User's Manual for EL5 Servo

Introduction

Thank you for purchasing Leadshine EL5-0750 AC servo drivers, this instruction manual provide knowledge and notes of using this driver.

Operation incorrect can arise intention fault, before use this system, please read this manual carefully.

We reserve the right to modify equipment and documentation without prior notice.
The customer's any modify to product, our company don't undertake any responsibility; the product guarantee list will be cancel.
The following symbols are used throughout this document to draw attention to important operating inform,.

Warning The error operation maybe arise the disastrous consequence—die or series injury.

Caution The error operation maybe makes operation worker injury, also make equipment damage.

Notice The error use maybe damage product and equipment.

Safety Rule

Warning
l This product design and product doesn't use in mechanic and system which to man body have injury. l When the user mechanic and system select this product, must be considering the safeguarding measure, prevent because of incorrect operation or this product abnormal accident.

Check and Acceptance

Caution
l The product of damage or have default don't come into use.

Transportation

Caution
▪ Must be according to product Storage and transportation environment storage and transport. ▪ Don't stack too high, prevent fall. ▪ When convert transport, the product should be packaging properly. ▪ May not pull the wiring, the motor stall and encoder carry the servo motor. ▪ The servo driver and servo motor can't undertake outside force and impact.

Installation

Caution
Servo Driver and Servo Motor: ▪ Don't install in inflammable top and near, prevent fire hazard. ▪ Avoid vibrate, prohibit undertake impact. ▪ When damage or part imperfect, may not install. *Servo Driver:* ▪ Must be install inner sufficient safeguarding grade control cabinet. ▪ Must be reserve sufficient gap with the other equipment. ▪ Must be have very good cooling condition. ▪ Prevent dust, corrosive gas, conducting objects, fluid and inflammable ,explosive object invade. *Servo Motor:* ▪ Install must be fastness, prevent fetch way because of vibrate. ▪ Prevent fluid invade damage motor and encoder. ▪ Prohibit knock the motor and shaft, avoid damage encoder. ▪ The motor shaft can't undertake beyond the limit load.

Wiring

Warning
▪ The workers of participation in wiring or check must be possess sufficient ability do this job. ▪ The wiring and check must be going on after five minutes in power off. ▪ Servo driver and servo motor must be connecting to ground properly. ▪ Error voltage and power polarity may be arise explosion or operation default. ▪ After the servo driver and servo motor install properly, can go on connect wiring. ▪ Assure the wire insulation, avoid extrusion wire, prevent electric shock.

Caution
l The wiring must be correct and fastness, otherwise may be arise servo motor error run, may be also damage the equipment because of bad contact. l Servo motor U, V, W terminal don't connect reverse, don't connect AC power. l Between servo motor and servo driver must be connect directly, can't connect capacitance, inductance and filter. l Prevent conductive fasteners and wire end into servo driver. l The wire and temperature-resistant object may not near to servo driver radiator and motor. l The freewheel diode which parallel connection to output signal DC relay may not connect reverse.

Debug run

Caution
l Assure the servo driver and servo motor install properly before power on, fixed fastness, power voltage and wiring correct.
l Debug servo motor, the first should be run without load, after confirm parameter setting correct, and then debug with load, prevent the mechanical and equipment damage because of error operation.

Using

Caution
l Should be access a emergency stop circuit, assure when the accident happened, the equipment can stop run immediately, the power cut off immediately.
l Before reset a alarm, must be confirm run signal have cut off, otherwise will start again suddenly.
l The servo driver must be use match with specified motor.
l Don't on and off servo system power frequently, prevent damage system.
l After servo driver and servo motor run continuous will be hot, within some time after run and power off, can't touch the driver radiator and resistor.
l May not remake the servo system.

Fault Processing

Warning
l Even if after the servo driver power off, the high voltage also will keep some time, within five minutes after power off, please don't touch terminal strip.
l The worker who participate in remove and maintain must be provided with relevant professional knowledge and job ability.

Caution
l After when there is alarm, must be eliminate fault cause, before restart, reset alarm signal.
l When power on again after momentary interruption, should be far away mechanical, because the mechanical may be start suddenly (the design of the mechanical should be assure it doesn't arise dangerous when restart)

System Matching

Notice
l The servo motor rate torque more high than effect continues load torque. l The ratio of load inertia and servo motor inertia should be smaller than recommendation value. l The servo driver should be use match servo motor.

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Chapter 1 Introduction

1.1 Production Introduction

AC servo technically century since the early nineties, the technology has matured, and continuously improves performance, is now widely used in the field of CNC machine tools, printing and packaging machinery, textile machinery, and automated production line automation. EL5-0750 AC servo system is Leadshine R&D new generation full digital AC servo system; adopt American TI company newest digital signal processor DSP, Large-scale programmable gate array (CPLD) and MITSUBISHI intelligent power module (IPM), high integration, small size, perfect protection, good reliability. The optimal PID algorithm to complete the PWM control, performance has reached the level of similar foreign products.

Compare to the stepper system, EL5-0750 AC servo system has following characteristics:

◆Avoid lost step phenomenon

Servo motor with encoder, position signal feedback to servo driver, formation semi-closed control system

◆Width ratio, constant torque

Speed ratio is 1:5000, has stability torque features from low speed to high speed

◆High-speed, high-precision

The maximum speed of the servo motor up to 3000rpm, rotation positioning accuracy 1/10000r. T

〖Note〗The different models of the maximum speed of the servo motor.

◆Simple, flexible control

By modifying the parameters of the work of the servo system, the operating characteristics make the appropriate settings to suit different requirements.

1.2 Inspection of Incoming Goods

1.After receipt, you must check the following:

(1) The box is in good condition, and whether the goods are damaged due to transportation?

(2) Check the servo drive and servo motor nameplate, goods received are the goods?

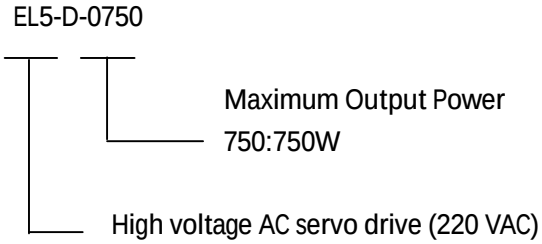
(3) Check the packing list, the accessories are complete?

Notice

- Damaged or missing parts of the servo system, can not be installed.
- Supporting the use of servo drive must match the performance servo motor.
- After receiving have any questions, please contact with the vendor or company

2 Type meaning

(1)EL5 series servo driver

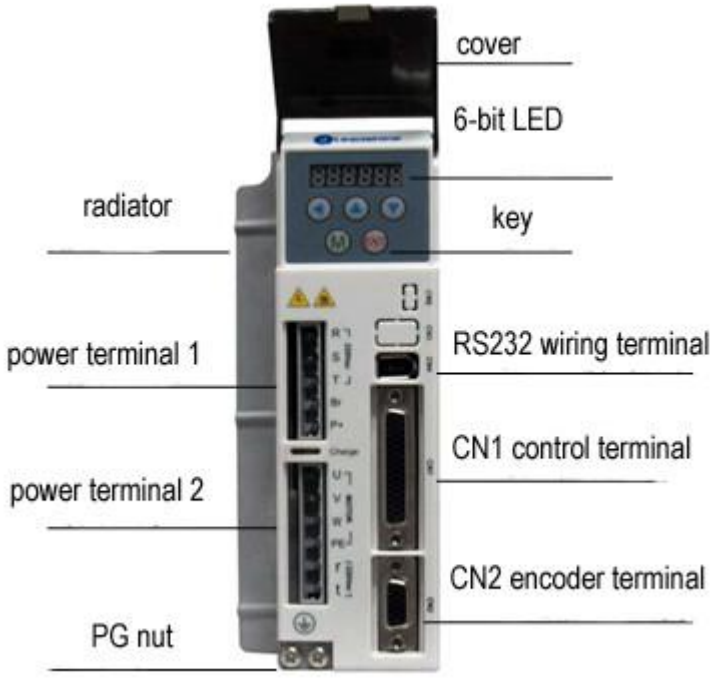


(2)Servo motor type

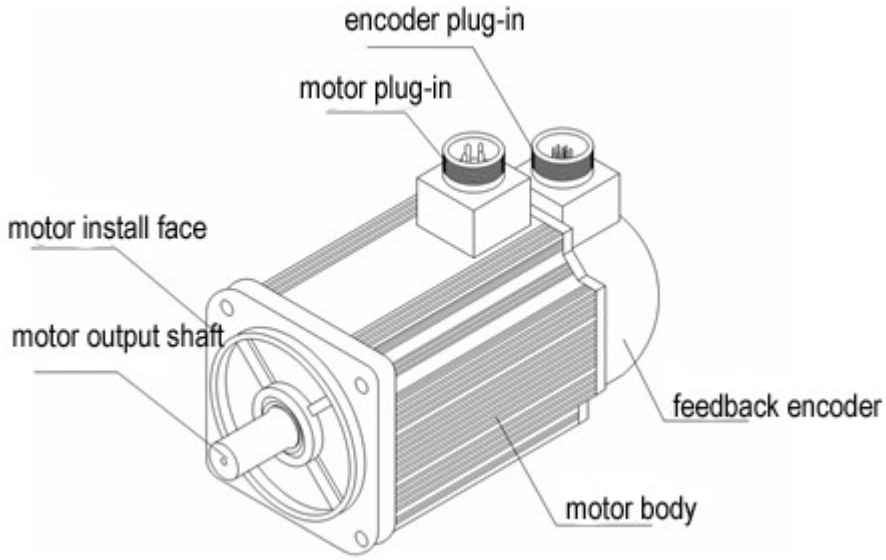
The EL5-D0750 AC servo drive can be used with a variety of domestic and foreign servo motor matching, selected by the user ordering.

1.3 Production Appearance

1. EL5 series AC servo driver appearance.



2. Servo motor appearance.



3. Accessory

EL5-0750 servo drive standard accessories

① installation manual (this book) a book

② CN1 connector (DB44 hole) a set

③ CN2 plug (DB15 pin) a set

〖Note〗: The ACH750 supporting the PC debugging software needed to be purchased separately.

Chapter 2 Installation

2.1 Storage and Installation Circumstance

Figure 3.1 Servo Driver, Servo Motor Storage Circumstance Demand

Item	EL5 series driver	Match servo motor
Temperature	-20-80℃	-25-70℃
Humility	Under 90%RH (non-condensate)	Under 80%RH(non-condensate)
Atmospheric environment	Indoor(no exposure)no corrosive gas, flammable, oil or dust	Indoor(no exposure)no corrosive gas, flammable, oil or dust
Normal high	Under elevation 1000m	Under elevation 2500m
Vibrate	Less than 0.5G (4.9m/s2) 10-60Hz (non-continuous transport)	
Protection level	IP00(no protection)	IP65

Figure 3.2 Servo Driver, Servo Motor Installation Circumstance Demand

Item	EL5 series driver	Match servo motor
Temperature	0-55℃	-25-40℃
Humility	Under 90%RH (non-condensate)	Under 90%RH(non-condensate)
Atmospheric environment	Indoor(no exposure)no corrosive gas, flammable, oil or dust	Indoor(no exposure)no corrosive gas, flammable, oil or dust
Normal high	Under elevation 1000m	Under elevation 2500m
Vibrate	Less than 0.5G (4.9m/s2) 10-60Hz (non-continuous transport)	
Protection level	IP00(no protection)	IP65

2.2 Servo Driver Installation

Notice
l Servo driver must be installing in the good protection cabinet.
l The servo drive must be in the specified direction and intervals installed, and ensure good heat dissipation conditions.
l May not install surface or nearby of flammable, prevent fire hazard.

2.2.1 Installation Method

Users can use the backplane mounting or panel mounting installation, mounting direction perpendicular to the mounting face up. 2.1 chassis installation diagram.

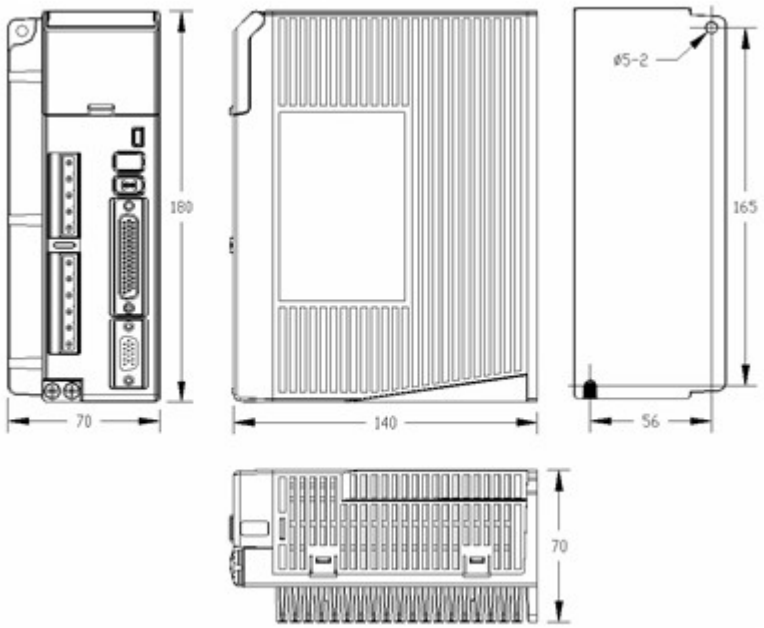


Figure 2.1 Driver Baseboard Installs Method

2.2.2 Installation Space

In order to ensure good cooling conditions, the actual installation should be as leaving a larger interval.

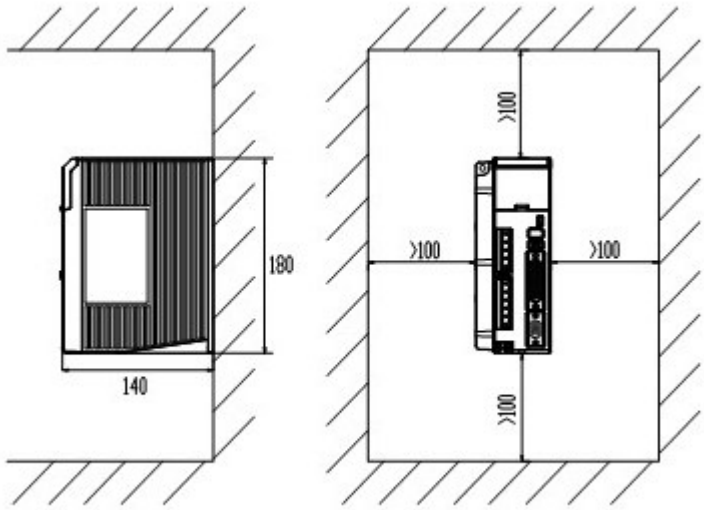


Figure 2-2 Single Driver Install Space

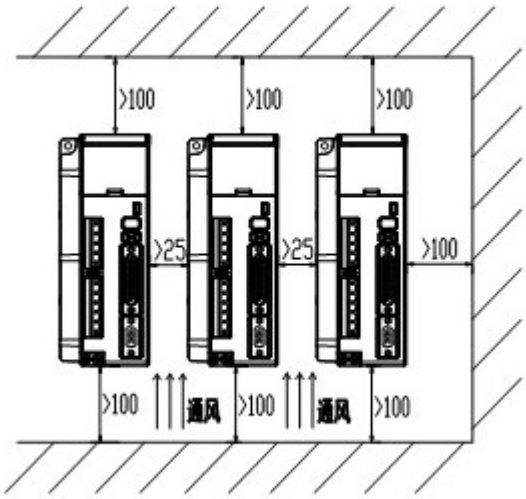


Figure 2-3 Many Sets of Driver Install Space

2.3 Servo Motor Installation

Notice
l Dismantling belt wheel should be used when the screw dismounting tool.
l No knocking motor shaft or encoders, prevent motor by vibration or shock.
l Handling motor may drag the motor shaft, pin out or encoder.
l Motor shaft does not bear the axial load, radial load, otherwise you may damage the motor.
l Suggested the use of elastic coupling.
l Motor installation must be solid, and locking measures, fixed motor with the fastening lock washer

Install method:

EL5 series servo motor by supporting flange installation, electrical installation in arbitrary direction.

Chapter 3 Wiring

Warning
l The workers of participation in connect wiring or check must be possess sufficient ability do this job.
l The wiring and check must be going on after five minutes in power off.
Caution
l Must be according to terminal voltage and polar wiring, prevent equipment damage or worker injury
l Driver and servo motor must be connect ground good

3.1 Wiring

3.1.1 Wire Gauge

⑴Power supply terminal TB

● Diameter: R, S, T, PE, U, V, W terminals diameter ≥ 1.5mm2 (AWG14-16), r, t terminal diameter ≥ 1.0 mm2 (AWG16-18).

● Ground: The ground wire should be as thick as possible, drive servo motor the PE terminal point ground, ground resistance <100 Ω.

● Proposed by the three-phase isolation transformer power supply, to reduce the possibility of electrical burns people. Recommend power by the noise filter supply; improve the anti-jamming capability.

● Installation fuse (NFB) breaker promptly cut off the external power supply, drive failure.

(2) The control signal CN1 feedback signal CN2

● Diameter: shielded cable (the best selection of shield cable), the diameter ≥ 0.12mm2 (AWG24-26), the shield should be connected to FG terminal.

● Length of line: cable length as short as possible and not more than 3 meters control CN1 cable, the CN2 cable length of the feedback signal is not more than 20 meters.

● Wiring: away from the power line wiring, to prevent interference string into.

● To the relevant line in the inductive element (coil), install a surge absorbing element: DC coil reverse parallel freewheeling diode AC coil parallel RC snubber circuit. .

Notice

l	U, V, W, and the motor windings a one-to-one connection, not reverse polarity.
l	Cables and wires to be fixed, and avoid close to the radiator and motor drive, so as not to be reduced due to the heat insulation properties.
l	Large-capacity electrolytic capacitor in the servo drive, even after the power is turned off, and will continue to keep the pressure up to 5 minutes after the power failure, do not touch the drive and motor.

3.1.2 Position Control Mode

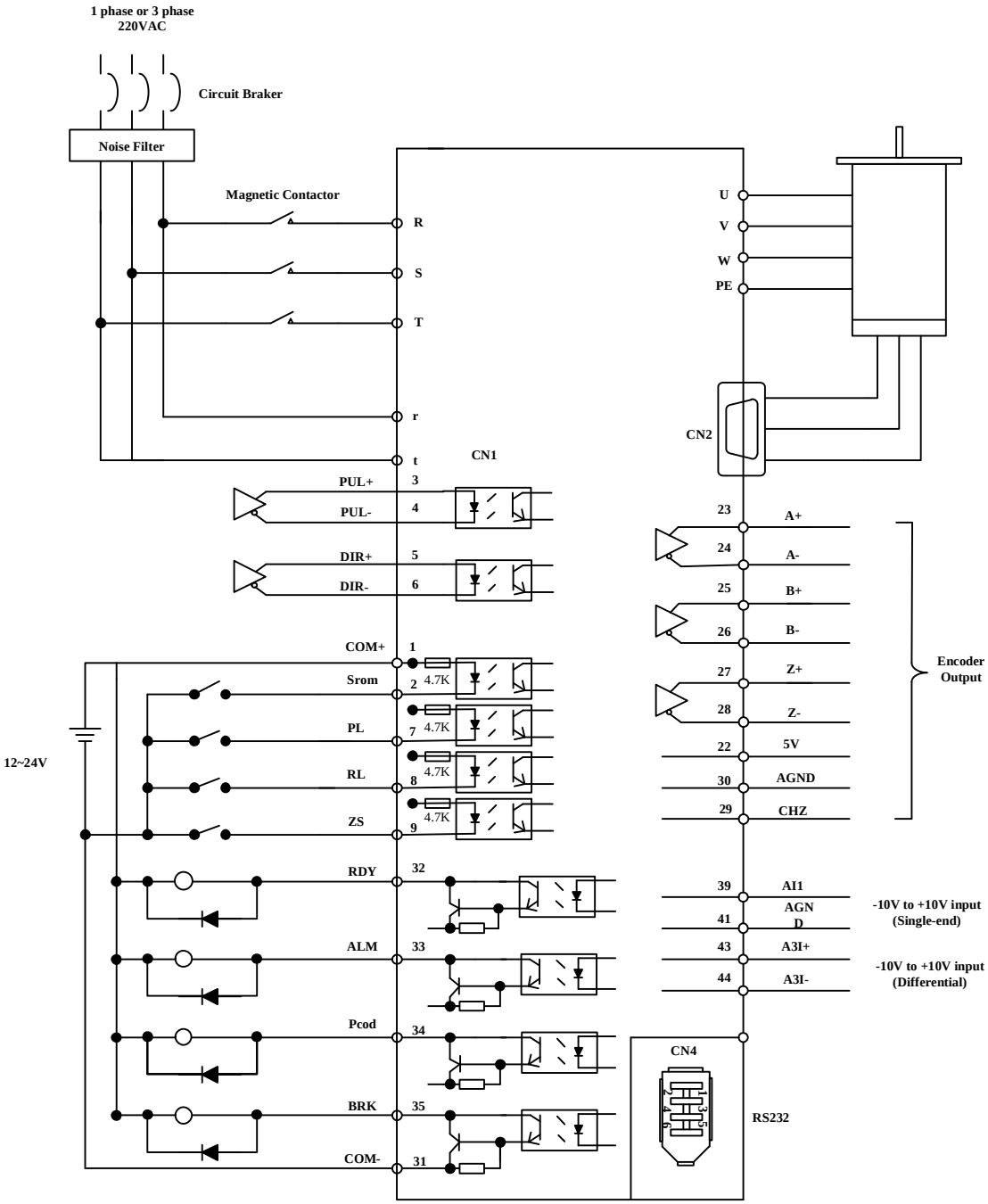


Figure 3-1 Position Control Mode Normal Wiring

3.1.3 Torque /Velocity Control Mode

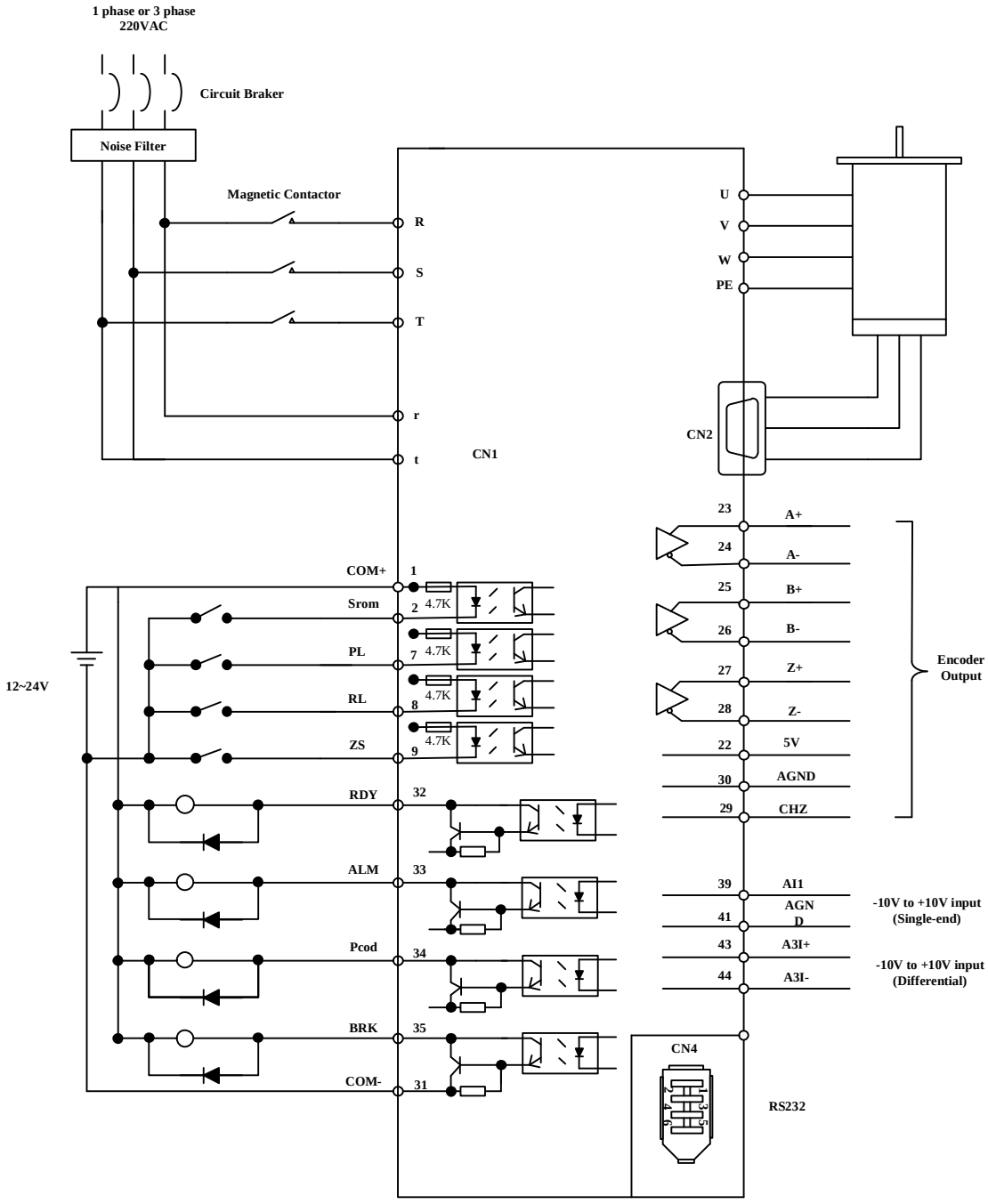


Figure 3-2 Torque/Velocity Control Mode Normal Wiring

3.2 Driver Terminals Function

3.2.1 Control Signal Port-CN1 Terminal

The left in Figure 3.3 servo drive control signal port CN1 DB44 connectors, drive side socket connection plug for the hole type, with the controller side needle; Figure 3.3 right side of the top to bottom of the SI input of the switch, the switch SO outputs, analog A1 input, the A3 input.

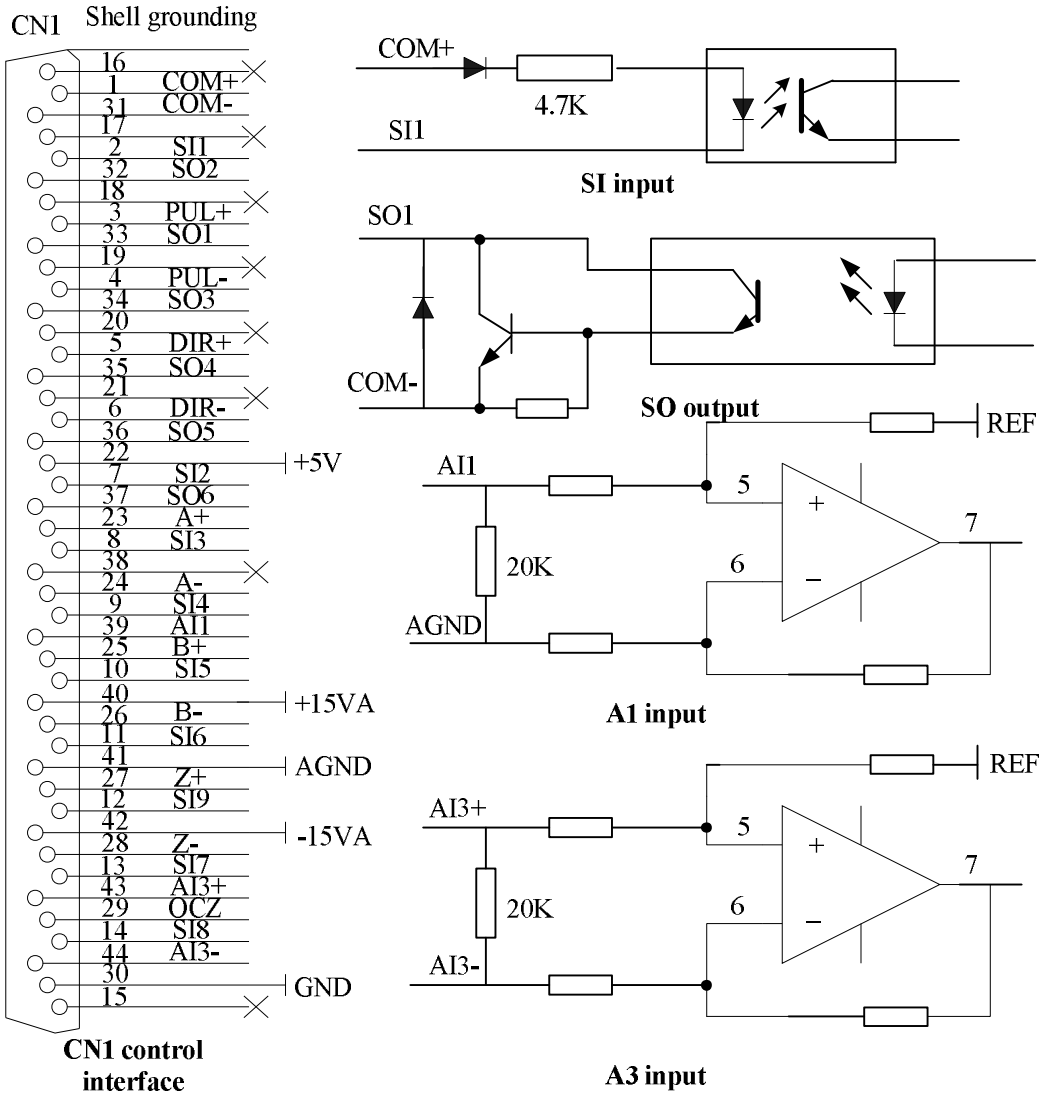


Figure 3-3 Servo Driver Port Terminal Layout

Figure3.1 Control Signal Port-CN1 Signal Explain

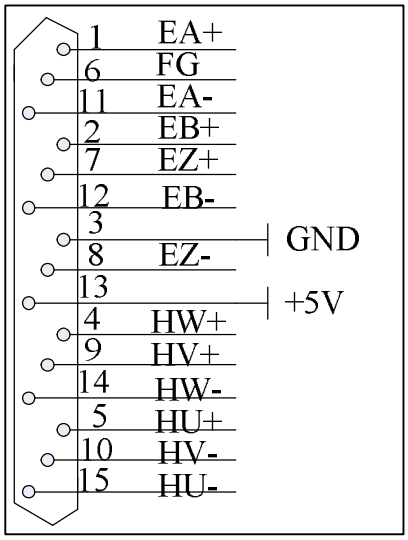
Subscript	Signal	Input/output	Name and Explain
1	COM+	input	Public power supply positive terminal of the external input control signal, 12V ~ 24V
2	SI1	input	Digital input signal 1, default active low maximum

			input 24V
3	PUL+	input	Enter the positive and negative terminals, respectively, for pulse TTL level (5V), the rising edge of default Effect
4	PUL-	input	
5	DIR+	input	Respectively, the direction of the input to the positive terminal and a negative terminal, TTL level (5V), default optocoupler deadline As a positive direction
6	DIR-	input	
7	SI2	input	Digital input signal 2,default low level is effect Maximum input 24V
8	SI3	input	Digital input signal 3,default low level is effect Maximum input 24V
9	SI4	input	Digital input signal 4,default low level is effect Maximum input 24V
10	SI5	input	Digital input signal 5,default low level is effect Maximum input 24V
11	SI6	input	Digital input signal 6,default low level is effect Maximum input 24V
12	SI9	input	Digital input signal 9,default low level is effect Maximum input 24V
13	SI7	input	Digital input signal 7,default low level is effect Maximum input 24V
14	SI8	input	Digital input signal 8,default low level is effect Maximum input 24V
22	+5V	output	Reserve, encoder signal output +5V
23	A+	output	Motor encoder A phase positive, negative different output terminal
24	A-	output	
25	B+	output	Motor encoder B phase positive, negative different output terminal
26	B-	output	
27	Z+	output	Motor encoder Z phase positive, negative different output terminal
28	Z-	output	
29	OCZ	output	Z signal OC output
30	GND5V	output	Encoder signal output power ground
31	COM-	output	Digital output signal commonality ground
32	SO2	output	Digital output signal 2
33	SO1	output	Digital output signal 1
34	SO3	output	Digital output signal 3

35	SO4	output	Digital output signal 4
36	SO5	output	Digital output signal 5
37	SO6	output	Digital output signal 6
39	AI1	input	Analog input 1,input voltage range -10-10V,input resistor 20KΩ
40	+15VA	output	Reserve output inner 15V,less than 50mA
41	GND15VA	output	Reserve,+15V ground
43	AI3+	input	Analog input 3 positive, negative, input voltage range -10-10V,input resistor 20KΩ
44	AI3-	input	
15-21,38, 42	NC	/	Not connect
Shell	FG	/	Shield ground

3.2.2 Encoder Input Port-CN2 Terminal

Figure 3.2 Encoder Input Port-CN2 Terminal Signal Explain

Pin	Signal	Name	Terminal Arrange Figure
1	EA+	Encoder channel A+ input	
2	EB+	Encoder channel B+ input	
3	EGND	Signal ground	
4	Hall W+	Hall sensor W+ input	
5	Hall U+	Hall sensor U+ input	
6	FG	Ground terminal for shielded	
7	EZ+	Encoder channel Z+ input	
8	EZ-	Encoder channel Z- input	
9	Hall V+	Hall sensor V+ input	
10	Hall V-	Hall sensor V- input	
11	EA-	Encoder channel A- input	
12	EB-	Encoder channel B- input	
13	VCC	+5V @ 100 mA max.	
14	Hall W-	Hall sensor W- input	
15	Hall U-	Hall sensor U- input	

3.2.3 Communication Port

Figure 3.3 Connect STU Port-CN4 Signal Explain

RS232	May via dedicated series cable connect PC or STU, prohibit insertion power on, and suggest use twisted-pair or shielded wire. the wire long is less than 2 meter

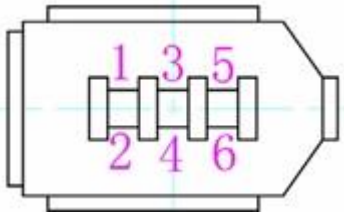
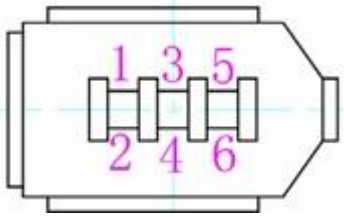
RS485	Suggest adopt shield twisted-pair.		
Terminal	signal	name	
1	GND	Power ground	
2	TxD	RS232 send terminal	
3	5V	Reserve, provide current less than 50mA	
4	RxD	RS232 receive terminal	
5	RS485+	Reserve,RS485+/A	
6	RS485-	Reserve,RS485-/B	

Figure 3.4 Driver interconnect interface-CN3 signal explain

RS485			
Terminal	signal	name	
1	GND	Power ground	
2	NC	Not connect	
3	5V	Reserve, provide current less than 50mA	
4	NC	Not connect	
5	RS485+	Reserve,RS485+/A	
6	RS485-	Reserve,RS485-/B	

3.2.4 Power Port

Figure 3.5 Main Power Input Port-CN5

Terminal	Signal	Name	
1	R	Drive the main power input: connecting 3-phase 220Vac (line voltage); orders phase 220Vac, the hot and neutral should be connected to the R and T both ends.	
2	S		
3	T		
4	BR	Outside brake resistor input terminal	Outside brake resistor connect between BR and P+
5	P+	DC busbar voltage+	

Figure 3.6 Control Power Input Port-CN6

Terminal	Signal	Name
1	U	3 phase motor power input
2	V	
3	W	
4	PE	Frame ground

5	r	Control power input 1	Control power voltage range between 1 and 2:85Vac-265Vac
	t	Control power input 2	

3.3 I/O Interface Principle

3.3.1 Switch Value Input Interface

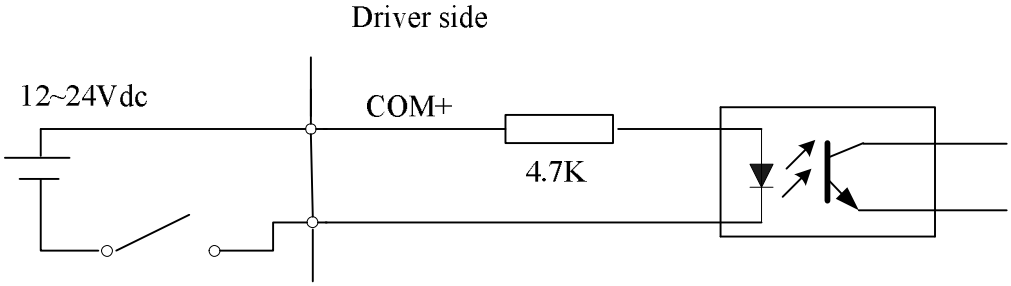


Figure 3-4 Switch Value Input Interface

(1)The user provide power, DC 12-24V,current≥100mA

(2)Notice, if current polar connect reverse, will make servo driver can't run.

3.3.2 Switch Value Output Interface

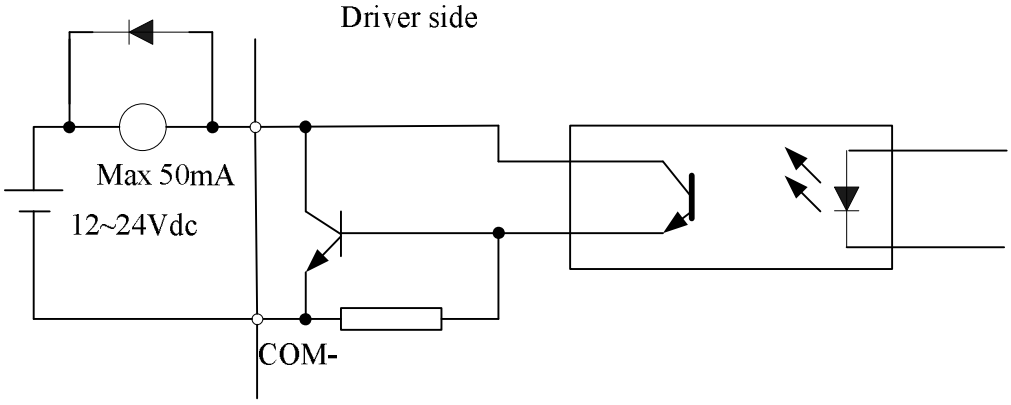


Figure 3.5 Switch Value Output Interface

(1) The external power supply is provided by the user, but care must be taken, if the power supply polarity reversal, the servo drive is damaged.

(2) The output of the form of open-collector maximum voltage of 25V, maximum current of 50mA, external power supply. Therefore, the load switch output signal must meet the limited

requirements. If you exceed the limit requirements or output directly connected with the power supply, the servo drive is damaged.

(3) If the load is inductive loads relays, etc., must be anti-parallel freewheeling diode across the load. If the freewheeling diode connected reversely, the servo drive is damaged.

3.3.3 Pulse Value Input Interface

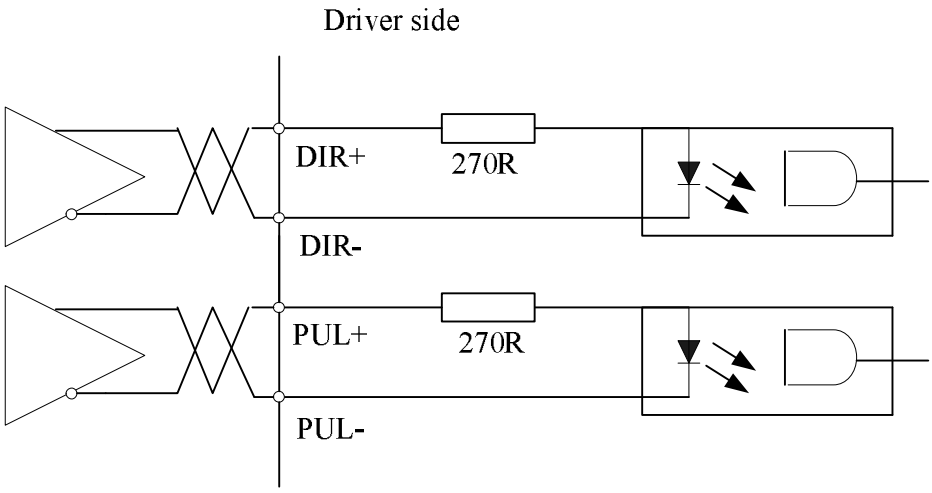
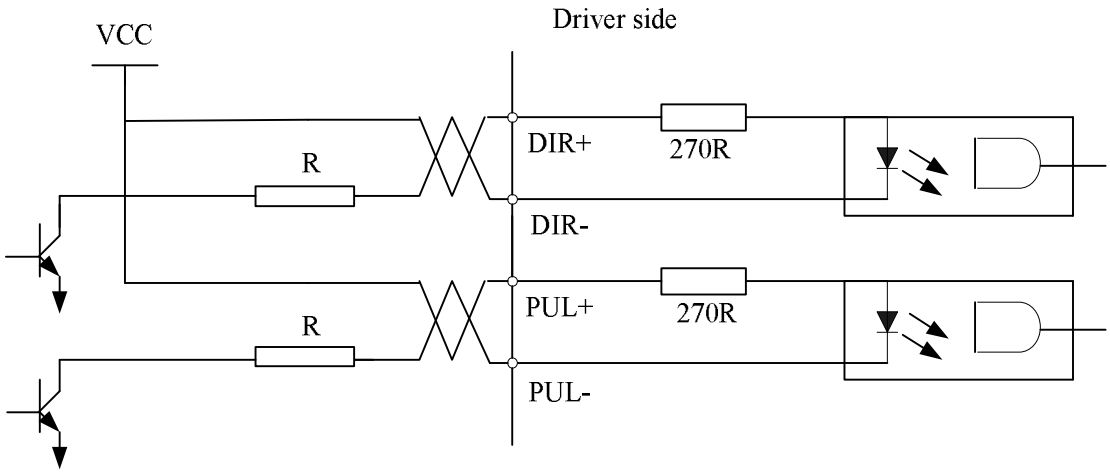


Figure 3-6 Pulse Value Input Interface Different Drive Mode



Vcc =12V, R select 1K,0.25W

Vcc =24V, R select 2K,0.25W

Figure3-7 Pulse Value Input Interface Single Terminal Drive Mode

(1) In order to properly transmit pulse volume data, we recommend using the differential drive mode.

(2) The differential drive mode, AM26LS31, MC3487 or similar RS422 line drive.

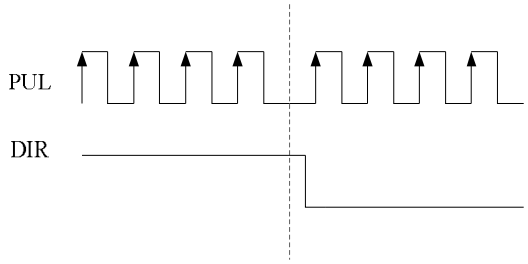
(3) The use of single-ended drive, will make the operation frequency reduced. Pulse input circuit, drive current 10 ~~ 15mA, limited the maximum voltage of 25V external power supply conditions to determine the value of the resistance R. Empirical data: VCC = 24V, R = 1.3 to 2K; VCC = 12V, R

= 510 ~ 820Ω; VCC = 5V, R = 82 ~~ 120Ω.

(4) Single-ended drive, the external power supply is provided by the user, but it must be noted, if the power supply polarity reversal, the servo drive is damaged.

(5) Pulse input in the form shown in Table 3.4, the arrows indicates the count along Table 3.5 pulse input timing parameters. When using the form of 2-phase input, the 4 octave pulse frequency ≤ 500kH.

Figure 3.7 Pulse Input Form

Pulse command form	CCW	CW	Parameter setting value
Pulse train symbol			Pulse + direction

3.3.4 Analog Value Input Interface (reserve)

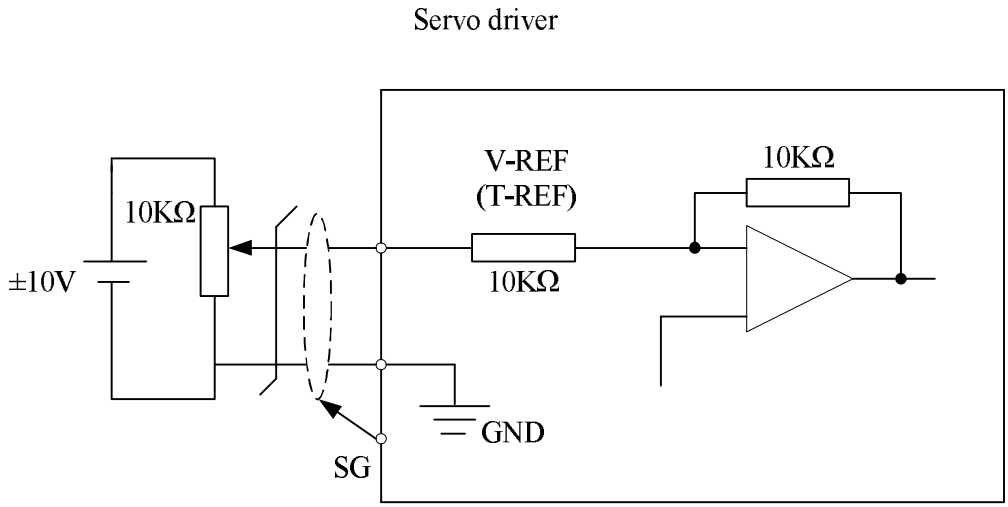


Figure 3-8 Analog AI1 Input Interface

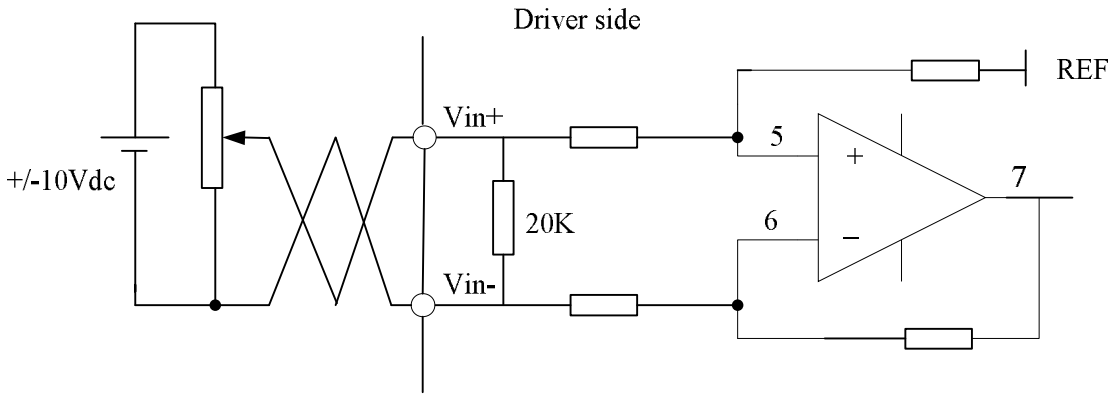


Figure 3-9 Analog AI3 Input Interface

3.3.5 Servo Motor Photo Electricity Encoder Input Interface

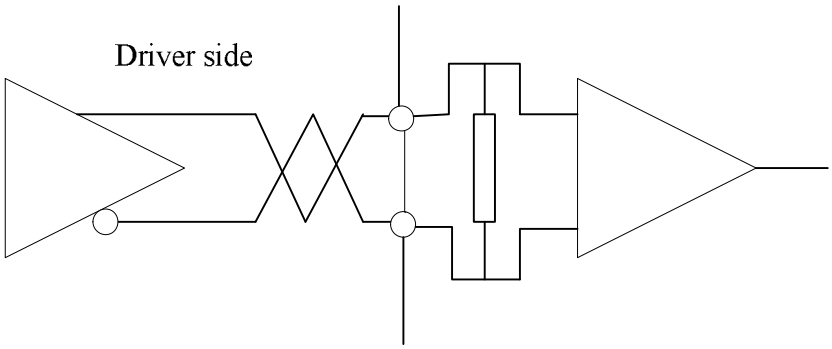


Figure 3-10 Servo Motor Photo Electricity Encoder Input Interface

Chapter 4 Parameter

4.1 Parameter List

Related Mode			Parameter Number		Name	
P	S	T	Classify	Number		
P	S	T	【Classify0】	01	Control mode setup	

P	S	T	Gain Adjust	02	Setup Auto-adjust	
P	S	T		03	Mechanical rigidity setup	
P	S	T		04	Ratio of inertia	
P				06	Command pulse polar setup	
P				07	Command pulse input mode setup	
P				09	1st numerator of electronic gear	
P				10	Denominator of electronic gear	
P	S	T		11	Encoder pulse output molecular	
P	S	T		12	Pulse output logic reverse	
P	S	T		13	1st torque limit	
P				14	Position deviation setup	
P			【Classify1】	00	1st position loop gain	
P	S	T	Gain Adjust	01	1st velocity loop gain	
P	S	T		02	1st velocity loop integration time constant	
P	S	T		03	1st velocity detection filter	
P	S	T		04	1st torque filter	
P				05	2nd position loop gain	
P	S	T		06	2nd velocity loop gain	
P	S	T		07	2nd velocity loop integration time constant	
P	S	T		08	2nd velocity detection filter	
P	S	T		09	2nd torque filter	
P				10	Velocity feed forward time constant gain	
P				11	Feed forward filter time constant	
P	S			12	Torque feed forward gain	
P	S			13	Torque feed forward filter	
P	S	T		14	2nd gain setup	
P				15	Control switching mode	
P				17	Control switching level	
P				18	Control switch hysteresis	
P				19	Gain switching time	
P				35	Position command filter setup	
P	S	T		36	Encoder feedback pulse digital filter setup	
P	S		【Classify2】	00	Self-adaption filter mode setup	
P	S	T	Vibrate	01	1st notch frequency	
P	S	T	Restrain	02	1st notch width select	
P	S	T	Function	03	1st notch depth select	
P	S	T		04	2nd notch frequency	
P	S	T		05	2nd notch width select	
P	S	T		06	2nd notch depth select	
P				22	Position command smooth filter	
P				23	Position command FIR filter	
	S		【Classify3】	00	Velocity setup internal and external switching	
	S		Speed,	01	Speed command direction appoint select	

	S	T	Torque Control	02	Speed command input gain	
	S			03	Speed command input reversal	
	S			04	1st speed setup	
	S			05	2nd speed setup	
	S			06	3rd speed setup	
	S			07	4th speed setup	
	S			08	5th speed setup	
	S			09	6th speed setup	
	S			10	7th speed setup	
	S			11	8th speed setup	
	S			12	Acceleration time setup	
	S			13	Deceleration time setup	
	S			14	Sigmoid acceleration/deceleration time setup	
	S	T		16	Zero-clamp level	
		T		18	Torque command direction selection	
		T		19	Torque command input gain	
		T		20	Torque command input reversal	
		T		21	Speed limit value 1	
P	S	T		24	Motor rotate maximum speed	
P	S	T	【Classify4】 I/F Monitor Setting	00	SI 1 input selection	
P	S	T		01	SI 2 input selection	
P	S	T		02	SI 3 input selection	
P	S	T		03	SI 4 input selection	
P	S	T		04	SI 5 input selection	
P	S	T		10	SO 1 output selection	
P	S	T		11	SO 2 output selection	
P	S	T		12	SO 3 output selection	
P	S	T		13	SO 4 output selection	
P	S	T		22	Analog input 1(AI 1) offset setup	
P	S	T		23	Analog input 1(AI 1) filter	
P	S	T		28	Analog input 3(AI 3) offset setup	
P	S	T		29	Analog input 3(AI 3) filter	
P				31	Positioning complete range	
P				32	Positioning complete output setup	
P				33	INP hold time	
P	S	T		34	Zero-speed	
	S			35	Speed coincidence range	
P	S	T		36	At-speed	
P	S	T		37	Mechanical brake action at stalling setup	
P	S	T		38	Mechanical brake action at running setup	
P	S	T		39	Brake release speed setup	
P			【Classify5】 Extended	00	2nd numerator of electronic gear	
P				01	3rd numerator of electronic gear	

P			Setup	02	4th numerator of electronic gear	
P	S	T		03	Denominator of pulse output division	
P	S	T		06	Sequence at servo-off	
P	S	T		08	Main power off LV trip selection	
P	S	T		09	Main power off detection time	
P	S	T		13	Over-speed level setup	
P	S	T		15	I/F reading filter	
P	S	T		28	LED initial status	
P	S	T		29	RS232 communication baud rate setup	
P	S	T		30	RS485 communication baud rate setup	
P	S	T		31	Axis address	
P	S	T		35	Front panel lock setup	
P	S	T	【Classify6】	03	JOG trial run command torque	
P	S	T	Special	04	JOG trial run command speed	
P	S	T	Setup	08	Positive direction torque compensation value	
P	S	T		09	Negative direction torque compensation value	
P				20	Trial running distance	
P				21	Trial running wait time	
P				22	Trial running cycle times	

4.2 Parameter Function

4.2.1【Classify0】Basic Setup

Pr0.01*	Parameter Name	Control Mode Setup			Related Mode	P	S	T
	Set range	0-2	Unit	-	Normal Default Set	0		

Set using control mode

Setup value	Content	
	1st mode	2nd mode
0	Position	-
1	Velocity	-
2	Torque	-

Pr0.02	Parameter Name	Real-time Auto-gain Tuning Setup			Related Mode	P	S	T
	Set Range	0-2	Unit	-	Normal Default Set	0		

You can set up the action mode of the real-time auto-gain tuning.

Setup value	mode	Varying degree of load inertia in motion
0	invalid	Real-time auto-gain tuning function is disabled.
1	standard	Basic mode. do not use unbalanced load, friction compensation or gain switching
2	positioning	Main application is positioning. it is recommended to use this mode on equipment without unbalanced horizontal axis, ball screw driving equipment with low friction, etc.

Pr0.03	Parameter Name	Selection of Machine Stiffness at Real-time Auto-gain Tuning			Related Mode	P	S	T
	Set Range	0-31	Unit	-	Normal Default Set	11		

You can set up response while the real-time auto-gain tuning is valid.

Low ⟶ Machine stiffness ⟶ High

Low ⟶ Servo gain ⟶ High

0.1·····11.12.13·····30.31

Low ⟶ Response ⟶ High

Notice: Higher the setup value, higher the velocity response and servo stiffness will be obtained. However, when increasing the value, check the resulting operation to avoid oscillation or vibration.

Pr0.04	Parameter Name	Ratio of Inertia			Related Mode	P	S	T
	Set Range	0-10000	Unit	%	Normal Default Set	250		

You can set up the ratio of the load inertia against the rotor(of the motor)inertia.

Pr0.04=(load inertia/rotate inertia)×100%

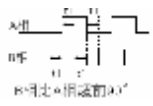
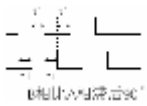
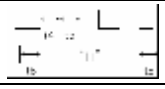
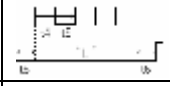
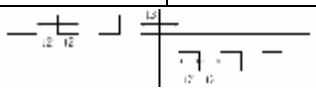
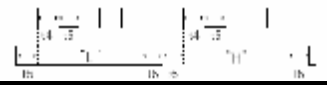
Notice:

If the inertia ratio is correctly set, the setup unit of Pr1.01 and Pr1.06 becomes (Hz). When the inertia ratio of Pr0.04 is larger than the actual, the setup unit of the velocity loop gain becomes larger, and when the inertia ratio of Pr0.04 is smaller than the actual, the setup unit of the velocity loop gain becomes smaller.

Pr0.06*	Parameter Name	Command Pulse Rotational Direction Setup			Related Mode	P		
	Set Range	0-1	Unit	-	Normal Default Set	0		

Set command pulse input rotate direction, command pulse input type

Pr0.07*	Parameter Name	Command Pulse Input Mode Setup			Related Mode	P		
	Set Range	0-3	Unit	-	Normal Default Set	1		

Pr0.06	Pr0.07	Command Pulse Format	Signal Title	Positive Direction Command	Negative Direction Command
0	0 or 2	90 phase difference 2-phase pulse(A phase +B phase)	Pulse sign		
	1	Positive direction pulse + negative direction pulse	Pulse sign		
	3	Pulse + sign	Pulse sign		
1	0 or 2	90 phase difference 2 phase pulse(A phase +B phase)	Pulse sign		
	1	Positive direction pulse + negative direction pulse	Pulse sign		
	3	Pulse + sign	Pulse sign		

Command pulse input signal allow largest frequency and smallest time width

PULS/SIGN Signal Input I/F		Permissible Max. Input Frequency	Smallest Time Width					
			t1	t2	t3	t4	t5	t6
Pulse series interface	Long distance interface	500kpps	2	1	1	1	1	1
	Open-collector output	200kpps	5	2.5	2.5	2.5	2.5	2.5

Pr0.09	Parameter Name	Command Pulse Polar Set			Related Mode	P		
	Set Range	1-32767	unit	-	Normal Default Set	1		

Set command pulse input frequency divide, frequency double process

Pr0.10	Parameter Name	Command Pulse Input Mode Set			Related Mode	P		
	Set Range	1-32767	Unit	-	Normal Default Set	1		

Set command pulse input divide frequency, double frequency process denominator

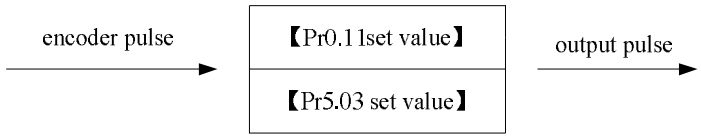
Pr0.09	Pr0.10	command
1-32767	1-32767	Command pulse input → 【Pr0.09 set value】 / 【Pr0.10 set value】 → position command

Pr0.11*	Parameter Name	Command Pulse Polar Set			Related Mode	P	S	T
	Set Range	1-2500	Unit	P/r	Normal Default Set	2500		

Set encoder divide frequency output resolution

Pr5.03*	Parameter Name	Pulse Output Divide Frequency Denominator			Related Mode	P	S	T
	Set Range	1-2500	Unit	-	Normal Default Set	2500		

Pr0.11 motor output pulse rotate 1 and Pr5.03 pulse output divide frequency denominator

1-2500	1-2500	

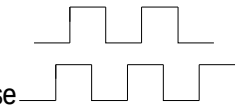
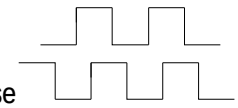
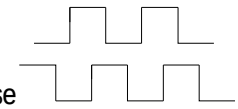
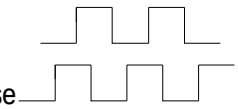
Pulse output resolution after divide double frequency 4 times

$$\text{Pulse output resolution} = \text{encoder} \times 4 \times \frac{\text{Pr0.11(pulse output divide frequency molecule)}}{\text{Pr5.03(pulse output divide frequency denominator)}}$$

Pr0.12*	Parameter Name	Pulse Output Logic Reversal			Related Mode	P	S	T
	Set Range	0-2	Unit	-	Normal Default Set	0		

You can set up the B phase logic and the output source of the pulse output. With this parameter, you can reverse the phase relation between the A-phase pulse and B-phase pulse by reversing the B-phase logic.

<encoder pulse output logic reversal>

Pr0.12	B-phase Logic	CCW Direction Rotation	CW Direction Rotation
0	Non-Reversal	A phase  B phase	A phase  B phase
1	Reversal	A phase  B phase	A phase  B phase

Pr0.13	Parameter Name	1st Torque Limit			Related Mode	P	S	T
	Set Range	0-500	Unit	%	Normal Default Set	300		

You can set up the limit value of the motor output torque, as motor rate current %,the value can't beyond driver max output current.

Pr0.14	Parameter Name	Position Deviation Excess Setup			Related Mode	P	S	T
	Set Range	0-500	Unit	0.1rev	Normal Default Set	200		
Adopt encoder pulse as unit, if setup over-small, will appear fault Err24.0(Position deviation over-large abnormal detection)								

4.2.2【Classify 1 】Gain Adjust

Pr1.00	Parameter Name	1st Gain of Position Loop			Related Mode	P		
	Set Range	0-30000	Unit	0.1/s	Normal Default Set	320		
You can determine the response of the positional control system. Higher the gain of position loop you set, faster the positioning time you can obtain. Note that too high setup may cause oscillation.								

Pr1.01	Parameter Name	1st Gain of Velocity Loop			Related Mode	P	S	T
	Set Range	0-32767	Unit	0.1Hz	Normal Default Set	180		
You can determine the response of the velocity loop. In order to increase the response of overall servo system by setting high position loop gain, you need higher setup of this velocity loop gain as well. However, too high setup may cause oscillation. Notice:when the inertia ratio of Pr0.04 is set correctly, the setup unit of Pr1.01 becomes (HZ)								

Pr1.02	Parameter Name	1st Time Constant of Velocity Loop Integration			Related Mode	P	S	T
	Set Range	0-10000	Unit	0.1ms	Normal Default Set	310		
You can set up the integration time constant of velocity loop, Smaller the set up, faster you can dog-in deviation at stall to 0.The integration will be maintained by setting to"9999".The integration effect will be lost by setting to"10000".								

Pr1.03	Parameter Name	1st Filter of Velocity Detection	Related Mode	P	S	T

	Set Range	0-31	Unit	-	Normal Default Set	15

You can set up the time constant of the low pass filter (LPF) after the speed detection, in 32 steps (0 to 31).
Higher the setup, larger the time constant you can obtain so that you can decrease the motor noise, however, response becomes slow.
The loop gain to set the filter parameters, referring to the following table:

Set Value	Speed Detection Filter Cut-off Frequency(HZ)	Set Value	Speed Detection Filter Cut-off Frequency(HZ)
0	2500	16	750
1	2250	17	700
2	2100	18	650
3	2000	19	600
4	1800	20	550
5	1600	21	500
6	1500	22	450
7	1400	23	400
8	1300	24	350
9	1200	25	300
10	1100	26	250
11	1000	27	200
12	950	28	175
13	900	29	150
14	850	30	125
15	800	31	100

Pr1.04	Parameter Name	1st Time Constant of Torque Filter			Related Mode	P	S	T
	Set Range	0-2500	Unit	0.01ms	Normal Default Set	126		

You can set up the time constant of the 1st delay filter inserted in the torque command portion. You might expect suppression of oscillation caused by distortion resonance.

Pr1.05	Parameter Name	2nd Gain of Position Loop			Related Mode	P		
	Set Range	0-30000	Unit	0.1/s	Normal Default Set	380		

Pr1.06	Parameter	2nd Velocity Loop Gain	Related	P	S	T

	Name				Mode			
	Set Range	0-32767	Unit	0.1HZ	Normal Default Set	180		

Pr1.07	Parameter Name	2nd Velocity Loop Integration Time Constant			Related Mode	P	S	T
	Set Range	0-10000	Unit	0.1ms	Normal Default Set	10000		

Pr1.08	Parameter Name	2nd Velocity Detection Filter			Related Mode	P	S	T
	Set Range	0-31	Unit	-	Normal Default Set	15		

Pr1.09	Parameter Name	2nd Torque Filter			Related Mode	P	S	T
	Set Range	0-2500	Unit	0.01ms	Normal Default Set	126		
Position loop, velocity loop, velocity detection filter, torque command filter have their 2 pairs of gain or time constant.								

Pr1.10	Parameter Name	Speed Feed Forward Constant Gain			Related Mode	P		
	Set Range	0-1000	Unit	0.10%	Normal Default Set	300		
Multiply the speed control command calculated according to the internal positional command by the ratio of this parameter and add the result to the speed command resulting from the positional control process.								

Pr1.11	Parameter Name	Speed Feed Forward Constant Gain			Related Mode	P		
	Set Range	0-6400	Unit	0.01ms	Normal Default Set	50		
Set the time constant of 1st delay filter which affects the input of speed feed forward. (speed feed forward use) The velocity feed forward will become effective as the velocity feed forward gain is gradually increased with the speed feed forward filter set at approx.50 (0.5ms). The positional deviation during operation at a constant speed is reduced as shown in the equation below in proportion to the value of velocity feed forward gain. Position deviation [command unit]=command speed [command unit/s]/position loop gain[1/s]×(100-speed feed forward gain[%]/100								

Pr1.12	Parameter	Torque feed forward gain	Related	P	S	

	name				mode			
	Set range	0-1000	unit	0.1%	Normal default set	0		
Multiply the torque control command calculated according to the velocity control command by the ratio of this parameter and add the result to the torque command resulting from the velocity control process. When use torque feed forward, need to set ratio of inertia correctly, please will use machine each element calculate ratio of inertia setup Pr0.04[ratio of inertia] Position deviation at a constant acceleration/deceleration can be minimized close to 0 by increasing the torque feed forward gain ,this means that position deviation can be maintained at near 0 over entire operation while driving in trapezoidal speed pattern under ideal condition where disturbance torque is not active.								

Pr1.13	Parameter name	Torque feed forward filter time constant			Related mode	P	S	
	Set range	0-6400	unit	0.01ms	Normal default set	0		
Set up the time constant of 1st delay filter which affects the input of torque feed forward. zero positional deviation is impossible in actual situation because of disturbance torque. as with the velocity feed forward, large torque feed forward filter time constant decreases the operating noise but increases positional deviation at acceleration change point.								

Pr1.15	Parameter name	Control switching mode			Related mode	P		
	Set range	0-10	unit	-	Normal default set	0		

Setting value	Switching condition	Gain switching condition
0	Fixed to 1st gain	Fixed to the 1st gain (Pr1.00-Pr1.04)
1	Fixed to 2nd gain	Fixed to the 2nd gain (Pr1.05-Pr1.09)
2	with gain switching input	1st gain when the gain switching input is open. 2nd gain when the gain switching input is connected to com- . If no input signal is allocated to the gain switching input, the 1st gain is fixed.
3	Torque command is large	Shift to the 2nd gain when the absolute value of the torque command exceeded (level + hysteresis)[%]previously with the 1st gain. Return to the 1st gain when the absolute value of the torque command was kept below (level + hysteresis)[%]previously during delay time with the 2nd gain.

4	reserve	reserve
5	Speed command is large	Valid for position and speed controls. Shift to the 2nd gain when the absolute value of the speed command exceeded (level + hysteresis)[r/min]previously with the 1st gain. Return to the 1st gain when the absolute value of the speed command was kept below (level + hysteresis)[r/min]previously during delay time with the 2nd gain.
6	Position deviation is large	Valid for position control. Shift to the 2nd gain when the absolute value of the positional deviation exceeded (level + hysteresis)[pulse]previously with the 1st gain. Return to the 1st gain when the absolute value of the positional deviation was kept below (level + hysteresis)[r/min]previously during delay time with the 2nd gain. Unit of level and hysteresis [pulse] is set as the encoder resolution for positional control.
7	with position command	Valid for position control. Shift to the 2nd gain when the positional command was not 0 previously with the 1st gain. Return to the 1st gain when the positional command was kept 0 previously during delay time with the 2nd gain.
8	Not in positioning complete	Valid for position control. Shift to the 2nd gain when the positioning was not completed previously with the 1st gain. Return to the 1st gain when the positioning was kept in completed condition previously during delay time with the 2nd gain.
9	Actual speed is large	
10	Have position command +actual speed	Position control is effect In the first gain, if the position command is not zero, transfer to the second gain In the second gain, if the position command is zero and continue in delay time period, and actual speed absolute value less than (grade-hysteresis)[r/min],back to the first gain

When position control, may setup Pr1.15=3,5,6,9,10;
When speed control, may setup Pr1.15=3,5,9;

Pr1.17	Parameter name	Control switching level			Related mode	P		
	Set range	0-20000	unit	According to mode	Normal default set	50		
Unit of setting varies with switching mode. switching condition: position is encoder pulse number, speed is r/min, torque is %. Notice: set the level equal to or higher than the hysteresis.								

Pr1.18	Parameter name	Control switching hysteresis			Related mode	P		
	Set range	0-20000	unit	According to mode	Normal default set	33		
Combine Pr1.17(control switching level)setup Notice: when level< hysteresis, the hysteresis is internally adjusted so that it is equal to level.								

Pr1.19	Parameter name	gain switching time			Relatede mode	P		
	Set range	0-10000	unit	0.1ms	Normal default set	33		
For position controlling: if the difference between 1st gain and 2nd gain is large, the increasing rate of position loop gain can be limited by this parameter. <Position gain switching time> Notice: when using position control, position loop gain rapidly changes, causing torque change and vibrate. By adjusting Pr1.19 position loop gain switching time, increasing rate of the position loop gain can be decreased and variation level can be reduced.								

Pr1.35*	Parameter name	Position specify filter setup			Related mode	P		
	Set range	0-200	unit	0.05us	Normal default set	0		
To position given pulse do filtering, eliminate the interference of the narrow pulse, over-large setup will influence the receive of high frequency position command pulse, and will bring larger delay time.								
Pr1.36*	Parameter	Encoder feedback pulse			Related	P		

	name	digital filter setup			mode			
	Set range	0-200	unit	0.05us	Normal default set	0		
To encoder feedback pulse do filtering, eliminate the interference of the narrow pulse, over-large setup will influence motor high speed running, and will bring larger delay time, influence motor control performance.								

4.2.3 【Classify 2】Vibrate Restrain

Pr2.0.1	Parameter name	1st notch frequency			Related mode	P	S	T
	Set range	50-2000	unit	HZ	Normal default set	2000		
Set the center frequency of the 1st notch filter Notice: the notch filter function will be invalidated by setting up this parameter to "2000".								

Pr2.0.2	Parameter name	1st notch width selection			Related mode	P	S	T
	Set range	0-20	unit	-	Normal default set	2		
Set the width of notch at the center frequency of the 1st notch filter. Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation.								

Pr2.0.3	Parameter name	1st notch depth selection			Related mode	P	S	T
	Set range	0-99	unit	-	Normal default set	0		
Set the depth of notch at the center frequency of the 1st notch filter. Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain.								

Pr2.0.4	Parameter name	2nd notch frequency			Related mode	P	S	T
	Set range	50-2000	unit	HZ	Normal default set	2000		
Set the center frequency of the 2nd notch filter Notice: the notch filter function will be invalidated by setting up this parameter to "2000".								

Pr2.0.5	Parameter name	2nd notch width selection			Related mode	P	S	T
	Set range	0-20	unit	-	Normal	2		

					default set	

Set the width of notch at the center frequency of the 2nd notch filter.
Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation.

Pr2.0.6	Parameter name	2nd notch depth selection			Related mode	P	S	T
	Set range	0-99	unit	-	Normal default set	0		

Set the depth of notch at the center frequency of the 2nd notch filter.
Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain.

Pr2.22	Parameter name	Positional command smoothing filter			Related mode	P		
	Set range	0-32767	unit	0.1ms	Normal default set	0		

Set up the time constant of the1st delay filter in response to the positional command.

Pr2.23	Parameter name	Positional command FIR filter			Related mode	P		
	Set range	0-10000	unit	0.1ms	Normal default set	0		

Set up the time constant of the1st delay filter in response to the positional command.

4.2.4【Classify 3】Velocity/ Torque Control

Pr3.00	Parameter name	Speed setup, Internal /External switching			Related mode		S	
	Set range	0-3	unit	-	Normal default set	0		

This driver is equipped with internal speed setup function so that you can control the speed with contact inputs only.

Setup value	Speed setup method
0	Analog speed command(SPR)
1	Internal speed command 1st to 4th speed(PR3.04-PR3.07)
2	Internal speed command 1st to 3rd speed (PR3.04-PR3.06),Analog speed command(SPR)

3	Internal speed command 1st to 8th speed (PR3.04-PR3.11)

<relationship between Pr3.00 Internal/External switching speed setup and the internal command speed selection 1-3 and speed command to be selected>

Setup value	selection 1 of internal command speed(INTSPD1)	selection 2 of internal command speed (INTSPD2)	selection 3 of internal command speed (INTSPD3)	selection of Speed command
1	OFF	OFF	NO effect	1st speed
	ON	OFF		2nd speed
	OFF	ON		3rd speed
	ON	ON		4th speed
2	OFF	OFF	NO effect	1st speed
	ON	OFF		2nd speed
	OFF	ON		3rd speed
	ON	ON		Analog speed command
3	The same as [Pr3.00=1]		OFF	1st to 4th speed
	OFF	OFF	ON	5th speed
	ON	OFF	ON	6th speed
	OFF	ON	ON	7th speed

Pr3.01	Parameter name	Speed command rotational direction selection			Related mode		S	
	range	0-1	unit	-	default	0		

Select the Positive /Negative direction specifying method

Setup value	Select speed command sign(1st to 8th speed)	Speed command direction (VC-SIGN)	Position command direction
0	+	No effect	Positive direction
	-	No effect	Negative direction
1	Sign has no effect	OFF	Positive direction
	Sign has no effect	ON	Negative direction

Pr3.02	Parameter name	Input gain of speed command			Related mode		S	T
	range	10-2000	unit	(r/min)/v	default	500		

Based on the voltage applied to the analog speed command (SPR), set up the conversion gain to motor command speed.

You can set up "slope" of relation between the command input voltage and motor speed, with Pr3.02. Default is set to Pr3.02=500(r/min)/V, hence input of 6V becomes 3000r/min.

Notice:

1. Do not apply more than ±10V to the speed command input(SPR).
2. When you compose a position loop outside of the driver while you use the driver in velocity

control mode, the setup of Pr3.02 gives larger variance to the overall servo system.
3. Pay an extra attention to oscillation caused by larger setup of Pr3.02.

Pr3.03	Parameter name	Reversal of speed command input			Related mode		S	
	range	0-1	unit	-	default	1		

Specify the polarity of the voltage applied to the analog speed command (SPR).

Setup value	Motor rotating direction	
0	Non-reversal	[+ voltage] →[+ direction] [- voltage] →[-direction]
1	reversal	[+ voltage] →[- direction] [- voltage] →[+direction]

Caution: When you compose the servo drive system with this driver set to velocity control mode and external positioning unit, the motor might perform an abnormal action if the polarity of the speed command signal from the unit and the polarity of this parameter setup does not match.

Pr3.04	Parameter name	1st speed of speed setup			Related mode		S	
	range	-20000-20000	unit	r/min	default	0		
Pr3.05	Parameter name	2nd speed of speed setup			Related mode		S	
	range	-20000-20000	unit	r/min	default	0		
Pr3.06	Parameter name	3rd speed of speed setup			Related mode		S	
	Set range	-20000-20000	unit	r/min	Normal default set	0		
Pr3.07	Parameter name	4th speed of speed setup			Related mode		S	
	Set range	-20000-20000	unit	r/min	Normal default set	0		
Pr3.08	Parameter name	5th speed of speed setup			Related mode		S	
	Set range	-20000-20000	unit	r/min	Normal default set	0		
Pr3.09	Parameter name	6th speed of speed setup			Related mode		S	
	Set range	-2000	unit	r/min	Normal	0		

		0-20000			default set			
Pr3.10	Parameter name	7th speed of speed setup			Related mode		S	
	Set range	-20000-20000	unit	r/min	Normal default set	0		
Pr3.11	Parameter name	8th speed of speed setup			Related mode		S	
	Set range	-20000-20000	unit	r/min	Normal default set	0		
	Set up internal command speed, 1st to 8th							

Pr3.12	Parameter name	Acceleration time setup			Related mode		S	
	Set range	0-10000	unit	Ms/(1000r/min)	Normal default set	100		
Pr3.13	Parameter name	Deceleration time setup			Related mode		S	
	Set range	0-10000	unit	Ms/(1000r/min)	Normal default set	100		
Pr3.14	Parameter name	Sigmoid acceleration/deceleration time setup			Related mode		S	
	Set range	0-1000	unit	ms	Normal default set	0		

Pr3.16	Parameter name	Speed zero clamp level			Related mode		S	T
	Set range	10-20000	unit	r/min	Normal default set	30		
When analog speed given value under speed control mode less than zero speed clamp level setup, speed command will set to 0 strongly.								

Pr3.18	Parameter name	Torque command direction selection			Related mode			T
	Set range	0-1	unit	-	Normal default set	0		
select the direction positive/negative direction of torque command								

→ →

0	Specify the direction with the sign of torque command Torque command input[+] → positive direction, [-] → negative direction
1	Specify the direction with torque command sign(TC-SIGN). OFF: positive direction ON: negative direction

Pr3.19	Parameter name	Torque command input gain			Related mode			T
	Set range	10-1000	unit	0.1V/100%	Normal default set	0		
Based on the voltage (V) applied to the analog torque command (TRQR),set up the conversion gain to torque command(%) .								

Pr3.20	Parameter name	torque command input reversal			Related mode			T
	Set range	0-1	unit	-	Normal default set	0		

Set up the polarity of the voltage applied to the analog torque command(TRQR).

Setup value	Direction of motor output torque	
0	Non-reversal	[+ voltage] →[+ direction] [- voltage] →[-direction]
1	reversal	[+ voltage] →[- direction] [- voltage] →[+direction]

Pr3.21	Parameter name	Speed limit value 1			Related mode			T
	Set range	0-20000	unit	r/min	Normal default set	0		
Set up the speed limit used for torque controlling. During the torque controlling, the speed set by the speed limit value cannot be exceeded.								

Pr3.24*	Parameter name	Motor max rotate speed			Related mode	P	S	T
	Set range	0-6000	unit	r/min	Normal default set	3000		
Set up motor running max rotate speed, but can't be exceeded motor allowed max rotate speed.								

Notice: have [*] remark parameter indicate control power on vary content is valid

4.2.5【Classify 4】I/F Monitor Setting

Pr4.00*	Parameter name	SI1 input selection	Related mode	P	S	T

	Set range	0-00FFFFFFh	unit	-	Normal default set	00828282h		
Pr4.01*	Parameter name	The SI2 input select			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	0081818h		
Pr4.02*	Parameter name	The SI3 input select			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	0091910Ah		
Pr4.03*	Parameter name	The SI4 input select			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	00060606h		
Pr4.04*	Parameter name	The SI5 input select			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	0000100Ch		

Set SI1 input function allocation.

This parameter use 16 binary system do setup, as following :

00- - - - * * h: position control

00- - * * - - h: velocity control

00* * - - - - h: torque control

Please at [**] partition set up function number

For the function number, please refer to the following Figure.

Signal name	symbol	Set value	
		A connect	B connect
Invalid	-	00h	Do not setup
Positive direction over-travel inhibition input	POT	01h	81h
negative direction over-travel inhibition input	NOT	02h	82h
Servo-ON input	SRV-ON	03h	83h
Alarm clear input	A-CLR	04h	Do not setup
Gain switching input	GAIN	06h	86h
Deviation counter clear input	CL	07h	Do not setup
Command pulse inhibition input	INH	08h	88h
Electronic gear switching input 1	DIV1	0Ch	8Ch
Electronic gear switching input 2	DIV2	0Dh	8Dh
Selection 1 input of internal command speed	INTSPD1	0Eh	8Eh

Selection 2 input of internal command speed	INTSPD2	0Fh	8Fh
Selection 3 input of internal command speed	INTSPD3	10h	90h
Speed zero clamp input	ZEROSPD	11h	91h
Speed command sign input	VC-SIGN	12h	92h
Torque command sign input	TC-SIGN	13h	93h
Forced alarm input	E-STOP	14h	94h

Pr4.10*	Parameter name	SO1 output selection			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	00030303h		
Pr4.11*	Parameter name	SO2 output selection			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	00020202h (131586)		
Pr4.12*	Parameter name	SO3 output selection			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	00010101h (65793)		
Pr4.13*	Parameter name	SO4 output selection			Related mode	P	S	T
	Set range	0-00FFFFFFh	unit	-	Normal default set	00050504h (328964)		

Assign functions to SO1 outputs.

This parameter use 16 binary system do setup, as following :

00- - - - * * h: position control

00- - * * - - h: velocity control

00* * - - - - h: torque control

Please at [**] partition set up function number.

For the function number, please refer to the following Figure.

Signal name	symbol	Setup value
Invalid	-	00h
Alarm output	Alm	01h
Servo-Ready output	S-RDY	02h
Eternal brake release signal	BRK-OFF	03h
Positioning complete output	INP	04h
At-speed output	AT-SPPED	05h
Zero-speed detection output	ZSP	07h
Velocity coincidence output	V-COIN	08h
Positional command ON/OFF output	P-CMD	0Bh
Speed command ON/OFF output	V-CMD	0Fh

Pr4.22	Parameter	Analog input 1 (AI1) offset	Related		S	

	name	setup			mode			
	Set range	-5578-5578	unit	-	Normal default set	0		
Set up the offset correction value applied to the voltage fed to the analog input 1.								

Pr4.23	Parameter name	Analog input 1 (AI1) filter			Related mode		S	
	Set range	0-6400	unit	0.01ms	Normal default set	0		
Set up the time constant of 1st delay filter that determines the lag time behind the voltage applied to the analog input 1.								

Pr4.28	Parameter name	Analog input 3 (AI3) offset setup			Related mode			T
	Set range	-342-342	unit	-	Normal default set	0		
Set up the offset correction value applied to the voltage fed to the analog input 3.								

Pr4.29	Parameter name	Analog input 3 (AI3) filter			Related mode			T
	Set range	0-6400	unit	0.01ms	Normal default set	0		
Set up the time constant of 1st delay filter that determines the lag time behind the voltage applied to the analog input 3.								

Pr4.31	Parameter name	Positioning complete range			Related mode	P		
	Set range	0-10000	unit	Encoder unit	Normal default set	10		
Set up the timing of positional deviation at which the positioning complete signal (INP1) is output.								

Pr4.32	Parameter name	Positioning complete output setup			Related mode	P		
	Set range	0-3	unit	Command unit	Normal default set	10		

Select the condition to output the positioning complete signal (INP1).

Setup value	Action of positioning complete signal
0	The signal will turn on when the positional deviation is smaller than Pr4.31 [positioning complete range].
1	The signal will turn on when there is no position command and position deviation is smaller than Pr4.31 [positioning complete range].

2	The signal will turn on when there is no position command, the zero-speed detection signal is ON and the positional deviation is smaller than Pr4.31 [positioning complete range].
3	The signal will turn on when there is no position command and the positional deviation is smaller than Pr4.31 [positioning complete range].Then holds "ON" states until the next position command is entered. Subsequently, ON state is maintained until Pr4.33 INP hold time has elapsed. After the hold time, INP output will be turned ON/OFF according to the coming positional command or condition of the positional deviation.

Pr4.33	Parameter name	INP hold time			Related mode	P		
	Set range	0-30000	unit	1ms	Normal default set	0		

Set up the hold time when Pr 4.32 positioning complete output setup=3.

Setup value	State of Positioning complete signal
0	The hold time is maintained definitely, keeping ON state until next positional command is received.
1-30000	ON state is maintained for setup time (ms)but switched to OFF state as the positional command is received during hold time.

Pr4.34	Parameter name	Zero-speed			Related mode	P	S	T
	Set range	10-20000	unit	r/min	Normal default set	50		

You can set up the timing to feed out the zero-speed detection output signal(ZSP or TCL) in rotate speed (r/min).
The zero-speed detection signal(ZSP) will be fed out when the motor speed falls below the setup of this parameter, Pr4.34

Pr4.35	Parameter name	Speed coincidence range			Related mode		S	
	Set range	10-20000	unit	r/min	Normal default set	50		

Set the speed coincidence (V-COIN) output detection timing.
Output the speed coincidence (V-COIN) when the difference between the speed command and the motor speed is equal to or smaller than the speed specified by this parameter.

Pr4.36	Parameter name	At-speed(Speed arrival)			Related mode		S	
	Set range	10-20000	unit	r/min	Normal default set	1000		

Set the detection timing of the speed arrival output (AT-SPEED). When the motor speed exceeds this setup value, the speed arrive output (AT-SPEED) is output. Detection is associated with 10r/min hysteresis.

Pr4.37	Parameter name	Mechanical brake action at stalling setup			Related mode	P	S	T
	Set range	0-10000	unit	1ms	Normal default set	0		
Motor brake delay time setup, main use prevent servo on "galloping "phenomenon								

Pr4.38	Parameter name	Mechanical brake action at running setup			Related mode	P	S	T
	Set range	0-10000	unit	1ms	Normal default set	0		
mechanical brake start delay time setup, main use prevent servo off "galloping "phenomenon								

Pr4.39	Parameter name	Brake release speed setup			Related mode	P	S	T
	Set range	30-3000	unit	1ms	Normal default set	30		
When servo off, rotate speed less than this setup vale, and mechanical brake start delay time arrive, motor lost power								

4.2.6【Classify 5】Extended Setup

Pr5.00	Parameter name	2nd numerator of electronic gear			Related mode	P	S	T
	Set range	1-32767	unit	-	Normal default set	1		
Pr5.01	Parameter name	3rd numerator of electronic gear			Related mode	P	S	T
	Set range	1-32767	unit	-	Normal default set	1		
Pr5.02	Parameter name	4th numerator of electronic gear			Related mode	P	S	T
	Set range	1-32767	unit	-	Normal default set	1		
Pr5.03	Parameter name	Denominator of electronic gear			Related mode	P	S	T
	Set range	1~2500	unit	0.1ms	Normal default set	2500		
According to the command pulse input , set the 2nd to 4th numerator of electronic gear								

DIV1	DIV2	numerator of electronic gear	denominator of electronic gear
OFF	OFF	Pr0.09	Pr5.03
ON	OFF	Pr5.00	Pr5.03
OFF	ON	Pr5.01	Pr5.03
ON	ON	Pr5.02	Pr5.03

Pr5.06	Parameter name	Servo-off sequence			Related mode	P	S	T
	Set range	0~2	unit	-	Normal default set	0		

Specify the status during deceleration and after stop, after servo-off.

Setup value	during deceleration	After stop
0	Stop immediately	Idle
1	idle	idle

Pr5.08	Parameter name	LV trip selection at main power OFF			Related mode	P	S	T
	Set range	0~1	unit	-	Normal default set	1		

You can select whether or not to activate Err13.1 (main power under-voltage protection)function while the main shutoff continues for the setup of Pr5.09(The main power-OFF detection time).

Pr5.09*	Parameter name	The main power-OFF detection time			Related mode	P	S	T
	Set range	70~2000	unit	1ms	Normal default set	70		

You can set up the time to detect the shutoff while the main power is kept shut off continuously. The main power off detection is invalid when you set up this to 2000.

Pr5.13	Parameter name	Over-speed level setup			Related mode	P	S	T
	Set range	0-20000	unit	r/min	Normal default set	0		

If the motor speed exceeds this setup value, Err1A.0 [over-speed protect] occurs.
The over-speed level becomes 1.2 times of the motor max, speed by setting up this to 0.

Pr5.15*	Parameter name	I/F reading filter			Related mode	P	S	T
	Set range	0~255	unit	0.1ms	Normal default set	0		

I/O input digital filtering; higher setup will arise control delay.

Pr5.28*	Parameter name	LED initial status			Related mode	P	S	T
	Set range	0~35	unit	-	Normal default set	1		

You can select the type of data to be displayed on the front panel LED (7-segment) at the initial status after power-on.

Setup value	content	Setup value	content	Setup value	content
0	Positional command deviation	12	Error factor and reference of history	24	Encoder positional deviation[encoder unit]
1	Motor speed	13	Alarm display	25	External scale deviation [external scale unit]
2	Positional command speed	14	Regenerative load factor	26	Hybrid deviation[command unit]
3	Velocity control command	15	Over-load factor	27	Voltage across PN [V]
4	Torque command	16	Inertia ratio	28	Software version
5	Feedback pulse sum	17	Factor of no-motor running	29	Driver serial number
6	Command pulse sum	18	No. of changes in I/O signals	30	Motor serial number
8	External scale feedback pulse sum	20	Absolute encoder data	31	Accumulated operation time
9	Control mode	21	Absolute external scale position	32	Automatic motor recognizing function
10	I/O signal status	22	No. of encoder/external scale communication errors monitor	33	Temperature information
11	Analog input value	23	Communication axis address	36	Safety condition monitor

Pr5.29*	Parameter name	baud rate setup of RS232 communication			Related mode	P	S	T
	Set range	0~6	unit	-	Normal default set	4		
You can set up the communication speed of RS232.								

Pr5.30*	Parameter	baud rate setup of RS485	Related	P	S	T

	name	communication			mode			
	Set range	0~6	unit	0.1ms	Normal default set	2		

You can set up the communication speed of RS485.

Set value	Baud rate	Set value	Baud rate
0	2400bps	4	38400bps
1	4800bps	5	57600bps
2	9600bps	6	115200bps
3	19200bps		

Baud rate error is 2400-38400bps±5% ,57600-115200bps±2%

Pr5.31*	Parameter name	Axis address			Related mode	P	S	T
	Set range	0~127	unit	-	Normal default set	1		

During communication with the host (e.g. PC) to control multiple shafts, the shaft being accessed by the host should be identified.

Notice: when using RS232/RS485, the maximum valid value is 31.

Pr5.35*	Parameter name	Front panel lock setup			Related mode	P	S	T
	Set range	0~1	unit	-	Normal default set	0		

Lock the operation on the front panel.

Setup value	content
0	No limit on the front panel operation
1	Lock the operation on the front panel

4.2.7【Classify 6】Special Setup

Pr6.03	Parameter name	JOG trial run command torque			Related mode			T
	Set range	0-100	unit	%	Normal default set	0		

You can set up the command speed used for JOG trial run (torque control).

Pr6.04	Parameter name	JOG trial run command speed			Related mode	P	S	T
	Set range	0~500	unit	r/min	Normal default set	300		

You can set up the command speed used for JOG trial run (velocity control).

Pr6.07	Parameter name	Torque command additional value			Related mode	P	S	T
	Set range	-100~100	unit	%	Normal default set	0		
Pr6.08	Parameter name	Positive direction torque compensation value			Related mode	P	S	T
	Set range	-100-100	unit	%	Normal default set	0		
Pr6.09	Parameter name	Negative direction torque compensation value			Related mode	P	S	T
	Set range	-100-100	unit	%	Normal default set	0		
This three parameters may apply feed forward torque superposition directly to torque command.								

Pr6.20	Parameter name	Trial running distance			Related mode	P		
	Set range	0~200	unit	0.1rev	Normal default set	10		
JOG running(position control): running distance each time								

Pr6.21	Parameter name	Trial running wait time			Related mode	P		
	Set range	0~30000	unit	Ms	Normal default set	1000		
JOG running (position control): wait time after running each time.								

Pr6.22*	Parameter name	Trial running cycle times			Related mode	P		
	Set range	0~32767	unit	-	Normal default set	10		
JOG running(position control): cycle times								

Chapter 5 Alarm and Processing

5.1 Alarm List

Protection function is activated when an error occurs, the drive will stop the rotation of the motor, and the front panel will automatically display the corresponding fault

Error code. Data monitoring mode to view the history of the error, error logging submenu "AL.ERR".

The error code displayed:

Er---

Figure 5-1Panel Alarm Display

Figure 5.1 Error Code List

Error code		content	property		
Main code	Extra-code		save	emergency	May remove
09	0~F	FPGA communication error	●		
0A	0~1	Current detection circuit error	●		
	2~4	Analog input circuit error	●		
	5	DC bus circuit error	●		
	6	Temperature detection circuit error	●		
0b	0	Control power velocity lower	●		
0d	0	DC bus velocity higher	●		●
0d	0	DC bus velocity lower	●		●
0E	0	Over-current	●		
	1	Intelligent power module(IPM)over -current	●		

0F	0	Driver over -hot	●	●	
10	0	Motor over -load	●		●
12	0	Resistor discharge circuit over-load	●	●	
15	0	Encoder break line	●		
	2	Encoder initial position error	●		
18	0	Encoder data error	●	●	
18	0	Position error too big	●	●	●
	1	Velocity error too big	●	●	●
1A	0	Over-speed 1	●	●	●
28	0	I/F input interface allocation error	●		●
	1	I/F input interface function set error	●		●
	2	I/F input interface function set error	●		●
24	0	When EEPROM parameter save, CRC verify error			
26	0	Positive/negative over-distance input valid	●	●	●
58	0	Force alarm input valid	●	●	

Save: save this error history record

Emergency: error, driver will stop immediately

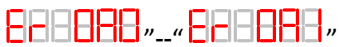
May remove: may through SI input/panel/software ACH Series remove alarm

5.2 Alarm Processing Method

When appear error, please clear error reason, renew power on

Error code	Main code	Extra-code	Display: "Er0090"--"Er009F"

			Content: FPGA communication error
Error reason		Error check	Error process
r,t terminal velocity over-low		Check r,t terminal voltage whether over-low	Assure r,t terminal voltage in properly range
Driver internal fault		/	change new driver

Error code	Main code	Extra-code	Display:'  "--" "
			Content: current detection circuit error
Error reason		Error check	Error process
Motor output U,V,W terminal Wiring error		Check motor output U,V,W terminal wiring whether error	Assure motor U,V,W terminal wiring correct
Main voltage R,S,T terminal voltage whether over-low		Check main voltage R,S,T terminal voltage whether over-low	Assure R,S,T terminal Voltage in properly range
Driver inner fault		/	change new driver

Error code	Main code	Extra-code	Display: "  "--" "
			Content: analog input circuit error
Error reason		Error check	Error process
Analog input Wiring error		Check analog input wiring	Assure analog input wiring correct
Driver inner fault		/	change new driver

Error code	Main code	Extra-code	Display: "  "
			Content: DC bus circuit error
Error reason		Error check	Error process
Main voltage R,S,T terminal voltage whether over-low		Check main voltage R,S,T terminal voltage whether over-low	Assure R,S,T terminal Voltage in properly range
Driver inner fault		/	change new driver

Error code	Main code	Extra-code	Display: "Er.0A6"
	08	0	Content: temperature detection circuit error

Error reason	Error check	Error process
r,t terminal velocity over-low	Check r,t terminal voltage whether over-low	Assure r,t terminal voltage in properly range
Driver inner fault	/	change new driver

Error code	Main code	Extra-code	Display: "Er.050"
	05	0	Content: control power voltage over-low

Error reason	Error check	Error process
r,t terminal voltage over-low	Check r,t terminal voltage whether over-low	Assure r,t terminal voltage in properly range
Power capacity insufficient	/	Promote power capacity
Driver inner fault	/	change new driver

Error code	Main code	Extra-code	Display: "Er.0c0"
	0C	0	Content: DC bus voltage over-high

Error reason	Error check	Error process
Main voltage R,S,T terminal voltage whether over-high	Check main voltage R,S,T terminal voltage whether over-high	decrease R,S,T terminal Voltage
Inner brake circuit damage	/	change new driver
Driver inner fault	/	change new driver

Error code	Main code	Extra-code	Display:"Er.0d0"
	0D	0	Content: DC bus voltage over-low

Error reason	Error check	Error process
Main voltage R,S,T terminal voltage whether over-low	Check main voltage R,S,T terminal voltage whether over-low	increase R,S,T terminal Voltage
Driver inner fault	/	change new driver

Error code	Main code	Extra-code	Display: "Er.08.0"
	08	0	Content: over-current

Error reason	Error check	Error process
Driver output short circuit	Driver between output wire whether short circuit, whether short circuit to PG ground	Assure driver output wire no short circuit, assure motor no damage
Motor wiring abnormal	Check motor wiring sequence	Adjust motor wiring sequence
IGBT module short circuit fault	Cut off driver output wiring, Srv_on and drive motor, check whether over-current	change new driver
Control parameter set abnormal	Parameter set whether beyond limit	Parameter adjust to properly range
Control command set abnormal	Check control command whether change too violent	Adjust control command: open filter

Error code	Main code	Extra-code	Display:"Er.08.1"
	08	1	Content: IPM over-current

Error reason	Error check	Error process
Driver output short circuit	Driver between output wire whether short circuit, whether short circuit to PG ground	Assure driver output wire no short circuit, assure motor no damage
Motor wiring abnormal	Check motor wiring sequence	Adjust motor wiring sequence
IGBT module short circuit fault	Cut off driver output wiring, Srv_on and drive motor, check whether over-current	change new driver
IGBT module low-voltage fault	/	change new driver
Control parameter set abnormal	Parameter set whether beyond limit	Parameter adjust to properly range
Control command set abnormal	Check control command whether change too violent	Adjust control command: open filter

Error code	Main code	Extra-code	Display: "Er.08.2"
	08	2	Content: driver over-hot

Error reason	Error check	Error process
Driver power temperature beyond upper limit	Check driver radiator temperature whether over-high	Strengthen cooling conditions, promote driver motor capacity, enlarge accelerate/decelerate time, reduce load

Error code	Main code	Extra-code	Display: "Er.108"
	08	0	Content: motor over-load

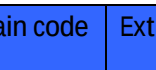
Error reason	Error check	Error process
Load over-weight	Check actual load whether beyond parameter set maximum load	Decrease load, adjust limit parameter
Motor ,encoder wiring error	Check motor, encoder wiring whether error, whether break line	Adjust wiring ,change encoder/motor
electromagnetic brake action	Check brake terminal voltage	Cut off brake

Error code	Main code	Extra-code	Display: "Er.120"
	18	0	Content: Resistance discharge circuit over-load

Error reason	Error check	Error process
Recovered energy beyond discharge limit	Motor rotate speed whether over-quick, load inertia whether over-large	Decrease motor speed, decrease load inertia ,increase External regeneration resistance, improve driver, motor capacity
Discharge circuit damage	/	Increase External regeneration resistance, change new driver

Error code	Main code	Extra-code	Display: "Er.150"
	15	0	Content: encoder break line

Error reason	Error check	Error process
Encoder break line	Encoder whether wiring fastness	Fastness encoder wiring
Encoder wiring error	Encoder wiring whether correct	Correct encoder wiring error
Encoder damage	/	Change new motor
Encoder measuring circuit	/	Change new motor

Error code	Main code	Extra-code	Display: "  "
			Content: encoder initialize position error

Error reason	Error check	Error process
Communication data abnormal	Encoder power voltage whether DC5V±5%,encoder cable whether damage; encoder cable shielded line whether connect good, encoder cable whether intertwined together with strong wire	Ensure encoder power voltage normal, ensure encoder cable intact, ensure encoder cable shielded line contact good with FG ground, ensure encoder cable separate wiring with strong wire
Encoder damage	/	Change new motor
Encoder measuring circuit	/	Change new motor

Error code	Main code	Extra-code	Display:"  "
			Content: encoder data error

Error reason	Error check	Error process
Communication data abnormal	Encoder power voltage whether DC5V±5%,encoder cable whether damage; encoder cable shielded line whether connect good, encoder cable whether intertwined together with strong wire	Ensure encoder power voltage normal, ensure encoder cable intact, ensure encoder cable shielded line contact good with FG ground, ensure encoder cable separate wiring with strong wire
Encoder damage	/	Change new motor
Encoder measuring circuit	/	Change new motor

Error code	Main code	Extra-code	Display: "Er018"
	18	0	Content: position error over-large error

Error reason	Error check	Error process
Position error parameter set unreasonable	Check parameter PA_014 value whether too small	Enlarge parameter PA_014 value
Gain set too small	Check parameter PA_100, PA_105 value whether too small	Enlarge parameter PA_100, PA_105 value
Torque limit too small	Check parameter PA_013, PA_522 value whether too small	Enlarge parameter PA_103, PA_522 value
Outside load over-large	Check whether accelerate decelerate speed time over-quick, rotate whether over-quick, load whether over-large	Decrease accelerate decelerate time over-quick, decrease speed, decrease load

Error code	Main code	Extra-code	Display: "Er019"
	19	0	Content: velocity error over-large error

Error reason	Error check	Error process
Inner position command velocity deviation over-large with actual speed	Check parameter PA_602 value whether too small	Enlarge parameter PA_602 value, set to 0,,make position deviation over-large detection invalid
Inner position command velocity accelerate decelerate time too short	Check parameter PA_312, PA_313 value whether too small	Enlarge parameter PA_312, PA_313 value, adjust velocity relative gain, improve tracing ability

Error code	Main code	Extra-code	Display: "Er010"
	10	0	Content: over-speed 1

Error reason	Error check	Error process
Motor speed beyond the first speed limit	Check motor speed command whether over-quick, check analog speed command voltage whether over-large, check parameter PA_321 whether too small, check command pulse input frequency and divide frequency coefficient whether	Adjust input speed command too small, enlarge parameter PA_321 value, modification command pulse input frequency and divide frequency coefficient, assure encoder wiring

	properly, encoder whether wiring correct	correct

Error code	Main code	Extra-code	Display: "Er.210"
	21	0	Content: I/F input interface allocation error
Error reason	Error check		Error process
Signal reset	Check parameter PA_400,PA_401,PA_402,PA_403 ,PA_404 whether set correct		Assure parameter PA_400,PA_401,PA_402,PA _403,PA_404 set correct
Signal no set	Check parameter PA_400,PA_401,PA_402,PA_403 ,PA_404 whether set correct		Assure parameter PA_400,PA_401,PA_402,PA _403,PA_404 set correct

Error code	Main code	Extra-code	Display: "Er.211"
	21	1	Content: I/F input interface function set error
Error reason	Error check		Error process
Signal allocation error	Check parameter PA_400,PA_401,PA_402,PA_40 3,PA_404 whether set correct		Assure parameter PA_400,PA_401,PA_402,PA_ 403,PA_404 set correct

Error code	Main code	Extra-code	Display: "Er.212"
	21	2	Content: I/F input interface function set error
Error reason	Error check		Error process
Signal reset	Check parameter PA_410,PA_411,PA_412,PA_413 whether set correct		Assure parameter PA_410,PA_411,PA_412,PA _413 set correct
Signal no set	Check parameter PA_410,PA_411,PA_412,PA_413 whether set correct		Assure parameter PA_410,PA_411,PA_412,PA _413 set correct

Error code	Main code	Extra-code	Display: "Er.240"
	24	0	Content: when EEPROM parameter save, CRC verify error
Error reason	Error check		Error process

r,t terminal voltage over-low	Check r,t terminal voltage whether over-low	Assure r,t terminal voltage in appropriate range
Driver damage	May repeat save several times	Change new driver

Error code	Main code	Extra-code	Display: "EA260"
	88	8	Content: positive negative over-travel input valid

Error reason	Error check	Error process
positive negative over-travel input signal conduct	Check positive negative over-travel input signal state	/

Error code	Main code	Extra-code	Display: "EA50"
	98	8	Content: forced alarm input valid

Error reason	Error check	Error process
forced alarm input signal conduct	Check forced alarm input signal whether conduct	Assure input signal wiring correct

Chapter 6 Display and Operation

6.1 Introduction

Figure 6-1 Front Panel Appearance

Figure 6.1 Button Name and Function

Name	Symbol	Function
display	/	6 LED display monitor value, parameter value and set value
Mode switch button	M	May switch between 4 mode 1.data monitor mode

		2.Parameter set mode 3.auxiliary function mode 4.EEPROM write mode
Confirm button	ENT	Entrance submenu, confirm input
Up button	▲	Switch submenu, increase numerical value
Down button	▼	Switch submenu, decrease numerical value
Left button	▲	Input position(shining)left shift

6.2 Panel Display and Panel Operation

6.2.1 Panel Operation Flow Figure

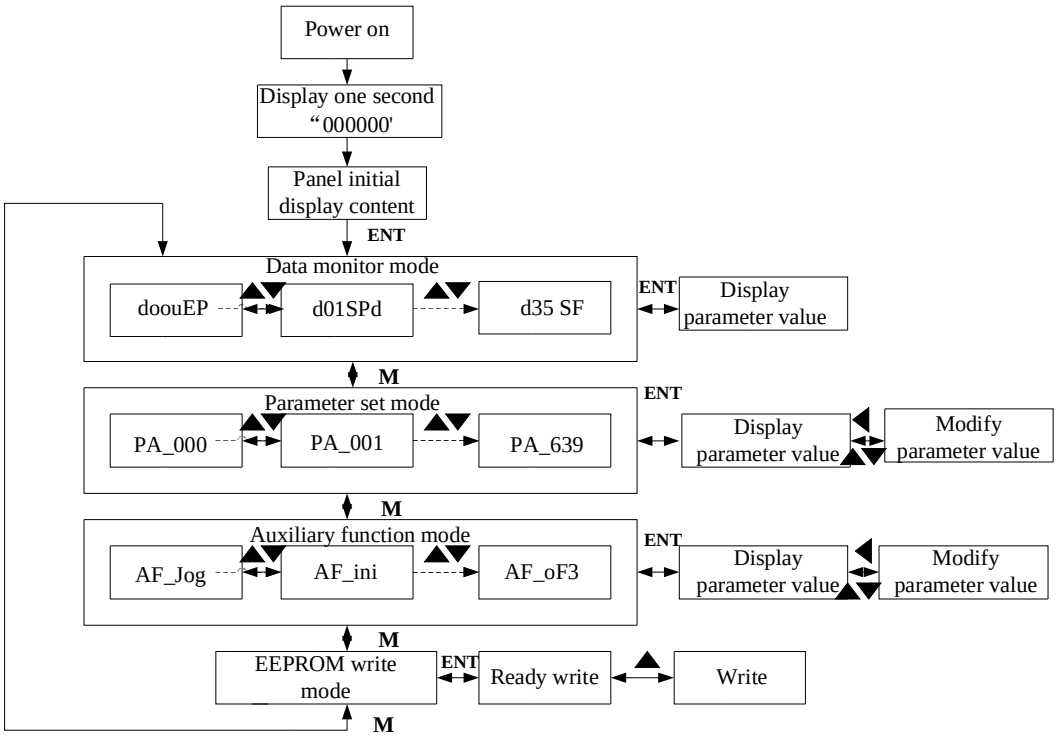


Figure 6-2 Panel Operation Flow Figure

(1) The drive power is turned on, the displayer display first sign 000000 for about one

second. Then if the drive is no abnormal alarm, enter data monitoring mode, display initial monitoring parameter values; otherwise, display abnormal alarm code.

(2) Press the M key to switch the data monitor mode → parameter setting mode → auxiliary function mode → EEPROM write mode.

(3) When new abnormal alarm occurs, in any mode will immediately switch to the abnormal alarm display mode, press the M key to switch to the other mode.

(4) In the data monitor mode, by▲or ▼key, select the type of parameters to be monitored; Press ENT to enter the parameter type by ◀selecting parameter values for the high-four "H" or low 4 "L".

(5) In the parameter setting mode, by◀selecting parameters No. edit bit, by▲ or▼ key to change the parameter No. editing bit numerical size. Press the ENT key to enter the parameters of the serial numbers of the corresponding parameter value setting mode. Edit parameter values , this bit of editing by◀ selecting parameter values, by▲or▼ key to change the parameter value, the value of the current editing bit size. Parameter value changes are complete, press ENT, the parameter values will be saved, and the selection interface returns to the parameters of the serial number.

6.2.2 Driver Operating Data Monitor

Figure 6.2 Driver Monitor Function List

Serial Number	Name	Specification	Display	Unit	Data Format(x,y is numerical value)
0	d00uEP	Position command deviation		pulse	Low-bit "L xxxx" High-bit"H xxxx"
1	d01SPd	Motor speed		r/min	"r xxxx"
2	d02cSP	Position command speed		r/min	"r xxxx"
3	d03cuL	Speed control command		r/min	"r xxxx"
4	d04trq	Torque command		%	"r xxxx"
5	d05nPS	Feedback pulse total		pulse	Low-bit "L xxxx" High-bit"H xxxx"
6	d06cPS	Command pulse total		pulse	Low-bit "L xxxx" High -bit"H xxxx"
7	d07	/		/	" xxxx"
8	d08FPS	External grating ruler		pulse	Low-bit "L xxxx" High -bit"H xxxx"

		feedback pulse total			
9	d09cnt	Control mode		/	Position:"  " Speed:"  " Torque:"  " Composite mode"  "
10	d10Io	Output input signal state		/	Input:"In0x y" (x:interface series number,arbitrary value between1-8) (y:invalid -,valid A) output:"ot0x y" (x:interface series number,arbitrary value between1-8) (y:invalid -,valid A)
11	d11Ain	Analog input value		v	"x yyyy" x:AI1 A,AI2 b,AI3 c
12	d12Err	Error reason and history record		/	"Er xxx"
13	d13 rn	Alarm number		/	"m xxx"
14	d14 r9	Regeneration load rate		%	"rg xxx"
15	d15 oL	Load rate		%	"oL xxx"
16	d16Jrt	Ratio of inertia		%	"J xxx"
17	d17 ch	No rotate reason		/	"cP xxx"
18	d18ict	Output input signal change frequency		/	"n xxx"

19	d19	/		/	" xxxx"
20	d20Abs	Absolute type encoder data		pulse	Low-bit "L xxxx" High -bit"H xxxx"
21	d21AES	Absolute feedback grating ruler position		pulse	Low-bit "L xxxx" High -bit"H xxxx"
22	d22rEc	Encoder communication abnormal times monitor		times	"n xxx"
23	d23 id	Communication shaft address		/	"id xxx" "Fr xxx"
24	d24PEP	Encoder position deviation		pulse	Low-bit "L xxxx" High -bit"H xxxx"
25	d25PFE	Feedback grating ruler deviation		pulse	Low-bit "L xxxx" High -bit"H xxxx"
26	d26hyb	Mixed deviation		pulse	Low-bit "L xxxx" High -bit"H xxxx"
27	d27 Pn	Voltage between PN		V	"u xxx"
28	d28 no	Software version		/	"d xxx" "F xxx" "P xxx"
29	d29ASE	Driver made number		/	"n xxx"
30	d30NSE	Motor made number		/	Low-bit "L xxxx" High -bit"H xxxx"
31	d31 tE	Cumulative working time		/	Low-bit "L xxxx" High -bit"H xxxx"
32	d32Aud	Motor automatic identification		/	"r xxx"
33	d33Ath	Driver temperature		℃	"th xxx"
34	d34	/		/	"t xxx"
35	d35 SF	Safe state monitor		/	"xxxxxx"

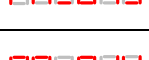
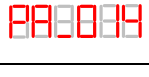
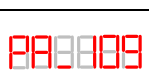
Figure 6.3 "d17 ch" Motor No Rotate Reason Code Definition

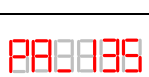
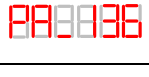
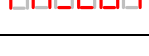
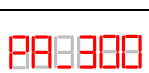
Code	Display Code	Specification	Content
1		Bus voltage over-low	/
2		No enabled signal	COM- no connect servo conduct
3		POT/NOT input valid	PA_504=0,POT is open circuit, speed command positive direction NOT is open circuit, speed command negative direction
4		Driver fault	/
6		Pulse input prohibit(INH)	PA_518=0,INH is open circuit
8		CL is valid	PA_517=0,deviation counter reset connect to COM-
9		Zero speed clamping is valid	PA_315=1,Zero speed clamping input is open circuit

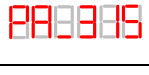
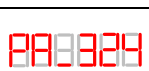
6.2.3 System Parameter Setup Interface

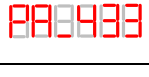
Figure 6.4 System Parameter Setup Interface

Classify	Series Number	Name	Display Code
0	01	Control mode setting	
0	02	Set real-time automatic adjust	
0	03	Real-time automatic adjust mechanic rigid setting	
0	04	Ratio of inertia	
0	06	Command pulse polar setting	
0	07	Command pulse input mode setting	
0	09	The first command divide double frequency molecule	
0	10	command divide double frequency denominator	

0	11	Encoder pulse output divide frequency molecule	
0	12	Pulse output logic reverse	
0	13	The first torque limit	
0	14	Position deviation over-large setting	
1	00	The first position loop gain	
1	01	The first velocity loop gain	
1	02	The first velocity loop integration time constant	
1	03	The first velocity detection filter	
1	04	The first torque filter	
1	05	The second position loop gain	
1	06	The second velocity loop gain	
1	07	The second velocity loop integration time constant	
1	08	The second velocity detection filter	
1	09	The second torque filter	
1	10	The velocity feed forward constant gain	
1	11	Feed forward filter time constant	
1	12	Torque feed forward gain	
1	13	Torque feed forward filter time constant	
1	14	The second gain setting	
1	15	Position control switch mode	
1	17	Position control switch grade	
1	18	Position control switch hysteresis	

1	19	Position gain switch time	
1	33	Velocity given filter time constant	
1	35	Position appointed filter setting	
1	36	Encoder feedback pulse digital filter setting	
2	00	Adaptive notch filter mode setting	
2	01	The first notch frequency	
2	02	The first notch width select	
2	03	The first notch depth select	
2	04	The second notch frequency	
2	05	The second notch width select	
2	06	The second notch depth select	
2	22	Position command smooth filter	
2	23	Position command FIR filter	
3	00	Velocity setting inside and outside switch	
3	01	Velocity command direction appointed select	
3	02	Velocity command input gain	
3	03	Velocity command input reverse	
3	04	Velocity setting the first velocity	
3	05	Velocity setting the second velocity	
3	06	Velocity setting the third velocity	
3	07	Velocity setting the fourth velocity	
3	08	Velocity setting the fifth velocity	

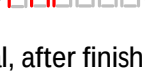
3	09	Velocity setting the sixth velocity	
3	10	Velocity setting the seventh velocity	
3	11	Velocity setting the eighth velocity	
3	12	Accelerate time setting	
3	13	Decelerate time setting	
3	14	S word accelerate/decelerate Settings	
3	15	reserve	
3	16	Zero speed clamping grade	
3	17	torque setting inside and outside switch	
3	18	torque command direction appointed select	
3	19	torque command input gain	
3	20	Torque command input conversion	
3	21	Speed limit value 1	
3	24	Motor max speed	
4	00	SI1 input select	
4	01	SI2 input select	
4	02	SI3 input select	
4	03	SI4 input select	
4	04	SI5 input select	
4	10	SO1 output select	
4	11	SO2 output select	
4	12	SO3 output select	

4	13	SO4 output select	
4	22	Analog input 1(AI1) zero drift setting	
4	23	Analog input 1(AI1) filter	
4	28	Analog input 3(AI3) zero drift setting	
4	29	Analog input 3(AI3) filter	
4	31	Position finish range	
4	32	Position finish output setting	
4	33	INP hold time	
4	34	Zero speed	
4	35	Velocity matching amplitude	
4	36	Reach speed	
4	37	When stop, mechanical brake operation setting	
4	38	When run, mechanical brake operation setting	
4	39	Brake remove speed setting	
5	00	The second command divide double frequency molecule	
5	01	The third command divide double frequency molecule	
5	02	The fourth command divide double frequency molecule	
5	03	Pulse output divide frequency denominator	
5	06	Servo close sequence	
5	08	Main power close LV trigger select	
5	09	Main power close detection time	
5	13	Over-speed grade setting	

5	15	I/F read filter	
5	28	LED initial state	
5	29	RS232 communication baud rate setting	
5	30	RS485 communication baud rate setting	
5	31	Shaft address	
6	03	JOG test machine command torque	
6	04	JOG test machine command speed	
6	08	Positive direction torque compensation value	
6	09	negative direction torque compensation value	
6	20	Test run distance	
6	21	Test run wait time	
6	22	Test run cycle times	

6.2.4 Auxiliary Function

Figure 6.5 System parameter setting interface

Series Number	Name	Specification	Display Code	Operation Flow
0	AF_jog	Motor test run		Please refer to "test running" chapter content
1	AF_InI	Recovery factory parameters		1. press ENT button enter operation, display"  "。 2.press ▲button one time ,display"  ",in dication initial, after finish

				display"AAnASh"。
2	AF_unL	Front panel release	AF_unL	1. press ENT button enter operation, display"unLOCK-"。 2. press ▲button one time ,display"AAnASh",indication unlock success
3	AF_AcL	Alarm clear	AF_AcL	3. press ENT button enter operation, display"AcLOCK-"。 press ▲button one time ,display"AAnASh",indication alarm clear success
4	AF_oF1	AI1 zero drift correct	AF_oF1	1.press ENT button enter operation, display"oF1CAL-"。 2.press ▲button one time ,display"StArt",indication start correct, then display"AAnASh"indication correct finished。
5	AF_oF2	AI2 zero drift correct	AF_oF2	1.press ENT button enter operation, display"oF2CAL-"。 2.press ▲button one time ,display"StArt",indication start correct, then display"AAnASh"indication correct finished。
6	AF_oF3	AI3 zero drift correct	AF_oF3	1.press ENT button enter operation, display"oF3CAL-"。

				2.press ▲button one time ,display"  ",in dication start correct, then display"  "indicatio n correct finished。

Figure 6.6 The Locked State Operation Projects Limited Circumstances

Mode	The Locked State Limited Circumstances
Data monitor mode	No limit
Parameter setting mode	Parameter only read, can't modification
Auxiliary function mode	Only unlock function is visible
EEPROM write mode	No limit

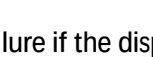
6.2.5 Parameter Saves

Operation procedure:

1. Through M button select EEPROM write mode, display "  ";

2. Press ENT button enter into write mode operation:

3. Press and hold ▲button, display from"  " become"  ", and become"  ",until it become"  ",indicate began EEPROM write operation;

4.If display  "that write failure if the display finally turned to  " show that the write was successful;

Follow steps 3 and 4 to repeat the operation; repeated several times still write fails, the drive may be damaged, repair.

5. Write successful ,drives need to power off restart.

NOTE: EEPROM write operation, do not turn off the power, otherwise it may cause a write error data; If this happens, please re-set all the parameters into the EEPROM write operation.

6.2.6 Abnormal Alarm

Drive error occurs, the front panel will automatically enter the abnormal alarm display mode, display the corresponding error code. Error code, see Chapter 5 alarm processing.

Chapter 7 Power On Run

Notice
l Drive and motor must be grounded, the drive PE terminal must be reliably connected with the equipment grounding terminal. l The proposed drive power isolation transformer and power filter, in order to guarantee the security and anti-jamming capability. l Must check to make sure the wiring is correct, to power. l Must be connected to an emergency stop circuit, to ensure that the failure occurs, the power able to immediately stop. l Drive failure alarm, restart required to confirm the fault has been ruled, Svon signal is inactive. l At least 5 minutes after the power failure of the drive and the motor must not touch, to prevent electric shock. l Drive and the motor running for some time, you may have a higher temperature rise to prevent burns.

Note: Run two kinds, the first test run, the second part is to run with a load. For security, users must first conduct a test run.

7.1 Inspection Before Run

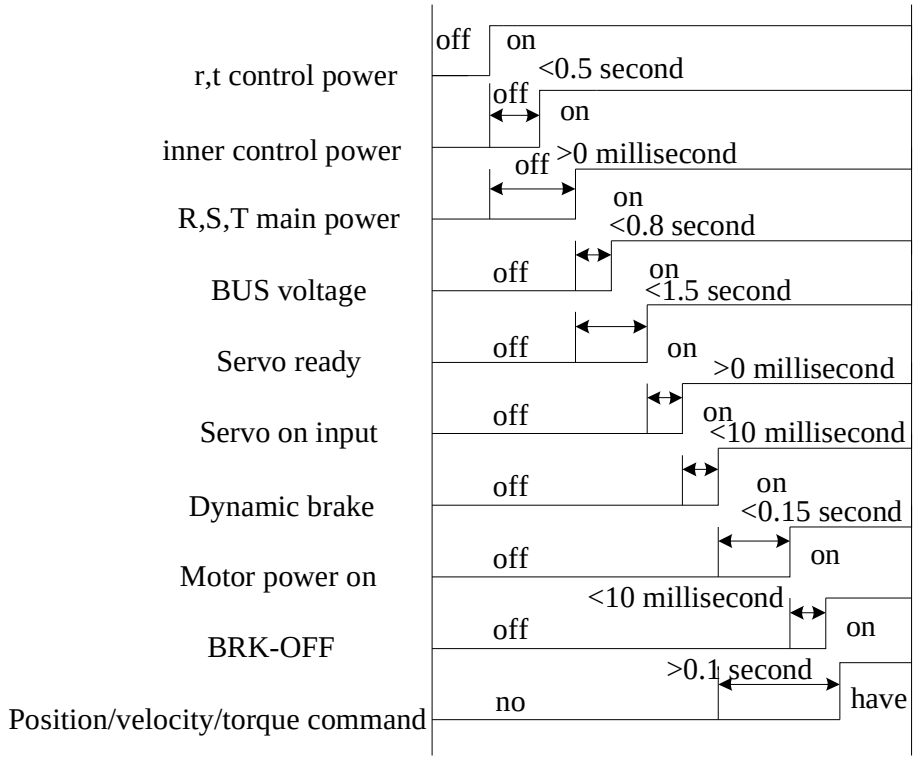
7.1.1 Wiring Check

Figure 7.1 Check Item Before Run

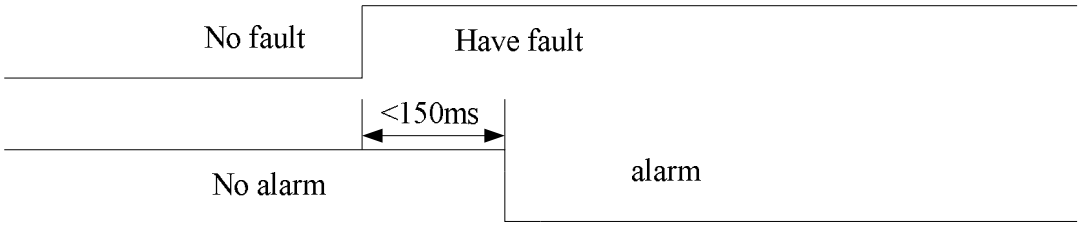
Series Number	Item	Content	Comment
1	Match wire check	1, the input power terminals, motor output power terminal coding input terminal CN2, the control signal terminal CN1 (JOG Test run and then from time to time), communication	

		terminal the CN4 (JOG trial is running from time connected) must be properly wired; wiring must be solid. 2, between the power input line, between motor output line must not short circuit, and PG ground short circuit.	
2	Power voltage check	1, logic power input r, t must be within the rated range. 2, the main power input R, S, T must be within the rated range.	
3	Fixed position check	1, the motor and the drive must be firmly fixed	
4	No-load check	1, the motor shaft must not be with a mechanical load.	
5	Control signal check	1, all of the control switch must be placed in the OFF state. 2, servo enable input Srv_on in the OFF state.	

7.1.2 Power On Sequence Figure



7.1.3 Fault Sequence Figure



7.2 Trial Run

After installation and connection is completed first before turning on the power, check the following items:

Power terminal wiring is correct, reliable, the input voltage is correct?

Power cord, motor cable short circuit or ground?

The encoder cables connected correctly?

The control signal terminals are connected accurate?

Power polarity and the correct size?

The drive motor is fixed firmly?

Motor shaft is connected to the load?

7.2.1 Jog Control

Notice
l JOG trial run before you do the pre-operational inspection.

Jog control that JOG control.

This control mode, users may access the control signal terminal the CN1 and communication terminal CN4.

For security reasons, JOG control at low speed is recommended; this mode the motor will set the parameters to do the moves accordingly.

JOG control is divided into two kinds: speed JOG mode and location JOG way.

Figure 7.2 Parameter Setup of Velocity JOG

Series number	parameter	name	Set value	unit
1	PA_001	Control mode setting	1	/

2	PA_312	Accelerate time setting	User-specified	millisecond
3	PA_313	Decelerate time setting	User-specified	millisecond
4	PA_314	S word acceleration and deceleration settings	User-specified	millisecond
5	PA_604	JOG test machine command velocity	User-specified	rpm

Figure 7.23 Parameter Setup of Position JOG

Series number	parameter	name	Set value	unit
1	PA_001	Control mode setting	0	/
2	PA_312	Accelerate time setting	User-specified	millisecond
3	PA_313	Decelerate time setting	User-specified	millisecond
4	PA_314	S word acceleration and deceleration settings	0	millisecond
5	PA_604	JOG test machine command velocity	User-specified	rpm
6	PA_620	Position run distance	User-specified	0.1 rotate
7	PA_621	Position run intermittent time	User-specified	0 millisecond
8	PA_622	Position run number of repetitions	User-specified	times

◆JOG trial run operation process

1, First set the speed JOG or JOG all parameters corresponding to the position;

2, Enter the EEPROM write mode, to save the modified parameter values;

3, After the success of the drive is written ,power off restart;

4, Enter the auxiliary function mode under the  "sub-menu;

5, Press ENT, and you should display  ";

6, Press key one time, without exception, you should display  "; for  " renewable press Button once, it should be appeared  "; still shows  ", please switch to the data monitoring mode  "sub-menu, find the cause of the motor does not rotate, troubleshooting and try again;

7, If the position JOG mode, the motor will directly start to rotate; if motor is not rotating, switch to data monitoring mode  "sub-menu, find the cause of the motor does not rotate, troubleshooting and try again;

if the speed JOG mode, press button once make the motor to forward rotate(hold down key will cause the motor speed has been increased to the maximum speed of PA_604 set), you should

display "; press button once allows the motor to reverse 1 times (hold down key will cause the motor speed has been increased to the maximum speed set by the PA_ 604), you should display "; motor is not rotating, switch to the data monitoring mode " submenu, search the cause of the motor does not rotate, troubleshooting and try again;,

8. JOG commissioning process will exit JOG control, press ENT.

7.2.2 Position Control

Notice
❙ You do the pre-operational inspection. before Position control test run

Figure 7.4 Parameter Setup of Position Control

Series number	parameter	name	Corresponding input symbols	Setting value	unit
1	PA_001	Control mode setting	/	0	/
2	PA_312	Accelerate time setting	/	User-specified	millisecond
3	PA_313	Decelerate time setting	/	User-specified	millisecond
4	PA_314	S word acceleration and deceleration settings	/	User-specified	millisecond
5	PA_504	Driver prohibit input setting	/	1	/
6	PA_005	Command pulse input select	/	0	/
7	PA_007	Command pulse mode select	/	3	/
8	PA_518	Command pulse prohibit input invalid setting	/	1	/
9	PA_517	Counter clear input mode	/	2	/
10	PA_400	SI1 input select	Srv_on	Hex:0003	/

◆ Wiring Figure

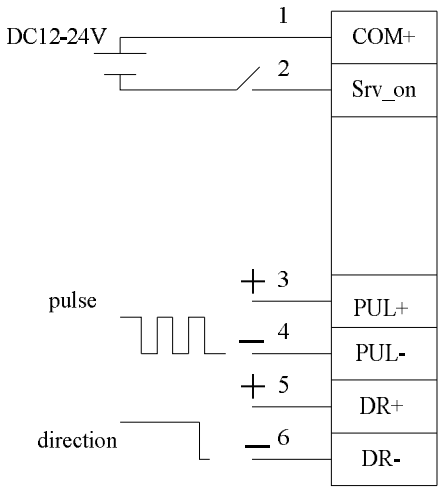


Figure 7-3 Position Control Mode Control Terminal CN1 Signal Wiring

◆Operation Steps

1 connection control IO terminal CN1.

2, according to the requirements of access control IO power (the COM + and COM-).

3, turned on the power to the drive.

4, according to the requirements of the parameters set (need to set the parameters, see the list), and written to the EEPROM, the drive is powered down to restart.

5, turned Srv_on, the motor enters the excitation state.

6. PUL (+, - between) DIR (+, -), access to the low-frequency pulses and direction signals, Check whether the motor rotation.

7. View data monitoring mode, the front panel of the drive motor speed the ("d01SPd" subkey), to confirm whether the actual speed and the set speed? The motor is also stopped when the input pulse is stopped?

Motor rotation is not smooth through the data monitor mode to view motor does not rotate reasons ("d17ch" subkey).

7.2.3 Velocity Control

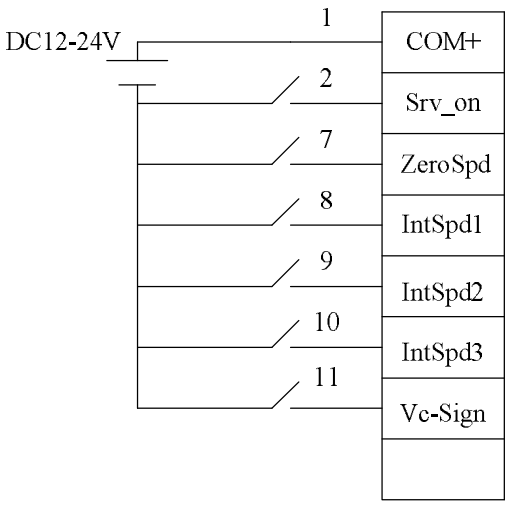
Notice
! You do the pre-operational inspection. before velocity control trial run.

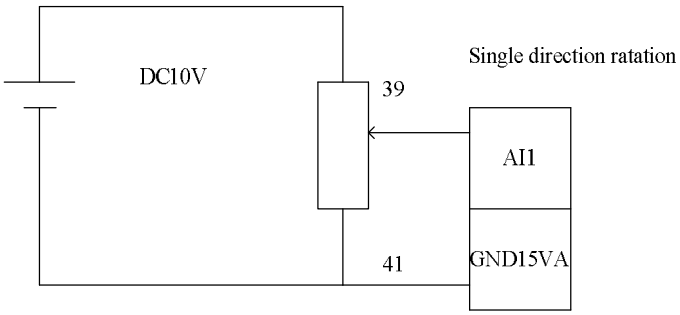
Figure 7.5 Parameter Setup of Velocity Control

Series number	Parameter	Name	Corresponding input symbols	Setup value	Unit
1	PA_001	Control mode setup	/	1	/
2	PA_312	Acceleration time	/	User-specified	millisecond

		setup			
3	PA_313	Deceleration time setup	/	User-specified	millisecond
4	PA_314	Sigmoid acceleration/deceleration time setup	/	User-specified	millisecond
5	PA_504	Driver prohibit input setup	/	1	/
6	PA_315	Zero speed clamping function select	/	1	/
7	PA_300	Velocity setup internal and external switching	/	User-specified	/
8	PA_301	Speed Command direction selection	/	User-specified	/
9	PA_302	Speed command input gain	/	User-specified	Rpm/M
10	PA_303	Speed setting input reversal	/	User-specified	/
11	PA_422	Analog input I(AI1) offset setup	/	User-specified	0.359mv
12	PA_423	Analog input I(AI1) filter	/	User-specified	0.01ms
13	PA_400	SI1 input selection	Srv_on	hex:0300	/
14	PA_401	SI2 input selection	ZeroSpd	hex:1100	/
15	PA_402	SI3 input selection	IntSpd1	hex:0E00	/
16	PA_403	SI4 input selection	IntSpd2	hex:0F00	/
17	PA_404	SI5 input selection	IntSpd3	hex:1000	/
18	PA_405	SI6 input selection	Vc-Sign	hex:1200	/

◆ wiring Figure





◆Operation steps

1 Connection control IO terminal CN1.

2, According to the requirements of access control IO power (the COM + and COM-).

3, Turned on the power to the drive.

4, According to the requirements of the parameters set (need to set the parameters, see the list), and written to the EEPROM, the drive is powered down to restart.

5, Turned Srv_on, the motor enters the excitation state.

6, Switched ZeroSpd, analog speed command input AI1 and AGND voltage, voltage from 0V gradually increased to confirm the condition of the motor rotation.

7. View data monitoring mode, the front panel of the drive motor speed the ("d01SPd" subkey), to confirm whether the actual speed and the set speed? Input instructions for 0:00 the motor is stopped (if micro-speed rotation, can be corrected input instructions)?

8. By: C-Mode IntSpd1, IntSpd2 IntSpd3 Vc-Sign change motor rotation speed and direction. Motor rotation is not smooth through the data monitor mode to view motor does not rotate reasons ("d17ch" subkey).

7.2.4 Torque Control

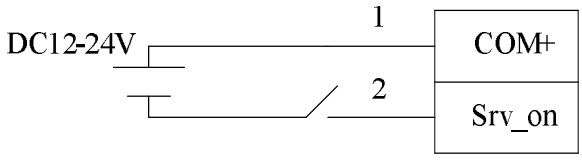
Notice

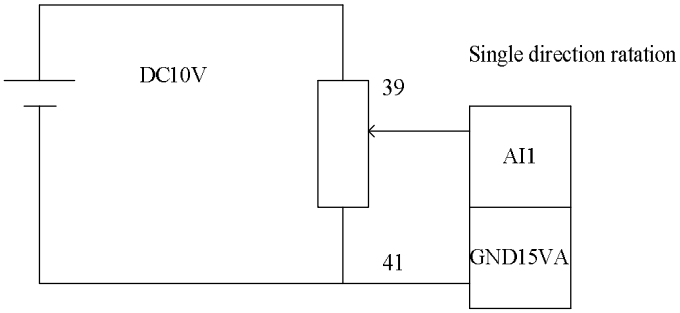
! You do the pre-operational inspection. before torque control trial run

Figure 7.6 Parameter Setup of Torque Control

Series number	Parameter	Name	Corresponding input symbols	Setup value	Unit
1	PA_001	Control mode setup	/	2	/
2	PA_312	Acceleration time setup	/	User-specified	millisecond
3	PA_313	Deceleration time setup	/	User-specified	millisecond
4	PA_314	Sigmoid acceleration/deceleration time setup	/	User-specified	millisecond
5	PA_504	Driver prohibit input setup	/	1	/
6	PA_315	Zero-clamp function selection	/	0	/
7	PA_317	Torque setup internal/external switching	/	0	/
8	PA_319	Torque command direction input gain	/	User-specified	0.1V/100%
9	PA_320	Torque setup input reversal	/	User-specified	/
10	PA_321	Speed limit value 1	/	User-specified	R/min
13	PA_400	SI1 input selection	Srv_on	hex:0300	/
11	PA_422	Analog input I(AI1) offset setup	/	User-specified	0.359mv
12	PA_423	Analog input I(AI1) filter	/	User-specified	0.01ms

◆ Wiring Figure





◆Operation Steps

1 Connection control IO terminal CN1.

2, According to the requirements of access control IO power supply (COM and COM-).

3, Turned on the power to the drive.

4, According to the requirements of the parameters set (need to set the parameters, see the list), and written to the EEPROM, the drive is powered down to restart.

5, Turned Srv_on, the motor enters the excitation state.

6, AI1 and AGND input voltage of the analog torque command voltage from 0V gradually increase and confirm the condition of the motor rotation.

7. View data monitoring mode, the front panel of the drive motor torque the ("d04trq" subkey), to confirm whether the actual torque is consistent with the set torque?

Motor rotation is not smooth through the data monitor mode to view motor does not rotate reasons ("d17ch" subkey).

7.3 Automatic Control Mode Run

7.3.1 Operation Mode Selection

EL5 series AC servo drives support the position, speed, torque three basic modes of operation, and can switch freely between the three basic modes of operation by switch or modify parameters.

Figure 7.7 Parameter setup of Operation Mode Selection

Series number	Mode name	Parameter	Specification
1	Position mode	PA_001=0	Driver receive position command, control motor reach to target position Speed command via terminal input or internal parameter provide
2	Velocity mode	PA_001=1	Driver receive speed command, control motor reach to target speed Speed command via terminal input or

			internal parameter provides.
3	Torque mode	PA_001=2	Driver receive torque command, control motor reach to target torque. Torque command via terminal input or internal parameter provides.
4	1st mode: position mode 2nd Mode: speed mode	PA_001=3	Through outside switch input switch.
4	1st mode: position mode 2nd Mode: torque mode	PA_001=4	Through external switch input switching
4	1st mode: speed mode 2nd Mode: torque mode	PA_001=5	Through external switch input switching

The step of changing the operation mode:
1, Switch the drive to Servo Off status.
2, Modify the control mode corresponding parameters to EEPROM.
After setup is complete, the drive power failure restart operation mode settings to take effect.

7.3.2 Position Mode

Position control mode application in precise position occasion

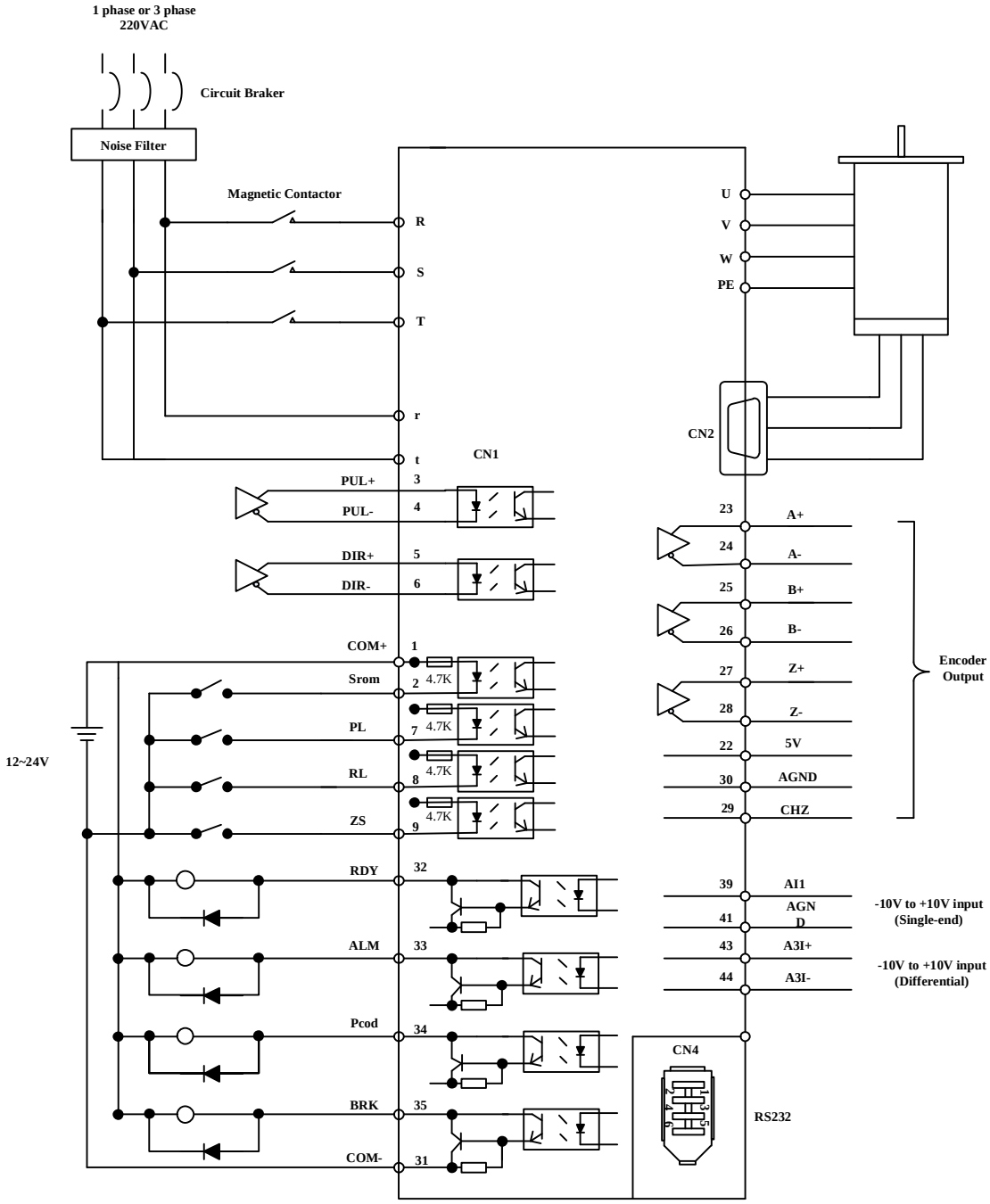


Figure 7-6 Position Mode Typical Outside Wiring Figure

Position control mode relevant parameter set

1. Command pulse input process

Position command possess three input mode

◆A, B phase orthogonal pulse

◆Positive direction/negative direction pulse

◆Pulse number + symbol

Please according to actual situation do relevant setting

Figure 7.8 Parameter Setup of Position Command Selection

Series number	Parameter	Name	Setup method

1	PA_005	Command pulse input select	Please refer to chapter 4 content
2	PA_006	Command pulse polar setting	Please refer to chapter 4 content
3	PA_007	Command pulse input mode setting	Please refer to chapter 4 content

2. Electronic gear ratio setting

Figure 7.9 Parameter Setup of Electronic Gear Ratio

1	PA_008	Motor	Please refer to chapter 4 content
2	PA_009	First command frequency double molecular	Please refer to chapter 4 content
3	PA_010	Command frequency double denominator	Please refer to chapter 4 content
4	PA_500	The second command divide double frequency molecular	Please refer to chapter 4 content
5	PA_501	The third command divide double frequency molecular	Please refer to chapter 4 content
6	PA_502	The fourth command divide double frequency molecular	Please refer to chapter 4 content

3. Position command filter

Figure 7.10 Parameter Setup of Position Command Filter

Series number	Parameter	Name	Setup method
1	PA_222	Position command smooth filter	Please refer to chapter 4 content
2	PA_223	Position command FIR filter	Please refer to chapter 4 content t

4. Motor encoder pulse output

Figure 7.11 Parameter Setup of Driver Encoder Pulse Output

Series number	Parameter	Name	Setup method
1	PA_011	Encoder pulse output molecular	Please refer to chapter 4 content
2	PA_012	Pulse output logic reverse	Please refer to chapter 4 content
3	PA_503	Pulse output divide	Please refer to

		frequency denominator	chapter 4 content
4	PA_533	Pulse regeneration output boundary set	Please refer to chapter 4 content

5. Deviation Counter clear

Figure 7.12 Parameter Setup of Deviation Counter Clear

Series number	parameter	name	Setup method
1	PA_517	Counter clear input mode	Please refer to chapter 4 content

6. Position complete output (INP)

Figure 7.13 Related Parameter Setup of Position Complete Output

Series number	Parameter	Name	Setup method
1	PA_431	Position complete range	Please refer to chapter 4 content
2	PA_432	Position complete output setup	Please refer to chapter 4 content
3	PA_433	INP hold time	Please refer to chapter 4 content
4	PA_442	2nd position complete range	Please refer to chapter 4 content

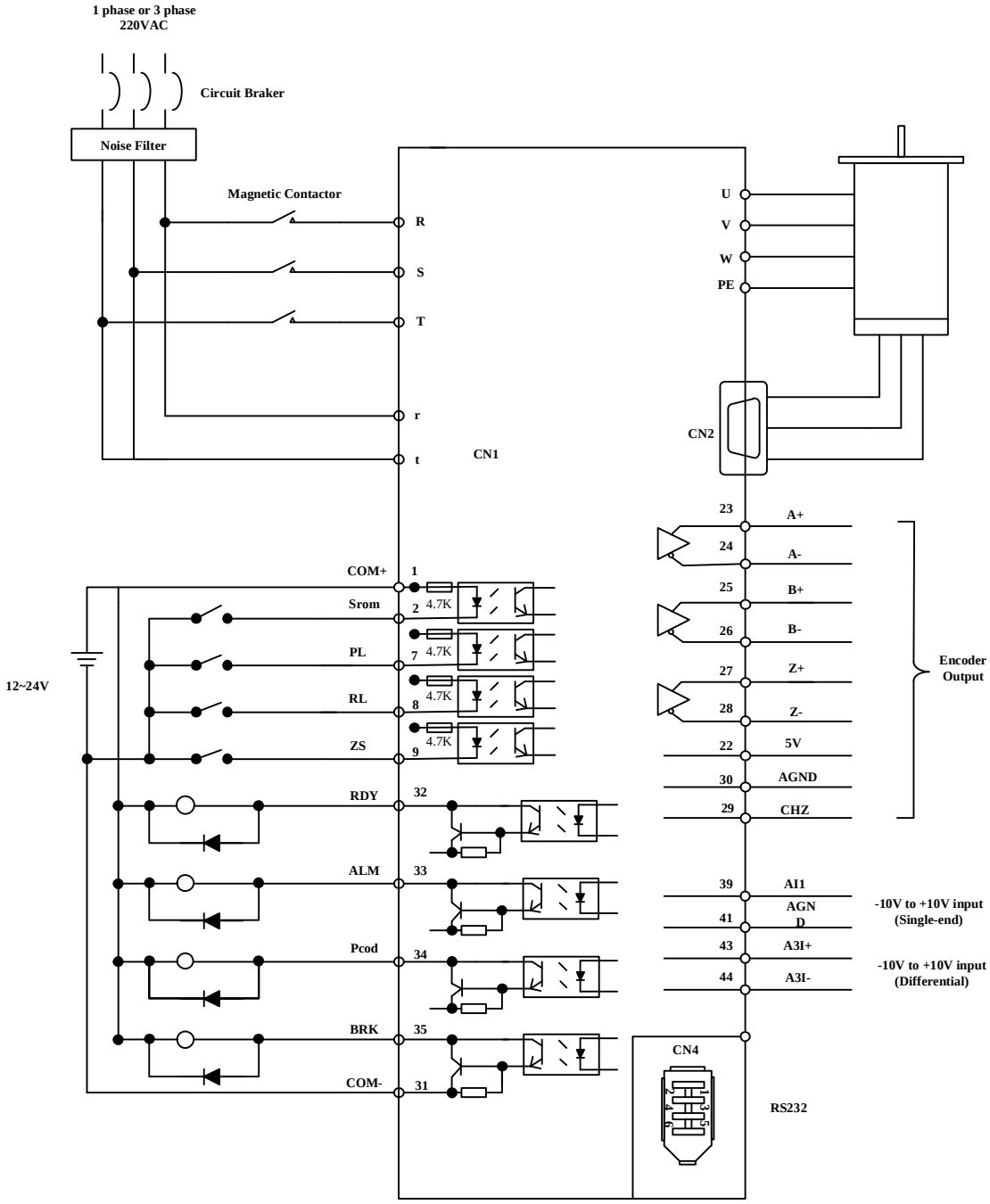
7. Command pulse prohibit (INH)

Figure 7.14 Related Parameter Setup of Command Pulse Prohibit

Series number	Parameter	Name	Setup method
1	PA_518	Command pulse prohibit input invalid setup	Please refer to chapter 4 content
2	PA_519	Command pulse prohibit input read setup	Please refer to chapter 4 content

7.3.3 Velocity Mode

Velocity mode is applied in accuracy control speed occasion



Speed control mode relevance parameter set

1. Through analog speed command carry out speed control

Figure 7.15 Parameter Setup of Analog Speed Command Carry Out Speed Control

Series number	Parameter	Name	Setup method
1	PA_300	Velocity setting inside and outside switch	Please refer to chapter 4 content
2	PA_301	Speed command direction appoint select	Please refer to chapter 4 content

3	PA_302	Speed command input gain	Please refer to chapter 4 content
4	PA_303	Speed command input reverse	Please refer to chapter 4 content
5	PA_422	Analog input 1(AI 1) zero drift setting	Please refer to chapter 4 content
6	PA_423	Analog input 1(AI 1) filter	Please refer to chapter 4 content

2. Through inner speed command carry out speed control

Figure 7.16 Parameter Setup of Internal Speed Commands Carry Out Speed Control

Series number	parameter	name	Setup method
1	PA_300	Velocity setting inside and outside switch	Please refer to chapter 4 content
2	PA_301	Speed command direction appoint select	Please refer to chapter 4 content
3	PA_304	Speed setting the first speed	Please refer to chapter 4 content
4	PA_305	Speed setting the second speed	Please refer to chapter 4 content
5	PA_306	Speed setting the third speed	Please refer to chapter 4 content
6	PA_307	Speed setting the fourth speed	Please refer to chapter 4 content
7	PA_308	Speed setting the fifth speed	Please refer to chapter 4 content
8	PA_309	Speed setting the sixth speed	Please refer to chapter 4 content
9	PA_310	Speed setting the seventh speed	Please refer to chapter 4 content
10	PA_311	Speed setting the eighth speed	Please refer to chapter 4 content

3. Zero speed clamping (ZEROSPD)

Figure 7.17 Parameter Setup of Zero-speed Clamp

Series number	parameter	name	Setup method
1	PA_315	Zero clamping function select	Please refer to chapter 4 content
2	PA_316	Zero clamping level	Please refer to chapter 4 content

4. Speed arrive output (AT-SPEED)

Figure 7.18 Parameter Setup of Speed Arrival Output

Series number	Parameter	Name	Setup method

1	PA_436	Destination speed	Please refer to chapter 4 content

5. Speed consistent output (V-COIN)

Figure 7.19 Parameter Setup of Speed Consistent Output

Series number	Parameter	Name	Setup method
1	PA_435	Speed consistent amplitude	Please refer to chapter 4 content

6. Speed command accelerates and decelerates setup

Figure 7.20 Parameter Setup of Speed Command Acceleration/Deceleration

Series number	Parameter	Name	Set method
1	PA_312	Accelerate time setting	Please refer to chapter 4 content
2	PA_313	Decelerate time setting	Please refer to chapter 4 content
3	PA_314	S word acceleration and deceleration setting	Please refer to chapter 4 content

7. SI/SO function setup.

7.3.4 Torque Mode

Torque mode is applied in need to torque control occasion

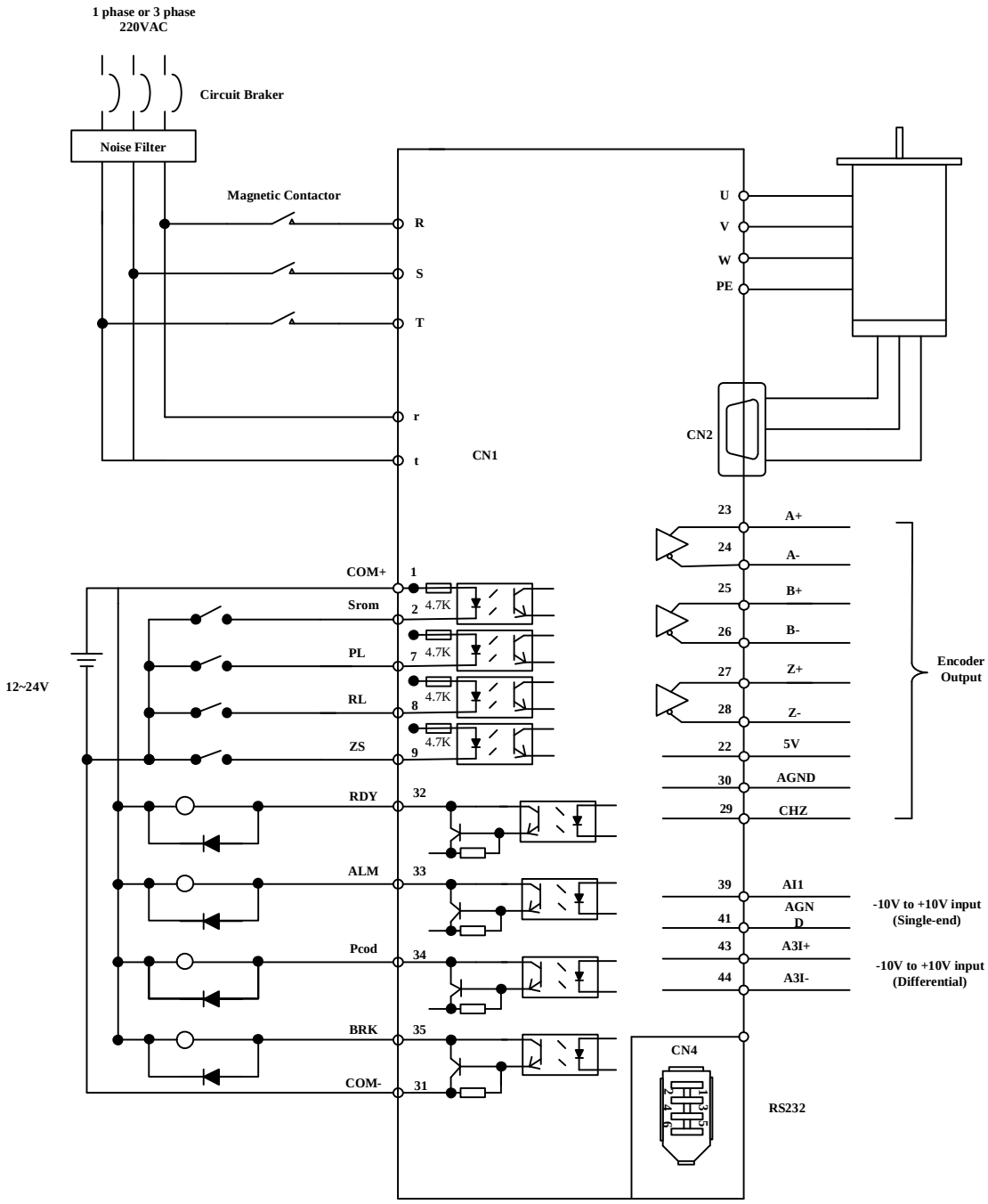


Figure 7-10 Torque Mode Typical External Wiring Figure

Torque control mode relevance parameter set

1. Analog torque command input

Figure 7.21 Parameter Setup of Analog Torque Command Input

Series Number	Parameter	Name	Setup Method
1	PA_317	Torque set inside and outside switch	Please refer to chapter 4 content
2	PA_318	Torque command direction appoint select	Please refer to chapter 4 content
3	PA_319	Torque command input gain	Please refer to

			chapter 4 content
4	PA_320	Torque command input convert	Please refer to chapter 4 content
5	PA_422	Analog input 1(AI 1) zero drift setting	Please refer to chapter 4 content
6	PA_423	Analog input 1(AI 1) filter	Please refer to chapter 4 content
7	PA_428	Analog input 3(AI 3) zero drift setting	Please refer to chapter 4 content
8	PA_429	Analog input 3(AI 3) filter	Please refer to chapter 4 content

2.Speed limit function

Figure 7.22 Parameter Setup of Speed Limit Function

Series number	Parameter	Name	Setup method
1	PA_321	Speed limit value 1	Please refer to chapter 4 content
2	PA_322	Speed limit value 2	Please refer to chapter 4 content
3	PA_315	Zero-clamp function selection	Please refer to chapter 4 content
4	PA_302	Speed command input gain	Please refer to chapter 4 content
5	PA_422	Analog input 1(AI 1) offset setup	Please refer to chapter 4 content
6	PA_423	Analog input 1(AI 1) filter	Please refer to chapter 4 content

3. SI/SO function set

Chapter 8 Product Specification

Notice
Servo driver must be shop match servo motor, this manual according to shenzhen Leadshine ACH series servo motor describe, user need shop other manufacturers servo motor, please explain when shop.

8.1 Driver Technical Specification

Figure 8.1 Driver Specification List

Parameter	EL5-0400	EL5-0750	EL5-1000	EL5-1500
Rated output power	400W	750W	1KW	1.5KW
Rated output current	2	3.7	5	7.5
Max output current	8.5	16	22	25
Main power	Single phase or three phase 220V -15%~+10% 50/60HZ			
Control power	Single phase 220V -15%~+10%			
Control mode	IGBT SVPWM sinusoidal wave control			
Feedback mode	2500P/R incremental encoder			
Input pulse	0-500kHZ,5V different			
Adjust speed ratio	30000:1			
Position bandwidth	200HZ			
Electronic gear ratio	1~32767/1~32767			
Analog input	-10~10Vdc,input resistor 20KΩ,no isolation			
Speed bandwidth	500HZ			
Input signal	Servo enable, positive limit, negative limit, zero speed clamping, analog quantity			
Output signal	Alarm output, arrive position output			
Encoder signal output	A phase, B phase, Z phase, long-distance drive mode output			
Alarm function	Over-voltage, low-voltage, over-current, over-load, default phase, encoder fault, position deviation, brake alarm, limit alarm, over-speed fault etc.			
Operation and display	Five button, may jog, trapezoidal wave test, also may each loop parameter and input output signal effect level modify and save, six-bit LED, may display rotate speed, current, position error, driver type version and address ID value etc.			
Debug software	By ACH Series can adjust the current loop, the position of the ring, speed ring of various parameters to change the input and output signals effective electric calm motor parameters and parameter import export can document form, convenient drive and different motor or a different load of the match; monitoring in the ladder The wave test run speed,			

	position error waveform.	
Communication interface	RS-232，1:1 communication;RS485，1:N(0≤N≤63),Modbus agreement	
Brake mode	Built-in brake 50Ω/50W	
Adapt load inertia	Less than motor inertia five times	
weight	1.9Kg	
size	225*149*75mm	
use environment	Environment	Avoid dust, oil fog and corrosive gases
	Ambient Temp.	0 to +40℃ .
	Humidity	40% RH to 90%RH , no condensation
	Vibration	5.9 m/s2 MAX
	Storage Temperature	-20~80℃
	install	Vertical install

Chapter 9 Order Guidance

9.1 Capacity Selection

To determine the capacity of servo system, we must consider the load inertia, load torque, the positioning accuracy, the requirements of the highest speed, proposal according to the following procedure:

1) Calculate Load Inertia and Torque

Refer to relative information calculate load inertia, load torque, acceleration/deceleration torque, effect torque as the next step basis.

2) Initially Identified the Mechanical Gear Ratio

According to the maximum speed and the highest speed of the motor calculates the maximum mechanical reduction ratio, with it and minimum turning unit of motor account whether or not meet the requirements of the smallest position unit, if the position precision is high, can increase the mechanical reduction ratio (the actual maximum speed reducing) or selection of higher speed motor.

3) Calculate Inertia and Torque.

Mechanical reduction ratio of the load inertia and load torque is converted to the motor shaft, inertia is calculated shall be not more than 5 times the motor inertia, effective torque ,load torque, calculated should not exceed the rated torque of motor. If not meet the above

requirements, can be taken to increase the mechanical reduction ratio (the actual maximum speed reducing) or selection of larger capacity motor.

9.2 Electronic Gear Ratio

Speed control mode, the actual load speed = command pulse velocity× G ×mechanical reduction ratio.

Position control mode, the actual load minimum displacement = minimum command pulse travel ×G ×mechanical reduction ratio.

【Note 】when the electronic gear ratio of G is not 1, gear ratio division may have the remainder, then there will be the position deviation, the maximum deviation is the minimum amount of rotation of the motor (minimum resolution).

9.3 Stop Feature

Position control mode with the pulse series control servo motor, there is a difference value between command pulse and feedback, called lag pulse, this value accumulated in the position deviation counter; it has the following relationship between with the command pulse frequency, electronic gear ratio and position proportional gain:

$$E = \frac{F \times G}{Kip}$$

In the middle of formula,

E: lag pulse (pulse);

F: command pulse frequency (Hz);

Kip: position proportional gain (1/S);

G: electronic gear ratio.

【Note】: The above relationship is in the position feed forward gain of 0% conditions, if the position feed forward gain >0%, the lag pulse is smaller than the calculated value of above formula.

Contact Us

China Headquarters
Address: 3/F, Block 2, Nanyou Tianan Industrial Park, Nanshan District Shenzhen, China
Web: http://www.leadshine.com

Sales Hot Line:
Tel: 86-755-2641-7674 (for Asia, Australia, Africa areas)
86-755-2640-9254 (for Europe areas)
86-755-2641-7617 (for Europe areas)
Fax: 86-755-2640-2718
Email: sales@leadshine.com.

Technical Support:
Tel: 86-755-2641-8447, 86-755-2641-8774, 86-755-2641-0546
Fax: 86-755-2640-2718
Email: tech@leadshine.com(for All)

Leadshine U.S.A
Address: 25 Mauchly, Suite 318 Irvine, California 92618
Tel: 1-949-608-7270
Fax: 1-949-608-7298
Web: http://www.leadshineUSA.com
Email: sales@leadshineUSA.com and support@leadshineUSA.com.