Smarter. Greener. Together.

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DELTA_IA-ASD_Tool Turrets_AN_EN_20140818

User Guide for Tool Turrets Application

User Guide for Tool Turrets Application

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Preface

[About this manual]

This manual mainly introduces the control solution of tool turrets with Delta servo system and the available hardware platform, such as servo drives, motor with magnetic encoder or motor with optical encoder, absolute motor or incremental motor as well as DI/O expansion module. For firmware function, it focuses on parameters setting, applications and tuning based on different framework.

Safety Precautions

[Important Messages]

For safety reasons, please carefully read through the descriptions below, including error and warning messages, before installing and operating the system.

[Attention]

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 ti 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.

Table of Contents

Chapter 1 Hardware and Softwre Structure

The control solution of tool turrets can satisfy the demand of different target position and mechanism, which is a rather flexible system. Under the structure of specific control program and expandable DI/O, it can meet various demands in turret industry. This chapter introduces various combinations of hardware and software to meet all requirements.

1.1 Available Hardware Platform

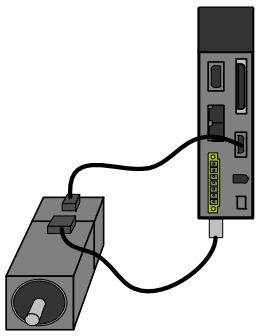
Servo systems that can be applied to tool magazine and turrets application:

Servo Drive	ASDA-A2 (-L, -U, -M), ASDA-A2R (-L, -U, -M), ASDA-A2R-T
Motor	Incremental type of 17-bit motor with optical encoder, incremental type of 20-bit motor with optical encoder, absolute type of 17-bit motor with optical encoder and incremental type of 12-bit motor with magnetic encoder (with semi-absolute encoder function)
Extension DI/O card	Single-port extension card (16 DI and 12 DO in total), dual-port extension card (32DI and 24DO in total)

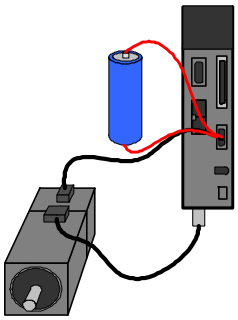
Limitations:

1. **If DI / DO extension module is needed, please select A2R as the servo drive.**
2. **If users use 12-bit motor with magnetic encoder, please select A2R as the servo drive.**

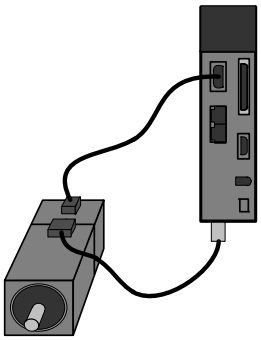
Example for installation:



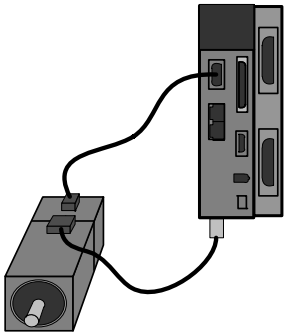
Incremental system (A2 or A2R)
(motor with optical encoder)



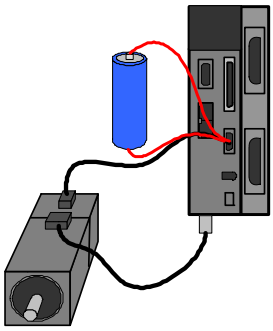
Absolute system (A2 or A2R)
(motor with optical system)



Incremental system(A2R)
(Motor with magnetic encoder)



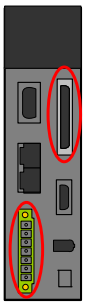
Incremental system (A2R)
(Motor with magnetic encoder)



Absolute system (A2R)
(Motor with optical encoder)

ASDA series platform supports 8DI / 5DO (ASDA-A2-L, M; ASDA-A2R) or 14DI / 5DO (ASDA-A2-U). With the basic algorithm, it combines signals to control up to 27 stations.

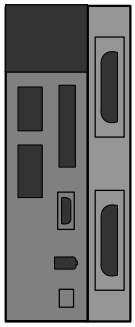
ASDA-A2-L
ASDA-A2-U
ASDA-A2R



14 (or 8) DIs and 5 DOs
DI: Source & Sink
DO: Source & Sink

With extension module, ASDA-A2R can increase the number of DI/O, which meets the requirement of more number of stations. The extension module has two types, single and dual port. Each port provides 16 DI and 12 DO.

Expansion DI/O Module
(A2-R)



(16 DIs and 12 DOs) x 2
DI: Source & Sink
DO: Source & Sink
0.4KW ~ 3KW

Two standard control solutions are provided now. Please see the descriptions below:

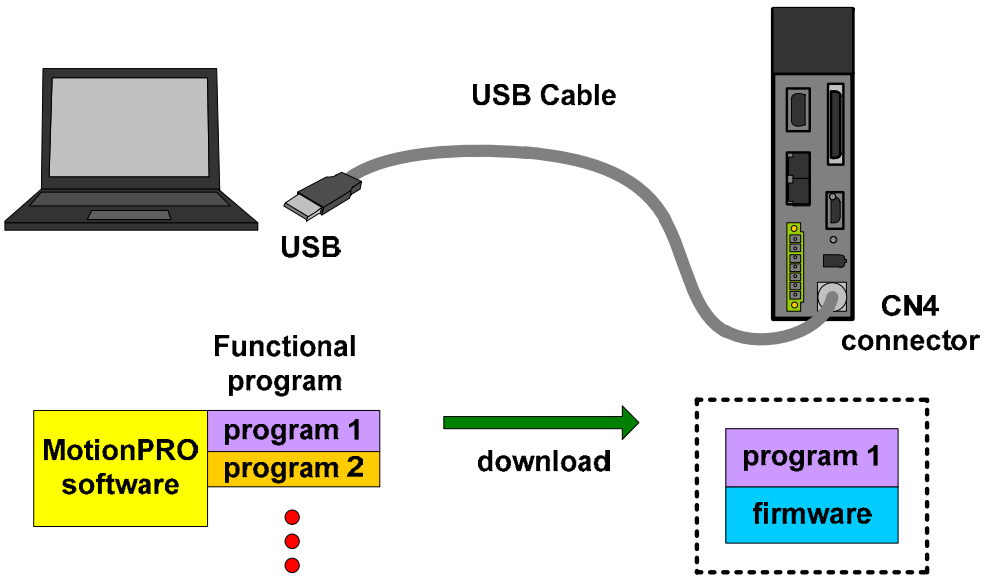
Without extension module		With extension module	
ASDA-A2	Motor with optical encoder (absolute/increment)	ASDA-A2	N/A
ASDA-A2R	Motor with optical encoder (absolute/increment)	ASDA-A2R	Motor with optical encoder (absolute/increment)
	Motor with magnetic encoder (incremental type. Note 1, 2)		Motor with magnetic encoder (incremental type. Note 1, 2)
A2-L (8 DI / 5 DO), A2-U (14 DI / 5DO)		Extension module; single-port: 16 DI / 12 DO; duel-port: 32 DI / 24 DO	
Up to 27 stations		256 or more	

Note 1: Motor with magnetic encoder of Delta is incremental type (it can be called semi-absolute type). However, with the algorithm provided by Delta, when the machine stops, if the motor position remains, the machine can keep running without homing after restart the system.

Note 2: The resolution of motor with magnetic encoder is 12 bit (4096 pulse /rev), which is quite enough for the application of tool turrets. Its features also include oil resistant, shock resistant and oil and vapor proof.

1.2 Servo System Control Structure

The control structure of tool turrets consists of two layers. The upper one is application layer (use Motion PRO to download); while the lower one is the firmware layer (upgraded by burning new firmware). The best feature of this structure is that users can select the application and control function of upper layer for proper installation. See the descriptions below:



The available versions are:

Motor with magnetic encoder (A2R servo drive only): V5125 or the later version.

Motor with optical encoder (A2 or A2R servo drive): V5103 or the later version.

Chapter 2 Installation and Wiring

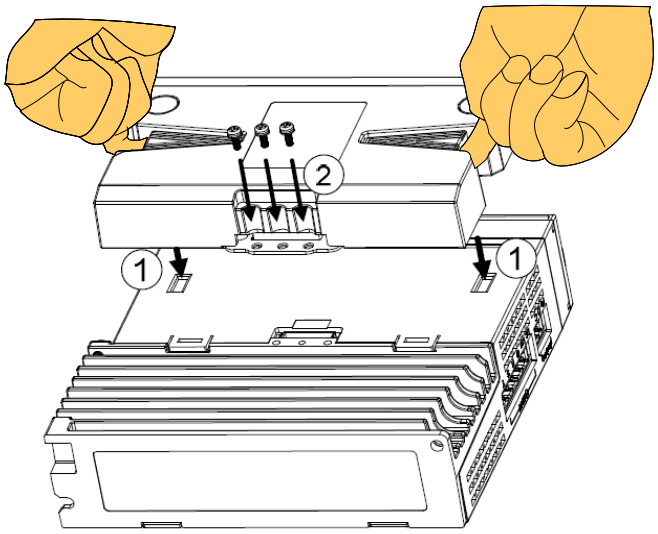
This chapter only describes the installation and wiring method of servo drive, motor with magnetic encoder and extension module. Please refer to other user manuals for the installation and wiring of motor with optical encoder.

2.1 Installation and Wiring of Extension Module

2.1.1 Extension Module Installation

Please follow the steps below for installing extension module:

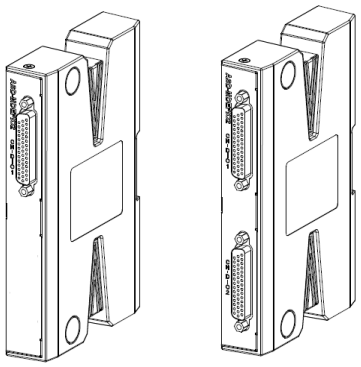
1. Insert the tenon of the module into the mounting hole and extension slot of the servo drive. Then, exert an appropriate force to combine the module and the drive. Please apply force carefully and equally, or the driver's installation slot will be damaged if installing with improper power.
2. Tighten the screws to complete the installation.



When installing extension module, please make sure to insert the tenon aiming at extension slot. Apply an appropriate force only, otherwise it might damage the extension slot and cause poor communication between extension module and the servo drive.

2.1.2 Port Definition of Extension Module

The module number of extension module is: ASD-MDEPIO01 (single port) and ASD-MDEPIO02 (dual port). The difference between both is the digital input / output number. The wiring method of these two is the same.



44 Pin D-sub digital input can receive the input signal from Source and Sink, but only for one format (either Source signal or Sink signal), which is determined by the signal received via COM+/-. Both pins of digital output (DO) can be allocated as Source or Sink signal individually. The 24V power on extension slot comes from the servo drive and parallel connects to the 24V power of CN1. The total power supply is 500 mA.

DI: 16 pins with common COM+/- and supports Source and Sink signal.

DO: Its pin can be defined as Source or Sink individually.

24V power: Parallel connect to CN1.The total power supply is 500 mA.

Reserved: Do not use.

WARNING

While using 24V power from extension module, please consider the maximum allowable current.

CN-DIO 1

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
DI15	DI14	DI13	DI12	DI11	DI10	DI9	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1

30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
COM+/-	Reserved	DO5-	DO5+	DO4-	DO4+	DO3-	DO3+	DO2-	DO2+	DO1-	DO1+	0V	+24V	DI16

44	43	42	41	40	39	38	37	36	35	34	33	32	31
DO12-	DO12+	DO11-	DO11+	DO10-	DO10+	DO9-	DO9+	DO8-	DO8+	DO7-	DO7+	DO6-	DO6+

CN-DIO 2

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
DI35	DI34	DI33	DI32	DI31	DI30	DI29	DI28	DI27	DI26	DI25	DI24	DI23	DI22	DI21

30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
COM+/-	Reserved	DO25-	DO25+	DO24-	DO24+	DO23-	DO23+	DO22-	DO22+	DO21-	DO21+	0V	+24V	DI36

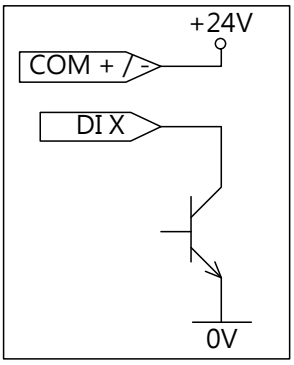
44	43	42	41	40	39	38	37	36	35	34	33	32	31
DO32-	DO32+	DO31-	DO31+	DO30-	DO30+	DO29-	DO29+	DO28-	DO28+	DO27-	DO27+	DO26-	DO26+

CN-DIO1			CN-DIO2		
Pin #	Definition	Description	Pin #	Definition	Description
1	DI 1	Digital Input 1	1	DI 21	Digital Input 21
2	DI 2	Digital Input 2	2	DI 22	Digital Input 22
3	DI 3	Digital Input 3	3	DI 23	Digital Input 23
4	DI 4	Digital Input 4	4	DI 24	Digital Input 24
5	DI 5	Digital Input 5	5	DI 25	Digital Input 25
6	DI 6	Digital Input 6	6	DI 26	Digital Input 26
7	DI 7	Digital Input 7	7	DI 27	Digital Input 27
8	DI 8	Digital Input 8	8	DI 28	Digital Input 28
9	DI 9	Digital Input 9	9	DI 29	Digital Input 29
10	DI 10	Digital Input 10	10	DI 30	Digital Input 30
11	DI 11	Digital Input 11	11	DI 31	Digital Input 31
12	DI 12	Digital Input 12	12	DI 32	Digital Input 32
13	DI 13	Digital Input 13	13	DI 33	Digital Input 33
14	DI 14	Digital Input 14	14	DI 34	Digital Input 34
15	DI 15	Digital Input 15	15	DI 35	Digital Input 35
16	DI 16	Digital Input 16	16	DI 36	Digital Input 36
17	+24 V	DC power. 500mA in total	17	+24 V	DC power. 500mA in total
18	0 V	DC power. 500mA in total	18	0 V	DC power. 500mA in total
19	DO 1+	Digital Output 1 Positive	19	DO 21+	Digital Output 21 Positive
20	DO 1-	Digital Output 1 -	20	DO 21-	Digital Output 21 Negative
21	DO 2+	Digital Output 2 Positive	21	DO 22+	Digital Output 22 Positive
22	DO 2-	Digital Output 2 Negative	22	DO 22-	Digital Output 22 Negative
23	DO 3+	Digital Output 3 Positive	23	DO 23+	Digital Output 23 Positive
24	DO 3-	Digital Output 3 Negative	24	DO 23-	Digital Output 23 Negative
25	DO 4+	Digital Output 4 Positive	25	DO 24+	Digital Output 24 Positive
26	DO 4-	Digital Output 4 Negative	26	DO 24-	Digital Output 24 Negative
27	DO 5+	Digital Output 5 Positive	27	DO 25+	Digital Output 25 Positive
28	DO 5-	Digital Output 5 Negative	28	DO 25-	Digital Output 25 Negative
29	Reserved	Do not use.	29	Reserved	Do not use.
30	COM +/-	Common Input can be positive or negative	30	COM +/-	Common Input can be positive or negative
31	DO 6+	Digital Output 6 Positive	31	DO 26+	Digital Output 26 Positive
32	DO 6-	Digital Output 6 Negative	32	DO 26-	Digital Output 26 Negative
33	DO 7+	Digital Output 7 Positive	33	DO 27+	Digital Output 27 Positive
34	DO 7-	Digital Output 7 Negative	34	DO 27-	Digital Output 27 Negative
35	DO 8+	Digital Output 8 Positive	35	DO 28+	Digital Output 28 Positive
36	DO 8-	Digital Output 8 Negative	36	DO 28-	Digital Output 28 Negative
37	DO 9+	Digital Output 9 Positive	37	DO 29+	Digital Output 29 Positive

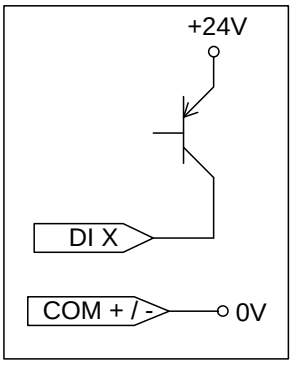
38	DO 9-	Digital Output 9 Negative	38	DO 29-	Digital Output 29 Negative
39	DO 10+	Digital Output 10 Positive	39	DO 30+	Digital Output 30 Positive
40	DO 10-	Digital Output 10 Negative	40	DO 30-	Digital Output 30 Negative
41	DO 11+	Digital Output 11 Positive	41	DO 31+	Digital Output 31 Positive
42	DO 11-	Digital Output 11 Negative	42	DO 31-	Digital Output 31 Negative
43	DO 12+	Digital Output 12 Positive	43	DO 32+	Digital Output 32 Positive
44	DO 12-	Digital Output 12 Negative	44	DO 32-	Digital Output 32 Negative

2.1.3 Extension Module Wiring

Wiring of Digital Input (DI)

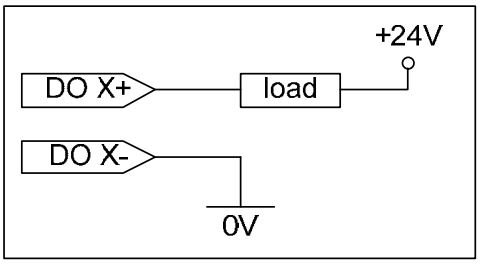


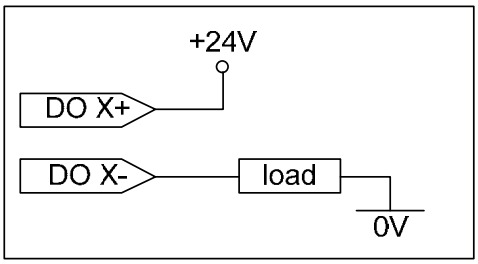
Sink



Source

Wiring of Digital Output (DO)



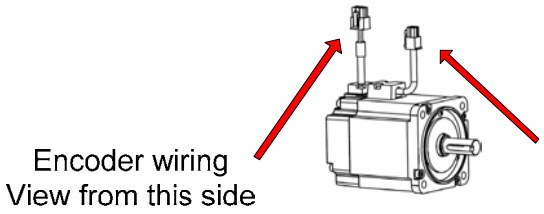


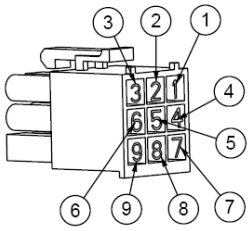
2.2 Wiring of Motor with Magnetic Encoder

2.2.1 Quick Connector

ECMA-C8 and ECMA-E8 series motor with magnetic encoder and servo drive mainly uses pulse to communicate. These series of motor can only communicate via CN5 of A2R for now. The wiring definitions are as the followings:

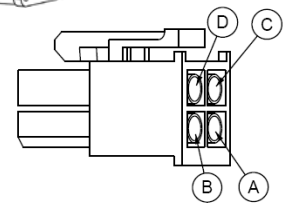
(1) Pin definition of motor connector:





AMP 1-172169-9 DETAIL

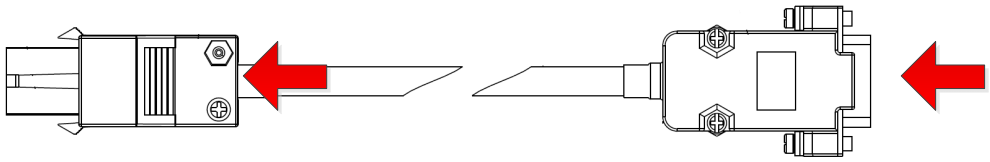
ENCODER CONNECTOR TABLE		
CODE	DESCRIPTION	COLOR
1	A	BLK
2	B	WHE
3	$\overline{Z}$	ORG
4	$\overline{A}$	BLK/RED
5	$\overline{B}$	WHT/RED
6	Z	ORG/RED
7	DC +5V	BRN
8	GND	BLUE
9	SHIELD	SHIELD

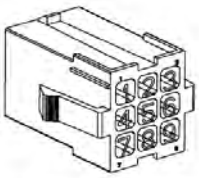


C4202H00-2*2P DETAIL

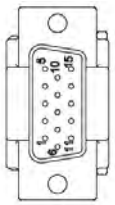
MOTOR CONNECTOR TABLE		
CODE	DESCRIPTION	COLOR
A	U PHASE	RED
B	V PHASE	WHE
C	W PHASE	BLK
D	GND	GRN/YEL

(2) Pin definition of encoder connector:





AMP 1-172161-9 DETAIL



D-SUB 15P DETAIL

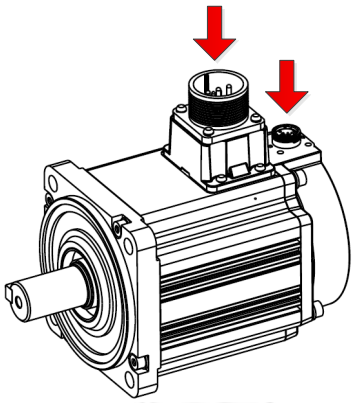
CABLE CODE	DESCRIPTION	COLOR
1	A+	BLK
2	B+	WHT
3	Z+	ORG
4	A-	BLK/RED
5	B-	WHT/RED
6	Z-	ORG/RED
7	+5V	BRN
8	GND	BLU
9	SHIELD	NOTE1

D-SUB 15P CODE	DESCRIPTION	COLOR
1	Z-	ORG/RED
2	B-	WHT/RED
3	B+	WHT
4	A+	BLK
5	A-	BLK/RED
6	GND	BLU
7	GND	BLU
8	+5V	BRN
9	Z+	ORG
	SHIELD	NOTE2

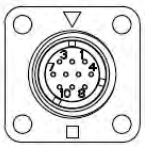
2.2.2 Military Connector

The wiring definitions of encoder communication cable are the same from encoder side regardless the power rating of motor for military connector. However, the wiring definitions of power cable are different.

(1) The wiring definition of motor connector:

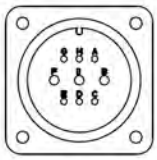


Wiring definition of encoder

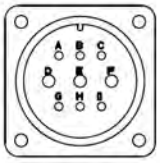


JN1AS10ML2-R (JAE) CONNECTOR CODE	NOTE
1	A
2	A-
3	Z+
4	+5V
5	B-
6	B+
7	Z-
8	----
9	GND
10	SHIELD

Wiring definition of power cable

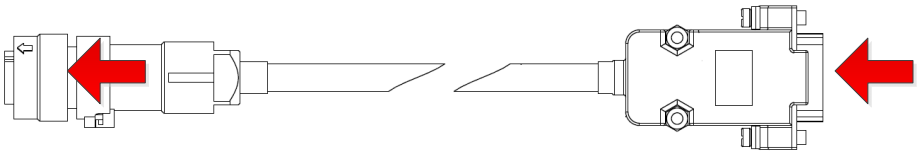


MS3102A 20-18P CONNECTOR CODE	NOTE
A	----
B	W PHASE
C	----
D	----
E	GND
F	U PHASE
G	BRAKE
H	BRAKE
I	V Phase



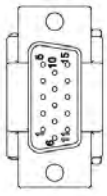
MS3102A 24-11P CONNECTOR CODE	NOTE
A	BRAKE
B	BRAKE
C	----
D	U PHASE
E	V PHASE
F	W PHASE
G	GND
H	----
I	----

(2) Wiring definition of encoder connector:



JAE JN1DS10SL1 DETAIL

CABLE CODE	DESCRIPTION	COLOR
1	A+	BLK
2	A-	BLK/RED
3	Z+	ORG
4	+5V	BRN
5	B-	WHT/RED
6	B+	WHT
7	Z-	ORG/RED
8		
9	GND	BLU
10	SHIELD	NOTE1

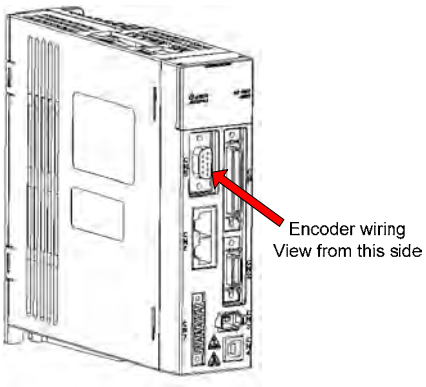


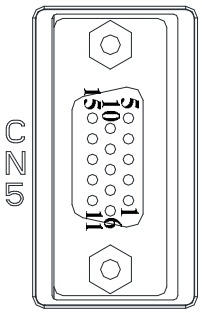
D-SUB 15P DETAIL

D-SUB 15P CODE	DESCRIPTION	COLOR
1	Z-	ORG/RED
2	B-	WHT/RED
3	B+	WHT
4	A+	BLK
5	A-	BLK/RED
6	GND	BLU
7	GND	BLU
8	+5V	BRN
9	Z+	ORG
	SHIELD	NOTE2

2.2.3 Wiring of Servo Drive

Wiring of CN5 on A2R:





CN5 connector (female)

Pin No	Signal Name	Terminal Symbol	Function and Description
1	/Z phase input	Opt_/Z	/Z phase input
2	/B phase input	Opt_/B	/B phase input
3	B phase input	Opt_B	B phase input
4	A phase input	Opt_A	A phase input
5	/A phase input	Opt_/A	/A phase input
6	Encoder grounding	GND	Ground
7	Encoder grounding	GND	Ground
8	Encoder power	+5V	+ 5V power
9	Z phase input	Opt_Z	Z phase input
10	Hall sensor U phase input	HALL_U	Hall sensor U phase input
11	Hall sensor V phase input	HALL_V	Hall sensor V phase input
12	Hall sensor W phase input	HALL_W	Hall sensor W phase input
13	Temperature detection of linear motor +	TEMP+	Temperature detection of linear motor +
14	Temperature detection of linear motor -	TEMP-	Temperature detection of linear motor -
15	Reserved	Reserved	Reserved

This series of motor with magnetic encoder does not need to install Hall sensor and the device of linear motor temperature detection. Please refer to the related user manuals for further information about optical encoder or CN2 wiring.

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Chapter 3 Algorithm for Tool Position Control

This chapter describes the operation of tool position control program and parameters setting, including installation and time sequence control.

3.1 Function Download and Setup

Before downloading the application layer, please make sure the firmware version in lower layer is correct. Contact your distributors or Delta service center if you have any question about firmware version.

Use MotionPRO to download the motion control function of the upper layer. The updating methods are shown as below:

(1) Make sure ASDA-Soft is disabled first. Otherwise it will be failed to download the firmware.

(2) Use USB cable (the same as ASDA-soft) to connect computer to servo drive. Enable MotionPRO, then click setting to setup communication interface. See figure (3.1).

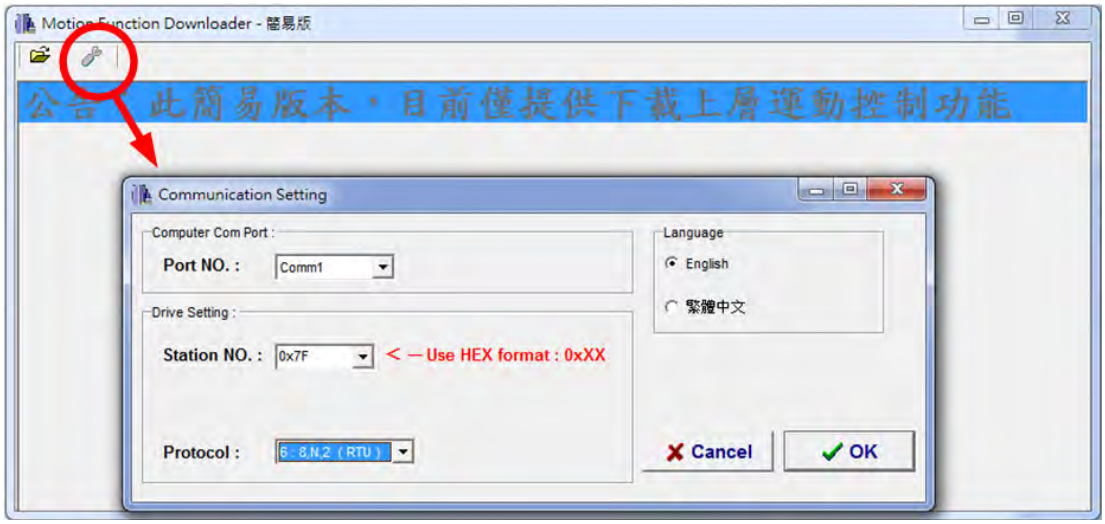


Figure (3.1) Communication setup window

(3) Open .dmp file of motion program and download it into the servo drive. See figure (3.2).

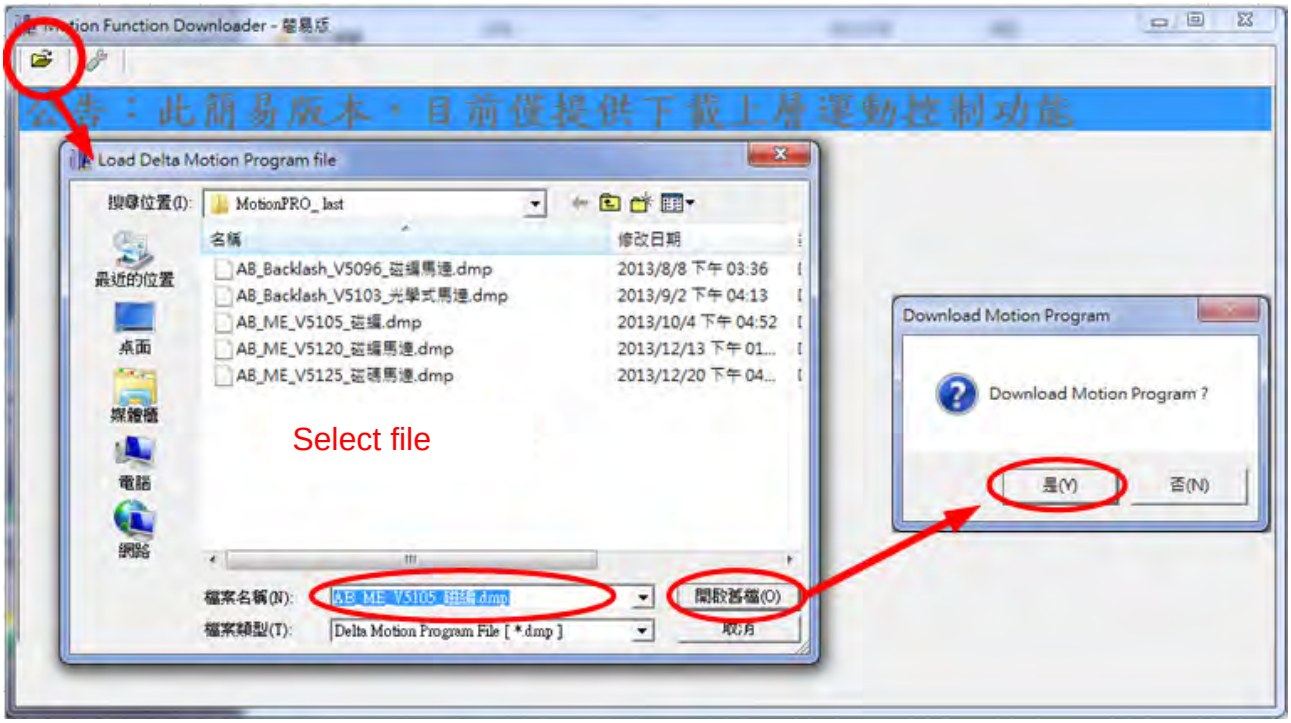


Figure (3.2) Select and download the function

(4) When downloading is complete, the original function inside the servo drive will be changed to the one that just downloaded. Some parameters will be modified as well. Users have to setup parameters again.

3.2 Description of Parameter and Interface Setting

Delta′ s control solution of tool turrets follows the control theorem of AB series servo drive. Apart from the original control function, various functions are added, such as homing methods and backlash compensation. All related parameter setting and setting methods will be elaborated in this chapter.

3.2.1 How to Read the System Firmware Version

In this system, users can access the firmware version of lower layer and control function of the upper layer.

P0-00： Main firmware version

P5-00： Low word is for firmware sub-version; High word is the version of motion function, which only can be accessed when it is in P1-01=0x11 mode.

P3-16： Set P3-16 to 0x00000004. Then, read P3-16 again. Press SHIFT to read firmware version of extension module via high word.

3.2.2 Related Parameters of Tool Turrets

Set up parameters below to build the turret control function. For motor performance, please refer to other chapter or other related Delta documents.

(1) Mode Selection

P1-01：Mode selection. The mode must to be set as 0x11. Otherwise, the control function of tool magazine and turrets will not be enabled.

(2) Torque Limit when Reached Target Position

P1-12：When it reaches the target position, this parameter can be used to do torque limit and limit the motor. The value is defined to 100% as rated torque. Its setting range is between 0% and 300%.

(3) E-gear Ratio and Turret Setting

The planning of tool station is closely related to electric gear and gear box. The setting method of motor with magnetic encoder and optical encoder is different. Resolution of magnetic encoder is 4097 per revolution, which is not high. Thus, when setting up e-gear ratio, the principle is to magnify the encoder pulse per revolution to make the turret to turn one cycle. However, for optical encoder, it is suggested to use the most convenient way to set up electric gear. Please see examples described below:

P1-44：E-gear ratio (Numerator) (N)

P1-45：E-gear ratio (Denominator) (M)

P2-52：Indexing coordinates scale. Unit: PUU.

P5-96：Indexing number setting (= the number of stations)

Interval of each tool = $\frac{P2-52}{P5-96}$.

Figure (3.3) is applied to the following three examples.

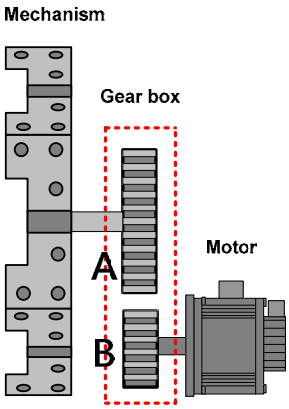


Figure (3.3) Gear box demonstration

Example 1: E-gear ratio of motor with magnetic encoder and indexing setting
If gear box ratio is 1(B) : 18(A), which has 8 tool stations in total.
Motor runs 18 cycles and tool turrets run 1 cycle.
P1-44 = 1,
P1-45 = B = 1. Motor needs 4096 pulses per cycle. The pulse number of tool turrets runs a cycle: (4096 * A) = (4096 * 18) = 73728. Thus, the setting should be:
P1-44 = 1, P1-45 = 1, P5-96 = 8 (number of tool station), P2-52 = 73728 (total pulse number). Re-power on the servo drive after the setting of P2-52 and P5-96 is complete.

Example 2: E-gear ratio of motor with magnetic encoder and indexing setting
If gear box ratio is 3(B) : 17(A), which has 7 tool stations in total
Motor runs 17 cycles and tool turrets run 3 cycles.
P1-44 = 1,
P1-45 = B = 3. Motor needs 4096*3=12288 pulses per cycle. The pulse number of tool turrets runs a cycle: (11288 * A) / B = ((4096 *3)* 17) / 3 = 4096*17 = 69632. Thus, the setting should be:
P1-44 = 1, P1-45 = 3, P5-96 = 7 (number of tool station), P2-52 = 69632 (total pulse number). Re-power on the servo drive after the setting of P2-52 and P5-96 is complete.

Example 3: E-gear ratio of motor with optical encoder and indexing setting
If gear box ratio is 3(B) : 17(A), which has 7 tool stations in total
Motor runs 17 cycles and tool turrets run 3 cycles.
P1-44 = 128,
P1-45 = B = 3. Motor needs 10000*3=30000 pulses per cycle. The pulse number of tool turrets runs a cycle: (30000 * A) / B = ((10000 *3)* 17) / 3 =10000* 17 =170000. Thus, the setting should be:
P1-44 = 128, P1-45 = 3, P5-96 = 7 (number of tool station), P2-52 = 170000 (total pulse number). Re-power on the servo drive after the setting of P2-52 and P5-96 is complete.

(4) Setting of Absolute Type Encoder

Only the motor with optical encoder supports absolute function (≠ semi absolute type of magnetic encoder) so far. This function can only be set with absolute type of motor with optical encoder.

P2-69：Absolute function switch. P2-69 = 1 means to use absolute encoder, otherwise to set P2-69 to 0 to disable the function.

(5) Select the Homing Method

Same as ASDA-A2, this system provides various homing methods. The related parameters setting are shown as below:

a) P5-04: Homing mode
b) Speed of searching original point. P5-05: 1st speed; P5-06: 2nd speed; P6-00: acceleration / deceleration.
c) P6-01: Reference point and the offset value of coordinate system
d) P5-93: Triggering method of searching original point, which can be combination DI or IHOM (single DI).
e) P5-94: The station number after homing is complete.

5.a) P5-04：Homing method in W Z Y X format

<table>
<tr><th>W</th><th>Z</th><th>Y</th><th>X</th></tr>
<tr><td>Reserved</td><td>Limit setting</td><td>Z pulse setting</td><td>Homing method</td></tr>
<tr><td rowspan="9">-</td><td>0 ~ 1</td><td>0 ~ 2</td><td>0 ~ 8</td></tr>
<tr><td rowspan="2"></td><td rowspan="3">Y=0 : Return to Z
Y=1 : Go forward to Z pulse
Y=2 : Do not look for Z pulse</td><td>X=0: Homing in forward direction and regard PL as the homing origin</td></tr>
<tr><td>X=1: Homing in reverse direction and regard NL as the homing origin</td></tr>
<tr><td rowspan="6">When encounter limit:
Z=0: shows error
Z=1: rotates backwards</td><td>X=2: Homing in forward direction
ORG：OFF → ON, as the homing origin</td></tr>
<tr><td>X=3: Homing in reverse direction
ORG：OFF → ON, as the homing origin</td></tr>
<tr><td rowspan="2"></td><td>X=4：Look for Z pulse in forward direction and regard it as the homing origin</td></tr>
<tr><td>X=5：Look for Z pulse in reverse direction and regard it as the homing origin</td></tr>
<tr><td rowspan="2">Y=0：Return to Z
Y=1：Go forward to Z pulse
Y=2 : Do not look for Z pulse</td><td>X=6：Homing in forward direction
ORG：ON → OFF, as the homing origin</td></tr>
<tr><td>X=7：Homing in reverse direction
ORG：ON → OFF, as the homing origin</td></tr>
<tr><td></td><td></td><td>X=8：Directly define the current position as the origin</td></tr>
</table>

P5-05: First homing speed. If it is written by communication, the unit is 0.1 rpm. If it is written via panel, the unit is 1 rpm.

P5-06: Second homing speed. If it is written by communication, the unit is 0.1 rpm. If it is written via panel, the unit is 1 rpm.

5.b) P6-00：Acceleration/deceleration time setting of homing. Format is A B C D W Z Y X.

Item	A	B	C	D	W	Z	Y	X
Function	-	-	Delay	The 2nd deceleration time	The 1st deceleration time	Acceleration time	-	-
Range	-	-	0x0~0xF	0x0~0xF	0x0~0xF	0x0~0xF	-	-
Description	-	-	Select delay time Corresponds to P5-40 ~ P5-55. 16 sets in total.	Select dec. time Corresponds to P5-20 ~ P5-35. 16 sets in total.	Select dec. time Corresponds to P5-20 ~ P5-35. 16 sets in total.	Select acc. time Corresponds to P5-20 ~ P5-35. 16 sets in total.	-	-

Corresponding table of Acceleration / Deceleration time: Unit of P5-20 ~ P5-35 is ms. This setting value is the time for motor to accelerate from 0 rpm to 3000 rpm. Acceleration time setting for other speed can be set as ratio of acceleration time to 3000 rpm. If the acceleration time is set to 300ms, and the target speed is 2000 rpm, the actual deceleration time will be (2000 / 3000) * 300 ms = 200 ms. The default value of P5-20 ~ P5-35 can be modified according to the demand. The user must be very careful about modifying parameter value when multiple settings refer to one parameter. Once the parameter is changed, other parameters from the same group will be changed as well. For example, if value of P5-20 is changed to 250ms, all setting which related to P5-20 will be changed to 250 ms.

Code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
P5- 20~35	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Default value (ms)	200	300	500	600	800	900	1000	1200	1500	2000	2500	3000	5000	8000	50	30

Corresponding table of delay time: Unit of P5-40 ~ P5-55 is ms. The default value can be modified according to the demand. The user must be very careful about modifying parameter value when multiple settings refer to one parameter.

Code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
P5- 40~55	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
Default value (ms)	0	100	200	400	500	800	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500

Corresponding table of speed: If it is written by communication, its unit is 0.1 rpm; if it is written via panel, its unit is 1 rpm. The default value can be modified according to the demand. The user must be very careful about modifying parameter value when multiple settings refer to one parameter.

Code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
P5- 60~75	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Default value (1 r/min)	20	50	100	200	300	500	600	800	1000	1300	1500	1800	2000	2300	2500	3000

Example of P6-00 setting:
The format is P6-00 = ABCDWZYX. If the setting value of P6-00 is 0x0020DA00, then the acceleration time (Z) is determined by P5-30. It is because the setting value is 0x□□□□□A□□;
The first deceleration time (W) is determined by P5-33, because the setting value is 0x□□□□D□□□;
The second deceleration time (D) is determined by P5-20, because the setting value is 0x□□□0□□□□;
Delay time (C) is determined by P5-42, because the setting value is 0x□□2□□□□□.

Directly change the setting value of P6-00 and select the speed to adjust the acceleration/deceleration and delay time. Or modify the content of P5-30 to directly change the content of the target value.

5.c) P6-01：Origin definition, home reference point defined in coordinate system or origin offset value

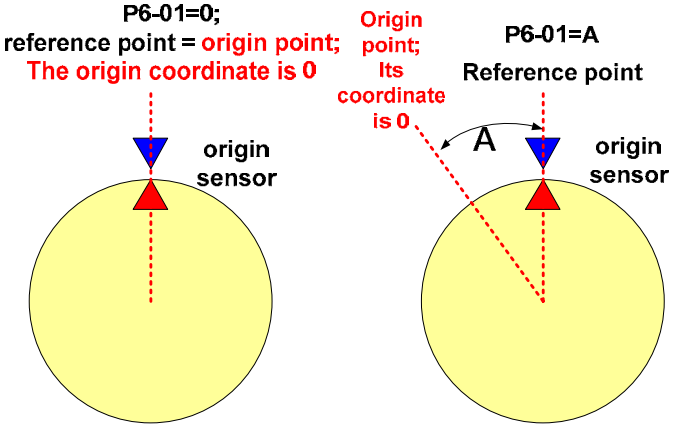


Figure (3.4) Homing offset setting

5.d) P5-93：Motion selection. 32-Bit in D C B A U Z Y X format

P5-93	D	C	B	A	U	Z	Y	X
Function	-		DO control selection	DI control selection	Manual continuous operation setting	Tool position record function	Use IHOME to homing	Whether to use extension IO

Description:

X：Use I/O extension module. If this setting is changed, please power cycle the servo drive to take the change effect. **This function can only be used with A2R.**

X = 0: Do not use I/O extension module. Use I/O on CN1.

X = 1: Use I/O extension module. If communication (between extension module and servo drive) error occurs, ALE.3C5 occurs.

Y：Use combination DI or use a single DI IHOM to trigger homing

Y = 0: Use combination DI to trigger homing (MD0 and MD1)

Y = 1: Use IHOM to trigger homing (DI code: 0x55; if it is in extension module, no need to use DI code).

Z：Use tool position record function for the motor with magnetic encoder. Set P6-02 ~ P6-99 to 0 before enabling this function. Do not modify or manually enter any value of P6-02 ~ P6-99 after the setting is complete. **This function is for magnetic encoder and A2R only.**

Z = 0: Disable the tool position record function.

Z = 1: Enable the tool position record function.

Tool position record function can realize the function of absolute type in incremental system. Before the power is cut off, the servo drive will record the current tool position. As long as the mechanical position is not moved over the range set by P7-27 after power off, it does not need to do homing when power is on again. The machine can go for the next tool position. If the mechanical position was moved over the range of P7-27, it needs to do homing and rebuild the coordinate system.

U：Setting of manual continuous operation, which means MDP0 = 1, in manual operation mode. When this function is enabled, it operates at continuous speed. If not, it stops at every station.

U = 0: Manual continuous operation. Stops at every station and operates to the next station again.

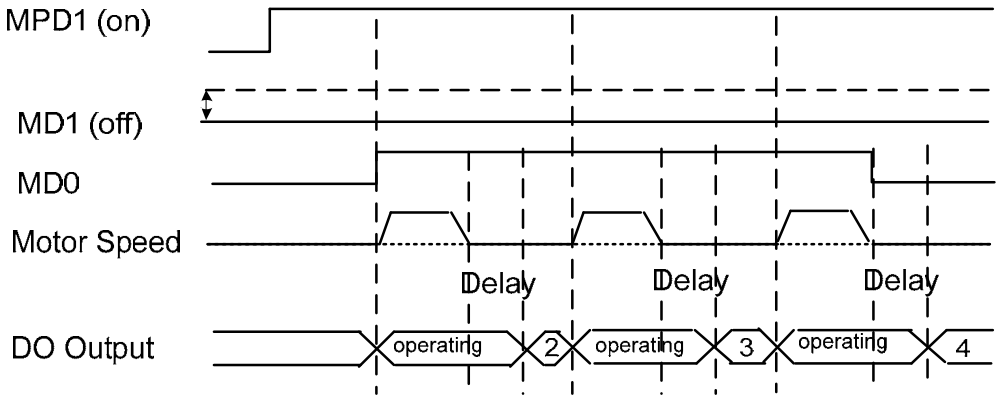


Figure (3.5) Time sequence when stopping at every station

U = 1 : Operate non-stop in manual operation mode. When the signal stops, the tool stops at the nearest station.

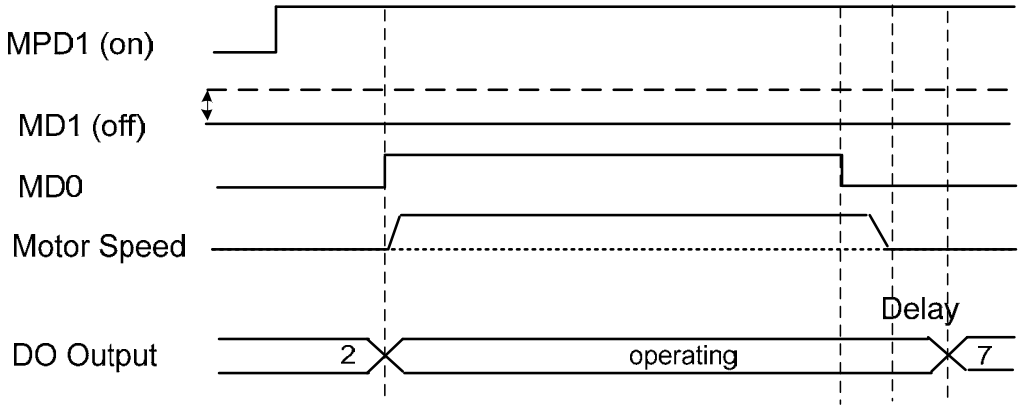


Figure (3.6) Time sequence when stopping at the nearest station

A： DI control selection

A = 0: The external DI is inputted by physical DI on extension module. DI status can be monitored via P7-08.

A = 1: The external DI is set by P7-08 (EDI15 has no B contact function). This is for easily controlling DI signal and to perform system testing.

B： DO control selection

B = 0: The external DO is controlled by logic. Its status can be monitored via P7-10.

B = 1: The external DO is set by P7-10. This is for easily controlling DI signal and to perform system testing.

5.e) P5-94：After homing is triggered, it automatically goes to the tool station set by P5-94. If the value is set to 0, it does not move. When the original point is found, it will move to the specified tool station at 2nd speed of homing.

(6) Moving method and moving speed

The moving method and moving speed is set here. Users can use digital input (SPS) to switch the speed.

a) P5-95：The direction for searching the target station.

P5-95=0, search at forward direction
P5-95=1, search at reverse direction
P5-95=2, search at shortest distance

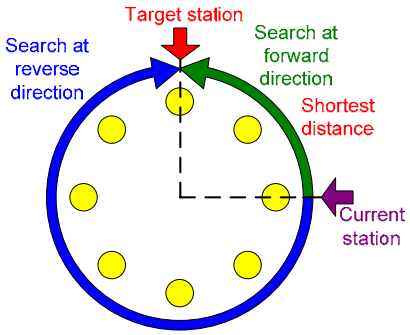


Figure (3.7) Target station searching method

b) P7-22：The speed setting of manual operation. This setting is to select the operation speed, in A B C D W Z Y X format. Refer to the description of P6-00 for its setting method.

Item	A	B	C	D	W	Z	Y	X
Function	-	-	Delay	Speed	Deceleration Time	Acceleration Time	-	-
Range	-	-	0x0~0xF	0x0~0xF	0x0~0xF	0x0~0xF	-	-
Description	-	-	Select delay time Corresponds to P5-40 ~ P5-55, 16 sets in total.	Select speed Corresponds to P5-60 ~ P5-75, 16 sets in total.	Select dec. time Corresponds to P5-20 ~ P5-35, 16 sets in total.	Select acc. time Corresponds to P5-20 ~ P5-35, 16 sets in total.	-	**Value has to be 0xA**

c) P7-24：First index speed setting, in A B C D W Z Y X format. Refer to the description of P6-00 for its setting method.

Item	A	B	C	D	W	Z	Y	X
Function	-	-	Delay	Speed	Deceleration Time	Acceleration Time	-	-
Range	-	-	0x0~0xF	0x0~0xF	0x0~0xF	0x0~0xF	-	-
Description	-	-	Select delay time Corresponds to P5-40 ~ P5-55, 16 sets in total.	Select speed Corresponds to P5-60 ~ P5-75, 16 sets in total.	Select dec. time Corresponds to P5-20 ~ P5-35, 16 sets in total.	Select acc. time Corresponds to P5-20 ~ P5-35, 16 sets in total.	-	**Value has to be 0xA**

d) P7-26：Second index speed setting, in A B C D W Z Y X format. Use DI (SPS) to select the speed during operation. Refer to the description of P6-00 for its setting method.

Item	A	B	C	D	W	Z	Y	X
Function	-	-	Delay	Speed	Deceleration Time	Acceleration Time	-	-
Range	-	-	0x0~0xF	0x0~0xF	0x0~0xF	0x0~0xF	-	-
Description	-	-	Select delay time Corresponds to P5-40 ~ P5-55, 16 sets in total.	Select speed Corresponds to P5-60 ~ P5-75, 16 sets in total.	Select dec. time Corresponds to P5-20 ~ P5-35, 16 sets in total.	Select acc. time Corresponds to P5-20 ~ P5-35, 16 sets in total.	-	**Value has to be 0xA**

(7) Position Range Confirm

P7-27: When the system resumes after servo off or emergency stop, if the motor is still at the positioning point or within the range of P7-27, DO will display the tool position. The setting range of absolute system of optical encoder and position record function of magnetic encoder is based on this. This function is enabled when coordinate setting is complete (= after homing is complete).

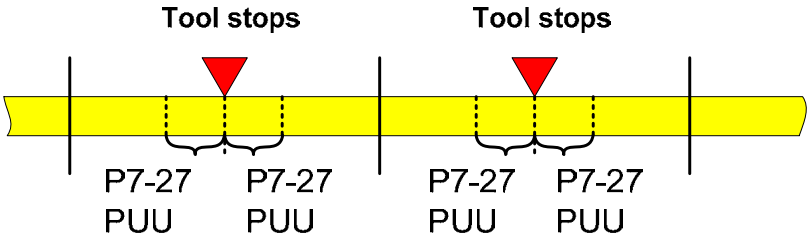


Figure (3.8) Tool position range confirm

For A2R magnetic motor system, when the power is off, if the motor is moved exceeding the range, it will not display the correct tool position after the power resumes. The system has to perform homing to recover coordinate system. If the motor is moved over one cycle and stops within the range set by P7-27, no alarm will occur. However, the position is incorrect. Please take it into consideration when applying A2R motor system with magnetic encoder. **When the system is power off, it is better to have the mechanism to avoid this situation. The setting of P7-27 should be reasonable, too.**

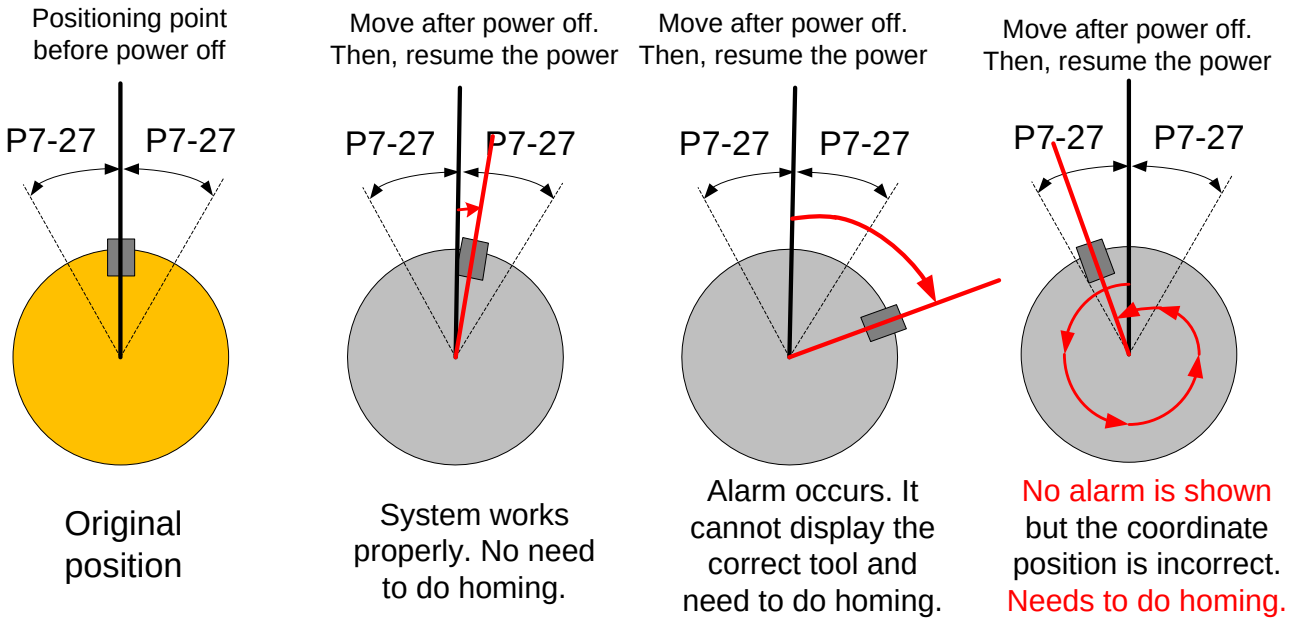


Figure (3.9) Allowable range for magnetic encoder

(8) Related parameters of backlash compensation

P7-01: When the value is set to 0, compensation function is disabled. When the value of P7-01> 0, it compensates when moving at forward direction; when the value of P7-01< 0, it compensates when moving at reverse direction.

The direction of backlash compensation has to be opposite to homing direction. See the example below:

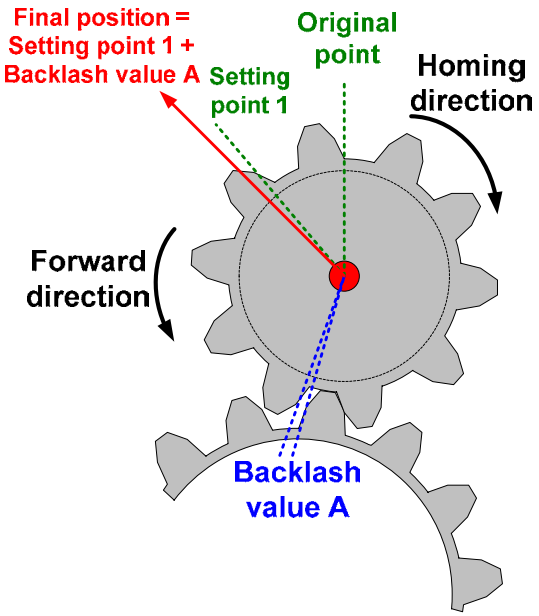


Figure (3.10) Backlash compensation

(9) De-bounce time of combination signals

P7-07: Due to the combination use of signals, when switching the signal, this parameter can be used to setup de-bounce time for avoiding the error caused by switching bouncing, such as (MD0 = 0 + MD1 = 1) → (20ms) → stable, (MD0 = 1 + MD1 = 0) → (20ms) → stable, or (MD0 = 1 + MD1 = 1) → (20ms) → stable. The unit is 1ms. When the value is set to 20, it means the de-bounce time is 20 ms. The setting takes effect after re-power on.

(10) Parameters of A2R

Following describes A2R parameters when applying extension module or motor with magnetic encoder:

a) P2-84 = 0x111: The resolution of optical encoder (4096 pulse/rev) is better than magnetic encoder. If the motor resolution is lower, noise easily occurs when the gain increases. Set P2-84 to 0x111 can reduce the noise.
b) PM-03 = 0x1002: PM parameters are for A2R only and are for adjusting motor specifications and characteristics parameters. When connecting to motor with magnetic encoder, PM-03 (H3-03) should be set to 0x1002. Of these, 0x1000 means the encoder feedback signal goes to the servo drive from CN5; while 0x0002 represents ECMA-C8 series motor with magnetic encoder. Thus, (0x1000 OR 0x0002) = 0x1002. The value can be set via ASDA-soft, which is more convenient. If desire to adjust the value via drive panel, set P2-08 to 40 first. Then, switch to PM parameter group by the SHIFT Key. (Since it is 7-segment display, it will show РП on panel.)
c) P1-74 = 0x6000: This can setup filter frequency of CN5 and avoid pulse counting error caused by noise interference.
d) P2-35 = 12288: This parameter called Condition of Excessive Position Control Deviation Warning. When the command and feedback error exceeds the setting value, AL.009 will occur. Resolution of magnetic encoder and optical encoder is different, users have to

change the setting. The current value is 3 cycles (12288/4096 = 3). Users can adjust the value according to the actual requirement.

e) P2-81=0 x1: Enable the function of pulse loss detection. The servo drive will take Z pulse as reference to count the pulse number. When the deviation of counting pulse and encoder pulse exceeds the setting value of P2-82 for three times and the situation has not been improved, AL.057 will occur.
f) P2-82 = 10: As mentioned above, this parameter is to set the boundary to trigger the pulse loss alarm. The default value is 10 and the minimum value should be 3 at least.
g) “Tool position record function” set by P5-93 is for motor with magnetic encoder only. Please refer to item (5) above for detailed information.

(11) Reserved parameters

Do not modify the parameters content and value that show below:

a) P7-03: Do not modify its content and setting value.
b) P6-02 ~ P6-99: For enabling the record function of motor with magnetic encoder. Do not modify its content and setting value.

(12) Error status display

P7-04: Error status of absolute coordinate system.

P7-04 Bit	F-5	4	3	2	1	0
	-	Absolute encoder alarm occurs	Homing is not complete	PUU overflow	E-gear ratio is changed	User change the value of P1-01.Z

Bit 0: Users change the definition of motor torque output direction. However, homing is not done yet.
Bit 1: Change E-gear ratio but does not reset the system.
Bit 3: Homing is not complete.
Bit 4: Error occurs in absolute type of encoder (optical type)

3.2.3 DI/O Setting on CN1

(a) DI setting

Users have to plan DI function between P2-10 and P2-17. And set EDI9 ~ EDI14 (P2-36 ~ P2-41) as Servo On (contact of normal close). So that the regular DI can be used for other functions, such as DI1, P2-10 = 0x11, is set as normal close contact. Its function is index selection 0. Set P2-10 to 0x111 as normally open contact and the function is the same.

Number	Name	Function
0x01	SON	Servo ON
0x11	IDX0	Index Selection 0
0x12	IDX1	Index Selection 1
0x13	IDX2	Index Selection 2
0x1A	IDX3	Index Selection 3
0x1B	IDX4	Index Selection 4
0x1C	IDX5	Index Selection 5
0x24	ORGP	Origin Point Signal
0x50	MD0	Mode Switching 0
0x51	MD1	Mode Switching 1
0x52	MDP0	Continuous Manual Operation
0x53	MDP1	Single-step Manual Operation
0x54	SPS	0:1st speed (P7-24) 1:2nd speed (P7-26)
0x55	IHOM	Homing trigger (use combination command or individual command)

(b) Mode Description

MDPn	Status	MD0	MD1	Description
OFF	1	OFF	OFF	Torque Limit
	2	OFF	ON	Indexing Trigger
	3	ON	OFF	Homing Trigger
	4	ON	ON	Emergency Stop
ON		-	-	N/A
		OFF	ON	Backward Manual Operation
		ON	OFF	Forward Manual Operation
		-	-	N/A

(c) DO Setting

Users have to plan DO function between P2-18 and P2-22. For example, DO1, P2-18 = 0x20, is set as normal close contact. Its function is combo DO1. Set P2-18 = 0x120 as normal open contact and the function is the same.

Number	Name	Function
0x20	IDO1	Combo DO 1
0x21	IDO2	Combo DO 2
0x22	IDO3	Combo DO 3
0x23	IDO4	Combo DO 4
0x24	IDO5	Combo DO 5

(d) Combo DO function

DI for tool position starts from 0 and the display of DO starts from tool station 1.
For example, there are 8 tool stations in total. While DI shows 0 to 7, DO shows 1 to 8 for tool stations.
Index poison number: (IDX5, IDX4, IDX3, IDX2, IDX1)

項目	IDO5	IDO4	IDO3	IDO2	IDO1	Function
1	0	0	0	0	0	ALRM: Alarm
2	0	0	0	0	1	SRDY: Servo ready
3	0	0	0	1	0	Homing command is executing
4	0	0	0	1	1	Homing completes
5	0	0	1	0	0	Indexing command is executing
6	0	0	1	0	1	Index position 1 (IDX5~1)= 0 0 0 0 0
7	0	0	1	1	0	Index position 2 (IDX5~1)= 0 0 0 0 1
8	0	0	1	1	1	Index position 3 (IDX5~1)= 0 0 0 1 0
9	0	1	0	0	0	Index position 4 (IDX5~1)= 0 0 0 1 1
10	0	1	0	0	1	Index position 5 (IDX5~1)= 0 0 1 0 0
11	0	1	0	1	0	Index position 6 (IDX5~1)= 0 0 1 0 1
12	0	1	0	1	1	Index position 7 (IDX5~1)= 0 0 1 1 0
13	0	1	1	0	0	Index position 8 (IDX5~1)= 0 0 1 1 1
14	0	1	1	0	1	Index position 9 (IDX5~1)= 0 1 0 0 0
15	0	1	1	1	0	Index position 10 (IDX5~1)= 0 1 0 0 1
16	0	1	1	1	1	Index position 11 (IDX5~1)= 0 1 0 1 0
17	1	0	0	0	0	Index position 12 (IDX5~1)= 0 1 0 1 1
18	1	0	0	0	1	Index position 13 (IDX5~1)= 0 1 1 0 0
19	1	0	0	1	0	Index position 14 (IDX5~1)= 0 1 1 0 1
20	1	0	0	1	1	Index position 15 (IDX5~1)= 0 1 1 1 0
21	1	0	1	0	0	Index position 16 (IDX5~1)= 0 1 1 1 1
22	1	0	1	0	1	Index position 17 (IDX5~1)= 1 0 0 0 0
23	1	0	1	1	0	Index position 18 (IDX5~1)= 1 0 0 0 1
24	1	0	1	1	1	Index position 19 (IDX5~1)= 1 0 0 1 0
25	1	1	0	0	0	Index position 20 (IDX5~1)= 1 0 0 1 1
26	1	1	0	0	1	Index position 21 (IDX5~1)= 1 0 1 0 0
27	1	1	0	1	0	Index position 22 (IDX5~1)= 1 0 1 0 1
28	1	1	0	1	1	Index position 23 (IDX5~1)= 1 0 1 1 0
29	1	1	1	0	0	Index position 24 (IDX5~1)= 1 0 1 1 1
30	1	1	1	0	1	Index position 25 (IDX5~1)= 1 1 0 0 0
31	1	1	1	1	0	Index position 26 (IDX5~1)= 1 1 0 0 1
32	1	1	1	1	1	Index position 27 (IDX5~1)= 1 1 0 1 0

3.2.4 DI/O Setting of Extension Module

When applying extension module, there is no need to plan DI/O function (it cannot be changed, either.). It supports up to 128 tools in total. It is suggested to disable DI/O function on servo drive. P2-10 ~ P2-17 = 0x100, P2-18 ~ P2-22 = 0x100 and P2-36 ~ P2-41 = 0x100 are the function for CN-DIO1 (it only supports single port so far.)

(a) DI Setting

DI number	Name	Function
EDI_1	IDX0	Index Selection 0
EDI_2	IDX1	Index Selection 1
EDI_3	IDX2	Index Selection 2
EDI_4	IDX3	Index Selection 3
EDI_5	IDX4	Index Selection 4
EDI_6	IDX5	Index Selection 5
EDI_7	IDX6	Index Selection 6
EDI_8	SON	Servo ON
EDI_9	ORGP	Original point
EDI_10	IHOM	Homing Trigger (use combination command or individual command)
EDI_11	MD0	Mode Switching 0
EDI_12	MD1	Mode Switching 1
EDI_13	MDP0	Continuous Manual Operation
EDI_14	MDP1	Single-step Manual Operation
EDI_15	SPS	0:1st Speed (P7-24) 1:2nd Speed (P7-26)
EDI_16	EMGS (Set to normal close as default value)	Emergency Stop (use combo command or individual command)

(b) Mode Description

MDPn	Status	MD0	MD1	Description
OFF	1	OFF	OFF	Torque limit
	2	OFF	ON	Indexing trigger
	3	ON	OFF	Homing trigger
	4	ON	ON	Emergency stop
ON		-	-	N/A
		OFF	ON	Backward manual operation
		ON	OFF	Forward manual operation
		-	-	N/A

(c) Switching Function in Manual Mode

Status	MPD0	MPD1	Description
No action (Auto mode)	0	0	When manual operation stops, the system runs in auto mode.
Single-step manual mode (The stop point is the tool position)	0	1	It operates one step and triggers rising-edge when MD0 and MD1 are triggered once.
Continuous manual mode (The stop point is the tool position)	1	0	When manual operation begins, it will run with single step or at continuous speed depends on P5-93.U. When manual operation stops, it stops at the nearest station.
JOG (any point could be the stop point)	1	1	When manual operation begins, motor runs. Otherwise, motor stops. The operation is determined by the signal.

(d) DO Setting

DO number	Name	Function
EDO_1	IDO1	Combo DO 1
EDO_2	IDO2	Combo DO 2
EDO_3	IDO3	Combo DO 3
EDO_4	IDO4	Combo DO 4
EDO_5	IDO5	Combo DO 5
EDO_6	IDO6	Combo DO 6
EDO_7	IDO7	Combo DO 7
EDO_8	IDO8	ALRM: Alarm. Normal closed contact
EDO_9	IDO9	SRDY: Servo ready
EDO_10	IDO10	Homing command or switching index position command is executing
EDO_11	IDO11	Homing complete
EDO_12	IDO12	Tool is in station

(e) Combination DO Description

Item	IDO7	~	IDO3	IDO2	IDO1	Function
1	0	~	0	0	0	Index Position 1
2	0	~	0	0	1	Index Position 2
3	0	~	0	1	0	Index Position 3
4	0	~	0	1	1	Index Position 4
5	0	~	1	0	0	Index Position 5
6	0	~	1	0	1	Index Position 6
7	0	~	1	1	0	Index Position 7
8	0	~	1	1	1	Index Position 8
~	~	~	~	~	~	~
128	1	1	1	1	1	Index Position 128

3.2.5 Newly Added Alarm List and Clear

Apart from the alarm loaded in ASDA-A2 and A2R, the newly added alarms are shown below:
AL.3C3: Emergency Stop
AL.3C4: P1-01 setting error. The control mode has to be 0x11.
AL.3C5: Communication of extension module breakdown or communication error
AL.3C6: Status of extension module is in error
AL.057: Feedback pulse is lost.
AL.041: Encoder signal error

When alarm occurs, it can be cleared when Servo off → Servo On the servo drive. (*switch off then switch on the servo drive can cleared the alarm as well.)

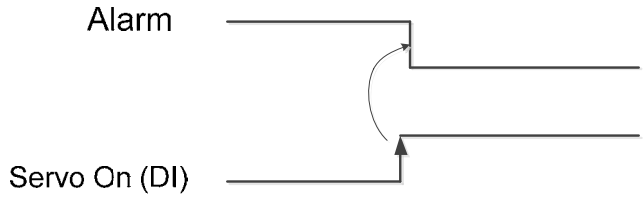


Figure (3.11) Method to clear the alarm

If desire to manually clear the alarm, simultaneously press the Up and Down buttons for 2 seconds.

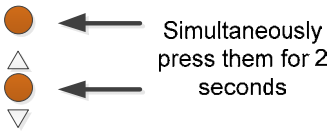


Figure (3.12) Press buttons to clear the alarm

3.2.6 Setting Examples

(a) Application 1

A system with ratio of 54 gear box has 12 tool positions in total and applying motor with magnetic encoder and DI/O extension slot. See the example below:
A:B = 54 : 1

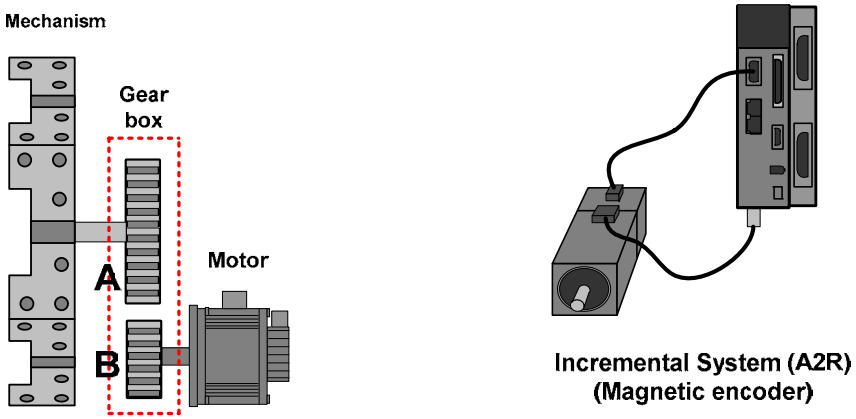


Figure (3.13) Example 1

This system uses A2R. Download the installation program first, then to setup parameters.
(1) P1-01 = 0x11: Set to specific mode.
(2) P1-12 = 30%: When it reaches the position, torque limits. Please adjust the value according to the real situation.
(3) Set P1-44 = 1, P1-45 = 1, P2-52 = 54*4096 = 221184 and P5-96 = 12. When motor turns 54 cycles per revolution, the tool turrets turns one cycle which has 12 tool stations in total. Re-power on the servo drive when the setting of P2-52 and P5-96 is complete.
(4) P2-69 = 0: Not to use absolute type (optical type).
(5) Select the homing function and setup the speed.
   a) P5-04 = 0x0002: look for original point and return to Z pulse.
   b) P5-05 = 5000 (500 rpm), P5-06 = 500 (50 rpm), P6-00=0x00101100 and Delay Time = P5-41 = 100 ms; The 2nd deceleration time = P5-20 = 200 ms, the 1st deceleration time = P5-21 = 300 ms and the acceleration time = P5-21 = 300 ms. If desire to change the setting time, users can directly change the setting of P6-00 or the target parameter, such as P5-21. In this example, change the value of P5-21will change the 1st deceleration time and acceleration time.
   c) P6-01 = 0: When it reaches the original point, users can setup the coordinate offset value. No offset is set for this case.
   d) P5-93 = 0x00000100: Not to use extension module. Use combination DI to do homing. Enable tool position record function and continuous manual operation. Also, make sure value of P6-02 ~ P6-99 is all cleared to 0.
   e) P5-94 = 1: After homing, it stops at the first tool station.
(6) Moving method and speed test
   a) P5-95 = 2: Setup the shortest distant way to look for tool station.
   b) Manual operation speed P7-22 = 0x0024000A; delay time is determined by P5-42; speed is set by P5-64; acceleration / deceleration is set by P5-20.
   c) 1st auto speed P7-24 = 0x002A110A; delay time is determined by P5-42; speed is set by P5-70 and acceleration / deceleration is set by P5-21.
   d) 2nd auto speed P7-26 = 0x0025110A; delay time is determined by P5-42; speed is set by P5-65 and acceleration /deceleration is set by P5-21.
(7) P7-27 = 200: If motor is still within the range (+/- 200 pulses) when power on or Servo On after Servo Off, it will display the correct tool station.

(8) P7-01 = 0: Not to use backlash compensation function.
(9) P7-07 = 20: Setup combination signal delay time, 20ms, to avoid noise.
(10) Setting of magnetic encoder and A2R parameters
a) P2-84 = 0x111: This setting can reduce the noise caused by low resolution of magnetic encoder.
b) H3-03(PM-03) = 0x1002: Use the motor with magnetic encoder. The signal is from CN5.
c) P1-74 = 0x6000: Setup filter frequency to reduce the interference of the noise.
d) P2-35 = 2000: The position error exceeds the range set by AL.009. The resolution of magnetic encoder is 4096 pulses. Set the protection range to half cycle here. The unit is pulse. Users can change it according to the demand.
e) P2-81 = 0x1, P2-82 = 10: Enable pulse loss detection. Once the pulse loss number exceeds 10 from Z to Z and the situation has not been improved after running 3 cycles, AL.057 occurs.
(11) DI/O program
P2-10 ~ P2-17 = 0x100; P2-18 ~ P2-22 = 0x100; P2-36 ~ P2-41 = 0x100 to disable DI/O function of this system. Please refer to section 3.2.4 for other settings.

(b) Application 2

A system with ratio of 54 gear box has 12 tool stations in total and applying motor with magnetic encoder. See the example below:

A:B = 54 : 1

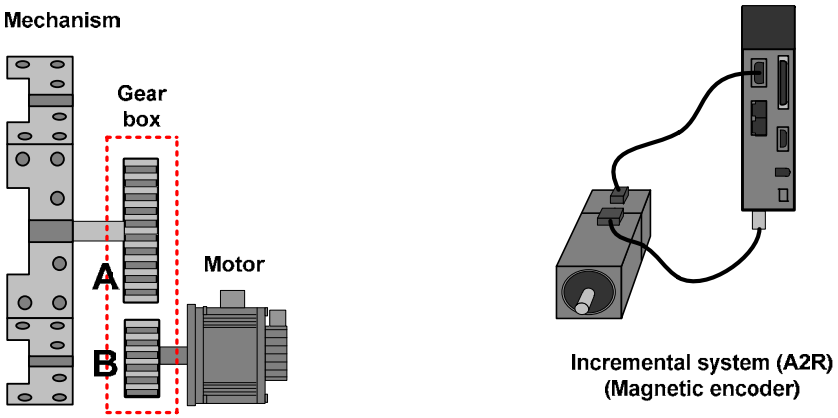


Figure (3.14) Example 2

Use A2R and download the installation program first, then to setup parameters.

(1) P1-01 = 0x11: Set to specific mode.

(2) P1-12 = 30%: When it reaches the station, torque limits. Please adjust the value according to the real situation.

(3) Set P1-44 = 1, P1-45 = 1, P2-52 = 54*4096 = 221184 and P5-96 = 12. When motor turns 54 cycles per revolution, the tool turrets turns one cycle which has 12 tool stations in total. Re-power on the servo drive when the setting of P2-52 and P5-96 is complete.

(4) P2-69 = 0: Not to use absolute type (optical type).

(5) Select the homing function and setup the speed.

a) P5-04 = 0x0002: look for origin point and return to Z pulse.

b) P5-05 = 5000 (500 rpm), P5-06 = 500 (50 rpm), P6-00 = 0x00101100 and Delay Time = P5-41 = 100 ms; The 2nd deceleration time = P5-20 = 200 ms; the 1st deceleration time = P5-21 = 300 ms; the acceleration time = P5-21 = 300 ms; If desire to change the setting time, users can directly change the setting of P6-00 or the target parameter, such as P5-21. In this example, change the value of P5-21will change the 1st deceleration time and acceleration time.

c) P6-01 = 0: When it reaches original point, users can setup the coordinate offset value. No offset is set for this case.

d) P5-93 = 0x00000100: Not to use extension module. Use combination DI to do homing. Enable tool station record function and continuous manual operation. Also, make sure value of P6-02 ~ P6-99 is all cleared to 0.

e) P5-94 = 1: After homing, it stops at the first tool station.

(6) Moving method and speed test

a) P5-95 = 2: Setup the shortest distant way to look for tool station.

b) Manual operation speed P7-22 = 0x0024000A; delay time is determined by P5-42; Speed is set by P5-64 and Acceleration / deceleration is set by P5-20.

c) 1st auto speed P7-24 = 0x002A110A; delay time is determined by P5-42; Speed is set by P5-70 and Acceleration / deceleration is set by P5-21.

d) 2nd auto speed P7-26 = 0x0025110A; delay time is determined by P5-42; Speed is set by P5-65 and Acceleration / deceleration is set by P5-21.

(7) P7-27 = 200: If motor is still within the range (+/- 200 pulses) when power on or Servo On after Servo Off, it will display the correct tool station.

(8) P7-01 = 0: Not to use backlash compensation function.
(9) P7-07 = 20: Setup combination signal delay time, 20ms, to avoid noise.
(10) Setting of magnetic encoder and A2R parameters
a) P2-84 = 0x111: This setting can reduce the noise caused by low resolution of magnetic encoder.
b) H3-03(PM-03) = 0x1002: Use the motor with magnetic encoder. The signal is from CN5.
c) P1-74 = 0x6000: Setup filter frequency to reduce the interference of the noise.
d) P2-35 = 2000: The position error exceeds the range set by AL.009. The resolution of magnetic encoder is 4096 pulses. Set the protection range to half cycle here. The unit is pulse. Users can change it according to the demand.
e) P2-81 = 0x1, P2-82 = 10: Enable pulse loss detection. Once the pulse loss number exceeds 10 from Z to Z and the situation has not been improved after running 3 cycles, AL.057 occurs.
(11) DI program
a) DI 1: P2-10 = 0x111 → IDX0, Index selection 0, normal open.
b) DI 2: P2-11 = 0x112 → IDX1, Index selection 1, normal open.
c) DI 3: P2-12 = 0x113 → IDX2, Index selection 2, normal open.
d) DI 4: P2-13 = 0x11A → IDX3, Index selection 3, normal open.
e) DI 5: P2-14 = 0x124 → ORGP, Reference “Home” sensor, normal open.
f) DI 6: P2-15 = 0x150 → MD0, Mode switching 0, normal open.
g) DI 7: P2-16 = 0x151 → MD1, Mode switching 0, normal open.
h) DI 8: P2-17 = 0x154 → SPS, Switch between two speed, normal open.

If the system is A2R-U, it can switch the physical extension DI; if the system is A2R-L, although it has no physical extension DI to switch the status, it can apply its parameters.

A2R-U:
It can switch DI after servo on. Manual function is added.
a) EDI 9: P2-36 = 0x101 → SON, Servo On, normal open.
b) EDI 10: P2-37 = 0x152 → MDP0, Continuous manual operation, normal open.
c) EDI 11: P2-38 = 0x153 → MDP1, Single-step manual operation, normal open.

A2R-L:
No physical DI. Set servo on as normal close contact. Activate immediately after power on.
a) EDI 9: P2-36 = 0x001 → SON, Servo On, normal close.

(12) DO program:
a) DO 1: P2-18 = 0x120 → IDO1, Combo DO1, normal open.
b) DO 2: P2-19 = 0x121 → IDO2, Combo DO2, normal open.
c) DO 3: P2-20 = 0x122 → IDO3, Combo DO3, normal open.
d) DO 4: P2-21 = 0x123 → IDO4, Combo DO4, normal open.
e) DO 5: P2-22 = 0x124 → IDO5, Combo DO5, normal open.

3.3 Control Time Sequence

3.3.1 Homing

The following example uses combination DI command to do homing (MD0, MD1). Its homing method is to look for ORGP point at forward direction and then return to Z pulse. Not to setup the offset value of P6-01. Therefore, do not need to move to the next tool station when it reaches origin point.

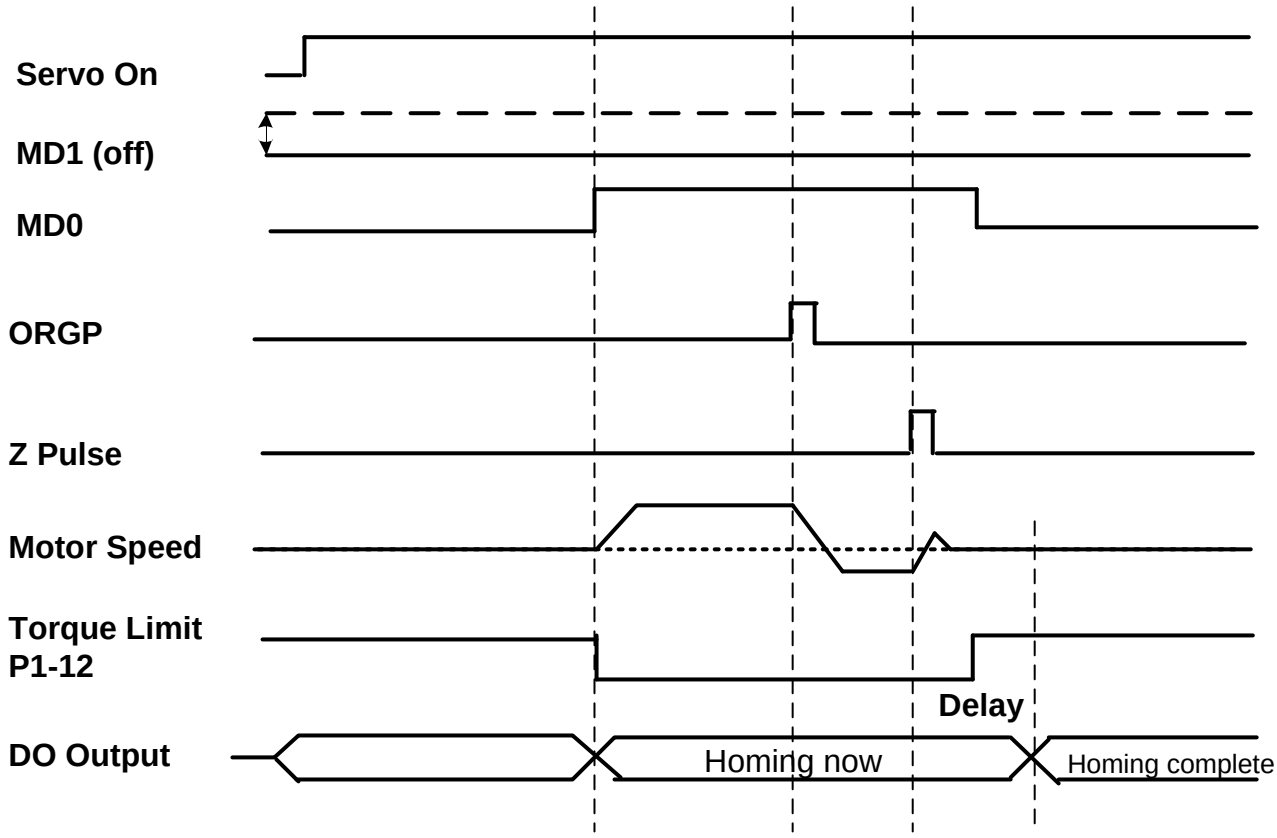


Figure (3.15) Timing diagram for homing process

Example below uses IHOM to do homing. Users only need to set one of the DI to 0x55 and enable this function at P5-93 (P5-93 = 0x10). When DI is triggered, MD0 and MD1 cannot be on at the same time. If they do, the system will be in emergency stop. The way to homing is to look for ORGP point at forward direction, and then return to Z. Not to setup the offset value of P6-01. When it reaches the origin point, it goes to the 2nd tool station by the 2nd homing in shortest distance. When positioning point is reached, DO will show “Tool is in station”.

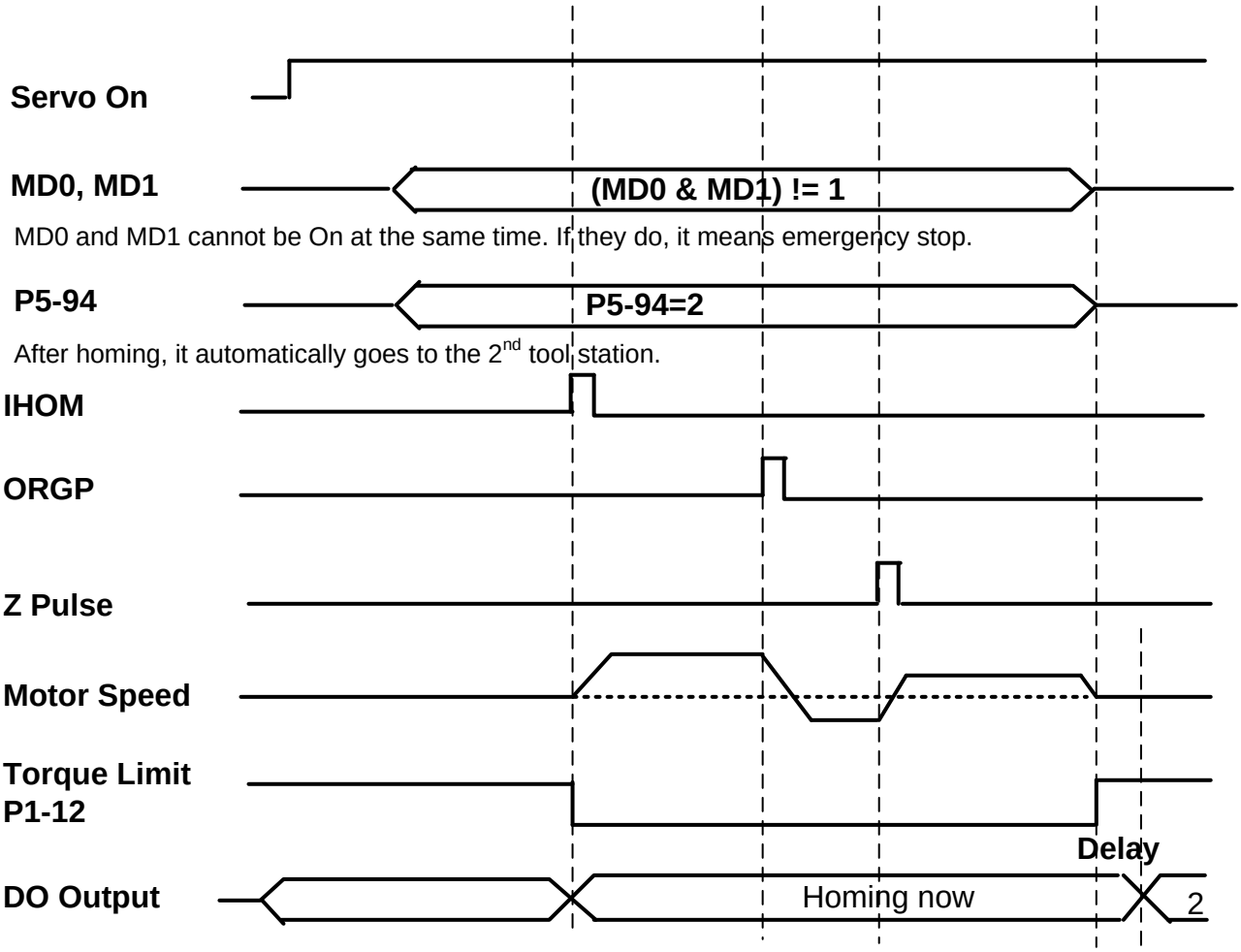


Figure (3.16) Timing diagram of moving to next tool station after homing

3.3.2 Auto Position Function

The following example sets up the shortest path for positioning:

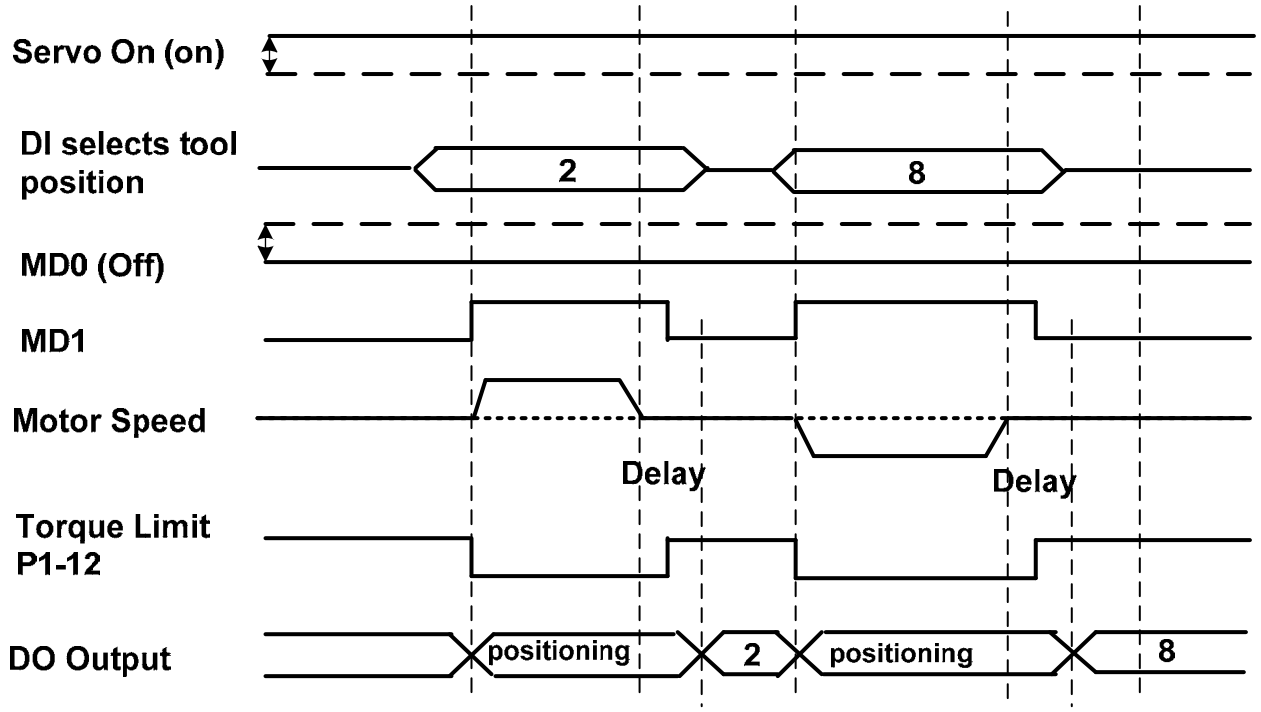


Figure (3.17) Timing diagram of auto operation with one speed setting

Use SPS to change the speed:

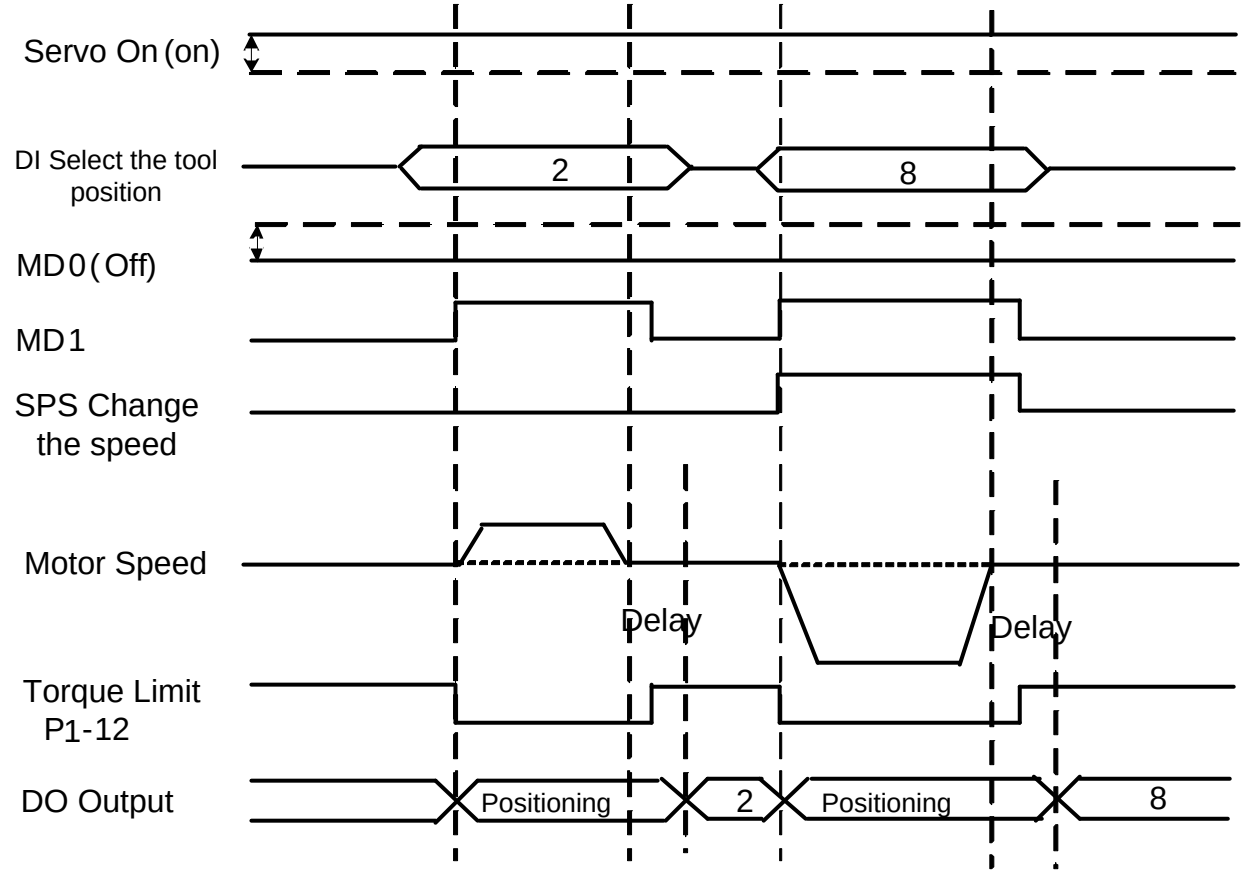


Figure (3.18) Timing diagram of auto operation with speed switching

3.3.3 Manual Index Function

Example below sets up for searching the shortest path, auto trigger and timing diagram.

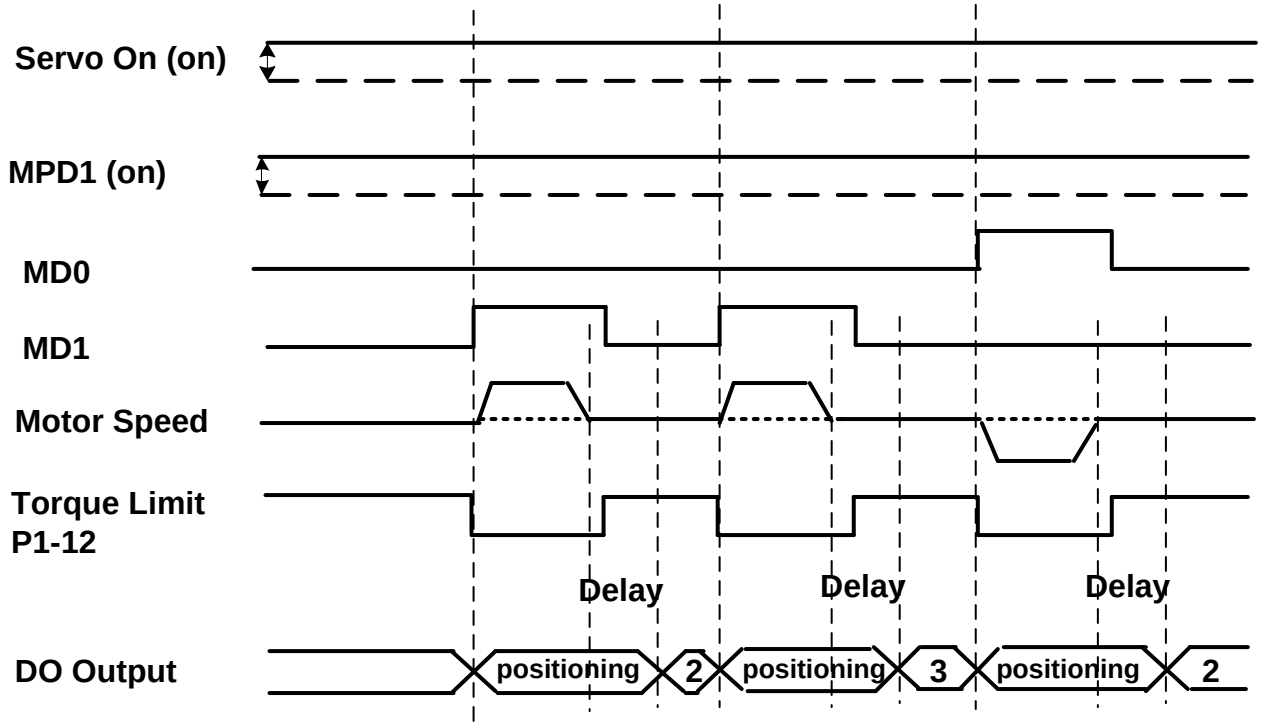


Figure (3.19) Timing diagram for manual index control

3.3.4 DI/O Status Monitor and Force Output

During the trial operation, Delta′ s PC scope can access the digital input / output status of extension module. This is very useful for logic debugging and understand the application.

When value of P5-93.BA is set to 0, P7-08 can access DI status and P7-10 can access DO status. Enter these two data into the scope of ASDA-Soft, the signal variation can be seen clearly and easy for debugging.

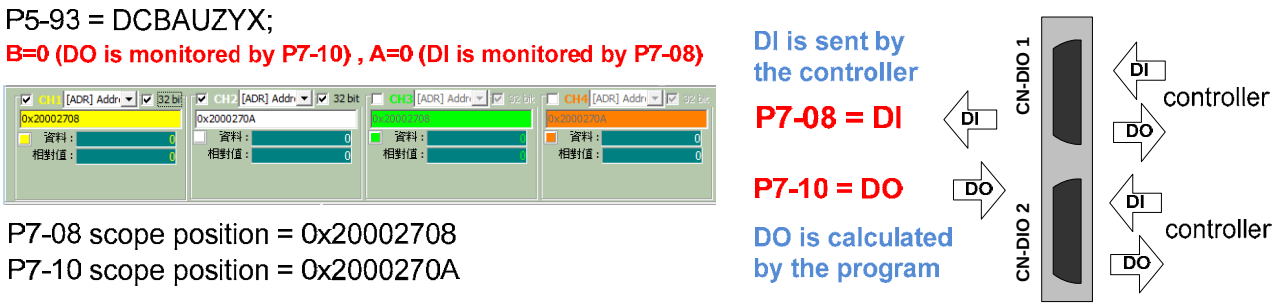


Figure (3.20) Monitor the DI/O status on extension module

P5-93.BA can be used to setup the controller's signal. This is quite convenient to output signals to extension DI/O module to test the status. See figure (3.21).

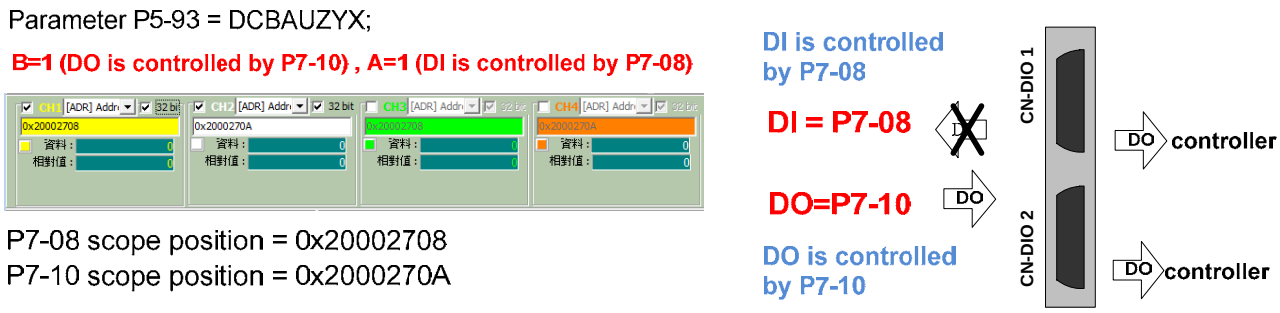


Figure (3.21) DI/O status control method on extension module

If desire to view the data in different format on scope, e.g. hexadecimal, decimal or binary, please double click on data field to view the value. See figure (3.22).

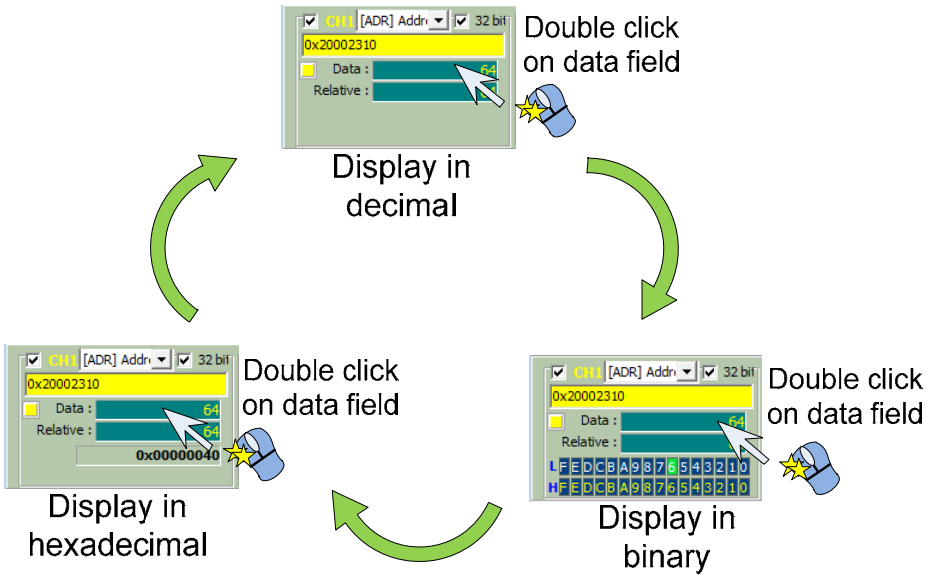


Figure (3.22) Switch the display format of scope signal

3.3.5 Servo Tuning

For those who already familiar with Delta servo system, they can directly tune the servo. For those who do not know, please follow the instructions below. Motor with magnetic encoder causes louder noise because its resolution is lower. However, the noise does not influence the performance. During tuning, it is better to adjust the value of motor inertia ratio (P1-37) lower. It is easy to cause vibration if the value is set too big. Two tuning methods are provided below, by ASDA-soft and panel. Usually, it is suggested to use DELTA's servo system to conduct tuning.

(1) Follow the steps below if you tune the system by ASDA-Soft:

(a) After enabling ASDA-Soft, click ⓐ (Auto Gain Tuning) shown in figure (3.23). Then, enable Gain Control Panel marked in ⓑ. The screen ⓒ will show. Users can start to operate the motor and estimate motor inertia ratio.

(b) Click ⓓ to enable Servo. The user will hear the magnetic noise from servo motor at the moment. Enter the appropriate motor speed in speed field. It is suggested to enter lower speed first to ensure the mechanical operation is safe and has no interference. Then, gradually increase the speed. After filling in speed and acceleration/deceleration time, click ⓔ to download and load the setting into the servo drive.

(c) When using ⓕ and ⓖ to control the motor operation, please pay attention to the mechanical situation and see if there is any noise or interference. Personnel who are in charge of operation shall follow the safety instructions. If there is no problem when operating at low speed, users can increase the speed. Click ⓔ to download and use ⓕ and ⓖ to operate at forward or reverse direction. To acquire a correct inertia ratio, the motor speed has to be set at 200 rpm at least.

(d) If the speed setting is higher than or equals to 200 rpm, click ⓕ to move the motor to one position, and click ⓗ to set this position as position 1. Then, click ⓖ to operate the motor at reverse direction. Click ⓘ to move to the other position. When positioning (both at forward and reverse direction) is complete, click ⓙ, the motor will operate at forward and reverse direction within the setting range and estimate the inertia ratio at the same time. Pay attention to the mechanism, click ⓙ again to stop the operation if any problem occurs.

(e) When the value of inertia ratio is stable (or the variation is small), click ⓙ to stop the operation. Then, increase the speed again. Click ⓔ to download and click ⓙ to start the operation again. Repeat these steps until the inertia ratio has no big change even when it is in high speed. If the variation value is smaller than 1, it means the inertia estimation is complete. Click ⓚ to load the inertia into the system. Then, click ⓑ again to disable Gain Control Panel and proceed to the next step.

Figure (3.23) Inertia estimation

(f) To continue the above operation, please see figure (3.24). The inertia ratio will appear in the field of ⓜ inertia ratio and saved in P1-37. In field of ⓘ, users can enter system bandwidth. Please start from the small value (It is suggested to start with 20 Hz). Then, click ⓝ to compute. And select “P2-47 = 1 Auto Resonance Suppression – Non-continuous adjustment” when downloading it for the first time at selection ⓞ. Check to download and click ⓟ to download the parameter into the servo drive.

(g) When all steps that mentioned above are complete, users can start to operate the motor. It is suggested to use the controller to operate the motor. If not, enable ⓑ Gain Control Panel again. Use ⓕ and ⓖ to do JOG operation. If users do not satisfy the performance, adjust the bandwidth ⓘ to compute the gain again ⓝ. Not to take the setting of ⓞ resonance suppression into consideration when downloading the bandwidth for the 2nd time (uncheck the box to cancel this function). Do not select P2-47 = 1 to re-estimate resonance frequency until the resonance sound is heard during bandwidth adjustment (Please note that this sound is different from the magnetic sound because of high bandwidth.). Please do not adjust the bandwidth up to the mechanical limit. It might cause noise and vibration after a long time operation.

(h) Few more things need to be bore in mind:

①When all tests is complete, if the value of P2-47 is still 1, please manually disable this function.

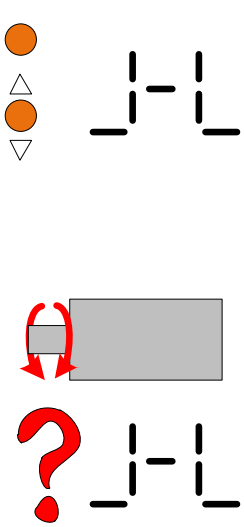
②If the motor does not run smoothly when just starting or stop, apart from adjusting the bandwidth, P1-68 (Position command moving filter) and P1-08 (Low-pass filter) can be used to smooth the command. Please note that the unit of P1-68 is ms and unit of P1-08 is 10 ms. The filter can smooth the command, but it might cause the delay of operation.

③If the value of P1-37 (inertia ratio) is set too high, e.g. exceeds 20, it is suggested to reduce the value of P1-37 to obtain a better flexibility of tuning.

Figure (3.24) Compute and Download the Gain

(2) Tune the system via panel:

Estimate the load inertia of mechanism first. Then, to run the motor at forward or reverse direction by the controller.



Use Up and Down button to adjust the panel to J-L and to display the inertia ratio on panel.

Use the controller to operate the motor at forward and reverse direction. The speed must exceed 200 rpm. If the operation has no problem, increase the operation speed at both direction to monitor the value of J-L. Access the stable value of J-L then write it into P1-37.

Figure (3.25) Use panel to read inertia ratio

Estimate the bandwidth (system response speed) and see if the mechanism performance is satisfactory. The initial bandwidth can be smaller. When value of (P1-37) x (P2-31, bandwidth) exceeds 240, the system might be unstable. This is for reference only though. For some equipment which has better stiffness, users can setup higher bandwidth. For some mechanicals with poor characteristics, it will still have problem even if the value is less than 240. The principle of tuning is that as long as the bandwidth can meet the system requirements, the tuning process is done. Reserve some spare bandwidth in order to handle the mechanical situation changes in the future.

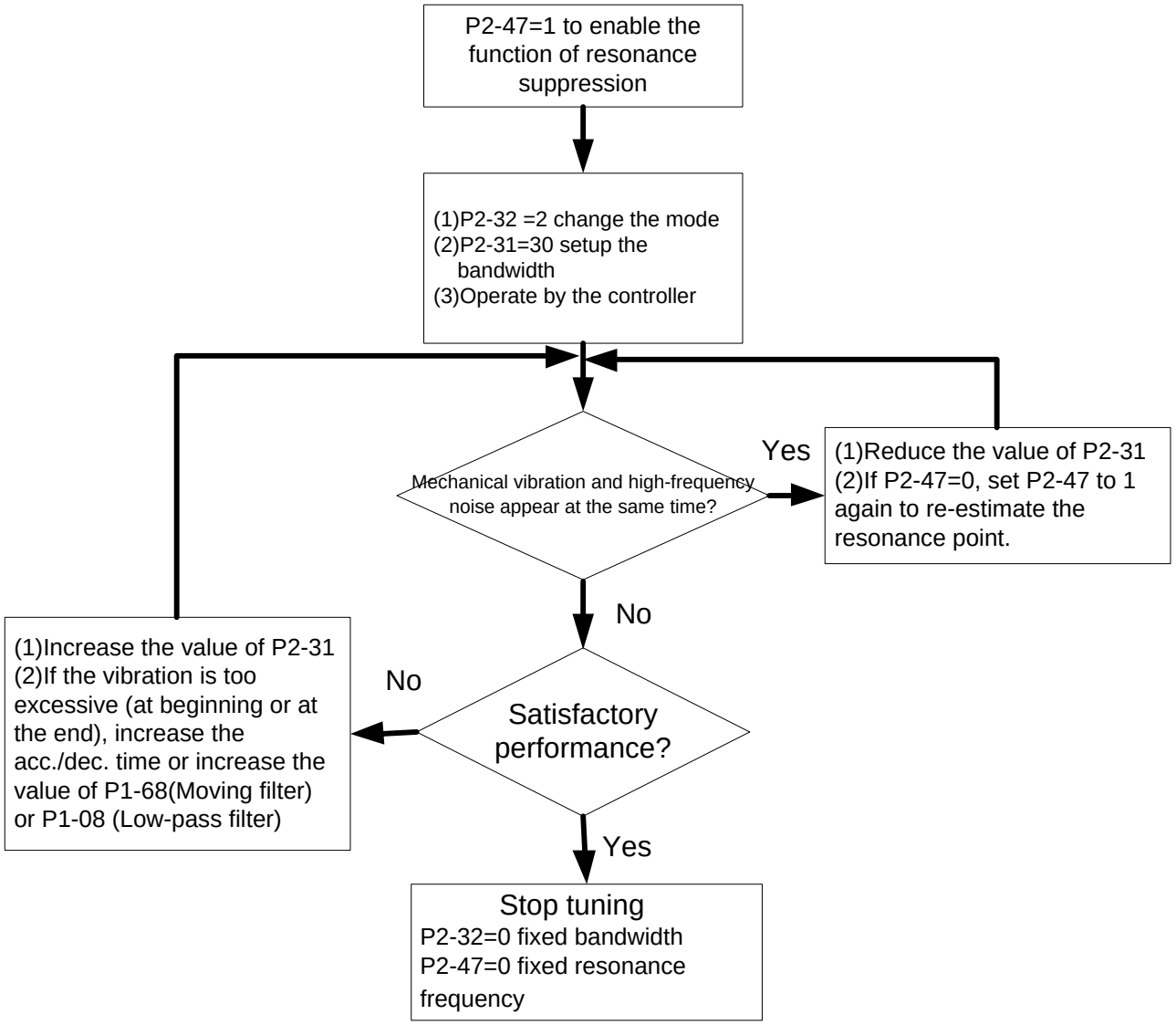


Figure (3.26) Use panel to tune the system

Chapter 4 Troubleshooting

4.1 Alarm List of the Servo Drive

Alarm List of the 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 performing 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
AL017	Abnormal EEPROM	It is in error when DSP accesses EEPROM.	ALM	Servo Off
AL018	Abnormal signal	The encoder output exceeds the rated	ALM	Servo

Alarm List of the Servo Drive				
Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
	output	output frequency.		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	An encoder data error is detected for three times.	ALM	Servo Off
AL027	Encoder Reset Error	The internal reset of the encoder is in error.	ALM	Servo Off
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	The wiring connections of U, V, W (for servo motor output) and GND (for grounding) are in error.	ALM	Servo Off
AL033	Connection of 26 pin on converter box is breakdown	Connection of 26 pin on converter box (encoder) is breakdown	ALM	Servo 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
AL044	Warning of	Warning of servo drive function	WARN	Servo

Alarm List of the Servo Drive				
Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
	servo drive function overload	overload		On
AL050	Auto detection of motor parameters is completed.	When executing PM-01, function of auto detection, this alarm will occur when the detection is completed.	ALM	Servo Off
AL051	Auto detection of motor parameters is in error	During auto detection, when friction is too big, motor is stuck or entering wrong resolution and pole pitch, this alarm will occur.	ALM	Servo Off
AL052	Initial magnetic pole detection error	When PM-03.Y = 0, it will detect the initial magnetic pole automatically. When it cannot find the initial magnetic pole, this alarm will occur.	ALM	Servo Off
AL053	Motor parameter is not confirmed	If PM-02 = 0, this alarm will occur when motor servo On.	ALM	Servo Off
AL054	Exceeding the range of motor parameter	Parameter range of linear motor is different from rotary motor. In PM-00, if it exceeds the range when switching the motor type, this alarm will occur.	ALM	Servo Off
AL055	Motor magnetic fields is abnormal	When enabling the Y item of PM-09, servo will detect the motor's current magnetic field, and compare it with the position of Hall sensor's. When the deviation between both is too excessive, this alarm will occur.	ALM	Servo Off
AL057	Feedback pulse is lost	When P2-81 = 1, it will check if the pulse is lost. If the loss amount is more than the value of P2-82, this alarm will occur.	ALM	Servo Off
AL058	Excessive deviation of initial magnetic pole detection position when power on	During initial magnetic pole detection, it will check if the position error exceeds the range. If yes, this alarm will occur.	ALM	Servo Off
AL3C3	Emergency stop	Emergency stop	ALM	Servo Off
AL3C4	Incorrect setting of P1-01	Incorrect setting of P1-01. The control mode must be set as 0x11.	ALM	Servo Off
AL3C5	Extension module disconnected or	Extension module disconnected or communication error	ALM	Servo Off

Alarm List of the Servo Drive				
Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
	communication error			
AL3C6	Extension module status abnormal	Extension module status abnormal	ALM	Servo Off

4.2 Alarm Disposal

AL001	**Over current**	Turn DI.ARST on to clear the alarm

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.
Motor wiring 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
Control parameter setting 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**	Turn DI.ARST on to clear the alarm

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 5.1)	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	The alarm can be cleared after the voltage returns to normal.

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)	Use the voltmeter to see if the power system matches the specification.	Apply to the correct power supply or serial adaptor.

AL004	Motor Combination Error	The alarm can be cleared after re-power on.

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.
The type of the servo motor is incorrect.	Connect to the right motor.	Change the motor

AL005	Regeneration Error	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Select incorrect regenerative resistor	Check the connection of regenerative resistor.	Re-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 setup parameters (P1-52 and P1-53) value.

AL006	Overload	Turn DI.ARST on to clear the alarm

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.	1. Check if there is any mechanical vibration. 2. Check if the acceleration / deceleration constant is set too fast.	1. Adjust the gain value of the control circuit. 2. Slow down the acceleration / deceleration setting time.
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	Over speed	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Unreasonable command	Use the scope to check if the signal of analog voltage is abnormal.	Less steep command used or filter applying to smooth command.
Inappropriate parameter setting	Check if the setting of parameter P2-34 is too small (the condition of over-speed warning).	Correctly set parameter P2-34 (the condition of over-speed warning).

AL008	Abnormal Pulse Command	Turn DI.ARST on to clear the alarm

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.

AL009	Excessive Deviation of Position Command	Turn DI.ARST on to clear the alarm

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

AL010	Reserved

AL011	Encoder Error	The alarm can be cleared after re-power on.

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	Conduct the wiring again
The encoder is damaged	Check if the motor is damaged	Change the motor

AL012	Adjustment Error	The alarm can be cleared when removing CN1 wiring and execute auto adjustment.

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	The alarm can be cleared automatically after turning DI.EMGS off

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	Turn DI.ARST on or Servo Off to clear the alarm. The alarm also can be cleared when the motor operates backwards.

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.	Check the control parameter and inertia ratio	Modify the parameter setting or evaluate the motor capacity.

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.

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.	Check the control parameter and inertia ratio	Modify the parameter setting or evaluate the motor capacity.

AL016	IGBT Overheat	Turn DI.ARST on to clear the alarm

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	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.

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 AB = hexadecimal of the parameter 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 when applying to the power. It means one of the parameters is over the reasonable range. Please re-power on after modifying the parameter setting. 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 EEPROM is damaged or there is no data in EEPROM. Please send the drive back to the distributors or contact with Delta.

AL018	Abnormal Signal Output	Turn DI.ARST on to clear the alarm

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 (AL.011, AL.024, AL.025, AL.026)	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 occurs: P1-76 < Motor Speed or $\frac{\text{Motor Speed}}{60} \times P1-46 \times 4 > 19.8 \times 10^6$	Correctly set parameter P1-76 and P1-46: P1-76 > Motor Speed or $\frac{\text{Motor Speed}}{60} \times P1-46 \times 4 < 19.8 \times 10^6$

AL019	Serial Communication Error	Turn DI.ARST on to clear the alarm

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	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Improper setting of the time-out parameter	Check the parameter setting	Correctly set the value of P3-07.
The drive hasn′ t received the communication command for a long time.	Check if the communication cable is loose or broken.	Correct wiring

AL021	Reserved	Turn DI.ARST on to clear the alarm

AL022	The Main Circuit Power is Abnormal	Turn DI.ARST on to clear the alarm

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	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Early warning for overload	1. Check if it is used in overload condition. 2. Check if the value of parameter P1-56 is set to small.	1. Please refer to the corrective actions of AL.006. 2. Please increase the setting value of parameter P1-56. Or set the value over 100 and deactivate the overload warning function.

AL024	Encoder Initial Magnetic Field Error	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
The initial magnetic field is of the encoder in error (Signal, U, V, W of the encoder magnetic field is in error.)	1. Check if the servo is properly grounded. 2. Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference. 3. Check if the shielding cables are used in the wiring of the encoder. 4. If it connects to Hall sensor, please check the wiring of Hall sensor.	If issue persists, please send the drive back to the distributors or contact with Delta.

AL025	The Internal of the Encoder is in Error	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
The internal of the encoder is in error. (The internal memory and the internal counter are in error.)	1. Check if the servo is properly grounded. 2. Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference. 3. Check if the shielding cables are used in the wiring of the encoder.	1. Please connect the UVW connector (color green) to the heat sink of the servo drive. 2. Please check if the encoder cable separates from the power supply or the high-current circuit. 3. Please use shielding mesh. 4. If issue persists, please send the drive back to the distributors or contact with Delta.
When applying to the power, the motor operates because of mechanism inertia or other reason.	Make sure the shaft of the motor is still when applying to the power.	Make sure the shaft of the motor is still when applying to the power.

AL026	Unreliable Internal Data of the Encoder	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
The encoder is in error. (Errors occur in the internal data for three times continuously)	1. Check if the servo is properly grounded. 2. Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference. 3. Check if the shielding cables are used in the wiring of the encoder.	1. Please connect the UVW connector (color green) to the heat sink of the servo drive. 2. Please check if the encoder cable separates from the power supply or the high-current circuit. 3. Please use shielding mesh. 4. If issue persists, please send the drive back to the distributors or contact with Delta.

AL027	Encoder Reset Error	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
Reset the encoder	1. If the contact of the signal cable is poor 2. If the encoder power is stable 3. If the operating temperature is higher than 95 ℃	1. Make sure the signal cable is normal 2. Please use shielded net for encoder signal cable. 3. If issue persists, please send the drive back to the distributors or contact with Delta.

AL030	Motor Crash Error	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Motor Crash Error	1. Check if P1-57 is enabled. 2. Check if P1-57 is set too small and the time of P1-58 is set too short.	1. If it is enabled by mistake, please set P1-57 to zero. 2. 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 the function of protection.

AL031	Incorrect Wiring of the Motor Power Line U, V, W, GND	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
The wiring of U, V, W, and GND of the motor is incorrect connected.	Check if U, V, W of the motor is incorrect connected	Follow the user manual to correctly wire U, V, W and make sure it is grounded.

AL033	Connection of 26 pin on Converter Box is Breakdown	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
Connection of 26 pin on converter box is breakdown	Check the status of converter box 1. Switch mode Rotary switch at X1: AB pulse: Check if the connection of pin 1~6 on 26 pin is breakdown. Rotary switch at X2: SIN COS: Check if the connection of pin 8~13 on 26 pin is breakdown. 2. Drive mode The 1st bit of PM-03 = 0: Check if the connection of pin 1~6 on 26 pin is breakdown. The 1st bit of PM-03 = 1: Check if the connection of pin 8~13 on 26 pin is breakdown.	Re-connect the breakdown part and then cycle power the drive.

AL040	Excessive Deviation of Full-closed Loop Position Control	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Excessive deviation of full closed-loop position control	1. Check if P1-73 is set too small. 2. Check if the connector is loose or there is any connection problem of other mechanism.	1. Increase the value of P1-73. 2. Check if the connection is well connected.

AL041	Communication of CN5 is Breakdown	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Communication of CN5 is breakdown	Check if the connection of pin1~5 and pin 9 on CN5 connector is breakdown.	Make sure the connection is correct and then re-servo on.

AL044	Warning of Servo Drive Function Overload	Set Bit 4 of P2-66 to 1 and re-power on.

Causes	Checking Method	Corrective Actions
Warning of servo drive function overload	N/A	Set Bit 4 of P2-66 to 1 could close the display of this alarm.

AL050	Auto Detection of Motor Parameters is Complete	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
When executing the function of PM-01 (Automatic Identification of Motor Parameter), the alarm occurs when the auto detection is complete.	It informs users the detection is completed and should re-power on the servo drive.	Please cycle power the servo drive.

AL051	Auto Detection of Motor Parameters is in Error	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
When executing the function of PM-01, if the friction is too big, motor is stuck or entering wrong resolution and pitch pole, this alarm will occur.	1. Check if motor pole pitch, encoder resolution and encoder type are entered correctly. 2. Check if motor is stuck during detection. 3. Check if the motor friction is too big. 4. Check if the feedback of linear scale is abnormal, the connection is breakdown, the scale is not installed properly or there is noise interference.	1. Enter the value which is the same as the actual one and activate the detection again. 2. The rotary motor will rotate at forward and reverse direction for one magnetic cycle during detection. The linear motor will move for a pitch forward and backward. Please preserve the moving distance before detection. 3. Chang another motor with more power. 4. Correct the problem of linear scale.

AL052	Initial Magnetic Pole Detection Error	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
When motor does not connect to Hall sensor, it will search the initial magnetic pole when power on. If the initial magnetic pole is not found, this alarm will occur.	1. Check if the feedback is normal 2. Check if the motor friction is too big	Correct the problem of the encoder

AL053	Motor Parameter is not Confirmed	Set PM-02 to 1 and re-power on. The alarm will be cleared automatically.

Causes	Checking Method	Corrective Actions
If PM-02 = 0, this alarm occurs when motor servo On.		Make sure the motor parameter group is entered correctly. Set PM-02 to 1 and re-power on. After the detection procedure is complete, this parameter will be setup automatically.

AL054	Exceeding the Range of Motor Parameters	Correctly setup the parameter and re-power on. The alarm will be cleared automatically.

Causes	Checking Method	Corrective Actions
When switching the motor type, if the setting value exceeds the range of PM-00, this alarm will occur.	Check if the parameter is incorrect: Press the **SHIFT** Key to display EXGAB X = 1, 2, 3 G = Parameter group code AB = Hex. Code of parameter E320A represents P2-10; E3610 represents P6-16; and E3D10 represents PM-16.	The parameter setting range of linear motor is different from rotary motor. Please setup the correct parameter according to the motor type.

AL055	Motor magnetic fields is abnormal	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
When enabling the Y item of PM-09, servo will detect the motor's current magnetic field, and compare it with the position of Hall sensor's. When the deviation between both is too excessive, this alarm will occur.	The servo drive monitors motor′ s magnetic field through the encoder, thus, 1. check if the feedback of encoder interferes the pulse loss because of the noise. 2. assume that the feedback type of the encoder is square wave digital signal, check if the motor is over speed and exceeds the limit that hardware could take. The limit is 20Mhz (the resolution of quadruple frequency) 3. check if Hall sensor is normal.	1. Exclude the noise problem, if the type is square wave digital signal, users could filter out the noise through the proper setting of filter function. The setting of converter box =>PM-03 The setting of CN5 =>P1-74 2 Limit the max. speed of motor. Setup P1-55.

AL057	Feedback Pulse is Lost	The alarm can be cleared after re-power on.

Causes	Checking Method	Corrective Actions
When P2-81 = 1, it will check if pulse is lost. If the pulse loss amount exceeds the value of P2-82, this alarm will occur.	1. Check if the feedback of encoder interferes the pulse loss because of the noise. 2. Assume that the feedback type of the encoder is square wave digital signal, check if the motor is over speed and exceeds the limit that hardware could take. The limit is 20Mhz (the resolution of quadruple frequency)	1. Exclude the noise problem, if the type is square wave digital signal, users could filter out the noise through the proper setting of filter function. The setting of converter box =>PM-03 The setting of CN5 =>P1-74 2 Limit the max. speed of motor. Setup P1-55.

AL058	Excessive Deviation of Initial Magnetic Pole Detection Position when Power On	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
During initial magnetic pole detection, it will check if the position error exceeds the range. If yes, this alarm will occur.	1. Check if the command is issued when power just on. 2. Check if the moving is too excessive during initial pole detection.	1. Do not issue the command right after the power is on. Users can issue the command until TPOS is On. 2. Reduce the value of PM-11. Reduce the detect current of initial pole.

AL3C3	Emergency Stop	Disable the emergency DI to clean-up the alarm

Causes	Checking Method	Corrective Actions
Emergency stop	Check emergency stop DI	Disable emergency stop DI

AL3C4	P1-01 Setting Error	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Incorrect setting of P1-01	Check P1-01 setting, the control mode must be 0x11	Correct P1-01 setting, the control mode must be 0x11

AL3C5	Extension module disconnected	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Extension module disconnected	Check the communication status of expansion module board	Troubleshoot the communication issue

AL3C6	Extension module malfunction	Turn DI.ARST on to clear the alarm

Causes	Checking Method	Corrective Actions
Extension module malfunction	Check the status of extension module board	Extension module malfunction, please contact with Delta

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Chapter 5 Specifications

5.1 Servo Drive and Servo Motor

	Servo Drive	Servo Motor	
		Permanent Magnetic Synchronous Rotary Motor	Motor with Magnetic Encoder
100W	ASD-A2R-0121-T	ECMA-C△0401□S (S = 8 mm) ECMA-C1040F□S (S = 8 mm)	-
200W	ASD-A2R-0221-T	ECMA-C△0602□S (S = 14 mm)	-
400W	ASD-A2R-0421-T	ECMA-C△0604□S (S = 14 mm) ECMA-C△0604□H ECMA-C△0804□7 (7 = 14 mm) ECMA-E△1305□S (S = 22 mm) ECMA-G△1303□S (S = 22 mm)	ECMA-C80604RS ECMA-C80804R7
750W	ASD-A2R-0721-T	ECMA-F11305□S (S = 22mm) ECMA-C△0807□S (S = 19 mm) ECMA-C△0807□H ECMA-C△0907□S (S = 16mm) ECMA-G△1306□S (S = 22mm)	ECMA-C80807RS
1000W	ASD-A2R-1021-T	ECMA-C△0910□S (S = 16 mm) ECMA-C△1010□S (S = 22 mm) ECMA-E△1310□S (S = 22 mm) ECMA-F△1308□S (S = 22 mm) ECMA-G△1309□S (S = 22 mm)	ECMA-C81010RS
1500W	ASD-A2R-1521-T	ECMA-E△1315□S (S = 22 mm)	ECMA-E81315RS
2000W	ASD-A2R-2023-T	ECMA-C△1020□S (S = 22 mm) ECMA-E△1320□S (S = 22 mm) ECMA-E△1820□S (S = 35 mm) ECMA-F11313□S (S = 22 mm) ECMA-F11318□S (S = 22 mm)	ECMA-E81320RS ECMA-E81820RS
3000W	ASD-A2R-3023-T	ECMA-C△1330□4 (4 = 24 mm) ECMA-E△1830□S (S = 35 mm) ECMA-E△1835□S (S = 35 mm) ECMA-F△1830□S (S = 35 mm)	ECMA-E81830RS

NOTE

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

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

5.2 Specifications of Servo Drive

ASDA-A2R Series			100W	200W	400W	750W	1kW	1.5kW	2kW	3kW
			01	02	04	07	10	15	20	30
Power	Phase / Voltage		Single phase/ Three phase 220 VAC						Three phase 220 VAC	
	Permissible voltage		Single phase/ Three phase 200 ~ 230 VAC, -15% ~ 10%						Three phase 200 ~ 230 VAC, -15% ~10%	
	Continuous output current		0.9 Arms	1.55 Arms	2.6 Arms	5.1 Arms	7.3 Arms	8.3 Arms	13.4 Arms	19.4 Arms
Cooling method			Natural cooling			Fan cooling				
Encoder resolution / Feedback resolution (for Delta′s 20BIT rotary motor)			20-bit (1280000 p/rev)							
Main circuit control			SVPWM control							
Control mode			Manual / Auto							
Dynamic brake			N/A			Built-in				
Position Control Mode	Max. input pulse frequency		Transmitted by differential: 500K/4Mpps, transmitted by open-collector: 200Kpps							
	Pulse type		Pulse + symbol; A phase + B phase; CCW pulse + CW pulse							
	Command source		External pulse / Register							
	Smoothing strategy		Low-pass and P-curve filter							
	E-gear ratio		E-gear ratio: N / M time, limitation: (1/50 < N/M < 25600) N: 1~32767 / M: 1:32767							
	Torque limit		Parameter settings							
	Feed forward compensation		Parameter settings							
Speed Control Mode	Analog command input	Voltage range	0 ~ ±10 V_{DC}							
		Input resistance	10KΩ							
		Time constant	2.2 us							
	Speed control range*1		1:5000							
	Command source		External analog command / Register							
	Smoothing strategy		Low-pass and S-curve filter							
	Torque limit		Via parameter setting or analog input							
	Bandwidth		Max.1kHz							
	Speed accuracy*2		The load fluctuation (0 ~ 100%) is 0.01%							
			The power fluctuation ±10% is 0.01%							
			The ambient temperature fluctuation (0 ~ 50℃) is 0.01%							

ASDA-A2R Series			100W	200W	400W	750W	1kW	1.5kW	2kW	3kW
			01	02	04	07	10	15	20	30
Torque Control Mode	Analog command input	Voltage range	0 ~ ±10 V_{DC}							
		Input resistance	10KΩ							
		Time constant	2.2 us							
	Command source									
	Smoothing strategy									
	Speed limit									
Analog monitor output			The monitor signal which can be set via parameters (Output voltage range: ±8 V)							
Digital Input / Output		Input	Servo on, Fault reset, Gain switch, Pulse clear, Zero clamp, Command input reverse control, Internal position command trigger, Torque (force) limit, Speed limit, Internal position command selection, Motor stop, Speed command selection, Speed / position mode switching, Speed / torque (force) mode switching, Torque (force) / 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-gear N selection, Pulse input prohibition							
		Output	A, B, Z Line Driver output							
			Servo on, Servo ready, Zero speed, Target speed reached, Target position reached, torque (force) limiting, Servo alarm, Brake control, Homing completed, Early warning for overload, Servo warning, Position command overflows, Software negative limit, Software positive limit, Internal position command completed, Capture procedure completed, Servo procedure completed, Master position area of E-CAM							
Protective 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							
Communication interface			RS-232 / RS-485 / CANopen / USB							
Environment	Installation site		Indoors (avoid the direct sunlight), no corrosive fog (avoid fume, flammable gas and dust)							
	Altitude		Elevation under 1000M							
	Atmospheric pressure		86 kPa ~ 106 kPa							
	Operating temperature		0 ℃ ~ 55 ℃ (If the temperature is over 45℃, forced air circulation is needed.)							
	Storage temperature		-20 ℃ ~ 65 ℃							
	Humidity		Under 0 ~ 90% RH (non-condensing)							
	Vibrating		Under 20Hz, 9.80665m/s^2 (1G), 20 ~ 50Hz 5.88m/ s^2 (0.6G)							
	IP rating		IP20							
	Power system		TN system[*3]							
	Approvals		IEC/EN 61800-5-1, UL 508C, C-tick							

Note:

*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.

5.3 Specifications of Servo Motor (Permanent Magnetic Synchronous Rotary Motor)

Low Inertia Series

ECMA	C104	C△04	C△06		C△08		C△09	
	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)*1	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)	3000						3000	
Max. speed (r/min)	5000						3000	
Rated current (A)	0.66	0.90	1.55	2.60	2.60	5.10	3.66	4.25
Max. instantaneous current (A)	2	2.70	4.65	7.80	7.80	15.3	11	12.37
Max. power per second (kW/s)	12.27	27.7	22.4	57.6	24.0	50.4	29.6	38.6
Rotor inertia ($\times 10^{-4}$kg.m^2)	0.0206	0.037	0.177	0.277	0.68	1.13	1.93	2.62
Mechanical constant (ms)	1.14	0.75	0.80	0.53	0.74	0.63	1.72	1.20
Torque constant – KT(N-m/A)	0.24	0.36	0.41	0.49	0.49	0.47	0.65	0.75
Voltage constant – KE (mV/(r/min))	10	13.6	16.0	17.4	18.5	17.2	24.2	27.5
Armature resistance (Ohm)	12.7	9.30	2.79	1.55	0.93	0.42	1.34	0.897
Armature inductance (mH)	26	24.0	12.07	6.71	7.39	3.53	7.55	5.7
Electric constant (ms)	2.05	2.58	4.30	4.30	7.96	8.36	5.66	6.35
Insulation class	Class A (UL), Class B (CE)							
Insulation resistance	> 100MΩ, DC 500V							
Insulation strength	1.8k Vac,1 sec							
Weight – without brake (kg)	0.42	0.5	1.2	1.6	2.1	3.0	2.9	3.8
Weight – with brake (kg)	--	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
Max. power per second (kW/s) (with brake)	--	25.6	21.3	53.8	22.1	48.4	29.3	37.9
Rotor inertia ($\times 10^{-4}$kg.m^2) (with brake)	--	0.04	0.19	0.30	0.73	1.18	1.95	2.67
Mechanical constant (ms) (with brake)	--	0.81	0.85	0.57	0.78	0.65	1.74	1.22
Brake holding torque [Nt-m (min)] *2	--	0.3	1.3	1.3	2.5	2.5	2.5	2.5
Brake power consumption (at 20˚C) [W]	--	7.3	6.5	6.5	8.2	8.2	8.2	8.2
Brake release time [ms (Max)]	--	5	10	10	10	10	10	10

ECMA	C104	C△04	C△06		C△08		C△09	
	0F	01	02	04□S	04	07	07	10
Brake pull-in time [ms (Max)]	--	25	70	70	70	70	70	70
Vibration grade (μm)	15							
Operating temperature (˚C)	0 ℃ ~ 40 ℃							
Storage temperature (˚C)	-10 ℃ ~ 80 ℃							
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 shaft seal installation (or oil seal)							
Approvals	CE c UL us LISTED							

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 / 08：250mm x 250mm x 6mm

ECMA-_ _ 10：300mm x 300mm x 12mm

ECMA-_ _ 13：400mm x 400mm x 20mm

ECMA-_ _ 18：550mm x 550mm x 30mm

Material: Aluminum – F40, F60, F80, F100, 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.

Low Inertia Series

ECMA	C△10		C△13
	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	19.1	28.65
Rated speed (r/min)	3000		3000
Max. speed (r/min)	5000		4500
Rated current (A)	7.30	12.05	17.2
Max. instantaneous current (A)	21.9	36.15	47.5
Max. power per second (kW/s)	38.1	90.6	71.8
Rotor inertia ($\times 10^{-4}$kg.m^2)	2.65	4.45	12.7
Mechanical constant (ms)	0.74	0.61	1.11
Torque constant – KT(N-m/A)	0.44	0.53	0.557
Voltage constant – KE (mV/(r/min))	16.8	19.2	20.98
Armature resistance (Ohm)	0.20	0.13	0.0976
Armature inductance (mH)	1.81	1.50	1.21
Electric constant (ms)	9.30	11.4	12.4
Insulation class	Class A (UL), Class B (CE)		
Insulation resistance	> 100MΩ, DC 500V		
Insulation strength	1.8k Vac,1 sec		
Weight – without brake (kg)	4.3	6.2	7.8
Weight – with brake (kg)	4.7	7.2	9.2
Radial max. loading (N)	490	490	490
Axial max. loading (N)	98	98	98
Max. power per second (kW/s) (with brake)	30.4	82.0	65.1
Rotor inertia ($\times 10^{-4}$kg.m^2) (with brake)	3.33	4.95	14.0
Mechanical constant (ms) (with brake)	0.93	0.66	1.22
Brake holding torque [Nt-m (min)] [*2]	8.0	8.0	10.0
Brake power consumption (at 20˚C) [W]	19.4	19.4	19.0

ECMA	C△10		C△13
	10	20	30
Brake release time [ms (Max)]	10	10	10
Brake pull-in time [ms (Max)]	70	70	70
Vibration grade (μm)	15		
Operating temperature (˚C)	0 ℃ ~ 40 ℃		
Storage temperature (˚C)	-10 ℃ ~ 80 ℃		
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 shaft seal installation (or oil seal) model)		
Approvals	CE c UL US LISTED		

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 / 08：250mm x 250mm x 6mm

ECMA-_ _ 10：300mm x 300mm x 12mm

ECMA-_ _ 13：400mm x 400mm x 20mm

ECMA-_ _ 18：550mm x 550mm x 30mm

Material: Aluminum – F40, F60, F80, F100, 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

ECMA	E△13				E△18			G△13		
	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
Max. power per second (kW/s)	7.0	27.1	45.9	62.5	26.3	37.3	50.8	10.0	39.0	66.0
Rotor inertia ($\times 10^{-4}$kg.m^2)	8.17	8.41	11.18	14.59	34.68	54.95	54.95	8.17	8.41	11.18
Mechanical constant (ms)	1.91	1.51	1.10	0.96	1.62	1.06	1.08	1.84	1.40	1.06
Torque constant – KT(N-m/A)	0.83	0.85	0.87	0.87	0.85	0.89	0.87	1.15	1.19	1.15
Voltage constant – KE (mV/(r/min))	30.9	31.9	31.8	31.8	31.4	32.0	32	42.5	43.8	41.6
Armature resistance (Ohm)	0.57	0.47	0.26	0.174	0.119	0.052	0.052	1.06	0.82	0.43
Armature inductance (mH)	7.39	5.99	4.01	2.76	2.84	1.38	1.38	14.29	11.12	6.97
Electric constant (ms)	12.96	12.88	15.31	15.86	23.87	26.39	26.39	13.55	13.50	16.06
Insulation class	Class A (UL), class B (CE)									
Insulation resistance	> 100MΩ, DC 500V									
Insulation strength	1.8k Vac,1 sec									
Weight – without brake (kg)	6.8	7.0	7.5	7.8	13.5	18.5	18.5	6.8	7.0	7.5
Weight – with brake (kg)	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
Max. power per second (kW/s) (with brake)	6.4	24.9	43.1	59.7	24.1	35.9	48.9	9.2	35.9	62.1
Rotor inertia ($\times 10^{-4}$kg.m^2) (with brake)	8.94	9.14	11.90	15.88	37.86	57.06	57.06	8.94	9.14	11.9
Mechanical constant (ms) (with brake)	2.07	1.64	1.19	1.05	1.77	1.10	1.12	2.0	1.51	1.13
Brake holding torque [Nt-m (min)] *2	10.0	10.0	10.0	10.0	25.0	25.0	10.0	10.0	10.0	10.0
Brake power consumption (at 20˚C) [W]	19.0	19.0	19.0	19.0	20.4	20.4	19.0	19.0	19.0	19.0
Brake release time [ms (Max)]	10	10	10	10	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70	70	70	70	70	70	70
Vibration grade (μm)	15									
Operating temperature (˚C)	0 ℃ ~ 40 ℃									

ECMA	E△13				E△18			G△13		
	05	10	15	20	20	30	35	03	06	09
Storage temperature (˚C)	-10 ℃ ~ 80 ℃									
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 shaft seal installation (or oil seal) model)									
Approvals	CE c UL US LISTED									

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 / 08：250mm x 250mm x 6mm

ECMA-_ _ 10：300mm x 300mm x 12mm

ECMA-_ _ 13：400mm x 400mm x 20mm

ECMA-_ _ 18：550mm x 550mm x 30mm

Material: Aluminum – F40, F60, F80, F100, 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 / High Inertia Series

ECMA	F113	F△13	F113		F△18
	05	08	13	18	30
Rated power (kW)	0.5	0.85	1.3	1.8	3.0
Rated torque (N-m)*1	3.18	5.41	8.34	11.48	19.10
Max. torque (N-m)	8.92	13.8	23.3	28.7	57.29
Rated speed (r/min)	1500				
Max. speed (r/min)	3000				
Rated current (A)	3.9	7.1	12.6	13	19.4
Max. instantaneous current (A)	12.1	19.4	38.6	36	58.2
Max. power per second (kW/s)	9.8	21.52	34.78	52.93	66.4
Rotor inertia ($\times 10^{-4}$kg.m^2)	10.3	13.6	20	24.9	54.95
Mechanical constant (ms)	2.8	2.43	1.62	1.7	1.28
Torque constant - KT (N-m/A)	0.82	0.76	0.66	0.88	0.98
Voltage constant – KE (mV/(r/min))	29.5	29.2	24.2	32.2	35.0
Motor resistance (Ohm)	0.624	0.38	0.124	0.185	0.077
Motor inductance (mH)	7	4.77	1.7	2.6	1.27
Motor constant (ms)	11.22	12.55	13.71	14.05	16.5
Insulation class	Class A (UL), Class B (CE)				
Insulation resistance	> 100MΩ, DC 500V				
Insulation strength	1.8k Vac,1 sec				
Weight – without brake (kg)	6.3	8.6	9.4	10.5	18.5
Weight – with brake (kg)	--	10.0	--	--	22.5
Radial max. loading (N)	490	490	490	490	1470
Axial max. loading (N)	98	98	98	98	490
Max. power per second (kW/s) (with brake)	8.8	19.78	32.66	50.3	63.9
Rotor inertia ($\times 10^{-4}$kg.m^2) (with brake)	11.5	14.8	21.3	26.2	57.06

ECMA	F113	F△13	F113		F△18
	05	08	13	18	30
Mechanical constant (ms) (with brake)	3.12	2.65	1.73	1.79	1.33
Brake holding torque [Nt-m (min)] *2	10	10.0	10.0	10.0	25.0
Brake power consumption (at 20˚C)[W]	19	19.0	19.0	19.0	20.4
Brake release time [ms (Max)]	10	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70	70
Vibration grade (μm)	15				
Operating temperature (℃)	0 ℃~ 40 ℃				
Storage temperature (℃)	-10 ℃ ~ 80 ℃				
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 shaft seal installation (or oil seal) model)				
Approvals*3	CE c UL US LISTED				

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 / 08：250mm x 250mm x 6mm

ECMA-_ _ 10：300mm x 300mm x 12mm

ECMA-_ _ 13：400mm x 400mm x 20mm

ECMA-_ _ 18：550mm x 550mm x 30mm

ECMA-_ _ 22：650mm x 650mm 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.

*3 The application of UL safety compliance for ECMA-F11305, ECMA-F11308, ECMA-F11313, ECMA-F11318 is under processing.

4 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

ECMA	C△06	C△08
	04□H	07□H
Rated power (kW)	0.4	0.75
Rated torque (N-m)*1	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 ($\times 10^{-4}$kg.m^2)	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
Motor resistance (Ohm)	1.55	0.42
Motor inductance (mH)	6.71	3.53
Motor constant (ms)	4.3	8.36
Insulation class	Class A (UL), Class B (CE)	
Insulation resistance	> 100 MΩ, DC 500 V	
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 ($\times 10^{-4}$kg.m^2) (with brake)	0.751	2.96
Mechanical constant (ms) (with brake)	1.43	1.62
Brake holding torque [Nt-m (min)] *2	1.3	1.3

ECMA	C△06	C△08
	04□H	07□H
Brake power consumption (at 20˚C)[W]	6.5	6.5
Brake release time [ms (Max)]	10	10
Brake pull-in time [ms (Max)]	70	70
Vibration grade (μm)	15	
Operating temperature (℃)	0 ℃ ~ 40 ℃	
Storage temperature (℃)	-10 ℃ ~ 80 ℃	
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 shaft seal installation (or oil seal) model)	
Approvals	CE c UL US LISTED	

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 / 08：250mm x 250mm x 6mm

ECMA-_ _ 10：300mm x 300mm x 12mm

ECMA-_ _ 13：400mm x 400mm x 20mm

ECMA-_ _ 18：550mm x 550mm x 30mm

ECMA-_ _ 22：650mm x 650mm 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.

3 If desire to reach the max. torque limit of motor 250%, it is suggest to use the servo drive with higher watt.

5.4 Specifications of Servo Motor (Motor with Magnetic Encoder)

Low Inertia Series

ECMA	C806	C808		C810
	04	04	07	10
Rated power (kW)	0.4	0.4	0.75	1.0
Rated torque (N-m)*1	1.27	1.27	2.39	3.18
Max. torque (N-m)	3.82	3.82	7.16	9.54
Rated speed (r/min)	3000			
Max. speed (r/min)	5000			
Rated current (A)	2.88	2.75	5.40	7.6
Max. instantaneous current (A)	8.20	8.10	14.7	21.1
Max. power per second (kW/s)	58.23	23.72	50.55	38.16
Rotor inertia ($\times 10^{-4}$kg.m^2)	0.277	0.68	1.13	2.65
Mechanical constant (ms)	0.59	0.77	0.66	0.79
Torque constant - KT (N-m/A)	0.44	0.46	0.44	0.42
Voltage constant – KE (mV/(r/min))	17.4	18.5	17.2	16.8
Motor resistance (Ohm)	1.55	0.93	0.42	0.2
Motor inductance (mH)	6.71	7.39	3.53	1.81
Motor constant (ms)	4.33	7.96	8.36	9.05
Insulation class	Class A (UL), Class B (CE)			
Insulation resistance	> 100 MΩ, DC 500 V			
Insulation strength	1.8k Vac,1 sec			
Weight – without brake (kg)	1.6	2.1	3.0	4.3
Radial max. loading (N)	196	245	245	490
Axial max. loading (N)	68	98	98	98
Vibration grade (μm)	15			
Operating temperature (℃)	0 ℃ ~ 40 ℃			
Storage temperature (℃)	-10 ℃ ~ 80 ℃			
Operating humidity	20 ~ 90 % RH (non-condensing)			
Storage humidity	20 ~ 90 % RH (non-condensing)			
Vibration capacity	2.5G			

ECMA	C806	C808		C810
	04	04	07	10
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)			
Approvals	CE			

Medium / High Inertia Series

ECMA	E813		E818	
	15	20	20	30
Rated power (kW)	1.5	2.0	2.0	3.0
Rated torque (N-m)*1	7.16	9.55	9.55	14.32
Max. torque (N-m)	21.48	28.65	28.65	42.97
Rated speed (r/min)	2000			
Max. speed (r/min)	3000			
Rated current (A)	8.61	11.39	11.61	16.66
Max. instantaneous current (A)	24.9	33.1	33.7	48.3
Max. power per second (kW/s)	45.89	62.5	26.3	37.3
Rotor inertia ($\times 10^{-4}$kg.m^2)	11.18	14.59	34.68	54.95
Mechanical constant (ms)	1.16	0.96	1.62	1.06
Torque constant - KT (N-m/A)	0.83	0.84	0.82	0.86
Voltage constant – KE (mV/(r/min))	31.8	31.8	31.4	32.0
Motor resistance (Ohm)	0.26	0.174	0.119	0.052
Motor inductance (mH)	4.01	2.76	2.84	1.38
Motor constant (ms)	15.31	15.86	23.87	26.39
Insulation class	Class A (UL), Class B (CE)			
Insulation resistance	> 100 MΩ, DC 500 V			
Insulation strength	1.8k Vac,1 sec			
Weight (kg)	7.5	7.8	13.5	18.5
Radial max. loading (N)	490	490	1176	1470
Axial max. loading (N)	98	98	490	490
Vibration grade (μm)	15			
Operating temperature (℃)	0 ℃ ~ 40 ℃			

ECMA	E813		E818	
	15	20	20	30
Storage temperature (℃)	-10 ℃ ~ 80 ℃			
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 shaft seal installation (or oil seal) model)			
Approvals	CE			

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-_ _ 06 / 08：250mm x 250mm x 6mm

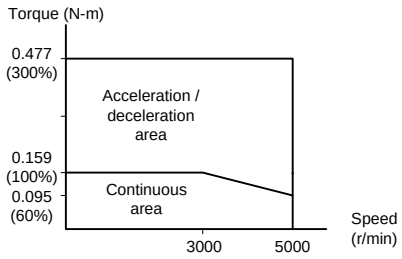
ECMA-_ _ 10：300mm x 300mm x 12mm

ECMA-_ _ 13：400mm x 400mm x 20mm

ECMA-_ _ 18：550mm x 550mm x 30mm

Material: Aluminum – F60, F80, F100, F130, F180

5.5 Torque Features (T-N Curve)



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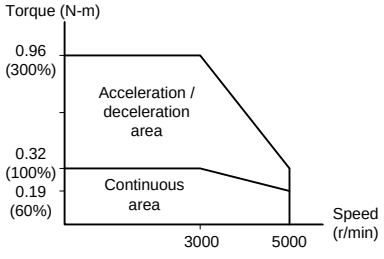

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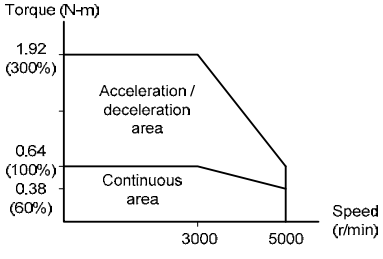

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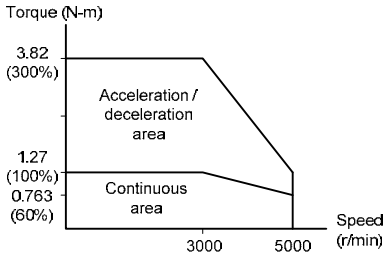
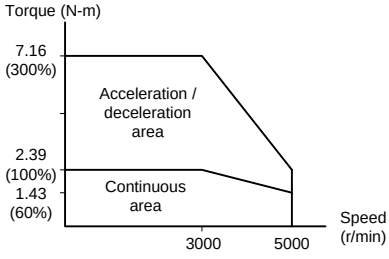


ECMA-C10604□S, ECMA-C10604□H

ECMA-C10804□7



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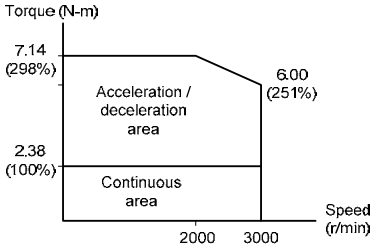

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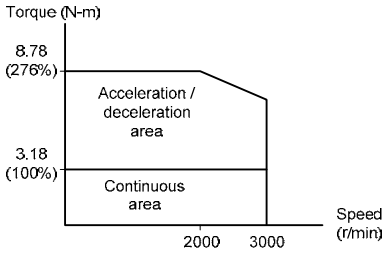

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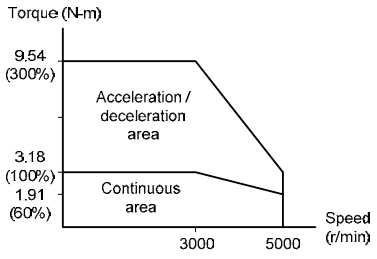

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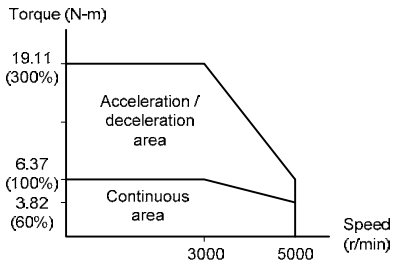

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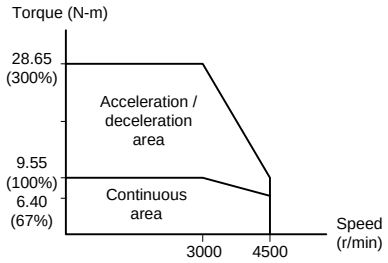
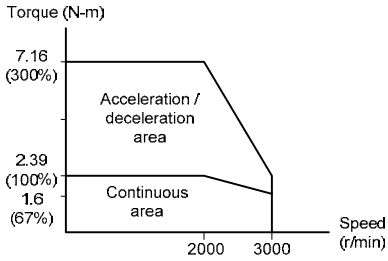


ECMA-C11330□4



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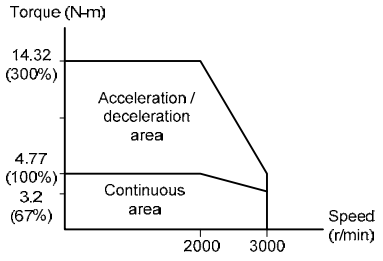

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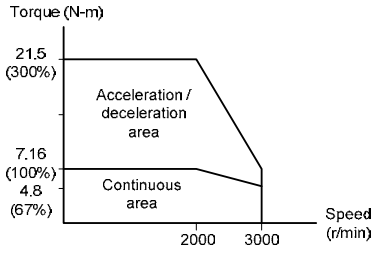

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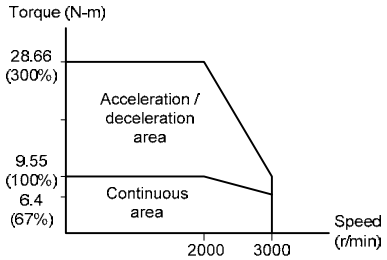

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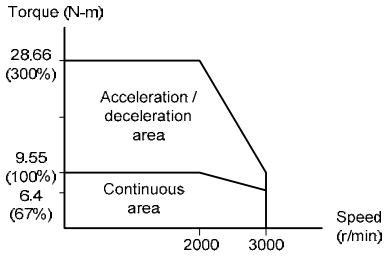

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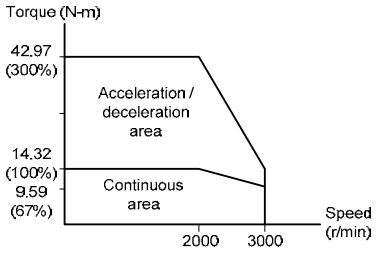

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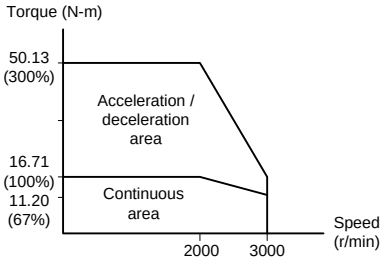

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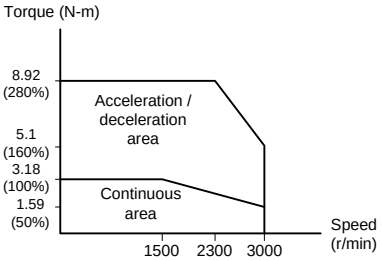

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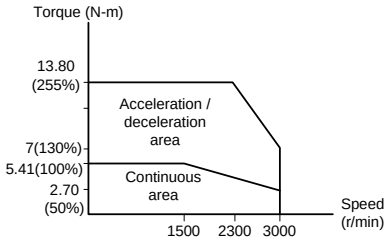

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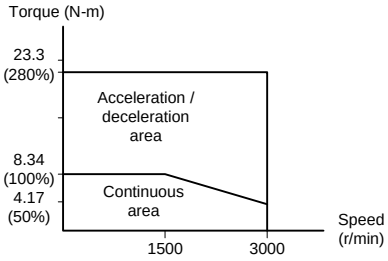

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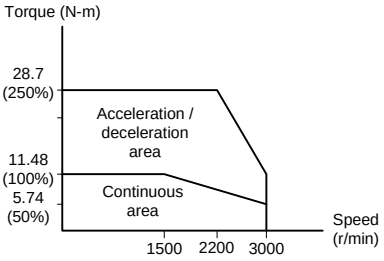

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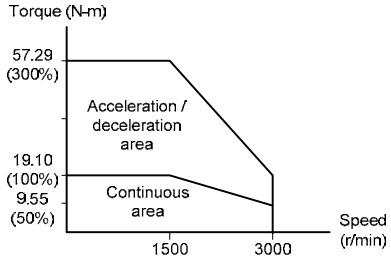

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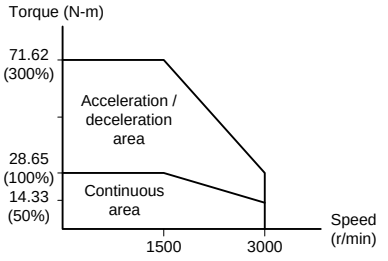

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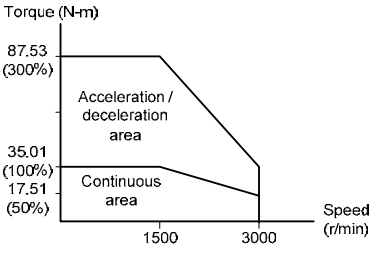

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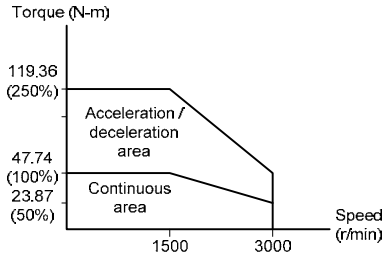

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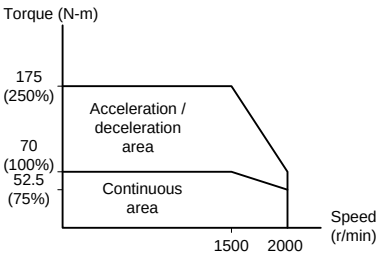

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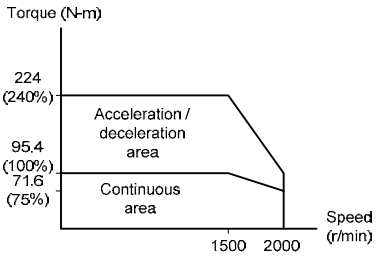

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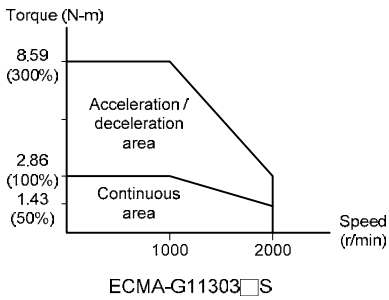

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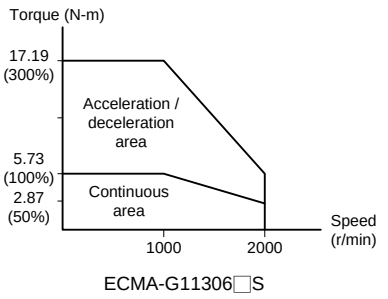

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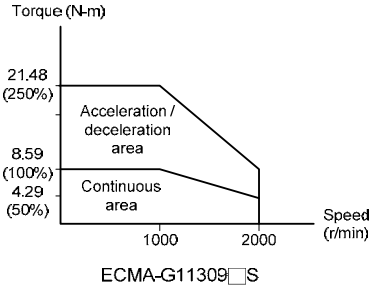

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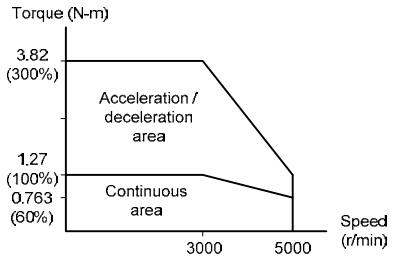
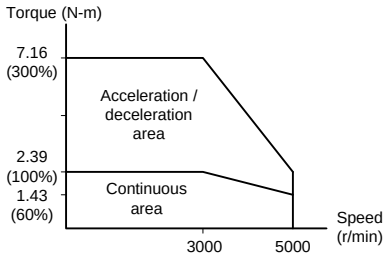


ECMA-C80604RS
ECMA-C80804R7



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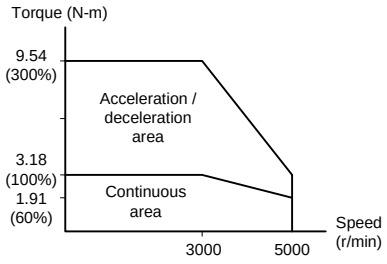
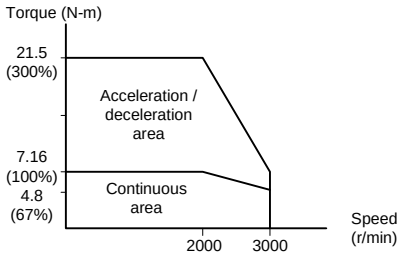


ECMA-C81010RS



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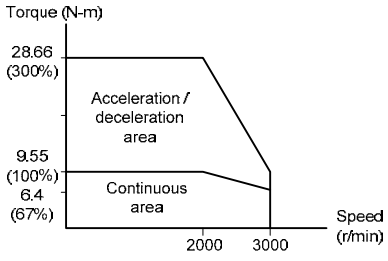
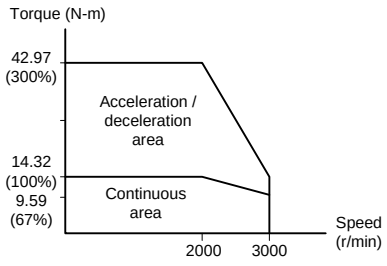


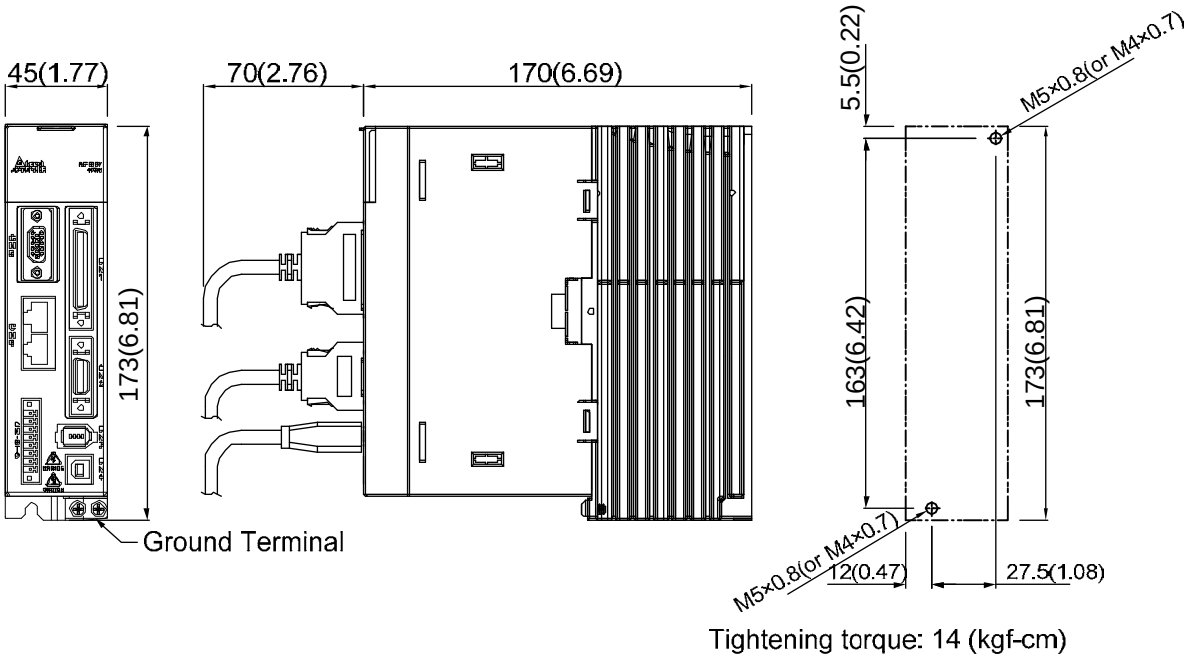
ECMA-E81320RS
ECMA-E81820RS



ECMA-E81830RS

5.6 Dimensions of the Servo Drive

ASD-A2R-0121; ASD-A2R-0221; ASD-A2R-0421 (100 W ~ 400 W)

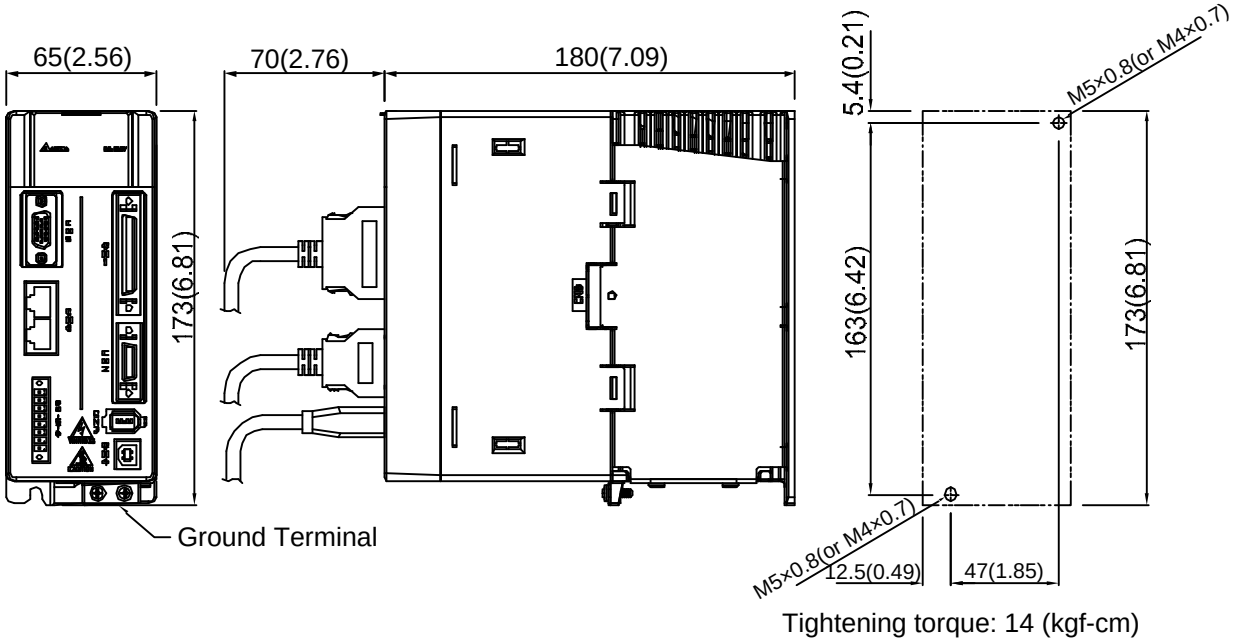


Weight	1.5 (3.3)

NOTE

1) Dimensions are in millimeters (inches); Weights are in kilograms (pounds).
2) Dimensions and weights might be revised without prior notice.

ASD-A2R-0721; ASD-A2R-1021; ASD-A2R-1521 (750 W ~ 1.5 kW)



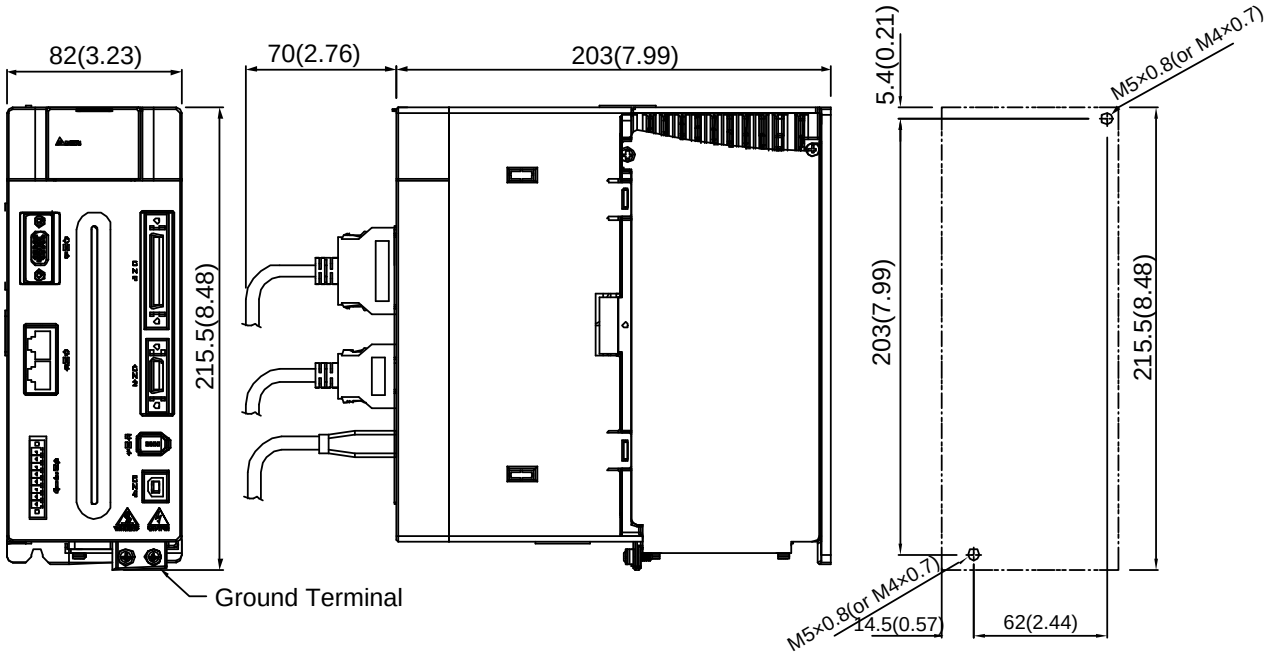
Tightening torque: 14 (kgf-cm)

Weight	2.0 (4.4)

NOTE

1) Dimensions are in millimeters (inches); Weights are in kilograms (pounds).
2) Dimensions and weights might be revised without prior notice.

ASD-A2R-2023; ASD-A2R-3023 (2 kW ~ 3 kW)



Tightening torque: 14 (kgf-cm)

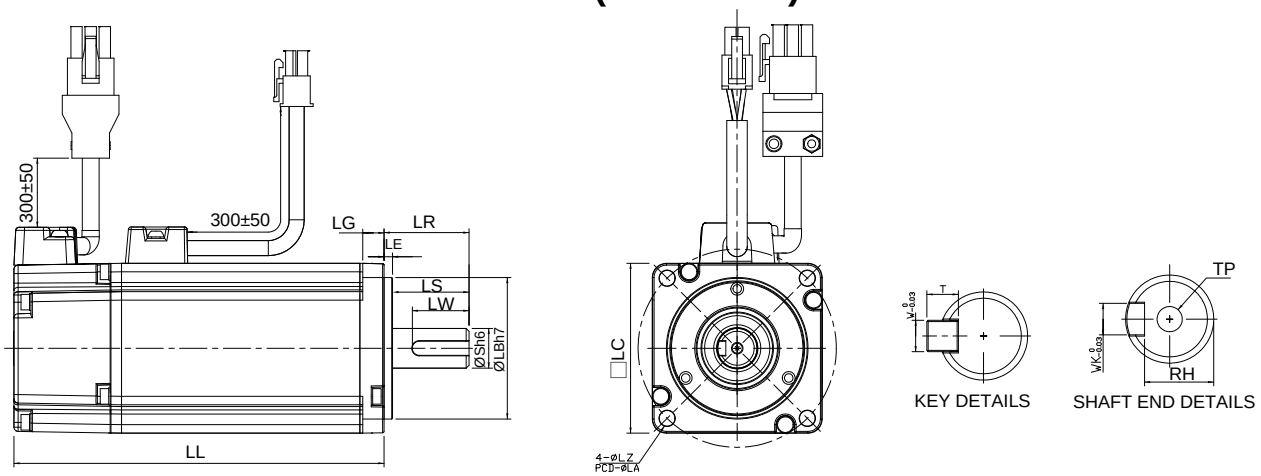
Weight	2.89 (6.36)

NOTE

1) Dimensions are in millimeters (inches); Weights are in kilograms (pounds).
2) Dimensions and weights might be revised without prior notice.

5.7 Dimensions of Permanent Magnetic Synchronous Rotary Motor

Motor frame size: 86 or below (Units: mm)

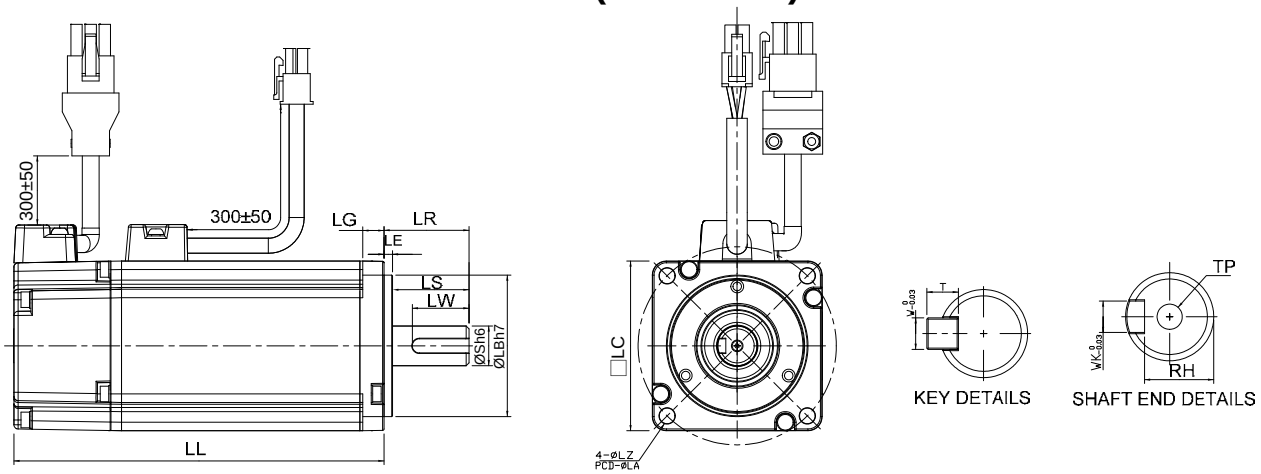


Model	C1040F□S	C△0401□S	C△0602□S	C△0604□S	C△0604□H
LC	40	40	60	60	60
LZ	4.5	4.5	5.5	5.5	5.5
LA	46	46	70	70	70
S	$8(^{+0}_{-0.009})$	$8(^{+0}_{-0.009})$	$14(^{+0}_{-0.011})$	$14(^{+0}_{-0.011})$	$14(^{+0}_{-0.011})$
LB	$30(^{+0}_{-0.021})$	$30(^{+0}_{-0.021})$	$50(^{+0}_{-0.025})$	$50(^{+0}_{-0.025})$	$50(^{+0}_{-0.025})$
LL (without brake)	79.1	100.6	105.5	130.7	145.8
LL (with brake)	--	136.6	141.6	166.8	176.37
LS	20	20	27	27	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
W	3	3	5	5	5
T	3	3	5	5	5
TP	--	M3 Depth 8	M4 Depth 15	M4 Depth 15	M4 Depth 15

NOTE

1) Dimensions are in millimeters.
2) Dimensions and weights might be revised without prior notice.
3) Box, (□) represents the shaft end/ brake or the number of oil seal.
4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

Motor frame size: 86 or below (Units: mm)

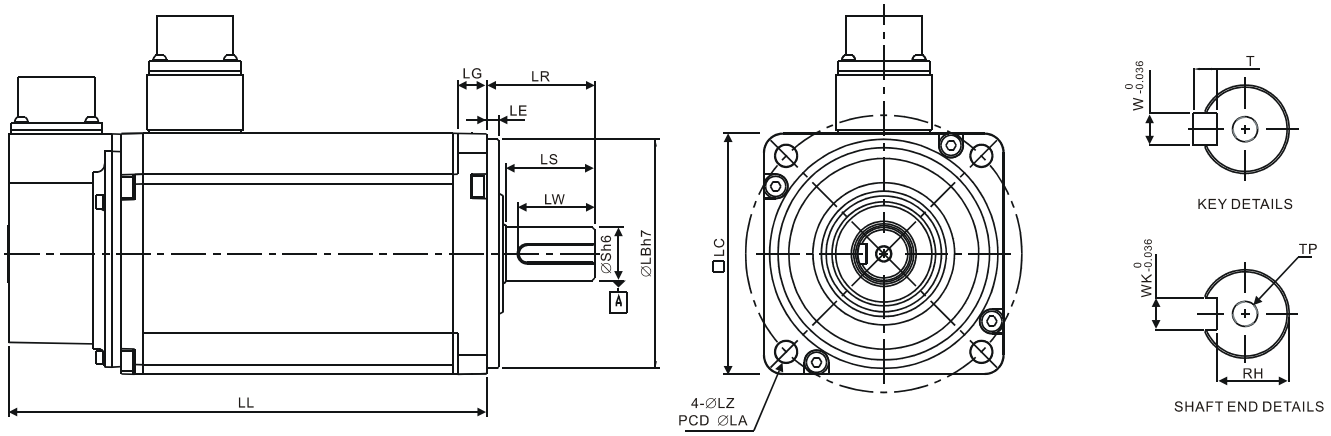


Model	C△0804□7	C△0807□S	C△0807□H	C△0907□S	C△0910□S
LC	80	80	80	86	86
LZ	6.6	6.6	6.6	6.6	6.6
LA	90	90	90	100	100
S	$14(^{+0}_{-0.011})$	$19(^{+0}_{-0.013})$	$19(^{+0}_{-0.013})$	$16(^{+0}_{-0.011})$	$16(^{+0}_{-0.011})$
LB	$70(^{+0}_{-0.030})$	$70(^{+0}_{-0.030})$	$70(^{+0}_{-0.030})$	$80(^{+0}_{-0.030})$	$80(^{+0}_{-0.030})$
LL (without brake)	112.3	138.3	151.1	130.2	153.2
LL (with brake)	152.8	178	189	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
T	5	6	6	5	5
TP	M4 Depth 15	M6 Depth 20	M6 Depth 20	M5 Depth 15	M5 Depth 15

NOTE

1) Dimensions are in millimeters.
2) Dimensions and weights might be revised without prior notice.
3) Box, (□) represents the shaft end/ brake or the number of oil seal.
4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

Motor frame size: 100 ~ 130 (Units: mm)

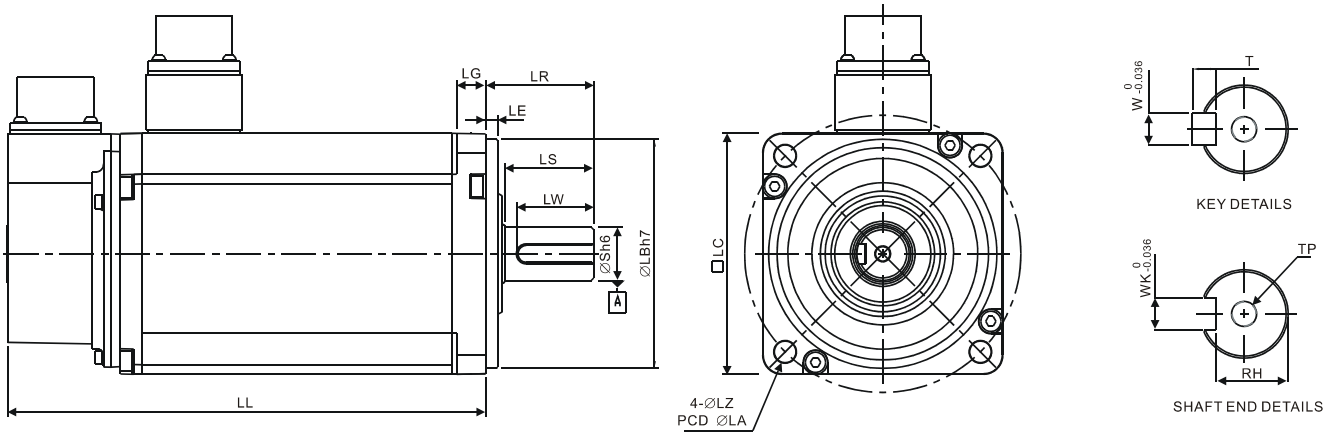


Model	C△1010□S	C△1020□S	C△1330□4	E△1305□S	E△1310□S	E△1315□S	E△1320□S
LC	100	100	130	130	130	130	130
LZ	9	9	9	9	9	9	9
LA	115	115	145	145	145	145	145
S	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$24(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$
LB	$95(^{+0}_{-0.035})$	$95(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$
LL (without brake)	153.3	199	187.5	147.5	147.5	167.5	187.5
LL (with brake)	192.5	226	216.0	183.5	183.5	202	216
LS	37	37	47	47	47	47	47
LR	45	45	55	55	55	55	55
LE	5	5	6	6	6	6	6
LG	12	12	11.5	11.5	11.5	11.5	11.5
LW	32	32	36	36	36	36	36
RH	18	18	20	18	18	18	18
WK	8	8	8	8	8	8	8
W	8	8	8	8	8	8	8
T	7	7	7	7	7	7	7
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20

NOTE

1) Dimensions are in millimeters.
2) Dimensions and weights might be revised without prior notice.
3) Box, (□) represents the shaft end/ brake or the number of oil seal.
4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

Motor frame size: 100 ~ 130 (Units: mm)

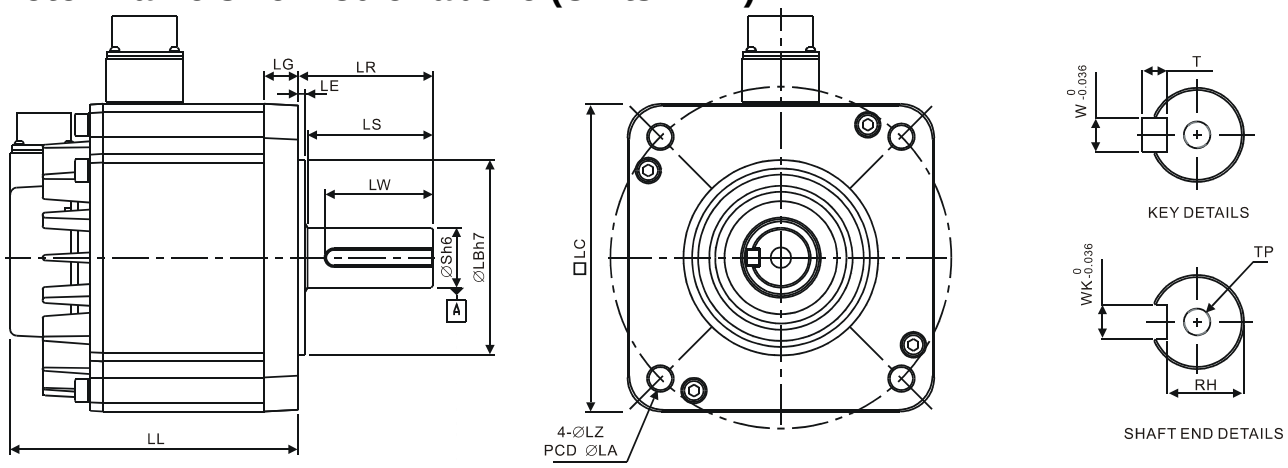


Model	F11305□S	F△1308□S	F11313□S	F11318□S	G△1303□S	G△1306□S	G△1309□S
LC	130	130	130	130	130	130	130
LZ	9	9	9	9	9	9	9
LA	145	145	145	145	145	145	145
S	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$
LB	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$
LL (without brake)	139.5	152.5	187.5	202	147.5	147.5	163.5
LL (with brake)	168	181	--	--	183.5	183.5	198
LS	47	47	47	47	47	47	47
LR	55	55	55	55	55	55	55
LE	6	6	6	6	6	6	6
LG	11.5	11.5	11.5	11.5	11.5	11.5	11.5
LW	36	36	36	36	36	36	36
RH	18	18	18	18	18	18	18
WK	8	8	8	8	8	8	8
W	8	8	8	8	8	8	8
T	7	7	7	7	7	7	7
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20

NOTE

1) Dimensions are in millimeters.
2) Dimensions and weights might be revised without prior notice.
3) Box, (□) represents the shaft end/ brake or the number of oil seal.
4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

Motor frame size: 180 or above (Units: mm)



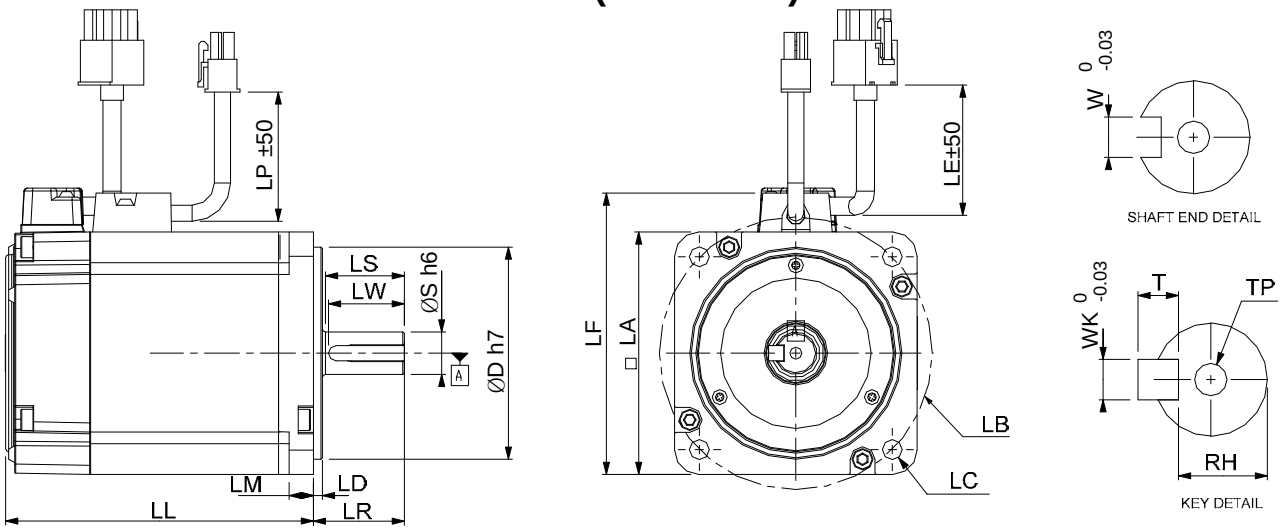
Model	E△1820□S	E△1830□S	E△1835□S	F△1830□S
LC	180	180	180	180
LZ	13.5	13.5	13.5	13.5
LA	200	200	200	200
S	$35(^{+0}_{-0.016})$	$35(^{+0}_{-0.016})$	$35(^{+0}_{-0.016})$	$35(^{+0}_{-0.016})$
LB	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$
LL (without brake)	169	202.1	202.1	202.1
LL (with brake)	203.1	235.3	235.3	235.3
LS	73	73	73	73
LR	79	79	79	79
LE	4	4	4	4
LG	20	20	20	20
LW	63	63	63	63
RH	30	30	30	30
WK	10	10	10	10
W	10	10	10	10
T	8	8	8	8
TP	M12 Depth 25	M12 Depth 25	M12 Depth 25	M12 Depth 25

NOTE

1) Dimensions are in millimeters.
2) Dimensions and weights might be revised without prior notice.
3) Box, (□) represents the shaft end/ brake or the number of oil seal.
4) The boxes (△) in the model names are for encoder resolution types (△=1: Incremental encoder, 20-bit; △=2: Incremental encoder, 17-bit).

5.8 Dimensions of Motor with Magnetic Encoder

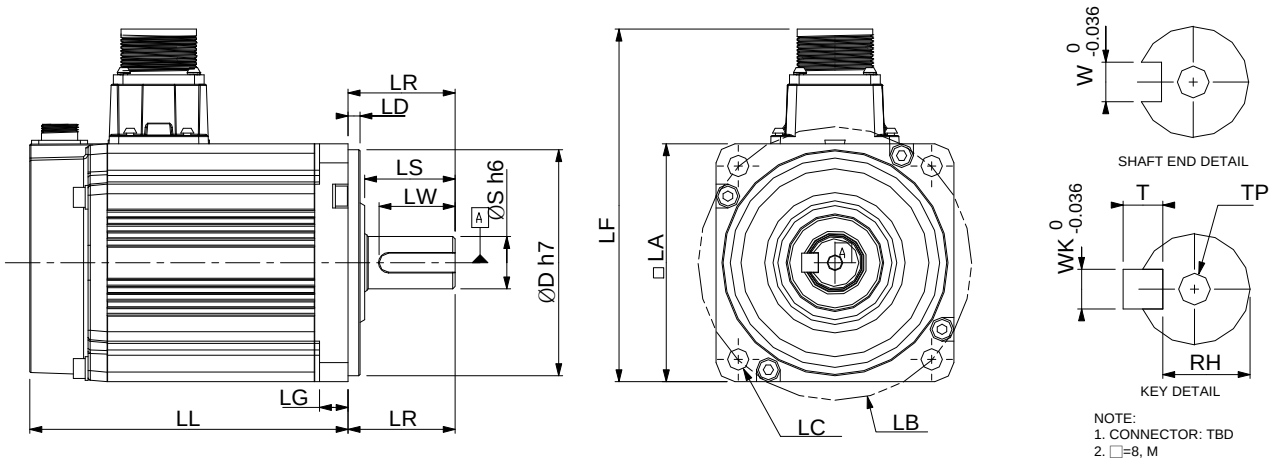
Motor frame size: 86 or below (Units: mm)



Model	C80604RS	C80804R7	C80807RS
LA	60	80	80
LC	5.5	6.6	6.6
LB	70	90	90
S	$14(^{+0}_{-0.011})$	$14(^{+0}_{-0.011})$	$19(^{+0}_{-0.013})$
D	$50(^{+0}_{-0.025})$	$70(^{+0}_{-0.030})$	$70(^{+0}_{-0.030})$
LL	120.2	101.5	127.5
LS	27	27	31
LR	30	30	35
LD	3	3	3
LM	7.5	8	8
LW	20	20	25
RH	11	11	15.5
WK	5	5	6
W	5	5	6
T	5	5	6
TP	M4 Depth 15	M4 Depth 15	M6 Depth 20

NOTE
1) Dimensions are in millimeters.
2) Dimensions and weights might be revised without prior notice.

Motor frame size: 100 ~ 130 (Units: mm)



Model	E81010RS	E81315RS	E81320RS	E81820RS	E81830RS
LA	100	130	130	180	180
LC	9	9	9	13.5	13.5
LB	115	145	145	200	200
S	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$22(^{+0}_{-0.013})$	$35(^{+0}_{-0.016})$	$35(^{+0}_{-0.016})$
D	$95(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$110(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$	$114.3(^{+0}_{-0.035})$
LL	134	143	163	148	181
LS	37	47	47	73	73
LR	45	55	55	79	79
LD	5	6	6	4	4
LG	12	11.5	11.5	20	20
LW	32	36	36	63	63
RH	18	18	18	30	30
WK	8	8	8	10	10
W	8	8	8	10	10
T	7	7	7	8	8
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M12 Depth 25	M12 Depth 25

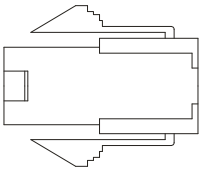
NOTE

1) Dimensions are in millimeters.
2) Dimensions and weights might be revised without prior notice.

Chapter 6 Accessories

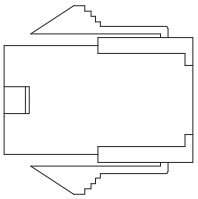
■ Power Connector

Delta Part Number: **ASDBCAPW0000**



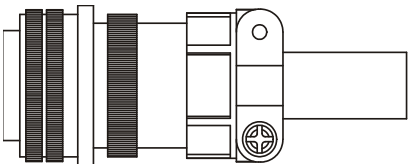
Title	Part No.	Manufacturer
Housing	C4201H00-2*2PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: **ASDBCAPW0100**



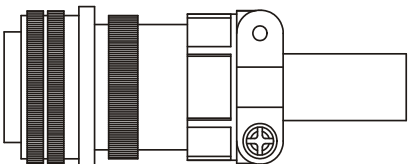
Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: **ASD-CAPW1000**



3106A-20-18S

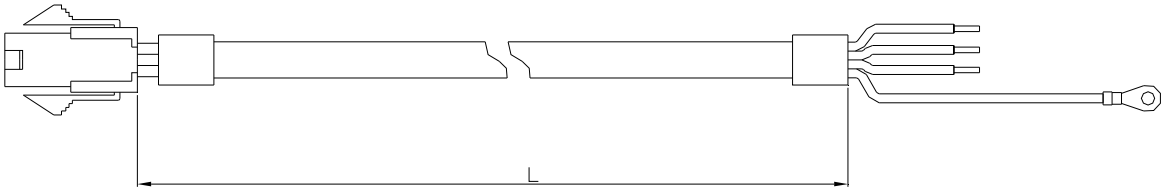
Delta Part Number: **ASD-CAPW2000**



3106A-24-11S

■ Power Cable

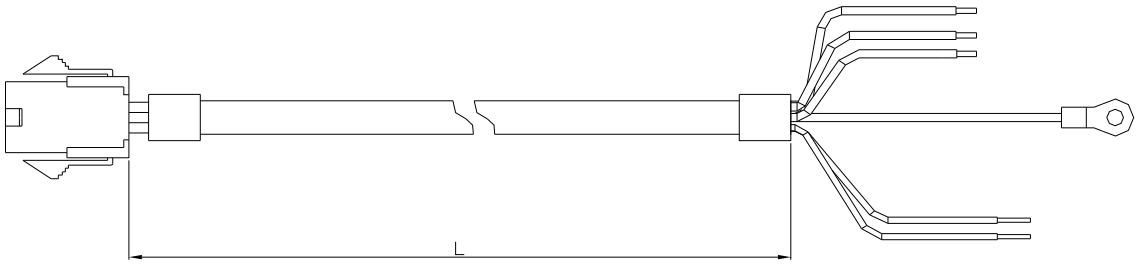
Delta Part Number: **ASD-ABPW0003, ASD-ABPW0005**



Title	Part No.	Manufacturer
Housing	C4201H00-2*2PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Title	Part No.	L	
		mm	inch
1	ASD-ABPW0003	3000 ± 100	118 ± 4
2	ASD-ABPW0005	5000 ± 100	197 ± 4

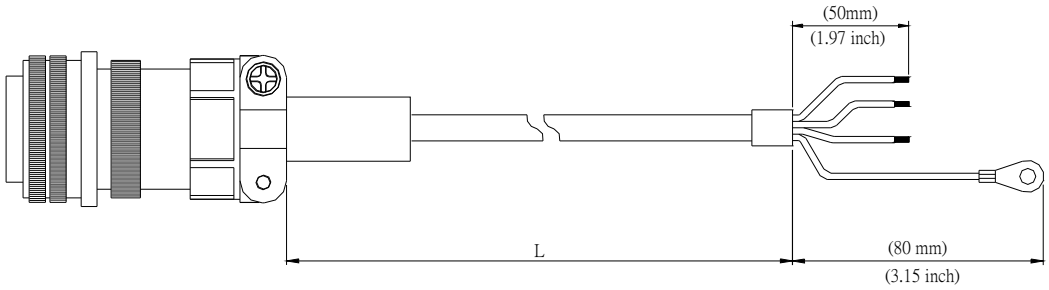
Delta Part Number: **ASD-ABPW0103, ASD-ABPW0105**



Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

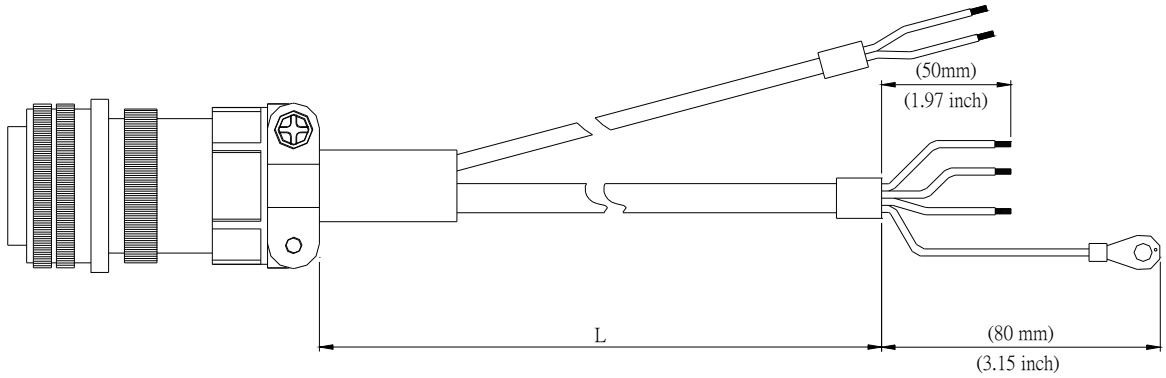
Title	Part No.	L	
		mm	inch
1	ASD-ABPW0103	3000 ± 100	118 ± 4
2	ASD-ABPW0105	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAPW1003, ASD-CAPW1005**



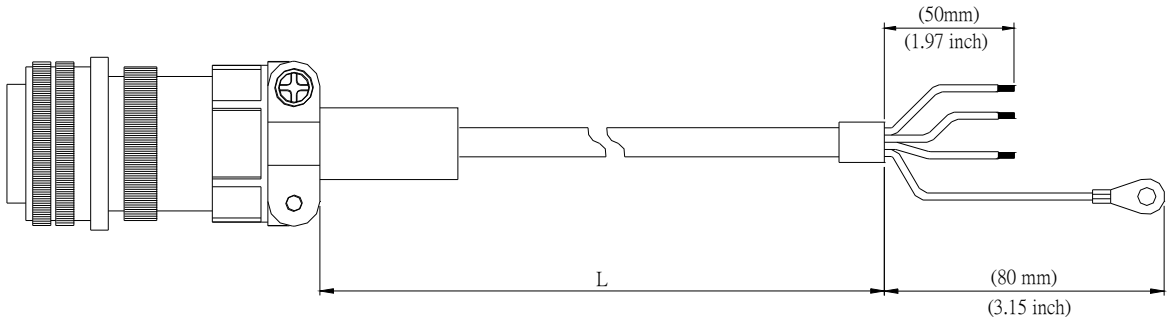
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1003	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-CAPW1005	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAPW1103, ASD-CAPW1105**



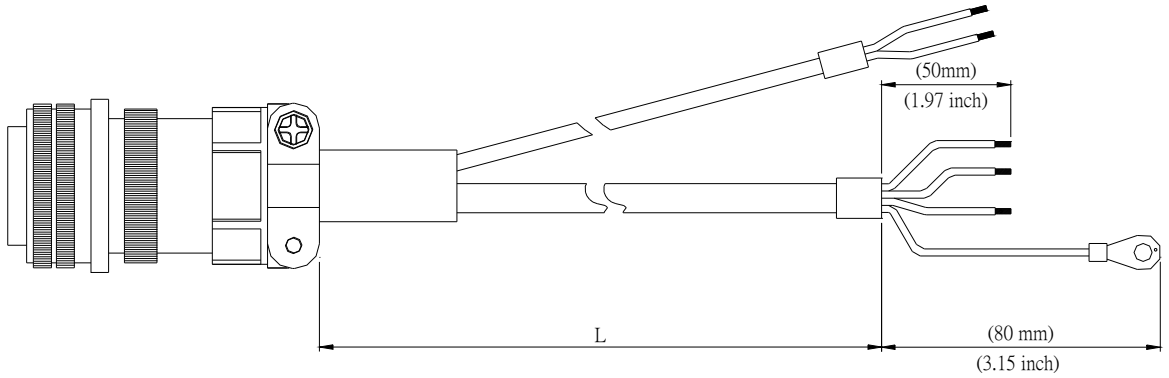
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1103	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-CAPW1105	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-A2PW1003, ASD-A2PW1005**



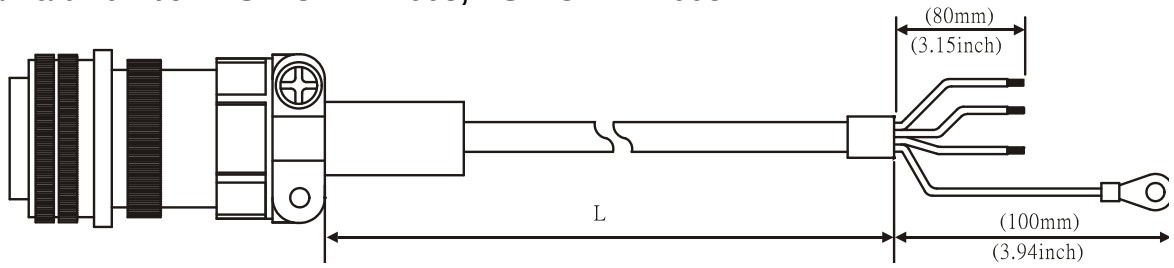
Title	Part No.	Straight	L	
			mm	inch
1	ASD-A2PW1003	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-A2PW1005	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-A2PW1103, ASD-A2PW1105**



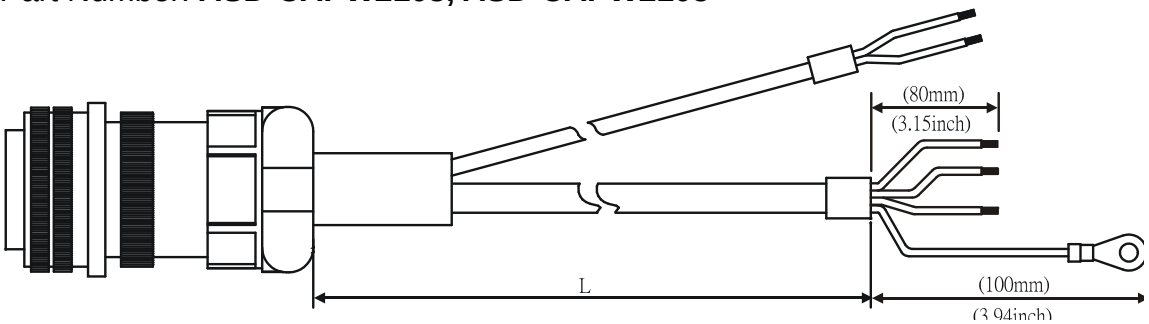
Title	Part No.	Straight	L	
			mm	inch
1	ASD-A2PW1103	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-A2PW1105	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAPW2003, ASD-CAPW2005**



Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2003	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2005	3106A-24-11S	5000 ± 100	197 ± 4

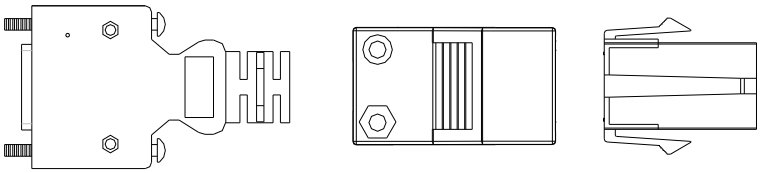
Delta Part Number: **ASD-CAPW2103, ASD-CAPW2105**



Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2103	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2105	3106A-24-11S	5000 ±100	197 ± 4

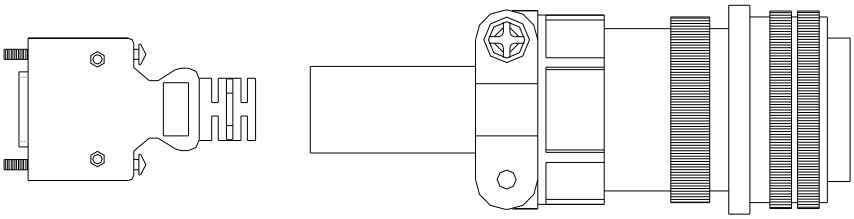
■ Encoder Connector

Delta Part Number: **ASD-ABEN0000**



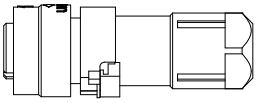
Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Delta Part Number: **ASD-CAEN1000**

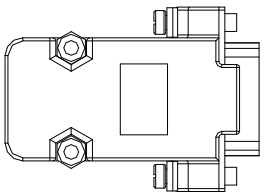


Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Delta Part Number: **MEC-TJ1D10S**

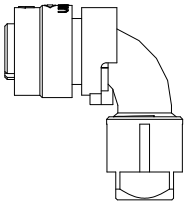


MOTOR SIDE

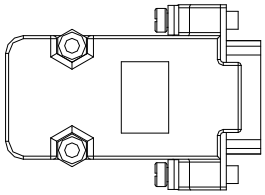


DRIVE SIDE

Delta Part Number: **MEC-TJ1F10S**



MOTOR SIDE

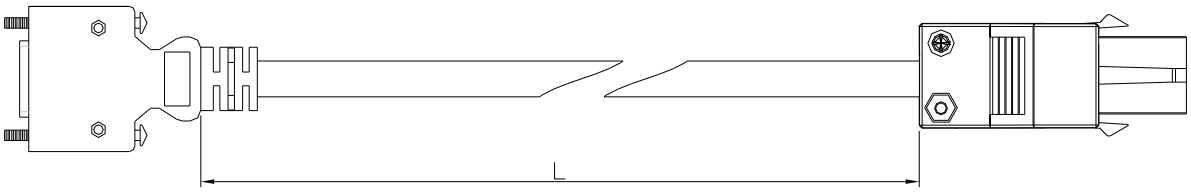


DRIVE SIDE

Title		Part No.
MOTOR SIDE	MEC-TJ1D10S	JN1DS10SL1
	MEC-TJ1F10S	JN1FS10SL1
DRIVE SIDE	PLUG	D-SUB 15P PLUG, P/N: 3074045987
	SHELL	3050594043

■ Encoder Cable (Incremental Type)

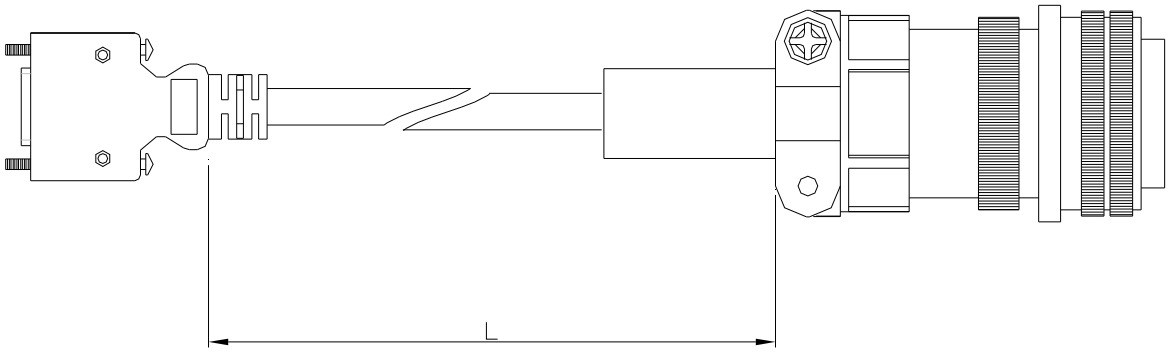
Delta Part Number: **ASD-ABEN0003, ASD-ABEN0005**



Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	L	
		mm	inch
1	ASD-ABEN0003	3000 ± 100	118 ±4
2	ASD-ABEN0005	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAEN1003, ASD-CAEN1005**

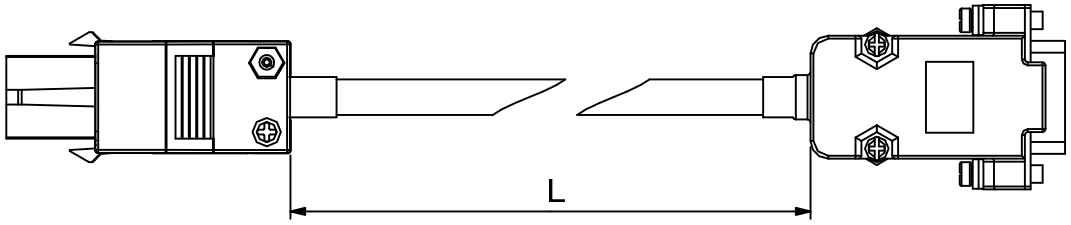


Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAEN1003	3106A-20-29S	3000 ± 100	118 ± 4
2	ASD-CAEN1005	3106A-20-29S	5000 ± 100	197 ± 4

■ Encoder Cable (Magnetic Encoder)

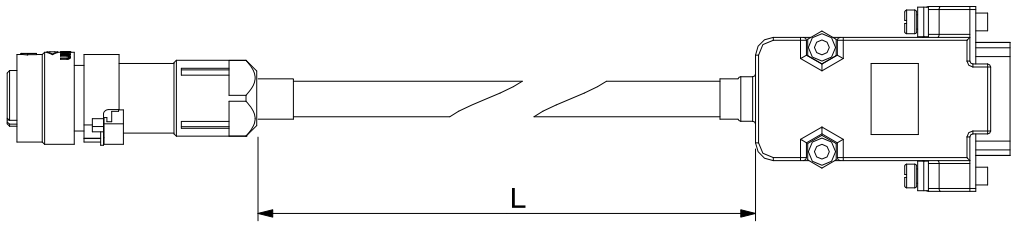
Delta Part Number: **MEC-SM3026P**



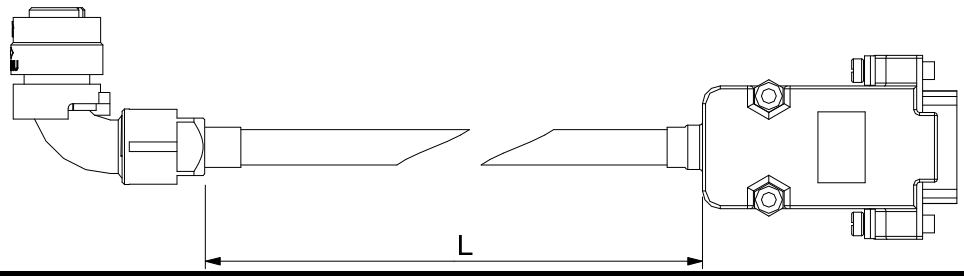
Title		Part No.
MOTOR SIDE	Housing	AMP (1-172161-9)
	Terminal	AMP (170359-3)
	CLAMP	DELTA (34703237XX)
DRIVE SIDE	PLUG	D-SUB 15P PLUG, P/N: 3074045987
	SHELL	3050594043

Part No.	L	
	mm	inch
MEC-SM3026P	3000 ± 100	118 ±4

Delta Part Number: **MEC-SM3026J**



Delta Part Number: **MEC-SM3026R**

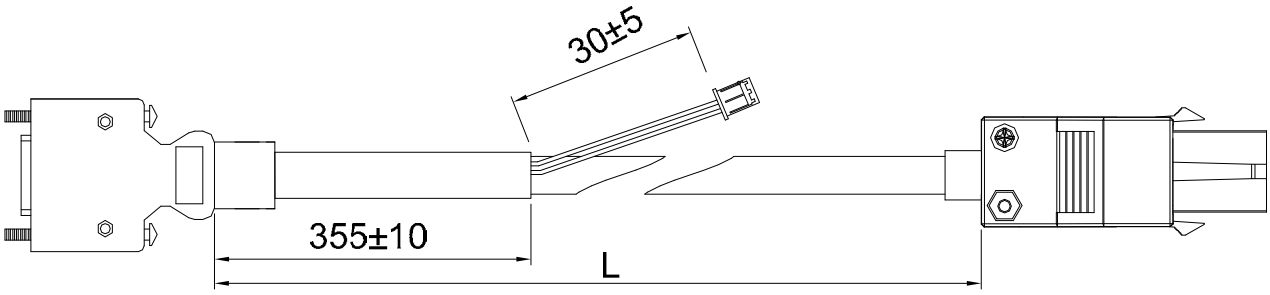


Title		Part No.
MOTOR SIDE	MEC-SM3026J	JN1DS10SL1
	MEC-SM3026R	JN1FS10SL1
DRIVE SIDE	PLUG	D-SUB 15P PLUG, P/N: 3074045987
	SHELL	3050594043

Part No.	L	
	mm	inch
MEC-SM3026J	3000 ± 100	118 ±4

■ Encoder Cable (Absolute Type)

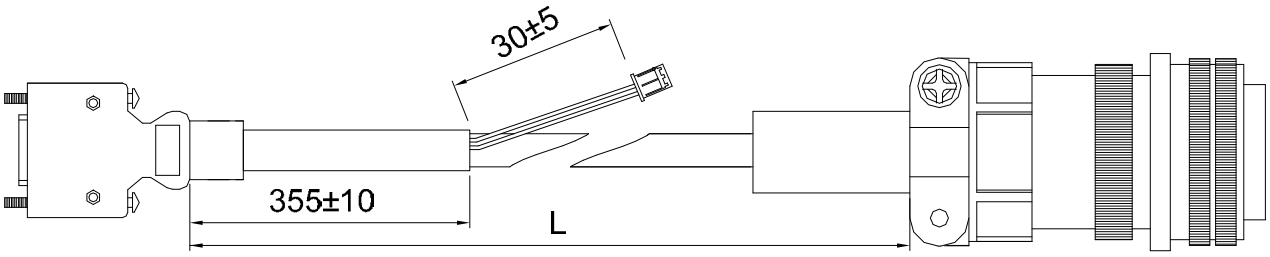
Delta Part Number: **ASD-A2EB0003, ASD-A2EB0005**



Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Model Name	L	
		mm	inch
1	ASD-A2EB0003	3000 ± 100	118 ± 4
2	ASD-A2EB0005	5000 ± 100	197 ± 4

Delta Part Number: **ASD-A2EB1003, ASD-A2EB1005**

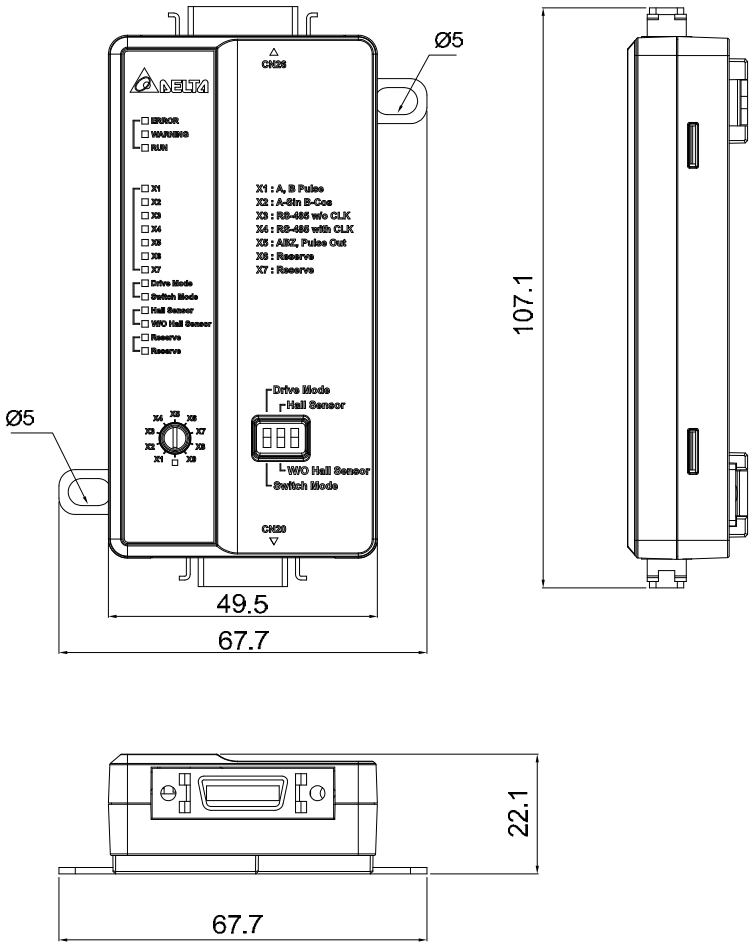


Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Model Name	L	
		mm	inch
1	ASD-A2EB1003	3000 ± 100	118 ± 4
2	ASD-A2EB1005	5000 ± 100	197 ± 4

■ Signal Converter Box

Delta Part Number: **ASD-IF-EN0A20**



■ SCSI 26 pin Connector

Delta Part Number: **ASD-CNSC0026**

Title	Part No.	Vender Part No.	Manufacturer
Housing	305059030L	10326-52A0-008	3M
Terminal	307740120L	10126-3000PE	3M

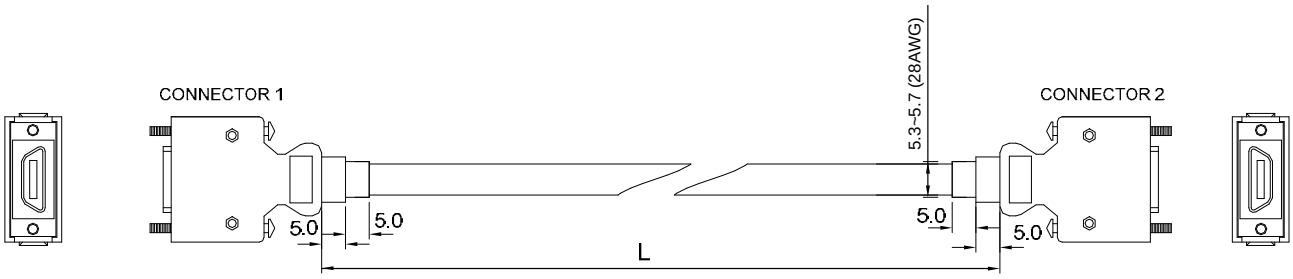
■ SCSI 20 pin Connector

Delta Part Number: **ASD-CNSC0020**

Title	Part No.	Vender Part No.	Manufacturer
Housing	305059010L	10320-52A0-008	3M
Terminal	307740110L	10120-3000PE	3M

■ Cable of Signal Converter Box

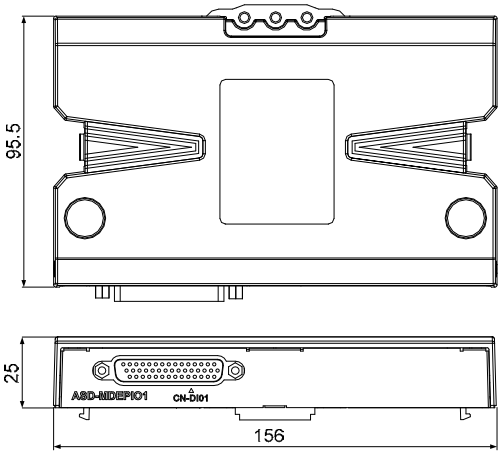
Delta Part Number: **ASD-CASC2003 , ASD-CASC2005**



Title	Part No.	mm² (AWG)	Type	L	
				mm	inch
1	ASD-CASC2003	5.3~5.7(28AWG)	UL2464	3000 ± 100	118 ± 4
2	ASD-CASC2005	5.3~5.7(28AWG)	UL2464	5000 ± 100	197 ± 4

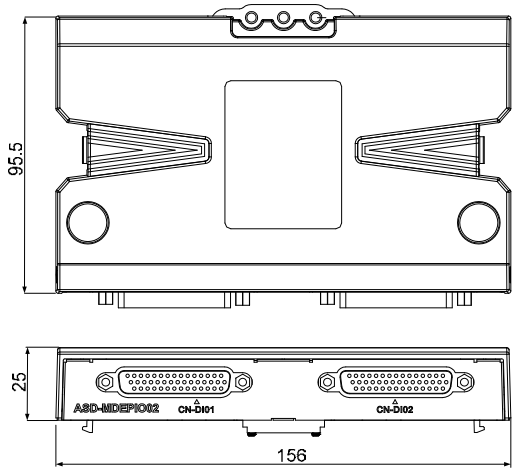
■ ASD-MDEPIO01, ASD-MDEPIO02 DI/DO Extension Module

Delta Part Number: **ASD-MDEPIO01**



Unit: mm

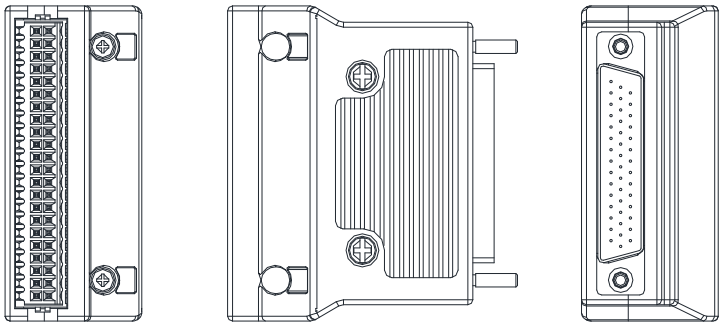
Delta Part Number: **ASD-MDEPIO02**



Unit: mm

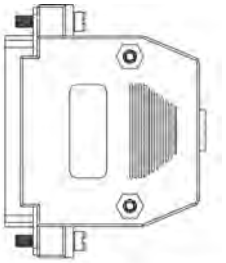
■ DI/O Quick Connector

Delta Part Number: **ASD-IF-DS440T**



■ DI/O Connector

Delta Part Number: **ASDBCNDS0044**

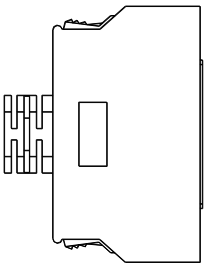


D-SUB 44 PIN PLUG

■ I/O Terminal Connector

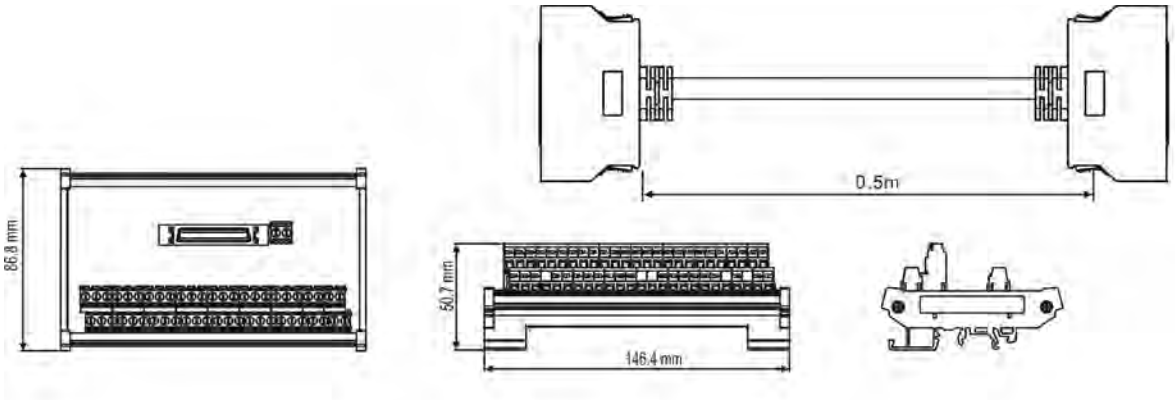
Delta Part Number: **ASD-CNSC0050**

Vendor Name	Vendor P/N
3M TAIWAN LTD	10150-3000PE
3M TAIWAN LTD	10350-52A0-008



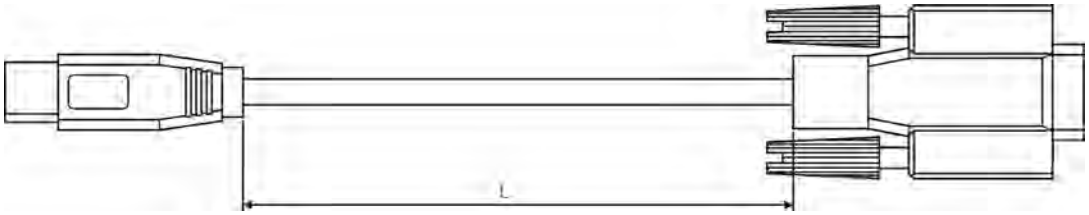
■ Terminal Block Module

Delta Part Number: **ASD-BM-50A**



■ RS-232 Communication Cable

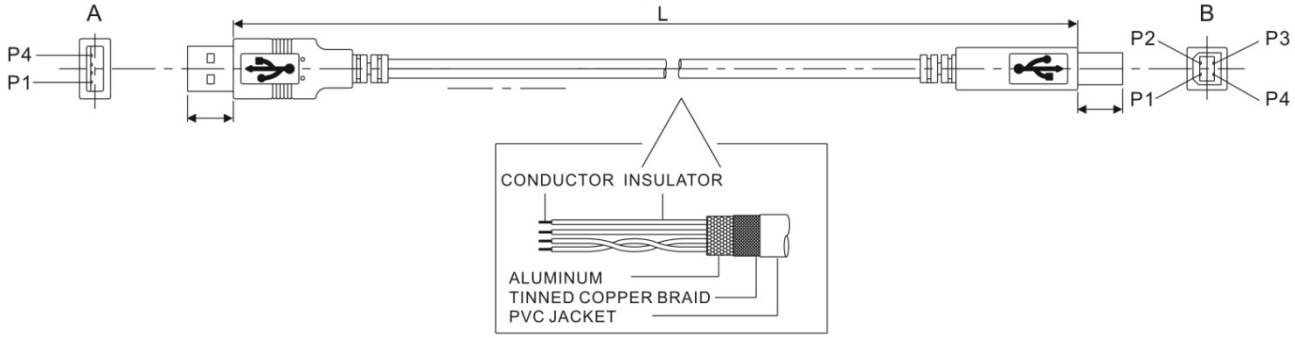
Delta Part Number: **ASD-CARS0003**



Title	Part No.	L	
		mm	inch
1	ASD-CARS0003	3000 ± 100	118 ±4

■ Software Communication Cable

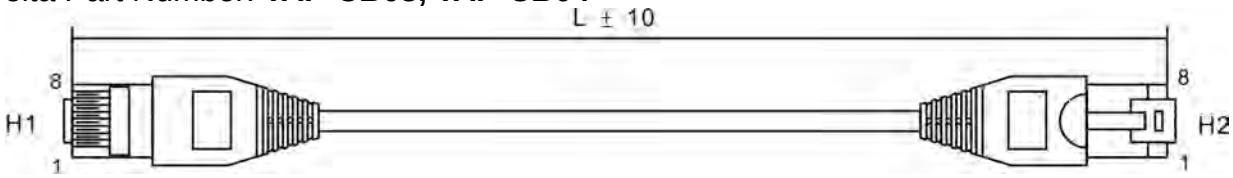
Delta Part Number: **DOP-CAUSBAB**



Title	Part No.	L	
		mm	inch
1	DOP-CAUSBAB	1400 ± 30	55 ±1.2

■ CANopen Communication Cable

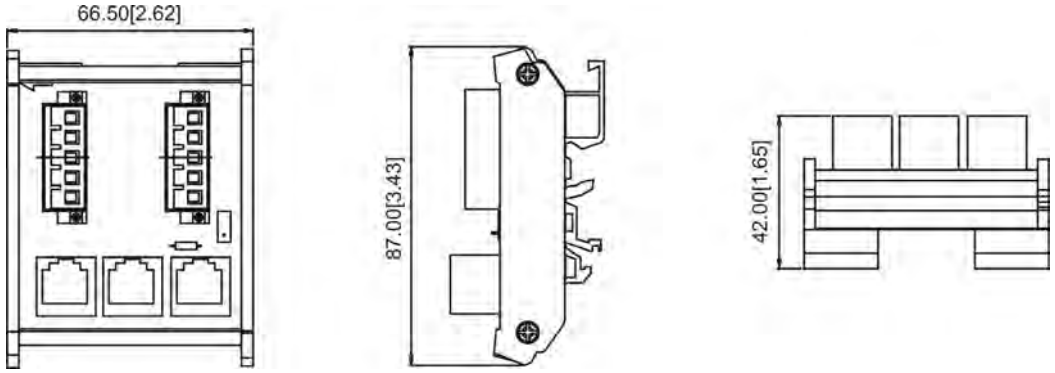
Delta Part Number: **TAP-CB03, TAP-CB04**



Title	Part No.	L	
		mm	inch
1	TAP-CB03	500 ± 10	19 ± 0.4
2	TAP-CB04	1000± 10	39 ± 0.4

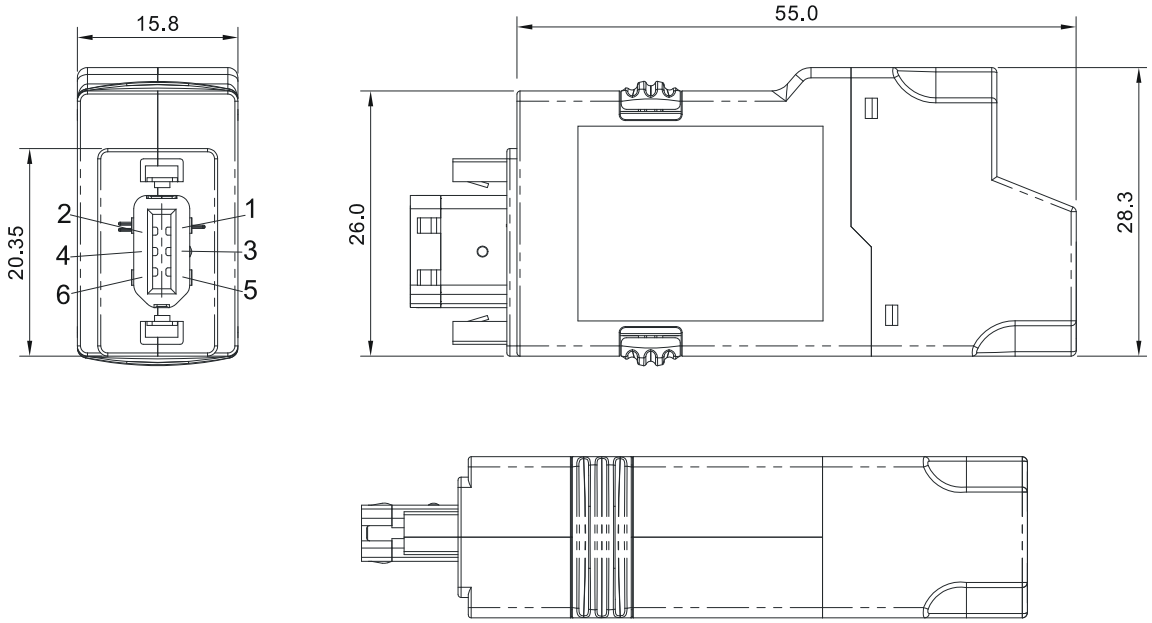
■ CANopen Distribution Box

Delta Part Number: **TAP-CN03**



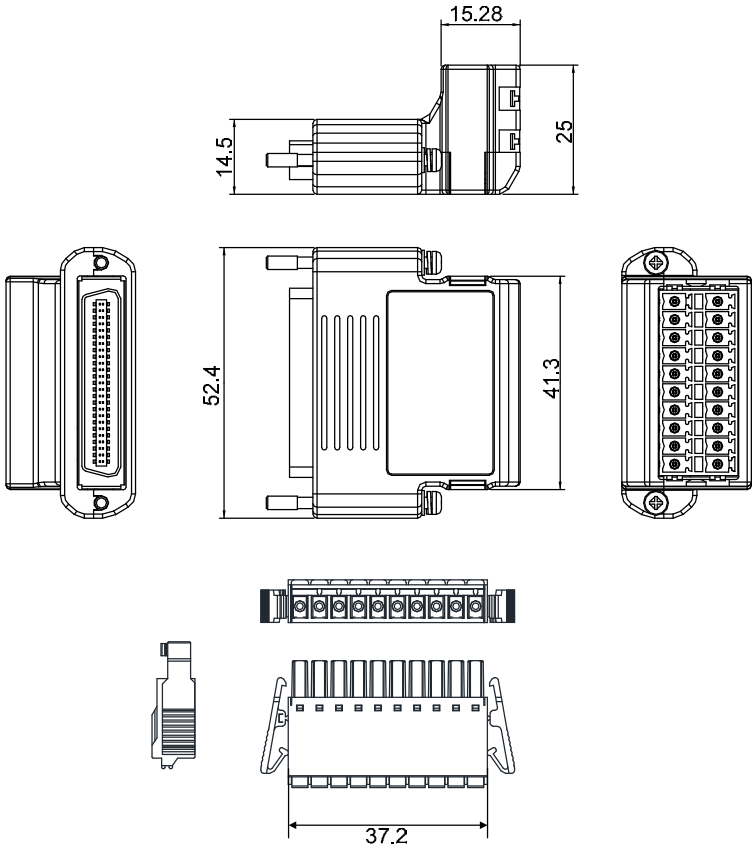
■ RS-485 Connector

Delta Part Number: **ASD-CNIE0B06**



■ CN1 Quick Connector

Delta Part Number: **ASD-IF-SC5020**



■ Optional Accessories for Rotary Motor

100 W servo drive and 50 W low-inertia motor

Servo Drive	ASD-A2R-0121-□
Low-inertia Motor	ECMA-C1040F□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 Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

100 W servo drive and 100 W low-inertia motor

Servo Drive	ASD-A2R-0121-□
Low-inertia 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 Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

200 W servo drive and 200 W low-inertia motor

Servo Drive	ASD-A2R-0221-□
Low-inertia 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 Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

400 W servo drive and 400 W low-inertia motor

Servo Drive	ASD-A2R-0421-□
Low-inertia Motor	ECMA-C△0604□S ECMA-C△0604□H ECMA-C△0804□7
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

400 W servo drive and 500 W medium-inertia motor

Servo Drive	ASD-A2R-0421-□
Medium-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

400 W servo drive and 300 W high-inertia motor

Servo Drive	ASD-A2R-0421-□
High-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

750 W servo drive and 500 W high-inertia motor

Servo Drive	ASD-A2R-0721-☐
High-inertia Motor	ECMA-F11305☐S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

750 W servo drive and 750 W low-inertia motor

Servo Drive	ASD-A2R-0721-☐
Low-inertia Motor	ECMA-C△0807☐S 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 Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

750 W servo drive and 600 W high-inertia motor

Servo Drive	ASD-A2R-0721-□
High-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	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 kW servo drive and 1 kW low-inertia motor

Servo Drive	ASD-A2R-1021-□
Low-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	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 kW servo drive and 1 kW low-inertia motor

Servo Drive	ASD-A2R-1021-□
Low-inertia Motor	ECMA-C△0910□S
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

1 kW servo drive 1 kW medium-inertia motor

Servo Drive	ASD-A2R-1021-□
Medium-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	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 kW servo drive and 850 W medium-high-inertia motor

Servo Drive	ASD-A2R-1021-□
Medium-high-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	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 kW servo drive and 900 W high-inertia motor

Servo Drive	ASD-A2R-1021-□
High-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

1.5 kW servo drive 1.5 kW medium-inertia motor

Servo Drive	ASD-A2R-1521-□
Medium-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

2 kW servo drive 2 kW low-inertia motor

Servo Drive	ASD-A2R-2023-□
Low-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

2 kW servo drive and 2 kW medium-inertia motor

Servo Drive	ASD-A2R-2023-□
Medium-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

2 kW servo drive and 2 kW medium-inertia motor

Servo Drive	ASD-A2R-2023-□
Medium-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

2 kW servo drive and 1.3 kW medium-high-inertia motor

Servo Drive	ASD-A2R-2023-□
Medium-high-inertia Motor	ECMA-F11313□S
Motor Power Cable (without brake)	ASD-A2PW100X
Motor Power Cable (with brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

2 kW servo drive and 1.8 kW medium-high-inertia motor

Servo Drive	ASD-A2R-2023-□
Medium-high-inertia Motor	ECMA-F11318□S
Motor Power Cable (without brake)	ASD-A2PW100X
Motor Power Cable (with brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

3 kW servo drive and 3 kW low-inertia motor

Servo Drive	ASD-A2R-3023-□
Low-inertia Motor	ECMA-C△1330□4
Motor Power Cable (without brake)	ASD-A2PW100X
Motor Power Cable (with brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

3 kW servo drive and 3 kW medium-inertia motor

Servo Drive	ASD-A2R-3023-□
Medium-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

3 kW servo drive and 3.5 kW medium-inertia motor

Servo Drive	ASD-A2R-3023-□
Medium-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

3 kW servo drive and 3 kW medium-high inertia motor

Servo Drive	ASD-A2R-3023-□
Medium-high-inertia 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 Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

Other Accessories (suitable for the whole series of ASDA-A2R)	
Name	Product Number
50Pin I/O Connector (CN1)	ASD-CNSC0050
Terminal Block Module	ASD-BM-50A
RS-232 Communication Cable	ASD-CARS0003
Software Communication Cable	DOP-CAUSBAB
CANopen Communication Cable	TAP-CB03 / TAP-CB04
CANopen Distribution Box	TAP-CN03
RS-485 Connector	ASD-CNIE0B06
Regenerative Resistor 400W 40Ω	BR400W040
Regenerative Resistor 1kW 20Ω	BR1K0W020
Regenerative Resistor 1.5kW 5Ω	BR1K5W005

■ Optional Accessories for Motor with Magnetic Encoder

400 W servo drive and 400 W low-inertia motor

Servo Drive	ASD-A2R-0421-T
Low-inertia Motor	ECMA-C80604RS ECMA-C80804R7
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Encoder Cable	MEC-SM3026P
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

750 W servo drive and 750 W low-inertia motor

Servo Drive	ASD-A2R-0721-T
Low-inertia Motor	ECMA-C80807RS
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Encoder Cable	MEC-SM3026P
Encoder Connector	ASD-ABEN0000

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

1 kW servo drive and 1 kW low-inertia motor

Servo Drive	ASD-A2R-1021-T
Low-inertia Motor	ECMA-C81010RS
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	MEC-SM3026J, MEC-SM3026R
Encoder Connector	MEC-TJ1D10S, MEC-TJ1F10S

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

1.5 kW servo drive and 1.5 kW medium-high-inertia motor

Servo Drive	ASD-A2R-1521-T
Medium-high-inertia Motor	ECMA-E81315RS
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	MEC-SM3026J, MEC-SM3026R
Encoder Connector	MEC-TJ1D10S, MEC-TJ1F10S

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

2 kW servo drive and 2 kW medium-high inertia motor

Servo Drive	ASD-A2R-2023-T
Medium-high-inertia Motor	ECMA-E81320RS
Motor Power Cable (without brake)	ASD-A2PW100X
Motor Power Cable (with brake)	ASD-A2PW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	MEC-SM3026J, MEC-SM3026R
Encoder Connector	MEC-TJ1D10S, MEC-TJ1F10S

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

2 kW servo drive and 2 kW medium-high inertia motor

Servo Drive	ASD-A2R-2023-T
Medium-high-inertia Motor	ECMA-E81820RS
Motor Power Cable (without brake)	ASD-CAPW200X
Motor Power Cable (with brake)	ASD-CAPW210X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Connector	MEC-SM3026J, MEC-SM3026R
Encoder Connector	MEC-TJ1D10S, MEC-TJ1F10S

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

3 kW servo drive and 3 kW medium-high inertia motor

Servo Drive	ASD-A2R-3023-T
Medium-high-inertia Motor	ECMA-E81830RS
Motor Power Cable (without brake)	ASD-CAPW200X
Motor Power Cable (with brake)	ASD-CAPW210X
Power Connector	ASD-CAPW2000
Incremental Type Encoder Connector	MEC-SM3026J, MEC-SM3026R
Encoder Connector	MEC-TJ1D10S, MEC-TJ1F10S

(X=3 indicates that the cable length is 3m; X=5 indicates that the cable length is 5m)

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