bit 15 ~ Bit 0
Check Sum	Encoder PUU -2147483648 - 2147483647	0	Encoder status, P0-50

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	Encoder turn	Encoder status,	
	0 ~ 1279999 (= 1280000-1)	-32768 ~ +32767	P0-50	

Explanation:

Check Sum = ((((((WORD\_0+0xA700) XOR WORD\_1)+0x605A) XOR WORD\_2)+0x30A5) XOR WORD\_3)+0x5A06)

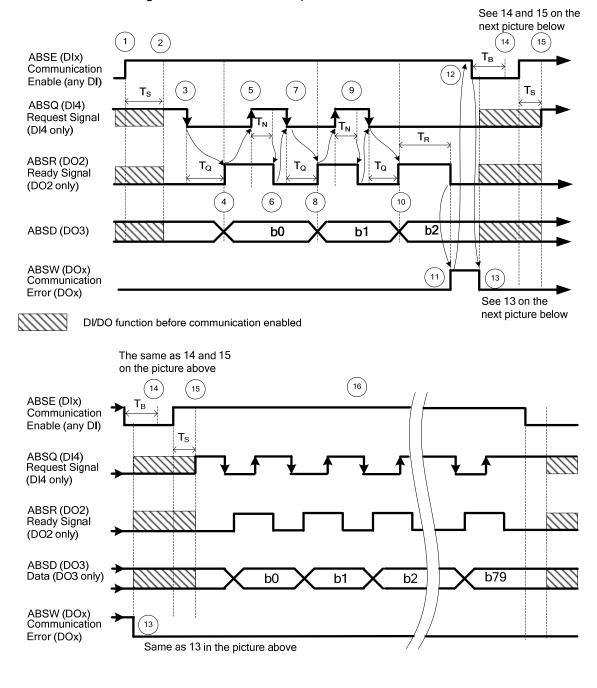


Note:

- 1. This algorithm has no plus or minus sign.
- 2. 0xA700, 0x605A, 0x30A5 and 0x50A6 are the constans 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 <sub>R(ms)</sub>	T <sub>S(ms)</sub> T <sub>Q(ms)</sub> T <sub>N(ms)</sub> T			T <sub>B(ms)</sub>	
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 Ts 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 to set to 0 for communication use only.
- ③. When ABSE is at high level and retaining Ts long, the function of DI4 will be switched to ABSQ. If the host controller switch ABSQ to low after it is defined, the servo drive will recognize that host controller wants to read data from it.
- ④. After confirming time T<sub>Q</sub>, 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<sub>Q</sub> (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 dada read.
- (6). After confirming time T<sub>N</sub> for ABSQ kept high, the servo drive will maintain ABSR to low for signaling the host controller to be ready for accessing next bit.
- 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 t o 7, the host controller will get the data, bit, and have an acknowledgement to the servo drive.
- (1). The third bit data is ready on the servo drive side.
- ①. After the data is ready and has been held for time T<sub>R</sub>, 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.
- ①. The host controller will set the ABSE to low for restart the communication cycle after getting the communication error message from the servo drive.
- ①. The communication error flag on servo drive side will be reset after detecting a low signal ABSE from the host controller.
- (4). A new communication cycle on host controller will be restarted after the buffering time  $T_B$ .
- (5). Repeat the step 1 for the host controller to start a new communication cycle.

(b). 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.

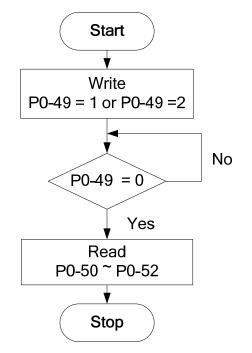


If ABSW does not go back to high level signal after the changing of ABSE for signal low to high that is a sign of error occurring, there must be some other errors existing. Please check if the coordinate data still there, the voltage level of battery, or overflowing on the coordinate value.

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 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.



ABS AI	osolute Encoder Set	Address: 028AH 028BH	
Operationa Interface :	·Panal / Softwara	Communication	Related Section: N/A
Default :	-		
Contro Mode:			
Unit :			
Range :	0x0 ~ 0x1		
Data Size :	16-bit		
Format :	Hexadecimal		
Settings	with absolute e connected, if P2-	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w	ncremental servo motor vill occur.)
	1: Absolute mode. with absolute e connected, if P2-	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se	ncremental servo motor vill occur.)
	1: Absolute mode. with absolute e connected, if P2- This parameter is e ad Data Format Sel	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se	ncremental servo motor vill occur.) ervo drive is re-powered on. Address: 028CH
MRS Re Operationa	<ol> <li>Absolute mode. with absolute e connected, if P2-</li> <li>This parameter is e</li> <li>Ead Data Format Sel</li> <li>Panel / Software</li> </ol>	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se ection	ncremental servo motor vill occur.) ervo drive is re-powered on Address: 028CH 028DH
MRS Re Operationa Interface :	<ol> <li>Absolute mode. with absolute e connected, if P2-</li> <li>This parameter is e</li> <li>This parameter is e</li> <li>Panel / Software</li> <li>0x0</li> </ol>	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se ection	ncremental servo motor vill occur.) ervo drive is re-powered on. Address: 028CH 028DH
MRS Re Operationa Interface : Default : Contro	<ol> <li>Absolute mode. with absolute e connected, if P2-</li> <li>This parameter is e</li> <li>Contract Sel</li> <li>Panel / Software</li> <li>0x0</li> <li>ALL</li> </ol>	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se ection	ncremental servo motor vill occur.) ervo drive is re-powered on. Address: 028CH 028DH
MRS Re Operationa Interface : Default : Contro Mode : Unit :	<ol> <li>Absolute mode. with absolute e connected, if P2-</li> <li>This parameter is e</li> <li>Contract Sel</li> <li>Panel / Software</li> <li>0x0</li> <li>ALL</li> </ol>	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se ection	Address: 028CH 028DH
MRS Re Operationa Interface : Default : Contro Mode : Unit :	1: Absolute mode. with absolute e connected, if P2- This parameter is e ad Data Format Sel Panel / Software 0x0 ALL N/A 0x00 ~ 0x07	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se ection	ncremental servo motor vill occur.) ervo drive is re-powered on. Address: 028CH 028DH
MRS Re Operationa Interface : Default : Contro Mode : Unit : Range : Data Size :	1: Absolute mode. with absolute e connected, if P2- This parameter is e ad Data Format Sel Panel / Software 0x0 ALL N/A 0x00 ~ 0x07	(This setting is only a encoder. When an ir 69 is set to 1, AL.069 w ffective only after the se ection	ncremental servo motor vill occur.) ervo drive is re-powered on Address: 028CH 028DH

### 12.4 Related Parameters for Absolute System

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8

Bit 0: Data unit setting of digital input/output (DI/DO);

1: Pulse, 0: PUU

Bit 1: Communication data unit setting; 1: Pulse, 0: PUU

Bit 2: Overflow warning; 1: No overflow warning, 0: Overflow warning,

AL.289 (PUU), AL.062 (pulse).

Bit 3 ~ Bit 15: Reserved. Must be set to 0.

P2-71∎	CAP At	osolute Position Ho	Address: 028EH 028FH	
	Operationa Interface :		Communication	Related Section: N/A
	Default :	0x0		• • • •
	Contro Mode :	· A I I		
	Unit :	N/A		12 2 2 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
	Range :	0x0 ~ 0x1		
	Data Size :	16-bit		
	Format :	Hexadecimal		<b>4</b> 5 5 5 5 5 5 5 5

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.

P0-49∎	UAP	Rei	new Encoder Absolu	Address: 0062H 0063H	
	Operation Interface		Panel / Software	Communication	Related Section: N/A
	Default	t :			
	Cont Mode		ALL		7 1 1 1 1 1 1 1 1 1 1 1 1 1
	Uni	t :	N/A		
	Range	e :	0x00 ~ 0x02		
	Data Size	e : :			
:	Format : Hexadecimal				
	Setting			d to renew the absolute	position data of the



Parameter Renew Setting

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).

P0-50 <del>★</del>	APSTS A	bsolute Coordinate	Address: 0064H 0065H	
	Operation Interface		Communication	Related Section: N/A
	Default	: 0x0		<b>.</b>
	Contro Mode	· A I I		
	Unit	: N/A		7 - - - -
	Range	: 0x00 ~ 0x1F		-
	Data Size	: 16-bit		
	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.

P0-51★	APR	Encoder Absolute Po	sition (Multiturn)	Address: 0066H 0067H
	Operatio Interface	e : Panel / Software	Communication	Related Section: N/A
	Defau	lt: 0x0		7 2 2 2 2 2 2 2 2
	Con Mode	trol e:		
	Un	it : rev		
	Range	e : -32768 ~ +32767		• • •
	Data Size	e : 32-bit		1 - - -
	Forma	at : Decimal		7 

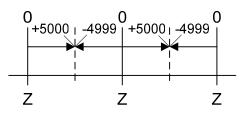
Settings : While the Bit 1 of P2-70 is set to read the encoder pulse number, this parameter represents the turns of encoder absolute position. While the Bit 1 of P2-70 is set to read the PUU number, this parameter becomes disabled and the setting value of this parameter is 0.

P0-52 <del>★</del>			Absolute Pos mber within	sition Singleturn or PUU)	Address: 0068H 0069H
	Operation Interface	·Panel /	Software	Communication	Related Section: N/A
	Default :				
	Cont Mode	·ΔI I			
	Uni	t: Pulse o			: Pulse or PUU
	Range : 0~1280000-1 (Pulse Number); -2147483648 ~ 2147483647 (PUU) Data Size : 32-bit				
	Forma	t : Decima	al		

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.

P0-02	STS	Dri	ve Status	Address: 0004H 0005H	
	Operation Interfact		Panel / Software	Communication	Related Section: 7.2
	Defau	ılt :	00		
	Cor Mod	ntrol le :	ALL		
	Ur	nit :	-		
	Rang	le :	00 ~ 127		
	Data Siz	:e	16-bit		
	Forma	at :	Decimal		
	Settings :		00:Motor feedback p gear ratio) [PUU]	oulse number (after the	scaling of electronic
			01 : Input pulse numb electronic gear ra	er of pulse command ( atio) [PUU]	after the scaling of
			02 : Deviation betwee number[PUU]	n control command pu	lse and feedback pulse
			03 : The number of m Pulse/rev]	otor feedback pulse [E	ncoder unit, 1,280,000
			04 : Distance to comr	nand terminal (Encode	r unit) [Pulse]
			05 : Error pulse numl (Encoder unit) [F	per (after the scaling of Pulse]	f electronic gear ratio)
			06: The frequency of	pulse command input	[Kpps]
			07 : Motor speed [r/m	in]	
			08 : Speed command	input [Volt]	
			09 : Speed command	input [r/min]	
			10 : Torque command	l input [Volt]	
			11 : Torque command	d input [%]	
			12 : Average torque [	%]	
			13 : Peak torque [%]		
			14 : Main circuit volta	ge (BUS voltage) [Volt]	l
			15 : Load/motor inerti	a ratio [0.1times]	
			16 : IGBT temperatur	e	

- 17 : The frequency of resonance suppression
- 18 : The distance from the current position to Z. The range of the value is between -5000 and +5000;



The interval of the two Z-phase pulse command if 10000 Pulse.

- 19 : Mapping Parameter #1 : P0 25
- 20 : Mapping Parameter #2 : P0 26
- 21 : Mapping Parameter #3 : P0 27
- 22 : Mapping Parameter #4 : P0 28
- 23 : Monitor Variable #1 : P0 09
- 24 : Monitor Variable #2 : P0 10
- 25 : Monitor Variable #3 : P0 11
- 26 : Monitor Variable #4 : P0 12
- 38 : It display the battery voltage [0.1 Volt ]. For example, if it displays 36, it means the battery voltage is 3.6 V.
- 72 : Analog speed command [0.1 r/min] (This is supported by A2-M/-U/-L.)

## 12.5 Digital Input (DI) Function Definition (for Absolute System)

### Setting Value: 0x1D

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
ABSE	When DI.ABSE is ON, it is in ABS mode. DI.ABSQ, DI.ABSC, DI.ABSR, DI.ABSD and DI.ABSC are enabled. When DI.ABSE is ON, the function of DI4, DO2, and DO3 will be disabled. Function of DI4 will be ASDQ, DO2 will be ABSR and DO3 will be ABSD.	Level Triggered	ALL

# Setting Value: When DI.ABSE is ON, DI4 inputs ABSQ signal, function set by P2-13 is disabled.

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
always	During I/O transmission, Handshaking signal will be sent to the servo drive by the controller. When DI.ABSQ is OFF, it means the controller issues Request ; DI.ABSQ is ON means the controller has already recdived ABSD signal. When DI.ABSE is ON, this DI is enabled. Please refer to diagram 13.4 for detailed description.	Rising / Falling- edged Triggered	ALL

Setting Va	Setting Value: 0x1F			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode	
ABSC	When DI.ABSC is ON, multi-turn data stored in absolute encoder will be cleared. When DI.ABSE is ON, this function is enabled.	Rising- edge Triggered	ALL	

## 12.6 Digital Output (DO) Function Definition (for Absolute System)

# Setting Value: When DI.ABSE is ON, DO2 outputs ABSR signal, function set by P2-19 is disabled.

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
always	DO.ABSR is OFF means the Request sent by ABSQ has been received. DO.ABSR is ON means the data that is outputted by ABSD is valid. When DI.ABSE is ON, this DO is enabled. Please refer to diagram 12.4 for detailed description.	Level Triggered	ALL

## Setting Value: When DI.ABSE is ON, DO3 outputs ABSD signal, function set by P2-20 is disabled.

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
ABSD is always	Position data of ABS is outputted. The data is valid when ABSR is ON. When DI.ABSE is ON, this DO is enabled. Please refer to diagram 13.4 for detailed description.	Level Triggered	ALL
outputted			
by DO3			

Setting Value:0x0D			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
ABSW	Warning of absolute encoder.	Level Triggered	ALL

## 12.7 Alarms for Absolute System

Display	Alarm Name	Alarm Description
AL028	Encoder voltage error or the internal of the encoder is in error	Charging circuit of the servo drive is not removed and the battery voltage is higher than the specification (>3.8 V) or the encoder signal is in error.
AL029	Gray code error	Absolute position is in error.
AL060	The absolute position is lost	Due to battery under voltage or the failure of power supply, the encoder lost the internal record.
AL061	Encoder under voltage	The voltage of the absolute encoder is lower than the specification
AL062	The multi-turn of absolute encoder overflows	The multi-turn of absolute encoder exceeds the maximum range: -32768 ~ +32767
AL068	Absolute data transmitted via I/O is in error	The sequence is wrong when reading the absolute position via DIO.
AL069	Wrong motor type	Incremental motor is not allowed to activate the absolute function.
AL289	Feedback position counter overflows	Feedback position counter overflows.

#### 12.7.1 Causes and Corrective Actions

#### AL028: Encoder voltage error or the internal of the encoder is in error

Causes	Checking Method	Corrective Actions
Battery voltage is too high	<ol> <li>Check if the charging circuit exists in the servo drive.</li> <li>Check if the battery is correctly installed</li> </ol>	According to the procedure of Over voltage to check. When corrective actions are done, AL.028 will be cleared automatically.
The internal encoder is in error.	<ol> <li>Check if it is the absolute type encoder.</li> <li>Check if the servo is properly grounded.</li> <li>Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	cable separates from the power supply or the high-current circuit.

#### AL029: Gray code error

Causes	Checking Method	Corrective Actions
Absolute position is in		If the alarm occurs again,
error	check if the alarm will occur again.	please change the encoder.

#### AL060: Absolute Position Lost

Causes	Checking Method	Corrective Actions
Battery under voltage	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> <li>Install the battery.</li> <li>Check the wiring between the battery pack and the power cable of the servo drive.</li> <li>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> <li>Check the wiring of the encoder.</li> <li>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

Causes	Checking Method	Corrective Actions
		of absolute coordinate
		initialization in Chapter 12.

#### AL062: Encoder under voltage

Causes	Checking Method	Corrective Actions
Battery under voltage	<ol> <li>Check if the voltage of the battery on the panel is lower than 3.1 V (tentative specification).</li> <li>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
range the absolute	Check if the operation distance exceeds	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

Causes	Checking Method	Corrective Actions
Sequence error	<ol> <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: Wong motor type

Causes	Checking Method	Corrective Actions
Incremental motor is not allowed to activate the absolute function	absolute encoder. 2. Check parameter P2-69.	If the user desires to use absolute function, please choose absolute motor. If not, please set parameter P2-69 to 0.

#### AL289: Feedback position counter overflows

Causes	Checking Method	Corrective Actions
		NMT: Reset node or 0x6040.Fault Reset

## 12.8 Related Monitoring Variables

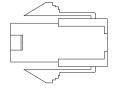
Code	Monitoring Variables / Attribute	Explanation
038 (26h)	Voltage level of battery	The voltage level of battery for an absolute encoder.

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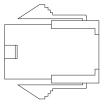
# **Appendix A Accessories**

# Power Connectors

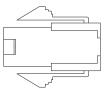
Delta Part Number: ASDBCAPW0000 (for 200V series servo drive)



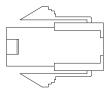
Delta Part Number: ASDBCAPW0100 (for 200V series servo drive, with brake contact)



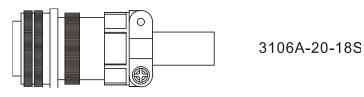
Delta Part Number: ASD-CAPW5400 (for 400V series servo drive)



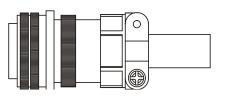
Delta Part Number: ASD-CAPW5100 (for 400V series servo drive, with brake contact)



### Delta Part Number: ASD-CAPW1000

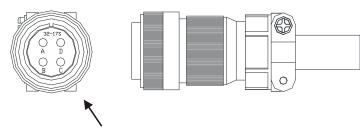


### Delta Part Number: ASD-CAPW2000



3106A-24-11S

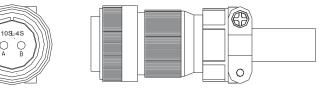
Delta Part Number: ASD-CAPW4000 CLAMP: WPS3057-20A



Straight Plug WPS3106A-32-17S

Motor Brake Connector: ASD-CNBR1000 CLAMP: WPS3106A 10SL-4S-R

Ò



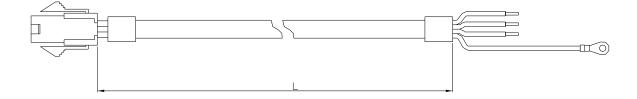
#### Power Cables

Delta Part Number: ASD-ABPW0003, ASD-ABPW0005 (for 200V series servo drive)



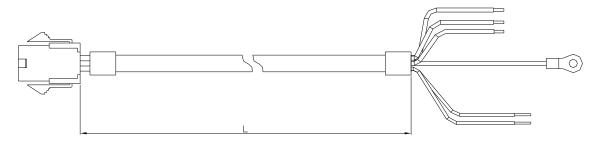
Title	Dort No	L	
Title	Title Part No.		inch
1	ASD-ABPW0003	$3000\pm100$	118 ± 4
2	ASD-ABPW0005	$5000\pm100$	$197\pm4$

#### Delta Part Number: ASD-CAPW5403, ASD-CAPW5405 (for 400V series servo drive)



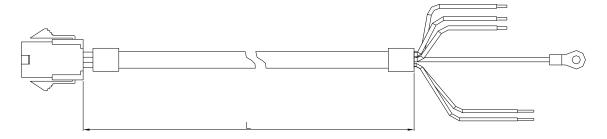
Title	Dort No	L	
Title	Title Part No.		inch
1	ASD-CAPW5403	$3000\pm100$	$118\pm4$
2	ASD-CAPW5405	$5000\pm100$	197 ± 4

# Delta Part Number: ASD-ABPW0103, ASD-ABPW0105 (for 200V series servo drive, with brake cable)



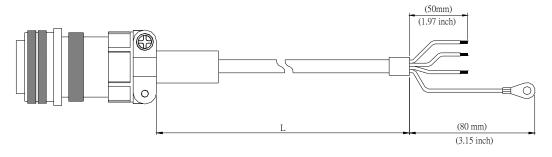
Title	Part No.	L	
The	Fait NO.	mm	inch
1	ASD- ABPW0103	$3000\pm100$	$118\pm4$
2	ASD- ABPW0105	$5000\pm100$	$197\pm4$

Delta Part Number: ASD-CAPW5103, ASD-CAPW5105 (for 400V series servo drive, with brake cable)



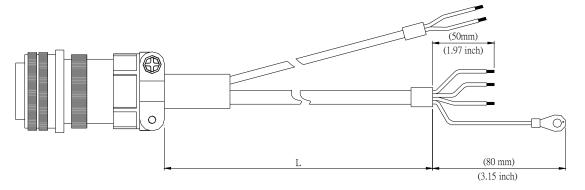
Titlo	Dort No.	L	
Title	Title Part No.	mm	inch
1	ASD- CAPW5103	$3000\pm100$	$118\pm4$
2	ASD- CAPW5105	$5000\pm100$	$197\pm4$

#### Delta Part Number: ASD-CAPW1003, ASD-CAPW1005



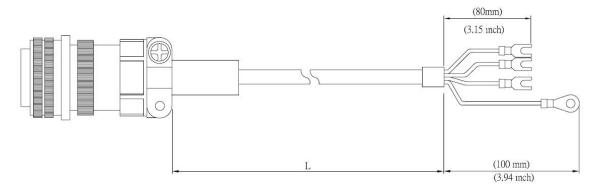
Title	Title Part No. Straight	L		
The		Straight	mm	inch
1	ASD-CAPW1003	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-CAPW1005	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: ASD-CAPW1103, ASD-CAPW1105



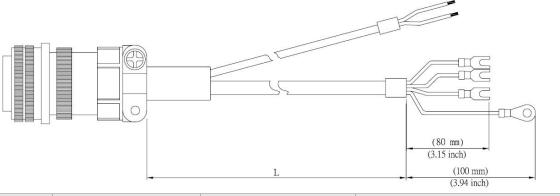
Title	Part No. Straight	L		
The	Fait NO.	rt No. Straight	mm	inch
1	ASD-CAPW1103	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-CAPW1105	3106A-20-18S	$5000\pm100$	$197\pm4$

Delta Part Number: ASDB-CAPW1203, ASDB-CAPW1205



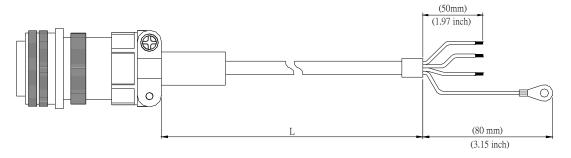
Title	Part No.	Straight	L	
The		mm	inch	
1	ASD-CAPW1203	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-CAPW1205	3106A-20-18S	$5000\pm100$	197 ± 4

#### Delta Part Number: ASD-CAPW1303, ASD-CAPW1305



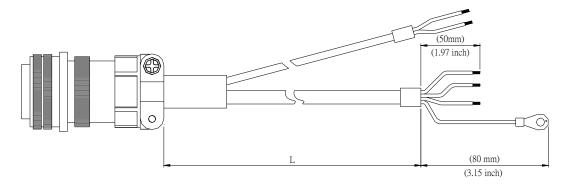
Title	Part No	Part No. Straight	L	
The	Fait NO.		mm	inch
1	ASD-CAPW1303	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-CAPW1305	3106A-20-18S	$5000\pm100$	$197\pm4$

Delta Part Number: ASD-A2PW1003, ASD-A2PW1005



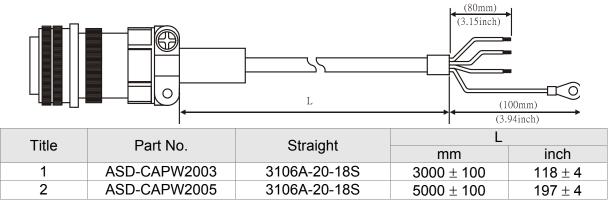
Title	Title Part No. Straight	Straight	L	
Title	Fall NO.	Io. Straight	mm	inch
1	ASD-A2PW1003	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-A2PW1005	3106A-20-18S	$5000\pm100$	197 ± 4

Delta Part Number: ASD-A2PW1103, ASD-A2PW1105

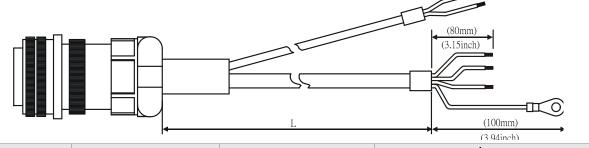


Titlo	Part No.	Straight	L	
Title	Fall NO.		mm	inch
1	ASD-A2PW1103	3106A-20-18S	$3000\pm100$	118 ± 4
2	ASD-A2PW1105	3106A-20-18S	$5000\pm100$	197 ± 4

#### Delta Part Number: ASD-CAPW2003, ASD-CAPW2005

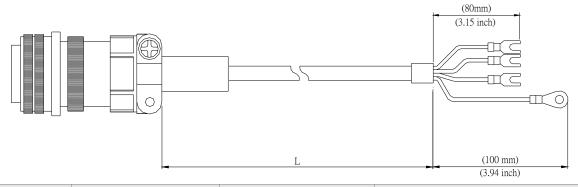


Delta Part Number: ASD-CAPW2103, ASD-CAPW2105

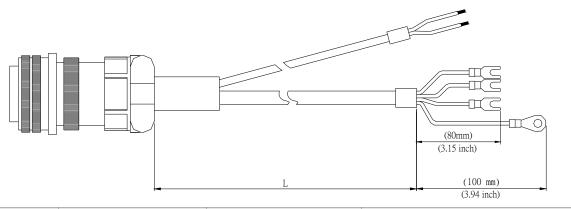


Title	e Part No. Straight	L		
The	Fait NO.	Stratyfit	mm	inch
1	ASD-CAPW2103	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-CAPW2105	3106A-20-18S	$5000\pm100$	$197\pm4$

Delta Part Number: ASD-CAPW2203, ASD-CAPW2205



Title	Part No.	Straight	L	
THE	Fait No.		mm	inch
1	ASD-CAPW2203	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-CAPW2205	3106A-20-18S	$5000\pm100$	$197\pm4$



Title	Part No.	Straight	L	
The	Fait NO.	Straight	mm	inch
1	ASD-CAPW2303	3106A-20-18S	$3000\pm100$	$118\pm4$
2	ASD-CAPW2305	3106A-20-18S	$5000\pm100$	$197\pm4$

Delta Part Number: ASD-CAPW3203, ASD-CAPW3205 (for 4.5 kW models)



MS 3106-24-11S

 $5000\pm100$ 

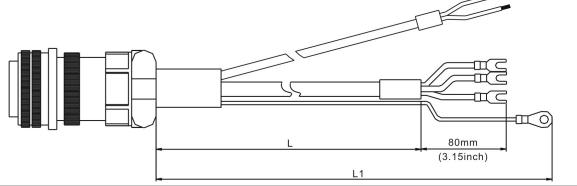
 $197\pm4$ 

2

ASD-CAPW3205

Revision February, 2017

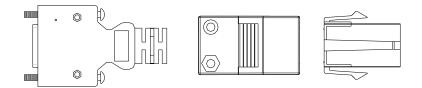
Delta Part Number: ASD-CAPW3303, ASD-CAPW3305 (for motors with brake)



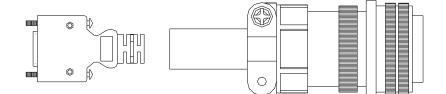
Item	Part No.	o. Straight			L1	
nom	i artito.	otraight	mm	inch	mm	inch
1	ASD-CAPW3303	MS 3106-24-11S	3000±100	$118\pm4$	3100±100	$122\pm4$
2	ASD-CAPW3305	MS 3106-24-11S	5000±100	$197\pm4$	5100±100	$201\pm4$

#### Encoder Connectors

Delta Part Number: ASD-ABEN0000

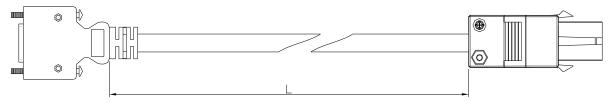


#### Delta Part Number: ASD-ABEN1000



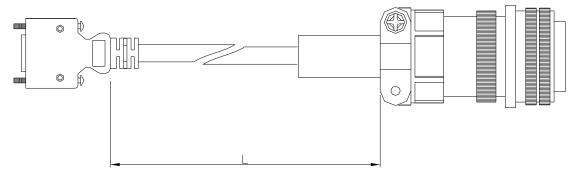
# Incremental Type Encoder Cables

# Delta Part Number: ASD-ABEN0003, ASD-ABEN0005



Title	Part No.	L	
The	Fait No.	mm	inch
1	ASD-ABEN0003	$3000\pm100$	118 ±4
2	ASD-ABEN0005	$5000\pm100$	197 ± 4

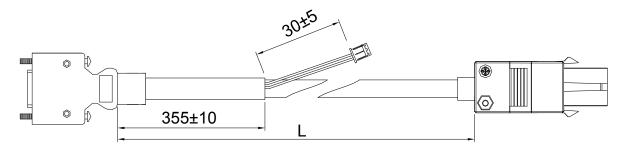
#### Delta Part Number: ASD-ABEN1003, ASD-ABEN1005



Title	Part No.	Straight	L	
The	Fall NO.	Straight	mm	inch
1	ASD-CAEN1003	3106A-20-29S	$3000\pm100$	$118\pm4$
2	ASD-CAEN1005	3106A-20-29S	$5000\pm100$	$197\pm4$

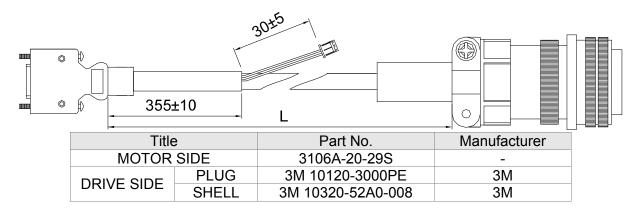
# ■ Absolute Type Encoder Cables

Delta Part Number: ASD-A2EB0003, ASD-A2EB0005



Title Part No.	L		
The	Fait NO.	mm	inch
1	ASD-A2EB0003	$3000\pm100$	$118\pm4$
2	ASD-A2EB0005	$5000\pm100$	197 ± 4

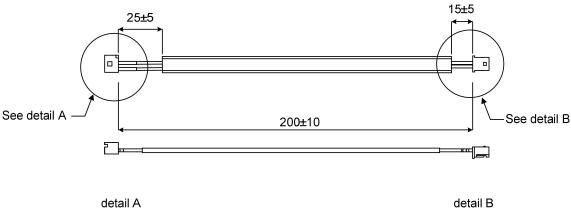
#### Delta Part Number: ASD-A2EB1003, ASD-A2EB1005

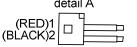


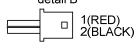
Title Model Name		L	
Title	Model Name	mm	inch
1	ASD-A2EB1003	$3000\pm100$	$118\pm4$
2	ASD-A2EB1005	$5000\pm100$	197 ± 4

# Battery Box Cord AW (Connects to the battery side of the encoder cable)

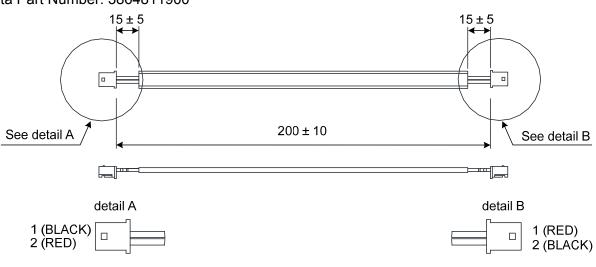
Delta Part Number: 3864573700







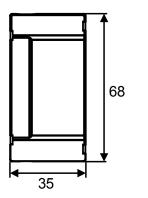
# Battery Box Cord IW (Connects to CN8)

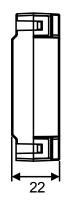


Delta Part Number: 3864811900

# Battery Boxes

### Single Battery Box Delta Part Number: ASD-MDBT0100

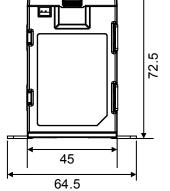


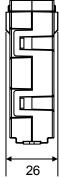


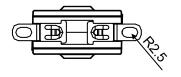


Delta Part Number: ASD-MDBT0200

**Dual Battery Box** 





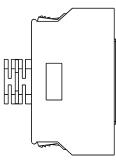


Units: mm

# Units: mm

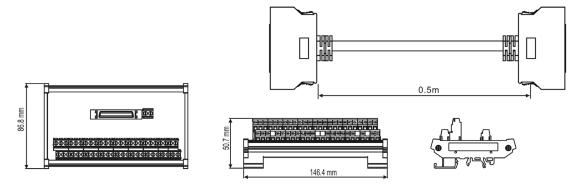
## I/O Signal Connector

Delta Part Number: ASD-CNSC0050



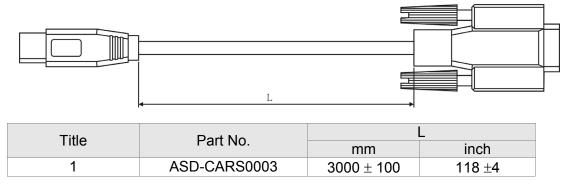
# ■ I/O Terminal Block Module

Delta Part Number: ASD-BM-50A

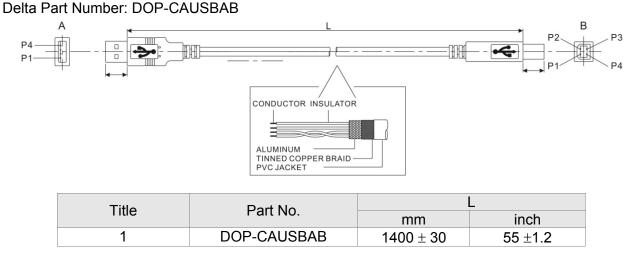


#### **RS-232** Communication Cable

#### Delta Part Number: ASD-CARS0003

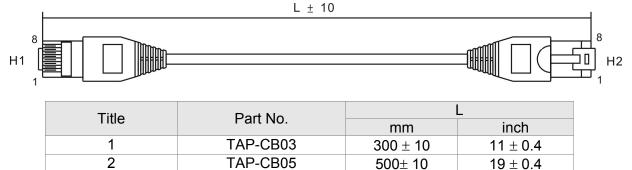


#### Communication Cable between Drive and Computer (for PC)



# **CANopen Communication Cable**

Delta Part Number: TAP-CB03, TAP-CB05

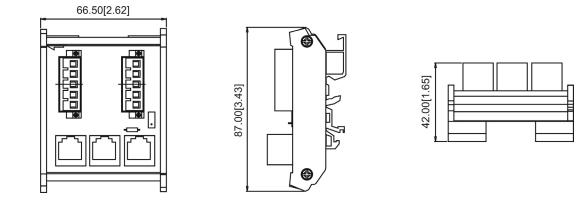


 $500\pm10$ 

 $19\pm0.4$ 

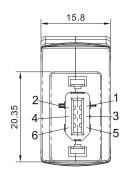
# CANopen Distribution Box

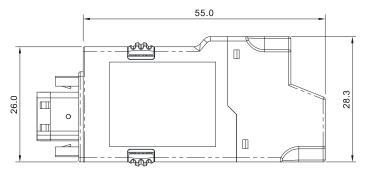
Delta Part Number: TAP-CN03

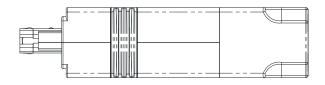


# RS-485 Connector

Delta Part Number: ASD-CNIE0B06

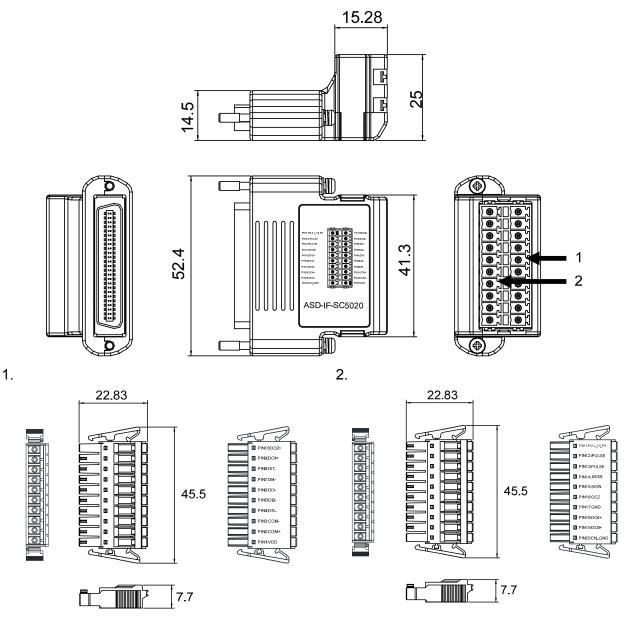






### ■ CN1 Convenient Connector

#### Delta Part Number: ASD-IF-SC5020



# Optional Accessories - 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

#### 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-□
	ECMA-C∆0604⊟S
Low Inertia Servo Motor	ECMA-C∆0604□H
	ECMA-C∆0804 <b>⊡</b> 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

#### 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-□
	ECMA-C∆0807⊡S
Low Inertia Servo Motor	ECMA-C∆0807□H
	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 Medium-High Inertia Servo Motor

Servo Drive	ASD-A2-0721-□
Medium-High Inertia Servo Motor	ECMA-F∆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

#### 750W Servo Drive and 600W High Inertia Servo Motor

Servo Drive	ASD-A2-0721-□
Servo Drive	A3D-A2-0721-L
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
Motor Power Cable (With Brake)	ASD-ABPW010X
Incremental Type Encoder Cable	ASD-ABEN000X
Absolute Type Encoder Cable	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

#### 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

#### 1.5kW Servo Drive and 1.5kW Medium Inertia Servo Motor

Sonio Drivo	
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

#### 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-F∆1313⊡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 1.8kW Medium-High Inertia Servo Motor

Servo Drive	ASD-A2-3023-□
Medium-High Inertia Servo Motor	ECMA-F∆1318□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

#### 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

#### 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

#### 7.5kW Servo Drive and 7.5kW Medium-High Inertia Servo Motor

Servo Drive	ASD-A2-7523-ロ
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-F1221FDS
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

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- 1. The boxes (□) at the ends of the servo drive model names are for optional configurations. Please refer to the ordering information of the actual purchased product.
- 2. The boxes (△) in the model names are for encoder resolution types. Please refer to Chapter 1 for further information.
- 3. The boxes ( $\Box$ ) in the model names represent brake or keyway / oil seal.

#### Optional Accessories - 400V Series

750W Servo Drive and 400W Low Inertia Servo Motor

Servo Drive	ASD-A2-0743-□
Low Inertia Servo Motor	ECMA-J∆0604⊡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-J∆0807⊡S
	ECMA-J∆0907⊡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 500W Medium Inertia Servo Motor

Servo Drive	ASD-A2-0743-□
Medium Inertia Servo Motor	ECMA- K∆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

#### 750W Servo Drive and 500W Medium-High Inertia Servo Motor

Servo Drive	ASD-A2-0743-□
Medium-High Inertia Servo Motor	ECMA- L∆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)

#### 1kW Servo Drive and 1kW Low Inertia Servo Motor

Servo Drive	ASD-A2-1043-□
Low Inertia Servo Motor	ECMA-J∆0910□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-L∆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

#### 1kW Servo Drive and 1kW Medium Inertia Servo Motor

Servo Drive	ASD-A2-1043-□
Medium Inertia Servo Motor	ECMA-K∆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)

1.5kW Servo Drive and 900W High Inertia Servo Motor

Servo Drive	ASD-A2-1543-ロ
High Inertia Servo Motor	ECMA-M∆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 1kW Low Inertia Servo Motor

Servo Drive	ASD-A2-1543-□
Low Inertia Servo Motor	ECMA-J∆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

#### 1.5kW Servo Drive and 1.3kW Medium-High Inertia Servo Motor

Servo Drive	ASD-A2-1543-□
Medium-High Inertia Servo Motor	ECMA-L∆1313⊡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-ロ
Medium Inertia Servo Motor	ECMA-K∆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 Motor

Servo Drive	ASD-A2-2043-□
Low Inertia Servo Motor	ECMA-J∆1020□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

#### 2kW Servo Drive and 2kW Medium Inertia Servo Motor

Servo Drive	ASD-A2-2043-□
Medium Inertia Servo Motor	ECMA-K∆1320⊡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-K∆1820□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-J∆1330□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

#### 3kW Servo Drive and 3kW Medium-High Inertia Servo Motor

Servo Drive	ASD-A2-3043-□
Medium-High Inertia Servo Motor	ECMA- L∆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-ロ
Medium-High Inertia Servo Motor	ECMA-L∆1845⊡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	

#### 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)



- 1. The boxes (□) at the ends of the servo drive model names. 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. Please refer to Chapter 1 for further information.
- 3. The boxes  $(\Box)$  in the model names represent brake or keyway / oil seal.

#### Other Accessories (for ASDA-A2 series all models)

Description	Delta Part Number	
50Pin I/O signal connector (CN1)	ASD-CNSC0050	
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-CB05	
CANopen Distribution Box	TAP-CN03	
RS-485 Connector	ASD-CNIE0B06	
Regenerative Resistor 400W $40\Omega$	BR400W040	
Regenerative Resistor 1kW $20\Omega$	BR1K0W020	
Regenerative Resistor 1.5kW 5 $\Omega$	BR1K5W005	

# **Appendix B** Maintenance and

# Inspection

# **Basic Inspection**

Item	Content
General inspection	Periodically check if the screws of the servo drive, the connection between the motor shaft and the mechanical system as well as the connection of terminal block and mechanical system are securely tightened.
	The gap of the control chamber and the installation of the cooling fan should free from oil, water or metallic particles. Also, the servo drive shall free from the cutting power of the power drill.
	If the control chamber is installed in the site which contains harmful gas or full of dust, please be ensured the servo drive is free from the harmful gas and dust.
	When making encoder cable or wire rods, please be ensured the wiring is correct. Otherwise, the motor may have sudden unintended acceleration or be burned.
	To avoid the electric shock, the ground terminal of the servo drive should firmly connect to the ground terminal of the control chamber. If the wiring is needed, wait at least 10 minutes after disconnecting the drive from the main supply power, or discharge electricity by discharge device.
	The splicing parts of the wiring terminal should be isolated.
Inspection before operation	Make sure the wiring is correct so as to avoid the damage or any abnormity.
	Check if the electric conductivity objects including sheetmetal (such as screws) or inflammable objects are not inside the servo drive.
(has not applied to the	Check if the control switch is in OFF status.
power yet)	Do not place the servo drive of external regenerative resistor on inflammable objects.
	To avoid the electromagnetic brake losing efficacy, please check if stop function and circuit break function can work normally.
	If the peripheral devices are interfered by the electronic instruments, please reduce electromagnetic interference with devices.
	Please make sure the external voltage level of the servo drive is correct.
Inspection before	The encoder cable should avoid excessive stress. When the motor is running, please be ensured the cable is not frayed or over extended.

running the servo drive (has already applied to	Please contact with Delta if there is any vibration of the servo motor or unusual noise during the operation.
the power)	Make sure the setting of the parameters is correct. Different machinery has different characteristic, please adjust the parameter according to the characteristic of each machinery.
	Please reset the parameter when the servo drive is in the status of SERVO OFF, or it may cause malfunction.
	When the relay is operating, make sure it can work properly.
	Check if the power indicator and LED display works normally.

#### Maintenance

- Please use and store the product in a proper site.
- Periodically clean the surface of the servo drive and servo motor so as to avoid the dust and dirt.
- Do not disassemble any mechanical part when in maintenance.
- Periodically clean the ventilation ports of the servo drive and do not use the product in a hightemperature site for a long time so as to avoid the malfunction.

#### The lifetime of machinery parts

DC Bus Capacitor

DC Bus Capacitor will be deteriorated by the affection of ripple current. Its lifetime is determined by the surrounding temperature and operating conditions. If it is operating in an air-conditioned site, its lifetime can up to 10 years.

Relay

The contact of switching power supply will wear and leads to poor contact. The lifetime of relay is influenced by the power supply capacity; thus, the accumulative time of switching power supply is about 100,000 times.

Cooling Fan

In continuous operation, the lifetime of the cooling fan is 2 to 3 years. However, if there is any unusual noise or vibration during inspection, place a new one is a must.