SDF-X/W/E Series
AC Servo driver manual
V2.4

Thank you for choosing F series servo driver. Please read this manual before using. The main contents of this manual include:

* Servo driver inspection, installation and wiring steps.
* Digital panel operation steps, status display, trouble alarm and disposal.
* Servo system control mode, trial running and adjustment steps.
* List of all the parameters of the servo drives.
* Servo drives specifications.

For daily inspection, maintenance,finding the exception reasons and countermeasures, please keep this manual for easy reference.

Note: Please give this manual to the end user so as to maximize the utility of the servo drives.

● The manual contents may be changed due to the product improvements, there will be no prior notice.

● Any changes made to the product by users, the company will not undertake any responsibility and the product warranty will be invalid.

When reading this manual, please pay special attention to the following warning signs

⚠ **Warn**   Indicates the wrong operation may cause disastrous consequences—death or serious injury!

⚠ **caution**   Indicates the wrong operation may hurt the operator and also make damage to the equipment!

⚠ **attention**   Indicates improper use may damage the product and equipment!

CONTENT

Chapter 1 Product inspection and installation

Summarize

SDF series servo is our fourth generation servo. All the input and output port can define itself, which is convenient to the user; standard RS485 communication function, realize uploads and downloads network control; internal simple PLC function, the PLC can be completely eliminated in some easy control occasions so as to lower the cost. Compare with the third generation SDD series servo, it has obvious improvement on the function and performance.

1.1   Product inspection

Our servo products have been done a completely functional test before leaving factory, in order to prevent the product exception in the process of shipment, please check the following items carefully when open the package:

1) Check the servo drive and motor model whether same as ordered. 2) Check the servo drive and motor appearance whether with damage or scratch. If there is any above mentioned defective or abnormal signs, please contact with local distributors immediately

1.1.1   Model confirmation

Servo drive model

SD F 04 N K7—X

SD series servo drive	**Version identification number**

Sub-series:
A series:
B series:
C series:
D series:
E series:
F series

Output power
04:   400W
08：800W
13：1.3KW
20：2.0KW

Power supply
N：220V series
H：380V series

Shape code
K7:
K8:
K9:
K10
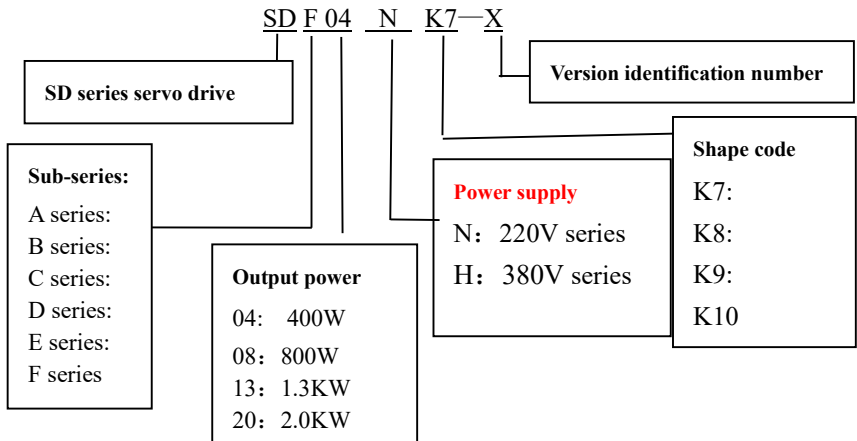
Suffix -X series: can be equipped with 17BIT absolute value magnetic encoder or photoelectric encoder.
Suffix -W series: small volume economical servo driver.

1.1.2 SDF servo drive attached standard accessories

① CN1 plug（DB25 hole） 1 set
② CN2 plug（DB9 pin） 1 set
③ 5 pin power plug（SDF04/08NK7 drive）1 piece
④ 3 pin power plug（SDF04/08NK7 drive）1piece
⑤ RS485 communication line（model CABLE01）2 piece **optional**
⑥ Debugging communication line（model CABLE02）1 piece **optiona**l

1.1.3 **Servo drive installation size**
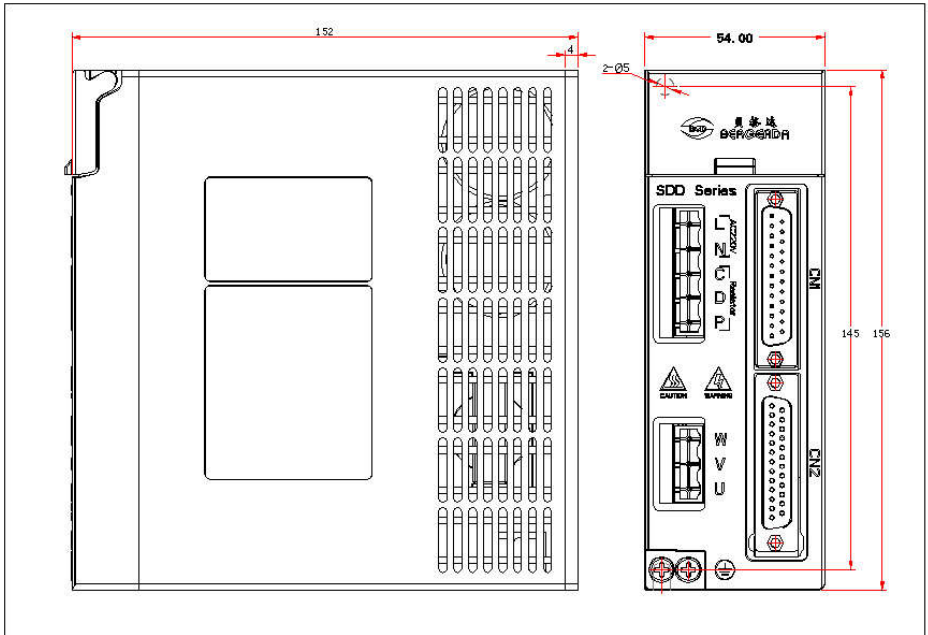
SDF04NK7X servo drive installation dimensional
!!!!Notice: L N is 220V power supply , PD,C is external braking resistor terminals. It can not be connected wrong！
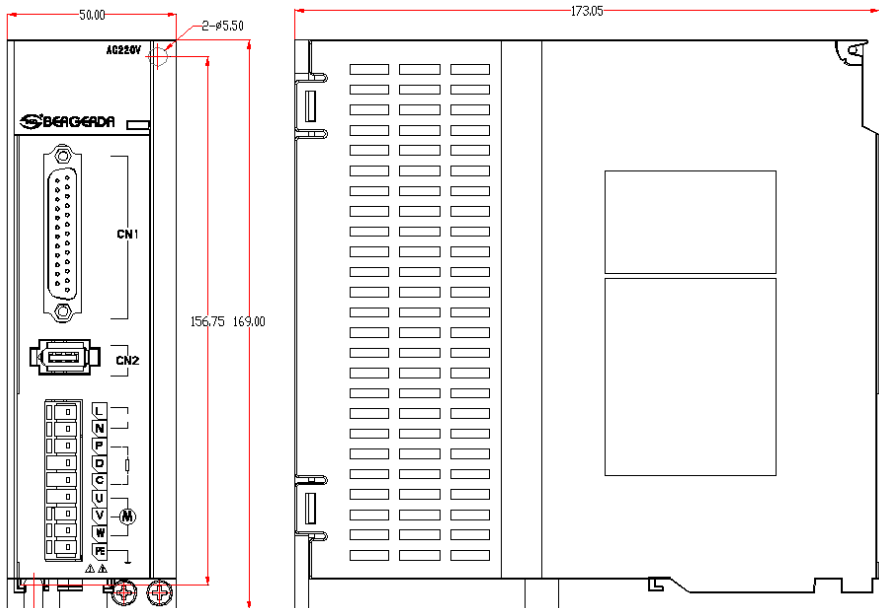
SDF08NKW   **servo drive installation dimensional**

!!!!Notice: L N is 220V power supply , PD,C is external braking resistor terminals. It can not be connected wrong！
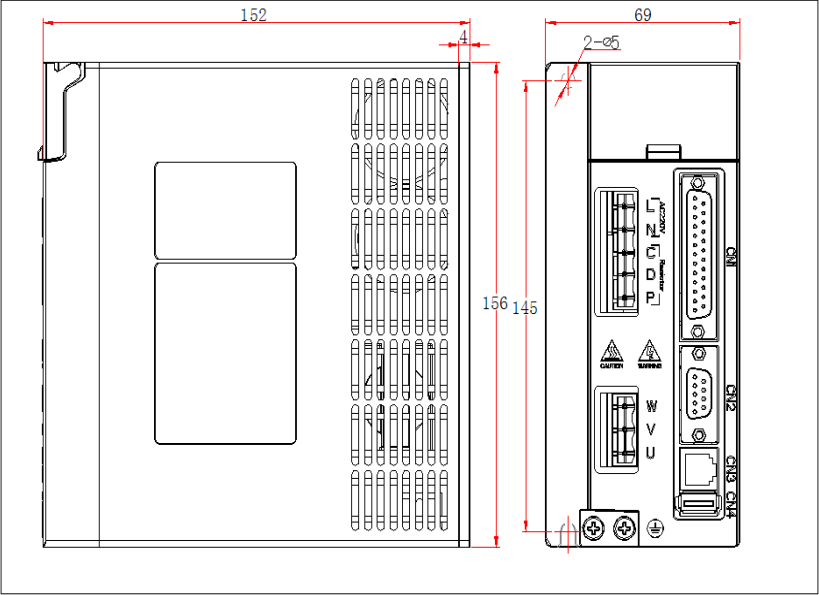
SDF08NK8X servo drive installation dimensional

!!!!Notice: L N is 220V power supply , PD,C is external braking resistor terminals. It can not be connected wrong！

SDFNK9X** servo drive installation dimensional

SDF50NK10X servo drive installation dimensional
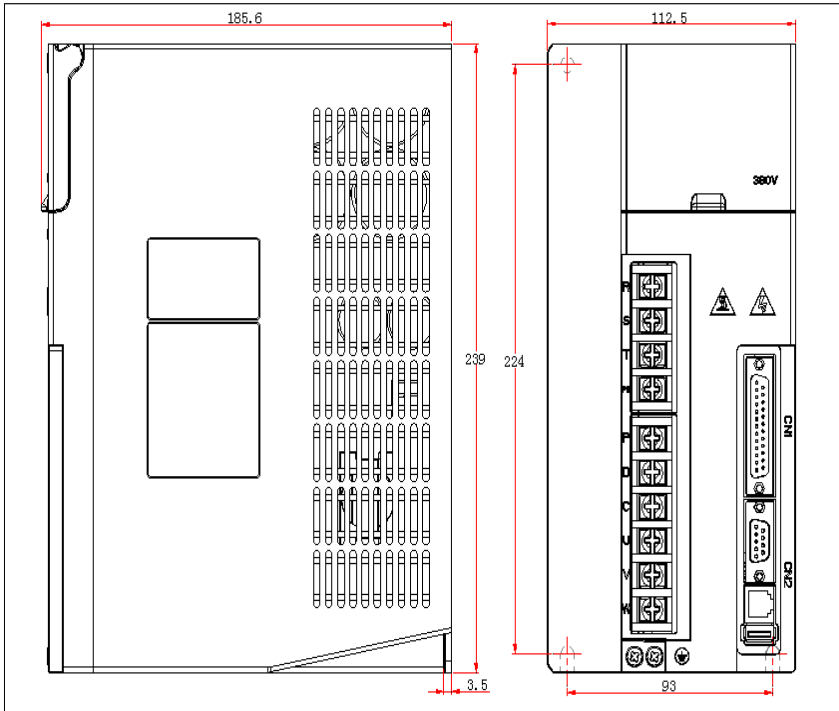
SDF55HK12X servo drive installation dimensional

1.2 Servo Drive and Motor Specifications

1.2.1 Servo Drive Specifications

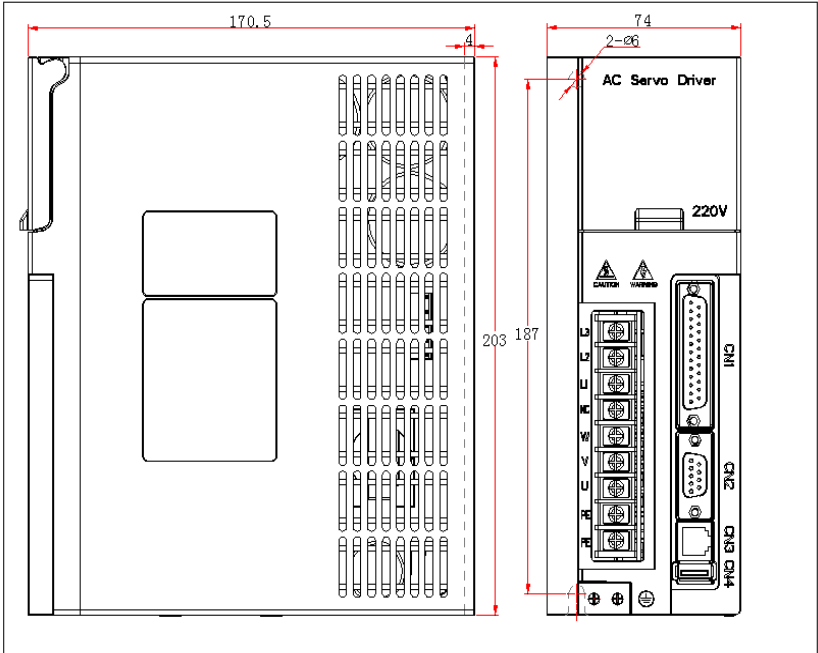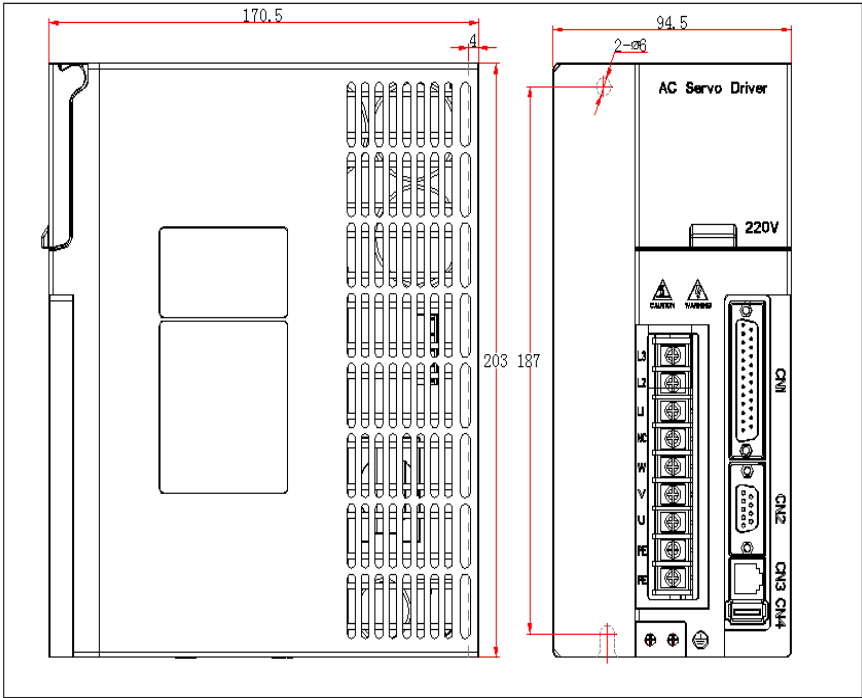|		mode	SDF04	SDF08	SDF13	SDF20	SDF50
Basic specificat ions		Maximum current(A)	8.9	8.9	12.5	18.0	25.0
		Power supply	single phase AC170~253V				
			50/60Hz				
		Cooling method	Natural cooling/ fan Cooling ?				
		Control method	SVPWM control				
		Encoder	17Bit or 23 Bit absolute single-turn or multi-turn magnetic or photoelectric encoder				
Internal functions		display and operation	Six of seven-segment display LED: four function keys				
		Control model	position control / speed control / torque control / Jog operation /RS485 communication				
		Braking function	Built-in				
		Protection function	Under voltage, over voltage, over load, over current, encoder exception, braking, position error etc.				
Position control model		Command control model	External pulse				
	External command pulse input	Form	pulse+ direction cw/ccw A/B orthogonality				
		Maximum frequency	Differential motion:1MHZ open collector: 200KHZ				
		Electronic gear ratio	1～32767/1～32767				
		Speed control range	speed ratio: 1:5000				
		Speed rate of change	Speed fluctuation ratio: < ±0.03 （load 0 ～ 100%）．< ±0.05（power-15%～+10%）				
		Command smooth way	Linear time constant 1 ms～10000ms（0r/min←→1000r/min）				
		frequency characteristic	300HZ				
input / output	location signal output	output type	ABZ phase line drive output/ Z open collector output				
		Frequency division ratio	1 to 65535 pulses				

signal	input signal	7 points photoelectric isolation input	Input point can be defined as any 23kinds, see parameter settings
	output signal	4 collector open	1) location/speed reach 2) servo alarm output；3)Z signal output 4) brake output. Freely defined
Usage temperature			Operation:0℃～55℃storage:-20℃～80℃

1.2.2 TCL series low-power servo motor specifications (17-bit magnetic encoder)

Model	Power（KW）	poles	Rated torque（N.M）	Rated speed（r/min）	Rate current（A）	Rotor inertia（×10kgm²）	weight（KG）
60F-00630TCL	0.2	5	0.64	3000	2.0	0.14	1.12
60F-0130TCL	0.4	5	1.27	3000	3.2	0.56	1.2
80F-0230TCL	0.75	5	2.39	3000	5.1	1.56	2.2
80F-0330TCL	1.0	5	2.39	3000	5.7	1.93	3.7
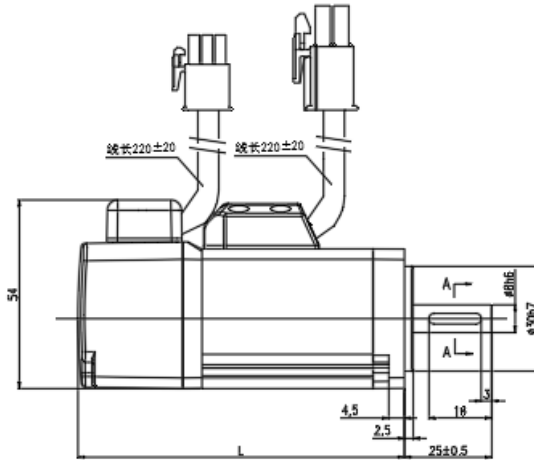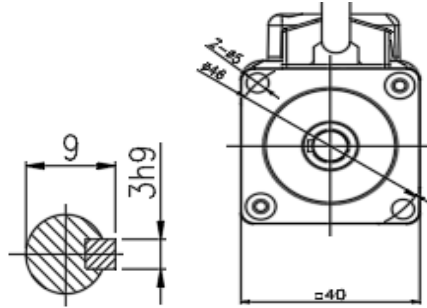
Motor Model	40F-00230TCL（Z）		40F-00330TCL（Z）	
L（mm）	Without brake	With brake	Without brake	With brake
	93.5	123.5	104.5	134.5

TCL series 40 flange AC servo motor installation outline and installation dimension drawing
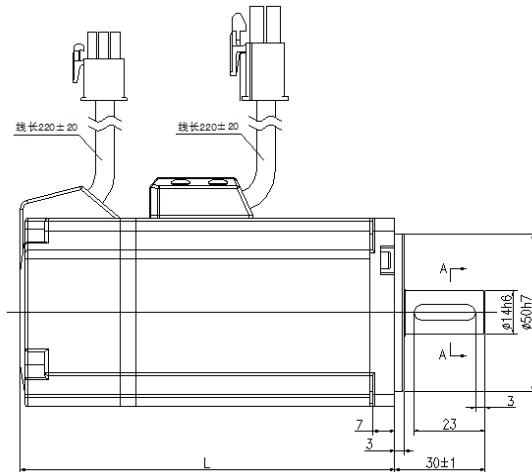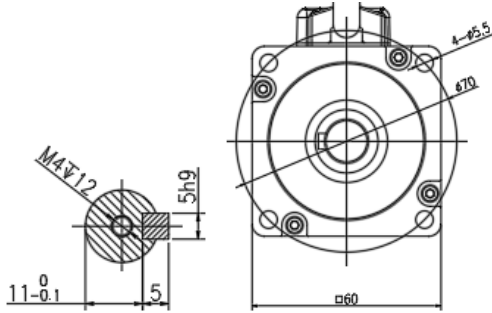
Motor model	60F-00630T*L（Z）		60F-0130T*L（Z）	
L（mm）	Without brake	With brake	Without brake	With brake
	82（TCL）	110.0（TCL）	99（TCL）	127（TCL）

TCL series 60 flange AC servo motor installation outline and installation dimension drawing
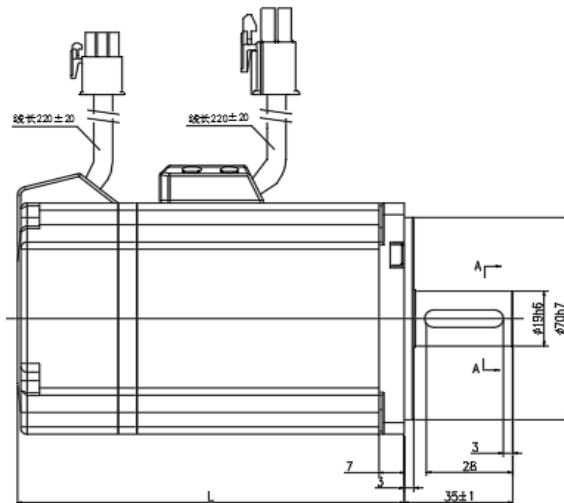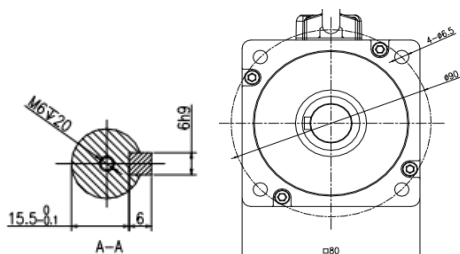
Motor Model	80F-0230T*L（Z）		80F-0330T*L（Z）	
L（mm）	Without brake	With brake	Without brake	With brake
	109(TCL)	142(TCL)	123(TCL)	155(TCL)

TCL series 80 flange AC servo motor installation outline and installation dimension drawing

1.2.3 TCL series low-power servo motor wiring diagram (encoder socket is 9-core AMP)

motor winding socket	W（black）		V（white）	U（red）	PE（yellow-green）
	2		3	1	4
Encoder socket	5V	0V	PS+	PS-	PE
	7	8	1	4	9
	red	Red white	blue	Blue black	shield

1.2.4 TDL series medium (high) power servo motor specifications

Model	Power (KW)	poles	Rated torque (N.M)	Rated speed (r/min)	Rate current (A)	Rotor inertia (×10kgm²)	Rated Voltage
110F-0425TDL	1.0	5	3.82	2500	5.5	3.8	220
110F-0625TDL	1.5	5	5.73	2500	6.8	5.2	220

130F-0520TDL	1.0	5	4.78	2000	5.6	6.1	220
130F-0820TDL	1.5	5	7.16	2000	7.2	7.9	220
130F-1020TDL	2.0	5	9.55	2000	10.2	11.1	220
130F-1520TDL	3.0	5	14.33	2000	11.0	13.2	220
130F-1915TDL	3.0	5	19.10	1500	16.8	13.2	220

A—A
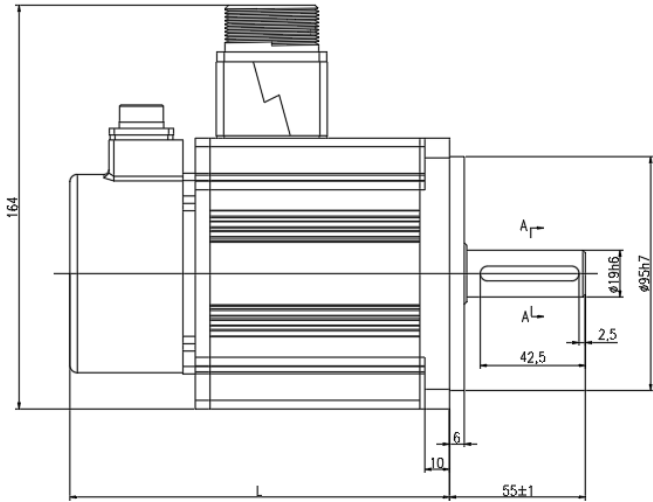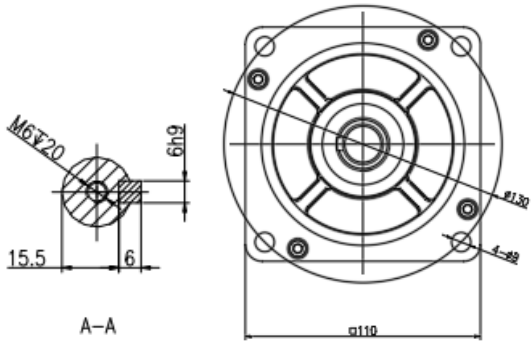
Motor model	110F-0425TDL（Z）		110F-0625TDL（Z）	
L（mm）	Without brake	With brake	Without brake	With brake
	154	186	170	202

TDL series 110 flange AC servo motor installation outline and installation dimension drawing
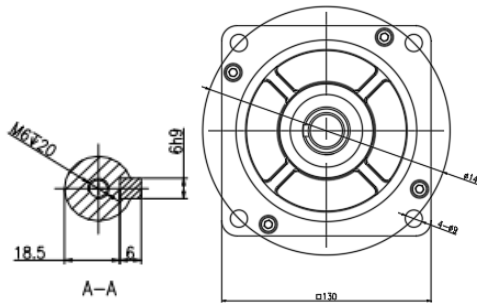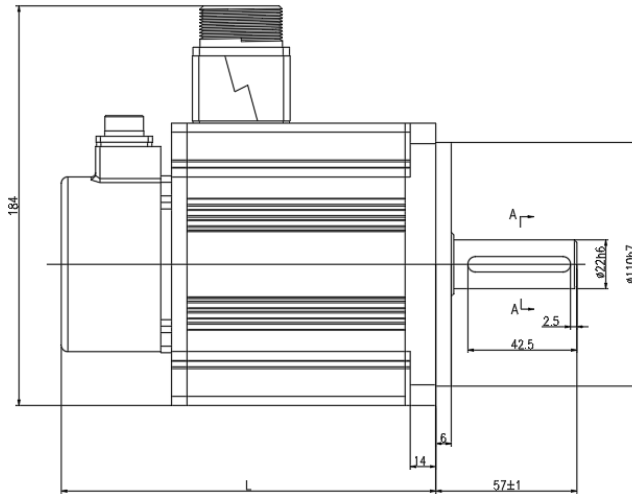
Model	L（mm）			
	130F-0520TDL	130F-0820TDL	130F-1020TDL	130F-1520TDL
Without brake	151	166	180	193
With brake	187	202	214.5	229.5

TDL series 130 flange AC servo motor installation outline and installation dimension drawing

1.2.5 TDL series medium (high) power servo motor wiring diagram (without brake)

motor winding socket	W（yellow）		V（blue）	U（red）	PE（yellow green）
	3		4	2	1
Encoder socket	5V	0V	PS+	PS-	PE
	4	5	2	3	1
	red	Red white	blue	Blue black	shield

1.2.6 TDL series medium (high) power servo motor wiring diagram (with brake)

motor winding socket	W(yellow)	V（blue）	U（red）	24V	0V
	6	3	7	2	5
Encoder socket	5V	0V	PS+	PS-	PE
	4	5	2	3	1
	red	Red white	blue	Blue black	shield

1.3 Servo drive installation

1.3.1　Installation environment conditions

Servo drive installation environment has a direct effection to the servo function and service life, therefore, the drive installation environment conditions must comply with following conditions:

Items	SDF servo drive
usage temperature/ humidity	0°C～55°C （no frozen frost） 90%RH below （no condensation）
storage temperature/ humidity	-20°C～80°C 90%RH （no condensation）
atmospheric environment	In control cabinet, no corrosive gas, inflammable gas, oil mist or dust etc
vibration	less than 0.5G （4.9m/s^2） 10 Hz -60Hz （not run continuously）
Protection level	IP54

When several drives installed in the control cabinet, please keep enough space for sufficient heat dissipation; please add an additional cooling fan to keep the drive ambient temperature below 55 °C.

Please install the drive by vertical way, face forward, top up for heat dissipation.

Avoid any drilling cuttings or other things falling in the drive during assembly.

Please use M4 screws when installing.

If there is vibration source (punch) nearby and can not avoid it, please use vibration absorber or add anti-vibration rubber gasket.

If there is a large magnetic switch, welding machine etc noise interference sources nearby, the drive is easily interfered by outside and make wrong action, therefore, a noise filter must be added; but the noise filter will increase leak current, so, an insulating

transformer must be installed at the input end of the drive.

1.3.2 Servo installation direction and interval

Below chart shows a drive and multiple drives installation interval, the interval should be larger enough for a good heat dissipation conditions.
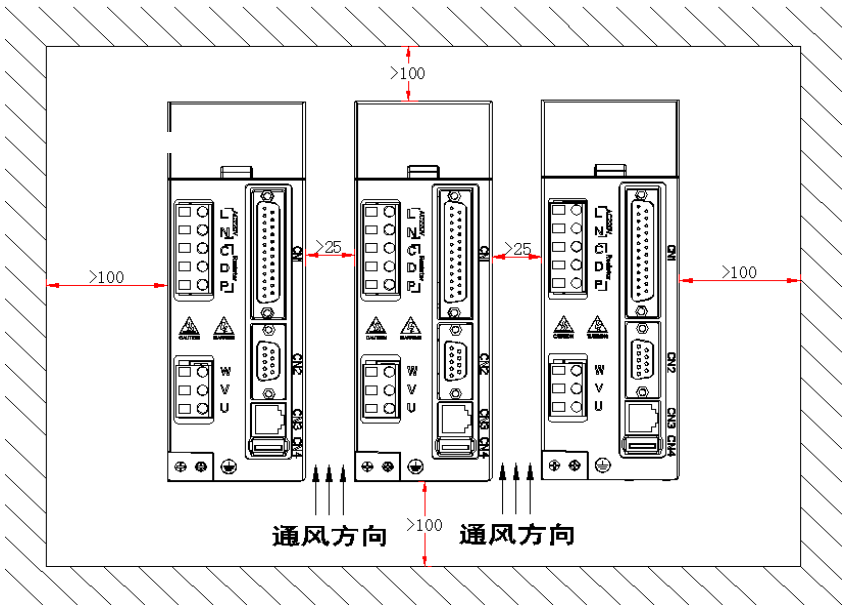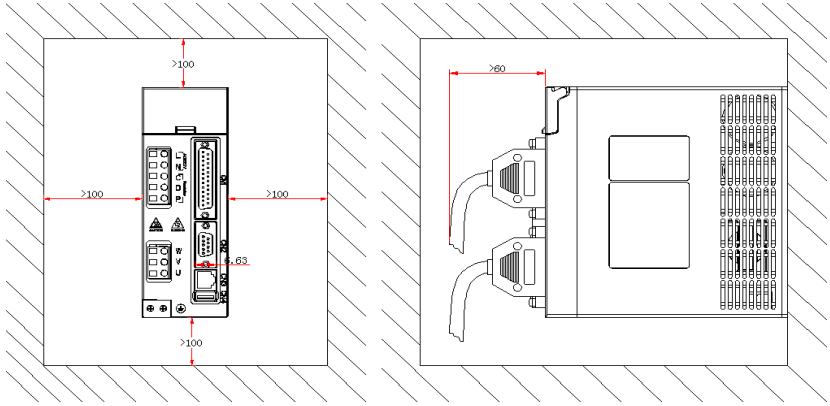
Chapter 2 Servo Drive and Motor Wiring

2.1 Servo drive power supply and peripheral devices wiring
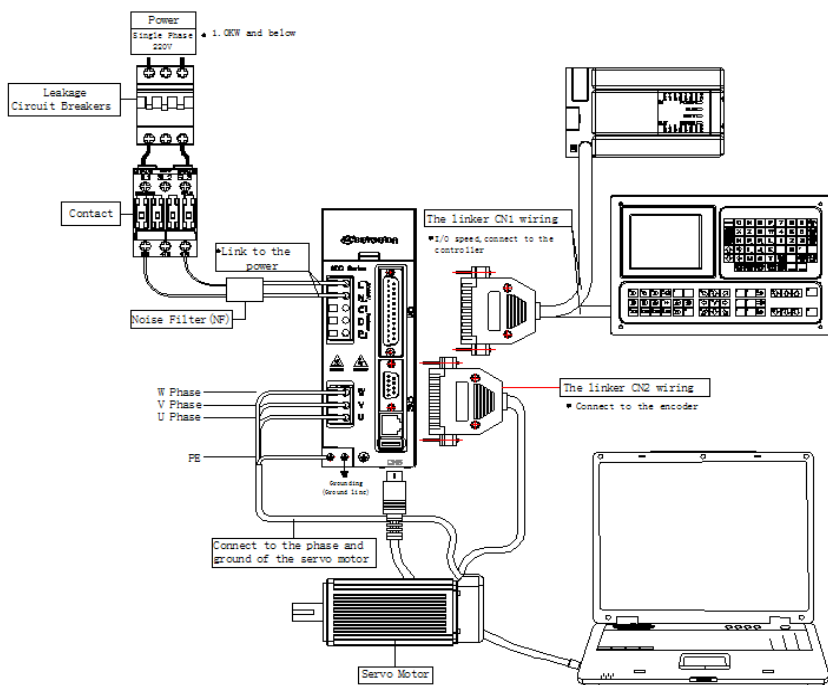
SDF04NK7X servo drive peripheral devices wiring
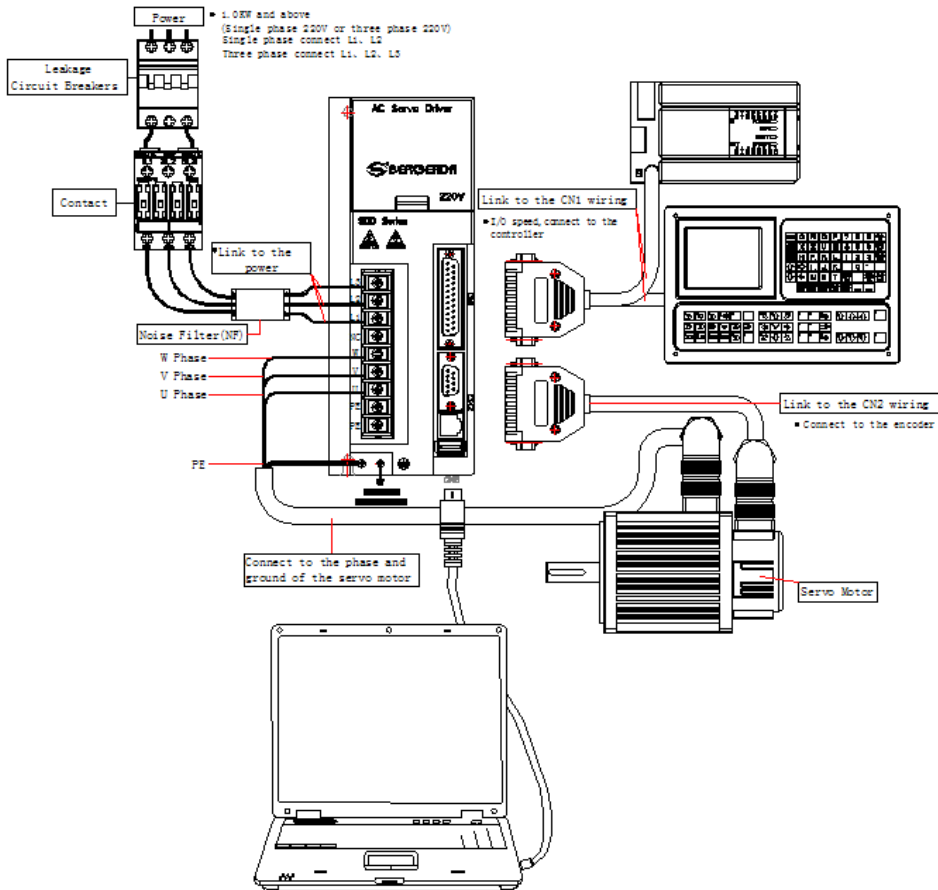
SDF20NK9X servo drive peripheral devices wiring

2.1.1 Wiring diagram of position control mode 0
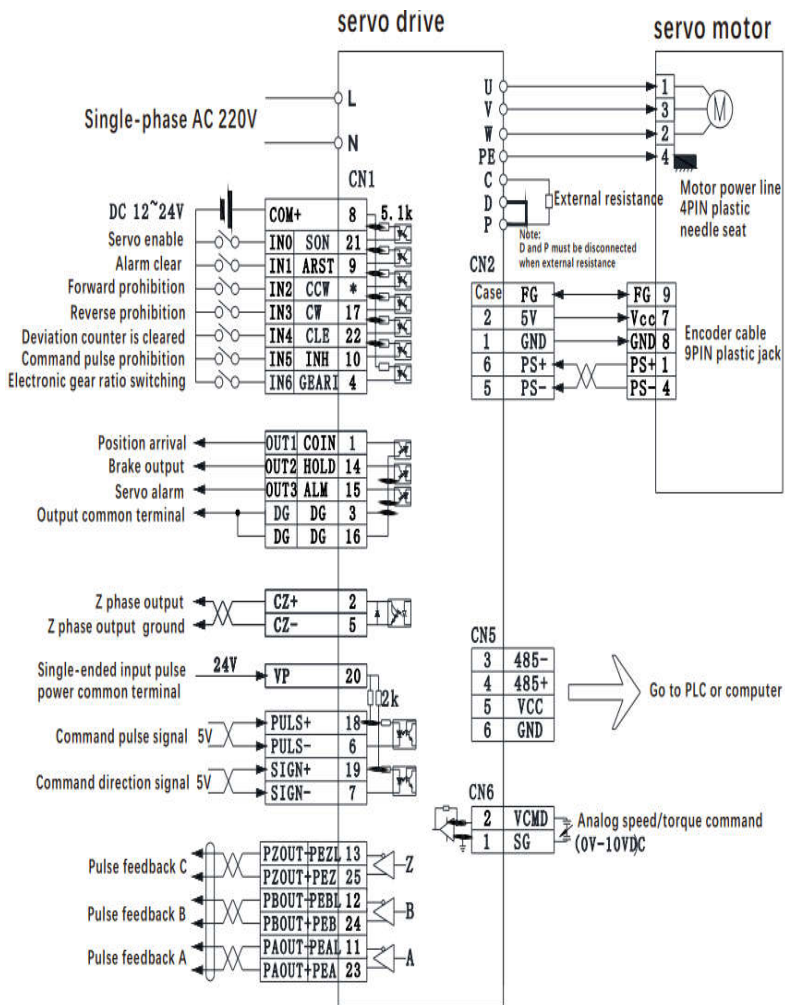
SDF04NKW   SDF08NKW Wiring diagram of position control mode

2.2 position control mode wiring diagram 1
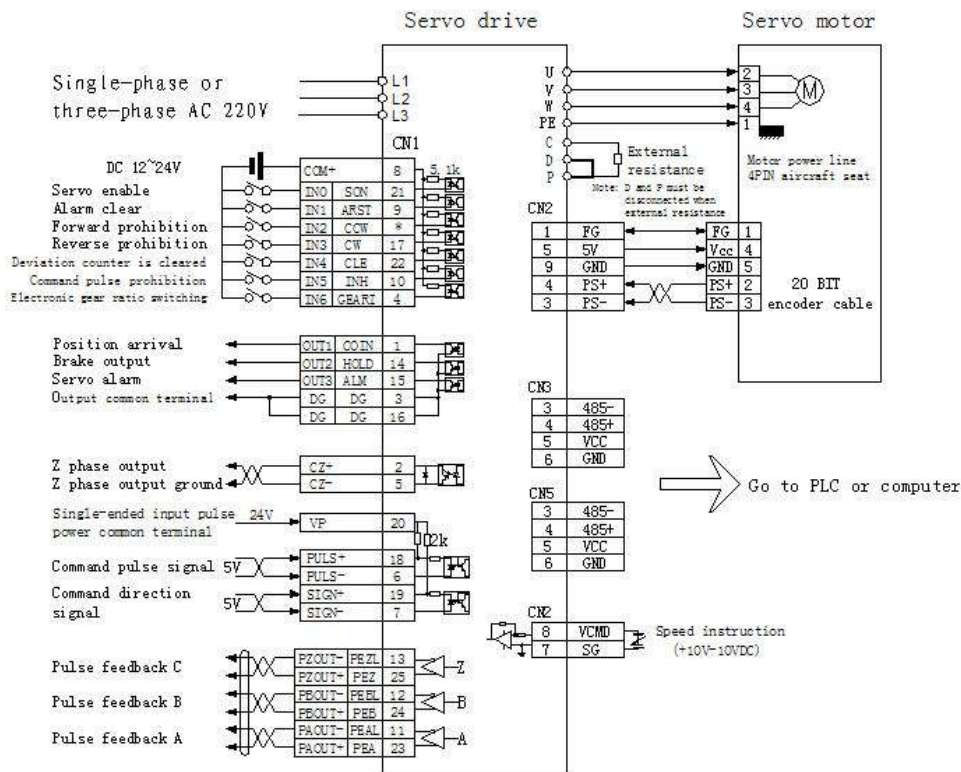
SDF04NK7X SDF08NK8X position control mode wiring diagram

2.3 position control mode wiring diagram 2
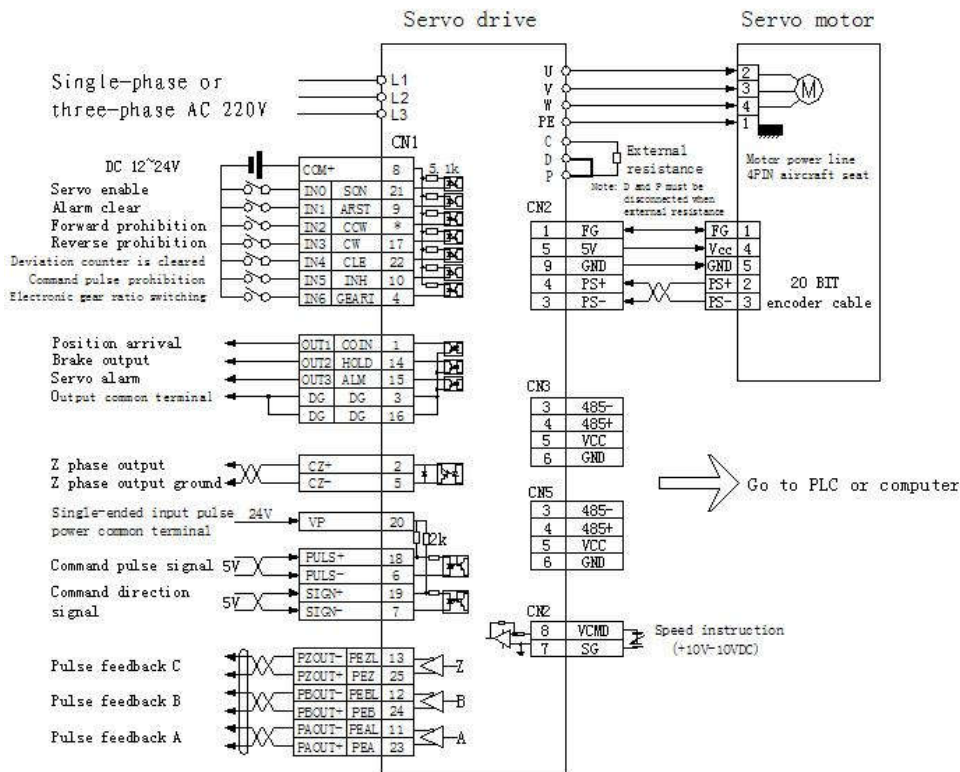
SDF13NK9X/SDF20NK9X/SDF50NK10X position control mode wiring diagram

2.4 position control mode wiring diagram 3
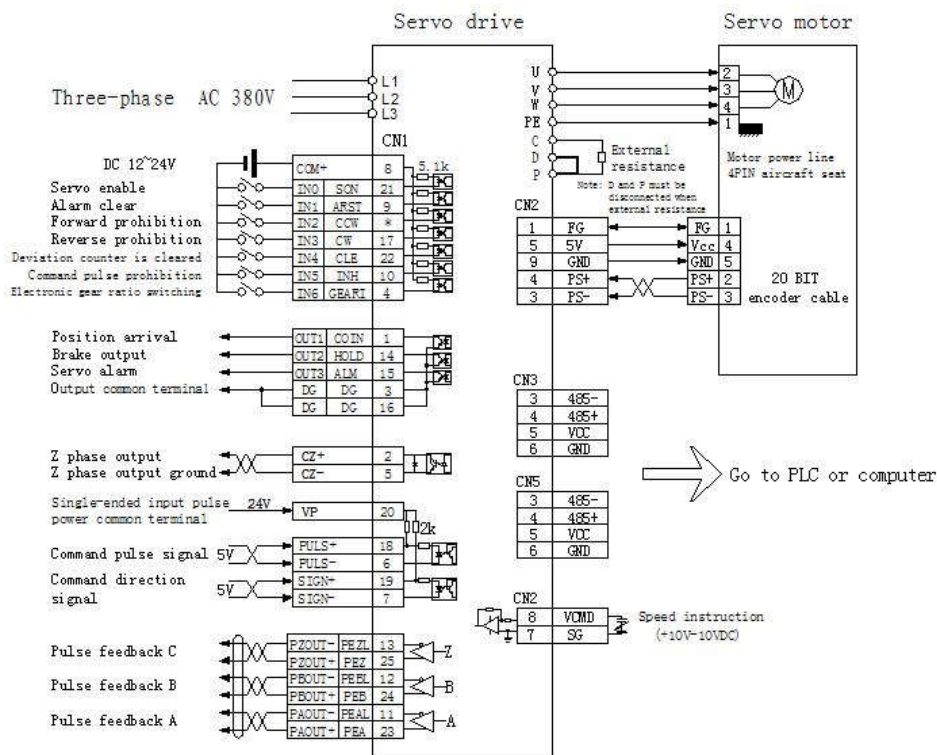
SDF55HK12X position control mode wiring diagram

2.5 position control mode wiring diagram 4
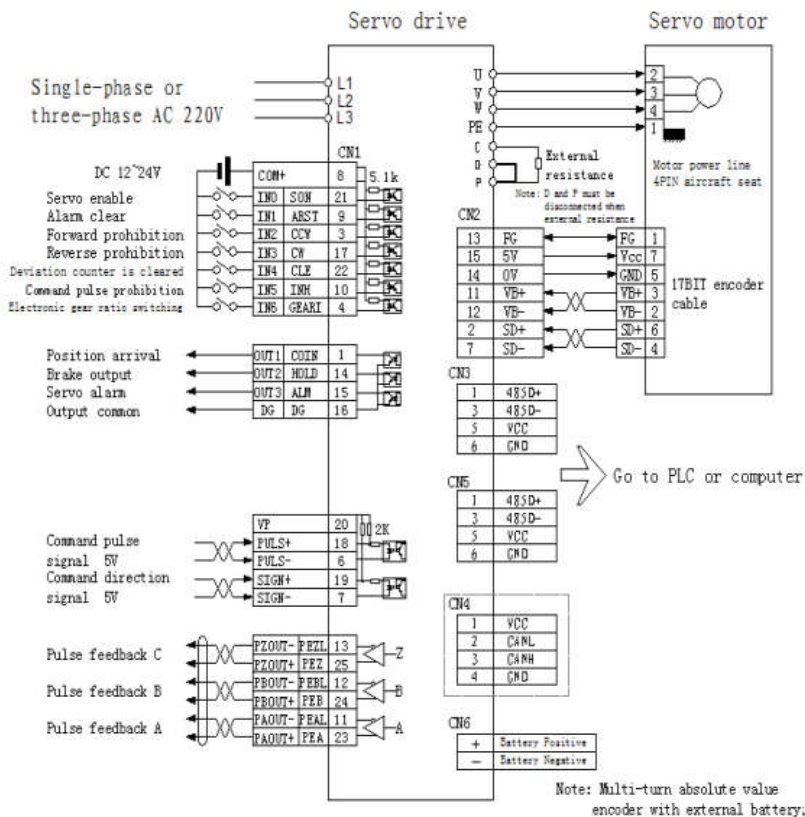
SDF04NK7E SDF08NK8E Multi-turn absolute value wiring diagram (The interface function is compatible with the previous generation SDE)
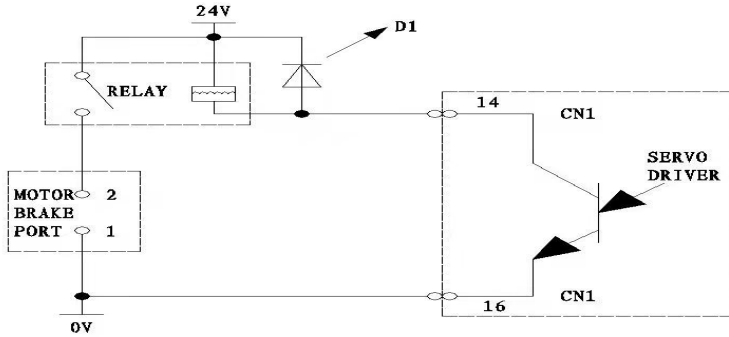
locking type brake motor wiring diagram

2.5 Terminal electrical connection

2.5.1   Definition of the power terminal (SDF04NK7X   SDF04NKW series)

	Terminal marking	signal definition	function
	L	power supply	power input terminal～220V 50Hz
	N		note: do not connect with motor output terminal U, V, W.
	P	external connect brake resistor select terminal	Built-in braking resistor: P and D short circuit connection.
	D		With external braking resistor:P and D open.The external resistance connection between P and C.
	C		
	PE	System grounding	1、grounding terminal resistance＜100Ω; 2、Servo motor output and power input with one public point grounding.
	W	Servo motor output	Servo motor output terminals must connect with motor terminals W,V,U
	V		
	U		

2、Power terminal definition **(SDF20NK9X series)**

	Terminal marking	signal definition	function
	L1	Power supply single-phase or three phase	power input terminal～220V　50Hz,single phase connect L1 L2 note: do not connect with motor output terminal U, V, W.
	L2		
	L3		
	PE	System grounding	grounding terminal resistance＜100Ω； Servo motor output and power input with one public point grounding
	U	Servo motor output	Servo motor output terminals must connect with motor terminals W,V,U
	V		
	W		
	P	external connect brake resistor select terminal	Built-in braking resistor::P and D short circuit connection.
	D		With external braking resistor:P and D open.The external resistance connection between P and C.
	C		

2.5.3 Power line terminals wiring

- L1, L2, L3, PE, U, V, W terminal, transversal area$\geq$1.5mm^2(AWG14-16). L, N terminal, transversal area$\geq$1.0 mm^2(AWG16-18)。

- Grounding: the grounding wire should be as thick as possible, drive and servo motor grounding at PE terminal, grounding resistance＜100Ω。

- Suggest providing power supply by three-phase isolating transformer to reduce the possibility of electric shock hurts.

- Suggest providing power supply by the noise filter to improve the anti-interference ability.

- Please install non fuse type(NFB) circuit breakers, so that the external power supply can be cut off promptly when the drive with failure.

2.5.4 Signal terminal definition

SDF servo drive unit interface terminal configuration as follows.CN1 signal control terminal is DB25 connector, the socket is pin type, plug is hole type; The CN2 feedback terminal is a DB9 connector, the socket is a two-row 9-pin hole type, and the plug is a two-row 9-pin type.

1）**Control terminal   CN1**

Abbreviation of control method：

Terminal No	signal name	mark	I/O	System default function
CN1-8	Control Power supply positive	COM+	power supply	Power supply positive pole of input terminal Photoelectric coupler used for drive the input terminals DC12 ～ 24V, electric current≥100mA
CN1-21	Input port0	IN0(SON)	input	System default： input terminals of Servo-enabled: SON ON：allow the drive to work. SON OFF：drive off, stop working, the motor in free state.
CN1-9	Input port 1	IN1 （ARST）	input	System default：servo alarm clear ON：servo alarm output normally OFF：remove the system alarm
CN1-*	Input port 2	IN2(CCW)	input	System default：Forward drive prohibition
CN1-17	Input port 3	IN3(CW)	input	System default：Reverse drive prohibition
CN1-22	Input port 4	IN4(CLE)	input	System default：position deviation counter reset CLE ON: position control, position deviation counter reset
CN1-10	Input port 5	IN5(INH)	input	System default：position command pulse prohibit input terminals INH ON: command pulse input prohibited INH OFF: Command pulse input effective
CN1-4	Input port 6	IN6 (GEARI)	input	System default：electronic gear ratio choose terminal（default as OFF） ON：choose PN31 parameter as present position control gear ratio OFF：choose PN9 parameter as present position control gear ratio

CN1-1	Output port 1	OUT1 （COIN）	output	System default： position reach. position reach signal output , when the servo position reach to the target position（Pn12 parameter value）, output ON
CN1-14	Output port 2	OUT2 (HOLD)	output	System default： brake output Open-drain output, normal working, optocoupler breakover. Output ON No enable, drive prohibited. When alarm, optocoupler cut-off; output OFF
CN1-15	Output port 3	OUT3 （ALM）	output	System default: servo alarm output ALM ON: servo drive without alarm, servo alarm output ON. ALM OFF: servo drive alarm, servo alarm output OFF.
CN1-3/16	common terminal of the output	DG	common termina	Grounding common terminal of the control signal output terminal(except CZ)
CN1-2	encoder Z phase output	CZ+	output	the encoder Z phase output terminals: photoelectric code of the servo motor Z phase pulse output CZ ON: Z phase signal appear, optocoupler collector open circuit output
CN1-5	encoder Z phase output	CZ-	output	
CN1-18	Command pulse	PULS+	input	external Command pulse input terminals Note 1: the parameter Pn8 set pulse input model;
CN1-6		PULS-		
CN1-19	command direction	SIGN+	input	0. Command pulse+symbol mode; 1. CCW/CW Command pulse mode; 2. A/B orthogonal Command pulse mode
CN1-7		SIGN-		
CN1-23	Output encoder signal A	PEA	output	Each round of the motor with pulse output The output pulse is mainly used to return to the upper machine. To achieve closed loop control, the frequency of the output signal can be set by PN41,PN42..
CN1-11		PEAL	output	
CN1-24	Output encoder signal B	PEB	output	
CN1-12		PEBL	output	
CN1-25	Output encoder	PEZ	output	

	signal Z			Each motor round output a signal, the width of
CN1-13		PEZL	output	the signal related to the speed of the motor
CN1-20	External public power supply	VP	input	If the pulse signal is 24 v, connect the power supply can be without resistance
CN1-PE	Shield ground	PE		

2) The feedback signal terminal　CN2

terminal No	signal name	terminal mark	I/O	function
CN2-4	Serial encoder signal	PS+	Two way	Code wheel serial data
CN2-3	Serial encoder signal	PS-	Two way	Code wheel serial data
CN2-5	+5Vpower supply	VCC		Power supply
CN2-9	Digitally Ground	GND		Code wheel serial data
CN2-1	Shielding ground	FG		

3) Serial communication terminal CN3/CN5

terminal No.	signal name	mark	function
3	RS485 communication signal	485D-	RS485 communication signal
1	RS485 communication signal	485D+	RS485 communication signal

The two terminals CN3 and CN5 can be interconnected to form multiple network communication.

The terminal interface is as shown below:

2) The feedback signal terminal CN2　　(SDF-W series)

terminal No	signal name	terminal mark	I/O	function
CN2-6	Serial encoder signal	PS+	Two way	Code wheel serial data
CN2-5	Serial encoder signal	PS-	Two way	Code wheel serial data
CN2-2	+5Vpower supply	VCC		Power supply
CN2-1	Digitally Ground	GND		Code wheel serial data
Shell	Shielding ground	FG		

2.5.5 signal terminals wiring

- Cable selection: use shield cable (It is better to choose twisted shielded cable), wire core cross-sectional area$\geq 0.12mm^2$(AWG24-26), shield must connect with FG terminals.
- cable length: cable length as short as possible, CN1 control cable should be less than 3meters, signal feedback CN2 cable should be less than 20meters.
- Wiring: away from power cabling to prevent interference entering. Please install surge absorber component in the relevant circuit inductor components (coil); direct current coil anti-parallel free-wheeling diode, AC coil in parallel and RC absorb return circuit.

2.6　The principle diagram of the signal interface

2.6.1 digital input interface circuit

Digital input interface circuit could be controlled by relay or open collector transistor circuit. User provide power, DC12～24V, current$\geq$100mA；note: if the current polarity reversed, the drive does not work. Input signal IN0-IN6 all can ref
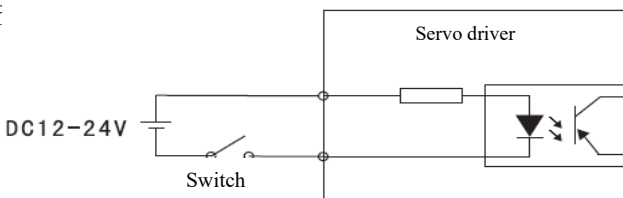
When input signal connect with OV, signal is ON input and effective. It can be judged by display menu UN-17, when input ON, the corresponding nixie tube will be light. Input OFF, the corresponding nixie tube will die out. Use this display content properly, convenient for servo input signal debugging and maintenance.
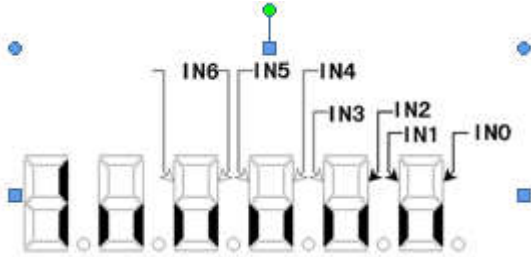
Input terminal display

(The stroke is lit to indicate ON, and to be off to indicate OFF)

2.6．2 Servo motor photoelectric encoder input interface

In the differential output mode, use AM26LS32、MC3487 or similar line drive RS422 as a receiver.
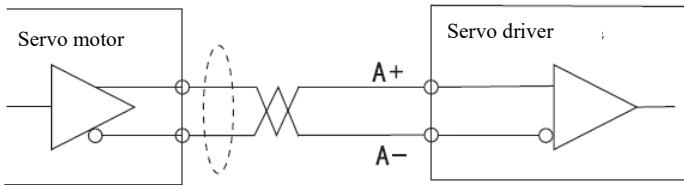
2.6.3 The pulse signal input interface circuit

In order to transmit pulse data correctly, suggest to use differential drive way; in differential drive mode, use AM26LS31、MC3487 or similar line driver RS422 as follow diagram
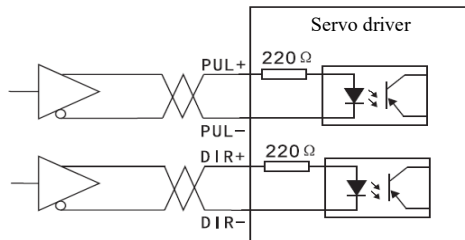
Using single-ended drive mode will lower the operating frequency.

A：Input circuit according to the pulse quantity. drive current 10～25mA Limit external power maximum voltage as 24V, determine the value of resistance R. experience data:VCC=24V，R=1.3～2k；VCC=12V，R=510～820Ω。External power supply provided by user, please note that if the power polarity reversed, the servo drive unit will be damaged. Details as follow diagram.
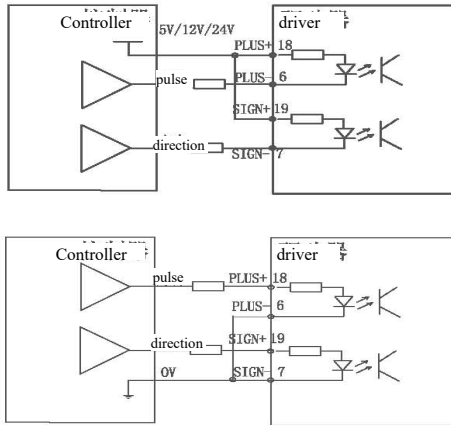
B：Don't concatenated resistance, with the internal resistance of the drive function implementation. The wiring method as diagram below.
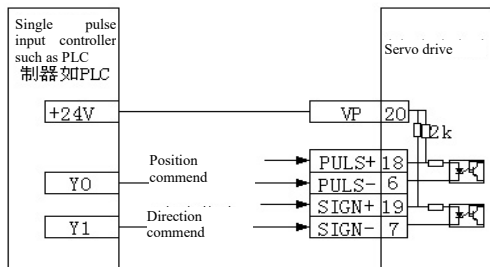
2.6.4 driver speed output interface
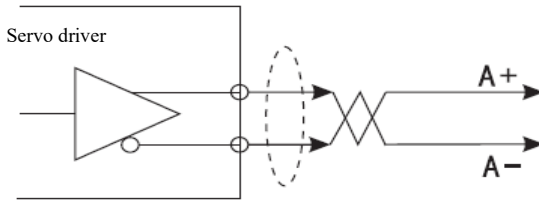
2.6.5 The digital output interface circuit

Please pay attention to the power polarity when using external power, reversed polarity will damage the drive. Digital output is open collector mode, limit external voltage maximum as 24V, maximum current is 10mA. In terms of load, when using relay etc inductive load, a diode need be added to parallel with inductive load, if the polarity of the diode is reversed, the drive will be damaged.The status of the output signal can be observed by UN-18.

Output terminal display
Light display ON, go out display OFF
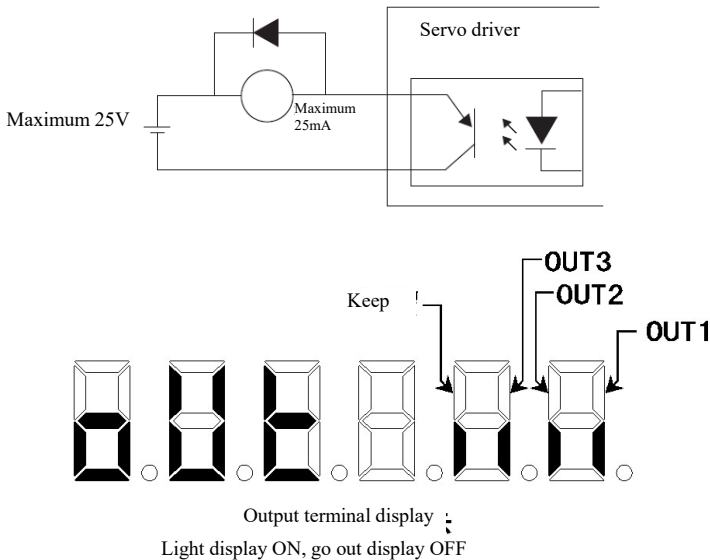
Chapter 3 operation and display

3.1 **Keyboard operation**

● Servo panel with 6 LED nixie tube display and 4 buttons to display various status, parameter setting . Key functions as follows:

　　　　$\boxed{\blacktriangle}$： number, value increase, or forward.

　　　　$\boxed{\blacktriangledown}$： number, value decrease, or back.

　　　　$\boxed{\blacktriangleleft}$： return to upper menu or cancel the operation.

　　　　$\boxed{\hookleftarrow}$： enter the next layer operation menu or input confirmation.

Note: $\boxed{\blacktriangle}$、$\boxed{\blacktriangledown}$ keep press down, repeat operation, the longer the holding time, the faster the repetition rate.

*** 6 section LED digital tube display all kinds of status and data of the system, all digital tube or the decimal point of the rightmost digital tube blink, it means alarm.

*** According to multiple-layer menu to operate, the first layer is main menu, including 8 kinds operation mode, the second layer is the function menu of all operation modes. The below diagram shows the main menu operation:

Display status	meaning
Un	Status surveillance
Pn	parameter
Sn	Parameter operation
F1	Internal speed run
F2	Jog operation
F4	Encoder adjustment
F5	Open loop run

3.2 Monitoring method

Choose "Un-" in the first layer, press ⏎ entering monitoring mode; there are 22

display status, the user use ▲、▼ to choose the display mode.

Display status	Display code	Display meaning	Example
Un-01	r500	Motor speed	Current motor speed is 500 turn
Un-02	P1230	present position low 5	
Un-03	P20	present position high 5	
Un-04	C20	Command pulse low 5	
Un-05	C1232	Command pulse high5	
Un-06	E2	Position deviation low 5	
Un-07	E0	Position deviation high 5	
Un-08	t30	Motor torque	
Un-09	I 2.0	Motor current	
Un-10	LS.00	present linear speed	
Un-11	Cnt1	Control mode	
Un-12	F100	pulse frequency	

Un-13	**r600**	Speed command	
Un-14	**t30**	Torque command	
Un-15	**A5600**	The rotor is absolutely low 5	
Un-16	**A. 50**	The rotor is absolutely high 5	
Un-17	**In......l..**	Input signal status	
Un-18	**OUt..ll**	Output signal status	
Un-19	**COdll...**	Encoder signal status	
Un-20	**rn-OFF**	Running status	
Un-21	**AL --**	Alarm code	
Un-22	**A. 50**	The number of turns of the rotor	
Un-23	**2048**	Display analog AD value	
Un-24	**2048**	Display analog torque AD value	SDF-W model indicates the main circuit voltage
Un-25	**FUI500**	Show FPGA version	
Un-26	**FU. 0**	Display the number of code disc communication errors	

3.3 Parameter setting

Choose "PN-" in the first layer, and press key ⏎ to enter parameter setting mode. Use ▲ 、 ▼ to choose parameter, press key ⏎ , display the value of the parameter, use ▲ 、 ▼ to modify parameter values. press ▲ or ▼ once, parameter increase or decrease one, press and keep ▲ or ▼ , the parameter can be increase or decrease continuously. When the parameter value is modified, the rightmost LED digital tube lit up, press ⏎ to make sure the modified value effective, the LED digital tube decimal point of the right side go out, the modified value will be reflected in the control immediately, then press ▲ or ▼ keep on modify parameter, after modified press ◀ back to the parameter selection status. If you are not satisfied with the value you are modifying, do not press ⏎ , can press ◀ to cancel, restore original parameter value, and back to the parameter selection status.
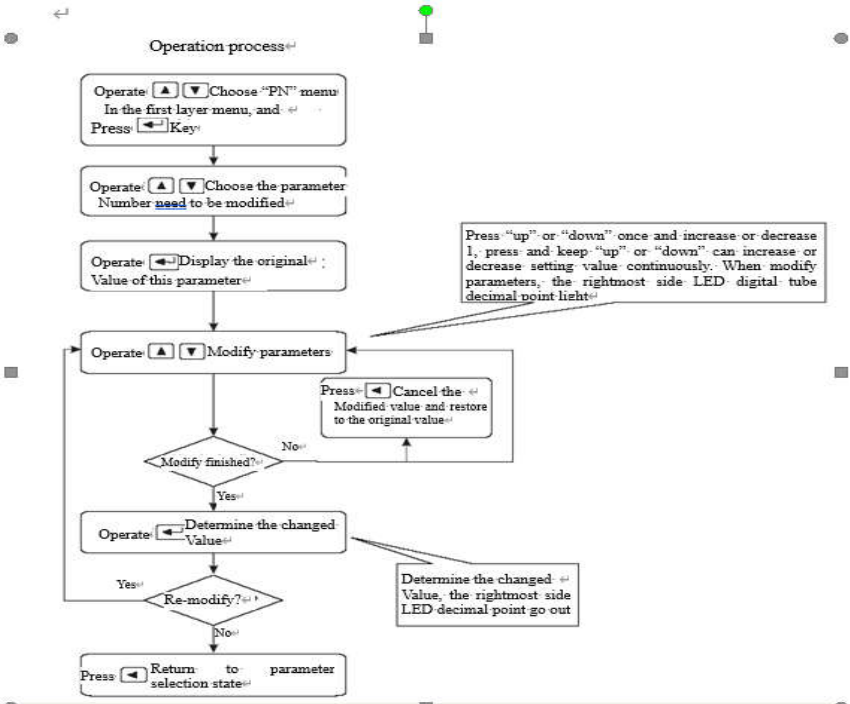
Shift fast data setting method: go to the parameter value interface, press and hold the enter key, and then press the return key, the small light in the lower right corner of the digital tube lights up, keep pressing until the thousands or hundreds decimal places you want to modify lights up, indicating that the bit.is selected. Then press the up and down keys to modify the value. After the modification, press the Enter key to confirm. (V5109 or V6004 or above is valid)

3.4 Parameter management

Parameter management mainly deals with the operation between memory and EEPROM, choose "Sn-" in the first layer, and press ⏎ entering parameter management mode. First, choose the operation mode, there are 5 modes, use ▲、▼ to choose. Take "parameter write in" for example, choose "Sn-Set", press ⏎ and keep more than 2 seconds, if the write success, display "DONE", if fail, display "ERR". Press ◀ again back to the operation mode selection status.

Sn－SEt parameter write in, it means to write the memory parameter to the parameter area of EEPROM. When the users changed the parameters, only the memory parameter values changed, next power supply will be restored to the original value. If you want to change the parameter values permanently, need to perform write in operation, write the memory parameter into parameter area of EEPROM, next power supply will use the modified parameters.
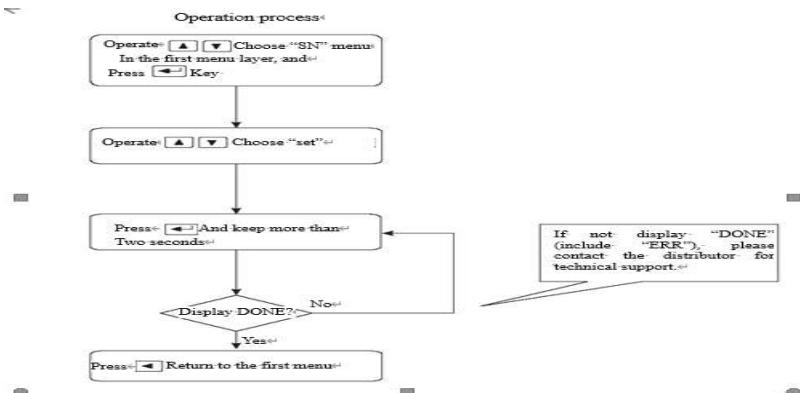
- **Sn－rd** parameter read, it means read EEPROM data in parameter area into the memory. The process will perform automatically when power on, at the beginning, the memory parameter and the EEPROM parameter is the same. But when the user modified the parameter, the memory parameter value changed too. When the user is not satisfied with the modified parameter or the parameter is messy, perform the parameter read operation, the data in the ENPROM parameter area will read into the memory again and restore to the original parameters when power on at the first time.

- **Sn－SS backup parameters**

- **Sn－rS Restore backup area parameters to current memory**

- **Sn－dEF** restore default value, it means to read all the parameter default value(factory defaults) into the memory, and write in the EEPROM parameter area, next power on will use the default parameter. When the user messed the parameter and can not work properly, use this operation can restore all parameters to factory default. As different drive mode with different parameter default values, when using restore default parameters, firstly have to ensure the motor ID (parameter PN1) is correct.

Operation process

Operate ▲ ▼ Choose "SN" menu
In the first menu layer, and
Press ◄┘ key

Operate ▲ ▼ Choose dEF

Press ◄┘ key

Yes

Press ◄ Return to the first menu .
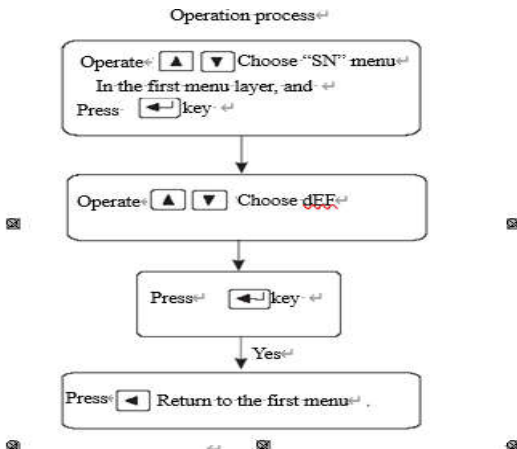
3.5   3.5 **F1   operation mode (panel test-run function)**

Choose "F1-" in the first layer, press ⏎ entering speed trial operation mode. Speed trial prompt is "S", value unit is r/min. Speed command provided by keys, use ▲ 、▼ can change speed command. The motor operated at the given speed. ▲ Control the speed positive increasing, ▼ control the speed reducing (reverse increasing). When the speed value is positive, the motor rotated in the forward direction; when the speed value is negative, the motor rotated in the reverse direction. **Note: the speed mode is a continuous motion, please ensure the motion axes with enough run distance to avoid impact and limit.**
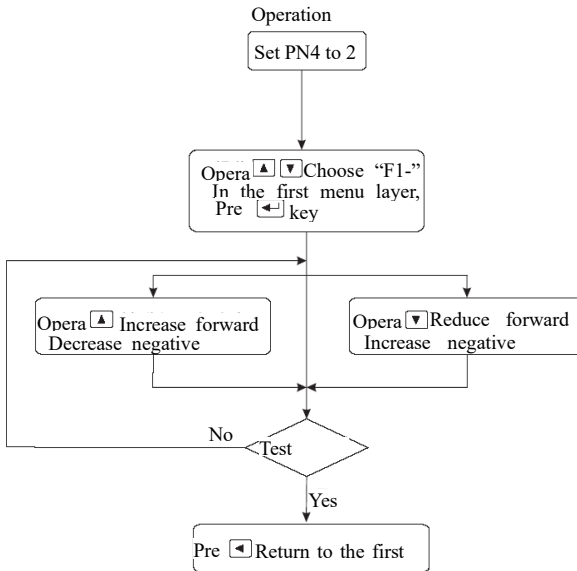
Operation
┌──────────────┐
│ Set PN4 to 2 │
└──────────────┘

┌──────────────────────────┐
│ Opera ▲ ▼ Choose "F1-"   │
│ In the first menu layer, │
│ Pre ⏎ key   │
└──────────────────────────┘

┌──────────────────────────┐   ┌──────────────────────────┐
│ Opera ▲ Increase forward │   │ Opera ▼ Reduce forward   │
│ Decrease negative   │   │ Increase negative   │
└──────────────────────────┘   └──────────────────────────┘

No ◇ Test

Yes

┌──────────────────────────────┐
│ Pre ◀ Return to the first   │
└──────────────────────────────┘

Note: if without outside enable signal, please set PN95 parameter as 1. Or the motor won't

work.

3.6   3.6 **F2 run mode(JOG run test function)**

Choose "F2-"in the first layer, press ⏎ entering jog operation mode. JOG run prompt is "J", value unit is r/min，speed command provided by keys. Enter F2

operation, press [▲] key and keep, motor run at jog speed, release the button, motor stop running, retain zero speed; press [▼] and keep, the motor inverted running at jog speed, release the key, the motor stop running, retain zero speed, jog speed set by parameter PN22.

Operation process
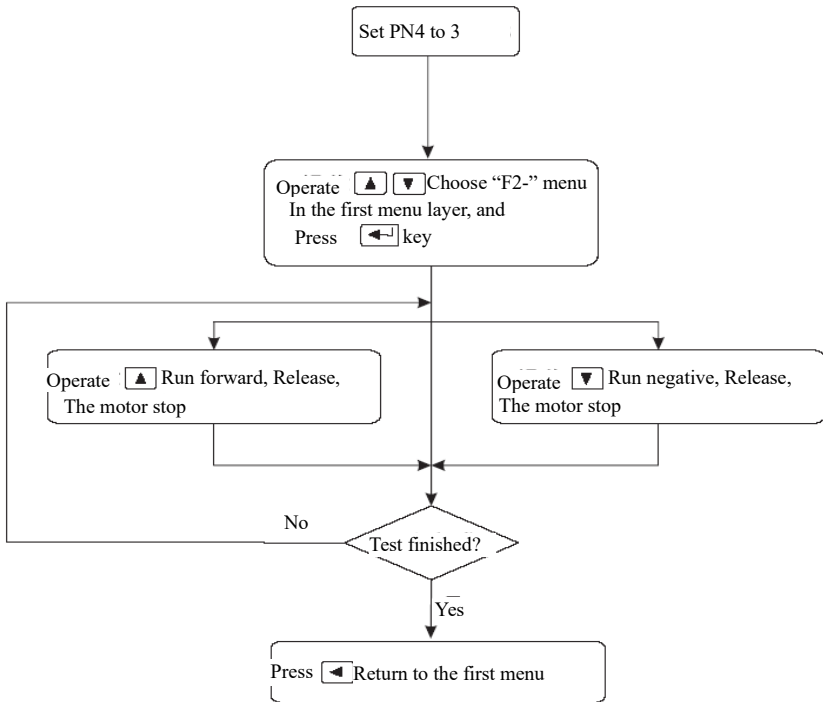
Note: if without outside enable signal, please set PN95 parameter as 1. Or the motor won't work.

3.7 Other

F4 is the photoelectric encoder zero set function, for motor manufactures use. The user can not use it.

F5 function reserve.

Chapter 4 parameter

SDF series servo with total 137 parameters can be adjusted, adjust the user parameters can meet most requirements of the user. The motor mating parameters can not be modified randomly, or there will be unpredictable results appear. Pn5-Pn16 are position control parameters, Pn17-42 are speed control parameters, Pn43-Pn50 are current control parameters, Pn51-Pn59 are I/O control parameters. Pn60-Pn96 are motor mating parameters.Pn97- Pn137 are internal control parameters and communication control parameters. Take the default parameters of the 80F-0230TCL motor as an example.

4.1.0   List of all parameters

No.	Name	Value	No.	Name	Value
0	Parameter password	168	16	drive ban input invalid	1
1	Motor ID	83	17	speed proportion gain	200
2	Software version	6004	18	speed integral time constant	160
3	initial display status	0	19	speed detection low pass filter	580
4	control mode	0	20	User speed limit	6000
5	position proportion gain	250	21	Arrive speed	500
6	position feed forward	0	22	Jog speed	600
7	position feed forward low pass filter cut-off frequency	300	23	Enable OFF delay	0
8	Position command pulse input form	0	24	Back to zero absolute orientate pulse number	100
9	Position command pulse fractional frequency numerator	1	25	Position command pulse division numerator high	0
10	Position command pulse fractional frequency denominator	1	26	Back to zero speed	-100
11	Position control motor rotation direction	0	27	Orientation/zero return completion identification range	30
12	orientate completion range	200	28	Feedback output pulse A/B/Z phase sequence	0

13	Position out of tolerance detection range	4000	29	Speed control mode Ac/deceleration time constant	0
14	Position out of tolerance error invalid	0	30	Position control mode Ac/deceleration time constant	0
15	Position command smoothing filter	0			
31	Position command pulse second gear ratio numerator	1	60	Motor inertia ratio	220
32	Internal control method selection	0	61	Motor rated torque	24
33	Speed 1	−300	62	motor rated speed	3000
34	Speed 2	-200	63	Motor maximum speed	6000
35	Speed 3	−100	64	motor rated current	50
36	Speed 4	0	65	system allowed maximum overload capacity	300
37	Speed 5	100	66	Current integral separation point	800
38	Speed 6	200	67	Analog voltage dead zone	0
39	Speed 7	300	68	Current command low pass filter	340
40	Speed 8	400	69	Speed integral separation point	200
41	Encoder output signal frequency	10000	70	output port 1 function selection	2
42	User pulse command equivalent	10000	71	output port 2 function selection	0
43	Electric current loop proportion gain	1307	72	output port 3 function selection	1
44	Electric current loop integral time constant	110	73	Analog command selection	3
45	Internal torque1	50	74	Reserve	0
46	Internal torque 2	-50	75	Overload torque detection point	130
47	Internal torque 3	100	76	Overload point torque	200
48	Internal torque 4	-100	77	Maximum overload time of the overload point	1000
49	Torque setting	300	78	Analog voltage filter factor	100

50	Torque command filter	100	79	Speed amplifier saturation detection time	1500
51	Input port low 4 force effective	0	80	Blocking speed	0
52	Input port high 3 force effective	0	81	Blocking confirmation time	170
53	input port low 4 reverse	0	82	Input pulse filter frequency	600
54	input port high 3 reverse	0	83	Key response time	20
55	output port reverse	7	84	Current detection coefficient	500
56	Analog instruction, direction reversal	1	85	Position error clear method / Pulse speed command filter	234
57	The second position proportion gain	225	86	Encoder bits	17
58	Historical alarm record	0	87	Code wheel battery detection	0
59	Z signal stretch ratio	0	88	Current when encoding disk is zero	60
89	Motor thermal overload	105	113	Input port 3 definition	15
90	Motor thermal overload torque	130	114	Input port 4 definition	4
91	Motor thermal overload time	900	115	Input port 5 definition	3
92	Motor pole pairs	5	116	Input port 6definition	0
93	Position gain attenuation coefficient	2	117	RS485 communication address	1
94	Torque when torque arrival signal is valid	150	118	RS485 communication rate	5
95	Forced enable	0	119	RS485 communication agreement	0
96	Maximum current limit	148	120	Position/speed integral saturation fault detection	0
97	Internal position 0 turns	0	121	Reserve	500
98	Internal position 0 pulse number	0	122	Analog speed proportional gain	2048 1160
99	Speed at internal position 0 orientate	1000	123	Analog torque proportional gain	2048 1160
100	Internal position 1 turns	0	124	Analog zero point	2048 20
101	Internal position 1 pulse number	0	125	Torque mode speed limit	20

102	Speed at internal position 1 orientate	1000	126	PWM frequency	100
103	Internal position2 turns	0	128	Encoder angle compensation	0 60
104	Internal position 2 pulse number	0	129	Code disc communication fault tolerance times	3
105	Speed at internal position 2 orientate	1000	130	Reserve	0
106	Internal position 3turns	0	131	Reserve	0
107	Internal position 3 pulse number	0	132	Orientation/homing single and multi-turn selection	1
108	Speed at internal position 3 orientate	1000	133	Filter coefficient for converting position command to velocity	350
109	Ac/deceleration of the internal position	1	134	Following error compensation coefficient	0
110	Input port 0 definition	1	135	Overvoltage alarm filter	5
111	Input port 1 definition	2	136	Reserve	0
112	Input port 2 definition	14	137	Reserve	0

4.1.1 All parameters function and significance detail list

No.	name	function	parameter range
0	parameter password	① password with different level, corresponding to user parameters, system parameters ② To modify the motor ID(Pn1) , must set this item to 0, user parameter password is 168. Please consult the manufacture for system parameters.	0~300
1	Motor ID	For supporting motor model. Each motor with a unique ID number, Set password Pn0 to be 0 firstly, then modify this parameter. After the setting is completed, the SN-DEF needs to be executed to be valid. Please operate this parameter with caution.	0~113
2	software ID	Reserved by the manufacturer	

3	initial display status	Choose the display status when the drive power on 0: display motor rotation speed; 1: display current position low 5; 2: display current position high 5 8: display motor current; 11:display position command pulse frequency; 12:display speed command; 13:display torque command; 14:Display the rotor absolute position	0~25
4	Control Mode	The drive control mode can be set by this parameter: 0: position control mode; 1: internal position/speed/torque control mode 2: internal speed control mode; 3: jog control mode. 4:zero mode. 6：Aging operating mode 7:Analog speed mode 8:Analog torque mode 9:Position and Analog speed mode. 10:Position and Analog torque model. 11: pulse speed control mode 12: Analog zero automatic adjustment (after connecting the upper computer system, Setting this parameter can automatically write the zero point of the current analog and simplify the debugging of the analog. 13: PC Debug Run Mode The internal position/speed/torque is determined by the I/O port. Please refer to PN32 parameter description for details. When working in multiple modes, you need to observe what control mode you are currently in. You can check un-11 to determine the working status and facilitate debugging.	0~13
5	position proportion gain	Set the proportion gain of the location loop regulator. The greater the setting value, the higher the gain, and the greater the stiffness, under the same frequency command pulse condition, the location hysteresis will	1~10000

		be less. But if the value is too big may cause oscillation or overshoot.	
6	position feed forward	When the feed forward gain of the location loop increase, the high-speed response characteristics of the control system will be enhanced, but it make the system location loop unstable and easy to vibrate. Unless very high response characteristics needed, the location loop feedforward gain usually set to 0.	0~100
7	Position Feedforwar d Low Pass Filter Cutoff Frequency/ Pulse Velocity Control Mode Filter	Set the cutoff frequency of the low-pass filter for the feedforward amount of the position loop. The higher the cutoff frequency, the better the position tracking, but it is easy to oscillate. In the pulse speed control mode, the function is the pulse speed control mode filter. Set the pulse count filter level: PN6=0, corresponding to 8 samples for averaging; PN6=1, corresponding to 7 times of sampling to average, and so on; PN6=7 and above do not filter; This parameter is a multiplexing parameter.	1~1200
8	position command pulse input form	Set the position command pulse input form 0: pulse＋sign; 1: CCW pulse/CW pulse; CCW is observed from the axial of servo motor, counter clockwise rotate, it defined as forward direction. CW is observed from the servo motor axial, clockwise rotate, it defined as reverse direction. 2：A/B orthogonal signal	0~2
9	Position command pulse gear ratio numerator	Electronic gear ratio numerator The actual pulse executed by the driver is: f ×(PN9/PN10) You can also directly set pn42 without setting pn9 and pn10, that is, the number of command pulses required for the motor to make one revolution. The effect of the two methods is equivalent, depending on the operating habits.	1~65535
10	Position command pulse gear ratio denominator	Electronic gear ratio denominator.	1~65535
11	position	0: normal;	0~1

	control motor rotate direction	1: direction reversed.	
12	Positioning finished range	set the positioning finish pulse range under the position control; This parameter provide basis whether drive unit judgment finished positioning under the position control mode.	0~30000
13	Position tolerance detection range	set position tolerance alarm detection range; Under the position control mode, when the count value in the position deviation counters over this parameter, the servo drive unit will give position error alarm. The internal calculation is multiplied by one hundredth of a circle, for example: 17-bit code disc, the actual number of out-of-tolerance alarm pulses is Pn13*1310.72	0~30000
14	position error invalid	0: position error alarm detection valid; 1: position error alarm detection invalid, stop detecting location error.	0~1
15	position command smoothing filter	smooth filtering command pulse, with exponential form acceleration and deceleration, numerical value means time constant; The filter will not lose input pulse, but there will be command delay phenomenon; When set to 0, the filter doesn't work.	0ms~20000×0.1ms
16	drive ban input invalid	0: CCW、CW input ban valid; 1: cancel CCW、CW input ban.	0~1
17	speed proportion gain	Set the speed loop regulator proportion gain. 1.The greater the setting value, the higher the gain, and the greater stiffness. 2.The greater the load inertia, the greater the setting value.	5Hz ~2000Hz
18	speed integral time constant	Set speed loop regulator integral time constant; 1.The smaller the set value, the faster integral speed and the greater stiffness. 2.The greater load inertia, the greater of set value. At the frequent start-stop small power occasion, the set value is small to prevent overshoot.	1ms ~1000ms

		set speed test low pass filter characteristic;	
19	speed detection low pass filter	1. The smaller value, the low cutoff frequency, the smaller of the motor noise. If the load inertia is large, could reduce the setting value. If the value is too small may cause to low response and vibration. 2. The larger the value, the higher the cutoff frequency, the speed response faster. If high speed response needed, could increase the setting value.	1%~580%
20	User speed limit	The maximum speed of the motor can be limited according to the application.	0~ 6000 r/min
21	reach speed	Set the speed value when input signal reach effective	0~6000 r/min
22	jog speed	Set jog speed.	-6000~6000 r/min
23	Enable OFF delay	Enable OFF will take effect after the delay of this parameter, which can prevent the brake motor from falling when the power is off.	0-30000ms
24	Orientation absolute positioning pulse count	Precise position when external triggering orientation control Actual operation position is set value *4	-32768~32767
25	Orientation absolute positioning circles	When the multi-turn code wheel is used, the number of turns when the directional control is triggered externally	-32768~32767
26	Orientation speed	The speed when external triggering orientation control, by setting plus or minus speed to decide rotation direction when orientation. Or select the nearest zero return through PN132	-6000~6000 r/min
27	Orientation complete range	Identified range when external triggering orientation control.It is convenient to output orientation/homing completion signal	0-32767
28	Feedback output pulse A/B/Z phase sequence	Drive motor output pulse A/B/Z phase sequence during initial power-up 0: Normal; 1: Phase A is inverted; 2: Phase B is inverted; 3: A/B is reversed when it is the same; 4: Phase Z is inverted; 5: A/Z is reversed simultaneously; 6: B/Z is also Inverse; 7: A/B/Z is also reversed	0~7

29	Speed control mode ac/deceleration time constant	Indicates the acceleration and deceleration time of the motor from 0r/min to 1000r/min. The acceleration and deceleration characteristics are linear. When set to 0, speed acceleration and deceleration do not work, only for speed mode.	0 ~32767ms
30	Position control mode ac/deceleration time constant	Indicates the acceleration and deceleration time of the motor from 0r/min to 1000r/min. The acceleration and deceleration characteristics are linear. When it is set to 0, the position acceleration and deceleration does not work. When it is set to other values, it can effectively reduce the impact of the reversal of the position loop and the acceleration and deceleration, and the operation is more stable. It is only used in the position mode.	0~32767ms
31	Position command pulse second gear ratio numerator	The second gear ratio numerator of position control can switch two sets of gear ratios through the input point to achieve equivalent pulse commands and different motor output speeds. That is to switch between PN9 and PN31.	1～65536
32	Choice of internal control methods	0: Internal position or speed or torque switching mode 1. Switch between internal speed and external pulse position 2. Switch between internal torque and external pulse position 3. Switch between internal position and external pulse position 4. Internal speed mode 5. Internal torque mode 6. Internal position mode 4.5.6 Functions added by mode V5109 andSDF**KW Note: When switching, you only need to define the corresponding input port as function 19. If only the internal speed or internal torque or internal position is used, when the function does not need to be switched, define the corresponding input port as function 19, and set the input port to high or low permanently according to the actual situation.	0～6
33	Speed 1	Internal speed control mode: by external I/O point status to control the speed. For example:	-6000~6000 r/min
34	Speed 2	：SC1 SC2 SC3： Pn33: OFF OFF OFF	-6000~6000 r/min

35	Speed 3	Pn34: ON OFF OFF	-6000~6000 r/min
36	Speed 4	Pn35: OFF ON OFF Pn36: ON ON OFF	-6000~6000 r/min
37	Speed 5	Pn37: OFF OFF ON Pn38: ON OFF ON	-6000~6000 r/min
38	Speed 6	Pn39: OFF ON ON Pn40: ON ON ON	-6000~6000 r/min
39	Speed 7		-6000~6000 r/min
40	Speed 8		-6000~6000 r/min
41	Encoder output signal frequency	The number of output pulses per revolution of the motor is set.	1~65536
42	User pulse command equivalent	Set the number of unit command pulses required for the motor to run one revolution. The function of this parameter is the same as that of PN9 PN10, but it can simplify the calculation of the user's gear ratio. When using, you can directly set this parameter without setting PN9 PN10. The physical resolution of the 17-bit code disc is 131072. If this parameter is set to 10000, it is equivalent to the user code disc resolution of 10000, and the drive will make one revolution after receiving 10000 commands. Electronic gear PN9:PN10 ratio still works.	1~65536
43	current loop proportion gain	1.The higher the set value, the greater the gain, the current tracking error is smaller. But too much gain will produce vibration or noise, 2.it related with the servo motor, 3. Independent of load	1～500
44	current loop integral time constant	1.The smaller the set value, the faster the integral speed, and the current tracking error is smaller. But too small integral will produce vibration or noise.2. It related with servo motor, 3. Independent of load. 4.Try to set larger value under the condition of the system without vibration.	1~10000
45	Internal torque 1	Internal torque control mode: the size of the torque is controlled by the status of the external I/O point. For	0%~300%

46	Internal torque 2	example: 　　　T0　　T1 Pn45：OFF　OFF Pn46：ON　　OFF Pn47：OFF　ON Pn48: ON　　ON	-300%~0%
47	Internal torque 3		0%~300%
48	Internal torque 4		-300%~0%
49	torque set	internal speed, jog speed torque	0~300%
50	torque command filter	1. Setting the torque command filter characteristics can restrain the vibration which produced by torque (the motor give out sharp vibration noise). 2. The smaller of the value, the lower of the cutoff frequency, the smaller noise produced by motor. If the load inertia is very big, can reduce the set value properly. If the value is too small, may result in slow response and may cause instability.	1%~500%
51	Input low 4 enforce effective	The lower four bits of the input signal are forced ON. Invert the binary, set the value to decimal, for example: 1 (0001) the lowest bit is forced to be valid, 2 (0010) the second bit is forced to be valid, 4 (0100) the third bit is forced to be valid ,8 (1000) the fourth bit is forced to be valid.	0-15
52	Input high 3 enforce effective	Input signal high 3 enforce ON	0-7
53	input low 4 reverse	input signal low 4 reverse, used to match the electrical level of the input signal contact spot	0-15
54	input high 3 reverse	input signal high 3 reverse, used to match the electrical level of the input signal contact spot	0-7
55	output port reverse	Output signal reverse, used to match the electrical level of the output signal	0-15
56	Analog instruction, direction reversal	Analog instruction, direction reversal. Switch direction.	0-1
57	The second position proportion gain	The function is same with PN5, which parameter used as position proportion gain in system, is determined by external I/O, in default situation, with PN5 as system internal position proportion gain.	1-1000
58	Historical alarm record	Original alarm record	0~50

59	Z signal stretch ratio	When using a host computer such as a PLC, if the Z signal reception is difficult, this parameter can be used to widen the output Z signal to facilitate the use of the upper computer. When set to 0, no stretch function	0~31
60	Motor inertia ratio	Set the motor inertia ratio.	1~32767
61	motor rated torque	set motor rated torque	1~1000
62	motor rated speed	Set motor rated speed.	0~6000 r/min
63	Motor maximum speed	Set motor maximum speed	0~8000 r/min
64	motor rated current	Set motor rated current. Set value is valid.	1~500×0.1A
65	system allowed maximum overload capacity	Set system allowed maximum overload multiple	0~300%
66	Current integral separation point	Current error over the set value, the current loop from PI change to P, value is the percentage of rated current	0~800%
67	Analog voltage dead zone	Analog voltage dead zone AD value, set this value reasonable，with the absence of the input voltage, and solve the motor rotation produced by the zero voltage wave.	0~4096
68	current command low pass filter	Set current command low pass filter cutoff frequency. Used to limit the current command frequency band, avoid the current shock and vibration, and make the current response stably.	1~1500HZ
69	Speed integral separation point	When speed error over the set value, the speed change from PI to P	0~300
70	Output port 1function	Set output port 1 function:	0-7

		selection	0: break output function	
			1: servo alarm output	
			2: position reach	
			3: speed reach	
			4: servo ready	
			5: back to zero complete	
			6: out of torque reach	
			7: Motor stall signal output	
71	Output port2 function selection	Set Output 2 function: refer to Pn70		0~7
72	Output port3 function selection	Set output 3 function: refer to Pn70		0~7
73	Analog command selection	0: -10V~10V voltage analog input, the voltage is positive and negative to determine the direction 1: 0V~10V voltage analog input, IO input port function is set to 22, 23, the two-way signal on and off determine different directions 2: -10V~0V voltage analog input, IO input port function is set to 22, 23, the two-way signal on and off determine different directions 3: 0V~10V voltage analog input, the function of IO input port is set to 22, and the on-off of one signal determines the direction The above functions can be used in both analog speed and analog torque modes (V1508) Note: SDF**KW series models do not support -10V input		0~3
74	Reserve			0
75	Overload torque detect point	Set the start torque value of the overload protection, rated percentage. When the present torque over this value, the systerm		0~300%

		internal overload counter work, counter exceeds, system output overload alarm.	
76	Overload feature point torque	Set overload point torque, This parameter and Pn77 make up the overload characteristic of the motor together. Set by the motor overload characteristic parameters. Note Pn76 》 Pn75	0~300%
77	Maximum overload time of the overload point	refer to Pn76	0~3000×10 ms
78	Analog voltage filter coefficients	Analog voltage filter coefficient, the greater the setting, the more stable the speed.	0~1000
79	Speed amplifier saturation time	When the continuous saturation time of the system's internal speed regulator exceeds this value, a speed saturation alarm is generated. Used to prevent mechanical jamming or other reasons caused the continuous current larger.	0~3000×10 ms
80	Blocking speed	In position or speed control, if the value is lower than the set value, it can be considered that the motor has blocked, and it is used in conjunction with the PN81 parameter.	0~100
81	Blocking confirmation time	Output blocking signal from the time when the lock is confirmed to the set value When the stall signal is enabled, the output port function is set to 7 to be effective.	0~32767x0.1 ms
82	Input pulse filtering frequency	Set input pulse pass frequency, unit 1 means 1KHZ, set at 500, means the system maximum pass frequency is 500KHZ.	1-10000
83	Key period	The key response time	2~200
84	Current Detection	Current detection coefficient	500
85	Position difference removal method/pulse speed instruction filter	0：no enable status, position deviation command pulse accumulation reset 1：no enable status, position deviation command pulse accumulation is not reset, count continuously.;	0~500
86	Encoder bits	17-bit or 23-bit	17

87	Code wheel battery detection	0: Do not detect the battery of the encoder wheel; 1: Detect the battery of the encoder disc and the alarm is valid.	0~1
88	Encoder current when reset	Set current value when the encoder reset, the percentage cannot too big to avoid motor overheating	0~100%
89	Motor thermal overload torque detect point	Thermal overload use I*I*T calculate method	10~300%
90	Motor thermal overload torque	Set this parameter bigger than Pn89	10~300%
91	Motor thermal overload time	Set thermal overload maximum time	0~1000S
92	motor pole pairs	Set servo motor pole pairs, different manufacture and different model motor may with different pole pairs, cannot change this parameter randomly	1~36
93	Position gain attenuation coefficient	In the state of high position gain, reduce the jitter or noise when the motor is stationary, the larger the parameter, the more obvious the effect.	1~3000
94	Torque reached output signal ratio	Simulation control torque reaches the set value, torque reach output signals effectively. The value is the percentage of rated torque.	0~300%
95	Force enable	0: servo enable is controlled by external I/O 1: automatic servo enable when forced power on, do not need to connect external signal	0~1
96	Maximum current limit	User may not change	154
97	Internal position 0 turn	Set internal position 0 precise position When the internal position control: target position determine by these 2 parameters, position 0= Pn97*131072+ Pn98*4 For example: Pn97=2 Pn98=1000	-32768~32767

		Indicates internal position movement =2*131072+4000=266144unit	
98	Internal position 0 pulse		-32768~32767
99	Speed at internal position 0 positioning	The speed of positioning to internal position 0	0～6000 r/min
100	Internal position 1 turn	Set internal position 1 precise position Refer to Pn97 Pn98	-32768~32767
101	Internal position 1 pulse		-32768~32767
102	Speed at internal position 1 positioning	The speed of positioning to internal position 1	0～6000 r/min
103	Internal position 2 turn	Set internal position 2 precise position Refer to Pn97 Pn98	-32768~32767
104	Internal position 2 pulse		-32768~32767
105	Speed at internal position 2 positioning	The speed of positioning to internal position 2	0～6000 r/min
106	Internal position 3 turn	Set internal position 3 precise position Refer to Pn97 Pn98	-32768~32767
107	Internal position 3 pulse		-32768~32767
108	Speed at internal position 3 positioning	The speed of positioning to internal position 3	0～6000 r/min
109	Acceleration of the internal position	Acceleration and deceleration time when internal positioning, the greater the value, the faster the acceleration.	0~2000
110	Input port 0 definition	Servo enable function, this input port cannot define other functions	1

111	Input port 1 definition	Used to define the function of the input port, for the convenience of customers The set value and functions as follows: 0：no definition, no function 1：servo enable 2：alarm clear 3：input pulse prohibited 4：position deviation counter reset 5：speed command input 0 6：speed command input 1 7：speed command input 2 8：The input signal level switches the running direction of the motor (both position and speed are effective), ON: Forward rotation OFF: Reverse rotation 9：position gain switch 10: position gear ratio numerator switch 11：empty 12：torque command input 0 13：torque command input 1 14：positive drive prohibited 15：reverse drive prohibited 16：internal position command 0 17：internal position command 1 18：internal position running start 19: Internal control mode selection 0 (mode switching function input) 20: Internal control mode selection 1 21: Orientation (return to zero) control input signal 22: Voltage analog input inversion 23: Voltage analog input forward rotation Note: switch between internal/analog speed and pulse position; switch between internal/analog torque and	0-23

		pulse position; after setting PN4 PN32, you only need to set the switch input point function to 19.	
112	Input port 2 definition	Refer to Pn111	0-23
113	Input port 3 definition	Refer to Pn111	0-23
114	Input port 4 definition	Refer to Pn111	0-23
115	Input port 5 definition	Refer to Pn111	0-23
116	Input port 6 definition	Refer to Pn111	0-23
117	Communicate address	More than one drive communicate, set the station number	0-127
118	Communication rate	Communication rate 0：4800 1：9600 2：19200 3：38400 4：57600 5：115200	0-5
119	Transport protocol	Transmission protocol, using RTU mode: 0: 8 O 1 (MODBUS, RTU); 1: 8 E 1 (MODBUS, RTU); 2: 8 N 2 (no parity, 2 stop bits) 3: 8 N 1 (no parity, 1 stop bit) Note: 8 means 8-bit data; E means even parity; O means odd parity; 1 means 1 stop bit. N means no verification	0-3
120	position/speed integral sa turation fault detect	0：detect integral saturation fault 1：do not detect integral saturation fault	0-1
121	Reserve		
122	analog speed proportional gain	When analog speed control,Certain input voltage, the bigger of the set values, the higher speed got.	0-4096

123	analog torque proportional gain	When analog torque control,Certain input voltage, the bigger of the set values, the bigger of the torque got.	0-4096
124	Simulation zero	Set up to simulate zero voltage, adjust the symmetry of positive and negative direction of speed or torque.	0-4096
125	The speed limit of torque mode	Torque control mode to limit the speed	0-4000
126	PWM frequency	Manufacturers use	40-120
127	Analog AD conversion method	Analog control AD conversion mode: 0: When the voltage is higher than the dead zone, start to accelerate and deceleration from0. 1: When the voltage is higher than the dead zone, the speed starts to jump to the speed corresponding to the dead zone voltage start acceleration and deceleration. 2: When the voltage is lower than the dead zone, add position control and lock the current position.	0-2
128	Encoder angle compensation	Use with caution	-100-100%
129	Code disc communication fault tolerance range	The number of times of code disc communication fault tolerance.	0~10000
132	Orientation/homing single and multi-turn selection	Select the orientation within a single turn or the orientation within multiple turns (return to zero) control. PN25 is meaningless when orienting within a single turn. This parameter is used with single-turn or multi-turn absolute encoder. 0: multi-turn orientation; 1: single-turn orientation; 2: Single-turn quick orientation, which can be positioned nearby, which is convenient for customers to use.	0~2
133	Filter coefficient for converting position	Filter coefficient for converting position command to velocity	350

	command to velocity		
134	Following error compensation coefficient	The setting can reduce the following error, 0 normal following error, 100 no following error; the larger the value, the smaller the following error can be.	0
135	Overvoltage alarm filter	Special occasion use (for 6004 version only)	5

4. 2 parameter adjust diagram model
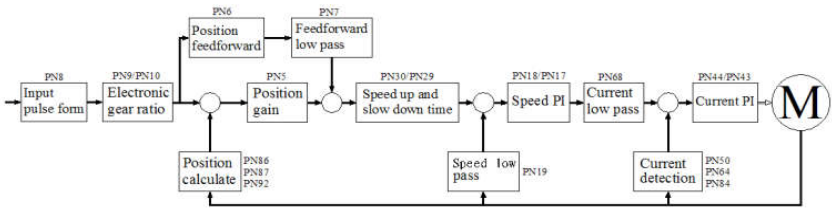
4.3 Description of Servo key parameters

As the default motor mating parameters has been optimized, therefore, the parameters (except electronic gear) do not need to adjust in most applications and can be used directly. But the actual mechanic is complex. If abnormity appear or needs high response when adjusting, then need to adjust the parameters to meet requirement. The adjustment principle is first current loop, second speed loop, last position loop.

The current loops do not need to adjust except for individual situation. The too fast speed response results in current shock and AL11 alarm. It can adjust PN64 to solve.

Speed loop: If high speed response needed, can increase PN17 or decrease PN18. However, the PN17 setting too large will cause vibrate. In the occasion of too big load inertia, if the load motor park unstably when decelerating and wag from side

to side, need to increase PN18 to solve.

Position loop: If high location response needed, can increase PN5. Some occasions can increase PN6 to meet requirement. But PN5 PN6 is too large will cause vibrate. The setting precondition is to adjust PN5 prior, only in the short distance and high response occasion can use PN6.

electronic gear ratio: 1） if calculate from rotate speed angle, the below formula can be used

$$f \times (PN9/PN10)=131072$$

in which f denotes the upper computer pulse, unit is KHZ/circle

If knows the pulse number from the upper computer and make the motor or load turn a circle, the gear ratio set value can be calculated with the above formula.

2） calculate according to the position accuracy directly

（lead/pulse equivalent）×(PN9/PN10)=10000

For example: screw lead is 5mm, motor and screw lead connected directly, the motor rotates a circle, the load move 5mm. If the accuracy need 0.001mm, there are 5000 pulse needed for motor rotating a circle; that is: PN9=10，PN10=5

Pulse input form: support pulse with direction and double pulse (positive and negative pulse), set PN8

4. 4 parameter adjusting steps in actual application

In the process of adjusting or application, if there is vibration, noise or cannot reach the control accuracy, can adjust system parameters and meet the control requirement as the following methods.

When the motor is in static locking state, if there is vibration or sharp noise, please decrease parameter Pn43; set this parameter as large as possible under the

condition without vibration. The larger the parameter, the better the current tracking effect and the faster the motor response; but too large parameter results in vibration or noise.

（1）: speed control mode parameters adjustment

1）[speed proportion gain]（parameter Pn17）set value, as large as possible under the condition without vibration. Generally, the larger of the load inertia, the larger of the set value.

2）[speed integral time constant]（parameter Pn18）set value, try to set as small as possible according to the given condition. If the set value is too small, the response speed will be increased, but easy to vibration. Try to set the value as small as possible under the condition of no vibration. If the value is too large, when the load changed, the speed will change bigger.

（2）: position control mode parameter adjustment

1）according to the above method to set proper[speed proportion gain] and [speed integral time constant].

2) [position feed forward gain]（parameter Pn6）set to 0%.

3) [position proportion gain]（parameter Pn5）set value, set as large as possible in the stable range. When the parameter is large, the position tracking will be good and hysteresis error is small, but easy to produce vibration when stop positioning. When the parameter is small, the system in stable state, but the position tracking become worse and hysteresis error become larger.

4) If position tracking requirement quite high, can increase Pn6 set value; but if it is too big, can lead to overshoot.

Chapter 5 operation and adjustment

5.1 special attention during debugging:

1) （large/medium-power model suffix are K8） servo drive Connect the three phase AC 220V power to input terminal. three phase connect L1、L2、L3, single phase connect L2、L1.

2) （small power model suffix is K7） servo drive single phase connect L、N.

3) motor power line U，V，W，PE，the sequence cannot reverse.

4) Drive connection as above. The wrong connection may cause burning, motor does not run, alarm etc. please check the line connection correct or not.

5.1.1 Power on sequence

1) When the power supply switch on, servo alarm signal output in 1S, after 1.5S signal output ready, after 10MS response to enable signal, less than 10MS motor excitation lock; waiting for running.

5．2 Position control mode

1) Connect control circuit power and main circuit power, the display of the drive lighten. If there is alarm, please check the line connection.

2) Set below parameters:

parameter No.	parameter name	definition	Set value
Pn4	Control mode	0: position mode 1:internal position mode	0
Pn8	Position command pulse input mode	0: Single pulse 1: double pulse 2: A/B orthogonal pulse	0
Pn5	Position proportional gain	Increase can reduce position deviation and improve system rigidity	300
Pn9	gear ratio numerator		1
Pn10	gear ratio denominator		1

parameter No.	parameter name	definition	Set value
Pn30	Position acceleration and deceleration	Ac/decelerates in position mode to reduce vibration during commutation.	0
Pn 41	Encoder output signal frequency	Used to feedback the position of the code disc to the host computer	10000
Pn 42	User pulse command equivalent	To set how many pulses make one revolution, you can directly set this parameter without setting the gear ratio	10000
Pn 59	Z signal stretch ratio	Expand the Z signal to facilitate the host computer to receive	0
Pn95	Servo enable	0: External enable 1: Force enable	1

3) Confirm there are no alarm and any abnormal situation, make enable servo (SON) ON, at this time, the motor motivated, in a state of zero velocity. If enable signal cannot connect wire, set Pn95 as 1 can make enable motor automatically.

4) Adjust the pulse frequency of the input signal; make the motor running according to command.

5.3 speed trial run mode

1) Connect control circuit power and main circuit power, the display of the drive lighten.If there is alarm, please check the line connection.

2) Set parameter as below:

parameter No.	parameter name	definition	Set value
Pn4	Control mode	0: position mode 1:internal position mode	2

		2: trial run	
Pn95	Servo enable	0: external enable 1: force enable	1

3) Confirm there are no alarm and any abnormal situation, make enable servo (SON) ON, at this time, the motor motivated, in a state of zero velocity. If enable signal cannot connect wire, set Pn95 as 1 can make enable motor automatically.

4) Through key operation enter F1 speed trial operation mode, speed trial operation prompt "S", value unit is r/min, system in the speed trial mode, speed command provided by key, use ⏶ ⏷ change speed command, the motor run based on the setting speed.

5.4   Jog operation

1) Connect control circuit power and main circuit power, the display of the drive lighten. If there is alarm, please check the line connection.

2) Set parameter as below:

parameter No.	parameter name	definition	Set value
Pn4	Control mode	0: position mode 1:internal position mode 2: trial run 3: jog run	3
Pn95	Servo enable	0: external enable 1: force enable	1

3) Confirm there are no alarm and any abnormal situation, make enable servo (SON) ON, at this time, the motor motivated, in a state of zero velocity. If enable signal cannot connect wire, set Pn95 as 1 can make enable motor automatically.

4) Through key operation enter F2 speed trial operation mode, JOG run prompt "J", value unit is r/min, system in the speed control mode, speed and direction determined by parameter Pn22, press ⏶ motor running according to the speed and direction which determined by Pn22, press ⏷ motor running opposite

direction according to the given speed.

5.5 Internal position/speed/torque control mode

1) Connect control circuit power and main circuit power supply, the drive display light. If there is alarm, please check the line connection.

2) Set parameter as below:

parameter No.	parameter name	definition	Set value
Pn4	Control mode	0: position mode 1:internal position mode	1
Pn95	Servo enable	0: external enable 1: force enable	1
Pn111	IN1 definition	Define as position trigger	18
Pn112	IN2 definition	Define as orientation start	21
Pn113	IN3 definition	Define internal mode selection 0	19
Pn114	IN4 definition	Define internal position 0	16
Pn115	IN5 definition	Define internal position 1	17
Pn116	IN6 definition	Define internal mode selection 1	20

3) Power off, re-up electricity, Confirm there are no alarm and any abnormal situation, make enable servo (SON) ON, at this time, the motor motivated, in a state of zero velocity. If enable signal cannot connect wire, set Pn95 as 1 can make enable motor automatically.

4) By switching the status of IN3 IN6 can switch under the mode position, speed and torque

Corresponding method as follows:

IN3. IN6 input signal status	Internal control mode
OFF OFF	position

68

ON　　OFF	speed
OFF　ON	torque

5）By switching the status of IN4 IN5 can realize 4 point positioning movement, the speed of 4 point positioning movement and accurate position set by Pn97- Pn109.

IN4 IN5 input signal status	Internal control mode
OFF　　OFF	Position A
ON　　OFF	Position B
OFF　　ON	Position C
ON　　ON	Position D
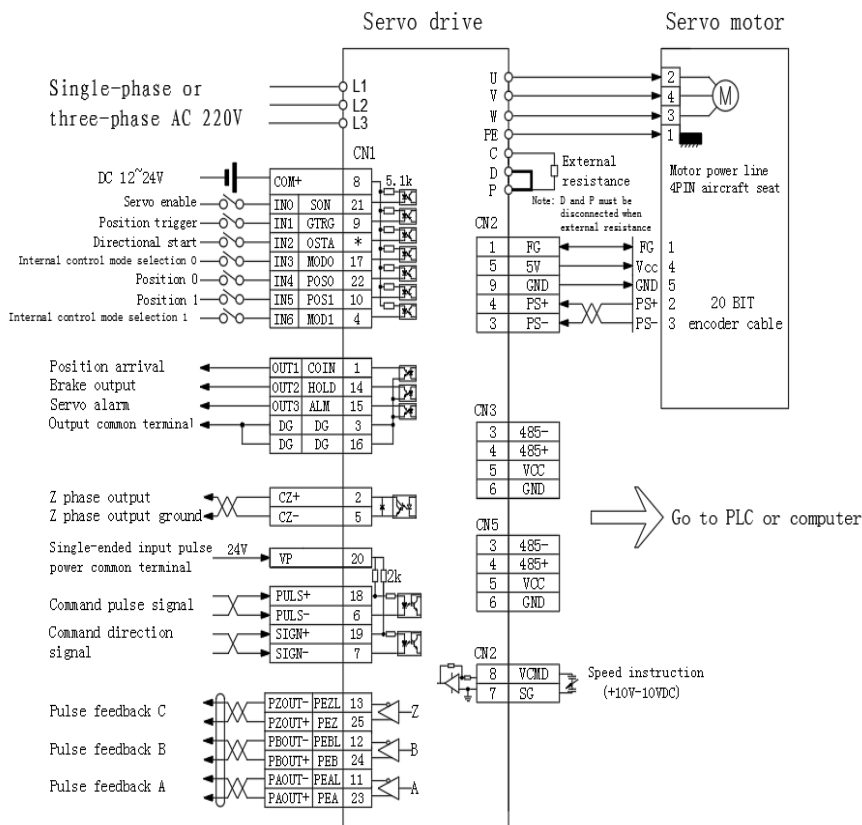
5.5.1 Internal position application example

Use internal position control to realize the belowing 4 point movement mode.
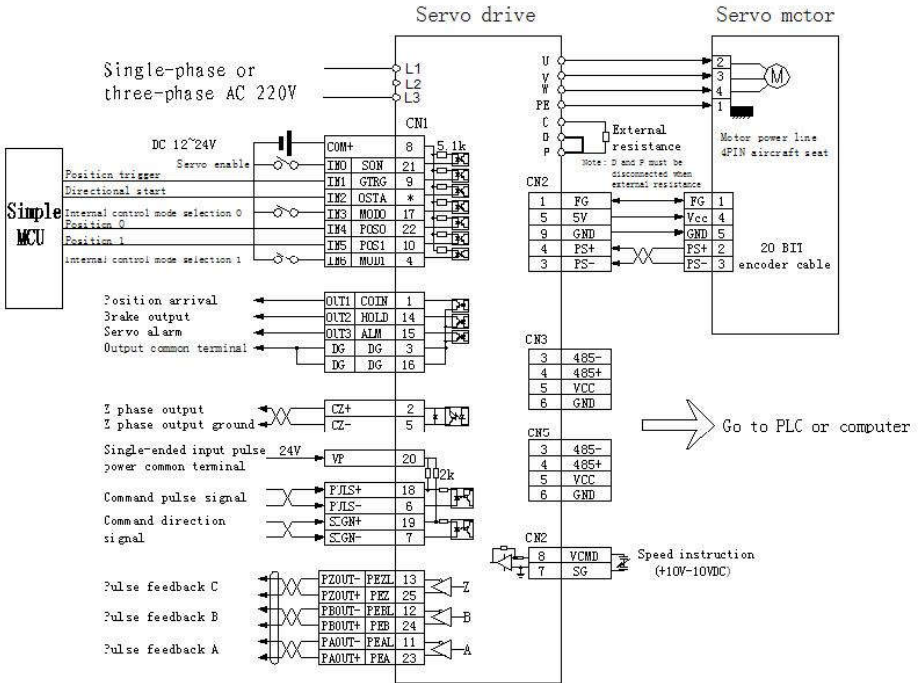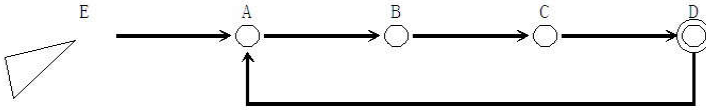
Internal position control application electrical wiring diagram

The framework consists of one of the simplest microcontrollers and this servo system. The one-chip computer is used to send three control signals to the servo to trigger the servo's internal position control mode and the precise positioning of the operation. This example can be omitted high-end computer such as: PLC motion controller. At the same time, interference during pulse transmission is eliminated. More accurate servo positioning. In the case of repeated positioning within four points, it has a very economical cost and

excellent control performance.

Control detailed description: IN3 IN6 signal connect with OV signal, it means choose internal position control mode. IN0 signal connect with OV signal, it means choose servo automatic enable after power on. Singlechip control process: system power on, the singlechip send a low level signal to servo IN2 signal, start servo and orientation back to the origin point A. carry out every time when starting up, it means wherever the origin position is, will be back to the fixed position before work. When servo position back to point A, the singlechip send two level signal to servo IN4 IN5 so as to control servo move from point A to point B, C, D and back to point A, complete a circulation. Every time start and trigger are done by IN2 signal. Rising edge effective.

This system has the characteristics of simple control, accurate positioning, and strong anti-interference ability. The run speed and precise position set by Pn97- Pn109. The parameters needed to be set as below:

parameter No.	parameter name	definition	Set value
Pn4	Control mode	0: position mode 1:internal position mode	1
Pn111	IN1 definition	Define as position trigger	18
Pn112	IN2 definition	Define as orientation start	21
Pn113	IN3 definition	Define internal mode selection 0	19
Pn114	IN4 definition	Define internal position 0	16
Pn115	IN5 definition	Define internal position 1	17
Pn116	IN6 definition	Define internal mode selection 1	20
Pn 97	Internal position 0 turns		
Pn 98	Internal position		Set relevant

	0 pulse		parameters according to the actual ABCD four coordinates
Pn 99	Internal position speed of 0 positioning		
Pn 100	Internal position 1 turns		
Pn 101	Internal position 1 pulse		
Pn 102	Internal position speed of 1positioning		
Pn 103	Internal position 2 turns		
Pn 104	Internal position 2 pulse		
Pn 105	Internal position speed of 2 positioning		
Pn 106	Internal position 3 turns		
Pn 107	Internal position 3 pulse		
Pn 108	Internal position speed of 3 positioning		
Pn 109	Acceleration and deceleration time constant of internal control		

5.5.2 internal speed application example
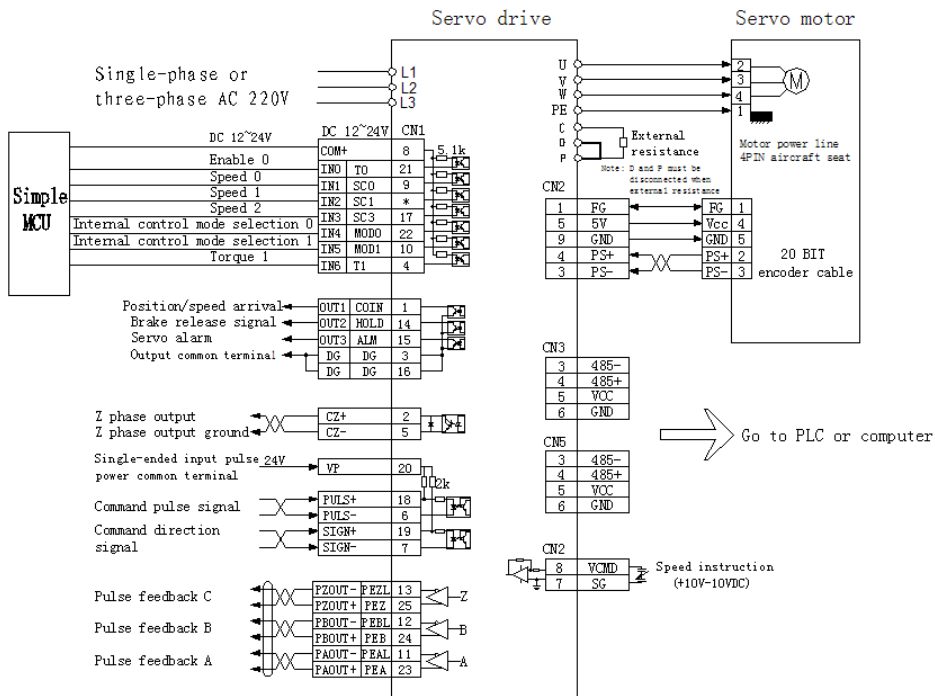
Internal speed and torque hybrid control application wiring diagram

As shown in the figure, according to this example, 8 kinds of internal speed control and 2 types of internal torque control can be realized. And can be switched to each other. IN1 IN2 and IN3 are internal speed switch signals. Internal speed value set by parameters Pn33- Pn40. IN4 IN5 are internal speed and torque mode switch signals. Internal torque value set by parameters Pn45-Pn46.

Servo relevant parameters set as below:

parameter No.	parameter name	definition	Set value
Pn4	Control mode	0: position mode 1:internal position mode	1
Pn95	Servo enable	0: external enable 1: force enable	1
Pn110	IN0 definition	Servo enable	1

Pn111	IN1 definition	Define as speed 0	5
Pn112	IN2 definition	Define as speed 1	6
Pn113	IN3 definition	Define as speed 2	7
Pn114	IN4 definition	Define internal selection mode 0	19
Pn115	IN5 definition	Define internal selection mode 1	20
Pn116	IN6 definition	Define as moment of force 1	13
Pn 33	Speed 1		Set relevant parameters according to the actual run speed and moment of force requirements
Pn 34	Speed 2		
Pn 35	Speed 3		
Pn 36	Speed 4		
Pn 37	Speed 5		
Pn 38	Speed 6		
Pn 39	Speed 7		
Pn 40	Speed 8		
Pn 45	Internal torque 1		
Pn 46	Internal torque 2		

5.6 5.6 **Servo features application**

Servo start orientation function：

When the input port is set as the servo start orientation (zero return) function, as long as the input signal is set to ON, the orientation (zero return) function will be automatically started (except for the torque control mode). The direction of rotation during orientation is determined by Pn 26. The precise position of the single-turn orientation is determined by Pn 24 . When the output port function is set to 5. After the orientation is completed, the corresponding pin outputs a zero return completion signal. When the input signal is OFF, the orientation function is closed.

5.6.1 Position gear ratio switch function

When input port set as position gear ratio switch function, and input signal set as ON, the system use parameters of Pn 31 as present input pulse electronic gear. When input signal set as OFF, the system use the parameters of Pn9 as present input pulse electronic gear. This function mainly used to the occasions that dynamic electronic gear ratio needed.

5.6.2 Position gain switch function

When input port set as position gain switch function and input signal set as ON, the system use the parameters of Pn57 as present position loop control gain. When input signal set as OFF, the system use parameters of Pn5 as present position loop control gain. This function mainly used to the occasions that dynamic position gain needed.

5.6.3 Input pulse command filter

In the practice industry application sit, there is much interference, the input pulse command may caused the servo counting error because of the external interference. Therefore, affect the servo repositioning accuracy. Setting this filter can prevent the interference into the servo system. Improve the ability of anti-interference of the system.

The relationship of set value and the passable frequency as below:

Pn 82 set value	The maximum passable pulse frequency
1000	1MHZ
500	500KHZ
250	250KHZ
100	50KHZ

5.7 Running in analog voltage speed regulation mode

1) Turn on the control circuit power supply and the main circuit power supply, and the display of the drive unit lights up; If an alarm occurs, please check the wiring. Input analog voltage signal from CN6

2) The relevant parameters are as follows：

Parameter No.	Parameter Name	Definition	Set Value
Pn4	control mode	7：Analog speed control mode	0
Pn29	Speed ac/deceleration	The larger the setting, the smoother and smoother the commutation.	100
Pn73	Analog command selection	0: Positive and negative 10V voltage input 1: 0V~10V voltage analog input, IO input port function is set to 22, 23, the two-way signal on and off determine different directions 3: 0V~10V voltage analog input, the function of IO input port is set to 22, and the on-off of one signal determines the direction	3
Pn67	Analog voltage deadband	Analog voltage dead zone AD value, set this value reasonably, when there	0

		is no input voltage, it can solve the motor fretting caused by the voltage drift.	
Pn114	input port definition 4	ON: Forward, OFF: reverse	8
Pn115	input port definition 5	ON: reverse, OFF: stop	22
Pn116	input port definition 义 6	ON: Forward, OFF: stop	23
Pn 123	Analog speed proportional gain	In analog torque control mode, for a certain input voltage, the larger the setting value, the larger the torque. 5V corresponds to 1500 rpm, 10V corresponds to 3000 rpm	0-4096
Pn 124	Analog zero	Set the zero point of the analog voltage and adjust the speed symmetry of the positive and negative sides.	0-4096
Pn95	Servo enable	0: External enable 1: Force enable	1

Note: SDF_x series supports positive and negative 10V speed regulation, SDF_W series only supports 0-10V speed regulation.

3) After confirming that there is no alarm or any abnormal situation, turn the servo enable (SON) ON, at this time the motor is excited and is in the state of zero speed. If the enable signal cannot be wired, you can set Pn95 to 1 to automatically enable the motor;

4) Adjust the voltage level of the input signal and the level of the input signal to make the motor run according to the command.

5.8 **Simulation torque control mode**

Input analog voltage single by the CN6, and set PN4 to be 8.Servo work in analog torque. We can control the torque of motor by adjust the size of voltage.

Parameter reference 5.7

5.9 Position and simulation speed hybrid control mode

The analog voltage signal is input from CN6, PN4 is set to 9, the pulse

command is input from the control, and the servo works in the mixed control mode of position and analog speed. Through I/O port (internal mode selection 0) control can realize the switching between position and analog speed. Take an input port function and set it to 19. The current working mode can be viewed through UN-11. Typical applications such as: machine tool spindles, etc.

5.10 Position and simulation torque hybrid control mode

Input analog voltage single by CN6, and set PN4 to be 10, pulse commend input from the control port. Servo work in position and analog torque hybrid control mode. Can be realized the switch between position and analog torque by I/O port control. Typical applications such as: Injection molding machine, screw machine.

5.11 External pulse position and internal torque mixed control mode

The relevant parameters are as follows:

Parameter No.	parameter name	Definition	Set value
Pn4	control mode	1: Internal position mode	1
Pn30	Position ac/deceleration	The larger the setting, the smoother and smoother the commutation.	100
Pn32	Choice of internal control methods	0: Internal position or speed or torque switching mode 1. Switch between internal speed and external pulse position 2. Switch between internal torque and external pulse position 3. Switch between internal position and external pulse position 4. Internal speed mode 5. Internal torque mode 6. Internal position mode Note:4.5.6 Mode are V5109 version and added functions of SDF_W Note: When switching, you only need to define the corresponding input port as function 19. If only the internal speed or internal torque or internal position is used, when the function does not need to be switched, define the corresponding input port as function 19, and set the input port to high or low permanently according to the actual situation.	2
Pn45	Internal torque 1	Set torque percentage	3
Pn46	Internal torque 2	Set torque percentage	0
Pn47	Internal torque 3	Set torque percentage	0
Pn48	Internal	Set torque percentage	0

		torque 4		
Pn115	input port definition 5	Torque command 0 Torque command 1 (Select the torque value of PN45-PN48 by the state of the two input points)	12
Pn116	input port definition 6		13
Pn 111	input port definition 2	Set to mode switch function	19
Pn94	Torque when torque arrival signal is valid	Set according to the application requirements, when the torque reaches the set value, when the output signal function is set to 6, the output torque reaches signal.	30
Pn95	Servo enable	0: External enable 1: Force enable	1

Chapter 6 RS485 communication

6.1. RS485 communication hardware interface

6.1.1 This servo drive added RS485 communication function; it can drive servo system, change parameters, monitoring servo system status etc. So as to adapt to specific application.

6.1.2 External connection diagram

External thumbnails

HMI/PLC controller

RS-485
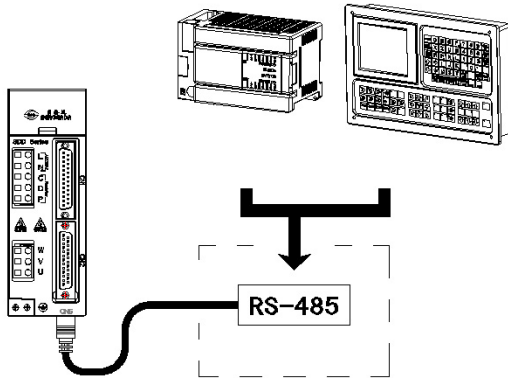
6.1.3 Several external connection diagrams:

NO.N   NO.4   NO.3   NO.2   NO.1
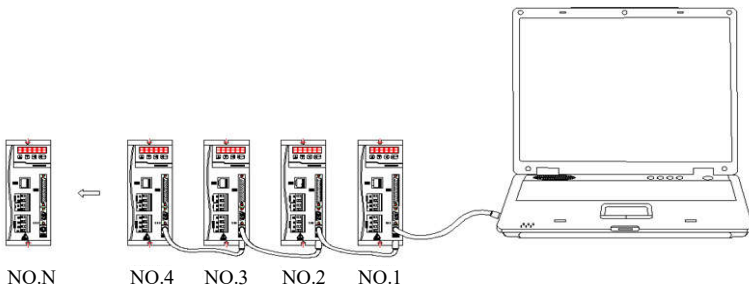
6.2 Communication protocol

This servo system uses a standard asynchronous serial master-slave MODBUS communication protocol. Only one device host in the network can establish a protocol. Other device slaves can respond to the host's commands only by providing data or perform corresponding actions according to the host's commands. The host computer refers to a personal computer, an industrial control device or a PLC, etc. The slave refers to the servo system.

When the transmitting equipment(host) send communication command to the receiving equipment(device), the device which conform to corresponding address code receive the communication command and read message according to function code and relevant requirements. If CRC verify is correct, carry out the corresponding tasks and send the execution result (data) to the host. The returned information include address code, function code, execution data and CRC verify code. If CRC verify error, there will be no return information.

Communication form structure use RTU mode

6.2.1 Communication code and data description

Function code	definition	operation（binary system）
03	Read register data	Read one or several register data
06	Write one way register	Write the binary system data in single register
10	Write multichannel register	Write the binary system data in multi- register

6.2.2 Function code"03": read multiplex register input

For example: host read address is 01, initial address is 3 device register data of 0116.

Bdevice（PDM）data register address and data is:

Register address	Register data（hexadecimal）	Corresponding PDM electricity
0116	1784	UA
0117	1780	UB
0118	178A	UC

Message format sent by host:

Host send	bytes number	Sent message	remark
bdevice address	1	01	Send to the device which the address is 01
Function code	1	03	Read register
Initial address	2	0116	Initial address is 0116
Data length	3	0003	Read 3 registers（total 6 bytes）
CRC code	2	E5F3	Get CRC code from the host

Bdevice（PDM）response the returned message format

Bdevice response	bytes number	Returned message	remark
Bdevice address	1	01	From bdevice 01
Function code	1	03	Read register
Read data	1	06	3 registers total 6 bytes
Register data 1	2	1784	Address is 0116 memory content
Register data 2	2	1780	Address is 0117 memory content
Register data 3	2	178A	Address is 0118 memory content
CRC code	2	5847	Get CRC code from the bdevice

6.2.3 function code"06"：write one way register

For example: The host wants to save the data 07D0 to the slave register with address 002C (the slave address code is 01). After the communication data is saved, the PDM table with the address 002C with the original stored information as below.

address	Original stored data（hexadecimal）
002C	04B0

Message format sent by host:

Host send	bytes number	Sent message	For example
Bdevice address	1	01	Send to the bdevice which address is01
Function code	1	06	Write one way register
Initial address	2	002C	Register address need to write in

Write in data	2	07D0	Corresponding new data
CRC code	2	4BAF	CRC code get from the host

bdevice(PDM) response to the returned message format:

Message format and data are exactly the same with those sent from host.

6.2.4 Function code"10": write multi-channel register

The host using this function code to save multiple data into data memory of the PDM sheet

Modbus communication protocol register is 16 bit(2 bytes), and MSB first. Such PDM memory is 2 bytes. As the Modbus communication protocol allows to save maximum 60 registers each time, therefore, PDM is allowed to save maximum 60 data registers each time.

for example: the host want to save 0064, 0010 into bdevice memory with address 002C, 002D（bdevice address code 01）. After the communication data is saved, the PDM table with the address 002C/002D with the original stored information as below.

address	Original stored data（hexadecimal）
002C	04B0
002D	1388

Message format send by host:

Host send	Bytes number	Send message	example
Bdevice address	1	01	send to bdevice 01
Function code	1	10	write multi-channel register
Initial address	2	002C	The register initial address needed to write in
Saved data bytes length	2	0002	Save data bytes length（total 2 bytes）
Saved data bytes length	1	04	Save data bytes length（total 4 bytes）
Save data 1	2	04B0	data address 002C
Save data 2	2	1388	data address 002D
CRC code	2	FC63	CRC code get from the host

bdevice（PDM）respond　returned message format:

Bdevice response	Bytes number	Bytes number	example
Bdevice address	1	01	Come from bdevice 01
Function code	1	10	write multi-channel register
Initial address	2	002C	Initial address is 002C
Saved data bytes length	2	0002	Save 2 bytes length data
CRC code	2	8001	CRC code get from bdevice

6.2.5 error verify code（CRC verify）：

Ths host or bdevice can use check code to judge whether the received message is correct or not. Due to the electroic noise or other interference, the information may wrong during transmission, error verify code（CRC）can verify whether the information of the host or bdevice is correct in the process of transmission, the wrong data can be given up（whether send or receive）,which increased the safety and efficiency of the system. MODBUS protocol CRC(redundancy cycle code) include 2 bytes, namely 16 bit binary number. CRC code calculated by transmitting equipment(host), place to the end of send information frame. The receive information equipment (bdevice) re-calculate the received CRC of the information, and compare the calculated CRC with the received CRC, if they are not consistent, then means wrong.

When doing CRC calculation, use only 8 data bits. start bit and stop bit, if there is a parity bit also including the parity bit, do not participate in the CRC calculation.

● CRC code calculation method is:

1．Preset a 16-bit register as hexadecimal FFFF（that is all 1）; called this register as CRC register;

2．The first 8-bit binary data (ie, the first byte of the communication message frame) is XORed with the lower 8 bits of the 16-bit CRC register, and the result is placed in the CRC register.

3．Right shift the content of CRC register a bit（forward the low bit）use 0 fill the highest bit, and check the shift bit after the right shift;

4．If the shift bit is 0: repeat the third step(right shift a bit again); if shift bit is 1: CRC register XORed with polynomial A001（1010 0000 0000 0001）;

5．Repeat step 3 and 4, until right shift 8 times, then, all the 8 bits data are processed

entirely;

6．Repeat Step 2 to Step 5 to process the next byte of the communication information frame;

7．When calculated all the bytes of the communication frame according to above steps, exchange the high and low bytes get from 16-bits CRC register;

8．At last the result of CRC register content is: CRC code.

6.3 Communication error and data process:

When PDM table detected other errors except CRC code error, must return the information to the host, the highest bit of the function code is 1, the function code from bdevice return to the host is on the basis of the host function code add 128. The following code indicates that an unexpected error has occurred

PDM received information from the host with CRC error, will be ignored by PDM table.

PDM returned error code format as below (except CRC code)

　　Address code: 1 byte

　　Function code: 1 byte 　（the highest bit is 1）

　　Error code:　1 byte

　　CRC code: 2 bytes

　PDM response and return below error code:

　　81．Illegal function code.

　　　　PDM table do not support the received function code.

　　82．Illegal data position

　　　　Specified data position beyond PDM table range.

　　83．Illegal data value

　　　　Received the host sending data values exceed the PDM corresponding data range.

6.4 SDD series drive debugging software description and usage

This servo debugging software is green software and does not require installation. After obtaining the software from the manufacturer and storing it on the computer, it can be run directly. To connect the computer with the servo driver, you must use the manufacturer's special debug communication cable model (CABLE02). Using other communication lines can result in damage to the drive or inability to communicate.

1.Double click BGD Servo get in the first interface. As following:
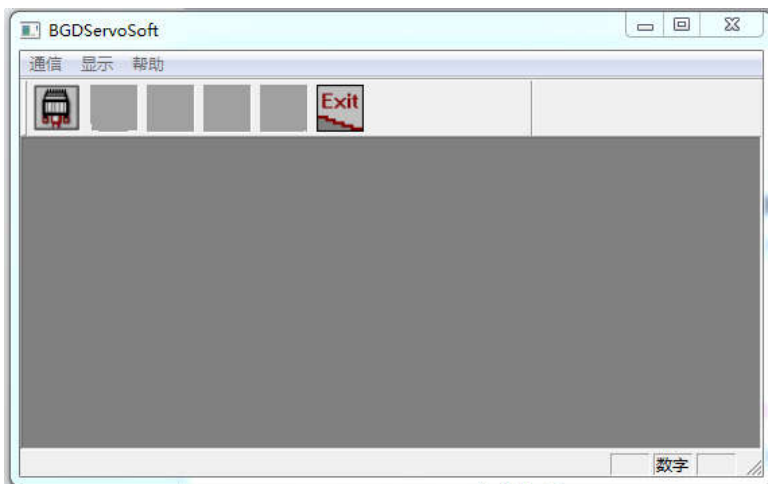
2.Click on the serial port Settings software will automatically identify COM port. Choosing baud rate accord to the drive settings. If don't match that will cause communication error. The default baud rate of software and drive is 9600. The station number is based on the driver setting. The driver model is selected the other parameters are default.Save the parameter and then click the "链接"button. Now this software and drive can be normal communication. Offline mode is used to check other information of the software without connect the drive.
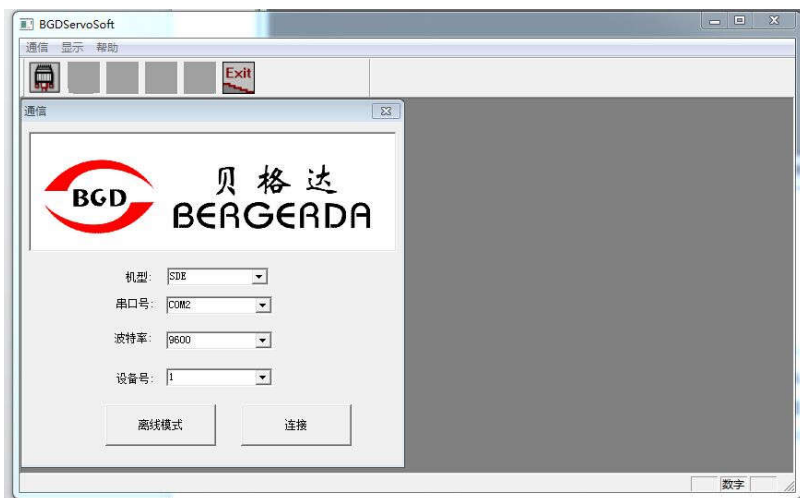
Serial port Settings interface

Parameter Settings interface

3.Click the parameter setting. This interface mainly used for viewing and modifying the drive parameters. It Can be modified individually or in batches. It's greatly improve the efficiency of derive debugging.

Functional specifications:

Reading: Read the external parameter list file to the current computer software.

Save as: Save the parameter in current software as other files. Providing download.

Upload: Upload the parameter in servo drive to the software in computer.

Download: Download the parameter in software to the servo drive.

Each issued: Download the parameter in software to the servo drive. Single data processing.

Save: Saving the modify parameter in current software to EEPROM in servo drive directly.
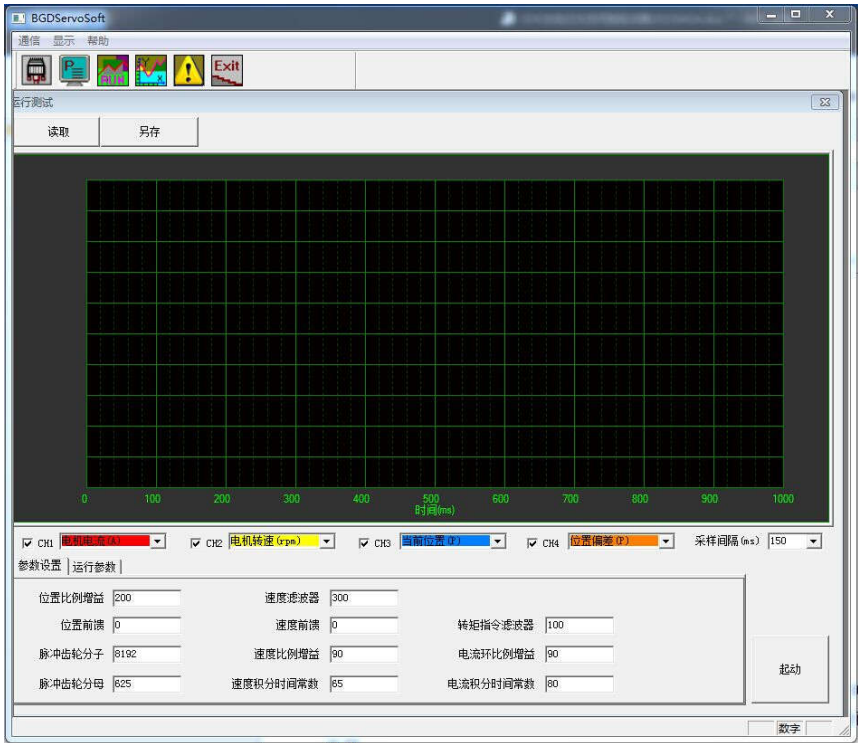
Running test interface

4. Running the test icon can make four-way acquisition of the motor speed, position, command position, torque and current to facilitate the debugging of the driver. For specific commands, please refer to the commands for use in the debug software. This manual is no longer discussed.

6.5 Communication commend example

RTU command: 03 read single or multiple register

06 write single register

10 write multiple registers

6.5.1 application example:

Read multi-channel register（for example: read PN9 PN10 electronic gear ratio）

01	03	00 09	00 02	14 09
Station No.	read command	No.9 address	2 datas	check bit

return

01   03   04   00 01   00 01   6A   33

Return result: 4 bytes, two parameters are 01 01. that is PN9 PN10=1

Write multi-channel register（for example: write PN9 PN10 electronic gear ratio）

01	10	00 09	00 02	04	00 05	00 04	22 07
Station Number	write command	No. 9 address	2 datas	4 bytes	data 5 and 4		check code

return

01   10   00 09   00 02   91   CA

Return result: already wrote in 2 bytes parameters, check the drive, PN9=5 PN10=4

Read single register（like read current magnitude of the servo output, namely UN-I address is 148）

01   03   00 94   00 01 C5 E6

return：01 03 02 00 03 F8 45   indicates the read data is 03 means 0.3A

For example: read present motor position UN-2 UN-3

01 03 00 8D 00 02 54 20

return：01 03 01 F5 B1 00 03 D9 D9

F5B1=62897   0003=03

so, present position is 0362897

01 06 00 5F 00 01 78 18：Use communication to modify PN95=1 to control motor enable

01 06 00 04 00 02 49 CA：Modify PN4=2 with communication

SDF－X　Common communication address

Motor speed	012DH
The current position of the motor is 5 bits lower	012EH
The current position of the motor is 5 bits higher	012FH
Motor torque	0134H
Motor current	0135H
frequency pulse	0138H
speed command	0139H
Torque command	013AH
Absolute position of motor physical encoder, 32-bit data composed of single-turn and multi-turn combination (code disc resolution)	0191H (must be set to 32-bit read)
Motor physical encoder absolute position single turn low 16 bits	0195H
Motor physical encoder absolute position single turn high 16 bits	0196H
Motor physical encoder absolute position multi-turn number of turns 16 bits (197h*131072) +(196H*65535+195H)	0197H
The absolute position of the user code wheel, the 32-bit data composed of single-turn and multi-turn combination, If pn42 is set to 10000 and the current code disc is 17 bits, then this data has been converted into 10000 pulses per turn. The relationship between the	0193H (must be set to 32-bit read)

absolute position of the motor physical encoder and the absolute position of the user code disc is as follows: 193H(data) = 191H(data)*(PN42/131072)	
The absolute position of the user code wheel is multi-turn and the number of turns is 16 bits. 197H*10000+198H (198H already corresponds to 10000 pulses per circle) 197H*10000+198H=UN28*100000+UN27 UN27 UN28 is the content in the monitoring menu.	0197H
User code disc absolute position Single-turn absolute position 16-bit	0198H

Note:

①. Read the address of the monitoring menu, mainly through 485 communication, let the host computer read it, and use it to transmit the servo state to the host computer.

②. Monitoring menu address: 12DH ~ 148H, the sequence is the same as the original driver.

③ .Read the address of the input port I00-I06, which is used to read the status of the input point through communication. The input port address is 122H ~ 128H, and the output port address is 129H/12AH/12BH.

④. The communication port standard is debugged by SDF servo software, and it can also be debugged by computer serial port. Debugging with a computer must be connected to a USB to RS485 converter.

6.5.2 **SDF-X   SDF－W** servo system communicate address list

Communicate items	Communicate address	Read/write status

Servo parameters	0-00FFH	Can read and write
input port status	0122H-0128H	Can read only
output port status	0129H-012BH	Can read only
monitoring menu content	012DH-0148H	Can read only

SDF－W　Common communication address

Motor speed	012DH
The current position of the motor is 5 bits lower	012EH
The current position of the motor is 5 bits higher	012FH
Motor torque	0134H
Motor current	0135H
frequency pulse	0138H
speed command	0139H
Torque command	013AH
Absolute position of motor physical encoder, 32-bit data composed of single-turn and multi-turn combination (code disc resolution)	0191H (Must be set to 32-bit read)
Motor physical encoder absolute position single turn low 16 bits	0195H
Motor physical encoder absolute position single turn high 16 bits	0196H
Motor physical encoder absolute position multi-turn number of turns 16 bits (197h*131072) +(196H*65535+195H)	0197H

The absolute position of the user code wheel, the 32-bit data composed of single-turn and multi-turn combination, If pn42 is set to 10000 and the current code disc is 17 bits, then this data has been converted into 10000 pulses per turn. The relationship between the absolute position of the motor physical encoder and the absolute position of the user code disc is as follows: 193H(data) = 191H(data)*(PN42/131072)	0193H (Must be set to 32-bit read)
The absolute position of the user code wheel is multi-turn and the number of turns is 16 bits. 197H*10000+198H (198H already corresponds to 10000 pulses per circle) 197H*10000+198H=UN28*100000+UN27 UN27 UN28 is the content in the monitoring menu.	0197H
User code disc absolute position Single-turn absolute position 16-bit	0198H

Chapter 7 Alarm and processing

If the servo with failure in use, the display will show: Al—xx, if there are various alarms, different alarm message will display by turns. For fault diagnosis, please operate according to the content of this chapter, get rid of the corresponding fault and can be put into use again.

7.1 Alarm list

alarm code	alarm name	alarm reason
AL-0	normal	
AL-1	overspeed	servo motor speed exceeds the set value
AL-2	main circuit overvoltage	main circuit voltage too high
AL-3	main circuit undervoltage	main circuit voltage too low
AL-4	Position out of tolerance	motor with deviation over parameter Pn13 setting value
AL-6	speed amplifier saturation	speed amplifier saturated a long time
AL-7	Servo drive prohibition limit	Press to limit switch
AL-8	Position deviation counter overflow	Input command frequency is too high
AL-9	encoder abnormal	encoder with break line or short circuit
AL-11	Overcurrent 1	Excessive output current for a short time
AL-12	Overcurrent 2	Current sampling saturation
AL-13	overload	Mechanically stuck or loaded more than 130% above rated value
AL-14	Abnormal braking	Braking resistor power is too

		small or braking failure
AL-16	Motor thermal overload	The motor is overloaded under 100%-120% working conditions for a long time
AL-20	EPROM error	servo inside EEPROM read-write abnormal
AL-24	FPGA communication abnormal	FPGA communication abnormal
AL-25	Code disc CRC check error	Drive and motor do not match
AL-45	ADC error	ADC error
AL-46	Codepad battery is low	The battery voltage is lower than 3.1V
AL-47	The encoder battery has no voltage	add battery
AL-48	Error in the number of turns of the code wheel during operation	The code wheel is damaged or the battery voltage of the code wheel is low

7.2 Alarm processing method

alarm code	alarm name	reason	disposal method
AL-1	overspeed	input command pulse frequency is too high	Set input command pulse correct
		input electronic gear ratio is too large	set Pn9 Pn10 parameter correct
		encoder zero point error	ask the factory to reset the encoder zero
		motor U、V、W lead connect wrong	confirm the wiring sequence
AL-2	main circuit overvoltage	input L1 L2 L3 power voltage higher than AC260V	reduce power voltage
		brake circuit capacity is not enough **(Usually occur in the occasion that frequently and rapidly start and stop and the load inertia is large)**	1.prolong control system acceleration and deceleration time 2.contact manufacturer to increase braking resistance capacity
AL-3	main circuit undervoltage	input L1 L2 L3 power voltage less than AC170V	find out the external reason of low voltage
		Immediately alarm after the power is turned on	replace a new servo drive
AL-4	position error	operation, the motor does not turn any angle, immediately alarm	1.confirm UVW wire phase sequence correct or not 2.confirm if the input pulse frequency is too high 3.pulse electronics gear setting it too large, set parameter Pn9 Pn10 correctly
		alarm when rotating (**input pulse abnormal**)	confirm input pulse frequency and width
		alarm when rotating (**error detection range is too small**)	set parameter Pn13 larger
		alarm when rotating (**position proportion gain is too small**)	increase position gain Pn5 set value
		alarm when rotating (**lack of**	higher power servo motor

		torque)	
AL-6	speed amplifier saturation	motor mechanically locked	check the load mechanical part
		the load is too large	1.decrease load, 2.change a higher power drive and motor
AL-9	Encoder failure	Encoder wiring error or disconnection	Check or replace the encoder wire
		on-site disturbance	Relocate electrical cabinets away from sources of interference
		The encoder cable is too long, causing the encoder power supply voltage to be low	Shorten the cable or increase the number of cable cores
AL-11	Overcurrent occurs at power-up	Poor grounding	properly grounded
		Damaged motor insulation or motor short circuit	Replace the motor after measuring the insulation with a megohmmeter
		Broken power cord or shorted to case	Replace the motor power cable
		After unplugging the power cord, it still alarms when it is powered on again	Replace the servo drive
	Overcurrent occurs during operation	Servo supporting motor parameters do not match	Reset the motor ID
		The ac/deceleration time is too short	Increase the ac/deceleration time of the host computer or increase the Pn29 and Pn30 to reduce the current impact
		current surge	Reduce parameters Pn43 Pn5
AL-12	Over current 2	Damaged motor insulation	Replace the motor
		Poor grounding	properly grounded
		After unplugging the power cord, it still alarms when it is powered on again	Replace the servo drive
AL-13	excess load	servo output torque over the allowed value	1.mechanically locked or resistance is large, 2.motor type is not good, change to higher power drive and motor

		Alarm once power on again	Increase the external braking unit
AL-14	braking abnormal	brake circuit capacity is not enough	1.increase acceleration/deceleration time constant 2.replace a larger power servo and motor
		main circuit power is too high	check the AC input power supply
AL-16	Motor thermal overload	The motor is overloaded under 100%-120% working conditions for a long time	1. Exclude the cause of large mechanical resistance 2. Replace the high-power servo drive
AL-20	EEPROMabnormal	servo inside EEPROM read-write abnormal	replace servo drive
AL-24	FPGA error	FPGA communication error	replace servo drive
AL-25	Code disc CRC check error	CRC check error	1. Check or replace the encoder cable 2. Replace the motor 3. Eliminate external interference, optimize the electrical cabinet layout, stay away from interference sources, and properly ground the encoder cable 4. Replace the drive 5. Encoder shell, motor shell and driver metal shell are all connected to the FG end of the machine
AL-45	ADC error	ADC error	replace servo drive
AL-46	Encoder battery low	The encoder battery voltage is lower than 3.1V Remind the user to replace the battery	This alarm will appear when the machine is turned on, and it cannot be enabled. If you want to continue to use it, you can set Pn87=0 to use it. If it occurs during operation, only the alarm will be turned off and enabled, and it will not affect the use. This alarm will be cleared by itself after the battery is replaced and the power is turned

			on again.
AL-47	The encoder battery has no voltage	Indicates that the battery is dead, and the lap data is incorrect when powered on.	Need to run the code disc alarm clear program to clear. Pn87=1 does not check this alarm.
AL-48	Absolute value code wheel turns wrong	The code wheel is damaged or the battery voltage of the code wheel is low	The code disc alarm clear procedure needs to be run to clear or replace the code disc.

Note: These two kinds of alarms, AL-47 and AL-48, may appear only if they are equipped with multi-turn absolute encoders. For the sake of safety, if the above two kinds of alarms occur, power on again, and the alarms cannot be eliminated directly. Need to do the following: The method to clear AL47: Pn4=4 Pn95=1 Pn0=789 In the F4 interface, press and hold the Enter key for 5 seconds, then power on again. If invalid, please replace the motor encoder. The method of clearing AL48: Pn4=4 Pn95=1 Pn0=788 In the F4 interface, press and hold the Enter key for 5 seconds, then power on again. If invalid, please replace the motor encoder.

Special explanation: if the servo drive alarm, but after power on again, the alarm will disappear. Generally, it is considered that the servo drive outside parts with problem or the parameter adjusted improperly; please check the servo peripheral parts. For example: power voltage, controller, mechanical load, motor etc. if the peripheral parts without problem, please consult the manufacture about parameter adjustment.

If the alarm cannot clear after power on, please replace the servo drive and observe.

7.3 FAQ or exception handling in use

1、No-load operation motor vibrate strongly or scream, load with noise or position error.

Handling method: confirm the servo drive PN 1 parameter whether match with the connected motor, set correct parameter based on table 7.2, then restore to factory value.

For example: the current motor is 60F-M01330

    1）check table appendix A, and get the motor ID=1

    2）operate drive, set PN0 to 0

    3）set PN1 to motor ID number, that is PN1=1

    4）operate drive and enter SN-DEF interface, press the ENTER key on the display panel for 2 seconds, when display DONE, indicates success.

    5）turn off and power on again, done.

2、**The motor run positional accuracy and the required accuracy deviation is very large but regular**

Solution: Correctly set the position pulse electronic gear ratio. This servo system defaults to 10,000 pulse motors to make one revolution. If the control requirement of the host computer is that 3000 pulses require the motor to rotate once, it is necessary to set the gear ratio to meet the requirement. It can be calculated by the following formula: 3000*(PN9/PN10)=10000 It can be concluded that PN9=10 PN10=3

3、**drive input, output signal level reversed**

1）Set parameter PN53 PN54 PN55 to set input/output suitable high level or low level so as to adapt to different input/output level requirement of the controller.

4、**upper computer pulse but motor not running**

Make sure PN4=0, check UN-12 monitoring value, if there is digital shows that means the drive received pulse, it indicates the control signal connection without problem. Please refer to method 1 to clear fault. If display F 0.0 it indicates the drive do not received pulse. Please refer to method 2 to clear fault .UN-12 display unit is KHZ , like display F150, it indicates the present drive received pulse frequency is 150KHZ.

Method1:

Set below two parameters: PN95=1 PN4=3 in F2 model performs JOG function. If the motor can rotate, it indicates the motor, the motor power line, encoder wire connected correct, there is no problem.

Check CN1 signal if with INH signal or CLE signal with ON or not. It can be found by check UN-16.

If the motor can not run, please do following inspection

1）Check the drive with enable motor or not, and turn the motor shaft by hand. If it can not be rotated, indicates the motor enable locked. If it can be rotated, indicates there is no enable, please check if CN1 input enable signal correct connected or not. If the enable signal do not need to control by the upper computer. CN1 input enable signal not connected, can set PN95=1, drive motor automatically enable locked.

2）Check if the power cable which between drive and motor connected correctly or not, and the socket loose or not. Drive output terminal U V W PE and motor U V W PE whether corresponding. Power cable U V W PE must be connected correctly, can not change the sequence randomly.

3）Please contact the factory technical personnel.

Method 2:

1）Check the pulse amplitude input to drive, the standard is 5V. If the pulse amplitude is 12V, must series 1K resistance; if the pulse amplitude is 24K, must series 2K resistance. The drive input circuit will be burned if not series resistance according to the requirements. Lead to the servo can not receive pulse.

2）Confirm the pulse connection mode is correct, the connection mode: differential connection mode and single end connection mode. Specific see below chart

Typic application: numerical control system, motion
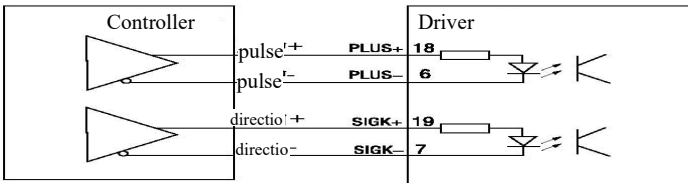
Typic application: PLC, SCM controller
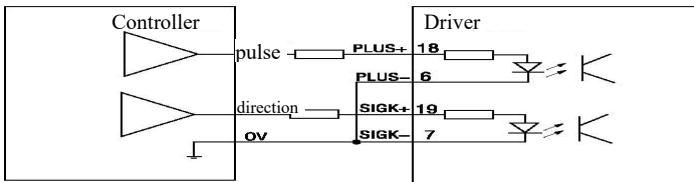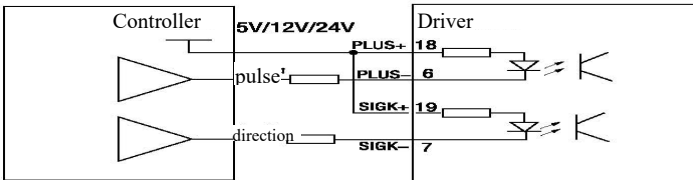
5、The motor can only turn to one direction

1）Confirm the input pulse type to drive, pulse and direction setting PN8=0；Double pulse setting PN8=1；A/B orthogonal pulse setting PN8=1，and confirm the drive model is SDxxx-D。

2）Observe UN-12 display state, upper computer send forward signal should display F xx. Reversal signal should display F -xx. If the upper computer send forward signal or reversal signal both display F xx or F -xx. Please check the direction signal SIGN from upper computer to drive.

3）Please contact the factory technical personnel.

6、high speed stop or from top to down does negative work, the drive display AL－3

1）modify the upper computer deceleration time

2）reduce motor speed

3）small power drive access external braking resistance

4）medium high power drive please contact the factory technical personnel.

7、there is no display when power on

1）Confirm power connecting wire and input power

2）Please contact the factory technical personnel.

8、Power on drive display "。。。。。。。。" or "888888"

1）the input power lack phase, check each phase power line

2）servo drive damaged by short circuit, and lead to servo drive damaged. The motor damage can be judged by rotate motor shaft under the no-load situation, rotate a circle, if the shaft is not smooth, can be concluded that the motor is damaged.

9、Motor position is not accurate

1）Irregular, check motor connection mechanical part

2）Regular, monitor and analyse UN-02 UN-03 UN-04 UN-05 can get results

3）Screening interference, the signal wire use shield wire and grounding, add magnetic coiling. Motor cable change to shield wire. Electronic control system wiring again, make the strong and weak electricity line separately. Install filter etc.

The effect of the servo monitoring menu in analysis and adjustment processes.

1）UN-01 motor speed   observe the motor actual speed

2）UN-02 UN-03   The current position of the motor: used to observe the current position of the motor. It is represented by the number of pulses. For example, if the control takes a fixed trajectory, the displayed value should be the same when each repeat operation is performed. Indicates accurate positioning each time.

3）UN-04 UN-05 Pulse command count, used to monitor whether the pulse from the host computer is accurate. For example, if the control traverses a fixed trajectory, the displayed value should be the same when it comes to the same position each time it repeats its operation, indicating that the pulse sent by the host computer is accurate.

4）UN-08 motor present torque, used to observe motor actual operate situation. If this value over 90 for a long time, means the current motor type is small.

5）UN-12 input pulse frequency, used to observe pulse frequency from upper computer and stability state

6）UN-17 input signal state, used to judge whether the input signal is normal

7）UN-18 output signal state, used to judge whether the output signal is normal

8）UN-23 input model voltage AD value，used to indicate the level of the input voltage，it's 2048 with no input.
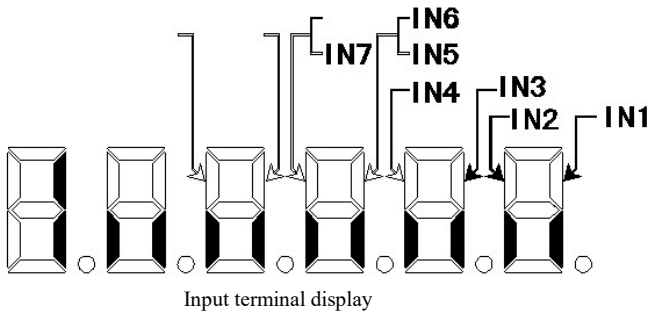
Input terminal display

Light display ON, go out display OFF
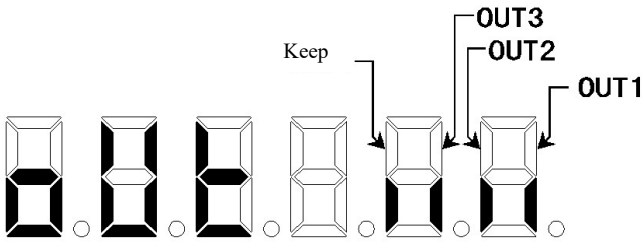
Output terminal display

Light display ON, go out display OFF

Appendix A: SDF series driver and motor parameter matching table (220V series)

A1: SDF-W series servo is matched with GCL\GDL motor and PN1 parameter (motor ID) setting

Motor Model	Torque N.m	speed rpm	Power KW	GCL Five-pole magnetic knitting motor GDL Five-pole aurora knitting motor ID (drive PN1 parameter) **V6005**	
				SDF04NKW	SDF08NKW
40F-00330GCL	0.32	3000	0.1	80	
60F-00630GCL	0.64	3000	0.2	81	
60F-0130GCL	1.27	3000	0.4	82	
80F-0230GCL	2.39	3000	0.75		83
80F-0330GCL	3.18	3000	1.0		84
40F-00330GDL	0.32	3000	0.1	38	
60F-00630GDL	0.64	3000	0.2	0	
60F-0130GDL	1.27	3000	0.4	1	
80F-0230GDL	2.39	3000	0.75		2
80F-0330GDL	3.18	3000	1.0		3

Note: When equipped with a 17-bit magnetic encoder motor, the new motor must be re-zeroed and matched.

A2: SDF-X series servo and TCL motor matching and PN1 parameter (motor ID) setting

Motor Model	Torque N.m	speed rpm	Power KW	Bergerda TDL Five-pole magnetic braided motor ID (drive PN1 parameter) **V5109**			
				SDF04NK7X	SDF08NK8X	SDF13NK9X	SDF20NK9X

60F-00630TCL	0.64	3000	0.2	81			
60F-0130TCL	1.27	3000	0.4	82			
80F-0230TCL	2.39	3000	0.75		83		
80F-0330TCL	3.18	3000	1.0		84		

Note: When equipped with a 17-bit magnetic encoder motor, the new motor must be re-zeroed and matched.

A3: SDF-X series servo and TDL motor matching and PN1 parameter (motor ID) setting

Motor Model	Torque N.m	speed rpm	Power KW	Bergerda TDL Five-pole of Aurora Tamagawa protocol motors ID (drive PN1 parameter) V5109				
				04X	08X	13X	20X	50X
40F-00230TDL	0.16	3000	0.05	37				
40F-00330TDL	0.32	3000	0.1	38				
60F-00630TDL	0.64	3000	0.2	0				
60F-0130TDL	1.27	3000	0.4	1	1			
80F-0230TDL	2.39	3000	0.75		2			
80F-0330TDL	3.18	3000	1.0		3			
110F-0425TDL	3.82	2500	1.0			11		
110F-0625TDL	5.73	2500	1.5			13		
130F-0520TDL	4.78	2000	1.0			16		
130F-0820TDL	7.16	2000	1.5				18	
130F-1020TDL	9.55	2000	2.0				21	
130F-1520TDL	14.3	2000	3.0				22	102
130F-1915TDL	19.1	1500	3.0					24

A4: SDF_X SDF_E series servo and NEL motor matching and PN1 parameter (motor ID) setting

Motor Model	Torque N.m	speed rpm	Power KW	Bergerda NEL Four-pole Tamagawa photoelectric encoder motor ID (drive PN1 parameter) V5109				
				04X	08X	13X	20X	50X
40SM-M0330NEL	0.32	3000	0.1	40				
60SM-M00630NEL	0.64	3000	0.2	41				
60SM-M0130NEL	1.27	3000	0.4	42				
60SM-M0230NEL	1.91	3000	0.6		43			
80SM-M0230NEL	2.39	3000	0.75		44			
80SM-M0425NEL	3.18	3000	1.0		45			
130SM-M0425NEL	3.82	2500	1.0			46		
130SM-M0525NEL	5.73	2500	1.5			47		
130SM-M0625NEL	4.78	2000	1.0			48		
130SM-M0825NEL	7.16	2000	1.5				49	
130SM-M1025NEL	9.55	2000	2.0				50	
130SM-M1525NEL	14.3	2000	3.0				51	

A5: SDF-X series matching with TDL motor (380V series) and setting of PN1 parameters

Motor Model	Torque N.m	speed rpm	Power KW	Bergerda TBH Series motor ID (drive PN1 parameter)	
				SDF30HK10	SDF55HK12
130F-0520	4.78	2000	1.0	110	110
130F-0825	7.16	2000	1.5	111	111
130F-1020	9.55	2500	2.0	112	112
130F-1520	14.3	2000	3.0	113	113

180F-1915	19.1	1500	3.0		61
180F-2815	28.6	1500	4.5		64
180F-3515	35.0	1500	5.5		66

In order to achieve the best control effect, the driver and the motor must be used in pairs (configure the Pn1 motor ID to the corresponding model). Otherwise, vibration, screaming, and inaccurate positioning may occur. Pairing method:

1) Change Pn0 to 0 first;

2) Set Pn1 to the ID number value of the desired motor;

3) After entering the SN-DEF menu, press and hold the Enter key for about 2 seconds until DONE appears;

4) Power off and re-power on to work normally.

Appendix C: Product after-sales service description

According to the correct method of use, this product can have a long service life. If it is used improperly, or the environment is harsh beyond the allowable range. This product will malfunction. The standard warranty period for this product is 18 months. Repairs will be charged due to improper use or failure over 18 months.

Please note the following regarding maintenance services:

1) The product label is an important certificate for maintenance, please do not tear or damage it at will. Otherwise, there is no warranty;

2) The warranty period is within 12 months from the date of purchase, if the proof of purchase cannot be provided, it will be within 12 months from the date of manufacture on the product label;

3) If you need maintenance services, you can contact each office or dealer;

4) In the process of product maintenance and transportation, please pack it well to prevent secondary damage.

The following situations are not covered by the warranty:

* Due to wrong use, such as wrong power supply, self-disassembly, modification, water, oil, etc. damage caused by factors;

* Damage caused by natural disasters, such as lightning, earthquake, etc.