

# HSD2 Series Servo Drive User Manual



**HNC Electric Limited** 

HSD2 Series AC Servo Drive

Thank you for purchasing our HSD2 AC servo drives.

This manual provides the related information about product installation, wiring, inspection and operation of our AC servo drive. Before using the product, please read through this manual carefully in order to ensure the correct use of the product.

### This manual includes:

Installation of AC servo drives Configuration and wiring Parameter settings Control functions and adjusting methods of AC servo drives Trial run steps Troubleshooting

### This manual is intended for the personnel with the following qualifications:

Installation or wiring personnel

Operating or programming personnel

Troubleshooting personnel

### **Important Precautions**

Before using the product, please read this user manual thoroughly to ensure correct use and place this manual in a safe place for a quick reference whenever is needed. In addition, please pay your attention to the following precautions accordingly:

No water, corrosive and inflammable gas are allowed in the installation environment.

Ensure that the drive is correctly connected to a ground. The grounding method must comply with the electrical standard of the country.

Do not connect a commercial power supply to the U,V,W terminals of drives, it may damage the drive.

Do not disconnect servo drive, motor or change the wiring when power is ON

Do not touch the heat sink of the drive before connecting to the power and operation.

If you have any inquiries, please contact your local distributor or our customer service center.

### Preface

Please read and follow the following NOTES before using the product:

- 1. HSD2 series driver is designed to apply with AC 220V power input. Do not connect this product with AC 380V power, it's possible to damage the drive or cause personnel injury.
- 2. Please refer to this user manual, set the correct motor parameters PA1, so as to ensure proper parameters match between servo drive and motor.
- 3. HSD2 supports 5V signal for PULS/SIGN. If the control voltage is 24V, please connect 1.2k  $\Omega$  resistance in series on PULS+(26)/SIGN+(24), otherwise the diver will be damaged; if the control voltage is 12V, please connect 500  $\Omega$  resistance.
- 4. Do not turn the power on and off too often, if continuous power on and off is needed, please add break resistor. Please follow the user manual or contact our technical support, use the correct break resistor for the driver.
- 5. Please set the right Electronic Gear Ratio parameter PA12, PA13.
- 6. Please set the right pulse command input parameter PA14.
- 7. When you finished the parameters setting of PA1,PA14, PA35, please re-power the drive to activate and save the modified settings.
- 8. Please use stranded wires and multi-core shielded-pair wires for making the encoder cable. The total length should not exceed 15meters.
- 9. Please use shielded wires to make control cable as well, and the max length of the control cable is 15meters, otherwise it may cause pulse lose.

### **Safety Precautions**

#### Installation

◆It is not allowed to expose the product with the environment which contains water, corrosive gas, inflammable gas, etc.Otherwise it may result in electric shock, fire or personal injury.

◆Do not apply the product to the environment of direct sunlight,dust,salt and metal powder,etc.

◆It is prohibited to apply this product to the place which contains oil and pharmaceuticals, etc.

#### Wiring

◆Please connect the ground terminals to a class-3 ground system (Under 100  $\Omega$ ),poor grounding may result in electric shock or fire.

◆ The HSD2 series AC servo drive is applicable for AC 220V single-phase or three-phase power. Please do not connect the product to AC 380V power. Otherwise it's may lead to possible drive damage..

◆ Do not connect the three-phase source to the output terminal U, V

and W. Or it is possible to cause personnel injury or fire, or damage the drive.

◆Please tighten the screws of the power, wire terminals & connectors of the motor and drive, otherwise it may result in damage, fire or personnel injury.

◆In order to prevent any danger, it is strongly recommended to follow the specifications outlined in this manual when wiring.

### Operation

◆Before the operation, please change the parameter setting value according to the requirement, if it is not properly adjusted to the correct setting value, it may cause equipment out of control, or lead to malfunction of the machine.



◆Do not touch or approach any rotating parts (e.g. Heat sink) during operation, it may cause serious personnel injury.



◆Do not remove /disconnect the operation panel while the drive is connected to the power supply, otherwise, it is possible to cause electric shock.



◆Do not disassemble the servo drive as this may cause electric shock or personnel injury.

◆Do not connect or disconnect wires or connectors while power is on, otherwise it may cause electric shock or personnel injury.

igoplus The high voltage may still remain in the servo drive when the power is off,

please wait for at least 10 minutes (after power is off) before touching or

performing any inspections.

### Contents

CHAPTER 1	PRODUCT DESCRIPTION	1
1.1 HSD2 SI	ERIES SERVO DRIVES	1
1.2 Appeara	NCE	
1.3 Expland	ATION OF EACH POWER TERMINALS	
1.3.1 P / D	D / C terminals	
1.3.2 R / S	S / T terminals	2
1.3.3 R / 1	۲ terminals	
1.3.4 U / \	/ / W / PE terminals	
1.3.5 CN1	connector	
1.3.6 CN2	connector	
1.3.7 CN3	connector	
CHAPTER 2	INSTALLATION & WIRING	4
2.1 PRE-CHE	CK BEFORE INSTALLATION	4
2.2 PRODUC	T SIZE	
2.3 SIZE DAT	FA FOR INSTALLATION	
2.4 Installa	TION ENVIRONMENT	6
2.5 INSTALLA	TION PROCEDURE & MINIMUM CLEARANCES	
2.6 CONNEC	TION TERMINALS	9
CHAPTER 3	SIGNAL INTERFACE AND WIRING	12
3.1 OVERVIE	W	12
3.2 CN1 ENG	CODER CONNECTOR	
3.2.1 CN1	connector view and layout	
3.2.2 Sign	al definition for CN1	13
3.3 CN2 Co	NNECTOR VIEW AND LAYOUT	13
3.4 SIGNAL E	DEFINITION OF CN2 CONNECTOR	14
3.5 I/O INTEF	RFACE	16
3.5.1 Digit	al signal input interface	16
3.5.2 Digit	al signal output interface	
3.5.3 Puls	e command input interface	17
3.5.4 Anal	log signal input interface	
3.5.5 Enco	oder signal output interface	
3.5.6 Enco	oder open-collector Z-pulse output interface	
3.5.7 Enco	oder feedback signal input interface	
3.6 STANDAF	RD CONNECTION EXAMPLE	21
3.6.1 Posi	tion control mode	
3.6.2 Spe	ed / torque control mode	
CHAPTER 4	PANEL DISPLAY & OPERATION	
4.1 PANEL D	ESCRIPTION	23

4.2 Main Menu	
4.3 Monitoring Display (DP)	
4.4 PARAMETER SETTING (PA)	
4.5 Parameter Management (EE)	
4.6 Speed Trial Run Without Load (SR)	
4.7 JOG TRIAL RUN WITHOUT LOAD (JR)	
4.8 ANALOG ZERO-OFFSET ADJUSTMENT (AU)	
CHAPTER 5 TRIAL RUN AND TUNING	
5.1 INSPECTION WITHOUT LOAD	
5.1.1 Apply power to the drive	
5.1.2 JOG trial run without load	
5.1.3 Speed trial run without load	
5.2 Position Control Mode	
5.2.1 Simple position control system	
5.2.2 Parameters for the position control	
5.2.3 Electronic gear ratio	
5.2.4 Position control gain	
5.3 GAIN ADJUSTMENT	
5.3.1 Steps for gain adjustment	
5.3.2 Gain adjustment for speed control loop	41
5.3.3 Gain adjustment for position control loop	
5.4 ELECTROMAGNETIC BRAKE	
5.4.1 Parameters of electromagnetic brake	
5.4.2 Wiring of electromagnetic brake	
5.5 TIMING	45
5.5.1 Timing for power supply	
5.5.2 Timing for enable operation	
5.5.3 Servo enable & servo alarm flowchart	
5.6 START & STOP	
5.6.1 On-off frequency and load inertia	
5.6.2 Adjustment Method	
CHAPTER 6 PARAMETERS	
6.1 PARAMETER SUMMARY	
6.2 DETAILED PARAMETER DESCRIPTION	
CHAPTER 7 MOTOR TYPE MATCHING	
7.1 MOTOR TYPE LIST FOR HSD2-020	
7.2 MOTOR TYPE LIST FOR HSD2-030	
7.3 MOTOR TYPE LIST FOR HSD2-050	
7.4 MOTOR TYPE LIST FOR HSD2-065	
7.5 MOTOR TYPE LIST FOR HSD2-030A	71

CHAPTER 8	ALARM, PROTECTION FUNCTION & TROUBLESHOOTING	72
8.1 Alarm	CODE CHECK LIST	72
8.2 POTENT	TAL CAUSE AND CORRECTIVE ACTIONS	74
CHAPTER 9	CONNECTION TO MOTOR	79
CHAPTER 10	SYSTEM CONNECTION	80

### Chapter 1 Product Description

### 1.1 HSD2 Series Servo Drives

HSD2 series drives include five different models: HSD2-020, HSD2-030, HSD2-050, HSD2-065 and HSD2-030A.

Except for HSD2-030A, which has a barrier screw secure terminal, the rest of above mentioned models have pinhole type power terminals (P / D / C, R / S / T, r / t, U / V / W / PE)

CN1, CN2, CN3 are signal connectors.

Please refer to the power level table (1-1) for each HSD2 series servo drives:

TYPE	IPM (A)	POWER LEVEL (kw)
HSD2-020	20	1.0
HSD2-030	30	1.5
HSD2-050	50	2.5
HSD2-065	65	3.5
HSD2-030A	30	1.5

Table 1-1 Power level of HSD2 series drivers

### 1.2 Appearance

The appearance of HSD2-030, HSD2-050, HSD2-065 are the same. They have designed with P / D / C, R / S / T / r / t terminals and CN1, CN2, CN3 connectors..

HSD2-020 doesn't have P / D / C terminals and CN3 connector..

The power terminal of HSD2-030A differs from the rest of four models, it has not equipped with P / D / C ports additionally.



Figure 1-1 appearance of HSD2

### **1.3 Explanation of Each Power Terminals**

### 1.3.1 P / D / C terminals

- 1. P / D / C are the wiring terminals of brake resistor.
- 2. It is prohibited to connect P and C directly, this will damage the drive.
- 3. When P and D is connected, it means the inner brake resistor is effective, the default setting is P and D being connected.
- 4. If an extra break resistor is needed, it will be connected between P and C.
- 5. If P and D is connected, an extra external break resistor is connected between P and C, both the internal and external resistors are working on a parallel basis.

### 1.3.2 R / S / T terminals

R / S / T are the three phased AC 220V power supply connection terminals, no phase sequence requirement.

Do not connect AC 380V power supply to the R/S/T terminals, otherwise it will damage the drive and cause personnel injury.

#### 1.3.3 R / T terminals

R/T are the power supply terminals for the control system of the servo drive, AC 220V power supply is required in this case.

It will cause damages to the drive if you connect AC 380V power supply to these two terminals.

#### 1.3.4 U / V / W / PE terminals

U / V / W / PE are the power output terminals of the drive, they can be connected to the corresponding ports of the servo motor.

The power cable is generally supplied by the manufacturer, if you need to make the power cable by yourself, please make sure you use the right shielded wire and ensure a correct connection of U / V / W / PE terminals to avoid loosing control of the drive.

Please follow up the instructions from table 2-3 and table 2-4.

### 1.3.5 CN1 connector

CN1 is the encoder signal interface, it's used to receive position signals from servo motor.

Only incremental encoder is applicable to our HSD2 series servo drive.

Incremental encoder has 6 signals: U V W A B Z, adopting differential output for each signal. The encoder resolution is 2500 PPR, please find the detailed definitions from table 3-1.

### 1.3.6 CN2 connector

CN2 is the control signal interface, detailed definitions, please refer to table 3-2.

### 1.3.7 CN3 connector

CN3 is the communication interface, it is a reserved port at the time being.

### Chapter 2 Installation & Wiring

In this chapter, you will find the related information and cautions for storage, installation environment, wiring of HSD2 series servo drive.

1. If the driver is severely damaged during transportation, please do not power on the drive, contact the supplier for further actions.

2. Do not connect AC 380V power supply to R/S/T terminals.

3. Please ensure PE port is properly connected and earthed.

### 2.1 Pre-check Before Installation

After receiving the AC servo drive, please check for the following:

#### Ensure that the product is what you have ordered.

Please check the nameplate to identify if the product you received is what you've ordered from the supplier. (You can refer to Section 1.1 and 1.3 for more details about the model explanation).

#### Check the appearance to see if there is any damage.

Please inspect the product carefully to see whether or not there is any damage during transportation or shipping. Turn the motor shaft by hand, a smooth rotation indicates a good motor. However, a servo motor with an electromagnetic brake can not be rotated manually.

#### Check the screws

Ensure that all necessary screws are tightened and secured.

If any items are damaged, please inform the distributor whom you purchased the product from or your local sales representative.

### 2.2 Product Size

Product size of HSD2 series servo drives, please refer to Figure 2-1 and table 2-1.

Figure 2-1 Dimensions sketch

Туре	C(mm)	D (mm)	E(mm)	Heat sink depth(mm)
HSD2-020	170	77	172	16
HSD2-030	185	82	182	21
HSD2-050	200	92	186	31
HSD2-065	215	105	207	29.5
HSD2-030A	195	97	155	34

### 2.3 Size Data for Installation

Please refer to the installation size from Figure 2-2 and Table 2-2.



Figure 2-2 installation size sketch

Installation size data			
Туре	A(mm)	B(mm)	
HSD2-020	60	160	
HSD2-030	65	175	
HSD2-050	75	189.3	
HSD2-065	88	203.5	
HSD2-030A	25	208	

Table 2-2 installation size data for HSD2 series drives

### 2.4 Installation Environment

The operating temperature for the HSD2 series servo drive is ranging from  $0^{\circ}C$  (32°F) to 55°C (131°F). If the ambient temperature of servo drive is higher than 45°C, please install the drive in a well-ventilated location and do not block the ventilation holes. The ambient temperature of servo drive for long-term reliability should be under 45°C (113°F).

If you need to install the servo drive and motor in a confined space, please ensure sufficient space around the units and make sure the ventilation status and size of the confined space won't cause overheating of the product. In addition, please also pay your attention to the following cautions:

1. The ambient humidity should be less than 80%, without condensing.

2. Please keep the servo drive or motor away from the heat-radiating equipment or in direct sunlight.

3. Do not install the drive or motor in a location subjected to the environment which contains water, corrosive gas or liquid, dust or oily dust, floating dust, metallic particles.

4. Do not mount the servo drive or motor in the places where it will be subjected to high levels of electromagnetic radiation.

5. Do not mount the servo drive or motor in a location where temperature and humidity will exceed specification.

6. Do not mount the servo drive or motor in a location where vibration and shock will exceed specification.

7. The mounted position vibration should be less than 0.5G.

### 2.5 Installation Procedure & Minimum Clearances

Incorrect installation may result in a drive malfunction or premature failure of the drive. Please follow the guidelines in this manual when installing the servo drive.

1. The servo drive should not be tilted or upside down. Please mount the drive perpendicular to the wall or in the control panel, otherwise malfunction and damage will occur.

2. The servo drive should be mounted in the control panel with a cooling fan, to enhance air circulation and cooling.

3. In order to ensure the drive is well ventilated, ensure that the all ventilation holes are not obstructed and sufficient free space is given to the servo drive. To define the free space, please refer to the section "Minimum Spacing".

4. Please tighten the screws for securing drive or motor. Otherwise it may result in product damage or personnel injury.

5. As the drive conducts heat away via the mounting, the mounting plane or surface should not bring heat into the drive from external sources.



Figure 2-3 The correct direction for mounting



Figure 2-4 Installation Minimum Spacing

In order to increase ventilation to avoid ambient temperature being exceed to specification, please install a fan. A minimum spacing of two inches must be maintained above and below the drive for ventilation and heat dissipation. Additional space may be necessary for wiring and cable connections. When installing two or more drives next to each other, please follow the spacing diagram from the above Figure 2-4.

### 2.6 Connection Terminals

Please select the connecting terminals carefully and follow the instructions from table 2-3 and 2-4.

Terminal	Terminal	Descriptions			
Identification	Description	Descriptions			
R、S、T	Main circuit terminal	Used to connect three-phase AC main circuit power depending on connecting servo drive model.			
R, t	Control circuit terminal	Used to connect single-phase AC control circuit power. (Control circuit uses the same voltage as the main circuit.)			
		Used	to connect ser	vo motor	
			Terminal symbol	Wire colour	
U、V、W、	Servo motor		U	Brown	
PE	output		V	Black	
			W	Grey	
			DE	Yellow and	
				green	
DE	Ground	Used	to connect wit	th the grounding wi	ires of
F L	terminal	power supply and servo motor.			
Encoder CN1		Used to connect with the encoder of servo motor. Please refer to section 3.2 for more			
	connector	details.			
CND	1/O connector	Used to connect with external controllers.			rs.
CN2	I/O connector	Please refer to section 3.3 for more details		etails.	
CN3	Communicatio n connector (Reserved)	Connect with personal computer (PC or laptop).			

Table 2-3 Definition and function of the terminals

Terminal Identification	Terminal Description	Cable specification
R、 S、 T	Main circuit terminal	1.5~2.5mm <sup>2</sup>
r⊾ t	Control circuit terminal	0.75~1 mm²
U, V, W	Servo motor output	1.5~2.5 mm <sup>2</sup>
PE	Ground terminal	1.5~2.5 mm <sup>2</sup>
CN1	Encoder connector	≥0.14 mm², 7 pair shielded twisted-pair cable
CN2	I/O connector	≥0.14 mm², shielded twisted-pair cable

 Table 2-4
 Cable specifications for the terminals

#### **Wiring Cautions**

Please read and follow up the below wiring precautions while performing wire connections with the servo drive and servo motor.

1. Please ensure that the wiring of the main power supply terminal R/S/T and control power supply terminal R/T are properly selected and connected, power specification is correct.

2. Please use shielded twisted-pair cables for wiring to voltage coupling and eliminate electrical noise and interference.

3. Please ensure a correct connection for U, V, W terminals, or it may not be able to start the motor or cause galloping.

4. The ground terminal of the servo motor should be connect with the PE of the servo drive properly and ensure a single point grounding. The grounding cable requires to be coarse as well.

5. As a residual hazardous voltage may remain inside the drive, please do not touch any of the terminals (R, S, T, & U, V, W) or the cables connected to them after the power has just been turned off. Wait for at least 10 minutes until the charging light is off before you take any further actions with the drive.

6. With regards to the I/O signal cable, please use the recommended cable or similar shield cable. The total length of I/O signal cable shouldn't exceed 3 meters, while encoder cable should be less than 15 meters. Please use a twisted-shield signal wire with grounding conductor for the encoder cable (CN1) and the position feedback signal connector (CN2). The wire length shouldn't exceed 20meters. If it exceeds 20m, please choose a bigger wire diameter (double the existing one) of signal cable to reduce the signal fading.

7. The shield of shielded twisted-pair cables (encoder cable) should be connected to the SHIELD end (ground terminal) of the servo drive.

8. The cables which connected to R, S, T and U, V, W terminals should be placed in separate conduits from the encoder or other signal cables. Separate them by at least 30cm.

9. Please ensure the diode connecting direction of signal output relay is correct, otherwise it may lead to malfunction of the drive.

10. Please install a non fuse type circuit breaker (NFB) to achieve external power cut offs when the servo drive is in a malfunction status.

11. Shut down the power supply if the servo drive is not being used for a long term.

12. Definition of rotating directions: face the motor shaft, the counter-clockwise direction is defined as the CCW. And the clockwise direction of rotation is defined as the CW. Generally, we refer the CCW as the positive direction, while CW as negative direction.



Figure 2-5 Definition of rotating directions

### Chapter 3 Signal Interface And Wiring

CN1, CN2, CN3 are the signal interfaces of the servo drive, while CN3 is the communication port, (reserved).

This chapter provides the definitions and standard wiring/connections for the three ports.

### 3.1 Overview

- 1. CN1 is an encoder connector, used for receiving position signals from servo motor.
- 2. HSD2 series servo drive is only applicable with incremental optical encoder(resolution 2500ppr)
- 3. Incremental optical encoder includes 6 signals: U V W A B Z respectively. It adopts differential encoder signal output(15-line output generally).
- 4. CN2 is the I/O connector, used to receive control signal from the controller, and output the feedback signal to the controller by return.
- 5. Control signal generally include pulse command signal: PULS+, PULS-, and direction signal: SIGN+, SIGN-, analog speed command signal :AS+, AS-, drive signal: SON etc.
- 6. The feedback signal include encoder signal: A+, A-, B+, B-, Z+, Z-, Z ;signal OC, output signal :CZ, servo drive alarm signal: ALM+, ALM-, etc.

### 3.2 CN1 Encoder Connector

### 3.2.1 CN1 connector view and layout

CN1 is the encoder connector for the motor, which named as DB26M.Please refer to the layout from the below Figure 3-1.



Figure 3-1 The view and layout of the CN1 encoder connector interface

### 3.2.2 Signal definition for CN1

PIN No.	Identification	Description
1	A+	Encoder signal A+
9	A-	Encoder signal A-
2	B+	Encoder signal B+
10	B-	Encoder signal B+
3	Z+	Encoder signal Z+
11	Z-	Encoder signal Z+
14	U+	Encoder signal U+
6	U-	Encoder signal U-
13	V+	Encoder signal V+
5	V-	Encoder signal V-
4	W+	Encoder signal W+
12	W-	Encoder signal W-
7	+5V	Power supply 5V
8	GND	GND for power supply
15	PE	Shielded wire

Table 3-1 Signal definition for CN1

### 3.3 CN2 Connector View and Layout

CN2 is the signal I/O connector, please refer to the view and layout from the below Figure 3-2.



Figure 3-2 The view and layout of the CN2 I/O connector

### 3.4 Signal Definition of CN2 Connector

Table 3-2	CN2 Signal	definition
	0	

Termin	Terminal	Description	
al No.	Identification		
19	OA+		
10	OA-		
11	OB+	Encoder signal output A, B, Z (Line-driver output). The	
1	OB-	motor encoder signals are available through these	
2	OZ+		
12	OZ-		
4	CZ	Encoder signal Z open-collector output.	
6	DGND	Encoder digital signal ground	
16	COM+	power input (DC 12-24V) positive end	
14	SON	<ul> <li>Servo drive enable signal input terminal:</li> <li>SON ON: enable the drive.</li> <li>SON OFF: drive disabled and the motor is in free status.</li> <li>Note 1: The motor must be still before enabling the drive.</li> <li>Note 2: Any other command should be inputted after the</li> <li>SON on signal for 50ms</li> </ul>	
17	ZCLAMP/ CLE/SC1	In the speed control model when PA23=1 the input terminal is defined as the zero speed clamping function. When PA4=0 the terminal is defined as deviation zero reset function The input terminal is defined as the speed command selection SC1 in the speed control model (PA4=1) when the parameter PA23=0	

8	SC2	The input terminal is defined as the speed command selection in the speed control model when PA4=1 and PA23=0. Used to select the different internal speed through the combination of SC1 and SC2. SC1 OFF, SC2 OFF: internal speed 1. SC1 ON, SC2 OFF: internal speed 2. SC1 OFF, SC2 ON: internal speed 3. SC1 ON, SC2 ON: internal speed 4.	
7	ALRS	Clear alarm signal	
23	DOCOM	I/O signal output ground	
21	ALM	Servo Alarm signal	
22	BRK	Break release	
20	In the position control mode (PA4=0), COIN is activated when the position error is equal below the setting value of PA16. In the speed control mode (PA=1), COIN will be activated when the drive has detected motor has reached the Target Rotation Speed setting defined in parameter PA28.		
13	AS+	Motor speed command:	
3	AS-	-10V~+10V, corresponds to -3000~+3000 r/min command and the input impedance is 10KΩ	
5,15	AGND	analog signal ground	
26	PULS+	Position Pulse Input	
18	PULS-		
24	SIGN+	Position Sign Input	
25	SIGN-		
9	PE	Shielding earth cable	

### 3.5 I/O Interface

#### 3.5.1 Digital signal input interface

Digital signal input interface circuit is generally composed by optocouplers, switches, relays, open-collector transistors or other components as shown in the following diagram(3-3).



Diagram 3-3 Digital signal input interface circuit type 1

1. The voltage of the external power is DC12~24V and available current should be 100mA at least.

2. Ensure that the polarity of the power is correct, otherwise it will damage the drive.

### 3.5.2 Digital signal output interface

The digital signal output interface circuit is connected with optocoupler or optocoupler and relays together, achieve the transferring of the isolated digital signal.



Diagram 3-4 Digital signal output interface circuit type 2

1. The voltage of the external power is DC5~24V.

2. The output form of optocoupler is open-collector, the max current is 50mA and the external max DC voltage is 25V.

3. When inductive components (i.e relays) are on load, please parallel fly-wheel diode at each end of the component, ensure the correct connection of the polarity, otherwise, it may damage the drive.

### 3.5.3 Pulse command input interface

The drive can run two different types of pulse inputs: Line-drive input and Open-collector input. The maximum input frequency of line-drive input is 500Kpps,with strong anti-jamming capability, while the Open-collector input type is 200Kpps.In order to ensure reliable signal transition, the Line-drive input circuit is recommended.

1. Diagram for Line-drive input circuit

In the Line-drive mode, AM26LS31,MC3487 or RS422 is used in the Line-drive output circuit of the host controller.



Diagram 3-5 Pulse input interface circuit type 3 (Line-drive input circuit)

2. Diagram for Open-collector input circuit

The source of pulse input is open-collector PNP equipment which applies the external power of the servo drive. Please pay attention to the power polarity, incorrect connection may damage the drive.

By adopting the open-collector input circuit, it reduces the motion frequency, the driving current of the circuit is between 10~15mA, users can calculate the resistance value of R according to the power supply voltage.





### 3.5.4 Analog signal input interface

There are two different input circuit types of analog signal: differential input mode

and single-ended input mode. It is recommended to use the differential input circuit as it can inhibit the common-mode interference.

The valid voltage range of analog input command in speed and torque mode is  $-10V \sim +10V$ , and the input impedance is  $10K\Omega$ . The command value can be set via relevant parameters. The zero drift of the analog signal could be compensated by adjusting the parameters.



Diagram3-7Analog signal input interface circuit type 4 (differential input mode )



Diagram3-8 Analog signal input interface circuit type 4 (single-ended input mode)

1. Three connecting wires are needed in differential input mode, but only two connecting wires required in single-ended input mode.(The wires mentioned here means the wire from the analog generator.)

Note: under the single ended input mode, the short-circuit is not pre-designed inside of the servo drive in order to avoid the potential interference. Users need to create the short-circuit for CN2 side.

2. The voltage of the signal should not exceed the specified range (-10V~+10V) or it may damage the drive.

3. This interface is a non-isolated input interface, so the shielded cable is recommended to reduce the noise interference.

#### 3.5.5 Encoder signal output interface

The servo drive output the motor encoder feedback position signals by Line-drive transmitter chip AM26LS31 to the controller signal input end. The user could receive the encoder A, B and Z phase signals by two types: Line-drive receiver chip and the

high-speed optocoupler.

The host controller receives the encoder signals by Line-drive receiver chip. Please refer to the wiring diagram from the below Diagram 3-9



Diagram 3-9 Encoder position signals output interface circuit type 5 (Line-drive)

The value of the resistance is  $220\Omega \sim 470\Omega$ , and the command ground (GND) of the encoder should connect with the signal ground of the host controller.

When the host controller is receiving the signal by high speed optocoupler, series resistor is required to be added at the input end of host controller, resistance value is  $220\Omega$  approx. Detailed circuit please refer to the below Diagram 3-10.



Diagram 3-10 Encoder position signals output interface circuit type 5 (optocoupler)

#### 3.5.6 Encoder open-collector Z-pulse output interface

The drive transmit encoder zero position signal Z to the host controller via open-collector output interface mode. The width of the zero position pulse is narrow, therefore the high-speed optocoupler is recommended as the receiver. This interface is a non-isolated input interface, the maximum current is 50mA and the maximum voltage is 30V. The specific interface circuit is shown as the following.





#### 3.5.7 Encoder feedback signal input interface

The servo drive adopts AM26LS32 or equivalent IC encoder to receive the feedback signal, the detailed circuit please refer to the below Diagram 3-12.



Diagram 3-12 Encoder feedback signal input interface circuit type 7

### 3.6 Standard Connection Example

#### 3.6.1 Position control mode



Diagram 3-13 position control mode

#### Motor ٩ DRIVER R 3 PHASE U U 2 S $\mathcal{O}$ AC220V V V 3 $\sim$ Т ю W W 4 QF KM r PE 1 t CN2 CN1 DC12-24V **CON+** 16 7 2 5V £ 4.7k $\Omega$ 8 OV ┢┱╍Ҳ 3 5 SON SON 14 $\phi - \Box$ 1 OA+ 4 ┢┱┲╺╤Қ ŒЕ ŒЕ 17**∲**-⊡ 9 OA-7 ▲\*\*< SC2 SC2 8 6-0 2 0B+ 5 ৾৾৾৾য়ৼ৾ৼ৾৾৻ ALRS ALRS 7 10 0B-8 3 6 0Z+ 26LS32 RX CN2 encoder 9 OZ-11 ALM ← ALM 21 10 ₽:≰ 14 $U\!\!\!+$ 6 U 13 BRK **BRK** 22 $\triangleleft$ 13 V+ 11 $\nabla$ 5 V-14 COIN ↔ **COIN** 20 4 12 ₩+ $\nabla$ 12 ₩-15 15 PΕ 1 DOCOM ↔ DOCOM 23 CN1 metal case CN2 AS+ 13 input of AS (-10V~+10V) AS-3 10k GND -AGND 5 h 0N2 OA+ A ∢ 19 А Ā OA-10 4 26LS31 В 4 0B+ 11 ·B ТΧ Β 0B-1 4 Ζ OZ+ 2 4 Ζ Ż 0Z-12 4 Z(0C) ↔ CZ 4 DGND 🔶 DGND 6 DGND ΡE ON2 metal case

#### 3.6.2 Speed / torque control mode

## Chapter 4 Panel Display & Operation

This chapter describes the panel status and basic operations of the digital keypad.

### **4.1 Panel Description**

The operation panel is composed by an LED display panel, and 4 functional keypads, for the use of displaying current status of the drive, and setting parameters etc. Please refer the key functions from Table 4-1 and overview of the panel from Figure 4-1



Figure 4-1 Display Panel overview

Table 4-1	Function	descriptions
		accompaction

Symbol	Name	Function		
Power	Power	The LED light indicates the control power is		
	supply	applied to the circuit.		
Run	Running	The LED light indicates the main power is applied		
	status	to the circuit and the drive is OK to be started.		
	Up key	Pressing the Up and Down key can scroll through		
▼	Down key	various parameter settings.		
•	Return key	Pressing the Return key can exit the menu or cancel the operation or the settings.		
Enter	Set	Pressing the Set key can enter the menu or save		
		the operation /the parameter settings.		

Note :The 6 segment LED display is blinking means there is a failure or alarm.

### 4.2 Main Menu

As the first layer of the operation panel, the main menu consists six sections. You can use the Up and Down key to change the content of the main menu display and press the Set key to enter the secondary menu, you can also press the Return key to quit the secondary menu and back to the main menu.



Figure 4-2 Flowchart for the main menu of the operational processes

### 4.3 Monitoring Display (DP--)

Press the Up and the Down key to find the monitor display from the main menu. When "dp-" is displayed, please press the Set key to enter the monitor mode. There are 19 kinds status for the monitor display, details shown in the following Diagram .Use Up and Down key to select the display and press the Set key to enter the specific monitor and display interface.



Diagram 4-3 The operational process of the monitor display

### 4.4 Parameter Setting (PA--)

Find the "PA-" on the main menu by using the Up and Down key, and then enter the parameter selection interface by pressing the Set key. By using the Up and Down key

you can select the parameters according to your requirement, and then press the Set key to enter the parameter modification interface. When the parameter is being modified, the LED digital display is ON, that means you are in the process of changing the parameters but they are not yet being activated. Press the Set key to save them and the light will go off. Press the Return key to cancel the settings if required.



Diagram 4-4 Operation process of parameter settings

### 4.5 Parameter Management (EE--)

Find the "EE-" from the main menu by using the Up and Down key, and then enter the parameter management interface by pressing the Set key. The functions and descriptions of each symbol are shown in the Diagram 4-5. By using the Up and Down key you can select the operations according to your requirement. Press and hold the Set key for 3 seconds, when "FINISH" is displayed on the LED panel, it means the operation is completed. But if it displays "Error", it means the operation failed, please press the Return key to cancel.



Diagram4-5 Operation process of parameter management

- EE-set Parameters write: It indicates that all the parameters will be stored in the EEPROM parameters district, power-off is not going to lose the saved settings.
- EE-rd Parameters read: you can read the parameters from EEPROM district, modify the parameters according to your request, however,when the power goes off, your revised data won't be saved.
- EE-rs Parameters restore: you can read the data from the EEPROM parameter list, do the changes according to your requirement, perform a write operation to save the revised parameters permanently.
- EE-def Restore the default parameters: when the parameters are disordered or changed improperly, you can bring all of the defaults into the parameter list, and then write the parameters into the EEPROM. After this operation, you should ensure that the motor code (PA1) is matching with the motor you are using.

### 4.6 Speed Trial Run Without Load (Sr--)

You can enable the "Sr" operation mode by set parameter PA4=3. Find the "Sr-" on the main menu by using the Up and Down key, and then enter the speed trial run operation interface by pressing the Set key. This mode will display an "s" and "Sr 0.00", the speed unit is r/min, input the speed command by pressing Up or Down key.



Figure 4-6 Speed trial (off load) display

### 4.7 JOG Trial Run Without Load (Jr--)

You can enable the "Jr" operation mode by set parameter PA4=4 and change the JOG speed command by setting parameter PA 21. You can find the "Jr-" on the main menu by using the Up and Down key, and then enter the JOG trial run operation interface by pressing the Set key. When "J 0.0" is displayed (unit is r/min), press Up or Down key to jog the motor CCW or CW direction. The motor will rotate according to the given speed command.


Figure 4-7 Jog trail run without load

### 4.8 Analog Zero-offset Adjustment (AU)

By performing the following operation, the drive can automatically detect the zero bias of the analog speed or torque command, and write the value in the parameter PA45 or PA39. After that, the drive will save the parameter in the EEPROM automatically. You can find the "AU-" from the main menu by using the Up and Down key, and then enter the operation interface for Zero-offset adjustment by pressing the Set key. The AU-SPD correspond to the speed zero-offset adjustment and the AU-trq correspond to torque zero-offset adjustment. Select the process by Up or Down key, and then press and hold the Set key for 3 seconds till the LED displays "FINISH".



Figure 4-8 Operations of analog zero-offset adjustment

# **Chapter 5 Trial Run and Tuning**

This chapter describes trial run for servo drive and motor, including the trial run without load and introductions about the operation mode of the drive. Please always make sure that you perform a trial run without load first, before an on-load running/operation.

# 5.1 Inspection Without Load

In order to prevent accidents and avoid any potential damages to the servo drive and mechanical system, the trial run should be performed without load. Please remove the load of the servo motor, including coupling on the shaft and accessories so as to avoid any damage on servo drive or mechanism. This is aiming to avoid the falling off of the disassembled parts of the motor shaft and indirectly causing the personnel injury or equipment damage during operation.

Always remember to perform the trial without load first before you connect the drive with power supply.

Before the trial run (without load), please inspect the following points carefully:

1. Check the drive and motor appearance to see whether or not there is any obvious damage.

2. Check all the wiring to see if they are correctly connected, especially R, S, T, U, V, W and PE terminal. The terminals should be connected with the specified cables.

3. Ensure that there are no extra things inside the drive, such as conductive objects and flammable objects.

4. Confirm that the electromagnetic brake is working normally if brake is required.

5. Please make sure the external voltage level of the servo drive is correct.

6. Make sure that the cable and the mechanical parts are not intertwined, to avoid wear or pulling phenomenon at the run time.

7. Ensure that the servo drive and motor are well connected to the ground.

Please pay attention to the following notes when you are undertaking the trial run.

1. Please check if there is any abnormal display of the power indicator and LED display panel.

2. Ensure that all user-defined parameters are being set correctly. The

characteristics of different machinery equipment differ from each other, in order to avoid accident or cause potential damage, do not adjust the parameter abnormally and change parameter to an excessive value.

3. Make sure that the servo drive is off when you set parameters.

4. Check the vibrations and sound during operation. If the servo motor is vibrating or there are unusual noises while the motor is running, please contact your local distributor or manufacturer for further assistance.

5. Please make sure that all the relays are working properly, contact our local distributor or us directly if there is any abnormal case.

#### 5.1.1 Apply power to the drive

Turn on the control power supply (leave the main power off at the moment), the LED indicator should be lighted, if there is any alarm displayed on the panel, please check the wiring.

Next, connect the main power supply, the RUN indicator should be on, if not or there is any alarm, check the wiring, or replace your drive.

#### 5.1.2 JOG trial run without load

It is very convenient to use JOG trial run without load to test the servo drive and motor as it doesn't require an extra wiring. In order to ensure a safe trial run, it is recommended to set JOG speed at low speed level such as 100r/min. The JOG speed could be set in the parameter PA21.

#### 1. Parameter settings

Table 5-1 Parameter setting table of the JOG trial run

Parameter NO.	Name	Default	Setting	Description
PA04	Control Mode	0	4	Select the operation mode as JOG trial running mode.
PA20	Inhibit Drive Function	1	1	Ignore the drive prohibition
PA21	JOG speed	120	100	Speed command selection
PA40	Acceleration Time	0	Opportune	Reduce the acceleration Shock.

HSD2 Series AC Servo Drive

PA41	Deceleration Time	0	Opportune	Reduce the deceleration Shock.
PA53	Enabled Word 1	1	1	Enable the drive without the external force

#### 2. Operation

Step 1: Set the parameter PA53=0001, the servo drive is activated, indicator Power and Run is on light, both the drive and motor are in a zero speed running status.

Step 2: Set parameter PA21 as JOG speed. After the desired JOG speed is set, and then press the Set key, the speed will be written into the control software.

Step 3: Enter the JOG operation interface by using the digital keypad, and the digital LED display should be displayed as the following:

**J 0.0** (r/min)

Step 4: Press the Up key and the servo motor will run in CCW direction. After releasing Up key, the motor will stop running.

Step 5: Press the Down key and the servo motor will run in CW direction. After releasing Down key, the motor will stop running.

Step 6: Press Return key, the drive exits JOG operation mode.

CCW and CW definition.

CCW (): Face the servo motor shaft, CCW is running in the counterclockwise direction.

CW (): Face the servo motor shaft, CW is running in clockwise direction.



Figure 5-1 JOG trial run without load

#### 5.1.3 Speed trial run without load

Before you perform this operation, please ensure all the parts and basement are properly tightened and secured with the servo drive and motor. During the high speed running, any unsecured parts can cause malfunction and personnel injury.

#### 1. Parameter setting

Parameter	Name	Default	Setting	Description
PA04	Control mode	0	3	Select the operation mode as speed trial running control mode.
PA20	Inhibit Drive Function	1	1	Ignore the drive prohibition
PA53	Control word 1	1	1	Enable the drive without the external signal

Table 5-2Parameters for the speed trial run

### 2. Operation

Step 1: Set the parameter PA53=1the servo drive is activated, indicator Power and Run is on light, both the drive and motor are in a zero speed running status.

Step 2: Set parameter PA04 =3, choose the speed trial running mode as the current mode.

Step 3: Enter the speed trail run operation interface by pressing the UP and DOWN key, the minimum given vale is 0.1r/min.Use the Up or Down key to select the "Sr" mode on the main menu, and the press the Set key to enter the operation interface for the speed trial running. And the LED display should be shown as the following:

S 0.0 (r/min)

Step 4: By pressing the UP and DOWN key, you can change the running speed as well as the running directions (CCW, and CW).



Figure 5-2 Speed trial run

## **5.2 Position Control Mode**

The position control mode is usually used for the applications requiring precision positioning, i.e, industry positioning machine. Before position trial run, please carry out the following inspections:

1. Ensure that all wiring is correct and wiring terminals of the servo drive and motor are correctly insulated.

2. Ensure all the parts and basement are properly tightened and secured with the servo drive and motor. During the high speed running, any unsecured parts can cause malfunction and personnel injury.

#### 5.2.1 Simple position control system

A simple position control system only requires two sets of position pulse command signals, drive enable signal, prohibited drive signal, servo ready and servo alarm output signals. Please refer to the wiring from the below Diagram 5-3.





Note: In section 3.6.1, you can find the detailed wiring diagram for the position control system.

# 5.2.2 Parameters for the position control

е

Parameter NO.	Name	Value range	default	unit
PA04	Control mode	0~-5	0	
PA09	Proportional Position Loop Gain	1~1000	130	Hz
PA10	Position Feed Forward Gain	0~100	0	%
PA11	Filter time Constant of PA10	0~1000	0	ms
PA12	Pulse command Electronic Gear Ratio (Numerator) N1	1~30000	1	
PA13	Pulse command Electronic Gear Ratio (Denominator) M1	1~30000	1	
PA14	External Pulse Input Type	0~2	0	
PA15	Direction of external pulse	0~1	0	
PA16	Positioning Completion range	0~30000	20	
PA17	Position error Range	0~30000	400	100 pulse
PA18	Position Error Invalid control bit range	0~1	0	
PA19	Position command Smooth filter	0~30000	0	0.1Ms
PA20	Inhibit Drive Function Selection	0~1	0	
PA53	Digital Input Terminals Function Selection / Enabled Word 1	0~1	1	

#### Pulse command input type

Pulse Type	Forward	Reverse	PA14
Pulse	PULS		0
Direction	SIGN		0
CCW + CW	PULS		1
AB Phase Pulse	PULS		2

 Table 5-4
 Type and waveform of position command input type

The host controller uses pulse command to control motor running and positioning via servo drive, in general, there are three different types of pulse outputting from the host controller: Pulse+ direction; CCW+CW;AB phase pulse..

The above three types are applicable with HSD2 series drive, you can select the required mode by setting parameter PA14.The detailed descriptions, please refer to the Table 5-4, the arrows indicate pulse counting, PA15 is used to change the pulse count direction.

Position pulse inputs through the terminals PULSE+(26), PULSE-(18), SIGN+(24), SIGN-(25) of CN2 connector, please refer to the detailed definition and description from section 3.4

#### Filter for position control

The filter is designed to smooth the motion command. You can set parameter PA19 to to achieve pulse filtering under the following circumstances: when the host controller doesn't have accelerate or decelerate function, electronic gear ratio set value being too high; system load inertia being high or command frequency value is low. By using the pulse filter, you can have a more stable and smooth pulse frequency, avoid position command lose, however, this performance will delay command reactions. When PA19=0,it means the filter is being disabled. This parameter indicates the time for position frequency varies from 0-63% of the external pulse frequency. The pre and after filtering diagram comparison, please refer to the following Diagram 5-4.



Diagram5-4 Comparison waveform between Pre and after filtering

#### 5.2.3 Electronic gear ratio

Electronic gear provides simple ratio change of travel distance. The high electronic gear ratio would cause the position command to be the stepped command.

Please follow the below rules for setting:

- N1: Numerator of the electronic gear ratio (PA12)
- M1: Denominator of the electronic gear ratio (PA13)
- P1: Number of pulses corresponding to 1mm in the host controller
- F2: Number of encoder pulses per circle
- S1: Screw pitch of the mechanical transmission (mm)
- F1: Number of pulses required by actual moving distance 1mm.

F1=N1\*P1/M1 (pulses / mm)

F1=F2/S1 (pulses / mm) for actual moving distance without gearbox

Therefore the electronic gear ratio N1/M1 is equal to F2/(S1\*P1).

For example, if P1 of the host is 1000 pulses/mm, F2 of the H series servo drive is 10000, S1 of the screw is 6mm, the electronic gear ratio N1/M1=10000/( $1000^{*}6$ )=5/3. So you can set the parameter PA12 (N1)=5 and the PA13 (M1)=3.

If there is a gearbox between ball screw and motor, the ratio of the gearbox is N2/M2;

N2: rotation number of the motor

M2: rotation number of the ball screw

F1=N1\*P1/M1 (pulses / mm) for host controller

F1=F2\*N2/(S1\*M2) (pulses / mm) for actual moving distance with gearbox Therefore the electronic gear ratio N1/M1 equals to F2\*N2/(S1\*P1\*M2).

For the above-mentioned example, if the ratio of the gearbox is N2/M2=5/3.

According to the formula, the electronic gear ratio N2/M2=10000\*5/(1000\*6\*3)=25/9. So you should set the parameter PA12 (N2) =25 and the PA13 (M2) =9 for the mechanical transmission system with a gearbox.



Diagram5-5 Dynamic electronic gear ratio

**Note:** HSD2 series servo drive provides two sets of dynamic electronic gear ratio. The second numerator of the electronic gear ratio is set in the parameter PA 52, and denominator is same as the first one (PA13). When the PA51 equal to 1, the function of the dynamic electronic gear is enabled and the signal connected to pin-15 of the I/O port CN2 could control the switching of the electronic gear. When the level of the signal is low, the servo drive chooses the second electronic gear ratio PA52/PA13.

#### 5.2.4 Position control gain

Before you set the position control unit, please complete the setting of speed control unit manually since the speed loop is included in the position loop. After this operation, you can then adjust the position loop gain PA09 and position feed forward gain PA10 accordingly.

Parameter NO.	Name	Description	Value range	Defaults
PA-09	Position control gain	Increase the gain so as to enhance the response bandwidth of position loop.	0~1000	50
PA-10	Position feed forward gain	Minimize the deviation of phase delay	0~100	0
PA-11	Feed forward smooth filter	Smooth the accelerate and decelerate ,reduce overshoot.	0~1000	0

Table 5-5	The parameters f	for the position	control gain
-----------	------------------	------------------	--------------

Because the positional control loop includes the speed control loop, the position loop bandwidth can be restricted by the one of the speed loop. It is recommended that the speed loop bandwidth should be at least four times faster than the position loop bandwidth. This means that the setting value of the proportional speed loop gain PA05 should be at least four times more than position control gain PA09.

The position loop bandwidth cannot exceed the speed loop bandwidth. It is suggested that  $fp \le fv/4$ .

fv: response bandwidth of speed loop (Hz).

Fp: response bandwidth of position loop(Hz)

KPP (PA09)= 2 × π × fp

For example, the desired position loop bandwidth is 40 Hz.

Then PA09=2\* π \*40=251 rad/s



Diagram 5-6 Flowchart of the position control loop

Increase the value of position loop gain can enhance the position response and reduce position error. If the set value is too high, it may cause vibration and noise.

If the position command is being transmitted smoothly, increasing the gain value can reduce the position error. However, if the position command is not transmitted smoothly, decreasing the gain value can tackle the problem of mechanical vibration.

When the value of proportional gain, (KPP set value) is too big, the response bandwidth of position loop will be increased and diminish the phase margin. And the motor rotor rotates back and forth with vibration. Thus, KPP has to be decreased until the rotor stops vibrating. When the external torque interrupts, the over low KPP (PA09) cannot meet the demand of position deviation. In this situation, adjusting parameter PA10 can effectively reduce the position error.

#### 5.3 Gain Adjustment

Servo drive has three control loops: position control loop, speed control loop and current control loop. Please refer to the below Diagram 5-7 for detailed explanation.

The inner control loop bandwidth should always be higher than the outer control loop, otherwise it will cause motor rotor running back and forth with vibration and noise, affect the actual performance.

Therefore, having correct selection of response bandwidth for each control loop is very crucial. Generally speaking, the current loop has the highest response bandwidth while the position loop has the lowest.

The response bandwidth of the current loop is decided by the system itself, users can't modify this value by themselves. Please set and match the bandwidths for both speed loop and position loop properly through adjusting.



Diagram 5-7 Servo closed-loop control

### 5.3.1 Steps for gain adjustment

Since the motor load inertia, stiffness, damp ratio differ from the environment or application changes, the system default settings are not good enough to ensure a perfect response and cover all the circumstances. Therefore, adjusting the speed and position respond bandwidth according to each application is quite necessary to achieve a good performance from the servo system.

As for the whole system, when you change one of the parameters, the relevant ones also need to be modified accordingly, please do not set some excessive values and follow the below operation rules respectively:

	Reduce vibration or overshoot	Increase response speed	
Step 1	Decrease the proportional position	Increase the proportional speed	
	control gain PA9	control gain PA9	
Step 2	Increase the integral time of the	Decrease the integral time of the	
	speed control PA6	speed control PA6	
01	Decrease the proportional speed	Increase the proportional position	
Step 3	control gain PA5	control gain PA9	

Table 5-6 steps and rules for parameters setting

#### 5.3.2 Gain adjustment for speed control loop

You can adjust the relative speed control loop gain according to the following steps: Step 1: Increase the integral time of the speed control loop PA6 Step 2: Gradually increase the value of the proportional speed control loop gain PA5 setting without causing major vibration or noise ,if this does occur, please decrease the gain setting value properly.

Step 3: Gradually decrease the integral time of the speed control loop PA6 until the resonance occurs, and then increase the setting value to eliminate the vibration.

Step 4: If the mechanical system resonates at a certain point, it's impossible to get a very good system response performance. In this case, please adjust the torque value PA7 for the low-pass filter to suppress the resonance, repeat the above steps to achieve a better response characteristic for the position and speed control loop.

#### 5.3.3 Gain adjustment for position control loop

If the inertia of the machinery and conditions of applications is too high, and it creates system resonance, you can adjust the relative parameters according to the following steps:

Step 1: Increase the integral time of the speed control loop PA6

Step 2: Gradually increase the value of the proportional speed control loop gain PA5 setting without causing major vibration or noise ,if this does occur, please decrease the gain setting value properly.

Step 3: Gradually decrease the integral time of the speed control loop PA6 until the resonance occurs, and then increase the setting value to eliminate the vibration.

Step 4: Gradually increase the value of proportional position loop gain until the resonance occurs, and then decrease the setting value to eliminate the vibration.

Step 5: If want to shorten position control time and minimise position error, you can adjust position feed forward gain PA10 and PA11 (the smooth constant of feed forward gain) to achieve it.

Step 6: If the mechanical system resonates at a certain point, it's impossible to get a very good system response performance. In this case, please adjust the torque value PA7 for the low-pass filter to suppress the resonance, repeat the above steps to achieve a better response characteristic for the position and speed control loop.

#### 5.4 Electromagnetic Brake

When operating brake via servo drive, if the digital output BRK is set to off, it

indicates that the electromagnetic brake is disabled and motor is locked. If the digital output BRK is set to ON, it indicates electromagnetic brake is enabled and motor can be operated. The electromagnetic brake is usually applied in Z-axis to reduce the large energy generated from servo motor. In order to avoid the brake error, it must be on when the servo drive if off. The brake has to be activated before the motor stops running (Servo OFF). The brake has to be released after Servo ON. Otherwise, it would become the load of the motor and may damage the brake.

If the brakes is working during the process of acceleration or constant speed, the servo drive needs to generate more current to resist the force of brake and it may cause the alarm of overload warning.

#### 5.4.1 Parameters of electromagnetic brake

The on delay time of the electromagnetic brake is set within the servo drive, except this there are three parameters about the off delay time (speed) of the electromagnetic brake. The users can use these three parameters to set the off delay time of electromagnetic brake.

Parameter	Nama	Value	Defaulta	Unite	Applic
NO.	Name	range	Delaults	Units	able
	Motion delay time of				A 11
PA47	electromagnetic brake when	0~200	0	10ms	
	motor is still				
	Motion delay time of				A 11
PA48	electromagnetic brake when	0~200	50	10ms	
	motor is running				
	Motion speed for				A 11
PA49	electromagnetic relay when the	0~3000	100	r/min	
	motor is running.				

 Table 5-7
 Parameters for the electromagnetic brake

### 5.4.2 Wiring of electromagnetic brake

Wiring of the electromagnetic brake is shown in the below Diagram 5-8.



### Diagram 5-8 Diagram for electromagnetic brake

The BRK signal controls the brake operation. The VDD DC24V power supply supplied externally should be used to power the relay coil. When BRK is on, the motor brake is activated. Please note the coil of the brake has no polarity, while the diode has polarity, please ensure the polarity of the diode is correctly matched or it may cause damages to the drive. Power supply for brake is DC24V. Never use brake power and control power (VDD) at the same time.

Timing diagram of electromagnetic brake control:



Diagram 5-9 Timing diagram of brake control

BRK output timing explanation:

1. when servo off ( when DI SON is not activated), the BRK output goes off (electromagnetic brake is locked ) after the delay time set by PA48 reached and the motor speed is still higher than the setting value of PA49.

2. when servo off ( when DI SON is not activated), the BRK output goes off (electromagnetic brake is locked ) if the delay time set by PA48 has not reached but the motor speed is still lower than the setting value of PA49.

# 5.5 Timing

#### 5.5.1 Timing for power supply

Step 1. Control power supply should be turned on earlier than the main power, or simultaneously.

Step 2. When the main power is turned on, it delays for about 1.2s. The servo SYDY signal is ready, then the servo drive is able to receive enable signal (SON) from host controller. When the drive detects SON signal, main circuit can be activated, the motor is now in a operational status. If the serve drive detects the invalid SON signal or there is any alarm, main circuit will be disabled and the motor will be in a zero-speed status.

Step 3. Please try to avoid switching the system power on and off too often.



Diagram5-10 Timing flowchart of control power and main power

**Note:** Even if the host controller output the SON signal before the SRDY signal of the drive, the servo drive couldn't receive the SON until the SRDY signal is ON for 5 ms.

#### 5.5.2 Timing for enable operation

1. Enable operation ON/OFF timing for standstill motor

When the motor is still, if the SON is OFF, the main circuit continues to work to hold the position, the brake is going through the stage of OFF-ON-OFF, wait for a while(PA47 setting value) and disable the power supply for the motor.





2. Enable operation ON/OFF timing when the motor is running

When the motor is running, if the SON is off, the main circuit of the drive will be disabled and the brake continues to be ON before it turns OFF because of the delay. In this way, we can avoid the potential damage to the brake when the motor is still running at a very high speed. The actual delay timing is decided either by parameter PA48 or the time for the motor to be slowed down to the set value of PA49, the lower one of the two numbers is the actual delay time.





## 5.5.3 Servo enable & servo alarm flowchart

1.servo enable & servo alarm timing flowchart when the motor is in static status:



Note: when the motor is in a static status, an error occurs, it will trigger the servo alarm, servo enable OFF very instantly, this will cut off the power at the same time. If you want the brake to work instantly, you need to set PA47=0.

servo enable & servo alarm timing flowchart when the motor is in the running status.



Note: when the motor is in a running status and there is an error and it triggered the servo alarm, servo enable will be off very instantly, power will be cut off at the same time. The motor may be running at a high speed when the alarm triggers, in this case, if the brake is enabled to stop the motor at a high speed, it may damage the brake. Therefore, we have PA48 and PA49 two parameters to avoid the potential damage. PA48 is the brake response delay time, PA49 is the set motor speed for the brake to enable. The brake will work if one of these parameters reached it's set value.

If the motor is applied on the vertical axis of the equipment/machine, and it doesn't allow any degree of free-fall of the motor, set PA48=0,and the brake will be working straight after the alarm triggered.

If the applied equipment can allow a certain distance of free-fall for the motor, you can set proper values for PA48 & PA49, the brake will be enabled until the motor speed slows down to a certain degree(PA49 set value).During the speed slowdown process, the power is in OFF status for the servo, the load inertia slows the motor down in this case. If the time for the motor to reach PA49 set point is longer than PA48, then once it passed PA48 set time, brake enables.

# 5.6 Start & Stop

The drive start/stop characteristics is determined by many aspects, such as load inertia, on/off frequency, the status of both the drive itself and servo motor.

#### 5.6.1 On-off frequency and load inertia

When the servo drive is used in the applications which require high on-off frequency, please confirm whether the frequency is within the rated frequency range of "H" series servo drives before you connect the application. The frequency range is determined by the motor type, the load inertia and the speed of the motor etc. Please refer to the detailed information from Table 5-8.

Inertia multiples	On-off frequency and ACC/DEC time
J≤3J <sub>motor</sub>	f>100 /min; less than 70Ms
J≤5J <sub>motor</sub>	60 <f≤100 130ms<="" less="" min;="" td="" than=""></f≤100>
J>5J <sub>motor</sub>	f≤60 /min; greater than 150Ms

Table 5-8 On-off frequency VS Load inertia

**Note:** The above table only provides the on-off frequency in the general cases, the specific circumstances will vary from the motor types and the load conditions.

#### 5.6.2 Adjustment Method

When the load inertia is five times (or above) greater than the motor inertia, some errors may occur, such as position overshoot, excessive position deviation and speed response fault, break abnormal etc.

Under the above situations, you can take relevant actions according to the following steps:

Step 1: Increase the value of PA5 properly.

Step 2: Decrease the value of PA9 in the meantime. Reduce the inner torque limitation value PA36.

Step 3: Increase the value of the parameter PA40, PA41 and PA42. (ACC/DEC time content) along with the S-curve ACC/DEC time content.

Step 4. Increase the ACC/DEC time content of the host system.

You can also consider of selecting a bigger inertia motor to meet your requirement.

# **Chapter 6 Parameters**

## 6.1 Parameter Summary

The defaults of the following parameter table is shown as an example of HSD2-030 drive. The value of the parameters marked "\*" may be different from other types.

In the table, Applicable Mode means that the parameter can play a role in a certain control mode: P refers to position control mode, S refers to speed control mode, T refers to Torque control mode and ALL refers to all of the control mode(position, speed and torque control mode).

Input password parameter PA0 =315, you are able to set all parameters except for PA1.You need to set password PA0 = 302 to do changes about PA1.

		Applicabl			
No	Eurotion Description	Applicabl	Pange	Default	Linit
110.	i difetion Description	e Mada	Tange	Delault	Onit
		Iviode			
PA-0	Password	ALL	1-1000	315	
PA-1	Motor Type Code	ALL	20~200	53*	
PA-2	Software Version(read only)	ALL	0~99999	3.85.19*	
PA-3	Initial Display Status	ALL	0~19	0	
PA-4	Control Mode Selection	ALL	0~5	0	
PA-5	Proportional Speed Loop	P, S	1~5000	280*	Hz
	Gain	., -		200	
PA-6	Speed Integral Time	P, S	1~1000	30*	ms
PA-7	Torque filter	ALL	0~1000	10	0.1ms
PA-8	Speed Detection Filter	ALL	1~1000	10	0.1ms
<b>ΡΔ_</b> 9	Proportional Position Loop	Р	1~1000	100	Hz
177-5	Gain		1 1000	100	112
PA-10	Position Feed Forward Gain	Р	0~100	0	%
DA 11	Smooth Constant of Position	D	0.1000	25	ma
FA-11	Feed Forward Gain		0~1000		1115
DA 12	Electronic Gear Ratio	D	1~20000	1	
FA-12	(Numerator) N1		1~30000		
DA 12	Electronic Gear Ratio	р	1~20000	1	
PA-13	(Denominator) M1	F	1~30000	1	
PA-14	External Pulse Input Type	Р	0~2	0	
PA-15	Direction of External Pulse	Р	0~1	0	

PA-16	Positioning Completed Width	Р	0~30000	20	pulse
PA-17	Excessive Position Error Range	Р	0~30000	400	×100 pulse
PA-18	Excessive Position Error Invalid	Р	0~1	0	
PA-19	Smooth Constant of Position Command	Р	0~30000	1	0.1Ms
PA-20	Inhibit Drive Function Invalid	ALL	0~1	1	
PA-21	JOG Operation Speed	S	-3600~3600	120	r/min
PA-22	Reserved			167	
PA-23	Inner Speed Command selection	S	0~5	0	
PA-24	Inner Speed Command 1	S	-3600~3600	0	r/min
PA-25	Inner Speed Command 2	S	-3600~3600	100	r/min
PA-26	Inner Speed Command 3	S	-3600~3600	300	r/min
PA-27	Inner Speed Command 4	S	-3600~3600	-100	r/min
PA-28	Target Motor Speed	S	0~3600	500	r/min
PA-29	Analog Torque Command Gain(input)	Т	10~100	50	0.1V/100 %
PA-30	Direction of Torque Command	т	0~1	0	
PA-31	Zero-offset Compensation for Torque Command	Т	-2000~2000	0	
PA-32	Max speed limit of Torque Command	Т	0~3600	1000	r/min
PA-33	Reserved			167	
PA-34	Reserved			167	
PA-35	Max speed limit of motor	ALL	0~3600	1000	
PA-36	Internal torque limit	ALL	5~600	300	%
PA-37	Negative torque arrival set point	ALL	5~300	100	%
PA-38	Positive torque arrival set point	ALL	5~300	100	%
PA-39	Min speed limit under analog speed control mode	S	0~1000	3	
PA-40	Time of acceleration for 0 to 1000rpm	S	0~10000	0	Ms
PA-41	Time of deceleration for 0 to 1000rpm	S	0~10000	0	Ms

PA-42	ACC/DEC S-curve duration time	S	0~10000	0	Ms
PA-43	Analog Speed Command Gain	S	10~3000	300	(r/min)/V
PA-44	Direction of Speed Command	S	0~1	0	
PA-45	Zero-offset Compensation for Analog Speed Command	S	-2000 ~2000	0	
PA-46	Low-pass Filter for Speed Command	S	0~1000	3	Ms
PA-47	Motion control for Electromagnetic Brake when motor stops	ALL	0~300	0	×10Ms
PA-48	Motion control for Electromagnetic Brake when motor is running	ALL	0~300	50	×10Ms
PA-49	Speed control for Electromagnetic Brake when motor is running	ALL	0~3600	100	r/min
PA-50	Sampling Gain for Bus Voltage	ALL	10~3000	511*	
PA-51	effective electronic gear ratio	ALL	0~1	0	
PA-52	Electronic gear ratio(Numerator 2)	ALL	1~30000	1	
PA-53	Inside SON enable	ALL	0~1	1	
PA-54	Z signal output pulse width selection	ALL	0~1	1	
PA-55*	AB output dividing factor	ALL	0~1	0	
PA-56	Digital Output effect level	ALL	000~111	000	
PA-57	DO1 function definition(ALM)	ALL	1~5	1	
PA-58	DO2 function definition(COIN)	ALL	1~5	3	
PA-59	DO3 function definition(BRK)	ALL	1~5	4	
PA-60	Reserved			167	
PA-61	Input vibration elimination time constant	ALL	0~100	2	
PA-62	Digital Import effect level	ALL	0000 ~1111	0000	

PA-63	DI1 function definition(SON)	ALL	1~7	1	
PA-64	DI2 function definition(CLE)	ALL	1~7	2	
PA-65	DI3 function definition(SC2)	ALL	1~7	3	
PA-66	DI4 function		1~7	1	
	definition(ALRS)		1.27		

Note1: "\*" next to the parameter numbers means this function may be "reserved" for some models, for instance,PA-55\*, it may not exist or reserved in some models, the detailed information, please consult with our after sales service center or local distributors.

# 6.2 Detailed Parameter Description

# Table 6-2 Detailed description for the parameter settings

NO Name		Eunction description	Value
	Name		range
	Password	1: Password is 315	
0		2: motor type password is 302, you only need this	1~1000
		when you are modifying PA1	
	Motor type	Select the motor type that you are using; in case	
	code	you need to revise this number, input PA0 is 302,	
1		which is the password, finish off your parameters	20~200
		setting, power the drive off and on again then the	
		changes will be effective.	
	Software	Software version read only, you can't change the	
	Version	details, A means the drive power level, B C D E	
		means the different software versions.	
		A=1, 500W;	0~9999
2		A=2, 900W;	9
		A=3, 1.5kw;	
		A=4, 1.5KW;	
		A=5, 2.5KW, A=6, 3.5kW	
	Initial display	Select the display status when the drive has been	
	status	powered on:	
		0: actual motor speed.	
		1:low data of the feedback position	
		2:high data of the feedback position	
		3: Low data of the position command	
		4: High data of the position command	
		5: Low data of the position error	
3		6: High data of the position error	0~19
		7: motor torque	
		8: motor current(Q axis);	
		9: Reserved	
		10: control mode:	
		11: pulse frequency of position command	
		12: Speed command	
		13: Torque command	
		14: Motor feedback current -position.	

		15: D-axis current	
		16: Reserved	
		17: DC bus voltage	
		18: Drive operation status	
		19: Error/alarm code,	
	Control	Select the requested control mode by changing the	
	Mode	following parameters:	
	selection	0: Position control mode, controlling the position	
		command pulse input and output;	
		1: Speed control mode.	
		2: Torque control mode	
		3: Speed trial run control mode, type in the	
		numbers via keypad, users can test the drive and	
Δ		motor.	0~5
-		4: JOG control mode, enter the Jog control	00
		operation panel, press and hold the UP key, the	
		motor will be running at a JOG speed, release the	
		UP key, the motor stops with a zero speed; press	
		and hold the DOWN key, the motor will be running	
		at the JOG speed in a reverse direction, release	
		the DOWN key, motor stops.	
		5:zeroing encoder control mode, set PA4=5 will	
	Drapartianal	Concrethy encedding, increases this value con	
	Spood Loop	Generally speaking, increase this value can	
	Gain	error. The default value is 170. The gain should be	
	Gain	increased if the load inertia is relatively high	1~5000
5		Generally if the load inertia is creater, the value	H7
		should be modified larger. You can increase the	
		gain as much as possible without causing big noise	
		and obvious vibration.	
	Integral Time	The value of the integral time has an effect on the	
	of Speed	response performance of the speed control loop.	
	Control Loop	The lower the value is, the quicker the speed will	
6		be, however, when the value is too low, it may	1~1000
Ö		cause overshoot. Users need to adjust the value by	Ms
		the motor type and load inertia etc. Generally,	
		having a big load inertia requires a bigger value	
		setting.	

	Time	Time constant for torque low-pass filter has an	
	constant of	effect on the response performance of the torque	
	torque low	control. The resonance can be suppressed by	
	pass filter	adjusting this setting. The bigger this value is, the	
		lower the cut-off frequency would be, and this lower	0 1000
7		value will also eliminate the vibration and noise. If	0~1000 ×0.1Ma
		the load inertia is too big, you can increase this	×0.1IVIS
		value slightly without causing obvious vibration and	
		noise. If you require high torque response	
		performance, please decrease this value	
		considerably.	
	Speed	1.the bigger this value is, the lower the cut-off	
	Detection	frequency will be, less produced noise from the	
	Filter time	motor. If the load inertia is being very high, please	
Q	constant	increase this value considerably without causing	1~1000
0		major vibration and noise.	×0.1Ms
		2.Decreasing the value can uplift the cut-off	
		frequency, enhance the speed feedback response	
		performance.	
	Proportional	Increasing this value can improve the response	
	Position	performance and position precision. However	1~1000
9	Loop Gain	excessive value will cause vibration and overshoot.	/S
		The detailed value will be decided by the motor	
	<b>D</b>	type, load inertia etc.	
	Position	Increasing the value can reduce the position track	
	Feed	error, set value 100% means the total position error	
	Forward	is always zero under any frequency pulse. Increase	
10	Gain	this value can enhance the system response	0~100%
		performance, but will make the position loop	
		the act value is 0 unless users require very high	
		the set value is 0 unless users require very high	
	Smooth	This parameter is used to set the time constant of	
	Constant for	Imis parameter is used to set the time constant of	0~1000
11	constant for	function of this low pass filter is to maintain the	0~1000 x0.1ms
	forward	stability of position control	^U. IIII5
	Electronic	Linder the control mode users can matching	
	Gear Ratio	different types of pulse commands and achieve	1~
12	(Numerator)	their desired resolutions (angle/pulse) by adjusting	30000
	N1	PA12 & PA13	00000

		The electronic gear ratio can be calculated as the following :N1/M1 =F2/(S1*P1)	
		P1:Number of pulses corresponding to 1mm in the	
		host controller	
		F2:Number of encoder pulses per circle (Default is	
		10000)	
		S1:Screw pitch of the mechanical transmission	
		(mm)	
		The ideal range of the gear ratio is from 1/50 to 50.	
13	Electronic Gear Ratio (Denominato r) M1	Refer to parameter PA12	1~ 30000
	Position	Note the revised parameters will only be effective	
	command	after you turn the power off and on again in	
	Pulse Input	completion of the changes.	
	Туре	I here are three different types of pulse input:	
14		$\begin{array}{c} 0:  \text{pulse} + \text{direction.} \\ 1  0  0  \text{Minsula} \\ \end{array}$	0~2
		1: CCVV pulse + CVV pulse.	
		2: AB phase pulse.	
		Definitions of CCW and CW: face the motor,	
		clockwise running direction is CCW(positive) while	
	Position	0. Normal direction	
	command	1. Negative direction	<b>a</b> (
15	Pulse		0~1
	Direction		
	Positioning	In PT mode, this parameter is used to monitor the	
	Completed	pulse range for the completion of the position	
	Range	controlling. The servo drive will need to use this	0~
16		value to judge whether or not the position control is	30000
		completed.	pulse
		he on when the leftover pulse of the position error	
		is less then set value of PA16.	
	Excessive	Users can set position error detection range by	0~
17	Position	adjusting this parameter. Under the position control	30000
	Error	mode, if the actual position error exceeds to the set	×100
	Detection	value, the servo drive will send the alarm signal	pulse

	Range		
18	Excessive Position Error selection mode	<ul><li>0: Enable detection function for excessive position error.</li><li>1: Disable the function for detecting the position error.</li></ul>	0~1
19	Smooth Constant of Position Command	<ul> <li>This filter is used to smooth the position command pulse, value means the smooth constant.</li> <li>Command pulse going through the filter won't cause any pulse lose, but result in command delays.</li> <li>When the set value is 0, this means the filter is disabled.</li> <li>This filter will be used under the following circumstances:</li> <li>The host controller does not have a deceleration / acceleration function.</li> <li>The electronic gear ratio is larger than 10.</li> <li>The position frequency is low. ;</li> <li>Step jumping and vibration occur when the motor is running.</li> </ul>	0~ 30000 ×0.1Ms
20	Inhibition Function Selection	0: Enable the inhibition function for both CCW and CW, when the drive inhibition switch(FSTP) is ON, drive inhibition enabled, when it's in OFF status, the CCW torque value maintains at 0.(Same as CW direction operation). If both CCW and CW drive inhibitions are OFF, it will trigger the alarm. Cancel CCW and CW input inhibition, whether the FSTP is ON or off, both CCW and CW are enabled, in the meantime, if you turn both CCW and CW drive inhibitions off, it won't trigger any alarms.	0~1
21	JOG Operation Command	Set the operation speed command for JOG control mode.	-3600~3 600 r/min
22	Torque filtering time constant	*Set the characteristics of torque instruction filter; *Used to suppress resonance generated by torque; *If the moment of inertia of the load is very large, PA22 can be increased appropriately. If the value is too large, the response will slow down, which may	0~1000 *0.1ms

		cause oscillation.	
		*The smaller the value, the higher the cutoff	
		frequency and the faster the response. If a higher	
		torque response is required, the set value can be	
		reduced appropriately.	
	Speed	0: External analog input( analog voltage between	
	Command	AS+,AS- to control the speed)	
	selection	1:select the 1 <sup>st</sup> speed command(determined by PA24)	
		2: select the 2 <sup>nd</sup> speed command(determined by PA25)	
		3: select the 3 <sup>rd</sup> speed command(determined by	
23		4: select the 4 <sup>th</sup> speed command(determined by	0~5
		PA27)	
		5:select the speed command via SC2, SC1	
		SC2=0, SC1=0, select the 1 <sup>st</sup> speed command	
		SC2=0, SC1=1, select the 2nd speed command	
		SC2=1, SC1=0, select the 3rd speed command	
		SC2=1, SC1=1, select the 4th speed command	
	1 <sup>st</sup> Speed	Set inner speed 1	-3600
24	Command		~3600
			r/min
	2 <sup>nd</sup> Speed	Set inner speed 2	-3600
25	Command		~3600
			r/min
	3 <sup>rd</sup> Speed	Set inner speed 3	-3600
26	Command		~3600
			r/min
	4 <sup>th</sup> Speed	Set inner speed 4	-3600
27	Command		~3600
			r/min
	Target Motor	1.this parameter is used to set the targeted speed	
	Speed	value;	
		2.Under the non position control mode, if the	0.0000
28		detected motor speed is over the set value, the	0~3600
		SCMP will be ON, otherwise, the SCMP is OFF.	r/min
		3. There is no need to use this parameter under	
		position control mode	
		4. The motor speed has nothing to do with the	

		rotating directions.	
	Analog	Set the proportional relationship between analog	
	Torque	input voltage and the value of torque command.	
	Command	This function is effective only under the torque	10~100
29	Gain	control mode (PA4=2).	(0.1V/10
		The unit is 0.1V/100%.	0%)
		The default is 50, which means it will produce	
		100% rated torque by inputting 5v voltage.	
	Direction of	0: The direction of the torque is CCW	
20	Analog	1: The direction of the torque is CW	0.4
30	Torque		0~1
	Command		
	Zero-offset	The value is the offset compensation for the analog	
24	Compensatio	signal of torque command.	-2000
31	n for Torque		~2000
	Command		
	Max speed	In torque control mode, this setting will limit the	0~3600
32	Limit under	max running speed of the servo motor.	r/min
	torque mode		1/11111
	DO status	1.monitoring the output level status for the 3 DO	
	monitoring	ports	
		2.Bit0 corresponds to DO1; Bit1 corresponds to	
		DO2; Bit2 corresponds to DO3;Under the default	
33		parameters setting status: bit0=ALR ; bit1=coin;	111
		bit2=BRK	
		3.When Bitx=1,it means the related DO port output	
		high level	
		When Bitx=0, it means the related DO port	
		output low level.	
	DI status	1.monitoring the input level status for the 4 DI ports	
	monitoring	2.Bit0 corresponds to DI1; Bit1 corresponds to DI2;	
		Bit2 corresponds to DI3;Bit3 corresponds to DI4.	
		Under the default parameter setting status,	
34		bit0=SON; bit1=CLE/SC1; bit2=SC2; bit3=ALRS	1111
		3.When Bitx=1,it means the related DI port input	
		high level	
		When Bitx=0, it means the related DI port input	
		low level.	
25	Max speed	Limit the max speed of motor, when you've done	0~3600
- 55	limit of motor	the parameter settings, turn the power off and on	r/min

		again to enable the changes.	
36	Internal	Control the drive torque output,	5~400%
50	torque limit	T max=PA36*T rated *1%.	0 40070
37	Negative torque arrived set point	When negative torque arrived at the set point, the TRQL signal output is active.But this value should not considered as the limited negative torque set point, the torque limit should be set by PA36.	5~300%
38	Positive torque arrived set point	1.Under the position control mode,PA38 is set as the positive torque arrived at the set point,theTRQL signal output is active. But this value should not considered as the limited positive torque set point. 2.under the trial run (PA4=3) and Jog mode(PA4=4), PA38 is the limit parameter of the max torque output.And the max drive output torque will be the lower value between PA36 & PA38.	5~300%
39	Min speed limit for Analog speed control mode	PA4=1 means it's in analog speed control mode, this parameter is used to control the min speed of the motor.	0~1000 r/min
40	Acceleration Time	<ol> <li>1.set value indicates the acceleration time for the motor to reach the speed from 0 to 1000r/min.</li> <li>2.It has a linear feature.</li> <li>3.Only used under the speed control mode.</li> <li>4.If the drive is being used together with the external position loop, please set PA40=0.</li> <li>5.This parameter is effective when PA4=1 or PA4=4.</li> </ol>	0~1000 0Ms
41	Deceleration Time	<ul> <li>1.set value indicates the acceleration time for the motor to reach the speed from 0 to 1000r/min.</li> <li>2.It has a linear feature.</li> <li>3.Only used under the speed control mode.</li> <li>4.If the drive is being used together with the external position loop, please set PA40=0.</li> <li>5.This parameter is effective when PA4=1 or PA4=4.</li> </ul>	0~1000 0Ms
42	Acc/Dec S-curve	Stabilize the motor start-up and stop, set the S-curve continuous time for acceleration or deceleration. This parameter is effective when PA4=1 or PA4=4.	0~1000 0Ms

	Analog	Set the proportional relationship between analog	
	Speed	input voltage and the speed command.	10~300
43	Command	Only when PA4=1 and PA23=0, or PA4=2, the	0
	Gain	function is active.	r/min/V
	Direction of	Select the direction for the external speed	
	analog	command.	
11	Speed input	0: When analog speed command is positive, the	0-1
44	Command	speed direction is CCW.	0~1
		1: When analog speed command is negative, the	
		speed direction is CW.	
	Zero-offset		
	Compensatio	This is the analog speed command zero speed	-2000
45	n for Analog	clamp value.	~2000
	Speed		
	Command		
	Low-pass	1.this is a low-pass filter working on analog input.	
	Filter for	2.Increase the set value will down grade the	
	Analog	response performance but eliminate the hoise	0 4000
46	Command	Impact to the signal.	0~1000
		source under the following	1115
		1 $PA_{-1}$ and $PA_{-2}$	
		2 PA4=2	
	Enable		
	Delay time of	Set the delay time between output terminal(BRK)	
47	the	ON to OFF and the actual current cut-off.	0~300
	electromagn	I his value shall not be lower than the mechanical	×10Ms
	etic Brake	brake delay time.	
	Disable	Set the delay time between current cut-off and	
	Delay	output terminal(BRK) OFF to ON. When the motor	
48	Time of the	is running at a very high speed, wait until it slows	
	electromagn	down and enable the brake will protect the brake	0~300
	etic Brake	from potential damage. The actual time is the	×10Ms
		lowest one between PA48 and the required time for	
		the motor to decrease the speed to the set value of	
		PA49.	
	Droke	Cat the broke working and draw assument as to fit to	0.000
49	operating	set the brake working speed from current cut-off to mechanical brake enabled (output terminal RRK	0~3600 r/min
	peraing	meenamea blake enabled, (output terminal DRK	1/11111

	speed when	from ON to OFF)						
	the motor is							
	Sampling	It is used to compensate the voltage offset for the						
50	Gain for Bus	input DC Bus. This parameter is not allowed to be	10~300					
	Voltage	changed.	0					
51	Dynamic Gear ratio	0:dynamic gear ratio invalid, the function of the input terminal INH is to disable the pulse command, gear ratio is decided by PA12/PA13 1:dynamic gear ratio is effective, the function of the input terminal INH is to switch over the gear, when INH is in an invalid electric level,(valid electric level is set by PA62), gear ratio is decided by PA12/PA13, when INH is in an valid electric level, the gear ratio is PA52/PA13.	0~1					
	Electronic							
52	gear	The function is the same as PA12, only effective						
	ration( numer	when there is INH signal.						
	ator)							
52	SON Force	0: the drive can't be force enabled.	0.1					
55	nosition	T.the drive can be force enabled.	0~1					
	Z output	0: output original Z pulse signal without processing						
	pulse	1:output Z pulse signal with a bandwidth min	<b>.</b>					
54	bandwidth	0.2ms.	0~1					
	select							
	Position	0:output original AB pulse signal						
	encoder AB	1,AB signal output bandwidth is 10.						
55*	signal output		0~1					
	dividing							
		This parameter is to define the electric level of						
	effective	output terminals BRK COIN AI M						
	electric level	Symbol DO3 DO2 DO1						
		default (BRK) (COIN) (ALM)						
56		Control	000~111					
		position PA56.2 PA56.1 PA56.0						
		PA56 2-0 RPK offective level is low:						
		PA56.1=0,COIN effective level is low;						
----	-----------------	----------------------------------------------	----------------------------------------	---------------	--------------------------	---------------	-----------	--------
		PA56.1=1	PA56.1=1,COIN effective level is high.					
		PA56.0=0	,ALM eff	ective lev	vel is low	';		
		PA56.0=1	,ALM eff	ective lev	vel is hig	h.		
	DO1(ALM)se	DO has	three	actual	output	terminals	, four	
	If define	functions:						
		PA57=1,D	001 is fin	ed as AL	.M; servo	o is alarm	;	
		PA57=2,D	01 is de	fined as	SRDY: s	servo is re	eady:	
57		PA57=3,D	)O1 is	defin	ied as		N;when	1~5
		PA4=0,CC	DIN m	eans p	osition	reache	d,when	
		PA4=1, it	means s	peed rea	ched.			
		PA57=4,D	01 is de	, fined as	BRK: co	ntrol brał	ke	
		PA57=5,D	01 is de	fined as	TRQL: T	orque ari	rived	
	DO2(COIN)	Refer to P	A57		- ,			
58	self define							1~5
	DO3(BRK)	Refer to P	A57					
59	self define		-					1~5
60	Reserved							
	Input filtering	1. Define the input filtering time constant.						
	time constant	2. The lo	wer this	value	is, the b	better re	sponse	
		performar	ice you v	will get,	but in the	e meanti	me, it'll	0.400
61		be very ea	asy to int	roduce ir	nterferen	ce.		0~100m
		3. The bi	gger this	s value i	is, the p	oorer re	sponse	S
		you will	get,	but you	u will	get a	better	
		anti-interfe	erence p	erformar	ice.			
	Input	This parar	neter is t	to define	the elect	tric level of	of input	
	terminal DI	terminal D	) :					
	effective	Symbol	DI4	DI3	DI2	DI1	]	
	electric level	Default						
	self define	definition	(ALRS)	(SC2)	(CLE)	(SON)	-	
		Control						
		position	PA62.3	PA62.2	PA62.1	PA62.0		
62		DA62 2-0		otivo lov				0000
		PA02.3-0	DI4 elle		el is iow,			~1111
		PA02.3-1				,		
		PA02.2-0		ctive leve	el is iow,			
		PA02.2-1		ctive leve	el is high al is low:	,		
		DΔ62.1-0		ctive leve	al ie hiah			
	1					-		
		PA62 0-0		ctive lev	al ie low.	,		
		PA62.0=0	,DI1 effe	ctive leve	el is low;			

	DI1(SON)	DI1 has 4 actual output terminals, with 7 different	
	self define	functions:	
		PA63=1,DIx is defined as SON, servo on;	
		PA63=2,DIx is defined as CLE/SC1/ZCLAMP;	
63		PA63=3,DIx is defined as INH/SC2;	1~7
		PA63=4,DIx is defined as ALRS;	
		PA63=5,DIx is defined as FSTP;	
		PA63=6,DIx is defined as RSTP;	
		PA63=7,Dix is defined as AIR;Analog input reverse.	
64	DI2(CLE)	Refer to PA63	1~7
04	self define		1~1
65	DI3(SC2)self	Refer to PA63	1~7
05	define		1~1
66	DI4(ALRS)	Refer to PA63	1~7
66	self define		1~1

Note1: "\*" next to the parameter numbers means this function may be "reserved" for some models, for instance,55\*, it may not exist or just reserved in some models, the detailed information, please consult with our after sales service center or local distributors.

### Chapter 7 Motor Type Matching

Before you power the servo drive, please make sure the motor is properly selected and all parameters are set correctly, otherwise, it may cause malfunction, trigger the alarms off, or the motor may lose its control.

You need to input the password,(set PA0=302) before you modify the parameter PA1.

When you've done setting of PA1, please write(save) the parameters into servo drive(when the panel displays EE-SET, press the **Enter** key for 3 seconds until it displays "FINISH", this means the parameters are saved in the drive). Then power OFF and ON again, the set parameters will be effective.

Generally, please follow the following list when you are selecting the motor type:

Drive HSD2-020 is adaptive for 60, 80, 90, and 110 series motor. Drive HSD2-030/030A is adaptive for 80, 90, 110 and 130 series motor. Drive HSD2-050 is adaptive for 110, 130 and 150 series motor. Drive HSD2-065 is adaptive for 130, 150 and 180 series motor.

If client want to match other motors which is not produced by our company, please consult with your local distributor or our technical department.

# 7.1 Motor Type List for HSD2-020

	Motor model	Power	Torqu	Rated	Rated
Code			е	Speed	Current
		(kw)	(Nm)	(rpm)	(A)
21	S60-2-006M30	0.2	0.6	3000	1.5
23	S60-2-013M30	0.4	1.3	3000	2.8
25	S60-2-019M30	0.6	1.9	3000	3.5
31	S80-2-013M30	0.4	1.3	3000	2.6
33	S80-2-024M30	0.75	2.4	3000	4.2
35	S80-2-033M30	1	3.3	3000	4.5
41	S90-2-024M30	0.75	2.4	3000	3
45	S90-2-035M20	0.75	3.5	2000	3
48	S90-2-040M25	1	4	2500	4
51	S110-2-020M30	0.6	2	3000	4
53	S110-2-040M30	1.2	4	3000	5
56	S110-2-060M30	1.2	6	2000	6
others	S80-2-024M30	0.75	2.4	3000	4.2

Table 7-1 Motor type list for HSD2-020

# 7.2 Motor Type List for HSD2-030

Table 7-2	Motor type list for HSD2-030	

		Powe	Torquo	Rated	Rated
Code	Motor model	r	Torque	Speed	Current
		(kw)	(Nm)	(rpm)	(A)
31	S80-2-013M30	0.4	1.3	3000	2.6
33	S80-2-024M30	0.75	2.4	3000	4.2
35	S80-2-033M30	1	3.3	3000	4.5
41	S90-2-024M30	0.75	2.4	3000	3
45	S90-2-035M20	0.75	3.5	2000	3
48	S90-2-040M25	1	4	2500	4
51	S110-2-020M30	0.6	2	3000	4
53	S110-2-040M30	1.2	4	3000	5
55	S110-2-050M30	1.5	5	3000	6
56	S110-2-060M30	1.2	6	2000	6
61	S130-2-040M25	1	4	2500	4
63	S130-2-050M20	1	5	2000	4.5
64	S130-2-050M25	1.3	5	2500	5
65	S130-2-050M30	1.5	5	3000	6
67	S130-2-060M25	1.5	6	2500	6
69	S130-2-077M20	1.6	7.7	2000	6
72	S130-2-100M10	1	10	1000	5
73	S130-2-100M15	1.5	10	1500	6
Others	S110-2-040M30	1.2	4	3000	5

# 7.3 Motor Type List for HSD2-050

	Motor model	Power	Torque	Rated	Rated
Code			Torque	Speed	Current
		(kw)	(Nm)	(rpm)	(A)
51	S110-2-020M30	0.6	2	3000	4
53	S110-2-040M30	1.2	4	3000	5
55	S110-2-050M30	1.5	5	3000	6
56	S110-2-060M30	1.2	6	2000	6
58	S110-2-060M30	1.8	6	3000	8
61	S130-2-040M25	1	4	2500	4
63	S130-2-050M20	1	5	2000	4.5
64	S130-2-050M25	1.3	5	2500	5
65	S130-2-050M30	1.5	5	3000	6
67	S130-2-060M25	1.5	6	2500	6
69	S130-2-077M20	1.6	7.7	2000	6
70	S130-2-077M25	2	7.7	2500	7.5
71	S130-2-077M30	2.4	7.7	3000	9
72	S130-2-100M10	1	10	1000	5
73	S130-2-100M15	1.5	10	1500	6
75	S130-2-100M25	2.6	10	2500	10
78	S130-2-150M15	2.3	15	1500	9.5
79	S130-2-150M25	3.8	15	2500	17
82	S150-2-150M20	3	15	2000	14
83	S150-2-150M25	3.8	15	2500	17
86	S150-2-180M20	3.6	18	2000	16.5
Others	S130-2-077M20	1.6	7.7	2000	6

Table 7-3 Motor type list for HSD2-050

### 7.4 Motor Type List for HSD2-065

		Device	<b>T</b>	Rated	Rated
Code	Motor model	Power	Iorque	Speed	Current
		(kw)	(Nm)	(rpm)	(A)
65	S130-2-050M30	1.5	5	3000	6
67	S130-2-060M25	1.5	6	2500	6
69	S130-2-077M20	1.6	7.7	2000	6
70	S130-2-077M25	2	7.7	2500	7.5
71	S130-2-077M30	2.4	7.7	3000	9
72	S130-2-100M10	1	10	1000	5
73	S130-2-100M15	1.5	10	1500	6
75	S130-2-100M25	2.6	10	2500	10
78	S130-2-150M15	2.3	15	1500	9.5
79	S130-2-150M25	3.8	15	2500	17
82	S150-2-150M20	3	15	2000	14
83	S150-2-150M25	3.8	15	2500	17
86	S150-2-180M20	3.6	18	2000	16.5
89	S150-2-230M20	4.7	23	2000	20.5
92	S150-2-270M20	5.5	27	2000	20.5
94	S180-2-172M15	2.7	17.2	1500	10.5
95	S180-2-190M15	3.0	19	1500	12
96	S180-2-215M20	4.5	21.5	2000	16
97	S180-2-270M15	4.3	27	1500	16
98	S180-2-350M10	3.7	35	1000	16
99	S180-2-350M15	5.5	35	1500	19
Other s	S150-2-150M15	2.3	15	1500	9.5

Table 7-4 Motor type list for HSD2-065

# 7.5 Motor Type List for HSD2-030A

		Power	Torque	Rated speed	Rated
Code	Motor Model	(Kw)	(N.m)	(rpm)	current
					(A)
22	60ST-006M30	0.2	0.64	3000	1.2
23	60ST-013M30	0.4	1.27	3000	2.8
24	60ST-019M30	0.6	1.91	3000	3.7
25	80ST-013M30	0.4	1.3	3000	2.6
26	80ST-024M30	0.75	2.4	3000	4.2
27	80ST-033M30	1	3.3	3000	4.2
30	80ST-040M25	1	4	2500	4.4
31	90ST-024M30	0.75	2.4	3000	3
32	90ST-035M20	0.75	3.5	2000	3
33	90ST-040M25	1	4	2500	4
34	110ST-020M30	0.6	2	3000	4
35	110ST-040M30	1.2	4	3000	5
36	110ST-050M30	1.5	5	3000	6
37	110ST-M06020	1.2	6	2000	6
38	110ST-060M30	1.8	6	3000	8
44	130ST-040M25	1.0	4	2500	4
45	130ST-050M25	1.3	5	2500	5
46	130ST-060M25	1.5	6	2500	6
47	130ST-077M20	1.6	7.7	2000	6
48	130ST-077M30	2.4	7.7	3000	9
49	130ST-100M15	1.5	10	1500	6
50	130ST-100M25	2.6	10	2500	10
51	130ST-150M15	2.3	15	1500	9.5
52	130ST-120M20	2.4	12	2000	10
Others	110ST-040M30	1.2	4	3000	5

Table 7-5 Motor type list for HSD2-030A

### Chapter 8 Alarm, Protection Function & Troubleshooting

When any trouble occurs, the "Err xx" would be shown on the digital keypad and blink. "xx" is the code for the error kind. The common errors are Err 3, Err 9, Err 11, Err 13, Err 17 and Err 38, which caused by improper wiring or mechanical problem.

#### 8.1 Alarm Code Check List

Display Code	Fault Name	Fault Description		
	Normal	There is no error.		
1	Over speed	Motor speed exceeds to set value		
2	Over voltage	The voltage of the main circuit is higher than the standard voltage.		
3	Under voltage	The voltage of the main circuit is lower than the standard voltage.		
4	Excessive Deviation of position command	Position control deviation value exceeds to the set value		
5	Internal incorrect parameter settings	Wrong model selection for servo drive or motor, or wrong settings for drive/motor		
6	Wrong model type for the motor	The set model type can't be matched with the motor		
7	Drive inhibition error	Both inhibition input for CCW and CW are OFF		
8	Position deviation counter overflow	Position counter overflow absolute value exceeds to 2 <sup>30</sup>		
9	Encoder error	The encoder produces abnormal pulse.		
11	Current response fault	Current error has exceeded the specified value for a long time.		
12	Over current	The current of the main circuit is more than the instantaneous current of the motor and cause short circuit.		
13	Drive overheat for a long	Drive overload, the temperature of drive is too		
	UIIIC Procking time being too	Real circuit is working for a long period of		
14	long	time.		

Table 8-1	Alarm code check list
-----------	-----------------------

15	Breaking function is	The breaking action has been enabled too		
	enabled too often	often.		
17 Speed response fault		Speed error has exceeded the specified value		
17		for a long time.		
19	Warm reset	System warm reset		
		An error occurs when writing the current		
20	EE-PROM error	settings into EE-PROM.		
21	DI function set error	Digital input port function setting duplicated		
22	DO function set error	Digital output port function setting duplicated		
	Current sensor adjustment	Adjusted value of the current sensor exceeds		
23	error	the limit of its allowable setting value.		
29	Overload for motor torque	Servo motor is overload.		
30	Encoder pulse Z lose	The pulse Z of the encoder is being lost.		
		The signal of U,V,W (for encoder interface) are		
32	Encoder U, V, VV signal error	in error		
27	Instantaneous overheat for	The instantaneous load of the motor is		
37	motor	overload.		
38	Long term motor overheat	The motor is overload for a long time.		
10, 16, 1	18, 24, 25, 26, 27, 28, 31, 33,	Deserved		
34, 35, 3	36	Keservea		

### 8.2 Potential Cause and Corrective Actions

Generally, when the alarm occurs, you can power off and on the drive to clear the error, and the drive back to work normally. If this doesn't work, and the alarm repeats, please follow up the following solutions or contact your local distributors if necessary.

Code	Fault Name	Cause	Corrective Actions	
		Improper input Pulse, or wrong gear ratio setting	Check the pulse frequency and the electronic gear ratio	
		The load inertia is	Decrease the load inertia	
Err1	Over speed	excessive	Increase the Accel/Decel time	
		Encoder fault	Replace the motor	
		Encoder cable fault	Replace the cable	
		Incorrect parameter	Reset the parameters and	
		settings	modify the settings again	
	Over voltage	Servo drive default	Replace the drive; check the	
		U V W PE wiring error	wiring or replace the cables	
Err2		The power voltage is too high	Check the newer supply	
		The power waveform is abnormal	Check the power supply.	
		Servo drive is damaged	Replace the drive	
		The power voltage is too low.	Check the power supply.	
Err3	Under voltage	Transformer capacity is not	Replace the transformer by a	
		enough.	larger one	
		Poor contact of RST	Check and rewire the related	
		terminal wiring	cables	
		Encoder cable or encoder fault	Replace the cable or motor	
Err4	position deviation	The stiffness is not enough	Increase the set value of PA5 and PA9	
		The output torque of motor	Check the torque limit	

 Table 8-2
 Corrective actions for trouble shooting

HSD2 Series AC Servo Drive

	1			
			Decrease the load	
			Replace and upgrade the	
			power level of the drive and	
			motor	
		Improper command pulse	Decrease the pulse frequency.	
	Parameters set error	The parameters in the		
Err5		drive is or are being	Reset the parameters	
		modified wrongly		
	Wrong model type setting for the motor	Wrong model type setting	Please choose the right motor	
Err6		for the motor	type	
		Inhibition signal for both	Check the digital input signal	
	Drive inhibition abnormal alarm	CCW and CW are	and wiring	
Err7		disconnected		
		Enable Inhibition function	Disable the function	
		is ON		
	Position counter overflow	The motor is being stuck	Check the mechanical structure	
Err8		by the mechanical parts		
		Pulse signal is abnormal	Check the pulse signal	
	Encoder error	Encoder or drive being	Penlace the motor or drive	
		damaged		
Frr9		Encoder cable damaged or	Replace the cable	
		doesn't match the spec		
		The encoder cable is too	Shorten the cable	
		long		
	Current response fault	Servo motor is being stuck.	Check the mechanical parts	
		Wrong wring between U, V	Check the wiring	
Err11		and W terminals		
		Poorly grounded	Check the grounding	
		The lead wiring of U V W	Replace the motor	
		from the motor side is		
		wrong		
Err10	Over current	Short-circuit between U, V	Chock the wiring	
Err12		and W terminals		

		Drive overload	Replace ad upgrade the drive	
		Encoder cable or encoder fault	Replace the encoder cable	
		Servo drive is damaged	Replace the drive	
Err13	Drive overheat for a long term	Drive is running with overload	Decrease the load or replace the current drive with a bigger powered one.	
	Brake error	Brake circuit fault or voltage detection fault	Replace the drive	
Err14		System inertia is too big, drive ON and OFF too often.	Set PA34 correctly, install a proper external brake resistor between P and C terminal. Increase the acceleration and deceleration time constant; reduce the load inertia	
Err15	Breaking action is enabled too often	Load inertia is too high, servo on and off too often.	Under the speed control mode,increase the set value of PA40,PA41,PA42. Under the position control mode,set proper Accel/Decel curve for the host controller. Reduce the load inertia Replace the motor.	
Err17	Speed response fault	Motor being stuck, drive fault	Check the mechanical parts, check the drive or replace the drive	
		Interval time between start and stop is too short.	Set the Accel and Decel time constant correctly	
		The lead wiring of U V W from the motor side is wrong	Replace the motor	
Err19	Warm reset	The power supply is unstable	Check wiring or replace the drive	
Err20	EEPROM error	Servo drive fault	Replace the servo drive	

Err21	DI function set error	Check PA63,PA64,PA65,PA66, there may be duplication among these 4 parameters.	Set right parameters	
Err21	DO function set error	Check PA57,PA58, PA59, there may be duplication among these 3 parameters.	Set right parameters	
Err23	Current sensor adjustment fault	Servo drive fault	Replace the servo drive	
	Overload for motor torque	Overload	Check the load	
Err29		Motor type doesn't match with the drive	Match the drive with a proper motor	
		Parameter is being set incorrectly	Increase the torque limit value properly within the safety allowed range	
	Encoder Z signal pulse lose	Encoder being damaged	Replace the servo motor	
Err30		Encoder cable improper shielding or poor encoder cable communication	Replace the encoder cable	
		Shielding ground cable fault	Recheck interface and I/O circuit	
Err32	U,V,W signal error for encoder	Encoder U V W signal damaged	Replace the motor	
		Encoder cable improper shielding or poor encoder cable communication	Replace the encoder cable	
		Encoder signal interface circuit fault	Replace the drive	
Err37	Instantaneous overheat for motor	Overload for the motor	Decrease the load	
		Short circuit for the motor	Recheck the wiring or replace the motor	
		Motor type(model) is wrong	Choose a proper motor to match the drive	

Err38		Motor overload, or wrong type of motor being	Decrease the load or choose a proper spec of motor to match	
	Motor overheat	connected with the drive	the drive	
	for a long time	Encoder cable or encoder	Replace the encoder cable or	
		fault; drive current		
		detection fault		

#### Chapter 9 Connection to Motor

Our HSD2 series servo drive is only applicable with 2500ppr incremental photoelectric encoder. If you have purchased both our servo drive and motor, then the encoder and encoder cable and power cable will be included as our agreed standard package. For special requirement and our users may need to make the encoder cable or modify the cable, please follow up the following diagram for connections. Please use proper shield cable if you want to make encoder cable by yourself.





#### Diagram 9-1 Connecting diagram HSD2 series drive to motor encoder

### Chapter 10 System Connection

The connection between HSD2 Driver and HNC-602 CNC control system show as below:

### control system

#### driver

CN5: DB25F			CN2:DB25M	
name	pin		pin	name
XCP+	6		26	PULS+
XCP-	18		18	PULS-
XDIR+	7		24	SIGN+
XDIR-	19		25	SIGN-
XZO+	5		2	OZ+
XZO-	17		12	OZ-
ALM	12		21	ALM
0V	13/23		23	DOCOM
INIT	10		14	SON
+24V	11		16	COM+
FG	case		9	PE
			CNZ	2: DB25M
ZOP+	3		26	PULS+
ZCP-	15		18	PULS-
ZDIR+	4	-	24	SIGN+
ZDIR-	16		25	SIGN-
ZZO+	2		2	OZ+
ZZO-	14		12	OZ-
ALM	12		21	ALM
0V	13/23		23	DOCOM
INIT	10		14	SON
+24V	11		16	COM+
FG	case		9	PE

Thanks for choosing HNC product. Any technique support, PLS feel free to contact our support team Tel: 86(20)84898493 Fax: 86(20)61082610 URL: www.hncelectric.com Email: <u>support@hncelectric.com</u>

