DSL200-F1

SERVO DRIVE INSTRUCTIONS

⚠ **DANGEROUS**

■To use the appropriate force to fasten each wiring terminals in the main circuit.
Otherwise, it is easy to cause spark, even the fire because the wires would be loosed.

■To install all drive units and brake resistors above the non-combustible objects, and keep away from the flammable ,material.
Otherwise, it is easy to cause the fire.

■To make sure that the input power supply is off before wiring.
Otherwise, the electric shock maybe occurs.

■To install circuit breakers, interference filters and AC reactors in time.
Otherwise, the lightning strikes, failures or damages maybe occur.

■wiring or inspection shall be carried out by the professional electrical engineers.
Otherwise, the electric shock or fire maybe occur.

■If move, wire distribution, inspection or maintenance are to be needed, it shouldn't be carried out until 10 minutes after the power is turned off.
Otherwise, the electric shock maybe occurs.

■PE, the servo unit grounding terminal, must be grounded.
Otherwise, the electric shock maybe occurs.

■To install the emergency-stop switch.
Otherwise, injury, failures or mechanical damages maybe occur.

■To ensure the wiring correct.
Otherwise, it is easy to cause the electric shock.

■To make sure to tighten the power terminals and the motor output terminals.
Otherwise, injury, failures and mechanical damages maybe occur.

■Don't open cover plate of the terminal strip when servo drive is electrified or running.
Otherwise, the electric shock maybe occurs.

■Don't touch the main circuit wiring terminal of the drive unit directly.
Otherwise, the electric shock maybe occurs.

■Don't operate the switch by wet hands.
Otherwise, the electric shock maybe occurs.

■Don't prevent heat diffusion or place the irrelevant objects inside the dissipation fans or radiators.
Otherwise, damages and fires maybe occur.

■Don't operate the spindle motor shaft connecting device right now after the power supply is restored, because it perhaps be started suddenly.

Otherwise, personal injury maybe occurs.

■Don't put your hands inside the servo units.
Otherwise, It is easy to have electric shock.

■Don't put the wires on the sharp edge. Don't carry the heavy load and huge pulling force.
Otherwise, electric shock, failures and damages maybe occur.

■Don't operate the spindle drive device when it is electrified, after removing the cover plate of the terminal strip.
Otherwise, the electric shock maybe occurs.

⚠ CAUTIOUS

■To correctly connect drive units and motors strictly depending on the wiring diagram.
Otherwise, it maybe damages the devices.

■The loaded voltage grades on each terminal should base on those that were ruled in the instructions.

Otherwise, it maybe damages the devices.

■Only can Load operating be carried after the no-load running of motor has be tested successfully.
Otherwise, it maybe damages the devices.

■After the alarm occurs, please exclude the alarm before running.
Otherwise, it maybe damages the devices.

■To correctly connect the brake resistances according to the wiring diagram.
Otherwise, it is easy to cause spark, even the fire because the wires would be loosed.

■Motor must match with the appropriate servo units.
Otherwise, it maybe damages the devices.

■Don't modify, detach or maintain the drive units privately.
Otherwise, it maybe damages the devices.

■Don't hold the cable and motor shaft during the transportation.
Otherwise, it maybe damages the devices.

■Don't touch the heat dissipation device of motor, brake resistance or servo units when it is running because the high temperature maybe occurs.
Otherwise, it maybe burns the hands.

■Don't extremely adjust or modify the parameters privately.
Otherwise, it maybe damages the devices.

■Don't connect the input terminals R, S, T of power supply with the output terminals U, V, W of the motor.
Otherwise, it maybe damages the devices.

■If the components of the spindle drive units are missed or damaged, don't run it, and contact the agent immediately.

■For the scrapped drive units, its internal electronic components can only be dealt as the industrial waste, which aren't reusable.
Otherwise, the accidents maybe occur.

■Don't turn on or off the input power frequently.
Otherwise, it maybe damages the devices.

CONTENTS

CHAPTER 1   OUTLINES

1.1 Introduction

DSL200-F1 series are the good cost-effective products focusing on the special applications of location controlling, speed controlling and torque controlling, which can match kinds of open loop system, half –close loop system and close loop system. It adopts the advanced motor-controlled professional DSP processor and IMP intelligent power module to keep the high integration, small body, good protection and reliable performance.   It adopts optimal PID algorithm to finish PWM controlling to make its performance be in the advanced level comparable with the like products.

1.2 Performance indices of Servo Drive Units for DSL200-F1

<table>
<tr>
<td rowspan="9">specifications</td>
<td colspan="3">control mode</td>
<td>single phase:110V/ three phase: 220V,full-wave rectification</td>
</tr>
<tr>
<td colspan="3"></td>
<td>IPM SVPWM control, sinusoidal-wave current drive mode</td>
</tr>
<tr>
<td colspan="3">feedback of encoder</td>
<td>general-increment type:2500 line resolution.</td>
</tr>
<tr>
<td rowspan="6">operation condition</td>
<td colspan="2">operation/ store temperature</td>
<td>0～+40℃/ -20～+65℃, to make the air circulating much more, when it is above +40℃.</td>
</tr>
<tr>
<td colspan="2">operation/ store humidity</td>
<td>below 90% RH (no frost)</td>
</tr>
<tr>
<td colspan="2">anti-vibration/ anti-impact strength</td>
<td>4.9m/s^2/ 19.6/s^2</td>
</tr>
<tr>
<td colspan="2">protection grade</td>
<td>IP10</td>
</tr>
<tr>
<td colspan="2">pollution grade</td>
<td>2</td>
</tr>
<tr>
<td colspan="2">altitude</td>
<td>below1000m (Please add input the power value to keep the rated power, when the altitude is over 1000m)</td>
</tr>
<tr>
<td rowspan="12">speed, torque control mode</td>
<td rowspan="12">input signals</td>
<td rowspan="12">performance</td>
<td colspan="1">load changing rate</td>
<td>between 0～100% load: below ±0.01% (within rated speed)</td>
</tr>
<tr>
<td>speed changing rate</td>
<td>between 0～100% load: about ±0.01%</td>
</tr>
<tr>
<td>voltage changing rate</td>
<td>about ±10% rated voltage (within rated speed)</td>
</tr>
<tr>
<td>over-current capacity</td>
<td>150% (rated current for 1 minute), 200% (rated current for 5 second)</td>
</tr>
<tr>
<td>temperature changing rate</td>
<td>25±25℃: below ±0.1% (within rated speed)</td>
</tr>
<tr>
<td>speed control range</td>
<td>1:5000</td>
</tr>
<tr>
<td>frequency character</td>
<td>≤800Hz</td>
</tr>
<tr>
<td>torque control precision</td>
<td>±1%</td>
</tr>
<tr>
<td>speed response   no-load</td>
<td>10ms (from 0rpm to rated speed)</td>
</tr>
<tr>
<td>rated load</td>
<td>100ms (from 0rpm to rated speed)</td>
</tr>
</table>

			soft-start time setting	0～10s (acceleration and deceleration can be set separately)
		speed instruction input	instructing voltage	DC±10V/ rated speed (factory default set. It can be set by parameters)
				input voltage: Max.±12V (positive instruction，the motor rotates forward)
			input impendence	about 14kΩ
			circuit time constant	about 4.7μs
		torque instruction input	instructing voltage	DC±10V/ rated speed (factory default set. It can be set by parameters)
				input voltage: Max.±12V (positive instruction，it is the positive torque instruction)
			input impedance	about 14kΩ
			circuit time constant	about 4.7μs
position control mode	performance		instruction smoothness ways	low pass/ S curve smoothly filtering
			feed-forward compensation	0～100%
			positioning completion width	0～65535 instruction unit (set resolution to be 1 pulse)
	position instruction input	instruction pulse	input pulse status	Pulse + direction; CCW/CW
			input form	difference drive
				integrated electrode open circuit
			input pulse frequency	integrated electrode open circuit:500Khz
			instruction smoothness ways	low-pass filtering / FIR filtering
		built-in integrated electrode open circuit up-pulling resistance		built-in two passes up-pulling to external +24V， 2kΩ resistance
I/O signals	digital input signals	signals amount		pass 1 DI input
		functional planning		I/O input function planning can be carried
		signals function		servo enabling, speed reverse, abnormal alarm clearing
	digital output signals	signals content		brake signal output, servo alarm signal output and Z pulse integrated electrode output
	feedback signals of encoder	feedback pulse form		difference output
		feedback pulse ways		A/B phase orthogonal code signals
		feedback pulse amount		2500 line resolution (orthogonal code)
built-in functions	origin zero-return function for various machines			origin-return way of various machines
	electron gear ratio			1/1000 ≤ N/M ≤1000
	regenerated brake	brake mode		energy-consumed brake
		brake resistance		built-in or external

	protection function	over-/under- position, over-speed, over-/under- voltage of main circuit, power module failures，abnormal brake return circuit, over-current, over-load, encoder signals interference, encoder broken wire, abnormal control power supply etc.
	monitoring function	motor speed, present position pulse amount, position instruction pulse amount, position deviation, motor torque, motor current, running status, I/O signals, analog instruction/ torque voltage, servo alarm memory etc.
	communication function	RS485 (standard ModBus agreement)
	display and operation	5 bit LED Nixie tube; 4 buttons

Chapter 2   Wiring

WARNING

●Driving power supply of this series is AC single phase or three phase 220V, the running power supply of driver must be checked before wiring.

●User must consider the secure protection measurement during the design and installation of the series so as to prevent the accidental event from the incorrect operation.

●Driver terminals U, V, W must connect motor terminal U, V, W correspondingly.

●Both driver and motor must ground well.

●Driver must be cut off the power for over 5 minutes before user dismantles it so as to avoid electric shock.

●Don't open/ close the power supply frequently. Please operate it one time within 1 minute if needed.

2.1 Primary Circuit Routes

2.1.1Terminals name of primary circuit

●1Kw～3.8Kw

Terminals code	Name	Description
R	single phase or three phase main return-circuit power supply	to connect single phase/ three phase AC power supply (to select the appropriate specifications according to driver type, it's okay to just connect R and S for single phase 220V)
S		
T		
FG	grounded protecting terminal	to connect the grounding terminals of the power supply and motor
U	motor power connecting terminals	to connect the motor, must keep the accordance with motor terminals U,V, W.
V		
W		
R	control power supply (single phase)	control return-circuit power supply input terminal～220V 50/60Hz
S		

●100w～750w

Terminals code	Name	Description
R	single phase or three phase	to connect single phase/ three phase AC power supply

S	main return-circuit power supply	(to select the appropriate specifications according to driver type, it's okay to just connect R and S for single phase 220V)
FG	grounded protecting terminal	to connect the grounding terminals of the power supply and motor
FG	grounded protecting terminal	
U	motor power connecting terminals	to connect the motor, must keep the accordance with motor terminals U,V, W.
V		
W		

2.1.2 Selection of power wire

●Section area of wire: wire U, V, W section area$\geq$ 1.5 mm^2 (AWG14-16); wire R,S section area$\geq$ 1.0mm^2 (AWG16-18)

●Grounding wire: the ground wire needs to be thick ASAP. The driver and servo motor ground in PE port. Ground resistance ＜100Ω. Port connection adopts SVM2-4 pre-insulated cold-pressing terminals. Please fasten the connecting. Three-phase isolation transformer power supply are recommended so as to avoid the electric shock. Noise filter of power supply is recommended to increase the anti-interference. Please install Non-fuse breaker (NFB) so that the external power can be broken off timely when the failures of driver occur.

2.1.3 Selection of signal cable

● Cable material: please select the shielded cable (the inter-twisted shielded cable is best). Section area of cable $\geq$ 0.12mm^2 (AWG24-26) . shielded layer must connect the FG ports.

● Cable length: it should be short ASAP. Control cable CN2 is no more than 3m. Feedback signal cable CN1 is no more than 20m.

● Wiring: to wire it far away from power supply cable so as to prevent the cross-line interference. Please install the surge absorption elements for inductive parts(coils) in related circuits. When wiring, don't damage the cable with sharp objects, don't pull the cable hard, otherwise electric shock or bad wire contact maybe happen. Don't make the main return-circuit wire and signal cable together pass through the same tube, also don't bind them together. The main return-circuit wire and signal cable should be wired dividedly or crosswise , and the distance keeps away over 30cm, to prevent the interference in signal cable from strong electric wire, to ensure the drive unit to be in good condition.

●Don't add power capacity, surge absorbers and radio noise filters between the output side of the drive units and servo motor. To make the main return-circuit wire and signal cable keep away from the radiator and motor so not decline the insulation performance due to heating. After finishing the main return-circuit connecting, the cap of terminals must be covered to avoid the electric shock.

2.2 Primary Circuit Connecting
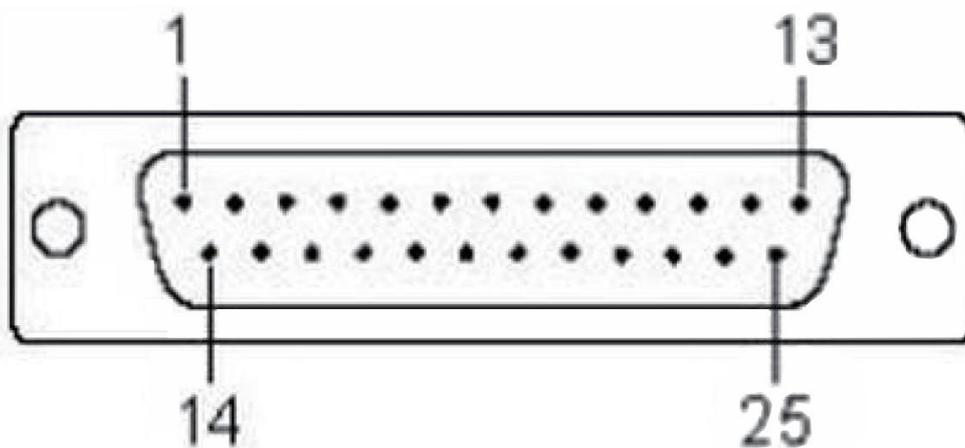
● Connecting of single-phase power supply
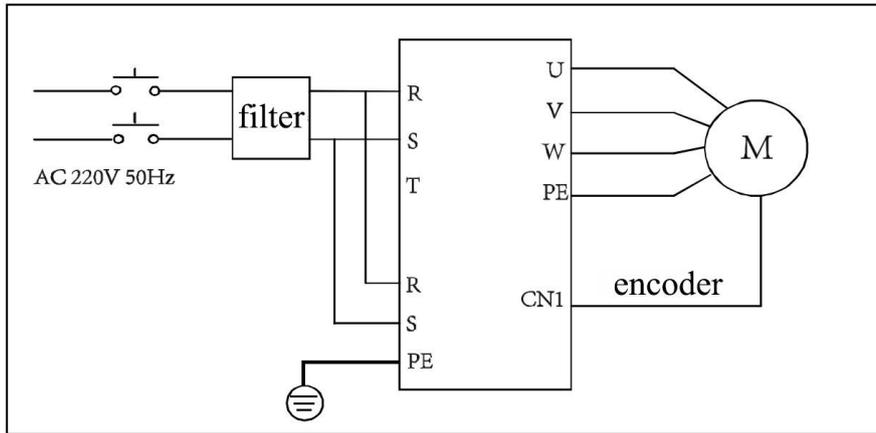
● Connecting of three-phase power supply
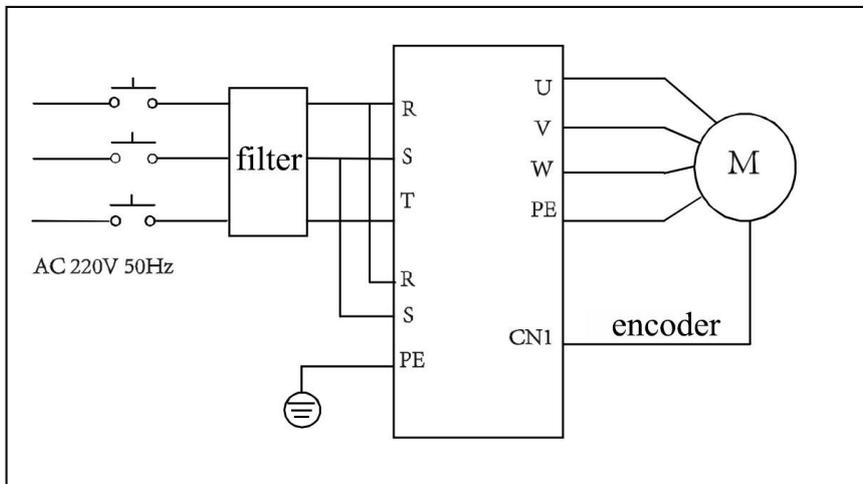
2.3 CN2 Routes and Wiring

2.3.1 CN2 port diagram

DSL200-F1CN2 port welded front section

2.3.2 CN2 Ports definition table

Pin No.	Pin symbol	Symbol content	Remarks
20	COM+	external power+24V	
6	SON	servo enable	I/O input
25	PULSE	instruction pulse input signal	
13	/PULSE	instruction pulse input signal ground	
24	SIGN	instruction pulse direction input signal	
12	/SIGN	instruction pulse direction input signal ground	
15	BRKR+	electromagnetic brake signal	I/O input
3	BRKR-	electromagnetic brake signal ground	
17	ALAM+	servo alarm output signal	I/O input
5	ALAM-	servo alarm output signal ground	
18	TSPD+	torque reached output signal	I/O input
19	TSPD-	torque reached output signal ground	
16	CZ+	Z-phase pulse integrated electrode output signal	I/O input
4	CZ-	Z-phase pulse integrated electrode output signal ground	
21	A+	servo encoder pulse feedback A+	
9	A-	servo encoder pulse feedback A-	
22	B+	servo encoder pulse feedback B+	
10	B-	servo encoder pulse feedback B-	
23	Z+	servo encoder pulse feedback Z+	
11	Z-	servo encoder pulse feedback Z-	
7	RP1	internal up-pull 2K resistance port1	
8	RP2	internal up-pull 2K resistance port2	
2	V-REF	speed instruction analog voltage input	
1	T-REF	torque instruction analog voltage input	
14	AGND	analog voltage instruction ground	

2.3.2.1 Position control mode (pulse mode):

A: The pulse voltage of master computer is 5V, when the upper computer is a numerical control system or a motion control card.

Diagram1.1.1 DSL200-F1 position control (pulse mode) standard connecting

B: The pulse voltage of master computer is 24V, when the upper computer is PLC control
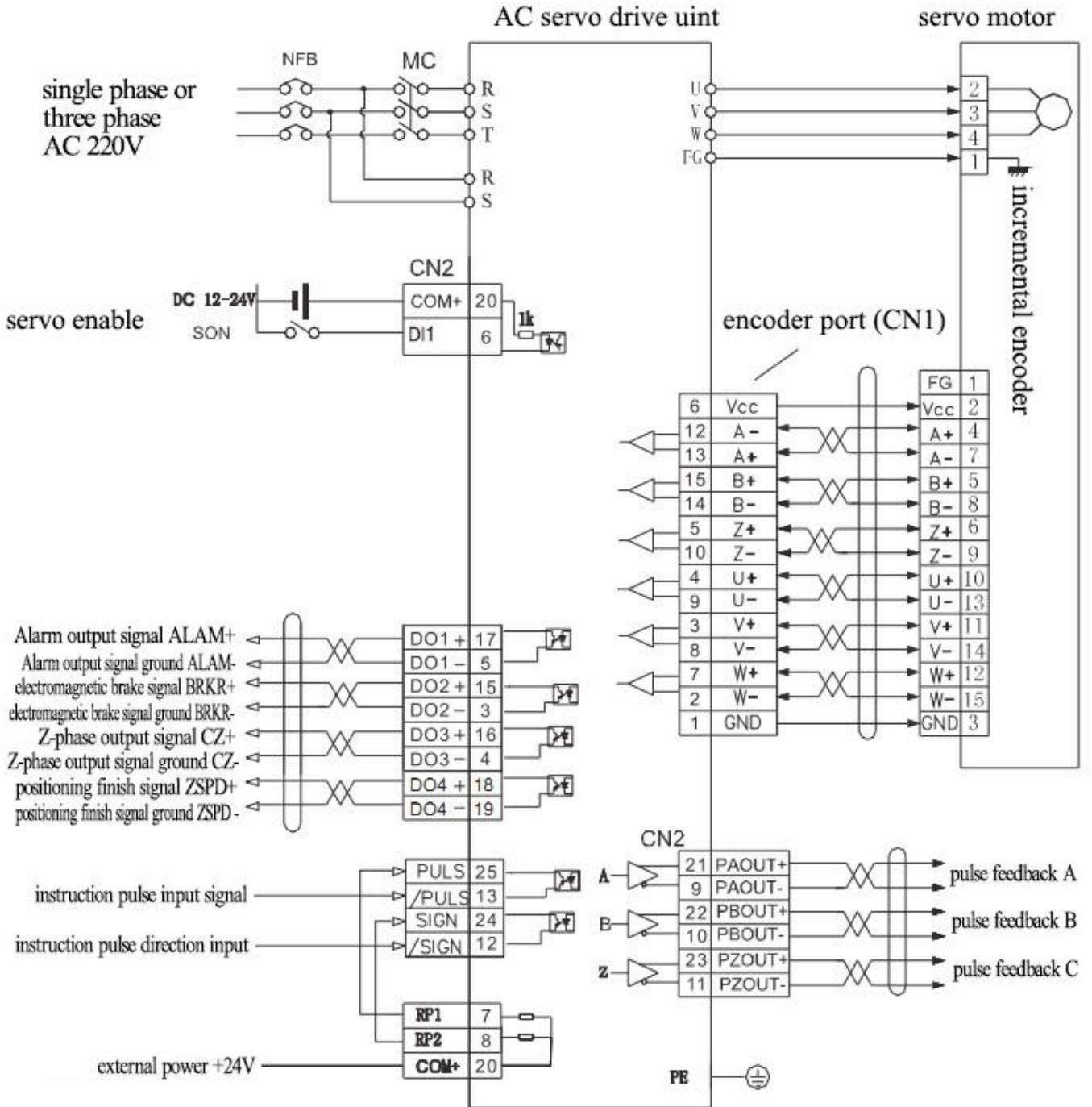
Diagram1.1.2 DSL200-F1 position control (pulse mode) standard connecting

2.3.2.2 Speed control mode (analog voltage):
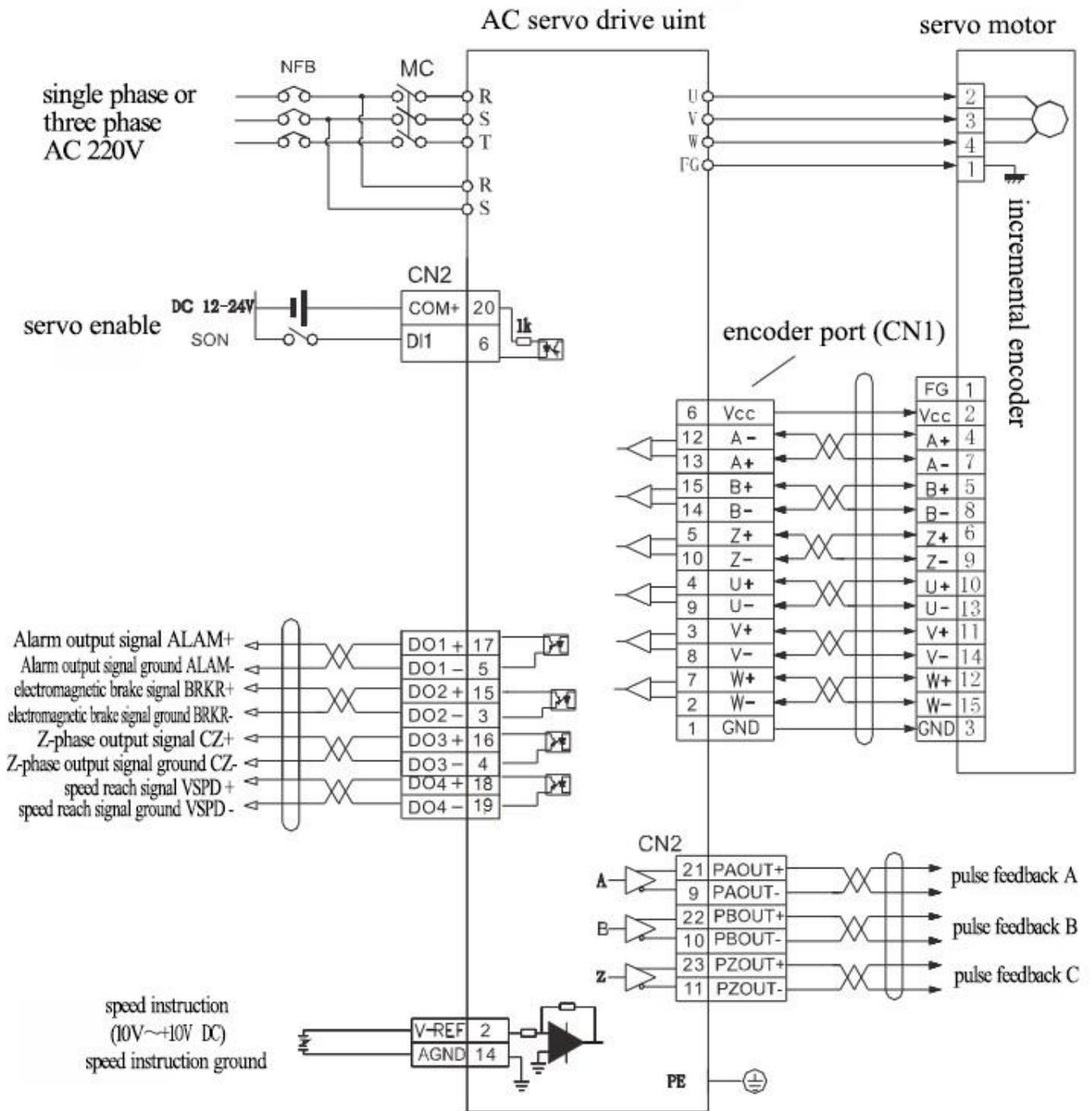
Diagram1.1.3 DSL200-F1 speed control (analog voltage mode) standard connecting

2.3.2.2 Torque control mode (analog voltage):
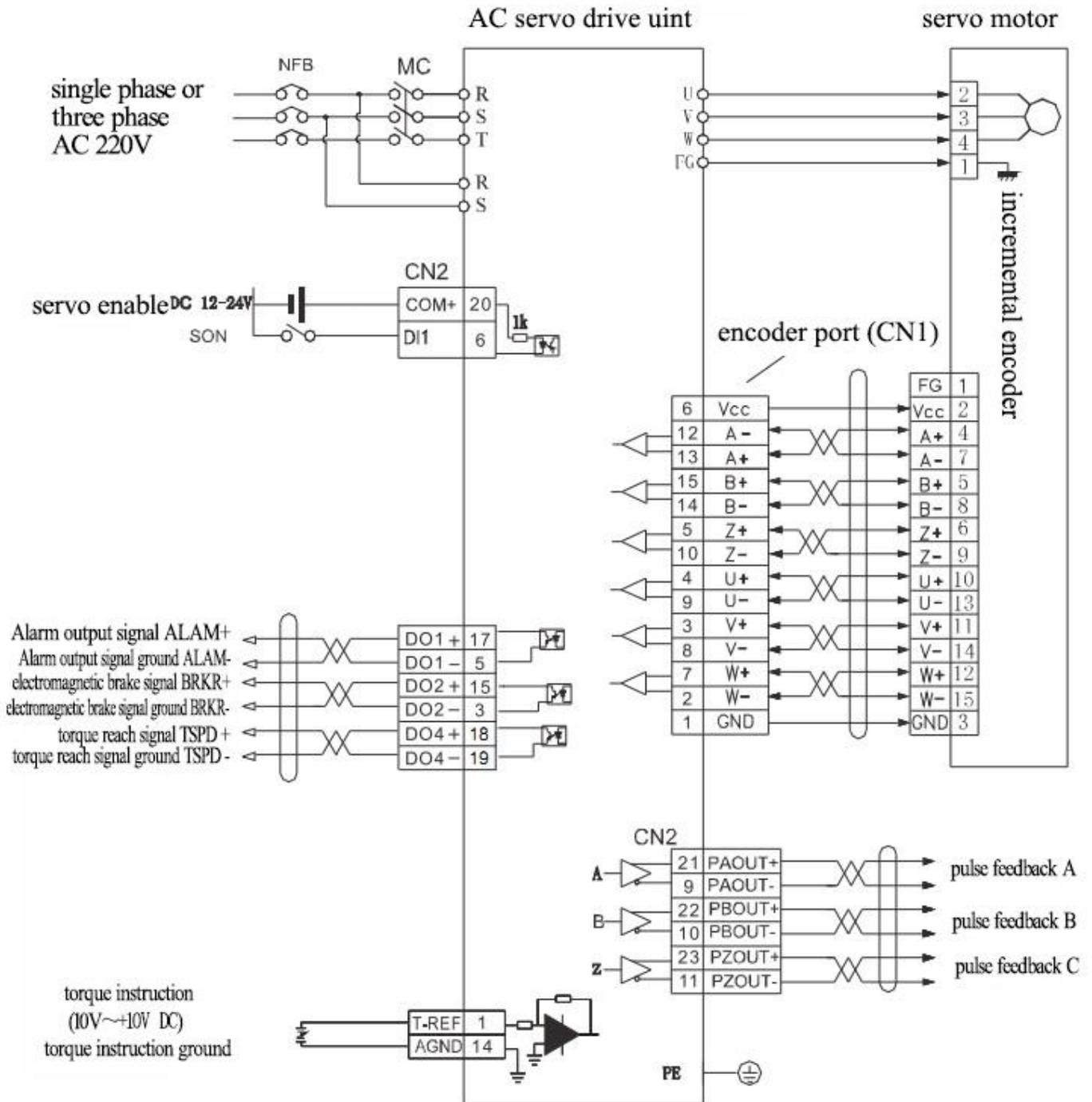
Diagram1.1.4 DSL200-F1 speed control (analog voltage mode) standard connecting

2.4 CN2 Ports circuits

●Speed analog instruction input signal:
V-REF+ (CN2-2) / AGND (CN2-14) is the speed analog instruction input port. The Max. received voltage signal is 10VDC. Its port input impedance is 20KΩ.

Wire V-REP and AGND can't be connected reversely.
Otherwise the motor can't run normally.

drive unit

15V

V-REF   20K

ANGD   15K
               20K

0V

Ø : port metal shell   PE

port metal shell has connected
with the PE of PLC

Wire V-REP and AGND can't be connected reversely.
Otherwise the motor can't run normally.

drive unit

master computer

VC   V-REF   20K

0V   AGND   15K
                           20K

0V

Ø : port metal shell   PE
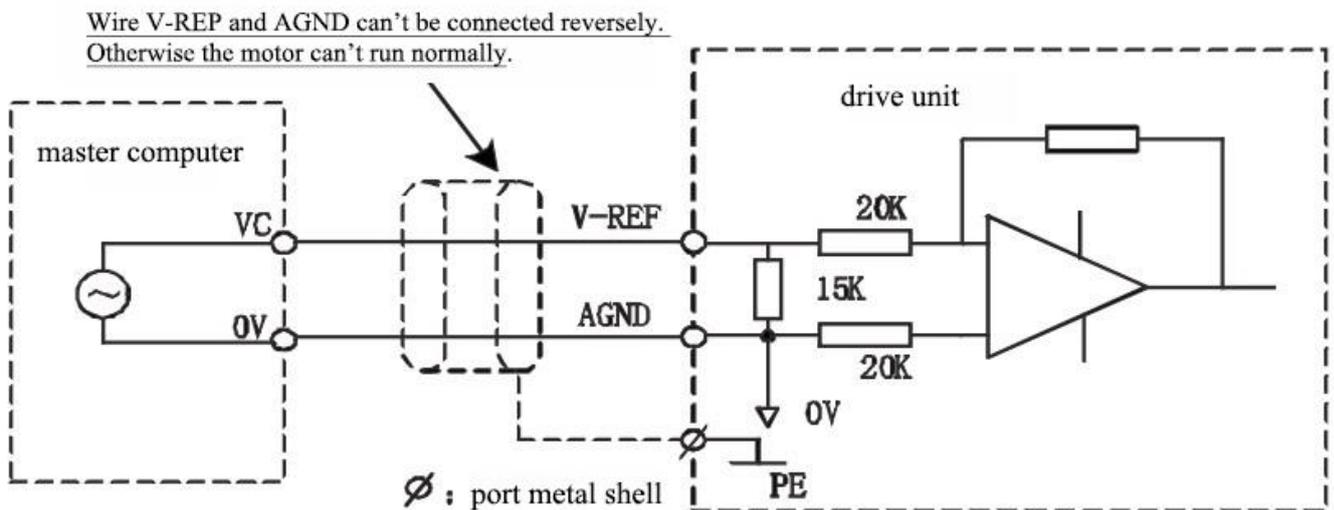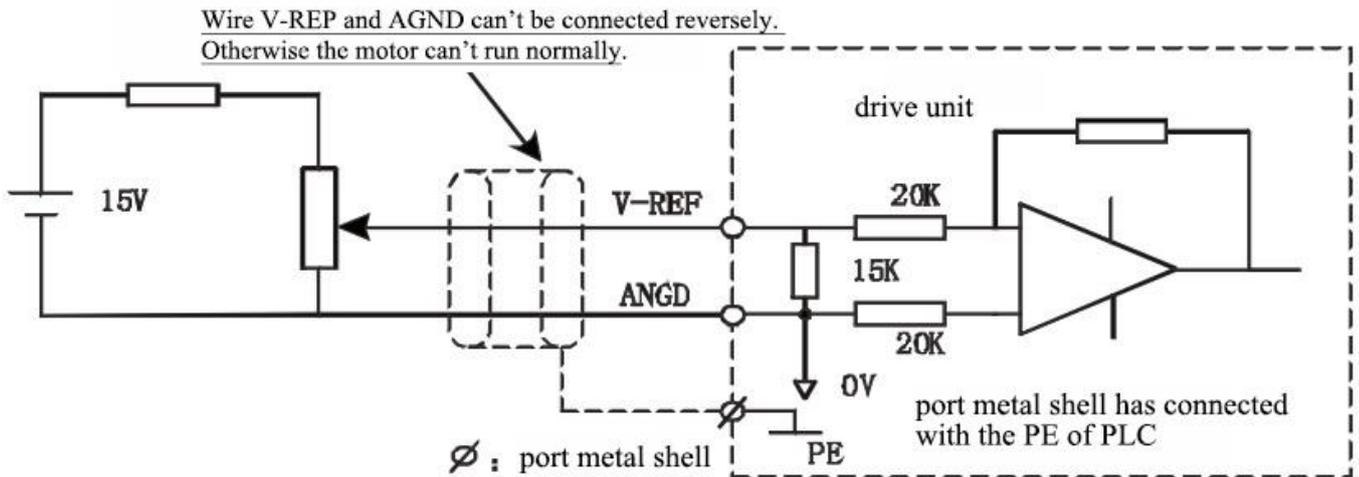
●Torque analog instruction input signal:

V-REF+ (CN2-1) / AGND (CN2-14) is the torque analog instruction input port. The Max. received voltage signal is 10VDC. Its port input impedance is 20KΩ.

Wire V-REP and AGND can't be connected reversely.
Otherwise the motor can't run normally.

Wire V-REP and AGND can't be connected reversely.
Otherwise the motor can't run normally.
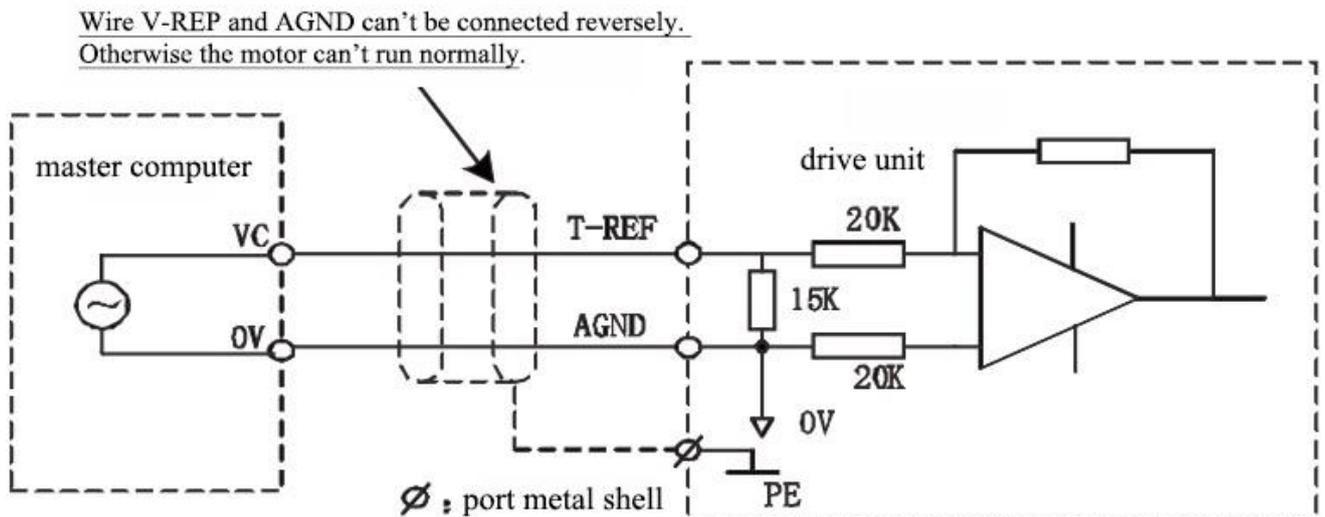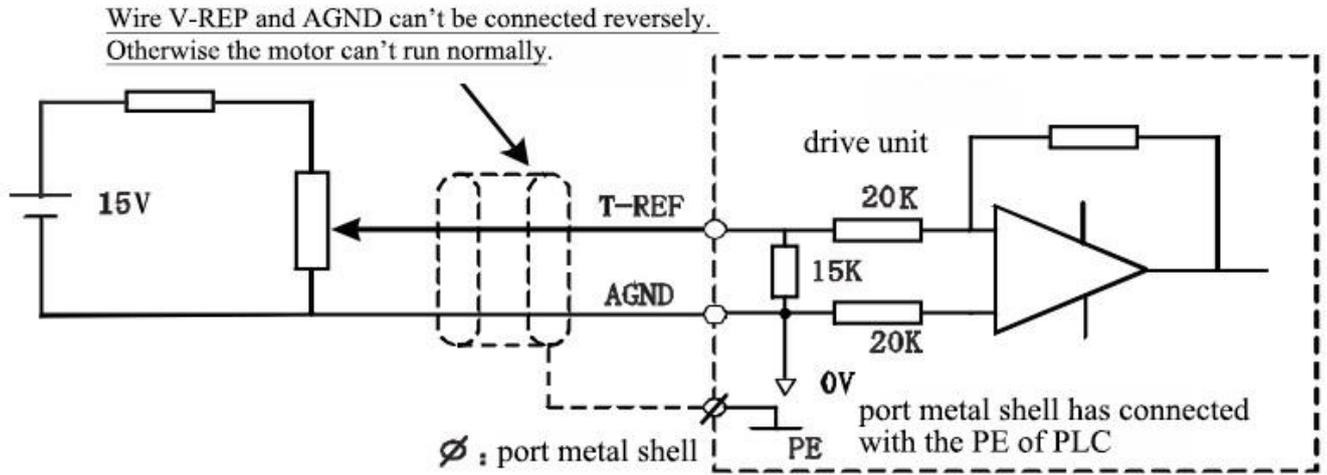
Notes: double cross-twisted wires are recommended for signal cable, although shielded cables are recommended, however it isn't always suitable.

●Position instruction input signal:

Type	Signal symbol	CN2 Pin No.	Definition
input	PULS+	25	instruction pulse input signal
	PULS-	13	instruction pulse input signal ground
	SING+	24	instruction pulse direction input
	SING-	12	instruction pulse direction input ground

User can adopt difference drive connecting, also can use single- terminal drive connecting. Which are shown as below.

●Difference drive connecting

∅：port metal shell
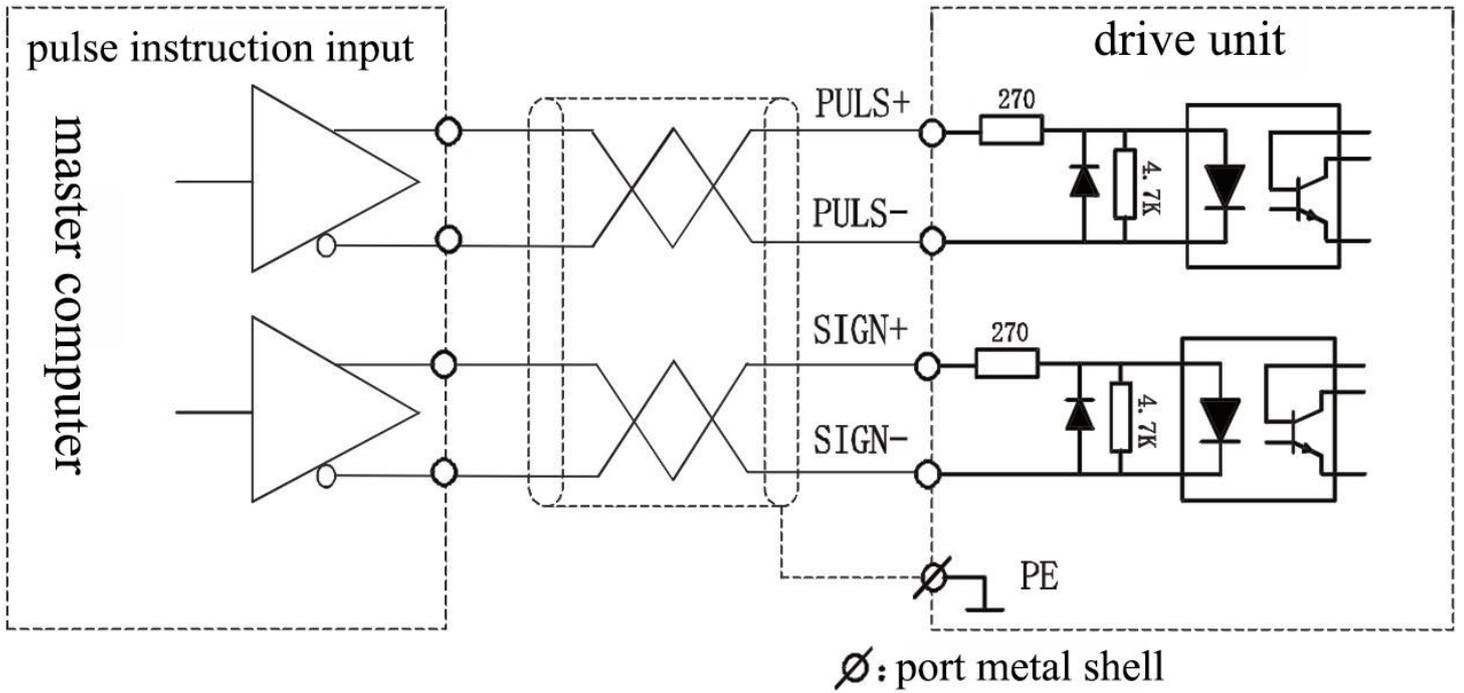
●Single- terminal drive connecting
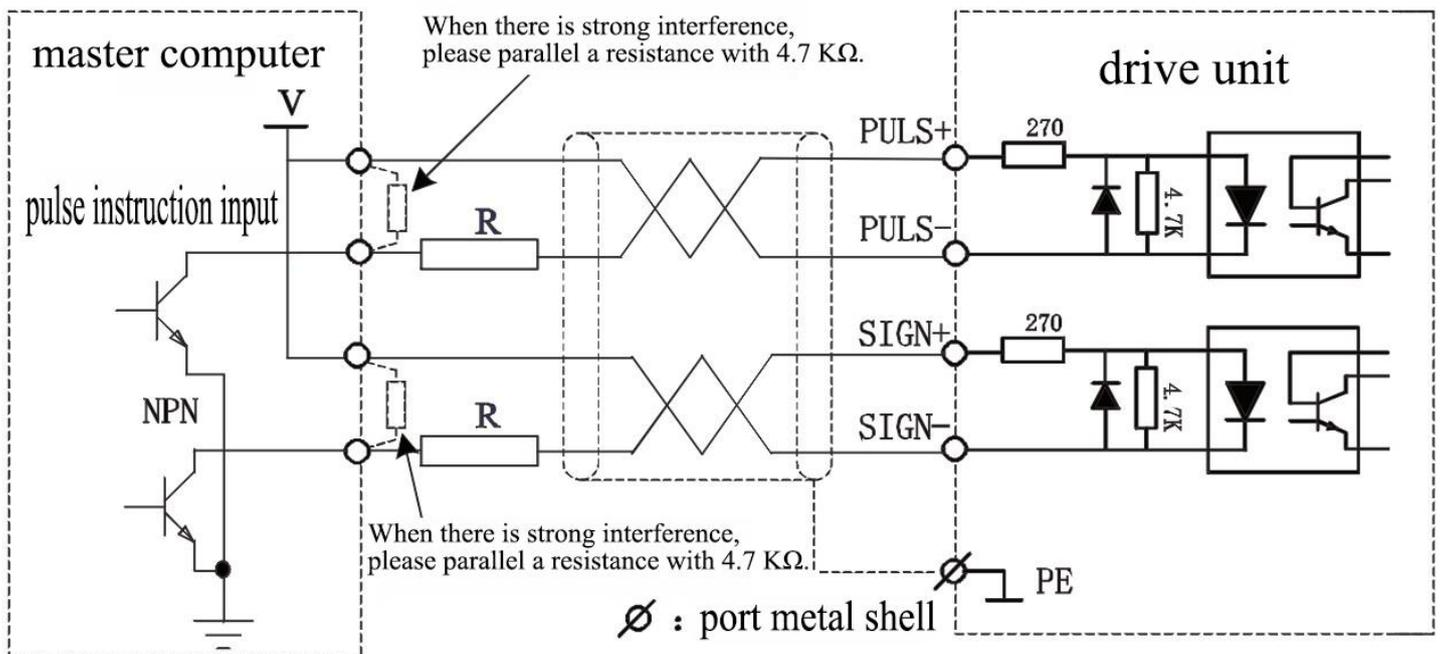
(a)NPN Single- terminal drive connecting
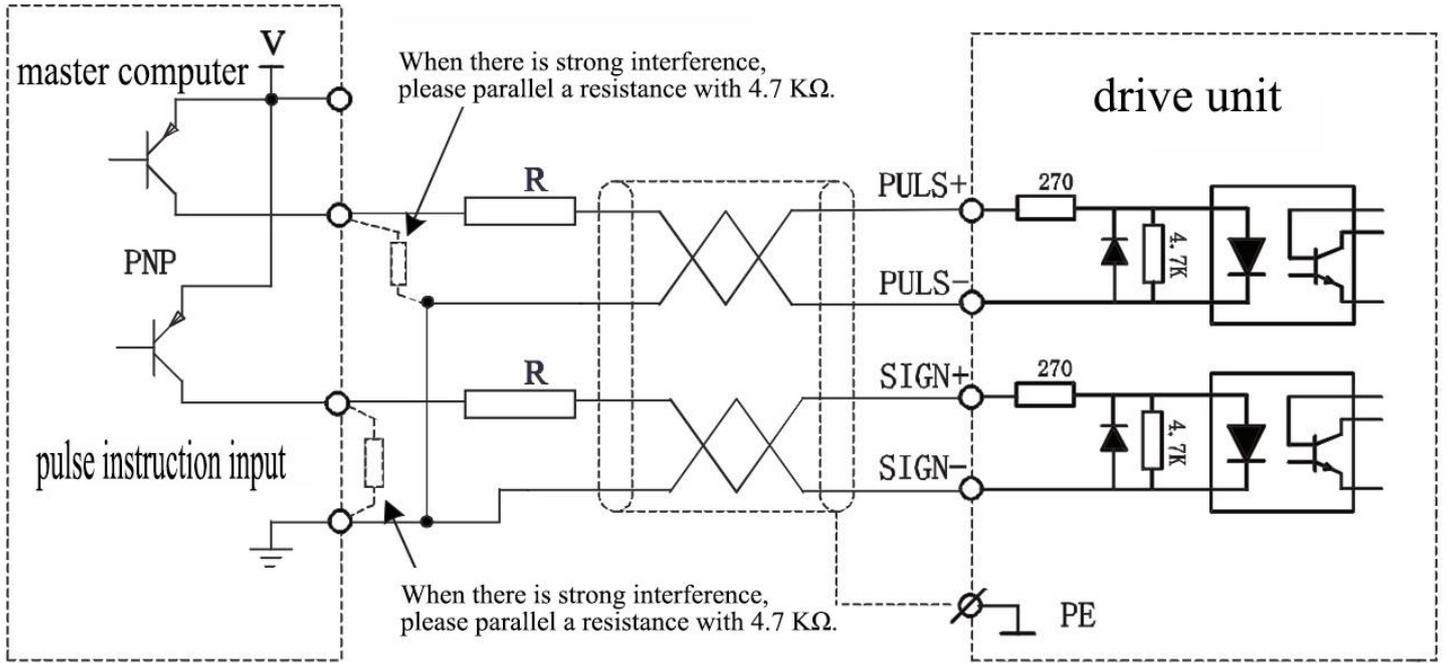
(b)PNP Single- terminal drive connecting

● Pulse input mode selected

There are 8 receivable position instruction input modes which are set by P1-02 as shown in the following table, the arrows indicate
counting edge.

pulse instruction mode	CCW	CW	parameters setting value
pulse direction	PULS SIGN		P1-02=0, 1, 2, 3 instruction pulse + direction
CCW pulse CW pulse	PULS SIGN		P1-02=4, 5 CCW pulse + CWpulse

● Switch amount input signal
There isn't 24V power supply output for servo unit, when the switch amount signals input, there need an extra
external power supply with 24V. Specifications are DC15V～24V, ＞100mA. It is recommended to share the

same power supply with output circuit. COM+(CN2-20) indicates the positive pole of the external power supply.

Two common connecting examples are below. INX indicates input point:(SON)
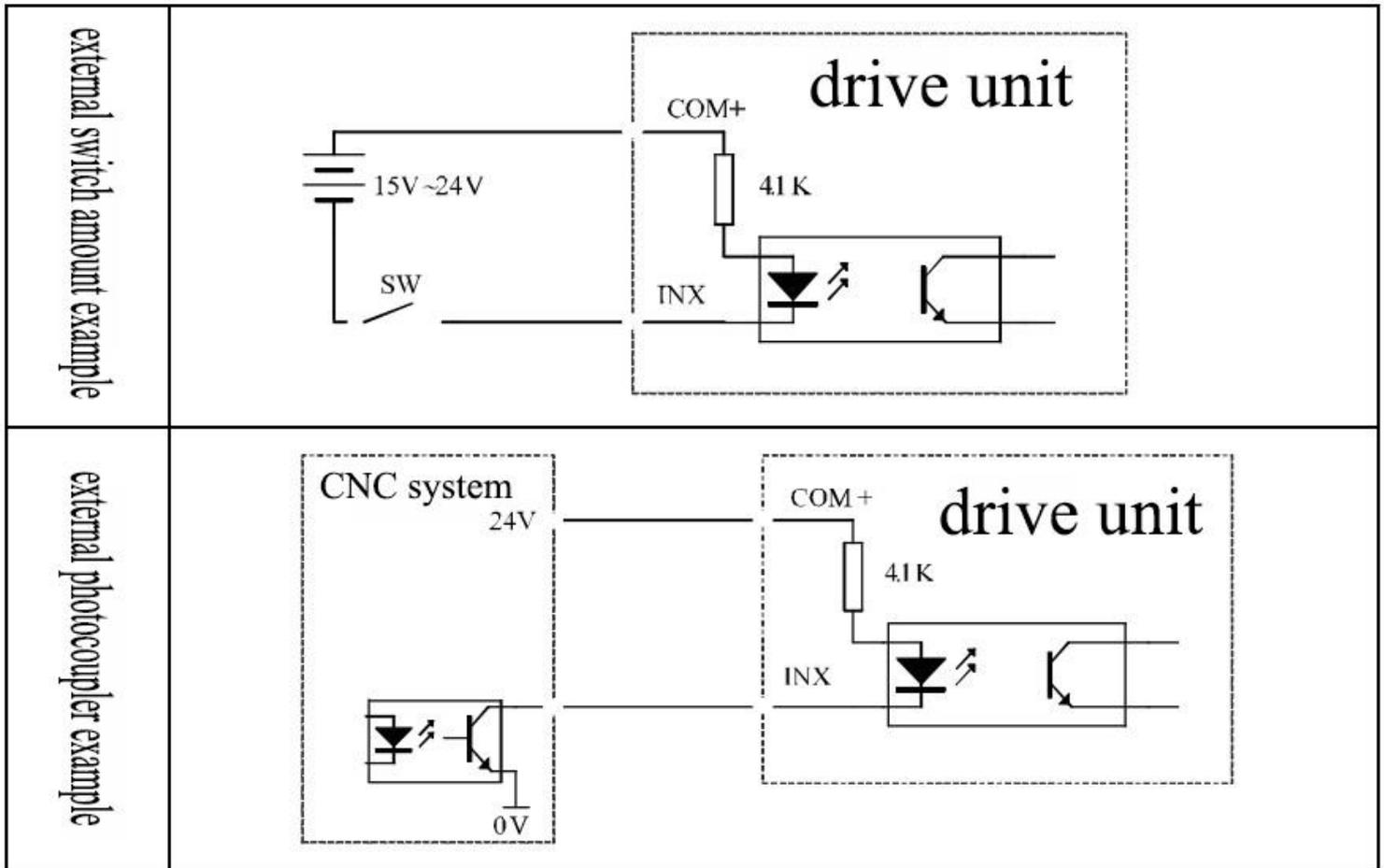
When SON (CN2-6) is "ON", to start servo enable, looking up the monitor window Fn-20, "Rn-on" displays.

Parameters	implications	Unit	Default value	Suitable ways
P1-04	Without external SON input signal, force to enable motor from inside the drive unit. P1-04=0: only when external input signal SON is "ON", can motor be enabled. P1-04=1: force to enable motor from inside the drive unit, so needn't external input signal SON. After P1-04 is set, press the "Enter" key for three seconds, "SAVE" appears, and it means that P1-04 will save the parameters values.		0	P, S

●Output signal

① servo status signal output (double terminals integrated electrode):

◎ ALRM + (CN2-17), ALRM - (CN2-5) are the output signal when drive unit inspects abnormality. Output status is related with P1-48.

P1-48=2	drive unit alarms, ALM and DG connect.
P1-48=1002	drive unit alarms, ALM and DG shut off.
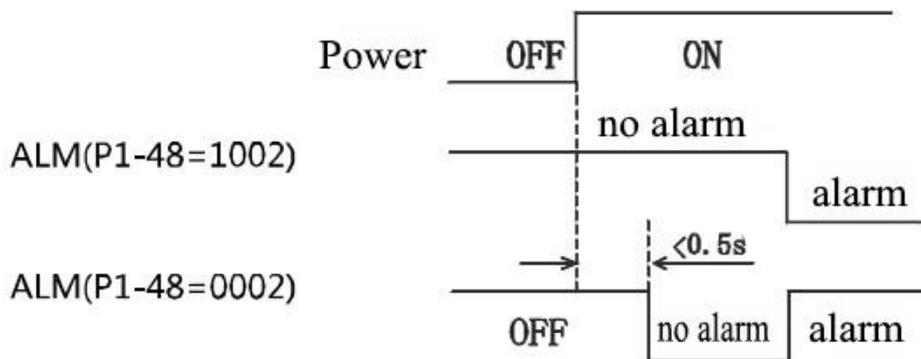
●Output signal

① torque reach signal output (double terminals integrated electrode):

◎ TSPD + (CN2-18), TSPD - (CN2-19) are the output signal when position, speed or torque reach. Output status is related with P1-51. Specific use method is same as P1-48.

P1-51=0005	drive unit alarms, TSPD and DG connect.
P1-51=1005	drive unit alarms, TSPD and DG shut off.
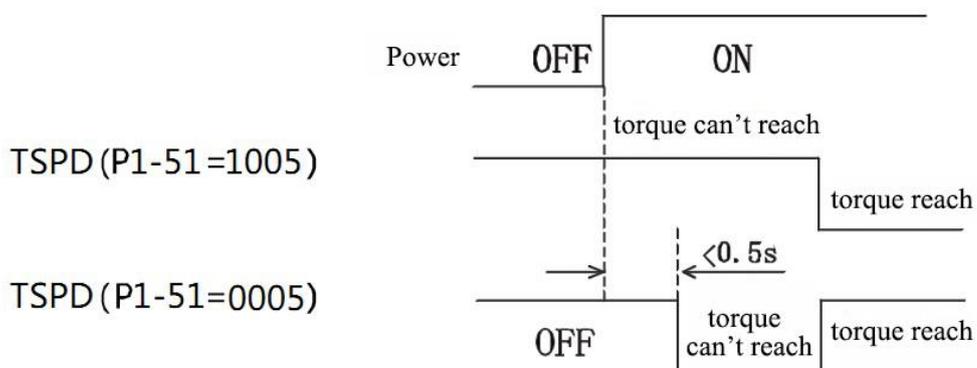
◎ CZ + (CN2-16), CZ - (CN2-4) are position feedback output signal.
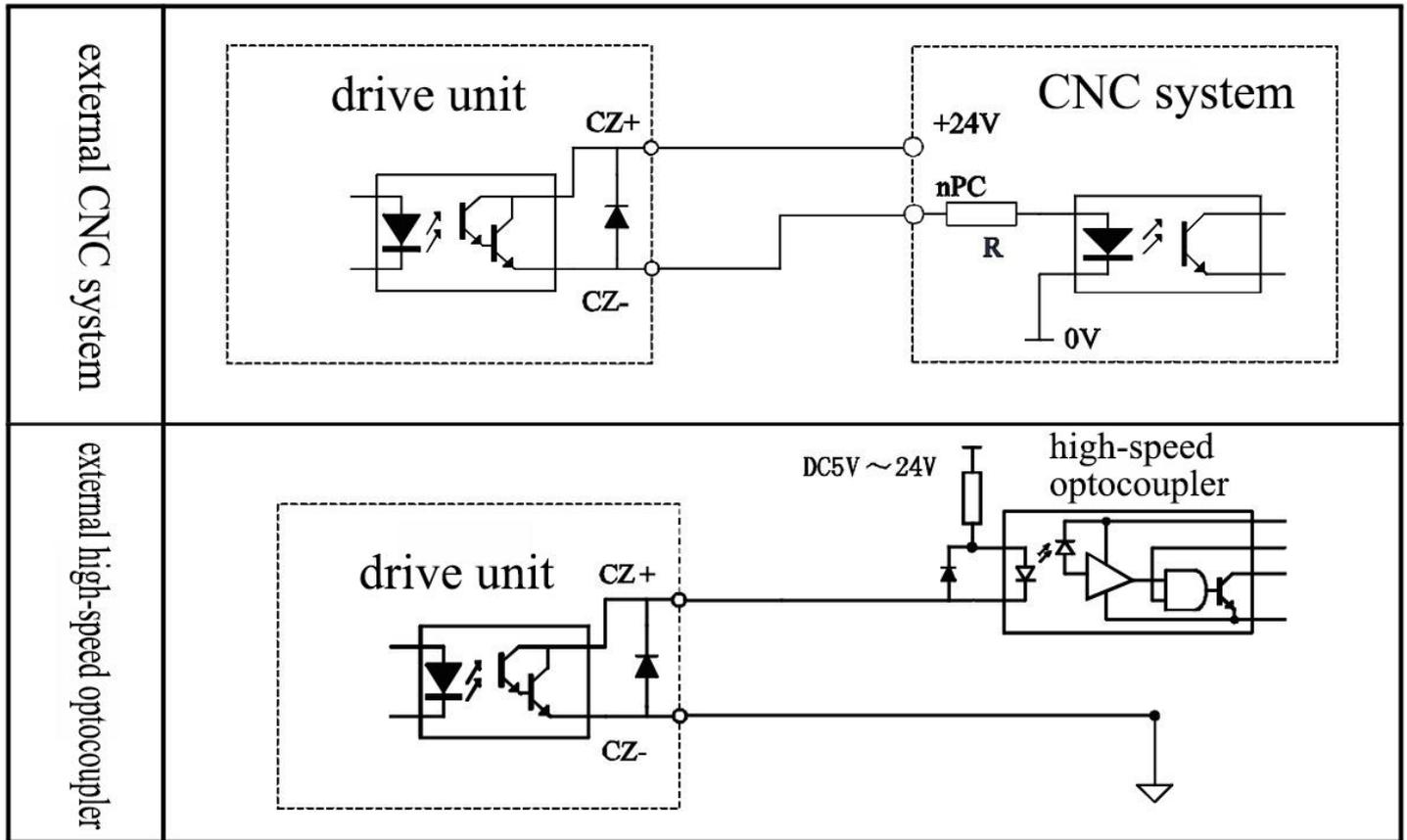
◎ BRKR + (CN2-15), BRKR - (CN2-3) are brake release signal which connects external relay.
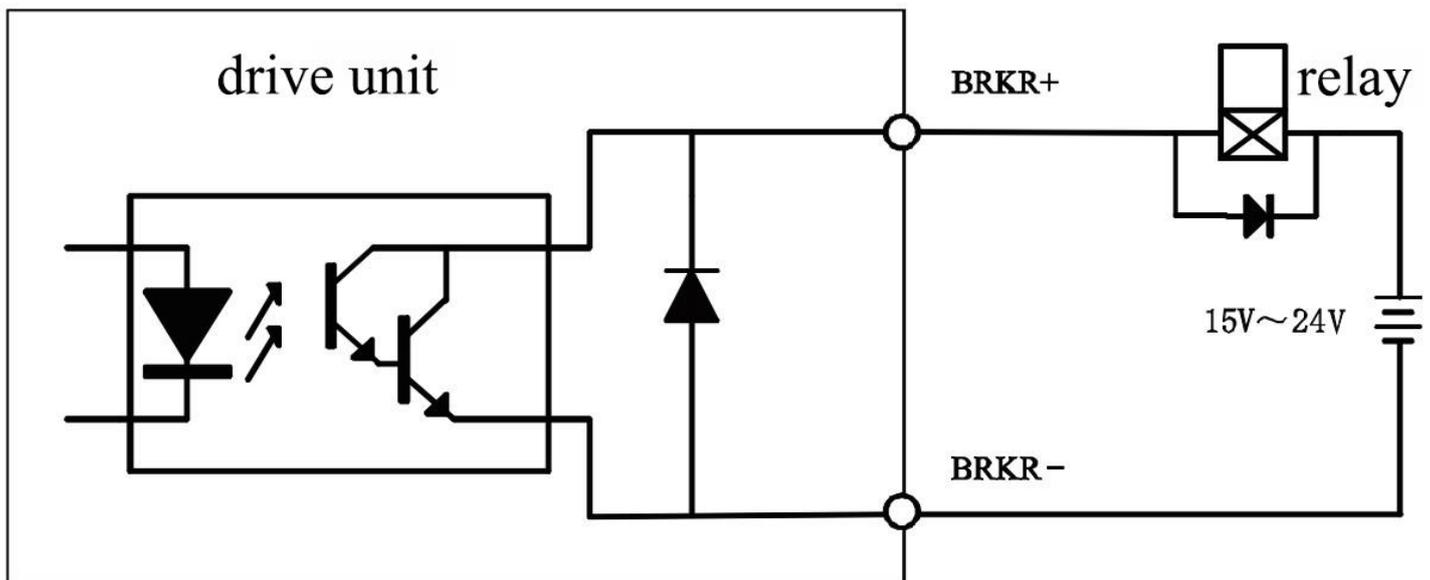
●Servo feedback differential output:

Position output signal PAOUT+/PAOUT-, PBOUT+/PBOUT-, PZOUT+/PZOUT- adopt differential output. The position input signal outputted from CN2 is increment encoder feedback pulse signals, like the encoder output signal form from Tamagawa is incremental

When P1-01=1, 2, position feedback output signal outputs according to position input signal wave. When P1-01=3, 4. Position feedback output signal is reverse.
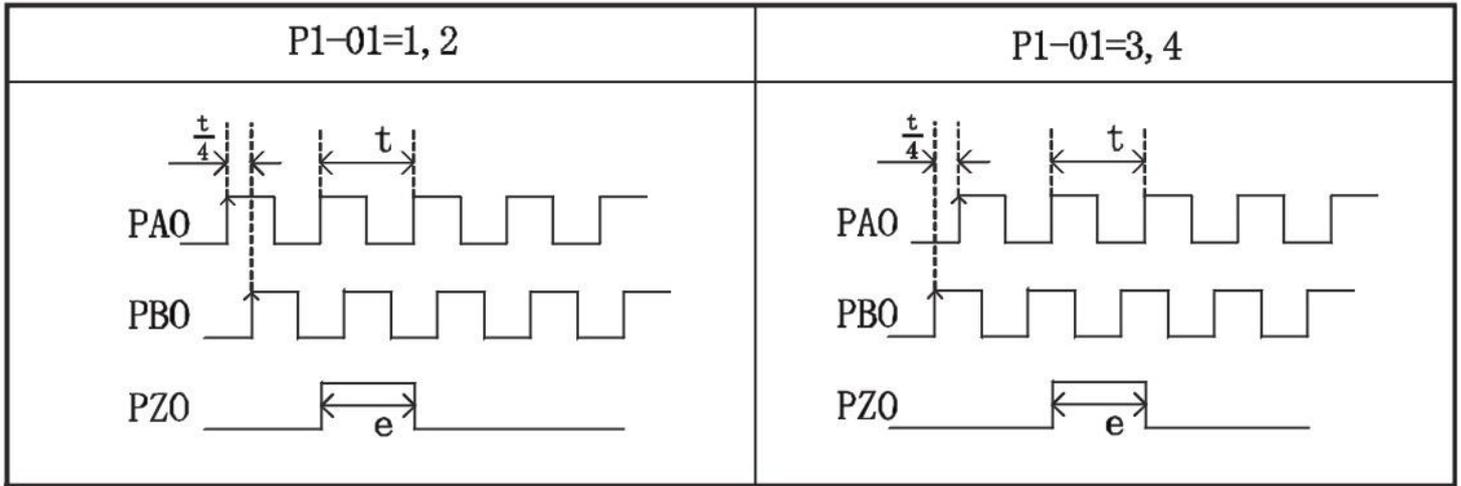
Wiring principle is as follow:
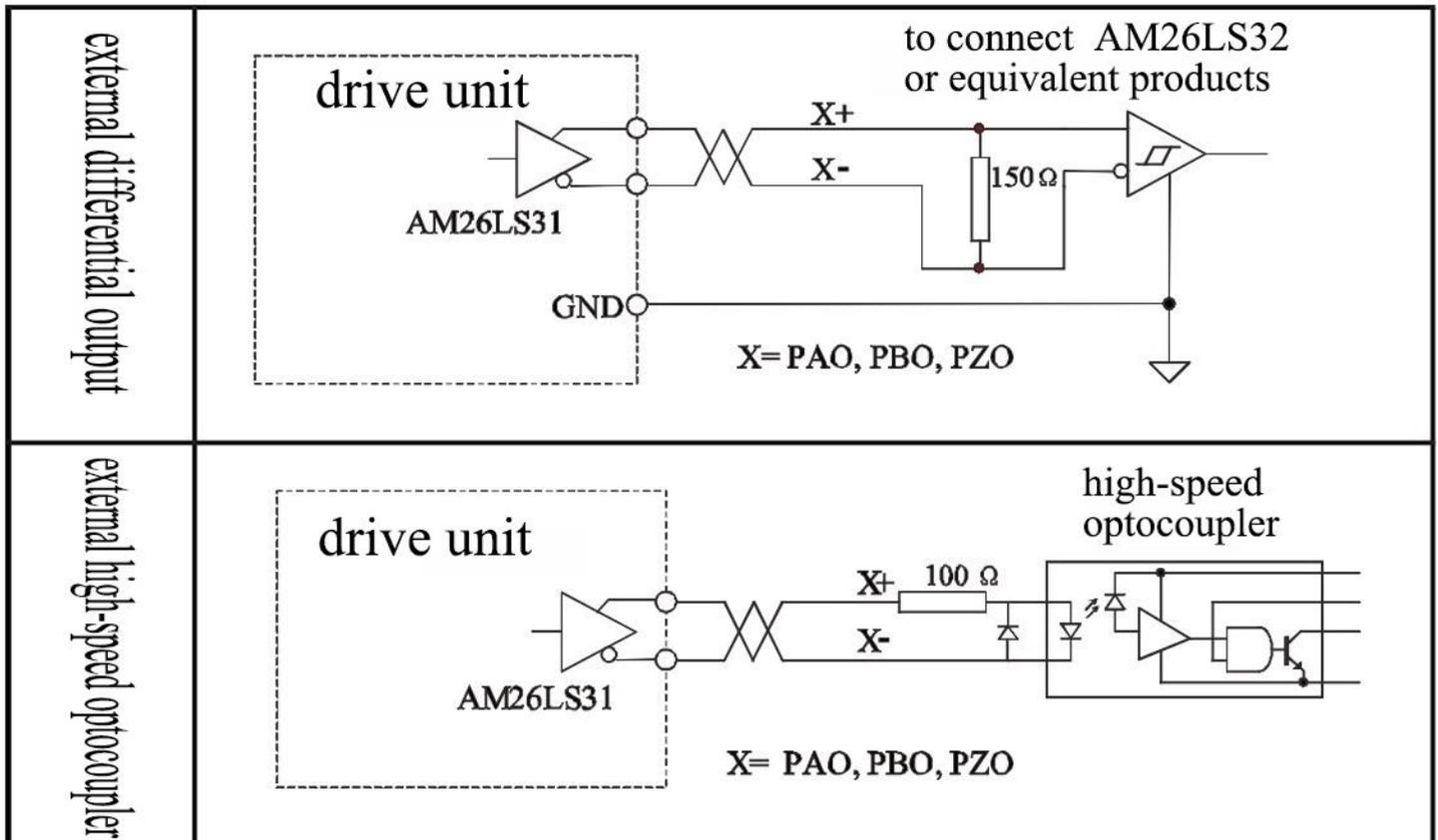
2.5 CN1 Routes and Wiring

2.5.1 CN1 wiring diagram (welding end)
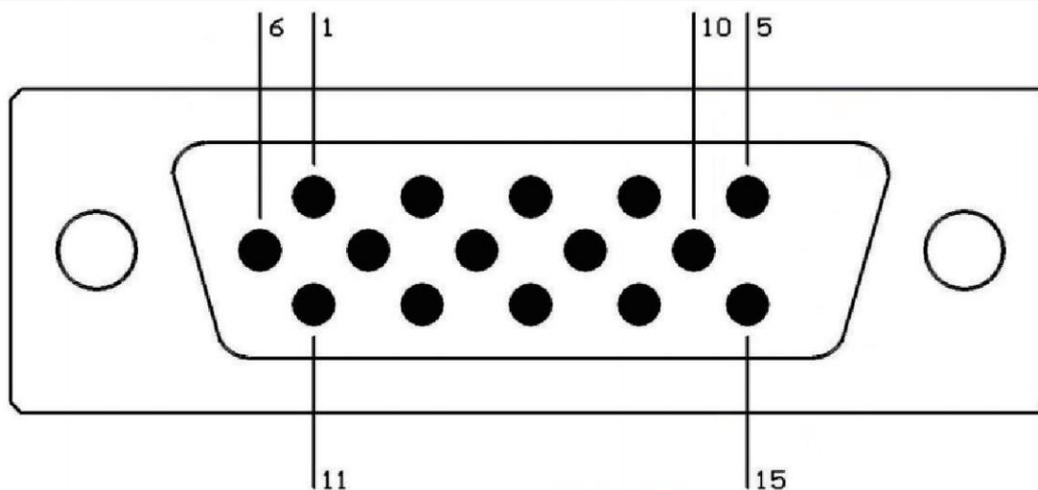
DSL200-F1 CN1 front section of port weling end

2.5.2 CN1 port definition table

Pin No.	Pin Symbol	Definition	Remark
6	VCC	servo inner+5V	
1	GND	servo inner 0V	
13	A+	encoder input A+	double cross-twisted wire
12	A-	encoder input A-	
15	B+	encoder input B+	double cross-twisted wire
14	B-	encoder input B-	
5	Z+	encoder input Z+	double cross-twisted wire
10	Z-	encoder input Z-	
4	U+	encoder input U+	double cross-twisted wire
9	U-	encoder input U-	
3	V+	encoder input V+	double cross-twisted wire
8	V-	encoder input V-	
7	W+	encoder input W+	double cross-twisted wire
2	W-	encoder input W-	

2.6 Connecting and Description of Communication Terminals (CN3,CN4)

2.6.1 CN3，CN4 port definition table

CN3(Crystal head plane end from left to right)			CN4(Crystal head plane end from left to right)		
Pin No.	Pin Symbol	Definition	Pin No.	Pin Symbol	Definition
1	GND	servo inner digital ground	1	GND	servo inner digital ground
4	RS-485-	RS485 digital signal-	4	RS-485-	RS485 digital signal-

| 2 | RS-485+ | RS485 digital signal+ | 2 | RS-485+ | RS485 digital signal+ | |

Notes:

1.When the communication is interfered much, CN3-1 or CN4-1 connects with upper computer OV.

2.When one PLC is for several drivers communication, if need to connect a communication resistance of 120Ω in series,P3-03 can be set up to 1.

2.6.2 communications description

Baud rate:38400Bps (default)

Data length: 8 bits

Start bit:1 bit

Stop bit:1 bit

Check bit: none

Notes: When one PLC is for several drivers communication, please correctly set the station Number of the servo slave station.

Chapter 3 Display and Operation

3.1 Panel Operation

● Panel appearance
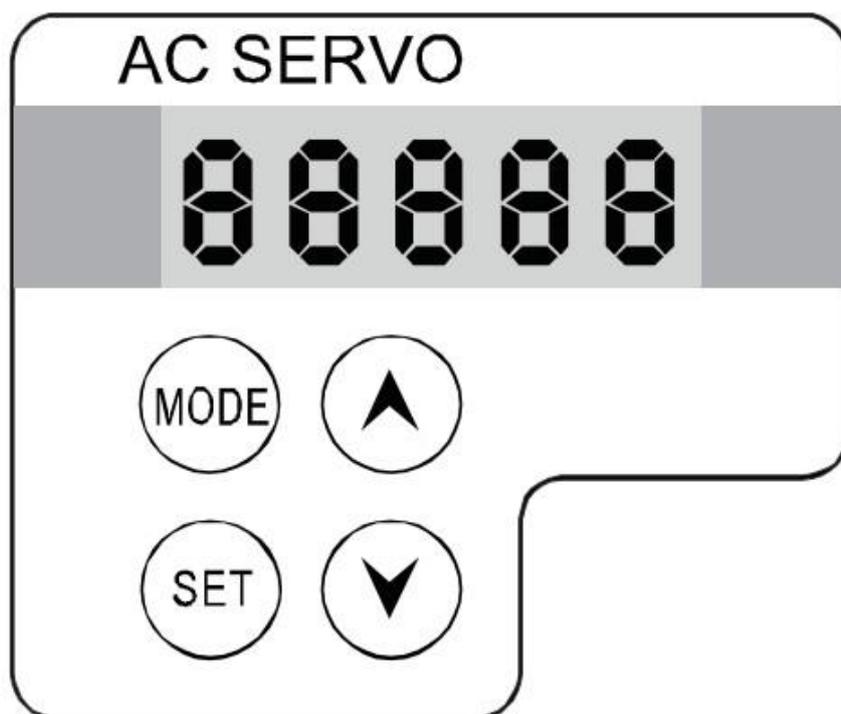
● Panel function key

Drive unit panel is made up 5 LED digital tube display and 4 press keys , which shows each status and parameters setting of unit etc. The functions of press key is as follow.

Ⓐ：serial number, figure increasing, or options forward.

Ⓥ：serial number, figure decreasing, or options step backward.

(MODE)：return to the previous operation, or cancel it.

(SET)： go to the next step, or enter confirmation.

Notes: when keep to press the key Ⓐ、Ⓥ,operations are carried out repeatedly. The longer the keep press time is, the more rapid the repeat frequency is.

● Menu shift
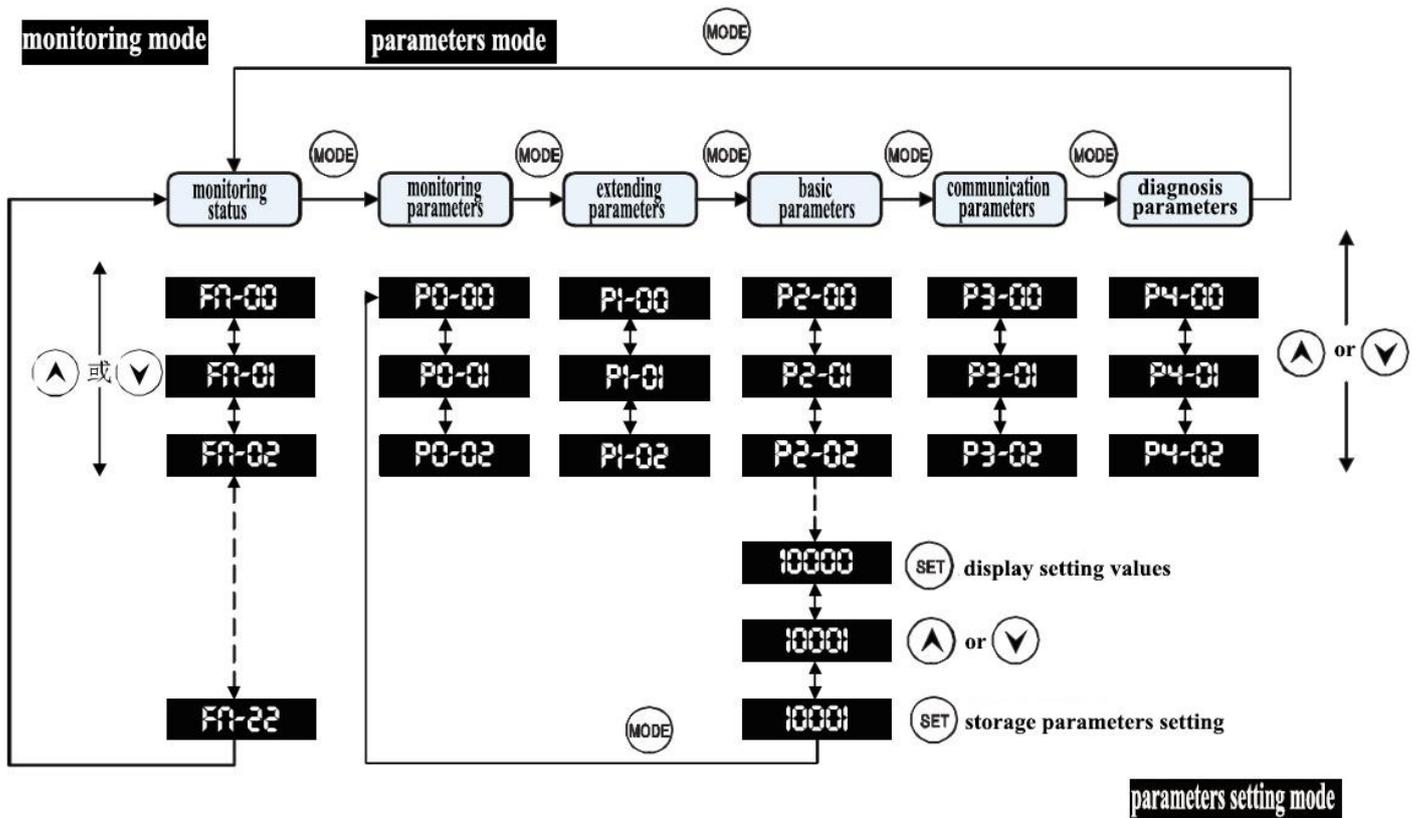
Diagram3.1 Mode selection operation block diagram

(1)When turn on the power of driver, the display device shows the monitoring symbol lasted for one second firstly, then starts the monitoring display mode.

(2)Under the monitoring mode, if press the key ⓐ or ⓥ, can switch the monitoring parameters, monitoring display symbol will show lasted for one second.

(3) Under the monitoring mode, if press the key (MODE), can switch the monitoring mode and parameters mode freely. Under the parameters mode, press the key ⓐ or ⓥ, can alter the following-two-characters parameters number.

(4)Under the parameters mode, press the key (SET), system immediately goes to setting mode, the display simultaneously shows the parameter and its setting value. In this case, can modify the parameters value by the key ⓐ or ⓥ, or press the key (MODE) to leave the setting motor, and return to parameters mode. When modify the parameters, a decimal dot appears under the lower right corner of the parameters value.

(5)After finishing the modification of setting value, press the key (SET),can carry out the instruction of parameter storage and executive.

(6) After finishing the parameters setting, the decimal dot in the display vanishes, press the key (MODE), can switch to other parameters group or monitoring mode.

3.2 Menu

3.2.1 Menu summary

Menu code	Submenu name	Function
Fn-00 ～ Fn-22	monitoring status	to show the status information of servo driver such as speed, current and so on.
P0-00 ～ P0-03	monitoring parameters	to show software and hardware version of servo driver, and factory parameter recovery.
P1-00 ～ P1-62	extending parameters	to set the corresponding parameters can extend some functions of servo driver.
P2-00 ～ P2-61	basic parameters	the common parameters setting of user,like PID proportional gain, integral coefficient etc.
P3-00 ～ P3-07	communications parameters	To realize the communications with the master computer, like RS-232, RJ-485.
P4-00 ～ P4-62	diagnosis parameters	to record alarm number, analog instruction function setting, single-shaft function timer.

3.2.2 Parameter setting

To recover default values: when leave the factory, for each servo driver, each type motor has a corresponding code, to set P1-05 parameters values according to motor code. After setting P0-02 up to 1, the present values freely recover the factory default values.

Related parameters	Name	Unit	Parameter range	Default values	Suitable ways
P1-05	motor type code		0～100	0	Pt, S
P0-02	executive operation code		0～2	0	Pt, S

Servo motor type code is as follow:

type code	matched motor type	motor flange	rated power	rated current	rated torque	rated speed	number of pole-pairs
10	40ST-M00330	40mm	100W	0.9A	0.319N.m	3000rpm	4
11	60ST-M00630	60mm	200W	1.5A	0.637N.m	3000rpm	4
2	60ST-M01330	60mm	400W	2.8A	1.27N.m	3000rpm	4
13	60ST-M01930	60mm	600W	3.5A	1.91N.m	3000rpm	4

21	80ST-M01330	80mm	400W	2.0A	1.27N.m	3000rpm	4
22	80ST-M02430	80mm	750W	3.0A	2.4N.m	3000rpm	4
23	80ST-M03530	80mm	730W	3.0A	3.5N.m	2000rpm	4
24	80ST-M04025	80mm	1KW	4.4A	4.0N.m	2500rpm	4
31	90ST-M02430	90mm	750W	3.0A	2.4N.m	3000rpm	4
32	90ST-M03520	90mm	750W	3.0A	3.5N.m	2000rpm	4
33	90ST-M04025	90mm	1KW	4.0A	4.0N.m	2500rpm	4
41	110ST-M02030	110mm	600W	2.5A	2.0N.m	3000rpm	4
42	110ST-M04020	110mm	800W	3.5A	4.0N.m	2000rpm	4
43	110ST-M04030	110mm	1.2KW	5.0A	4.0N.m	3000rpm	4
44	110ST-M05030	110mm	1.5KW	6.0A	5.0N.m	3000rpm	4
45	110ST-M06020	110mm	1.2KW	4.5A	6.0N.m	2000rpm	4
46	110ST-M06030	110mm	1.8KW	6.0A	6.0N.m	3000rpm	4
51	130ST-M04025	130mm	1.0KW	4.0A	4.0N.m	2500rpm	4
52	130ST-M05025	130mm	1.3KW	5.0A	5.0N.m	2500rpm	4
53	130ST-M06025	130mm	1.5KW	6.0A	6.0N.m	2500rpm	4
54	130ST-M07725	130mm	2.0KW	7.5A	7.7N.m	2500rpm	4
55	130ST-M10010	130mm	1.0KW	4.5A	10.0N.m	1000rpm	4
56	130ST-M10015	130mm	1.5KW	6.0A	10.0N.m	1500rpm	4
57	130ST-M10025	130mm	2.6KW	10.0A	10.0N.m	2500rpm	4
58	130ST-M15015	130mm	2.3KW	9.5A	15.0N.m	1500rpm	4
59	130ST-M15025	130mm	3.8KW	13.5A	15.0N.m	2500rpm	4
61	180ST-M17215	180mm	2.7KW	10.5A	17.2N.m	1500rpm	4
62	180ST-M19015	180mm	3.0KW	12.0A	19N.m	1500rpm	4
63	180ST-M21520	180mm	4.5KW	16.0A	21.5N.m	2000rpm	4
64	180ST-M27010	180mm	2.9KW	12.0A	27.0N.m	1000rpm	4
65	180ST-M27015	180mm	4.3KW	16.0A	27.0N.m	1500rpm	4
66	180ST-M35010	180mm	3.7KW	16.0A	35.0N.m	1000rpm	4
67	180ST-M35015	180mm	5.5KW	19.0A	35.0N.m	1500rpm	4
68	180ST-M78015	180mm	7.5KW	32.0A	48.0N.m	1500rpm	4
69	180ST-M23825	180mm	5.5KW	19.7A	23.8N.m	2000rpm	4

(1) The numbers of pole-pairs of servo motor in the above table all are 4, when recover default parameters, please correctly set P1-05 value according to above table, then carry out the default parameters to recover the operation. To want to recover other numbers of pole-pairs of servo motor default parameters value, please contact the manufacture.

(2)When set P0-02 up to 1, servo driver freely recovers the default parameters according to P1-05 value. Other setting values haven't been defined up to now.

Chapter 4   Parameters and Monitoring

Notices:

◎ The people who sets the parameters must understand the real meanings of parameters. The incorrect set maybe damage the device or hurt people.

◎ Before setting parameters, no load for servo motor is suggested. If the motor doesn't work normally due to the parameters modification, can carry out the parameters default values to recover.

4.1 Parameter Definition

There are following five groups of parameters definition. The first character followed parameter start code P is the group character. The followed two characters are parameters characters. The communications address is made up of group character and the parameters characters with 16 bits value. Parameters group definition is as follow.

group 0: monitoring parameters   (such as P0-xx)
group 1: extending parameters   (such as P1-xx)
group 2: basic parameters   (such as P2-xx)
group 3: function parameters   (such as P3-xx)
group 4: spreading parameters   (such as P4-xx)
group 5: operation monitoring   (such as P5-xx)

4.1.1 Control mode description

Control mode group	Subgroup	P1-00 setting value	Description
P (position control)	Pt	0	external position pulse instruction control
S (speed control)	St	2	speed control 1 (external analog voltage instruction input)
	Si	5	speed control 2 (internal register speed setting)
	Ps	6	speed control 1 (with zero fixed function, external analog voltage instruction input)
T (torque control)	Tt	3	torque control 1 (external analog voltage instruction

			input)
	Ti	4	torque control 2 (external analog voltage instruction input)
test ways	Sr	11	speed test running
	JOG	12	JOG running
	OL	13	speed test mode
	OP	15	open loop running (only for factory)

4.2 Monitor States

In the layer 1 menu, to press the key ⏎, can switch to the grade 1 menu of monitoring states. By using the key

▲ or ▼ , can select the needed display mode, then press the key ⏎, can go to the grade 2 menu of monitoring states, can display the specific states.

4.2.1 DSL200-F1 series (incremental 2500 lines)

grade 1 menu	function	grade 2 menu	content	communication address (decimal system)
Fn-01	lower than present position 4 bits (pulse)	P 5806	present position , 145806 pulse	4×1281
Fn-02	higher than present position 4 bits (×10000 pulse)	P.14		4×1282
Fn-03	lower than position instruction 4 bits (pulse)	C 5810	position instruction , 145810 pulse	4×1283
Fn-04	higher than position instruction 4 bits (×10000 pulse)	C.14		4×1284
Fn-05	lower than position deviation 4 bits (pulse)	E 4	position deviation , 4 pulse	4×1285
Fn-06	higher than position deviation 4 bits (×10000 pulse)	E. 0		4×1286
Fn-07	position instruction pulse frequency (KHz)	F 12.6	position instruction pulse frequency 12.6KHz	4×1287
Fn-08	motor speed (r/min)	R 1000	motor speed 1000r/min	4×1288
Fn-09	speed analog instruction input (V)	S 2.5	speed analog voltage 2.5V	4×1289
Fn-10	speed analog instruction input (rpm)	S. 750	speed analog instruction 750r/min	4×1290

Fn-11	torque analog instruction input (V)	T 2.5	torque analog voltage 2.5V	4×1291
Fn-12	torque analog instruction input (%)	T. 25	torque analog instruction 25%	4×1292
Fn-13	average current (A)	I 2.3	average current 2.3A	4×1293
Fn-14	peak current (A)	I. 3.5	peak current 3.5A	4×1294
Fn-15	motor feedback pulse amount (relative value)	A 3265	rotor absolute position value 3265	4×1295
Fn-16	motor feedback pulse amount (absolute value)	A. 0		4×1296
Fn-17	input states terminal	In 1111	input terminal	4×1297
Fn-18	output states terminal	Out 11	output terminal	4×1298
Fn-19	encoder value input signal	Cod --	encoder language	4×1299
Fn-20	servo running states	Rn On	in process	4×1300
Fn-21	alarm code	ALE 9	No.9 alarms	4×1301
Fn-22	external speed analog voltage input display	U 0.000	external input speed analog voltage 0.000V	4×1302
Fn-23	external torque analog voltage input display	U 0.000	external input torque analog voltage 0.000V	4×1303
Fn-24	servo alarm amount memorizing	AC 8	servo has given 8 alarms	4×1304

4.3 List of Parameters

4.3.1 Monitoring parameters

parameters	function code	suitable ways	setting range	factory default value	unit	communication address (decimal system)
P0-00	software version	PST		407	/	4×0000
P0-01	hardware version	PST		200	/	4×0001
P0-02	parameters default value recovery 0: no operation 1:to recover factory parameters setting 2:zero-point position setting for absolute encoder motor (only for factory)	PST	0~2	0	/	4×0002
P0-03	software reset 0: no operation 1: servo software reset	PST	0~1	0	/	4×0003
P0-04	previous alarm code 1	PST		0	/	4×0004

P0-05	previous alarm code 2	PST		0	/	4×0005
P0-06	previous alarm code 3	PST		0	/	4×0006
P0-07	previous alarm code 4	PST		0	/	4×0007
P0-08	previous alarm code 5	PST		0	/	4×0008

4.3.2 Extending parameters

parameters	function code	suitable ways	setting range	factory default value	unit	communication address (decimal system)
P1-00	control mode selection. Specifics reference 4.6 "control mode definition table"	PST	0～100	0	/	4×256
P1-01	direction setting of pulse instruction and encoder feedback output 0: instruction pulse direction logical positive, encoder feedback direction logical positive 1: instruction pulse direction logical negative, encoder feedback direction logical positive 2: instruction pulse direction logical positive, encoder feedback direction logical negative 3: instruction pulse direction logical negative, encoder feedback direction logical negative	P	0～3	0	/	4×257
P1-02	output mode setting of external pulse train instruction 0: pulse + direction 1:to recover factory parameters setting 4:CCW/ CW pulse	PST	0～7	0	/	4×258

P1-03	control instruction input source setting 0:control command terminal given 1: control command ModBus RTU communications given (RS-485)	PST	0～2	0	/	4×259
P1-04	internal servo start setting 0:servo prohibition 1:servo enable after finishing the parameters setting, need to press the key "SET" for 3 seconds, when display "SAVE", means save the parameters value, otherwise the modified values haven't been saved.	PST	0～100	0	/	4×260
P1-05	motor type code: when P0-02=1, servo freely recover factory default values according to motor type code	PST	0～100	2	/	4×261
P1-06	electronic gear ratio numerator	P	1～32767	1	/	4×266
P1-10	electronic gear ratio denominator	P	1～32767	1	/	4×262
P1-12	motor halt mode function 0:　free halt, the time is long　　　　　　　　　1: inertia halt, the time is short 2: retaining	PST	0～2	0	/	4×268
P1-13	analog speed instruction Max. swiveling speed: the corresponding max speed based on analog input ±10	S	-6000～6000	3000	rpm	4×269
P1-14	analog torque instruction Max output	T	0～6000	100	rpm	4×270
P1-15	analog torque instruction Max output:: the corresponding max torque　based on analog	T	0～500	100	%	4×271

	input ±10					
P1-16	motor over-speed alarm detection threshold	PST	0～6000	3000	rpm	4×272
P1-17	hardware drift amount automatic correction of analog speed / torque input 0: no operation 1: hardware zero drift automatic correction of analog speed / torque input pass	ST	0～100	0	/	4×273
P1-18	hardware drift amount manual correction of analog speed input	S	-4096～4096	0	/	4×274
P1-19	hardware drift amount manual correction of analog torque input	T	-4096～4096	0	/	4×275
P1-20	analog speed input proportion gain	S	20～3000	1000	0.001	4×276
P1-21	analog speed instruction voltage positive gain	S	20～3000	1000	0.001	4×277
P1-22	analog speed instruction voltage negative gain	S	20～3000	1000	0.001	4×278
P1-23	zero speed analog instruction voltage clamping down	S	-6000～6000	20	5mV	4×279
P1-24	analog torque input proportion gain	T	20～3000	1000	0.001	4×280
P1-25	analog torque instruction voltage positive gain	T	20～3000	1000	0.001	4×281
P1-26	analog torque instruction voltage negative gain	T	20～3000	1000	0.001	4×282
P1-27	zero-speed torque analog instruction voltage clamping down	S	-6000～6000	20	/	4×283

P1-28	automatic back-to-origin mode switch 0: after servo obtaining the enable signals, need external I/O to trigger back to origin. 1. after servo obtaining the enable signals, return the origin automatically. 2. to set origin position, directly set the current position of the absolute encoder as the origin. to set it by incremental encoder is invalid.	PST	0～2	0	/	4×284
P1-29	origin regression mode	PST	0～15	0	/	4×285
P1-30	high-speed origin regression speed setting in the first stage	PST	-3000～3000	200	rpm	4×286
P1-31	low-speed origin regression speed setting in the first stage	PST	-3000～3000	50	rpm	4×287
P1-32	origin regression deviation rotating number	PST	0～32767	0	×10000	4×288
P1-33	origin regression deviation pulse number	PST	0～32767	0	pulse	4×289
P1-34	retaining		0～32767	0	pulse	4×290
P1-35						
P1-36	when position deviation value less than its pulse number, ZSPD signal output is "ON"	PST	0～100	0	pulse	4×292
P1-38	digital I/O access pin D11 function planning ① bit 2: access pin function planning code (specifics refer "4.4") ② bit 3: the corresponding servo I/O signal forced validity ③ bit 4: the corresponding servo I/O signal input reversely	PST	0～1135	1	/	4×294
P1-55	retaining		0～12800	0	0.001	4×311
P1-56	inertial halt decay	PST	0～40	2	/	4×312

parameters	function code	suitable ways	setting range	factory default value	unit	communication address (decimal system)
	coefficient					
P1-57	inertial halt ways selection	PST	0～1	0	/	4×313
P1-58	motor type inexactness alarm shield 0: invalid 1:shield motor type inexactness alarm	PST	0～1	0	/	4×314
P1-59	multiple of motor admitted Max over load	PST	0～500	200	%	4×315
P1-60	motor rated current	PST	0～1000	60	0.1A	4×316
P1-61	the current sampling circuit allows Max current	PST	0～10000	2500	0.01A	4×317
P1-62	retaining					4×318
P1-63	retaining					4×319

4.3.3 basic parameters

parameters	function code	suitable ways	setting range	factory default value	unit	communication address (decimal system)
P2-00	speed control gain speed control gain increases, can promote speed response performance ; but if the value is set too much, easily cause vibration and noise	PST	0～1280	155	0.1	4×512
P2-01	speed integral time constant speed integral time constant reduces, can promote speed response and reduce speed control error, but if the value is set too much, easily cause vibration and noise	PST	1～32767	150	0.1ms	4×513
P2-02	position control gain	PS	0～2000	280	0.01	4×514
P2-03	servo motor load inertia ratio	PST	0～1000	100	%	4×515
P2-04	position control feed-forward gain	P	0～1280	0	0.1	4×516
P2-05	cut-off frequency of feed-forward instruction low-pass filter	P	1～2000	300	Hz	4×517

P2-06	position over-difference detection range	P	0～32767	600	×100	4×518
P2-07	position over-difference detection range 0:don't shield position over-difference alarm 1: shield position over-difference alarm	P	0～1	0	/	4×519
P2-08	speed gain switching threshold at low speed	PST	0～6000	100	rpm	4×520
P2-09	speed gain switching coefficient	PST	0～500	100	%	4×521
P2-10	speed gain variation ratio	PS	0～500	100	%	4×522
P2-11	position gain variation ratio	P	0～500	100	%	4×523
P2-12	automatic tuning of expert parameters	PST	0～32	0	/	4×524
P2-13	current control proportion gain	PST	0～6000	750	0.001	4×525
P2-14	current integral time constant	PST	1～32767	130	0.1ms	4×526
P2-15	current detection low-pass filter coefficient	PST	1～2000	25	%	4×527
P2-16	speed detection low-pass filter coefficient	PS	1～2000	40	%	4×528
P2-17	speed integral separation point	PS	0～3000	100	rpm	4×529
P2-18	speed control gain variation radio	PST	100～500	100	%	4×530
P2-19	the third return origin speed	PST		50	rpm	4×531

P2-20	speed P and PI adjuster selection 0:PI adjuster common adjuster, when load inertia ratio is much, certain over-adjusting sometimes occurs 1:P adjuster when load inertia ratio is much, can use P adjuster to reduce over-adjusting 2:PDFF adjuster, between PI and P adjuster, can meet with the requirements about little speed over-adjusting and quick response	PS	0～2	0	/	4×532
P2-21	analog instruction low-pass filter cu-off frequency	ST	0～32767	10	0.1ms	4×533
P2-22	analog speed/ torque instruction average filter time	ST	0～32767	300	0.1ms	4×534
P2-23	position instruction smooth enable 0: invalid 1: position instruction smooth function open 2: retaining	P	0～2	0	/	4×535
P2-24	position instruction smooth filter coefficient	P	1～10000	200	/	4×536
P2-25	retaining		0～1000	0		4×537
P2-26	speed control accelerating time	PST	0～10000	300	ms	4×538
P2-27	speed control decelerating time / internal position control accelerating-decelerating time	PS	0～10000	100	ms	4×539
P2-28	reverse gap compensation: owing to the gap of the screw pitch there occur error in the process of servo motor rotating positively and reversely. It can compensate the reverse gap	P	-30000～ 30000	0	pulse	4×540
P2-29	servo response Max	PST	10～600	200	Hz	4×541

parameters	function code	suitable ways	setting range	factory default value	unit	communication address (decimal system)
	frequency					
P2-30	torque reach time servo dealing modes selection 0:output torque reach signal 1:output torque reach signal and servo motor halt motion	PST	0～1	0	/	4×542
P2-31	retaining					4×543
P2-32	power-on release switch time-delayed effective detection	PST	0～1	0	/	4×544
P2-33	electromagnetic brake opening delay time	PST	0～32767	1500	0.1ms	4×545
P2-34	electromagnetic brake closing delay time	PST	0～32767	10000	0.1ms	4×546
P2-39	incremental encoder Hall type selection	PST	0～6	0	/	4×551
P2-40	motor origin point signal deviation amount	PST	0～360	21	度	4×552
P2-41	motor pole pairs amount	PST	0～20	4		4×553
P2-42	retaining					4×554
P2-43	No. "ALE-23" alarm shield switch	PST	0～1			4×555
P2-44	IPM module alarm delay time	PST	0～100	20	0.1ms	4×556
P2-50	CCW / CW drive forbidding function switch	PST	0～1	0	/	4×562
P2-51	IPM module alarm electric level selection	PST	0～1	0	/	4×563
P2-52	speed output amplitude limiting 1	PST	100～2000	1000	0.001	4×564
P2-53	speed output amplitude limiting 2	PST	100～2000	1000	0.001	4×565
P2-54	current output amplitude limiting	PST	100～1000	950	0.001	4×566
P2-55	benchmark reference voltage	PST	1000～3000	1700	0.1V	4×567

4.3.4 communication parameters

parameters	function code	suitable ways	setting range	factory default value	unit	communication address (decimal system)
P3-00	station No. setting	PST	1～127	1		4×768

P3-01	communication transmission ratio 0: 4800 1:9600 2: 19200 3:38400 4:57600 5:1M 6:2M 7: 2.5M	PST	0～7	3	/	4×769
P3-02	protocol 0: No check 1+8+N+1 1: odd check 1+8+O+1 2: even check1+8+E +1 3: No check 1+8+N+2 4: odd check 1+8+O+2 5: even check1+8+E +2	PST	0～5	0	/	4×770
P3-03	internal communication 120Ω resistance using switch 0: no use 1: use	PST	0～1	0	/	4×771
P3-04	communication overtime setting	PST	0～200	0	0.1s	4×772
P3-05	communication mode selection 0:RS-48: (MODBUS RTU) 1: retaining 2:RS-232 (free broadcast protocol) 3: RS-485 (free broadcast protocol) 4: CAN (CAN open protocol)	PST	0～1	0	/	4×773
P3-06	servo communication response delay time	PST	0～1000	20	0.1s	4×774

4.3.5 spreading parameters

parameters	function code	suitable ways	setting range	factory default value	unit	communication address (decimal system)
P4-00	servo motor JOG control	JOG	0～6000	0	rpm	4×1024
P4-01	given speed under the way of test	OL	-6000~6000	100	rpm	4×1025

P4-02	speed trial running start speed	Sr	-6000~6000	0	rpm	4×1026
P4-03	open loop running voltage	OP	0～31000	1395	0.01V	4×1027
P4-04	open loop running speed	OP	0～3000	18	rpm	4×1028
P4-05	internal position automatic motion and external input selection	Pr	0～1	0	/	4×1029
P4-09	internal torque instruction	T	0～500	15	%	4×1033
P4-44	internal speed control given	S	-6000~6000	100	rpm	4×1068
P4-51	delay time of under-voltage alarm in major loop	PST	0～10000	20	0.1s	4×1075
P4-52	delay time of over-current alarm	PST	0～200	1	0.05s	4×1076

4.4 Planning Table of I/O Digital Input(DI) Function Codes

setting value	symbol	function name	function description	trigger ways	running mode
1	SON	servo start	OFF-servo motor enable forbidden ON- servo motor electrifying enable	level triggered	PST
2	ALRS	alarm reset signal	the failure can be divided into reset fault and non-resetting fault. This function can be used to dear the alarm or reset system after troubleshooting.	edge triggered	PST
15	SPDINV	speed control direction reverse	under the direction of speed control, can be used for motor direction reverse	level triggered	

4.5 Controlling Modes Definition Table

DSL200-F1series in-built various control modes, can select the different control mode by setting P1-100 value as following table.

P1-00	control mode	mode content	mode description		remark

0	Pt	external position control	external pilse instruction input	
2	St	speed control 1	①to input analog instruction voltage by V-REF (CN2_2) ② to input voltage range: -10V～+10V	
5	Si	speed control 2	to realize the different speed by setting P4-44 value	
3	Tt	torque control 1	①to input analog instruction voltage by T-REF (CN2_1) ② to input voltage range: -10V～+10V	
4	Ti	torque control 2	to realize the different torque by setting P4-09 value	
6	Ps	speed control with Zero fixed function	①to input analog instruction voltage by V-REF (CN2_2) ② to input voltage range: -10V～+10V	
11	Sr	speed trial running	P4-02 can adjust motor running speed, parameters don't save after cut off the power	
12	JOG	JOG running	P4-00 can adjust motor running speed, parameters don't save after cut off the power	
13	OL	test mode	P4-01 can adjust motor running speed, parameters don't save after cut off the power	

Chapter 5 Electrification Operation

5.1 Power Supply Connecting

⑴ To connect the power supply with main circuit power input terminals (three phase connecting R,S,T; single phase connecting R, S) electromagnetic contactor.

⑵ Power terminal R,S of control circuit connection should be coinstantaneous with or prior to main circuit, if only connecting the power of control circuit, servo be ready for signal (SRDY) OFF.

⑶ After connecting main circuit power, delays about 1.5s, servo be ready for signal (SRDY)ON, this moment, can accept servo enable (SON) signal, after detecting servo enable be effective, driver output be valid, motor excitation, be in the state of running. When detect servo enable be invalid or alarm, base pole circuit shut off, motor is in the state of free.

⑷ When servo enable connecting with power supply, base pole circuit will be electrified about 1.5s later.

⑸ Frequently switching power supply maybe damages the soft-start circuit and energy-consuming-brake circuit, the frequency of switch is best to be limited within 5 time each hour, below 30 time each day. If drive unit or motor be over-heat, after troubleshooting, there are still need 30minutes to cool down, then connect the power supply again.

Pay attention to the following connecting:

◎ Whether is power supply terminals wiring correct? Whether is the reliable input voltage correct?

◎ Whether do the wire of power supply and motor short or ground?

◎ Whether is the encoder cable connecting correct?

◎ Whether does control signal terminals connect correctly?

◎ Whether are the power supply polarity and size correct?

◎ Whether do drive unit and motor fix firmly?

◎ Whether does the motor shaft connect load?

5.2 Speed Trial Operation

5.2.1 operating process

⑴ To set parameter P1-00=11, make servo working in the mode of speed trial running.

⑵ To set parameter P1-04=1, servo enable.

⑶ To go to parameter P4-02, use key ⊼, ⊻ to adjust speed instruction.

⑷ Motor runs at the given speed. ⊼control speed positive increase, ⊻ control speed positive reduce (reversely, increase). When display speed is positive value, motor rotates positively ; When display speed is negative value, motor rotates reversely.

5.2.2 parameters setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-04	servo internal enable	/	0	0

P4-02	speed trial running internal speed instruction given	Rpm	0	0

5.3 JOG Operation

5.3.1 operating process

The unit of JOG running value is r/min, can operate the JOG mode according to the following setting.
（1）To set parameter P1-00=12, make servo working in the mode of JOG running.
（2）To set parameter P1-04=1, servo internal enable.
（3）To go to parameter P4-00, modify parameter value given speed instruction.
（4）To press key ▲, ▼ to modify JOG speed value, like P4-00=100 showing 100r/min.
（5）After finishing the modification, press the key ⏎ to confirm.
（6）To press key ▲, ▼ to make servo motor rotate in a positive direction or in and inverse direction, release the key, then the servo motor stop immediately.

Notices:
  When speed trial running, JOG operation or JOG trial running, if abnormalities like motor vibrating, noise etc occur, need to adjust parameters P2-00, P2-01, P2-16 and so on. specifics reference parameters description of Chapter 4.

5.3.2 parameters setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-04	servo internal enable	/	0	0
P4-00	JOG running internal speed instruction given	Rpm	0	0

5.4 Operation Testing

5.4.1 operating process

（1）To set parameter P1-00=13, make servo working in the mode of test running.
（2）To set parameter P1-04=1, servo internal enable.
（3）To go to parameter P4-01, modify parameter value given speed instruction.

(4)After finishing the modification, press the key ⏎ to confirm, servo runs according to set value of P4-01, plus value means to rotate in a positive direction, minus value means to rotate in a inverse direction.

5.4.2 parameters setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-04	servo internal enable	/	0	0
P4-02	test running internal speed instruction given	Rpm	0	0

5.5 Location Controlling

5.5.1 operating process

⑴To connect CN2, make the control signal (SON) be in the state of OFF.
⑵To connect control circuit power supply (no connecting the main return circuit power temporarily), the light of drive unit in the display is on, if no any alarm, it shows "r-0", if having any alarm, please find out the reasons and dealing with them until there is no alarm.
⑶To set control mode selection parameter P1-00=0, and set the suitable electronic gear ratio (P1-06~P1-10)
⑷To select external position instruction pulse input form, like pulse + direction, and P1-02=0.
⑸To connect main return circuit power.
⑹After ensuring that there aren't any abnormalities and alarms, make the input control signal (SON) be in the state of ON, in this case, motor excitation, and be in the state of zero speed.
⑺To operate the position pulse signals output to pins CN2_25, CN2_13, CN2_24, CN2_12, make the motor run according to the instruction.
⑻If the rotating direction of motor isn't in accord with the real required direction, then set P1-01=1（reverse）
⑼ in the state of monitoring, Fn-01 and Fn-01can show the current pulse value of encoder feedback; Fn-03 and Fn-04can show the position instruction pulse input value of master computer.

5.5.2 parameters setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-01	instruction direction	/	0-3	0
P1-02	test running internal speed instruction given	Rpm	0-6000	0
P1-04	servo internal enable	/	0-1	0

P1-06	numerator of electronic gear ratio (N1)	/	1-32767	1
P1-10	denominator of electronic gear ratio (M)	/	1-32767	1
P2-00	speed control proportion gain	0.1	5-1280	155
P2-01	speed integral time constant 1	0.1ms	1-32767	130
P2-02	position control proportion gain	0.1	0-2000	280
P2-16	speed detect low-pass filter coefficient	/	10-10000	100
P2-23	position instruction smooth function selection switch	/	0-1	0
P2-24	position instruction smooth filter coefficient	%	1-10000	200

5.6 Speed Controlling 1(external analog instruction voltage input)

5.6.1 operating process

⑴To connect CN2, make the input control signal (SON) be in the state of OFF.
⑵To connect control circuit power supply (no connecting the main return circuit power temporarily), the light of drive unit in the display is on, if no any alarm, it shows "r-0", if having any alarm, please find out the reasons and dealing with them until there is no alarm.
⑶To set control mode selection parameter P1-00=2
⑷To connect main return circuit power.
⑸To adjust analog speed potentiometer(V-REF) output to minimum, After ensuring that there aren't any abnormalities and alarms, make the input control signal (SON) be in the state of ON, in this case, motor excitation, owing to the zero-drift existence of voltage. Motor might rotates at the little speed.
⑹To adjust analog speed instruction voltage to zero. Specifics ways as follow:
●To adjust it to zero by hand
①To shift the menu display into "Fn-08" monitoring mode (speed monitoring state).
②To observe the current speed, if it rotates in the positive direction, go into parameters mode to adjust the value of P1-18 to major direction; if it rotates in the reverse direction, adjust the value of P1-18 to minor direction, until the motor shaft stops, the speed shows "r-0".

●To adjust it to zero automatically
①To shift the menu display into "Fn-08" monitoring mode (speed monitoring state).
②To set parameter P1-17=1, then can realize the automatic adjusting of zero-drift, after finished, P1-17 recovers "0" automatically

(7)Actual speed instruction=(input voltage value/ 10.0V) ×(P1-13).

5.6.2 parameter setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-01	instruction direction	/	0-3	0
P1-13	analog instruction Max swing speed	Rpm	-6000-6000	3000
P1-17	voltage hardware zero-drift automatic adjust of analog speed instruction	/	0-1	
P1-18	voltage hardware zero-drift manual adjust of analog speed instruction	/	-4096-4096	0
P1-20	Analog speed input proportion gain	0.001	20-3000	1000
P1-21	Analog speed instruction voltage positive gain	0.001	20-3000	1000
P1-22	Analog speed instruction voltage negative gain	0.001	20-3000	1000
P2-00	Speed control proportion gain	0.1	5-1280	155
P2-01	Speed integral time constant 1	0.1ms	1-32767	130
P2-16	speed detect low-pass filter coefficient	/	10-10000	100

5.7 Speed Controlling 2 (internal register speed given)

5.7.1 operating process

(1)To connect CN2, make the input control signal (SON) be in the state of OFF.

(2)To connect control circuit power supply (no connecting the main return circuit power temporarily), the light of drive unit in the display is on, if no any alarm, it shows "r-0", if having any alarm, please find out the reasons and dealing with them until there is no alarm.

(3)To set control mode selection parameter P1-00=5

(4)To connect main return circuit power.

(5)To set internal speed given value of parameter P4-44.

(6)After ensuring that there aren't any abnormalities and alarms, make the input control signal (SON) be in the state of ON, meantime, motor rotates at the speed of P4-44 setting value.

5.7.2 parameters setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-01	instruction direction	/	0-3	0
P2-00	Speed control proportion gain	0.1	5-1280	155
P2-01	Speed integral time constant 1	0.1ms	1-32767	130
P2-16	speed detect low-pass filter coefficient	%	10-10000	100
P4-44	Internal speed control given	Rpm	-6000-6000	100

5.8 Torques Controlling 1 (internal analog instruction voltage input)

5.8.1 operating process

(1)To connect CN2, make the input control signal (SON) be in the state of OFF.

(2)To connect control circuit power supply (no connecting the main return circuit power temporarily), the light of drive unit in the display is on, if no any alarm, it shows "r-0", if having any alarm, please find out the reasons and dealing with them until there is no alarm.

(3)To set control mode selection parameter P1-00=3

(4)To connect main return circuit power.

(5)To adjust torque potentiometer(T-REF) output to minimum, After ensuring that there aren't any abnormalities and alarms, make the input control signal (SON) be in the state of ON, in this case, motor excitation, owing to the zero-drift existence of voltage. Motor might rotates at the little speed.

(6)To adjust analog torque instruction voltage to zero. Specifics ways as follow:

●To adjust it to zero by hand

①To shift the menu display into "Fn-08" monitoring mode (speed monitoring state).

②To observe the current speed, if it rotates in the positive direction, go into parameters mode to adjust the value of P1-19 to major direction; if it rotates in the reverse direction, adjust the value of P1-19 to minor direction, until the motor shaft stops, the speed shows "r-0".

●To adjust it to zero automatically

①To shift the menu display into "Fn-08" monitoring mode (speed monitoring state).

②To set parameter P1-17=1, then can realize the automatic adjusting of zero-drift, after finished, P1-17 recovers "0" automatically

(7)After finishing the zero-drift adjusting, begin to rotate the potentiometer to the suitable torque given position, motor runs at the speed of P4-44 setting value.

(8)Actual input torque instruction=(input voltage value/ 10.0V) ×(motor rated torque×P1-15 / 100).

5.8.2 parameter setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-01	instruction direction	/	0-3	0
P1-15	analog torque instruction Max output	%	0-500	100
P1-17	voltage hardware zero-drift automatic adjust of analog torque instruction	/	0-1	
P1-19	voltage hardware zero-drift manual adjust of analog torque instruction	/	-4096-4096	0
P1-24	Analog torque input proportion gain	0.001	20-3000	1000
P1-25	Analog torque instruction voltage positive gain	0.001	20-3000	1000
P1-26	Analog torque instruction voltage negative gain	0.001	20-3000	1000
P2-00	Speed control proportion gain	0.1	5-1280	155
P2-01	Speed integral time constant 1	0.1ms	1-32767	130
P2-16	speed detect low-pass filter coefficient	/	10-10000	100
P4-44	Internal speed control given	Rpm	-6000-6000	100

5.9 Torques Controlling 2 (internal register torque given)

5.9.1 operating process

(1)To connect CN2, make the input control signal (SON) be in the state of OFF.

⑵To connect control circuit power supply (no connecting the main return circuit power temporarily), the light of drive unit in the display is on, if no any alarm, it shows "r-0", if having any alarm, please find out the reasons and dealing with them until there is no alarm.

⑶To set control mode selection parameter P1-00=4

⑷To connect main return circuit power.

⑸To set internal speed given parameter value P4-44.

⑹To set P4-09 value, set one suitable torque instruction value.

⑺After ensuring that there aren't any abnormalities and alarms, make the input control signal (SON) be in the state of ON, meantime, motor rotates at the speed of P4-44 setting value.

5.9.2 parameter setting

necessary parameter	name	unit	parameter range	default value
P1-00	control mode	/	0-31	0
P1-01	instruction direction	/	0-3	0
P2-00	Speed control proportion gain	0.1	5-1280	155
P2-01	Speed integral time constant 1	0.1ms	1-32767	130
P2-16	speed detect low-pass filter coefficient	%	10-10000	100
P4-09	Internal torque control given	0.001	0-1000	200
P4-44	Internal speed control given	Rpm	-6000-6000	100

Chapter 6 Alarm and Coping with

Notices:

■The people involved in the maintenance must have the corresponding professional knowledge and ability.

■Before touching the driver and motor, the power supply for servo drive unit and motor must be cut off at least for 5 minutes, so as to avoid electric shock and burn.

■After the driver unit failures alarming, before putting them into use again, need to deal with the failures according to the alarm code.

■Before reset alarm, must confirm SON (servo be effective) signal invalid, to avoid motor run suddenly to cause accidents.

6.1 List of Alarm

Alarm symbol	Alarm name	Content
--	normal	
ALE01	over-speed	servo motor speed over the setting value
ALE02	main circuit over-voltage	voltage of main circuit power supply is too high
ALE03	main circuit under-voltage	voltage of main circuit power supply is too low
ALE04	Position over-error value	the value of position deviation counter is higher than the set value
ALE05	Motor overheating	the temperature of motor is too high
ALE06	Saturation fault of speed amplifier	the speed amplifier saturates in long time

ALE07	Driver prohibition be abnormal	CCW,CW drive prohibiting input both in the state of "OFF"
ALE08	position deviation counter spill	the absolute value of position deviation counter over 2^{30}
ALE09	encoder feedback signal fault	feedback data or signal of encoder is wrong
ALE10	control power supply under-voltage	the voltage of control power supply is lower
ALE11	IPM module fault	IPM intelligent module fault
ALE12	over-current	the current passing the motor is too high
ALE13	over-load	the load is over the allowed Max load of servo driver and motor (instantaneous over-heat)
ALE14	brake failure	brake circuit failure
ALE15	motor pole pairs fault alarm	the pole pairs number aren't suitable for the correspondent motor
ALE16	main circuit cut-off alarm	main circuit not be electrified
ALE17	retaining	retaining
ALE18	motor type invalid	motor type not be written inside incremental encoder EEPROM
ALE19	encoder wire cut-off alarm	encoder wire no connecting or cut off
ALE20	EEPROM wrong	EEPROM wrong
ALE21	series ports communication error alarm	RS232 or RS485 communication error
ALE22	current samples circuit alarm	the current sample power supply input is incorrect
ALE23	Phase sequence error of motor power line	the sequence of motor power line UVW is wrong
ALE26	CPLD data bus error	the data bus of DSP and CPLD is wrong

6.2 Ways to Cope with Alarms

alarm code	alarm name	running states	reason	Methods
ALE01	over-speed	to occur when connecting control power supply	① control circuit failure ② encoder failure	①change servo driver ②change servo motor

		to occur during the process of motor running	input instruction pulse frequency too high	correctly set input instruction pulse
			the time constant of acceleration / deceleration too small, to make speed over-adjusting-amount too large	to increase the time constant of acceleration / deceleration
			input electronic gear ratio too large	correctly set the ratio
			encoder failure	change servo motor
			encoder cable is damaged	change encoder cable
			servo system unsteadily, to arise over-adjusting	①reset the related gain ②if gain can't set up to suitable value, to reduce the load rotary inertia rate
		to occur when the motor just starts	load inertia too high	①reduce load inertia ②change the big power driver and motor
			encoder zero-point fault	①change servo motor ②ask for the factory to reset the encoder zero-point
			①wrong lead wire connecting of motor terminals U, V, W ②wrong lead wire connecting of encoder cable	correctly connecting
ALE02	main circuit over- voltage	to occur when connecting control power supply	circuit failure	change servo drive unit
		to occur when connecting main power supply	①voltage of power supply to high ②voltage wave form of power supply be abnormal	check the power supply
		to occur during the process of motor running	brake resistance connecting wire be shut off	connect the wire again
			① brake transistor be damaged ②internal brake resistance be damaged	change servo drive unit

			capacity of brake return-circuit not enough	①reduce the switch frequency ②raise acceleration / deceleration time constant ③decrease the torque limitation value ④reduce load inertia ⑤ change big power driver and motor
ALE03	main circuit under- voltage	to occur when connecting main power supply	①circuit board failure ② power supply fuse be damaged ③soft-start circuit failure ④rectifier be damaged	change servo drive unit
			①power supply under-voltage ②power be cut off temporarily over 20ms	check the power supply
			electrify frequently	The interval between power on and on is more than 3 seconds.
		to occur during the process of motor running	①power supply capacity not enough ②instant power-down ③IPM module short circuit	check the power supply and IPM module
			radiator overheating	check the load
ALE04	Position over-error value	to occur when connecting control power supply	circuit board failure	change servo driver
		to connect main power supply and control wire, input instruction pulse, motor don't rotate	①the lead wire of motor terminals U, V, W connecting wrong ②the lead wire of encoder cable connecting wrong	connect correctly
			encoder failure	change servo motor
			position over-error detecting range be set to too small	increase the position over-error testing range
			position proportion gain too small	increase gain
			torque not enough	①check torque limitation value ②reduce load ③change big power drive unit and motor
			instruction pulse frequency too high	reduce frequency
ALE05	motor overheating	to occur when connecting control power supply	circuit board failure	change servo drive unit
			①cable cut off ②temperature relay inside the motor be damaged	①check cable ②check motor

		to occur during the process of motor running	motor over load	①reduce load ②reduce switch frequency ③reduce torque limitation value ④reduce related gain ⑤change big power drive unit and motor
			motor internal failure	change motor
ALE06	Saturation fault of speed amplifier	to occur during the process of motor running	motor be jammed by machinery	check load from machinery part
			load too large	①check load ②change big power drive unit and motor
ALE07	Driver prohibition be abnormal		CCW,CW drive prohibition terminals all be cut off	check wiring, power supply for input terminals
ALE08	position deviation counter spill		① motor be jammed by machinery ②input instruction pulse abnormally	①check load from machinery part ②check instruction pulse ③ check motor whether rotates according to its receiving instruction pulse
ALE09	encoder feedback signal fault		encoder wiring wrong	check wiring
			encoder be damaged	change motor
			encoder cable is damaged	change cable
ALE09	encoder communication fault		encoder cable is too long, to cause power supply voltage of encoder be little low	①shorten cable ②adopt multi-core parallel power supply
ALE10	control power supply under-voltage		①driver inner connector be abnormal ②switch power be abnormal ③ chips be damaged	①alter drive unit ②check connector ③ check switch power supply
ALE11	IPM module fault	to occur when connecting control power supply	circuit board failure	alter servo drive unit
		to occur during the process of motor running	①voltage of power supply be little low ②over-heat	①check drive unit ②electrify again ③ alter drive unit
			short circuit among driver terminals U, V, W	check wiring
			grounding abnormally	grounding correctly
			motor insulation be damaged	alter motor

|			be interfered	①add circuit filter ②electrify again ③ avoid interference
ALE12	over-current		short circuit among driver terminals U, V, W	check wiring
			grounding abnormally	grounding correctly
			motor insulation be damaged	alter motor
			driver be damaged	alter drive unit
ALE13	over-load	to occur when connecting control power supply	circuit board failure	alter servo drive unit
		to occur during the process of motor running	exceed rated torque to run	①check load ②reduce switch frequency ③reduce torque limitation value ④alter big power drive unit and motor
			holding brake doesn't open	check holding brake
			motor running unsteadily and vibrating	①increase gain ②increase acceleration / deceleration time ③reduce load inertia
			① the wiring of one phase among terminals U,V,W be cut off ②encoder connecting wrong	check wiring
ALE14	brake failure	to occur when connecting control power supply	circuit board failure	alter servo drive unit
		to occur during the process of motor running	the connecting of brake resistance be cut off	connect the wire again
			① brake transistor be damaged ②internal brake resistance be damaged	alter servo drive unit
			capacity of brake return-circuit not enough	①reduce the switch frequency ②raise acceleration / deceleration time constant ③decrease the torque limitation value ④reduce load inertia ⑤ alter big power driver and motor

			voltage of main circuit power supply too high	check main power supply
ALE15	motor pole pairs fault alarm	to occur during the process of motor electrifying or running	motor pole pairs aren't matched with the correspondent motor	modify the correct pole pairs of the correspondent motor, then re-electrify again
ALE16	main circuit cut-off alarm		main return-circuit no power	check main power supply
			main return-circuit over-voltage	check main power supply
			main return-circuit under-voltage	check main power supply
ALE18	motor type invalid		motor type not be written inside incremental encoder EEPROM	write motor type into incremental encoder when the motor out from factory
ALE19	encoder wire cut-off alarm		encoder wire no connecting or be damaged	connect the encoder cable, or alter encoder cable
ALE20	EEPROM wrong		chips or circuit board be damaged	①alter servo driver unit ②after restoring them, must reset driver type (parameters P1-01), then restore default parameters
ALE21	series ports communication error alarm		RS232 or RS485 communication error	①check whether the communication wire is good ②whether communication data form is correct.
ALE22	current samples circuit alarm		the current sample power supply input is incorrect	①check whether the current of power supply is within the rated range ②check whether amplifying circuit link be abnormal.
ALE23	Phase sequence error of motor power line		the sequence of motor power line UVW is wrong	①check whether the wiring sequence of motor power line is correct ②under the condition of confirming the wiring sequence be correct, can set P2-44=1 to shield this kind of alarm
ALE26	CPLD data bus error		the data bus of DSP and CPLD is wrong	①the data bus pins of DSP and CPLD exists rosin joint ②after repairing the welding of DSP and CPLD pins, if alarm still occurs, can alter these two chips in sequence

Chapter 7 Communications

7.1 Suitable for the Extent

DSL200-F1series driver support MODBUS RTU protocol, can use RS485 or CAN communication, can carry out "one PLC for several drivers" communication network. After utilizing communication , each driver must set communication parameters (station No. : P3-00, baud rate: P3-1, data format: P3-02) well. By communication function of master computer, can directly modify driver internal parameters, read servo running states

7.2 Protocol Format
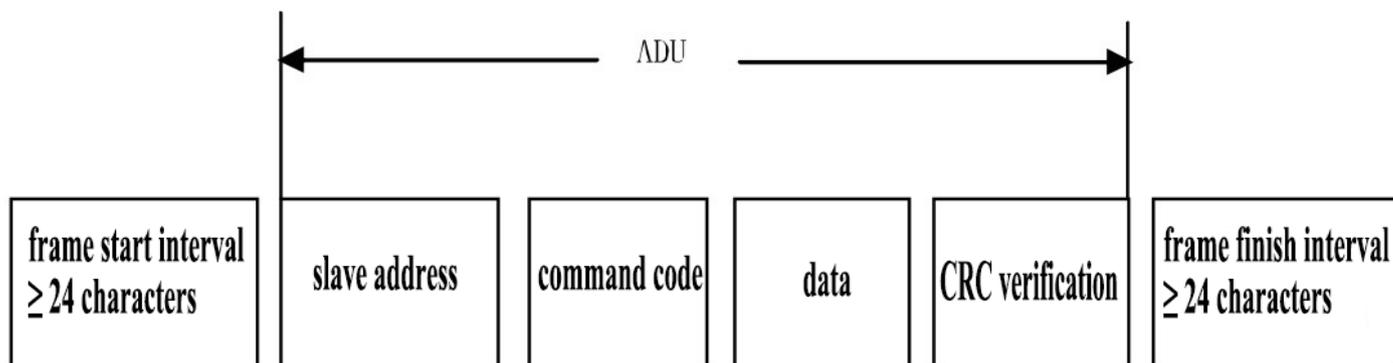
The protocol format is shown as the above diagram, verification in ADU is the front part of CRC16 verification , and is obtained by the delivery among high-low characters. In protocol format, the low bytes of CRC are in the front, the high bytes are in the rear.

7.2.1 Read servo drive function code parameters or states bytes (command code : 0×03)

ADU part content	bytes	range
Host send request		
slave machine address	1	1-0×FEH
command code	1	0×03H
register start address	2	0×0000H-0×FFFFH
register numbers	2	0×0000H-0×0008H
CRC verification (the low bytes are in the front)	2	
slave machine response		
slave address	1	local address
command code	1	0×03H
read bytes numbers	1	0×02H
register content	2	register content
CRC verification	2	

For example: read parameter P1-06=1
Host station send: 0×01   0×03   0×01   0×06   0×00   0×01   0×65   0×f7
Slave station response: 0×01   0×03   0×02   0×00   0×01   0×79   0×84

7.2.2 Write servo drive single function code or control parameters (command code : 0×06)

ADU part content	bytes	range
Host send request		
slave machine address	1	1-0×FEH
command code	1	0×06H
register start address	2	0×0000H-0×FFFFH
data content	2	0×0000H-0×0008H

CRC verification (the low bytes are in the front)	2	
slave machine response		
slave address	1	local address
command code	1	0×03H
register address	2	0×0000H-0×FFFFH
register content	2	register content
CRC verification	2	

For example: to write 10 into the parameter P1-06

Host station send: 0×01   0×06   0×01   0×05   0×00   0×0A   0×36   0×C2

Slave station response: 0×01   0×06   0×01   0×05   0×00   0×0A   0×69   0×FB

7.2.3 Write servo drive single function code or control parameters (command code : 0×10)

ADU part content	bytes	range
Host send request		
slave machine address	1	1-0×FEH
command code	1	0×10H
register start address	2	0×0000H-0×FFFFH
register content bytes number	1	0×0000-0×0008
register content	2*register number	
CRC verification (the low bytes are in the front)	2	
slave machine response		
slave address	1	local address
command code	1	0×10
register address	2	0×0000-0×FFFF
ADU part content	bytes	range
register number	2	0×0000-0×0008
CRC verification	2	

7.3 CRC Verification

For sender, calculate CRC values firstly, and attach its in the sending messages. After receiving the messages, the receiver will re-calculate CRC values again, then compare the recalculated values with the received CRC values. If they aren't equal, it means that there are something wrong during the process of sending.

The calculating process of CRCj verification:

⑴To define one CRC register, and assign an initial value, 0×FFFF

⑵To make XOR calculation between the first byte of sent messages and the values of CRC register, and put the calculation result into CRC register, begin from the address code, the calculation excludes start bit and stop bit.

(3)To abstract and check LSB (the lowest bit of CRC register)

(4)Each bit of CRC register moves one bit to the right, and the highest bit is supplemented by "0".

(5)If LSB is1, to make XOR calculation between the values of register and A001H, and put the result into CRC register.

(6)To repeat the procedure (3),(4),(5), till finishing 8 times move.

(7)To repeat the procedure(2),(3),(4),(5),(6), deal with the next byte of sent information. Continue to repeat the above procedure, till finishing all the works to deal with all bytes of information sending.

(8)Calculation finished, the content of CRC register is the CRC verification vales

(9)When sending, firstly send low bytes of CRC verification values, then send high bytes.