Instructions of CDS500 Series Servo Drive

Delixi (Hangzhou) Inverter Co., Ltd.

To Users

Dear Users,

Thank you for choosing the CDS500 series servo drive (hereinafter referred to as “the Product”) manufactured by Delixi (Hangzhou) Inverter Co., Ltd. (Delixi) Please keep an eye to the followings for better usage experience:

1. Fasten the parts, or conductor, or connecting bolts of conductor, in particular, before the Product is mounted and debugged; otherwise, fire will be triggered where parts are connected due to overheat.

2. The mounting location should be well designed and ventilated.

3. Do NOT connect the servo driver’s incoming/outgoing power wire inversely; otherwise, it will explode.

4. Do NOT start/stop the motor by switching on/off the Product’s main circuit; otherwise, the Product will undergo faults repeatedly.

5. Select the Product properly depending on the real load power (load working current). For any heavy load, select the Product with 1 or 2 grades higher; otherwise, overcurrent or overload will occur!

6. The Product should enjoy Grade IP10 protection, which means, solid objects with diameter of or over 12.5 mm are inaccessible to the Product. The Product is not waterproof.

7. Once idled for over half a year, increase the voltage slowly by using a voltage regulator when powering on the Product; otherwise, electric shock and explosion will occur!

8. AC output reactor must be added if wiring between motor and the Product is over 50 m; otherwise, both of the motor and the Product will be damaged!

As a high-performance medium and small-power AC servo drive developed by our company, the Product has power range of 100W~7.5kW, supports MODBUS communication protocol and provides RS-485/RS-232 communication interfaces to realize online running of multiple servo drivers with the help of upper computer. The Product can be used easily based on rigid meters, inertia Identification and parameter self-rectification functions, making it applicable to the automation equipment such as semiconductor manufacturing equipment, chip mounter, perforating machine of printed circuit board, handling machinery, food processing machinery, machine tool and transmission machinery, in order to control the position, speed and torque precisely.

Please inspect and clean the Product at shutdown state regularly to ensure long-term and safe running. For any difficulty in inspection, please call 0571-86680070 for after-sales service. Technicians will be assigned to provide assistance in solving the problems at site and ensure safe and reliable running of the Product.

Contents

Chapter 1 Safety & Notic

Please read the Instructions carefully before installation, operation, maintenance and inspection of the Product.

Please read the Chapter carefully before using the Product to keep safety of operator, equipment and property. Notice of safe running is divided into “Warning” and “Attention” in the Instructions.

Warning : Potential hazards. Major casualties may occur if violated.

Attention : Potential hazards. Minor or moderate damages of operator and equipment may occur if violated. Applies to warning to unsafe operation.

1.1 Acceptance

Inspection items as shown in table below:

Inspection Items	Introduction
Whether the Product’s model is consistent with that on order?	Check the model on lateral nameplate of the Product
Whether the servo motor’s model is consistent with that on order?	Check the model on the nameplate of servo motor
Whether parts are damaged?	Visually inspect the appearance to see if there’s damage during transport.
Whether rotation axis of servo motor is smooth?	Rotate the axis of servo motor slightly
Whether the Instructions, quality certificate and warranty card are attached?	Check the Instructions, quality certificate and warranty card of servo drive

For any violation of items above, please contact us or our agent.

1.2 Safety Notice

	Installation and maintenance should be carried out by professional technicians only.
 Warning	The Product's rated voltage must be consistent with AC power and voltage grade; otherwise, personal injury or fire may occur!
	Do NOT connect power of AC main circuit to output terminal U, V or W; otherwise, the Product will be damaged and warranty card will be invalid.
	Do NOT connect power supply unless panel is mounted. Do NOT remove the shell once powered on; otherwise, electric shock may occur!
	The Product's ground terminal must be grounded (Type D); otherwise, electric shock will occur!
	Do NOT touch the Product's high-voltage terminals once powered on; otherwise, electric shock will occur!
	Due to large-amount of electric energy stored in the Product's capacitor, do NOT maintain or operate the Product unless it is powered off for at least 10 min, charging indicator is off or voltage of positive/negative busbar is below 36V; otherwise, electric shock will occur!
	Do NOT connect or disconnect the conductor and connector if circuit is powered on; otherwise, personal injury will occur!
	Do NOT touch the revolving parts of running servo motor; otherwise, personal injury will occur!
	Do NOT touch the electronic components; otherwise, they will be damaged easily by static electricity!
	Do NOT power on until cover plate is closed; otherwise, electric shock and explosion will occur!
	Do NOT mix the input terminal; otherwise, explosion and property loss will occur!
 Anti-static	Once idled for over half a year, increase the voltage slowly by using a voltage regulator when powering on the Product; otherwise, electric shock and explosion will occur!
	Do NOT handle the Product with wet hands; otherwise, electric shock will occur!
	Parts MUST be replaced professional technicians only! Do NOT leave thread residue or metal objects in the Product; otherwise, fire hazards will occur!
	Once control panel is replaced, do NOT start the Product unless parameters are set properly; otherwise, property loss will occur!

 Attention	Storage	Do NOT store or place the Product in places below; otherwise, fire hazards, electric shock or damage will occur! Places with direct sunlight, ultrahigh environment, ultrahigh relative humidity, high temperature difference, condensation, corrosive gas or combustible gas; places with large amount of dust, salt or metal powders, as well as places with dropping of water, oil and drugs, shocking or impact to the Product. Do NOT handle the Product by holding its cable or motor axis; otherwise, personal injury or fault will occur!
	Installation	Do NOT install the Product in places with water splashing or corrosion.
		Do NOT use the Product near flammable gas or combustibles; otherwise, electric shock or fire hazard will occur!
		Make sure the Product has specified spacing with inner surface of cabinet or other machines and install it at the correct direction; otherwise, fire hazards or faults will occur!
		Do NOT apply ultrahigh impacts; otherwise, faults will occur!
	Wiring	Do NOT connect the Product's output terminal U, V and W to 3-phase power supply; otherwise, personal injury or fire hazard will occur!
		Power terminal MUST be connected to motor terminal firmly; otherwise, fire hazards will occur easily!
		Do NOT cross the power wire and signal wire in the same pipe nor bound them together! Instead, keep power wire and signal wire separated for at least 30 cm during wiring!
		Double stranded shielded cable, of which both ends should be grounded, should be used as signal wire and encoder cable.
	Running	Make sure to carry out no-load commissioning (not connected to transmission shaft) of servo motor; otherwise, personal injury will occur!
		Make sure to set rotational inertia ratio correctly if online auto tuning is disabled; otherwise, vibration will occur!
		For any alarm, do NOT reset nor restart until fault is removed and safety is guaranteed; otherwise, personal injury will occur!
		Do NOT apply general braking by using the brake motor's brake function; otherwise, faults will occur!

1.3 Maintenance & Inspection

1. The Product should be powered on/off by trained operators only.

2. Do NOT start insulation resistance test until the Product is fully disconnected from all external equipment; otherwise, faults will occur!

3. Do NOT clean the Product using gasoline, diluent, alcohol, acid or alkali detergent; otherwise, shell will be discolored or damaged!

4. Once the Product is replaced, do NOT restart it until the parameters of replaced product is fully transferred to the new one; otherwise, damage will occur!

5. Do NOT change wiring at powered-on status; otherwise, electric shock or personal injury will occur!

6. Do NOT dismantle the servo motor without permission; otherwise, electric shock or personal injury will occur!

1.4 Inspection Items and Period

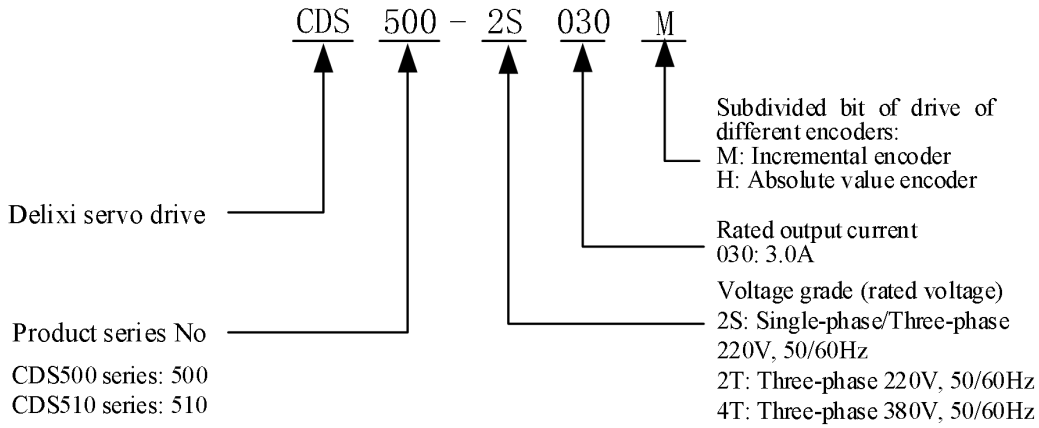
The ambient environment for the servo system: Annual mean ambient temperature: 30℃; Mean load rate: Below 80 %; daily running period: Below 20 h. Carry out daily and regular inspection according to the following key points:

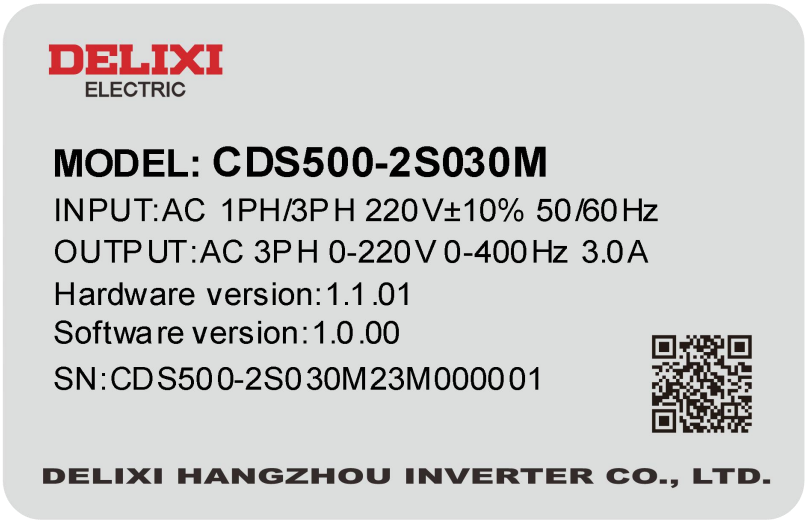
Type	Inspection Period	Inspection Items
Daily Inspection	Daily	Whether there's odor
		Whether power voltage is normal
		Whether there's abnormal vibration and noise
		Whether air inlet has thread residue of fiber
		Check the ambient temperature, moisture, dust and foreign matters
		Whether front end and connector of drive are clean
		Whether load end has foreign matters
Regular Inspection	Annual	Whether fastened part is loose
		Whether it is overheated
		Whether terminal board is damaged
		Whether fastened part of terminal board is loose

Chapter 2 Product Information

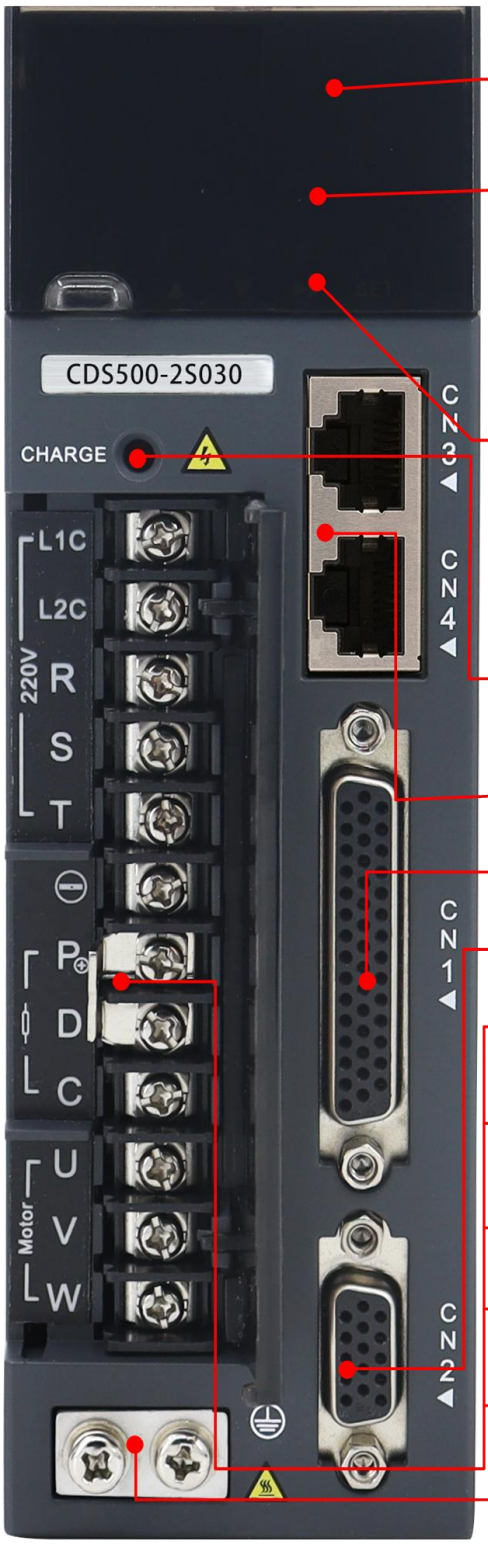
2.1 About the Product

2.1.1 Nameplate and Model





2.1.2 Composition of Servo Drive



Name	Introduction
Interface CN5	Oscilloscope and backstage software interface
LED	5-bit LED to display the Product's running status and parameter setting
Keys	0 0 0 0 0 MODE ▲ ▼ ▶▶ SET → Save the present data and skip to the next parameter automatically Right shift the flicker bit by one bit Long press: Display the higher 5 bits if this parameter is over 5 bits Decrease the value of present flickering bit Increase the value of present flickering bit Switch display of function code in turns
CHARGE power indicator	The Product is powered on if this indicator is on. However, it is not the only factor for determining whether the Product is powered on or off. Make sure the upper circuit is disconnected and capacitor is fully discharged before touching the Product's live parts.
Communication interface CN3/CN4	With parallel connection internally, Interface CN3/CN4 applies to connection of communication device RS-485
Drive control interface CN1	44-pin female terminal interface for controlling drive input/output signals
Interface of encoder CN2	15-pin female terminal interface for connecting the motor encoder
Input terminal of control power supply L1C/L2C	Input terminal of control power supply L1C/L2CConnect power supply of control circuit correctly by referring to parameters on the Product's nameplate
Power input terminal of main circuit R, S, T	Power input terminal of main circuit R, S, T,Connect power supply of main circuit correctly by referring to parameters on the Product's nameplate
$P_{\oplus}$、$\ominus$ DC busbar terminal	DC busbar terminal applies to common DC busbar of multiple drives
Connect$P_{\oplus}$、D、C to brake resistance terminal	Connect short contact tag between $P_{\oplus}$ and D as default. Remove the short contact tag between $P_{\oplus}$ and D and connect brake resistor to $P_{\oplus}$ and C before external connection of brake resistor.
Motor connection terminal U, V, W	Connected to Phase U, V, W of servo motor
Ground terminal of drive PE	Connected to grounding terminal and power grounding terminal of servo motor for purpose of grounding

Composition of Servo Drive

2.1.3 Technical Data

<table>
<tr><th colspan="2">Item</th><th colspan="4">Specification</th></tr>
<tr><td colspan="2" rowspan="8">Basic Parameters</td><td rowspan="4">Rated current</td><td colspan="2">CDS500-2S series</td><td>1.6~14.0A</td></tr>
<tr><td colspan="2">CDS510-2S series</td><td>1.6~6.0A</td></tr>
<tr><td colspan="2">2T series</td><td>1.6~20A</td></tr>
<tr><td colspan="2">4T series</td><td>8.5~20A</td></tr>
<tr><td rowspan="3">Power supply of main circuit</td><td>2S series</td><td colspan="2">1-phase /3-phase AC220V±10%, 50/60Hz</td></tr>
<tr><td>2T series</td><td colspan="2">3-phase AC220V±10%, 50/60Hz</td></tr>
<tr><td>4T series</td><td colspan="2">3-phase AC380V±10%, 50/60Hz</td></tr>
<tr><td rowspan="3">Power supply of control circuit</td><td>2S series</td><td colspan="2" rowspan="2">1-phase AC220V±10%, 50/60Hz</td></tr>
<tr><td>2T series</td></tr>
<tr><td>4T series</td><td colspan="2">1-phase AC380V±10%, 50/60Hz</td></tr>
<tr><td colspan="2">Control Mode</td><td colspan="4">Position control, speed control and torque control</td></tr>
<tr><td colspan="2">Encoder Feedback</td><td colspan="4">Incremental encoder；Communication encoder</td></tr>
<tr><td colspan="2">Regenerative Brake</td><td colspan="4">Internal/external</td></tr>
<tr><td rowspan="8">Configuration</td><td>P24V power supply</td><td colspan="4">P24V-COM; max. output: 200 mA</td></tr>
<tr><td>P5V power supply</td><td colspan="4">P5V-GND; max. output: 200 mA</td></tr>
<tr><td>Pulse input</td><td colspan="4">P_HI, PULSE+, PULSE-, S_HI, SGN+, SGN-; both of differential input and open collector input are supported</td></tr>
<tr><td>Digital input</td><td colspan="4">8-way digital input terminal (DI1~DI8). Both of internal/external power supply are supported</td></tr>
<tr><td>Digital output</td><td colspan="4">4-way digital output terminal (DO1~DO4); max. output: 20 mA</td></tr>
<tr><td>Analog input</td><td colspan="4">1-way analog input (AIN), DC±10V, 12-bit conversion accuracy</td></tr>
<tr><td>Analog output</td><td colspan="4">1-way analog output (AO1+, AO1-), DC±10V; min. output: 1mA</td></tr>
<tr><td>Frequency dividing output</td><td colspan="4">Differential output (≤500khz); Collector output（≤10khz）</td></tr>
<tr><td rowspan="4">Control Characteristic</td><td>Velocity – bandwidth response</td><td colspan="4">Over 1．6KHz</td></tr>
<tr><td>Speed fluctuation ratio:</td><td colspan="4"><±1.5% (Load 0~100%); <±0.3% (Power -15~+10%) (Value corresponds to the rated speed)</td></tr>
<tr><td>Speed ratio</td><td colspan="4">1～65535/1～65535</td></tr>
<tr><td>Input pulse frequency</td><td colspan="4">≤500kHz</td></tr>
<tr><td rowspan="2">Position Control</td><td>Input mode</td><td colspan="4">① Pulse + signal ② CW pulse + CCW pulse ③ Orthogonal Phase AB pulse</td></tr>
<tr><td>Electronic gear ratio</td><td colspan="4">1~32767/1~32767</td></tr>
</table>

Item	Specification
Feedback Mode	Feedback by motor shaft encoder
Parameter Setting Mode	① Be set and inputted via keyboard ② RS485 MODBUS communication input
Load Inertia	Lower than 20 times of motor inertia
Brake Mode	Resistance energy braking

2.1.4 Product List

List of CDS500 series products

Drive Model	Rated Output Current	Max. Output Current	Brake Resistance	Voltage Grade	
				Main Circuit	Control Circuit
2S (1-phase 220V±10%, 50/60Hz)					
CDS500-2S016	1.6A	4.8A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-2S030	3.0A	9A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-2S045	4.5A	13.5A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-2S060	6.0A	18A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-2S100	10A	30A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-2S140	14A	42A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
2T (3-phase 220V±10%, 50/60Hz)					
CDS500-2T016	1.6A	4.8A	Standard configuration, built-in	3-phase 220V	1-phase 220V
CDS500-2T030	3.0A	9A	Standard configuration, built-in	3-phase 220V	1-phase 220V
CDS500-2T045	4.5A	13.5A	Standard configuration, built-in	3-phase 220V	1-phase 220V
CDS500-2T060	6.0A	18A	Standard configuration, built-in	3-phase 220V	1-phase 220V
CDS500-2T100	10A	30A	Standard configuration, built-in	3-phase 220V	1-phase 220V
CDS500-2T140	14A	42A	Standard configuration, built-in	3-phase 220V	1-phase 220V
CDS500-2T200	20A	60A	Standard configuration, built-in	3-phase 220V	1-phase 220V
4T (3-phase 380V±10%, 50/60Hz)					
CDS500-4T085	8.5A	25.5A	Standard configuration, built-in	3-phase 380V	1-phase 380V
CDS500-4T120	12A	36A	Standard configuration, built-in	3-phase 380V	1-phase 380V
CDS500-4T200	20A	60A	Standard configuration, built-in	3-phase 380V	1-phase 380V

List of CDS510 series products

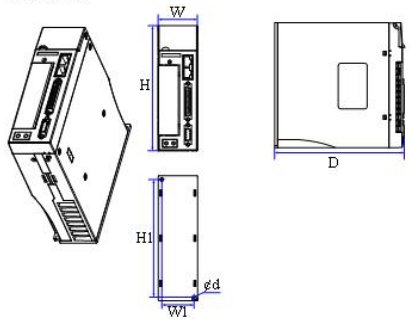
Drive Model	Rated Output Current	Max. Output Current	Brake Resistance	Voltage Grade	
				Main Circuit	Control Circuit
2S (1-phase 220V±10%, 50/60Hz)					
CDS510-2S016	1.6A	4.8A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS510-2S030	3.0A	9A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS510-2S045	4.5A	13.5A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS510-2S060	6.0A	18A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V

Remarks: CDS510 series is the same with CDS500 in terms of use method but they are different in model and dimension drawings。

2.1.5 Appearance & Mounting Dimensions

Dimension drawings of CDS500 series

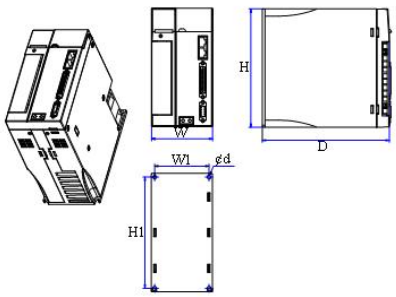
SIZE-A



Drive model	W	W1	H	H1	D	φd
CDS500-2S016	55	45	166	156	179	5
CDS500-2S030						
CDS500-2S045						
CDS500-2S060						
CDS500-2T016						
CDS500-2T030						
CDS500-2T045						
CDS500-2T060						

Unit: mm

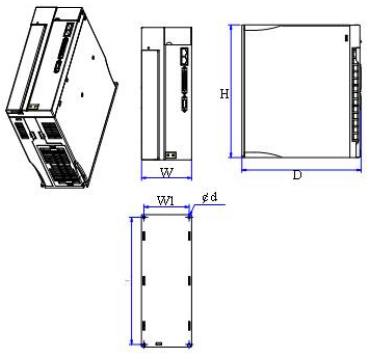
SIZE-B



Drive model	W	W1	H	H1	D	φd
CDS500-2T100	90	80	166	156	187.1	5.5
CDS500-2T140						
CDS500-4T085						
CDS500-2S100						
CDS500-2S140						
CDS500-4T120						

Unit: mm

SIZE-C

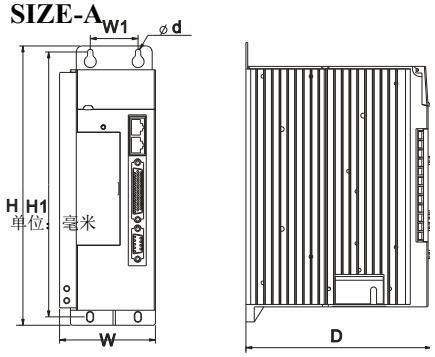


Drive model	W	W1	H	H1	D	φd
CDS500-2T200	100	90	251	241	237.7	5.5
CDS500-4T200						

Unit: mm

Dimension drawings of CDS510 series

SIZE-A



Drive model	W	W1	H	H1	D	¢d
CDS510-2S016 CDS510-2S030 CDS510-2S045 CDS510-2S060	80	40	232	220	155	4.5

Unit: mm

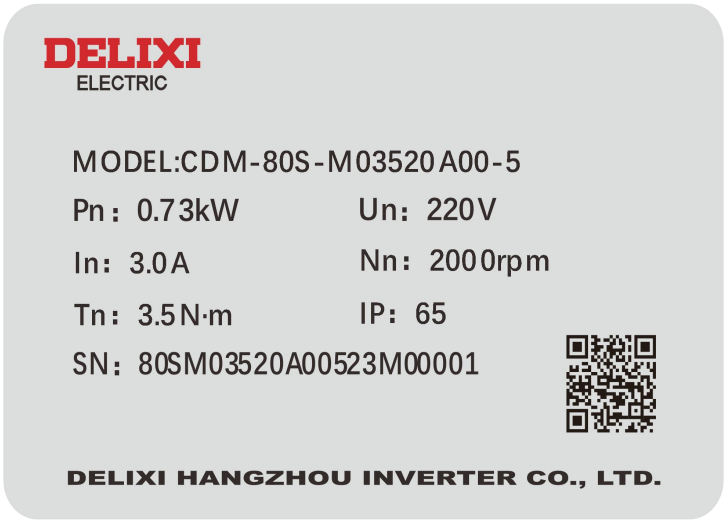
2.1.6 Specification of Brake Resistor

Model of Servo Drive		Specification of Built-in Brake Resistor		Min. Allowable Resistance (Ω)	Max. Brake Energy (J) Absorbed by Capacitor
		Resistance	Power		
1-phase /3-phase 220V	CDS500-2S016	50	50	50	9
	CDS500-2S030	50	50	50	18
	CDS500-2S045	50	50	50	24
	CDS500-2S060	50	50	50	32
	CDS500-2S100	25	100	18	50
	CDS500-2S140	25	100	15	60
3-phase 220V	CDS500-2T016	50	50	50	9
	CDS500-2T030	50	50	50	9
	CDS500-2T045	50	50	50	14
	CDS500-2T060	50	50	50	18
	CDS500-2T100	25	100	18	43
	CDS500-2T140	25	100	15	52
	CDS500-2T200	25	100	20	85
3-phase 380V	CDS500-4T085	50	100	30	50
	CDS500-4T120	50	100	30	50
	CDS500-4T200	30	100	25	120

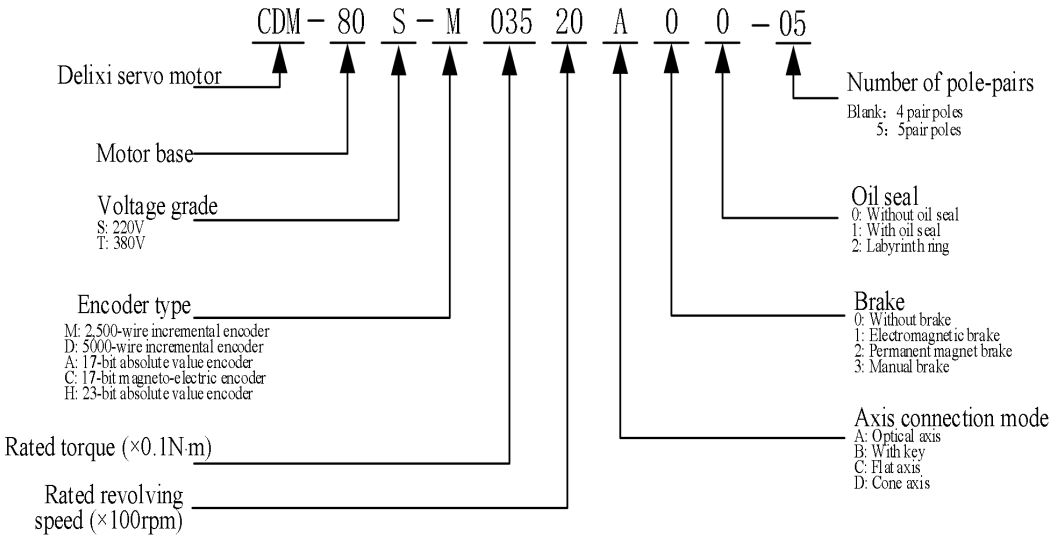
The built-in brake resistor applies to small-inertia and non-frequent braking only. For any high braking torque or repeated braking, the user needs to install the large-power brake resistor and select the brake resistance carefully by referring to the table above. For any query, please call our technicians for solutions.

2.2 About the Servo Motor

2.2.1 Nameplate and Model



Model instruction：



Note: Fill the model of servo motor completely for procurement.

2.2.2 Specification of Servo Motor

1) Mechanical characteristics and parameters of servo motor

Item	Description
Rated Period	Continuous
Vibration Grade	V15
Insulation Grade	Over DC500V, 10MΩ
Ambient Temperature	-20℃~40℃
Excitation Mode	Permanent magnet type
Mounting Type	Flange type
Classification of Electrical Insulation	Class F
Insulation Voltage	AC1500V1 min (Class 200V) AC1800V1 min (Class 400V)
Shell Protection Mode	IP65 (except for axis cut-through part)
Ambient Humidity	<90% (no condensation)
Connection Mode	Direct connection
Revolving Direction	Upon release of forward revolving command, be revolving anticlockwise (CCW) when observed from load side

2) Brake motor

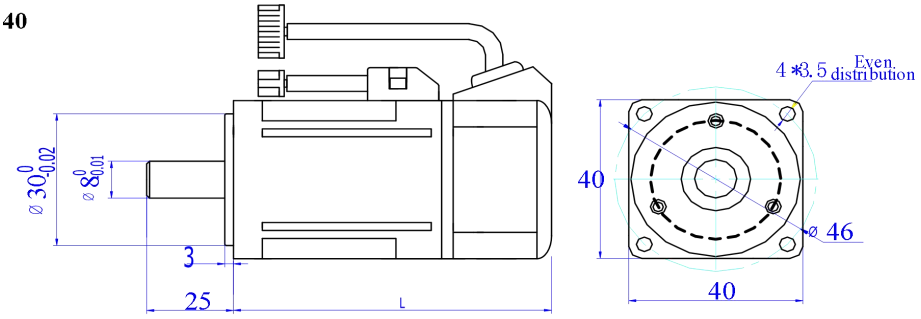
1. Do NOT share the power supply of brake with other electric appliances; otherwise, brake misoperation will occur due to voltage or current reduction due to the operation of other electric appliances.

2. Cables with diameter over 0.5mm^2 are recommended.

2.2.3 Servo motor size specifications

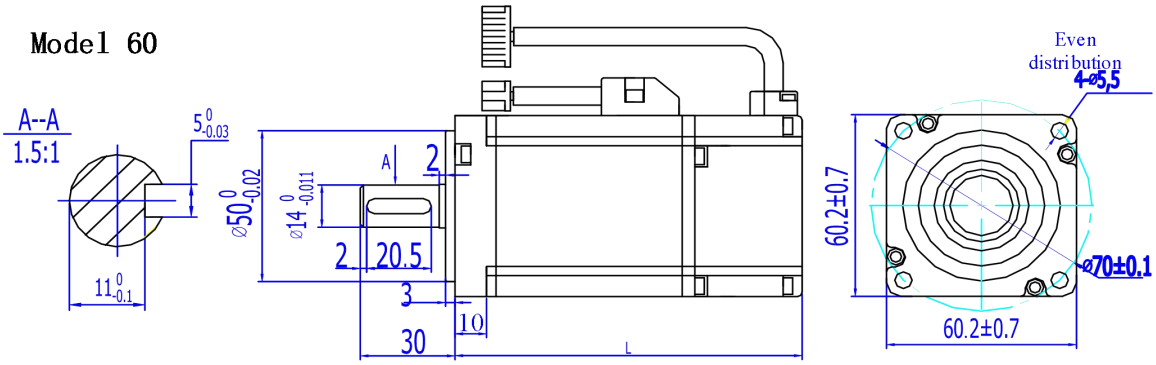
The four-pole motor is shown below:

Model 40



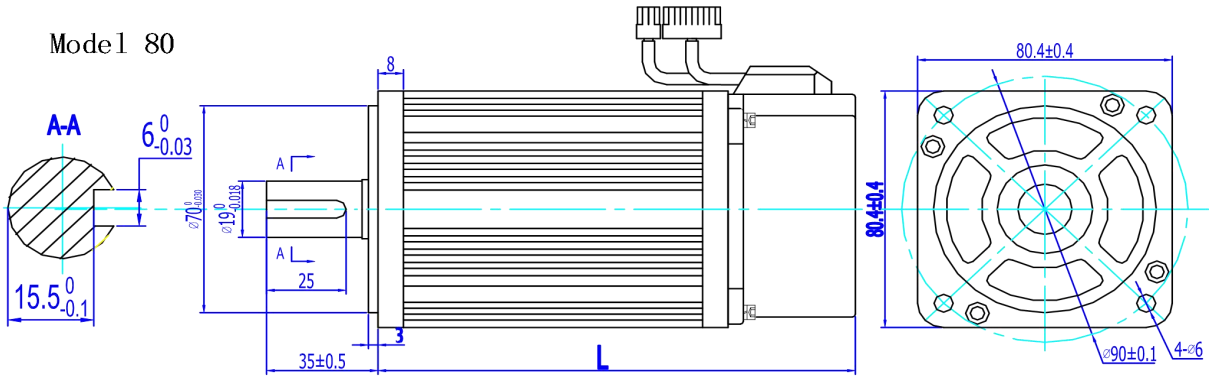
Specification	0.16N·m	0.32N·m
L without brake	75	90
L with permanent magnet brake	109	124

Model 60



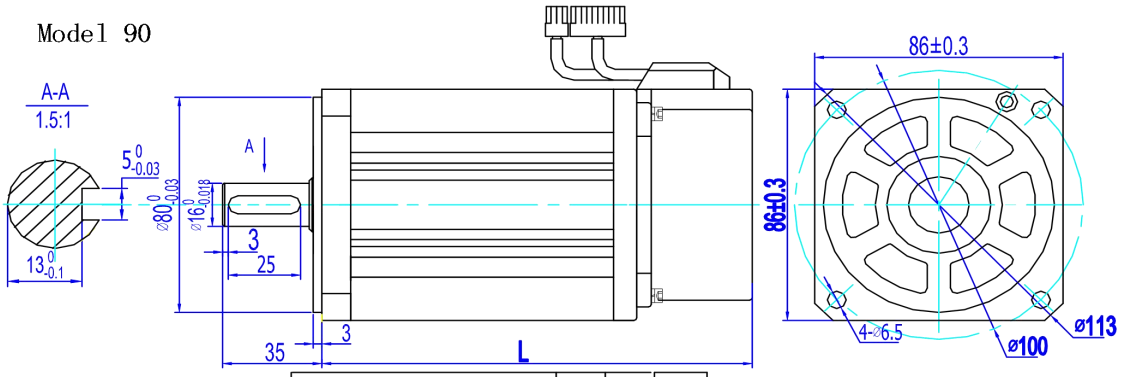
Specification	0.6N.m	1.3N.m	1.9N.m
L without brake	116	141	169
L with permanent magnet brake	164	189	217

Model 80



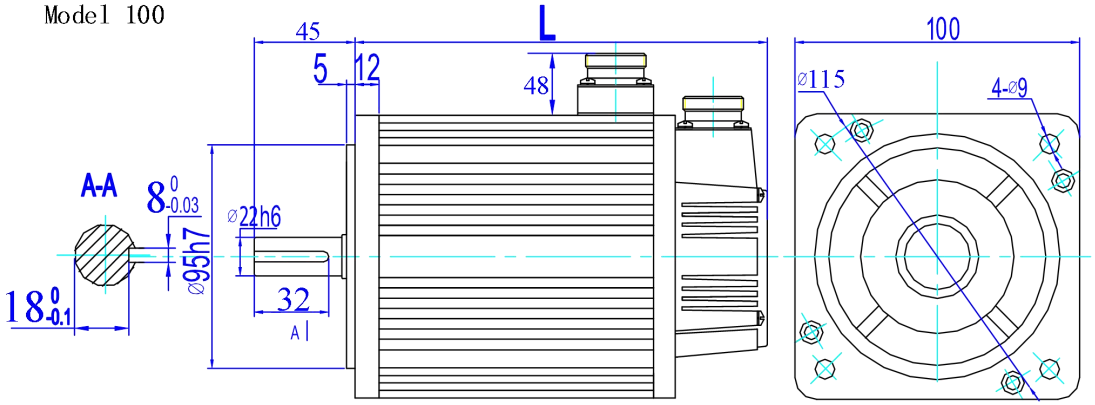
Specification	1.3N.m	2.4N.m	3.5N.m	4N.m
L without brake	124	151	179	191
L with permanent magnet brake	178	205	233	245
L with electromagnetic brake	164	191	219	231

Model 90



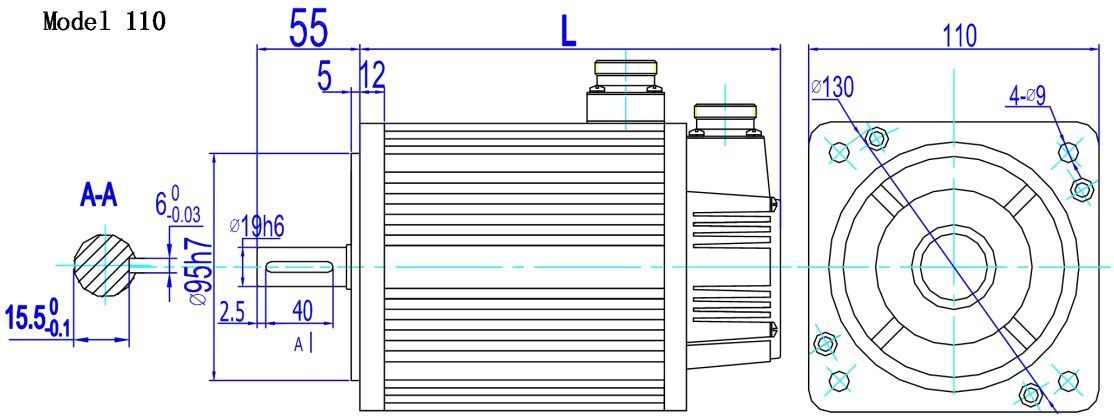
Specification	2.4N.m	3.5N.m	4N.m
L without brake	150	172	182
L with permanent magnet brake	207	229	239
L with electromagnetic brake	198	220	230

Model 100



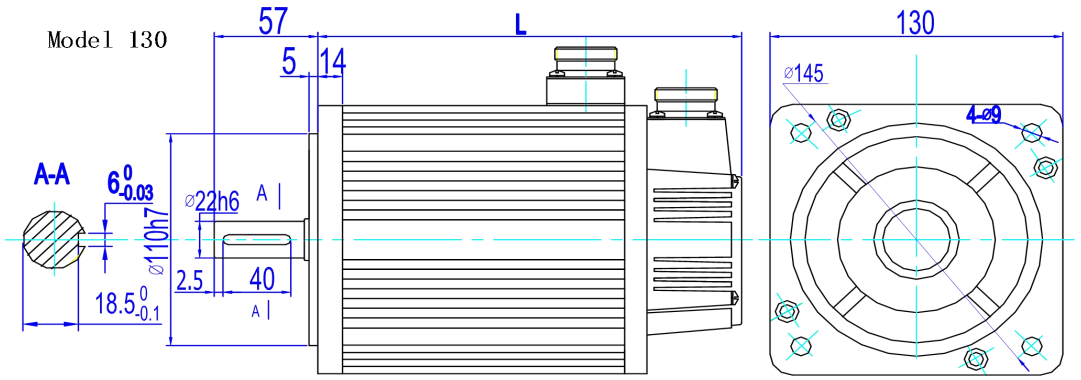
Specification	3.2N·m	6.4N·m
L without brake	153	198
L with permanent magnet brake	194	239

Model 110



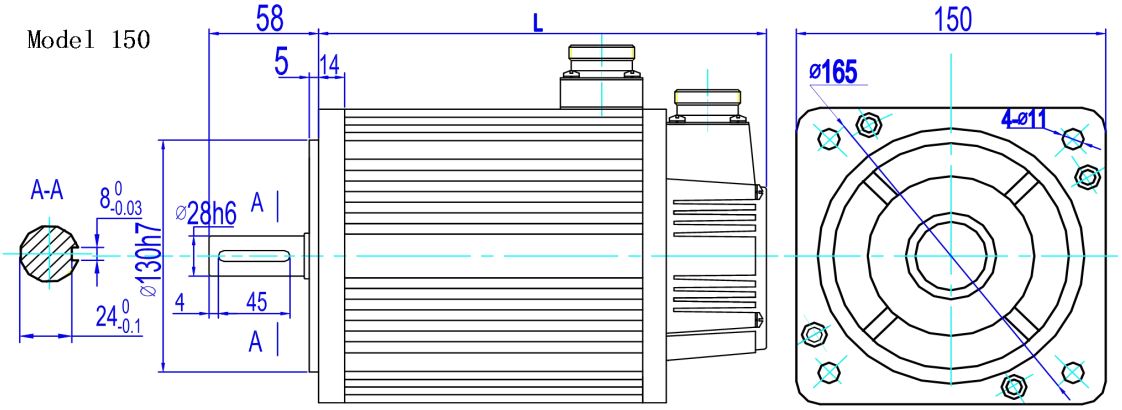
Specification	2N.m	4N.m	5N.m	6N.m
L without brake	159	189	204	219
L with permanent magnet brake	215	245	260	275
L with electromagnetic brake	233	263	278	293

Model 130



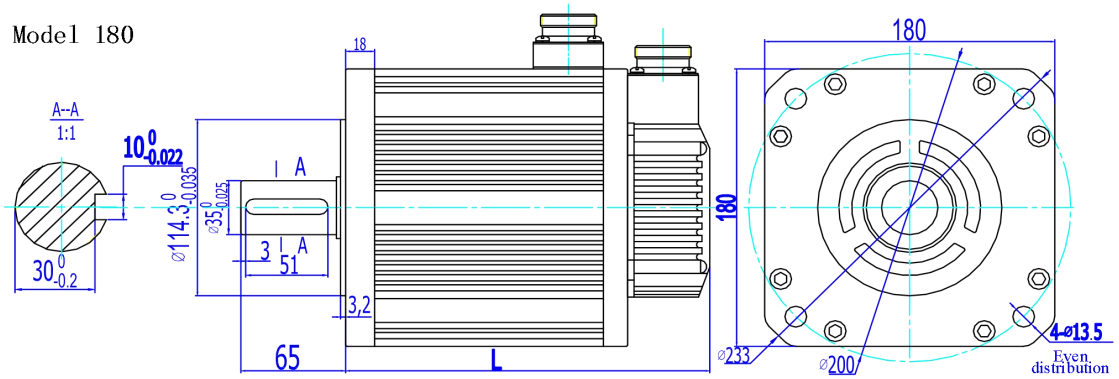
Specification	4N.m	5N.m	6N.m	7.7N.m	10N.m			15N.m	
					1000r	1500r	2500r	1500r	2500r
L without brake	166	171	179	192	213		209	241	231
L with permanent magnet brake	236	241	249	262	283		279	311	301
L with electromagnetic brake	223	228	236	249	294		290	322	312

Model 150



Specification	15N.m		18N.m	23N.m	27N.m
	2000r	2500r			
L without brake	230	230	248	278	302
L with electromagnetic brake	303	303	321	351	375

Model 180

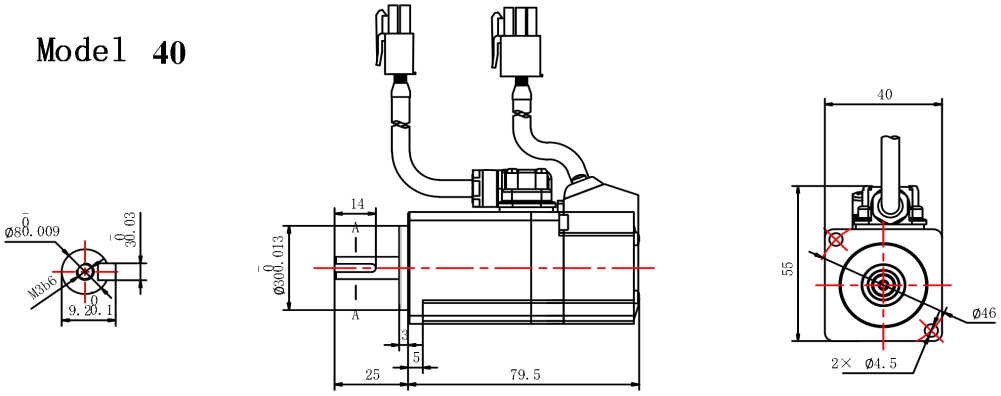


Specification	17.2N.m	19N.m	21.5N.m	27N.m	35N.m	48N.m
L without brake	226	232	243	262	292	346
L with permanent magnet brake	308	314	325	344	382	436
L with electromagnetic brake	298	304	315	334	364	418

Unit: mm

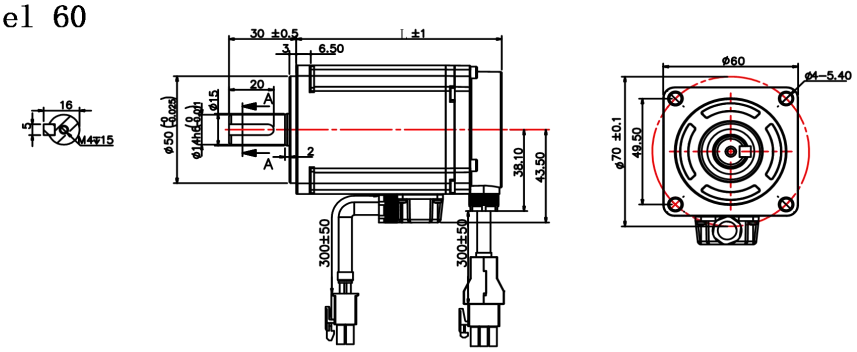
The five-pole motor is shown below:

Model 40



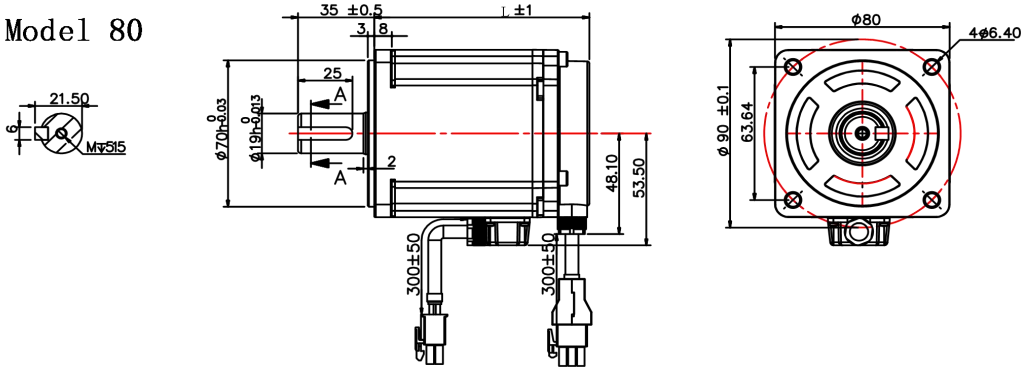
Specification	L without brake	L with electromagetic brake
CDM-40S-C00130B01-5	68.5	101.5
CDM-40S-C00330B01-5	79.5	112.5

Model 60



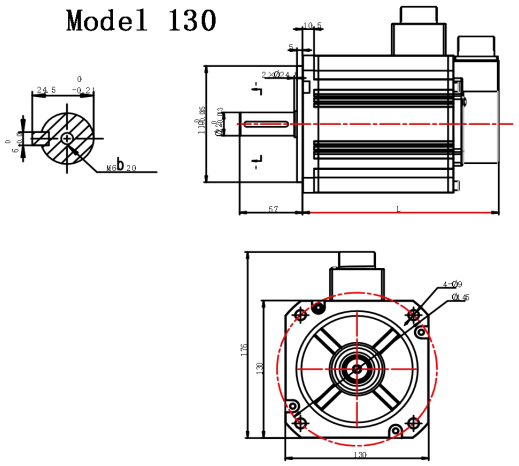
Specification	L without brake	L with electromagetic brake
CDM-60S-C00630B01-5	75	105
CDM-60S-C01330B01-5	92	122
CDM-60S-C01930B01-5	109	139

Model 80

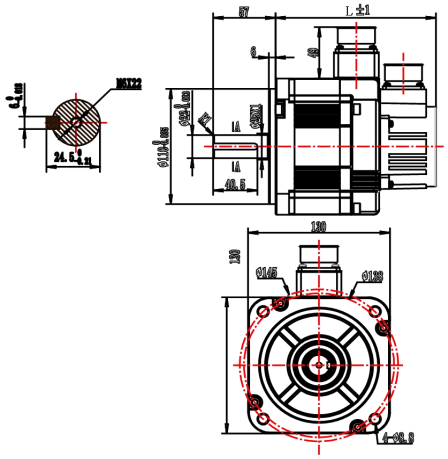


Specification	L without brake	L with electromagetic brake
CDM-80S-C02430B01-5	100	134
CDM-80S-C02430B01X-5	100	134
CDM-80S-C03330B01-5	113	147

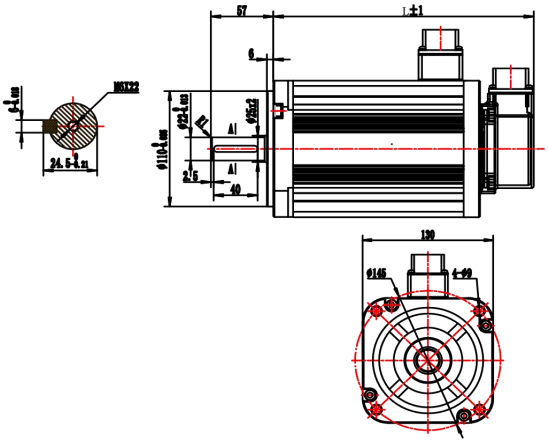
Model 130



Specification	L without brake	L with electromag etic brake
CDM-130S-C05415B01-5	135	187
CDM-130S-C08315B01-5	152.5	204.5
CDM-130S-C11515B01-5	170	222
CDM-130S-C14315B01-5	200	252
CDM-130T-C05415B01-5	135	187
CDM-130T-C08315B01-5	152.5	204.5
CDM-130T-C11515B01-5	170	222
CDM-130T-C14315B01-5	200	252

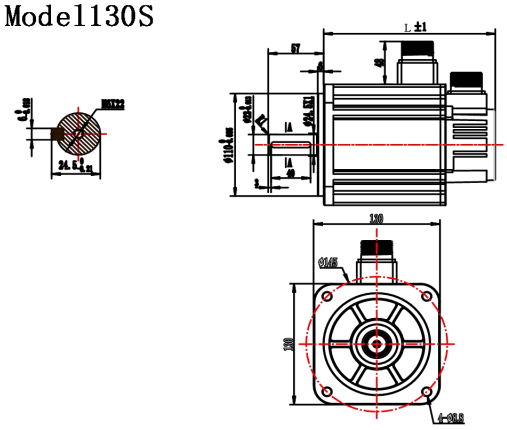


Specification	L without brake	L with electromag etic brake
CDM-130S-C06415B01-5	135	187
CDM-130S-C07515B01-5	152.5	204.5
CDM-130S-C09615B01-5	170	222
CDM-130T-C06415B01-5	200	252
CDM-130T-C07515B01-5	135	187
CDM-130T-C09615B01-5	152.5	204.5
CDM-130T-C14615B01-5	170	222

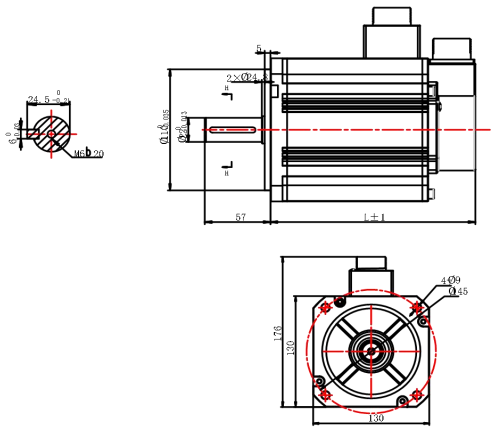


Specification	L without brake	L with electromag etic brake
CDM-130S-C17815B01-5	237.5	265.5
CDM-130T-C17815B01-5	237.5	265.5

Model130S

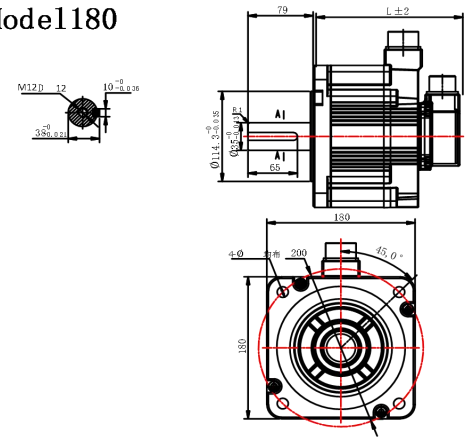


Specification	L without brake	L with electromag etic brake
CDM-130S-C05415B01S-5	152.5	186
CDM-130S-C08315B01S-5	177.5	211
CDM-130S-C11525B01S-5	177.5	211
CDM-130S-C14615B01S-5	228	255.5
CDM-130T-C05415B01S-5	152.5	186
CDM-130T-C11525B01S-5	177.5	211
CDM-130T-C14615B01S-5	177.5	211
CDM-130T-C14315B01S-5	228	255.5

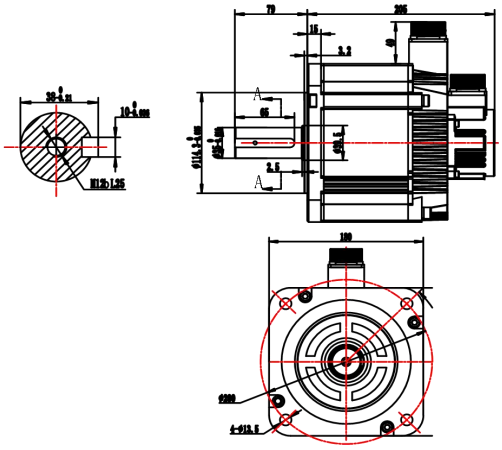


Specification	L without brake	L with electromag etic brake
CDM-130S-C04820B01-5	135	187
CDM-130S-C07220B01-5	152.5	204.5
CDM-130S-C09620B01-5	170	222
CDM-130S-C14320B01-5	200	252
CDM-130T-C04820B01-5	135	187
CDM-130T-C07220B01-5	152.5	204.5
CDM-130T-C09620B01-5	170	222
CDM-130T-C14320B01-5	200	252

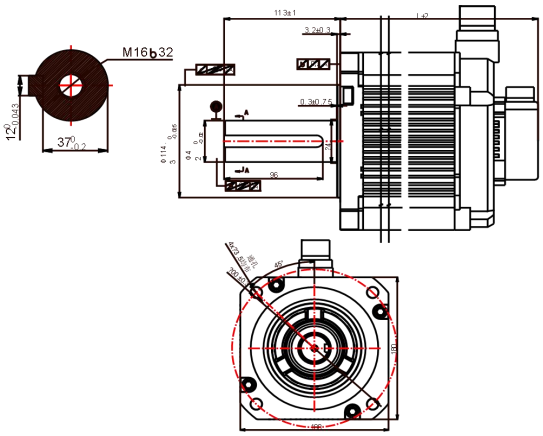
Model180



Specification	L without brake	L with electromag etic brake
CDM-180T-C18615B01X-5	176	224
CDM-180T-C28415B01X-5	200	248
CDM-180T-C35015B01X-5	237	285



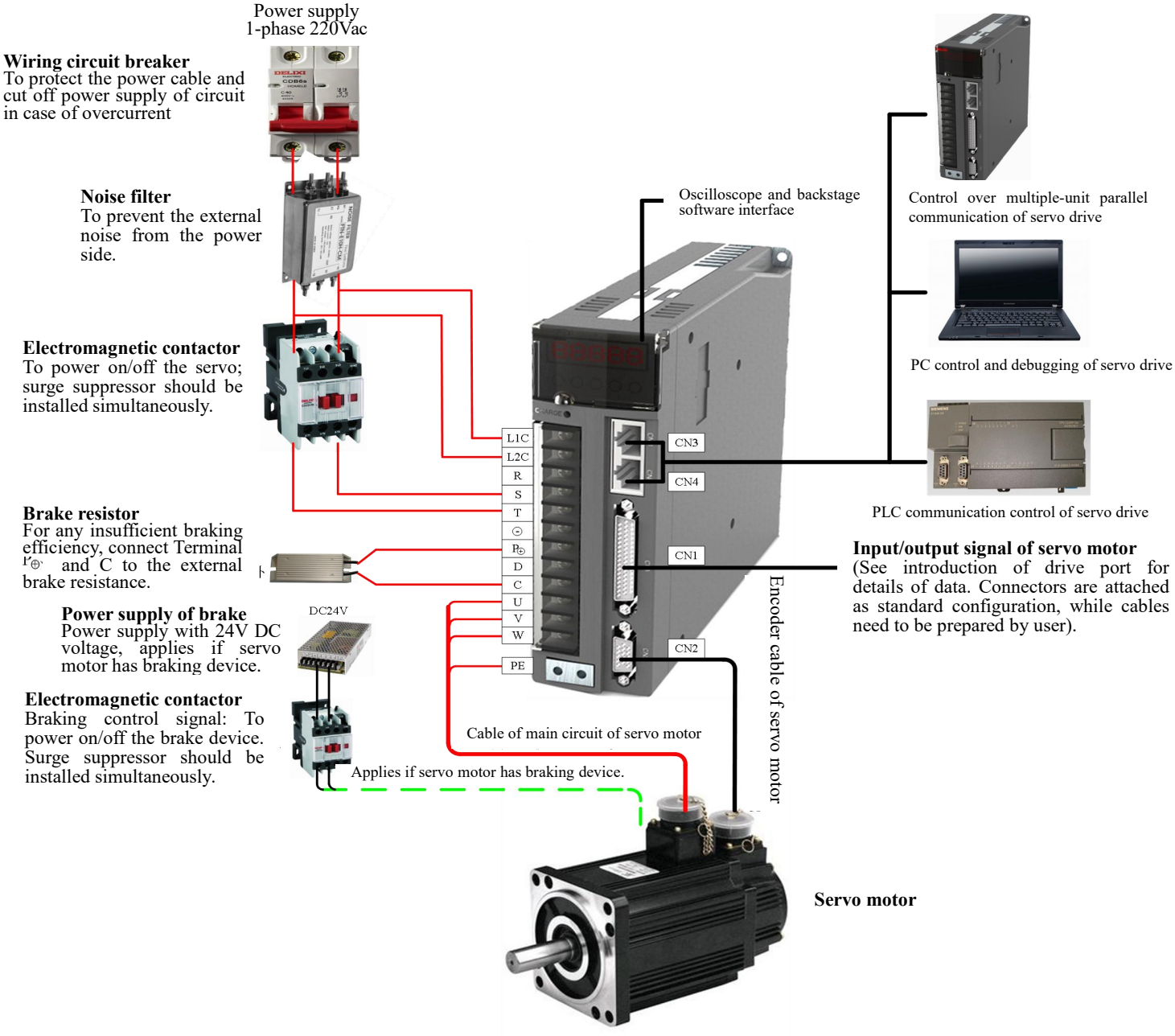
Specification	L without brake	L with electromagetic brake
CDM-180T-C18615B01X-5	205	252
CDM-180T-C28415B01X-5	232	279
CDM-180T-C35015B01X-5	260	307



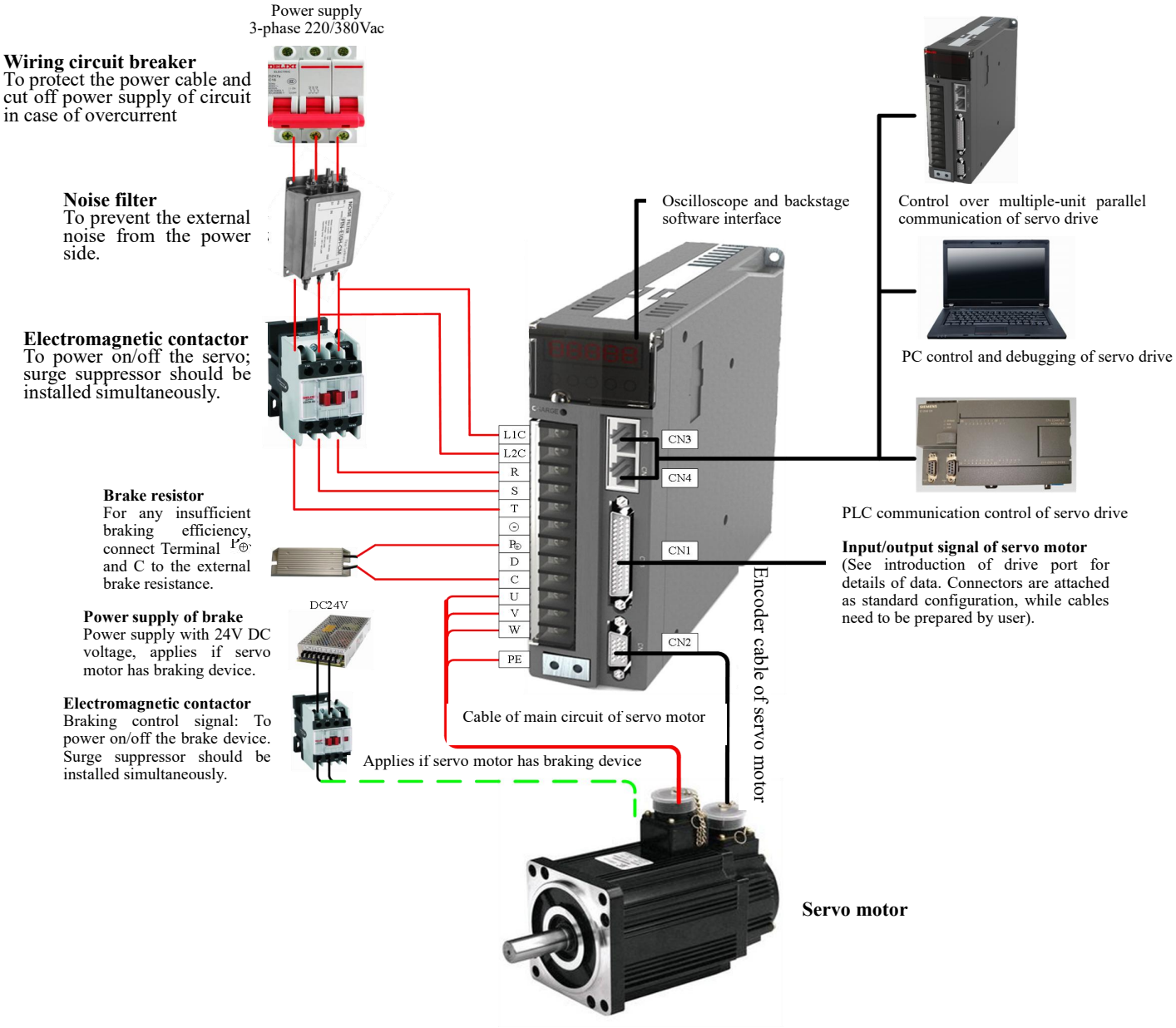
Specification	L without brake	L with electromagetic brake
CDM-180T-C48015B01X-5	310	360

2.3 Wiring Diagram of Servo System

2.3.1 Wiring Diagram of 1-phase 220V System



2.3.2 Wiring Diagram of 3-phase 220V/380V System



As the Product is directly connected to the industrial power supply without power isolation by those including transformer, please install fuse or wiring circuit breaker on the input power for avoiding cross electric shock accidents of servo system, and please install overload and short-circuit protection RCCB or specific ground wire protection RCCB to ensure higher safety of system, for the Product has no built-in grounding protection circuit.

Do NOT start/stop the motor by using an electromagnetic contactor, for the motor is a high-inductance element and the instantaneous high voltage will breakdown the contactor.

Keep an eye on the capacity of power supply when using external power supply or 24VDC power supply, especially power is supplied to multiple drives or multi-way brake, for insufficient capacity of power supply will lead to insufficient power supply current and final failure of the Product or brake. If 24V DC voltage power supply is adopted for braking, the power should be selected considering the motor model and conforming to the power requirements of brake.

Note: 1. Do not connect the external brake resistor until the short contact tag between the Product's P⊕ and Terminal D is firstly removed. 2. As the consistent communication interface of pin, CN3 and CN4 can be selected freely.

Chapter 3 Mounting & Wiring

3.1 Mounting of Servo Drive

3.1.1 Requirements for Mounting Places and Environment

Item	Description	
Mounting location	Be mounted in cabinets free from direct sunlight or rainfall	
	Do NOT use the Product in places with corrosive substances, such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali and salt, as well as flammable gas and combustibles;	
	Do NOT install the Product in places with high temperature, high moisture, dust or metal dust	
	Places without vibration;	
	Pollution grade of mounting location: PD2	
Environment requirements	Ambient temperature	0 ~ +45℃
	Ambient humidity	Below 90%RH (no condensation)
	Vibration	Below 4.9m/s^2
	Impact	Below 19.6m/s^2
	Protection grade	IP10
	Altitude	Below 1,000 m

3.1.2 Mounting Notice

1) Method

Keep installation direction vertical to the wall, cool the Product by using free convection or fan, firmly fix the Product onto the mounting surface through 2~4 mounting holes (number of which varies depending on the capacity).

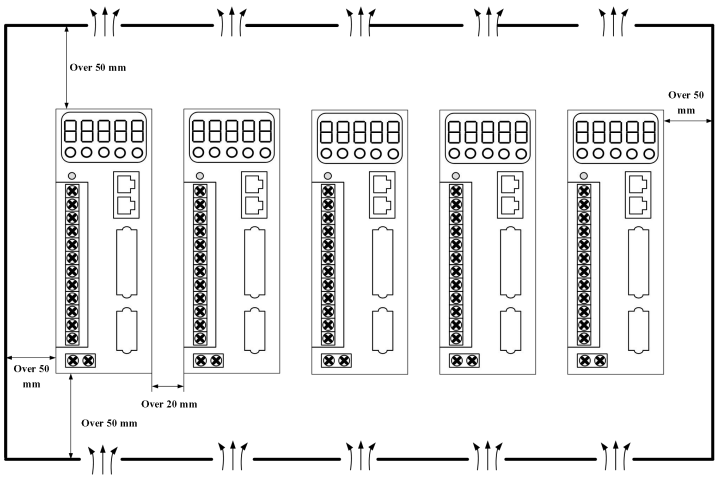


Fig. 3-1 Schematic Diagram for Mounting of Servo Drive

Keep the Product's front side (actual mounting side of operator) towards the operator and vertical to the wall during mounting.

2) Cooling

Leave sufficient space around the Product by referring to the diagram above, in order to fully cool it through fans and free convection. Install a cooling fan above the Product to avoid local overheat and guarantee even temperature in the cabinet.

3) Side-by-side mounting

Once mounted side by side, spacing over 10 mm and 50 mm is recommended at both sides at horizontal direction (spacing at horizontal direction can be avoided due to restriction of mounting space) and longitudinal direction respectively.

4) Grounding

Grounding terminal must be grounded; otherwise, electric shock or misoperation due to disturbance will occur.

3.2 Mounting of Servo Motor

3.2.1 Mounting Location

1. Do NOT use the Product in places with corrosive substances, such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali and salt, as well as flammable gas and combustibles;

2. The Product should be equipped with oil seal before mounted in places with grinding fluid, oil mist, iron powder and cutting fluid.

3. Be away from places with heat sources such as furnace.

4. Do NOT use the motor in confined space; otherwise, motor's service life will be shortened due to overheat.

3.2.2 Ambient Conditions

Item	Description
Ambient Temperature	-20℃~40℃ (no freezing)
Ambient Humidity	20%~90%RH (no condensation)
Storage Temperature	-20℃~60℃ (max. storage temperature: 80℃ for 72 h)
Storage Humidity	20%~90%RH (no condensation)
Vibration	Below 49m/s^2
Impact	Below 490m/s^2
Protection Grade	IP65 (axis cut-through part, except for the position where motor connector connects the terminal)
Altitude	Below 1,000 m; degraded if used over 1,000 m

3.2.3 Mounting Notice

Item	Description
Derusting	Firstly remove the “antirust agent” at axis stretch end of servo motor and carry out derusting treatment before installation.
Encoder	◆Do NOT collide the axis stretch end during installation; otherwise, the internal encoder will crack. ◆Install the pulley on the servo motor shaft with keyslot by using screw holes at the axis end. Firstly insert the double-headed nails into the screw holes, put gasket onto the surface of coupling end and gradually lock-in the nuts into the pulley. ◆Servo motor shaft with keyslot should be mounted screw holes at shaft end; while shaft without keyslot should be mounted via friction coupling or similar methods.
Centering	Keep the axis of servo motor at the same straight line of mechanical axis. The servo motor should conform to the centering precision requirements in the left diagram during installation. Insufficient centering may lead to vibration and even damage of bearing and encoder.
Installation Direction	◆The servo motor should be mounted at the horizontal or vertical direction.
Countermeasures to Oil and Water	The servo motor should be used based on the protection grade in the places with water drops; or the servo motor with oil seal should be used if oil will be dropped onto the axis cut-through part, i.e. the clearance of stretching-out part of axis from motor end surface. **Work conditions for servo motors with oil seals on transmission shaft:** ◆Make sure oil level is lower than the mouth of oil seal during use. ◆Make sure oil seal can be well used when splashed with oil. ◆Avoid oil accumulation at the mouth of oil seal when installing the servo motor upwards and vertically.
Cable Stress	◆Do NOT "bend" the wire or apply "tension" to it, especially the 0.2 mm or 0.3 mm core wire of signal cable. Do NOT apply too tight tension to the wiring (during operation).
Handling of Connector	Notice of connector: ◆Make sure the connector has no foreign matters such as waste or metal sheets before connection. ◆Connect the connector to the servo motor from the main circuit cable side of servo motor firstly and make sure grounding wire of main cable is connected reliably; Otherwise, the encoder will become faulty due to the potential difference between PE if the cable at encoder side is connected firstly. ◆Make sure pins are arranged correctly during wiring. ◆Do not apply impacts on the connector that is made of resin; Otherwise, it will be damaged. ◆Make sure to hold the body of servo motor when handling the connected cables; Otherwise, the connector or cable will be damaged. ◆Do NOT apply stress to the connector during wiring if bent cable is used; Otherwise, the connector will be damaged.

3.3 Wiring

3.3.1 Mounting Notice

 Danger	★Wiring MUST be carried out by professional technicians and well protected. ★Do NOT dismantle the Product unless the Product is powered off for over 5 min and the voltage between P⊕ and Θ is measured when power indicator is off; Otherwise, electric shock will occur! ★Do NOT start wiring unless the Product and servo motor are mounted; Otherwise, electric shock will occur! ★Make sure to protect the cable. Do NOT apply excessive pulling force, suspend heavy objects or squeeze the cable; otherwise, electric shock will occur!
 Attention	★Make sure to protect the connection position of power terminal; Otherwise, electric shock or short circuit will occur! ★Specification and mounting mode of external wiring should conform to the requirements of local laws and regulations. ★Make sure to use the cables as specified. Yellow and green cable should be used as grounding wire. ★Make sure to carry out safety protection measures during installation, debugging and inspection; for example, hang inspection mark and arrange specific person for monitoring.

3.3.2 Wiring

1. Wiring materials should conform to the cable specification (next section)

2. Do NOT connect input power wire to output terminal U, V or W; otherwise, the Product will be damaged!

3. Output terminal U, V and W of motor MUST correspond to the Product's terminals; otherwise, rotation failure or speed loss will occur!

4. It MUST be grounded reliably through single point.

5. Make sure to use the ground wire with the same section area of main circuit wire. Please use 2.0mm^2 ground wire if section area of main circuit wire is below 1.6 mm^2.

6. The absorption diode of relay at output signal section MUST be connected at the correct direction; otherwise, fault signals may fail to be outputted!

7. Please install devices such as insulating transformer and noise filter on the power supply to avoid misoperation due to noise.

Please install non-fuse circuit breaker to timely cut off the external power supply in case the Product becomes faulty.

8. Make sure the bending radius of cable is over 10 times of outer diameter of cable; otherwise, the internal cores of cable will crack due to long-term bending.

9. Please use the cables resistant to voltage over AC600v and rated temperature over 75℃; the allowable current density of cable conductor should not exceed 8A/mm^2 at 30℃, normal cooling conditions and total current below 50A, or not exceed 5A/mm2 when total current is over 50A.

10. Do NOT cross the power wire and signal wire in the same pipe nor bound them together! Instead, keep power wire and signal wire separated for at least 30 cm during wiring to avoid disturbance!

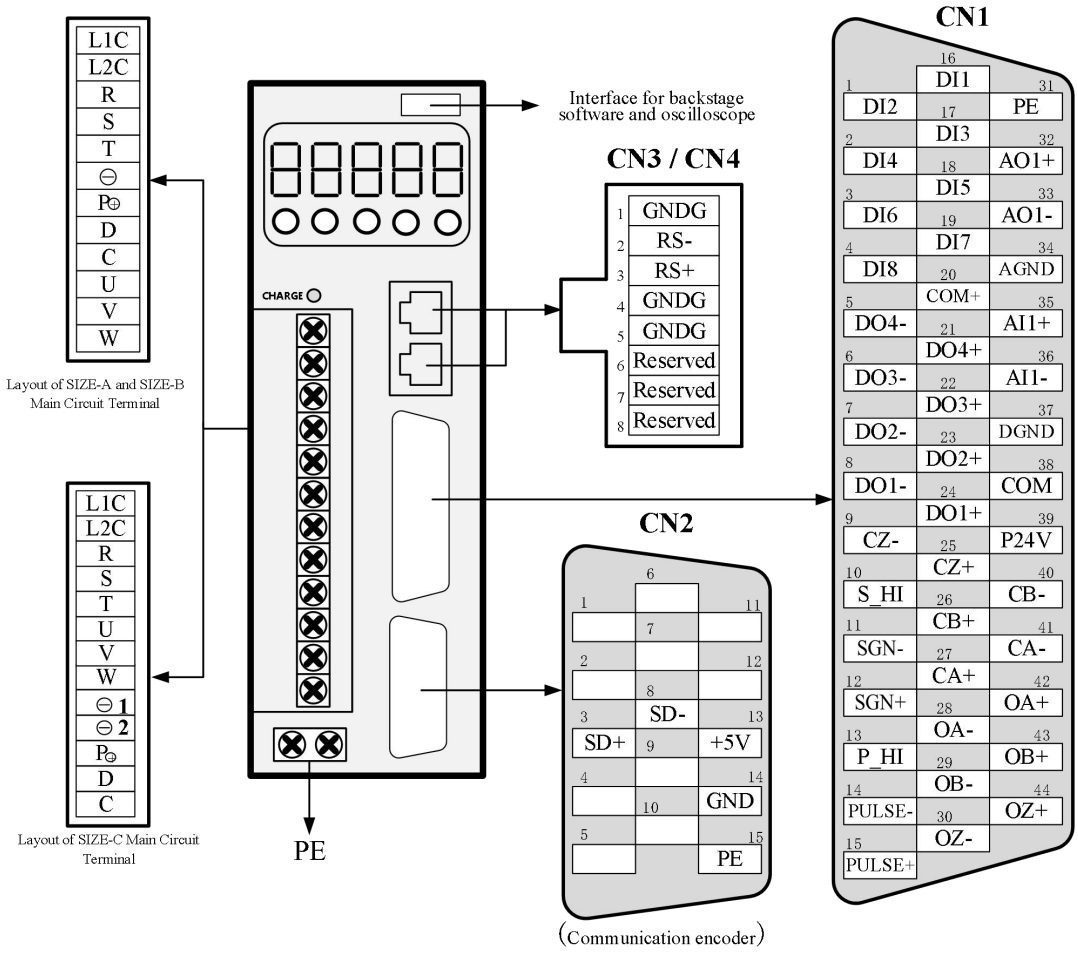
11. Do NOT touch the power terminal within 5 min after the Product is powered off, for it may have residual high voltage internally.

12. Do NOT power on when screws or cables of terminal block are loose; otherwise, fire hazard will occur!

3.3.3 Wire Specification

Terminal Block	Symbol	Wire Specification
Main circuit power supply	R, S, T	0.75~10mm^2
Control power supply	L1C, L2C	0.75~1.0mm^2
Motor connection terminal	U, V, W	0.75~1.0mm^2
Ground terminal	⏚	0.75~4mm^2
Control terminal	CN1	≥0.14mm^2 (AWG26), including shielded wire
Encoder signal terminal	CN2	≥0.14mm^2 (AWG26), including shielded wire
Brake resistance terminal	P⊕, C	1.5~4mm^2

3.3.4 Layout of Drive Terminal Pins



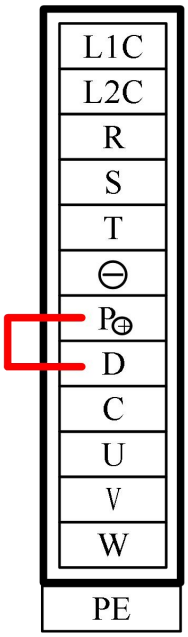
The diagram above shows the arrangement of pins of the Product's terminals

3.3.5 About the Main Circuit Terminal

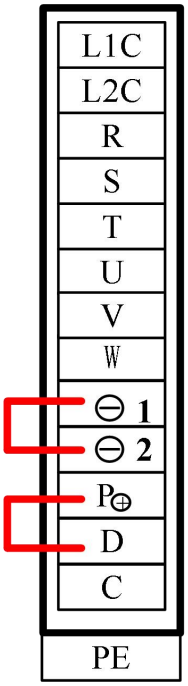
1. Please use cable resistant to voltage over 600V as the main circuit.

2. Please consider the allowed current attenuation coefficient of cable when binding cables and put them into the hard PVC pipe or metal casing.

3. Please use heat-resistant cable at high temperature (cabinet temperature), for general PVC cable will be aged quickly and fail to be reused within short period.



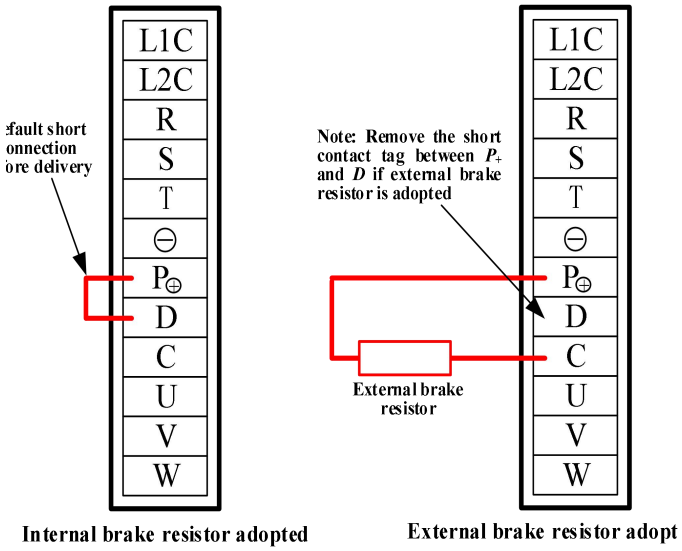
Layout of SIZE-A and SIZE-B Main



Layout of SIZE-C Main Circui

Terminal Symbol	Terminal Name	Description
R, S, T	Power input terminal of main circuit	1-phase 220V, 3-phase 220V/380V power input terminal of main circuit, applies to 2S、2T、4T series servo drive
L1C, L2C	Control power input terminal	Control circuit power input; 1-phase 220V for 2S and 2T series servo drive, or 1-phase 380V for 4T series servo drive
P⊕, D, C	External brake resistance connection terminal	Carry out short connection between P⊕ and D as default. Please dismantle the short contact tag and connect external brake resistor between P⊕ and C if there's insufficient braking capability. The external brake resistor should be ordered separately as required.
P⊕, Θ or P⊕, 1/2	Shared DC busbar terminal	The DC busbar terminal of servo can be connected to shared busbar under parallel connection of multiple machines
1, 2	External reactor connection terminal	Connect short contact tag between 1 and 2 as default; remove the short contact tag and connect DC reactor between 1 and 2 if higher harmonic of power supply needs to be restrained.
U, V , W	Servo motor connection terminal	Connect the connection terminal of servo motor to terminal U, V and W of motor.
PE	Grounding	Connect the two grounding terminals to the power grounding terminal and motor grounding terminal. Make sure to carry out grounding of the entire system.

3.3.6 Wiring of Brake Resistor



Refer to Chapter 2.1.6 for the type selection and use of brake resistor.

Wiring Notice of Brake Resistor:

1. Do NOT connect the external brake resistor onto the positive/negative anode P⊕ / ⊖ directly; otherwise, explosion and fire will occur!

2. Make sure to remove the short contact tag between Drive P⊕ and D if external resistor is used; otherwise, brake pipe will be damaged due to overcurrent!

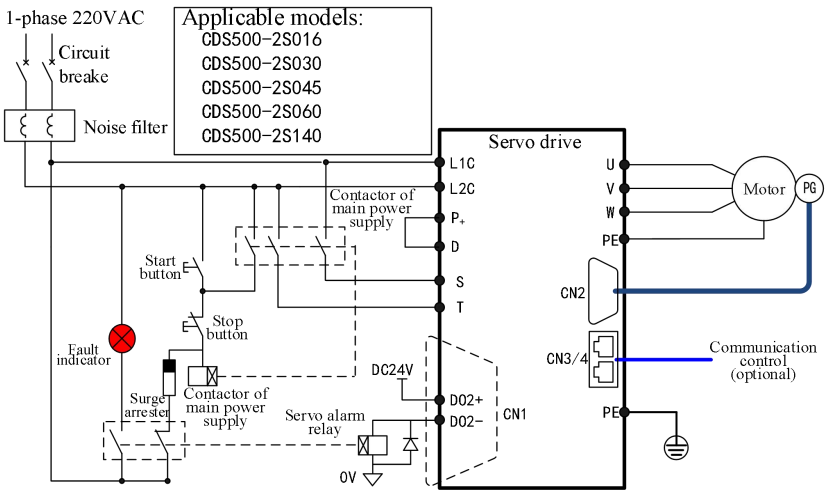
3. Please mount the external brake resistor on incombustibles, such as metal.

4. Make sure parameters of brake resistor are set properly before use of servo.

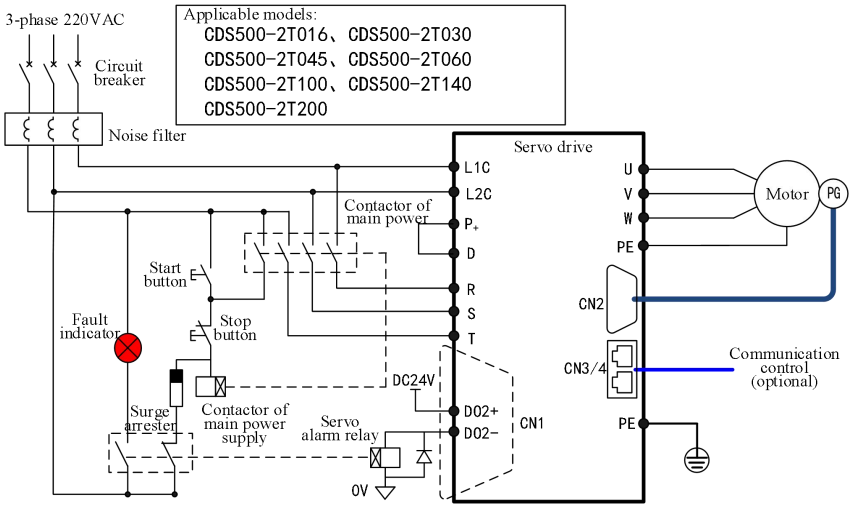
5. Do NOT run the Product under the min. allowable resistance; otherwise, the Product will give out alarm or be damaged!

3.3.7 Cases of Power Supply Wiring

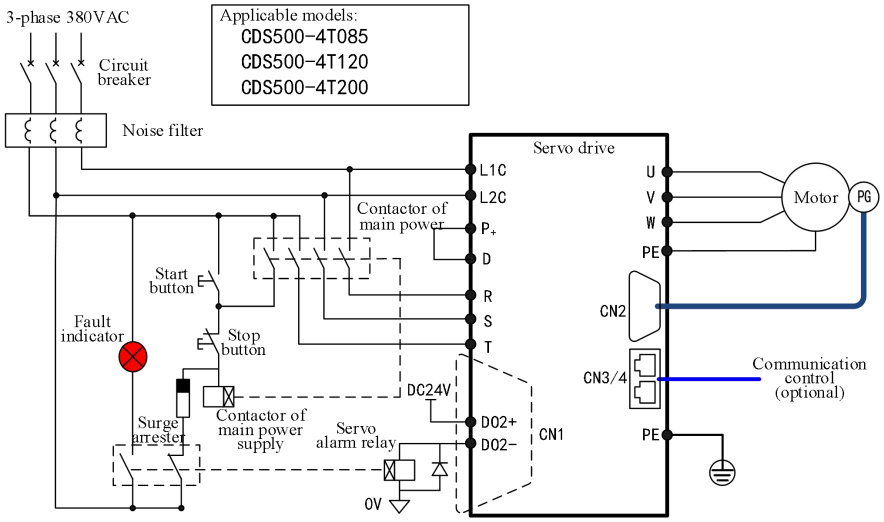
1) 1-phase 220VAC:



2) 3-phase 220VAC:

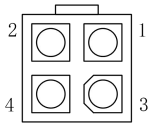
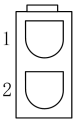


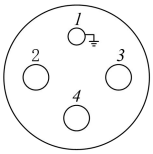
3) 3-phase 380VAC:



3.3.8 Connection of Power Line between Servo Drive and Servo Motor

Connector at servo motor side of power cable

Name	Layout of Plug Pin		Applicable Motors
Common plug of motor power line		Pin / Name 1 / U 2 / V 3 / W 4 / PE	40 60 80 90
Common plug of motor brake coil		Pin / Name 1 / + 2 / -	Motor with brake

Name	Layout of Plug Pin	Applicable Motors
Aviation plug of motor power line		100 110 130 150 180

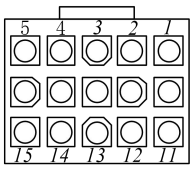
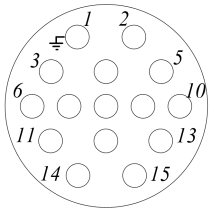
Pin	Name
1	PE
2	U
3	V
4	W

Note: The power cable color should be subject to the real objects. Colors of cables in the Instructions should be subject to our company cables.

3.3.9 Connection of Encoder Line between Servo Drive and Servo Motor

(1) 2,500-wire incremental encoder

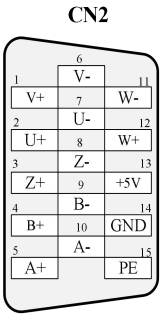
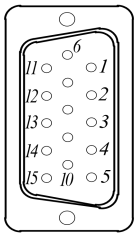
Connector at servo motor side of encoder cable

Name	Layout of Plug Pin	Applicable Motor Flanges
Common plug of encoder		40 60 80 90
Aviation plug of encoder		100 110 130 150 180

Pin	Name	Pin	Name
1	PE	9	A+
2	+5V	10	V+
3	GND	11	W+
4	B+	12	V-
5	Z-	13	A-
6	U+	14	B-
7	Z+	15	W-
8	U-		

Pin	Name	Pin	Name
1	PE	9	Z-
2	+5V	10	U+
3	GND	11	V+
4	A+	12	W+
5	B+	13	U-
6	Z+	14	V-
7	A-	15	W-
8	B-		

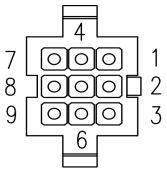
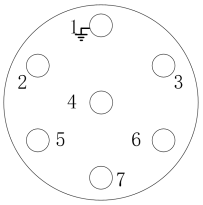
Connector at servo drive side of encoder cable

Encoder		

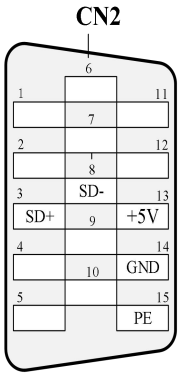
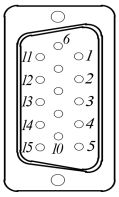
Pin	Name	Pin	Name
1	V+	9	B-
2	U+	10	A-
3	Z+	11	W-
4	B+	12	W+
5	A+	13	+5V
6	V-	14	GND
7	U-	15	PE
8	Z-		

(2) Communication encoder wire

Connector at servo motor side of encoder cable

<table>
<tr><th>Name</th><th colspan="2">Layout of Plug Pin</th><th>Applicable Motors</th></tr>
<tr><td>Communication encoder
AMP plug</td><td> 
</td><td>
<table>
<tr><th>Pin</th><th>Name</th><th>Pin</th><th>Name</th></tr>
<tr><td>1</td><td>PE</td><td>5</td><td>GND</td></tr>
<tr><td>2</td><td>/</td><td>6</td><td>SD+</td></tr>
<tr><td>3</td><td>/</td><td>7</td><td>+5V</td></tr>
<tr><td>4</td><td>SD-</td><td></td><td></td></tr>
</table>
</td><td>40
60
80
90</td></tr>
<tr><td>Communication encoder
Aviation plug</td><td> 
</td><td>
<table>
<tr><th>Pin</th><th>Name</th><th>Pin</th><th>Name</th></tr>
<tr><td>1</td><td>PE</td><td>5</td><td>GND</td></tr>
<tr><td>2</td><td>E-</td><td>6</td><td>SD+</td></tr>
<tr><td>3</td><td>E+</td><td>7</td><td>+5V</td></tr>
<tr><td>4</td><td>SD-</td><td></td><td></td></tr>
</table>
</td><td>100
110
130
150
180</td></tr>
</table>

Connector at servo drive side of encoder cable

<table>
<tr><td>Communication encoder</td><td> 
</td><td> 

<table>
<tr><th>Pin</th><th>Name</th><th>Pin</th><th>Name</th></tr>
<tr><td>1</td><td>-</td><td>9</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>10</td><td>-</td></tr>
<tr><td>3</td><td>SD+</td><td>11</td><td>-</td></tr>
<tr><td>4</td><td>-</td><td>12</td><td>-</td></tr>
<tr><td>5</td><td>-</td><td>13</td><td>+5V</td></tr>
<tr><td>6</td><td>-</td><td>14</td><td>GND</td></tr>
<tr><td>7</td><td>-</td><td>15</td><td>PE</td></tr>
<tr><td>8</td><td>SD-</td><td></td><td></td></tr>
</table>
</td></tr>
</table>

Wiring Notice of Encoder Signal Cable:

1. Please earth the shielding network at driver and motor side reliably; otherwise, driver may give out an alarm by mistake.

2. The cable shielding layer of encoder must be earthed reliably and differential signal can be connected with one group of twisted pair of cable.

3. Voltage reduction caused by cable resistance must be considered for the length of signal cable. Capacity of power supply must be considered in course of distribution.

Ensure the signal and power supply can satisfy driver requirements when they are accessed to driver input side.

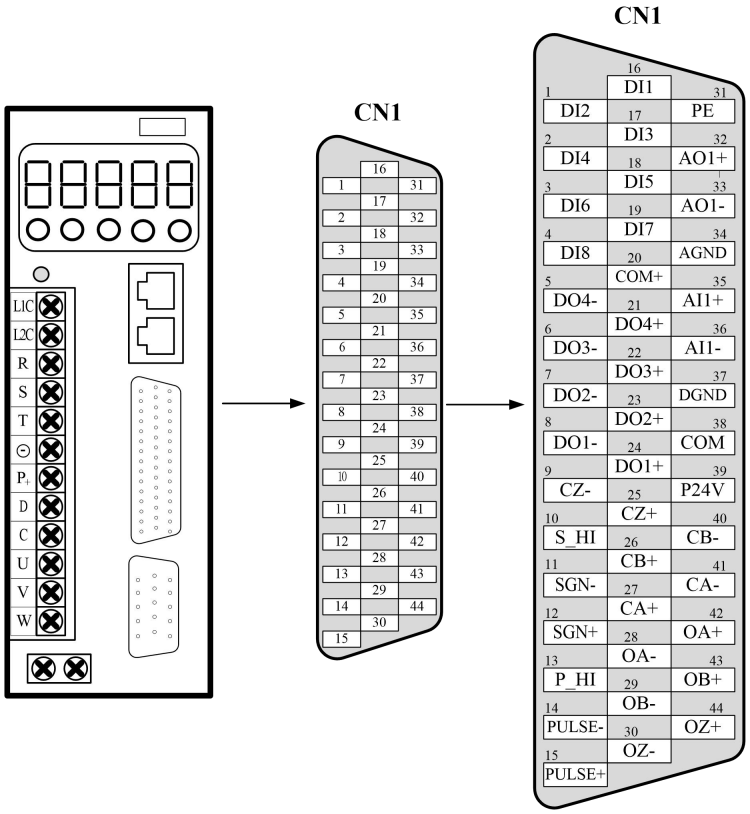
4. The encoder cable should be separated from strong current cable with an interval of being greater than 30cm.

5. Connect shielding layer and ensure the layer is earthed reliably when connecting encoder cable.

6. Encoder cable should be separated from high-voltage cable with clearance over 30 cm.

7. The shielded layer should be connected and grounded reliably when connecting the encoder cable.

3.4 Connection of Control Signal Terminal CN1 of Servo Drive



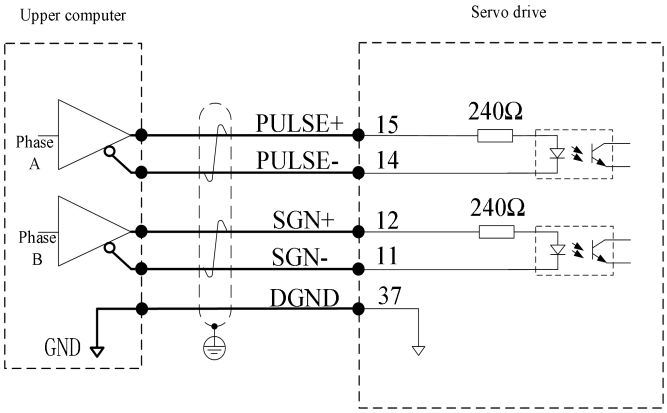
3.4.1 Input Signal

Signal Name		Pin No.	Function	
Pulse input	PULSE+	15	Input mode of pulse command: ●Differential drive input ●Open circuit of collector	Form of input pulse: ●Direction + pulse ●Phase A and B of orthogonal pulse ●Pulse sequence CW/CCW
	PULSE-	14		
	SGN+	12		
	SGN-	11		
External power supply	P_HI	13	External power input interface of command pulse	
	S_HI	10		
Signal ground	DGND	37	Digital signal ground	

The command pulse at upper compute side and symbol output circuit can be selected from the differential drive output or open circuit of collector. The max. input frequency and the min. pulse width are shown in table below:

Pulse Mode	Max. Frequency	Min. Pulse Width (us)
Difference	500K	1
Open collector	200K	2.5
Note: Pulse receiving error will occur in the Product if the output pulse width of upper device is lower than the min. pulse width.		

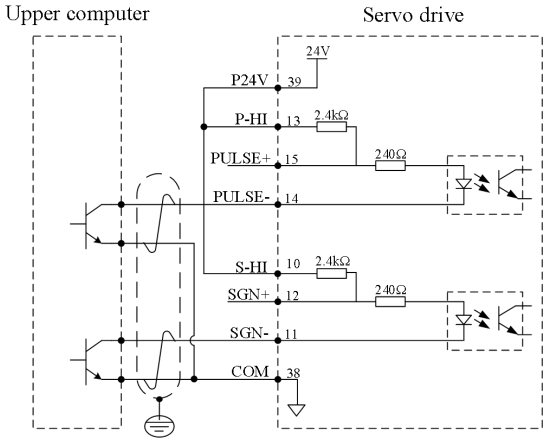
a) Under differential mode



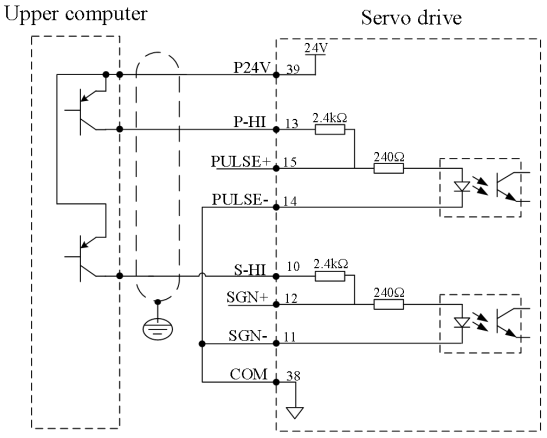
b) Under open circuit of collector

①Internal 24V power supply in servo drive is adopted

◆ Common cathode



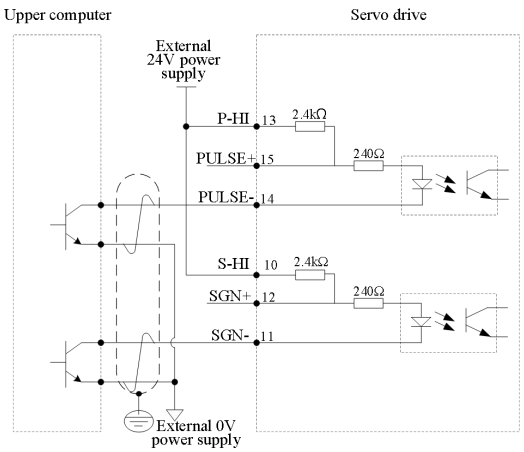
◆ Common anode



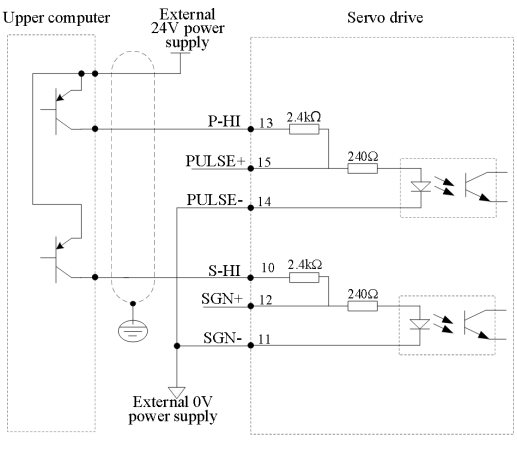
②External 24V power supply is adopted

I. Internal resistor adopted (recommended)

◆ Common cathode

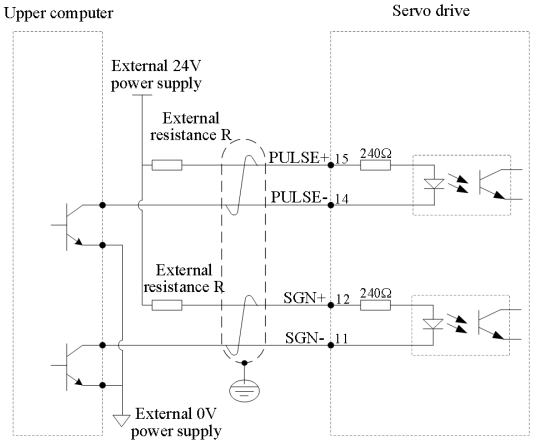


◆ Common anode

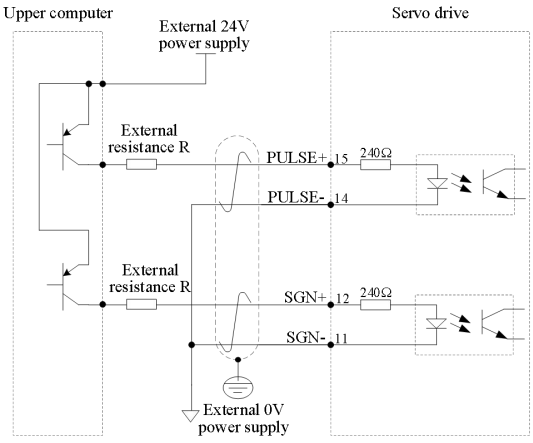


II. External resistor adopted

◆ Common cathode



◆ Common anode



Resistance R should be selected according to the formula:

$$\frac{V_{CC}-1.5}{R+200}=10\text{mA}$$

Voltage Vcc	Resistance R	Power R
24V	2.4kΩ	0.5W
12V	1.5kΩ	0.5W

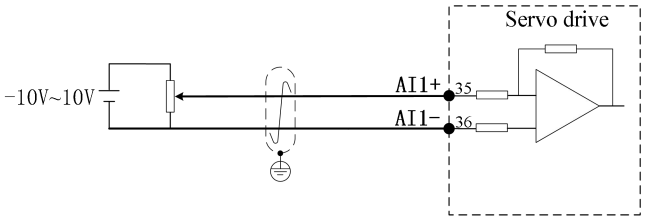
Introduction to Pulse Input Wiring:

1. If external resistor wiring method is adopted, select current-limiting resistor, its resistance and power correctly; otherwise, the terminal will be burnt.
2. If multiple terminals are used, allocate independent current-limiting resistor to each terminal instead of sharing it; otherwise, pulse receiving error will occur!
3. Each signal current circuit should include positive/negative anode of power supply, current-limiting resistance, signal sending and receiving; otherwise, it will damage the terminal or lead to pulse receiving error.
4. Please use twisted shielded pair wire as the pulse input/output wire. Both ends of the shielded layer MUST be connected to PE, GND and upper computer signal ground reliably.

3.4.2 Input Signal of Analog Quantity

Signal Name	Pin No.	Description
AI1+	35	Input signal of analog quantity Voltage input range: -10V~10V; resolution: 12-bit Input impedance: About 9kΩ
AI1-	36	
AGND	34	Signal ground of analog quantity

AI1+ and AI1- are input terminals for analog signals of speed and torque. Voltage commands are set through F2.1 group.



Offset: Input voltage of analog channel when servo sampling voltage is 0 after null shift correction.

Dead zone: Range of input voltage of analog channel when sampling voltage is 0 after offset setting is completed.

Null drift: Sampling voltage of servo when input voltage of analog channel is 0.

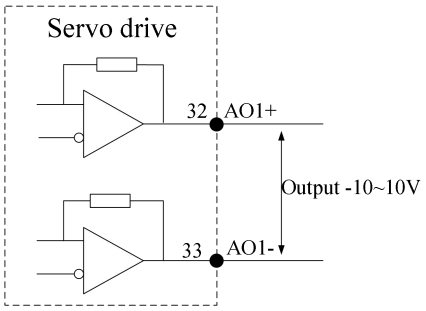
●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F2.1.00	AI1 offset	-5.000~5.000	0	V	◇	**PST**
F2.1.01	AI1 filtering coefficient	0~2000.0	2.0	ms	◇	**PST**
F2.1.02	AI1 dead zone + (anode)	0~5.000	0.006	V	◇	**PST**
F2.1.03	AI1 dead zone - (cathode)	-5.000~0	-0.006	V	◇	**PST**
F2.1.04	AI1 null drift voltage	-5.000~5.000	0	V	◇	**PST**
F2.1.05	Selection of null drift function H.0 0 | | A B [A] Function mode 0: Mode 0 1: Mode 1 [B] Starting mode 0: No correction 1:Single keyboard/communication 2: Power-on delay 1 (delay 0.5s) 3: Power-on delay 2 (delay 1.0s) 4: Power-on delay 3 (delay 1.5s) 5: Power-on delay 4 (delay 2.0s)	H.00~H.15	H.00	1	▲●	**PST**
F2.1.06	Corresponding speed of analog input 10V	-6000~6000	3000	rpm	◇	**PST**
F2.1.07	Corresponding torque of analog input 10V	-500.0~500.0	100.0	%	◇	**PST**

3.4.3 Output Signal of Analog Quantity

Signal Name	Pin No.	Description
AO1+	32	Output signal of analog quantity Voltage output range: -10V~10V Max. output current: 1mA
AO1-	33	
AGND	34	Signal ground of analog quantity

AO1+ and AO1- are signal output terminal of the Product's analog quantity. The outputted monitoring contents are set through F2.1 group.



Note: Please use twisted shielded pair for wiring of AI/AO circuit. Both ends of shielded layer MUST be connected to PE.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F2.1.08	Given AO1 analog output 0: Motor speed (1V: 1000 rpm) 1: Speed command (1V: 1000 rpm) 2: Torque command (1V: 100% rated) 3: Position deviation (0.05V: 1 pulse) 4: Pulse command frequency (0.01V: 1 kHz) 5: AI1 voltage 6: Reserved 7: Output current (0.01V: 1A) 8: Busbar voltage (1V: 100V) 9: AO1 Given by figure (F2.1.09)	0~9	0	1	◇	**PST**
F2.1.09	AO1 Given by figure	-9.999~9.999	0.000	V	■	**PST**
F2.1.10	AO1 output offset	-10.00~10.00	0.00	V	◇	**PST**
F2.1.11	AO1 output gain	-10.00~10.00	1.00	times	◇	**PST**

3.4.4 Digital Input/output Signal

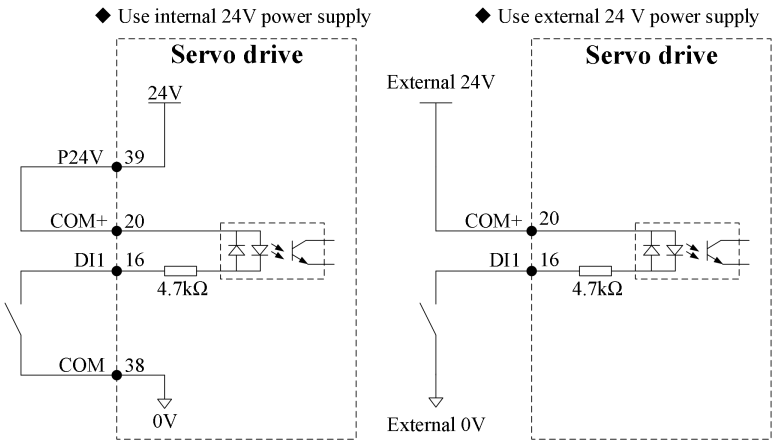
Signal Name	Pin No.	Function Introduction
P24V	39	Internal 24V power supply; voltage range: +20~28V; max. output current: 200mA.
COM	38	Internal 0V
COM+	20	Common terminal of Signal DI input (12V~24V) (Resistance should be modified in order to use 12V voltage)
DI1	16	Signal DI1 input terminal, set SON servo function as default
DI2	1	Signal DI2 input terminal, set emergency stop of EMGS servo as default
DI3	17	Signal DI3 input terminal, set CCWL forward rotation limit as default
DI4	2	Signal DI4 input terminal, set CWL reverse rotation limit as default
DI5	18	Signal DI5 input terminal, set CCLR and clear pulse counter as default
DI6	3	Signal DI6 input terminal, set command ban of INHP position as default
DI7	19	Signal DI7 input terminal, set TRLM forward rotation torque limit as default
DI8	4	Signal DI8 input terminal, set TLLM reverse rotation torque limit as default
DO1+	24	Signal DO1 signal output + terminal, set SDRY servo preparation + as default
DO1-	8	Signal DO1 output – terminal, set SDRY servo preparation – as default
DO2+	23	Signal DO2 output + terminal, set ALRM servo alarm + as default
DO2-	7	Signal DO2 output – terminal, set ALRM servo alarm – as default
DO3+	22	Signal DO3 output + terminal, set TTQR servo torque arrival + as default
DO3-	6	Signal DO3 output – terminal, set TTQR servo torque arrival – as default
DO4+	21	Signal DO4 output + terminal, set BRK servo brake output + as default
DO4-	5	Signal DO4 output – terminal, set BRK servo brake output – as default

Note: For details, please refer to function of input/output terminal

1) Input Circuit of Digital Quantity

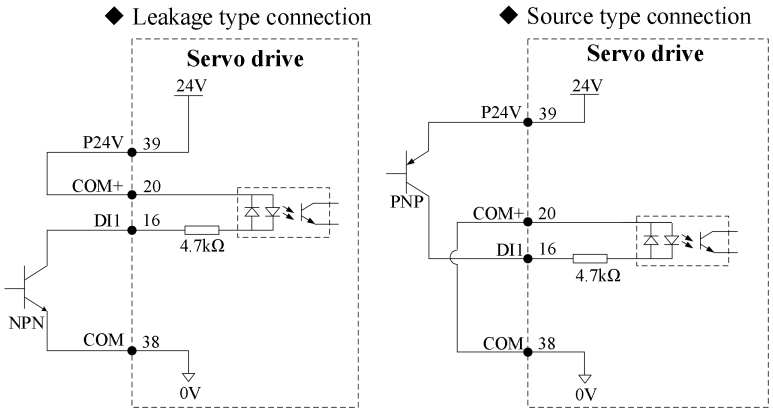
Take DI1 as example, the circuits of Interface DI1-DI8 are the same

a) If passive switch is adopted by the upper device:

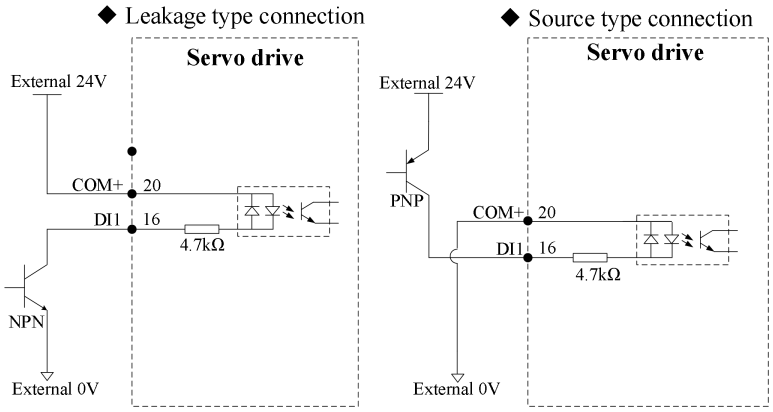


b) If open collector is adopted in upper device:

①When internal 24V power supply is adopted in servo drive:



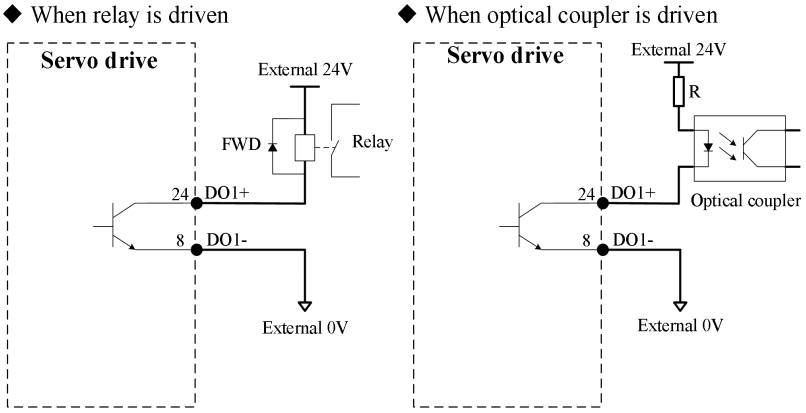
②If external power supply is adopted:



Note: Mixed use of PNP and NPN input is not supported.

2) Output Circuit of Digital Quantity

Take DO1 as example, the circuits of Interface DO1~DO4 are the same



Note: 1. As a passive output, DO must be supplemented with power supply for driving the loads. Power range of Terminal DO: 5V~24V; the max. allowed current is DC50mA.

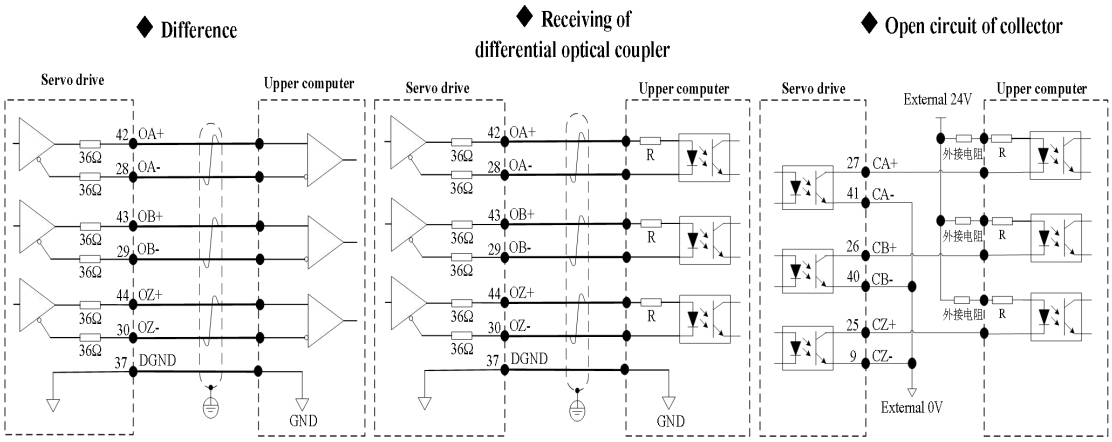
2. Make sure to connect the FWD at the correct direction when driving the relay; otherwise, the Terminal DO can be damaged.

3. Make sure to connect proper current-limiting resistor when driving the optical coupler; otherwise, Terminal DO can be damaged.

3.4.5 Frequency Division Output Signals of Encoder

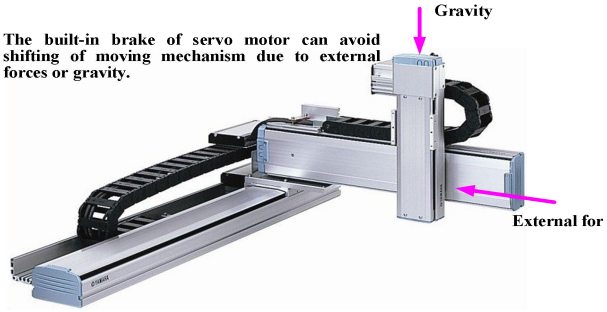
Signal Name	Pin No.	Function Description	
CA+	27	Phase A frequency division output (collector signal)	Output signal of orthogonal frequency division of Phase A and B
CA-	41		
OA+	42	Phase A frequency division output (differential signal)	
OA-	28		
CB+	26	Phase B frequency division output (collector signal)	
CB-	40		
OB+	43	Phase B frequency division output (differential signal)	Output signal of orthogonal frequency division of Phase A and B
OB-	29		
CZ+	25	Phase Z frequency division output (collector signal)	Output signal of original pulse
CZ-	9		
OZ+	44	Phase Z frequency division output (differential signal)	
OZ-	30		
PE	Shell	Shielded ground	

The frequency division output circuit of encoder outputs through differential signal (collector). Generally, feedback signal will be provided if position control system is composed of upper device. The max. output current of differential output is 20mA. The max. output current is 20mA for differential output, or 50mA for the open circuit of collector. **Note: It is recommended to use twisted shielded pair as output cable. Both ends of shielded layer must be connected to PE.**



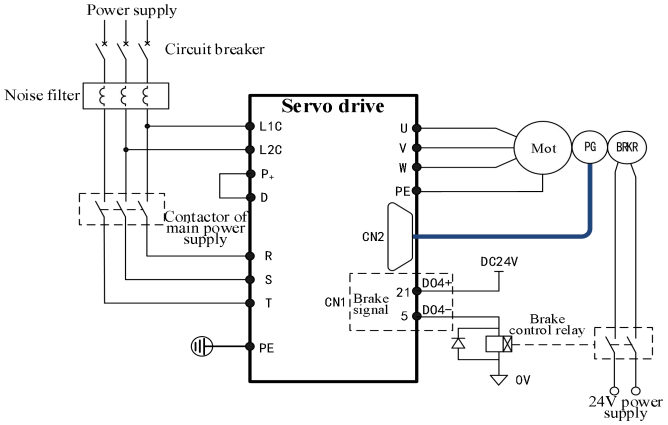
3.4.6 Brake Output

The brake is designed for preventing movement of motor shaft, locking the motor position and preventing shifting of mechanical moving parts due to weight or external forces when the Product is not running.



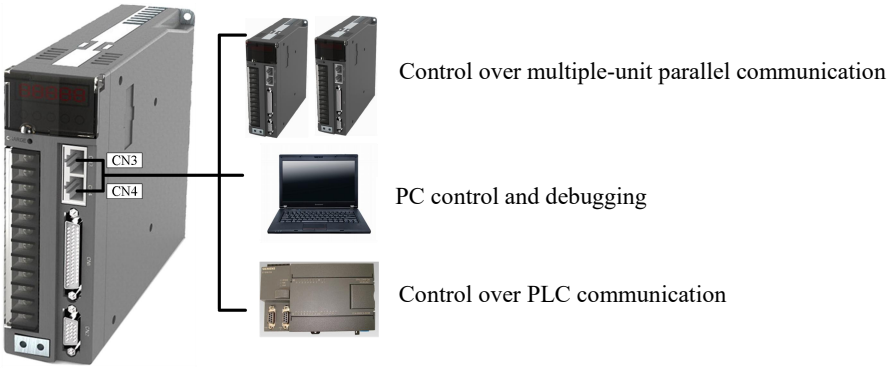
Note:

1. As a non-energized acting mechanism for fixing purpose, the built-in brake of servo motor is designed for keeping the servo motor stopped, instead of braking.
2. The built-in brake may have “click” sounds when its motor is rotating and it has no influences on the functions.
3. Flux leakage may occur at the shaft end when brake coil is powered on (brake is open). Be careful when using instruments such as magnetic sensor near the motor.
5. 24V power supply should be prepared by user for there’s polarity in the connection of brake input signal of brake wiring.
6. Examples of brake signal BRK and standard wiring of brake power supply are shown below:

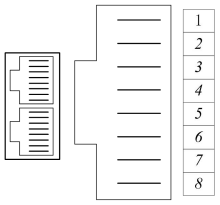


7. The length of motor brake cable should be determined by fully considering the voltage drop due to cable resistance. The brake should ensure input voltage of 21.6V at least.
8. Do NOT share the power supply of brake with other electrical appliances; for other appliances may reduce the working voltage or current and lead to misoperation of brake.
9. Cable with diameter over 0.5mm^2.

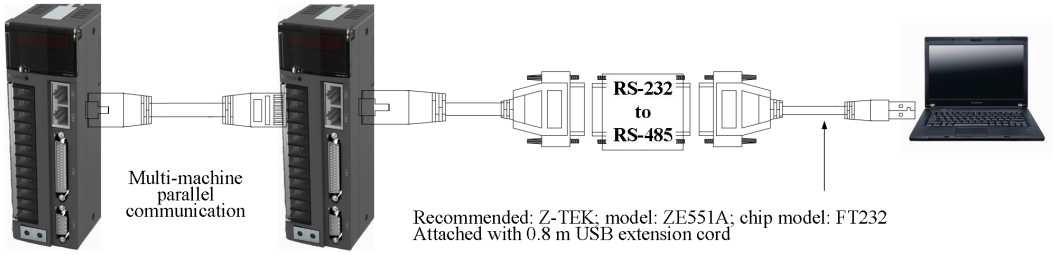
3.5 CN3/CN4 Wiring of RS-485 Communication



Communication interface (CN3 and CN4) means two communication signal connectors of the same type and with internal parallel connection. Terminal definition is as follows:

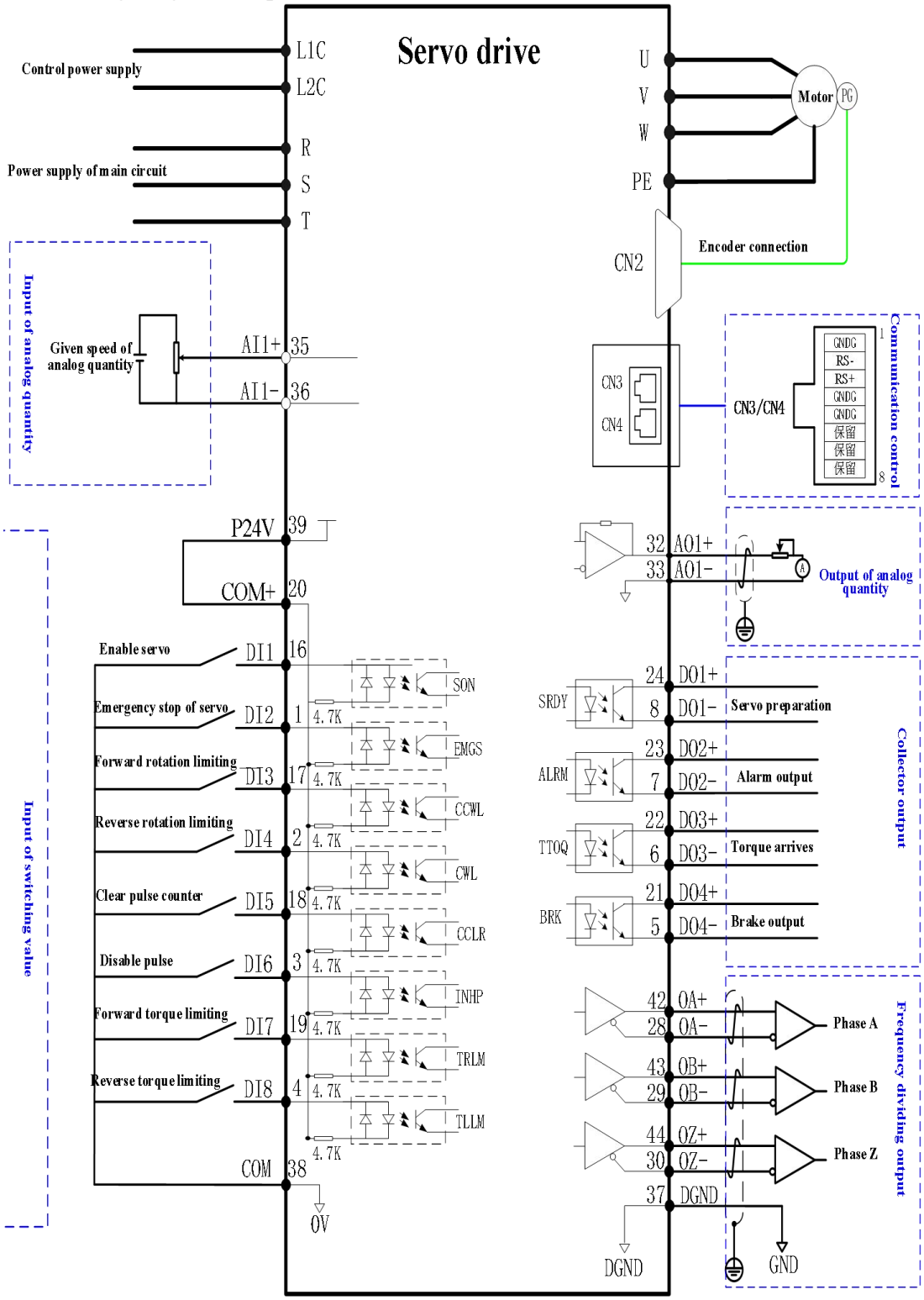
Pin No.	Definition	Description	Layout of Terminal Pin (Drive)
1	GNDG	Ground	
2	RS-	RS-485 communication terminal	
3	RS+		
4~5	GNDG	Ground	
6~8	Reserved	-	
Shell	PE	Shielded	

Serial port can be connected to USB wire for conversion if upper computer has no serial port as follows:

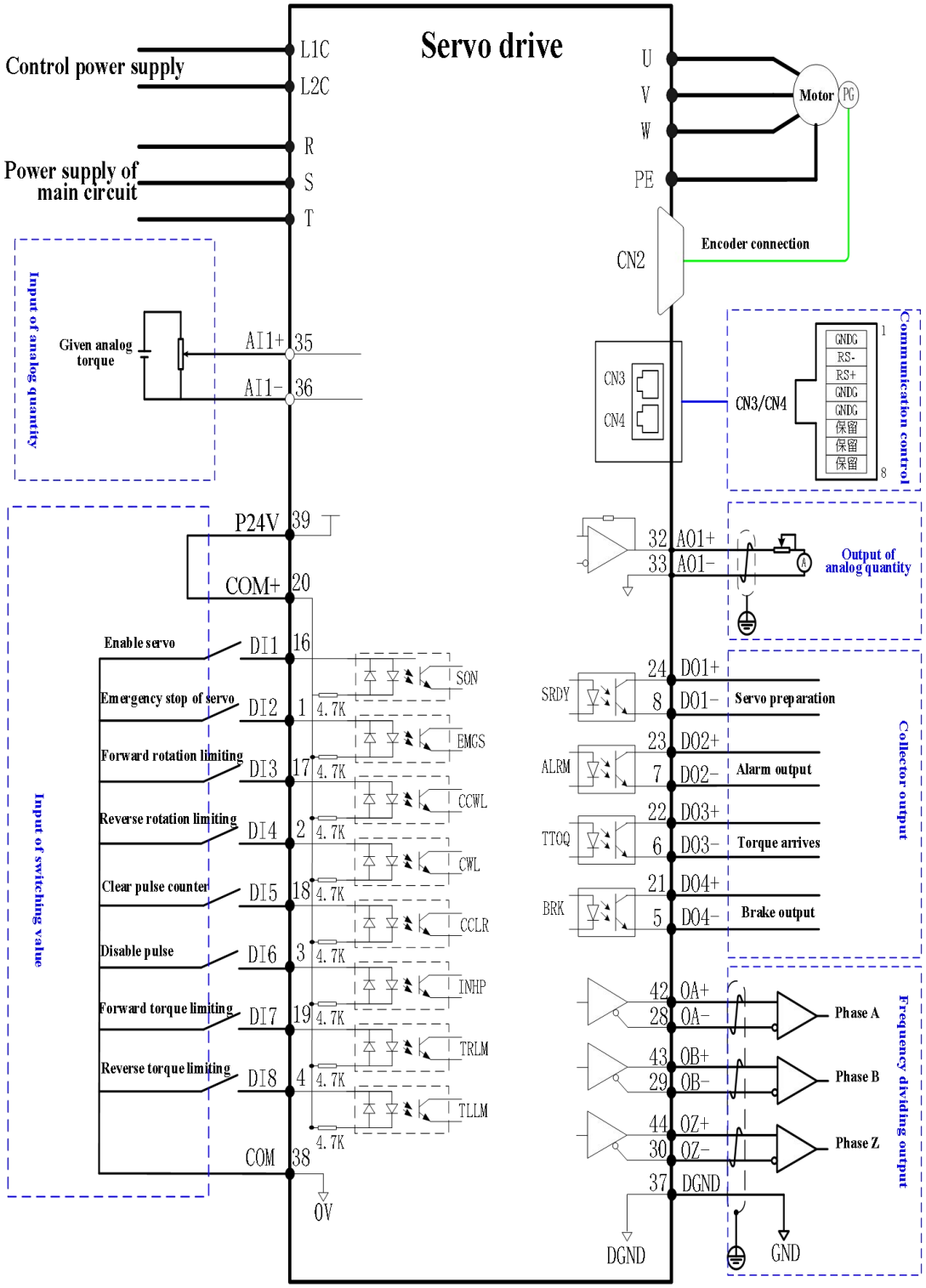


3.6 Wiring of Control Mode

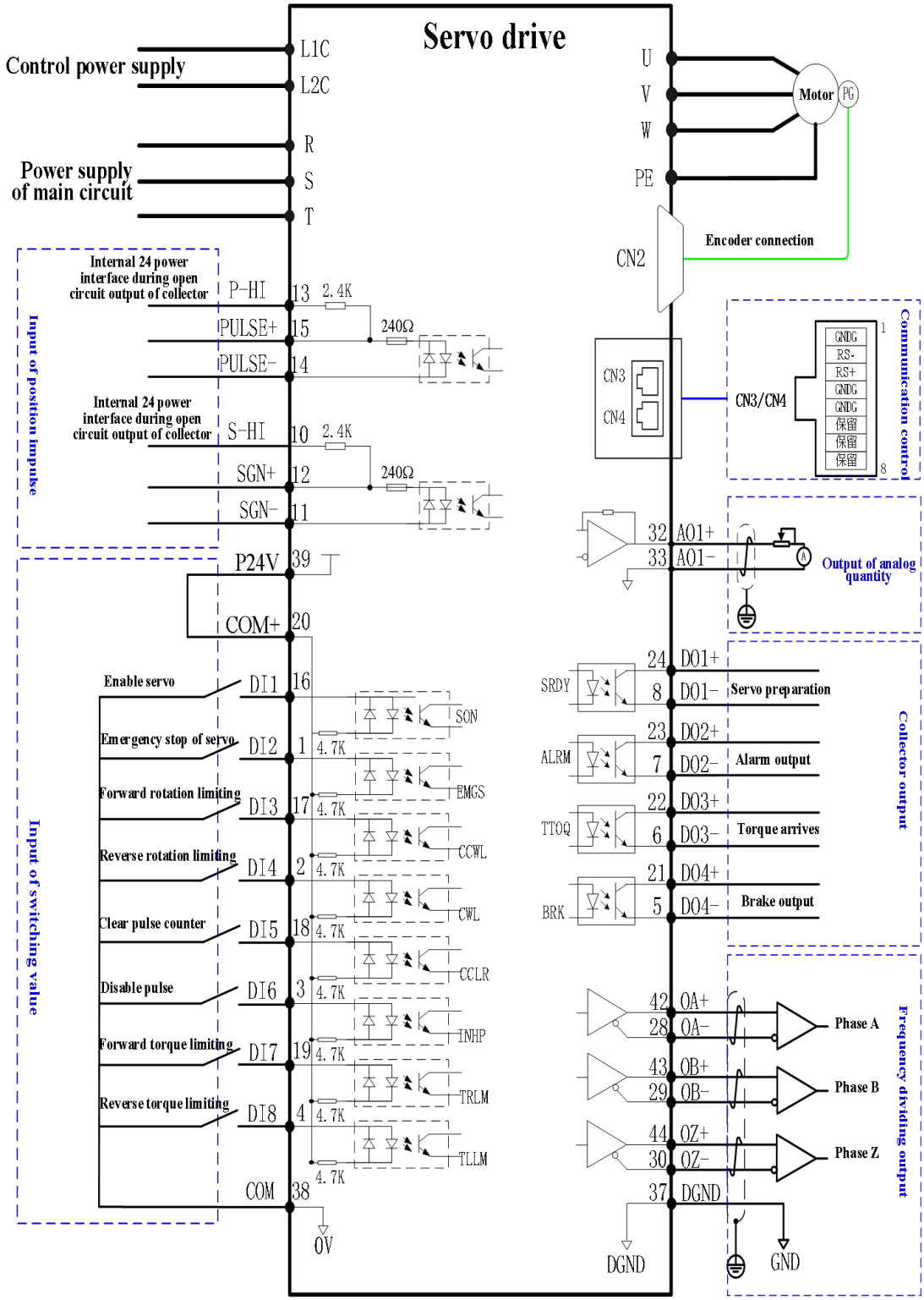
3.6.1 Wiring Diagram of Speed Control Mode



3.6.2 Wiring Diagram of Torque Control Mode

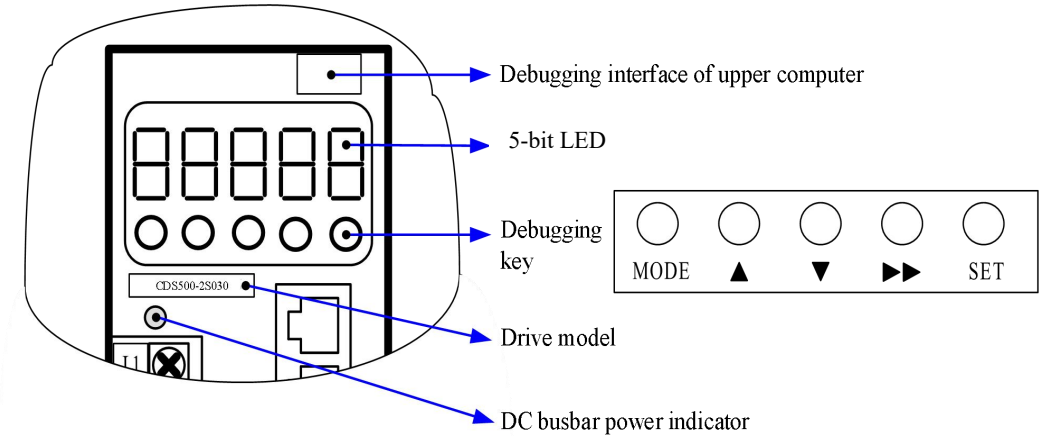


3.6.3 Wiring Diagram of Position Control Mode



Chapter 4 Panel Display and Operation

4.1 Composition of Panel



Schematic Diagram for Panel Appearance

Composed of display (5-bit 7-section LED) and keys, the Product's panel is designed for displaying, parameter and password setting and execution of general functions. Take parameter setting as example, the common functions of keys are as follows:

Name	Functions
MODE key	Menu key: Switch modes and return to the upper menu
▲key	Up key: Increase the LED number in flickering
▼key	Down key: Decrease the LED number in flickering
►► key	Shift key: Select and set parameter, move data modification bit; switch the display of data in other bits when viewing the data with over 5 bits
SET key	Confirmation key: Enter the next menu and execute storage of parameter setting

4.2 Panel Display

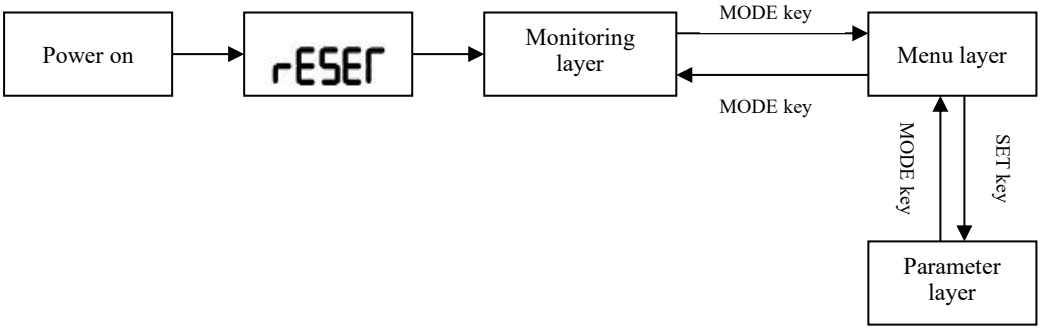
While the Product is running, the display can show the status, parameter, fault and monitoring status of servo.

● Monitoring layer: Display the real-time data and status of servo, such as motor speed, running mode and fault status;

● Parameter layer: Display the servo parameter and set value.

● Menu layer: Display the code and set value of servo parameter;

4.2.1 Switching of Panel Display



Schematic Diagram for Switching of Panel Displays

●Power on, the display shows “reset” for short period before entering the display layer.

●Press “MODE” key to switch display modes based on the switch conditions in diagram above.

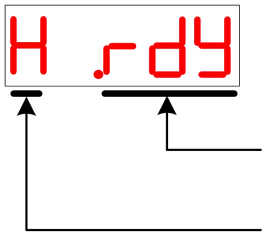
● For any fault, switch to fault display mode (monitoring layer) immediately and 5-bit LED will flicker simultaneously. Press “MODE” key again to switch to parameter display mode.

4.2.2 Monitoring Layer

Once powered on and initialized, the panel will enter the monitoring layer automatically and display the contents of running status by default (d-STo). If menu layer is entered, press MODE key to return to the monitoring layer. When monitoring layer is entered, the panel will display the monitoring code “d-###” for about 1-2s before displaying the designated monitoring contents. The user may click ▲/▼ to change the monitoring contents (No backup data for power failure). The detailed description is shown in table below:

Display	Name	Monitoring Value 1	Reflection Parameter
d-SrD	Servo status	0	F9.0.32
d-Err	Fault code	1	F6.1.09
d-SPd	Motor speed	2	F9.0.00
d-PoS	Motor feedback pulse number	3	F9.0.07
d-PoS.	Motor feedback coil	4	F9.0.08
d- CP	Total number of common pulse L	5	F9.0.09
d- CP.	Total number of command pulse H (*10000)	6	F9.0.10
d-EPo	Difference between command pulse and feedback pulse	7	F9.0.12
d-Tr9	Output torque [% rated]	8	F9.0.03
d- I	Effective current	9	F9.0.22
d-UdC	Busbar voltage	10	F9.0.15
d-Fr9	Frequency of command pulse	11	F9.0.11
d- CS	Speed command	12	F9.0.01
d- CT	Given torque [% rated]	13	F9.0.04
d- dI	Status of input terminal	14	F9.0.19
d- do	Status of output terminal	15	F9.0.20
d-AIn	AI1 voltage value	16	F9.0.17
d-ArD	Module temperature	17	F9.0.16

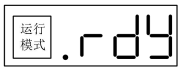
4.2.3 Servo Status (F9.0.32)



The last three bits represent the status of servo drive
Refer to table of drive status for status introduction

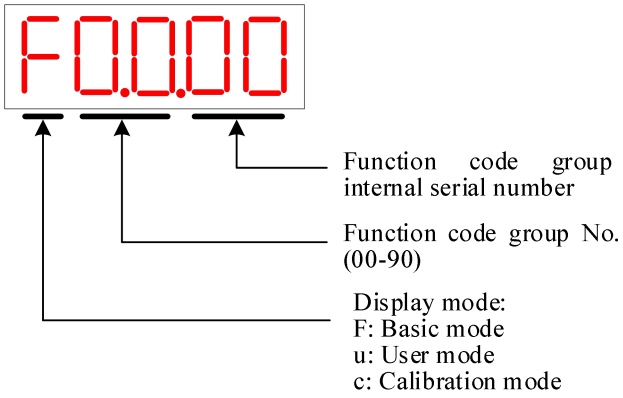
The previous bit represents the running mode of drive
H: Reset
S: Speed mode
P: Position mode
T: Torque mode

Table of Drive Status

Display	Name	Display Scenario	Meaning
	Servo initialization	Servo power-on moment	The Product is initialized or reset. Once initialized or reset, it will be switched to other status automatically. The servo maintains at this status if the main circuit is not powered on.
	rdy Servo ready	Drive is ready	The Product is under ready status and waits for the servo enabling signal from the upper computer.
	run Servo running	Servo enabling signal is effective (SON is ON)	The Product is running.

4.2.4 Parameter Display

The Product can be divided into F0.0~F9.0 groups of function codes depending on the parameter functions. The position of function code can be located quickly according to function code group as follows:



Function code group internal serial number

Function code group No. (00-90)

Display mode:
F: Basic mode
u: User mode
c: Calibration mode

For example, function code F1.2.21 is displayed as follows:

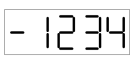
Display	Name	Contents
	Function code F1.2.21	F1.2: Function code group No. 21: Function code group internal serial number

1) Display of Different Length Data and Negative Numbers

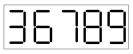
a) Signed number of and below 4 bits or unsigned number of and below 5 bits

Be displayed on single page (5-bit LED). For signed number, the top bit of data "-" means the negative sign.

For example: -1234 is displayed as follows:



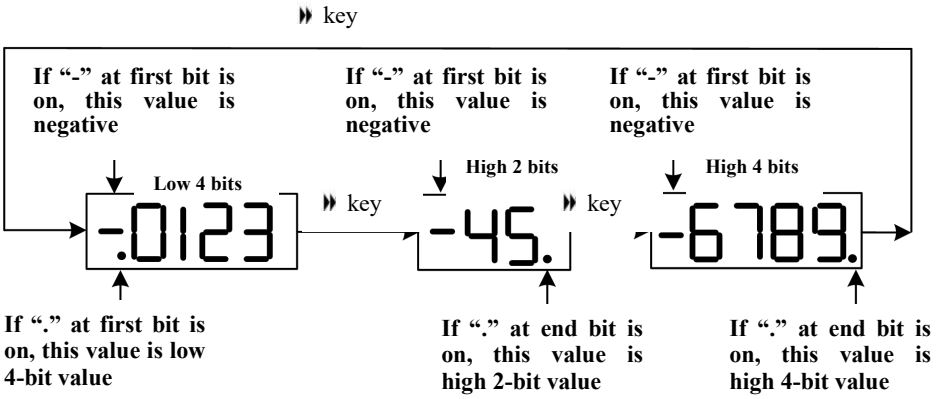
For example: 36789 is displayed as follows:



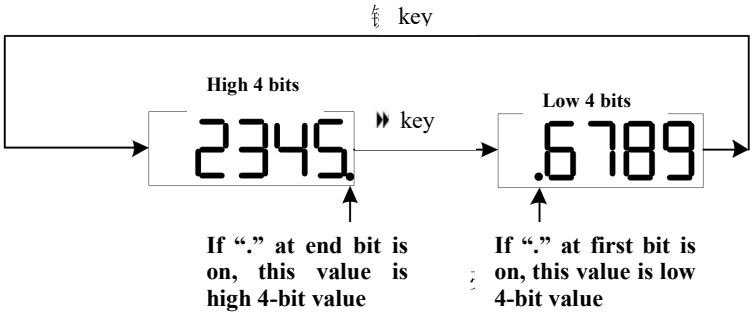
b) Signed number over 4 bits or unsigned number over 5 bits

Be displayed in pages from low to high bits. Display method: Low 4-bit value + high 2-bit value + high 4-bit value, as shown in diagram below; press "►►" key to switch the present page.

For example: -0123456789 are displayed as follows:

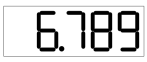


For example, 23456789 are displayed as follows:



2) Display of Decimal Points

The "." of nixie tube of units digit data means decimal point and "." of units digit is not flickering. For example, 6.789 is displayed as:



4.2.5 Fault Display

1. The panel can display the present or historical fault and alarm code (F6.1.09). Refer to Chapter 12 for analysis and troubleshooting of faults and alarms.

2. For any single fault or alarm, display the present fault or alarm code immediately; for any simultaneous occurrence of multiple faults and alarms, display the code of fault with the highest grade.

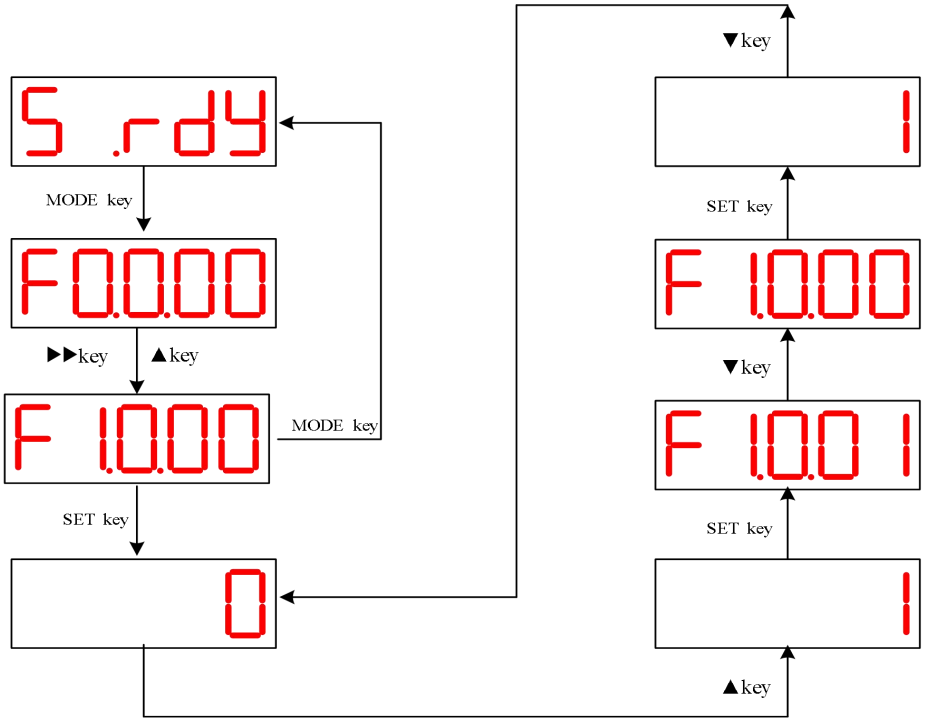
3. See the historical fault codes by referring to F5.1.00~ F5.1.02.

For example: Fault Err.13 is displayed as follows:

Display	Name	Contents
	Code of present alarm	Err: Servo drive has fault 13: Fault code

4.3 Parameter Setting

Set parameters by using the Product's panel. Refer to Chapter 10 for details of parameters. For example, power on and switch the Product from speed control mode to internal position control mode:



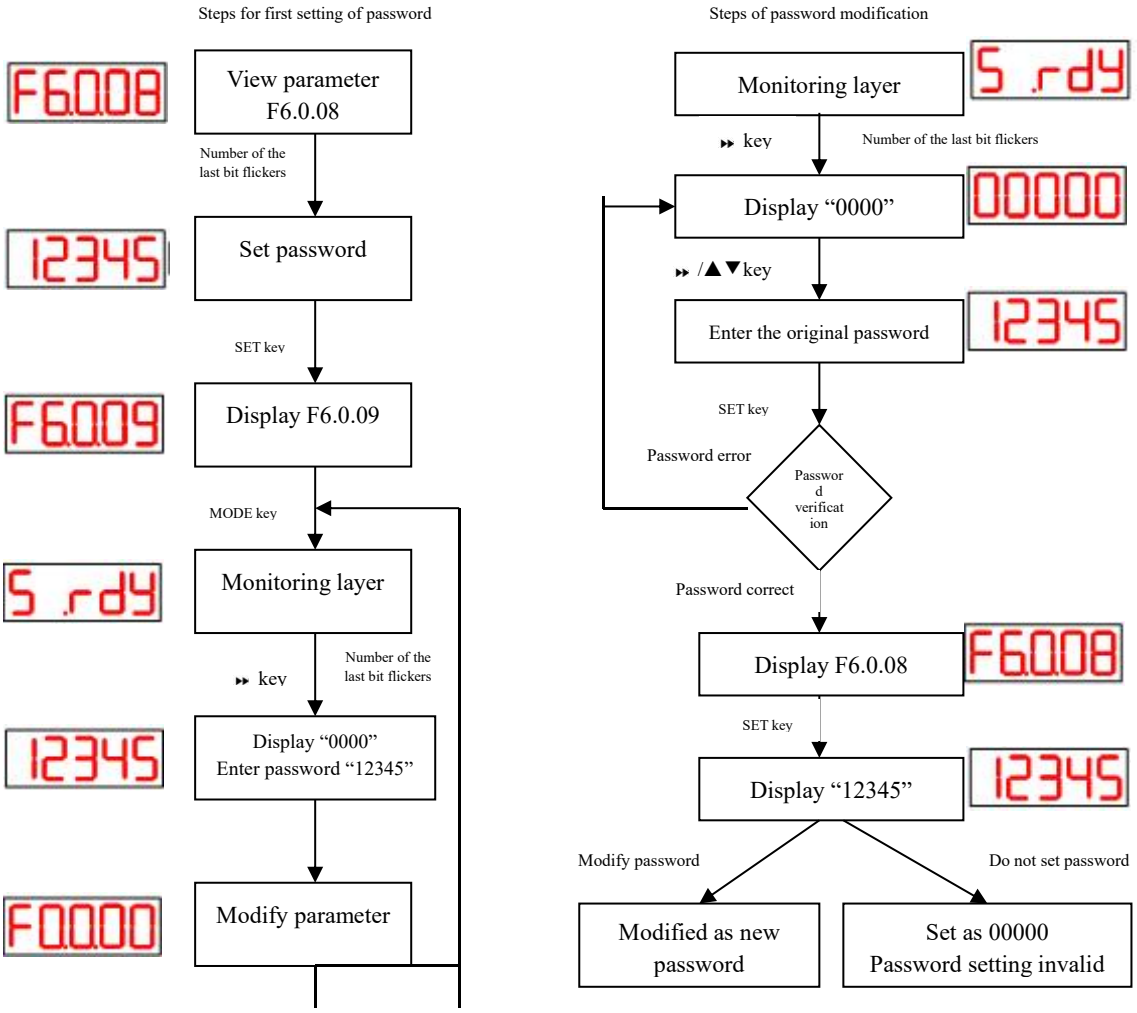
- "MODE" key: Switch display mode of panel and return to the previous interface;
- "▼"/ "▲" key: Increase/decrease the value at the current flickering bit;
- "►►" key: Change the present flickering bit;
- "SET " key: Save the present set value or enter the next interface.

4.4 User Password

Once user password (P6.0.08) function is enabled, the user is authorized to set parameters, while other operators can view the parameters only and unable to modify them.

1) Setting of user password

Setting process and display of user password are shown in diagram below. For example, set password as “12345”.



1. Press ►► key under the status or parameter monitoring status and it displays “00000”, which means password protection status is entered; Once password is entered, it means password is wrong if it shows “FAIL”, or password is correct if it shows “done”.

2. First present the present password to enable the parameter setting authority before modifying the user password. Enter F6.0.08 again to set the new password according to the method shown in diagram above.

2) Disable user password

The user needs to firstly enter the user password and set parameter F6.0.08 as “00000” to disable the password.

4.5 Identification of motor zero position

Position identification means open ring running of servo. Its functions are as below:

1) Judge if motor wires are connected correctly:

The motors of all models should face motor shaft when zero position identification starts. The motor wire order is correct, if motor rotates anticlockwise.

2) Judge motor zero position or reinstall encoder for the purpose of determining zero position.

Requirements for the identification of motor zero position:

1) Run motor with no load.

2) Leave a space of 5 forward and backward rotations of motor.

3) Do not move motor at will in course of identification in order to avoid inaccurate zero position identified.

Identification steps of zero position:

1) Close enabling signal;

2) Set F4112 as 1 and press SETkey to enter the identification ofzero position. The nixie tube will display drun;

3) Rotate motor positively first for 3 cycles, lock shaft, then rotate it reversely for 3 cycles and lock shaft. Stop it after finishing identification;

(Nixie tube will display the followings after identification: Mode.rdy (such as P.rdy);

The value of zero position identification is within F0015. Here is the scope of factory reset of different types of encoders:

4 poles:

2500-wire encoder: Factory reset: 2,350; range of normal value: 2,300~2,400

Communication encoder: Factory reset: -8,110; range of normal value: -7,900~-8,600)

4) Zero position identification will be completed after restarting becomes valid.

If Err25 (fault of zero position identification) occurs in course of normal identification, refer to 11.2 Troubleshooting.

Chapter 5 Function of Input/Output Terminal

5.1 Distribution of Input Signals

The function distribution of input signal terminal mainly consists of filtering time, delay time and terminal logic.
The filtering time can be set and selected through F2.0.20~F2.0.23 filtering time
The filtering time can be set and selected through F2.0.24~F2.0.27 filtering time
The logic level of terminal can be set directly

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.10 ~ F2.0.17	DI function property H.0 0 0 | | | A B C [A] Filtering time selection 0 ~3: Filtering time 0~3 (F2.0.20 ~ F2.0.23) [B] Delay time selection 0 ~3: Delay time 0~3 (F2.0.24 ~ F2.0.27) [C] Terminal logic 0: Positive logic 1: Reverse logic	H.000~H.331	H.000	1	◇	**PST**

1) Factory setting of input signal terminal

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.00	DI1 function selection (enable SON servo)	0~41	1	1	▲	**PST**
F2.0.01	DI2 function selection (EMGS emergency stop)	0~41	30	1	▲	**PST**
F2.0.02	DI3 function selection (forward rotation restriction bit)	0~41	27	1	▲	**PST**
F2.0.03	DI4 function selection (CWL reverse rotation restriction bit)	0~41	26	1	▲	**PST**
F2.0.04	DI5 function selection (CCLR clear pulse counter register)	0~41	29	1	▲	**PST**
F2.0.05	DI6 function selection (INHP position command prohibition)	0~41	13	1	▲	**PST**
F2.0.06	DI7 function selection (TRLM forward torque restriction)	0~41	15	1	▲	**PST**
F2.0.07	DI8 function selection (TLLM reverse rotation restriction)	0~41	14	1	▲	**PST**

5.2 Analog Input Signal

Analog input signal, i.e. VDI signal, can carry out logic calculation with DI signal to determine the final level of Terminal DI.

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.08	DI1 logic function selection 0: Logic OR virtual input VDI1 (F2.0.18) 1: Logic AND virtual input VDI1 (F2.0.18) 2: Logic XOR virtual input VDI1 (F2.0.18) 3:Logic OR input DI3 (DI3 function selection NON) 4:Logic AND input DI3 (DI3 function selection NON) 5:Logic XOR input DI3 (DI3 function selection NON)	0~5	0	1	▲	**PST**
F2.0.09	DI2 logic function selection 0: Logic OR virtual input VDI2 (F2.0.19) 1: Logic AND virtual input VDI2 (F2.0.19) 2: Logic XOR virtual input VI2 (F2.0.19) 3:Logic OR input DI4 (DI4 function selection NON) 4:Logic AND input DI4 (DI4 function selection NON)	0~5	0	1	▲	**PST**

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
	3:Logic XOR input DI4 (DI4 function selection NON)					
F2.0.18	Virtual input VDI1 status	0~1	0	1	■	**PST**
F2.0.19	Virtual input VDI2 status	0~1	0	1	■	**PST**

5.3 Filtering Time of Input Terminal

The filtering time constant can filter out the interference (if any) of DI signal. The default parameters can be used in general. The filtering time can be increased properly in environment with large interference.

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.20	DI Filtering time 0	0~1,000	10	ms	◇	**PST**
F2.0.21	DI Filtering time 1	0~1,000	10	ms	◇	**PST**
F2.0.22	DI Filtering time 2	0~1,000	10	ms	◇	**PST**
F2.0.23	DI Filtering time 3	0~1,000	10	ms	◇	**PST**

5.4 Delay Time of Input Terminal

The delay of input terminal to take effects. The delay time can be set.

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.24	DI Filtering time 0	0~10,000	5	ms	◇	**PST**
F2.0.25	DI Filtering time 1	0~10,000	5	ms	◇	**PST**
F2.0.26	DI Filtering time 2	0~10,000	5	ms	◇	**PST**
F2.0.27	DI Filtering time 3	0~10,000	5	ms	◇	**PST**

5.5 Function Definition of Input Terminal

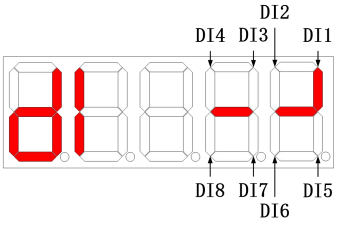
Terminal Name	Terminal Function	Function Description
SON	Enable servo	Invalid: Disable servo motor Valid: Enable motor power-on
ARST	Fault reset	Invalid: Not reset Valid: Enable reset
CMDSWT	Multi-segment speed switch of running direction	Invalid: Run at the default direction Valid: Run at the reverse direction by default
CMD1	Multi-segment run command switch 1	Selection and switch of command at internal position and internal speed mode
CMD2	Multi-segment run command switch 2	
CMD3	Multi-segment run command switch 3	
CMD4	Multi-segment run command switch 4	
M1SWT	Mode switch 1	Switch between position mode, speed mode and torque mode based on the selected control mode (4, 5)
M2SWT	Mode switch 2	
ZCLAMP	Zero bit fixation	Invalid: No influence on running Valid: Zero bit fixation function is valid
INHP	Position command prohibition	Invalid: No influence on running Valid: Set position command as 0
TLLM	Reverse torque restriction	Switch torque restriction source when function code F1.3.08 is selected as 1, 4, 6 When F1.3.08=1

Terminal Name	Terminal Function	Function Description
		Invalid: Reverse torque is internal torque Valid: Reverse torque is external torque When F1.3.08=4 Invalid: Reverse torque is the lower value between corresponding torque and external torque of AI Valid: Reverse torque is the corresponding torque of AI When F1.3.08=6 Invalid: Reverse torque is internal torque Valid: Reverse torque is the corresponding torque of AI
TRLM	Forward torque restriction	Switch torque restriction source when function code F1.3.08 is selected as 1, 4, 6 When F1.3.08=1 Invalid: Forward torque is internal torque Valid: Forward torque is external torque When F1.3.08=4 Invalid: Forward torque is the lower value between corresponding torque and external torque of AI Valid: Forward torque is the corresponding torque of AI When F1.3.08=6 Invalid: Forward torque is internal torque Valid: Forward torque is the corresponding torque of AI
JOGD	Jog reverse rotation	Invalid: No influence on running Valid: Jog reverse rotation of motor under PR mode
JOGU	Jog forward rotation	Invalid: No influence on running Valid: Jog forward rotation of motor under PR mode
GEARSEL	Electronic gear selection	Invalid: Select electronic gear 1 Valid: Select electronic gear 2
TOQDIR	Torque command direction	Invalid: Run at the default direction Valid: Run at the reverse direction by default
SPDDIR	Speed command direction	Invalid: Run at the default direction Valid: Run at the reverse direction by default
POSDIR	Position command direction	Invalid: Run at the default direction Valid: Run at the reverse direction by default
MULPOS	Enable internal position command	Invalid: No influence on running Valid: Enable internal position
ORGP	Origin detection	Invalid: Origin not reached Valid: Origin reached
SHOM	Start origin reset	Invalid: Prohibit origin reset Valid: Enable origin reset
CWL	Reverse rotation restriction	Invalid: Allow reverse rotation Valid: Prohibit reverse rotation
CCWL	Forward rotation restriction	Invalid: Allow forward rotation Valid: Prohibit forward rotation
CCLR	Clear pulse counter register	Invalid: Not clear pulse counter register Valid: Clear pulse counter register
EMGS	Emergency stop	Invalid: No influence on running Valid: Motor zero-speed stop
HOLD	Pause internal position control command	Invalid: No influence on running Valid: Pause the internal multi-segment position being executed and lock the motor
SPDLRS	Switch speed restriction source	When F1.2.24 speed restriction source is 3, it can be switched through DI Invalid: Take F1.2.22 as forward/reverse speed restriction Valid: Take F1.2.23 as forward/reverse speed restriction
EncodePosClr	Clear communication encoder feedback position	Invalid: No influence on running Valid: Clear communication encoder feedback position
AbsPosORPG	Origin of absolute position	Invalid: No influence on running Valid: Record current value of F3.0.07 into F9.0.59

5.6 Input Terminal Monitoring

Output terminal status: When DI1 is high level, while DO2~DO8 is low level, the status of Terminal DI is as follows:

●Related function codes

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F9.0.19	Input terminal status 	-	-	-	★	**PST**
Corresponding relationship between terminal status and 16-bit binary system: DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1 Lower 8 bits B7 B6 B5 B4 B3 B2 B1 B0 DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1 Higher 8 bits B15 B14 B13 B12 B11 B10 B9 B8 When Terminal DI input and higher 8 bits are valid, the corresponding binary system is “1”; otherwise, it is “0”; the lower 8 bits corresponding to higher 8 bits are taken as reverse.						

5.7 Output Terminal Distribution

The function distribution of output signal terminal mainly consists of delay time and terminal logic.
The filtering time can be set and selected through F2.0.38~F2.0.41 filtering time
The logic level of terminal can be set directly

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.33 ~ F2.0.36	DO property configuration H.0 0 A B [A] Delay time selection 0 ~3: Delay time 0~3 (F2.0.38 ~ F2.0.41) [B] Terminal logic 0: Positive logic 1: Reverse logic	H.00~H.31	H.00	1	◇	**PST**

1. Factory setting of output signal terminal

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.28	DO1 function selection (prepare SRDY servo)	0~22	1	1	▲	**PST**
F2.0.29	DO2 function selection (output ALRM servo alarm)	0~22	10	1	▲	**PST**
F2.0.30	DO3 function selection (output TTOQ torque arrival)	0~22	14	1	▲	**PST**
F2.0.31	DO4 function selection (output BRK servo brake)	0~22	9	1	▲	**PST**

5.8 Delay Time of Output Terminal

Make output terminal delay in taking effects. The delay time can be set.

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.38	DO Delay time 0	0~10000	5	ms	◇	**PST**
F2.0.39	DO Delay time 1	0~10000	5	ms	◇	**PST**
F2.0.40	DO Delay time 2	0~10000	5	ms	◇	**PST**
F2.0.41	DO Delay time 3	0~10000	5	ms	◇	**PST**

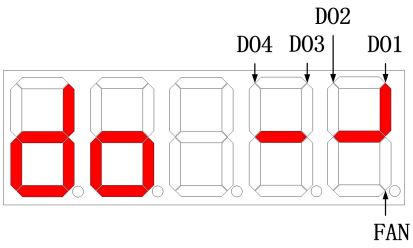
5.9 Function Definition of Output Terminal

Terminal Name	Terminal Function	Function Description	Effective Mode
SRDY	Prepare servo	Servo is prepared, enable signal can be received Invalid: Servo is not prepared Valid: Servo is prepared	PST
SVON	Start servo	Whether servo is enabled Invalid: Servo is not enabled Valid: Servo is enabled	PST
ZSPD	Zero-speed detection	Output signal when servo stops running. The specific zero-speed detection speed can be set through F1.2.30 Invalid: Motor speed is higher than zero-speed detection signal Valid: Motor speed is lower than zero-speed detection signal	PST
VCMP	Speed consistency output	In case of speed control, it is valid when the absolute value of difference between actual servo motor speed and speed command is lower than the speed consistency deviation of F1.2.28.	S
COIN	Positioning completion output	In case of position control, it is valid when reaching the positioning completion output condition of F1.1.15	P
NEAR	Positioning approach output	In case of position control, it is valid when position deviation pulse reaches the positioning approach amplitude of F1.1.17	P
TQL	Torque restriction output	Confirmation signal of torque restriction Invalid: Motor torque is not restricted Valid: Motor torque is restricted	T
VLT	Speed restriction output	Confirmation signal of speed restriction in case of torque control Invalid: Motor speed is not restricted Valid: Motor speed is restricted	S
BRK	Servo brake output	Brake signal output Invalid: Enable brake, motor is locked Valid: Disable brake, motor is free	PST
ALRM	Servo alarm output	Invalid: Servo has no alarm output Valid: Servo outputs alarm	PST
WARN	Servo alarm output	Invalid: Servo has no warning output Valid: Servo outputs warning	PST
HOME	Output origin reset completion	Invalid: Origin reset not completed Valid: Origin reset completed	P
TTOQ	Output torque arrival	Invalid: Absolute value of torque is lower than set value Valid: Absolute value of torque reaches set value	T
ANG	Initial angle identification completed	Invalid: Position identification not implemented Valid: Position identification completed	
TGON	Output motor rotation	It is valid when motor rotation speed is higher than the motor rotation range of F1.2.27	PST
VARR	Speed detection	Invalid: The actual speed does not reach the speed detection threshold Valid: The actual speed reaches the speed detection threshold	PST
ZPHD	Output zero bit fixation	Invalid: Zero bit fixation function is invalid Valid: Zero bit fixation function is valid	
MOD0	Servo current running mode 0	Output different effective combinations according to the position mode, speed mode and torque mode in the selected control mode (4, 5)	
MOD1	Servo current running mode 1		
MOD2	Servo current running mode 2		
MOD3	Servo current running mode 3		

5.10 Output Terminal Monitoring

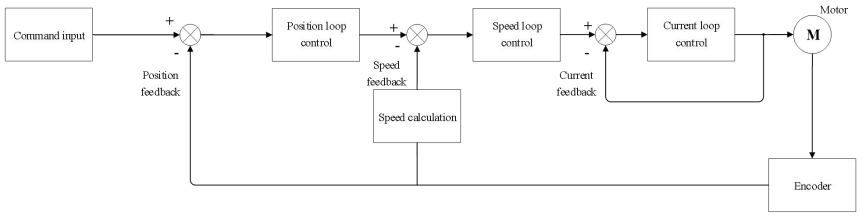
Output terminal status: When DO1 is high level, while DO2~DO4 is low level, the status of Terminal DO is as follows:

●Related function codes

<table>
<tr><th>Function Code</th><th>Name</th><th>Set Range</th><th>Factory Default Value</th><th>Unit</th><th>Change Restriction</th><th>Valid Mode</th></tr>
<tr><td>F9.0.20</td><td>Output terminal status (FAN)
 
</td><td>-</td><td>-</td><td>-</td><td>★</td><td>PST</td></tr>
<tr><td colspan="7">Corresponding relationship between terminal status and 16-bit binary system:
FAN DO4 DO3 DO2 DO1
Lower 8 bits B7 B6 B5 B4 B3 B2 B1 B0
FAN DO4 DO3 DO2 DO1
Higher 8 bits B15 B14 B13 B12 B11 B10 B9 B8
When Terminal DO output and higher 8 bits are valid, the corresponding binary system is “1”; otherwise, it is “0”; the lower 8 bits corresponding to higher 8 bits are taken as reverse.</td></tr>
</table>

Chapter 6 Servo Running and Control Mode

The servo system consists of servo drive, servo motor and encoder.



As the control core of servo system, the servo drive is based on the 3 closed-loop control algorithm of vector control-based current, speed and position, and the servo drive can realize precise control over position, speed and torque of servo motor.

Under position control mode, the servo drive can determine the displacement distance according to the pulse number acquired and determine the revolving speed according to pulse frequency. The pulse sending device can be PLC, motion controller, control card, etc. The position control mode, which can realize precise and fast control over position, mainly applies to the scenarios such as CNC machine tool, chip mounter, manipulator, etc.

Under speed control mode, the revolving speed can be controlled by speed command. The control speed can be sourced from set function code, analog voltage and set communication. The speed control mode, which can realize precise and fast control over speed, mainly applies to the scenarios such as engraving and milling machine.

The torque can be controlled by controlling current, for the torque of servo motor has linear relationship with current. Under torque control mode, the output torque can be controlled by controlling torque command. The torque control can be sourced from function code, analog voltage, set communication and it mainly applies to the scenarios in which the winding device needs tension control, to make sure material stress is not changed.

The running mode of servo drive can be set through function code F1.0.00.

●Relevant parameters

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F1.0.00	Control Mode 0: Position mode (PT) 1: Position mode (PR) 2: Position mode (S) 3: Torque mode (T) 4: Position mode (PT) ↔ Speed mode (S) 5: Position mode (PT) ↔ Speed mode (T) 6~8: Reserved 9: Sr test run mode 10: Jog mode	0~10	0	1	▲	PST

6.1 Enable Servo

1) After power-on, set DI function 1 (1: Enable SON servo) as valid to enable the servo. Select d-STo (servo status) in monitoring layer and it is enabled successfully when it shows run.

●Relevant parameters

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F2.0.00	DI1 function selection (SON) 1: Enable SON servo	0~34	1	1	▲	**PST**

2) Under speed mode, the motor can be rotated through proper command after servo is enabled, to see if motor has normal running

6.2 Basic Parameters Setting

6.2.1 Motor Rotation Direction

The motor rotation direction can be changed through function code F1.0.01 without changing other commands.

●Relevant parameters

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F1.0.01	Select motor rotation direction 0: Forward direction of axis by default 1: Reverse of forward direction by default	0~1	0	1	▲	PST

This function code can change the motor rotation direction only, while the parameters such as drive output pulse and monitoring parameters are not changed.
The final rotation direction of motor is decided by F1.0.01 selection of motor rotation direction, command direction and switch of command direction DI.
Take the bus motor as example:

F1.0.01	DI switch	Command direction	Rotation direction of bus motor
0	Invalid	+	Anticlockwise
0	Invalid	-	Clockwise
0	Valid	+	Clockwise
0	Valid	-	Anticlockwise
1	Invalid	+	Clockwise
1	Invalid	-	Anticlockwise
1	Valid	+	Anticlockwise
1	Valid	-	Clockwise

Note: The rotation direction of incremental encoder motor is opposite to that of bus motor.

6.2.2 Stop Mode

Free stop: The motor is stopped via friction force without applying additional force. This stop mode enjoys small mechanical impact, smooth deceleration, but the deceleration efficiency is low.
Zero-speed stop: The drive outputs the torque that is opposite to the motor running direction, to stop the motor. This stop mode has large mechanical impact, but the stop is fast.
The status after stop is divided into free status and position lock.
Free status: The motor shaft is not restricted and can move freely after stop.
Position lock: The motor shaft is locked and can't move freely after stop.
It can be divided into fault stop, overrun stop and EMGS emergency stop, SON (OFF) STOP based on the stop scenarios, and the stop mode can be set respectively.

●Relevant parameters

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F1.0.04	Stop mode H.0 0 0 0 | | | | A B C D [A] Class 2 fault stop modes 0: Free stop, free status 1: Zero-speed stop, free status [B] Overrun stop mode 0: Zero-speed stop, position lock 1: Free stop, free status 2: Zero-speed stop, free status [C] EMGS emergency stop mode 0: Free stop, free status 1: Zero-speed stop, free status [D] SON (OFF) stop mode 0: Free stop, free status 1: Zero-speed stop, free status	H.000~H.1211	H.0000	1	▲	PST

6.2.3 Brake Setting

When load is controlled by servo, the brake should be used in order to lock the motor shaft position under non-motion state and prevent motion of motor shaft under the action of external force or dead load.
When DO function is selected as 9 (9:BRK servo brake output) and brake has action, the motor position will be locked and DO output will be invalid.
The rotation speed threshold of motor rotation status can be set through function code F1.2.27 motor rotation speed range.

●Relevant parameters

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F1.0.05	Delay of SON brake ON (brake release delay)	1~1000	1	ms	▲	PST
F1.0.06	Delay from brake output ON to command receiving	1~1000	250	ms	▲	PST
F1.0.07	Delay from brake OFF to motor power-off under static status	1~2000	600	ms	▲	PST
F1.0.08	Rotation speed threshold when brake is OFF under	1~3000	30	rpm	▲	PST

	rotation status					
F1.0.09	Delay of brake OFF under rotation status	1~1000	500	ms	▲	PST
F1.0.10	Delay from brake OFF to motor power-off under rotation status	1~1000	50	%	▲	PST
F1.2.27	Motor rotation speed range	0~1000	20	rpm	◇	S

6.2.4 Brake Setting

When motor torque is opposite to rotation direction, the energy will be transferred to drive from the motor end, to generate the power, increase the busbar voltage; now, brake resistance is required for consuming this energy; otherwise, the servo drive can be damaged.

It can be switched through function code F1.0.17 brake resistor selection in order to replace brake resistor and connect the external brake resistor; meanwhile, the external brake resistor can be wired according to 3.3.6 brake resistor wiring.

When external brake resistor is used, set the cooling coefficient according to the cooling conditions.

The built-in brake resistor applies to the scenarios with small inertia and infrequent braking. The user should prepare the external and high-power brake resistor when high braking torque or frequent braking is required. Choose the external brake resistor carefully according to the following table. For any query, please consult our technicians. Err28 (brake resistor overload) may occur when braking resistance is too low.

The specification for built-in brake resistor of CDS500 servo drive is as shown in table below:

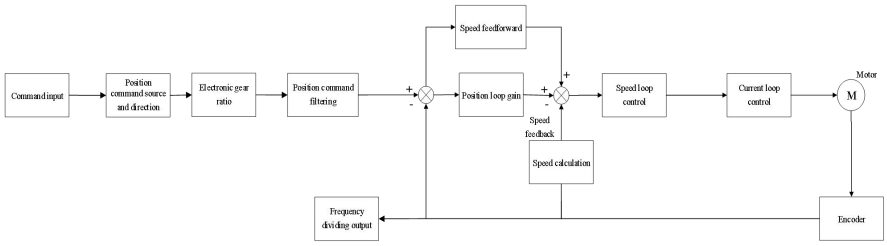
Model of servo drive		Specification of built-in brake resistor		Minimum Allowed Resistance (Ω)	Maximum Braking Energy (J) Absorbed by Capacitor
		Resistance	Power		
Single/three-phase 220V	CDS500-2S016	50	50	50	9
	CDS500-2S030	50	50	50	18
	CDS500-2S045	50	50	50	24
	CDS500-2S060	50	50	50	32
	CDS500-2S100	25	100	18	50
	CDS500-2S140	25	100	15	60
Three-phase 220V	CDS500-2T016	50	50	50	9
	CDS500-2T030	50	50	50	9
	CDS500-2T045	50	50	50	14
	CDS500-2T060	50	50	50	18
	CDS500-2T100	25	100	18	43
	CDS500-2T140	25	100	15	52
	CDS500-2T200	25	100	20	85
Three-phase 380V	CDS500-4T085	50	100	30	50
	CDS500-4T120	50	100	30	50
	CDS500-4T200	30	100	25	120

● Relevant parameters

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F1.0.14	Allowed minimum braking resistance of drive	1~1000	Model	Ω	▲	PST
F1.0.15	Power of built-in brake resistor	1~65535	Model	W	▲	PST
F1.0.16	Resistance of built-in brake resistor	1~1000	Model	Ω	▲	PST
F1.0.17	Brake resistor selection 0: Use built-in brake resistor 1: Use external brake resistor (natural cooling) 2: Use external brake resistor (forced air cooling) 3: Do not use brake resistor, use capacitor for absorption	0~3	0	1	▲	PST
F1.0.18	Power of external brake resistor	1~65535	Model	W	▲	PST
F1.0.19	Resistance of external brake resistor	F1.0.14~1000	Model	Ω	▲	PST
F1.0.20	Brake opening rate	0~200	200	%	▲	PST

F1.0.21	Resistor cooling coefficient	1~65535	100	%	▲	PST
F1.0.22	Single heating coefficient	1~65535	100	%	▲	PST
F5.0.15	Braking opening coefficient	0~200	120	%	▲●	**PST**
F5.0.16	Braking closing coefficient	0~200	118	%	▲●	**PST**
F5.0.18	Braking protection time	0~65535	1.6	s	▲●	**PST**

6.3 Position Control Mode



Position mode of servo drive includes: External position mode (PT) and internal position mode (PR), which can be set and switched through control mode (F1.0.00).

6.3.1 Pulse command input mode

1） External position (PT)

When external position mode is adopted, five input modes are composed of pulse direction and pulse form by setting the pulse command input mode (F1.1.01).

As for input form at servo drive side, please set the function code F1.1.01 according to command type of upper computer.

● Relevant parameters

Function Code	Name	Set Range	Set Value	Unit	Change Restriction	Valid Mode
F1.1.01	Pulse command input mode H.0 0 | | A B [A] Pulse direction 0: Positive 1: Reverse [B] Pulse form 0: Pulse + direction 1: Forward pulse sequence CW/CCW 2: AB orthogonal pulse	H.00~H.12	H.00	1	▲●	P

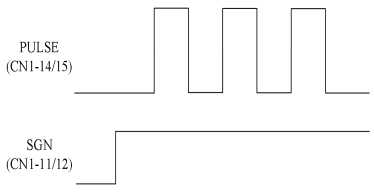
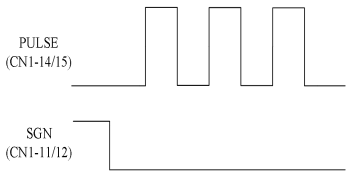
The servo drive pulse command has three forms:

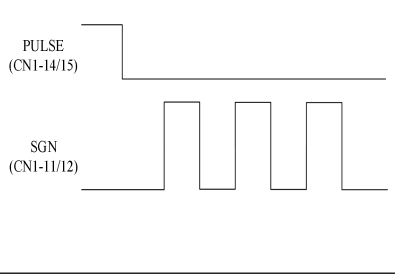
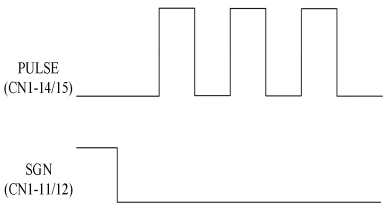
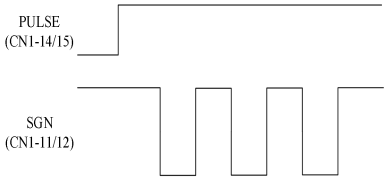
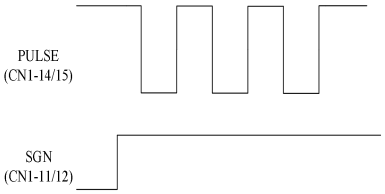
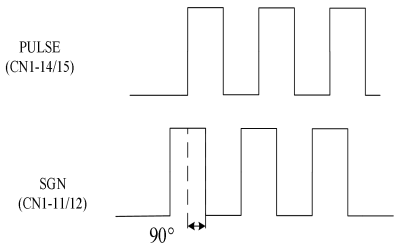
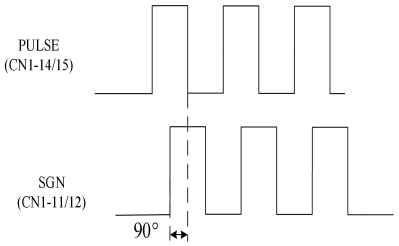
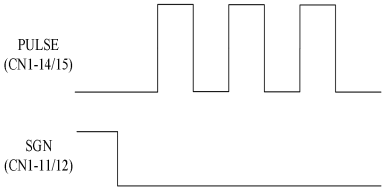
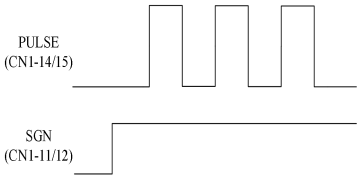
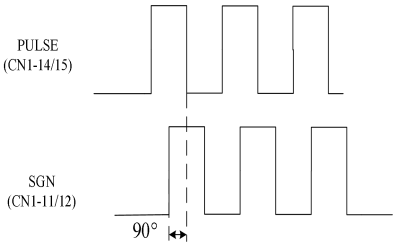
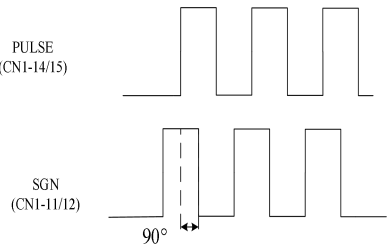
1: Pulse + direction

2: Forward pulse sequence CW/CCW

3: AB orthogonal pulse

The pulse form is as shown in picture below

Function Code		Command direction	Forward rotation command	Reverse rotation command
F1.1.01	H.00	Pulse + direction		

Function Code		Command direction	Forward rotation command	Reverse rotation command
	H.01	CW+CCW		
				
	H.02	AB orthogonal pulse		
	H.10	Pulse + direction (reverse)		
	H.12	AB orthogonal pulse (reverse)		

Please refer to 3.4.1 input signal for the specific connection method, the maximum frequency and the minimum time width of position pulse command

2) Multi-segment position (PR)

When the internal multi-segment position mode is adopted, the internal position control mode, as well as the total pulse, running speed and curve source (acceleration/deceleration, smooth acceleration/deceleration) of 8-stage position can be set through Group F3.0 function code. The specific motion during each pulse period can be completed without using the upper computer. When setting is done, select 23 through DI function (23: Enable

internal position command of MULPOS). The internal position mode is enabled when this terminal triggers the rising edge.
The internal position control mode can be divided into 5 modes, which can be selected through function code F3.0.00:
1. Shut down after single machine running completes: Start running according to the set sect ion quantity and sequence and run for one round only. It will be disabled after running completes.
2. Hold after single machine running completes: Start running according to the set sect ion quantity and sequence and run for one round only. It will not be disabled after running completes.
3: Continuous cycle: Start running according to the set section quantity and sequence and keep running constantly, until the internal position enable signal is set as 0
4: Hold circulation for N times: Keep running according to the set section quantity and sequence. The cycle times are set by F3.0.01
5: Terminal DI switching: When rising edge of internal position enable signal is received, 6, 7, 8, 9 (switch CMD multi-segment running command) can be selected and the position curve of corresponding section quantity can be run through DI input function. Please refer to the following table for the corresponding sections of Terminal DI input signal:

Note: When internal multi-segment position is used, F1.1.02 (pulse number per turn) mustn't be set as 0.

S/N	1	2	3	4	5	6	7	8
DI function 6	0	1	0	1	0	1	0	1
DI function 7	0	0	1	1	0	0	1	1
DI function 8	0	0	0	0	1	1	1	1
DI function 9	0	0	0	0	0	0	0	0

The relative position and absolute position mode of internal position can be set through F3.0.04[C] internal position control word.
Relative position command mode: Take the first segment of position pulse as example, set the total number of running pulse through F3.0.07, set running speed through F3.0.09, select the preset curve and set acceleration/deceleration through F3.0.10, set the hold time after this segment completes through F3.0.11; the specific time unit can be set through A of F3.0.04; set DI function 23 (enable internal position command of MULPOS) and run the internal position according to the set function.
Absolute position command mode: Set F3.0.07 as the difference between the current position and origin of motor. Enable DI function 41 (41: Origin of AbsPosORPG absolute position) under the enabled status, and the servo will record the current set value in F9.0.59. Then, modify the value of F3.0.07, set DI function 23 (enable internal position command of MULPOS) as valid, to start movement of motor.

● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F3.0.00	Internal position control mode 0. Shut down after single running completes 1. Hold after single running completes 2: Continuous cycle (reset position enable 0) 3: Hold circulation for N times 4: Terminal DI switching	0~4	1	1	▲	**P**
F3.0.01	Circulation times under circulation mode	1~65535	1	1	▲	**P**
F3.0.02	Valid section number	1~8	1	1	▲	**P**
F3.0.04	Internal position control word H. 0 0 0 | | | A B C [A] End time hold unit 0: ms 1: s [B] Position interruption and restart processing 0: Continue running of uncompleted sections 1: Restart [C] Position command type 0: Relative position 1: Absolute position (SON enable is zero bit)	H.000~H.111	H.000	1	▲	**P**
F3.0.05	Pulse at zero point position (valid at absolute position)	-20000000000 ~	0	pulse	▲	**P**

		20000000000				
F3.0.07	Position pulse of Section 1	-20000000000 ~ 20000000000	0	pulse	◇	**P**
F3.0.09	Running speed of Section 1	-6000~6000	0	rpm	◇	**P**
F3.0.10	Curve selection of Section 1 0: Curve 0, from F1.2.05~F1.2.08 1: Curve 1, from F1.2.09~F1.2.12 2: Curve 2, from F1.2.13~F1.2.16 3: Curve 3, from F1.2.17~F1.2.20	0~3	0	0	◇	**P**
F3.0.11	Hold time after Section 1 completes (F3.0.04 [A])	0~65535	10	ms/s	◇	**P**

6.3.2 Electronic Gear Ratio

1） Set electronic gear ratio

Electronic gear ratio refers to the proportional relationship between motor position command and input position command. Set the electronic gear ratio to set the actual displacement of motor rotation when input position command is 1 command unit, or improve the motor speed when the set range of upper computer and function code is restricted.

When F1.1.02 pulse number per turn of pulse command is 0:

Position control command = numerator of electronic gear ratio/denominator of electronic gear ratio× input command

When F1.1.02 pulse number per turn of pulse command is not 0:

Position control command = Encoder resolution/F1.1.02×input command

Now, the set value from F1.1.04 to F1.1.07 is invalid.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.1.02	When pulse per turn of pulse command is F1.1.02 > 0, the electronic gear ratio from F1.1.04 to F1.1.07 is invalid.	0~1073741824	0	pulse	●	P
F1.1.04	Numerator 1 of electronic gear ratio	1~65535	1	1	●	P
F1.1.05	Denominator 1 of electronic gear ratio	1~65535	1	1	●	P
F1.1.06	Numerator 2 of electronic gear ratio	1~65535	1	1	●	P
F1.1.07	Denominator 2 of electronic gear ratio	1~65535	1	1	●	P

2） Switching of electronic gear rati

When pules per turn of F1.1.02 pulse command are 0, it can be switched and controlled through F1.1.18 electronic gear ratio.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.1.18	Switching and control of electronic gear ratio (GEARSEL signal) 0: Position pulse command is 0 and lasts for 2.5ms 1: Real-time switching	0~1	0	1	●	P

The electronic gear ratio will be switched automatically when F1.1.18 is 0, pulse command is 0 and lasts for 2.5ms.

When F1.1.18 is 1, it can be switched directly through DI signal and the DI terminal of servo drive can be configured as Function 19 (19: GEARSEL electronic gear selection); real-time switching will be triggered when terminal logic is valid.

6.3.3 Position command filtering

The position command filtering can smooth the position command and reduce vibration after treatment of electronic gear ratio; however, it may reduce the responsiveness when the set value is too high. So, please set the

filtering coefficient according to the realities.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.1.10	Low pass filtering coefficient of pulse command	0~2000	0	1	▲	P
F1.1.11	Average filtering coefficient of pulse command	0~2000	0	1	▲	P
F1.1.12	Signal filtering coefficient of pulse command	0~1000	10	10 ns	●▲	P

6.3.4 Position deviation clear function

Position deviation = (position command = position feedback) (encoder unit)

The position deviation function can clear the position deviation under certain conditions.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.1.14	Position deviation clearing mode 0: Clear position deviation in case of servo OFF and fault	0~2	0	1	▲	P

6.3.5 Positioning completion function

Detect whether position deviation is within the set range to determine positioning completion and positioning approach, output DO signal and the servo positioning can be determined when upper computer reaches this signal

DO output is valid when DO function selection is 5 (5: COIN positioning completion) and the deviation between current position and target position is less than the set value of F1.1.16.

DO output is valid when DO function selection is 6 (6: NEAR position approach) and the deviation between current position and target position is less than the set value of F1.1.17.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.1.15	Positioning completion (COIN) output condition 0: The absolute value of position deviation is lower than F1.1.16 1: When absolute value of position deviation is lower than F1.1.16 and the command after position command filtering is 0 2: Output when absolute value of position deviation is lower than F1.1.16 and the position command is 0	0~2	0	1	▲	P
F1.1.16	Positioning completion amplitude	1~65535	10	pulse	▲	P
F1.1.17	Positioning approach amplitude	1~65535	1000	pulse	▲	P

6.3.6 Origin reset function

When servo is enabled under position control mode, the servo drive will search the motor origin actively if origin reset function is triggered.

After origin reset is completed, DO output is valid when it is selected as 12 through DO function (12: HOME origin reset completes output)

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.1.20	Origin reset mode control H.0 0 0 0 | | | | A B C D [A] Origin stop mode: 0: When origin detection completes, the motor will decelerate to the origin 0: When origin detection completes, the motor will decelerate along with advance direction until it is stopped.	H.0000~ H.1225	H.0000	1	▲	P

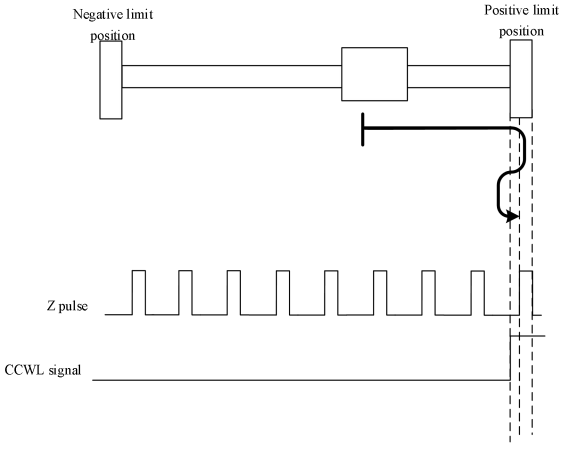
	[B] Origin trigger start mode: 0: Disable origin reset function 1: When power is on, execute origin reset automatically 2: Origin reset is triggered by SHOM signal input [C] Origin: 0: Origin is Z pulse 1: Origin is ORGP (Only if D=2,3). 2: Origin is limit switch (CW/CCW) (Only if D=0,1). [D] Type of origin detector and search direction: 0: Forward origin reset, CCWL is deceleration point 1: Reverse origin reset, CWL is deceleration point 2: Forward origin reset, ORGP is deceleration point 3: Reverse origin reset, ORGP is deceleration point 4: Search Z pulse directly as deceleration point 4: Search Z pulse directly as deceleration point in reverse rotation					
F1.1.21	Speed of high-speed origin reset	0~2000	100	rpm	▲	P
F1.1.22	Speed of low-speed origin reset	0~500	20	rpm	▲	P
F1.1.23	Origin offset position (32 bits)	-999999~ 999999	1000	pulse	▲	P

When DI function is selected as 24 (24: ORGP origin detection), it can be used as origin under the origin reset function
When DI function is selected as 25 (25: SHOM Start origin reset), the origin reset function can be started under the origin reset function.
When DI function is selected as 26 (26: CWL reverse restriction bit), it can be used as deceleration point or restriction point of negative limit position under origin reset function.
When DI function is selected as 27 (27: CCWL forward restriction bit), it can be used as deceleration point or restriction point of forward limit position under origin reset function.

The origin stop mode under origin reset mode is: 0: When origin detection completes, the motor will decelerate to the origin. The origin is: 0: Introduce origin reset by taking origin as Z pulse.

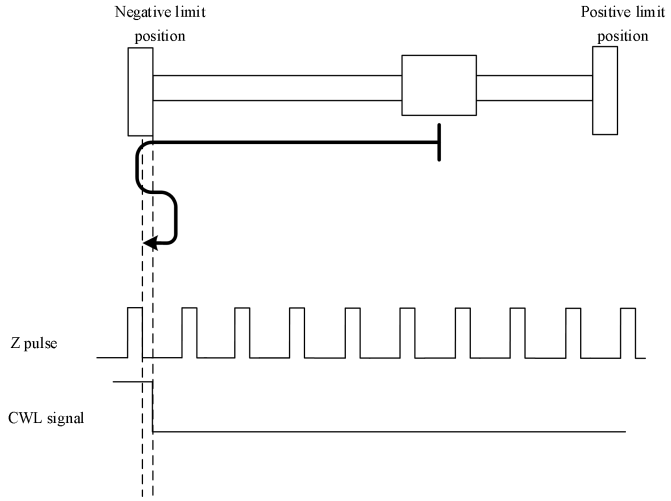
1）Forward origin reset, CCWL is deceleration point

When origin reset mode is triggered, the servo motor will firstly have high-speed forward searching of CCWL signal through the speed set in F1.1.21 (high-speed reset speed); when receiving the rising edge of CCWL signal for the first time, it will return slowly according to the low speed set in F1.1.22 (low-speed reset speed), until the signal falling edge is searched. After the signal falling edge is searched, it will continue reverse search of signal rising edge; after the rising edge is searched, it will continue search of Z pulse and then stop running when Z pulse is searched.

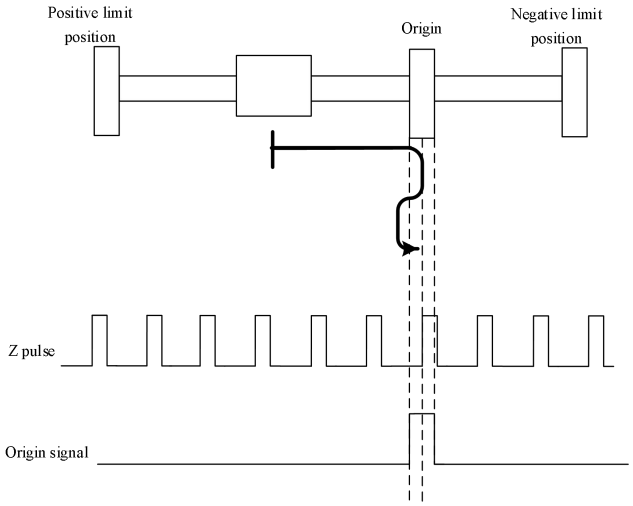


3） Forward origin reset, CWL is deceleration point

When origin reset mode is triggered, the servo motor will firstly have high-speed reverse searching of CWL signal through the speed set in F1.1.21 (high-speed reset speed); when receiving the rising edge of CWL signal for the first time, it will return slowly according to the low speed set in F1.1.22 (low-speed reset speed), until the signal falling edge is searched. After the signal falling edge is searched, it will continue reverse search of signal rising edge; after the rising edge is searched, it will continue search of Z pulse and then stop running when Z pulse is searched



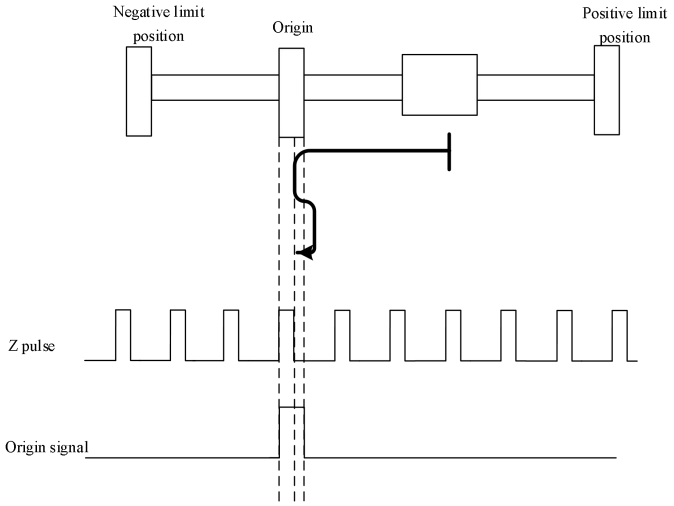
4）Forward origin reset, ORGP is deceleration point



When origin reset mode is triggered, the servo motor will firstly have high-speed forward searching of ORGP signal through the speed set in F1.1.21 (high-speed reset speed); when receiving the rising edge of ORGP signal for the first time, it will move forwards slowly and continuously according to the low speed set in F1.1.22 (low-speed reset speed) to search Z pulse, and it stop running when Z pulse is searched.

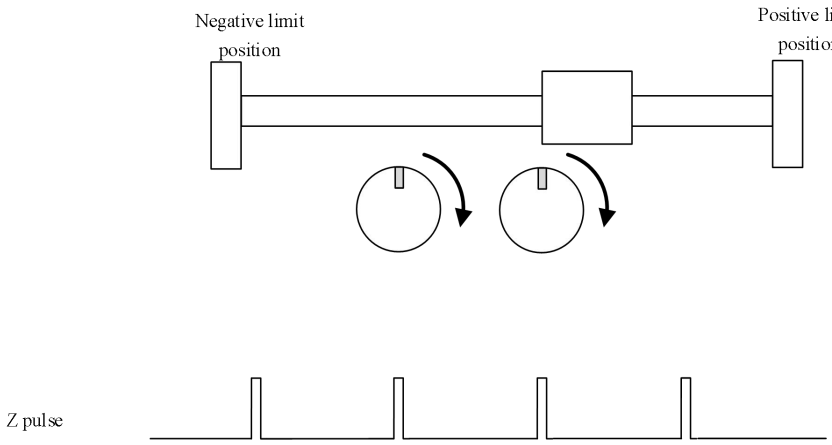
5）Reverse origin reset, ORGP is deceleration point

When origin reset mode is triggered, the servo motor will firstly have high-speed reverse searching of ORGP signal through the speed set in F1.1.21 (high-speed reset speed); when receiving the rising edge of ORGP signal for the first time, it will move forwards slowly and continuously according to the low speed set in F1.1.22 (low-speed reset speed) to search Z pulse, and it stop running when Z pulse is searched.



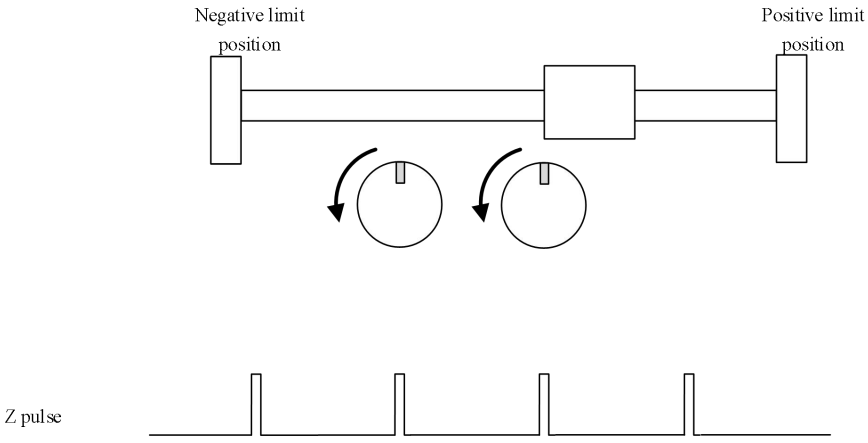
5） Search Z pulse directly as deceleration point

When origin rest mode is triggered, the motor will have forward rotation. It will stop when receiving Z pulse.

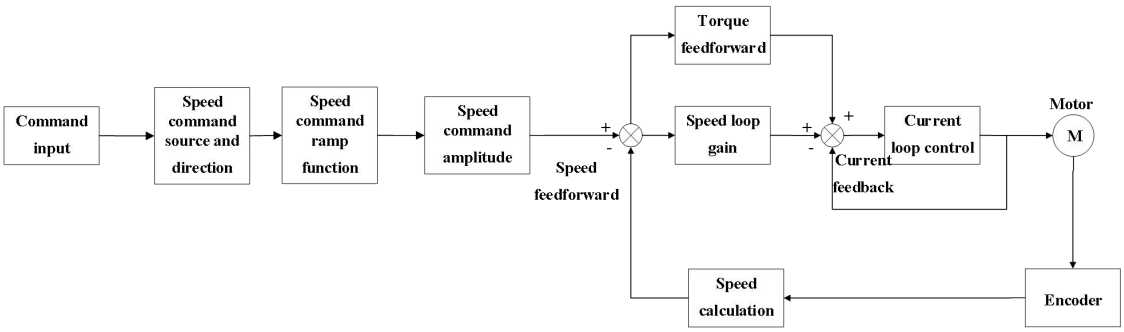


6）**Search Z pulse directly as deceleration point in reverse rotation**

When origin rest mode is triggered, the motor will have reverse rotation. It will stop when receiving Z pulse.



6.4 Speed Control Mode



Speed control can be realized through external communication or internal set curve under speed control mode.

6.4.1 Speed command source

The speed command source under speed control mode includes digital quantity, AI, switch forward/reverse rotation through TRLM and TLLM and multi-section speed.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.2.00	Speed source selection 0: Digital quantity (F1.2.03) 1: AI1 2:Switch forward/reverse rotation through TRLM and TLLM 3: Multi-segment speed	0~3	0	1	▲	S

1） **Digital quantity**

Set speed through F1.2.03 (set via speed keyboard).

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.2.03	Set via speed keyboard	-6000~6000	0	rpm	◇■	S

2）AI

It is set through analog voltage. The specific relationship between voltage and speed can be set through function code F2.1.06.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F2.1.06	Corresponding speed of analog input 10V	-6000~6000	3000	rpm	◇	PST

For details of analog quantity input circuit, please refer to 3.4.2 analog quantity input signal.

3) Switch forward/reverse rotation through TRLM and TLLM

When speed source is analog quantity and above zero, the motor forward/reverse rotation can be controlled through DI signal:

Select DI setting function as 14 (14: TLLM reverse torque restriction), select DI setting function as 15 (15: TRLM forward torque restriction). The motor has forward rotation when corresponding DI of Function 14 is valid while corresponding DI of Function 15 is invalid; the motor has reverse rotation when corresponding DI of Function 14 is invalid, while corresponding DI of Function 15 is valid. The motor has no rotation when both DI is valid or invalid at the same time.

The specific rotation direction of motor should be set combining function code F1.0.01 and DI function 21 (21: SPDDIR speed command direction).

4) Multi-segment speed

When the internal multi-segment speed mode is adopted, the internal speed control mode, as well as the running speed, running time, curve source (acceleration/deceleration, smooth acceleration/deceleration) of 8-stage speed can be set through Group F3.1 function code. The specific motion can be completed without using the upper computer.

The internal speed control mode can be divided into 5 modes, which can be selected through function code F3.1.00:
1. Shut down after single machine running completes: Start running according to the set sect ion quantity and sequence and run for one round only. It will be disabled after running completes.
2. Hold after single machine running completes: Start running according to the set sect ion quantity and sequence and run for one round only. It will not be disabled after running completes.
3: Continuous cycle: Start running according to the set section quantity and sequence and keep running constantly, until it is disabled.
4: Hold circulation for N times: Keep running according to the set section quantity and sequence. The cycle times are set by F3.1.01.
5: Terminal DI switching: 6, 7, 8, 9 (switch CMD multi-segment running command) can be selected and the speed curve of corresponding section quantity can be run through DI input function. Please refer to the following table for the corresponding sections of Terminal DI input signal:

S/N	1	2	3	4	5	6	7	8
DI function 6	0	1	0	1	0	1	0	1
DI function 7	0	0	1	1	0	0	1	1
DI function 8	0	0	0	0	1	1	1	1
DI function 9	0	0	0	0	0	0	0	0

When setting is done, enable the servo to run it according to the internal speed mode.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F3.1.00	Speed control mode 0. Shut down after single running completes 1. Hold after single running completes 2: Continuous cycle 3: Circulation for N times 4: Terminal DI switching	0~4	1	1	▲	**S**
F3.1.01	Circulation times (valid when F3.1.00 is 3)	1~65535	1	1	▲	**S**
F3.1.02	Unit of speed running time 0: 0.1s 1: 0.1min	0~1	0	1	▲	**S**

For details of analog quantity input circuit, please refer to 3.4.2 analog quantity input signal.
Select 21 through DI function (21: SPDDIR speed control direction) and control the direction of multi-segment speed.

6.4.2 Acceleration/deceleration setting

The acceleration/deceleration setting can smooth speed change, avoid jump or serious vibration of motor when speed command is too high, and ensure stable speed change.
4 groups of acceleration/deceleration curves of servo drive can be set; in which, the acceleration/deceleration of digital quantity and AI1 are set as Curve 0 (F1.2.05~F1.2.08), and multi-section speed can be applies to different curves to realize different purposes. Acceleration/deceleration is the time required for realizing 3000rpm from 0. Acceleration/deceleration can be smoother when S acceleration/deceleration smoothness increases.

Actual acceleration time = Speed command/3000×acceleration time

Actual deceleration time = Speed command/3000×deceleration time

● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.2.05	Acceleration time 0	0~30000	25	ms	◇	**PST**
F1.2.06	Deceleration time 0	0~30000	25	ms	◇	**PST**
F1.2.07	S smooth acceleration 0	0~10000	0	ms	◇	**PST**
F1.2.08	S smooth deceleration 0	0~10000	0	ms	◇	**PST**

6.4.3 Speed restriction

When motor speed exceeds the speed restriction source, the rotation speed will be restricted at the set speed. The speed command restriction is set through function code (F1.2.24):
0: Digital quantity, the forward/reverse maximum rotation speed is set by function code F1.2.22 and F1.2.23 only.
1: AI1, compare the corresponding speed of AI1 with F1.2.22 and choose the lower value to decide the forward maximum rotation speed; compare the corresponding speed of AI1 with F1.2.23 and choose the lower value to decide the reverse maximum rotation speed
3:Switch forward/reverse maximum rotation speed of F1.2.22 or F1.2.23 through DI setting

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.2.22	Forward maximum rotation speed	0~6000	3500	rpm	◇	**PST**
F1.2.23	Reverse maximum rotation speed	0~6000	3500	rpm	◇	**PST**
F1.2.24	Speed restriction source 0: Digital quantity (F1.2.22 and F1.2.23) 1: AI1 (decided by different direction and the minimum value of F1.2.22 and F1.2.23) 2: Reserved 3. Select F1.2.2 or F1.2.23 as forward/reverse speed restriction through DI	0~3	0	1	▲	**ST**

Select DI set function as 33 (33: SPDLRS switch speed restriction source); take F1.2.22 as forward/reverse rotation speed restriction when function is invalid; take F1.2.23 as forward/reverse rotation speed restriction when function is valid.

6.4.4 Zero bit fixation

When zero bit fixation function is under speed mode, DI set function selection 12 (12: Zero bit fixation) is valid and speed command is lower than the rotation speed range of F1.2.26 zero bit fixation, the servo motor is locked and the speed command is invalid. When speed command is above the rotation speed range of F1.2.26 zero bit fixation, the zero speed fixation function is invalid and the motor has normal rotation.

● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.2.26	Range of zero bit fixed rotation speed	0~100	10	rpm	●	**S**

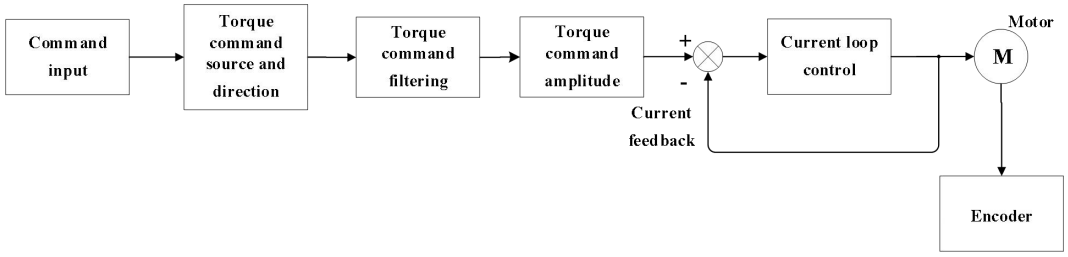
6.4.5 Deviation of speed consistency

DO signal output is valid when DO signal is set as 4 (4: VCMP speed consistency output) and the deviation between the current speed and target speed is lower than F1.2.28 speed consistency deviation.

● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.2.28	Speed consistency deviation	0~100	10	rpm	◇	**S**

6.5 Torque Control Mode



The torque can be controlled by controlling current, for the current of servo motor has linear relationship with torque. Torque control: Control the output torque of motor through torque command. The torque command can be set through communication. Torque control mode mainly applies to the devices which have strict requirements for materials, such as tension control scenarios like winding/unwinding device. The set value of torque should ensure that stress is not affected by the changes of winding radius.

6.5.1 Speed command source

The torque command of torque control mode can be sourced from digital quantity and AI.

● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.3.00	Torque source selection 0: Digital quantity 0 (F1.3.02) 1: Digital quantity 1 (F1.3.03) 2: AI1 3: Reserved	0~3	1	1	▲	**T**

1） **Digital quantity**

The function code F1.3.02 and F1.3.03 are given. The given command torque is the percentage of motor rated torque.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.3.02	Set digital torque as 0 (no saving after power-failure)	-300.0~300.0	0	%	■	**T**
F1.3.03	Set digital torque as 1 (saving after power-failure)	-300.0~300.0	0	%	◇	**T**

2）AI

Convert the analog voltage inputted by upper computer or other device into torque command.

● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F2.1.07	Corresponding torque of analog input 10V	-500.0~500.0	100.0	%	◇	**PST**

6.5.2 Parameter restriction

1）Torque restriction

The source of torque command restriction can be selected through F1.3.08. The torque type can be set through F1.3.10. However, only one torque restriction value is valid at the same time.

When F1.3.08 is 0, the torque is controlled by internal torque restriction only

When F1.3.08 is 1 and Terminal DI is invalid, the torque is controlled by internal torque restriction; when Terminal DI is valid, the internal torque is controlled by external torque restriction.

When F1.3.08 is 2, the torque is controlled by positive/negative absolute value restriction of AI torque.

When F1.3.08 is 4 and Terminal DI is invalid, it is decided by the lower value between AI torque value and external torque; when Terminal DI is valid, it is decided by AI torque.

When F1.3.08 is 6 and Terminal DI is invalid, it is decided by the lower value of internal torque; when Terminal DI is valid, it is decided by AI torque.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.3.04	Forward internal torque restriction	0~300.0	300.0	%	◇	**PST**
F1.3.05	Reverse internal torque restriction	0~300.0	300.0	%	◇	**PST**
F1.3.06	Forward external torque restriction	0~300.0	300.0	%	◇	**PST**
F1.3.07	Reverse external torque restriction	0~300.0	300.0	%	◇	**PST**
F1.3.08	Torque restriction source 0: Forward/reverse internal torque restriction 1: Switch forward/reverse external torque restriction and forward/reverse internal torque restriction (selected through TLLM and TRLM) 2: Take AI1 as forward/reverse torque restriction 3: Reserved 4: Take the minimum value of forward/reverse external torque restriction and AI1 as the torque restriction (selected through TLLM and TRLM) 5: Reserved 6: Take forward/reverse internal torque restriction and AI1 switch as torque restriction (selected through TLLM and TRLM) 7: Reserved	0~7	0	1	◇	**PST**
F1.3.10	Set torque type 0: Two-way restriction 1: Forward restriction 2: Reverse restriction	0~2	0	1	◇	**T**

2）Speed restriction in case of torque restriction

Speed restriction must be implemented to keep safety, for speed control is not conducted during torque control. This speed restriction is valid under torque mode only. The lower value is selected when speed is controlled by F1.2.22 and F1.2.23 speed restriction source under torque mode

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.2.22	Forward maximum rotation speed	0~6000	3500	rpm	◇	**PST**
F1.2.23	Reverse maximum rotation speed	0~6000	3500	rpm	◇	**PST**
F1.3.12	Forward rotation speed restriction	0~3000	3000	rpm	◇	**T**
F1.3.13	Reverse rotation speed restriction	0~3000	3000	rpm	◇	**T**

6.5.3 Torque arrival control

When the actual torque reaches the set torque command threshold, the DO (14: TTOQ torque arrival output) signal output is valid.

Both torque valid value and torque invalid value have offset above and below the reference value. When the actual torque satisfies the following condition

|Actual torque-Reference value|>Valid value

DO signal output is valid; otherwise, DO signal is invalid.

When the actual torque command satisfies the following condition

|Actual torque-Reference value|<Invalid value

DO signal output is invalid; otherwise, DO signal is valid.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.3.14	Torque reaches reference value	0.0~300.0	0	%	◇	**T**
F1.3.15	Torque reaches reference value	0.0~300.0	20.0	%	◇	**T**

F1.3.16	Torque reaches invalid value	0.0~300.0	10.0	%	◇	**T**
F1.3.17	Torque arrival (TTOQ) control 0: Basic torque hysteresis F1.3.14~F1.3.16 1~3: Reserved	0~3	0	1	◇	**T**
F1.3.18	Torque reaches shutdown delay	0~5.000	0	ms	◇	**T**
F1.3.19	Torque reaches startup rotation speed	0~4000	10	rpm	◇	**T**
F1.3.20	Torque reaches shutdown rotation speed	0~100	1	rpm	◇	**T**

6.6 Mixed Control Mode

In addition to three standard control modes, the servo controller also includes the mixed control mode. Under mixed mode, the enabled servo can also be switched under different control modes. The mixed mode has two conditions as follows:
Position mode (PT) ↔ Speed mode (S)
Position mode (PT) ↔ Speed mode (T)
●Relevant parameters

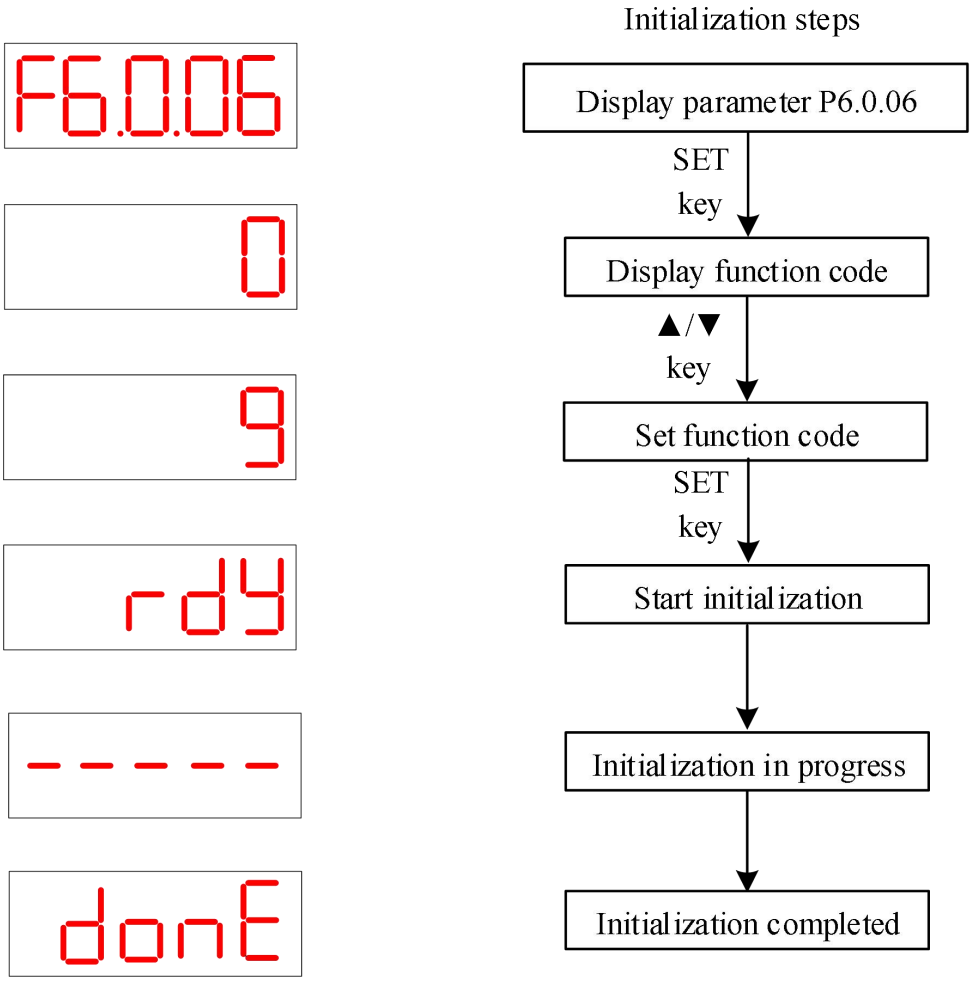
Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F1.0.00	Control Mode 0: Position mode (PT) 1: Position mode (PR) 2: Speed mode (S) 3: Torque mode (T) 4: Position mode (PT) ↔ Speed mode (S) 5: Position mode (PT) ↔Torque mode (T) 6~8: Reserved 9: Sr test run mode 10: Jog mode	0~10	0	1	▲	PST

When F1.0.00=4/5, the running mode is switched by selecting 10 (10: M1SWT mode switch 10) through DI function.

Chapter 7 Auxiliary Functions

7.1 Parameter Initialization Function

This function can be used for parameter initialization of servo drive. The specific operation method is as shown in picture below:



● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F6.0.06	Parameter initialization 9: Recover factory settings except for password group, motor group, correction group, fault information group, display control group and drive information group. 19: Recover default settings except for password group, motor group and device information group (client is not suggested to use this code). 30: Backup parameters; 60: Recover backup parameters.	0~999	0	1	▲	**PST**

7.2 Parameter Change Restriction

The parameter change function can be restricted through the function code, to avoid accidental parameter wiring. When F6.0.07=1, other parameters, except for this parameter, can't be modified nor written through the button or upper computer.

● Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F6.0.07	Parameter change restriction 0: Modifiable 1: Non-modifiable	0~1	0	1	◇	**PST**

7.3 Motor Overload Protection Function

The motor overload protection can protect the motor against burnout due to overheat. When motor overload energy reaches the protection coefficient, the servo drive will give out alarm of Err15. The motor overload protection coefficient of function code F5.0.01 and translation coefficient of F5.0.02 motor overload time can be set. Generally, the parameters can be maintained as the default value. However, the parameters can be modified according to actual heating conditions of motor in the following scenarios: 1. The scenarios with high working temperature of servo. 2. The scenarios with frequent acceleration/deceleration of motor.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F5.0.00	Motor overload protection function (0: Invalid; 1: Enable)	0~1	1	1	▲●	**PST**
F5.0.01	Motor overload protection coefficient	0~200	100	%	▲●	**PST**
F5.0.02	Motor overload time translation coefficient	1~200	80	%	▲●	**PST**

Note: Please set the motor overload protection function under the guidance of professional personnel; otherwise, motor may be burned

7.4 Motor Overspeed Protection Function

The motor overspeed protection function can protect the motor against damage due to overspeed The servo drive will give out alarm of Err13 when motor overspeed is triggered.

●Relevant parameters

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F5.0.03	Motor overspeed level	0~200	120	%	▲●	**PST**
F5.0.04	Motor overspeed time	0~6000	20	ms	▲●	**PST**

Note: Please set motor overspeed protection function under the guidance of professional personnel; otherwise, the motor can be burned

7.5 Voltage Protection Function

Based on voltage protection function, the servo drive can give out Alarm Err11 and Err12 when voltage is too high or too low. The overvoltage and undervoltage coefficient can be set through function code. Generally, the parameters can be maintained as the default value.

●Relevant parameters

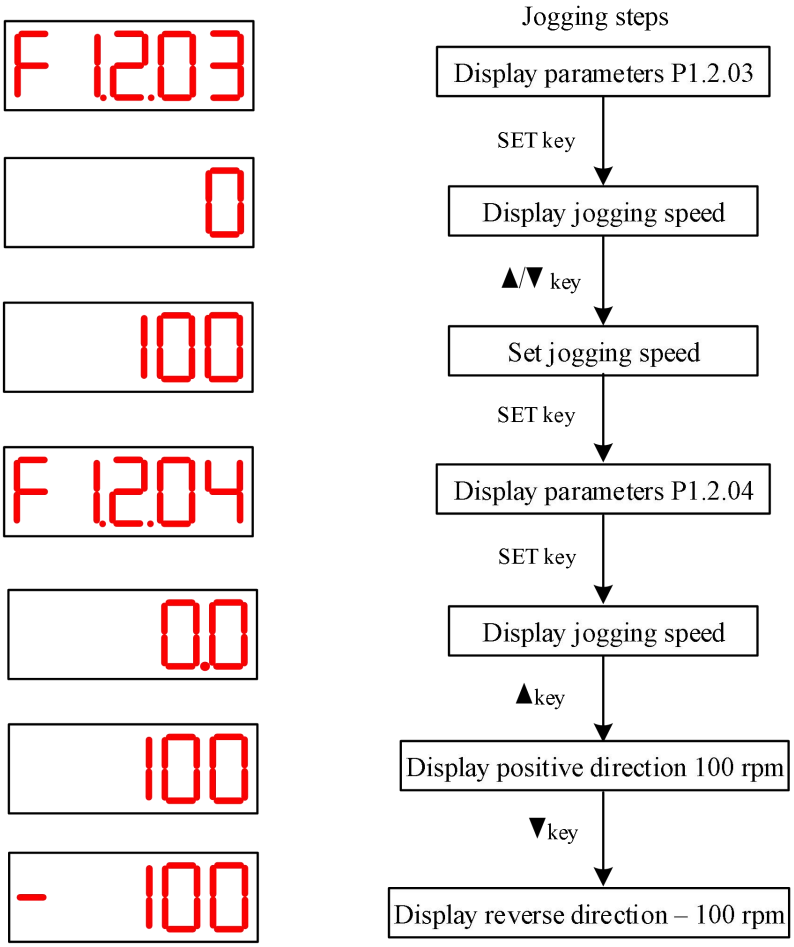
Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F5.0.11	Overvoltage coefficient	0~200	100	%	▲●	**PST**
F5.0.12	Overvoltage time	1~65535	1	ms	▲●	**PST**
F5.0.13	Undervoltage coefficient	0~200	100	%	▲●	**PST**
F5.0.14	Undervoltage time	1~65535	100	ms	▲●	**PST**

Note: Please set voltage protection function under the guidance of professional personnel; otherwise, the motor can be burned

7.6 Jog Running

● Operation method

Set F1.0.00 = 10, F2.0.08 = 0 and F2.0.18 = 1 and do jogging according to the diagram below:



1. Press "▲" or "▼" key to control the motor's revolving direction; release the key to stop motor revolving.
2. Function code F1.2.03: The set revolving speed of JOG under JOG mode. User can set it as required.
3. Make sure stroke is not exceeding the mechanical limit points if motor is mounted on the Product.

● Related function codes

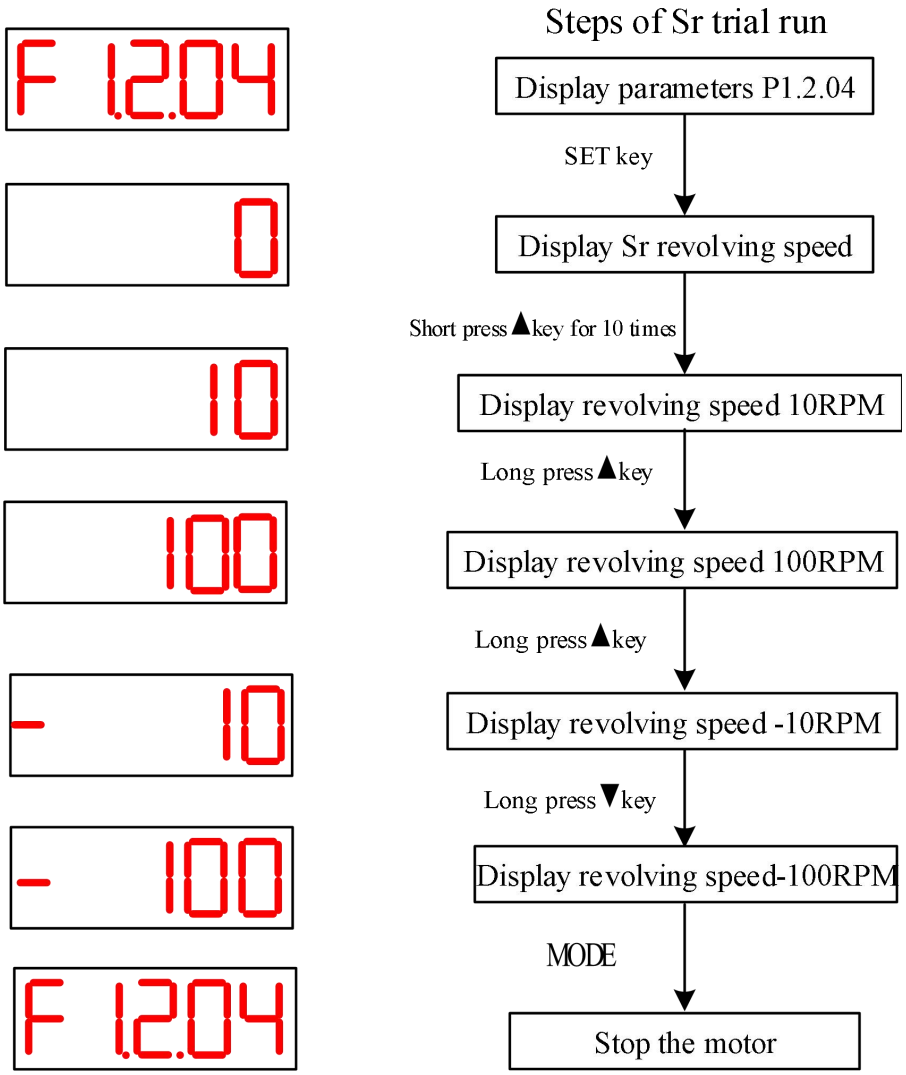
Function Code	Name	Range	Set Value	Unit
F1.0.00	Control mode (10: Jog mode)	0~10	10	1
F1.2.03	Speed keyboard setting (as Jog speed)	-6000～6000	100	rpm
F2.0.08	DI1 logic function selection (0: Logic or virtual input VDI1)	0~5	0	1
F2.0.18	Virtual input VDI1 status (equivalent to forced running)	0~1	1	1

Note: Setting of F2.0.08 and F2.0.18 not required if external terminal is used.

7.7 Test Run of Sr

● Operation method

Set F1.0.00 = 9, F2.0.08 = 0 and F2.0.18 = 1 and carry out jogging according to the following diagram:



1. Press "▲" or "▼" key to set the revolving speed of motor; release the key and motor will keep revolving at the displayed speed.
2. Function code F1.2.04: The set revolving speed of Sr under Sr mode. User can set it as required.
3. Sr function is not recommended and stroke should not exceed the mechanical limit position if motor is mounted on the Product.

● Related function codes

Function Code	Name	Range	Set Value	Unit
F1.0.00	Control mode (0: Sr trial run mode)	0~10	9	1
F2.0.08	DI1 logic function selection (0: Logic or virtual input VDI1)	0~5	0	1
F2.0.18	Virtual input VDI1 status (equivalent to forced running)	0~1	1	1
Note: Setting of F2.0.08 and F2.0.18 not required if external terminal is used.				

Chapter 8 Monitoring Display

8.1 List of Monitoring Parameters

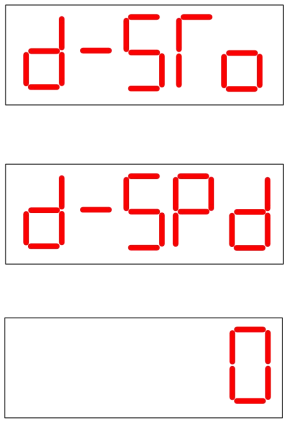
When power-on initialization is done, the panel will enter monitoring layer automatically, and display the contents of running status (d-STo) by default. When the current menu layer is entered, press MODE key to return to monitoring layer. When monitoring layer is returned, the panel will display the monitoring code "d-###" and stay for about 1-2s, then enter the designed monitoring contents. The user can press ▲, ▼ key to select and replace the monitoring contents (power-off no memory). The detailed description is as shown in table below:

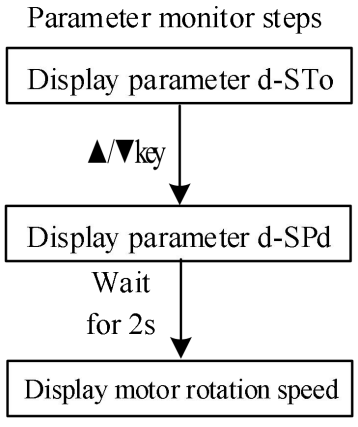
Display	Name	Monitoring Value 1	Mapping Parameter
d-STo	Servo status	0	F9.0.32
d-Err	Fault code	1	F6.1.09
d-SPd	Motor speed	2	F9.0.00
d-PoS	Motor feedback pulse number	3	F9.0.07
d-PoS.	Motor feedback coil number	4	F9.0.08
d- CP	Command pulse total number L	5	F9.0.09
d- CP.	Command pulse total number H (*10000)	6	F9.0.10
d-EPo	Deviation between command pulse and feedback pulse	7	F9.0.12
d-Tr9	Output torque [% rated]	8	F9.0.03
d- I	Effective current	9	F9.0.22
d-UdC	Busbar voltage	10	F9.0.15
d-Fr9	Command pulse frequency	11	F9.0.11
d- CS	Speed command	12	F9.0.01
d- CT	Given torque [% rated]	13	F9.0.04
d- dI	Input terminal status	14	F9.0.19
d- do	Output terminal status	15	F9.0.20
d-AIn	AI1 voltage	16	F9.0.17
d-ArO	Module temperature	17	F9.0.16

8.2 Examples of Monitoring Operation

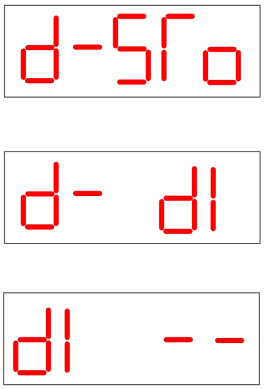
Monitoring display can be used for viewing the parameter, actual value, input/output signal status, as well as the internal status of servo drive.
Take servo initialization status as example, the monitoring operation process is as follows:

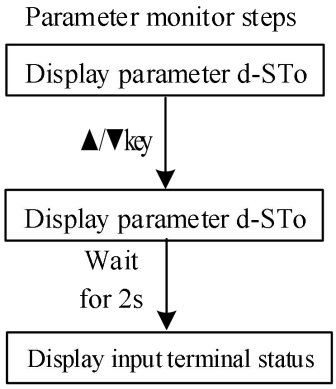
8.2.1 Example of monitoring speed





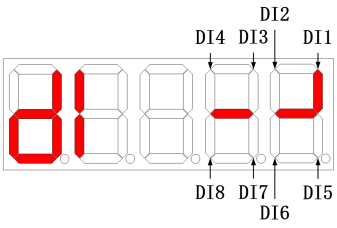
8.2.2 Example of monitoring input





The specific status of input terminal is as shown below

●Related function codes

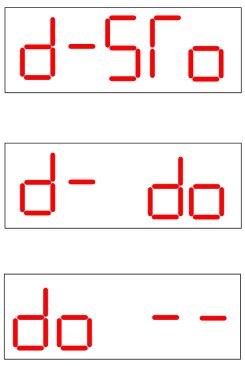
Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F9.0.19	Input terminal status 	-	-	-	★	**PST**

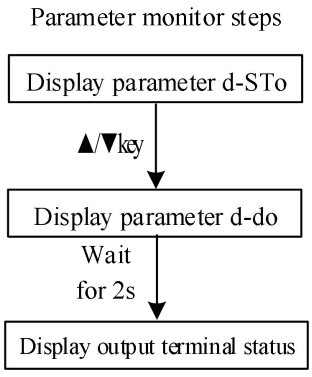
Corresponding relationship between terminal status and 16-bit binary system:

	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1
Lower 8 bits	B7	B6	B5	B4	B3	B2	B1	B0
	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1
Higher 8 bits	B15	B14	B13	B12	B11	B10	B9	B8

When Terminal DI input and higher 8 bits are valid, the corresponding binary system is “1”; otherwise, it is “0”; the lower 8 bits corresponding to higher 8 bits are taken as reverse.

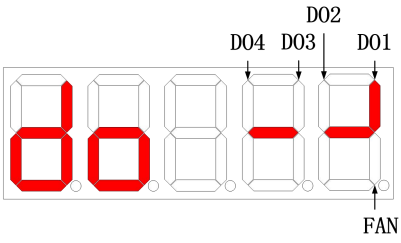
8.2.3 Example of monitoring output





The specific status of output terminal is as shown below

●Related function codes

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F9.0.20	Output terminal status (FAN) 	-	-	-	★	**PST**

Corresponding relationship between terminal status and 16-bit binary system:

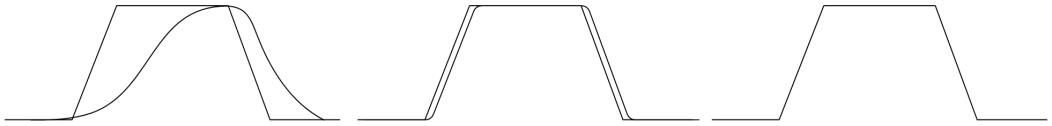
			FAN	DO4	DO3	DO2	DO1	
Lower 8 bits	B7	B6	B5	B4	B3	B2	B1	B0
			FAN	DO4	DO3	DO2	DO1	
Higher 8 bits	B15	B14	B13	B12	B11	B10	B9	B8

When Terminal DO output and higher 8 bits are valid, the corresponding binary system is “1”; otherwise, it is “0”; the lower 8 bits corresponding to higher 8 bits are taken as reverse.

Chapter 9 Adjustment

9.1 Overview of Servo Gain

Fast and accurate drive motor is required by the servo drive. The gain of servo drive must be adjusted, to make sure there's no delay in motor operation.



Gain level: Low
Position loop gain: 60 1/s
Speed loop gain: 30 Hz
Speed loop integral: 3100
Speed feedforward gain: 0

Load inertia ratio: 1
Gain level: high
Position loop gain: 100 1/s
Speed loop gain: 50 Hz
Speed loop integral: 2150
Speed feedforward gain: 0
Load inertia ratio: 1
Gain level: High+ feedforward
Position loop gain: 100 1/s

Speed loop gain: 50 Hz
Speed loop integral: 2150
Speed feedforward gain: 50%
Load inertia ratio: 1

9.2 Instructions of Servo Gain Adjustment

Servo gain is general and stable setting before leaving factory. The user can adjust the servo gain as required, in order to improve the responsiveness and timeliness. When installation is done, carry out inertia identification and rigid adjustment based on the status and environment of current system

9.2.1 Inertia identification

Method of inertia identification:

1)Ensure a motion space of being no smaller than 5 forward and backward rotations for motor;

2)Disabling;

3)Set F4103 as 1 (servo automatic enabling) to enter the status of inertia identification;

4) Keep pressing +key to enable positive identification of motor and keep pressing -key to enable reverse identification of motor;

(Identification will be finished for once after motor rotates for 1.5 circles. The identification results will be displayed on nixie tube in real time. Keep pressing the key and identification will be repeated. Loose the key and the motor will stop immediately. The display change of nixie tube will become small after positive and reverse identifications for 3~4 times respectively);

5)Press MODE key to exit identification (motor enabling will be disabled) and nixie tube will be switched to F4102 display value;

6) Adjust identification value (user judges if the ratio of identification inertia is proper based on realities; reduce the value of identification inertia if it is greater than 10.00). Press SET key and the identification result will become valid.

Note:If Err31 (inertia identification fault) occurs in course of normal identification, refer to 12 Troubleshooting.

●Related function codes

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F4.1.02	Inertia ratio	0.95~110.00	1.00	1	◇	**PST**
F4.1.03	Enable offline inertia identification mode 0: Disable 1: Enable	0~1	0	1	◇	**PST**
F4.1.04	Motor rotation turns for completing single identification	0~1000.0	1.5	turn	◇	**PST**
F4.1.05	Maximum speed of inertia identification	300~2000	600	rpm	◇	**PST**
F4.1.06	Time interval of offline inertia identification	0~65535	1000	ms	◇	**PST**
F4.1.07	Acceleration/deceleration of offline inertia identification	50~65535	150	ms	◇	**PST**

9.2.2 Gain Adjustment

Gain adjustment can be conducted after inertia identification is done. The rigidity corresponds to one group of gain parameter. For any mechanical resonance or motor whistle, the rigidity can be reduced by one level. When the current scenario fails to be satisfied after completing inertia identification and rigid adjustment, carry out fine adjustment to gain through F4.0.00 position loop gain, F4.0.01 speed gain, F4.0.02 speed integral and F4.0.03 torque command filtering.

●Related function codes

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F4.1.00	Enable rigidity meter	0~1	1	1	▲	**PST**
F4.1.01	Rigidity grade	0~31	Model	1	◇	**PST**
F4.0.00	Position loop gain 1 When position gain increases, it can improve the position responsiveness and reduce the position control error. However, vibration and noise may occur easily when it is too high.	0~3000	Model	1/s	◇	**P**
F4.0.01	Speed gain 1 When speed gain increases, it can improve the speed responsiveness. However, vibration and noise may occur easily when it is too high.	0~3000	Model	Hz	◇	**PST**
F4.0.02	Speed integral 1 When speed integral reduces, it can improve the speed responsiveness. However, vibration and noise may occur easily when it is too low.	20~10000	Model	0.01 ms	◇	**PST**
F4.0.03	Torque command filtering 1	0~50000	Model	0.01 ms	◇	**PST**

9.2.3 Gain Switch

The gain switch can be provided with gain switch and control through F4.0.20. Gain switch has three modes:

0: No switch, from the first gain

Not implement gain switch, use the first gain.

1: High/low speed switch

When the first gain is entered and the absolute value of speed command exceeds (level + return difference), it will be switched to the second gain; when the second gain is entered and the absolute value of speed command does not reach the status (level + return difference), it will return to the first gain after passing the time of gain switch delay, and it will be maintained at the second gain status within the delay period.

●Related function codes

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F4.0.20	Gain switch control 0: No switch, from the first gain 1: High/low speed switch 2: Reserved	0~2	0	1	◇	**PST**
F4.0.21	Gain switch level	0~65535	40	1	◇	**PST**
F4.0.22	Return difference of gain switch	0~65535	20	1	◇	**PST**
F4.0.23	Delay time of gain switch	0~65535	5	ms	▲	**PST**
F4.0.24	Last period of gain switch	0~65535	3	ms	▲	**PST**
F1.2.22	Forward maximum rotation speed	0~6000	3500	rpm	◇	**PST**
F1.2.23	Reverse maximum rotation speed	0~6000	3500	rpm	◇	**PST**
F1.2.24	Speed restriction source 0: Digital quantity (F1.2.22 and F1.2.23) 1: AI1 (decided by different direction and the minimum value of F1.2.22 and F1.2.23) 2: Reserved Select F1.2.2 or F1.2.23 as forward/reverse speed restriction through DI	0~3	0	1	▲	**ST**

9.2.4 Feedforward gain

In case of position control, the corresponding speed control value can be calculated through the servo position control command, and it can be compared with position feedback to get the speed feedforward; it enjoys higher responsiveness when compared with the exclusive use of feedback control. Likewise, the corresponding torque control value can be calculated through servo speed control command, and it can be compared with speed feedforward to get the torque feedforward, to improve the responsiveness of speed system.

1) Speed feedforward

Speed feedforward applies to position mode only. The speed feedforward gain can reduce the speed following error and ensure higher accuracy of speed.

●Related function codes

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F4.0.09	Enable speed feedforward 0: Invalid 1: Enable feedforward mode 1	0~2	0	1	◇	**P**

	2: Enable feedforward mode 2					
F4.0.10	Speed feedforward filtering time	0~65535	50	0.01 ms	◇	**P**
F4.0.11	Speed feedforward gain The gain will increase when speed control command has smooth change It can improve the speed following error. When speed control command has non-smooth change, the running vibration of mechanism can be reduced by reducing the gain.	0~200	0	%	◇	**P**

2) Torque feedforward

Under position mode, the torque feedforward can improve the torque command response and reduce the position error; under speed mode, it can also improve the torque command response and reduce the speed deviation.

●Related function codes

Function Code	Name	Set Range	Factory Default Value	Unit	Change Restriction	Valid Mode
F4.0.12	Enable torque feedforward	0~1	0	1	◇	**PST**
F4.0.13	Torque feedforward filtering time	0~65535	50	0.01 ms	◇	**PST**
F4.0.14	Torque feedforward gain	0~200	0	%	◇	**PST**

Chapter 10 Parameter Introduction

Function Group	Group Name
Group F0.0	Motor parameter
Group F1.0	Basic control parameter
Group F1.1	Position control parameter
Group F1.2	Speed control parameter
Group F1.3	Torque control parameter
Group F2.0	Input/output terminal parameter
Group F2.1	Analog quantity parameter
Group F2.2	Calibration parameter
Group F3.0	Internal position control parameter
Group F3.1	Internal speed control parameter
Group F4.0	Gain parameter
Group F4.1	Self-adaption parameter
Group F5.0	Failure protection and handling
Group F5.1	Fault record
Group F6.0	Display control
Group F6.1	Drive information
Group F7.0	User function customization
Group F8.0	Communication parameter
Group F9.0	Monitoring parameters

Introduction to Effective Modes:

P: Position control mode

S: Speed control mode

T: Torque control mode

Introduction to Change Limitation:

★: Read-only register

☆: Communication modifiable

▲: Run read-only

●: Re-power enabled

■: No backup data for power failure

◇: Unlimited

Introduction to Default Settings:

Motor: Default settings are associated with setting of F0.0.00 only

Model: Default settings are associated with default calibration of drive manufacturer only

10.1 Motor Parameter F0.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F0.0.00	Motor No.	H.0000~H.FFFF	*	1	★	PST
F0.0.01	Motor rated power	1~655.35	Motor	kw	★	PST
F0.0.02	Motor rated voltage	1~2000	Motor	V	★	PST
F0.0.03	Motor rated current	1~655.35	Motor	A	★	PST
F0.0.04	Motor rated torque	1~655.35	Motor	N.m	★	PST
F0.0.05	Motor max. torque	1~655.35	Motor	N.m	★	PST
F0.0.06	Motor rated speed	1~9000	Motor	rpm	★	PST
F0.0.15	Encoder zero bit value	4 poles: 2500-wire is 2350 before leaving factory; communication-type default factory value is -8110 5 poles: 2500-wire is 1880 before leaving factory; communication-type default factory value is -6550	Model	1	★	PST
F0.0.18	Enabling of motor parameter setting 0: Disable 1: Enable	0~1	0	1	■	PST
F0.1.01	Drive parameter number	H.0000～H.FFFF	*	1	★	PST

10.2 Basic Control Parameter F1.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F1.0.00	Control mode 0: Position mode (PT) 1: Position mode (PR) 2: Speed mode (S) 3: Torque mode (T) 4: Position mode (PT) ↔Speed mode (S) 5: Position mode (PT) ↔Torque mode (T) 6~8: Reserved 9: Sr trial run mode 10: Jog mode	0~10	0	1	▲	PST
F1.0.01	Select motor rotation direction 0: Forward direction of axis by default 1: Reverse of forward direction by default	0~1	0	1	▲	PST
F1.0.02	Frequency division output control H. 0 0 0 0 A B C D [A] Expansion width of Pulse Z 0: Original width 1~F: A * 6.4us [B] Polarity of Pulse Z 0: Positive polarity 1: Negative polarity [C] Frequency division source 0: Encoder	H.0000~H.9111	H.0000	1	▲	PST

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
	1: External pulse [D] Frequency division direction 0: Positive 1: Reverse					
F1.0.03	Pulse count per coil of frequency division output	32~32768	10000	pulse	▲	PST
F1.0.04	Shutdown mode I. 0 0 0 0 A B C D [A] Shutdown under Class 2 fault 0: Free shutdown, free status 0: Zero-speed shutdown, free status [B] Over-travel shutdown mode 0: Zero-speed shutdown, position lock 1: Free shutdown, free status 2: Zero-speed shutdown, free status [C] EMGS emergency shutdown mode 0: Free shutdown, free status 1: Zero-speed shutdown, free status [D] SON(OFF) shutdown mode 0: Free shutdown, free status 1: Zero-speed shutdown, free status	H.000~H.1211	H.0000	1	▲	PST
F1.0.05	SON brake ON delay (brake release delay)	1~1000	1	ms	▲	PST
F1.0.06	Delay of brake output ON to command receiving	1~1000	250	ms	▲	PST
F1.0.07	Static status, delay of brake OFF to motor power-off	1~2000	600	ms	▲	PST
F1.0.08	Revolving status, revolving speed threshold when brake is OFF	1~3000	30	rpm	▲	PST
F1.0.09	Revolving status, delay of brake OFF	1~1000	500	ms	▲	PST
F1.0.10	Revolving status, delay of brake OFF to motor power-off	1~1000	50	%	▲	PST
F1.0.11	Reserved	-	-	-	▲	PST
F1.0.12	Fan control 0: Revolving when running 1: Always on 2: Always off 3: Be revolving based on temperature	0~3	0	1	◇	PST
F1.0.13	Type of communication encoder 0: Single coil of communication encoder 1: Multi-ring communication encoder	0~1	0	1	▲●	PST
F1.0.14	The allowed min. brake resistance of drive	1~1000	Model	Ω	▲	PST
F1.0.15	Power of built-in brake resistor	1~65535	Model	W	▲	PST
F1.0.16	Resistance of built-in brake resistor	1~1000	Model	Ω	▲	PST
F1.0.17	Brake resistor selection 0: Enable built-in brake resistor 1: Enable external brake resistor (natural cooling) 2: Enable external brake resistor (strong wind cooling) 3: Disable brake resistor, be fully absorbed by capacitor	0~3	0	1	▲	PST
F1.0.18	Power of external brake resistor	1~65535	Model	W	▲	PST
F1.0.19	Resistance of external brake resistor	F1.0.14~1000	Model	Ω	▲	PST
F1.0.20	Brake enabling rate	0~200	200	%	▲	PST
F1.0.21	Coefficient of heat dispersion of resistor	1~65535	100	%	▲	PST

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F1.0.22	Single heating coefficient	1~65535	100	%	▲	PST
F1.0.27	Reverse wire order	0～1	0	1	▲	PST
F1.0.29	Storage shielding of communication eeprom	0～1	0	1	▲	PST

10.3 Position Control Parameter F1.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F1.1.01	Pulse command input mode H.0 0 | | A B [A] Pulse direction 0: Positive 1: Reverse [B] Pulse mode 0: Pulse + direction 1: Positive pulse sequence CW/CCW 2: orthogonal pulse AB	H.00~H.12	H.00	1	▲●	P
F1.1.02	When pulse count per coil of pulse command is F1.1.02 > 0, the electronic gear from F1.1.04 to F1.1.07 is invalid.	0~1073741824	0	pulse	●	P
F1.1.04	Numerator 1 of electronic gear ratio	1～65535	1	1	●	P
F1.1.05	Denominator 1 of electronic gear ratio	1～65535	1	1	●	P
F1.1.06	Numerator 2 of electronic gear ratio	1～65535	1	1	●	P
F1.1.07	Denominator 2 of electronic gear ratio	1～65535	1	1	●	P
F1.1.08	Reserved	-	-	-	-	-
F1.1.09	Reserved	-	-	-	-	-
F1.1.10	Low-pass filter coefficient of pulse command	0~2000	0	1	▲	P
F1.1.11	Mean filter coefficient of pulse command	0~2000	0	1	▲	P
F1.1.12	Signal filter coefficient of pulse command	0~1000	10	10ns	●▲	P
F1.1.13	Reserved	-	-	-	-	-
F1.1.14	Clearing of position error 0: Clear position error if servo is OFF and faulty 1: Reserved 2: Reserved	0~2	0	1	▲	P
F1.1.15	Output condition of location completion (COIN) 0: Absolute value of position error is below F1.1.16 1: Absolute value of position error is below F1.1.16 and filtered position command is 0. 2: Absolute value of position error is below F1.1.16 and outputs when position command is 0.	0~2	0	1	▲	P
F1.1.16	Amplitude of location completion	1~65535	10	pulse	▲	P
F1.1.17	Amplitude of location approaching	1~65535	1000	pulse	▲	P
F1.1.18	Switching control of electronic gear ratio (signal GEARSEL) 0: Position pulse command is 0 and lasts for 2.5 ms 1: Real-time switching	0~1	0	1	▲	P
F1.1.19	Reserved	-	-	-	-	-

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F1.1.20	Control over original point return mode H. 0 0 0 0 A B C D [A] Original point stop mode: 0: Upon finishing original point testing, motor is slowed down to the original point 1: Upon finishing original point testing, motor is slowed down towards the moving direction until it is stopped. [B] Original point trigger mode: 0: Disable original point reset function 1: Execute original point reset automatically when powered on 2: Original point reset triggered by SHOM signal input [C] Original point: 0: Original point is Z pulse 1: Original point is ORGP (Only when D=2,3). 2. Original point is limit switch (CW/CCW) (Only when D=0,1). [D] Type and searching direction of original point detector: 0: Reset original point at forward direction, CCWL is deceleration point 1: Reset original point at reverse direction, CWL is deceleration point 2: Reset original point at forward direction, ORGP is deceleration point 3: Reset original point at reverse rotation, ORGP is deceleration point 4: Seek Z pulse directly as the deceleration point 5: Search Z pulse directly in reverse rotation as the deceleration point	H.0000~H.1225	H.0000	1	▲	P
F1.1.21	Speed of original pint reset at high speed	0~2000	1000	rpm	▲	P
F1.1.22	Speed of original pint reset at low speed	0~500	50	rpm	▲	P
F1.1.23	Original point offset position (32-bit)	-9999999 ~9999999	1000	pulse	▲	P
F1.1.25	Z-pulse width	0～10000	1000	pulse	▲	PST
F1.1.26	Speed limit of position loop	0～300	120	Rated speed (%)	▲	P
F1.1.27	Logic of reverse wire order	0～1	0	1	▲	PST

10.4 Speed Control Parameter F1.2

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F1.2.00	Speed source selection 0: Digital quantity (F1.2.03) 1: AL1 2: Positive and negative rotation switching through TRLM and TLLM 3: Multistage speed	0~3	0		▲	**S**
F1.2.01	Reserved	-	-	-	-	**-**
F1.2.02	Reserved	-	-	-	-	**-**
F1.2.03	Speed keyboard setting	-6000～6000	0	rpm	◇■	**S**
F1.2.04	Auxiliary speed setting (see 4.4 Jog for details)	-6000.0～6000.0	0	rpm	★☆	**S**
F1.2.05	Acceleration period 0	0~30000	25	ms	◇	**PST**
F1.2.06	Deceleration period 0	0~30000	25	ms	◇	**PST**
F1.2.07	S smooth acceleration 0	0~10000	0	ms	◇	**PST**
F1.2.08	S smooth deceleration 0	0~10000	0	ms	◇	**PST**
F1.2.09	Acceleration period 1	0~30000	50	ms	◇	**PST**
F1.2.10	Deceleration period 1	0~30000	50	ms	◇	**PST**
F1.2.11	S smooth acceleration 1	0~10000	0	ms	◇	**PST**
F1.2.12	S smooth deceleration 1	0~10000	0	ms	◇	**PST**
F1.2.13	Acceleration period 2	0~30000	100	ms	◇	**PST**
F1.2.14	Deceleration period 2	0~30000	100	ms	◇	**PST**
F1.2.15	S smooth acceleration 2	0~10000	0	ms	◇	**PST**
F1.2.16	S smooth deceleration 2	0~10000	0	ms	◇	**PST**
F1.2.17	Acceleration period 3	0~30000	150	ms	◇	**PST**
F1.2.18	Deceleration period 3	0~30000	150	ms	◇	**PST**
F1.2.19	S smooth acceleration 3	0~10000	0	ms	◇	**PST**
F1.2.20	S smooth deceleration 3	0~10000	0	ms	◇	**PST**
F1.2.21	Reserved	-	-	-	-	**-**
F1.2.22	Max. positive revolving speed	0~6000	3500	rpm	◇	**PST**
F1.2.23	Max. reverse revolving speed	0~6000	3500	rpm	◇	**PST**
F1.2.24	Speed limitation source 0: Digital quantity (F1.2.22 and F1.2.23) 1: AL1 (determined by the min. value of F1.2.22 and F1.2.23 at different directions) 2: Reserved 3: Choose F1.2.22 or F1.2.23 as the positive/reserve speed limitation through DI	0~3	0	1	▲	**ST**
F1.2.25	Inching speed under PR mode	-6000～6000	0	rpm	●	PR
F1.2.26	Range of fixed-speed revolving at zero	0~6000	10	rpm	◇	**S**
F1.2.27	Range of motor revolving	0~1000	20	rpm	◇	**S**
F1.2.28	Speed deviation	0~100	10	rpm	◇	**S**
F1.2.29	Speed detection threshold	0~6000	1000	rpm	◇	**S**
F1.2.30	Zero speed detection range	0~6000	10	rpm	◇	**S**

10.5 Torque Control Parameter F1.3

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F1.3.00	Torque source selection 0: Digital quantity 0 (F1.3.02) 1: Digital quantity 1 (F1.3.03) 2: AI1 3: Reserved	0~3	1	1	◇	**T**
F1.3.02	Digital torque set as 0 (No backup data for power failure)	-300.0~300.0	0	%	■	**T**
F1.3.03	Digital torque set as 1 (backup data for power failure)	-300.0~300.0	0	%	◇	**T**
F1.3.04	Limitation of internal torque at positive direction	0~300.0	300.0	%	◇	**PST**
F1.3.05	Limitation of internal torque at reverse direction	0~300.0	300.0	%	◇	**PST**
F1.3.06	Limitation of external torque at positive direction	0~300.0	300.0	%	◇	**PST**
F1.3.07	Limitation of external torque at reverse direction	0~300.0	300.0	%	◇	**PST**
F1.3.08	Torque limitation source 0: Limitation of internal positive/negative torque 1: Switch forward/reverse external torque restriction and forward/reverse internal torque restriction (selected through TLLM and TRLM) 2: AI1 as limitation of positive/negative torque 3: Reserved 4: Choose limitation of external positive/negative torque and the min. value of AL1 as torque limitation (through TLLM and TRLM) 5: Reserved 6: Choose limitation of internal positive/negative torque and AL1 as torque limitation (through TLLM and TRLM) 7: Reserved	0~7	0	1	◇	**PST**
F1.3.10	Set torque type 0: 2-way limitation 1: Limitation at positive direction 2: Limitation at negative direction	0~2	0	1	◇	**T**
F1.3.11	Filtering of feedback current display	0~3000	10	ms	◇	**PST**
F1.3.12	Limitation of positive revolving speed	0~3000	0	rpm	◇	**T**
F1.3.13	Limitation of reverse revolving speed	0~3000	0	rpm	◇	**T**
F1.3.14	Torque reaches the reference value	0.0~300.0	0	%	◇	**T**
F1.3.15	Torque reaches the valid value	0.0~300.0	20.0	%	◇	**T**
F1.3.16	Torque reaches the invalid value	0.0~300.0	10.0	%	◇	**T**
F1.3.17	Control over torque reaching (TTOQ) 0: Basic torque hysteresis F1.3.14~F1.3.16 1~3: Reserved	0~3	0	1	◇	**T**
F1.3.18	Torque reaches shutdown delay	0~30000	0	ms	◇	**T**
F1.3.19	Torque reaches start-up revolving speed	0~4000	10	rpm	◇	**T**
F1.3.20	Torque reaches revolving stop speed	0~100	1	rpm	◇	**T**

10.6 Parameters of Input/output Terminal F2.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F2.0.00	Dl1 function selection (SON) 0: NON no function 1: SON servo enabling 2: ARST fault reset 3~4: Reserved 5: CMDSWT Multi-stage speed switching of revolving direction 6: CMD1 multi-stage command switching 1 7: CMD2 multi-stage command switching 2 8: CMD3 multi-stage command switching 3 9: CMD4 multi-stage command switching 4 10: M1SWT mode switching 1 11: M2SWT mode switching 2 12: ZCLAMP zero position fixing 13: INHP position command disabling 14: TLLM torque limitation of reverse rotation 15: TRLM torque limitation of positive rotation 16: JOGD jog reverse rotation 17: JOGU jog positive rotation 18: Reserved 19: GEARSEL electronic gear selection 20: TOQDIR torque command direction 21: SPDDIR speed command direction 22: POSDIR position command direction 23: MULPOS internal position command enabling (rising edge) 24: ORGP original point detection 25: SHOM enable original point reset 26: CWL reverse rotation limitation bit 27: CCWL positive rotation limitation bit 28: Reserved 29: CCLR clear register of pulse counter 30: EMGS emergency stop 31: Reserved 32: HOLD pause the internal position control command 33: SPDLRS switch speed limitation source 34：Zero clearing of feedback position of EncodePosClr communication encoder 41:AbsPosORPG origin of absolute position	0~41	1	1	▲	**PST**
F2.0.01	DI2 function selection (EMGS)	0~41	30	1	▲	**PST**
F2.0.02	DI3 function selection (CCWL)	0~41	27	1	▲	**PST**
F2.0.03	DI4 function selection (CWL)	0~41	26	1	▲	**PST**
F2.0.04	DI5 function selection (CCLR)	0~41	29	1	▲	**PST**
F2.0.05	DI6 function selection (INHP)	0~41	13	1	▲	**PST**
F2.0.06	DI7 function selection (TRLM)	0~41	15	1	▲	**PST**
F2.0.07	DI8 function selection (TLLM)	0~41	14	1	▲	**PST**

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F2.0.08	DI1 logic function selection 0: Logic or virtual input VDI1 (F2.0.18) 1: Logic or virtual input VDI1 (F2.0.18) 2: Logic XOR virtual input VDI1 (F2.0.18) 3: Logic or virtual input DI3 (DI3 function selection NON) 4: Logic and input DI3 (DI3 function selection NON) 5: Logic XOR virtual input DI3 (DI3 function selection NON)	0~5	0	1	▲	**PST**
F2.0.09	DI2 logic function selection 0: Logic or virtual input VDI2 (F2.0.19) 1: Logic and virtual input F2.0.19 (F2.0.19) 2: Logic XOR virtual input VI2 (F2.0.19) 3: Logic or input DI4 (DI4 function selection NON) 4: Logic and input DI4 (DI4 function selection NON) 5: Logic XOR input DI4 (DI4 function selection NON)	0~5	0	1	▲	**PST**
F2.0.10	DI1 function property H.0 0 0 | | | A B C [A] Filtering time selection 0~3: Filtering time 0~3 (F2.0.20~F2.0.23) [B] Delay time selection 0~3: Delay time 0~3(F2.0.24~F2.0.27) [C] Terminal logic 0: Positive logic 1: Negative logic	H.000~H.331	H.000	1	◇	**PST**
F2.0.11	DI2 function property	H.000~H.331	H.000	1	◇	**PST**
F2.0.12	DI3 function property	H.000~H.331	H.000	1	◇	**PST**
F2.0.13	DI4 function property	H.000~H.331	H.000	1	◇	**PST**
F2.0.14	DI5 function property	H.000~H.331	H.000	1	◇	**PST**
F2.0.15	DI6 function property	H.000~H.331	H.000	1	◇	**PST**
F2.0.16	DI7 function property	H.000~H.331	H.000	1	◇	**PST**
F2.0.17	DI7 function property	H.000~H.331	H.000	1	◇	**PST**
F2.0.18	Virtual input of VDI1 status	0~1	0	1	■	**PST**
F2.0.19	Virtual input of VDI2 status	0~1	0	1	■	**PST**
F2.0.20	DI filtering time 0	0~1000	10	ms	◇	**PST**
F2.0.21	DI filtering time 1	0~1000	10	ms	◇	**PST**
F2.0.22	DI filtering time 2	0~1000	10	ms	◇	**PST**
F2.0.23	DI filtering time 3	0~1000	10	ms	◇	**PST**
F2.0.24	DI delay time 0	0~10000	5	ms	◇	**PST**
F2.0.25	DI delay time 1	0~10000	5	ms	◇	**PST**

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F2.0.26	DI delay time 2	0~10000	5	ms	◇	**PST**
F2.0.27	DI delay time 3	0~10000	5	ms	◇	**PST**
F2.0.28	DO1 function selection (SRDY) 0: NON no function 1: SRDY servo preparation 2: SVON servo enabling 3: ZSPD zero speed detection 4: VCMP speed consistency output 5: COIN location completion output 6: NEAR location approaching output 7: TQL torque limitation output 8: VLT speed limitation output 9: BRK servo brake output 10: ALRM servo alarm output 11: WARN servo alarm output 12: HOME output of original point reset completion 13: TSPD speed reaching output 14: TTOQ torque reaching output 15: ANG initial angle identification completion 16: TGON motor revolving output 17: VARR speed detection 18: ZPHD zero positioning fixing output 19: MOD0 current running mode 0 of servo 20: MOD1 current running mode 1 of servo 21: MOD2 current running mode 2 of servo 22: MOD3 current running mode 3 of servo	0~22	1	1	▲	**PST**
F2.0.29	DO2 function selection (ALRM)	0~22	10	1	▲	**PST**
F2.0.30	DO3 function selection (TTOQ)	0~22	14	1	▲	**PST**
F2.0.31	DO4 function selection (BRK)	0~22	9	1	▲	**PST**
F2.0.33	DO1 property configuration H.0 0 | | A B [A] Delay time selection 0~3: Delay time 0~3 (F2.0.38~F2.0.41) [B] Terminal logic 0: Positive logic 1: Negative logic	H.00~H.31	H.00	1	◇	**PST**
F2.0.34	DO2 property configuration	H.00~H.31	H.00	1	◇	**PST**
F2.0.35	DO3 property configuration	H.00~H.31	H.00	1	◇	**PST**
F2.0.36	DO4 property configuration	H.00~H.31	H.00	1	◇	**PST**
F2.0.38	DO delay time 0	0~10000	5	ms	◇	**PST**
F2.0.39	DO delay time 1	0~10000	5	ms	◇	**PST**
F2.0.40	DO delay time 2	0~10000	5	ms	◇	**PST**
F2.0.41	DO delay time 3	0~10000	5	ms	◇	**PST**
F2.0.42	Limit enable effective	0-1	0	1	▲	PST

10.7 Analog Quantity Parameter F2.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F2.1.00	AI1 offset	-5.000~5.000	0	V	◇	**PST**
F2.1.01	AI1 filter coefficient	0~2000.0	2.0	ms	◇	**PST**
F2.1.02	AI1 dead zone + (positive)	0~5.000	0.006	V	◇	**PST**
F2.1.03	AI1 dead zone – (negative)	-5.000~0	-0.006	V	◇	**PST**
F2.1.04	AI1 zero drift voltage	-5.000~5.000	0	V	◇	**PST**
F2.1.05	Zero drift function selection H.0 0 | | A B [A] Function mode 0: Mode 0 1: Mode 1 [B] Startup mode 0: No calibration 1: Single keyboard/communication 2: Power-on delay 1 (delay 0.5s) 3: Power-on delay 2 (delay 1.0s) 4: Power-on delay 3 (delay 1.5s) 5: Power-on delay 4 (delay 2.0s)	H.00~H.15	H.00	1	▲●	**PST**
F2.1.06	Speed corresponds to 10V analog input	-6000~6000	3000	rpm	◇	**PST**
F2.1.07	Torque corresponds to 10V analog input	-500.0~500.0	100.0	%	◇	**PST**
F2.1.08	Setting of AO1 analog output 0: Motor revolving speed (1V: 1,000 rpm) 1: Speed command (1V: 1,000 rpm) 2: Torque command (1V: 100% rated) 3: Position deviation (0.05V: 1 pulse) 4: Pulse command frequency (0.01V: 1kHz) 5: AI1 voltage 6: Reserved 7: Output current (0.01V: 1A) 8: Busbar voltage (1V: 100V) 9: AO1 number setting (F2.1.09)	0~9	0	1	◇	**PST**
F2.1.09	AO1 number setting	-9.999~9.999	0.000	V	■	**PST**
F2.1.10	AO1 output offset	-10.00~10.00	0.00	V	◇	**PST**
F2.1.11	AO1 output gain	-10.00~10.00	1.00	Times	◇	**PST**

10.8 Calibration Parameter F2.2

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F2.2.00	AI1 measured value 1	-9.999~9.999	-8.000	V	◇	**PST**
F2.2.01	AI1 displayed value 1	-9.999~9.999	-8.000	V	◇	**PST**
F2.2.02	AI1 measured value 2	-9.999~9.999	8.000	V	◇	**PST**
F2.2.03	AI1 displayed value 2	-9.999~9.999	8.000	V	◇	**PST**
F2.2.04	AO1 measured value 1	-9.999~9.999	0.000	V	◇	**PST**
F2.2.05	AO1 target value 1	-9.999~9.999	0.000	V	◇	**PST**
F2.2.06	AO1 measured value 2	-9.999~9.999	8.000	V	◇	**PST**
F2.2.07	AO1 target value 2	-9.999~9.999	8.000	V	◇	**PST**

10.9 Internal Position Control Parameter F3.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F3.0.00	Internal position control mode 0: Shut down at completion of single running 1: Maintain at completion of single running 2: Constant circulating (reset position enabling 0) 3: Maintain N times of circulating 4: Switch DI terminal	0~4	1	1	▲	**P**
F3.0.01	Circulation times under circulating mode	1~65535	1	1	▲	**P**
F3.0.02	Number of valid segments	1~8	1	1	▲	**P**
F3.0.03	Number of initial segments since the first round	1~8	1	1	▲	**P**
F3.0.04	Internal position control word H.0 0 0 | | | A B C [A] Maintenance unit of completion time 0: ms 1: s [B] Position disconnection and restart 0: Continue running of unfinished segment 1: Restart [C] Position command type 0: Relative position 1: Absolute position (SON enabling at zero position)	H.000~H.111	H.000	1	▲	**P**
F3.0.05	Pulse at zero position (effective at absolute position)	-20000000000 ～ 20000000000	0	pulse	▲	**P**
F3.0.06	Reserve	–	–	–	–	–
F3.0.07	Pulse in the 1st segment	-20000000000 ～ 20000000000	0	pulse	◇	**P**
F3.0.08	Reserve	–	–	–	–	–
F3.0.09	Running speed of the 1st segment	-6000～6000	0	rpm	◇	**P**
F3.0.10	Selection of curve in the 1st segment 0: Curve 0, from F1.2.05~F1.2.08 1: Curve 1, from F1.2.09~F1.2.12 2: Curve 2, from F1.2.13~F1.2.16 3: Curve 3, from F1.2.17~F1.2.20	0~3	0	0	◇	**P**
F3.0.11	Maintenance period at the completion of the 1st segment (F3.0.04 [A])	0~65535	10	ms/s	◇	**P**
F3.0.12	Pulse in the 2nd segment	-20000000000 ～ 20000000000	0	pulse	◇	**P**
F3.0.13	Reserve	–	–	–	–	–
F3.0.14	Running speed of the 2nd segment	-6000～6000	0	rpm	◇	**P**
F3.0.15	Selection of curve in the 2nd segment	0~3	0	0	◇	**P**
F3.0.16	Maintenance period at the completion of the 2nd segment	0~65535	10	ms/s	◇	**P**
F3.0.17	Pulse in the 3rd segment	-20000000000 ～ 20000000000	0	pulse	◇	**P**

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F3.0.18	Reserve	–	–	–	–	–
F3.0.19	Running speed of the 3rd segment	-6000～6000	0	rpm	◇	**P**
F3.0.20	Selection of curve in the 3rd segment	0~3	0	0	◇	**P**
F3.0.21	Maintenance period at the completion of the 3rd segment	0~65535	10	ms/s	◇	**P**
F3.0.22	Pulse in the 4th segment	-20000000000 ～ 20000000000	0	pulse	◇	**P**
F3.0.23	Reserve	–	–	–	–	–
F3.0.24	Running speed of the 4th segment	-6000～6000	0	rpm	◇	**P**
F3.0.25	Selection of curve in the 4th segment	0~3	0	0	◇	**P**
F3.0.26	Maintenance period at the completion of the 4th segment	0~65535	10	ms/s	◇	**P**
F3.0.27	Pulse in the 5th segment	-20000000000 ～ 20000000000	0	pulse	◇	**P**
F3.0.28	Reserve	–	–	–	–	–
F3.0.29	Running speed of the 5th segment	-6000～6000	0	rpm	◇	**P**
F3.0.30	Selection of curve in the 5th segment	0~3	0	0	◇	**P**
F3.0.31	Maintenance period at the completion of the 5th segment	0~65535	10	ms/s	◇	**P**
F3.0.32	Pulse in the 6th segment	-20000000000 ～ 20000000000	0	pulse	◇	**P**
F3.0.33	Reserve	–	–	–	–	–
F3.0.34	Running speed of the 6th segment	-6000～6000	0	rpm	◇	**P**
F3.0.35	Selection of curve in the 6th segment	0~3	0	0	◇	**P**
F3.0.36	Maintenance period at the completion of the 6th segment	0~65535	10	ms/s	◇	**P**
F3.0.37	Pulse in the 7th segment	-20000000000 ～ 20000000000	0	pulse	◇	P
F3.0.38	Reserve	–	–	–	–	–
F3.0.39	Running speed of the 7th segment	-6000～6000	0	rpm	◇	P
F3.0.40	Selection of curve in the 7th segment	0~3	0	0	◇	P
F3.0.41	Maintenance period at the completion of the 7th segment	0~65535	10	ms/s	◇	P
F3.0.42	Pulse in the 8th segment	-20000000000 ～ 20000000000	0	pulse	◇	P
F3.0.43	Reserve	–	–	–	–	–
F3.0.44	Running speed of the 8th segment	-6000～6000	0	rpm	◇	P
F3.0.45	Selection of curve in the 8th segment	0~3	0	0	◇	P
F3.0.46	Maintenance period at the completion of the 8th segment	0~65535	10	ms/s	◇	P

10.10 Internal Speed Control Parameter F3.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F3.1.00	Speed control mode 0: Shut down at completion of single running 1: Maintain at completion of single running 2: Constant circulating N times of circulating 4: Switch DI terminal	0~4	1	1	▲	S
F3.1.01	Circulation times (valid when F3.1.00 is 3)	1~65535	1	1	▲	S
F3.1.02	Unit of speed and running period 0: 0.1 s 1: 0.1 min	0~1	0	1	▲	S
F3.1.04	Speed command of the 1st segment	-6000～6000	0	rpm	◇	S
F3.1.05	Running period of the 1st segment Time unit is determined by (F3.1.02)	0~6553.5	0	s/min	◇	S
F3.1.06	Selection of curve in the 1st segment 0: Curve 0, from F1.2.05~F1.2.08 1: Curve 1, from F1.2.09~F1.2.12 2: Curve 2, from F1.2.13~F1.2.16 3: Curve 3, from F1.2.17~F1.2.20	0~3	0	1	◇	S
F3.1.07	Speed command of the 2nd segment	-6000～6000	0	rpm	◇	S
F3.1.08	Running time of the 2nd segment	0~6553.5	0	s/min	◇	S
F3.1.09	Selection of curve in the 2nd segment	0~3	0	1	◇	S
F3.1.10	Speed command of the 3rd segment	-6000～6000	0	rpm	◇	S
F3.1.11	Running time of the 3rd segment	0~6553.5	0	s/min	◇	S
F3.1.12	Selection of curve in the 3rd segment	0~3	0	1	◇	S
F3.1.13	Speed command of the 4th segment	-6000～6000	0	rpm	◇	S
F3.1.14	Running time of the 4th segment	0~6553.5	0	s/min	◇	S
F3.1.15	Selection of curve in the 4th segment	0~3	0	1	◇	S
F3.1.16	Speed command of the 5th segment	-6000～6000	0	rpm	◇	S
F3.1.17	Running time of the 5th segment	0~6553.5	0	s/min	◇	S
F3.1.18	Selection of curve in the 5th segment	0~3	0	1	◇	S
F3.1.19	Speed command of the 6th segment	-6000～6000	0	rpm	◇	S
F3.1.20	Running time of the 6th segment	0~6553.5	0	s/min	◇	S
F3.1.21	Selection of curve in the 6th segment	0~3	0	1	◇	S
F3.1.22	Speed command of the 7th segment	-6000～6000	0	rpm	◇	S
F3.1.23	Running time of the 7th segment	0~6553.5	0	s/min	◇	S
F3.1.24	Selection of curve in the 7th segment	0~3	0	1	◇	S
F3.1.25	Speed command of the 8th segment	-6000～6000	0	rpm	◇	S
F3.1.26	Running time of the 8th segment	0~6553.5	0	s/min	◇	S
F3.1.27	Selection of curve in the 8th segment	0~3	0	1	◇	S

10.11 Gain Parameter F4.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F4.0.00	Position loop gain 1 Increase positional responsiveness and reduce position control error when position gain increases. However, excessive gain may lead to vibration and noise.	0~3000	Model	1/s	◇	**P**
F4.0.01	Speed gain 1 Increase speed responsiveness when position gain increases. However, excessive gain may lead to vibration and noise.	0~3000	Model	Hz	◇	**PST**
F4.0.02	Speed integral 1 Increase speed responsiveness when speed integral increases. However, low speed integral may lead to vibration and noise.	20~10000	Model	0.01ms	◇	**PST**
F4.0.03	Torque command filtering 1	0~50000	Model	0.01ms	◇	**PST**
F4.0.04	Position loop gain 2	0~3000	30	1/s	◇	**P**
F4.0.05	Speed integral 2	0~3000	50	Hz	◇	**PST**
F4.0.06	Speed integral 2	20~10000	2000	0.01ms	◇	**PST**
F4.0.07	Torque command filtering 2	0~5000	40	0.01ms	◇	**PST**
F4.0.08	Reserved	-	-	-	-	**-**
F4.0.09	Enabling of speed feedforward 0: Disabled 1: Enabled	0~1	0	1	◇	**P**
F4.0.10	Filtering period of speed feedforward	0~65535	50	0.01ms	◇	**P**
F4.0.11	Speed feedforward gain For any smooth variation of control command, increase gain to improve the speed following error. For any unsmooth variation of speed control command, decrease the gain to reduce the vibration of mechanism running.	0~200	0	%	◇	**P**
F4.0.12	Enabling of torque feedforward	0~1	0	1	◇	**PST**
F4.0.13	Filtering time of torque feedforward	0~65535	50	0.01ms	◇	**PST**
F4.0.14	Torque feedforward gain	0~200	0	%	◇	**PST**
F4.0.15	Speed command filtering	0~5000	0	0.01ms	◇	**PST**
F4.0.16	Speed feedback filtering	0~5000	0	0.01ms	◇	**PST**
F4.0.17	Reserved	-	-	-	-	**-**
F4.0.18	Torque feedback filtering	0~5000	0	0.01ms	◇	**PST**
F4.0.19	Feedback filtering of speed source 1	0~65535	50	0.01ms	◇	**PST**
F4.0.20	Gain switching control 0: No switching, from the first gain 1: High/low speed switching 2: Reserved	0~2	0	1	◇	**PST**
F4.0.21	Gain switching level	0~65535	40	1	◇	**PST**
F4.0.22	Gain switching difference	0~65535	20	1	◇	**PST**
F4.0.23	Delay time of gain switching	0~65535	5	ms	▲	**PST**
F4.0.24	Lasting time of gain switching	0~65535	3	ms	▲	**PST**
F4.0.25	Control coefficient of pseudo differential feedforward	0.0~100.0	100.0	%	◇	**PS**

10.12 Self-adaption Parameter F4.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F4.1.00	make Rigidity table effective	0~1	1	1	▲	**PST**
F4.1.01	Rigidity level	0~31	Model	1	◇	**PST**
F4.1.02	Inertia ratio	0.95~110.00	1.00	1	◇	**PST**
F4.1.03	Enabling of offline inertia identification mode 0: Disabling 1: Enabling	0~1	0	1	0	**PST**
F4.1.04	Number of motor coils at completion of single identification	0~1000.0	1.5	turn	◇	**PST**
F4.1.05	Max. speed of inertia identification	300~2000	600	rpm	◇	**PST**
F4.1.06	Interval of offline inertia identification	0~65535	1000	ms	◇	**PST**
F4.1.07	Acceleration/deceleration time of offline inertia identification	50~65535	150	ms	◇	**PST**
F4.1.08	Reserved	-	-	-	-	-
F4.1.09	Reserved	-	-	-	-	-
F4.1.10	Reserved	-	-	-	-	-
F4.1.11	Reserved	-	-	-	-	-
F4.1.12	Enabling of position identification (0: Disabled, 1: Enabled)	0~1	0	1	1	**PST**

10.13 Fault Protection and Troubleshooting F5.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F5.0.00	Enabling of motor overload protection (0: Disabled, 1: Enabled)	0~1	1	1	▲●	**PST**
F5.0.01	Motor overload protection coefficient	0~200	100	%	▲●	**PST**
F5.0.02	Translation coefficient of motor overload time	1~200	80	%	▲●	**PST**
F5.0.03	Motor overspeed level	0~200	120	%	▲●	**PST**
F5.0.04	Motor overspeed time	0~6000	20	ms	▲●	**PST**
F5.0.05	Enabling of out-of-tolerance position (0: Disabled; 1: Enabled)	0~1	1	1	▲●	**PST**
F5.0.06	Out-of-tolerance level of position Number of pulse per revolution of motor ×F5.0.06 (number of turns)	0~655.35	4.00	turn	▲●	**PST**
F5.0.07	Out-of-tolerance level of revolving speed	1~20000	6000	rpm	▲●	**PST**
F5.0.08	Out-of-tolerance detection time of revolving speed	0~6000	20	ms	▲●	**PST**
F5.0.09	Open-phase protection of input (0: Disabled; 1: Enabled)	0~1	Machine type	1	▲●	**PST**
F5.0.10	Open-phase protection of output (0: Disabled; 1: Enabled)	0~1	0	1	▲●	**PST**
F5.0.11	Overvoltage coefficient	0~200	100	%	▲●	**PST**
F5.0.12	Overvoltage time	1~65535	1	ms	▲●	**PST**
F5.0.13	Undervoltage coefficient	0~200	100	%	▲●	**PST**
F5.0.14	Undervoltage time	1~65535	100	ms	▲●	**PST**
F5.0.15	Brake on coefficient	0~200	120	%	▲●	**PST**
F5.0.16	Brake off coefficient	0~200	118	%	▲●	**PST**
F5.0.17	Speed loop and protection time	0~65535	10000	ms	▲●	**PST**
F5.0.18	Brake protection time	0~65535	1.6	s	▲●	**PST**
F5.0.19	Power failure judgment enabled	0~1	1	1	▲●	**PST**
F5.0.20	Power failure judgment cycle	0~65535	20	1	▲●	**PST**
F5.0.21	Scope of restriction of analog zero position	0～65535	500	1	▲●	PST

10.14 Fault Records F5.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F5.1.00	Code of the 1st fault	-	Err--	1	★	-
F5.1.01	Code of the 2nd fault	-	Err--	1	★	-
F5.1.02	Code of the 3rd fault	-	Err--	1	★	-
F5.1.03	Speed 1 at faulty condition	-9000~9000	-	rpm	★	-
F5.1.04	Current 1 at faulty condition	0~655.35	-	A	★	-
F5.1.05	Busbar voltage 1 at faulty condition	0~2000	-	V	★	-
F5.1.06	DI input status 1 at faulty condition (display is the same with F9.0.19)	-	-	1	★	-
F5.1.07	DO output status 1 at faulty condition (display is the same with F9.0.20)	-	-	1	★	-
F5.1.09	Power-on time 1 at faulty condition	0~65535	-	h	★	-
F5.1.10	Running time 1 at faulty condition	0~65535	-	h	★	-
F5.1.11	Speed 2 at faulty condition	-9000~9000	-	rpm	★	-
F5.1.12	Current 2 at faulty condition	0~655.35	-	A	★	-
F5.1.13	Busbar voltage 2 at faulty condition	0~2000	-	V	★	-
F5.1.14	DI input status 2 at faulty condition (display is the same with F9.0.19)	-	-	1	★	-
F5.1.15	DO output status 2 at faulty condition (display is the same with F9.0.20)	-	-	1	★	-
F5.1.17	Power-on time 2 at faulty condition	0~65535	-	h	★	-
F5.1.18	Running time 2 at faulty condition	0~65535	-	h	★	-
F5.1.19	Speed 3 at faulty condition	-9000~9000	-	rpm	★	-
F5.1.20	Current 3 at faulty condition	0~655.35	-	A	★	-
F5.1.21	Busbar voltage 3 at faulty condition	0~2000	-	V	★	-
F5.1.22	DI input status 3 at faulty condition (display is the same with F9.0.19)	-	-	1	★	-
F5.1.23	DO output status 3 at faulty condition (display is the same with F9.0.20)	-	-	1	★	-
F5.1.25	Power-on time 3 at faulty condition	0~65535	-	h	★	-
F5.1.26	Running time 3 at faulty condition	0~65535	-	h	★	-

10.15 Display Control Parameter F6.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F6.0.00	Display mode 0: Basic mode (FX.X.XX) 1: User mode (uX.X.XX) 2: Calibration mode (cX.X.XX)	0~2	0	1	◇	**PST**
F6.0.01	Selection of parameter group display H. 0 0 0 | | | A B C [A] Calibration group 0: Display calibration group parameter 1: Display calibration group parameter [B] User Group F7 0: Do not display Group F7 1: Display Group F7 [C] Password group 0: Do not display password group 1: Display password group	H.000~H.111	H.000	1	◇	**PST**
F6.0.02	Monitoring value 1 (see 4.2.2)	0~17	0	1	●	**PST**

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F6.0.06	Parameter initialization 9: Recover the default setting, except for password group, motor group, calibration group, fault information group, display control group and drive information group. 19: Recover the default setting, except for password group, motor group and equipment information group (this code is not recommended for customer). Enter the values above, display “rdy”, “-----” for several seconds and followed by “done”, which means recovery is done. 30：Backup parameters: 60：Recover backup parameters.	0~999	0	1	▲	**PST**
F6.0.07	Limitation of parameter change 0: Modifiable 1: Unmodifiable	0~1	0	1	◇	**PST**
F6.0.08	User password	0~65535	0	1	◇	**PST**

10.16 Drive Information F6.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F6.1.00	Accumulative running time	0~65535	0	h	★	**PST**
F6.1.01	Accumulative power-on time	0~65535	0	h	★	**PST**
F6.1.02	Reserved	0~65535	-	-	★	**PST**
F6.1.03	Version No.	-	-	1	★	**PST**
F6.1.04	Supplementation of version No.	-	-	1	★	**PST**
F6.1.05	FPAG version No.	-	-	1	★	**PST**
F6.1.06	Version No. of expansion board	-	-	1	★	**PST**
F6.1.07	Version No. of user	-	-	1	★	**PST**
F6.1.08	Reserved	-	-	-	★	**PST**
F6.1.09	Fault code	Err--~Err99	Err--	1	★	**PST**

10.17 User Function Customization F7.0

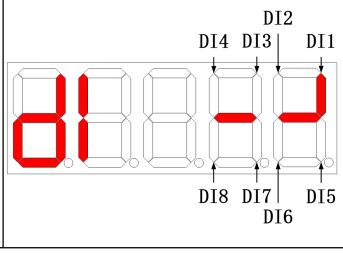
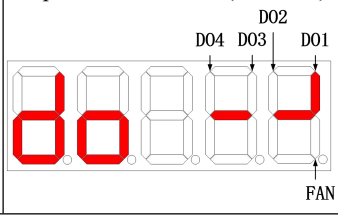
Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F7.0.00	User function 0	u0.0.00~u9.7.99	u6.0.00	1	★	**PST**
F7.0.01	User function 1	u0.0.00~u9.7.99	u1.0.00	1	◇	**PST**
F7.0.02	User function 2	u0.0.00~u9.7.99	u2.0.00	1	◇	**PST**
F7.0.03	User function 3	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.04	User function 4	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.05	User function 5	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.06	User function 6	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.07	User function 7	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.08	User function 8	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.09	User function 9	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.10	User function 10	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.11	User function 11	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.12	User function 12	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.13	User function 13	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.14	User function 14	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.15	User function 15	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F7.0.16	User function 16	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.17	User function 17	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.18	User function 18	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.19	User function 19	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.20	User function 20	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.21	User function 21	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.22	User function 22	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.23	User function 23	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.24	User function 24	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.25	User function 25	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.26	User function 26	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.27	User function 27	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.28	User function 28	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**
F7.0.29	User function 29	u0.0.00~u9.7.99	uF.F.FF	1	◇	**PST**

10.18 Communication Parameter F8.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F8.0.00	Communication selection 0: RS-485 1~3: Reserved	0~3	0	1	◇	**PST**
F8.0.01	RS-485 baud rate 0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps 4: 38400bps 5: 57600bps	0~5	2	1	◇	**PST**
F8.0.02	RS-485 data format 0: No calibration (8-N-2) 2: Even parity check (8-E-1) 2: Odd parity check (8-O-1) 3: No calibration (8-N-1)	0~3	0	1	◇	**PST**
F8.0.03	RS-485 local address (0: Broadcast address)	0~249	1	1	◇	**PST**
F8.0.04	RS-485 response delay	0~20	1	ms	◇	**PST**
F8.0.05	RS-485 communication timeout	0~60.0	0	s	◇	**PST**
F8.0.06	RS-485 selection of communication data transmission format 0: RTU mode 1: Reserved	0~1	0	1	◇	**PST**
F8.0.07	RS-485 disabling of command reply 0: Reply enabled 1: Reply disabled	0~1	0	1	◇	**PST**

10.19 Monitoring Parameter F9.0

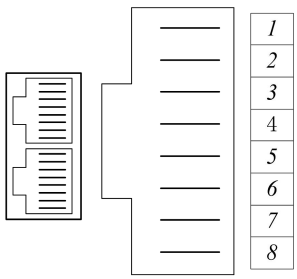
Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
F9.0.00	Motor revolving speed	-	-	rpm	★	**PST**
F9.0.01	Revolving speed command	-	-	rpm	★	**PST**
F9.0.02	Set revolving speed	-	-	rpm	★	**PST**
F9.0.03	Output torque [% rated]	-	-	%	★	**PST**
F9.0.04	Set torque [% rated]	-	-	%	★	**PST**
F9.0.07	Number of motor feedback pulse	-	-	pulse	★	**PST**
F9.0.08	Number of motor feedback turns	-	-	turn	★	**PST**
F9.0.09	Total number of command pulse L	-	-	pulse	★	**PST**
F9.0.10	Total number of command pulse H (*10000)	-	-	pulse	★	**PST**
F9.0.11	Common pulse frequency	-	-	hz	★	**PST**
F9.0.12	Difference between command pulse and feedback pulse	-	-	pulse	★	**PST**
F9.0.13	Mean torque [% rated]	-	-	%	★	**PST**
F9.0.14	Peak torque [% rated]	-	-	%	★	**PST**
F9.0.15	Busbar voltage	-	-	V	★	**PST**
F9.0.16	Module temperature	-	-	℃	★	**PST**
F9.0.17	AI1 voltage	-	-	V	★	**PST**
F9.0.19	Input terminal status 	-	-	-	★	**PST**
Relationship between terminal status and 16-bit binary system: DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1 Low 8-bit B7 B6 B5 B4 B3 B2 B1 B0 DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1 High 8-bit B15 B14 B13 B12 B11 B10 B9 B8 When input of Terminal DI and high 8-bit are valid, the corresponding binary system is “1”; otherwise, it is “0”; the corresponding bits of low 8-bit value are reverse to that of high 8-bit value.						
F9.0.20	Output terminal status (FAN-fan) 	-	-	-	★	**PST**

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode
Relationship between terminal status and 16-bit binary system: FAN DO4 DO3 DO2 DO1 | | | | | | | | Low 8-bit B7 B6 B5 B4 B3 B2 B1 B0 FAN DO4 DO3 DO2 DO1 | | | | | | | | High 8-bit B15 B14 B13 B12 B11 B10 B9 B8 When output of Terminal DO and high 8-bit are valid, the corresponding binary system is "1"; otherwise, it is "0"; the corresponding bits of low 8-bit value are reverse to that of high 8-bit value.						
F9.0.22	Effective current	-	-	A	★	**PST**
F9.0.23	Voltage before AI1 calibration	-	-	V	★	**PST**
F9.0.24	Brake protection time	-	-	1	★	**PST**
F9.0.25	Motor revolving speed (unfiltered)	-	-	rpm	★	**PST**
F9.0.26	Revolving speed command (post-treatment)	-	-	rpm	★	**PST**
F9.0.27	Command pulse and revolving speed (with electronic gear ratio)	-	-	rpm	★	**PST**
F9.0.28	Low motor position (Communication encoder)	-	-	pulse	★	**PST**
F9.0.29	High motor position (Communication encoder)	-	-	pulse	★	**PST**
Absolute position of 17-bit encoder = F9029×2 + F9028 % 2; Absolute position of 23-bit encoder = F9029×128 + F9028 % 128;(%: Except for remainder)						
F9.0.30	Revolution times of motor (Communication encoder)	-	-	turn	★	**PST**
F9.0.31	Reserved	-	-	1	★	**PST**
F9.0.32	Servo status (see 4.2.2 for details)	-	-	1	★	**PST**
F9.0.33	Load inertia	-	-	1	★	**PST**
F9.0.34	Command pulse	-	-	pulse	★	**P**
F9.0.35	Command pulse filtering value	-	-	pulse	★	**P**
F9.0.36	AI1 register value	-	-	1	★	**PST**
F9.0.37	Reserve	-	-	1	★	**PST**
F9.0.38 F9.0.39	Absolute position of motor encoder (32 digits) （For zero position clearing）	-	-	1	★	**PST**
F9.0.40 F9.0.41	Absolute position of motor encoder (32-bit)	-	-	1	★	**PST**
F9.0.42~F9.0.49	Reserved	-	-	-	-	-
F9.0.50	Brake tolerance coefficient	-	-	1	★	**PST**
F9.0.51～F9.0.55	Reserve	-	-	-	-	-
F9.0.56	Storage times of Eeprom	-	-	1	★	**PST**
F9.0.57	Overload tolerance coefficient	-	-	1	★	**PST**
F9.0.58	Reserve	-	-	-	-	-
F9.0.59	Absolute position origin	-	-	pulse	★	**PST**

Chapter 11 Introduction to RS-485 Communication

11.1 About RS-485 Communication Interface

With RS-232 and RS-485 communication being supported, the Product can realize functions such as parameter modification, parameter query and status monitoring of servo drive with the help of upper computer. RS-485 communication protocol, which supports single-master multi-slave communication mode and networking of multiple servo drives, does not support the networking of multiple servo drives however. Two communication signal connectors (CN3 and CN4) which are the same and provided with internal parallel-connection are adopted.

Pin No.	Definition	Description	Layout of Terminal Pin (Drive)
1	GNDG	Ground	
2	RS-	RS485 communication port	
3	RS+		
4	GNDG	Ground	
5	GNDG	Ground	
6	Reserved		
7	Reserved		
8	Reserved		
Shell	PE	Shielded	

11.2 Introduction to RS-485 Communication Parameter

Firstly set the “Select communication mode”, “Baud rate”, “Data format” and “Local address” and other communication parameters of the Product before use of communication.

Function Code	Name	Range	Default Value	Unit
F8.0.00	Communication selection 0: RS-485 1~3: Reserved	0~3	0	1
F8.0.01	RS-485 Baud rate 0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps 4: 38400bps 5: 57600bps	0~5	2	1
F8.0.02	RS-485 data format 0: No calibration (8-N-2) 1: Even parity check (8-E-1) 2: Odd parity check (8-O-1) 3: No calibration (8-N-1)	0~3	0	1
F8.0.03	RS-485 local address (0: Broadcast address)	0~249	1	1
F8.0.04	RS-485 response delay	0~20	1	ms
F8.0.05	RS-485 communication timeout	0~60.0	0	s
F8.0.06	RS-485 selection of communication data transmission format 0: RTU mode 1: Reserved	0~1	0	1
F8.0.07	RS-485 disabling of command reply 0: Reply enabled 1: Reply disabled	0~1	0	1

Response delay: Upon receiving the data, the Product will make reply to it after finishing the test set by function

code F8.0.04.

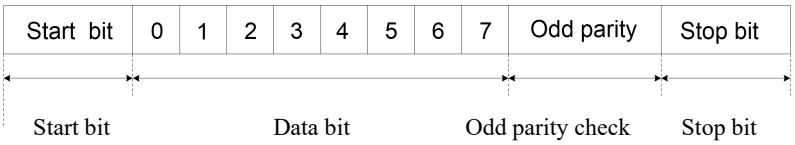
Communication timeout: If interval of data frames received by the Product exceeds the set time of function code, the Product will report communication timeout fault and this is considered as communication error. If the time is set as 0.0, the communication timeout will be disabled.

11.3 Introduction to Standard MODBUS Communication Format

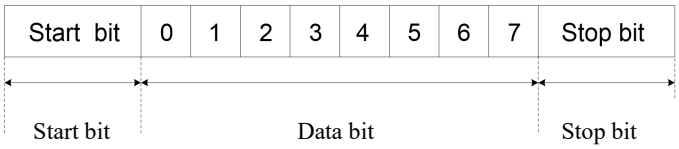
11.3.1 Character Structure

(8-E-1, F8.0.02=1)

(8-O-1, F8.0.02=2)



(8-N-1, F8.0.02=3)



11.3.2 MODBUS RTU Communication Data Structure

Read 16-bit and 32-bit function codes by using command code: read/write 16-bit and 32-bit function code by using the following command codes:

ADR	Slave (servo drive) address Address range of servo drive (001~247), (8-bit hexadecimal number) Note: When address ADR=000H, be effective to all slaves and no message will be sent by any slave (broadcasting method)
CMD	Function code of data packet (06: Write contents of one register 03: Read contents from 1 or multiple registers continuously) (8-bit hexadecimal number) 07: Write contents of 1 register, no data backup for power failure
ADRESS	Sending of master station: Data address (16-bit hexadecimal number) in case of 06 function code, or data initial address (16-bit hexadecimal number) in case of 03 function code Reply of slave station: Data address (16-bit hexadecimal number) in case of 06 function code, or data initial address (8-bit hexadecimal number) in case of 03 function code
DATA	Sending of master station: Data contents (16-bit hexadecimal number) in case of 06 function code, or data number (16-bit hexadecimal number) in case of 03 function code Reply of slave station: Data contents (16-bit hexadecimal number) in case of 06 function code, or data contents (N 8-bit hexadecimal number) in case of 03 function code
CRC	Detection error value (16-bit hexadecimal number)

CRC detection error value, which is adopted in RTU, is calculated according to the following steps:

Step 1: Load a 16-bit register (CRC register) with contents of FFFFH.

Step 2: Carry out XOR calculation to the first byte of communication data and contents in CRC register and store the results in CRC register.

Step 3: Move the contents of CRC register to the lowest significance bit for 1 bit, fill the highest significance bit with 0 and detect the lowest significance bit of CRC register.

Step 4: Carry out XOR calculation to the CRC register and preset values if the lowest significance bit is 1. No action if the lowest significance bit is 0.

Step 5: Repeat the Step 3 and 4 for 8 times and the manipulation of this byte is done.

Step 6: Repeat the Step 2-5 to the next byte of communication data, until manipulation of all bytes is done; the final contents of CRC register are the CRC values. The low bytes will be added and followed by high bytes when transferring CRC value, which means, the low bytes will be transferred firstly.

For any communication error, the slave will reply ADRESS and DATA as follows:

ADRESS	DATA	Introduction	ADRESS	DATA	Introduction
FF01	0001	Invalid address	FF01	0005	Invalid parameter
FF01	0002	CRC calibration error	FF01	0006	Parameter change invalid
FF01	0003	Command read/write error	FF01	0007	System lock
FF01	0004	Password error	FF01	0008	Storing parameters

11.4 Definition of Parameter Address of Communication Protocol

Introduction to Read/Write Address of Function Code Parameter:

The high bits of parameter address are composed of group and level of function code parameter, while the low bits of parameter address are composed of serial number.

EEPROM fails to be stored repeatedly during communication for some of them have limited service life; so, just change the values of RAM instead of storing the function codes into the EEPROM

Take the high-bit address of parameter address as hexadecimal value and convert the low-bit address into hexadecimal value as decimal numeral, in order to write the function codes into EEPROM. Finally, combine the high-bit and low-bit address into a 4-bit hexadecimal value.

For example, the address of F2.1.12 in EEPROM is:
High-bit address is hexadecimal 21, while low-bit address is decimal 12 and converted into hexadecimal 0C. So, the address is expressed as 0x210C.

The function code hundred place +4, if it does not need writing in EEPROM.
For instance, If reading-writing function code is F4101, operate RAM and the address is F4501.
Note: Contact the company for confirming the function code that needs writing for frequent communication.

11.5 Examples

Example 1 Set Revolving Speed of 1# Servo Drive

Set revolving speed of 1# servo drive as 1000 rpm

Method: Decimal 1000 is converted into hexadecimal 03E8H

Host sends data packet

ADR	01H
CMD	06H
ADRESS	12H
	03H
DATA	03H
	E8H
CRC	7CH
	0CH

Reply data packet

ADR	01H
CMD	06H
ADRESS	12H
	03H
DATA	03H
	E8H
CRC	7CH
	0CH

Example 2 Query Motor Revolving Speed of 1# Servo Drive

Query the "revolving speed" of 1# servo drive under the running status.

Method: Set the function code parameter of motor revolving speed as P9.0.00 and convert the address as 9000H

If "revolving speed" of 1# servo drive is 1000 rpm, the decimal 1000 will be converted into hexadecimal 03E8H

Host sends data packet

ADR	01H
CMD	03H
ADRESS	90H
	00H
DATA	00H
	01H
CRC	A9H
	0AH

Reply from slave

ADR	01H
CMD	03H
ADRESS	02H
DATA	03H
	E8H
CRC	B8H
	FAH

Chapter 12 Troubleshooting

12.1 Fault and Alarm Records

With fault recording function supported, the Product can record the name of the latest 3 faults, as well as the status parameters of the Product when fault or alarm occurs.

View the code of the latest 3 faults or alarms through the monitoring parameter of F5.1.00~F5.1.02. For example, “13” means Err. 13. The parameter shows “Err-- ” if there's no fault.

12.2 Diagnosis and Troubleshooting of Faults of Servo Drive

Fault	Introduction	Description	Troubleshooting
Err01	Hardware overcurrent	Feedback current from any phase is higher than the specified overcurrent point of drive.	● Check if the Product's output circuit has short circuit ● Check if load has sudden changes; ● Check if the motor or the Product has sufficient rated power;
Err05	Signal Z loss	Signal Z loss of incremental encoder	● Check if Signal Z is lost due to fault of the encoder; ● Check if Signal Z is lost due to poor or wrong wiring;
Err06	Current detection fault	Fault of current detection circuit	● Check the current sampling device; ● Check the Product;
Err08	Encoder fault 1	Detection fault of incremental encoder	● Check if the encoder has wrong wiring; ● Check if the encoder's cable is loose; ● Check if the encoder's Signal Z is disturbed; ● Check if motor encoder has fault;
Err09	Parameter storage fault	Read-write fault of internal storage chip	● Check the storage chip of control board
Err10	Zero-drift detection fault	Power-on zero-drift detection fault	● Check if there's excessive analog quantity or hardware interface fault at startup
Err11	Undervoltage of main circuit	DC busbar voltage between P⊕ and - is lower than the fault value: Grade 220V: 200V Grade 380V: 380V	● Check if wiring terminal is loose ● Check if there's instantaneous power failure or unstable power supply ● Check if power voltage is dropped in running process ● Check if there's open phase ● Check if the Product is faulty
Err12	Overvoltage of main circuit	DC busbar voltage between P⊕ and - is over fault value: Grade 220V: 420V Grade 380V: 760V	● Check if input voltage of main circuit is too high; ● Check if power supply is unstable or under lightning stroke; ● Check if resistor fails; ● Check if resistance of external resistor is too high; ● Check if sampled value of busbar voltage has high deviation ● Check if the Product is faulty;
Err13	Motor overspeed	Actual revolving speed of servo motor exceeds the fault threshold.	● Check if Phase U, V and W of motor cable are wrong; ● Check if Parameter F5.0.03 is wrong; ● Check if input command exceeds the threshold of overspeed fault; ● Check if motor speed exceeds the limit; ● Check if the Product is faulty;
Err15	Motor overload protection	Accumulative heat of motor is too high and reaches the fault threshold.	● Check if wiring of motor and encoder is wrong and poor; ● Check if load is too high and there's long-term and continuous running; ● Check if acceleration/deceleration is too frequent or load inertia is too high; ● Check if gain adjustment is proper or rigidity is too high; ● Check if model of the Product or model is set wrongly; ● Check if motor is blocked due to mechanical factor; ● Check if the Product is faulty;

Fault	Introduction	Description	Troubleshooting
Err16	Integral saturation fault of speed ring	Internal algorithm is saturated	● Check if wiring of motor and encoder is wrong and poor; ● Check if model of the Product or model is set wrongly; ● Check if motor is blocked due to mechanical factor; ● Check if the Product is faulty;
Err17	Open phase of input	Open phase of 3-phase drive	● Check if 3-phase input wiring is poor; ● Check if 3-phase drive is running under single phase; ● Check if 3-phase power is imbalanced or mean value of 3-phase voltage is too low; ● Check if the Product is faulty;
Err18	Open phase of output	The actual phase current of motor is lower than 10% of rated current;	● Check if power wire of motor is disconnected;
Err20	Position feedback fault	Motor running is out of control	● Check if wiring of motor and encoder is wrong and poor; ● Check if gain adjustment is proper or rigidity is too high; ● Check if model of the Product or model is set wrongly; ● Check if the Product is faulty;
Err21	Drive overheat	Temperature of the Product's power module is higher than the over-temperature protection point.	● Check if the ambient temperature is too high; ● Check if there's overload; ● Check if fan is damaged; ● Check if the Product's installation direction and spacing with other servo drives is reasonable; ● Check if the Product is faulty;
Err22	Original point reset timeout	Fail to find the original point within the specified period when recovering the Product's original point.	● Check if the original point switch is faulty; ● Check if the switching signal speed of high-speed original point searching is too low;
Err23	Position deviation is too high	Position deviation is over F5.0.06 under the position control mode.	● Check if the Product's output has open circuit or phase is connected wrongly; ● Check if the Product's output or encoder is d ● Check if motor is blocked due to mechanical factor; ● Check if the Product's gain is too low; ● Check if frequency of input pulse is too high; ● Check if fault value F5.0.06 is too low; ● Check if the Product/motor is faulty;
Err24	Speed deviation is too high	Speed deviation is over F5.0.07 and continuously higher than set value of F5.0.08 under the speed control mode.	● Check if the Product's output has open circuit or phase is connected wrongly ● Check if the Product's output or encoder is disconnected ● Check if motor is blocked due to mechanical factor; ● Check if the Product's gain is too low ● Check if fault value F5.0.07 is too low ● Check if the Product/motor is faulty;
Err25	Faults of identification of zero position	Faults of identification of zero position	● Check if the output of drive is in phase loss or if phase sequence is wrong ● Check if the output of drive or encoder is disconnected ● Check if there is any loaded learning ● Fault of servo drive/motor ● Encoder fault or shaft scratch

Fault	Introduction	Description	Troubleshooting
Err28	Brake resistor overload	Accumulative heat of the brake resistor is over the set value.	● Check if the wiring of external brake resistor is poor or disconnected ● Check if cable between P⊕ and D is falling or has open circuit when inspecting the built-in brake resistor ● Check if F1.0.17 is selected wrongly when inspecting the external brake resistor ● Check if the resistance of external resistor is too high when inspecting the resistance of external resistor ● Check if F1.0.19 is higher than the actual resistance of external brake resistor; ● Check if the input voltage of main circuit exceeds the specified range; ● Check if the ratio between load and rotational inertia is too high; ● Check if motor speed is too high; deceleration is finished within the specified deceleration period, and if it is under continuous deceleration status in periodic movement; ● Check if the Product or brake resistor's capacity is insufficient; ● Check if the Product/motor is faulty;
Err29	Alarm of over stroke at positive direction	Corresponding DI terminals of DI function 27 have valid logic.	● Check DI function 27: Disable drive at positive direction and check if terminal logic is valid.
Err30	Alarm of over stroke at reverse direction	Corresponding DI terminals of DI function 26 have valid logic.	● Check DI function 26: Disable drive at reverse direction and check if terminal logic is valid.
Err31	Inertia identification errors	Error of inertia identification process or result	● Check if the output of drive is in phase loss or if phase sequence is wrong ● Check if load is excessive and increase F4107 until it reaches 350 ● Check if there is any parameter conflict. Try to restore factory setting ● Fault of servo drive/motor
Err34	CPLD/FPGA initialization fault	-	● Please contact our technician.
Err35	CPLD/FPGA internal communication fault	-	● Please contact our technician.
Err36	Error of CPLD/FPGA version	Drive is not matched with motor	● Check drive model and motor type (Set busbar encoder motor for F0000, if the suffix of drive model is H; (Set incremental encoder motor for F0000, if the suffix of drive model is M;)
Err37	Internal position fault	-	● Please contact our technician.
Err97	Communication encoder battery fault	-	● Please change the encoder's batteries.
Err99	Communication encoder disconnection fault	-	● Please contact our technician.

Annex 1 Recommended Combination for Servo System

Taking some motors + 2500-line incremental photoelectric encoder as examples of the following combinations; in which, the motor S/N is named as follows：

2,500-wire incremental photoelectric encoder: H.0xxx

5,000-wire incremental photoelectric encoder: H.1xxx

17-bit communication encoder: H.2xxx

23-bit communication encoder: H.3xxx

Type 2S 220V drive is compatible with 1-phase 220v and 3-phase 220v input. Only 3-phase 220V input is supported by Type 2T drive.

Recommended Combination for 1/3-phase 220V Input of Drive			
Servo Motor		Servo Drive	
Motor S/N	Model	Model	Rated Current (A)
H. 0100	CDM-40S-M00130B01	CDS500-2S016M	1.6
H. 0101	CDM-40S-M00330B01		
H. 0200	CDM-60S-M00630B01	CDS500-2S030M	3
H. 0201	CDM-60S-M01330B01		
H. 0202	CDM-60S-M01930B01	CDS500-2S045M	4.5
H. 0300	CDM-80S-M01330B01	CDS500-2S030M	3
H. 0301	CDM-80S-M02430B01		
H. 0302	CDM-80S-M03520B01		
H. 0303	CDM-80S-M03530B01	CDS500-2S045M	4.5
H. 0304	CDM-80S-M04025B01		
H. 0305	CDM-80S-M04030B01		
H. 0400	CDM-90S-M02430B01	CDS500-2S030M	3
H. 0401	CDM-90S-M03520B01		
H. 0402	CDM-90S-M04025B01	CDS500-2S045M	4.5
H. 0600	CDM-110S-M02030B01	CDS500-2S030M	3
H. 0601	CDM-110S-M04020B01	CDS500-2S045M	4.5
H. 0602	CDM-110S-M04030B01	CDS500-2S060M	6
H. 0603	CDM-110S-M05030B01		
H. 0604	CDM-110S-M06020B01	CDS500-2S045M	4.5
H. 0605	CDM-110S-M06030B01	CDS500-2S060M	6
H. 0606	CDM-110S-M10010B01		
H. 0700	CDM-130S-M04025B01	CDS500-2S045M	4.5
H. 0701	CDM-130S-M05025B01	CDS500-2S060M	6
H. 0702	CDM-130S-M06025B01		
H. 0703	CDM-130S-M07715B01		
H. 0704	CDM-130S-M07725B01	CDS500-2S100M	10
H. 0705	CDM-130S-M10010B01	CDS500-2S045M	4.5
H. 0706	CDM-130S-M10015B01	CDS500-2S060M	6
H. 0707	CDM-130S-M10025B01	CDS500-2S100M	10
H. 0708	CDM-130S-M15015B01		

Recommended Combination for 1/3-phase 220V Input of Drive			
Servo Motor		Servo Drive	
Motor S/N	Model	Model	Rated Current (A)
H.0709	CDM-130S-M15025B01	CDS500-2S140M	14
H.070A	CDM-130S-M07720B01	CDS500-2S100M	10
H.070B	CDM-130S-M06030B01		
H.070C	CDM-130S-M07730B01		
H.070D	CDM-130S-M10020B01		
H.070F	CDM-130S-M04030B01	CDS500-2S045M	4.5
H.07A0	CDM-130S-M06015B01		
H.07A1	CDM-130S-M10030B01	CDS500-2S140M	14
H.07A2	CDM-130S-M15020B01		
H.0802	CDM-150S-M18020B01	CDS500-2T200M	20
H.0901	CDM-180S-M17015B01	CDS500-2S100M	10
H.0902	CDM-180S-M19015B01	CDS500-2S140M	14
H.0903	CDM-180S-M21520B01		
H.0904	CDM-180S-M27020B01	CDS500-2T200M	20
H.0905	CDM-180S-M27015B01		
H.0906	CDM-180S-M35010B01		
H.0907	CDM-180S-M19025B01		

Recommended Combination for 3-phase 380V Input of Drive			
Servo Motor		Servo Drive	
Motor S/N	Model	Model	Rated Current (A)
H.0310	CDM-80T-M04025B01	CDS500-4T085M	8.5
H.0610	CDM-110T-M06030B01		
H.0710	CDM-130T-M10010B01		
H.0711	CDM-130T-M10015B01		
H.0712	CDM-130T-M10025B01		
H.0713	CDM-130T-M15015B01		
H.0714	CDM-130T-M15025B01	CDS500-4T120M	12
H.0715	CDM-130T-M07725B01	CDS500-4T085M	8.5
H.0716	CDM-130T-M04025B01		
H.0717	CDM-130T-M05025B01		
H.0718	CDM-130T-M06025B01		
H.0719	CDM-130T-M07720B01		
H.071A	CDM-130T-M10020B01		
H.071B	CDM-130T-M10030B01		
H.071C	CDM-130T-M15030B01	CDS500-4T120M	12
H.071D	CDM-130T-M07730B01	CDS500-4T085M	8.5
H.071E	CDM-130T-M25020B01	CDS500-4T120M	12
H.071F	CDM-130T-M20020B01	CDS500-4T085M	8.5
H.0910	CDM-180T-M17015B01	CDS500-4T085M	8.5
H.0912	CDM-180T-M19015B01		
H.0913	CDM-180T-M21520B01	CDS500-4T120M	12
H.0914	CDM-180T-M27020B01	CDS500-4T200M	20
H.0915	CDM-180T-M27015B01	CDS500-4T120M	12
H.0916	CDM-180T-M35010B01		
H.0917	CDM-180T-M35015B01		
H.0918	CDM-180T-M48015B01	CDS500-4T200M	20
H.0919	CDM-180T-M35020B01		
H.091A	CDM-180T-M21525B01	CDS500-4T120M	12
H.0A13	CDM-200T-M70015B01	CDS500-4T200M	20

Recommended Combination for 1/3-phase 220V Input of Drive（5 pair poles）			
Servo Motor		Servo Drive	
Motor S/N	Model	Model	Rated Current (A)
H.XXXX	CDM-40S-M00130B01-5	CDS500-2S016M	1.6
H.XXXX	CDM-40S-M00330B01-5		
H.XXXX	CDM-60S-M00630B01-5	CDS500-2S030M	3
H.0281	CDM-60S-M01330B01-5		
H.0282	CDM-60S-M01930B01-5	CDS500-2S045M	4.5
H.0381	CDM-80S-M02430B01-5	CDS500-2S060M	6
H.0387	CDM-80S-M02430B01X-5	CDS500-2S045M	4.5
H.0382	CDM-80S-M03330B01-5	CDS500-2S060M	6
H.07D1	CDM-130S-M05415B01-5	CDS500-2S100M	10
H.07D2	CDM-130S-M08315B01-5	CDS500-2S140M	14
H.07D5	CDM-130S-M11515B01-5		
H.XXXX	CDM-130S-M14315B01-5		
H.XXXX	CDM-130S-M06415B01-5	CDS500-2S100M	10
H.XXXX	CDM-130S-M07515B01-5		
H.XXXX	CDM-130S-M09615B01-5		
H.XXXX	CDM-130S-M17815B01-5	CDS500-2T200M	20
H.078A	CDM-130S-M05415B01S-5	CDS500-2S060M	6
H.078B	CDM-130S-M08315B01S-5	CDS500-2S100M	10
H.078C	CDM-130S-M11525B01S-5		
H.XXXX	CDM-130S-M14615B01S-5	CDS500-2T200M	20
H.07DA	CDM-130S-M04820B01S-5	CDS500-2S060M	6
H.XXXX	CDM-130S-M07220B01S-5	CDS500-2S100M	10
H.XXXX	CDM-130S-M09620B01S-5	CDS500-2S100M	10
H.XXXX	CDM-130S-M14320B01S-5	CDS500-2T200M	20

Recommended Combination for 3-phase 380V Input of Drive（5 pair poles）			
Servo Motor		Servo Drive	
Motor S/N	Model	Model	Rated Current (A)
H.XXXX	CDM-130T-M05415B01-5	CDS500-4T085M	8.5
H.XXXX	CDM-130T-M08315B01-5		
H.XXXX	CDM-130T-M11515B01-5		
H.XXXX	CDM-130T-M14315B01-5	CDS500-4T120M	12
H.XXXX	CDM-130T-M06415B01-5	CDS500-4T085M	8.5
H.XXXX	CDM-130T-M07515B01-5		
H.XXXX	CDM-130T-M09615B01-5		
H.XXXX	CDM-130T-M14615B01-5	CDS500-4T120M	12
H.XXXX	CDM-130T-M17815B01-5		
H.XXXX	CDM-130T-M05415B01S-5	CDS500-4T085M	8.5
H.XXXX	CDM-130T-M08315B01S-5		
H.XXXX	CDM-130T-M11525B01S-5		
H.XXXX	CDM-130T-M14615B01S-5	CDS500-4T120M	12
H.XXXX	CDM-130T-M04820B01S-5	CDS500-4T085M	8.5
H.XXXX	CDM-130T-M07220B01S-5		
H.07EC	CDM-130T-M09620B01S-5		
H.XXXX	CDM-130T-M14320B01S-5	CDS500-4T120M	12
H.0984	CDM-180T-M18615B01X-5	CDS500-4T120M	12
H.XXXX	CDM-180T-M28415B01X-5	CDS500-4T200M	20
H.0997	CDM-180T-M35015B01X-5		
H.0968	CDM-180T-M48015B01X-5		
H.XXXX	CDM-180T-M18615B01-5	CDS500-4T120M	12
H.XXXX	CDM-180T-M28415B01-5	CDS500-4T200M	20
H.XXXX	CDM-180T-M35015B01-5		
H.XXXX	CDM-180T-M48015B01-5		

Version Information

Date	Version	Change
November, 2023	V0.0	Publish first version