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Safety Precautions

This section describes the important matters that users must comply with when the product arrives, such as confirmation, storage, handling, installation, wiring, operation, inspection, and abandonment.

Danger

- **Input power.**
  The input power supply of the driver is AC220V or AC380V. Please input the power supply according to the driver nameplate.
- **When installed on the machine to start running, please put the motor in a state that can be stopped at any time.**
  Otherwise, personal injury and mechanical damage may occur.
- **When the power is on, make sure to install the cover of the power terminal block.**
  Failure to do so can result in electric shock.
- **Do not touch the power terminal while the CHARGE indicator is on after the power is turned off or after the voltage resistance test.**
  Otherwise it will cause electric shock due to residual voltage.
- **Please follow the steps and instructions in the user manual corresponding to the product for trial operation.**
  The servo motor is installed in the mechanical state, if the operation error occurs, it will not only cause mechanical damage, but also sometimes lead to personal injury accidents.
- **Please do not modify this product, and do not set, disassemble or repair other than designated personnel.**
  Failure to do so can result in injury, mechanical damage or fire.
- **Please set a stop device on the mechanical side to ensure safety.**
  The holding brake of a servo motor with a brake is not a stopping device used to ensure safety. Failure to do so could result in injury.
- **Ensure that the ground terminal of the servo driver is connected to the ground terminal (the ground resistance of the power input servo driver is less than 100Ω).**
  Failure to do so could result in electric shock or fire.

Care and Handling

- **Do not store or store in the following environment.**
  Failure to do so can result in fire, electric shock or machine damage.
  - Places in direct sunlight.
  - Place where the ambient temperature exceeds the storage and setting temperature conditions.
  - Places where the relative humidity exceeds the storage and setting humidity conditions.
  - Places with corrosive gases and combustible gases.
  - Places where dust, dust, salt and metal powder are abundant.
  - Places where water, oil and drugs are easily splashed.
  - Vibrations or shocks are transmitted to the site of the subject.
- **Do not handle cables, motor shafts, or detectors.**
  Failure to do so may result in injury or failure.

Operational Attention

- **In order to prevent accidents, please test run the servo motor unit (the machine is not connected to the drive shaft of the servo motor).**
  After the test run is correct, the machine is connected to run. Failure to do so could result in injury.
- **When it is installed on the supporting machine, please set the parameters in accordance with the machine in advance.**
  If the operation is started without parameter setting, it will lead to mechanical loss of control or failure.
- **Do not frequently ON/OFF the power supply.**
  Because the power supply part of the servo driver has a capacitor, a large charging current will flow when the power is ON. Therefore, if the power is frequently ON/OFF, the performance of the main loop components inside the servo drive will be degraded.
- **Please note that the emergency stop function due to forward side overdrive and reverse side overdrive is invalid during JOG operation (Fn02) and manual load inertia detection (Fn15).**
  Failure to do so may result in machine damage.
- **When using the servo motor on the vertical axis, please set the safety device to prevent the workpiece from falling under the state of alarm, overdrive, etc. In addition, please set up a fixed stop via zero in the event of an overshoot.**
  Otherwise, it may cause the workpiece to drop in the out-of-range state.
- **Extreme parameter adjustment and setting changes will cause the servo system to become unstable, please never perform such operations.**
  Otherwise, personal injury and machine damage may occur.
- **When an alarm occurs, reset the alarm after eliminating the cause and ensuring safety, and restart the operation.**
  Failure to do so may result in machine damage, fire or injury.
- **Do not use the brake of a servo motor with a holding brake for braking.**
  Failure to do so may result.
- **Please use the servo motor and servo drive in the specified combination.**
  Failure to do so may result in fire or failure.

Maintenance attention

- **Do not change the wiring while powered on.**
  Failure to do so may result in electrocution or injury.
- **When replacing the servo drive, copy the parameters of the servo drive to be replaced to the new servo drive, and then start running again.**
  Failure to do so may result in machine damage.

Other attention

- For the purpose of elaboration, some illustrations in this manual are depicted without enclosures or safety guards. In actual operation, be sure to install the cover or safety protection body to the original position according to the regulations, and then run according to the instructions in the user manual.
- The illustrations in this manual are representative legends and may differ from the products you received.
- During the debugging and use of the drive, please set the relevant protection and safety device. The Company shall not be liable for the special losses, indirect losses and other related losses caused by the Company's products.
- The information contained in this manual is a general description or feature introduction and may not always be exactly as described in practical application or may not be fully applicable due to further development of the product.

1 Summary

1.1 Product Examination

In order to prevent negligence during the purchase and delivery of this product, please check the items listed in the table below.

Item	Reference
Is the arrived product the type you want to buy?	Check the model number on the motor and driver nameplates separately, see the model description listed in the next section.
Is the motor shaft running smoothly?	Rotate the motor shaft by hand, if it can run smoothly, it means that the motor shaft is normal. However, a motor with an electromagnetic brake cannot be run smoothly by hand.
Is the appearance damaged?	Visually inspect for any damage to appearance.
Are there loose screws?	Use a screwdriver to check whether the servo drive mounting screw is loose.

If any of the above situations occur, please contact the agent or manufacturer for proper resolution.

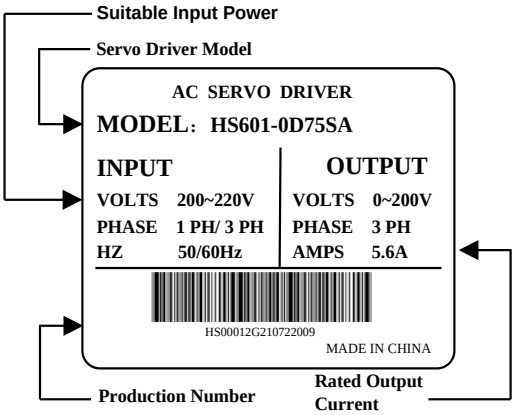
A complete set of servo components should include the following items.

Serial Number	Reference
1	Servo drive and its matching servo motor.
2	Motor power line: Driver motor power plug (standard) or a UVW motor power cable (optional).
3	Motor encoder line: A plug for the driver encoder and a plug for the motor encoder (standard) or an encoder signal cable (optional).
4	CN1 uses an RJ45 connector for RS485 communication. (Optional)
5	CN2 uses DB-44-A connectors (Nance analog products). (Optional)
6	CN3 uses DB-9P connectors (Nance analog products). (Optional)
7	Driver power input plug: 5PIN quick connector terminals (L1, L2, L3, L1C, L2C) (Type A, Type B chassis only)
8	External brake resistors and DC reactor plugs: 5PIN quick connector terminals (P, D, C, 1, 2) (Type A, Type B chassis only)
9	Two metal short circuits
10	An installation manual

1.2 Product Model

1.2.1 Nameplate Description

HS601 Series Servo Driver Nameplate Description:



1.2.2 Model Description

Servo Driver Model Description

HS 601– 01D5 S A – □□□□

Servo Driver Name：HS 【1】 【2】 【3】【4】 【5】

【1】Servo Driver Series

Mark	Specification
601	601 Series
602	602 Series

【2】Servo Driver Power

Mark	Specification	Mark	Specification
0D40	400W	04D5	4.5KW
0D75	750W	05D5	5.5KW
0001	1.0KW	07D5	7.5KW
01D5	1.5KW	0011	11KW
02D2	2.2KW	0015	15KW
0003	3.0KW	0022	22KW

【3】Power Phase Number

Mark	Specification
A	Single Phase
T	Three Phase

【4】Rated Input Voltage

Mark	Specification
A	220V
B	380V

【5】Plant Code

Mark	Specification
Not	Common Specification 1
001	Dynamic Brake
300	CAN Communications

Servo Motor Model Description

H A 1 - 130 A 10 A K M - XX

Servo Motor Name：H 【1】 【2】 【3】【4】【5】【6】【7】【8】 【9】

【1】Voltage Classes

Mark	Specification
A	220V/5 Opposites
B	380V/5 Opposites
E	220V/4 Opposites
F	380V/4 Opposites

【2】Generations of Products

Mark	Specification
1	First Generation Product

【3】Flange

Mark	Specification
40	40 Flange
60	60 Flange
80	80 Flange
130	130 Flange
180	180 Flange
220	220 Flange

【4】Rated Speed

Mark	Specification
A	1000r/min
B	1500r/min
C	2000r/min
D	3000r/min

【5】Rated Power

Mark	Specification	Mark	Specification
04	400W	30	3.0KW
06	600W	45	4.5KW
07	750W	55	5.5KW
08	850W	75	7.5KW
10	1.0KW	A1	11KW
15	1.5KW	A5	15KW
22	2.2KW	B2	22KW

【6】With or without brakes

Mark	Specification
A	Without brake
B	With brake

【7】Encoder Type

Mark	Specification
E	Provincial line increment 2500ppr
K	Provincial line increment 5000ppr
J	17-bit absolute value
Q	Provincial line increment 5000ppr

【8】Shaft End Specification

Mark	Specification
K	With keyway, no oil seal
Y	No keyway, with oil seal
M	With keyway and oil seal
N	No keyway and oil seal

【9】Non-standard

Mark	Specification
-Z01	Shaft end non-standard
-F	With fan
-D	With base

1.3 Driver And Motor Parameter Matching Tabl

This driver is designed for the use of the motor specified by our company, please confirm the motor model, rated output, voltage specifications, encoder specifications.

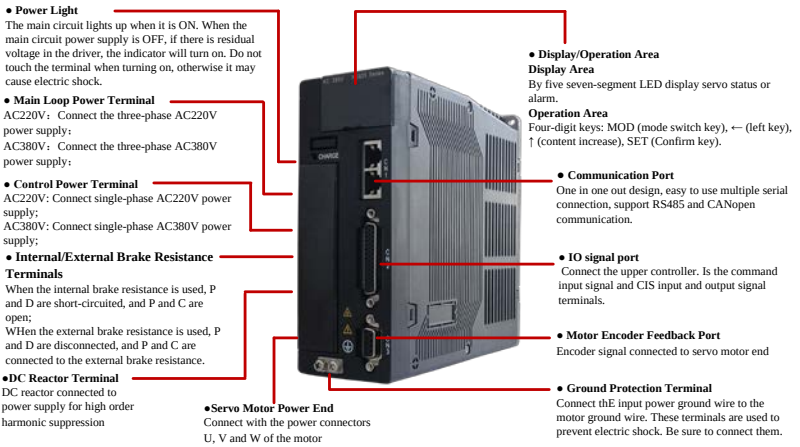
Driver				Motor				
Model	Chassis Type	Input Power	Pn012 Numeral Value	Model	Rated Power	Rated Speed	Rated Torque	Encoder Specification
HS601-0D20SA	Type A	220V	5002	HA1-60D02A	200W	3000rpm	0.64N·M	
HS601-0D40SA	Type A	220V	5003	HA1-60D04A	400W	3000rpm	1.27N·M	
HS601-0D75SA	Type B	220V	5012	HA1-80D07A	750W	3000rpm	2.37N·M	
HS601-0001SA	Type B	220V	5013	HA1-80D10A	1KW	3000rpm	3.2N·M	
HS601-0001SA	Type B	220V	5033	HA1-130C10A	1KW	2000rpm	5N·M	
HS601-01D5SA	Type B	220V	5034	HA1-130C12A	1.2KW	2000rpm	6N·M	
HS601-01D5SA	Type B	220V	5035	HA1-130C15A	1.5KW	2000rpm	7.2N·M	
HS601-02D2SA	Type C	220V	5041	HA1-130C15A	1.5KW	2000rpm	7.2N·M	
HS601-02D2SA	Type C	220V	5042	HA1-130C22A	2.2KW	2000rpm	10.5N·M	
HS601-0003SA	Type C	220V	5045	HA1-130C30A	3.0KW	2000rpm	14.3N·M	2500PPR、
HS601-0003SA	Type C	220V	4070	HE1-180B30A	3.0KW	1500rpm	19.1N·M	5000PPR、
HS601-02D2TB	Type C	380V	5042	HB1-130C22A	2.2KW	2000rpm	10.5N·M	17bit
HS601-0003TB	Type C	380V	5045	HB1-130C30A	3.0KW	2000rpm	14.3N·M	
HS601-0003TB	Type C	380V	4070	HF1-180B30A	3.0KW	1500rpm	19.1N·M	
HS601-04D5TB	Type C	380V	4072	HF1-180B45A	4.5KW	1500rpm	28.6N·M	
HS601-05D5TB	Type D	380V	4073	HF1-180B55A	5.5KW	1500rpm	35N·M	
HS601-07D5TB	Type D	380V	4074	HF1-180B75A	7.5KW	1500rpm	47.7N·M	
HS601-0011TB	Type E	380V	4078	HF1-180BA1A	11KW	1500rpm	70N·M	
HS601-0015TB	Type E	380V	4100	HF1-200CA5A	14.7KW	2000rpm	70N·M	
HS601-0022TB	Type E	380V	4101	HF1-200CB2A	22KW	2000rpm	105N·M	
HS601-0015TB	Type E	380V	4125	HF1-220CA5A	15KW	1500rpm	92N·M	
...								

Note:

1. The above table only lists some motor and drive models, and only 3 encoder types are listed, if in doubt, please call the company to confirm.

2. Please refer to Section 11.3 for the dimensions of the drive case.

1.4 Name Of Each Part Of The Drive



1.5 Maintenance And Inspection

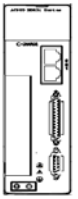
Perform regular maintenance and inspection of the drive and motor for safe and easy use. Routine inspection and periodic inspection shall be carried out according to the following items.

Type	Search Cycle	Inspection Item
Daily Check	Daily	・ Check the temperature, humidity, dust, foreign matter, etc. of the environment in which h is used. ・ Is there any abnormal vibration or sound. ・ The input power voltage is normal. ・ Is there any odor ? ・ Whether there are foreign objects such as fiber thread stuck to the vent. ・ Driver front, connector cleanliness. ・ Whether the motor connecting part with the control device and equipment is loose and the core foot is deviated. ・ There is no foreign body embedded in the load part.
Regular Checking	1 year	・ Check whether the fastening part is loose. ・ Any signs of overheating. ・ Whether the terminal is damaged or loose.

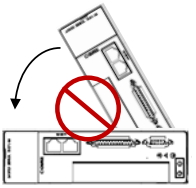
2 Install

2.1 Installation Direction And Space

The installation direction must comply with the specified requirements; otherwise, faults may occur. In order to make the cooling cycle effect good, when installing the AC servo drive, it must maintain enough space with the adjacent items and baffles (walls), otherwise it will cause failure. When the AC servo drive is installed, its suction and exhaust holes should not be sealed, nor should they be placed over, otherwise it will cause failure.

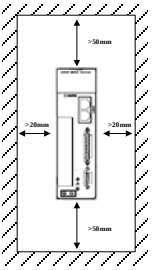


Correct Method



MIstake Method

In order to enable the cooling fan to have a relatively low wind resistance in order to effectively discharge heat, the user should comply with the recommended installation distance between one and multiple AC servo drivers (as shown in the figure below).



2.2 Recommended Circuit Breakers And Fuses Specification Sheet

■ 220V Type

Chassis Type	Breaker	Fuse（Class T）
A Type	10A	20A
B Type	20A	40A
C Type	30A	80A
D Type	50A	120A

Note:
1. Highly recommended: Use UL/CSA approved fuses and circuit breakers.
2. If the driver is equipped with a leakage circuit breaker as a leakage fault protection, in order to prevent the leakage circuit breaker from operating incorrectly, please select the inductive current above 200Ma and the operation time is more than 0.1 seconds.

2.3 Noise Interference And Countermeasures Of Higher Harmonics

Because the main circuit of the servo driver uses high-speed switching elements, the noise of switching elements may be affected when wiring and grounding the peripheral of the servo driver. In order to prevent the occurrence of noise, the following noise countermeasures can be taken according to the need.

- Install a noise filter on the input side of the driver main loop cable.
- Connection of AC/DC reactors for high order harmonic suppression.
- If possible, set the command input device and noise filter near the servo drive.
- When wiring, the main loop cable (cable for the main loop of the motor) and the input and output signal line should leave more than 30cm. Do not put in the same casing or bundle together.
- Do not use the same power supply with welding machines, EDM processing machines, etc. Even if it is not the same power supply, when there is a high-frequency signal generator nearby, connect a noise filter on the input side of the main loop cable.
- Perform proper grounding.

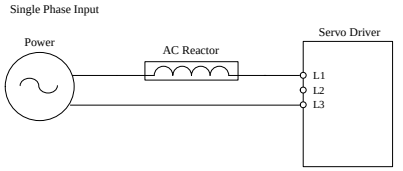
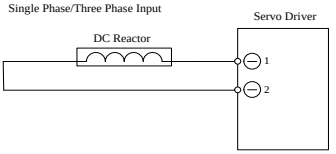
2.3.1 Install Noise Filter

In order to ensure that the EMI Filter can exert the maximum effect to suppress servo driver interference, in addition to the servo driver must be able to install and wire according to the content of the user manual, the following points should be noted:

Item	Content
1	Both the servo driver and the noise filter must be mounted on the same metal plane.
2	Wiring should be as short as possible.
3	The metal plane should be well grounded.
4	The metal housing or ground of the servo driver and noise filter must be reliably fixed on the metal plane, and the contact area between the two should be as large as possible.
5	Electric motor power line using shielded copper mesh cable (if there is a double shield layer is better).
6	The shielded copper mesh at both ends of the motor wire must be grounded at the shortest distance and maximum contact area.

2.3.2 Connection Of AC/DC Reactors For High Order Harmonic Suppression

When it is necessary to take higher harmonic countermeasures, an AC/DC reactor for higher harmonic suppression can be connected to the servo drive.
Please refer to the figure below to connect the reactor.

Use an AC reactor	Use an DC reactor
	

2.4 Selection Of Regenerative Resistors

When the torque of the motor and the speed of the opposite direction, it represents the energy from the load end back to the driver. This energy is injected into the capacitor of the DC Bus to cause its voltage value to rise. When it rises to a certain value, the recharge energy can only be consumed by regenerating resistance. The driver contains a regenerative resistor, and the user can also connect an external regenerative resistor.

The following table provides specifications with regenerative resistors for the HS601 220V series.

Chassis Type	Internal Regenerative Resistance Specifications		Minimum Allowable Resistance （Ohm）
	Resistance Value （Ohm）	Capacity （Watt）	
A Type	—	—	30
B Type	30(220V)	60	20
C Type	30(220V)\ 40(380V)	80	13(220V)\ 30(380V)
D Type	20(220V)\ 40(380V)	100	10(220V)\ 20(380V)

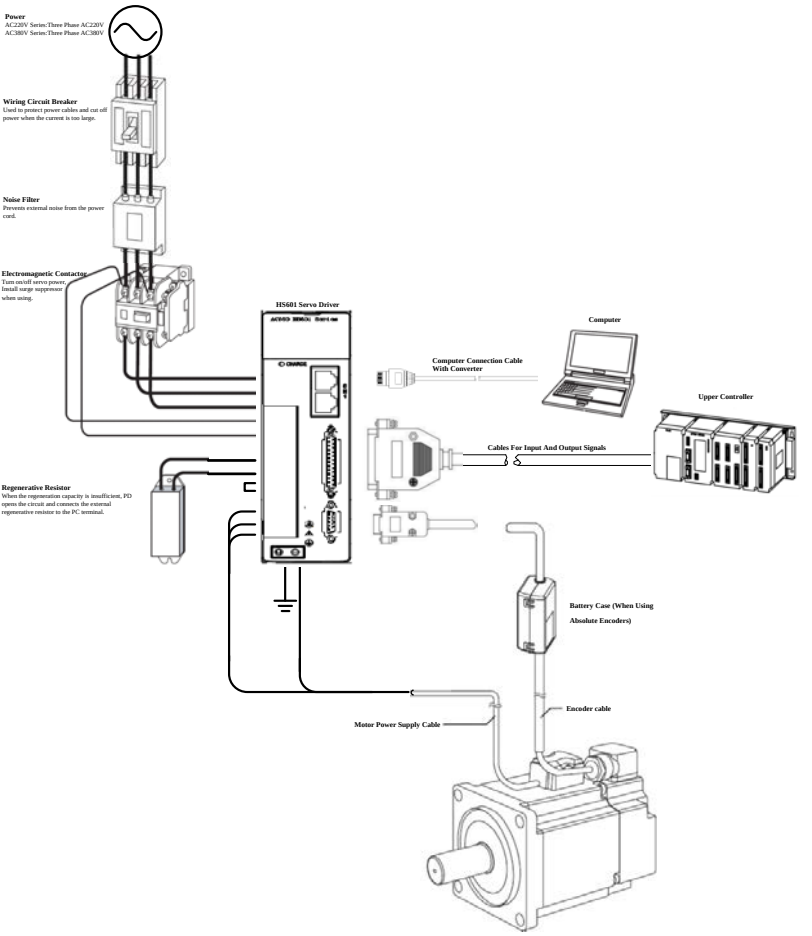
When the regenerative capacity exceeds the regenerative capacity that the built-in regenerative resistor can handle, an external regenerative resistor should be connected. Note the following items when using a regenerative resistor.

Item	Content
1	Set the resistance value and capacity of the regenerative resistor correctly; otherwise, the function will be affected.
2	When the user wants to connect an external regenerative resistor, please make sure that the resistance value used is not less than the minimum allowable resistance value; If the user wants to increase the power of the regenerative resistor in parallel, determine whether its resistance value meets the limit.
3	In the natural environment, when the regenerative capacity (average) that the regenerative resistor can handle is used at the rated capacity, the temperature of the resistance will rise to more than 120℃ (in the case of continuous regenerative). For safety, a regenerative resistor with a thermal switch is recommended.
4	When an external regenerative resistor is used, the resistor is connected to the P and C terminals, and the P and D terminals are open. External regenerative resistance try to select the resistance value suggested in the table above.

3 Wiring

3.1 System Structure And Wiring

3.1.1 Servo System Architecture



3.1.2 Connector And Terminal Of The Driver

Terminal Marking	Name	Explain
L1，L2，L3	Main loop power input terminal	Connect the three-phase AC power supply. (According to the product model, select the appropriate voltage specification).
L1C，L2C	Control loop power input terminal	Connect the single-phase AC power supply. (According to the product model, select the appropriate voltage specification).
P，D，C	External regenerative resistor connection terminal	If a built-in regenerative resistor is used: Short circuit between P and D. When the capacity of the built-in regenerative resistor is insufficient: open the circuit between P and D (remove the short wiring), and connect the external regenerative resistor between P and C. External regenerative resistors can be purchased separately.
⊖1，⊖2	DC for high harmonic suppression of power supply Reactor connection terminal	Usually, a short circuit is performed in ⊖1 or ⊖2 rooms. When it is necessary to suppress the higher harmonics of the power supply, connect the DC reactor between 1 and 2.
U，V，W	Servo motor connection terminal	Connect with servo motor.
⏚	Ground terminal	Connect to the ground terminal of the power supply and the ground terminal of the motor for grounding treatment.
CN1	Communication port connector	RJ45 connector for RS-485 communication (optional).
CN2	I/O connector	Connect to the upper controller.
CN3	Encoder connector	Encoder for connecting the motor.

Note: The E-type chassis does not have a built-in resistor, and the external resistor must be connected between P and C.

3.1.3 Wiring Of The Main Loop

1) Servo driver main loop wire size

External Terminal Name	Terminal Symbol	Wire Diameter mm2(AWG)				
		HS601-				
		0D02A	0D04A	0D75A	0001A	01D5A
Main Loop Power Line	L1、L2、L3	1.25(AWG-16)		2.0(AWG-14)		
Control Power Cord	L1C、L2C	1.25(AWG-16)				
Motor Power Line	U、V、W	1.25(AWG-16)		2.0(AWG-14)		
External Regenerative Resistance Wire	P，D，C	1.25(AWG-16)				
Ground Lead	⏚	2.0(AWG-14)以上				

2）Typical main loop wiring example

Main loop wiring attention

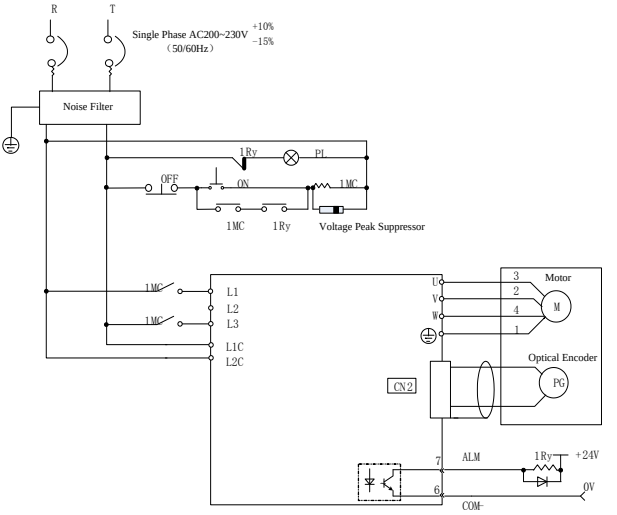
In the design of power connection smooth control, please consider the following points.

Please design the power connection smooth control as follows: After the output "servo alarm" signal, the main loop power supply should be in the OFF state.

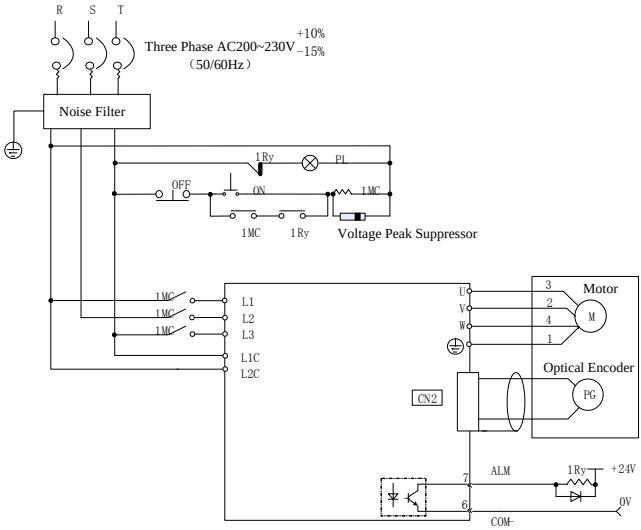
When switching on the control power supply and the main loop power supply, switch on the main loop power supply at the same time or after switching on the control power supply.

When cutting off the power supply, disconnect the control power supply after cutting off the main loop power supply.

◆ **Single Phase AC220V Power Input**

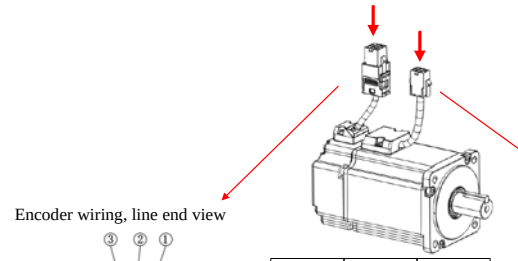


◆ **Three Phase AC220V Power Input**

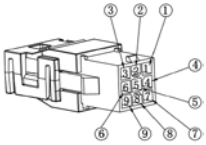


3.2 Wiring At The Motor End

3.2.1 Quick Plug Terminal Outline And Definition

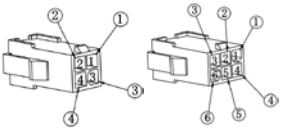


Encoder wiring, line end view



	Dart Type Encoder	Communication Encoder	Rotary Encoder
CABLE CODE	DESCRIPTION	DESCRIPTION	DESCRIPTION
1	+5V	+5V	
2	0V	0V	
3	PA	PD+	SIN+
4	/PA	PD-	SIN-
5	PB	BAT+	COS+
6	/PB	BAT-	COS-
7	PZ		REF+
8	/PZ		REF-
9	FG	FG	FG

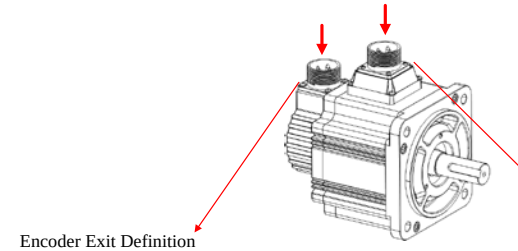
Power distribution, line end view



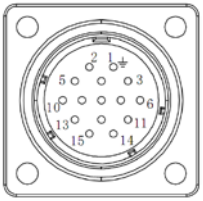
Motor End Power Plug（4P）	
CODE	DESCRIPTION
1	U
2	V
3	W
4	PE

Motor End Power Plug（6P with holding brake）	
CODE	DESCRIPTION
1	U
2	V
3	W
4	PE
5	+24V
6	24VGND

3.2.2 Aviation Plug Terminal Outline And Definition

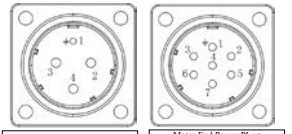


Encoder Exit Definition



	Dart Type Encoder	Communication Encoder	Rotary Encoder
CABLE CODE	DESCRIPTION	DESCRIPTION	DESCRIPTION
1	FG	FG	FG
2	+5V	+5V	COS-
3	0V	0V	SIN-
4	PA	PD+	SIN+
5	PB	BAT+	REF+
6	PZ		COS+
7	/PA	PD-	REF-
8	/PB	BAT-	
9	/PZ		

Power Outlet Definition



Motor End Power Plug（4P）	
CODE	DESCRIPTION
1	PE
2	V
3	U
4	W

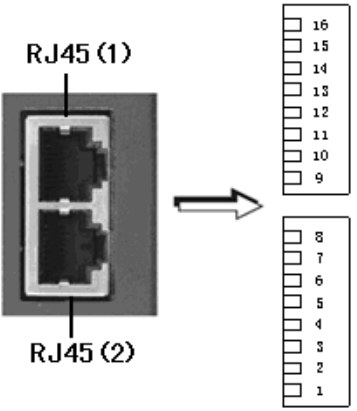
Motor End Power PLug (7P With Lock)	
CODE	DESCRIPTION
1	PE
2	V
3	U
4	W
5	+24V
6	24VGND
7	

3.3 Cable Distribution Of Connector CN1

Connector CN1 is a communication plug, and the servo driver provides RS485 communication.

3.3.1 Terminal Arrangement

1) Terminal Shape



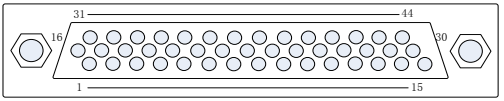
2) Terminal Signal Definition

Terminal Mark	Name	Function
1,9	RS485+	RS485 Positive Signal
2,10	RS485-	RS485 Negative Signal
3,11	GND	Digital Ground
4,12	NC	Suspended, cannot connect
5,13	NC	Suspended, cannot connect
6,14	GND	Digital Ground
7,15	CANH	CAN Positive Signal
8,16	CANL	CAN Negative Signal
Shell	FG	Shielded Wire

Note: The NC pin cannot be connected to the cable and should be suspended.

3.4 Connector Cable Distribution Of CN2

3.4.1 Arrangement Of Connector CN2



1	DO4+	Digital Output 4+				31	DI7	Digital Input 7
2	DO3−	Digital Output 3-	16	SG	GND	32	DI6	Digital Input 6
3	DO3+	Digital Output 3+	17	+24V	24V(+)	33	DI5	Digital Input 5
4	DO2−	Digital Output 2-	18	T−REF	Torque simulation +	34	DI3	Digital Input 3
5	DO2+	Digital Output 2+	19	AGND	Torque analog -	35	PL	Pulse Collector Open Command Power Supply
6	DO1−	Digital Output 1-	20	V−REF	Speed analog +	36	HPULS−	High Speed Command Pulse -
7	DO1+	Digital Output 1+	21	AO+	Encoder Frequency Division Output A+	37	SIGN−	Instruction Direction -
8	DI4	Digital Input 4	22	AO−	Encoder Frequency Division Output A-	38	HPULS+	High Speed Command Pulse +
9	DI1	Digital Input 1	23	BO−	Encoder Frequency Division Output B-	39	SIGN+	Instruction Direction +
10	DI2	Digital Input 2	24	ZO−	Encoder Frequency Division Output Z-	40	HSIGN−	High Speed Instruction Direction -
11	COM+	External 24V	25	BO+	Encoder Frequency Division Output B+	41	PULS−	Command Pulse -
12			26	DO4−	Digital Output -	42	HSIGN+	High Speed Command Pulse +
13	ZO+	Encoder Frequency Division Output Z+	27			43	PULS+	Command Pulse +
14	24V−GND	24V Ground	28			44	DAOUT	Analog Output
15			29	AGND	Speed Analog Quantity -			
			30	DI8	Digital Input 8			

Note:

1) Do not use empty terminals.

2) Please connect the shielding layer of the input and output signals with the cable to the connector housing. Through the connector on the servo driver side

Frame grounding (FG).

3) Except for alarm pins CN2-6 and CN2-7(ALM), all input and output pins can be assigned signals by parameter setting.

3) The maximum output current of internal 24V power supply is 300mA. If the internal 24V power supply is used, it will cause the internal 5V power supply of the drive to lose power quickly. Therefore, after modifying the parameters, the data needs to be stored in a special way (first set Pn006 to 0000, then modify the parameter to be modified, and then Pn006=0080, Pn006 will automatically change to 0100).

3.4.2 Signal Description Of Connector CN2

The name of the input signal and its function (with default pin assignment).

Control Mode	Signal Name	Pin Number	Function	
General	S-ON	9	Servo ON: The motor becomes energized.	
	C-MOD	10	Control mode switch: Switch between two control modes.	
	POT NOT	34 8	Forward drive prohibited Reverse drive disable	Overrange prohibition: Stop the operation of the servo motor when ON.
	CLR	33	Position deviation pulse clearing: Position deviation pulse is cleared during position control.	
	A-RST	32	Alarm reset: Release the servo alarm state.	
	INHIBIT	31	Pulse disable input.	
	ZEROSPD	30	Zero speed signal input.	
	COM+	11	The I/O signal power supply must be provided by the customer.	
Positioning Control	HPULS+	38	High speed channel pulse input * Symbol + pulse column *CCW+CW pulse column *A+B pulse column	
	HPULS-	36		
	HSIGN+	42		
	HSIGN-	40		
	PULS+	43	Low speed channel pulse input form: * Symbol + pulse column *CCW+CW pulse column *A+B pulse column	
	PULS-	41		
	SIGN+	39		
	SIGN-	37		
	PL	35	Collector pulse signal terminal	
Speed Control	V-REF	20	Speed command voltage input	
	AGND	29		
Torque Control	T-REF	18	Torque command voltage input	
	AGND	19		

The name of the output signal and its function.

Control Mode	Signal Name	Pin Number	Function	
	PAO+	21	A Phase Signal	Two phase pulse (phase A, phase B) encoder frequency division output signal.
	PAO-	22		
	PBO+	25	B Phase Signal	
	PBO-	23		
	PZO+	13	Z Phase Signal	Origin pulse (Z phase) signal
	PZO-	24		
	ALM+	7	Servo alarm: OFF when abnormal state is detected.	
	ALM-	6		

	COIN+	5	Positioning complete: In position control mode, this signal is active when the deviation pulse is less than Pn525(positioning complete width).
	COIN-	4	
	CZ+	3	Optical coupling output Z-phase pulse.
	CZ-	2	
	BK+	1	External brake signal output.
	BK-	26	
	MON	44	Speed analog or torque analog output signal. Voltage range is ±8V.
	SG	16	

3.4.3 I/O IO Signal Distribution

1. Distribution of input signals

The input signal can generally be used in accordance with the factory Settings, but also can be allocated according to the need.

(1) When used according to factory Settings

Parameter Number	Name	Setting Range	Unit	Def	Effective Time
Pn500	Port DI1 Input signal selection [0] Servo Enable (S-ON) [1] Control mode switching (C-MODE) [2] Forward Drive Prohibition (POT) [3] Negative drive Disable (NOT) [4] Deviation Counter Clearing (CLR) [5] Alarm Clearance (A-RST) [6] Pulse input INHIBIT [7] Zero Speed clamp (ZEROSPD) [8] Forward Torque Limit (PCL) [9] Negative Torque Limit (NCL) [10] GAIN [11] Origin Signal (ZPS) [12] CMDINV under internal position and velocity control [13] Instruction frequency division frequency multiplier switch 0 (DIV0) [14] Command frequency division frequency multiplier Switch 1 (DIV1) [15] Internal command speed selection 0 (INSPD0) [16] Internal command Speed Selection 1 (INSPD1) [17] Internal Command Speed Selection 2 (INSPD2) [18] Internal position select 0 (INPOS0) [19] Internal Location Selection 1 (INPOS1) [20] Internal Location Selection 2 (INPOS2) [21] Internal Location Selection 3 (INPOS3) [22] Internal position triggering (PTRG	0～30		0	Promptly

Parameter Number	Name	Setting Range	Unit	Def	Effective Time
	[23] Forward JOG operation under internal position control (P-POS) [24] Reverse JOG operation under internal position control (N-POS) [25] Internal position control next zero start (SHOME) [26] Stop signal under internal position control (PZERO) [28] Internal torque selection 0 (INTor0) [29] Internal torque Option 1 (INTor1) [30] Selection of incremental \ absolute operating mode under internal position control (Pnbs) [Other] Special functional purposes				
Pn501	Port DI2 Input signal selection	0～30		1	Promptly
Pn502	Port DI3 Input signal selection	0～30		2	Promptly
Pn503	Port DI4 Input signal selection	0～30		3	Promptly
Pn504	Port DI5 Input signal selection	0～30		4	Promptly
Pn505	Port DI6 Input signal selection	0～30		5	Promptly
Pn506	Port DI7 Input signal selection	0～30		6	Promptly
Pn507	Port DI8 Input signal selection	0～30		7	Promptly

The input signal distribution status at the factory can be confirmed by Pn500~Pn507.

Input ports DI1 to DI8 correspond to pins and default signal names as follows:

Parameter Number	Port Name	CN2 Port Pin	Default Signal
Pn500	DI1	9	S-ON
Pn501	DI2	10	C-MOD
Pn502	DI3	34	POT
Pn503	DI4	8	NOT
Pn504	DI5	33	CLR
Pn505	DI6	32	A-RST
Pn506	DI7	31	INHIBIT
Pn507	DI8	30	ZEROSPD

Input signal form selection instructions:

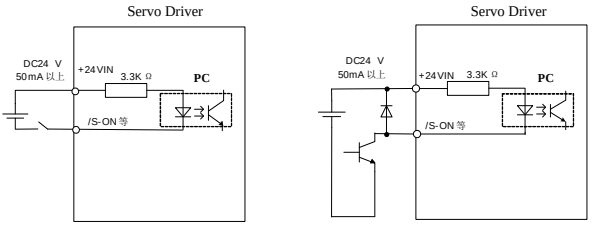
Parameter Number	Name	Setting Range	Unit	Def	Effective Time
Pn508	Input signal mode select 0 b.000□: DI1 input signal form selection; [0] Signal L level is valid (optocoupler conduction) [1] Signal H level is valid (no optocoupler conduction) b.00□0: DI2 input signal mode selection; [0] Signal L level is valid (optocoupler conduction) [1] Signal H level is valid (no optocoupler conduction) b.0□00: DI3 input signal mode selection; [0] Signal L level is valid (optocoupler conduction)	b. 0000 ~1111		b.0000	Promptly

Parameter Number	Name	Setting Range	Unit	Def	Effective Time
	[1] Signal H level is valid (no optocoupler conduction) b. □000: DI4 input signal form selection; [0] Signal L level is valid (optocoupler conduction) [1] Signal H level is valid (no optocoupler conduction)				
Pn509	Input signal mode select 1 b.000□: DI5 input signal form selection; [0] Signal L level is valid (optocoupler conduction) [1] Signal H level is valid (no optocoupler conduction) b.0□00: DI7 input signal mode selection; [0] Signal L level is valid (optocoupler conduction) [1] Signal H level is valid (no optocoupler conduction) b. □000: DI8 input signal form selection; [0] Signal L level is valid (optocoupler conduction) [1] Signal H level is valid (no optocoupler conduction)	b. 0000 ~1111		b.0000	Promptly

(2) Change the allocation of the input signal after use

When the servo ON is used through the "polarity reverse", the forward drive is prohibited, and the reverse drive is prohibited, the signal line will not move in the safe direction in the event of abnormalities such as broken lines. If you have to use this setting, be sure to confirm the action to ensure that there are no safety issues.

The typical circuit of the input signal is shown in the figure below:



In the above diagram, when the optocoupler is on, the S-ON signal is L level, and when the optocoupler is not on, the S-ON signal is H level. The parameter Pn508 determines the active level of S-ON. When Pn508.0=0, the S-ON signal is active at L level, and when Pn508.0=1, the S-ON signal is active at H level.

CN2 Pin	Name	Signal Selection Parameter	Signal Name	Signal takes the inverse parameter	Signal Status
40	DI1	Pn500=0	Servo Enable (S-ON)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=1	Control Mode switching (C-MODE)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=2	Forward drive Disable (POT)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=3	Negative drive disable (NOT)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid

CN2 Pin	Name	Signal Selection Parameter	Signal Name	Signal takes the inverse parameter	Signal Status
		Pn500=4	Deviation counter Clearing (CLR)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=5	Alarm Clearance (A-RST)	Pn508.0=1	Signal H valid
				Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=6	Pulse input disable (PULSEHIBIT)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=7	Zero speed clamp (ZEROSPD)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=8	Forward torque Limit (PCL)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=9	Negative torque Limit (NCL)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=10	GAIN switching	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=11	Origin signal (ZPS)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=12	Inverse signal taking under internal position and speed control (CMDINV)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=13	Command frequency division Frequency multiplier Switch 0 (DIV0)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=14	Command Frequency Division Frequency Multiplier Switch 1 (DIV1)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=15	Internal instruction Speed selection 0 (INSPD0)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=16	Internal command Speed Selection 1 (INSPD1)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=17	Internal Command Speed Option 2 (INSPD2)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=18	Internal location Select 0 (INPOS0)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=19	Internal Location Selection 1 (INPOS1)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=20	Internal Location Selection 2 (INPOS2)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=21	Internal Location Selection 3 (INPOS3)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=22	Internal position Trigger (PTRG)	Pn508.0=0	Effective rising edge
				Pn508.0=1	
		Pn500=23	Forward JOG operation under internal Position control (P-POS)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
		Pn500=24	Reverse JOG operation under internal position control (N-POS)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid

CN2 Pin	Name	Signal Selection Parameter	Signal Name	Signal takes the inverse parameter	Signal Status
		Pn500=25	Internal position control Next zero start (SHOME)	Pn508.0=0	Effective rising edge
				Pn508.0=1	
		Pn500=26	Internal position controlled stop signal (PZERO)	Pn508.0=0	Signal L valid
				Pn508.0=1	Signal H valid
41	DI2	Pn501=n	The corresponding N-signal	Pn508.1=0	Signal L valid
				Pn508.1=1	Signal H valid
42	DI3	Pn502=n	The corresponding N-signal	Pn508.2=0	Signal L valid
				Pn508.2=1	Signal H valid
43	DI4	Pn503=n	The corresponding N-signal	Pn508.3=0	Signal L valid
				Pn508.3=1	Signal H valid
44	DI5	Pn504=n	The corresponding N-signal	Pn508.4=0	Signal L valid
				Pn508.4=1	Signal H valid
45	DI6	Pn505=n	The corresponding N-signal	Pn508.5=0	Signal L valid
				Pn508.5=1	Signal H valid
46	DI7	Pn506=n	The corresponding N-signal	Pn508.6=0	Signal L valid
				Pn508.6=1	Signal H valid
48	DI8	Pn507=n	The corresponding N-signal	Pn508.7=0	Signal L valid

(3) Confirmation of input signal

The status of the input signal can be confirmed by the input signal monitor (dn012). For input signal monitoring (dn012), see "8.4 Input Signal Monitoring".

(4) Relevant precautions

If two IO pins are assigned to the same signal, the effective state of this signal is subject to the DI signal with a higher label. If both DI1 and DI2 are set to 0 (S-ON signal), the S-ON signal status of the driver is determined by DI2 (pin CN2-10).

2. Distribution of input signals

The output signal is assigned to the input/output signal connector (CN2) according to the Settings of Pn510 and Pn511.

(1) Confirm the distribution status at factory time

The following parameters can be used to confirm the output signal distribution status at the factory.

Code	Name	Setting Range	Unit	Def	Effective Time
Pn510	Output signal selection h.000□ : DO1 Output signal selection [0] Alarm signal output (ALM) [1] Positioning complete (COIN) : position deviation pulse is less than Pn525; [2] Z pulse collector signal (CZ) : encoder origin signal output,Pn003.3 can be reversed,Pn201.3 combined with Pn210 can be broadened; [3] External brake release signal (BK) : adjust Pn518 as needed;	h. 0000 ~DDD0		h.3210	Promptly

Code	Name	Setting Range	Unit	Def	Effective Time
	[4] Servo ready output (S-RDY) : This signal is valid when the servo is in normal condition; [5] Speed consistent output (VCMP) : The speed error is less than Pn517 this signal is effective; [6] Motor rotation detection (TGON) : The motor speed exceeds Pn516, this signal is valid; [7] Torque Limit signal (TLC) : load torque reaches Pn402 or Pn403 torque limit value; [8] Zero speed detection signal (ZSP) : The motor speed is less than Pn515 this signal is effective; [9] Warning Output (WARN) [A] HOME signal [B] Position command completion signal (CMD-OK) [C] Positioning and command completion signal (MC-OK) [D] TREACH: positive load torque exceeds Pn404 value or negative load torque exceeds Pn405 value; h.00□0: DO2 output signal selection Same as D01 h.0□00: DO3 Output signal selection Same as D01 h. □000: DO4 output signal selection Same as D01				
Pn511	The output signal is reversed b.000□ : DO1 (alarm signal ALM) output signal form selection; [0] When the signal is effective, it is an H level signal (no optocoupler conduction). [1] L level signal when the signal is invalid (optocoupler conduction) b.00□0: DO2 output signal mode selection; [0] When the signal is effective, it is an L-level signal (optocoupler conduction). [1] H level signal when the signal is invalid (no optocoupler conduction) b.0□00: DO3 output signal mode selection; [0] When the signal is effective, it is an L-level signal (optocoupler conduction). [1] H level signal when the signal is invalid (no optocoupler conduction) b.□000: DO4 output signal form selection; [0] When the signal is effective, it is an L-level signal (optocoupler conduction). [1] H level signal when the signal is invalid (no optocoupler conduction)	b. 0000 ~1111		b.0000	Promptly

Input ports DO1 to DO4 correspond to the following pins:

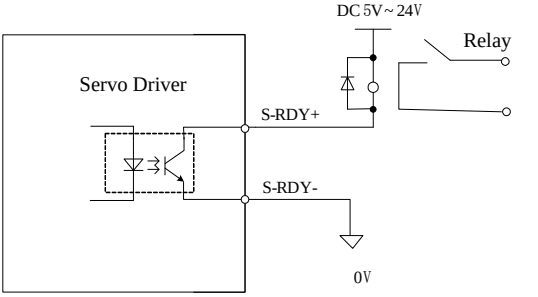
Parameter number	Name	CN2 Port Pin	Default Signal
Pn510.0	DO1	6、7	ALM
Pn510.1	DO2	4、5	COIN
Pn510.2	DO3	2、3	CZ
Pn510.3	DO4	1、26	BK

(2) Change the assignment of the output signal after use

Signals that are not detected are in the "invalid" state. For example, when speed is controlled, the positioning complete (COIN) signal is "invalid".

The distribution of output signals is shown in the following table.

The typical circuit of the output signal is shown in the figure below:



Note: The maximum allowable voltage and current capacity of the optocoupler output circuit is as follows:
Voltage: DC30V (Max)
Current: DC50mA (Max)

For example, parameter Pn511 determines the level of COIN. When the COIN signal is valid, when Pn511=0, and when the optocoupler PC is on, the L level is the effective level of the COIN signal. When Pn511=1 and the optocoupler PC is not on, the H level is the active level of the COIN signal.

CN2 Pin	Name	Signal Selection Parameter	Signal Name	Signal takes the inverse parameter	Signal Status
31、32	DO1	Pn510=0	Alarm output (ALM)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=1	Positioning complete (COIN)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=2	Z Pulse Collector Signal (CZ)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=3	External Brake Release Signal (BK)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=4	Servo ready output (S-RDY)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=5	Speed Consistent Output (VCMP)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid

CN2 Pin	Name	Signal Selection Parameter	Signal Name	Signal takes the inverse parameter	Signal Status
		Pn510=6	Motor rotation Detection (TGON)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=7	Torque Limited Medium Signal (TLC)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=8	Zero Speed Detection Signal (ZSP)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=9	Warning output (WARN)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=A	Complete origin return (HOME) under internal position control	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=B	Under internal position control, position command complete (CMD-OK)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=C	Positioning and command completion under internal position control (MC-OK)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
		Pn510=D	Torque arrival (TREACH)	Pn511.0=0	Signal L valid
				Pn511.0=1	Signal H valid
29、30	DO2	Ditto	Positioning complete (COIN)	Pn511.1=0	Signal L valid
				Pn511.1=1	Signal H valid
27、28	DO3	Ditto	Collector Z pulse (CZ)	Pn511.2=0	Signal L valid
				Pn511.2=1	Signal H valid
25、26	DO4	Ditto	External Brake Release Signal (BK)	Pn511.3=0	Signal L valid
				Pn511.3=1	Signal H valid

(3) Relevant precautions

■ When Z pulse collector output signal, its output level state cannot be changed (the corresponding Pn[511] bit is useless);

■ If there are two IO pins assigned to the Z pulse collector output signal, the effective state of this signal is subject to the higher label DO signal. If DO2 and DO3 are set to 2 (Z pulse collector signal), DO3 (CN2-2, 3 pin) outputs Z pulse signal;

■ Caution If the alarm signal (ALM) and warning signal (WARN) are effective, the alarm is reported. If they are invalid, the alarm is not reported.

3.4.4 Example Connection To Upper Device

The input and output signals of the servo driver and their connection to the upper device are shown below.

1、Instruction Input Loop

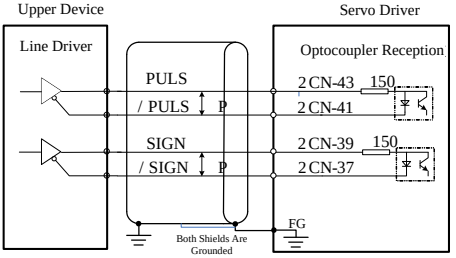
(1) Low speed position instruction input loop

The following describes the 41-43 (command pulse input), 37-39 (command symbol input) terminals of the CN2 connector.

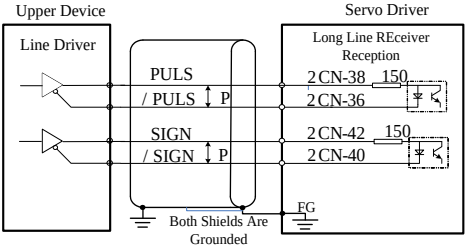
The output loop of the command pulse on the upper side of the device can be either output from a linear driver or an open collector (2 kinds). The following are the explanations.

■ Linear driver output

（a）The driver is received through a low-speed pulse channel



（b）The driver is received through a high-speed pulse channel. Note This is a 5V system. Do not input more than 5V power.

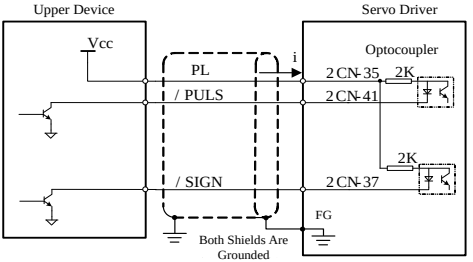


Suitable linear drives, such as TI AM26LS31's similar products

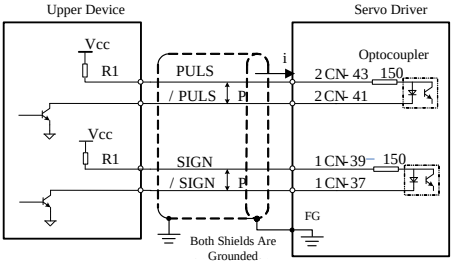
In order to improve the anti-interference ability of the high-speed pulse input interface, it is recommended that the controller and the servo driver are connected together.

■ Open-collector output

(a) When the upper computer has open collector output and provides 24VDC signal power supply, connection mode 1



(b) When the upper computer has an open collector output and provides 5VDC, 12VDC, or 24VDC signal power supply, connect mode 2.



Attention:

◆ Please set Resistor R1 in the range of input current values required below.

Input current i = 10 ~ 15mA:

When Vcc is 24V, R1=2KΩ

When Vcc is 12V, R1=510Ω

When Vcc is 5V, R1=180Ω

◆ In general, the collector type pulse input is susceptible to interference, and there are mainly several ways to reduce interference:

- Wiring: The shielding layer of the control line is connected to the power supply at the upper computer end (such as 24V power supply, then the shielding is connected to 24V ground), and the shielding of the control line at the driver end is suspended;
- Modify Pn201.0 parameters: The larger the parameter setting, the larger the filter and the lower the input cutoff frequency.

(2) High speed position instruction input loop

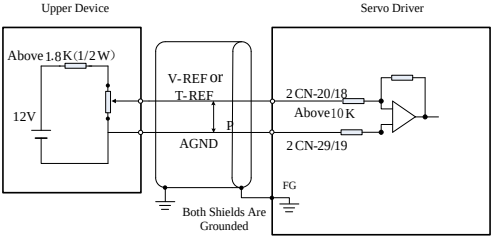
The following describes the 38-36 (command pulse input), 42-40 (command symbol input) terminals of the CN2 connector.

The output loop of the command pulse on the upper device side can only be output from the 5V linear driver.

(3) Analog input loop

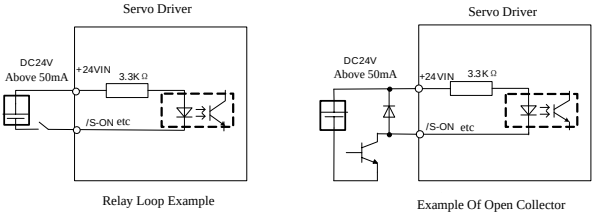
The following describes the 20-29 (speed instruction input), 18-19 (torque instruction input) terminals of the CN2 connector.

Analog signal refers to the speed command or torque command signal. The input impedance is shown below.



(4) Cis control input loop

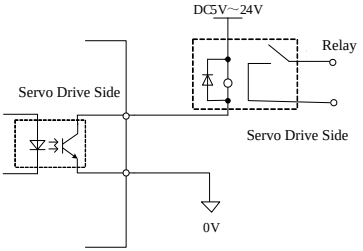
Connection via relay or transistor circuit with open collector. When using a relay connection, select a relay for small currents. If the relay with small current is not used, it will cause poor contact.



2、Output Circuit

(1) Cis control output loop

The servo alarm, servo ready and other sequential output signals are composed of the photoelectric coupler output circuit, please use relay connection.



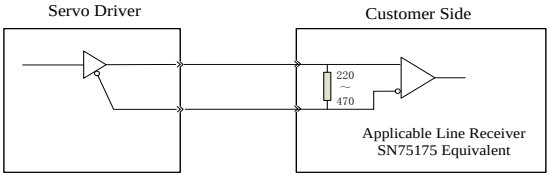
Note: The maximum allowable voltage and maximum current of the photoelectric coupler output circuit are as follows:

Voltage: DC30V (Max)
Current: DC50mA (Max)

(2) Linear driver output loop

The following describes terminals 21-22 (A trust number), 25-23 (B trust number), and 13-24 (C trust number) of CN2 ports.

The serial data of the encoder is converted into output signals (PAO, /PAO, PBO, /PBO) of 2-phase (phase A, phase B) pulses and origin pulse signals (PZO, /PZO) for output through the linear driver output loop. Generally, in the speed control of servo drive, it is necessary to use the position control system on the side of the upper device. On the upper device side, use a linear receiver loop for reception.



(3) Analog Output Loop

The 44 (MON) and 16 (SG) ports of the CN2 provide monitoring analog data, such as motor speed and current, which can be expressed in the form of analog voltage. This driver provides the output of a Channel, and the user can use the parameter Pn021 to select the data to be monitored. This signal is based on the ground (GND) of the power supply, and the analog output voltage range is -8V~+8V.

3.5 Connector Cable Distribution Of CN3

An example of the connection between the encoder, the servo driver, and the output signal from the servo driver upward device, and the terminal arrangement of the encoder connection port (CN3), are illustrated below.

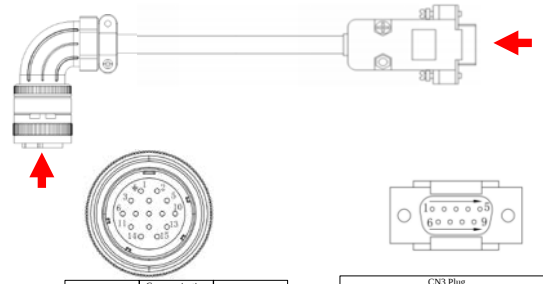
3.5.1 Connector CN3 Cable Distribution Description

1、Fast plug encoder cable

	Dart Type Encoder	Communication Encoder	Rotary Encoder
CABLE CODE	DESCRIPTION	DESCRIPTION	DESCRIPTION
1	+5V	+5V	
2	0V	0V	
3	PA	PD+	SIN+
4	/PA	PD-	SIN-
5	PB	BAT+	COS+
6	/PB	BAT-	COS-
7	PZ		REF+
8	/PZ		REF-
9	FG	FG	FG

CN3 Plug		
DB-9P	DESCRIPTION	Communication Encoder
1	PA	PD+
2	PB	
3	PZ	
4		
5	+5V	+5V
6	/PA	PD-
7	/PB	
8	/PZ	
9	0V	0V
外壳	FG	FG

2、Aviation plug encoder cable



	Dart Type Encoder	Communication Encoder	Rotary Encoder
CABLE CODE	DESCRIPTION	DESCRIPTION	DESCRIPTION
1	FG	FG	FG
2	+5V	+5V	COS-
3	0V	0V	SIN-
4	PA	PD+	SIN+
5	PB	BAT+	REF+
6	PZ		COS+
7	/PA	PD-	REF-
8	/PB	BAT-	
9	/PZ		

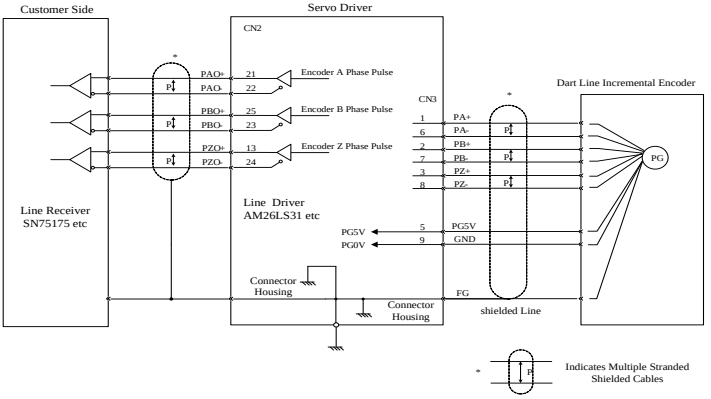
CN3 Plug		
DB-9P	DESCRIPTION	Communication Encoder
1	PA	PD+
2	PB	
3	PZ	
4		
5	+5V	+5V
6	/PA	PD-
7	/PB	
8	/PZ	
9	0V	0V
Outer Shell	FG	FG

Note:

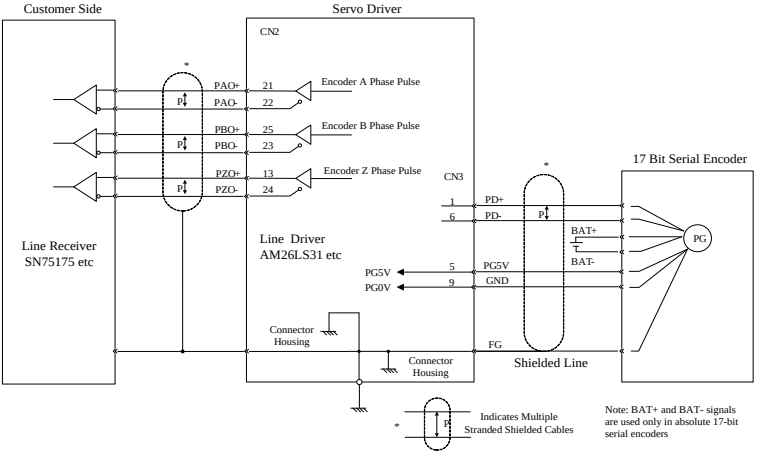
communication encoder if the absolute value of the use of BAT+, BAT- to connect the external battery. Communication encoders do not use BAT+ and BAT- signals if they are incremental.

3.5.2 Connector CN3 Connection Example

■ Provincial Incremental Encoder Wiring

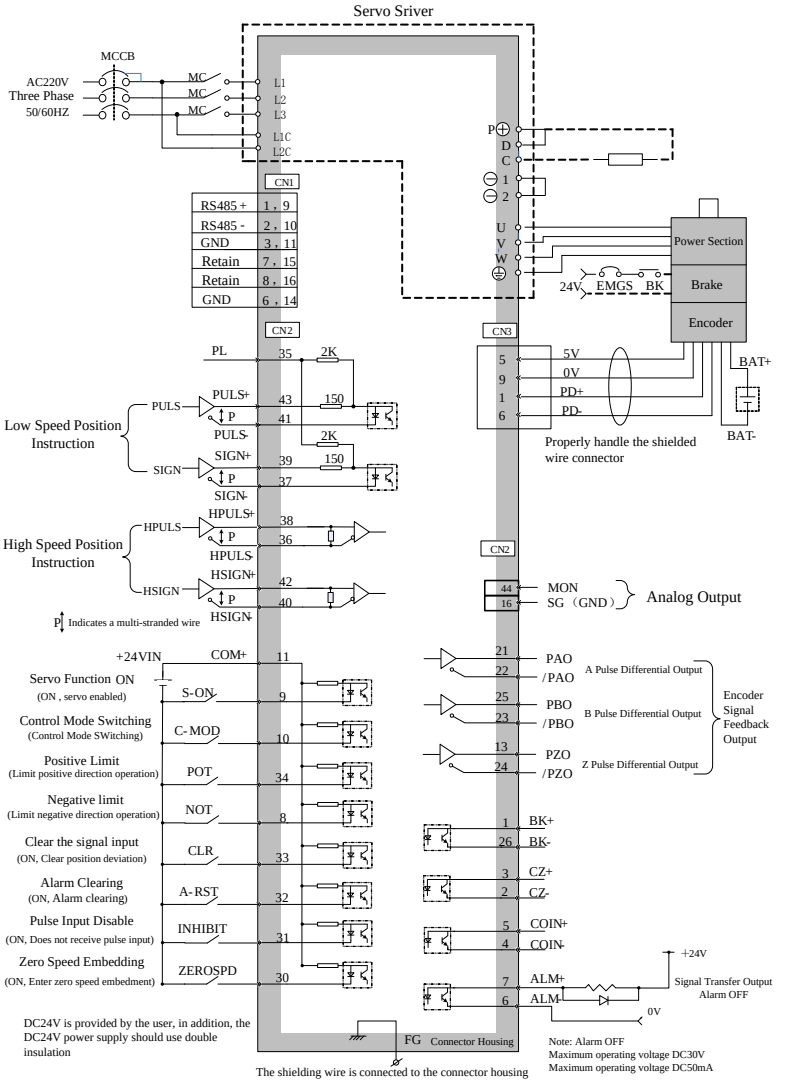


■ 17 Bit Serial Encoder Wiring

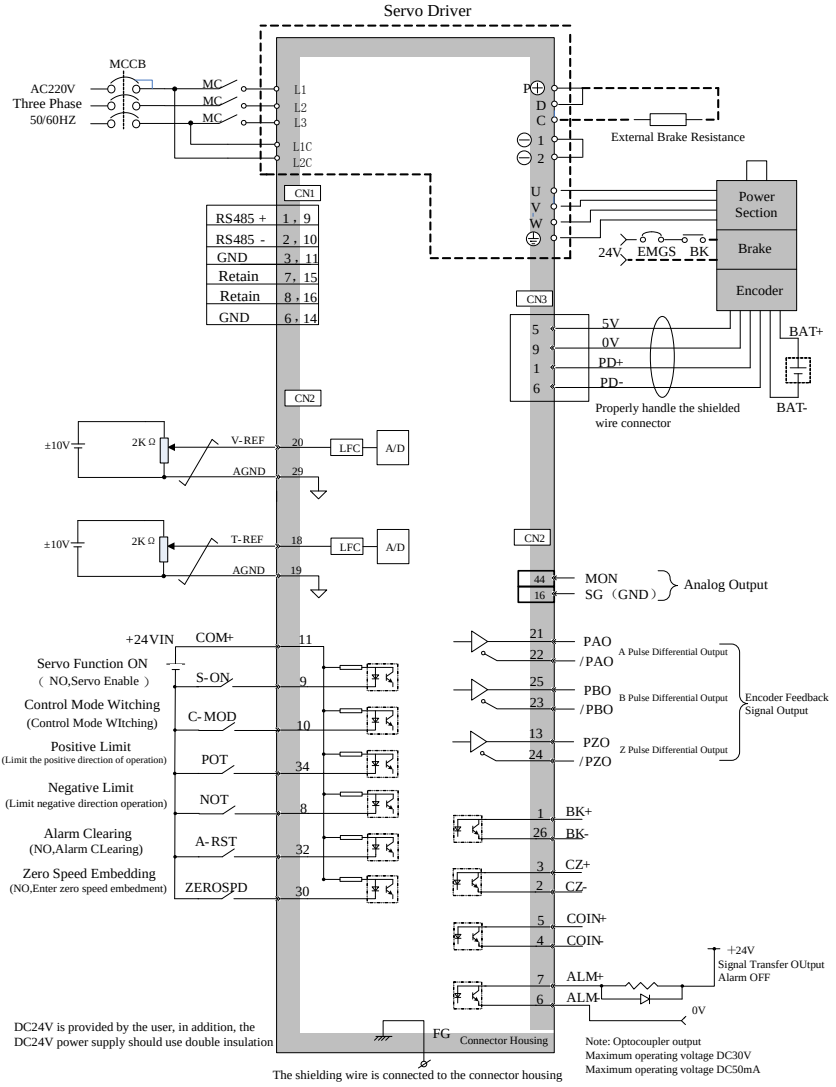


3.6 Standard Connection

3.6.1 Positioning Control



3.6.2 Speed \ Torque Control

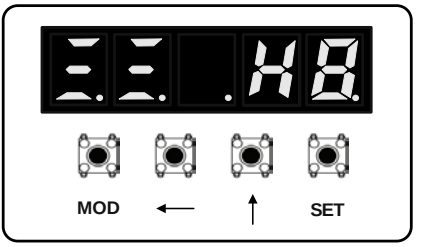


4 Panel operation

4.1 Panel Operator

The panel operator is composed of a panel operator display section and a panel operator key. The panel operator allows you to display status, perform auxiliary functions, set parameters and monitor the actions of the servo drive.

The names and functions of the panel operator keys are as follows.



Key	Function/Description
MOD	Switch between modes or exit layer by layer as cancel button
←	The operation bit is rotated to the left
↑	The operation bit value continues to increase, and no carry is generated. If the data is a signed number, the operation bit switches between + and -
SET	ENTER the parameter and display the menu, equivalent to enter

How to clear the servo alarm?

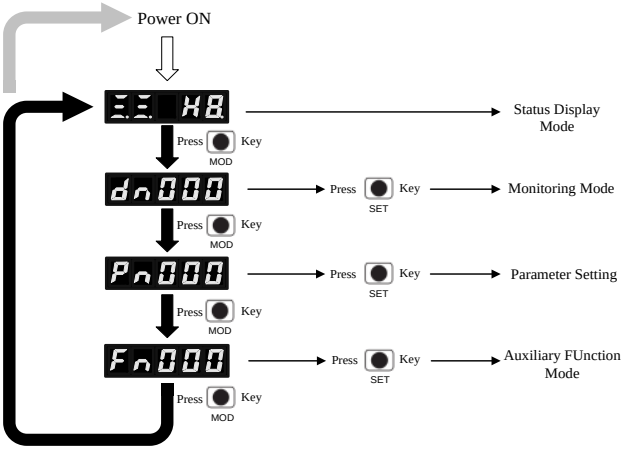
Press and hold the UP and DOWN keys at the same time to clear the servo alarm.

(Note) Before clearing the servo alarm, be sure to exclude the cause of the alarm.

4.2 Switching Of Functions

Press the MODE/SET key to switch functions as follows.

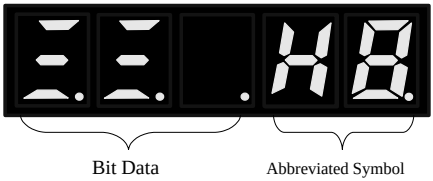
For instructions on how to operate each function, please read the following sections.



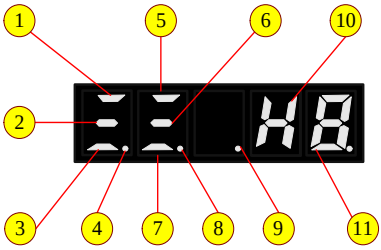
4.3 Status Surveillance

The number of bits in the status display mode indicates the status of the servo drive.

The status display identification method is as follows.



Display Content



Bit Data			
Monitor Signal	**Name**	**Position control mode description**	**Speed/ torque control mode content description**
①	Power supply ready display	Light up when the main circuit power is ON. The main circuit power supply is OFF.	Light up when the main circuit power is ON. The main circuit power supply is OFF.
②	Congruence mark	Positioning complete (COIN)	Consistent Speed (VCMP) display
③	Clear the signal input flag	Light up when there is a clear signal (CLR) input. Extinguish when no clear signal is input.	Light up when there is a clear signal (CLR) input. Extinguish when no clear signal is input.
④	Position control mode flag	This light is on.	This light goes off.
⑤	Rotate check out display	When the speed is higher than the set speed, this light is on (TGON).	When the speed is higher than the set speed, this light is on (TGON).
⑥	Instruction input flag	Instruction pulse input is displayed.	Speed control: Displayed in speed instruction input. Torque control: is displayed in the torque instruction input.
⑦	Torque detection display	The torque instruction in the input lights up when it is greater than the specified value (20% of the rated torque), and turns off when it is less than the specified value.	The torque instruction in the input lights up when it is greater than the specified value (20% of the rated torque), and turns off when it is less than the specified value.
⑧	Speed control mode flag	This light goes off.	This light is on when the current mode is under speed control.
⑨	Torque control mode flag	This light goes off.	This light is on when the current mode is under torque control.
Abbreviated symbol			
⑩	Limit mark	Left limit when displayed . Right limit when displayed  . At the same time limit, alternate display  .	Left limit when displayed  . Right limit when displayed . At the same time limit, alternate display  .
⑪	Running mark	When the motor excites, dynamic display of rotation of  . When the motor is in an unexcited state, stop rotating.	When the motor excites, dynamic display of rotation of  . When the motor is in an unexcited state, stop rotating.

4.4 Monitor Display（dn □□）

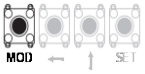
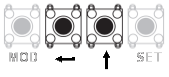
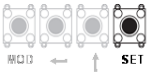
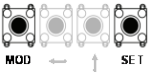
In the monitoring mode, the command values set in the servo drive, the state of the input and output signals and the internal state of the servo drive can be monitored (displayed). Appears as a number beginning with dn on the panel operator.

4.4.1 Display Content

For details about what is displayed in monitoring mode, see section 5.1.

4.4.2 Example Of Operations In Monitoring Mode

The following takes the motor speed (dn 00) as an example to illustrate the operation method of the monitoring display.

Step	Display Symbol	Keys used	operation
1			Press the MOD key to select accessibility.
2			If dn 00 is not displayed, press ↑ or ← to display dn 00.
3			Press the SET key to enter the monitoring interface. The picture on the left shows that the motor speed is 1600rpm.
4			Press the SET or MOD key to return to the display in step 1.
5	End Of Operation		

4.5 Parametric Model

4.5.1 Related Illustration

Set the parameters of the servo drive. Appears as a number beginning with Pn on the panel operator.

■ Storage setting state

When the parameters are edited and the SET save setting key is pressed, the panel display will continue to display the set status symbol for one second.

Display Symbol	Contents Note
	The set value is stored correctly（Saved）。
	This parameter is valid only after being restarted（Reset）。

	The set value is incorrect or the entered data exceeds the maximum and minimum value（Out of Range）。
	The parameter is password protected and cannot be modified（Can not operation）。

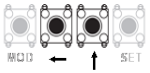
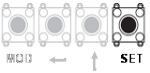
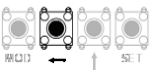
■ Value Type

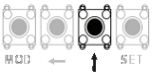
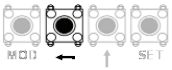
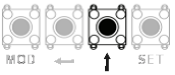
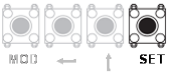
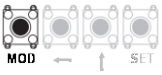
The highest bit of the parameter display indicates the numeric type.

Display Symbol	Contents Note
	The highest bit is not displayed, indicating that the parameter is set to decimal. If the data is an unsigned number, the value of the highest bit ranges from 0 to 6, and the value of other bits ranges from 0 to 9. When the data is a signed number, the highest bit is a sign bit.
	The highest bit is b, indicating that the parameter is set to binary. Each value ranges from 0 to 1.
	The highest bit is d, indicating that the parameter is set to decimal. Each value ranges from 0 to 9.
	The highest digit is h, indicating that the parameter is set to hexadecimal. Each value ranges from 0 to F.

4.5.2 Parameter Settings （Pn□□□） Operation Example

The following uses the first position loop gain (Pn100) as an example to explain how to modify parameters. Change the Pn100 value from 40 to 200.

Step	Display Symbol	Keys used	operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display Pn100.
3			Press the SET key to enter the parameter editing interface. The left picture is displayed, indicating that the current value is 40.
4			Press ← to move the blinking digit so that 4 is blinking. (Blinking digits indicate changeable digits.)

Step	Display Symbol	Keys used	operation
5			Press ↑ six times. The display value is changed to “00”.
6			Press the "←" key to move the blinking digits so that they are displayed as shown on the left.
7			Press ↑ twice. The display value is changed to 200.
8			Press the SET key to change the Pn100 value to 200. If the value is within the maximum and minimum range of this parameter and the value takes effect immediately, the following figure is displayed.
			If the value is within the maximum and minimum range of this parameter but takes effect only after the system is powered on again, the following figure is displayed.
			If the value set is not within the maximum and minimum range of this parameter, it is displayed as shown in the figure on the left. The set data will be discarded.
9			After about 1 second, the parameter editing screen is displayed, as shown in Step 2.
10			Press the MODE key, the Pn100 value will not be modified, then exit the parameter editing interface, and return to the display in Step 2.
11	End Of Operation		

4.6 Auxiliary Function （Fn □□） Operation Example

Auxiliary functions are used to perform functions related to the setup and adjustment of the servo drive.

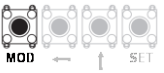
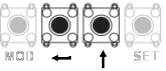
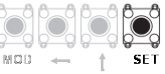
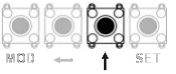
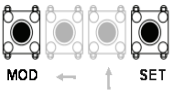
Appears as a number beginning with AF on the panel operator.

4.6.1 Accessibility Content

Please refer to Section 6.1.

4.6.2 Auxiliary Function（Fn □□）Operation Example

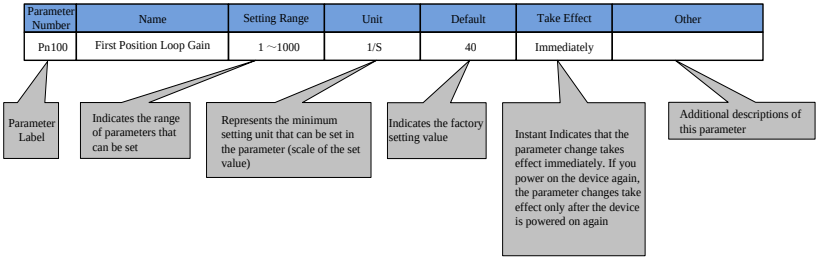
The following uses restoring factory defaults (AF005) as an example to illustrate the operation of auxiliary functions.

Step	Display Symbol	Keys used	operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF005.
3			If the servo is not running, press the SET key to display the left picture.
			If the servo is running or the front panel lock (Fn 03) is set, the picture on the left is displayed, indicating that this auxiliary function operation cannot be performed.
4			Keep holding down ↑ to display the left image.
5			Until the picture on the left is displayed, the operation is complete.
6			Release the button to display the left picture.
7			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
8	End Of Operation		

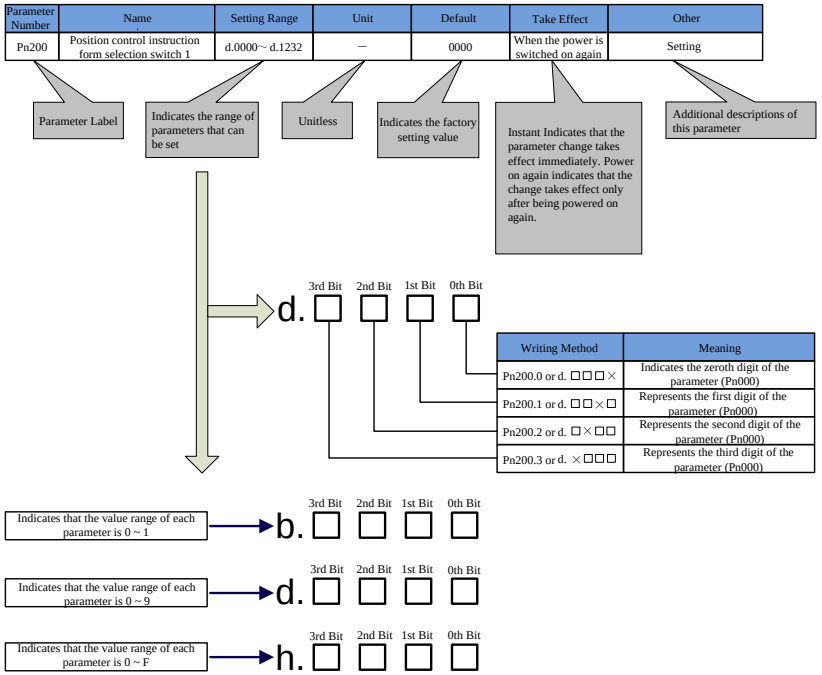
4.7 Parameter Writing Method Of This Manual

The following describes how to write the parameters used in this manual.

4.7.1 Method Of Writing "Numerical Setting"



4.7.2 Method Of Writing "Functional Settings"



5 Display

5.1 Monitor Display Table

Monitoring display refers to the function of displaying the command value set in the servo drive, the state of the input and output signals and the internal state of the servo drive.
An overview of the monitoring display is shown below.

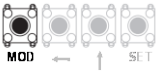
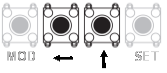
Code	Display Content	Unit
dn 00	**Motor speed** Display motor speed.	【r/min】
dn 01	**Number of motor feedback pulses (encoder unit, low 4 bits)** Displays the lower 4 digits of the motor encoder feedback pulse sum.	【1 encoder pulse】
dn 02	**Number of motor feedback pulses (encoder unit, high 5 bits)** Displays the top 5 digits of the motor encoder feedback pulse sum.	【10000 encoder pulse 】
dn 03	**Pulse command input pulse number (before electronic gear) (user unit, low 4 digits)** Under position control, the lower 4 digits of the sum of pulse command input pulses are displayed.	【1 command pulse】
dn 04	**Pulse command input pulse number (before electronic gear) (user unit, high 5 bits)** Under position control, the higher 5 digits of the total number of pulse input pulses are displayed.	【10000 encoder pulse】
dn 05	**Number of error pulses (encoder unit, low 4 bits)** Under position control, the lower 4 digits of the total number of error pulses are displayed.	【1 encoder pulse】
dn 06	**Number of error pulses (encoder unit, high 5 bits)** Under position control, the higher 5 digits of the total number of error pulses are displayed.	【10000 encoder pulse】
dn 07	**Speed command (analog voltage command)** Under speed control (analog instruction), the voltage value of the analog input is displayed. This display value is the value after zero correction. Voltage above ±10V cannot be displayed correctly.	【0.1V】
dn 08	**Internal speed instruction** Displays internal speed instructions under speed control and position control.	【r/min】
dn 09	**Torque command (analog voltage command)** Under torque control (analog instruction), the voltage value of the analog input is displayed. This display value is the value after zero correction. Voltage above ±10V cannot be displayed correctly.	【0.1V】
dn 10	**Internal torque instruction** Displays internal torque instructions under torque control, speed control, and position control.	【%】
dn 11	**Torque feedback** Display torque feedback values under torque control, speed control, and position control.	【%】
dn 12	**Input signal monitoring** Displays the status of the control input signal connected to the CN2 connector.	——
dn 13	**Output signal monitoring** Displays the output signal status of the driver connected to the CN2 connector.	——
dn 14	**Command pulse frequency** Under position control, the frequency of the command pulse of the upper computer.	【0.1Khz】
dn 15	**Main loop voltage** Displays the DC voltage of the input power after rectification.	【V】

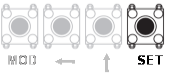
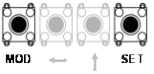
Code	Display Content	Unit
dn 16	**Total running time** Displays the total time the drive has been running. This time records the time when the drive is powered on. If the Fn005 (Restore factory value) operation is performed, this value will be cleared to zero.	【Hous】
dn 17	**Rotation Angle** Show the electrical rotation Angle of the motor.	【deg】
dn 18	**Actual encoder position (single-turn absolute or multi-turn absolute encoder)** When using an absolute encoder (single-turn absolute encoder or multi-turn absolute encoder), the absolute position data of the encoder in one turn is displayed.	【2 Encoder pulse（17bit）】【16 encoder pulse（17bit）】
dn 19	**Encoder number display (only valid for absolute encoder)** When using an absolute encoder (multi-turn absolute encoder), the absolute position data of the encoder in one turn is displayed.	【1 Round】
dn 20	**Cumulative load ratio (using the cumulative load rating as 100%)** Show the corresponding rate of alarm occurrence level of motor overload protection	【%】
dn 21	**Regenerative load rate (using the regenerative load rating as 100%)** Shows the corresponding rate of alarm occurrence level of regenerative overload protection	【%】
dn 22	**DB load rate (using the DB load rating as 100%)** Shows the corresponding rate of alarm occurrence level for DB brake protection.	【%】
dn 23	**Load inertia ratio** Displays the ratio of load inertia to motor body inertia.	【%】
dn 24	**Effective gain monitoring** Shows which set of gain data is used for position speed control. 1: indicates the first group gain 2: indicates the second group gain	
dn 30	**Subsoftware version** Subsoftware version under Fn10 version. For example, Fn10 is d.3.10, dn30=1; The main software version of the DSP is V3.10, and the sub-software version is 1.	
dn 40	**Voltage level** Input voltage level as determined by Pn000.3. 220 indicates that the input level is 220V and 220 indicates that the input level is 220V.	
dn 46	**IGBT temperature**	℃

5.2 Monitor Display Action Examples

The following table uses dn 00 as an example.

The following is an example of the display when the servo motor speed is 1600 rpm.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			If the parameter number is not dn00, press ↑ or ← to display dn00.

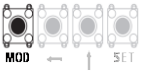
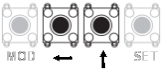
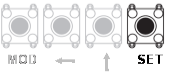
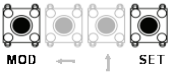
Step	Display Symbol	Keys used	Operation
3			Press the SET key to enter the monitoring interface. The picture on the left shows that the motor speed is 1600rpm.
4			Press the SET or MOD key to return to the display in step 1.
5	End Of Operation		

5.3 Input Signal Monitoring

The status of the input signal can be confirmed by Input Signal Monitoring (dn 12).
Display steps, display discrimination methods and display examples are shown below.

5.3.1 Display Step

The steps for displaying the input signal are as follows.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			If dn 12 is not displayed, press ↑ or ← to display dn 12.
3			Press the SET key to enter the input signal monitoring interface, showing the left picture.
4			Press the SET or MOD key to return to the display in step 1.
5	End Of Operation		

5.3.2 Display Discrimination Method

The assigned input signal is displayed through the lit state of the panel operator segment (LED).
The corresponding relationship between the input pin and the LED number is shown in the following table.

◆ The upper segment (LED) lights up when the input signal is active.
◆ When the input signal is L-level (input optocoupler conduction), the lower segment (LED) is lit.

Display LED number	Input Pin		Signal Name (Factory Settings)
1	9	DI1	S-ON
2	10	DI2	C-MOD
3	34	DI3	POT
4	8	DI4	NOT
5	33	DI5	CLR
6	32	DI6	A-RST
7	31	DI7	INHIBIT
8	30	DI8	ZEROSPD

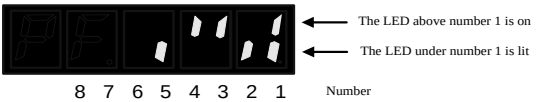
Note:

1. In the case of no external input, by modifying the parameters Pn[508], Pn[509] (input signal shape selection), the corresponding IO signal can also be effective. The dn 12 displays both the level status of the external input IO signal and the active status of the internal signal.
2. In the case that the input signal is NOT reversed, the state of the optocoupler is POT, and the NOT signal is invalid, indicating that the drive is prohibited (overrange).

5.3.3 Display Example

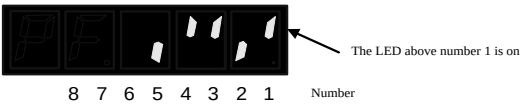
The following is an example of an input signal.

Input optocoupler conduction, Pn508.0=0, S-ON signal is effective (L power level servo ON).



Input optocoupler conduction, Pn508.0=1, S-ON signal invalid (H power level servo ON).

Input optocoupler is not conducting, Pn508.0=1, S-ON signal is effective (H power level servo ON).

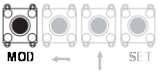
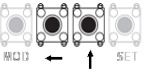
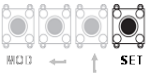
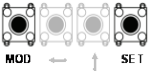


5.4 Output Signal Monitoring

The status of the output signal can be confirmed by the Output Signal Monitor (dn 13). Display steps, display discrimination methods and display examples are shown below.

5.4.1 Display Step

The following is the procedure for displaying the output signal.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			If dn 12 is not displayed, press ↑ or ← to display dn 12.
3			Press the SET key to enter the input signal monitoring interface, showing the left picture.
4			Press the SET or MOD key to return to the display in step 1.
5	End Of Operation		

5.4.2 Display Discrimination Method

The assigned output signal is displayed through the lit state of the panel operator segment (LED). The corresponding relationship between the input pin and the LED number is shown in the following table.

- ◆ The upper segment (LED) lights up when the output signal is active.
- ◆ When the output signal is L-level (output optocoupler conduction), the lower segment (LED) is lit.

Display LED number	Input Pin		Signal Name (Factory Settings)
1	7、6	DO1+、DO1－	ALM
2	5、4	DO2+、DO2－	COIN
3	3、2	DO3+、DO3－	CZ
4	1、26	DO4+、DO4－	BK

Note:

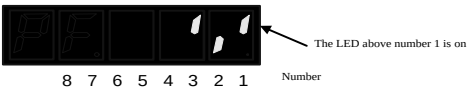
1. Even if the output signal is invalid, the level polarity of the corresponding output IO can be changed by modifying parameter Pn[511] (output signal shape selection). The dn 13 can display both the output signal level status and the internal signal active status.

2.Output pin CN2-7,CN2-6 can only be used as ALM signal, its output polarity can be modified by parameter Pn[511] (output signal shape selection). When the output pin is selected as the Z pulse collector output (CZ), the corresponding bit of dn 13 is not lit, and when more than one pin is selected as the Z pulse output, only one Z signal can be output (the priority is DO2> DO3> DO4).

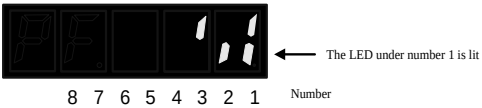
5.4.3 Display Example

The following is an example of the output signal.
Pn511.0=0, the ALM signal is invalid, the optocoupler is on (the ALM signal is L level)

Pn511.0=0, after the ALM signal is effective, the optocoupler does not conduct (ALM signal is H level)



Pn511.0=1, after the ALM signal is effective, the optocoupler is on (ALM signal is L level)



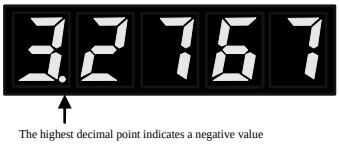
5.5 Monitoring Display When Power Is Turned On

If the dn number is set through Pn014, the data of the set dn number is displayed on the panel operator when the power is turned on.
However, if it is set to 50(factory value), the status is displayed when the power is turned on.

Code	Name	Setting Range	Unit	Def	Effective Time
Pn014	**Initial display status** Please view the monitoring content. If the value is set to 50, the status code is displayed	0～50		50	Power on reset

5.6 Other Description

◆ The value range of dn 01, dn 03 and dn 05 is 【-32767, 32767】. When the value is -32767, the following is displayed:



When the absolute value of the motor feedback pulse number (dn 02×10000+dn 01), pulse command input pulse number (dn 04×10000+dn 03) and deviation pulse number (dn 06×10000+dn 05) is greater than 327679999, the display data will no longer be updated.

6 Function

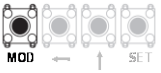
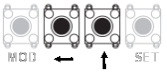
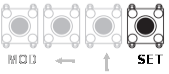
6.1 Function List

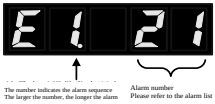
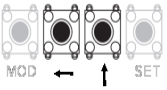
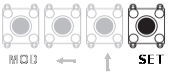
Auxiliary functions are represented by the number beginning with Fn and perform functions related to the operation and adjustment of the servo motor.
The following table lists accessibility features and reference sections.

AF Number	Function	Reference Chapter
Fn 00	Error record display	6.2
Fn 01	Location assignment (valid only in location mode)	6.3
Fn 02	JOG running mode	6.4
Fn 03	The front panel is locked	6.5
Fn 04	Clearing of alarm records	6.6
Fn 05	Initialization of parameters	6.7
Fn 06	Automatic adjustment of analog (speed, torque) instruction bias	6.8
Fn 07	Manual adjustment of speed instruction offset	6.9
Fn 08	Manual adjustment of torque instruction offset	6.10
Fn 09	View motor related parameters	6.11
Fn 10	Displays the software version of the servo drive	6.12
Fn 11	Absolute encoder multi-turn data clear and alarm clear	6.13
Fn 12	Clear absolute encoder alarm	6.13
Fn 15	Manual load inertia detection	6.14

6.2 Alarm Record Display (Fn 00)

The servo drive has a retrospective display alarm function, which can display up to 10 alarm records that have occurred.
The procedure for displaying alarm records is as follows.

Step	Display Symbol	Keys used	operation
1			Press the MOD key to select accessibility.
2			If AF 00 is not displayed, press ↑ or ← to display Fn 00.
3			Press the SET key to display the image on the left, which is the latest alarm code.

Step	Display Symbol	Keys used	Operation
4			Each time you press the ← key, an old alarm is displayed back. Each time you press ↑, a new alarm is displayed. The larger the number in the left digit, the older the alarm is displayed.
5			Press the SET key to exit this auxiliary function and return to the display shown in Step 2.
6	End Of Operation		

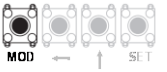
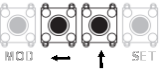
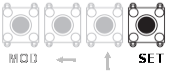
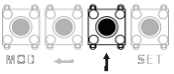
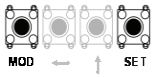
Addendum

• When no alarm occurs, the alarm number is 0.

• Alarm records can be deleted by "Alarm Record Deletion (Fn 04)". Even if the alarm is reset or the main circuit power of the servo drive is cut off, the alarm record will not be deleted.

6.3 Location Assignment (Fn 01)

Servo drive position assignment function, after performing this function, the motor feedback position and the given pulse position are set to Pn766, Pn767 values.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF001.
3			Press the SET key to display the left image.
4			Keep holding down ↑ to display the left image.
5			Until the picture on the left is displayed, the operation is complete.
6			Release the button to display the left picture.
7			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
8	End Of Operation		

6.4 JOG Running（Fn 02）

JOG operation refers to the function of confirming the action of the servo motor through speed control without connecting the upper device.

The JOG overshoot prevention function is invalid during operation. The operation range of the machinery used must be considered at the same time.

(1) Settings before operation

To run JOG, the following Settings must be made in advance.

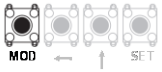
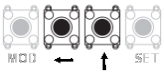
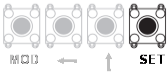
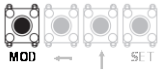
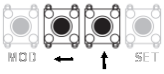
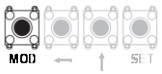
• S-ON When the input signal is ON, switch it to OFF.

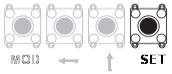
• Please set the JOG speed after considering the operating range of the machinery used. JOG running speed is set by Pn306.

• Please take the necessary safety measures to keep it in a state that can be stopped in an emergency at any time.

(2) Operating Steps

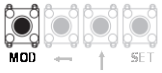
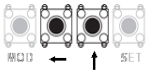
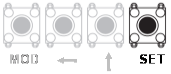
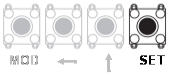
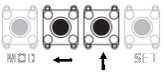
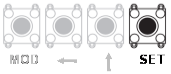
The steps for JOG running are as follows. The following describes the operation steps when the rotation direction of the servo motor is set to Pn000.0=0 (forward rotation command).

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			If the parameter number is not AF 02, press ↑ or ← to display Fn 02.
3			If the servo is not running and ready, press the SET key to enter the JOG running interface as shown on the left.
4			If the servo is running or the front panel lock (Fn 03) is set, the picture on the left is displayed, indicating that this auxiliary function operation cannot be performed.
5			Press the MODE key to enter the servo ON (motor power on) state.
6			Press the " ← " key (forward) or " ↑ " key (reverse), during the key, the servo motor rotates according to the speed set by Pn306.
7			Press the MODE key to enter the servo OFF (motor no power) state. Addendum:You can also press the SET key to exit the JOG operating interface, and the servo will also be OFF.

8			Press the SET key to exit this auxiliary function and return to the display shown in Step 2.
9	End Of Operation		

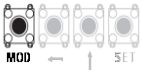
6.5 Front Panel Lock (Fn 03)

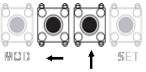
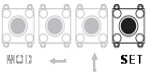
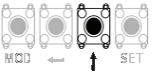
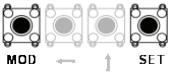
Password setting
If the value is set to 58, parameters and functions cannot be operated
Set to 315 for all parameters and functions
If the value is set to other values, only the parameters and functions in the manual can be operated

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF003.
3			Press the SET key to display the left image.
4			Press SET to enter the lock password setting state.
5			Press ↑ or ← to set the password.
6			Press the SET key to set the lock password and return to Step 2.
7	End Of Operation		

6.6 Deletion Of Alarm Records (En 04)

The function to delete all alarm records recorded in the servo drive.
Note) Alarm records can be deleted through this function. Even if the alarm is reset or the main circuit power of the servo drive is cut off, the alarm record will not be deleted.
The following describes the procedure.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.

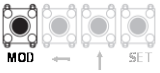
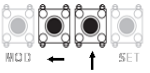
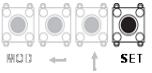
Step	Display Symbol	Keys used	Operation
2			Press ↑ or ← to display AF004.
3			Press the SET key to display the left image.
4			Keep holding down ↑ to display the left image.
5			Until the picture on the left is displayed, the operation is complete.
6			Release the button to display the left picture.
7			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
8	End Of Operation		

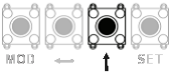
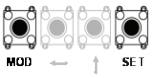
6.7 Initialization of parameter Settings (Fn 05)

Restores parameters to the functionality used when they are factory set.

- Parameter setting initialization must be performed in the servo OFF state. Cannot execute when the servo is ON.
- For the setting to take effect, the servo drive must be powered back on after operation.

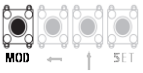
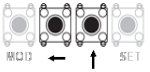
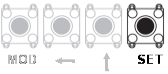
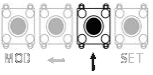
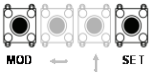
The following describes the procedure.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF005.
3			If the servo is not running, press the SET key to display the left picture.
4			If the servo is running or the front panel lock (Fn 03) is set, the picture on the left is displayed, indicating that this auxiliary function operation cannot be performed.

Step	Display Symbol	Keys used	Operation
5			Keep holding down ↑ to display the left image.
6			Until the picture on the left is displayed, the operation is complete.
7			Release the button to display the left picture.
8			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
9	Power On Reset		
10	End Of Operation		

6.8 Analog Instruction Automatic Zero Correction (Fn 06)

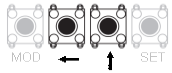
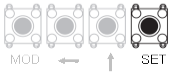
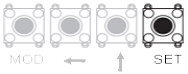
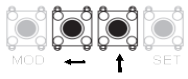
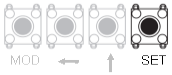
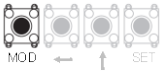
The automatic adjustment of instruction offset is a method to automatically adjust the instruction voltage (speed instruction and torque instruction) after measuring the offset.
The measured offset will be saved in the servo drive.
The steps to perform automatic adjustment of instruction offset using the panel operator are as follows.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF006.
3			Press the SET key to display the left image.
4			Keep holding down ↑ to display the left image.
5			Until the picture on the left is displayed, the operation is complete.
6			Release the button to display the left picture.
7			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
8	End Of Operation		

6.9 Manual Adjustment Of Speed Instruction Offset (Fn 07)

This auxiliary function is a way to adjust the offset value of the speed instruction directly.

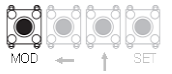
The steps to perform manual adjustment of the instruction offset using the panel operator are as follows.

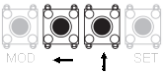
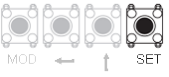
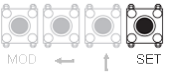
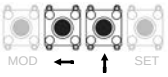
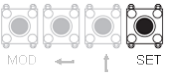
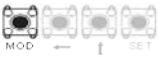
Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF007.
3			Press the SET key to display the left image.
4			If the motor is enabled, the content shown on the left is displayed.
5			Press the SET key to display the current offset of the speed instruction.
6			Press ↑ or ← to adjust the Settings
7			When the SET key is pressed, "Save" flashes, and then switches to the display shown in Step 2.
8			If you do not want to save data, press the MOD key to exit, and the information shown in Step 2 is displayed.
9	End Of Operation		

6.10 Torque Simulation Instruction Manual Zero Correction (Fn 08)

This auxiliary function is a direct input torque instruction offset adjustment method.

The steps to perform manual adjustment of the instruction offset using the panel operator are as follows.

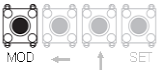
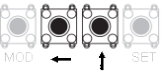
Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.

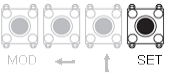
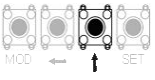
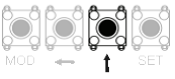
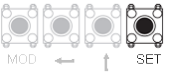
Step	Display Symbol	Keys used	Operation
2			Press ↑ or ← to display AF008.
3			Press the SET key to display the left image.
4			If the motor is enabled, the content shown on the left is displayed.
5			Press the SET key to display the current offset of the speed instruction
6			Press ↑ or ← to adjust the Settings
7			When the SET key is pressed, "Save" flashes, and then switches to the display shown in Step 2.
8			If you do not want to save data, press the MOD key to exit, and the information shown in Step 2 is displayed.
9	End Of Operation		

6.11 Display Motor Model (Fn 09)

Displays the type of servo motor connected to the servo drive, the encoder type, and the phase of the motor. If the servo drive is a special specification product, the number of the specification product will also be displayed. This feature is only available for communication 17-bit absolute encoders.

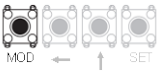
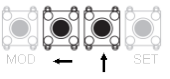
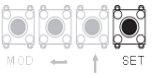
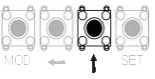
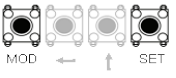
The following describes the procedure.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF009.

Step	Display Symbol	Keys used	Operation
3			Press the SET key to display the left image. Indicates that the drive model is 0. The initial letter is identified as "d".
4			Press ↑ to display the motor model. The initial letter is identified as "F".
5			Press ↑ to display the encoder model. 0, indicates the absolute encoder, 1, indicates the single-turn absolute encoder, 2 indicates the provincial line incremental encoder. The initial letter is identified as "E".
6			Press the SET key to set the lock password and return to Step 2.
7	End Of Operation		

6.12 Display Servo Driver Software Version (Fn 10)

Displays the function of the software version of the servo drive and encoder.
The following describes the procedure.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF005.
3			Press the SET key to display the left image. d 1.00 indicates that the DSP software version is 1.00
4			Press ↑ to display the left image. F 1.03 indicates that the FPGA software version is 1.03
5			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
6	End Of Operation		

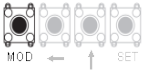
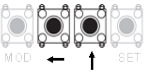
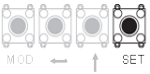
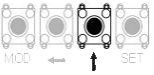
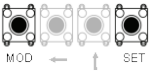
6.13 Set Absolute Encoder (Fn 11)

This operation is only valid if an absolute encoder is used, and is generally used in the following cases.

- When using absolute value motor for the first time;
- When a correlation encoder alarm occurs;
- When you want to set the multi-turn value of the absolute encoder to 0;

Attention:

1. Encoder setting operation can only be carried out under servo OFF;
2. When absolute encoder-related alarms occur, this operation can only be used to complete the alarm removal operation, and the alarm reset signal (A-RST) cannot remove these alarms;
3, after the completion of this operation, before the correct operation, you must re-power on, please re-power on to check the alarm;
4, after the completion of this operation, the absolute value of the multi-turn value is set to 0 (the data of the single turn will not change), and the related alarm of the absolute value encoder is cleared.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF011.
3			Press the SET key to display the left image.
4			Keep pressing ↑.
5			Until the picture on the left is displayed, the operation is complete.
6			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
7	Power On Reset		
8	End Of Operation		

6.14 Manual Load Inertia Detection (Fn 15)

The function of manual load inertia detection refers to the function of detecting the load inertia value of the servo system under manual operation.

The overpass prevention function is invalid during manual load inertia detection. The operation range of the machinery used must be considered at the same time. The running distance during the inspection can be set by parameter Pn300.2.

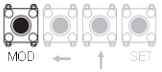
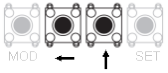
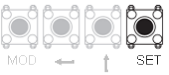
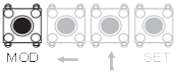
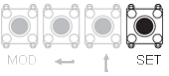
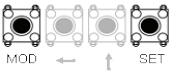
(1) Settings before operation

To perform manual load inertia detection, the following Settings must be made in advance.

- S-ON When the input signal is ON, switch it to OFF.
- Please set the running distance after considering the operating range of the machine used. The running distance is set by Pn300.2.
- Please take the necessary safety measures to keep it in a state that can be stopped in an emergency at any time.
- For safety, install a stop device on the mechanical side.

(2) Procedure

The following describes the procedure for manually checking the load inertia.

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			Press ↑ or ← to display AF015.
3			If the servo is not running and ready, press the SET key to display the left picture.
4			If the servo is running or the front panel lock (Fn 03) is set, the picture on the left is displayed, indicating that this auxiliary function operation cannot be performed.
5			Press MOD key for manual load inertia detection.
6			During the detection process, if you need to stop the detection immediately, you can press the SET key to exit directly.
7			
8			Press the MOD key or SET key to exit the auxiliary function and return to the display shown in Step 2.
9	End Of Operation		

7 Trial Run

7.1 Check And Precautions Before Trial Run

To ensure safe and correct trial operation, please check and confirm the following items in advance.

Item	Content
Servo motor	Is the motor off load?
	Are the wiring and connections correct?
	Are the fastening parts loose?
	When a servo motor with a holding brake is used, is the brake pre-disengaged? When disarming the brake, apply a specified voltage to the brake (generally DC24V)
Servo Driver	Are the wiring and connections correct?
	Is the power supply voltage to the servo driver normal?

7.2 JOG Operation Via Panel Operator

The following describes the execution steps for JOG running through the panel operator.

• JOG operation refers to the function of confirming the action of the servo motor through speed control without connecting the upper device.

• The JOG overshoot prevention function is invalid during operation. The operation range of the machinery used must be considered at the same time.

(1) Settings before operation

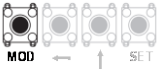
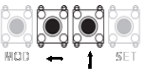
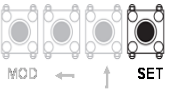
To run JOG, the following Settings must be made in advance.

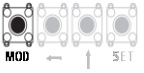
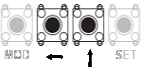
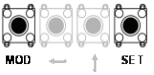
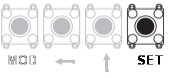
• S-ON When the input signal is ON, switch it to OFF.

• Please set the JOG speed after considering the operating range of the machinery used. JOG running speed is set by Pn306.

(2) Procedure

The steps for JOG running are as follows. The following describes the operation steps when the rotation direction of the servo motor is set to Pn000.0=0 (forward rotation command).

Step	Display Symbol	Keys used	Operation
1			Press the MOD key to select accessibility.
2			If Fn 02 is not displayed, press ↑ or ← to display Fn 02.
3			Press the SET key to enter the JOG running interface display content as shown on the left. (Note) When writing is disabled, "no_oP" is displayed. Please press AF03 to set the status to writable before performing this operation.

Step	Display Symbol	Keys used	Operation
4			Press the MODE key to enter the servo ON (motor power on) state. The right-most decimal point of the digital tube is lit, indicating that the motor has been excited.
5			Press ↑ (forward) or ← (reverse). During the press, the servo motor rotates at the speed set by Pn306.
6			Press the MODE key to enter the servo OFF (motor no power) state. **Addendum:** You can also press the SET key to exit the JOG operating interface, and the servo will also be OFF.
7			Press the SET key to exit this auxiliary function and return to the display shown in Step 2.
8	End Of Operation		

7.3 Servo Motor Single Trial Run

Please confirm the following items when conducting the trial run of the servo motor unit according to the upper instruction:

Item	Content
1	Confirm that the servo motor movement instructions and input and output signals from the upper device to the servo drive are correctly set.
2	Verify that the wiring between the upper device and the servo driver is correct and the polarity setting is correct.
3	Verify that the servo drive action Settings are correct.

7.3.1 Input Signal Loop Connection And Status Confirmation

When the speed control and position control are tested according to the upper command, the connection confirmation as shown in step 1 below is required.
Please follow the steps below to confirm the connection and status of the input signal.

Step	Operation	Reference Chapter
1	Connect the input signal loop required for the trial run to the input/output signal connector (CN2). The following conditions must be met during the connection. • The servo ON input signal (S-ON) is an input state. • No forward drive (POT), no reverse drive (NOT) input signal ON (L level) (can be driven forward and reverse).	3.3
2	Connect the connector of the upper device to the input and output signal port (CN2).	

Step	Operation	Reference Chapter
3	Power on the servo drive. Make sure the "Power Ready" button of the panel operator is on. Confirm the status of the input signal through the input monitor (dn012).	4.3
4	Input the S-ON signal to make the servo ON. Verify that the Run Flag of the panel operator is displayed correctly.	4.3
5	At this point, the trial operation is ready. Please continue to perform the trial run under each control mode	

7.3.2 Position Control Trial Run

The following describes the trial operation method of position control. This paper introduces the procedure of trial operation after the position control is connected with the input signal.

Step	Operation	Reference Chapter
1	Confirm the power supply and input signal loop again, and then switch on the control power of the servo driver.	3.1
2	According to the pulse output form of the upper device, Pn200.0 is used to set the command pulse form.	8.4.1
3	Set the command unit, according to the upper device through Pn205 and Pn206 to set the electronic gear ratio and frequency division Pn210.	8.4.2 8.5.7
4	Power on the device again. Make the parameter changes in Step 3 take effect. Switch on the main loop power to the servo drive.	
5	Set the servo ON (S-ON) input signal to ON.	
6	Output a low-speed pulse command from the upper device with an easily identifiable motor rotation (e.g. : 1 turn).	
7	According to the input instruction pulse counter (dn003, dn004), the amount of pulse change before and after the instruction is issued is monitored to confirm the number of instruction pulses entered into the servo drive.	5.1
8	According to the feedback pulse counter (dn001, dn002), the pulse change before and after the instruction is monitored to confirm the actual rotation of the motor.	5.1
9	Verify that the servo motor rotates in the direction instructed.	
10	If the driver has feedback pulses, check that the number of feedback pulses is consistent with the expected value. Feedback pulse number = (dn01*10000+dn02) *Pn210*4/ encoder resolution.	5.1
11	Stop pulse command to turn servo OFF.	

7.3.3 Speed Control Trial Run

The trial operation method of speed control is described below. This section describes the trial operation procedure for speed control after the input signal connection is completed (refer to "4.3.1 Input signal loop connection and status Confirmation").

Step	Operation	Reference Chapter
1	Confirm the power supply and input signal loop again, and then switch on the control power of the servo driver.	3.1
2	Adjust Speed instruction input gain (Pn301).	8.5
3	Switch on the main loop power to the servo drive.	
4	Verify that the speed command input (v-ref, voltage between AGND) is 0 V, and then switch ON the servo ON (S-ON) input signal.	
5	The voltage at the speed instruction input (v-ref, voltage between AGND) starts at 0 V and rises slowly.	
6	Confirm the speed command value (voltage) with the Speed command Monitor (dn07).	5.1

Step	Operation	Reference Chapter
7	Confirm motor speed (RPM) with motor Speed Monitor (dn00).	5.1
8	Verify that the values in steps 6 and 7 (dn07 and dn00) are consistent according to the conversion relationship.	5.1
9	Verify that the servo motor rotates in the direction instructed.	
10	Restore the speed instruction input to 0V and turn the servo OFF. Speed trial run completed.	

7.4 Motor And Mechanical Connection Trial Run

After the monomer test run is correct, the servo electricity is connected to the machine, and the test run after the machine is connected is carried out.

Step	Item	Content	Reference Chapter
1	Parameter Setting 1	Switch on the control power supply and the main loop power supply to set the protection functions related to the safety function, overrange, braking, etc.	3.1 8.2
2	Parameter Setting 2	Switch on the control power supply and the main loop power supply to set the protection functions related to the safety function, overrange, braking, etc.	
3	Install	In the state of power OFF, the servo motor and the machine are connected through the coupling.	
4	Examine	Switch on the power supply of the upper device, set the servo drive to servo OFF, and confirm whether the protection function set in step 1 works normally.	
5	Run	Test run according to "7.3 Test run of servo motor monomer according to upper instructions", and confirm that the test run result is the same as that of the test run of the servo motor monomer. And confirm that the setting of the command unit is consistent with the machine.	—
6	Adjust	Adjust the servo gain as needed to improve the response characteristics of the servo motor. Note: During the trial run, the servo motor and the machinery may not adapt to the situation, please fully implement the run-in operation.	—
7	S-ON Signal Input	At this point, the trial operation is over.	Superior Instruction

7.5 Trial Run Of Servo Motor With Brake

Please observe the following precautions for trial operation of servo motor with brake.

Item	Content
1	When the servo motor with brake is tested, before confirming the brake action, it is necessary to take measures to prevent the mechanical natural fall or vibration caused by external forces.
2	When running a servo motor with a brake, please confirm the servo motor and hold the brake action first when the servo motor and the machine are not connected. After no problem, please connect the servo motor to the machine and then test run again.
3	Use the brake interlock output (BK) signal of the servo drive to control the holding brake action of the servo motor with brake.

8 Run

8.1 Choice Of Control Mode

The following is a description of the control mode (control mode) that can be performed by the HS601 series servo driver.

User Parameter		Control Mode (Control Mode)	Reference
Pn000	h. □□0□ 【factory default】	**Position control (pulse command)** The position of servo motor is controlled by the pulse line position command. The position is controlled by the number of input pulses, and the speed is controlled by the frequency of input pulses. Used when positioning action is required.	8.4
	h. □□1□	**Speed control (analog voltage command)** Use the analog voltage speed command to control the speed of the servo motor in the following occasions. ◆ When you want to control the speed ◆ When the encoder pulse output of servo driver is used, the position loop is constructed through the upper device for position control.	8.5
	h. □□2□	**Torque control (analog voltage command)** The output torque of servo motor is controlled by the analog voltage torque command. Please use when you want to output push action.	8.6
	h. □□3□	**Speed control (internal setting speed selection)** A total of three input signals, INSPD0, INSPD1 and INSPD2, were used to control the speed by setting the 8-segment running speed in the servo drive in advance. When selecting this control mode, no analog instruction is required.	8.7
	h. □□4□ ～ h. □□9□	It is a switching mode compatible with the above four control modes. Please select the switching mode suitable for the customer's purpose.	8.10
	h. □□A□	**Internal position control** The system can control the position without a computer.	8.8

8.2 General Basic Function Settings

8.2.1 Servo ON Setting

Set the servo ON signal (S-ON) that gives the command of the on/off status of the servo motor.

(1) Servo ON signal (S-ON)

Kind	Signal	State	Input Level	Explain
Input	S-ON	ON	CN2-9：“L” level	Servo motor power state (servo ON state), can run.
		OFF	CN2-9：“H” level	Servo motor is not powered on (servo OFF state) and cannot run.

(2) Input level selection of servo ON signal

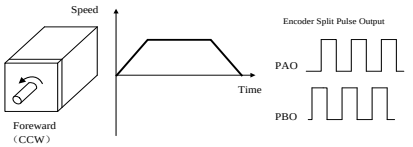
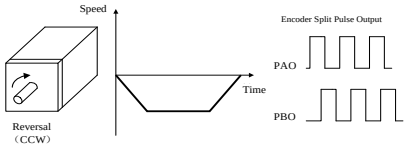
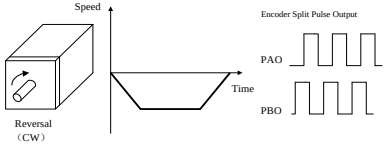
The input level can be selected by user parameters. That is, set the effective level of the servo ON signal (2CN-40).

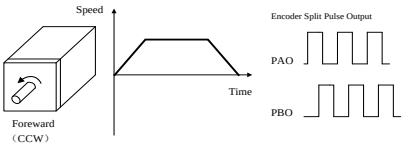
Parameter		Explain
Pn508	b. □□□0	The S-ON signal input from the input terminal CN2-9 is active at a low level. (Factory value).
	b. □□□1	The S-ON signal input from the input terminal CN2-9 is active at high level.

8.2.2 Motor Rotation Direction Switch

The servo drive can make the rotation direction of the servo motor run in reverse mode without changing the wiring of the servo motor.

The "positive direction" set by the standard is "counterclockwise rotation (CCW)" from the load side of the servo motor. The "reverse mode" only changes the direction of rotation of the motor, in this case, the "positive direction" is "clockwise rotation" from the load side of the servo motor. At this time, the direction of movement of the shaft (+, -) is reversed, but the polarity of the output signal from the servo driver, such as the encoder pulse output and the analog monitoring signal, remains unchanged.

Parameter		Order	Overrange（OT）
Pn000	h. □□□0 Standard setting (Forward turn instruction is forward turn, CCW direction) (Factory value)	■ Action when the forward turn command  Speed Encoder Split Pulse Output PAO PBO Time Foreward （CCW）	When turning forward: Stop by POT
		■ Action when reversing instruction  Speed Encoder Split Pulse Output PAO PBO Time Reversal （CCW）	When reversed: Stop by NOT
	h. □□□1 Inversion mode (Forward instruction is reverse, CW direction)	■ Action when the forward turn command  Speed Encoder Split Pulse Output PAO PBO Time Reversal （CW）	When reversed: Stop by POT

Parameter		Order	Overrange（OT）
		■ Action when reversing instruction 	When turning forward: Stop by NOT

8.2.3 Overrange Setting

Overreach refers to the safety function that makes the limit switch operate (ON) when the movable part of the machine exceeds the movable setting area, so that the servo motor is forced to stop.

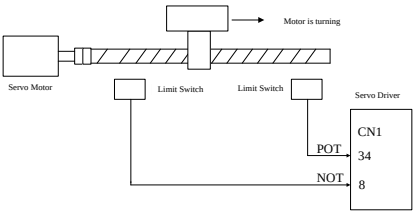
Attention
Installation of limit switch In cases such as linear operation, be sure to connect the limit switch to prevent mechanical damage. When the contact part of the limit switch has poor contact or broken line, please use the "normally closed contact" to make the motor move to the safety side. **When the servo motor is used in the case of vertical axis** The workpiece may fall off during the over-range state. In order to prevent the workpiece from falling, please set the servo motor to enter the zero fixed state after the over-range. Please refer to "" for setting method.

(1) Over-range signal connection

In order to use the overrange function, properly connect the input signal of the overrange limit switch described below to the corresponding pin number of the servo drive CN2 connector.

kind	Signal Name	Connector Pin Number	Setting	Significance
Input	POT	CN2-34 (Factory value)	ON=L Level	Reversible side drive (normal operation).
			OFF=H Level	No forward side drive (forward side overdrive).
Input	NOT	CN2-8 (Factory value)	ON=L Level	Reversible side drive (normal operation).
			OFF=H Level	No reverse side drive (reverse side overdrive).

In the case of linear drive, etc., in order to prevent mechanical damage, be sure to connect the limit switch as shown in the figure below. Even in the overrange state, it can also be driven to the opposite side of the phase. For example, in the state of positive side overdrive, it can be driven to the reverse side.



■ Importance
* In position control, when the motor is stopped by overdrive, there will be position deviation pulse retention. To clear the position offset pulse, a clear signal (CLR) must be entered.
* POT, NOT signals can be freely assigned the input connector pin number by user parameters. For details, see 3.4.3 I/O Signal Allocation.
* To use the POT, NOT signal, set Pn003.0 and Pn003.1 to 0 (to make the POT, NOT signal valid).
* During deceleration.

(2) Selection of motor stop method when using overrange

Set the stopping method of the servo motor when the POT, NOT signal is input during rotation (note that some drive models do not have DB braking function).

Parameter		Motor Stop Method	After Motor Stop	Significance
Pn001	d. □□0□ d. □□□0	DB Stop	Inertial operating condition	The DB(dynamic brake) is used for quick stop, and the servo motor enters the inertial operation (non-energized) state after stopping.
	d. □□0□			Stop by inertial operation (natural stop), the servo motor stops and enters the inertial operation (non-energized) state.
	d. □□0□ d. □□□2	Inertia Stop		Follow the same stopping method as when the servo is OFF (inertia stop), and the servo motor enters the inertia run (non-powered) state after stopping.
	d. □□1□	Retard Stop	Zero clamp state	Decelerated to stop by emergency stop torque (Pn406), the servo motor stops and enters a zero-clamp (servo lock) state.
	d. □□2□		Inertial operating condition	Decelerated to stop by emergency stop torque (Pn406), the servo motor stops and enters the inertial operation (non-energized) state.

• After changing this user parameter, the power supply must be restarted for the setting to take effect.

• During the inertial operation when setting n.□□□2, if the servo ON signal is received, the servo motor can be controlled only when the motor is slowed down to 0.

■ Expressions

• DB: Stop braking with dynamic brake (short circuit in servo drive internal circuit). (Note that the standard servo does not have DB)

• Inertial operation stop: No DB braking is performed but a natural stop is achieved through the friction resistance of the motor as it rotates.

• Deceleration stop: Stop using deceleration (brake) torque.

Zero clamp state: The state where the position instruction is zero. In the zero-clamp state, the position deviation is automatically zeroed out.

* For the servo OFF and stop method when alarm occurs, please refer to "8.2.5 Stop Method Selection when servo OFF".

(3) Enable the overrange signal

Parameter		Explain
Pn003	b. □□□0	Positive Side Drive Prohibition (POT) signal is valid.
	b. □□□1	The positive Side Drive Prohibition (POT) signal is invalid. (Factory value).
	b. □□0□	The reverse side drive Disable (NOT) signal is valid.
	b. □□1□	The reverse side drive Disable (NOT) signal is invalid. (Factory value)

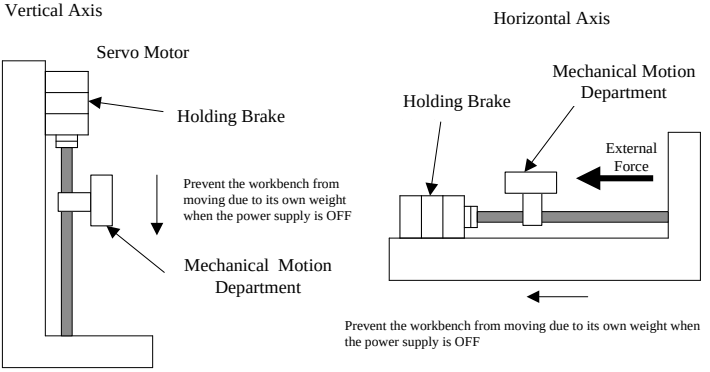
(4) Stop torque setting during overdrive

Pn406	Emergency Stop Torque			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～300	1%	250	Immediately

- Set the stopping torque at input overshoot signal (POT, NOT).
- Set the unit as % relative to the rated torque. (Rated torque is 100%)
- When the emergency stop torque set exceeds the maximum motor torque value, the actual output emergency stop torque is the maximum motor torque, when the emergency stop torque set is too small, there may be E.28 alarm during deceleration.

8.2.4 Hold Brake Setting

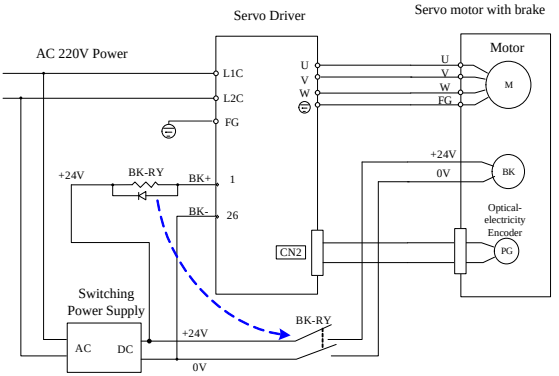
Keep the brake in use when the servo motor is driving the vertical shaft. When the power supply of the servo drive is OFF, a servo motor with a brake is used to keep the moving part from moving due to gravity. (Please refer to "7.5 Trial Operation of servo Motor with Brake").



1. The brake in the servo motor is a non-exciting action type of special brake, which can not be used for braking, but can only be used to maintain the stop state of the servo motor. The braking torque is more than 70% of the rated torque of the servo motor.
2. When the servo motor is operated by the speed ring only, the servo is set to OFF and the input command is set to "0V" while the brake is operating.
3. When configuring the position ring, because the servo motor is in the servo lock state when it stops, do not make the mechanical brake operate.

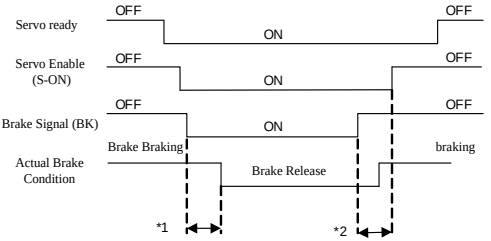
(1) Connect instances

The sequential output signal "BK" of the servo driver and the brake power supply constitute the ON/OFF of the brake. An example of a circuit standard connection is shown below.



Note:
1. BY-RY: brake control relay.
2, the current provided by the switching power supply needs to be selected according to the brake, different brake working current is not the same, under normal circumstances, the DC24V of the switching power supply needs to be able to provide >1A current.
3. The DC24V input of the brake has no direction limit.

The brake has an action delay time. Please refer to the following figure for the ON and OFF timing of the action.



*1. the brake signal effective to the brake opening time varies according to the type of brake.
*2. the value of PA518.

(2) Brake interlock output

kind	Signal Name	Connector Pin Number	Setting	Significance
Output	BK	Need Distribution	ON=L Level	Release the brake
			ON=H Level	Apply brake

When using a servo motor with a brake, it is the output signal that controls the brake. In addition, this output signal is not used in the factory setting. The output signal needs to be assigned (Pn510 setting). Do not connect when using a motor without a brake.

■ Important

In the overrange state, even if the servo motor is not powered, it does not output BK signal.

(3) Brake signal (BK) distribution

The brake signal (BK) is assigned to the DO4 (CN2-1, CN2-26) signal at the factory.

Parameter		Connector Pin Number		Significance
		+Terminal	-Terminal	
Pn510	n. □□3□	CN2-5	CN2-4	The output terminals CN2-5 and CN2-4 output BK signals.
	n. □3□□	CN2-3	CN2-2	The output terminals CN2-3 and CN2-2 output BK signals.
	n. 3□□□	CN2-1	CN2-26	The output terminals CN2-1 and CN2-26 output BK signals.

■ Important

For details about how to assign other output signals of the servo drive, see "3.4.3 I/O IO Signal Assignment".

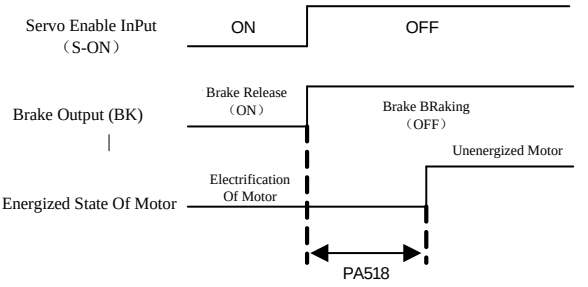
(4) Timing setting of the brake (after the servo motor stops)

The standard setting is that the BK signal is output at the same time that the S-ON signal is set to OFF(servo OFF), but the timing of the servo OFF can be changed through user parameters.

Pn518	Brake Command - Servo OFF delay time			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～500	ms	100	Immediately

• When used ON the vertical shaft, due to the timing of the brake on, the mechanical movable part will sometimes move a small amount due to the action of self-weight or external force. This small amount of movement can be eliminated by delaying the servo OFF action with this user parameter.

• This user parameter can change the brake ON timing when the servo motor is stopped. For brake action during servo motor rotation, please refer to "8.2.4(5) Brake ON Timing Settings (when servo motor is rotating)" in this subparagraph.



■ Important

When the alarm occurs, the servo motor immediately enters the non-energized state and has nothing to do with the setting of the user's parameters.

Due to the influence of the weight of the movable part of the machine or external force, the machine sometimes moves in the time before the brake action.

(5) Timing setting of the brake (when the servo motor is rotating)

The output condition of the BK signal can be changed according to the following user parameters when the servo is OFF or an alarm is issued to the rotating servo motor to stop.

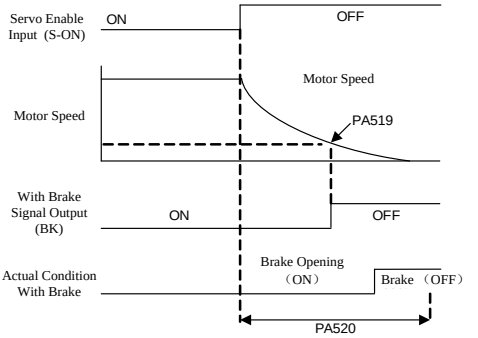
Pn519	Brake Command Operating Speed Limit			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～1000	rpm	100	Immediately
Pn520	**Servo OFF Brake Command Wait Time**			
	Setting Range	Set Unit	Factory Default	Effective Time
	100～1000	1ms	500	Immediately

BK signal output conditions during servo motor rotation.

If any of the following conditions are true, the BK signal is set to the H level.

• When the servo is OFF, the motor speed is below Pn519.

• After servo OFF, when the Pn520 set time is exceeded.



■ **Important**

• Even if the Pn519 is set to a value above the maximum revolution of the servo motor used, the servo motor is limited by the maximum speed of the motor itself.

8.2.5 Stop Method Selection When Servo OFF

Select the stopping method when the servo drive is in the servo OFF state.

Parameter		Motor Stop Method	After Motor Stop	Significance
Pn001	d. □□□0	DB Stop	DB Hold	Stop with a dynamic brake (DB), and keep the DB state after the servo motor stops. (Factory value, note that the standard servo does not have DB).
	d. □□□1		Inertial Operating Condition	Stop by the dynamic brake (DB), the servo motor stops and enters the inertial operation (non-energized) state.
	d. □□□2	Inertia Stop	Inertial Operating Condition	Through the inertial operation stop, the servo motor stops and enters the inertial operation (non-energized) state.

	d. □□□3	Slow Stop	DB State	Stop the motor at the deceleration speed of Pn522, when the speed is reduced to Pn523, the motor is in DB state.
	d. □□□4		Inertial Operating Condition	Stop the motor at the deceleration speed of Pn522, when the speed is reduced to Pn523, the motor is in a free state.

The setting of this user parameter is valid under the following circumstances.

•S-ON input signal OFF(servo OFF)

• In case of an alarm

• When the main power supply (L1, L2, L3) is OFF

In the above setting of " d. □□□0" "DB status after DB stop", if the servo motor stops or rotates at a very low speed, it is the same as the inertia operation state, and no braking force will be generated.

■ Expressions

•DB stop: braking and stopping with dynamic brake (short circuit of servo motor internal circuit).

• Inertial operation stop: No braking is performed, but a natural stop is carried out through the friction resistance of the motor as it rotates.

The dynamic brake (DB) is a function used for emergency stopping.

When the servo motor is frequently started and stopped by the power supply ON/OFF or the servo ON signal (S-ON), the DB circuit is also frequently repeated ON and OFF operations, which is the main reason for the aging of the internal components of the servo drive. Please start and stop the servo motor through the control of the speed input command and the position command.

8.2.6 Instantaneous Power Failure Processing Settings

When the voltage supply to the main circuit power supply of the servo driver is temporarily OFF, set to continue running or set to the servo OFF.

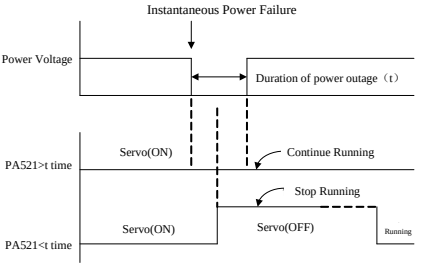
Pn521	Instant Stop Hold Time			
	Setting Range	Set Unit	Factory Default	Effective Time
	40～800	1ms	60	Immediately

Instantaneous power failure detection is to detect the main circuit power supply ON/OFF.

If the OFF→ ON reset time is lower than the set value of this user parameter, the operation continues. However, the Settings of user parameters cannot take effect in the following cases:

• The servo motor is overloaded and undervoltage warning occurs during A transient power outage (A.96) ".

• When the control power supply becomes uncontrollable during a momentary outage period (same as the usual power OFF operation).



8.2.7 Analog Voltage Output

The 44 (MON), 16 (SG) of the CN2 ports provide monitoring analog data, such as the running status of the motor; The speed and current of the motor can be represented by simulating voltage. This driver provides a Channel output with an analog output voltage range of -8V to +8V.
Related parameters are as follows:

Parameter		Explain
Pn021	d. □□□	The analog output signal is selected as the motor speed. (Factory value).
	d. □□□1	The analog output signal is selected as the motor torque.
	d. □□0□	The output voltage is not reversed. (Factory value).
	d. □□1□	The output voltage is reversed.

Pn023	Analog Voltage Output Gain			
	Setting Range	Set Unit	Factory Default	Effective Time
	0~65535		0	Immediately

The corresponding relationship is as follows:

Parameter Pn023	Analog Output Data: Speed	Voltage Calculation Method When Pn023≠0
0	500rpm output 1V voltage, -1000rpm output -2V voltage	Output Voltage = $\frac{\text{Motor Speed}}{\text{PA023}}$, Output Voltage Unit：Volts Motor Speed Unit：rpm
500	500rpm output 1V voltage	
1000	1000rpm output 1V voltage	
250	500rpm output 2V voltage	

Parameter Pn023	Analog Output Data: Torque	Voltage Calculation Method When Pn023≠0
0	100% torque output 3V voltage, -100% torque output -3V voltage.	Output Voltage = $\frac{\text{Motor Torque}\times 10}{\text{PA023}}$, Output Voltage Unit：Volts Motor torque unit: 1% rated torque
333	100% torque output 3V voltage, -100% torque output -3V voltage.	
222	100% torque output 4.5V voltage, -50% torque output -2.25V voltage.	
666	100% torque output 1.5V voltage, -200% torque output -3V voltage.	

Pn024	Analog voltage output zero correction			
	Setting Range	Set Unit	Factory Default	Effective Time
	−8000～8000	mV	0	Immediately

8.3 Absolute Value Encoder Usage

If a servo motor with an absolute value encoder is used, an absolute value detection system can be configured at the command controller. The result is that after the power supply is ON again, it can be run directly again without the origin reset.

Type Of Encoder	Resolution Ratio	Multiple rotation data output range	Action when the limit is exceeded
There are multi-loop memory absolute encoders	17 Bit	-32768～+32767	• When the upper limit of the positive rotation direction is exceeded (+32767), the multi-rotation data becomes -32768. • When the lower limit of the reversal direction is exceeded (-32768), the multi-rotation data becomes +32767.

When multi-circle data overflow, E.58 alarm will be generated; Parameter Pn007.1 can mask this alarm.

Parameter		Explain
Pn007	d. □□0□	E.58 alarm is generated when the absolute value encoder multi-turn data overflow. (Factory value).
	d. □□1□	Absolute encoder multi-turn data overflow does not alarm.

8.3.1 Absolute Value Encoder Selection

Parameter		Explain
Pn002	d. □0□□	Use the absolute value encoder as an incremental encoder. (Factory value).
	d. □1□□	Use the absolute value encoder as an absolute value encoder.

• When used as an incremental encoder, no backup battery is required.
• After changing this user parameter, the power supply must be restarted for the setting to take effect.

8.3.2 Battery Usage

Even when the power is OFF, a battery backup is required to enable the absolute value encoder to save position information.
(1) Battery selection
Please prepare according to the specifications of the command controller, the battery should use the equivalent of ER3V (3.6V, 1000mA Toshiba battery).
(2) Battery installation
The battery is installed in the battery box of the encoder cable, and the positive and negative terminals are not connected in reverse.

8.3.3 Battery Replacement

When the battery voltage drops below approximately 3.1V, the servo drive will issue A 17-bit Serial encoder Battery Warning (A.97). However, this warning is only output when the power of the servo drive is ON. Therefore, if the battery voltage of the servo drive is too low while the power is ON, the servo drive will not issue a warning. The battery voltage is too low by setting the user parameter variable.
• Battery replacement procedure
1. Replace the battery while keeping the servo drive control power ON.
2. After replacing the battery, set the power supply of the servo drive to OFF to disable the 17-bit Serial Encoder Battery Warning (A.97).
3. Restart the power supply of the servo driver. If there is no abnormal action, it indicates that the battery replacement is finished.

When the control power of the servo drive is set to OFF and the battery connection is removed (this also includes removing the encoder cable), the data in the absolute value encoder will be lost. In this case, the absolute value encoder must be set up. Please refer to "6.13 Absolute Encoder Multi-turn data Clearing and Alarm Clearing (AF011)".

8.3.4 Absolute Encoder Settings (Fn011)

In this case, the absolute value encoder must be set up.

- When initially starting the machine
- "17-bit Serial encoder Battery Warning (A.97)" occurs
- When E55 ~ E62 alarm occurs
- When you want to set the multi-rotation data of the absolute value encoder to 0

Set up with the driver Panel operator (see 6.13). The AF011 operation takes effect only after being powered on again.

8.4 Position Control Operation

8.4.1 User Parameter Setting

When using the pulse column for position control, set the following user parameters.

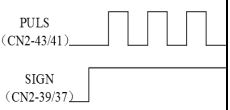
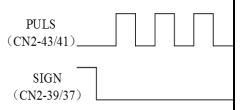
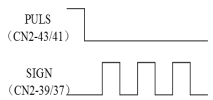
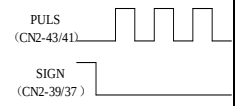
(1) Control mode selection

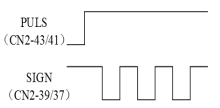
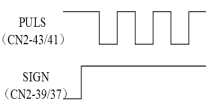
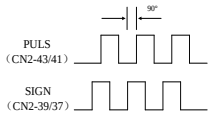
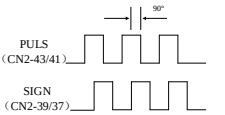
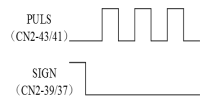
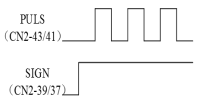
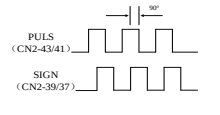
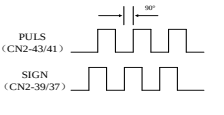
Parameter		Explain
Pn000	h. □□0□	Control mode selection: Position control (pulse column instruction).

(2) Pulse command form selection

kind		Signal Name	Connector Pin Number	
Input	Low speed pulse input channel	PULS+	CN2-43	Instruction pulse input
		PULS-	CN2-41	Instruction pulse input
		SIGN+	CN2-39	Symbol Input
		SIGN-	CN2-37	Symbol Input
	High speed pulse input channel	HPULS+	CN2-38	Instruction Pulse Input
		HPULS-	CN2-36	Instruction Pulse Input
		HSIGN+	CN2-42	Symbol Input
		HSING-	CN2-40	Symbol Input

Set user parameters Pn200.0 and Pn200.1 according to the specifications of the command controller.

Parameter		Instruction Type	Forward Instruction	Reverse Instruction
Pn200	d. □□00	Symbol + pulse column (positive logic) (Factory value)		
	d. □□01	CW+CCW		

Parameter		Instruction Type	Forward Instruction	Reverse Instruction
				
	d. □□02	Phase A + Phase B pulse 4X (positive logic)		
	d. □□10	Symbol + pulse column (negative logic)		
	d. □□12	Phase A + Phase B pulse 4X (negative logic)		

(3) Selection of clearing action

In conditions other than the clear signal (CLR), the timing clear offset pulse clear can be selected according to the status of the servo drive. The action mode of the offset pulse can be selected by the user parameter Pn200.2.

Parameter		Content
Pn200	d. □0□□	The offset pulse is cleared when the basic module and CLR signal are input. (Factory value). The basic module refers to the state when the S-ON signal is set to OFF, the main power supply is set to OFF, and the alarm occurs.
	d. □1□□	The offset pulse is not cleared. Only the CLR signal can be cleared.
	d. □2□□	Offset pulses are cleared only when an alarm or input clear signal (CLR) occurs.

(4) Selection of instruction pulse input channel

Select pulse input channel by setting parameter Pn200.3.

Parameter		Content
Pn200	d. 0□□□	**PULS, SIGN input (low speed pulse channel).** The pulse input of this channel is optocoupler reception, which is suitable for the upper computer with collector output and long line transmitter output, and the frequency is less than 500K.
	d. 1□□□	**PULSH, SIGNH input (high speed pulse channel).** The pulse input of this channel is received by the long-line receiver, which is suitable for the upper computer output by the long-line transmitter, and the frequency is ≤4000K

8.4.2 Electronic Gear Setting

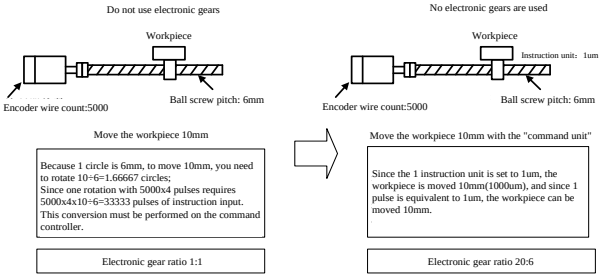
(1) Number of encoder pulses

Parameter		Encoder Specification	Encoder Pulse Number（P/R）	Resolution Ratio
Pn002	d. 0□□□	17 bit absolute encoder	32768	131072（17bit）
	d. 1□□□	17 bit incremental encoder	32768	131072（17bit）
	d. 2□□□	Incremental encoder	5000	20000
	d. 7□□□	Rotary encoder	4096	16384（15bit）

The bits representing the encoder resolution are not the same as the number of pulses in the encoder signal output (phase A, phase B). The number of encoder pulses x 4(multiplied) is equal to the number of bits representing the resolution.

(2) Electronic gear

The electronic gear function refers to the function that the workpiece movement equivalent to the input instruction 1 pulse of the command controller can be set to any value.
The minimum unit of the instruction 1 pulse from the instruction controller is called "1 instruction unit".



(3) Relevant user parameters

	First Electronic Gear（Molecule）			
Pn205	Setting Range	Set Unit	Factory Default	Effective Time
	0～65535	—	1	Immediately
	Electronic Gear (Denominator)			
Pn206	Setting Range	Set Unit	Factory Default	Effective Time
	0～65535	—	1	Immediately

If the mechanical deceleration ratio between the motor shaft and the load side is set to n/m, the set value of the electronic gear ratio can be obtained from the following formula.
(When the servo motor rotates m turns and the load shaft rotates n turns);

$$Electronic\ gear\ \frac{B}{A} = \frac{Pn205}{Pn206} = \frac{Encoder\ pulse\ number\ X\ 4}{Load\ shaft\ rotation\ 1\ turn\ movement}\ X\ \frac{m}{n}$$

* If you exceed the set range, divide the numerator and denominator into integers within the set range.
Please be careful not to change the electronic tooth ratio.

■ Important

Recommended setting range of electronic tooth ratio: 0.01≤ electronic tooth ratio (B/A)≤ 100.

（4）Electronic gear ratio setting procedure

Please follow the steps below to set the electronic tooth ratio.

Step	Content	Explain
1	Confirm mechanical specifications	Confirm deceleration ratio, ball screw pitch, pulley diameter, etc.
2	Confirm the number of encoder pulses	Confirm the number of encoder pulses of the servo motor used.
3	Decision order unit	Determines the 1 instruction unit from the instruction controller. Please consider the mechanical specifications, positioning accuracy and other factors on the basis of determining the unit of instruction.
4	Calculate the movement of the load shaft for 1 turn	Based on the determined instruction unit, calculate the number of instruction units required for the load shaft to rotate 1 turn.
5	Calculate the electronic tooth ratio	The electronic tooth ratio (B/A) is calculated according to the calculation formula of the electronic tooth ratio.
6	Set user parameters	The calculated value is set as the electronic tooth ratio.

（5）Calculation method of electronic tooth ratio

In position control mode, the actual load speed is:

Command Pulse Speed x (B/A) x Mechanical Deceleration Ratio

In the case of transmissions such as belt wheels, the electronic gear ratio (B/A) is calculated as follows:

$$\frac{\mathbf{B}}{A} = \frac{\mathbf{P_{pulse}} \times \mathbf{M} \times \mathbf{i}}{\mathbf{L}}$$

$\mathbf{P_{pulse}}$：Motor encoder resolution. Refers to the number of pulses fed back by the motor feedback element in one rotation of the motor. For example, an incremental encoder with 5000 lines, the number of pulses fed back to the driver is 5000×4=20000.

M： Calculated pulse equivalent (mm). The resolution of the upper controller.

L： Lead screw pitch (mm).

i： Mechanical gear ratio.

$$i = \frac{Number\ of\ driven\ side\ belt\ gears\ (machine\ side)}{\text{Driving side belt gear teeth (motor side)}}$$

For example, the upper controller pulse equivalent is 0.001mm (1um); The mechanical deceleration ratio is: i= driven wheel/driving wheel = 36/24; Lead screw pitch is 6mm; The motor encoder is 5000P/r, and the number of feedback pulses per revolution is 5000×4 = 20000.

Is calculated according to the above formula

$$\frac{\mathbf{B}}{A} = \frac{\mathbf{20000} \times \mathbf{0.001} \times \frac{\mathbf{36}}{\mathbf{24}}}{\mathbf{6}} = \frac{\mathbf{10}}{\mathbf{2}} = 5$$

The numerator of the electronic gear should be set to 5 and the denominator to 1.
If in this case the lead screw is directly connected, then the deceleration ratio is 1, and the lead screw pitch is also 6mm, then

$$\frac{B}{A}=\frac{20000\times 0.001\times 1}{6}=\frac{10}{3}$$

8.4.3 Position Instruction

The command in the form of pulse column is issued to control the position of the servo motor.
The output patterns of the pulse train of the command controller include the following types.

- Bus driver output
- +24V open collector output
- +12V open collector output
- +5V open collector output

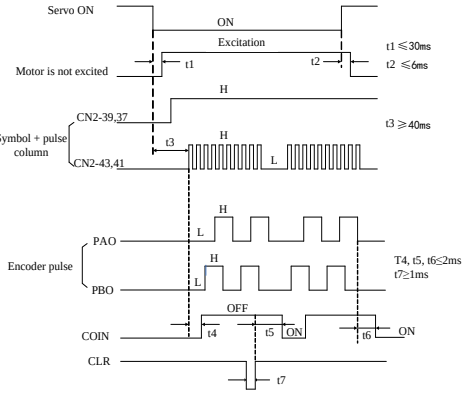
■ Precautions for open-circuit collector output

The open-collector output signal can only be received by CN2-43, 41, 39, 37 of the servo driver, and the setting parameter is to select the pulse input as the low-speed pulse channel input, that is, Pn200.3=0 (factory value).

Parameter		Significance
Pn200	d. 0□□□	Low speed pulse input channel selection
	d. 1□□□	High speed pulse input channel selection

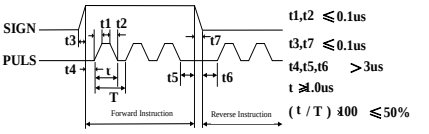
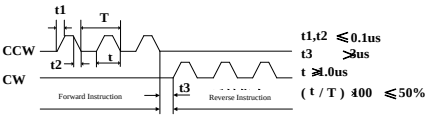
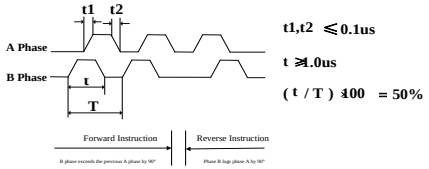
When the pulse input is performed through an open collector, the interference tolerance of the input signal decreases.
If the offset is due to interference, please change it in the following user parameters.

(1) Timing examples of input and output signals



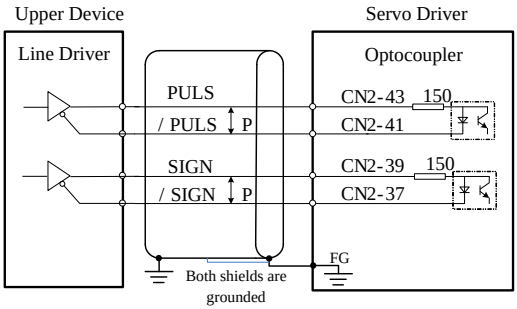
Note:
1. The interval between the servo ON signal set to ON and the input command pulse should be controlled at more than 40ms. If the command pulse is entered within 40ms of the time when the servo ON signal is set to ON, the servo driver sometimes does not accept the command pulse.
2. Set the ON of the clear signal to more than 20μs.

Table 8.1 Timing of instruction pulse input signal

Command pulse signal form	Electrical Specification	Remark
Symbol + pulse column input (SIGN + PULS signal) Maximum command frequency: 500kpps (Open collector output: 200kpps)		**SIGN** **H= forward turn instruction** **L= reverse instruction**
CW pulse +CCW pulse Maximum command frequency: 500kpps (Open collector output: 200kpps)		
90° phase difference 2 phase pulse(Phase A + phase B) Maximum command frequency: X 4 multiplier :200kpps (Open collector output: 150kpps)		

(2) Connect instances

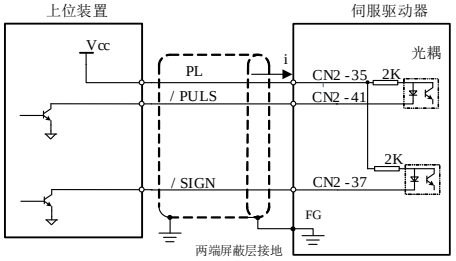
(a) A connection instance of the bus driver output



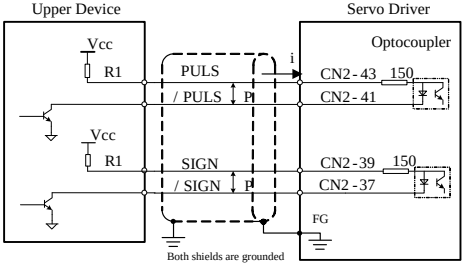
Suitable linear drives, such as T1 AM26LS31's equivalent

(b) Examples of connections for open collector outputs

When the collector power supply is 24V, the connection can be made according to the following figure.



When the collector power supply is 12V or 5V, you can connect it according to the following figure.



Please select the value of the limiting resistor R1 to ensure that the input current i enters the following range

Input current i = 7 to 15mA.

■ Important

The interference tolerance of the input signal is reduced when the command pulse is output through the open collector. When the deviation occurs due to interference, please set the user parameters Pn201.0 Increase the setting value and pay attention to the connection of the shielded wire.

8.4.4 Smoothness

The command pulse input of a certain frequency can be filtered inside the servo driver.

(1) Filter related user parameters

Pn214	**Position instruction acceleration and deceleration time parameter 1**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～1000	0.1ms	0	Immediately
Pn216	**Position instruction moves the average time**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～500	rpm	0	Immediately

■ Important

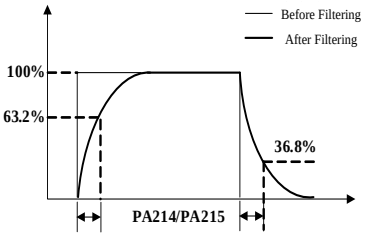
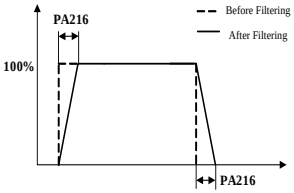
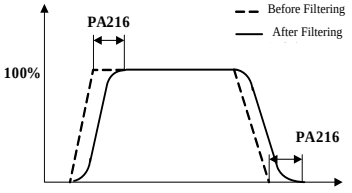
In the case of changing the position instruction acceleration and deceleration time parameters (Pn214, Pn215), the changed value takes effect when there is no instruction pulse input. To accurately reflect the set value, enter a clear signal (CLR) to disable the command pulse of the command controller or to clear the offset pulse as a servo ON.

The motor can be run smoothly even in the following situations and this setting has no effect on the amount of movement (number of instruction pulses)

- When the command controller issuing the command cannot accelerate or decelerate.
- When the frequency of the instruction pulse is low.
- When the number of electronic teeth is relatively large (more than 10 times).

■ Replenishment

The difference between the position instruction acceleration and deceleration time constant (Pn214) and the position instruction average movement time (Pn216) is shown below.

Acceleration and deceleration time parameters	Average moving filter
Pn214	Pn216
 The response waveform of step instruction input	 The response waveform of step instruction input  Response waveform of ladder instruction input

8.4.5 Positioning Complete Signal (COIN)

This signal is a signal indicating the completion of servo motor positioning when position control. Please use it when ordering the controller to confirm the interlock of positioning completion.

kind	Signal Name	Connector Pin Number	Setting	Significance
Output	COIN	CN2-5、4(Factory value)	ON=L Level	Position Complete
			OFF=H Level	Locating Incomplete

The located signal can be assigned to the output terminal using user parameter Pn510. For details, see 3.4.3 I/O Signal Assignment. The factory Settings are assigned to CN2-5 and 4.

Pn525	Positioning Completion Width			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～65535	1pulse	10	Immediately

If the difference between the command pulse output of the command controller and the movement of the servo motor (offset pulse) is lower than the set value of the user parameter, the setting unit of the output positioning completion signal (COIN) is the instruction unit, which depends on the instruction unit set by the electronic gear.
If the value is set too large, the offset can be reduced at low speed, but it is possible to output the COIN model frequently, so please note.
The setting of this user parameter does not affect the final positioning accuracy.

■ Replenishment
The COIN signal is the signal for position control.

8.4.6 Positioning Approach Signal (NEAR)

The positioning approach signal (NEAR) is a signal indicating that the servo motor is located near the positioning completion.
It is used to receive the signal near the positioning before the command controller confirms the positioning signal to prepare the action sequence after the positioning is completed to shorten the positioning.
The time required for the action at bit completion.

kind	Signal Name	Connector Pin Number	Setting	Significance
Output	NEAR	To be distributed	ON=L Level	Reached near the completion of positioning
			OFF=H Level	Not reached near the completion of positioning

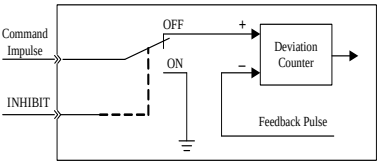
The positioning proximity signal can be assigned to the output terminal using user parameter Pn510.
For details about how to assign input signals, see 3.4.3 I/O Signal Assignment.

Pn526	NEAR Signal Width			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～65535	4pulse	100	Immediately

If the difference (offset) between the command pulse output of the command controller and the movement of the servo motor is lower than the set value of the user parameter Pn526, the positioning NEAR message is output.
The set unit is the command unit depending on the command unit set by the electronic gear
In general, set a value larger than the positioning completion width (Pn525). For details about how to assign input signals, see 3.4.3 I/O Signal Assignment.

8.4.7 Command Pulse INHIBIT Function

(1) Command pulse INHIBIT function (INHIBIT function)
Is the function to stop (disable) the count of the instruction pulse input during position control, during which the servo-locked (clamped) state is entered.



(2) Setting of input signal

kind	Signal Name	Connector Pin Number	Setting	Significance
Input	INHIBIT	CN2-31 (Factory Value)	ON=L Level	INHIBIT function ON (Stop (disable) instruction pulse count).
			OFF=H Level	INHIBIT function OFF (Count the instruction pulses).

INHIBIT signal function works only with position controls

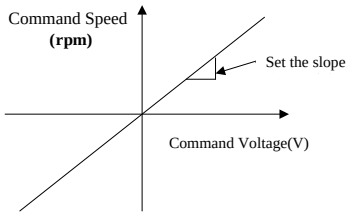
8.5 Speed Control (Analog Voltage Command) Operation

8.5.1 User Parameter Setting

Parameter		Significance
Pn000	h. □□1□	Control mode selection: speed control (analog voltage command).

Pn301	Speed Instruction Input Gain			
	Setting Range	Set Unit	Factory Default	Effective Time
	150～3000	0.01V/ Rated Speed	600	Do without

Set the analog voltage level for the speed instruction (V-REF) required to run the servo motor at rated speed.



■ Examples

Pn301=600 indicates that when set to 6V input, use the rated speed of the motor to run (factory value).

Pn301=1000 indicates that the rated speed of the motor is used when the input is set to 10V.

Pn301=200 indicates that the rated speed of the motor is used when the input is set to 2V.

8.5.2 Input Signal Setting

(1) Speed instruction input

When the speed command in the form of analog voltage command is sent to the servo driver, the speed of the servo motor is controlled at a speed proportional to the input voltage.

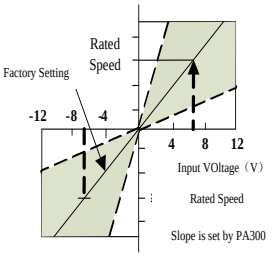
kind	Signal Name	Connector Pin Number	Name
Input	V-REF	CN2-20	Speed instruction input
	AGND	CN2-29	Speed instruction input with new ground

Used in speed control (analog voltage command). (Pn000.1= 1,5,7,9)

Set the speed instruction input gain with the Pn301. Please refer to "8.5.1 Setting of User Parameters" for details on the setting.

■ Input specification

- Input range: DC±2V ~ ±10V/rated speed.
- Maximum allowable input voltage: DC±12V.



• Setting instance

Pn301=600: Rated speed at ±6V

Examples are shown below.

Speed Instruction Input	Rotate Direction	Speed	Rated speed =3000rpm motor
+6V	Foreward	Rated Speed	3000rpm
+1V	Foreward	1/6 Rated Speed	500rpm
-3V	Reversal	1/2 Rated Speed	-1500rpm

Change the voltage input range with user parameter Pn301.

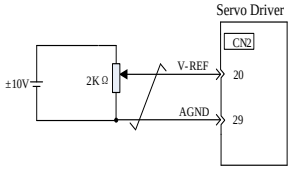
■ Input circuit example

• In order to be able to take effective measures to prevent interference, be sure.

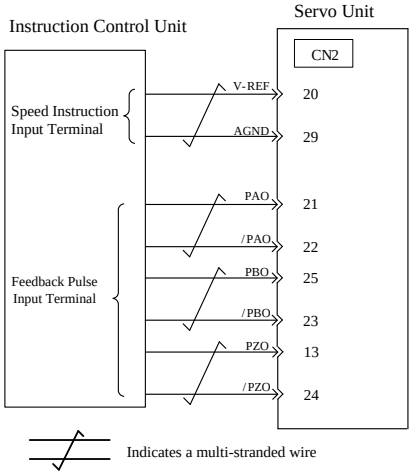
Multiple stranded wires are used in wiring.

• Examples of variable resistors

The 25HP-10B model is manufactured by Rong Communication Industries.



When the command controller is used for position control, it is connected to the speed command output terminal of the command controller.



(2) Proportional Action Command Signal (P-CON)

kind	Signal Name	Connector Pin Number	Setting	Significance
Input	P-CON	Required Terminal Assignment	ON=L Level	Run the servo drive in P control mode.
			OFF=H Level	Run the servo drive in PI control mode.

The P-CON signal is the signal that selects the speed control mode from the PI(proportional integral) or P(proportional) control.

If set to P, the control can mitigate motor rotation and slight vibration caused by drift of the speed instruction input.

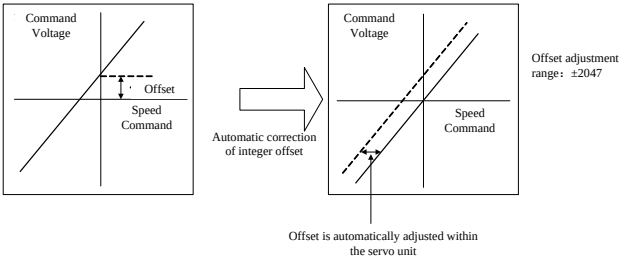
Input command: The servo motor rotation can be decreased by 0V when the drift is generated, but the servo rigidity (support force) decreases when it is stopped.

The P-CON signal allows the input connector pin number to be assigned elsewhere through user parameters. For details, see 3.4.3 I/O Signal Allocation.

8.5.3 Instruction Offset Adjustment

When the speed mode is used, even if the 0V command voltage is issued as an analog quantity, the motor will rotate at a small speed. This occurs when the command voltage of the superior control device or external circuit is offset (offset) by a small amount (mV units). In this case, the command offset can be automatically adjusted using the panel operator. • For manual adjustment, see "7.2 Operations in Auxiliary Function Execution Mode (Fn□□□)".

Automatic adjustment of analog (speed and torque) instruction offset is a function of measuring offset and automatically adjusting voltage. When the voltage instruction of the upper control device and the external circuit is offset, the servo driver will automatically adjust the offset as follows.



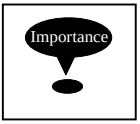
Once the automatic adjustment of the instruction offset is made, the offset is saved inside the servo drive. The offset can be confirmed by manual adjustment of the speed instruction offset (Fn007). Please refer to 8.5.3(2) Manual Adjustment of Offset of Speed Instruction.

(1) Automatic adjustment of offset of speed instruction

Automatic instruction offset adjustment (Fn006) cannot be used when the offset pulse at servo lock stop is set to zero while the instruction controller is configured with the position ring. In this case use manual adjustment of the speed instruction offset (Fn007).

The zero speed command is also equipped with a zero-clamp speed control function that forces servo locking. For details, see 8.5.6 Using the Zero-Clamp Function.

Perform automatic adjustment of analog value zero offset in servo OFF state.



Perform automatic adjustment of analog value zero offset in servo OFF state.
Please follow the steps below to automatically adjust the offset of the speed instruction.

2) Manual adjustment of offset of speed instruction

Use manual adjustment of the speed instruction offset (Fn007) in the following cases.

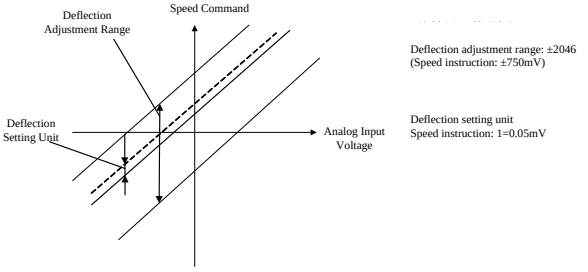
• Instructs the controller to configure the position loop to set the offset pulse at servo lock stop to zero

• When the offset is consciously set to a given quantity

• Confirm offset data set with auto adjustment

The basic function is the same as the automatic adjustment of the offset of the analog quantity (speed • torque) instruction (Fn006), but in the manual adjustment (Fn007), the adjustment must be made at the same time as the offset is directly entered.

The offset adjustment range and setting unit are shown below.



For details about how to automatically adjust the offset of the speed command, see Section 6.8.

8.5.4 Soft Start

Soft start refers to the function of converting the step speed command input into a certain acceleration or deceleration command inside the servo drive.

Pn303	**Soft Start Acceleration Time**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～5000	1ms	0	Immediately
Pn304	**Soft Start Deceleration Time**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～5000	1ms	0	Immediately

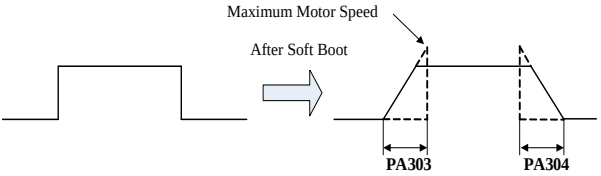
Smooth speed control when entering step speed instructions or selecting internal set speed.

(General speed control please set to "0")

Each set value is shown below

•Pn303: The time from the stopped state to 1000rpm, that is, the acceleration time at 1000rpm intervals.

•Pn304: The time from 1000rpm to the stop state, that is, the deceleration time at 1000rpm intervals.



Pn317	Soft start acceleration time			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～3	-	0	Immediately

Unit of acceleration and deceleration time of Pn303 and Pn304 above:
0：1ms　　1：2ms　　2：10ms　　3：100ms

8.5.5 Speed Instruction Filter

Pn302	Speed Instruction Filter Time Parameter			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～1000	0.01ms	40	Immediately

The analog speed instruction (V-REF) input is passed through a one-time delay filter to smooth the speed instruction. If you set too large a value, responsiveness decreases.

8.5.6 Zero Clamp Function Is Used

（1）Zero clamp function

A function used in a system where the command controller is not configured with a position loop during speed control.

If the ZEROSPD (Pn300.3=0) signal is set to ON, or the input voltage of the speed instruction (V-REF) (Pn300.3=1) is below the speed of Pn316(zero-clamp class), the position ring is configured inside the servo drive. Ignore the speed command and bring the servo motor to an emergency stop to enter the servo lock state. The servo motor is clamped to within ±1 pulse at the position where the zero clamp is in effect and returns to the zero clamp position even when turned by an external force.

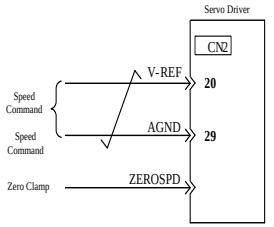
(2) User parameter setting

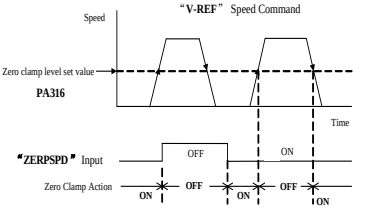
Parameter	Significance
Pn300	Speed control function switch 0
	Pn300.3=0，Use external IO control (ZEROSPD signal)
	Pn300.3=1，Automatic (according to Pn316 range as speed dead zone)

Zero clamp action switching condition

When Pn000=h.□□1□, Pn300.3=0, ZEROSPD is ON(L level), it will enter the zero-clamp action.

When Pn000=h.□□1□, Pn300.3=1, the speed instruction (V-REF) is lower than the set value of Pn316, it will enter the zero-clamp action.





(3) Input signal setting

kind	Signal Name	Connector Pin Number	Setting	Significance
Input	ZERPSPD	Need Distribution	ON=L Level	Zero clamp function ON (valid)
			OFF=H Level	Zero clamp function OFF (invalid)

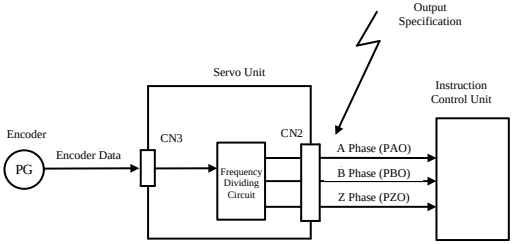
Is the input signal used to switch to the zero-clamp action.
When using the ZERPSPD signal, the input signal needs to be assigned.
For details, see 3.4.3 I/O Signal Allocation.

■ Important
When the ZEROSPD signal has been allocated, the zero-clamp action is effective even at Pn000=h.□□1□(speed control).

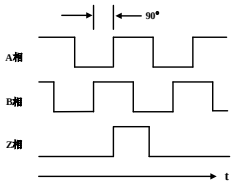
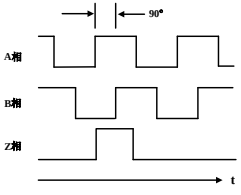
8.5.7 Encoder Signal Output

The encoder feedback pulse is processed internally by the servo drive and then output externally.

kind	Signal Name	Connector Pin Number	Name
Output	PAO	CN2-21	Encoder output phase A
	/PAO	CN2-22	Encoder output phase /A
Output	PBO	CN2-25	Encoder output phase B
	/PBO	CN2-23	Encoder output phase /B
Output	PZO	CN2-13	Encoder output phase Z (origin pulse)
	/PZO	CN2-24	Encoder output phase /Z (origin pulse)



■ Output phase pattern

Forward (B phase 90° lead)	Reverse (A phase 90° lead)
	

After rotating the servo motor twice, use the Z-phase pulse output of the servo drive for the mechanical origin reset action.

According to the structure of the mechanical system, when the above action cannot be carried out, please carry out the origin reset action at a speed below 600rpm (according to the speed conversion of the servo motor). If the speed above 600rpm is used, sometimes the Z phase pulse cannot be correctly output.

Frequency division means that the pulse density set by the user parameter (Pn210) is converted and output based on the pulse data of the encoder installed on the servo motor. The unit is "pulse number /1 turn".

Encoder pulse frequency division ratio setting

Pn210	PG Frequency Division Ratio			
	Setting Range	Set Unit	Factory Default	Effective Time
	16～16384	1P/ rew	16384	Immediately

Sets the number of output pulses of the PG output signal (PAO,/PAO,PBO,/PBO) sent from the servo drive to the outside.

Each turn of the feedback pulse from the encoder is divided into the set value of the Pn210 inside the servo drive and is output. (Please set according to the system specifications of the machine and command controller.)

In addition, the setting range varies depending on the number of encoder pulses of the servo motor used.

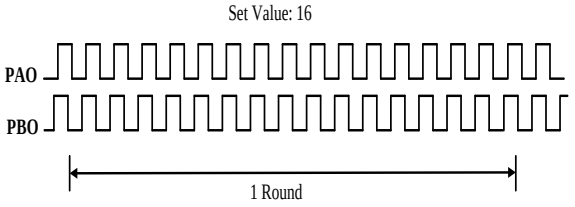
Encoder Specification	Resolution Ratio	Encoder Pulse Number （P/R）	Setting Range
Dart ine incremental encoder	20,000 pulses/turns	5000P/R	16～5000
Absolute Encoder	17 bits, 131,072 pulses/turn	32768P/R	16～16384

■ Important

When the Pn210 value is set to exceed the number of encoder lines, its frequency division value is the number of encoder lines. If the Pn210 is set to 16384 when using an incremental encoder of 5000ppr, the frequency dividing pulse is the number of encoder lines 5000.

■ Output examples

Pn210=16(16 pulse output per 1 turn)



8.5.8 Simultaneous Detection Output

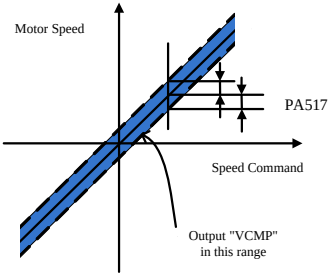
When the speed of the servo motor is consistent with the command speed, the output of the same speed detection output (VCMP) signal is used when interlocking with the command controller.

kind	Signal Name	Connector Pin Number	Setting	Significance
Output	VCMP	Need Distribution	ON=L Level	Same speed status
			OFF=H Level	Different speed status

The output signal needs to be allocated by parameter Pn510.
For details about how to assign output signals, see 3.4.3 I/O Signal Assignment.

Pn517	Same Speed Detection Width			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～100	rpm	10	Immediately

If the difference between the motor speed and the command speed is lower than the set value of the Pn517, a "VCMP" signal is output.



■ Examples
When Pn517=100 and the command speed is 2000rpm, if the motor speed is between 1900 and 2100rpm, "VCMP" is set to ON.

■ Replenishment
The "VCMP" signal is the output signal for speed control.

8.6 Torque Control Operation

8.6.1 User Parameter Setting

The following user parameters need to be set when running torque control using analog voltage instructions.

Parameter		Significance
Pn000	h. □□2□	Control mode selection: Torque control (analog instruction).

Pn400	Torque Instruction Input Gain			
	Setting Range	Set Unit	Factory Default	Effective Time
	10～100	0.1V/ rated torque	30	Immediately

8.6.2 Torque Instruction Input

The torque command in the form of analog voltage command is issued to the servo driver, and the torque is proportional to the input voltage to the servo motor torque control.

kind	Signal Name	Connector Pin Number	Name
Output	T-REF	CN2-18	Torque instruction input
	AGND	CN2-19	Torque instruction input

Used when performing torque control (analog voltage instruction) (Pn000.1=2, 6, 8, 9).

Torque instruction input gain is set using Pn400.

■ Input specification

Input range DC 1V~10V/ rated torque.

The maximum allowable input voltage is DC12V.

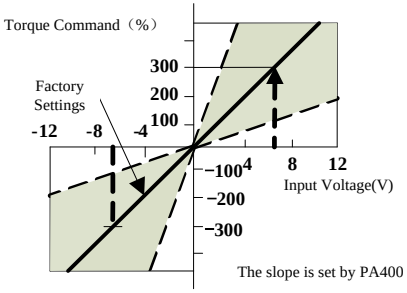
At the factory value, Pn400 = 30, rated torque under 3V conditions.

+3V input positive direction is rated torque.

+9V input positive direction is 300% of the rated torque.

-0.3V input in the opposite direction is 10% of the rated torque.

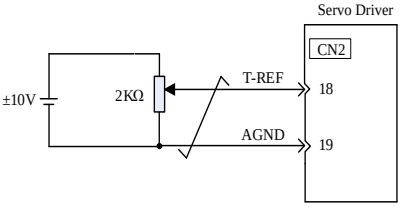
The voltage input range can be changed with the user parameter Pn400.



■ Input circuit example

In order to be able to take effective measures to prevent interference, it is necessary to use multi-stranded wire when wiring.

Example of variable resistor, type 25HP-10B made by Rong Communication Industry.



Confirmation of internal torque instructions

1. Confirm the internal torque instruction through the panel operator.

Internal torque instructions can be verified in Monitor mode (dn010), see 4.4.2 Operation in Monitor mode.

8.6.3 Offset Adjustment

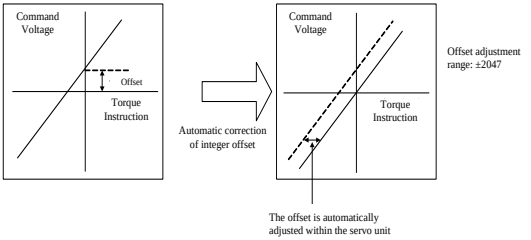
(1) Automatic adjustment of torque instruction offset

When torque control mode is used, as an analog command voltage, even if the 0V command is issued, the motor will rotate at a small speed, which occurs when the command voltage of the upper control device or the external circuit is offset by a small amount (mV units) (offset).

In this case, the command offset can be adjusted automatically and manually using the panel operator.

Automatic adjustment of analog (speed torque) instruction offset (Fn006) is a function that measures the offset and automatically adjusts the voltage.

When the voltage instruction of the upper control device and the external circuit is offset, the servo driver will automatically adjust the offset as follows.



Once the automatic adjustment of the instruction offset is made, the offset is saved inside the servo drive. Offset can be confirmed by manual adjustment of torque instruction offset (Fn008).

Automatic adjustment of the instruction offset (Fn006) cannot be used when the offset pulse at servo lock stop is set to zero in the state of the instruction controller configuration position ring. In this case, manual adjustment of the torque instruction offset (Fn008) can be used.

Please follow the steps below to automatically adjust the torque instruction offset.

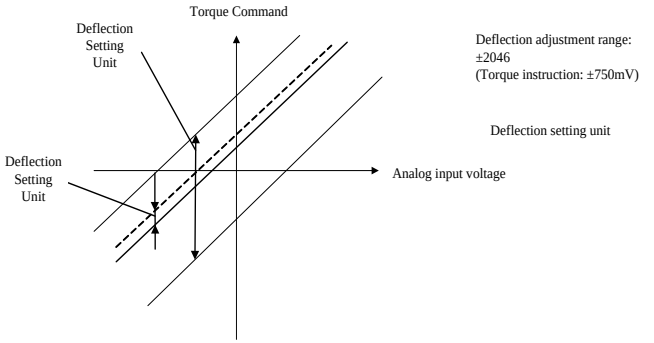
(2) Manual adjustment of torque instruction offset

Please use manual adjustment of torque instruction offset (Fn008) in the following cases.

- The command controller configures the position loop to set the offset pulse to zero when the servo lock stops.
- When the offset is consciously set to a given quantity.
- Confirm offset data set with auto adjustment.

The basic function is the same as the automatic adjustment (Fn006) of the analog quantity (speed, torque) instruction offset, but in the manual adjustment (Fn008), the adjustment must be made at the same time as the offset is directly entered.

The figure below shows the offset adjustment range and setting unit.



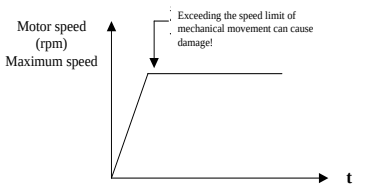
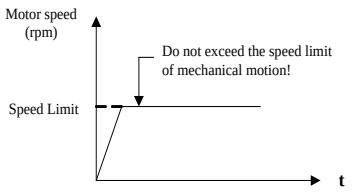
Please follow the steps below to manually adjust the torque instruction offset.

8.6.4 Torque Control When Speed Limit

Since the servo motor should be controlled to output the torque issued by the command during torque control, the motor speed management is not carried out.

If the command torque is set too large relative to the load torque on the mechanical side, it will exceed the mechanical torque, resulting in a significant increase in motor speed.

As a protective measure on the mechanical side, it is equipped with a function to limit the speed of the servo motor during torque control.

No Speed Limit	Speed Limit
	

(1) Choice of speed limit mode (torque limit option)

Parameter		Significance
Pn002	d. □□0□	Use the value set by the Pn407 as a speed limit (internal speed limit function).
	d. □□1□	Use V-REF(CN2-20, 29) as an external speed limit input to provide speed limits with the input voltage of V-REF and the set value of Pn301 (external speed limit function).

(2) Internal speed limiting function

Pn407	Torque Control When Speed Limit			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～5000	rpm	1500	

Motor speed limit when torque limit is set
When Pn002.1 is 0, this parameter takes effect
Even if a value is set in Pn407 that exceeds the maximum speed of the servo motor used, the actual value is still limited to the maximum speed of the servo motor used.

(3) External speed limit function

kind	Signal Name	Connector Pin Number	Name
Input	V-REF	CN2-20	External speed limit input
	AGND	CN2-29	External speed limit input

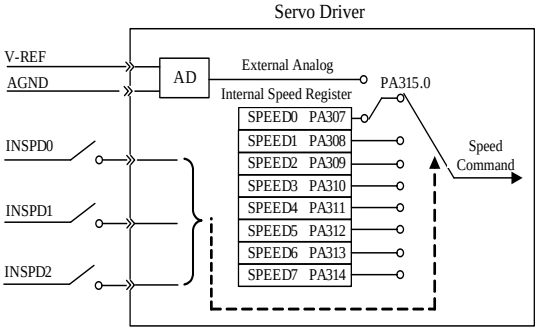
The set value of the Pn301 determines the voltage level entered as a limit independent of polarity.

Pn301	Speed Instruction Input Gain			
	Setting Range	Set Unit	Factory Default	Effective Time
	150～3000	0.01V/rated speed	600	Immediately

Torque control sets the voltage level of the speed at which the external speed limit is applied
When Pn301=600(factory value), if the input V-REF(CN2-20, 29) is 6V voltage, the actual speed is limited to the rated speed of the servo motor used.

8.7 Speed Control (Internally Set Speed Selection) Runs

Internally set the meaning of speed selection
The internal setting speed is selected by setting 8 motor speeds in advance through the user parameters inside the servo drive and using external input signals
Its speed is the function of speed control operation, and it is effective for speed control actions within 8 motor speeds.
In addition, when Pn315.0 is set to 1, the speed instruction source is selected as an external analog input.
There is no need for an external speed generator or pulse generator.
The combination of INSPD2, INSPD1 and INSPD0 selected internal speed, with INSPD2 as the high and INSPD0 as the low. If INSPD2 is valid but INSPD1 and INSPD0 are not, select internal speed SPEED4.



8.7.1 User Parameter Setting

Pn000	h. □□3□	Control mode selection: internal setting speed control (contact command).

Pn307	**Internal setting speed 1(SPEED0)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	100	Immediately
Pn308	**Internal setting speed 1(SPEED1)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	200	Immediately
Pn309	**Internal setting speed 1(SPEED2)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	300	Immediately
Pn310	**Internal setting speed 1(SPEED3)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	400	Immediately
Pn311	**Internal setting speed 1(SPEED4)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	500	Immediately
Pn312	**Internal setting speed 1(SPEED5)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	600	Immediately
Pn313	**Internal setting speed 1(SPEED6)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	700	Immediately
Pn314	**Internal setting speed 1(SPEED7)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	−5000～5000	rpm	800	Immediately

■ Important

Even if the value exceeds the maximum speed of the servo motor used in Pn307 ~ Pn314, the actual value is still limited to the maximum speed of the servo motor used.

8.7.2 Input Signal Setting

Use the following input signals to switch operating speeds.

kind	Signal Name	Connector Pin Number	Name
Input	INSPD0	CN2-□□(Need Distribution)	Internal speed select signal 0
	INSPD1	CN2-□□(Need Distribution)	Internal speed select signal 1
	INSPD2	CN2-□□(Need Distribution)	Internal speed select signal 2

About input signal selection

The combination of INSPD0, INSPD1 and INSPD2 signals corresponds to 8 speeds.

When using INSPD0, INSPD1, INSPD2 for operation, the input signal must be assigned by user parameters Pn500 ~ Pn507. For details, see 3.4.3 I/O Signal Allocation.

8.8 Internal Position Control

In the mode of internal position control (contact command) (Pn000.1=A) of the servo drive, the drive has a simple single-axis motion function, which can be controlled without complex upper computer.

The control mode has 16 sections of position control, each point can be independently set the displacement, running speed, acceleration and deceleration time constant, stop time after place, etc. The control mode has the function of returning to zero (to find the reference point), and the two speed of returning to zero can be set (1, the speed of returning to zero 1 (the speed before not touching the origin signal); 2, return to zero speed 2 (the speed after touching the origin signal), the direction and mode of return to zero can be set (parameter Pn771).

There are several kinds of point switching for internal position control (Pn700) :

External I/O ports (INPOS0, INPOS1, INPOS2, and INPOS3) Select a certain point and run the current location segment by triggering signals. The trigger mode can also be set to external I/O (PTRG) or the change of I/O port (INPOS0, INPOS1, INPOS2, or INPOS3) by parameter Pn770.1.

Loop running triggered by external IO (PTRG). The starting position point of the cycle is Pn700.2 and the ending point is Pn700.3.

Periodic trigger cycle operation. The starting position point of the cycle is Pn700.2 and the ending point is Pn700.3.

■ Set Displacement

The amount of displacement at each point corresponds to two parameters, which are combined to form a 32-bit position data. This data is a signed number. The high 16 bits of 32-bit signed data are stored in the high part of the hexadecimal positional parameter, and the low 16 bits are stored in the low part of the positional parameter. The data is in hexadecimal form and displayed in the parameters is also displayed in hexadecimal. That is, the high position parameter and the low position parameter are combined into 32 bits of signed position data.

Position segment X data (32-bit data) = (position segment X data high 16 bits <<16) & Position segment X data low 16 bits;

For example, to store data:

If the 32-bit data at position 0 is 0xFF104321, the low data 0x 4321 is stored in Pn701 and the high data 0xFF10 is stored in Pn702. Indicates that the data at position 0 is -15711455 pulses.

The same method, such as reading data:

If Pn702 is 0x0007 and Pn701 is 0xA120, the 32-bit position 0 data is 0x0007A120, which is 500,000 pulses.

Attention:

The value range of Pn701 is 0x0000, 0xFFFF. The value range of Pn702 is 0x0000, 0xFFFF.

The position here has to do with the electronic gear. If the electronic gear is set to 2:1, the set position displacement is half of the actual amount.

Of course, setting parameters can also be achieved by means of communication, and the corresponding displacement can be set in the computer by modifying parameters Pn701 and Pn702.

■ Speed

The speed here refers to the speed of the stable phase of the motor operation, similar to the frequency of the external given pulse in ordinary position control, but the speed here is related to the electronic gear. If the electronic gear is set to 2:1, the current speed set is half the actual speed.

■ Position command acceleration and deceleration time parameters

This parameter is the same as the position command of the ordinary position control to add and subtract speed time Pn214, see section 8.4.4 for details.

■ Change time after position

For this parameter to be valid, an internal timing loop must be used, that is, set Pn700.0 = 2.

Step change time refers to the time from the command completion signal (CMD_OK) output at the current position to the time when the servo starts executing the next position.

8.8.1 Correlated Input Signal

kind	Signal Name	Connector Pin Number	Setting	Significance
Input	ZPS	Need Distribution	ON=L Level	External origin signal ON (valid)
			OFF=H Level	External origin signal OFF (invalid)
	PZERO	Need Distribution	ON=L Level	Internal position control stop (effective)
			OFF=H Level	Internal position control operation (invalid)
	INPOS0	Need Distribution	ON=L Level	INPOS0 signal valid
			OFF=H Level	INPOS0 signal invalid
	INPOS1	Need Distribution	ON=L Level	INPOS1 signal valid
			OFF=H Level	INPOS1 signal invalid
	INPOS2	Need Distribution	ON=L Level	INPOS2 signal valid
			OFF=H Level	INPOS2 signal invalid
	INPOS3	Need Distribution	ON=L Level	INPOS3 signal valid
			OFF=H Level	INPOS3 signal invalid
	PTRG	Need Distribution	OFF(H Level)到ON（L Level）	PTRG signal valid
	P-POS	Need Distribution	ON=L Level	P-POS signal valid
			OFF=H Level	P-POS signal invalid
	N-POS	Need Distribution	ON=L Level	N-POS signal valid
			OFF=H Level	N-POS signal invalid
	SHOME	Need Distribution	OFF(H Level)到ON（L Level ）	SHOME signal is valid

The above signals need to be assigned input signals.
For details, see 3.4.3 I/O Signal Allocation.

■ Important
The above signals are only valid in internal position control mode.

■ Origin signal (ZPS)

This signal is only used during the return to zero process of internal position control, please refer to section 8.9.

■ Internal position stop signal (PZERO)

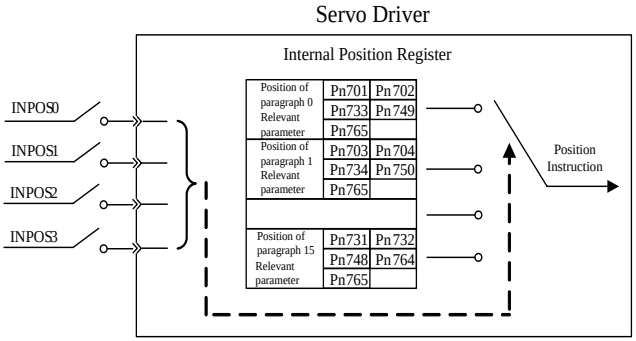
In the internal position control, this signal is valid, the motor stops running, the clamp is in the current position, and the current operation can be selected by the parameter Pn750.0 to stop or pause. If the function is stopped, the current state is in the zero-back mode, and the signal is invalid, the zero-back process needs to be re-operated; If the current state is the internal position loop control, after this signal is invalid, the cycle process returns to zero, and the point is in the starting position. If the pause function is used, after the signal is invalid, the current return to zero operation or point operation continues.

■ Internal position selection signal (INPOS0, INPOS1, INPOS2, INPOS3)

Through the combination of INPOS0, INPOS1, INPOS2 and INPOS3 signals, the position of 16 segments is selected. The following table shows the INPOS signals.

INPOS3	INPOS2	INPOS1	INPOS0	Select Location Segment
0(Invalid)	0(Invalid)	0(Invalid)	0(Invalid)	Position of paragraph 0（Pn702&Pn701）
0(Invalid)	0(Invalid)	0(Invalid)	1(Valid)	Position of paragraph 1（Pn704&Pn703）
0(Invalid)	0(Invalid)	1(Valid)	0(Invalid)	Position of paragraph 2（Pn706&Pn705）
0(Invalid)	0(Invalid)	1(Valid)	1(Valid)	Position of paragraph 3（Pn708&Pn707）
0(Valid)	1(Valid)	0(Invalid)	0(Invalid)	Position of paragraph 4（Pn710&Pn709）
0(Valid)	1(Valid)	0(Invalid)	1(Valid)	Position of paragraph 5（Pn712&Pn711）
0(Valid)	1(Valid)	1(Valid)	0(Invalid)	Position of paragraph 6（Pn714&Pn713）
0(Valid)	1(Valid)	1(Valid)	1(Valid)	Position of paragraph 7（Pn716&Pn715）
1(Valid)	0(Invalid)	0(Invalid)	0(Invalid)	Position of paragraph 8（Pn718&Pn717）
1(Valid)	0(Invalid)	0(Invalid)	1(Valid)	Position of paragraph 9（Pn720&Pn719）
1(Valid)	0(Invalid)	1(Valid)	0(Invalid)	Position of paragraph 10（Pn722&Pn721）
1(Valid)	0(Invalid)	1(Valid)	1(Valid)	Position of paragraph 11（Pn724&Pn723）
1(Valid)	1(Valid)	0(Invalid)	0(Invalid)	Position of paragraph 12（Pn726&Pn725）
1(Valid)	1(Valid)	0(Invalid)	1(Valid)	Position of paragraph 13（Pn728&Pn727）
1(Valid)	1(Valid)	1(Valid)	0(Invalid)	Position of paragraph 14（Pn730&Pn729）
1(Valid)	1(Valid)	1(Valid)	1(Valid)	Position of paragraph 15（Pn732&Pn731）

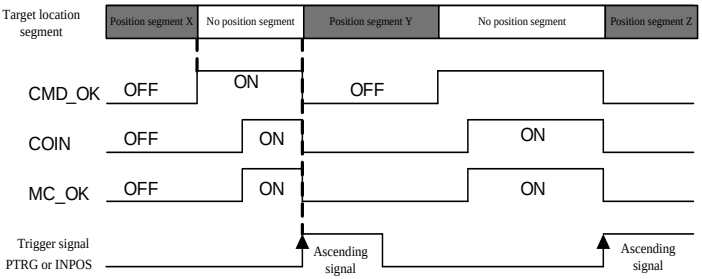
The diagram is as follows:



■ **Internal position trigger signal (PTRG)**

In internal position control, this signal is valid as a rising edge when the trigger mode is selected to run (Pn700.0=0 or 1, and Pn750.1=0).

When the trigger mode is used, the signal input and output timing of the servo is shown as follows:



■ **Forward JOG operation under internal position control (P-POS)**

In internal position control, even if the current operation is in return to zero mode or internal multi-segment position, after this signal is effective, the position command immediately starts JOG forward operation, and the parameter Pn768 is JOG speed. If you enter the JOG control, the current running state is cancelled and the starting point of the cycle is reset.

■ **Reverse JOG operation under internal position control (N-POS)**

With the P-POS signal described above, the difference is that the direction of operation is opposite.

■ **Zero return start signal (SHOME) under internal position control**

In the internal position control mode, after this signal is effective, the current multi-segment position run will be interrupted and the origin regression operation will be performed. This signal is valid for rising edge.

8.8.2 Correlated Output Signal

kind	Signal Name	Connector Pin Number	Level State	Significance
Output	HOME	Need Distribution	Valid Status	Origin regression complete
			Invalid Status	Origin regression incomplete
	CMD-OK	Need Distribution	Valid Status	Location command completed
			Invalid Status	Location command not completed
	MC-OK	Need Distribution	Valid Status	Location command execution completed
			Invalid Status	Location command execution incomplete

The above signals need to be assigned output signals.
For details, see 3.4.3 I/O Signal Allocation.

■ Important
The above signal is only valid in position control mode.

■ Zero completion signal (HOME) under internal position control

When the origin regression is complete, the position coordinate system makes sense, the position counter makes sense, and this signal is ON. When powered ON, this signal is OFF, and when the origin regression is complete, this signal is on. After running for a period of time, this signal is OFF. This signal is OFF when SHOME triggers the origin regression command, and ON when the origin regression is complete. The return to zero operation can be stopped by the input stop signal SZERO, which is OFF.

■ Position command completion signal under internal position control (CMD-OK)

Initial entry into internal position mode, this signal ON. When the command is executed, the local signal is OFF. When the location command is executed, the local signal is ON. This signal only indicates that the command is completed, and does not mean that the motor positioning is complete.

■ Position command completion signal under internal position control (MC-OK)

This signal represents the completion of the position command execution, CMD-OK signal and COIN (positioning complete) signal are both ON, the output is ON, otherwise it is OFF.

8.8.3 Related Parameter Setting

Parameter		Significance
Pn000	h. □□A□	Internal position control （ Contact instruction）

Parameter		Significance
Pn700	h. □□□0	**Position change mode:** The external IO signal (INPOS) selects the position segment and the external IO signal (PTRG) triggers the motion.
	h. □□□1	**Position change mode:** The external IO signal (PTRG) triggers the motion, and the position segment cycles.

Parameter		Significance
	h. □□□2	**Position change mode:** Internal timing loop running position segment
	h. □□0□	**Location Operation mode:** Incremental position
	h. □□1□	**Location Operation mode:** Absolute position
	h. □X□□	**Cycle running position Starting point:** Select location start
	h. X□□□	**Cycle running position End:** Select position end

Pn701	**Internal position 0 Low 16 bits**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0x0000～0xFFFF	pulse	0x4E20	Immediately
Pn702	**Internal position 0 high 16 bits**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0x0000～0xFFFF	pulse	0x0000	Immediately
	～～			
Pn731	**Internal position 15 Low 16 bits**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0x0000～0xFFFF	pulse	0xE200	Immediately
Pn732	**Internal position 15 High 16 bits**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0x0000～0xFFFF	pulse	0x0004	Immediately
Pn733	**Internal position 0 speed**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～5000	rpm	100	Immediately
	～～			
Pn748	**Internal position 15 speed**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～5000	rpm	100	Immediately
Pn749	**Internal position 0 Acceleration and deceleration time**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～500	ms	0	Immediately
	～～			
Pn764	**Internal position 15 acceleration and deceleration time**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～500	ms	0	Immediately
Pn765	**Internal position stop time**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～5000	rpm	100	Immediately

Pn768	Position control under JOG speed			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～5000	rpm	100	Immediately

■ Important

Even if the value exceeds the maximum speed of the servo motor used in Pn733~Pn748, the actual value is still limited to the maximum speed of the servo motor used.

Parameter		Significance
Pn770	b. □□□0	**Trigger signal selection:** Use an external signal PTRG to trigger the run.
	b. □□□1	**Trigger signal selection:** The location selection signal (INPOS0, INPOS1, INPOS2, INPOS3) changes when it is triggered.
	b. □□0□	**Trigger timing selection:** A new trigger signal is received only after the current segment position is complete (CMD-OK signal is valid).
	b. □□1□	**Trigger timing selection:** A new next position trigger signal can also be received if the current segment running position is not completed.
	b. □0□□	**PZERO signal function:** The operation is stopped. Under the zero or position node, the operation will stop immediately after this signal is effective.
	b. □1□□	**PZERO signal function:** Pause. Under the zero or position node, the operation will be suspended after the signal is valid, and the operation will continue after the signal is invalid.
	b. 0□□□	**Software limit enable:** The software limit cannot be enabled.
	b. 1□□□	**Software limit enable:** Software limit enabled. Pn756 and Pn757 are positive limit distances, and Pn758 and Pn759 are negative limit distances.

8.9 Zero Return Function

On the workbench, there is generally a reference point switch, which is used as the coordinate zero of the point control, which needs to be returned to zero once during power-on or after each processing, and then processed. Under the internal position control, after the upper computer outputs the SHOME signal, the drive completes the zero-back operation by itself. The zero return mode, zero return speed, offset, etc. can be set by parameters Pn771, Pn775, Pn776, Pn777, Pn778.

■ **Select The Reset Mode**

Parameter		Significance
Pn771	d. □□□0	Positive return to zero
	d. □□□1	Negative return to zero
	d. □□0□	When you hit the origin switch, go back and look for the Z pulse

■ **Relevant Parameter**

Pn771				
	Setting Range	Set Unit	Factory Default	Effective Time
	0x0000～0x1111	——	0000	Immediately
Pn775	**Return to zero velocity 1 (Speed before hitting the reference point)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～3000	rpm	500	Immediately
Pn776	**Return to zero velocity 2(Speed before hitting the reference point)**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0～500	rpm	30	Immediately
Pn777	**Origin offset 16 bits lower**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0x0000～0xFFFF	pulse	0	Immediately
Pn778	**Origin offset 16 bits higher**			
	Setting Range	Set Unit	Factory Default	Effective Time
	0x0000～0x1FFF	pulse	0	Immediately

■ **Important**

1. Even in Pn775, Pn776 set a value exceeding the maximum speed of the servo motor used, the actual value is still limited to the maximum speed of the servo motor used.
2. The direction of the origin offset is determined according to the direction of the return to zero, which is the offset of the motor running direction.

Origin offset = (origin offset 16 bits higher <<16) & Origin offset 16 bits lower.

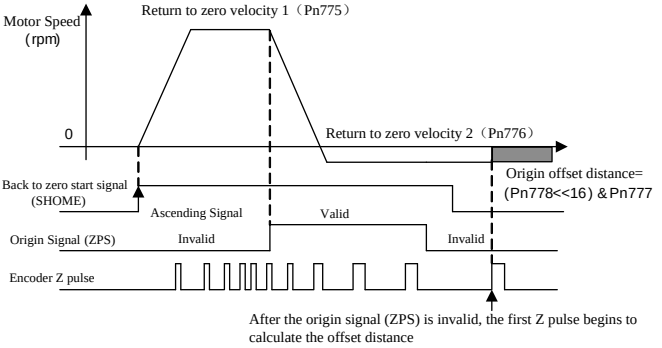
3. The zero-back function is suitable for position control (pulse instruction) and internal position control (contact instruction).
4. Back to zero operation process, the driver will not receive the upper computer pulse.

■ **Zero-back process description**

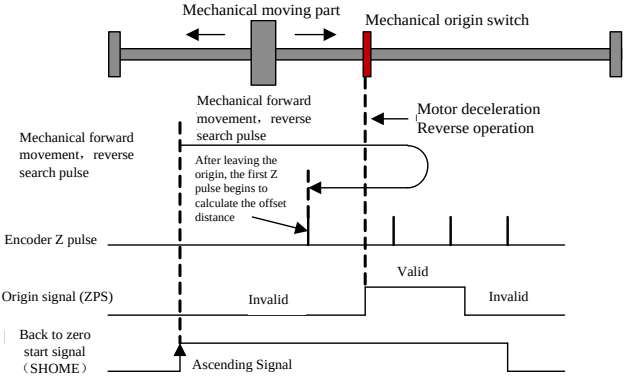
In the internal position control mode, when the rise edge of the SHOME signal is detected, the motor runs in the direction set by Pn771.0 and the speed set by Pn775. When the origin (reference point) signal ZPS is detected to be effective, the Z-pulse is found according to the zero-back mode set by the parameter Pn771.1. The motor runs at the speed set by Pn775. When the origin signal ZPS is invalid and the encoder Z pulse is detected, the motor runs at the speed set by Pn776 and begins to calculate the number of origin offset pulses. After the offset pulse is reached, the motor stops and outputs the return to zero completion signal (HOME), indicating that the return to zero operation is complete.

In general, set the return to zero velocity 1 (the speed at which the origin signal is not touched) to high speed and the return to zero velocity 2 (the speed at which the origin signal is touched) to low speed. Note that setting the zero return speed 2 too large will affect the accuracy of the zero return.

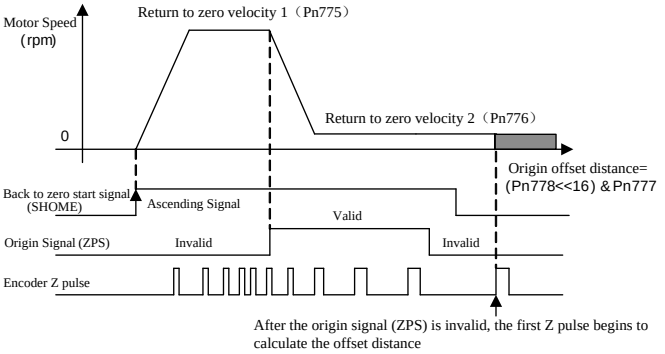
1) Pn771.1=0, after touching the origin signal, the motor returns to find the Z pulse timing is as follows:



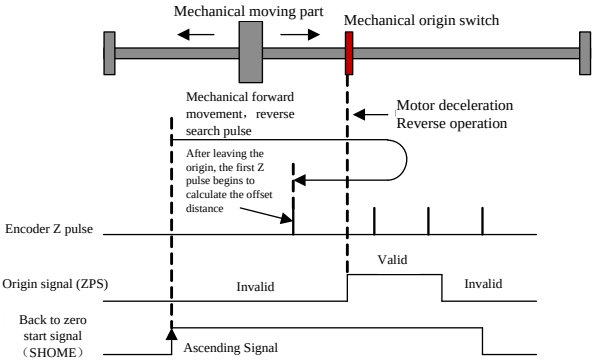
The corresponding position relationship is shown in the figure below:



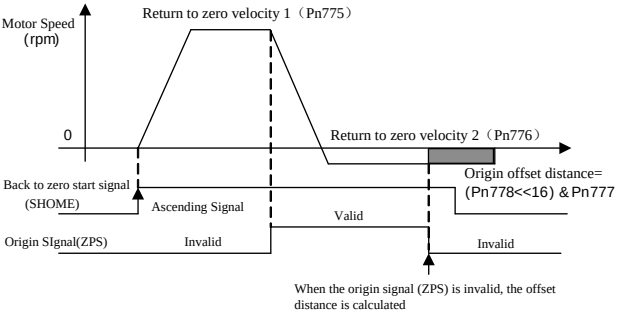
2） Pn771.1=1，After touching the origin signal, the motor does not return to find the Z pulse timing is as follows:



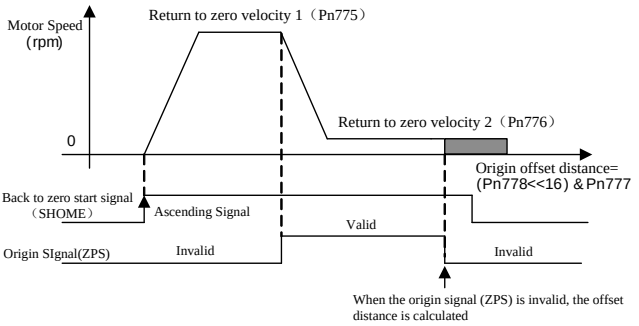
The corresponding position relationship is shown in the figure below:



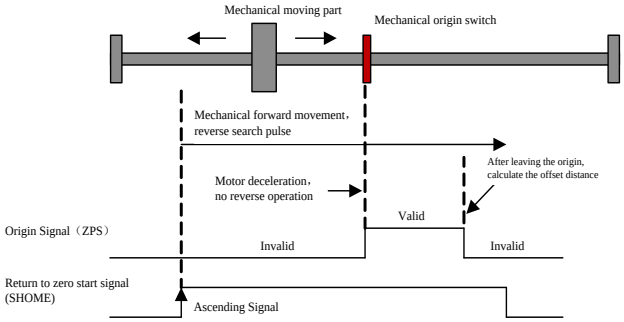
3）Pn771.1=2，After touching the origin signal, the motor returns to operation without looking for the Z pulse:



4）Pn771.1=3，After touching the origin signal, the motor does not return to operation and does not look for the Z pulse:



The corresponding position relationship is shown in the figure below:



8.10 Control Mode Combination Selection

The servo unit can choose two kinds of combination from various control modes and switch to use. The control mode is selected by Pn000.1. The switching method and switching conditions are described below:

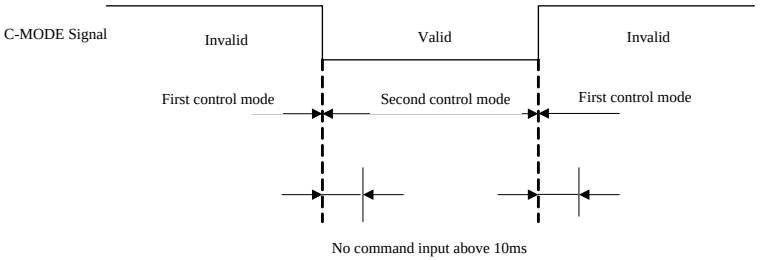
8.10.1 User Parameter Setting

Parameter		Control Mode Combination
Pn000	h. ☐☐4☐	Internal Speed Control (contact command) ←→ Position Control (pulse command)
	h. ☐☐5☐	Internal Speed Control (Contact instruction) ←→ Speed Control (analog instruction)
	h. ☐☐6☐	Internal Speed Control (Contact instruction) ←→ Torque Control (analog instruction)
	h. ☐☐7☐	Position Control (Pulse instruction) ←→ Speed Control (analog instruction)
	h. ☐☐8☐	Position Control (Pulse instruction) ←→ Torque Control (analog instruction)
	h. ☐☐9☐	Torque Control (Analog instruction) ←→ Speed Control (analog instruction)
	■ Important The external input signal C-MODE must be used to switch the control mode, and the input signal must be assigned by user parameters Pn500 to Pn507.	

8.10.2 Control Mode Switching Description

When Pn000.1 is set to the compound control of 4~9, the input signal (C-MODE) can be selected by selecting the control mode.

If the C-MODE signal is invalid, select the first control mode; if the C-MODE signal is valid, select the second control mode. Do not enter commands within 10ms before or after selection. The C-MODE signal switches the control mode as shown in the following figure.



9 Fault Diagnosis

9.1 Alarm Cause And Treatment Measures

The following is a description of the control mode (control mode) that can be performed by the HS601 series servo driver.

Alarm number	Name	Failure Cause	Clear or not	Treatment Measure
E.03	Parameter error	Parameters and verification are abnormal	NO	1. Restore factory defaults (Fn005). 2. Modify the corresponding parameters. After modification, modify Pn006=0080 (equivalent to parameter locking); Power on the device again. 3. After setting the second step, although the parameters of the drive can be modified, it is not saved. If you need to modify the parameters again, you need to change Pn006 to 0, and then modify the corresponding parameters, and then set Pn006 to 0080.
E.04	Parameter format exception	The data format of the internal parameters of the servo drive is abnormal	NO	1.Perform factory restore operation (Fn005).
E.05	Current detection Channel 1 is abnormal	Internal circuit anomaly	NO	1. Power off, and power on again after 1 minute.
E.06	Current detection Channel 2 is abnormal	Internal circuit anomaly	NO	1. Power off, and power on again after 1 minute.
E.08	Internal communication error	Internal communication error of servo drive	NO	1. Power off, and power on again after 1 minute. 2.Check whether the motor PE is connected correctly, whether there is a large external interference source;
E.10	Encoder break	The signal line of the provincial encoder is disconnected	NO	1.Check the encoder wiring. 2.Check whether the parameter Pn002.3 setting matches the type of motor encoder.
E.11	Encoder AB pulse is lost	Incremental encoder AB pulse loss	NO	1. Check the encoder wiring 2.Check the ground connection of the driver and motor, and the shielding wire connection is correct. 3.Check that the encoder cable is separated from the strong current cable.
E.12	Encoder Z pulse is lost	Encoder Z pulse is lost	NO	1.Check the encoder wiring.
E.13	Encoder UVW error	Encoder UVW error	NO	1.Check whether the encoder type installed by the motor is a provincial encoder; 2.Check the encoder wiring. 3. Whether it is powered on too fast; Wait at least 10 seconds before powering on the device.
E.14	Encoder status error	Dart type initial status error	NO	1.Check whether the encoder type installed by the motor is a provincial encoder.

Alarm number	Name	Failure Cause	Clear or not	Treatment Measure
				2. Check the encoder wiring; 3.Whether it is powered on too fast; Wait at least 10 seconds before powering on the device.
E.15	Main circuit power supply wiring error	One phase of the three-phase input main circuit power supply is not connected.	NO	1. Check whether the input power supply lacks phase. 2.Check whether the input power supply voltage meets the requirements. 3. Set Pn001.2 to 1.
E.16	Htteroplasia	Regeneration processing loop exception.	NO	1. Regeneration processing loop abnormal. 2. L1, L2, L3 input power supply voltage is low. 3. Set Pn009.0=1 to shield this alarm.
E.17	Regenerated resistance anomaly	Regenerative resistance fault	NO	1.Regenerative resistor is not connected or faulty. 2. L1, L2, L3 input power supply voltage is low. 3. Set Pn009.0=1 to shield this alarm.
E.18	Undertension	DC voltage of the main loop is insufficient	NO	1. Check the input power supply voltage is correct. 2. Check whether the drive relay operates after power-on (the relay should sound when power-on).
E.19	Overvoltage	DC voltage of the main loop is abnormally high	NO	1. Check the input power supply voltage. 2. Check the bleed resistance. 3.Adjust the brake voltage parameters (Pn536, Pn542) to correct the release action; (For example, Pn536 is reduced to -20, Pn542=0).
E.20	Power module alarm	Power module alarm	NO	1. Check the driver and motor matching is correct. 2.Reduce the drive overload multiple (Pn402, Pn403). 3.Increase the torque filtering time (Pn104).
E.21	Overload	Motor runs continuously with a torque exceeding the rated value	Yes	1. Increase the overload curve (Pn010.3). After modifying this parameter, pay attention to the temperature rise of the motor. 2. Increase the servo system acceleration and deceleration time (under position control: reduce Pn100, increase Pn214, Pn215, Pn216; Under speed control: Pn302, Pn303, Pn304). 3. reduce the servo overload multiple (Pn402, Pn403). 4. Replace more power servo system.
E.22	Regenerative overload	Regenerative resistance overload protection.	Yes	1.Increase the servo system acceleration and deceleration time (position control: reduce Pn100, increase Pn214, Pn215, Pn216; Speed control: increase Pn302, Pn303, Pn304). 2. Under the condition that the regenerative resistance can withstand, increase the parameter Pn010.2; Note that the setting of this parameter is too large, which may cause damage to the bleed resistance. 3.Adjust the brake voltage parameters (Pn536, Pn542); (For example, Pn536 is reduced to -15, Pn542=5).
E.23	Input pulse frequency is too high	Input pulse frequency is greater than the maximum motor speed	Yes	1. Motor model (Pn012) is set incorrectly, and the maximum speed of the motor becomes smaller. 2.Electronic gear set is too large.

Alarm number	Name	Failure Cause	Clear or not	Treatment Measure
E.25	Deviation counter overflow	Internal position deviation counter overflows, position deviation exceeds 256×65536	Yes	1. Check whether the motor is running correctly in JOG. 2.Check whether the electronic gear setting is correct. 3. Check whether the torque limit setting of the servo is correct. 4.Check whether there is a limit.
E.26	Position overshoot	Position offset pulse exceeds the set value of user parameter Pn528.	Yes	1.Check whether the motor is running correctly in JOG. 2.Check whether the electronic gear setting is correct. 3.Check whether there is a limit situation. 4. Increase Pn528 value.
E.27	Overspeed	Motor speed is more than 1.2 times its maximum speed	Yes	1.Check the motor U, V, W wiring is correct. 2. Check whether the servo parameters are correct. If the load inertia is large and the system gain parameter is set small, a large overshoot will occur, causing this alarm. 3.Increase the servo system acceleration and deceleration time (position control: reduce Pn100, increase Pn214, Pn215, Pn216; Under speed control: Pn302, Pn303, Pn304).
E.28	Motor stall	Motor speed does not match the given speed for a long time	Yes	1.Check the motor U, V, W wiring is correct; 2. Check whether the servo parameters are modified too small, resulting in a slow response. 3.Check whether the operation is normal at low speed, if normal, you can appropriately increase the Pn530 value, that is, increase the alarm threshold. However, too large a value may lead to the loss of this protection function, resulting in security failures.
E.29	Motor runaway	Motor is running abnormally, the motor power line may be wrong, the encoder line may be wrong, the driver and the motor may not match	Yes	1.Check the motor U, V, W wiring is correct; 2.Check whether the encoder type is correct (Pn002.3); 3.Check whether the driver and motor match correctly (Pn012); 4. Appropriately reduce the gain of the driver. Add filtering appropriately. For example, add Pn104 and Pn214. 5. Check whether the operation is normal at low speed. If it is normal, increase the value of Pn005.3 appropriately. However, too large a value may lead to the loss of this protection function, resulting in security failures.
E.30	Electronic gear protection	Electronic gear ratio setting is too large	Yes	1.Check whether the electronic gear setting is correct. 2.Check whether the input pulse frequency is correct.
E.31	Internal data computing protection	Internal data value is larger than 32 bits	Yes	1.check whether the electronic gear setting is correct. 2. check whether the input pulse frequency is correct. 3. Check whether the host computer sends pulses immediately after mode switching, in which case a smaller Pn512 value is required.
E.35	Drive disable input protection	Finite bit signal input	Yes	1. Check whether the limit signal has input. 2.Shield this alarm by setting parameter Pn003.2=1.

Alarm number	Name	Failure Cause	Clear or not	Treatment Measure
E.36	Full closed loop deviation protection	The deviation between the external grating ruler pulse and the motor encoder feedback pulse is too large	Yes	1.Check the external grating ruler input pulse number and direction is correct (Consistent with motor encoder feedback direction). 2.Check whether the Settings of Pn211, Pn212, Pn217 and Pn218 are correct.
E.40	High current alarm	High current alarm	NO	1.Check the driver and motor matching is correct. 2. Perform factory restore operation. 3.Reduce the drive overload multiple (Pn402, Pn403). 4.Increase the torque filtering time (Pn104).
E.44	Encoder electrical phase error	Encoder electrical phase does not match	NO	1.Check whether the encoder model is correct. 2.Check whether the initial phase is correct.
E.45	Internal error 1	Error inside drive 1	NO	
E.46	Internal error 2	Error inside drive 2	NO	
E.47	Internal error 3	Error inside drive 3	NO	
E.49	No strong input alarm	The main power supply has no power input	NO	1.When Pn025=0 (default), there is a strong input, then no strong input, and then strong electricity, then this alarm appears. That is, in the case of 5V voltage inside the driver, there is a strong current drop detected, then the alarm. 2.When Pn025=1, no strong input will not alarm.
E.50	17 Bit serial encoder communication is abnormal	The servo drive cannot communicate with the encoder.	NO	1.Check whether the parameter Pn002.3 setting matches the type of motor encoder; 2.Check the encoder wiring is correct. 3. Replace the motor.
E.51	17 Bit serial encoder control domain check error	Parity bit, cut-off bit error, encoder signal interference or encoder decoding circuit damage	Yes	1.Check the encoder wiring is correct. 2.Check whether the encoder shielding line is correctly connected to the servo end. 3.Replace the motor.
E.52	17 Bit serial encoder communication data check error	The encoder signal is disturbed or the encoder decoding circuit is damaged	Yes	Ditto
E.53	17 Bit serial encoder status field cutoff bit error	The encoder signal is disturbed or the encoder decoding circuit is damaged	Yes	Ditto
E.54	17 Bit serial encoder SFOME cutoff bit error	The encoder signal is disturbed or the encoder decoding circuit is damaged	Yes	Ditto

Alarm number	Name	Failure Cause	Clear or not	Treatment Measure
E.55	17 Bit serial encoder overspeed	After the power is OFF, the encoder rotates at a high speed, or the absolute value encoder is not connected to the battery.	Yes	1. Check whether the motor shaft has a large speed movement during the servo power failure. 2.Perform the absolute value encoder alarm clearing operation (Fn.12). 3.Check whether the absolute value encoder is connected to the battery.
E.56	17 Bit serial encoder absolute status error	1.The encoder is damaged or the encoder decoding circuit is damaged. 2.Serial communication interference.	Yes	Perform absolute encoder alarm clearing and multi-turn information clearing operations (Fn.11).
E.57	17 Bit serial encoder count error	1.The encoder is damaged or the encoder decoding circuit is damaged. 2.Serial communication interference.	Yes	Perform absolute encoder alarm clearing and multi-turn information clearing operations (Fn.11).
E.58	17 Bit serial encoder multi-turn information overflow	The distance of the motor running in one direction is more than 65535 turns, and the information of multiple turns is overflow.	Yes	Perform absolute encoder alarm clearing and multi-turn information clearing operations (Fn.11).
E.59	17 Bit serial encoder overheating	Absolute encoder overheating	Yes	1.Check the motor temperature. 2.Perform absolute encoder alarm clear operation (Fn.12)
E.60	17 Bit serial encoder multi-turn message error	Multiple loops of information error	Yes	1.Check the absolute encoder battery voltage. 2.Perform absolute encoder alarm clear and multi-circle information clear operation (Fn.11).
E.61	17 Bit serial encoder battery alarm	The battery voltage is lower than 3.1V, and the battery voltage is low.	Yes	1. Replace the power supply battery of the absolute value encoder; 2.Perform absolute encoder alarm clear operation (Fn.12)
E.62	17 Bit serial encoder battery alarm	The battery voltage is lower than 2.5V, and the multi-turn position information has been lost.	NO	Ditto
E.63	17 Bit serial encoder data not initialized	17 Bit serial encoder storage area data error	Yes	1.Please confirm that Pn002.3 and motor encoder model match correctly. 2. Please confirm that the 17-bit serial encoder has performed initialization operation.
E.64	17 Bit serial encoder data and number check error	17 Bit serial encoder storage area data and number check is abnormal	Yes	1.Please confirm that Pn002.3 and motor encoder model match correctly. 2. Please confirm that the 17-bit serial encoder has performed initialization operation.
E.67	The drive and motor do not match	The drive and motor model (Pn012) do not match	Yes	Although this alarm can be cleared, it can also be shielded by Pn007.3, but an inappropriate match can cause the motor performance to deteriorate, or the E.29 alarm to appear during operation.

Alarm number	Name	Failure Cause	Clear or not	Treatment Measure
				1. Replace the driver. 2.Reset the Pn012 value to match Pn012 with the motor.
E.68	Wrong motor type	The drive should not match this type of motor	Yes	Communication encoders have this alarm. Although this alarm can be cleared, it can also be shielded by Pn007.3, but an inappropriate match can cause the motor performance to deteriorate, or the E.29 alarm to appear during operation. 1. Modify the motor model (Pn012). 2. Replace the motor.
E.69	Servo driver error	The motor does not match this servo drive	Yes	Communication encoders have this alarm. Although this alarm can be cleared, it can also be shielded by Pn007.3, but an inappropriate match can cause the motor performance to deteriorate, or the E.29 alarm to appear during operation. 1. Modify the drive model (Pn011). 2. Replace the drive.
E.70	An absolute encoder count error was detected	An absolute encoder count error was detected	Yes	Valid in encoder test mode
E.71	CAN connection failure	The CAN communication cable is disconnected or the CAN communication client is faulty	Yes	1.Check communication cables. 2.Check whether the upper computer is running normally.
E.76	Module temperature is too high	Module temperature is too high	Yes	1. Check whether the driver fan works normally. 2.Check the ventilation, operating environment. 3. This alarm can be shielded by setting parameter Pn009.2=0.
E.77	Soft limit alarm	The running distance exceeds the distance set by the software	Yes	1. Check whether parameters Pn779~ Pn782 are set correctly. 2. This alarm can be shielded by setting parameter Pn770.3=0.
E.78\ E.79	Motor temperature is too high alarm	The driver detects that the motor temperature is too high (dn47 is the motor temperature)	NO	1.Check whether the motor temperature sensor cable is connected correctly (Only some motors have temperature sensors). 2.In the case of confirming that the motor temperature is not high, modify Pn009.3 to 0: do not detect the motor temperature.
E.91	The rotation power-on position is incorrect	The position is incorrect when the rotation is powered on	NO	1.Check the transformer wiring. 2.Check the motor PE wire connection is correct.
E.92~ E.94	Rotary comprehensive alarm sign	Rotary comprehensive alarm sign	NO	1.Check the transformer wiring. 2.Check the motor PE wire connection is correct.

9.2 Warning Causes And Handling Measures

Warning Number	Warning Name	Warning Content	Treatment Measure
A.90	Excessive Position Deviation	The accumulated position deviation pulse exceeds the set ratio	1.Check whether the electronic gear setting is correct. 2.Check whether there is a limit situation. 3. Increase Pn527 value.
A.91	Overload	Is a warning display before the overload alarm is about to be reached. If the operation continues, an alarm may occur	1.Increase the acceleration and deceleration time or the number of starts and stops. 2. Increase the value of Pn010.3. 3.Reduce the load. 4.Replace more power servo system.
A.92	Regenerative Overload	Is a warning display before the regenerative overload alarm is about to be reached. If the operation continues, an alarm may occur.	1.Increase the acceleration and deceleration time or reduce the number of starts and stops. 2.The use of external bleeder resistance (larger power, smaller resistance). 3. Increase the value of Pn010.2.
A.95	Overvoltage Warning	Is a warning display before an overvoltage alarm is about to be reached. If the operation continues, an alarm may occur.	1.Increase the acceleration and deceleration time or the number of starts and stops. 2.R educe the bleed resistance value.
A.96	Undervoltage Warning	It is a warning display before an undervoltage alarm is reached. If the operation continues, an alarm may occur.	1.Check whether the input voltage meets the requirements.
A.97	17 Bit serial encoder battery warning	The battery voltage is lower than 3.1V, and the battery voltage is low	1. Check the battery voltage and cable connections. 2. Replace the battery.
A.98	Incremental encoder AB pulse loss	Incremental encoder AB pulse loss	1. Check whether the encoder type is correct. 2. Check whether the encoder cable is correct and both ends of the shielded cable are correctly connected.

10 Communication

10.1 Communication Interface

For details about the communication ports, see section 3.3 "Cabling CN1".

10.1.1 Communicating Junctions

1) If the upper computer is connected to a single driver, connect the RJ45(1) of the CN1 port of the driver to the upper computer, and connect the RJ45(2) to a terminal resistor of about 120Ω.

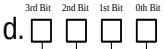
2) If the host computer is connected to multiple drives, the RJ45(1) of the CN1 port of the drive 1 is connected to the host computer, the RJ45(2) is connected to the RJ45(1) of the next drive, and the RJ45(2) of this drive is connected to the RJ45(1) of the next drive. The RJ45(2) of the last driver is connected to a terminal resistor of about 120Ω.

3) Note that pins 4 and 5 of RJ45 cannot be connected.

10.2 Communication Parameter

The communication description in this document is only for RS485 MODBUS communication. For CAN communication, refer to the company's CAN communication manual.

Code	Name	Setting Range	Unit	Factory Default	Effective Time
Pn015	RS485 communication address	1～31		1	Immediately
Pn016	RS485 communication function selection switch	d.0000～0095		d.0095	Immediately



RS485 Communication Rate	
0	2400bps
1	4800bps
2	9600bps
3	19200bps
4	38400bps
5	57600bps

Communication Protocol	
0	8，N，1 Modbus Protocol, RTU Mode
1	8，N，2 Modbus Protocol, RTU Mode
2	8，E，1 Modbus Protocol, RTU Mode
3	8，O，1 Modbus Protocol, RTU Mode
4	7，N，2 Modbus Protocol, ASCII Mode
5	7，E，1 Modbus Protocol, ASCII Mode
6	7，O，1 Modbus Protocol, ASCII Mode
7	8，N，2 Modbus Protocol, ASCII Mode
8	8，E，1 Modbus Protocol, ASCII Mode
9	8，O，1 Modbus Protocol, ASCII Mode

Retain

Retain

10.3 Communication Protocol

The bit machine then controls the corresponding servo drive according to the shaft number. The communication method is to use MODBUS network communication, wherein MODBUS can use the following two modes: American Standard Code for information interchange (ASCII) mode or Remote Terminal Unit (RTU) mode.
The following is a description of MODBUS communication.

10.3.1 Coded Meaning

◆ **ASCII Mode：**

The so-called ASCII mode is that the data is transmitted using the American Standard Communication Exchange Code (ASCII), and each 8-bits of data is composed of two ASCII bytes. For example, a 1-byte data 64H (hexadecimal representation), expressed as ASCII "64", contains the ASCII code of '6' (36H) and the ASCII code of '4' (34H).
ASCII code of numbers 0 to 9 and letters A to F, as shown in the following table.

Table 1

Byte Symbol	**‘0’**	**‘1’**	**‘2’**	**‘3’**	**‘4’**	**‘5’**	**‘6’**	**‘7’**
Corresponding ASCII Code	30H	31H	32H	33H	34H	35H	36H	37H
Byte Symbol	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
Corresponding ASCII Code	38H	39H	41H	42H	43H	44H	45H	46H

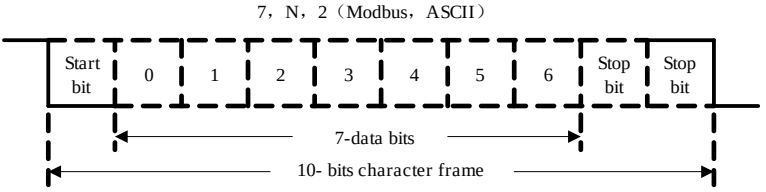
◆ **RTU Mode：**

Each 8-bits of data consists of two 4-bits of hexadecimal bytes. For example, if the value 64H is to be exchanged, 1-byte data 64H is directly transmitted.

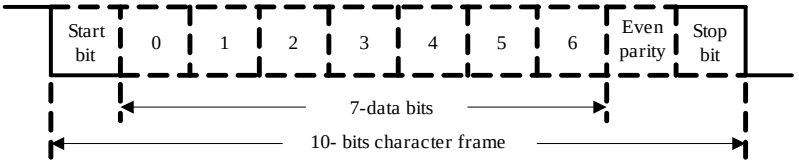
10.3.2 Byte Structure

◆ **10bits Indicates the byte frame**

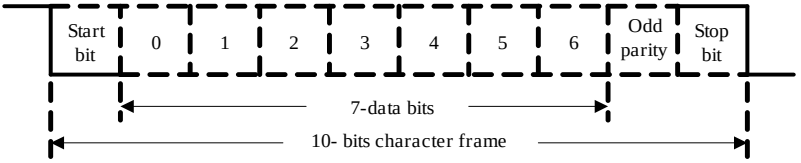
For 7 bits bytes



7，E，1（Modbus，ASCII）



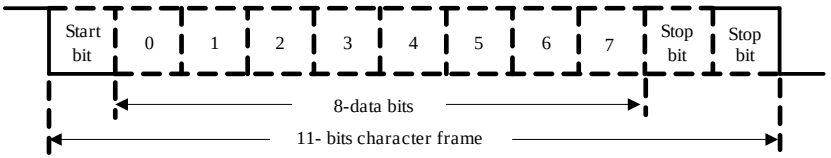
7，O，1（Modbus，ASCII）



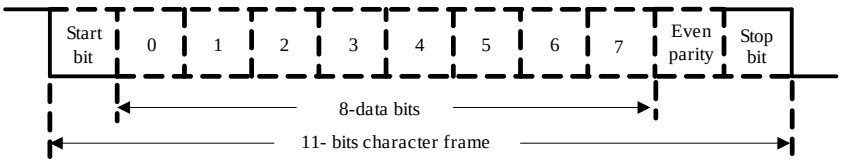
◆ **Byte Frame**

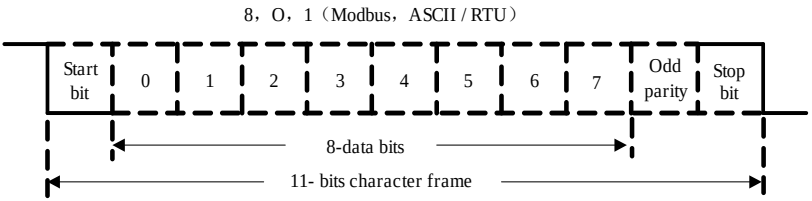
For 8 bits bytes

8，N，2（Modbus，ASCII / RTU）



8，E，1（Modbus，ASCII / RTU）





10.3.3 Communication Data Structure

The data formats for the two different communication modes are defined as follows:

◆ **ASCII Mode**

STX	Start byte: ':'（3AH）
ADR	Communication Address：1-byte contains two ASCII codes
CMD	Command Code: 1-byte contains two ASCII codes
DATA（n-1）	Data Content: N-word =2n-byte contains 4n ASCII codes, n≤12
…….	
DATA（0）	
LRC	Command Code: 1-byte contains two ASCII codes
End 1	End Code 1：(0DH)（CR）
End 0	End Code 0：(0AH)（LF）

◆ **RTU Mode**

STX	More than 3.5 bytes of rest time
ADR	Communication Address：1-byte
CMD	Command Code ：1-byte
DATA（n-1）	Data Content：n-word =2n-byte，n≤12
…….	
DATA（0）	
CRC	Command Code ：1-byte
End 1	More than 3.5 bytes of rest time

Details of the communication data formats are set out below:

- **STX（Communication Start）**

ASCII mode: ':' bytes (3AH).

RTU mode: more than 3.5 bytes of rest time at the current communication rate.

- **ADR（Communication Address）**

Valid addresses range from 1 to 127. For example, to communicate with a servo driver whose axis number is 16 (hexadecimal 10H) :

ASCII mode: ADR= '1', '0' => '1' =31H, '0' =30H

RTU mode: ADR = 10H

- **CMD（Instruct）and DATA（Data Byte）**

The format of the data byte depends on the instruction code. Common commands are shown in the following table.

Command	Command Content	Explain
03H	Read N words，N<=29	Standard 03 command
06H	Write 1 word	Standard 06 command
10H	Write N words，N<=29	Standard 10 command

1) Instruction code: 03H, read N words，N≤29

For example, read two characters consecutively from the start address 0200H of the office number 01H servo drive.

ASCII Mode：

Command Information

STX	**':'**
ADR	**'0'**
	'1'
CMD	**'0'**
	'3'
Initial data location (first high and then low)	**'0'**
	'2'
	'0'
	'0'
Data Number (WORD)	**'0'**
	'0'
	'0'
	'2'
LRC Check (first high and then low)	**'F'**
	'8'
End 1	**(0DH)(CR)**
End 0	**(0AH)(LF)**

Response Information

STX	**':'**
ADR	**'0'**
	'1'
CMD	**'0'**
	'3'
Data word count (in byte)	**'0'**
	'4'
Origin data address The contents of 0200H (first high and then low)	**'0'**
	'0'
	'B'
	'1'
The second data address Contents of 0201H (first high and then low)	**'1'**
	'F'
	'4'
	'0'
LRC Check (first high and then low)	**'E'**
	'8'
End 1	**(0DH)(CR)**
End 0	**(0AH)(LF)**

RTU Mode：

Command Information

ADR	**01H**
CMD	**03H**
Initial data location (first high and then low)	**02H**
	00H
Data word count (first high and then low)	**00H**
	02H
CRC Check Low	**C5H（low byte）**
CRC Check High	**B3H（high byte）**

Response Information

ADR	**01H**
CMD	**03H**
Data word count (in byte)	**04H**
Origin data address The contents of 0200H	**00H（high byte）**
	B1H（low byte）
The second data address Contents of 0201H	**1FH（high byte）**
	40H（low byte）
CRC Check Low	**A3H（low byte）**
CRC Check High	**D4H（high byte）**

2) Instruction code: 06H, write 1 word

For example, write 100 (0064H) to the start address 0200H of the drive whose office number is 01H.
ASCII Mode：

Command Information

STX	**':'**
ADR	**'0'**
	'1'
CMD	**'0'**
	'6'
Initial data location (first high and then low)	**'0'**
	'2'
	'0'
	'0'
Data Content	**'0'**
	'0'
	'6'
	'4'
LRC Check	**'9'**
	'3'
End 1	**(0DH)(CR)**
End 0	**(0AH)(LF)**

Response Information

STX	**':'**
ADR	**'0'**
	'1'
CMD	**'0'**
	'6'
Initial data location (first high and then low)	**'0'**
	'2'
	'0'
	'0'
Data Content	**'0'**
	'0'
	'6'
	'4'
LRC Check	**'9'**
	'3'
End 1	**(0DH)(CR)**
End 0	**(0AH)(LF)**

RTU Mode：

Command Information

ADR	**01H**
CMD	**10H**
Initial data address (first high and then low)	**02H**
	00H
Number of data words (first high and then low)	**00**
	02
Data bytes	**04**
Data 1 Content (first high, then low)	**00H**
	64H
Data 2 Content (first high, then low)	**00H**
	66H
CRC Check Low	**50H**
CRC Check High	**11H**

Response Information

ADR	**01H**
CMD	**10H**
Initial data location (first high and then low)	**02H**
	00H
Number of data words (first high and then low)	**00H**
	02H
CRC Check Low	**40H**
CRC Check High	**70H**

3) Instruction code: 10H, write N words (word),N≤29

For example, write 100 (0064H) and 102 (0066H) to the 01H servo drive with the start address 0200H.

ASCII mode:

Command Information

STX	**':'**
ADR	**'0'**
	'1'
CMD	**'1'**
	'0'
Origin data address (first high and then low)	**'0'**
	'2'
	'0'
	'0'
Number of data words (high Bit)	**'0'**
	'0'
Number of data words (low Bit)	**'0'**
	'2'
Data Bytes	**'0'**
	'4'
Data 1 Content (first high, then low)	**'0'**
	'0'
	'6'
	'4'
Data 2 Content (first high, then low)	**'0'**
	'0'
	'6'
	'6'
LRC Check	**'1'**
	'D'
End 1	**(0DH)(CR)**
End 0	**(0AH)(LF)**

Response Information

STX	**':'**
ADR	**'0'**
	'1'
CMD	**'1'**
	'0'
Origin data address (first high and then low)	**'0'**
	'2'
	'0'
	'0'
Number of data words (first high and then low)	**'0'**
	'0'
	'0'
	'2'
LRC Check	**'9'**
	'3'
End 1	**(0DH)(CR)**
End 0	**(0AH)(LF)**

LRC (ASCII mode) and CRC (RTU mode) error detection value calculation

ASCII Mode：

Longitudinal Redundancy Check (LRC) is used for error detection in ASCII mode. The LRC error detection value is summed up from ADR to the last data content, and the result is obtained in 256 units, and the excess part is removed (for example, the result obtained after the sum is 128H of hexadecimal, only 28H is taken), and then the complement of two is calculated, and the result obtained is the LRC error detection value.

RTU Mode：

The RTU mode uses the Cyclical Redundancy Check (CRC) detection value.

Step 1: A 16-bits register with FFFFH content is called a CRC register.

Step 2: The first byte of the instruction information is Exclusive OR with the low byte of the 16-bits CRC register, and the result is stored back in the CRC register.

Step 3: Check the lowest position of the CRC register (LSB), if this bit is 0, move one bit to the right; If this bit is 1, the CRC register value is shifted one bit to the right, and then the Exclusive OR operation is performed with A001H.

Step 4: Go back to Step 3 until Step 3 has been executed 8 times before moving to Step 5.

Step 5: Repeat steps 2 to 4 for the next byte of instruction information until all bits have been completely processed.

In this case, the content of the CRC register is the CRC error detection value.

After calculating the CRC detection value, in the instruction information, you must first fill in the low CRC, and then fill in the high CRC.

End1, End0 (End of communication)

ASCII Mode：

(0DH) is byte '\r' (carriage return) and (0AH) is byte '\n' (new line), representing the end of the communication.

RTU Mode：

More than 3.5 bytes of rest time at the current communication rate.

10.3.4 Communication Error Handling

The data formats for the two different communication modes are defined as follows:
During the communication process, errors may occur. Common error sources are as follows:

- The data address is incorrect when I read or write parameters.
- When a parameter is written, the data exceeds the maximum value or is smaller than the minimum value of the parameter.
- Communication interference, data transmission error or check code error.

When the above communication error occurs, the drive operation is not affected, and the drive will feedback an error frame.
The error frame format is as follows:

Upper computer data frame:

Start	Slave Address	Command	Data Address, Data, Etc	Verify

Driver feedback error frame:

Start	Slave Address	Response Code	Error Code	Verify

Among them,

Error frame response code = command +80H;

Error code = 00H: Communication is normal;

= 01H: The drive does not recognize the requested function;

= 02H: The data address given in the request does not exist in the drive;

= 03H: The data given in the request is not allowed in the drive (exceeds the maximum or minimum value of the parameter);

= 04H: The drive has started executing the request, but it cannot complete the request.

For example, the drive axis is 03H, write data 06H to the parameter Pn004, because the maximum and minimum values of the parameter Pn004 are 0, so the write data will not be accepted, the drive will return an error frame with the error code 03 (exceeding the maximum or minimum value of the parameter), the structure is as follows:

Upper computer data frame:

Start	Slave Address	Command	Data Address, Data, Etc	Verify
	03H	06H	0004H 0006H	

Driver feedback error frame:

Start	Slave Address	Response Code	Error Code	Verify
	03H	86H	03H	

Note:
If the address of the slave station in the data frame sent by the upper computer is 00H, it means that the frame data is broadcast data, and the driver will not return the frame.

10.4 Communication Address

Communication Address hexadecimal	Content	Related Illustration	Data Type	Operation (read and write)
0000~03E7H	Parameter area	Correspond to parameters in 12.3.3 Parameter Table. For example, Pn005, its corresponding address is 0005H. For example, Pn101, the corresponding address is 0065H. For example, Pn307, its corresponding address is 0133H; For example, Pn530, its corresponding address is 0212H.	According to 12.3.3, there are the following data types: Unsigned 16 bits. Signed 16 bits. Signed 32 bits.	It can be read and written
0600~0628H	Monitoring data (consistent with panel display)	The data is not updated in real time, and some data is the average value, which is only used for the monitoring of the upper computer		read only
0600H	Motor speed	RPM	Signed 16 bits	read only
0601H	The number of motor feedback pulses is low	pulse	Signed 16 bits	read only
0602H	The number of motor feedback pulses is high	pulse	Signed 16 bits	read only
0603H	Pulse command input pulse number low	pulse	Signed 16 bits	read only
0604H	Pulse command input pulse number high	pulse	Signed 16 bits	read only
0605H	Low error pulse number	pulse	Signed 16 bits	read only
0606H	High error pulse number	pulse	Signed 16 bits	read only
0607H	Instruction speed	0.01V	unsigned 16 bits	read only
0608H	Instruction speed	RPM	Signed 16 bits	read only
0609H	Torque instruction	0.01V	unsigned 16 bits	read only

Communication Address Hexadecimal	Content	Related Illustration	Data Type	Operation (read and write)
060AH	Torque input	%	Signed 16 bits	read only
060BH	Internal torque feedback	%	Signed 16 bits	read only
060CH	Input signal monitoring		unsigned 16 bits	read only
060DH	Output signal monitoring		unsigned 16 bits	read only
060EH	Command pulse frequency	0.1Khz	Signed 16 bits	read only
060FH	Main loop voltage	V	unsigned 16 bits	read only
0610H	Total running time	H	unsigned 16 bits	read only
0611H	Rotation angle		unsigned 16 bits	read only
0612H	Actual encoder position (valid only for absolute encoder)	2pulse	unsigned 16 bits	read only
0613H	Encoder number display (only valid for absolute encoder)	Round	unsigned 16 bits	read only
0614H	Cumulative load rate	%	unsigned 16 bits	read only
0617H	Load inertia ratio	%	unsigned 16 bits	read only
0618H	Effective gain monitoring		unsigned 16 bits	read only
0630H	Current alarm	Driver current alarm number	unsigned 16 bits	read only
0631H	Current alert	Driver current alarm number	unsigned 16 bits	read only
0780H	Absolute value encoder multi-turn information	Unit: 1 turn, limited to multiple turns absolute encoder	unsigned 16 bits	read only
0781H	Absolute encoder information is 16 bits higher per turn	Unit: 65536pulse, limited absolute value encoder	unsigned 32 bits	read only
0782H	Absolute encoder information is 16 bits lower per turn	Unit: 1pulse, limited absolute value encoder		read only
0783H	Motor feedback position is 16 bits lower	Unit：1pulse	Signed 32 bits	read only
0784H	Motor feedback position is 16 bits higher	Unit ： 1pulse		read only
0785H	Motor set position 16 bits lower	Unit ： 1pulse	Signed 32 bits	read only
0786H	Motor set position is 16 bits higher	Unit ： 1pulse		read only
0787H	Absolute encoder data high (32bit up to 16bit)	1.The absolute encoder data is 17 bit +16 bit =33 bit data; Because more than 32bit is not good to calculate, it	Combine into signed 32-bit data	read only
0788H	Absolute encoder data low (32bit to 16bit)			read only

Communication Address Hexadecimal	Content	Related Illustration	Data Type	Operation (read and write)
		is reduced by half (can be regarded as a circle of motor pulses for 16 bits: 65536 pulses), for which 32-bit data. 2.For example, the current position of the motor is 0, after 10 rotation, the value is 10*65536=0xA0000, 0787H address is 000A, 0788H data is 0000. 3.After using AF11 operation, 0788H, 0787H is 0.		

Note：

1. If the addresses in the preceding table are consecutive, continuous read/write operations can be performed. If the data that is consecutively operated is not in the table, the read/write operations are invalid. For example, 0x0630 starts with only two data, when more than two data are read consecutively, the read data drive judgment is invalid, and an error code is returned.

2. All data of the drive is hexadecimal representation, divided into 16 bits, 32 bits of data. 16-bit data has signed and unsigned numbers, and 32-bit data is composed of two 16-bit data. If 0781H is 0001H and 0782H is 013AH, the encoder data is 0001013AH and the decimal data is 65850. Similarly, the motor position feedback 0783H is FFF1H, 0784H is 8A1CH, the motor position feedback data is FFF18A1C, and the decimal data is -947684.

3. In normal mode, the motor position feedback, the encoder multi-turn data, and the encoder single-turn data are all increased counterclockwise (from the motor axis) and decreased clockwise.

4. 0787H, 0788H Usage instructions: Before use, the absolute value data must be cleared manually (perform AF11 operation); By default, 0787H and 0788H are the data after the conversion of the electronic gear (in customer units, such as the electronic gear is 3:1, the motor runs 10 laps, the feedback data is 10*65536/3= 218453), and when Pn524.0=1, the actual motor encoder unit (one lap pulse is 65536). In addition, the high and low bits of our address can also be reversed by parameters. Pn772.3 (leftmost bit) = 0:0787H is the high 32-bit data, 0788H is the low 32-bit data; Pn772.3 (leftmost bit) = 1:0787H for 32-bit data low, 0788H for 32-bit data high.

11 Specification

11.1 Servo Driver Specification

11.1.1 Basic Specification

The basic specifications of the servo drive are shown below.

Basic Specification			
Input Power	220V		Three Phase AC220V +10～-15%，50/60Hz
	380V		Three Phase AC380V +15～-15%，50/60Hz
Control Mode			Single-phase or three-phase full wave rectification IGBT PWM control sine wave current drive mode
Feedback			Dart line incremental encoder: 5000ppr (1/20000 resolution, increment). 17-bit serial encoder: 17 bits (incremental/absolute).
Operating Condition	Ambient Temperature/Storage Temperature		Ambient Temperature ： 0～ 45℃ Storage Temperature ： -20～ 55℃
	Ambient Humidity/Storage Humidity		Less than 90%RH (no freezing, condensation)
	Vibration/Impact Strength		4.9 m/s2～19.6 m/s2
	Protection Level/Cleanliness		Protection level: IP10, cleanliness: 2 But for • Non-corrosive gas, flammable gas • No water, oil, medicine spatter • In environments with less dust, dust, salt and metal powder
	Level		Below 1000m
Fit Standard			CE
Construction			Pedestal mounted type
Performance	Speed Control Range		1：5000
	Velocity fluctuation	Load Fluctuation	0 ~ 100% load: ±0.01% or less (rated speed)
		Voltage Fluctuation	Rated voltage ±10% : 0.001% (rated speed)
		Temperature Fluctuation	25 ±25℃ ： ±0.1% or less (rated speed)
	Torque Control Accuracy (reproducibility)		±3%
	Soft Start Time Setting		0 ~ 10S (acceleration and deceleration can be set separately)
Input/ Output Signal	Encoder Split Pulse Output		Phase A, phase B, phase Z: linear drive output Frequency division pulse number: The provincial line type incremental encoder is 16~ encoder line number. 17-bit serial encoder is 16~16384.
	Cis control Input Signal	Assignable Input Signal	Count 8 points Servo on input (S-ON), control mode switching input (control mode switching input), forward drive disable input (POT), negative drive disable input (NOT), deviation counter clear input (CLR), alarm clear.

			(A-RST), GAIN switching input (GAIN), command pulse INHIBIT input (INHIBIT), etc. The above signals can be assigned and the positive/negative logic can be changed.	
	Cis Control Output Signal	Unassignable Input Signal	Count	1Point. Alarm signal.
		Assignable Input Signal	Count	4 Point
			Function	Alarm signal (ALM), positioning complete signal (COIN), Z pulse collector signal (CZ), external brake release signal (BK), servo ready (S-RDY), etc. The above signals can be assigned and the positive/negative logic can be changed.
Communication Function	RS485 Communication	1:N Communication	If a trunk is used, the maximum number of stations can be N=31	
		Axis Address Setting	By parameter setting	
		Connecting Device	Computer, upper computer	
Display key function			7 LED x 5 bits, 4 buttons	
Dynamic Brake (DB) (Optional)			Operate when the main circuit power supply is OFF, servo alarm, servo OFF, and OT	
Retexture			Built-in regenerative resistor or external regenerative resistor	
Overrange (OT) Prevention Function			POT, NOT input action Dynamic brake (DB) stop, slow down stop or free run stop	
Protection Function			Overcurrent, overvoltage, undervoltage, overload, regenerative failure, etc	

11.1.2 Speed/ Position/Torque Control Specifications

The specifications for speed, position and torque control of the servo drive are shown below

Specification			
Control Mode			
Position Control	Feedforward Compensation		0～100% （set unit：1%）
	Positioning Completes Width Setting		0～65535 encoder units
	Input Signal	Input Pulse Type	Choose any of the following: Symbol + pulse train, CW+ CCW pulse train, 90° phase difference two-phase pulse (phase A + phase B)
		Input Pulse Form	Support linear drive, open collector
		Maximum Input Pulse Frequency	Long line receiver driver: Symbol + pulse sequence, CW pulse +CCW pulse sequence: 4Mpps 90° phase difference two-phase pulse: 1M pps Linear drive: Symbol + pulse train, CW pulse +CCW pulse train: 500pps 90° phase difference two phase pulse: 125Kpps Open collector:

			Symbol + pulse train, CW pulse +CCW pulse train: 200 kpps 90° phase difference two-phase pulse: 200 kpps
		Reset Signal	Clear deviation pulse Support long line receiver drive, linear drive, open collector
	Internal Setting Position Control	Position Select	Use external IO signal input selection
Speed Control	Soft Start Time Setting		0 ～ 5S （Acceleration and deceleration can be set separately）
	Input Signal	Command Voltage	Maximum input voltage: ±10 V (positive voltage command when the motor is turning forward)
		Input Impedance	About 9kΩ
	Internal Set Speed Control	Speed Selection	Use external IO signal input selection
Torque Control	Input Signal	Command Voltage	Maximum input voltage: ±10 V (positive torque output at positive voltage command)
		Input Impedance	About 9kΩ

11.2 Servo Motor Specification

Working system: S1 continuous

Heat resistance grade: Class B

Vibration：5G

Insulation voltage: AC1500V, 1 minute

Insulation resistance: DC500V, more than 10MΩ

Installation mode: Flange type

Operating temperature: 0~40℃ (no freezing)

Working humidity: 20%~80% (no condensation)

Altitude: Below 1000 meters above sea level

Protection mode: fully closed self-cooling IP65(except shaft penetration)

11.2.1 60/80 Series Servo Motor Parameter Table

Voltage Classes		**220V**		
Motor Type		**HA1-60D02A**	**HA1-60D04A**	**HA1-80D07A**
Flange		**□60**	**□60**	**□80**
Rated Output	W	200	400	750
Rated Torque	N·m	0.64	1.28	2.39
Instantaneous Maximum Torque	N·m	1.91	3.81	7.16
Rated Current	Arms	1.7	2.9	4.2
Instantaneous Maximum Current	Arms	5	8.7	12.6
Rated Speed	Min^{-1}	3000	3000	3000
Maximum Speed Of Revolution	Min^{-1}	5000	5000	4500
Torque Constant	N·m/Arms	0.38	0.44	0.57
Rotational Inertia	$Kg·m^2x10^{-4}$	0.094	0.24	0.94

11.2.2 130 Series Servo Motor Parameter Table

Voltage Classes		220V		
Motor Type		HA1-130C08A	HA1-130C10A	HA1-130C12A
Flange		□130	□130	□130
Rated Output	W	850	1000	1200
Rated Torque	N·m	4.0	5.0	6.0
Instantaneous Maximum Torque	N·m	12.0	15.0	18.0
Rated Current	Arms	4.1	5.1	6.3
Instantaneous Maximum Current	Arms	12.7	15.8	19.5
Rated Speed	Min-1	2000	2000	2000
Maximum Speed Of Revolution	Min-1	3000	3000	3000
Torque Constant	N·m/Arms	0.98	0.98	0.95
Rotational Inertia	$Kg·m2x10^{-4}$	7.7	9.5	11.4

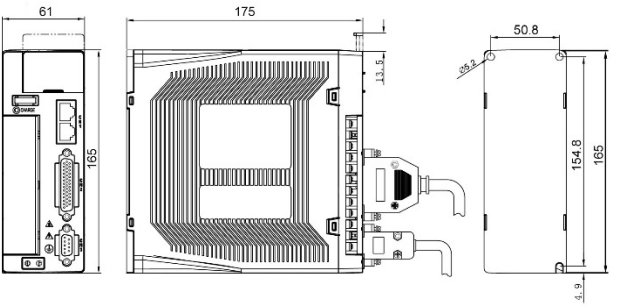
Voltage Classes		220V		
Motor Type		HA1-130C15A	HA1-130C22A	HA1-130C30A
Flange		□130	□130	□130
Rated Output	W	1500	2200	3000
Rated Torque	N·m	7.2	10.5	15
Instantaneous Maximum Torque	N·m	21.6	29.1	39.3
Rated Current	Arms	7.5	10.5	16.9
Instantaneous Maximum Current	Arms	22.8	31.5	50.7
Rated Speed	Min^{-1}	2000	2000	2000
Maximum Speed Of Revolution	Min^{-1}	3000	3000	3000
Torque Constant	N·m/Arms	0.96	1.0	0.848
Rotational Inertia	$Kg·m^2x10^{-4}$	14.3	15.6	22.9

11.2.3 180 Series Servo Motor Parameter Table

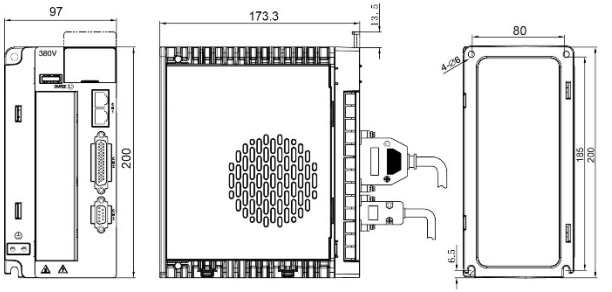
Voltage Classes		220V			
Motor Type		HE1-180B30A	HE1-180B40A	HE1-180B45A	HE1-180B55A
Flange		□180	□180	□180	□180
Rated Output	W	3000	4000	4500	5500
Rated Torque	N·m	19.1	25.5	28.6	35
Instantaneous Maximum Torque	N·m	57.3	76.5	85.8	105
Rated Current	Arms	12	17	18.4	23.5
Instantaneous Maximum Current	Arms	36	51	55.2	70.5
Rated Speed	Min^{-1}	1500	1500	1500	1500
Maximum Speed Of Revolution	Min^{-1}	2000	2000	2000	2000
Torque Constant	N·m/Arms	1.8	1.67	1.3	1.3
Rotational Inertia	$Kg·m^2x10^{-4}$	49.5	63.7	63.7	42.5

11.3 Servo Driver Dimensions

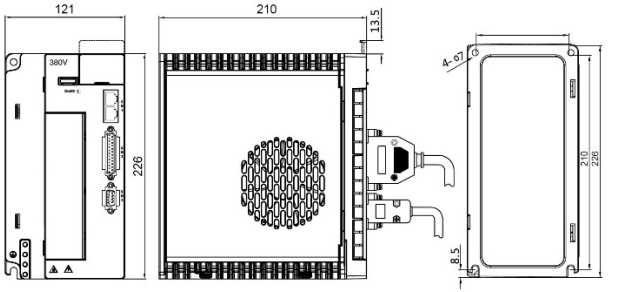
11.3.1 HS601 Driver Type B Chassis



11.3.2 HS601 Driver Type C Chassis



11.3.3 HS601 Driver Type D Chassis

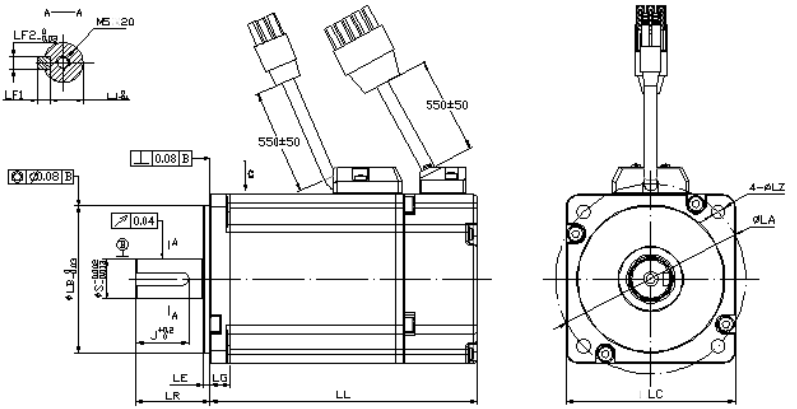


Note：

1) The unit of dimensions is mm.
2) If the dimensions and weight are changed due to product changes, without prior notice.

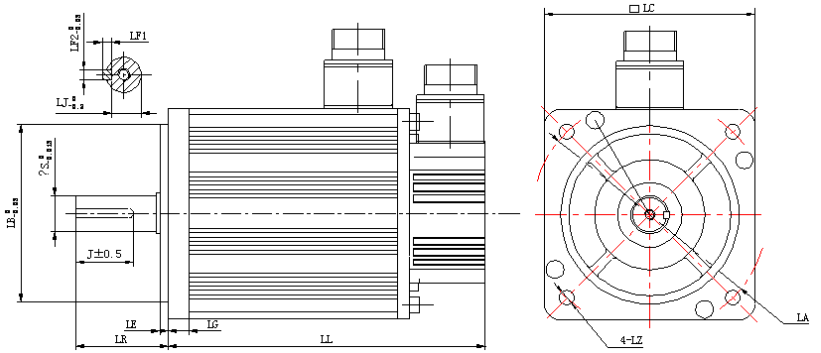
11.4 Servo Motor Dimensions

11.4.1 60/80 Series Motor Mounting Size: Unit (mm)



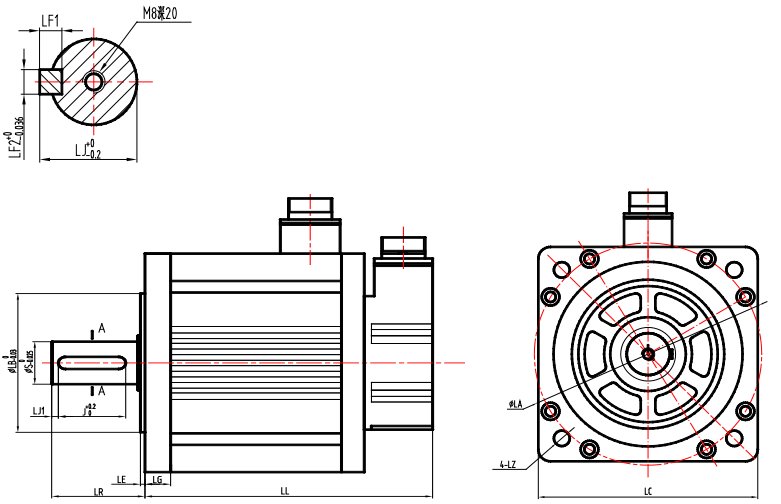
Model	Flange Size				Shaft End Dimension					LL (With Brake)	LR	LE	LG
	LC	LA	LB	LZ	S	LJ	J	LF1	LF2				
HA1-60D02A	60	70	50	5.5	14	11	20	5	5	105 (140)	30	3	8
HA1-60D04A	60	70	50	5.5	14	11	20	5	5	140 (160)	30	3	8
HA1-80D07A	80	90	70	6.5	19	15.5	25	6	6	144.7 (183.9)	35	3	9.8

11.4.2 130 Series Motor Mounting Size: Unit (mm)



Model	Flange Size				Shaft End Dimension					LL (With Brake)	LR	LE	LG
	LC	LA	LB	LZ	S	LJ	J	LF1	LF2				
HA1-130C10A	130	145	110	9.5	22	18	36	7	8	154 (198)	57	5	13
HA1-130C15A	130	145	110	9.5	22	18	36	7	8	173 (217)	57	5	13
HA1-130C22A	130	145	110	9.5	22	18	36	7	8	192 (236)	57	5	13
HA1-130C30A	130	145	110	9.5	22	18	36	7	8	230 (274)	57	5	13

11.4.3 180 Series Motor Mounting Size: Unit (mm)



Model	Flange Size				Shaft End Dimension					LL (With Brake)	LR	LE	LG
	LC	LA	LB	LZ	S	LJ	J	LF1	LF2				
HF1-180B30A	180	200	114.3	13	35	30	51	8	10	212 (287)	65	3.2	18
HF1-180B40A	180	200	114.3	13	35	30	51	8	10	232 (307)	65	3.2	18
HF1-180B45A	180	200	114.3	13	35	30	51	8	10	252 (327)	65	3.2	18
HF1-180B55A	180	200	114.3	13	35	30	51	8	10	272 (347)	65	3.2	18

12 Appendix

12.1 Monitor Mode Table

Code	Display Content	Unit
dn 00	Motor speed	【r/min】
dn 01	Number of motor feedback pulses (encoder unit, low 4 bits)	【1 Encoder pulse】
dn 02	Number of motor feedback pulses (encoder unit, high 5 bits)	【10000 Encoder pulse】
dn 03	Pulse command input pulse number (before electronic gear) (user unit, low 4 digits)	【1 Command pulse】
dn 04	Pulse command input pulse number (before electronic gear) (user unit, high 5 bits)	【10000 Encoder pulse】
dn 05	Number of error pulses (encoder unit, low 4 bits)	【1 Encoder pulse】
dn 06	Number of error pulses (encoder unit, high 5 bits)	【10000 Encoder pulse】
dn 07	Speed command (analog voltage command)	【V】
dn 08	Internal speed instruction	【r/min】
dn 09	Torque command (analog voltage command)	【V】
dn 10	Internal torque instruction（The value relative to the rated torque）	【%】
dn 11	Torque feedback(The value relative to the rated torque)	【%】
dn 12	Input signal monitoring	——
dn 13	Output signal monitoring	——
dn 14	Command pulse frequency	【0.1Khz】
dn 15	Main loop voltage	【V】
dn 16	Total running time	【Hous】
dn 17	Rotation angle	【deg】
dn 18	Actual encoder position (single-turn absolute or multi-turn absolute encoder)	【2 Encoder pulse】
dn 19	Encoder number display (only valid for absolute encoder)	【1 Round】
dn 20	Cumulative load ratio (using the cumulative load rating as 100%)	【%】
dn 21	Regenerative load rate (using the regenerative load rating as 100%)	【%】
dn 22	DB load rate (using the DB load rating as 100%)	【%】
dn 23	Load inertia ratio	【%】
dn 24	Effective gain monitoring	1: Indicates the first group gain
dn 25	Retain	
dn 26	Retain	
dn 27	Retain	
dn 28	Load inertia value (automatic)	0.1Kgcm2
dn 29	Retain	
dn 54	Actual display current	【A】
dn 55	Set the rated motor current	【A】

12.2 Auxiliary Function Table

AF Number	Function	Reference Chapter
Fn 00	Display of error records	6.2
Fn 01	Location assignment (valid only in location mode)	6.3
Fn 02	JOG running mode	6.4
Fn 03	The front panel is locked	6.5
Fn 04	Clearing of alarm records	6.6
Fn 05	Initialization of parameters	6.7
Fn 06	Automatic adjustment of analog (speed, torque) instruction bias	6.8
Fn 07	Manual adjustment of speed instruction offset	6.9
Fn 08	Manual adjustment of torque instruction offset	6.10
Fn 09	View motor related parameters	6.11
Fn 10	Displays the software version of the servo drive	6.12
Fn 11	Set absolute encoder	6.13
Fn 15	Manual load inertia detection	6.14

12.3 User Parameter

12.3.1 Display Mode Of User Parameters

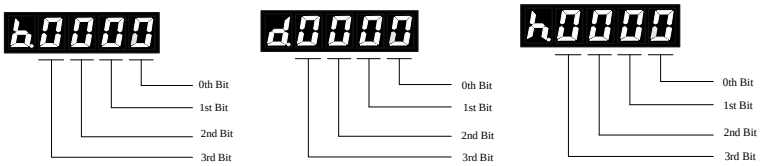
The user parameters are displayed as follows:

12.3.2 Function Select The Parameter Display Mode

Each bit of the function selection parameter has its own meaning.

This manual uses the following representation for function selection parameters.

Parameter	Explain
Pn000.0 or n.×××□	Represents the value represented by the "0 digit" of the set value of the user parameter "Pn000".
Pn000.1 or n.××□×	Represents the value represented by "1 digit" of the set value of the user parameter "Pn000".
Pn000.2 or n.×□××	Represents the value represented by "2 digits" of the set value of the user parameter "Pn000".
Pn000.3 or n.□×××	Represents the value represented by "3 digits" of the set value of the user parameter "Pn000".
n.××××	Represents b.××××、d.×××× or h.××××



b：Indicates the binary display setting and the range of bit values：0～1.

d：Indicates the decimal display setting and the range of bit values：0～9.

h：Indicates the hexadecimal display setting and the range of bit values：0～F.

12.3.3 Parameter List

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn000	Function Select Basic switch 1	h.0000~11D1		h.0000	Power-on again	

h. □ □ □ □ (3rd Bit 2nd Bit 1st Bit 0th Bit)

Rotation Direction Selection

0	Normal Mode
1	Reverse Mode

Control Mode Selection

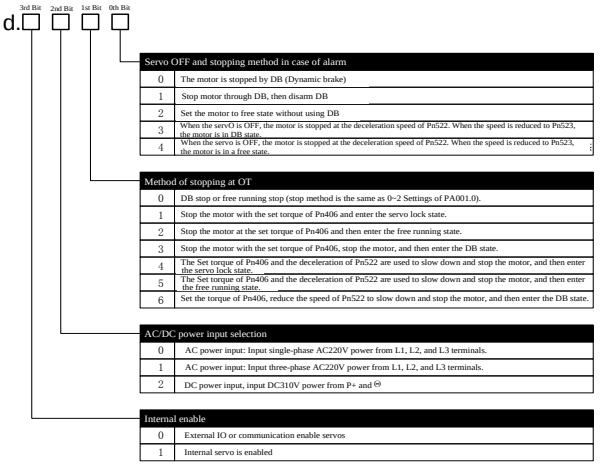
0	Position control (pulse command)
1	Speed control (analog command)
2	Torque control (analog command)
3	Internal speed control (contact command)
4	Internal speed control (contact command)←→Position control (pulse command)
5	Internal speed control (contact command)←→Speed control (analog command)
6	Internal speed control (contact command)←→Torque control (analog command)
7	Position control (pulse command)←→Speed control (analog command)
8	Position control (pulse command)←→Torque control (analog command)
9	Torque control (analog command)←→Speed control (analog command)
A	Internal position control (contact command)
B	Internal position control (contact command)←→Position control (pulse command)
C	Retain
D	Full closed loop position control

Retain

Driver Adapter Power Supply

0	220V Type
1	380V Type

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	Attention: 1. 220V model must set Pn000.3 to 0, 380V model must set Pn000.3 to 1, After this parameter is modified, you must perform the AF05 operation.					
Pn001	Function Select Basic Switch 2	d.0000~1264		d.0000	Power-on again	



Servo OFF and stopping method in case of alarm

0	The motor is stopped by DB (Dynamic brake)
1	Stop motor through DB, then disarm DB
2	Set the motor to free state without using DB
3	When the servO is OFF, the motor is stopped at the deceleration speed of Pn522. When the speed is reduced to Pn523, the motor is in DB state.
4	When the servo is OFF, the motor is stopped at the deceleration speed of Pn522. When the speed is reduced to Pn523, the motor is in a free state.

Method of stopping at OT

0	DB stop or free running stop (stop method is the same as 0~2 Settings of PA001.0).
1	Stop the motor with the set torque of Pn406 and enter the servo lock state.
2	Stop the motor at the set torque of Pn406 and then enter the free running state.
3	Stop the motor with the set torque of Pn406, stop the motor, and then enter the DB state.
4	The Set torque of Pn406 and the deceleration of Pn522 are used to slow down and stop the motor, and then enter the servo lock state.
5	The Set torque of Pn406 and the deceleration of Pn522 are used to slow down and stop the motor, and then enter the free running state.
6	Set the torque of Pn406, reduce the speed of Pn522 to slow down and stop the motor, and then enter the DB state.

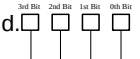
AC/DC power input selection

0	AC power input: Input single-phase AC220V power from L1, L2, and L3 terminals.
1	AC power input: Input three-phase AC220V power from L1, L2, and L3 terminals.
2	DC power input, input DC310V power from P+ and ⊖

Internal enable

0	External IO or communication enable servos
1	Internal servo is enabled

Pn002	Function Select Basic Switch 3	d.0000～8112		d.0000	Power-on again	



Speed/position control selection (T-REF assignment)

0	None T-REF assignment
1	Use the T-REF as an external analog torque limiting input
2	PCL and NCL are used as external torque limiting inputs

Torque control selection (V-REF assignment)

0	None T-REF assignment
1	Use V-REF as an external speed limit input

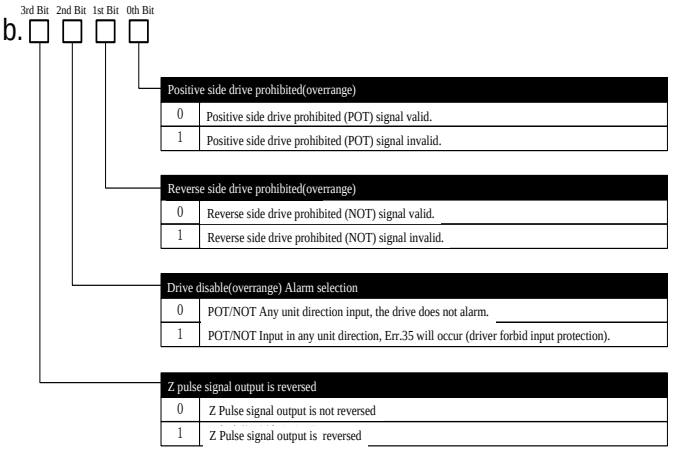
Absolute value encoder usage

0	Use the absolute encoder as an incremental encoder
1	Use the absolute encoder as an absolute encoder

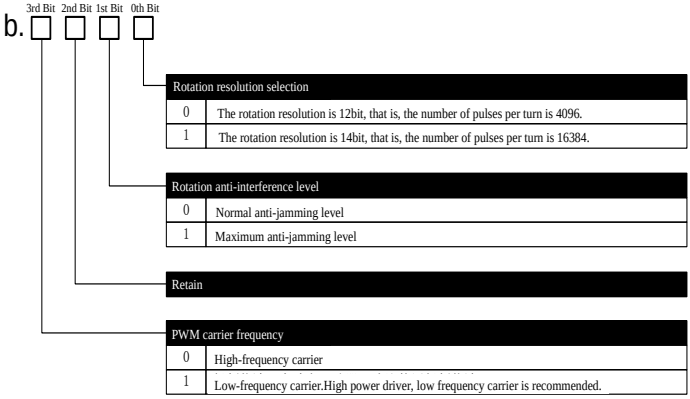
Encoder type selection

0	Absolute encoder (17 bits per turn, 16 bits for multiple turns)
1	Absolute encoder (17 bits per turn, 131072 resolution)
2	Magnetic encoder with dart line (5000ppr, 20000 resolution)
3	Tama River provincial line encoder (2500ppr, 10000 resolution)
4	Sharp eagle dart line encoder (5000ppr, 20000 resolution)
6	Rotary transformer type encoder(4096ppr, 16384 resolution)
7	
8	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn003	Function Select Basic switch 4	b.0000～1111		b.0011	Power-on again	

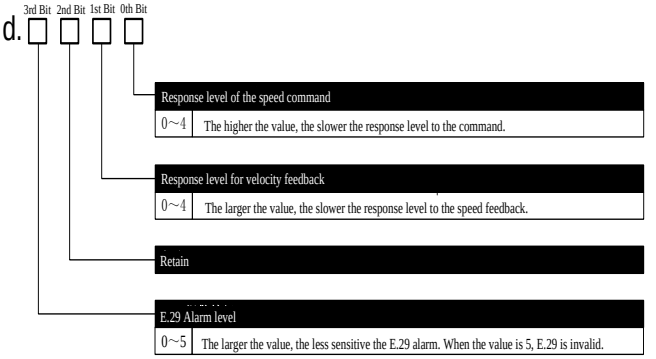


Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn004	Function Select Basic switch 5	b.0000～0011		b.0001	Power-on again	



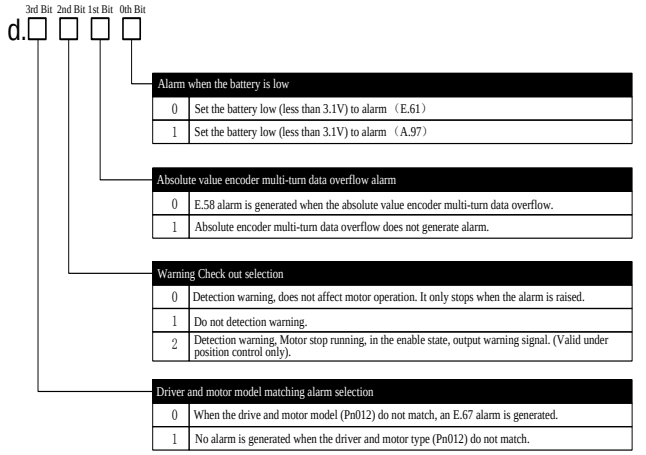
Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	Function Select Basic switch 6	d.0000～5044		d.3022	Immediately	

Pn005



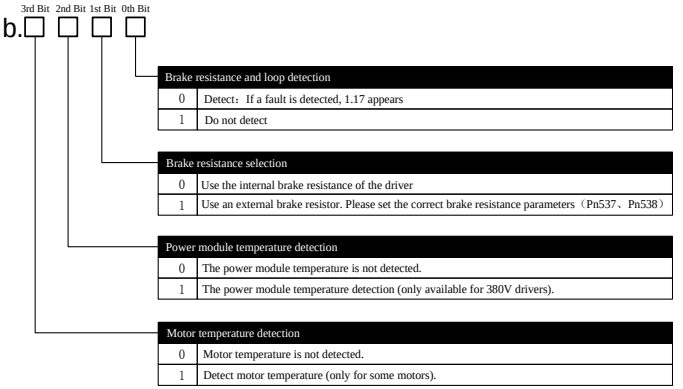
Pn006	Retain					
	Function Select Basic switch 8	d.0000～1211		d.0000	Power-on again	

Pn007

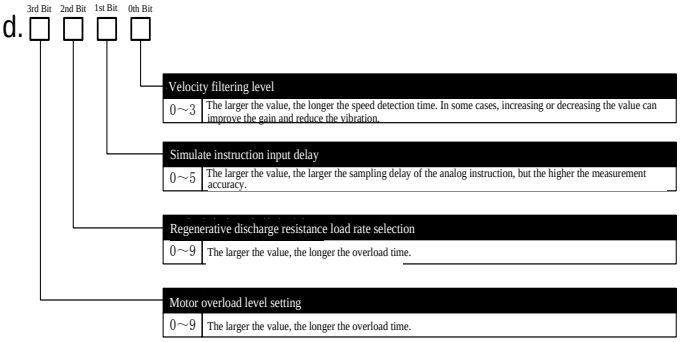


Pn008	Retain					

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn009	Function Select Basic switch 10	b.0000～1111		b.0000	Power-on again	



Pn010	Function Select Basic switch 11	d.0000～9953		d.0021	Immediately	



Pn011	Retain	0～5		2	Power-on again	
Pn012	Please refer to Section 1.3 for motor model selection. The drive and motor models must match operation. Modify this parameter.	0～59		5012	Power-on again	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	Then you must perform the Fn05 operation.					
Pn013	Retain					
Pn014	Initial display number	0～50		50	Power-on again	
	Please view the monitoring content. If the value is set to 50, the status code is displayed. If the value is set to a non-50 value, the initial content displayed is the content corresponding to the monitoring number.					
Pn015	RS485 communication address	1～31		1	Immediately	
Pn016	RS485 communication function selection switch	d.0000～1096		d.0002	Immediately	

n.□□□□ (3rd Bit 2nd Bit 1st Bit 0th Bit)

RS485 communication rate

0	2400bps
1	4800bps
2	9600bps
3	19200bps
4	38400bps
5	57600bps
6	115200bps

Communication protocol

0	8，N，1（Modbus Protocol，RTU Model）
1	8，N，2（Modbus Protocol，RTU Model）
2	8，E，1（Modbus Protocol，RTU Model）
3	8，O，1（Modbus Protocol，RTU Model）
4	7，N，2（Modbus Protocol，ASCII Model）
5	7，E，1（Modbus Protocol，ASCII Model）
6	7，O，1（Modbus Protocol，ASCII Model）
7	8，N，2（Modbus Protocol，ASCII Model）
8	8，E，1（Modbus Protocol，ASCII Model）
9	8，O，1（Modbus Protocol，ASCII Model）

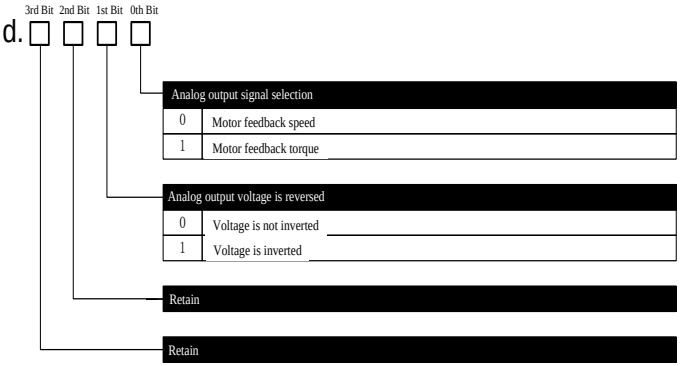
Communication saved or not

0	Do not save
1	Save

Communication data equivalent

0	The internal speed and internal torque are ordinary equivalent, the speed is 1rpm, and the torque is 1% rated torque.
1	0.1 equivalent, PA307 and other internal speed is 0.1rpm, PA414 and other internal torque is 0.1% rated torque.

Pn017	Retain	1～127		1		
Pn018	Retain	d.0000～0006		d.0003		
Pn019	Retain					
Pn020	Retain					
Pn021	Analog output signal selection	d.0000~0011		d.0000	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
						
Pn022	Retain					
	Analog voltage output gain	0～65535		0	Immediately	

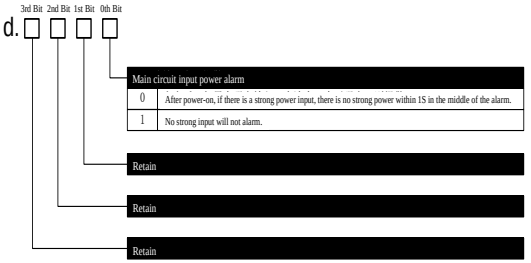
The corresponding relationship is as follows:

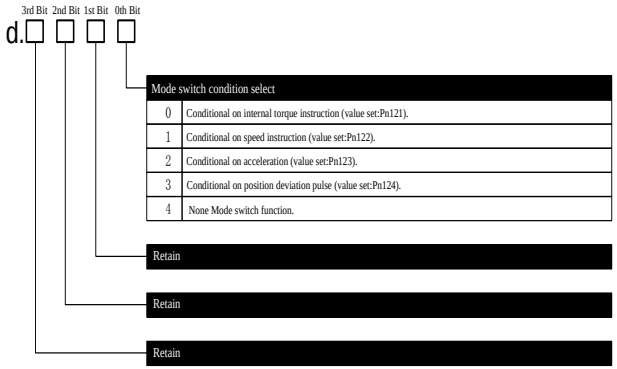
Pn023

Parameter Pn023	Analog output data: speed	Voltage calculation method when Pn023≠0
0	500rpm output 1V voltage, -1000rpm output -2V voltage	Output voltage $=\frac{\text{Motor speed}}{\text{PA023}}$ Output voltage unit：Volts Motor speed unit：rpm
500	500rpm output 1V voltage	
1000	1000rpm output 1V voltage	
250	500rpm output 2V voltage	

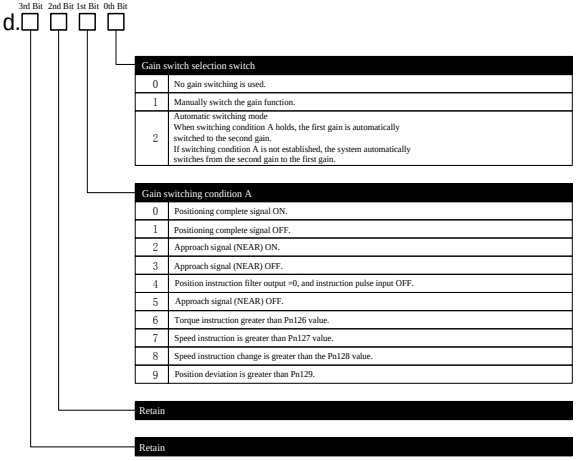
Parameter Pn023	Analog output data: speed	Voltage calculation method when Pn023≠0
0	100% torque output 3V voltage, -100% torque output -3V voltage.	Output voltage $=\frac{\text{Motor torque X 10}}{\text{PA023}}$ Output voltage unit：Volts Motor speed unit：rpm
333	100% torque output 3V voltage, -100% torque output -3V voltage.	
222	100% torque output 4.5V voltage, -50% torque output -2.25V voltage.	
666	100% torque output 1.5V voltage, -200% torque output -3V voltage.	

Pn024	Analog voltage output zero correction	-8000～8000	mV	0	Immediately	
	Use Pn024 to calibrate the output voltage to the zero of the set value.					
Pn025	Function Select Basic switch 12	b.0000～0012		b.0000	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
						
Pn100	First position loop gain	1～1000	1/s	40	Immediately	
	Determines the responsiveness of the position control system. Set a larger position loop gain value to shorten the positioning time. However, if the setting is too large, it may cause vibration, so pay attention to it when modifying it.					
Pn101	First speed loop gain	1～3000	Hz	40	Immediately	
	Determines the speed loop response characteristics. In order to increase the gain of the position loop and improve the responsiveness of the whole servo system, it is necessary to increase the setting of the gain of the speed loop. However, if the setting is too large, it may cause vibration, so pay attention to it when modifying it.					
Pn102	First velocity loop integral time constant	1～2000	0.1 ms	200	Immediately	
	Set the velocity loop integral time constant. The smaller the setting value, the greater the integration effect and the stronger the anti-disturbance ability, but too large a setting may cause vibration.					
Pn103	First speed detection filter	0～1000	0.01ms	0	Immediately	
	After the speed detection, the time constant of the low-pass filter can be set. If the setting value is large, the time constant is also large, and although the motor noise can be reduced, the responsiveness will also decrease.					
Pn104	First torque filter	0～1000	0.01ms	50	Immediately	
	Sets the time constant of the first-order lag filter inserted into the torque instruction section. Vibration due to twisted resonance can be controlled. If the setting value is large, the time constant is also large, and although the motor noise can be reduced, the responsiveness will also decrease.					
Pn105	second position loop gain	1～1000	1/s	40	Immediately	
Pn106	second speed loop gain	1～3000	1 Hz	80	Immediately	
Pn107	Second velocity loop integral time constant	1～2000	0.1 ms	400	Immediately	
Pn108	Second speed detection filter	0～1000	0.01ms	0	Immediately	

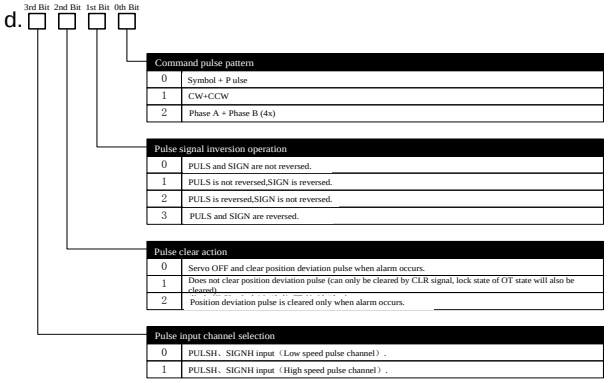
Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn109	Second torque filter	0～1000	0.01ms	20	Immediately	
Pn110	Velocity feedforward gain	0～100	%	0	Immediately	
	In the speed control instruction calculated from the internal position instruction, the value multiplied by the ratio of this parameter is added to the speed instruction from the position control processing.					
Pn111	Velocity feedforward filter	0～1000	0.1ms	0	Immediately	
	Set the time constant of the first order lag filter required for the speed feedforward input.					
Pn112	Percentage of torque feedforward	0～100	%	0	Immediately	
	The amount of torque feedforward applied according to the value of inertia of Pn118.					
Pn 113	Torque feedforward percentage	0~1000	0.01ms	0	Immediately	
Pn 114	Torque feedforward filter	0～1000	0.1%	0	Immediately	
Pn 115	Friction compensation smoothing constant	0～1000	0.1%	0	Immediately	
Pn 116	Friction compensation threshold speed	0～3000	0.1rpm	100	Immediately	
Pn 117	Retain					
Pn 118	Ratio of inertias	0～5000	1%	0	Immediately	
	Set the corresponding motor rotor inertia and load inertia ratio. Pn118 ＝（Load inertia / Rotor inertia）×100「%」 This parameter is invalid for real-time automatic gain adjustment. For example, if this parameter is set to 500, the load inertia is 5 times the motor inertia.					
Pn 119	Retain	0～32767	0.1ms	0		
Pn 120	Gain class application selection switch 1	d.0000～0034		d.0000	Immediately	
						
Pn121	Mode switch (Torque instruction)	0～300	1%	200	Immediately	
Pn122	Mode switch (speed command)	0～3000	1min-1	0	Immediately	
Pn123	Mode switch （acceleration）	0～65535	10rpm	0	Immediately	
Pn124	Mode switch (position deviation)	0～65535		0	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn125	Gain class application select switch 2	d.0000~0092		d.0000	Immediately	

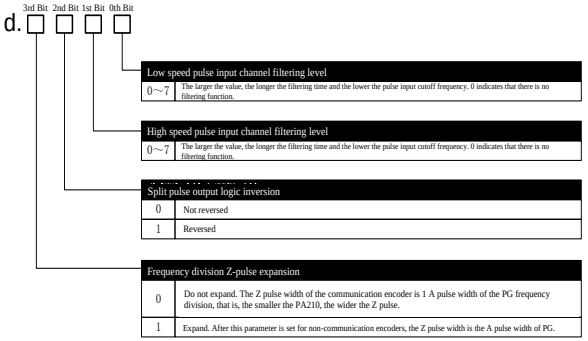


Pn126	Gain switching level (Torque command)	0~300	1%	200	Immediately	
Pn127	Gain switching level （speed command）	0~3000	1 min-1	100	Immediately	
Pn128	Gain switching level(Speed command change)	0~65535	10rpm/s	10000	Immediately	
Pn129	Gain switching class	0~65535	1pulse	100	Immediately	
Pn130	Gain switching time 1	0~10000	0.1ms	10	Immediately	
Pn131	Gain switching time 2	0~10000	0.1ms	10	Immediately	
Pn132	Gain switching wait time 1	0~10000	0.1ms	10	Immediately	
Pn133	Gain switching wait time 2	0~10000	0.1ms	10	Immediately	
Pn134	Retain	0~10000		0		
Pn136	Retain					
Pn137	Retain	0~500		50		
Pn138	Retain	0~5000		0		
Pn139	Retain	0~10		0		
Pn140	Retain	0~5000		0		
Pn141	Retain	0~100		0		
Pn142	Retain					
Pn200	Position control function switch 1	d.0000~1232		d.0000	Power-on again	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	Position control function switch 2	d.0000~3177		d.0000	Power-on again	



Pn201

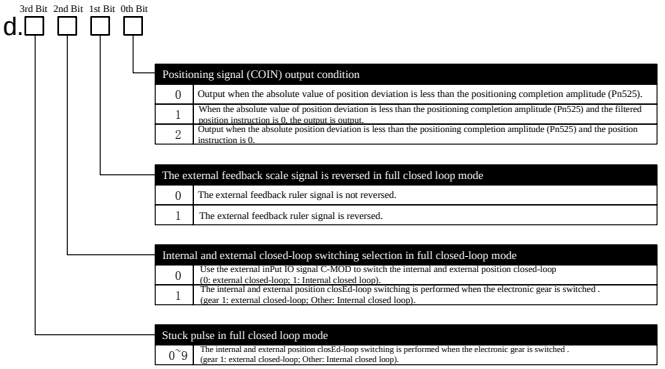


The relationship between the value of Pn201.0 and the input pulse cutoff frequency is shown in the following table:

【Pn201.0】	Cut-off Frequency （KHZ）	Remarks
0	500	Look at the dn14 instruction pulse frequency and set the value of [Pn201.0]. The maximum value displayed by dn14 must be in the cutoff frequency (KHZ) range.
1	340	
2	170	
3	80	
4	40	
5	20	
6	10	
7	5	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	Position control function switch 3	d.0000~9112		d.0000	Immediately	

Pn202



Pn203	Position control function switc 4	d.0000~0022		d.0000	Power-on again	
Pn204	Retain					
Pn205	First electron tooth ratio	0～65535		1	Immediately	
	Refer to Pn206.					
Pn206	Low electronic tooth ratio(denominator)	0～65535		1	Immediately	

1. When Pn206 or Pn226 is not 0, the first electronic gear molecule = (Pn225×10000 + Pn205), the electronic gear denominator = (Pn226×10000 + Pn206); Similarly, the second electron gear molecule = (Pn227×10000 + Pn207), the third electron gear molecule = (Pn228×10000 + Pn208), and the fourth electron gear molecule = (Pn229×10000 + Pn209).
2. When Pn206 and Pn226 are 0, the number of instruction pulses per rotation 1= (Pn225×10000 + Pn205), equivalent to the number of instruction pulses per rotation 1 of the motor is (Pn225×10000 + Pn205); Similarly, the number of instruction pulses per revolution 2= (Pn227×10000 + Pn207).

In this way, the driver automatically calculates the electronic gear according to the encoder type.

Pn206	Pn226	Instruction Frequency Division Processing
=0	=0	Pulse Input → Encoder Resolution / Pn225 × 10000 + Pn205 → Position Instruction
≠0	=0	Pulse Input → Pn225 × 10000 + Pn205 / Pn226 × 10000 + Pn206 → Position Instruction
=0	≠0	
≠0	≠0	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	Second electron number ratio low (molecule)	0～65535		1	Immediately	

Pn207

The electron gear molecule (Pn205\Pn207\Pn208\Pn209) can be selected by external IO with the denominator (Pn206) unchanged. Before use, the input IO should be defined as the instruction frequency division frequency multiplier switch 0\1 (DIV0\ DIV1). Select the electronic gear according to DIV0, DIV1 combination.

DIV1	DIV0	Instruction Frequency Division Processing
0	0	Pulse Input → Pn205 / Pn206 → Position Instruction
0	1	Pulse Input → Pn207 / Pn206 → Position Instruction
1	0	Pulse Input → Pn208 / Pn206 → Position Instruction
1	1	Pulse Input → Pn209 / Pn206 → Position Instruction

Note:
1. "0" indicates that the signal is invalid, "1" indicates that the signal is valid.
2. When using, please switch the electronic gear ratio when there is no pulse input, otherwise it may cause inaccurate pulse.

Pn208	Third electron number ratio low (molecule)	0～65535		1	Immediately	
Pn209	Fourth electron number ratio low (molecule)	0～65535		1	Immediately	
Pn210	Encoder frequency dividing pulse number	16～16384	1P/Rev	16384	Power-on again	

1. Set the pulse output resolution with the number of output pulses per rotation of OA and OB respectively. If set to 1000, the motor rotates one circle, the output OA pulse number is 1000, and the output OB pulse number is 1000.
2. When the Pn210 value is set to exceed the number of encoder lines, its frequency division value is the number of encoder lines. If the Pn210 is set to a value greater than 5000 when using an incremental encoder of 5000ppr, the number of frequency dividing pulses is 5000.
3. The Z pulse width of the communication encoder is an A pulse width, that is, the smaller the value of Pn210, the wider the OA width at the same speed, the wider the Z pulse.

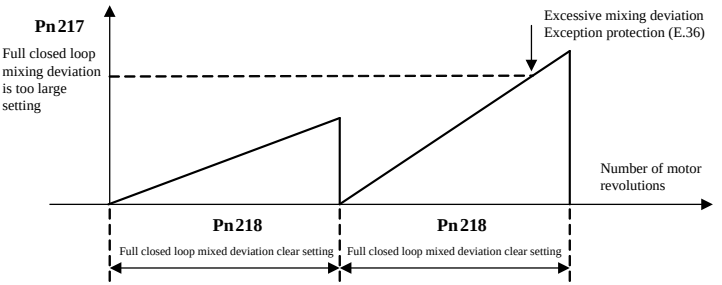
Pn211	External feedback grating ruler molecule	0～65535	--	0	Immediately	

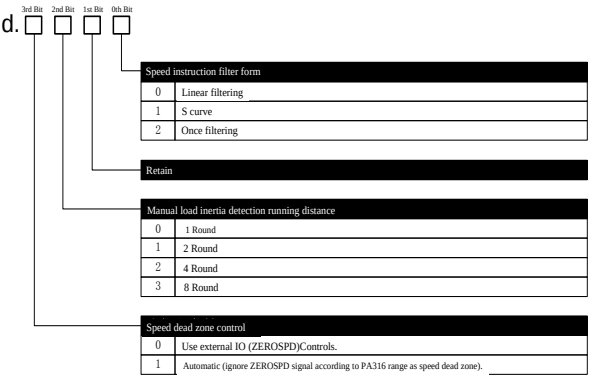
The molecule that sets the frequency dividing setting of the external feedback grating ruler. When the set value is =0, the encoder resolution will be used as the molecule, and only Pn212 can be set as the number of feedback pulses of the external grating ruler after one rotation of the motor.

Pn212	External feedback grating ruler denominator	1～65535	--	10000	Immediately	

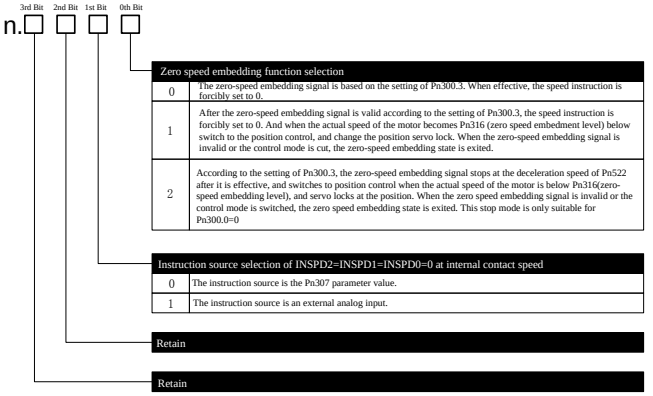
Confirm the number of encoder feedback pulses per turn of the motor and the number of external grating ruler pulses per turn of the motor. In order to make the following formula work, set the external feedback ruler numerator (Pn211) and the external feedback ruler denominator (Pn212).

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	Set Pn211=0, encoder resolution times automatically set to molecular; Example: the motor and the lead screw are directly connected, the lead screw pitch is 10mm, the feedback scale is 1um/pulse, and the encoder resolution is 20000(5000ppr encoder resolution is 20000 pulse; 17bit encoder resolution is 131072 pulse; 20bit encoder is 1048576pulse). $\frac{Pn211[20000]}{Pn212[10000]} = \frac{Encoder\ resolution\ per\ motor\ rotation(pulse)}{External\ feedback\ scale\ resolution\ per\ motor\ rotation(pulse)}$ Attention: If this ratio is wrong, the position calculated by the driver from the encoder feedback pulse and the position calculated by the external grating ruler pulse will be biased. This bias will accumulate with the increase of the running distance, and the turn deviation overprotection will be generated when the mixed deviation threshold (Pn217) is exceeded.					
Pn213	Retain					
Pn214	Position instruction acceleration and deceleration time parameter 1	0～1000	0.1 ms	0	Immediately	
Pn215	Position instruction acceleration and deceleration time parameter 2	0～1000	0.1 ms	0	Immediately	
Pn216	Position instruction averaging filter	0～500	0.1 ms	0	Immediately	
Pn217	Full closed loop mixing deviation is too large setting	0~65535	0.01round	10	Immediately	
	Set the allowable error (mixing deviation) for the position of the motor (encoder) and the position of the load (external grating ruler). The unit is 0.01 laps of the servo motor, the default is 10, and the mixing deviation is 0.1 laps. This parameter varies according to the encoder resolution, for example, an encoder with an encoder resolution of 20000 (5000ppr), the unit is 20000*0.1=2000pulse. When the encoder resolution is 1048576 encoder (20bit), the unit is 1048576*0.1=104857pulse. When this value =0, the mixing bias protection is invalid and the drive does not judge the mixing error.					
Pn218	Full closed loop mixed deviation clear setting	0~65535		100	Immediately	
	The unit is the number of servomotor turns. Each time the incremental running distance exceeds the Pn218 value, the driver will clear the accumulated mixing deviation value to zero, and the mixing deviation will be accumulated again. When the set value is 0, the mixing deviation is not cleared. Specification for Clearance of Mixed Deviations The value set according to the Mixing deviation Clear setting (Pn218) clears the mixing deviation at each rotation.					

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	 The number of turns set by the full closed-loop mixing deviation clearing (Pn218) is detected by the encoder feedback pulse. Attention: When using mixed bias Clear, be sure to set the mixed Bias Clear setting (Pn218) to an appropriate value. If the Pn218 setting is too small, it may not be able to protect the external feedback ruler from abnormal actions caused by connection errors. When used, the mechanical structure should pay full attention to the setting of limit sensors and other safety aspects.					
Pn219	Retain					
Pn220	Retain					
Pn221	Retain					
Pn225	First electronic tooth ratio is high (molecule)	0～32767	×10000	0	Immediately	
	Refer to Pn206.					
Pn226	High electronic tooth ratio(denominator)	0～32767	×10000	0	Immediately	
	Refer to Pn206.					
Pn227	Second electron number ratio high (molecule)	0～32767	×10000	0	Immediately	
	Refer to Pn206.					
Pn228	Third electron number ratio high (molecule)	0～32767	×10000	0	Immediately	
	Refer to Pn206.					
Pn229	Fourth electron number ratio high (molecule)	0～32767	×10000	0	Immediately	
	Refer to Pn206.					
Pn300	Speed control function switch	d.0000~1333		d.0200	Power-on again	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
						
Pn301	Speed instruction input gain	150～30000	0.01V/rated speed	600	Immediately	
Pn302	Speed instruction filter time constant	0～1000	0.1 ms	0	Immediately	
Pn303	Command linear acceleration time	0～5000	1ms	0	Immediately	
Pn304	Command linear deceleration time	0～5000	1ms	0	Immediately	
Pn305	Command type S acceleration and deceleration time	0～5000	1ms	0	Immediately	
Pn306	JOG speed	0～5000	1 min-1	500	Immediately	
Pn307	Internal 0 speed	-5000~5000	1 min-1	100	Immediately	
Pn308	Internal 1 speed	-5000~5000	1 min-1	200	Immediately	
Pn309	Internal 2 speed	-5000~5000	1 min-1	300	Immediately	
Pn310	Internal 3 speed	-5000~5000	1 min-1	400	Immediately	
Pn311	Internal 4 speed	-5000~5000	1 min-1	500	Immediately	
Pn312	Internal 5 speed	-5000~5000	1 min-1	600	Immediately	
Pn313	Internal 6 speed	-5000~5000	1 min-1	700	Immediately	
Pn314	Internal 7 speed	-5000~5000	1 min-1	800	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn315	Speed control function switch 1	n.0000~n.0012		0	Immediately	



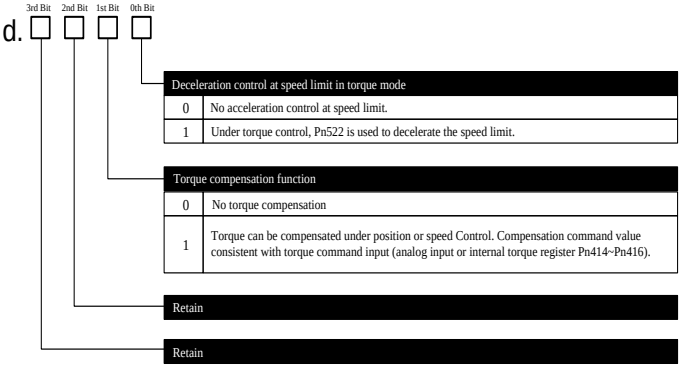
Pn316	Zero speed embedding level	1~2000	rpm	30	Immediately	
Pn317	Acceleration and deceleration unit selection 0：1ms 1：2ms 2：10ms 3：100ms	0~3	-	0	Immediately	
Pn318	Retain					
Pn400	Torque instruction input gain	10～1000	0.1V/ rated torque	30	Immediately	
Pn401	Torque input filter time constant	0～1000	0.1ms	0	Immediately	
Pn402	Forward side torque limit	0～300	1%	250	Immediately	
Pn403	Reverse side torque limit	0～300	1%	250	Immediately	
Pn404	Forward side external torque limit	0～100	1%	100	Immediately	
Pn405	Reverse side external torque limit	0～100	1%	100	Immediately	
Pn406	Emergency stop torque limit	0～300	1%	250	Immediately	
Pn407	Speed limit when torque is controlled	0～5000	1 min-1	1500	Immediately	
Pn408	Retain					
Pn409	Torque instruction input gain	10～1000	0.1V/ rated torque	30	Immediately	
	Under torque control, when the torque exceeds this value, the output signal "Consistent speed (VCMP)/torque arrival signal" is effective.					

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn410	First notch filter frequency	50～2000	1 Hz	2000	Immediately	
Pn411	First notch filter attenuation rate	0～32	db	0	Immediately	
Pn412	Second notch filter frequency	50～2000	1 Hz	2000	Immediately	
Pn413	Second notch filter attenuation rate	0～32	db	0	Immediately	
Pn414	Internal torque register 0	-3000~3000	1%	0	Immediately	

Under torque control, when the external input IO signal selects "Internal torque select 0 (INTor0)" or "Internal torque select 0 (INTor0)", and the two signals are not valid at the same time, select the internal torque register mode. When Pn016.3=1 (0.1 equivalent), the unit of this parameter is 0.1%, that is, when Pn414=100, the corresponding internal torque is 10% of the rated.

INTor1	INTor0	Torque Control Instruction
Invalid	Invalid	External analog instruction
Invalid	Valid	Internal torque register 0
Valid	Invalid	Internal torque register 1
Valid	Valid	Internal torque register 2

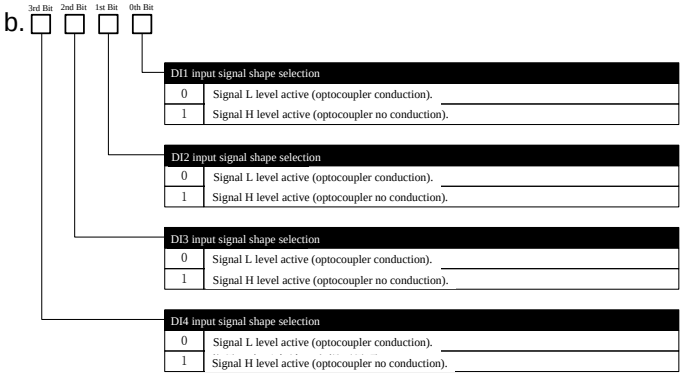
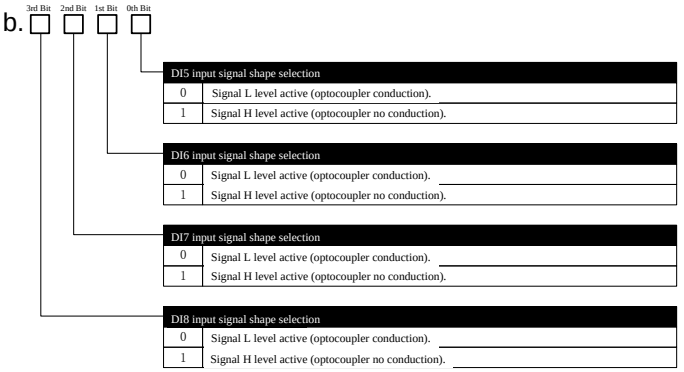
Pn415	Internal torque register 1	-3000~3000	1%	0	Immediately	
Pn416	Internal torque register 2	-3000~3000	1%	0	Immediately	
Pn417	Retain					
Pn418	Torque control basic function switch 1	d.0000 ～ 0011		d.0000	Immediately	



Pn500	Port DI1 Input signal selection	0～31		0	Immediately	

[0] Servo Enable (S-ON)
[1] Control mode switching (C-MODE)
[2] Forward Drive Prohibition (POT)
[3] Negative drive Disable (NOT)

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	[4] Deviation Counter Clearing (CLR) [5] Alarm Clearance (A-RST) [6] Pulse input INHIBIT [7] Zero Speed clamp (ZEROSPD) [8] Forward Torque Limit (PCL) [9] Negative Torque Limit (NCL) [10] GAIN [11] Origin Signal (ZPS) [12] CMDINV under internal position and velocity control [13] Instruction frequency division frequency multiplier switch 0 (DIV0) [14] Command frequency division frequency multiplier Switch 1 (DIV1) [15] Internal command speed selection 0 (INSPD0) [16] Internal command Speed Selection 1 (INSPD1) [17] Internal Command Speed Selection 2 (INSPD2) [18] Internal position select 0 (INPOS0) [19] Internal Location Selection 1 (INPOS1) [20] Internal Location Selection 2 (INPOS2) [21] Internal Location Selection 3 (INPOS3) [22] Internal Position Trigger (PTRG) [23] Forward JOG operation under internal position control (P-POS) [24] Reverse JOG operation under internal position control (N-POS) [25] Internal position control next zero start (SHOME) [26] Stop signal under internal position control (PZERO) [28] Internal torque selection 0 (INTor0) [29] Internal torque Option 1 (INTor1) [30] Selection of incremental \ absolute operating mode under internal position control (Pnbs) [Other] invalid					
Pn501	Port DI2 Input signal selection	0～31		1	Immediately	
	Same as Pn500					
Pn502	Port DI3 Input signal selection	0～31		2	Immediately	
	Same as Pn500					
Pn503	Port DI4 Input signal selection	0～31		3	Immediately	
	Same as Pn500					
Pn504	Port DI5 Input signal selection	0～31		4	Immediately	
	Same as Pn500					
Pn505	Port DI6 Input signal selection	0～31		5	Immediately	
	Same as Pn500					
Pn506	Port DI7 Input signal selection	0～31		6	Immediately	
	Same as Pn500					
Pn507	Port DI8 Input signal selection	0～31		7	Immediately	
	Same as Pn500					
Pn508	Input signal mode select 1	b.0000~1111		b.0000	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	 Note: When Pn508 (address is 01FC H) is modified through communication, data is written in hexadecimal format, for example: b.1111=(0x1111)H=163+162+161+160.					
	Input signal mode is selected 2	b.0000~1111		b.0000	Immediately	
Pn509	 Note: When modifying Pn509 (address is 01FD H) through communication, data is written in hexadecimal format, for example: b.1111=(0x1111)H=163+162+161+160.					
Pn510	**Output signal shape selection** 【 Except for alarm pins CN2-7, CN2-6(ALM+, ALM-).	h.0000~DDDD		h.3210	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
	All output pins can be assigned signals by parameter setting.】					

DO1 output signal selection	
0	ALarm signal output（ALM）
1	Positioning complete(COIN): Position deviation pulse less than Pn525.
2	Z pulse collector signal(CZ): encoder origin signal output, Pn003.3 can be reversed, Pn201.3 can be broadened.
3	External brake release signal: Adjust Pn518 as needed.
4	Servo ready(S-RDY): Servo detection no alarm This signal is valid.
5	Consistent speed output(VCMP): This signal is valid if the speed error is less than Pn517.
6	Motor rotation detection(TGON): motor speed exceeds Pn516 This signal is valid.
7	Torque limit signal(TLC): load torque reaches Pn402 or Pn403 torque limit value.
8	Zero speed detection signal(ZSP): the motor speed is less than Pn515 this signal is effective.
9	Warning output(WARM).
A	Under internal position control, the origin regression completes the signal(HOME).
B	Under internal position control, position command completes signal(CMD-OK).
C	Under internal position control, position and command complete signals(MC-OK).
D	Torque arrival(TREACH): Load torque exceeds Pn404 value.

DO2 output signal selection	
0～D	Same as DO1 signal distribution.

DO3 output signal selection	
0～D	Same as DO1 signal distribution.

DO4 output signal selection	
0～D	Same as DO1 signal distribution.

Pn511	Output signal is reversed	b.0000~1111		b.0000	Immediately	

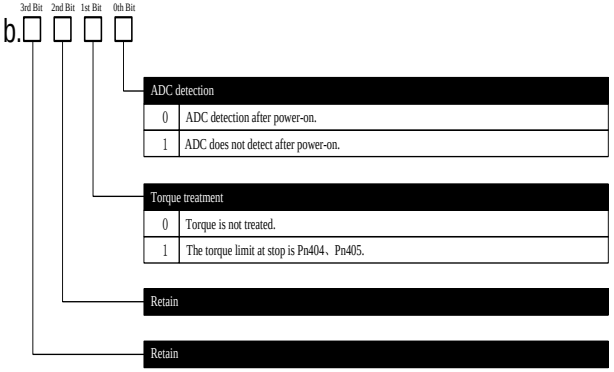
DO1 input signal shape selection	
0	When the ERR signal is effective (that is, when the alarm is generated), the corresponding output optocoupler is turned off; When there is no alarm, the optocoupler is switched on.
1	When the ERR signal is effective (that is, when the alarm is generated), the corresponding output optocoupler is switched On; When there is no alarm, the optocoupler is turned off.

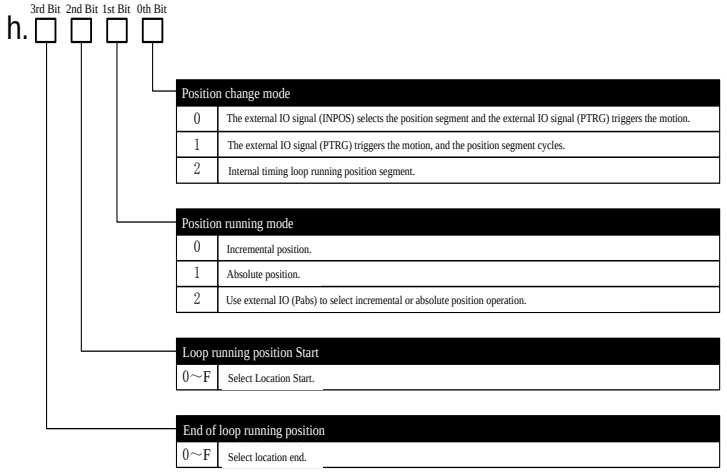
DO2 input signal shape selection	
0	When the DO2 signal is effective, the corresponding output optocoupler is on. When the DO2 signal is invalid, the optocoupler is turned off.
1	When the DO2 signal is effective, the corresponding output optocoupler is turned off; When the DO2 signal is invalid, the Optocoupler conducts.

DO3 input signal shape selection	
0	When the DO3 signal is effective, the corresponding output optocoupler is on. When the DO3 signal is invalid, the optocoupler is turned off.
1	When the DO3 signal is effective, the corresponding output optocoupler is turned off; When the DO3 signal is invalid, the Optocoupler conducts.

DO4 input signal shape selection	
0	When the DO4 signal is effective, the corresponding output optocoupler is on. When the DO4 signal is invalid, the optocoupler is turned off.
1	When the DO4 signal is effective, the corresponding output optocoupler is turned off; When the DO4 signal is invalid, the Optocoupler conducts.

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn512	Input signal filtering time	1～1000	1ms	10	Immediately	
Pn513	Serial encoder communication alarm time	1～100	0.1ms	10	Immediately	
Pn514	Retain					
Pn515	Zero fixed value	0～3000	1 min-1	10	Immediately	
Pn516	Rotate the check out value	1～3000	1 min-1	20	Immediately	
Pn517	Simultaneous signal detection width	1～100	1 min-1	10	Immediately	
Pn518	Brake command - Servo OFF delay time	0～500	1 ms	100	Immediately	
Pn519	Brake command operating speed limit	0～1000	1 min-1	100	Immediately	
Pn520	Servo OFF- brake command wait time	100～1000	1 ms	500	Immediately	
Pn521	Instant power failure holding time	40～800	1ms	60	Immediately	
Pn522	Servo ON position deviation is too large alarm value (ERR) servo OFF stop deceleration. If this parameter is set to 1000, it means that the motor takes 1000ms to decelerate from 1000rpm to 0rpm when it is stopped. Set to 200 indicates that the time taken by the motor to decelerate from 2000rpm to 0rpm when stopped is 200ms*2=400ms	0～5000	1ms	100	Immediately	
Pn523	Servo OFF Stop threshold	20～2000	rpm	50	Immediately	
Pn525	Positioning completion width	0~65535	pulse	10	Immediately	
Pn526	NEAR signal width	0~65535	4pulse	1000	Immediately	
Pn527	Excessive position deviation when servo ON warning value (WARN)	1~65535	0.01r	300	Immediately	
	The unit is 0.01 circle of servo motor. Depending on the resolution of the encoder, for example, encoder with 5000ppr (resolution 5000*4), then the unit is 5000*4*0.01=200pulse, when the warning value is set to 200, the position deviation is too large warning value 200*200=40000 pulse.					
Pn528	Servo ON position deviation is too large alarm value (ERR)	1~65535	0.01r	500	Immediately	
	Ditto					
Pn529	Speed deviation alarm detection time	20~2000	1ms	300	Immediately	
Pn530	Speed deviation alarm threshold level	0～10		5	Immediately	
	If the speed deviation exceeds this threshold, E.28 (excessive speed deviation protection) occurs. When the set value is 10, no excessive speed deviation protection is detected.					
Pn531	Overload warning value	5~100	%	50	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn532	Speed increment threshold	0~1000	Rpm	0	Immediately	
Pn533	Alarm clear input Settings	0~3		0	Immediately	
Pn534	Main power off detection time	100～2000	1ms	2000	Immediately	
	Set the time required for detecting the mains interruption when the mains interruption status persists. When set to 2000, the main power off detection is invalid.					
Pn535	Special control switch 1	b.0000 ~1111		b.0000	Immediately	
						
Pn536	Pump lift treatment high pressure compensation	-20~20	V	-5	Immediately	
Pn537	Resistance of the external regenerative resistor	5～200	Ohm	30	Power-on again	
Pn538	External regenerative resistance capacity	20～3000	Watt	60	Power-on again	
Pn542	Pump lift treatment low pressure compensation	-20~20	V	5	Immediately	
Pn543	IGBT temperature compensation	-20~20	℃	0	Immediately	
	Driver temperature correction amplitude with IGBT temperature sampling.					
Pn544	Dynamic braking (DB braking) on time	0～1000	0.1ms	500	Immediately	
Pn545	Servo preparation time	0～1000	ms	30	Immediately	
Pn700	Internal position mode switch 1	h.0000 ～FF22		h.1002	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
						
Pn701	Internal position 0 Low 16 bits	h.0000～FFFF	pulse	h.4E20	Immediately	
Pn702	Internal position 0 high 16 bits	h.0000～FFFF		h.0000	Immediately	
Pn703	Internal position 1 Low 16 bits	h.0000～FFFF	pulse	h.9C40	Immediately	
Pn704	Internal position 1 high 16 bits	h.0000～FFFF		h.0000	Immediately	
Pn705	Internal position 2 Low 16 bits	h.0000～FFFF	pulse	h.EA60	Immediately	
Pn706	Internal position 2 high 16 bits	h.0000～FFFF		h.0000	Immediately	
Pn707	Internal position 3 Low 16 bits	h.0000～FFFF	pulse	h.3881	Immediately	
Pn708	Internal position 3 high 16 bits	h.0000～FFFF		h.0001	Immediately	
Pn709	Internal position 4 Low 16 bits	h.0000～FFFF	pulse	h.86A0	Immediately	
Pn710	Internal position 4 high 16 bits	h.0000～FFFF		h.0001	Immediately	
Pn711	Internal position 5 Low 16 bits	h.0000～FFFF	pulse	h.D4C0	Immediately	

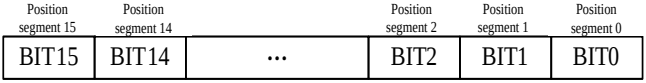
Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn712	Internal position 5 high 16 bits	h.0000～FFFF		h.0001	Immediately	
Pn713	Internal position 6 Low 16 bits	h.0000～FFFF	pulse	h.22E0	Immediately	
Pn714	Internal position 6 high 16 bits	h.0000～FFFF		h.0002	Immediately	
Pn715	Internal position 7 Low 16 bits	h.0000～FFFF	pulse	h.7100	Immediately	
Pn716	Internal position 7 high 16 bits	h.0000～FFFF		h.0002	Immediately	
Pn717	Internal position 8 Low 16 bits	h.0000～FFFF	pulse	h.BF20	Immediately	
Pn718	Internal position 8 high 16 bits	h.0000～FFFF		h.0002	Immediately	
Pn719	Internal position 9 Low 16 bits	h.0000～FFFF	pulse	h.0D40	Immediately	
Pn720	Internal position 9 high 16 bits	h.0000～FFFF		h.0003	Immediately	
Pn721	Internal position 10 Low 16 bits	h.0000～FFFF	pulse	h.5B60	Immediately	
Pn722	Internal position 10 high 16 bits	h.0000～FFFF		h.0003	Immediately	
Pn723	Internal position 11 Low 16 bits	h.0000～FFFF	pulse	h.A980	Immediately	
Pn724	Internal position 11 high 16 bits	h.0000～FFFF		h.0003	Immediately	
Pn725	Internal position 12 Low 16 bits	h.0000～FFFF	pulse	h.F7A0	Immediately	
Pn726	Internal position 12 high 16 bits	h.0000～FFFF		h.0003	Immediately	
Pn727	Internal position 13 Low 16 bits	h.0000～FFFF	pulse	h. 45C0	Immediately	
Pn728	Internal position 13 high 16 bits	h.0000～FFFF		h. 0004	Immediately	
Pn729	Internal position 14 Low 16 bits	h.0000～FFFF	pulse	h. 93E0	Immediately	
Pn730	Internal position 14 high 16 bits	h.0000～FFFF		h. 0004	Immediately	
Pn731	Internal position 15 Low 16 bits	h.0000～FFFF	pulse	h. E200	Immediately	
Pn732	Internal position 15 high 16 bits	h.0000～FFFF		h. 0004	Immediately	
Pn733	Internal position 0 speed	0~5000	1 min-1	100	Immediately	
Pn734	Internal position 1 speed	0~5000	1 min-1	100	Immediately	
Pn735	Internal position 2 speed	0~5000	1 min-1	100	Immediately	
Pn736	Internal position 3 speed	0~5000	1 min-1	100	Immediately	
Pn737	Internal position 4 speed	0~5000	1 min-1	100	Immediately	
Pn738	Internal position 5 speed	0~5000	1 min-1	100	Immediately	
Pn739	Internal position 6 speed	0~5000	1 min-1	100	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn740	Internal position 7 speed	0~5000	1 min-1	100	Immediately	
Pn741	Internal position 8 speed	0~5000	1 min-1	100	Immediately	
Pn742	Internal position 9 speed	0~5000	1 min-1	100	Immediately	
Pn743	Internal position 10 speed	0~5000	1 min-1	100	Immediately	
Pn744	Internal position 11 speed	0~5000	1 min-1	100	Immediately	
Pn745	Internal position 12 speed	0~5000	1 min-1	100	Immediately	
Pn746	Internal position 13 speed	0~5000	1 min-1	100	Immediately	
Pn747	Internal position 14 speed	0~5000	1 min-1	100	Immediately	
Pn748	Internal position 15 speed	0~5000	1 min-1	100	Immediately	
Pn749	Internal position 0 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn750	Internal position 1 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn751	Internal position 2 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn752	Internal position 3 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn753	Internal position 4 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn754	Internal position 5 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn755	Internal position 6 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn756	Internal position 7 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn757	Internal position 8 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn758	Internal position 9 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn759	Internal position 10 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn760	Internal position 11 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn761	Internal position 12 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn762	Internal position 13 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn763	Internal position 14 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn764	Internal position 15 Acceleration and deceleration time parameter	0~500	ms	0	Immediately	
Pn765	Internal position stop time	0~65535	ms	1	Immediately	
Pn766	Position indicates low 16 bits	h.0000～FFFF	pulse	h.0000	Immediately	
Pn767	Position indicates high 16 bits	h.0000～FFFF		h.0000	Immediately	
Pn768	Position control under JOG speed	0~5000	rpm	100	Immediately	
	Internal position increment absolute mode selection	0~65535	--	200	Immediately	

Pn769

16 positions, expressed in binary, correspond to the following:



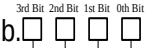
When the corresponding BIT is 0, the segment runs in incremental mode. When the corresponding BIT is 1, the segment runs in absolute mode.

Such a parameter Pn769=4, the corresponding binary representation should be 00000000000000000100, only BIT2 is 1, then the position segment 2 is run in absolute mode, the other segments are run in incremental mode.

Attention:

1. When this parameter is used, Pn700.1=0 is required, and no external IO port Pnbs signal is used (IO signal selection is 30: incremental \ absolute value operation mode selection under internal position control (Pnbs).

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn770	Internal position mode switch 2	b.0000～1111		b.0000	Immediately	



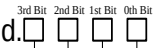
Trigger signal selection	
0	Use external signals PTRG trigger signals.
1	A change in the position selection signal(IPPOS0、INPOS1、INPOS3) triggers the operation.

Trigger timing selection	
0	A new trigger signal is received only after the current segment position is complete (CMD-OK signal is valid).
1	A new next position trigger signal can also be received if the current segment running position is not completed.

PZERO semiotic function	
0	The operation is stopped. Under the zero or position node, the operation will stop immediately after this signal is effective.
1	Pause. Under the zero or position node, the operation will be suspended after the signal is valid, and the operation will continue after the signal is invalid.

Software limit enabled	
0	Software limit cannot be enabled.
1	Software limit enabled. Pn779、Pn780 is a positive limit distance, Pn781、Pn782 is a negative limit distance.

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn771	Internal position mode switch 3	d.0000～1131		b.0000	Immediately	



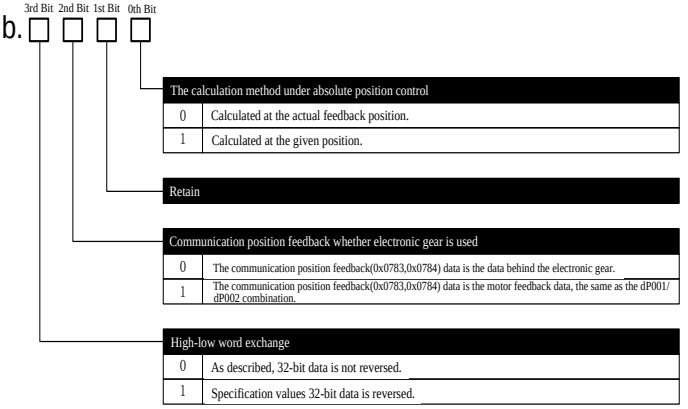
Spin back to zero	
0	Positive return to zero.
1	Negative return to zero.

Select the reset mode	
0	After touching the origin switch, return to run, look for Z pulse.
1	After touching the origin switch, do not return to run, look for Z pulse.
2	After touching the origin switch, return to run, do not look for Z pulse.
3	After touching the origin switch, do not return to run, do not look for Z pulse.

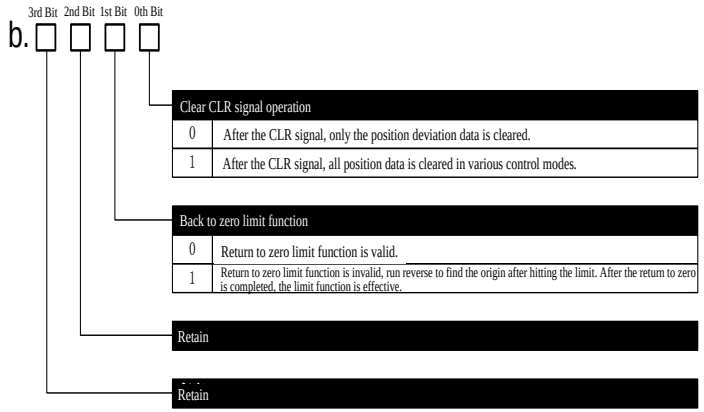
Return to zero to complete the operation	
0	All location data is cleared after the return to zero is complete.
1	All location data is not cleared after the return to zero is complete.

Return to zero signal selection	
0	The external input zero signal ZPS is used as the zero signal.
1	No external zero signal is used, and the Z pulse signal of the motor is used as the origin signal.

Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn772	Internal position mode switch 4	b.0000～1111		b.0000	Immediately	



Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn773	Internal position mode switch 5	b.0000～1111		b.0000	Immediately	



Code	Name	Setting Range	Unit	Factory Default	Effective Time	Reference
Pn774	Retain					
Pn775	Return to zero velocity 1 （**V**elocity before hitting the origin signal）	0～3000	Rpm	500	Immediately	
Pn776	Return to zero velocity 2（ The velocity after hitting the origin signal ）	0～500	Rpm	30	Immediately	
Pn777	Origin offset 16 bits lower	h.0000～FFFF	Pulse	0	Immediately	
Pn778	Origin offset 16 bits higher	h.0000～1FFF		0	Immediately	
Pn779	Positive soft limit lower 16 bits data	h.0000～FFFF	Pulse	h.0000	Immediately	
Pn780	Positive soft limit higher 16 bits data	h.0000～FFFF		h.1000	Immediately	
Pn781	Negative soft limit lower 16 bits data	h.0000～FFFF	Pulse	h.0000	Immediately	
Pn782	Negative soft limit higher 16 bits data	h.0000～FFFF		h.E000	Immediately	