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Basic Information of Manual

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Proofreading Records

This version add MSComm function and apply introduce； and confirm the cable connection between motor and dirver.

Date	Version/Page	Result	Confirmation
12-02-14	48		

Precautions and Explanations

■Transport and storage

- Do not stack product package more than six layers;
- Do not climb, stand on or place heavy stuff on the product package;
- Do not pull the cable still connecting with machine to move product.
- Forbid impact and scratch on the panel and display;
- Prevent the product package from humidity, sun exposure, and rain.

■Wiring

- Ensure the persons involved into wiring and inspecting are specialized staff;
- Guarantee the product is grounded with less than 4Ω grounding resistance. Do not use neutral line (N) to substitute earth wire.
- Ensure grounding to be correct and solid, in order to avoid product failures or unexpected consequences;
- Connect the surge absorption diodes to the product in the required direction, otherwise, the product will be damaged;
- Ensure the power switch is OFF before inserting or removing plug, or disassembling chassis.

■Overhauling

- Ensure the power is OFF before overhauling or components replacement;
- Make sure to check failures after short circuit or overloading, and then restart the machine after troubleshooting
- Do not allow to frequently connect and disconnect the power, and at least one minute interval between power-on and power-off.

■Maintenance

Please implement routine inspection and regular check upon the following items, under the general usage conditions (i.e. environmental condition: daily average 30℃, load rate: 80%, and operating rate: 12 hours/ day)

Routine Inspection	Routine	● Confirm environmental temperature, humidity, dust, or foreign objects. ● Confirm abnormal vibration and noise; ● Check whether vents are blocked by yarn etc..
Regular Check	One year	● Check whether solid components are loose ● Confirm whether terminal block is damaged

■ Guarantee period

- the guarantee period is 12 months（from the date of shipment），if it is broken under correct operation in guarantee period，we can promise give our customer repair for free。
- broken by the reason as below, customer need pay for the maintainance：
  （1）wrong operation and repair by customer themself、retrofit induce driver broken；
  （2）broken by fire、water、abnormal voltage、other accident or twice accident induced device broken
  （3）broken by human accident；
  （4）doesn’t operate base on our use mamual book

Anyother reasons，please contact us。

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CHAPTER1 PRODUCT'S INSPECTION AND INFORMATION

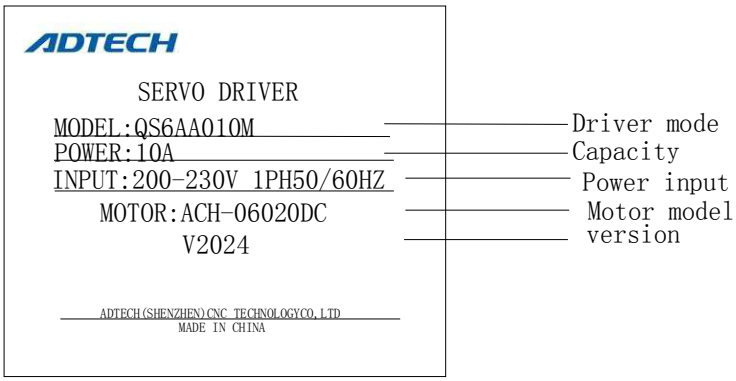
1.1 Product's inspection

The product's function and stability has been tested before shipment, for avoid some abnormal oversight accident induce the problem happen in transportation, pls check the item as below:

- Pls confirm if the product's model number and make sure it is the model you want。
- Compare the product list and see if accessories integrity and not been broken
- Check the appearance of motor and driver, if it is damage by the transportation, do not electrify
- Inspection if any parts fall off
- Inspect the axis of the motor can rolling by hand smoothly。Note motor with break can't be roll without external breaking power .

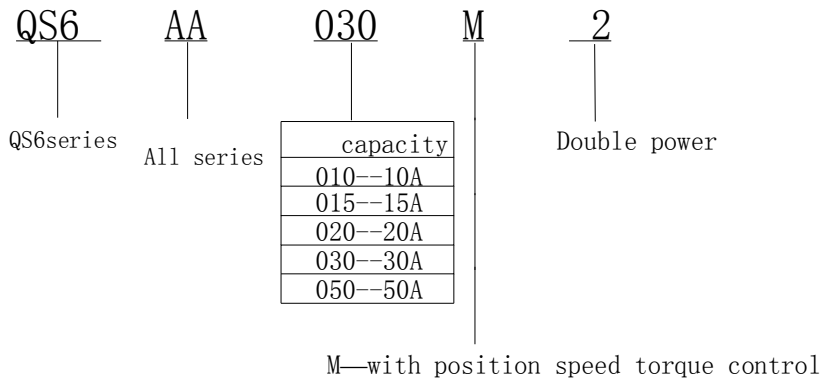
If any abnormal happen as describe above， pls contact us as soon as possible.

1.2 Product's nameplate

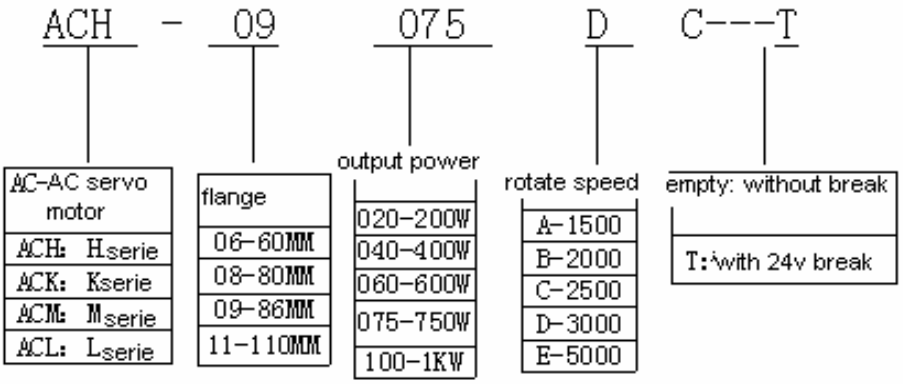


1.3Naming rule of servo motor and driver

1.3.1 Servo driver's naming



1.3.2 Servo motor's naming rule



1.4 Match chart of servo motor and driver

Output rate	series	Servo motor	Servo driver	B	K	Motor rate torque and current	remark
50W	ACK	ACK-04005DC	QS6AA010M		S	0.16Nm,1.20A	B With barek S Small inertia M Mid inertia L Big inertia
100W	ACK	ACK-04010DC			S	0.32Nm,1.38A	
200W	ACH	ACH-06020DC			S	0.64Nm,1.38A	
	ACK	ACK-06020DC			S	0.64Nm,1.50A	
400W	ACH	ACH-06040DC	QS6AA015M		S	1.27Nm,2.89A	
	ACK	ACK-06040DC			S	1.27Nm,2.80A	
750W	ACH	ACH-08075DC	QS6AA020M		S	2.40Nm,4.78A	
	ACH	ACH-09075DC			S	2.40Nm,3.00A	
	ACH	ACH-08075BC			S	3.50Nm,3.00A	
	ACH	ACH-09075DC-T		B	M	2.40Nm,4.78A	
1000W	ACF	ACF-13100CC			M	4.00Nm,4.00A	
	ACH	ACH-13100CC-T		B	S	4.00Nm,4.00A	
1200W	ACH	ACH-11120BC	QS6AA030M2		S	6.00Nm,4.50A	
	ACH	ACH-11120DC			M	4.00Nm,5.00A	
	ACH	ACH-11120BC-T		B	S	6.00Nm,4.50A	
1500W	ACH	ACH-13150CC			M	6.00Nm,6.00A	
	ACH	ACH-11150DC			M	5.00Nm,6.00A	
	ACH	ACH-13150AC	QS6AA050M2		M	10.0Nm,6.00A	
	ACH	ACH-13150AC-T		B	S	10.0Nm,6.00A	
1800W	ACH	ACH-11180DC			M	6.00Nm,6.00A	
2000W	ACH	ACH-13200CC-T		B	M	7.70Nm,7.00A	
2300W	ACH	ACH-13230AC			L	15.0Nm,9.50A	
2600W	ACH	ACH-13260CC			S	10.0Nm,10.0A	

1.5 Technical specifications of servo driver

Base specification	control technique			Three phase full-wave rectification SVPWM Space Vector cotrol
	Powe input			AC220V -15%~10%
	reaction			2500-line incremental photoelectric encoder
	Use condition	use/Storage temperature		45℃/-40℃~55℃
		use/Storage humidity degrees		40%~80%/90%（non condensing）
		Protection level		IP10
		Vibration resistance/ inpact resistance		4.9m/s^2/19.6 m/s^2
		sea level elevation		<1000m,1000m reduce rate voltage
		Atm press		86~106kpa
Position mode	Input signal	Command	Impulse various	1. inpulse+direction 2. inpulse+inpulse 3. A+B 90°Orthogonal pulse

		inpu lse	Pulse form	1. Differential drive 2. collector open circuit
			impulse frequency	1. Differential drive：500K 2. collector open circuit：200K
Speed mode	Simulation command input		-10V~10V input impedanc 10kΩ	
	Command +/- speed		Parameter setting	
	Instructions percentage		Parameter setting	
	Instructions source		External analogue 、Internal speed instructions	
Torque mode	Simulation command input		-10V~10V, input impedanc 10kΩ	
	Command +/- speed		Parameter setting	
	Instructions percentage		Parameter setting	
	Instructions source		External analogue 、Internal speed instructions	
I/O signal	Pulse output signal		Encoder A、B、Z differ act output，Zsignal corrector output	
	Input signal		Servo EN、ACLR、Position banned、Are turning the limit、Reversal limit、conrol mode。	
	Output signal		Positioning complete、Servo alarm、servo ready、break output、zero point output	
Built in Functions	defencive function		overcurrent、overvoltage、low voltage、overload 、over heat、lack phase，over speed、encoder abnormal、outoftolerance、mode abnormal alarm etc.	
	Surveillance Function		Rotate speed、current location、current pulse frequency、positional deviation、Motor torque、Motor current、Analog input values, etc	
	Communicatio n function		Through RS232 reality communication with PC，reality parameter change、monitor of servo system’s wroking	
	deixis		6 point LED display	
Other characteri stics	speed regulation ratio		1:5000	
	Speed fluctuation rate		<±0.03%（Rated load in）	

CHAPTER Ⅱ INSTALLMENT

2.1 SERVO DRIVER'S INSTALLMENT

2.1.1 Installing environmental conditions

The install environment has directly effect of driver's function and service life，so it must be installed under condition as below:

1. Working temperature：0~45℃；Work environment humidity：lower than 40%~80% (non condensing)。
2. Storage environment temperature：-40~55℃；Storage environment humidity：lower than 90% (non condensing)。
3. vibrate： lower than 0.5G。
4. To prevent the rain drops of rain or moist environment。
5. Avoid direct sunlight。
6. Prevent oil mist、erosion of salt。
7. Prevent corrosive liquid、gas。
8. Prevent dust、cotton fibre And metal scraps into thin。
9. Far from radioactive substances and flammable objects。
10. Many driver install in one box，pls remain enough space between each driver，it is better for flow of air to help heat dissipation，Please plus the configuration of the fan，make sure the temperature not too high。The safe temperature is 45℃。
11. Near a vibration sources，pls add a vibration absorber or vibration rubber gaskets if can not avoid the vibration
12. Jamming equipment around the servo drive will produce interference, resulted in false operation. Noise filter and other anti-jamming measures can be used to guarantee drive to operate normally. Please note that leakage current will increase after noise filter added. To avoid the above situation, isolation transformer can be adopted. Please pay special attention that reasonable wring and shielding measures can prevent drive control signal from interference.

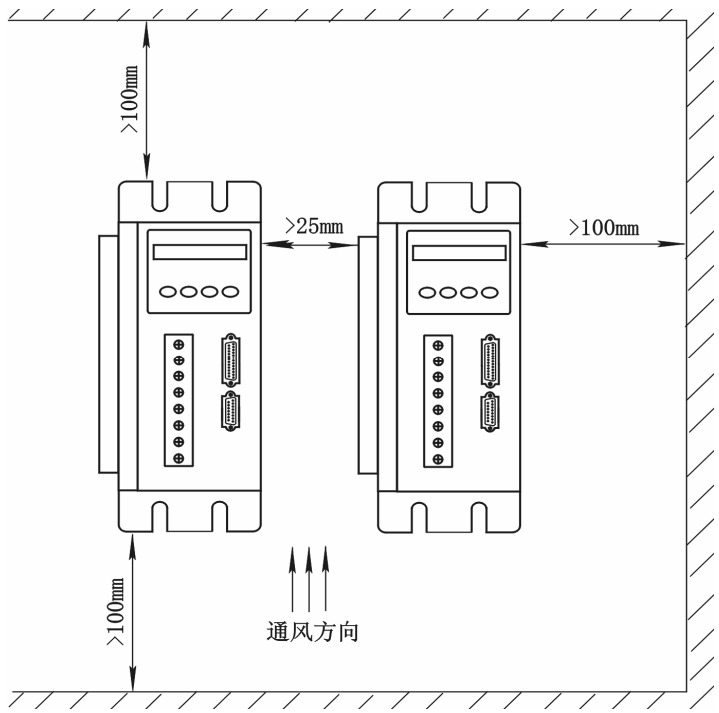
2.1.2 Use under harsh environments

When used in harsh environments, servo drive will contact with corrosive gases, moisture, metal dust, water and processing liquids, which shall bring the malfunctions. Therefore, noise filter and other anti-interference measures should be taken to ensure the drive to work normally. Please note that leakage current will be increased after installed noise filter. In order to avoid the above situation, you can select isolation transformer, in particular, control signal lines of drive are easy to be interfered and reasonable wiring and shielding measures should be considered.

2.1.3 Installation method

- Installation direction: the direction of the normal installation is vertical upright orientation.
- Fixing: 4 pieces M5 screw on servo drive should be fixed.
- Ventilation and cooling: natural cooling mode is adopted. Cooling fan should be installed in the electric control cabinet.

2.1.4 Multi- drivers install



2.2 Servo motor's install

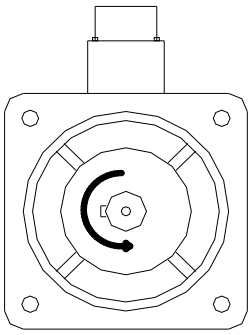
- Working environment temperature：0~45℃； Work environment humidity：lower than 40% ~80% (non condensing).
- Storage environment temperature：-40~55℃； Storage environment humidity：lower than 80% (non condensing).
- vibrate： lower than 0.5G。
- Avoid direct sunlight。
- Prevent oil mist、erosion of salt。
- Prevent corrosive liquid、gas。

2.3 Notice of installment

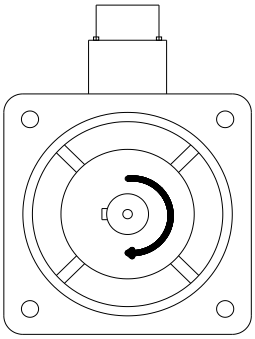
- Do not hit motor or motor shaft while disassembling pulley, in order to prevent encoder from damage; use spiral drawing tools for disassembly;
- Prohibit large axial and radial load on motor; suggest to select flexible coupling to connect the load;
- Fix motor with washer fastening to prevent the motor from loosing.

2.4 Motor rotation direction definition

Face motor's shaft extension，counterclockwise rotation direction is foreward，clockwise rotation direction is inversion。The driver's num 11 parameter can change the motor's rotate direction, According to the situation to change the direction。



foreward
anticlockwise（CW）



inversion
clockwise（CCW）

Chapter III Wiring

3.1 Wiring requirement

● Use correct wire material according to the wire use specification,
● Cable Length ， Instructions cable , less than 3m，encoder wire must less than10m；
● Check R、S、T and r、t power box wire connecting correct or not，do not connect with 380V power source;
● Motor U、V、W connector，much match motor's relevant connector, wrong connect will induce motor stop or damage;
● Must be reliable grounding，And the single point grounding；
● Avoid wrong motion by noise，pls add insulating transformer in the power source and noise prevent device
●Signal wire keep distance more than 30cm to match power wire(power line/motor line), do no put them in same wiring tube.
● Pls install using type circuit breaker make sure driver can cutting down power in emergency situation.
● Pls install Surge absorption components to match circuit's Perceptual component, DC coil reverse in parallel fly-wheel diode, AC coil in parallel with Resistance and capacitance absorption loop.

3.1.1 Driver terminal

● QS6AA010M/015M/020M

terminal marking	terminal name	specification
R、T	Main power input	Driver's main power input
CN1	control	Use for connect controller or PLC
CN2	Encoder connector	Encoder refund signal
CN3	Communication connector	Use for communication with PC (usb port)
PE	ground connection	Motor external hall ground connector
U、V、W	Motor power line	Supply current to motor

● QS6AA030M2/050M2

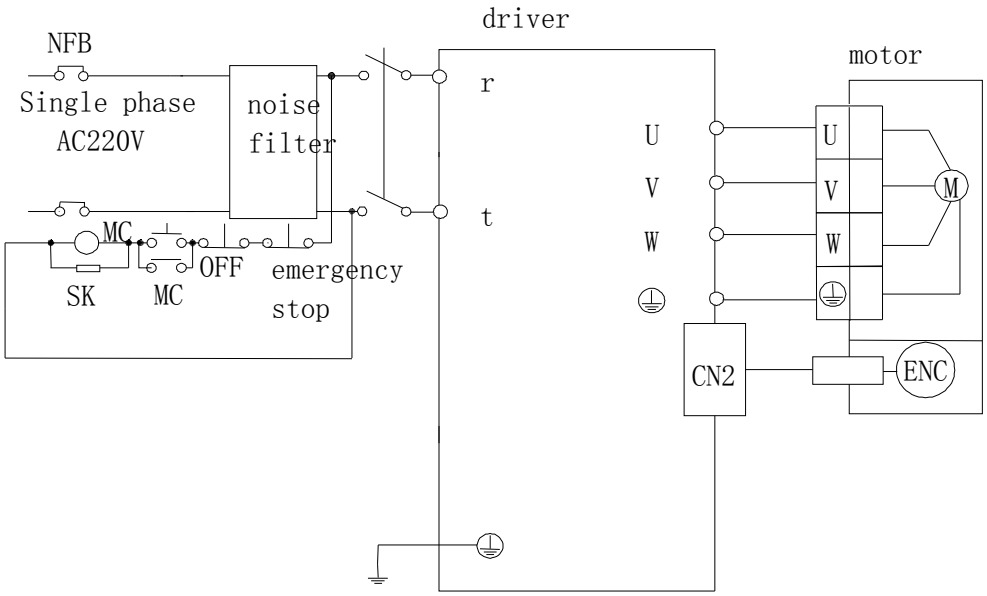
terminal mark	terminal name	specification
R、S、T	Main power input,	Driver's main power input
r、t	Power control	Driver's control power input
U、V、W	Motor power line	Supply current to motor
CN1	control	Use for connect controller or PLC
CN2	Encoder connector	Encoder refund signal
CN3	Cmu connector	Use for communication with PC (usb port)
P、D	blank	
PE	Connect ground	Motor external hall ground connector

3.1.2 Wire specification

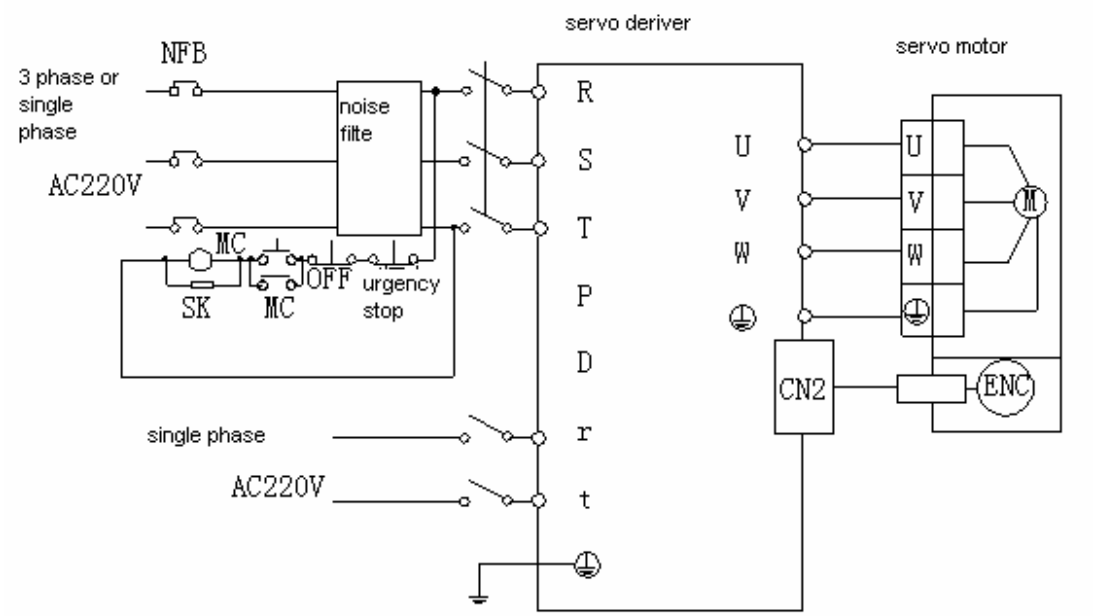
Motor model	Line diameter requirements			
	Main power	Control power	Motor power line	Encoder and control signal wire
100~750W	1.25 mm^2	1.25 mm^2	1.4 mm^2	0.14mm^2
1KW~1.5KW	2.0mm^2	1.25 mm^2	2.0 mm^2	0.14mm^2
2.3KW~2.6KW	3.5mm^2	1.25 mm^2	3.5mm^2	0.14mm^2

3.2 Motor and power's wiring diagram

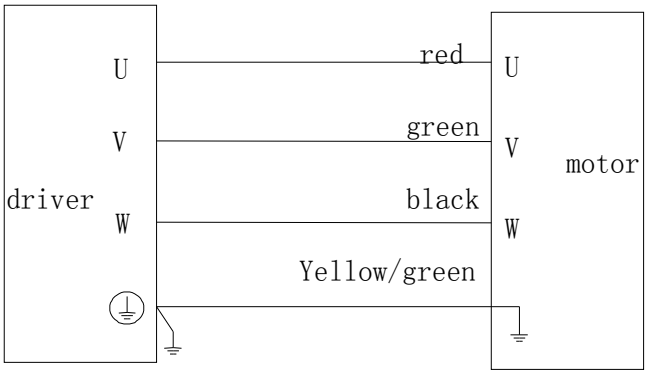
3.2.1 QS6AA010M/015M/020M wiring diagram



3.2.2 QS6AA030M2/050M2 connection diagram



3.3 Power line terminal even chart



3.4 CN1 Signal controller terminals

3.4.1 Terminal arrangement

18	16	14	12	10	8	6	4	2	
	17	15	13	11	9	7	5	3	1
36	34	32	30	28	26	24	22	20	
	35	33	31	29	27	25	23	21	19

Note:
here for welding connection side aspect

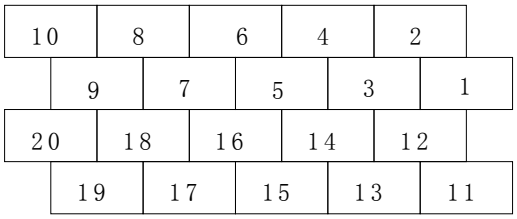
3.2.2 Terminal name and function

TERMINALS	REMARK	STATE	TERMINALS	NAME	STATE
1	COIN+	POSITIONING COMPLETE +	19	VIN	ANALOG INPUT
2	COIN-	POSITIONING COMPLETE -	20	GND	ANALOG GROUND
3	ALM-	SERVO ALARM-	21	RESERVE	——
4	ALM+	SERVO ALARM +	22	RESERVE	——
5	SRDY+	SERVO READY +	23	RESERVE	——
6	SRDY-	SERVO READY -	24	PULSE-	PULSE SIGNAL
7	BRK+	BRAKE SIGNAL	25	PULSE+	PULSE SIGNAL
8	BRK-	BRAKE SIGNAL	26	SIGN-	DIRECTION SIGNAL
9	INCOM+	V+	27	SIGN+	DIRECTION SIGNAL
10	EN-	SERVO EN	28	CZ+	ENCODER ZSIGNAL
11	INTH-	COMMAND PULSE FORBID	29	CZ-	
12	CW-	ARE TURNING LIMIT	30	OZ+	ENCODER Z+
13	CCW-	REVERSAL LIMIT	31	OZ-	ENCODER Z-
14	CLR-	ACLR	32	OB+	ENCODER B+
15	MODE-	FUNCTION	33	OB-	ENCODER

		SELECT			B-
16	RESERVE	——	34	OA+	ENCODER A+
17	RESERVE	——	35	OA-	ENCODER A-
18	RESERVE	——	36	RESERVE	——

3.5 CN2 encoder Terminal

3.5.1 Terminal arrangement



Note: picture show welding wire connect side aspect

3.5.2 Terminal definition

TERMINALS	REMARK	STATE	TERMINALS	NAME	STATE
1	A+	PG INPUT A PHASE	11	U+	PG INPUT U PHASE
2	A-		12	U-	
3	B+	PG INPUT B PHASE	13	V+	PG INPUT V PHASE
4	B-		14	V-	
5	Z+	PG INPUT Z PHASE	15	W+	PG INPUT W PHASE
6	Z-		16	W-	
7			17		
8	+5V	POWER 5V	18	0V	POWER 0V
9			19		
10	RESERVE	—	20	RESERVE	—

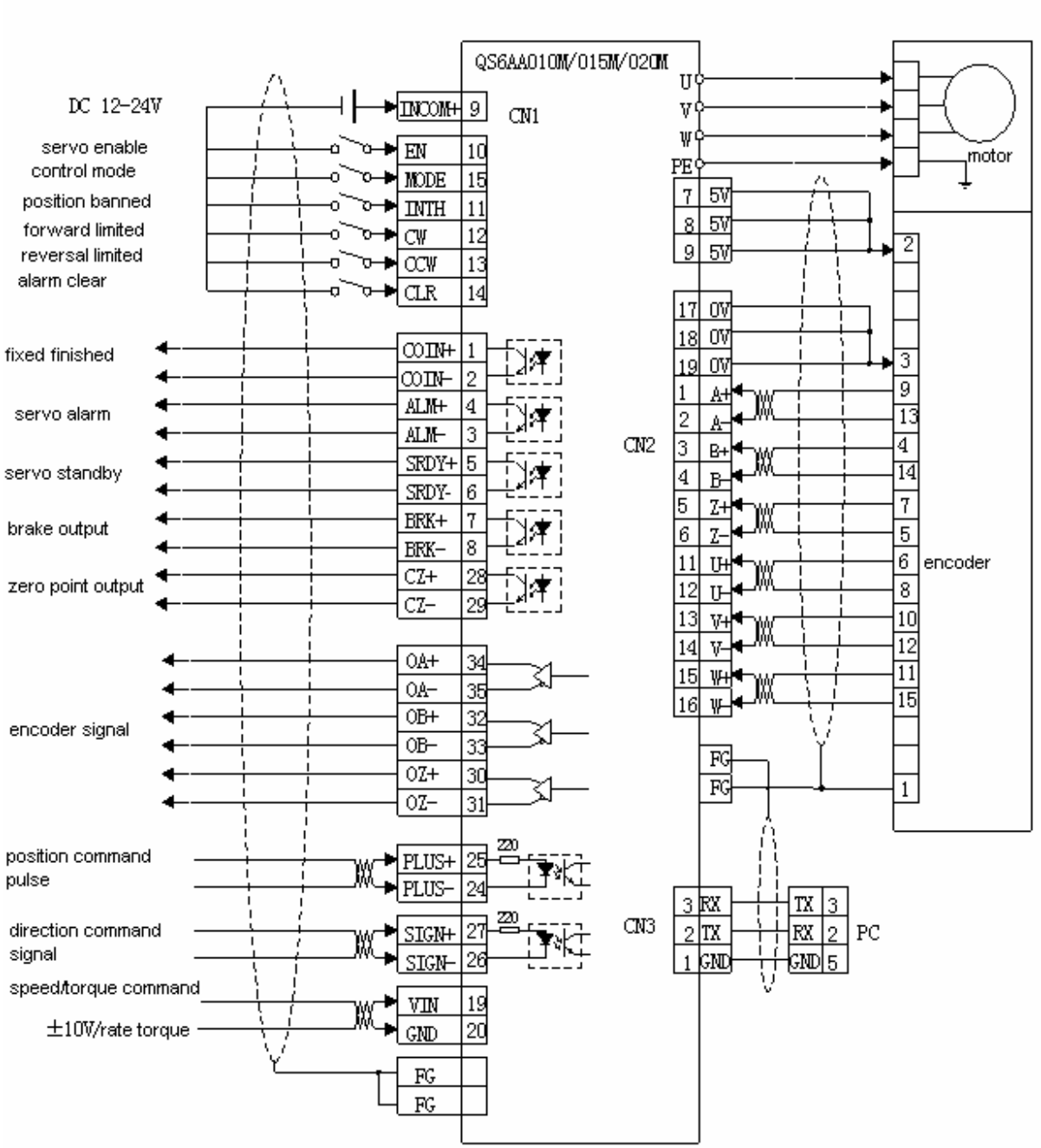
3.6 CN3 Computer communication terminals

Adopt international standard DB9 terminal， more detail pls reference chapter 9。

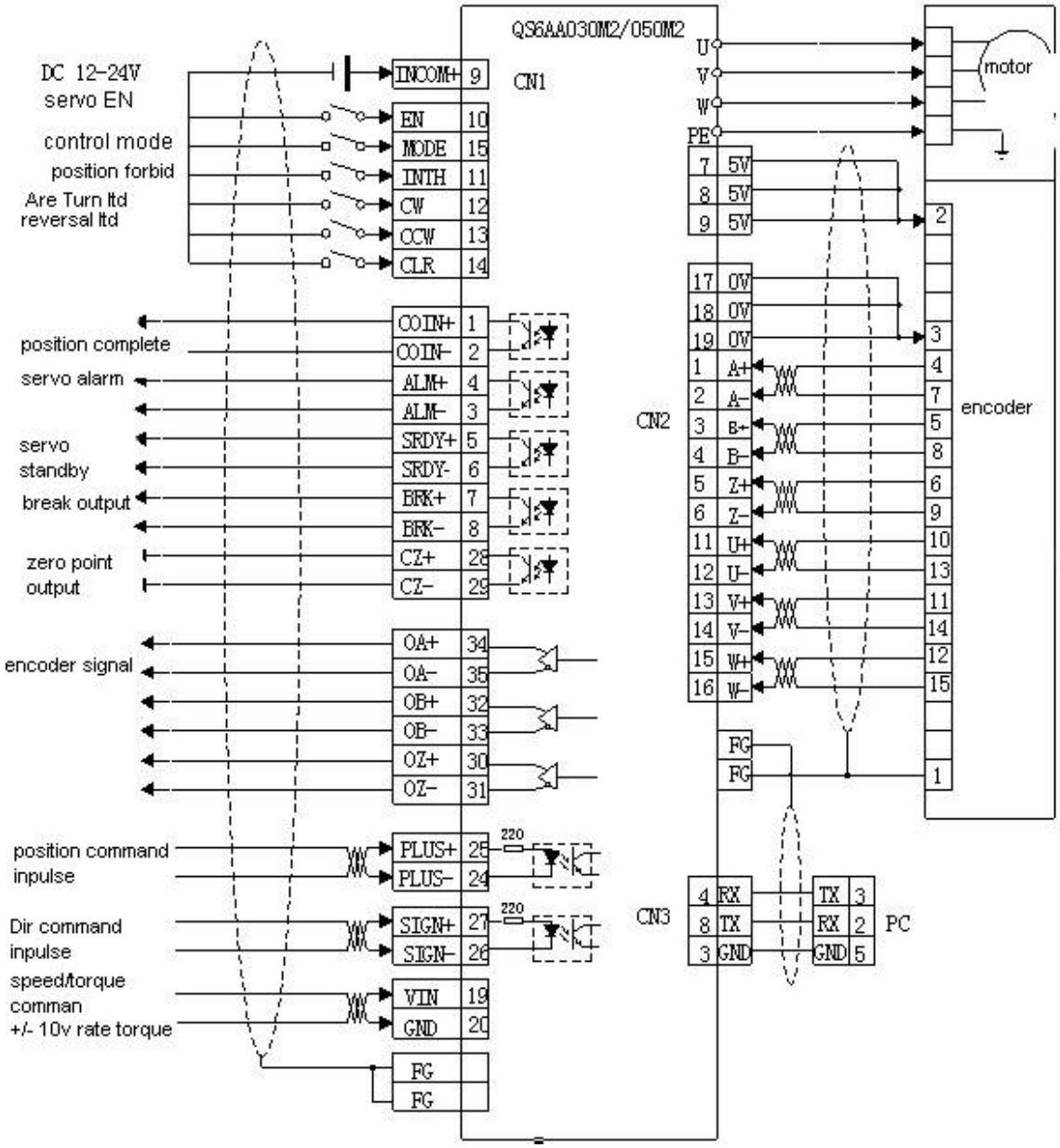
3.7 whole wiring diagrams

Since motor’s outlet wire definition is difference, ADTECH has arrange matchable cable, do no use other’s unmatchable cable induce driver’s damage .

3.7.1 QS6AA010M/020M（Fast terminal type）Servo drive the wiring diagram

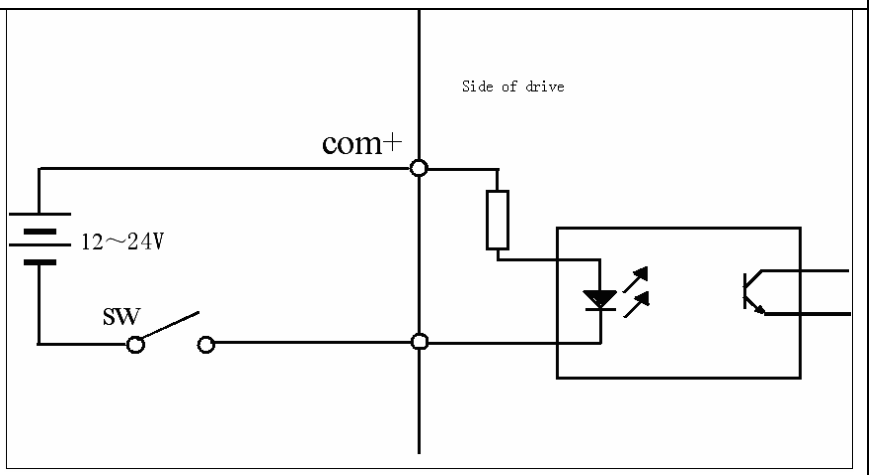


3.7.2 QS6AA030M2/050M2（Aviation plug type）servo driver wiring diagram



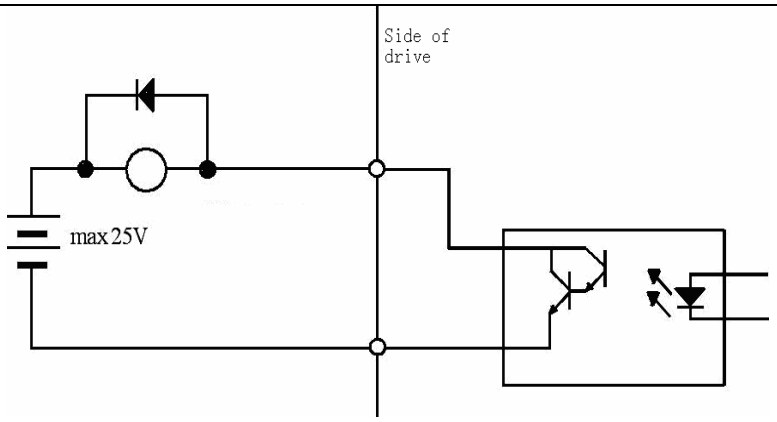
3.8 Principles of input and output interfaces

3.8.1 EN, MODE, INTH, CW, and CCW Switch Input Interface

EN, MODE, INTH, CW, and CCW Switch Input Interface	
1.DC 12V-24V 2. current < 20mA 3. Please note the reversed current polarity will cause servo drive to fail to work properly 4. Inductive must be connect with fly-wheel diode in parallel connection at the two end of load	

Switch Input Interface

3.8.2 SRDY, ALM, BRAKE, COIN, and OZ Switch Output Interface

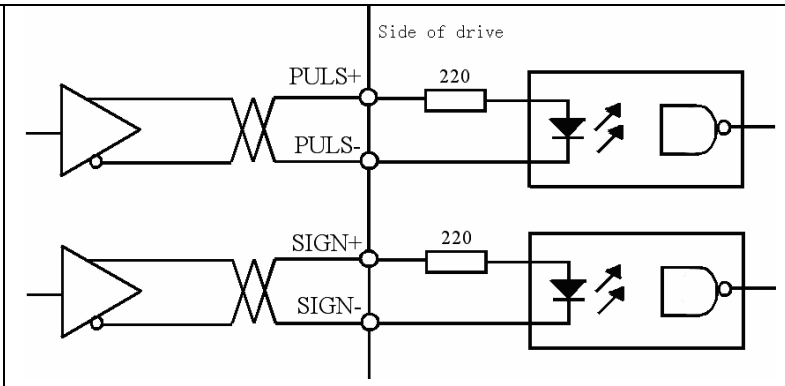
SRDY, ALM, BRAKE, COIN, and OZ Switch Output Interface	
1. OZ, SRDY, COIN, and ALM signal maximum current is 20mA; BRAKE signal maximum current is 50mA; 2. Output is open collector form. 3. please note the reversed current polarity will lead servo drive to be damaged.	

Switch output Interface

3.8.3 Pulse Signal Input Interface:

Pulse signal input interface of the differential drive mode

1.required pulse frequency ≤ 500 kHz. ， Duty cycle is 1:1, and actual demand is to be required to pass 0.4US
2. adopting differential drive mode
3.AM26LS31, MC3487 or similar RS422 line drivers should be used



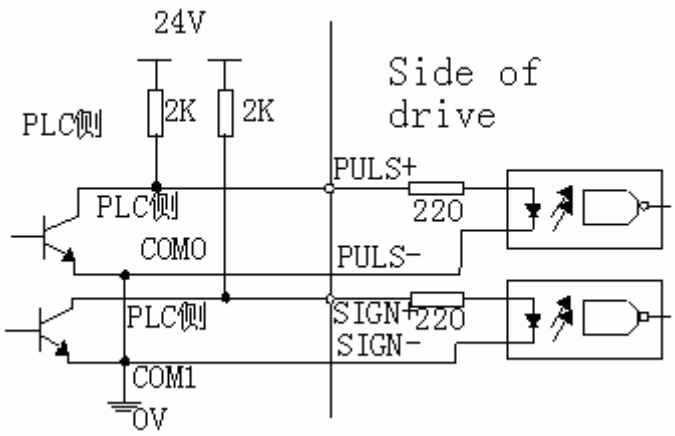
Pulse signal input interface of the differential drive mode

Pulse signal single-ended input（applicated to PLC upper monitor and so on）

●usually used as PLC pulse control

voltage	Resisstance value R(reference value)
24V	2KΩ
12V	1KΩ
5V	100Ω

●driver current 10 ～ 15mA。
●noted do not connect in reverse for polar of porwer
●pulse frequency ≤200KHz。
●the connection is used as Mitsubishi PLC with ADTECH



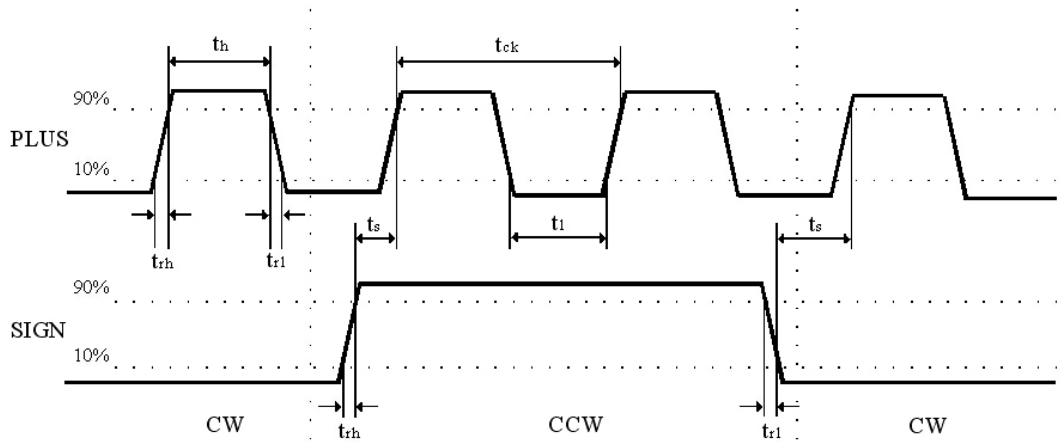
Pulse signal single-ended input mode

Pulse Input Modes

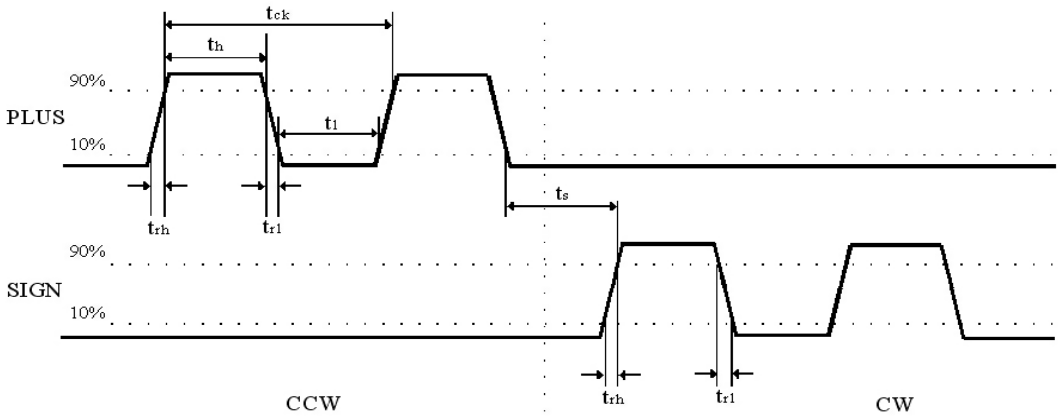
Pulse command	PLUS mode	P10 Settings
Pulse + sign	PULS SIGN	0 Pulse + sign
CCW Pulse CW Pulse	PULS SIGN	1 CW+CCW Pulse
A + B Pulse	PULS SIGN	2 A+B 90° Orthogonal pulse

Pulse Input Timing Parameters

Parameter	Differential Driver Input	Single-ended driven input
tck	>2uS	>5uS
th	>1uS	>2.5uS
tl	>1uS	>2.5uS
trh	<0.2uS	<0.3uS
trl	<0.2uS	<0.3uS
ts	>1uS	>2.5uS
tqck	>8uS	>10uS
tqh	>4uS	>5uS
tql	>4uS	>5uS
tqrh	<0.2uS	<0.3uS
tqrl	<0.2uS	<0.3uS
tqs	>1uS	>2.5uS



Pulse + Sign Input Interface Timing Diagram (Pulse Frequency ≤ 500kHz)

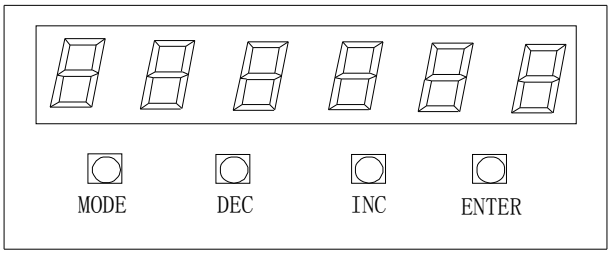


CW + CCW Pulse Input Interface Timing Diagram (Pulse Frequency ≤ 500kHz)

Chapter IV Display and Parameter Settings

4.1 Servo System panel

Servo System panel comprises 6 LED digital tube displays and 4 keys. Digital tube is used to show the various states and parameters of servo drive; key is used to set and access system parameters.。



4.2 Keyboard Operation

Drive panel comprises 6 LED digital tube displays and four keys “DEC”、“INC”、“Mode”、“Enter”to display various states of the system and set parameters。Key features are as follows:

“DEC”： parameter number, value increase, or motor running forward under the JOG mode;

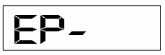
“INC”： parameter number, value reduction, or motor running reversely under the JOG mode; clerance alarm。

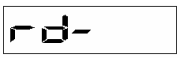
“Mode”： function options, or the current digital cursor moving left.

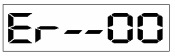
“Enter”： function key for confirmation, or data entry confirmation.

Under normal circumstances, press "Mode" to entry ① "parameters" setting, ②"parameter written", ③ "parameter initialization" ， ④ “Alarm display” (it will not be displayed when no alarm), ⑤ “Display state”, all of which can be cycle selected.

①"Parameter": P1～P63 

②"Parameter writing": It is valid when entering right password; 

③"Parameters initialization”: It is valid when entering right password; 

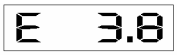
④“Alarm display” (the picture shows no alarm) 

⑤“Display state”: Same as indicated content of P3 parameter 

The servo system is normally displayed with the following 10 methods:

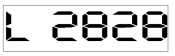
1）display motor rotation speed ： parameter P3=0，unit：r/min 

2）display motor current： parameter P3=1，unit：A 

3）display motor torque percent： parameter P3=2，unit：% 

4）Indicating motor operation position 4-bit lower：parameter P3=3，uni 

5）Indicating motor operation position 4-bit higher：parameter P3=4，unit：pulse

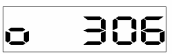
6）input pulse 4-bit lower：parameter P3=5，unit：pulse 

7）input pulse 4-bit higher：parameter P3=6，unit：x1000pulse 

8）display position deviate： parameter P3=7，unit：pulse 

9）input interface diagnose：

display the hexadecimal number of data：
when D0=1, “EN”input is Valid；display 1.
when D1=1,“INTH”input is Valid；display 2.
when D2=1,“CLR”input is Valid； display 4.
when D3=1,“MODE”input is Valid ,display 8.
when D4=1,“ZO”input is Valid, display 16.
when D5=1,“CW”input is Valid,display 32.
when D6=1,“CCW”input is Valid,display 64.
when D7=1,“RLM”input is Valid,display 128.

10）Analog input: indicating the size of inputted analog: parameter： 

11）Input pulse frequency：unit：kHz 

When alarm occurs, please adjust to the alarm screen and press “DEC” to eliminate alarm.

When password of input system fails to be found, you can access P3 "parameters" view, and enter password to modify P3 parameter; however, other parameters cannot be changed.

4.3 Parameter Settings

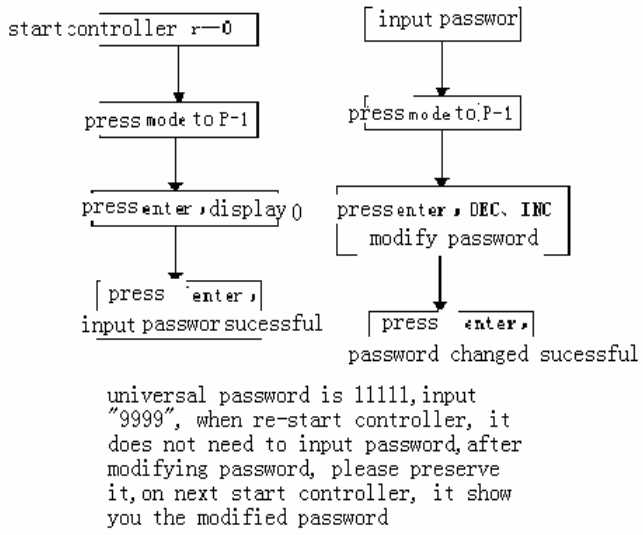
●Parameter P1 is input to display “0”; at this situation, “Enter” key can be pressed directly to indicate that system password has been input.

4.3.1 Password input and changes

1. Password must be entered into the system for system parameter setting of each boot.P1 parameter input is system password input. When the input password is correct, it can set other parameters; otherwise other parameters cannot be set.

2. Password changes must enter the old password firstly, and then you can set the P1 parameters. If system password cannot remember, please use universal password: 11111.

3. When the password is set to "9999", you can modify parameters without password input for the next boot.

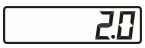


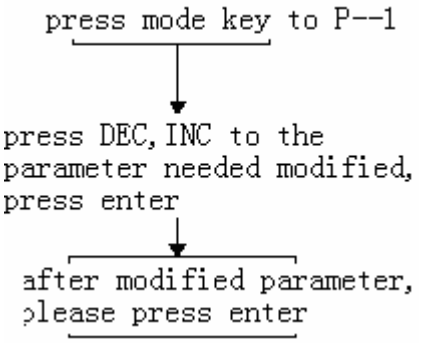
4.3.2 Parameter settings

1 Under normal circumstances, press "Mode" to entry ① "Parameters"

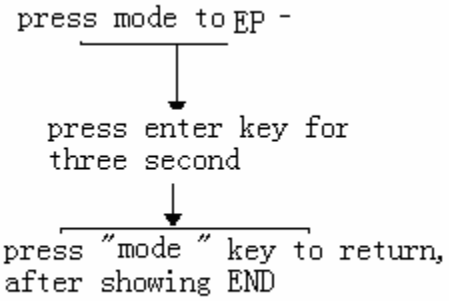
2.Press " INC " or " DEC " keys to select the parameters number which you want to modify, and then press "Enter".

3)Press " INC " to auto-add one value, press " DEC " key to auto –reduce one value, and press "Mode" key to shift current the current number (decimal point position) to the left, and press "Enter" key for data confirmation.

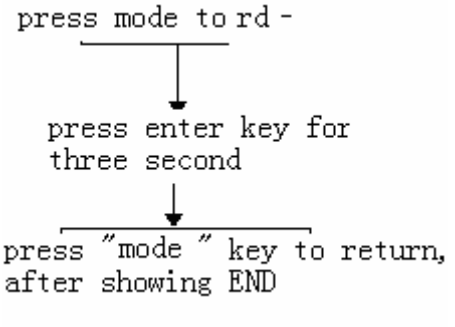




4.3.3 Parameter writing:

1.In the display status, press "Mode" and select to enter EP- ② "parameter writing" parameter writable state, When changed parameters by user need to save for long term, parameter writing operation should be implemented. 2. Press "Enter" key for three seconds, and the parameters will be written in the internal EEPROM 3.then press "Enter" key to return, after writing completion and showing End	

4.3.4 Parameter initialization:

1.In the display status, press "Mode" and select to entry rd- ③ "parameter initialization" state. 2. When the user needs to import the factory system parameter values, press "Enter" key for three seconds, and parameters except for password will be initialized to be the factory default values for the system。however these values do not write into the internal EEPROM 3.After completion and showing End ,please press "Enter" key to return. 4.If writing is necessary, please implement writing operation. And press Mode key to return.	

Chapter V Parameters

- Personnel involved into parameter adjustment must understand the meaning of parameters, for the wrong settings may cause equipment damage and personnel injury;
- It is suggested that all the parameters adjustment should be under the situation of the servo motor stationary.

Parameter List:

Parameter No.	Parameter Name	Application Mode	Parameter Range	Factory Default	Unit	Remark
P0	Software version	P, S, T	2015－2050			②
P1	Parameter password	P, S, T	0-9999	0		①
P2	Motor model	P, S, T		400	Motor power	①
P3	Boot display	P, S, T	0－10	0		①
P4	Control mode	P, S, T	0－7	0		①
P5	Servo enable control	P, S, T	0－1	0		①
P6	Servo input signal INTH function	P, S, T	0－1	0		①
P7	Limit input control	P	0－4	0		①
P8	Coin output mode	P, S, T	0－1	0		①
P9	Alarm output mode	P, S, T	0－1	0		①
P10	Pulse mode	P	0－2	0		①
P11	Motor direction	P, S	0－1	0		①
P12	Electronic gear numerator	P,`	1－32000	1		①
P13	Electronic gear denominator	P,	1－32000	1		①
P14	Positioning completion scope	P,	0－32000	5	Pulse	①
P15	Position deviation alarm range	P,	0－32000	0	Pulse	①
P16	Position gain	P,	1－2000	100		①
P17	Position feed-forward	P,	0－32000	0		①
P18	Position smoothing constant	P,	0－1000	0		①
P19	Position acceleration time	P,	0－32000	0		①
P20	Position deceleration time	P,	0－32000	0		①
P21	Speed gain	P, S	1－1000	50		①
P22	Speed integral	P, S	1－32000	10		①
P23	Acceleration time (speed)	S	0 － 32000(ms)	100	ms	①
P24	Deceleration time (speed)	S	0 － 32000(ms)	100	ms	①

P25	Analog input method	S, T	0－1	0		①
P26	Analog Max. speed	S	1－5000	2000	r/min	①
P27	Torque Max. speed	T	1－5000	2000	r/min	①
P28	Analog input filter coefficient	S, T	0－1000	0		①
P29	Analog input voltage at zero	S, T		0		①
P30	Inertia ration	P, S, T	0-1000	0		①
P31	Analog input percentage	S, T	0-500	0	%	①
P32	Encoder lines frequency splitting	P, S, T	0－127	0		③
P33	Encoder alarm permit	P, S, T	0－1	0		①
P34	JOG speed	S	0－5000	1000		①
P35	Internal speed 1	S	0－5000	100	r/min	①
P36	Internal speed 2	S	0－5000	200	r/min	①
P37	Internal speed 3	S	0－5000	300	r/min	①
P38	Internal speed 4	S	0－5000	400	r/min	①
P39	Internal position 1	P	0－±32000	100	Pulse	①
P40	Internal position 2	P	0－±32000	200	Pulse	①
P41	Internal position 3	P	0－±32000	300	Pulse	①
P42	Internal position 4	P	0－±32000	400	Pulse	①
P43	Communication address	P, S, T	0－255	0		①
P44	Communication baud rate	P, S, T		9600		①
P45	Torque reaching percentage	P, S, T	0－100	100	%	①
P46	Torque percentage of motor stationary	P,	0－100	0	%	①
P47	Start delay of electromagnetic brake	P, S, T	0-3200（ms）	0	ms	①
P48	Stop delay of electromagnetic brake	P, S, T	0-3200（ms）	0	ms	①
P49	Zero speed clamp-on					
P50	Current loop gain	P, S, T	10-4000	600		①
P51	Current loop integral	P, S, T	1-2000	150		①
P52	Encoder lines	P, S, T	1000－6000	2500		③
P53	Encoder type	P, S, T	0－1	0		③
P54	Pole-pairs	P, S, T	2－6	4		③
P55	Drift angle	P, S, T	0—2500	2360		③
P56	Rated current	P, S, T	0－100	28	0.1A	③
P57	Rated torque	P, S, T	0－200	13	0.1NM	③
P58	second electronic gear radio numerator	P	0-32000			①
P59	second electronic gear radio denominator	P	0-32000			①

P60	filter coefficient	P, S, T	0－9	0		①
P61	driver current type		0－1	0		①
P62	V phase current Zero point adjusted value	P, S, T	2008-2088			②
P63	W phase current Zero point adjusted value	P, S, T	2008-2076			②

Remarks:

① It is immediately valid after modification;
② Fixed parameters cannot be modified;
③ I shall be valid when restarting it after modification.

Parameters Detailed table:

SN	Parameter Name	Functional Description	Parameter Range
P0	Software version	● Display different versions	2015-
P1	Parameter password	● The correct password should be input and confirmed when parameter is required to modify after power connection; ● Set to be 0 when delivery from factory; ● 9999 can be input when the password is failure; ● 11111 is the universal password。 ● 22222 can be input to correct the current zero.	0-32000
P2	Motor model	● Motor model is entered to directly impact on the following protection features: over-current, overload, and over-speed protections. ● Specification for motor model 101 -------- ACK04010D 201 ------- ACK06020D 400 ------- ACH06040D 401 ------- ACK06040D 700 ------- ACH09075D 801 ------- ACK08080D 1000 ------- ACH13100D 1200 ------- ACH09120D 1500 ------- ACH13150C 2300 ------- ACH13230C 2600 ------- ACH13260C ● 9999 is self-defined type, and please enter it upon the motor specification. P52—Encoder lines P53—Encoder type P54—Pole-pairs P55— Drift angle P56—Rated current P57—Rated torque	
P3	Boot display	0－Rotational speed（RPM） 1－Motor current （A）	0－10

		2— Motor loading rate 3— Motor positions: 4-bit lower 4— Motor position: 4-bit higher 5— Input pulse : 4-bit lower 6—Input pulse: 4-bit higher 7—Position deviation 8—Input status 9—Analog input 10—Pulse frequency	
P4	Control mode	0—Position mode: external pulse input; 1—JOG mode: key control; 2—Speed mode: external analog voltage input; 3—Torque mode: external analog voltage input; 4— Position and speed mode: MODE control; 5—Position and torque mode: MODE control; 6—CW CCW: external signal JOG mode 7—4 sections speed control	0—7
P5	Servo enable control	0—Valid 1—Invalid: forcibly lock shaft	0—1
P6	Servo input signal INTH function	0—Invalid 1—Input pulse prohibition and position deviation clear 2— Input pulse prohibition and position deviation not clear	0—1
P7	Limit input control	0—Invalid; 1— Active LOW without alarm; 2— Active HIGH without alarm; 3— Active LOW with alarm; 4— Active HIGH with alarm;	0—4
P8	Coin output mode	0—Orientation completion 1—Torque reaching 2 – Output when speed is less than P49 speed (When P49 < 10rpm, it is handled upon 10rpm.)	0—2
P9	Alarm output mode	0—Normal close type 1—Normal open type	0—1
P10	Pulse mode	● 0—Pulse ＋direction: normal direction; ● 1—Pulse＋pulse: normal direction ● 2—Orthogonal pulse: normal direction	0—2
P11	Motor direction	● 0 — Normal ● 1 — Reverse	0—1
P12	Electronic gear numerator	● Sub-octave of position command pulse is set (E-gear); ● Under the mode of position control, a variety of pulse sources matching can be facilitated through P12 and P13 parameters setup; this value should increase as far as possible under the consideration for drive to accept frequency range less than 500K.	1—32000

		● P×G=N×C×4 P: Pulses entered into the command G: E-gear ration $G=\frac{\text{Numerator of splitting frequency}}{\text{Denominator of splitting frequency}}$ N:Motor rotations C:Optical encoder lines；generally it is 2500 lines ● 〖Example〗When command pulse is required to input 8000，servo motor shall rotate one loop. $G=\frac{N\times C\times 4}{P}=\frac{1\times 2500\times 4}{8000}=\frac{5}{4}$ Then parameter P12 is set as 5，and P13 is set as 4； ● Recommended range of E-gear ratio: $\frac{1}{50}\le G\le 50$	
P13	Electronic gear denominator	Same as the above parameter P12.	1－32000
P14	Orientation completion scope	● Set orientation completion pulse range under the mode of position control; ● This parameter provides the basis whether the orientation is completed determined by drive under the position control mode; when the remaining pulse in the position deviation counter is less or same as its set value, the drive will determine the orientation is completed, with signal COIN ON; otherwise, will be COIN OFF.	0－32000
P15	Position deviation alarm range	● When it is set as 0, disable position alarm detection is invalid; ● Disable position alarm detection is valid when it is not 0, and this parameter provides the basis whether deviation is too large determined by drive under the mode of position control; When the remaining pulse in the deviation counter is less or same as its set value, the drive will determine the position to not disable without alarm display; otherwise, alarm ER0-04 will occur.	0－32000
P16	Position gain	● Set the proportional gain for position loop regulator; ● Bigger in set value, higher in gain and rigidity. Under the condition of identical frequency command pulse, position lag will be smaller; however, too big value will lead vibration and over-regulation of system; ● The principle of debugging is to possibly adjust this parameter to be bigger, under the situation of guaranteeing the system to operate without vibration and jetter.	1－2000
P17	Position feed-	● Set position loop feed-forward coefficient ; ● When it is set as 0, no feed-forward coefficient is added;	0－32000

	forward	Bigger in set value, bigger in feed-forward; When position loop fee-forward is bigger, the high-speed response property of control system is better.	
P18	Position smoothing constant	● Smoothing filter is conducted for command pulse; acceleration and deceleration values with exponential form indicate the acceleration and deceleration. ● Filter will not lose pulse; command delay will exist yet; ● Main applications: Host computer controller has no acceleration and deceleration functions; E-gear sub-octave is large (larger than 8); When motor operational speed is slow, pulse frequency is lower; When step jump happens for motor operation, unstable phenomenon exists. When it is set as 0, filter cannot work.	0－1000
P19	Position acceleration time	Bigger in its value, acceleration time is shorter, and orientation is faster.	0－32000
P20	Position deceleration time	Bigger in its value, acceleration time is shorter, and orientation is faster.	0－32000
P21	Speed gain	● Set proportional gain of speed loop regulator; ● Bigger in its set value, bigger in gain and rigidity; the parameter value can be determined upon the specific servo drive model and loading situation. Generally, bigger in load inertia, bigger in its set value; ● It can be possibly set to be bigger under the situation of system without vibration.	1－1000
P22	Speed integral	● Set integral time constant for speed loop regulator; ● Bigger in its set value, faster in integral speed, and stronger in system deviation resistance, i.e. bigger in rigidity; ● However, too big value will produce overshooting. ● It can be possibly set to be smaller under the situation of system without vibration.	1－32000
P23	Acceleration time (speed)	● Setup value refers to the motor acceleration time from 0 to 1000r/min; ● Acceleration and deceleration are characterized with the linear; ● It is valid under the modes of speed control and torque control, and it is invalid under the mode of position control.	0 － 32000(ms)
P24	Deceleration time (speed)	● Setup value refers to the motor deceleration time from 1000 to 0r/min; ● Acceleration and deceleration are characterized with the linear; ● It is valid under the modes of speed control and torque control, and it is invalid under the mode of position control.	0 － 32000(ms)
P25	Analog	0－AD input value 1- P35 value fixed to be used;	0－1000

	input method		
P26	Analog max. speed	It refers to the corresponding speed when analog output reaches the maximum;	1—5000
P27	Torque max. speed	It refers to the limited max. rotation speed under the torque mode.	1—5000
P28	Analog input filter coefficient	0—Prohibition	0—1000
P29	Analog input voltage at zero	Analog input volatge 0V , the relative point is at Zero	0
P30	Inertia ratio		0-1000
P31	Analog input percentage	0—equivalent to 100%	0-500
P32	Encoder lines frequency splitting	0- Splitting frequency is not used, setting value N, mean encoder A and B phase output frequency /N	0—127
P33	Encoder alarm allowance	0— Detect encoder 1—Not detect encoder	0—1
P34	JOG speed	When JOG running, speed setting	0—5000
P35	Internal speed 1	when running internal four section speed control mode, the setting speed 1	0—5000
P36	Internal speed 2	when running internal four section speed control mode, the setting speed 2	0—5000
P37	Internal speed 3	when running internal four section speed control mode, the setting speed 3	0—5000
P38	Internal speed 4	when running internal four section speed control mode, the setting speed 4	0—5000
P39	Internal position 1	when running internal four section position control mode, the setting position 1	0 — ±32000
P40	Internal position 2	when running internal four section position control mode, the setting position 2	0 — ±32000
P41	Internal position 3	when running internal four section position control mode, the setting position 3	0 — ±32000
P42	Internal position 4	when running internal four section position control mode, the setting position 4	0 — ±32000
P43	Communication address	1	0—255
P44	Communication baud rate	0-4800,1-9600,2-14400,3-19200,4,5-38400,6-57600,7-115200	0—7
P45	Percentage of torque	● Set the proportional relation between analog torque input voltage and motor actual operation torque;	0—100

	arrival	● The unit of set value is 0.1V/100%; ● Default value is 100，to correspond to 10V/100%，i.e. 100％ rated torque is produced after 10 V is input.	
P46	Percentage of motor static torque	● Set the torque size of lock shaft when motor stops; ● The unit of its set value: rated torque ×100%; ● Only position loop is valid, with invalid speed loop and torque loop; ● 0 – prohibit this function prohibition; ● Other values - use this function	0－100
P47	Electromagnetic brake ON delay	● It defines the motor enable lock shaft (input terminal SON from OFF to ON); ● Delay time to open brake. (output terminal BRK from OFF to ON) ● This parameter is set to ensure the switch from brake lock shaft to motor enable lock shaft to be stable when the motor with brake is connected to the power.	0－32000（ms）
P48	Electromagnetic brake OFF delay	● It defines the motor enable removal (input terminal SON from ON to OFF); ● Delay time to close brake. (output terminal BRK from OFF to ON) ● This parameter is set to ensure the switch from motor lock shaft to brake lock shaft be stable when the motor with brake is disconnected to the power; ● This parameter can be prolonged when the motor is from high-speed operation to stop, to enhance the effect of rapid deceleration.	0－32000（ms）
P49	Zero speed clamp-on	The motor will stop when the value is less than this parameter.	0-2000
P50	Current loop gain	● Current loop proportional gain, and when motor current is bigger, its set value should be adjusted to be bigger appropriately, and the operational sound of motor operation will be louder. Generally it doesn't need to be adjusted. ● Default value is 600.	10-4000
P51	Current loop integral	● Current loop integral gain, and when motor current is bigger, its set value should be adjusted to be bigger appropriately, and the operational sound of motor operation will be louder. Generally it doesn't need to be adjusted. ● Default value is 150.	1-2000
P52	Encoder lines	● Only if motor type is set to be （P2=9999）, this parameter will be valid. ● Encoder lines of input motor is generally 1024,2048, 2500, 3000, 5000. ● Please note that this parameter will be valid after it is modified and saved, and then restart the machine; ● Default value is 2500.	1000 － 6000
P53	Encoder type	● Only if motor type is set to be （P2=9999）, this self-defined parameter will be valid. ● Set value as 0 refers to general non-cable saving	0－1

		encoder; set value as 1 refers to cable saving encoder; ● Please note that this parameter will be valid after it is modified and saved, and then restart the machine; ● Default value is 0.	
P54	Pole-pairs	● Only if motor type is set to be （P2=9999）, this self-defined parameter will be valid. ● Set value refers to the number of pole-pairs; ● Please note that this parameter will be valid after it is modified and saved, and then restart the machine; ● Default value is 4.	2－6
P55	Drift angle	● Only if motor type is set to be （P2=9999）, this self-defined parameter will be valid. ● Set value refers to drift angle between motor angle and zero point; ● Please note that this parameter will be valid after it is modified and saved, and then restart the machine; ● Default value is 2360.	0－2500
P56	Rated current	● Only if motor type is set to be （P2=9999）, this self-defined parameter will be valid. ● Set value refers to the motor rated current size, to only impact on the protective function of motor current without impact on motor operational effect; ● Setup unit （0.1A）.	0－100
P57	Rated torque	● Only if motor type is set to be （P2=9999）, this parameter will be valid. ● Set value refers to the motor rated torque size, to only impact on the protective function of torque control without impact on motor operational effect; ● Setup unit （0.1A）. ● Self-defined unit (0.1Nm)	0－200
P58	second electronic gear radio numerator	use method is same as first electronic gear radio .	
P59	second electronic gear radio denominator	use method is same as first electronic gear radio .	0－1
P60	filter coefficient	adopt to remove the motor voice lead by speed loop gain too big	0—9
P61	Drive current type	0 refers to QS6AA015M above; 1 refers to QS6AA010M.	0－1
P62	V-phase current zero correction	It refers to drift value of V-phase current zero	2008 — 2088
P63	W-phase	It refers to drift value of W-phase current zero	2008 —

	current zero correction		2076

Note:

- It is recommended that all parameter settings and modification should be implemented when the motor is prohibited.
- All parameters (only P2 parameter will be effective after re-electrified when disconnecting power) settings will be effective after just pressing "Enter", without re-electrifying; however, parameter writing should be performed for long-term preservation;
- When the power of drive is OFF, please wait for more than 30 seconds and then re-electrify it.
- When the drive is used fro numerical control system, the parameters P12 and P13 are calculated as follows:

$$\frac{P12}{P13} = \frac{\text{Mechanical reduction ratio} * \text{System pulse equivalent} * 10000}{\text{Screw pitch (mm)}}$$

General CNC pulse equivalent: 0.001mm

Chapter VI Operation

After completion of the installation and connection, please check the following items before power-on:

- Whether the power terminal wiring is correct and reliable? Whether the input voltage is correct?
- Whether power lines and motor wires get short circuit or grounding?
- Whether the control signal terminal is connected correctly? Whether power supply polarity and size are correct?
- Whether drive and the motor are fixed firmly?
- Whether motor shaft is not connected to the load?
- Whether specification of motor and driver are matching?

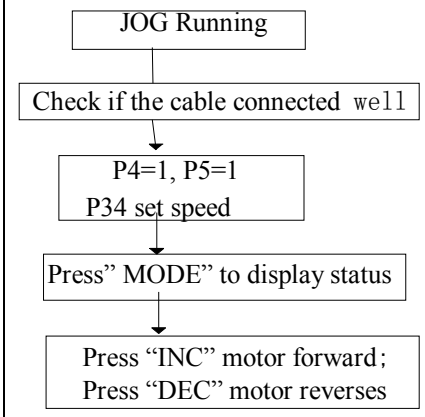
6.1 JOG Control of Servo System

When the system parameter is set to be P4 = 1 inner enable (P5=1), the servo system is under the mode of JOG control.

Press "INC", servo motor rotates forward; Key-up the motor stops. Running speed is determined by the setting values of parameters P34.

Press "DEC" servo motor rotates reversely; Key-up the motor stops. Running speed is determined by the setting values of parameters P34.

JOG control acceleration time constant is adjusted through parameters P23; JOG control deceleration time constant is adjusted through the parameter P24.



6.2 Position Control of Servo System

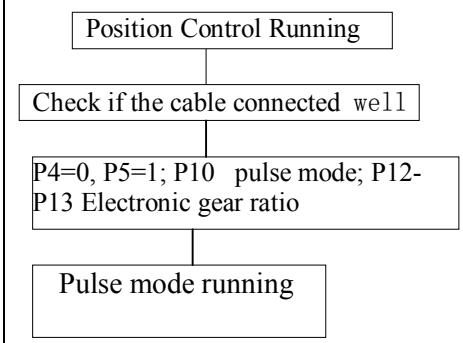
When the system parameters are set to be P4 = 0, P4=4, or P4= 5 and signal is invalid, servo system in under position control mode. Running speed is determined by input pulse frequency; running direction is determined by the input direction and P11; running pulse mode is set by P10.

When P6 = 1, 2, and INTH signal is valid, this function can be terminated.

Electronic gear is determined by P12 and P13.

When P18 confirmed as 0 for position smoothing, it cannot be used, as less use, more effect;

Position control acceleration time is usually regulated through parameter P19; Position control deceleration time is usually regulated through parameter P20.



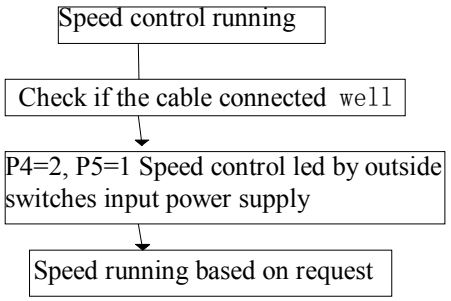
6.3 Speed Control of Servo System

When the system parameters are set to be P4 = 2, or P4 = 4, and MODE is valid, servo system is in the speed control mode. The maximum operating speed is determined by the parameters P26 and P31. The maximum operating speed refers to the operating speed when input voltage is 10V.

Operating speed is determined by Vin1 voltage, and direction is determined by the symbols of Vin 1 and P11. When P15=2, direction is determined by CW and CCW, wherein, CW and CCW respectively refer to motor rotation forward and reversely.

Zero-drift of speed control is adjusted through parameter P29, and adjusting this parameter to set motor speed to be 0 when input voltage is 0V.

Speed control acceleration time constant is adjusted through the parameter P23; speed control deceleration time constant is adjusted through the parameter P24.



Attention: When P4 = 4, under the MODE switch, feeding instruction can be transmitted after 10ms delay of MODE reaching.

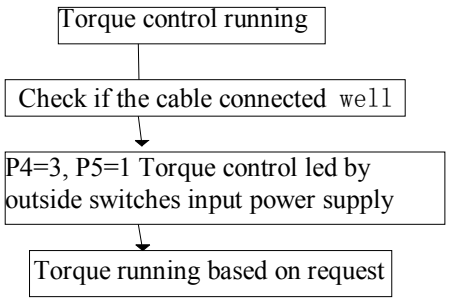
6.4 Torque Control of Servo System

When P4 = 3, or P4 = 5, then, Inner enable (P5=1) and MODE is effective, servo system is in torque control mode. Torque is determined by the input voltage Vin1. The direction is determined by the symbols of Vin1and P11. Input voltage is maximum torque when the torque is 10V. The maximum speed specified by the internal rate of P27.

Zero-drift of torque control is adjusted through the parameter P29, and adjusting this parameter to set motor speed to be 0 when input voltage is 0V.

Torque can be adjusted through the parameter P45 to gain size compensation adjustment; bigger value, greater torque.

When the output torque reaches parameter rated current percentage P45, COIN signal is output. COIN is the pulse signal with the width of 10ms.



6.5 Internal Speed Control Servo System

When the system parameter is set to be P4 = 7, servo system is in the internal speed control mode.

After the input signal MODE (level signal) is input and valid, the motor starts; after the input signal INTH (NC signal) is input and effective, the motor stops. Speed is determined by the input signals CW and CCW decision. Please see the below table:

MODE signal	INTH signal	CCW signal	CW signal	Motor speed
	0			0
1	1	0	0	P26(the max. rotational rate when Vin=10V)analog control when P35=0;
1	1	0	1	P36
1	1	1	0	P37
1	1	1	1	P38

6.6 Internal Four Section Position control servo system

When the system parameter is set to be P4 = 8, servo system is in the internal speed control mode.

After the input signal MODE (level signal) is input and valid, the motor starts; after the input signal INTH (NC signal) is input and effective, the motor stops. Speed is determined by the input signals CW and CCW decision. Please see the below table:

MODE signal	CCW signal	CW signal	Run Speed	Running length
1	0	0	P35	P41*(P12/13)
1	0	1	P36	P42*(P12/P13)
1	1	0	P37	P43*(P12/P13)
1	1	1	P38	P44*(P12/P13)

Chapter VII Error Alarm

Attention

- Do not touch drive and motor within 5 minutes after driver and motor power-off, to prevent person from injury due to electric shock;
- Allow to use drive after drive alarm code troubleshooting while drive failure alarms;
- Show Er0-xx and blinking while error is found, wherein xx refers to alarm code;
- Operate drive to view and modify parameters after alarming.

Alarm List:

Alarm Code	Alarm Content	Cause of Malfunction
ER0-00	Normal	
ER0-01	Motor speed is too high	1) Encoder wiring error 2) Encoder damage 3) Encoder cable is too long, resulting in the low encoder supply voltage 4) Running too fast 5) Input pulse frequency is too high 6) Electronic gear ratio too big 7) Servo system instability causes overshooting 8) Circuit Board Fault
ER0-02	The main circuit supply voltage is too high	1) The supply voltage is too high (more than +20%) 2) Disconnect the brake resistor wiring 4) The internal regenerative braking transistor is broken 5) The internal regenerative braking circuit capacity is too small 6) The circuit board failure
ER0-03	The main circuit power supply voltage is too low or drive temperature is too high	1) The supply voltage is too low (less than -20%) 2) Temporary power outages for more than 200mS 3) Power start circuit failure 4) The circuit board failure 5) The drive temperature is too high
ER0-04	Tolerance alarm	1) Mechanical choked to death 2) Input pulse frequency is too high 3) Encoder zero change in 4) Encoder wiring error 5) P16 position loop gain is too small 6) Less torque 7) P15 parameter setting is too small 8) P15 = 0 shields this feature, resulted in no alarm

ER0-05	Drive temperature is too high	1） The ambient temperature is too high 2） Bad cooling fan 3） Broken temperature sensor 4） Motor current is too big 5） Internal regenerative braking circuit failure 6） Broken internal regenerative braking transistor 7） Circuit Board Failure
ER0-06	EEPROM writing memory error on drive	Chip U19 failed and should be replaced.
ER0-07	CW Motor Forward limit	Hit the forward limit switch, you can set the parameter P7 = 0 to shield this feature or reversely rotate motors.
ER0-08	CCW Motor Reverse limit	Hit the reverse limit switch, you can set the parameter P7 = 0 to shield this feature or reversely rotate motor.
ER0-09	Encoder fault	1) Encoder damage 2) Encoder wiring is damaged or broken 3) P33 = 1 shields this feature, resulted in no alarm 4) Encoder cable is too long, resulting in low encoder supply voltage
ER0-10	Motor overload alarm	Overload excesses the parameters of motor rated torque: More than 150% rated overload: over 10000 ms; More than 300% rated overload: over 1000ms; More than 500% rated overload: over 10ms The machine is stuck for rigidity is adjusted too strong; Speed increase and decrease are too fast.
ER0-11	Power module fault	1） Over-current 2） Voltage is too low 3） Motor insulation is damaged 4） Gain parameter is set incorrectly 5） Overload 6） Temperature is too high 7） Module is damaged 8） Interference 9） Short-circuits occurs among motor cables U, V, and W.
ER0-12	Over-current	1） Short-circuits occurs among motor cables U, V, and W. 2） Imperfect grounding 3） Broken motor insulation

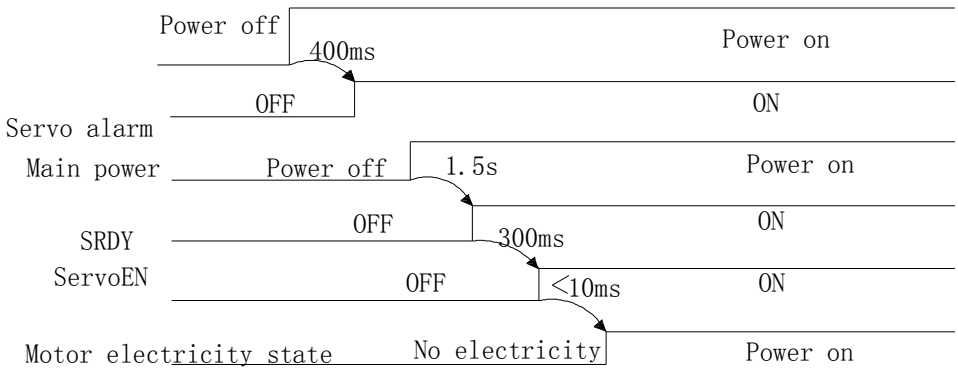
Chapter VIII Debugging

- Motor and driver must connect to GND, PE must connect GND with Motor.
- Suggestions power drive provide by the isolated transformer for safely and anti-interference.
- Before power on, check all of connected wire are correctly.
- After driver fault alarm, confirm if fault are settled before re-start.
- Don't touch motor and driver within 5 munities after power off for prevent shock?
- It may high temperature after motor & driver running a long time for prevent burns.

8.1 Working sequence

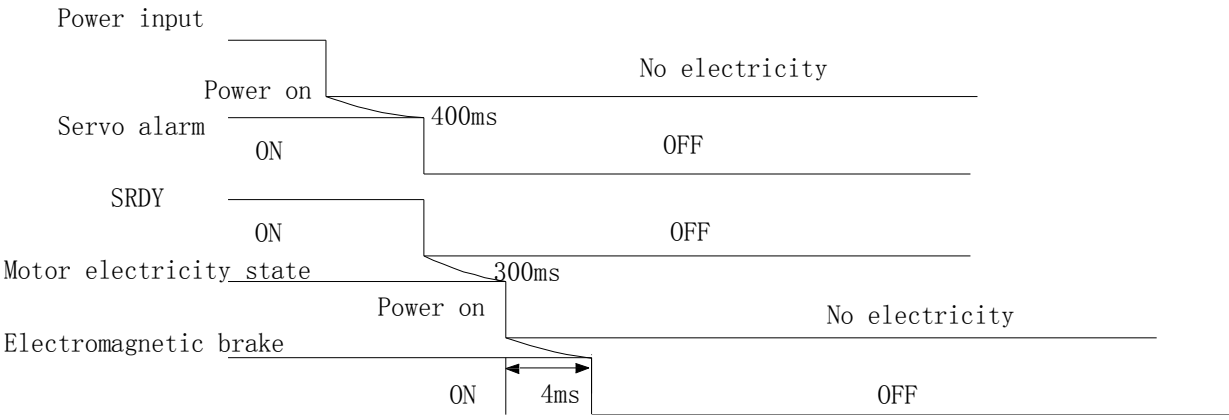
8.1.2 Sequence of connected power

- When connect control power, servo driver alarms within 400ms; when main power is on, the alarm disappear, servo motor prepare signal ON within 1.5s, internal servo's enable become effective, the motor excitation is on within 10ms.



8.1.3 Sequence of servo off

Alarm sequence during motor's running: SRDY signal and servo enable signal are ineffective at the same time, and the motor's electromagnetic brake signal is off 4ms later.

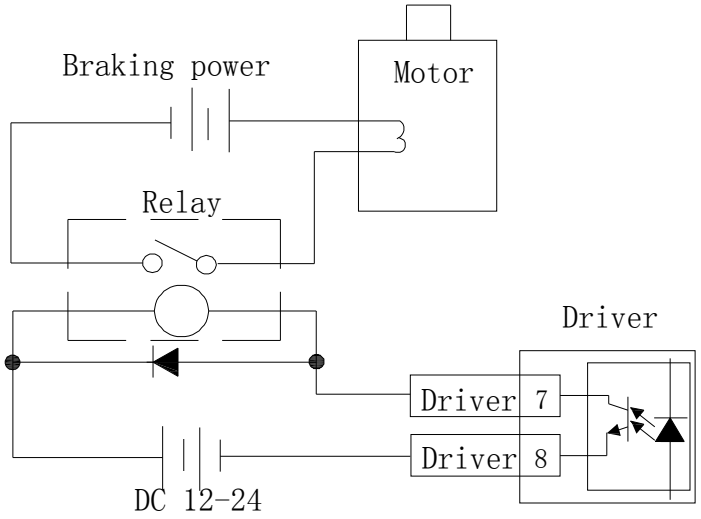


8.2 Usage of Mechanical Brake " BRAKE"

Mechanical brake is used to lock the vertical or tilt table connecting motor, to prevent motor from falling down after power-failure. The motor with brake feature should be selected to achieve this function. This brake can only be used for keep the table, not for motor's deceleration or machine's stop. After connecting with the required voltage, the internal brake will open, and the motor bearings can rotate freely.

Using Driver BRAKE signal control intermediate relay, which is start braking power by inte rmediate relay (Braking power provide by user). Brake signal are valid when delay time is P47 a fter drive motor power on; power off or alarm when BRAKE signal auto shutdown, delay time is P47, power off power again.

When install the signal, brake power must have enough capacity, then it must use free-whee ling diode as surge absorber.



8.3 Debugging

Before power on, it must check the correctness of the parametersIncorrect parameter settin g will may caused machine fault and accident

Suggestion no-load debugging firstly, then load debugging.

8.3.1 Adjustment of gain and rigidity

The servo system applies feedback system of PID adjustment, current loop, speed loop and position loop. The rule it obeys is: the inside of the ring, the need to improve its ability of response. Or it will appear over-adjust or vibration. As the current loop is enough to ensure its ability of response, usually it doesn't need to change. What should be adjusted are position loop and speed loop.

The servo adjustment of position mode as below:

- Set a relative high value of speed loop integral;
- Set a relative low value of position loop gain, then begin to add the speed if there is no vibration or abnormal noise;
- Adjust the value of speed loop integral to smaller if there is no vibration;

● Add the position loop gain until there is no vibration;

● If the electronic gear ratio is bigger, please adjust the value of P18 to make motors run at quiet;

Knowledge of mechanical system's rigidity:

● If the rigidity of the conveyors connected by belt is low, please use low rigidity parameter;

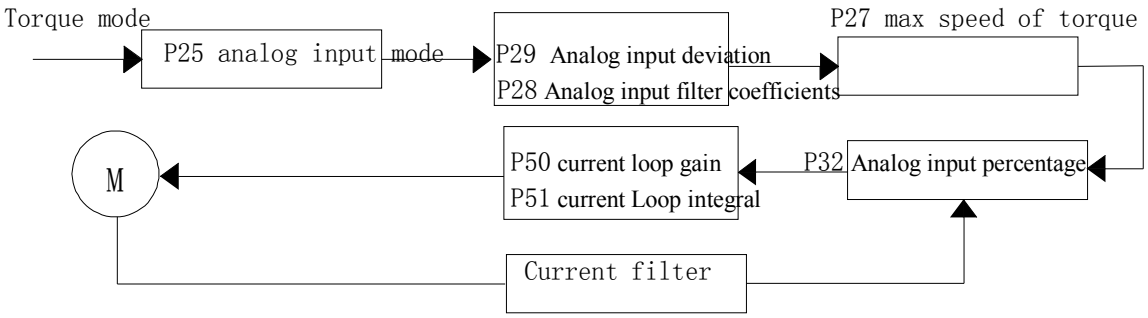
● If the rigidity of the ball screw drove by gear box is medium, please use medium rigidity parameter;

● If the rigidity of ball screw drove by servo motor is high, please use high rigidity parameter.

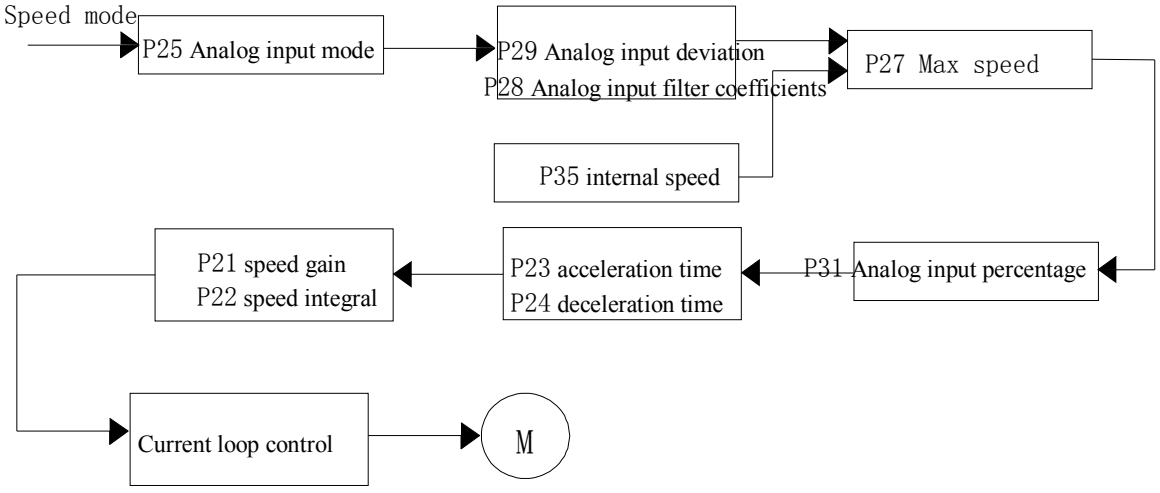
The adjustment of servo depends on the system, which needs your careful watching, thinking, then you can find suitable parameters.

8.3.2 Basic Parameters Adjustment Diagrams

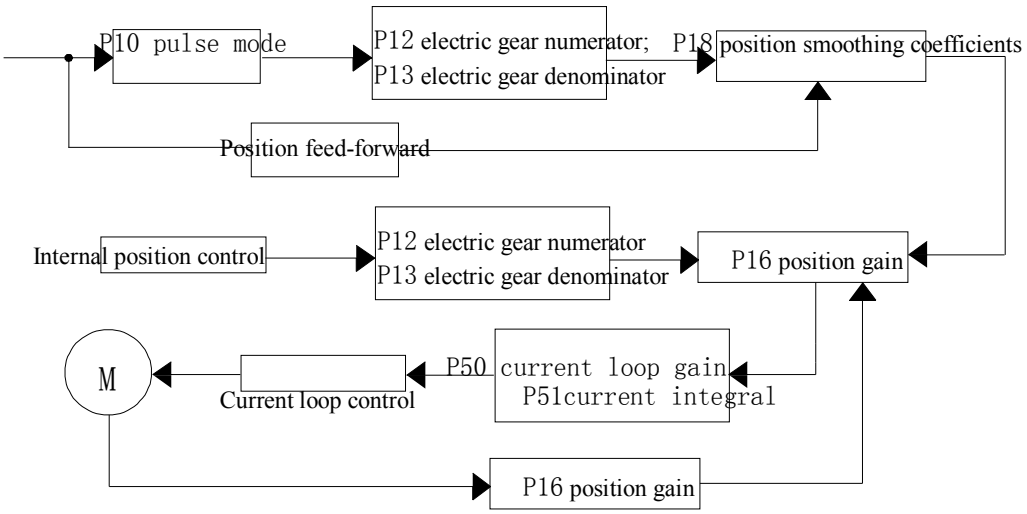
●Torque Control Flow Diagram



a) Speed Control Flow Diagram



- **Position Control Flow Diagram**



8.3.3 Basic Parameters Adjustment Diagrams

Position resolution (an impulse travel) determines the stroke per turn on the servo motor and encoder feedback pulses per turn Pt, which can be expressed with the below formulation:

$$\Delta l = \frac{\Delta S}{P_t}$$

Equation,

Δl: A pulse travel（mm）;

ΔS: Servo motor stroke per revolution（mm/r）;

P_t: Encoder feedback pulses per revolution（pulse/r）。

The system has four multiplier circuit, so $P_t = 4 \times C$, wherein, C refers to the number of lines per revolution of encoder. In this system, C = 2500 lines / turn, so Pt = 10000 pulses / turn.

A command pulse multiplies electronic gear ratio G and then it can be transferred into position control pulse, so a command pulse stroke is expressed as follows:

$$\Delta l^{*} = \frac{\Delta S \times G}{Pt}$$

Equation, $G = \frac{\text{Command Pulse Divider numerator}}{\text{Command Pulse Divider denominator}}$

When the drive is used for numerical control system, the parameters P12 and P13 are calculated as follows:

$$\frac{P12}{P13} = \frac{\text{Mechanical reduction ratio} \times \text{system pulse equivalent} \times 10000}{\text{Screw pitch(mm)}}$$

General CNC pulse equivalent: 0.001mm

8.3.4 Basic Parameters Adjustment Diagrams

Servo System start-stop feature refers to the time of acceleration and deceleration, which is determined by the load inertia, start, and stop frequency, and also limited by the servo drive and servo motor performance. Frequent start-stop, too short acceleration and deceleration time, too big load inertia will result in overheating of the drive and motor, overvoltage alarm of main circuit. Therefore it must be adjusted upon the actual conditions.

1) Load inertia and start-stop frequency

When used under the situation of high start-stop frequency, it is necessary to confirm in advance whether the motor is in the allowed frequency range. Allowed frequency range varies in terms of the different motor type, capacity, load inertia, and motor speed. Under the condition of load inertia of m times motor inertia, start-stop frequency and recommended acceleration and deceleration time of servo motor are as follows:

Multiples of the load inertia	Allowed start-stop frequency
m≤3	＞100Times/min：Acceleration and deceleration time constant is 500 or less
m≤5	60～100Times/min：Acceleration and deceleration time is 150 or less
m＞5	＜60Times/min：Acceleration and deceleration time is 50 or less

2) Impact of servo motor

Different types of servo motors permitted start-stop frequency and acceleration and deceleration time vary according to different load conditions, run-time, duty cycle, and ambient temperature. Please refer to electrical specifications and make the adjustment upon specific conditions, to avoid overheating resulted in the alarm or affect the service life.

3) Adjustment method

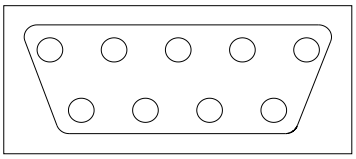
General load inertia should be less than 5 times of rotator inertia. If always used for large load inertia, the motor may generate over-voltage of main circuit or abnormal braking at the time of slowing down, and then the following methods can be adopted:

- Increase the acceleration and deceleration time. You can set a little too big value firstly and then gradually reduce it to be an appropriate value.
- Reduce the internal torque limit value and lower current limit.
- Reduce the maximum motor speed.
- Use motor with bigger power and inertia.

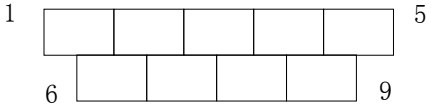
Chapter IX Communication between servo driver and PC

9.1 Connection of communication line

The PC terminal uses standard DB9, as following diagram:

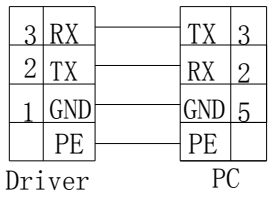


Look from the front

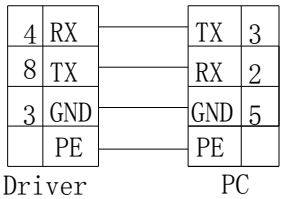


Note: The diagram show the welding connecting side

As there is special definition of servo driver, so it's better to use our special communication line (USB-TO-COM). If use RS-232 interface, the driver's definition as below:
Note. Different terminals of driver should use different wiring method.



Suitable for QS6AA010M/020M/015M



Suitable for QS6AA030M2/050M2

9.2 Preparation work before Communication

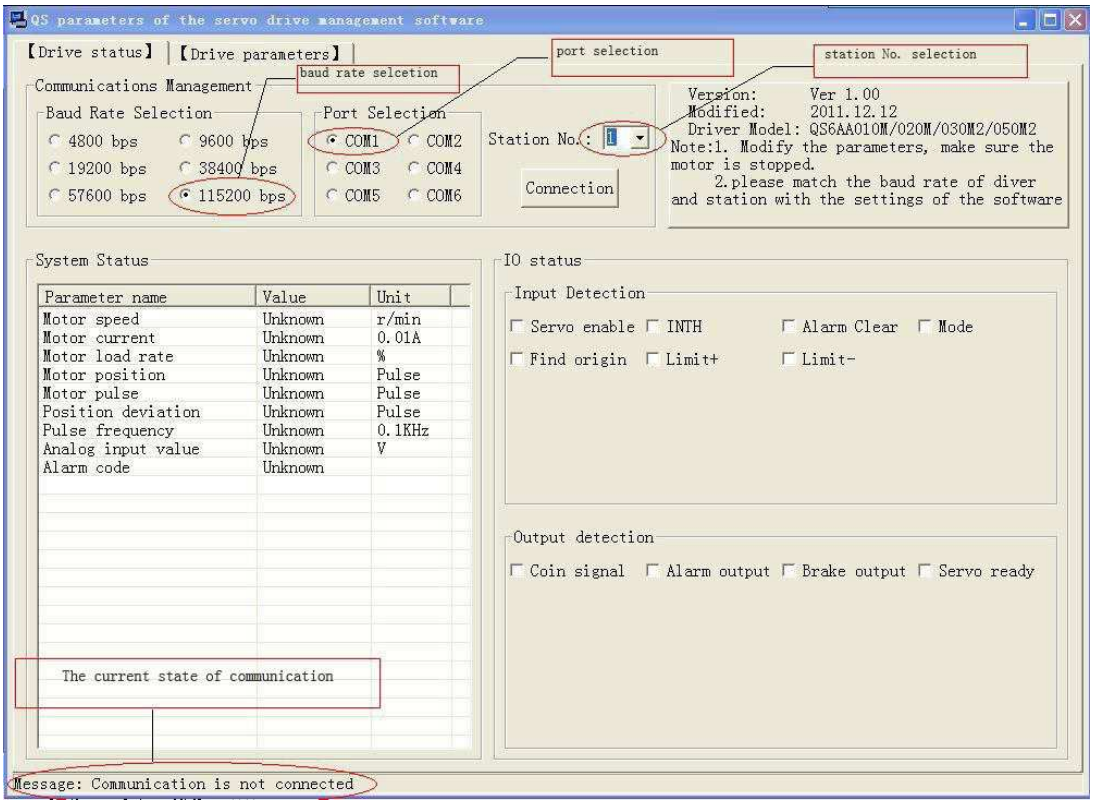
1. Check the driver version no.: operation mode: Driver power on, check P0, Version no must 2024 or above;

2. Sure the communication signal, communication baud rate in driver can correspond to PC software;

3. Sure the communication software is installed, connection is good.

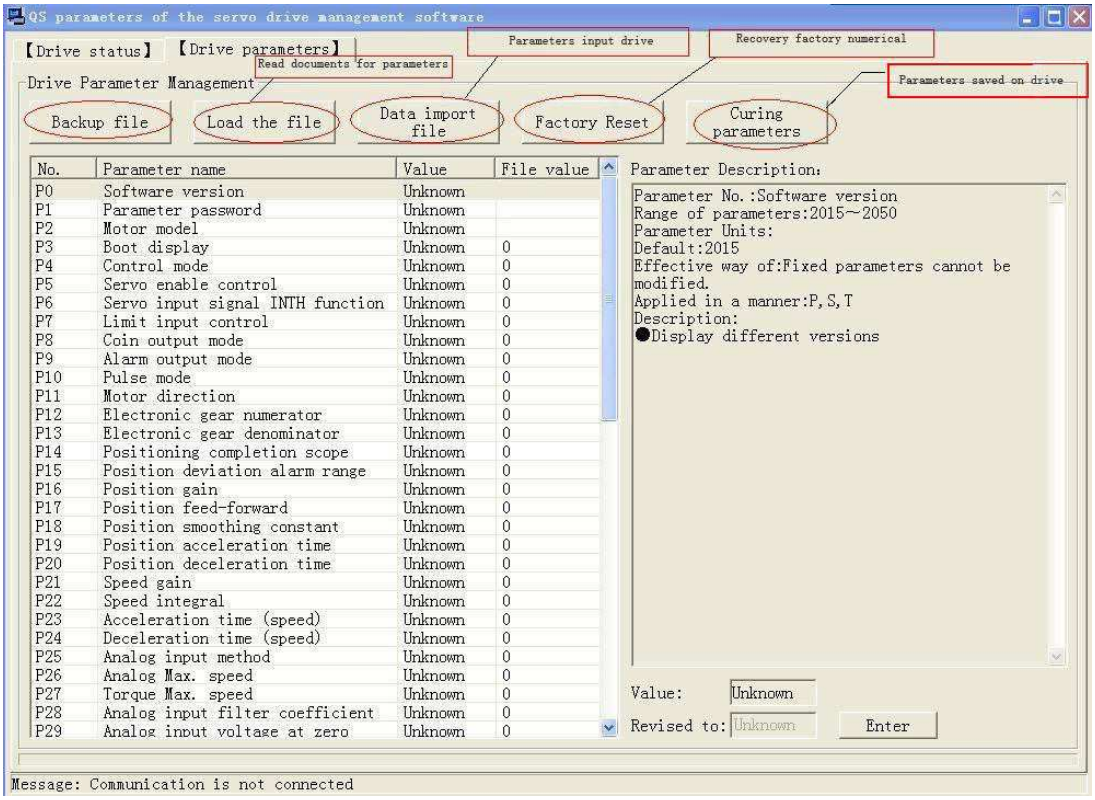
9.3 Communication

Open SEVERSOFT.EXE software; choose language and the interface come out as below:



According to drive's parameters to change the communication baud rate (P44 parameters of driver),
The port selection (right-click My computer-Device Manager-COM and LPT, select the serial port except COM1) and communication signal (P43 parameters of driver), after set up completed, click the link, the bottom of left corner of the interface will show "communication connection OK"

Click on driver's parameters, the parameters interface will come out as below:



After this interface come out, you can set up parameters.

9.4 Problem and solution during the communication processing

1. In case of servo drives alarm, it may not communicate even the cable connect is correct
Solution: exclude the alarm of driver and restart the driver.

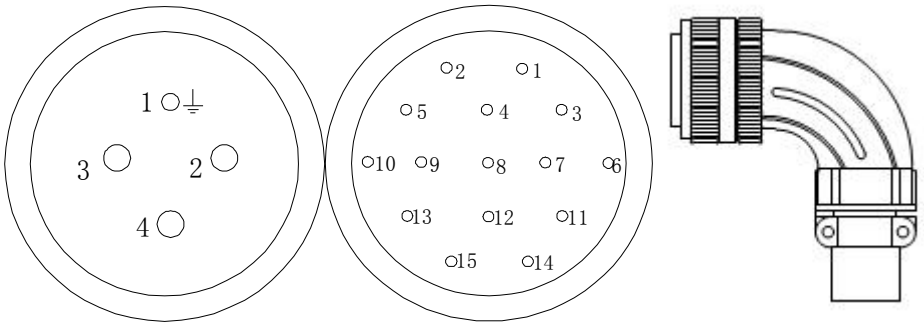
2. The communication can not work when select the wrong communication baud rate.
Solution: Pull out of USB disk and reconnection, restart driver's communication software.

3. The driver may not communicate when plug the USB and start driver in repeatedly and quickly.

Solution: In this case, the USB disk and driver communication need a certain reaction time, and wait for a moment in intercellular communication.

Supplemental pages

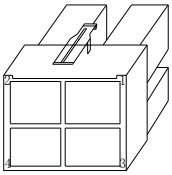
1. Aviation plug model electrical motor defined (motor side):



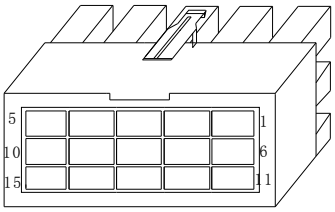
Note: Welding line from the side view

Aviation plug the definition of power lines			
Serial No.	Name	Color	Remark
1	PE	Yellow/Green	Ground wire
2	U	Red	Motor U Phase
3	V	Green	Motor V Phase
4	W	Black	Motor W Phase
Aviation plug the definition of Encoder line			
Serial No.	Name	Color	Remark
1	FG	—	Shielded cable
2	5V	Red	Voltage 5V
3	0V	Red & White	Voltage 0V
4	A+	Black	Encoder A +Signal
5	B+	Brown	Encoder B + Signal
6	Z+	Yellow	Encoder Z + Signal
7	A-	Black & White	Encoder A-Signal
8	B-	Brown & White	Encoder B-Signal
9	Z-	Green	Encoder Z-Signal
10	U+	White	Encoder U+ Signal
11	V+	Orange	Encoder V+ Signal
12	W+	Grey	Encoder W+ Signal
13	U-	Purple	Encoder U- Signal
14	V-	Blue	Encoder V- Signal
15	W-	Orange & White	Encoder W- Signal

2. Fast terminal model electrical motor definition



Power line terminal



encoder Terminal

Note: Welding ling from the side view

Power lines fast terminal motor outlet side definition			
Serial No.	Name	Color	Remark
1	U	Red	Motor U Phase
2	V	Yellow	Motor V Phase
3	W	Blue	Motor W Phase
4	PE	Yellow & Green	Ground wire
Encoder fast terminal motor outlet side definition			
1	FG	—	Shielded cable
2	5V	Red	Voltage 5V
3	0V	Black	Voltage 0V
4	B+	Green	Encoder B+ Signal
5	Z-	Yellow & Black	Encoder Z- Signal
6	U+	Brown	Encoder U+ Signal
7	Z+	Yellow	Encoder Z+ Signal
8	U-	Brown & Black	Encoder U- Signal
9	A+	Blue	Encoder A+ Signal
10	V+	Grey	Encoder V+ Signal
11	W+	White	Encoder W+ Signal
12	V-	Grey& Black	Encoder V- Signal
13	A-	Blue & Black	Encoder A- Signal
14	B-	Green & Black	Encoder B- Signal
15	W-	White & Black	Encoder W- Signal