User Manual Of ELP AC Servo

Ver1.35

Introduction

Thanks for purchasing ELP-series AC servo drivers, this instruction manual provides knowledge and attention for using this driver.

Incorrect operation may cause unexpected accident, please read this manual carefully before using product.

- ✧ We reserve the right to modify equipment and documentation without prior notice.
- ✧ We won't undertake any responsibility with customer's any modification of product, and the warranty of product will be cancel at the same time.

Safety Items

ELP Series servo drive, should be mounted in cover type control box during operating. The mounting of drive, wiring and motor should be under the regulations of EN 61800-5-1.
Safety items indicate a potential for personal injury or equipment damage if the recommended precautions and safe operating practices are not followed.
The following safety-alert symbols are used on the drive and in the documentation:

	Indicates great possibility of death or serious injury
	Indicates something that must be done.
	Indicates something that must not be done.
	Indicates dangerous voltage.
	Indicates do not touch hot heat sink when power on.
	Protective Earth

Safety precautions

Warning

- The design and manufacture of product doesn't use in mechanic and system which have a threat to operator.
- The safety protection must be provided in design and manufacture when using this product to prevent incorrect operation or abnormal accident.

Acceptance

Caution

- The product which is damaged or have fault is forbidden to use.

Transportation

Caution

- The storage and transportation must be in normal condition.
- Don't stack too high, prevent falling.
- The product should be packaged properly in transportation,
- Don't hold the product by the cable, motor shaft or encoder while transporting it.
- The product can't undertake external force and shock.

Installation

Caution

Servo Driver and Servo Motor:

- Don't install them on inflammable substance or near it to preventing fire hazard.
- Avoid vibration, prohibit direct impact.
- Don't install the product while the product is damaged or incomplete.

Servo Driver:

- Must install in control cabinet with sufficient safeguarding grade.
- Must reserve sufficient gap with the other equipment.
- Must keep good cooling condition.
- Avoid dust, corrosive gas, conducting object, fluid and inflammable ,explosive object from invading.

Servo Motor:

- Installation must be steady, prevent drop from vibrating.
- Prevent fluid from invading to damage motor and encoder.
- Prohibit knocking the motor and shaft, avoid damaging encoder.
- The motor shaft can't bear the load beyond the limits.

Wiring

Warning

- The workers of participation in wiring or checking must possess sufficient ability do this job.
- The wiring and check must be going with power off after 10 minutes
- Ground the earth terminal of the motor and driver without fail.
- The wiring should be connected after servo driver and servo motor installed correctly
- After correctly connecting cables, insulate the live parts with insulator.

Caution

- The wiring must be connected correctly and steadily, otherwise servo motor may run incorrectly, or damage the equipment .
- Servo motor U, V, W terminal should be connected correctly , it is forbidden to connect them directly to AC power.
- We mustn't connect capacitors ,inductors or filters between servo motor and servo driver .
- The wire and temperature-resistant object must not be close to radiator of servo driver and motor.
- The freewheel diode which connect in parallel to output signal DC relay mustn't connect reversely.

Debugging and running

Caution

- Make sure the servo driver and servo motor installed properly before power on, fixed steadily, power voltage and wiring correctly.
- The first time of debugging should be run without loaded, debugging with load can be done after confirming parameter setting correctly, to prevent mechanical damage because of error operation.

Using

Caution

- Install a emergency stop protection circuit externally, the protection can stop running immediately to prevent accident happened and the power can be cut off immediately.
- The run signal must be cut off before resetting alarm signal, just to prevent restarting suddenly.
- The servo driver must be matched with specified motor.
- Don't power on and off servo system frequently, just to prevent equipment damaged.
- Forbidden to modify servo system.

Fault Processing

Warning

- The high voltage also will contain in several minutes even if the servo driver is powered off, please don't touch terminal strip or separate the wiring.
- The workers of participation in wiring or checking must possess sufficient ability do this job.

Caution

- The reason of fault must be figured out after alarm occurs, reset alarm signal before restart.
- Keep away from machine, because of restart suddenly if the driver is powered on again after momentary interruption(the design of the machine should be assured to avoid danger when restart occurs)

Table of Contents

ELP series function guidance

NO	Function	Details	Section index
1	Position control	Position control parameter specification, guidance	8.1 Position control
2	Velocity control	Velocity control parameter specification, guidance	6.2 Velocity control
3	Torque control	Torque control parameter specification, guidance	6.3 Torque control
4	Encoder supported	5000lines、17bit、23bit encoder	
5	Auxiliary Function	JOG、parameter initialization、Soft Reset、inertia ratio identification etc	7.2.3 Auxiliary Function
6	Vibration Suppression	It can suppress torque oscillation caused by too high rigidity	8.5 Vibration Suppression
7	Inertia ratio identification	The inertia of the load can be accurately identified by a simple trial run	6.4 Inertia ratio identification
8	Electronic gear function	A certain range of electronic gear ratio can be set	8.1.2 Electronic gear function
9	Position command filter	FIR filter and command smoothing filter are used to smooth the position command	6.1.3 Position command filter
10	Acceleration and Deceleration	Set the speed command acceleration and deceleration	6.2.3 Speed command acceleration and deceleration
11	Third gain switching	An additional third gain is added to allow faster positioning by switching between the first and second gain	6.6 Third gain switching
12	Friction torque compensation	The friction torque and gravity torque are compensated for the load.	6.7 Friction torque compensation
13	Alarm processing method		6.2 Alarm Processing Method
14	IO interface principle	IO input and output functions and each function can be freely configured to any physical IO port, Six IO outputs are available for master station operation through parameter setting	4.3 IO interface principle
15	Trial run	Directly through the servo drive panel or PC can achieve servo motor operation	7.3 Trial run
16	Torque limit		8.9.2 Torque limit
17	Speed limit		8.9.1 Speed limit
18	Regenerative resister setting	Support internal brake resistance and external brake resistance, match the resistance through parameter setting	6.8 Regenerative resister setting
19	Driver Operating Data Monitor	Driver operating data monitor	7.2.2 Driver Operating Data Monitor
20	Alarm and Processing	A variety of alarm code output to protect the servo driver security	Chapter 6 Alarm and Processing
21	Multi-turn absolute encoder	The driver use the memory position of the motor with multi-turn absolute encoder to realize the function of not losing absolute position after restart power supply	8.10 Multi-turn absolute encoder

Chapter 1 Introduction

1.1 Product Introduction

ELP/ELM Series AC servo products are high performance AC digital servo which is designed for position/velocity/torque high accurate control , power range up to 2kw ,which can provide a perfect solution for different applications, performance with easy tuning process .

Combined with abundant features like MFC, vibration suppression, Multi - mode filter function etc, and with high resolution encoder up to 23bit , it can provide machines a intelligent performance.

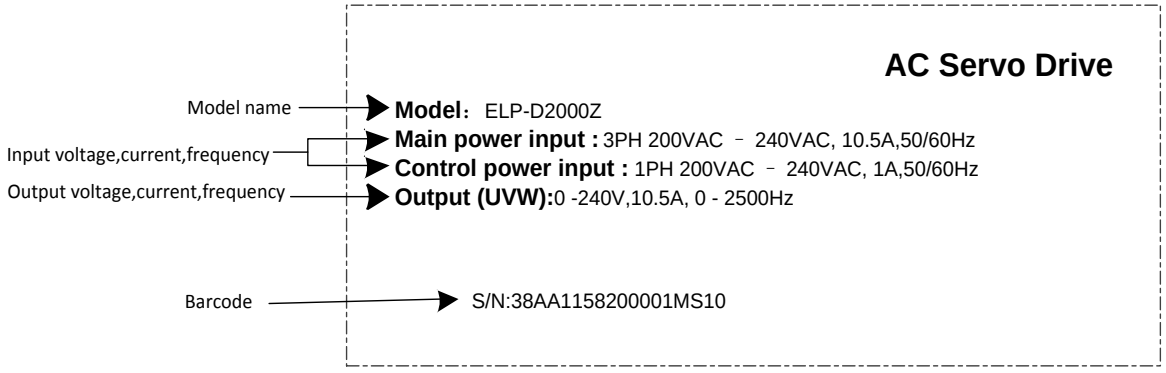
1.2 Inspection of product

1. **You must check the following thing before using the products :**
   a. Check if the product is damaged or not during transportation.
   b. Check if the servo drive & motor are complete or not.
   c. Check the packing list if the accessories are complete or not.
2. **Type meaning**

a. ELP series servo driver

ELP-D 2000 Z
① ② ③ ④

NO	Details	
①	Series Num	ELP：Servo drive series
②	Command source	D：Stand version RS：RS485 EC：EtherCAT
③	Power	0400: 400W 0750: 750W 1000:1000W 1500: 1500W 2000: 2000W
④	Encoder	Z: Serial encoder



b. Servo motor type

The ELP series AC servo driver can be matched with a variety of domestic and foreign servo motor.

3. **Accessory list**
   1. User manual
   2. Power connector
   3. Control signal terminal CN1 (44 pin)

Chapter 2 Product Specification

Notice

Servo driver must be matched with relevant servo motor, this manual describes Leadshine ELP series servo motor.

Contact tech@leadshine.com if you need more technical service .

2.1 Driver Technical Specification

Table 2.1 Driver Specification A

Parameter	ELP-*0400Z	ELP-*0750Z	ELP-*1000Z	ELP-*1500Z	ELP-*2000Z
Rated output power	400W	750W	1KW	1.5KW	2KW
Rated output current	3.5	5.5	7	9.5	12
Max output current	8.5	16	21	28.5	36
Main power Control power	Single phase 220V -15%~+10% 50/60HZ			Single phase /Three phase 220V -15%~+10% 50/60HZ	
Control mode	IGBT SVPWM sinusoidal wave control				
Feedback mode	17bit single-turn incremental encoder/23bit multi-turn absolute encoder				
Input pulse	0-500kHZ,5V differential input				
Adjust speed ratio	6000:1				
Position bandwidth	200HZ				
Electronic gear ratio	1~32767/1~32767				
Analog input	-10~10Vdc,input resistance 20KΩ, no isolation(Only available for ELP-RS version)				
Velocity bandwidth	500HZ				
Input signal	DI：9 inputs（Support common + and common - two wiring modes） Servo enable, over-travel inhibition, gain switching, command pulse inhibition, speed zero clamp, deviation counter clear, alarm clear				
Output signal	DO：6 outputs（4 single-ended，2 differential） Alarm output, servo-ready, at-speed, zero-detection, velocity coincidence				
Encoder signal output	A phase, B phase, Z phase, long-distance drive mode output				
Alarm function	Over-voltage, under-voltage, over-current, over-load, encoder error, position deviation error, brake alarm, limit alarm, over-speed error etc.				
Operation and display	jog, trapezoidal wave test, each parameter and input output signal can be modified and saved, six-bit LED to display rotational speed, current, position deviation, driver type version and address ID value etc.				
Debug software	Can adjust the parameters of current loop, velocity loop, position loop , and change the value of input and output signals and the parameter of motor and save the values to the files which can be downloaded and uploaded, monitor the waveform of velocity and position in the ladder.				
Communication interface	USB：Based on Modbus protocol (according to USB2.0 specification) RS485				
Brake mode	Built-in brake 50Ω/50W				
Adapt load inertia	Less than 5 times motor inertia				
weight	About 1.5-3Kg				
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/s^2 MAX			
	Storage Temperature	-20~80℃			
	Installation	Vertical installation			

Table 2.1 Driver Specification B

Servo drive series	ELP-D***Z	ELP-RS***Z	ELP-EC***Z
Control mode	● Position control ● JOG	● Position control ● Velocity control ● Torque control ● JOG	● CSP(Cyclic Synchronous Position) ● CSV(Cyclic Synchronous Velocity) ● CST(Cyclic Synchronous Torque) ● PP(Profile Position) ● PV(Profile Velocity) ● PT(Profile Torque) ● HM(Homing)
Encoder output	5V differential,0~500kHz 24Vsingle-ended,0~200kHz	5V differential,0~500kHz 24Vsingle-ended,0~200kHz	--
Digital input	9 inputs (common-cathode common-anode)	9 inputs (common-cathode common-anode)	14 inputs (common-cathode/common-anode) 2 differential (for capture probe)
Digital output	6 outputs(4 single-ended, 2 differential)		
Analog input	--	2 analog input:-10~+10Vdc	--
Network	--	Modbus RTU(RJ45)	EtherCAT(RJ45)
Maximum frequency of pulse input	5V differential,0~500kHz 24Vsingle-ended,0~200kHz	5V differential,0~500kHz 24Vsingle-ended,0~200kHz	--

2.2 Accessory selection

1. Motor cable:
   CABLE-RZ3M0-S (V3.0)
2. Encoder cable:
   CABLE-7BM3M0-Z (V3.0)
3. Brake cable (if necessary):
   CABLE-SC3M0-S (V3.0)
4. Software configuration cable:
   CABLE-USB1M5
5. Control signal terminal CN1 (44 pin)
6. Control signal shell CN1

Chapter 3 Installation

3.1 Storage and Installation Circumstance

Table 3.1 Servo Driver, Servo Motor Storage Circumstance Requirement

Item	ELP series driver	Servo motor
Temperature	-20-80℃	-25-70℃
Humility	Under 90%RH (free from condensation)	Under 80%RH(free from condensation)
Atmospheric environment	Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust	Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust
Altitude	Lower than 1000m	Lower than 2500m
Vibration	Less than 0.5G (4.9m/s^2) 10-60Hz (non-continuous working)	
Protection level	IP20(no protection)	IP54 or IP65

Table 3.2 Servo Driver, Servo Motor Installation Circumstance Requirement

Item	ELP series driver	Servo motor
Temperature	0-55℃	-25-40℃
Humility	Under 90%RH(free from condensation)	Under 90%RH(free from condensation)
Atmospheric environment	Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust	Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust
Altitude	Lower than 1000m	Lower than 2500m
Vibration	Less than 0.5G (4.9m/s^2) 10-60Hz (non-continuous working)	
Protection level	IP20(no protection)	IP54 or IP65

Contact tech@leadshine.com if you need more technical service .

3.2 Servo Driver Installation

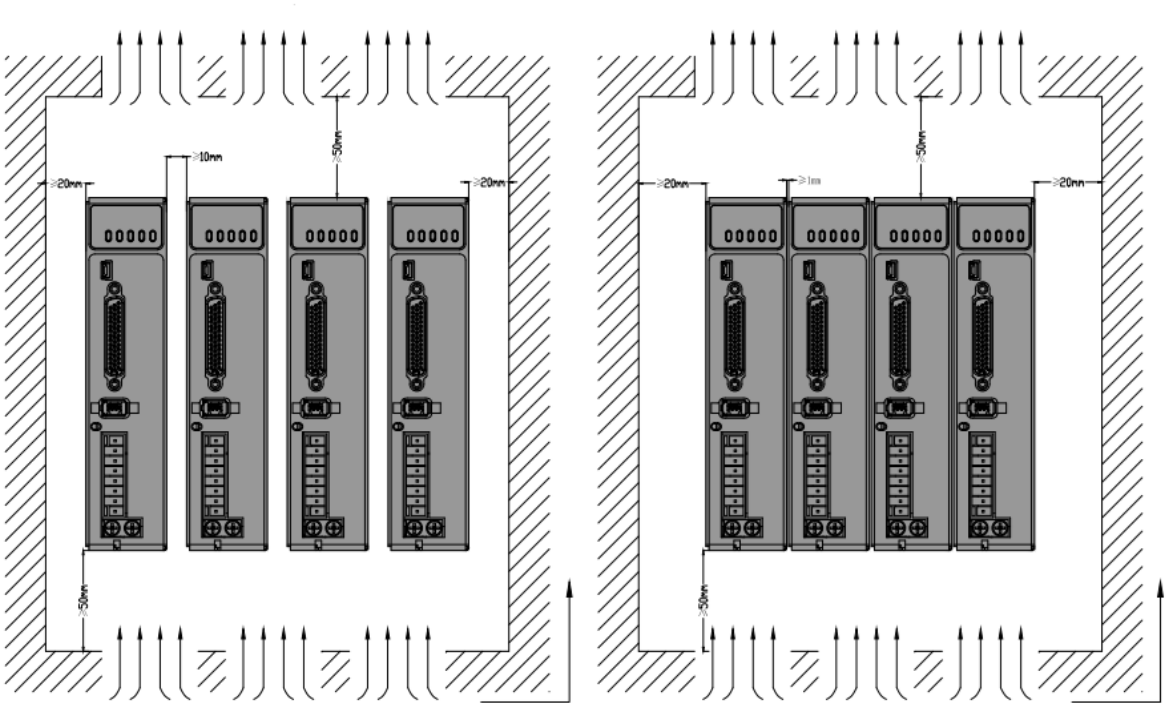
Notice
● Must install in control cabinet with sufficient safeguarding grade.
● Must install with specified direction and intervals, and ensure good cooling condition.
● Don't install them on inflammable substance or near it to prevent fire hazard.

Install in vertical position ,and reserve enough space around the servo driver for ventilation.

The user may install the product in the mode of bottom plate installation or panel installation, and the installation direction is perpendicular to the installation face. In order to ensure good heat dissipation conditions, at least 10MM of installation space should be set aside in the actual installation.

When mounting drives compactly, consider installation tolerances and leave at least 1MM between each two drives. Use it below 75% of the actual load rate.

Here is the installation diagram:



3.3 Servo Motor Installation

Notice
● Don't hold the product by the cable, motor shaft or encoder while transporting it. ● No knocking motor shaft or encoders, prevent motor by vibration or shock. ● The motor shaft can't bear the load beyond the limits. ● Motor shaft does not bear the axial load, radial load, otherwise you may damage the motor. ● Use a flexible with high stiffness designed exclusively for servo application in order to make a radial thrust caused by micro misalignment smaller than the permissible value. ● Install must be steady, prevent drop from vibrating.

Chapter 4 Wiring

Warning

- The workers of participation in wiring or checking must possess sufficient ability do this job.
- The wiring and check must be going with power off after five minutes.

Caution

- Ground the earth terminal of the motor and driver without fail.
- The wiring should be connected after servo driver and servo motor installed correctly

Contact tech@leadshine.com if you need more technical service .

4.1 Wiring

4.1.1 Wire Gauge

(1)Power supply terminal TB

● Diameter:

Table 4.1 Power wiring specification

Driver	Wire diameter (mm^2/AWG)			
	L1.L2.L3	P+.BR	U.V.W	PE
ELP-*0400Z	0.81/AWG18	2.1/AWG14	1.3/AWG16	2.1/AWG14
ELP-*0750Z	0.81/AWG18	2.1/AWG14	1.3/AWG16	2.1/AWG14
ELP-*1000Z	0.81/AWG18	2.1/AWG14	2.1/AWG14	2.1/AWG14
ELP-*1500Z	1.3/AWG16	2.6/AWG13	2.6/AWG13	2.6/AWG13
ELP-*2000Z	2.1/AWG14	2.6/AWG13	3.3/AWG12	2.6/AWG13

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

●Use noise filter to remove external noise from the power lines and reduce an effect of the noise generated by the servo driver.

● Install fuse (NFB) promptly to cut off the external power supply if driver error occurs.

(2) The control signal CN1 feedback signal CN2

● Diameter: shielded cable (twisting shield cable is better), the diameter ≥ 0.14mm^2 (AWG24-26), the shield should be connected to FG terminal.

● Length of line: cable length should be as short as possible and control CN1 cable is no more than 3 meters, the CN2 cable length of the feedback signal is no more than 20 meters.

● Wiring: be away from the wiring of power line, to prevent interference input.

●Install a surge absorbing element for the relevant inductive element (coil),: DC coil should be in parallel connection with freewheeling diode reversely; AC coil should be in parallel connection with RC snubber circuit.

（3）Regenerative resister

When the torque of the motor is opposite to the direction of rotation (common scenarios such as deceleration, vertical axis descent, etc.), energy will feedback from the load to the driver. At this time, the energy feedback is first received by the capacitor in the driver, which makes the voltage of the capacitor rise. When it rises to a certain voltage value, the excess energy needs to be consumed by the regenerative resistance

The recommended regenerative resistance specifications for the ELP series are as follows：

Table 4.2 Regenerative resistance specification sheet

Driver	Built-in resister value (Ω)	Built-in resister power (W)
ELP-*0400Z	100	50
ELP-*0750Z	50	50
ELP-*1000Z	50	100
ELP-*1500Z	50	100
ELP-*2000Z	50	100

Method for determining regenerative resistance specification

- Firstly, use the built-in resistance of the driver to run for a long time to see if it can meet the requirements: ensure that the driver temperature d33<60℃, the braking circuit does not alarm (Regeneration load factor d14<80), and the driver does not report overvoltage error
- If the driver temperature is high, try to reduce the regenerative energy power, or external resistance of the same specification (in this case, cancel the built-in resistance).
- If the brake resistance burns out, try to reduce the regenerative energy power, or put an external resistance of the same specification or even more power (in this case, cancel the built-in resistance).
- If d14 is too large or accumulates too fast, it means that the regenerative energy is too large, and the built-in resistance cannot consume the generated energy, the regenerative energy power will be reduced, or the external resistance with higher resistance value or power will be reduced.
- If an overvoltage error is reported by the driver, the regenerative energy power is reduced, or a resistance with a smaller external resistance, or a parallel resistance.

Attention

- Match the colors of the motor lead wires to those of the corresponding motor output terminals (U.V.W)
- Never start nor stop the servo motor with this magnetic contactor.
- Cable must be fixed steadily, avoid closing to radiator and motor to prevent reducing the properties of heat insulation

4.1.2 Position Control Mode

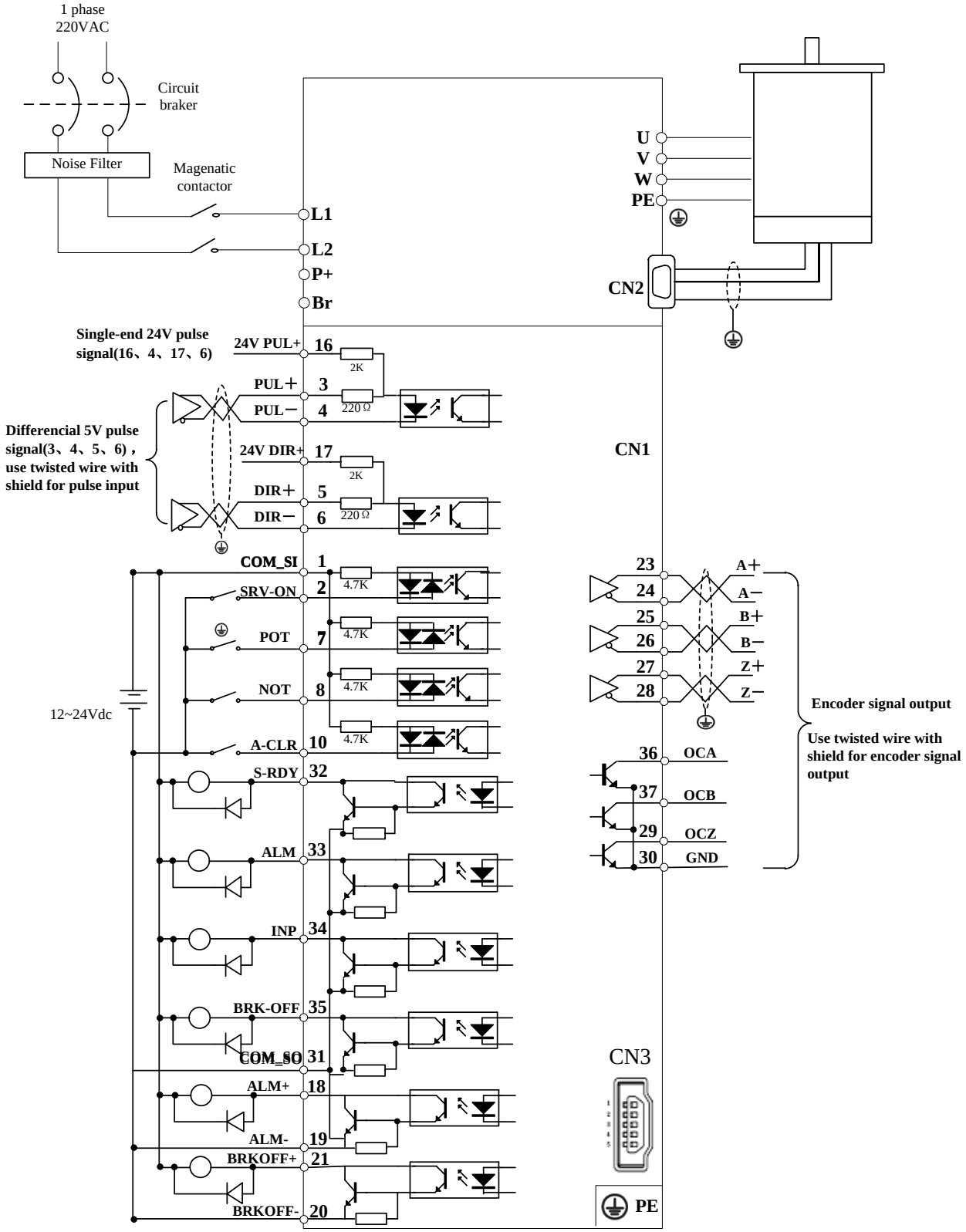


Figure 4-1 Positional Control Mode Wiring

Note:

For driver more than 1.5kw, 3 phase is better than single phase, connect L1,L2,L3

4.1.3 Torque /Velocity Control Mode

Notice : Analog input for Torque/Velocity mode is only available for ELP-RS***Z version

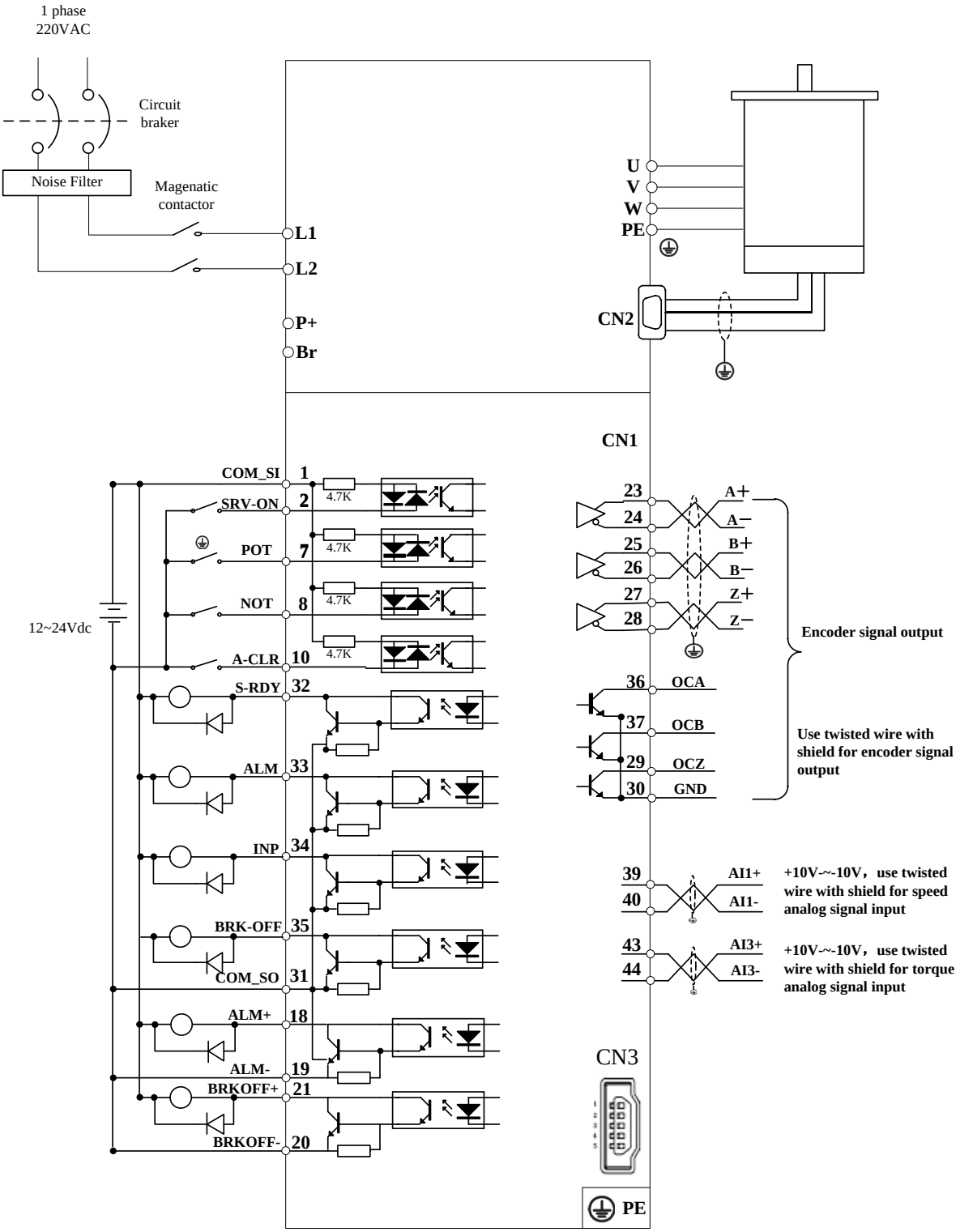


Figure 4-2 Torque/Velocity Control Mode Wiring

Note:

For driver more than 1.5kw, 3 phase is better than single phase, connect L1,L2,L3

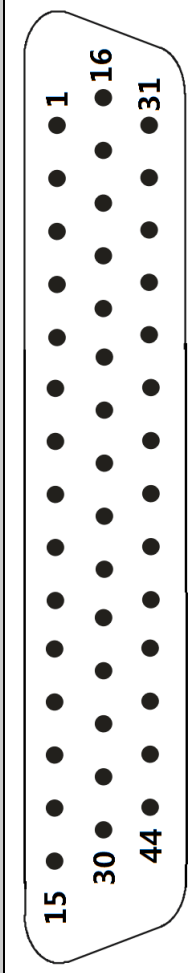
4.2 Driver Terminals Function

Table 4.3 Functions of driver port

Port	Function
CN1	Control Signal Port
CN2	Encoder Input Port
CN3	USB Communication Port
CN4	RS232、RS485 Communication Port(Only for ELP-RS***Z version)
CN5	RS232、RS485 Communication Port(Only for ELP-RS***Z version)
X1	Power Port

4.2.1 Control Signal Port-CN1 Terminal

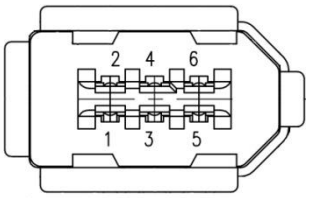
Table 4.4 Signal Explanation of Control Signal Port-CN1

Port		Pin	Signal	I/O	Name	Explanation
CN1		1	COM_SI	input	Digital input common terminal, Com+/Com-， 12VDC~24VDC	Two-way digital input with common terminal, function can be configured. 12VDC ~ 24VDC
		2	SI1	input	Digital input 1	
		7	SI2	input	Digital input 2	
		8	SI3	input	Digital input 3	
		9	SI4	input	Digital input 4	
		10	SI5	input	Digital input 5	
		11	SI6	input	Digital input 6	
		12	SI7	input	Digital input 7	
		13	SI8	input	Digital input 8	
		14	SI9	input	Digital input 9	
		31	COM_SO	output	Digital output common- terminal	Low resistor output in default . OC, the maximum voltage/current is no more than 30V, 50mA . Recommend the voltage : 12 V-24V. Current :10mA
		33	SO1 +	output	Digital output 1	
		32	SO2 +	output	Digital output 2	
		34	SO3 +	output	Digital output 3	
		35	SO4 +	output	Digital output 4	
		18	SO5 +	output	Differential Digital output 5	Differential Digital output , the maximum voltage/current is no more than 30V/50mA . Recommended voltage : 12 -24V. Current :10mA
		19	SO5-	output		
		20	SO6-	output	Differential Digital output 6	
		21	SO6 +	output		
		23	A +	output	Differential output terminal of motor encoder A phase	Differential output, High >= 2.5vdc, low <= 0.5vdc, maximum current ±20mA
		24	A -	output		
		25	B +	output	Differential output terminal of motor encoder B phase	
		26	B -	output		
		27	Z +	output	Differential output terminal of motor encoder Z phase	
		28	Z -	output		
		36	OCA	output	OC output terminal of motor encoder A phase	
		37	OCB	output	OC output terminal of motor encoder B phase	
		29	OCZ	output	OC output terminal of motor encoder Z phase	
		30	GND	output	OC output GND terminal of motor encoder	
		3	PUL +	input	Pulse input ,	

		4	PUL -	input	PUL+ and PUL-：5V differential input PUL+_24 and PUL-：24V differential input
		16	PUL + _24	input	
		5	DIR +	input	Direction input， DIR+ and DIR-：5V differential input DIR+_24 and DIR-：24V differential input
		6	DIR -	input	
		17	DIR + _24	input	
		39	AI1+	input	Analog input 1, voltage input range : -10VDC~+10VDC , input resistor 20KΩ. Mainly for velocity mode (Analog input)
		40	AI1-	input	
		41	AGND	input	
		43	AI3 +	input	Analog input 3, voltage input range : -10VDC~+10VDC , input resistor 20KΩ. Mainly for torque mode (Analog input)
		44	AI3 -	input	
		15.22.38.40.42	NC	/	Not connection
		Shell	FG		Shield ground

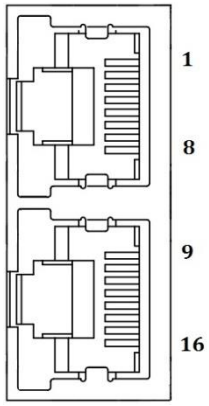
4.2.2 Encoder Input Port-CN2 Terminal

Table 4.5 Encoder Input Port-CN2 Terminal Signal Explain

Port		Pin	Signal
CN2		1	VCC5V
		2	GND
		3	BAT+
		4	BAT-
		5	SD+
		6	SD-
			PE

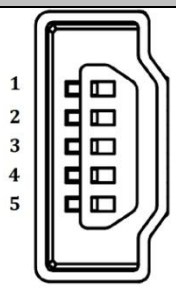
4.2.3 RS232/RS485 Communication Port

Table 4.6 signal explanation of driver interconnection interface-CN4 CN5

Port		Pin	Signal
CN4 CN5		1，9	RDO+(RS485)
		2，10	RDO-(RS485)
		3，11	/
		4，12	TXD(RS232)
		5，13	RXD(RS232)
		6，14	VCC5V(RS232)
		7，15	GND(RS232)
		8，16	/
			PE

4.2.4 USB Communication Port

Table 4.7 USB Communication Port –CN3

Port		Pin	Signal
CN3		1	VCC5V
		2	D+
		3	D-
		4	
		5	GND
			USB_GND

4.2.5 Power Port

Table 4.8 Main Power Input Port-X1

Port	Pin	Signal	Detail
X1	L1	For single phase 220V	For single phase 220V，+15～-15%，50/60Hz
	L2	For single phase 220V	
Notes	① Isolation transformer can be used for power supply; ② Do not access the 380VAC power supply, or it will cause serious damage to the drive; ③ In the case of serious interference, it is recommended to use noise filter for power supply; ④ It is recommended to install a non-fusible circuit breaker to cut off external power supply in time when the driver fails.		

Port	Pin	Signal	Detail
X1	P +	Dc bus + terminal	① Driver Dc bus + terminal ② External regenerative resistor P terminal
	Br	External regenerative resistor terminal	External regenerative resistor terminal
Notes	When using external resistors, the values of resistance and power are selected as follows：		

Driver	Resistor（Ω）	Power（W）
ELP-400	≥ 40	100

Port	Pin	Signal	Detail
X1	U	U	3 phase motor power input
	V	V	
	W	W	
	PE	PE	Frame ground
Notes	① Connect the driver to the ground end (PE) of the motor and connect it to the earth		

4.3 I/O Interface Principle

4.3.1 Switch Input Interface

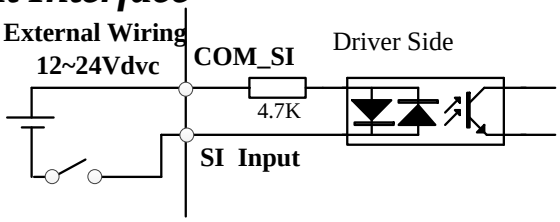


Figure 4-3 Switch Input Interface

1. The user provide power supply, DC 12-24V, current≥100mA
2. **Notice:** if current polar connect reversely, servo driver doesn't run.

Pr4.00*	Name	Input selection SI1			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	303		
	Data Type	16bit	Access	R/W	Address	0401H		
	Repower	o						
Pr4.01*	Name	Input selection SI2			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0403H		
	Repower	o						
Pr4.02*	Name	Input selection SI3			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0405H		
	Repower	o						
Pr4.03*	Name	Input selection SI4			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0207H		
	Repower	o						
Pr4.04*	Name	Input selection SI5			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0409H		
	Repower	o						
Pr4.05*	Name	Input selection SI6			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	040BH		
	Repower	o						
Pr4.06*	Name	Input selection SI7			Mode	P	S	T

	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	040DH		
	Repower	o						
Pr4. 07＊	Name	Input selection SI8			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	040FH		
	Repower	o						
Pr4. 08＊	Name	Input selection SI9			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0411H		
	Repower	o						

Set SI input function allocation.

This parameter use 16 binary system to set up the values,

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

Signal name	Symbol	Setup value	
		Normally open	Normally closed
Invalid	-	00h	Do not setup
Positive direction over-travel inhibition	POT	01h	81h
Negative direction over-travel inhibition	NOT	02h	82h
Servo-ON input	SRV-ON	03h	83h
Alarm clear input	A-CLR	04h	Do not setup
Control mode switching input	C-MODE	05h	85h
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

Note:

- Normally open means input signal comes from external controller or component, for example: PLC .
- Normally closed means input signal comes from driver internally.
- Don’t setup to a value other than that specified in the table .
- Don’t assign specific function to 2 or more signals. Duplicated assignment will cause Err21.0 I/F input multiple assignment error 1or Err21.1 I/F input multiple assignment error 2

Pr-Mode related input setup as below:

Input			
Signal name	**Symbol**	**Setup value**	
		Normally open	**Normally closed**
Trigger command	CTRG	20h	A0h
Homing signal	HOME	21h	A1h
Forced stop	STP	22h	A2h
Forward direction JOG	JOG+	23h	A3h
Opposite direction JOG	JOG-	24h	A4h
Forward limit	PL	25h	A5h
Reverse limit	NL	26h	A6h
Homing signal	ORG	27h	A7h
Road strength address 0	ADD0	28h	A8h
Road strength address 1	ADD1	29h	A9h
Road strength address 2	ADD2	2ah	Aah
Road strength address 3	ADD3	2bh	Abh
Torque switching	TC-SEL	09h	89h

Note:
CTRG, HOME is edge triggered, but the valid level must be last more than 1ms.

I/O input digital filtering

Pr5. 15＊	Name	I/F reading filter			Mode	P	S	T
	Range	0~255	Unit	0.1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	051FH		
	Repower	o						
I/O input digital filtering; higher setup will arise control delay.								

4.3.2 Switch Output Interface

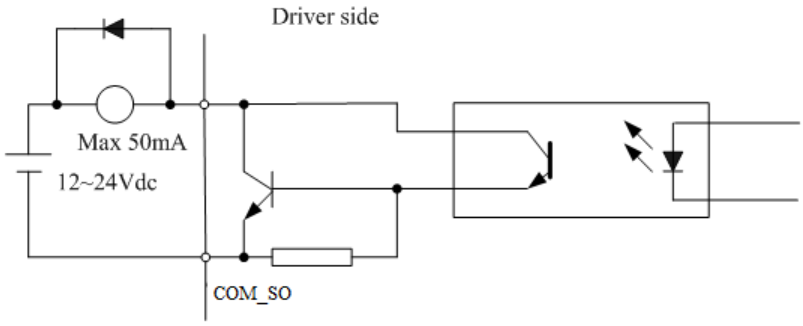


Figure 4.4 Switch Output Interface

(1) The user provide the external power supply . However, if current polarity connects reversely, servo driver is damaged.
(2) The output of the form is open-collector, the maximum voltage is 25V, and maximum current is 50mA. Therefore, the load of switch output signal must match the requirements. If you exceed the requirements or output directly connected with the power supply, the servo drive is damaged.
(3) If the load is inductive loads relays, etc., there must be anti-parallel freewheeling diode across the load. If the freewheeling diode is connected reversely, the servo drive is damaged.
(4) 32、33、34、35、31 Pin：Single-ended output;
18、19 Pin ， 20、21 Pin：Differencial output.

Pr4. 10＊	Name	Output selection SO1			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	101		
	Data Type	16bit	Access	R/W	Address	0415H		
	Repower	o						
Pr4. 11＊	Name	Output selection SO2			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	202		
	Data Type	16bit	Access	R/W	Address	0417H		
	Repower	o						
Pr4. 12＊	Name	Output selection SO3			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	404		
	Data Type	16bit	Access	R/W	Address	0419H		
	Repower	o						
Pr4. 13＊	Name	Output selection SO4			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	303		
	Data Type	16bit	Access	R/W	Address	041BH		
	Repower	o						
Pr4. 14＊	Name	Output selection SO5			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	101		
	Data Type	16bit	Access	R/W	Address	041DH		
	Repower	o						
Pr4. 15＊	Name	Output selection SO6			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	303		
	Data Type	16bit	Access	R/W	Address	041FH		
	Repower	o						

Assign functions to SO outputs.
This parameter use 16 binary system do setup
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

Pr-Mode related output setup as below;

Output			
Signal name	**Symbol**	**Set value**	
		Normally open	**Normally closed**
Command complete	CMD-OK	20h	A0h
Road strength address	MC-OK	21h	A1h
Homing finish	HOME-OK	22h	A2h
Torque limit	TQL	06h	86h

Note:
CMD-OK indicates PR command sent complete, but the motor may not in-position.
MC-OK indicates command complete and the motor in-position.
*1 Pay attention to the front panel display is hexadecimal.

4.3.3 Pulse Input Interface

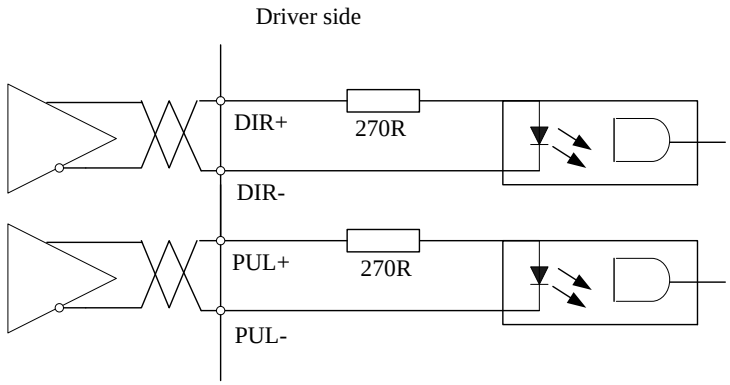
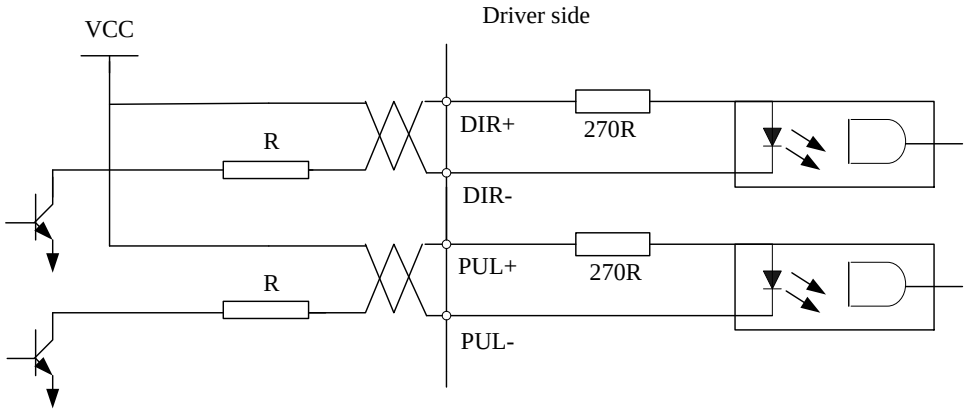


Figure 4-6 Differential 5V Pulse Signal（Pin3、Pin4、Pin5、Pin6 of CN1 Terminal）

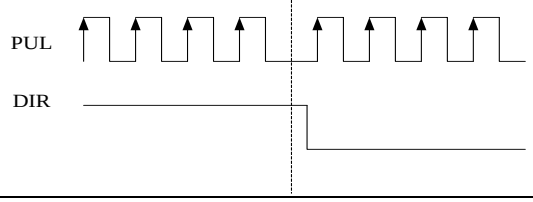


Vcc =12V, R = 1K, 0.25W; Vcc =24V, R = 2K, 0.25W

Figure 4-5 Pulse Input Interface Single Terminal Drive Mode

(1) In order to transmit pulse data properly , we recommend using the differential drive mode.
(2) The differential drive mode, AM26LS31, MC3487 or similar RS422 line drive.
(3) Using of single-ended drive will cause reduction of the operation frequency. The value of the resistance R depends on pulse input circuit and the external voltage,while drive current should be at the range of 10 - 15mA and the maximum voltage is no more than 25V .
Recommendation:
VCC = 24V, R = 1.3 to 2KΩ;
VCC = 12V, R = 510 ~ 820Ω;
VCC = 5V, R = 82 ~ 120Ω.
(4) The user provide external power supply for single-ended drive. However, if current polarity connect reversely, servo driver is damaged.
(5) The form of pulse input is the following form 3.7 below, while the arrows indicates the count.

Table 4.9 Pulse Input Form

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

The form of pulse input timing parameter is the following form 3.8 below. The 4 times pulse frequency ≤ 500kH if 2-phase input form is used.

Table 4.10 the parameters of pulse input time sequence

parameter	Differential drive input	Single-ended drive input
t_{ck}	＞2μs	＞5μs
t_h	＞1μs	＞2.5μs
t_l	＞1μs	＞2.5μs
t_{rh}	＜0.2μs	＜0.3μs
t_{rl}	＜0.2μs	＜0.3μs
t_s	＞1μs	＞2.5μs
t_{qck}	＞8μs	＞10μs
t_{qh}	＞4μs	＞5μs
t_{ql}	＞4μs	＞5μs
t_{qrh}	＜0.2μs	＜0.3μs
t_{qrl}	＜0.2μs	＜0.3μs
t_{qs}	＞1μs	＞2.5μs

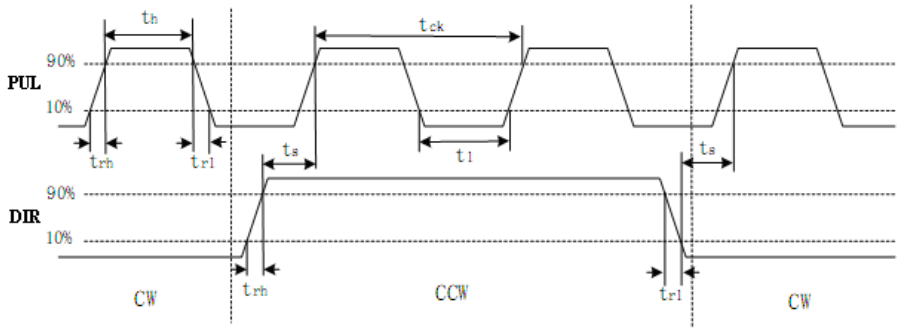
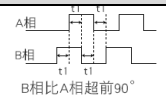
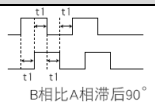
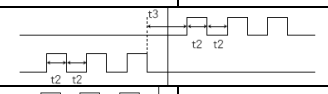
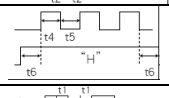
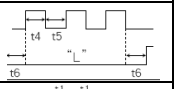
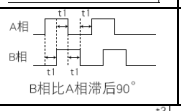
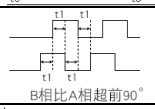
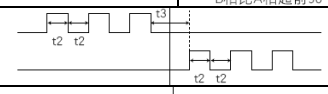
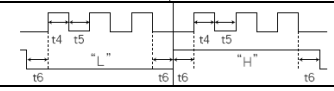


Figure 4.6 pulse + direction input interface timing (the maximum of pulse frequency : 500KHZ)

Pr0. 06 *	Name	Command Pulse Rotational Direction Setup			Mode	P	
	Range	0~1	Unit	—	Default	0	
	Data Type	16bit	Access	R/W	Address	000DH	
	Repower	o					
Set command pulse input rotate direction, command pulse input type							
Pr0. 07 *	Name	Command Pulse Input Mode Setup			Mode	P	
	Range	0~3	Unit	—	Default	1	
	Data Type	16bit	Access	R/W	Address	000FH	

	Repower	o				

Pr0.06	Pr0.07	Command Pulse Format	Signal	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

4.3.4 Analog Value Input Interface

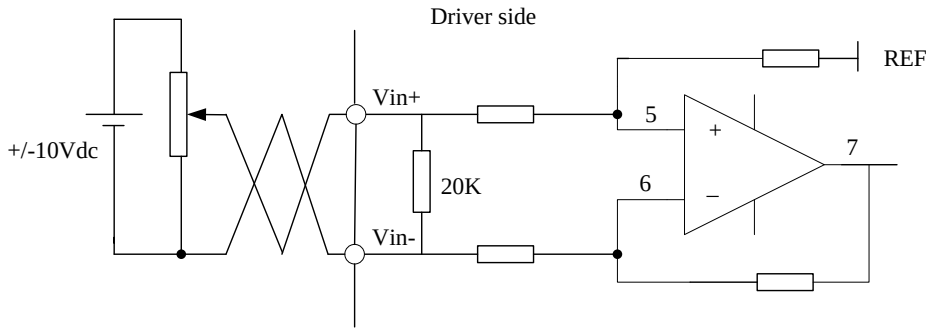


Figure 4-7 Analog AI1 Input Interface

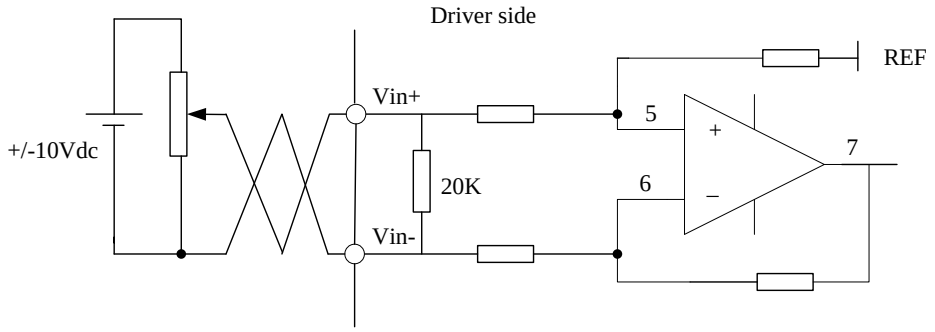


Figure 4-8 Analog AI3 Input Interface

4.3.5 Servo Motor Encoder Input Interface

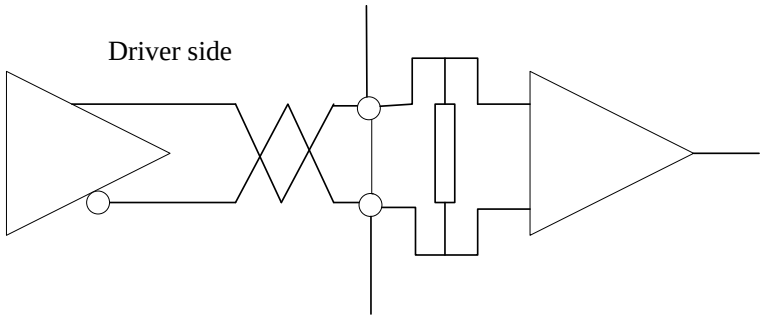


Figure 4-9 Servo Motor optical-electrical Encoder Input Interface

Chapter 5 Parameter

5.1 Parameter List

Notes: The parameters like Pr0.01*, which contain' *' means that the new value of this parameters will vaild after power is restarted!

Parameter Number		Name	Default value	Repower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Add
【Class 0】 Basic setting	00	MFC function	1	—	O	—	—	16bit	R/W	0001H
	01	control mode setup	0	O	O	O	O	16bit	R/W	0003H
	02	real-time auto-gain tuning	2	—	O	O	O	16bit	R/W	0005H
	03	selection of machine stiffness at real-time auto-gain tuning	70	—	O	O	O	16bit	R/W	0007H
	04	Inertia ratio	250	—	O	O	O	16bit	R/W	0009H
	06	command pulse rotational direction setup	0	O	O	—	—	16bit	R/W	000DH
	07	command pulse input mode setup	3	O	O	—	—	16bit	R/W	000FH
	08	command pulse per one motor revolution	10000	O	O	—	—	32bit	R/W	0010H 0011H
	09	1st numerator of electronic gear	1	O	O	—	—	32bit	R/W	0012H 0013H
	10	denominator of electronic gear	1	O	O	—	—	32bit	R/W	0014H 0015H
	11	output pulse counts per one motor revolution	2500	O	O	O	O	16bit	R/W	0017H
	12	reversal of pulse output logic	0	O	O	O	O	16bit	R/W	0019H
	13	1st torque limit	300	—	O	O	O	16bit	R/W	001BH
	14	position deviation excess setup	200	—	O	—	—	16bit	R/W	001DH
	15	Absolute encoder setup	0	—	O	O	O	16bit	R/W	001FH
	16	External regenerative discharge resistor setup	100	—	O	O	O	16bit	R/W	0021H
	17	External regenerative discharge power value	50	—	O	O	O	16bit	R/W	0023H
	25	Auxiliary function	0	—	O	O	O	16bit	R/W	0033H

Parameter Number		Name	Default value	Repower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Address
【Class 1】 Gain Adjust	00	1st gain of position loop	320	—	O	—	—	16bit	R/W	0101H
	01	1st gain of velocity loop	180	—	O	O	O	16bit	R/W	0103H
	02	1st time constant of velocity loop integration	310	—	O	O	O	16bit	R/W	0105H
	03	1st filter of velocity detection	15	—	O	O	O	16bit	R/W	0107H
	04	1st time constant of torque filter	126	—	O	O	O	16bit	R/W	0109H
	05	2nd gain of position loop	380	—	O	—	—	16bit	R/W	010BH
	06	2nd gain of velocity loop	180	—	O	O	O	16bit	R/W	010DH
	07	2nd time constant of velocity loop integration	10000	—	O	O	O	16bit	R/W	010FH
	08	2nd filter of velocity detection	15	—	O	O	O	16bit	R/W	0111H
	09	2nd time constant of torque filter	126	—	O	O	O	16bit	R/W	0113H
	10	Velocity feed forward gain	300	—	O	—	—	16bit	R/W	0115H
	11	Velocity feed forward filter	50	—	O	—	—	16bit	R/W	0117H
	12	Torque feed forward gain	0	—	O	O	—	16bit	R/W	0119H
	13	Torque feed forward filter	0	—	O	O	—	16bit	R/W	011BH
	15	Control switching mode	0	—	O	—	—	16bit	R/W	011FH
	17	Control switching level	50	—	O	—	—	16bit	R/W	0123H
	18	Control switch hysteresis	33	—	O	—	—	16bit	R/W	0125H
	19	Gain switching time	33	—	O	—	—	16bit	R/W	0127H
	35	Positional command filter setup	0	O	O	—	—	16bit	R/W	0147H
	36	Encoder feedback pulse digital filter setup	0	—	O	O	O	16bit	R/W	0149H
	37	Special register	0	—	O	O	O	16bit	R/W	014BH

Parameter Number		Name	Default value	Repower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Address
【Class 2】 Vibration Restrain Function	00	adaptive filter mode setup	0	—	O	O	—	16bit	R/W	0201H
	01	1st notch frequency	2000	—	O	O	O	16bit	R/W	0203H
	02	1st notch width selection	2	—	O	O	O	16bit	R/W	0205H
	03	1st notch depth selection	0	—	O	O	O	16bit	R/W	0207H
	04	2nd notch frequency	2000	—	O	O	O	16bit	R/W	0209H
	05	2nd notch width selection	2	—	O	O	O	16bit	R/W	020BH
	06	2nd notch depth selection	0	—	O	O	O	16bit	R/W	020DH
	07	3rd notch frequency	2000	—	O	O	O	16bit	R/W	020FH
	08	3rd notch width selection	2	—	O	O	O	16bit	R/W	0211H
	09	3rd notch depth selection	0	—	O	O	O	16bit	R/W	0213H
	14	1st damping frequency	0	—	O	—	—	16bit	R/W	021DH
	16	2nd damping frequency	0	—	O	—	—	16bit	R/W	0221H
	22	Positional command smooth filter	0	O	O	—	—	16bit	R/W	022DH
	23	Positional command FIR filter	0	O	O	—	—	16bit	R/W	022FH

Parameter Number		Name	Default value	Repower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Address
【Class 3】 Speed, Torque Control	00	Velocity setup internal/external switching	0	—	—	O	—	16bit	R/W	0301H
	01	Speed command rotational direction selection	0	—	—	O	—	16bit	R/W	0303H
	02	Speed command input gain	500	—	—	O	O	16bit	R/W	0305H
	03	Speed command reversal input	0	—	—	O	—	16bit	R/W	0307H
	04	1st speed setup	0	—	—	O	—	16bit	R/W	0309H
	05	2nd speed setup	0	—	—	O	—	16bit	R/W	030BH
	06	3rd speed setup	0	—	—	O	—	16bit	R/W	030DH
	07	4th speed setup	0	—	—	O	—	16bit	R/W	030FH
	08	5th speed setup	0	—	—	O	—	16bit	R/W	0311H
	09	6th speed setup	0	—	—	O	—	16bit	R/W	0313H
	10	7th speed setup	0	—	—	O	—	16bit	R/W	0315H
	11	8th speed setup	0	—	—	O	—	16bit	R/W	0317H
	12	time setup acceleration	100	—	—	O	—	16bit	R/W	0319H
	13	time setup deceleration	100	—	—	O	—	16bit	R/W	031BH
	14	Sigmoid acceleration/deceleration time setup	0	O	—	O	—	16bit	R/W	031DH
	15	Speed zero-clamp function selection	0	—	—	O	—	16bit	R/W	031FH
	16	Speed zero-clamp level	30	—	—	O	—	16bit	R/W	0321H
	17	Torque command selection	0	—	—	—	O	16bit	R/W	0323H
	18	Torque command direction selection	0	—	—	—	O	16bit	R/W	0325H
	19	Torque command input gain	30	—	—	—	O	16bit	R/W	0327H
	20	Torque command input reversal	0	—	—	—	O	16bit	R/W	0329H
	21	Speed limit value 1	0	—	—	—	O	16bit	R/W	032BH
	22	2nd torque limit	0	—	O	O	O	16bit	R/W	032DH
	24	Maximum speed of motor rotation	0	—	O	O	O	16bit	R/W	0331H
	28	Synchronous parameter setting of gantry	0	—	O	O	O	16bit	R/W	0339H

Parameter Number		Name	Default value	Repower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Address
【Class 4】 I/F Monitor Setting	00	input selection SI1	3	O	O	O	O	16bit	R/W	0401H
	01	input selection SI2	0	O	O	O	O	16bit	R/W	0403H
	02	input selection SI3	0	O	O	O	O	16bit	R/W	0405H
	03	input selection SI4	0	O	O	O	O	16bit	R/W	0407H
	04	input selection SI5	0	O	O	O	O	16bit	R/W	0409H
	05	input selection SI6	0	O	O	O	O	16bit	R/W	040BH
	06	input selection SI7	0	O	O	O	O	16bit	R/W	040DH
	07	input selection SI8	0	O	O	O	O	16bit	R/W	040FH
	08	input selection SI9	0	O	O	O	O	16bit	R/W	0411H
	10	output selection SO1	1	O	O	O	O	16bit	R/W	0415H
	11	output selection SO2	2	O	O	O	O	16bit	R/W	0417H
	12	output selection SO3	4	O	O	O	O	16bit	R/W	0419H
	13	output selection SO4	3	O	O	O	O	16bit	R/W	041BH
	14	output selection SO5	1	O	O	O	O	16bit	R/W	041DH
	15	output selection SO6	3	O	O	O	O	16bit	R/W	041FH
	22	Analog input 1(AI 1) offset setup	0	—	—	O	O	16bit	R/W	042DH
	23	Analog input 1(AI 1) filter	0	—	—	O	O	16bit	R/W	042FH
	24	Analog input 1(AI 1) over-voltage setup	0	—	—	O	O	16bit	R/W	0431H
	28	Analog input 3(AI 3) offset setup	0	—	—	O	O	16bit	R/W	0439H
	29	Analog input 3(AI 3) filter	0	—	—	O	O	16bit	R/W	043BH
	30	Analog input 3(AI 3) over-voltage setup	0	—	—	—	O	16bit	R/W	043DH
	31	Positioning complete range	10	—	O	—	—	16bit	R/W	043FH
	32	Positioning complete output setup	0	—	O	—	—	16bit	R/W	0441H
	33	INP hold time	0	—	O	—	—	16bit	R/W	0443H
	34	Zero-speed	50	—	O	O	O	16bit	R/W	0445H
	35	Speed coincidence range	50	—		O	—	16bit	R/W	0447H
	36	At-speed	1000	—		O	—	16bit	R/W	0449H
	37	Mechanical brake action at stalling setup	0	—	O	O	O	16bit	R/W	044BH
	38	Mechanical brake action at running setup	0	—	O	O	O	16bit	R/W	044DH
	39	Brake action at running setup	30	—	O	O	O	16bit	R/W	044FH
	43	E-stop function active	0	—	O	O	O	16bit	R/W	0457H

Parameter Number		Name	Default value	Reower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Address
【Class 5】Extended Setup	00	2nd numerator of electronic gear	10000	O	O	—	—	32bit	R/W	0500H 0501H
	01	3rd numerator of electronic gear	1	O	O	—	—	32bit	R/W	0502H 0503H
	02	4th numerator of electronic gear	1	O	O	—	—	32bit	R/W	0504H 0505H
	04	Drive inhibit input setup	0	—	O	O	O	16bit	R/W	0509H
	06	Sequence at servo-off	0	—	O	O	O	16bit	R/W	050DH
	09	Main power off detection time	70	—	O	O	O	16bit	R/W	0513H
	10	Dynamic braking mode	0	O	O	O	O	16bit	R/W	0515H
	11	Torque setup for emergency stop	0	—	O	O	O	16bit	R/W	0517H
	12	Over-load level setup	0	—	O	O	O	16bit	R/W	0519H
	13	Over-speed level setup	0	—	O	O	O	16bit	R/W	051BH
	15	I/F reading filter	0	O	O	O	O	16bit	R/W	051FH
	17	Counter clear up input mode	3	—	O	—	—	16bit	R/W	0523H
	20	Position setup unit select	2	—	O	—	—	16bit	R/W	0529H
	21	Selection of torque limit	0	—	O	O	O	16bit	R/W	052BH
	22	2nd torque limit	300	—	O	O	O	16bit	R/W	052DH
	23	Torque limit switching setup 1	0	—	O	O	O	16bit	R/W	052FH
	24	Torque limit switching setup 2	0	—	O	O	O	16bit	R/W	0531H
	28	LED initial status	1	—	O	O	O	16bit	R/W	0539H
	29	RS485 mode selection	21	—	O	O	O	16bit	R/W	053BH
	30	RS485 baud rate setup	2	—	O	O	O	16bit	R/W	053DH
	31	RS485 slave axis address	1	—	O	O	O	16bit	R/W	053FH
	32	Command pulse input maximum setup	0	—	O	—	—	16bit	R/W	0541H
	35	Front panel lock setup	0	—	O	O	O	16bit	R/W	0547H
	36	Password for opening group 7 parameter	0	—	O	O	O	16bit	R/W	0549H

Parameter Number		Name	Default value	Repower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Address
【Class 6】Special Setup	01	Encoder zero position compensation	0	O	O	O	O	16bit	R/W	0603H
	03	JOG trial run command torque	0	—	O	—	—	16bit	R/W	0607H
	04	JOG trial run command speed	400	—	O	—	—	16bit	R/W	0609H
	05	Position 3rd gain valid time	0	—	O	—	—	16bit	R/W	060BH
	06	Position 3rd gain scale factor	100	—	O	—	—	16bit	R/W	060DH
	07	Torque command additional value	0	—	O	O	O	16bit	R/W	060FH
	08	Positive direction torque compensation value	0	—	O	O	O	16bit	R/W	0611H
	09	Negative direction torque compensation value	0	—	O	O	O	16bit	R/W	0613H
	14	Emergency stop time at alarm	0	—	O	O	O	16bit	R/W	061DH
	20	distance of trial running	10	—	O	—	—	16bit	R/W	0629H
	21	waiting time of trial running	100	—	O	—	—	16bit	R/W	062BH
	22	cycling times of trial running	5	—	O	—	—	16bit	R/W	062DH
	25	Acceleration of trial running	200	—	O	—	—	16bit	R/W	0633H
	63	Absolute multi-turn position upper bound	0	O	O	O	O	16bit	R/W	067FH

Parameter Number		Name	Default value	Repower	Mode			Communication		
Classify	NO				P	V	T	Data Type	Access	Address
【Class B】Status Information	00	Software version 1（DSP）		—	O	O	O	16bit	R	0B00H
	01	Software version 2（CPLD）		—	O	O	O	16bit	R	0B01H
	02	Software version 3（other）		—	O	O	O	16bit	R	0B02H
	05	Drive operating state		—	O	O	O	16bit	R	0B05H
	07	Actual torque feedback		—	O	O	O	16bit	R	0B07H
	08	Actual current feedback		—	O	O	O	16bit	R	0B08H
	09	Speed（After filtering）		—	O	O	O	16bit	R	0B09H
	10	DC bus voltage		—	O	O	O	16bit	R	0B0AH
	11	Drive temperature		—	O	O	O	16bit	R	0B0BH
	12	Analog input1		—	O	O	O	16bit	R	0B0CH
	13	Analog input2		—	O	O	O	16bit	R	0B0DH
	14	Analog input3		—	O	O	O	16bit	R	0B0EH
	15	Over-load ratio		—	O	O	O	16bit	R	0B0FH
	16	Regeneration load ratio		—	O	O	O	16bit	R	0B10H
	17	Digital input signal status		—	O	O	O	16bit	R	0B11H
	18	Digital output signal status		—	O	O	O	16bit	R	0B12H
	20	Motor position feedback（Command unit）		—	O	O	O	32bit	R	0B14H 0B15H
	21	Command pulse sum（Command unit）		—	O	-	-	32bit	R	0B16H 0B17H
	22	Positional deviation（Command unit）		—	O	O	O	32bit	R	0B18H 0B19H
	23	Position command（Encoder unit）		—	O	O	O	32bit	R	0B1AH 0B1BH
	24	Motor position（encoder unit）		—	O	-	-	32bit	R	0B1CH 0B1DH
	25	Positional deviation (encoder unit)		—	O	O	O	32bit	R	0B1EH 0B1FH
	26	Position feedback in rotation mode(encoder unit)		—	O	-	-	32bit	R	0B20H 0B21H

Note：

（1）The "O" in the repower bar indicates that the new value valid after repower, and the "-" indicates that the new value valid immediately;

（2）The "O" in the mode bar indicates this parameter related to this mode，“—”indicates this parameter dose not related to this mode;

（3）32bit data，high data before, low data after.

5.2 Parameter Function

Here is the explanation of parameters ,you can check them or modify the value using software Protuner or the front panel of driver.

Contact tech@leadshine.com if you need more technical service .

5.2.1【Class 0】Basic Setting

Pr0. 00	Name	Mode loop gain			Mode	P	S	T
	Range	0-2000	Unit	0.1Hz	Default	1		
	Data Type	16bit	Access	R/W	Address	0001H		
	Repower	--						

Set up the bandwidth of MFC , it is similar to the response bandwidth

Setup value	Meaning
0	Disable the function.
1	Enable the function , set the bandwidth automatically , recommended for most application .
2-10	Forbidden and reserved .
11-20000	Set the bandwidth manually , 1.1Hz – 2000Hz

MFC is used to enhance the performance of dynamic tracing for input command , make positioning faster , cut down the tracking error , run more smooth and steady . It is very useful for multi-axis synchronous movement and interpolation, the performance will be better.

The main way to use this function :

a. Choose the right control mode : Pr001 = 0
b. Set up the inertia of ratio : Pr004
c. Set up the rigidity : Pr003
d. Set up the Pr000 :
   1) If no multi-axis synchronous movement , set Pr000 as 1 or more than 10 ;
   2) If multi-axis synchronous movement needed , set Pr000 as the same for all the axes .
   3) If Pr000 is more than 10 , start with 100 , or 150 , 200 , 250 , …. .

Caution:

1. Set up the right control mode , the right inertia of ratio and rigidity firstly .
2. Don't change the value of Pr000 when the motor is running , otherwise vibration occurs

Set up a small value from the beginning if using it in manual mode , smaller value means running more smooth and steady , while bigger one means faster positioning

Pr0. 01*	Name	Control Mode Setup			Mode	P	S	T
	Range	0~10	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0003H		
	Repower	o						

Set using control mode:

Setup value	Content	
	1st mode	2nd mode
0	Position	-
1	Velocity	-
2	Torque	-
3	Position	Velocity
4	Position	Torque
5	Velocity	Torque
6	Pr-Mode	
7~10	Reserved	

When you set up the combination mode of 3.4.5, you can select either the 1st or the 2nd with control mode switching input(C-MODE).
When C-MODE is open, the 1st mode will be selected.
When C-MODE is shorted, the 2nd mode will be selected.

Pr0. 02	Name	Real-time Auto-gain Tuning			Mode	P	S	T
	Range	0~2	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0005H		
	Repower	-						

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 compensat gain switching. It is usually for interpolation movement.
2	positioning	Main application is positioning. it is recommended to use th mode on equipment without unbalanced horizontal axis, bal driving equipment with low friction, etc. it is usually for poi point movement .

Caution: If pr0.02=1 or 2 , you can't modify the values of Pr1.01 – Pr1.13, the values of them depend on the real-time auto-gain tuning ,all of them are set by the driver itself

Pr0. 03	Name	Selection of machine stiffness at real- time auto-gain tuning			Mode	P	S	T
	Range	50 -81	Unit	—	Default	70		
	Data Type	16bit	Access	R/W	Address	0007H		
	Repower	-						

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

Low ⟶ Machine stiffness ⟶ High

Low ⟶ Servo gain ⟶ High

81.80·····70.69.68·····51.50

Low ⟶ Response ⟶ High

Notice: Lower the setup value, higher the velocity response and servo stiffness will be obtained. However, when decreasing the value, check the resulting operation to avoid oscillation or vibration. Control gain is updated while the motor is stopped. If the motor can't be stopped due to excessively low gain or continuous application of one-way direction command ,any change made to Pr0.03 is not used for update. If the changed stiffness setting is made valid after the motor stopped, abnormal sound or oscillation will be generated. To prevent this problem, stop the motor after changing the stiffness setting and check that the changed setting is enabled.

Pr0. 04	Name	Inertia ratio			Mode	P	S	T
	Range	0~10000	Unit	%	Default	250		
	Data Type	16bit	Access	R/W	Address	0009H		
	Repower	-						

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

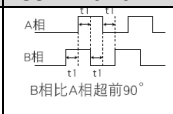
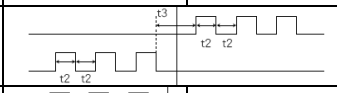
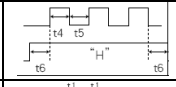
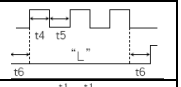
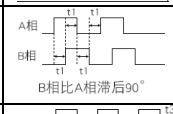
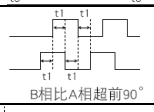
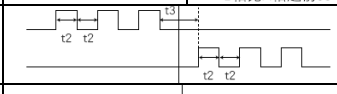
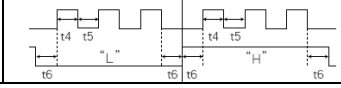
Pr0.04=(load inertia/rotate inertia)×100%

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 value, the setup unit of the velocity loop gain becomes larger, and when the inertia ratio of Pr0.04 is smaller than the actual value, the setup unit of the velocity loop gain becomes smaller..

Pr0. 06 *	Name	Command Pulse Rotational Direction Setup			Mode	P		
	Range	0~1	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	000DH		
	Repower	o						
Set command pulse input rotate direction, command pulse input type								

Pr0. 07 *	Name	Command Pulse Input Mode Setup			Mode	P		
	Range	0~3	Unit	—	Default	1		
	Data Type	16bit	Access	R/W	Address	000FH		
	Repower	o						

Pr0.06	Pr0.07	Command Pulse Format	Signal	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. 08	Name	Command pulse counts per one motor revolution			Mode	P	S	T
	Range	0-8388608	Unit	P	Default	0		
	Data Type	32bit	Access	R/W	Address	0010H 0011H		
	Repower	o						

Set the command pulse that causes single turn of the motor shaft.
1) If Pr008≠0 , the actual turns = pulse number / Pr008
2) If Pr008 = 0 , Pr0.09 1st numerator of electronic gear and Pr0.10 Denominator of electronic Gear become valid.

Pr0. 09	Name	1st numerator of electronic gear			Mode	P		
	Range	1~1073741824	Unit	—	Default	1		
	Data Type	32bit	Access	R/W	Address	0012H 0013H		
	Repower	o						

Set the numerator of division/multiplication operation made according to the command pulse input.

Pr0. 10	Name	1st denominator of electronic gear			Mode	P		
	Range	1~1073741824	Unit	—	Default	1		
	Data Type	32bit	Access	R/W	Address	0014H 0015H		
	Repower	o						

Set the denominator of division/multiplication operation made according to the command pulse input.

Pr0.09	Pr0.10	Command division/multiplication operation
1-10737 41824	1-10737 41824	Command pulse input → 【Pr0.09 set value】 / 【Pr0.10 set value】 → position command

1. Settings：
   1)The driver input command pulse number is X
   2)The pulse number of encoder after frequency division and frequency doubling is Y
   3)The number of pulses per revolution of the motor encoder is Z
   4)Number of turns of motor is W
2. Calculations：
   1)Y=X* Pr0.09 / Pr0.10
   2)17Bit encoder: Z=2^17 = 131072
   23Bit encoder: Z=2^23 = 8388608

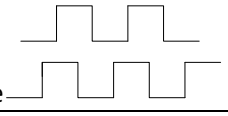
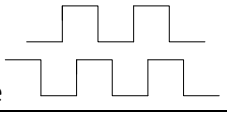
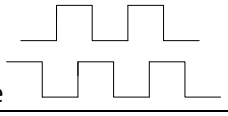
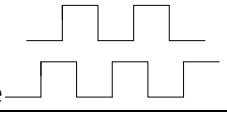
Pr0. 11＊	Name	Output pulse counts per one motor revolution			Mode	P	S	T
	Range	1~2500	Unit	P/r	Default	2500		
	Data Type	16bit	Access	R/W	Address	0017H		
	Repower	o						

Set the numerator of division/multiplication operation made according to the command pulse input

Pr0. 12＊	Name	reversal of pulse output logic			Mode	P	S	T
	Range	0~1	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0019H		
	Repower	o						

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.

< **reversal of pulse output logic** >

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	Name	1st Torque Limit			Mode	P	S	T
	Range	0~500	Unit	%	Default	300		
	Data Type	16bit	Access	R/W	Address	001BH		
	Repower	-						

You can set up the limit value of the motor output torque, as motor rate current %, the value can't exceed the maximum of output current.

Pr0. 14	Name	Position Deviation Excess Setup			Mode	P		
	Range	0~500	Unit	0.1rev	Default	200		
	Data Type	16bit	Access	R/W	Address	001DH		
	Repower	-						

Set excess range of positional deviation by the command unit(default).Setting the value too small will cause Err18.0 (position deviation excess detection)

Pr0. 15	Name	Absolute Encoder Setup			Mode	P	S	T
	Range	0~15	Unit		Default	0		
	Data Type	16bit	Access	R/W	Address	001FH		
	Repower	o						

How to use:

0: Incremental position mode:

The encoder is used as a incremental encoder, and the position retentive at power failure is not supported.

1: Absolute position linear mode:

The encoder is used as an absolute encoder, and the position retentive at power failure is supported..

It is applicable to the scenario where the travel range of device load is fixed and the encoder multi-turn data dose not overflow.

2: Absolute position rotation mode:

The encoder is used as an absolute encoder, and the position retentive at power failure is supported..

It is mainly applicable to the scenario where the load travel range is not limited and the number of motor single-direction revolution is less than 0~(Pr6.63+1)

5: Clean multi-turn alarm, and open multi-turn absolute function.

It will become 1 when normal clearance, if it's still 5 after 3seconds, please deal with according to 153 alarm processing.

9: Clear multi-turn position and reset multi-turn alarm, open multi-turn absolute function.
It will become 1 when normal clearance, if it's still 9 after 3seconds, please deal with according to 153 alarm processing. Please remember to do mechanical homing.
Notes: Set to 9 after homing process finished and servo disabled., ,valid after repower.

Pr0. 16	Name	External regenerative resistance			Mode	P	S	T
	Range	10~50	Unit	Ω	Default	100		
	Data Type	16bit	Access	R/W	Address	0021H		
	Repower	-						
	Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current.							

Pr0. 17	Name	External regenerative resistor power value			Mode	P	S	T
	Range	0~10000	Unit	W	Default	20		
	Data Type	16bit	Access	R/W	Address	0023H		
	Repower	-						
	Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current.							

Pr0. 25	Name	Auxiliary function			Mode	P	S	T
	Range	0~0xFFFF	Unit		Default	0		
	Data Type	16bit	Access	R/W	Address	0023H		
	Repower	-						

Value	Auxiliary function
0x1111	Reset current alarm
0x1122	Reset history alarm
0x2211	Save parameter
0x2222	Reset to factory setting except motor parameters
0x2233	Reset to factory setting
0X4001	JOG_P（50ms time period）
0X4002	JOG_N（50ms time period）
0x6666	Soft reset

5.2.2【Class 1】Gain Adjust

Pr1.00	Name	1st gain of position loop			Mode	P		
	Range	0~30000	Unit	0.1/s	Default	320		
	Data Type	16bit	Access	R/W	Address	0101H		
	Repower	-						
	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	Name	1st gain of velocity loop			Mode	P	S	T
	Range	0~32767	Unit	0.1Hz	Default	180		
	Data Type	16bit	Access	R/W	Address	0103H		
	Repower	-						
	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.							

Pr1.02	Name	1st Time Constant of Velocity Loop Integration			Mode	P	S	T
	Range	0~10000	Unit	0.1ms	Default	310		
	Data Type	16bit	Access	R/W	Address	0105H		
	Repower	-						
	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	Name	1st Filter of Velocity Detection			Mode	P	S	T
	Range	0~31	Unit	—	Default	15		
	Data Type	16bit	Access	R/W	Address	0107H		
	Repower	-						

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.

You can set the filter parameters through the loop gain, 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	2 50	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	10

Pr1.04	Name	1st Time Constant of torque filter			Mode	P	S	T
	Range	0~2500	Unit	0.01ms	Default	126		
	Data Type	16bit	Access	R/W	Address	0109H		
	Repower	-						

Pr1.05	Name	2nd gain of position loop			Mode	P		
	Range	0~30000	Unit	0.1/s	Default	380		
	Data Type	16bit	Access	R/W	Address	010BH		
	Repower	-						

Pr1.06	Name	2nd gain of velocity loop			Mode	P	S	T
	Range	0~32767	Unit	0.1Hz	Default	180		
	Data Type	16bit	Access	R/W	Address	010DH		
	Repower	-						

Pr1.07	Name	2nd Time Constant of Velocity Loop Integration			Mode	P	S	T
	Range	0~10000	Unit	0.1ms	Default	10000		
	Data Type	16bit	Access	R/W	Address	010FH		
	Repower	-						

Pr1.08	Name	2nd Filter of Velocity Detection			Mode	P	S	T
	Range	0~31	Unit	—	Default	15		
	Data Type	16bit	Access	R/W	Address	0111H		
	Repower	-						

Pr1.09	Name	2nd Time Constant of torque filter			Mode	P	S	T
	Range	0~2500	Unit	0.01ms	Default	126		
	Data Type	16bit	Access	R/W	Address	0113H		
	Repower	-						
	Position loop, velocity loop, velocity detection filter, torque command filter have their 2 pairs of gain or time constant(1st and 2nd).							

Pr1.10	Name	Velocity feed forward gain			Mode	P		
	Range	0~1000	Unit	0.10%	Default	300		
	Data Type	16bit	Access	R/W	Address	0115H		
	Repower	-						
	Multiply the velocity 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	Name	Velocity feed forward filter			Mode	P		
	Range	0~6400	Unit	0.01ms	Default	50		
	Data Type	16bit	Access	R/W	Address	0117H		
	Repower	-						
	Set the time constant of 1st delay filter which affects the input of speed feed forward. **(usage example of velocity feed forward)** 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 [unit of command]=command speed [unit of command /s]/position loop gain[1/s]×(100-speed feed forward gain[%]/100							

Pr1.12	Name	Torque feed forward gain			Mode	P	S	
	Range	0~1000	Unit	0.1%	Default	0		
	Data Type	16bit	Access	R/W	Address	0119H		
	Repower	-						
	● 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.							

- To use torque feed forward, correctly set ratio of inertia. Set the inertia ratio that can be calculated from the machine specification to Pr0.04 inertia ratio.
- Positional deviation at a constant acceleration/deceleration can be minimized close to 0 by increasing the torque forward gain .this means that positional deviation can be maintained at near 0 over entire operation range while driving in trapezoidal speed pattern under ideal condition where disturbance torque is not active.

Pr1. 13	Name	Torque feed forward filter			Mode	P	S
	Range	0~6400	Unit	0.01ms	Default	0	
	Data Type	16bit	Access	R/W	Address	011BH	
	Repower	-					

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	Name	Mode of position control switching			Mode	P		
	Range	0~10	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	011FH		
	Repower	-						

Set 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	reserve	reserve
6	reserve	reserve
7	reserve	reserve
8	reserve	reserve
9	reserve	reserve
10	Have position command +actual speed	● 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 at 0 during the delay time and the absolute value of actual speed was kept below (level - hysteresis) (r/min) previously with the 2nd gain.

Pr1. 17	Name	Level of position control switching			Mode	P		
	Range	0~20000	Unit	Mode specific	Default	50		
	Data Type	16bit	Access	R/W	Address	0123H		
	Repower	-						
	Unit of setting varies with switching mode. switching condition: position :encoder pulse number ; speed : r/min ; torque : % . Notice: set the level equal to or higher than the hysteresis.							

Pr1. 18	Name	Hysteresis at position control switching			Mode	P		
	Range	0~20000	Unit	Mode specific	Default	33		
	Data Type	16bit	Access	R/W	Address	0125H		
	Repower	-						
	Combining Pr1.17(control switching level)setup Notice: when level< hysteresis, the hysteresis is internally adjusted so that it is equal to level.							

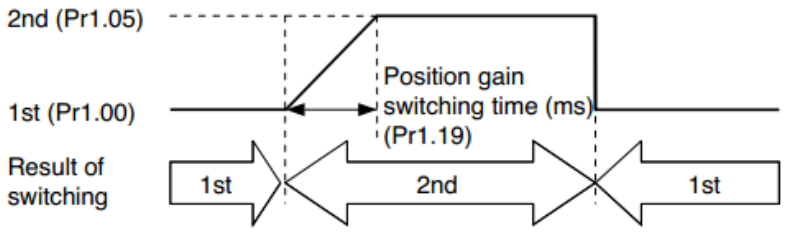
Pr1. 19	Name	position gain switching time			Mode	P		
	Range	0~10000	Unit	0.1ms	Default	33		
	Data Type	16bit	Access	R/W	Address	0127H		
	Repower	-						

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 vibration. By adjusting Pr1.19 position gain switching time, increasing rate of the position loop gain can be decreased and variation level can be reduced.

Example: 1st (pr1.00) <-> 2nd (Pr1.05)



Pr1. 35*	Name	positional command filter setup			Mode	P		
	Range	0~200	Unit	0.05us	Default	0		
	Data Type	16bit	Access	R/W	Address	0147H		
	Repower	-						

	Do filtering for positional command pulse, eliminate the interference of the narrow pulse, over-large setup will influence the input of high frequency positional command pulse, and make more time-delayed.

Pr1.37	Name	Special register			Mode	P	S	T
	Range	0~32767	Unit	-	Default	0		
	Data Type	16bit	Access	R/W	Address	014BH		
	Repower	-						

Under binary, these bits in register are used for some function operation.
Bit2=1, shield the speed out of control alarm (1A1)
Bit4=1, shield the over-load alarm 100,101
Bit6=1, shield the excessive vibration alarm 190
Bit7=1, shield the braking resistor over-load alarm 120
Bit9=1, shield the lacking of phase alarm0dl (other bits are forbidden to use, default 0)

For example : Pr137 = 4 can be used to shield alarm code 1A1
Pr137 = 64 can be used to shield alarm code 190
Pr137 =68 can be used to shield both 1A1 and 190 .

5.2.3【Class 2】Vibration Suppression

Pr2.00	Name	Adaptive filter mode setup			Mode	P	S	
	Range	0~4	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0201H		
	Repower	-						

Set up the resonance frequency to be estimated by the adaptive filter and the special the operation after estimation.

Setup value	Details	
0	Adaptive filter: invalid	Parameters related to the 3rd and 4th notch filter hold the current value.
1	Adaptive filter,1 filter is valid, one time	One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation.
2	Adaptive filter, 1 filter is valid, It will be valid all the time	One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance.
3-4	Not use	Non-professional forbidded to use

Pr2.01	Name	1st notch frequency			Mode	P	S	T
	Range	50~2000	Unit	Hz	Default	2000		
	Data Type	16bit	Access	R/W	Address	0203H		
	Repower	-						

Set the center frequency of the 1st notch filter

Notice: the notch filter function will be invalid by setting up this parameter to “2000”.

Pr2. 02	Name	1st notch width selection			Mode	P	S	T
	Range	0~20	Unit	—	Default	2		
	Data Type	16bit	Access	R/W	Address	0205H		
	Repower	-						

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. 03	Name	1st notch depth selection			Mode	P	S	T
	Range	0~99	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0207H		
	Repower	-						

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. 04	Name	2nd notch frequency			Mode	P	S	T
	Range	50~2000	Unit	Hz	Default	2000		
	Data Type	16bit	Access	R/W	Address	0209H		
	Repower	-						

Set the center frequency of the 2nd notch filter

Notice: the notch filter function will be invalid by setting up this parameter to “2000”.

Pr2. 05	Name	2nd notch width selection			Mode	P	S	T
	Range	0~20	Unit	—	Default	2		
	Data Type	16bit	Access	R/W	Address	020BH		
	Repower	-						

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. 06	Name	2nd notch depth selection			Mode	P	S	T
	Range	0~99	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	020DH		
	Repower	-						

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.

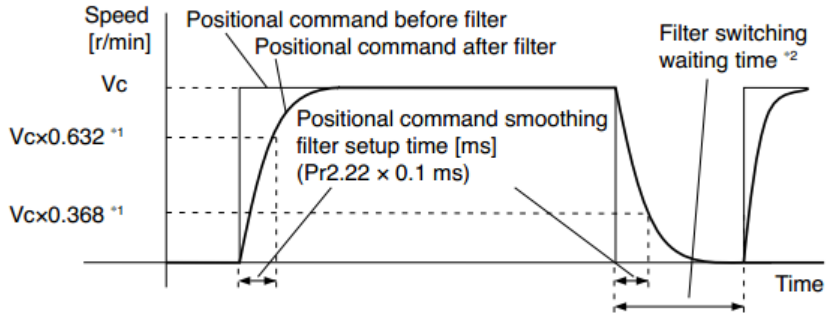
Pr2. 07	Name	3rd notch frequency			Mode	P	S	T
	Range	50~2000	Unit	Hz	Default	2000		
	Data Type	16bit	Access	R/W	Address	020FH		
	Repower	-						
Set the center frequency of the 3rd notch filter Notice: the notch filter function will be invalid by setting up this parameter to “2000”.								
Pr2. 08	Name	3rd notch width selection			Mode	P	S	T
	Range	0~20	Unit	—	Default	2		
	Data Type	16bit	Access	R/W	Address	0211H		
	Repower	-						
Set the width of notch at the center frequency of the 3rd notch filter. Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation.								
Pr2. 09	Name	3rd notch depth selection			Mode	P	S	T
	Range	0~99	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0213H		
	Repower	-						
Set the depth of notch at the center frequency of the 3rd notch filter. Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain.								

Pr2. 14*	Name	1st damping frequency			Mode	P		
	Range	10~2000	Unit	0.1HZ	Default	0		
	Data Type	16bit	Access	R/W	Address	021DH		
	Repower	-						
0: close Setup damping frequency, to suppress vibration at the load edge.								
Pr2. 16*	Name	2nd damping frequency			Mode	P		
	Range	10~2000	Unit	0.1HZ	Default	0		
	Data Type	16bit	Access	R/W	Address	0221H		
	Repower	-						
0: close Setup damping frequency, to suppress vibration at the load edge								

Pr2. 22	Name	positional command smoothing filter			Mode	P		
	Range	0~32767	Unit	0.1ms	Default	0		

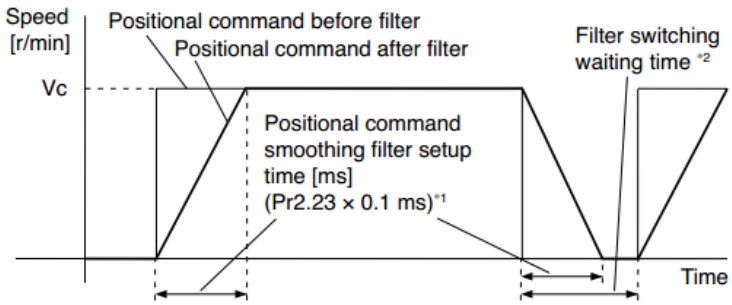
	Data Type	16bit	Access	R/W	Address	022DH
	Repower	o				

- Set up the time constant of the1st delay filter in response to the positional command.
- When a square wave command for the target speed Vc is applied ,set up the time constant of the 1st delay filter as shown in the figure below



Pr2. 23	Name	positional command FIR filter			Mode	P
	Range	0~10000	Unit	0.1ms	Default	0
	Data Type	16bit	Access	R/W	Address	022FH
	Repower	o				

- Set up the time constant of the1st delay filter in response to the positional command.
- When a square wave command for the target speed Vc is applied , set up the Vc arrival time as shown in the figure below.



5.2.4【Class 3】Velocity/ Torque Control

Pr3. 00	Name	Speed setup, Internal /External switching			Mode	S
	Range	0~3	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	0301H
	Repower	-				

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
	ON	ON	ON	8th speed

Pr3.01	Name	Speed command rotational direction selection			Mode	S
	Range	0~1	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	0303H
	Repower	-				

Select the Positive /Negative direction specifying method

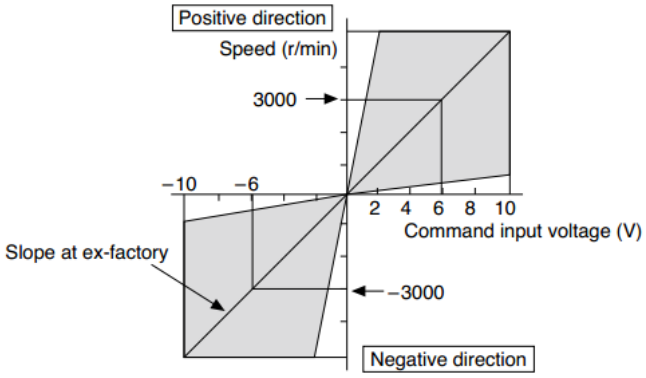
Setup value	Select speed command sign (1st to 8th speed)	Speed command direction (VC-SIGN)	Position command direction
0	+	No effect	Positive direction
	-	No effect	Negative direction
1	Sign has no effect	OFF	Positive direction
	Sign has no effect	ON	Negative direction

Pr3. 02	Name	Input gain of speed command			Mode	S
	Range	10~2000	Unit	(r/min)/V	Default	500
	Data Type	16bit	Access	R/W	Address	0305H
	Repower	-				

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	Name	Reversal of speed command input			Mode	S
	Range	0~1	Unit	—	Default	1
	Data Type	16bit	Access	R/W	Address	0307H
	Repower	-				

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]

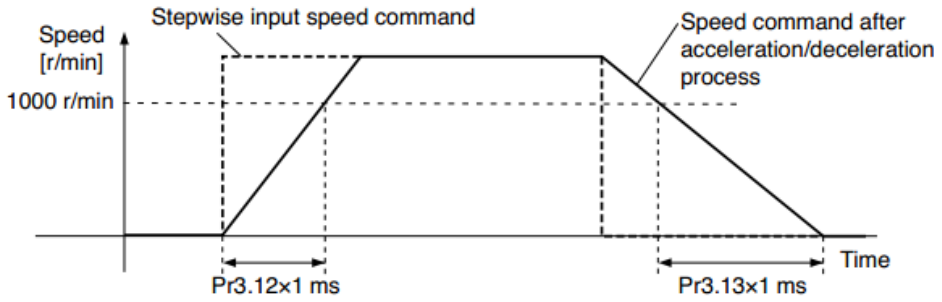
Caution: When you compose the servo drive system with this driver set to velocity control mode and external positioning unit, the motor might perform an abnormal action if the polarity of the speed command signal from the unit and the polarity of this parameter setup does not match.

Pr3.04	Name	1st speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0309H
	Repower	-				
Pr3.05	Name	2nd speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	030BH
	Repower	-				
Pr3.06	Name	3rd speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	030DH
	Repower	-				
Pr3.07	Name	4th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	030FH
	Repower	-				
Pr3.08	Name	5th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0311H
	Repower	-				
Pr3.09	Name	6th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0313H
	Repower	-				
Pr3.10	Name	7th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0315H
	Repower	-				
Pr3.11	Name	8th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	0
	Data Type	16bit	Access	R/W	Address	0317H
	Repower	-				
	Set up internal command speeds, 1st to 8th					

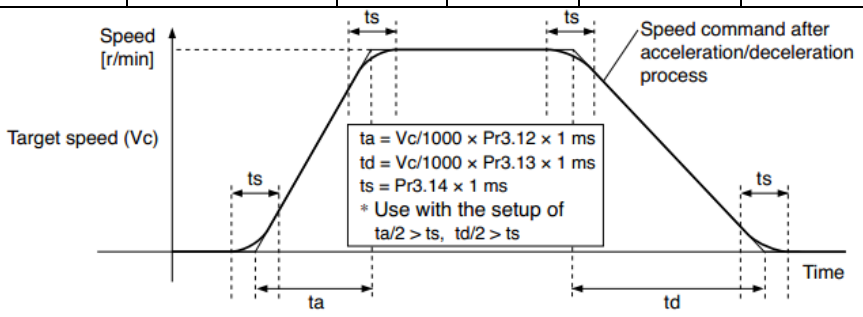
Pr3. 12	Name	time setup acceleration			Mode	S
	Range	0~10000	Unit	Ms/ (1000r/min)	Default	100
	Data Type	16bit	Access	R/W	Address	0319H
	Repower	-				
Pr3. 13	Name	time setup deceleration			Mode	S
	Range	0~10000	Unit	Ms/ (1000r/min)	Default	100
	Data Type	16bit	Access	R/W	Address	031BH
	Repower	-				

Set up acceleration/deceleration processing time in response to the speed command input.
Set the time required for the speed command(stepwise input)to reach 1000r/min to Pr3.12
Acceleration time setup. Also set the time required for the speed command to reach from 1000r/min to 0 r/min, to Pr3.13 Deceleration time setup.
Assuming that the target value of the speed command is Vc(r/min), the time required for acceleration/deceleration can be computed from the formula shown below.

Acceleration time (ms)=Vc/1000 *Pr3.12 *1ms
Deceleration time (ms)=Vc/1000 *Pr3.13 *1ms



Pr3. 14	Name	Sigmoid acceleration /deceleration time setup			Mode	S
	Range	0~1000	Unit	ms	Default	0
	Data Type	16bit	Access	R/W	Address	031DH
	Repower	o				



Set S-curve time for acceleration/deceleration process when the speed command is applied. According to Pr3.12 Acceleration time setup and Pr3.13 Deceleration time setup, set up sigmoid time with time width centering the inflection point of

acceleration/deceleration.

Pr3. 15	Name	Speed zero-clamp function selection			Mode	S
	Range	0~3	Unit	0.1HZ	Default	0
	Data Type	16bit	Access	R/W	Address	031FH
	Repower	-				

1. If Pr3.15=0, the function of zero clamp is forbidden. It means the motor rotates with actual velocity which is controlled by the analog voltage input 1 even if the velocity is less than 10 rpm. The motor runs no matter what the value of Pr3.16 is. The actual velocity is controlled by external the analog voltage input .
2. If Pr3.15=1 and the input signal of Zero Speed is available in the same time, the function of zero clamp works. It means motor will stop rotating in servo-on condition no matter what the velocity of motor is, and motor stop rotating no matter what the value of Pr3.16 is.
3. If Pr3.15=2 , the function of zero clamp belongs to the value of Pr3.16. If the actual velocity is less than the value of Pr3.16, the motor will stop rotating in servo-on condition.

Pr3. 16	Name	Speed zero-clamp level			Mode	S
	Range	10~2000	Unit	r/min	Default	30
	Data Type	16bit	Access	R/W	Address	0321H
	Repower	-				

When analog speed given value under speed control mode less than zero speed clamp level setup, speed command will set to 0 strongly.

Pr3. 17	Name	Selection of torque command			Mode	T
	Range	0、1、2	Unit		Default	0
	Data Type	16bit	Access	R/W	Address	0323H
	Repower	-				

Setup value	Torque command input	Velocity limit input
0	Analog input 3	Parameter value (P3.21)
1	Analog input 3	Analog input 1 for Speed limit
2	Parameter value (P3.22)	Parameter value (P3.21)
3	Analog input 3	Speed limit 0

Pr3. 18	Name	Torque command direction selection			Mode	T
	Range	0~1	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	0325H
	Repower	-				

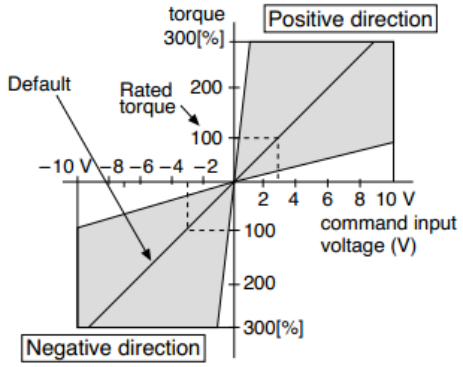
Select the direction positive/negative direction of torque command

Setup value	Details
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	Name	Torque command input gain			Mode		T
	Range	10~100	Unit	0.1V/100%	Default	0	
	Data Type	16bit	Access	R/W	Address	0327H	
	Repower	-					

Based on the voltage (V) applied to the analog torque command (TRQR),set up the conversion gain to torque command(%)

- Unit of the setup value is 0.1V/100%] and set up input voltage necessary to produce the rated torque.
- Default setup of 30 represents 3V/100%



Pr3. 20	Name	Torque command input reversal			Mode		T
	Range	0~1	Unit	—	Default	0	
	Data Type	16bit	Access	R/W	Address	0329H	
	Repower	-					

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	Name	Speed limit value 1			Mode		T
	Range	0~10000	Unit	r/min	Default	0	
	Data Type	16bit	Access	R/W	Address	032BH	
	Repower	-					

Set up the speed limit used for torque control.

During the torque controlling, the speed set by the speed limit cannot be exceeded.

Pr3. 22	Name	Torque command			Mode			T
	Range	0~300	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	032DH		
	Repower	-						
Set up torque limit value in torque mode control.								

Pr3. 24＊	Name	Motor rotate maximum speed limit			Mode	P	S	T
	Range	0~10000	Unit	r/min	Default	3000		
	Data Type	16bit	Access	R/W	Address	0331H		
	Repower	-						
Set up motor running max rotate speed, but can't be exceeded motor allowed max rotate speed.								

5.2.5【Class 4】I/F Monitor Setting

Pr4. 00＊	Name	Input selection SI1			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	303		
	Data Type	16bit	Access	R/W	Address	0401H		
	Repower	o						
Pr4. 01＊	Name	Input selection SI2			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0403H		
	Repower	o						
Pr4. 02＊	Name	Input selection SI3			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0405H		
	Repower	o						
Pr4. 03＊	Name	Input selection SI4			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0207H		
	Repower	o						
Pr4. 04＊	Name	Input selection SI5			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0409H		

	Repower	o						
Pr4. 05＊	Name	Input selection SI6			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	040BH		
	Repower	o						
Pr4. 06＊	Name	Input selection SI7			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	040DH		
	Repower	o						
Pr4. 07＊	Name	Input selection SI8			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	040FH		
	Repower	o						
Pr4. 08＊	Name	Input selection SI9			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0411H		
	Repower	o						

Set SI input function allocation.
This parameter use 16 binary system to set up the values,
For the function number, please refer to the following Figure.

Signal name	**Symbol**	**Setup value**	
		Normally open	**Normally closed**
Invalid	-	00h	Do not setup
Positive direction over-travel inhibition	POT	01h	81h
Negative direction over-travel inhibition	NOT	02h	82h
Servo-ON input	SRV-ON	03h	83h
Alarm clear input	A-CLR	04h	Do not setup
Control mode switching input	C-MODE	05h	85h
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

Note:

- Normally open means input signal comes from external controller or component, for example: PLC .
- Normally closed means input signal comes from driver internally.
- Don't setup to a value other than that specified in the table .
- Don't assign specific function to 2 or more signals. Duplicated assignment will cause Err21.0 I/F input multiple assignment error 1or Err21.1 I/F input multiple assignment error 2

Pr-Mode related input setup as below:

Input			
Signal name	**Symbol**	**Setup value**	
		Normally open	**Normally closed**
Trigger command	CTRG	20h	A0h
Homing signal	HOME	21h	A1h
Forced stop	STP	22h	A2h
Forward direction JOG	JOG+	23h	A3h
Opposite direction JOG	JOG-	24h	A4h
Forward limit	PL	25h	A5h
Reverse limit	NL	26h	A6h
Homing signal	ORG	27h	A7h
Road strength address 0	ADD0	28h	A8h
Road strength address 1	ADD1	29h	A9h
Road strength address 2	ADD2	2ah	Aah
Road strength address 3	ADD3	2bh	Abh
Torque switching	TC-SEL	09h	89h

Note:

CTRG, HOME is edge triggered, but the valid level must be last more than 1ms.

Pr4. 10＊	Name	Output selection SO1			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	101		
	Data Type	16bit	Access	R/W	Address	0415H		
	Repower	o						
Pr4. 11＊	Name	Output selection SO2			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	202		
	Data Type	16bit	Access	R/W	Address	0417H		
	Repower	o						
Pr4. 12＊	Name	Output selection SO3			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	404		
	Data Type	16bit	Access	R/W	Address	0419H		
	Repower	o						
Pr4. 13＊	Name	Output selection SO4			Mode	P	S	T
	Range	0~00FFFFFFh	Unit	—	Default	303		
	Data Type	16bit	Access	R/W	Address	041BH		
	Repower	o						
Pr4. 14＊	Name	Output selection SO5			Mode	P	S	T

	Range	0~00FFFFFFh	Unit	—	Default	101
	Data Type	16bit	Access	R/W	Address	041DH
	Repower	o				
Pr4. 15＊	Name	Output selection SO6			Mode	P S T
	Range	0~00FFFFFFh	Unit	—	Default	303
	Data Type	16bit	Access	R/W	Address	041FH
	Repower	o				

Assign functions to SO outputs.
This parameter use 16 binary system do setup
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

Pr-Mode related output setup as below;

Output			
Signal name	Symbol	Set value	
		Normally open	Normally closed
Command complete	CMD-OK	20h	A0h
Road strength address	MC-OK	21h	A1h
Homing finish	HOME-OK	22h	A2h
Torque limit	TQL	06h	86h

Note:
CMD-OK indicates PR command sent complete, but the motor may not in-position.
MC-OK indicates command complete and the motor in-position.
*1 Pay attention to the front panel display is hexadecimal.

Pr4. 22	Name	Analog input 1 (AI1) offset setup			Mode	S
	Range	-5578~5578	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	042DH
	Repower	-				

Set up the offset correction value applied to the voltage fed to the analog input 1.

Pr4. 23	Name	Analog input 1 (AI1) filter			Mode	S
	Range	0~6400	Unit	0.01ms	Default	0
	Data Type	16bit	Access	R/W	Address	042FH
	Repower	-				

Set up the time constant of 1st delay filter that determines the lag time behind the voltage applied to the analog input 1.

Pr4. 24	Name	Analog input 1 (AI1) over -voltage setup			Mode		S	
	Range	0~100	Unit	0.1v	Default	0		
	Data Type	16bit	Access	R/W	Address	0431H		
	Repower	-						
	Set up the excessive level of the input voltage of analog input 1 by using the voltage associated with offset							

Pr4. 28	Name	Analog input 3 (AI3) offset setup			Mode			T
	Range	-342~342	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0439H		
	Repower	-						
	Set up the offset correction value applied to the voltage fed to the analog input 3.							

Pr4. 29	Name	Analog input 3 (AI3) filter			Mode			T
	Range	0~6400	Unit	0.01ms	Default	0		
	Data Type	16bit	Access	R/W	Address	043BH		
	Repower	-						
	Set up the time constant of 1st delay filter that determines the lag time behind the voltage applied to the analog input 3.							

Pr4. 30	Name	Analog input 3 (AI3) overvoltage setup			Mode			T
	Range	0~100	Unit	0.1v	Default	0		
	Data Type	16bit	Access	R/W	Address	043DH		
	Repower	-						
	Set up the excessive level of the input voltage of analog input 3 by using the voltage associated with offset.							

Pr4. 31	Name	Positioning complete range			Mode	P		
	Range	0~10000	Unit	Encoder unit	Default	10		
	Data Type	16bit	Access	R/W	Address	043FH		
	Repower	-						
	Set up the timing of positional deviation at which the positioning complete signal (INP1) is output.							

Pr4. 32	Name	Positioning complete output setup			Mode	P		
	Range	0~3	Unit	command unit	Default	0		

	Data Type	16bit	Access	R/W	Address	0441H
	Repower	-				

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								
	Name	INP hold time			Mode	P		
	Range	0~30000	Unit	1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	0443H		
	Repower	-						

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

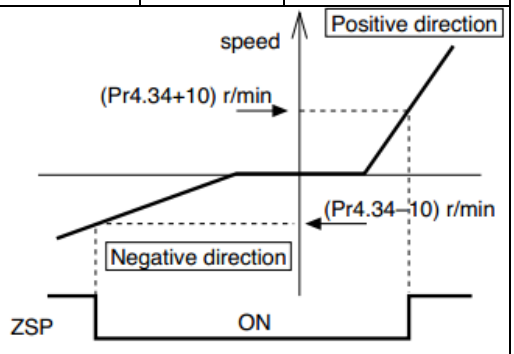
Setup value	State of Positioning complete signal
0	The hold time is maintained definitely, keeping ON state until next positional command is received.
1-30000	ON state is maintained for setup time (ms)but switched to OFF state as the positional command is received during hold time.

Pr4. 34								
	Name	Zero-speed			Mode	P	S	T
	Range	10~20000	Unit	r/min	Default	50		
	Data Type	16bit	Access	R/W	Address	0445H		
	Repower	-						

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

- The setup of pr4.34 is valid for both positive and negative direction regardless of the motor rotating direction.
- There is hysteresis of 10[r/min]

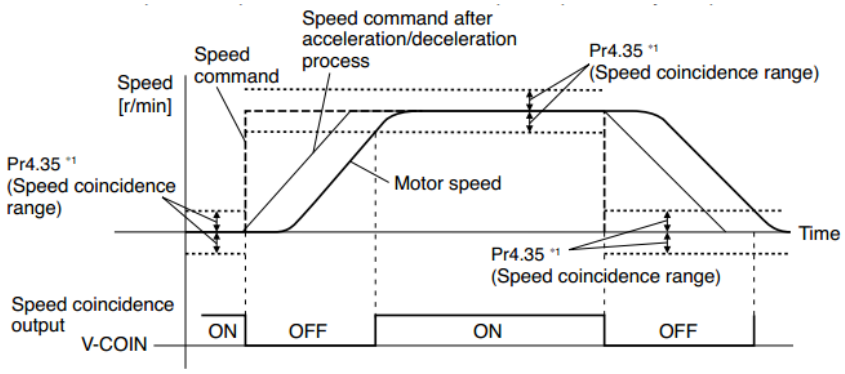


Pr4. 35	Name	Speed coincidence range			Mode		S	
	Range	10~2000	Unit	r/min	Default	50		
	Data Type	16bit	Access	R/W	Address	0447H		
	Repower	-						

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.

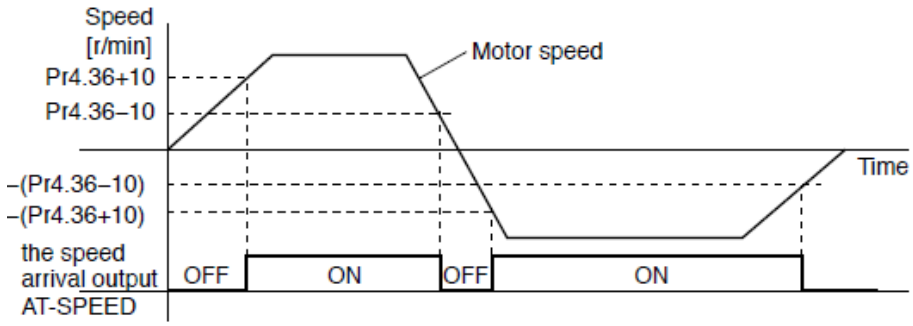
Because the speed coincidence detection is associated with 10 r/min hysteresis, actual detection range is as shown below.

Speed coincidence output OFF -> ON timing (Pr4.35 -10) r/min
Speed coincidence output ON -> OFF timing (Pr4.35 +10) r/min



Pr4. 36	Name	At-speed(Speed arrival)			Mode		S	
	Range	10~2000	Unit	r/min	Default	1000		
	Data Type	16bit	Access	R/W	Address	0449H		
	Repower	-						

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 .



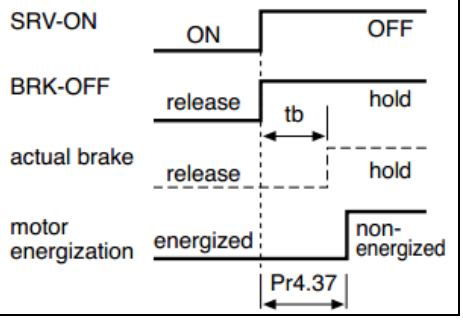
Pr4. 37	Name	Mechanical brake action at stalling setup	Mode	P	S	T

	Range	0~10000	Unit	1ms	Default	0
	Data Type	16bit	Access	R/W	Address	044BH
	Repower	-				

Motor brake delay time setup, mainly used to prevent servo on "galloping "phenomenon.

Set up the time from when the brake release signal(BRK-OFF) turns off to when the motor is de-energized (servo-free),when the motor turns to servo-off while the motor is at stall

- Set up to prevent a micro-travel/drop of the motor (work) due to the action delay time(tb) of the brake.
- Ni After setting up Pr4.37>=tb, then compose the sequence so as the driver turns to servo-off after the brake is actually activated.

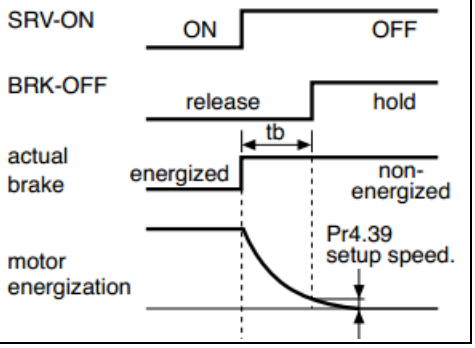


Pr4. 38	Name	Mechanical brake action at running setup			Mode	P	S	T
	Range	0~10000	Unit	1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	044DH		
	Repower	-						

Mechanical brake start delay time setup, mainly used to prevent servo off "galloping "phenomenon.

Set up time from when detecting the off of servo-on input signal(SRV-ON)is to when external brake release signal(BRK-OFF)turns off, while the motor turns to servo off during the motor in motion

- Set up to prevent the brake deterioration due to the motor running.
- At servo-OFF during the motor is running , tb of the right fig will be a shorter one of either Pr4.38 setup time, or time lapse till the motor speed falls below Pr4.39 setup speed



Pr4. 39	Name	Brake release speed setup			Mode	P	S	T
	Range	30~3000	Unit	1ms	Default	30		
	Data Type	16bit	Access	R/W	Address	044FH		
	Repower	-						

When servo off, rotate speed less than this setup vale, and mechanical brake start delay time arrive, motor lost power.

5.2.6【Class 5】Extended Setup

Pr5. 00	Name	2nd Command pulse counts per one motor revolution			Mode	P		
	Range	0-8388608	Unit	P	Default	0		
	Data Type	32bit	Access	R/W	Address	0500H 0501H		
	Repower	o						
	Set the command pulse that causes single turn of the motor shaft. Select Pr0.08 1st or Pr5.00 2nd by IO signal. 1) If Pr5.00≠0 , the actual turns = pulse number / Pr5.00 2) If Pr5.00 = 0 , Pr5.01 2nd numerator of electronic gear and Pr5.02 2nd Denominator of electronic Gear become valid.							

Pr5. 01	Name	2nd numerator of electronic gear			Mode	P		
	Range	1~1073741824	Unit	—	Default	1		
	Data Type	32bit	Access	R/W	Address	0502H 0503H		
	Repower	o						
	Set the numerator of division/multiplication operation made according to the command pulse input							
Pr5. 02	Name	2nd denominator of electronic gear			Mode	P		
	Range	1~1073741824	Unit	—	Default	1		
	Data Type	32bit	Access	R/W	Address	0504H 0505H		
	Repower	o						
	Set the denominator of division/multiplication operation made according to the command pulse input. Instructions refer to Pr0.09 and Pr0.10 and select by IO signal							

Pr5. 04	Name	Over-travel inhibit input setup			Mode	P	S	T
	Range	0/1/2	Unit	1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	0509H		
	Repower	-						
	0: positive and negative limit effective, no alarm output; 1: positive and negative limit effective invalid; 2: positive and negative limit effective, alarm output;							

Pr5. 06	Name	Sequence at servo-off			Mode	P	S	T
	Range	0~1	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	050DH		
	Repower	-						

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

Setup value	during deceleration	After stop
0	emergency	Free-run
1	Free-run	Free-run

Pr5. 08	Name	LV trip selection at main power OFF			Mode	P	S	T
	Range	0~1	Unit	—	Default	1		
	Data Type	16bit	Access	R/W	Address	0511H		
	Repower	-						

You can select whether or not to activate Err0d.0 (main power under-voltage protection)function while the main shutoff continues for the setup of Pr5.09(The main power-OFF detection time).

Setup value	Action of main power low voltage protection
0	When the main power is shut off during Servo-On,Err0d.0 will not be triggered and the driver turns to Servo-OFF. The driver returns to Servo-On again after the main power resumption.
1	When the main power is shut off during Servo-On, the driver will trip due to Err0d.0

Caution: Err0d.0(main power under-voltage protection) is trigged when setup of Pr5.09 is long and P-N voltage of the main converter falls below the specified value before detecting the main power shutoff , regardless of the Pr5.08 setup.

Pr5. 09＊	Name	The main power-OFF detection time			Mode	P	S	T
	Range	70~2000	Unit	1ms	Default	70		
	Data Type	16bit	Access	R/W	Address	0513H		
	Repower	o						

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. 10	Name	Dynamic braking mode			Mode	P	S	T
	Range	0~2	Unit		Default	0		
	Data Type	16bit	Access	R/W	Address	0515H		
	Repower	o						

0：Dynamic braking is valid in both normal and abnormal conditions.

1：Dynamic braking is valid in normal condition, invalid in abnormal condition. (used to prevent abnormal conditions, high speed and large inertia to burn up the dynamic braking)

2：Dynamic braking is invalid in both normal and abnormal conditions.

Pr5. 11＊	Name	Torque setup for emergency stop	Mode	P	S	T

	Range	0~500	Unit	%	Default	0
	Data Type	16bit	Access	R/W	Address	051H
	Repower	-				
	Set up the torque limit at emergency stop When setup value is 0, the torque limit for normal operation is applied.					

Pr5. 12	Name	Over-load level setup			Mode	P	S	T
	Range	0~115	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	0519H		
	Repower	-						
	You can set up over-load level. The overload level becomes 115% by setting up this value to 0. Use this with 0 setup in normal operation, set up other value only when you need to low this over-load level. The setup value of this parameter is limited by 115% of the motor rating.							

Pr5. 13	Name	Over-speed level setup			Mode	P	S	T
	Range	0~10000	Unit	r/min	Default	0		
	Data Type	16bit	Access	R/W	Address	051BH		
	Repower	-						
	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＊	Name	I/F reading filter			Mode	P	S	T
	Range	0~255	Unit	0.1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	051FH		
	Repower	o						
	I/O input digital filtering; higher setup will arise control delay.							

Pr5. 17	Name	Counter clear input mode			Mode	P		
	Range	0~4	Unit	—	Default	3		
	Data Type	16bit	Access	R/W	Address	0523H		
	Repower	-						

Set up the clearing conditions of the counter clear input signal

Setup value	Clear condition
0/2/4	invalid
1	Always clear
3	Only clear one time

Pr5. 20	Name	Position setup unit select			Mode	P		
	Range	0~2	Unit	—	Default	2		

	Data Type	16bit	Access	R/W	Address	0529H
	Repower	-				

Specify the unit to determine the range of positioning complete and excessive positional deviation

Setup value	unit
0	Encoder unit
1	Command unit
2	10000pulse/rotation

Pr5. 21	Name	Selection of torque limit			Mode	P	S	T
	Range	0~5	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	052BH		
	Repower	-						

Set up the torque limiting method

Setup value		Limiting value
0		PR0.13
1		PR5.22
2	TL-SEL off	PR0.13
	TL-SEL on	PR5.22
5		PR0.13 Positive torque limit PR5.22 Negative torque limit

Pr5. 22	Name	2nd torque limit			Mode	P	S	T
	Range	0~500	Unit	%	Default	300		
	Data Type	16bit	Access	R/W	Address	052DH		
	Repower	-						

Set up the 2nd limit value of the motor torque output
The value of the parameter is limited to the maximum torque of the applicable motor.

Pr5. 23	Name	Positive torque reached			Mode	P	S	T
	Range	0~300	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	052FH		
	Repower	-						

- Default setting is 0，if the torque feedback is greater than 95% of the rated torque, output TCL signal.
- If the torque feedback is greater than the user setting value, output TCL signal.

Pr5. 24	Name	Negative torque reached			Mode	P	S	T
	Range	0~300	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	0531H		
	Repower	-						

- Default setting is 0，if the torque feedback is greater than 95% of the rated torque, output TCL signal.
- If the torque feedback is greater than the user setting value, output TCL signal.

Pr5. 28＊	Name	LED initial status			Mode	P	S	T
	Range	0~35	Unit	—	Default	1		
	Data Type	16bit	Access	R/W	Address	0539H		
	Repower	-						

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	10	I/O signal status	27	Voltage across PN [V]
1	Motor speed	11	Analog input value	28	Software version
2	Positional command speed	12	Error factor and reference of history	29	Driver serial number
3	Velocity control command	16	Inertia ratio	30	Motor serial number
4	Torque command	17	Factor of no-motor running	31	Accumulated operation time
5	Feedback pulse sum	23	Communication axis address	33	Temperature information
6	Command pulse sum	24	Encoder positional deviation [encoder unit]	36	Safety condition monitor
9	Control mode				

Pr5. 29＊	Name	Mode setup of RS485 communication			Mode	P	S	T
	Range	0~255	Unit	—	Default	5		
	Data Type	16bit	Access	R/W	Address	053BH		
	Repower	-						

Value	Data bit	Parity-check	Stop bit
0	8	Even Parity	2
1	8	Odd Parity	2
2	8	Even Parity	1
3	8	Odd Parity	1
4	8	None	1
5	8	None	2

Pr5. 30＊	Name	Baud rate setup of RS485 communication			Mode	P	S	T
	Range	0~6	Unit	—	Default	4		
	Data Type	16bit	Access	R/W	Address	053DH		
	Repower	-						

You can set up the communication speed of RS485.

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

Pr5.31*	Name	RS485 slave axis address			Mode	P	S	T
	Range	0~127	Unit	—	Default	1		
	Data Type	16bit	Access	R/W	Address	053FH		
	Repower	-						

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

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

Pr5.32	Name	Command pulse input maximum setup			Mode	P		
	Range	0~4000	Unit	KHZ	Default	0		
	Data Type	16bit	Access	R/W	Address	0541H		
	Repower	-						

Set the maximum number of pulses to be used as command pulse input, if the number of the input pulse exceeds the setup value ,ERR1B0 command pulse input frequency error protection occurs

Pr5.35*	Name	Front panel lock setup			Mode	P	S	T
	Range	0~1	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0547H		
	Repower	-						

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

Pr5.36	Name	7th setting parameters open			Mode	P	S	T
	Range	0、102	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0549H		
	Repower	-						

7th setting parameters open.

Setup value	content
0	
102	Open 7th setting parameters modification authority.

5.2.7【Class 6】Special Setup

Pr6. 03	Name	JOG trial run command torque			Mode			T
	Range	0~100	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	0607H		
	Repower	-						
You can set up the command speed used for JOG trial run (torque control).								

Pr6. 04	Name	JOG trial run command speed			Mode	P	S	T
	Range	0~10000	Unit	r/min	Default	300		
	Data Type	16bit	Access	R/W	Address	0609H		
	Repower	-						
You can set up the command speed used for JOG trial run (velocity control).								

Pr6. 05	Name	Position 3rd gain valid time			Mode	P		
	Range	0~1000	Unit	0.1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	060BH		
	Repower	-						
Set up the time at which 3rd gain becomes valid. When not using this parameter, set PR6.05=0, PR6.06=100 This is valid for only position control/full-closed control.								

Pr6. 06	Name	Position 3rd gain multiplication			Mode	P		
	Range	0~1000	Unit	100%	Default	0		
	Data Type	16bit	Access	R/W	Address	060DH		
	Repower	-						
Set up the 3rd gain by multiplying factor of the 1st gain 3rd gain= 1st gain * PR6.06/100.								

Pr6. 07	Name	Torque command additional value			Mode	P	S	T
	Range	-100~100	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	060FH		
	Repower	-						
Pr6. 08	Name	Positive torque compensation value			Mode	P	S	T
	Range	-100~100	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	0611H		

	Repower	-				
Pr6. 09	Name	Negative torque compensation value			Mode	P S T
	Range	-100~100	Unit	%	Default	0
	Data Type	16bit	Access	R/W	Address	0613H
	Repower	-				
	This three parameters may apply feed forward torque superposition directly to torque command.					

Pr6. 13	Name	2nd inertia ratio			Mode	P S T
	Range	0~10000	Unit	%	Default	0
	Data Type	16bit	Access	R/W	Address	061BH
	Repower	-				
	Set up 2nd inertia ratio Set up the ratio of the load inertia against the rotor of the motor ratio. PR6.13= (load inertia/ rotor inertia) * 100 【%】					

Pr6. 14	Name	Emergency stop time at alarm			Mode	P S T
	Range	0~3000	Unit	ms	Default	200
	Data Type	16bit	Access	R/W	Address	061DH
	Repower	-				
	Set up the time allowed to complete emergency stop in an alarm condition, exceeding this time puts this system in alarm state.					

Pr6. 20	Name	Trial run distance			Mode	P
	Range	0~1200	Unit	0.1rev	Default	10
	Data Type	16bit	Access	R/W	Address	0629H
	Repower	-				
	The distance of running each time in JOG run(position control)					

Pr6. 21	Name	Trial run waiting time			Mode	P
	Range	0~30000	Unit	Ms	Default	100
	Data Type	16bit	Access	R/W	Address	062BH
	Repower	-				
	The waiting time after running each time in JOG run(position control)					

Pr6. 22	Name	Trial run cycle times			Mode	P		
	Range	0~32767	Unit	—	Default	5		
	Data Type	16bit	Access	R/W	Address	062DH		
	Repower	-						
	The cycling times of JOG run(position control)							

Pr6. 25	Name	Acceleration of trial running			Mode	P	S	
	Range	0~32767	Unit	ms	Default	100		
	Data Type	16bit	Access	R/W	Address	0633H		
	Repower	-						
	Acceleration time from 0rpm~1000rpm of trial running							

Pr6. 63	Name	Absolute multi-turn position upper bound			Mode	P	S	T
	Range	0~32766	Unit	Rotation	Default	0		
	Data Type	16bit	Access	R/W	Address	067FH		
	Repower	o						
	While Pr0.15=2: Absolute position rotation mode: The encoder is used as an absolute encoder, and the position retentive at power failure is supported.. It is mainly applicable to the scenario where the load travel range is not limited and the number of motor single-direction revolution is less than 0~(Pr6.63+1)							

5.2.7【Class B】Status Information

Note: This parameters class is only for RS485 communication.

PrB. 00	Name	Software version 1 (DSP)			Mode	P	S	T
	Range		Unit		Default			
	Data Type	16bit	Access	R	Address	0B00H		
	Display Software version 1（DSP）							

PrB. 01	Name	Software version 2 (CPLD)			Mode	P	S	T
	Range		Unit		Default			
	Data Type	16bit	Access	R	Address	0B01H		
	Display Software version 2（CPLD）							

PrB. 02	Name	Software version 3 (other)			Mode	P	S	T
	Range		Unit		Default			

	Data Type	16bit	Access	R	Address	0B02H
	Display Software version 3					

PrB. 05	Name	Drive operating state			Mode	P	S	T
	Range		Unit		Default			
	Data Type	16bit	Access	R	Address	0B05H		

Bit	Function	Details
0	RDY	Servo ready
1	RUN	Servo run
2	ERR	Servo error
3	HOME_OK	Homing process finished
4	INP	Positioning complete
5	AT-SPEED	At-speed
6~15		Reserve

PrB. 06	Name	Motor speed (unfiltered)			Mode	P	S	T
	Range		Unit	RPM	Default			
	Data Type	16bit	Access	R	Address	0B06H		
	Motor speed (unfiltered)							

PrB. 07	Name	Actual torque feedback			Mode	P	S	T
	Range		Unit	%	Default			
	Data Type	16bit	Access	R	Address	0B07H		
	Actual torque feedback（Percentage of the rated torque）							

PrB. 08	Name	Actual current feedback			Mode	P	S	T
	Range		Unit	0.01A	Default			
	Data Type	16bit	Access	R	Address	0B08H		
	Actual current feedback							

PrB. 09	Name	Speed (After filtering)			Mode	P	S	T
	Range		Unit	RPM	Default			
	Data Type	16bit	Access	R	Address	0B09H		
	Speed（After filtering）							

PrB. 10	Name	DC bus voltage			Mode	P	S	T
	Range		Unit	V	Default			
	Data Type	16bit	Access	R	Address	0B0AH		

DC bus voltage

PrB. 11	Name	Drive temperature			Mode	P	S	T
	Range		Unit	℃	Default			
	Data Type	16bit	Access	R	Address	0B0BH		
Drive temperature								

PrB. 12	Name	Analog input1			Mode	P	S	T
	Range		Unit	0.01V	Default			
	Data Type	16bit	Access	R	Address	0B0CH		
Analog input1								

PrB. 13	Name	Analog input 2			Mode	P	S	T
	Range		Unit	0.01V	Default			
	Data Type	16bit	Access	R	Address	0B0DH		
Analog input2								

PrB. 14	Name	Analog input 3			Mode	P	S	T
	Range		Unit	0.01V	Default			
	Data Type	16bit	Access	R	Address	0B0EH		
Analog input3								

PrB. 15	Name	Over-load ratio			Mode	P	S	T
	Range		Unit	%	Default			
	Data Type	16bit	Access	R	Address	0B0FH		
Over-load ratio（%）								

PrB. 16	Name	Regeneration load ratio			Mode	P	S	T
	Range		Unit	%	Default			
	Data Type	16bit	Access	R	Address	0B10H		
Regeneration load ratio（%）								

PrB. 17	Name	Digital input signal status			Mode	P	S	T
	Range		Unit		Default			
	Data Type	16bit	Access	R	Address	0B11H		

Digital input signal status：

Bit	SI input
0	SI1
1	SI2
2	SI3
…	…
8	SI9

Bitn=1,indacates SI(n+1)is at high level; Bitn=0,indacates SI(n+1)is at low level.

PrB. 18	Name	Digital output signal status			Mode	P	S	T
	Range		Unit		Default			
	Data Type	16bit	Access	R	Address	0B11H		

Digital output signal status：

Bit	SO output
0	S01
1	S02
2	S03
…	…
5	S06

Bitn=1, indacates SO(n+1)is at high level; Bitn=0,indacates SO(n+1)is at low level.

PrB. 20	Name	Motor position feedback (Command unit)			Mode	P		
	Range		Unit	P	Default			
	Data Type	32bit	Access	R	Address	0B14H~0B15H		

Motor position feedback（Command unit）.

If the driver receives 8388608 pulse, and the driver's instruction unit is 10000pulse/ r, the encoder unit is 8388608 pulse/r, then the driver motor position feedback pulse number is 10000P

PrB. 21	Name	Command pulse sum (Command unit)			Mode	P		
	Range		Unit	P	Default			
	Data Type	32bit	Access	R	Address	0B16H~0B17H		

Command pulse sum（Command unit）

PrB. 22	Name	Positional deviation (Command unit)			Mode	P		
	Range		Unit	P	Default			
	Data Type	32bit	Access	R	Address	0B18H~0B19H		

Positional deviation（Command unit）, refer to PrB.23 for details.

PrB. 23	Name	Position command (Encoder unit)			Mode	P		
	Range		Unit		Default			
	Data Type	32bit	Access	R	Address	0B1AH~0B1BH		
	Position command（Encoder unit） If the driver's instruction unit is 10000pulse/ r, the encoder unit is 8388608 pulse/r, then the driver receive 10000pulse, the position command pulse number is 8388608 pulse							

PrB. 24	Name	Motor position (encoder unit)			Mode	P		
	Range		Unit		Default			
	Data Type	32bit	Access	R	Address	0B1CH~0B1DH		
	Motor position（encoder unit）							

PrB. 25	Name	Positional deviation(encoder unit)			Mode	P		
	Range		Unit		Default			
	Data Type	32bit	Access	R	Address	0B1EH~0B1FH		
	Positional deviation(encoder unit)							

PrB. 26	Name	Position feedback in rotation mode(encoder unit)			Mode	P		
	Range		Unit		Default			
	Data Type	32bit	Access	R	Address	0B29H~0B21FH		
	Position feedback in rotation mode(encoder unit)， refer to PrB.23 for details.							

Chapter 6 Alarm and Processing

6.1 Alarm List

Protection function is activated when an error occurs, the driver will stop the rotation of servo motor, and the front panel will automatically display the corresponding fault error code. The history of the error can be viewed on data monitoring mode. error logging submenu displays like:"d12Er".

Table 6.1 Error Code List

Error code		Content	Attribute		
Main	Sub		History	Immediate stop	Can be cleared
09	0~F	FPGA communication error	●		
0A	0~1	Current detection circuit error	●		
	2．4	Analog input circuit error	●		
	3	Power line（U、V、W）not connected	●		
	5	DC bus circuit error	●		
	6	Temperature detection circuit error	●		
0b	0	Control power under-voltage	●		
0c	0	DC bus over-voltage	●		●
0d	0	DC bus under-voltage	●		●
	2	Power line（U、V、W）not connected			●
0E	0	Over-current	●		
	1	over-current of intelligent power module (IPM)	●		
0F	0	Driver over-heat	●	●	
10	0	Motor over-load	●		●
	1	Driver over-load	●		●
12	0	Resistor discharged circuit overload	●	●	
	1	Brake error	●		
15	0	Encoder wiring error	●		
	1	Encoder data error	●		
	2	Encoder initial position error	●		
	3	Encoder battery low-voltage error	●		●
17	0	Encoder data error	●	●	
	1	Motor parameter error			
18	0	Too large position pulse deviation	●	●	●
	1	Too large velocity deviation	●	●	●
19	0	Vibration is too large	●	●	●
1A	0	Over-speed 1	●	●	●
	1	Speed out of control	●		●
21	0	I/F input interface allocation error	●		●
	1	I/F input interface function set error	●		●
	2	I/F output interface function set error	●		●
24	0	CRC verification error when EEPROM parameter saved			
26	0	Positive/negative over-range input valid	●	●	●
57	0	Compulsory 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

6.2 Alarm Processing Method

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

Error code	Main	Extra	**Display:** "Er 090" -- "Er 09F"	
	09	0~F	**Content:** FPGA communication error	
Cause			Confirmation	Solution
L1,L2 terminal under-voltage			Check L1,L2 terminal voltage	Make sure voltage of L1,L2 terminal in proper range
Driver internal fault			/	replace the driver with a new one

Error code	Main	Extra	**Display:** "Er 0A0" -- "Er 0A1"	
	0A	0~1	**Content:** current detection circuit error	
Cause			Confirmation	Solution
Wiring error of motor output U,V,W terminal			Check wiring of motor output U,V,W terminal	Make sure motor U,V,W terminal wiring correctly
Main voltage L1,L2,L3 terminal voltage whether over-low			Check main voltage L1,L2,L3 terminal voltage	Make sure voltage of L1,L2,L3 terminal in proper range
Driver inner fault			/	replace the driver with a new one

Error code	Main	Extra	**Display:** "Er 0A2"、"Er 0A4"	
	0A	2、4	**Content:** analog input circuit error	
Cause			Confirmation	Solution
Analog input Wiring error			Check wiring of analog input	Make sure analog input wiring correctly
Driver inner fault			/	replace the driver with a new one

Error code	Main	Extra	**Display:** "Er 0A3"	
	0A	3	**Content:** Power line（U、V、W）not connected	
Cause			Confirmation	Solution
Power line（U、V、W）not connected			Check wiring of U、V、W	Make sure U、V、W wiring correctly
Motor inner fault			/	replace the motor with a new one

Error code	Main	Extra	**Display:** "Er 0A5"	
	0A	5	**Content:** DC bus circuit error	
Cause			Confirmation	Solution
Main voltage L1,L2,L3 terminal under-voltage			Check L1,L2,L3 terminal voltage	Make sure voltage of L1,L2,L3 terminal in proper range
Driver inner fault			/	replace the driver with a new one

Error code	Main	Extra	Display: "Er 0A6"
	0A	6	Content: temperature detection circuit error

Cause	Confirmation	Solution
L1,L2,L3 terminal under-voltage	Check L1,L2,L3 terminal voltage	Make sure voltage of L1,L2,L3 terminal in proper range
Driver inner fault	/	replace the driver with a new one

Error code	Main	Extra	Display: "Er 0b0"
	0b	0	Content: control power under-voltage

Cause	Confirmation	Solution
L1,L2,L3 terminal under-voltage	Check L1,L2,L3 terminal voltage	Make sure voltage of L1,L2,L3 terminal in proper range
Driver inner fault	/	replace the driver with a new one

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

Cause	Confirmation	Solution
Main power L1,L2,L3 terminal over-voltage	Check L1,L2,L3 terminal voltage	decrease L1,L2,L3 terminal Voltage
Inner brake circuit damaged	/	replace the driver with a new one
Driver inner fault	/	replace the driver with a new one

Error code	Main	Extra	Display: "Er 0d0"
	0d	0	Content: DC bus under-voltage

Cause	Confirmation	Solution
Main power L1,L2,L3 terminal under-voltage	Check L1,L2,L3 terminal voltage	increase L1,L2 terminal Voltage
Driver inner fault	/	replace the driver with a new one

Error code	Main	Extra	Display: "Er 0E0"
	0E	0	Content: over-current

Cause	Confirmation	Solution
Short of driver output wire	Short of driver output wire, whether short circuit to PG ground or not	Assure driver output wire no short circuit, assure motor no damage
Abnormal wiring of motor	Check motor wiring order	Adjust motor wiring sequence
Short of IGBT module	Cut off driver output wiring, make srv_on available and drive motor, check whether over-current exists	replace the driver with a new one
abnormal setting of control parameter	Modify the parameter	Adjust parameter to proper range
abnormal setting of control command	Check control command whether command changes too violently or not	Adjust control command: open filter function

Error code	Main	Extra	Display: "Er 0E1"
	0E	1	Content: IPM over-current

Cause	Confirmation	Solution

Short of driver output wire	Short of driver output wire, whether short circuit to PG ground or not	Assure driver output wire no short circuit, assure motor no damage
Abnormal wiring of motor	Check motor wiring order	Adjust motor wiring sequence
Short of IGBT module	Cut off driver output wiring, make srv_on available and drive motor, check whether over-current exists or not	replace the driver with a new one
Short of IGBT module	/	replace the driver with a new one
abnormal setting of control parameter	Modify the parameter	Adjust parameter to proper range
abnormal setting of control command	Check control command whether command changes too violently or not	Adjust control command: open filter function

Error code	Main	Extra	**Display:** "Er 0F0"
	0F	0	**Content**: driver over-heat
Cause		Confirmation	Solution
the temperature of power module have exceeded upper limit		Check driver radiator whether the temperature is too high or not	Strengthen cooling conditions, promote the capacity of driver and motor, enlarge acceleration/deceleration time, reduce load

Error code	Main	Extra	**Display:** "Er 100"
	10	0	**Content:** motor over-load
Cause		Confirmation	Solution
Load is too heavy		Check actual load if the value of parameter exceed maximum or not	Decrease load, adjust limit parameter
Oscillation of machine		Check the machine if oscillation exists or not	Modify the parameter of control loop; enlarge acceleration/deceleration time
wiring error of motor		Check wiring if error occurs or not, if line breaks or not	Adjust wiring or replace encoder/motor for a new one
electromagnetic brake engaged		Check brake terminal voltage	Cut off brake

Error code	Main	Extra	**Display:** "Er 101"
	10	1	**Content:** Driver over-load
Cause		Confirmation	Solution
wiring error of motor power line		Check U、V、W wiring if error occurs or not, if line breaks or not	Check U、V、W wiring if error occurs or not, if line breaks or not
Motor dosen't match the driver		Driver over-current	Motor current exceed driver current

Error code	Main	Extra	**Display:** "Er 120"
	12	0	**Content:** Resistance discharge circuit over-load
Cause		Confirmation	Solution
Regenerative energy has exceeded the capacity of regenerative resistor .		Check the speed if it is too high. Check the load if it is too large or not.	lower motor rotational speed; decrease load inertia ,increase external regenerative resistor, improve the capacity of the driver and motor
Resistance discharge circuit damage		/	Increase external regenerative resistor, replace the driver with a new one

Error code	Main	Extra	Display: "Er 121"
	12	1	Content: braking error

Cause	Confirmation	Solution
Braking circuit damage	Braking resistor short circuit	Change a new braking resistor
	Braking IGBT damaged	Repair IGBT

Error code	Main	Extra	Display: "Er 150"
	15	0	Content: encoder line breaked

Cause	Confirmation	Solution
Encoder line disconnected	check wiring if it steady or not	Make encoder wiring steady
Encoder wiring error	Check encoder wiring if it is correct or not	Reconnect encoder wiring
Encoder damaged	/	replace the motor with a new one
Encoder measuring circuit damaged	/	replace the driver with a new one

Error code	Main	Extra	Display: "Er 151"
	15	1	Content: encoder data error

Cause	Confirmation	Solution
Encoder data error	Check for interference	Anti-interference treatment

Error code	Main	Extra	Display: "Er 152"
	15	2	Content: initialized position of encoder error

Cause	Confirmation	Solution
Communication data abnormal	Check encoder power voltage if it is DC5V ± 5% or not; check encoder cable and shielded line if it is damaged or not; check encoder cable whether it is intertwined with other power wire or not	Ensure power voltage of encoder normally, ensure encoder cable and shielded line well with FG ground, ensure encoder cable separated with other power wire
Encoder damaged	/	replace the motor with a new one
Encoder measuring circuit damaged	/	replace the driver with a new one

Error code	Main	Extra	Display: "Er 153"
	15	3	Content: encoder battery under voltage

Cause	Confirmation	Solution
Multi-turn absolute encoder power off	Check battery	Change a battery
	/Check motor	Motor damaged, replace the motor with a new one
	/Clear drive alarm	Clear alarm after changing battery

Error code	Main	Extra	Display: "Er 170"
	17	0	Content: encoder data error

Cause	Confirmation	Solution
Communication data	Check encoder power voltage if it is	Ensure power voltage of encoder

abnormal	DC5V ± 5% or not ; check encoder cable and shielded line if it is damaged or not; check encoder cable whether it is intertwined with other power wire or not	normally, ensure encoder cable and shielded line well with FG ground, ensure encoder cable separated with other power wire
Encoder damaged	/	replace the motor with a new one
Encoder measuring circuit damaged	/	replace the driver with a new one

Error code	Main	Extra	**Display:** "Er 171"
	17	1	**Content:** motor parameters error

Cause	Confirmation	Solution
Motor parameters error		Input motor parameters to match with driver or replace the motor with a new one

Error code	Main	Extra	**Display:** "Er 180"
	18	0	**Content:** position error over-large error

Cause	Confirmation	Solution
Unreasonable set of position error parameter	Check parameter Pr0.14 value if it is too small or not	Enlarge the value of Pr0.14
Gain set is too small	Check parameter Pr1.00, Pr1.05 value if it is too small or not	Enlarge the value of Pr1.00, Pr1.05
Torque limit is too small	Check parameter Pr0.13, Pr5.22 value whether too small or not	Enlarge the value of Pr1.03, Pr5.22
Outside load is too large	Check acceleration/ deceleration time if it is too small or not , check motor rotational speed if it is too big or not ; check load if it is too large or not	Increase acceleration/ deceleration time decrease speed, decrease load

Error code	Main	Extra	**Display:** "Er 181"
	18	1	**Content:** velocity error over-large error

Cause	Confirmation	Solution
The deviation of inner position command velocity is too large with actual speed	Check the value of PA_602 if it is too small or not	Enlarge the value of PA_602, or set the value to 0, make position deviation over-large detection invalid
The acceleration/ decelerate time Inner position command velocity is too small	Check the value of PA_312, PA_313 if it is too small or not	Enlarge the value of PA_312, PA_313. adjust gain of velocity control, improve trace performance.

Error code	Main	Extra	**Display:** "Er 190"
	19	0	**Content:** motor vibration

Cause	Confirmation	Solution
Current vibration	Current vibration	Cut down the value of Pr003. Pr004
Current loop is too strong	Current loop is too strong	

Error	Main	Extra	**Display:** "Er 1A0"

code	1A	0	**Content:** over-speed 1

Cause	Confirmation	Solution
Motor speed has exceeded the first speed limit (Pr3.21)	Check speed command if it is too large or not; check the voltage of analog speed command if it is too large or not; check the value of Pr3.21 if it is too small or not; check input frequency and division frequency coefficient of command pulse if it is proper or not; check encoder if the wiring is correct or not	Adjust the value of input speed command, enlarge the value Pr3.21 value, modify command pulse input frequency and division frequency coefficient, assure encoder wiring correctly

Error code	Main	Extra	**Display:** "Er 1A1"
	1A	1	**Content:** speed out of control

Cause	Confirmation	Solution
Control maladjustment	UVW wrong connection	
Encoder error	Monitor D30 count increasing	Anti-interference treatment or change motor
Special application	The rotation direction of the motor is opposite with motor force direction.	The special assessment of practical application, set 0 to 4 for PA137 to shield ERR1A1 alarm.

Error code	Main	Extra	**Display:** "Er 1b0"
	1b	0	**Content:** input pulse format incorrect or out of frequency

Cause	Confirmation	Solution
The input pulse frequency is too high	Too high pulse frequency	To decrease pulse input frequency, less than 500K

Error code	Main	Extra	**Display:** "Er 1b1"
	1b	1	**Content:** incorrect electronic gear ratio

Cause	Confirmation	Solution
Out of range	Numerator denominator is zero, or setting values out of range	Reduce the number of pulses per revolution

Error code	Main	Extra	**Display:** "Er 210"
	21	0	**Content:** I/F input interface allocation error

Cause	Confirmation	Solution
The input signal are assigned with two or more functions.	Check the value of PA_400, PA_401, PA_402,PA_403,PA_404 if it is proper or not	Assure the value of PA_400, PA_401, PA_402, PA_403, PA_404 set correctly
The input signal aren't assigned with any functions.	Check the value of PA_400, PA_401,PA_402,PA_403,PA_404 if it is proper or not	Assure parameter PA_400, PA_401, PA_402,PA_403,PA_404 set correctly

Error	Main	Extra	**Display:** "Er 211"

code	21	1	**Content:** I/F input interface function set error	
Cause			Confirmation	Solution
Signal allocation error			Check the value of PA_400, PA_401, PA_402,PA_403,PA_404 if it is proper or not	Assure the value of PA_400, PA_401, PA_402, PA_403, PA_404 set correctly

Error code	Main	Extra	**Display:** "Er 212"	
	21	2	**Content:** I/F input interface function set error	
Cause			Confirmation	Solution
The input signal are assigned with two or more functions.			Check the value of PA_410, PA_411, PA_412, PA_413, if it is proper or not	Assure the value of PA_410, PA_411, PA_412,PA_413 set correctly
The input signal aren't assigned with any functions.			Check the value of PA_410, PA_411, PA_412, PA_413, if it is proper or not	Assure the value of PA_410, PA_411,PA_412,PA_413 set correctly

Error code	Main	Extra	**Display:** "Er 240"	
	24	0	**Content:** CRC verification error when EEPROM parameter is saved	
Cause			Confirmation	Solution
L1,L2,L3 terminal under-voltage			Check L1,L2,L3 terminal voltage	Assure L1,L2,L3 terminal voltage in proper range
Driver is damaged			save the parameters again	replace the driver with a new one
The setting of driver maybe default setting which isn't suitable for motor .			Check the setting of driver if it is suitable for your motor	Download the suitable project file to driver for motor

Error code	Main	Extra	**Display:** "Er 260"	
	26	0	**Content:** positive negative over-travel input valid	
Cause			Confirmation	Solution
positive /negative over-travelling input signal has been conducted			Check the state of positive negative over-travel input signal	/

Error code	Main	Extra	**Display:** "Er 270~ Er 272"	
	27	0~2	**Content**: analog input out of range	
Cause			Confirmation	Solution
Analog input out of range				Try to adjust analog input within limited range

Error code	Main	Extra	**Display:** " Er 570"	
	57	0	**Content**: forced alarm input valid	
Cause			Confirmation	Solution
Forced-alarm input signal has been conducted			Check forced-alarm input signal	Assure input signal wiring correctly

6.3 Alarm clear

For alarm can be cleared:

1、Use auxiliary function “AF_ACL”

a. Press M to select auxiliary function

b. Press SET to enter into “AF_ACL”

c. Press and hold ◄ to clear the alarm

2、Set IO input function as Alarm clear input “ (A-CLR)”，refer to switch input interface connection to clear the alarm

For alarm can not be cleared:

1、 Restart the power-supply to clear the alarm.

Chapter 7 Display and Operation

7.1 Introduction

The operation interface of servo driver consists of six LED nixie tubes and five key , which are used for servo driver's status display and parameter setting. The inter face layout is as follows :

Figure 7-1 front panel

Table 7.1 The name and function of keys

Name	Key	Function
Display	/	There are 5 LED nixie tubes to display monitor value, parameter value and set value
Key of mode switch	**M**	Press this key to switch among 4 mode: 1.data monitor mode 2.parameter setting mode 3.auxiliary function mode 4.EEPROM written mode
Confirming key	**SET**	Entrance for submenu, confirming input
Up key	▲	Press this key to increase the set value of current flash bit
Down key	▼	Press this key to decrease the set value of current flash bit
Left key	◄	Press this key to shift to the next digit on the left

7.2 Panel Display and Operation

7.2.1 Panel Operation Flow Figure

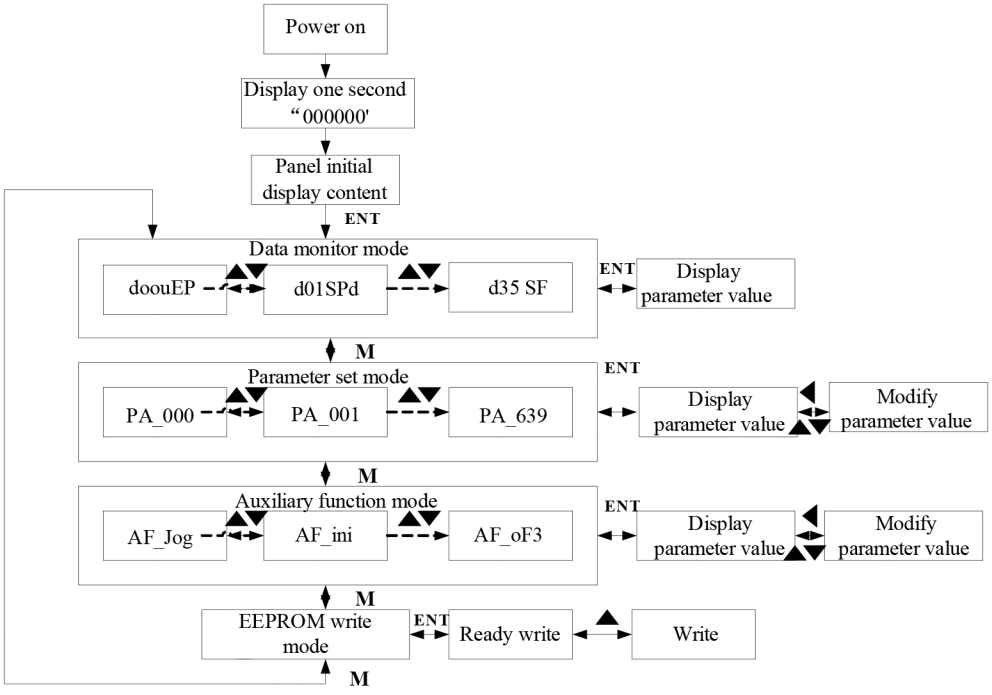


Figure 7-2 the flow diagram of panel operation

(1) The front panel display rEAdY for about one second firstly after turning on the power of the driver. Then if no abnormal alarm occurs, monitor mode is displayed with the value of initial parameter ; otherwise, abnormal alarm code is displayed.

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

(3) If new abnormal alarm occurs, the abnormal alarm will be displayed immediately in abnormal mode no matter what the current mode is, press M key to switch to the other mode.

(4) In data monitor mode, press ▲ or ▼ to select the type of monitor parameter; Press ENT to enter the parameter type , then press ◀ to display the high 4 bits "H" or low 4 bits "L" of some parameter values.

(5) In parameter setting mode, press ◀ to select current editing bit of parameter No, press ▲ or ▼ to change current editing bit of parameters No. Press ENT key to enter the parameter setting mode of corresponding parameters No. Press ◀ to select current bit of parameter value when editing it, press ▲ or ▼ to change the value of the bit. Press ENT to save it and switch to the interface of parameter No.

7.2.2 Driver Operating Data Monitor

Table 7.2 Function List of Driver Monitor

Serial Number	Name	Specification	Display	Unit	Data Format (x, y is numerical value)
0	d00uE	Positional command deviation	d00uE	pulse	Low-bit "L xxxx" High-bit "H xxxx"
1	d01SP	Motor speed	d01SP	r/min	"r xxxx"
2	d02cS	Positional command speed	d02CS	r/min	"r xxxx"
3	d03cu	Velocity control command	d03Cu	r/min	"r xxxx"

4	d04tr	Torque feedback	d04tr	%	“r xxxx”
5	d05nP	Feedback pulse sum	d05nP	pulse	Low-bit “L xxxx” High-bit”H xxxx”
6	d06cP	Command pulse sum	d06CP	pulse	Low-bit “L xxxx” High -bit”H xxxx”
7	d07	Maximum torque feedback	d07	/	“ xxxx”
8	d08FP	Internal scale feedback pulse sum	d08FP	pulse	Low-bit “L xxxx” High -bit”H xxxx”
9	d09cn	Control mode	d09Cn	/	Position:“PoScn” Speed:”SPdcn” Torque:”trqcn” Composite mode” cnt”
10	d10Io	I/O signal status	d10 Io	/	Refer instructions for details
11	d11Ai	Analog input value	d11Ai	v	“x yyyy” x:AI1 A,AI2 b,AI3 c yyyy:value
12	d12Er	Error factor and reference of history	d12Er	/	“Er xxx”
13	d13 rn	Alarm display	d13rn	/	“m xxx”
14	d14 r9	Regeneration load factor	d14r9	%	“rg xxx”
15	d15 oL	Over-load factor	d15oL	%	“oL xxx”
16	d16Jr	Inertia ratio	d16Jr	%	“J xxx”
17	d17ch	Factor of no-motor running	d17Ch	/	“cP xxx”
18	d18ic	No. of changes in I/O signals	d18ic	/	“n xxx”
19	d19	/	d19	/	“ xxxx”
20	d20Ab	Absolute encoder data	d20Ab	pulse	Low-bit “L xxxx” High-bit”H xxxx”
21	d21AE	Absolute external scale position	d21AE	pulse	Low-bit “L xxxx” High -bit”H xxxx”
22	d22rE	No of Encoder/external scale communication errors monitor	d22rE	times	“n xxx”
23	d23 id	Communication axis address	d23id	/	“id xxx” “Fr xxx”
24	d24PE	Encoder positional deviation(encoder unit)	d24PE	pulse	Low-bit “L xxxx” High -bit”H xxxx”
25	d25PF	Encoder scale deviation (external scale unit)	d25PF	pulse	Low-bit “L xxxx” High -bit”H xxxx”
26	d26hy	hybrid deviation (command unit)	d26hy	pulse	Low-bit “L xxxx” High -bit”H xxxx”
27	d27 Pn	Voltage across PN [V]	d27Pn	V	“u xxx”
28	d28 no	Software version	d28no	/	“d xxx” “F xxx” “P xxx”
29	d29AS	Driver serial number	d29AS	/	“n xxx”
30	d30NS	Motor serial number	d30sE	/	Low-bit “L xxxx” High -bit”H xxxx”
31	d31 tE	Accumulated operation time	d31tE	/	Low-bit “L xxxx” High -bit”H xxxx”
32	d32Au	Automatic motor	d32Au	/	“r xxx”

		identification			
33	d33At	Driver temperature	d33At	℃	“th xxx”
34	d34	/	d34	/	“t xxx”
35	d35 SF	Safety condition monitor	d35SF	/	“xxxxxx”

Instructions:

1、d01SP Motor speed

Driver display s 0 after power on, in disable state. While in enable state, display r 0. Motor speed display r xxx. So users can distinguish in disable state or in enable state by display s 0 or r 0 .

2、d10 Io I/O signal status

The upper half of the nixie tube is valid, the lower half is invalid, the decimal point represents the input and output state, lit represents the input, not bright represents the output

Input:  , from low to high, the order is SI1, SI2…SI10. The next figue represents SI1、SI8、SI10 input are valid, other inputs are invalid.

Output:  , from low to high, the order is SO1, SO2…SO10. The next figue represents SO1 output are valid, other inputs are invalid.

3、d11Ai Analog input value

d11Ai is used to monitor the state of the three channels of simulation. The horizontal line on the leftmost digital tube represents which channel of simulation, specifically, the horizontal line above represents the first channel of simulation, the horizontal line in the middle represents the second channel of simulation, and the horizontal line below represents the third channel of simulation. The analog display unit is 0.001V, and the fourth and fifth decimal places on the right represent negative signs. Analog monitoring switch by up and down keys. Example the third analog value of -11.5v is shown as follows:

4、Parameter high and low bit, positive and negative Numbers.

The highest and lowest digits of data and the signs are shown as follows. The first and second decimal points on the right are bright, indicating the data of high order. The two decimal points are not lit, indicating the data of low order. The fourth and fifth decimal places on the right indicate negative Numbers, otherwise positive Numbers

Users can choose to set the initial display state of power supply to any of the below:

Pr5. 28★	Name	LED initial status			Mode	P	S	T
	Range	0~35	Unit	—	Default	1		
	Data Type	16bit	Access	R/W	Address	0539H		
	Repower	-						

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	10	I/O signal status	27	Voltage across PN [V]
1	Motor speed	11	Analog input value	28	Software version
2	Positional command speed	12	Error factor and reference of history	29	Driver serial number
3	Velocity control command	16	Inertia ratio	30	Motor serial number
4	Torque command	17	Factor of no-motor running	31	Accumulated operation time
5	Feedback pulse sum	23	Communicati on axis address	33	Temperature information
6	Command pulse sum	24	Encoder positional deviation [encoder unit]	36	Safety condition monitor
9	Control mode				

Table 7.3 "d17 ch" Motor No Rotate Reason Code Definition

Code	Display Code	Specification	Content
0	cP 0	Working normally	
1	cP 1	DC bus under-voltage	/
2	cP 2	No entry of Srv-On input	The Servo-ON input (SRV-ON) is not connected to COM-
3	cP 3	POT/NOT input is valid	PA_504=0,POT is open , speed command is positive direction NOT is open , speed command is negative direction
4	cP 4	Driver fault	/
5	cP 5	The relay inside the driver isn't closed	/
6	cP 6	Pulse input prohibited (INH)	PA_518=0,INH is open
8	cP 8	CL is valid	PA_517=0,deviation counter clear is connected to COM-
9	cP 9	speed zero-clamp is valid	PA_315=1, speed zero-clamp is open

7.2.3 Auxiliary Function

Table 7.4 setting interface System parameter

No	Name	Specification	Display Code	Operation Flow
0	AFjog	Trial run	AFjog	Please refer to the chapter of"trial run"
1	AFInI	Initialization of parameter	AFInI	1. press SET to enter operation, display "InI -"。 2.press ▲ once to display "InI---", indicated initialization; after finishing it, display"FinSh"。
2	AFunL	Release of front panel lock	AFunL	1. press SET to enter operation, display "unL -"。 2. press ▲button one time , display

				"FinSh",indicated unlock the panel successfully
3	AFAcL	Alarm clear	AFAcL	1. press SET to enter operation, display"Acl -"。 2. press ▲once , display "FinSh", indicated alarm clear successfully
4	AFoF1	A1 automatic offset adjustment	AFoF1	1.press SET to enter operation, display "of1 -"。 2.press ▲once , display "StArt", indication start correct, then display"FiniSh"indicated correction finished。
5	AFoF2	A2 automatic offset adjustment	AFoF2	1.press SET to enter operation, display "oF2 -"。 2.press ▲once , display "StArt", indicated start to correct the offset, then display"FinSh"indicated that correction finished。
6	AFoF3	A3 automatic offset adjustment	AFoF3	1.press SET to enter operation, display "oF3 -"。 2.press ▲once , display "StArt", indicated start to correct the offset, then display"FinSh"indicated correction finished .
7	AFEnc	Motor Angle correction	AFEnc	1. Press SET once to enter operation, display "Enc -" 2. press ▲once , display "StArt", indicated start to correct the angle, then display"FiniSh"indicated correction finished
8	AF tUn	Reserved	AFtUn	
9	AF_GL	Inertia ratio identification	AF_GL	1. Press SET once to enter operation, display "G---" 2. Press◀ once， display "StUon" 3. Press▲， motor running， indicated start to identification 4. Finishing， display G xxx， xxx indicated Inertia ratio value
10	AFrSt	Soft reset	AFrSt	1. Press SET once to enter operation, display "rSt -" 2. Press▲ and hold on， display "StArt" Then， finished

Table 7.5 The Locked panel conditions

Mode	The Locked panel conditions
Monitor mode	No limitation: all monitored data can be checked.
Parameter set up mode	No parameter can be changed but setting can be checked.
Auxiliary function mode	Cannot be run except for" release of front panel lock"
EEPROM writing mode	No limitation

7.2.4 Saving parameter

Operation procedure:
1. press M to select EEPROM writing mode, display "EESet";
2. Press ENT to enter into writing mode operation:
3. Press and hold ▲, display LED from" EP -" to" EP--", then it become" EP---", finally it become" StArt", indicated EEPROM writing operation have been began;
4. "Error" means that writing is unsuccessful，while "Finish" show that the writing is successful; Follow steps 3 and 4 to repeat the operation; the drive may be damaged if repeat of several times still fails. The driver need to

repair.
5. The driver need to power off and restart again if writing is successful .

NOTE: Don't turn off the power if EEPROM writing operation goes on, otherwise it may cause a writing wrong data; If this happens, please reset all the parameters ,then do EEPROM writing operation again.

7.2.5 Abnormal Alarm

The front panel will automatically enter the abnormal alarm display mode if driver error occurs while it displays the corresponding error code. Please refer to Chapter 6 of alarm processing about the detail of error code.

7.3 Trial Run

Attention

- Ground the earth terminal of the motor and driver without fail. the PE terminal of driver must be reliably connected with the grounding terminal of equipment.
- The driver power need with isolation transformer and power filter in order to guarantee the security and anti-jamming capability.
- Check the wiring to make sure correctness before power on.
- Install a emergency stop protection circuit externally, the protection can stop running immediately to prevent accident happened and the power can be cut off immediately.
- If drive alarm occurs, the cause of alarm should be excluded and Svon signal must be invalid before restarting the driver.
- The high voltage also will contain in several minutes even if the servo driver is powered off, please don't touch terminal strip or separate the wiring.
-

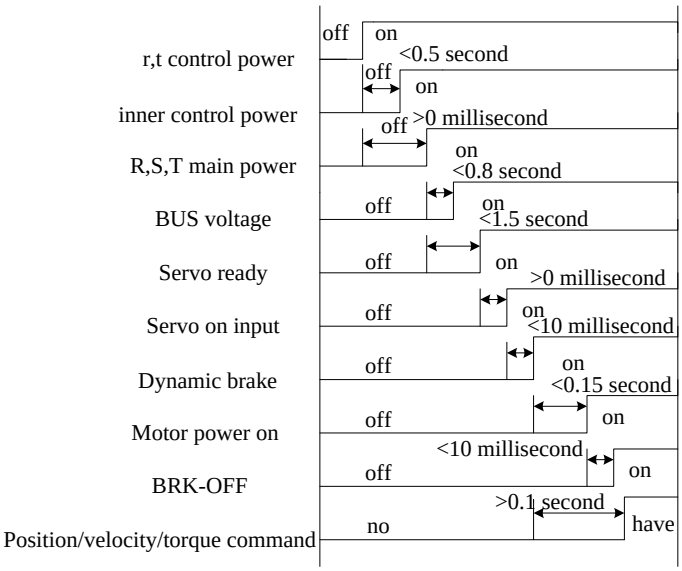
Note: there are two kinds of trial run : trial run without load and trial run with load . The user need to test the driver without load for safety first.
Contact tech@leadshine.com if you need more technical service .

7.3.1 Inspection Before trial Run

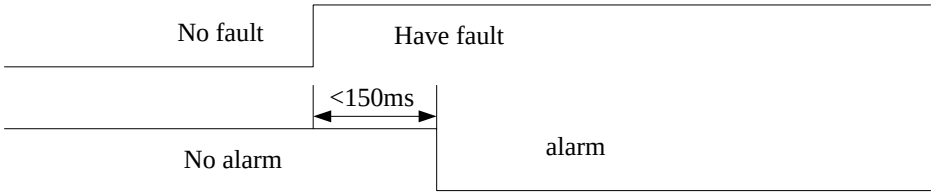
Table7.6 inspection Item Before Run

No	Item	Content
1	Inspection on wiring	1. Ensure the following terminals are properly wired and securely connected : the input power terminals, motor output power terminal ,encoder input terminal CN2, control signal terminal CN1, communication terminal CN4(it is unnecessary to connect CN1 andCN4 in Jog run mode) 2.short among power input lines and motor output lines are forbidden , and no short connected with PG ground.
2	Confirmation of power supply	1. The range of control power input r, t must be in the rated range. 2. The range of the main power input R, S, T must be in the rated range. 3. Single phase 220VAC input is sufficient if the power of driver is no more 1.5kw .
3	Fixing of position	the motor and driver must be firmly fixed
4	Inspection without load	the motor shaft must not be with a mechanical load.
5	Inspection on control signal	1, all of the control switch must be placed in OFF state. 2, servo enable input Srv_on must be in OFF state.

7.3.2 Timing chart on power-up



7.3.3 Timing chart on fault

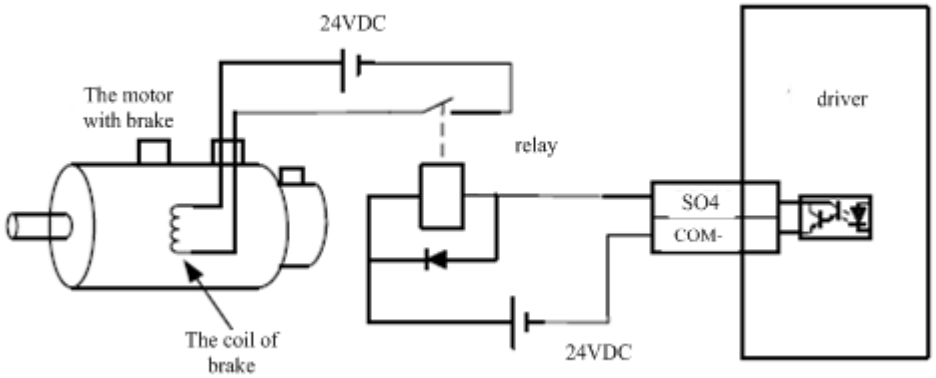


7.3.4 Holding brake

In applications where the motor drives the vertical axis, this brake would be used to hold and prevent the work (moving load) from falling gravity while the power to the servo is shut off .

Never use this for "Brake" purpose to stop the load in motion.
Use this built-in brake for "holding" purpose only. That is to hold the stalling status.

For the brake release timing at power-on ,or braking timing at servo-off/servo-alarm while the motor is in motion ,refer to chapter 7.1.2 timing chart on power-up.
You can follow the diagram about the wiring below :



About the wire of brake ,there should be an 24VDC for brake, the brake will be loosed with the 24VDC

input, and the driver give an output signal to control the connection or disconnection of the 24VDC , pin 31 and pin 35 of CN1 is the control signal , and it is forbidden to connect these signal directly for the power of 24VDC , it will destroy the hardware of servo driver.

And if you connect the pin31 and pin35 for controlling the brake , just make sure the setting value of Pr4.13. The default is 00000303h , if the driver works in torque mode , this value should be changed to 00030303h .

7.3.5 Trial Run Jog Control

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

Wiring ? (especially power input and motor output)
Short or grounded ?
Loose connection ?
Unstable mounting ?
Separation from the mechanical system ?

It is unnecessary to connect control signal terminal CN1 and communication terminal CN4 in Jog run mode. It is recommended that motor runs at low speed for safety, while the speed depends on the parameters below: there are two different modes : **speed JOG mode** and **location JOG mode.**

Table 7.7 Parameter Setup of Velocity JOG

No	parameter	name	Set value	unit
1	Pr0.01	Control mode setting	1	/
2	Pr3.12	Acceleration time setup	User-specified	millisecond
3	Pr3.13	Deceleration time setup	User-specified	millisecond
4	Pr3.14	Sigmoid acceleration/deceleration time setup	User-specified	millisecond
5	Pr6.04	JOG trial run command speed	User-specified	rpm

Table 7.8 Parameter Setup of Position JOG

No	parameter	name	value	unit
1	Pr0.01	Control mode setting	0	/
2	Pr3.12	Acceleration time setup	User-specified	millisecond
3	Pr3.13	Deceleration time setup	User-specified	millisecond
4	Pr3.14	Sigmoid acceleration/deceleration time setup	0	millisecond
5	Pr6.04	JOG trial run command speed	User-specified	rpm
6	Pr6.20	distance of trial running	User-specified	0.1 rotation
7	Pr6.21	waiting time of trial running	User-specified	millisecond
8	Pr6.22	cycling times of trial running	User-specified	times

◆JOG trial run operation process

1. set all parameters above corresponding to velocity JOG or position JOG ;
2. Enter EEPROM writing mode, and save the value of modified parameters ;
3. The driver need to restart after the value is written successfully;
4. Enter auxiliary function mode, and go to "AFJog "sub-menu;
5. Press ENT once, and display Jog - ";
6. Press once, and display " Srvon " if no exception occurs; press once again if "Error " occurs, it should display "Srvon "; If "Error " still occurs, please switch to data monitoring mode "d17 Ch "sub-menu, find the cause why motor doesn't rotate, fix the trouble and try again;
7. In position JOG mode, the motor will rotate directly; if motor doesn't rotate, switch to data monitoring mode d17 Ch "sub-menu, find the cause why motor doesn't rotate, fix the trouble and try again;

In speed JOG mode, press once, the motor rotates once (hold will make motor rotating to value of Pr6.04); press once, the motor rotates once (hold will make motor rotating to value of Pr6.04); if motor doesn't rotate, switch to data monitoring mode d17 Ch "sub-menu, find the cause why motor doesn't rotate, fix the trouble and try again;

8. Press SET will exit JOG control in JOG run mode.

Chapter 8 Application Case

Operation Mode Selection

ELP 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.

Table 8.1 Parameter setup of Operation Mode Selection

No	Mode	Parameter	Specification
1	Position mode	Pr0.01=0	The position control is performed based on the positional command (pulse train) from the host controller or the command set in the servo driver.
2	Velocity mode	Pr0.01=1	The velocity control is performed according to the analog speed command from the host controller or the speed command set in the servo driver.
3	Torque mode	Pr0.01=2	The torque control is performed according to the torque command specified in the form of analog voltage or the command set in the servo driver.
4	1st mode: position mode 2nd mode: speed mode	Pr0.01=3	The control mode is switched through external input.
5	1st mode: position mode 2nd Mode: torque mode	Pr0.01=4	The control mode is switched through external input.
6	1st mode: speed mode 2nd Mode: torque mode	Pr0.01=5	The control mode is switched through external input.

The step of changing the operation mode:
1, Switch the driver to Servo Off status.
2, Modify the corresponding parameters of control mode to EEPROM.
Turn off/on the power to make the new mode works after setup completed.

8.1 Position Control

Notice : You must do inspection before position control test run.

Table 8.2 Parameter Setup of Position Control

No	parameter	name	input	value	unit
1	Pr0.01	control mode setup	/	0	/
2	Pr0.06	command pulse rotational direction setup		0	
3	Pr0.07	command pulse input mode setup		0~3	
4	Pr0.08	Command pulse per one motor revolution		User-specified	Pulse
5	Pr0.09	1st numerator of electronic gear		1	
6	Pr0.10	denominator of electronic gear		1	
7	Pr3.12	Acceleration time setup	/	User-specified	millisecond
8	Pr3.13	Deceleration time setup	/	User-specified	millisecond
9	Pr3.14	Sigmoid acceleration/deceleration time setup	/	User-specified	millisecond
10	Pr5.18	Command pulse prohibit input invalidation	/	1	/
11	Pr4.00	SI1 input select	Srv_on	Hex:0003	/

◆ Wiring Diagram

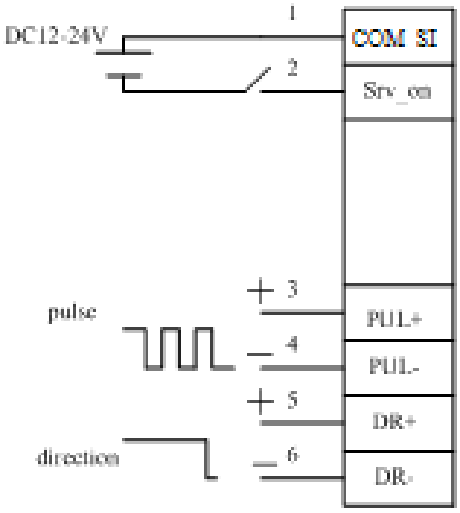


Figure 8-1 Control Terminal CN1 Signal Wiring in Position Control Mode

◆**Operation Steps**

1. connect terminal CN1.
2. Enter the power (DC12V to 24V) to control signal (the COM_SI + and SI1).
3. Enter the power to the driver.
4. Confirm the value of the parameters, and write to the EEPROM and turn off/on the power (of the driver)
5.Connect the Srv_on input to bring the driver to servo-on status and energize the motor.
6. Enter low-frequency pulse and direction signal to run the motor at low speed.
7. Check the motor rotational speed at monitor mode whether, ("d01SP "),
   Rotational speed is as per the setup or not, and
   The motor stops by stopping the command (pulse) or not
   If the motor does not run correctly, refer to the Factor of No-Motor running in data monitor mode ("d17Ch ").

The driver is widely used for precise positioning in position control mode.

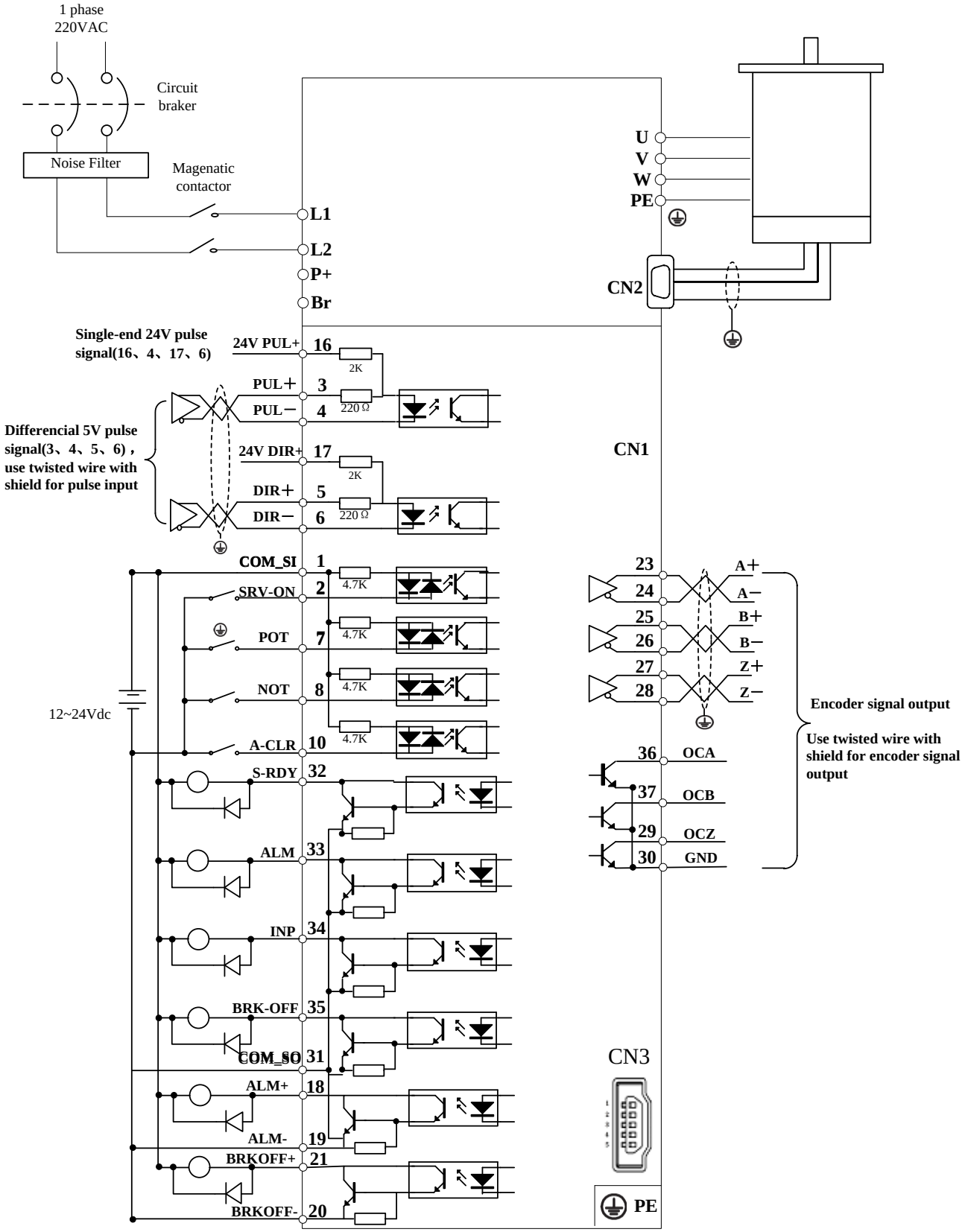


Figure 8-2 Position Mode Typical Wiring Diagram

Note:

For driver is more than 1.5kw, 3 phase is better than single phase, connect L1,L2,L3

Relevant parameters setup of position control mode

8.1.1 Process of command pulse input

The positional commands of the following 3 types (pulse train) are available.

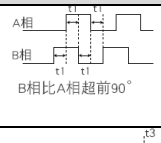
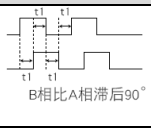
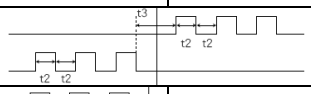
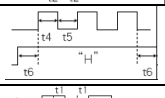
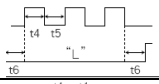
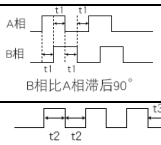
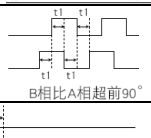
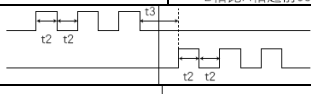
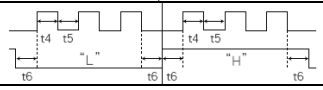
◆A, B phase pulse

◆Positive direction pulse/negative direction pulse

◆Pulse + sign

Please set the pulse configuration and pulse counting method based on the specification and configuration of installation of the host controller.

Pr0. 06 *	Name	Command Pulse Rotational Direction Setup			Mode	P		
	Range	0~1	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	000DH		
	Repower	o						
Set command pulse input rotate direction, command pulse input type								
Pr0. 07 *	Name	Command Pulse Input Mode Setup			Mode	P		
	Range	0~3	Unit	—	Default	1		
	Data Type	16bit	Access	R/W	Address	000FH		
	Repower	o						

Pr0.06	Pr0.07	Command Pulse Format	Signal	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

8.1.2 Electronic gear function

The function multiplies the input pulse command from the host controller by the predetermined dividing or multiplying factor and applies the result to the position control section as the positional command. By using this function, desired motor rotations or movement distance per unit input command pulse can be set.

Pr0. 08	Name	Command pulse counts per one motor revolution			Mode	P	S T
	Range	0-8388608	Unit	P	Default	0	
	Data Type	32bit	Access	R/W	Address	0010H 0011H	
	Repower	o					
Set the command pulse that causes single turn of the motor shaft. 1) If Pr008≠0 , the actual turns = pulse number / Pr008 2) If Pr008 = 0 , Pr0.09 1st numerator of electronic gear and Pr0.10 Denominator of electronic Gear become valid.							

Pr0. 09	Name	1st numerator of electronic gear			Mode	P	
	Range	1~1073741824	Unit	—	Default	1	
	Data Type	32bit	Access	R/W	Address	0012H 0013H	
	Repower	o					
Set the numerator of division/multiplication operation made according to the command pulse input.							
Pr0. 10	Name	1st denominator of electronic gear			Mode	P	
	Range	1~1073741824	Unit	—	Default	1	
	Data Type	32bit	Access	R/W	Address	0014H 0015H	
	Repower	o					

Set the denominator of division/multiplication operation made according to the command pulse input.

Pr0.09	Pr0.10	Command division/multiplication operation
1-10737 41824	1-10737 41824	Command pulse input → 【Pr0.09 set value】 / 【Pr0.10 set value】 → position command

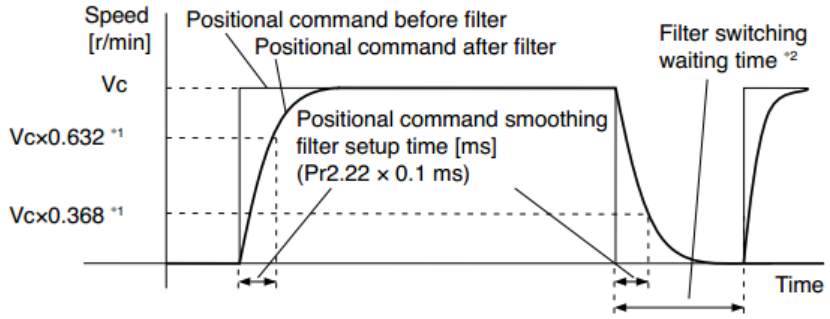
1. Settings：
   1)The driver input command pulse number is X
   2)The pulse number of encoder after frequency division and frequency doubling is Y
   3)The number of pulses per revolution of the motor encoder is Z
   4)Number of turns of motor is W
2. Calculations：
   1)Y=X* Pr0.09 / Pr0.10
   2)17Bit encoder: Z=2^17 = 131072
   23Bit encoder: Z=2^23 = 8388608

8.1.3 Position command filter

To make the positional command divided or multiplied by the electronic gear smooth, set the command filter.

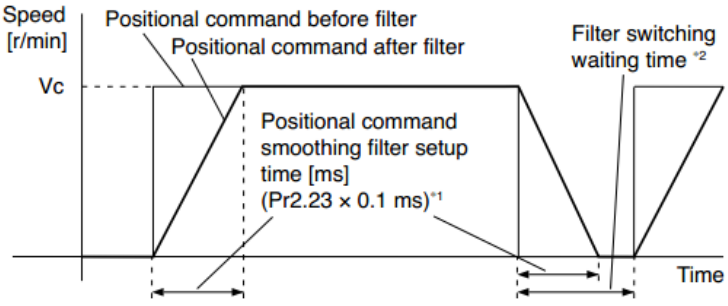
Pr2. 22	Name	positional command smoothing filter			Mode	P		
	Range	0~32767	Unit	0.1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	022DH		
	Repower	o						

- Set up the time constant of the1st delay filter in response to the positional command.
- When a square wave command for the target speed Vc is applied ,set up the time constant of the 1st delay filter as shown in the figure below



Pr2. 23	Name	positional command FIR filter			Mode	P		
	Range	0~10000	Unit	0.1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	022FH		
	Repower	o						

- Set up the time constant of the1st delay filter in response to the positional command.
- When a square wave command for the target speed Vc is applied , set up the Vc arrival time as shown in the figure below.



8.1.4 Motor encoder pulse output

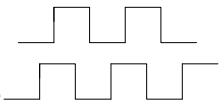
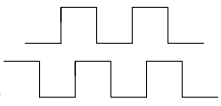
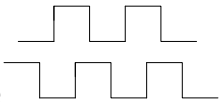
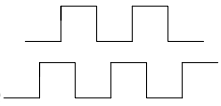
The information on the amount of movement can be sent to the host controller in the form of A and B phase pulses from the servo driver.

Pr0. 11＊	Name	Output pulse counts per one motor revolution			Mode	P	S	T
	Range	1~2500	Unit	P/r	Default	2500		
	Data Type	16bit	Access	R/W	Address	0017H		
	Repower	o						
	Set the numerator of division/multiplication operation made according to the command pulse input							

Pr0. 12＊	Name	reversal of pulse output logic			Mode	P	S	T
	Range	0~1	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0019H		
	Repower	o						

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.

< **reversal of pulse output logic** >

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 

8.1.5 Position complete output (INP)

The completion of positioning can be verified by the positioning complete output (INP).When the absolute value of the positional deviation counter at the position control is equal to or below the positioning complete Range by the parameter, the output is ON. Presence and absence of positional command can be specified as one of judgment conditions.

Pr4. 31	Name	Positioning complete range			Mode	P		
	Range	0~10000	Unit	Encoder unit	Default	10		
	Data Type	16bit	Access	R/W	Address	043FH		
	Repower	-						
	Set up the timing of positional deviation at which the positioning complete signal (INP1) is output.							

Pr4. 32	Name	Positioning complete output setup			Mode	P		
	Range	0~3	Unit	command unit	Default	0		
	Data Type	16bit	Access	R/W	Address	0441H		

	Repower	-				

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						
	Name	INP hold time			Mode	P
	Range	0~30000	Unit	1ms	Default	0
	Data Type	16bit	Access	R/W	Address	0443H
	Repower	-				

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.

And the output port should be assigned for "INP", for details of these parameters, refer to PA_410 – PA415.

Other setup for SI/SO function

For details of SI input function, refer to Pr4.00 – Pr4.09.

For details of SO output function, refer to Pr4.10 – Pr4.15.

8.2 Velocity Control

Notice : Analog input for Torque/Velocity mode is only available for ELP-RS***Z

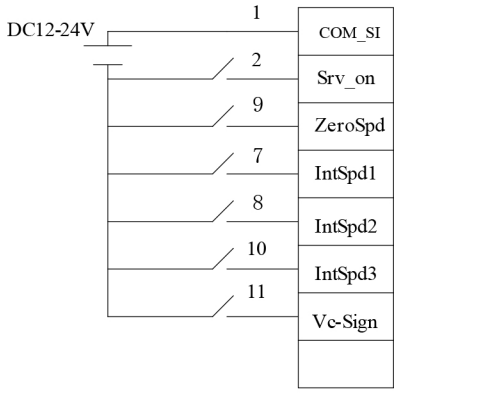
Pls do inspection before velocity control test run.

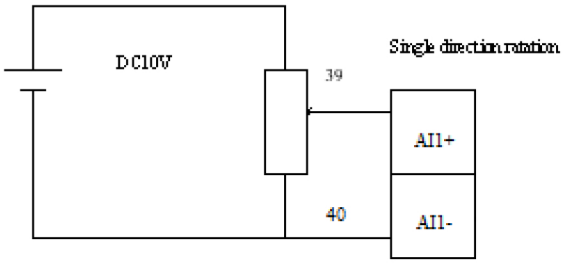
Table 8.3 Parameter Setup of Velocity Control

No	Parameter	Name	input	Setup value	Unit
1	Pr0.01	Control mode setup	/	1	/
2	Pr3.12	Acceleration time setup	/	User-specified	millisecond
3	Pr3.13	Deceleration time setup	/	User-specified	millisecond
4	Pr3.14	Sigmoid acceleration/deceleration time setup	/	User-specified	millisecond
5	Pr3.15	Zero speed clamping function select	/	1	/
6	Pr3.00	Velocity setup internal and external switching	/	User-specified	/

7	Pr3.01	Speed Command direction selection	/	User-specified	/
8	Pr3.02	Speed command input gain	/	User-specified	Rpm/V
9	Pr3.03	Speed setting input reversal	/	User-specified	/
10	Pr4.22	Analog input I(AI1) offset setup	/	User-specified	0.359mv
11	Pr4.23	Analog input I(AI1) filter	/	User-specified	0.01ms
12	Pr4.00	SI1 input selection	Srv_on	hex:0300	/
13	Pr4.01	SI2 input selection	ZeroSpd	hex:1100	/
14	Pr4.02	SI3 input selection	IntSpd1	hex:0E00	/
15	Pr4.03	SI4 input selection	IntSpd2	hex:0F00	/
16	Pr4.04	SI5 input selection	IntSpd3	hex:1000	/
17	Pr4.05	SI6 input selection	Vc-Sign	hex:1200	/

◆Wiring Diagram





◆Operation steps

1. connect terminal CN1.
2. Enter the power (DC12V to 24V) to control signal (the COM_SI and SI1).
3. Enter the power to the driver.
4. Confirm the value of the parameters, and write to the EEPROM and turn off/on the power (of the driver)
5.Connect the Srv_on input to bring the driver to servo-on status and energize the motor.
6. apply DC voltage between velocity command input ,AI1 and AGND, and gradually increase from 0V to confirm the motor runs.
7. Check the motor rotational speed at monitor mode , ("d01SP ")
   Whether rotational speed is as per the setup or not, and
   Whether the motor stops with zero command or not
   If the motor does rotate at a micro speed with command voltage of 0.
8. When you want to change the rotational speed and direction, set up the following parameters again.
   Pr3.00. Pr3.01. Pr3.03

If the motor does not run correctly, refer to the Factor of No-Motor running in data monitor mode ("d17Ch ").

The driver is widely used for accuracy speed control in velocity control mode.
You can control the speed according to the analog speed command from the host controller or the speed command set in servo driver.

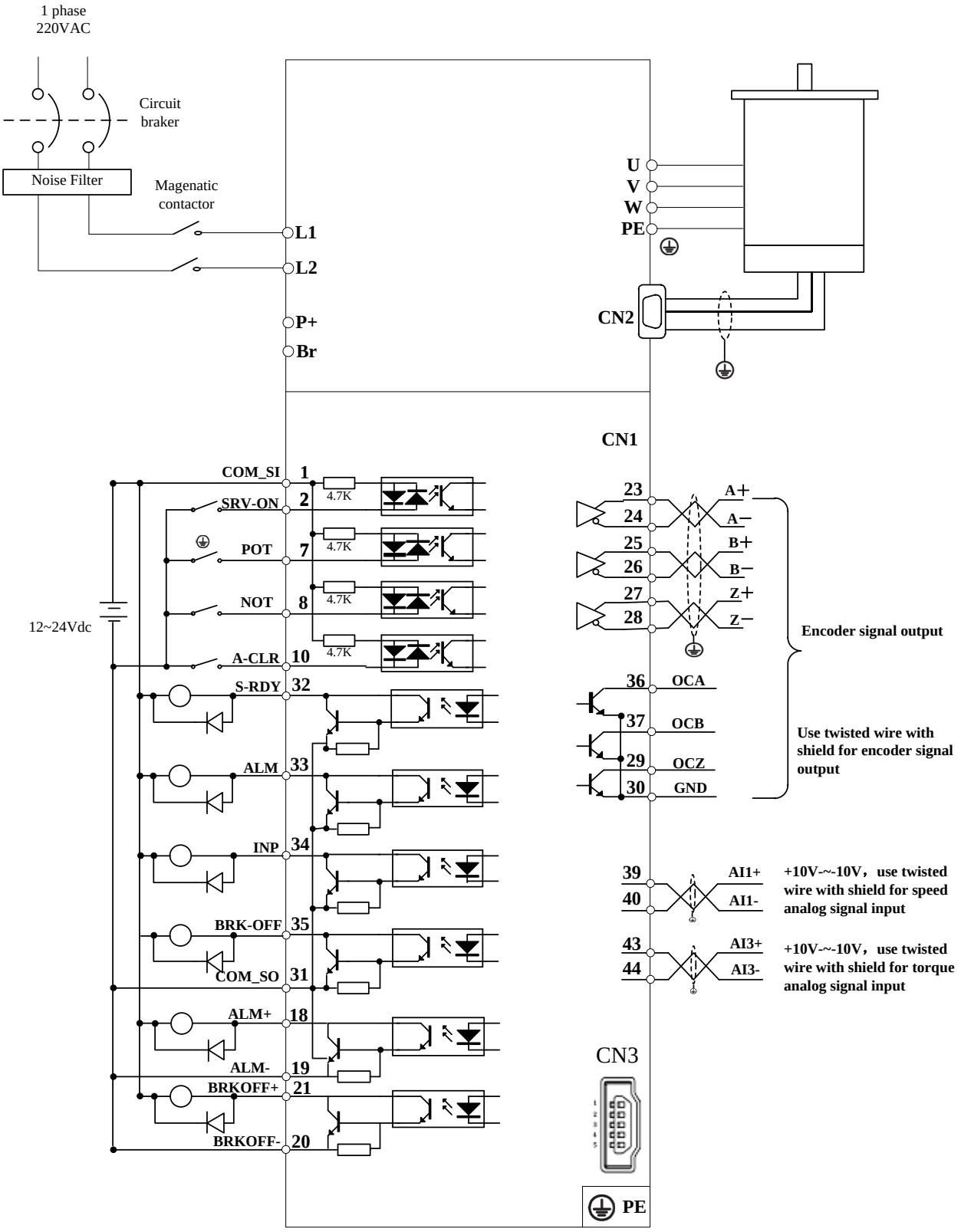


Figure 8-3 Velocity Mode Typical Wiring Diagram

Note: For driver is more than 1.5kw, 3 phase is better than single phase, connect L1,L2,L3

Relevant parameters setup of velocity control mode

8.2.1 Velocity control by analog speed command

The analog speed command input voltage is converted to equivalent digital speed command. You can set the filter to eliminate noise or adjust the offset.

Pr3. 00	Name	Speed setup, Internal /External switching			Mode	S
	Range	0~3	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	0301H
	Repower	-				

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
	ON	ON	ON	8th speed

Pr3. 01	Name	Speed command rotational direction selection			Mode	S
	Range	0~1	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	0303H
	Repower	-				

Select the Positive /Negative direction specifying method

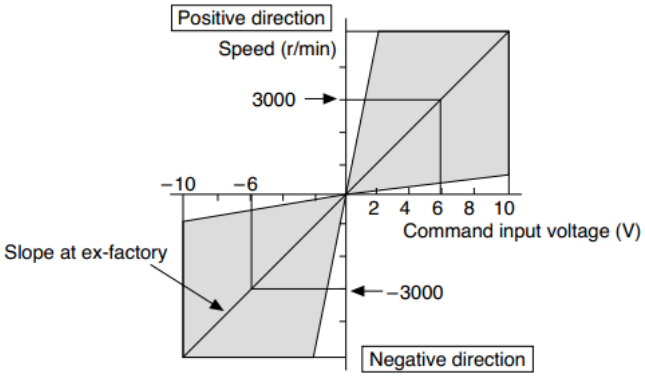
Setup value	Select speed command sign (1st to 8th speed)	Speed command direction (VC-SIGN)	Position command direction
0	+	No effect	Positive direction
	-	No effect	Negative direction
1	Sign has no effect	OFF	Positive direction
	Sign has no effect	ON	Negative direction

Pr3. 02	Name	Input gain of speed command			Mode	S
	Range	10~2000	Unit	(r/min)/V	Default	500
	Data Type	16bit	Access	R/W	Address	0305H
	Repower	-				

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	Name	Reversal of speed command input			Mode	S
	Range	0~1	Unit	—	Default	1
	Data Type	16bit	Access	R/W	Address	0307H
	Repower	-				

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.

8.2.2 Velocity control by internal speed command

You can control the speed by using the internal speed command set to the parameter. By using the internal speed command selection 1,2,3(INTSPD 1,2,3), you can select best appropriate one

Pr3. 00	Name	Speed setup, Internal /External switching			Mode	S
	Range	0~3	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	0301H
	Repower	-				

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
	ON	ON	ON	8th speed

Pr3. 01	Name	Speed command rotational direction selection			Mode	S
	Range	0~1	Unit	—	Default	0
	Data Type	16bit	Access	R/W	Address	0303H
	Repower	-				

Select the Positive /Negative direction specifying method

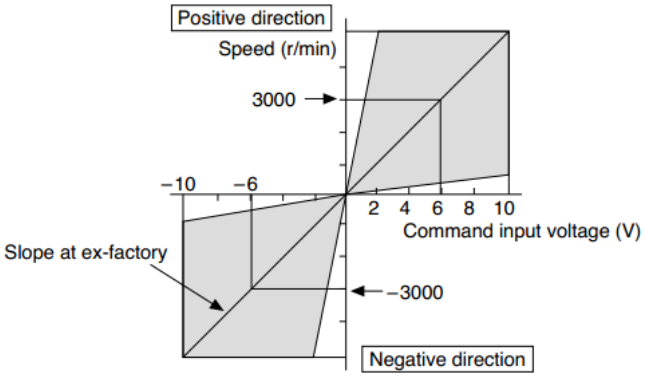
Setup value	Select speed command sign (1st to 8th speed)	Speed command direction (VC-SIGN)	Position command direction
0	+	No effect	Positive direction
	-	No effect	Negative direction
1	Sign has no effect	OFF	Positive direction
	Sign has no effect	ON	Negative direction

Pr3. 02	Name	Input gain of speed command			Mode	S
	Range	10~2000	Unit	(r/min)/V	Default	500
	Data Type	16bit	Access	R/W	Address	0305H
	Repower	-				

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	Name	Reversal of speed command input			Mode	S
	Range	0~1	Unit	—	Default	1
	Data Type	16bit	Access	R/W	Address	0307H
	Repower	-				

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	Name	1st speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0309H
	Repower	-				
Pr3. 05	Name	2nd speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	030BH
	Repower	-				
Pr3. 06	Name	3rd speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	030DH
	Repower	-				
Pr3. 07	Name	4th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	030FH
	Repower	-				
Pr3. 08	Name	5th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0311H
	Repower	-				
Pr3. 09	Name	6th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0313H
	Repower	-				
Pr3. 10	Name	7th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	
	Data Type	16bit	Access	R/W	Address	0315H
	Repower	-				
Pr3. 11	Name	8th speed of speed setup			Mode	S
	Range	-10000~10000	Unit	r/min	Default	0
	Data Type	16bit	Access	R/W	Address	0317H

	Repower	-				
Set up internal command speeds, 1st to 8th						

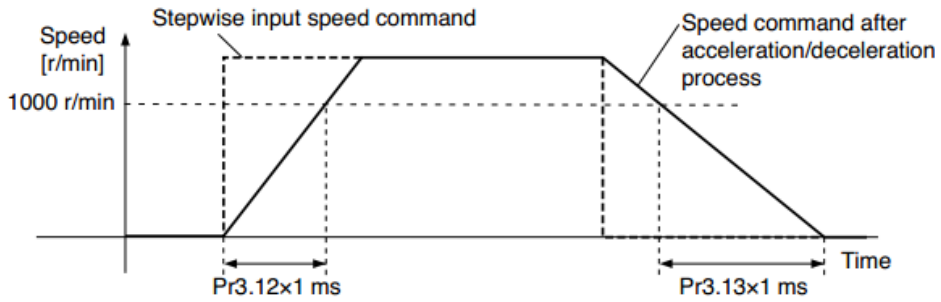
8.2.3 Speed command acceleration and deceleration

On the basis of speed command input, acceleration and deceleration are added as internal speed commands to control the speed. This function can be used when entering the ladder-like speed command and internal speed setting. In addition, the acceleration and deceleration function can also be used when the vibration is reduced by the change of acceleration

Pr3. 12	Name	time setup acceleration			Mode	S
	Range	0~10000	Unit	Ms/ (1000r/min)	Default	100
	Data Type	16bit	Access	R/W	Address	0319H
	Repower	-				
Pr3. 13	Name	time setup deceleration			Mode	S
	Range	0~10000	Unit	Ms/ (1000r/min)	Default	100
	Data Type	16bit	Access	R/W	Address	031BH
	Repower	-				

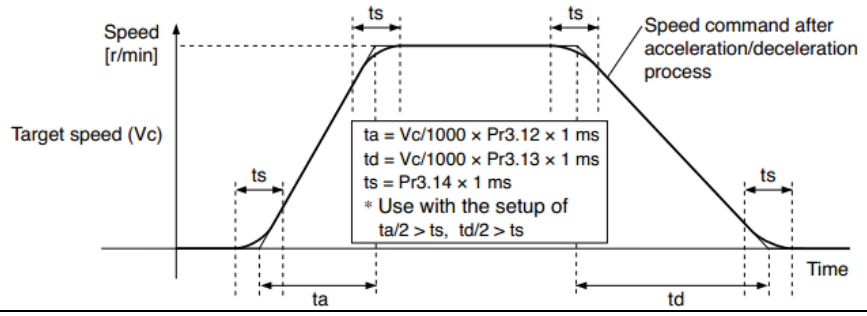
Set up acceleration/deceleration processing time in response to the speed command input.
Set the time required for the speed command(stepwise input)to reach 1000r/min to Pr3.12
Acceleration time setup. Also set the time required for the speed command to reach from 1000r/min to 0 r/min, to Pr3.13 Deceleration time setup.
Assuming that the target value of the speed command is Vc(r/min), the time required for acceleration/deceleration can be computed from the formula shown below.

Acceleration time (ms)=Vc/1000 *Pr3.12 *1ms
Deceleration time (ms)=Vc/1000 *Pr3.13 *1ms



Pr3. 14	Name	Sigmoid acceleration /deceleration time setup			Mode	S
	Range	0~1000	Unit	ms	Default	0
	Data Type	16bit	Access	R/W	Address	031DH
	Repower	o				

Set S-curve time for acceleration/deceleration process when the speed command is applied. According to Pr3.12 Acceleration time setup and Pr3.13 Deceleration time setup, set up sigmoid time with time width centering the inflection point of acceleration/deceleration.



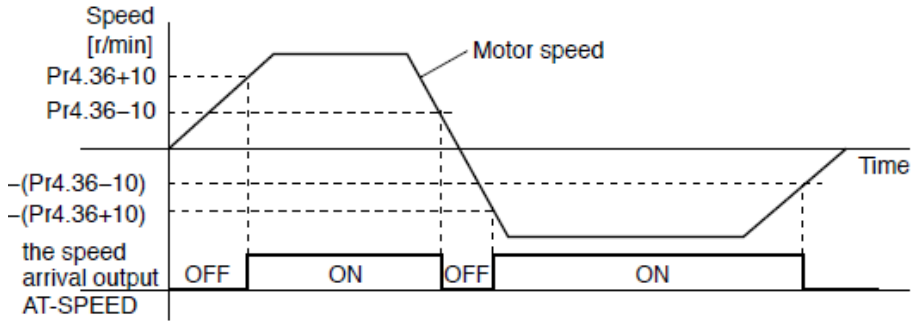
8.2.4 Attained Speed signal AT-SPEED output

When the motor speed reaches the speed set by the parameter PA_436 (setting of arrival speed), the output speed reaches the output (AT-SPEED) signal.

This function can be configured by IO output function parameters, as described in IO Pr4.10 parameters. When the speed meets the set conditions, the set corresponding output IO port can output ON.

Pr4. 36	Name	At-speed(Speed arrival)			Mode	S
	Range	10~2000	Unit	r/min	Default	1000
	Data Type	16bit	Access	R/W	Address	0449H
	Repower	-				

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 .



8.2.5 Speed coincidence output (V-COIN)

When the speed command (before acceleration and deceleration processing) is consistent with the motor speed, the output speed is consistent (V-COIN). If the difference between the speed command and the motor speed before acceleration and deceleration processing in the driver is within the parameter PA_435 (setting the same speed range), it is judged to be consistent.

This function can be configured by IO output function parameters, as described in IO Pr4.10 parameters. When the speed difference meets the setting conditions, the corresponding output IO port set can output ON.

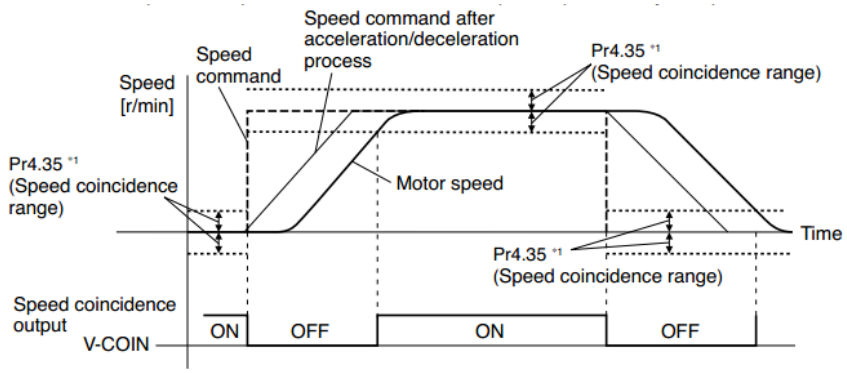
Among them, the in place signal of PV mode is synchronized with the v-coin signal

Pr4. 35	Name	Speed coincidence range			Mode		S
	Range	10~2000	Unit	r/min	Default	50	
	Data Type	16bit	Access	R/W	Address	0447H	
	Repower	-					

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.

Because the speed coincidence detection is associated with 10 r/min hysteresis, actual detection range is as shown below.

Speed coincidence output OFF -> ON timing (Pr4.35 -10) r/min
Speed coincidence output ON -> OFF timing (Pr4.35 +10) r/min



8.2.6 Speed zero clamp (ZEROSPD)

You can forcibly set the speed command to 0 by using the speed zero clamp input.

Pr3. 15	Name	Speed zero-clamp function selection			Mode		S
	Range	0~3	Unit	0.1HZ	Default	0	
	Data Type	16bit	Access	R/W	Address	031FH	
	Repower	-					

1. If Pr3.15=0, the function of zero clamp is forbidden. It means the motor rotates with actual velocity which is controlled by the analog voltage input 1 even if the velocity is less than 10 rpm. The motor runs no matter what the value of Pr3.16 is. The actual velocity is controlled by external the analog voltage input .
2. If Pr3.15=1 and the input signal of Zero Speed is available in the same time, the function of zero clamp works. It means motor will stop rotating in servo-on condition no matter what the velocity of motor is, and motor stop rotating no matter what the value of Pr3.16 is.
3. If Pr3.15=2 , the function of zero clamp belongs to the value of Pr3.16. If the actual velocity is less than the value of Pr3.16, the motor will stop rotating in servo-on condition.

Pr3. 16	Name	Speed zero-clamp level			Mode		S
	Range	10~2000	Unit	r/min	Default	30	
	Data Type	16bit	Access	R/W	Address	0321H	

	Repower	-				
	When analog speed given value under speed control mode less than zero speed clamp level setup, speed command will set to 0 strongly.					

Other setup for SI/SO function

For details of SI input function, refer to Pr4.00 – Pr4.09.

For details of SO output function, refer to Pr4.10 – Pr4.15.

8.3 Torque Control

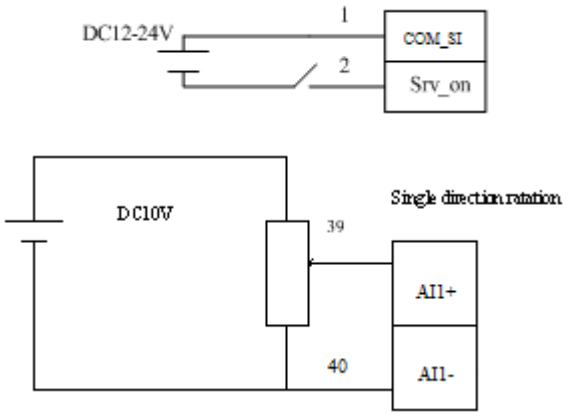
Notice : Analog input for Torque/Velocity mode is only available for ELP-RS***Z

Pls do inspection before velocity control test run.

Table 8.6 Parameter Setup of Torque Control

No	Parameter	Name	input	Setup value	Unit
1	Pr0.01	Control mode setup	/	2	/
2	Pr3.12	Acceleration time setup	/	User-specified	ms
3	Pr3.13	Deceleration time setup	/	User-specified	ms
4	Pr3.14	Sigmoid acceleration/deceleration time setup	/	User-specified	ms
5	Pr3.15	Zero-clamp function selection	/	0	/
6	Pr3.17	Torque setup internal/external switching	/	0	/
7	Pr3.19	Torque command direction input gain	/	User-specified	0.1V/100%
8	Pr3.20	Torque setup input reversal	/	User-specified	/
9	Pr3.21	Speed limit value 1	/	User-specified	r/min
10	Pr4.00	SI1 input selection	Srv_on	hex:030000	/
11	Pr4.28	Analog input 3(AI3) offset setup	/	User-specified	0.359mv
12	Pr4.29	Analog input 3(AI3) filter	/	User-specified	0.01ms

◆Wiring Diagram



◆Operation Steps

1. connect terminal CN1.
2. Enter the power (DC12V to 24V) to control signal (the COM_SI + and SI1).
3. Enter the power to the driver.
4. Confirm the value of the parameters, and write to the EEPROM and turn off/on the power (of the driver)
5.Connect the Srv_on input to bring the driver to servo-on status and energize the motor.
6. apply DC voltage between torque command input ,AI1 and AGND, and gradually increase from 0V to confirm the motor runs.
7. Check the motor torque at monitor mode ("d04tr "), Whether actual torque is as per the setup or not
8. When you want to change the torque magnitude, direction and velocity limit value against the command voltage, set up the following parameters : Pr3.19. Pr3.20. Pr3.21

If the motor does not run correctly, refer to the Factor of No-Motor running in data monitor mode ("d17Ch ").

The torque control is performed according to the torque command specified in the form of analog voltage. For controlling the torque, the speed limit input is required in addition to the torque command to maintain the motor speed within the speed limit.

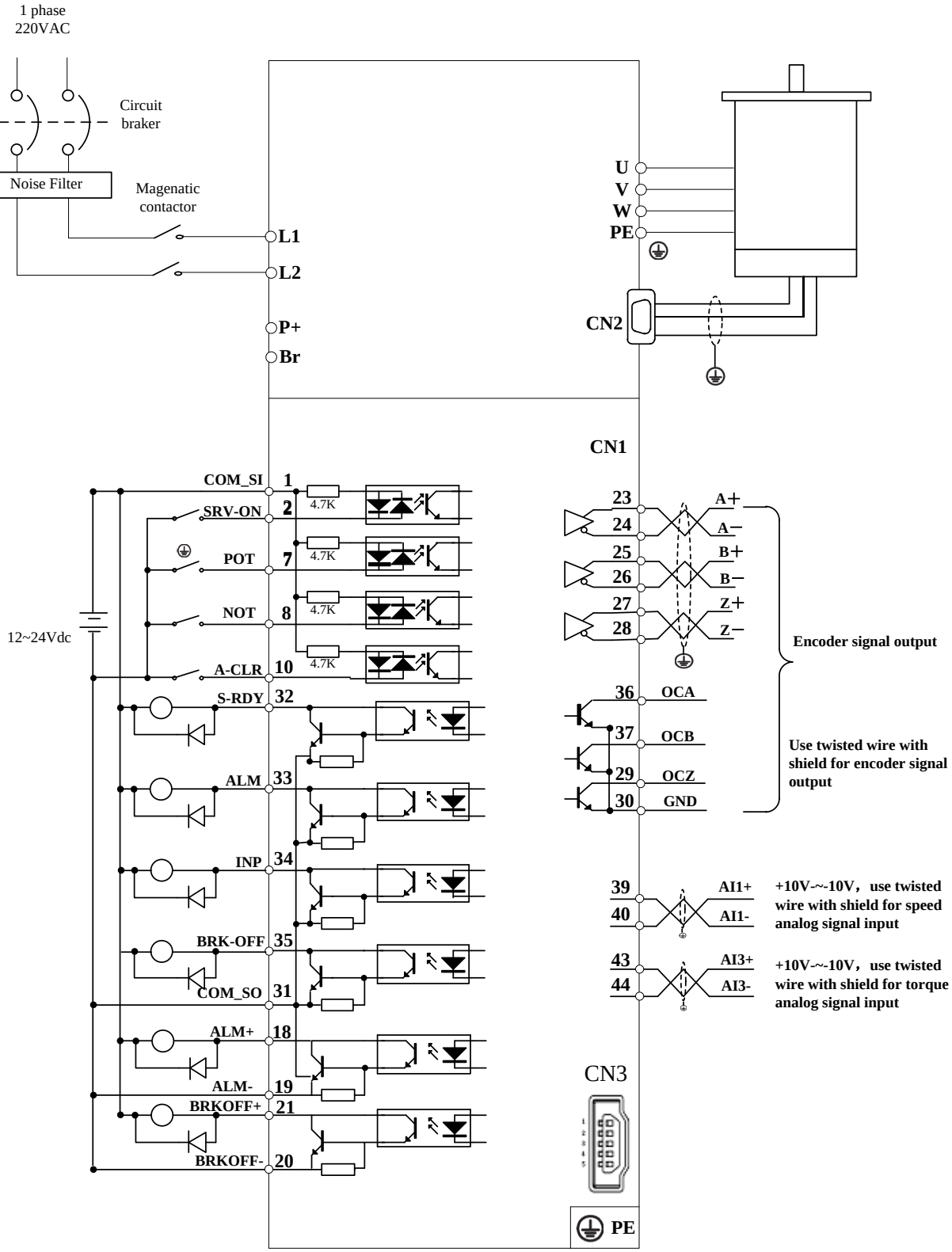


Figure 8-4 Torque Mode Typical External Wiring Diagram

Note: For driver is more than 1.5kw, 3 phase is better than single phase, connect L1,L2,L3

Relevant parameters setup of torque control mode

8.3.1 Analog torque command input

The analog torque command input voltage is converted to equivalent digital torque command. You can set the filter to eliminate noise or adjust the offset.

Pr3. 17	Name	Selection of torque command			Mode			T
	Range	0、1、2	Unit		Default	0		
	Data Type	16bit	Access	R/W	Address	0323H		
	Repower	-						

Setup value	Torque command input	Velocity limit input
0	Analog input 3	Parameter value (P3.21)
1	Analog input 3	Analog input 1 for Speed limit
2	Parameter value (P3.22)	Parameter value (P3.21)
3	Analog input 3	Speed limit 0

Pr3. 18	Name	Torque command direction selection			Mode			T
	Range	0~1	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0325H		
	Repower	-						

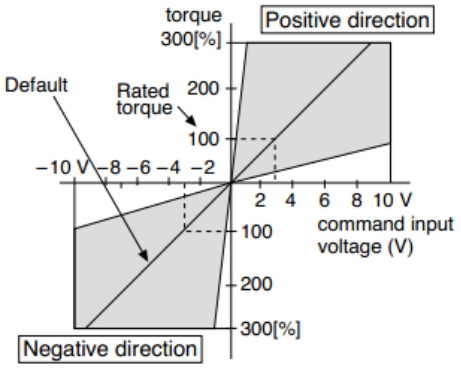
Select the direction positive/negative direction of torque command

Setup value	**Details**
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	Name	Torque command input gain			Mode			T
	Range	10~100	Unit	0.1V/100%	Default	0		
	Data Type	16bit	Access	R/W	Address	0327H		
	Repower	-						

Based on the voltage (V) applied to the analog torque command (TRQR),set up the conversion gain to torque command(%)

- Unit of the setup value is 0.1V/100%] and set up input voltage necessary to produce the rated torque.
- Default setup of 30 represents 3V/100%



Pr3. 20	Name	Torque command input reversal			Mode		T
	Range	0~1	Unit	—	Default	0	
	Data Type	16bit	Access	R/W	Address	0329H	
	Repower	-					

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]

8.3.2 Torque limit function

The speed limit is one of protective functions used during torque control.
This function regulates the motor speed so that it doesn't exceed the speed limit while the torque is controlled.

Pr3. 20	Name	Torque command input reversal			Mode		T
	Range	0~1	Unit	—	Default	0	
	Data Type	16bit	Access	R/W	Address	0329H	
	Repower	-					

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	Name	Speed limit value 1			Mode		T
	Range	0~10000	Unit	r/min	Default	0	
	Data Type	16bit	Access	R/W	Address	032BH	
	Repower	-					

Set up the speed limit used for torque control. During the torque controlling, the speed set by the speed limit cannot be exceeded.

Other setup for SI/SO function

For details of SI input function, refer to PA_400 – PA409.

For details of SO output function, refer to PA_410 – PA415.

8.4 Inertia ratio identification

Pr0. 04	Name	Inertia ratio			Mode	P	S	T
	Range	0~10000	Unit	%	Default	250		
	Data Type	16bit	Access	R/W	Address	0009H		
	Repower	-						
	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 value, the setup unit of the velocity loop gain becomes larger, and when the inertia ratio of Pr0.04 is smaller than the actual value, the setup unit of the velocity loop gain becomes smaller..							

8.4.1 On-line inertia ratio identification

The motor is operated by the controller, and the motor speed is above 400rmp. The running stroke has obvious acceleration, uniform speed and deceleration process, and the load inertia ratio can be tested by running 2-3 times continuously. The inertia ratio of the test is viewed through panel d16. Write the corresponding panel value minus 100 into PA004.

8.4.2 Off-line inertia ratio identification

Pre-conditions： 1、servo disable. 2、Positive limit and negative limit invalid

Steps:

1、Set the trial running speed PA604, and the setting of PA604 should not be too large

2、Enter auxiliary inertia ratio identification function on the drive panel, AF_GL

3、Press ENT once to enter operation， display “G---”

4、Press ◀ once， display “StUon”

5、Press ▲ once， motor start running to identification

6、After finishing， display G XXX, which represents the measured inertia ratio value

7、Write the corresponding panel value minus 100 into PA004.

8.5 Vibration Suppression

Specific resonance frequency can be obtained from PC upper computer software according to waveform monitoring, and filter frequency can be set to effectively suppress the oscillation ripple of a certain frequency in the current instruction.

The width of the notch is the ratio of the frequency of the notch center at a depth of 0 to the frequency range width of the attenuation rate of -3db.

The depth of the trap is: when the set value is 0, the input of the center frequency is completely disconnected; When the set value is 100, it represents the ratio of input and output that are completely passed

Pr2. 00	Name	Adaptive filter mode setup			Mode	P	S	
	Range	0~4	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0201H		
	Repower	-						

Set up the resonance frequency to be estimated by the adaptive filter and the special the operation after estimation.

Setup value	Details	
0	Adaptive filter: invalid	Parameters related to the 3rd and 4th notch filter hold the current value.
1	Adaptive filter,1 filter is valid, one time	One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation.
2	Adaptive filter, 1 filter is valid, It will be valid all the time	One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance.
3-4	Not use	Non-professional forbidded to use

Pr2. 01	Name	1st notch frequency			Mode	P	S	T
	Range	50~2000	Unit	Hz	Default	2000		
	Data Type	16bit	Access	R/W	Address	0203H		
	Repower	-						

Set the center frequency of the 1st notch filter

Notice: the notch filter function will be invalid by setting up this parameter to "2000".

Pr2. 02	Name	1st notch width selection			Mode	P	S	T
	Range	0~20	Unit	—	Default	2		
	Data Type	16bit	Access	R/W	Address	0205H		
	Repower	-						

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. 03	Name	1st notch depth selection			Mode	P	S	T
	Range	0~99	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	0207H		
	Repower	-						

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. 04	Name	2nd notch frequency			Mode	P	S T
	Range	50~2000	Unit	Hz	Default	2000	
	Data Type	16bit	Access	R/W	Address	0209H	
	Repower	-					
	Set the center frequency of the 2nd notch filter Notice: the notch filter function will be invalid by setting up this parameter to "2000".						
Pr2. 05	Name	2nd notch width selection			Mode	P	S T
	Range	0~20	Unit	—	Default	2	
	Data Type	16bit	Access	R/W	Address	020BH	
	Repower	-					
	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. 06	Name	2nd notch depth selection			Mode	P	S T
	Range	0~99	Unit	—	Default	0	
	Data Type	16bit	Access	R/W	Address	020DH	
	Repower	-					
	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.						

Check the current command waveform on the upper computer. When the increase of rigidity causes the current command to produce the oscillation motor to scream, obtain its oscillation frequency from the waveform, and set the frequency to the notch frequency to debug the width and depth：

The notch width is described as follows：

notch width	notch width / notch frequency	notch width	notch width / notch frequency	notch width	notch width / notch frequency
0	0.50	7	1.68	14	5.66
1	0.59	8	2.00	15	6.73
2	0.71	9	2.38	16	8.00
3	0.84	10	2.83	17	9.51
4	1.00	11	3.36	18	11.31
5	1.19	12	4.00	19	13.45
6	1.41	13	4.76	20	16.00

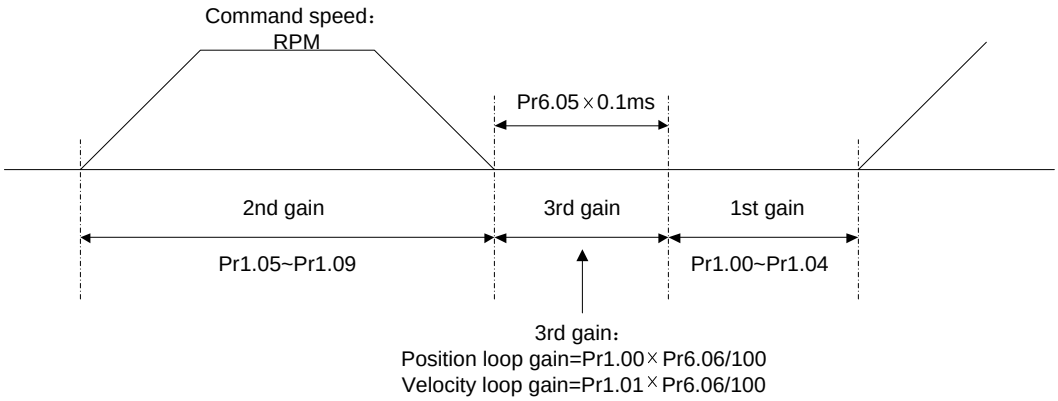
8.6 Third gain switching

In addition to the conventional switch between the first and second gain, add the third gain switch function to shorten the positioning and setting time.

Pr6. 05	Name	Position 3rd gain valid time			Mode	P		
	Range	0~1000	Unit	0.1ms	Default	0		
	Data Type	16bit	Access	R/W	Address	060BH		
	Repower	-						
	Set up the time at which 3rd gain becomes valid. When not using this parameter, set PR6.05=0, PR6.06=100 This is valid for only position control/full-closed control.							

Pr6. 06	Name	Position 3rd gain multiplication			Mode	P		
	Range	0~1000	Unit	100%	Default	0		
	Data Type	16bit	Access	R/W	Address	060DH		
	Repower	-						
	Set up the 3rd gain by multiplying factor of the 1st gain 3rd gain= 1st gain * PR6.06/100.							

This function is only effective for position control. When Pr6.06 is set to non-0 value, the third gain function will be turned on. Pr6.05 is set to specify the value of the third gain. When switching from the second gain to the first gain, there will be a transition from the third gain. The switching time is set as Pr1.19. Take Pr1.15=7(with or without position instruction as the first and second gain of conditional switching) as an example to illustrate the figure below:



8.7 Friction torque compensation

Pr6. 07	Name	Torque command additional value			Mode	P	S	T
	Range	-100~100	Unit	%	Default	0		
	Data Type	16bit	Access	R/W	Address	060FH		
	Repower	-						
Pr6. 08	Name	Positive torque compensation value			Mode	P	S	T

	Range	-100~100	Unit	%	Default	0
	Data Type	16bit	Access	R/W	Address	0611H
	Repower	-				
Pr6. 09	Name	Negative torque compensation value			Mode	P S T
	Range	-100~100	Unit	%	Default	0
	Data Type	16bit	Access	R/W	Address	0613H
	Repower	-				
This three parameters may apply feed forward torque superposition directly to torque command.						

8.8 Regenerative resister setting

When the torque of the motor is opposite to the direction of rotation (common scenarios such as deceleration, vertical axis descent, etc.), energy will feedback from the load to the driver. At this time, the energy feedback is first received by the capacitor in the driver, which makes the voltage of the capacitor rise. When it rises to a certain voltage value, the excess energy needs to be consumed by the regenerative resistance

Pr0. 16	Name	External regenerative resistance			Mode	P S T
	Range	10~50	Unit	Ω	Default	100
	Data Type	16bit	Access	R/W	Address	0021H
	Repower	-				
Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current.						

Pr0. 17	Name	External regenerative resistor power value			Mode	P S T
	Range	0~10000	Unit	W	Default	20
	Data Type	16bit	Access	R/W	Address	0023H
	Repower	-				
Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current.						

8.9 Security Features

8.9.1 Speed limit

Pr3. 24*	Name	Motor rotate maximum speed limit			Mode	P S T
	Range	0~10000	Unit	r/min	Default	3000
	Data Type	16bit	Access	R/W	Address	0331H

	Repower	-				
Set up motor running max rotate speed, but can't be exceeded motor allowed max rotate speed.						

8.9.2 Torque limit (TL-SEL)

Pr5. 21	Name	Selection of torque limit			Mode	P	S	T
	Range	0~5	Unit	—	Default	0		
	Data Type	16bit	Access	R/W	Address	052BH		
	Repower	-						

Set up the torque limiting method

Setup value		Limiting value
0		PR0.13
1		PR5.22
2	TL-SEL off	PR0.13
	TL-SEL on	PR5.22
5		PR0.13 Positive torque limit PR5.22 Negative torque limit

Pr5. 22	Name	2nd torque limit			Mode	P	S	T
	Range	0~500	Unit	%	Default	300		
	Data Type	16bit	Access	R/W	Address	052DH		
	Repower	-						

Set up the 2nd limit value of the motor torque output
The value of the parameter is limited to the maximum torque of the applicable motor.

Pr0. 13	Name	1st Torque Limit			Mode	P	S	T
	Range	0~500	Unit	%	Default	300		
	Data Type	16bit	Access	R/W	Address	001BH		
	Repower	-						

You can set up the limit value of the motor output torque, as motor rate current %, the value can't exceed the maximum of output current.

8.10 Multi-turn absolute encoder

The absolute encoder remember position, When the absolute encoder is used for the first time, it needs to move to the home position, and clear the absolute position value of multiple turns through the driver to set the home position. It is unnecessary to return to zero in the future (except for the absolute encoder alarm and other situations). It is recommended that the motor is stationary when reading the position to prevent dynamic data jump.

8.10.1 Parameters setting

Pr0. 15	Name	Absolute Encoder Setup	Mode	P	S	T

	Range	0~15	Unit		Default	0
	Data Type	16bit	Access	R/W	Address	001FH
	Repower	o				

How to use:

0: Incremental position mode:
The encoder is used as a incremental encoder, and the position retentive at power failure is not supported.

1: Absolute position linear mode:
The encoder is used as an absolute encoder, and the position retentive at power failure is supported..
It is applicable to the scenario where the travel range of device load is fixed and the encoder multi-turn data dose not overflow.

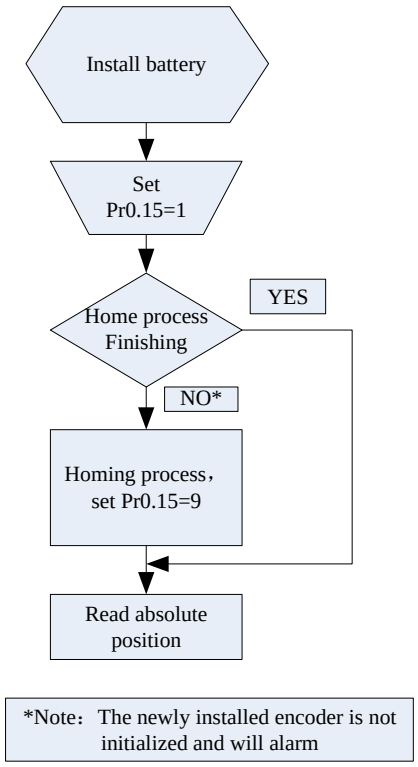
2: Absolute position rotation mode:
The encoder is used as an absolute encoder, and the position retentive at power failure is supported..
It is mainly applicable to the scenario where the load travel range is not limited and the number of motor single-direction revolution is less than 0~(Pr6.63+1)

5: Clean multi-turn alarm, and open multi-turn absolute function.
It will become 1 when normal clearance, if it's still 5 after 3seconds, please deal with according to 153 alarm processing.

9: Clear multi-turn position and reset multi-turn alarm, open multi-turn absolute function.
It will become 1 when normal clearance, if it's still 9 after 3seconds, please deal with according to 153 alarm processing. Please remember to do mechanical homing.
Notes: Set to 9 after homing process finished and servo disabled., ,valid after repower.

8.10.2 Read absolute position

1、Steps：



（1）Firstly, select the multi-turns absolute encoder motor, install the battery, and confirm whether the driver version supports multi-turns absolute encoder motor;

（2）Set Pr0.15=1 to open absolute encoder. If it is the first time of installation, the driver will alarm Err153. The reason is that the multi-turn position is invalid due to the newly installed battery of the motor. At this time, it is necessary to return to the home position of the machine and perform the multi-turn position reset operation (see multi-turn position reset).

（3）When the absolute value origin is set and there is no battery fault, the alarm will be cancelled

（4）Finally, the user can read the absolute position, even if the power off the position will not lost.

2、Read absolute position

The absolute encoder counting mode is that when the motor rotates clockwise, the number of turns is defined as negative, while motor rotates counterclockwise the number of turns is defined as positive. The maximum rotation number is -32768 to +32767. After the number of turns is out of range, if the number of turns is 32767 counterclockwise, it will reverse to -32768, -32767... ; If the number of turns clockwise -32768, it will reverse to 32767, 32766...

Absolute encoder read mode: read 6064h data object

3、Clear absolute position

Before clear absolute position, the machine needs to return to the home point. After clear absolute position, the absolute position =0, the single-turn position remains unchanged, and the absolute value of the encoder is cleared to alarm

Set Pr0.15=9: multi-turn zero clearing and reset multi-turn alarm, open multi-turn absolute function. It will become 1 when normal clearance, if it's still 9 after 3seconds, please deal with according to 153 alarm processing. Please remember to do mechanical homing.

8.10.3 Alarm

1、Introductions

The multi-turns absolute encoder alarm function can determine whether the absolute encoder is valid or not, such as battery under voltage or power failure, encoder fault, etc., users can judge the absolute encoder alarm through bus alarm output, IO alarm output, and driver operation panel alarm. At this time, the controller should stop operation immediately, and the absolute motion operation can only be carried out after the alarm is eliminated

2、Alarm output

Absolute encoder alarm can be displayed by the panel Err153, IO output alarm signal, or read alarm information by communication

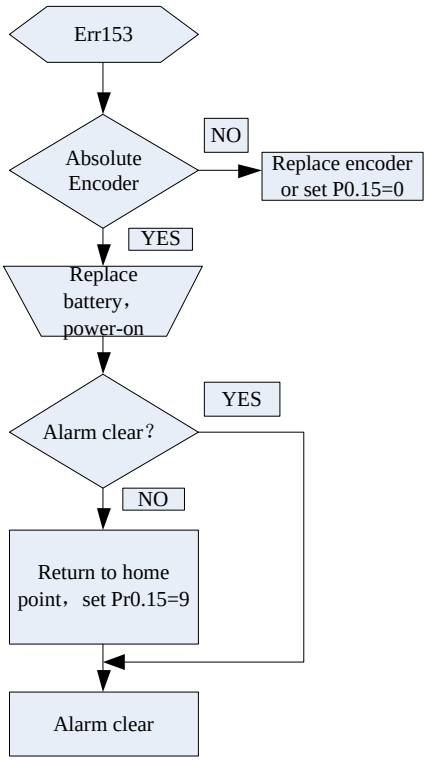
3、The driver sends an absolute encoder alarm Err153, the main situation is as follows:

（1）When the absolute encoder is used for the first time, absolute encoder alarm will be generated due to the new battery of the motor. At this time, it is necessary to return to the home point and perform multi-turn zero clearing operation

（2）When the battery under voltage is lower than 3.2v, absolute encoder alarm will be generated by the driver. At this time, the alarm will be automatically eliminated after the battery is recharged by replacing the battery

（3）When the battery voltage is lower than 2.5v, or the battery has a power failure, the absolute encoder alarm will be generated. Even if the battery is replaced, the alarm cannot be eliminated. At this time, the return to the home point and multi-turn zero clearing operation should be performed

4、Alarm processing flow chart



8.11 Other functions

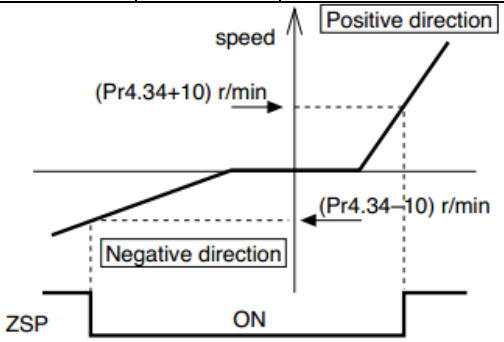
8.11.1 Zero speed output（ZSP）

This function can be configured by IO output function parameters, as described in IO Pr4.10 parameters. When the enabling and time meet the setting conditions, the corresponding output IO port set can output ON

Pr4. 34	Name	Zero-speed			Mode	P	S	T
	Range	10~20000	Unit	r/min	Default	50		
	Data Type	16bit	Access	R/W	Address	0445H		
	Repower	-						

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



- The setup of pr4.34 is valid for both positive and negative direction regardless of the motor rotating direction.
- There is hysteresis of 10[r/min]

8.11.2 Position deviation cleared（CL）

This function can be configured by IO input function parameters, as described in IO Pr4.00 parameters.

Pr5.17	Name	Counter clear input mode			Mode	P		
	Range	0~4	Unit	—	Default	3		
	Data Type	16bit	Access	R/W	Address	0523H		
	Repower	-						

Set up the clearing conditions of the counter clear input signal

Setup value	Clear condition
0/2/4	invalid
1	Always clear
3	Only clear one time

8.11.3 Position setup unit select

Pr5.20	Name	Position setup unit select			Mode	P		
	Range	0~2	Unit	—	Default	2		
	Data Type	16bit	Access	R/W	Address	0529H		
	Repower	-						

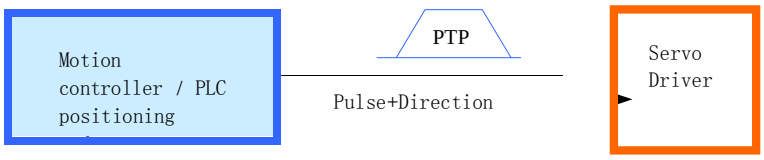
Specify the unit to determine the range of positioning complete and excessive positional deviation

Setup value	unit
0	Encoder unit
1	Command unit
2	10000pulse/rotation

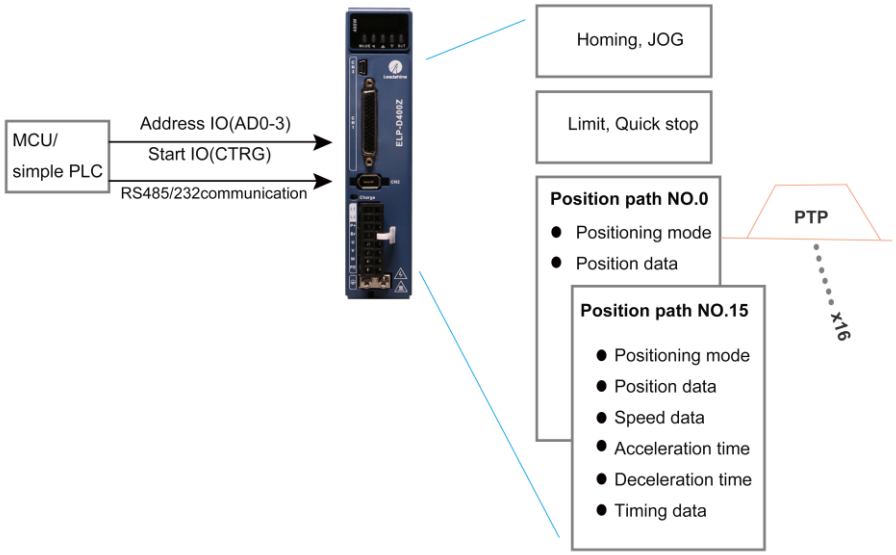
Chapter 9 Pr-Mode function

9.1 Overview

PR is uniaxial motion control function which is controlled by procedure software. Mainly uniaxial motion command control, save the motion control function of the controller.



General positioning motion control system



Pr-Mode motion control system

9.1.1 Main function

Main function as below：

PR function	Specification
Homing	Through homing process, the machine can find the homing point， 1、Limit signal homing, home signal homing, and manual homing all selectable, 2、Homing direction settable 3、Home deviation position settable. Can be positioned to the specified location after homing. 4、Homing acceleration and deceleration settable **Remark：Cannot input external pulse during homing!**
JOG	Trigger positive/negative point move by I/O, for debugging

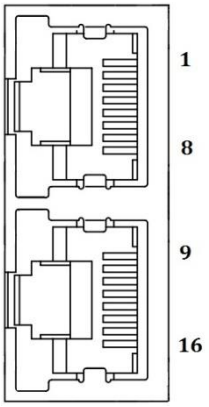
	1、Positive point move，Negative point move 2、JOG speed and acceleration selectable
Position limit	Protect device by limiting move range 1、Positive and negative signal input by IO 2、Software position limit setting 3、Position limit deceleration settable **Remark：Software position limit effective after homing accomplish.**
E-stop	Input E-stop signal through I/O，stop positioning operation.
Positioning	Select 16 motion path by positioning address IO(ADD0-3), Then start the location path operation by execute digital input signal(CTRG) 1、Contains the position mode, speed mode and homing mode. 2、IO rising edge / double edge trigger start. 3、Support continuous positioning 4、Upto 16 motion path 5、Position, speed, acceleration/decleration settable 6、Pause time settable **Remark： Double edge trigger only effective for CTRG !**
485 control	RS485 communication to trigger Pr-Mode working

Remark：（1）For PR mode, position command adopt unit: 10000P/r .

（2）PR position control mode, P0.01=6.

9.1.2 Installation wiring

485 communication terminal connection diagram：

Port		Pin	Signal
CN4 CN5		1，9	RDO+
		2，10	RDO-
		3，11	/
		4，12	TXD
		5，13	RXD
		6，14	VCC5V
		7，15	GND
		8，16	/
			PE

IO terminal wiring and parameter configuration：Newly added IO of PR on the base of standard IO

Relevant parameters：

Parameters	Name	Specification
Pr4.00-Pr4.08	SI input selection	Specific of the 9 input terminals' function distribution，refer to functional allocation table.
Pr4.10-Pr4.15	SO output selection	Specific of the 6 output terminals' function distribution，refer to functional allocation table.

IO terminal functional allocation table：

Input				Output			
Signal name	Symbol	set value		signal name	Symbol	set value	
		Normally open	Normally closed			Normally open	Normally closed
Trigger command	CTRG	20h	A0h	Accomplish commands	CMD_OK	20h	A0h
Homing signal	HOME	21h	A1h	Accomplish path	MC_OK	21h	A1h
Forced to stop	STP	22h	A2h	Homing	HOME_OK	22h	A2h
PositiveJOG	JOG+	23h	A3h	Torque limit	TQL	06h	86h
NegativeJOG	JOG-	24h	A4h				
Forward limit	PL	25h	A5h				
Reverse limit	NL	26h	A6h				
Home signal	ORG	27h	A7h				
Path address 0	ADD0	28h	A8h				
Path address 1	ADD1	29h	A9h				
Path address 2	ADD2	2ah	Aah				
Path address 3	ADD3	2bh	Abh				
Torque switch	TC-SEL	09h	89h				

Remark：CMD_OK means PR instruction is sent，maybe motor is not yet in place.
MC_OK means PR instruction is sent and motor is in place.
CTRG、HOME is edge trigging, but effective level need to last more than 1ms.

9.2 Pr-Mode Parameters

Pr-Mode parameters contain 8th and 9th parameters, 8th parameters is e-stop and control parameters, 9th parameters is store path table.

9.2.1 8th parameters specification

Parameters	Name	Definition	485 address
Pr8.00	Pr control setting	Pr-Mode control function Bit0：=0, CTRG rising edge trigger =1, double edge trigger， Bit1：Software limit effectively，0 invalid / 1 valid Bit2：Homing after power on ,0 invalid / 1 valid Bit3: Absolute encoder function, 0 invalid / 1 valid	0X6000
Pr8.01	Pr motion path number	Up to 16 paths	0X6001
Pr8.02	Control register input	Write 0x1P，P section locate 0-1555 Write 0x20，homing Write 0x21，set current position as zero point Write 0x40，e-stop Read 0x00P，indicate positioning finished， can receive new data Read 0x10P，In operation Read 0x20P，In positioning	0X6002
Pr8.06	Positive software limit H		0X6006
Pr8.07	Positive software limit L		0X6007
Pr8.08	Negative software limit H		0X6008
Pr8.09	Negative software limit L		0X6009
Pr8.10	Homing Method	Homing Method Bit0：homing direction =0： Negative direction； =1： Positive direction. Bit1：Whether go to the set point after homing =0：no； =1：yes. Bit2-7：Homing mode =0：homing with limit switch detect =1：homing with homing switch detect =2：homing with single turn Z signal detect =3：homing with torque detect =8：set current position as homing point Bit8： =0：homing process without Z signal detect =1：homing process with Z signal detect	0X600A

Pr8.11	Homing position H		0X600B
Pr8.12	Homing position L		0X600C
Pr8.13	Homing stop positionH		0X600D
Pr8.14	Homing stop position L		0X600E
Pr8.15	Homing high speed		0X600F
Pr8.16	Homing low speed		0X6010
Pr8.17	Homing acceleration		0X6011
Pr8.18	Homing deceleration		0X6012
Pr8.19	Holding time of homing with torque detect		0X6013
Pr8.20	Torque value of homing with torque detect		0X6014
Pr8.21	Overpass distance setting while homing		0X6015
Pr8.22	Position limit e-stop speed		0X6016
Pr8.23	E-stop speed		0X6017
Pr8.26	IO combined trigger mode	0：invalid，CTRG signal trigger 1：valid after homing process finished 2：valid without homing process	0X601A
Pr8.27	IO combined filtering		0X601B
Pr8.28	Output value of S code		0X601C
Pr8.29	PR alarm	=0x100：Homing overpass limit switch =0x101：Homing process not complete and stop urgently; =0x20x：Path X overpass the limit switch	0X601D
Pr8.39	JOG speed		0X6027
Pr8.40	Acceleration of JOG		0X6028
Pr8.41	Deceleration of JOG		0X6029
Pr8.42	Command position H		0X602A
Pr8.43	Command position L		0X602B
Pr8.44	Motor position H		0X602C
Pr8.45	Motor position L		0X602D

9.2.2 9th parameters specification

Parameters	Name	Definition	485 address
Pr9.00	Path0 Mode	The motion mode of Path0 motion **Bit0-3**：TYPE: 0 No Action 1 position mode 2 velocity mode 3 homing	0X6200

		4 stop **Bit4:** INS, 0 do not interrupt 1 interrupt （All interrupt now） **Bit5:** OVLP， 0 do not overlap 1 overlap **Bit6-7:** 0 absolute position 1 relative to command 2 relative to motor **Bit8-13：** 0-15 Jump to the corresponding path **Bit14：**JUMP: 0 do not jump 1 jump	
Pr9. 01	Path0 position H		0X6201
Pr9. 02	Path0 position L		0X6202
Pr9. 03	Path0 speed	rpm	0X6203
Pr9. 04	Path0 acceleration	ms/1000rpm	0X6204
Pr9. 05	Path0 deceleration	ms/1000rpm	0X6205
Pr9. 06	Path0 Pause time	The pause of path, delay time parameter etc, refer to PR motion type for specific meaning.	0X6206
Pr9. 07	Special Parameters	Path 0 is mapped to Pr8.02 parameters	0X6207

9.3 Pr-Mode motion control

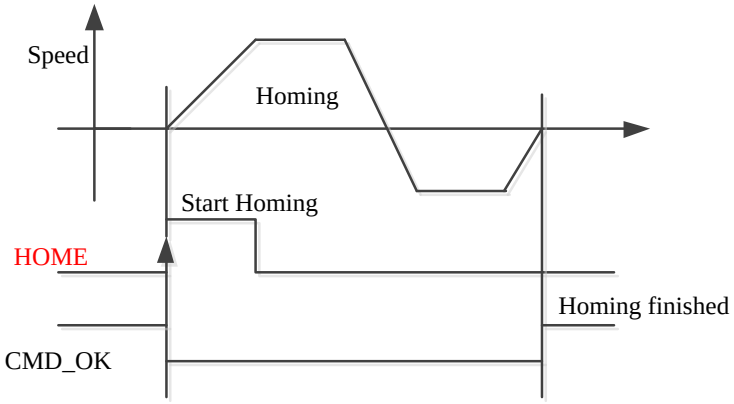
9.3.1 Homing

Homing include zero point homing and manual homing. At the same time also includes first time power on active homing.

Relevant parameters：

Parameters	**Name**	**Definition**	**485 address**
Pr8. 00	Pr control setting	Pr-Mode control function Bit0：=0, CTRG rising edge trigger =1, double edge trigger， Bit1：Software limit effectively，0 invalid / 1 valid Bit2：Homing after power on ,0 invalid / 1 valid Bit3: Absolute encoder function, 0 invalid / 1 valid	0X6000

Pr8.01	Pr motion path number	Up to 16 paths	0X6001
Pr8.02	Control register input	Write 0x1P，P section locate 0-1555 Write 0x20，homing Write 0x21，set current position as zero point Write 0x40，e-stop Read 0x00P，indicate positioning finished， can receive new data Read 0x10P， In operation Read 0x20P，In positioning	0X6002
Pr8.06	Positive software limit H		0X6006
Pr8.07	Positive software limit L		0X6007
Pr8.08	Negative software limit H		0X6008
Pr8.09	Negative software limit L		0X6009
Pr8.10	Homing Method	Homing Method Bit0：homing direction =0： Negative direction； =1： Positive direction. Bit1：Whether go to the set point after homing =0：no； =1：yes. Bit2-7：Homing mode =0：homing with limit switch detect =1：homing with homing switch detect =2：homing with single turn Z signal detect =3：homing with torque detect =8：set current position as homing point Bit8： =0：homing process without Z signal detect =1：homing process with Z signal detect	0X600A
Pr8.11	Homing position H		0X600B
Pr8.12	Homing position L		0X600C
Pr8.13	Homing stop positionH		0X600D
Pr8.14	Homing stop position L		0X600E
Pr8.15	Homing high speed		0X600F
Pr8.16	Homing low speed		0X6010
Pr8.17	Homing acceleration		0X6011
Pr8.18	Homing deceleration		0X6012
Pr8.19	Holding time of homing with torque detect		0X6013
Pr8.20	Torque value of homing with torque detect		0X6014
Pr8.21	Overpass distance setting while homing		0X6015



Remark：Homing also be done by positioning function, only need to set the path to be homing mode.

CMD_OK and MC_OK Both of them can be used to represent action is complete，after the signal effective, there will have a delay within 1 ms.

9.3.2 Path Motion

Positioning path can make single segment running, also can make continuous running, configurable. There are three types of positioning path：Position location type, Speed running type and homing type.

A total of 16 path, each path set movement type alone, position method, speed, deceleration and pause time, etc.

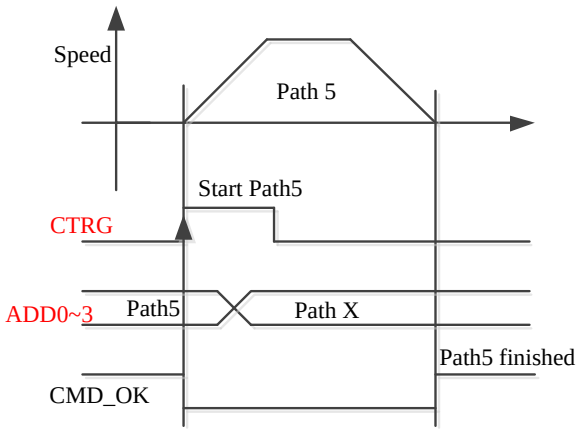
Relevant parameters：

Parameters	Name	Definition	485 address
Pr9. 00	Path0 Mode	The motion mode of Path0 motion **Bit0-3：** TYPE: 0 No Action 1 position mode 2 velocity mode 3 homing 4 stop **Bit4:** INS, 0 do not interrupt 1 interrupt （All interrupt now） **Bit5:** OVLP， 0 do not overlap 1 overlap **Bit6-7:** 0 absolute position 1 relative to command 2 relative to motor **Bit8-13：**	0X6200

		0-15 Jump to the corresponding path **Bit14：** JUMP: 0 do not jump 1 jump	
Pr9. 01	Path0 position H		0X6201
Pr9. 02	Path0 position L		0X6202
Pr9. 03	Path0 speed	rpm	0X6203
Pr9. 04	Path0 acceleration	ms/1000rpm	0X6204
Pr9. 05	Path0 deceleration	ms/1000rpm	0X6205
Pr9. 06	Path0 Pause time	The pause of path, delay time parameter etc, refer to PR motion type for specific meaning.	0X6206
Pr9. 07	Special Parameters	Path 0 is mapped to Pr8.02 parameters	0X6207

9.3.2.1 Single path motion

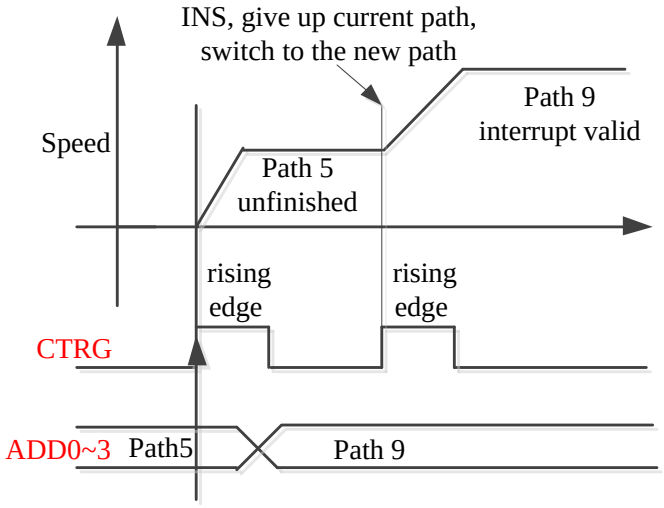
CTRG rising edge /double edge trigger the motion(Pr8.00)， take CTRG rising edge signal to trigger path5 as example:



9.3.2.2 Multi path interrupt motion

Interrupt function means a higher path's priority. Interrupt the current valid path, give up the current path and run the new path directly. Similar to the interrupt priority level of functions.

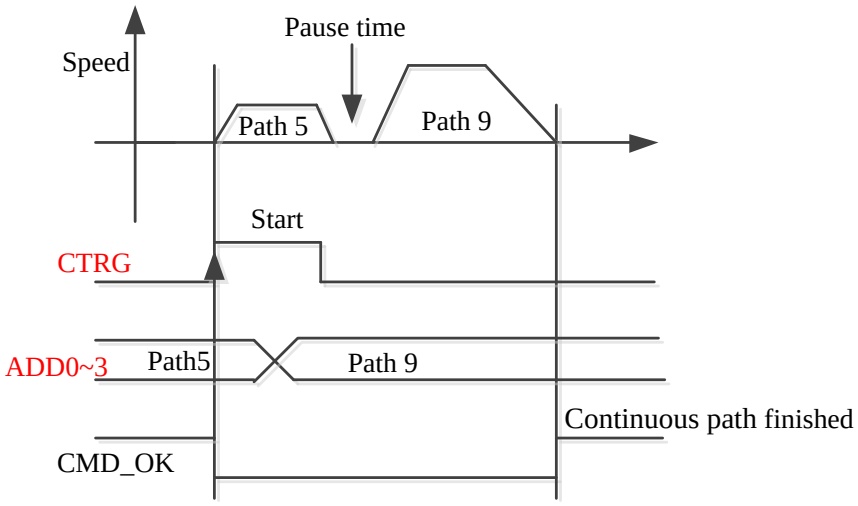
Pr9.00 bit4 = 0, interrupt



9.3.2.3 Continuous path motion without overlap

After the first path motion finished and pause time delay, start another path motion automatically without trigger signal.

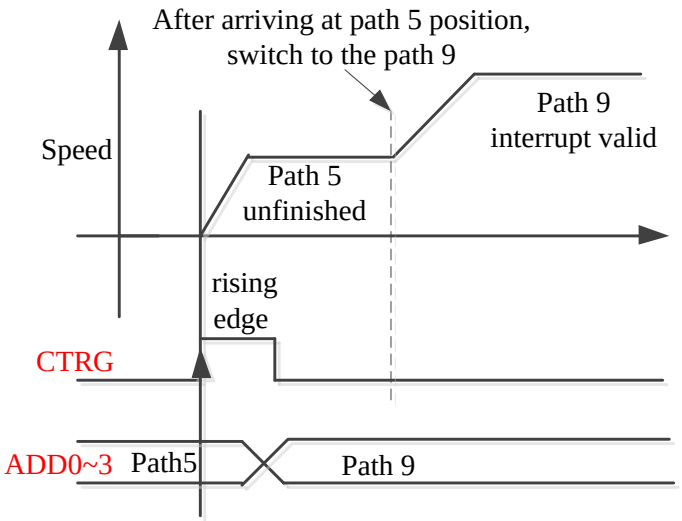
P9.00 bit5 = 0, continuous path motion without overlap



9.3.2.4 Continuous path motion with overlap

After arriving at the first path position, start another path motion automatically without trigger signal.

Pr9.00 bit5 = 1, continuous path motion with overlap



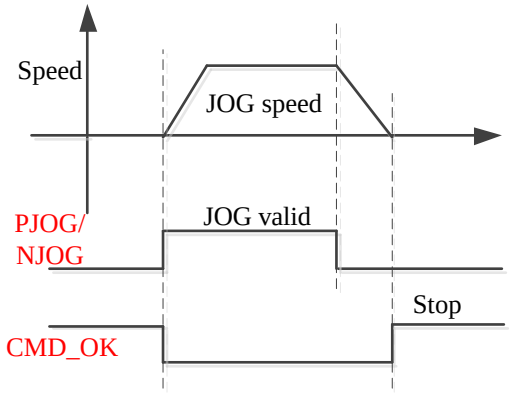
9.3.3 Position limit, JOG and E-stop function.

Relevant parameters

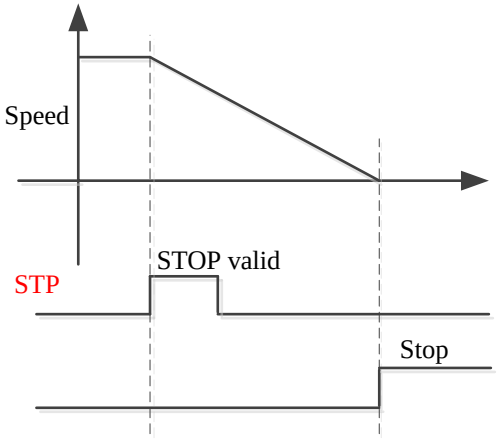
Parameters	Name	Definition	485 address
Pr8.00	Pr control setting	Pr-Mode control function Bit0：=0, CTRG rising edge trigger =1, double edge trigger， Bit1：Software limit effectively，0 invalid / 1 valid Bit2：Homing after power on ,0 invalid / 1 valid Bit3: Absolute encoder function, 0 invalid / 1 valid	0X6000
Pr8.06	Positive software limit H		0X6006
Pr8.07	Positive software limit L		0X6007
Pr8.08	Negative software limit H		0X6008
Pr8.09	Negative software limit L		0X6009
Pr8.22	Position limit e-stop speed		0X6016
Pr8.23	E-stop speed		0X6017
Pr3.12	JOG Acceleration time	Unit: ms/1000rpm	0X0319
Pr3.13	JOG Deceleration time	Unit: ms/1000rpm	0X031B
Pr6.04	JOG speed	Unit: rpm	0X0609
SI	Input terminal		

1、JOG

Manual point move function



2、Position limit and E-stop



9.4 Trigger method of Pr-Mode

9.4.1 Configuration software operation

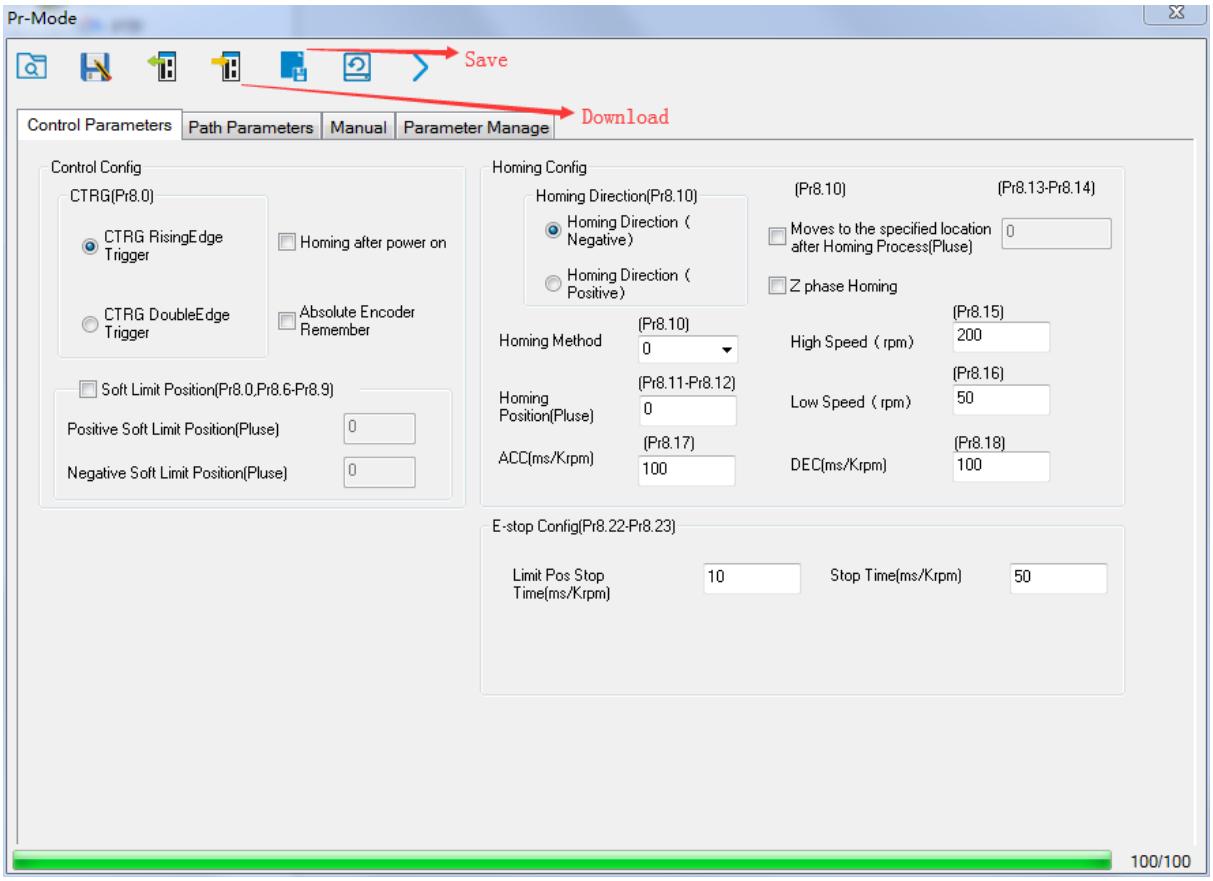
Upper computer is used for drive parameter setting and save, steps for debugging is:

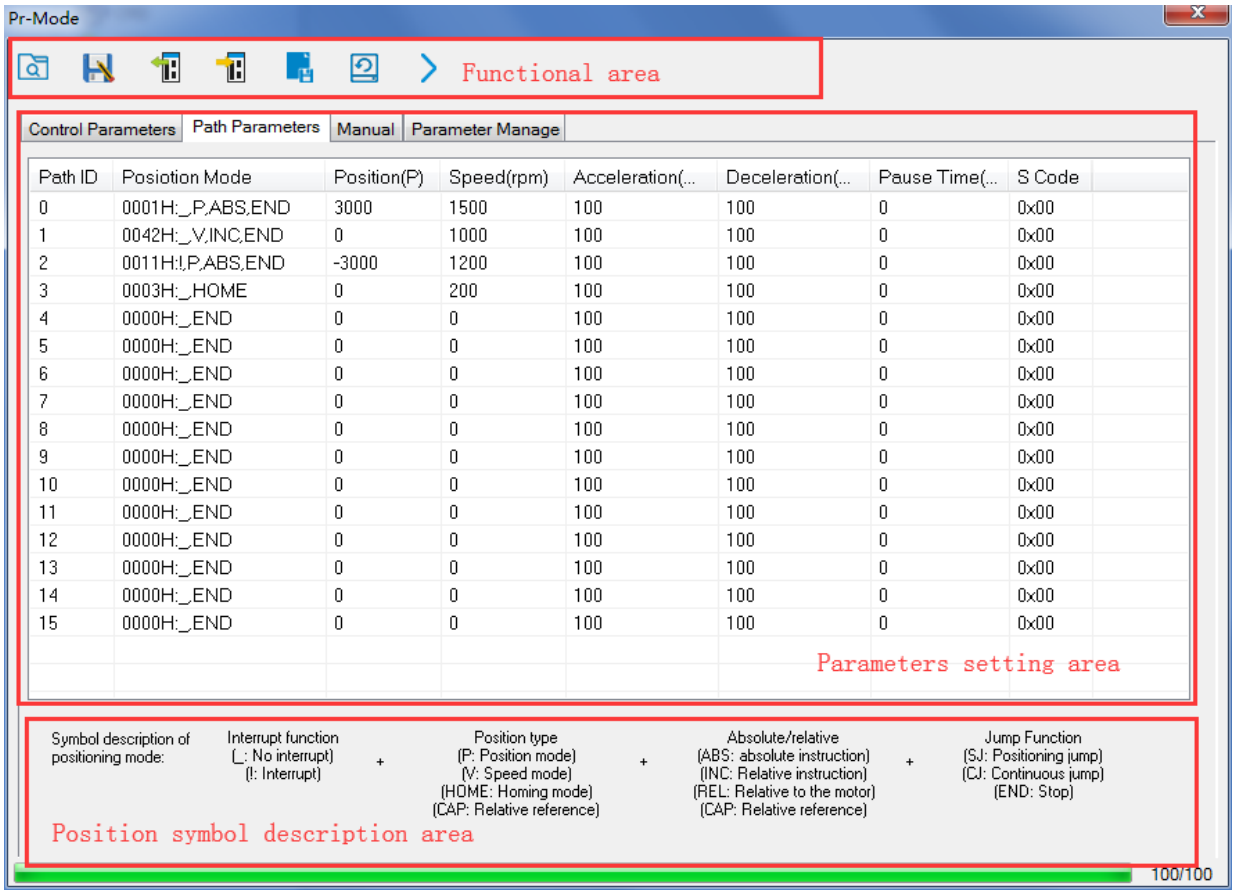
1. Three-loop control parameters. According to the position mode debugging method.

2. Set the work mode to be PR mode（Pr0.01=0），Internal SERVO-enabled （Pr4.00=83），set the distribution of IO register P4.0-P4.13) Confirm the running direction and so on.

3. Setting up the PR basic control parameters through upper computer's "Pr-Mode" interface. Include: trigger setting, software limit, JOG function, homing function, e-stop function and so on.

4. Setting up the PR positioning path parameters through upper computer's " Pr-MODE " interface, include:


Pr-Mode
Save
Download
Control Parameters
Path Parameters
Manual
Parameter Manage
Control Config
CTRG(Pr8.0)
CTRG RisingEdge Trigger
CTRG DoubleEdge Trigger
Homing after power on
Absolute Encoder Remember
Soft Limit Position(Pr8.0,Pr8.6-Pr8.9)
Positive Soft Limit Position(Pluse)
Negative Soft Limit Position(Pluse)
Homing Config
Homing Direction(Pr8.10)
Homing Direction (Negative)
Homing Direction (Positive)
(Pr8.10)
(Pr8.13-Pr8.14)
Moves to the specified location after Homing Process(Pluse)
Z phase Homing
Homing Method
(Pr8.10)
High Speed (rpm)
(Pr8.15)
Homing Position(Pluse)
(Pr8.11-Pr8.12)
Low Speed (rpm)
(Pr8.16)
ACC(ms/Krpm)
(Pr8.17)
DEC(ms/Krpm)
(Pr8.18)
E-stop Config(Pr8.22-Pr8.23)
Limit Pos Stop Time(ms/Krpm)
Stop Time(ms/Krpm)
100/100


Pr-Mode
Functional area
Control Parameters
Path Parameters
Manual
Parameter Manage
Path ID
Posiotion Mode
Position(P)
Speed(rpm)
Acceleration(...
Deceleration(...
Pause Time(...
S Code
0 0001H:_P,ABS,END 3000 1500 100 100 0 0x00
1 0042H:_V,INC,END 0 1000 100 100 0 0x00
2 0011H:!,P,ABS,END -3000 1200 100 100 0 0x00
3 0003H:_HOME 0 200 100 100 0 0x00
4 0000H:_END 0 0 100 100 0 0x00
5 0000H:_END 0 0 100 100 0 0x00
6 0000H:_END 0 0 100 100 0 0x00
7 0000H:_END 0 0 100 100 0 0x00
8 0000H:_END 0 0 100 100 0 0x00
9 0000H:_END 0 0 100 100 0 0x00
10 0000H:_END 0 0 100 100 0 0x00
11 0000H:_END 0 0 100 100 0 0x00
12 0000H:_END 0 0 100 100 0 0x00
13 0000H:_END 0 0 100 100 0 0x00
14 0000H:_END 0 0 100 100 0 0x00
15 0000H:_END 0 0 100 100 0 0x00
Parameters setting area
Symbol description of positioning mode:
Interrupt function (_: No interrupt) (!: Interrupt)
Position type (P: Position mode) (V: Speed mode) (HOME: Homing mode) (CAP: Relative reference)
Absolute/relative (ABS: absolute instruction) (INC: Relative instruction) (REL: Relative to the motor) (CAP: Relative reference)
Jump Function (SJ: Positioning jump) (CJ: Continuous jump) (END: Stop)
Position symbol description area
100/100

For the convenience of the positioning model expressing, use mnemonic symbol to express, such as:

_P , ABS , SJ1 means that path is position addressing, position value is absolute position, jump to No.1 path with delay, and can not interrupt running.

!V , ABS , SJ1 means that path is speed running, jump to No.1 path with delay, and can interrupt running.

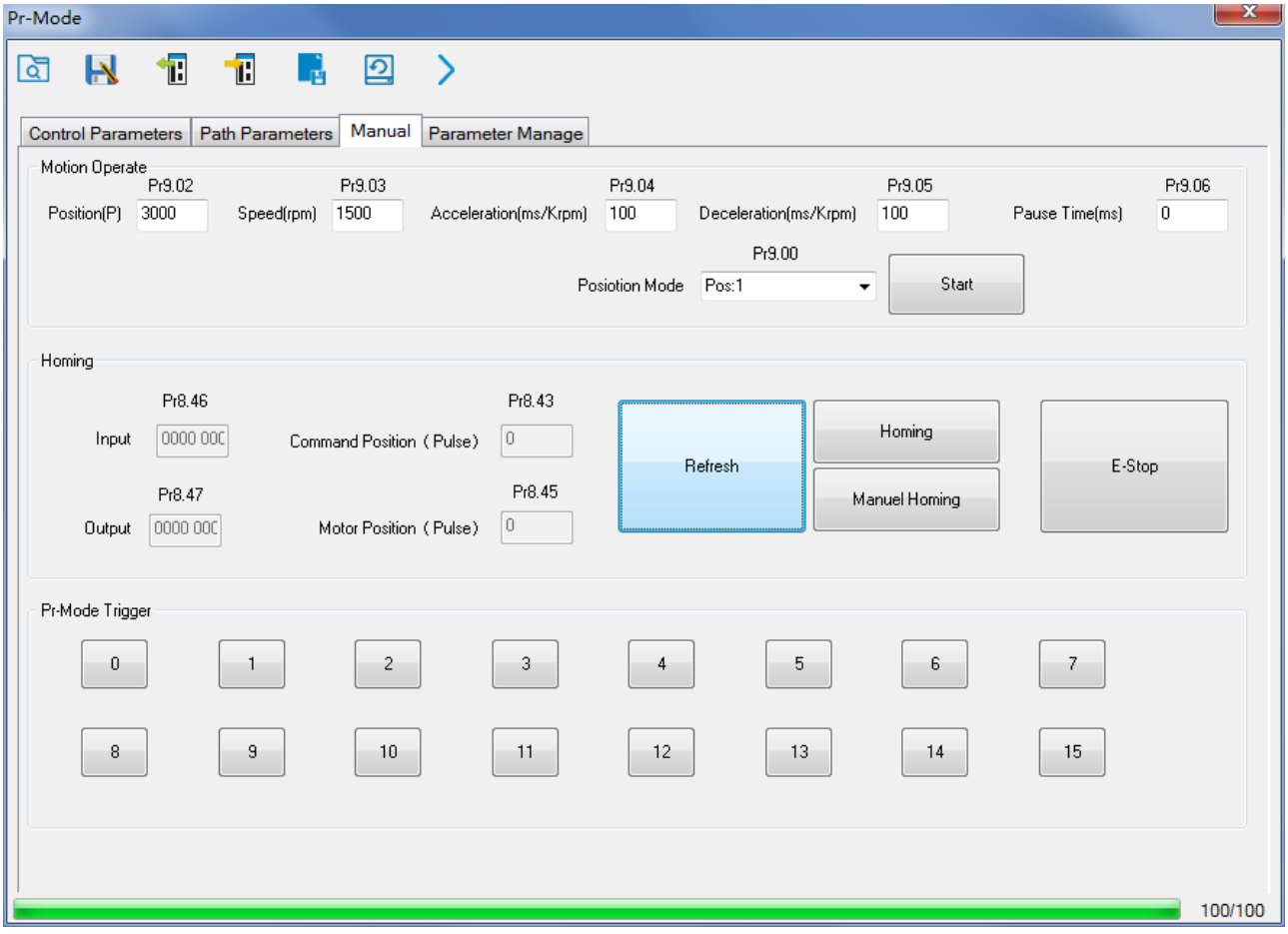
_HOME means that path is homing movement.

_END means that path is E-stop.

5. Test run

After confirming that the parameters are set correctly, the test begins. The interface is shown below

Click the number marked red in the figure and click start to run according to the speed in the path parameter configuration diagram. Click the corresponding number and click to run at the configured speed. If not, check that the parameters are set correctly



9.4.2 IO digital signal Trigger

Pr-Mode motion can be triggered by IO signal.

Parameters	Name	Specification
Pr4.00-Pr4.08	SI input selection	Specific of the 9 input terminals' function distribution，refer to functional allocation table.
Pr4.10-Pr4.15	SO output selection	Specific of the 6 output terminals' function distribution，refer to functional allocation table.

IO terminal functional allocation table：

Input				Output			
Signal name	Symbol	set value		signal name	Symbol	set value	
		Normally open	Normally close			Normally open	Normally close
Trigger command	CTRG	20h	A0h	Accomplish commands	CMD_OK	20h	A0h
Homing signal	HOME	21h	A1h	Accomplish path	MC_OK	21h	A1h
Forced to stop	STP	22h	A2h	Accomplish homing	HOME_OK	22h	A2h
PositiveJOG	JOG+	23h	A3h	Torque limit	TQL	06h	86h
NegativeJOG	JOG-	24h	A4h				
Forward limit	PL	25h	A5h				
Reverse limit	NL	26h	A6h				
Home signal	ORG	27h	A7h				
Path address 0	ADD0	28h	A8h				
Path address 1	ADD1	29h	A9h				
Path address 2	ADD2	2ah	Aah				
Path address 3	ADD3	2bh	Abh				
Torque switch	TC-SEL	09h	89h				

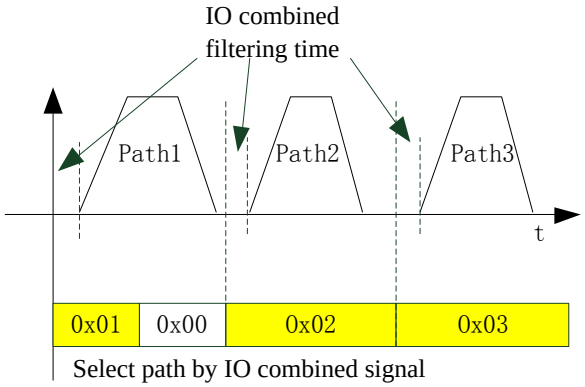
IO Trigger

The trigger mode of path motion is divided into edge trigger and IO combination trigger. Determined by control parameter Pr8.26; The edge trigger selects the motion path by the combination of paths, and then triggers the edge event of IO CTRG signal to start a motion. The IO combination trigger means that the

combination of IO path select signal is directly used to trigger the motion without IO CTRG signal, the path 0 is invalid. When the IO combination signal turns into a non-zero path, the path will run once triggered after IO filtering. The timing diagram is shown below：

Parameters	Name	Range	Default Value	Definition
Pr8.26	IO combined trigger mode	0~65535	0	0: invalid，CTRG signal trigger 1: valid after homing process finished 2: valid without homing process
Pr8.27	IO combined filtering	0~65535	10	IO combined filtering time

Notes： The path 0 is invalid, so the path 0 cannot be triggered by the IO combined signal, so the IO combined signal will trigger the motion from path 1 to path 15.



IO combined signal trigger sequence

Notes 1： The path 0 is invalid, so the path 0 cannot be triggered by the IO combined signal. If users want to trigger incremental position, the IO combined signal should be as follow:
Path X IO combined signal —> Path 0 IO combined signal —> Path Y IO combined signal, trigger incremental position multiple times by these 3 steps.

Notes 2： If the IO combined trigger mode=2（Pr8.26=2）, when the drive is powered on , the motion will be triggered while the IO combined signal select path≠0.

9.4.3 RS485 Communication control mode

Communication control mode can realize same function as IO operation, Can flexible modify parameters and trigger action to run, can control more than one operation by field bus, save the wiring and good flexibility. Communications control includes two modes: Fixed trigger mode and immediately trigger mode.

9.4.3.1 Parameters setting

Parameters	Name	Specification
Pr0.01	Control Mode Setup	Set Pr0.01=6 for Pr-Mode
Pr4.00	SI1 Input selection	Set 83 for internal Servo-Enable Set 03 for external Servo-Enable（Digital SI input for Servo-Enable ）

<table>
<tr><td>Pr5.29</td><td>Communication mode</td><td>
<table>
<tr><td>Value</td><td>Data bit</td><td>Parity-check</td><td>Stop bit</td></tr>
<tr><td>0</td><td>8</td><td>Even Parity</td><td>2</td></tr>
<tr><td>1</td><td>8</td><td>Odd Parity</td><td>2</td></tr>
<tr><td>2</td><td>8</td><td>Even Parity</td><td>1</td></tr>
<tr><td>3</td><td>8</td><td>Odd Parity</td><td>1</td></tr>
<tr><td>4</td><td>8</td><td>None</td><td>1</td></tr>
<tr><td>5</td><td>8</td><td>None</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>Pr5.30</td><td>Communication baud rate</td><td>
<table>
<tr><td>Setting value</td><td>Baud rate</td></tr>
<tr><td>0</td><td>2400bps</td></tr>
<tr><td>1</td><td>4800bps</td></tr>
<tr><td>2</td><td>9600bps</td></tr>
<tr><td>3</td><td>19200bps</td></tr>
</table>
<table>
<tr><td>Setting value</td><td>Baud rate</td></tr>
<tr><td>4</td><td>38400bps</td></tr>
<tr><td>5</td><td>57600bps</td></tr>
<tr><td>6</td><td>115200bps</td></tr>
</table>
Baud rate deviation is 2400~38400bps±5%,
57600~115200bps±2%
</td></tr>
<tr><td>Pr5.31</td><td>Device No.</td><td>Modbus sub-station address number(Slave ID).</td></tr>
<tr><td>Pr8.02</td><td>PR trigger</td><td>（16bit，485 address..0x6002）
Write 0x01P，P path positioning
Write 0x020，homing
Write 0x021，set current position as zero point
Write 0x040，E-stop
Read 0x000p，means positioning completed, can receive new data .
Read 0x01P、0x020、0x040 means still no responding to commands.</td></tr>
</table>

9.4.3.2 Pr-Mode parameters communication address：

8th parameters：0x6000+(Parameters NO - 800）

The address of Pr8.06: 0x6000+(806-800)=0x6006

9th parameters：0x6200+(Parameters NO - 900）

The address of Pr9.06: 0x6200+(906-900)=0x6206

485 communication address of Pr-Mode

485 address	Parameter	Name	Specification
0x6000	Pr8.00	PRcontrol setup	HEX
0x6002	Pr8.02	PRcontrol register	HEX
0x6006	Pr8.06	Positive software limit H	Pulse
0x6007	Pr8.07	Positive software limit L	Pulse
0x6008	Pr8.08	Negative software limit H	Pulse

0x6009	Pr8.09	Negative software limit L	Pulse
0x600a	Pr8.10	Homing mode	HEX
0x600b	Pr8.11	Zero position H	Pulse
0x600c	Pr8.12	Zero position L	Pulse
0x600d	Pr8.13	Homing stop position H	Pulse
0x600e	Pr8.14	Homing stop position L	Pulse
0x600f	Pr8.15	High speed homing	r/min
0x6010	Pr8.16	Low speed homing	r/min
0x6011	Pr8.17	Homing acceleration	ms/Krpm
0x6012	Pr8.18	Homing deceleration	ms/Krpm
0x6016	Pr8.22	Position limit e-stop speed	r/min
0x6017	Pr8.23	STP e-stop speed	r/min
0x602a	Pr8.42	ommand positionH	Read only
0x602b	Pr8.43	Command positionL	Read only
0x602c	Pr8.44	Motor position H	Read only
0x602d	Pr8.45	Motor position L	Read only
0x602e	Pr8.46	Input IO status	Read only
0x602f	Pr8.47	Output IO status	Read only
	Pr9.00~Pr9.07	Path 0 parameters	
0x6200	Pr9.00	PR0 mode	HEX
0x6201	Pr9.01	PR0 position H	Pulse
0x6202	Pr9.02	PR0 position L	Pulse
0x6203	Pr9.03	PR0 speed	r/min
0x6204	Pr9.04	PR0 acceleration	ms/Krpm
0x6205	Pr9.05	PR0 deceleration	ms/Krpm
0x6206	Pr9.06	PR0 pause time	ms
0x6207	Pr9.07	PR0 trigger	
0x6208~0x620f	Pr9.08~Pr9.15	Path 1 parameters	
	The same with Pr9.00~Pr9.07		
0x6210~0x6217	Pr9.16~Pr9.23	Path 2 parameters	
	The same with Pr9.00~Pr9.07		
0x6218~0x621f	Pr9.24~Pr9.31	Path 3 parameters	
	The same with Pr9.00~Pr9.07		
0x6220~0x6227	Pr9.32~Pr9.39	Path 4 parameters	
	The same with Pr9.00~Pr9.07		
0x6228~0x622f	Pr9.40~Pr9.47	Path 5 parameters	
	The same with Pr9.00~Pr9.07		
0x6230~0x6237	Pr9.48~Pr9.55	Path 6 parameters	
	The same with Pr9.00~Pr9.07		
0x6238~0x623f	Pr9.56~Pr9.63	PR7 parameters	

	The same with Pr9.00~Pr9.07		
0x6240~0x6247	Pr9.64~Pr9.71	Path 8 parameters	
	The same with Pr9.00~Pr9.07		
0x6248~0x624f	Pr9.72~Pr9.79	Path 9 parameters	
	The same with Pr9.00~Pr9.07		
0x6250~0x6257	Pr9.80~Pr9.87	Path 10 parameters	
	The same with Pr9.00~Pr9.07		
0x6258~0x625f	Pr9.88~Pr9.95	Path 11 parameters	
	The same with Pr9.00~Pr9.07		
0x6260~0x6267	Pr9.96~Pr9.103	Path 12 parameters	
	The same with Pr9.00~Pr9.07		
0x6268~0x626f	P9.104~Pr9.11	Path 13 parameters	
	The same with Pr9.00~Pr9.07		
0x6270~0x6277	Pr9.112-Pr119	Path 14 parameters	
	The same with Pr9.00~Pr9.07		
0x6278~0x627f	Pr9.120-Pr127	Path 15 parameters	
	The same with Pr9.00~Pr9.07		

9.4.4 Fixed trigger method

Fixed trigger mode：Setup motion parameters. Then, replace CTRG and HOME signal with Pr8.02 (trigger register) to trigger the path. This mode apply to fixed motion and simple operation system.

As below procedure：

1. Firstly, setup homing and path 0~ path 15 which need to run, can transmit parameter configuration temporarily after power on, also can configured to save with upper computer.

2. Enable drive.

3. Implement choice and start of actions by write corresponding instructions into 0x6002 (Pr8.02) .

Write 0x01P, P path motion (write 0x010 to run path 0, write 0x013 to run path 3)

Write 0x020, homing

Write 0x021, set current position as homing position.

Write 0x040, E-stop.

Read 0x000p, means positioning accomplished, can receive new data

Read 0x01P, 0x020, 0x040 means still does not response to instructions.

Read 0x10P, means path is running.

Read 0x200, means instruction accomplished and wait for positioning.

Set path 0 parameters as the table showing , path 1~path15 parameters are the same as path 0

Parameters	**Name**	**Definition**	**485 address**
Pr9. 00	Path0 Mode	The motion mode of Path0 motion **Bit0-3：** TYPE: 0 No Action 1 position mode	0X6200

		2 velocity mode 3 homing 4 stop **Bit4:** INS, 0 do not interrupt 1 interrupt （All interrupt now） **Bit5:** OVLP， 0 do not overlap 1 overlap **Bit6-7:** 0 absolute position 1 relative to command 2 relative to motor **Bit8-13：** 0-15 Jump to the corresponding path **Bit14：** JUMP: 0 do not jump 1 jump	
Pr9. 01	Path0 position H		0X6201
Pr9. 02	Path0 position L		0X6202
Pr9. 03	Path0 speed	rpm	0X6203
Pr9. 04	Path0 acceleration	ms/1000rpm	0X6204
Pr9. 05	Path0 deceleration	ms/1000rpm	0X6205
Pr9. 06	Path0 Pause time	The pause of path, delay time parameter etc, refer to PR motion type for specific meaning.	0X6206
Pr9. 07	Special Parameters	Path 0 is mapped to Pr8.02 parameters	0X6207
And so on		Each path occupy eight parameters	

Set path 1~ path15 as same as path 0 .

Implement choice and start of actions by write corresponding instructions into 0x6002 (Pr8.02), to select which path to run.

9.4.5 Immediately trigger method

Fixed trigger is limited by 16 path, but immediately trigger method is flexible. It is written to the current path at each time, at the same time trigger the operation of this path. Trigger position, speed , homing by a data frame.

This method adopt path0 to implement, path0 has 8 data in total, the last data Pr9.07 of it will mapped to Pr8.02, write in 0x10 can trigger path0 motion immediately.

As below procedure：

1. Firstly, configure homing and path which need to run, set these parameters by communication or set these parameters and save with upper computer. (homing must be configured)
2. Enable drive.

3. Trigger fixed path by Pr8.02
4. Or write in immediate data into Pr9.00-9.07, set Pr9.07=0x10, implement immediately running path 0.

For example：

Order	Sending orders （Master->Slave）				Return command (Slave->Master）		
1	**ID**	Sub-station No.	0~31		**ID**	Sub-station No.	0~31
2	**FC**	Function code	0x10		**FC**	Function code	0x10
3	**ADDR**	Address	0x62		**ADDR**	Address	0x62
4			0x00				0x00
5	**NUM1**	Data quantity Word	0x00		**NUM**	Actually written data quantity	0x00
6			0x08				0x08
7	**NUM2**	Data quantity Byte	0x10		**CRC**	check code	L
							H
8-9	**Pr9.00**	Mode	XXXX				
10-11	**Pr9.01**	High position	XXXX				
12-13	**Pr9.02**	Low position	XXXX				
14-15	**Pr9.03**	Speed	XXXX				
16-17	**Pr9.04**	Acceleration	XXXX				
18-19	**Pr9.05**	Deceleration	XXXX				
20-21	**Pr9.06**	Delay time	XXXX				
22-23	**Pr9.07**	Trigger control	0x0010				
24	**CRC**	Check code	L				
25			H				

Please refer to parameter specification for specific data setting.

9.5 Operation case

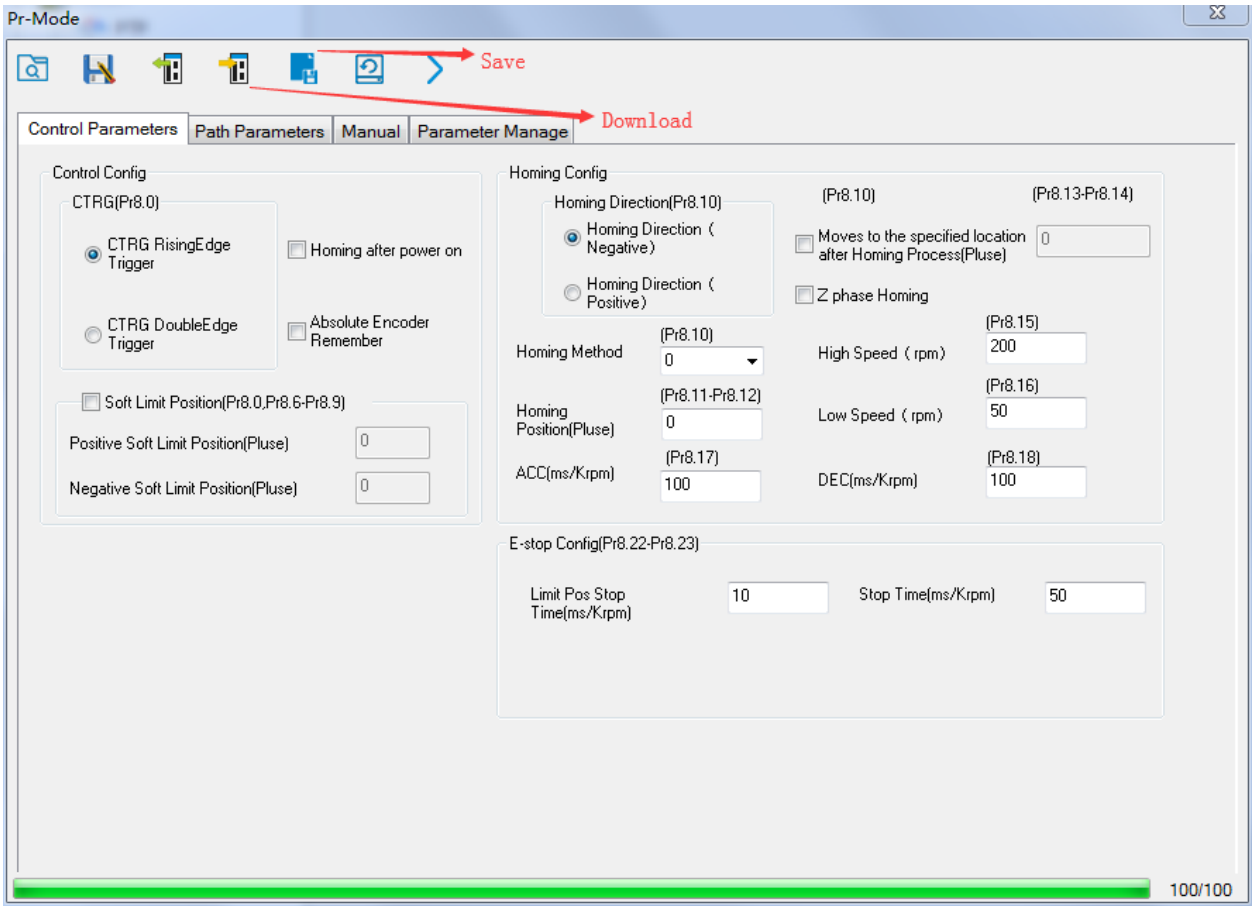
9.5.1 IO trigger case

Pr-Mode motion can be triggered by IO signal.

1、Parameters setting as follows:

Parameters	Name	Specification
Pr0.01	Control Mode Setup	Set Pr0.01=6 for Pr-Mode
Pr4.00	SI1 Input selection	Set 83 for internal SERVO-ON Set 03 for external SERVO-ON
Pr4.00-Pr4.08	SI input selection	Specific of the 9 input terminals' function distribution，refer to functional allocation table.
Pr4.10-Pr4.15	SO output selection	Specific of the 6 output terminals' function distribution，refer to functional allocation table.

2、Setup control parameters, such as: Trigger mode, Homing process, E-stop speed etc. The setting window as follow:



Notes: After the control parameter setting is completed, click the Download button of the toolbar to make the parameters valid. Click Save button to save the parameter to drive permanently.

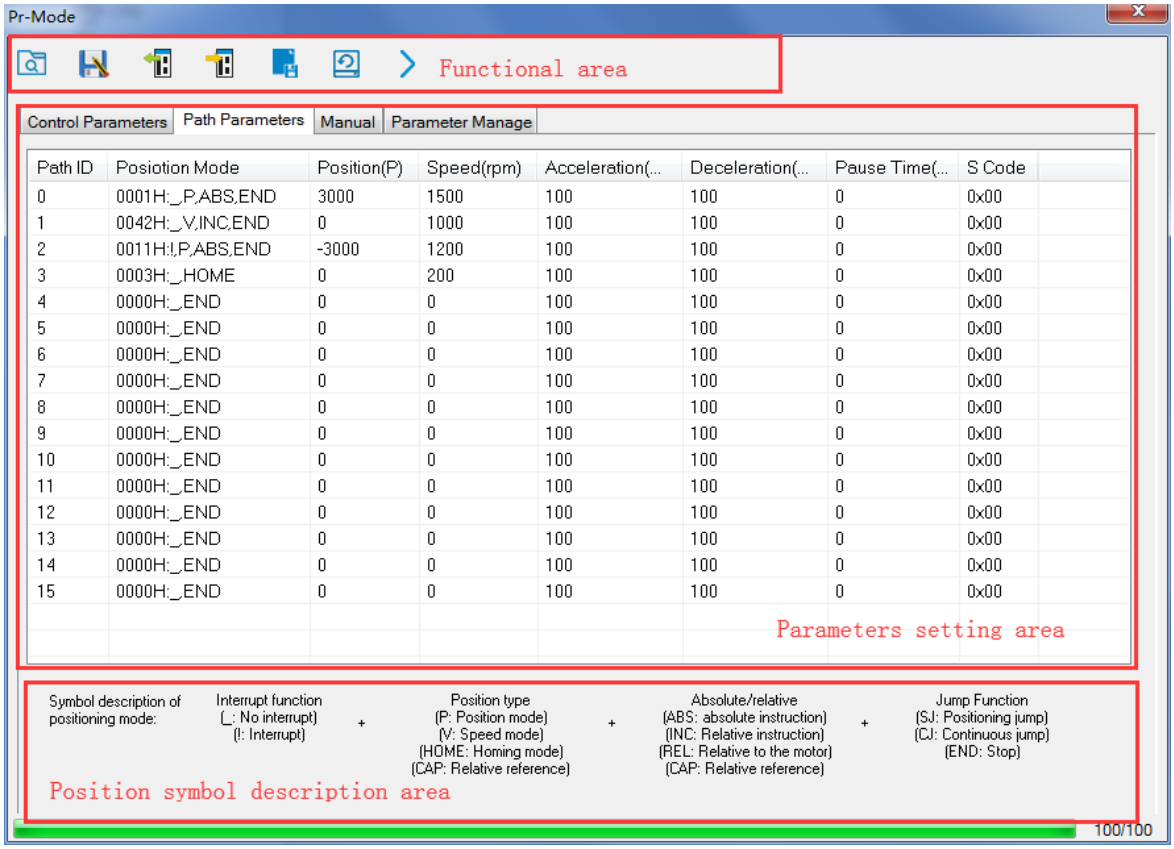
3、Setup path parameters, such as: Position mode, speed, ACC/DEC, etc.

Functional area: Read file, Upload, Download, Save, etc.

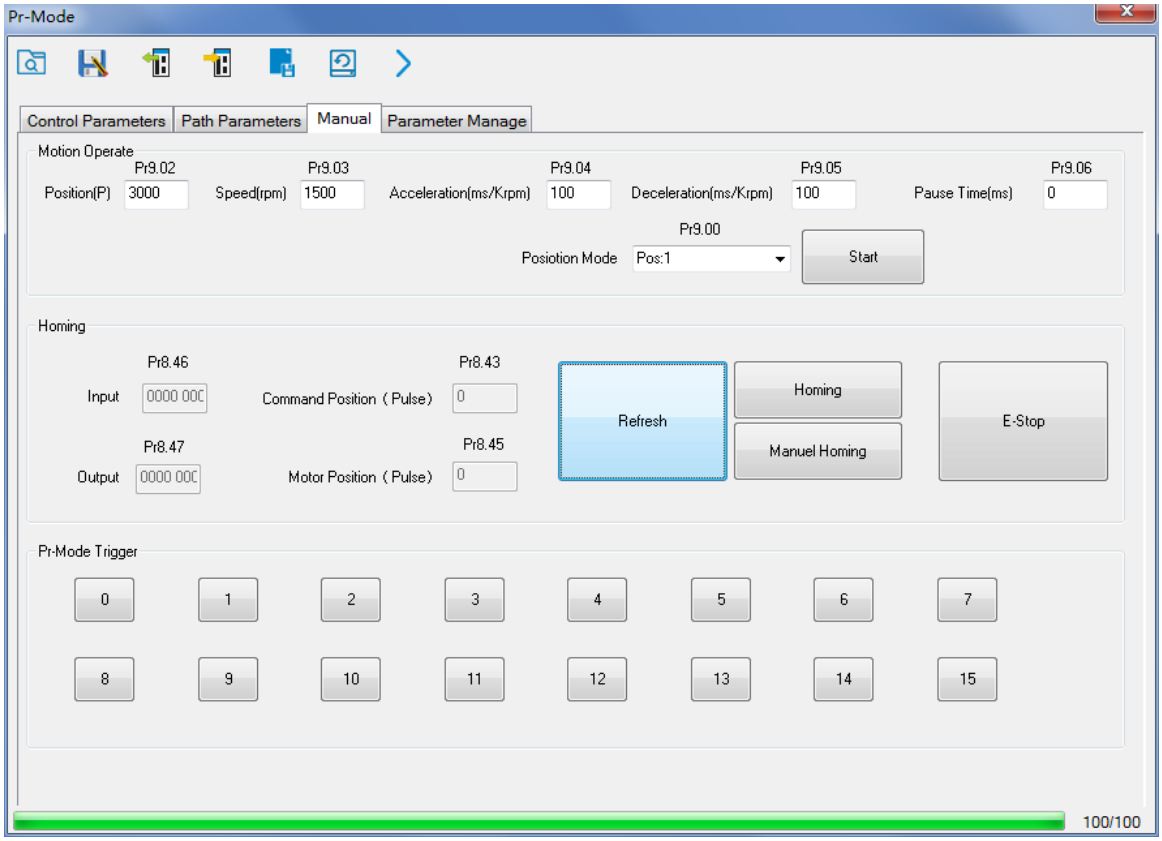
Parameters setting area: Position mode, speed, ACC/DEC, etc.

Position symbol description area: Explains the meaning of the path position symbol.

Notes: After the path parameter setting is completed, click the Download button of the toolbar to make the parameters valid. Click Save button to save the parameter to drive permanently.



4、Debug homing process, path trigger motion, input and output, etc. Its debugging interface is shown as follow:



Notes 1: Before using IO CTRG edge signal trigger path motion, select path number by IO combined signal,

and then use IO CTRG edge signal to trigger the corresponding path motion

Notes 2: If IO combined trigger mode valid, the IO combined filtering time must be set to ensure that all the IO combined signal changes finished within the filtering time range.

9.5.2 RS485 communication case

9.5.2.1 Write single data 0x06

NO	Send				Receive		
1	**ID**	Slave ID	0x01		**ID**	Slave ID	0x01
2	**FC**	Function code	0x06		**FC**	Function code	0x06
3	**ADDR**	Address	H		**ADDR**	Address	H
4			L				L
5	**DATA**	Data quantity (Word)	H		**DATA**	Actually written data quantity	H
6			L				L
7	**CRC**	Check code	L		**CRC**	Check code	L
8			H				H

Notes： The number of receive frame is the same as the send frame.

（1）Path 0（Absolute position mode，200000pulse，600rpm，50ms/1000rpm）

NO	RS485 communication data frame	Details
0	01 06 20 09 00 01 93 C8	Servo enable
1	01 06 62 00 00 01 57 B2	Absolute position mode
2	01 06 62 01 00 03 87 B3	200000pulse, 16 bit H
3	01 06 62 02 0D 40 32 D2	200000pulse, 16 bit L
4	01 06 62 03 02 58 66 E8	600rpm
5	01 06 62 04 00 32 56 66	ACC: 50ms/1000rpm
6	01 06 62 05 00 32 07 A6	DEC: 50ms/1000rpm
7	01 06 60 02 00 10 37 C6	Trigger Path0 motion
8	01 06 60 02 00 40 37 FA	E-stop
9	01 06 20 09 00 00 52 08	Servo disable

（2）Path 0（Relative position mode，10000pulse，600rpm，50ms/1000rpm）

NO	RS485 communication data frame	Details
0	01 06 20 09 00 01 93 C8	Servo enable
1	01 06 62 00 00 41 56 42	Relative position mode
2	01 06 62 01 00 00 C7 B2	10000pulse, 16 bit H
3	01 06 62 02 27 10 2D 8E	10000pulse, 16 bit L
4	01 06 62 03 02 58 66 E8	600rpm
5	01 06 62 04 00 32 56 66	ACC: 50ms/1000rpm
6	01 06 62 05 00 32 07 A6	DEC: 50ms/1000rpm
7	01 06 60 02 00 10 37 C6	Trigger Path0 motion
8	01 06 60 02 00 40 37 FA	E-stop
9	01 06 20 09 00 00 52 08	Servo disable

（3）Path 0（Velocity mode，600rpm，50ms/1000rpm）

NO	RS485 communication data frame	Details
0	01 06 20 09 00 01 93 C8	Servo enable
1	01 06 62 00 00 02 17 B3	Velocity mode
2	01 06 62 03 02 58 66 E8	600rpm
3	01 06 62 04 00 32 56 66	ACC: 50ms/1000rpm
4	01 06 62 05 00 32 07 A6	DEC: 50ms/1000rpm
5	01 06 60 02 00 10 37 C6	Trigger Path0 motion
6	01 06 60 02 00 40 37 FA	E-stop
7	01 06 20 09 00 00 52 08	Servo disable

（4）Path 1（Absolute position mode，-200000pulse，600rpm，50ms/1000rpm）

NO	RS485 communication data frame	Details
0	01 06 20 09 00 01 93 C8	Servo enable
1	01 06 62 08 00 01 D6 70	Absolute position mode
2	01 06 62 09 FF FC 07 C1	-200000pulse, 16 bit H
3	01 06 62 0A F2 C0 F3 40	-200000pulse, 16 bit L
4	01 06 62 0B 02 58 E7 2A	600rpm
5	01 06 62 0C 00 32 D7 A4	ACC: 50ms/1000rpm
6	01 06 62 0D 00 32 86 64	DEC: 50ms/1000rpm
7	01 06 60 02 00 11 F6 06	Trigger Path1 motion
8	01 06 60 02 00 40 37 FA	E-stop
9	01 06 20 09 00 00 52 08	Servo disable

（5）Path 1（Velocity mode，300rpm，50ms/1000rpm）

NO	RS485 communication data frame	Details
0	01 06 20 09 00 01 93 C8	Servo enable
1	01 06 62 08 00 02 96 71	Velocity mode
2	01 06 62 0B 01 2C E7 FD	300rpm
3	01 06 62 0C 00 32 D7 A4	ACC: 50ms/1000rpm
4	01 06 62 0D 00 32 86 64	DEC: 50ms/1000rpm
5	01 06 60 02 00 11 F6 06	Trigger Path1 motion
6	01 06 60 02 00 40 37 FA	E-stop
7	01 06 20 09 00 00 52 08	Servo disable

（6）Homing

NO	RS485 communication data frame	Details
0	01 06 20 09 00 01 93 C8	Servo enable
1	01 06 60 0A 00 00 B7 C8	Homing Method
2	01 06 60 0F 00 64 A6 22	High speed for homing
3	01 06 60 10 00 1E 16 07	Low speed for homing
4	01 06 60 02 00 20 37 D2	Trigger Homing process
5	01 06 60 02 00 40 37 FA	E-stop

7	01 06 20 09 00 00 52 08	Servo disable

9.5.2.2 Write multiple data 0x10

Fixed trigger is limited by 16 segment position, but immediately trigger method is flexible. It is written to the current path at each time, at the same time trigger the operation of this path. Realize position, speed, homing and such actions by a data frame.

This method adopt PR0 to implement, PR0 has 8 data in total, the last data Pr9.07 of it will mapped to Pr8.02, write in 0x10 can trigger Path0 operation immediately, realize data trigger running immediately.

Operating steps:

1. Firstly, configure homing and path which need to run, can power on and send parameter configuration temporarily, also can configure and save with upper computer. (homing must be configured)
2. Enable drive.

NO	RS485 communication data frame	Details
0	01 06 20 09 00 01 93 C8	Servo enable
1	01 06 20 09 00 00 52 08	Servo disable

3. Operate fixed path by Pr8.02
4. write in immediate data by Pr9.00-9.07, and Pr9.07=0x10, implement immediately running path 0.

Demonstrate with immediately trigger method

An example of 485 communication data frame operation is shown below:

Order	Sending orders （Master->Slave）				Return command (Slave->Master）		
1	**ID**	Sub-station No.	0~31		**ID**	Sub-station No.	0~31
2	**FC**	Function code	0x10		**FC**	Function code	0x10
3	**ADDR**	Address	0x62		**ADDR**	Address	0x62
4			0x00				0x00
5	**NUM1**	Data quantity Word	0x00		**NUM**	Actually written data quantity	0x00
6			0x08				0x08
7	**NUM2**	Data quantity Byte	0x10		**CRC**	check code	L
							H
8-9	**P9.00**	Mode	XXXX				
10-11	**P9.01**	High position	XXXX				
12-13	**P9.02**	Low position	XXXX				
14-15	**P9.03**	Speed	XXXX				
16-17	**P9.04**	Acceleration	XXXX				
18-19	**P9.05**	Deceleration	XXXX				
20-21	**P9.06**	Delay time	XXXX				
22-23	**P9.07**	Trigger control	0x0010				
24	**CRC**	Check code	L				
25			H				

Absolute position mode： 01 10 62 00 00 08 10 00 01 00 01 86 A0 01 F4 00 64 00 64 00 00 00 10 AA BF

01 slave ID 01

10 function code，write multi data

62 00 first address mapped to Pr9.00

00 08 8 consecutive operating addresses from 62 00 to 62 07，mapped to Pr9.00~Pr9.07

10 Hexadecimal data of the number of data，8 register，each address data is divided into high and low bits， 8*2=16

00 01 data written down to the first addresses of 6200 mapped to Pr9.00.
Motion Mode, absolute position mode

00 01 86 A0 data written down to the second and third addresses of 6201 mapped to Pr9.01；6202 mapped to Pr9.02.
Hexadecimal data of position=100000plus. All positions in PR mode are in units of 10000P/r,
00 01 86 A0 represents 10 turns of motor rotation.

01 F4 data written down to the 4th addresses of 6203 mapped to Pr9.03
Hexadecimal data of Speed=500r/min

00 64 data written down to the 5th addresses of 6204 mapped to Pr9.04
Hexadecimal data of acceleration time=100ms

00 64 data written down to the 6th addresses of 6205 mapped to Pr9.05
Hexadecimal data of deceleration time=100ms

00 00 data written down to the 7th addresses of 6206 mapped to Pr9.06
Hexadecimal data of the delay time=0ms

00 10 data written down to the 8th addresses of 6207 mapped to Pr9.07, to trigger the action, immediately trigger method（1P，Immediately trigger path P）

AA BF the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

The final analysis is as follows: speed is 500r/min, acceleration and deceleration time is 100ms, and the position of absolute positioning is 10 rotations.

01 10 62 00 00 08 10 00 01 00 00 00 00 01 F4 00 64 00 64 00 00 00 10 A0 4A

The final analysis was performed at a speed of 500r/min, acceleration and deceleration time of 100ms, and the position of absolute positioning 0 rotations.

Relative position mode： 01 10 62 00 00 08 10 00 41 00 01 86 A0 01 F4 00 64 00 64 00 00 00 10 EA 8F

01 slave ID 01

10 function code，write multi data

62 00 first address mapped to Pr9.00

00 08 8 consecutive operating addresses from 62 00 to 62 07，mapped to Pr9.00~Pr9.07

10 Hexadecimal data of the number of data，8 register，each address data is divided into high and low bits， 8*2=16

00 41 data written down to the first addresses of 6200 mapped to Pr9.00.
Motion Mode, relative position mode

00 01 86 A0 data written down to the second and third addresses of 6201 mapped to Pr9.01；6202 mapped to Pr9.02.
Hexadecimal data of position=100000plus. All positions in PR mode are in units of 10000P/r,

00 01 86 A0 represents 10 turns of motor rotation.

01 F4 data written down to the 4th addresses of 6203 mapped to Pr9.03
Hexadecimal data of Speed=500r/min

00 64 data written down to the 5th addresses of 6204 mapped to Pr9.04
Hexadecimal data of acceleration time=100ms

00 64 data written down to the 6th addresses of 6205 mapped to Pr9.05
Hexadecimal data of deceleration time=100ms

00 00 data written down to the 7th addresses of 6206 mapped to Pr9.06
Hexadecimal data of the delay time=0ms

00 10 data written down to the 8th addresses of 6207 mapped to Pr9.07, to trigger the action, immediately trigger method（1P，Immediately trigger path P）

EA 8F the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

The final analysis is as follows: speed is 500r/min, acceleration and deceleration time is 100ms, and the position of relative positioning is 10 rotations.

Homing mode：01 06 60 02 00 21 F6 12 （Back to origin high-speed, low-speed, and back to zero mode can be set in the eighth set of parameters, using default values this time）

Caution：In Pr mode, the origin induction switch is connected to the driver, which is different from the impulse control. Limited by conditions, only the current position can be demonstrated to the customer： Write 0x021，The current location manually set to zero.。

The frame format function is：

01 slave ID 01

06 function code，write single data

NO	Send				Receive		
1	ID	Slave ID	0~31		ID	Slave ID	0~31
2	FC	Function code	0x06		FC	Function code	0x06
3	ADDR	Address	H		ADDR	Address	H
4			L				L
5	DATA	Data quantity (Word)	H		DATA	Actually written data quantity	H
6			L				L
7	CRC	check code	L		CRC	check code	L
8			H				H

60 02 register address，mapped to Pr8.02

00 21 the data write into the register，Write 0x021，The current location manually set to zero.
Write 0x01P，P section positioning
Write 0x020，homing
Write 0x021，set current position as homing point
Write 0x040，e-stop

F6 12 the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

After the current position is set to zero manually, you can click absolute positioning again to send it manually,

indicating that the current position is set to zero manually

JOG is IO input, there is no communication control method, you can push users to write relative positioning data in real time, and trigger inching motion immediately instead.

Velocity mode： 0110 62 00 00 08 10 00 02 00 00 00 00 03 E8 00 64 00 64 00 00 00 10 DA 41

01 slave ID 01

10 function code，write multi data

62 00 first address mapped to Pr9.00

00 08 8 consecutive operating addresses from 62 00 to 62 07，mapped to Pr9.00~Pr9.07

10 Hexadecimal data of the number of data，8 register，each address data is divided into high and low bits， 8*2=16

00 02 data written down to the first addresses of 6200 mapped to Pr9.00, speed mode

00 00 00 00 data written down to the second and third addresses of 6201 mapped to Pr9.01；6202 mapped to Pr9.02.Hexadecimal data of position=0plus. All positions in PR mode are in units of 10000P/r，, 00 00 00 00 represents 0 turns of motor rotation in Speed mode

03 E8 data written down to the fourth addresses of 6203 mapped to Pr9.03
Hexadecimal data of Speed=1000r/min

00 64 data written down to the five addresses of 6204 mapped to Pr9.04
Hexadecimal data of acceleration time=100ms

00 64 data written down to the six addresses of 6205 mapped to Pr9.05
Hexadecimal data of deceleration time=100ms

00 00 data written down to the seven addresses of 6206 mapped to Pr9.06
Hexadecimal data of the delay time=0ms

00 10 data written down to the eight addresses of 6207 mapped to Pr9.07 ， to trigger the action，
Immediately trigger method（1P，Immediately trigger path-P，The sample Pr9.00~9.07 is the positioning related data of path-0）

DA 41 the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

The final analysis is as follows: speed=1000r/min, acceleration and deceleration time is 100ms, velocitymode

E-stop: 01 06 60 02 00 40 37 FA

Servo enable: 01 06 20 09 00 01 93 C8

Servo disable: 01 06 20 09 00 00 52 08

Chapter 10 Order Guidance

10.1 Capacity Selection

To determine the capacity of servo system, we must consider the inertia of load, torque of load, the positioning accuracy, the requirement of the highest speed, consider the selection according to the following steps:

1) Calculate Inertia of Load and Torque

You can refer to relative information to calculate inertia of load, torque of load, acceleration/deceleration torque as the next step basis.

2) Identify Mechanical Gear Ratio

According to the maximum speed and the highest speed of the motor ,you can calculate the maximum of mechanical reduction ratio, by using it and minimum of motor turning unit ,to calculate if they can meet the requirements of the smallest position unit or not. If the positional precision is high, you can increase the mechanical reduction ratio or select motor with higher capacity.

3) Calculate Inertia and Torque.

Convert mechanical reduction ratio of the load inertia and load torque to the motor shaft, while the result shall be not 5 times more than motor inertia. If the requirements can't be matched, you can increase the mechanical reduction ratio (the actual maximum speed reducing) or select larger capacity motor.

10.2 Electronic Gear Ratio

In position control mode, the actual speed = command pulse velocity× G ×mechanical reduction ratio.
In position control mode, the actual load minimum displacement = minimum command pulse travel ×G ×mechanical reduction ratio.
【Note】If the electronic gear ratio of G is not 1, gear ratio division may have the remainder, then there will be position deviation existed, the maximum deviation is the minimum of rotation (minimum resolution).

Appendix

A、Modbus Communication

There are two kinds of modbus communication methods of drivers: RS485 and RS232. RS232 belongs to point-to-point communication, which is used for PC protocol and cannot realize multi-network. RS485 belongs to a single master and multi slave communication mode and can realize multi network control.

A.1 Wiring

（1）The shorter the connection between each node is the better. The recommend connection should no more than 3m；

（2）Connect one terminal resistor to each end of the node. The recommended resistance value is 120 ohms；

（3）Shielded twisted pair is recommended for RS485 communication wirings；

（4）Connect GND is essential for communication；

（5）When using the shield wire, the two ends of the shield should connect PE, not GND, otherwise the port will be damaged；

（6）In order to reduce interference, RS485 communication cables should installed separately from other cables；

A.2 Parameters and interface for communication

A.2.1 Parameters setting

Pr5.29*	Name	Mode setup of RS485 communication			Mode	P	S T
	Range	0~255	Unit	—	Default	5	
	Data Type	16bit	Access	R/W	Address	053BH	
	Repower	–					

Value	Data bit	Parity-check	Stop bit
0	8	Even Parity	2
1	8	Odd Parity	2
2	8	Even Parity	1
3	8	Odd Parity	1
4	8	None	1
5	8	None	2

Pr5.30*	Name	Baud rate setup of RS485 communication	Mode	P	S T

	Range	0~6	Unit	—	Default	2
	Data Type	16bit	Access	R/W	Address	053DH
	Repower	–				

You can set up the communication speed of RS485.

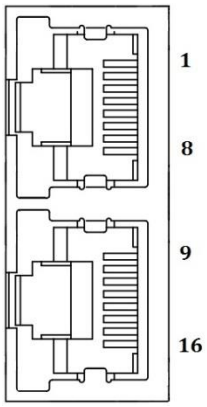
Setup value	Baud rate	Setup value	Baud rate
0	2400bps	4	38400bps
1	4800bps	5	57600bps
2	9600bps	6	115200bps
3	19200bps		

Pr5. 31 *	Name	RS485 slave axis address			Mode	P	S	T
	Range	0~127	Unit	—	Default	1		
	Data Type	16bit	Access	R/W	Address	053FH		
	Repower	-						

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

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

A.2.2 RS232/RS485 Communication Port

Port		Pin	Signal
CN4 CN5		1，9	RDO+(RS485)
		2，10	RDO-(RS485)
		3，11	/
		4，12	TXD(RS232)
		5，13	RXD(RS232)
		6，14	VCC5V
		7，15	GND
		8，16	/
			PE

A.3 Modbus Protocol

The driver supports 16bit data read and write of Modbus-RTU protocol, and its function codes include 0x03,0x06 and 0x10. 0x03 read data function code, 0x06 write single data function code and 0x10 write multiple data function code.

Notes： 1word=2byte=16bit

A.3.1 Function code of read data 0x03

The function code of read data is 0x03. It can read 1~100 16bit data. Now take slave ID 1, read 2 data as an example：(H is 8bit high for 16bit, L is 8bit low for 16bit)

NO	Send				Receive		
1	**ID**	Slave ID	0x01		**ID**	Slave ID	0x01
2	**FC**	Function code	0x03		**FC**	Function code	0x03
3	**ADDR**	Address	H		**NUM**	Data quantity（Byte）	0x00(H)
4			L				0x04(L)
5	**NUM**	Data quantity (Word)	0x00(H)		**DATA1**	Data1	H
6			0x02(L)				L
7	**CRC**	Check code	L		**DATA2**	Data2	H
8			H				L
9					**CRC**	Check code	L
10							H

Notes： The number of receive data is twice the number of send data quantity.

The communication data is shown as below：

[Send] 01 03 00 04 00 02 85 CA

[Receive] 01 03 04 00 00 00 02 7B F2

Send： The sent frame represents that the master reads the data from slave ID 1, the starting address is 0x0004 , the length is 2 Word (16bit). The CRC check code is 0xCA85.

Receive： The receive frame represents that the receive data is 4 byte (8bit) and the data is 00 00 00 02. The CRC check code is 0xF27B.

A.3.2 Function code of write single data 0x06

The function code of write single data is 0x06. Now take slave ID 1, write 1 data as an example：(H is 8bit high for 16bit, L is 8bit low for 16bit)

NO	Send				Receive		
1	**ID**	Slave ID	0x01		**ID**	Slave ID	0x01
2	**FC**	Function code	0x06		**FC**	Function code	0x06
3	**ADDR**	Address	H		**ADDR**	Address	H
4			L				L
5	**DATA**	Data quantity (Word)	H		**DATA**	Actually written data quantity	H
6			L				L
7	**CRC**	Check code	L		**CRC**	Check code	L
8			H				H

Notes： The number of receive frame is the same as the send frame.

The communication data is shown as below：

[Send] 01 06 00 04 00 02 49 CA

[Receive] 01 06 00 04 00 02 49 CA

Send： The send frame represents that the master write the data into slave ID 1, the starting address is 0x0004 , the length is 2 Word (16bit). The data is 0x0002. The CRC check code is 0xCA49.
Receive： The receive frame represents that write data into slave ID 1 finished successfully.

A.3.3 Function code of write multiple data 0x10

The function code of write multiple data is 0x10. In this case, 16 bits of multiple data are written. Now take slave ID 1, write 2 data as an example：(H is 8bit high for 16bit, L is 8bit low for 16bit)

NO	Send				Receive		
1	**ID**	Slave ID	0x01		**ID**	Slave ID	0x01
2	**FC**	Function code	0x10		**FC**	Function code	0x10
3	**ADDR**	Address	H		**ADDR**	Address	H
4			L				L
5	**NUM1**	Data quantity (Word)	0x00（H）		**NUM**	Actually written data quantity	0x00（H）
6			0x02（L）				0x02（L）
7	**NUM2**	Data quantity (Byte)	0x04 （2* NUM1）		**CRC**	Check code	L
							H
8	**DATA1**	DATA1	H				
9			L				
10	**DATA2**	DATA2	H				
11			L				
12	**CRC**	Check code	L				
13			H				

The communication data is shown as below：
[Send] 01 10 00 04 00 02 04 01 00 00 00 F3 A0
[Receive] 01 10 00 04 00 02 00 09
Send： The send frame represents that the master write the data into slave ID 1, the starting address is 0x0004 , the length is 2 Word (16bit). The data is 0x01000 and 0x0000. The CRC check code is 0xA0F3.
Receive： The receive frame represents that write data into slave ID 1 finished successfully.

A.3.4 Error response

When there is a mistake in the format of the send frame data, the slave feeds back the wrong reply frame data to the master station. The format is as follows：

NO	Error response frame data（Slave-->Master）		
1	**ID**	Slave ID	0~31
2	**FC**	Function code	(0x03/0x06/0x10)+0x80
3	**Error code**	Error code	0x01/0x02/0x03/0x08
4	**CRC**	Check code	L
5			H

The error code and its meaning are as follows：

Error code	Meaning
0x01	Function code error
0x02	Access address error
0x03	Data error, such as write data exceeding the limit
0x08	CRC check error

The communication data is shown as below：

[Send] 01 11 00 04 00 02 04 01 00 00 00 F3 A0

[Receive] 01 91 08 4C 56

Receive： CRC check error in the send data frame sent by the master station

[Send] 01 11 00 04 00 02 04 01 00 00 00 A2 65

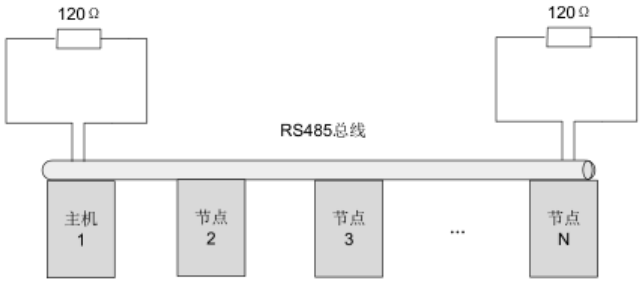
[Receive] 01 91 01 8C 50

Receive： Function code error in the send data frame sent by the master station

A.4 RS485 common problems and solutions

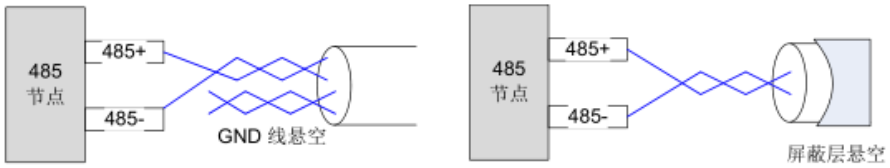
A.4.1 Common problems

1、Terminal resistance



The correct connection of terminal resistance is shown in the above figure, a 120 ohm terminal resistance need to connect in the head end and the end of the communication bus.

2、Wiring error



Firstly, confirm that the signal line of RS485 is connected correctly. Secondly, confirm whether the communication reference ground is connected correctly. If the node has no communication reference ground, it will be suspended, as shown in figure above. The shielding is connected the same way.

3、Signal interference

When there is an external interference signal in communication, magnetic rings can be placed at 1 and 2 in above figure to suppress the incoming external interference signal into the bus.

When there is an internal interference signal in communication, magnetic rings can be placed at 1 and 2 in above figure to suppress the incoming internal interference signal into the bus. Loop the UVW line around the magnetic ring three times. Be careful not to connect PE to the magnetic ring.

A.4.2 Problem solving procedure

1：Whether the communication parameters are set correctly (Slave ID no repetition, baud rate is set the same, data format is consistent)

2：Whether the terminal resistance connection is correct

3：Whether the wiring is standard for anti-interference

4：PE connection between ground and ground wire

5：Whether the communication lines are installed separately from other wirings