

Instructions of CDS500-EC Series Servo Drive

Delixi (Hangzhou) Inverter Co., Ltd.

To Users

Dear Users,

Thank you for choosing the CDS500-EC 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 Delixi, the Product has power range of 100W~7.5kW, supports MODBUS communication protocol and provides 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 moulder, 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

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Chapter 1 Safety & Notice

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

 Warning	Installation and maintenance should be carried out by professional technicians only.
	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!
 Anti-static	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!
	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

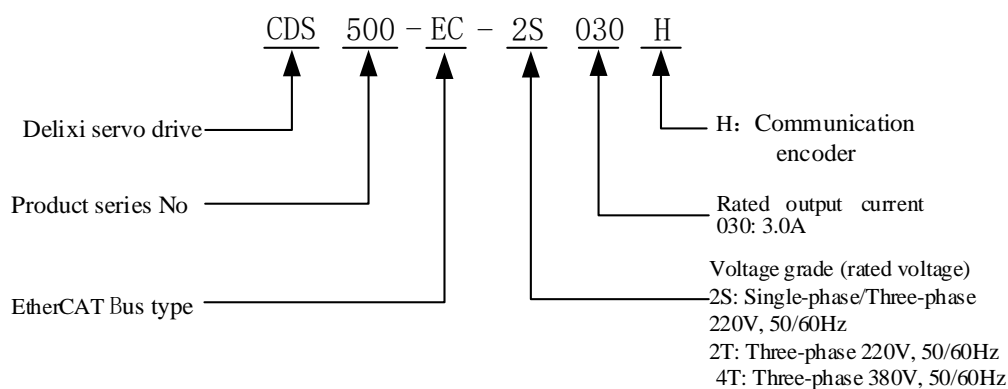
The ambient environment for the servo system: Annual mean ambient temperature: 30°C; Mean load rate: Below 80%; daily running period: Below 20 h. Carry out daily and regular inspection according to the following key points:

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



DELIXI

Model: CDS500-EC-2S030H

Input: AC 1PH/3PH 220V \pm 10% 50/60Hz

Output: AC 3PH 0-220V 0-400Hz 3.0A

Hardware Ver.: 1.0.00 **Software Ver.:** 7.00



CDS500-EC-2S030H201014268

德力西(杭州)变频器有限公司
DELIXI HANGZHOU INVERTER CO., LTD.

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	<p>0 0 0 0 0</p> <p>MODE ↑ ↓ SET →</p> <ul style="list-style-type: none"> 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	Applies to connection of EtherCAT communication device
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/L2C Connect 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_{Φ} , \ominus DC busbar terminal	DC busbar terminal applies to common DC busbar of multiple drives
Connect P_{Φ} , D, C to brake resistance terminal	Connect short contact tag between P_{Φ} and D as default. Remove the short contact tag between P_{Φ} and D and connect brake resistor to P_{Φ} 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

Item		Specification		
Basic Parameters	Rated current	CDS500-EC-2S Series	1.6~14.0A	
		CDS500-EC-2T Series	20A	
		CDS500-EC-4T Series	8.5~20A	
	Power supply of main circuit	2S series	1-phase /3-phase AC220V±10%, 50/60Hz	
		2T series	3-phase AC220V±10%, 50/60Hz	
		4T series	3-phase AC380V±10%, 50/60Hz	
	Power supply of control circuit	2S series	1-phase AC220V±10%, 50/60Hz	
2T series				
4T series		1-phase AC380V±10%, 50/60Hz		
Control Mode		Position control		
Encoder Feedback		Communication encoder		
Regenerative Brake		Internal/external		
Configuration	P24V power supply	P24V-COM; max. output: 200 mA		
	P5V power supply	P5V-GND; max. output: 200 mA		
	Pulse input	P_HI, PULSE+, PULSE-, S_HI, SGN+, SGN-; both of differential input and open collector input are supported		
	Digital input	5-way digital input terminal (DI1~DI5). Both of internal/external power supply are supported		
	Digital output	3-way digital output terminal (DO1~DO3); max. output: 20 mA		
	Frequency dividing output	Frequency dividing output of Pulse-Z collector		
Control Characteristic	Velocity – bandwidth response	Over 1.6KHz		
	Speed fluctuation ratio:	<±1.5% (Load 0~100%); <±0.3% (Power -15~+10%) (Value corresponds to the rated speed)		
	Speed ratio	1:30000		
	Input pulse frequency	≤500kHz		
Position Control	Input mode	① Pulse + signal ② CW pulse + CCW pulse ③ Orthogonal Phase AB pulse		
	Electronic gear ratio	1~65535/1~65535		
Item		Specification		
Feedback Mode		Feedback by motor shaft encoder		
Parameter Setting Mode		① Be set and inputted via keyboard ② EtherCAT communication input		
Load Inertia		Lower than 20 times of motor inertia		
Brake Mode		Resistance energy braking		

2.1.4 Product List

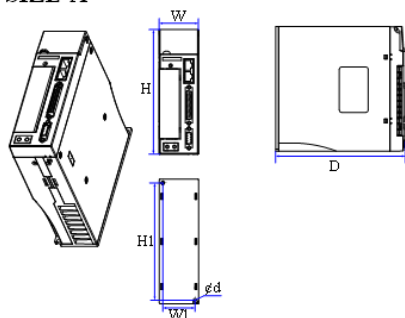
List of CDS500-EC series products

Drive Model	Rated Output Current	Max. Output Current	Brake Resistance	Voltage Grade	
				Main Circuit	Control Circuit
2S (1-phase 220V±10%, 50/60Hz)					
CDS500-EC-2S016H	1.6A	4.8A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-EC-2S030H	3.0A	9A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-EC-2S045H	4.5A	13.5A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-EC-2S060H	6.0A	18A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-EC-2S100H	10A	30A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
CDS500-EC-2S140H	14A	42A	Standard configuration, built-in	1-phase/3-phase 220V	1-phase 220V
2T (3-phase 220V±10%, 50/60Hz)					
CDS500-EC-2T200H	20A	60A	Standard configuration, built-in	3-phase 220V	1-phase 220V
4T (3-phase 380V±10%, 50/60Hz)					
CDS500-EC-4T085H	8.5A	25.5A	Standard configuration, built-in	3-phase 380V	1-phase 380V
CDS500-EC-4T120H	12A	36A	Standard configuration, built-in	3-phase 380V	1-phase 380V
CDS500-EC-4T200H	20A	60A	Standard configuration, built-in	3-phase 380V	1-phase 380V

2.1.5 Appearance & Mounting Dimensions

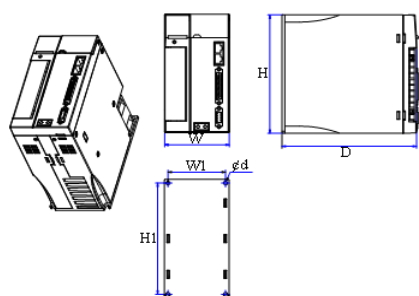
Dimension drawings of CDS500-EC series

SIZE-A



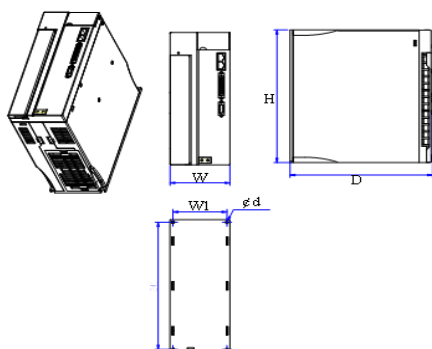
Drive model	W	W1	H	H1	D	Ø d
CDS500-EC-2S016H	55	45	166	156	179	5
CDS500-EC-2S030H						
CDS500-EC-2S045H						
CDS500-EC-						

SIZE-B



Drive model	W	W1	H	H1	D	Ø d
CDS500-EC-4T085H	90	80	166	156	187.1	5.5
CDS500-EC-2S100H						
CDS500-EC-2S140H						

SIZE-C



Drive model	W	W1	H	H1	D	Ø d
CDS500-EC-2T200H	100	90	251	241	227.7	5.5
CDS500-EC-4T200H						

Unit: mm

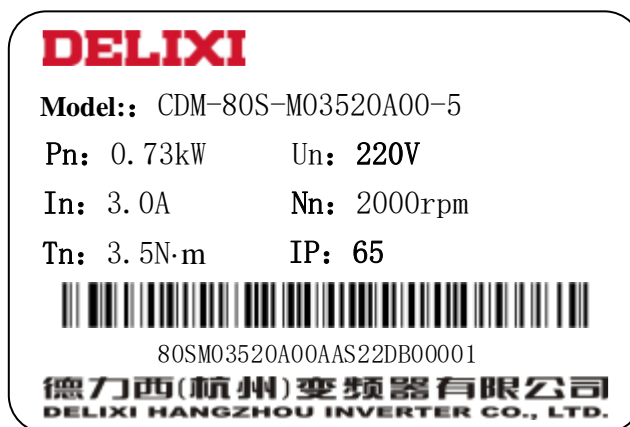
2.1.6 Specification of Brake Resistor

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-EC-2S016H	50	50	50	9
	CDS500-EC-2S030H	50	50	50	18
	CDS500-EC-2S045H	50	50	50	24
	CDS500-EC-2S060H	50	50	50	32
	CDS500-EC-2S100H	25	100	18	50
	CDS500-EC-2S140H	25	100	15	60
3-phase 220V	CDS500-EC-2T200H	25	100	20	85
3-phase 380V	CDS500-EC-4T085H	50	100	30	50
	CDS500-EC-4T120H	50	100	30	50
	CDS500-EC-4T200H	30	100	25	120

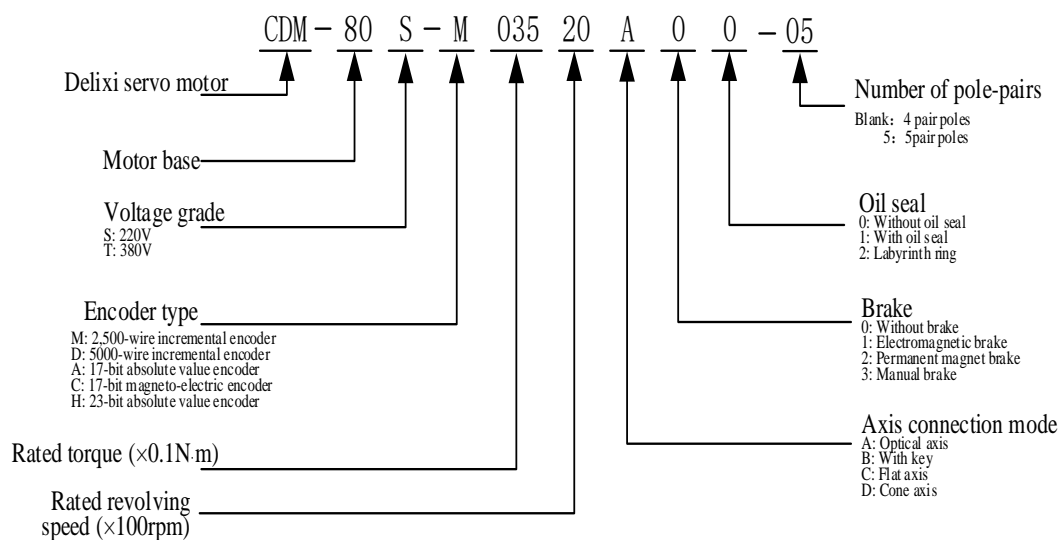
The built-in brake resistor applies to small-inertia and non-frequent braking only. For any high braking torque or repeated braking, the user needs to install the large-power brake resistor and select the brake resistance carefully by referring to the table above. For any query, please call our technicians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

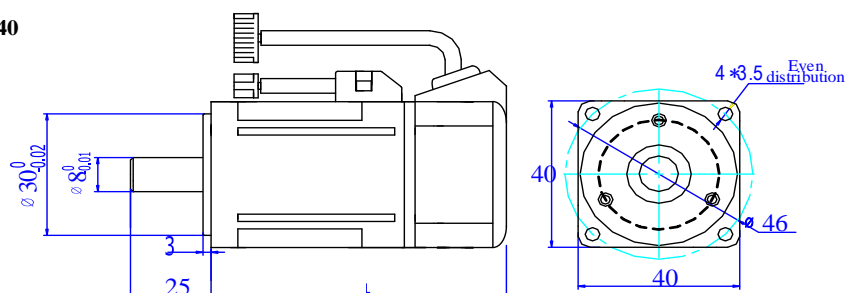
Item	Description
Rated Period	Continuous
Vibration Grade	V15
Insulation Grade	Over DC500V, 10MΩ
Ambient Temperature	-20°C~40°C
Excitation Mode	Permanent magnet type
Mounting Type	Flange type
Classification of Electrical Insulation	Class F
Insulation Voltage	AC1500V1 min (Class 200V) AC1800V1 min (Class 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 0.5mm² are recommended.

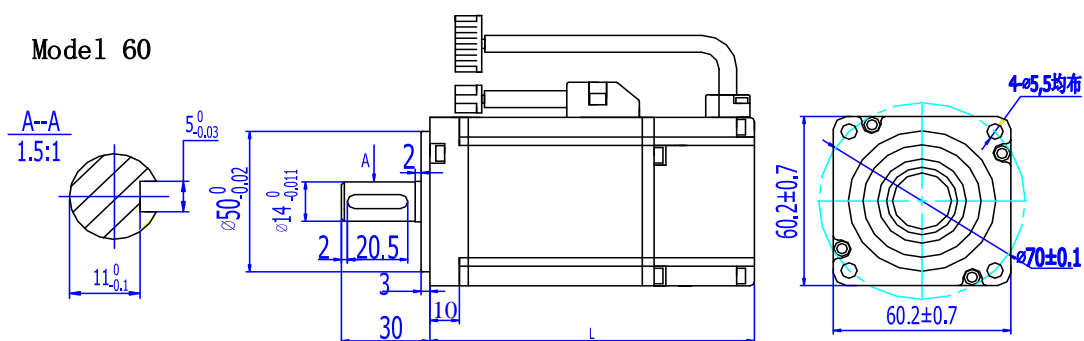
2. 2. 3 Servo motor size specifications

Model 40



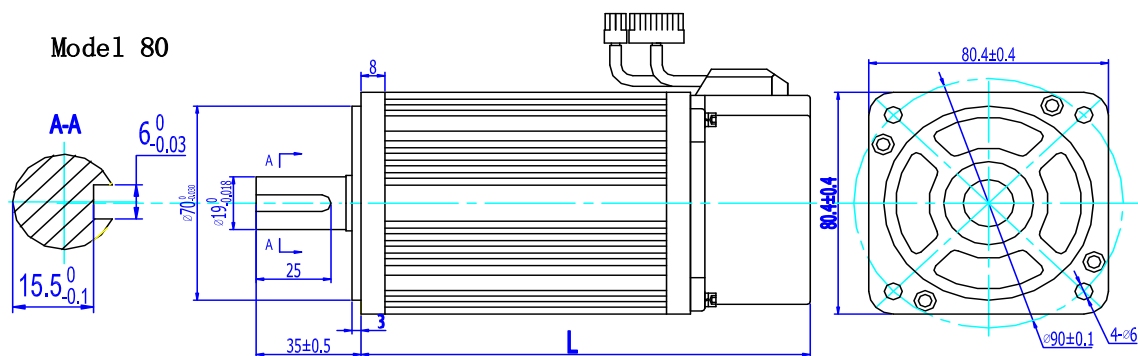
specifications	0.16N·m	0.32N·m
L without brake	75	90
L with permanent magnet brake	109	124

Model 60



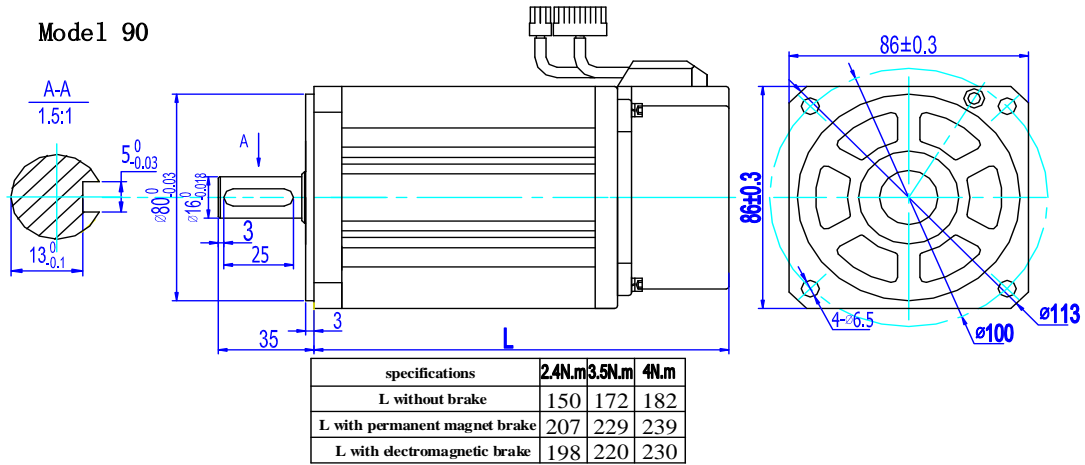
specifications	0.6N.m	1.3N.m	1.9N.m
L without brake	116	141	169
L with permanent magnet brake	164	189	217

Model 80

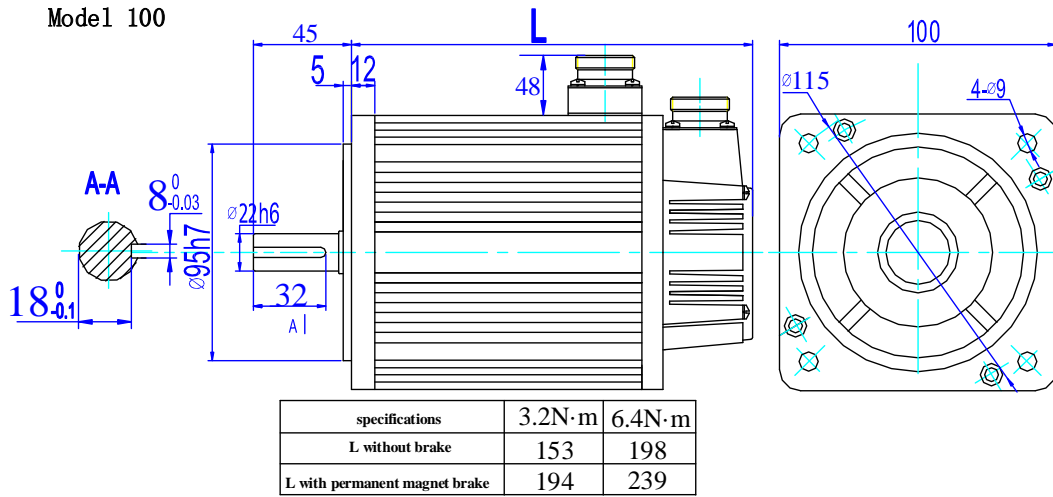


specifications	1.3N.m	2.4N.m	3.5N.m	4N.m
L without brake	124	151	179	191
L with permanent magnet brake	178	205	233	245
L with electromagnetic brake	164	191	219	231

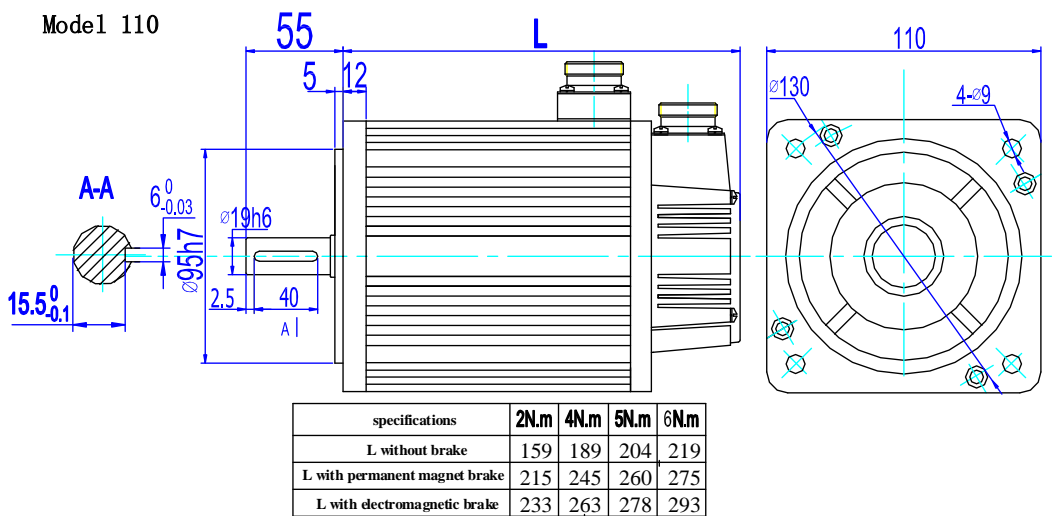
Model 90

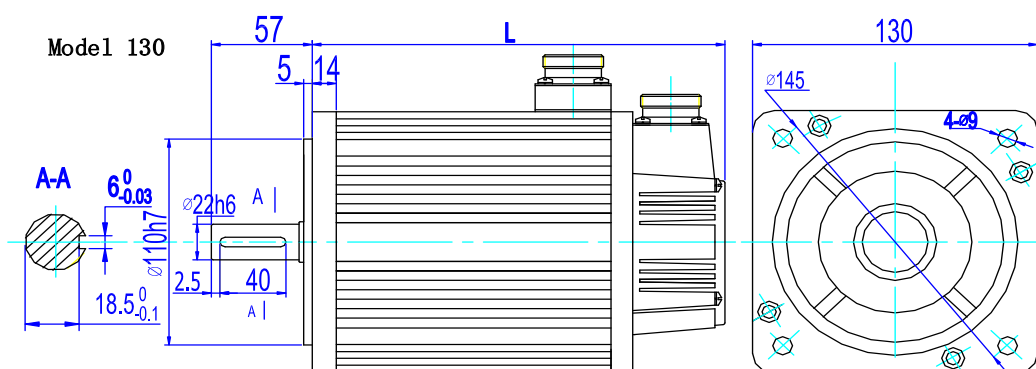


Model 100

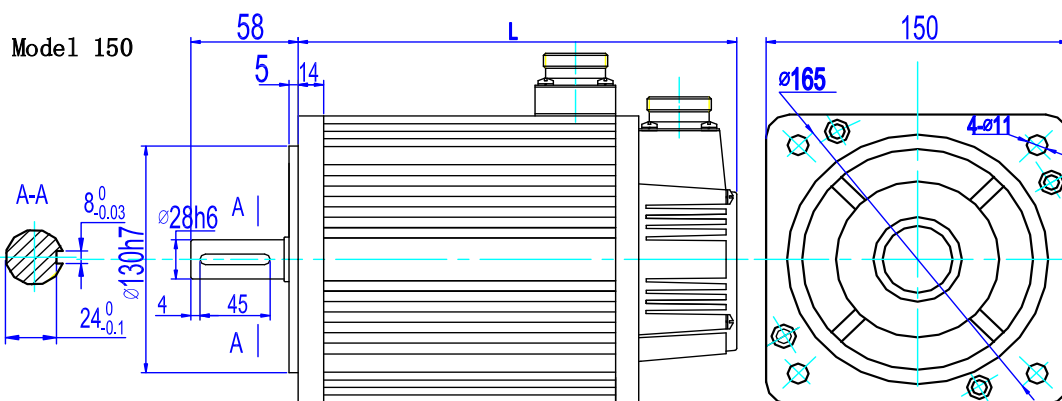


Model 110

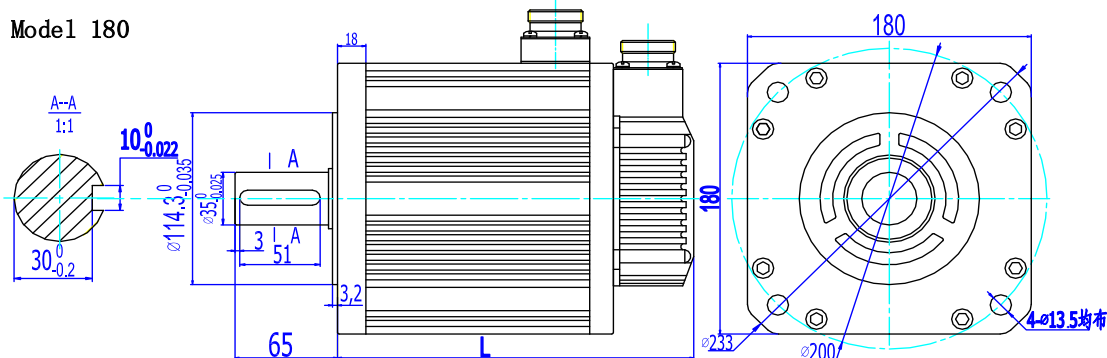




specifications	4N.m	5N.m	6N.m	7.7N.m	10N.m			15N.m	
					1000r	1500r	2500r	1500r	2500r
L without brake	166	171	179	192	213	209	241	231	
L with permanent magnet brake	236	241	249	262	283	279	311	301	
L with electromagnetic brake	223	228	236	249	294	290	322	312	



specifications	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



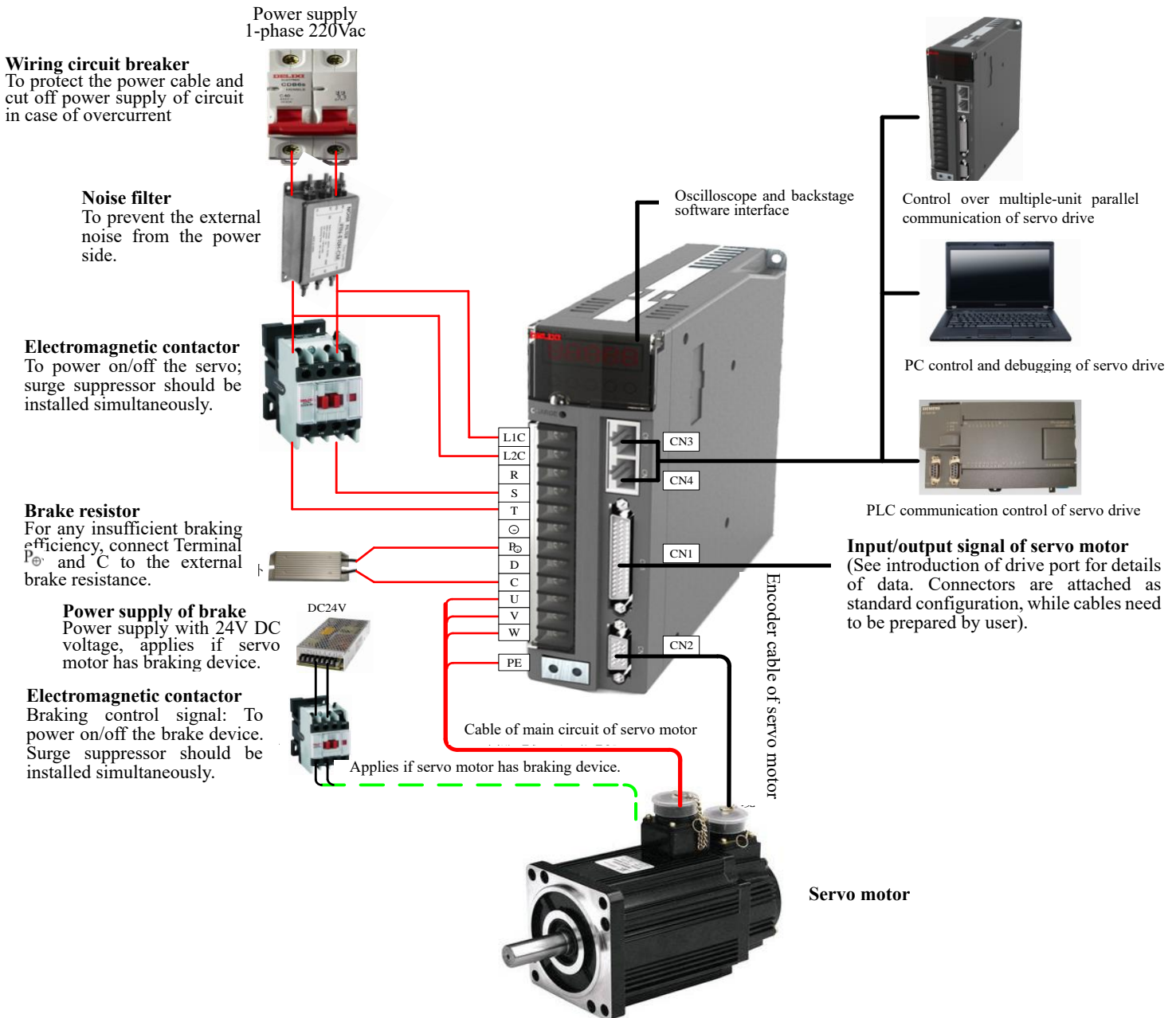
specifications	17.2N.m	19N.m	21.5N.m	27N.m	35N.m	48N.m
L without brake	226	232	243	262	292	346
L with permanent magnet brake	308	314	325	344	382	436
L with electromagnetic brake	298	304	315	334	364	418

Unit: mm

Note: The motor above is of 4 pair poles

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

Power supply
3-phase 220/380Vac

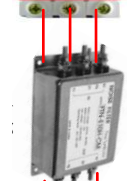
Wiring circuit breaker

To protect the power cable and cut off power supply of circuit in case of overcurrent



Noise filter

To prevent the external noise from the power side.



Electromagnetic contactor

To power on/off the servo; surge suppressor should be installed simultaneously.



Brake resistor

For any insufficient braking efficiency, connect Terminal P \oplus and C to the external brake resistance.



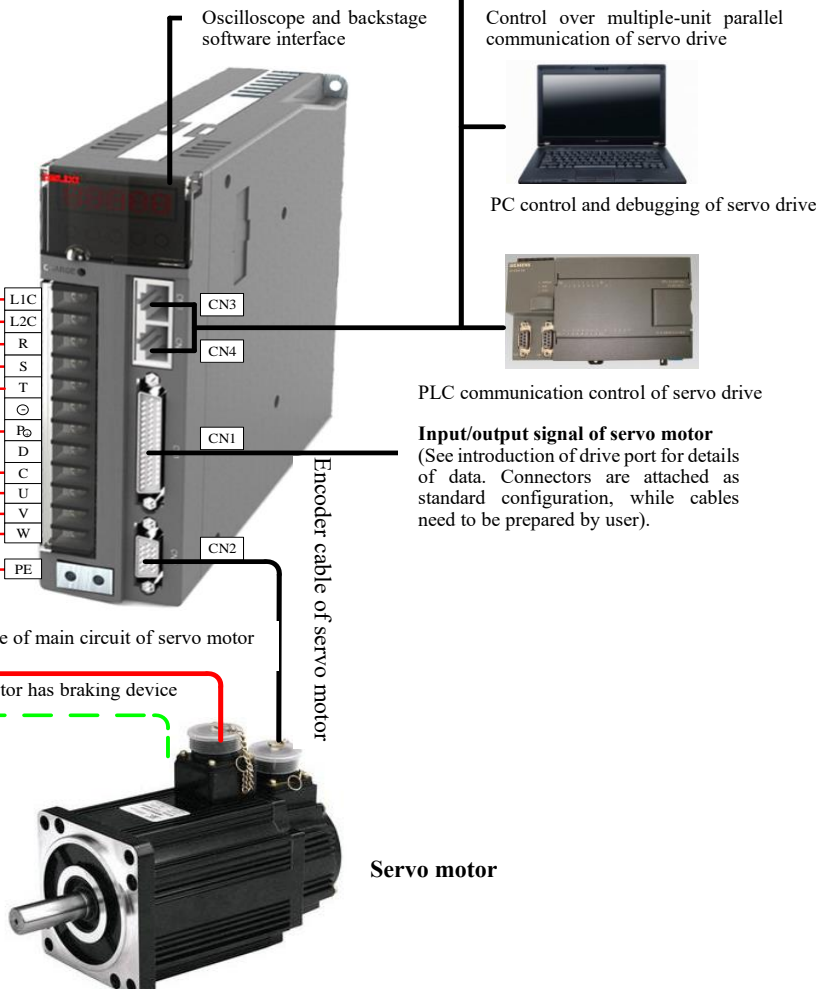
Power supply of brake

Power supply with 24V DC voltage, applies if servo motor has braking device.



Electromagnetic contactor

Braking control signal: To power on/off the brake device. Surge suppressor should be installed simultaneously.



Control over multiple-unit parallel communication of servo drive

PC control and debugging of servo drive

PLC communication control of servo drive

Input/output signal of servo motor
(See introduction of drive port for details of data. Connectors are attached as standard configuration, while cables need to be prepared by user).

Servo motor

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 \oplus 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°C
	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).

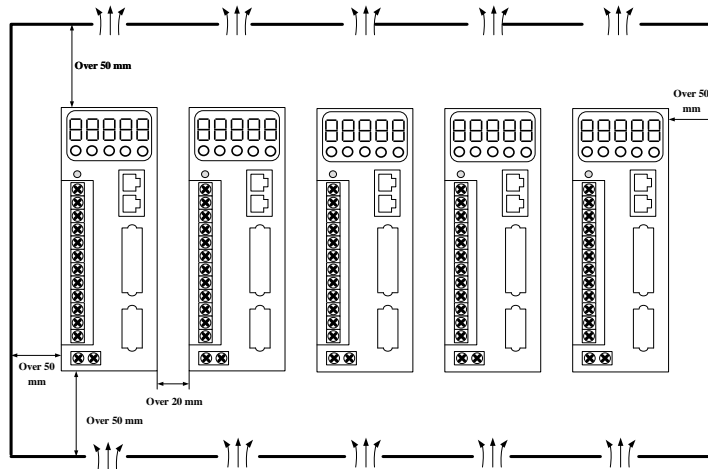


Fig. 3-1 Schematic Diagram for Mounting of Servo Drive

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°C~40°C (no freezing)
Ambient Humidity	20%~90%RH (no condensation)
Storage Temperature	-20°C~60°C (max. storage temperature: 80°C 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	<ul style="list-style-type: none"> ◆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	<p>Keep the axis of servo motor at the same straight line of mechanical axis.</p> <p>The servo motor should conform to the centering precision requirements in the left diagram during installation.</p> <p>Insufficient centering may lead to vibration and even damage of bearing and encoder.</p>
Installation Direction	◆The servo motor should be mounted at the horizontal or vertical direction.
Countermeasures to Oil and Water	<p>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.</p> <p>Work conditions for servo motors with oil seals on transmission shaft:</p> <ul style="list-style-type: none"> ◆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	<p>Notice of connector:</p> <ul style="list-style-type: none"> ◆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

 <p>Danger</p>	<ul style="list-style-type: none"> ★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\oplus and \ominus 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!
 <p>Attention</p>	<ul style="list-style-type: none"> ★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.

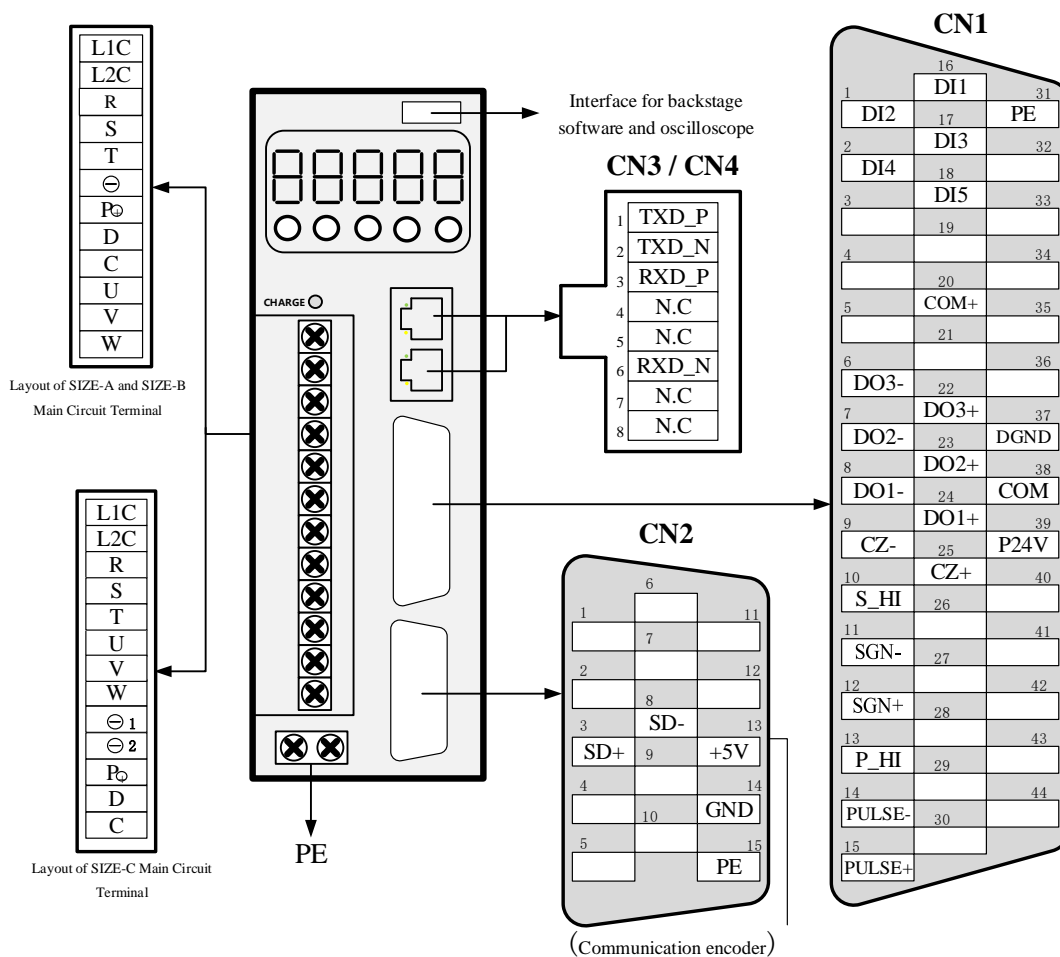
3.3.2 Wiring

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 2.0mm² ground wire if section area of main circuit wire is below 1.6 mm².
 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°C; the allowable current density of cable conductor should not exceed 8A/mm² at 30°C, 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 Φ , C	1.5~4mm ²

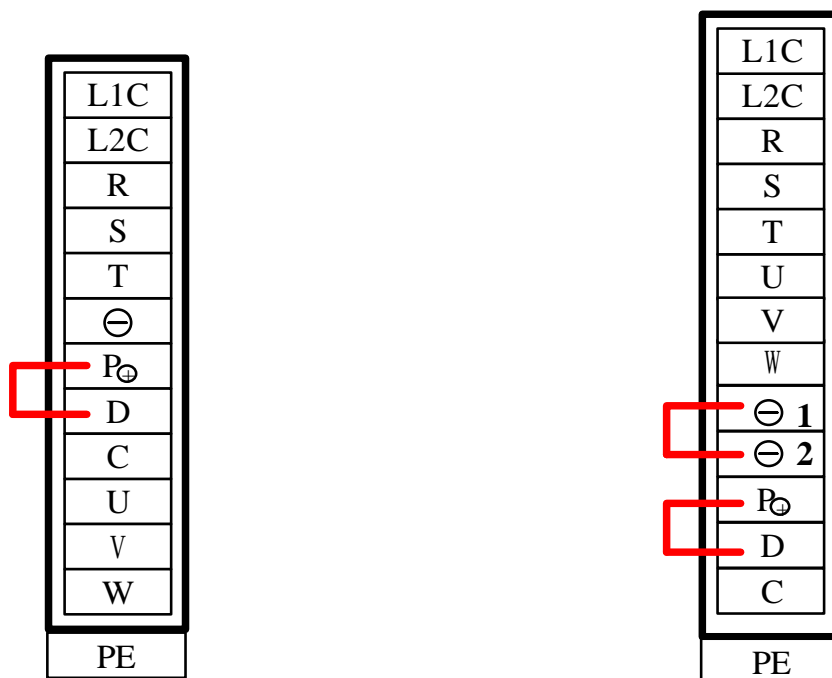
3.3.4 Layout of Drive Terminal Pins



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.

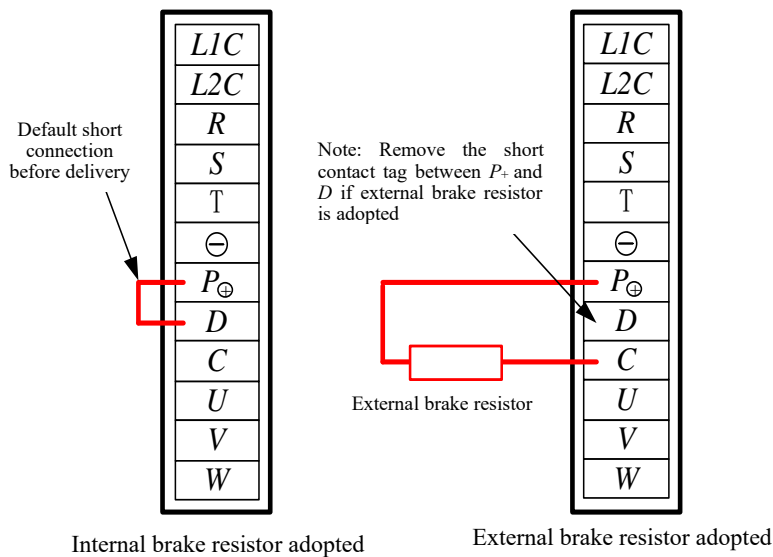


Layout of SIZE-A and SIZE-B Main

Layout of SIZE-C Main Circuit

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 ϕ , D, C	External brake resistance connection terminal	Carry out short connection between P ϕ and D as default. Please dismantle the short contact tag and connect external brake resistor between P ϕ and C if there's insufficient braking capability. The external brake resistor should be ordered separately as required.
P ϕ , \emptyset or P ϕ , 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



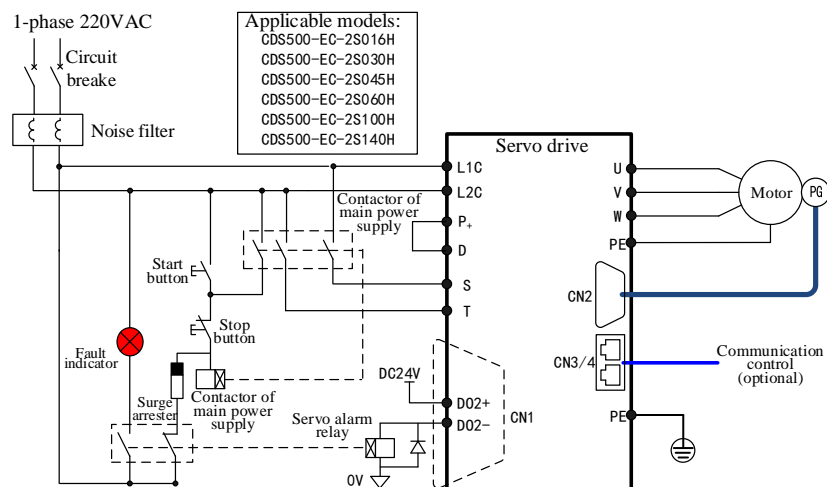
Refer to Chapter 2.1.6 for the type selection and use of brake resistor.

Wiring Notice of Brake Resistor:

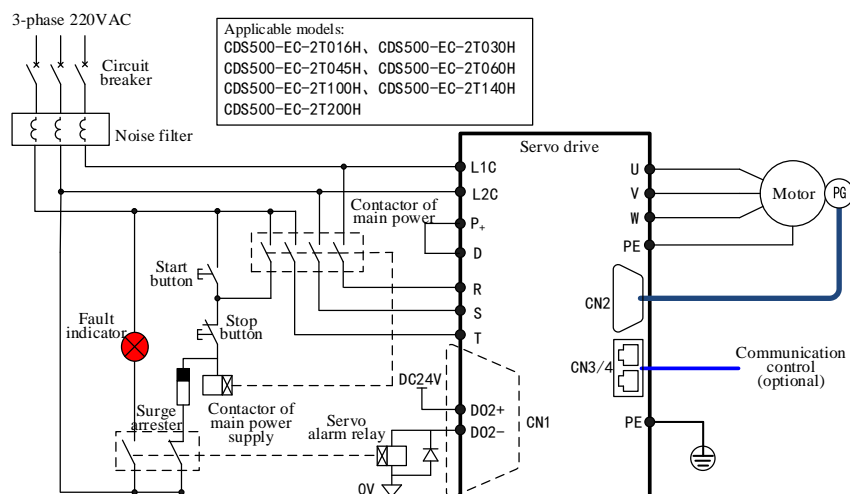
1. Do NOT connect the external brake resistor onto the positive/negative anode $P_+/⊖$ directly; otherwise, explosion and fire will occur!
2. Make sure to remove the short contact tag between Drive P_+ and D if external resistor is used; otherwise, brake pipe will be damaged due to overcurrent!
3. Please 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

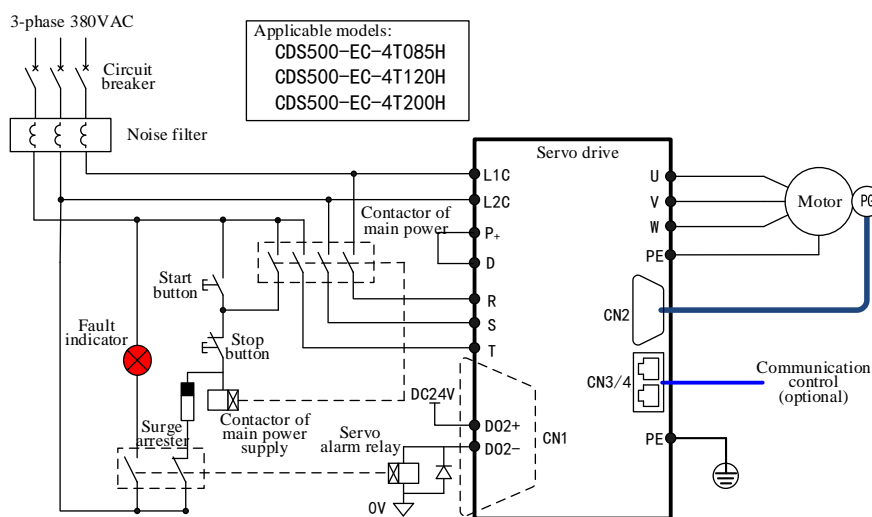
1) 1-phase 220VAC:



2) 3-phase 220VAC:



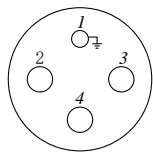
3) 3-phase 380VAC:



3.3.8 Connection of Power Line between Servo Drive and Servo Motor

Connector at servo motor side of power cable

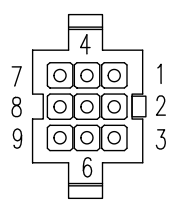
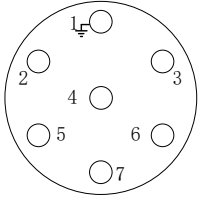
Name	Layout of Plug Pin		Applicable Motors										
Common plug of motor power line		<table border="1"> <thead> <tr> <th>Pin</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>U</td> </tr> <tr> <td>2</td> <td>V</td> </tr> <tr> <td>3</td> <td>W</td> </tr> <tr> <td>4</td> <td>PE</td> </tr> </tbody> </table>	Pin	Name	1	U	2	V	3	W	4	PE	40
		Pin	Name										
		1	U										
		2	V										
		3	W										
4	PE												
60													
80													
90													
Common plug of motor brake coil		<table border="1"> <thead> <tr> <th>Pin</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+</td> </tr> <tr> <td>2</td> <td>-</td> </tr> </tbody> </table>	Pin	Name	1	+	2	-	Motor with brake				
		Pin	Name										
		1	+										
2	-												

Name	Layout of Plug Pin	Applicable Motors											
Aviation plug of motor power line		<table border="1"> <thead> <tr> <th>Pin</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>PE</td> </tr> <tr> <td>2</td> <td>U</td> </tr> <tr> <td>3</td> <td>V</td> </tr> <tr> <td>4</td> <td>W</td> </tr> </tbody> </table>	Pin	Name	1	PE	2	U	3	V	4	W	100
		Pin	Name										
		1	PE										
		2	U										
		3	V										
4	W												
110													
130													
150													
180													
<p>Note: The power cable color should be subject to the real objects. Colors of cables in the Instructions should be subject to Delixi cables.</p>													

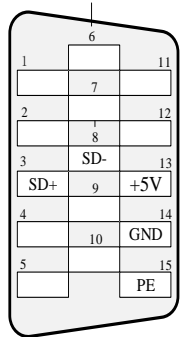
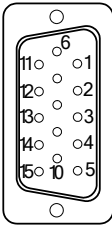
3.3.9 Connection of Encoder Line between Servo Drive and Servo Motor

(1) Communication encoder wire

Connector at servo motor side of encoder cable

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

Connector at servo drive side of encoder cable

Communication encoder			<table border="1"> <thead> <tr> <th>Pin</th> <th>Name</th> <th>Pin</th> <th>Name</th> </tr> </thead> <tbody> <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> </tbody> </table>	Pin	Name	Pin	Name	1	-	9	-	2	-	10	-	3	SD+	11	-	4	-	12	-	5	-	13	+5V	6	-	14	GND	7	-	15	PE	8	SD-		
			Pin	Name	Pin	Name																																	
			1	-	9	-																																	
			2	-	10	-																																	
			3	SD+	11	-																																	
			4	-	12	-																																	
			5	-	13	+5V																																	
			6	-	14	GND																																	
			7	-	15	PE																																	
			8	SD-																																			

Wiring Notice of Encoder Signal Cable:

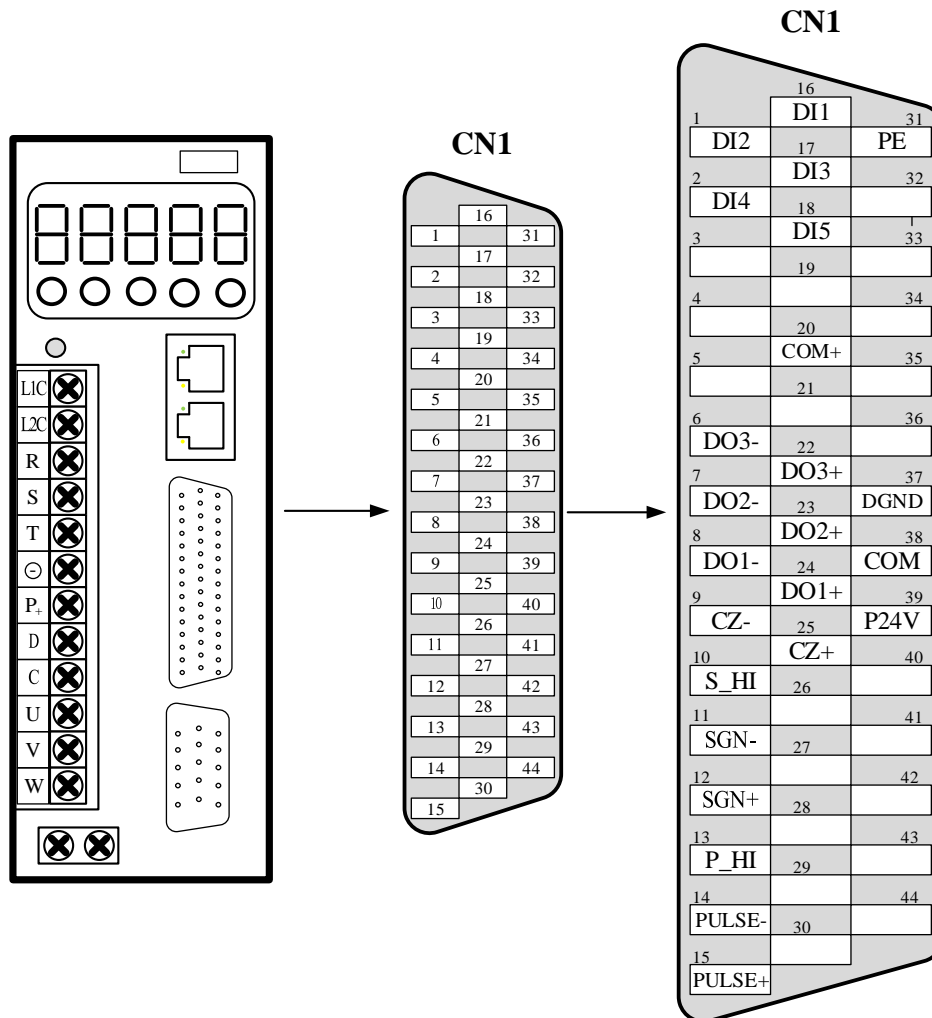
1. Please earth the shielding network at driver and motor side reliably; otherwise, driver may give out an alarm by mistake.
2. The cable shielding layer of encoder must be earthed reliably and differential signal can be connected with one group of twisted pair of cable.
3. Voltage reduction caused by 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

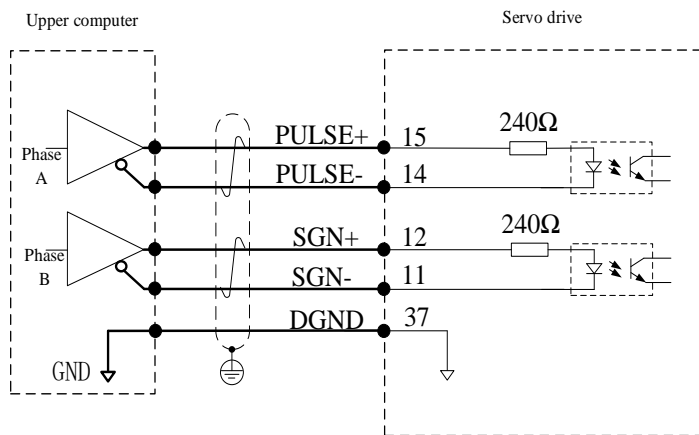
Signal Name	Pin No.	Function
Pulse input	PULSE+	15
	PULSE-	14
	SGN+	12
	SGN-	11
		Input mode of pulse command: <ul style="list-style-type: none"> •Differential drive input •Open circuit of collector
		Form of input pulse: <ul style="list-style-type: none"> •Direction + pulse •Phase A and B of orthogonal pulse •Pulse sequence CW/CCW
Signal Name	Pin No.	Function
External power supply	P_HI	13
	S_HI	10
		External power input interface of command pulse
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

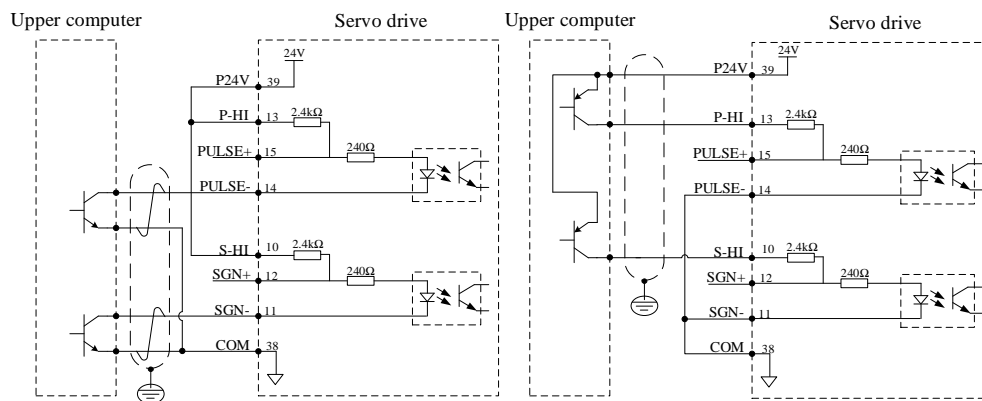


b) Under open circuit of collector

① Internal 24V power supply in servo drive is adopted

◆ Common cathode

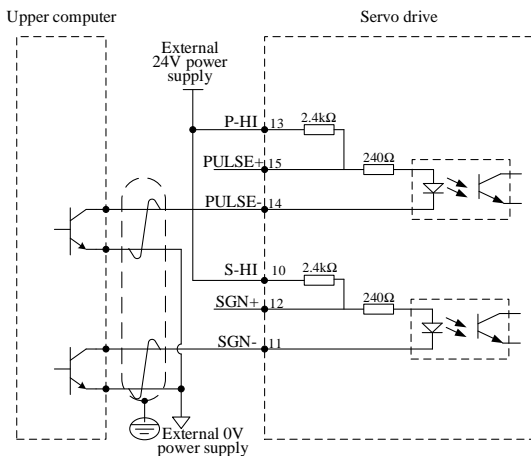
◆ Common anode



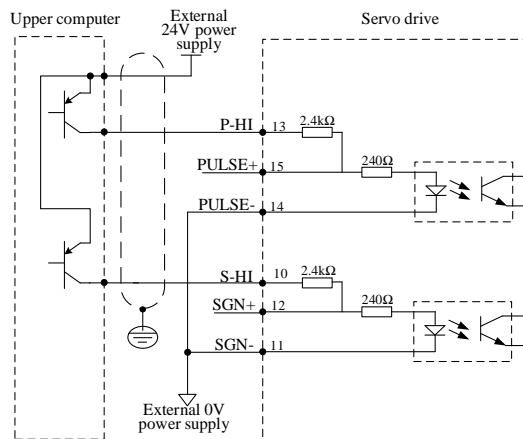
② External 24V power supply is adopted

I. Internal resistor adopted (recommended)

◆ Common cathode

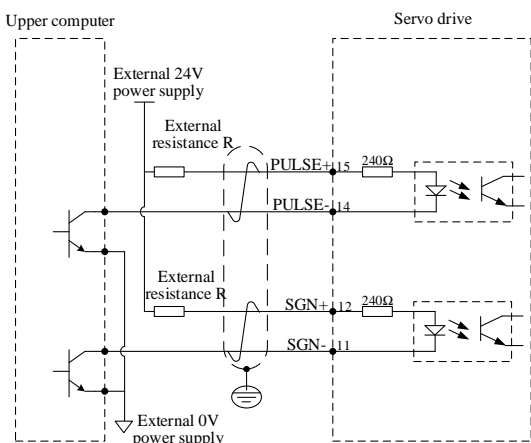


◆ Common anode

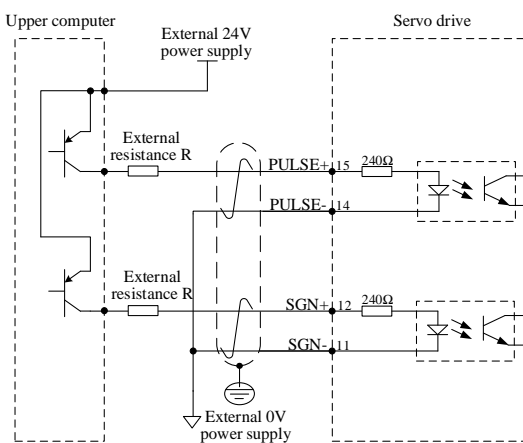


II. External resistor adopted

◆ 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.

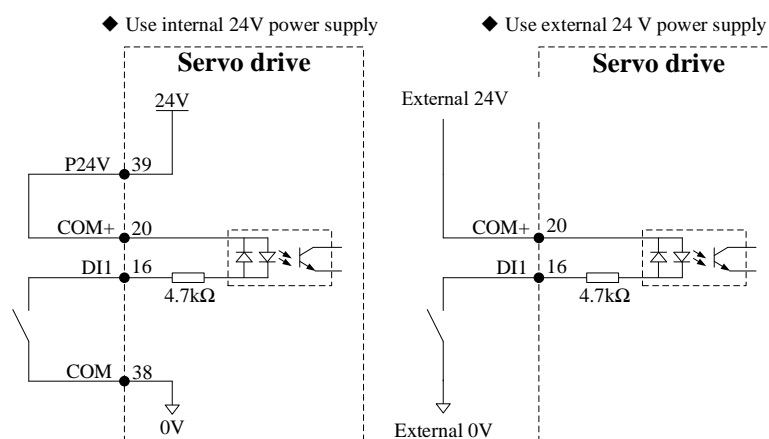
3.4.2 Digital Input/output Signal

Signal Name	Pin No.	Function Introduction
P24V	39	Internal 24V power supply; voltage range: +20~28V; max. output current: 200mA.
COM	38	
COM+	20	Common terminal of Signal DI input (12V~24V)
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
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

1) Input Circuit of Digital Quantity

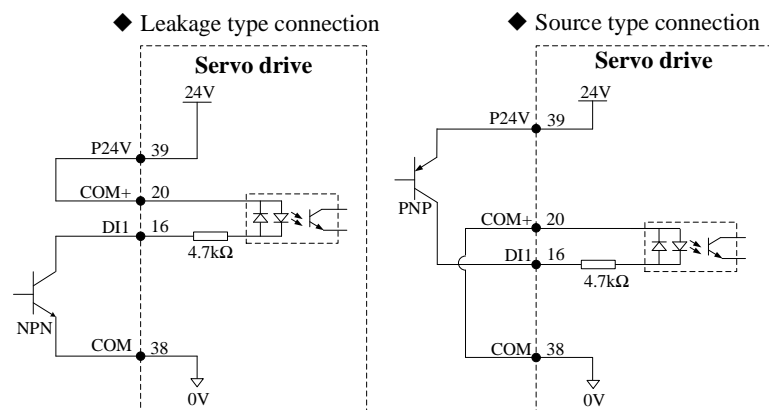
Take DI1 as example, the circuits of Interface DI1-DI5 are the same

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

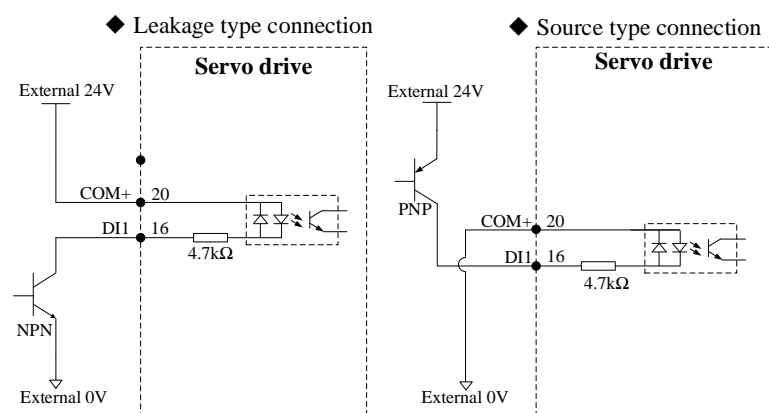


b) If open collector is adopted in upper device:

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



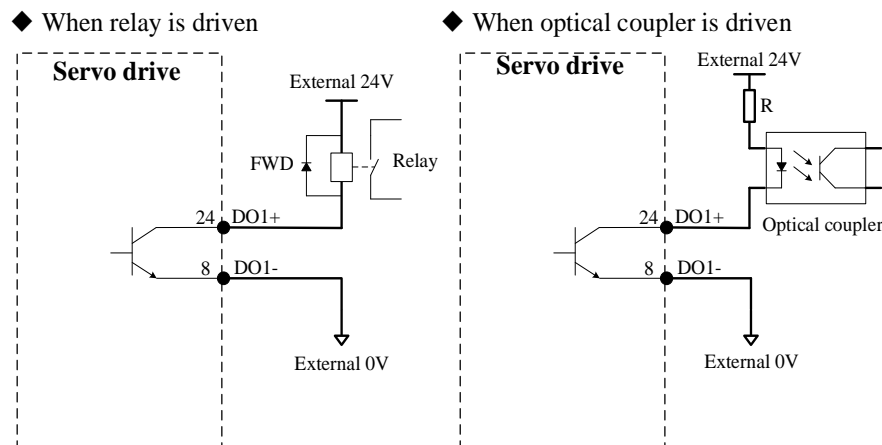
② If external power supply is adopted:



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~DO3 are the same



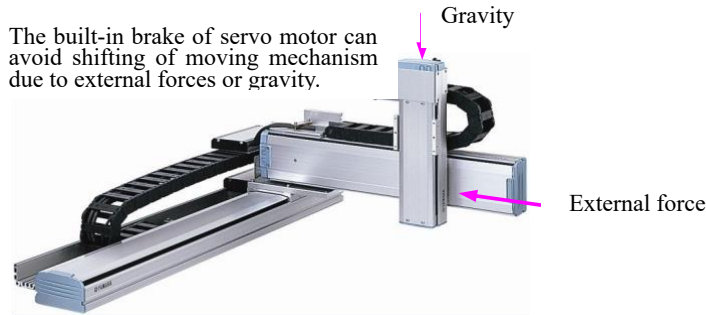
- Note:**
1. As a passive output, DO must be supplemented with power supply for driving the loads. Power range of Terminal DO: 5V~24V; the max. allowed current is DC50mA.
 2. Make sure to connect the FWD at the correct direction when driving the relay; otherwise, the Terminal DO can be damaged.
 3. Make sure to connect proper current-limiting resistor when driving the optical coupler; otherwise, Terminal DO can be damaged.

3.4.3 Frequency Division Output Signals of Encoder

Signal Name	Pin No.	Function Description	
CZ+	25	Phase Z frequency division output (collector signal)	Output signal of original pulse
CZ-	9		
PE	Shell	Shielded ground	

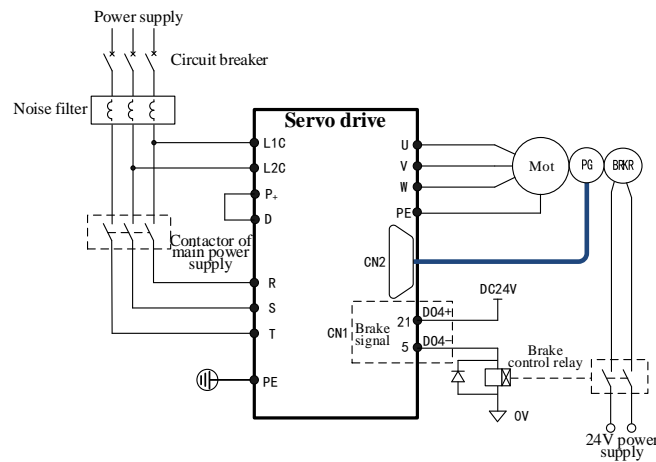
3.4.4 Brake Output

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:

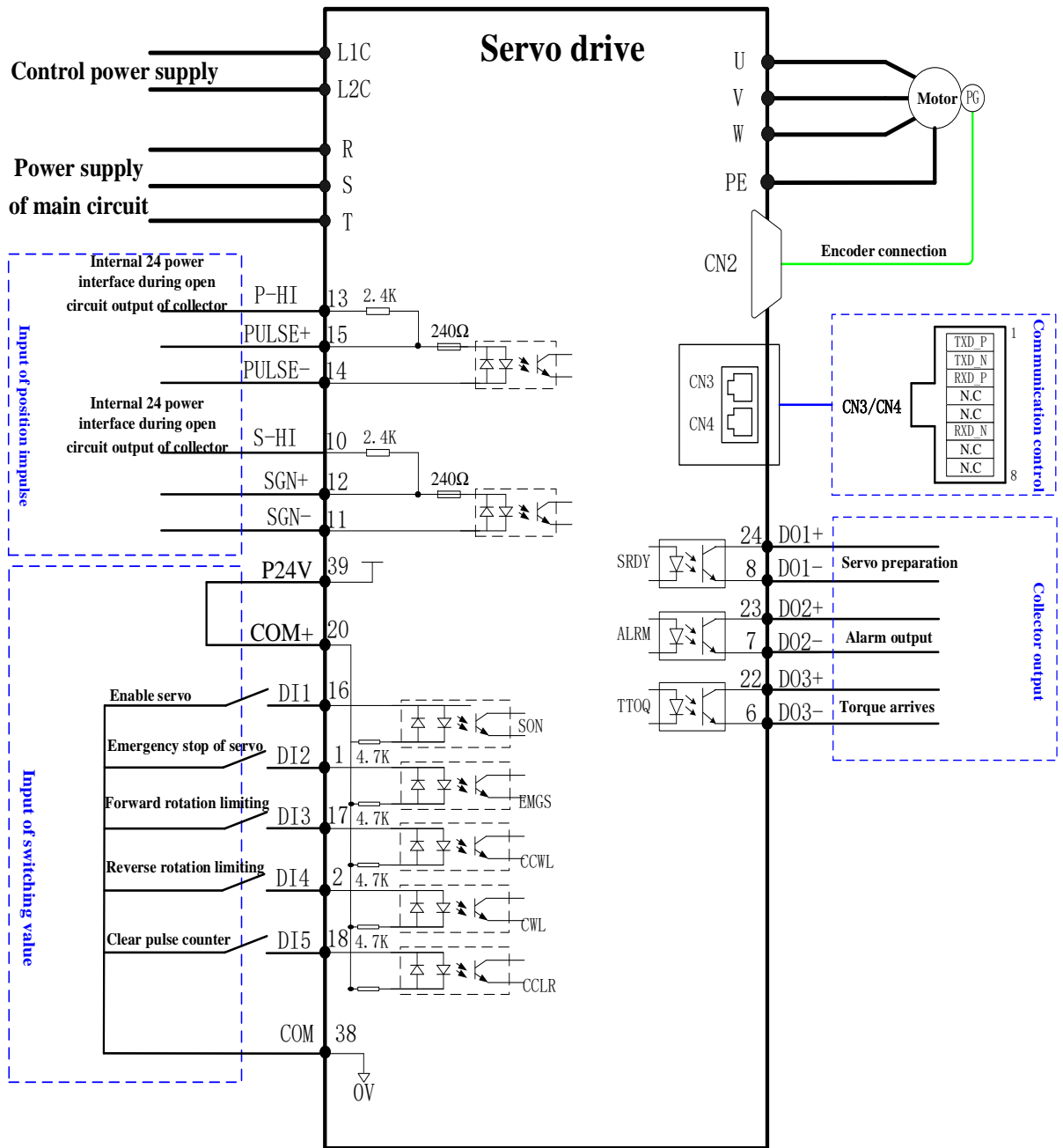


7. The length of motor brake cable should be determined by fully considering the voltage drop due to cable resistance.

The brake should ensure input voltage of 21.6V at least.

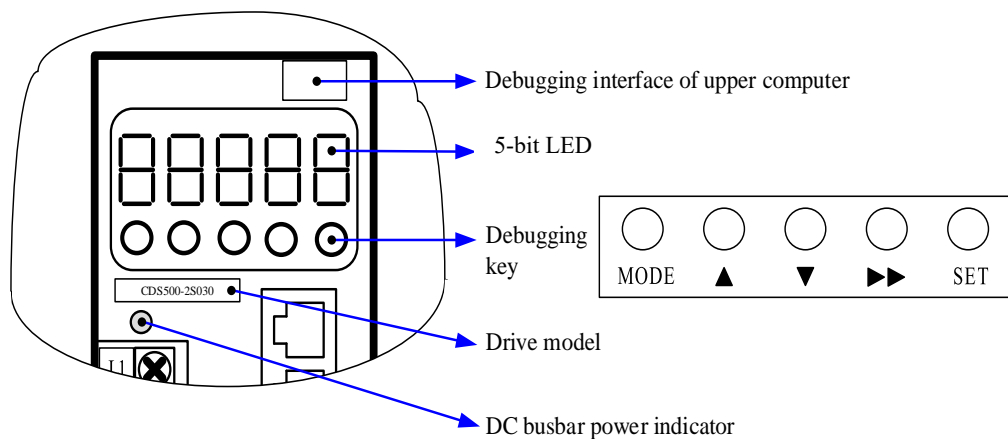
8. Do NOT share the power supply of brake with other electrical appliances; for other appliances may reduce the working voltage or current and lead to misoperation of brake.
9. Cable with diameter over 0.5mm².

3.5 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

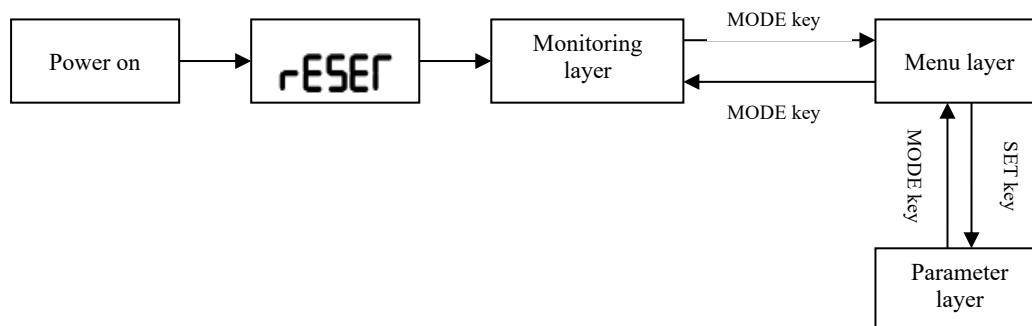
While the Product is running, the display can show the status, parameter, fault and monitoring status of servo.

- 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-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	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-Trq	Output torque [% rated]	8	F9.0.03
d-I	Effective current	9	F9.0.22
d-Udc	Busbar voltage	10	F9.0.15
d-Frq	Frequency of command pulse	11	F9.0.11
d-Cv	Speed command	12	F9.0.01
d-Tr	Given torque [% rated]	13	F9.0.04

d- dl	Status of input terminal	14	F9.0.19
d- do	Status of output terminal	15	F9.0.20
d- AI n	All voltage value	16	F9.0.17
d- AFO	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	When servo is powered on	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 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:

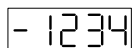
Display	Name	Contents
	Function code F1.2.21	F1.2: Function code group No. 21: Function code group No.

1) Display of Different Length Data and Negative Numbers

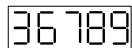
a) Signed number of and below 4 bits or unsigned number of and below 5 bits

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:



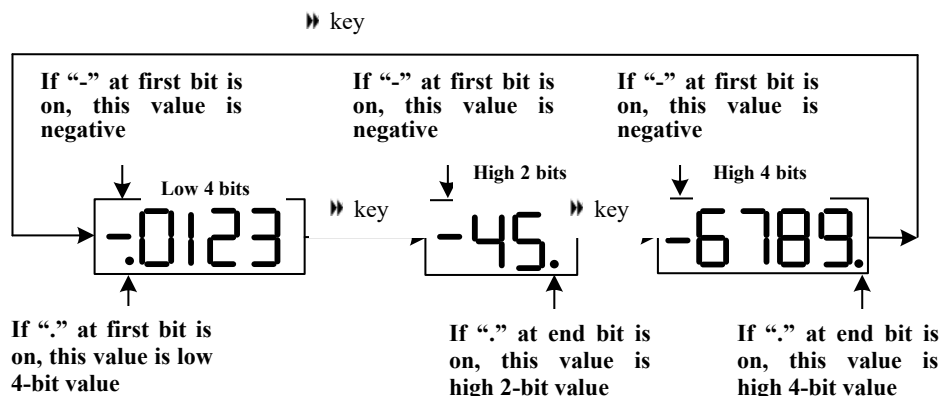
For example: 36789 is displayed as follows:



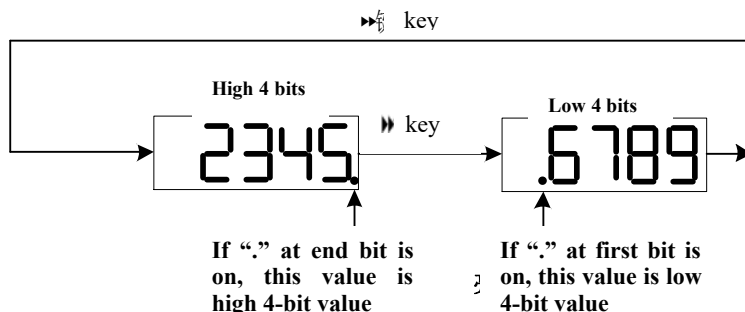
b) Signed number over 4 bits or unsigned number over 5 bits

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:

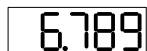


For example, 23456789 are displayed as follows:



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

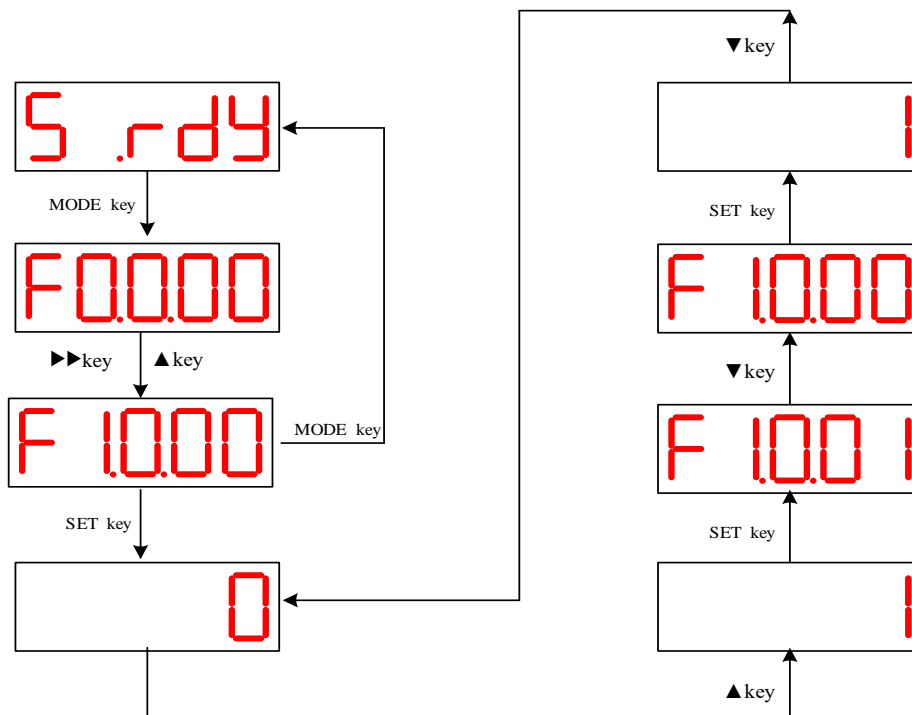
1. The panel can display the present or historical fault and alarm code (F6.1.09). Refer to Chapter 7 for analysis and troubleshooting of faults and alarms.
2. For any single fault or alarm, display the present fault or alarm code immediately; for any simultaneous occurrence of multiple faults and alarms, 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
Err 13	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 5 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 Jog Running

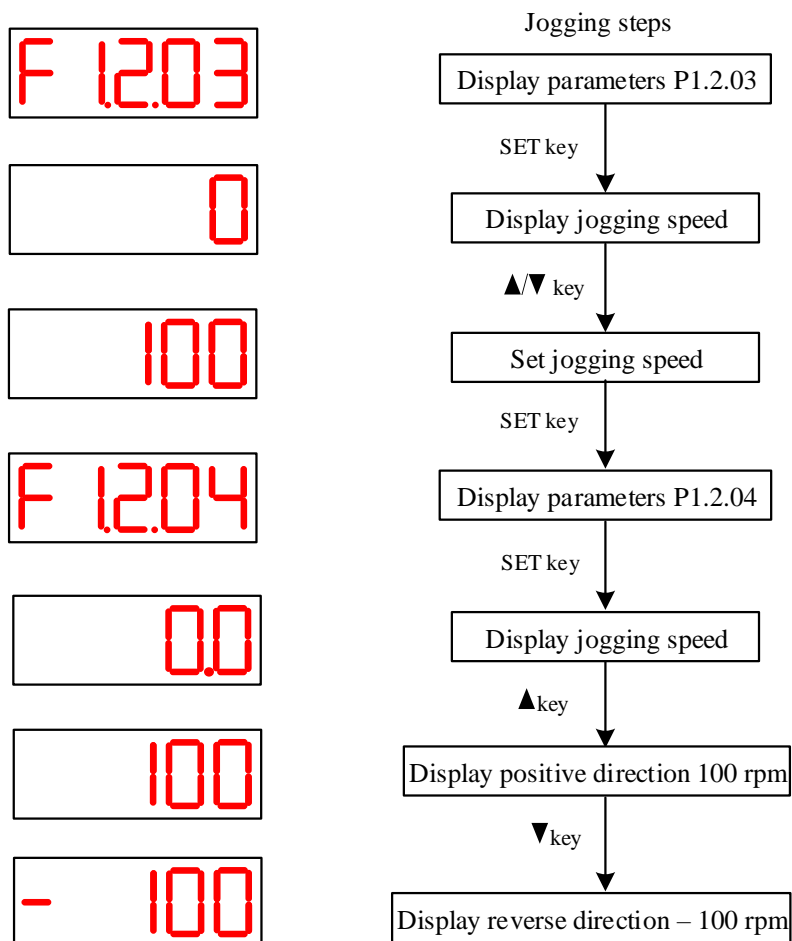
1) Associated function code

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	DII 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.

2) 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.

4.5 Test Run of Sr

1) Associated function code

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.

2) 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:

F 12.04

0

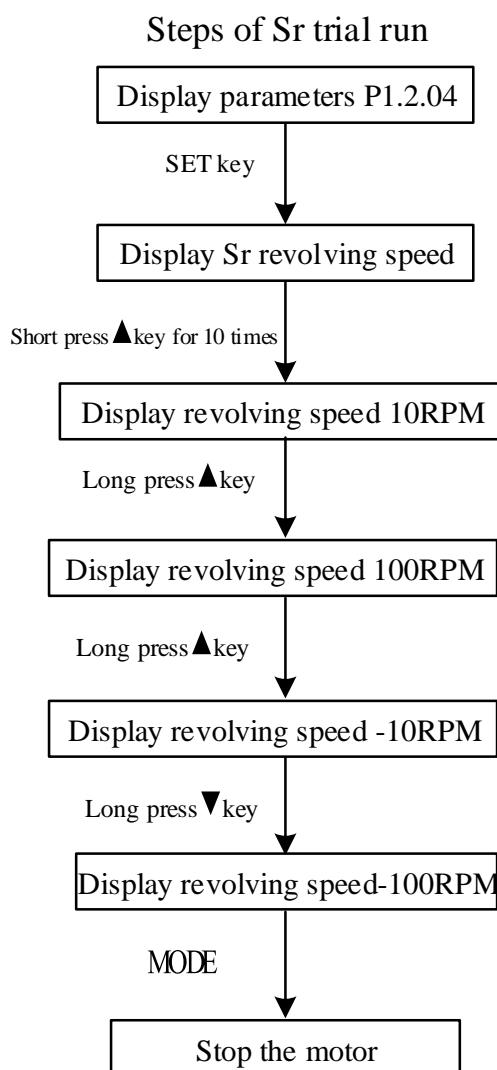
10

100

- 10

- 100

F 12.04



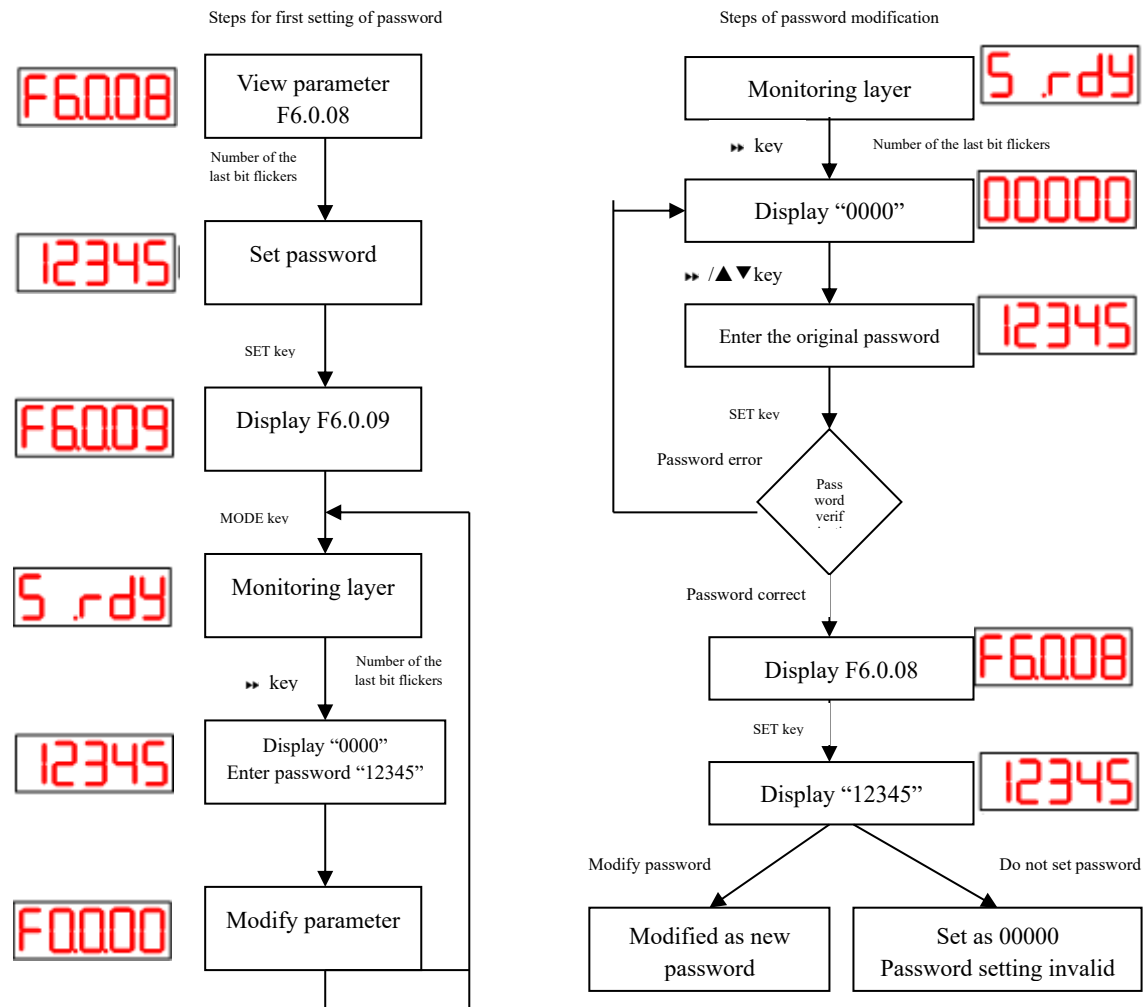
1. Press “▲” or “▼” key to set the revolving speed of motor; release the key and motor will keep revolving at the displayed speed.
2. Function code F1.2.04: The set revolving speed of Sr under Sr mode. User can set it as required.
3. Sr function is not recommended and stroke should not exceed the mechanical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

4.6 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.

4.7 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 7.1 Troubleshooting.

4.8 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 of zero 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 pair poles:

2500 linear 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 7.2 Troubleshooting.

Chapter 5 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	Basic monitoring

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

5.1 Motor Parameter F0.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F0.0.00	Motor No.	H.0000~H.FF FF	*	1	★	PST	0x3000
F0.0.01	Motor rated power	1~655.35	Motor	kw	★	PST	0x3001
F0.0.02	Motor rated voltage	1~2000	Motor	V	★	PST	0x3002
F0.0.03	Motor rated current	1~655.35	Motor	A	★	PST	0x3003
F0.0.04	Motor rated torque	1~655.35	Motor	N.m	★	PST	0x3004
F0.0.05	Motor max. torque	1~655.35	Motor	N.m	★	PST	0x3005
F0.0.06	Motor rated speed	1~9000	Motor	rpm	★	PST	0x3006
F0.0.18	Enabling of motor parameter setting 0: Disable 1: Enable	0~1	0	1	■	PST	0x3018

5.2 Basic Control Parameter F1.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
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	0x3100
F1.0.01	How to determine positive direction 0: Anticlockwise from direction of motor shaft 1: Clockwise from direction of motor shaft	0~1	0	1	▲	PST	0x3101
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 1: External pulse [D] Frequency division direction 0: Positive 1: Reverse	H.0000~H.9111	H.0000	1	▲	PST	0x3102
F1.0.03	Pulse count per coil of frequency division output	32~32768	10000	pulse	▲	PST	0x3103

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F1.0.04	Shutdown mode H. 0 0 0 0 A B C D [A] Shutdown under Class 2 fault 0: Free shutdown, free status 1: 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	0x3104
F1.0.05	SON brake ON delay (brake release delay)	1~1000	1	ms	▲	PST	0x3105+1
F1.0.06	Delay of brake output ON to command receiving	1~1000	250	ms	▲	PST	0x3105+2
F1.0.07	Static status, delay of brake OFF to motor power-off	1~2000	600	ms	▲	PST	0x3105+3
F1.0.08	Revolving status, revolving speed threshold when brake is OFF	1~3000	30	rpm	▲	PST	0x3105+4
F1.0.09	Revolving status, delay of brake OFF	1~1000	500	ms	▲	PST	0x3105+5
F1.0.10	Revolving status, delay of brake OFF to motor power-off	1~1000	50	%	▲	PST	0x3105+6
F1.0.11	Control word: H. 0 0 0 0 A B C D [A] Reverse [B] Clear the fault 0: Invalid 1: Valid [C] Emergency stop 0: Invalid 1: Valid [D] Enable 0: Invalid 1: Valid	H.0000~ H.1111	H.0000	1	▲	PST	0x3106
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	0x3107
F1.0.13	Type of communication encoder 0: Single coil of communication encoder 1: Multi-ring communication encoder	0~1	0	1	▲●	PST	0x3108
F1.0.14	The allowed min. brake resistance of drive	1~1000	Model	Ω	▲	PST	0x3109+1
F1.0.15	Power of built-in brake resistor	1~65535	Model	W	▲	PST	0x3109+2
F1.0.16	Resistance of built-in brake resistor	1~1000	Model	Ω	▲	PST	0x3109+3
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	0x3109+4
F1.0.18	Power of external brake resistor	1~65535	Model	W	▲	PST	0x3109+5

F1.0.19	Resistance of external brake resistor	F1.0.14~1000	Model	Ω	▲	PST	0x3109+6
F1.0.20	Brake enabling rate	0~200	200	%	▲	PST	/
F1.0.21	Coefficient of heat dispersion of resistor	1~65535	100	%	▲	PST	/
F1.0.22	Single heating coefficient	1~65535	100	%	▲	PST	/

5.3 Position Control Parameter F1.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
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.	0~107374182 4	0	pulse	●	P	0x3112
F1.1.04	Numerator 1 of electronic gear ratio	1~32767	1	1	●	P	0x3113+1
F1.1.05	Denominator 1 of electronic gear ratio	1~32767	1	1	●	P	0x3113+2
F1.1.06	Numerator 2 of electronic gear ratio	1~32767	1	1	●	P	0x3113+3
F1.1.07	Denominator 2 of electronic gear ratio	1~32767	1	1	●	P	0x3113+4
F1.1.08	Reserved	-	-	-	-	-	/
F1.1.09	Reserved	-	-	-	-	-	/
F1.1.10	Low-pass filter coefficient of pulse command	0~2000	0	1	▲	P	0x3114+1
F1.1.11	Mean filter coefficient of pulse command	0~2000	0	1	▲	P	0x3114+2
F1.1.12	Signal filter coefficient of pulse command	0~1000	10	10ns	●▲	P	0x3114+3
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	0x3115+1
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	0x3115+2
F1.1.16	Amplitude of location completion	1~65535	10	pulse	▲	P	0x3115+3
F1.1.17	Amplitude of location approaching	1~65535	1000	pulse	▲	P	0x3115+4
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	Name	Range	Default	Unit	Change	Effective	SDO

Code			Value		Limitation	Mode	Mapping address
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] Short-distance motion to reach the original point: 0: Search Pulse Z during original point reset 1: Not returned during original point reset, search Pulse Z 2: Be located at original point of detector or Pulse Z during original point reset (only if X=2,3,4). [D] Type of original point detector and searching direction: 0: Original point reset at positive direction, CCWL as original point 1: Original point reset at reverse direction, CWL as original point 2: Original point reset at positive direction, ORGP as original point 3: Original point reset at reverse direction, ORGP as original point 4: Direct searching of Pulse Z as the original point 5: Reverse revolving and direct searching of Pulse Z as the original 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	0x6081
F1.1.22	Speed of original pint reset at low speed	0~500	50	rpm	▲	P	0x6081
F1.1.23	Original point offset position (32-bit)	-9999999~9999999	1000	pulse	▲	P	0x607C
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	

5.4 Speed Control Parameter F1.2

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F1.2.00	Speed source selection 0: Digital quantity (F1.2.03) 1: Reserved 2: Positive and negative rotation switching through TRLM and TLLM 3: Multistage speed	0~3	0		▲	S	0x3120
F1.2.01	Reserved	-	-	-	-	-	/
F1.2.02	Reserved	-	-	-	-	-	/
F1.2.03	Speed keyboard setting	-6000~6000	0	rpm	◇■	S	0x60FF/0x3117
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	0x6083/0x3118
F1.2.06	Deceleration period 0	0~30000	25	ms	◇	PST	0x6084/0x3119
F1.2.07	S smooth acceleration 0	0~10000	0	ms	◇	PST	0x3121+1
F1.2.08	S smooth deceleration 0	0~10000	0	ms	◇	PST	0x3121+2
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	0x3121+4
F1.2.23	Max. reverse revolving speed	0~6000	3500	rpm	◇	PST	0x3121+5
F1.2.24	Speed limitation source 0: Digital quantity (F1.2.22 and F1.2.23) 1: Reserved 2: Reserved 3: Choose F1.2.22 or F1.2.23 as the positive/reserve speed limitation through DI	0~3	0	1	▲	ST	0x3121+6
F1.2.25	Inching speed under PR mode	-6000~6000	0	rpm	▲	PR	0x3121+7
F1.2.26	Range of fixed-speed revolving at zero	0~6000	10	rpm	◇	S	0x3121+8
F1.2.27	Range of motor revolving	0~1000	20	rpm	◇	S	0x3121+9
F1.2.28	Speed deviation	0~100	10	rpm	◇	S	0x3121+10
F1.2.29	Speed detection threshold	0~6000	1000	rpm	◇	S	0x3121+10
F1.2.30	Zero speed detection range	0~6000	10	rpm	◇	S	0x3121+12

5.5 Torque Control Parameter F1.3

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F1.3.00	Torque source selection 0: Digital quantity 0 (F1.3.02) 1: Digital quantity 1 (F1.3.03) 2: Reserved 3: Reserved	0~3	1	1	◇	T	0x3130+1
F1.3.02	Digital torque set as 0 (No backup data for power failure)	-300.0~300.0	0	%	■	T	0x6071
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	0x3130+2
F1.3.05	Limitation of internal torque at reverse direction	0~300.0	300.0	%	◇	PST	0x3130+3
F1.3.06	Limitation of external torque at positive direction	0~300.0	300.0	%	◇	PST	0x3130+4
F1.3.07	Limitation of external torque at reverse direction	0~300.0	300.0	%	◇	PST	0x3130+5
F1.3.08	Torque limitation source 0: Limitation of internal positive/negative torque 1: Limitation of external positive/negative torque 2: Reserved 3: Reserved 4: Reserved 5: Reserved 6: Reserved 7: Reserved	0~7	0	1	◇	PST	0x3130+6
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	0x3130+8
F1.3.11	Filtering of feedback current display	0~3000	10	ms	◇	PST	0x3130+9
F1.3.12	Limitation of positive revolving speed	0~3000	0	rpm	◇	T	0x3130+10
F1.3.13	Limitation of reverse revolving speed	0~3000	0	rpm	◇	T	0x3130+11
F1.3.14	Torque reaches the reference value	0.0~300.0	0	%	◇	T	0x3130+12
F1.3.15	Torque reaches the valid value	0.0~300.0	20.0	%	◇	T	0x3130+13
F1.3.16	Torque reaches the invalid value	0.0~300.0	10.0	%	◇	T	0x3130+14
F1.3.17	Control over torque reaching (TTOQ) 0: Basic torque hysteresis F1.3.14~F1.3.16 1: Auto shutdown delay, terminal SON (OFF) reset 2~3: Reserved	0~3	0	1	◇	T	0x3130+15
F1.3.18	Torque reaches shutdown delay	0~30000	0	ms	◇	T	0x3130+16
F1.3.19	Torque reaches start-up revolving speed	0~4000	10	rpm	◇	T	0x3130+17
F1.3.20	Torque reaches revolving stop speed	0~100	1	rpm	◇	T	0x3130+18

5.6 Parameters of Input/output Terminal F2.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F2.0.00	DI1 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: CLRPE clear position deviation 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	0~33	1	1	▲	PST	0x3200+1
F2.0.01	DI2 function selection (EMGS)	0~33	30	1	▲	PST	0x3200+2
F2.0.02	DI3 function selection (CCWL)	0~33	27	1	▲	PST	0x3200+3
F2.0.03	DI4 function selection (CWL)	0~33	26	1	▲	PST	0x3200+4
F2.0.04	DI5 function selection (CCLR)	0~33	29	1	▲	PST	0x3200+5
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	H.000~H.331	H.000	1	◇	PST	0x3201+1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
	0~3: Delay time 0~3(F2.0.24~F2.0.27) [C] Terminal logic 0: Positive logic 1: Negative logic						
F2.0.11	DI2 function property	H.000~H.331	H.000	1	◇	PST	0x3201+2
F2.0.12	DI3 function property	H.000~H.331	H.000	1	◇	PST	0x3201+3
F2.0.13	DI4 function property	H.000~H.331	H.000	1	◇	PST	0x3201+4
F2.0.14	DI5 function property	H.000~H.331	H.000	1	◇	PST	0x3201+5
F2.0.20	DI filtering time 0	0~1000	10	ms	◇	PST	0x3202+1
F2.0.21	DI filtering time 1	0~1000	10	ms	◇	PST	0x3202+2
F2.0.22	DI filtering time 2	0~1000	10	ms	◇	PST	0x3202+3
F2.0.23	DI filtering time 3	0~1000	10	ms	◇	PST	0x3202+4
F2.0.24	DI delay time 0	0~10000	5	ms	◇	PST	0x3203+1
F2.0.25	DI delay time 1	0~10000	5	ms	◇	PST	0x3203+2
F2.0.26	DI delay time 2	0~10000	5	ms	◇	PST	0x3203+3
F2.0.27	DI delay time 3	0~10000	5	ms	◇	PST	0x3203+4
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	0~22	1	1	▲	PST	0x3204+1
F2.0.29	DO2 function selection (ALRM)	0~22	10	1	▲	PST	0x3204+2
F2.0.30	DO3 function selection (TTOQ)	0~22	14	1	▲	PST	0x3204+3
F2.0.31	DO4 function selection (BRK)	0~22	9	1	▲	PST	0x3205+1
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	0x3205+1
F2.0.34	DO2 property configuration	H.00~H.31	H.00	1	◇	PST	0x3205+2
F2.0.35	DO3 property configuration	H.00~H.31	H.00	1	◇	PST	0x3205+3
F2.0.38	DO delay time 0	0~10000	5	ms	◇	PST	0x3206+1
F2.0.39	DO delay time 1	0~10000	5	ms	◇	PST	0x3206+2
F2.0.40	DO delay time 2	0~10000	5	ms	◇	PST	0x3206+3
F2.0.41	DO delay time 3	0~10000	5	ms	◇	PST	0x3206+4
F2.0.42	Limit enable effective	0-1	0	1	▲	PST	/

5.7 Internal Position Control Parameter F3.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
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	0x3300
F3.0.01	Circulation times under circulating mode	1~65535	1	1	▲	P	0x3301
F3.0.02	Number of valid segments	1~8	1	1	▲	P	0x3302
F3.0.03	Number of initial segments since the first round	1~8	1	1	▲	P	0x3303
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	0x3304
F3.0.05	Pulse at zero position (effective at absolute position)	0~65535	0	pulse	▲	P	0x3305
F3.0.06	Number of turns at zero position (effective at absolute position)	0~65535	0	turn	▲	P	0x3306
Total number (of pulse) at the absolute position of zero point = (F3.0.06×F1.1.02) + F3.0.05;							
F3.0.07	Pulse in the 1 st segment	0~65535	0	pulse	◇	P	0x3307
F3.0.08	Number of turns in the 1 st segment	0~65535	0	turn	◇	P	0x3308
Total number (of pulse) in the 1 st segment = (F3.0.08×F1.1.02) + F3.0.07;							
F3.0.09	Running speed of the 1 st segment	-6000~6000	0	rpm	◇	P	0x6081
F3.0.10	Selection of curve in the 1 st 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 1 st segment (F3.0.04 [A])	0~65535	10	ms/s	◇	P	/
F3.0.12	Pulse in the 2 nd segment	0~65535	0	pulse	◇	P	/
F3.0.13	Number of coil in the 2 nd segment	0~65535	0	turn	◇	P	/
F3.0.14	Running speed of the 2 nd segment	-6000~6000	0	rpm	◇	P	/
F3.0.15	Selection of curve in the 2 nd segment	0~3	0	0	◇	P	/
F3.0.16	Maintenance period at the completion of the 2 nd segment	0~65535	10	ms/s	◇	P	/
F3.0.17	Pulse in the 3 rd segment	0~65535	0	pulse	◇	P	/
F3.0.18	Number of turns in the 3 rd segment	0~65535	0	turn	◇	P	/

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

5.8 Internal Speed Control Parameter F3.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
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 1 st segment	-6000~6000	0	rpm	◇	S	/

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F3.1.05	Running period of the 1 st segment Time unit is determined by (F3.1.02)	0~6553.5	0	s/min	◇	S	/
F3.1.06	Selection of curve in the 1 st 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 2 nd segment	-6000~6000	0	rpm	◇	S	/
F3.1.08	Running time of the 2 nd segment	0~6553.5	0	s/min	◇	S	/
F3.1.09	Selection of curve in the 2 nd segment	0~3	0	1	◇	S	/
F3.1.10	Speed command of the 3 rd segment	-6000~6000	0	rpm	◇	S	/
F3.1.11	Running time of the 3 rd segment	0~6553.5	0	s/min	◇	S	/
F3.1.12	Selection of curve in the 3 rd segment	0~3	0	1	◇	S	/
F3.1.13	Speed command of the 4 th segment	-6000~6000	0	rpm	◇	S	/
F3.1.14	Running time of the 4 th segment	0~6553.5	0	s/min	◇	S	/
F3.1.15	Selection of curve in the 4 th segment	0~3	0	1	◇	S	/
F3.1.16	Speed command of the 5 th segment	-6000~6000	0	rpm	◇	S	/
F3.1.17	Running time of the 5 th segment	0~6553.5	0	s/min	◇	S	/
F3.1.18	Selection of curve in the 5 th segment	0~3	0	1	◇	S	/
F3.1.19	Speed command of the 6 th segment	-6000~6000	0	rpm	◇	S	/
F3.1.20	Running time of the 6 th segment	0~6553.5	0	s/min	◇	S	/
F3.1.21	Selection of curve in the 6 th segment	0~3	0	1	◇	S	/
F3.1.22	Speed command of the 7 th segment	-6000~6000	0	rpm	◇	S	/
F3.1.23	Running time of the 7 th segment	0~6553.5	0	s/min	◇	S	/
F3.1.24	Selection of curve in the 7 th segment	0~3	0	1	◇	S	/
F3.1.25	Speed command of the 8 th segment	-6000~6000	0	rpm	◇	S	/
F3.1.26	Running time of the 8 th segment	0~6553.5	0	s/min	◇	S	/
F3.1.27	Selection of curve in the 8 th segment	0~3	0	1	◇	S	/

5.9 Gain Parameter F4.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
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	0x3400+1
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	0x3400+2
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	0x3400+3
F4.0.03	Torque command filtering 1	0~50000	Model	0.01ms	◇	PST	0x3400+4
F4.0.04	Position loop gain 2	0~3000	30	1/s	◇	P	0x3400+5
F4.0.05	Speed integral 2	0~3000	50	Hz	◇	PST	0x3400+6
F4.0.06	Speed integral 2	20~10000	2000	0.01ms	◇	PST	0x3400+7

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F4.0.07	Torque command filtering 2	0~5000	40	0.01ms	◇	PST	0x3400+8
F4.0.08	Reserved	-	-	-	-	-	/
F4.0.09	Enabling of speed feedforward 0: Disabled 1: Enabled	0~1	0	1	◇	P	0x3400+10
F4.0.10	Filtering period of speed feedforward	0~65535	50	0.01ms	◇	P	0x3400+11
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	0x3400+12
F4.0.12	Enabling of torque feedforward	0~1	0	1	◇	PST	0x3400+13
F4.0.13	Filtering time of torque feedforward	0~65535	50	0.01ms	◇	PST	0x3400+14
F4.0.14	Torque feedforward gain	0~200	0	%	◇	PST	0x3400+15
F4.0.15	Speed command filtering	0~5000	0	0.01ms	◇	PST	0x3400+16
F4.0.16	Speed feedback filtering	0~5000	0	0.01ms	◇	PST	0x3400+17
F4.0.17	Reserved	-	-	-	-	-	/
F4.0.18	Torque feedback filtering	0~5000	0	0.01ms	◇	PST	0x3400+19
F4.0.19	Feedback filtering of speed source 1	0~65535	50	0.01ms	◇	PST	0x3400+20
F4.0.20	Gain switching control 0: No switching, from the first gain 1: High/low speed switching 2: Speed threshold	0~2	0	1	◇	PST	0x3400+21
F4.0.21	Gain switching level	0~65535	40	1	◇	PST	0x3400+22
F4.0.22	Gain switching difference	0~65535	20	1	◇	PST	0x3400+23
F4.0.23	Delay time of gain switching	0~65535	5	ms	▲	PST	0x3400+24
F4.0.24	Lasting time of gain switching	0~65535	3	ms	▲	PST	0x3400+25
F4.0.25	Control coefficient of pseudo differential feedforward	0.0~100.0	100.0	%	◇	PS	0x3400+26

5.10 Self-adaption Parameter F4.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F4.1.00	make Rigidity table effective	0~1	1	1	▲	PST	0x3410+1
F4.1.01	Rigidity level	0~31	Model	1	◇	PST	0x3410+2
F4.1.02	Inertia ratio	0.95~110.00	1.00	1	◇	PST	0x3410+3
F4.1.03	Enabling of offline inertia identification mode 0: Disabling 1: Enabling	0~1	0	1	0	PST	0x3410+4
F4.1.04	Number of motor coils at completion of single identification	0~1000.0	1.5	turn	◇	PST	0x3410+5
F4.1.05	Max. speed of inertia identification	300~2000	600	rpm	◇	PST	0x3410+6
F4.1.06	Interval of offline inertia identification	0~65535	1000	ms	◇	PST	0x3410+7
F4.1.07	Acceleration/deceleration time of offline inertia identification	50~65535	150	ms	◇	PST	0x3410+8

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
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	0x3410+13

5.11 Fault Protection and Troubleshooting F5.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F5.0.00	Enabling of motor overload protection (0: Disabled, 1: Enabled)	0~1	1	1	▲●	PST	0x3500+1
F5.0.01	Motor overload protection coefficient	0~200	100	%	▲●	PST	0x3500+2
F5.0.02	Translation coefficient of motor overload time	1~200	80	%	▲●	PST	0x3500+3
F5.0.03	Motor overspeed level	0~200	120	%	▲●	PST	0x3500+4
F5.0.04	Motor overspeed time	0~6000	20	ms	▲●	PST	0x3500+5
F5.0.05	Enabling of out-of-tolerance position (0: Disabled; 1: Enabled)	0~1	1	1	▲●	PST	0x3500+6
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	0x3500+7
F5.0.07	Out-of-tolerance level of revolving speed	1~20000	6000	rpm	▲●	PST	0x3500+8
F5.0.08	Out-of-tolerance detection time of revolving speed	0~6000	20	ms	▲●	PST	0x3500+9
F5.0.09	Open-phase protection of input (0: Disabled; 1: Enabled)	0~1	Machine type	1	▲●	PST	0x3500+10
F5.0.10	Open-phase protection of output (0: Disabled; 1: Enabled)	0~1	0	1	▲●	PST	0x3500+11
F5.0.11	Overvoltage coefficient	0~200	100	%	▲●	PST	0x3500+12
F5.0.12	Overvoltage time	1~65535	1	ms	▲●	PST	0x3500+13
F5.0.13	Undervoltage coefficient	0~200	100	%	▲●	PST	0x3500+14
F5.0.14	Undervoltage time	1~65535	100	ms	▲●	PST	0x3500+15
F5.0.15	Brake on coefficient	0~200	120	%	▲●	PST	0x3500+16
F5.0.16	Brake off coefficient	0~200	118	%	▲●	PST	0x3500+17
F5.0.17	Speed loop and protection time	0~65535	10000	ms	▲●	PST	0x3500+18
F5.0.18	Brake protection time	0~65535	1.6	s	▲●	PST	0x3500+19
F5.0.19	Power failure judgment enabled	0~1	1	1	▲●	PST	0x3500+20
F5.0.20	Power failure judgment cycle	0~65535	20	1	▲●	PST	0x3500+21

5.12 Fault Records F5.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F5.1.00	Code of the 1 st fault	-	Err--	1	★	-	0x3510+1
F5.1.01	Code of the 2 nd fault	-	Err--	1	★	-	0x3510+2
F5.1.02	Code of the 3 rd fault	-	Err--	1	★	-	0x3510+3
F5.1.03	Speed 1 at faulty condition	-9000~9000	-	rpm	★	-	0x3510+4
F5.1.04	Current 1 at faulty condition	0~655.35	-	A	★	-	0x3510+5
F5.1.05	Busbar voltage 1 at faulty condition	0~2000	-	V	★	-	0x3510+6
F5.1.06	DI input status 1 at faulty condition (display is the same with F9.0.19)	-	-	1	★	-	0x3510+7
F5.1.07	DO output status 1 at faulty condition (display is the same with F9.0.20)	-	-	1	★	-	0x3510+8
Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F5.1.09	Power-on time 1 at faulty condition	0~65535	-	h	★	-	0x3510+10
F5.1.10	Running time 1 at faulty condition	0~65535	-	h	★	-	0x3510+11
F5.1.11	Speed 2 at faulty condition	-9000~9000	-	rpm	★	-	0x3510+12
F5.1.12	Current 2 at faulty condition	0~655.35	-	A	★	-	0x3510+13
F5.1.13	Busbar voltage 2 at faulty condition	0~2000	-	V	★	-	0x3510+14
F5.1.14	DI input status 2 at faulty condition (display is the same with F9.0.19)	-	-	1	★	-	0x3510+15
F5.1.15	DO output status 2 at faulty condition (display is the same with F9.0.20)	-	-	1	★	-	0x3510+16
F5.1.17	Power-on time 2 at faulty condition	0~65535	-	h	★	-	0x3510+18
F5.1.18	Running time 2 at faulty condition	0~65535	-	h	★	-	0x3510+19
F5.1.19	Speed 3 at faulty condition	-9000~9000	-	rpm	★	-	0x3510+20
F5.1.20	Current 3 at faulty condition	0~655.35	-	A	★	-	0x3510+21
F5.1.21	Busbar voltage 3 at faulty condition	0~2000	-	V	★	-	0x3510+22
F5.1.22	DI input status 3 at faulty condition (display is the same with F9.0.19)	-	-	1	★	-	0x3510+23
F5.1.23	DO output status 3 at faulty condition (display is the same with F9.0.20)	-	-	1	★	-	0x3510+24
F5.1.25	Power-on time 3 at faulty condition	0~65535	-	h	★	-	0x3510+26
F5.1.26	Running time 3 at faulty condition	0~65535	-	h	★	-	0x3510+27

5.13 Display Control Parameter F6.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
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	/
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	0x3600+1
F6.0.07	Limitation of parameter change 0: Modifiable 1: Unmodifiable	0~1	0	1	◇	PST	0x3600+2
F6.0.08	User password	0~65535	0	1	◇	PST	0x3600+3

5.14 Drive Information F6.1

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F6.1.00	Accumulative running time	0~65535	0	h	★	PST	0x3610+1
F6.1.01	Accumulative power-on time	0~65535	0	h	★	PST	0x3610+2
F6.1.02	Reserved	0~65535	-	-	★	PST	0x3610+3
F6.1.03	Version No.	-	-	1	★	PST	0x3610+4
F6.1.04	Supplementation of version No.	-	-	1	★	PST	0x3610+5
F6.1.05	FPAG version No.	-	-	1	★	PST	0x3610+6
F6.1.06	Version No. of expansion board	-	-	1	★	PST	0x3610+7

F6.1.07	Version No. of user	-	-	1	★	PST	0x3610+8
F6.1.08	Reserved	-	-	-	★	PST	0x3610+9
F6.1.09	Fault code	Err---Err99	Err--	1	★	PST	0x3610+10

5.15 User Function Customization F7.0

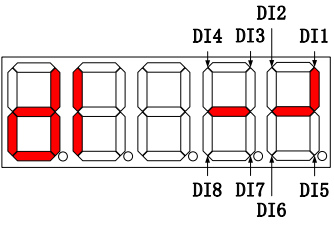
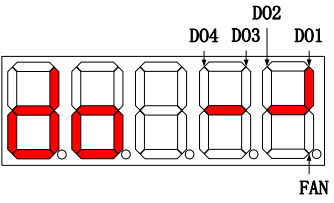
Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F7.0.00	User function 0	u0.0.00~u9.7.99	u6.0.00	1	★	PST	/
F7.0.01	User function 1	u0.0.00~u9.7.99	u1.0.00	1	◇	PST	/
F7.0.02	User function 2	u0.0.00~u9.7.99	u2.0.00	1	◇	PST	/
F7.0.03	User function 3	u0.0.00~u9.7.99	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	/
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	/

5.16 Communication Parameter F8.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F8.0.00	Selection of basic control modes 0: Pulse mode 1: M3 mode 2: EtherCAT mode 3: Reserved	0~3	1	1	◇	PST	/
F8.0.01~ F8.0.10	Reserved	-	-	-	-	-	F8.0.01~ F8.0.10
F8.0.12	M3 Frame size	0~1	1	1	●	PST	
F8.0.13	Spline type of interpolation mode	0~2	2	1	●	PST	
F8.0.14	Manufacturer identification and selection	0~2	1	1	●	PST	

5.17 Monitoring Parameter F9.0

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F9.0.00	Motor revolving speed	-	-	rpm	★	PST	0x3900+1
F9.0.01	Revolving speed command	-	-	rpm	★	PST	0x3900+2
F9.0.02	Set revolving speed	-	-	rpm	★	PST	0x3900+3
F9.0.03	Output torque [% rated]	-	-	%	★	PST	0x3900+4
F9.0.04	Set torque [% rated]	-	-	%	★	PST	0x3900+5
F9.0.07	Number of motor feedback pulse	-	-	pulse	★	PST	0x3900+8
F9.0.08	Number of motor feedback turns	-	-	turn	★	PST	0x3900+9
F9.0.09	Total number of command pulse L	-	-	pulse	★	PST	0x3900+10
F9.0.10	Total number of command pulse H (*10000)	-	-	pulse	★	PST	0x3900+11
F9.0.11	Common pulse frequency	-	-	hz	★	PST	0x3900+12
F9.0.12	Difference between command pulse and feedback pulse	-	-	pulse	★	PST	0x3900+13
F9.0.13	Mean torque [% rated]	-	-	%	★	PST	0x3900+14
F9.0.14	Peak torque [% rated]	-	-	%	★	PST	0x3900+15
F9.0.15	Busbar voltage	-	-	V	★	PST	0x3900+16

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
F9.0.16	Module temperature	-	-	°C	★	PST	0x3900+17
F9.0.17	All voltage	-	-	V	★	PST	0x3900+18
F9.0.19	Input terminal status 	-	-	-	★	PST	0x3207/0x3900+20
<p>Relationship between terminal status and 16-bit binary system:</p> <p style="text-align: center;">DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1</p> <p style="text-align: center;"> </p> <p>Low 8-bit B7 B6 B5 B4 B3 B2 B1 B0</p> <p style="text-align: center;">DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1</p> <p style="text-align: center;"> </p> <p>High 8-bit B15 B14 B13 B12 B11 B10 B9 B8</p> <p>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.</p>							/
F9.0.20	Output terminal status (FAN-fan) 	-	-	-	★	PST	0x3208/0x3900+21
<p>Relationship between terminal status and 16-bit binary system:</p> <p style="text-align: center;">FAN DO4 DO3 DO2 DO1</p> <p style="text-align: center;"> </p> <p>Low 8-bit B7 B6 B5 B4 B3 B2 B1 B0</p> <p style="text-align: center;">FAN DO4 DO3 DO2 DO1</p> <p style="text-align: center;"> </p> <p>High 8-bit B15 B14 B13 B12 B11 B10 B9 B8</p> <p>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.</p>							/
F9.0.22	Effective current	-	-	A	★	PST	0x3900+23
F9.0.23	Voltage before All calibration	-	-	V	★	PST	0x3900+24
F9.0.24	Brake protection time	-	-	l	★	PST	0x3900+25
F9.0.25	Motor revolving speed (unfiltered)	-	-	rpm	★	PST	0x3900+26
F9.0.26	Revolving speed command (post-treatment)	-	-	rpm	★	PST	0x3900+27
F9.0.27	Command pulse and revolving speed (with electronic gear ratio)	-	-	rpm	★	PST	0x3900+28
F9.0.28	Low motor position (Communication encoder)	-	-	pulse	★	PST	0x3900+29
F9.0.29	High motor position (Communication encoder)	-	-	pulse	★	PST	0x3900+30

Function Code	Name	Range	Default Value	Unit	Change Limitation	Effective Mode	SDO Mapping address
	encoder)						
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	All register value	-	-	1	★	PST	/
F9.0.37	Reserve	-	-	1	★	PST	
F9.0.38	Absolute position of motor encoder (32 digits) (For zero position clearing)	-	-	1	★	PST	/
F9.0.39							
F9.0.40	Absolute position of motor encoder (32-bit)	-	-	1	★	PST	/
F9.0.41							/
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~F9.0.59	Reserved	-	-	-	-	-	/

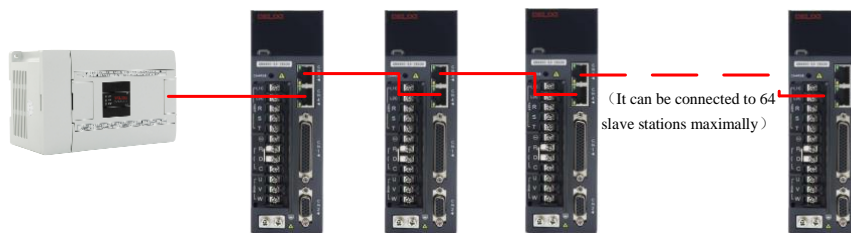
Chapter 6 Introduction to EtherCAT Communication

6.1 EtherCAT Introduction to communication interface

CDS500-EC servo drive can realize the communication functions of EtherCAT. EtherCAT is featured by high performance, low cost and simple applications. Only one industrial Ethernet cable is required for connecting the master station and slave station and connecting two slave stations, to realize the communication.

Pin No.	Definition	Description	Layout of Terminal Pin (Drive)
1	TX+	Sending port of EtherCAT communication	
2	TX-	Sending port of EtherCAT communication	
3	RX+	Receiving port of EtherCAT communication	
4	Reserved		
5	Reserved		
6	RX-	Receiving port of EtherCAT communication	
7	Reserved		
8	Reserved		
Shell	PE	Shielded	

Signal connector: Two communication signal connectors of same type and have internal parallel connection; the input/output interface of signal is: CN4 (OUT), CN3 (IN).



Chapter 7 Troubleshooting

7.1 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.

7.2 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.	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Check the current sampling device; • Check the Product;
Err08	Encoder fault 1	Detection fault of incremental encoder	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Check the storage chip of control board
Err10	Zero-drift detection fault	Power-on zero-drift detection fault	<ul style="list-style-type: none"> • Check if there's excessive analog quantity or hardware interface fault at startup
Err11	Undervoltage of main circuit	DC busbar voltage between P \oplus and - is lower than the fault value: Grade 220V: 200V Grade 380V: 380V	<ul style="list-style-type: none"> • 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 \oplus and - is over fault value: Grade 220V: 420V Grade 380V: 760V	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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;

Fault	Introduction	Description	Troubleshooting
Err15	Motor overload protection	Accumulative heat of motor is too high and reaches the fault threshold.	<ul style="list-style-type: none"> ● 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;
Err16	Integral saturation fault of speed ring	Internal algorithm is saturated	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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;	<ul style="list-style-type: none"> ● Check if power wire of motor is disconnected;
Err20	Position feedback fault	Motor running is out of control	<ul style="list-style-type: none"> ● 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.	<ul style="list-style-type: none"> ● 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.	<ul style="list-style-type: none"> ● 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.	<ul style="list-style-type: none"> ● 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.	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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.	<ul style="list-style-type: none"> • Check if the wiring of external brake resistor is poor or disconnected • Check if cable between P\oplus 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	-	<ul style="list-style-type: none"> • Please contact our technician.
Err35	CPLD/FPGA internal communication fault	-	<ul style="list-style-type: none"> • Please contact our technician.
Err36	Error of CPLD/FPGA version	Drive is not matched with motor	<ul style="list-style-type: none"> • 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	-	<ul style="list-style-type: none"> • Please contact our technician.
Err97	Communication encoder battery fault	-	<ul style="list-style-type: none"> • Please change the encoder's batteries.
Err99	Communication encoder disconnection fault	-	<ul style="list-style-type: none"> • Please contact our technician.

Annex 1 Recommended Combination for Servo System

For the combinations below, the motors which are fitted with 23-bit communication encoder are taken as the examples, The naming rules for motor S/N:

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. 3100	CDM-40S-H00130A00	CDS500-EC-2S016H	1.6
H. 3131	CDM-40S-H00330A00	CDS500-EC-2S030H	3
H. 3200	CDM-60S-H00630A00		
H. 3201	CDM-60S-H01330A00		
H. 3202	CDM-60S-H01930A00	CDS500-EC-2S045H	4.5
H. 3230	CDM-60S-H00630A00	CDS500-EC-2S030H	3
H. 3231	CDM-60S-H01330A00		
H. 3300	CDM-80S-H01330A00		
H. 3301	CDM-80S-H02430A00		
H. 3302	CDM-80S-H03530A00		
H. 3303	CDM-80S-H03530A00	CDS500-EC-2S045H	4.5
H. 3305	CDM-80S-H04030A00		
H. 33B1	CDM-80S-H02430A00	CDS500-EC-2S060H	6
H. 3401	CDM-90S-H03530A00	CDS500-EC-2S030H	3
H. 3402	CDM-90S-H04030A00	CDS500-EC-2S045H	4.5
H. 3600	CDM-110S-H06030A00	CDS500-EC-2S030H	3
H. 3601	CDM-110S-H04030A00	CDS500-EC-2S045H	4.5
H. 3602	CDM-110S-H04030A00	CDS500-EC-2S060H	6
H. 3603	CDM-110S-H05030A00		
H. 3604	CDM-110S-H06020A00	CDS500-EC-2S045H	4.5
H. 3605	CDM-110S-H06030A00	CDS500-EC-2S060H	6
H. 3606	CDM-110S-H06030A00		
H. 3636	CDM-110S-H10010A00	CDS500-EC-2S060H	6
H. 3700	CDM-130S-H04025A00	CDS500-EC-2S045H	4.5
H. 3701	CDM-130S-H05025A00	CDS500-EC-2S060H	6
H. 3702	CDM-130S-H06025A00		
H. 3703	CDM-130S-H07015A00		
H. 3704	CDM-130S-H07725A00	CDS500-EC-2S100H	10
H. 3705	CDM-130S-H10010A00	CDS500-EC-2S045H	4.5

H. 3706	CDM-130S-H10015A00	CDS500-EC-2S060H	6
H. 3707	CDM-130S-H10025A00	CDS500-EC-2S100H	10
H. 3708	CDM-130S-H15015A00		
H. 3709	CDM-130S-H15025A00	CDS500-EC-2S140H	14
H. 370A	CDM-130S-H07720A00	CDS500-EC-2S100H	10
H. 370B	CDM-130S-H06030A00		
H. 370C	CDM-130S-H07730A00		
H. 370D	CDM-130S-H10020A00		
H. 370E	CDM-130S-H07730A00		
H. 370F	CDM-130S-H04030A00	CDS500-EC-2S045H	4.5
H. 37A0	CDM-130S-H06015A00		
H. 37A1	CDM-130S-H10030A00	CDS500-EC-2S140H	14
H. 37A2	CDM-130S-H15020A00		
H. 3783	CDM-130S-H10015A00	CDS500-EC-2S100H	10
H. 3784	CDM-130S-H15015A00		
H. 3802	CDM-150S-H18020A00	CDS500-EC-2T200H	20
H. 3901	CDM-180S-H17015A00	CDS500-EC-2S100H	10
H. 3902	CDM-180S-H19015A00	CDS500-EC-2S140H	14
H. 3903	CDM-180S-H21520A00		
H. 3904	CDM-180S-H27020A00	CDS500-EC-2T200H	20
H. 3905	CDM-180S-H27015A00		
H. 3906	CDM-180S-H35010A00		
H. 3907	CDM-180S-H19025A00		

Recommended Combination for 1/3-phase 220V Input of Drive			
Servo Motor		Servo Drive	
Motor S/N	Model	Model	Rated Current (A)
H. 3310	CDM-80T-H04030A00	CDS500-EC-4T085H	8.5
H. 3610	CDM-110T-H06030A00		
H. 3710	CDM-130T-H10010A00		
H. 3711	CDM-130T-H10015A00		
H. 3712	CDM-130T-H10025A00		
H. 2713	CDM-130T-H15015A00		
H. 3714	CDM-130T-H15025A00	CDS500-EC-4T120H	12
H. 3715	CDM-130T-H07725A00	CDS500-EC-4T085H	8.5
H. 3716	CDM-130T-H04025A00		
H. 3717	CDM-130T-H05025A00		
H. 3718	CDM-130T-H06025A00		
H. 3719	CDM-130T-H07720A00		
H. 371A	CDM-130T-H10020A00		
H. 371B	CDM-130T-H10030A00		

Annex 1 Recommended Combination for Servo System

H. 371C	CDM-130T-H15030A00	CDS500-EC-4T120H	12
H. 371D	CDM-130T-H05530A00	CDS500-EC-4T085H	8.5
H. 371E	CDM-130T-H25020A00	CDS500-EC-4T120H	12
H. 371F	CDM-130T-H20020A00		
H. 3910	CDM-180T-H17015A00	CDS500-EC-4T200H	20
H. 3912	CDM-180T-H19015A00	CDS500-EC-4T085H	8.5
H. 3913	CDM-180T-H21520A00	CDS500-EC-4T120H	12
H. 3914	CDM-180T-H27020A00	CDS500-EC-4T200H	20
H. 3915	CDM-180T-H27015A00	CDS500-EC-4T120H	12
H. 3916	CDM-180T-H35010A00		
H. 3917	CDM-180T-H35015A00		
H. 3918	CDM-180T-H48015A00	CDS500-EC-4T200H	20
H. 3919	CDM-180T-H35020A00		
H. 391A	CDM-180T-H21525A00	CDS500-EC-4T120H	12
H. 3A13	CDM-200T-H70015A00	CDS500-EC-4T200H	20

Recommended Combination for 1/3-phase 220V Input of Drive (5pair poles)			
Servo Motor		Servo Drive	
Motor S/N	Model	Model	Rated Current (A)
H. 3281	CDM-60S-H01330A00-5	CDS500-EC-2S030H	3
H. 3381	CDM-80S-H02430A00-5	CDS500-EC-2S060H	6
H. 3382	CDM-80S-H03330A00-5		
H. 3750	CDM-130S-H06415A00-5	CDS500-EC-2S100H	10
H. 3752	CDM-130S-H08415A00-5		
H. 3781	CDM-130S-H05415A00-5		
H. 3782	CDM-130S-H08315A00-5		
H. 3785	CDM-130S-H11515A00-5	CDS500-EC-2S140H	14
H. 3756	CDM-130S-H14615A00-5		