JSDG2-E
JSDG2S SERIES

User Manual

TECO

Driving & Connecting Globally

First of all, thank you for choosing TECO Motor Servo Drive JSDE2 Series (hereinafter referred to as “JSDE2”) and Servo Motor.

JSDE2 can be operated by the digital panel manipulator or through the PC man-machine program to provide various functions that enable the product to further address customers’ different application requirements.

Before using JSDE2, please read this Technical Manual; main contents of this Manual include:

- Inspection, installation and wiring procedures of the Servo System.
- The operating procedures, state display, error alarms and handling counter-measures description of the digital panel manipulator.
- Servo System control function, trial run and adjustment steps.
- Description of all Servo Driver parameters.
- The rated specifications of the standard model.

In order to facilitate routine inspections and maintenance and to understand the cause of the error and the counter-measures, please keep this Manual in a safe place for access at any time.

Note: Please deliver this Manual to the end user for the maximum effectiveness of the Servo Driver.

■ **Warnings and Pre-cautions:**

Warnings
• **Do not conduct wiring work when power is turned ON.** • **Do not touch the circuit or replace parts after the input power is turned OFF but before the state of the Servo Driver displays the CHARGE LED light is OFF.** • **The output terminals U, V, W of the Servo Driver must not be connected to the AC power.** • **Motor overheat protection is not provided.**

Attention

- **When the servo driver is installed in the control panel, if the ambient temperature is too high, please install a cooling fan.**
- **Do not conduct pressure resistance test on the Servo Driver.**
- **Before the machine starts to operate, confirm whether or not the emergency stop switch can be started at any time to stop the machine.**
- **Before the machine starts to operate, the user parameter setting value must be coordinated with the machine. Failure to adjust to the matched correct setting values may result in a loss of control or failure of the machine.**
- **Before the machine starts to operate, make sure to confirm the parameter Cn030: serial model settings, and select the correct Driver and Motor matching combination! Confirm the parameter Cn001 control mode selection.**

■ Safety Pre-cautions:

Please read this Manual thoroughly before installing, operating, maintaining, and checking. Only a professional qualified personnel can perform assembly line work.

The safety pre-cautions in the Manual are divided into two items: "Warnings" and "Pre-cautions".

Warnings	: Indicating a dangerous situation that may result in death or serious injury of personnel if ignored.
Pre-cautions	: Indicating a possible hazardous situation that may result in a less serious or minor injury of personnel and damage of machinery equipment if not resolved.

Therefore, this Technical Manual shall be read in detail before using this Servo Driver.

Table of Contents

Chapter 1 Product Inspection and Installation

Chapter 2 Wiring Preparation

Chapter 6 Parameter Functions

Chapter 7 Parameter Functions

Chapter 8 Communication Function

Chapter 9 Error Alarm Clear

Chapter 10 Comprehensive Specification

Chap 1 Product Inspection and Installation

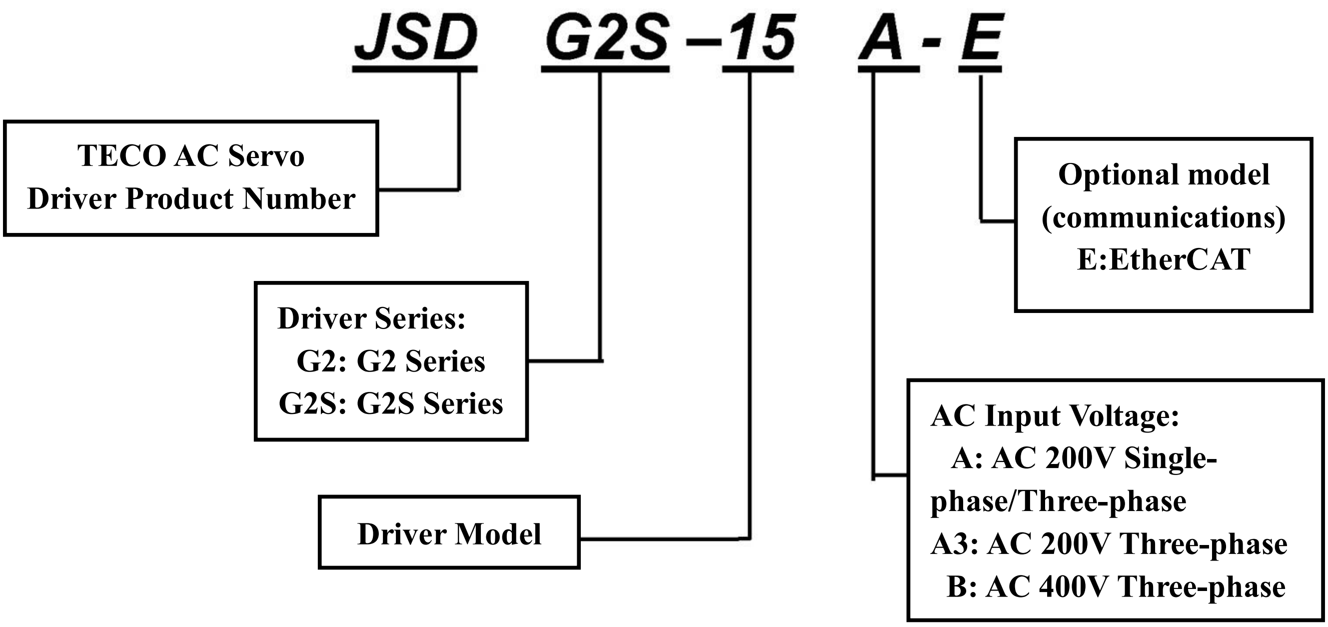
1-1 Product Inspection

This servo product has been completely functional tested before shipping off the factory, to prevent the product from non-conforming caused by negligence during delivery process, please check the following items in detail after unpacking:

- Check the model numbers of servo driver and servo motor are the same as the model ordered. (Please refer to the following chapters for model number description)
- Check whether or not the appearance of servo driver and servo motor are damaged or scratched. (Do not wire or connect to power when there is damage during shipping!)
- Check whether or not there is any poor assembly; loose parts and components in the servo driver and servo motor.
- Check with the hand whether or not the servo motor rotor shaft can rotate smoothly. (Servo motor attached with mechanical brake cannot be rotated directly!)

If there is any failure or abnormal indication mentioned above, please contact TECO Electric & Machinery sales representatives or local distributors immediately from whom you have purchased this product.

1-1-1 Servo Driver Model Verification



Output Power List by Servo Model

200V Class		400V Class	
10A: 100W	75A3: 3.0kW	10B: 750W	75B: 5.5kW
15A: 400W	100A3: 4.4kW	15B: 1.0kW	100B: 7.5kW
20A: 750W	150A3: 5.5kW	25B: 2.0kW	150B: 15.0kW
30A: 1.0kW	200A3: 7.5kW	35B: 3.0kW	200B: 22.0kW
50A3: 2.0kW	300A3: 15.0kW	50B: 4.4kW	

1-1-2 Servo Motor Model Verification

JSM A – P U C 04 A 3 K B

TECO AC ServoMotor Product Number

Motor Series
A Series

IP67 Rating
(except Axis and Joints)

Motor Inertia:
- S/U: Ultra low inertia
- L: Low Inertia
- M: Medium Inertia
- H: Medium Inertia
- I: Medium Inertia
- B: High Inertia

Motor Rated Rotational Speed:
- A: 1000 rpm
- B: 2000 rpm
- C: 3000 rpm
- H: 1500 rpm

Motor Rated Power:

P5: 50 W	18: 1.8 kW
01: 100 W	20: 2.0 kW
03: 300 W	29: 2.9 kW
04: 400 W	30: 3.0 kW
05: 550 W	44: 4.4 kW
08: 750 W	55: 5.5 kW
09: 850 W	75: 7.5 kW
10: 1.0 kW	110: 11.0 kW
13: 1.3 kW	150: 15.0 kW
15: 1.5 kW	

AC Input Voltage:
- A: AC 200V
- B: AC 400V

Encoder Specifications:
- 7: 17 bit (incremental)
- 3: 23 bit (incremental)
- 5: 15 bit (absolute type)
- A: 17 bit (absolute type)
- W: 23 bit (absolute type)

Coding	Key slot	Oil seal
□	No	No
K	Yes	No
O	No	Yes
A	Yes	Yes

Mechanical Brake:
- □: No Brake
- B: With Mechanical Brake

1-1-3 Servo Driver and Servo Motor Matching Comparison Table

⚠ Attention
• **Before the machine starts to operate, make sure to confirm the parameter Cn030: serial model settings, and select the correct Driver and Motor matching combination! Confirm the parameter Cn001 control mode selection.**

Users can use **dn-08** to check the driver/motor combination set in the driver currently. If the displayed combination differs from actual condition, please reset parameter **Cn030** (Serial model setting) according to the following table and set **Cn029** (Parameter reset) as 1 to stop power supply to reset driver parameter; users may also consult their local distributors.

200V Class

JSDG2(S) Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Setting Value
Matching Capacity	Motor Model (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / 3 (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ W (23bit)	Power (kW)	Speed (rpm)	Encoder Specifications (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / C (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ D (23bit)
10A	JSMA-PSCP5A□	0.05	3000	H101□
	JSMA-PUCP5A□	0.05	3000	H105□
	JSMA-PSC01A□	0.1	3000	H102□
	JSMA-PUC01A□	0.1	3000	H106□
	JSMA-PBC01A□	0.1	3000	H107□
	JSMA-PUC02A□	0.2	3000	H108□
	JSMA-PBC02A□	0.2	3000	H109□
15A	JSMA-PSC01A□	0.1	3000	H111□
	JSMA-PSC02A□	0.2	3000	H113□
	JSMA-PUC02A□	0.2	3000	H119□
	JSMA-PBC02A□	0.2	3000	H11A□
	JSMA-PLC03A□	0.3	3000	H112□
	JSMA-SC04A□	0.4	3000	H114□
	JSMA-PSC04A□	0.4	3000	H115□
	JSMA-PUC04A□	0.4	3000	H11D□
	JSMA-PBC04A□	0.4	3000	H11E□
20A	JSMA-SC04A□	0.4	3000	H122□
	JSMA-PSC04A□	0.4	3000	H126□
	JSMA-PMA05A□	0.55	1000	H124□
	JSMA-PMH05A□	0.55	1500	H125□
	JSMA-PLC08A□	0.75	3000	H121□
	JSMA-PSC08A□	0.75	3000	H123□
	JSMA-PUC08A□	0.75	3000	H12D□
	JSMA-PBC08A□	0.75	3000	H12E□

JSDG2(S) Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Setting Value
Matching Capacity	Motor Model (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / 3 (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ W (23bit)	Power (kW)	Speed (rpm)	Encoder Specifications (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / C (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ D (23bit)
JSDG2S Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Setting Value
Matching Capacity	Motor Model (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / 3 (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ W (23bit)	Power (kW)	Speed (rpm)	Encoder Specifications (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / C (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ D (23bit)
30A	JSMA-PSC08A□	0.75	3000	H131□
	JSMA-PUC08A□	0.75	3000	H13B□
	JSMA-PBC08A□	0.75	3000	H13C□
	JSMA-PBH09A□	0.85	1500	H13E□
	JSMA-PMA10A□	1.0	1000	H132□
	JSMA-PMB10A□	1.0	2000	H133□
	JSMA-PMH10A□	1.0	1500	H134□
	JSMA-PMC10A□	1.0	3000	H135□
	JSMA-PUC10A□	1.0	3000	H13F□
	JSMA-PLC10A□	1.0	3000	H531□
	JSMA-PBC12A□	1.2	3000	H532□
50A3	JSMA-PBH09A□	0.85	1500	H15B□
	JSMA-PUC10A□	1.0	3000	H15D□
	JSMA-PLC10A□	1.0	3000	H551□
	JSMA-PBH13A□	1.3	1500	H15C□
	JSMA-PMA15A□	1.5	1000	H151□
	JSMA-PMB15A□	1.5	2000	H152□
	JSMA-PMC15A□	1.5	3000	H153□
	JSMA-PLC15A□	1.5	3000	H15E□
	JSMA-PMB20A□	2.0	2000	H154□
	JSMA-PMC20A□	2.0	3000	H155□
	JSMA-PLC20A□	2.0	3000	H552□
75A3	JSMA-PBH13A□	1.3	1500	H174□
	JSMA-PBH18A□	1.8	1500	H175□
	JSMA-PBH18-18A□	1.8	1500	H176□
	JSMA-PLC20A□	2.0	3000	H571□
	JSMA-PMB30A□	3.0	2000	H171□
	JSMA-PMC30A□	3.0	3000	H172□
	JSMA-PMH30A□	3.0	1500	H173□
	JSMA-PIH30A□	3.0	1500	H177□
	JSMA-PMB40A□	4.0	2000	H178□
	JSMA-PMB45A□	4.5	2000	H179□

JSDG2S Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Setting Value
Matching Capacity	Motor Model (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / 3 (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ W (23bit)	Power (kW)	Speed (rpm)	Encoder Specifications (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / C (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ D (23bit)
100A3	JSMA-PBH29A□	2.9	1500	H185□
	JSMA-PHH30A□	3.0	1500	H183□
	JSMA-PMH44A□	4.4	1500	H182□
	JSMA-PIH44A□	4.4	1500	H186□
	JSMA-MA44A□	4.4	1500	H18D□
	JSMA-MB45A□	4.5	2000	H187□
	JSMA-MB55A□	5.5	2000	H184□
150A3	JSMA-PHH44A□	4.4	1500	H193□
	JSMA-PBH44A□	4.4	1500	H194□
	JSMA-PMH55A□	5.5	1500	H192□
	JSMA-PIH55A□	5.5	1500	H195□
	JSMA-PBH55A□	5.5	1500	H19B□
	JSMA-PMB70A□	7.0	2000	H19C□
200A3	JSMA-PBH55A□	5.5	1500	H1A3□
	JSMA-PMH75A□	7.5	1500	H1A1□
	JSMA-PBH75A□	7.5	1500	H1A5□
	JSMA-PIH75A□	7.5	1500	H1A6□
	JSMA-PIH110A□	11	1500	H1A7□
300A3	JSMA-PIH75A□	7.5	1500	H1B8□
	JSMA-PBH75A□	7.5	1500	H1B5□
	JSMA-PMH110A□	11.0	1500	H1B1□
	JSMA-PIH110A□	11.0	1500	H1B7□
	JSMA-PMH150A□	15.0	1500	H1B2□
	JSMA-PIH150A□	15.0	1500	H1BB□

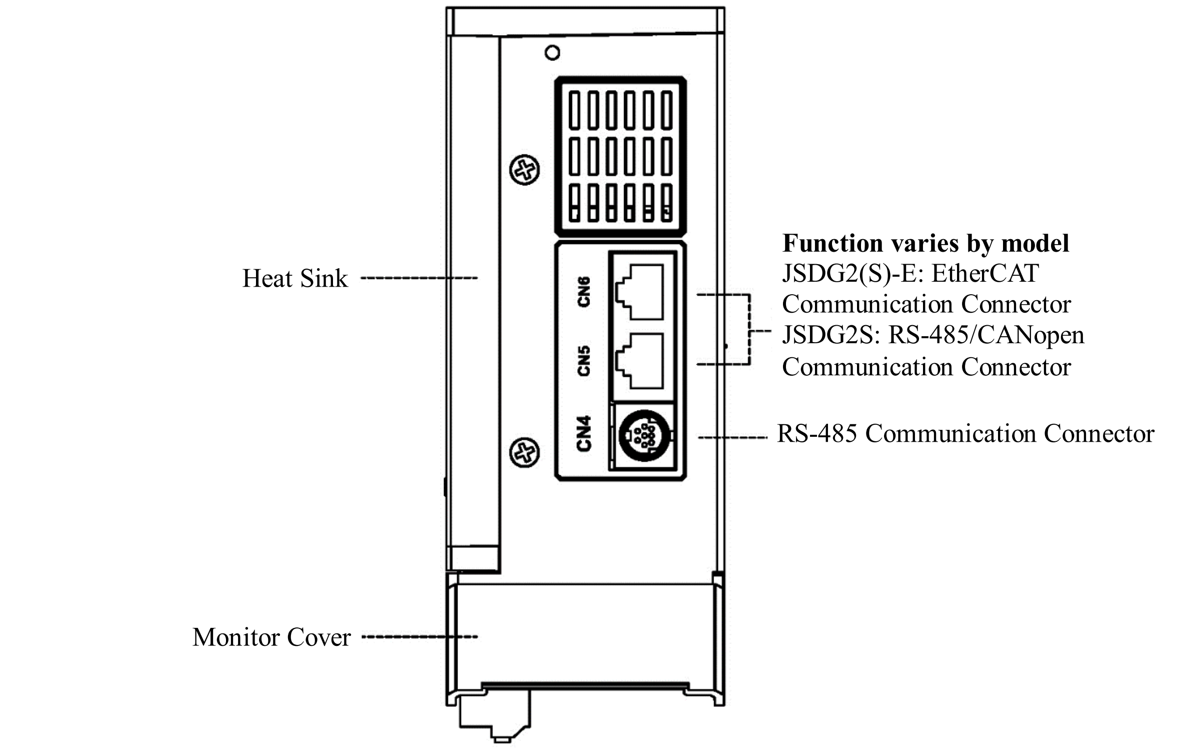
400V Class

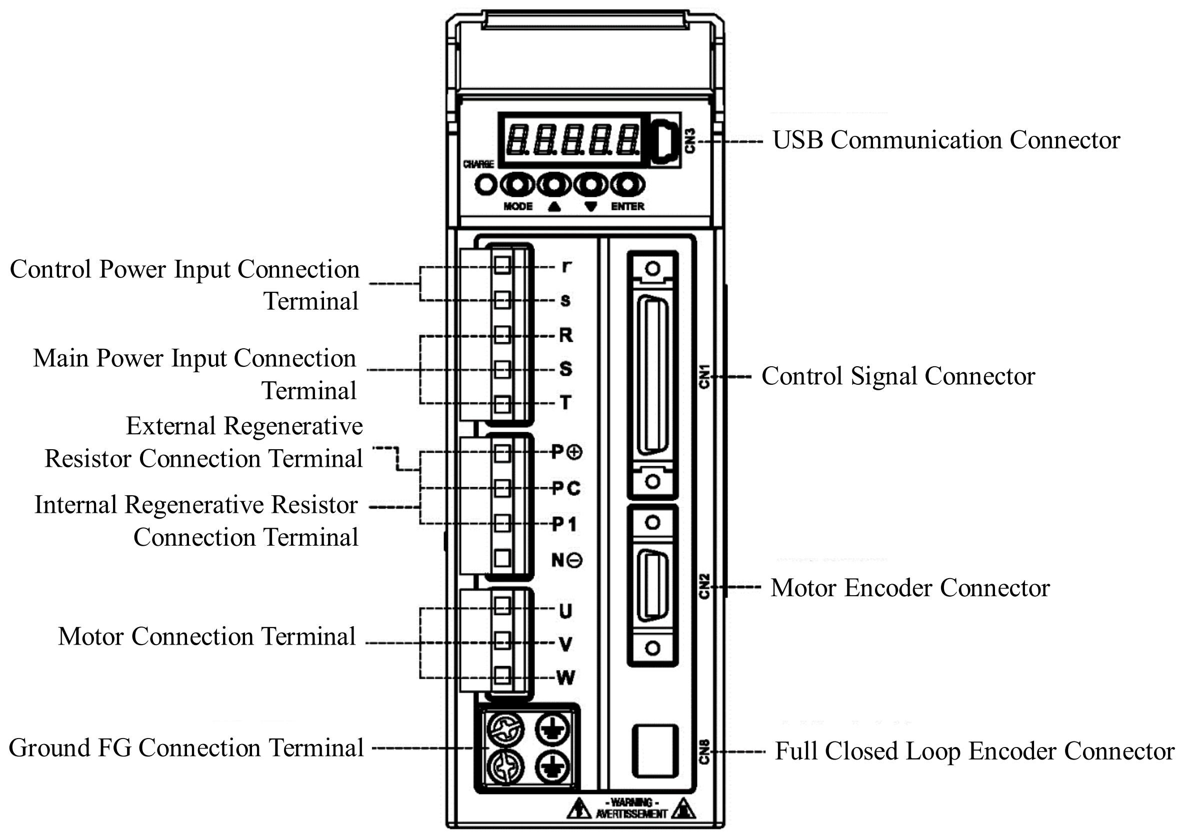
JSDG2S Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Setting Value
Matching Capacity	Motor Model (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / 3 (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ W (23bit)	Power (kW)	Speed (rpm)	Encoder Specifications (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / C (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ D (23bit)
10B	JSMA-PUC04B□	0.4	3000	H201□
	JSMA-PBC04B□	0.4	3000	H202□
	JSMA-PUC08B□	0.75	3000	H203□
	JSMA-PBC08B□	0.75	3000	H204□
15B	JSMA-PUC08B□	0.75	3000	H211□
	JSMA-PBC08B□	0.75	3000	H212□
	JSMA-PBH09B□	0.85	1500	H213□
	JSMA-PMB10B□	1.0	2000	H214□
25B	JSMA-PMB10B□	1.0	2000	H221□
	JSMA-PLC10B□	1.0	3000	H226□
	JSMA-PBH13B□	1.3	1500	H222□
	JSMA-PMB15B□	1.5	2000	H223□
	JSMA-PLC15B□	1.5	3000	H227□
	JSMA-PMB20B□	2.0	2000	H225□
35B	JSMA-PLC15B□	1.5	3000	H237□
	JSMA-PBH18B□	1.8	1500	H232□
	JSMA-PBH18-18B□	1.8	1500	H236□
	JSMA-PMB20B□	2	2000	H231□
	JSMA-PLC20B□	2	3000	H238□
	JSMA-PMB30B□	3	2000	H233□
	JSMA-PMH30B□	3	1500	H234□
	JSMA-PIH30B□	3	1500	H235□
50B	JSMA-PBH29B□	2.9	1500	H244□
	JSMA-PMB30B□	3	2000	H240□
	JSMA-PMH30B□	3	1500	H241□
	JSMA-PIH30B□	3	1500	H245□
	JSMA-PMH44B□	4.4	1500	H242□
	JSMA-PIH44B□	4.4	1500	H246□

JSDG2S Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Setting Value
Matching Capacity	Motor Model (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / 3 (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ W (23bit)	Power (kW)	Speed (rpm)	Encoder Specifications (The last code represents the difference of encoder specifications) Incremental type: 7 (17bit) / C (23bit) Absolute type: 5 (15Bit)/ A (17bit)/ D (23bit)
75B	JSMA-PMH44B□	4.4	1500	H250□
	JSMA-PBH44B□	4.4	1500	H252□
	JSMA-PIH44B□	4.4	1500	H257□
	JSMA-PMH55B□	5.5	1500	H251□
	JSMA-PBH55B□	5.5	1500	H253□
	JSMA-PIH55B□	5.5	1500	H258□
	JSMA-PIH75B□	7.5	1500	H259□
100B	JSMA-PBH44B□	4.4	1500	H265□
	JSMA-PBH55B□	5.5	1500	H266□
	JSMA-PIH55B□	5.5	1500	H26B□
	JSMA-PMH75B□	7.5	1500	H261□
	JSMA-PBH75B□	7.5	1500	H267□
	JSMA-PIH75B□	7.5	1500	H269□
	JSMA-PIH110B□	11	1500	H26A□
150B	JSMA-PBH75B□	7.5	1500	H271□
	JSMA-PMH110B□	11	1500	H272□
	JSMA-PIH110B□	11	1500	H278□
	JSMA-PMH150B□	15	1500	H273□
	JSMA-PIH150B□	15	1500	H27A□
200B	JSMA-PMH150B□	15	1500	H281□
	JSMA-PIH150B□	15	1500	H285□

1-2 Servo Driver Appearance

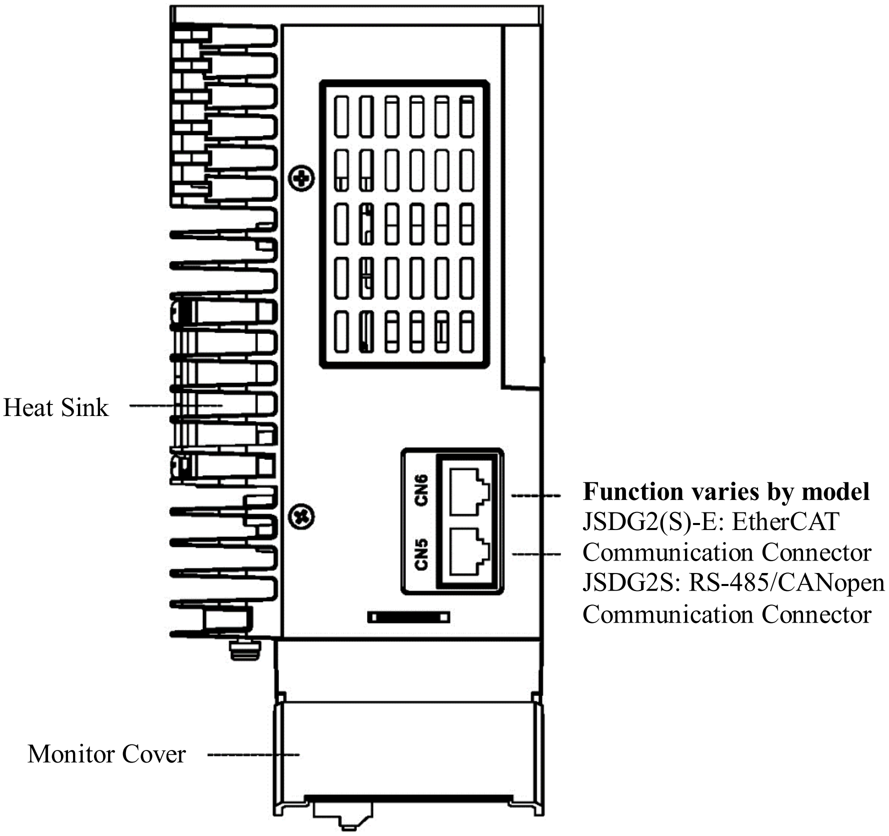
(1) JSDG2S-(E)-10A / 15A / 20A / 30A (200V Class)

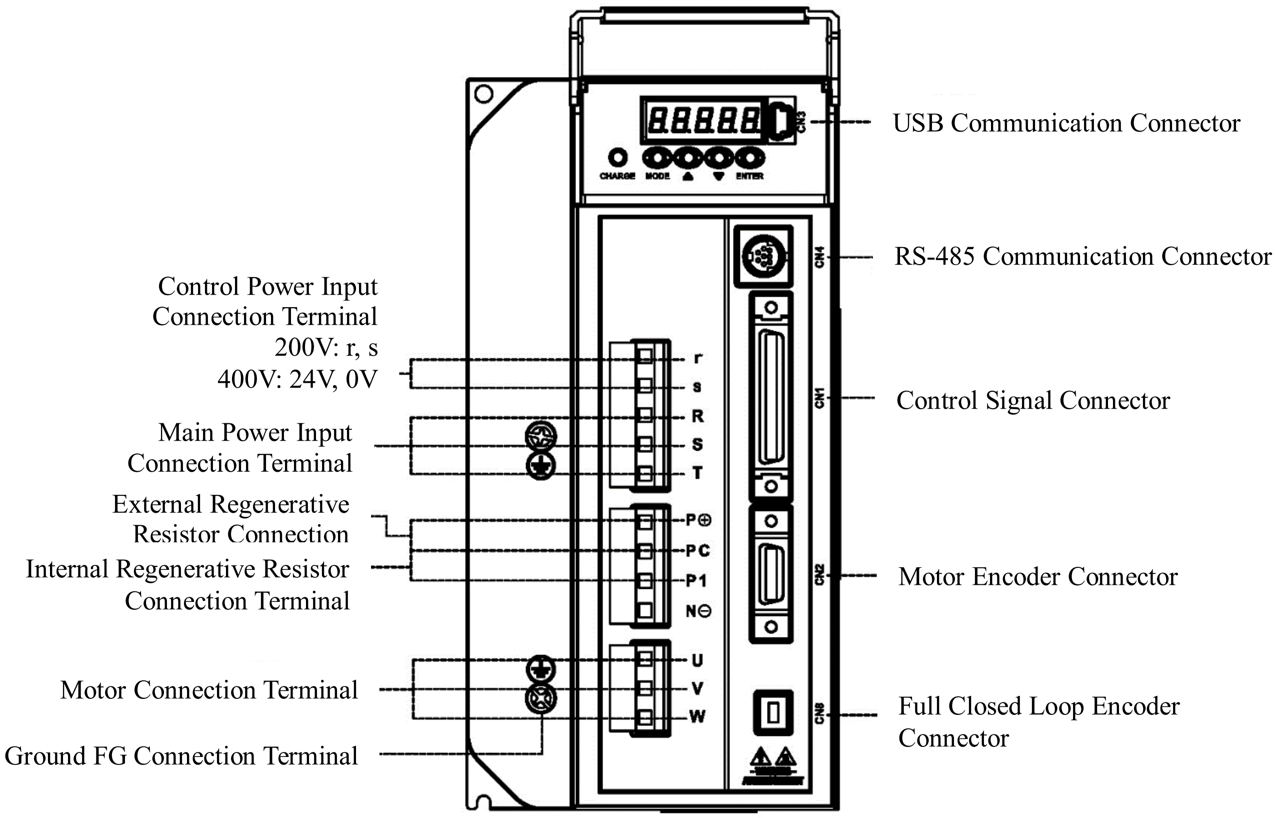




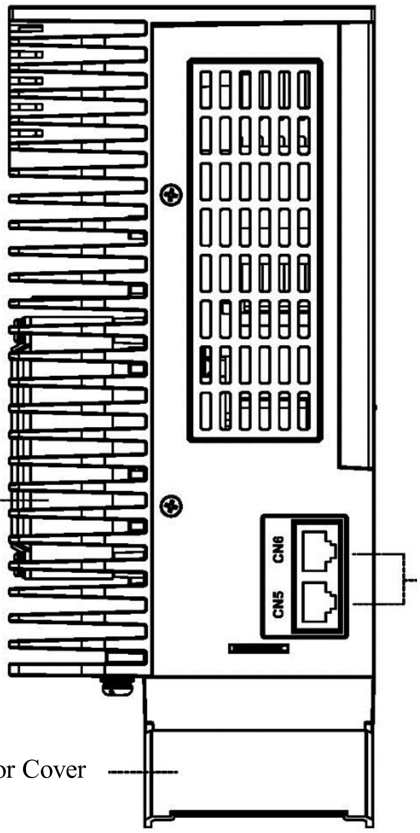
TECO

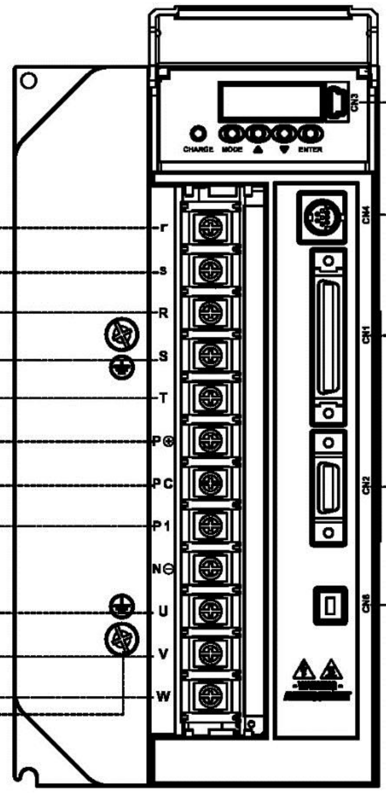
(2) JSDG2S-(E)-50A3 / 75A3 (200V Class)
JSDG2S-(E)-10B/15B/25B/35B (400V Class)





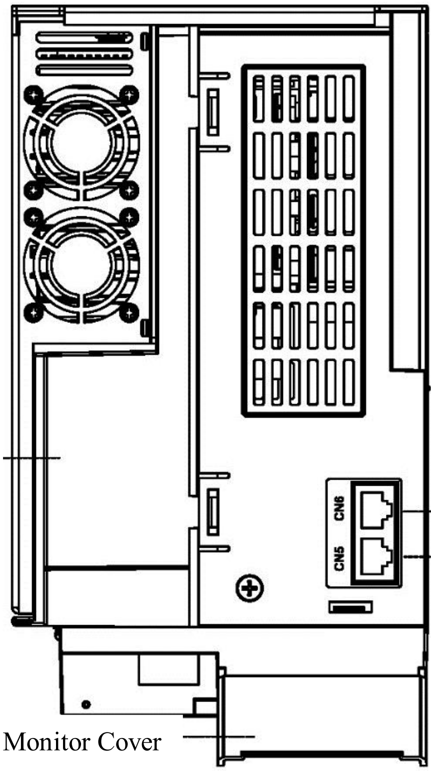
(3) JSDG2S-(E)-100A3 / 150A3 (200V Class)
JSDG2S-(E)- 50B/75B (400V Class)

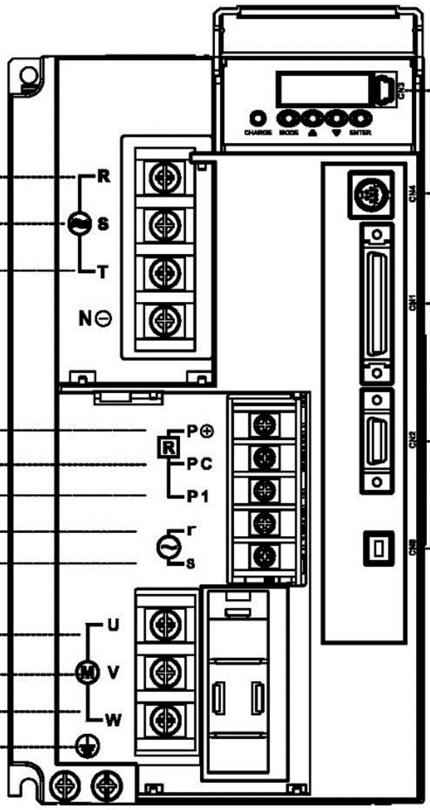




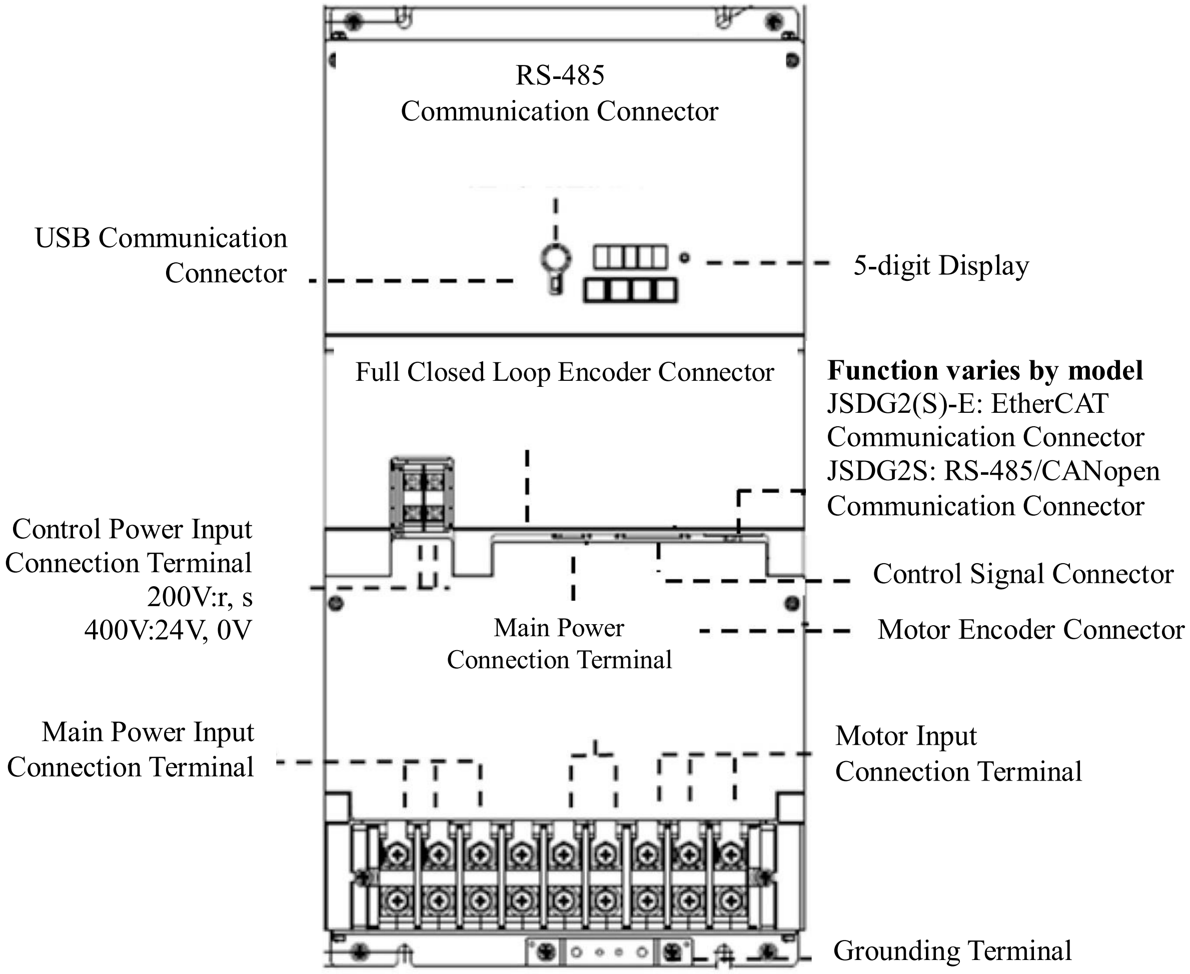
TECO

(4) JSDG2S-(E)-200A3 (200V Class)
JSDG2S-(E)- 100B (400V Class)





(5) JSDG2S-(E)-300A3 (200V Class)
JSDG2S-(E)- 150B/200B (400V Class)



1-3 Servo Driver Operation Mode Introduction

This Driver provides several operating modes that can be selected by the user, the detailed modes are as follows:

Mode Name		Mode Code	Description
Single Mode	Position Mode (External Pulse Command)	Pe	The driver is a position loop and performs positioning control, the external pulse command input mode is to receive the pulse command output by the Supervisory Controller to achieve the positioning function. The position command is input by the CN1 Terminal.
	Position Mode (Internal Position Command)	Pi	The driver is a position loop running positioning control. The internal position command mode offers users the function of setting position command value to 32 sets command register and plan the digital input connect to switching corresponding position command
	Speed Mode	S	The driver is a speed circuit offering 2 types of input command; users can use digital input connect to switch the internal pre-set three-stage speed command or use analog voltage (-10V ~ +10V) command signal for speed control.
	Torque Mode	T	The driver is a torque circuit, and the torque command performs torque control by external input analog voltage (-10V ~ +10V).
	Turret Mode	Pt	Match the driver with communication absolute type encoder servo motor for CNC servo tool magazine/turrent tool selection control. Monitor through DI/DO can achieve a maximum of 64 diving sets.
	CANopen Complete mode	Cob	The driver is in CANopen communication mode; the command input mode refers to the condition when the supervisory controller controls by commands output by CANopen interface. **※JSDG2(S)-E does not support this control mode**
	CANopen Simple Mode	CoC	The driver is in CANopen communication mode; the command input mode refers to the condition when the supervisory controller controls by commands output by CANopen interface. State machine can switch to Operation enabled rapidly under simple mode. **※JSDG2(S)-E does not support this control mode**
	EtherCAT Mode	EC	The driver is in EtherCAT communication code; the command input mode refers to the condition when the supervisory controller controls through commands output by EtherCAT interface. **※JSDG2S does not support this control mode**
Mixed Mode		Pe-S	Pe and S can be switched via digital input pins.
		Pe-T	Pe and T can be switched via digital input pins.
		Pi-S	Pi and S can be switched via digital input pins.
		Pi-T	Pi and T can be switched via digital input pins.
		S-T	S and T can be switched via digital input pins.

	Pe-Pi	Pe and Pi can be switched via digital input pins.

1-4 Servo Driver Installation Environment Conditions and Methods

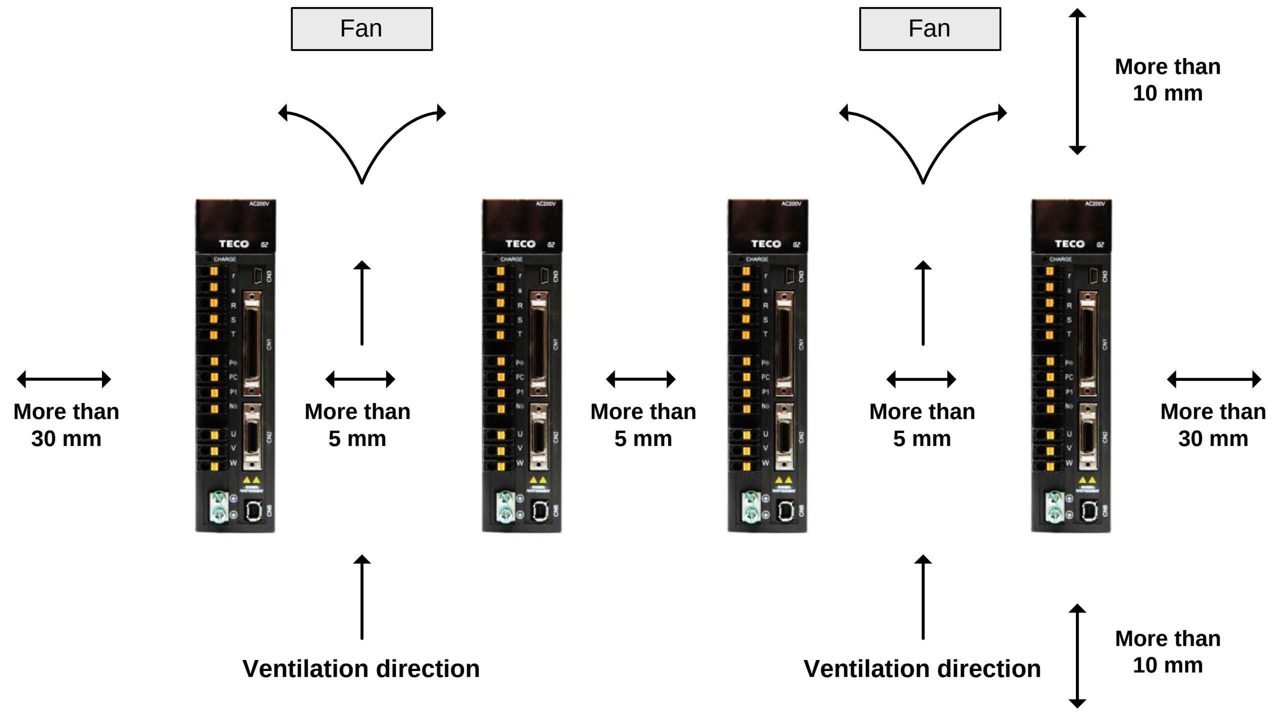
1-4-1 Installation Environment Conditions

The environment where the servo driver is installed has a direct impact on the normal function of the driver and its service life, therefore, the installation environment of the driver must conform to the following conditions:

- Ambient temperature: 0 ~ + 50 ℃; ambient humidity: under 90% RH (without condensation conditions).
- Storage Temperature: - 20 ~ + 65 °C; Storage Humidity: 90% RH or less (without condensation conditions).
- Vibration: 2G or less.
- Prevent rain dripping or humid environment.
- Avoid direct sunlight.
- Prevent oil mist and salt erosion.
- Prevent corrosive liquids, gas.
- Prevent the intrusion of powder dust, cotton wool or fine metal chips.
- Keep away from radioactive materials and combustibles.
- When installing several servos in the control panel, please leave sufficient space between each device to ensure enough air for heat dissipation. Meanwhile, please add heat dissipation fan to keep ambient temperature of servos under 50 degrees Celsius.
- When installing, please mount the driver in the way of vertically standing, with the front facing forward and the top facing up to facilitate cooling.
- When assembling, pay attention to avoid drilling debris and other foreign objects falling into the driver.
- When installing, make sure to fix with M5 screws.
- When there is a vibration source nearby (punching machine), please use a vibration absorber or install a vibration-proof rubber gasket if the vibration cannot be avoided.
- When there are large magnetic switch, fusion splicer and other noise interference sources near the driver that is easy to cause error operations for the driver due to external interference, at this time, a noise filter needs to be installed. However, the noise filter will increase the leakage of the current, therefore, it is necessary to install an insulation Transformer at the input end of the driver.

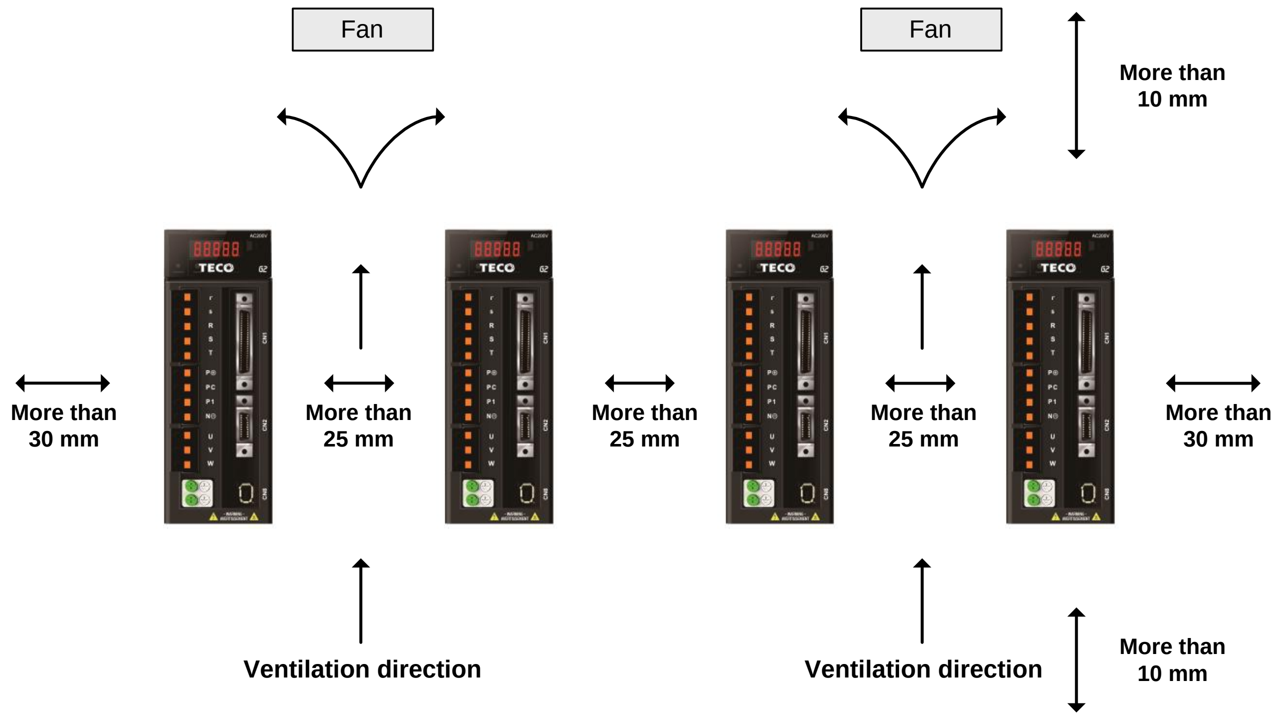
1-4-2 Installation Direction and Spacing

JSDG2S-10A / 15A / 20A / 30Av



JSDG2S-50A3 / 75A3 / 100A3 / 150A3 / 200A3 / 300A3

JSDG2S-10B / 15B / 25B / 35B / 50B / 75B / 100B / 150B / 200B



1-5 Servo Motor Installation Environment Conditions and Methods

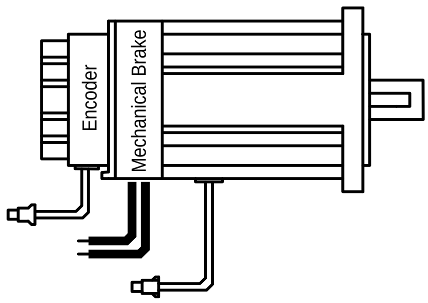
1-5-1 Installation Environment Conditions

- Ambient Temperature: 0 ~ + 40 °C; Ambient Humidity: 90% RH or less (without condensation conditions).
- Storage Temperature: - 20 ~ + 60 °C; Storage Humidity: 90% RH or less (without frosting conditions).
- Vibration: 2.5G or less.
- Places in the area of good ventilation, low moisture and dust.
- Environment without corrosive, pyrophoric gas, oil vapor, cutting fluid, cutting powder, iron powder, etc.
- Area without water vapor and direct sunlight.

1-5-2 Installation Methods

1. Horizontal installation: To prevent water, oil and other liquids from flowing into the motor from the motor outlet wire end; please place under the cable outlet.

Pre-cautions

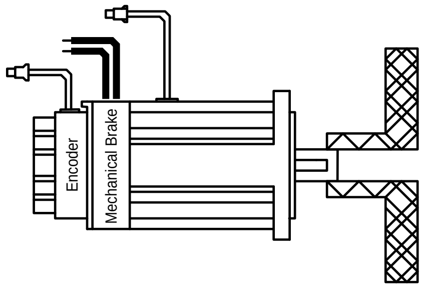


2. Vertical installation: If the motor shaft is installed upwards with the reducer attached, care must be taken to prevent the grease inside the reducer from passing through the motor shaft and into the inside of the motor.

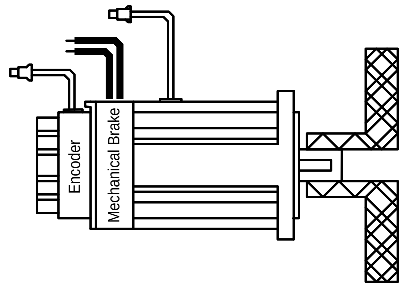
1-5-3 Other Pre-cautions

1. In order to prevent the oil in the reducer from penetrating the inside of the motor through the motor shaft, please use a motor with an oil seal.
2. The connection cable needs to be kept dry.
3. In order to prevent the cable from falling off or breaking due to mechanical movement, the connection cable shall be securely fixed.
4. The shaft extension space must be sufficient, it is easy to cause vibration when the motor moves if the extension space is insufficient.

Wrong Example

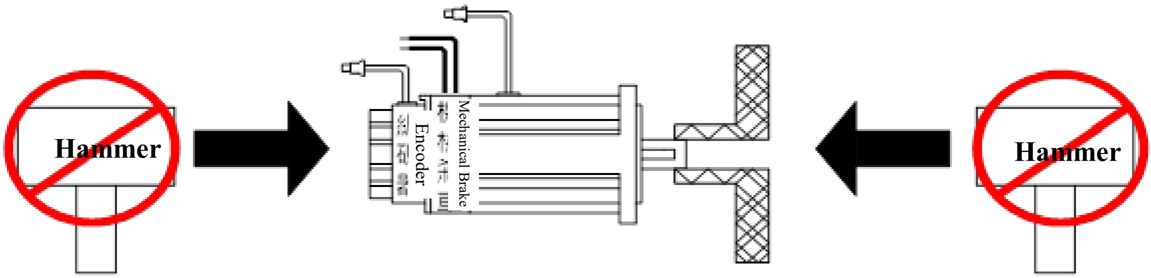


Correct Example



5. When installing and removing the motor, please do not hit the motor with a hammer, otherwise it may cause damage to the motor shaft and the rear encoder.

Pre-cautions

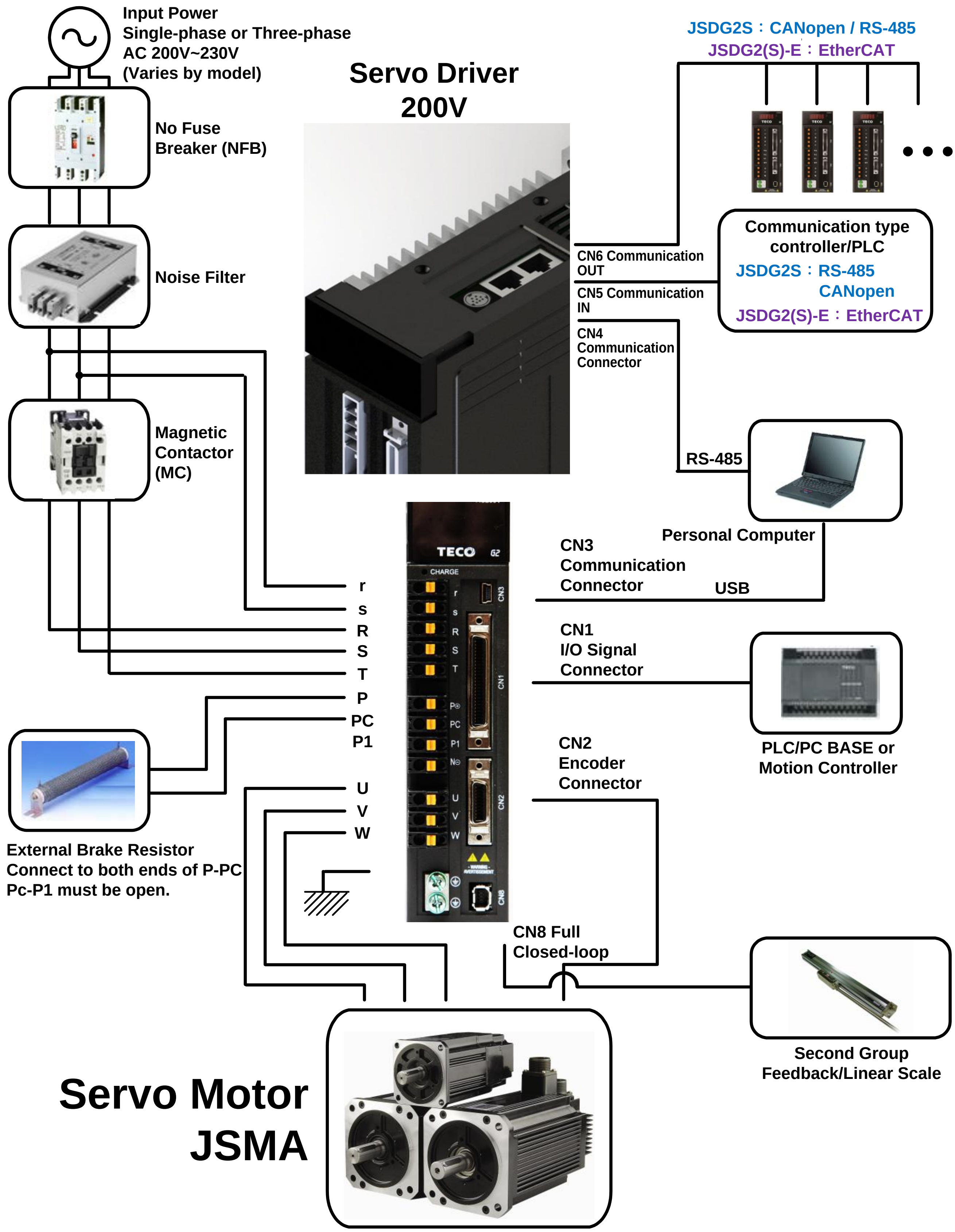


Chap 2 Wiring Preparation

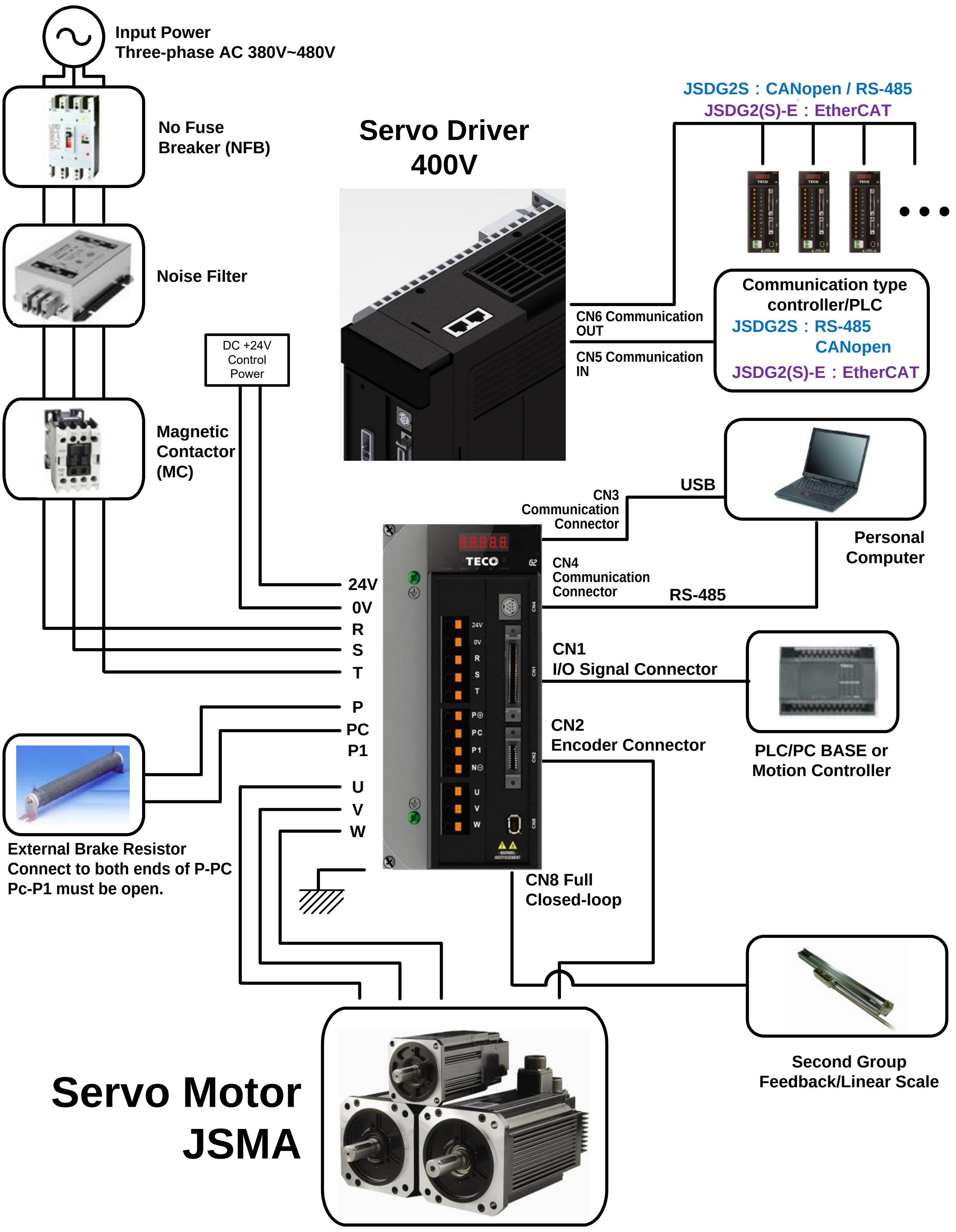
2-1 System Assembly and Wiring

2-1-1 Wiring diagram of Servo Driver Power Supply and Peripheral Devices

200V Class



400V Class



Input Power
Three-phase AC 380V~480V
No Fuse
Breaker (NFB)
Noise Filter
DC +24V
Control
Power
Magnetic
Contactor
(MC)
Servo Driver
400V
JSDG2S : CANopen / RS-485
JSDG2(S)-E : EtherCAT
CN6 Communication
OUT
CN5 Communication
IN
Communication type
controller/PLC
JSDG2S : RS-485
CANopen
JSDG2(S)-E : EtherCAT
CN3
Communication
Connector
USB
Personal
Computer
CN4
Communication
Connector
RS-485
24V
0V
R
S
T
P
PC
P1
U
V
W
CN1
I/O Signal Connector
PLC/PC BASE or
Motion Controller
CN2
Encoder Connector
External Brake Resistor
Connect to both ends of P-PC
Pc-P1 must be open.
CN8 Full
Closed-loop
Second Group
Feedback/Linear Scale
Servo Motor
JSMA

2-1-2 Servo Driver Wiring Instructions

- The wiring materials shall be used in accordance with the "Wire Specifications."
- Wiring Length: Within 3 meters of the Command Input Wire.

  Within 20 meters of the Encoder Input Wire.

  Please connect with the shortest distance when wiring.
- Wiring in accordance with the Standard Wiring Diagram, do not connect to the unused signals.
- Please make sure to install IEC-standard or UL-certified circuit breakers and fuses between the input power supply end and the servo driver.
- The maximum short-circuit current capacity at the maximum input voltage must be 5000 Arms or less, if there is any doubt for the power short-circuit current exceeds the specifications, please install a current limiting device (circuit breaker, fuse, transformer) to limit the short-circuit current.
- The servo driver output end (U, V, W motor terminals) must be connected properly. Otherwise, the servo motor will not operate normally.
- The isolation wire must be connected to the FG terminal.
- Please use the third type of grounding (grounding resistance of 100Ω or less) for grounding and must be **single point grounding**. Please ground the motor if between the motor and the machine is to be in insulated state.
- Do not install capacitors or overvoltage (surge) absorbers and noise filters at the servo driver output end.
- For the relay installed in the control output signal, the direction of the diode used for its overvoltage (surge) absorption must be correctly connected; otherwise, it will cause a failure to output the signal and may also affect the protection circuit of emergency stop.
- In order to prevent erroneous operation due to noise, please use the following measures:

  Please add an insulation transformer and noise filter devices on the power supply.

  Please wire the power lines (strong electric circuit such as power cables, motor wire, etc.,) more than 30 cm away from the signal wires and do not place them in the same wiring conduit.
- In order to prevent incorrect operations, an "Emergency Stop Switch" shall be installed to ensure safety.

- After completing the wiring, check the connection status of each connector (such as cold soldering of solder joints, short circuit of solder joints, improper pin sequence, etc.), press the connector to make sure whether or not it is properly connected with the driver and whether or not the screws are tightly fastened, and cannot have any conditions of cable damage, pulling or heavy pressure, etc.

  ※ In particular, pay special attention to the polarity of the servo motor connection cable and the encoder connection cable.

- Under normal conditions, it is not necessary to add external regenerative resistors, if there is a need or doubt, please contact the dealer or manufacturer.

2-1-3 Electric Wire Specifications

<table>
<tr><th colspan="3">Connection End</th><th colspan="10">Driver Specifications and Used Wire Specifications mm2 (AWG)</th></tr>
<tr><th>Connection End</th><th>Mark (Symbol)</th><th>Connection End Name</th><th>10A</th><th>15A</th><th>20A</th><th>30A</th><th>50A3</th><th>75A3</th><th>100A3</th><th>150A3</th><th>200A3</th><th>300A3</th></tr>
<tr><td rowspan="5">TB Terminal Base</td><td>R, S, T</td><td>Main Power Supply Terminal</td><td colspan="3">1.25 (16)</td><td colspan="3">2.0 (14)</td><td colspan="2">3.5 (12)</td><td>5.5 (10)</td><td>14.0 (6)</td></tr>
<tr><td>U, V, W</td><td>Motor Connection Terminal</td><td colspan="3">1.25 (16)</td><td colspan="2">2.0 (14)</td><td>3.5 (12)</td><td>5.5 (10)</td><td>8.0 (8)</td><td>14.0 (6)</td><td>22.0 (4)</td></tr>
<tr><td>r, s</td><td>Control Power Terminal</td><td colspan="10">1.25 (16)</td></tr>
<tr><td>P, Pc</td><td>External Regenerative Resistor Terminal</td><td colspan="3">1.25 (16)</td><td colspan="3">2.0 (14)</td><td colspan="2">3.5 (12)</td><td>5.5 (10)</td><td>14 (6)</td></tr>
<tr><td>FG ⏚</td><td>Ground Wire</td><td colspan="10">2.0(14) or Higher</td></tr>
</table>

<table>
<tr><th colspan="3">Connection End</th><th colspan="9">Driver Specifications and Used Wire Specifications mm2 (AWG)</th></tr>
<tr><th>Connection End</th><th>Mark (Symbol)</th><th>Connection End Name</th><th>10B</th><th>15B</th><th>25B</th><th>35B</th><th>50B</th><th>75B</th><th>100B</th><th>150B</th><th>200B</th></tr>
<tr><td rowspan="5">TB Terminal Base</td><td>R, S, T</td><td>Main Power Supply Terminal</td><td colspan="2">1.25 (16)</td><td colspan="2">2.0 (14)</td><td colspan="2">3.5 (12)</td><td>5.5 (10)</td><td>5.5 (10)</td><td>14.0 (6)</td></tr>
<tr><td>U, V, W</td><td>Motor Connection Terminal</td><td colspan="2">1.25 (16)</td><td colspan="2">2.0 (14)</td><td colspan="2">5.5 (10)</td><td>8.0 (8)</td><td>14.0 (6)</td><td>22.0 (4)</td></tr>
<tr><td>24V, 0V</td><td>Control Power Terminal</td><td colspan="9">1.25 (16)</td></tr>
<tr><td>P, Pc</td><td>External Regenerative Resistor Terminal</td><td colspan="2">1.25 (16)</td><td colspan="2">2.0 (14)</td><td colspan="2">3.5 (12)</td><td>5.5 (10)</td><td>14.0 (6)</td><td>14.0 (6)</td></tr>
<tr><td>FG ⏚</td><td>Ground Wire</td><td colspan="9">2.0(14) or Higher</td></tr>
</table>

<table>
<tr><th colspan="3">Connection End</th><th rowspan="2">Used Wire Specifications</th></tr>
<tr><th>Connection End</th><th>Pin Number</th><th>Pin Name</th></tr>
<tr><td rowspan="15">CN1
Control
Signal
Connector</td><td>26 (Note 7)</td><td>Analog speed command/Limit (SIC)</td><td rowspan="5">0.2mm² or 0.3mm² and analog grounded double twisted pair wire
(with isolation wire)</td></tr>
<tr><td>27 (Note 7)</td><td>Analog torque command/Limit (TIC)</td></tr>
<tr><td>30, 31 (Note 7)</td><td>Analog monitoring output 1, 2 (MON1, MON2)</td></tr>
<tr><td>33, 34 (Note 7)</td><td>Power output +15V & -15V (+15V, -15V)</td></tr>
<tr><td>28, 29, 32</td><td>Analog Grounding End (AG)</td></tr>
<tr><td>1~12</td><td>Digital input 1~12 (DI1~12)</td><td rowspan="10">0.2mm² or 0.3mm² and double twisted pair wire of I/O grounding wire
(with isolation wire)</td></tr>
<tr><td>18~25</td><td>Digital output 1~8 (DO1~8)</td></tr>
<tr><td>43</td><td>Origin Signal Output (ZO)</td></tr>
<tr><td>47, 44</td><td>Digital input/output common end (DICOM/DOCOM)</td></tr>
<tr><td>45
46, 48</td><td>24V power supply (IP24)
24V ground end (IG24)</td></tr>
<tr><td>49</td><td>Absolute type encoder power (BAT+)</td></tr>
<tr><td>14~17</td><td>Pulse position command input (Pulse, Sign, /Pulse, /Sign)</td></tr>
<tr><td>35~40</td><td>Encoder Signal Dividing Output (PA, /PA, PB, /PB, PZ, /PZ)</td></tr>
<tr><td>41, 42</td><td>Open collector pulse command input power 1, 2
(EXT1, EXT2)</td></tr>
<tr><td colspan="2" style="display:none"></td></tr>
<tr><td rowspan="6">CN2
Motor
Encoder
Connector</td><td>1, 2</td><td>5V power output (Vcc)</td><td rowspan="6">0.2mm² or 0.3mm² double twisted pair wire
(with isolation wire)</td></tr>
<tr><td>3, 4</td><td>Power Supply Output Grounding (GND)</td></tr>
<tr><td>13</td><td>SD</td></tr>
<tr><td>14</td><td>/SD</td></tr>
<tr><td>11</td><td>Battery Power Positive Polarity</td></tr>
<tr><td>12</td><td>Battery Power Negative Polarity</td></tr>
</table>

Connection End			Used Wire Specifications
Connection End	Pin Number	Pin Name	
Connection End			Used Wire Specifications
Connection End	Pin Number	Pin Name	
CN3 Computer Connection Communication Connector	1	VBUS	USB 2.0 A Male-Mini 5P Anti-interference signal Wire (Length of 1.0M or less)
	2	D-	
	3	D+	
	4	ID	
	5	GND	
CN4 RS-485 Communication connector	5	D+	0.2mm^2 or 0.3mm^2 double twisted pair wire (with isolation wire)
	7	D-	
	3	GND	
	2, 6, 8	-	
CN5/ CN6 EtherCAT Communication connector	1	TX+	Standard internet cable (CAT5e) For JSDG2-E / JSDG2S-E
	2	TX-	
	3	RX+	
	6	RX-	
	4, 5, 7, 8	-	
CN5 / CN6 CANopen Communication connector	1	CAN_H	Standard internet cable (CAT5e) For JSDG2S
	2	CAN_L	
	3	GND	
	7	GND	
	4, 5, 6, 8	-	
CN5/ CN6 RS485 Communication connector	3	GND	Standard internet cable For JSDG2S
	4	D+	
	5	D-	
	7	GND	
	1, 2, 6, 8	-	

Note: 1. When using multiple drivers, please pay attention to the capacity of non-fuse switch and power filter.

2. CN1 is 50 Pins SCSI Connector.

3. CN2 is 20 Pins SCSI Connector.

4. CN3 is 5 Pins Mini USB Connector.

5. CN4 is 8 Pins Mini-Din type Connector.

6. CN5/CN6 is 8 Pins RJ45 Connector.

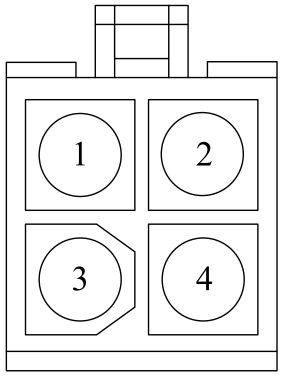
7. JSDG2S-E does not have TIC, SIC, MON1, MON2, +15V and -15V

2-1-4 Motor Terminal Outlet Wire

- **Motor Power Outlet Wire Table**

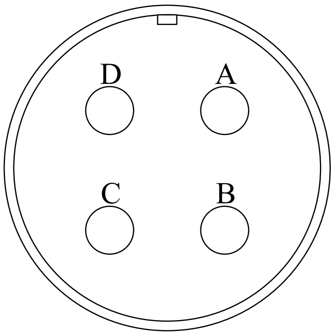
(1) General Connector:

Terminal Symbol	Wire Color	Signal
1	Red	U
2	White	V
3	Black	W
4	Yellow/Green	FG
Mechanical Brake Control Wire	Thin White 1	0V
	Thin White 2	DC +24V



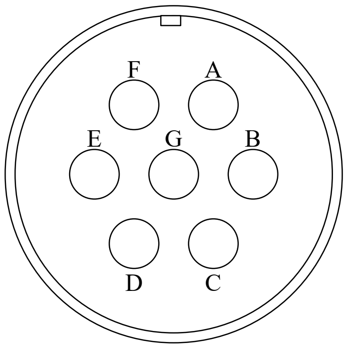
(2) Military Specifications Connector (without Mechanical Brake):

Terminal Symbol	Wire Color	Signal
A	Red	U
B	White	V
C	Black	W
D	Green	FG



(3) Military Specifications Connector (with Mechanical Brake):

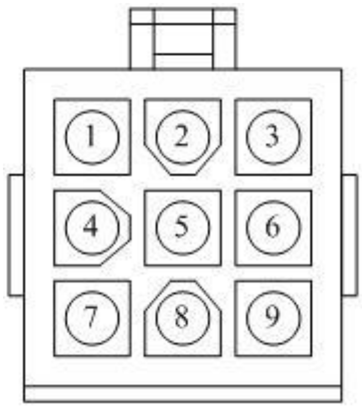
Terminal Symbol	Wire Color	Signal	
B	Red	U	
G	White	V	
E	Black	W	
C	Green	FG	
A	Thin White 1	Mechanical Brake Control Wire	0V
F	Thin White 2		DC +24V



- **Motor Encoder Outlet Wire Table**
  - **Communication Encoder:**

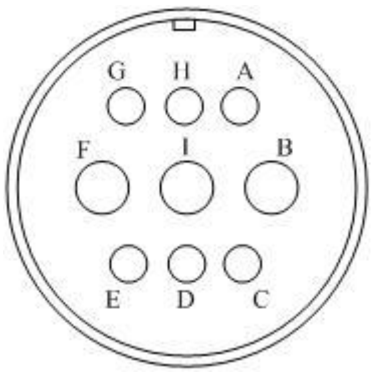
(1) General Connector:

Terminal Symbol	Wire Color		Signal	
	Absolute Value	Incremental	Absolute Value	Incremental
1	Red	White	+ 5V	VCC
2	Black		0V	GND
3	Brown	--	VB +	--
4	Brown/Black	--	VB -	--
5	Blue		SD	
6	Blue/Black	Purple	/SD	
7	--		--	
8	--		--	
9	Shield		FG	



(2) Military Specifications Connector:

Terminal Symbol	Wire Color		Signal	
	Absolute Value	Incremental	Absolute Value	Incremental
B	Red	White	+ 5V	
I	Black		0V	
A	Brown	--	VB +	--
C	Brown/Black	--	VB -	--
H	Blue		SD	
D	Blue/Black	Purple	/SD	
G	--		--	
E	--		--	
F	Shield		FG	



2-1-5 TB Terminal Description

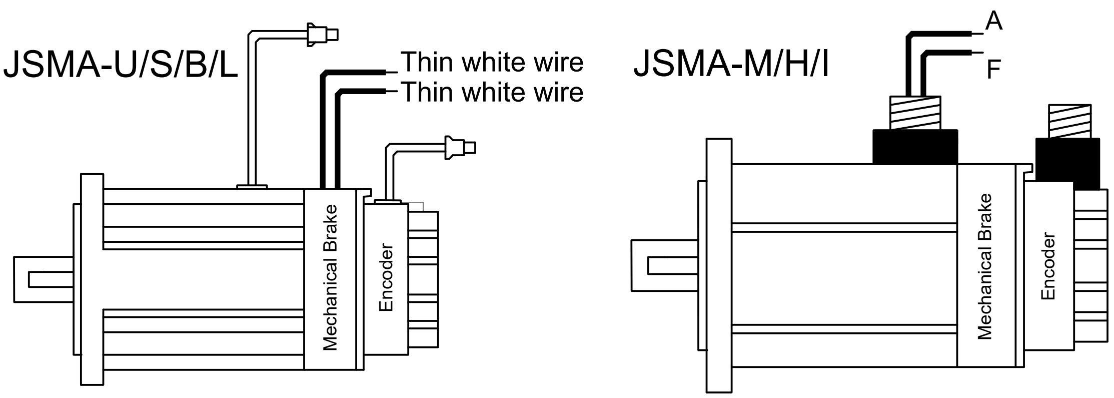
Name	Terminal Symbol	Detailed Description
Control Circuit Power Input End	r	**200V** ➢ Connect External AC Power. ➢ Single-phase 200~230VAC +10 ~ -15% 50/60Hz ±5%
	s	
	24V	**400V** ➢ Connect external DC power. ➢ Single-phase 24VDC ±10%
	0V	
Primary Circuit Power Input End	R	**200V** ➢ Connect External AC Power. ➢ Single / Three Phase 200~230VAC +10 ~ -15% 50/60Hz ±5% **400V** ➢ Connect External AC Power. ➢ Three Phase 380~480VAC ±10% 50/60Hz ±5%
	S	
	T	
External Regenerative Resistor Terminal	P	When using the external regenerative resistor, the capacity can be increased according to requirement. Please refer to **Cn012** resistance to set up. ※ **When external regenerative resistor is not used, PC-P1 must be shorted and do not connect any wire to P.** ※ **When using external regenerative resistor, please add the regenerative resistor between PC-P and do not connect any wire to P1.**
Regenerative Terminal Common Point	PC	
Internal Regenerative Resistor Terminal	P1	
Motor Power Output Terminal	U	Output to motor U phase power, motor terminal wire color is **red**.
	V	Output to motor V phase power, motor terminal wire color is **white**.
	W	Output to motor W phase power, motor terminal wire color is **black**.
Motor casing grounding terminal	FG	The motor casing ground wire contact, motor terminal wire color is **green** or **yellow-green**.

TB terminal maximum screw locking strength table

Servo Model Number	Maximum screw locking strength (kgf-cm / in-lbs)	
	Control Circuit Terminals	**Primary Circuit Other Terminals**
JSDG2S-(E) - 10A / 15A / 20A / 30A	------ (Pluggable Terminal)	
JSDG2S-(E) - 50A3 / 75A3 JSDG2S-(E) - 10B/15B/25B/35B	------ (Pluggable Terminal)	
JSDG2S-(E) -100A3 / 150A3 JSDG2S-(E) - 50B/75B	16 / 13.9	
JSDG2S-(E) - 200A3 JSDG2S-(E) - 100B	18 / 15.6	30 / 26
JSDG2S-(E) - 300A3 JSDG2S-(E) - 150B/200B	15 / 13	30 / 26

2-1-6 Motor with Mechanical BRAKE Wiring Instructions

If you wish to disable the mechanical brake, please connect the thin white wire of JSMA small motor series to DC +24V **(no polarity difference)**. For JSMA medium and large capacity series, the output is from “**A” & “F” pins of motor power connector** and must be disabled to make the servo motor operate normally.



2-1-7 Recommend specification of circuit breaker/ fuse/noise filter

- **Please make sure to install IEC-standard or UL-certified circuit breakers and fuses between the input power supply end and the servo driver.**
- **To avoid any environmental interference caused by servo driver operation, the combination of appropriate noise filter can effectively**

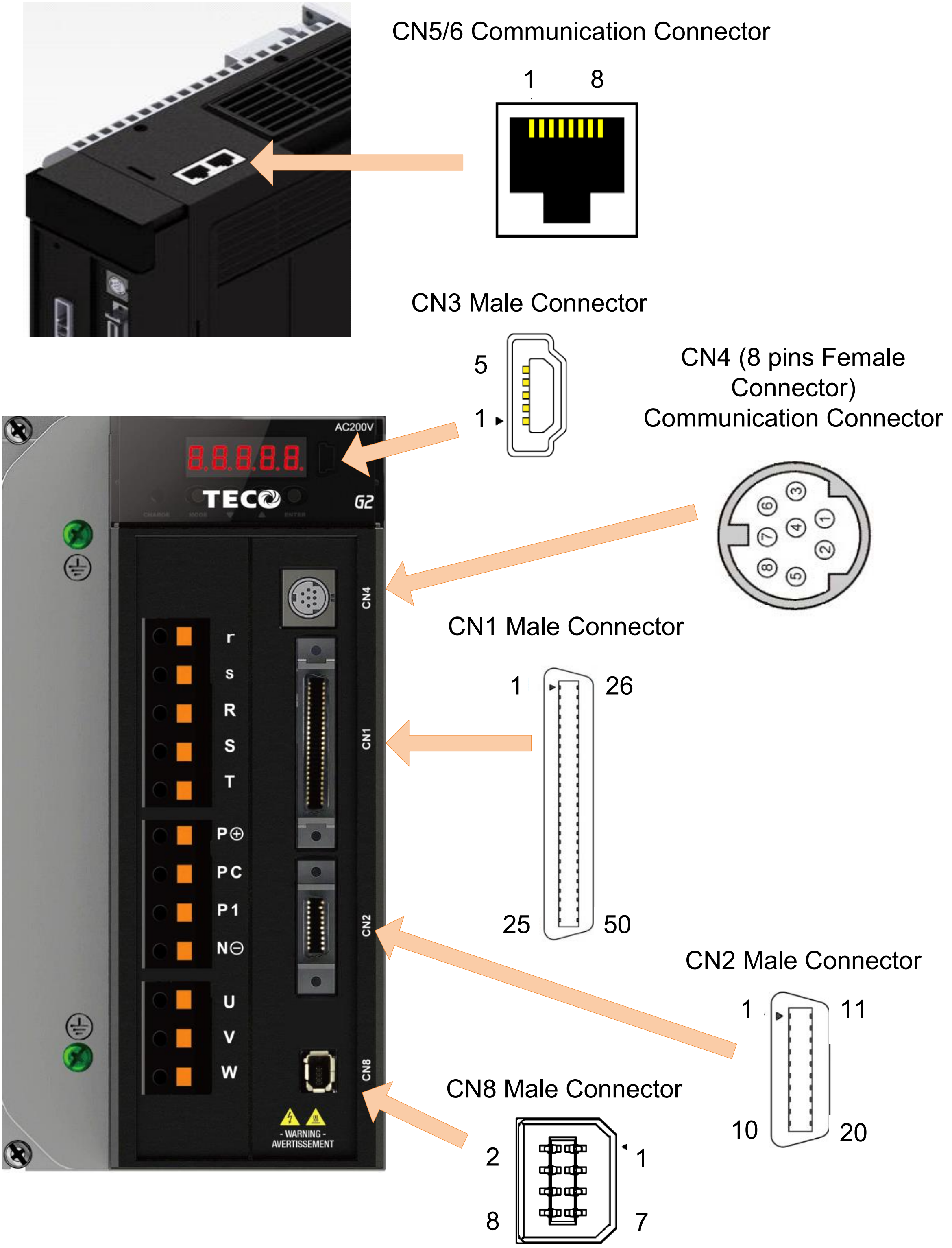
  decrease EMI as well as eliminate environmental interference.

Recommend specification of circuit breaker/ fuse/noise filter

Servo Model Number	Circuit breaker	Fuse		Noise Filter
		Specification	Recommended model	Recommended model
JSDG2S-10A	10A	20A	Bussmann 20CT	Schaffner FN3258-16
JSDG2S-15A	10A	20A	Bussmann 20CT	Schaffner FN3258-16
JSDG2S-20A	15A	20A	Bussmann 20CT	Schaffner FN3258-16
JSDG2S-30A	15A	20A	Bussmann 20CT	Schaffner FN3258-16
JSDG2S-50A3	30A	40A	Bussmann 40FE	Schaffner FN3258-16
JSDG2S-75A3	30A	40A	Bussmann 40FE	Schaffner FN3258-16
JSDG2S-100A3	50A	63A	Bussmann 63FE	Schaffner FN3258-42
JSDG2S-150A3	50A	63A	Bussmann 63FE	Schaffner FN3258-42
JSDG2S-200A3	75A	100A	Bussmann 100FE	Schaffner FN3258-42
JSDG2S-300A3	125A	100A	Sensata QFS25U-100	Schaffner FN3258-100
JSDG2S-10B	10A	4A	Bussmann KLM-4	Schaffner FN3258-16
JSDG2S-15B	10A	4A	Bussmann KLM-4	Schaffner FN3258-16
JSDG2S-25B	10A	10A	Bussmann 10CT	Schaffner FN3258-16
JSDG2S-35B	15A	20A	Bussmann 20CT	Schaffner FN3258-16
JSDG2S-50B	20A	20A	Bussmann 20CT	Schaffner FN3258-42
JSDG2S-75B	30A	40A	Bussmann 40FE	Schaffner FN3258-42
JSDG2S-100B	30A	50A	Bussmann 50FE	Schaffner FN3258-42
JSDG2S-150B	50A	80A	Bussmann FWP-80B	Schaffner FN3258-100
JSDG2S-200B	50A	80A	Bussmann FWP-80B	Schaffner FN3258-100

2-2 I/O Signal terminal description

The servo driver offers 7 sets of connection terminals, including CN1 control signal connection terminal, CN2 encoder connection terminal, CN3/ CN4/CN5/CN6 communication connection terminal, and CN8 full- closed loop encoder connection terminal. Refer to the following diagram for pin mapping.



2-2-1 CN1 Control Signal Terminal Description

(1) CN1 Terminal Configuration Diagram:

Pin	Name	Function									
2	DI-2	Digital input 2	1	DI-1	Digital input 1	27	TIC (Note 3)	Analog Torque Command/Limit	26	SIC (Note 3)	Analog Speed Command/Limit
4	DI-4	Digital input 4	3	DI-3	Digital input 3	29	AG	Analog Signal Ground End	28	AG	Analog Signal Ground End
6	DI-6	Digital input 6	5	DI-5	Digital input 5	31	MON2 (Note 3)	Analog Monitoring Output 2	30	MON1 (Note 3)	Analog Monitoring Output 1
8	DI-8	Digital input 8	7	DI-7	Digital input 7	33	+15V (Note 3)	+15V Power Output	32	AG	Analog Signal Ground End
10	DI-10	Digital input 10	9	DI-9	Digital input 9	35	PA	Dividing Output Phase A	34	-15V (Note 3)	-15V Power Output
12	DI-12	Digital input 12	11	DI-11	Digital input 11	37	PB	Dividing Output Phase B	36	/PA	Dividing Output / Phase A
14	Pulse	Position Pulse Command Input (+)	13	----	-----	39	PZ	Dividing Output Phase Z	38	/PB	Dividing Output / Phase B
16	Sign	Position Sign Command Input (+)	15	/Pulse	Position Pulse Command Input (-)	41	EXT1	Open Collector Pulse Command Power Input (Pulse)	40	/PZ	Dividing Output / Phase Z
18	DO-1	Digital output 1	17	/Sign	Position Sign Command Input (-)	43	ZO	Origin Signal Output	42	EXT2	Open Collector Direction Command Power Input (Sign)
20	DO-3	Digital output 3	19	DO-2	Digital output 2	45	IP24	+24V Power Output	44	DOCOM	DO Power Common End
22	DO-5	Digital output 5 Torque in Restriction / Error Alarm Code 0	21	DO-4	Digital output 4	47	DICOM	DI Power Common End	46	IG24	+24V Power Ground End
24	DO-7	Digital output 7 Drive under prohibition/ Error Alarm Code 2	23	DO-6	Digital output 6 P in Operation / Error Alarm Code 1	49	BAT+	Absolute Encoder Power	48	IG24	+24V Power Ground End
			25	DO-8	Digital output 8 BASE BLOCK/ Error Alarm Code 3				50	----	-----

Note: 1. For the terminals not used, please do not connect or use as relay terminals.

2. The shielding wire of the I/O signal wire shall be connected with the connector casing.

3. JSDG2S-E does not have TIC, SIC, MON1, MON2, +15V & -15V

(2) CN1 Signal Name and Description:

(a) General I/O Signal Description

Function Code	Signal	Pin No.	Wiring Mode	Function Code	Signal	Pin No.	Wiring Mode
DI1~DI12	Digital input 1~12	1~12	IO1	**DO1~DO8**	Digital output 1~8	18~25	IO2
				ZO	Origin Signal Output	43	
DICOM	DI Power Common End	47		**DOCOM**	DO Power Common End	44	
Pulse	Position Pulse Command Input	14	IO3	**PA**	Dividing Output Phase A	35	IO4
/Pulse		15		**/PA**	Dividing Output / Phase A	36	
Sign	Position Sign Command Input	16		**PB**	Dividing Output Phase B	37	
/Sign		17		**/PB**	Dividing Output / Phase B	38	
EXT1	Open collector pulse position command power input 1, 2	41		**PZ**	Dividing Output Phase Z	39	
EXT2		42		**/PZ**	Dividing Output / Phase Z	40	
SIC (Note)	Analogspeed command/limit	26	IO5	**BAT+**	Absolute type encoder power	49	IO7
TIC (Note)	Analog torque command/limit	27		**+15V** (Note)	+15V power output end	33	
AG	Analog Signal Grounding End	28,29, 32		**-15V** (Note)	-15V power output end	34	
MON1 (Note)	Analog monitoring output 1	30	IO6	**IP24**	+24V Power Output	45	
MON2 (Note)	Analog Monitoring Output 2	31		**IG24**	+24V Power Ground End	46,48	

Note: JSDG2S-E does not have TIC, SIC, MON1, MON2, +15V & -15V

Function Code	Signal Name	Mode	I/O Operating Function Description
Pulse	Position Pulse Command Input	Pe/Pt	The Driver can receive the following three different types of pulse commands: ◆ Pulse/ Sign ◆ CCW / CW pulse ◆ A / B phase pulse
/Pulse			
Sign	Position Sign Command Input		
/Sign			
EXT1 **EXT2**	Open collector pulse position command power input 1, 2	Pe/Pt	When the position commands uses open collector type input, users can connect the external power or internal 24 power to this pin.
SIC (Note 2)	Analogspeed command	S	When using external analog speed command (set digital input connection as **SPD1=OFF, SDP2=OFF** (Note1)) under speed mode, the input voltage range is **-10V ~ +10V. Sn216** can be used to set the motor speed command when input voltage is 10V.
	Analogspeed limit	T	When using external analog speed limit (set digital input connection as **SPD1=OFF, SDP2=OFF** (Note 1), parameter **Tn101.2=0**) under torque mode, the input voltage range is **-10V ~ +10V. Tn109** can be used to set the motor rotational speed limit when input voltage is 10V.
TIC (Note 2)	Analogtorque limit	Pi/Pe /Pt/S	When using external analog torque limit (set digital input connection machine **TLMT=ON** (Note 1)) under non-torque mode, input voltage range is **-10V ~ +10V. Tn103** can be used to set motor torque limit when input voltage is 10V.
	Analogtorque command	T	When using external analog torque command (set parameter **Tn101.1=0**) under torque mode, input voltage range is **-10V ~ +10V. Tn103** can be used to set motor torque command when input voltage is 10V.
MON1 (Note 2)	Analog monitoring output 1	ALL	According to Cn006.0, analog monitoring output setting value turns the monitoring value into voltage output.
MON2 (Note 2)	Analog Monitoring Output 2	ALL	According to Cn006.1, analog monitoring output setting value turns the monitoring value into voltage output.
PA	Dividing Output Phase A	ALL	Output the motor's encoder signal after being processed through the Division Ratio. The number of pulses per revolution can be set in **Cn005**. When **Cn004** is set to 1, it is a CCW rotation viewed from the motor load end with the Phase A leading the Phase B by 90 degrees. The Output Signal is with Line Driver Method.
/PA	Dividing Output / Phase A		
PB	Dividing Output Phase B		
/PB	Dividing Output / Phase B		
PZ	Dividing Output Phase Z		
/PZ	Dividing Output / Phase Z		
ZO	Origin Signal Output	ALL	Is the Output Contact of Phase Z Open Collector.

Function Code	Signal Name	Mode	I/O Operating Function Description
AG	Analog Signal Grounding End	ALL	Analog signal grounding: Grounding end of analog voltage pin, including **Pin 26, 27, 28, 30, 31, 33, 34 & 49 of CN1.**
+15V (Note 2)	+15V power output end	ALL	Provide ±15V output power (Max. 10mA) ; can be used on servo driver external voltage command. Recommend using **variable resistors above 3kΩ.**
-15V (Note 2)	-15V power output end	ALL	
DICOM	DI Power Common End	ALL	Digital Input Power Supply Common End.
DOCOM	DO Power Common End	ALL	Digital Output Power Supply Common End.
IP24	+24V Power Output	ALL	+24V Power Output End (Max. 0.2A).
IG24	+24V Power Ground End	ALL	+24V Power Grounding End
BAT+	Absolute type encoder power	ALL	Absolute type encoder power end

Note: 1. Please refer to "5-6-1 Digital input/output contact function planning" for setting.

2. JSDG2S-E does not have TIC, SIC, MON1, MON2, +15V & -15V

(b) Digital I/O Signals Description:

Due to the requirements of the servo driver application, the digital input/output pin functions used by each operating mode are also different, in order to provide more functions with the limited pins, this driver provides multifunction pin settings, from which the users can conduct function settings for each pin in accordance with the application requirements.

The digital input pin offers 12 **(Pin1~12)** plannable pints and the digital output pin offers 4 **(Pin18~21)** plannable pins.For related parameter setting, please refer to "5-6-1 Input/output contact function planning".

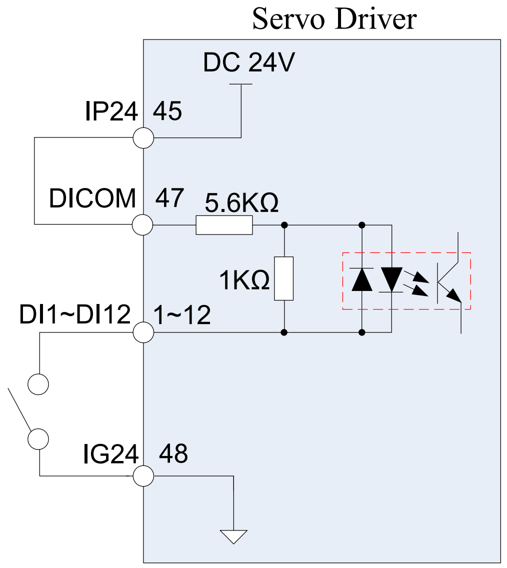
(3) CN1 Interface Circuit and Wiring Mode:

The following will introduce the interface circuit of each CN1 contact and the connection method with the Supervisory Controller.

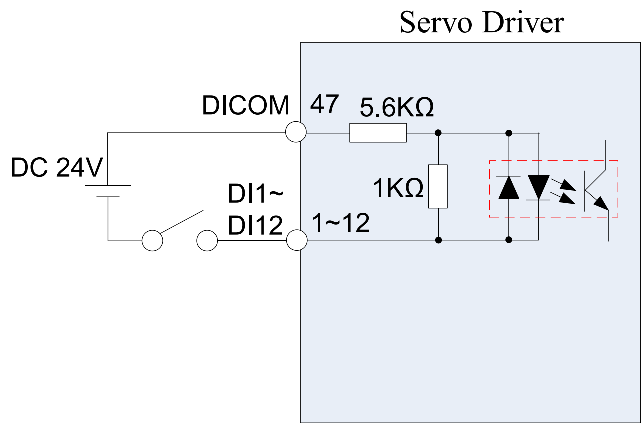
(a) Digital Input Interface Circuit **(IO1)**:

The Digital Input Interface Circuit can be controlled by relay or open collector transistor circuit. The relay needs to select a low-current relay to avoid poor contact. Use a maximum external voltage up to 24V.

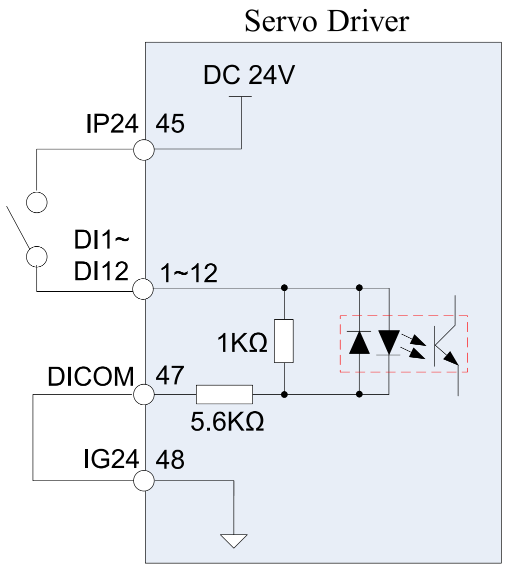
NPN Transistor, (SINK Mode) using Internal Power Supply



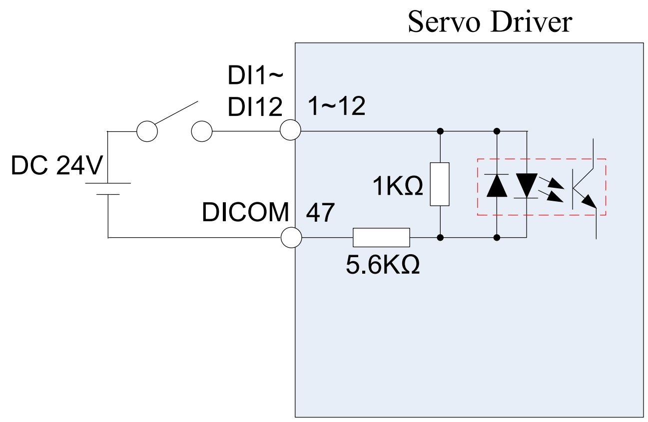
NPN Transistor, (SINK Mode) using External Power Supply



PNP Transistor, (SOURCE Mode) using Internal Power Supply

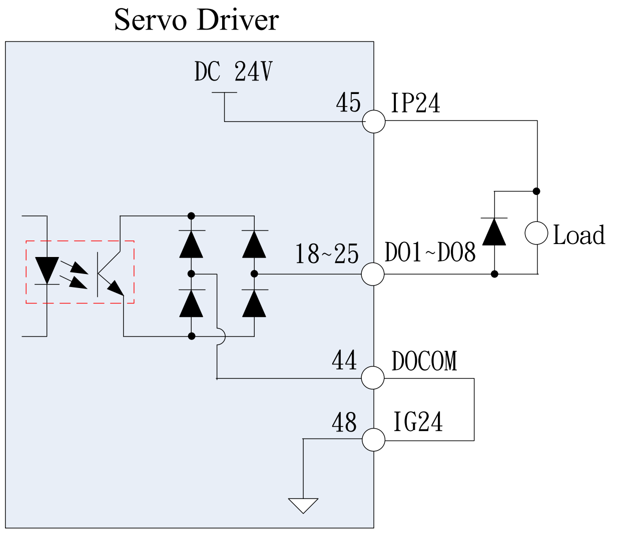
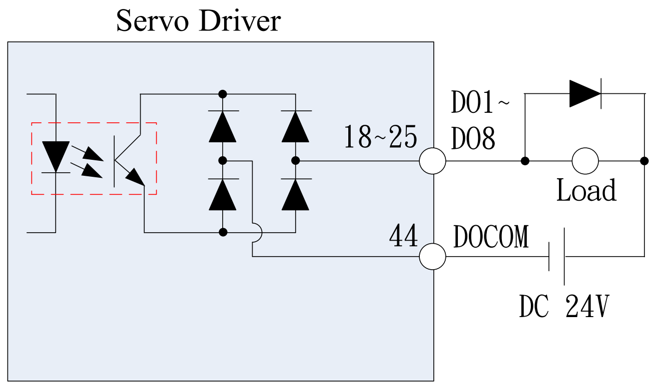


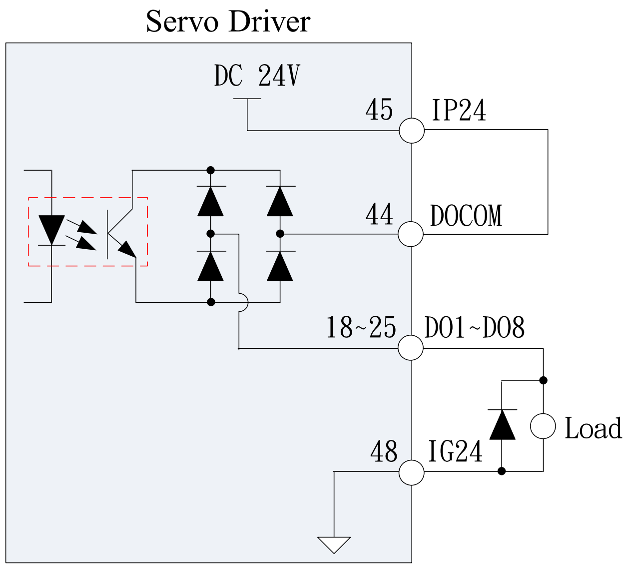
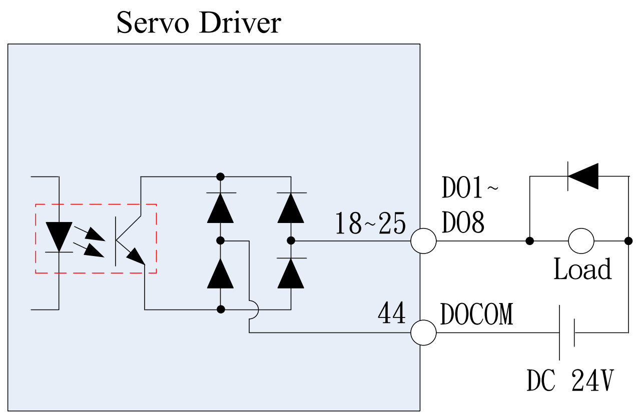
PNP Transistor, (SOURCE Mode) using External Power Supply



(b) Digital Output Interface Circuit **(IO2)**:

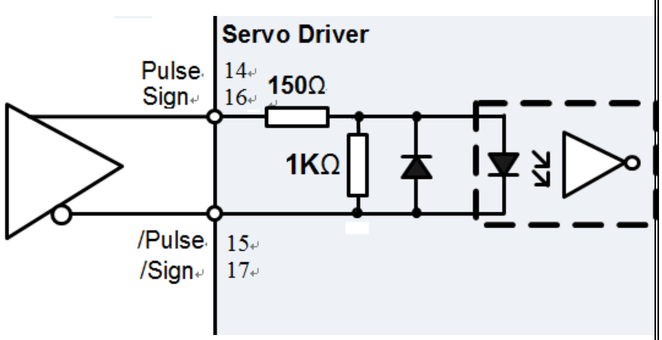
When using an external power supply, pay attention to the polarity of the power supply, reverse polarity will cause damage to the driver. The digital output is an Open Collector method, the maximum external voltage is limited to 24V, and the maximum current is 10mA. In terms of load, when using a relay or other inductive loads, it is necessary to add a diode in parallel with the inductive load, if the polarity of the diode is reversed it will cause damage to the driver.

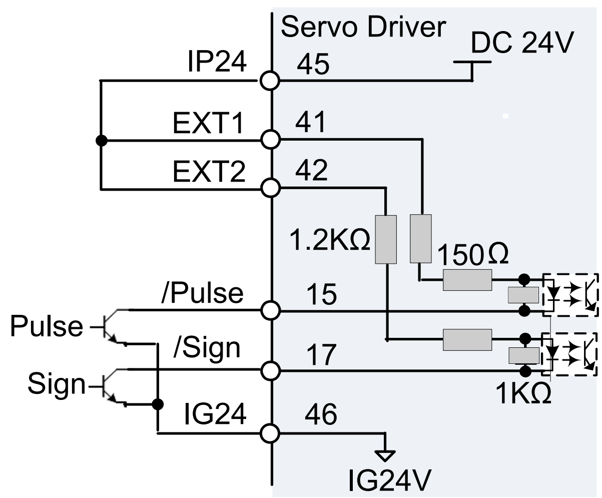
NPN Transistor, (SINK Mode) using Internal Power Supply	NPN Transistor, (SINK Mode) using External Power Supply
	

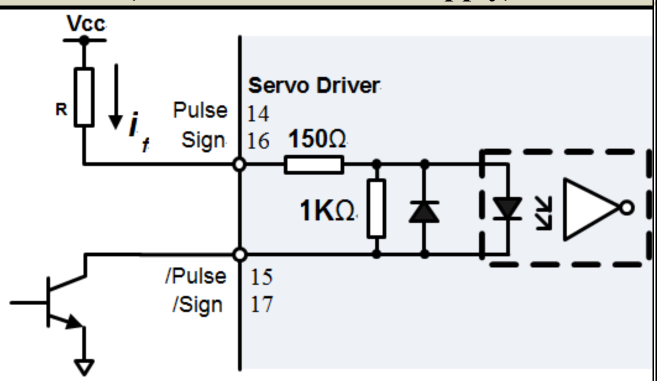
PNP Transistor, (SOURCE Mode) using Internal Power Supply	PNP Transistor, (SOURCE Mode) using External Power Supply
	

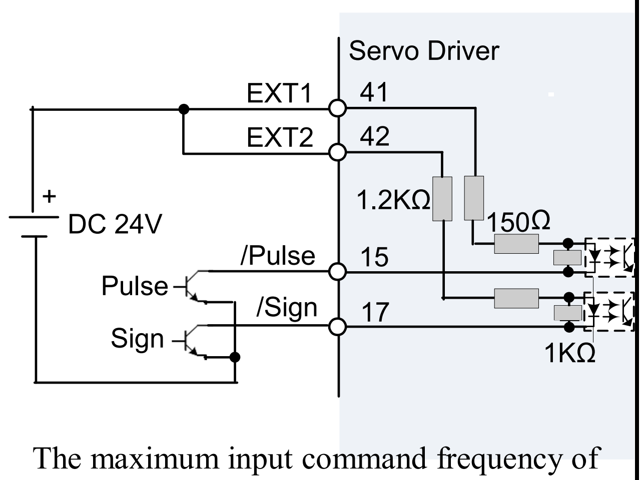
(c) Pulse Command Input Interface Circuit **(IO3)**:

We recommend using Line Driver input to accurately pulse.....command; maximum input command frequency is 4000kpps. The use of Open Collector Input Method will cause the input command frequency to decrease and the maximum input command frequency is 200kpps. The Servo Driver only provides 24V power and other power supplies need to be self-prepared. If the power supply polarity is reversed it will cause damage to the driver. The maximum external power supply (Vcc) is limited to 24V, and the input current is about 8~15mA, please refer to the following examples to select the resistor **R**. Please refer to [5-4-1 External Pulse Command Mode] for Pulse Command Input Time Sequence Waveform.

<table>
<tr><th colspan="3">Differential Input Pulse Command
(Line Driver)</th><th>Open the Collector Input Pulse Command
(use Internal 24V)</th></tr>
<tr><td colspan="3">

The maximum input command frequency of Differential Command is 4000kpps</td>
<td>

The maximum input command frequency of Open Collector Command is 200kpps</td></tr>
<tr><th colspan="3">Open Collector Input Pulse Command
(use External Power Supply)</th><th>Open Collector Input Pulse Command
(use External Power Supply)</th></tr>
<tr><td colspan="3">

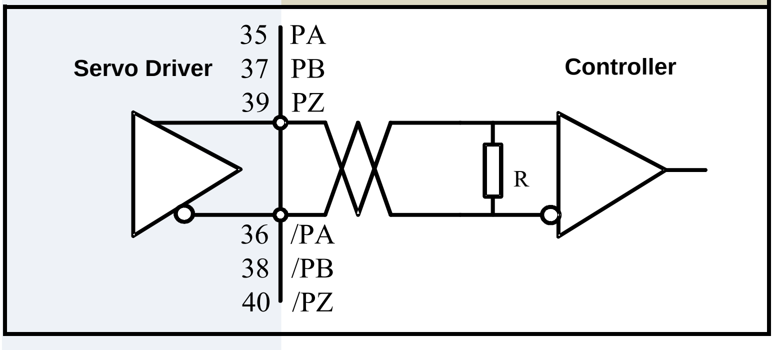
The maximum input command frequency of Open Collector Command is 200kpps</td>
<td rowspan="2">

The maximum input command frequency of Open Collector Command is 200kpps</td></tr>
<tr><td>Vcc=24V
Select R=2KΩ</td><td>Vcc=12V
Select
R=750Ω</td><td>Vcc=5V
Select R=100Ω</td></tr>
</table>

(d) Dividing Output Interface Circuit **(IO4)**:

For the Dividing Output Interface Circuit of Line Drive Input Method, please connect the terminal resistor (R=200-330Ω) to the Line Receiver Input End.

Dividing Output Interface Circuit (Line Driver)



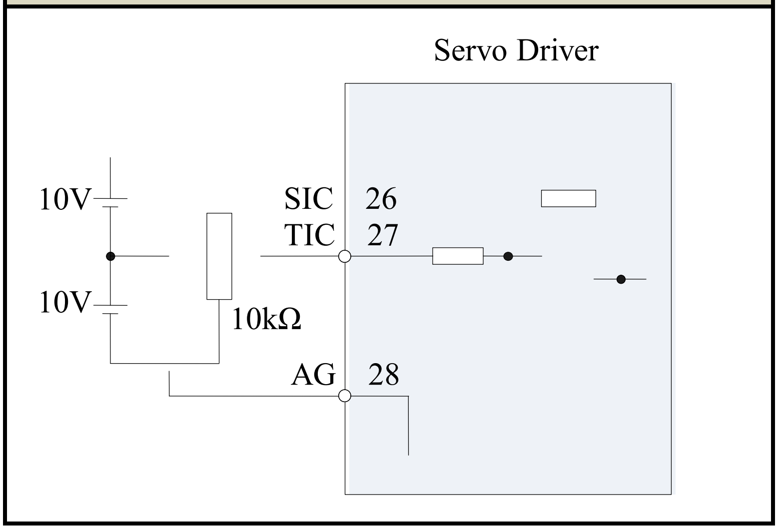
(e) Analog Input Interface Circuit (**IO5**):

Because of the internal power supply of the driver sometimes it will carry a ripple, therefore, use an external power supply as much as possible. When the polarity of the external power supply is reversed, will cause damage to the driver. The maximum external power supply voltage (Vc) shall be 12V or less, the terminal input voltage shall not exceed 10V, excessive input voltage will cause damage to the driver. When using the driver's internal power supply, select the resistor R with a maximum current of 10 mA or less (it is recommended R is 3KΩ or higher).

SIC Input Impedance: 20KΩ

TIC Input Impedance: 20KΩ

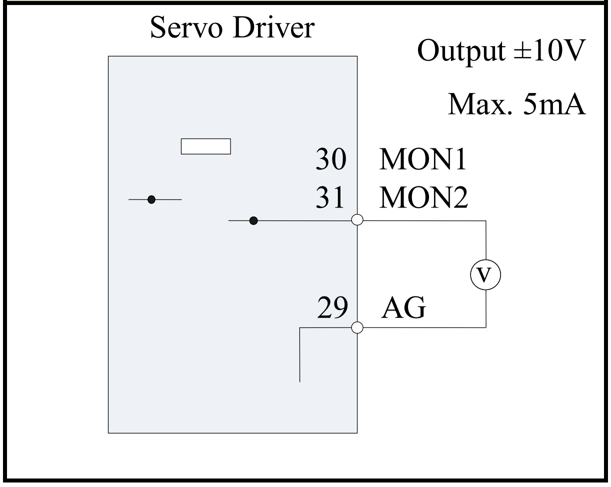
Analog Input Interface Circuit



(f) Analog output interface circuit (**IO6**):

Maximum drive current of analog output is 5mA; please select a measuring device with larger impedance.

Analog output interface circuit



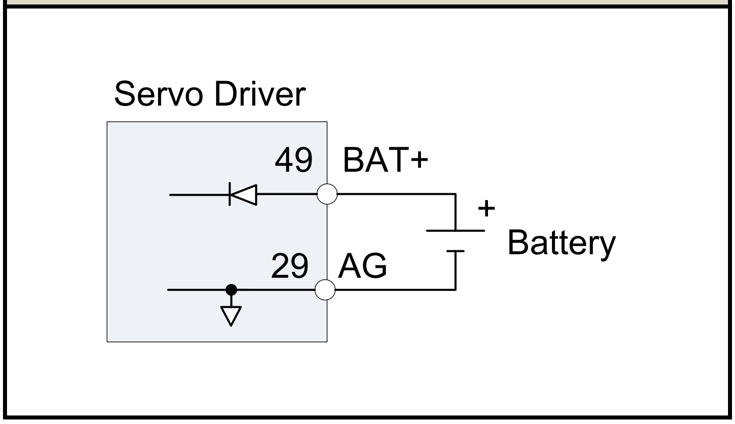
(g) Absolute position encoder battery interface circuit (**IO7**):

If the battery is already installed in the encoder or on encoder wire, please DO NOT make this circuit connected.

Battery Specification

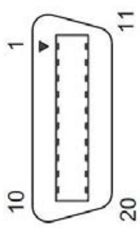
- Labeled Capacity: 2400mAh
- Labeled Voltage: 3.6V
- Operating Temperature Range: -40~85℃
- Maximum Continuous Discharge Current: 100 mA

Absolute position encoder battery interface circuit



2-2-2 CN2 Encoder Signal Terminal Description

(1) CN2 Terminal Configuration Diagram (communication type encoder configuration diagram):



Pin No.	Pin Code	Function
2	Vcc	Power Output End
4	GND	Power Ground End
6	—	—
8	—	—
10	—	—
1	Vcc	Power Output End
3	GND	Power Ground End
5	—	—
7	—	—
9	—	—
12	VB-	Battery Power Negative Polarity
14	/SD	Serial Data Output Negative Polarity
16	—	—
18	—	—
20	—	—
11	VB+	Battery Power Positive Polarity
13	SD	Serial Data Output Positive Polarity
15	—	—
17	—	—
19	—	—

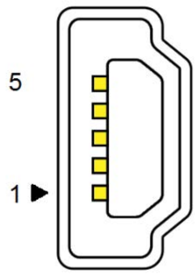
Note: Please do not connect to any wiring to unused terminals.

(2) I/O Signal Name and Description:

Pin No.	Signal Name	Function Code	Encoder output wire color		Pin Function Description
			Incremental	Absolute type	
1 2	Power Output End	Vcc	White	Red	The encoder uses a 5V power supply (provided by the driver), when the cable is more than 20 meters, two power cables shall be used separately to prevent the encoder voltage from decreasing. When more than 30 meters, please consult with the Supplier.
3 4	Power Ground End	GND	Black	Black	
11	Battery Power Positive Polarity	VB+		Brown	Battery Power Positive Polarity
12	Battery Power Negative Polarity	VB-		Brown/Black	Battery Power Negative Polarity
13	Serial Data Output Positive Polarity	SD	Blue	Blue	Serial Data Output Positive Polarity
14	Serial Data Output Negative Polarity	/SD	Purple	Blue/Black	Serial Data Output Negative Polarity
Other	Unused				Please DO NOT connect to any wire.

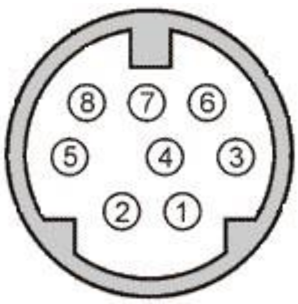
2-2-3 CN3/CN4/CN5/CN6/CN8 Communication Signal Terminal Description

CN3 Terminal Configuration Diagram:



Pin	Name
1	VBUS
2	D-
3	D+
4	ID
5	GND

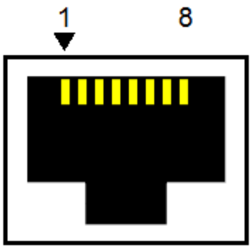
CN4 Terminal Configuration Diagram:



Pin	Name	Function
1	-------	----------------
2	-------	----------------
3	GND	Signal grounding end
4	-------	----------------
5	D+	Serial data transmission +
6	-------	----------------
7	D-	Serial data transmission -
8	-------	----------------

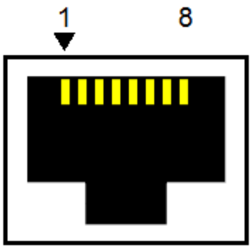
Note: Please do not connect to any wiring to unused terminals.

JSDG2S CN5/CN6 Terminal configuration diagram (CANopen communication):



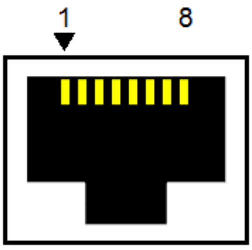
Pin	Name
1	CAN_H
2	CAN_L
3	GND
4	-
5	-
6	-
7	GND
8	-

JSDG2S CN5/CN6Terminal configuration diagram (RS-485 communication):



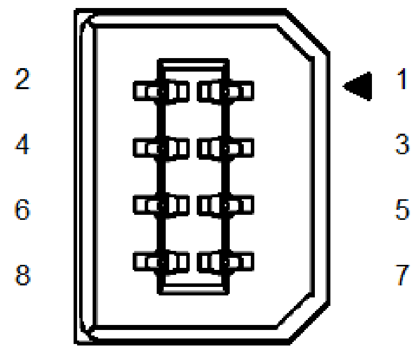
Pin	Name
1	-
2	-
3	GND
4	D+
5	D-
6	-
7	GND
8	-

JSDG2(S)-E CN5/CN6Terminal configuration diagram (EtherCAT communication):



Pin	Name
1	TX+
2	TX-
3	RX+
4	-
5	-
6	RX-
7	-
8	-

CN8 Full-closed loop signal terminal configuration diagram:



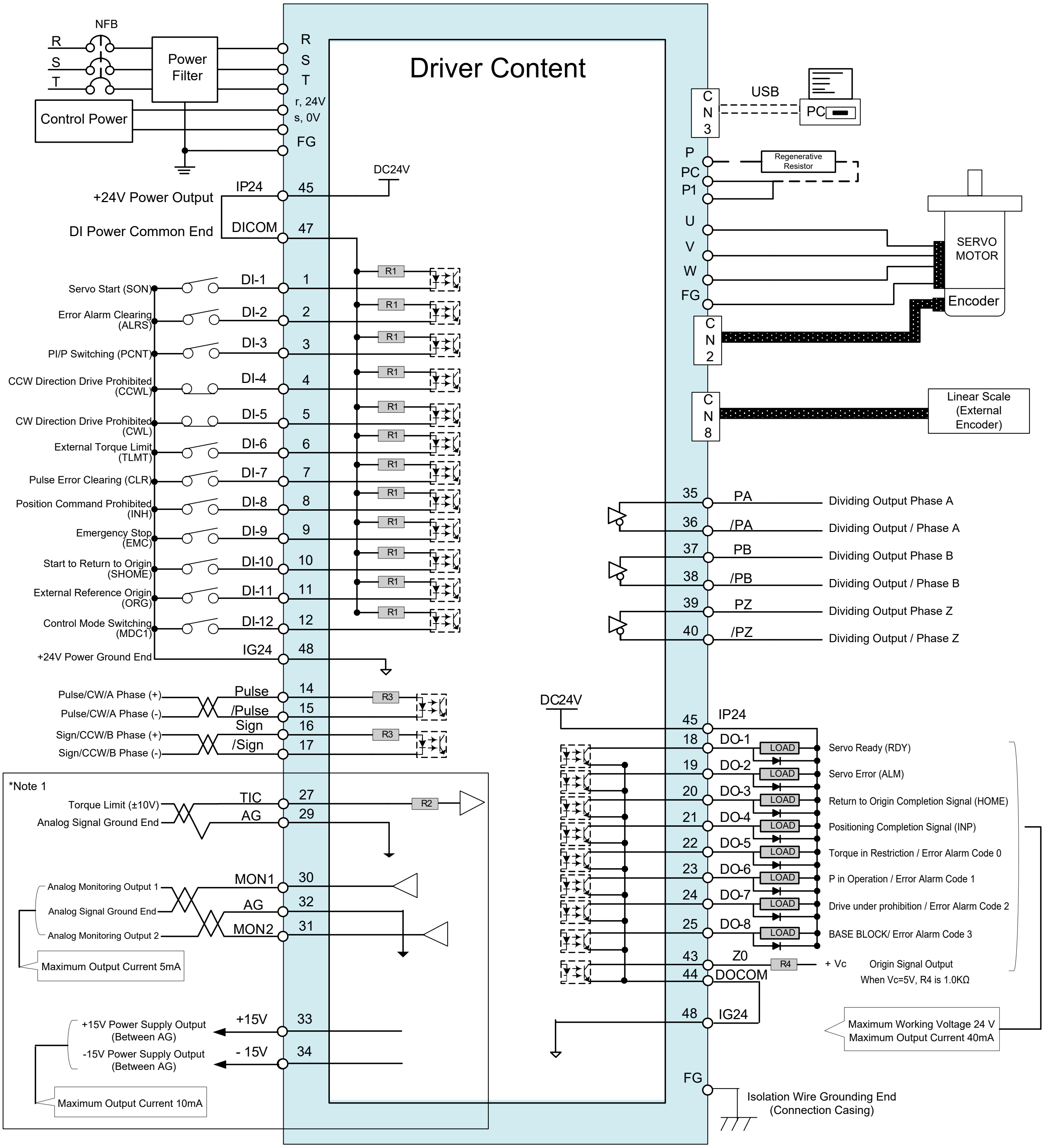
Pin	Name
1	+5V
2	0V
3	A
4	/A
5	B
6	/B
7	Z
8	/Z

Note 1: Support encoder of A/B phase signal and 5V voltage only.

Note 2: Maximum resolution for encoder support is 1000000 pulse/rev (pulse equals to the corresponded full-closed loop 4-time maximum when the motor rotates 1 cycle).

2-3 Control Signal Standard Wiring Diagram

2-3-1 Position Control (Pe Mode) Wiring Diagram (Line Driver)

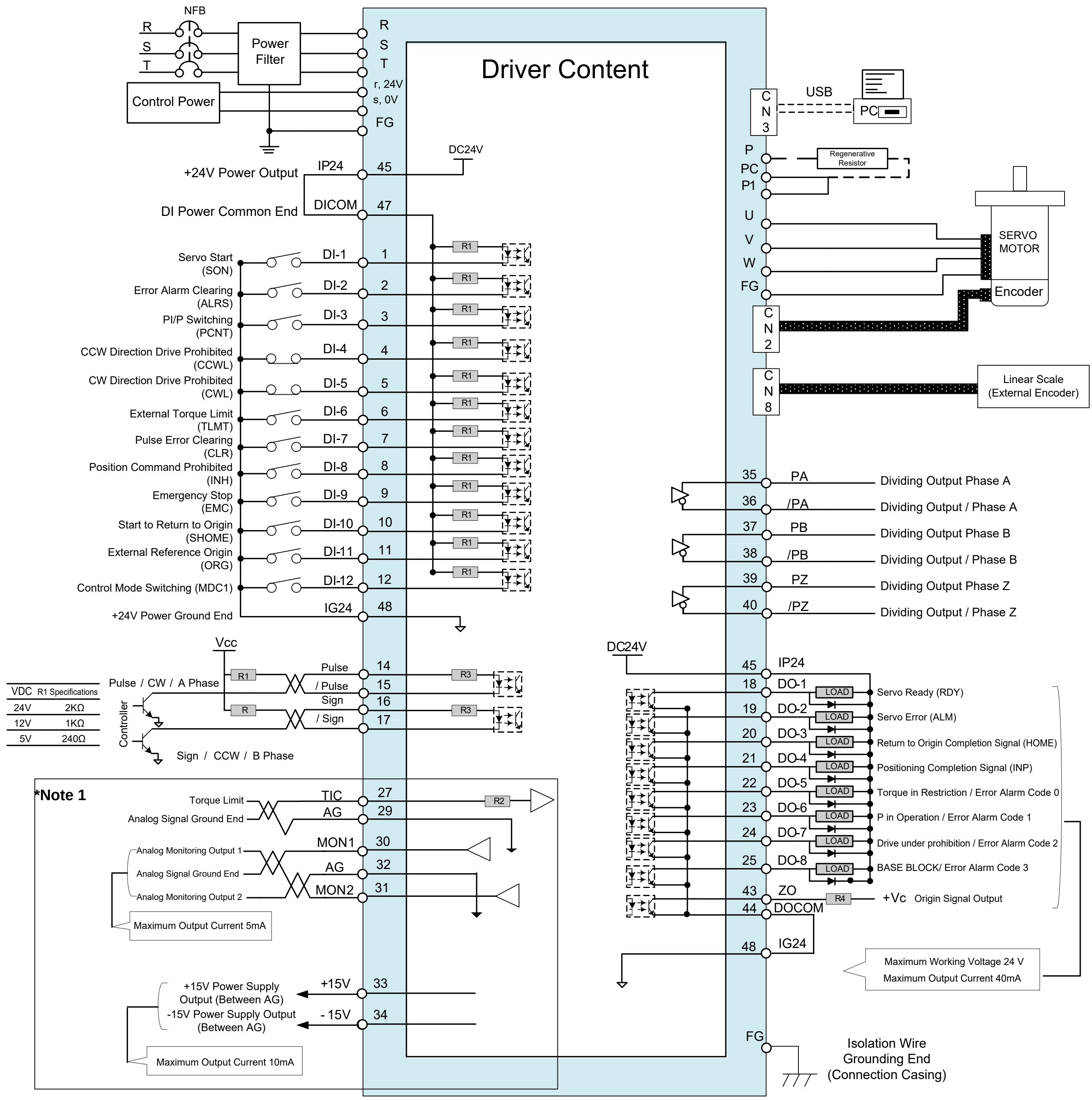


***Note 1: JSDG2S-E model does not have the framed functions**

***Note 2: Function of multifunction DI1~DI12 can be set by Hn601~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

2-3-2 Position Control (Pe Mode) Wiring Diagram (Open Collector)

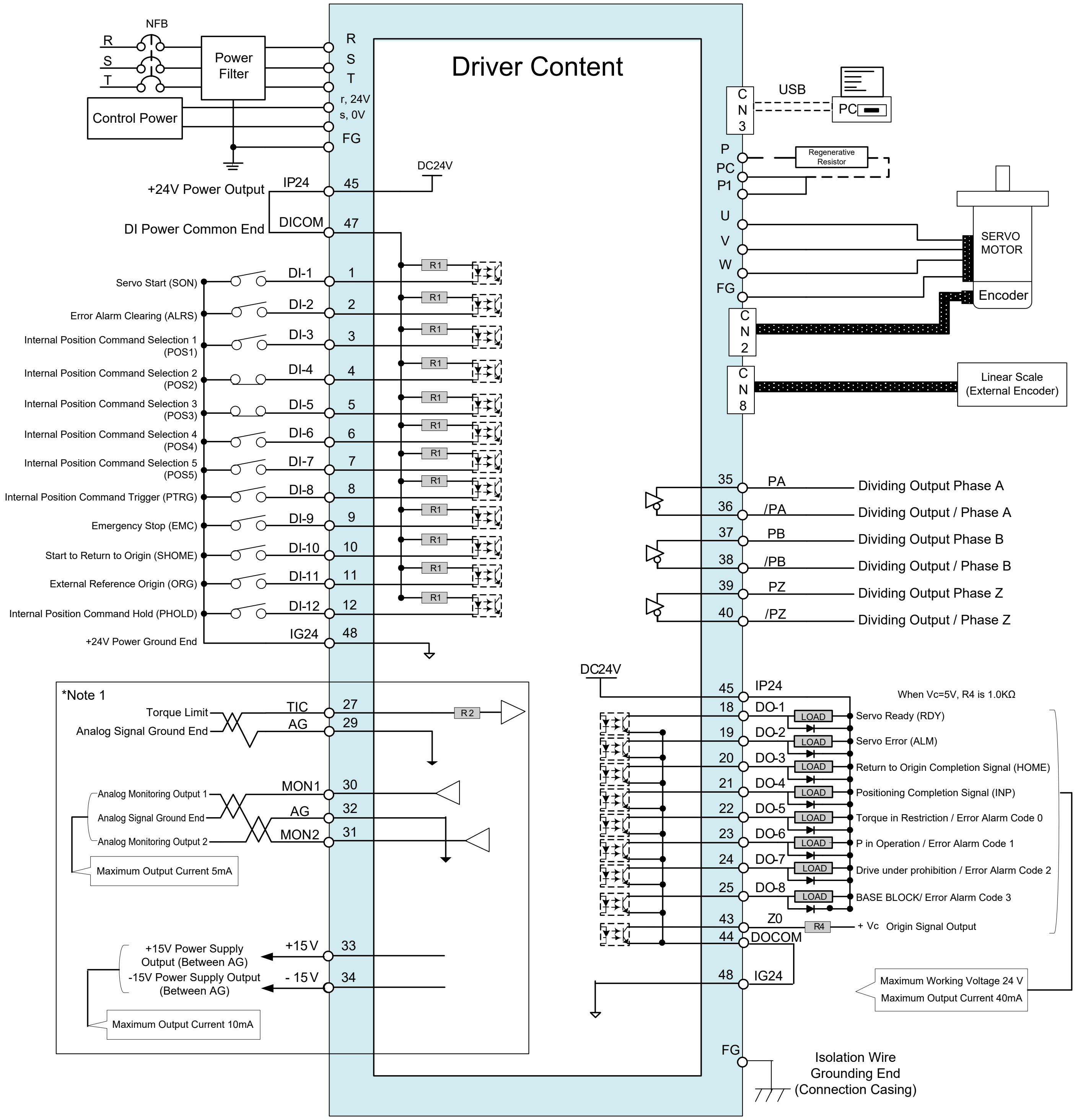


***Note 1: JSDG2S-E model does not have the framed functions**

***Note 2: Function of multifunction DI1~DI12 can be set by Hn601~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

2-3-3 Position Control (Pi Mode) Wiring Diagram

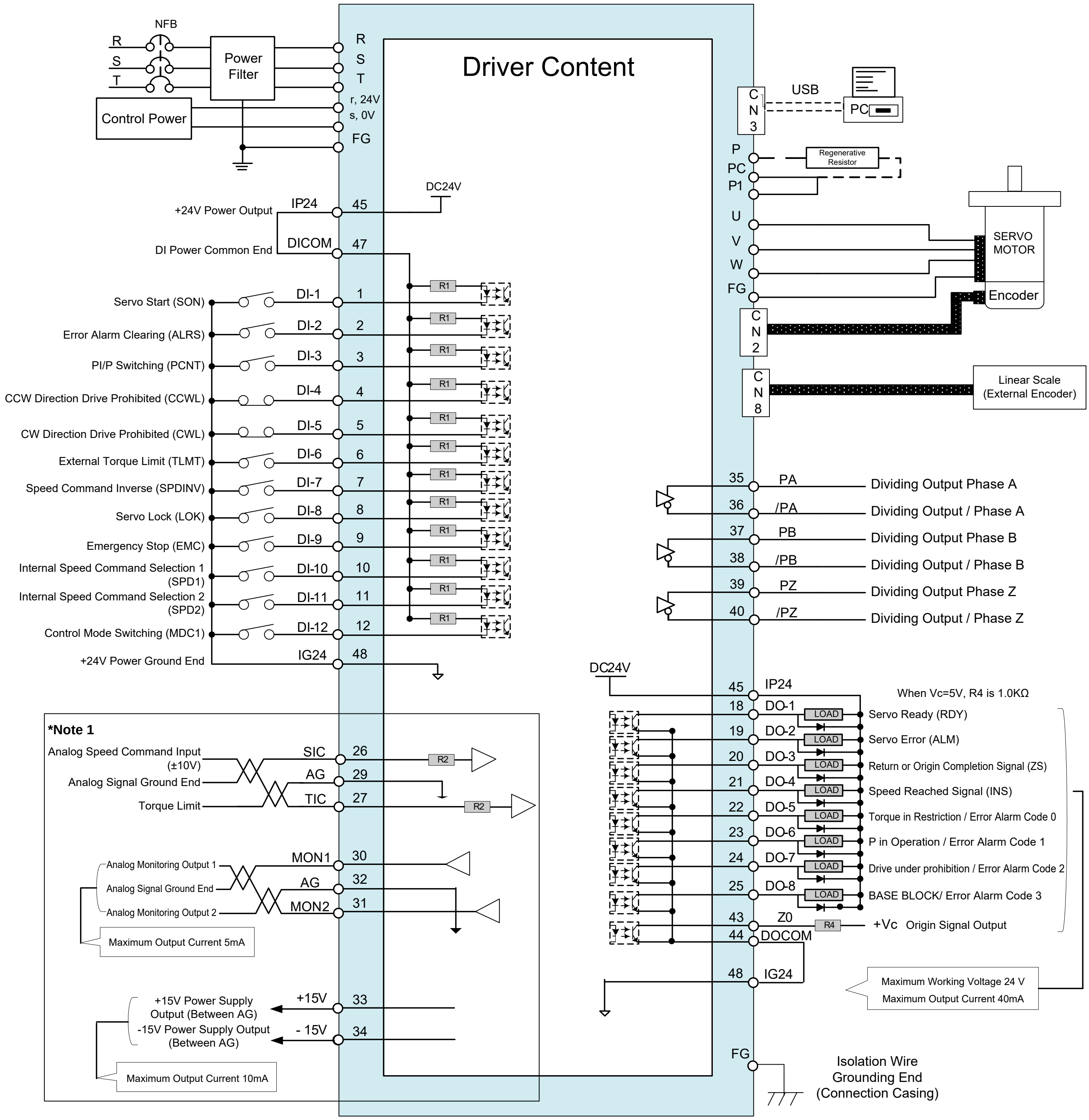


***Note 1: JSDG2S-E model does not have the framed functions**

***Note 2: Function of multifunction DI1~DI12 can be set by Hn601~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

2-3-4 Speed Control (S Mode) Wiring Diagram

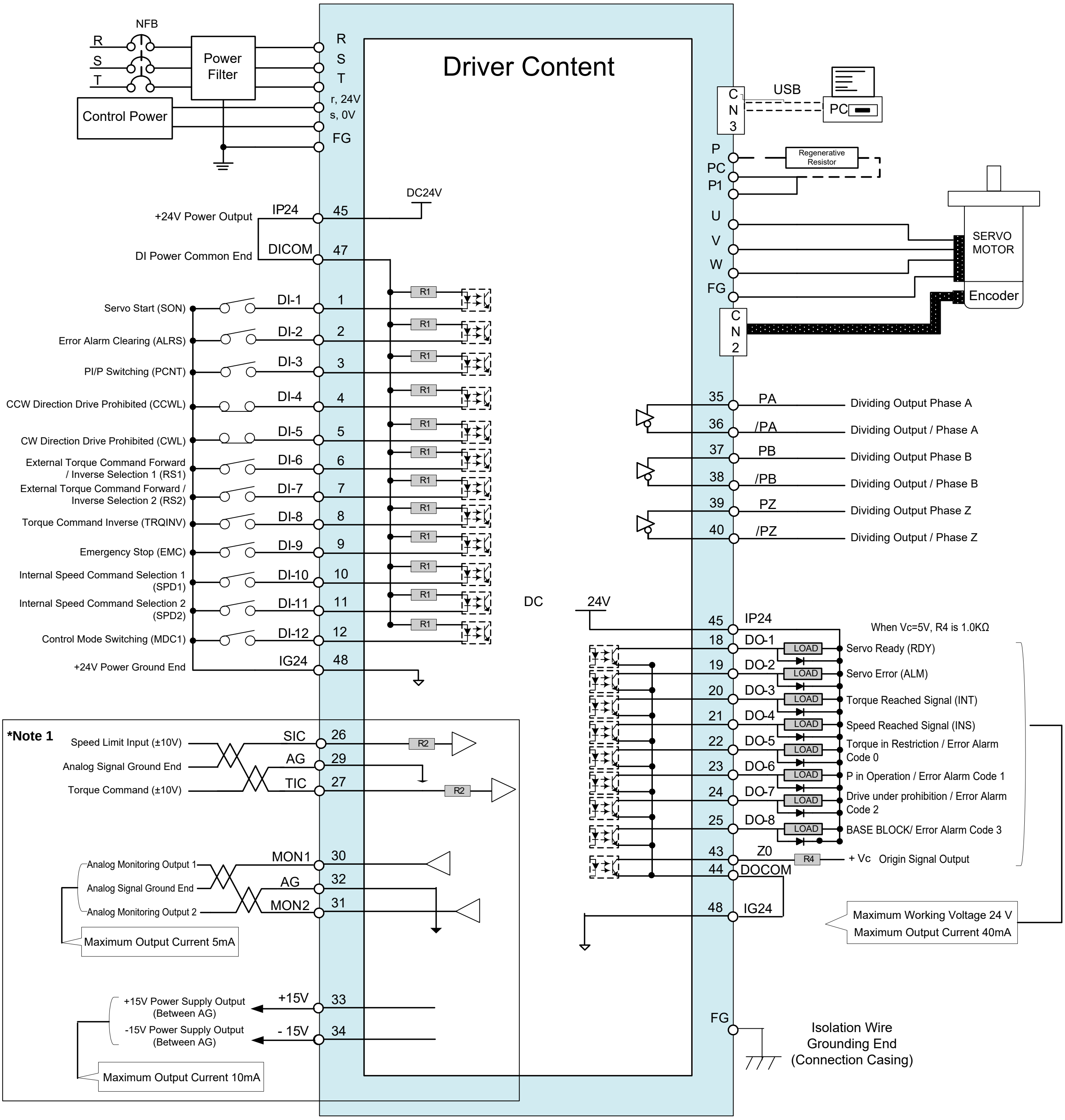


***Note 1: JSDG2S-E model does not have the framed functions**

***Note 2: Function of multifunction DI1~DI12 can be set by Hn601~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

2-3-5 Torque Control (T Mode) Wiring Diagram

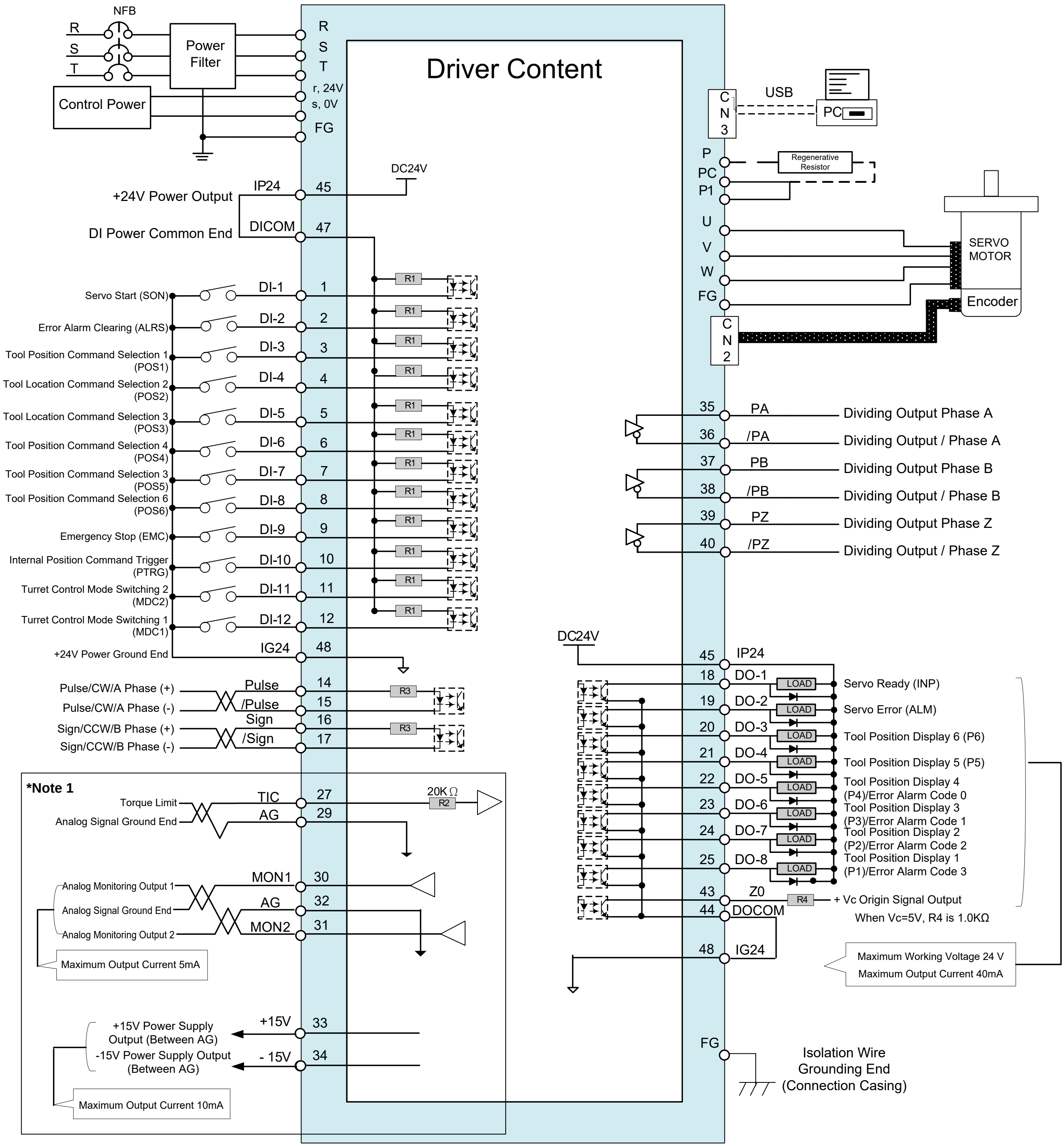


***Note 1: JSDG2S-E model does not have the framed functions**

***Note 2: Function of multifunction DI1~DI12 can be set by Hn601~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

2-3-6 Tool Magazine Mode (Pt Mode) Wiring Diagram

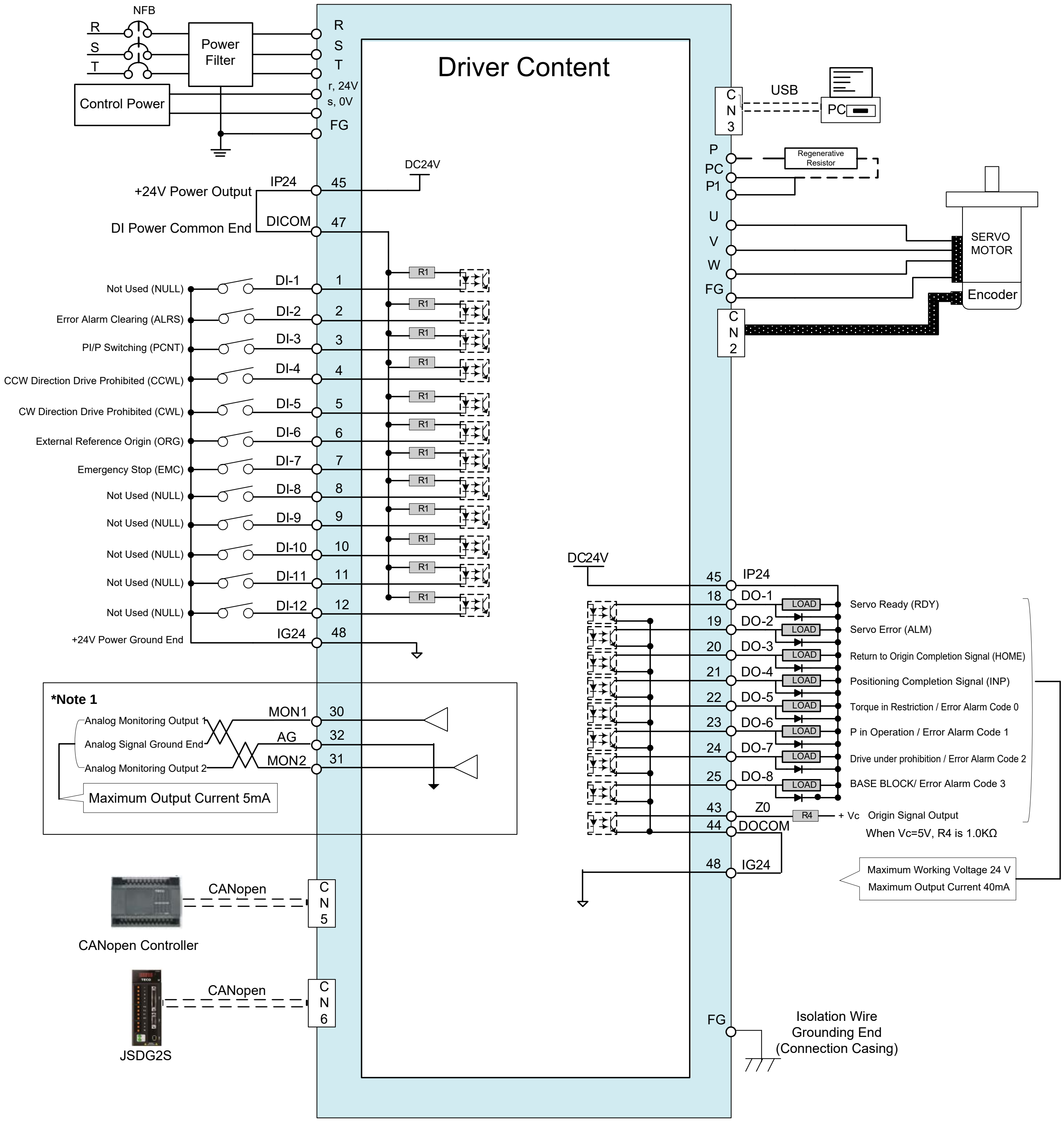


***Note 1: JSDG2S-E model does not have the framed functions**

***Note 2: Function of multifunction DI1~DI12 can be set by Hn601~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

2-3-7 CANopen mode (Cob CoC Mode) wiring diagram ※Applicable to JSDG2S

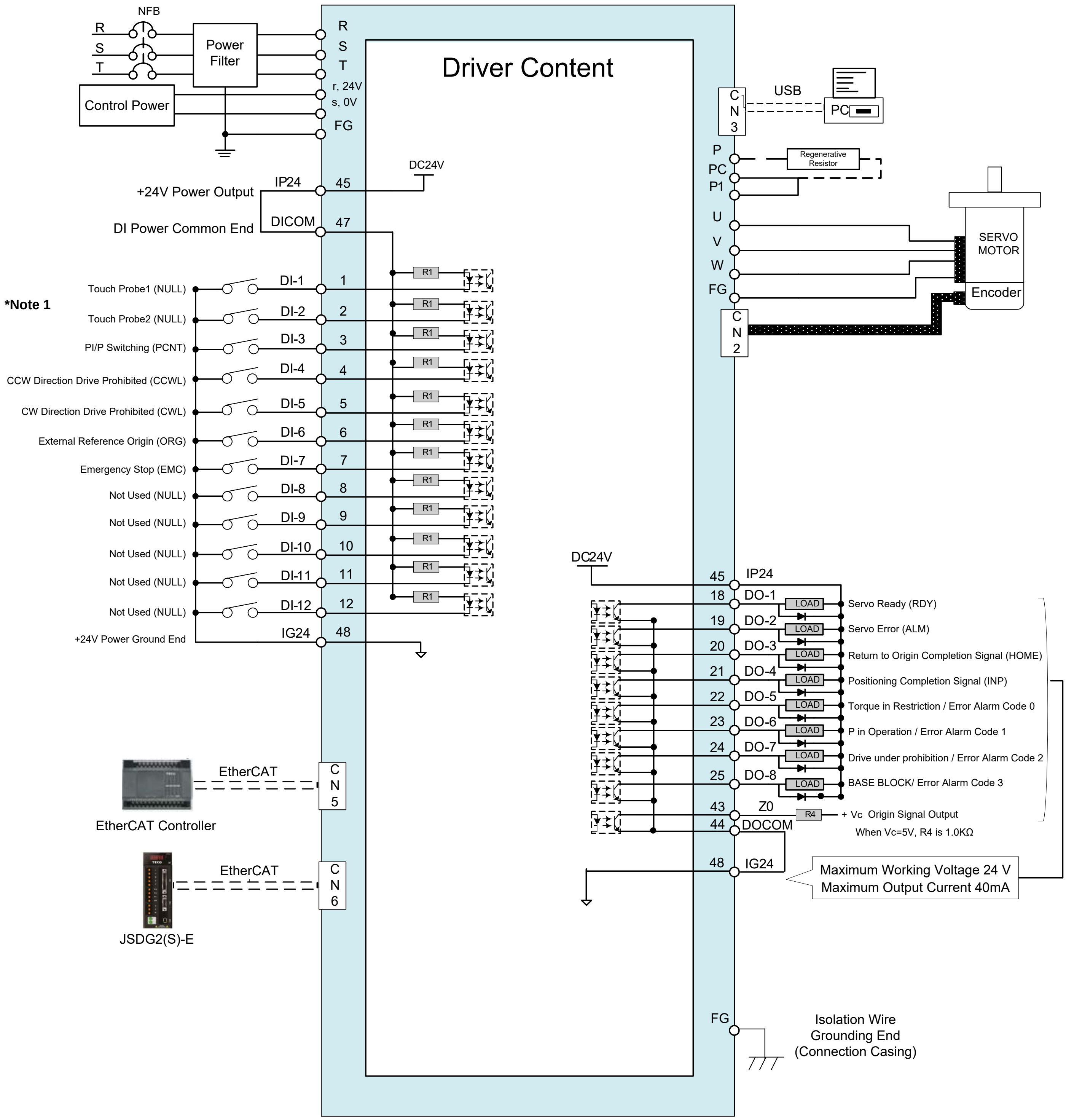


***Note 1: JSDG2S-E model does not have the framed functions**

***Note 2: Function of multifunction DI1~DI12 can be set by Hn601~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

2-3-8 EtherCAT mode (EC Mode) wiring diagram ※Applicable to JSDG2(S)-E



***Note 1: For multifunction DI1~DI2, please maintain the digital input function as NULL**

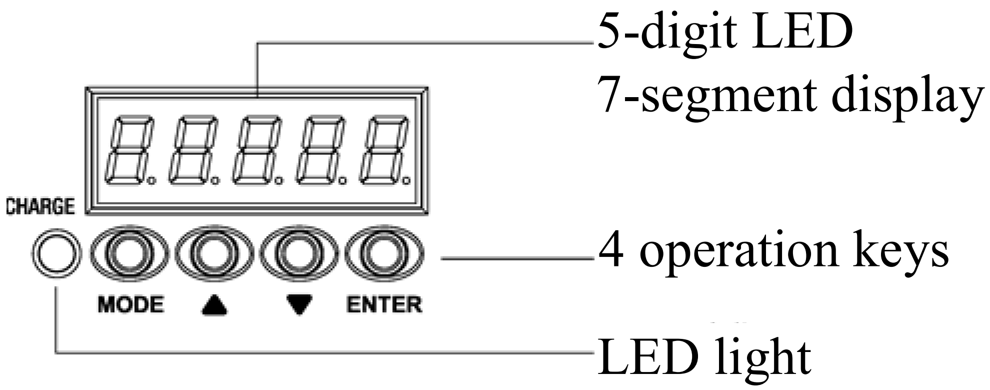
***Note 2: Function of multifunction DI3~DI12 can be set by Hn603~Hn612**

***Note 3: Function of multifunction DO1~DO4 can be set by Hn613~Hn616**

Chap 3 Panel Operation Description

3-1 Driver Panel Operating Instructions

This Device contains five LED seven-segment displays, four operating keys and a **CHARGE Indicator**, as shown in the following Figure. **When CHARGE indicator (red)** is on, it means power still exists in the primary circuit of the device when the power is switched off. Users must disconnect the cables until this indicator completely goes out.



Key Symbol	Key Name	Key Function Description
MODE	Mode Selection Key (MODE Key)	1. Select from 12 parameters offered by this device. The parameter will rotate by each press. 2. When setting the data screen, click to jump back to the parameter selection screen.
▲	Number Up Key (UP Key)	1. Select each parameter item. 2. Change the number data. 3. Press the ▲ and ▼ keys at the same time to clear the Error Alarm State.
▼	Down Key (DOWN Key)	
ENTER	Data Setting Key (ENTER) Key	1. Data Confirmation; Parameter Item Confirmation. 2. Move left to adjust the number of digits. 3. End the setting data.

When the power is on, users can use MODE key to select from 12 parameters, described as follows, offered by this device.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	Un-01	Press MODE Key once to enter **Status Display Parameters**.
3	MODE	dn-01	Press MODE Key once to enter **Diagnostic Parameters**.
4	MODE	AL.000	Press MODE Key once to enter **Error Alarm History Parameters.**
5	MODE	Cn001	Press MODE Key one time to enter the **System Parameter**.
6	MODE	Tn101	Press MODE Key once to enter **Torque Control Parameters**.
7	MODE	Sn201	Press MODE Key once to enter **Speed Control Parameters.**
8	MODE	Pn301	Press MODE Key once to enter **Position Control Parameters**.
9	MODE	Pn401	Press MODE Key once to enter **Point to Point Position Control Parameters**.
10	MODE	qn501	Press MODE Key once to enter **Shortcut Parameters**.
11	MODE	Hn601	Press MODE Key once to enter **Multifunction Contact Planning Parameters**.
12	MODE	ECA01	Press MODE Key once to enter Rotary Cut and **Flying Shear Parameters**.
13	MODE	En701	Press MODE Key once to enter **CiA402 parameters.**
14	MODE	- bb	Press MODE Key once to enter **Status Display Screen**. Cycle through in sequence.

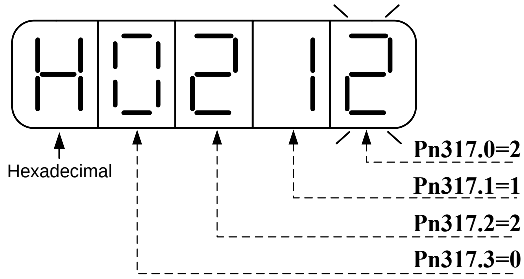
The following provides a setting example. All key functions are used. Users can operate once to understand the function of each key, for example, to set **Sn203** (Internal Speed Command 3) to 100rpm, please follow the steps below:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	Sn201	Press MODE Key 6 times to enter **Speed Control Parameters**.
3	▲	Sn203	Press UP Key 2 times to select the **Speed Control Parameter** Items.
4	ENTER	00300	After press and hold the ENTER Key for 2 seconds to enter **Sn203** Setting Screen,
5	ENTER	00300	Press ENTER Key 1 time, move left to adjust the number of digits (flashing LED).
6	ENTER	00300	Press ENTER Key 1 time, move left to adjust the number of digits (flashing LED).
7	▼	00100	Press DOWN Key 2 times, to adjust the hundredths digit number 3 downwards to 1.
8	ENTER	-SET- Sn203	Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

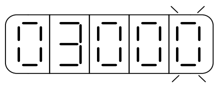
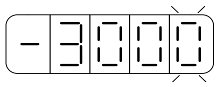
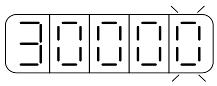
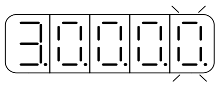
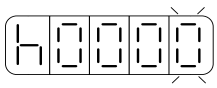
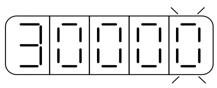
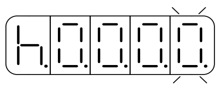
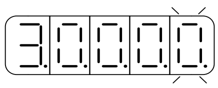
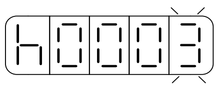
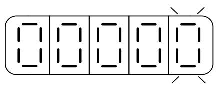
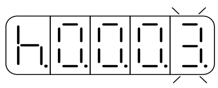
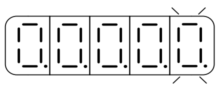
When entering the setting screen and don't want to make any setting adjustments, simply press the MODE Key 1 time to jump back to the Parameter Selection Screen.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	Sn201	Press MODE Key 6 times to enter **Speed Control Parameters**.
3	▲	Sn203	Press UP Key 2 times to select the **Speed Control Parameter** Items.
4	ENTER	00300	After press and hold the ENTER Key for 2 seconds to enter **Sn203** Setting Screen,
5	MODE	Sn203	Press MODE Key 1 time to jump back to the Parameter Selection Screen.

Some parameters of this Device are displayed in Hexadecimal, if the highest digit of the setting screen shows **H**, indicating that this parameter is set in Hexadecimal. Setting Example Description: Suppose **Pn317 (Return to Origin Mode Setting)=0212**, then the Display Screen is



The Positive / Negative Values of this Device are displayed as follows:

Positive / Negative Sign Display Description	Positive Value Display	Negative Value Display
If the settable value range is less than or equal to 4 digits, the highest digit will display a negative sign when the negative value is displayed, for example, **Sn201** (Internal Speed Command 1).	3000	-3000
		
If the settable range is equal to 5 digits, the decimal points of all digits are ON when the negative value is displayed, for example, **Pn401** (Internal Position Command 1-Number of Revolutions).	30000	-30000
		
If the settable range is more than 5 digits, the Enter Key can be used to switch between high and low digits, the decimal points of all digits are ON when the negative value is displayed, for example, **Pn402** (Internal Position Command 1 - Number of Pulses).	30000	-30000
	Higher 5 Digits:  Lower 5 Digits: 	Higher 5 Digits:  Lower 5 Digits: 
	300000	-300000
	Higher 5 Digits:  Lower 5 Digits: 	Higher 5 Digits:  Lower 5 Digits: 

The negative setting of this Device is explained as follows:

(1) If the settable value range is less than or equal to 4 digits, for example, set **Sn201** (Internal Speed Command 1)=100 to -100

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	Sn201	Press MODE Key 6 times to enter **Speed Control Parameters**.
3	ENTER	00100	After pressing, hold the ENTER Key for 2 seconds to enter the **Sn201** setting screen.
4	ENTER	00100	Press the ENTER Key 4 times to move the adjustable digits 4 places to the left, that is, to the highest digit.
5	▲ or ▼	-0100	Press the UP Key or DOWN Key 1 time, the negative sign appears. If pressing one more time, then the negative sign disappears.
6	ENTER	-SEt- Sn201	Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

(2) If the settable range is equal to 5 digits, for example, set **Pn401** (Internal Position Command 1-Number of Revolutions)=0 to -10000.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	Pn401	Press MODE Key 8 times to enter the **Point to Point Position Control Parameters**.
3	ENTER	00000	After press and hold the ENTER Key for 2 seconds, enter the **Pn401** Setting Screen.
4	ENTER	00000	Press ENTER Key 4 times, to move the adjustable digits 4 places to the left.
5	▼	1.0.0.0.0.	Press DOWN Key 1 time, to adjust the 10,000th digit down to 1, and the decimal point of all digits is ON, indicating that the current setting value is negative.
6	ENTER	-SEt-	Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to

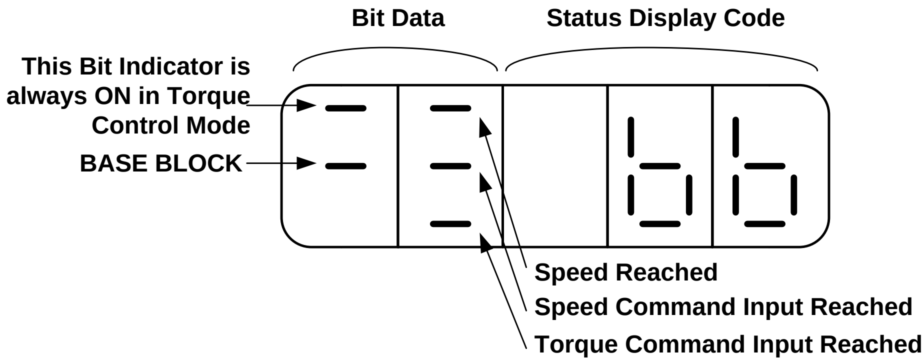
		Pn401	the current parameter item selection screen immediately.

(3) If the settable range is more than 5 digits, for example, set **Pn402** (Internal Position Command 1-Number of Pulses)=0 to -100000.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	Pn401	Press MODE Key 8 times to enter the **Point to Point Position Control Parameters**.
3	▲	Pn402	Press UP Key 1 time, to select the Item of **Control Parameter Item for Multi-position Control**.
4	ENTER	00000	Press and hold the ENTER Key for 2 seconds, to enter the **Pn402** Setting Screen.
5	ENTER	h0000	Press ENTER Key 5 times, to move the adjustable digits 5 places to the left.
6	▼	h.0.0.0. 1.	Press DOWN Key 1 time, to adjust the 10,000th digit down to 1, and the decimal point of all digits is ON, indicating that the current setting value is negative.
7	ENTER	-SEt- Pn402	Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

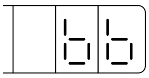
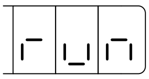
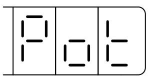
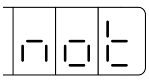
When the power of this device is on, the screen of LED display will indicate device status by bit data and status display codes. Definitions of speed control mode, torque control mode and position control mode differ from the displayed content under status display screen. The following are the descriptions:

(1) Speed/Torque control mode:

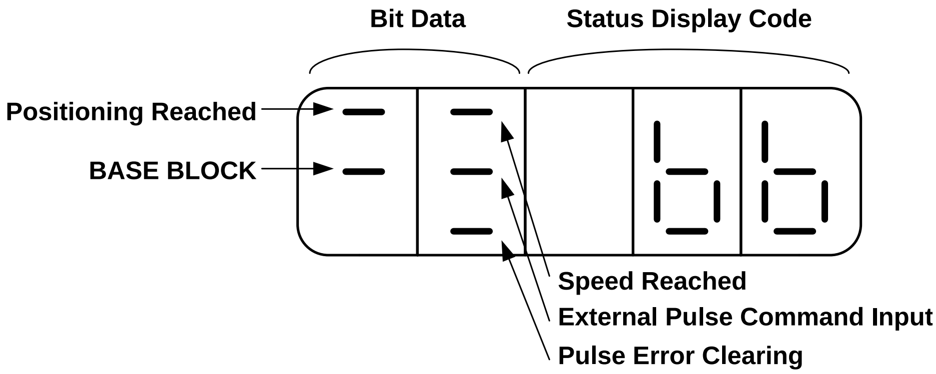


The Display Codes related to Bit Data and Status are described as follows:

Bit Data	Description	
	Bit Indicator ON	**Bit Indicator OFF**
BASE BLOCK	In **Servo OFF** Status	In **Servo ON** Status
Speed Reached (INS)	Motor speed larger than **Cn007** (Speed reached determined value)	Motor speed smaller than **Cn007** (Speed reached determined value)
Speed Command Input Reached	Speed command input value larger than **Cn007** (Speed reached determined value)	Speed command input value smaller than **Cn007** (Speed reached determined value)
Torque Command Input Reached	Torque Command Input Value higher than **10%** of Rated Torque	Torque Command Input Value lower than **10%** of Rated Torque

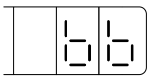
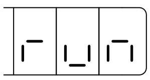
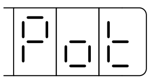
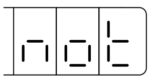
Status Display Code	Description
	**In BASE BLOCK** In **Servo OFF** State (Motor in Non-excitation State)
	**Servo-excitation in Operation** In **Servo ON** State (Motor in Excitation State)
	**CCW Direction Drive Prohibited** Digital input contact **CCWL** operation
	**CW Direction Drive Prohibited** Digital input contact **CWL** operation

(2) Position Control Mode:



The Display Codes related to Bit Data and Status are described as follows:

Bit Data	Description	
	Bit Indicator ON	**Bit Indicator OFF**
BASE BLOCK	In **Servo OFF** Status	In **Servo ON** Status
Positioning Completed (INP)	Position error smaller than **Pn307** (Positioning completed determined value)	Position error larger than **Pn307** (Positioning completed determined value)
Speed Reached (INS)	Motor speed larger than **Cn007** (Speed reached determined value)	Motor speed smaller than **Cn007** (Speed reached determined value)
External Pulse Command Input	With External Pulse Command Input	Without External Pulse Command Input
Pulse Error Clearing	Digital input contact**CLR**(pulse error clearing) operating	Digital input contact**CLR**(pulse error clearing) not operating

Status Display Code	Description
	**In BASE BLOCK** In **Servo OFF** State (Motor in Non-excitation State)
	**Servo-excitation in Operation** In **Servo ON** State (Motor in Excitation State)
	**CCW Direction Drive Prohibited** Digital input contact **CCWL** operation
	**CW Direction Drive Prohibited** Digital input contact **CWL** operation

3-2 State Display Function Description

The user can use the Status Display Parameter to know all information of the current driver and motor operations, please refer to [7-3-11 Monitoring Parameters] for detail description:

Parameter Code	Display Content	Unit	Description	RS-485 Address	Index
Un-01	Actual Motor Speed	rpm	For example: The display of 120 indicates that the current Motor Speed is 120 rpm.	0601H	2801H
Un-02	Actual Motor Torque	%	Expressed by the percentage of Rated Torque. For example: The display of 20 indicates that the Motor Torque Output is now 20% of the Rated Torque.	0602H	2802H
Un-03	Regenerative Load Rate	%	The average percentage of Regenerative Power Output.	0603H	2803H
Un-04	Effective Load rate	%	The average percentage of Power Output.	0604H	2804H
Un-05	Maximum Load Rate	%	The maximum value of Effective Load Rate has ever appeared.	0605H	2805H
Un-06	Speed Command	rpm	For example: The display of 120 indicates that the current Speed Command is 120 rpm.	0606H	2806H
Un-07	Position Error ※ The Range is more than 5 digits	pulse	Difference between Position Command and Position Feedback.	0607H 0608H	2807H
Un-09 (Note 1)	External Analog Voltage Command Value	V	For example: The display of 5.25 indicates that the External Voltage Command is 5.25V.	060BH	2809H
Un-10	Main Circuit (Vdc Bus) Voltage	V	For example: The display of 310 indicates that the Main Circuit Voltage is 310V.	060CH	280AH
Un-11 (Note 1)	External Analog Voltage Limit Value	V	For example: The display of 5.25 indicates that the External Voltage Command is 5.25V.	060DH	280BH
Un-12	External CCW Direction Torque Limit Command Value	%	For example: The display of 100 indicates that the current External CCW Direction Torque Limit Command is 100%.	060EH	280CH
Un-13	External CW Direction Torque Limit Command Value	%	For example: The display of 100 indicates that the current External CW Direction Torque Limit Command is 100%.	060FH	280DH
Un-14	Motor Feedback - Number of Pulses in one Rotation ※ The Range is more than 5 digits	pulse	When the power is on, the value will return to zero; display the number of pulses in one motor rotation. ※ When conducting the Servo internal Return to Origin operation will clear to 0	0610H 0611H	280EH
Un-16	Motor Feedback - Number of Rotations ※ The Range is more than 5 digits	rev	When the power is on, the value will return to zero; display the cycles of motor rotation. ※ When conducting the Servo internal Return to Origin operation will clear to 0	0613H 0614H	2810H
Un-18	Pulse Command - Number of pulses in one rotation ※ The Range is more than 5 digits	pulse	After power is on, count the number of pulses in 1 rotation of pulse command input under Servo ON condition. (After the power is on, the value is 0)	0616H 0617H	2812H
Un-20	Pulse Command - Number of Rotations ※ The Range is more than 5 digits	rev	After the power is on, count and display cycle number of pulse command input under Servo ON condition. (After the power is on, the value is 0)	0619H 061AH	2814H
Un-24	Multi-revolution Position Information of the Communication Encoder Feedback	rev	Multi-revolution Absolute Position of the Communication Encoder Motor ※Absolute type: Absolute Number of Revolutions Data ※Incremental: 0	061FH	2818H
Un-25	Communication type encoder feedback Position information in	pulse	Single Revolution Absolute Position of the Communication Encoder Motor	0620H 0621H	2819H

Parameter Code	Display Content	Unit	Description	RS-485 Address	Index
	single rotation ※ The Range is more than 5 digits				
Un-27	Communication Encoder Message	—	Feedback communication type encoder status	0623H	281BH
Un-28	Torque Command	%	Expressed by the percentage of Rated Torque. For example: The display of 50 indicates that the current Motor Torque Command is 50% of the Rated Torque.	0624H	281CH
Un-29	Load Inertia Ratio	0.1	Displays the current default Load Inertia Ratio of Cn025.	0625H	281DH
Un-30	Digital Output Contact Status (DO)	—	Displays the Status of Digital Output Contact (DO) in Hexadecimal For example: H00XX (0000 0000 DO-8/7/6/5 DO-4/3/2/1)	0626H	281EH
Un-31	Digital Input Contact Status (D1)	—	Displays the Status of Digital Input Contact (DI) in Hexadecimal For example: HXXXX (0000 DI-12/11/10/9 DI-8/7/6/5 DI-4/3/2/1)	0627H	281FH
Un-43	Motor Electrical Angle	deg	Motor Current Electrical Angle Position	0633H	282BH
Un-44	xx read by communication type encoder Motor Model	—	For example: The display of H1267 indicates that the Motor Cn030 Number is H1267	0634H	282CH
Un-45	OnLine_AutoTuning Inertia Estimation	0.1	For example: The display of 100 indicates that the Load Inertia Ratio is 10 times.	0635H	282DH
Un-46	OFFLine_Tuning Status	—	OFFLine_Tuning Operating Status	0636H	282EH
Un-47	OFFLine_Tuning Error Code	—	bit.0: 1 is inertia estimation status, 2 is gain estimation status bit.2: 1 is load estimation fail, 2 is gain estimation fail	0637H	282FH
Un-49	Driver Temperature	deg	Driver Temperature	0639H	2831H
Un-50	External Encoder Number of Pulses ※The Range is more than 5 digits	pulse	When using the fully closed loop function of the External Encoder, after the power is turned on, the value will return to zero and start displaying the External Encoder Position.	063AH 063BH	2832H
Un-52	The Error of External Encoder and Motor Encoder ※ The Range is more than 5 digits	pulse	The Error of External Encoder and Motor Encoder When Operating with a Fully Closed Loop Function	063DH 063EH	2834H
Un-53	Current Alarm Number	—	For example: The display of 01 indicates that the current alarm number is AL001	063FH	2835H
Un-54	EtherCAT PDO Packet Loss Counter	—	Monitor the quality of communication is normal and generate AL049 if abnormal	0640H	2836H
Un-55	System Multi-revolution Position	rev	System Multi-revolution Position ※ When conducting the Servo internal Return to Origin operation will clear to 0	0641H	2837H
Un-56	System Single Revolution Position ※ The Range is more than 5 digits	pulse	System Single Revolution Position ※ When conducting the Servo internal Return to Origin operation will clear to 0	0642H 0643H	2838H
Un-88	ServoOn total time	hour	ServoOn total time	0663H	N/A
Un-89	PowerOn total time	hour	PowerOn total time	0664H	N/A

Note 1: JSDG2S-E does not have this function

3-3 Diagnostic Function Description

The user can use the Diagnostic Parameters to know the current system information, as described below:

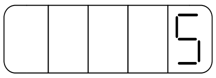
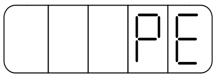
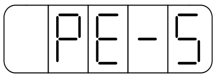
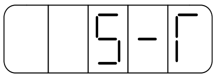
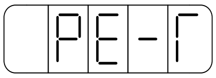
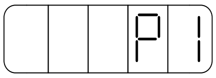
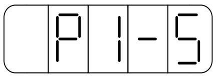
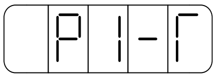
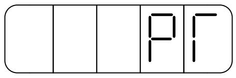
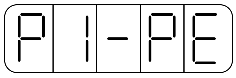
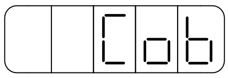
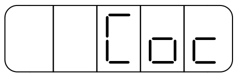
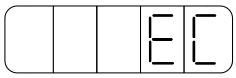
Parameter Code	Name and Function	RS-485 Communication Address
dn-01	Current Control Mode Display	0F01H
dn-02	Digital Output Contact Signal Status	0F02H
dn-03	Digital Input Contact Signal Status	0F03H
dn-04	CPU Software Version Display	0F04H
dn-05	Jog Mode Operation	N/A
dn-06	Reserved	N/A
dn-07	Automatic adjustment of external analog voltage offset **(Note 1)**	0F07H
dn-08	Display Serialized Models	0F08H
dn-09	ASIC Software Version Display	0F09H
dn-11	Automatic Detection of Magnetic Angle Position	0F0BH

Note 1: JSDG2S-E does not have this function

Note 2: JSDG2S does not have this function

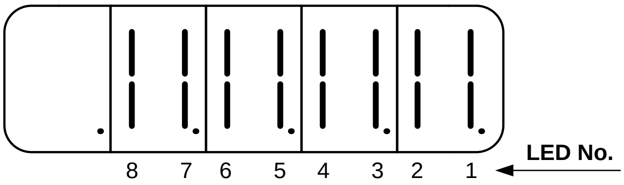
dn-01 (Current Control Mode Display)

The user can use **dn-01** to know the current Control Mode of this Device, Control Mode and Panel Display Comparison Table is as follows:

Cn001	Control Mode	dn-01 (Current Control Mode Display)
0	Torque Control – T	
1	Speed Control – S	
2	Position Control (External Pulse Command) – Pe	
3	External Position / Speed Control Switching – Pe/S	
4	Speed / Torque Control Switching – S/T	
5	External Position / Torque Control Switching – Pe/T	
6	Position Control (Internal Position Command) – Pi	
7	Internal Position / Speed Control Switching – Pi/S	
8	Internal Position / Torque Control Switching – Pi/T	
9	CNC Tool Magazine Automatic Selection Control – Pt	
A	Internal / External Position Switching – Pi/Pe	
B	CANopen-Complete (JSDG2S function) – Cob	
C	CANopen-Simple (JSDG2S function) – CoC	
D	EtherCAT Mode (JSDG2-E/JSDG2S-E function) – EC	

dn-02 (Digital output contact signalstatus)

Users can use **dn-02** to check current digital output contact signal status. The following is the description of panel display:

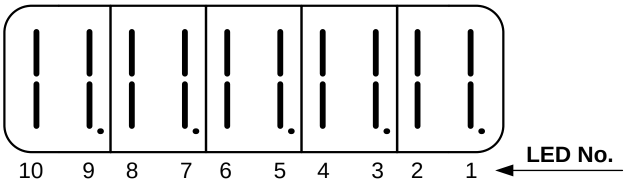


When a digital output contact signal status is ON, the corresponding LED will light up. When a digital output contact status is OFF, the corresponding LED will not light up. The following comparison table shows LED No. and digital output contact code. **DO-1**~**DO-4** are multifunction planning contact and can be set by **Hn613~Hn616**. They can also be set as switch in conduction or open under ON status. Please refer to "5-6-1 Digital input/output contact function planning" to set their functions. **DO-5**~**DO-8** are digital output contact with determined functions.

LED No.	Output Contact Code
1	DO-1
2	DO-2
3	DO-3
4	DO-4
5	DO-5
6	DO-6
7	DO-7
8	DO-8

dn-03 (Digital input contact signal status)

Users can use **dn-03** to check current digital input contact signal status. The following is the description of panel display:



When a digital input contact signal status is ON, the corresponding LED will light up; when a digital input contact signal status is OFF, the corresponding LED will not light up. The following comparison table shows LED No. and digital input contact code. **DI-1**~**DI-12** are multifunction planning contact and can be set by **Hn601~Hn612**. They can also be set as switch in conduction or open under ON status. For detailed setting information, please refer to “5-6-1 Digital input/output contact function planning".

※For DI-11 & DI-12, please monitor through Un-31 digital input contact status (DI).

LED No.	Digital input contact code
1	DI-1
2	DI -2
3	DI -3
4	DI -4
5	DI -5
6	DI -6
7	DI -7
8	DI -8
9	DI -9
10	DI -10

dn-04 (Software Version Display)

The User can use **dn-04** to know the current Software Version of this Device, the Panel Display Description is as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	dn-01	Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲	dn-04	Press UP Key 3 times to select **dn-04** Item.
4	ENTER	A0280	Press and hold the ENTER Key for 2 seconds, enter the Display **Software Version** Screen, the Software Version is 2.80.
5	MODE	dn-04	Press MODE Key 1 time to jump back to the Parameter Selection Screen.

dn-05 (JOG Mode Operation)

⚠ Attention

- **The JOG speed is based on Sn201 (Internal Speed Command 1) to operate; therefore, Sn201 must be set before executing this function.**
- **No matter the motor is excited by using digital input contact SON or not, it will be excited immediately after entering JOG mode.**

The User can use **dn-05** to operate JOG operation, the operating instructions are as follows:

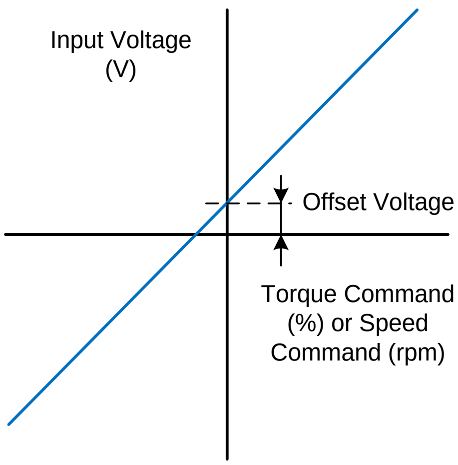
Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	dn-01	Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲	dn-05	Press UP Key 4 times to select **dn-05** Item.
4	ENTER	Jog--	Press and hold the ENTER Key for 2 seconds to enter **JOG Mode**, and the Motor is excited immediately.
5	▲	Jog-P	Press and hold the UP Key, the Motor rotates in the currently defined positive direction.
6	▼	Jog-n	Press and hold the DOWN Key, the Motor rotates in the currently defined negative direction.
7	MODE	dn-05	Press MODE Key 1 time, jump back to the Parameter Selection Screen, the Motor releases excitation.

dn-07 (Automatic adjustment of external analog voltage offset) ※JSDG2S-E does not have this function

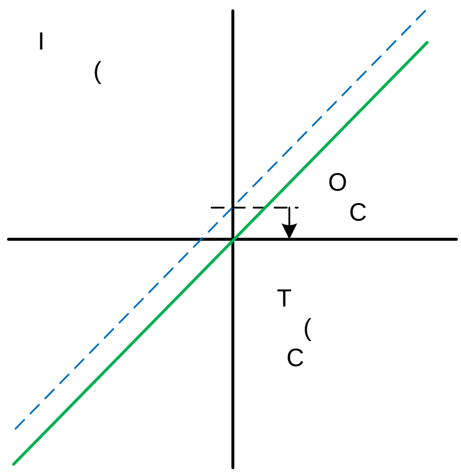
When the External Torque or Speed Analog Command Input is 0V, the Motor may still rotate slowly, the User can use **dn-07** to automatically adjust and correct the Analog Command Offset, the External Voltage Offset can be checked with **Un-09** and **Un-11** after automatically adjusted, and the Automatic Adjustment Procedure is described as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	**Please confirm the status is Servo off before adjustment; Input 0V voltage command from the supervisory controller or external loop to analog command connect SIC (CN1-26) & TIC (CN-1-27).**		
2	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
3	MODE	dn-01	Press MODE Key 2 times to enter **Diagnostic Parameters**.
4	▲	dn-07	Press UP Key 6 times to select **dn-07** Item.
5	ENTER	00000	Press and hold the ENTER Key for 2 seconds, enter **dn-07** setting screen.
6	▲	00001	Press UP Key 1 time, the value of 1 represents the Offset Automatic Adjustment to be executed.
7	ENTER	-SEt- dn-07	Press and hold the ENTER for 2 seconds until -SET- appears 1 time then jump back to the current parameter item selection screen immediately, the Offset Automatic Adjustment **Sn217 (Analog Speed Command Offset Adjustment)** and **Tn104 (Analog Torque Command Offset Adjustment)** settings are completed at this time.

Before Offset Adjustment



A



TECO

dn-08 (Display Serialized Models)

Users can use **dn-08** to check driver/motor combination set in the driver currently. If the displayed combination differs from actual condition, please refer to “1-1-3 Matching list of servo driver and motor” to reset parameter **Cn030** or consult local distributor.

dn-09 (ASIC software version display)

The User can use **dn-09** to know the current ASIC Version of this Device, the Panel Display Description is as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	dn-01	Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲	dn-09	Press UP Key 8 times to select **dn-09** item.
4	ENTER	A02.80	Press and hold the ENTER Key for 2 seconds, enter the Display **Software Version** Screen, the Software Version is 2.80.
5	MODE	dn-09	Press MODE Key 1 time to jump back to the Parameter Selection Screen.

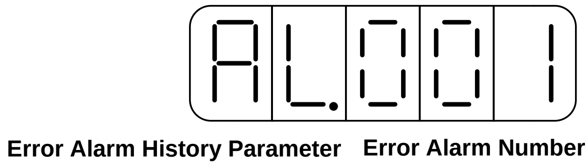
dn-11 (Automatic detection of magnetic angle position)

The Magnetic Angle Detection refers to detecting the electrical angle coordinates (electrical angle phase) of the Servo Motor. If the servo system does not correctly know the servomotor's electric angle coordinate position, the servomotor cannot be controlled normally. For the automatic alignment function of the Encoder Magnetic Angle, the operation steps are as follows:

1. Motor U, V, W are wired in accordance with TECO Phase Sequence
2. Connect the Encoder Wiring
3. Motor No-load Condition
4. After the Driver is powered ON, set the Parameter dn-11=1, it will enter the excitation state automatically at this time, (Display the word of "auto" during the process).
5. After the completed auto-alignment, it will leave the page automatically and dn-11 returns to 0
6. The electrical angle can be confirmed from Un-43. Motor does not move after alignment. Un-43 should be original Un-43 electrical angle ±1°

3-4 Alarm Monitoring Description

When the leftmost 2 LEDs display AL, it means the device cannot function normally. Users can run troubleshooting according to the solutions in “9-2 Countermeasures to Clear Error” and operate the device by normal procedures. If the error alarm still cannot be cleared, please contact the distributor or manufacturer for further countermeasures. When Error Alarm occurs, LED Display Status is shown as follows:



Please refer to “9-1 Error List” for the corresponding alarm of each error alarm number. For example, error alarm No.001 means low power voltage alarm is occurring now.

This Device also provides the user with inquiry of the past nine Error Alarms, as shown in the following:

Parameter Code	Name and Function
AL.xxx	Current Alarm Message
A1.xxx	Past First Alarm Message
A2.xxx	Past Second Alarm Message
A3.xxx	Past Third Alarm Message
A4.xxx	Past Fourth Alarm Message
A5.xxx	Past Fifth Alarm Message
A6.xxx	Past Sixth Alarm Message
A7.xxx	Past Seventh Alarm Message
A8.xxx	Past Eighth Alarm Message
A9.xxx	Past Ninth Alarm Message

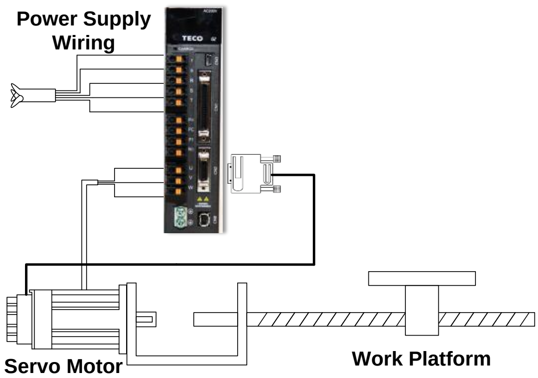
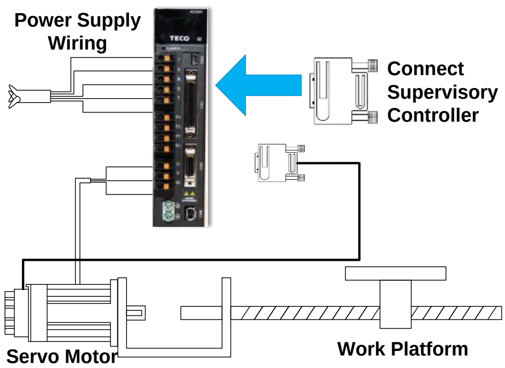
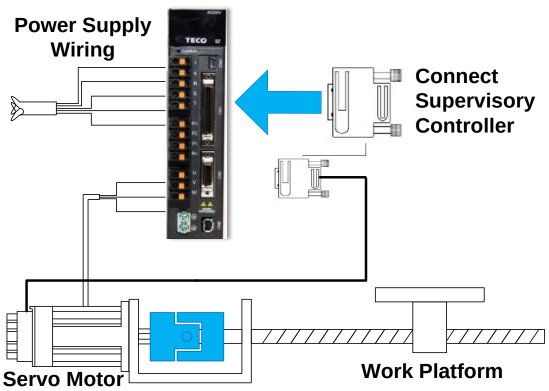
Note) xxx means current error alarm number.

Please follow the steps below to use the Error Alarm History Parameters to inquire the past nine Error Alarms.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	AL.000	Press MODE Key three times to enter the **Error Alarm History Parameter**.
3	▲	A 1.003	Press UP Key one time, to select the **Previous first Alarm History** item, two LEDS on the right side display the **Alarm Number** of 003 (Motor Overload).
4	▲	A2.001	Press UP Key one time, to select the **Previous second Alarm History** item, two LEDS on the right side display the **Alarm Number** of 001 (Power Supply Voltage Too Low).

Chap 4 Trial Run Operation Description

Please make sure all wiring are completed before trial run. The following describes the three-stage Trial Run Operations and Purpose in sequence, and will describe with the Speed Control Loop (Analog Voltage Command) and Position Control Loop (External Pulse Command) when working with the Supervisory Controller.

<table>
<tr><td colspan="2">[4-1 No-load Servo Motor Trial Run]</td></tr>
<tr><td>A. Servo Driver Wiring and Motor Installation</td><td>B. Purpose of Trial Run</td></tr>
<tr><td>
</td><td>Confirm that the following items are correct:
• Driver Power Supply Wiring
• Servo Motor Wiring
• Encoder Wiring
• Servo Motor Operating Direction and Speed</td></tr>
<tr><td colspan="2">[4-2 Non-load Servo Motor with Supervisory Controller Trial Run]</td></tr>
<tr><td>A. Servo Driver Wiring and Motor Installation</td><td>B. Purpose of Trial Run</td></tr>
<tr><td>
</td><td>Confirm that the following items are correct:
• Control Signal Wiring between the Supervisory Controller and Servo Driver
• Servo Motor Operating Direction, Speed and Number of Revolutions
• Brake Function, Drive Prohibit Function and Protection Function</td></tr>
<tr><td colspan="2">[4-3 Connect the Load Servo Motor with Supervisory Controller Trial Run]</td></tr>
<tr><td>A. Servo Driver Wiring and Motor Installation</td><td>B. Purpose of Trial Run</td></tr>
<tr><td>
</td><td>Confirm that the following items are correct:
• Servo motor Operating Direction, Speed and Mechanism Travel
• Set Related Control Parameters</td></tr>
</table>

4-1 No-load Servo Motor Trial Run

⚠ Attention
• **During the Trial Run, make sure to separate the Servo Motor from the Machine, such as Couplers and Belts.**   • **In order to avoid damage to the machine during a Trial Run, the Trial Run of the Servo Motor must be under no load conditions.**

This stage of the Trial Run can confirm the Driver Wiring, if there is any incorrect wiring, it will cause an error to the Servo Motor during the Trial Run process.

1. **Install Servo Motor:**

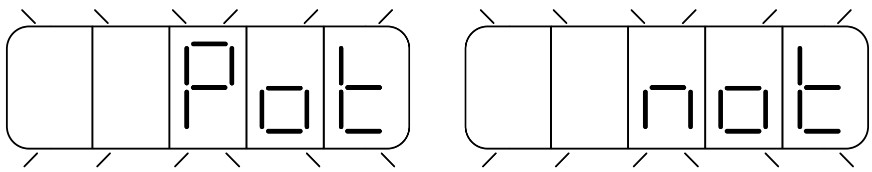
   Fix the Servo Motor on the Machine Table, to prevent the Servo Motor from bounding or moving during the Trial Run.

2. **Check the Wiring:**

   Check the Servo Driver Power Wiring, Servo Motor Wiring and Encoder Wiring. At this stage of the Trial Run, no control signal line is used, please remove the Control Signal Wire (CN1).

3. **Turn on the Servo Driver Power:**

   Turn on the Servo Driver Power, if the Driver Panel displays as below:



This is because digital input contact **CCWL** & **CWL** are operating (please set according to “5-6-1 Digital input/output contact function planning” to determine the operation is under switch in conduction or open) When the above screen is displayed on driver panel, servo driver cannot function normally. Users need to turn off drive prohibit function temporarily during trial run by setting parameter **Cn002.1=1**. After first stage trial run is completed, please restore parameter **Cn002.1=0**.

Setting Operations Description is as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	Cn001	Press MODE Key 4 times to enter the **System Parameters**.
3	▲	Cn002	Press UP Key 1 time to select **Cn002** Item.
4	ENTER	H0000	Press and hold the ENTER Key for 2 seconds to enter **Cn002** Setting Screen.
5	ENTER	H0000	Press ENTER Key 1 time, move left to adjust the number of digits (flashing LED).
6	▼	H0010	Press UP Key 1 time to adjust the tens digit to 1 and set as do not use digital input contact **CCWL** & **CWL**.
7	ENTER	-SET- Cn002	Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

Please reboot after the setting is completed. If other error alarms occur, it means the driver still cannot function normally and users need to run troubleshooting according to “9-2 Countermeasures to Clear Error” and operate the driver again. If the error alarm message still occurs, please contact local distributor for further countermeasures.

4. Release Mechanical Brake:

When using the Servo Motor with Mechanical Brake, please first complete the + 24V wiring to release the mechanical brake. If the brake is not released properly, the Trial Run will be abnormal.

5. Servo Driver Panel Operations:

Use the Servo Driver panel to operate **JOG** operations to confirm whether or not the Servo Motor rotational speed and direction are correct. If the operating speed and direction are abnormal, please confirm whether or not the Speed Control Parameter **Sn201** (internal Speed Command 1) and System Parameter **Cn004** (Motor Rotation Direction Definition) are set correctly. **JOG** Operating Instructions are as follows:

⚠ Attention

- **The JOG Speed operates in accordance with Sn201 (Internal Speed Command 1), therefore, set Sn201 before executing this function.**
- **No matter the motor is excited by using digital input contact SON or not, it will be excited immediately after entering JOG mode.**

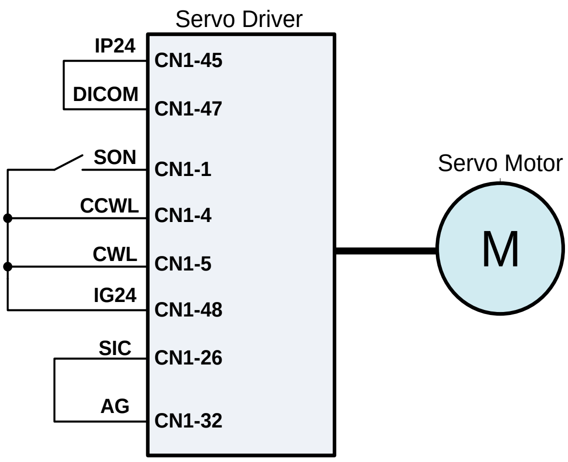
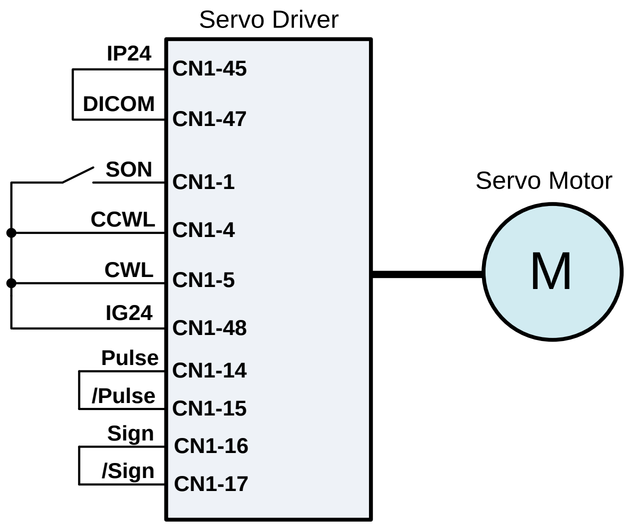
Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power	- bb	When the power is turned on, Enter the **Status Display Screen**.
2	MODE	dn-01	Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲	dn-05	Press UP Key 4 times to select **dn-05** Item.
4	ENTER	Jog--	Press and hold the ENTER Key for 2 seconds to enter **JOG Mode**, and the Motor is excited immediately.
5	▲	Jog-P	Press and hold the UP Key, the Motor rotates in the currently defined positive direction.
6	▼	Jog-n	Press and hold the DOWN Key, the Motor rotates in the currently defined negative direction.
7	MODE	dn-05	Press the MODE Key 1 time, to jump back to the Parameter Selection Screen, and the Motor will release excitation immediately. .

4-2 Non-load Servo Motor with Supervisory Controller Trial Run

This Stage of the Trial Run can determine whether or not the Control Signal Wiring between the Servo Driver and the Supervisory Controller is correct and whether or not the control signal electric potential is correct. After completing this stage of the Trial Run, the Servo Motor can be connected to the mechanism.

A. Start Servo Motor:

Please refer to the following to conduct wiring

Speed Control (**Cn001=1**)	Position Control (**Cn001=2**)
	

a. Confirm that there is No Command Signal Input:

   In the Speed Control Mode, please input 0V to the Speed Analog Input Contact.

   In the Position Control Mode, please short the External Pulse Command Contact, short Pulse and /Pulse, short Sign and /Sign.

b. Start the Servo ON Signal:

   Connect the Servo Start Contact **(SON)** to the Low Electric Potential and start the Servo Motor to observe whether or not there is any error signal generated. If there is still an Error Alarm, the user needs to resolve the alarm conditions in accordance with “9-2 Countermeasures to Clear Error”.

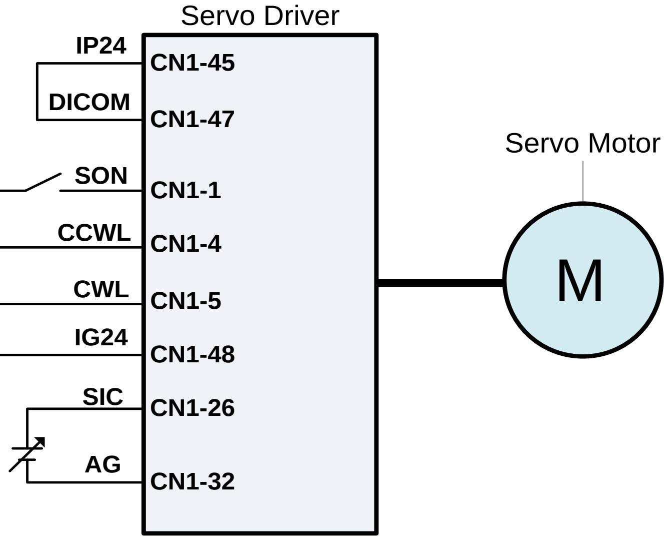
⚠ Attention

- **Please enter speed/position command for motor activation or operation stop after servo start contact (SON) signal is activated!**

B. Speed Control Mode Trial Run (Cn001-1):

1. Check the Wiring:

Check if servo driver power and control signal wiring are correct; check if speed analog signal input is 0V. The Wiring Diagram is as follows



2. Start Servo Motor:

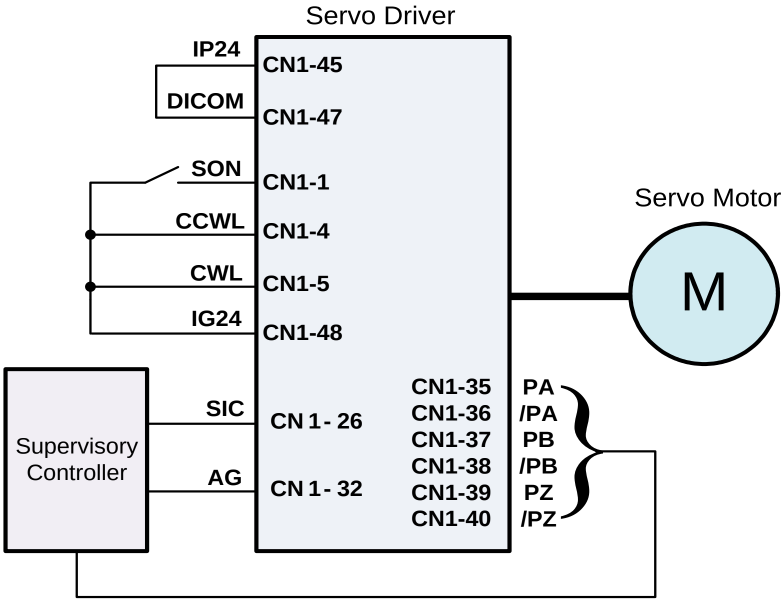
Connect the Servo Start Contact (**SON**) to the Low Electric Potential and start the Servo Motor. If the servo motor rotates slowly, please run **dn-07** to automatically correct analog command offset. Refer to “3-3 Diagnostic Function Description”.

3. **Confirm the relationship between the Motor Speed and Speed Analog Command Input:**

   Gradually increase the Speed Analog Command Voltage, monitor the Motor Actual Speed through the Status Parameter **Un-01**, observe whether or not the Analog Speed Command Proportioner **Sn216**, the analog speed command limit **Sn218** are correct, and confirm whether or not the Motor Rotation Direction is correct, if the Rotation Direction is incorrect, please adjust the System Parameter **Cn004**. After completing the setting, connect the Servo Start Contact **(SON)** to the High Electric Potential and turn off the Servo Motor.

4. **Complete the Wiring with Supervisory Controller:**

   Confirm the wiring of Servo Driver and Supervisory Controller, Speed Analog Signal Input **(SIC)**, Division Ratio Output **(PA, /PA, PB, /PB, PZ, /PZ)** and alarm signals. The Wiring Diagram is as follows



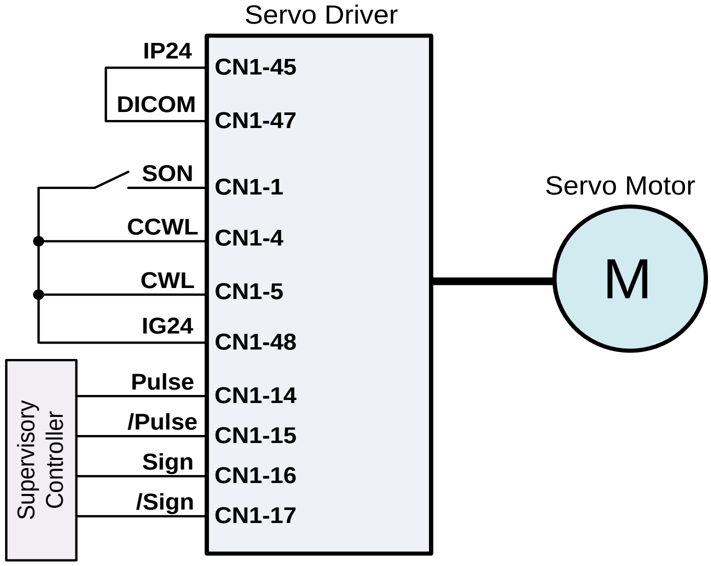
5. **Confirm the Servo Motor Number of Revolutions and Dividing Output:**

Start the Servo Motor, the Supervisory Controller issues Servo Motor Number of Rotations Command, and monitor the motor number of rotations with the Status Parameter **Un-16**, to check whether or not both are the same. If different, please confirm whether or not the System Parameter Encoder Signal Dividing Output **Cn005** is correct. After completing the setting, connect the Servo Start Contact **(SON)** to the High Electric Potential and turn off the Servo Motor.

C. Position Control Mode Trial Run (Cn001=2):

1. Check the Wiring:

Confirm whether or not the Servo Driver Power Supply and the Control Signal Wiring are correct. The Wiring Diagram is as follows



2. Set the Electronic Gear Ratio:

Please set the required Position Control Parameter Electronic Gear Ratio **Pn302~Pn306 or Single-turn Pulse Command Function Pn354** in accordance with the Servo Motor Encoder Specifications and Machine Application Specifications. Please refer to [5-4-3 Electronic Gear Ratio].

3. Start Servo Motor:

Connect the Servo Start Contact (**SON**) to the low electric potential to start the Servo Motor.

4. Confirm the Motor Rotation Direction, Speed and Number of Rotations:

The Supervisory Controller outputs Low-speed Pulse Command to allow the Servo Motor operates at low speed, comparing the Status Parameter **Un-14** Motor Feedback Number of Pulses and Status Parameter **Un-18** Number of Pulse Commands. Then, issue the Number of Rotations Command, comparing the Status Parameter **Un-16** Motor Feedback Number of Rotations and Status Parameter **UN-20** Pulse Command Number of Rotations. If actual motor feedback is incorrect, please adjust position control parameter electronic gear ratio **Pn302~Pn306** or **Pn354**. Please confirm repeatedly until it is correct.

If the motor rotation direction is not correct, please confirm the Position Control Parameter Pulse Command Form selection **Pn301.0** and the Command Direction Definition **Pn314**. After completing the setting, connect the Servo Start Contact **(SON)** to the High Electric Potential and turn off the Servo Motor.

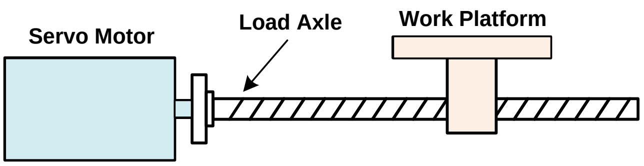
4-3 Connect the Load Servo Motor with Supervisory Controller Trial Run

⚠ Attention
• **Please connect the load trial run in accordance with the following steps accurately.** • **The Servo Motor operates under the condition of connecting to a machine, if the setting is incorrect, the machine may be damaged or the personnel may be injured.**

Before implementing this stage of the trial run, please re-confirm the following:

■ Please set the Servo Driver related parameters in accordance with the requirements of the Supervisory Controller and the Machine Operations.

■ Check whether or not the Servo Motor rotation direction and speed setting conform to the requirements of the machine.



1. **Make sure the Servo Driver Power is OFF**
2. **Connect Servo Motor and Load Axle:**

   Please refer to [1-5 Servo Motor Installation Environment Conditions and Methods] for Servo Motor Installation Pre-cautions,
3. **Servo Driver Gain Adjustment:**

   Please refer to [6 Servo Gain Adjustment] to adjust Servo Gain in accordance with the Load Mechanism.
4. **Supervisory Controller Trial Run:**

   Commands given out from supervisory controller. Please observe machine motion condition according to the motion command described in “4-2 No-load Servo Motor with Supervisory Controller Trial Run”. Conduct adjustment in coordination with the Controller.
5. **Repeat the Adjustment and Record the Setting Value:**

   Repeat Steps 3 and 4 until the machine operations conform to the requirements. Record the setting value accurately for the use of future machine maintenance.

Chap 5 Control Functions

5-1 Control Mode Selection

This Device provides control modes for Torque, Speed, External Position, Internal Position, Tool Magazine Automatic Tool Selection and communication; in addition to operating single control mode, it can also use mixed modes to switch control modes. The following is the description of the Control Mode Parameter Selection

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	Power Re-set	0001H

Setting Description:

Setting	Description
0	Torque Control
1	Speed Control
2	External Position Control (External Pulse Command)
3	External Position / Speed Control Switching
4	Speed / Torque Control Switching
5	External Position / Torque Control Switching
6	Internal Position Control (Internal Position Command)
7	Internal Position / Speed Control Switching
8	Internal Position / Torque Control Switching
9	CNC Tool Magazine Automatic Tool Selection Control
A	Internal / External Position Switching
B	CANopen-complete (JSDG2S function)
C	CANopen-simple (JSDG2S function)
D	EtherCAT mode (JSDG2-E/JSDG2S-E function)

●This parameter is not subject to Cn029 Factory Re-set.

5-2 Torque Mode

The Torque Mode is used for printing presses, winding machines and injection molding machines that need to perform Torque Control. The user shall set **Cn001** (Control Mode Selection) in accordance with the mode to be used. The setting method is as follows:

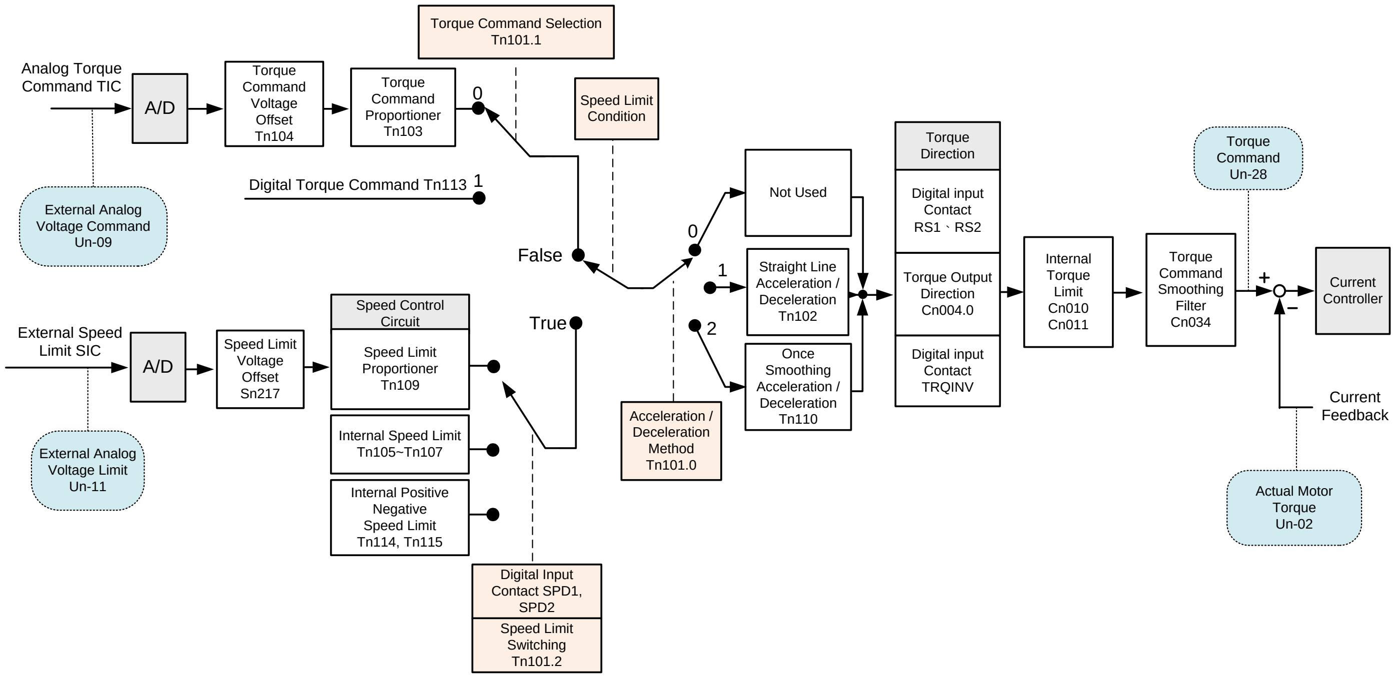
Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	Power Re-set	0001H

Setting Description:

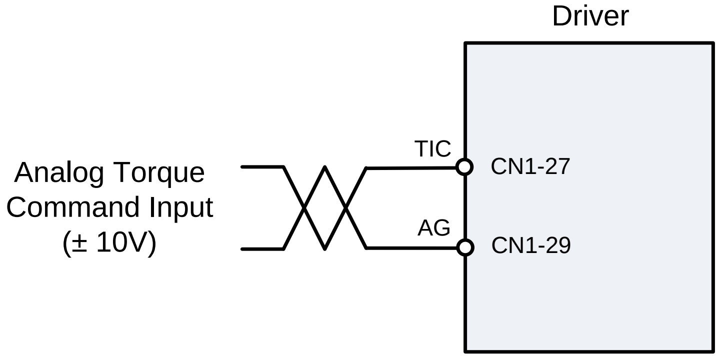
Setting	Description
0	Torque Control
4	Speed / Torque Control Switching
5	External Position / Torque Control Switching
8	Internal Position / Torque Control Switching

Torque Circuit Control Block is as shown in the Figure below:



5-2-1 Analog torque command ※ JSDG2S-E does not have this function

Use TIC external analog voltage to control Motor Torque. The following is the wiring diagram:



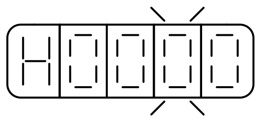
Adjust the slope of Voltage Command relative to Torque Command in coordination with Analog Torque Command Proportioner **Tn103**, and **Tn104** to correct Analog torque command voltage offset.

⚠ Attention
• **It is necessary to confirm the corresponding relationship between TIC (Analog Torque Command Input) and Digital Input Contacts RS1, RS2 (Torque Command Forward and Reverse Selection); please refer to “5-2-4 Torque Output Direction Definition”.**

Tn101.1 Torque command selection

Initial Value	Unit	Setting Range	Effective	RS-485
0	--	0 ~ 1	After Servo OFF	0101H

Setting Description: When using Analog Torque Command, please set Tn101.1 = 0



Setting	Description
0	Use Analog TIC Torque Command
1	Use Digital Tn113 Torque Command

Tn103 Analog torque command proportioner ※JSDG2S-E does not have this function

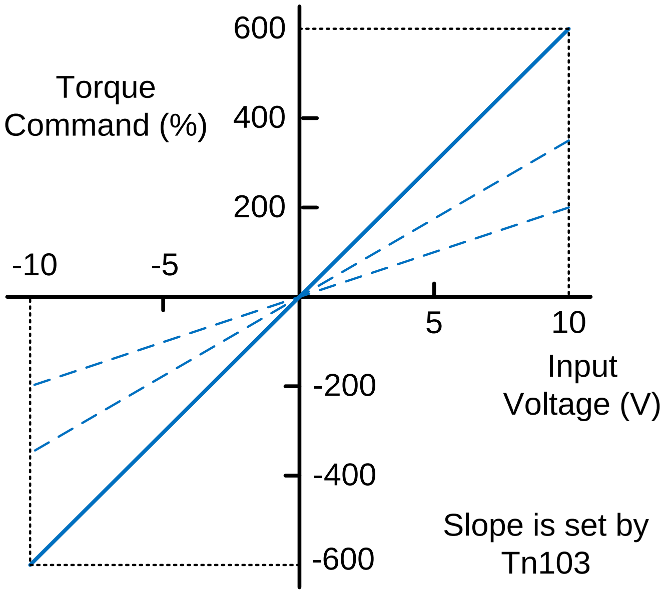
Initial Value	Unit	Setting Range	Effective	RS-485
300	%/10V	0 ~ 600	Effective after Set	0103H

Setting Description: Used to adjust the slope of the Voltage Command relative to the Torque Command.

Setting Example:

(1) If **Tn103** is set to 300, it means Analog Input Voltage 10V corresponds to 300% rated Torque Command; if Input Voltage is 5V at this time, then it corresponds to 150% rated Torque Command.

(2) If **Tn103** is set to 200, it means Analog Input Voltage 10V corresponds to200% rated Torque Command; if Input Voltage is 5V at this time, then it corresponds to 100% rated Torque Command.



Even if the Torque Command is 0V, the Motor may rotate slowly, mainly due to a slight offset of External Analog Voltage, in this case, the user can manually adjust the **Tn104** to correct the offset or use **dn-07** to automatically adjust the offset. Please refer to "3-3 Diagnostic Function Description".

⚠ Attention

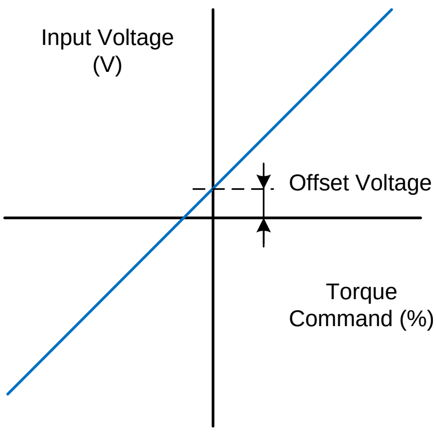
- **Please confirm the status is Servo off before adjustment; Input 0V voltage command from the supervisory controller or external loop to analog command connect TIC (CN-1-27).**

Tn104 Analog torque command offset adjustment ※JSDG2S-E does not have this function

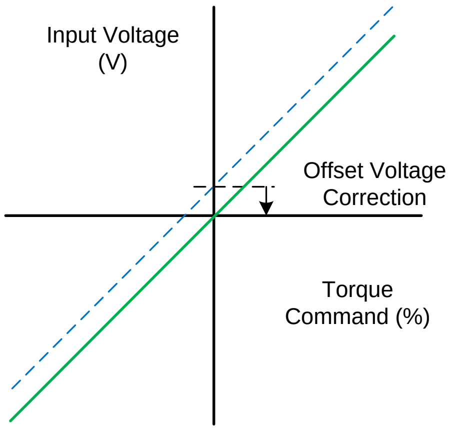
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	mV	-2500 ~ 2500	Effective after Set	0104H

Setting Description: Used to correct offset when the Analog Torque Command Voltage generated offset phenomenon.

Before Offset Adjustment



After Offset Adjustment

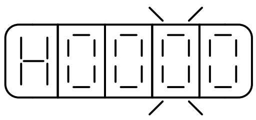


5-2-2 Digital Torque Command

Tn101.1 Analog and Digital Torque Command Selection

Initial Value	Unit	Setting Range	Effective	RS-485
0	--	0 ~ 1	After Servo OFF	0101H

Setting Description: When using Digital Torque Command, please set Tn101.1=1



Setting	Description
0	Use Analog TIC Torque Command
1	Use Digital Tn113 Torque Command

Tn113 Digital Torque Command Value

Initial Value	Unit	Setting Range	Effective	RS-485
0	0.1%	-3000 ~ 3000	Effective after Set	010DH

Setting Description: Set Tn101.1=1 to activate Digital Torque Command Functions.

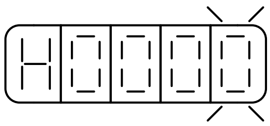
5-2-3 Torque Command Linear Acceleration / Deceleration

If users need the Smooth Torque Command, set **Tn101.0** to activate the function first.

Tn101.0 Torque Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 2	After Servo OFF	0101H

Setting Description:



Setting	Description
0	Do not use Torque Command Linear Acceleration / Deceleration Function
1	Use Torque Command Linear Acceleration / Deceleration Function
2	Use Torque Command One Time Smoothing Acceleration / Deceleration Function

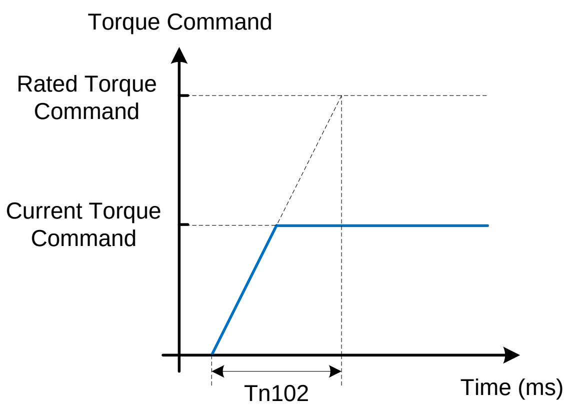
(1) Use torque command linear acceleration/deceleration function

To use this function, must set **Tn101.0=1** to activate Torque Command Linear Acceleration / Deceleration Function.

Tn102 Torque Command Linear Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	ms	1 ~ 50000	After Servo OFF	0102H

Setting Description: The Torque Command Linear Acceleration/Deceleration Constant is defined as the time for the Torque Command to rise from zero linearly to the Rated Torque.



Setting Example:

(1) To reach 50% of Rated Torque output in 10ms

$$Tn102 = 10(ms) \times \frac{100\%}{50\%} = 20(ms)$$

(2) To reach 75% of Rated Torque output in 10ms

$$Tn102 = 10(ms) \times \frac{100\%}{75\%} = 13(ms)$$

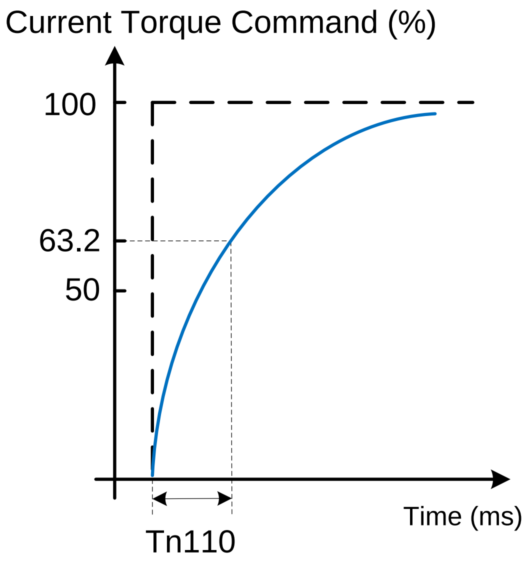
(2) Use torque command one time smoothing acceleration/deceleration function

To use this function,must set **Tn101.0=2** to activate Torque Command **One time Smoothing Acceleration / Deceleration Function.**

Tn110 Torque Command One Time Smoothing Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	ms	1 ~ 10000	After Servo OFF	010AH

Setting Description: Set Tn101 = 2 to activate the Torque Command One Time Smoothing Acceleration / Deceleration Function. Torque Command One Time Smoothing Acceleration / Deceleration Time Constant is defined as the time for the Torque one time delayed rise from 0% to 63.2% of the current Torque Command.



5-2-4 Torque output direction definition

In the torque mode, the user can use the following three methods to define the Motor Rotation Direction:

(1) Digital Input Contacts **RS1, RS2** (Forward and Reverse selection of Torque Command)

(2) **Cn004.0** (Motor Rotation Direction Definition)

(3) Digital Input Contact **TRQINV** (Reverse of Torque Command)

Attention

- **The three methods can be used at the same time. The user must confirm the definition of the final Motor Rotation Direction to avoid confusion.**

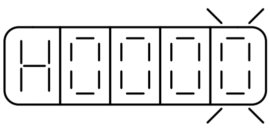
(1) Digital Input Contacts RS1, RS2 (Forward and Reverse selection of Torque Command)

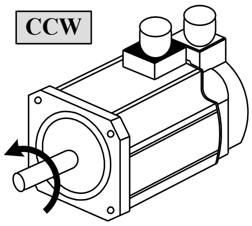
Input Contact		Description	Control Mode
RS2	RS1		
OFF (Switch does not function)	OFF (Switch does not function)	No Torque generated	T
OFF (Switch does not function)	ON (Switch functions)	Rotate in accordance with the current Torque Command Direction	
ON (Switch functions)	OFF (Switch does not function)	Reverse rotation in accordance with the current Torque Command Direction	
ON (Switch functions)	ON (Switch functions)	No Torque generated	

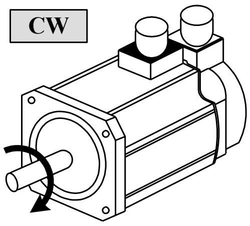
(2) Cn004.0 Motor Rotation Direction Definition (from the Motor Load End)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Effective after Set	0004H

Setting Description: When the Torque or Speed Command is positive, the Rotation Direction Setting from the Motor Load End is as follows







Setting	Description	
	Torque Control	Speed Control
0	Counterclockwise Rotation (CCW)	Counterclockwise Rotation (CCW)
1	Clockwise Rotation (CW)	Counterclockwise Rotation (CCW)
2	Counterclockwise Rotation (CCW)	Clockwise Rotation (CW)
3	Clockwise Rotation (CW)	Clockwise Rotation (CW)

(3) Digital Input Contact TRQINV (Reverse of Torque Command)

Input Contact TRQINV	Description	Control Mode
OFF (Switch does not function)	Rotate in accordance with the current Torque Command Direction	T
ON (Switch functions)	Reverse rotation in accordance with the current Torque Command Direction	

Note) Please refer to "5-6-1 Digital Input / Output Contact Function Planning" to set the Driver Effective Logic.

5-2-5 Internal Torque Limit Setting

In Torque Control, the user can set the Internal Torque Limit value based on the requirements, setting is as follows:

Cn010 CCW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0 ~ 300	Effective after Set	000BH

Note) Default and setting range of parameter Cn010/Cn011 vary by model. Please refer to “7-3-1 System parameters (Cn0□□)” for details.

Cn011 CW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 Note)	%	-300 ~ 0	Effective after Set	000CH

Note) Default and setting range of parameter Cn010/Cn011 vary by model. Please refer to “7-3-1 System parameters (Cn0□□)” for details.

5-2-6 Speed Limit of Torque Mode

In Torque Control, Motor Speed Limit is achieved by using parameter **Tn101.2** and Input Contact **SPD1**, **SPD2** Switching:

Tn101.2	Input Contact SPD2	Input Contact SPD1	Forward Speed Limit	Reverse Speed Limit
0	OFF (Switch does not function)	OFF (Switch does not function)	External analog speed limit SIC(CN1-26) ※JSDG2S-E does not have this function	
0	OFF (Switch does not function)	ON (Switch functions)	Internal Speed Limit 1 (Tn105)	
0	ON (Switch functions)	OFF (Switch does not function)	Internal Speed Limit 2 (Tn106)	
0	ON (Switch functions)	ON (Switch functions)	Internal Speed Limit 3 (Tn107)	
1	-	-	Forward Rotation Speed Limit Value (Tn114)	Reverse Rotation Speed Limit Value (Tn115)

Note) Please refer to ”5-6-1 Digital Input / Output Contact Function Planning to set the Driver Effective Logic.

Tn105 Internal Speed Limit 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	0 ~ 1.5*Rated Speed	Effective after Set	0105H

Setting Description: In Torque Control, Digital Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit when the setting is Tn101.2=0.

Tn106 Internal Speed Limit 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	rpm	0 ~ 1.5*Rated Speed	Effective after Set	0106H

Setting Description: In Torque Control, Digital Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit when the setting is Tn101.2=0.

Tn107 Internal Speed Limit 3

Initial Value	Unit	Setting Range	Effective	RS-485 Address
300	rpm	0 ~ 1.5*Rated Speed	Effective after Set	0107H

Setting Description: In Torque Control, Digital Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit when the setting is Tn101.2=0.

Tn114 Internal Forward Rotation Speed Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	0 ~ 1.5*Rated Speed	Effective after Set	010EH

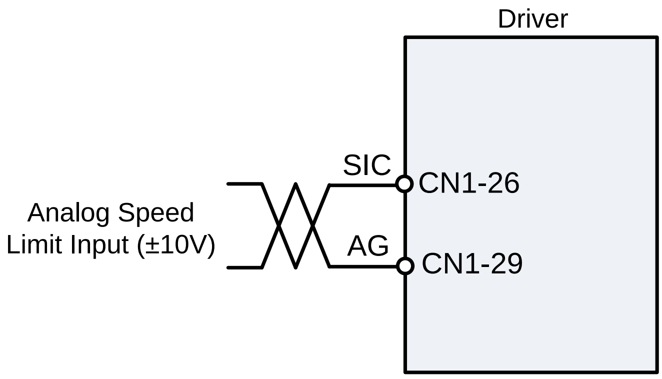
Setting Description: Set Tn101.2=1, set the Forward Speed Limit value in Torque Mode with this parameter.

Tn115 Internal Reverse Rotation Speed Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-100	rpm	-1.5*rated rotational speed ~ 0	Effective after Set	010FH

Setting Description: Set Tn101.2=1, set the Reverse Speed Limit value in Torque Mode with this parameter.

Following is External Analog Speed Limit Command Wiring Diagram:

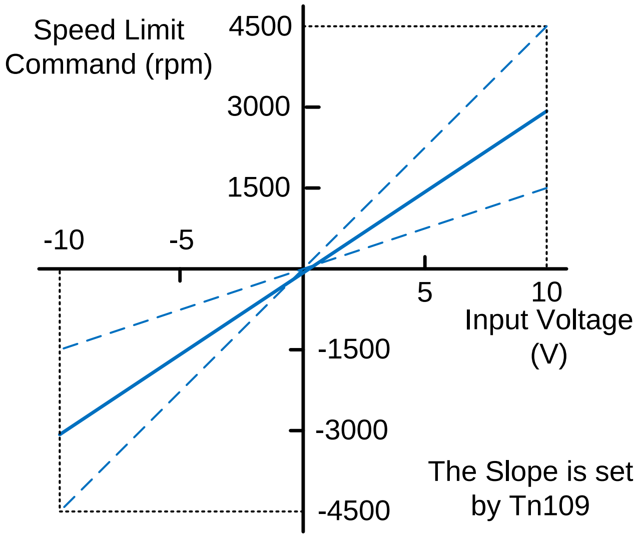


Adjust the slope of Voltage Command relative to Torque Command in coordination with Analog Torque Command Proportioner **Tn109**, and **Sn217** to correct Analog torque command voltage offset.

Tn109 Analog speed limit proportioner ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Rated Speed	rpm	100 ~ 10000	Effective after Set	0109H

Setting Description: Used to adjust the slope of Voltage Command relative to the Speed Limit Command



⚠ Attention

- **Analog speed limit input voltage has no polarity. + oltage or – voltage are received as an absolute value. The speed limit of this absolute value is applied to forward and reverse direction.**

Even if Analog Speed limit is 0V, the Motor may rotate slowly; this is mainly caused by the minor Offset of External Analog Voltage. In this case, the user can manually adjust **Sn217** to correct the offset or use Automatic Adjustment. Please refer to “3-3 Diagnostic Function Description”.

Attention
• **Please confirm the status is Servo off before adjustment; Input 0V voltage command from the supervisory controller or external loop to analog command connect SIC (CN-1-26).**

Sn217 Zero analog speed command offset adjustment ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	mV	-2500 ~ 2500	Effective after Set	0211H

Setting Description: Used to correct offset when the Analog Speed Command Voltage generates the offset phenomenon.

5-2-7 Other Torque Control Functions

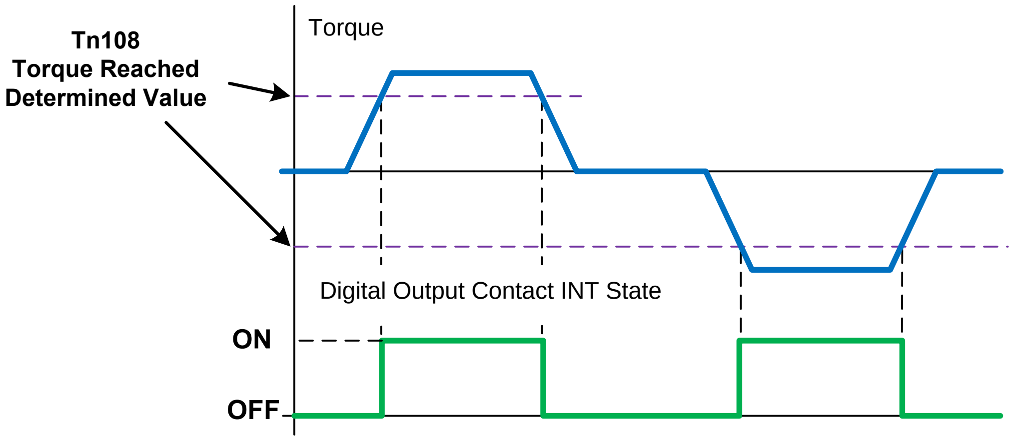
Torque Reached Function

When Forward or Reverse Torque exceeds the Level set by **Tn108** (Torque Reached Determined Value), Digital Output Contact **INT** operates; refer to following description:

Tn108 Torque Reached Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	%	0 ~ 300	Effective after Set	0108H

Setting Description: When the Forward or Reverse Torque exceeds the set level, the Digital Output Contact INT operates.



5-3 Speed Mode

Speed Mode is used in situations where precise speed control is required, such as Braiding Machines, Drilling Machines, and CNC Machines. The user shall set **Cn001** (Control Mode Selection) in accordance with the mode to be used. The setting method is as follows:

Cn001 Control Mode Selection

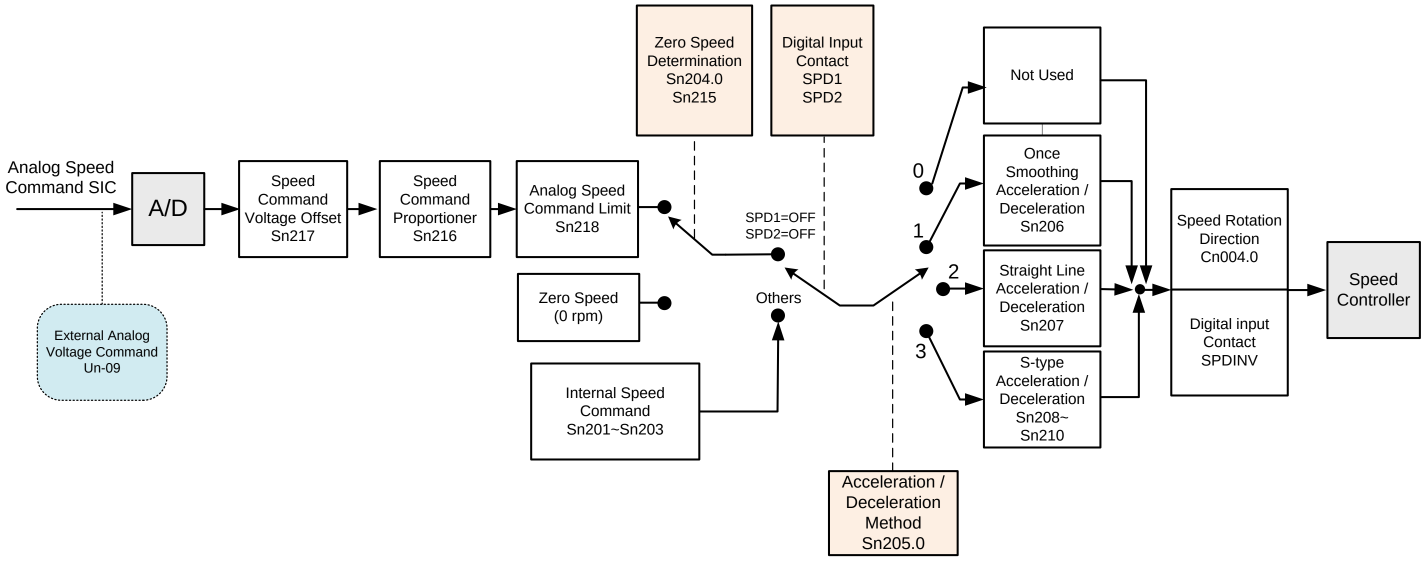
Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	Power Re-set	0001H

Setting Description:

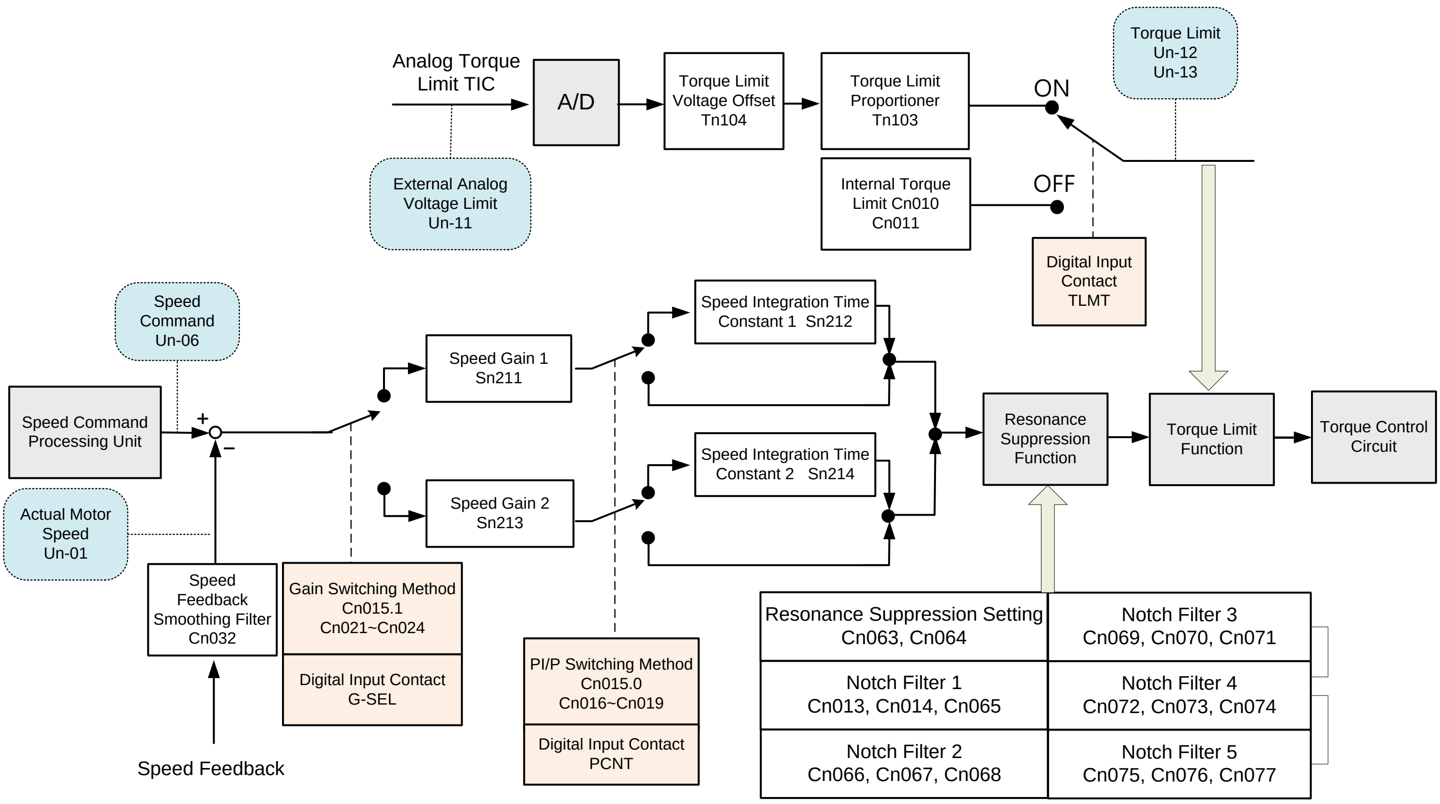
Setting	Description
1	Speed Control
3	External Position / Speed Control Switching
4	Speed / Torque Control Switching
7	Internal Position / Speed Control Switching

The Speed Loop Control Block Diagram is shown in the following two Figures; detailed functions of each block are described in the following Sections.

Speed Command Processing Unit



Speed Controller



5-3-1 Select Speed Command

This Device provides two Input Command Methods which are achieved by Digital Input Contact **SPD1**, **SPD2** switching the following two methods:

(1) Internal Speed Command: Internal pre-set three-stage Speed Command.

(2) External Analog speed Command: Control speed by inputting a set of Analog Voltage Command signals to **SIC (CN1-26)**.

Please refer to the Table below:

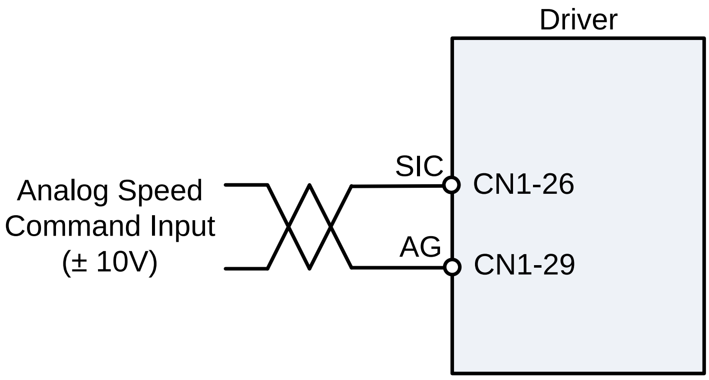
Digital Input Contact SPD2	Digital Input Contact SPD1	Speed Command	Control Mode
OFF (Switch does not function)	OFF (Switch does not function)	External Analog Speed Command **SIC(CN1-26)** ※JSDG2S-E does not have this function	S
OFF (Switch does not function)	ON (Switch functions)	Internal Speed Command 1 **Sn201**	
ON (Switch functions)	OFF (Switch does not function)	Internal Speed Command 2 **Sn202**	
ON (Switch functions)	ON (Switch functions)	Internal Speed Command 3 **Sn203**	

Note) Please refer to ”5-6-1 Digital Input / Output Contact Function Planning to set the Driver Effective Logic.

(1) Internal Speed Command: Internal three-stage Speed Command setting is as follows:

Parameter Code	Name and Function	Default Value	Unit	Setting Range	Effective	RS-485 Address
Sn201	Internal Speed Command 1	100	rpm	-1.5*rated rotational speed ~ 1.5*rated rotational speed	Effective after Set	0201H
Sn202	Internal Speed Command 2	200				0202H
Sn203	Internal Speed Command 3	300				0203H

(2) External Analog Command: The following is the External Analog Speed Command Wiring Diagram:



5-3-2 Analog speed command proportioner ※JSDG2S-E does not have this function

Adjust the slope of Voltage Command relative to the Speed Command in coordination with the Analog Speed Command Proportioner.

Sn216 Analog speed command proportioner ※JSDG2S-E does not have this function

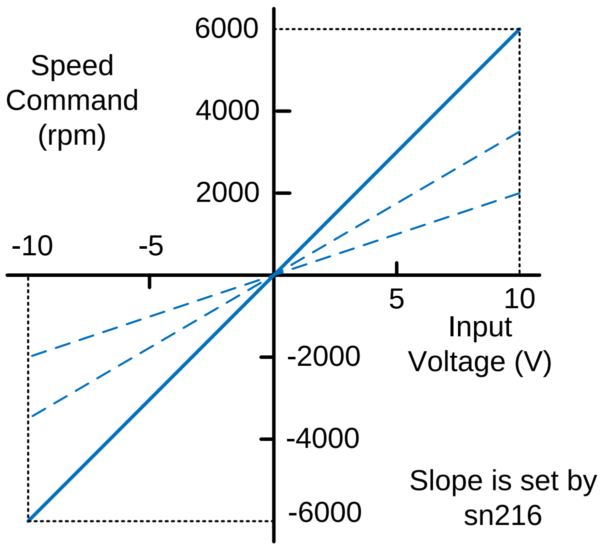
Initial Value	Unit	Setting Range	Effective	RS-485 Address
Rated Speed	rpm/10V	100 ~ 10000	Effective after Set	0210H

Setting Description: Used to adjust the slope of Voltage Command relative to the Speed Command.

Setting Example:

(1) If **Sn216** is set to 3000, it means Analog Input Voltage 10V corresponds to 3000rpm Speed Command; if Analog Input Voltage is 5V at this time, then it corresponds to 1500rpm Speed Command.

(2) If **Sn216** is set to2000, it means Analog Input Voltage 10V corresponds to 2000rpm Speed Command; if Analog Input Voltage is 5V at this time, then it corresponds to 1000rpm Speed Command.



Note: The displayed speed needs to be determined according to the different motors.

5-3-3 Analog speed command offset adjustment ※JSDG2S-E does not have this function

Even if Analog Speed Command is 0V, the Motor may rotate slowly; this is mainly caused by the minor Offset of External Analog Voltage. In this case, the user can manually adjust the **Sn217** to correct the offset or use Automatic Adjustment. Please refer to "3-3 Diagnostic Function Description".

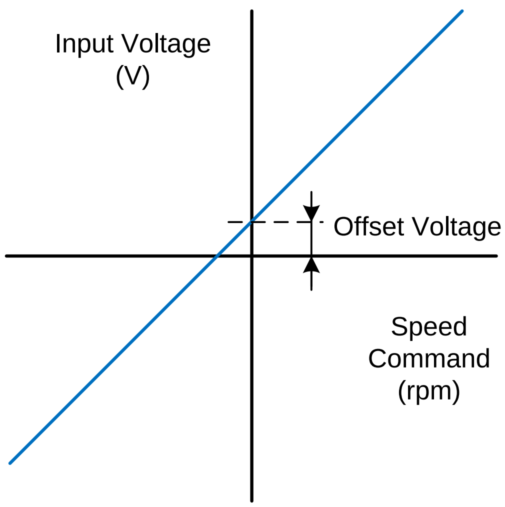
⚠ Attention
• **Please confirm the status is Servo off before adjustment; Input 0V voltage command from the supervisory controller or external loop to analog command connect SIC (CN-1-26).**

Sn217 Zero analog speed command offset adjustment ※JSDG2S-E does not have this function

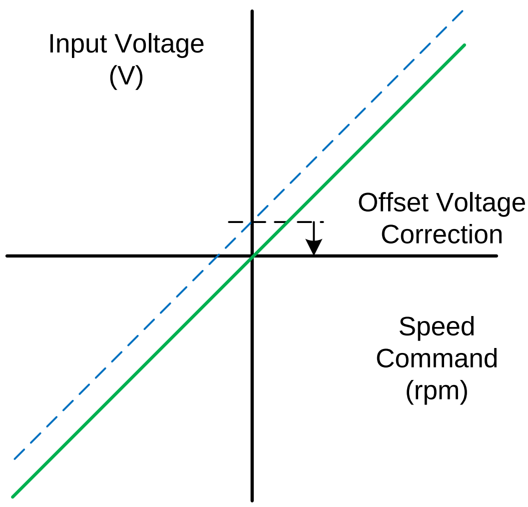
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	mV	-2500 ~ 2500	Effective after Set	0211H

Setting Description: Used to correct offset when the Analog Speed Command Voltage generates the offset phenomenon.

Before Offset Adjustment



After Offset Adjustment



5-3-4 Analog speed command limit ※JSDG2S-E does not have this function

The user can limit the Analog Speed Command, setting is as follows:

Sn218 Analog speed command limit ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1.02* Rated Speed	rpm	100 ~ 1.5*Rated Rotational Speed	Effective after Set	0212H

Setting Description: The user can set Sn218 to limit the Maximum Speed of the Analog Input.

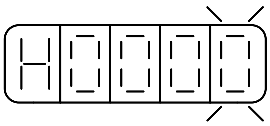
5-3-5 Speed Command Smoothing

If the Motor overshoots or vibrates due to a serious speed command change, this Driver can be used to provide three Speed Command Smoothing operations. The user can decide which smoothing operation should be used based on the requirements. **If one of these functions is to be used, Sn205.0 needs to be set up to activate each function.**

Sn205.0 Speed Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Effective after Set	0205H

Setting Description:



Setting	Description
0	Do not use Speed Command Acceleration / Deceleration Function
1	Use the Speed Command One Time Smoothing Acceleration / Deceleration Function
2	Use the Speed Command Linear Smoothing Acceleration / Deceleration Function
3	Use S-type Speed Command One Time Smoothing Acceleration / Deceleration Function

The following explains three Speed Command Smoothing operations.

(1) Speed Command One Time Smoothing Acceleration / Deceleration:

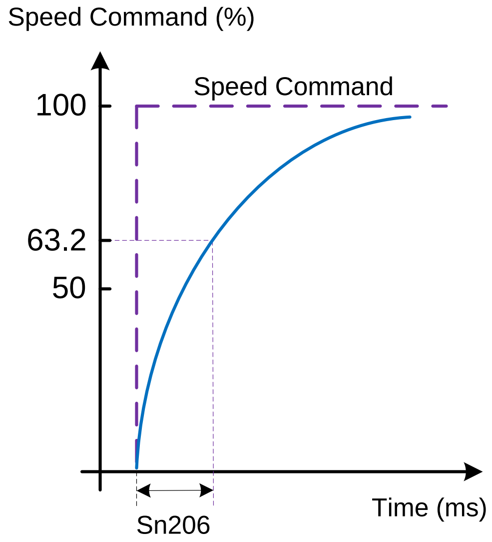
To use this function, **Sn205.0=1** must be set to activate Speed Command One time Smoothing Acceleration / Deceleration Function.

Sn206 Speed Command One Time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	ms	1 ~ 10000	Effective after Set	0206H

Setting Description: Set Sn205.0=1 to activate Speed Command One time Smoothing Acceleration / Deceleration Function. The definition of Speed Command One Time Smoothing Acceleration / Deceleration Time Constant is the time for the Speed one time delayed rise from Zero Speed to 63.2% of the Speed Command.

Diagram as follows:



Setting Example:

(1) To reach 95% of Speed Command output in 30ms, then

$$Sn206 = \frac{30(msec)}{-\ln(1-95\%)} = 10(msec)$$

(2) To reach 75% of Speed Command output in 30ms, then

$$Sn206 = \frac{30(msec)}{-\ln(1-75\%)} = 22(msec)$$

Note) ln(x) is the Natural Logarithm Operation symbol

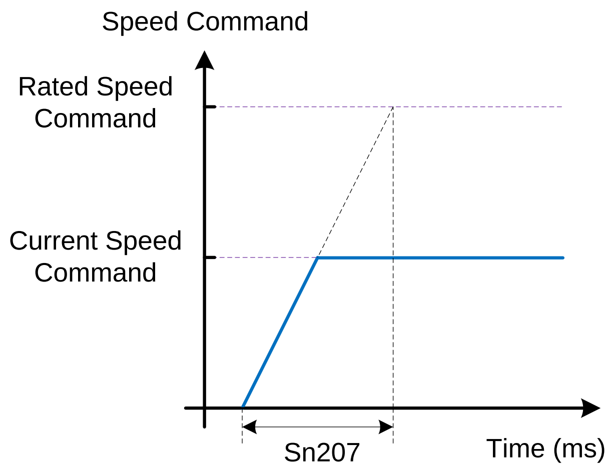
(2) Speed Command Linear Acceleration / Deceleration Function:

To use this function, **Sn205.0=2** must be set to activate Speed Command Linear Acceleration / Deceleration Function.

Sn207 Speed command linear acceleration/deceleration constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	ms	1 ~ 50000	Effective after Set	0207H

Setting Description: Set Sn205.0=2 to activate Speed Command Linear Acceleration / Deceleration Function. The definition of Speed Command Linear Acceleration / Deceleration Time Constant is the time of Speed from zero linear rises to Rated Speed. Diagram as follows:



Setting Example:

(1) To reach 50% of Rated Speed output in 10ms, then

$$Sn207 = 10(ms) \times \frac{100\%}{50\%} = 20(ms)$$

(2) To reach 75% of Rated Speed output in 10ms, then

$$Sn207 = 10(ms) \times \frac{100\%}{75\%} = 13(ms)$$

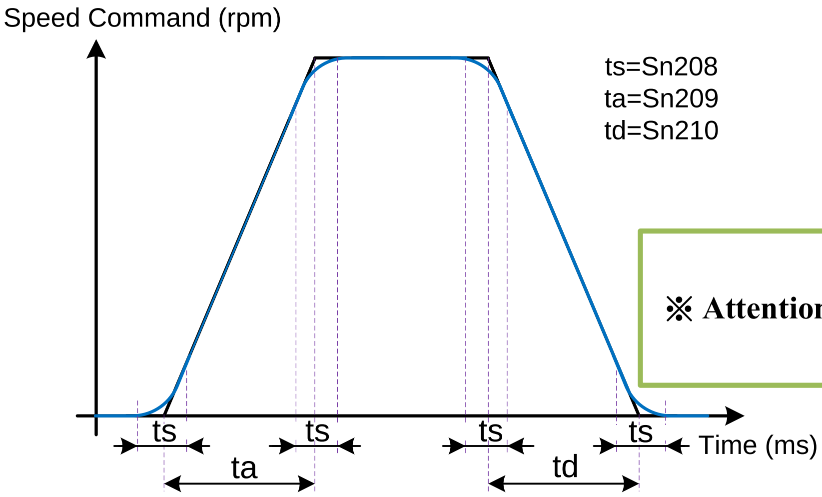
(3) S-type Speed Command Acceleration / Deceleration:

To use this function, **Sn205.0=3** must be set to activate S-type Speed Command Acceleration / Deceleration Function.

Sn208 S-type Speed Command Acceleration / Deceleration Time Setting (t_S)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	ms	1 ~ 1000	Effective after Set	0208H

Setting Description: Set Sn205.0=3 to activate S-type Speed Command Acceleration / Deceleration Function. During Acceleration / Deceleration, due to the severe Acceleration / Deceleration Changes when activating Stop that resulted in machine oscillation, adding S-type Acceleration / Deceleration to Speed Command can achieve the function of smooth operations.



※ **Attention! Setting Rules:** $\frac{t_a}{2} > t_s$, $\frac{t_d}{2} > t_s$

Sn209 S-type Speed Command Acceleration Time Setting (t_a)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	ms	0 ~ 5000	Effective after Set	0209H

Setting Description: Please refer to Sn208 Description

Sn210 S-type Speed Command Deceleration Time Setting (t_b)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	ms	0 ~ 5000	Effective after Set	020AH

Setting Description: Please refer to Sn208 Description

5-3-6 Speed Rotation Direction Definition

In speed mode, the user can use **Cn004.0** (Motor Rotation Direction Definition) and Digital Input Contact **SPDINV** to define Motor Rotation Direction; refer to following description:

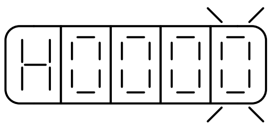
⚠ Attention
• **Both Methods can function simultaneously; the user shall confirm the final motor rotation direction definition to avoid confusion.**

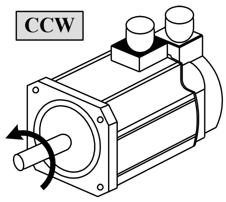
When the user can define the Speed Command as a positive value based on requirements, set the Motor Rotation Direction as follows:

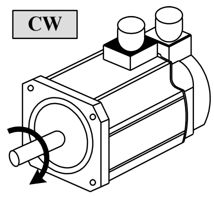
(1) Cn004.0 Motor Rotation Direction Definition (from the Motor Load End)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Effective after Set	0004H

Setting Description: When the Torque or Speed Command is positive, the Rotation Direction Setting from the Motor Load End is as follows







Setting	Description	
	Torque Control	Speed Control
0	Counterclockwise Rotation (CCW)	Counterclockwise Rotation (CCW)
1	Clockwise Rotation (CW)	Counterclockwise Rotation (CCW)
2	Counterclockwise Rotation (CCW)	Clockwise Rotation (CW)
3	Clockwise Rotation (CW)	Clockwise Rotation (CW)

(2) Digital Input Contact SPDINV defines Motor Rotation Direction

Input Contact SPDINV	Description	Control Mode
OFF (Switch does not function)	Rotation in accordance with the current Speed Command Direction	S
ON (Switch functions)	Reverse Rotation in accordance with the current Speed Command Direction	

Note) Please refer to ”5-6-1 Digital Input / Output Contact Function Planning to set the Driver Effective Logic.

5-3-7 Torque Limit in Speed Mode

In Speed Control, Motor Torque Limit is achieved by using Digital Input Contact **TLMT** to switch the two following methods:

(1) Internal Torque Limit: Use the internally pre-set **Cn010** (CCW Direction Torque Command Limit Value) and **Cn011** (CW Direction Torque Command Limit Value).

(2) External Analog Command Torque Limit: Use Analog Voltage Command Signal input to **TIC (CN1-27)** to limit the CCW Direction Torque and CW Direction Torque.

Please refer to the Table below:

Digital input contact TLMT	CCW Direction Torque Command Limit source	CCW Direction Torque Limit source
OFF (Switch does not function)	Cn010	Cn011
ON (Switch functions)	External Analog Command TIC (CN1-27) ※JSDG2S-E does not have this function	External Analog Command TIC (CN1-27) ※JSDG2S-E does not have this function

Note) Please refer to "5-6-1 Digital Input / Output Contact Function Planning" to set the Driver Effective Logic.

Attention

- **When using External Analog Torque Command Limit, if this Analog Torque Command Limit is greater than the Internal Torque Command Limit, then the Internal Torque Command Limit is ultimately used. .**

(1) Internal Torque Limit: The following is the Internal Torque Limit setting description:

Cn010 CCW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0 ~ 300	Effective after Set	000BH

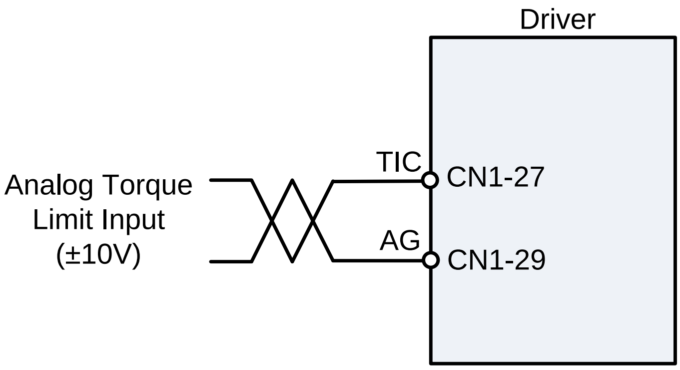
Note) Default and setting range of parameter Cn010/Cn011 vary by driver model. ; for details, please refer to "7-3-1 System parameters (Cn0□□)".

Cn011 CW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 Note)	%	-300 ~ 0	Effective after Set	000CH

Note) Default and setting range of parameter Cn010/Cn011 vary by driver model. ; for details, please refer to "7-3-1 System parameters (Cn0□□)".

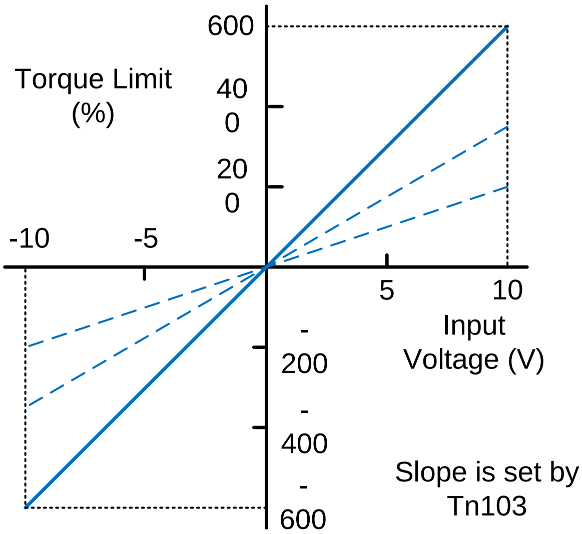
(2) External Analog Command Torque Limit: The following is the External Analog Torque Limit Command Wiring Diagram:



Tn103 Analog torque limit proportioner ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
300	%/10V	0 ~ 600	Effective after Set	0103H

Setting Description: Used to adjust the slope of Voltage Command relative to the Torque Command



Attention

- **The input voltage of analog torque limit voltage command does not have polarity. + voltage or – voltage are received as an absolute value. The speed limit of this absolute value is applied to forward and reverse direction.**

5-3-8 Other Speed Control Functions

This Section explains other functions related to Speed Control.

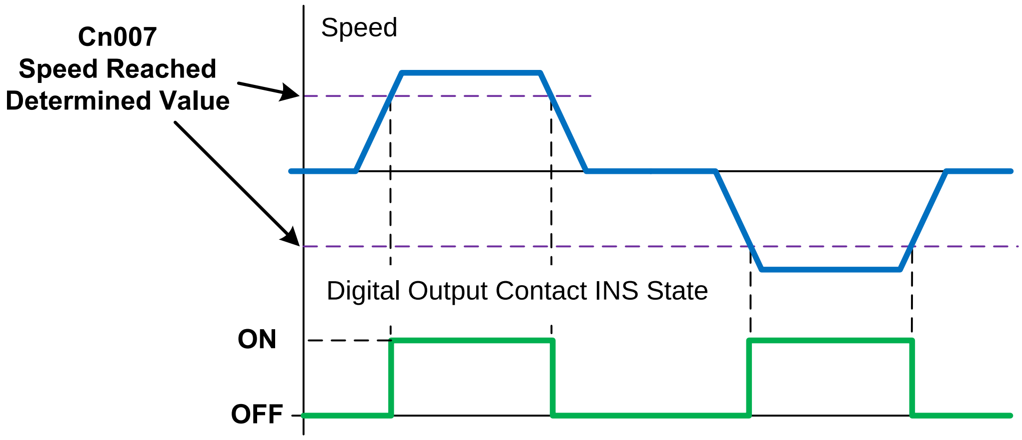
Speed Reached Function

When Forward or Reverse Speed exceeds the speed set by **Cn007** (Speed Reached Determined Value), Digital Output Contact **INS** operates; refer to following description:

Cn007 Speed Reached Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Rated rotational speed* 1/3	rpm	0 ~ 1.5*Rated Speed	Effective after Set	0008H

Setting Description: When the Forward or Reverse Speed exceeds the speed set by Cn007 (Speed Reached Determined Value), Digital Output Contact INS activates



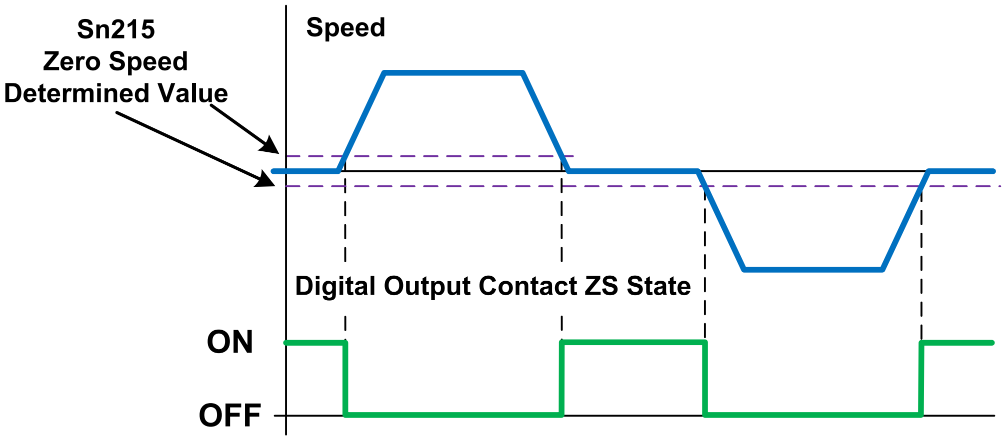
Zero Speed Function

When the Speed is lower than the Speed set by **Sn215** (Zero Speed Determined Value), Digital Output Contact **ZS** operates; refer to the following description:

Sn215 Zero Speed Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
50	rpm	0 ~ 1.5*Rated Speed	Effective after Set	020FH

Setting Description: When speed is lower than the speed set by Sn215 (zero speed determined value), digital output contact ZS activates.

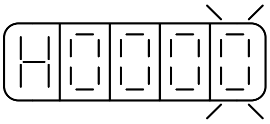


The user can set **Sn204.0** (Zero Speed Determined Operation) to 1, and when the Zero Speed is determined, the Speed Command is treated as Zero, as described below:

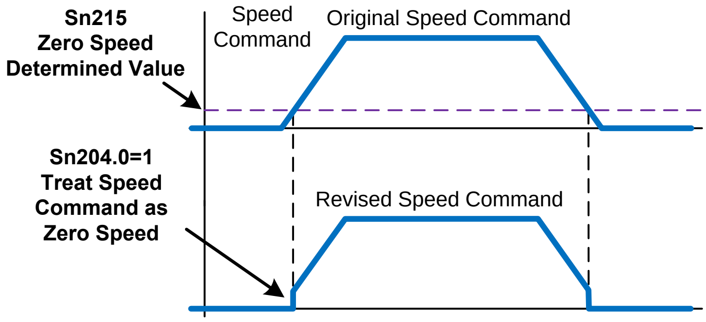
Sn204.0 Zero Speed Determined Operation

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Effective after Set	0204H

Setting Description:



Setting	Description
0	Does not operate
1	Treat Speed Command as Zero Speed



Servo Lock

Servo lock-Under speed control mode, even if the voltage command input from the supervisory machine is 0V, the driver may still make the motor generating slight vibration because of the received noise. Therefore, this function is applied to stop locking servo motor. When Digital Input Contact LOK operates, although this Device is in Speed Control Mode, it will temporarily change to Internal Position Control Mode to fix the Motor Position. To use Servo Lock Function, please refer to ”5-6-1 Input / Output Contact Function Planning” to set the used Digital Input Contact as LOK Function.

5-4 Position Mode

Position Mode is used in the system that requires precision positioning, such as all types of processing machines, industrial machinery, etc. The Position Mode Command of this Device has two input modes:

1. The External Pulse Command Input Mode is to receive the Pulse Command output by the Supervisory Controller to achieve the Positioning Function.
2. Internal Position Command Mode refers to the mode that the user sets Position Command Value in thirty-two sets of Command Registers (**Pn401~Pn496**) and conduct planning on Digital Input Contacts **POS1~POS5** to switch to relative Position Commands.

The user shall set **Cn001** (Control Mode Selection) in accordance with the mode to be used. The setting method is as follows:

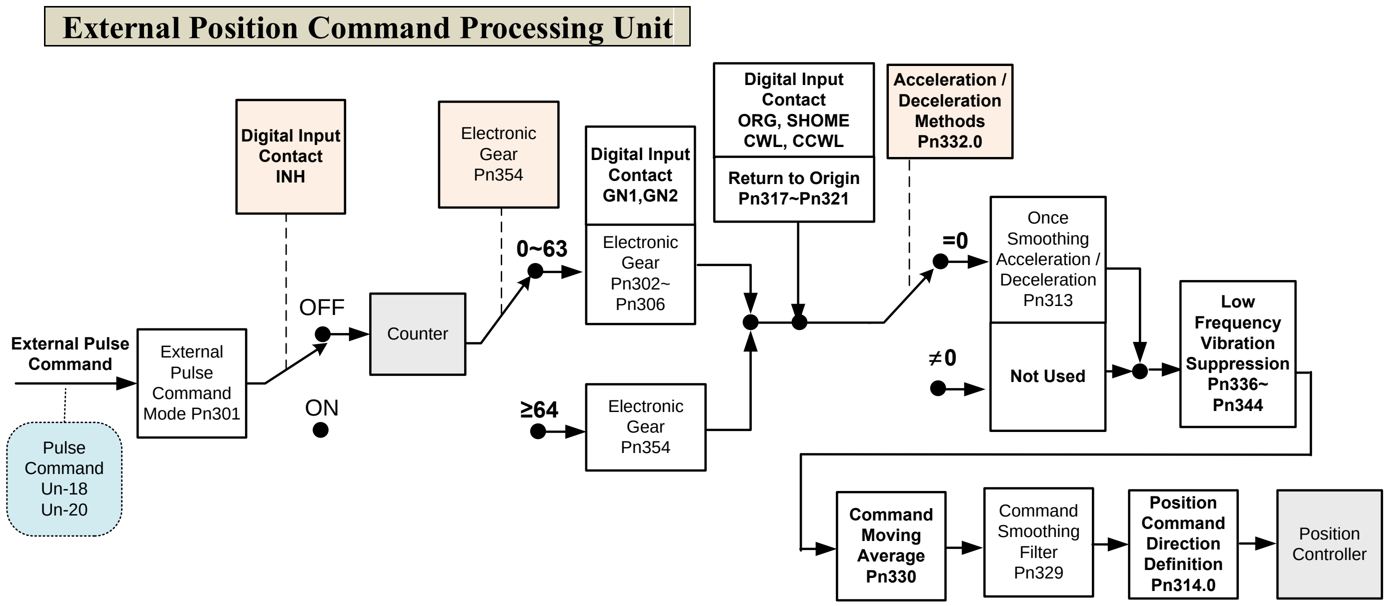
Cn001 Control Mode Selection

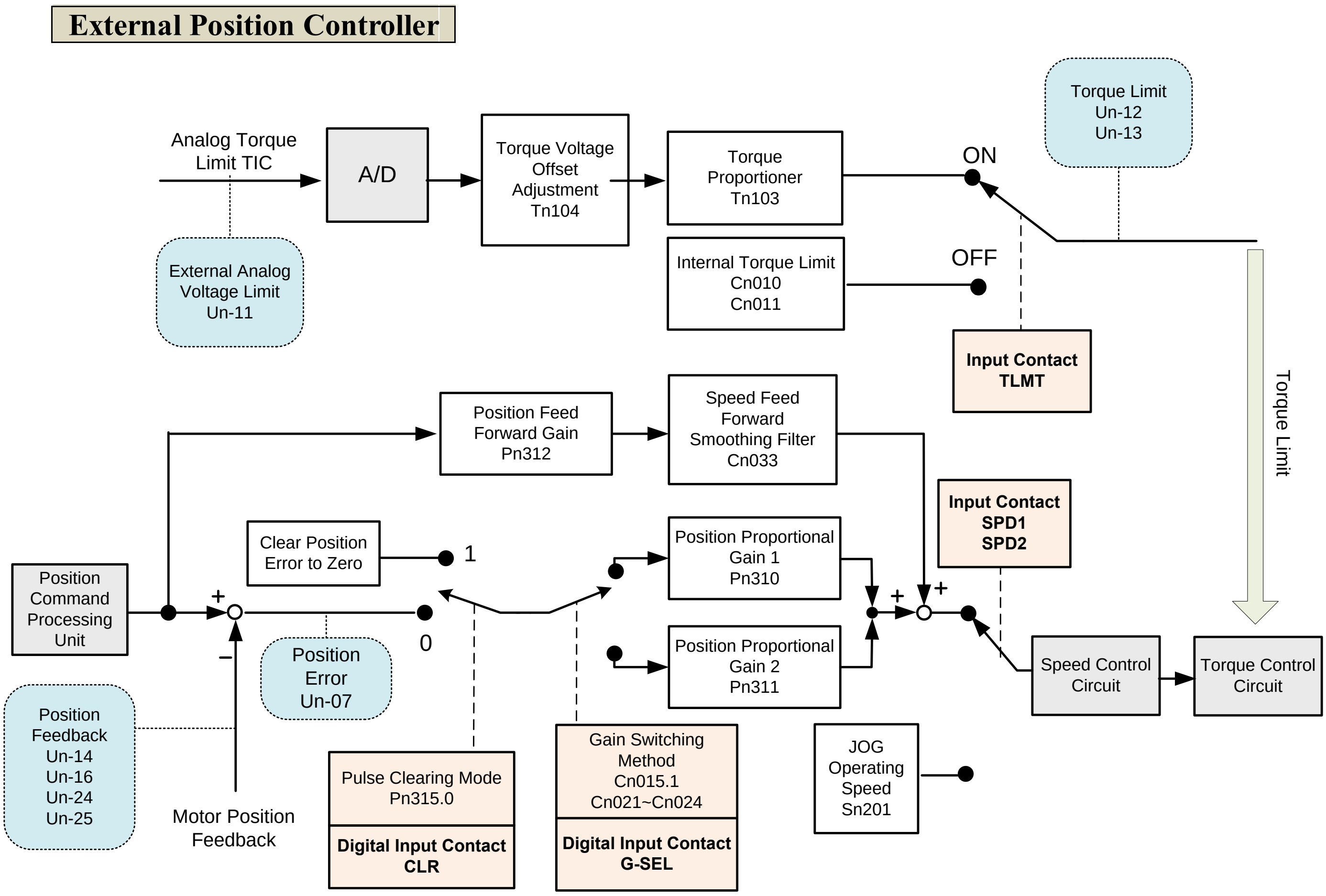
Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	Power Re-set	0001H

Setting Description:

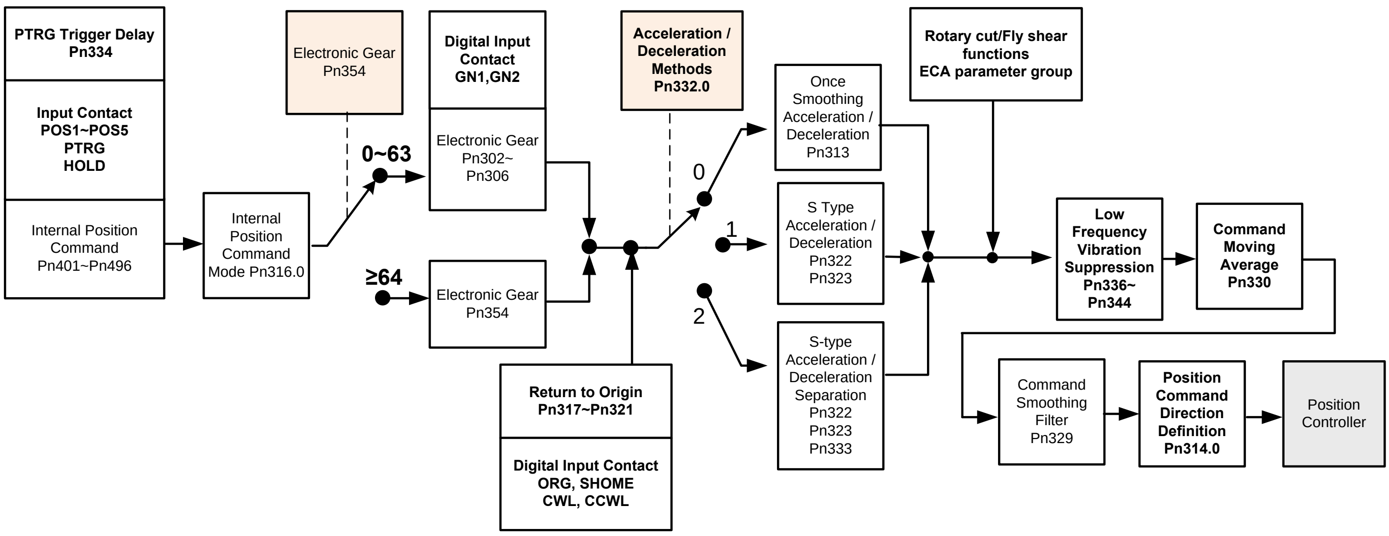
Setting	Description
2	External Position Control (External Pulse Command)
3	External Position / Speed Control Switching
5	External Position / Torque Control Switching
6	Internal Position Control (Internal Position Command)
7	Internal Position / Speed Control Switching
8	Internal Position / Torque Control Switching
A	Internal / External Position Switching

The Position Loop Control Block Diagram is shown in the following Figure; detailed functions of each block are described in the following Sections.

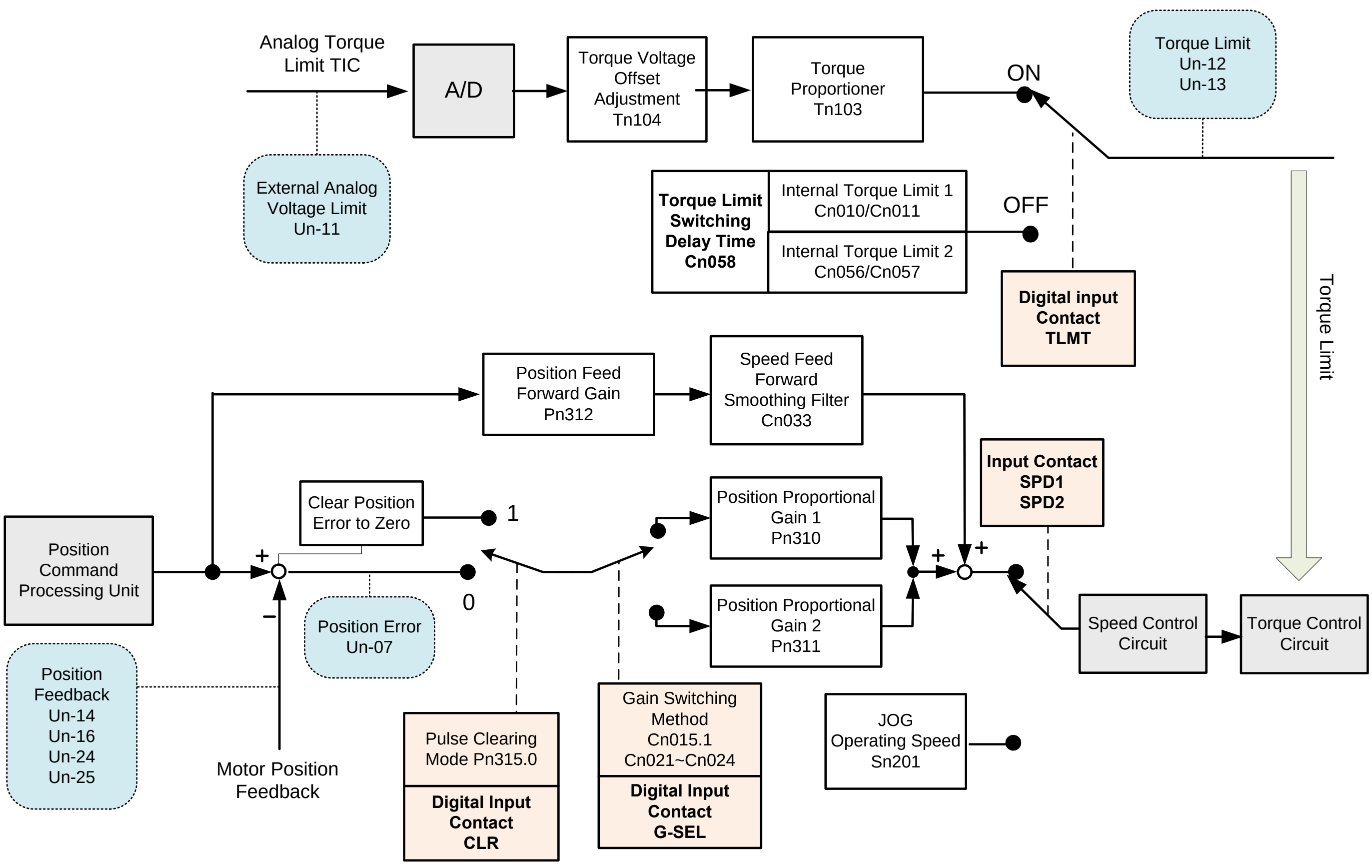




Internal Position Command Processing Unit



Internal Position Controller



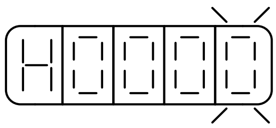
5-4-1 External Pulse Command Mode

The Pulse Command in this Mode is provided by an external device there are three pulse patterns can be selected, each pulse pattern can also be programmed as positive or negative logic. The user sets the corresponding pattern based on the External Input Pulse Command pattern. The setting method is as follows:

Pn301.0 Position pulse command pattern selection

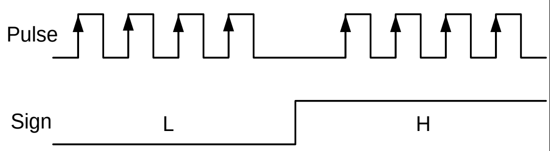
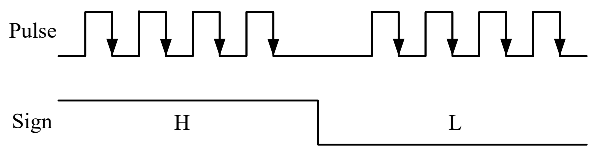
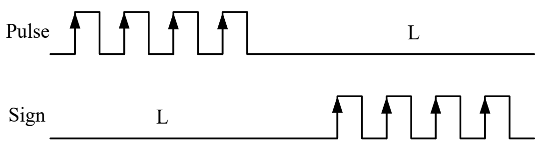
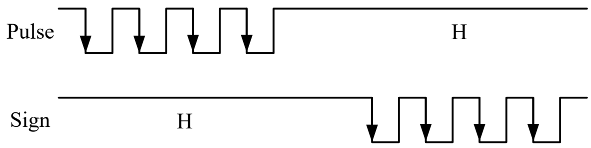
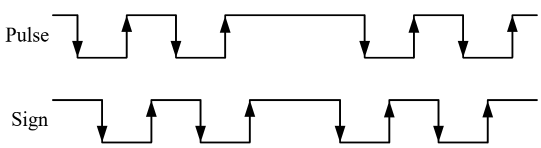
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Power Re-set	0301H

Setting Description:

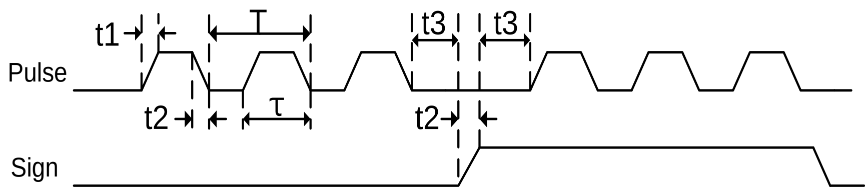
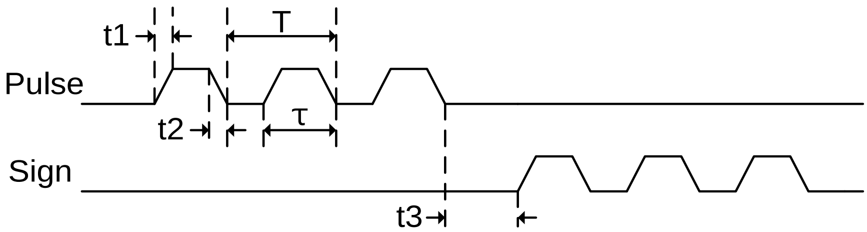
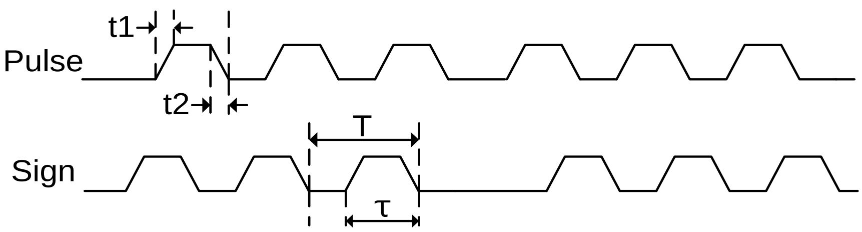


Setting	Description
0	Pulse+Sign
1	CCW+CW Pulse
2	A phase+ B phase pulse * 2
3	A phase+ B phase pulse * 4

Setting Description: Can select Filter Smoothing Time.

Position Pulse Command Pattern	Positive Logic		Negative Logic	
	CCW Command	CW Command	CCW Command	CW Command
Pulse + Sign				
CCW+ CW/Pulse				
Phase A Phase B Pulse				

There are two types of Pulse Command Input Interfaces, Open Collector and Line Driver respectively. Please refer to "**2-2-1 CN1 Control Signal Terminal Description"** for the wiring method. Please input the Pulse Command in accordance with the time sequence specifications.

Pulse Command Pattern	Pulse command Time Sequence Diagram	Time Specification
Pulse + Sign		Line Driver Input: t1, t2 ≤ 0.1μs t3 > 3μs τ ≥ 1.0μs (τ/T) ≤ 50% Open Collector Input: t1, t2 ≤ 0.2μs t3 > 3μs τ ≥ 2.0μs (τ/T) ≤ 50%
CCW+ CW/Pulse		Line Driver Input: t1, t2 ≤ 0.1μs t3 > 3μs τ ≥ 1.0μs (τ/T) ≤ 50% Open Collector Input: t1, t2 ≤ 0.2μs t3 > 3μs τ ≥ 2.0μs (τ/T) ≤ 50%
Phase A+ Phase B Pulse		Line Driver Input: t1, t2 ≤ 0.1μs τ ≥ 1.0μs (τ/T) ≤ 50% Open Collector Input: t1, t2 ≤ 0.2μs τ ≥ 2.0μs (τ/T) ≤ 50%

This Device provides a Digital Input Contact **INH**; Pulse Command Input is prohibited when this contact operates, indicating this Device no longer receives any Pulse Command. Refer to the following description:

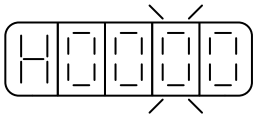
Input Contact INH	Description	Control Mode
OFF (Switch does not function)	Receive Pulse Command normally	Pe
ON (Switch functions)	No longer receives any Pulse Command	

Note) Please refer to ”5-6-1 Digital Input / Output Contact Function Planning” to set the Driver Effective Logic.

Pn301.1 Position Pulse Command Logic Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0301H

Setting Description:

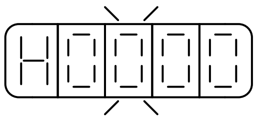


Setting	Description
0	Positive Logic
1	Negative Logic

Pn301.2 Drive inhibits Command Receiving Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0301H

Setting Description:

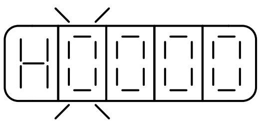


Setting	Description
0	After the Drive Prohibition occurs, continue recording the Position Command Input Quantity.
1	After the Drive Prohibition occurs, ignore Position Command Input Quantity.

Pn301.3 Position Pulse Command Filter Width Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0 ~ 7	Power Re-set	0301H

Setting Description:



Setting	Description	Setting	Description
0	4500KHz	4	370KHz
1	2500KHz	5	190KHz
2	1200KHz	6	90KHz
3	750KHz	7	40KHz

5-4-2 Internal Position Command Mode

The Command Source of this Mode is thirty-two sets of Command Register (**Pn401~Pn496**) which are used to switch the corresponding position command according to the planned input contacts **POS1~POS5**. Each set of position command works with a moving speed register to set the moving speed of this position command set as shown in the following table:

Position Command	POS5	POS4	POS3	POS2	POS1	Position Command Parameter		Moving Speed Parameter
P1	OFF	OFF	OFF	OFF	OFF	Number of Revolutions	Pn401	Pn403
						Number of Pulses	Pn402	
P2	OFF	OFF	OFF	OFF	ON	Number of Revolutions	Pn404	Pn406
						Number of Pulses	Pn405	
P3	OFF	OFF	OFF	ON	OFF	Number of Revolutions	Pn407	Pn409
						Number of Pulses	Pn408	
P4	OFF	OFF	OFF	ON	ON	Number of Revolutions	Pn410	Pn412
						Number of Pulses	Pn411	
P5	OFF	OFF	ON	OFF	OFF	Number of Revolutions	Pn413	Pn415
						Number of Pulses	Pn414	
P6	OFF	OFF	ON	OFF	ON	Number of Revolutions	Pn416	Pn418
						Number of Pulses	Pn417	
P7	OFF	OFF	ON	ON	OFF	Number of Revolutions	Pn419	Pn421
						Number of Pulses	Pn420	
P8	OFF	OFF	ON	ON	ON	Number of Revolutions	Pn422	Pn424
						Number of Pulses	Pn423	
P9	OFF	ON	OFF	OFF	OFF	Number of Revolutions	Pn425	Pn427
						Number of Pulses	Pn426	
P10	OFF	ON	OFF	OFF	ON	Number of Revolutions	Pn428	Pn430
						Number of Pulses	Pn429	
P11	OFF	ON	OFF	ON	OFF	Number of Revolutions	Pn431	Pn433
						Number of Pulses	Pn432	
P12	OFF	ON	OFF	ON	ON	Number of Revolutions	Pn434	Pn436
						Number of Pulses	Pn435	
P13	OFF	ON	ON	OFF	OFF	Number of Revolutions	Pn437	Pn439
						Number of Pulses	Pn438	
P14	OFF	ON	ON	OFF	ON	Number of Revolutions	Pn440	Pn442
						Number of Pulses	Pn441	
P15	OFF	ON	ON	ON	OFF	Number of Revolutions	Pn443	Pn445
						Number of Pulses	Pn444	
P16	OFF	ON	ON	ON	ON	Number of Revolutions	Pn446	Pn448
						Number of Pulses	Pn447	
P17	ON	OFF	OFF	OFF	OFF	Number of Revolutions	Pn449	Pn451
						Number of Pulses	Pn450	
P18	ON	OFF	OFF	OFF	ON	Number of Revolutions	Pn452	Pn454

Position Command	POS5	POS4	POS3	POS2	POS1	Position Command Parameter		Moving Speed Parameter
						Number of Pulses	Pn453	
P19	ON	OFF	OFF	ON	OFF	Number of Revolutions	Pn455	Pn457
						Number of Pulses	Pn456	
P20	ON	OFF	OFF	ON	ON	Number of Revolutions	Pn458	Pn460
						Number of Pulses	Pn459	
P21	ON	OFF	ON	OFF	OFF	Number of Revolutions	Pn461	Pn463
						Number of Pulses	Pn462	
P22	ON	OFF	ON	OFF	ON	Number of Revolutions	Pn464	Pn466
						Number of Pulses	Pn465	
P23	ON	OFF	ON	ON	OFF	Number of Revolutions	Pn467	Pn469
						Number of Pulses	Pn468	
P24	ON	OFF	ON	ON	ON	Number of Revolutions	Pn470	Pn472
						Number of Pulses	Pn471	
P25	ON	ON	OFF	OFF	OFF	Number of Revolutions	Pn473	Pn475
						Number of Pulses	Pn474	
P26	ON	ON	OFF	OFF	ON	Number of Revolutions	Pn476	Pn478
						Number of Pulses	Pn477	
P27	ON	ON	OFF	ON	OFF	Number of Revolutions	Pn479	Pn481
						Number of Pulses	Pn480	
P28	ON	ON	OFF	ON	ON	Number of Revolutions	Pn482	Pn484
						Number of Pulses	Pn483	
P29	ON	ON	ON	OFF	OFF	Number of Revolutions	Pn485	Pn487
						Number of Pulses	Pn486	
P30	ON	ON	ON	OFF	ON	Number of Revolutions	Pn488	Pn490
						Number of Pulses	Pn489	
P31	ON	ON	ON	ON	OFF	Number of Revolutions	Pn491	Pn493
						Number of Pulses	Pn492	
P32	ON	ON	ON	ON	ON	Number of Revolutions	Pn494	Pn496
						Number of Pulses	Pn495	

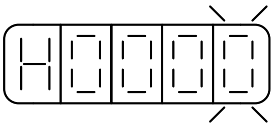
Internal position command =Number of resolution * encoder revolution + number of pulse.

The Internal Position Command Mode can select two types of Positioning Pattern, Absolute Type and Relative Type according to **Pn316.0**, the setting is as follows:

Pn316.0 Internal position command mode

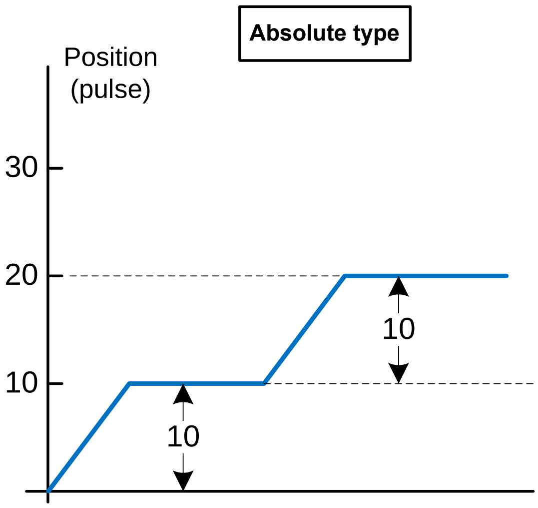
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0326H

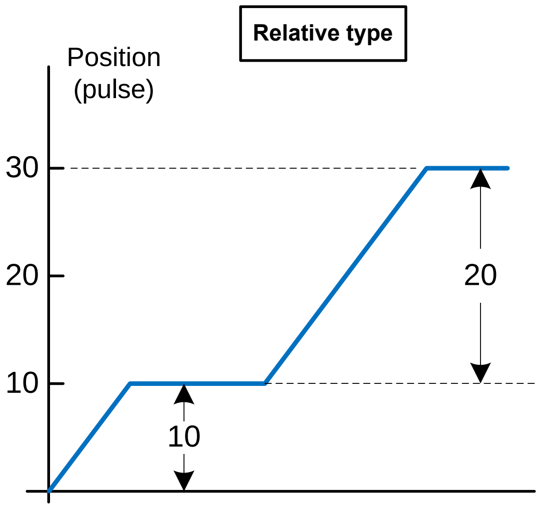
Setting Description:



Setting	Description
0	Absolute Type Positioning
1	Relative Type Positioning

In the Absolute Type and Relative Type Positioning Mode, after issuing the 10pulse Position Command then issue 20pulse Command separately, the Position Path Differential Diagrams are as follows:





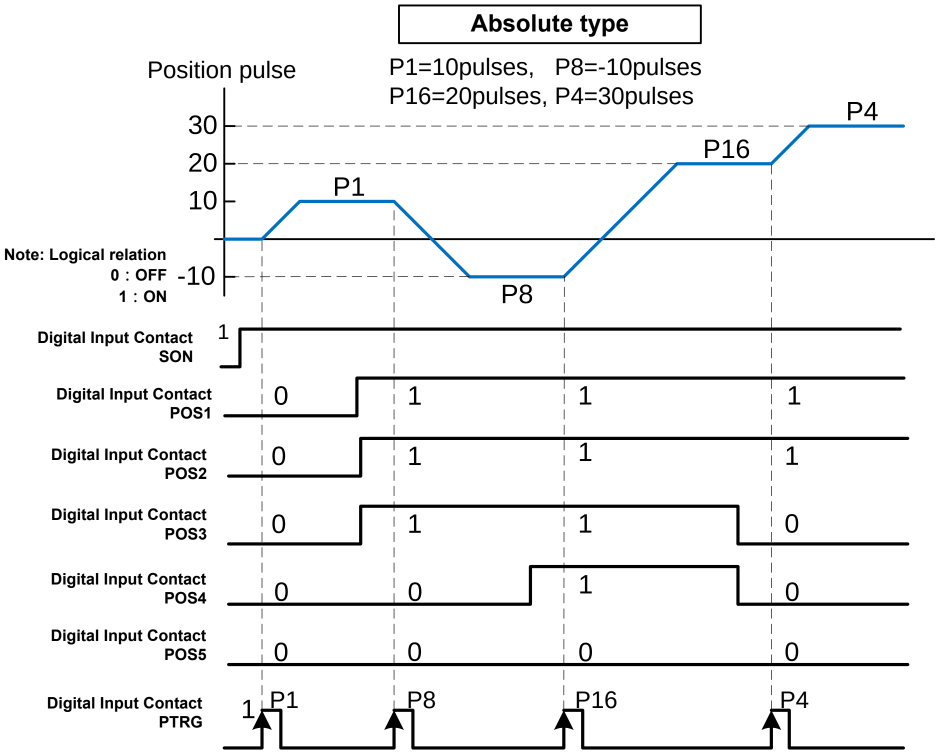
DI – PTRG Function, Trigger Time can also perform Time Delay, the setting is as follows:

Pn334 PTRG Trigger Delay Time Parameter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	4ms	0 ~ 2500	Effective after Set	032BH

Setting Description: After PTRG is triggered, and after the Delay setting time, the Motor starts rotation.

After the User selects the corresponding Position Command using the Input Contacts **POS1~POS5**, the Input Contact **PTRG** must be triggered, this Device will officially accept the Position Command and the Motor starts operation. Please refer to the following Time Sequence Diagram:

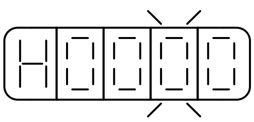


If the user wishes to stop motor operation temporarily during position moving process, the motor will decelerate to stop if Digital input contact **PHOLD** is triggered

Pn316.1 Internal Position Command Hold (PHOLD) Procedure Selection

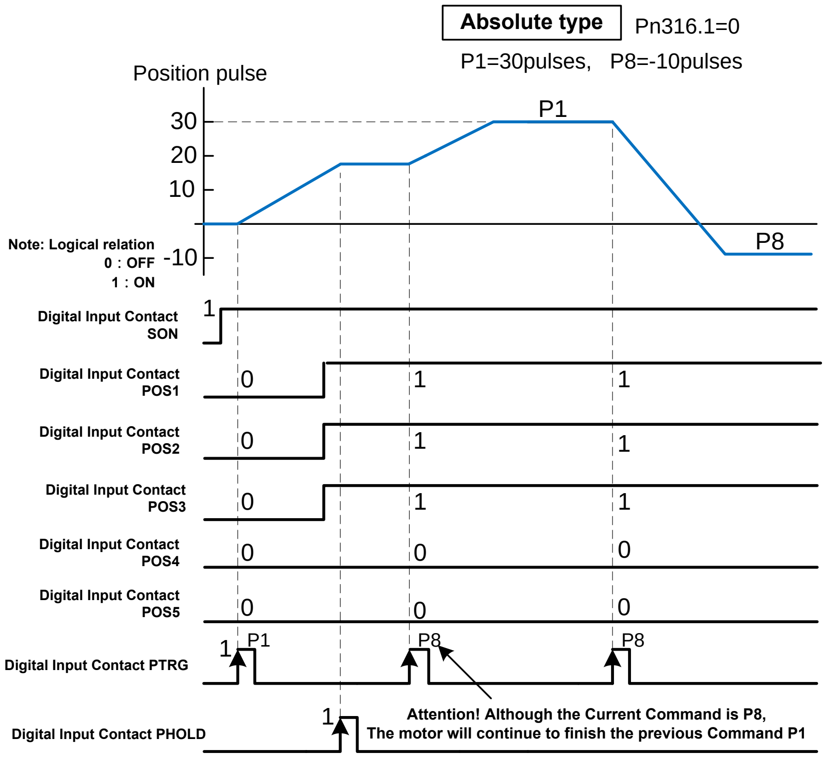
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0316H

Setting Description:

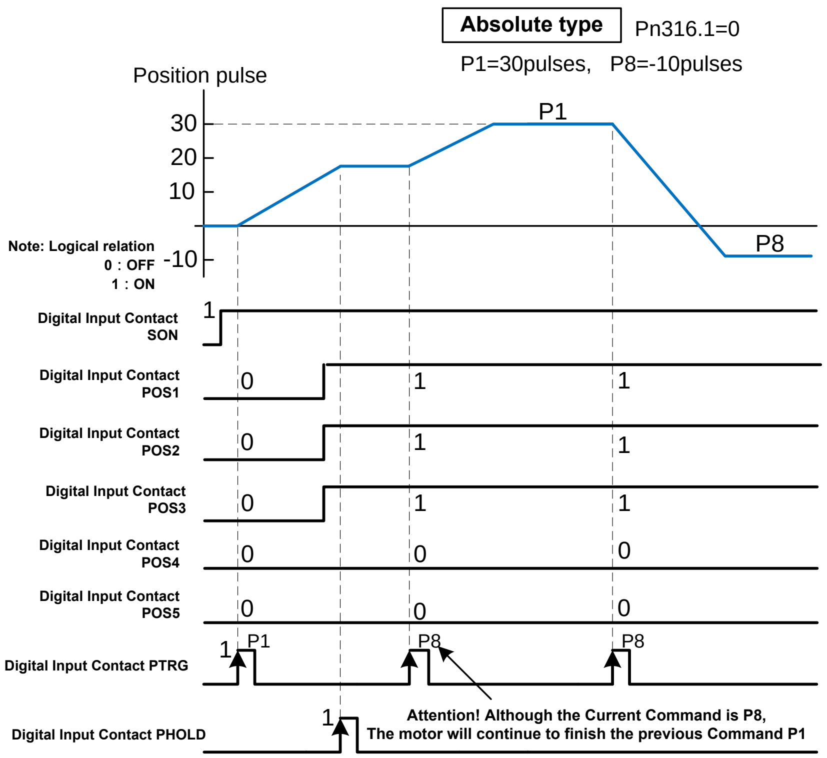


Setting	Description
0	After Digital Input Contact PHOLD operates, when PTRG is triggered again, Motor will continue to complete the Internal Position Command before PHOLD is triggered.
1	After Digital Input Contact PHOLD operates, when PTRG is triggered again, Motor will operate according to current selected Internal Position Command immediately.

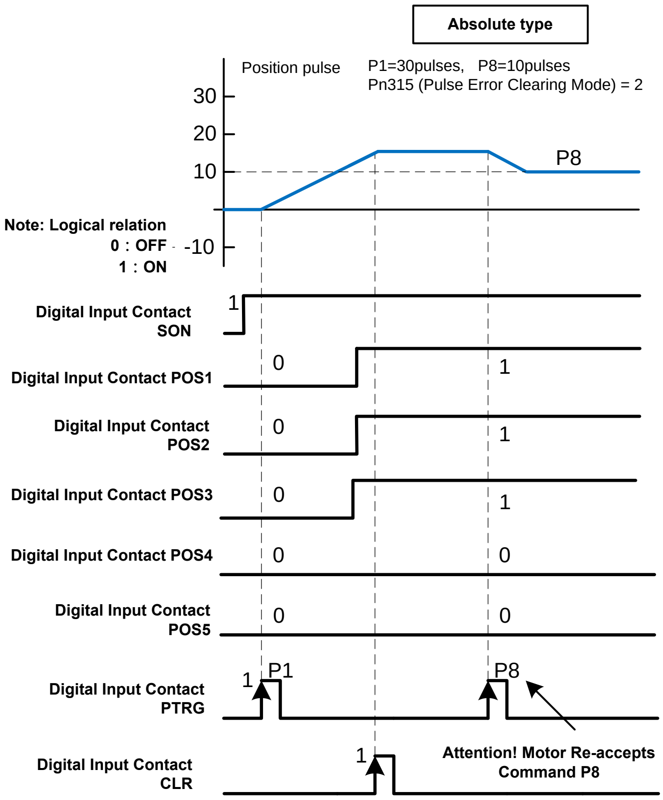
When Pn316.1=0 and Digital input contact **PTRG** is triggered again, the motor will continue to complete the rest pulse command to reach the target position set before Digital input contact **PHOLD** is triggered. Please refer to the following timing diagram:



When Pn316.1=1 and PTRG is triggered again, the motor will operate according to the selected internal position command. Please refer to the following timing diagram:



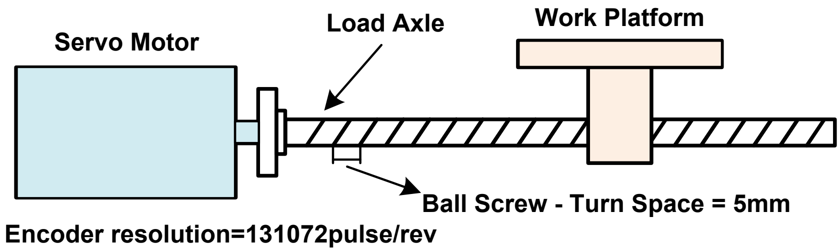
If the user wishes to ignore this Position Command and stop the Motor during the position movement process, simply trigger Digital Input Contact **CLR** (**Pn315.0** must be set to **1** or **2**, please refer to ”5-4-7 Pulse Error Clearing”setting); the Motor will stop immediately and the uncompleted Pulse Command will be cleared. When Digital Input Contact **PTRG** is triggered again, the Motor will operate according to the Position Command selected by **POS1~POS5**. Please refer to the following Timing Diagram:



5-4-3 Electronic Gear Ratio

The user can define the Unit Pulse Command input to this Device through the Electronic Gear Ratio to move the Transmission Device by any distance, the Pulse Command generated by the Supervisory Controller does not need to consider the gear ratio, reduction ratio or motor encoder pulses of the Transmission System, the description is as follows:

The following Figure is the Servo Motor Drive Ball Screw Transmission Device, if the work platform is to be moved by 10mm, how many Pulse Commands the Supervisory Controller need to be issued to the Servo Driver?



Without Electronic Gear Ratio Function	With Electronic Gear Ratio Function
1. The work platform will move 5mm with one revolution of the Ball Screw. 2. To move the work platform by 10mm, the Ball Screw needs to be rotated $10\text{mm} \div 5\text{mm/rev} = 2$ resolutions. 3. And the 131072 Pulse Command will cause the Motor rotate one turn. 4. Therefore, the Supervisory Controller needs to issue the $131072\text{pulse/rev} \times 2\text{ rev} = 262144\text{pulse}$ Command. ➔ **Before every move, the Supervisory Control must follow the above steps to calculate the Pulse Command.**	➔ **Set the Electronic Gear Ratio first** (Assuming that the Definition One Pulse Command moves 1um, the Electronic Gear Ratio setting method is detailed in the following Sections) 1. Since One Pulse Command moves 1um. 2. To move the work platform by 10mm, the Supervisory Controller needs to issue the $10\text{mm} \div 1\text{um/pulse} = 10000\text{pulse}$ command. ➔ **As long as the One Pulse Command Moving Distance and the Electronic Gear Ratio are defined first, the Supervisory Control can easily determine the Pulse Command.**

TECO Servo provides two methods to set the Electronic Gear Ratio:

(1) Directly Set the number of Pulse Commands of the Single Rotation - Pn354

(2) Use the Numerator of the Electronic Gear Ratio and Denominator of Electronic Gear Ratio — Pn302~Pn306

The two above methods are set and switched by Parameter Pn354, Digital Input Contacts GN1 and GN2:

Pn354	GN1	GN2	Pulse Command Quantity of Single Rotation
≥ 64	-	-	Pn354
0~63	OFF	OFF	Encoder resolution * Pn306 / Pn302
0~63	OFF	ON	Encoder resolution * Pn306 / Pn303
0~63	ON	OFF	Encoder resolution * Pn306 / Pn304
0~63	ON	ON	Encoder resolution * Pn306 / Pn305

Electronic gear ratio setting method (1) – Directly set the number of pulse command for a single rotation

1. Understand the overall system specifications

Obtain the System Specification first in order to determine the Electronic Gear Ratio, such as: Reduction Ratio, Gear Ratio, the quantity of movement for one revolution of the Load Axis, and the diameter of Roller. Please refer to "1-1-2 Confirmation of Servo Motor Model".

2. Define One Pulse Command Moving Distance

Define the distance that the Transmission Device will move when the Supervisory Controller issues a Pulse Command. For example: when one pulse commands to move 1um

3. Calculate Single Rotation Pulse Command

※ If the deceleration ratio between the Motor and the Load Shaft is $^{n}/_{m}$ (m refers to the number of Motor rotations and n the number of Load Shaft rotations), single-rotation Pulse Command will be calculated according to the following formula.

$$\text{Single Rotation Pulse Command} = \frac{\begin{array}{c}\text{The distance of the load movement}\\ \text{by one revolution of the Load Shaft}\end{array}}{\text{One Pulse Command Moving Distance}} \times \frac{n}{m}$$

Directly input the number of Single Rotation Pulse Commands to Pn354 Single Rotation Pulse Command Function

Pn354 Single Rotation Pulse Command Function

Initial Value	Unit	Setting Range	Effective	RS-485
0	pulse	Determined by the Encoder 0 ~ 10000: 2500ppr encoder 0 ~ 32768: 15bit encoder 0 ~ 131072: 17bit encoder 0 ~ 8388608: 23bit encoder Note: 0 ~ 63 means not use	Power Re-set	0342H/0343H

Setting Description: The pulse command required by one motor revolution. **When set as a value ≥64, Single pulse command function activates** and Pn302~Pn306 E-Cam ratio function becomes invalid.

Electronic Gear Ratio Setting Method (2) - Using the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator

1. Understand the overall system specifications

Obtain the System Specifications first in order to determine the Electronic Gear Ratio, such as: Reduction Ratio, Gear Ratio, the quantity of movement for one revolution of the Load Axis, the diameter of the Roller and the Number of Pulses in One Revolution of the Motor Encoder, Please refer to "1-1-2 Confirmation of Servo Motor Model".

2. Define One Pulse Command Moving Distance

Define the distance that the Transmission Device will move when the Supervisory Controller issues a Pulse Command. For example: When One Pulse Command moves 1um, if the Supervisory Controller issues 2000 Pulse Commands, the Transmission Device will move $2000\text{pulse}\times 1\text{um/pulse} = 2\text{mm}$ (provided that the Electronic Gear Ratio is set correctly).

3. Calculate Electronic Gear Ratio

※ If the Deceleration Ratio between the Motor and the Load Shaft is n/m (m refers to the number of Motor rotations and n the number of Load Shaft rotations), the Electronic Gear Ratio formula is as follows:

$$\text{Electronic Gear Ratio} = \frac{\text{Motor encoder resolution}}{\begin{array}{c}\text{Distance of the load movement}\\ \text{by one revolution of load shaft}\end{array} \div \text{one pulse command moving distance}} \times \frac{m}{n}$$

※ The Communication Encoder 15/17/23bits, the number of Pulses in One Revolution is 2 to the [bits] power.

EX: 1. 17bits Encoder's number of Pulses in One Revolution = 2^{17} = 131072

2. 23bits Encoder's number of Pulses in One Revolution = 2^{23} = 8388608

4. Electronic Gear Ratio Parameters Setting

Pn354 Single Rotation Pulse Command Function

Initial Value	Unit	Setting Range	Effective	RS-485
0	pulse	0 ~ 32768 (15bit encoder) 0 ~ 131072 (17bit encoder) 0 ~ 8388608 (23bit encoder)	Power Re-set	0341H/0342H

Setting Description: If to use the functions of Pn302~Pn306, please set Pn354 = 0~63.

Pn302 Electronic Gear Ratio Numerator 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 8388608	Effective after Set	0302H/0303H

Pn303 Electronic Gear Ratio Numerator 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 8388608	Effective after Set	0304H/0305H

Pn304 Electronic Gear Ratio Numerator 3

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 8388608	Effective after Set	0306H/0307H

Pn305 Electronic Gear Ratio Numerator 4

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 8388608	Effective after Set	0308H/0309H

Pn306 Electronic Gear Ratio Denominator

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 8388608	Power Re-set	030AH/030BH

Setting Description: Set Pn306 (Electronic Gear Ratio Denominator) and coordinate with the Electronic Gear Ratio Numerator selected by Digital Input Contact GN1, GN2; the obtained Electronic Gear Ratio must conform to the following conditions, otherwise this Device cannot operate normally.

$$\frac{1}{1000} \leq \text{Electronic Gear Ratio} \leq 4000$$

This Device provides four sets of Electronic Gear Ratio Numerators. Users can utilize Digital Input Contact **GN1**, **GN2** to switch to currently required Electronic Gear Ratio Numerators. Please refer to the following Table:

Input Contact GN2	Input Contact GN1	Electronic Gear Ratio Numerator	Electronic Gear Ratio Denominator
OFF (Switch does not function)	OFF (Switch does not function)	Electronic gear ratio numerator 1 (Pn302)	Electronic Gear Ratio Denominator (Pn306)
OFF (Switch does not function)	ON (Switch functions)	Electronic gear ratio numerator 2 (Pn303)	Electronic Gear Ratio Denominator (Pn306)
ON (Switch functions)	OFF (Switch does not function)	Electronic gear ratio numerator 3 (Pn304)	Electronic Gear Ratio Denominator (Pn306)
ON (Switch functions)	ON (Switch functions)	Electronic gear ratio numerator 4 (Pn305)	Electronic Gear Ratio Denominator (Pn306)

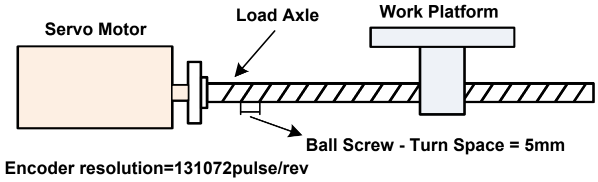
Note) Please refer to "5-6-1 Digital Input / Output Contact Function Planning" to set the Driver Effective Logic.

Example of Electronic Gear Ratio Setting Steps

Transmission System	Setting Steps

Transmission System

Ball Screw



Setting Steps

Method 1: Directly set the Pulse Command Number of Single Rotation

1. **Understand the Overall System Specifications:**

   Load Axis (Ball Screw) One Revolution Movement=5mm/rev

2. **Define One Pulse Command Moving Distance:**

   One pulse command moving distance=1um

3. **Set Number of Pulses in a Single Rotation**

$$\text{Single Rotation Pulse Command} = \frac{5\text{mm/rev}}{1\text{um/pulse}}$$
$$= 5000\ \text{pulse/rev}$$

Method 2: Use the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator

1. **Understand the Overall System Specifications:**

   Load Axis (Ball Screw) One Revolution Movement=5mm

   Motor encoder resolution=131072pulse

2. **Define One Pulse Command Moving Distance:**

   One pulse command moving distance=1um

3. **Calculate Electronic Gear Ratio:**

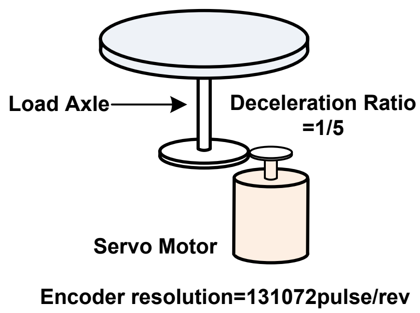
$$\text{Electronic Gear Ratio} = \frac{131072\text{pulse/rev}}{5\text{mm/rev} \div 1\text{um/pulse}}$$
$$= \frac{131072}{5000}$$

4. **Electronic Gear Ratio Parameters Setting:**

Electronic Gear Ratio Numerator	131072
Electronic Gear Ratio Denominator	5000

<table>
<tr><th>Transmission System</th><th>Setting Steps</th></tr>
<tr><td rowspan="2">

Index Plate



</td><td>

Method 1: Directly set the Pulse Command Number of Single Rotation

1. **Understand Overall System Specification:**
   Deceleration Ratio =1/5
   Load Axis (Index Plate) One Revolution Movement=360°
2. **Define One Pulse Command Moving Distance:**
   One pulse command moving distance=0.1°
3. **Set Number of Pulses in a Single Rotation**

$$\text{Single Rotation Pulse Command} = \frac{360\text{deg/rev}}{0.1\text{deg/pulse}} \times \frac{1}{5}$$
$$= 720\ \text{pulse/rev}$$

</td></tr>
<tr><td>

Method 2: Use the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator

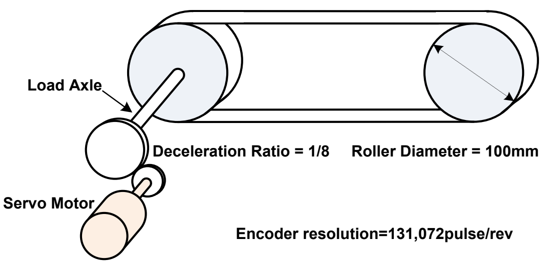
1. **Understand the Overall System Specifications:**
   Deceleration Ratio =1/5
   Load Axis (Index Plate) One Revolution Movement=360
   Motor encoder resolution=131072pulse
2. **Define One Pulse Command Moving Distance:**
   One pulse command moving distance=0.1°
3. **Calculate Electronic Gear Ratio:**

$$\text{Electronic Gear Ratio} = \frac{131072\text{pulse/rev}}{360° \div 0.1°/\text{pulse}} \times \frac{5}{1}$$
$$= \frac{655{,}360}{3600}$$

4. **Electronic Gear Ratio Parameters Setting:**

Electronic Gear Ratio Numerator	655360
Electronic Gear Ratio Denominator	3600

</td></tr>
</table>

<table>
<tr><th>Transmission System</th><th>Setting Steps</th></tr>
<tr><td rowspan="2">Conveyor Belt

</td>
<td>Method 1: Directly set the Pulse Command Number of Single Rotation
1. Understand Overall System Specification:
Deceleration Ratio = 1/8
Load Axis (Roller) One Revolution Movement
$= 3.14 \times 100mm = 314mm$
2. Define One Pulse Command Moving Distance:
One pulse command moving distance=10um
3. Calculate Electronic Gear Ratio:
$$\text{Single Rotation Pulse Command} = \frac{314mm/rev}{1um/pulse} \times \frac{1}{8}$$
$$= 3925\ pulse/rev$$
</td></tr>
<tr><td>Method 2: Use the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator
1. Understand the Overall System Specifications:
Deceleration Ratio = 1/8
Load Axis (Roller) One Revolution Movement
$= 3.14 \times 100mm = 314mm$
Motor encoder resolution=131072pulse
2. Define One Pulse Command Moving Distance:
One pulse command moving distance=10um
3. Calculate Electronic Gear Ratio:
$$\text{Electronic Gear Ratio} = \frac{131072pulse/rev}{314mm \div 10um/pulse} \times \frac{8}{1}$$
$$= \frac{1048576}{31400}$$
4. Electronic Gear Ratio Parameters Setting:
Simplify the Electronic Gear Ratio by Reduction of Fraction, to let both Numerator and Denominator are smaller than the integer value of 8388608.
<table>
<tr><td>Electronic Gear Ratio Numerator</td><td>131072</td></tr>
<tr><td>Electronic Gear Ratio Denominator</td><td>3925</td></tr>
</table>
</td></tr>
</table>

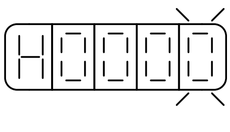
5-4-4 Position Command Acceleration / Deceleration Function

Item	Acceleration / Deceleration Function	External Pulse Command Mode	Internal Position Command Mode
(1)	One Time Smoothing Acceleration / Deceleration	Turn on when Pn332.0=0 Related Parameter: Pn313	Turn on when Pn332.0=0 Related Parameter: Pn313
(2)	S-type Acceleration / Deceleration	No	Turn on when Pn332.0=1 Related parameters: Pn322, Pn323
(3)	S-type Acceleration / Deceleration Separation	No	Turn ON when Pn332.0 = 2 Related parameters: Pn322, Pn323, Pn333
(4)	Command Moving Average	Set up is not required, use directly Related Parameter: Pn330	Set up is not required, use directly Related Parameter: Pn330
(5)	Command Smoothing Filter	Set up is not required, use directly Related Parameter: Pn329	Set up is not required, use directly Related Parameter: Pn329

Pn332.0 Internal/External Position Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 2	Effective after Confirmed	0327H/0328H

Setting Description:



Setting	Description
0	Use Position Command One Time Smoothing Acceleration / Deceleration
1	Use Internal Position Command S-type Acceleration / Deceleration (external position command does not have this function)
2	Use Internal Position Command S-type Acceleration / Deceleration Separation (external position command does not have this function)

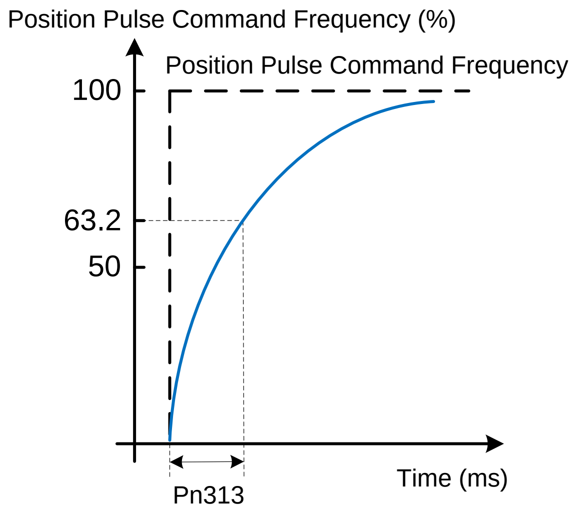
(1) Internal / External Position Command One time Smoothing Acceleration / Deceleration

Use Internal / External Position Command One time Smoothing Acceleration / Deceleration Function will smooth the Internal / External Position Command of originally Fixed Frequency

Pn313 Internal / External Position Command One time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	ms	0 ~ 10000	Power Re-set	0313H

Setting Description: Will smooth the Position Pulse Command of originally fixed frequency. The definition of Internal/External Position Command One Time Smoothing Acceleration / Deceleration Time Constant is the time of the Position Command Frequency starts one time delay rise from zero to 63.2% of the External Position Pulse Command Frequency.



Setting Example:

(1) To reach 95% of Position Pulse Command Frequency Output in 30msec, then

$$Pn313 = \frac{30(ms)}{-\ln(1-95\%)} = 10(ms)$$

(2) To reach 75% of Position Pulse Command Frequency Output in 30msec, then

$$Pn313 = \frac{30(ms)}{-\ln(1-75\%)} = 22(ms)$$

(2) Internal Position Command S-type Smoothing Acceleration / Deceleration

The S-type Smoothing Command Generator provides smoothing processing of movement commands, the generated speed and acceleration are continuous, and the jerkiness of acceleration is also small, which can improve the acceleration / deceleration characteristics of the Motor, and also more smoothing in the operations of the mechanical structure.

The S-type smooth command generator is suitable for the Control Mode when inputting the Internal Position Command, when the Position Command is changed from the External Pulse Signal Input, the input of Speed and Angular Acceleration are already continuous, so the S-type Smoother is not used.

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.4ms	0 ~ 5000	Effective after Set	031DH

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	0.4ms	1 ~ 5000	Effective after Set	031EH

The Input Time Parameters are defined here as TSL and TACC. First, Determine the Acceleration / Deceleration Travel by the input time parameter.

From the following Figure (a), it can be seen that when TACC>TSL, a constant acceleration zone is generated, and the fixed acceleration time is TACC-TSL.

When TACC = TSL, there is no fixed acceleration zone, as shown in Figure (b) below. According to the Definition, TACC<TSL cannot be achieved, Figure (c).

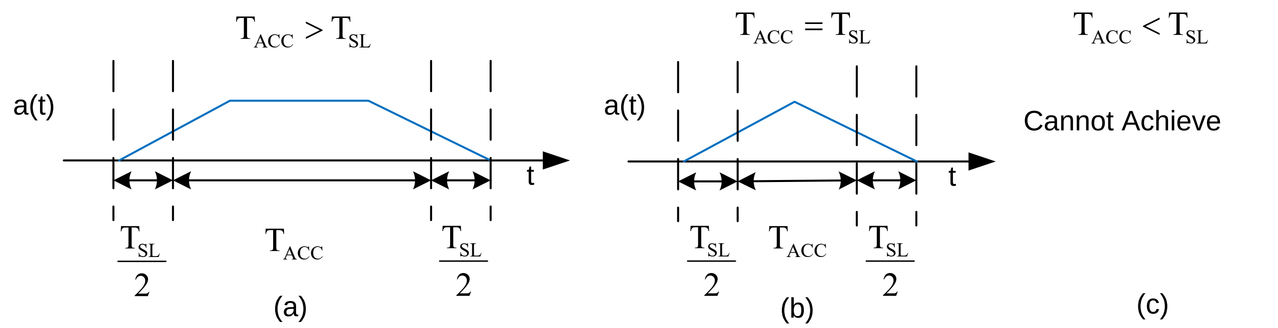


Figure: Definition of Travel Time for S-type Curve.

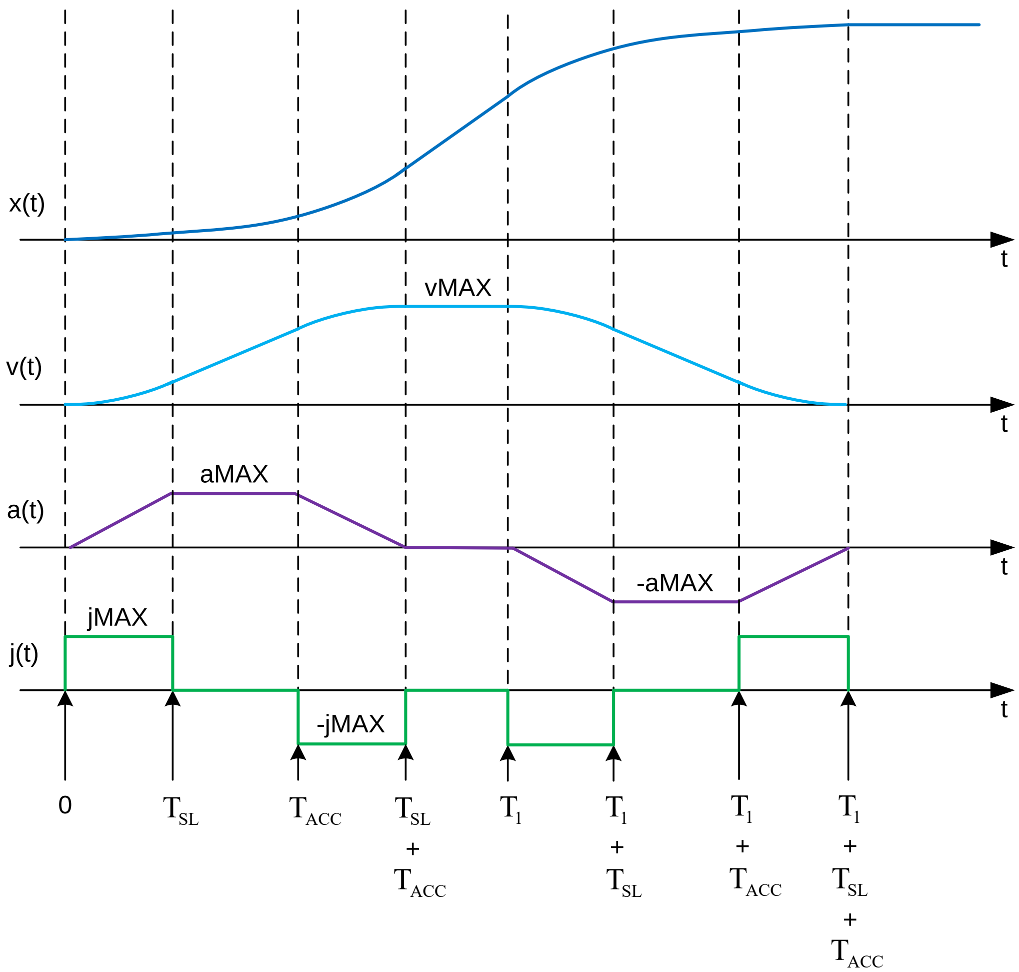


Figure: Definition of the Section Travel Time for S-type Curve.

(3) Internal Position Command S-type Smooth Acceleration / Deceleration Separation

Function is equivalent to (2) Internal Position Command S-type Smooth Acceleration / Deceleration, the difference is in the separation of TACC and TDEC.

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.4ms	0 ~ 5000	Effective after Set	031DH

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	0.4ms	1 ~ 5000	Effective after Set	031EH

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	0.4ms	1 ~ 5000	Effective after Set	032AH

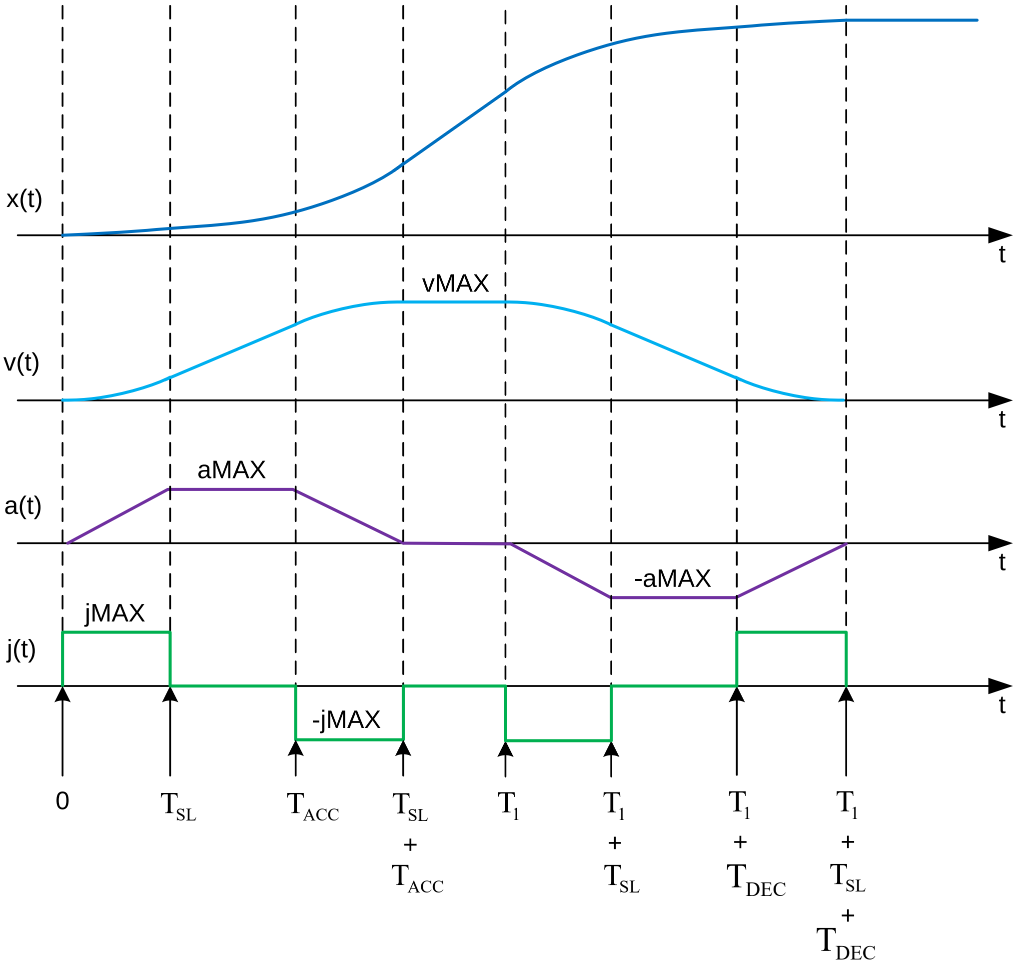


Figure: Definition of the Section Travel Time for S-type Curve.

(4) Pn329 Pulse command smoothing filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	2ms	0 ~ 2500	Effective after Set	0325H

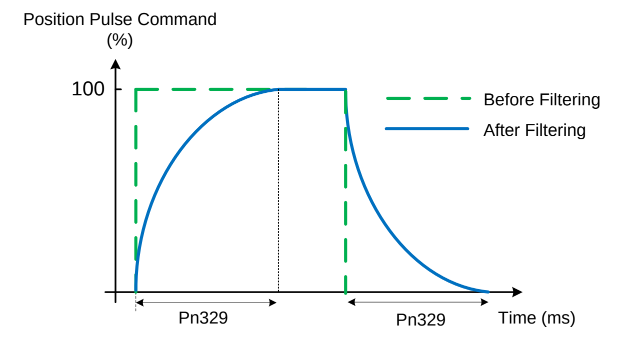
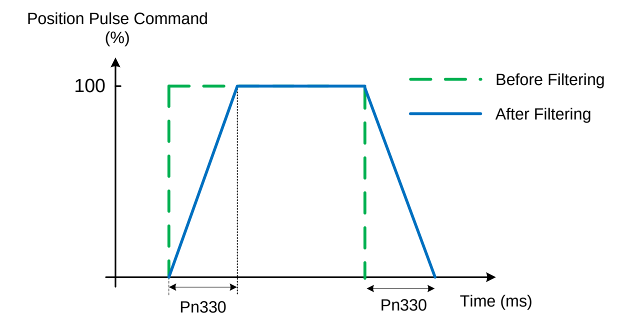
(5) Pn330 Pulse command moving filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.4ms	0 ~ 250	Effective after Set	0326H

The purpose of activating Pulse Command Smoothing Filter and Pulse Command Moving Filter on Position Instruction is to enable a smooth servo motor rotation. The above-mentioned filters are effective under the following conditions.

• The supervisory controller giving the command does not have acceleration/deceleration function

• When the Instruction Pulse Frequency is extremely low.

Pn329 Pulse Command Smoothing Filter	Pn330 Pulse Command Moving Filter
	

⚠ Attention

- **DO NOT change Pn329 & Pn330 when the motor is rotating.**
- **The filter becomes invalid after setting Pn329 and Pn330 value to 0**

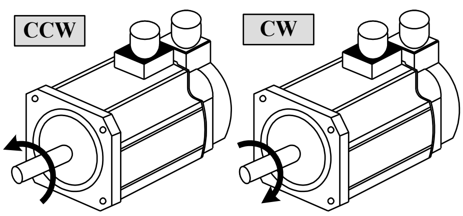
5-4-5 Position Command Direction Definition

In Position Mode, the User can use **Pn314.0** (Position Command Direction Definition) to define the Motor Rotation Direction, the settings are as follows:

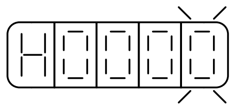
Pn314.0 Internal Position Command (from the Motor Load End)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0 ~ 1	Power Re-set	0314H

Setting Description:



(from the Motor Load End)



Setting	Description
0	Clockwise Rotation (CW)
1	Counterclockwise Rotation (CCW)

5-4-6 Pulse Error Clearing

In Position Mode, the User can use **Pn315.0** (Pulse Error Clearing Mode) to define the operating method of Digital Input Contact **CLR**. The settings are as follows:

Pn315.0 Pulse Error Clearing Mode

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 2	Effective after Set	0315H

Setting Description:

Setting	Description	Use Mode
0	When the Input Contact **CLR** operates, clear the Pulse Error.	Pe
1	When Digital Input Contact **CLR** triggers, cancel Position Command to interrupt the Motor operation, re-set Mechanical Origin, and clear Pulse Error.	Pe/Pi/Pt
2	When Digital Input Contact **CLR** is trigged, Position Command is cancelled to terminate Motor operation and clear Pulse Error.	Pi/Pt

5-4-7 Reset to Origin

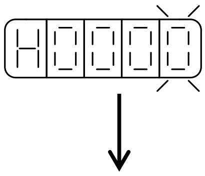
Return to Origin Mode Description

When using Return to Origin Function, the user can use Digital Input Contact **ORG** (External Detector Input Point), **CCWL** or **CWL** can be used as Origin Reference Point. The user can also use **Z**Pulse as Origin Reference Point. It is also possible to search by selecting Forward or Reverse Direction; when Return to Origin is completed, Un-55 (System multi-rotation position) and Un-56 (System Single-rotation position) will return to Zero. Refer to the following description for details:

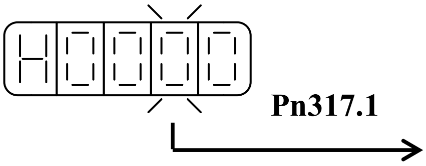
After activated the Pn317.0 Returns to Origin, the Origin Search Direction and Select Origin Reference Point Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	According to Parameters	Effective after Set	0317H

Setting Description: Note: Cn031.2 function should be set according to requirements when using ABS type encoder to run Return to zero.

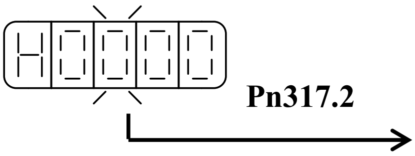


Setting	Description
0	After Return to Origin is activated, Motor searches for Origin with first stage Speed in **Forward Direction** and uses Digital Input Contact Point CCWL or CWL as Origin Reference Point. After Return to Origin and positioning are completed, Digital Input Contact CCWL or CWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Input Contact CCWL and CWL Function Selection) must be set to 0.
1	After Return to Origin is activated, Motor searches for Origin with first stage Speed in **Reverse Direction** and uses DigitalInput Contact Point CWL or CCWL as Origin Reference Point. After Return to Origin and positioning are completed, Digital Input Contact CWL or CCWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Input Contact CCWL and CWL Function Selection) must be set to 0.
2	After Return to Origin is activated, Motor searches the Origin with first stage Speed in **Forward Direction** and uses Digital Input Contact ORG **(**External Detector Input Point**)** as Origin Reference Point. If Pn317.1=2, system will directly search for the top edge closest to Digital Input Contact Point ORG as Machine Origin without Origin reference point and stop according to the method set in Pn317.3.
3	After Return to Origin is activated, Motor searches the Origin with first stage Speed in **Reverse Direction** and uses Digital Input Contact ORG **(**External Detector Input Point**)** as Origin Reference Point. If Pn317.1=2, system will directly search for the top edge closest to Digital Input Contact Point ORG as Machine Origin without Origin reference point and stop according to the method set in Pn317.3.
4	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Forward** Direction, the Origin Reference Point is not required and searches for the closest Phase Z Pulse Origin. When using this function, must set Pn317.1=2 **(**After searched Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3**)**.
5	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Reverse** Direction, the Origin Reference Point is not required and searches for the closest Phase Z Pulse Origin. When using this function, must set Pn317.1=2 **(**After searched Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3**)**.



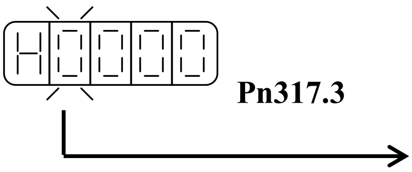
Pn317.1

Setting	Description
0	After finding the Reference Origin, the Motor will **return** with second stage speed to search the closest Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3.
1	After the Reference Origin is found, the Motor will **continue forward** with second stage speed to search the closest Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3.
2	When Pn317.0=2 or 3, system stops according to the method set in Pn317.3 after the top edge of Digital Input Contact ORG is found as the Mechanical Origin; when Pn317.0= 4 or 5, the system stop according to the method set in Pn317.3 after phase Z pulse is found as the mechanical origin.



Pn317.2

Setting	Description
0	Turn Off Return to Origin Function.
1	When the power is turned on, only the first Servo Activation **(Servo ON)** will automatically execute the Return to Origin Function. When the Servo System does not have to repeat executing the Return to Origin Function during operations, this Mode can be used to omit an Input Contact used to execute the Return to Origin Function.
2	Trigger the Return to Origin Function by digitalinput contact SHOME; the digitalinput contact SHOME can be triggered at any time to execute the Return to Origin Function.



Pn317.3

Setting	Description
0	After Mechanical Origin Signal is found, **record** this position as Mechanical Origin (both Un-14 Encoder Feedback Number of Revolutions, Un-16 Encoder Feedback Number of Pulse are all zero), Motor decelerates to stop, and **returns** to Mechanical Origin Position with second stage speed after the motor stops.
1	After Mechanical Origin Signal is found, **record** this position as Mechanical Origin (both Un-14 Encoder Feedback Number of Revolutions, Un-16 Encoder Feedback Number of Pulse are all zero), Motor decelerates to stop.

Return to Origin Mode Setting Comparison Table

The User sets **Pn317** in accordance with different operating requirement，the corresponding setting value must comply with the following table:

Pn317.0 / **Pn317.1**	**0**	**1**	**2**	**3**	**4**	**5**
0	●	●	●	●	×	×
1	×	×	●	●	×	×
2	×	×	●	●	●	●

of which, ●represents the Normal Operation of Return to Origin; ×represents the Return to Origin Operation will not be Executed

Other Return to Origin Setting Description

Return to Origin Speed Setting is as follows:

Pn318 Return to Origin First Stage High Speed

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	1 ~ rated rotational speed	--	0318H

Setting Description: Set the Moving Speed of Return to Origin First Stage High Speed

Pn319 Return to Origin Second Stage Low Speed

Initial Value	Unit	Setting Range	Effective	RS-485 Address
50	rpm	1 ~ rated rotational speed	--	0319H

Setting Description: Set the Moving Speed of Return to Origin Second Stage High Speed

The User can set the Return to Origin Offset Number of Revolutions / Number of Pulses, after the Motor has found the Mechanical Origin in accordance with **Pn317**(Return to Origin Mode), it will position in accordance with **Pn320**(Return to Origin Offset Number of Rotations)and **Pn321**(Return to Origin Offset Number of Pulses) as the New Mechanical Origin, the setting is as follows:

Pn320 Return to Origin Offset Number of Revolutions

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rev	-30000 ~ 30000	Effective after Set	031AH

Setting Description: After the Motor has found the Mechanical Origin in accordance with Pn317(Return to Origin Mode), it will position in accordance with Pn320 (Return to Origin Offset Number of Revolutions) and Pn321 (Return to Origin Offset Number of Pulses) as the New Mechanical Origin

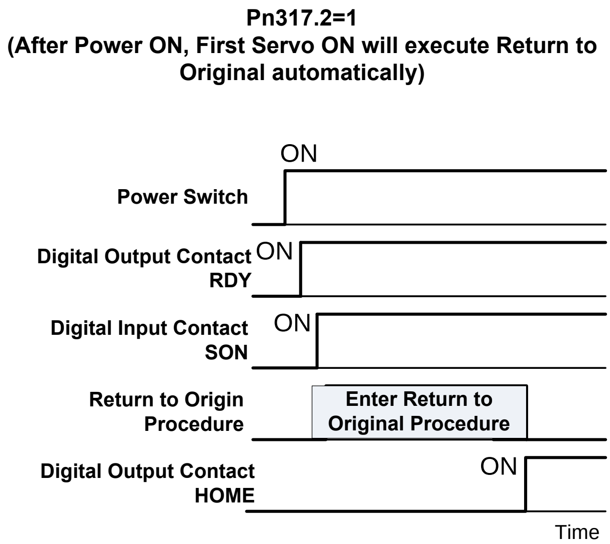
Pn321 Number of Pulse of Return to Origin Offset

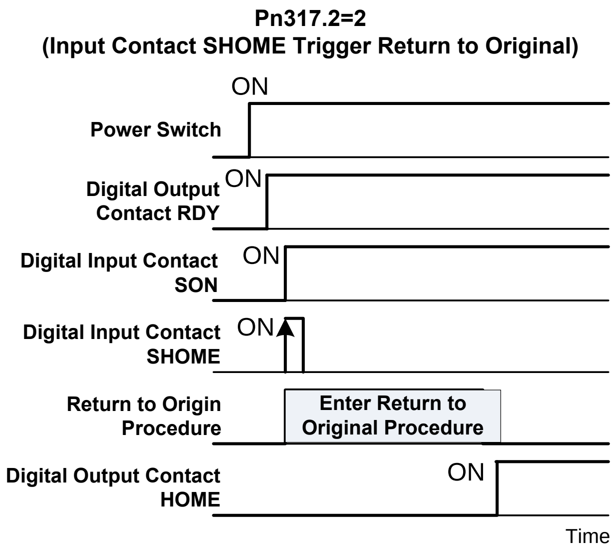
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	-9999 ~ 9999: 2500ppr -32767~32767: 15bit -131071~131071: 17bit -8388607~8388607: 23bit	Effective after Set	031BH/031CH

Setting Description: Return to Origin Offset Position =Pn320 (Number of Revolutions) x Number of Pulses in One Revolution of Encoder +Pn321(Number of Pulses)

Return to Origin Activation Mode Time Sequence Diagram

If Input Contact **SON** (Servo ON) operation is cancelled or any alarm is generated during Return to Origin procedure, Return to Origin function is discontinued and Digital Output Contact **HOME** (Complete Return to Origin) does not operate.





Note) Please refer to "5-6-1 Digital Input / Output Contact Function Planning" to set the Driver Effective Logic.

The Speed / Position of Return to Origin Time Sequence Diagram

The following Table is the Speed / Position Time Sequence Diagram of Return to Origin in comparison with different **Pn317**settings:

Pn317.1 \ Pn317.0	0	1	2	3	4	5
0	(1)	(2)	(1)	(2)	×	×
1	×	×	(3)	(4)	×	×
2	×	×	(5)	(6)	(7)	(8)

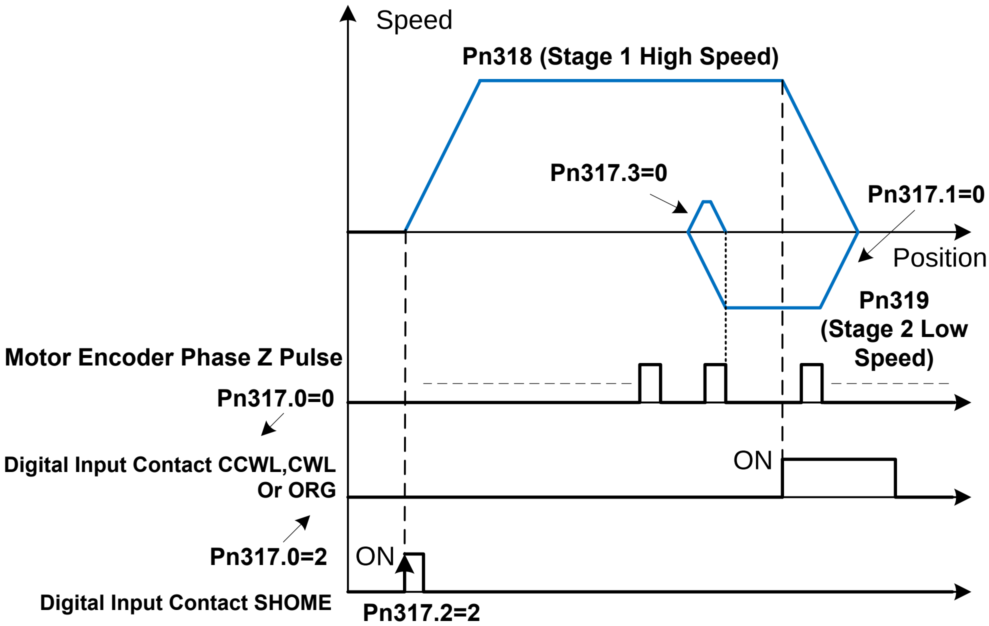
of which, ×indicates that the Return to Origin Operation will not be executed.

(1) **Pn317.0=0** or **2** (After activated Return to Origin, use first stage Speed **<u>Forward Rotation</u>** Direction to search the Origin Reference Point **CCWL, CWL** or **ORG**)

Pn317.1=0 (After found the Origin Reference Point, use second stage Speed **<u>Return</u>** to search for the closest Phase Z Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact SHOME activates Return to origin)

Pn317.3=0 (**<u>Return</u>** to Mechanical Origin)

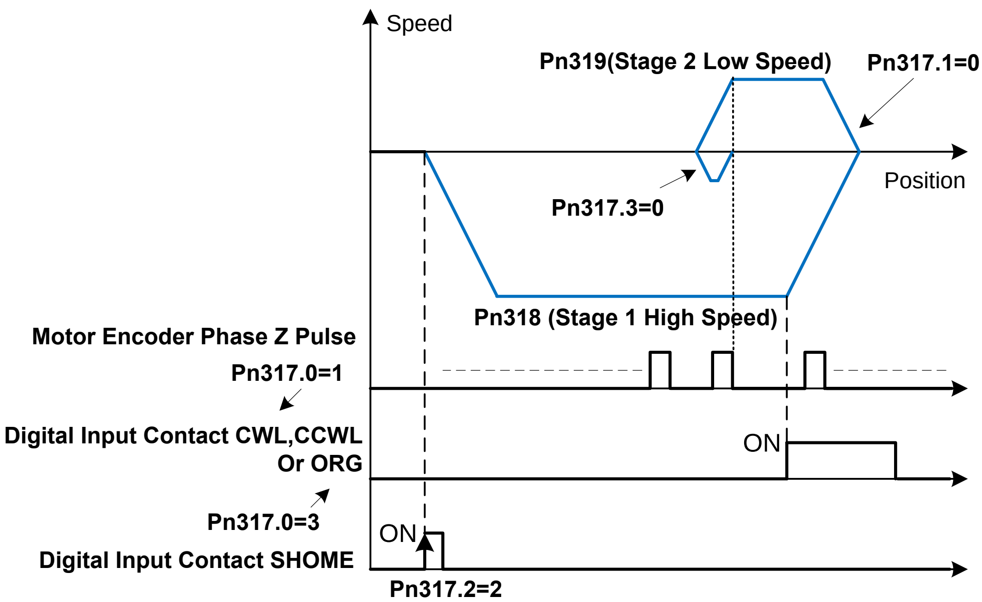


(2) **Pn317.0**=1or**3** (After activated Return to Origin, use first stage Speed **<u>Reverse Rotation</u>** Direction to search the Origin Reference Point **CWL, CCWL** or **ORG**)

Pn317.1=0 (After foundthe Origin Reference Point, use second stage Speed **<u>Return</u>** to search the closest Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact **SHOME** activates Return to origin)

Pn317.3=0 (**<u>Return</u>** to Mechanical Origin)

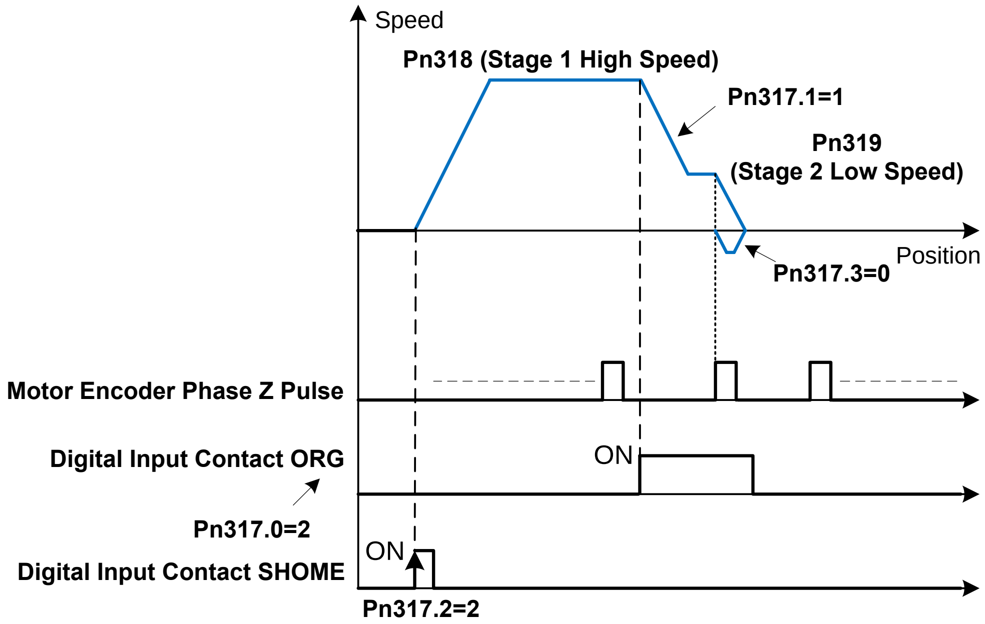


(3) **Pn317.0**=**2** (After activated Return to Origin, use first stage Speed **Forward Rotation** Direction to search the Origin Reference Point **ORG**)

Pn317.1=**1** (After foundthe Origin Reference Point, use second stage Speed **to continue forward** and search the closest Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact **SHOME** activates Return to Origin)

Pn317.3=**0** (**Return** to Mechanical Origin)

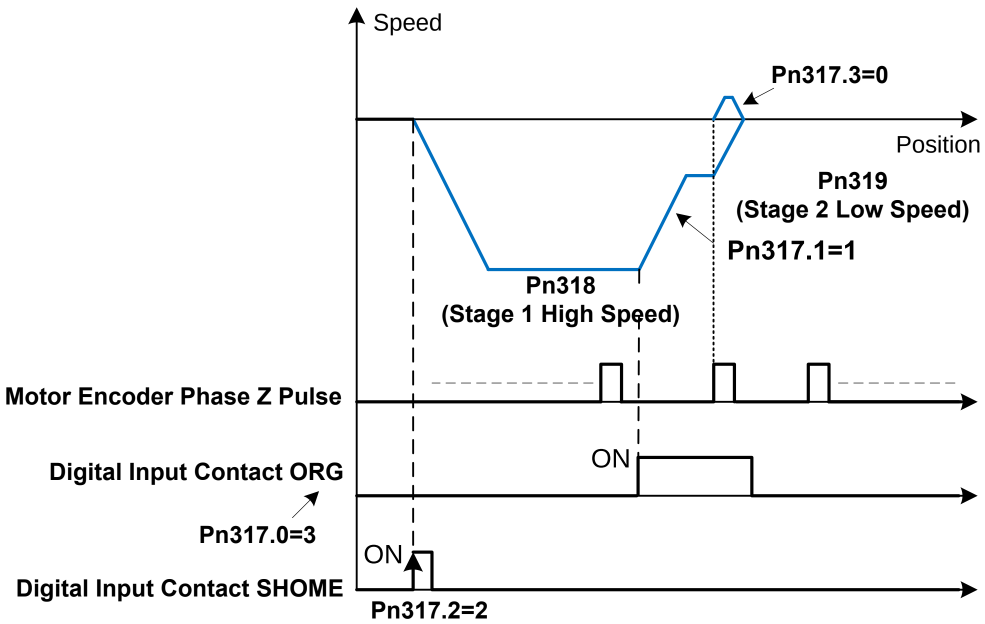


(4) **Pn317.0**=**3** (After activated Return to Origin, use first stage Speed **Reverse Rotation** Direction to search for the Origin Reference Point **ORG**)

Pn317.1=**1** (After foundthe Origin Reference Point, use second stage Speed **to continue forward** and search the closest Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact **SHOME** activates Return to Origin)

Pn317.3=**0** (**Return** to Mechanical Origin)

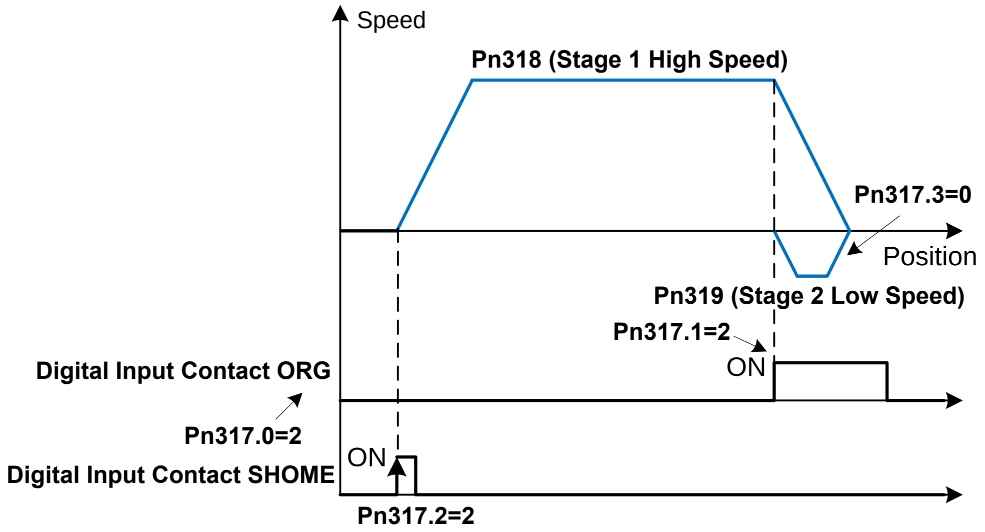


(5) **Pn317.0=2** (After activated Return to Origin, use first stage Speed **Forward Rotation** Direction to search for the Origin Reference Point **ORG**)

Pn317.1=2 (Found the Origin Reference Point **ORG** Top Edge to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact **SHOME** activates Return to origin)

Pn317.3=0 (**Return** to Mechanical Origin)

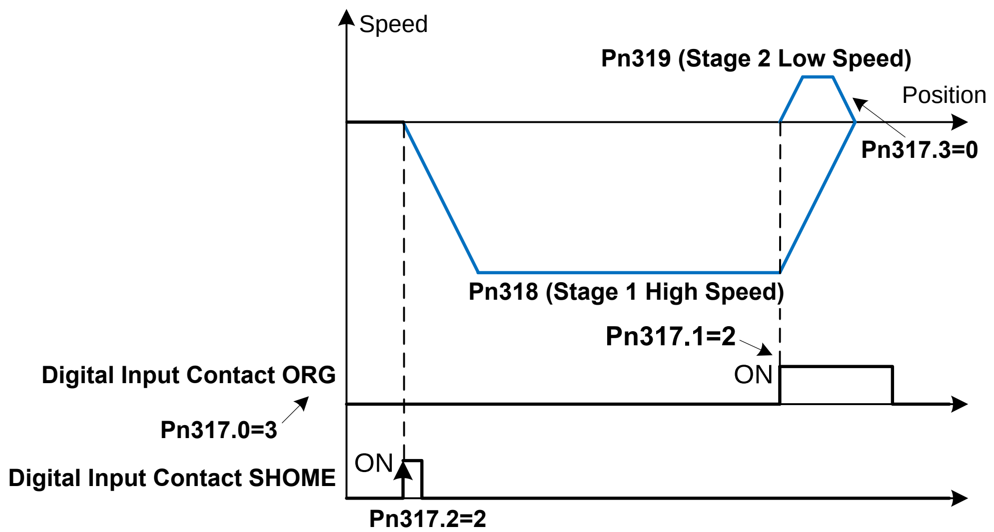


(6) **Pn317.0=3** (After activated Return to Origin, use first stage Speed **Reverse Rotation** Direction to search for the Origin Reference Point **ORG**)

Pn317.1=2 (Found the Origin Reference Point **ORG** Top Edge to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact **SHOME** activates Return to origin)

Pn317.3=0 (**Return** to Mechanical Origin)

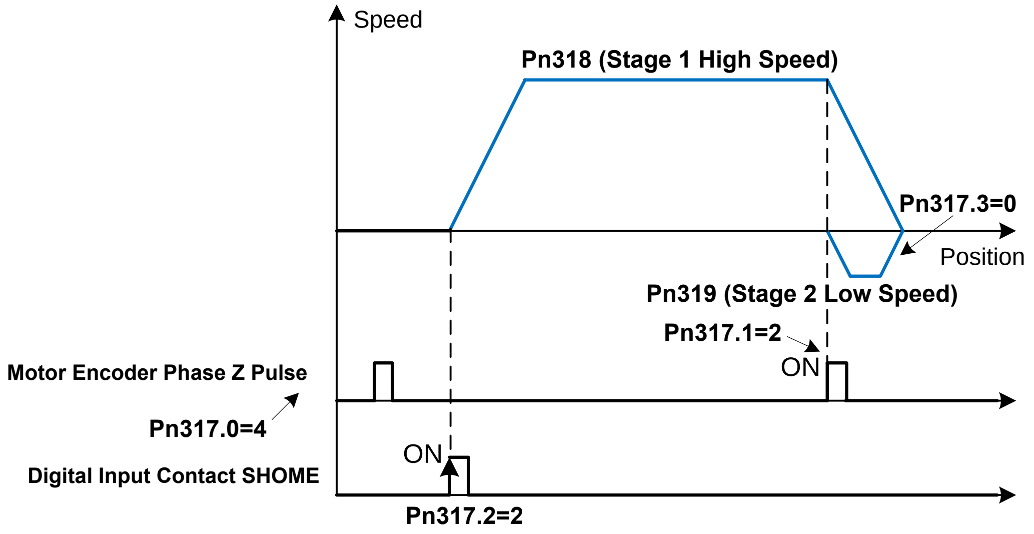


(7) **Pn317.0=4** (After activated Return to Origin, use first stage Speed **Forward Rotation** Direction to search for the closest Phase **Z** Pulse Origin)

Pn317.1=2 (Found the Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact **SHOME** activates Return to origin)

Pn317.3=0 (**Returnt** o Mechanical Origin)

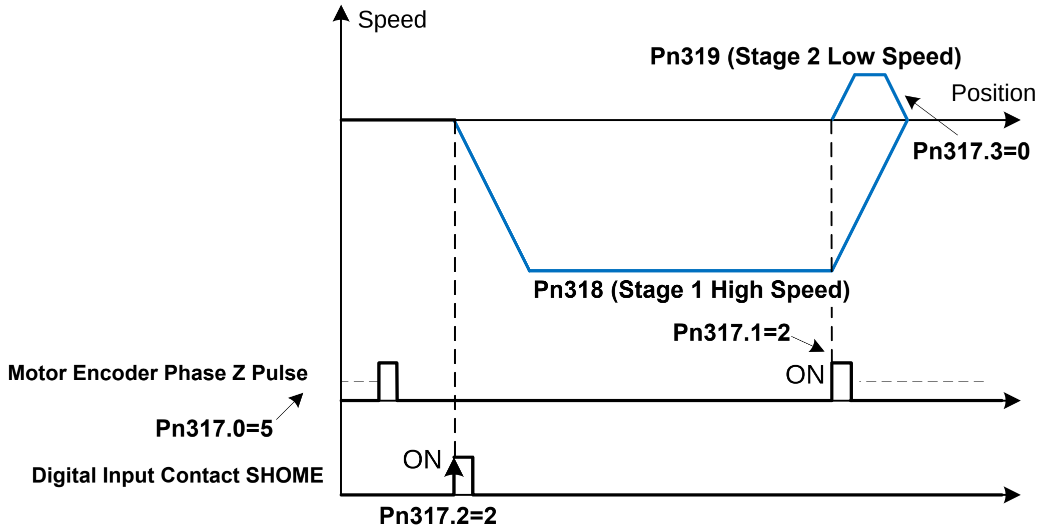


(8) **Pn317.0=5** (After activated Return to Origin, use first stage Speed **Reverse Rotation** Direction to search for the closest Phase **Z** Pulse Origin)

Pn317.1=2 (Found the Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Digital input contact **SHOME** activates Return to origin)

Pn317.3=0 (**Return** to Mechanical Origin)



5-4-8 Torque Limit of Position Mode

In Position Control, Motor Torque Limit is achieved by switching the following two methods using Digital Input Contact **TLMT**:

(1) Internal Torque Limit: Use internally to set **Cn010**, **Cn056** (CCW Direction Torque Command Limit Value) and **Cn011**, **Cn057** (CW Direction Torque Command Limit Value).
※ External Pulse Command Mode does not have two-stage Torque Limit

(2) External Analog Command Torque Limit: Use Analog Voltage Command Signal input to **TIC (CN1-27)** to limit the CCW Direction Torque and CW Direction Torque.

Please refer to the Table below:

Digital input contact TLMT	CCW Direction Torque Command Limit Source	CW Direction Torque Command Limit Source
OFF (Switch functions)	Under external pulse command mode: Cn010 Under internal position command mode: Cn010, Cn056	Under external pulse command mode: Cn011 Under internal position command mode: Cn011, Cn057
ON (Switch does not function)	External analog torque limit TIC(CN1-27) ※ JSDG2S-E does not have this function	External analog torque limit TIC(CN1-27) ※ JSDG2S-E does not have this function

Note) Please refer to "5-6-1 Digital Input / Output Contact Function Planning" to set the Driver Effective Logic.

⚠ Attention

- **When using External Analog Torque Command Limit, if this Analog Torque Command Limit is greater than the Internal Torque Command Limit, then the Internal Torque Command Limit is ultimately used.**

(1) Internal Torque Limit: The following is the Internal Torque Limit setting description:

Cn010/Cn056 CCW Direction Torque Command Limit Value Stage 1 / Stage 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0 ~ 300	Effective after Set	Each Parameter is different

Note) Default and setting range of parameter Cn010/Cn056/Cn011/Cn057 vary by driver model. Refer to "7-3-1 System parameters (Cn0□□)" for details.

Cn011/Cn057 CW Direction Torque Command Limit Value Stage 1 / Stage 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 Note)	%	-300 ~ 0	Effective after Set	Each Parameter is different

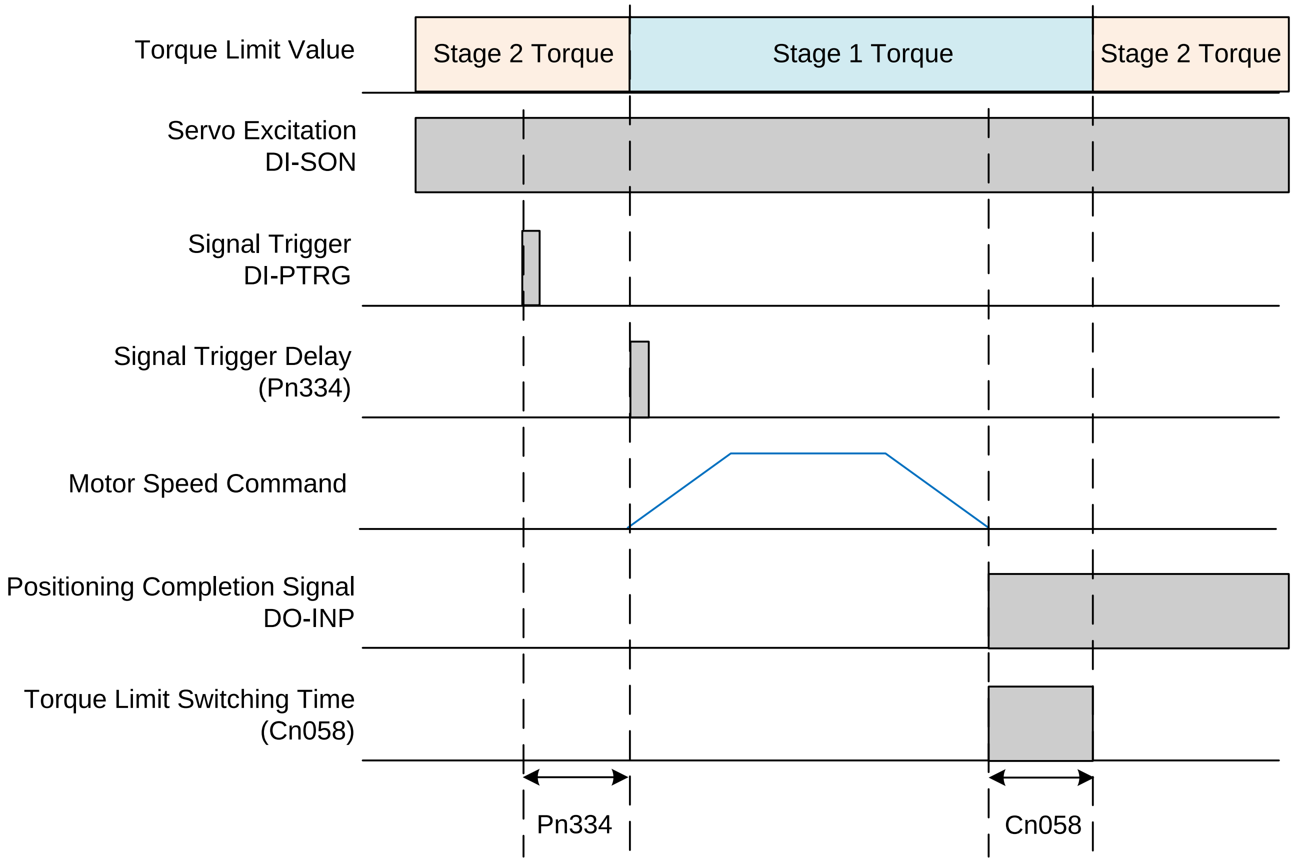
Note) Default and setting range of parameter Cn010/Cn056/Cn011/Cn057 vary by driver model. Refer to “7-3-1 System parameters (Cn0□□)” for details.

The Delay Time of Cn058 Stage 1 Torque Limit switch to Stage 2 Torque Limit

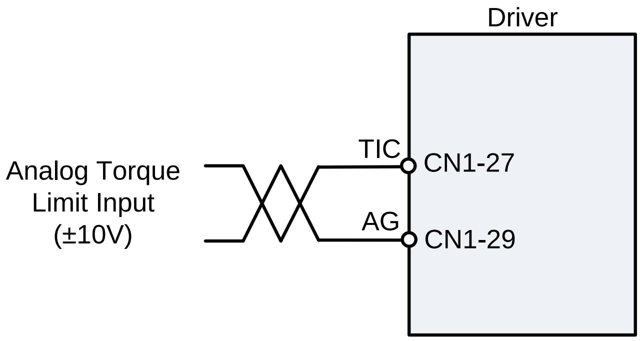
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	4ms	0 ~ 32767	--	003DH

Setting Description: After the digital output contact INP delays according to the time set by Cn058, the torque limit switch from (Cn010, Cn011) to (Cn056, Cn057) and from (Cn056, Cn057) to (Cn010, Cn011) after PTRG operates.

※ External Pulse Command Mode does not have two-stage Torque Limit



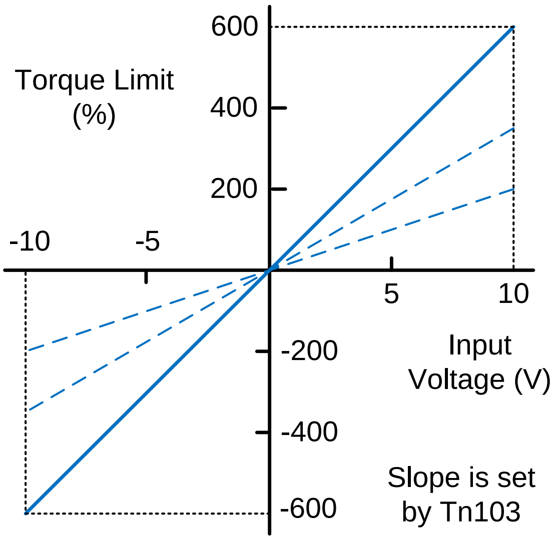
(2) External Analog Torque Limit: The following is External Analog Torque Limit Command Wiring Diagram:



Tn103 Analog torque limit proportioner ※ JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
300	%/10V	0 ~ 600	Effective after Set	0103H

Setting Description: Used to adjust the slope of Voltage Command relative to the Torque Command



⚠ Attention

- **The input voltage of analog torque limit voltage command does not have polarity. + voltage or – voltage are received as an absolute value. The speed limit of this absolute value is applied to forward and reverse direction.**
- **When using External Analog Torque Command Limit, if this Analog Torque Command Limit is greater than the Internal Torque Command Limit, then the Internal Torque Command Limit is ultimately used.**

5-4-9 Other Position Control Functions

This Section describes other functions related to Position Control.

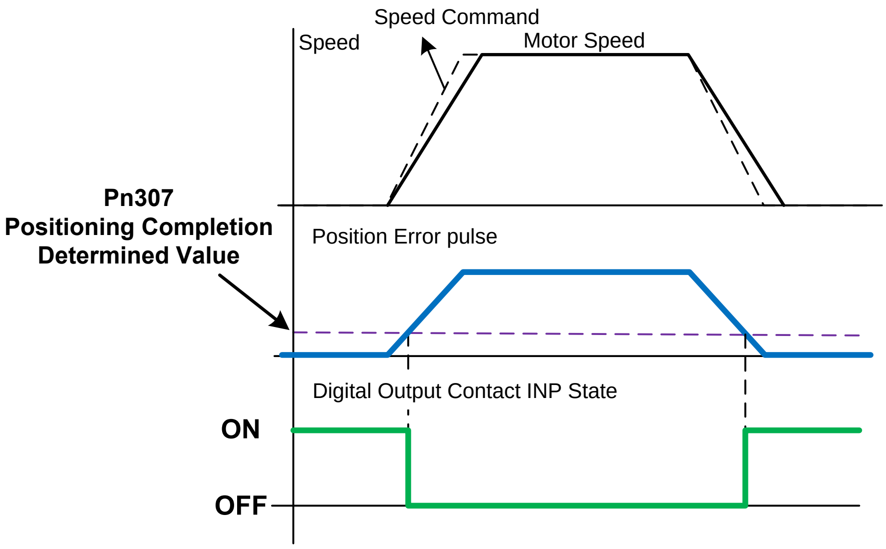
Positioning Completed Function

When Position Error is lower than the number of Pulses set by **Pn307** (Positioning Completed Determined Value), Digital Output Contact **INP** operates. Refer to the following description:

Pn307 Positioning Completed Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
One thousandth of a Revolution	pulse	0 ~ 41943040	Effective after Set	030CH/030DH

Setting Description: When Position Error is lower than the pulse number set by Pn307 (Positioning Completed Determined Value), Digital Output Contact INP operates.



Excessive Position Error Warning Function

When Position Error is larger than the number of Pulses set by **Pn308** (Positive Maximum Position Error Determined Value) or **Pn309** (Negative Maximum Position Error Determined Value), this device generates **AL011** (Excessive Position Error Alarm). The setting is as follows:

Pn308 Positive Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
5000	0.001rev	0 ~ 50000	Effective after Set	030EH

Setting Description: When Position Error is higher than the pulse number set by Pn308 (Positive Maximum Position Error Determined Value), this device generates AL011 (Excessive Position Error Alarm).

Pn309 Negative Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
5000	0.001rev	0 ~ 50000	Effective after Set	030FH

Setting Description: When position error is higher than the pulse number set by Pn309 (negative maximum position error determined value), this device generates AL011 (excessive position error alarm).

DI-JOG Function

In the Position Mode, the DI pin function SPD1 and SPD2 can be used to perform JOG speed operation, the control method is shown as follows

SPD1	SPD2	JOG Speed	Function
OFF (Switchdoes not function)	OFF (Switchdoes not function)	X	No JOG Function
ON (Switchfunctions)	OFF (Switchdoes not function)	Sn201	JOG Excitation_Forward Rotation
OFF (Switchdoes not function)	ON (Switchfunctions)	Sn201	JOG Excitation_Reverse Rotation
ON (Switchfunctions)	ON (Switchfunctions)	0	JOG Excitation_Zero Rotation

Sn201 Internal Speed Command 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	-1.5*rated rotational speed ~ 1.5*rated rotational speed	--	0201H

5-5 Tool Magazine Specific Mode

JSDG2S Series provides Turret-specific Mode; please refer to the following Sections for related settings and processes.

Attention
• **Turret Mode only supports ABS type encoders (Cn030 ended with 5, A, D); when Turret mode is used by non-ABS type encoders, the system will generate AL040 Turret Mode prohibits use of Non-absolute Type Encoders.**

Cn001 Control Mode Selection

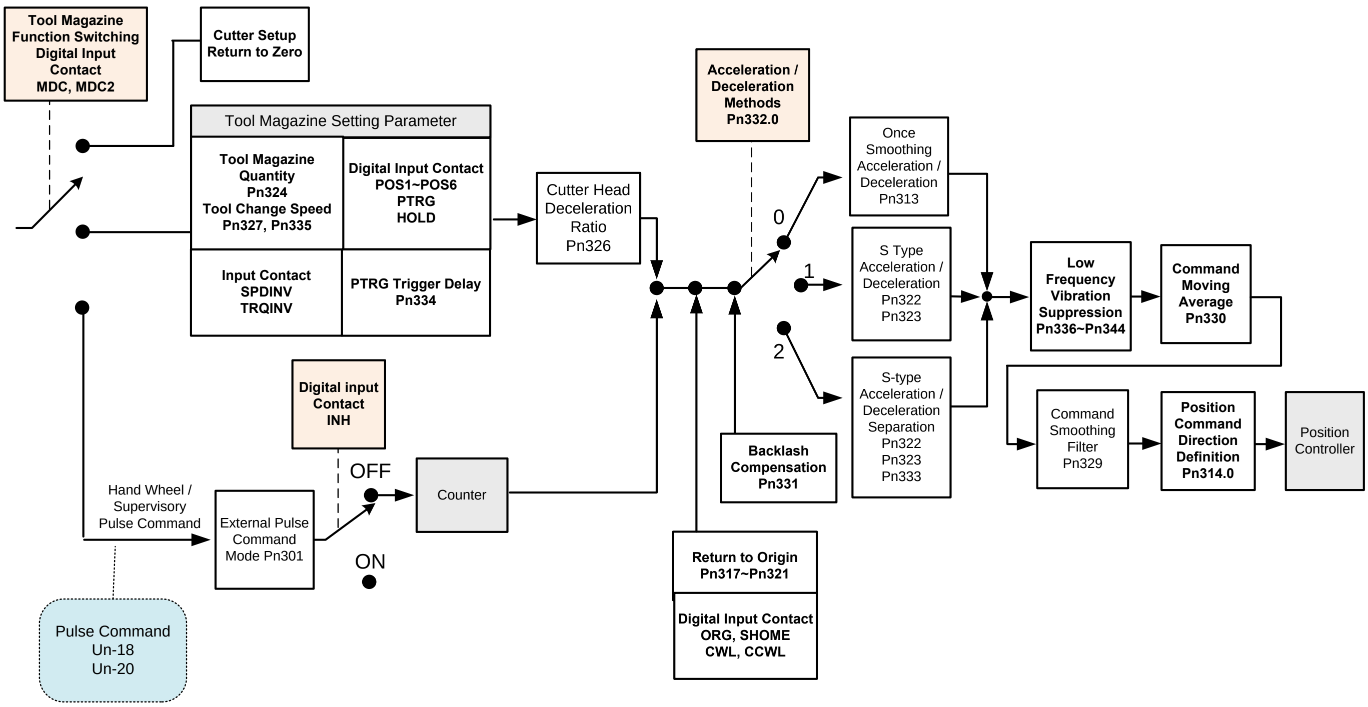
Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	Power Re-set	0001H

Setting Description:

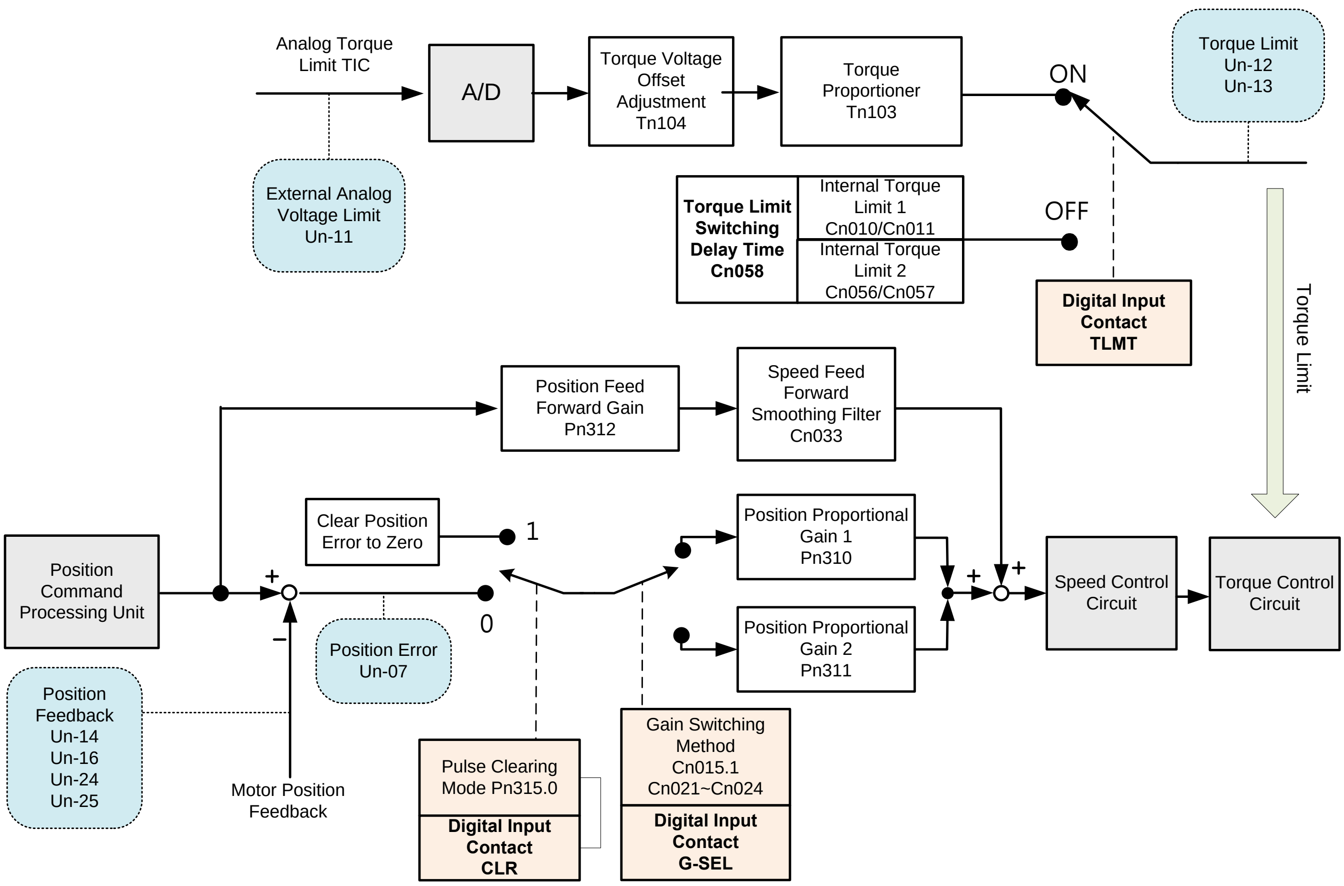
Setting	Description
9	CNC Tool Magazine Automatic Tool Selection Control

The Tool Magazine Loop Control Block Diagram is shown in the Figure below; detailed functions of each Block are described in the following Sections.

Tool Magazine Processing Unit



Tool Magazine Position Controller



5-5-1 Tool Contact Signal Operation Instructions

Servo Driver providesOpen DI/DO Control Interface, can be wired as NPN or PNP connection based on the customer requirements

Definition list of digital input/output preset pin:

Parameter Code	Name and Function	Setting Value	Code	Contact Operation Function
Cn001	Control Mode Selection	9	Tool Magazine Control (Used with Absolute Value Type Encoder)	
Hn601	DI-1 Pin Function	01	SON	Servo Start
Hn602	DI-2 Pin Function	02	ALRS	Error Alarm Clearing
Hn603	DI-3 Pin Function	16	POS1	Tool Magazine Tool Number Selection 1
Hn604	DI-4 Pin Function	17	POS2	Tool Magazine Tool Number Selection 2
Hn605	DI-5 Pin Function	18	POS3	Tool Magazine Tool Number Selection 3
Hn606	DI-6 Pin Function	19	POS4	Tool Magazine Tool Number Selection 4
Hn607	DI-7 Pin Function	1E	POS5	Tool Magazine Tool Number Selection 5
Hn608	DI-8 Pin Function	1F	POS6	Tool Magazine Tool Number Selection 6
Hn609	DI-9 Pin Function	09	EMC	Emergency Stop
Hn610	DI-10 Pin Function	12	PTRG	Internal Position Command Trigger
Hn611	DI-11 Pin Function	1D	MDC2	Turret Control Mode Switch 2
Hn612	DI-12 Pin Function	0C	MDC1	Turret Control Mode Switch 1
Hn613	D0-1 Pin Function	06	INP	Positioning Completion Signal
Hn614	D0-2 Pin Function	02	ALM	Servo Error
Hn615	D0-3 Pin Function	0E	P6	Tool Magazine Mode Selection Tool Position Display 6
Hn616	D0-4 Pin Function	0D	P5	Tool Magazine Mode Selection Tool Position Display 5
	D0-5 Pin Function		P4	Tool Magazine Mode Selection Tool Position Display 4
	D0-6 Pin Function		P3	Tool Magazine Mode Selection Tool Position Display 3
	D0-7 Pin Function		P2	Tool Magazine Mode Selection Tool Position Display 2
	D0-8 Pin Function		P1	Tool Magazine Mode Selection Tool Position Display 1

JSDG2S(-E) Tool magazine function can provide four types of control modes through DI switching. Summary of each mode is as follows:

1. Automatic Tool Selection Mode: uses the shortest path to select tool (rotates toward the shortest distance). This judgment is determined by the internal software calculation of the driver and does not require additional controller programming.
2. Cutter setup return to zero mode: The user can control tool position digital input contact according to the requirement and redefine the position of the first tool.
3. Manual single step mode: Under this mode, it is not necessary to control tool position digital input

contact; instead, the user only needs to control digital input contact PRTG. Each trigger will move tool position by one step.

4. External pulse mode: Work with cutter setup. During the first installation of servo motor and machine accelerations, position of the first tool on disc may be very far from the actual required position. Therefore, the user can input external pulse command through the hand wheel or other devices to directly control the servo motor rotating to the position of the first tool. If the user had switched to external pulse mode before, then it is necessary to re-enter the cutter setup return to zero mode to reset the position of the first tool or shut down driver power to redefine the absolute position; only this process, the user can use optional or manual single step mode to select the tool. Otherwise, once digital input contact PTRG triggering signal is input, the servo driver will generate AL011 alarm.

Operating Mode Comparison Table:

Digital input contact / Mode	MDC1	MDC2
Automatic Tool Selection Mode	OFF (Contact does not function)	OFF (Contact does not function)
Cutter Setup Return to Zero Mode	ON (Contact functions)	OFF (Contact does not function)
Manual Single-step Mode	OFF (Contact does not function)	ON (Contact functions)
External Pulse Mode	ON (Contact functions)	ON (Contact functions)

Tool Number selection and Current Tool Position can be determined by the binary decoding method through digital input/output signals:

Tool Number Position Contact Input Table:

DI / Tool Number	POS6	POS5	POS4	POS3	POS2	POS1
Tool Number 1	OFF	OFF	OFF	OFF	OFF	OFF
Tool Number 2	OFF	OFF	OFF	OFF	OFF	ON
:	:	:	:	:	:	:
Tool Number 11	OFF	OFF	ON	OFF	ON	OFF
Tool Number 12	OFF	OFF	ON	OFF	ON	ON
:	:	:	:	:	:	:
Tool Number 63	ON	ON	ON	ON	ON	OFF
Tool Number 64	ON	ON	ON	ON	ON	ON
※ OFF means the contact does not function (Open); ON means the contact functions (Closed).						

Absolute Value Type Encoder built-in Position Memory can permanently memorize the position information of each tool number. When start the machine after powered off, the Driver will automatically output the (DO) status to the controller; the controller performs binary decoding on the signal to obtain the current position of tool number, and does not need to perform the Return to Origin operation. If the 64th tool will be used, the 7th point INP signal must be added with P1~P6 to conduct Output Determination.

When in first tool position, the Digital Output Signals P1~P6 and INP Signal will all be output, when the Digital Output Signals P1~P6 and INP Signal are not all output, indicates the tool number is no longer in the range, and timing of tool number is not in the range:

1. First time use of the Tool Magazine Mode; the first time use of the Cutter Setup Return to Zero operation, to be able to operate correctly.
2. Switch back from the External Pulse Mode; make sure to conduct Cutter Setup Return to Zero operation again, to be able to operate correctly.
3. In the Process the Servo Motor moves to the next tool number position.

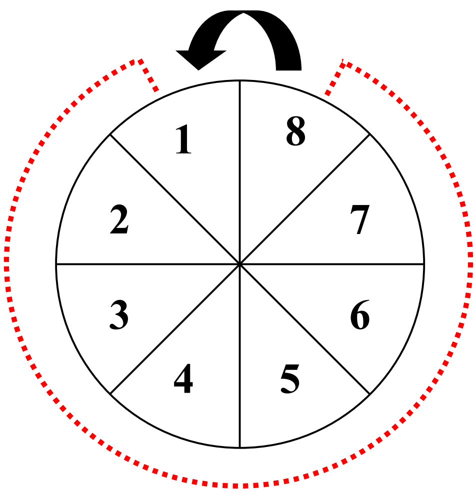
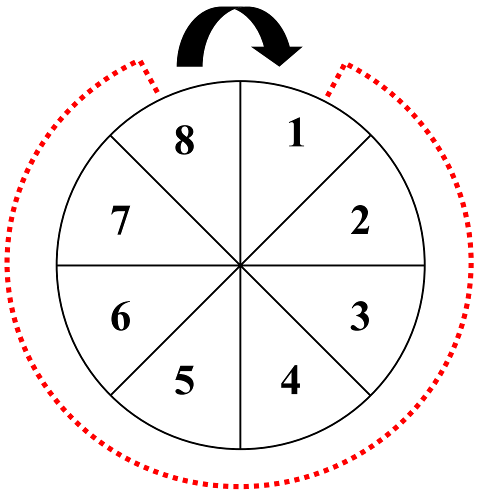
Tool Number Position Contact Output Table:

DO / Tool Number	P6	P5	P4	P3	P2	P1	INP
Not in the Range	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Tool Number 1	ON	ON	ON	ON	ON	ON	ON
Tool Number 2	ON	ON	ON	ON	ON	OFF	ON
:	:	:	:	:	:	:	ON
Tool Number 11	ON	ON	OFF	ON	OFF	ON	ON
Tool Number 12	ON	ON	OFF	ON	OFF	OFF	ON
:	:	:	:	:	:	:	ON
Tool Number 63	OFF	OFF	OFF	OFF	OFF	ON	ON
Tool Number 64	OFF	OFF	OFF	OFF	OFF	OFF	ON
※ OFF means the contact does not function (Open); ON means the contact functions (Closed).							

If the rotation direction of the tool holder is opposite to what is required, please set the DI pin SPDINV Function to control the disc rotation reverse operations.

Rotation Direction Definition Table:

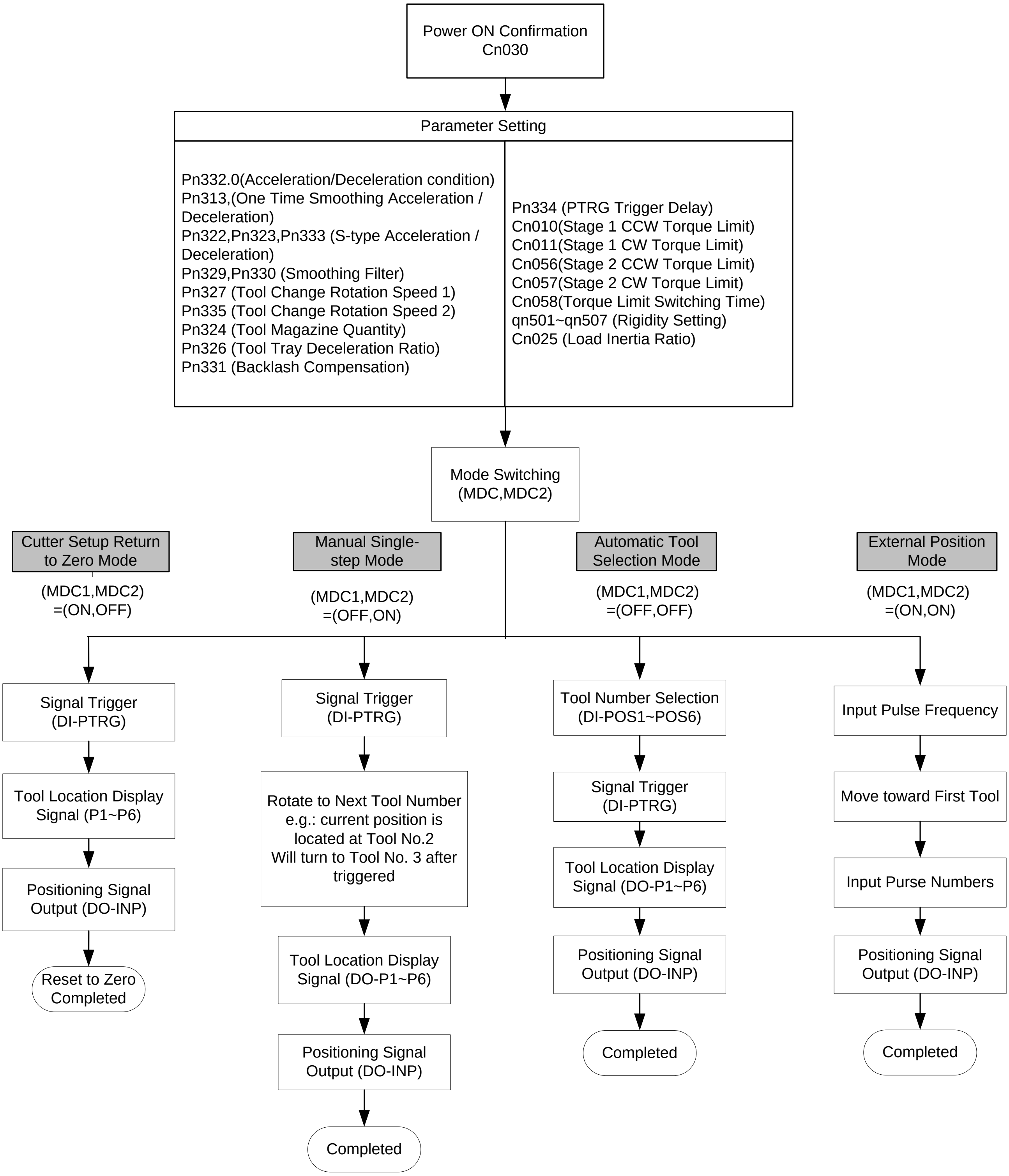
Digital input contact / Motor Rotation Direction	SPDINV	Tool Number Arrangement Method
Counterclockwise Rotation (CCW)	OFF (Contact does not function)	Tool Number Arranged according to Counterclockwise Order
Clockwise Rotation (CW)	ON (Contact functions)	Tool Number Arranged according to Clockwise Order

SPDINV=0	SPDINV=1
	

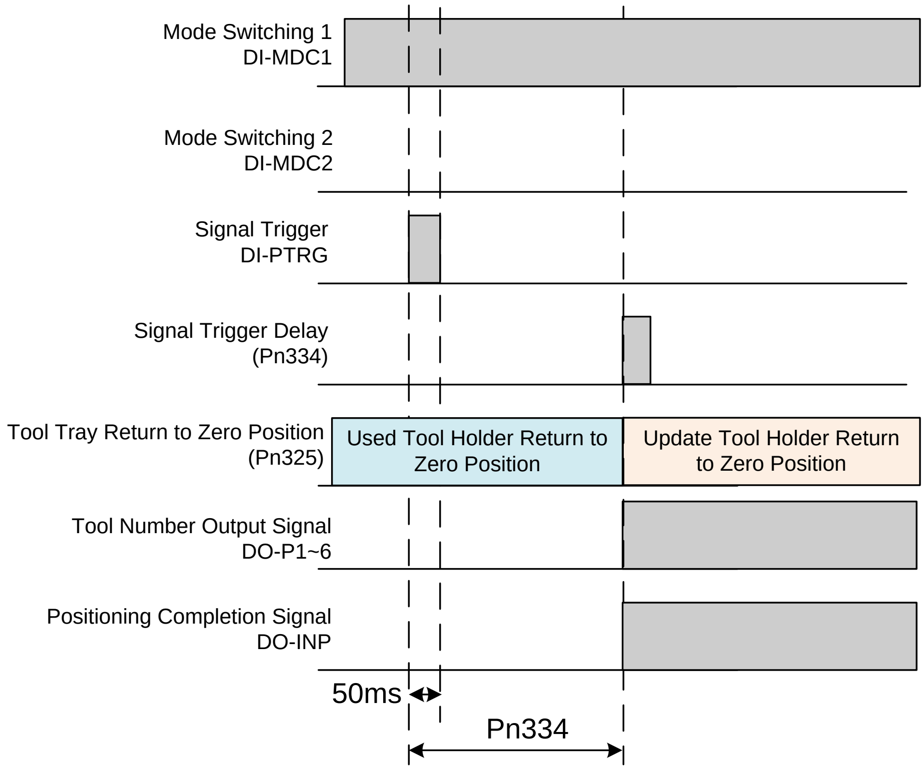
Tool Change Definition Table:

Digital Input Contact TRQINV	Tool Change Speed Parameter
OFF (Contact does not function)	Pn327 (Tool Change Rotation Speed 1)
ON (Contact functions)	Pn335 (Tool Change Rotation Speed 2)

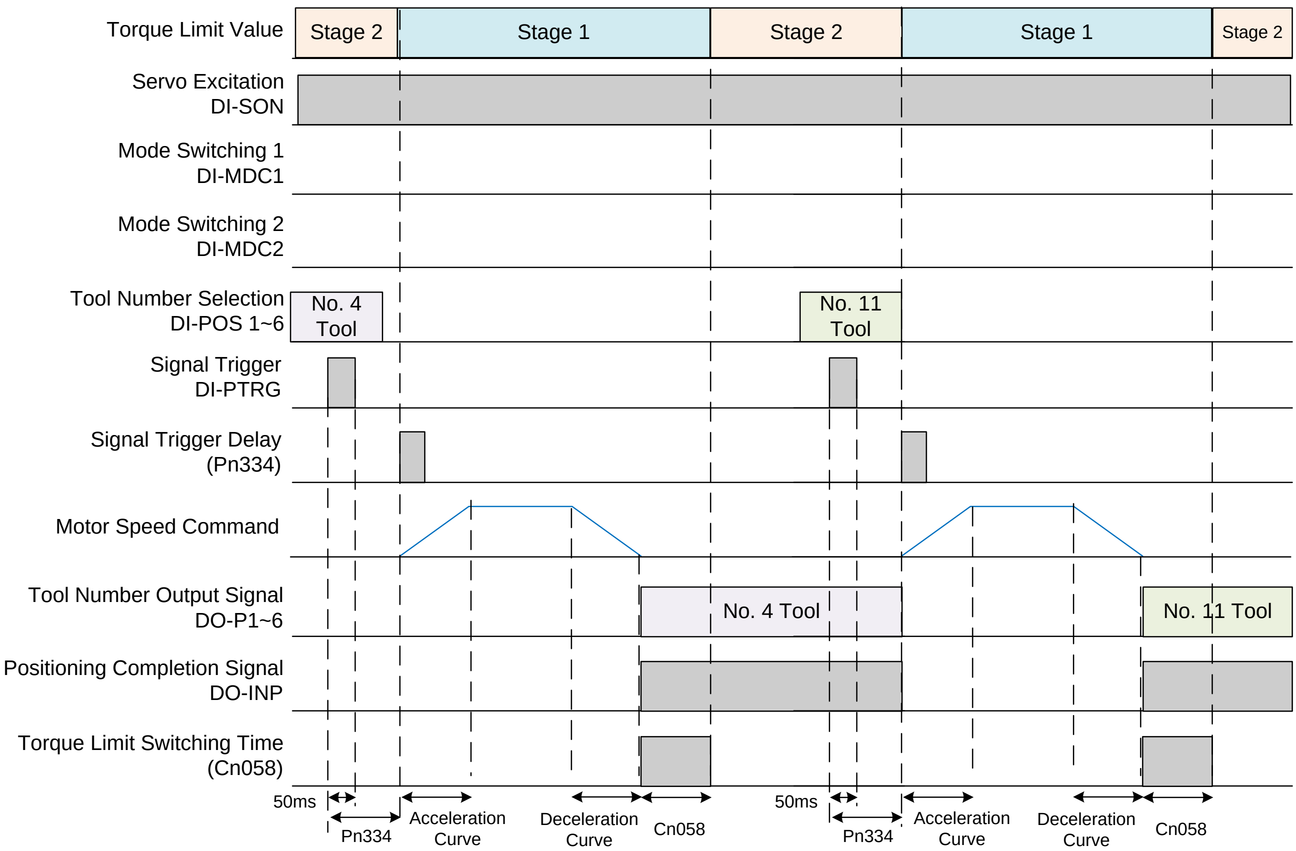
5-5-2 Tool Magazine Dedicated Mode Setting Flow Chart



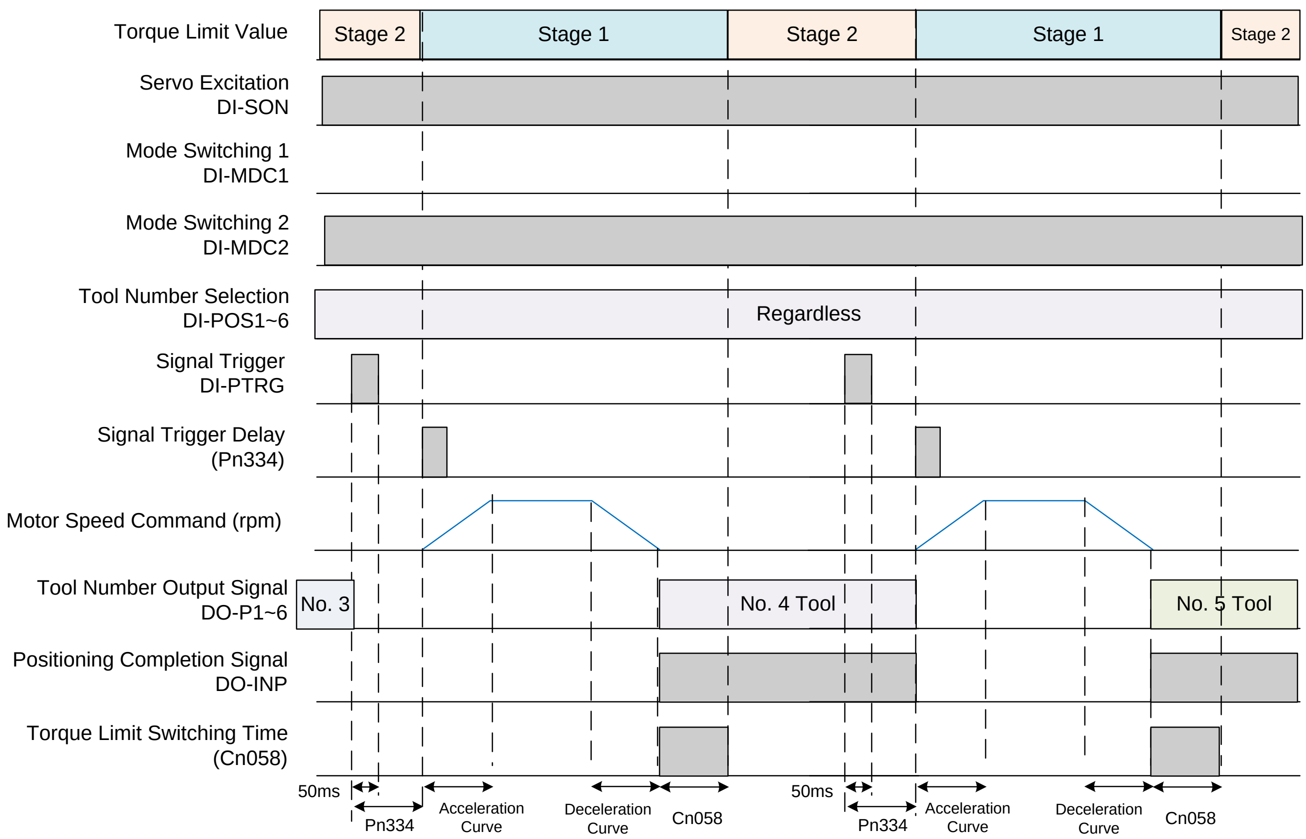
5-5-3 Tool Magazine Cutter Setup Return to Zero Mode Time Sequence Diagram



5-5-4 Tool Magazine Automatic Tool Selection Mode Time Sequence Diagram



5-5-5 Tool Magazine Manual Single Step Time Sequence Diagram



5-5-6 Tool Magazine Parameter Setting

Cn010/Cn056 CCW Direction Torque Command Limit Value Stage 1 / Stage 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0 ~ 300	Effective after Set	Each Parameter is different

Note) Default and setting range of parameter Cn010/Cn056/Cn011/Cn057 vary by driver model. Refer to “7-3-1 System parameters (Cn0□□)” for details.

Cn011/Cn057 CW Direction Torque Command Limit Value Stage 1 / Stage 2

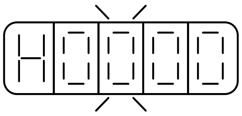
Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 Note)	%	-300 ~ 0	Effective after Set	Each Parameter is different

Note) Default and setting range of parameter Cn010/Cn056/Cn011/Cn057 vary by driver model. Refer to “7-3-1 System parameters (Cn0□□)” for details.

Cn041.2 Turret mode return to zero function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Effective after Confirmed	002CH

Setting Description:



Setting	Description
0	Not Functioning
1	The driver execute turret return to zero function after setting as 1; will automatically clear the setting to 0 after completed.

The Delay Time of Cn058 Stage 1 Torque Limit switch to Stage 2 Torque Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	4ms	0 ~ 32767	Effective after Confirmed	003DH

Setting Description: After the digital output contact INP delays according to the time set by Cn058, the torque limit switch from (Cn010, Cn011) to (Cn056, Cn057) and from (Cn056, Cn057) to (Cn010, Cn011) after PTRG operates.

Pn307 Positioning Completed Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
One thousandth of a Revolution	pulse	0 ~ 41943040	Effective after Set	030CH/030DH

Setting Description: When the Position Error is lower than the number of Pulses set by Pn307 (Positioning Completed Determined Value), the Output Contact INP operates.

Pn313 Internal / External Position Command One time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	ms	0 ~ 10000	Power Re-set	0313H

Setting Description: Will smooth the Position Pulse Command of originally fixed frequency. Time from zero to 63.2% external position pulse command frequency by single delay increase.

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.4ms	0 ~ 5000	Effective after Set	031DH

Setting Description: The Position S-type Smoother is suitable for the Control Mode of the Internal Position Command Input, and provides the smoothing process of the motion command. The generated speed and acceleration are continuous, and the jerkiness of the acceleration is smaller, which can improve the characteristics of acceleration / deceleration of the Motor, and more smooth in mechanical structure operations.

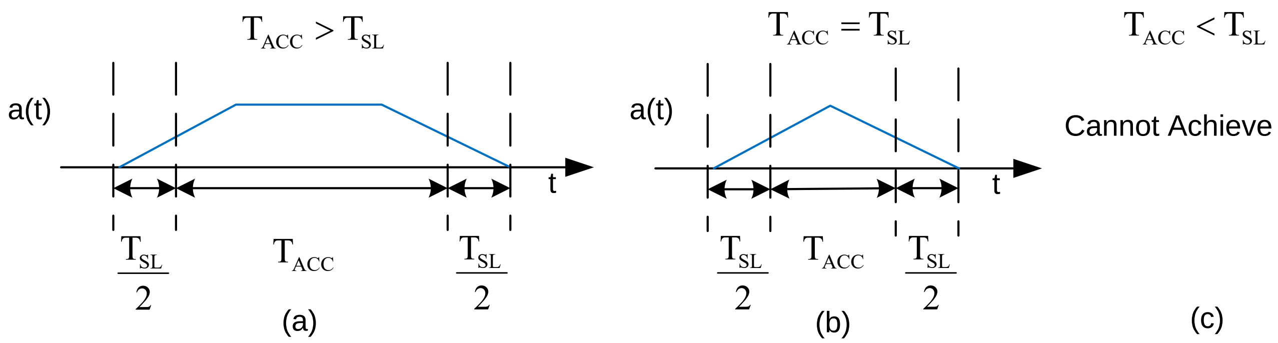


Figure: Definition of Travel Time for S-type Curve.

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	0.4ms	1 ~ 5000	Effective after Set	031EH

Setting Description: Please refer to Pn322 Description.

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	0.4ms	1 ~ 5000	Effective after Set	032AH

Setting Description: Please refer to Pn322 Description.

Pn324 CNC tool magazine quantity setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
12	--	1 ~ 64	Effective after Confirmed	031FH

Setting Description: Total Number of Tool Holders on Tool Tray

Pn325 CNC Tool Tray Return to Zero Position

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	0 ~ 8388607	Effective after Confirmed	0320H/0321H

Setting Description: Set the Zero Tool Position

Pn326 CNC Tool Tray Reduction Ratio

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 255	Effective after Confirmed	0322H

Setting Description: Tool Tray Reduction Ratio

Pn327 Tool change rotational speed 1

Initial Value	Unit	Setting Range	Effective	RS-485
100	rpm	1 ~ 2*rated rotational speed	Effective after Confirmed	0323H

Setting Description: Set digital input contact TRQINV=OFF under tool magazine mode and will change tool by the speed of tool change rotational speed 1.

Pn329 Pulse Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	2ms	0 ~ 2500	Effective after Confirmed	0325H

Setting Description: Can select Filter Smoothing Time.

Pn330 Pulse Command Moving Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.4ms	0 ~ 250	Effective after Confirmed	0326H

Setting Description: Pulse Command Moving Filter

Pn331 Turret Magazine Backlash Compensation Parameters

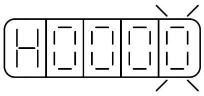
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	-8388607 ~ 8388607	Effective after Confirmed	0327H/0328H

Setting Description: Set Backlash Compensation Value

Pn332.0 Internal/External Position Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 2	Effective after Confirmed	0327H/0328H

Setting Description:



Setting	Description
0	Use Position Command One Time Smoothing Acceleration / Deceleration
1	Use Internal Position Command S-type Acceleration / Deceleration (external position command does not have this function)
2	Use Internal Position Command S-type Acceleration / Deceleration Separation (external position command does not have this function)

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	0.4ms	1 ~ 5000	Effective after Confirmed	032AH

Setting Description: Please refer to PN322 Description

Pn334 PTRG Trigger Delay Time Parameter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	4ms	0 ~ 2500	Effective after Confirmed	032BH

Setting Description: After PTRG is triggered, and after the Delay setting time, the Motor starts rotation.

Pn335 Tool change rotational speed 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	1 ~ rated rotational speed	Effective after Confirmed	032CH

Setting Description: Set digital input contact TRQINV=ON under tool magazine mode and will change tool by the speed of tool change rotational speed 2.

5-6 Other Functions

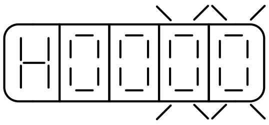
5-6-1 Digital input/output contact function planning

This Device has 12 Digital Input Contact Functions and 4 Digital Output Contact Functions can be planned, the description is as follows:

Hn601.0/Hn601.1~ Hn612.0/Hn612.1 DI-1~DI12 Pin Function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Change with Mode	--	00~20 (Hexadecimal)	Power Re-set	Please refer to Parameter Description

Setting Description:



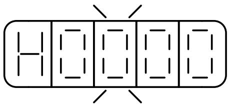
Setting	Description	
	Code	Contact Operation Function
00	NULL	Not Used
01	SON	Servo Start
02	ALRS	Error Alarm Clearing
03	PCNT	PI/P Switching
04	CCWL	CCW Direction Drive Prohibited
05	CWL	CW Direction Drive Prohibited
06	TLMT	External Torque Limit
07	CLR	Pulse Error Clearing
08	LOK	Servo Lock
09	EMC	Emergency Stop
0A	SPD1	Internal speed command selection 1 / DI_Jog_1
0B	SPD2	Internal speed command selection 2 / DI_Jog_2
0C	MDC1	Control mode switch/Control mode selection 1 under turret mode
0D	INH	Position Command Prohibited
0E	SPDINV	Speed Command Reverse
0F	G-SEL	Gain Switching

Setting	Description	
	Code	Contact Operation Function
10	GN1	Electronic Gear Ratio Numerator Selection 1
11	GN2	Electronic Gear Ratio Numerator Selection 2
12	PTRG	Internal Position Command Trigger
13	PHOLD	Internal Position Command Hold
14	SHOME	Start to Return to Origin
15	ORG	External Reference Origin
16	POS1	Internal Position Command Selection 1 (tool number 1)
17	POS2	Internal Position Command Selection 2 (tool number 2)
18	POS3	Internal Position Command Selection 3 (tool number 3)
19	POS4	Internal Position Command Selection 4 (tool number 4)
1A	TRQINV	Torque command reverse/turrent second stage rotational speed
1B	RS1	Torque Command Forward Selection
1C	RS2	Torque Command Reverse Selection
1D	MDC2	Control mode selection 2 in tool magazine mode/ Asynchronous triggering of gantry synchronization DI
1E	POS5	Internal Position Command Selection 5 (tool number 5)
1F	POS6	Tool Magazine Tool Number 6
20	VDI	Virtual Point Digital Input

Hn601.2~ Hn612.2 DI-1~ DI-12 Pin Function Operation Potential

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Change with Mode	--	0 ~ 1	Power Re-set	Please refer to Parameter Description

Setting Description:



Setting	Description
0	When the pin is in conduction, the function activates.
1	When the pin is open, the function activates.

Attention

- **DI-1~DI-12 Pin Functions can be repeated, but the pin operating potential of repeated function must be the same, otherwise it will generate AL007 alarm (digital input/output contact function planning error alarm).**
- **When DI-1~DI-12 pin functions are repeated, pin function is determined by OR (or gate) method**

Multifunction Planning Digital Input Contact Default Value

DI Code	Input Function	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	9 Pt	A Pi Pe	B Cob	C CoC	D EC
00	NULL												DI1 DI8~ DI12	DI1 DI8~ DI12	DI1 DI2 DI8~ DI12
01	SON	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1			
02	ALRS	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	
03	PCNT	DI3	DI3	DI3	DI3	DI3	DI3					DI3	DI3	DI3	DI3
04	CCWL	DI4	DI4	DI4	DI4	DI4	DI4					DI4	DI4	DI4	DI4
05	CWL	DI5	DI5	DI5	DI5	DI5	DI5					DI5	DI5	DI5	DI5
06	TLMT		DI6	DI6	DI6							DI6			
07	CLR			DI7							DI7	DI7			
08	LOK		DI8		DI8										
09	EMC	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI7	DI7	DI7
0A	SPD1	DI10	DI10		DI10	DI10	DI10		DI10						
0B	SPD2	DI11	DI11		DI11	DI11	DI11		DI11						
0C	MDC1	DI12	DI12	DI12	DI12	DI12	DI12		DI12	DI12	DI12	DI12			
0D	INH			DI8								DI8			
0E	SPDINV		DI7		DI7										
0F	G-SEL														
10	GN1														
11	GN2														
12	PTRG							DI8	DI8	DI8	DI10				
13	PHOLD							DI12							
14	SHOME			DI10				DI10				DI10			
15	ORG			DI11				DI11				DI11	DI6	DI6	DI6
16	POS1							DI3	DI3	DI3	DI3				
17	POS2							DI4	DI4	DI4	DI4				

DI Code	Input Function	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	9 Pt	A Pi Pe	B Cob	C CoC	D EC
18	POS3							DI5	DI5	DI5	DI5				
19	POS4							DI6	DI6	DI6	DI6				
1A	TRQINV	DI8				DI8	DI8								
1B	RS1	DI6				DI6	DI6			DI10					
1C	RS2	DI7				DI7	DI7			DI11					
1D	MDC2										DI11				
1E	POS5							DI7	DI7	DI7	DI7				
1F	POS6										DI8				
20	VDI														

Multifunction Planning Digital Input Function Description

This explains that except for the default value of CCWL and CWL is high-potential operation; the other pins are low-potential operation.

Signal Name	Function Code	Mode	I/O Operating Function Description
No Function Setting	**NULL**	ALL	No Function Setting
Servo Start	**SON**	ALL	When **SON** ON, enter Servo ON State
Abnormality Reset	**ALRS**	ALL	When **ALRS** is ON, the Stop State caused by abnormality is released. **※ Certain errors cannot be reset through ALRS. Please refer to "9-3 Countermeasures to clear error"**
PI/P Switching	**PCNT**	Pi/Pe/Pt/S	**PCNT** ON will convert the Speed Loop Control from Proportional Integration Control to Proportional Control.
CCW Direction Drive Prohibited	**CCWL**	ALL	Connect to CCW Over Travel Detector, when normal, **CCWL** ON, OFF indicates CCW Overall Travel occurred.
CW Direction Drive Prohibited	**CWL**	ALL	Connect to Connect to CW Over Travel Detector, when normal, **CWL** ON, OFF indicates CW Overall Travel occurred.
External Torque Limit	**TLMT**	Pi/Pe/Pt/S	When **TLMT** ON, will limit the Motor Output Torque to the Command Voltage range of the Torque Limit Pin (**TIC**) input.
Pulse Error Clearing	**CLR**	Pi/Pe/Pt	When **CLR** ON, clear the number of pulses accumulated in the Position Error Counter.
Servo Lock	**LOK**	S	When **LOK** ON, the servo motor is given a speed command of 0rpm.
Emergency Stop	**EMC**	ALL	When **EMC** ON, entering Emergency Stop State, Servo OFF immediately to exit the operation.

<table>
<tr><th>Signal Name</th><th>Function Code</th><th>Mode</th><th>I/O Operating Function Description</th></tr>
<tr><td>Internal Speed Command/ Limit selection 1/ DI_Jog_1

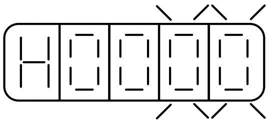
Internal Speed Command/ Limit selection 2/ DI_Jog_2</td><td>SPD1
SPD2</td><td>S/T/Pi/Pe</td><td>Internal Speed Setting and Limits Description:
<table>
<tr><th>SPD2</th><th>SPD1</th><th>In Speed Mode (Speed Command)</th><th>In Torque Mode (Speed Limits Commend)</th><th>In Position Mode (DI JOG)</th></tr>
<tr><td>OFF</td><td>OFF</td><td>External Speed Command (SIC)</td><td>Internal Speed Command (SIC)</td><td>No JOG Function</td></tr>
<tr><td>OFF</td><td>ON</td><td>Sn201</td><td>Tn105</td><td>JOG Excitation_Forward Rotation</td></tr>
<tr><td>ON</td><td>OFF</td><td>Sn202</td><td>Tn106</td><td>JOG Excitation_Reverse Rotation</td></tr>
<tr><td>ON</td><td>ON</td><td>Sn203</td><td>Tn107</td><td>JOG Excitation_Zero Rotation</td></tr>
</table></td></tr>
<tr><td rowspan="2">Control mode switch/Control mode selection 1 under turret mode</td><td rowspan="2">MDC1</td><td>S/T/Pi/Pe</td><td>When MDC1 ON, will change the current Control Mode to the pre-determined Control Mode. Please refer to Cn001.</td></tr>
<tr><td>Pt</td><td>Turret control mode switch 1; work with Digital input contact MDC2 to run turret function switching.</td></tr>
<tr><td>Position Command Prohibited</td><td>INH</td><td>Pe</td><td>When INH is ON, the Position Command Input is invalid (Externally delivered Pulse Command is not accepted).</td></tr>
<tr><td rowspan="2">Speed Command Reverse</td><td rowspan="2">SPDINV</td><td>S</td><td>Speed Mode: When SPDINV is ON, the set rotation speed becomes the reverse rotation speed.</td></tr>
<tr><td>Pt</td><td>Tool magazine exclusive mode: Tool holder direction</td></tr>
<tr><td>Gain Switching</td><td>G-SEL</td><td>Pi/Pe/S/Pt</td><td>When G-SEL is ON, the first stage Control Gain is switched to the second stage Control Gain</td></tr>
<tr><td>Electronic Gear Ratio Numerator Selection 1~2</td><td>GN1
GN2</td><td>Pi/Pe</td><td>Electronic Gear Ratio Numerator Selection Description:
<table>
<tr><th>GN2</th><th>GN1</th><th>Electronic Gear Ratio Numerator</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Pn302</td></tr>
<tr><td>OFF</td><td>ON</td><td>Pn303</td></tr>
<tr><td>ON</td><td>OFF</td><td>Pn304</td></tr>
<tr><td>ON</td><td>ON</td><td>Pn305</td></tr>
</table></td></tr>
<tr><td rowspan="2">Internal Position Command Trigger</td><td rowspan="2">PTRG</td><td>Pi</td><td>When PTRG is ON (top edge trigger), the Motor will select the corresponding Position Command in accordance with the contact points POS1~POS5 to operate.</td></tr>
<tr><td>Pt</td><td>When PTRG ON (top edge trigger), Motor will select the corresponding Position Command to act in accordance with the contact points MDC1 and MDC2.</td></tr>
<tr><td>Internal Position Command Hold</td><td>PHOLD</td><td>Pi/Pt</td><td>When PHOLD is ON (top edge trigger), the Motor will decelerate to stop.</td></tr>
<tr><td>Start to Return to Origin</td><td>SHOME</td><td>Pi/Pe/Pt</td><td>When SHOME is ON (top edge trigger), triggers the Return to Origin Function.</td></tr>
</table>

<table>
<tr><th>Signal Name</th><th>Function Code</th><th>Mode</th><th>I/O Operating Function Description</th></tr>
<tr><td>External Reference Origin</td><td>ORG</td><td>Pe/Pi/Pt</td><td>When ORG is ON (top edge trigger), the Servo Driver will use this as the External Reference Point of Return to Origin.</td></tr>
<tr><td rowspan="2">Internal Position Command Selection 1~5</td><td rowspan="2">POS1
POS2
POS3
POS4
POS5</td><td>Pi</td><td>Internal Position Mode: POS1~POS5 represent Internal Position Command Selection 1~5 respectively, please refer to"5-4-2 Internal Position Command Mode" for details</td></tr>
<tr><td>Pt</td><td>Tool magazine exclusive mode: POS1~POS5 represents tool position command selection 1~5 respectively. Refer to “5-5 Tool magazine exclusive mode” for details</td></tr>
<tr><td>Internal Position Command Selection 6</td><td>POS6</td><td>Pt</td><td>Tool Location Command Selection 6</td></tr>
<tr><td rowspan="2">Torque Command Reverse/ Turret Second Stage Speed</td><td rowspan="2">TRQINV</td><td>T</td><td>Torque mode: When using Torque Mode, when TRQINV ON, the set Torque Command Output Direction becomes Reverse Output.</td></tr>
<tr><td>Pt</td><td>Tool magazine exclusive mode: Tool change with turret second stage rotational speed</td></tr>
<tr><td>External Torque Command Forward / Reverse Selection</td><td>RS1
RS2</td><td>T</td><td>External Torque Command Forward / Reverse Selection Setting Description:
<table>
<tr><th>RS2</th><th>RS1</th><th>Description</th></tr>
<tr><td>OFF</td><td>OFF</td><td>No Torque generated</td></tr>
<tr><td>OFF</td><td>ON</td><td>Rotate in accordance with the current Torque Command Direction</td></tr>
<tr><td>ON</td><td>OFF</td><td>Reverse rotation in accordance with the current Torque Command Direction</td></tr>
<tr><td>ON</td><td>ON</td><td>No Torque generated</td></tr>
</table></td></tr>
<tr><td>Control mode selection 2 under tool magazine mode</td><td>MDC2</td><td>Pt</td><td>Turret control mode switch 2; work with MDC1 to run turret function switching.</td></tr>
<tr><td>Virtual Point Digital Input</td><td>VDI</td><td>ALL</td><td>Virtual Contact Digital Input, When VDI ON, the set Digital Output DVO will follow ON.</td></tr>
</table>

Hn613.0/Hn613.1~Hn616.0/Hn616.1 DO-1~ DO-4 Pin Function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Change with Mode	--	00 ~ 12	Power Re-set	050DH

Setting Description:



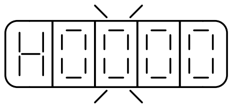
Setting	Description	
	Code	Contact Operation Function
00	NON	Not Used
01	RDY	Servo Ready
02	ALM	Servo Error
03	ZS	Zero Speed Signal
04	BI	Mechanical Brake Signal
05	INS	Speed Reached Signal
06	INP	Positioning Completion Signal
07	HOME	Return to Origin Completion Signal
08	INT	Torque Reached Signal
09	P1	Tool Magazine Mode Selection Tool Position Display 1

Setting	Description	
	Code	Contact Operation Function
0A	P2	Tool Magazine Mode Selection Tool Position Display 2
0B	P3	Tool Magazine Mode Selection Tool Position Display 3
0C	P4	Tool Magazine Mode Selection Tool Position Display 4
0D	P5	Tool Magazine Mode Selection Tool Position Display 5
0E	P6	Tool Magazine Mode Selection Tool Position Display 6
0F	OL	Motor Overload Signal
10	BAT	Encoder Battery Abnormality Signal
11	LIT	Left and Right Limit Signal
12	VDO	Virtual Point Digital Output

Hn613.2~Hn616.3 DO-1~ DO-4 Pin Function Operation Potential

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	050DH

Setting Description: Please refer to Hn601 Description for the Setting Method.



Setting	Description
0	When the function activates, the output pin is short-circuited.
1	When the function activates, the output pin is open.

Multifunction Planning Digital Output Function Description

Signal Name	Function Code	Mode	I/O Operating Function Description
Servo Ready	**RDY**	ALL	Main Power Supply, When the Control Power Input is normal without Error Alarm State, the Pin **RDY** ON
Servo Error	**ALM**	ALL	In Normal condition, the Pin **ALM** OFF. After the Driver occurred with Error Alarm, the Protection Function operates, ALM ON.
Zero Speed Signal	**ZS**	ALL	When the Motor speed is lower than the speed set by **Sn215**, pin **ZS** ON
Mechanical Brake Signal	**BI**	ALL	When **Cn008** is set to 1,3, when the Servo starts, pin **BI** is ON and OFF when the servo does not have excitation. (Normal use of this pin is connected to the relay of Mechanical Brake to control the Motor).
Speed Reached Signal	**INS**	ALL	When the Motor Speed reaches the Speed set by **Cn007**, the pin **INS** is ON.
Positioning Completion Signal	**INP**	Pi/Pe/Pt	When the value of Offset Counter is smaller than the Position Positioning Range set by **Pn307**, the pin **INP** ON.
Return to Origin Completion Signal	**HOME**	Pi/Pe/Pt	After being completed Return to Origin, Pin **HOME** is ON.
Torque Reached Signal	**INT**	ALL	When the Motor Output Torque reaches the Torque Reached Determined Value set by **Tn108**, the pin **INT** is ON.
Tool Magazine Mode Selection Tool Position Display	**P1~P6**	Pt	Tool holder number position displays 1~6. Please refer to “5-5 Tool magazine exclusive mode” for details
Motor Overload Signal	**OL**	ALL	When Motor Overload reaches the Determined Value, the pin **OL** is ON
Encoder Battery Abnormality Signal	**BAT**	ALL	When the Battery is abnormal (no power or disconnected), the pin **BAT** is ON
Positive and Negative Limit Signals	**LIT**	ALL	When the Mechanism touches the Positive and Negative Limits, the pin **LIT** is ON
Virtual Point Digital Output	**VDO**	ALL	When VDI ON, the set Digital Output VDO will follow ON.

Fixed Digital Output Function Description

This means pin default is low potential action. Please refer to "5-6-1 Digitalinput/output contact function planning" **for related parameter setting**

Signal Name	Function Code	Mode	I/O Operating Function Description
Torque in Restriction / Error Alarm Code 0	**LM/A0**	Pi/Pe/S/T	When the Motor Output Torque is limited by Internal Torque Limit Values (**Cn010 & Cn011**) or External Torque Limit Command (**PIC&NIC**), pin **LM/A0** is ON. When the Error Alarm occurs, this pin is the Error Alarm Code Output **A0**.
P in Operation / Error Alarm Code 1	**PC/A1**	Pe/Pi/S/T	When the Speed Loop is proportional (P) control, pin **PC/A1 is** ON. When the Error Alarm occurs, this pin is the Error Alarm Code Output **A1**.
Drive under prohibition/ Error Alarm Code 2	**ST/A2**	Pi/Pe/S/T	When CCW or CW direction drive prohibition occurs, pin **ST/A2** is ON. When the Error Alarm occurs, this pin is Error Alarm Code Output **A2**.
Base under Block/Error alarm code 3	**BB/A3**	Pi/Pe/S/T	When the servo motor is in unstarted status, pin **BB/A3** is ON. When Error Alarm occurs, this pin is Error Alarm Code Output **A3**.
Turret Display 4/ Error Alarm Code 0	**P4/A0**	Pt	Tool holder number position displays 4. Please refer to "5-5 Tool magazine exclusive mode" for details. When error alarm occurs, this pin is error alarm **A0**.
Turret Display 3/ Error Alarm Code 1	**P3/A1**	Pt	Tool holder number position displays 3. Please refer to "5-5 Tool magazine exclusive mode" for details. When error alarm occurs, this pin is error alarm **A1**.
Turret Display 2/ Error Alarm Code 2	**P2/A2**	Pt	Tool holder number position displays 2. Please refer to "5-5 Tool magazine exclusive mode" for details. When error alarm occurs, this pin is error alarm **A2**.
Turret Display 1/ Error Alarm Code 3	**P1/A3**	Pt	Tool holder number position displays 1. Please refer to "5-5 Tool magazine exclusive mode" for details. When error alarm occurs, this pin is error alarm **A3**.

Note: "1": indicates ON (Closed); "0": indicates OFF (Open).

⚠ Attention

- **DO-1~DO-4 Pin Function cannot be repeated; otherwise AL007 (5-5-1 Digital Input / Output Contact Function Planning Error Alarm) will occur.**

DO Code	Input Function	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	9 Pt	A Pi Pe	B Cob	C CoC	D EC
00	NULL														
01	RDY	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1		DO1	DO1	DO1	DO1
02	ALM	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2
03	ZS		DO3		DO3				DO3						
04	BI														
05	INS	DO4	DO4			DO4									
06	INP			DO4	DO4		DO4	DO4	DO4	DO4	DO1	DO4	DO4	DO4	DO4
07	HOME			DO3				DO3				DO3	DO3	DO3	DO3
08	INT	DO3				DO3	DO3			DO3					
09	P1														
0A	P2														
0B	P3														
0C	P4														
0D	P5										DO4				
0E	P6										DO3				
0F	OL														
10	BAT														
11	LIT														
12	VDO														

Hn617 Digital Input Contact Control Method Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H0000	--	H0000 ~ H0FFF (Hexadecimal)	Effective after Confirm Key	0511H

Setting Description: Determine the 12-bit Digital Input Contact controlled by external terminal or communication through Bit setting method; correspond Digital Input Contacts DI-1 ~ DI-12 to the binary 0th ~ 11th bits individually first, then convert the binary bits completed planning into hexadecimal for setting.

Binary Bit Representation:

0: Digital Input Contact is controlled by an External terminal.

1: Digital Input Contacts is controlled by communications.

Example: To set the Digital Input Contacts DI-1, DI-3, and DI-6 to use communication control, the remaining Contacts are controlled by the External Terminals; the corresponding binary bits of the Digital Input Contacts are: [0000 1111 0010 0101]; and can be set as [H 0 F 2 5] after converted to hexadecimal

Hn618 Communication Control Digital Input Contact Status

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H0000	--	H0000 ~ H0FFF (Hexadecimal)	Effective after Confirm Key	0512H

Setting Description: Determine the Contact State when the 12-bit Digital Input Contact uses communication control by the Bit Setting Method; please refer to Hn617 Description for Bit Setting Method.

Binary bit representation: 0: Digital Input Contact OFF
1: Digital Input Contact ON

Set the parameter to H0000 represents that all communication control Digital Input Contacts are Open. When set to H0FFF represents all communication control Digital Input Contacts are in Conduction.

(Note) The use of this function must coordinate with the setting of parameter Hn617.

5-6-2 Control Mode Switching

The user can use Digital Input Contact **MDC1** to switch the Control Mode set by **Cn001**. The setting is as follows:

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	Power Re-set	0001H

Setting Description:

Setting	Description
3	External Position / Speed Control Switching
4	Speed / Torque Control Switching
5	External Position / Torque Control Switching
7	Internal Position / Speed Control Switching
8	Internal Position / Torque Control Switching
A	Internal / External Position Switching

●This parameter is not subject to Cn029 Factory Re-set.

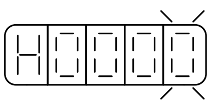
5-6-3 Contact Auxiliary Function

The User can select whether the corresponding function of Digital Input Contacts **SON**, **CCWL** and **CWL** is activated. The setting is as follows:

Cn002.0 Contact Auxiliary Function - Digital Input Contact SON Function Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0002H

Setting Description:



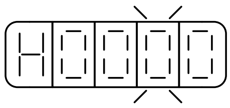
Setting	Description
0	Control Servo Activation by Digital Input ContactSON.
1	Do not control Servo Activation by Digital Input Contact SON; activate Servo immediately when the Power is ON.

※ **Remark: Invalid under EtherCAT & CANopen Mode**

Cn002.1 Contact Auxiliary Functions--Digital Input Contact CCWL and CWL Function Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0002H

Setting Description:

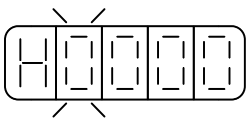


Setting	Description
0	Control CCW and CW Drive Prohibit by Digital Input Contacts CCWL and CWL.
1	Do not control CCW and CW Drive Prohibit by Digital Input Contacts CCWL and CWL; ignore CCW and CW Drive Prohibit Functions.

Cn002.3 EMC Return Mode Selection

Initial Value	Unit	Setting Range	Become effective and reset	RS-485 Address
0	--	0 ~ 1	Power Re-set	0002H

Setting Description:



Setting	Description
0	After emergency stop status is cleared, the AL009 Display can only be cleared with digital input contact ALRS in Servo Off State.
	Note) Cannot be cleared in **Servo On** State.
1	After emergency stop status is cleared, the AL009 Display can be automatically cleared no matter in Servo On or Servo off state.
	! Attention: In Servo On state, before the alarm clears and returns to normal operation, whether the Controller still issues command to the Drive must be confirmed to avoid causing sudden unintended acceleration of the Motor!

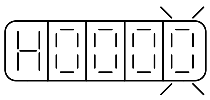
5-6-4 Brake Mode

The user can customize the brake combination when Servo off, EMC and CCW/CW drive prohibition. The setting is as follows:

Cn008.0 Brake Mode

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ 5	Effective after Confirm Key	0009H

Setting Description: The Brake Combination of Servo off, Emergency Stop (EMC), and when CCW/CW Drive is Prohibited.



Setting	Description	
	Dynamic Brake	Mechanical Brake
0	No	No
1	No	Yes
2	Yes	No
3	Yes	Yes
4	No (under 100rpm)	No
5	No (under 100rpm)	Yes

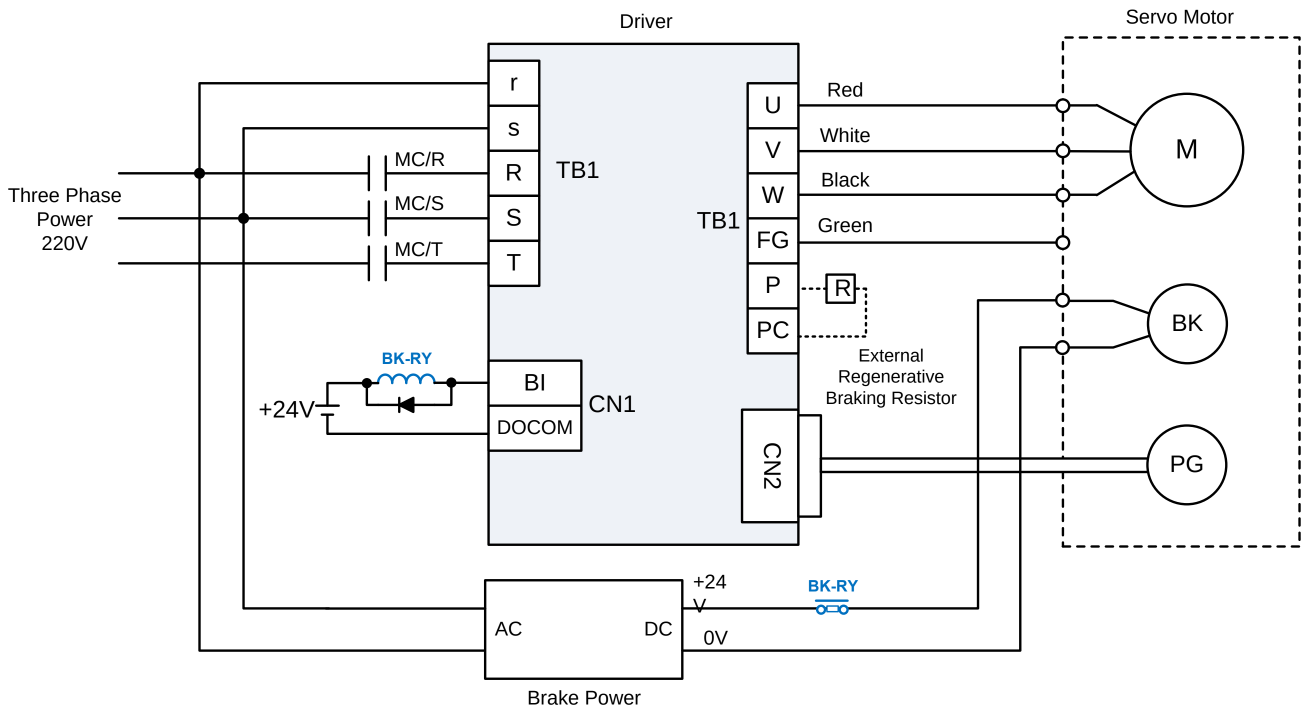
⚠ Attention

- **When CCW/CW generates drive prohibition, the setting of if use dynamic brake Cn009.0 is prior to Cn008, i.e. if Cn008.0 is set as 0 or 1 (without dynamic brake) and Cn009.0 is set as 1 (with dynamic brake), the dynamic brake will be implemented eventually.**

5-6-5 Mechanical Brake Time Sequence

When Servo System is vertically loaded, to prevent the load from being displaced due to gravity when the power is OFF, usually a Servo Motor with Mechanical Brake will be used. This Device provides Digital Output Contact **BI** to control the operation of the mechanical brake and then cooperate with **Cn003** (Mechanical Brake Signal Output Time) to control the Mechanical Brake Time Sequence. The description is as follows:

Wiring Diagram



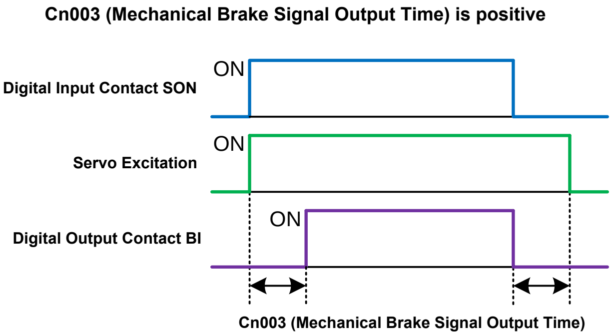
Mechanical Brake Time Sequence

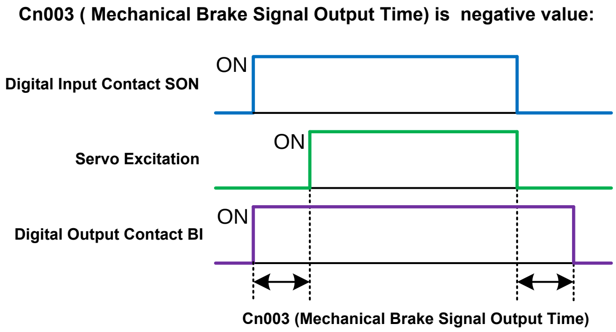
Cn003 Mechanical Brake Signal Output Time

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	ms	-2000 ~ 2000	Effective after Confirm Key	0003H

Setting Description: The Time Sequence Diagram is as follows

(Note) Before using this function, a digital output-Mechanical Brake Signal (**BI**) output pin must be planned first





Attention
• **Cn008.0 (Brake mode) must set as 1, 3 or 5.**

When the Servo System is vertical load, please set Cn003 to a positive value.

(1) **Cn003**(Mechanical Brake Signal Output Time) is **positive value** :

When the servo is not excited, it will be excited immediately when Digital input contact **SON** operates. Only when the time set by **Cn003** is exceeded, Digitaloutput contact **BI** activates (release mechanical brake);

When the servo is excited, if Digital input contact **SON** and Digitaloutput contact **BI** are not operating (activate mechanical brake), servo excitation will only be released after the time set by **Cn003** is exceeded.

(2) **Cn003** (Mechanical Brake Signal Output Time) is **negative value** :

When the servo is not excited, if Digital input contact **SON** operates, Digitaloutput contact **BI** operates immediately (release mechanical brake). Only when the time set by **Cn003** is exceeded,servo will be excited;

When the servo is excited, if Digital input contact **SON**, servo excitation will be released immediately. Only when the time set by **Cn003** is exceeded, Digital output contact **BI** will not activate (activate mechanical brake).

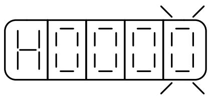
5-6-6 CW/CCW Drive Prohibited Method

When CW/CCW Drive is prohibited, the Motor Deceleration Stop Mode setting is as follows:

Cn009.0 CW/CCW Drive Prohibited Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 2	Power Re-set	000AH

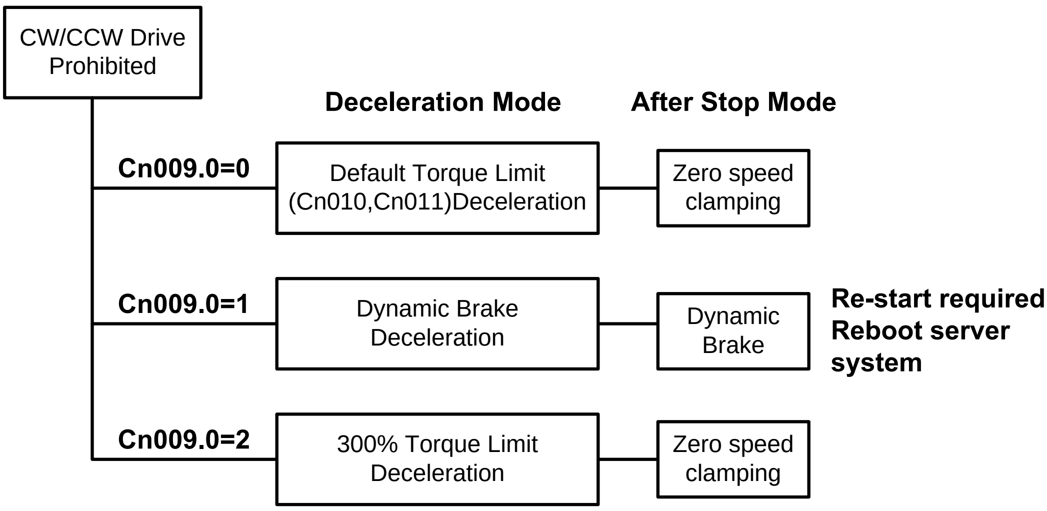
Setting Description:



Setting	Description
0	Use the pre-set Torque Limit (**Cn010**, **Cn011**) to decelerate, and in Zero Speed Clamping State after stopped.
1	Use dynamic brake to decelerate. In dynamic brake state (prior to **Cn008.0**) after the stop and need to reboot to activate the servo system.
2	Use ±300% Torque Limit to decelerate, and in Zero Speed Clamping State after stopped.

⚠ Attention

- **When CCW/CW generates drive prohibition, the setting of if use dynamic brake Cn009 is prior to Cn008, i.e. if Cn008.0 is set as 0 or 1 (without dynamic brake) and Cn009 is set as 1 (with dynamic brake), the dynamic brake will be implemented eventually.**



5-6-7 Selection of External Regenerative Resistor

When the Servo Motor is operating in the Generator Mode, the Electrical Energy will flow from the Motor to the Driver, which is called Regenerative Power. The following conditions will enable the Servo Motor to operate in the Generator (Regeneration) Mode:

(1) The period from deceleration to stop when the Servo Motor is operating in Acceleration / Deceleration.

(2) When used to vertically load.

(3) When the Load End drives the Servo Motor in operation.

This regenerative power will be absorbed by the main circuit filter capacitor of the Driver, but when there is excessive regenerative power and cannot be supported by the Filter Capacitor, Regenerative Resistor must be used to consume excess regenerative power. The specification of built-in regenerative resistor of this device is as follows:

Driver Model	Built-in regenerative resistor specification		Regenerative power (W) can be consumed by built-in regenerative resistor (Average value)	Minimum resistance tolerance (Ω)
	Resistance (Ω)	Power (W)		
JSDG2S-(E)-10A	25	40	16	25
JSDG2S-(E)-15A	25	40	16	25
JSDG2S-(E)-20A	25	40	16	25
JSDG2S-(E)-30A	25	40	16	25
JSDG2S-(E)-50A3	20	60	24	15
JSDG2S-(E)-75A3	12.5	60	24	10
JSDG2S-(E)-100A3	10	100	40	10
JSDG2S-(E)-150A3	7	100	40	7
JSDG2S-(E)-200A3	5	200	80	5
JSDG2S-(E)-300A3	--(No)	--(No)	--(No)	4

Driver Model	Built-in regenerative resistor specification		Regenerative power (W) can be consumed by built-in regenerative resistor (Average value)	Minimum resistance tolerance (Ω)
	Resistance (Ω)	Power (W)		
JSDG2S-10B	75	100	40	75
JSDG2S-15B	75	100	40	75
JSDG2S-25B	75	100	40	75
JSDG2S-35B	50	100	40	50
JSDG2S-50B	30	100	40	30
JSDG2S-75B	20	100	40	20
JSDG2S-100B	20	200	80	20
JSDG2S-150B	--(No)	--(No)	--(No)	7
JSDG2S-200B	--(No)	--(No)	--(No)	7

⚠ Attention

- **Consumable regenerative power (average) is 40% of the rated power of built-in regenerative resistor.**

The built-in regenerative resistor in this device is able to consume the regenerative power generated by acceleration/deceleration operation or vertical load. However, external regenerative resistor is necessary when servo motor operation is driven by load side, otherwise this device will not operate normally. When installing external regenerative resistor, please confirm the resistance is identical to the one of the built-in resistor. If the user uses multiple parallelly connected small power regenerative resistors to increase regenerative resistor power (W), please make sure the total resistance is greater than the minimum tolerance listed in the above list.

External Regenerative Resistor Power Setting

When using External Regenerative Resistor, the power of the selected Regenerative Resistor must be set correctly in **Cn012**.

Cn012 External Regenerative Resistor Power Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Default varies by driver model	W	0 ~ 10000	Effective after Confirmed	000DH

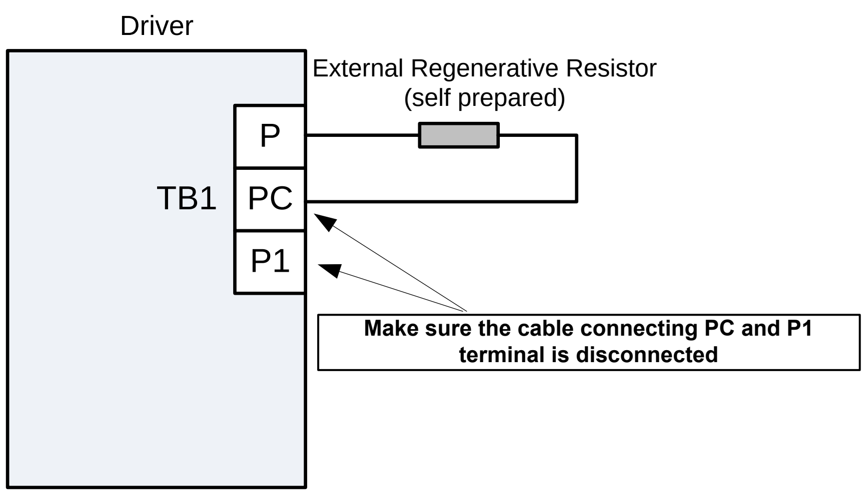
Setting Description: Please set the selected external resistor power value correctly in Cn012.

Model	Initial Value
10A / 15A / 20A / 30A	40
50A3 / 75A3	60
100A3 / 150A3 10B / 15B / 25B / 35B / 50B / 75B	100
250A3 / 100B	200
300A3 / 150B / 200B	0

External Regenerative Resistor Wiring

The user must prepare the Regenerative Resistor. When installing, the user must remove the wiring of **P1** Contact and the **PC** Contact of **TB1** terminal and then serially connect the regenerative resistor between **P** contact and **PC** contact. To secure personnel safety, it is recommended to use the Resistor with Thermal Switch.

The wiring diagram is as follows:



Since the Regenerative Resistor will generate temperature higher than 100°C when consuming regenerative power, be sure to use heat-resistant, non-flammable wire material when connecting Regenerative Resistor, and make sure that the Regenerative Resistor does not make contact with any items.

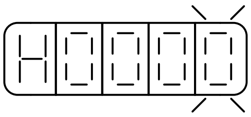
5-6-8 Fan Operation Settings

The User can set the fan operation state according to the requirements, the setting is as follows:

Cn031.0 Fan Operation Settings (Only Suitable to the Models equipped with Fan)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Effective after Confirmed	0022H

Setting Description:



Setting	Description
0	Temperature Sensing Automatic Operation
1	Operates when Servo starts
2	Continuous Operation
3	Stop Operation

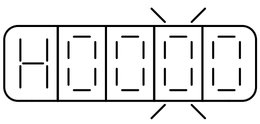
5-6-9 Low Voltage Protection Automatic Reset Selection

The User can set the Low Voltage Protection Automatic Reset Function according to the requirements, the setting is as follows:

Cn031.1 Low voltage protection (AL001) automatic return selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Effective after Confirmed	0022H

Setting Description: This parameter can set low voltage protection (AL001) return method



Setting	Description
0	When SON status shows run, AL001 Low Voltage Error Alarm is immediately displayed when a low voltage is detected; after the Error is resolved, it must be restored in Soff status.
1	When the SON status displays run, BB status is immediately displayed when a low voltage is detected; and automatically resets to SON status and displays run after the Error is resolved.

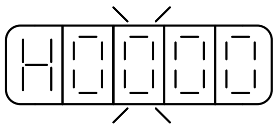
5-6-10 Absolute Value Encoder Battery Error Alarm Output

When the Absolute Value Encoder Battery is abnormal, the User can set the panel display and abnormal contact status with this parameter, setting is as follows:

Cn031.2 Absolute Value Encoder Battery Error Alarm Output

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0: ABS Encoder 1: IN Encoder	--	0 ~ 3	Re-start Power	0022H

Setting Description:



Setting	Description
0	When the battery is abnormal after power is turned ON, the panel displays AL016 and the digital output contact outputs ALM; the device cannot operate normally at this time.
1	When the battery is abnormal after power is turned ON, the panel displays no abnormality and the digital output contact does not output ALM and the Motor can still operate normally, but the multi-revolution address cannot be memorized after the power is turned OFF.
2	When the battery is abnormal after power is turned ON, the panel displays AL-16 and DO abnormal contact outputs. *Store the offset value in motor and driver side after returning to origin. The driver uses the offset value of motor side to run absolute position control. When the power is on, AL-50 alarm will occur when offset values of motor and drive side vary; offset value can be cleared through Cn041.0 = 2
3	When the battery is abnormal after power is turned ON, the panel displays AL-16 and DO abnormal contact outputs. *Store the offset value in motor and driver side after returning to origin. The driver uses the offset value of motor side to run absolute position control; offset value can be cleared through Cn041.0 = 2.

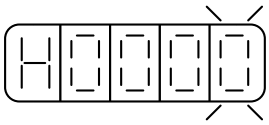
5-6-11 Analog monitoring ※ JSDG2S-E does not have this function

This device provides two analog signals to monitor motor operation status. Refer to the following setting:

Cn006.0 Analog monitoring output MON1 ※ JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ B	Effective after Confirmed	0007H

Setting Description:

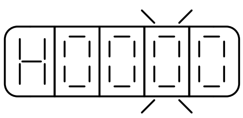


Setting	Description
0	Speed command (±10V/1.5x rated speed)
1	Speed feedback detection (±10V/1.5x rated speed)
2	Torque command (±10V/3.5x rated torque)
3	Torque feedback (±10V/3.5x rated torque)
4	Pulse input command (±10V/1.5x rated speed)
5	Position offset (±10V/±16384 pulse)
6	Electrical angle (±10V /0~360 degree)
7	Primary circuit (Vdc Bus) voltage (±10V /0~500V)
8	Speed command (±10V/1.5x rated speed)
9	Speed feedback detection (±10V/1.5x rated speed)
A	Torque command (±10V/3.5x rated torque)
B	Torque feedback detection (±10V/3.5x rated torque)

Cn006.1 Analog monitoring output MON2 ※ JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ B	Effective after Confirmed	0007H

Setting Description: Please refer to Cn006.0 Description for Setting Method



Cn043 Analog monitoring output MON1 output proportion ※ JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	%	1 ~ 1000	Effective after Confirmed	002EH

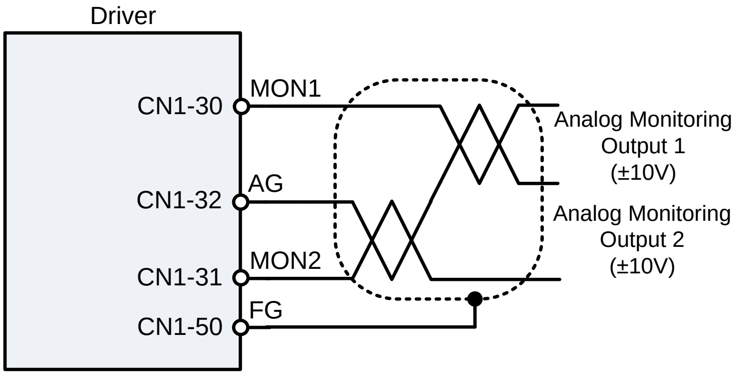
Setting Description: Take 10V/1.5x rotational speed = 100% as example, if the analog monitoring output proportion is changed to 10V/0.75x rotational speed, set the parameter as 200%

Cn044 Analog monitoring output MON2 output proportion ※ JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	%	1 ~ 1000	Effective after Confirmed	002FH

Setting Description: Please refer to the setting description of Cn043.

Following diagram shows the wiring of analog monitoring output:



When offset of analog monitoring output voltage occurs, the user can manually adjust **Cn027, Cn028** to correct the offset. Refer to the following setting:

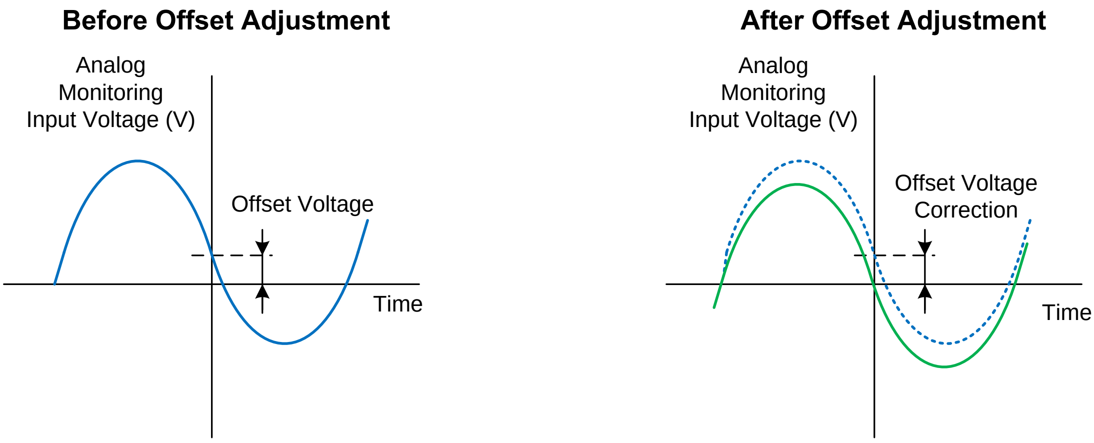
Cn027 Analog monitoring output 1 offset adjustment ※ JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	40mV	-250 ~ 250	Effective after Confirmed	001EH

Cn028 Analog monitoring output 2 offset adjustment ※ JSDG2S-E does not have this function

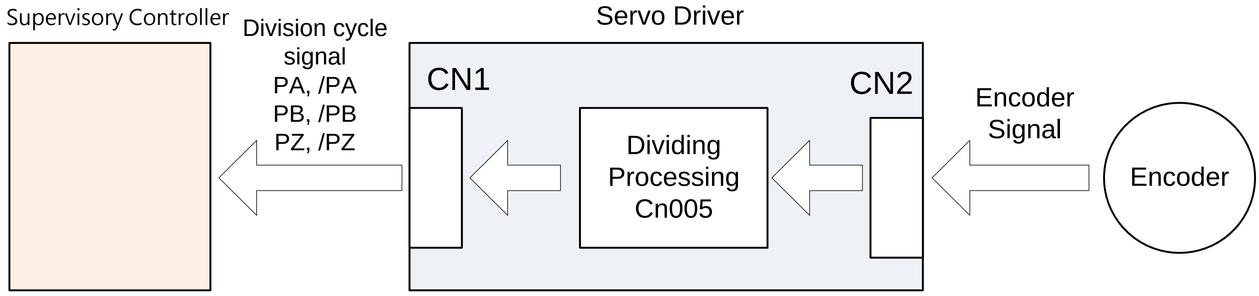
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	40mV	-250 ~ 250	Effective after Confirmed	001FH

Setting Description: Used to correct the offset when it occurs on analog monitoring output 1/2 voltage.



5-6-12 Encoder Signal Dividing Output

The Encoder Signal of Motor can be dividing processed by this Device and output to the Supervisory Control. Refer to the following diagram:



Dividing Processing means the number of pulse signals generated with one revolution of the Motor Encoder that is converted into number of pulse signals pre-set by **Cn005**.

Cn005 Encoder Signal Dividing Output

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Determined by the Encoder 2500: 2500ppr 8192: 15bit 32768: 17bit, 23bit	pulse	16 ~ 2097152	Re-start Power	0005H/0006H

Setting Description: Dividing Process means the number of pulse signals generated with one revolution of Motor Encoder is converted into preset by **Cn005**
Number of pulse signal. Example: The Motor Encoder is a 131072 pulse output with one revolution, if to obtain a 1000 pulse dividing output, please set **Cn005**=1000 directly.

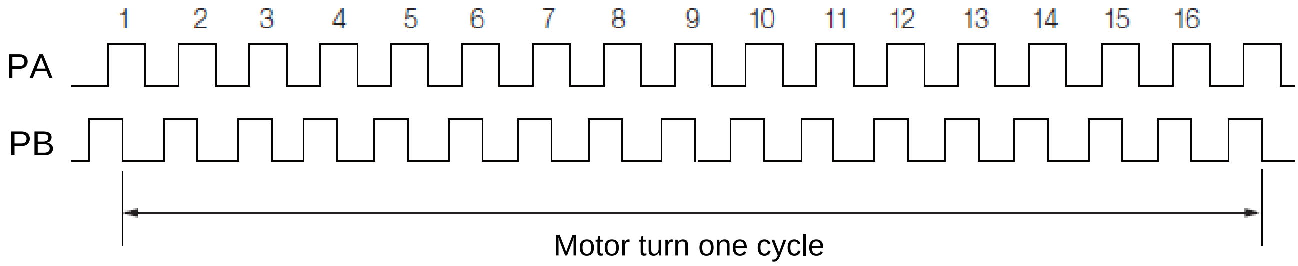
★ The power must be re-started for the setting value to be valid, and the dividing output and speed have a certain relationship limit.

Lower Limit Value (ppr)	Upper Limit Value (ppr)	Basic unit	PPR4				Maximum Rotational Speed
			10000	32768	131072	8388608	
16	2048	1	Suitable	Suitable	Suitable	Suitable	6000
2049	16384	1	Suitable	Suitable	Suitable	Suitable	6000
16386	32768	2	-	-	Suitable	Suitable	6000
32772	65536	4	-	-	-	Suitable	3000
65544	131072	8	-	-	-	Suitable	1500
131088	262144	16	-	-	-	Suitable	750
262176	524288	32	-	-	-	Suitable	375
524352	1048576	64	-	-	-	Suitable	188
1048704	2097152	128	-	-	-	Suitable	94

⚠ Attention

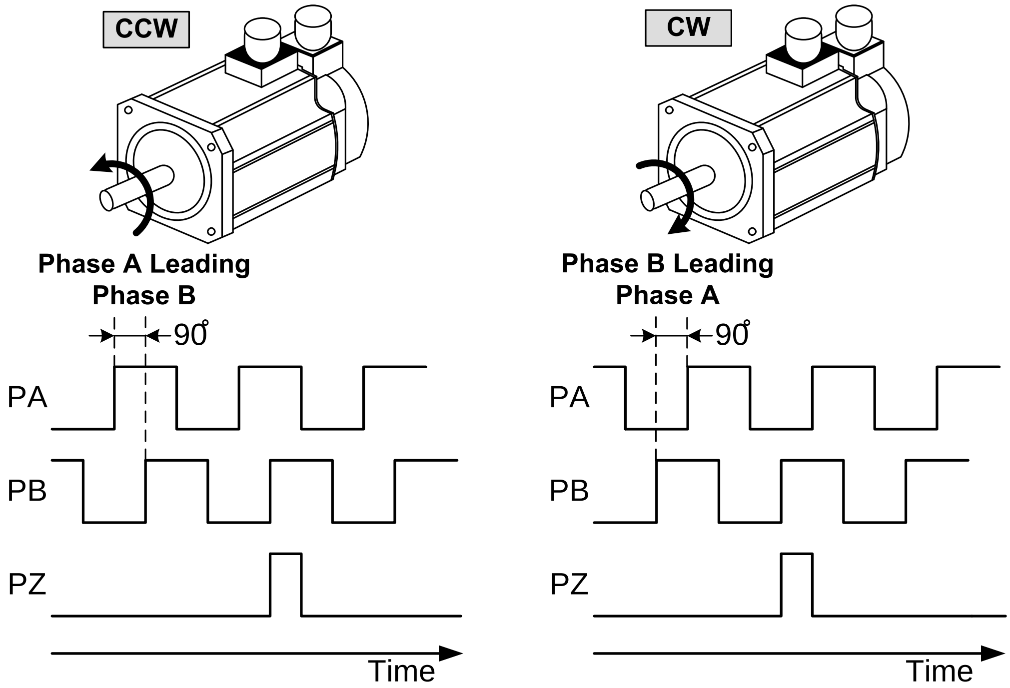
- **The Setting Range cannot exceed the Number of Pulses in One Revolution of Motor Encoder.**

For example: Following is the output example of the encoder diving pulse phase A (PA) signal and phase B (PB) when Cn005=16 (Output 16 pulses per rotation).



Dividing Output Pulse Signal Definition is as follows:

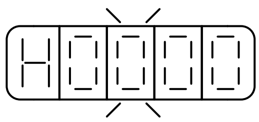
Pin Code	Name	Pin Number	Control Mode
PA	Encoder Dividing Output Phase A Signal	CN1-35	ALL
/PA	Encoder Dividing Output Phase /A Signal	CN1-36	
PB	Encoder Dividing Output Phase B Signal	CN1-37	
/PB	Encoder Dividing Output Phase /B Signal	CN1-38	
PZ	Encoder Dividing Output Phase Z Signal	CN1-39	
/PZ	Encoder Dividing Output Phase /Z Signal	CN1-40	



Pn316.2 Encoder Signal Dividing Output Phase

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0316H

Setting Description:

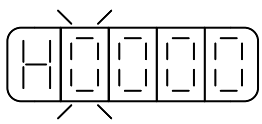


Setting	Description
0	Dividing Output Phase A leading Phase B
1	Dividing Output Phase A behind Phase B

Pn316.3 Encoder Signal Dividing Output Frequency Elimination

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0316H

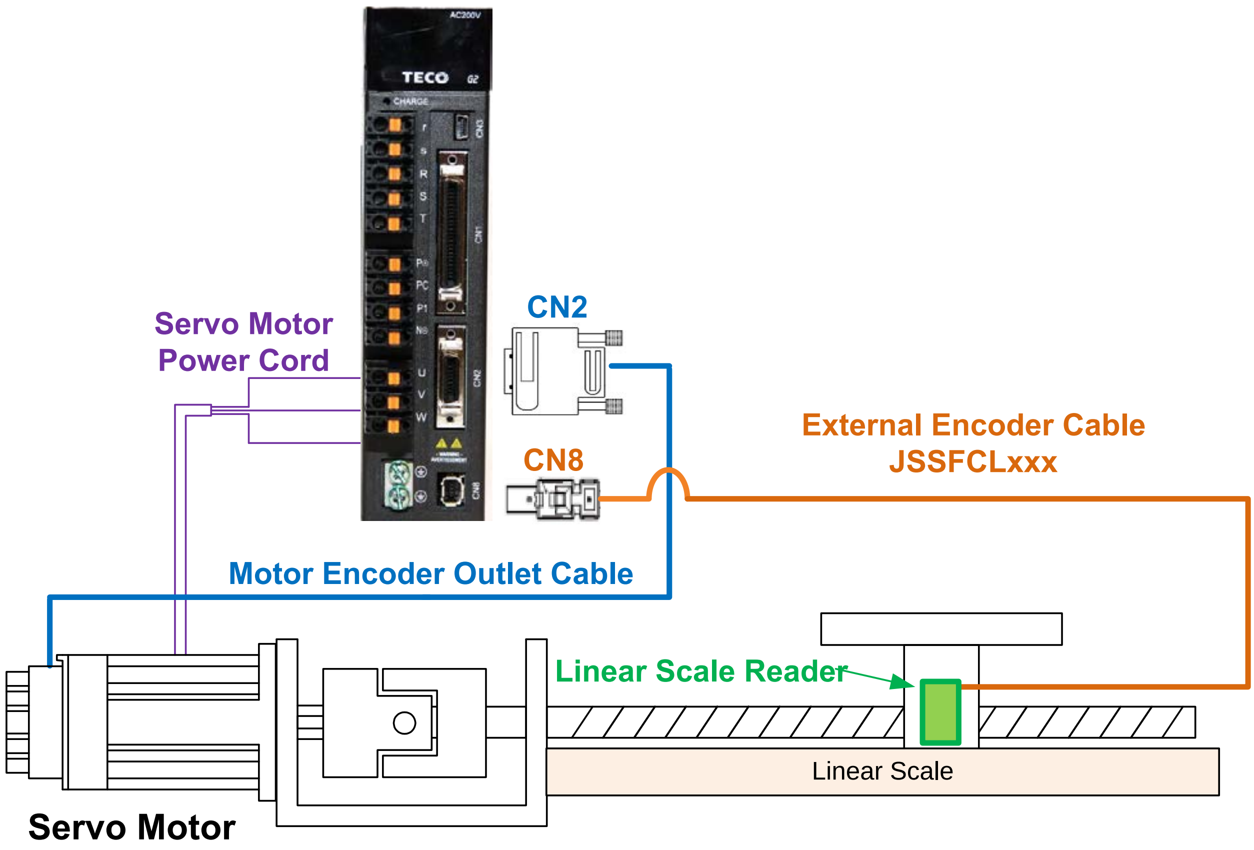
Setting Description:



Setting	Description
0	Output according to Cn005 setting value
1	Output according to Cn005 Setting Value divided by 4

5-6-13 Full Closed Loop Position Control Function

The so-called full-closed loop refers to the system which detects the mechanical position of controlled target by externally connected encoder and feedback it to the servo unit. If the user wishes to use external encoder or linear scale as the feedback signal, it is possible to achieve the connection to control board CN8 interface; support phase A/B/Z signal (linear scale or encoder),maximum supported encoder resolution is 1000000 pulse/rev (pulse number of up to 4x frequency corresponded by the full-closed loop when the motor rotates one cycle).

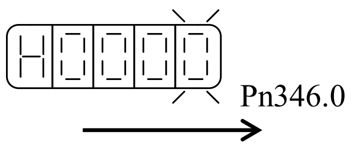


Parameter function

Pn346.0 Full-closed loop function activation

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Effective after Set	0337H

Setting Description:

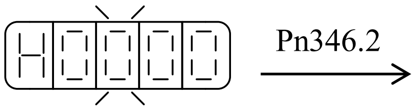


Setting	Description
0	Close
1	Activate

Pn346.2 Full-closed loop function dividing selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Effective after Set	0337H

Setting Description:



Setting	Description
0	Servo motor encoder
1	External encoder

Pn347 Maximum full-closed loop error

Initial Value	Unit	Setting Range	Effective	RS-485 Address
5000	pulse	0 ~ 536870912	Effective after Set	0338H/0339H

Setting Description: External encoder and actual encoder error setting value. When the position error is greater than the pulse number set by Pn347, this device generates AL022 (excessive pulse error between motor and load)

Pn348 Corresponded resolution of Full-closed loop Encoder one revolution

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1250	ppr	256 ~ 1048576	Power Re-set	0338H/0339H

Setting Description: The number of pulses corresponding to the External Optical Finger when the Motor rotates one resolution (Encoder resolution of the Fully Closed Loop CN8 connection)

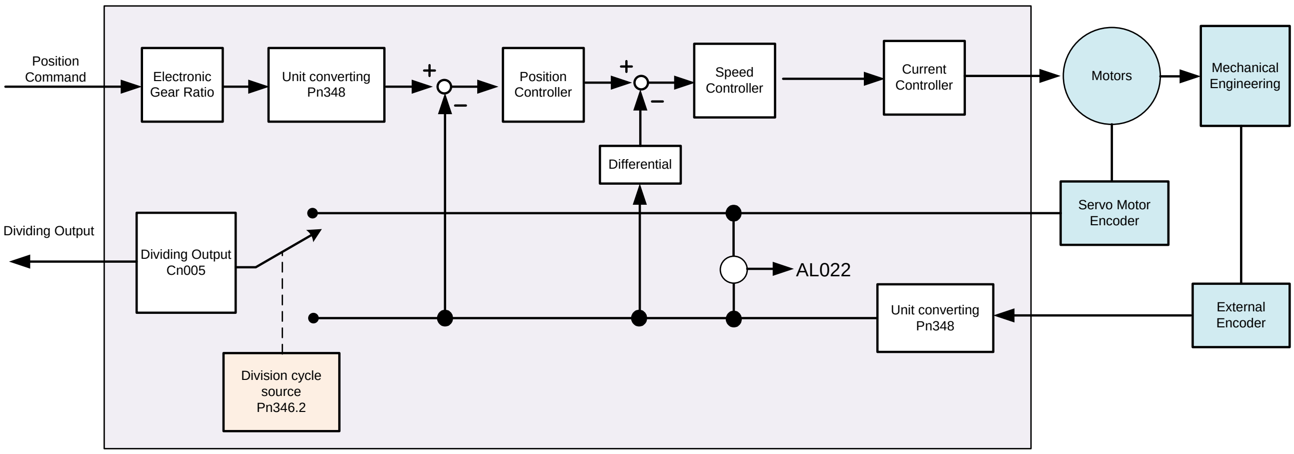
Pn349 Full-closed loop operation direction setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Power Re-set	033CH

Setting Description:

Setting	Description
0	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase A leading phase B
1	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase A leading phase B
2	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase B leading phase A
3	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase B leading phase A

Full-closed loop function block diagram



Full-closed loop function

Operation step of full-closed loop function:

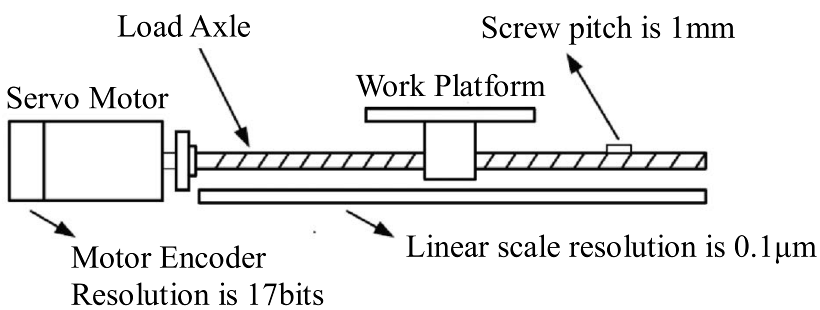
1. Check mechanism direction

Check the external encoder position direction corresponds to the motor direction. Set **Pn314** (Position command direction definition). Confirm by pushing manually (no excitation). When the external machine is pushed in positive direction, check **Un-14** (motor feedback-pulse number in one rotation) and confirm if the value is incremental.

2. Check if the internal direction the same with external direction

Push the external machine in positive direction manually (no excitation), check **Un-50** (external encoder pulse number) and confirm if the value is incremental. If not, please correct **Pn349** (full-closed loop direction) setting to 0 or 1.

3. Confirm **Pn348** (external encoder resolution)



TECO

When the external encoder or linear scale is used to control full-closed loop, it is necessary to set Pn348 (resolution corresponded to one cycle of full-closed loop Encoder) first. The following is an example when using the screw with linear scale:

$$\text{Pn348(Resolution corresponded to one cycle of full} - \text{closed loop Encoder)} = \frac{\text{Screw Pitch}}{\text{Resolution}}$$
$$= \frac{1\text{m}}{0.1\text{um}} = 10000(\text{pulse}) = 2500(\text{ppr})$$

After setting full-closed Encoder resolution, the user can set operation direction along with Pn349 (full-closed operation direction setting) or with Pn347 (full-closed loop maximum error) to set the maximum range of actual and external encoder and use Un-52 (error between external and motor encoder) to monitor the error between these two systems. When exceeds the range, AL022 alarm signal will occur (excessive pulse error between motor and load) and the servo stops operation. Lastly, set Pn346 (full-closed loop function diving selection) according to the requirement.

Push manually (no excitation); calculate the total move distance of motor count according to Un-14 (motor feedback-pulse number in one rotation) and Un-16 (motor feedback-rotation number). Compare the total position of this motor with Un50 (external encoder pulse number) to check if the directions are the same? Is the proportion of both values close to motor resolution and Pn348?

If the platform is like what shown in Fig. 1, ignore the effect of backlash. From status display parameter, the user will know Un-50 (external encoder pulse number) is 2500, and Un14 is 32768. The value of Pn348 (resolution corresponded by full-closed loop encoder one cycle) can be calculated accordingly:

$$\text{Pn348(External encoder resolution)} = \frac{1}{4} \times \text{Un50} \times \frac{131072(\text{Motor encoder resolution})}{\text{Un14}}$$
$$= \frac{1}{4} \times 2500 \times \frac{131072}{\text{Un14}} = 2500\ \text{ppr}$$

Full-closed loop related alarm

Error Alarm Number	Error Alarm Description	Alarm Clearing Method	Clearing countermeasure
AL022	Excessive Error between motor and load	Switch Re-set	1. Check if the connector falls out from the mechanism. 2. Check if internal and external count directions are the same; correct Pn349. 3. Check if Pn348 resolution is correct. 4. Increase the maximum of Pn347 full-closed loop error.
AL026	Full-closed Loop A/B/Z Phase Signal Error	Switch Re-set	1. Check if Full-closed loop encoder wire is connected to the Driver. 2. Check if the Full-closed loop Connector is short-circuited, cold-welded or falls out.
AL039	Full-closed Loop Encoder Matching Error	Switch Re-set	Encoder Matching Error

Note: AL022 (excessive pulse error between motor and load) means pulse error between motor and load exceeds the value set in Pn347 (Maximum full-closed loop error). The equation is as follows:

$$\left| \text{Un14} \times \frac{\text{Pn348} \times 4}{\text{Motor encoder resolution}} - \text{Un50} \right| > \text{Pn347}$$

5-6-14 Parameter Reset

This Function can be used to return all parameters to Factory Default Values. When set to **1**, the Power must be restarted to reset the parameters as follows:

Cn029 Parameter Reset

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0020H

Setting Description:

Setting	Description
0	Not Functioning
1	All Parameters returned to Factory Default Value

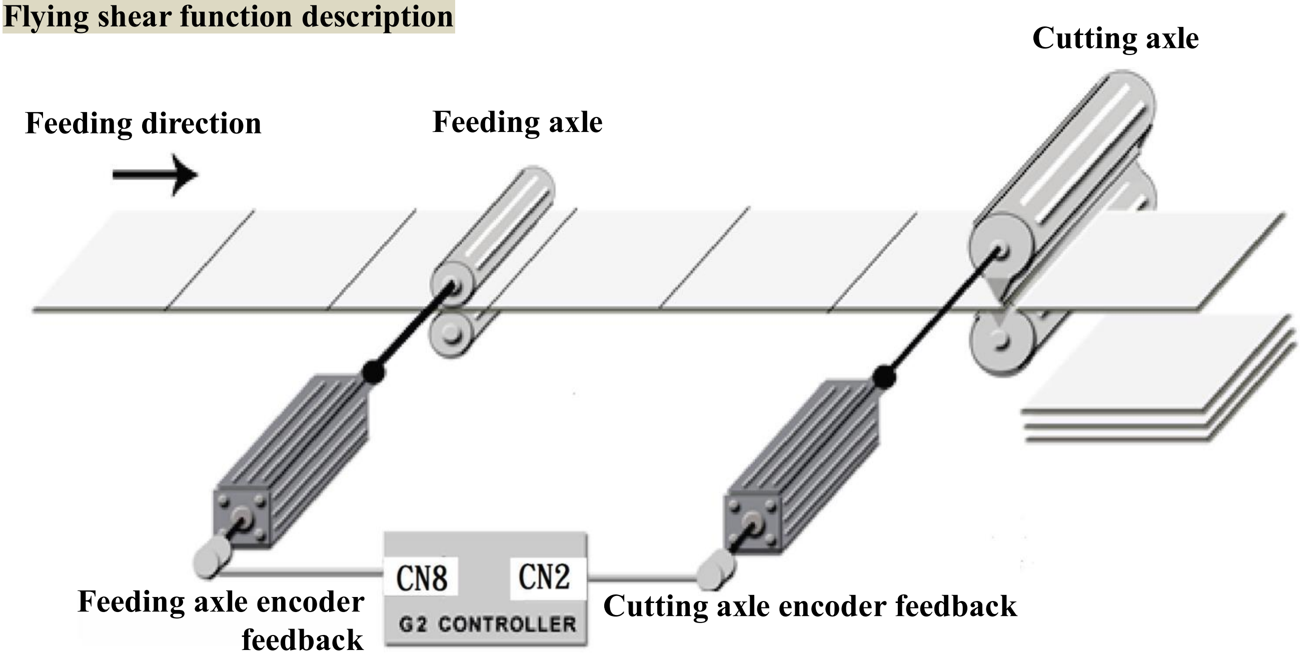
5-6-15 E-Cam Function Description

Traditional mechanical Cam needs go through special processing to achieve the required cam curve. Whenever an procedure adjustment is required, the user has to change to the corresponding mechanical cam and this can result in the problem and inconvenience of correction. The idea of E-Cam has thus derived. The differences, advantages and disadvantages of mechanical cam and E-Cam are listed in the following table.

Type	Mechanical cam	E-Cam
Planning	The longer the travel is, the larger the cam is and more difficult	Software automatic correction
Accuracy	Precise command under stable environment	Consider servo delay error
Precision	Differs from actual processing	Software automatic correction
Convenience	Main axle must exist and cannot be left out	Main axle can be left out under constant speed

The idea of E-Cam derives from the need to replace the traditional cam to plan master and slave. The position relationship between master and slave is planned by software to realize the status as if there is a virtual cam between master and slave. Two major functions of E-Cam planning: including "flying shear" and "rotary cut".

Flying shear function description



Flying shear diagram

Set flying shear to 1 by ECA01 and Cn001=6 (internal position control) to plan flying shear function. The user can plan according to actual disc distribution and select virtual main axle (automatic planning) or physical main axle (feeding axle feedback planning) by ECA02.0 (feedback source selection) for setting. If the user chooses the physical main axle (feeding axle feedback planning) to set, the main axle encoder feedback must be connected to CN8 slot. When E-Cam function and feedback source selection are determined, the user can start setting the associated parameters of master and slave as follows:

Parameter	Description	Parameter	Description
ECA01	Set as 1	ECA07	Main axle encoder resolution
ECA02.0	Physical/Virtual axle selection	ECA08	Auxiliary axle encoder resolution
ECA02.2	If to use return to origin	ECA09	Main axle
ECA03	Cutting quantity selection	ECA10	Auxiliary axle diameter
ECA04	Cutter quantity selection	ECA11	Cutting length
ECA05	Synchronous angle selection	ECA12	Distance between start material and cutting point
ECA06	Start angle selection	ECA13	S-curve time
Pn349	Full-closed loop rotation direction selection		

ECA04 E-Cam cutter quantity selection

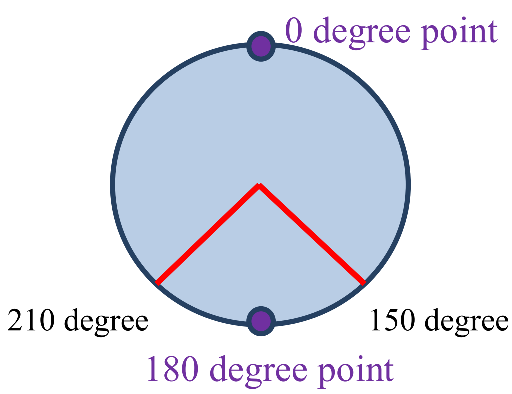
Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 4	Effective after Confirmed	0804H

Setting Description: Tool number per rotation,tool number means the cutter number installed on auxiliary axle machine and the position of each cutter must divide 360-degree equally. For example: when there are three cutters, then the separation between each cutter must be 120-degree.

ECA05 E-Cam synchronous angle

Initial Value	Unit	Setting Range	Effective	RS-485 Address
30	degree	1 ~ 120	Effective after Confirmed	0805H

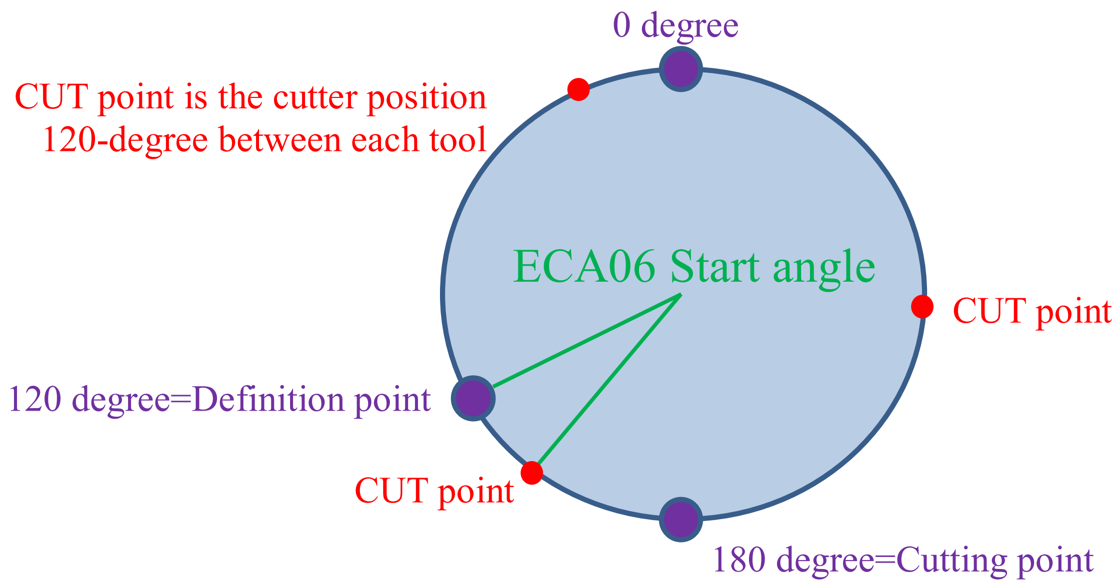
Setting Description: When the flying shear function is selected, the synchronized angle refers to the angle the auxiliary axle travels when the main axle and auxiliary axle shares the same speed (Definition: 1 revolution = 360-degree).This parameter determines the angle used by cutting synchronization and it will divide the cutting point in the range of 180-degree. For example: when the setting is 60-degree, the synchronization zone is between 150-degree and 210-degree.



ECA06 Start angle of E-Cam

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.01 degree	-9000 ~ 9000	Effective after Confirmed	0806H

Setting Description: When the flying shear function is selected, the synchronized angle refers to the angle the auxiliary axle travels when the main axle and auxiliary axle shares the same speed (Definition: 1 revolution = 360-degree).The definition is “the start angle of the first tool touching the cutting point” - “the defined point of start angle”. The defined point of start angle is 180- $\frac{360/ECA04}{2}$ and the setting range is $\frac{-90}{ECA04} \sim \frac{90}{ECA04}$. For example: if ECA04=3, then the defined point is 120-degree and the angle difference between the first tool and defined point is the setting value of ECA06.



ECA07 Encoder resolution of E-Cam main axle

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2500	ppr	1 ~ 32768	Effective after Confirmed	0807H

Setting Description: Main axle (feeding axle) encoder resolution.The resolution of main/auxiliary motor encoder. For incremental type, then input motor resolution; for communication type, input resolution per rotation/4. For example, for communication type 17bit motor, then input 131072/4=32768 in this parameter.

ECA08 Encoder resolution of E-Cam Auxiliary axle

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2500	ppr	1 ~ 32768	Effective after Confirmed	0808H

Setting Description: Auxiliary axle (cutter axle) encoder resolution.

ECA09 E-Cam feeding diameter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	0.1mm	1 ~ 10000	Effective after Confirmed	0809H

Setting Description: Main axle (feeding axle) diameter

ECA10 E-Cam cutter diameter

Initial Value	Unit	Setting Range	Effective	RS-485Address
100	0.1mm	1 ~ 10000	Effective after Confirmed	080AH

Setting Description: Auxiliary axle (cutter axle) diameter

The main axle refers to the conveyor diameter and the auxiliary axle to the cutting axle diameter. If it is hard to measure precisely, the user can rotate motor by one cycle and acquire the main axle diameter by dividing the moved distance of the conveyor by Pi.

ECA11 E-Cam cutting length

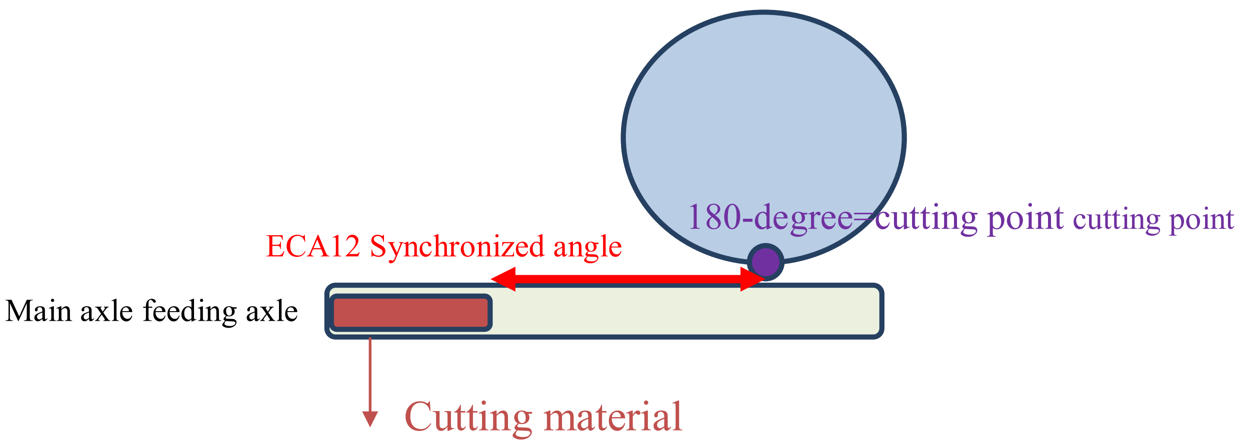
Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	0.1mm	1 ~ 50000	Effective after Confirmed	080BH

Setting Description: The total length of a single item to be cut.Set the cutting length of the item; this size must match the diameters of main/auxiliary axle. If the setting value is small, then the diameters of main/auxiliary axle should not be too long to avoid AL023 resulted from incorrect cutting curve planning.

ECA12 Distance between E-Cam Sensor to cutter point

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	0.1mm	1 ~ 50000	Effective after Confirmed	080CH

Setting Description: To measure the distance from cutting material sensor to the cutting point. The definition is the distance between the start positions of cutting material and cutting point. If the material is put on the cutting point directly, then set to 0.



Pn349 Full-closed loop operation direction setting

Initial Value	Unit	Setting Range	Effective	RS-485
0	--	0~3	Power Re-set	033CH

Setting Description: It is necessary to consider main axle feedback direction when choosing the physical main axle. AL023 will occur when the direction is incorrect.

Setting	Description
0	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase A leading phase B
1	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase A leading phase B
2	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase B leading phase A
3	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase B leading phase A

Rotary cut function description

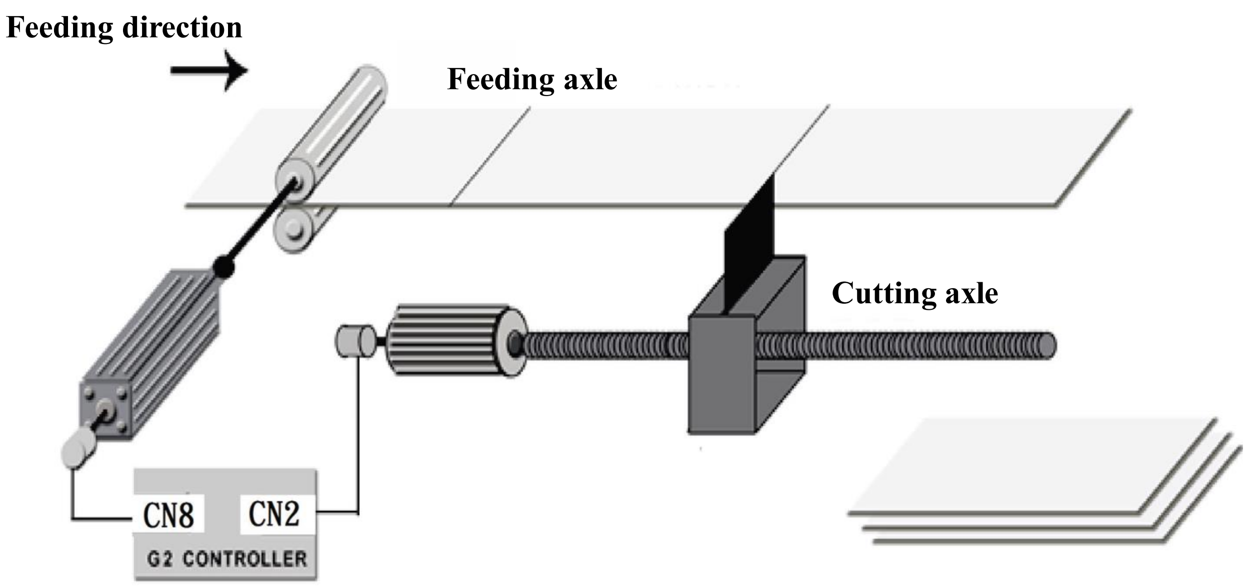


Fig 5.3 Rotary cut diagram

Set flying shear to 2 by ECA01 and Cn001=6 (activate flying shear function) to plan flying shear function. The user can plan according to actual disc distribution and select virtual main axle (automatic planning) or physical main axle (feeding axle feedback planning) by ECA02.0 (feedback source selection) for setting. If the user chooses the physical main axle (feeding axle feedback planning) to set, the main axle encoder feedback must be connected to CN8 slot. When E-Cam function and feedback source selection are determined, the user can start setting the associated parameters of master and slave as follows:

Parameter	Description	Parameter	Description
Pn349	Full-closed loop rotation direction selection	ECA14	Synchronization zone time
ECA01	Set as 2	ECA15	Synchronization zone DO delay time
ECA02.0	Physical/Virtual axle selection	ECA16	Auxiliary axle screw pitch
ECA02.2	If to use return to origin	ECA17	Maximum proceed distance of auxiliary axle
ECA03	Cutting quantity selection	ECA18	Main axle average proceeding speed
ECA07	Main axle encoder resolution	ECA20	Maximum return speed of rotary cut
ECA08	Auxiliary axle encoder resolution	ECA21	Acceleration/deceleration time of rotary cut
ECA09	Main axle	ECA22	Enable parameter change write-in
ECA11	Cutting length	ECA23	Parameter fine-tune factor
ECA12	Distance between start material and cutting point	ECA24.0	Rotary cut return origin return function
ECA13	S-curve time		

ECA07 Encoder resolution of E-Cam main axle

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2500	ppr	1 ~ 32768	Effective after Confirmed	0807H

Setting Description: Main axle (feeding axle) encoder resolution.

ECA08 Encoder resolution of E-Cam Auxiliary axle

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2500	ppr	1 ~ 32768	Effective after Confirmed	0808H

Setting Description: Auxiliary axle (cutter axle) encoder resolution.

ECA09 E-Cam feeding diameter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	0.1mm	1 ~ 10000	Effective after Confirmed	0809H

Setting Description: Main axle (feeding axle) diameter

ECA16 E-Cam auxiliary screw pitch

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	0.1mm	0~ 50000	Effective after Confirmed	0810H

Setting Description: E-Cam auxiliary axle screw pitch

The main axle refers to the conveyor diameter and the auxiliary axle to the cutting axle diameter. If it is hard to measure precisely, the user can rotate motor by one cycle and acquire the main axle diameter by dividing the moved distance of the conveyor by Pi. The same method can be used to verify the screw pitch of auxiliary axle.

ECA11 E-Cam cutting length

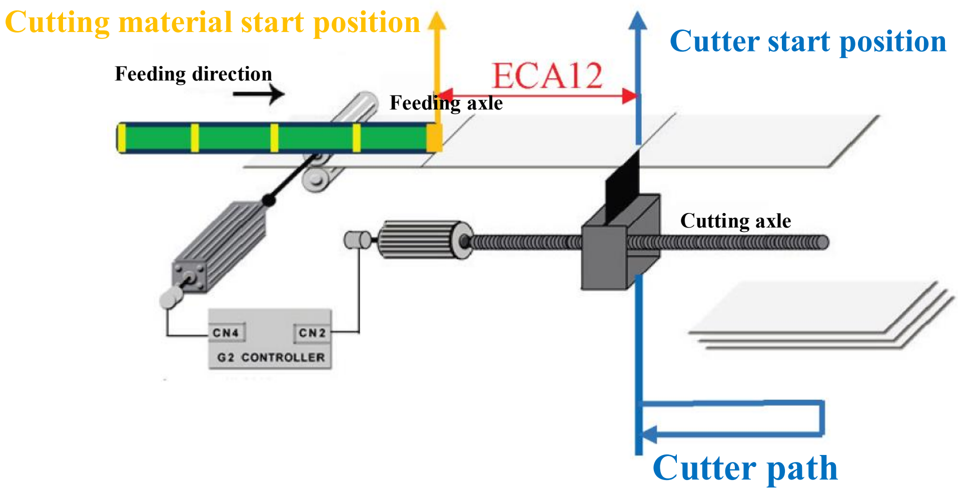
Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	0.1mm	1 ~ 50000	Effective after Confirmed	080BH

Setting Description: The total length of a single item to be cut.Set the cutting length of the item; this size must match the diameters of main/auxiliary axle. If the setting value is small, then the diameters of main/auxiliary axle should not be too long to avoid AL023 resulted from incorrect cutting curve planning.

ECA12 Distance between E-Cam start material and the cutting point

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	0.1mm	1 ~ 50000	Effective after Confirmed	080CH

Setting Description: The definition is the distance between cutting material start position and cutter start position. If the cutting material is put on the cutting point directly, then set to 0.



ECA14 E-Cam rotary cut synchronous time

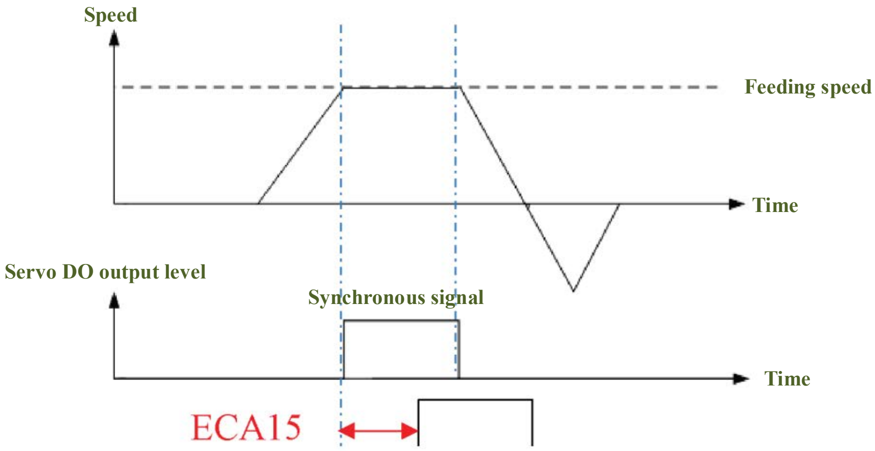
Initial Value	Unit	Setting Range	Effective	RS-485 Address
10	ms	1 ~ 65535	Effective after Confirmed	080EH

Setting Description: Set the required time of synchronization. Please remember this parameter can only generate correct synchronization time when ECA18 is correctly set.

ECA15 E-Cam rotary cut DO delay time

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	200us	0 ~ 10000	Effective after Confirmed	080FH

Setting Description: When entering the synchronization zone, the auxiliary driver will output DO signal. If the user wishes to avoid the cutting at speed turning point, then this parameter can be set to delay the synchronization signal.



ECA17 Maximum proceeding distance of E-Cam rotary cut auxiliary axle

Initial Value	Unit	Setting Range	Effective	RS-485 Address
10000	0.1mm	1 ~ 50000	Effective after Confirmed	0811H

Setting Description: Maximum axle moving distance. This parameter is the maximum movable distance of auxiliary axle screw and will determine if the range is exceeded in combination of other parameters.

ECA18 Average proceeding speed of E-Cam rotary cut main axle

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	1 ~ 1000	Effective after Confirmed	0812H

Setting Description: Average moving speed of the main axle. The user must fill in the correct average speed of the main axle so that ECA14 can have correct time.

ECA20 Maximum return speed of E-Cam rotary cut

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rpm	0 ~ 3000	Effective after Confirmed	081CH

Setting Description: Set the maximum return speed of rotary cut. The program will run internal calculation by itself when the setting is 0.

ECA21 Acceleration/Deceleration time of E-Cam rotary cut

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	ms	0 ~ 50000	Effective after Confirmed	081DH

Setting Description: Set the acceleration/deceleration time of rotary cut. The program will run internal calculation by itself when the setting is 0.

ECA22 Enable E-Cam parameter change write-in

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	-	0 ~ 1	Effective after Confirmed	081EH

Setting Description: Set this parameter as 1 when changing the parameter to enable parameter change.

ECA23 E-Cam parameter fine-tune factor

Initial Value	Unit	Setting Range	Effective	RS-485 Address
10000	0.01	0 ~ 65535	Effective after Confirmed	081FH

Setting Description: Fine-tune the cutting length to correct machine error.

ECA24.0 E-Cam rotary cut return origin return function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	-	0 ~ 1	Effective after Confirmed	0820H

Setting Description:

Setting	Description
0	Original curve
1	Return to Origin

Pn349 Full-closed loop operation direction setting

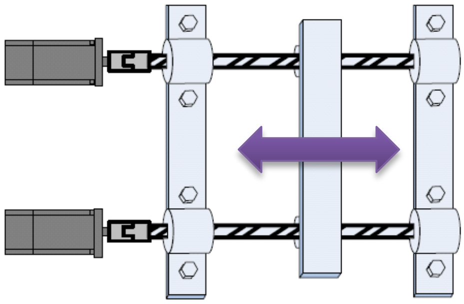
Initial Value	Unit	Setting Range	Effective	RS-485
0	--	0 ~ 3	Power Re-set	033CH

Setting Description: It is necessary to consider main axle feedback direction when choosing the physical main axle. AL023 will occur when the direction is incorrect.

Setting	Description
0	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase A leading phase B
1	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase A leading phase B
2	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase B leading phase A
3	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase B leading phase A

5-6-16 Gantry Synchronization Function Description

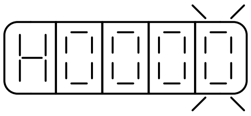
Servo motor application is getting more and more popular in industrial machines. Almost all precise movement and speed requirement are controlled by the servo motor. Many machines have to be set up in gantry way. So two axle synchronous control of the servo motor becomes very important. The servo motor has built-in gantry synchronization function; two axle synchronization can e achieved even if the loads of two axles are different.



Pn350.0 Enable gantry synchronization function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	033DH

Setting Description:



Setting	Description
0	Close
1	Activate

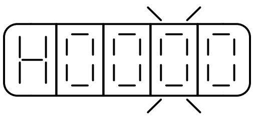
Attention

- **Gantry synchronization function and full-closed loop function cannot be activated at the same time. These two functions will be shut down forcibly when being activated at the same time.**

Pn350.1 Gantry synchronization triggered to enable asynchronous function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	033DH

Setting Description:



Setting	Description
0	Close
1	Activate

Pn351 Gantry synchronization controller gain value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
10	rad/s	0 ~ 10000	Effective after Confirmed	033EH

Setting Description: Gantry synchronization controller gain value. The larger the value, the smaller the synchronization error can be suppressed.

Pn352 Gantry synchronization maximum error tolerance

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	0 ~ 268435456	Effective after Confirmed	033FH/0340H

Setting Description: Maximum error between 2 axes tolerated by the machine

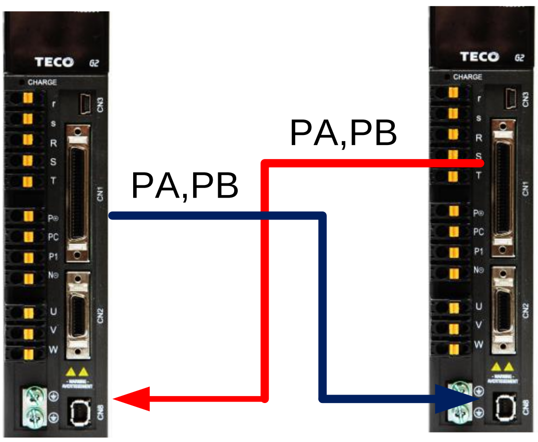
Pn348 Corresponded resolution of Full-closed loop Encoder one revolution

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1250	ppr	256 ~ 1048576	Power Re-set	033AH/033BH

Setting Description: The number of pulses corresponding to the External Optical Finger when the Motor rotates one resolution (Encoder resolution of the Fully Closed Loop CN8 connection)

Hardware connection:

- Name two sets of encoder as A and B. Connect the linear scale signal of A to CN8 of driver B and the linear scale of B to CN8 of driver A. This can also be achieved by dividing if there is no linear scale.



- Need to make sure the position command is given to driver A & B simultaneously. For example, short-circuit PP & PN of two machines respectively and connect to the signal generator.

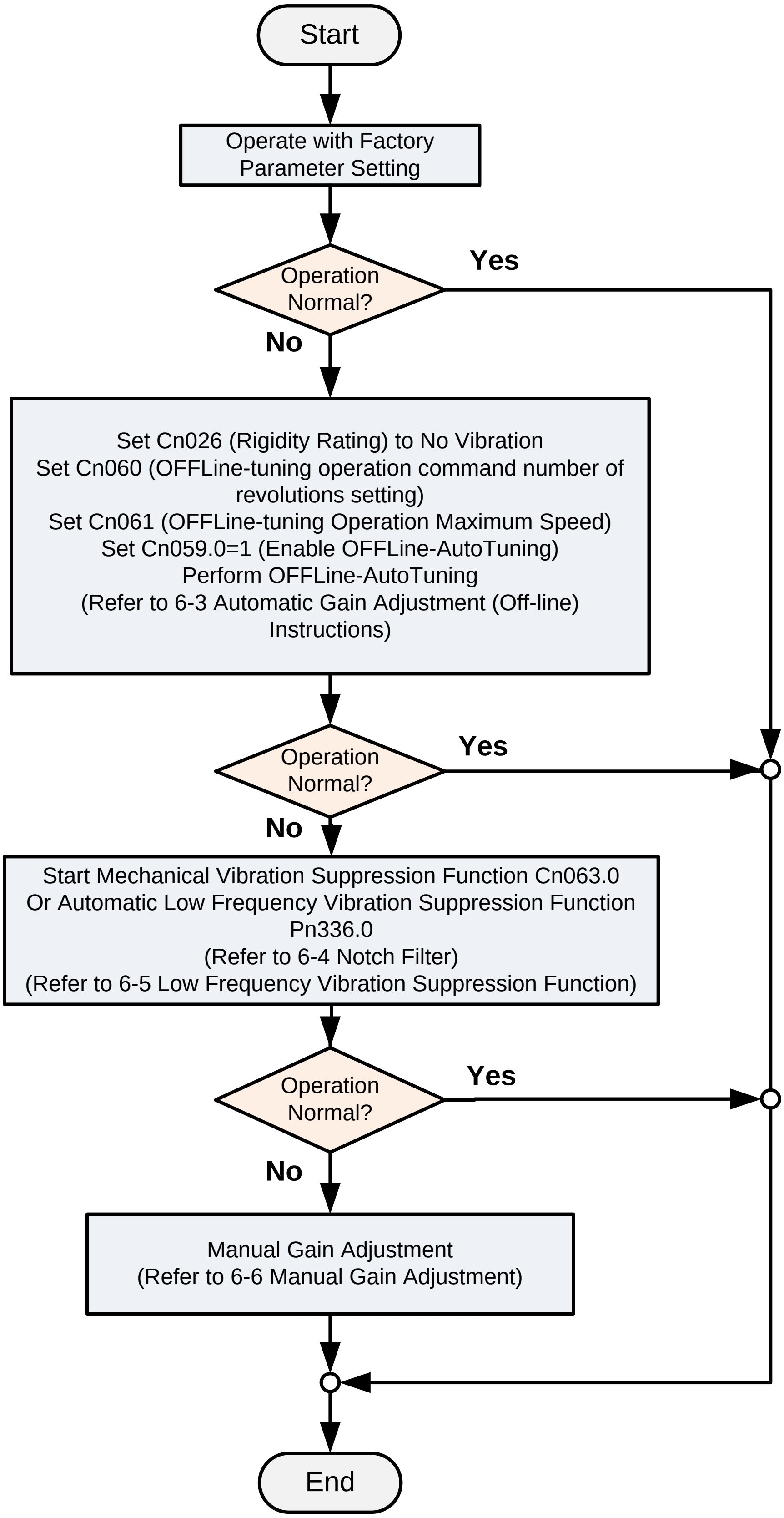
How to use:

- After the wiring is completed, give the position command without activating compensation and observe Un-52 value; this value shows the synchronous error of both machines.
- Then activate gantry synchronous compensation function, set Pn350=1 (both drivers) and adjust Pn351 gain value by observing Un-52 value. The larger the value is, the smaller the synchronous error is. However, an excessive value will result in machine vibration.
- Pn352 can determine when the two-axle synchronous error is greater than a pulse number, the system will jump to Alarm protection. Alarm will not pop up regardless how big this value is when the setting is 0.
- When gantry synchronization is used correctly, please adjust two-axle parameters to same values first and activate the compensation after confirming characteristics of both axles are identical. If the user wants a more obvious difference before and after the compensation is activated, it is possible to adjust parameters to show significant differences between characteristics of both axles and then activate compensation to observe differences.

Chap 6 Servo Gain Adjustment

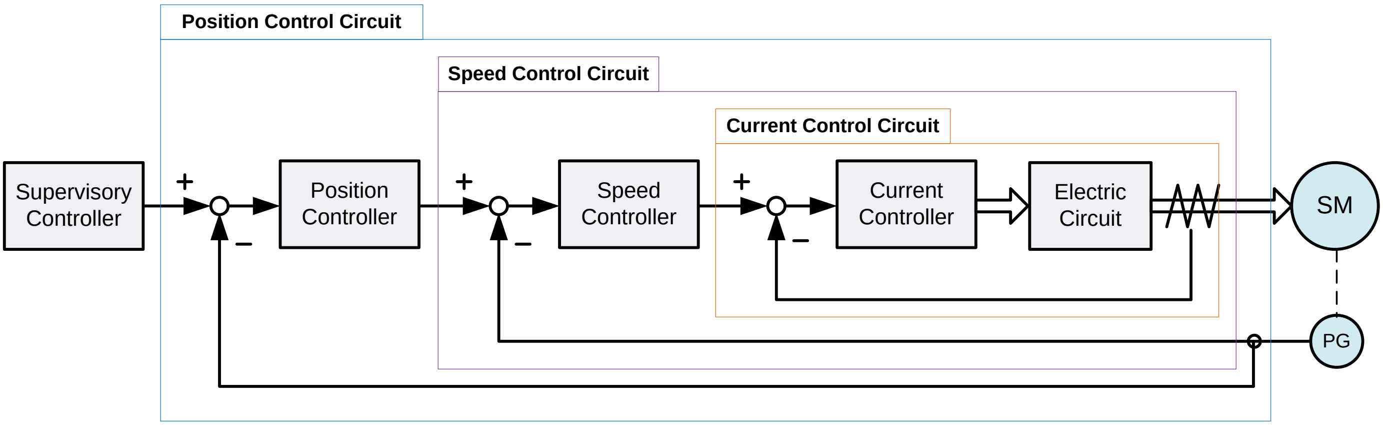
6-1 Servo Gain Adjustment Flowchart

Adjustment is a function to improve the responsiveness by adjusting the Servo Gain of the Servo Unit. The basic Adjustment Procedure is as shown in the flowchart below. Please make the appropriate adjustments after considering the mechanical conditions or operating conditions used.



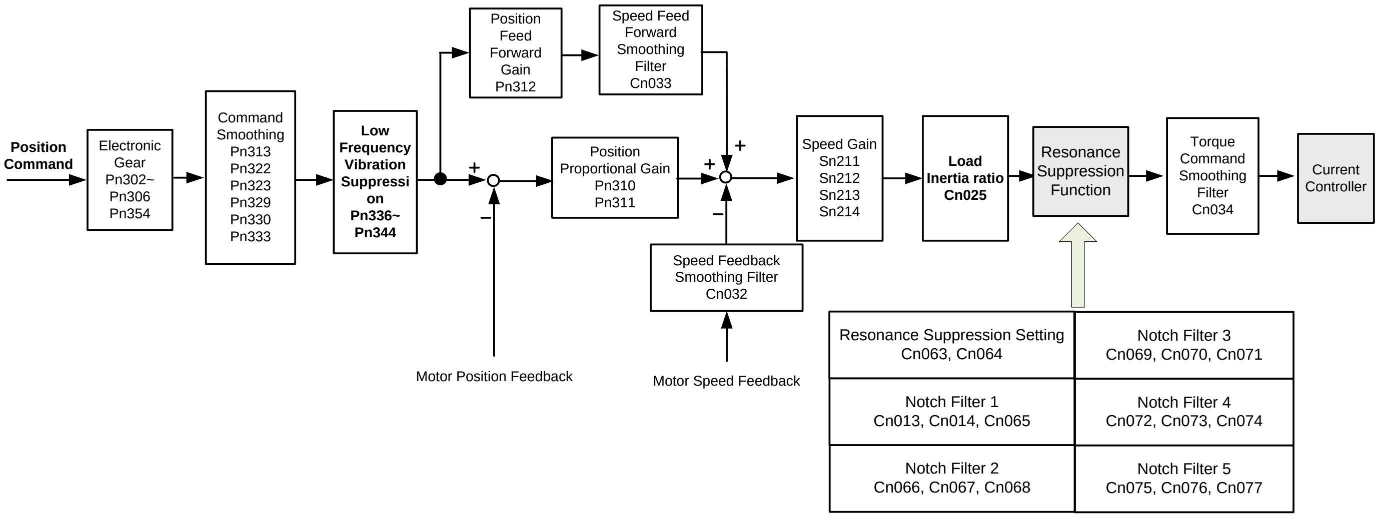
6-2 Servo Gain Adjustment Parameter Description

This Device includes three Loops of Current Control, Speed Control and Position Control. The block diagram is as follows:



In theory, the Control Loop Bandwidth of the Inner Layer must be higher than the Outer Layer; otherwise, the entire Control System will be unstable and cause vibrations or poor response. Therefore, the relationships between these three Control Loop Bandwidths are as follows:

Current Control Loop Bandwidth (the innermost layer) > Speed Control Loop Bandwidth (the middle layer) > Position Control Loop Bandwidth (the outermost layer)



Since this Device has adjusted the Current Control Loop Bandwidth to the best state, the User only needs to adjust the Speed and Position Control Loop Gain; the following describes the Gain Adjustment related parameters.

Current Control Loop Bandwidth (the innermost layer)

Cn034 Torque Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Hz	0 ~ 5000	Effective after Set	0025H

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Speed Control Loop Bandwidth (middle layer)

Cn025 Load Inertia Ratio

Initial Value	Unit	Setting Range	Effective	RS-485
10	0.1	0 ~ 2000	Effective after Set	001CH

Setting Description:

$$\text{Load Inertia Ratio} = \frac{\text{Convert to the Load Inertia of the Motor Shaft } (J_L)}{\text{Servo Motor Rotor Inertia}(J_M)} \times 100\%$$

Cn032 Speed Feedback Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
500	Hz	0 ~ 2500	Effective after Set	0023H

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Sn211 Speed Loop Gain 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Hz	2 ~ 1500	Power Re-set	033CH

Setting Description: The Speed Loop Gain directly determines the Response Bandwidth of the Speed Control Loop. Under the premise of the mechanical system does not generate vibration or noise, increasing the Speed Loop Gain value will speed up the Speed Response. If Cn025 (Load Inertia Ratio) is set correctly, the Speed Loop Bandwidth equals the Speed Loop Gain.

Sn212 Speed Loop Integration Time Constant 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2000	0.01ms	40 ~ 50000	Power Re-set	020CH

Setting Description: Adding integration components to the Speed Control Loop can effectively eliminate the speed steady-state error and quickly respond to subtle speed changes. In general, under the premise that the mechanical system does not generate vibration or noise, the speed loop integration time constant is reduced to increase the system rigidity. Please use the following formula to calculate Speed Loop Integration Time Constant:

$$\text{Speed Loop Integration Time Constant} \geq 5 \times \frac{1}{2\pi \times \text{Speed Loop Gain}}$$

Sn213 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Hz	2 ~ 1500	**Power Re-set**	020DH

Setting Description: Please refer to Sn211 Description

Sn214 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2000	0.01ms	40 ~ 50000	Power Re-set	020EH

Setting Description: Please refer to Sn212 Description

Position Control Loop Bandwidth (outermost layer)

Pn310 Position Loop Gain 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	rad/s	1 ~ 2000	Effective after Set	0310H

Setting Description: Under the premise that the mechanical system does not generate vibration or noise, increasing the Position Loop Gain value will speed up the Speed Response, shorten the Position Time. In general, the Position Loop Bandwidth cannot be higher than the Speed Loop Bandwidth. The recommended formula is as follows:

$$\text{Position Loop Gain} \leq 2\pi \times \frac{\text{Speed Loop Gain}}{5}$$

Pn311 Position Loop Gain 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	rad/s	1 ~ 2000	Effective after Set	0311H

Setting Description: Please refer to Pn310 Description for the Setting Method

Pn312 Position Loop Feed Forward Gain

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	%	0 ~ 100	Effective after Set	0312H

Setting Description: It can reduce the tracking errors of the position control and speed up the reaction. If the feed forward gain is too large, it may cause a speed overshoot and the output contact INP (positioning completion signal) to repeatedly turn on and off.

Cn033 Speed Forward Feed Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
500	Hz	0 ~ 1000	Effective after Set	0024H

Setting Description: Smooth the Speed Feed Forward Command.

Torque Command Smoothing Filter

When the system generates sharp vibration noise, **Cn034** (Torque Command Smoothing Filter) can be adjusted to suppress the vibration noise, adding this filter will delay the Servo System Response Speed at the same time.

Speed Loop Gain

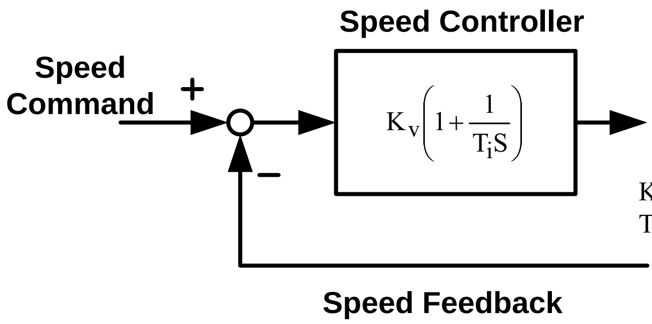
The Speed Loop Gain directly determines the Response Bandwidth of the Speed Control Loop. Under the premise that the mechanical system does not generate vibration or noise, increasing the Speed Loop Gain value will speed up the Speed Response. If **Cn025** (Load Inertia Ratio) is set correctly, the **Speed Loop Bandwidth** equals to **Sn211** (Speed Loop Gain 1) or **Sn213** (Speed Loop Gain 2).

※ Load inertia ratio (Ratio between the moment of inertia of the motor and the one of load) is the basic parameter when running gain adjustment; therefore, it must be set correctly as much as possible.

Speed Loop Integration Time Constant

Adding integration components to the speed control loop can effectively eliminate the speed steady-state error and quickly respond to subtle speed changes. In general, under the premise that the mechanical system does not generate vibration or noise, the speed loop integration time constant is reduced to increase the system rigidity. If the Load Inertia Ratio is large or there is a resonance factor in the mechanical system, the Speed Loop Integration Time Constant must be confirmed to be large enough; otherwise, the mechanical system generates resonance easily. Please use the following formula to calculate Speed Loop Integration Time Constant:

$$\mathbf{Sn212}(\text{Speed Loop Integration Time Constant 1}) \geq 5 \times \frac{1}{2\pi \times \mathbf{Sn211}(\text{Speed Loop Gain 1})}$$



K_V : Speed Loop Gain (Hz)
T_i: Speed Loop Integration Time Constant (sec)

TECO

Setting Example:

If **Cn025** (Load Inertia Ratio) is set correctly, and expect the Speed Loop Bandwidth reaches 100Hz, then set

$\textbf{Sn211}(\text{Speed Loop Gain 1}) = 100(\text{Hz})$

$$\textbf{Sn212}(\text{Speed Loop Integration Time Constant 1}) \geq 5 \times \frac{1}{2\pi \times 100} = 8\text{ms}$$
$$= 800\ (\times 0.01\text{ms})$$

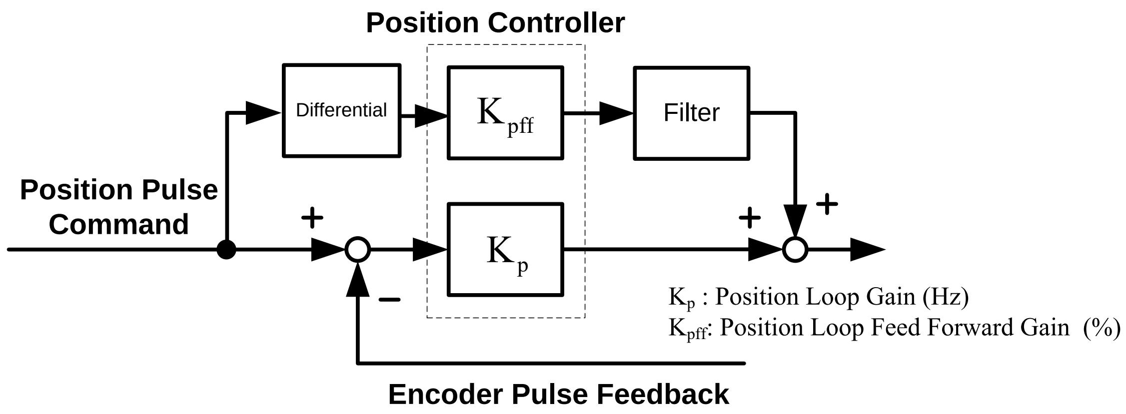
Position Loop Gain

Position loop gain directly determines the response speed of position loop. As long as the mechanical system does not generate vibration or noise, the addition of position loop gain value can expedite response speed and shorten positioning time.

$$\text{Position Loop Gain} \leq 2\pi \times \frac{\text{Speed Loop Gain}}{5}$$

Position Loop Feed Forward Gain

The use of the Position Loop Feed Forward Gain can speed up the response speed; if the feed forward gain is too large, it may cause speed overshoot and the Output Contact **INP** (Positioning Completion Signal) turns on and off repeatedly. Therefore, the speed waveform and Output Contact **INP** (Positioning Completion Signal) must be observed during adjusting and slowly increase the Feed Forward Gain Value. When the Position Loop Gain is too large, the effect of the Feed Forward Function is not obvious.



Gain Adjustment Shortcut Parameter

The Device provides Gain Adjustment Shortcut Parameter, centralizes the Gain Adjustment related parameters in the Shortcut Parameter to facilitate the user operations during Manual Gain Adjustment and increase the convenience of machine tuning.

When the user enters the Shortcut Parameter to change the value of the parameter, the value will be **written into storage and be effective immediately**, without having to press the Enter key again to store. Gain Adjustment Shortcut Parameter is shown as follows:

Parameter Code	Name and Function	Default Value	Unit	Setting Range
qn501	**Speed Loop Gain 1** Same as Sn211	40	Hz	2 ~ 1500
qn502	**Speed Loop Integration Time Constant 1** Same as Sn212	100	0.01ms	40 ~ 50000
qn503	**Speed Loop Gain 2** Same as Sn213	40	Hz	2 ~ 1500
qn504	**Speed Loop Integration Time Constant 2** Same as Sn214	100	0.01ms	40 ~ 50000
qn505	**Position Loop Gain 1** Same as Pn310	40	rad/s	1 ~ 2000
qn506	**Position Loop Gain 2** Same as Pn311	40	rad/s	1 ~ 2000
qn507	**Position Loop Feed Forward Gain** Same as Pn310	0	%	0 ~ 100

6-3 Automatic Gain Adjustment (Off-line tuning) Instructions

Automatic gain adjustment refers to the Servo Driver that can be automatically operated (Forward and Reverse reciprocating motions) without Commands issued by the Supervisory Device and run adjusting function in accordance with mechanical system characteristics during operations. The following are the parameters that will be automatically adjusted:

Parameter Code	Name and Function	Initial Value	Unit	Setting Range
Cn025	Load Inertia Ratio	10	0.1	0 ~ 2000
Cn034	Torque Command Smoothing Filter	0	Hz	0 ~ 5000
Sn211	Speed Loop Gain 1	40	Hz	2 ~ 1500
Sn212	Speed Loop Integration Time Constant 1	2000	0.01ms	40 ~ 50000
Pn310	Position Loop Gain 1	40	rad/s	1 ~ 2000
Cn013	Notch Filter First Set	0	Hz	0 ~ 2000
Cn066	Notch Filter Second Set	0	Hz	0 ~ 2000
Pn339	First Set Low Frequency Vibration Suppression Frequency	1000	0.1Hz	10 ~ 1000
Pn340	First Set Low Frequency Vibration Suppression Parameter	0	-	0 ~ 30

Automatic Gain Adjustment Pre-cautions

The Automatic Gain Adjustment is a function that accompanies the Motor Operation, please pay special attention to the following points:

(1) The Automatic Gain Adjustment will be adjusted using the set Load Inertia Ratio (Cn025) as the standard. If the system cannot operate steadily when the adjustment is started, correct adjustments cannot be performed. Please increase the Load Inertia Ratio (Cn025) until after the system can run steadily, and then perform the adjustment.

(2) The Automatic Gain Adjustment will be adjusted using the set System Rigidity (Cn026) as the standard. If vibration occurs at the beginning of the adjustment, correct adjustments cannot be performed. Please decrease the System Rigidity (Cn026) until no vibration occurs, and then perform the adjustment.

(3) The Automatic Gain Adjustment function performs automatic operations with vibrations, please execute in the situation of Emergency Stop (Power OFF) that can be done at any time during execution. In addition, since the two-way rotation is performed within the set movement range, please confirm the movement range and directions.

Rigidity Table Setting

When using Automatic Gain Adjustment Function, the Rigidity level needs to be set in accordance with the required gain of the application situation, the rigidity setting range corresponding to all types of application situations is shown in the table below.

Setting	Description		
	Position Loop Gain	Speed Loop Gain	Speed Loop Integration Time Constant
	Pn310 [1/s]	Sn211 [Hz]	Sn212 [0.01ms]
1	2	2	28000
2	3	3	19000
3	6	6	9000
4	9	9	6000
5	12	12	6000
6	15	15	6000
7	20	20	4500
8	30	30	3000
9	40	40	2000
10	50	50	1600
11	60	60	1500
12	70	70	1000
13	85	85	1000
14	100	100	800
15	120	120	800
16	140	140	600
17	160	160	600
18	180	180	500
19	200	200	500
20	225	225	400
21	250	250	400

Automatic Gain Adjustment Use Limit

The following are the limits when using Automatic Gain Adjustment:

(1) The System cannot be executed

- When the Mechanical System can only operate in a single direction
- When the Mechanical System's rotating range is less than 3 revolutions

(2) The System cannot be executed correctly

- When the appropriate movement range cannot be obtained
- When the Load Inertia Ratio changes greatly
- When the Rigidity of the Mechanical System is too low
- When the System uses P/PI Switching Mode
- When the System uses two stages of Gain Switching
- When the System uses Position Loop Feed Forward

Confirmations before execution of Automatic Gain Adjustment

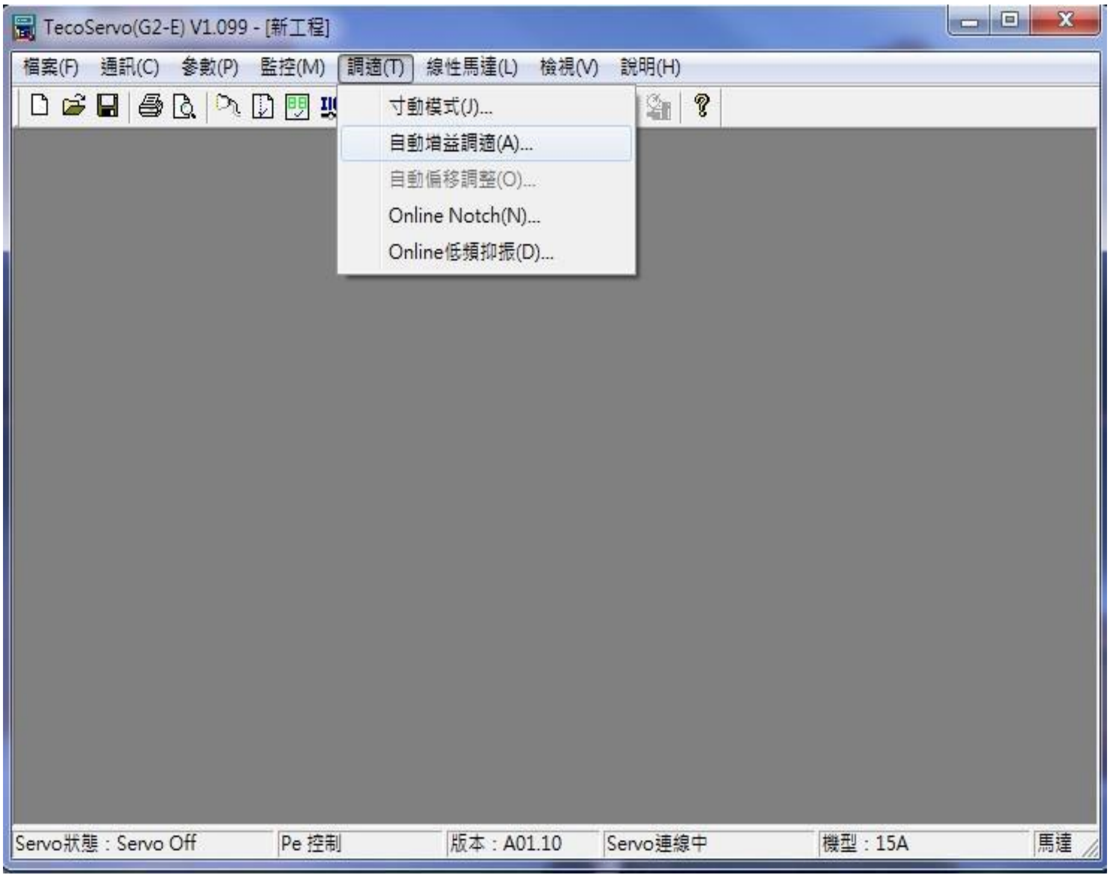
When executing Automatic Gain Adjustment, please be sure to confirm the following points:

- The Main Power Circuit is ON
- Servo Driver is in OFF State
- System Control Mode is not Torque Control
- It is not in Motor Testing Mode (JOG Function)
- It is not in On-line tuning Function
- No Alarm occurred
- If the Speed Control is used to execute Automatic Gain Adjustment, it will automatically switch to Position Control during adjustment, and switch back to
  Speed Mode after the adjustment is completed automatically.

Automatic Gain Adjustment Operating Procedure

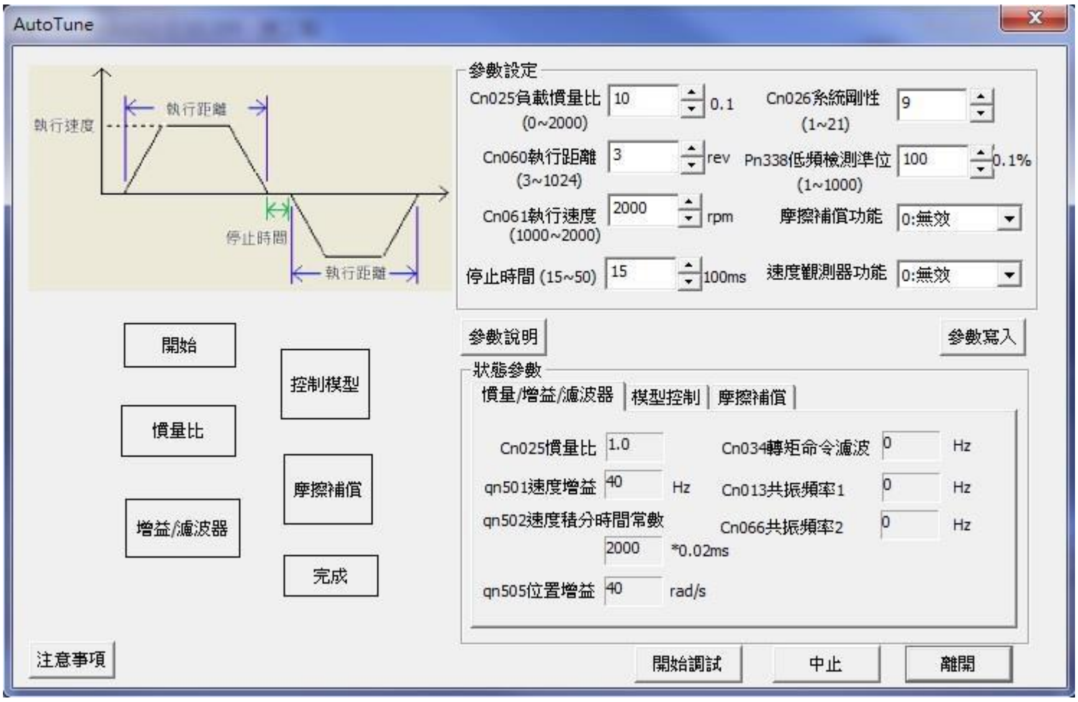
The following is the Operating Procedure when using Automatic Gain Adjustment. The Procedure is described with the PC-link Automatic Gain Adjustment page.

1. Click “Tuning (T)” on the tool bar and select “automatic gain adjustment” item.



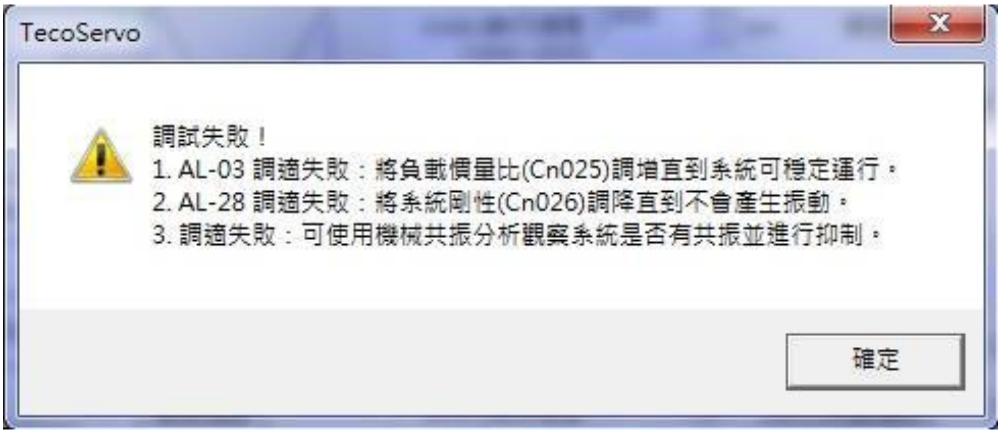
2. On the Precautions Page, please click on "Execute" to perform Off-line tuning.

3. Off-line tuning Page, can perform parameter setting. Completed parameter setting, click on "Parameter Write" Followed by clicking on "Start Tuning," the Motor starts rotation to conduct adjustment. The parameter setting method can click on "Parameter Description" part to understand. Click on "Parameter Write," "Parameter Write Successful" will appear if successful; if Writing failed, need to confirm all parameters are within the range.



4. Current tuning status can be known from the light indicator during execution. The Tuning Completion status will display a green light; current status of tuning will display a yellow light.

5. When Tuning fails and generates an Alarm, adjustment can be performed according to the handling guidelines. When completed tuning, you can select whether or not to Write Parameter. Lastly, click on "Exit" to complete Off-line tuning.



Automatic Gain Adjustment Alarm and Handling Actions

When an error occurs in the Automatic Gain Adjustment process, adjustments can be made through the following counter-measures:

AL003 Motor Overload

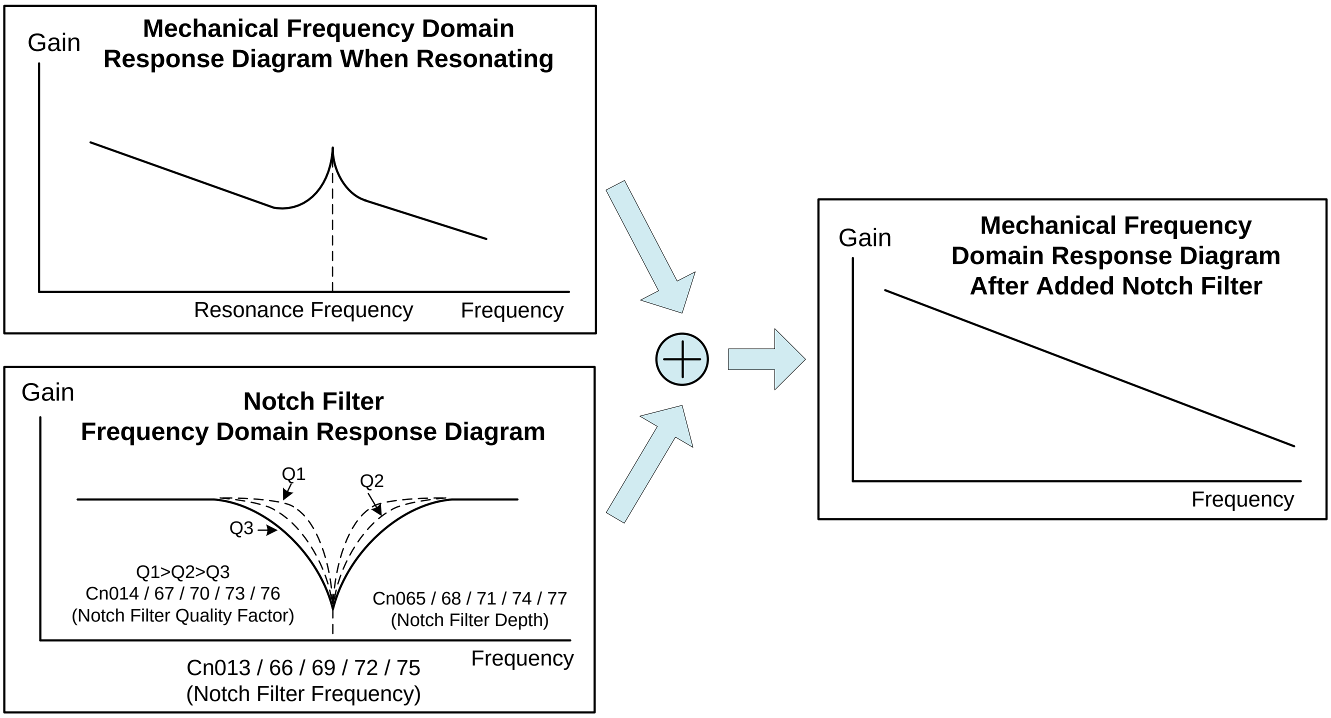
Cause	Counter-measure
The system generates large amplitude vibrations	Increase the Load Inertia Ratio (Cn025) until the System can operate steadily

AL035 Tuning Failed

Cause	Counter-measure
The System generates Vibration Resonance or Acoustic Resonance	Decrease the System Rigidity (Cn026) until the System can operate steadily
	Execute PC-Link Mechanical Characteristics Analysis Function Observation to observe if resonance exists with the system and suppress it

6-4 Notch Filter

When the machine rigidity is low and the machine can no longer increase the Controller Gain due to vibration or noise caused by bearing twisting or other resonances while the vibration frequency is higher than 100Hz, this Device provides Notch Filter to eliminate this phenomenon.



There are five sets of Resonance Suppression that can be set for JSDE2; each set can set Filter Frequency, Quality Factor and Depth. The parameter setting is as follows:

Cn013/Cn066/Cn069/Cn072/Cn075Notch Filter Frequency (First/Second/Third/Fourth/Fifth Set)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Hz	0 ~ 2000	Effective after Set	Each Parameter is different

Setting Description: When to eliminate the vibration or noise caused by Resonance, please input the Frequency when vibration occurs in Cn013/066/069/072/075, setting of 0 represents that the Notch Filter is not used.

Cn014/Cn067/Cn070/Cn073/Cn076Notch Filter Quality Factor (First/Second/Third/Fourth/Fifth Set)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
7	--	1 ~ 100	Effective after Set	Each Parameter is different

Setting Description: Used to adjust the frequency range to be suppressed, the smaller value of Cn014/067/070/73/076, the wider the frequency range of suppression, the User can adjust according to the actual situation.

Cn065/Cn068/Cn071/Cn074/Cn077Notch Filter Depth (First/Second/Third/Fourth/Fifth Set)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1000	Effective after Set	Each Parameter is different

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the value of the Cn065/068/071/074/077, the deeper the frequency depth of suppression, the User can adjust according to the actual situation.

Attention

- When Notch Filter (Cn013, Cn066, Cn069, Cn072 & Cn075) is set to zero, Notch Filter is not used.
- Only change Notch Filter (Cn013, Cn066, Cn069, Cn072 & Cn075) when the motor is stopped. Vibration may be generated when the change is made while the motor is under operation.
- DO NOT set Notch Filter (Cn013, Cn066, Cn069, Cn072 & Cn075) close to speed circuit response frequency. Please set a frequency which is at least 4 times of speed circuit gain (Sn211) (Under the condition when the setting of Cn025 (load inertia ratio) is correct). Incorrect setting may result in vibration which leads machine damage.
- DO NOT touch the servo motor or machine when automatic mechanical resonance suppression is under operation; fail to follow this instruction could lead to personnel injury.

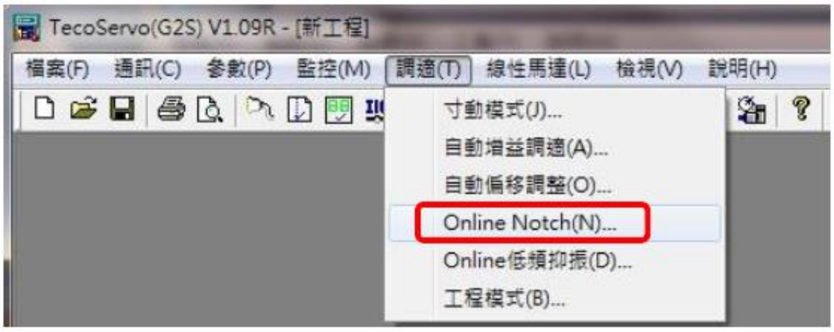
There are several methods used for this Device Resonance Suppression:

(1) Use panel keys to run automatic mechanical resonance suppression enablement selection parameter to look for suppression frequency

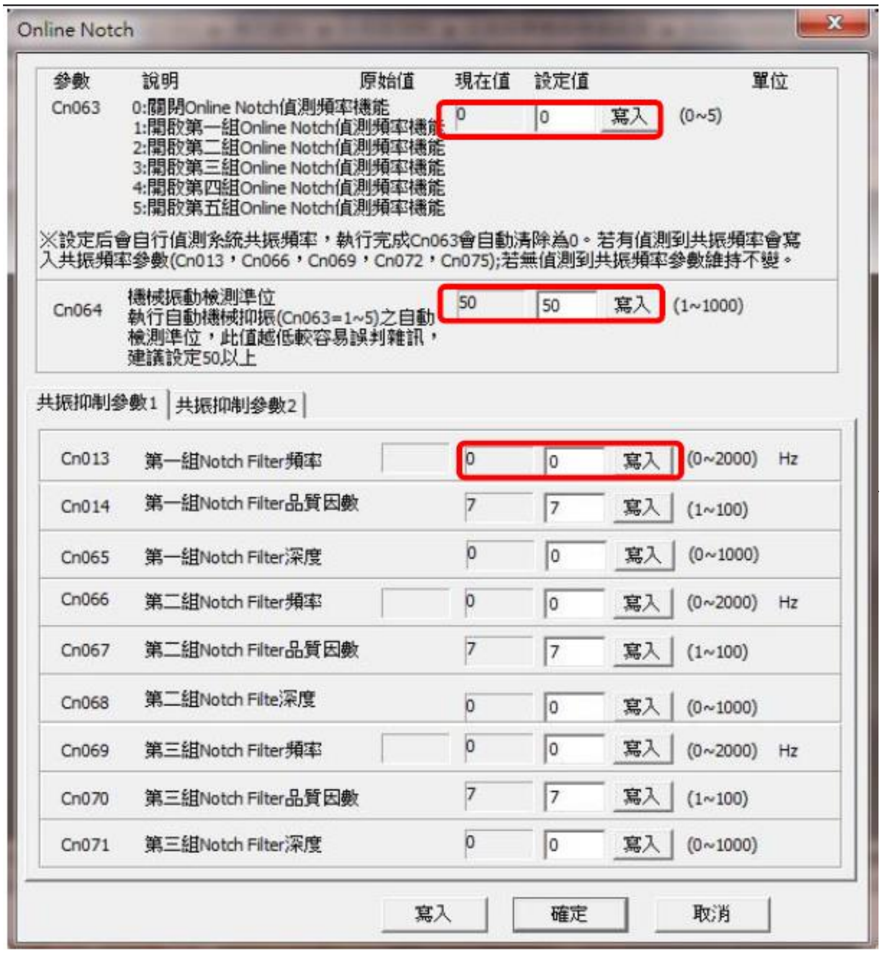
1. Set Cn064 (mechanical vibration detection level) according to requirement (recommend setting larger than 50)
2. When system suppression occurs, set Cn063.0 (automatic mechanical suppression enablement selection)=1~5 to enable automatic detection of mechanical vibration frequency.
3. When finding the resonance point, it will be stored in the driver and return Cn063.0 to 0 automatically (Disable Automatic Detection of Mechanical Vibration Frequency); if the resonance point cannot be found, Cn063.0 (Disable Automatic Detection of Mechanical Vibration Frequency) will return to 0 automatically after searching for resonance frequency for a period of time.

(2) <u>Use PC-Link to run automatic mechanical resonance suppression enablement selection parameter to look for suppression frequency</u>

1. Click "Tuning (T)" on the tool bar and select "Online Notch (N)"



2. Set Cn063.0 (automatic mechanical suppression enabling selection)=1~5 and select "write in" key to enable automatic detection of mechanical vibration frequency.
3. When finding the resonance point, it will be displayed in Notch Filter setting value column (Cn013, Cn066, Cn069, Cn072 & Cn075) and automatically return Cn063 (Disable Automatic Detection of Mechanical Vibration Frequency) to 0.
4. If the resonance point cannot be found, Cn063 (Disable Automatic Detection of Mechanical Vibration Frequency) will return to 0 automatically after finding the resonance frequency for a period of time.



Cn063.0 Automatic Mechanical Vibration Suppression Enabling Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 5	Effective after Set	0042H

Setting Description:

Setting	Description
0	Disable Automatic Detection of Mechanical Vibration Frequency
1	Enable Automatic Detection of First Set Mechanical Vibration Frequency
2	Enable Automatic Detection of Second Set Mechanical Vibration Frequency
3	Enable Automatic Detection of Third Set Mechanical Vibration Frequency
4	Enable Automatic Detection of Fourth Set Mechanical Vibration Frequency
5	Enable Automatic Detection of Firth Set Mechanical Vibration Frequency

Cn064 Mechanical Vibration Detection Level

Initial Value	Unit	Setting Range	Effective	RS-485 Address
50	--	1 ~ 1000	Effective after Set	0043H

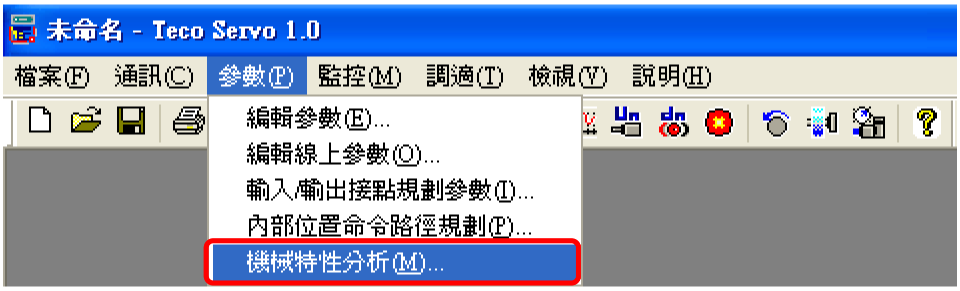
Setting Description: The automatic detection level when executing Automatic Mechanical Vibration Suppression (Cn063=1), the lower the value is, the more likely the noise is determined incorrectly, the recommended setting is 50 or higher.

(3) Use PC-Link to search for resonance frequency and further set Notch Filter

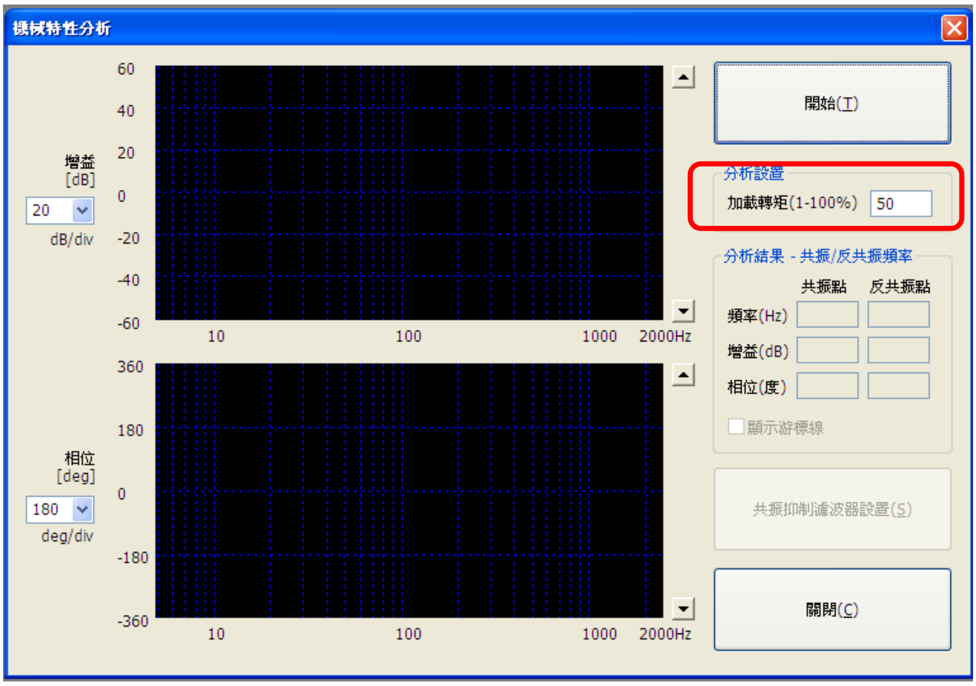
In addition to Automatic Search, the PC-Link Mechanical Characteristic Analysis can also be used to analyze the Resonance Frequency, and manually set **Cn013** (First Set Notch Filter Frequency) the frequency when vibration occurs, then in coordination with **Cn014** (First Set Notch Filter Quality Factor) to adjust the Frequency Range to be suppressed. The smaller the **Cn014** value is, the wider the frequency range of suppression, followed in coordination with **Cn065** (First Set Notch Filter Depth) to adjust the Depth Range to be suppressed, the User can adjust according to actual conditions. If there are multi-point resonances on the platform, please adjust the second to the fifth point Resonance Suppression Parameters of **Cn066~Cn077** in accordance with the setting method of the First Set.

※Attention! When Cn013, Cn066, Cn069, Cn072, Cn075 is set to zero, indicating the Notch Filter is not used.

1. On Tool Bar, click "Parameter(P)", and select "Mechanical Characteristics Analysis" option



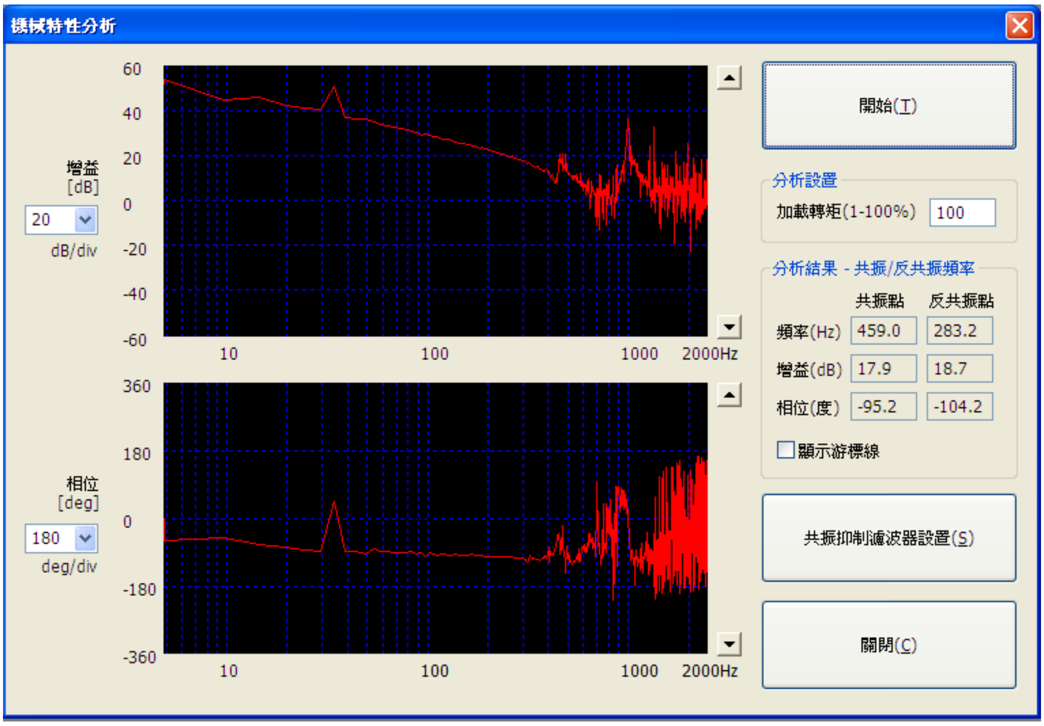
2. In the Mechanical Characteristic Analysis screen, Loading Torque can be selected, and the setting range is 1%~100%. The User can search in different Torque to increase the accuracy of search; the Loading Torque is based on not damaging the Machine as the standard, to estimate with different Loading Torques, and the Loading Torque too low may not enable the Machine to excite resonance, the variation in the Motor Current Feedback Signal Change is not large enough, causing the software unable to calculate the accurate vibration frequency correctly. The error setting of Resonance Frequency will cause the noise of the Machine to become more severe. It is recommended that the User can search for more than four times for each different Loading Torque, to increase the accuracy and judgment of the Frequency search.



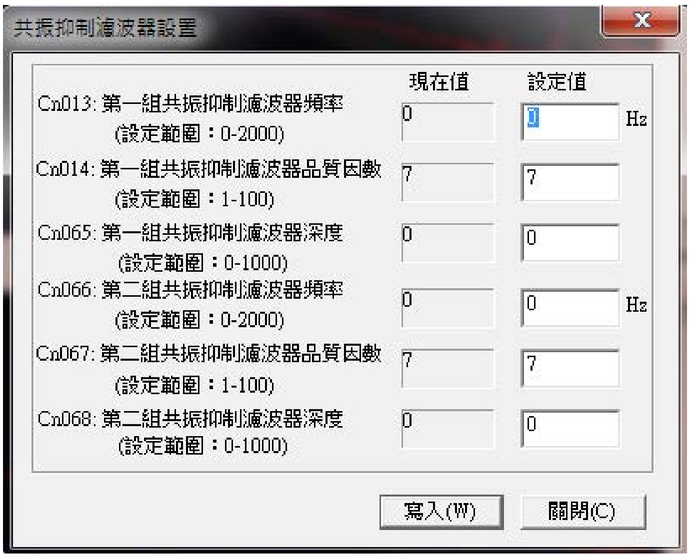
3. After completing the setting of the Loading Torque, press **"Start"** and the Driver will issue a high frequency signal to the Motor to capture the Mechanical Characteristics.

   The following Figure is an example to explain: In the Curve Diagram, it can be found that there is a low frequency Resonance Point around 34 Hz and there seems to be another Resonance Point at 459 Hz. The found Resonance Frequency can be input to the corresponding setting value according to the frequency:

- 34Hz: belongs to low frequency suppression frequency range (1~100Hz); set the value to the first set of low frequency suppression frequency **Pn339** in servo driver.
- 459Hz: belongs to resonance suppression range (above 100Hz); set the value to the first set of Notch Filter frequency **Cn013** in servo driver.



4. When resonance occurs in the system, users can key in “Notch Filter setting” on the interface. A window will pop up this time; Notch Filter can set at Cn013 for system resonance frequency judgement. If there’s another resonance frequency, it can be set at Cn066. After the setting is confirmed, users can key in “Write-in” to write in the set value into the system.



6-5 Low Frequency Vibration Suppression Function

Machine Tools Equipment are low-flexibility or rigid, which can easily cause the front end Low-frequency Vibration of the workpiece when the Motor in rapid acceleration / deceleration. This Device provides low-frequency vibration suppression function to eliminate this phenomenon, and the low-frequency vibration suppression is mainly used to perform vibration suppression on the vibration frequency below 100 Hz.

Pn339 / Pn341 / Pn343Low Frequency Suppression Frequency (First/Second/Third Set)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1000	0.1 Hz	10 ~ 1000	Effective after Set	0330H

Setting Description: Used to eliminate the Low Frequency Vibration generated by insufficient mechanism rigidity. When Pn340, Pn342, Pn344 are set to zero, this indicates the Low Frequency Suppression is not used.

Pn340 / Pn342 / Pn344Low Frequency Suppression Parameter (First/Second/Third Set)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 30	Effective after Set	0331H

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

⚠ Attention

- Low frequency vibration suppression can only be used under position control mode.
- When automatic low frequency vibration suppression is executed, system response before and after executing this function will change fiercely. To ensure the safety of operator, please execute this function under the condition when the emergency stop can be implemented at any time.
- When vibration does not occur in position offset of the vibration frequency is not within the detection frequency range, the frequency will not be detected. At this time, please use the equipment that is able to measure vibration frequency, such as a displacement meter or vibration meter, to measure the vibration.
- If the vibration cannot be cleared by using the automatically detected vibration frequency, it means the error may exist between the actual and the detected vibration frequencies. At this time, please fine-tune the detected vibration frequency.

This Driver has two methods of using Low Frequency Vibration Suppression:

(1) Use panel keys to run automatic mechanical resonance suppression enabling selection parameter to look for suppression frequency

1. Set Pn337 (automatic low frequency suppression delay) to adjust the delay time of automatically capturing suppression frequency and set Pn338 (low frequency swinging detection level) according to equipment needs.
2. Set Pn336.0 (automatic mechanical suppression enabling selection)=1~3 and click the "write in" key to enable automatic detection of low frequency vibration frequency.
3. When finding the low frequency vibration frequency, it will automatically store the low frequency vibration frequency into the driver parameter and return Pn336.0 to 0 (disable automatic detection of low frequency vibration frequency). If low frequency vibration frequency cannot be found, Pn336.0 automatically returns to 0 (disable automatic detection low frequency vibration frequency) after searching for low frequency vibration frequency for a period of time.

Attention

- **If users wish to use Automatic Low Frequency Suppression Function, the Stop Time needs to be 1.5 Seconds + Time of Pn337.**
- **When Pn340, Pn342, Pn344 are set to zero, this indicates the Low Frequency Suppression is not used.**

Pn336.0 Automatic Low Frequency Vibration Suppression Enablement Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Effective after Set	032DH

Setting Description:

Setting	Description
0	Disable Automatic Detection of Low Frequency Vibration Frequency
1	Enable Automatic Detection of Low Frequency Vibration Frequency 1
2	Enable Automatic Detection of Low Frequency Vibration Frequency 2
3	Enable Automatic Detection of Low Frequency Vibration Frequency 3

Pn337 Automatic Low Frequency Vibration Suppression Delay

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	1ms	0 ~ 1000	Effective after Set	032EH

Setting Description: Automatically detects the Delay Time of Low Frequency Vibration Frequency

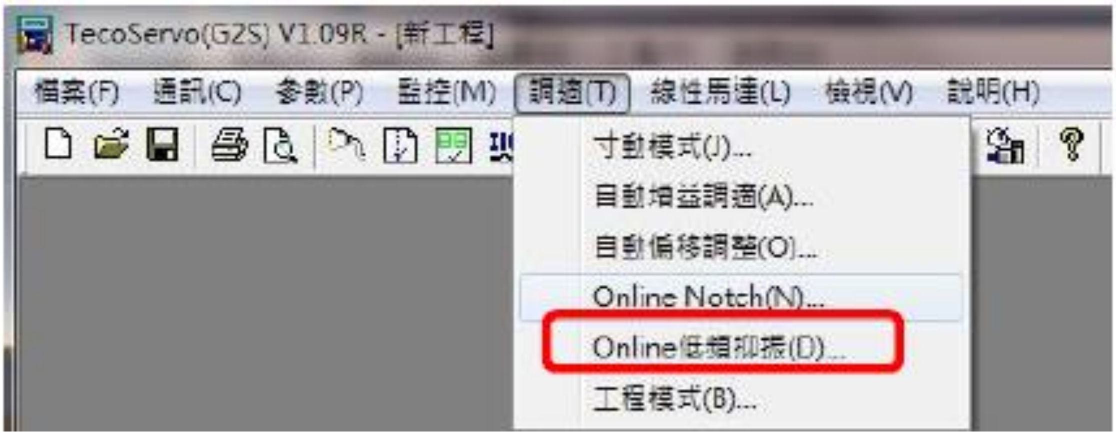
Pn338 Low Frequency Swinging Detection Level

Initial Value	Unit	Setting Range	Effective	RS-485 Address
50	0.1 %	1 ~ 1000	Effective after Set	032FH

Setting Description: The detection level when executing automatic low frequency vibration suppression (Pn336=1~3), this value setting method is used to set the percentage of the positioning completion determined value (Pn307), adjusting the low frequency swinging detection level (Pn338) can adjust the detection sensitivity, and the lower the setting the easier for the noise to be determined incorrectly.

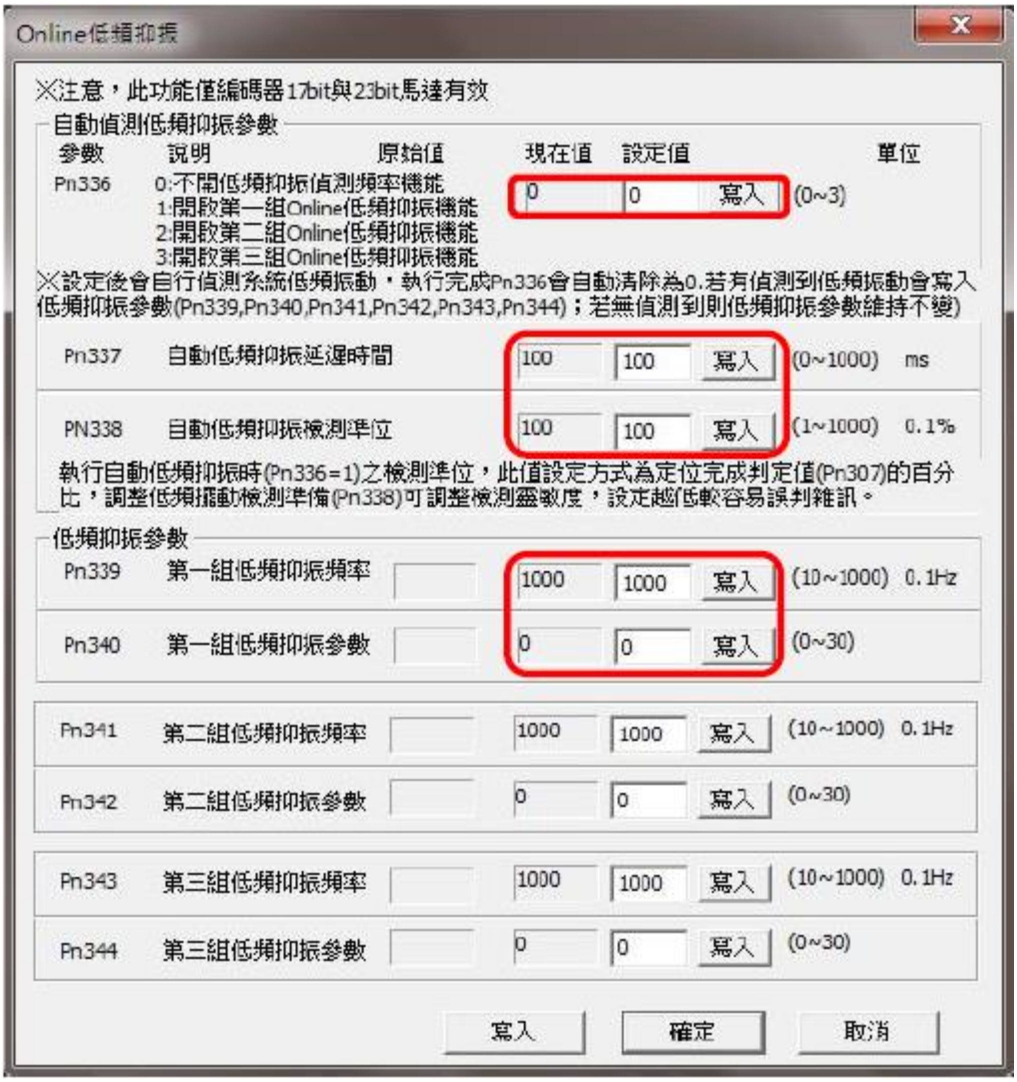
(2) Use PC-Link to run automatic mechanical resonance suppression enablement selection to look for suppression frequency

1. Click "Tuning (T)" on the tool bar and select "Online Low Frequency Suppression (D)"



2. Set Pn336.0 (automatic mechanical suppression enablement selection)=1~3 and click the "write in" key to enable automatic detection of low frequency vibration frequency.
3. When the low frequency vibration frequency is found, it will be displayed in low frequency vibration frequency setting value column (Pn339, Pn341, Pn343). Low frequency suppression parameter will also be set (Pn340, Pn342, Pn344) and return Pn336.0 to 0 automatically.

4. If low frequency vibration frequency cannot be found, Pn336.0 automatically returns to 0 after searching for low frequency vibration frequency for a period of time.



6-6 Manual Gain Adjustment

Speed Control Mode Manual Gain Adjustment

Step 1: Set the Rigidity Level and receive correct Load Inertia Ratio, can refer to 6-3 Automatic Gain Adjustment Instructions and 6-9 Online-Auto Tuning (Inertia Only Displays) to obtain Load Inertia Ratio.

Step 2: If this Device (Speed Control) forms position control with the Supervisory Controller, set the Position Loop Gain of the Supervisory Controller to a relatively low value.

Step 3: Manually adjust **Sn211** (Speed Loop Gain 1):

First set the **Sn212** (Speed Loop Integration Time Constant 1) higher than the value after being adjusted by automatic gain, and then increase the speed loop gain until no vibration or noise is generated. Then, adjust the speed loop gain slightly and increase the position loop gain of the supervisory controller until no vibration or noise is generated.

Step 4: Manually adjust **Sn212** (Speed Loop Integration Time Constant 1):

Decrease the Speed Loop Integral Time Constant under the premise of no mechanical vibration is generated and shortens the settling time.

Step 5: Finally, slowly fine tune the Speed Loop Gain, Position Loop Gain of the Supervisory Controller and the Speed Loop Integration Time Constant to adjust the system operation to the optimum response.

Position Control Mode Manual Gain Adjustment

Step 1: Set the Rigidity Level and receive correct Load Inertia Ratio, can refer to 6-3 Automatic Gain Adjustment Instructions and 6-9 Online-Auto Tuning (Inertia Only Displays) to obtain Load Inertia Ratio.

Step 2: Set **Pn310** (Position loop gain 1) as the value lower than the one after automatic gain adjustment.

Step 3: Increase torque command filter Cn034 under the condition no system vibration occurs.

Step 4: Increase speed loop gain Sn211 as much as possible and decrease speed integration time constant Sn212 under the condition no system vibration occurs.

Step 5: Repeat step 3 & 4; when vibration or noise occurs, return current parameters of Sn211 & Sn212 10%~20%.

Step 6: Manually adjust **Pn310** (Position Loop Gain 1):

Then, adjust the speed loop gain slightly, and increase the position loop gain until no vibration or noise is generated.

Step 7: Finally, slowly fine tune the Speed Loop Gain, Position Loop Gain as well as the Speed Loop Integration Time Constant to adjust the system operations to the optimum response.

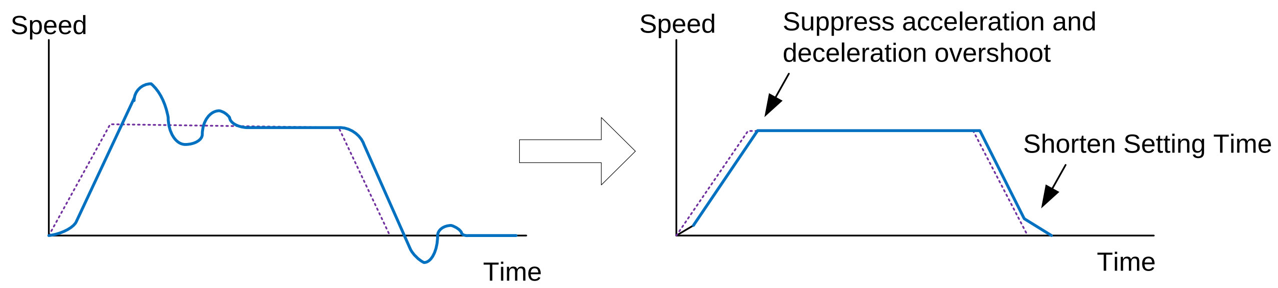
6-7 Gain Switching Function

The Gain Switching Function of this Device can be divided into two types of Speed Loop Gain PI/P Switching and Two-stage Gain Switching. The purposes of the function are as follows:

(1) In Speed Control, suppress the Acceleration / Deceleration overshoot.

(2) In Position Control, suppress the amplitude of oscillations caused by positioning and shortens the settling time.

(3) Can reduce the use of the Servo Lock function that causes a harsh noise.



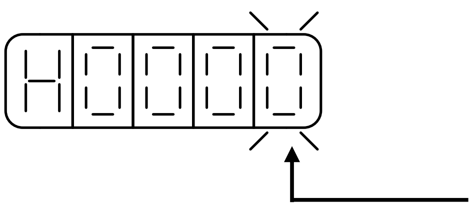
6-7-1 PI/P Switching Mode

Before using the PI/P Switching Mode, select **Cn015.0** (PI/P Mode Switching Determination Type Selection) first, and set the switching condition of PI/P Mode in the relative parameters, the description is as follows:

Cn015.0 PI/P Mode Switching Determination Type Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
4	--	0 ~ 4	Effective after Confirmed	0010H

Setting Description:



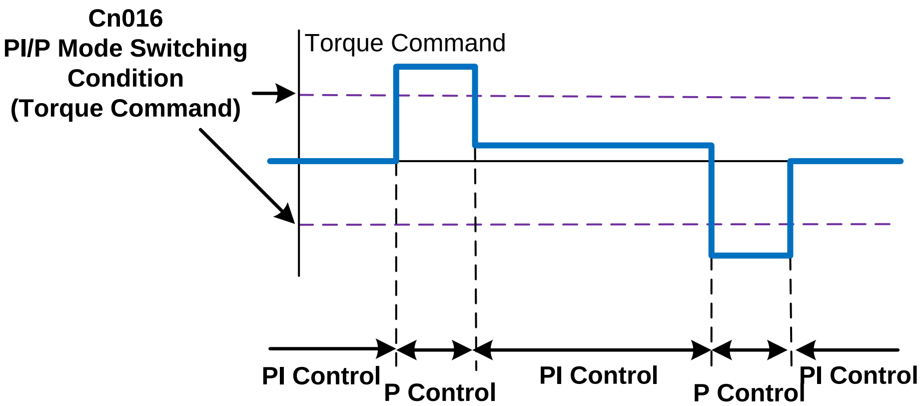
Setting	Description
0	Determine if the Torque Command is greater than Cn016
1	Determine if the Speed Command is greater than Cn017
2	Determine if the Acceleration Command is greater than Cn018
3	Determine if the Position Error is greater than Cn019
4	Use Input Contact PCNT to switch

(1) Determine the Torque Command to switch PI/P Mode

When the Torque Command is smaller than the **Cn016** Switching Condition, it is PI control; when the Torque Command is greater than the **Cn016** Switching Condition, then switch to only P Control, the schematic diagram is as follows:

Cn016 PI/P Mode Switching Condition (Torque Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	%	0 ~ 399	Effective after Confirmed	0011H

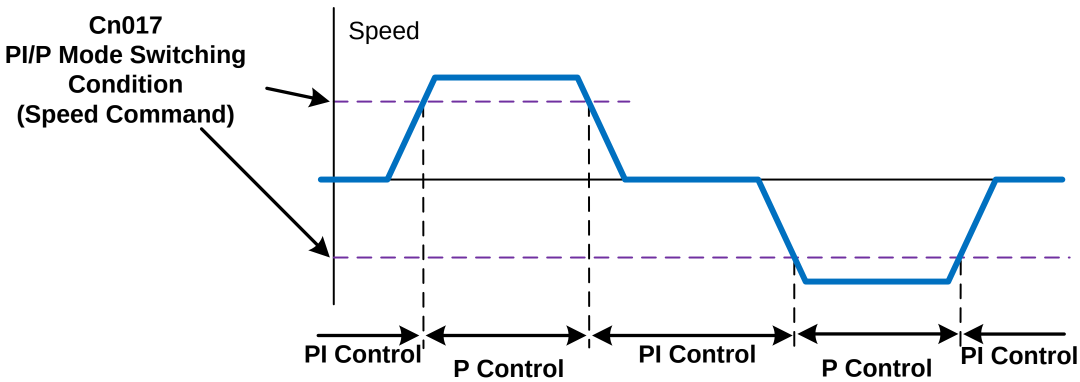


(2) Determine the Speed Command to switch to PI/P Mode

When the Speed Command is smaller than the **Cn017** Switching Condition, it is PI control; when the Speed Command is greater than the **Cn017** Switching Condition, then switch to only P Control, the schematic diagram is as follows:

Cn017 PI/P Mode Switching Condition (Speed Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rpm	0 ~ 1.5*Rated Speed	Effective after Confirmed	0012H

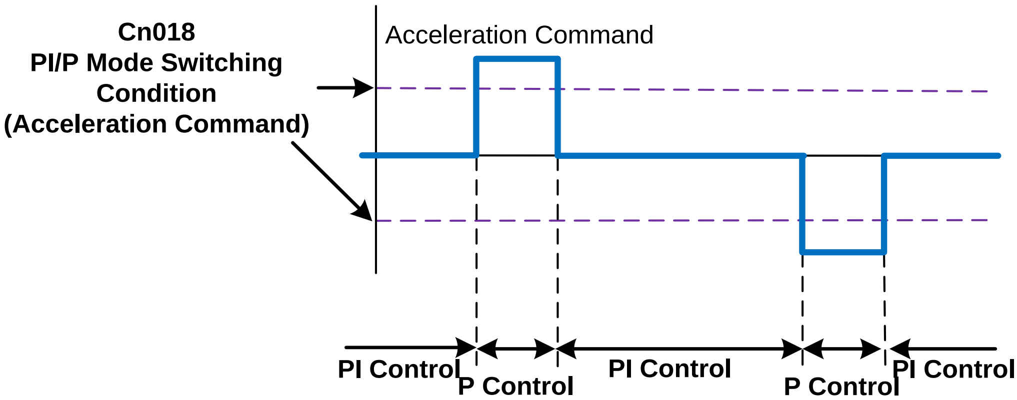


(3) Determine the Acceleration Command to switch to PI/P Mode

When the Acceleration Command is less than the **Cn018** switching condition, it is PI control; when the Acceleration Command is greater than the **Cn018** switching condition, then switch to P control only, the schematic diagram is as follows:

Cn018 PI/P Mode Switching Condition (Acceleration Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rps/s	0 ~ 18750	Effective after Confirmed	0013H

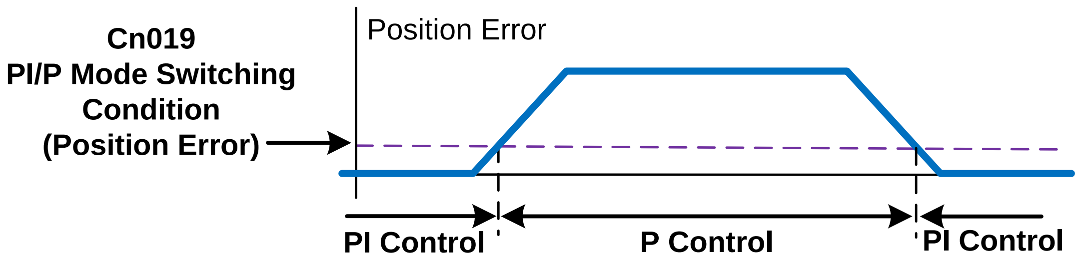


(4) Determine the Position Error to switch to PI/P Mode

When the Position Error is less than the **Cn019** switching condition, it is PI control. When the Position Error is greater than the **Cn019** switching condition, then switch to P control only, the schematic diagram is as follows:

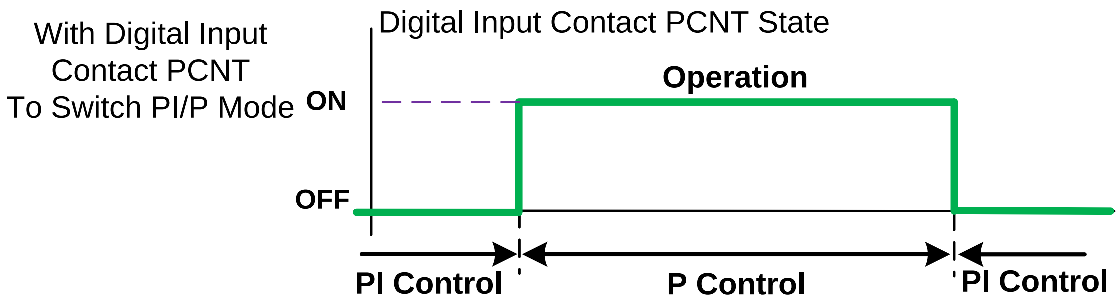
Cn019 PI/P Mode Switching Condition (Position Error)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	0 ~ 41943040	Effective after Confirmed	0014H/0015H



(5) Use Digital Input Contact **PCNT** to switch PI/P Mode

When the Digital Input Contact **PCNT** does not operate, it is PI Control, when the Digital Input Contact **PCNT** operates, then switch to P Control only, the schematic diagram is as follows:



Note) Please refer to 5-6-1 Input / Output Contact Function Planning to set the Driver Effective Logic.

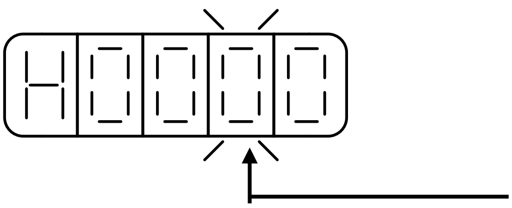
6-7-2 Two Stage Gain Switching Mode

Before using the Two Stage Gain Switching Mode, select **Cn015.1** (Two Stage Gain Mode Switching Determination Type Selection), and set the switching condition of the Two Stage Gain Mode in the relative parameters. The difference of this mode from the PI/P Switching Mode is the addition of the capability to set the Switching Delay Time and Switching Time, the description is as follows:

Cn015.1 Two Stage Gain Mode Switching Determination Type Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
4	--	0 ~ 4	Effective after Confirmed	0010H

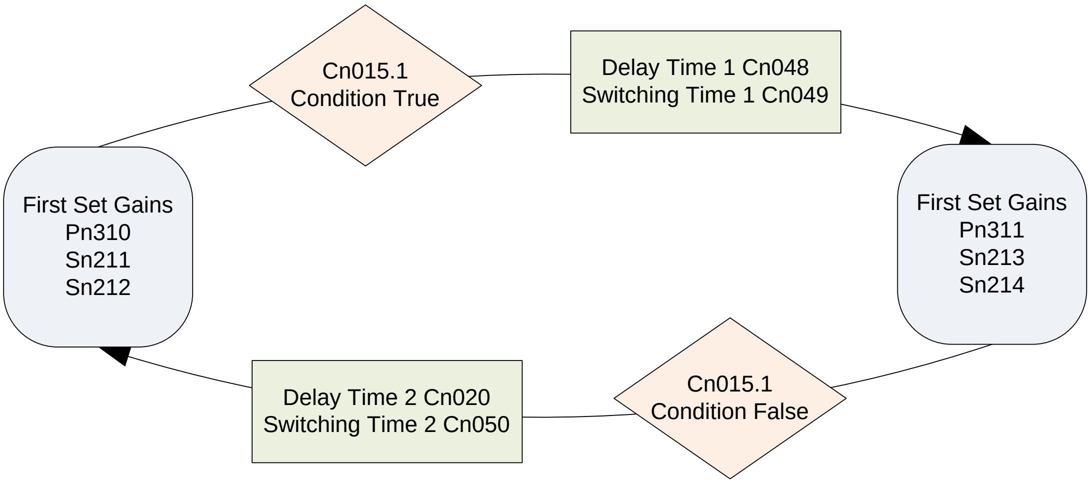
Setting Description:



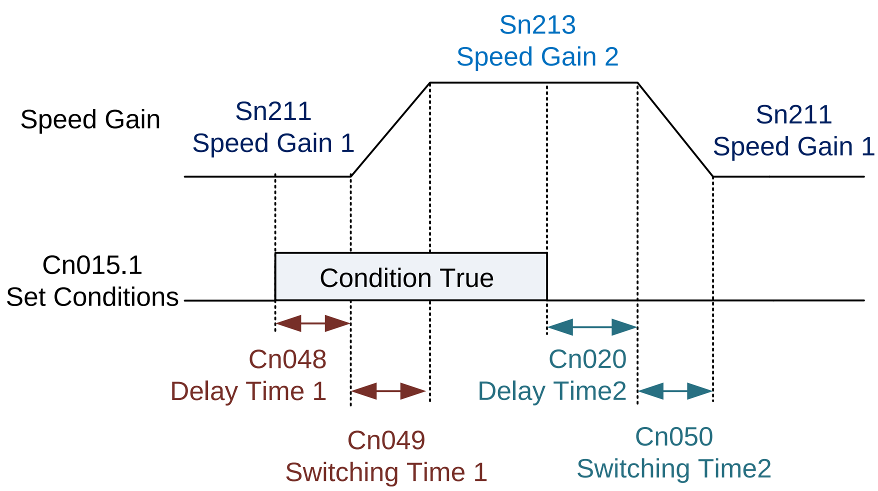
Setting	Description
0	Determine if the Torque Command is greater than Cn021
1	Determine if the Speed Command is greater than Cn022
2	Determine if the Acceleration Command is greater than Cn023
3	Determine if the Position Error is greater than Cn024
4	Use Input Contact G-SEL to switch

Switch Gain Combination

Switch Gain	Position Loop Gain	Speed Loop Gain	Speed Integration Time Parameter
First Gain	Pn310	Sn211	Sn212
Second Gain	Pn311	Sn213	Sn214



The relationship between Delay Time and Switching Time when switching gains:



Cn020 Two Stage Gain Mode Switching Delay Time 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0016H

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the Second Stage Gain to the First Stage Gain can be set.

Cn048 Two Stage Gain Mode Switching Delay Time 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0033H

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the First Stage Gain to the Second Stage Gain can be set.

Cn049 Two Stage Gain Mode Switching Time 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0034H

Setting Description: When using Two Stage Gain Mode, the Conversion Time from the First Stage Gain to the Second Stage Gain can be set.

Cn050 Two Stage Gain Mode Switching Time 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0035H

Setting Description: When using Two Stage Gain Mode, the Conversion Time from the Second Stage Gain to the First Stage Gain can be set.

<u>(1) Determine Torque Command to Switch to the Two Stage Gain Mode</u>

When the Torque Command is less than the **Cn021** switching condition, use the first stage to gain control. When the Torque Command is greater than the **Cn021** switching condition, then switch to the second stage gain control. If the Torque Command is less than the **Cn021** switching condition again, it will switch to the first stage gain control.

Cn021 Two Stage Gain Mode Switching Condition (Torque Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	%	0 ~ 399	Effective after Confirmed	0017H

<u>(2) Determine Speed Command to Switch Two Stage Gain Mode</u>

When the Speed Command is less than the **Cn022** switching condition, use the first stage gain control; when the Speed Command is greater than the **Cn022** switching condition, then switch to the second stage gain control. If the Speed Command is less than the **Cn022** switching condition again, it will switch to the first stage gain control.

Cn022 Two Stage Gain Mode Switching Condition (Speed Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rpm	0 ~ 1.5*Rated Speed	Effective after Confirmed	0018H

(3) Determine Acceleration Command to Switch Two Stage Gain Mode

When the Acceleration Command is less than the **Cn023** switching condition, use the first stage gain control; when the Acceleration Command is greater than the **Cn023** switching condition, then switch to the second stage gain control. If the Acceleration Command is less than the **Cn023** switching condition again, it will switch to the first stage gain control.

Cn023 Two Stage Gain Mode Switching Condition (Acceleration Command)

Initial Value	Unit	Setting Range	Effective	RS-485
0	rps/s	0 ~ 18750	Effective after Confirmed	0019H

(4) Determine Position Error to Switch Two Stage Gain Mode

When the Position Error is less than the **Cn024** switching condition, use the first stage gain control; when the Position Error is greater than the **Cn024** switching condition, then switch to the second stage gain control. If the Position Error is less than the **Cn024** switching condition again, it will switch to the first stage gain control.

Cn024 Two Stage Gain Mode Switching Condition (Position Error)

Initial Value	Unit	Setting Range	Effective	RS-485
0	pulse	0 ~ 41943040	Effective after Confirmed	001AH/001BH

(5) Use Digital Input Contact **G-SEL** to switch to the Two-stage Gain Mode

When the Digital Input Contact **G-SEL** does not operate, use the first stage gain control; when the Digital Input Contact **G-SEL** operates, then switch to the second stage gain control. If the Digital Input Contact **G-SEL** does not operate again, it will switch to the first stage gain control.

6-8 Improved Response Characteristics

The Server provides gain switching function and position loop feed forward gains to improve system response. Attention! These two functions must be used correctly to improve the response characteristics, otherwise the response will deteriorate. Description as follows:

Gain Switching Function

The Gain Switching Function of this Device can be divided into two types of Speed Loop Gain PI/P Switching and Two Stage Gain Switching. The purpose of this function is as follows:

(1) In Speed Control, suppress the Acceleration / Deceleration overshoot.

(2) In Position Control, suppress the amplitude of oscillations caused by positioning and shortens the settling time.

(3) Can reduce the use of the Servo Lock function that causes a harsh noise.

Please refer to "6-7 Gain Switching Function" for detailed description.

Position Loop Feed Forward Gain

The use of Position Loop Feed Forward Gain can reduce the Position Control following error and speed up the reaction speed. If the Position Loop Gain is large enough, the effect of this function is not significant, therefore, it is suitable to be used in the system that it cannot adjust the Position Loop Gain high enough and wants to increase the response speed.

Adjust Steps are as follows:

Step 1: Adjust Speed and Position Loop in accordance with the steps specified in"6-6 Manual Gain Adjustment".

Step 2: Slowly increase **Pn312** (Position Loop Feed Forward Gain), and observe the Output Contact **INP** (Positioning Completion Signal) at the same time to enable rapid output and shorten the settling time. Make sure the Position Loop Feed Forward Gain is not be too high. Excessive Feed Forward Gain can cause speed overshoot and the digital Output Contact **INP** (Positioning Completion Signal) turns on and off repeatedly.

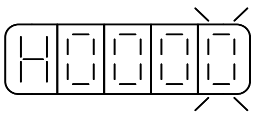
6-9 OnLine-AutoTuning (Inertia Only Displays)

If the User does not understand the Actual Inertia Ratio, the OnLine-AutoTuning (Inertia only Displays) function can be used. In case of supervisory controller issues Motion Control, the Driver will perform the Inertia evaluation and generate the Inertia Ratio result to Un-45 “OnLine_AutoTuning Inertia Estimation”

Cn059.0 AutoTuning Enablement Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 2	Effective after Set	003EH

Setting Description:



Setting	Description
0	Disable AutoTuning
1	Enable OFFLine-AutoTuning
2	Enable OnLine-AutoTuning (Inertia Only Displays)

Chap 7 Parameter function

TECO

7-1 Parameter Group Description

■ Parameter Group

Code	Description	Code	Description
Un-xx	Status Display Parameter	dn-xx	Diagnostic Parameter
AL0xx	Error Alarm History Parameter	Cn0xx	System parameter (including CANopen parameter)
Tn1xx	Torque Control Parameter	Sn2xx	Speed Control Parameter
Pn3xx	Position Control Parameter	Pn4xx	Point to Point Position Control Parameter
qn5xx	Shortcut Parameter	Hn6xx	Multifunction Contact Planning Parameter
ECAxx	E-Cam parameter	En7xx	CiA 402 parameter

■ Control Mode

Code	Description	Code	Description
ALL	All Types of Control	Pt	Turret Control
Pi	Position Control (Internal Position Command)	S	Speed Control
Pe	Position Control (External Pulse Command)	T	Torque Control
Cob CoC	CANopen Control	EC	EtherCAT Control

■ Parameter Effective Method

Code	Description
★	Must turn on power supply again, the setting value can be effective.
◆	Pressing the Enter Key is not required, effective immediately after the setting value is set.
▲	Parameter can be effective after Servo Off
○	It is necessary to set Cn029 parameter=1; function becomes effective after rebooting.
--	Press Enter Key to make the changed setting value become effective immediately.

■ Cn029 (parameter reset) effect

Code	Description
●	This parameter is not subject to Cn029 Factory Re-set (value does not change).
--	Return the value to factory default by Cn029 factory reset.

7-2 Parameter Function List

System Parameter (Cn0□□)

	Parameter Code	Name and Function	Unit	RS485	Index
★●	Cn001	Control Mode Selection	-	0001H	2001H
★	Cn002.0	Auxiliary function—Digitalinput contact SON function selection	-	0002H	2002H
★	Cn002.1	Auxiliary function—Digitalinput contact CCWL & CWL function selection			
★	Cn002.3	EMC Re-set Mode Selection			
--	Cn003	Mechanical Brake Signal Output Time	ms	0003H	2003H
--	Cn004.0	Motor Rotation Direction Definition (from the Motor Load End)	-	0004H	2004H
★	Cn005	Encoder Signal Dividing Output	pulse	0005H/0006H	2005H
--	Cn006.0	Analog monitor output MON1 **(Note 1)**	-	0007H	2006H
--	Cn006.1	Analog monitor output MON2 **(Note 1)**			
--	Cn007	Speed Reached Determined Value	rpm	0008H	2007H
--	Cn008.0	Brake Mode	-	0009H	2008H
★	Cn009.0	CW/CCW Drive Prohibited Method	-	000AH	2009H
--	Cn010	CCW Direction Torque Command Limit Value	%	000BH	200AH
--	Cn011	CW Direction Torque Command Limit Value	%	000CH	200BH
--	Cn012	External Regenerative Resistor Power Setting	W	000DH	200CH
--	Cn013	First Set Notch Filter Frequency	Hz	000EH	200DH
--	Cn014	First Set Notch Filter Quality Factor	-	000FH	200EH
--	Cn015.0	Switching Determination Type Selection of PI/P Mode	-	0010H	200FH
--	Cn015.1	Switching Determination Type Selection of Two Stage Gain Mode			
--	Cn016	Switching Condition of PI/P Mode (Torque Command)	%	0011H	2010H
--	Cn017	Switching Condition of PI/P Mode (Speed Command)	rpm	0012H	2011H
--	Cn018	Switching Condition of PI/P Mode (Acceleration Command)	rps/s	0013H	2012H
--	Cn019	Switching Condition of PI/P Mode (Position Error Command)	pulse	0014H/0015H	2013H
--	Cn020	Switching Delay Time 2 of Two Stage Gain Mode	0.2ms	0016H	2014H
--	Cn021	Switching Condition of Two Stage Gain Mode (Torque Command)	%	0017H	2015H
--	Cn022	Switching Condition of Two Stage Gain Mode (Speed Command)	rpm	0018H	2016H
--	Cn023	Switching Condition of Two Stage Gain Mode (Acceleration Command)	rps/s	0019H	2017H
--	Cn024	Two Stage Gain Mode Switching Condition (Position Error)	pulse	001AH/001BH	2018H
--	Cn025	Load Inertia Ratio	0.1	001CH	2019H

	Parameter Code	Name and Function	Unit	RS485	Index
--	Cn026	Rigidity Setting	-	001DH	201AH
●	Cn027	Analog monitoring output 1 offset adjustment **(Note 1)**	40mV	001EH	201BH
●	Cn028	Analog monitoring output 2 offset adjustment **(Note 1)**	40mV	001FH	201CH
★	Cn029	Parameter Reset	-	0020H	201DH
★●	Cn030	Serialized Model Setting	-	0021H	201EH
--	Cn031.0	Fan Operation Setting (only applicable to models equipped with fan)	-	0022H	201FH
--	Cn031.1	Low-voltage Protection (AL001) Automatic Reset Selection			
★	Cn031.2	Absolute Value Encoder Battery Error Alarm Output			
○●	Cn031.3	Motor Series Selection			
--	Cn032	Speed Feedback Smoothing Filter	Hz	0023H	2020H
--	Cn033	Speed Forward Feed Smoothing Filter	Hz	0024H	2021H
--	Cn034	Torque Command Smoothing Filter	Hz	0025H	2022H
--	Cn035	Panel Status Display Content Selection	-	0026H	2023H
★	Cn036	RS-485 ID Setting	-	0027H	2024H
★	Cn037.0	RS-485 Communication Transmission Rate	-	0028H	2025H
★	Cn037.2	RS-485 Communication Write Selection			
★	Cn038	RS-485 Communication Protocol	-	0029H	2026H
★	Cn039	RS-485 Communication Timeout Setting	sec	002AH	2027H
★	Cn040	RS-485 Communication Response Delay Time	0.5ms	002BH	2028H
--	Cn041.0	Absolute Type Encoder Multiple Number of Revolution Clearing Function	-	002CH	2029H
--	Cn043	Analog monitoring output MON1 output proportion **(Note 1)**	%	002EH	202BH
--	Cn044	Analog monitoring output MON2 output proportion **(Note 1)**	%	002FH	202CH
--	Cn048	Switching Delay Time 1 of Two Stage Gain Mode	0.2ms	0033H	2030H
--	Cn049	Switching Time 1 of Two Stage Gain Mode	0.2ms	0034H	2031H
--	Cn050	Switching Time 2 of Two Stage Gain Mode	0.2ms	0035H	2032H
--	Cn051	Low Voltage Protection Level	V	0036H	2033H
--	Cn052	Low Voltage Protection Alarm Delay Time	250ms	0037H	2034H
--	Cn053.0	Current Offset Automatic Correction (can be used only in Servo Off)	-	0038H	2035H
--	Cn054	Driver alarm setting (AL001~AL016)	-	0039H	2036H
--	Cn055	Driver Warning Delay Trigger Alarm Time	10ms	003AH	2037H
--	Cn056	Second Stage CCW Direction Torque Command Limit Value	%	003BH	2038H
--	Cn057	Second Stage CW Direction Torque Command Limit Value	%	003CH	2039H

	Parameter Code	Name and Function	Unit	RS485	Index
--	Cn058	Delay Time of Switch Stage 1 Torque Limit to Stage 2 Torque Limit	4ms	003DH	203AH
--	Cn059.0	AutoTuning Enabling Selection	-	003EH	203BH
--	Cn060	OFFLine-tuning Operation Command Number of Revolutions Setting	rev	003FH	203CH
--	Cn061	OFFLine-tuning Operation Maximum Speed	rpm	0040H	203DH
--	Cn063.0	Automatic Mechanical Vibration Suppression Enablement Selection	-	0042H	203FH
--	Cn064	Mechanical Vibration Detection Level	-	0043H	2040H
--	Cn065	First Set Notch Filter Depth	-	0044H	2041H
--	Cn066	Second Set Notch Filter Frequency	Hz	0045H	2042H
--	Cn067	Second Set Notch Filter Quality Factor	-	0046H	2043H
--	Cn068	Second Set Notch Filter Depth	-	0047H	2044H
--	Cn069	Third Set Notch Filter Frequency	Hz	0048H	2045H
--	Cn070	Third Set Notch Filter Quality Factor	-	0049H	2046H
--	Cn071	Third Set Notch Filter Depth	-	004AH	2047H
--	Cn072	Fourth Set Notch Filter Frequency	Hz	004BH	2048H
--	Cn073	Fourth Set Notch Filter Quality Factor	-	004CH	2049H
--	Cn074	Fourth Set Notch Filter Depth	-	004DH	204AH
--	Cn075	Fifth Set Notch Filter Frequency	Hz	004EH	204BH
--	Cn076	Fifth Set Notch Filter Quality Factor	-	004FH	204CH
--	Cn077	Fifth Set Notch Filter Depth	-	0050H	204DH
--	Cn097	Motor disconnection protection flag	-	0064H	--
--	Cn098	Motor cable disconnection detection time	ms	0065H	--

CANopen parameter (Cn0□□) ※ Only JSDG2S model contains this function

	Parameter Code	Name and Function	Unit	RS485	Index
★	Cn078.0	CANopen communication write-in selection **(Note 2)**	-	0051H	204EH
★	Cn078.2	CANopen communication transmission rate **(Note 2)**	-	0051H	204EH
★	Cn079	CANopen ID setting **(Note 2)**	-	0052H	204FH
★	Cn095	CANopen detect bus off and disconnection level **(Note 2)**	-	0062H	205FH
★	Cn096	CANopen disconnection clearing comparison level **(Note 2)**	-	0063H	2060H

Torque Control Parameter (Tn1□□)

	Parameter Code	Name and Function	Unit	RS485	Index
▲	Tn101.0	Torque Command Acceleration / Deceleration Method	-	0101H	2101H
▲	Tn101.1	Torque Command Selection			

	Parameter Code	Name and Function	Unit	RS485	Index
▲	Tn101.2	Speed Limit Value Switching Function			
▲	Tn102	Torque Command Linear Acceleration / Deceleration Constant	ms	0102H	2102H
--	Tn103	Analog Torque Command Proportioner **(Note 1)**	%/10V	0103H	-
--	Tn104	Analog Torque Command Offset Adjustment **(Note 1)**	mV	0104H	-
--	Tn105	Internal Speed Limit 1	rpm	0105H	2105H
--	Tn106	Internal Speed Limit 2	rpm	0106H	-
--	Tn107	Internal Speed Limit 3	rpm	0107H	-
--	Tn108	Torque Reached Determined Value	%	0108H	2108H
--	Tn109	Analog Speed Limit Proportioner **(Note 1)**	rpm	0109H	-
▲	Tn110	Torque Command One Time Smoothing Acceleration / Deceleration Constant	ms	010AH	210AH
--	Tn113	Digital Torque Command Value	0.1%	010DH	-
--	Tn114	Forward Rotational Speed Limit Value	rpm	010EH	-
--	Tn115	Reverse Rotational Speed Limit Value	rpm	010FH	-

Speed Control Parameter (Sn2□□)

	Parameter Code	Name and Function	Unit	RS485	Index
--	Sn201	Internal Speed Command 1	rpm	0201H	2201H
--	Sn202	Internal Speed Command 2	rpm	0202H	-
--	Sn203	Internal Speed Command 3	rpm	0203H	-
--	Sn204.0	Operation of Zero Speed Determination Established	-	0204H	2204H
--	Sn205.0	Speed Command Acceleration / Deceleration Method	-	0205H	2205H
--	Sn206	Speed Command One Time Smoothing Acceleration / Deceleration Time Constant	ms	0206H	2206H
--	Sn207	Speed Command Linear Acceleration / Deceleration Time Constant	ms	0207H	2207H
--	Sn208	S-type Speed Command Acceleration / Deceleration Time Setting	ms	0208H	2208H
--	Sn209	S-type Speed Command Acceleration Time Setting	ms	0209H	2209H
--	Sn210	S-type Speed Command Deceleration Time Setting	ms	020AH	220AH
--	Sn211	Speed Loop Gain 1	Hz	020BH	220BH
--	Sn212	Speed Loop Integration Time Constant 1	0.01ms	020CH	220CH
--	Sn213	Speed Loop Gain 2	Hz	020DH	220DH
--	Sn214	Speed Loop Integration Time Constant 2	0.01ms	020EH	220EH
--	Sn215	Zero Speed Determined Value	rpm	020FH	220FH
--	Sn216	Analog Speed Command Proportioner **(Note 1)**	rpm/10V	0210H	-
--	Sn217	Analog Speed Command Offset Adjustment **(Note 1)**	mV	0211H	-
--	Sn218	Analog Speed Command Limit **(Note 1)**	rpm	0212H	-

Position Control Parameter (Pn3□□)

	Parameter Code	Name and Function	Unit	RS485	Index
★	Pn301.0	Position Pulse Command pattern Selection	-	0301H	-
★	Pn301.1	Position Pulse Command Logic Selection			
★	Pn301.2	Drive Prohibited Command Receiving Selection			
★	Pn301.3	Position Pulse Command Filter Width Selection			
--	Pn302	Electronic Gear Ratio Numerator 1	-	0302H/0303H	-
--	Pn303	Electronic Gear Ratio Numerator 2	-	0304H/0305H	-
--	Pn304	Electronic Gear Ratio Numerator 3	-	0306H/0307H	-
--	Pn305	Electronic Gear Ratio Numerator 4	-	0308H/0309H	-
★	Pn306	Electronic Gear Ratio Denominator	-	030AH/030BH	-
--	Pn307	Positioning Completion Determined Value	pulse	030CH/030DH	2307H
--	Pn308	Positive Maximum Position Error Determined Value	0.001rev	030EH	2308H
--	Pn309	Negative Maximum Position Error Determined Value	0.001rev	030FH	230AH
--	Pn310	Position Loop Gain 1	rad/s	0310H	230BH
--	Pn311	Position Loop Gain 2	rad/s	0311H	230CH
--	Pn312	Position Loop Feed Forward Gain	%	0312H	230DH
★	Pn313	Internal / External Position Command One time Smoothing Acceleration / Deceleration Time Constant	ms	0313H	230EH
★	Pn314.0	Position Command Direction Definition (from the Motor Load End)	-	0314H	-
--	Pn315.0	Pulse Error Clearing Mode	-	0315H	-
★	Pn316.0	Internal Position Command Mode	-	0316H	2310H
★	Pn316.1	Internal Position Command Hold (PHOLD) Procedure Selection			
★	Pn316.2	Encoder Signal Dividing Output Phase Sequence			
★	Pn316.3	Encoder Signal Dividing Output Frequency Elimination			
--	Pn317.0	After activated Return to Origin, the Origin Search Direction and Select Origin Reference Point Setting	-	0317H	-
--	Pn317.1	After Found Origin Reference Point, the Moving Method of Search Mechanical Origin Setting			
--	Pn317.2	Return to Origin Activation Mode Setting			
--	Pn317.3	Stop Mode after Found Mechanical Origin Setting			
--	Pn318	Return to Origin First Stage High Speed	rpm	0318H	-
--	Pn319	Return to Origin Second Stage Low Speed	rpm	0319H	-
--	Pn320	Return to Origin Offset Number of Revolutions	rev	031AH	-
--	Pn321	Return to Origin Offset Number of Pulses	pulse	031BH/031CH	-
--	Pn322	Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)	0.4ms	031DH	-
--	Pn323	Internal Position Command S-type Acceleration / Deceleration Constant (TACC)	0.4ms	031EH	-

	Parameter Code	Name and Function	Unit	RS485	Index
--	Pn324	CNC Tool Magazine Quantity Setting	-	031FH	-
--	Pn325	CNC Tool Tray Return to Zero Position	pulse	0320H/0321H	-
--	Pn326	CNC Tool Tray Reduction Ratio	-	0322H	-
--	Pn327	Tool Change Rotational Speed 1	rpm	0323H	-
--	Pn329	Pulse Command Smoothing Filter	2ms	0325H	231DH
--	Pn330	Pulse Command Moving Filter	0.4ms	0326H	231EH
--	Pn331	Turret Magazine Backlash Compensation Parameters	pulse	0327H/0328H	-
--	Pn332.0	Internal/External Position Command Acceleration / Deceleration Method	-	0329H	-
--	Pn333	Internal Position Command S-type Deceleration Constant (TDEC)	0.4ms	032AH	-
--	Pn334	PTRG Trigger Delay Time Parameter	4ms	032BH	-
--	Pn335	Tool Change Rotational Speed 2	rpm	032CH	-
--	Pn336.0	Automatic Low Frequency Vibration Suppression Enablement Selection	-	032DH	2324H
--	Pn337	Automatic Low Frequency Vibration Suppression	1ms	032EH	2325H
--	Pn338	Low Frequency Swinging Detection Level	0.1%	032FH	2326H
--	Pn339	First Set Low Frequency Vibration Suppression Frequency	0.1Hz	0330H	2327H
--	Pn340	First Set Low Frequency Vibration Suppression Parameter	-	0331H	2328H
--	Pn341	Second Set Low Frequency Vibration Suppression Frequency	0.1Hz	0332H	2329H
--	Pn342	Second Set Low Frequency Vibration Suppression Parameter	-	0333H	232AH
--	Pn343	Third Set Low Frequency Vibration Suppression Frequency	0.1Hz	0334H	232BH
--	Pn344	Third Set Low Frequency Vibration Suppression Parameter	-	0335H	232CH
★	Pn346.0	Full-closed loop function activation	-	0337H	232EH
★	Pn346.2	Full-closed loop function dividing selection			
--	Pn347	Maximum of full-closed loop error	pulse	0338H/0339H	232FH
★	Pn348	Full-closed loop encoder resolution	ppr	033AH/033BH	2330H
★	Pn349	Full-closed loop direction	-	033CH	2331H
★	Pn350.0	Enable gantry synchronization function	-	033DH	-
★	Pn350.1	Gantry synchronization D triggered to enable asynchronous function	-	033DH	-
	Pn351	Gantry synchronization controller gain value	rad/s	033EH	-
	Pn352	Gantry synchronization maximum error tolerance	pulse	033FH/0340H	-
★	Pn354	Single Revolution Pulse Command Function	pulse	0342H/0343H	-

Multi-position Stage Position Control Parameters (Pn4□□)

	Parameter Code	Name and Function	Unit	RS485	Index
--	Pn401	Internal position command 1-Number of revolutions	rev	0701H	-
--	Pn402	Internal Position Command 1-Number of Pulses	pulse	0702H/0703H	-
--	Pn403	Internal Position Command 1-Moving Speed	rpm	0704H	-
--	Pn404	Internal position command 2-Number of revolutions	rev	0705H	-
--	Pn405	Internal position command 2-Number of pulses	pulse	0706H/0707H	-
--	Pn406	Internal Position Command 2-Moving Speed	rpm	0708H	-
--	Pn407	Internal position command 3-Number of revolutions	rev	0709H	-
--	Pn408	Internal position command 3-Number of pulses	pulse	070AH/070BH	-
--	Pn409	Internal Position Command 3-Moving Speed	rpm	070CH	-
--	Pn410	Internal position command 4-Number of revolutions	rev	070DH	-
--	Pn411	Internal position command 4-Number of pulses	pulse	070EH/070FH	-
--	Pn412	Internal Position Command 4-Moving Speed	rpm	0710H	-
--	Pn413	Internal position command 5-Number of revolutions	rev	0711H	-
--	Pn414	Internal position command 5-Number of pulses	pulse	0712H/0713H	-
--	Pn415	Internal Position Command 5-Moving Speed	rpm	0714H	-
--	Pn416	Internal position command 6-Number of revolutions	rev	0715H	-
--	Pn417	Internal position command 6-Number of pulses	pulse	0716H/0717H	-
--	Pn418	Internal Position Command 6-Moving Speed	rpm	0718H	-
--	Pn419	Internal position command 7-Number of revolutions	rev	0719H	-
--	Pn420	Internal position command 7-Number of pulses	pulse	071AH/071BH	-
--	Pn421	Internal Position Command 7-Moving Speed	rpm	071CH	-
--	Pn422	Internal position command 8-Number of revolutions	rev	071DH	-
--	Pn423	Internal position command 8-Number of pulses	pulse	071EH/071FH	-
--	Pn424	Internal Position Command 8-Moving Speed	rpm	0720H	-
--	Pn425	Internal position command 9-Number of revolutions	rev	0721H	-
--	Pn426	Internal position command 9-Number of pulses	pulse	0722H/0723H	-
--	Pn427	Internal Position Command 9-Moving Speed	rpm	0724H	-
--	Pn428	Internal position command 10-Number of revolutions	rev	0725H	-
--	Pn429	Internal position command 10-Number of pulses	pulse	0726H/0727H	-
--	Pn430	Internal Position Command 10-Moving Speed	rpm	0728H	-
--	Pn431	Internal position command 11-Number of revolutions	rev	0729H	-
--	Pn432	Internal position command 11-Number of pulses	pulse	072AH/072BH	-
--	Pn433	Internal Position Command 11-Moving Speed	rpm	072CH	-
--	Pn434	Internal position command 12-Number of revolutions	rev	072DH	-
--	Pn435	Internal position command 12-Number of pulses	pulse	072EH/072FH	-
--	Pn436	Internal Position Command 12-Moving Speed	rpm	0730H	-
--	Pn437	Internal position command 13-Number of	rev	0731H	-

	Parameter Code	Name and Function	Unit	RS485	Index
		revolutions			
--	Pn438	Internal position command 13-Number of pulses	pulse	0732H/0733H	-
--	Pn439	Internal Position Command 13-Moving Speed	rpm	0734H	-
--	Pn440	Internal position command 14-Number of revolutions	rev	0735H	-
--	Pn441	Internal position command 14-Number of pulses	pulse	0736H/0737H	-
--	Pn442	Internal Position Command 14-Moving Speed	rpm	0738H	-
--	Pn443	Internal position command 15-Number of revolutions	rev	0739H	-
--	Pn444	Internal position command 15-Number of pulses	pulse	073AH/073BH	-
--	Pn445	Internal Position Command 15-Moving Speed	rpm	073CH	-
--	Pn446	Internal position command 16-Number of revolutions	rev	073DH	-
--	Pn447	Internal position command 16-Number of pulses	pulse	073EH/073FH	-
--	Pn448	Internal Position Command 16-Moving Speed	rpm	0740H	-
--	Pn449	Internal position command 17-Number of revolutions	rev	0741H	-
--	Pn450	Internal position command 17-Number of pulses	pulse	0742H/0743H	-
--	Pn451	Internal Position Command 17-Moving Speed	rpm	0744H	-
--	Pn452	Internal position command 18-Number of revolutions	rev	0745H	-
--	Pn453	Internal position command 18-Number of pulses	pulse	0746H/0747H	-
--	Pn454	Internal Position Command 18-Moving Speed	rpm	0748H	-
--	Pn455	Internal position command 19-Number of revolutions	rev	0749H	-
--	Pn456	Internal position command 19-Number of pulses	pulse	074AH/074BH	-
--	Pn457	Internal Position Command 19-Moving Speed	rpm	074CH	-
--	Pn458	Internal position command 20-Number of revolutions	rev	074DH	-
--	Pn459	Internal position command 20-Number of pulses	pulse	074EH/074FH	-
--	Pn460	Internal Position Command 20-Moving Speed	rpm	0750H	-
--	Pn461	Internal position command 21-Number of revolutions	rev	0751H	-
--	Pn462	Internal position command 21-Number of pulses	pulse	0752H/0753H	-
--	Pn463	Internal Position Command 21-Moving Speed	rpm	0754H	-
--	Pn464	Internal position command 22-Number of revolutions	rev	0755H	-
--	Pn465	Internal position command 22-Number of pulses	pulse	0756H/0757H	-
--	Pn466	Internal Position Command 22-Moving Speed	rpm	0758H	-
--	Pn467	Internal position command 23-Number of revolutions	rev	0759H	-
--	Pn468	Internal position command 23-Number of pulses	pulse	075AH/075BH	-
--	Pn469	Internal Position Command 23-Moving Speed	rpm	075CH	-
--	Pn470	Internal position command 24-Number of	rev	075DH	-

	Parameter Code	Name and Function	Unit	RS485	Index
		revolutions			
--	Pn471	Internal position command 24-Number of pulses	pulse	075EH/075FH	-
--	Pn472	Internal Position Command 24-Moving Speed	rpm	0760H	-
--	Pn473	Internal position command 25-Number of revolutions	rev	0761H	-
--	Pn474	Internal position command 25-Number of pulses	pulse	0762H/0763H	-
--	Pn475	Internal Position Command 25-Moving Speed	rpm	0764H	-
--	Pn476	Internal position command 26-Number of revolutions	rev	0765H	-
--	Pn477	Internal position command 26-Number of pulses	pulse	0766H/0767H	-
--	Pn478	Internal Position Command 26-Moving Speed	rpm	0768H	-
--	Pn479	Internal position command 27-Number of revolutions	rev	0769H	-
--	Pn480	Internal position command 27-Number of pulses	pulse	076AH/076BH	-
--	Pn481	Internal Position Command 27-Moving Speed	rpm	076CH	-
--	Pn482	Internal position command 28-Number of revolutions	rev	076DH	-
--	Pn483	Internal position command 28-Number of pulses	pulse	076EH/076FH	-
--	Pn484	Internal Position Command 28-Moving Speed	rpm	0770H	-
--	Pn485	Internal position command 29-Number of revolutions	rev	0771H	-
--	Pn486	Internal position command 29-Number of pulses	pulse	0772H/0773H	-
--	Pn487	Internal Position Command 29-Moving Speed	rpm	0774H	-
--	Pn488	Internal position command 30-Number of revolutions	rev	0775H	-
--	Pn489	Internal position command 30-Number of pulses	pulse	0776H/0777H	-
--	Pn490	Internal Position Command 30-Moving Speed	rpm	0778H	-
--	Pn491	Internal position command 31-Number of revolutions	rev	0779H	-
--	Pn492	Internal position command 31-Number of pulses	pulse	077AH/077BH	-
--	Pn493	Internal Position Command 31-Moving Speed	rpm	077CH	-
--	Pn494	Internal position command 32-Number of revolutions	rev	077DH	-
--	Pn495	Internal position command 32-Number of pulses	pulse	077EH/077FH	-
--	Pn496	Internal Position Command 32-Moving Speed	rpm	0780H	-

Shortcut Parameters (qn5□□)

	Parameter Code	Name and Function	Unit	RS485	Index
◆	qn501	Speed Loop Gain 1	Hz	0401H	-
◆	qn502	Speed Loop Integration Time Constant 1	0.01ms	0402H	-
◆	qn503	Speed Loop Gain 2	Hz	0403H	-
◆	qn504	Speed Loop Integration Time Constant 2	0.01ms	0404H	-

	Parameter Code	Name and Function	Unit	RS485	Index
◆	qn505	Position Loop Gain 1	rad/s	0405H	-
◆	qn506	Position Loop Gain 2	rad/s	0406H	-
◆	qn507	Position Loop Feed Forward Gain	%	0407H	-

Multifunction Contact Planning Parameters (Hn6□□)

	Parameter Code	Name and Function	Unit	RS485	Index
★	Hn601	DI-1 Pin Function Planning	-	0501H	2601H
★	Hn602	DI-2 Pin Function Planning	-	0502H	2602H
★	Hn603	DI-3 Pin Function Planning	-	0503H	2603H
★	Hn604	DI-4 Pin Function Planning	-	0504H	2604H
★	Hn605	DI-5 Pin Function Planning	-	0505H	2605H
★	Hn606	DI-6 Pin Function Planning	-	0506H	2606H
★	Hn607	DI-7 Pin Function Planning	-	0507H	2607H
★	Hn608	DI-8 Pin Function Planning	-	0508H	2608H
★	Hn609	DI-9 Pin Function Planning	-	0509H	2609H
★	Hn610	DI-10 Pin Function Planning	-	050AH	260AH
★	Hn611	DI-11 Pin Function Planning	-	050BH	260BH
★	Hn612	DI-12 Pin Function Planning	-	050CH	260CH
★	Hn613	DO-1 Pin Function Planning	-	050DH	260DH
★	Hn614	DO-2 Pin Function Planning	-	050EH	260EH
★	Hn615	DO-3 Pin Function Planning	-	050FH	260FH
★	Hn616	DO-4 Pin Function Planning	-	0510H	2610H
--	Hn617	Digital Input Contact Control Method Selection	-	0511H	-
--	Hn618	Communication Control Digital Input Contact Status	-	0512H	-

E-Cam parameter (ECA□□)

	Parameter Code	Name and Function	Unit	RS485	Index
--	ECA01	E-Cam function selection	-	0801H	2701H
--	ECA02.0	E-Cam main axle feedback source	-	0802H	2702H
--	ECA02.2	If E-Cam uses return to origin			
--	ECA03	E-Cam cutting quantity	-	0803H	2703H
--	ECA04	E-Cam cutter selection	-	0804H	2704H
--	ECA05	E-Cam synchronous angle	deg	0805H	2705H
--	ECA06	E-Cam initiative angle	0.01deg	0806H	2706H
--	ECA07	E-Cam main axle encoder resolution	ppr	0807H	2707H
--	ECA08	E-Cam auxiliary axle encoder resolution	ppr	0808H	2708H
--	ECA09	E-Cam feeding diameter	0.1mm	0809H	2709H

	Parameter Code	Name and Function	Unit	RS485	Index
--	ECA10	E-Cam cutter diameter	0.1mm	080AH	270AH
--	ECA11	E-Cam cutting length	0.1mm	080BH	270BH
--	ECA12	Distance between E-Cam sensor and cutting point	0.1rpm	080CH	270CH
--	ECA13	Acceleration/deceleration smoothing constant of E-Cam S-curve	ms	080DH	270DH
--	ECA14	E-Cam rotary cut synchronous time	ms	080EH	270EH
--	ECA15	E-Cam rotary cut DO delay time	200us	080FH	270FH
--	ECA16	E-Cam auxiliary axle screw pitch	0.1mm	0810H	2710H
--	ECA17	Maximum proceeding distance of E-Cam rotary cut auxiliary axle	0.1mm	0811H	2711H
--	ECA18	Average proceeding speed of E-Cam rotary cut main axle	rpm	0812H	2712H
--	ECA19	Cumulative pulse quantity of E-Cam virtual axle	mm	0813H	2713H
--	ECA20	Maximum return speed of E-Cam rotary cut	rpm	081CH	2714H
--	ECA21	Acceleration/deceleration time of E-Cam rotary cut	ms	081DH	2715H
--	ECA22	Enable E-Cam parameter change write-in	-	081EH	2716H
--	ECA23	E-Cam parameter fine-tune factor	0.01	081FH	2717H
--	ECA24.0	E-Cam rotary cut return origin return function	-	0820H	2718H

CiA 402 parameter (En7□□)

	Parameter Code	Name and Function	Unit	RS485	Index
--	En701	CiA 402 position unit change (numerator)	-	-	-
--	En702	CiA 402 position unit change (denominator)	-	-	-
--	En703	CiA 402 speed unit change (numerator)	-	-	-
--	En704	CiA 402 speed unit change (denominator)	-	-	-
--	En705	CiA 402 acceleration unit change (numerator)	-	-	-
--	En706	CiA 402 acceleration unit change (denominator)	-	-	-
--	En707	CiA 402 stalling allowed times	-	-	-

Monitoring Parameters (Un-□□)

	Parameter Code	Name and Function	Unit	RS485	Index
--	Un-01	Actual Motor Speed	rpm	0601H	2801H
--	Un-02	Actual Motor Torque	%	0602H	2802H
--	Un-03	Regenerative Load Rate	%	0603H	2803H
--	Un-04	Effective Load rate	%	0604H	2804H
--	Un-05	Maximum Load Rate	%	0605H	2805H
--	Un-06	Speed Command	rpm	0606H	2806H
--	Un-07	Position Error	pulse	0607H/0608H	2807H
--	Un-09	External Analog Voltage Command Value	V	060BH	2809H
--	Un-10	Main Circuit (Vdc Bus) Voltage	V	060CH	280AH

	Parameter Code	Name and Function	Unit	RS485	Index
--	Un-11	External Analog Voltage Limit Value	V	060DH	280BH
--	Un-12	External CCW Direction Torque Limit Command Value	%	060EH	280CH
--	Un-13	External CW Direction Torque Limit Command Value	%	060FH	280DH
--	Un-14	Motor Feedback - Number of Pulses in one Rotation	pulse	0610H/0611H	280EH
--	Un-16	Motor Feedback - Number of Rotations	rev	0613H/0614H	2810H
--	Un-18	Pulse Command - Number of pulses in one rotation	pulse	0616H/0617H	2812H
--	Un-20	Pulse Command - Number of Rotations	rev	0619H/061AH	2814H
--	Un-24	Multi-revolution Position Information of the Communication Encoder Feedback	rev	061FH	2818H
--	Un-25	Single Revolution Position Information of the Communication Encoder Feedback	pulse	0620H/0621H	2819H
--	Un-27	Communication Encoder Message	-	0623H	281BH
--	Un-28	Torque Command	%	0624H	281CH
--	Un-29	Load Inertia Ratio	0.1	0625H	281DH
--	Un-30	Digital Output Contact Status (DO)	-	0626H	281EH
--	Un-31	Digital Input Contact Status (D1)	-	0627H	281FH
--	Un-43	Motor Electrical Angle	Deg	0633H	282BH
--	Un-44	Motor Model Number Read by the Communication Encoder	-	0634H	282CH
--	Un-45	OnLine_AutoTuning Inertia Estimation	0.1	0635H	282DH
--	Un-46	OFFLine_Tuning Status	-	0636H	282EH
--	Un-47	Error Code of OFFLine_Tuning	-	0637H	282FH
--	Un-49	Driver Temperature	degree	0639H	2831H
--	Un-50	External Encoder Number of Pulses	pulse	063A/063BH	2832H
--	Un-52	The Error of External Encoder and Motor Encoder	pulse	063DH/063EH	2834H
--	Un-53	Current Alarm Number	-	063FH	2835H
	Un-54	EtherCAT PDO Packet Loss Counter **(Note 3)**	-	0640H	2836H
--	Un-55	System Multi-revolution Position	rev	0641H	2837H
--	Un-56	System Single Revolution Position	pulse	06342H/0643H	2838H
--	Un-88	ServoOn total time	hour	0663H	N/A
--	Un-89	PowerOn total time	hour	0664H	N/A

Diagnostic Parameters (dn-□□)

	Parameter Code	Name and Function	Unit	RS485	Index
--	dn-01	Current Control Mode Display	-	0F01H	N/A
--	dn-02	Output Contact Signal Status	-	0F02H	N/A
--	dn-03	Input Contact Signal Status	-	0F03H	N/A
--	dn-04	CPU Software Version Display	-	0F04H	N/A

	Parameter Code	Name and Function	Unit	RS485	Index
--	dn-05	Jog Mode Operation	-	N/A	N/A
--	dn-06	Reserved	-	N/A	N/A
--	dn-07	External Voltage Offset Automatic Adjustment	-	0F07H	N/A
--	dn-08	Display Serialized Models	-	0F08H	N/A
--	dn-09	ASIC Software Version Display	-	0F09H	N/A
--	dn-11	Automatic Detection of Magnetic Angle Position	-	0F0BH	N/A

Note 1: JSDG2S-E does not have this function

Note 2: Only JSDG2S contains this function

Note 3: Only JSDG2(S)-E contains this function

7-3 Parameter Function Detail description

7-3-1 System Parameters (Cn0□□)

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2	--	0 ~ D	★	●

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0001H	2001H	2001H	O	O	O	O	O

Setting Description:

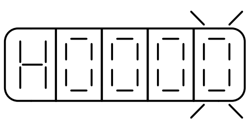
Setting	Description	Setting	Description
0	Torque Control	7	Internal Position / Speed Control Switching
1	Speed Control	8	Internal Position / Torque Control Switching
2	External Position Control (External Pulse Command)	9	CNC Tool Magazine Automatic Tool Selection Control
3	External Position / Speed Control Switching	A	Internal / External Position Switching
4	Speed / Torque Control Switching	B	CANopen-complete (JSDG2S function)
5	External Position / Torque Control Switching	C	CANopen-simple (JSDG2S function)
6	Internal Position Control (Internal Position Command)	D	EtherCAT mode (JSDG2-E/JSDG2S-E function)

Cn002.0 Contact Auxiliary Function - Digital Input Contact SON Function Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0002H	2002H	2002H	O	O	O	O	O

Setting Description:



Setting	Description
0	Control Servo Activation by Digital Input Contact SON.
1	Do not control Servo Activation by Digital Input Contact SON; activate Servo immediately when the Power is ON.

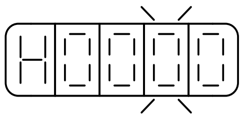
Remark: Invalid under EtherCAT & CANopen Mode

Cn002.1 Contact Auxiliary Functions--Digital Input Contact CCWL and CWL Function Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0002H	2002H	2002H	O	O	O	O	O

Setting Description:



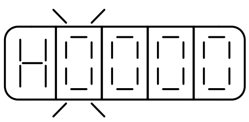
Setting	Description
0	Control CCW and CW Drive Prohibit by Digital Input Contacts CCWL and CWL.
1	Do not control CCW and CW Drive Prohibit by Digital Input Contacts CCWL and CWL; ignore CCW and CW Drive Prohibit Functions.

Cn002.3 EMC Return Mode Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0002H	2002H	2002H	O	O	O	O	O

Setting Description:



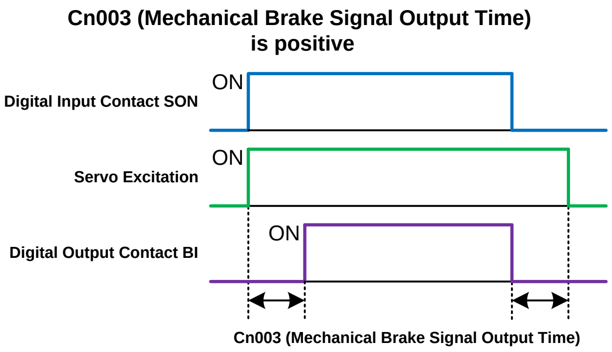
Setting	Description
0	After emergency stop status is cleared, the AL009 Display can only be cleared with digital input contact ALRS in Servo Off State.
	Note) Cannot be cleared in **Servo On** State.
1	After emergency stop status is cleared, the AL009 Display can be automatically cleared no matter in Servo On or Servo off state.
	! Attention: In Servo On state, before the alarm clears and returns to normal operation, whether the Controller still issues command to the Drive must be confirmed to avoid causing sudden unintended acceleration of the Motor!

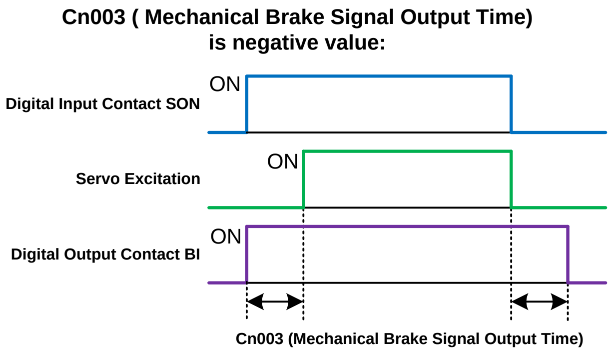
Cn003 Mechanical Brake Signal Output Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	ms	-2000 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0003H	2003H	2003H	O	O	O	O	O

Setting Description: The Time Sequence Diagram is as follows





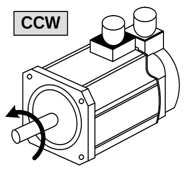
Note) Before using this function, it is necessary to plan one mechanical brake signal **(BI)** digital output pin. Cn008.0 (brake mode) must be set as 1, 3 or 5.

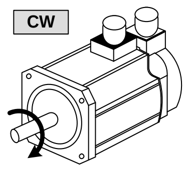
Cn004.0 Motor Rotation Direction Definition (from Motor Load End)

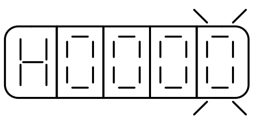
Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 3	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0004H	2004H	2004H	-	-	-	O	O

Setting Description: When the Torque or Speed Command is positive, the Rotation Direction Setting from the Motor Load End is as follows







Setting	Description	
	Torque Control	Speed Control
0	Counterclockwise Rotation (CCW)	Counterclockwise Rotation (CCW)
1	Clockwise Rotation (CW)	Counterclockwise Rotation (CCW)
2	Counterclockwise Rotation (CCW)	Clockwise Rotation (CW)
3	Clockwise Rotation (CW)	Clockwise Rotation (CW)

Cn005 Encoder Signal Dividing Output

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Determined by the Encoder 2500:2500ppr 8192:15bit 32768:17bit, 23bit	pulse	16 ~ 2097152	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0005H/0006H	2005H	2005H	O	O	O	O	O

Setting Description: Dividing Process means the number of pulse signals generated with one revolution of Motor Encoder that are converted into number of pulse signals preset by **Cn005**.
Example: The Motor Encoder is a 131072 pulse output with one revolution; to obtain a 1000 pulse dividing output, please set **Cn005**=1000 directly.

Note) Dividing output is related to rotation speed at a certain level.

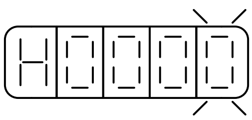
<Setting Limit> **Attention! The Setting Range cannot exceed the Number of Pulses in One Revolution of Motor Encoder.**

Cn006.0 Analog monitoring output MON1 ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2	--	0 ~ B	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0007H	2006H	2006H	O	O	O	O	O

Setting Description:



Setting	Description
0	Speed command (±10V/1.5x rated speed)
1	Speed feedback detection (±10V/1.5x rated speed)
2	Torque command (±10V/3.5x rated torque)
3	Torque feedback (±10V/3.5x rated torque)
4	Pulse input command (±10V/1.5x rated speed)
5	Position offset (±10V/±16384 pulse)
6	Electrical angle (±10V /0~360 degree)
7	Primary circuit (Vdc Bus) voltage (±10V /0~500V)
8	Speed command (±10V/1.5x rated speed)
9	Speed feedback detection (±10V/1.5x rated speed)
A	Torque command (±10V/3.5x rated torque)
B	Torque feedback detection (±10V/3.5x rated torque)

Cn006.1 Analog monitoring output MON2 ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ B	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0007H	2006H	2006H	O	O	O	O	O

Setting Description: Please refer to Cn006.0 Description for Setting Method

Cn007 Speed Reached Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Rated speed*1/3	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0008H	2007H	2007H	--	--	--	O	O

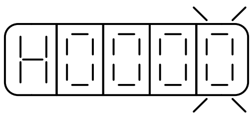
Setting Description: When the Forward or Reverse Speed exceeds the speed set by Cn007 (Speed Reached Determined Value), Digital Output Contact INS activates

Cn008.0 Brake Mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2	--	0 ~ 5	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0009H	2008H	2008H	O	O	O	O	O

Setting Description: The Brake Combination of Servo off, Emergency Stop (EMC), and when CCW/CW Drive is Prohibited.



Setting	Description	
	Dynamic Brake	Mechanical Brake
0	No	No
1	No	Yes
2	Yes	No
3	Yes	Yes
4	No (under 100rpm)	No
5	No (under 100rpm)	Yes

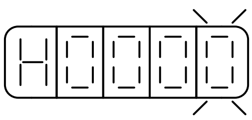
Attention! When **CCW/CW generates drive prohibition, the setting of if use dynamic brake Cn009 is prior to Cn008, i.e. if Cn008 is set as 0 or 1 (without dynamic brake) and Cn009 is set as 1 (with dynamic brake), the dynamic brake will be implemented eventually.**

Cn009.0 CW/CCW Drive Prohibited Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
000AH	2009H	2009H	O	O	O	O	O

Setting Description:



Setting	Description
0	Use the pre-set Torque Limit (**Cn010**, **Cn011**) to decelerate, and in Zero Speed Clamping State after stopped.
1	Use dynamic brake to decelerate. In dynamic brake state (prior to **Cn008**) after stop and need to reboot to activate the

	servo system.
2	Use ±300% Torque Limit to decelerate, and in Zero Speed Clamping State after stopped.

Cn010 CCW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200 ~ 300 **Note)**	%	0 ~ 300	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
000BH	200AH	200AH	O	O	O	O	O

Setting Description: To limit the Torque Command of CCW direction with doubled Rated Torque, set Cn010=200.

Cn011 CW direction torque command limit value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
-300 ~ -200 **Note)**	%	-300 ~ 0	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
000CH	200BH	200BH	O	O	O	O	O

Setting Description: To limit the Torque Command of CW direction with two times the Rated Torque, set Cn011=-200.

Note) Default and setting range of parameter Cn010/Cn011 vary by driver model.

200V

JSDG2(S) Matching Motor		Cn030 setting value	Torque command limit value	
Matching Capacity	Motor Model		Cn010(%)	Cn011(%)
10A	JSMA-PSCP5A□	H101□	300	-300
	JSMA-PUCP5A□	H105□	300	-300
	JSMA-PSC01A□	H102□	300	-300
	JSMA-PUC01A□	H106□	300	-300
	JSMA-PBC01A□	H107□	300	-300
	JSMA-PUC02A□	H108□	240	-240
	JSMA-PBC02A□	H109□	240	-240
15A	JSMA-PSC01A□	H111□	300	-300
	JSMA-PSC02A□	H113□	300	-300
	JSMA-PUC02A□	H119□	300	-300
	JSMA-PBC02A□	H11A□	300	-300
	JSMA-PLC03A□	H112□	300	-300
	JSMA-SC04A□	H114□	240	-240
	JSMA-PSC04A□	H115□	300	-300
	JSMA-PUC04A□	H11D□	300	-300
	JSMA-PBC04A□	H11E□	300	-300
20A	JSMA-SC04A□	H122□	300	-300
	JSMA-PSC04A□	H126□	300	-300
	JSMA-PMA05A□	H124□	300	-300
	JSMA-PMH05A□	H125□	300	-300

JSDG2(S) Matching Motor		Cn030 setting value	Torque command limit value	
Matching Capacity	Motor Model		Cn010(%)	Cn011(%)
	JSMA-PLC08A□	H121□	300	-300
	JSMA-PSC08A□	H123□	260	-260
	JSMA-PUC08A□	H12D□	260	-260
	JSMA-PBC08A□	H12E□	260	-260

JSDG2(S) Matching Motor		Cn030 setting value	Torque command limit value	
Matching Capacity	Motor Model		Cn010(%)	Cn011(%)
30A	JSMA-PSC08A□	H131□	300	-300
	JSMA-PUC08A□	H13B□	300	-300
	JSMA-PBC08A□	H13C□	300	-300
	JSMA-PBH09A□	H13E□	230	-230
	JSMA-PMA10A□	H132□	300	-300
	JSMA-PMB10A□	H133□	300	-300
	JSMA-PMH10A□	H134□	300	-300
	JSMA-PMC10A□	H135□	300	-300
	JSMA-PUC10A□	H13F□	250	-250
	JSMA-PLC10A□	H531□	260	-260
	JSMA-PBC12A□	H532□	270	-270
50A3	JSMA-PBH09A□	H15B□	260	-260
	JSMA-PUC10A□	H15D□	300	-300
	JSMA-PLC10A□	H551□	330	-330
	JSMA-PBH13A□	H15C□	240	-240
	JSMA-PMA15A□	H151□	300	-300
	JSMA-PMB15A□	H152□	300	-300
	JSMA-PMC15A□	H153□	300	-300
	JSMA-PLC15A□	H15E□	320	-320
	JSMA-PMB20A□	H154□	300	-300
	JSMA-PMC20A□	H155□	300	-300
	JSMA-PLC20A□	H552□	250	-250
75A3	JSMA-PBH13A□	H174□	300	-300
	JSMA-PBH18A□	H175□	260	-260
	JSMA-PBH18-18A□	H176□	240	-240
	JSMA-PLC20A□	H571□	320	-320
	JSMA-PMB30A□	H171□	300	-300
	JSMA-PMC30A□	H172□	300	-300
	JSMA-PMH30A□	H173□	260	-260
	JSMA-PIH30A□	H177□	250	-250

JSDG2(S) Matching Motor		Cn030 setting value	Torque command limit value	
Matching Capacity	Motor Model		Cn010(%)	Cn011(%)
	JSMA-PMB40A□	H178□	250	-250
	JSMA-PMB45A□	H179□	250	-250

JSDG2(S) Matching Motor		Cn030 setting value	Torque command limit value	
Matching Capacity	Motor Model		Cn010(%)	Cn011(%)
100A3	JSMA-PBH29A□	H185□	240	-240
	JSMA-PHH30A□	H183□	240	-240
	JSMA-PMH44A□	H182□	250	-250
	JSMA-PIH44A□	H186□	250	-250
	JSMA-MA44A□	H18D□	250	-250
	JSMA-MB45A□	H187□	250	-250
	JSMA-MB55A□	H184□	250	-250
150A3	JSMA-PHH44A□	H193□	250	-250
	JSMA-PBH44A□	H194□	250	-250
	JSMA-PMH55A□	H192□	260	-260
	JSMA-PIH55A□	H195□	250	-250
	JSMA-PBH55A□	H19B□	200	-200
	JSMA-PMB70A□	H19C□	250	-250
200A3	JSMA-PBH55A□	H1A3□	260	-260
	JSMA-PMH75A□	H1A1□	260	-260
	JSMA-PBH75A□	H1A5□	200	-200
	JSMA-PIH75A□	H1A6□	260	-260
	JSMA-PIH110A□	H1A7□	220	-220
300A3	JSMA-PIH75A□	H1B8□	260	-260
	JSMA-PBH75A□	H1B5□	250	-250
	JSMA-PBH55A□	H19B□	200	-200
	JSMA-PIH110A□	H1B7□	250	-250
	JSMA-PMH150A□	H1B2□	220	-220
	JSMA-PIH150A□	H1BB□	220	-220

400V Class

JSDG2(S) Matching Motor		Cn030 setting value	Torque command limit value	
Matching Capacity	Motor Model		Cn010(%)	Cn011(%)
10B	JSMA-PUC04B□	H201□	300	-300
	JSMA-PBC04B□	H202□	300	-300
	JSMA-PUC08B□	H203□	220	-220
	JSMA-PBC08B□	H204□	220	-220
15B	JSMA-PUC08B□	H211□	300	-300
	JSMA-PBC08B□	H212□	300	-300
	JSMA-PBH09B□	H213□	240	-240
	JSMA-PMB10B□	H214□	300	-300
25B	JSMA-PMB10B□	H221□	300	-300
	JSMA-PLC10B□	H226□	330	-330
	JSMA-PBH13B□	H222□	260	-260
	JSMA-PMB15B□	H223□	300	-300
	JSMA-PMB20B□	H225□	240	-240
	JSMA-PLC20B□	H227□	300	-300
35B	JSMA-PLC15B□	H237□	330	-330
	JSMA-PBH18B□	H232□	240	-240
	JSMA-PBH18-18B□	H236□	240	-240
	JSMA-PMB20B□	H231□	300	-300
	JSMA-PLC20B□	H238□	320	-320
	JSMA-PMB30B□	H233□	220	-220
	JSMA-PMH30B□	H234□	240	-240
	JSMA-PIH30B□	H235□	240	-240
50B	JSMA-PBH29B□	H244□	240	-240
	JSMA-PMB30B□	H240□	300	-300
	JSMA-PMH30B□	H241□	260	-260
	JSMA-PIH30B□	H245□	250	-250
	JSMA-PMH44B□	H242□	240	-240
	JSMA-PIH44B□	H246□	230	-230
75B	JSMA-PMH44B□	H250□	260	-260
	JSMA-PBH44B□	H252□	240	-240
	JSMA-PIH44B□	H257□	250	-250
	JSMA-PMH55B□	H251□	260	-260
	JSMA-PBH55B□	H253□	200	-200
	JSMA-PIH55B□	H258□	250	-250
	JSMA-PIH75B□	H259□	210	-210
100B	JSMA-PBH44B□	H265□	250	-250
	JSMA-PBH55B□	H266□	250	-250

JSDG2(S) Matching Motor		Cn030 setting value	Torque command limit value	
Matching Capacity	Motor Model		Cn010(%)	Cn011(%)
	JSMA-PIH55B□	H26B□	250	-250
	JSMA-PMH75B□	H261□	260	-260
	JSMA-PBH75B□	H267□	200	-200
	JSMA-PIH75B□	H269□	260	-260
	JSMA-PIH110B□	H26A□	200	-200
150B	JSMA-PBH75B□	H271□	250	-250
	JSMA-PMH110B□	H272□	260	-260
	JSMA-PIH110B□	H278□	250	-250
	JSMA-PMH150B□	H273□	220	-220
	JSMA-PIH150B□	H27A□	220	-220
200B	JSMA-PMH150B□	H281□	230	-230
	JSMA-PIH150B□	H285□	220	-220

Cn012 External regenerative resistor power setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Varies by model	W	0 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
000DH	200CH	200CH	O	O	O	O	O

Setting Description: Please set the selected external resistor power value correctly in Cn012.

Model	Initial Value
10A / 15A / 20A / 30A	40
50A3 / 75A3	60
100A3 / 150A3 / 10B / 15B / 25B / 35B / 50B / 75B	100
250A3 / 100B / 150B / 200B	200
300A3	0

Cn013 Notch filter frequency (first set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
000EH	200DH	200DH	O	O	O	O	-

Setting Description: Please input the Frequency when vibration occurs in Cn013 to eliminate vibrations or noises caused by resonance, etc.

Cn014 Notch filter quality factor (first set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1 ~ 100	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
000FH	200EH	200EH	O	O	O	O	-

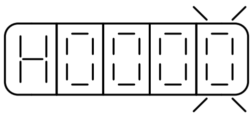
Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn014 value is, the wider the frequency range of suppression is, and the user can adjust according to actual conditions.

Switch of Cn015.0 PI/P mode judges type selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
4	--	0 ~ 4	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0010H	200FH	200FH	O	O	O	O	--

Setting Description:



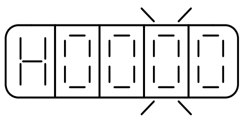
Setting	Description
0	Determine if the Torque Command is greater than **Cn016**
1	Determine if the Speed Command is greater than **Cn017**
2	Determine if the Acceleration Command is greater than **Cn018**
3	Determine if the Position Error is greater than **Cn019**
4	Use digital input contact **PCNT** to switch

Switch of Cn015.1 two stage gain mode judges type selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
4	--	0 ~ 4	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0010H	200FH	200FH	O	O	O	O	--

Setting Description:



Setting	Description
0	Determine if the Torque Command is greater than **Cn021**
1	Determine if the Speed Command is greater than **Cn022**
2	Determine if the Acceleration Command is greater than **Cn023**
3	Determine if the Position Error is greater than **Cn024**
4	Use digital input contact **G-SEL** to switch

Switch condition of Cn016 PI/P mode (torque command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	%	0 ~ 399	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0011H	2010H	2010H	O	O	O	O	--

Setting Description: First set Cn015.0=0, When the Torque Command is smaller than the Cn016 Switching Condition, it is PI control; when the Torque Command is greater than the Cn016 Switching Condition, then switch to only P Control.

Switch condition of Cn017 PI/P mode (speed command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0012H	2011H	2011H	O	O	O	O	--

Setting Description: First set Cn015.0=1, When the Speed Command is smaller than the Cn017 Switching Condition, it is PI control; when the Speed Command is greater than the Cn017 Switching Condition, then switch to only P Control.

Cn018 PI/P Mode Switching Condition (Acceleration Command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rps/s	0 ~ 18750	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0013H	2012H	2012H	O	O	O	O	--

Setting Description: First set Cn015.0=2, When the Acceleration Command is smaller than the Cn018 Switching Condition, it is PI control; when the Acceleration Command is greater than the Cn018 Switching Condition, then switch to only P Control.

Cn019 PI/P Mode Switching Condition (Position Error)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	0 ~ 41943040	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0014H/0015H	2013H	2013H	O	O	O	O	--

Setting Description: First set Cn015.0=3, When the Position Error is smaller than the Cn019 Switching Condition, it is PI control; when the Position Error is greater than the Cn019 Switching Condition, then switch to only P Control.

Switch delay time 2 of Cn020 two stage gain mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.2ms	0 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0016H	2014H	2014H	O	O	O	O	--

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the Second Stage Gain to the First Stage Gain can be set.

Switch condition of Cn021 two stage gain mode (torque command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	%	0 ~ 399	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0017H	2015H	2015H	O	O	O	O	--

Setting Description: Set Cn015.1=0 first, when the Torque Command is less than the Cn021 switching condition, use the first stage gain control; when the Torque Command is greater than the Cn021 switching condition, then switch to the second stage gain control. If the Torque Command is less than the Cn021 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Switch condition of Cn022 two stage gain mode (speed command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0018H	2016H	2016H	O	O	O	O	--

Setting Description: Set Cn015.1=1 first, when the Speed Command is less than the Cn022 switching condition, use the first stage gain control; when the Speed Command is greater than the Cn022 switching condition, then switch to the second stage gain control. If the Speed Command is less than the Cn022 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Switch condition of Cn023 two stage gain mode (acceleration command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rps/s	0 ~ 18750	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0019H	2017H	2017H	O	O	O	O	--

Setting Description: Set Cn015.1=2 first, when the Acceleration Command is less than the Cn023 switching condition, use the first stage gain control; when the Acceleration Command is greater than the Cn023 switching condition, then switch to the second stage gain control. If the Acceleration Command is less than the Cn023 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Switch condition of Cn024 two stage gain mode (position error)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	0 ~ 41943040	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
001AH/001BH	2018H	2018H	O	O	O	O	--

Setting Description: Set Cn015.1=3 first, when the Position Error is less than the Cn024 switching condition, use the first stage gain control; when the Position Error is greater than the Cn024 switching condition, then switch to the second stage gain control. If the Position Error is less than the Cn024 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Cn025 Load Inertia Ratio

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
10	0.1	0 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
001CH	2019H	2019H	O	O	O	O	--

Setting Description:

$$\text{Load Inertia Ratio} = \frac{\text{Convert to the Load Inertia of the Motor Shaft } (J_L)}{\text{Servo Motor Rotor Inertia}(J_M)} \times 100\%$$

Cn026 Rigidity Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
9	--	1 ~ 21	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
001DH	201AH	201AH	O	O	O	O	O

Setting Description:

Description							
Setting	Position Loop Gain **Pn310 [1/s]**	Speed Loop Gain **Sn211 [Hz]**	Speed Loop Integration Time Constant **Sn212 [0.01ms]**	Setting	Position Loop Gain **Pn310 [1/s]**	Speed Loop Gain **Sn211 [Hz]**	Speed Loop Integration Time Constant **Sn212 [0.01ms]**
1	2	2	28000	**12**	70	70	1000
2	3	3	19000	**13**	85	85	1000
3	6	6	9000	**14**	100	100	800
4	9	9	6000	**15**	120	120	800
5	12	12	6000	**16**	140	140	600
6	15	15	6000	**17**	160	160	600
7	20	20	4500	**18**	180	180	500
8	30	30	3000	**19**	200	200	500
9	40	40	2000	**20**	225	225	400
10	50	50	1600	**21**	250	250	400
11	60	60	1500	-	-	-	-

Cn027 Analog monitoring output 1 offset adjustment ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	40mV	-250 ~ 250	--	●

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
001EH	201BH	201BH	O	O	O	O	O

Setting Description: Used to correct the offset when it occurs on analog monitoring output 1 voltage.

Cn028 analog monitoring output 2 offset adjustment ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	40mV	-250 ~ 250	--	●

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
001FH	201CH	201CH	O	O	O	O	O

Setting Description: Used to correct the offset when it occurs on analog monitoring output 2 voltage.

Cn029 Parameter Reset

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0020H	201DH	201DH	O	O	O	O	O

Setting Description:

Setting	Description
0	Not Functioning
1	All Parameters returned to Factory Default Value

Cn030 Serialized Model Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Factory Setting	--	--	★	●

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0021H	201EH	201EH	O	O	O	O	O

Setting Description: The setting value of this parameter is the same as the dn-08 display value, please refer to “1-1-3 Servo Driver and Servo Motor Matching Comparison Table"for the detailed setting method.

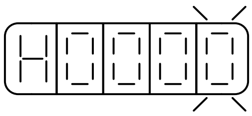
! Attention: Before the machine starts to operate, make sure to confirm the parameter setting value is the correct Driver and Motor matching combination! When differing from actual combination, please reset or contact local distributor!

Cn031.0 Fan operation setting (only applicable to models with a fan)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 3	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0022H	201FH	201FH	O	O	O	O	O

Setting Description:



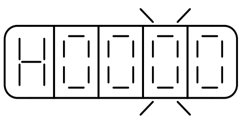
Setting	Description
0	Temperature Sensing Automatic Operation
1	Operates when Servo starts
2	Continuous Operation
3	Stop Operation

Cn031.1 Low voltage protection (AL001) automatic return selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0022H	201FH	201FH	O	O	O	O	O

Setting Description: This parameter can set low voltage protection (AL001) return method



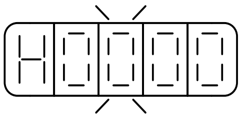
Setting	Description
0	When the SON status displays run, AL001 Low Voltage Error Alarm is immediately displayed when a low voltage is detected; after the error is cleared, must clear AL001 display by digital input contact ALRS under Soff status.
1	When the SON status displays run, BB status is immediately displayed when a low voltage is detected; and automatically resets to SON status and displays run after the Error is resolved.

Cn031.2 Absolute value encoder battery error alarm output

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0: ABS Encoder 1: IN Encoder	--	0 ~ 3	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0022H	201FH	201FH	O	O	O	O	O

Setting Description:



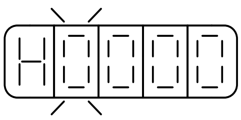
Setting	Description
0	When the battery is abnormal after power is turned ON, the panel displays AL016 and the digital output contact outputs ALM; the device cannot operate normally at this time.
1	When the battery is abnormal after power is turned ON, the panel displays no abnormality and the digital output contact does not output ALM and the Motor can still operate normally, but the multi-revolution address cannot be memorized after the power is turned OFF.
2	When the battery is abnormal after power is turned ON, the panel displays AL-16 and DO abnormal contact outputs. *Store the offset value in motor and driver side after returning to origin. The driver uses the offset value of motor side to run absolute position control. When the power is on, AL-50 alarm will occur when offset values of motor and drive side vary; offset value can be cleared through Cn041.0 = 2
3	When the battery is abnormal after power is turned ON, the panel displays AL-16 and DO abnormal contact outputs. *Store the offset value in motor and driver side after returning to origin. The driver uses the offset value of motor side to run absolute position control; offset value can be cleared through Cn041.0 = 2.

Cn031.3 Motor series selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	○●

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0022H	201FH	201FH	O	O	O	O	O

Setting Description:



Setting	Description
0	Select VARITRONIX identical model Motor parameter
1	Select VARITRONIX Identical model Motor parameter with brake
2	Reserved

Cn032 Speed feedback smoothing filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
500	Hz	0 ~ 2500	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0023H	2020H	2020H	O	O	O	O	--

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Cn033 Speed Feed Forward Smoothing Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
500	Hz	0 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0024H	2021H	2021H	O	O	O	--	--

Setting Description: Smooth the Speed Feed Forward Command.

Cn034 Torque command smoothing filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0 ~ 5000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0025H	2022H	2022H	O	O	O	O	O

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Cn035 Panel status display content selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ Un parameter maximum	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0026H	2023H	2023H	O	O	O	O	O

Setting Description:

Setting	Description
This parameter can set panel status display content after the power is ON.	
0	Display bit data and status code, please refer to "3-1 Driver Panel Operation Instructions"
1 ~ Maximum	Display Un Status Display parameter content, Please refer to "7-3-11 Monitoring Parameters". Example: When set Cn035=1, the panel will display actual Motor Speed (Un-01 content) after power is turned on.

Cn036 ID Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 254	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0027H	2024H	2024H	O	O	O	O	O

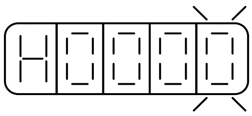
Setting Description: When using the Modbus Communication Interface, each set of Drivers needs to set different IDs in this parameter in advance; if the IDs are set repeatedly, it will result in communication not being operated normally.

Cn037.0 Modbus RS-485 Communication Transmission Rate

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0 ~ 5	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0028H	2025H	2025H	O	O	O	O	O

Setting Description:



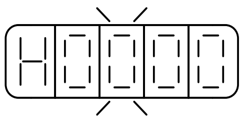
Setting	Description	Setting	Description
0	4800 bps	3	38400 bps
1	9600 bps	4	57600 bps
2	19200 bps	5	115200 bps

Cn037.2 RS-485 Communication Write Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0028H	2025H	2025H	O	O	O	O	O

Setting Description:



Setting	Description
0	RS-485 Communication Write to EEPROM
1	RS-485 Communication Write to SRAM

Cn038 Protocol

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 8	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0029H	2026H	2026H	O	O	O	O	O

Setting Description:

Setting	Description	Setting	Description
0	7 , N , 2 (Modbus , ASCII)	5	8 , O , 1 (Modbus , ASCII)
1	7 , E , 1 (Modbus , ASCII)	6	8 , N , 2 (Modbus , RTU)
2	7 , O , 1 (Modbus , ASCII)	7	8 , E , 1 (Modbus , RTU)
3	8 , N , 2 (Modbus , ASCII)	8	8 , O , 1 (Modbus , RTU)
4	8 , E , 1 (Modbus , ASCII)	-	

Cn039 Communication Timeout Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	sec	0 ~ 20	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
002AH	2027H	2027H	O	O	O	O	O

Setting Description: If the setting value is greater than 0, the Communication Timeout Function is turned on immediately and must conduct communication within the set time, otherwise, a communication error will appear. If the setting value is 0, then indicates this function is turned off.

Cn040 Communication response delay time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.5ms	0 ~ 255	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
002BH	2028H	2028H	O	O	O	O	O

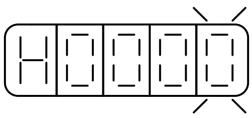
Setting Description: Delay the communication time of Driver responding to Supervisory Control Unit.

Cn041.0 Absolute type encoder multi-revolution clearing function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
002CH	2029H	2029H	O	O	O	O	O

Setting Description:



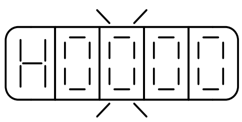
Setting	Description
0	Not Functioning
1	Clear the Encoder Internal Status
2	Clear the Encoder Internal Status and Number of Revolutions

Cn041.2 Turret mode return to zero function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	Pi	Pe	Pt	S	T
002CH	--	--	O	--	--

Setting Description:



Setting	Description
0	Not Functioning
1	The driver execute turret return to zero function after setting as 1; will automatically clear the setting to 0 after completed.

Cn043 Analog monitoring output MON1 output proportion ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	%	1 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
002EH	202BH	202BH	O	O	O	O	O

Setting Description: Take 10V/1.5x rotational speed = 100% as example, if the analog monitoring output proportion is changed to 10V/0.75x rotational speed, set the parameter as 200%

Cn044 Analog monitoring output MON2 output proportion ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	%	1 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
002FH	202CH	202CH	O	O	O	O	O

Setting Description: Tlease refer to the setting description of Cn043.

Cn048 Switch delay time 1 of two stage gain mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.2ms	0 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0033H	2030H	2030H	O	O	O	O	--

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the first stage gain to the second stage gain can be set.

Cn049 Switch time 1 of two stage gain mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.2ms	0 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0034H	2031H	2031H	O	O	O	O	--

Setting Description: When using the Two Stage Gain Mode, the Conversion Time from the first stage gain to the second stage gain can be set.

Cn050 Switch time 2 of two Stage Gain Mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.2ms	0 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0035H	2032H	2032H	O	O	O	O	--

Setting Description: When using the Two Stage Gain Mode, the Conversion Time from the second stage gain to the first stage gain can be set.

Cn051 Low voltage protection level

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200V: 190 400V: 380	Volt	200V: 170 ~ 190 400V: 340 ~ 380	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0036H	2033H	2033H	O	O	O	O	O

Setting Description: When the Driver input power supply voltage is less than Cn051, after delaying the Cn052 setting time, trigger the Low Voltage Protection Alarm. But if the voltage is under 170V, the system will run low voltage protection directly, regardless of Cn052 setting time.

Cn052 Low voltage protection alarm delay time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
4	250ms	0 ~ 100	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0037H	2034H	2034H	O	O	O	O	O

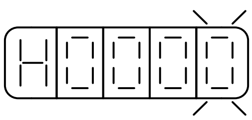
Setting Description: When the Driver input power supply voltage is less than Cn051, after delaying the Cn052 setting time, trigger the Low Voltage Protection Alarm. But if the voltage is under 170V, the system will run low voltage protection directly, regardless of Cn052 setting time.

Cn053.0 Current offset automatic correction (only usable under Servo Off)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0038H	2035H	2035H	O	O	O	O	O

Setting Description: The Driver executes the Current Offset Correction after setting to 1, and clear the setting to 0 automatically after the completed correction.



Setting	Description
0	Does not execute Current Offset Correction
1	Execute Current Offset Correction

Cn054 Driver warning setting (AL001-AL016)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0000 ~ FFFF	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0039H	2036H	2036H	O	O	O	O	O

Setting Description: Cn054 is a 16-bit parameter, each bit represents each Alarm separately. Setting the corresponding bit of the Alarm to 1 is the Warning Mode. When the alarm occurs, the Driver issues a warning first, and triggers the Alarm after continuous operation for the time set by Cn055.
Example: To set the low voltage and over speed alarms as warnings, and to trigger the alarm one second after the warning, it is necessary to set Cn054 as 0801H, and each bit setting status is 0000 1000 0000 0001, and then set Cn055 to 100.

Cn055 Driver warning delay trigger alarm time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	10ms	0 ~ 300	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
003AH	2037H	2037H	O	O	O	O	O

Setting Description: Same as Cn054

Cn56 Second stage CCW direction torque command limit value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200 ~ 300	%	0 ~ 300	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
003BH	2038H	2038H	O	O	O	O	O

Setting Description: Description is the same as Cn010

Cn057 Second stage CW direction torque command limit value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
-300 ~ -200	%	-300 ~ 0	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
003CH	2039H	2039H	O	O	O	O	O

Setting Description: Description is the same as Cn011

Cn058 Delay time when switching from first stage to second stage torque limit

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	4ms	0 ~ 32767	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
003DH	203AH	203AH	O	--	O	--	--

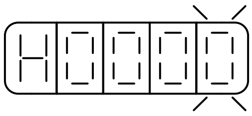
Setting Description: After the digital output contact INP delays according to the time set by Cn058, the torque limit switch from (Cn010, Cn011) to (Cn056, Cn057) and from (Cn056, Cn057) to (Cn010, Cn011) after PTRG operates.

Cn059.0 AutoTuning enablement selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
003EH	203BH	203BH	O	O	O	--	--

Setting Description:



Setting	Description
0	Disable AutoTuning
1	Enable OFFLine-AutoTuning
2	Enable OnLine-AutoTuning (Inertia Only Displays)

Cn060 OFFLine-tuning Operation Command Number of Revolutions Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
3	rev	3 ~ 1024	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
003FH	203CH	203CH	O	O	O	--	--

Setting Description: Set to 10 represents that the Process Command of tuning command will be within 10 revolutions

Cn061 OFFLine-tuning Operation Maximum Rotational Speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2/3*Rated Rotational Speed	rpm	Rated rotational speed/3 ~ rated rotational speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0040H	203DH	203DH	O	O	O	--	--

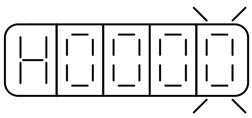
Setting Description: OFFLine_Tuning Maximum Operation speed

Cn063.0 Automatic mechanical suppression enablement selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 5	--	--

Communication position	Index position		Use Mode				
RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0042H	203FH	203FH	O	O	O	O	--

Setting Description:



Setting	Description
0	Disable Automatic Detection of Mechanical Vibration Frequency
1	Enable Automatic Detection of First Set Mechanical Vibration Frequency
2	Enable Automatic Detection of Second Set Mechanical Vibration Frequency
3	Enable Automatic Detection of Third Set Mechanical Vibration Frequency
4	Enable Automatic Detection of Fourth Set Mechanical Vibration Frequency
5	Enable Automatic Detection of Firth Set Mechanical Vibration Frequency

Cn064 Mechanical vibration detection level

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50	--	1 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0043H	2040H	2040H	O	O	O	O	-

Setting Description: The automatic detection level when executing Automatic Mechanical Vibration Suppression (Cn063=1), the lower the value is, the more likely the noise is determined incorrectly, the recommended setting is 50 or higher.

Cn065 Notch filter depth (first set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0044H	2041H	2041H	O	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn065 value is, the deeper the frequency depth to be suppressed. Users can adjust according to actual conditions.

Cn066 Notch filter frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0045H	2042H	2042H	O	O	O	O	-

Setting Description: When to eliminate the vibration or noise caused by resonance, etc., please input the frequency when vibration occurs in Cn066.

Cn067 Notch filter quality factor (second set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1 ~ 100	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0046H	2043H	2043H	O	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, smaller the Cn067 value is, wider the frequency range of suppression, and can be adjusted according to actual conditions.

Cn068 Notch filter depth (second set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	1 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0047H	2044H	2044H	O	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn068 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to the actual conditions.

Cn069 Notch filter frequency (third set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0048H	2045H	2045H	O	O	O	O	-

Setting Description: When vibration or noise is caused by eliminating resonance, please input the frequency when vibration occurs in Cn069.

Cn070 Notch filter quality factor (third set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1 ~ 100	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0049H	2046H	2046H	O	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn070 value is, the wider the frequency range of suppression, and the User can adjust according to the actual conditions.

Cn071 Notch filter depth (third set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	1 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
004AH	2047H	2047H	O	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn071 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to the actual conditions.

Cn072 Notch filter frequency (fourth set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
004BH	2048H	2048H	O	O	O	O	-

Setting Description: When to eliminate the vibration or noise caused by resonance, etc., please input the frequency when vibration occurs in Cn072.

Cn073 Notch filter quality factor (fourth set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	---	1 ~ 100	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
004CH	2049H	2049H	O	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn073 value is, the wider the frequency range of suppression, and the User can adjust according to actual conditions.

Cn074 Notch filter quality depth (fourth set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	---	0 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
004DH	204AH	204AH	O	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn074 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to actual conditions.

Cn075 Notch filter quality frequency (fifth set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
004EH	204BH	204BH	O	O	O	O	-

Setting Description: When to eliminate the vibration or noise caused by resonance, etc., please input the frequency when vibration occurs in Cn075.

Cn076 Notch filter quality factor (fifth set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1 ~ 100	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
004FH	204CH	204CH	O	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn076 value is, the wider the frequency range of suppression, and the User can adjust according to the actual conditions.

Cn077 Notch filter quality depth (fifth set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0050H	204DH	204DH	O	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn074 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to actual conditions.

Cn097 Motor disconnection protection flag

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	Pi	Pe	Pt	S	T
0064H	O	O	O	O	O

Setting Description:

Setting	Description
0	Disable motor cable disconnection protection
1	Enable motor cable disconnection protection. Note: When speed command is 0, it is determined by position error. Maximum and minimum can be set by Pn308 & Pn309.

Cn098 Motor cable disconnection detection time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
3000	ms	1000 ~ 10000	--	--

RS-485	Pi	Pe	Pt	S	T
0065H	O	O	O	O	O

Setting Description: Motor cable disconnection detection time; continuous detection and AL-20 will occur when time is up.

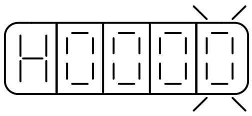
7-3-2 CANopen parameter (Cn0□□) ※ Only JSDG2S model contains this function

Cn078.0 CANopen communication write-in selection ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0051H	204EH	204EH	O	O	O	O	O

Setting Description:



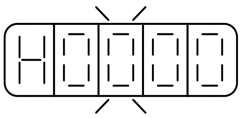
Setting	Description
0	CANopen communication write in SRAM
1	CANopen communication write in EEPROM

Cn078.2 CANopen communication transmission rate ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0 ~ 5	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0051H	204EH	204EH	O	O	O	O	O

Setting description:



Setting	Description	Setting	Description
0	1M	3	125k
1	500k	4	100k
2	250k	5	50k

Cn079 CANopen ID setting ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 127	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0052H	204FH	-	O	O	O	O	O

Setting Description: CANopen ID setting

Cn095 CANopen detection bus off and disconnection level ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
130	--	128 ~ 256	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0062H	205FH	-	O	O	O	O	O

Setting Description: When CANopen Error Counter is greater than the set level, AL029 alarm will occur.

Cn096 CANopen disconnection clearing comparison level ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	--	0 ~ 127	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0063H	2060H	-	O	O	O	O	O

Setting Description: When CANopen Error Counter is smaller than the set level, automatically clear AL029 (CANopen communication disconnection)

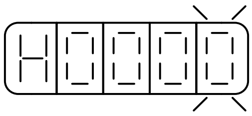
7-3-3 Torque Control Parameters (Tn1□□)

Tn101.0 Torque Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	▲	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0101H	2101H	2101H	-	-	-	-	O

Setting Description:



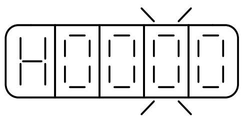
Setting	Description
0	Do not use Torque Command Linear Acceleration / Deceleration Function
1	Use Torque Command Linear Acceleration / Deceleration Function
2	Use Torque Command One Time Smoothing Acceleration / Deceleration Function

Tn101.1 Torque command selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	▲	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0101H	2101H	2101H	-	-	-	-	O

Setting Description:



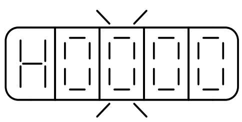
Setting	Description
0	Use Analog TIC Torque Command
1	Use Digital Tn113 Torque Command

Tn101.2 Speed limit value switch function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	▲	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0101H	2101H	2101H	-	-	-	-	O

Setting Description:



Setting	Description
0	Use SPD1, SPD2 to switch Speed Limit Value
1	Switch Tn114, Tn115 Positive and Negative Speed Limit Values by Positive and Negative Torque

Tn102 Torque Command Linear Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	ms	1 ~ 50000	▲	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0102H	2102H	2102H	-	-	-	-	O

Setting Description: The Torque Command Linear Acceleration/Deceleration Constant is defined as the time for the Torque Command to rise from zero linearly to the Rated Torque.

Tn103 Analog torque command proportioner ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300	%/10V	0 ~ 600	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0103H	-	-	-	-	-	-	O

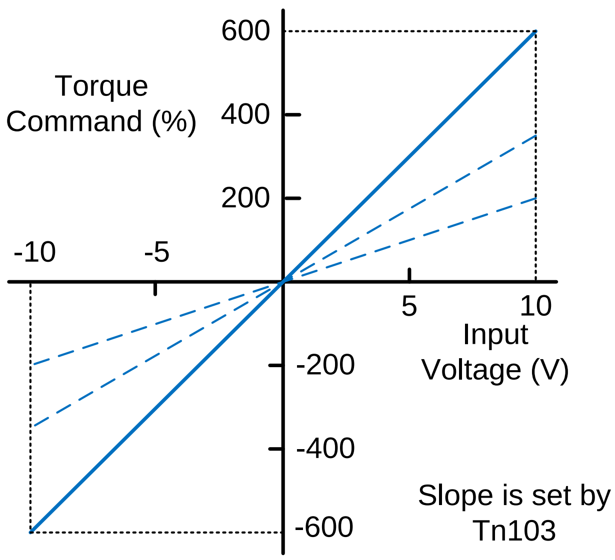
Setting Description: Used to adjust the slope of the Voltage Command relative to the Torque Command.

Setting Example:

(1) If Tn103 is set to 300, indicating the Input Voltage 10V corresponds to 300% rated Torque Command; if the Input Voltage is

5V at this time, the it corresponds to 150% rated torque command.

(2) If Tn103 is set to 200, indicating the Input Voltage 10V corresponds to 200% rated Torque Command; if the Input Voltage is 5V at this time, then it corresponds to 100% rated Torque Command.

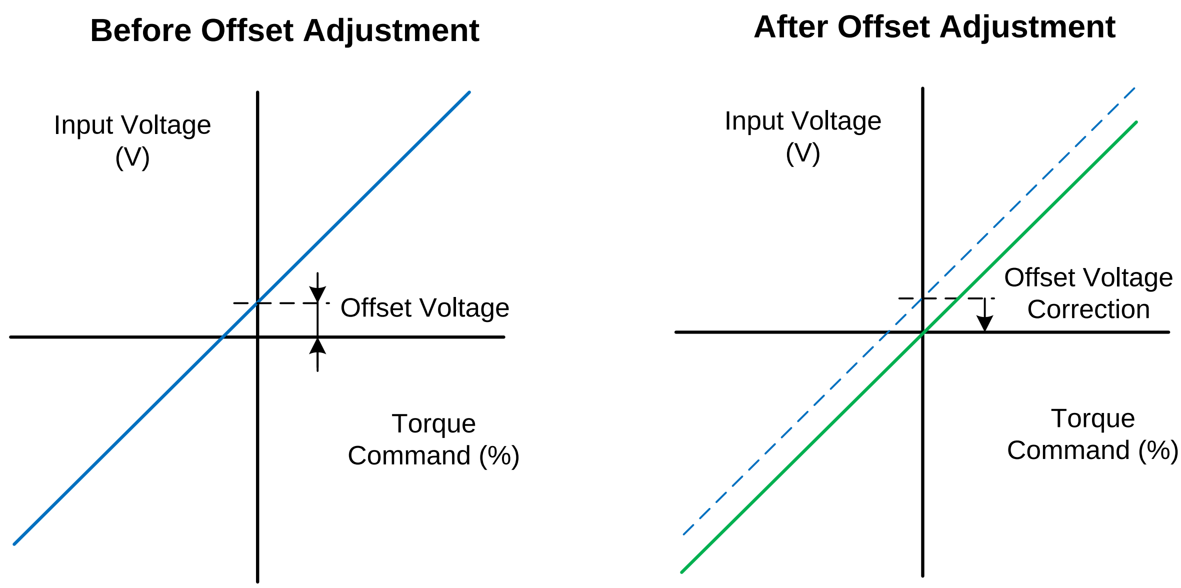


Tn104 Analog torque command offset adjustment ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	mV	-2500 ~ 2500	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0104H	-	-	-	-	-	-	O

Setting Description: Used to correct offset when the Analog Torque Command Voltage generated offset phenomenon.



Tn105 Internal Speed Limit 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0105H	2105H	2105H	--	--	--	--	O

Setting Description: In Torque Control, the Digital Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the DigitalInput Contact SPD1, SPD2 states are as the following combination:

Digital Input Contact SPD2	Digital Input Contact SPD1
0	1

Tn106 Internal Speed Limit 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0106H	-	-	--	--	--	--	O

Setting Description: In Torque Control, the Digital Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 2, the DigitalInput Contact SPD1, SPD2 states are as the following combination:

Digital Input Contact SPD2	Digital Input Contact SPD1
1	0

Tn107 Internal Speed Limit 3

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0107H	-	-	--	--	--	--	O

Setting Description: In Torque Control, the Digital Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 3, the DigitalInput Contact SPD1, SPD2 states are as the following combination:

Digital Input Contact SPD2	Digital Input Contact SPD1
1	1

Tn108 Torque Reached Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	%	0 ~ 300	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0108H	2108H	2108H	O	O	O	O	O

Setting Description: When the Forward or Reverse Torque exceeds the set level, the Digital Output Contact INT operates.

Tn109 Analog speed limit proportioner ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Rated Speed	rpm	100 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0109H	-	-	-	-	-	-	O

Setting Description: Used to adjust the slope of the Voltage Command relative to the Speed Limit.

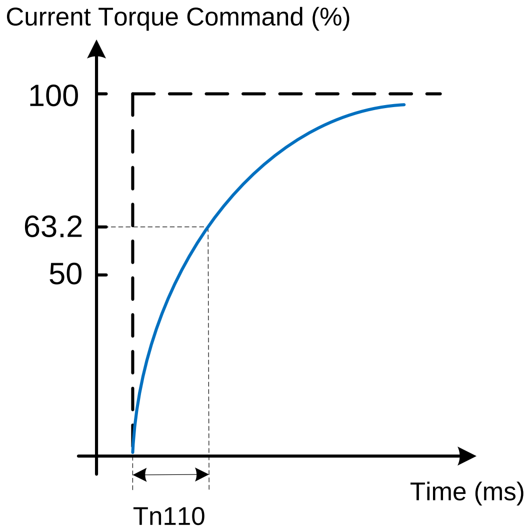
Note): This parameter is the same as Sn216, with different functions under different modes.

Tn110 Torque Command One Time Smoothing Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	ms	1-10000	▲	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
010AH	210AH	210AH	-	-	-	-	O

Setting Description: Set Tn101 = 2 to activate the Torque Command One Time Smoothing Acceleration / Deceleration Function. Torque Command One Time Smoothing Acceleration / Deceleration Time Constant is defined as the time for the Torque one time delayed rise from 0% to 63.2% of the current Torque Command.



Tn113 Digital Torque Command Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.1%	-3000 ~ 3000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
010DH	-	-	-	-	-	-	O

Setting Description: Set Tn101.1=1 to activate Digital Torque Command Functions.

Tn114 Forward Rotational Speed Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
010EH	-	-	-	-	-	-	O

Setting Description: Set Tn101.2=1, switch the Forward Reverse Speed Limit value by Positive and Negative Torques.

Tn115 Negative Rotational Speed Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
-100	rpm	-1.5*rated rotational speed ~ 0	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
010FH	-	-	-	-	-	-	O

Setting Description: Set Tn101.2=1, switch the Forward Reverse Rotational Speed Limit value Speed Control Parameter by Positive and Negative Torques.

7-3-4 Speed Control Parameters (Sn2□□)

Sn201 Internal Speed Command 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	-1.5*Rated Rotational Speed~1.5*Rated Rotational Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0201H	2201H	2201H	-	-	-	O	-

Setting Description: In Speed Control, the DigitalInput Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the DigitalInput Contact SPD1, SPD2 states are as the following combination:

Digital Input Contact SPD2	Digital Input Contact SPD1
0	1

Sn202 Internal Speed Command 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	rpm	-1.5*Rated Rotational Speed~1.5*Rated Rotational Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0202H	-	-	-	-	-	O	-

Setting Description: In Speed Control, the DigitalInput Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 2, the DigitalInput Contact SPD1, SPD2 states are as the following combination:

Digital Input Contact SPD2	Digital Input Contact SPD1
1	0

Sn203 Internal Speed Command 3

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300	rpm	-1.5*Rated Rotational Speed~1.5*Rated Rotational Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0203H	-	-	-	-	-	O	-

Setting Description: In Speed Control, the DigitalInput Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 3, the DigitalInput Contact SPD1, SPD2 states are as the following combination:

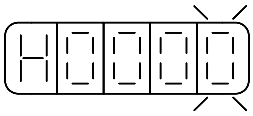
Digital Input Contact SPD2	Digital Input Contact SPD1
1	1

Sn204.0 Zero Speed Determined Operation

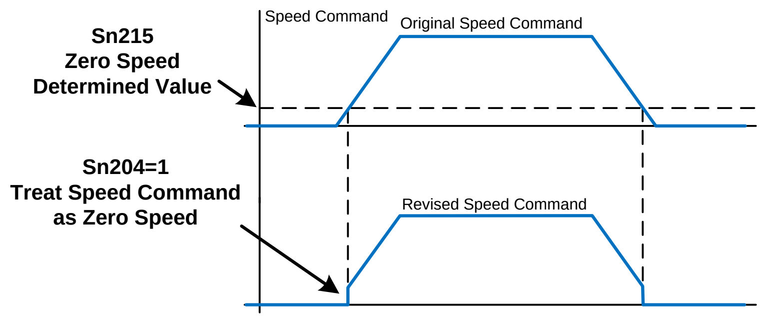
Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0204H	2204H	2204H	O	O	O	O	O

Setting Description:



Setting	Description
0	Does not operate
1	Treat Speed Command as Zero Speed

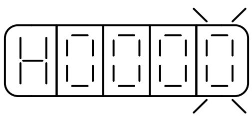


Sn205.0 Speed Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 3	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0205H	2205H	2205H	--	--	--	O	--

Setting Description:



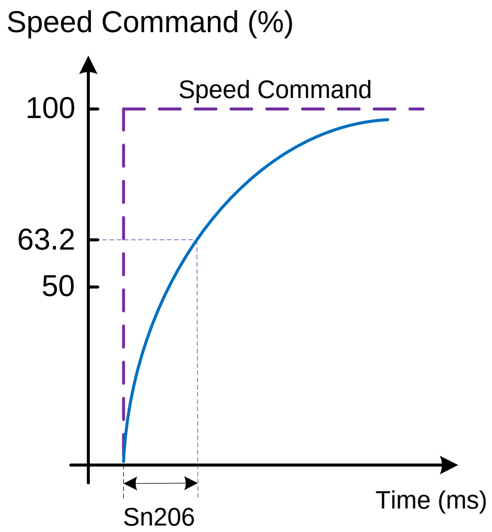
Setting	Description
0	Do not use Speed Command Acceleration / Deceleration Function
1	Use the Speed Command One Time Smoothing Acceleration / Deceleration Function
2	Use the Speed Command Linear Smoothing Acceleration / Deceleration Function
3	Use S-type Speed Command One Time Smoothing Acceleration / Deceleration Function

Sn206 Speed Command One Time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	ms	1-10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0206H	2206H	2206H	--	--	--	O	--

Setting Description: Set Sn205=1 to activate Speed Command One time Smoothing Acceleration / Deceleration Function. The definition of Speed Command One Time Smoothing Acceleration / Deceleration Time Constant is the time for the Speed one time delayed rise from Zero Speed to 63.2% of the Speed Command, the schematic diagram is as follows:

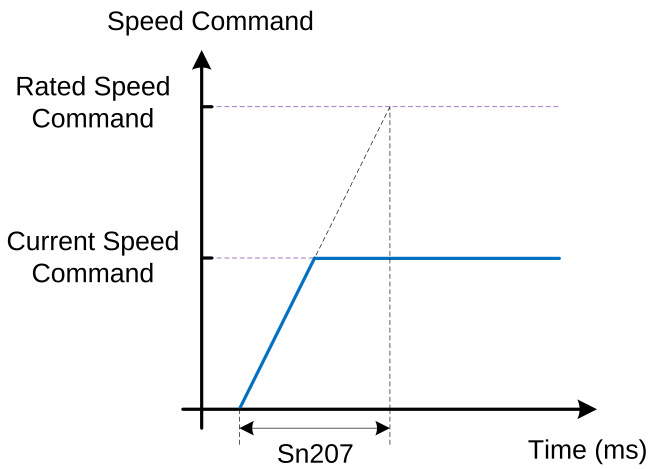


Sn207 Speed command linear acceleration/deceleration constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	ms	1-50000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0207H	2207H	2207H	--	--	--	O	--

Setting Description: Set Sn205=2 to activate Speed Command Linear Acceleration / Deceleration Function. The definition of Speed Command Linear Acceleration / Deceleration Time Constant is the time of Speed from zero linear to rise to Rated Speed, the schematic diagram is as follows:

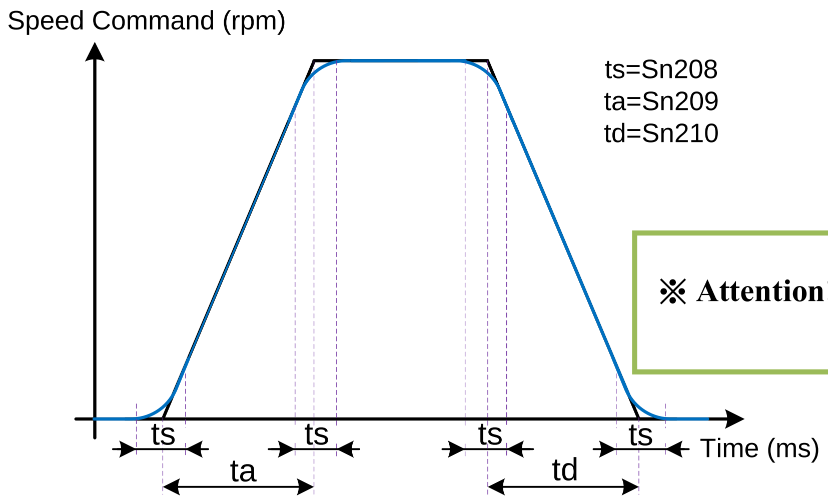


Sn208 S-type Speed Command Acceleration / Deceleration Time Setting (t_s)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	ms	1-1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0208H	2208H	2208H	--	--	--	O	--

Setting Description: Set Sn205=3 to activate S-type Speed Command Acceleration / Deceleration Function. During Acceleration / Deceleration, due to the severe Acceleration / Deceleration Changes when activating Stop that resulted in machine oscillation, adding S-type Acceleration / Deceleration to Speed Command can achieve the function of smooth operations.



※ **Attention! Setting Rules:** $\frac{t_a}{2} > t_s$, $\frac{t_d}{2} > t_s$

Sn209 S-type Speed Command Acceleration Time Setting (t_a)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	ms	0 ~ 5000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0209H	2209H	2209H	--	--	--	O	--

Setting Description: Please refer to Sn208 Description

Sn210 S-type Speed Command Deceleration Time Setting (t_b)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	ms	0 ~ 5000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
020AH	220AH	220AH	--	--	--	O	--

Setting Description: Please refer to Sn208 Description

Sn211 Speed Loop Gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2 ~ 1500	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
020BH	220BH	220BH	O	O	O	O	-

Setting Description: The Speed Loop Gain directly determines the Response Bandwidth of the Speed Control Loop. Under the premise of the mechanical system does not generate vibration or noise, increasing the Speed Loop Gain value will speed up the Speed Response. If Cn025 (Load Inertia Ratio) is set correctly, the Speed Loop Bandwidth equals the Speed Loop Gain.

Sn212 Speed Loop Integration Time Constant 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	0.01ms	40 ~ 50000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
020CH	220CH	220CH	O	O	O	O	-

Setting Description: Adding integration components to the Speed Control Loop can effectively eliminate the speed steady-state error and quickly respond to subtle speed changes. In general, under the premise that the mechanical system does not generate vibration or noise, the speed loop integration time constant is reduced to increase the system rigidity. Please use the following formula to calculate Speed Loop Integration Time Constant:

$$\text{Speed Loop Integration Time Constant} \geq 5 \times \frac{1}{2\pi \times \text{Speed Loop Gain}}$$

Sn213 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2 ~ 1500	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
020DH	220DH	220DH	O	O	O	O	-

Setting Description: Please refer to Sn211 Description for Setting Method

Sn214 Speed Loop Integration Time Constant 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	0.01ms	40 ~ 50000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
020EH	220EH	220EH	O	O	O	O	-

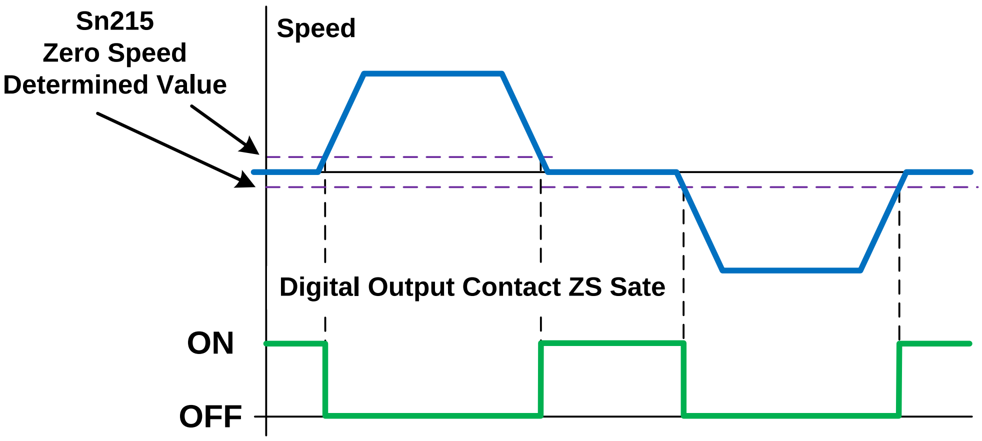
Setting Description: Please refer to Sn212 Description for Setting Method

Sn215 Zero Speed Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50	rpm	0 ~ 1.5*Rated Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
020FH	220FH	220FH	O	O	O	O	O

Setting Description: When speed is lower than the speed set by Sn215 (zero speed determined value), digital output contact ZS activates.



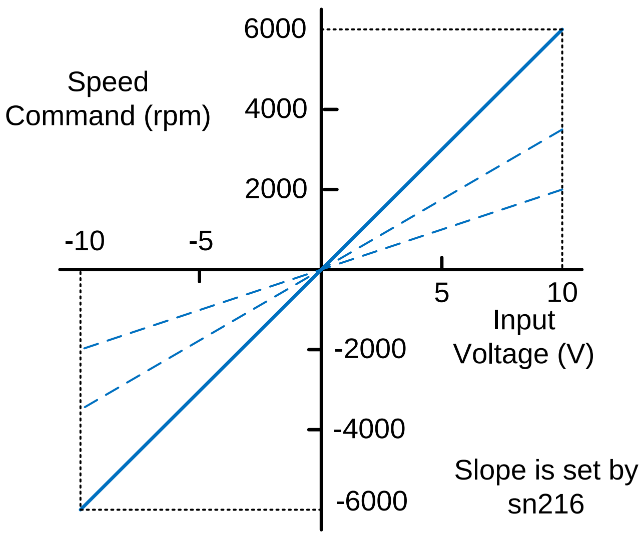
Sn216 Analog speed command proportioner ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Rated Speed	rpm/10V	100 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0210H	-	-	--	--	--	O	--

Setting Description: Used to adjust the slope of Voltage Command relative to the Speed Command.

Note): This Parameter is the same as Tn109, with different Functions under different Modes

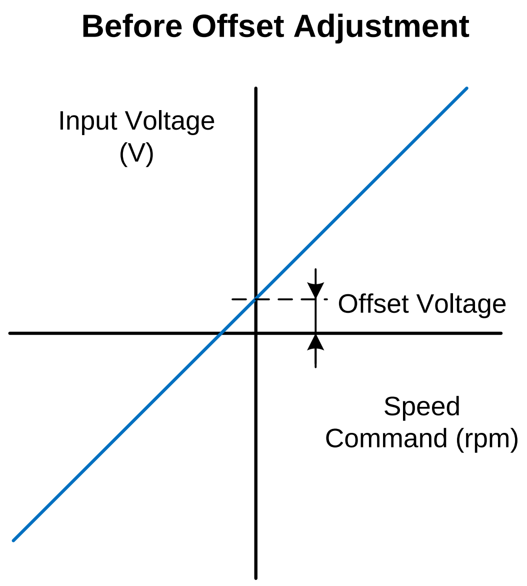


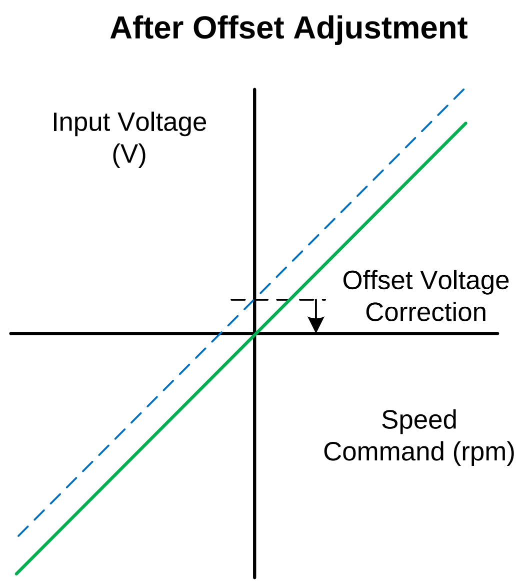
Sn217 Analog speed command offset adjustment ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	mV	-2500 ~ 2500	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0211H	-	-	--	--	--	O	--

Setting Description: Used to correct offset when the Analog Speed Command Voltage generates the offset phenomenon.





Sn218 Analog speed command limit ※JSDG2S-E does not have this function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1.02* Rated Speed	rpm	100 ~ 1.5*Rated Rotational Speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0212H	-	-	--	--	--	O	--

Setting Description: The user can set Sn218 to limit the Maximum Speed of the Analog Input.

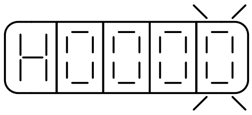
7-3-5 Speed Control Parameters (Sn3□□)

Pn301.0 Position Pulse /command Pattern Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 3	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0301H	-	-	--	O	--	--	--

Setting Description:



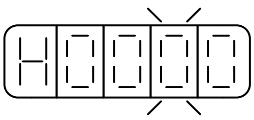
Setting	Description
0	Pulse+Sign
1	CCW+CW Pulse
2	A phase+ B phase pulse * 2
3	A phase+ B phase pulse * 4

Pn301.1 Position Pulse Command Logic Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0301H	-	-	--	O	--	--	--

Setting Description:



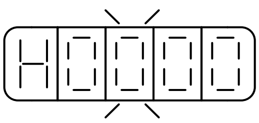
Setting	Description
0	Positive Logic
1	Negative Logic

Pn301.2 Drive inhibits Command Receiving Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0301H	-	-	O	O	--	--	--

Setting Description:



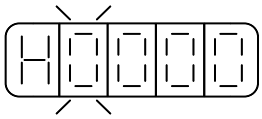
Setting	Description
0	After the Drive Prohibition occurs, continue recording the Position Command Input Quantity.
1	After the Drive Prohibition occurs, ignore Position Command Input Quantity.

Pn301.3 Position Pulse Command Filter Width Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0 ~ 7	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0301H	-	-	--	O	--	--	--

Setting Description:



Setting	Description	Setting	Description
0	4500KHz	4	370KHz
1	2500KHz	5	190KHz
2	1200KHz	6	90KHz
3	750KHz	7	40KHz

Pn302 Electronic Gear Ratio Numerator 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 8388608	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0302H/0303H	-	-	O	O	--	--	--

Setting Description: Please check if Pn354 = 0~63 is set when using functions of Pn302~Pn306. DigitalInput Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the DigitalInput Contact GN1, GN2 states are as the following combination:

Digital input contactGN2	Digital input contactGN1
0	0

Pn303 Electronic Gear Ratio Numerator 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 8388608	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0304H/0305H	-	-	O	O	--	--	--

Setting Description: Please check if Pn354 = 0~63 is set when using functions of Pn302~Pn306. DigitalInput Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the DigitalInput Contact GN1, GN2 states are as the following combination:

Digital input contactGN2	Digital input contactGN1
0	1

Pn304 Electronic Gear Ratio Numerator 3

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 8388608	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0306H/0307H	-	-	O	O	--	--	--

Setting Description: Please check if Pn354 = 0~63 is set when using functions of Pn302~Pn306. DigitalInput Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the DigitalInput Contact GN1, GN2 states are as the following combination:

Digital input contact GN2	Digital input contact GN1
1	0

Pn305 Electronic Gear Ratio Numerator 4

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 8388608	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0308H/0309H	-	-	O	O	--	--	--

Setting Description: Please check if Pn354 = 0~63 is set when using functions of Pn302~Pn306. DigitalInput Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the DigitalInput Contact GN1, GN2 states are as the following combination:

Digital input contact GN2	Digital input contact GN1
1	1

Pn306 Electronic Gear Ratio Denominator

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 8388608	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
030AH/030BH	-	-	O	O	--	--	--

Setting Description: Please check if Pn354 = 0~63 is set when using functions of Pn302~Pn306. Set Pn306 (Electronic Gear Ratio Denominator) and match the Electronic Gear Ratio Numerator selected by Digital Input Contact GN1, GN2. The obtained Electronic Gear Ratio must conform to the following conditions, otherwise this Device cannot operate normally.

$$\frac{1}{1000} \leq \text{Electronic Gear Ratio} \leq 4000$$

Pn307 Positioning Completed Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
One thousandth of a Revolution	pulse	0 ~ 41943040	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
030CH/030DH	2307H	2307H	O	O	O	--	--

Setting Description: When Position Error is lower than the pulse number set by Pn307 (Positioning Completed Determined Value), Digital Output Contact INP operates.

Pn308 Positive Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
5000	0.001rev	0 ~ 50000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
030EH	2308H	2308H	O	O	O	--	--

Setting Description: When Position Error is higher than the pulse number set by Pn308 (Positive Maximum Position Error Determined Value), this device generates AL011 (Excessive Position Error Alarm).

Pn309 Negative Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
5000	0.001rev	0 ~ 50000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
030FH	2309H	2309H	O	O	O	--	--

Setting Description: When position error is higher than the pulse number set by Pn309 (negative maximum position error determined value), this device generates AL011 (excessive position error alarm).

Pn310 Position Loop Gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	rad/s	1 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0310H	230AH	230AH	O	O	O	--	--

Setting Description: Under the premise that the mechanical system does not generate vibration or noise, increasing the Position Loop Gain value will speed up the Speed Response, shorten the Position Time. In general, the Position Loop Bandwidth cannot be higher than the Speed Loop Bandwidth. The recommended formula is as follows:

$$\text{Position Loop Gain} \leq 2\pi \times \frac{\text{Speed Loop Gain}}{5}$$

Pn311 Position Loop Gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	rad/s	1 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0311H	230BH	230BH	O	O	O	--	--

Setting Description: Please refer to Pn310 Description for the Setting Method

Pn312 Position Loop Feed Forward Gain

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	%	0 ~ 100	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0312H	230CH	230CH	O	O	O	--	--

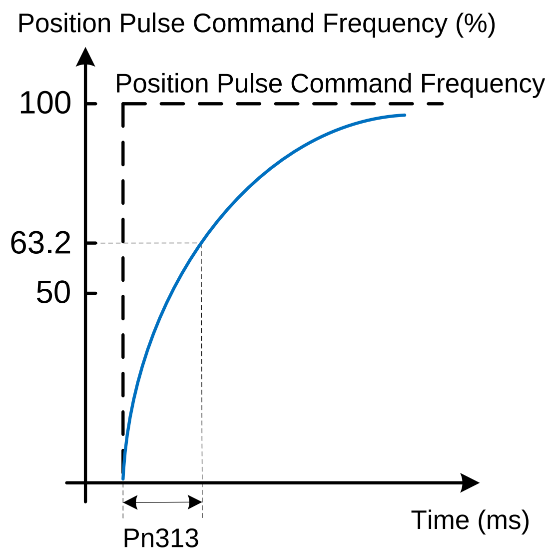
Setting Description: It can reduce the tracking error of position control and speed up reaction. If the feed forward gain is too large, speed overshoot and repeatedly turn on/off of output contact INP (positioning completion signal) may occur.

Pn313 Internal / External Position Command One time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	ms	0 ~ 10000	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0313H	230DH	230DH	O	O	O	--	--

Setting Description: Will smooth the Position Pulse Command of originally fixed frequency. The definition of External Position Command One Time Smoothing Acceleration / Deceleration Time Constant is the time of the Position Command Frequency starts one time delay rise from zero to 63.2% of the External Position Pulse Command Frequency, the schematic diagram is as follows:

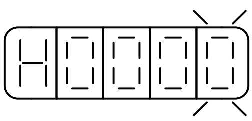


Pn314.0 Position Command Direction Definition (from Motor Load End)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0314H	230EH	230EH	O	O	--	--	--

Setting Description:



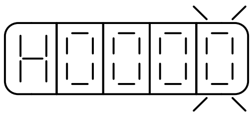
Setting	Description
0	Clockwise Rotation (CW)
1	Counterclockwise Rotation (CCW)

Pn315.0 Pulse Error Clearing Mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0315H	-	-	Determined by the Setting				

Setting Description:



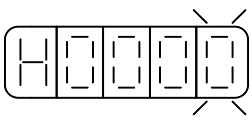
Setting	Description
0	When the Input Contact **CLR** operates, clear the Pulse Error.
1	When Digital Input Contact **CLR** triggers, cancel Position Command to interrupt the Motor operation, re-set Mechanical Origin, and clear Pulse Error.
2	When Digital Input Contact CLR triggers, cancel Position Command to interrupt Motor operation and clear Pulse Error.

Pn316.0 Internal position command mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0316H	2310H	2310H	O	--	--	--	--

Setting Description:



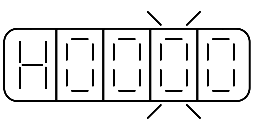
Setting	Description
0	Absolute Type Positioning
1	Relative Type Positioning

Pn316.1 Internal Position Command Hold (PHOLD) Procedure Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0316H	2310H	2310H	O	--	--	--	--

Setting Description:



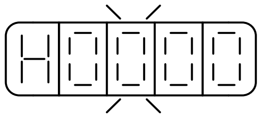
Setting	Description
0	After Digital Input Contact PHOLD operates, when PTRG is triggered again, Motor will continue to complete the Internal Position Command before PHOLD is triggered.
1	After Digital Input Contact PHOLD operates, when PTRG is triggered again, Motor will operate according to current selected Internal Position Command immediately.

Pn316.2 Encoder Signal Dividing Output Phase

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0316H	2310H	2310H	O	O	O	O	O

Setting Description:



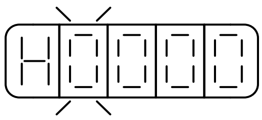
Setting	Description
0	Dividing Output Phase A leading Phase B
1	Dividing Output Phase A behind Phase B

Pn316.3 Encoder Signal Dividing Output Frequency Elimination

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0316H	2310H	2310H	O	O	O	O	O

Setting Description:

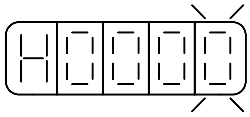


Setting	Description
0	Output according to Cn005 setting value
1	Output according to Cn005 Setting Value divided by 4

After activated the Pn317.0 Returns to Origin, the Origin Search Direction and Select Origin Reference Point Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 5	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0317H	-	-	O	O	O	--	--

Setting Description: 

Setting	Description
0	After Return to Origin is activated, Motor searches for Origin with first stage Speed in Forward Direction, and uses Digital Input Contact Point CCWL or CWL as Origin Reference Point. After Return to Origin and positioning are completed, Digital Input Contact CWL or CCWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Digital Input Contact CCWL and CWL Function Selection) must be set to 0.
1	After Return to Origin is activated, Motor searches for Origin with first stage Speed in Reverse Direction, and uses DigitalInput Contact Point CCWL or CWL as Origin Reference Point. After Return to Origin and positioning are completed, Digital Input Contact CWL or CCWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Digital Input Contact CCWL and CWL Function Selection) must be set to 0.
2	After Return to Origin is activated, Motor searches the Origin with first stage Speed in Forward Direction and uses Digital Input Contact ORG (External Detector Input Point) as Origin Reference Point. If Pn317.1=2, then Origin Reference Point is not required and searches for the top edge closest to Digital Input Contact Point ORG as Machine Origin and stops according to the method set in Pn317.3.
3	After Return to Origin is activated, Motor searches the Origin with first stage Speed in Reverse Direction and uses Digital Input Contact ORG (External Detector Input Point) as Origin Reference Point. If Pn317.1=2, then Origin Reference Point is not required and searches for the top edge closest to Input Contact Point ORG as Machine Origin and stops according to the method set in Pn317.3.
4	After Return to origin is activated, motor searches for the origin with first stage speed in forward direction. Origin reference point is not required and searches for the closest to phase Z pulse origin. When using this function, must set Pn317.1=2 (stop by the method set by Pn317.3 after finding phase Z pulse as the mechanical origin).
5	After Return to Origin is activated, Motor searches for the Origin with first stage Speed in Reverse Direction, the Origin Reference Point is not required and searches for the closest Phase Z Pulse Origin. When using this function, must set Pn317.1=2 (stop by the method set by Pn317.3 after finding phase Z pulse as the mechanical origin).

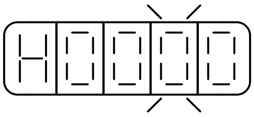
Note: Use ABS type encoder to execute return to zero. Set Cn031.2 function according to requirements.

Pn317.1 After Found Origin Reference Point, the Moving Method Setting for Searching Mechanical Origin

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0317H	-	-	O	O	O	--	--

Setting Description:



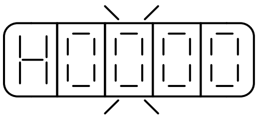
Setting	Description
0	After founding the Reference Origin, the Motor will**return** with a second stage speed to search the closest Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3.
1	After the Reference Origin is found, the Motor will **continue forward** with the second stage speed to search the closest PhaseZPulse as the Mechanical Origin and stops according to the method set in Pn317.3.
2	When Pn317.0=2 or 3, after the top edge of Digital Input Contact ORG is found as the Mechanical Origin and stops according to the method set in Pn317.3; when Pn317.0=4 or 5, after stops according to the method set in Pn317.3 after phase Z pulse is found as the mechanical origin.

Pn317.2 Return to Origin Activation Mode Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0317H	-	-	O	O	O	--	--

Setting Description:



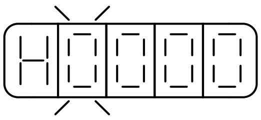
Setting	Description
0	Turn Off Return to Origin Function.
1	After the power is on, only first **Servo ON** will automatically execute return to origin function. When the Servo System does not have to repeat executing Return to Origin Function during operations, this Mode can be used to omit an Digital Input Contact used to execute Return to Origin Function.
2	Trigger Return to Origin Function by Digital input contact SHOME; the digital input contact SHOME can be triggered at any time to execute Return to Origin Function.

Pn317.3 Stop Mode Setting after the Mechanical Origin is Found

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0317H	-	-	O	O	O	--	--

Setting Description:



Setting	Description
0	After the Mechanical Origin Signal is found, **record** this position as the Mechanical Origin **(**both Un-14 Encoder Feedback Number of Revolutions, Un-15 Encoder Feedback Number of Pulse are all zero**)**, the Motor decelerates to stop, and after the Motor stopped, **return** moving to the Mechanical Origin Position with second stage speed.
1	After the Mechanical Origin Signal is found, **record** this position as the Mechanical Origin **(**both Un-14 Encoder Feedback Number of Revolutions, Un-15 Encoder Feedback Number of Pulse are all zero**)**, the Motor decelerates to stop.

Pn318 Return to Origin First Stage High Speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	1 ~ rated rotational speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0318H	--	--	O	O	O	--	--

Setting Description: Set the Moving Speed of Return to Origin First Stage High Speed

Pn319 Return to origin second stage low speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50	rpm	1 ~ rated rotational speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0319H	--	--	O	O	O	--	--

Setting Description: Set the Moving Speed of Return to Origin Second Stage High Speed

Pn320 Return to Origin Offset Number of Revolutions

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rev	-30000 ~ 30000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
031AH	-	-	O	O	O	--	--

Setting Description: After the Motor has found the Mechanical Origin in accordance with Pn317(Return to Origin Mode), it will position in accordance with Pn320 (Return to Origin Offset Number of Revolutions) and Pn321 (Return to Origin Offset Number of Pulses) as the New Mechanical Origin

Pn321 Number of Pulse of Return to Origin Offset

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	-32767~32767:8192ppr, 15bit -131071~131071:17bit -8388607~8388607:23bit	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
031BH/031CH	-	-	O	O	O	--	--

Setting Description: Return to Origin Offset Position =Pn320 (Number of Revolutions) x Number of Pulses in One Revolution of Encoder +Pn321(Number of Pulses)

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.4ms	0 ~ 5000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
031DH	-	-	O	--	O	--	--

Setting Description: The Position S-type Smoother is suitable for the Control Mode of the Internal Position Command Input, and provides the smoothing process of the motion command. The generated speed and acceleration are continuous, and the jerkiness of the acceleration is smaller, which can improve the characteristics of acceleration / deceleration of the Motor, and more smooth in mechanical structure operations.

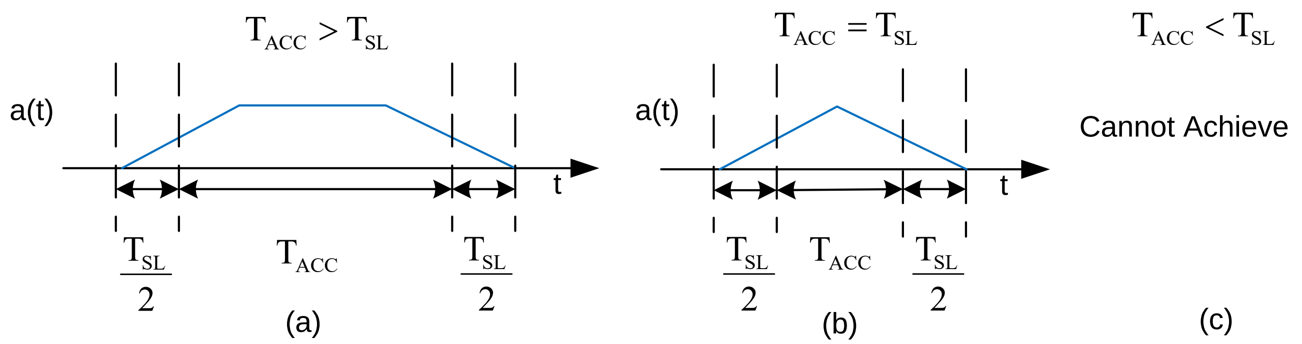


Figure: Definition of Travel Time for S-type Curve.

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	0.4ms	1 ~ 5000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
031EH	-	-	O	--	O	--	--

Setting Description: Please refer to Pn322 Description.

Pn324 CNC tool magazine quantity setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
12	--	1 ~ 64	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
031FH	--	--	--	--	O	--	--

Setting Description: Total Number of Tool Holders on Tool Tray

Pn325 CNC Tool Tray Return to Zero Position

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	0 ~ 8388607	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0320H/0321H	--	--	--	--	O	--	--

Setting Description: Set the Zero Tool Position

Pn326 CNC Tool Tray Reduction Ratio

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 255	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0322H	--	--	--	--	O	--	--

Setting Description: Tool Tray Reduction Ratio

Pn327 Tool change rotational speed 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	1 ~ 2*rated rotational speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0323H	--	--	--	--	O	--	--

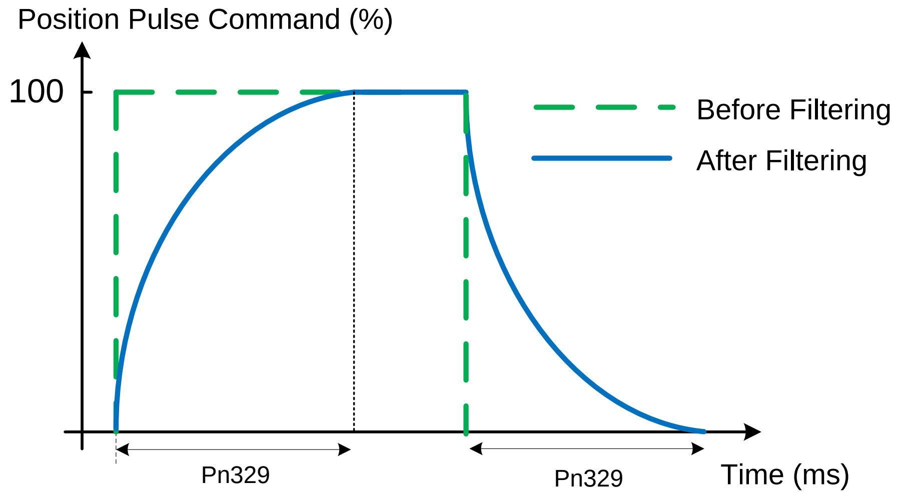
Setting Description: Set digital input contact TRQINV=OFF under tool magazine mode and will change tool by the speed of tool change rotational speed 1.

Pn329 Pulse Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	2ms	0 ~ 2500	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0325H	231DH	231DH	O	O	O	--	--

Setting Description: Can select Filter Smoothing Time.

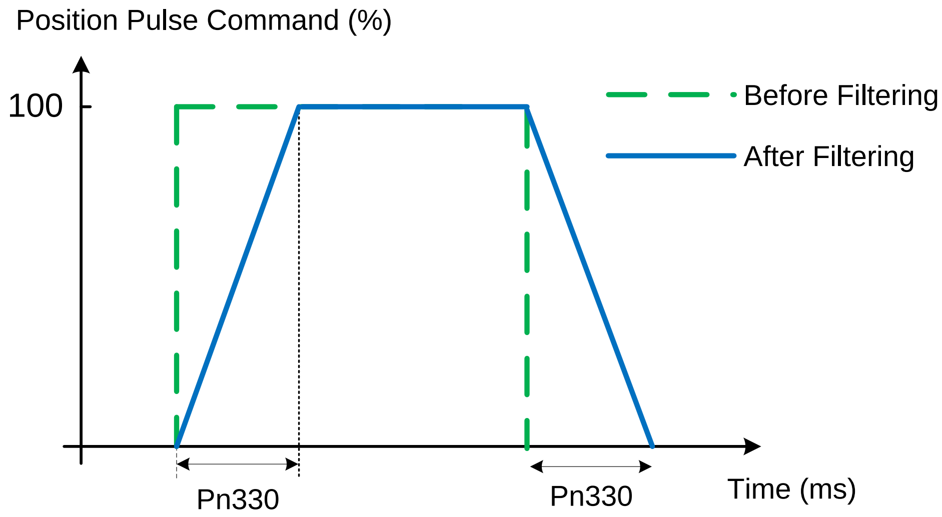


Pn330 Pulse Command Moving Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.4ms	0 ~ 250	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0326H	231EH	231EH	O	O	O	--	--

Setting Description: Pulse Command Moving Filter



Pn331 Turret Magazine Backlash Compensation Parameters

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	-8388607 ~ 8388607	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0327H/0328H	--	--	--	--	O	--	--

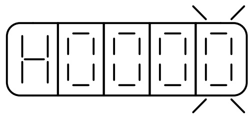
Setting Description: Set Backlash Compensation Value

Pn332.0 Internal Position Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0329H	--	--	O	--	O	--	--

Setting Description:



Setting	Description
0	Use Position Command One Time Smoothing Acceleration / Deceleration
1	Use Internal Position Command **S-type** Acceleration / Deceleration (external position command does not have this function)
2	Use Internal Position Command **S-type** Acceleration / Deceleration Separation (external position command does not have this function)

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	0.4ms	1 ~ 5000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
032AH	--	--	O	--	O	--	--

Setting Description: Please refer to PN322 Description

Pn334 PTRG Trigger Delay Time Parameter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	4ms	0 ~ 2500	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
032BH	--	--	O	--	O	--	--

Setting Description: After PTRG is triggered and delay by the set time, PTRG function becomes effective officially.

Pn335 Tool change rotational speed 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	1 ~ rated rotational speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
032CH	--	--	--	--	O	--	--

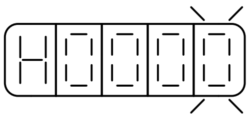
Setting Description: Set digital input contact TRQINV=ON under tool magazine mode and will change tool by the speed of tool change rotational speed 2.

Pn336.0 Automatic Low Frequency Vibration Suppression Enablement Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 3	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
032DH	2324H	2324H	O	O	O	-	-

Setting Description:



Setting	Description
0	Disable Automatic Detection of Low Frequency Vibration Frequency
1	Enable Automatic Detection of Low Frequency Vibration Frequency 1
2	Enable Automatic Detection of Low Frequency Vibration Frequency 2
3	Enable Automatic Detection of Low Frequency Vibration Frequency 3

Pn337 Automatic Low Frequency Vibration Suppression Delay

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	1ms	0 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
032EH	2325H	2325H	O	O	O	-	-

Setting Description: Automatically detects the Delay Time of Low Frequency Vibration Frequency

Pn338 Low Frequency Swinging Detection Level

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	0.1 %	1 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
032FH	2326H	2326H	O	O	O	-	-

Setting Description: The detection level when executing automatic low frequency vibration suppression (Pn336=1~3), this value setting method is used to set the percentage of the positioning completion determined value (Pn307), adjusting the low frequency swinging detection level (Pn338) can adjust the detection sensitivity, and the lower the setting the easier for the noise to be determined incorrectly.

Pn339 Low frequency suppression frequency (first set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1000	0.1 Hz	10 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0330H	2327H	2327H	O	O	O	-	-

Setting Description: Used to eliminate the Low Frequency Vibration generated by insufficient mechanism rigidity.

Pn340 Low frequency suppression parameter (first set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 30	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0331H	2328H	2328H	O	O	O	-	-

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn341 Low frequency suppression frequency (second set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1000	0.1Hz	10 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0332H	2329H	2329H	O	O	O	-	-

Setting Description: Used to eliminate the Low Frequency Vibration generated by insufficient mechanism rigidity.

Pn342 Low frequency suppression parameter (second set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 30	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0333H	232AH	232AH	O	O	O	-	-

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn343 Low frequency suppression frequency (third set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1000	0.1Hz	10 ~ 1000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0334H	232BH	232BH	O	O	O	-	-

Setting Description: Used to eliminate the Low Frequency Vibration generated by insufficient mechanism rigidity.

Pn344 Low frequency suppression parameter (third set)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 30	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0335H	232CH	232CH	O	O	O	-	-

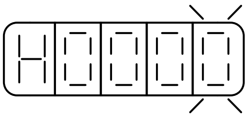
Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn346.0 Full-closed loop function activation

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0337H	232EH	232EH	O	O	--	--	--

Setting Description:



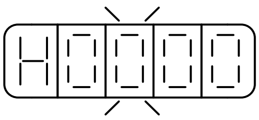
Setting	Description
0	Close
1	Activate

Pn346.2 Full-closed loop function dividing selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0337H	232EH	232EH	O	O	--	--	--

Setting Description:



Setting	Description
0	Servo motor encoder
1	External encoder

Pn347 Maximum full-closed loop error

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
5000	pulse	0 ~ 536870912	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0338H/0339H	232FH	232FH	O	O	--	--	--

Setting Description: The set error value between full-closed loop CN8 and actual encoder. When the position error is greater than the pulse set in Pn347, this device generates AL022 (excessive error between motor and load)

Pn348 Corresponded resolution of Full-closed loop Encoder one revolution

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1250	ppr	256 ~ 1048576	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
033AH/033BH	232FH	232FH	O	O	--	--	--

Setting Description: The number of pulses corresponding to the External Optical Finger when the Motor rotates one resolution (Encoder resolution of the Fully Closed Loop CN8 connection)

Pn349 Full-closed loop operation direction setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 3	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
033CH	2331H	2331H	O	O	--	--	--

Setting Description:

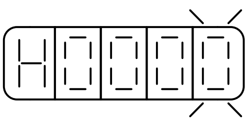
Setting	Description
0	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase A leading phase B
1	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase A leading phase B
2	External encoder positive direction corresponding counterclockwise (CCW) rotation, external encoder output phase B leading phase A
3	External encoder positive direction corresponding clockwise (CW) rotation, external encoder output phase B leading phase A

Pn350.0 Enable gantry synchronization function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
033DH	--	--	O	O	--	--	--

Setting Description:



Setting	Description
0	Close
1	Activate

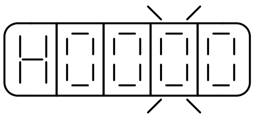
※ Attention! Gantry synchronization function CANNOT be activated with full-closed loop function at the same time. If both functions are turned on at the same time, they will be shut down forcibly.

Pn350.1 Gantry synchronization triggered to enable asynchronous function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
033DH	--	--	O	O	--	--	--

Setting Description:



Setting	Description
0	Close
1	Activate

Pn351 Gantry synchronization controller gain value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
10	rad/s	0 ~ 10000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
033EH	--	--	O	O	--	--	--

Setting Description: Gantry synchronization controller gain value. The larger the value, the smaller the synchronization error can be suppressed.

Pn352 Gantry synchronization maximum error tolerance

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	0-268435456	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
033FH/0340H	--	--	O	O	--	--	--

Setting Description: Maximum error between 2 axes tolerated by the machine

Pn354 Single Rotation Pulse Command Function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	0 ~ 2500: 2500ppr encoder 0 ~ 32768: 15bit encoder 0 ~ 131072: 17bit encoder 0 ~ 8388608: 23bit encoder	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0342H/0343H	--	--	O	O	--	--	--

Setting Description: The pulse command required by one motor revolution. When set as a value ≥64, Single pulse command function activates and Pn302~Pn306 E-Cam ratio function becomes invalid.

7-3-6 Control Parameter for Multi-position Control (Sn4□□)

Internal Position Command 1~32-Number of Revolutions

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rev	-16000 ~ 16000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
According to Parameters	--	--	O	--	--	--	--

Setting Description: Set Number of Rotations of Internal Position Command Use digital input contact POS1~POS5 to select the use of position command. Please refer to “5-4-2 Internal command position mode”. The following is the related parameter list.

Parameter Code	Parameter Name	RS-485	Parameter Code	Parameter Name	RS-485
Pn401	Internal position command 1-Number of revolutions	0701H	Pn449	Internal position command 17-Number of revolutions	0741H
Pn404	Internal position command 2-Number of revolutions	0705H	Pn452	Internal position command 18-Number of revolutions	0745H
Pn407	Internal position command 3-Number of revolutions	0709H	Pn455	Internal position command 19-Number of revolutions	0749H
Pn410	Internal position command 4-Number of revolutions	070DH	Pn458	Internal position command 20-Number of revolutions	074DH
Pn413	Internal position command 5-Number of revolutions	0711H	Pn461	Internal position command 21-Number of revolutions	0751H
Pn416	Internal position command 6-Number of revolutions	0715H	Pn464	Internal position command 22-Number of revolutions	0755H
Pn419	Internal position command 7-Number of revolutions	0719H	Pn467	Internal position command 23-Number of revolutions	0759H
Pn422	Internal position command 8-Number of revolutions	071DH	Pn470	Internal position command 24-Number of revolutions	075DH
Pn425	Internal position command 9-Number of revolutions	0721H	Pn473	Internal position command 25-Number of revolutions	0761H
Pn428	Internal position command 10-Number of revolutions	0725H	Pn476	Internal position command 26-Number of revolutions	0765H
Pn431	Internal position command 11-Number of revolutions	0729H	Pn479	Internal position command 27-Number of revolutions	0769H
Pn434	Internal position command 12-Number of revolutions	072DH	Pn482	Internal position command 28-Number of revolutions	076DH
Pn437	Internal position command 13-Number of revolutions	0731H	Pn485	Internal position command 29-Number of revolutions	0771H
Pn440	Internal position command 14-Number of revolutions	0735H	Pn488	Internal position command 30-Number of revolutions	0775H
Pn443	Internal position command 15-Number of revolutions	0739H	Pn491	Internal position command 31-Number of revolutions	0779H
Pn446	Internal position command 16-Number of revolutions	073DH	Pn494	Internal position command 32-Number of revolutions	077DH

Internal Position Command 1~32 - Number of Pulses

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	-8388608 ~ 8388608	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
According to Parameters	--	--	O	--	--	--	--

Setting Description: Set the Number of Rotation Pulse for the Internal Position Command, the following is the relevant parameter list.

Internal Position Command 1 = Pn401 (Number of Revolutions) x Number of Pulses in One Revolution of Encoder+ Pn402 (Number of Pulses).

Parameter Code	Parameter Name	RS-485 Communication Position
Pn402	Internal Position Command 1-Number of Pulses	0702H/0703H
Pn405	Internal position command 2-Number of pulses	0706H/0707H
Pn408	Internal position command 3-Number of pulses	070AH/070BH
Pn411	Internal position command 4-Number of pulses	070EH/070FH
Pn414	Internal position command 5-Number of pulses	0712H/0713H
Pn417	Internal position command 6-Number of pulses	0716H/0717H
Pn420	Internal position command 7-Number of pulses	071AH/071BH
Pn423	Internal position command 8-Number of pulses	071EH/071FH
Pn426	Internal position command 9-Number of pulses	0722H/0723H
Pn429	Internal position command 10-Number of pulses	0726H/0727H
Pn432	Internal position command 11-Number of pulses	072AH/072BH
Pn435	Internal position command 12-Number of pulses	072EH/072FH
Pn438	Internal position command 13-Number of pulses	0732H/0733H
Pn441	Internal position command 14-Number of pulses	0736H/0737H
Pn444	Internal position command 15-Number of pulses	073AH/073BH
Pn447	Internal position command 16-Number of pulses	073EH/073FH
Pn450	Internal position command 17-Number of pulses	0742H/0743H
Pn453	Internal position command 18-Number of pulses	0746H/0747H
Pn456	Internal position command 19-Number of pulses	074AH/074BH
Pn459	Internal position command 20-Number of pulses	074EH/074FH
Pn462	Internal position command 21-Number of pulses	0752H/0753H
Pn465	Internal position command 22-Number of pulses	0756H/0757H
Pn468	Internal position command 23-Number of pulses	075AH/075BH
Pn471	Internal position command 24-Number of pulses	075EH/075FH
Pn474	Internal position command 25-Number of pulses	0762H/0763H
Pn477	Internal position command 26-Number of pulses	0766H/0767H
Pn480	Internal position command 27-Number of pulses	076AH/076BH
Pn483	Internal position command 28-Number of pulses	076EH/076FH
Pn486	Internal position command 29-Number of pulses	0772H/0773H
Pn489	Internal position command 30-Number of pulses	0776H/0777H
Pn492	Internal position command 31-Number of pulses	077AH/077BH
Pn495	Internal position command 32-Number of pulses	077EH/077FH

Internal Position Command 1~32 - Moving Speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rpm	0 ~ 2*rated rational speed	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
According to Parameters	--	--	O	--	--	--	--

Setting Description: Set the Moving Speed of the Internal Position Command

Parameter Code	Parameter Name	RS-485	Parameter Code	Parameter Name	RS-485
Pn403	Internal Position Command 1-Moving Speed	0704H	Pn451	Internal Position Command 17-Moving Speed	0744H
Pn406	Internal Position Command 2-Moving Speed	0708H	Pn454	Internal Position Command 18-Moving Speed	0748H
Pn409	Internal Position Command 3-Moving Speed	070CH	Pn457	Internal Position Command 19-Moving Speed	074CH
Pn412	Internal Position Command 4-Moving Speed	0710H	Pn460	Internal Position Command 20-Moving Speed	0750H
Pn415	Internal Position Command 5-Moving Speed	0714H	Pn463	Internal Position Command 21-Moving Speed	0754H
Pn418	Internal Position Command 6-Moving Speed	0718H	Pn466	Internal Position Command 22-Moving Speed	0758H
Pn421	Internal Position Command 7-Moving Speed	071CH	Pn469	Internal Position Command 23-Moving Speed	075CH
Pn424	Internal Position Command 8-Moving Speed	0720H	Pn472	Internal Position Command 24-Moving Speed	0760H
Pn427	Internal Position Command 9-Moving Speed	0724H	Pn475	Internal Position Command 25-Moving Speed	0764H
Pn430	Internal Position Command 10-Moving Speed	0728H	Pn478	Internal Position Command 26-Moving Speed	0768H
Pn433	Internal Position Command 11-Moving Speed	072CH	Pn481	Internal Position Command 27-Moving Speed	076CH
Pn436	Internal Position Command 12-Moving Speed	0730H	Pn484	Internal Position Command 28-Moving Speed	0770H
Pn439	Internal Position Command 13-Moving Speed	0734H	Pn487	Internal Position Command 29-Moving Speed	0774H
Pn442	Internal Position Command 14-Moving Speed	0738H	Pn490	Internal Position Command 30-Moving Speed	0778H

Parameter Code	Parameter Name	RS-485	Parameter Code	Parameter Name	RS-485
Pn445	Internal Position Command 15-Moving Speed	073CH	Pn493	Internal Position Command 31-Moving Speed	077CH
Pn448	Internal Position Command 16-Moving Speed	0740H	Pn496	Internal Position Command 32-Moving Speed	0780H

7-3-7 Shortcut Parameters (qn5□□)

qn501 Speed loop gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2 ~ 1500	◆	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0401H	---	---	O	O	O	O	--

Setting Description: Same as Sn211

qn502 Speed Loop Integration Time Constant 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	0.01ms	40 ~ 50000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0402H	---	---	O	O	O	O	--

Setting Description: Same as Sn212.

qn503 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2 ~ 1500	◆	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0403H	---	---	O	O	O	O	--

Setting Description: Same as Sn213.

qn504 Speed Loop Integration Time Constant 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	0.01ms	40 ~ 50000	◆	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0404H	---	---	O	O	O	O	--

Setting Description: Same as Sn214.

qn505 Position Loop Gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	rad/s	1 ~ 2000	◆	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0405H	---	---	O	O	O	--	--

Setting Description: Same as Pn310.

qn506 Position loop gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	rad/s	1 ~ 2000	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0406H	---	---	O	O	O	--	--

Setting Description: Same as Pn311.

qn507 Position Loop Feed Forward Gain

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	%	0 ~ 100	◆	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0407H	---	---	O	O	O	--	--

Setting Description: Same as Pn312.

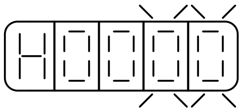
7-3-8 Multifunction Contact Planning Parameters (Hn6□□)

Hn601.0/Hn601.1 DI-1 Pin Function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	00 ~ 20	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0501H	2601H	2601H	O	O	O	O	O

Setting Description:



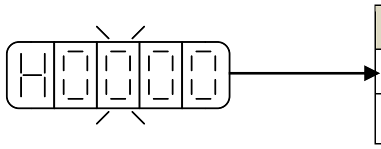
Setting	Description		Setting	Description	
	Code	Contact Operation Function		Code	Contact Operation Function
00	NULL	Not Used	11	GN2	Electronic Gear Ratio Numerator Selection 2
01	SON	Servo Start	12	PTRG	Internal Position Command Trigger
02	ALRS	Error Alarm Clearing	13	PHOLD	Internal Position Command Hold
03	PCNT	PI/P Switching	14	SHOME	Start to Return to Origin
04	CCWL	CCW Direction Drive Prohibited	15	ORG	External Reference Origin
05	CWL	CW Direction Drive Prohibited	16	POS1	Internal Position Command Selection 1 (tool number 1)
06	TLMT	External Torque Limit	17	POS2	Internal Position Command Selection 2 (tool number 2)
07	CLR	Pulse Error Clearing	18	POS3	Internal Position Command Selection 3 (tool number 3)
08	LOK	Servo Lock	19	POS4	Internal Position Command Selection 4 (tool number 4)
09	EMC	Emergency Stop	1A	TRQINV	Torque command reverse/turrent second stage rotational speed
0A	SPD1	Internal speed command selection 1 DI_Jog_1	1B	RS1	Torque Command Forward Selection
0B	SPD2	Internal speed command selection 2 DI_Jog_2	1C	RS2	Torque Command Reverse Selection
0C	MDC1	Control Mode Switching	1D	MDC2	Control Mode Selection in Tool Magazine Mode
0D	INH	Position Command Prohibited	1E	POS5	Internal Position Command Selection 5 (tool number 5)
0E	SPDINV	Speed Command Reverse	1F	POS6	Tool Number 6
0F	G-SEL	Gain Switching	20	VDI	Virtual Point Digital Input
10	GN1	Electronic Gear Ratio Numerator Selection 1			

Hn601.2 DI-1 Pin Function Operation Electric Potential

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0501H	2601H	2601H	O	O	O	O	O

Setting Description:



Setting	Description
0	When the pin is in conduction, the function activates.
1	When the pin is open, the function activates.

Hn602-Hn612 DI Pin Function Operation Potential (DI-2~DI-12)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	H0000 ~ H0120	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
Please refer to the Table below	Please refer to the Table below	Please refer to the Table below	O	O	O	O	O

Setting Description: Please refer to Hn601 Description for the Setting Method.

Parameter Code	Parameter Name	RS-485 Communication position	Index position	
			CANopen	EtherCAT
Hn602	DI-2 Pin Function Planning	0502H	2602H	2602H
Hn603	DI-3 Pin Function Planning	0503H	2603H	2603H
Hn604	DI-4 Pin Function Planning	0504H	2604H	2604H
Hn605	DI-5 Pin Function Planning	0505H	2605H	2605H
Hn606	DI-6 Pin Function Planning	0506H	2606H	2606H
Hn607	DI-7 Pin Function Planning	0507H	2607H	2607H
Hn608	DI-8 Pin Function Planning	0508H	2608H	2608H
Hn609	DI-9 Pin Function Planning	0509H	2609H	2609H
Hn610	DI-10 Pin Function Planning	050AH	260AH	260AH
Hn611	DI-11 Pin Function Planning	050BH	260BH	260BH
Hn612	DI-12 Pin Function Planning	050CH	260CH	260CH

Hn613.0/Hn613.1 DO-1 Pin Function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	00 ~ 12	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
050DH	260DH	260DH	O	O	O	O	O

Setting Description:

Setting	Description	
	Code	Contact Operation Function
00	NON	Not Used
01	RDY	Servo Ready
02	ALM	Servo Error
03	ZS	Zero Speed Signal
04	BI	Mechanical Brake Signal
05	INS	Speed Reached Signal
06	INP	Positioning Completion Signal
07	HOME	Return to Origin Completion Signal
08	INT	Torque Reached Signal
09	P1	Tool Magazine Mode Selection Tool Position Display 1

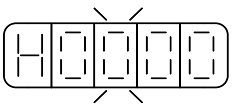
Setting	Description	
	Code	Contact Operation Function
0A	P2	Tool Magazine Mode Selection Tool Position Display 2
0B	P3	Tool Magazine Mode Selection Tool Position Display 3
0C	P4	Tool Magazine Mode Selection Tool Position Display 4
0D	P5	Tool Magazine Mode Selection Tool Position Display 5
0E	P6	Tool Magazine Mode Selection Tool Position Display 6
0F	OV	Motor Overload Signal
10	BAT	Encoder Battery Abnormality Signal
11	LIT	Left and Right Limit Signal
12	VDO	Virtual Point Digital Output

Hn613.2 DO-1 Pin Function Operation Electric Potential

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
050DH	260DH	260DH	O	O	O	O	O

Setting Description: Please refer to Hn601 Description for the Setting Method.



Setting	Description
0	When the function activates, the output pin is short-circuited.
1	When the function activates, the output pin is open.

Hn614-Hn616 DI Pin Function Operation Potential (DO-2~DO-4)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	H0000 ~ H0112	★	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
Please refer to the Table below	Please refer to the Table below	Please refer to the Table below	O	O	O	O	O

Setting Description: Please refer to Hn613 Description for the Setting Method.

Parameter Code	Parameter Name	RS-485 Communication position	Index position	
			CANopen	EtherCAT
Hn614	DO-2 Pin Function Planning	050EH	260EH	260EH
Hn615	DO-3 Pin Function Planning	050FH	260FH	260FH
Hn616	DO-4 Pin Function Planning	0510H	2610H	2610H

Hn617 Digital Input Contact Control Method Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
H0000	--	H0000 ~ H0FFF	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0511H	--	--	O	O	O	O	O

Setting Description: Determine the 12-bit Digital Input Contact controlled by external terminal or communication through Bit setting method; correspond Digital Input Contacts DI-1 ~ DI-12 to the binary 0th ~ 11th bits individually first, then convert the binary bits completed planning into hexadecimal for setting.

Binary Bit Representation: 0: Digital Input Contact is controlled by an External terminal.

1: Digital Input Contacts is controlled by communications.

Example: If users wish to set Digital input contact DI-1, DI-3, & DI-6 controlled by communication and other contacted by external terminals; the corresponding binary bits of digital input contact is :[0000 0000 0010 0101]; can be set as [H 0 0 2 5] when converted into hexadecimal.

Hn618 Communication Control Digital Input Contact Status

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
H0000	--	H0000 ~ H0FFF (Hexadecimal)	--	--

RS-485	CANopen	EtherCAT	Pi	Pe	Pt	S	T
0512H	--	--	O	O	O	O	O

Setting Description: Determine the Contact State when the 12-bit Digital Input Contact uses communication control by the Bit Setting Method; please refer to Hn617 Description for Bit Setting Method.

Binary bit representation: 0: Digital Input Contact OFF

1: Digital Input Contact ON

Set the parameter to H0000 represents that all communication control Digital Input Contacts are Open. When set to H0FFF represents all communication control Digital Input Contacts are in Conduction.

Hn 601~Hn 616 Corresponding to the Factory Setting Value of Different Model

Cn001 Parameter Code	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	9 Pt	A Pi Pe	B Cob	B CoC	D EC
Hn 601	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0000	0000	0000
Hn 602	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0000
Hn 603	0003	0003	0003	0003	0003	0003	0016	0016	0016	0016	0003	0003	0003	0003
Hn 604	0104	0104	0104	0104	0104	0104	0017	0017	0017	0017	0104	0104	0104	0104
Hn 605	0105	0105	0105	0105	0105	0105	0018	0018	0018	0018	0105	0105	0105	0105
Hn 606	001B	0006	0006	0006	001B	001B	0019	0019	0019	0019	0006	0015	0015	0015
Hn 607	001C	000E	0007	000E	001C	001C	001E	001E	001E	001E	0007	0009	0009	0009
Hn 608	001A	0008	000D	0008	001A	001A	0012	0012	0012	001F	000D	0000	0000	0000
Hn 609	0009	0009	0009	0009	0009	0009	0009	0009	0009	0009	0009	0000	0000	0000
Hn 610	000A	000A	0014	000A	000A	000A	0014	000A	001B	0012	0014	0000	0000	0000
Hn 611	000B	000B	0015	000B	000B	000B	0015	000B	001C	001D	0015	0000	0000	0000
Hn 612	000C	000C	000C	000C	000C	000C	0013	000C	000C	000C	000C	0000	0000	0000
Hn 613	0001	0001	0001	0001	0001	0001	0001	0001	0001	0006	0001	0001	0001	0001
Hn 614	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
Hn 615	0008	0003	0007	0003	0008	0008	0007	0003	0008	000E	0007	0007	0007	0007
Hn 616	0005	0005	0006	0006	0005	0006	0006	0006	0006	000D	0006	0006	0006	0006

7-3-9 E-Cam Parameteres (ECA□□)

ECA01-Cam function selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 2	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0801H	2701H	--	O	--	--	--	--

Setting Description:

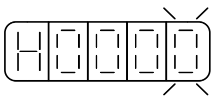
Setting	Description
0	No
1	Flying shear function
2	Rotary cut function

ECA02.0 E-Cam main axle feedback source

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0802H	2702H	--	O	--	--	--	--

Setting Description:



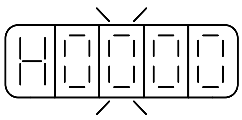
Setting	Description
0	Physical
1	Virtual

ECA02.2 If E-Cam uses return to origin

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 1	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0802H	2702H	--	O	--	--	--	--

Setting Description:



Setting	Description
0	Usage
1	Not Used

ECA03 E-Cam cutting quantity

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 65535	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0803H	2703H	--	O	--	--	--	--

Setting Description:

Setting	Description
0	Unlimited
1-65535	Not Used

ECA04 E-Cam cutter quantity selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 4	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0804H	2704H	--	O	--	--	--	--

Setting Description: Tool number per resolution

ECA05 E-Cam synchronous angle

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
30	deg	1 ~ 120	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0805H	2705H	--	O	--	--	--	--

Setting Description: When the flying shear function is selected, the synchronous angle refers to the angle the auxiliary axle travels when the main axle and auxiliary axle shares the same speed (Definition: 1 revolution = 360-degree)

ECA06 Start angle of E-Cam

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.01deg	9000 ~ -9000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0806H	2706H	--	O	--	--	--	--

Setting Description: When choosing the flying shear function, the start angle refers to the initial angle of the cutting axle. (Definition: cutter point is 180-degree)

ECA07 Encoder resolution of E-Cam main axle

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2500	ppr	1 ~ 32768	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0807H	2707H	--	O	--	--	--	--

Setting Description: Main axle (feeding axle) encoder resolution

ECA08 Encoder resolution of E-Cam Auxiliary axle

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2500	ppr	1 ~ 32768	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0808H	2708H	--	O	--	--	--	--

Setting Description: Auxiliary axle (cutter axle) encoder resolution.

ECA09 E-Cam feeding diameter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	0.1mm	1 ~ 10000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0809H	2709H	--	O	--	--	--	--

Setting Description: Main axle (feeding axle) diameter

ECA10 E-Cam cutter diameter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	0.1mm	1 ~ 10000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
080AH	270AH	--	O	--	--	--	--

Setting Description: Auxiliary axle (cutter axle) diameter

ECA11 E-Cam cutting length

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	0.1mm	1 ~ 50000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
080BH	270BH	--	O	--	--	--	--

Setting Description: Total length of a single item to be cut

ECA12 Distance between E-Cam Sensor to cutter point

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	0.1mm	1 ~ 50000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
080CH	270CH	--	O	--	--	--	--

Setting Description: Measure the distance between the sensor of item to be cut and the cutter point

ECA13 Acceleration/Deceleration smoothing constant of E-Cam S-curve

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
10	ms	0 ~ 1000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
080DH	270DH	--	O	--	--	--	--

Setting Description: Acceleration/Deceleration smoothing constant of E-Cam S-curve

ECA14 E-Cam rotary cut synchronous time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
10	ms	1~ 65535	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
080EH	270EH	--	O	--	--	--	--

Setting Description: Time of rotary cut synchronous zone

ECA15 E-Cam rotary cut DO delay time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	200us	0~ 10000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
080FH	270FH	--	O	--	--	--	--

Setting Description: Delay time when sending out DO signal after arriving the synchronous zone

ECA16 E-Cam auxiliary screw pitch

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	0.1mm	1 ~ 50000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0810H	2710H	--	O	--	--	--	--

Setting Description: E-Cam auxiliary axle screw pitch

ECA17 Maximum proceeding distance of E-Cam rotary cut auxiliary axle

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
10000	0.1mm	1 ~ 50000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0811H	2711H	--	O	--	--	--	--

Setting Description: Maximum proceeding distance of E-Cam rotary cut auxiliary axle

ECA18 Average proceeding speed of E-Cam rotary cut main axle

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	1 ~ 1000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0812H	2712H	--	O	--	--	--	--

Setting Description: Average proceeding speed of E-Cam rotary cut main axle

ECA19 Cumulative pulse quantity of E-Cam virtual axle

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
3	mm	1 ~ 200	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0813H	2713H	--	O	--	--	--	--

Setting Description: Cumulative number of pulse by every 200us of virtual main axle

ECA20 Maximum return speed of E-Cam rotary cut

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rpm	0 ~ 3000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
081CH	2714H	--	O	--	--	--	--

Setting Description: Set the maximum return speed of rotary cut. The program will run internal calculation by itself when the setting is 0.

ECA21 Acceleration/Deceleration time of E-Cam rotary cut

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	ms	0 ~ 50000	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
081DH	2715H	--	O	--	--	--	--

Setting Description: Set the acceleration/deceleration time of rotary cut. The program will run internal calculation by itself when the setting is 0.

ECA22 Enable E-Cam parameter change write-in

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	-	0 ~ 1	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
081EH	2716H	--	O	--	--	--	--

Setting Description: Set this parameter as 1 when changing the parameter to enable parameter change

ECA23 E-Cam parameter fine-tune factor

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
10000	0.01	0 ~ 65535	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
081FH	2717H	--	O	--	--	--	--

Setting Description: Fine-tune cutting length to correct machine error

ECA24 E-Cam rotary cut return origin return function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	-	0 ~ 1	--	--

RS-485	General Mode	CANopen mode	Pi	Pe	Pt	S	T
0820H	2718H	--	O	--	--	--	--

Setting Description:

Setting	Description
0	Original curve
1	Return to Origin

7-3-10 CiA 402 parameter (EC7□□)

En701 CiA 402 Position unit change (numerator)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 536870911	--	--

Communication position	Use Mode							
RS-485	Pi	Pe	Pt	S	T	Cob	CoC	EC
--	--	--	--	--	--	O	O	O

Setting Description: Same as object CiA402 subobject 6093 function 1.

En702 CiA 402 Position unit change (denominator)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 536870911	--	--

Communication position	Use Mode							
RS-485	Pi	Pe	Pt	S	T	Cob	CoC	EC
--	--	--	--	--	--	O	O	O

Setting Description: Same as object CiA402 subobject 6093 function 2.

En703 CiA 402 Speed unit change (numerator)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 536870911	--	--

Communication position	Use Mode							
RS-485	Pi	Pe	Pt	S	T	Cob	CoC	EC
--	--	--	--	--	--	O	O	O

Setting Description: Same as object CiA402 subobject 6095 function 1.

En704 CiA 402 Speed unit change (denominator)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 536870911	--	--

Communication position	Use Mode							
RS-485	Pi	Pe	Pt	S	T	Cob	CoC	EC
--	--	--	--	--	--	O	O	O

Setting Description: Same as object CiA402 subobject 6095 function 2.

En705 CiA402 Acceleration unit change (numerator)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 536870911	--	--

Communication position	Use Mode							
RS-485	Pi	Pe	Pt	S	T	Cob	CoC	EC
--	--	--	--	--	--	O	O	O

Setting Description: Same as object CiA402 subobject 6097 function 1.

En706 CiA402 Acceleration unit change (denominator)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1 ~ 536870911	--	--

Communication position	Use Mode							
RS-485	Pi	Pe	Pt	S	T	Cob	CoC	EC
--	--	--	--	--	--	O	O	O

Setting Description: Same as object CiA402 subobject 6097 function 2.

En707 CiA 402 Stalling allowed times

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0 ~ 65536	--	--

Communication position	Use Mode							
RS-485	Pi	Pe	Pt	S	T	Cob	CoC	EC
--	--	--	--	--	--	O	O	O

Setting Description: Same as object EtherCAT subobject 10F1 function 2.

※ When setting as 0, stalling detection and position command linear compensation will be disabled.

7-3-11 Monitoring Parameters (Un-□□)

Un-01 Actual motor speed

Unit	Communication position			Parameters description
rpm	RS-485	CANopen	EtherCAT	For example: The display of 120 indicates that the current Motor Speed is 120 rpm.
	0601H	2801H	2801H	

Un-02 Actual motor torque

Unit	Communication position			Parameters description
%	RS-485	CANopen	EtherCAT	Expressed by the percentage of Rated Torque. For example: The display of 20 indicates that the Motor Torque Output is now 20% of the Rated Torque.
	0602H	2802H	2802H	

Un-03 Regenerative load rate

Unit	Communication position			Parameters description
%	RS-485	CANopen	EtherCAT	The average percentage of Regenerative Power Output.
	0603H	2803H	2803H	

Un-04 Effective load rate

Unit	Communication position			Parameters description
%	RS-485	CANopen	EtherCAT	The average percentage of Power Output.
	0604H	2804H	2804H	

Un-05 Maximum load rate

Unit	Communication position			Parameters description
%	RS-485	CANopen	EtherCAT	The maximum value of Effective Load Rate has ever appeared.
	0605H	2805H	2805H	

Un-06 Speed command

Unit	Communication position			Parameters description
rpm	RS-485	CANopen	EtherCAT	For example: The display of 120 indicates that the current Speed Command is 120 rpm.
	0606H	2806H	2806H	

Un-07 Position error ※Range greater than 5-digit number

Unit	Communication position			Parameters description
pulse	RS-485	CANopen	EtherCAT	Difference between Position Command and Position Feedback.
	0607H 0608H	2807H	2807H	

Un-09 External analog voltage command value ※JSDG2S-E does not have this function

Unit	Communication position			Parameters description
V	RS-485	CANopen	EtherCAT	For example: The display of 5.25 indicates an External analog Voltage Command value of 5.25V.
	060BH	2809H	2809H	

Un-10 Primary circuit (Vdc Bus) voltage

Unit	Communication position			Parameters description
V	RS-485	CANopen	EtherCAT	For example: The display of 310 indicates that the Main Circuit Voltage is 310V.
	060CH	280AH	280AH	

Un-11 External analog voltage limit value ※JSDG2S-E does not have this function

Unit	Communication position			Parameters description
V	RS-485	CANopen	EtherCAT	For example: The display of 5.25 indicates an External analog Voltage limit value of 5.25V.
	060DH	280BH	280BH	

Un-12 External CCW direction torque limit command value

Unit	Communication position			Parameters description
%	RS-485	CANopen	EtherCAT	For example: The display of 100 indicates that the current External CCW Direction Torque Limit Command is 100%.
	060EH	280CH	280CH	

Un-13 External CW direction torque limit command value

Unit	Communication position			Parameters description
%	RS-485	CANopen	EtherCAT	For example: The display of 100 indicates that the current External CW Direction Torque Limit Command is 100%.
	060FH	280DH	280DH	

Un14 Motor feedback-pulse number within one revolution ※Range greater than 5-digit number

Unit	Communication position			Parameters description
pulse	RS-485	CANopen	EtherCAT	Display the pulse number within one motor revolution after the power is on. (After the power is on, the value is 0 and starts counting) (When the servo returns to the origin, the value will be cleared as 0 and start counting again)
	0610H 0611H	280EH	280EH	

Un-16 Motor feedback-rotation number ※Range greater than 5-digit number

Unit	Communication position			Parameters description
rev	RS-485	CANopen	EtherCAT	After the power is turned on, display motor rotation number. (After the power is on, the value is 0 and starts counting) (When the servo returns to the origin, the value will be cleared as 0 and start counting again)
	0613H 0614H	2810H	2810H	

Un-18 Pulse command-pulse number within one revolution ※Range greater than 5-digit number

Unit	Communication position			Parameters description
pulse	RS-485	CANopen	EtherCAT	After power is on, count the number of pulses in 1 rotation of pulse command input under Servo ON condition. (After the power is on, the value is 0)
	0616H 0617H	2812H	2812H	

Un-20 Pulse command-rotation number ※Range greater than 5-digit number

Unit	Communication position			Parameters description
rev	RS-485	CANopen	EtherCAT	After the power is on, count and display cycle number of pulse command input under Servo ON condition. (After the power is on, the value is 0)
	0619H 061AH	2814H	2814H	

Un-24 Multi-revolution position information of communication type encoder feedback

Unit	Communication position			Parameters description
rev	RS-485	CANopen	EtherCAT	Multi-revolution Absolute Position of the Communication Encoder Motor ※Absolute type: Absolute Number of Revolution Data ※Incremental type: always be 0
	061FH	2818H	2818H	

Un-25 Single revolution position information of communication type encoder feedback ※Range greater than 5-digit number

Unit	Communication position			Parameters description
pulse	RS-485	CANopen	EtherCAT	Single Revolution Absolute Position of the Communication Encoder Motor
	0620H 0621H	2819H	2819H	

Un-27 Communication type encoder message

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	Feedback communication type encoder status
	0623H	281BH	281BH	

Un-28 Torque command

Unit	Communication position			Parameters description
%	RS-485	CANopen	EtherCAT	Expressed by the percentage of Rated Torque. For example: The display of 50 indicates that the current Motor Torque Command is 50% of the Rated Torque.
	0624H	281CH	281CH	

Un-29 Load inertia ratio

Unit	Communication position			Parameters description
0.1	RS-485	CANopen	EtherCAT	Displays the current default Load Inertia Ratio of Cn025.
	0625H	281DH	281DH	

Un-30 Digital output contact status (DO)

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	Displays the Status of Digital Output Contact (DO) individually in Hexadecimal For example: H00XX (0000 0000 DO-8/7/6/5 DO-4/3/2/1)
	0626H	281EH	281EH	

Un-31 Digital input contact status (DI)

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	Displays the Status of Digital Input Contact (DI) in Hexadecimal For example: H0XXX (0000 DI-12/11/10/9 DI-8/7/6/5 DI-4/3/2/1)
	0627H	281FH	281FH	

Un-43 Motor Electrical Angle

Unit	Communication position			Parameters description
deg	RS-485	CANopen	EtherCAT	Display Motor Current Electrical Angle Position
	0633H	282BH	282BH	

Un-44 Motor model number read by the communication encoder

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	For example: The display of H1267 indicates that the Motor Cn030 Number is H1267
	0634H	282CH	282CH	

Un-45 OnLine_AutoTuning inertia estimation

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	For example: The display of 100 indicates that the Load Inertia Ratio is 10 times.
	0635H	282DH	282DH	

Un-46 OFFLine_Tuning status

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	OFFLine_Tuning operation status
	0636H	282EH	282EH	

Un-47 OFFLine_Tuning error code

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	bit.0: 1 is inertia estimation status, 2 is gain estimation status bit.2: 1 is load estimation fail, 2 is gain estimation fail
	0637H	282FH	282FH	

Un-49 Driver temperature

Unit	Communication position			Parameters description
degree	RS-485	CANopen	EtherCAT	Driver Temperature
	0639H	2831H	2831H	

Un-50 External encoder pulse number ※Range greater than 5-digit number

Unit	Communication position			Parameters description
pulse	RS-485	CANopen	EtherCAT	When using full-closed loop function, the external encoder displays pulse number after the power is on.
	063AH 063BH	2832H	2832H	

Un-52 Error between external and motor encoders ※Range greater than 5-digit number

Unit	Communication position			Parameters description
pulse	RS-485	CANopen	EtherCAT	The Error of External Encoder and Motor Encoder When Operating with a Fully Closed Loop Function
	063DH 063EH	2834H	2834H	

Un-53 Current alarm number

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	For example: The display of 01 indicates that the current alarm number is AL001
	063FH	2835H	2835H	

Un-54 EtherCAT PDO Packet Loss Counter

Unit	Communication position			Parameters description
---	RS-485	CANopen	EtherCAT	For example: Monitor if the quality of communication is normal; generate AL049 if abnormal
	0640H	2836H	2836H	

Un-55 System multi-revolution position

Unit	Communication position			Parameters description
rev	RS-485	CANopen	EtherCAT	System Multi-revolution Position (When the servo returns to the origin, the value will be cleared as 0 and start counting again)
	0641H	2837H	2837H	

Un-56 System single revolution position ※Range greater than 5-digit number

Unit	Communication position			Parameters description
rev	RS-485	CANopen	EtherCAT	System Single Revolution Position (When the servo returns to the origin, the value will be cleared as 0 and start counting again)
	0642H 0643H	2838H	2838H	

Un-88 Total ServoOn time

Unit	Communication position			Parameters description
hour	RS-485	CANopen	EtherCAT	ServoOn total time
	0663H	-	-	

Un-89 Total PowerOn time

Unit	Communication position			Parameters description
hour	RS-485	CANopen	EtherCAT	PowerOn total time
	0664H	-	-	

7-3-12 Diagnostic Parameters (dn-□□)

Parameter Code	Name and Function	RS-485 Communication Address
dn-01	Current Control Mode Display	0F01H
dn-02	Digital Output Contact Signal Status	0F02H
dn-03	Digital Input Contact Signal Status	0F03H
dn-04	CPU Software Version Display	0F04H
dn-05	Jog Mode Operation	-
dn-06	Reserved	-
dn-07	External Voltage Offset Automatic Adjustment **(Note 1)**	0F07H
dn-08	Display Serialized Models	0F08H
dn-09	ASIC Software Version Display	0F09H
dn-11	Automatic Detection of Magnetic Angle Position	0F0BH

Note 1: JSDG2S-E does not have this function

Chap 8 Communication function

8-1 RS-485 Communication Function

This Servo Driver provides RS-485 Communication Function and the following describes the communication wiring and communication protocol.

8-1-1 RS-485 Communication Wiring

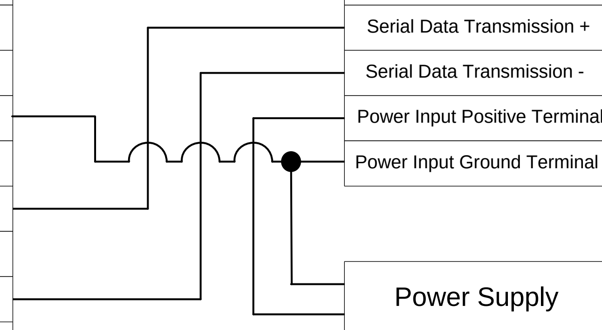
CN4 Wiring Method

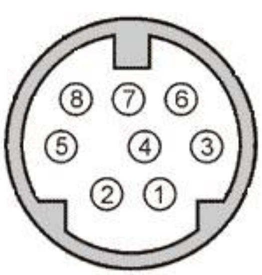
Driver end uses MD-Type 8Pins

Pin Number	Pin Name	Symbol
1	——————	——
2	——————	——
3	Signal Grounding	GND
4	——————	——
5	Serial Data Transmission +	D+
6	——————	——
7	Serial Data Transmission -	D-
8	——————	——

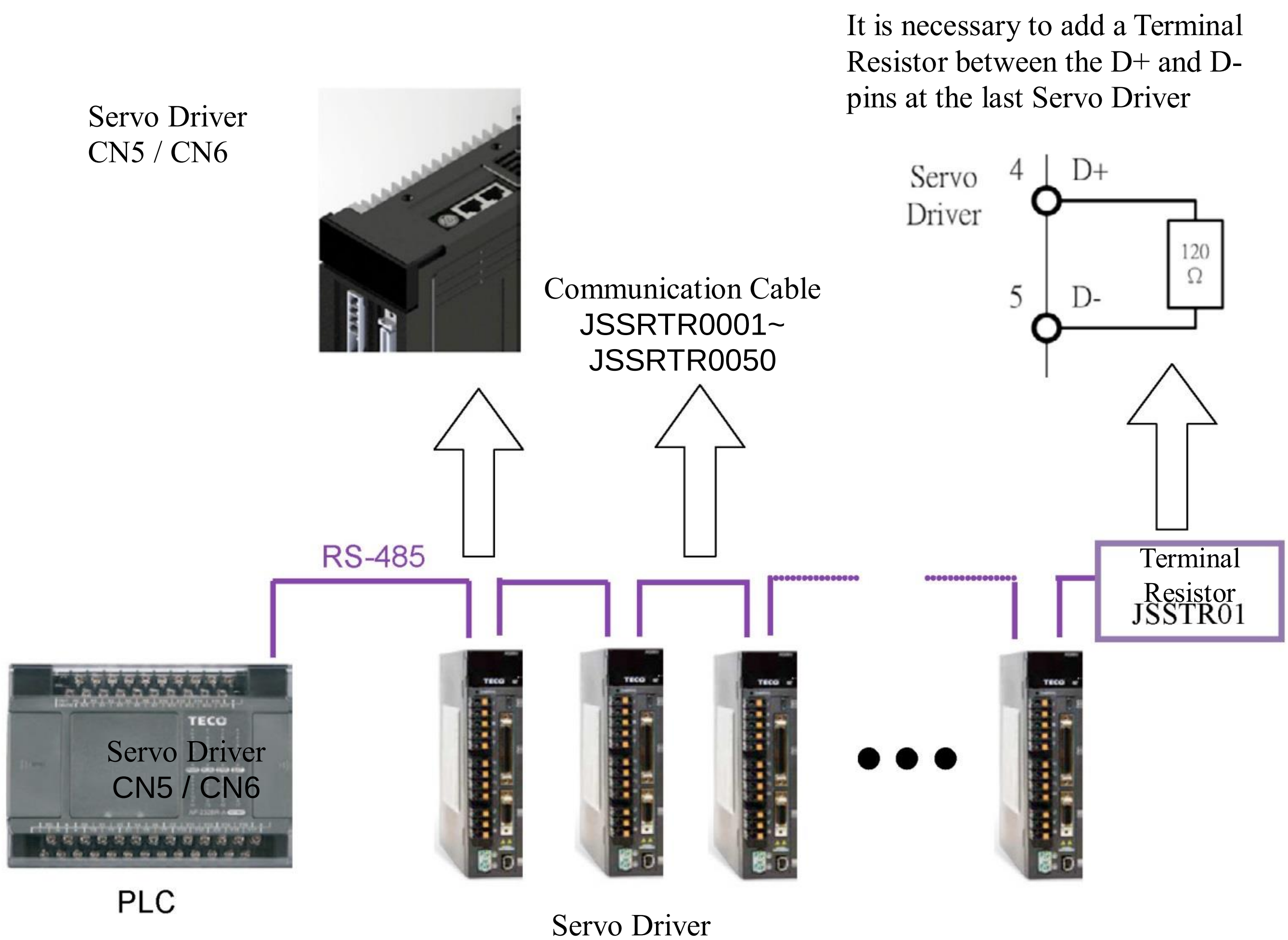
RS-485 converter

Pin Name	Symbol
Serial Data Transmission +	D+
Serial Data Transmission -	D-
Power Input Positive Terminal	+ VS
Power Input Ground Terminal	GND

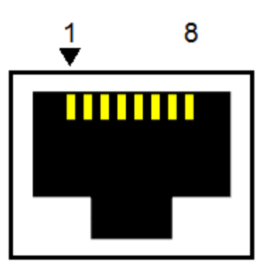




CN5 / CN6 Wiring method ※JSDG2(S)-E does not have this function



CN5 / CN6 Terminal Configuration Diagram (RS-485 Communication):



Pin	Name
1	-
2	-
3	GND
4	D+
5	D-
6	-
7	GND
8	-

8-1-2 RS-485 Communication Related Parameters

Cn036 ID Setting

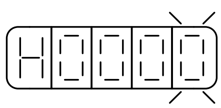
Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 254	Power Re-set	0027H

Setting Description: When using the Modbus Communication Interface, each set of Drivers needs to set different IDs in this parameter in advance; if the IDs are set repeatedly, it will result in communication not being operated normally.

Cn037.0 Modbus RS-485 Communication Transmission Rate

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0 ~ 5	Power Re-set	0028H

Setting Description:

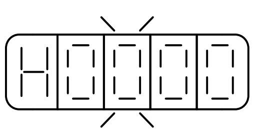


Setting	Description	Setting	Description
0	4800	3	38400
1	9600	4	57600
2	19200	5	115200

Cn037.2 RS-485 Communication Write Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0 ~ 1	Power Re-set	0028H

Setting Description:



Setting	Description
0	RS-485 Communication Write to EEPROM
1	RS-485 Communication Write to SRAM

Cn038 Communication Protocol

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 8	Power Re-set	0029H

Setting Description:

Setting	Description	Setting	Description
0	7 , N , 2 (Modbus , ASCII)	5	8 , O , 1 (Modbus , ASCII)
1	7 , E , 1 (Modbus , ASCII)	6	8 , N , 2 (Modbus , RTU)
2	7 , O , 1 (Modbus , ASCII)	7	8 , E , 1 (Modbus , RTU)
3	8 , N , 2 (Modbus , ASCII)	8	8 , O , 1 (Modbus , RTU)
4	8 , E , 1 (Modbus , ASCII)	-	

Cn039 Communication Timeout Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	sec	0 ~ 20	Power Re-set	002AH

Setting Description: If the setting value is greater than 0, the Communication Timeout Function is turned on immediately and must conduct communication within the set time, otherwise, a communication error will appear. If the setting value is 0, then indicates this function is turned off.

Cn040 Communication Response Delay Time

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.5ms	0 ~ 255	Power Re-set	002BH

Setting Description: Delay the communication time of Driver responding to Supervisory Control Unit.

Hn617 Digital Input Contact Control Method Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H’0000	--	H0000 ~ H0FFF (Hexadecimal)	Effective after Set	0511H

Setting Description: Digital Input Contact (12 contacts in total) is determined by Bit Setting Method with external terminal or communication control; bit setting uses a method by converting binary bits to hexadecimal. Correspond Digital Input Contacts DI-1 ~ DI-12 to the binary 0th~ 11th bits respectively first and then set after converting the planned binary bits to hexadecimal. Binary Bit Representation: 0: Digital Input Contact is controlled by an External terminal; 1: Digital input contact is controlled by communication. When the parameter is set to H’0000, it means all digital input contacts are controlled by external terminals and by communication when the setting is H’0FFF.

For example: if the user wants to set Digital input contact DI-1,DI-3, DI-6, DI-10 & DI-12 controlled by communication and other contacts by external terminals, the binary bit corresponds to digital input contact is [0000 1010 0010 0101]

Among this, set the 0th bit to 1 meaning DI-1 is controlled by communication and the first bit to 0 meaning DI-2 by external terminals. Set other bits by this method; after converting to hexadecimal, it can be set as〔H 0 A 2 5〕

Hn618 Communication Control Digital Input Contact Status

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H’0000	--	H0000 ~ H0FFF (Hexadecimal)	Effective after Set	0512H

Setting Description: Use the bit setting method to determine the contact State when Digital Input Contacts (12 contacts in total) are controlled by communication. Please refer to Hn617 Description for Bit Setting Method. When the parameter is set to H’0000, it means all digital input contacts are controlled by external terminals and by communication when the setting is H’0FFF.

Binary bit representation: 0: Digital Input Contact OFF; 1: Digital input contact ON When the parameter is set to H’0000, it means all digital input contacts are controlled by external terminals and by communication when the setting is H’0FFF.

(Note) The use of this function must coordinate with the setting of parameter Hn617.

8-1-3 RS-485 Communication Protocol and Format

When using the RS-485 Modbus communication interface, each set of drivers must set its driver ID in advance in parameter **Cn036**. The Supervisory Control Unit can then perform communication control on the individual Drivers based on the ID.

Communication method utilizes Modbus network communication and can use the following two protocols: ASCII (American Standard Code for information interchange) mode and RTU (Remote Terminal Unit) mode. The required mode can be set using parameter **Cn038**.

Code Meaning

ASCII Mode

Each byte data consists of two ASCII bits.

For example, a 1-byte data 26H is represented by ASCII Code '26' and includes ASCII Code of '2' <32H> and ASCII Code of “6” <36H>.

Number 0 ~ 9 and alphabet A ~ F represented by ASCII codes are listed in the following table:

Character Symbol	‘0’	‘1’	‘2’	‘3’	‘4’	‘5’	‘6’	‘7’
Corresponding ASCII Code	30H	31H	32H	33H	34H	35H	36H	37H
Character Symbol	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
Corresponding ASCII Code	38H	39H	41H	42H	43H	44H	45H	46H

RTU Mode

Every byte data consists of 2 4-bit hexadecimal bits.

For example: a 1-byte data 26H.

Byte Structure

10 bit Character Frame (for 7-bit Byte Data)

7N2	Start bit	0	1	2	3	4	5	6	Stop bit	Stop bit

←- - - - Data: 7 bits - - - -→

←- - - - - - - - - - Character Frame: 10 bits - - - - - - - - - -→

7E1	Start bit	0	1	2	3	4	5	6	Even parity	Stop bit

←- - - - Data: 7 bits - - - -→

←- - - - - - - - - - Character Frame: 10 bits - - - - - - - - - -→

7O1	Start bit	0	1	2	3	4	5	6	Odd parity	Stop bit

←- - - - Data: 7 bits - - - -→

←- - - - - - - - - - Character Frame: 10 bits - - - - - - - - - -→

11 bit Character Frame (for 8-bit Byte Data)

8N2	Start bit	0	1	2	3	4	5	6	7	Stop bit	Stop bit

←- - - - Data: 8 bits - - - -→

←- - - - - - - - - - Character Frame: 11 bits - - - - - - - - - -→

8E1	Start bit	0	1	2	3	4	5	6	7	Even parity	Stop bit

←- - - - Data: 8 bits - - - -→

←- - - - - - - - - - Character Frame: 11 bits - - - - - - - - - -→

8O1	Start bit	0	1	2	3	4	5	6	7	Odd parity	Stop bit

←- - - - Data: 8 bits - - - -→

←- - - - - - - - - - Character Frame: 11 bits - - - - - - - - - -→

Communication Data Structure

ASCII Mode

Code	Name	Content Description
STX	Communication Starts	3AH; Character ’:‘
ADR	Communication Address	1-byte includes 2 ASCII Codes For the communication address range is 1 ~ 254 must be converted to hexadecimal first; For example, the Driver ID is 20, hexadecimal is 14H, ADR = ’1‘ , ‘4’ → ’1‘ = 31H , ‘0’ = 34H
CMD	Command Instruction	1-byte includes 2 ASCII Codes Common command instruction codes are as follows: ‘0’3;H (Read Register), ‘0’6’H (Write Single Register), ‘0”8’H (Diagnostic Function), ‘1”0’H (Write Multiple Registers)
DATA(n-1) | DATA(0)	Data Character	n-word = 2n-byte (consists of 4n ASCII Codes)；n≤30 Data Character Format is determined by the Command Instruction Code
LRC	Check Digit	1-byte includes 2 ASCII Codes
END 1	End Code 1 (CR)	0DH；Character ' \ r'
END 0	End Code 0 (LF)	0AH；Character ' \ n'

RTU Mode

Code	Name	Content Description
STX	Communication Starts	More than 10ms of Quiescent Time
ADR	Communication Address	1-byte For the communication address range is 1 ~ 254 must be converted to hexadecimal first; For example, the Driver ID is 20, hexadecimal is 14H, and ADR = ’14H’
CMD	Command Instruction	1-byte Common command instruction codes are as follows: 03H (Read Register), 06H (Write Single Register), 08H (Diagnostic Function), 10H (Write Multiple Registers)
DATA(n-1) | DATA(0)	Data Character	n-word = 2n-byte；n≤30 Data Character Format is determined by the Command Instruction Code
CRC-Low	Check Digit - Least Significant Bit	1-byte
CRC-High	Check Digit - Most Significant Bit	1-byte
END 0	End Code 0	More than 10ms of Quiescent Time

Commonly Used Command Instruction Code

03H: Read Register

Read N words in succession, N maximum is 29 (1DH).

For Example: Read 2 words in succession from the starting address 0200 of the Driver with ID 01H.

ASCII Mode

Command message PC → Servo

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 3 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 2 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
		‘ 0 ’
		‘ 0 ’
		‘ 2 ’
LRC		‘ F ’
		‘ 8 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response message Servo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 3 ’
Data (Number of Bits)		‘ 0 ’
		‘ 4 ’
Address 0200H content	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ B ’
		‘ 1 ’
Address 0201H content	(MSB)	‘ 1 ’
		‘ F ’
	(LSB)	‘ 4 ’
		‘ 0 ’
LRC		‘ E ’
		‘ 8 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
	‘ 1 ’
CMD	‘ 8 ’
	‘ 3 ’
Error Code	‘ 0 ’
	‘ 2 ’
LRC	‘ 7 ’
	‘ A ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Command message PC → Servo

ADR		01H
CMD		03H
Starting Data Address	(MSB)	02H
	(LSB)	00H
Data Length (Calculated by word)		00H
		02H
CRC LSB		04H
CRC MSB		07H

Response message Servo → PC (OK)

ADR		01H
CMD		03H
Data (Number of Bits)		04H
Content of 0200H	(MSB)	00H
	(LSB)	BAH
Content of 0201H	(MSB)	1FH
	(LSB)	40H
CRC LSB		A3H
CRC MSB		D4H

Servo → PC (ERROR)

ADR	01H
CMD	83H
Error Code	02H
CRC LSB	C0H
CRC MSB	F1H

06H: Write Single Register

Write 1 word to Register

Write 100 (0064H) in the starting address 0200H of the Driver with ID 01.

ASCII Mode

Command message PC → Servo

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 6 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 2 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ 0 ’
		‘ 0 ’
		‘ 6 ’
		‘ 4 ’
LRC		‘ 9 ’
		‘ 3 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response message Servo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 6 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 2 ’
	(MSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ 0 ’
		‘ 0 ’
		‘ 6 ’
		‘ 4 ’
LRC		‘ 9 ’
		‘ 3 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
	‘ 1 ’
CMD	‘ 8 ’
	‘ 6 ’
Error Code	‘ 0 ’
	‘ 3 ’
LRC	‘ 7 ’
	‘ 6 ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Command message PC → Servo

ADR		01H
CMD		06H
Starting Data Address	(MSB)	02H
	(LSB)	00H
Data Content (word Format)		00H
		64H
CRC LSB		89H
CRC MSB		99H

Response message Servo → PC (OK)

ADR		01H
CMD		03H
Starting Data Address	(MSB)	02H
	(LSB)	00H
Data Content (word Format)		00H
		64H
CRC 低位		89H
CRC 高位		99H

Servo → PC (ERROR)

ADR	01H
CMD	86H
Error Code	03H
CRC LSB	02H
CRC MSB	61H

08H: Diagnostic Function

Use Sub-function Code 0000H to check the Transmission Signal between Master and Slaver. The Data Content can be any number.

For example: Use Diagnostic Function on the Driver with ID 01H.

ASCII Mode

Command message PC → Servo

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 8 ’
Sub-function Code	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ A ’
		‘ 5 ’
		‘ 3 ’
		‘ 7 ’
LRC		‘ 1 ’
		‘ B ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response message Servo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 8 ’
Sub-function Code	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ A ’
		‘ 5 ’
		‘ 3 ’
		‘ 7 ’
LRC		‘ 1 ’
		‘ B ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
	‘ 1 ’
CMD	‘ 8 ’
	‘ 8 ’
Error Code	‘ 0 ’
	‘ 3 ’
LRC	‘ 7 ’
	‘ 4 ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Command message PC → Servo

ADR		01H
CMD		08H
Sub-function Code	(MSB)	00H
	(LSB)	00H
Data Content (word Format)		A5H
		37H
CRC LSB		DAH
CRC MSB		8DH

Response message Servo → PC (OK)

ADR		01H
CMD		08H
Sub-function Code	(MSB)	00H
	(LSB)	00H
Data Content (word Format)		A5H
		37H
CRC LSB		DAH
CRC MSB		8DH

Servo → PC (ERROR)

ADR	01H
CMD	88H
Error Code	03H
CRC MSB	06H
CRC LSB	01H

10H: Write multiple registers (Long word parameters need to use Write multiple registers (10H) to complete)

Write N words to consecutive registers, N maximum is 27 (1BH).

For example: Write 100 (0064H), 300 (012CH) in two consecutive registers of starting address 0100H Servo Driver with ID 01.

ASCII Mode

Command message PC → Servo

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 1 ’
		‘ 0 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 1 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
		‘ 0 ’
		‘ 0 ’
		‘ 2 ’
Data Length (Number of Bits)		‘ 0 ’
		‘ 4 ’
Write Data to 0100H	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ 6 ’
		‘ 4 ’
Write Data to 0101H	(MSB)	‘ 0 ’
		‘ 1 ’
	(LSB)	‘ C ’
		‘ 2 ’
LRC		‘ 5 ’
		‘ 7 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response message Servo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 1 ’
		‘ 0 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 1 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
		‘ 0 ’
		‘ 0 ’
		‘ 2 ’
LRC		‘ E ’
		‘ C ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
	‘ 1 ’
CMD	‘ 9 ’
	‘ 0 ’
Error Code	‘ 0 ’
	‘ 2 ’
LRC	‘ 6 ’
	‘ D ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Command message PC → Servo

ADR		01H
CMD		10H
Starting Data Address	(MSB)	01H
	(LSB)	00H
Data Length (Calculated by word)		00H
		02H
Data (Number of Bits)		04H
Write Data to 0100H	(MSB)	00H
	(LSB)	64H
Write Data to 0101H	(MSB)	01H
	(LSB)	2CH
CRC LSB		BFH
CRC MSB		ADH

Response message Servo → PC (OK)

ADR		01H
CMD		10H
Starting Data Address	(MSB)	01H
	(LSB)	00H
Data Length (Calculated by word)		00H
		02H
CRC LSB		40H
CRC MSB		34H

Servo → PC (ERROR)

ADR	01H
CMD	90H
Error Code	02H
CRC LSB	CDH
CRC MSB	C1H

LRC (ASCII Mode) and CRC (RTU Mode) Check Digit

LRC Check Digit:

ASCII Mode uses LRC (Longitudinal Redundancy Check) Check Digit.

The LRC Check is to calculate the sum of ADR, CMD, starting data address, and data contents, after the sum is divided with the unit in 256 (100H) and take the remainder (if the total sum is 19DH, then take 9DH), and the remainder is calculated in 2's complement, the final result calculated is the LRC Check Digit.

For example: Use Diagnostic Function on the Driver with ID 01H.

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 8 ’
Sub-function Code	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ 0 ’
		‘ 0 ’

Data Content (word Format)	‘ A ’
	‘ 5 ’
	‘ 3 ’
	‘ 7 ’
LRC	‘ 1 ’
	‘ B ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

01H+08H+00H+00H+A5H+37H = E5H

Take E5H 2's complement is 1BH, so the LRC is '1', 'B'

CRC Check Digit:

RTU Mode uses CRC (Cyclical Redundancy Check) Check Digit.

CRC Check Calculation Method is as follows:

1. Load a 16-bit CRC register with FFFFH;
2. Perform XOR (Exclusive OR) calculation on the first 8-bit byte value of the data content with the low byte of the CRC Register, and store the result in the CRC Register.
3. Shift the CRC Register one bit (LSB) to the right, then fill 0 to the Most Significant Bit (MSB);
4. Check the value of bit (LSB) shifted to the right.

   If it is 0, then save the new value in the CRC Register;

   If it is 1, then perform XOR calculation on the new value and A001H, then save the result in the CRC Register;
5. Repeat Steps 3 ~ 4, until all 8 bit are completed calculation, then perform Step 6;
6. Take the next 8-bits message data of the data content to calculate repeating Steps 2 ~ 5, until all message data are completed calculations, the CRC Register content at this time is the CRC Check Digit.

Error Code

If an error occurs during communication connecting process, the Driver will issue an Error Code, add 80H to Command Function Code and then transmit to ModBus master station system altogether.

Error Code	Name	Description
01	Command Instruction Code Error	The function code received in the query is not an allowable action for the server (or slave).
02	Data Address Error	The data address received in the query is not an allowable address for the server (or slave).
03	Data Content Error	A value contained in the query data field is not an allowable value for server (or slave).
04	Slave Equipment Error	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.
05	Communication Command Mode Error	RTU mode: CRC check error
06	Communication Command Mode Error	ASCII mode: LRC check error or no end code(CRLF)

8-2 CANopen communication function ※ Only JSDG2S contains this function

8-2-1 CANopen Overview

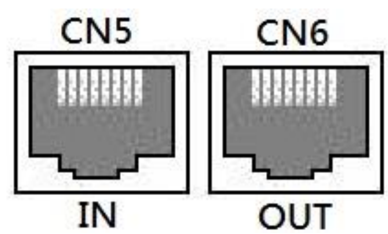
In this chapter, we will introduce CANopen communication specification, communication structure, object utilization and mode control of JSDG2S servo driver. The chapter will be divided into: system parameter setting, basic characteristics, CANopen communication, servo control and detailed description of object list. Through this document, users can have a basic understanding and use CANopen communication.

8-2-2 CANopen Basic Features

(1) Port message

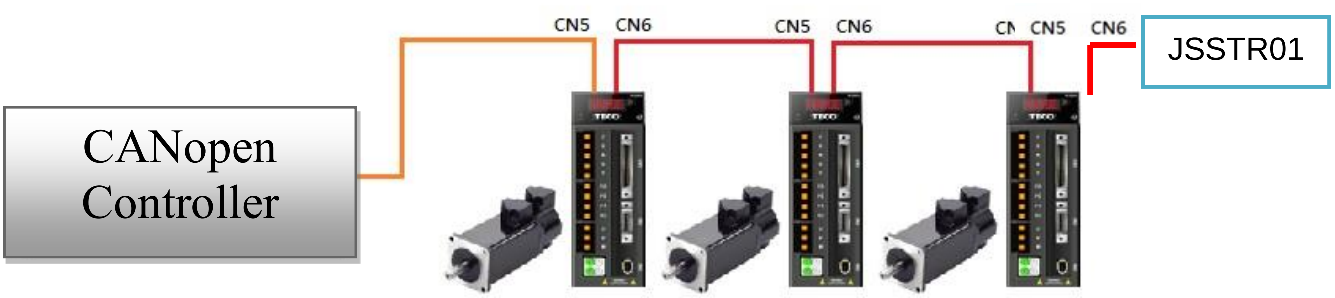
When the user needs to CANopen communication, JSDG2S servo driver provides two RJ-45 ports CN5 & CN6 on the hardware. This facilitates the drive and control to a single or multiple slave stations when using CANopen communication.

Pin	Definition	Pin	Definition
1	CAN_H	5	-
2	CAN_L	6	-
3	GND	7	GND
4	-	8	-



(2) Connection

Due to the physical characteristics of CANopen communication, when using the serial connection of a single or multiple slave stations, two RJ-45 ports (CN5/CN6) provided by JSDG2S servo driver do not have direction. The last driver needs to install a terminal resistor JSSTR01.



(3) Communication Cable

When using CANopen, the controller and servo driver use standard Ethernet cable CAT5e. It is recommended to use shielded Ethernet cable if an ideal communication quality is required.

8-2-3 CANopen Parameter Setting

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	**Power Re-set**	0001H

Setting Description:

Setting	Description
B	CANopen-complete (JSDG2S function)
C	CANopen-simple (JSDG2S function)

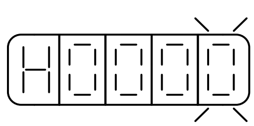
C mode-CANopen simple; can rapidly switch to Operation enabled under status machine state.

Mode	0x6040H (Controlword)
B mode (complete)	0[Switch on Disabled] → 6[Ready to Switch on] → 7[Switch on] → F[Operation enabled]
C mode (simple)	0[Switch on Disabled] → F[Operation enabled]

Cn078.0 CANopen communication write-in selection ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1	Power Re-set	0051H

Setting Description:



Setting	Description
0	CANopen communication write in SRAM
1	CANopen communication write in EEPROM

Cn078.2 CANopen communication transmission rate ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0 ~ 5	Power Re-set	0051H

Setting Description:

Setting	Description	Setting	Description
0	1M	3	125k
1	500k	4	100k
2	250k	5	50k

Cn079 CANopen ID setting ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 127	Power Re-set	0052H

Cn095 CANopen detection bus off and disconnection level ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
130	--	128 ~ 256	Power Re-set	0062H

Setting description: When CANopen Error Counter is greater than the set level, AL-29 alarm will occur.

Cn096 CANopen disconnection clearing comparison level ※ Only JSDG2S model contains this function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	--	0 ~ 127	Power Re-set	0063H

Setting description: When CANopen Error Counter is smaller than the set level, automatically clear AL-29 (CANopen communication disconnection)

En701 Position unit change (numerator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6093 function 1.

En702 Position unit change (denominator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6093 function 2.

En703 Speed unit change (numerator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6095 function 1.

En704 Speed unit change (denominator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6095 function 2.

En705 Acceleration unit change (numerator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6097 function 1.

En706 Acceleration unit change (denominator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6097 function 2.

En707 CiA402 Stalling allowed times

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 65536	Effective after Set	--

Setting description: Same as object EtherCAT subobject 10F1 function 2.

8-2-4 CANopen Protocol

G2S CANopen contains the following protocols:

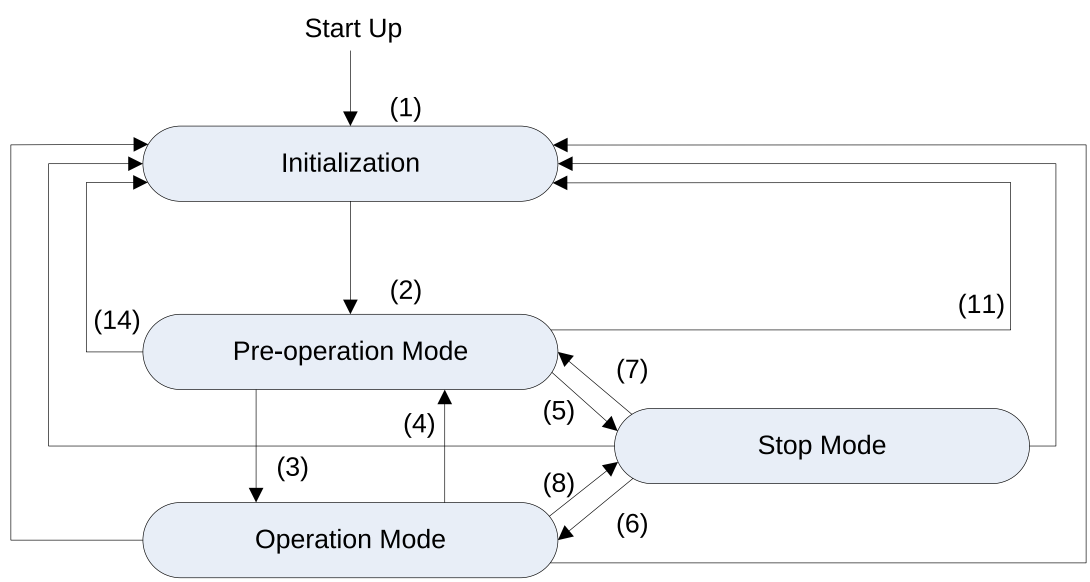
- NMT(Network Mangement Object)
- SDO(Service Data Object)
- PDO(Process Data Object)
- Special function object

Network management: used to activate network and monitor equipment (heartbeat, enable message). In network management, the same network only allows one master node and one or multiple slave nodes and follow the master-slave model. The equipment with network management master function is usually called CANopen master station and usually has SDO client functions. ON the contrary, the equipment with network management slave function is usually called CANopen slave station and must have PDO function. In this way, CANopen master station can control the slave station and read/write the object dictionary of CANopen slave station.

Network management NMT

1. NTM service and protocol

CANopen equipment activated and automatically enters pre-operation status after internal initialization. Then notify NMT master of this status change incident through Boot-up. The whole network will enter operation status when NMT master sends one CAN message. In addition, NMT master can force the equipment into prohibition status; all other communication services are prohibited except network management and heartbeat.



Steps	Definition	Command specifier
(1)	Automatic initialization	
(2)	Enter pre-operation mode automatically	
(3),(6)	Open remote node	01
(4),(7)	Enter pre-operation mode	80
(5),(8)	Enter stop mode	02
(9),(10),(11)	Reset node	81
(12),(13) ,(14)	Reset communication	82

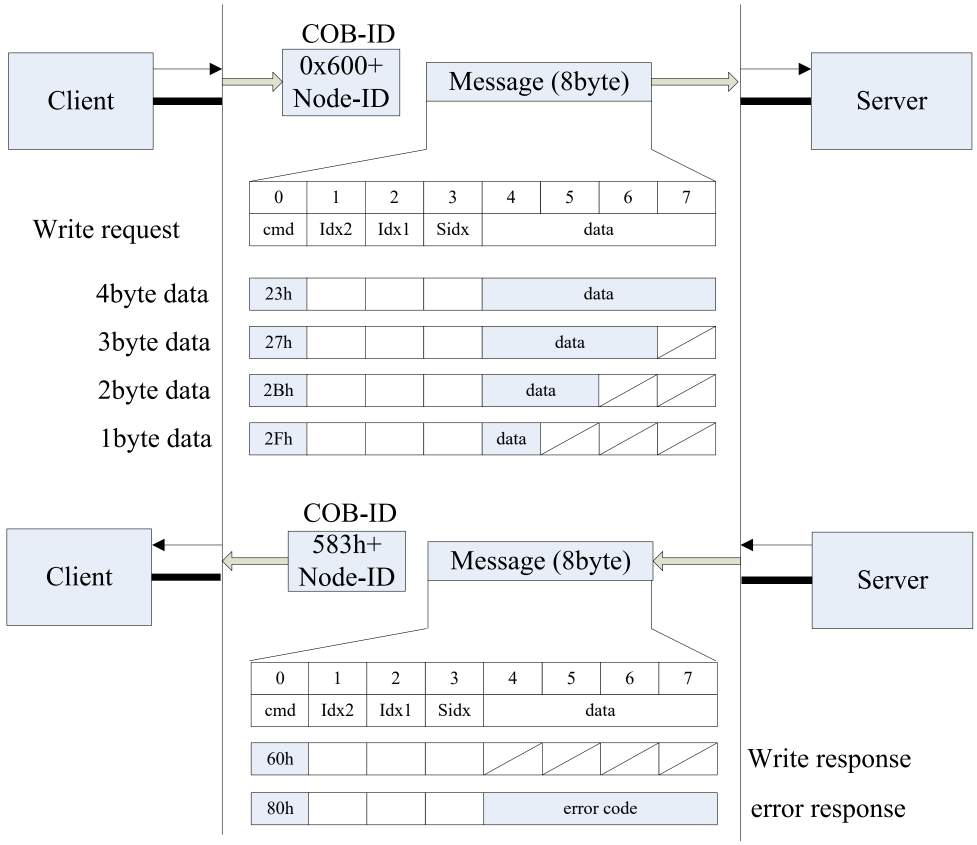
2. Equipment monitoring

Monitoring equipment (error control) services and protocols are used to detect if the equipment in the network is online and its status. CANopen system provides heartbeat message that can be applied to monitor equipment. The heartbeat message sends one or multiple equipment information regularly; devices monitor each other.

Service data Object SDO

Object dictionary bridges application and communication. All data entries of CANopen equipment are managed by the object dictionary. Each object dictionary entry can be addressed by index or subindex. CANopen defines the parameter setting of SDO mainly using on the master node to the slave node. Service confirmation is the most distinguishing feature of SDO; it generates one response for each information to secure the accuracy of data transmission.

In the CANopen system, this kind of communication mode for data exchange is based on client/server structure. Generally, CANopen slave mode serves as SDO server and CANopen master node as the client. The client visits the object dictionary on data server through “send SDO request” to read/write a single object in the dictionary. The following is the flowchart of SDO write-in status



Process data object PDO

PDO uses producer-consumer model to transmit real-time data. The producer is responsible for transmitting the information; for example, if data transmission is triggered by certain internal incident of the equipment, all other buses monitor data sent on buses. The priority of PDO is determined by corresponding CAN identifier (COB-ID). Whether the message (consumer) should be processed is judged by respective identifiers. PDO can be divided to RPDO (receiving process data object) and TPDO (transmitting process data object). TPDO and RPDO mentioned in the protocol are relative and described from a specific slave angle. For example: I/O equipment transmits its input data in TPDO; for equipment receives this TPDO data, this TPDO is the device's RPDO.

1. CAN identifier of PDO

CANopen protocol has pre-defined default identifiers for TPDO 1~4 and RPDO 1~4 according to node ID. If the default CAN identifier is used, the all slaves can communication with masters having corresponding RPDO and TPDO; however, the slave cannot monitor TPDO given out from other slaves. Therefore, if the producer-consumer model exchanges data directly between non-programmable slaves, it is necessary to reset COB-ID to make CAN identifiers of the producer and consumer identical.

Object	COB-ID	Object dictionary position	Map dictionary position
PDO 1 (transmit)	181h-1FFh	1800h	1A00h
PDO 1 (receive)	201h-27Fh	1400h	1600h
PDO 2 (transmit)	281h-2FFh	1801h	1A01h
PDO 2 (receive)	301h-37Fh	1401h	1601h
PDO 3 (transmit)	381h-3FFh	1802h	1A02h
PDO 3 (receive)	401h-47Fh	1402h	1602h
PDO 4 (transmit)	481h-4FFh	1803h	1A03h
PDO 4 (receive)	201h-27Fh	1403h	1603h

2. PDO communication parameter

The parameter mainly covers transmission type; time of prohibition.

- Transmission type
  - Synchronous transmission can be divided into non-cyclic and cyclic transmission. Non-periodical transmission is pre-triggered by the object specific incident specified in equipment subprotocol. On the other hand, periodical transmission is achieved by receiving SYNC. The user can set 1-240 synchronous object triggering.
  - The triggering of asynchronous transmission is achieved by object specific incident specified in equipment subprotocol.

Transmission type		Transmission type description	Note
0	RPDO	The master station transmits one synchronous message to the slave station every synchronous cycle. When RPDO data changes, RPDO data is transmitted to the slave station and the data received from the slave station becomes valid until receiving the next synchronous message. When there is no change in RPDO data, the master station does not transmit RPDO data to the slave station.	Synchronously non-cyclic
	TPDO	The master station transmits one synchronous message to the slave station every synchronous cycle. When TPDO data changes, TPDO data will be transmitted to the master station immediately and becomes valid after the master station receives TPDO. When there is no change in TPDO data, the slave station does not transmit TPDO data to the master station.	Synchronously non-cyclic
1	RPDO	The master station transmits one synchronous message to the slave station every synchronous cycle. The master station transmits RPDO data once every synchronous cycle; RPDO received by the slave station will become valid until receiving the next synchronous message.	Synchronous cyclic
	TPDO	The master station transmits one synchronous message to the slave station every synchronous cycle. The master station transmits TPDO data once every synchronous cycle; TPDO received by the slave station will become valid until receiving the next synchronous message.	Synchronous cyclic

Transmission type		Transmission type description	Note
2	RPDO	The master station transmits one synchronous message to the slave station every synchronous cycle. The master station transmits RPDO data once every two synchronous cycles; RPDO received by the slave station will become valid until receiving the next synchronous message.	Synchronous cyclic
	TPDO	The master station transmits one synchronous message to the slave station every synchronous cycle. The master station transmits TPDO data once every two synchronous cycles; TPDO received by the slave station will become valid until receiving the next synchronous message.	Synchronous cyclic
3~245	RPDO	Analogize by transmission type 1 & transmission type 2	Synchronous cyclic
	TPDO	Analogize by transmission type 1 & transmission type 2	Synchronous cyclic
254, 255	RPDO	When RPDO data changes, RPDO data is transmitted to the slave station and becomes valid after the slave station receives the data. When there is no change in RPDO data, the master station does not transmit RPDO data to the slave station.	Asynchronous
	TPDO	When times of prohibition are all 0 and after TPDO data changes, TPDO data is transmitted to the master station and becomes valid immediately after the master station receives the data; when TPDO data has no change, the slave station does not send TPDO data to the master station. When either time of incident time or prohibition is not 0, the slave station transmits TPDO data once every incident time (when TPDO is transmitted once, it is not allowed to send again during time of prohibition). When TPDO data changes, it will be transmitted to the master station immediately and the data received by the master station becomes valid right away.	Asynchronous

- Time of prohibition

The function of time of prohibition equals to PDO sending filtering program. When PDO input data changes for the first time, this PDO data will be sent directly without any delay. After that, if PDO changes again, PDO transmission will not be triggered immediately. Time of prohibition defines the least time interval when sending two PDO with same CAN identifiers; this is to prevent too frequent TPDO transmission which uses large bus bandwidth and thus effects bus communication. Meaning after PDO is sent, the next PDO will be sent after one time of prohibition. Invalid when the parameter is set as 0.

3. PDO mapping parameter

Mapping parameter includes object list in one object dictionary; there objects are mapped to the corresponding PDO, including data length (unit: bit). PDO message content is pre-defined; if PDO supports changeable PDO mapping, then this PDO can be configured through SDO. RxPDO provides 1600h~0x1603h; TxPDO provides 1A00h~0x1A03h. The user can choose one from each to use on PDO mapping.

PDO mapping	**Preset PDO mapping object**			
1st PDO Mapping (preset open)				
RxPDO1 (1600h)	Controlword (6040h)			
TxPDO1 (1A00h)	Statusword (6041h)			
2st PDO Mapping (preset close)				
*RxPDO2 (1601h)	Controlword (6040h)	Modes of operation (6060h)		
*TxPDO2 (1A01h)	Statusword (6041h)	Modes of operation display (6061h)		
3st PDO Mapping (preset close)				
RxPDO3 (1602h)	Controlword (6040h)	Target Position (607Ah)		
TxPDO3 (1A02h)	Statusword (6041h)	Position Actual Value (6064h)		
4st PDO Mapping (preset close)				
RxPDO4 (1603h)	Controlword (6040h)	Target Velocity (60FFh)		
TxPDO4 (1A03h)	Statusword (6041h)	Velocity actual value (606Ch)		

※ Each set of PDO mapping can use data up to 32bytes or a maximum of 8 objects. If there are 8 objects already and byte data is under 32 bytes, the user still cannot add any mapping object.

ESD document

When using CANopen communication, the user can configure CANopen controller through CANopen electronic data sheet (EDS) provided by TECO. EDS file consists of all object information JSDG2S servo driver can provide for using and related settings.

8-2-5 CANopen Servo Control

Please refer to **"8-3-6 EtherCAT servo control"**

8-2-6 CANopen Object List

Please refer to **"8-3-7 EtherCAT object list"**

8-3 EtherCAT communication function ※ Only JSDG2(S)-E contains this function

8-3-1 EtherCAT Overview

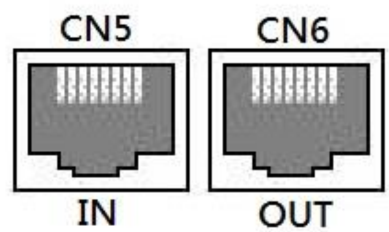
In this chapter, we will introduce EtherCAT communication specification, communication structure, object utilization and mode control of the servo driver. The chapter will be divided into: system parameter setting, basic characteristics, EtherCAT communication, servo control and detailed description of object list. Through this document, the user can have a basic understanding and use CANopen communication.

8-3-2 EtherCAT Basic Features

(1) Port message

When the user needs to use EtherCAT communication, JSDG2S servo driver provides two RJ-45 ports CN5 & CN6 on the hardware. This facilitates the drive and control to a single or multiple slave stations when using EtherCAT communication.

Pin	Definition	Pin	Definition
1	Tx+	5	-
2	Tx-	6	Rx-
3	Rx+	7	-
4	--	8	-



(2) Connection

Due to physical characteristics of EtherCAT communications, when using serially connected single or multiple slave stations, please pay attention to that two RJ-45 ports (CN5/CN6) provided by the servo driver have direction. CN5 is defined as IN; define CN6 as OUT.

(3) Communication Cable

When using Ethernet, the controller and servo driver use standard Ethernet cable CAT5e. It is recommended to use shielded Ethernet cable if an ideal communication quality is required.

8-3-3 EtherCAT Parameter Setting

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0 ~ D	Re-start Power	0001H

Setting Description:

Setting	Description
D	EtherCAT Mode

En701 CiA402 Position unit change (numerator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6093 function 1.

En702 CiA402 Position unit change (denominator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6093 function 2.

En703 CiA402 Speed unit change (numerator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6095 function 1.

En704 CiA402 Speed unit change (denominator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6095 function 2.

En705 CiA402 Acceleration unit change (numerator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6097 function 1.

En706 CiA402 Acceleration unit change (denominator)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1 ~ 536870911	Effective after Set	--

Setting description: Same as object CiA402 subobject 6097 function 2.

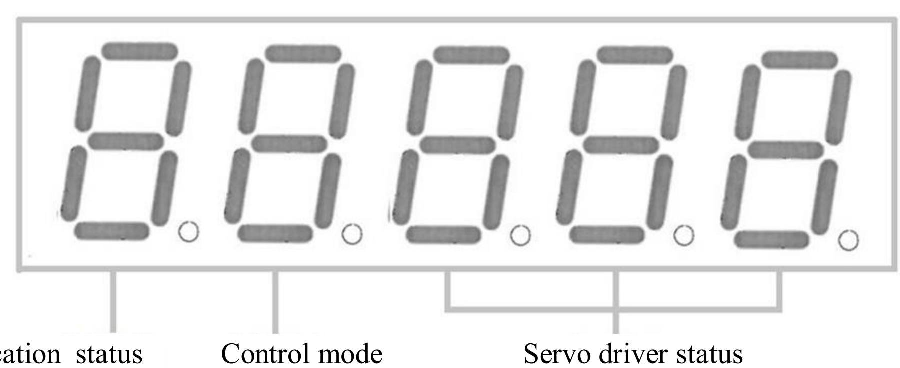
En707 CiA402 Stalling allowed times

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 65536	Effective after Set	--

Setting description: Same as object EtherCAT subobject 10F1 function 2.

8-3-4 EtherCAT Status Display

Under EtherCAT mode, the servo driver provides status display page and the Keypad panel shows current communication status. There are three parts in the display panel; 7-segment display from left to right are: communication status, control mode status and servo driver status.



(1) EtherCAT communication status

State machine of EtherCAT can be divided into four modes: Init, Pre-OP, Safe-OP and OP. Use the leftmost 7-segment display of the Keypad panel as the status. The following shows the numbers when four modes are shown in the 7-segment display.

Number displayed	Communication status
0	none
1	Init
2	Pre-OP
4	Safe-OP
8	OP

(2) EtherCAT control mode

EtherCAT protocol provides various control modes for users. Use the second 7-segment display from the left of Keypad panel as its status. The following list shows each mode and corresponding numbers the driver supports now.

Number displayed	Control Mode
0	none
1	PP
3	PV
4	PT
6	HM
7	IP
8	CSP
9	CSV
A	CST

(3) Servo driver status

Use the third 7-segment display from the right of Keypad display panel as its status display. The following list shows the driver status corresponding to each mode change when using EtherCAT communication.

Display mode	Communication status
pot	CW limit
not	CCW limit
nry	Not ready to run
rdy	Ready to run
run	Running

8-3-5 EtherCAT Communication

(1) ESI document

When using EtherCAT communication, the user can configure EtherCAT controller through EtherCAT slave information file (ESI) provided by TECO. ESI file consists of all object information JSDG2(S)-E servo driver can provide for using and related settings.

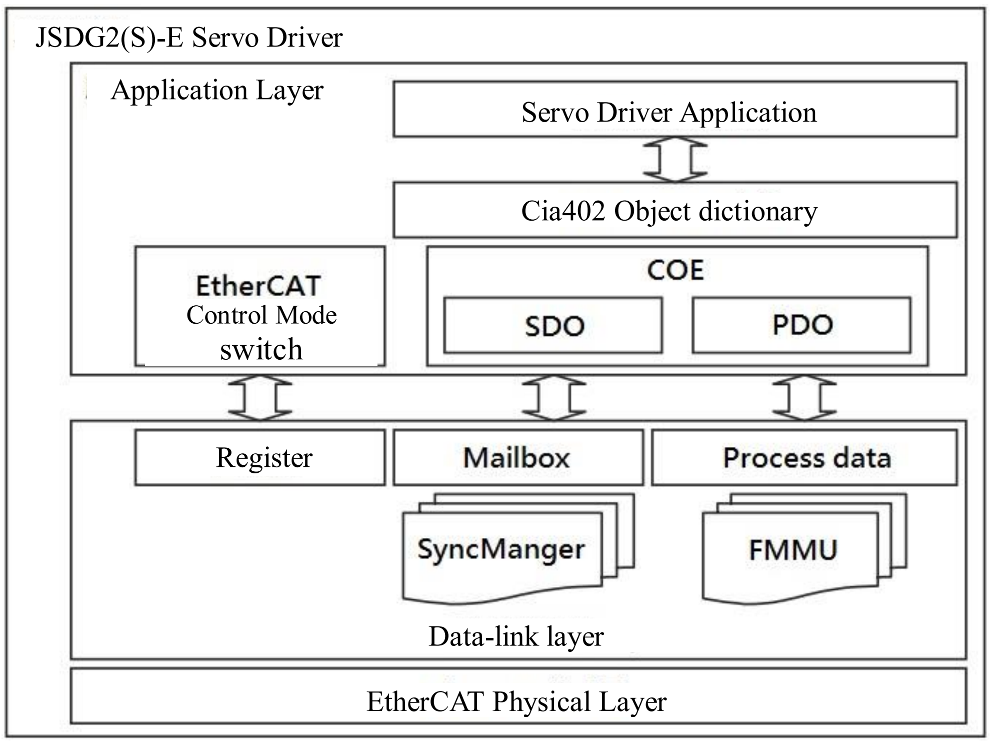
(2) Communication norm

Items	Specification
Communication standard	IEC 61158 Type 12, IEC 61800-7 CiA402 Drive Profile
Physical layer	100BASE-TX (IEEE802.3)
Transmission cable	Ethernet Category 5 (100BASE-TX) or higher
Transmission distance	Distance between nodes: 100 m max
Port	RJ45 × 2 (shielded) ECAT IN: EtherCAT input ECAT OUT: EtherCAT output
Mailbox(CoE)	SDO requests, SDO responses
Process data	PDO mapping(variable)
CiA402	Profile Position (PP) Profile Velocity (PV) Profile torque mode(PT) Homing Mode(HM) Interpolated position mode(IP) Cyclic Synchronous Position(CSP) Cyclic Synchronous Veocity(CSV) Cyclic Synchronous Torque(CST)
Distributed clock (DC)	Synchronization in DC mode: CSP: ≥ (200µs * 4) CSV: ≥ (200µs * 2) CST: ≥ (200µs * 1) Applicable DC cycles: 200 µs to 4 ms in 200µs increments

(3) Communication structure

EtherCAT communication can be applied to various application protocols. The application layer protocol which JSDG2(S)-E servo driver utilizes is IEC 61800-7─CANOpen motion control subprotocol.

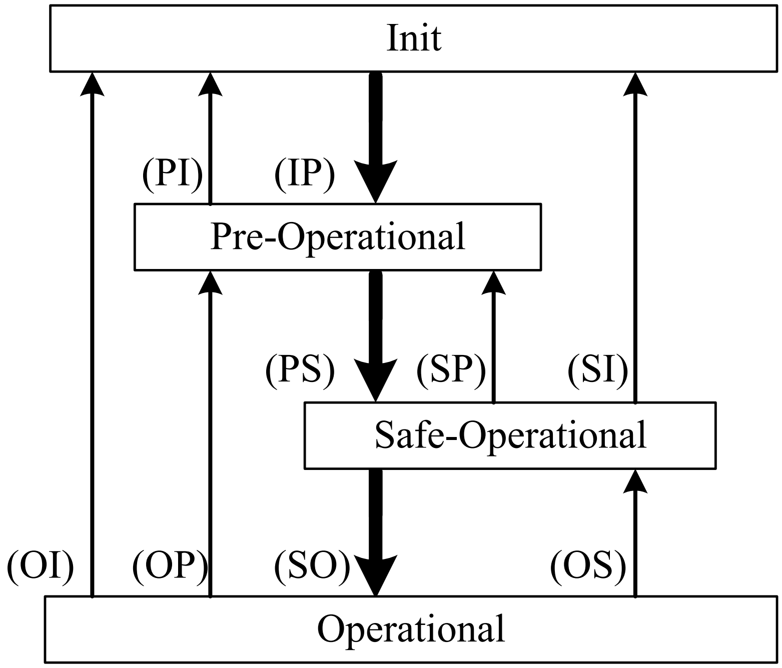
In the servo driver, the system structure related to EtherCAT communication can be divided into three parts: physical layer, data-link layer and application layer. The servo driver receives information sent from the controller by physical layer, judge and process the received information by data-link layer and lastly, distribute corresponding information to belonged CiA402 object by application layer to control the servo motor.



(4) State machine

In the servo motor, there are two types of transmission available: Mailbox and Process data. In EtherCAT communication protocol, these two types are controlled by state machine to facilitate the user to choose the desired control method. Communication state machine can be divided into four states: Init, Pre-Operationa-l, Safe-Operational & Operational. Under the selected corresponding mode, the user can choose if to enable/disable Mailbox and Process data transmission respectively.

The state of state machine will stay under Init mode when the power is on. The switch among each status needs to be done by the controller giving commands to the servo driver.



Symbol	Direction (=>)	Corresponding action description
IP	INIT TO PREOP	Start Mailbox communication
PI	PREOP TO INIT	Stop Mailbox communication
PS	PREOP TO SAFEOP	Start receiving TxPDO communication
SP	SAFEOP TO PREOP	Stop receiving TxPDO communication
SO	SAFEOP TO OP	Start receiving RxPDO communication
OS	OP TO SAFEOP	Stop receiving RxPDO communication
OP	OP TO PREOP	Stop receiving Tx/Rx PDO communication
SI	SAFEOP TO INIT	Stop receiving TxPDO communication, stop Mailbox communication
OI	OP TO INIT	Stop receiving Tx/Rx PDO communication, stop Mailbox communication

(5) Mailbox

In EtherCAT protocol, Mailbox uses master-slave method to exchange data; the transmitter and receiver need to continuously confirm if the data is successfully transmitted through handshaking. Through several handshaking processes, it can make sure the data can be received by the receiver accurately.

(6) PDO

In EtherCAT protocol, PDO transmission does not need to set up on any protocol; hence, it can complete data transmission very rapidly and is used to real-time data transmission in EtherCAT communication.

There are two PDO transmission directions: TxPDO & RxPDO. TxPDO direction is from the slave driver to master controller; RxPDO direction is from the master controller to slave driver.

(7) PDO mapping

As PDO transmission does not include any protocol, it is necessary to place the data to be received to the correct object through PDO mapping.

JSDG2(S)-E servo driver supports four sets of object address that can alter mapping object randomly of RxPDO & TxPDO; when using PDO communication, the user can select one from RxPDO & TxPDO respectively to set up the required object mapping.

RxPDO provides 1600h~0x1603h; TxPDO provides 1A00h~0x1A03h. The user can choose one from each to use on PDO mapping.

PDO mapping	Preset PDO mapping object			
1st PDO Mapping				
RxPDO1 (1600h)	Controlword (6040h)	Target Position (607Ah)	Target Velocity (60FFh)	Mode of Operation (6060h)
TxPDO1 (1A00h)	Statusword (6041h)	Position Actual Value (6064h)	Velocity Actual Value (606Ch)	Mode of Operation Display (6061h)
PDO mapping	**Preset PDO mapping object**			
2st PDO Mapping(Cyclic synchronous Position):default PDO assignment				
*RxPDO2 (1601h)	Controlword (6040h)	Mode of Operation (6060h)	Target Position (607Ah)	
*TxPDO2 (1A01h)	Statusword (6041h)	Position Actual Value (6064h)		
3st PDO Mapping(Cyclic synchronous Velocity)				
RxPDO3 (1602h)	Controlword (6040h)	Mode of Operation (6060h)	Target Velocity (60FFh)	
TxPDO3 (1A02h)	Statusword (6041h)	Position Actual Value (6064h)		
4st PDO Mapping(Cyclic synchronous Torque)				
RxPDO4 (1603h)	Controlword (6040h)	Mode of Operation (6060h)	Target Torque (6071h)	
TxPDO4 (1A03h)	Statusword (6041h)	Position Actual Value (6064h)	Torque Actual Value (6077h)	

※ Each set of PDO mapping can use data up to 32bytes or a maximum of 8 objects. If there are 8 objects already and byte data is under 32 bytes, the user still cannot add any mapping object.

(8) Distributed clock

In EtherCAT communication, the way of synchronization is called distributed clock. Due to the use of synchronous clock,EtherCAT communication can have all slave stations synchronized to the same system time.

(8-1) Free Run

Free Run uses the cycle time generated from JSDG2(S)-E servo driver system and receives commands regularly. Under this mode, cycle time is fixed at 4ms.

(8-2) DC mode

DC makes all slave stations use all system time; through controller's adjustment to error, the time of receiving the control command of all slave stations can be adjusted to almost the same and thus achieve synchronous control. JSDG2(S)-E servo driver synchronous cycle is controlled by SYNC0; the usable cycle range varies by motion mode.

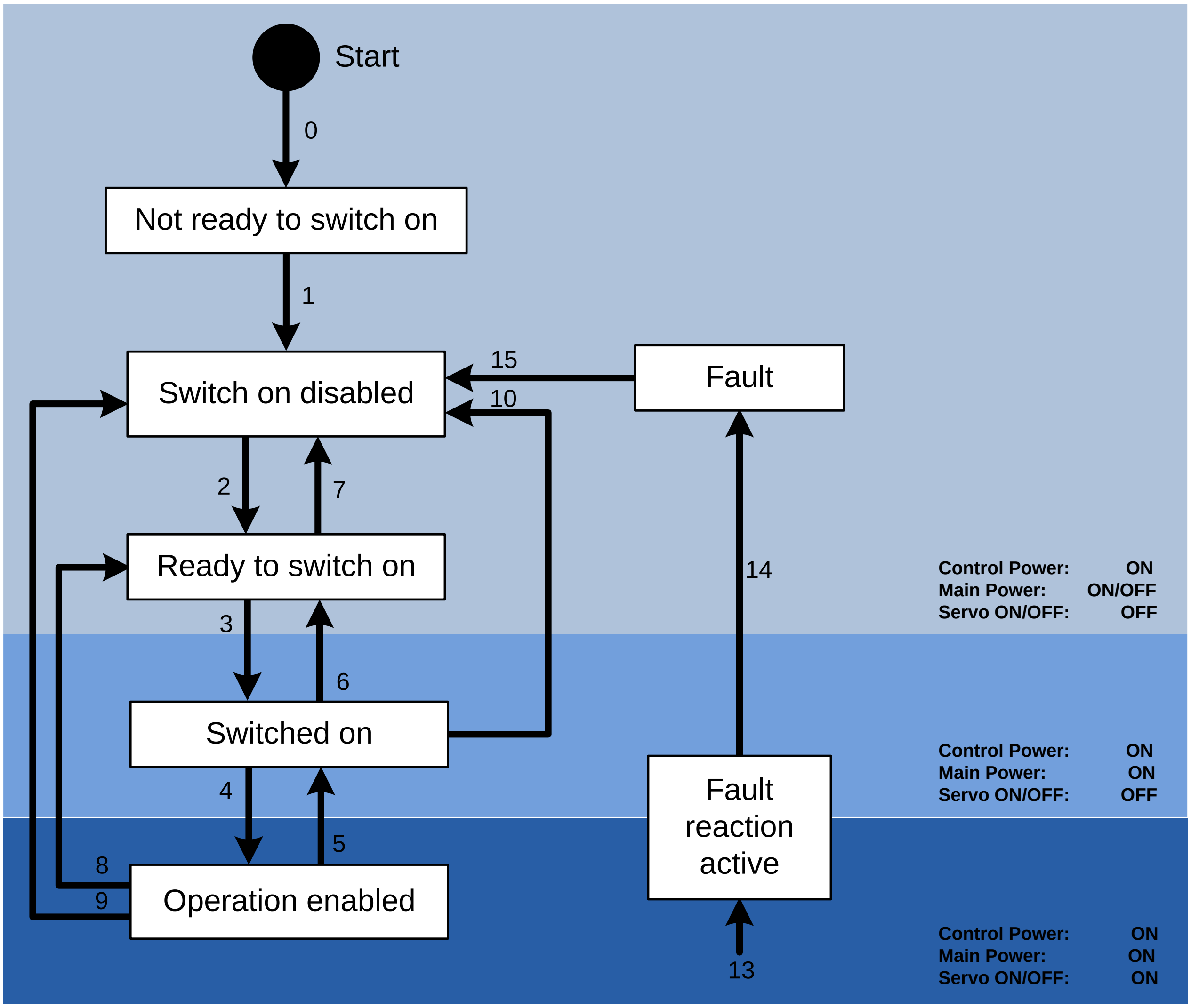
8-3-6 EtherCAT servo control

JSDG2(S)-E servo driver's subprotocol to EtherCAT communication support is CANopen over EtherCAT(Co-E). Therefore, when using CiA402 protocol of CANopen, the user can achieve the control over JSDG2(S)-E servo driver through the setting of object dictionary.

8-3-6-1 State Machine

A state machine is designed in CiA402 protocol; it rules how the user controls the use of slave station power. For JSDG2(S)-E servo driver, the most significant different to users is "Servo ON".

The state machine supported by JSDG2(S)-E servo driver is shown as the following diagram. The diagram shows all statuses of state machine and the correct power status of JSDG2(S)-E servo driver under that status. The arrow direction shows the next status after status change. The number shows the motion JSDG2(S)-E servo driver should generate when the state machine switches. In CiA402 protocol, two objects are used to control the state machine: Controlword(6040h) & Statusword(6041h).



- **State machine status switch**

The state machine status switching list shows the required “Event” when switching is processes between each status as well as the corresponding “Action” executed by JSDG2(S)-E servo driver after “Event” occurs.

No.	[Before Shift]→ [After]	Event / Action
0	[Start]→ [Not ready to Switch on]	**Event**: Execute automatically after servo driver control power is activated. **Action**: Servo driver operation initialization.
1	[Not ready to Switch on] → [Switch on Disabled]	**Event**: Automatic execution. **Action**: Servo driver allows communication.
2	[Switch on Disabled] → [Ready to Switch on]	**Event:** Controller gives 6040h [Shut down] command (Bit2, 1, 0 =1, 1, 0). **Action**: None.
3	[Ready to Switch on] → [Switch on]	**Event**: Controller gives 6040h [Switch On] command (Bit3, 2, 1, 0 =0, 1, 1, 1). **Action**: Please supply power if the main power of servo driver is not supplying yet.
4	[Switch on] → [Operation enabled]	**Event**: Controller gives 6040h [Enable operation] command (Bit3, 2, 1, 0 =1, 1, 1, 1). **Action**: Servo driver Servo ON; communication applicable functions are usable.
5	[Operation enabled]→ [Switch on]	**Event**: Controller gives 6040h [Disabled operation] command (Bit3, 2, 1, 0 =0, 1, 1, 1). **Action**: Servo driver Servo OFF.
6	[Switch on] → [Ready to Switch on]	**Event:** Controller gives 6040h [Shut down] command (Bit2, 1, 0 =1, 1, 0). **Action**: Controllers shuts down the main power of servo driver.
7	[Ready to Switch on] → [Switch on Disabled]	**Event**: Controller gives 6040h [Quick Stop] command (Bit2, 1 =0, 1) or [Disable voltage] command (Bit1 =0). **Action**: None.
8	[Operation enabled] → [Ready to Switch on]	**Event:** Controller gives 6040h [Shut down] command (Bit2, 1, 0 =1, 1, 0). **Action**: Servo driver Servo OFF immediately; controller shuts down the main power of servo driver.
9	[Operation enabled] → [Switch on Disabled]	**Event**: Controller gives 6040h [Disable voltage] command (Bit1=0). **Action**: Servo driver Servo OFF immediately; controller shuts down the main power of servo driver.
10	[Switch on] → [Switch on Disabled]	**Event**: Controller gives 6040h [Quick Stop] command (Bit2, 1 =0, 1) or [Disable voltage] command (Bit1 =0). **Action**: Controllers shuts down the main power of servo driver.
13	[Error occurs] → [Fault reaction active]	**Event**: ALARM occurs in servo driver. **Action**: Related countermeasure of servo driver execution error.
14	[Fault reaction active] → [Fault]	**Event**: Automatic execution. **Action**: Servo driver Servo OFF immediately; controller shuts down the main power of servo driver.
15	[Fault] → [Switch on Disabled]	**Event**: Controller gives 6040h [Fault reset] command (Bit7 =0 → 1). **Action**: Servo driver execution error reset and tries to recover the system.

- **State machine control command**

In CiA402 protocol, the control over state machine must be the control command given from Object 6040h. 8 sets of state machine command are provided in this object. The user can switch the status of state machine by these 8 sets of command as desired.

Command	Controlword (6040h) bit				
	bit7	bit3	bit2	bit1	bit0
Shutdown	0	-	1	1	0
Switch ON	0	0	1	1	1
Switch ON + Enable Operation	0	1	1	1	1
Disable Voltage	0	-	-	0	-
Quick Stop*	0	-	0	1	-
Disable Operation	0	0	1	1	1
Enable Operation	0	1	1	1	1
Fault Reset	0→1	-	-	-	-

'*': JSDG2(S)-E servo driver does not support.

- **State machine control state**

When the controller gives the control command to JSDG2(S)-E servo driver through Object 6040h, after the driver generates corresponding responses, the user can check if the status of driver is identical to the given command through Object 6041h.

Statusword (6041h) bit	State
xxxx xxxx x0xx 0000	Not ready to switch on
xxxx xxxx x1xx 0000	Switch on disabled
xxxx xxxx x01x 0001	ready to switch on
xxxx xxxx x01x 0011	Switched on
xxxx xxxx x01x 0111	Operation enabled
xxxx xxxx x00x 0111	Quick stop active*
xxxx xxxx x0xx 1111	Fault reaction active
xxxx xxxx x0xx 1000	Fault

'*': JSDG2(S)-E servo driver does not support.

The user can also refer to the following table to use control command Object 6040h to control the state machine and then have status Object 6041h read the value to confirm if the status JSDG2(S)-E servo driver has changed.

No.	[Before Shift]->[After]	Controlword (6040h)	Statusword (6041h)
0	[Start]->[Not ready to Switch on]	X	xxxx xxxx x0xx 0000
1	[Not ready to Switch on]->[Switch on Disabled]	X	xxxx xxxx x1xx 0000
2	[Switch on Disabled]->[Ready to Switch on]	0x0006	xxxx xxxx x01x 0001
3	[Ready to Switch on]->[Switch on]	0x0007	xxxx xxxx x01x 0011
4	[Switch on]->[Operation enabled]	0x000F	xxxx xxxx x01x 0111
5	[Operation enabled[->[Switch on]	0x0007	xxxx xxxx x01x 0011
6	[Switch on]->[Ready to Switch on]	0x0006	xxxx xxxx x01x 0001
7	[Ready to Switch on]->[Switch on Disabled]	0x0000	xxxx xxxx x1xx 0000
8	[Operation enabled]->[Ready to Switch on]	0x0006	xxxx xxxx x01x 0001
9	[Operation enabled]->[Switch on Disabled]	0x0000	xxxx xxxx x1xx 0000
10	[Switch on]->[Switch on Disabled]	0x0000	xxxx xxxx x1xx 0000
13	[Error occurs]->[Fault reaction active]	X	xxxx xxxx x0xx 1111
14	[Fault reaction active]->[Fault]	X	xxxx xxxx x0xx 1000
15	[Fault]->[Switch on Disabled]	0x0080	xxxx xxxx x1xx 0000

- **Basic control**

Switching mode precautions:

1. When using absolute type encoder under CSP mode, please confirm if the object value of current motor feedback identical to command object value. Different values will make JSDG2(S)-E servo motor start following with this difference after Servo ON.
2. Objects that the user planned to PDO for mapping. Run SDO write-in under Safe-operational and Operational and is invalid.

8-3-6-2 Servo mode

Object 6502h defines all modes can be used in EtherCAT protocol and shows all modes supported by the slave station. The user can understand modes supported by the servo driver by the following table.

Supported drive modes (6502h) bit	Mode	Support
0	PP	O
1	VI	X
2	PV	O
3	PT	O
4	Reserved	
5	HM	O
6	IP	X
7 (CANopen does not support)	CSP	O
8 (CANopen does not support)	CSV	O
9 (CANopen does not support)	CST	O
10~31	Customer definition	X

- **Mode Selection**

The user can input the setting of Object 6060h to change the operation mode of the servo driver.

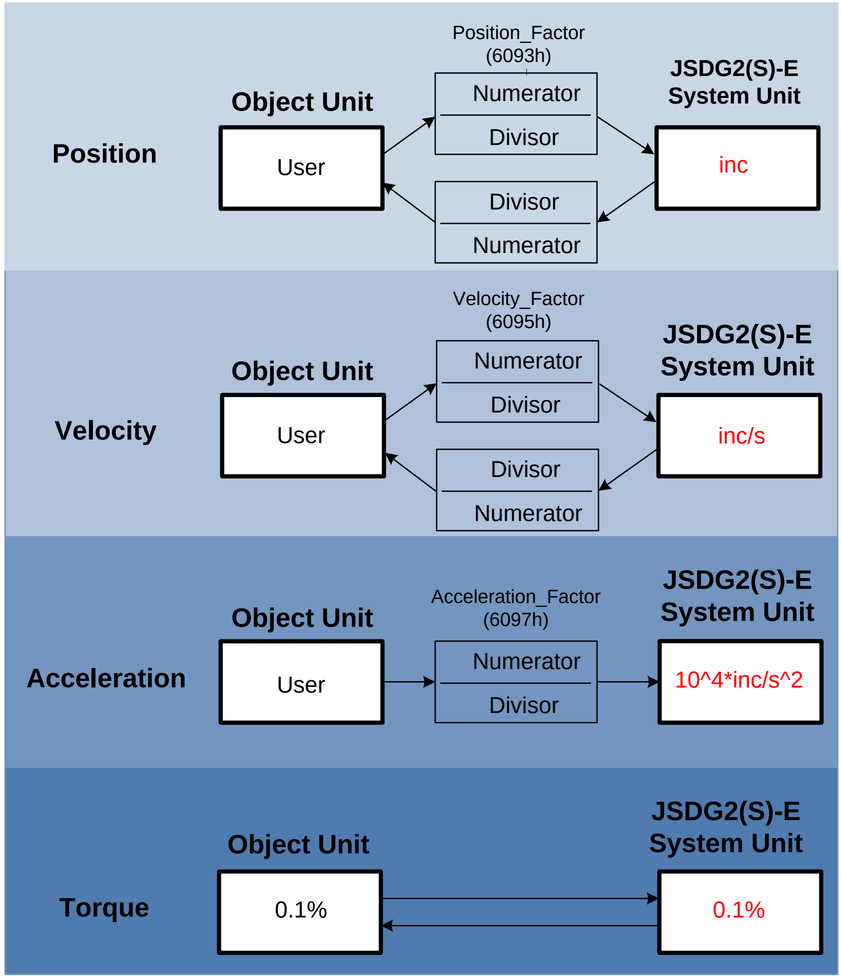
Modes of operation (6060h) setting value	Servo mode
0x00	NA
0x01	PP
0x03	PV
0x04	PT
0x06	HM
0x07 (not support)	IP
0x08 (CANopen does not support)	CSP
0x09 (CANopen does not support)	CSV
0x0A (CANopen does not support)	CST

After the user inputs the setting mode to Object 6060h, when he/she wants to check if JSDG2(S)-E servo driver has switched to that mode, the user can read its status by Object 6061h to confirm if status value is identical to the setting value of Object 6060h (when entering Operation enabled, the function set by Object 6060h becomes valid and will be displayed in Object 6061h).

Modes of operation display (6061h) state value	Servo mode
0x00	NA
0x01	PP
0x03	PV
0x04	PT
0x06	HM
0x07 (not support)	IP
0x08 (CANopen does not support)	CSP
0x09 (CANopen does not support)	CSV
0x0A (CANopen does not support)	CST

8-3-6-3 Unit Condition

JSDG2(S)-E servo drivers has the system unit used by the system. The user can directly choose to use that unit or change the unit through setting the unit condition object (6093h, 6095h, 6097h). After finishing the unit change setting, for objects using that unit, the user can directly type in the customized unit value. Please refer to the object list for detailed unit of each object.



Example:

Assumed the resolution of motor encoder working with SDG2(S)-E servo motor is 131072(17bits), and the original JSDG2(S)-E speed system unit is inc/s. But the user wants to change the speed unit to 0.01rpm. Calculation method is as follows:

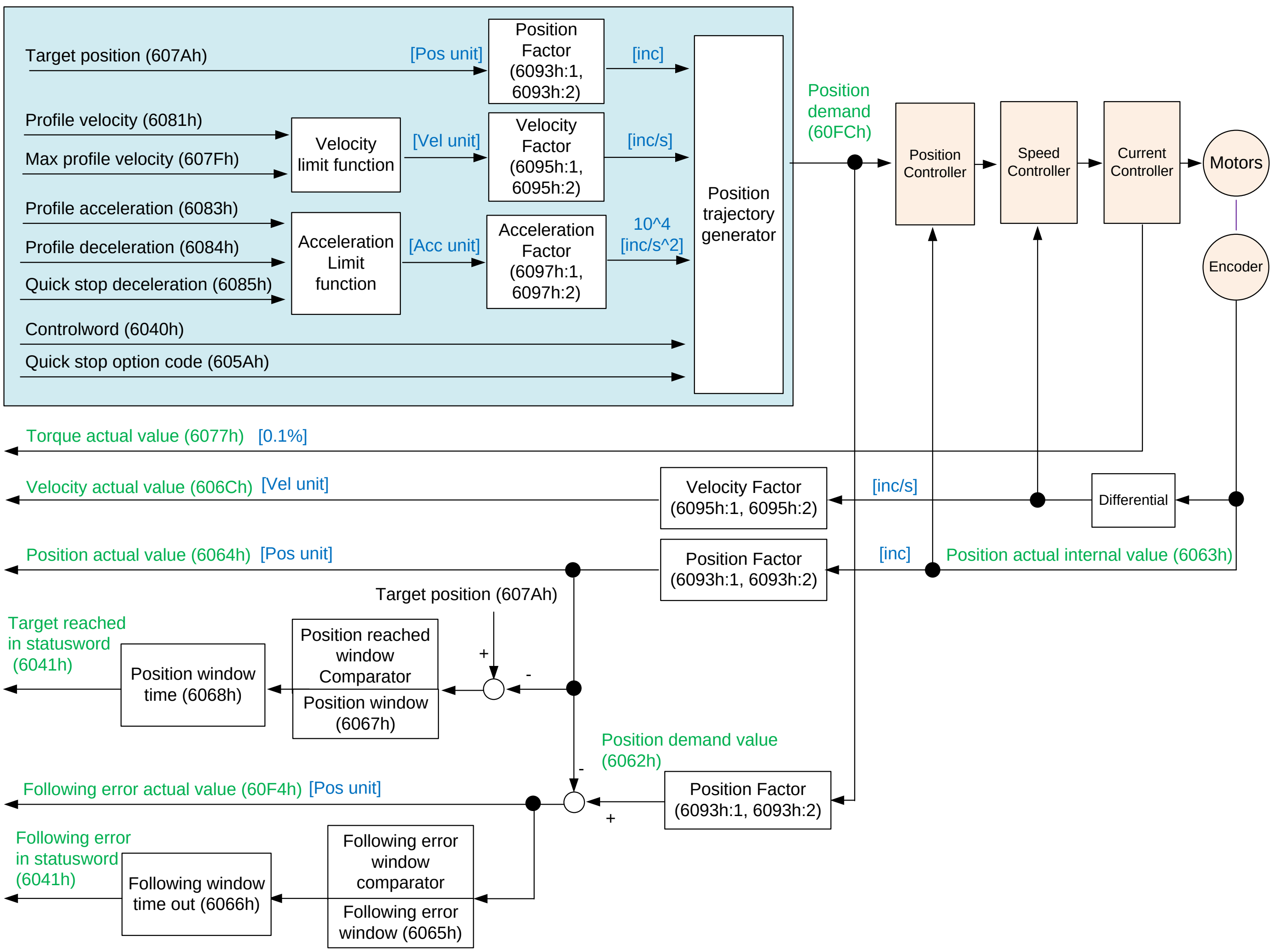
$$0.01rpm = 0.01 \times \frac{131072}{60s} = \frac{131072}{6000}$$

Lastly, set unit condition object Velocity factor (6095h) as

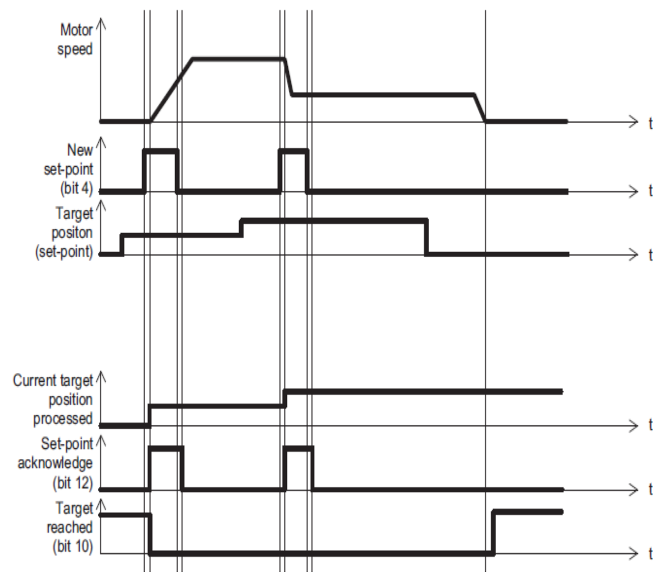
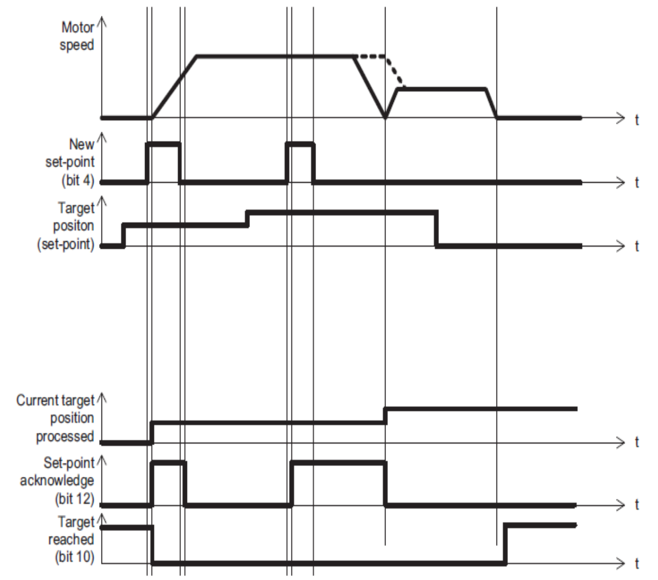
Object	Subobject	Name	Setting Value	Unit
0x6095	Velocity factor			
	0	Number of entries	2	-
	1	Numerator	131072	-
	2	Divisor	6000	-

8-3-6-4 Profile Position (PP)

Profile Position is an operation of command planning type and mainly used to the point-to-point positioning application. The supervisory controller needs to give JSDG2(S)-E servo driver target position value (absolute or relative), command acceleration/decelertaion value and travel speed. After receiving these parameters, the internal trajectory generator of JSDG2(S)-E servo driver system will automatically generate the operation travel based on these parameter settings.



Profile Position mode provides two ways for the user to select: Immediately & Single set point. “Immediately” refer to the condition when receiving a new command, new command travel will be operated. It can plan the next travel with current speed without decelerating the speed to 0. “Single set point” refer to the condition the new command travel will only be operated after completing current command travel.

Immediate	Single point
	

Control Word (6040h) bit	Name	Value	Description
4	New set-point	0	Target position not used
		1	Use target position
5	Change set immediately	0	Start the next travel when complete current travel
		1	Stop current travel and start the next travel immediately
6	abs/rel	0	Command absolute position
		1	Command relative position
8	Halt	0	Execute travel
		1	Pause
10	Target reached	0	Target position not reached
		1	Target position has reached
12	Set-point acknowledge	0	Current travel not completed
		1	Current travel has completed
13	following error	0	Position command no following error
		1	Position command following error

● Related object:

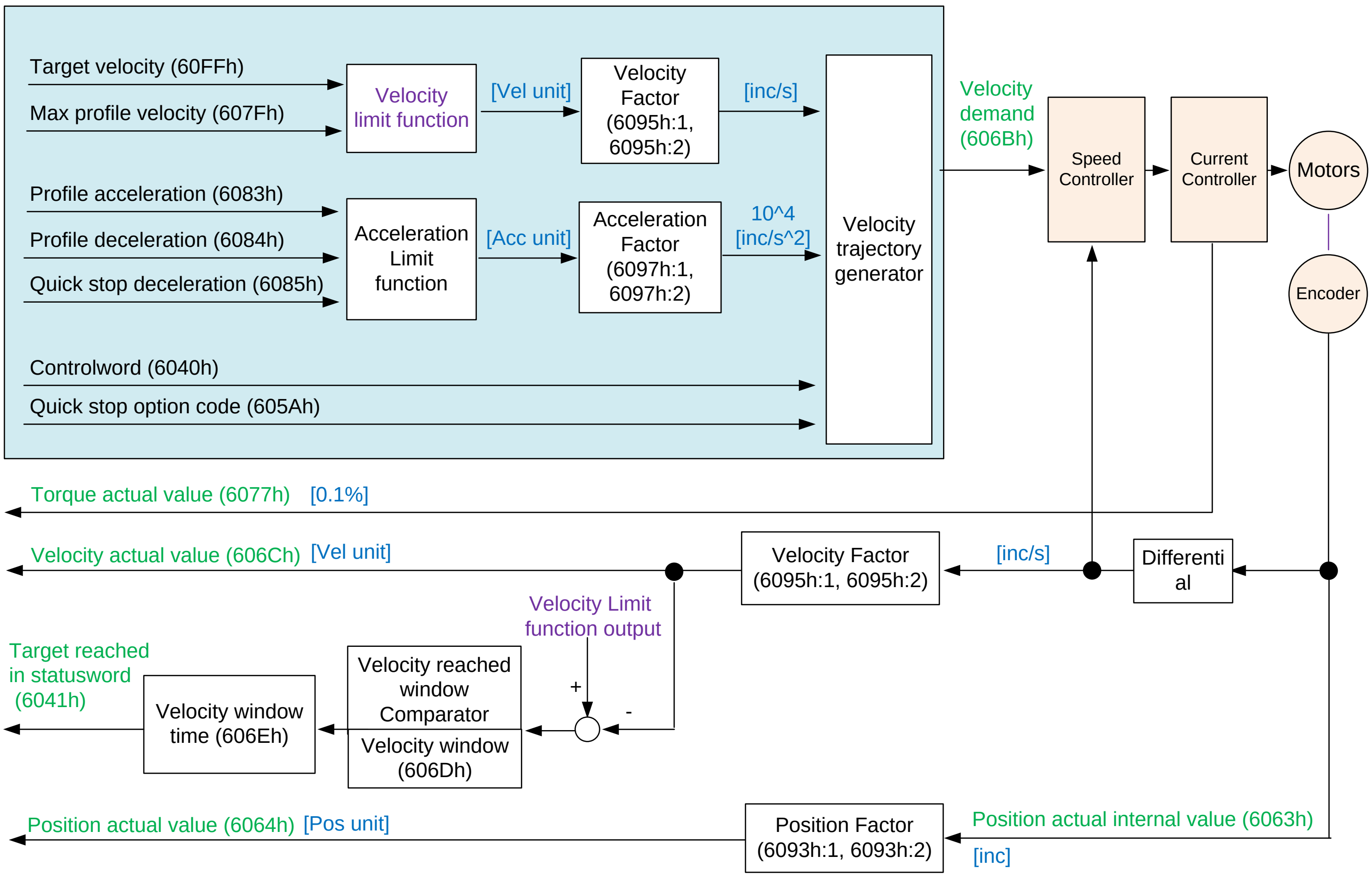
Object	Subobject	Name	Access	PDO mapping	Unit
6040h	0	Control Word	RW	YES	-
605Ah	0	Quick stop option code	RW	NO	-
6065h	0	Following error window	RW	YES	Pos unit
6066h	0	Following window time out	RW	YES	ms
6067h	0	Position window	RW	YES	Pos unit
6068h	0	Position window time	RW	YES	ms
607Ah	0	Target Position	RW	YES	Pos unit
607Fh	0	Max Profile Velocity	RW	YES	Vel unit
6081h	0	Profile Velocity	RW	YES	Vel unit
6083h	0	Profile Acceleration	RW	YES	Acc unit
6084h	0	Profile Deceleration	RW	YES	Acc unit
6085h	0	Quick stop deceleration	RW	YES	Acc unit
6041h	0	Status Word	RO	YES	-
6062h	0	Position demand value	RO	YES	Pos unit
6063h	0	Position actual internal value	RO	YES	inc
6064h	0	Position actual value	RO	YES	Pos unit
606Ch	0	Velocity actual value	RO	YES	Vel unit
6077h	0	Torque actual value	RO	YES	0.1%
60F4h	0	Following error actual value	RO	YES	Pos unit
60FCh	0	Position Demand Internal Value	RO	YES	inc

● Operation:

1. Set “6060h” as profile position mode (6060h = 01h).
2. Set “607Ah” as the target position. (Unit: Pos Unit)
3. Set ”6081h” velocity. (Unit: Vel Unit)
4. Set “6083h” acceleration slope. (Unit: Acc Unit)
5. Set “6084h” deceleration slope. (Unit: Acc Unit)
6. Set “6040h” to make JSDG2(S)-E servo driver Servo On and the motor start operation.
7. Read “6064h” to acquire current motor feedback position.
8. Read “6041h” to acquire JSDG2(S)-E servo driver status.

8-3-6-5 Profile Velocity (PV)

Profile Velocity is speed control. Under this mode, speed output will run speed command planning to JSDG2(S)-E servo driver according the acceleration/deceleration and target speed set by the user.



● Related object:

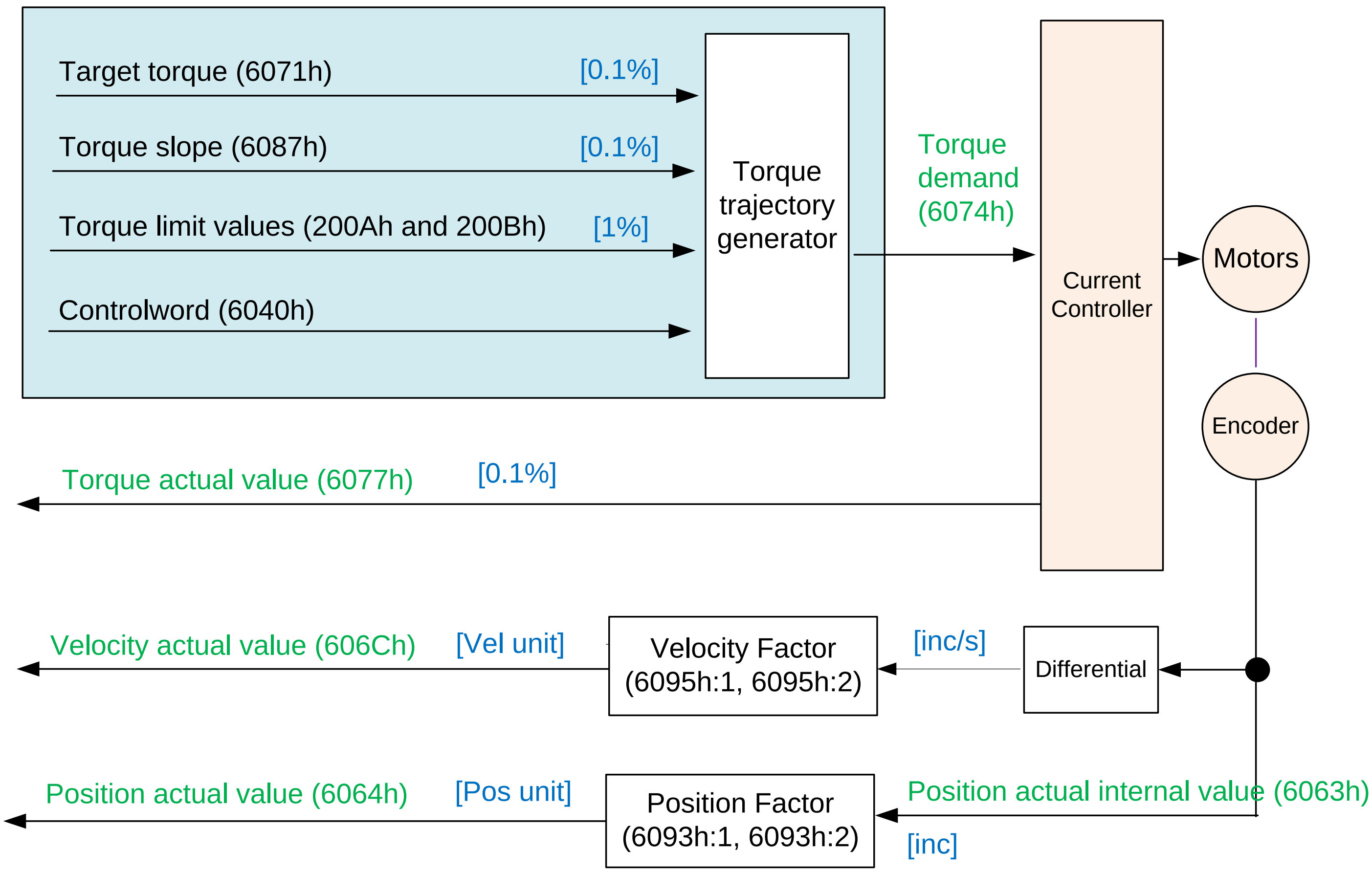
Object	Subobject	Name	Access	PDO mapping	Unit
6040h	0	Control Word	RW	YES	-
605Ah	0	Quick stop option code	RW	NO	-
606Dh	0	Velocity window	RW	NO	Vel unit
606Eh	0	Velocity window time	RW	NO	Vel unit
607Fh	0	Max Profile Velocity	RW	YES	Vel unit
6083h	0	Profile Acceleration	RW	YES	Acc unit
6084h	0	Profile Deceleration	RW	YES	Acc unit
6085h	0	Quick stop deceleration	RW	YES	Acc unit
60FFh	0	Target Velocity	RW	YES	Vel unit
6041h	0	Status Word	RO	YES	-
6063h	0	Position actual internal value	RO	YES	inc
6064h	0	Position actual value	RO	YES	Pos unit
606Bh	0	Velocity Demand Value	RO	YES	inc/s
606Ch	0	Velocity actual value	RO	YES	Vel unit
6077h	0	Torque actual value	RO	YES	0.1%

● Operation:

1. Set “6060h” as profile velocity mode (6060h = 03h).
2. Set “6040h” to make JSDG2(S)-E servo driver Servo On and the motor start operation.
3. Set “6083h” acceleration slope. (Unit: Acc Unit)
4. Set “6084h” deceleration slope. (Unit: Acc Unit)
5. Set “60FFh” target velocity. (Unit: Vel Unit)
6. Read “6041h” to acquire JSDG2(S)-E servo driver status.

8-3-6-6 Profile Torque (PT)

Profile Torque is torque control. Under this mode, the user plans the torque command and slope to JSDG2(S)-E servo driver.



● Related object:

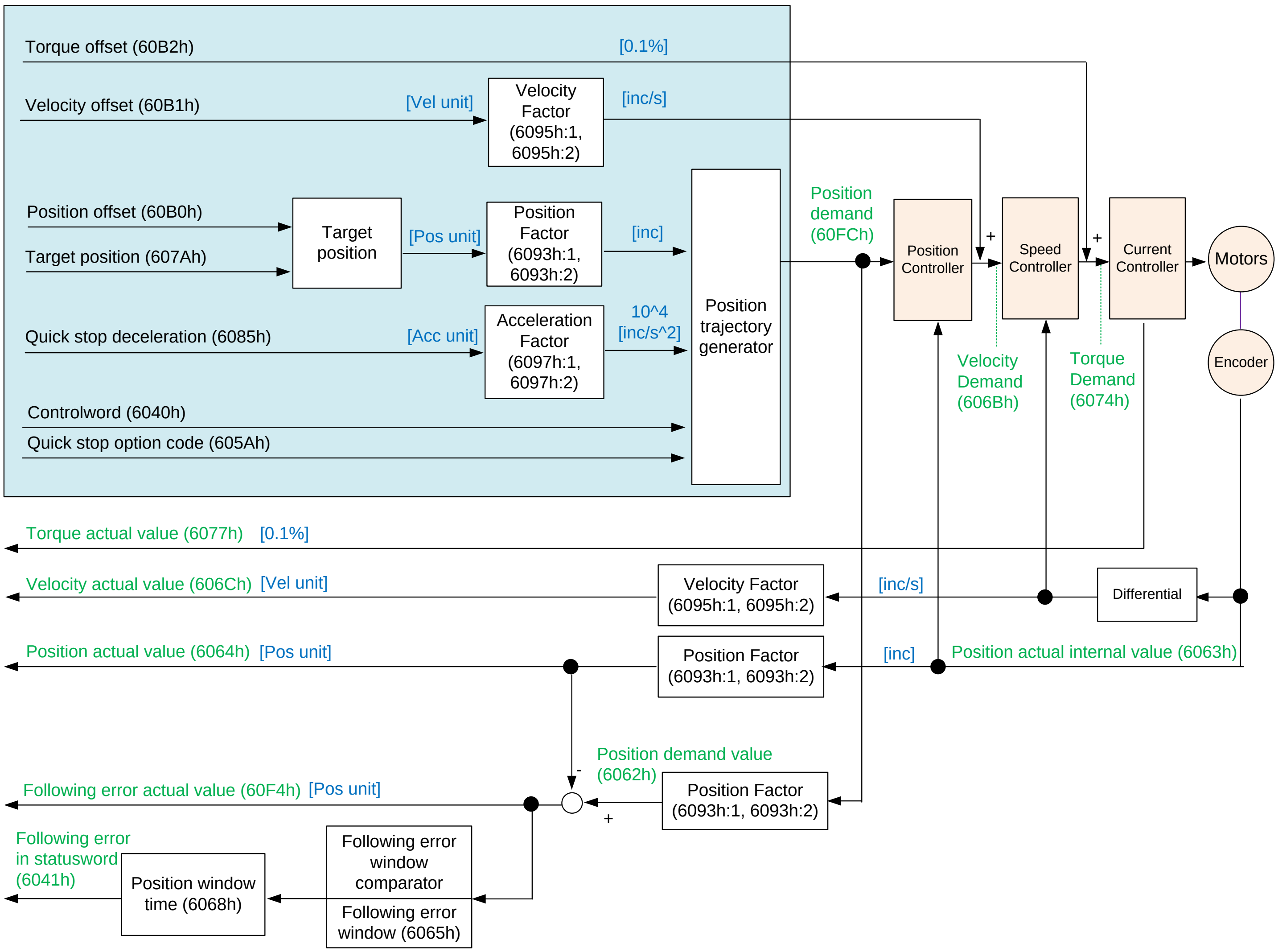
Object	Subobject	Name	Access	PDO mapping	Unit
200Ah	0	CCW Direction Torque Command Limit Value	RW	NO	%
200Bh	0	CCW Direction Torque Command Limit Value	RW	NO	%
6040h	0	Control Word	RW	YES	-
6071h	0	Target torque	RW	YES	0.1%
6087h	0	Torque slope	RW	YES	ms from 0 to 100% rated torque
6041h	0	Status Word	RO	YES	-
6063h	0	Position actual internal value	RO	YES	inc
6064h	0	Position actual value	RO	YES	Pos unit
606Ch	0	Velocity actual value	RO	YES	Vel unit
6074h	0	Torque Demand Value	RO	YES	0.1%
6077h	0	Torque actual value	RO	YES	0.1%

● Operation:

1. Set “6060h” as profile velocity mode (6060h = 04h)。
2. Set “6040h” to make JSDG2(S)-E servo driver Servo On and the motor start operation.
3. Set “6087h” torque slope. (Unit: ms from 0 to 100% rated torque)
4. Set “6071h” target torque. (Unit: 0.1%)
6. Read “6041h” to acquire JSDG2(S)-E servo driver status.

8-3-6-7 Cyclic Synchronous Position (CSP)

Cyclic Synchronous Position is the cyclic command mode. Under this mode, the user must use PDO communication to provide new commands cyclically. And JSDG2(S)-E servo driver will generate commands by linear interpolation to process position control.



● Related object:

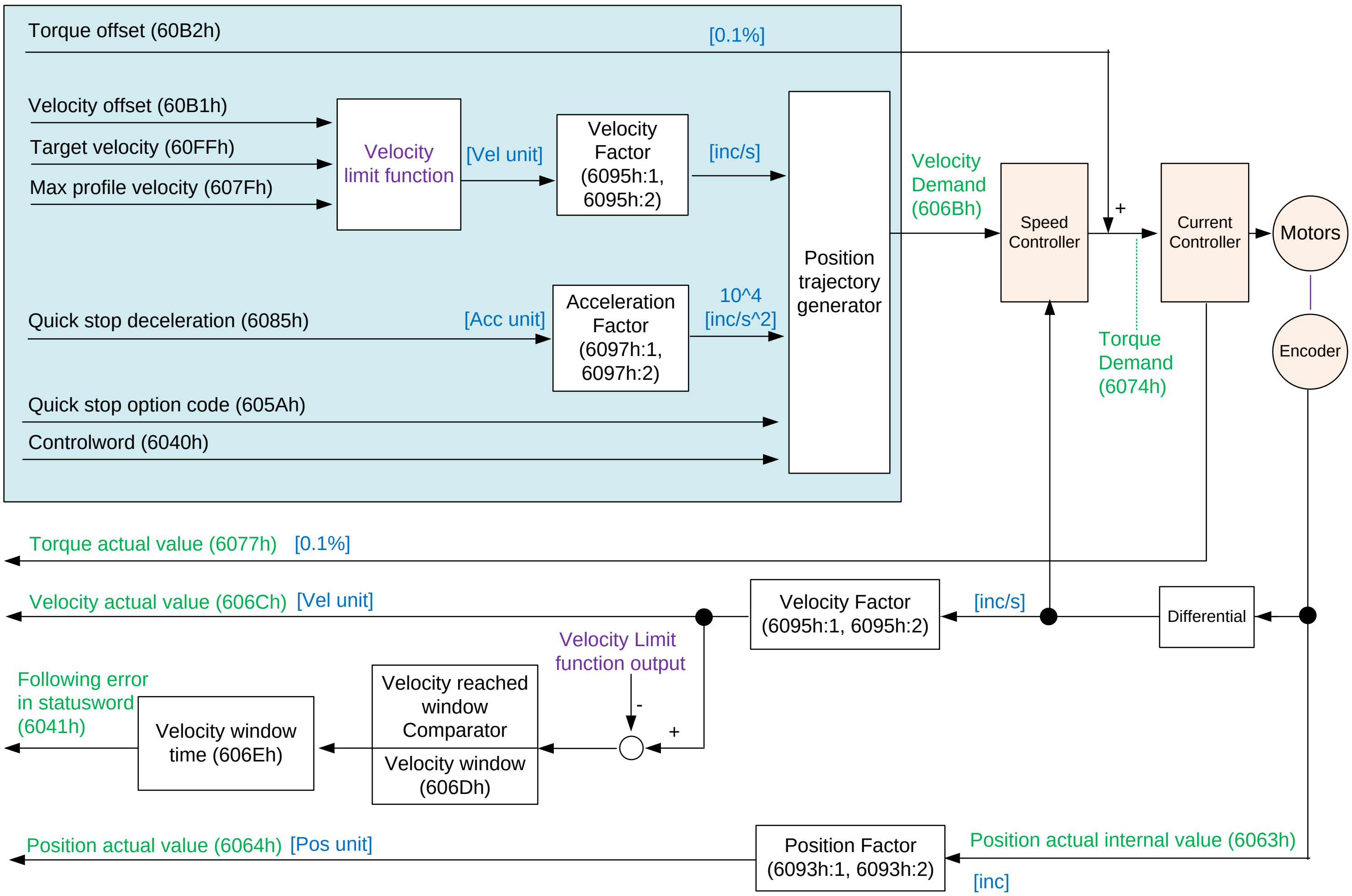
Object	Subobject	Name	Access	PDO mapping	Unit
6040h	0	Control Word	RW	YES	-
605Ah	0	Quick stop option code	RW	NO	-
6065h	0	Following error window	RW	YES	Pos unit
6066h	0	Following window time out	RW	YES	ms
607Ah	0	Target Position	RW	YES	Pos unit
6085h	0	Quick stop deceleration	RW	YES	Acc unit
60B0h	0	Position Offset	RW	YES	Pos unit
60B1h	0	Velocity Offset	RW	YES	Vel unit
60B2h	0	Torque Offset	RW	YES	0.1%
6041h	0	Status Word	RO	YES	-
6062h	0	Position demand value	RO	YES	Pos unit
6063h	0	Position actual internal value	RO	YES	inc
6064h	0	Position actual value	RO	YES	Pos unit
606Bh	0	Velocity Demand Value	RO	YES	Vel unit
606Ch	0	Velocity actual value	RO	YES	Vel unit
6074h	0	Torque Demand Value	RO	YES	0.1%
6077h	0	Torque actual value	RO	YES	0.1%
60F4h	0	Following error actual value	RO	YES	Pos unit
60FCh	0	Position Demand Internal Value	RO	YES	inc/s

● Operation:

1. Set “6060h” as profile position mode (6060h = 08h).
2. Set “607Ah” as the unit synchronous cyclic target position. (Unit: Pos Unit)
3. Set “6040h” to make JSDG2(S)-E servo driver Servo On and the motor start operation.
4. Read “6064h” to acquire current motor feedback position.
5. Read “6041h” to acquire JSDG2(S)-E servo driver status.

8-3-6-8 Cyclic Synchronous Velocity (CSV)

Cyclic Synchronous Velocity is the cyclic command mode. Under this mode, the user must use PDO communication to provide new commands cyclically. And JSDG2(S)-E servo driver will generate commands by linear interpolation to process speed control.



● Related object:

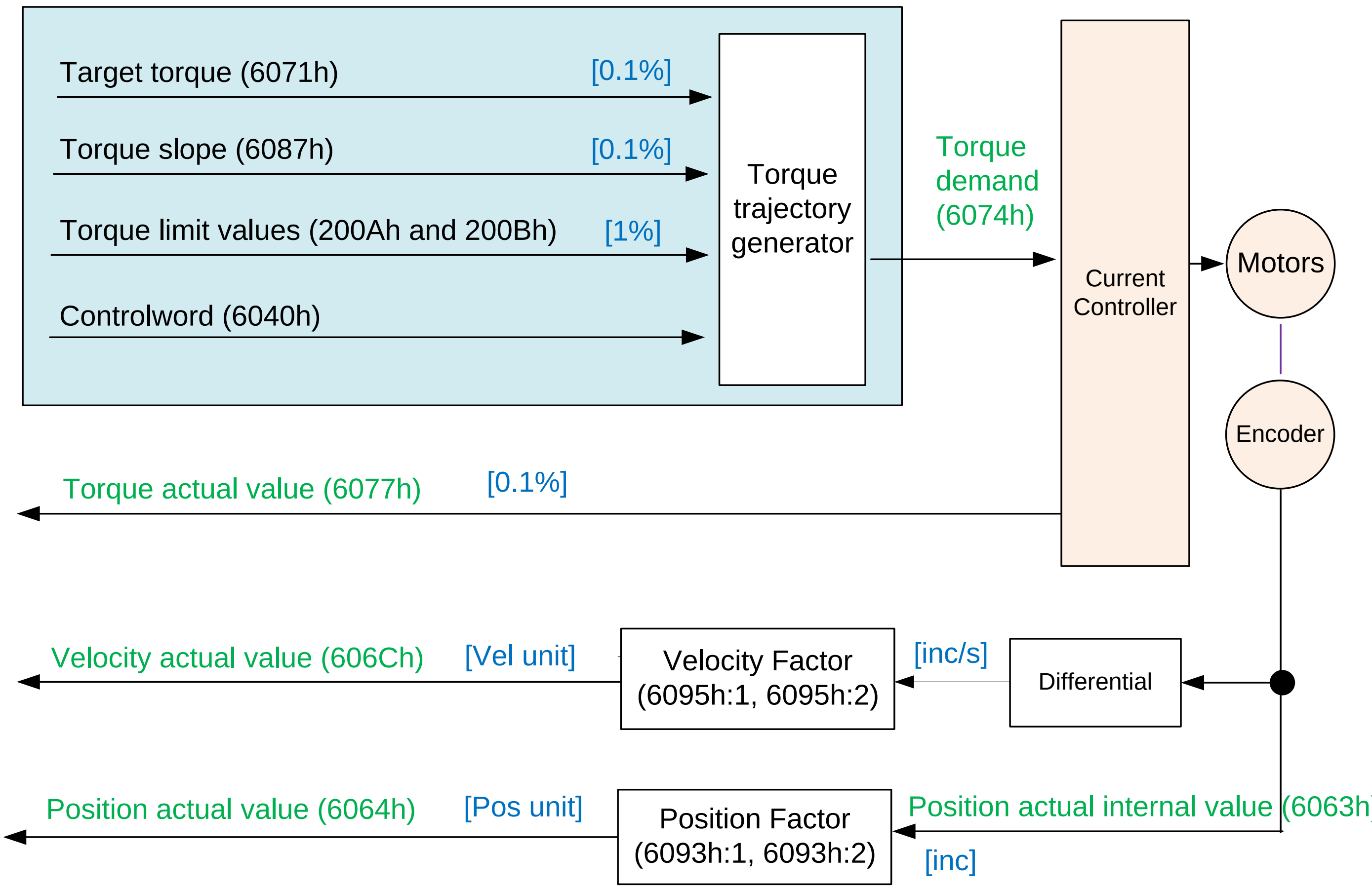
Object	Subobject	Name	Access	PDO mapping	Unit
6040h	0	Control Word	RW	YES	-
605Ah	0	Quick stop option code	RW	NO	Vel unit
606Dh	0	Velocity window	RW	NO	Vel unit
606Eh	0	Velocity window time	RW	NO	Vel unit
607Fh	0	Max Profile Velocity	RW	YES	Vel unit
60B1h	0	Velocity Offset	RW	YES	Vel unit
60B2h	0	Torque Offset	RW	YES	0.1%
6085h	0	Quick stop deceleration	RW	YES	Acc unit
60FFh	0	Target Velocity	RW	YES	Vel unit
6041h	0	Status Word	RO	YES	-
6063h	0	Position actual internal value	RO	YES	inc
6064h	0	Position actual value	RO	YES	Pos unit
606Bh	0	Velocity Demand Value	RO	YES	Vel unit
606Ch	0	Velocity actual value	RO	YES	Vel unit
6074h	0	Torque Demand Value	RO	YES	0.1%
6077h	0	Torque actual value	RO	YES	0.1%

● Operation:

1. Set “6060h” as profile velocity mode (6060h = 09h)。
2. Set “6040h” to make JSDG2(S)-E servo driver Servo On and the motor start operation.
3. Set “60FFh” target velocity. (Unit: Vel Unit)。
4. Read “6041h” to acquire JSDG2(S)-E servo driver status.

8-3-6-9 Cyclic Synchronous Torque (CST)

Cyclic Synchronous Torque is the cyclic command mode. Under this mode, the user must use PDO communication to provide new commands cyclically. And JSDG2(S)-E servo driver will generate commands by linear interpolation to process torque control.



● Related object:

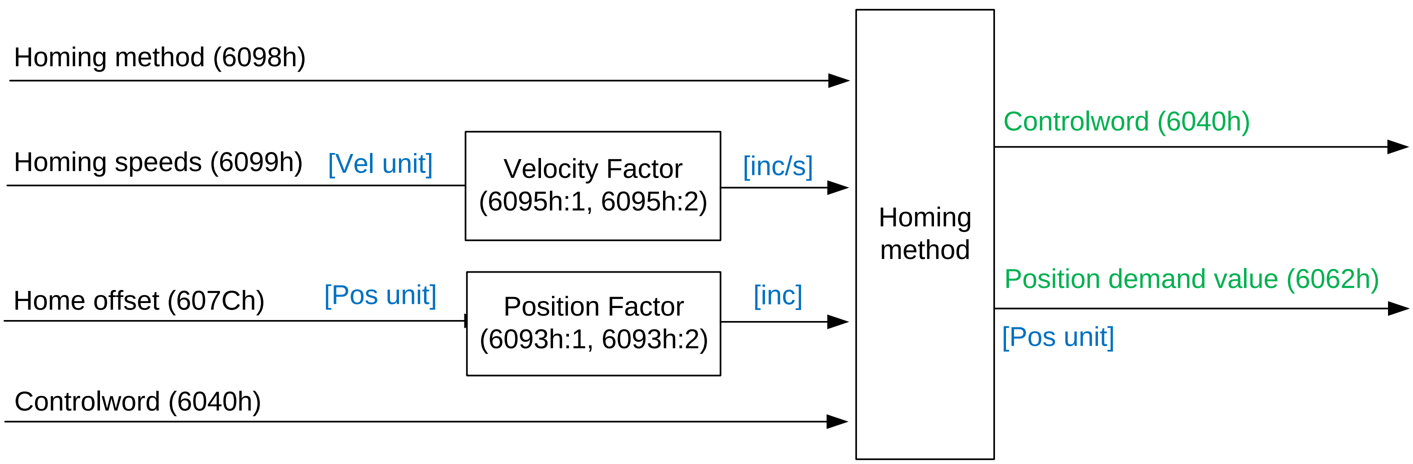
Object	Subobject	Name	Access	PDO mapping	Unit
200Ah	0	CCW Direction Torque Command Limit Value	RW	NO	%
200Bh	0	CCW Direction Torque Command Limit Value	RW	NO	%
6040h	0	Control Word	RW	YES	-
6071h	0	Target torque	RW	YES	0.1%
60B2h	0	Torque Offset	RW	YES	0.1%
6041h	0	Status Word	RO	YES	-
6063h	0	Position actual internal value	RO	YES	inc
6064h	0	Position actual value	RO	YES	Pos unit
606Ch	0	Velocity actual value	RO	YES	Vel unit
6074h	0	Torque Demand Value	RO	YES	0.1%
6077h	0	Torque actual value	RO	YES	0.1%

● Operation:

1. Set “6060h” set as profile torque mode (6060h = 0Ah).
2. Set “6040h” to make JSDG2(S)-E servo driver Servo On and the motor start operation.
3. Set “6071h” target torque. (Unit: 0.1%)
4. Read “6041h” to acquire JSDG2(S)-E servo driver status.

8-3-6-10 Homing Mode (HM)

There are 30 ways of Return to origin for JSDG2(S)-E servo driver. The user can set Object 6098h to determine the way of return. Each method are categorized by different activation directions, stop directions, origin signals and zero point signals. The use of each way of Return to origin is completely based on CiA402(Cia Draft Standard Proposal 402) protocol. The user can use by referring to this document.



Homing method (6098h)	Start direction	Stop direction	Return signal	Zero point signal
1	negative	positive	negative limit	Encoder Z puls
2	positive	negative	positive limit	Encoder Z puls
3	dependent on home switch	negative	positive home	Encoder Z puls
4	dependent on home switch	positive	positive home	Encoder Z puls
5	dependent on home switch	positive	negative home	Encoder Z puls
6	dependent on home switch	negative	negative home	Encoder Z puls
7	dependent on home switch	negative	positive limit, positive home	Encoder Z puls
8	dependent on home switch	positive	positive limit, positive home	Encoder Z puls
9	dependent on home switch	negative	positive limit, negative home	Encoder Z puls
10	dependent on home switch	positive	positive limit, negative home	Encoder Z puls
11	dependent on home switch	positive	negative limit, positive home	Encoder Z puls
12	dependent on home switch	negative	negative limit, positive home	Encoder Z puls
13	dependent on home switch	positive	negative limit, negative home	Encoder Z puls

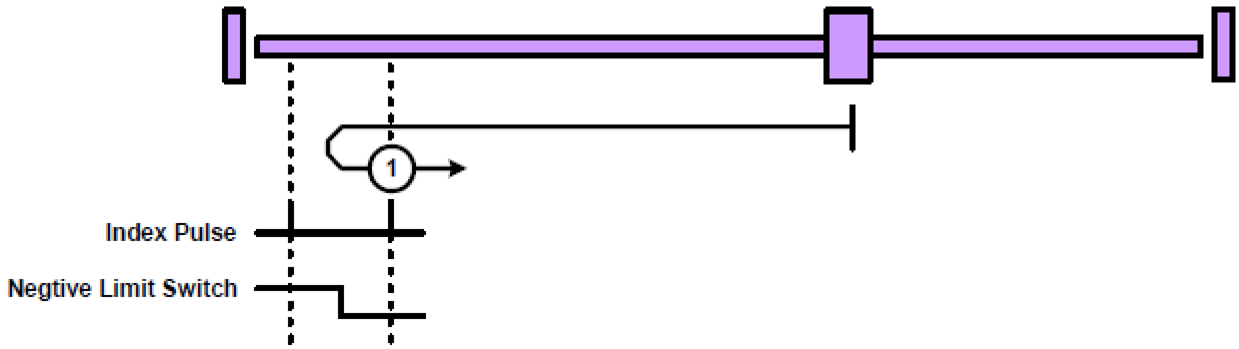
Homing method (6098h)	Start direction	Stop direction	Return signal	Zero point signal
14	dependent on home switch	negative	negative limit, negative home	Encoder Z puls
17	negative	positive	negative limit	negative limit
18	positive	negative	positive limit	positive limit
19	dependent on home switch	positive	positive home	positive home
20	dependent on home switch	negative	positive home	positive home
21	dependent on home switch	positive	negative home	negative home
22	dependent on home switch	negative	negative home	negative home
23	dependent on home switch	negative	positive limit, positive home	positive home
24	dependent on home switch	positive	positive limit, positive home	positive home
25	dependent on home switch	negative	positive limit, negative home	negative home
26	dependent on home switch	positive	positive limit, negative home	negative home
27	dependent on home switch	positive	negative limit, positive home	positive home
28	dependent on home switch	negative	negative limit, positive home	positive home
29	dependent on home switch	positive	negative limit, negative home	negative home
30	dependent on home switch	negative	negative limit, negative home	negative home
33	positive	negative	Encoder Z pulse	Encoder Z pulse
34	negative	positive	Encoder Z pulse	Encoder Z pulse
35	-	-	-	current position

Control Word (6040h) bit	Name	Value	Description
4	Homing operation start	0	Enable Return to Origin Mode
		1→0	Start Return to Origin
		1	Enable Return to Origin Mode
		0→1	Stop Return to Origin
8	Halt	0	Execute Return to Origin
		1	Pause
10	Target reached	0	Target position not reached
		1	Target position has reached
12	Set-point acknowledge	0	Current travel not completed
		1	Current travel has completed
13	following error	0	Position command no following error
		1	Position command following error

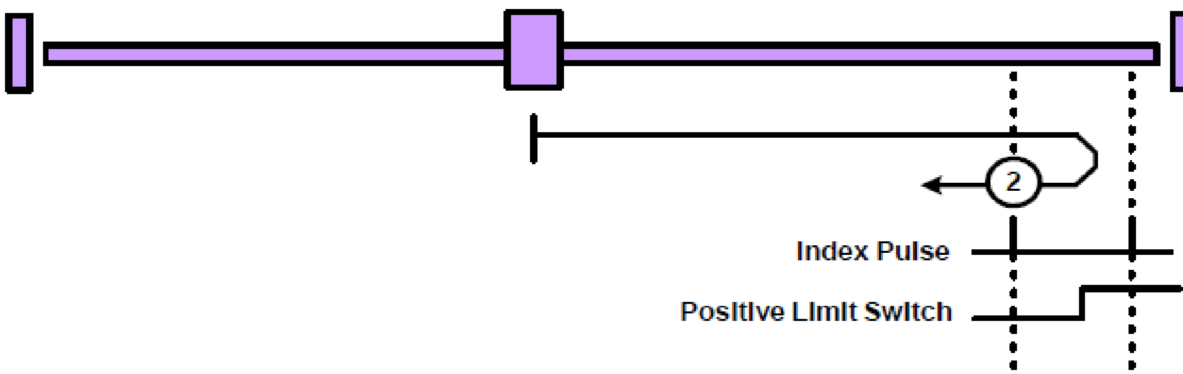
- Related object:

Object	Subobject	Name	Access	PDO mapping	Unit
6040h	0	Control Word	RW	YES	-
607Ch	0	Home Offset	RW	NO	Pos unit
6098h	0	Homing Method	RW	YES	-
6099h	Homing Speed				
	0	Number of entries	RO	NO	-
	1	Speed during search for switch	RW	YES	Vel unit
	2	Speed during search for zero	RW	YES	Vel unit
6041h	0	Status Word	RO	YES	-
6062h	0	Position Demand Value	RO	YES	Pos unit

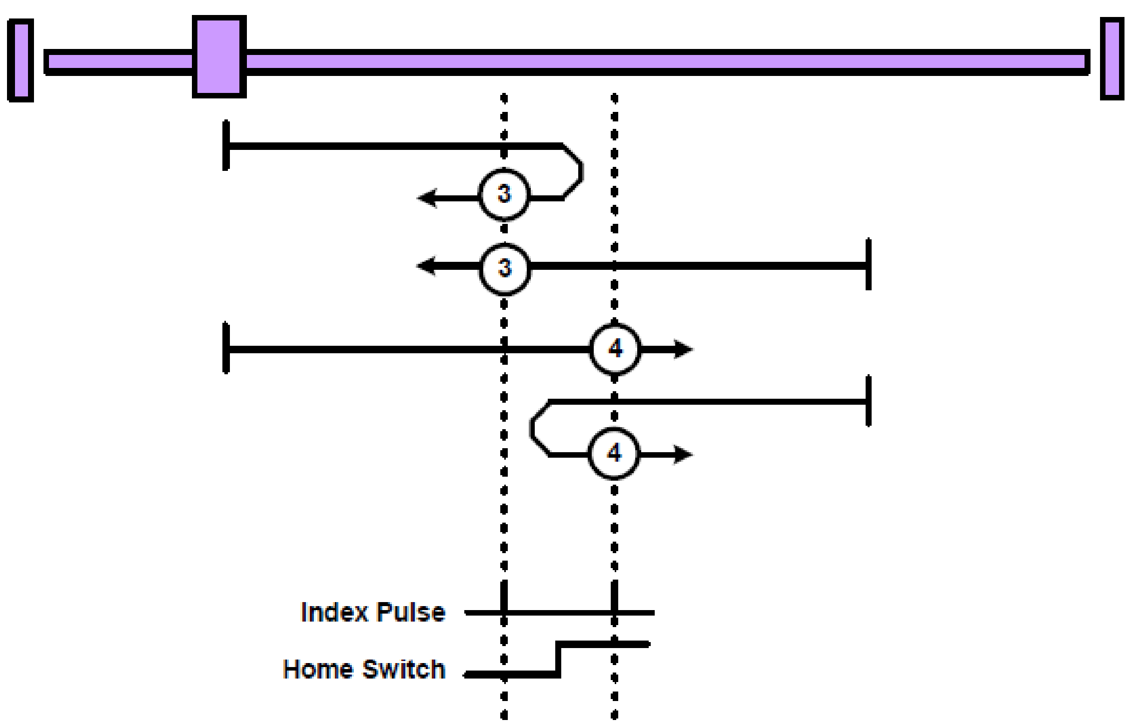
- Method 1: Homing on the negative limit switch and index pulse.



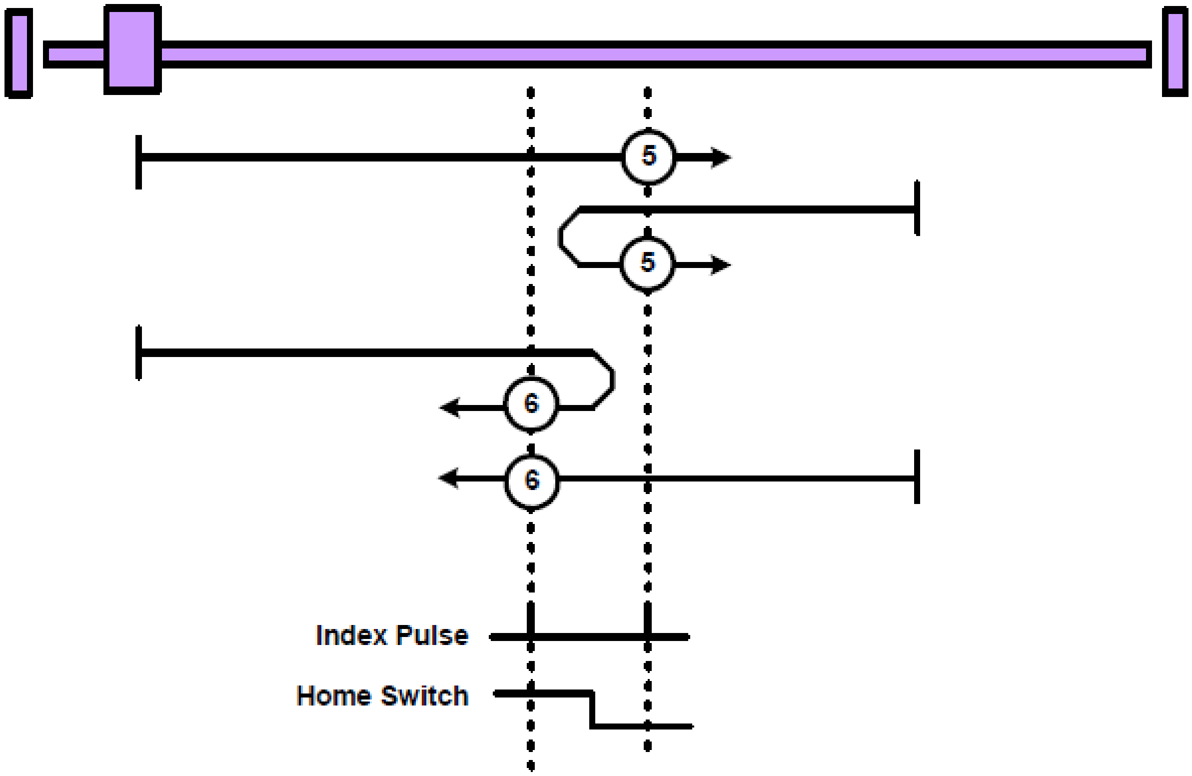
- Method 2 : Homing on the positive limit switch and index pulse.



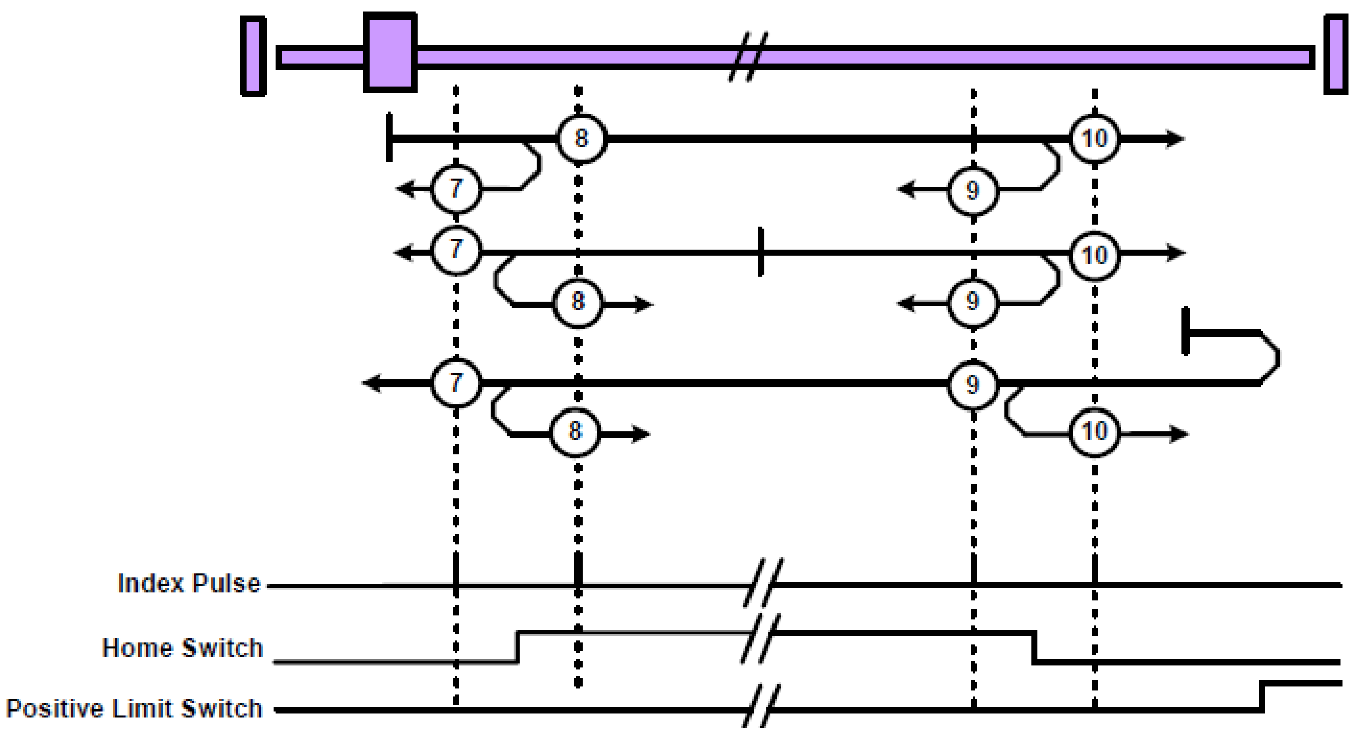
- Method 3 and 4: Homing on the positive home switch and index pulse.



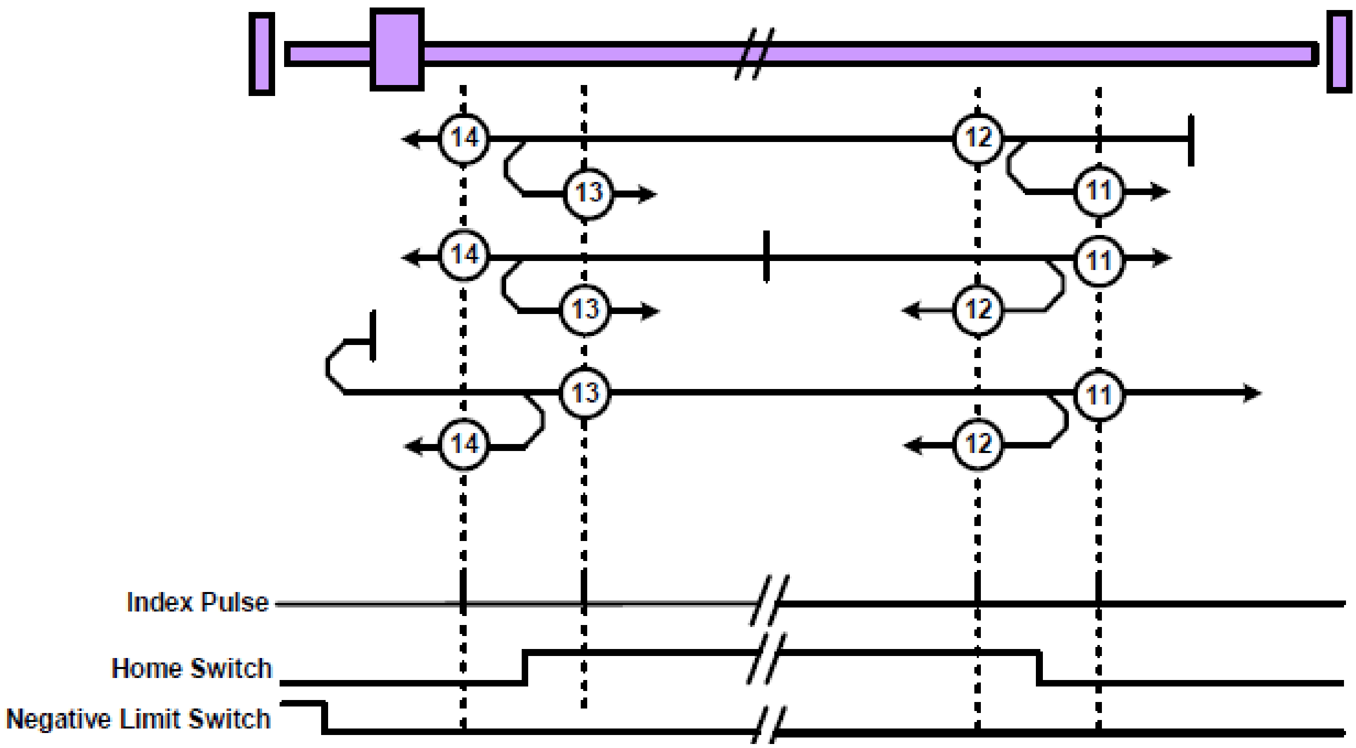
- Method 5 and 6 : Homing on the negative home switch and index pulse.



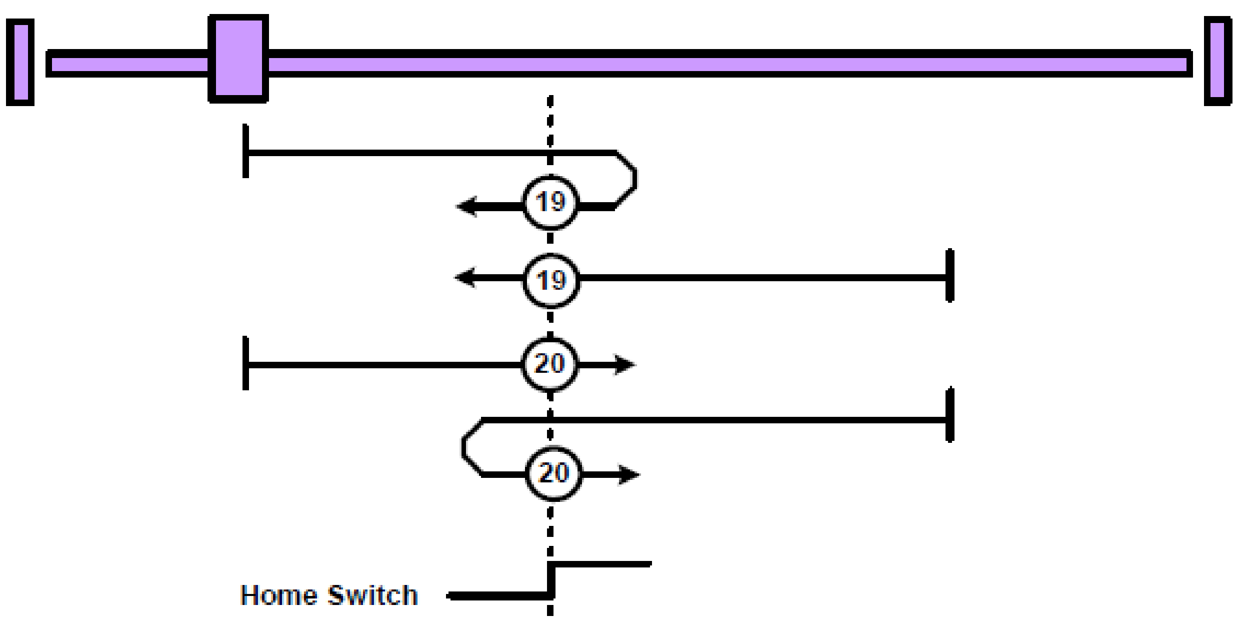
- Method 7 to 14 : Homing on the home switch and index pulse



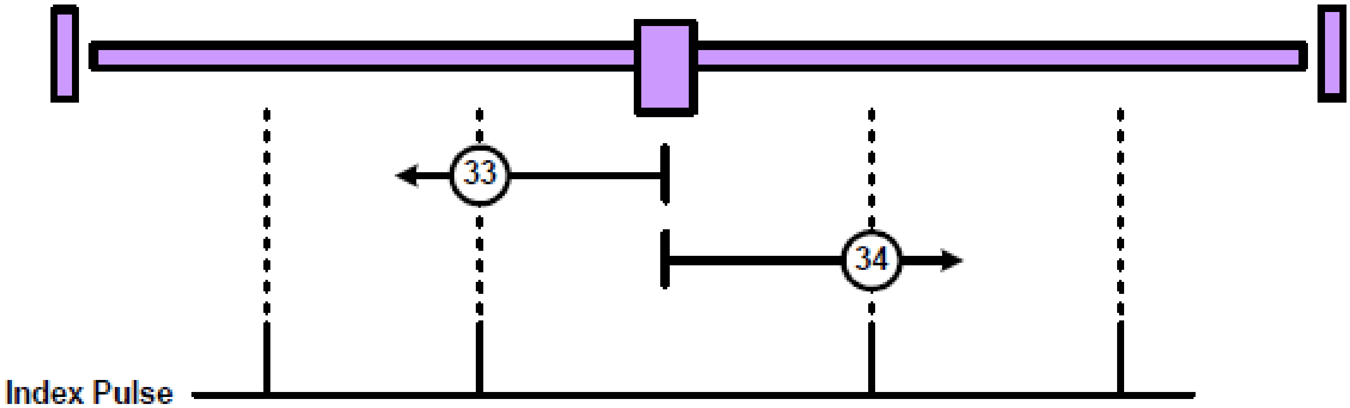
- Method 7 to 14 : Homing on the home switch and index pulse



- Method 19 to 20 : Homing without an index pulse.



◆ Method 33 to 34 : Homing on the index pulse.



◆ Method 35: Homing on current position (obsolete)

With this way, current position is defined as the origin position. This way can be implemented even if the servo driver is not under OperationEnabled condition.

● Operation:

1. Set “6060h” as homing mode (6060h =06h)
2. Set “6040h” to make JSDG2(S)-E servo driver Servo On and the motor start operation.
3. Set “6040h” to set Homing operation start bit as 1 to start Return to origin.
4. At this time, “6041h” Homing attained and Target reached bit will be cleared to 0.
5. After Return to origin is completed, “6041h” Homing attained and Target reached bit will be set as 1.
6. Set “6060h” to set Homing operation start bit as 0 to deactivate Return to origin.
7. At this time, “6041h” Target reached bit is cleared to 0 to prepare for receiving the next command.

8-3-6-11 Digital I/O

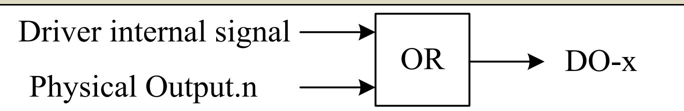
When using EtherCAT communication, JSDG2(S)-E servo driver also supports the user to use digital I/O; respectively controlled by Object Digital Input (60FDh) & Digital Output (60FEh).

Under EtherCAT communication, Digital Input (60FDh) can acquire the physical DI data of JSDG2(S)-E servo driver. Digital Output (0x60FE) can acquire the physical DO status of JSDG2(S)-E servo driver and control.

Digital Input (60FDh) bit	Signal	Description
0	CWL	1: Enable 0: Disable
1	CCWL	1: Enable 0: Disable
2	Home Switch	1: Enable 0: Disable
16	DI-1	1: Enable 0: Disable
17	DI-2	1: Enable 0: Disable
18	DI-3	1: Enable 0: Disable
19	DI-4	1: Enable 0: Disable
20	DI-5	1: Enable 0: Disable
21	DI-6	1: Enable 0: Disable
22	DI-7	1: Enable 0: Disable
23	DI-8	1: Enable 0: Disable
24	DI-9	1: Enable 0: Disable
25	DI-10	1: Enable 0: Disable
26	DI-11	1: Enable 0: Disable
27	DI-12	1: Enable 0: Disable

In object Digital Output (60FEh), there are two subobjects: Physical Output & Bit Mask。 Physical Output function is to modify physical DO status; Bit Mask function shields the original DO function.

When Bit Mask is 1, it means to retain the original DO function, physical DO status is Physical Output and the original DO status output after OR calculation. When Bit Mask is 0, it means to remove the original DO function and physical DO status is controlled by Physical Output.

DO-1 state when **Bit Mask.n=1**	DO-1 state when **Bit Mask.n=0**
	Physical Output.n → DO-x

※ n=16~23, x=n-15

Digital Output(60FEh)					
Physical Output			Bit Mask		
Bit	Signal	Description	Bit	Signal	Description
16	DO-1	1: Enable 0: Disable	16	DO-1	1: Retain original DO function 0: Remove original DO function
17	DO-2	1: Enable 1: Disable	17	DO-2	1: Retain original DO function 1: Remove original DO function
18	DO-3	1: Enable 2: Disable	18	DO-3	1: Retain original DO function 2: Remove original DO function
19	DO-4	1: Enable 3: Disable	19	DO-4	1: Retain original DO function 3: Remove original DO function
20	DO-5	1: Enable 4: Disable	20	DO-5	1: Retain original DO function 4: Remove original DO function
21	DO-6	1: Enable 5: Disable	21	DO-6	1: Retain original DO function 5: Remove original DO function
22	DO-7	1: Enable 6: Disable	22	DO-7	1: Retain original DO function 6: Remove original DO function
23	DO-8	1: Enable 7: Disable	23	DO-8	1: Retain original DO function 7: Remove original DO function

- Related object:

Object	Subobject	Name	Access	PDO mapping	Unit
60FDh	0	Digital Input	RO	YES	-
60FEh	Digital Output				
	0	Number of entries	RO	No	-
	1	Physical Output	RW	YES	-
	2	Bit Mask	RW	No	-

8-3-6-12 Touch Probe

JSDG2(S)-E servo driver supports Touch Probe function. This function can receive the specific signal source during the operation, capture the position and store in the specified objects. JSDG2(S)-E servo driver supports 2 sets of Touch Probe function objects and both positive and negative edges are possible to set. This provides up to 4 sets of object to record the position. The supported specific signal source includes DI-1, DI-2 and encoder origin.

Touch probe function (6098h) bit	Value	Description
0	0	Disable Touch Probe 1
	1	Enable Touch Probe 1
1	0	Single triggering mode
	1	Continuous triggering mode
3,2	0	Triggering signal is DI-1
	1	Triggering signal is the origin of encoder*
4	0	Disable Touch Probe1 positive edge triggering
	1	Enable Touch Probe 1 positive edge triggering
5	0	Disable Touch Probe1 negative edge triggering
	1	Enable Touch Probe1 negative edge triggering
6,7	-	Reserved
8	0	Disable Touch Probe 2
	1	Enable Touch Probe 2
9	0	Single triggering mode
	1	Continuous triggering mode
11,10	0	Triggering signal is DI-2
12	0	Disable Touch Probe2 positive edge triggering
	1	Enable Touch Probe2 positive edge triggering
13	0	Disable Touch Probe2 negative edge triggering
	1	Enable Touch Probe2 negative edge triggering
14,15	-	Reserved

'*' : only supports positive edge triggering

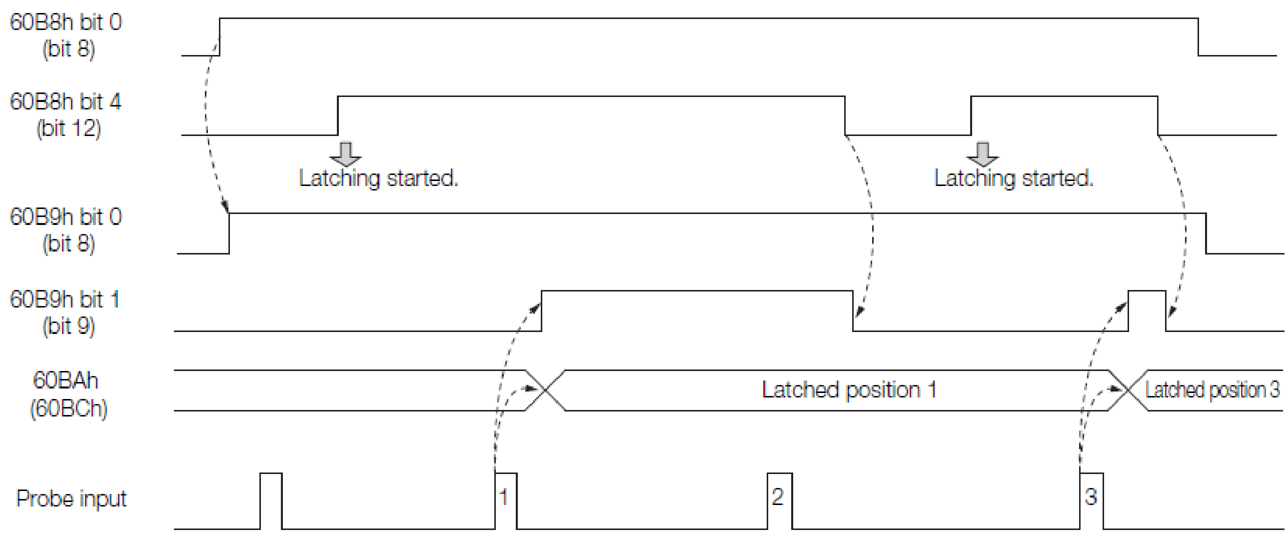
Touch probe status (60B9h) bit	Value	Description
0	0	Disable Touch Probe 1
	1	Enable Touch Probe 1
1	0	Touch Probe1 positive edge triggering position does not occur
	1	Touch Probe1 positive edge triggering position has occurred
2	0	Touch Probe1 negative edge triggering position does not occur
	1	Touch Probe1 negative edge triggering position has occurred
3-5	-	Reserved
8	0	Disable Touch Probe 2
	1	Enable Touch Probe 2
9	0	Touch Probe2 positive edge triggering position does not occur
	1	Touch Probe2 positive edge triggering position has occurred
10	0	Touch Probe2 negative edge triggering position does not occur
	1	Touch Probe2 negative edge triggering position has occurred
11-13	-	Reserved
14,15	-	Reserved

● Operation:

There are two modes available for JSDG2(S)-E servo driver Touch Probe function: single triggering and continuous triggering.

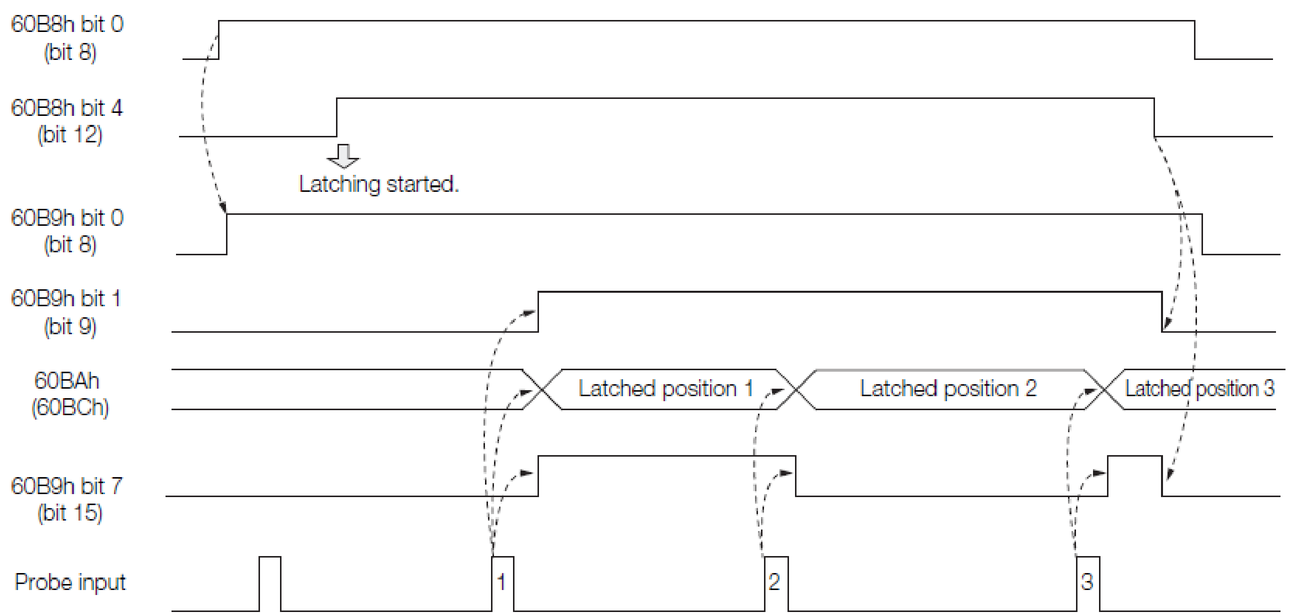
1. Single triggering mode

• Single Trigger Mode (60B8h bit 1 = 0 or bit 9 = 0)



2. Continuous triggering mode

• Continuous Trigger Mode (60B8h bit 1 = 1 or bit 9 = 1)



● Related item:

Object	Subobject	Name	Access	PDO mapping
60B8h	0	Touch probe function	RW	YES
60B9h	0	Touch probe state	RO	YES
60BAh	0	Touch probe1 positive edge position stored	RO	YES
60BBh	0	Touch probe1 negative edge position stored	RO	YES
60BCh	0	Touch probe1 positive edge position stored	RO	YES
60BDh	0	Touch probe1 negative edge position stored	RO	YES

8-3-6-13 Emergency Stop

(6-1) Failure shutdown

When error alarm occurs, JSDG2(S)-E servo driver will immediately switch the state machine to Switch On Disable status and turn JSDG2(S)-E servo driver to Servo OFF right away; at this time, the dynamic brake becomes valid to stop motor operation.

(6-2) Quick shutdown

According to the Shutdown command given to the state machine by the user, JSDG2(S)-E servo driver can rapidly stop motor operation and turn JSDG2(S)-E servo driver to Servo OFF. The ways to stop are controlled by Object 605Bh respectively.

(6-3) Pause

Under random mode, it is possible to execute pause function on JSDG2(S)-E. The command can be given by Halt of Object 6040h. Pause method of JSDG2(S)-E servo driver can be modified by item 605Dh.

(6-4) Diagnostic message

When error occurs to JSDG2(S)-E servo driver during EtherCAT communication, JSDG2(S)-E servo driver will store error information in Object 603Fh. The user can acquire error information from this object.

(6-5) Error code

CiA402 error code can be read from Object 603Fh; the user can check the cause by the following list and process troubleshooting.

Error Alarm Comparison Table:				
Error Alarm Number	**Alarm clearing**	**Error Alarm Description**	**603F$_h$ Error Code**	**3001$_h$ Error Code**
0	-	No alarm currently	0x0000	0x0000
1	Signal reset	Low power voltage	0x3220	0x0001
2	Signal reset	High power voltage Regeneration error	0x3210	0x0002
3	Signal reset	Motor Overload	0x3230	0x0003
4	Power Re-set	Driver Overcurrent	0x2310	0x0004
5	Power Re-set	EncoderA/B/Z phase signal error	0x7305	0x0005
6	Power Re-set	Encoder U/V/W phase signal error	0x7305	0x0006
7	Power Re-set	Multifunction terminal planning error	0x5441	0x0007
8	Power Re-set	Parameter data write-in error	0x5500	0x0008
9	Signal reset	Emergency Stop	0x5442	0x0009
10	Signal reset	Absolute encoder battery error	0x7305	0x0010
11	Signal reset	Excessive position error	0x8611	0x0011
12	Signal reset	Motor over speed	0x8400	0x0012
13	Power Re-set	Incorrect parameter setting	0x6320	0x0013
14	Signal reset	Rotation inhibit error	0x5443	0x0014
15	Signal reset	Drive overheat	0x4210	0x0015
16	Signal reset	Absolute type encoder number of revolution error (Absolute encoder battery error)	0x7305	0x0016
17~20	-	Reserved	-	-
21	Power Re-set	Communication type internal Encoder Error	0x7305	0x0021
22	Signal reset	Excessive Error between motor and load (Excessive pulse error at motor and load end)	0x8611	0x0022
23~28	-	Reserved	-	-
29	Signal reset	CANopen/EtherCAT communication Disconnected	0xFF00	0x0029

Error Alarm Comparison Table:				
Error Alarm Number	**Alarm clearing**	**Error Alarm Description**	**603F$_h$ Error Code**	**3001$_h$ Error Code**
30	Signal reset	Modbus communication error	0x7510	0x0030
31	-	Reserved	-	-
32	Signal reset	Linear Motor Magnetic Pole Alignment Error The wrong contraposition of linear motor	0xFF03	0x0032
33	Signal reset	FPGA error	0x5220	0x0033
34	Signal reset	Divided frequency high	0x5444	0x0034
35	Signal reset	Auto tuning error	0x6100	0x0035
36	Signal reset	Linear Motor Alignment not Completed The contraposition of linear motor is not ready	0xFF01	0x0036

8-3-6-14 Restoration

When JSDG2(S)-E servo driver generates errors, it is possible to acquire CiA402 error code from Object 603Fh. Based on this error code, the user can check the list to identify the correspo nding error alarm code and alarm clearing method.

Signal reset can give Fault Reset command (80h) to Object 6040h; for power reset, please reboot JSDG2(S)-E servo driver.

8-3-7 EtherCAT Object List

(1) Object structure

JSDG2(S)-E servo driver uses CAN application protocol over EtherCAT (CoE) object as the basis and defines all objects to 6 blocks by type.

Object address	Block name	Description
0000h~0FFFh	Data-type block	Define the used data type
1000h~1FFFh	CoE communication information block	Define the communication information that can be used or referred to
2000h~4FFFh	User self-defined 1 block	TECO self-defined object (open for user)
5000h~5FFFh	User self-defined 2 block	TECO self-defined object (not open for user)
6000h~9FFFh	CiA402 agreement object block	Object in CiA402 agreement
A000h~FFFFh	Reserved block	Reserved for future extension

(2) Object type

Object types used in JSDG2(S)-E servo driver are listed as follows. All CANopen/EtherCAT communication related data types in this document are based on this list.

Object type	Range
NULL	Object does not have a definition data column
VARIABLE	Object can enter one data value
ARRAY	Can include multiple subobjects. Subobjects have the same data type. (Subobject 0 does not contain)
RECORD	Can include multiple subobjects. Subobjects can contain different data types. (Subobject 0 does not contain)

(3) Access type

Object access types used in JSDG2(S)-E servo driver are listed as follows. All CANopen/EtherCAT communication related data types in this document are based on this list.

Access type	Range
RW	Object can read & write-in
WO	Object can only write-in
RO	Object can only read
CONST	Read only and the value is a constant

(4) Data type

Object data types used in JSDG2(S)-E servo driver are listed as follows. All CANopen/EtherCAT communication related data types in this document are based on this list

Data type	Code	Size	Range
Boolean	BOOL	1bit	1 or 0
Unsigned 8	USINT	1byte	0~255
Unsigned 16	UINT	2bytes	0~65,535
Unsigned 32	UDSINT	4bytes	0~4,294,967,295
Integer 8	SINT	1byte	-128~127
Integer 16	INT	2bytes	-32,768~32,767
Integer 32	DINT	4bytes	-2,147,483,648~2,147,483,647
String	STRING	-	-

(5)Application objects

The following is the list of all objects supported by the servo driver:

(1) Object 603Fh:Error code

INDEX	$603F_h$
Name	Error code
Object Code	VAR
Data Type	UNSIGNED 16
Access	RO
PDO Mapping	Yes
Value Range	UNSIGNED 16
Default Value	0

(2) Object 6040h:Control word

INDEX	6040_h
Name	Control word
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 16
Default Value	0

Bit definition:

15~11	10~9	8	7	6~4	3	2	1	0
Manufacturer specific	N/A	halt	Fault Reset	Operation Mode specific	Enable operation	Quick Stop	Enable voltage	Switch on

(3) Object 6041h:Statusword

INDEX	6041_h
Name	Status word
Object Code	VAR
Data Type	UNSIGNED 16
Access	RO
PDO Mapping	Yes
Value Range	UNSIGNED 16

Bit	Description	Support
0	Ready to switch on	O
1	Switch on	O
2	Operation enabled	O
3	Fault	O
4	Voltage enabled	O
5	Quick stop	O
6	Switch on disable	O
7	Warning	X
8	Manufacturer specific	X
9	Remote	O
10	Target reached	X
11	Internal limit active	X
12 - 13	Operation mode specific	O
14 - 15	Manufacturer specific	X

(4) Object 605Bh: Shutdown option code

INDEX	605Bh
Name	Shutdown option code
Object Code	VAR
Data Type	INTEGER 16
Access	RW
PDO Mapping	No
Value Range	0: Disable drive, motor is free to rotate 1: Slow down on slow down ramp
Default Value	0

(5) Object 605Ch: Disable option option code

INDEX	$605C_h$
Name	Disable option option code
Object Code	VAR
Data Type	INTEGER 16
Access	RW
PDO Mapping	No
Value Range	0: Disable drive, motor is free to rotate 1: Slow down on slow down ramp
Default Value	1

(6) Object 605Dh: Halt option code

INDEX	$605D_h$
Name	Halt option code
Object Code	VAR
Data Type	INTEGER 16
Access	RW
PDO Mapping	No
Value Range	1: Slow down on slow down ramp 2: Slow down on quick stop ramp
Default Value	1

(7) Object 6060h: Modes of operation

INDEX	6060_h
Name	Modes of operation
Object Code	VAR
Data Type	INTEGER 8
Access	RW
PDO Mapping	Yes
Value Range	0: No mode used 1: Position Mode 3: Velocity Mode 4: Profile torque mode 6: Homing Mode 7: Interpolated position mode (do not support) 8: Cyclic synchronous position mode (CANopen does not support) 9: Cyclic synchronous velocity mode (CANopen does not support) A: Cyclic synchronous Torque mode (CANopen does not support)
Default Value	8

(8) Object 6061h: Modes of operation display

INDEX	6061_h
Name	Modes of operation display
Object Code	VAR
Data Type	INTEGER 8
Access	RO
PDO Mapping	Yes
Value Range	0: No mode used 1: Position Mode 3: Velocity Mode 4: Profile torque mode 6: Homing Mode 7: Interpolated position mode (do not support) 8: Cyclic synchronous position mode (CANopen does not support) 9: Cyclic synchronous velocity mode (CANopen does not support) A: Cyclic synchronous Torque mode (CANopen does not support)
Default Value	0

(9) Object 6062h: Position demand value

INDEX	6062_h
Name	Position Demand value
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(10) Object 6063h: Position actual internal value

INDEX	6063_h
Name	Position actual internal value
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Inc.

(11) Object 6064h: Position actual value

INDEX	6064_h
Name	Position actual value
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(12) Object 6065h: Position error window

INDEX	6065_h
Name	Position error window
Object Code	VAR
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 32
Default Value	26214
Comment	Unit: Pos. Unit

(13) Object 6066h: Following error time out

INDEX	6066_h
Name	Following error time out
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 16
Default Value	10
Comment	Unit: millisecond

(14) Object 6067h: Position window

INDEX	6067_h
Name	Position window
Object Code	VAR
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 32
Default Value	30
Comment	Unit: Pos. Unit

(15) Object 6068h: Position window time

INDEX	6068_h
Name	Position window time
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 16
Default Value	0
Comment	Unit: millisecond

(16) Object 606Bh: Velocity demand value

INDEX	$606B_h$
Name	Velocity demand value
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Vel. Unit

(17) Object 606Ch: Velocity actual value

INDEX	$606C_h$
Name	Velocity actual value
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Vel. Unit

(18) Object 606Dh: Velocity window

INDEX	$606D_h$
Name	Velocity window
Object Code	VAR
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	0
Comment	Unit: Vel. Unit

(19) Object 606Eh: Velocity window time

INDEX	$606E_h$
Name	Velocity window time
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 16
Default Value	0
Comment	Unit: millisecond

(20) Object 606Fh: Velocity threshold

INDEX	$606F_h$
Name	Velocity threshold
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 16
Default Value	100
Comment	Unit: Vel. Unit

(21) Object 6070h: Velocity threshold time

INDEX	6070_h
Name	Velocity threshold time
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 16
Default Value	0
Comment	Unit: millisecond

(22) Object 6071h: Target torque

INDEX	6071_h
Name	Target torque
Object Code	VAR
Data Type	INTEGER 16
Access	RW
PDO Mapping	Yes
Value Range	INTEGER 16
Default Value	0
Comment	Unit: 0.1%

(23) Object 6074h: Target demand value

INDEX	6074_h
Name	Target demand value
Object Code	VAR
Data Type	INTEGER 16
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 16
Default Value	0
Comment	Unit: 0.1%

(24) Object 6077_h: Torque actual value

INDEX	6077_h
Name	Torque actual value
Object Code	VAR
Data Type	INTEGER 16
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 16
Default Value	0
Comment	Unit: 0.1%

(25) Object 6078h: Current actual value

INDEX	6078_h
Name	Current actual value
Object Code	VAR
Data Type	INTEGER 16
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 16
Default Value	0
Comment	Unit: Per thousand of rated current

(26) Object 607Ah: Target position

INDEX	$607A_h$
Name	Target position
Object Code	VAR
Data Type	INTEGER 32
Access	RW
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(27) Object 607Fh: Max Profile velocity

INDEX	$607F_h$
Name	Max Profile velocity
Object Code	VAR
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 32
Default Value	13107200
Comment	Unit: Vel. Unit

(28) Object 6081h: Profile velocity

INDEX	6081_h
Name	Profile velocity
Object Code	VAR
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 32
Default Value	0
Comment	Unit: Vel. Unit

(29) Object 6083h: Profile acceleration

INDEX	6083_h
Name	Profile acceleration
Object Code	VAR
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 32
Default Value	1000
Comment	Unit: Acc. Unit

(30) Object 6084h: Profile deceleration

INDEX	6084_h
Name	Profile deceleration
Object Code	VAR
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 32
Default Value	1000
Comment	Unit: Acc. Unit

(31) Object 6085h: Quick stop deceleration

INDEX	6085_h
Name	Quick stop deceleration
Object Code	VAR
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	Yes
ValueRange	UNSIGNED 32
Default Value	0
Comment	Unit: Acc. Unit

(32) Object 6093h: Position factor

INDEX	6093_h
Name	Position factor
Object Code	ARRAY
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 32

Sub-Index	0
Description	Number of entries
Data Type	UNSIGNED 8
Access	RO
PDO Mapping	No
ValueRange	2
Default Value	2

Sub-Index	1
Description	Numerator
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
ValueRange	UNSIGNED 32
Default Value	1
Parameter No.	En701

Sub-Index	2
Description	Feed constant
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
ValueRange	UNSIGNED 32
Default Value	1
Parameter No.	En702

(33) Object 6095$_h$: Velocity factor

INDEX	6095$_h$
Name	Velocity factor
Object Code	ARRAY
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 32

Sub-Index	0
Description	Number of entries
Data Type	UNSIGNED 8
Access	RO
PDO Mapping	No
ValueRange	2
Default Value	2

Sub-Index	1
Description	Numerator
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
ValueRange	UNSIGNED 32
Default Value	1
Parameter No.	En703

Sub-Index	2
Description	Feed constant
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
ValueRange	UNSIGNED 32
Default Value	1
Parameter No.	En704

(34) Object 6097$_h$: Position factor

INDEX	6097$_h$
Name	Acceleration factor
Object Code	ARRAY
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 32
Sub-Index	0
Description	Number of entries

Data Type	UNSIGNED 8
Access	RO
PDO Mapping	No
ValueRange	2
Default Value	2

Sub-Index	1
Description	Numerator
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
ValueRange	UNSIGNED 32
Default Value	1
Parameter No.	En705

Sub-Index	2
Description	Feed constant
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
ValueRange	UNSIGNED 32
Default Value	1
Parameter No.	En706

(35) Object 6098_h: Homing method

INDEX	6098_h
Name	Homing method
Object Code	VAR
Data Type	INTEGER 8
Access	RW
PDO Mapping	YES
Value Range	0~35
Default Value	1

(36) Object 6099_h: Homing speeds

INDEX	6099_h
Name	Homing speeds
Object Code	ARRAY
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	Yes

Sub-Index	0
Description	Number of entries
Data Type	UNSIGNED 8
Access	RO
PDO Mapping	No
Value Range	2
Default Value	2

Sub-Index	1
Description	Speed during search for switch
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	YES
Value Range	UNSIGNED 32
Default Value	50000
Comment	Unit: Vel. Unit

Sub-Index	2
Description	Speed during search for zero
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	YES
Value Range	UNSIGNED 32
Default Value	50000
Comment	Unit: Vel. Unit

(37) Object $60B0_h$: Position offset

INDEX	$60B0_h$
Name	Position offset
Object Code	VAR
Data Type	INTEGER 32
Access	RW
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0

(38) Object $60B1_h$: Velocity offset

INDEX	$60B1_h$
Name	Velocity offset
Object Code	VAR
Data Type	INTEGER 32
Access	RW
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Vel. Unit

(39) Object $60B2_h$: Torque offset

INDEX	$60B2_h$
Name	Torque offset
Object Code	VAR
Data Type	INTEGER 8
Access	RW
PDO Mapping	Yes
Value Range	INTEGER 8
Default Value	0
Comment	Unit: 0.1%

(40) Object 60B8h: Touch probe function

INDEX	$60B8_h$
Name	Touch probe function
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 16
Default Value	0

(41) Object 60B9h: Touch probe state

INDEX	$60B9_h$
Name	Touch probe state
Object Code	VAR
Data Type	UNSIGNED 16
Access	RO
PDO Mapping	Yes
Value Range	UNSIGNED 16
Default Value	0

(42) Object $60BA_h$: Touch probe1 positive edge position stored

INDEX	$60BA_h$
Name	Touch probe1 positive edge position stored
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(43) Object 60BBh: Touch probe1 negative edge position stored

INDEX	$60BB_h$
Name	Touch probe1 negative edge position stored
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(44) Object 60BCh: Touch probe1 positive edge position stored

INDEX	$60BC_h$
Name	Touch probe1 positive edge position stored
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(45) Object 60BDh: Touch probe1 negative edge position stored

INDEX	$60BD_h$
Name	Touch probe1 negative edge position stored
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(46) Object 60E0h: Positive torque limit value

INDEX	$60E0_h$
Name	Positive torque limit value
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 16
Default Value	3000
Comment	Unit: 0.1%

(47) Object 60E1h: Negative torque limit value

INDEX	$60E1_h$
Name	Negative torque limit value
Object Code	VAR
Data Type	UNSIGNED 16
Access	RW
PDO Mapping	Yes
Value Range	UNSIGNED 16
Default Value	3000
Comment	Unit: 0.1%

(48) Object 60F4h: Following error actual value

INDEX	$60F4_h$
Name	Following error actual value
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Pos. Unit

(49) Object 60FCh: Profile demand internal value

INDEX	$60FC_h$
Name	Profile demand internal value
Object Code	VAR
Data Type	INTEGER 32
Access	RO
PDO Mapping	Yes
Value Range	INTEGER 32
Default Value	0
Comment	Unit: Inc.

(50) Object 60FDh: Digital input

INDEX	$60FD_h$
Name	Digital input
Object Code	VAR
Data Type	UNSIGNED32
Access	RO
PDO Mapping	NO
Value Range	UNSIGNED 32

(51) Object 60FEh: Digital output

INDEX	$60FE_h$
Name	Digital output
Object Code	ARRAY
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	Yes

Sub-Index	0
Description	Number of entries
Data Type	UNSIGNED 8
Access	RO
PDO Mapping	No
Value Range	2
Default Value	2

Sub-Index	1
Description	Physical Output
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	YES
Value Range	UNSIGNED 32
Default Value	0

Sub-Index	2
Description	Bit Mask
Data Type	UNSIGNED 32
Access	RW
PDO Mapping	No
Value Range	UNSIGNED 32
Default Value	0xFFFF0000

(52) Object 60FFh: Target Velocity

INDEX	$60FF_h$
Name	Target Velocity
Object Code	VAR
Data Type	INTEGER32
Access	RW
PDO Mapping	Yes
Value Range	INTEGER32
Default Value	0
Comment	Unit: Vel. Unit

(53) Object 6502h: Supported drive modes

INDEX	6502_h
Name	Supported drive modes
Object Code	VAR
Data Type	UNSIGNED 32
Access	RO
PDO Mapping	No
Value Range	UNSIGNED 32
Default Value	0x03A5

(54) Object 2F00h: Encoder Resolution

INDEX	$2F00_h$
Name	Supported drive modes
Object Code	VAR
Data Type	UNSIGNED 32
Access	RO
PDO Mapping	No
Value Range	UNSIGNED 32

(55) Object 2F01h: DC cycle time

INDEX	$2F01_h$
Name	Supported drive modes
Object Code	VAR
Data Type	UNSIGNED 32
Access	RO
PDO Mapping	No
Value Range	UNSIGNED 32
Comment	Unit: 1 nanosecond

(6) Object list

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
1000h	0	Device type	UDINT	RO	No	No	0x00020192	-	-	-	-
1008h	0	Device name	STRING	RO	No	No	TECO-JSDG2	-	-	-	-
1009h	0	Hardware version	STRING	RO	No	No	1.0	-	-	-	-
100Ah	0	Software version	STRING	RO	No	No	-	-	-	-	-
1018h	Identity Object										
	0	Number of entries	USINT	RO	No	No	4	-	-	-	-
	1	Vendor ID	UDINT	RO	No	No	0x81B	-	-	-	-
	2	Product code	UDINT	RO	No	No	0x47322D45	-	-	-	-
	3	Revision	UDINT	RO	No	No	0x00010000	-	-	-	-
	4	Serial number	UDINT	RO	No	No	0x00000000	-	-	-	-
1600h	1st Receive PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	4	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60400010	0	0xFFFFFFFF	-	-
	2	Mapping entry 2	UDINT	RW	No	No	0x607A0020	0	0xFFFFFFFF	-	-
	3	Mapping entry 3	UDINT	RW	No	No	0x60FF0020	0	0xFFFFFFFF	-	-
	4	Mapping entry 4	UDINT	RW	No	No	0x60600008	0	0xFFFFFFFF	-	-
	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1601h	2nd Receive PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	2	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60400010	0	0xFFFFFFFF	-	-
1601h	2	Mapping entry 2	UDINT	RW	No	No	0x60600008	0	0xFFFFFFFF	-	-

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
	3	Mapping entry 3	UDINT	RW	No	No	0x607A0020	0	0xFFFFFFFF	-	-
	4	Mapping entry 4	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
0x1602h	3rd Receive PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	2	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60400010	0	0xFFFFFFFF	-	-
	2	Mapping entry 2	UDINT	RW	No	No	0x60600008	0	0xFFFFFFFF	-	-
	3	Mapping entry 3	UDINT	RW	No	No	0x60FF0020	0	0xFFFFFFFF	-	-
	4	Mapping entry 4	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1603h	4th Receive PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	2	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60400010	0	0xFFFFFFFF	-	-
	2	Mapping entry 2	UDINT	RW	No	No	0x60600008	0	0xFFFFFFFF	-	-
	3	Mapping entry 3	UDINT	RW	No	No	0x60710010	0	0xFFFFFFFF	-	-
	4	Mapping entry 4	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
1603h	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1A00h	1st Transmit PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	4	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60410010	0	0xFFFFFFFF	-	-
	2	Mapping entry 2	UDINT	RW	No	No	0x60640020	0	0xFFFFFFFF	-	-
	3	Mapping entry 3	UDINT	RW	No	No	0x606C0020	0	0xFFFFFFFF	-	-
	4	Mapping entry 4	UDINT	RW	No	No	0x60610008	0	0xFFFFFFFF	-	-
	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1A01h	2nd Transmit PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	2	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60410010	0	0xFFFFFFFF	-	-
	2	Mapping entry 2	UDINT	RW	No	No	0x60640020	0	0xFFFFFFFF	-	-
	3	Mapping entry 3	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	4	Mapping entry 4	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
d	3rd Transmit PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	2	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60410010	0	0xFFFFFFFF	-	-
	2	Mapping entry 2	UDINT	RW	No	No	0x60640020	0	0xFFFFFFFF	-	-

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
1603h	3	Mapping entry 3	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1603h	4	Mapping entry 4	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1603h	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1603h	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1603h	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1603h	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1A03h	4th Transmit PDO Mapping										
	0	Number of objects in this PDO	USINT	RW	No	No	2	0	8	-	-
	1	Mapping entry 1	UDINT	RW	No	No	0x60410010	0	0xFFFFFFFF	-	-
	2	Mapping entry 2	UDINT	RW	No	No	0x60640020	0	0xFFFFFFFF	-	-
	3	Mapping entry 3	UDINT	RW	No	No	0x60770010	0	0xFFFFFFFF	-	-
	4	Mapping entry 4	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	5	Mapping entry 5	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	6	Mapping entry 6	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	7	Mapping entry 7	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
	8	Mapping entry 8	UDINT	RW	No	No	0x0	0	0xFFFFFFFF	-	-
1C12h	RxPDO assign										
	0	Number of assigned PDOs	USINT	RW	No	No	1	0	1	-	-
	1	Index of assigned RxPDO1	UINT	RW	No	No	0x1601	0x1600	0x1603	-	-
1C13h	TxPDO assign										
	0	Number of assigned PDOs	USINT	RW	No	No	1	0	1	-	-
	1	Index of assigned TxPDO1	UINT	RW	No	No	0x1A01	0x1A00	0x1A03	-	-
1C32h	SM output parameter										
	0	Number of entries	USINT	RO	No	No	6	-	-	-	-
	1	Synchronization Type	UINT	RW	No	No	-	-	-	-	-

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
	2	Cycle Time	UDINT	RO	No	No	0x003D0900	-	-	-	-
	4	Synchronization Type supported	UINT	RO	No	No	0x0005	-	-	-	-
1C32h	5	Minimum Cycle Time	UDINT	RO	No	No	0x000186A0	-	-	-	-
	6	Calc and Copy Time	UDINT	RO	No	No	0x000186A1	-	-	-	-
	8	Get Cycle Time	UINT	RO	No	No	0x8480	-	-	-	-
1C33h	SM input parameter										
	0	Number of entries	USINT	RO	No	No	6	-	-	-	-
	1	Synchronization Type	UINT	RW	No	No	-	-	-	-	-
	2	Cycle Time	UDINT	RO	No	No	0x003D0900	-	-	-	-
	4	Synchronization Type supported	UINT	RO	No	No	0x0005	-	-	-	-
	5	Minimum Cycle Time	UDINT	RO	No	No	0x000186A0	-	-	-	-
	6	Calc and Copy Time	UDINT	RO	No	No	0x000186A1	-	-	-	-
	8	Get Cycle Time	UINT	RO	No	No	0x8480	-	-	-	-
603Fh	0	Error Code	UINT	RO	YES	No	0	-	-	-	-
6040h	0	Control Word	UINT	RW	YES	No	0	0	0xFFFF	-	-
6041h	0	Status Word	UINT	RO	YES	No	0	-	-	-	-
605Bh	0	Shutdown Option Code	INT	RW	No	No	0	0	1	-	-
605Ch	0	Disable Operation Option Code	INT	RW	No	No	1	0	1	-	-
605Dh	0	Halt Option Code	INT	RW	No	No	1	1	2	-	-
6060h	0	Modes of Operation	SINT	RW	YES	No	8	0	10	-	-
6061h	0	Mode of Operation Display	SINT	RO	YES	No	0	-	-	-	-
6062h	0	Position Demand Value	DINT	RO	YES	No	0	-	-	Pos. Unit	-
6063h	0	Position Actual Internal Value	DINT	RO	YES	No	0	-	-	Inc.	-
6064h	0	Position Actual Value	DINT	RO	YES	No	0	-	-	Pos. Unit	-
6065h	0	Following Error Window	UDINT	RW	No	No	26214	0	1073741823	Pos. Unit	-

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
6066h	0	Following Error Time Out	UINT	RW	No	No	10	0	65535	ms	-
6067h	0	Position Window	UDINT	RW	No	No	30	0	1073741823	Pos. Unit	-
6068h	0	Position Window Time	UINT	RW	No	No	0	0	65535	ms	-
606Bh	0	Velocity Demand Value	DINT	RO	YES	No	0	-	-	Vel. Unit	-
606Ch	0	Velocity Actual Value	DINT	RO	YES	No	0	-	-	Vel. Unit	-
606Dh	0	Velocity Window	UINT	RW	No	No	0	0	65535	Vel. Unit	-
606Eh	0	Velocity Window Time	UINT	RW	No	No	0	0	65535	ms	-
606Fh	0	Velocity Threshold	UINT	RW	No	No	100	0	65535	Vel. Unit	-
6070h	0	Velocity Threshold Time	UINT	RW	No	No	0	0	65535	ms	-
6071h	0	Target Torque	INT	RW	YES	No	0	–32768	32767	0.1%	-
6074h	0	Torque Demand Value	INT	RO	YES	No	0	-	-	0.1%	-
6077h	0	Torque Actual Value	INT	RO	YES	No	0	-	-	0.1%	-
6078h	0	Current actual value	INT	RO	YES	No	0	-	-	Per thousand of rated current	-
607Ah	0	Target Position	DINT	RW	YES	No	0	-2147483648	2147483647	Pos. Unit	-
607Fh	0	Max Profile Velocity	UDINT	RW	YES	No	13107200	0	4294967295	Vel. Unit	
6081h	0	Profile Velocity	UDINT	RW	YES	No	0	0	4294967295	Vel. Unit	-
6083h	0	Profile Acceleration	UDINT	RW	YES	No	1000	0	4294967295	Acc. Unit	-
6084h	0	Profile Deceleration	UDINT	RW	YES	No	1000	0	4294967295	Acc. Unit	-
6085h	0	Quick Stop Declaration	UDINT	RW	YES	No	0	0	4294967295	Acc. Unit	-
6093h	Position factor										
	0	Number of entries	USINT	RO	No	No	2	-	-	-	-
	1	Numerator	UDINT	RW	No	YES	1	1	1073741823	-	En701
	2	Feed_constant	UDINT	RW	No	YES	1	1	1073741823	-	En702
0x6095h	Velocity factor										

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
	0	Number of entries	USINT	RO	No	No	2	-	-	-	-
	1	Numerator	UDINT	RW	No	YES	1	1	1073741823	-	En703
	2	Divisor	UDINT	RW	No	YES	1	1	1073741823	-	En704
6097h	Acceleration factor										
	0	Number of entries	USINT	RO	No	No	2	-	-	-	-
	1	Numerator	UDINT	RW	No	YES	1	1	1073741823	-	En705
	2	Divisor	UDINT	RW	No	YES	1	1	1073741823	-	En706
6098h	0	Homing Method	SINT	RW	YES	No	1	0	35	-	-
6099h	Homing Speed										
	0	Number of entries	USINT	RO	No	No	2	-	-	-	-
	1	Speed during search for switch	UDINT	RW	YES	No	50000	0	4294967295	Vel. Unit	-
	2	Speed during search for zero	UDINT	RW	YES	No	50000	0	4294967295	Vel. Unit	-
60B0h	0	Position Offset	DINT	RW	YES	No	0	-2147483648	2147483647	-	-
60B1h	0	Velocity Offset	DINT	RW	YES	No	0	-2147483648	2147483647	Vel. Unit	-
60B2h	0	Torque Offset	INT	RW	YES	No	0	–32768	32767	0.1%	-
60B8h	0	Touch probe function	UINT	RW	YES	No	0	0	0xFFFF	-	-
60B9h	0	Touch probe state	UINT	RO	YES	No	0	-	-	-	-
60BAh	0	Touch probe1 positive edge position stored	DINT	RO	YES	No	0	-	-	Pos. Unit	-
60BBh	0	Touch probe1 negative edge position stored	DINT	RO	YES	No	0	-	-	Pos. Unit	-
60BCh	0	Touch probe1 positive edge position stored	DINT	RO	YES	No	0	-	-	Pos. Unit	-
60BDh	0	Touch probe1 negative edge position stored	DINT	RO	YES	No	0	-	-	Pos. Unit	-
60E0h	0	Positive Torque Limit Value	UINT	RW	YES	No	3000	0	65,535	0.1%	
60E1h	0	Negative Torque Limit Value	UINT	RW	YES	No	3000	0	65,535	0.1%	

Index	Subindex	Name	Data Type	Access	PDO Mapping	Saving to EEPROM	Default Value	Lower Limit	Upper Limit	Unit	Parameter No.
60F4h	0	Following Error Actual Value	DINT	RO	YES	No	0	-	-	Pos. Unit	-
60FCh	0	Position Demand Internal Value	DINT	RO	YES	No	0	-	-	Inc.	-
60FDh	0	Digital Input	UDINT	RO	YES	No	0	-	-	-	-
60FEh	Digital Output										
	0	Number of entries	USINT	RO	No	No	2	-	-	-	-
	1	Physical Output	UDINT	RW	YES	No	0	0	0xFFFFFFFF	-	-
	2	Bit Mask	UDINT	RW	No	No	0xFFFF0000	0	0xFFFFFFFF	-	-
60FFh	0	Target Velocity	DINT	RW	YES	No	0	–2147483648	2147483647	Vel. Unit	-
6502h	0	Supported Drive Modes	UDINT	RO	No	No	0x03A5	-	-	-	-
2F00h	0	Encoder Resolution	UDINT	RO	No	No	-	-	-	-	-
2F01h	0	DC Cycle Time	UDINT	RO	No	No	-	-	-	1ns	-

Chap 9 Error Alarm Clearing

9-1 Error List

Error Alarm Number	Error Alarm Description	CiA402 Error Code	Alarm Clearing Method	Alarm Code Output			
				A1	A2	A3	A4
AL000	No Alarm Currently	0x0000	—	Operate according to preset function when there's no error alarm			
AL001	Power Supply Voltage Too Low	0x3220-04-0001	Cn031.1	1	1	1	0
AL002	Power Supply Voltage Too High	0x3210-04-0002	Switch Reset	1	1	0	1
AL003	Motor Overload	0x3230-02-0003	Switch Reset	1	1	0	0
AL004	Driver Over Current	0x2310-02-0004	Power Re-set	1	0	1	1
AL005	Encoder Signal Error	0x7305-01-0005	Power Re-set	1	0	1	0
AL007	Multifunction Contact Planning Error	0x5441-01-0007	Power Re-set	1	0	0	0
AL008	Parameter Data Read/Write Error	0x5500-01-0008	Switch Reset	0	1	1	1
AL009	Emergency Stop	0x5442-01-0009	Cn002.3	0	1	1	0
AL010	Absolute Type Encoder Battery Warning	0x7305-01-0010	Switch Reset	0	1	0	1
AL011	Excessive Position Error	0x8611-01-0011	Switch Reset	0	1	0	0
AL012	Motor Over Speed	0x8400-01-0012	Switch Reset	0	0	1	1
AL013	Motor Model Number Error	0x6320-01-0013	Power Re-set	0	0	1	0
AL014	Drive Prohibit Error	0x5443-01-0014	Switch Reset	0	0	0	1
AL015	Driver Overheat	0x4210-08-0015	Switch Reset	0	0	0	0
AL016	Absolute Type Encoder Number of Revolution Error	0x7305-01-0016	Switch Reset	1	1	1	1
AL017	MCU Error 1	0x6100-80-0017	Power Re-set	X	X	X	X
AL018	MCU Error 2	0x6100-80-0018	Power Re-set	X	X	X	X
AL019	MCU Error 3	0x6100-80-0019	Power Re-set	X	X	X	X
AL020	Auto tune Motor Wire Disconnection Error	0xff03-80-0020	Power Re-set	X	X	X	X
AL021	Communication type Encoder Error	0x7305-01-0021	Power Re-set	X	X	X	X
AL022	Excessive Error between	0x8611-01-0022	Switch Reset	X	X	X	X

Error Alarm Number	Error Alarm Description	CiA402 Error Code	Alarm Clearing Method	Alarm Code Output			
				A1	A2	A3	A4
	motor and load						
AL023	E-Cam Function Error	0x6320-01-0023	Power Re-set	X	X	X	X
AL025	Driver Voltage Class Switching Error (200/400V)	0x6320-01-0025	Power Re-set	X	X	X	X
AL026	Full-closed Loop ABZ Phase Signal Error	0x7305-01-0026	Power Re-set	X	X	X	X
AL027	Synchronized Error	0x8611-01-0027	Switch Reset	X	X	X	X
AL028	Self-build Motor Parameter Error	0x5220-01-0028	Power Re-set	X	X	X	X
AL029	CANopen/EtherCAT communication Disconnected	0xff00-80-0029	Switch Reset	X	X	X	X
AL030	Modbus Communication Timeout Error	0x7510-01-0030	Switch Reset	X	X	X	X
AL032	Linear Motor Magnetic Pole Alignment Error	0xff03-80-0032	Switch Reset	X	X	X	X
AL033	Driver Chip Error	0x5220-01-0033	Power Re-set	X	X	X	X
AL034	Excessive Dividing Frequency	0x5444-01-0034	Switch Reset	X	X	X	X
AL035	Auto tuning Error	0x6100-01-0035	Switch Reset	X	X	X	X
AL036	Linear Motor Alignment not Completed	0xff01-01-0036	Switch Reset	X	X	X	X
AL037	Regenerative Error	0xff04-20-0037	Switch Reset	X	X	X	X
AL038	Start Up Circuit Error	0xff05-20-0038	Power Re-set	X	X	X	X
AL039	Full-closed Loop Encoder Matching Error	0x7305-80-0039	Power Re-set	X	X	X	X
AL040	Turret Mode is prohibited to use non-absolute type encoder	0x7305-80-0040	Power Re-set	X	X	X	X
AL041	Control Mode Selection Error	0x6320-80-0041	Power Re-set	X	X	X	X
AL042	Dividing Setting Error	0x6320-80-0042	Power Re-set	X	X	X	X
AL043	JOG Error	0xff04-80-0043	Power Re-set	X	X	X	X
AL044	Internal Position S Curve Setting Error	0x6320-80-0044	Switch Reset	X	X	X	X
AL045	Communication Type Encoder Model Error	0x7305-80-0045	Power Re-set	X	X	X	X
AL046	Encoder Feedback Value Error	0xff05-80-0046	Power Re-set	X	X	X	X

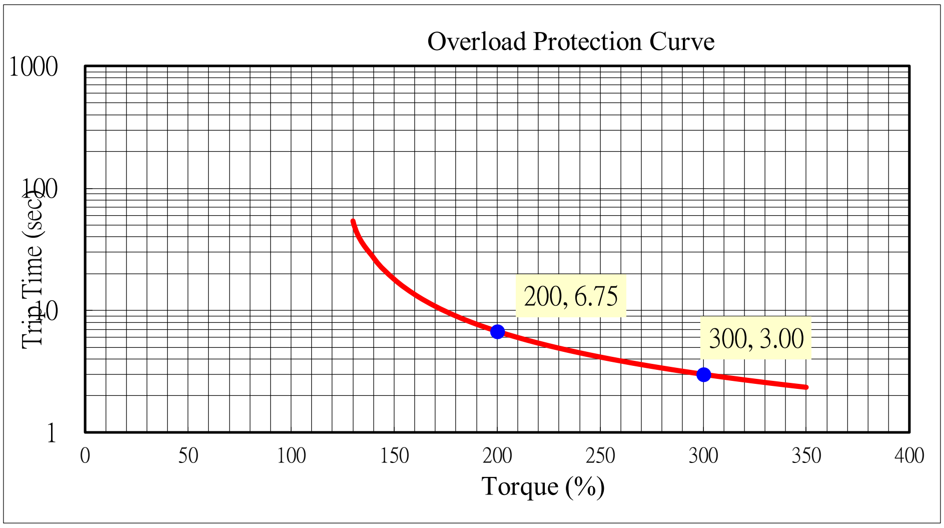
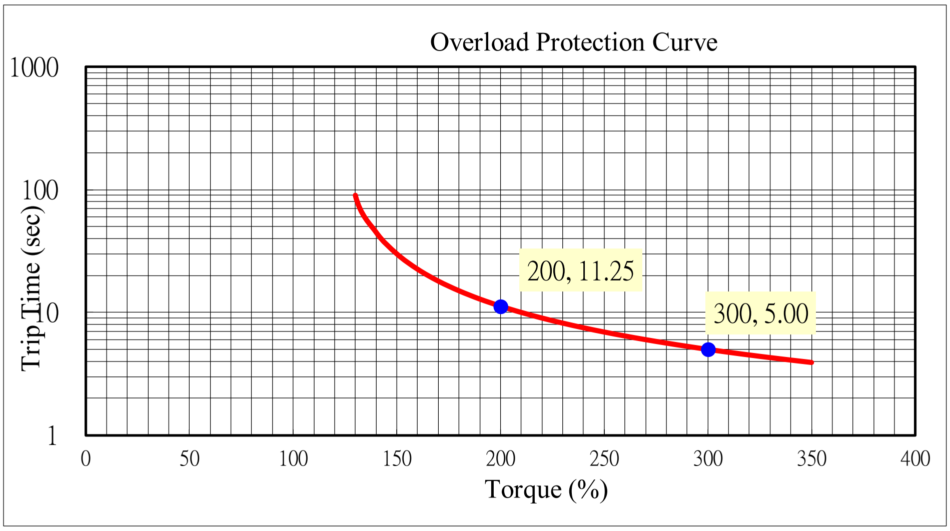
Error Alarm Number	Error Alarm Description	CiA402 Error Code	Alarm Clearing Method	Alarm Code Output			
				A1	A2	A3	A4
AL047	Turret Origin Return to Zero Error	0xff04-80-0047	Switch Reset	X	X	X	X
AL048	EtherCAT/CANopen Communication Mode Setting Error	0x6320-80-0048	Switch Reset	X	X	X	X
AL049	EtherCAT Synchronous Error	0xff00-80-0049	Switch Reset	X	X	X	X
AL050	Absolute Type Encoder Position Error	0x7305-80-0050	Power Re-set	X	X	X	X

(Note) X: No alarm code output function

9-2 Countermeasures to Clear Error

AL001	Power Supply Voltage Too Low	Cia402 Error Code	0x3220-04-0001
Alarm Cause	Primary circuit input power voltage is smaller than the setting value of Cn051 (low voltage protection level) and exceeds the time of Cn052 (low voltage protection alarm delay time). ※ Input voltage of 200V driver is smaller than 170V and the one of 400 driver is smaller than 340V. Generate alarm directly without counting time. 1. Primary circuit input voltage lower than specification; input power error; no primary circuit input power. 2. Sudden power outage occurs. 3. Power voltage decreases under operation. 4. Driver hardware failure.		
Check and Handling	1. Use an Electric Meter to measure the external power supply voltage and verify that the input voltage meets the specifications. Monitor if the voltage of Un-10 primary circuit (VDC Bus) is correct; if external input correct is correct ((AC 220/380V)) and Un-10 value too low (far lower than DC 310/620V), it could be the failure of driver internal component. 2. When the external power is comparatively unstable, users can adjust Cn051 & Cn052 to improve. 3. When power voltage decreases under operation, please make sure the input power can offer stable power constantly. 4. Pleasesend the device back to the distributor or manufacturer for overhaul.		
Alarm Clearing Method	According to Parameter Cn031.1 Low Voltage Protection (AL001) Automatic Reset Selection		

AL002	Power Supply Voltage Too High	Cia402 Error Code	0x3210-04-0002
Alarm Cause	VDC Bus power voltage higher than DC 410/820V (based on driver voltage class 200/400V). 1. Primary circuit input voltage over specification; primary circuit power input error. 2. Unstable power or effected by factors such as lightning. 3. Error occurs under operation conditions; acceleration/deceleration executed by the device is over spec. 4. Error occurs under operation conditions; the used regenerative resistance cannot meet operation conditions. 5. Driver hardware failure.		
Check and Handling	1. Use power meter to measure external power voltage and confirm if the input voltage is qualified. Please apply correct voltage source or connect voltage stabilizer serially when monitoring Un-10 primary circuit (VDC Bus) voltage exceeds DC 410/820V continuously. 2. Improve power status; reboot servo driver after devices like surge suppressor is installed. If the alarm still occurs, it may indicate the servo driver fail to work correctly. Replace the Servo Driver. 3. Extend the Acceleration / Deceleration Time or reduce the Load Inertia within the permitted range. 4. Review the regenerative resistance by considering operation condition and load and set Cn012 (external regenerative resistor power setting) correctly. 5. Pleasesend the device back to the distributor or manufacturer for overhaul.		
Alarm Clearing Method	Switch Reset		

AL003	Motor Overload	Cia402 Error Code	0x3230-02-0003
Alarm Cause	If continuing to use the Driver more than the Rated Load, this Error Alarm will be generated, please refer to the Overload Protection Curve. Overload Protection Curve under 1kW  Overload Protection Curve over 1kW  1. Incorrect wiring of motor and encoder. 2. Poor parameter setting of control system. 3. Acceleration/deceleration setting time too short or load inertia too large. 4. Cn030 Setting error. 5. Not able to drive the motor because of mechanical factors and results in excessive load during operation. 6. Driver hardware failure.		
Check and Handling	1. Check if the Motor Terminal wiring (U, V, W) and Encoder wiring is correct; please wire in accordance with Chapter 2 Servo Driver Power and Peripheral Wiring Diagram. 2. Adjust the Driver Gain since improper Gain Adjustment will cause Motor resonance and result in excessive current to cause Motor Overload. 3. In operation program, Un-04 monitors the average torque (%) keeps above 100% continuously and extends acceleration/deceleration time or reduce load inertia within permitted range.		

	4. Please confirm if Cn030 is the correct motor/driver matching; please refer to "Servo driver and servo motor matching comparison table" for Cn030 motor code. 5. Improve mechanical factors. 6. Driver error; please send the device back to the distributor or manufacturer to overhaul. ※ This message usually occurs during operation. If the Error Alarm occurs within when short period time of operation, please check item No. 1.
Alarm Clearing Method	Switch Reset

AL004	Driver Over Current	Cia402 Error Code	0x2310-02-0004
Alarm Cause	The primary circuit current of the Driver exceeds the protection range, and results in Power Transistor generating Error Alarm directly. 1. Incorrect primary circuit or encoder wiring or bad connection. 2. Internal short circuit of the servo driver, servo motor or primary circuit wires. 3. Incorrect regenerative resistor wiring or bad connection. 4. Cn030 Setting error. 5. Control Parameter Setting Error. 6. Malfunction caused by the noise. 7. Power Transistor Error. 8. Driver hardware failure.		
Check and Handling	1. Check if the Motor Terminal wiring (U, V, W) and Encoder wiring is correct; please wire in accordance with Chapter 2 Servo Driver Power and Peripheral Wiring Diagram. 2. Check if the servo unit and servo motor as well as connection terminal U, V, W & FG are short-circuited. 3. Check if the regenerative resistor wiring is correct. 4. Please confirm if Cn030 is the correct motor/driver matching; please refer to "Servo driver and servo motor matching comparison table" for Cn030 motor code. 5. Execute countermeasures of anti-noise, such as install FG wiring correctly. 6. Driver error; please send the device back to the distributor or manufacturer to overhaul.		
Alarm Clearing Method	Power Re-set		

AL005	Encoder Signal Error	Cia402 Error Code	0x7305-01-0005
Alarm Cause	Motor Encoder malfunction or poor connection of Encoder power line. 1. Encoder damaged. 2. Encoder wire loose or damaged. 3. Encoder motor code Cn030 setting error. 4. Encoder signal acquisition error.		
Check and Handling	1. Please send the device back to the distributor or manufacturer for overhaul. 2. Check if the encoder wire is connected to the driver, short-circuited, cold-welded or falls out.		

	3. Please confirm if Cn030 is the correct motor/driver matching; please refer to "Servo driver and servo motor matching comparison table" for Cn030 motor code. 4. Check if motor grounding end is grounded correctly. If the encoder signal wire is separated from the power of the circuit with large current to avoid any generation of interferences source. If the encoder wire uses separation net.
Alarm Clearing Method	Power Re-set

AL007	Multifunction Contact Planning Error	Cia402 Error Code	0x5441-01-0007
Alarm Cause	Digital input/output contact function planning error. 1. Several functions of the set digital input contact (DI-1~DI-12) are duplicate but contact potential is asynchronous. 2. Several functions are duplicate in the set digital output contact function (DO-1~DO-4).		
Check and Handling	1. Check whether the Digital Input Contact Function Planning Parameters (Hn601~Hn612) are corrected: DI-1~DI-12 pin function can be repeated, but the pin action electrical potential of repeated function must be the same. 2. Check if output contact function parameter (Hn613~Hn616) planning is correct: DO-1~DO-4 pin function cannot be duplicate.		
Alarm Clearing Method	Power Re-set		

AL008	Parameter Data Read/Write Error	Cia402 Error Code	0x5500-01-0008
Alarm Cause	An Error occurred when Writing the Parameter. 1. Parameter data write-in error. 2. The set parameter value exceeds reasonable range when using specific functions. 3. Driver hardware failure.		
Check and Handling	1. Please rewrite new parameter value. 2. Pleaseconfirm the modified parameter valueis within reasonable range. 3. If the alarm still occurs after all connectors removed, parameters (Cn029=1) reset and rebooting, please replace the driver.		
Alarm Clearing Method	Switch Reset		

AL009	Emergency Stop	Cia402 Error Code	0x5442-01-0009
Alarm Cause	Digital input contact EMC (emergency stop) generates action. 1. Digital input contact EMC (emergency stop) activates. 2. Caused by the driver is interfered by the noise internally.		
Check and Handling	1. Disable digital input contact EMC action. 2. Please follow the motor and power standard wiring diagram & control signal standard wiring diagram in Chapter 2 to connect external power and signal wires.		
Alarm Clearing Method	Based on parameter Cn002.3 (EMC Return Mode Selection)		

AL010	Absolute Type Encoder Battery Warning	Cia402 Error Code	0x7305-01-0010
Alarm Cause	Battery module voltage under 2.75V (the driver can continue operating when this error alarm occurs).		
Check and Handling	Please replace the battery.		
Alarm Clearing Method	Switch Reset		

AL011	Excessive Position Error	Cia402 Error Code	0x8611-01-0011
Alarm Cause	The difference between the Pulse Command and the Encoder Feedback Pulse exceeds the setting of Pn308 or Pn309. 1. Position gain value (Pn310 & Pn311)and feed forward gain(Pn312)settings are too small. 2. Setting of maximum position error determined value (Pn308 & Pn309) is too small. 3. Torque limit too low. 4. Change of position input command is too serious. 5. Excessive external load. 6. Incorrect Motor Wiring (U, V, W). 7. Continue recording position command input quantity after drive prohibition occurs; excessive cumulative commands. Generate alarm when activated.		
Check and Handling	1. Increase the setting of Position Loop Gain (Pn310 & Pn311) and feed forward gain (Pn312) to speed up Motor Reaction Speed. 2. Increase the setting of Pn308 (position maximum position error determined value) and Pn309 (negative maximum position error determined value). 3. Adjust torque limit value correctly. 4. Extend acceleration/deceleration time within permitted range. 5. Decrease external load or re-evaluate motor capacity. 6. Check whether the Motor Wiring (U, V, W) is connected properly. 7. Set the correct Pn301.2 (Drive prohibits command receiving selection) .		
Alarm Clearing Method	Switch Reset		

AL012	Motor Over Speed	Cia402 Error Code	0x8400-01-0012
Alarm Cause	The detected motor speed exceeds 1.75 times of the rated speed. 1. Change of speed input command is too serious. 2. Improper setting of E-Cam ratio. 3. Improper setting of speed loop gain (Sn211 & Sn213). 4. Encoder signal is interfered.		
Check and Handling	1. Decrease the speed of input command or activate smoothing function. 2. Please confirm the setting related to E-Cam ratio. 3. Adjust the Speed Loop Gain (Sn211 and Sn213) appropriately to speed up the Motor Reaction Speed. 4. If motor grounding end is grounded correctly; if the encoder signal wire is separated from the power of the circuit with large current to avoid any generation of interferences source; if the encoder wire uses separation net.		
Alarm Clearing Method	Switch Reset		

AL013	Motor Model Number Error	Cia402 Error Code	0x6320-01-0013
Alarm Cause	Incorrect setting of motor model or automatic verification function error 1. The driver does not match the servo motor 2. Encoder motor code Cn030 setting error.		
Check and Handling	1. Please confirm if the driver matches the servo motor. 2. Please check Cn030 to confirm if motor model setting is correct; please refer to “Servo driver and servo motor matching comparison table” for Cn030 motor code.		
Alarm Clearing Method	Power Re-set		

AL014	Drive Prohibit Error	Cia402 Error Code	0x5443-01-0014
Alarm Cause	This error alarm occurs when digital input contact CCWL & CWL activate simultaneously. 1. Incorrect movement logic setting of digital input contact CCWL & CWL. 2. Caused by the driver is interfered by the noise internally.		
Check and Handling	1. Set Cn002.1 to clear digital input contact CCWL or CWL motion; or check if the movement logic of Hn601~Hn612 is correctly set. 2. Please follow the motor and power standard wiring diagram & control signal standard wiring diagram in Chapter 2 for wiring.		
Alarm Clearing Method	Switch Reset		

AL015	Driver Overheat	Cia402 Error Code	0x4210-08-0015
Alarm Cause	Detected the Power Transistor Temperature exceeded the Temperature Resistance of the Component. 1. Continuous use with excessive motor rated load. 2. Ambient temperature too high. 3. The installation director of the servo unit and its spacing between other servo units are not reasonable. 4. Driver fan stops operation.		
Check and Handling	1. Increase motor capacity or decrease load. 2. Decrease ambient temperature. 3. Follow installation standard of the servo unit to install. 4. Remove any foreign object that jams the fan; replace the fan when it cannot function correctly.		
Alarm Clearing Method	Switch Reset		

AL016	Absolute Type Encoder Number of Revolution Error	Cia402 Error Code	0x7305-01-0016
Alarm Cause	Absolute Type Encoder Number of Revolution Data Error. 1. Battery module is removed or battery error. 2. Replace the battery when the driver power is off.		
Check and Handling	1. Please check battery wiring and power. 2. After the battery is replaced, use Cn041=2 or digital input contact ALRS to clear the rotation number of the encoder.		
Alarm Clearing Method	Switch Reset		

AL017	MCU Error 1	Cia402 Error Code	0x6100-80-0017
Alarm Cause	System Operating Error Self Checking Error during System Operations.		
Check and Handling	Please contact Dealer or Manufacturer		
Alarm Clearing Method	Power Re-set		

AL018	MCU Error 2	Cia402 Error Code	0x6100-80-0018
Alarm Cause	System Operating Error Self Checking Error during System Operations.		
Check and Handling	Please contact Dealer or Manufacturer		
Alarm Clearing Method	Power Re-set		

AL019	MCU Error 3	Cia402 Error Code	0x6100-80-0019
Alarm Cause	CPU Software and FPGA Software Version Compatibility Error		

Check and Handling	Please contact Dealer or Manufacturer
Alarm Clearing Method	Power Re-set

AL020	**Auto tune Motor Wire Disconnection Error**	**Cia402 Error Code**	**0xff03-80-0020**
Alarm Cause	Motor UVW Power Line Disconnection Error		
Check and Handling	Check if motor wiring (U, V, W) is normal. Please wire according to servo driver power and peripheral wiring diagram in Chapter 2.		
Alarm Clearing Method	Power Re-set		

AL021	**Communication type Encoder Error**	**Cia402 Error Code**	**0x7305-01-0021**
Alarm Cause	Communication type encoder error (Count Error).		
Check and Handling	Clear the internal circuit detection error of communication type encoder through Cn041=1. If the error occurs again after turning power off and on, it means the motor encoder fails and a replacement is required. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

AL022	**Excessive Error between motor and load**	**Cia402 Error Code**	**0x8611-01-0022**
Alarm Cause	The difference between motor and load feedback pulse exceeds the setting of Pn347. $\left\| \text{Un14} \times \frac{\text{Pn348} \times 4}{\text{Motor encoder resolution}} - \text{Un50} \right\| > \text{Pn347}$ 1. Maximum of Pn347 full-closed loop error is too small. 2. The connector falls out from the mechanism. 3. Slip caused by the mechanism		
Check and Handling	1. Increase the maximum of Pn347 full-closed loop error. 2. Check if the connector falls out from the mechanism. 3. Adjust the mechanism		
Alarm Clearing Method	Switch Reset		

AL023	**E-Cam Function Error**	**Cia402 Error Code**	**0x6320-01-0023**
Alarm Cause	Incorrect E-Cam parameter setting 1. Excessive S-type time. 2. Excessive initial angle. 3. Excessive synchronous angle. 4. Travel error. 5. Certain curves do not support a cutter number larger than 1. 6. Reverse full-closed loop feedback direction.		

Check and Handling	Please refer to “5-6-15 E-Cam function description”.
Alarm Clearing Method	Power Re-set

AL025	**Driver Voltage Class Switching Error (200/400V)**	**Cia402 Error Code**	**0x6320-01-0025**
Alarm Cause	Motor Model Number Setting Error or Automatic Identification Function Error. 1. The driver does not match the servo motor 2. Encoder motor code Cn030 setting error.		
Check and Handling	1. Please select the appropriate driver and servo motor. 2. Please set correct Cn030; please refer to “Servo driver and servo motor matching comparison table” for Cn030 motor code.		
Alarm Clearing Method	Power Re-set		

AL026	**Full-closed Loop ABZ Phase Signal Error**	**Cia402 Error Code**	**0x7305-01-0026**
Alarm Cause	1. Full-closed loop encoder error. 2. Wires connected to the encoder are bad or incorrectly connected.		
Check and Handling	1. Provide power to full-closed loop encoder and use the oscilloscope to measure if ABZ phase signal is output. 2. Check if the Full-closed loop connector is short-circuited, cold-welded or falls out as well as the correctness of encoder wiring.		
Alarm Clearing Method	Power Re-set		

AL027	**Synchronized Error**	**Cia402 Error Code**	**0x8611-01-0027**
Alarm Cause	Feedback pulse difference between 2 axes exceeds the setting of Pn352. 1. Pulse command asynchronous 2. Mechanism error 3. Linear scale (or diving) data error 4. Pn351 (Synchronized gain value) is too small		
Check and Handling	1. Please check if the pulse command is sent to 2 axes simultaneously and pulse command wiring is correct. 2. Please check if mechanism error occurs. 3. Please check if linear scale (or diving) is installed and correctly set. 4. Increase Pn351 (Synchronized gain value).		
Alarm Clearing Method	Switch Reset		

AL028	**Self-build Motor Parameter Error**	**Cia402 Error Code**	**0x5220-01-0028**
Alarm Cause	Motor Model Number Setting Error.		

Check and Handling	Please check one parameter groups one by one and set the self-defined motor parameters to appropriate values.
Alarm Clearing Method	Power Re-set

AL029	**CANopen/EtherCAT communication Disconnected**	**Cia402 Error Code**	**0xff00-80-0029**
Alarm Cause	EtherCAT communications disconnected. 1. EtherCAT communications cable falls out. 2. Poor EtherCAT communication quality. Number of CANopen communication error exceeds Cn095 setting. 1. CANopen communication cable falls out. 2. Terminal resistor is not added to CANopen communication circuit of the last driver. 3. If CANopen communication parameter is incorrect. 4. Poor CANopen communication quality.		
Check and Handling	EtherCAT communications disconnected. 1. Check if communication cable is disconnected or falls out. 2. Check if the communication cables qualified the requirement for driver EtherCAT communication and distant from interference source. CANopen communication disconnected 1. Check if CANopen communication wiring is correct. 2. Check if the terminal resistor is added to CANopen communication circuit of the last driver. 3. Check if CANopen communication parameter is correct (refer to CANopen section for details). 4. Check if the communication cables qualified the requirement for driver CANopen communication and distant from interference source.		
Alarm Clearing Method	Switch Reset		

AL030	**Modbus Communication Timeout Error**	**Cia402 Error Code**	**0x7510-01-0030**
Alarm Cause	The Modbus Communication Timeout exceeded the set value of Cn039. 1. The setting of Cn039 (communication timeout setting) is too small. 2. Poor Modbus communication quality. 3. Incorrect setting of Cn036 ~ Cn039 communication parameter		
Check and Handling	1. Check if the setting time of Cn039 is too short. 2. Check if communication status is abnormal, wires are short-circuited or with empty connection and if the terminal resistor added to the last communication equipment. 3. Check communication; settings related to ID Cn036, communication speed Cn037.0 and protocol Cn038		
Alarm Clearing Method	Switch Reset		

AL032	**Linear Motor Magnetic Pole Alignment Error**	**Cia402 Error Code**	**0xff03-80-0032**
Alarm Cause	During alignment, incorrect wiring and setting will result in error. 1. Incorrect wiring between power cable and encoder wire. 2. Incorrect setting of linear scale resolution. 3. Magnetic Pole Alignment Error		
Check and Handling	1. Check if the wiring of power cable and encoder wire are correct. 2. Please check if linear scale resolution setting and Pn348 (corresponding resolution of one rotation of full-closed loop Encoder) are correct. 3. Reset magnetic pole alignment current and realign.		
Alarm Clearing Method	Switch Reset		

AL033	**Driver Chip Error**	**Cia402 Error Code**	**0x5220-01-0033**
Alarm Cause	Driver FPGA chip error		
Check and Handling	The Alarm still occurs after power is re-connected, the Driver needs to be replaced. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

AL034	**Excessive Dividing Frequency**	**Cia402 Error Code**	**0x5444-01-0034**
Alarm Cause	1. Diving output frequency exceeds 3.2MHz. 2. Caused by the driver is interfered by the noise internally.		
Check and Handling	Check if Cn005 (Encoder signal dividing output) setting value and required operating speed are correct. Please refer to “5-6-12 Encoder signal dividing output” for details.		
Alarm Clearing Method	Switch Reset		

AL035	**Auto tuning Error**	**Cia402 Error Code**	**0x6100-01-0035**
Alarm Cause	The abnormality caused by system cannot converge in the Auto tuning process.		
Check and Handling	The System generates Vibration Resonance or Acoustic Resonance. Decrease Cn026 system rigidity until no vibration occurs or execute PC-link Mechanical Characteristics Analysis Function Observation to observe if the resonance occurs in the system and suppress it.		
Alarm Clearing Method	Switch Reset		

AL036	**Linear Motor Alignment not Completed**	**Cia402 Error Code**	**0xff01-01-0036**
Alarm Cause	If alignment is not completed after the power is on, the error will occur.		
Check and Handling	Please use dn-11 to complete magnetic pole angle position alignment and then excite the motor.		

Alarm Clearing Method	Switch Reset

AL037	Regenerative Error	Cia402 Error Code	0xff04-20-0037
Alarm Cause	Excessive primary capacitor voltage (Un-03 regenerative load ratio exceeds 100) resulted from excessive regenerative energy. 1. Error occurs under operation condition; acceleration/deceleration executed by the device is over spec. 2. Error occurs under operation conditions; the used regenerative resistance is higher than the one needed for operation conditions. 3. Driver hardware failure.		
Check and Handling	1. Extend the Acceleration / Deceleration Time or reduce the Load Inertia within the permitted range. 2. Review the regenerative resistance by considering operation condition and load; set external regenerative resistor power setting (Cn012) correctly when connecting to external regenerative resistor. 3. Check if Un-03 regenerative load ratio is over 100; if it's under 100, then there may be a driver hardware error. Please send the device back to the distributor or manufacturer for overhaul.		
Alarm Clearing Method	Switch Reset		

AL038	Start Up Circuit Error	Cia402 Error Code	0xff05-20-0038
Alarm Cause	Start Up Resistor Circuit Error		
Check and Handling	This Alarm still generated after power is disconnected, please replace the Driver. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

AL039	Full-closed Loop Encoder Matching Error	Cia402 Error Code	0x7305-80-0039
Alarm Cause	Encoder Matching Error		
Check and Handling	1. The full-closed loop function of used driver model (G2S-E, G2-E) prohibits the use of the motor matching pulse type encoder. 2. Confirm if the driver correctly matches Cn030 motor model; please refer to "Servo driver and servo motor matching comparison table" for Cn030 motor code.		
Alarm Clearing Method	Power Re-set		

AL040	Turret Mode is prohibited to use non-absolute type encoder	Cia402 Error Code	0x7305-80-0040
Alarm Cause	Encoder Matching Error		
Check and	Replace motor encoder.		

Handling	
Alarm Clearing Method	Power Re-set

AL041	**Control Mode Selection Error**	**Cia402 Error Code**	**0x6320-80-0041**
Alarm Cause	This driver model does not support such control mode. 1. JSDG2(S)-E control mode setting error 2. JSDG2S control mode setting error		
Check and Handling	1. Check Cn001 control mode; JSDG2(S)-E does not contain b & c modes (CANopen mode) 2. Check Cn001 control mode; JSDG2S does not contain d mode (EtherCAT mode)		
Alarm Clearing Method	Power Re-set		

AL042	**Dividing Setting Error**	**Cia402 Error Code**	**0x6320-80-0042**
Alarm Cause	Encoder signal dividing output (Cn005) setting error		
Check and Handling	Please refer to the description in “5-6-12 Encoder signal dividing output” to set Cn005 within the reasonable range.		
Alarm Clearing Method	Power Re-set		

AL043	**JOG Error**	**Cia402 Error Code**	**0xff04-80-0043**
Alarm Cause	After using PDO of EtherCAT/CANopen communication, it is prohibited to use SON of non-CiA402 protocol.		
Check and Handling	DO NOT use JOG function after connection under EtherCAT/CANopen mode.		
Alarm Clearing Method	Power Re-set		

AL044	**Internal Position S Curve Setting Error**	**Cia402 Error Code**	**0x6320-80-0044**
Alarm Cause	Pn322, Pn323 & Pn333 parameter setting error,		
Check and Handling	Please refer to the description “5-4-4 Position command acceleration/deceleration function”.		
Alarm Clearing Method	Switch Reset		

AL045	**Communication Type Encoder Model Error**	**Cia402 Error Code**	**0x7305-80-0045**
Alarm Cause	Motor Model Number Setting Error or Automatic Identification Function Error.		
Check and Handling	Confirm if the encoder correctly matches Cn030 motor model; please refer to “Servo driver and servo motor matching comparison table” for Cn030 motor code.		

Alarm Clearing Method	Power Re-set

AL046	Encoder Feedback Value Error	Cia402 Error Code	0xff05-80-0046
Alarm Cause	Encoder Speed Error is too High.		
Check and Handling	The Alarm still occurs after power is re-connected for operations, need to confirm if the Encoder is damaged. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

AL047	Turret Origin Return to Zero Error	Cia402 Error Code	0xff04-80-0047
Alarm Cause	Turret Origin Return to Zero Error.		
Check and Handling	Please continue the operation after returning to zero correctly.		
Alarm Clearing Method	Switch Reset		

AL048	EtherCAT/CANopen Communication Mode Setting Error	Cia402 Error Code	0x6320-80-0048
Alarm Cause	1. The driver receives Servo ON command while the state machine of CiA402 is not under operation yet. 2. The operation mode which object 6060h setting does not support.		
Check and Handling	1. Please run Servo On after confirming the state machines is under Operation. 2. Setting mode does not support; please check again.		
Alarm Clearing Method	Switch Reset		

AL049	EtherCAT Synchronous Error	Cia402 Error Code	0xff00-80-0049
Alarm Cause	Excessive EtherCAT PDO Packet Loss.		
Check and Handling	1. Observe if Un-54 exceeds the limit (object 0x10F1) 2. Check hardware wiring and cables.		
Alarm Clearing Method	Switch Reset		

AL050	Absolute Type Encoder Position Error	Cia402 Error Code	0x7305-80-0050
Alarm Cause	Absolute Type Encoder Position Error.		
Check and Handling	The Alarm still occurs after power is re-connected, need to confirm if the Encoder is damaged. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

Error Alarm Clearing Method Description:

1. Switch Re-set: Can use the following two methods to clear Error Alarms:
   (a) Digital Input Contact Reset: After Error is resolved, release Digital Input Contact **SON** operation first (i.e. release the Motor Excitation State), and then enable the Digital Input Contact **ALRS** operation. The error alarm can be cleared then and make the Driver return to normal operations. Please refer to "**5-6-1 Input** / Output Contact Function Planning" for the Digital Input Contact Effective Logic.
   (b) Key Re-set: After Error is resolved, release Digital Input Contact **SON** operations first (i.e. release the Motor Excitation State) and then press ▲ and ▼ keys at the same time to clear the Error Alarm and make the Driver return to normal operations.
2. Power Re-set: After Error is resolved, it is necessary to **Re-start** (Re-start Power after turning off power), in order to clear the Error Alarm to allow the Driver to return to normal operations. **It is highly recommended to use Power Re-set to clear the Error Alarm. It is better to release the Input Contact SON operations first (i.e. release the Motor Excitation State).**

⚠ Attention
• **Before clearing the Error Alarm, it is necessary to make sure that the controller did not issue Commands to the Driver to avoid causing sudden unintended acceleration of the Motor**

Chap 10 Comprehensive specification

10-1 Detailed specification of servo driver

<table>
<tr><th colspan="3" rowspan="2">Servo Driver Model
JSDG2-□□□□-E</th><th colspan="6">200V Class</th></tr>
<tr><th>10A</th><th>15A</th><th>20A</th><th>30A</th><th>50A3</th><th>75A3</th></tr>
<tr><td rowspan="8">Basic Specifications</td><td colspan="2">Servo capacity[kW]</td><td>0.1</td><td>0.4</td><td>0.75</td><td>1.0</td><td>2.0</td><td>3.0</td></tr>
<tr><td colspan="2">Continuous Output Current [A rms]</td><td>2.1</td><td>3.5</td><td>4.4</td><td>5.6</td><td>9.2</td><td>14.0</td></tr>
<tr><td colspan="2">Maximum Output Current [A rms]</td><td>5.7</td><td>8.5</td><td>11.3</td><td>17.0</td><td>28.3</td><td>42.4</td></tr>
<tr><td rowspan="2">Input Power</td><td>Primary circuit R, S, T</td><td colspan="4">Single-phase or Three-phase
AC 200 ~ 230V, -15~+10%</td><td colspan="2">Three-phase
AC 200 ~ 230V, -15~+10%</td></tr>
<tr><td>Control circuit r, s</td><td colspan="6">Single phase
AC 200 ~ 230V, -15~+10%</td></tr>
<tr><td colspan="2">Cooling Method</td><td colspan="2">Natural Cooling</td><td colspan="4">Fan Cooling</td></tr>
<tr><td colspan="2">Control Method</td><td colspan="6">Three-phase Full-wave Rectification IGBT PWM Control
(Sine Wave Current Drive Method)</td></tr>
<tr><td colspan="2">Encoder Resolution</td><td colspan="6">15 bits (absolute type) / 17 bits (incremental type/absolute type) /
23 bits (incremental type/absolute type)</td></tr>
<tr><td rowspan="6">Internal Features</td><td colspan="2">Display and Operations</td><td colspan="6">CHARGE Indicator; five-digit seven-segment display; four function keys</td></tr>
<tr><td colspan="2">Control Mode</td><td colspan="6">Position (external pulse command), position (internal position command), speed, torque, turret automatic tool change and dual-mode switching (position/speed, speed/torque, position/torque)</td></tr>
<tr><td colspan="2">Regenerative Brake</td><td colspan="6">Built-in brake transistor and break resistor/can connect to external brake resistor</td></tr>
<tr><td colspan="2">Dynamic Brake</td><td colspan="6">Built-in dynamic brake
Activates when Power Off, Servo Off, drive prohibition and error occur.</td></tr>
<tr><td colspan="2">Protection</td><td colspan="6">Various error alarms</td></tr>
<tr><td colspan="2">Communication Interface</td><td colspan="6">USB / RS-485 / EtherCAT</td></tr>
</table>

Servo Driver Model JSDG2S-□□□□ JSDG2S-□□□□-E			200V Class									
			10A	15A	20A	30A	50A3	75A3	100A3	150A3	200A3	300A3
Basic Specifications	Servo capacity[kW]		0.1	0.4	0.75	1.0	2.0	3.0	4.4	5.5	7.5	15.0
	Continuous Output Current [A rms]		2.1	3.5	4.4	5.6	9.2	14.0	25.3	33.2	42.1	78
	Maximum Output Current [A rms]		5.7	8.5	11.3	17.0	28.3	42.4	56.6	84.9	113.0	170.0
	Input Power	Primary circuit R, S, T	Single-phase or Three-phase AC 200 ~ 230V, -15~+10%				Three-phase AC 200 ~ 230V, -15~+10%					
		Control circuit r, s	Single phase AC 200 ~ 230V, -15~+10%									
	Cooling Method		Natural Cooling		Fan Cooling							
	Control Method		Three-phase Full-wave Rectification IGBT PWM Control (Sine Wave Current Drive Method)									
	Encoder Resolution		15 bits (absolute type) / 17 bits (incremental type/absolute type) / 23 bits (incremental type/absolute type)									
Internal Features	Display and Operations		CHARGE Indicator; five-digit seven-segment display; four function keys									
	Control Mode		Position (external pulse command), position (internal position command), speed), speed, torque, turret automatic tool change and dual-mode switching (position/speed, speed/torque, position/torque)									
	Regenerative Brake		Built-in brake transistor and break resistor/ can connect to external brake resistor									(Note 1)
	Dynamic Brake		Built-in dynamic brake Activates when Power Off, Servo Off, drive prohibition and error occur.									
	Protection		Various error alarms									
	Communication Interface		JSDG2S-□□□□：USB / RS-485 / CANopen JSDG2 (S)-□□□□-E：USB / RS-485 / EtherCAT									

Note 1: Built-in Brake Transistor / can connect to external Brake Resistor

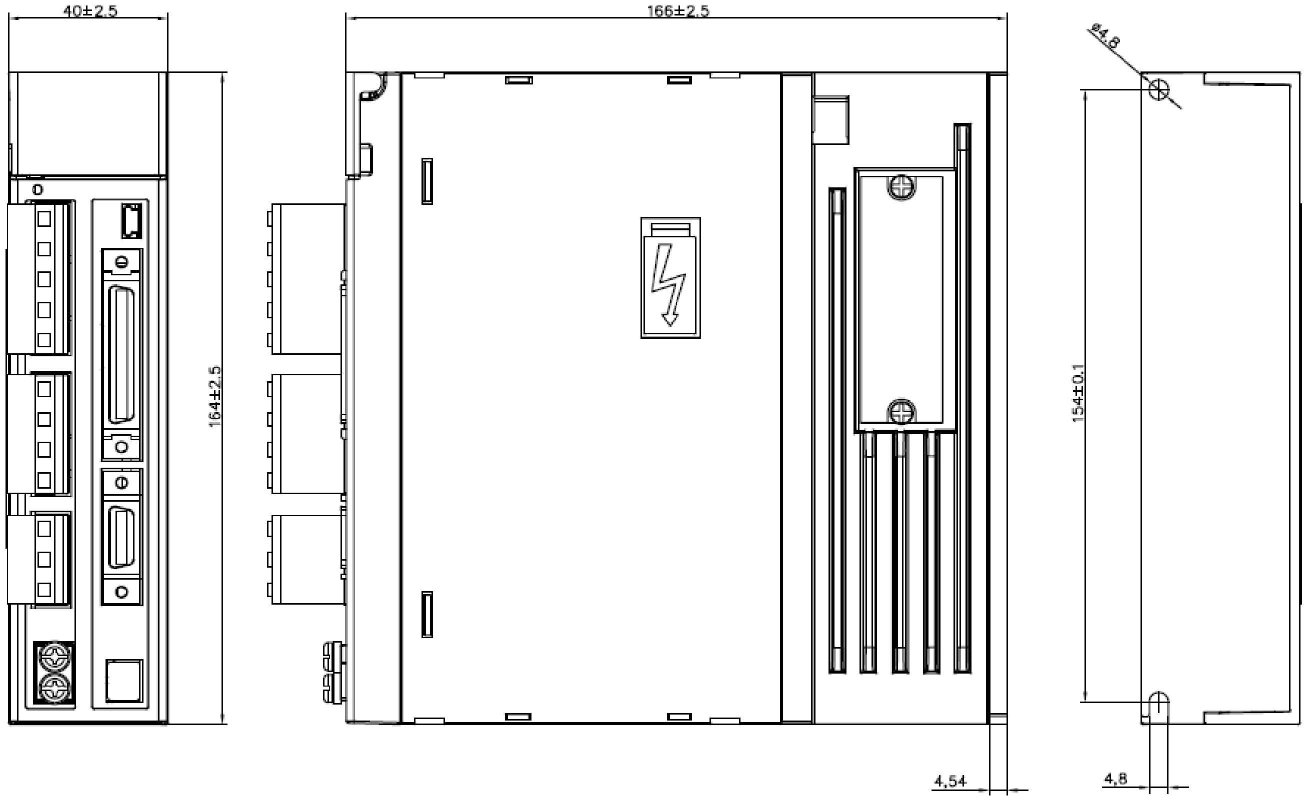
<table>
<tr><td colspan="3" rowspan="2">Servo Driver Model
JSDG2S-□□□□
JSDG2S-□□□□-E</td><td colspan="9">400V Class</td></tr>
<tr><td>10B</td><td>15B</td><td>25B</td><td>35B</td><td>50B</td><td>75B</td><td>100B</td><td>150B</td><td>200B</td></tr>
<tr><td rowspan="8">`Basic specification</td><td colspan="2">Servo capacity[kW]</td><td>0.75</td><td>1.0</td><td>2.0</td><td>3.0</td><td>4.4</td><td>7.5</td><td>11.0</td><td>15.0</td><td>22.0</td></tr>
<tr><td colspan="2">Continuous Output Current [A rms]</td><td>2.0</td><td>2.6</td><td>6.0</td><td>8.0</td><td>11.5</td><td>16.0</td><td>22.0</td><td>41.0</td><td>52.0</td></tr>
<tr><td colspan="2">Maximum Output Current [A rms]</td><td>5.7</td><td>8.5</td><td>14.0</td><td>19.8</td><td>28.3</td><td>42.4</td><td>56.6</td><td>84.9</td><td>113.0</td></tr>
<tr><td rowspan="2">Input Power</td><td>Primary circuit R, S, T</td><td colspan="9">Three-phase
AC 380~480V, ±10%</td></tr>
<tr><td>Control circuit +24V, 0V</td><td colspan="9">DC 24V, ±10%</td></tr>
<tr><td colspan="2">Cooling Method</td><td colspan="9">Fan Cooling</td></tr>
<tr><td colspan="2">Control Method</td><td colspan="9">Three-phase Full-wave Rectification IGBT PWM Control
(Sine Wave Current Drive Method)</td></tr>
<tr><td colspan="2">Encoder Resolution</td><td colspan="9">15 bits (absolute type) / 17 bits (incremental type/absolute type)
/ 23 bits (incremental type/absolute type)</td></tr>
<tr><td rowspan="6">Internal Features</td><td colspan="2">Display and Operations</td><td colspan="9">CHARGE Indicator; five-digit seven-segment display; four function keys</td></tr>
<tr><td colspan="2">Control Mode</td><td colspan="9">Position (external pulse command), position (internal position command), speed, torque, turret automatic tool change and dual-mode switching (position/speed, speed/torque, position/torque)</td></tr>
<tr><td colspan="2">Regenerative Brake</td><td colspan="7">Built-in brake transistor and break resistor/can connect to external brake resistor</td><td colspan="2">Built-in Brake Transistor / capable of connecting Brake Resistor</td></tr>
<tr><td colspan="2">Dynamic Brake</td><td colspan="9">Built-in dynamic brake
Activates when Power Off, Servo Off, drive prohibition and error occur.</td></tr>
<tr><td colspan="2">Protection</td><td colspan="9">Various error alarms</td></tr>
<tr><td colspan="2">Communication Interface</td><td colspan="9">JSDG2S-□□□□：USB / RS-485 / CANopen
JSDG2 (S)-□□□□-E：USB / RS-485 / EtherCAT</td></tr>
</table>

Servo Driver Model JSDG2-□□□□-E JSDG2S-□□□□ JSDG2S-□□□□-E			200V class / 400V class
Position Control Mode	Command Control Method		External Instruction Pulse Command / 32 Sets Internal Register Command
	External Command Pulse Input	Pattern	Pulse+direction (pulse+sign), CCW pulse+CW pulse, phase differential pulse (phase A+ phase B)
		Waveform	Differential Line Driver (+5V Level), Open Collector (+5 ~ +24V Level)
		Maximum Frequency	4000Kpps (Differential) / 200Kpps (Open Collector)
	Electronic Gear Ratio		1 / 1000 ≤ A/B ≤ 4000 (A = 1 ~ 8388608；B = 1 ~ 8388608)
	Command Smoothing Method		Smoothing Time Constant: 0 ~ 10sec
	Positioning Completion Judgment		0 ~ 41943040 pulse
	Feedforward Gain Compensation		0 ~ 100 %
	Origin Return Function		Internal Parameter Setting
Speedcontrolmode	Command Control Method		External analog command (JSDG2S-E does not have this function) / Three stage Internal speed command
	External Analog Command	Voltage Range	0 ~ ±10Vdc
		Input Impedance	10KΩ
	Speed Control Range		1: 5000 (Internal Speed Command / 1: 2000 (External Analog Command)
	Speed Fluctuation		Load Fluctuation: 0-100%±0.03% or less (at rated speed)
			Voltage Fluctuation: ±10% fluctuation ±0.2% or less (at rated speed)
			Temperature Fluctuation: 0-50^{0}C %±0.5% or less (at rated speed)
	Command Smoothing Method		Linear Time Constant: 0-50 seconds; S-shape Time Constant: 0-5 seconds; Smoothing Time Constant: 0-11 seconds
	Frequency characteristic		1500Hz (when J_L=J_M)
	Torque Limit		External analog command (JSDG2S-E does not have this function) / Internal parameter setting
	Zero Speed Determination / Speed Reached Determination		0-4500rpm (internal parameter setting)
Torque Control Mode	Command Control Method		External analog command (JSDG2S-E does not have this function) / Internal torque command
	External Analog Command	Voltage Range	0 ~ ±10Vdc
		Input Impedance	10KΩ
	Command Smoothing Method		Linear Time Constant: 0 ~ 50sec; Smoothing Time Constant: 0 ~ 10sec
	Speed Limit		External analog command (JSDG2S-E does not have this function) / Internal parameter setting
	Torque Arrival Judgment		0 ~ 300% (Internal Parameter Setting)

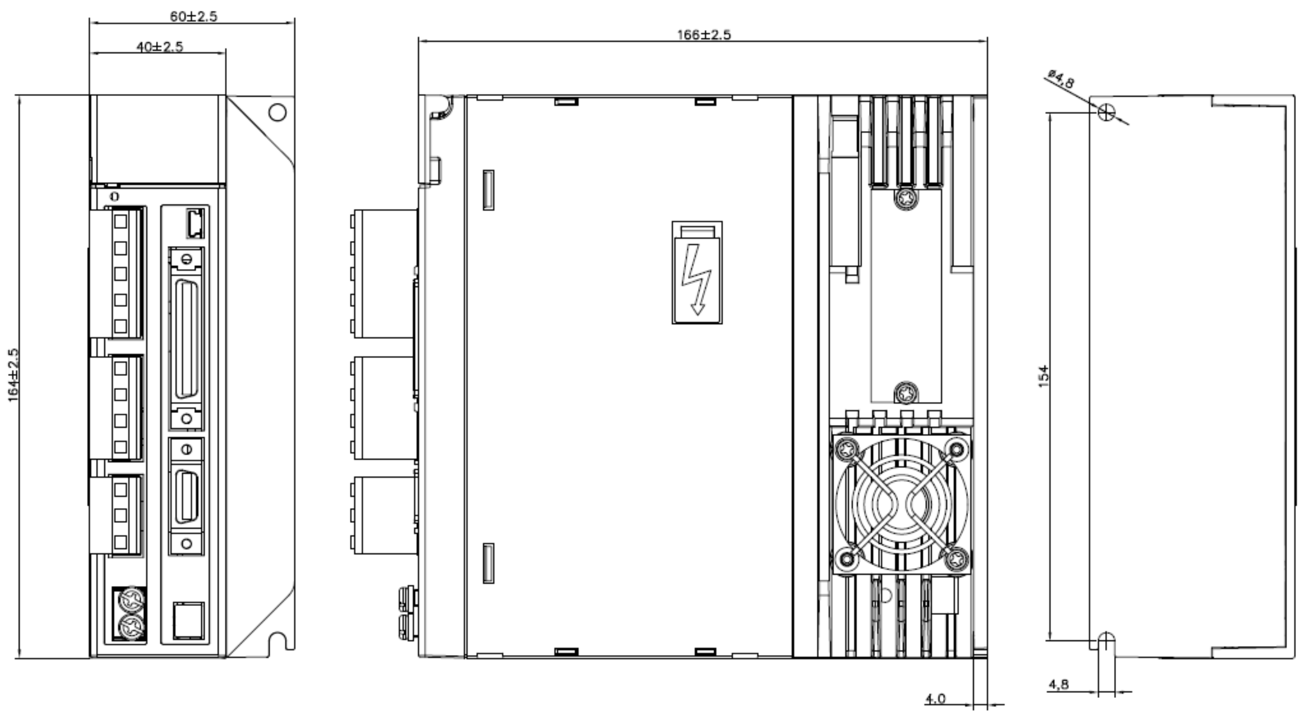
Servo Driver Model JSDG2-□□□□-E JSDG2S-□□□□ JSDG2S-□□□□-E			200V class / 400V class
Input / Output Signal	Position Output	Output Type	Phase A, B, Z differential Output / Phase Z Open Collector Output
Input / Output Signal	Position Output	Division Ratio	Pulse output: 1 ~ pulse number of one encoder revolution÷4 (Internal parameter random value setting)
Input / Output Signal	Digital input [NPN/PNP]	12 points can be planned arbitrarily	Servo start, error alarm clear, P/PI switching, CCW/CW direction drive prohibition, external torque limit, pulse error removal, servo lock, emergency stop, internal speed command selection, control mode switching, position command prohibition, gain switching, electronic gear ratio numerator selection, internal position command trigger, internal position command pause, start to return to origin, external reference origin, internal position command selection, virtual contact digit input, etc.
Input / Output Signal	Digital output [NPN/PNP]	4 Points Fixed Output	The fixed output contact function varies under different circumstances as described below. [No alarm, non-magazine mode]: limited torque/ in P action/drive prohibited/Base Block [No alarm, magazine mode]: tool handle position 1/tool handle position 2/tool handle position 3/tool handle position 4 [When alarm occurs]: abnormality alarm code 0/abnormality alarm code 1/ abnormality alarm code 2/ abnormality alarm code 3
Input / Output Signal	Digital output [NPN/PNP]	4 points can be planned arbitrarily	Servo ready, servo error, zero speed signal, mechanical brake signal, speed arrival signal, positioning completion signal, origin return completion signal, torque arrival output completion signal, magazine mode tool position display, motor overload signal, encoder battery error signal, positive and negative limit signals, virtual contact digital output, etc.
Input / Output Signal	Analog monitor output (JSDG2S-E does not have this function)	2 points can be planned arbitrarily	Speed command, speed feedback detection, torque command, torque feedback, pulse input command, position offset, electrical angle, primary circuit (Vdc Bus) voltage, etc.
Environment	Location		Indoors (avoid direct sunlight)
Environment	Location		Non-corrosive Mist (avoid fumes, flammable gases and dust)
Environment	Altitude		Up to 1000M
Environment	Temperature		Operating Temperature: 0 ~ 50ºC; Storage Temperature: -20 ~ +85ºC
Environment	Humidity		Up to 95%RH (non-condensing)
Environment	Vibration		10 ~ 57Hz：20m/s^2；57 ~ 150Hz：2G
Safety Certification	CE Declaration		In compliance with EN61800-3 and EN61800-5-1
Safety Certification	UL Certification		UL508C

10-2 Servo drive dimension

(1) JSDG2S- (E)-10A / 15A

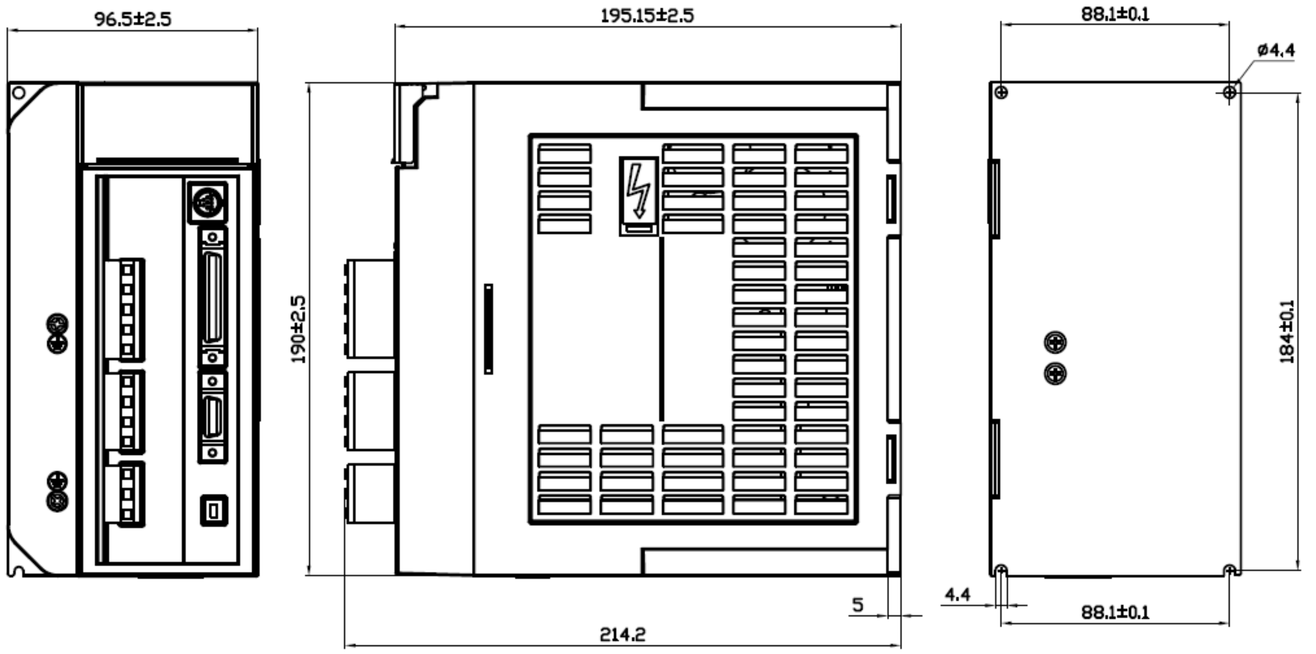


(2) JSDG2S- (E)- 20A / 30A (200V Class)

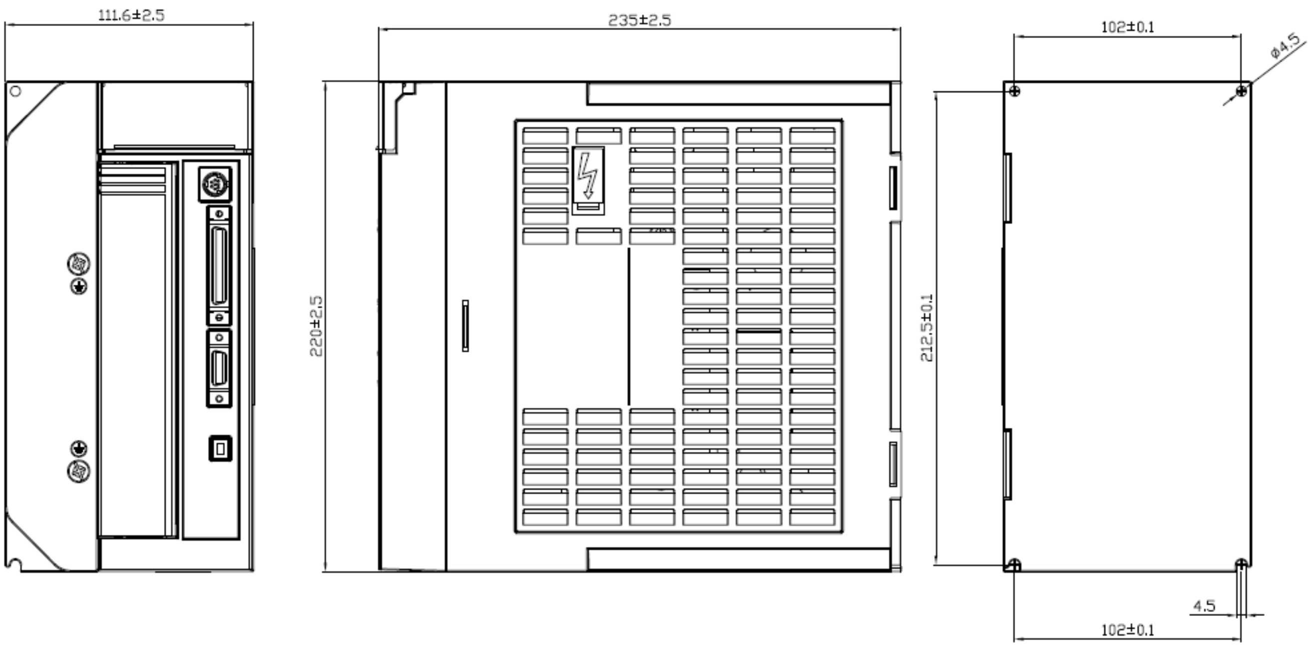


TECO

(3) JSDG2S- (E)-50A3 / 75A3 (200V Class)
JSDG2S- (E)-10B/15B/25B/35B (400V Class)

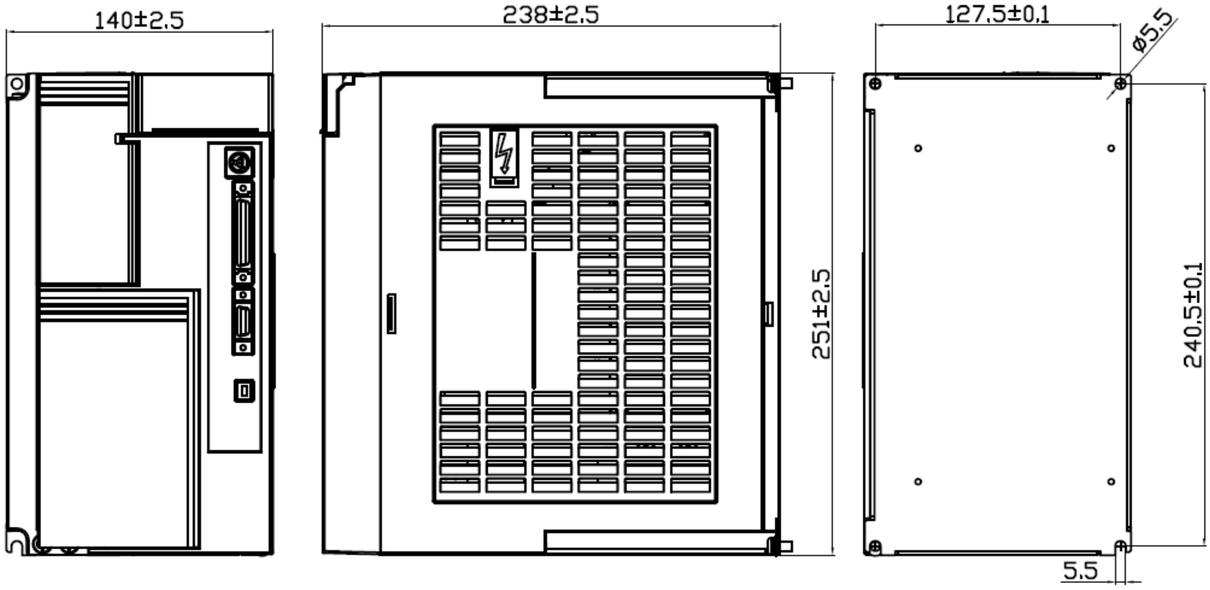


(4) JSDG2S- (E)-100A3 / 150A3 (200V Class)
JSDG2S- (E)- 50B/75B (400V Class)

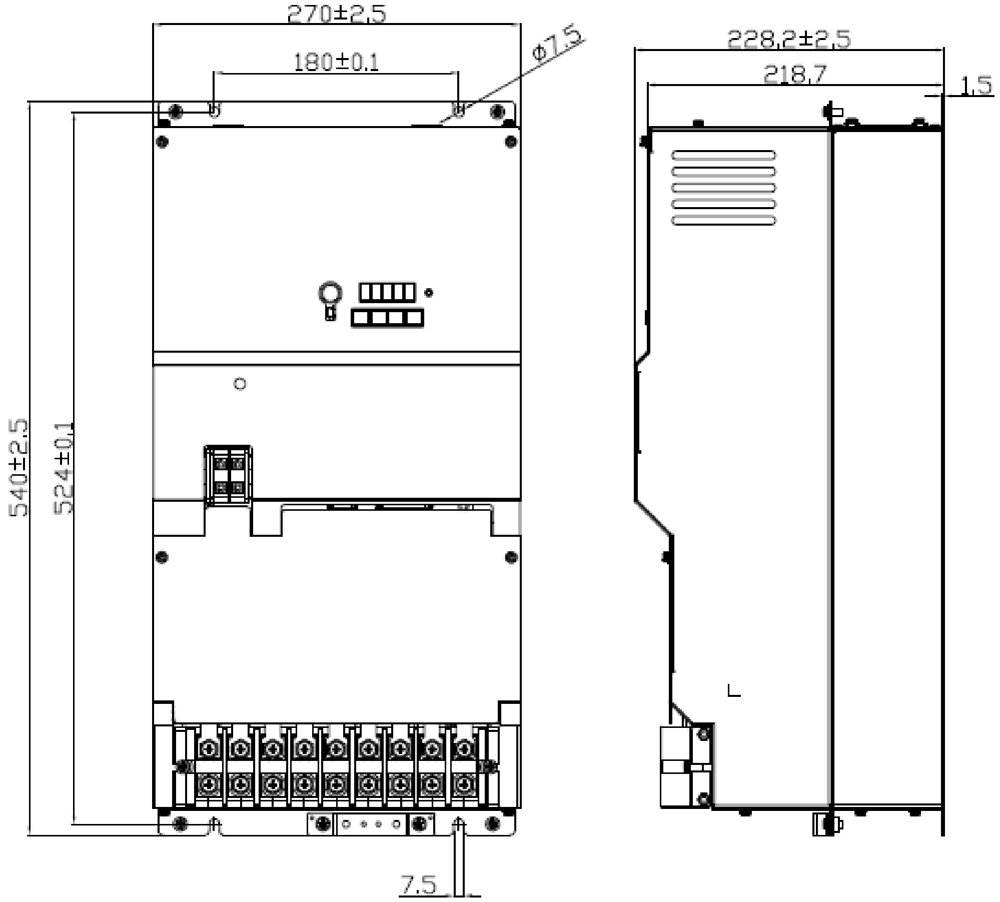


TECO

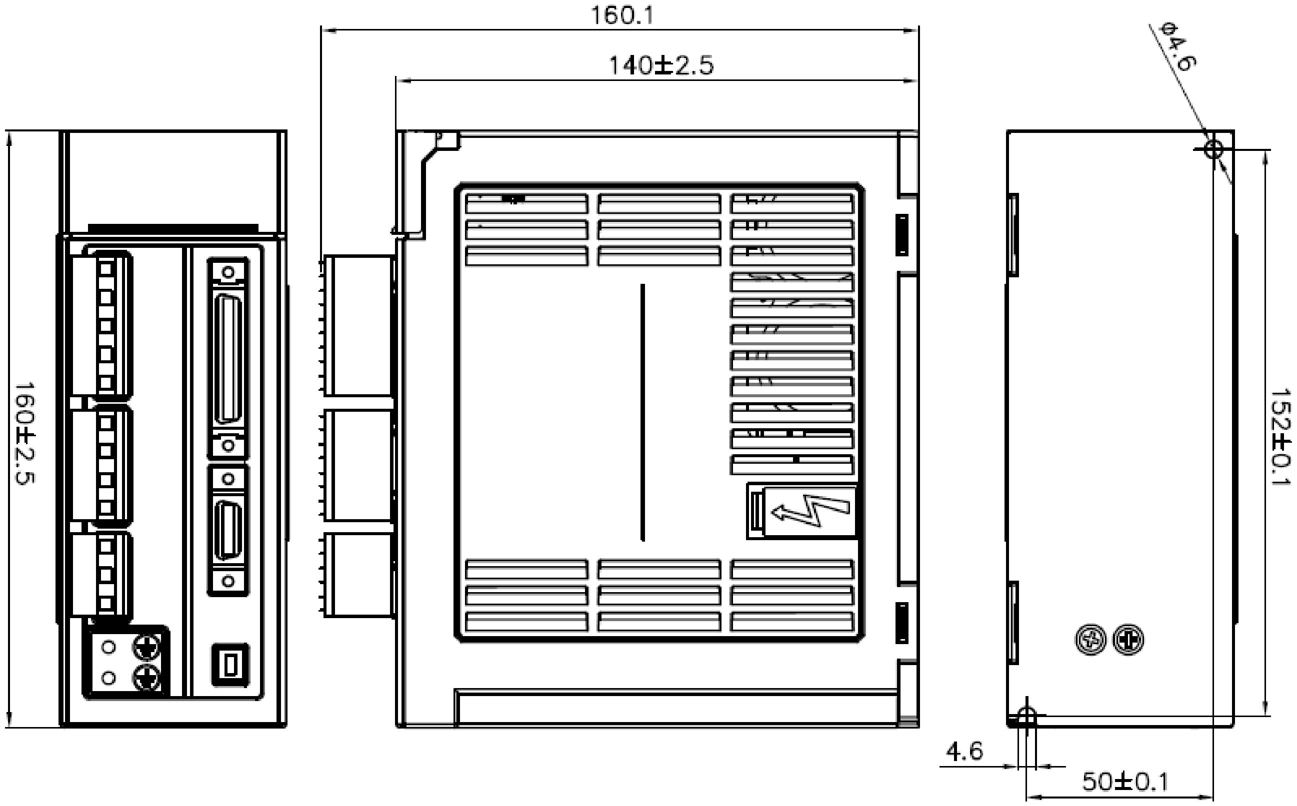
(5) JSDG2S- (E)-200A3 (200V Class)
JSDG2S- (E)- 100B (400V Class)



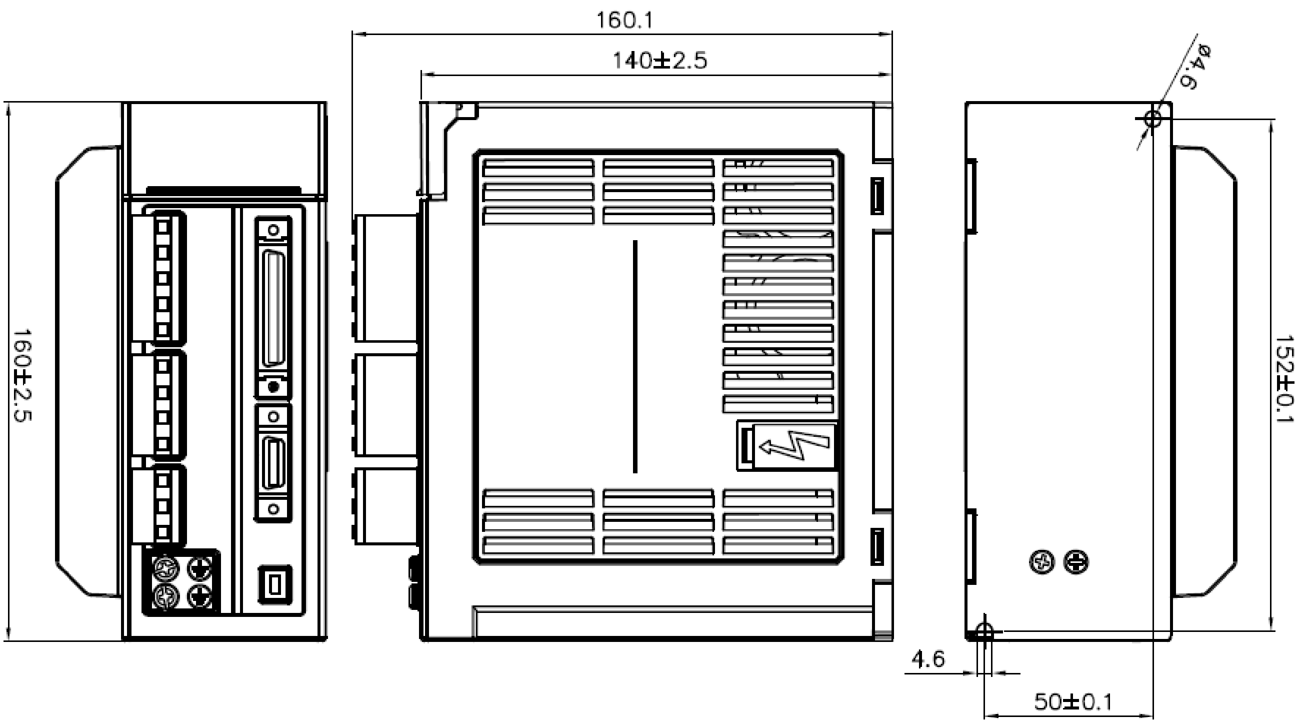
(6) JSDG2S- (E)-200A3 (200V Class)
JSDG2S- (E)- 100B (400V Class)



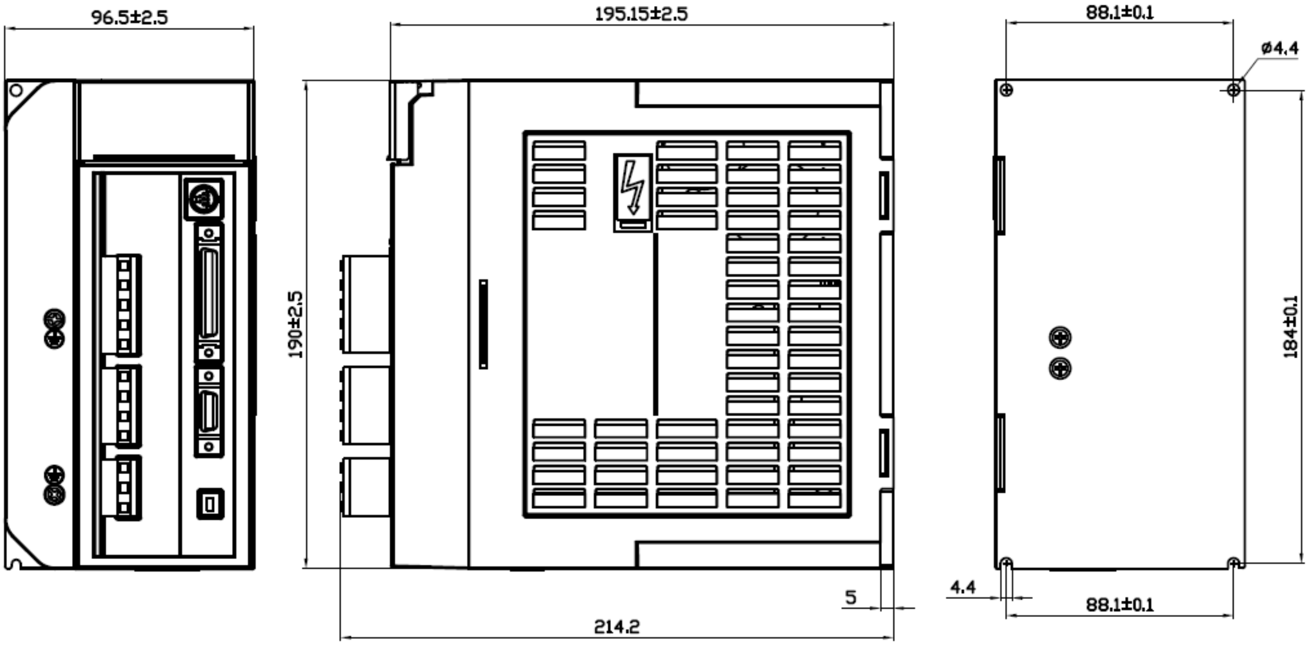
(1) JSDG2-E-10A / 15A (200V Class)



(2) JSDG2-E-20A / 30A (200V Class)



(3) JSDG2-E-50A3 / 75A3 (200V Class)



10-3 Servo Motor Specifications

Low Inertia Series

JSMA Low Inertia Series JSMA- P □□□□ A	Symbol	Unit	UCP5	UC01	UC02	UC04	UC08	LC03	LC08
Rated Output Power	P_R	KW	0.05	0.1	0.2	0.4	0.75	0.3	0.75
Rated Torque	T_R	N*M	0.16	0.032	0.64	1.27	2.39	0.95	2.39
Instantaneous Maximum Torque	T_{max}	N*M	0.48	0.095	1.91	3.81	7.16	2.86	7.16
Rated Speed	N_R	rpm	3000						
Instantaneous Maximum Rotational Speed	N_{max}	rpm	6000	6000	6000	6000	5000	4500	3800
Rated Phase Current	I_R	A	1	1	1.6	2.6	4.3	2	3.75
Instantaneous Maximum Current	I_{max}	A	3	3	4.8	8.1	14	6	11.25
Torque Constant	K_T	N*m/A	0.16	0.32	0.46	0.49	0.56	0.52	0.77
Rotor Inertia	J_M	Kg*cm^2	0.028	0.041	0.17	0.28	0.9	0.68	2.46
Motor Impedance	Ω	Ra	12.9	20.5	6.4	3.15	1.48	5.58	2.18
Motor Inductive Reactance	mH	La	14.8	27.5	16.2	11	10.1	11.6	7.7
Weight (standard)	W	Kgw	0.35	0.48	1	1.37	2.4	1.59	3.05
Insulation Class	-	-	Class F						
Operating Temperature	T	℃	0~40						
Operating Humidity	RH	%	<80						
Storage Temperature	T	℃	-20 - 60						
Storage Humidity	RH	%	<80						

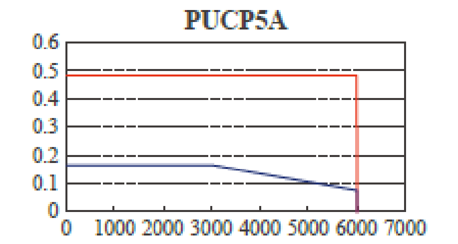
Medium Inertia Series

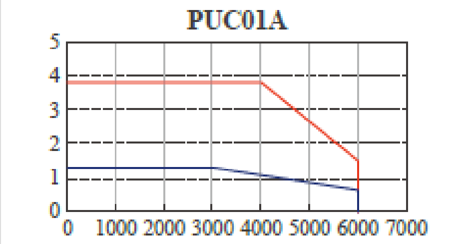
JSMA Medium Inertia Series JSMA- P □□□□ A	Symbol	Unit	MB10	MB15	MB20	MB30	IH30	IH44	IH55	IH75	MH110	MH150
Rated Output Power	P_R	KW	1.0	1.5	2.0	3.0	3	4.4	5.5	7.5	11	15
Rated Torque	T_R	N*M	4.78	7.16	9.55	14.33	19.1	28	35.1	47.8	70	95.5
Instantaneous Maximum Torque	T_{max}	N*M	14.33	21.49	28.65	42.69	47.75	70	87.75	122.6	175	214
Rated Speed	N_R	rpm	2000	2000	2000	2000	1500	1500	1500	1500	1500	1500
Instantaneous Maximum Rotational Speed	N_{max}	rpm	2800	2800	2500	2500	2000	2000	2000	2000	2000	2000
Rated Phase Current	I_R	A	5.16	7.57	9.18	14.0	16	23.6	28.5	38.6	56	38
Instantaneous Maximum Current	I_{max}	A	15.50	22.71	27.50	42.00	40	59	71.2	99.1	140	84.7
Torque Constant	K_T	N*m/A	1.02	1.04	1.14	1.13	1.19	1.19	1.23	1.24	1.37	2.51
Rotor Inertia	J_M	Kg*cm^2	6.26	8.88	12.14	17.92	39.95	59.17	77.9	108.4	152.86	235.2
Motor Impedance	Ω	Ra	1.22	0.79	0.58	0.33	0.275	0.167	0.129	0.1	0.07	0.15
Motor Inductive Reactance	mH	La	6.7	4.7	3.8	2.1	6.8	4.3	3.2	2.5	2.03	5.24
Weight (standard)	W	Kgw	6.47	8.08	10.16	13.87	16.9	22.1	27.1	T.B.D	46.8	70.5
Insulation Class	-	-	ClassB				ClassF					
Operating Temperature	T	℃	0~40									
Operating Humidity	RH	%	<90									
Storage Temperature	T	℃	-20 – 60									
Storage Humidity	RH	%	<90				<80					<90

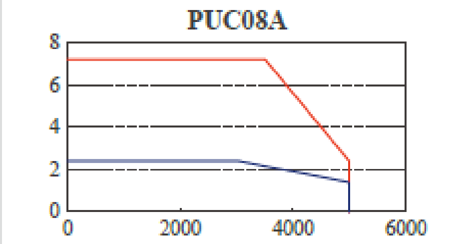
High Inertia Series

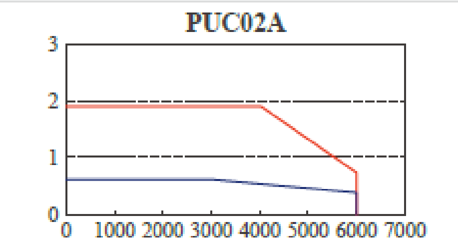
JSMA High Inertia Series JSMA-P □□□□ A	Symbol	BC01	BC02	BC04	BC08	BC09	BH13	BH18	BH 18_18	BH29	BH44	BH55	BH75
Rated Output Power	P_R	0.1	0.2	0.4	0.75	0.85	1.3	1.8	1.8	2.9	4.4	5.5	7.5
Rated Torque	T_R	0.32	0.64	1.27	2.39	5.39	8.34	11.5	11.5	18.5	28.4	35	48
Instantaneous Maximum Torque	T_{max}	0.95	1.91	3.81	7.16	13.8	23.3	28.7	27.6	44.3	71.1	87.6	119
Rated Speed	N_R	3000	3000	3000	3000	1500	1500	1500	1500	1500	1500	1500	1500
Instantaneous Maximum Rotational Speed	N_{max}	6000	6000	6000	5000	3000	3000	3000	3000	3000	3000	3000	3000
Rated Phase Current	I_R	0.9	1.6	2.6	4.3	7	11.4	14.8	17.8	24	33.5	42.1	54.7
Instantaneous Maximum Current	I_{max}	2.7	4.8	8.1	14	18.1	32.4	37.4	42.7	58	85	110	136
Torque Constant	K_T	0.35	0.46	0.47	0.56	0.75	0.72	0.78	0.65	0.77	0.84	0.83	0.88
Rotor Inertia	J_M	0.082	0.42	0.67	1.51	13.34	20.07	26.66	31.9	45.55	65.41	89.98	129.8
Motor Impedance	Ω	24	6.4	3.15	1.48	0.65	0.355	0.255	0.16	0.113	0.091	0.054	0.039
Motor Inductive Reactance	mH	22	16.2	11	10.1	5.5	3.4	2.7	2.7	2.5	2.2	1.4	1.1
Weight (standard)	W	0.48	1.5	1.53	2.7	6.7	8.9	11.1	14.1	18	23.5	35	41.2
Insulation Class	-	ClassF											
Operating Temperature	T	0~40											
Operating Humidity	RH	<80											
Storage Temperature	T	-20 – 60											
Storage Humidity	RH	<80											

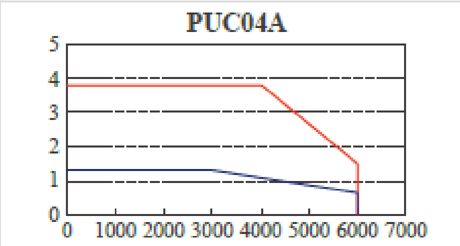
Up to 80 Frame Series

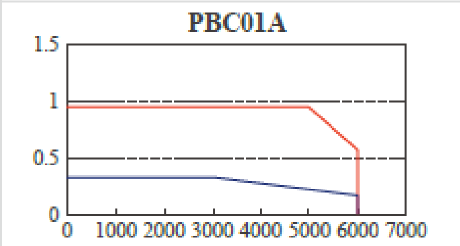


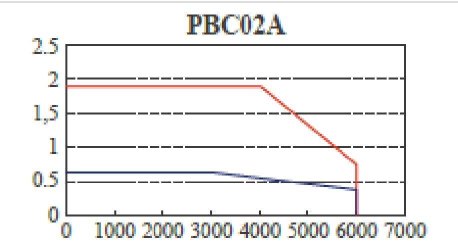


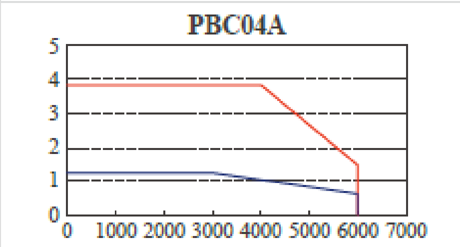


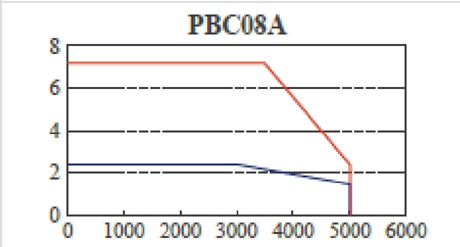






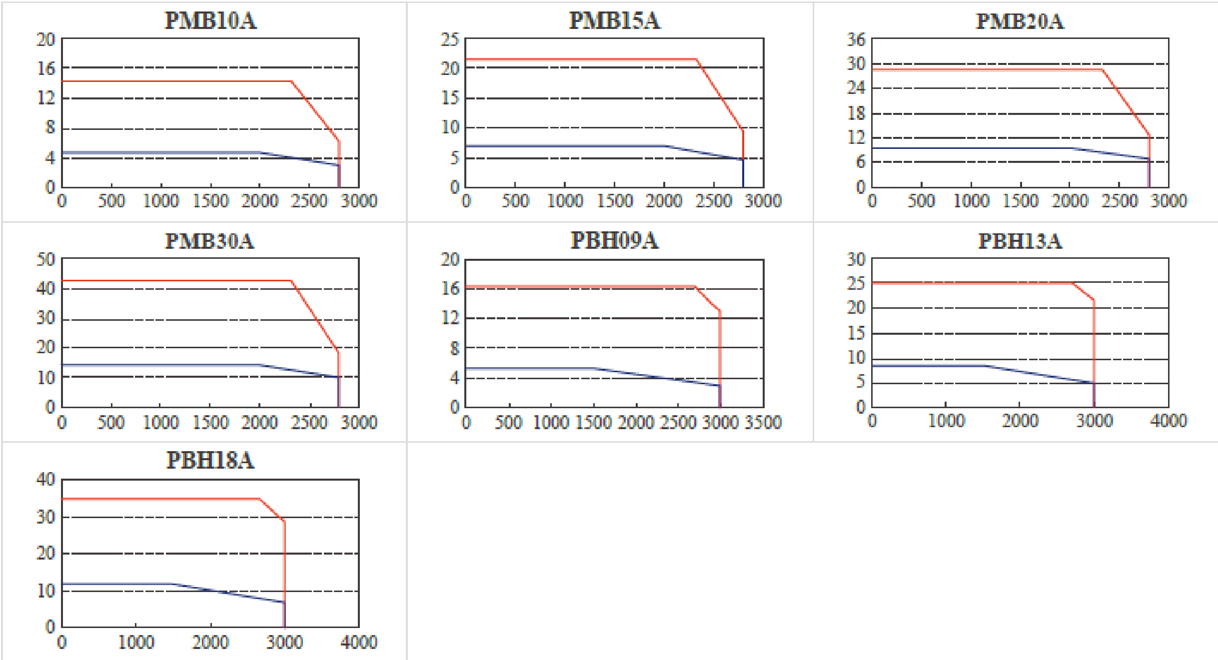




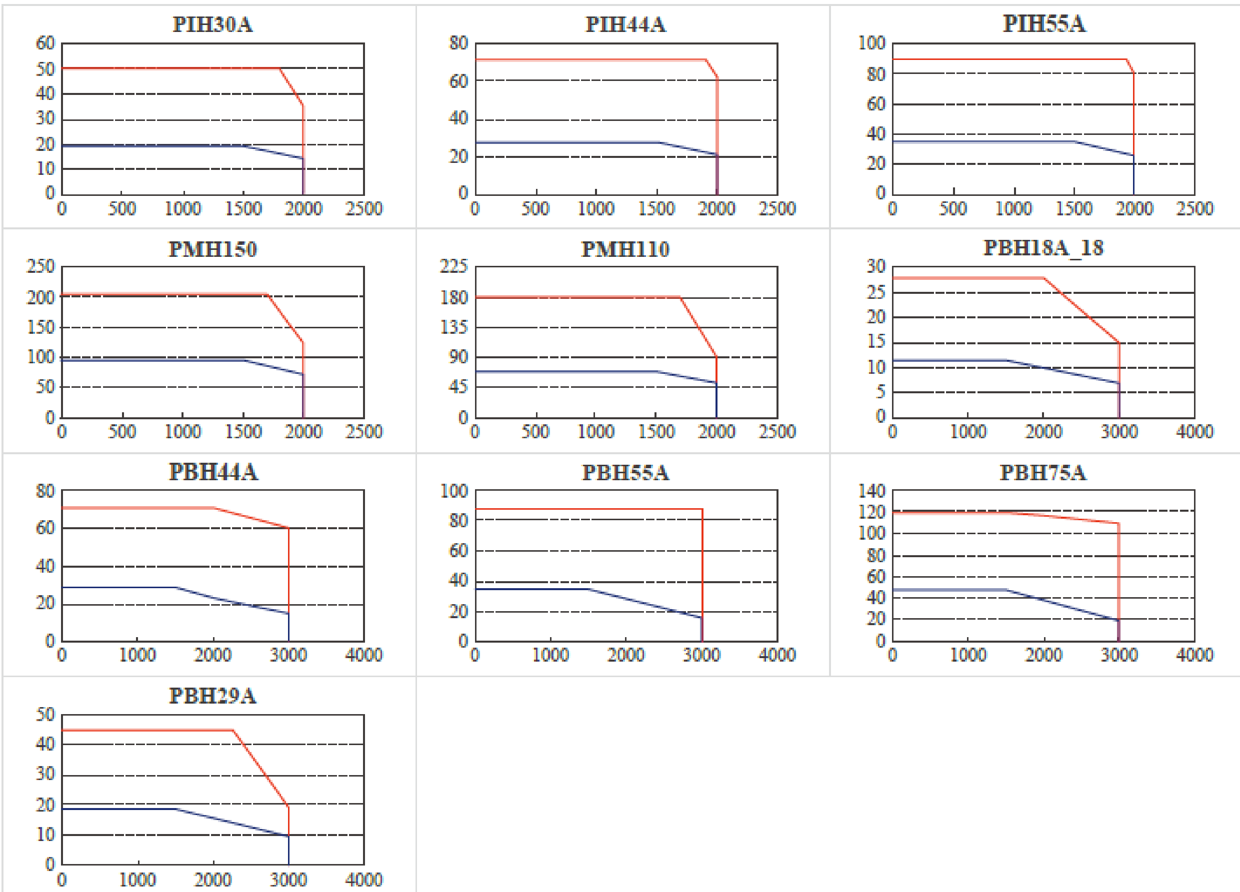


TECO

Up to 130 Frame Series

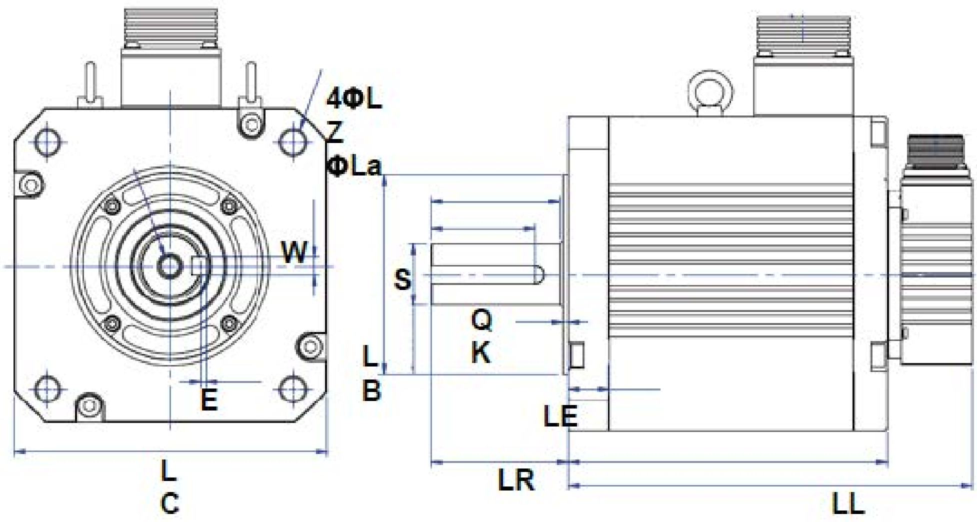


Up to 220 Frame Series



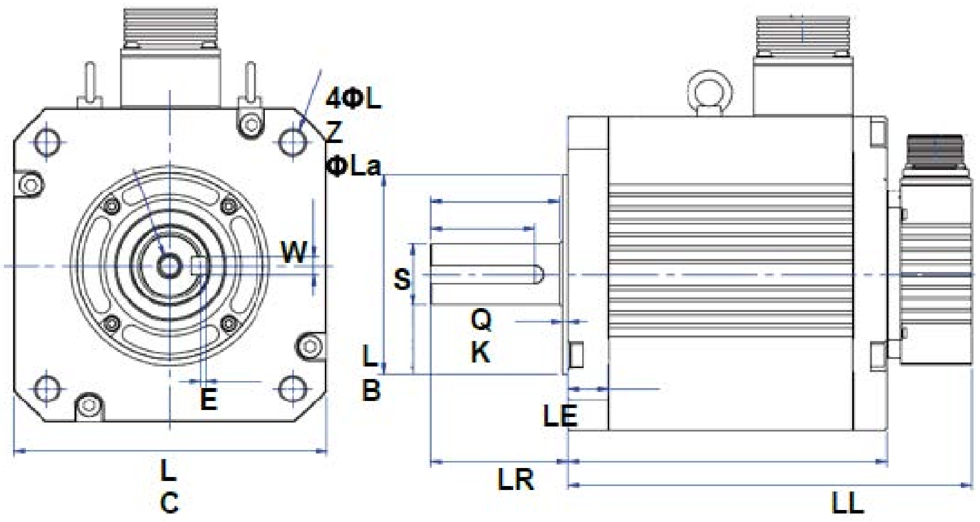
10-4 Servo Motor Dimension

Up to 80 Frame Series



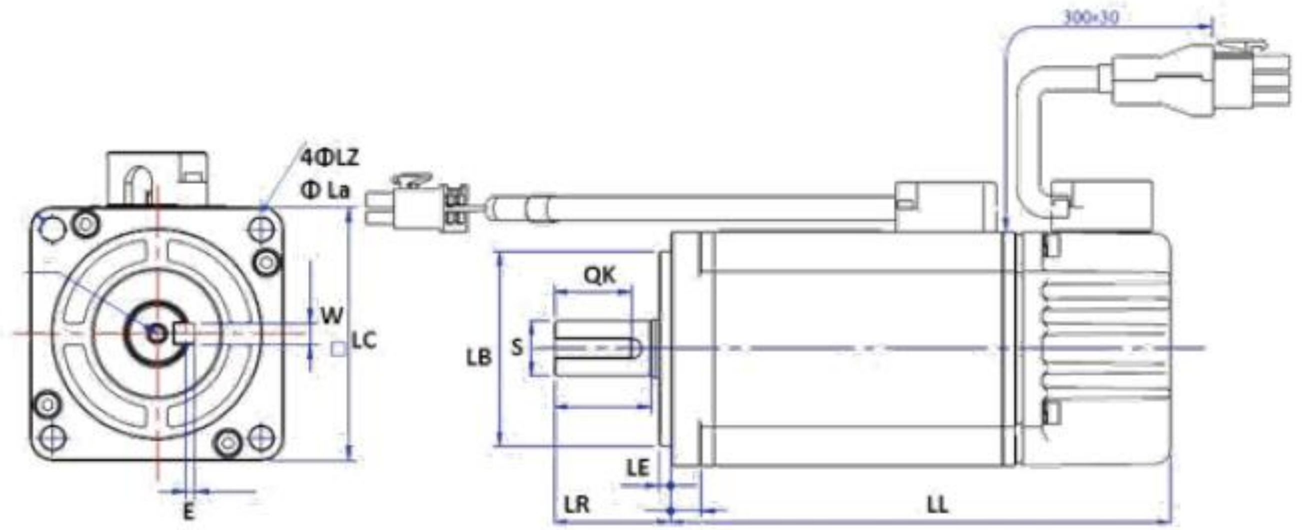
Up to 80 Frame Series JSMA-P□□□□A	JSMA-PUC Series				
	UCP5	UC01	UC02	UC04	UC08
LZ Φ	Φ 4.5	Φ 4.5	Φ 5.5	Φ 5.5	Φ 6.5
La Φ	Φ 46	Φ 46	Φ 70	Φ 70	Φ 90
LC	40	40	60	60	80
E	-	-	2	2	2.5
W	-	-	5	5	6
S Φ	Φ 8	Φ 8	Φ 14	Φ 14	Φ 19
LB Φ	Φ 30	Φ 30	Φ 50	Φ 50	Φ 70
QK	-	-	20	20	28
LE	2.5	2.5	3	3	3
LR	25	25	30	30	40
LL (Without brake)	73	88	101	123	122.2
LL (With brake)	116.6	131.6	139.5	161.5	160.5

Up to 80 Frame Series



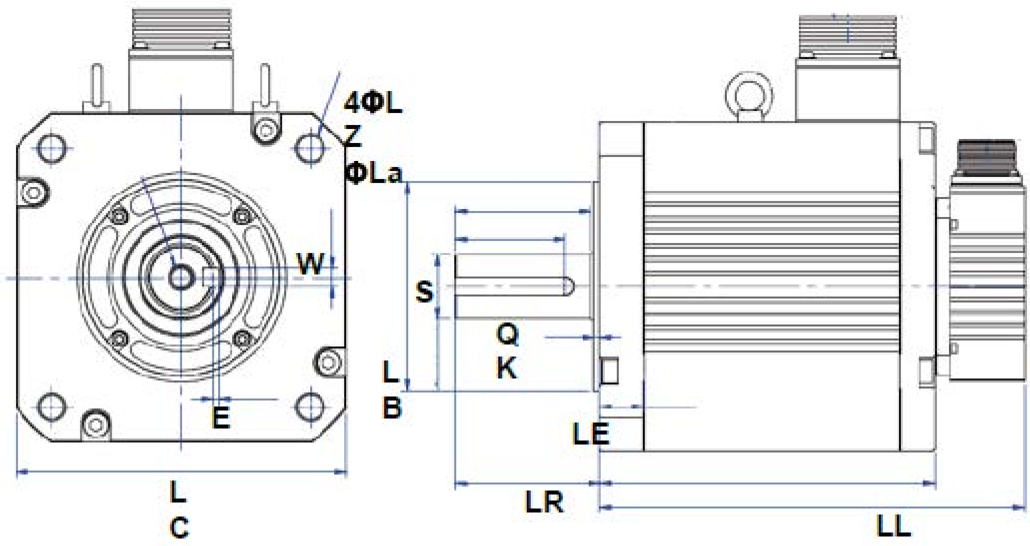
Up to 80 Frame Series JSMA-P□□□□A	JSMA-PBC Series				JSMA-PLC Series	
	BC01A	BC02A	BC04A	BC08A	LC03	LC08
LZ Φ	Φ4.5	Φ5.5	Φ5.5	Φ6.5	Φ5.5	Φ6.5
La Φ	Φ46	Φ70	Φ70	Φ90	Φ90	Φ100
LC	40	60	60	80	76	86
E	-	2	2	2.5	2	2
W	-	5	5	6	5	5
S Φ	Φ8	Φ14	Φ14	Φ19	Φ14	Φ16
LB Φ	Φ30	Φ50	Φ50	Φ70	Φ70	Φ80
QK	-	20	20	28	20	25
LE	2.5	3	3	3	3	3
LR	25	30	30	40	30	35
LL (Without brake)	86	101	101	137	113.4	148
LL (With brake)	129.6	139.5	139.5	175.3	147.8	183.2

Up to 130 Frame Series



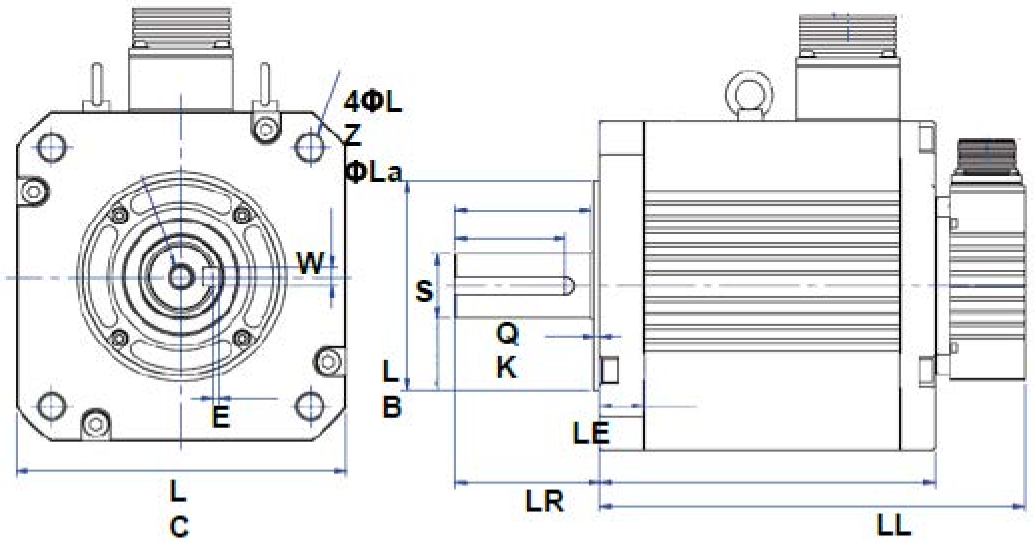
Up to 130 Frame Series JSMA-P□□□□A	MB Series				BH Series		
	MB10	MB15	MB20	MB30	BH09	BH13	BH18
LZ Φ	Φ9	Φ9	Φ9	Φ9	Φ9	Φ9	Φ9
La Φ	Φ145	Φ145	Φ145	Φ145	Φ145	Φ145	Φ145
LC	130.4	130.4	130.4	130.4	130	130	130
E	2.5	2.5	2.5	2.5	2.5	2.5	2.5
W	6	6	6	6	6	6	6
S Φ	Φ22	Φ22	Φ22	Φ22	Φ22	Φ22	Φ22
LB Φ	Φ110	Φ110	Φ110	Φ110	Φ110	Φ110	Φ110
QK	35	35	35	35	35	35	35
LE	6	6	6	6	6	6	6
LR	58	58	58	58	58	58	58
LL (Without brake)	163.8	184.8	213.8	263.8	153.3	178.3	203.3
LL (With brake)	218.3	238.3	268.3	318.3	195.9	220.9	245.9

Up to 220 Frame Series



Up to 130 Frame Series JSMA-P□□□□A	IH Series			
	IH30	IH44	IH55	IH75
LZ Φ	Φ13.5	Φ13.5	Φ13.5	Φ13.5
La Φ	Φ200	Φ200	Φ200	Φ200
LC	180	180	180	180
E	3	3	3	3
W	10	10	10	12
S Φ	Φ35	Φ35	Φ42	Φ42
LB Φ	Φ114.3	Φ114.3	Φ114.3	Φ114.3
QK	60	60	60	60
LE	3.2	3.2	3.2	3.2
LR	79	79	113	113
LL (Without brake)	191.4	221.4	248.9	306.4
LL (With brake)	243.6	273.6	301.1	359.6

Up to 220 Frame Series



Up to 130 Frame Series JSMA-P□□□□A	BH Series					MH Series	
	BH18_18	BH29	BH44	BH55	BH75	MH110	MH150
LZ Φ	Φ13.5	Φ13.5	Φ13.5	Φ13.5	Φ13.5	Φ13.5	Φ13.5
La Φ	Φ200	Φ200	Φ200	Φ200	Φ200	Φ235	Φ235
LC	180	180	180	180	180	220	220
E	3	3	3	3	3	3	4
W	10	10	10	12	12	12	16
S Φ	Φ35	Φ35	Φ35	Φ42	Φ42	Φ42	Φ55
LB Φ	Φ114.3	Φ114.3	Φ114.3	Φ114.3	Φ114.3	Φ200	Φ200
QK	60	60	60	90	90	90	90
LE	3.2	3.2	3.2	3.2	3.2	4	4
LR	79	79	79	113	113	116	116
LL (Without brake)	178.4	200.4	232.4	268.4	342.4	352	429
LL (With brake)	230.6	252.6	284.6	320.6	394.6	-	-

TECO

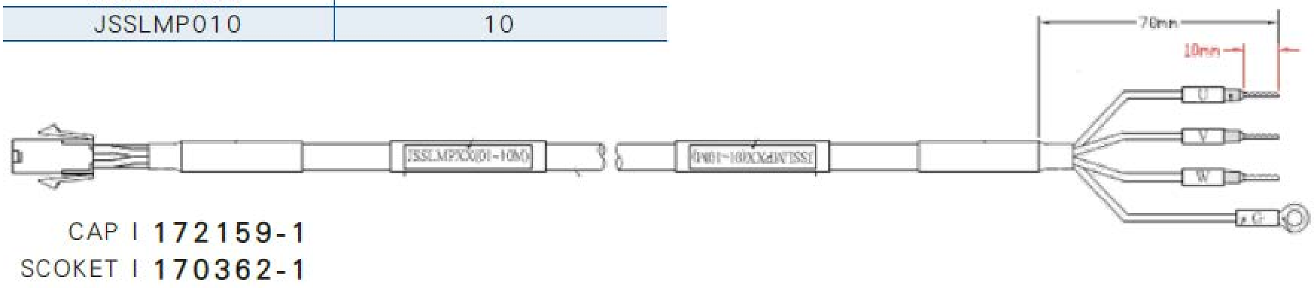
10-5 Accessories

10-5-1 Motor Power Cable

§ Motor power cable §

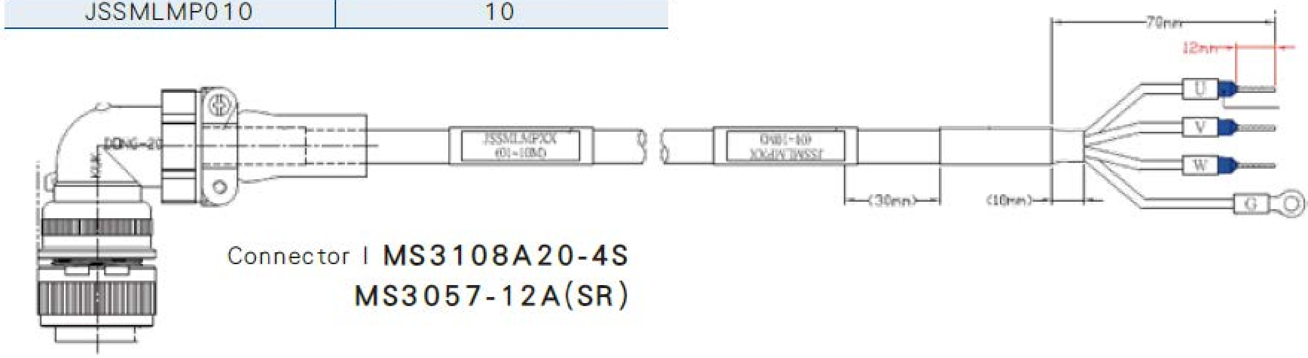
JSSLM – use with motors of UC / BC / LC03~08 series

No.	Length (m)
JSSLMP001	1
JSSLMP003	3
JSSLMP005	5
JSSLMP010	10



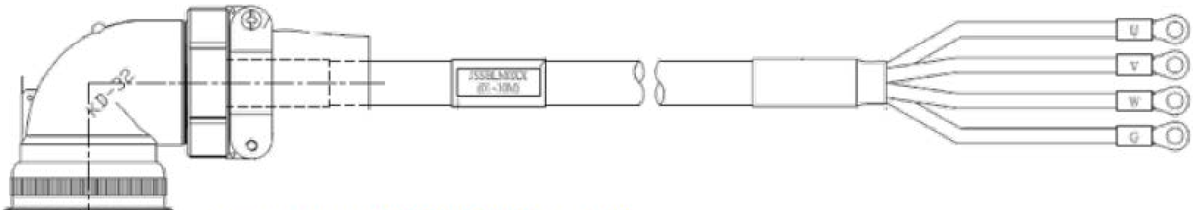
JSSMLM –use with motors of MA / MB / MC / BH09~BH18 series

No.	Length (m)
JSSMLMP001	1
JSSMLMP003	3
JSSMLMP005	5
JSSMLMP010	10



JSSBLM –use with motors of IH44~IH75 / BH44~BH55 series

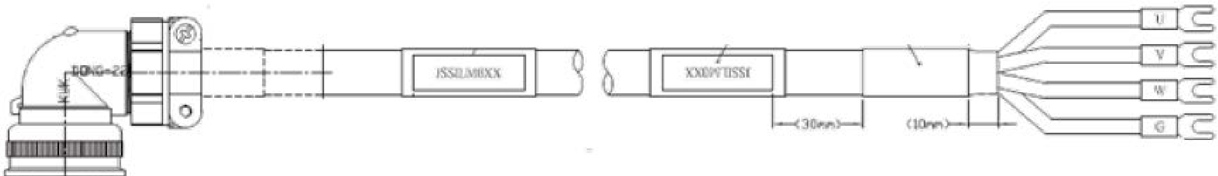
No.	Length (m)
JSSBLM001	1
JSSBLM003	3
JSSBLM005	5
JSSBLM010	10



Connector：MS3108A32-17S
MS3057-20A(SR)

JSSILM –use with motors of BH29 series

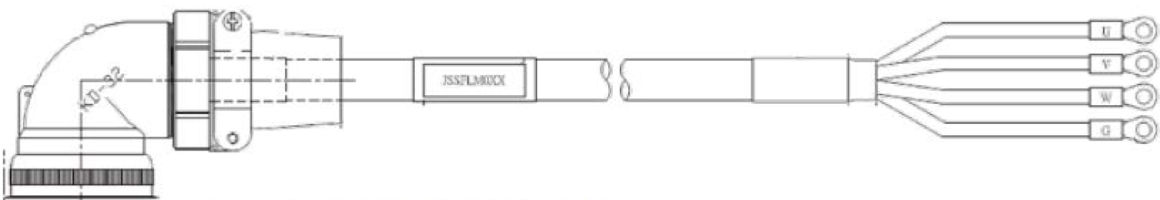
No.	Length (m)
JSSILM001	1
JSSILM003	3
JSSILM005	5
JSSILM010	10



Connector：MS3108A22-22S
MS3057-12A(SR)

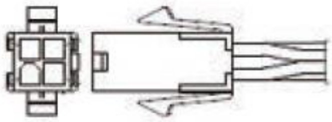
JSSFLM –use with motors of IH110~150 / BH75 series

No.	Length (m)
JSSFLM001	1
JSSFLM003	3
JSSFLM005	5
JSSFLM010	10



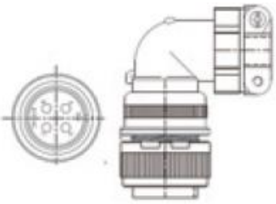
Connector：MS3108A32-17S
MS3057-20A(SR)

§ Motor power connector §



JSSCNM04

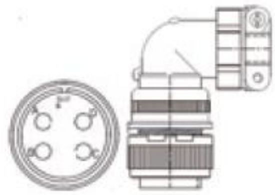
CAP	SCOKET
172159-1	170362-1



JSSCNML04

Connector

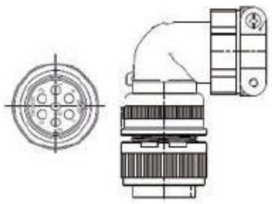
MS3108A20-4S
MS3057-12A(SR)



JSSCNBL04

Connector

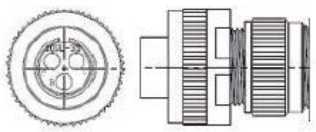
MS3108A32-17S
MS3057-20A(SR)



JSSCNML07 (Include brake connector)

Connector

MS310820-15S
MS3057-12A(SR)



JSSCNBL03 (Brake connector)

Connector

MS3106A10SL-3S
MS3057-4A(SR)

10-5-2 Encoder Trunk

§ Incremental encoder trunk §

JSSLG – use with motors of UC / BC / LC03~08 series

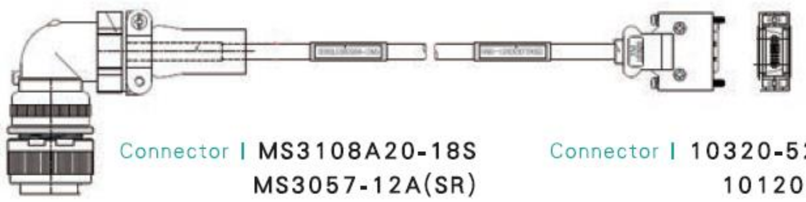
No.	Length (m)
JSSLG001	1
JSSLG003	3
JSSLG005	5
JSSLG010	10

Connector | 172161-1
Terminal | 170361-1

Connector | 10320-52A0-008
10120-3000PE

JSSMLG –use with motors of MA / MB / MC / BH / IH series

No.	Length (m)
JSSMLG001	1
JSSMLG003	3
JSSMLG005	5
JSSMLG010	10



Connector | MS3108A20-18S
MS3057-12A(SR)

Connector | 10320-52A0-008
10120-3000PE

§ Absolute encoder trunk §

JSSLG – use with motors of UC / BC / LC series

Encoder trunk (use with absolute value type encoder)

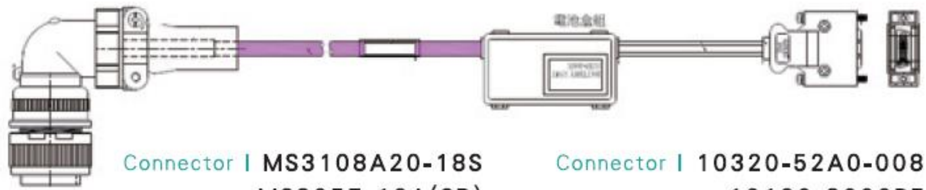
No.	Length (m)
JSSLB001	1
JSSLB003	3
JSSLB005	5
JSSLB010	10

Connector | 172161-1
Terminal | 170361-1

Connector | 10320-52A0-008
10120-3000PE

JSSMLG –use with motors of MA / MB / MC / BH / IH series

No.	Length (m)
JSSMLB001	1
JSSMLB003	3
JSSMLB005	5
JSSMLB010	10

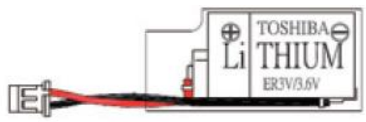


Connector | MS3108A20-18S
MS3057-12A(SR)

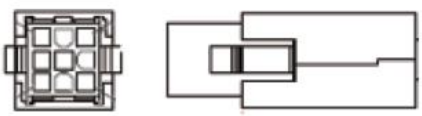
Connector | 10320-52A0-008
10120-3000PE

§ Absolute encoder battery §

No.
JSSBATS

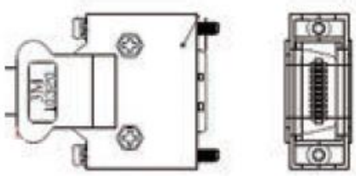


§ Encoder connector §



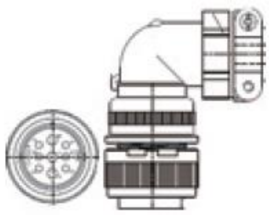
JSSCNP09

Connector: 172161-1
Terminal: 170361-1



JSSCN20P

Connector
10320-52A0-008
10120-3000PE



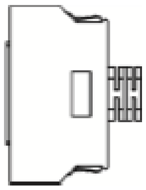
JSSCNPL09

Connector
MS3108A20-18S
MS3057-12A(SR)

10-5-3 I/O Connector

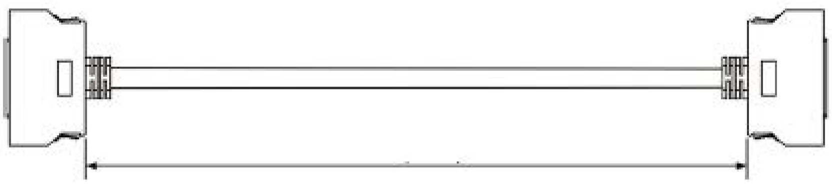
§ I/O connector terminal §

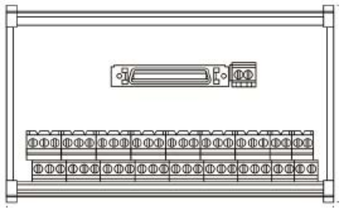
No.
JSSCN50P



§ I/O connector wire + terminal block §

No.	Length (m)
JSSTBC0P5	0.5
JSSTBC001	1
JSSTBC002	2
JSSTB50P	—

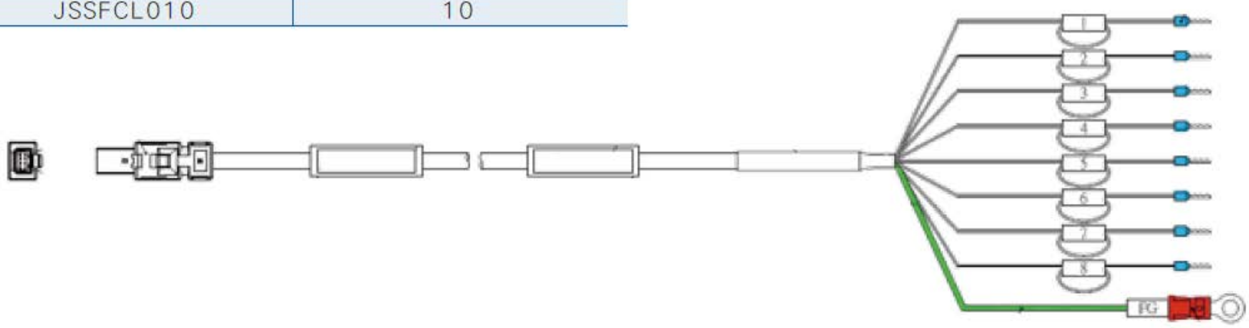




10-5-4 Full closed loop wire

§ Full-closed loop wire §

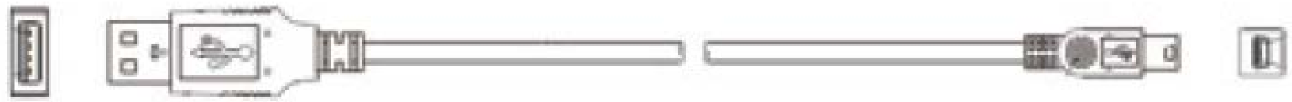
No.	Length (m)
JSSFCL001	1
JSSFCL003	3
JSSFCL005	5
JSSFCL010	10



10-5-5 Communication Cable

§ Computer communication cable §

No.	Length (m)
JSSDUC001	1
JSSDUC002	2

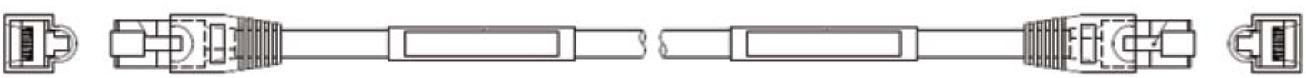


Connector I USB

Connector I Mini-USB

§ Ethernet / CANopen / RS-485 communication cable §

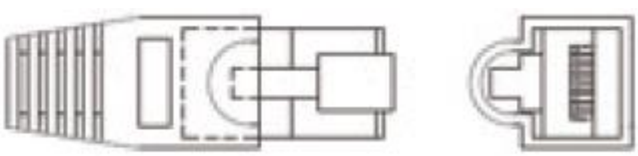
No.	Length (m)	No.	Length (m)
JSSRTR0001	0.1	JSSRTR0020	2
JSSRTR0003	0.3	JSSRTR0030	3
JSSRTR0005	0.5	JSSRTR0040	4
JSSRTR0010	1	JSSRTR0050	5



Connector I RJ-45

§ CANopen / RS-485 terminal resistor §

No.
JSSTR01



Chap 11 Appendix

11-1 Manual Revision History

Version	Add/Revision	Description
V1.04	Revision	Revised chapter description ● 1-1-3 Servo Driver and Servo Motor Matching Comparison Table ● 3-2 State display function description ● 3-3 Diagnostic Function Description ● 5-5-6 Tool magazine parameter setting ● 5-6-10 Absolute Value Encoder Battery Error Alarm Output ● 6-3 Automatic Gain Adjustment (Off-line tuning) Instructions ● 6-4 Notch Filter ● 6-5 Low frequency suppression function ● 6-6 Manual gain adjustment ● 7-3-1 System parameter (Cn0□□) ● 7-3-8 Monitoring parameter (Un-□□) ● 8 Communication function
	Add	Added data ● 7-2 Parameter Function List ⇨ AddUn & dn parameters Added chapter ● 10-3 Servo Motor Specification ● 10-4 Servo Motor Dimension ● 10-5 Accessories ● 10-5-1 Motor Power Cable ● 10-5-2 Encoder Trunk ● 10-5-3 I/O Connector ● 10-5-4 Communication cable ● 11 Appendix ● 11-1 Manual Revision History
V1.05	Revision	● 7-3-1 System parameter (Cn0□□) ⇨ Revise Cn037.2 description ● 8-3-6 EtherCAT servo control ⇨ revision illustration and description
	Add	Added chapter ● 5-6-16 Gantry Synchronization Function Description

Version	Add/Revision	Description
V1.06	Revision	● Chap 7 Parameter Function ⇨ Cn012 (External regenerative resistor power setting) 400V model default revision ⇨ Change Cn027 (Analog monitoring output 1 offset adjustment), Cn028 (Analog monitoring output 2 offset adjustment) to effective after rebooting. ⇨ Change the effective method of Cn031.3 (motor series selection) ⇨ Tn109, Sn216 setting range adjustment
	Add	● 1-1-3 Servo Driver and Servo Motor Matching Comparison Table ⇨ Add new matching motor ● 7-3-11 Monitoring parameter (Un-□□) & 3-2 State display function description ⇨ Un-88 (Total ServoOn time), Un-89 (Total PowerOn time)
	Remove	● 3-3 Diagnostic function description & 7-3-12 Diagnostic parameter (dn-□□) ⇨ dn-14 (EtherCAT XML version display)