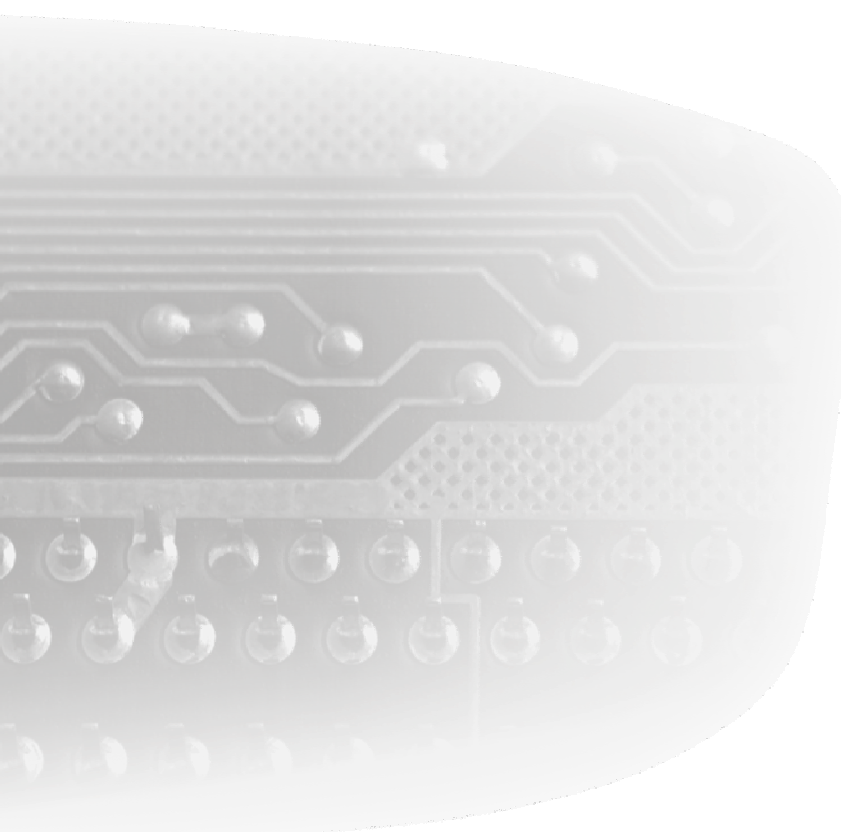# All-digital Single-channel AC Servo Driver

QS7 Series User Manual

This instruction only use to the drivers having software version above 30XX. Not for the drivers having 10XX or 20XX software version.

ADTECH众为兴

A D T E C H (S H E N Z H E N) T E C H N O L O G Y C O ,. LTD

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Basic Information of Manual

Item No.	Initial Uploading	Version No.	Total Page	Editing Engineer	Layout Engineer
QS7	2012-10-16	A0701	42	Yang Guo	Weihua Yang
Proofreading Records					
Date	Version/Page	Result	Confirmation		
2013-5-29			Weihua Yang		

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 promise to repair for free for our customer。
● broken by the reason as below, customer need to pay for the maintenance fee：
（1）wrong operation and repair by customer themselves、retrofit induce driver broken；
（2）Machine damage for the fire、water、abnormal voltage、other accident or second disaster
（3）Artificially drop or damage；
（4）Do not operate base as our use manual book
Any other reasons，please contact us。

Contents

CHAPTER1   PRODUCT INSPECTION AND INFORMATION

1.1 Product inspection

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

Confirmation Item	Reference Method
Does the arrived product matches the model that you order?	Please check by the nameplate marking on the Servo Motor and Driver .
Dose the rotation axis of servo motor work smoothly?	Use hand to turn softly, while the motor with "Brake" can not turn 。
Does the appearance of the servo drive and servo motor damage, spare parts complete?	Please refer the product's standard configure. Whether exist the damage through transport on appearance, if have, do not wire on power.

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

1.2 Product's nameplate
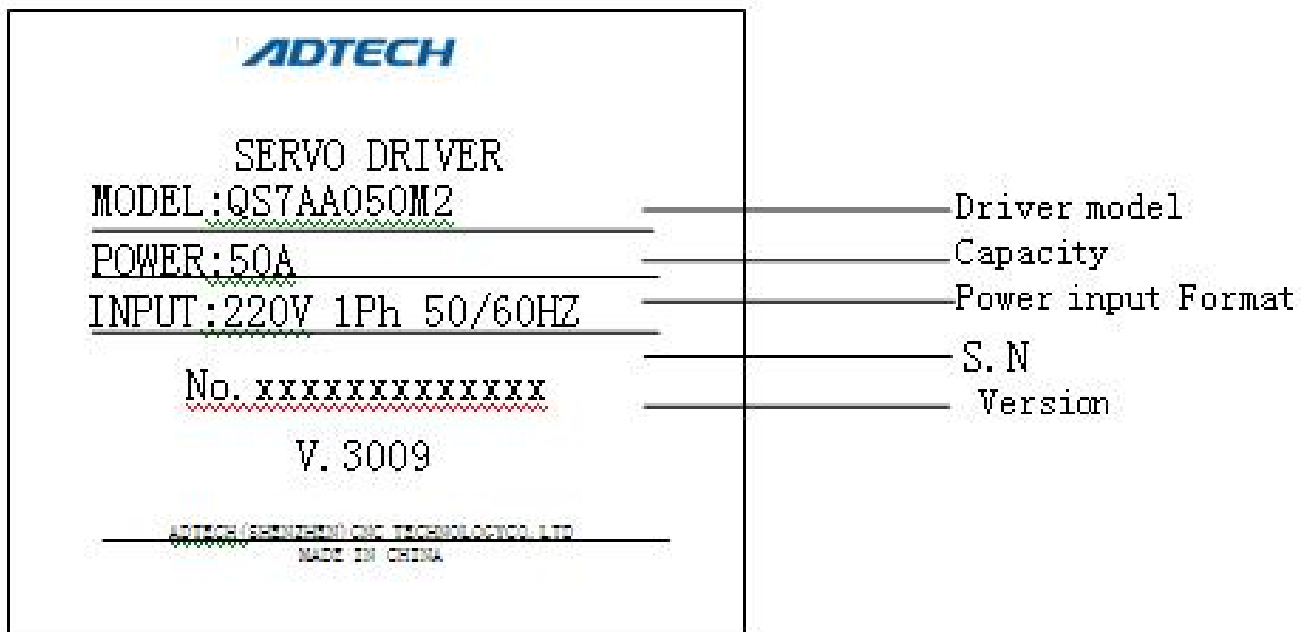
1.3Naming rule of servo motor and driver

1.3.1 Servo driver's naming

QS7   AA   030   M   2

QS6series   All series

capacity
010--10A
020--20A
030--30A
050--50A
075--75A

Double power

M—IPM type
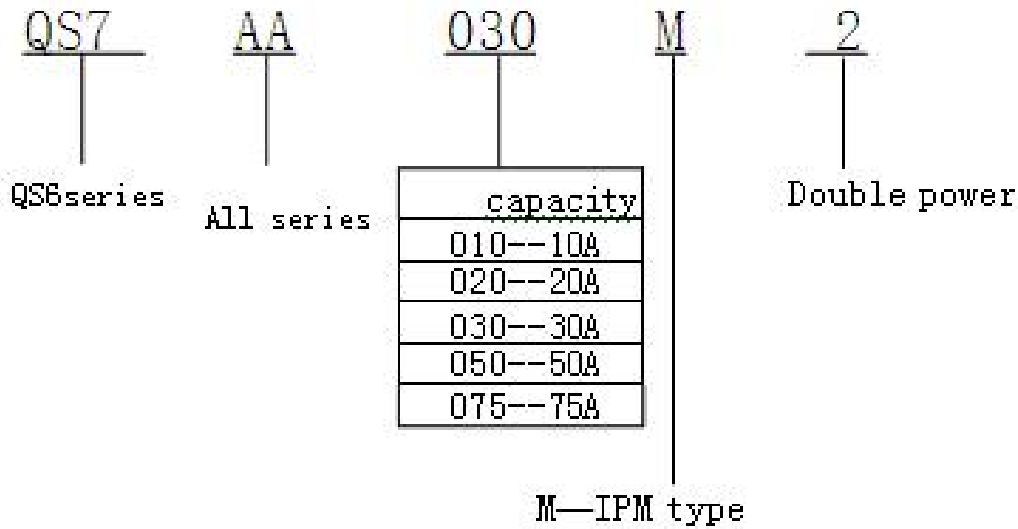
1.3.2 Servo motor's naming rule

ACH - 09   075   D   C---T

AC-AC servo motor
ACH: H serie
ACK: K serie
ACM: M serie
ACL: L serie

flange
06-60MM
08-80MM
09-86MM
11-110MM

output power

020-200W
040-400W
060-600W
075-750W
100-1KW

rotate speed

A-1500
B-2000
C-2500
D-3000
E-5000

empty: without break

T: with 24v break
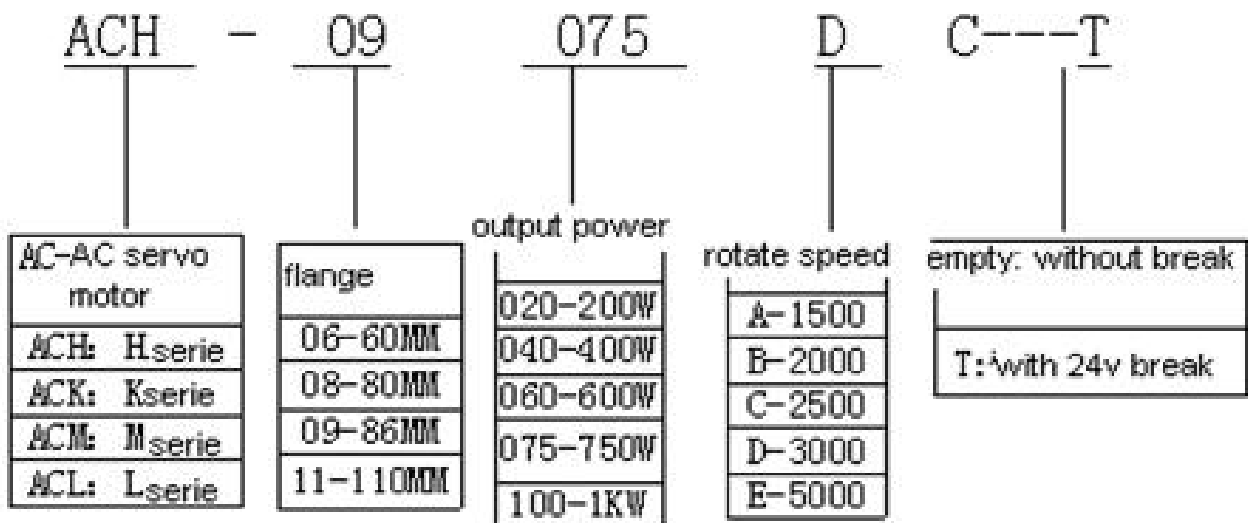
1.4 Match chart of servo motor and driver

Output rate	series	Servo motor	Servo driver	B	K	Motor rate torque and current
50W	ACN	ACN04005DC	QS7AA010M		S	0.1Nm,1.20A
100W	ACN	ACN04010DC			S	0.1Nm,1.38A
200W	ACH	ACH-06020DC			S	0.64Nm,1.38A
	MRMS	MRMS06020D			S	0.64Nm,1.40A
400W	MRMS	MRMS06040D	QS7AA010M QS7AA020M		S	1.27Nm,2.80A
	ACH	ACH-06040DC			S	1.27Nm,2.89A
750W	MRMS	MRMS08075D	QS7AA020M		S	2.39Nm, 5A
	ACH	ACH-08075DC			S	2.40Nm,4.78A
	ACH	ACH-09075DC			S	2.40Nm,3.00A
	ACH	ACH-08075BC			S	3.50Nm,3.00A
1000W	ACH	ACH-09075DC-T		B	M	2.40Nm,4.78A
	MRMS	MRMS08100D			S	3.3Nm,5.5A
1200W	ACH	ACH-13100CC-T	QS7AA030M	B	S	4.00Nm,4.00A
	ACH	ACH-11120BC			S	6.00Nm,4.50A
	ACH	ACH-11120DC			M	4.00Nm,5.00A
1500W	ACH	ACH-11120BC-T		B	S	6.00Nm,4.50A
	ACH	ACH-13150CC			M	6.00Nm,6.00A
	ACH	ACH-11150DC			M	5.00Nm,6.00A
	ACH	ACH-13150AC			M	10.0Nm,6.00A
1800W	ACH	ACH-13150AC-T	QS7AA050M2 QS7AA075M2	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

B：With brake S：Small inertia   M：Mid inertia L：Big inertia

1.5 Technical specifications of servo driver

Base specification	control technique			Three phase full-wave rectification SVPWM Space Vector control
	Power input			AC220V -15%~10%
	reaction			2500-line incremental photoelectric encoder
	Working condition	use/Storage temperature		45℃/-40℃~55℃
		use/Storage humidity degrees		40%~80%/90%（non condensing ）
		Protection level		IP10
		Vibration resistance/ impact resistance		4.9m/s^2/19.6 m/s^2
		sea level elevation		<1000m,1000m reduce rate voltage
		Atmosphere press		86~106kpa
Position mode	Input signal	Command impulse	Impulse various	1. impulse+direction 2. impulse+impulse 3. A+B 90°Orthogonal pulse
			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 impedance 10kΩ
	Command +/- speed			Parameter setting
	Instructions percentage			Parameter setting
	Instructions source			External analogue & Internal speed instructions
Torque mode	Simulation command input			-10V~10V, input impedance 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，Z signal corrector output
	Input signal			Servo EN、ACLR、Position banned、Are turning the limit、Reversal limit、control mode
	Output signal			Positioning complete、Servo alarm、servo ready、break output、zero point output
Built in Functions	Protection function		Overcurrent、overvoltage、low voltage、overload、over heat、lack phase，over speed、encoder abnormal、out of tolerance、mode abnormal alarm ,etc.	
	Surveillance Function		Rotate speed、current location、current pulse frequency、positional deviation、Motor torque、Motor current、Analog input values, etc	
	Communication function		Through RS232 reality communication with PC，reality parameter change、monitor of servo system's working	
	Display		6 bit LED display	
Other characteristics	speed regulation ratio		1:5000	
	Speed fluctuation rate		<±0.03%（Rated load in）	

CHAPTER Ⅱ INSTALLMENT

2.1 SERVO DRIVER'S INSTALLMENT
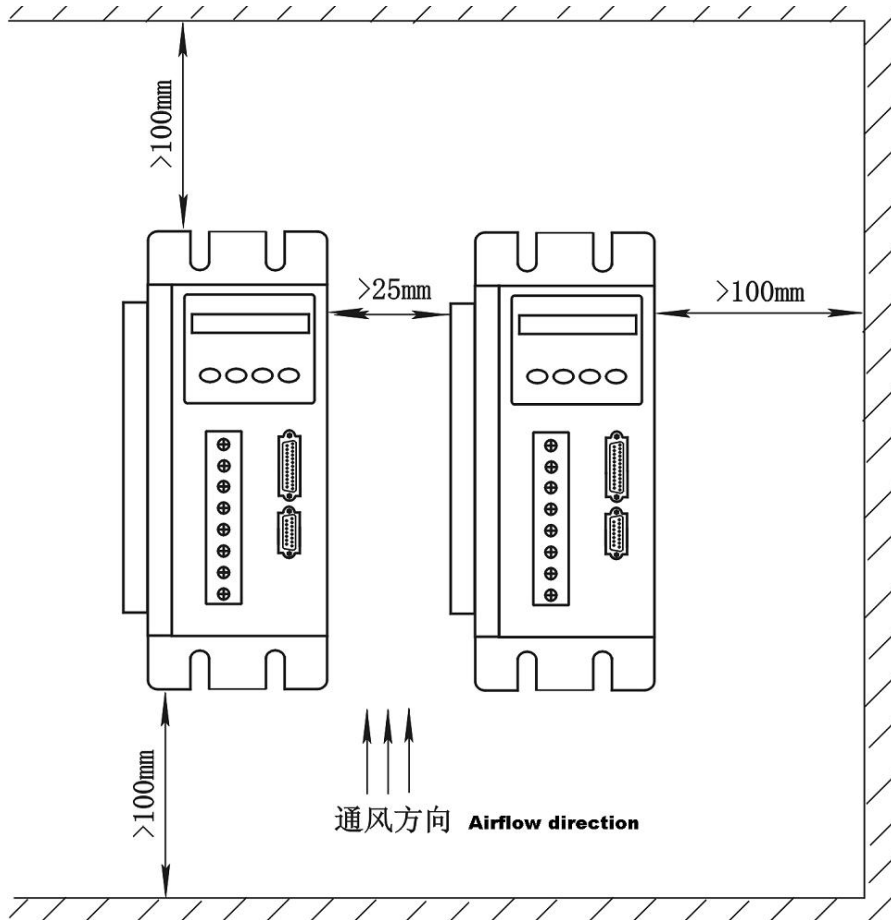
2.1.1 Installing environmental conditions

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 or moist environment。
5. Avoid direct sunlight。
6. Prevent oil mist、erosion of salt。
7. Prevent corrosive liquid、gas。
8. Prevent dust、cotton fiber And metal scraps into thin。
9. Far from radioactive substances and flammable objects。
10. Many driver install in one box，please 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，please 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 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.

2.1.3 Multi-Servo drivers install

2.2 Servo motor's install

2.2.1 Installing environmental conditions

● 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。

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.

2.2.2 Motor rotation direction definition

Face motor's shaft extension，counterclockwise rotation direction is forward，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。
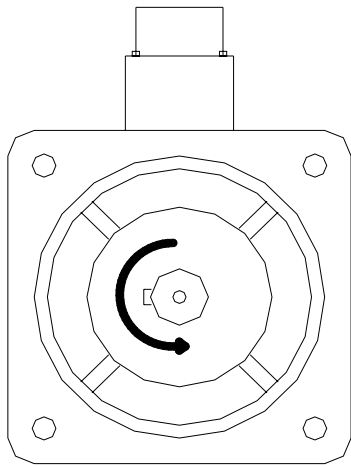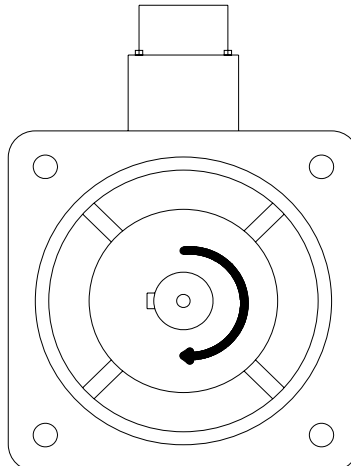
forward	inversion
anticlockwise（CW）	clockwise（CCW）

e

Chapter III Wiring

3.1 Whole Wiring Example

The QS7 series have 2 type connector according the current capacity

3.1.1 QS7AA010M/020M/030M wiring diagram
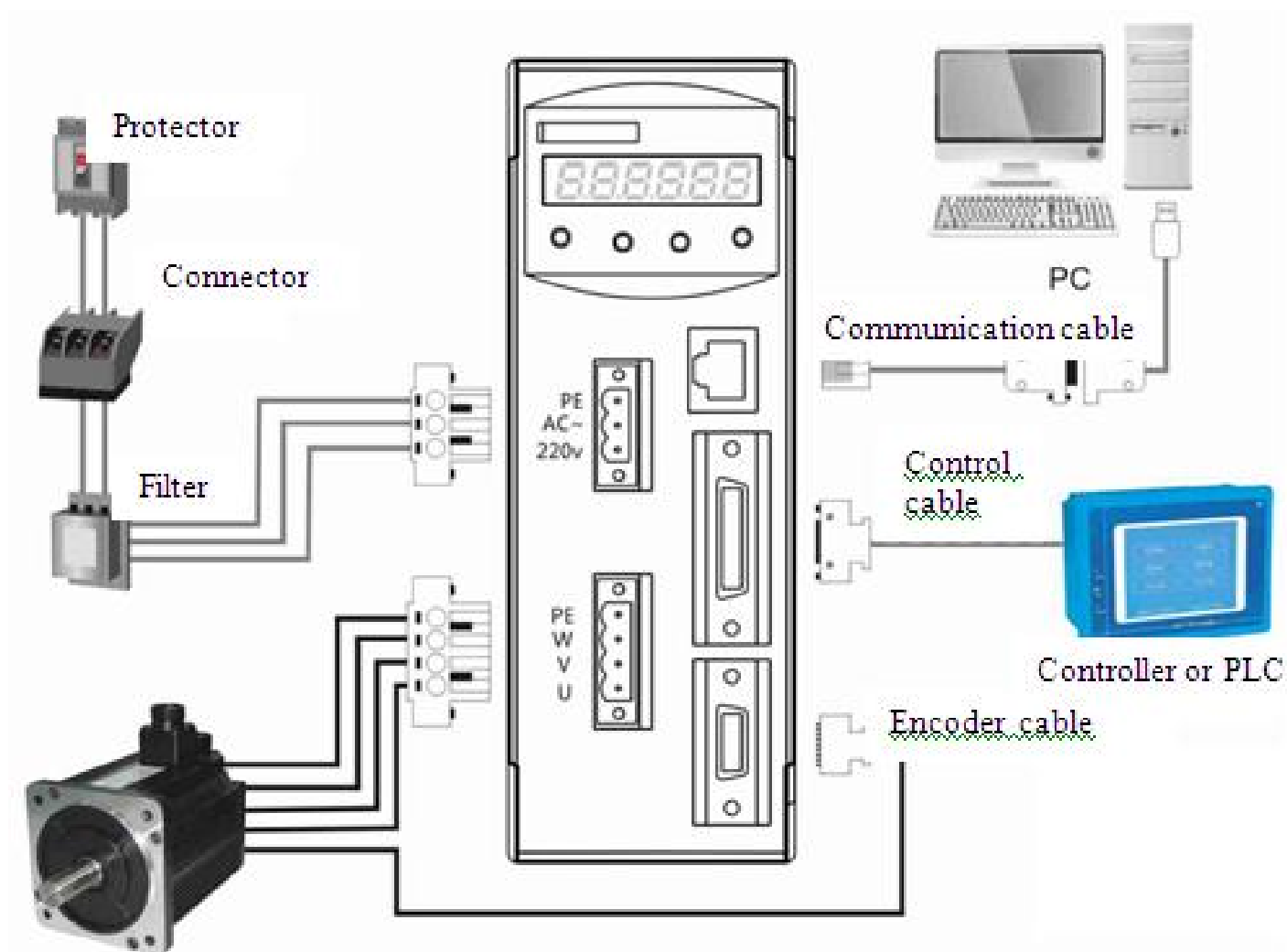
3.1.2 QS7AA050M2/075M2 wiring example
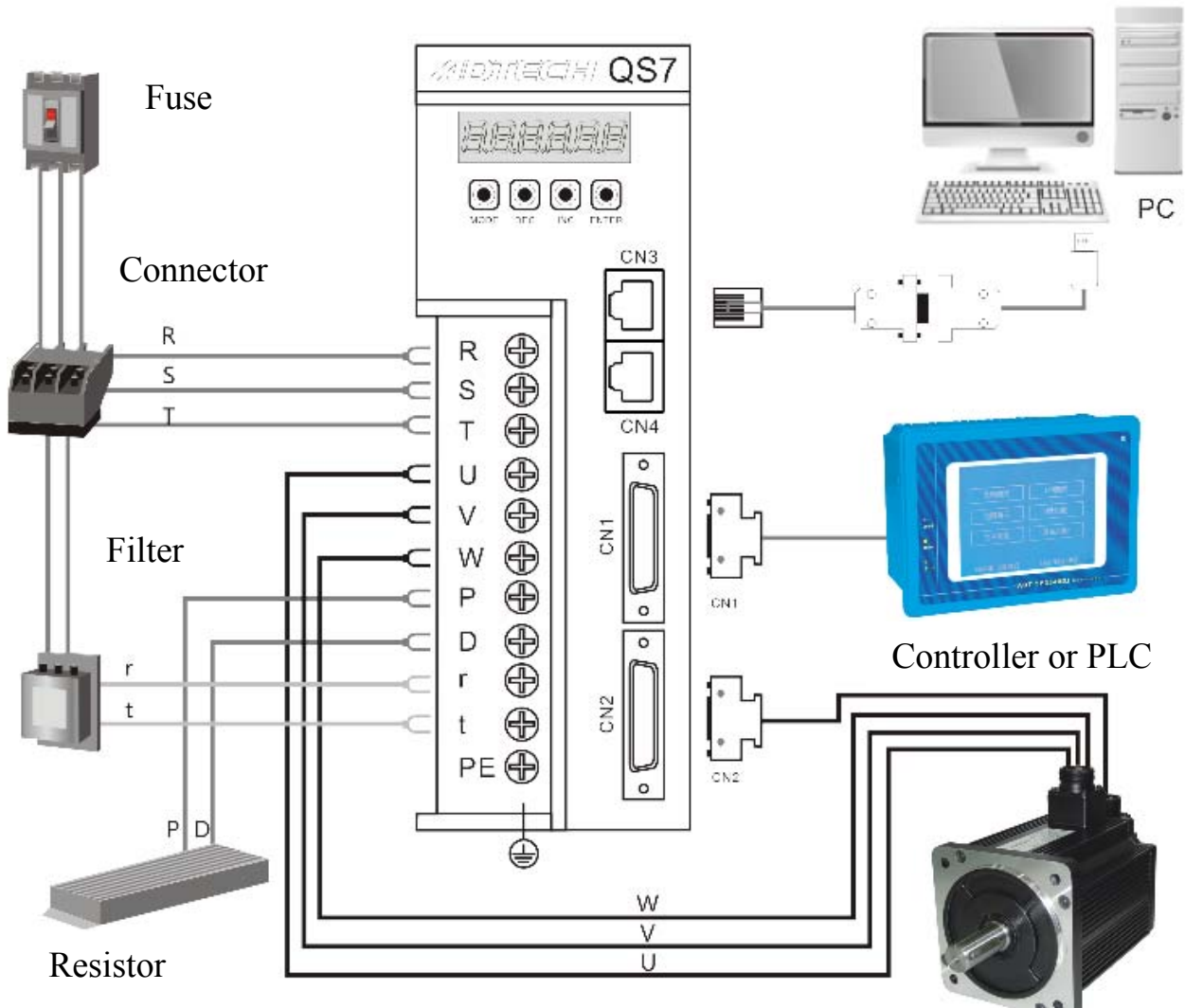
3.1.3 Cable Specification Instruction

Motor model	Cable 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	0.14 mm^2
1KW~1.5KW	2.0 mm^2	1.25 mm^2	2.0 mm^2	0.14 mm^2
2.3KW~2.6KW	3.5 mm^2	1.25 mm^2	3.5 mm^2	0.14 mm^2

3.1.4 Wiring requirement

● Use correct wire material according to the wire use specification,
● Cable Length ，Instructions cable , less than 3m，encoder wire must less than 10m；
● 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，please 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.
● Please install using type circuit breaker make sure driver can cutting down power in emergency situation.
● Please 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.

3.2 The Name and Function of Port

3.2.1 Port Introduction

QS7 series have 2 type connector according the current capacity

(1)QS7AA010M/020M/030M

terminal marking	terminal name	specification
R、T	Main power input	Driver's main power input
PE	ground connection	Motor external hall ground connector
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	Communication connector	Use for communication with PC (RJ45 port)

(2)QS7AA050M2/075M2

terminal marking	terminal name	specification
R、S、T	Main power input,	Driver's main power input
U、V、W	Motor power line	Supply current to motor

terminal marking	terminal name	specification
P、D	blank	No Connect
PE	Connect ground	Motor external hall ground connector
r、t	Control Power input	Driver's control power input
CN1	control	Use for connect controller or PLC
CN2	Encoder connector	Encoder refund signal
CN3 & CN4	Communication connector	Use for communication with PC or multi axis bus (RJ45 port)

3.2.2 Detail Directions of Port

1. CN1 Signal controller terminals
(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

(2)Terminal name and function

NO	NAME	STATE	NO	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	INSIDE INTEGRATION 2K RES CONNECT PLC+
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	29	CZ-	

NO	NAME	STATE	NO	NAME	STATE
		FORBID			
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 SELECT	33	OB-	ENCODER B-
16	0V	Internal power for PLC 12V 100mA	34	OA+	Encoder A+
17	12V+		35	OA-	Encoder A-
18	RESERVE	——	36	RESERVE	——

2. CN2 encoder Terminal
(1) Terminal arrangement

10	8	6	4	2
	9	7	5	3	1
20	18	16	14	12
	19	17	15	13	11

Note: picture show welding wire connect side aspect

(2)Terminal definition

NO	NAME	STATE	NO	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	+5V	POWER 5V	17	0V	POWER 0V
8			18		
9			19		
10	RESERVE	—	20	RESERVE	—

CN3 & CN4			
Pin	**Signal Name**	**Pin**	**Signal Name**
1	GND	5	RS485+
2	RXD	6	485-
3	TXD	7	485+
4	RS485-	8	Reserve

注：

　　1、CN3&CN4 's 050M2 and 075M2 actually internal connect.

　　2、 For the convenience of no serial port computer, these products are optional serial to USB adapter cable. Details please refer to Chapter Ⅸ communication papers

## 3. CN3 （CN4） Computer communication terminals

QS7 series servo driver adopt two kinds of communication connect port, QS7AA010M/020M/030M adopt RJ45 package series port for PC communication,

QS7AA050M2/075M2 have 2 RJ45 package series port to communicate with PC, or for multi axis communication . more detail please refer Chapter 9.

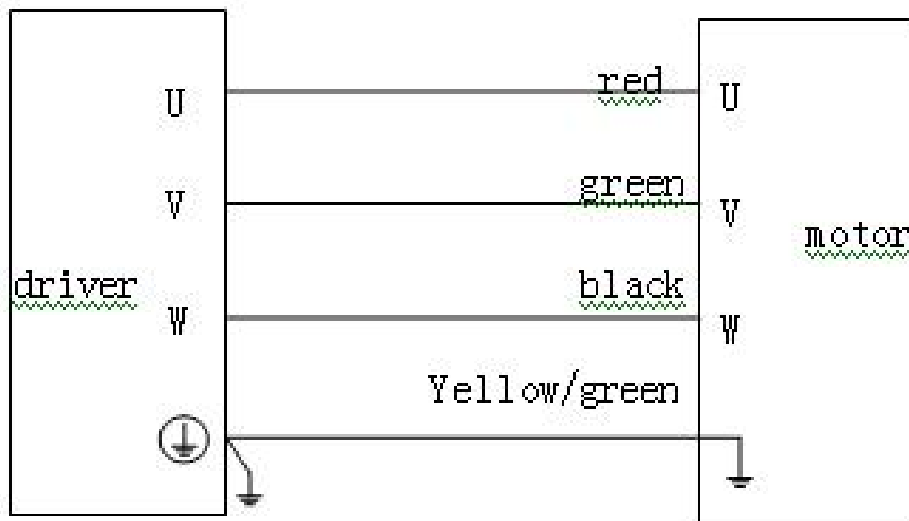### (1) Terminal arrangement
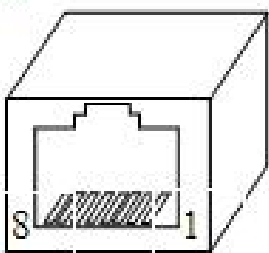
Base of Network Port
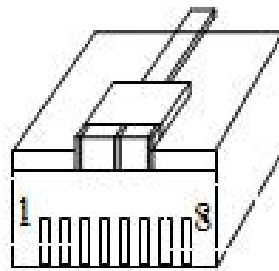
Crystal Head

(2) Terminal definition

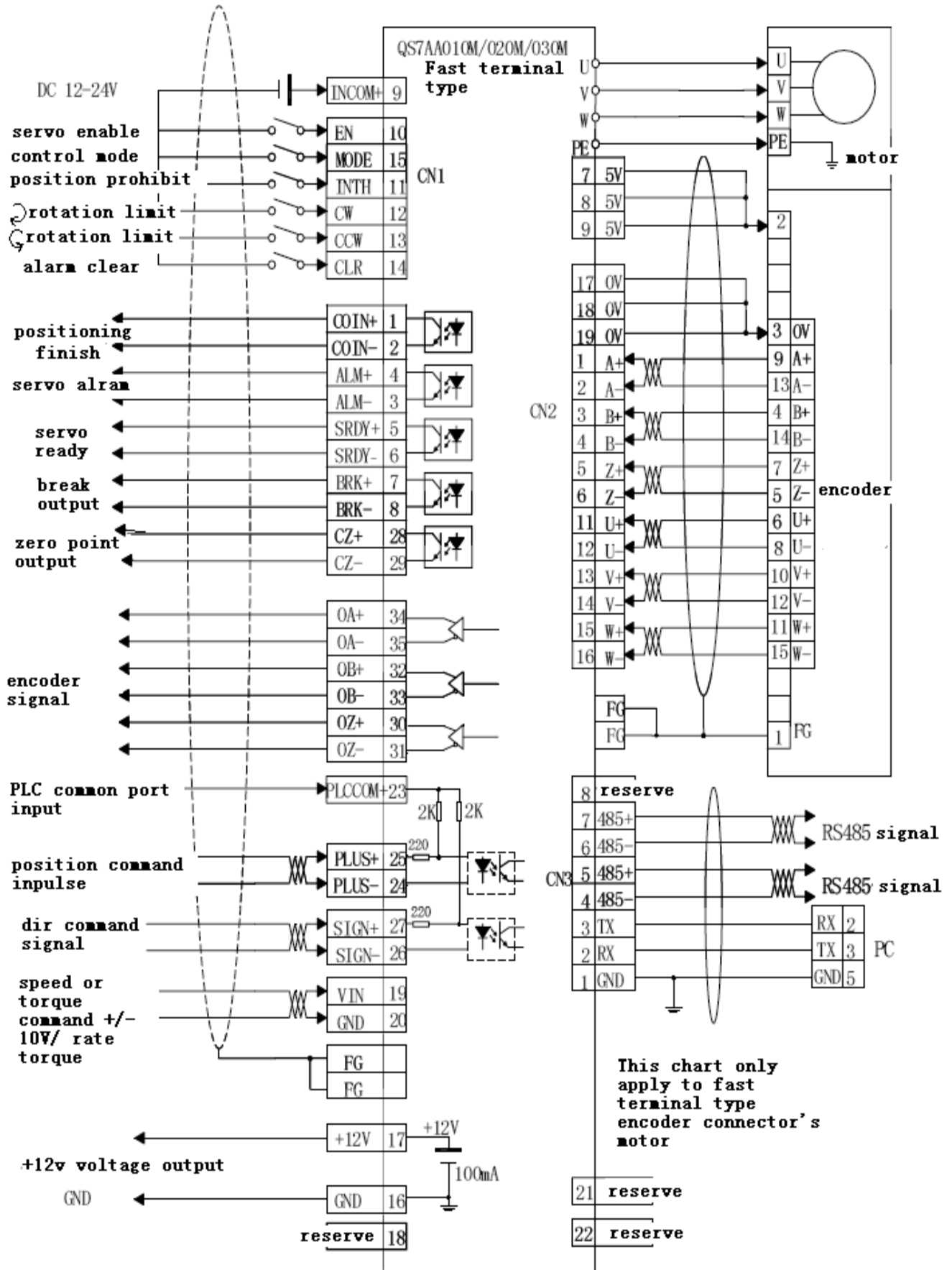detail please refer Chapter 9.

3.3 Servo driver Wiring Diagram
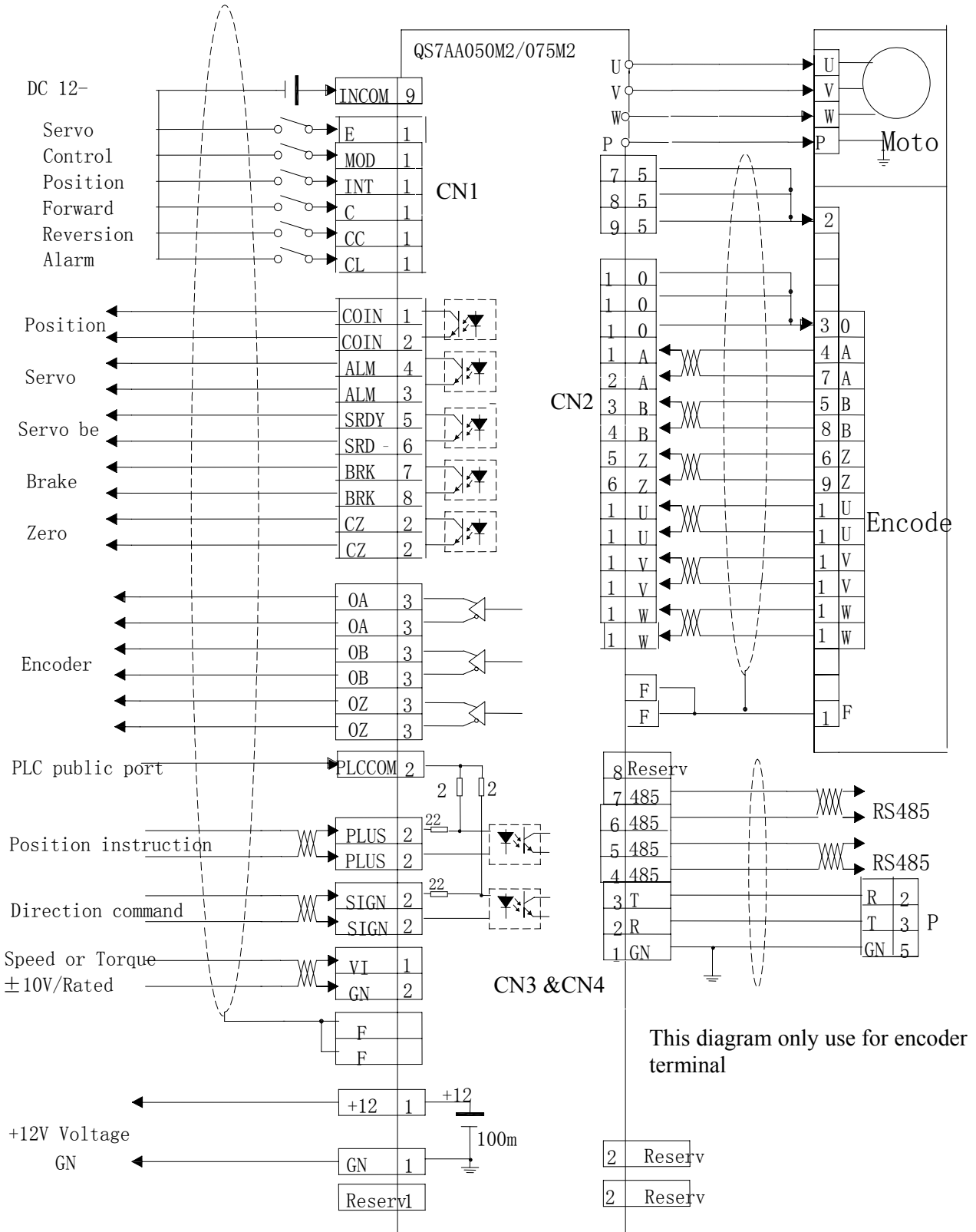

Since motor's outlet wire definition is difference, ADTECH has arrange matching cable, do not use other's unmatchable cable induce driver's damage .

3.3.1 QS7AA010M/020M/030M (Fast terminal type) Servo drive the wiring diagram

3.3.2 QS7AA050M2/075M2（Aviation plug type）servo driver wiring diagram

QS7AA050M2/075M2

This diagram only use for encoder terminal

3.4 Principles of input and output interfaces

3.4.1 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 |

3.4.2 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.

3.4.3 Pulse Signal Input Interface:
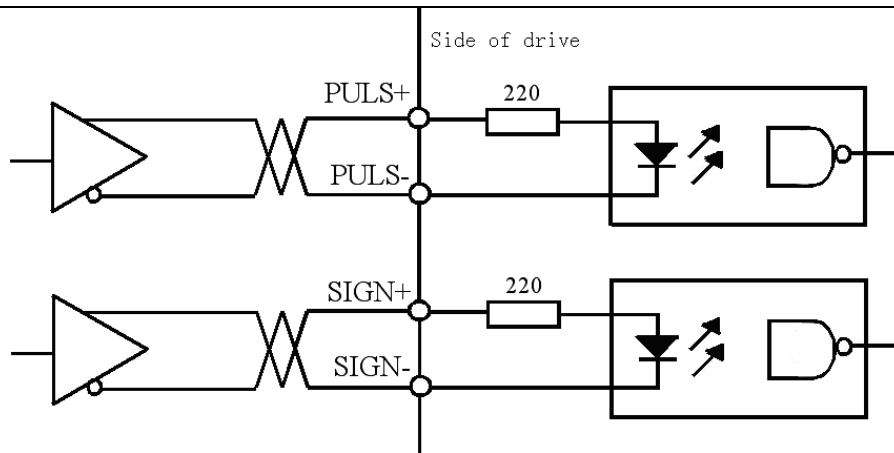
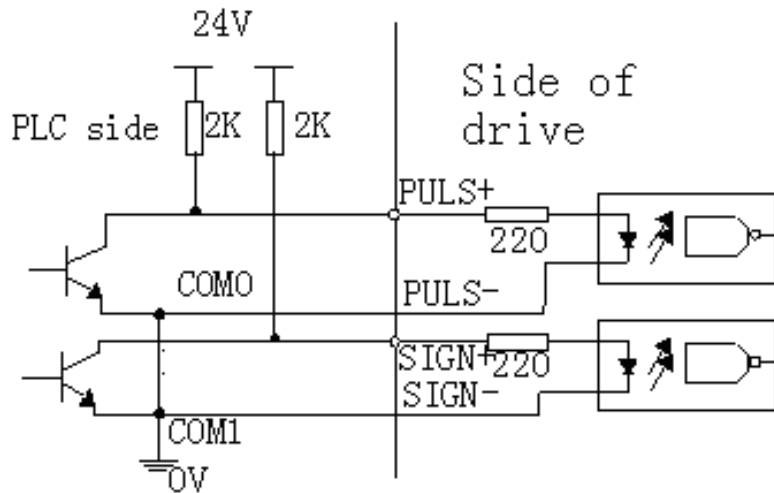| Pulse signal input interface of the differential drive mode |
| --- |
| |
| 1.required pulse frequency ≤ 500 kHz.
，Duty cycle is 1:1, and actual demand is to be required to pass 0.4US
2. adopting differential drive mode
3.AM26LS31, MC3487 or similar RS422 line drivers should be used |

Pulse signal input interface of the differential drive mode

Pulse signal single-ended input（Apply to PLC upper monitor and so on）	
●usually used as PLC pulse control | voltage	Resistance value R(reference value)
24V	2KΩ
12V	1KΩ
5V	100Ω		
	●driver current 10～15mA。 ●noted do not connect in reverse for polar of power ●pulse frequency ≤200KHz。 ●the connection is used as Mitsubishi PLC with ADTECH
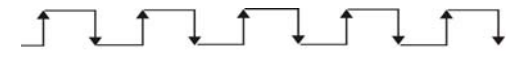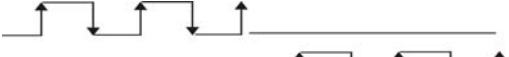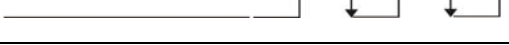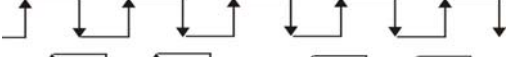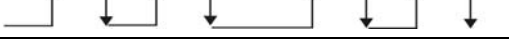
Pulse signal single-ended input mode

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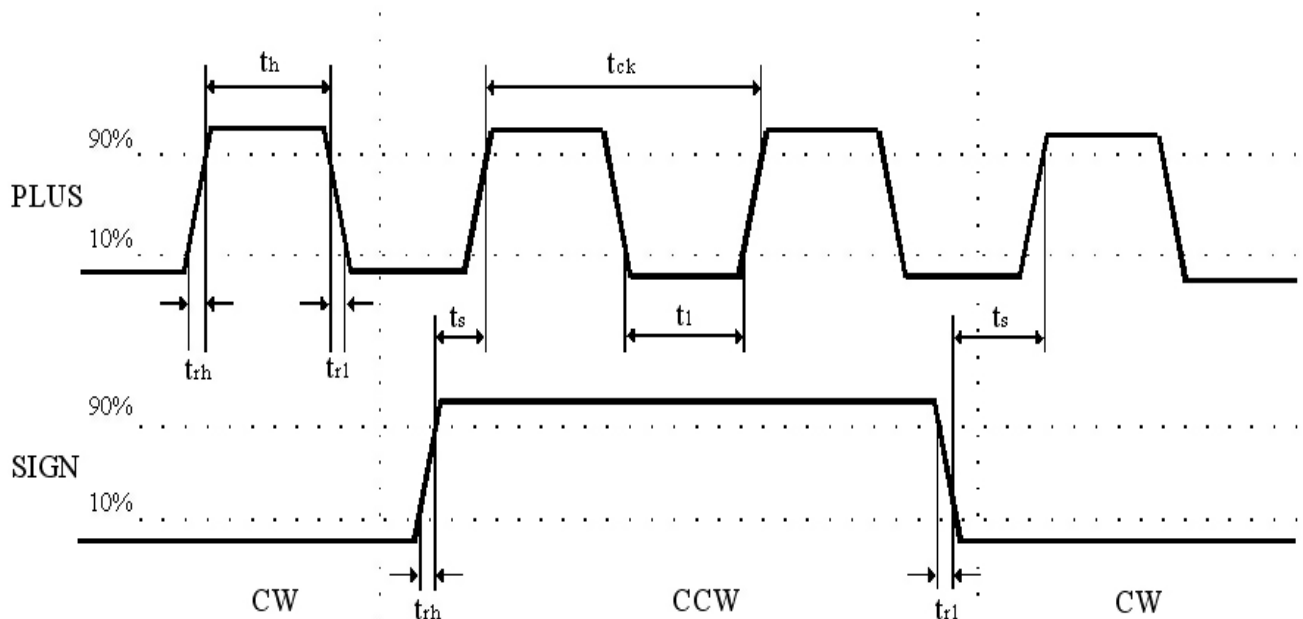
Pulse + Sign Input Interface Timing Diagram (Pulse Frequency ≤ 500kHz)
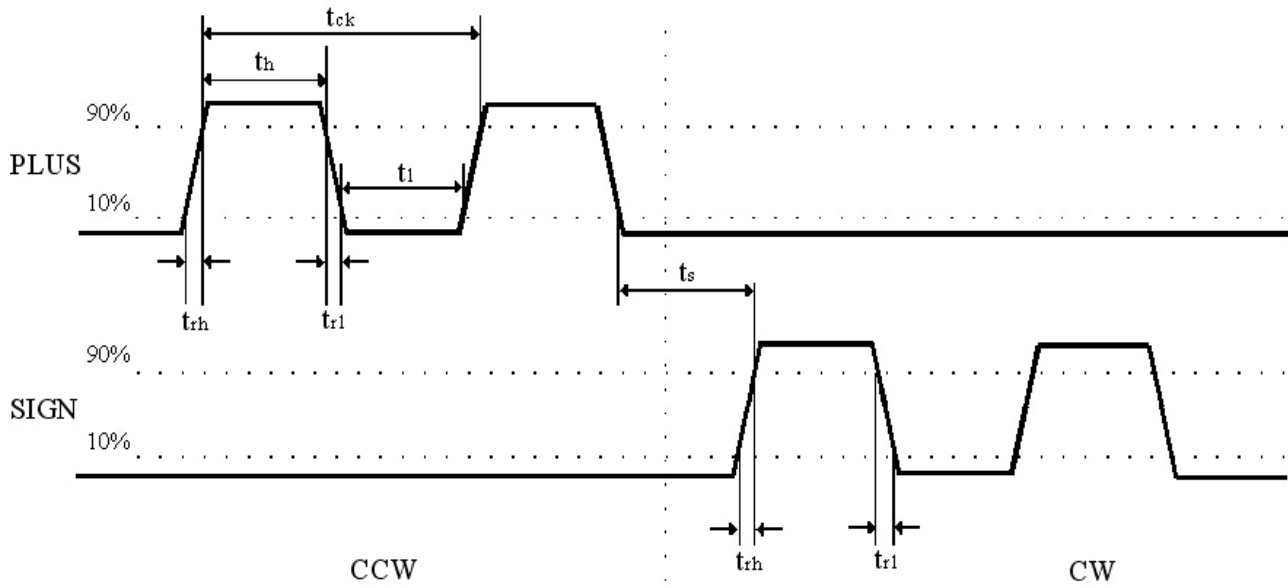
CW + CCW Pulse Input Interface Timing Diagram (Pulse Frequency ≤ 500kHz)

Chapter IV Display and Parameter Settings

4.1 Servo System panel Composition And Each parts Function

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.。
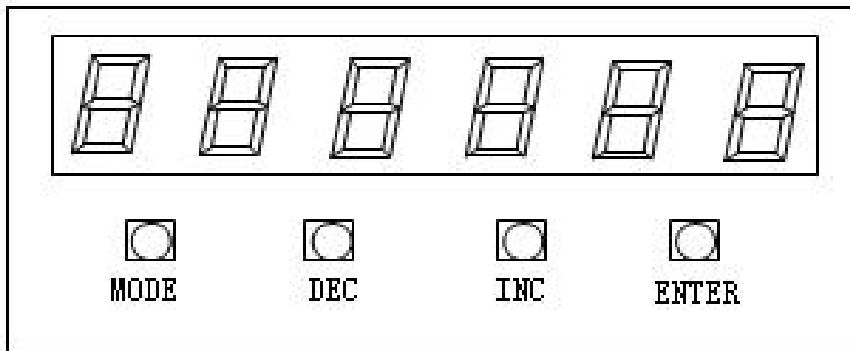
Name	Function
LED digital tube	show the various states and parameters
MODE	Feature selection, or the current point move left
DEC	Parameter No. numerical value reduce, or JOG motors corotation
INC	Parameter No. numerical value increase, or JOG motors rollback, alarm clear
ENTER	Feature confirmation，or data input confirmation

4.2 Keyboard Operation

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，unit：pulse

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 `h  28`

8）display position deviate ：parameter P3=7，unit：pulse `d  2`

9）input interface diagnose： `In  1`
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： `o  306`

11）Input pulse frequency：unit：kHz `C  .0`

Operate	Function Item	Diagram	Remark
Press the "MODE" button, choose the five function items in cycle.	①parameters setting	`P  1`	Parameter": P1～P63
	②Parameter writing	`EP-`	It is valid when entering right password;
	③Parameters initialization	`rd-`	It is valid when entering right password;
	④Alarm Display	`Er--00`	No alarm as the picture shows; change to alarm picture when the alarm appears, then press "DEC" to clean alarm
	⑤Display state	`r  600`	Same as indicated content of P3 parameter S

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; clear alarm。

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

　　"Enter"：function key for confirmation, or data entry confirmation.

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". 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-` `2.0` 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`	press mode to EP - press enter key for three second press "mode " key to return, after 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` ease press "Enter" key to return. 4.If writing is necessary, please implement writing operation. And press Mode key to return.	press mode to rd - press enter key for three second press "mode " key to return, after showing END

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	Parameter Range	Default	Unit	Remark
P0	Software Version	P, S, T	3000 － 30XX			②
P1	Code	P, S, T	0-9999	0		①
P2	Model No	P, S, T		400	Motor Voltage	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	0－2	0		①
P6	Servo Input INTH Function	P, S, T	0－2	0		①
P7	Limit Input Control	P	0－4	0		①
P8	Coin output	P, S, T	0－1	0		①
P9	Alarm output	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	50		①
P17	Position feed-forward	P	0－32000	0		①
P18	Position smoothing	P	0－1000	0		①

Parameter No.	Parameter Name	Application	Parameter Range	Default	Unit	Remark
	constant					
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	100		①
P22	Speed integral	P，S	1－32000	500		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

Parameter No.	Parameter Name	Application	Parameter Range	Default	Unit	Remark
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	1-7	0		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	0-32000（ms）	0	ms	①
P48	Stop delay of electromagnetic brake	P，S，T	0-32000（ms）	0	ms	①
P49	Zero speed clamp-on	P，S，T	0－2000	0	rpm	①
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	RS-232，RS-485	485		①
P58	second electronic gear radio numerator	P	0-32000	1		①
P59	second electronic gear	P	0-32000			①

Parameter No.	Parameter Name	Application	Parameter Range	Default	Unit	Remark
	radio denominator					
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:
It is immediately valid after modification;
Fixed parameters cannot be modified;
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	3000-30xx
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 (see table below)	

Rate power	P2 Parameter	Speed RPM	Current A	Torque Nm	Encoder type
ACH Series Motor					
200W	200	3000RPM	1.5	0.63	Normal
400W	400	3000RPM	2.8	1.27	Normal
600W	600	3000RPM	3.5	1.91	Normal
750W	750	3000RPM	3.0	2.4	Normal
1200W	1200	3000RPM	5.0	4.0	Normal
1500W	1500	3000RPM	6.0	5.0	Normal
1800W	1800	3000RPM	6.0	6.0	Normal
750W	751	2000RPM	3.0	3.5	Normal
1000W	1000	2500RPM	4.0	4.0	Normal
1200W	1201	2000RPM	4.5	6.0	Normal
1500W	1501	2500RPM	6.0	6.0	Normal
2000W	2000	2500RPM	7.5	7.7	Normal
2600W	2600	2500RPM	10.0	10.0	Normal
1500W	1502	1500RPM	6.0	10	Normal
2300W	2300	1500RPM	9.5	15	Normal
MRMS Series Motor					
200W	208	3000RPM	1.5	0.63	Wire saving
400W	408	3000RPM	2.8	1.27	Wire saving
750W	758	3000RPM	2.8	2.4	Wire saving
CAN Series Motor					
50W	No	3000RPM	0.65	1	Normal
100W	104	3000RPM	1.2	1	
200W	204	3000RPM	2.1	1.75	

		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—Communication mode Selection	
P3	Boot display	0－Rotational speed（RPM） 1－Motor current （A） 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	0－10
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 8－4 sections position control 9－communication control 10－internal position+ CW CCW jog	0－10
P5	Servo enable control	0－Valid 1－Invalid: forcibly lock shaft 2－power connection: automatic return to zero	0－2
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	0－2
P7	Limit input control	0－Invalid; 1－ Active LOW without alarm; 2－ Active HIGH without alarm; 3－ Active LOW with alarm;	0－4

		4－ Active HIGH with alarm;	
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(500K) 1－Pulse＋pulse: normal direction 2－Orthogonal pulse: normal direction 3－Pulse ＋direction: normal direction(100K)	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. 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: $$\frac{1}{50} \leq G \leq 50$$	1－32000
P13	Electronic gear denominator	Same as the above parameter P12.	1－32000
P14	Orientation completio n	Set orientation completion pulse range under the mode of position control; This parameter provides the basis whether the orientation is completed	0－32000

	n scope	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.	
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 jitter.	1－2000
P17	Position feed-forward	Set position loop feed-forward coefficient ; When it is set as 0, no feed-forward coefficient is added; 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.	0－32000
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	1－1000

		vibration.	
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 input method	0－AD input value　1- P35 value fixed to be used;	0－1000
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 voltage 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	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 －shield　　19－alarm	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 arrival	Set the proportional relation between analog torque input voltage and motor actual operation torque; 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.	0－100
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	The motor will stop when the value is less than this parameter.	0-2000

	clamp-on		
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 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.	0－1
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	Communication mode	Select RS-232 or RS-485 communication	232,485

P58	second electronic gear radio numerator	use method is same as first electronic gear radio .	0－500
P59	second electronic gear radio denominator	use method is same as first electronic gear radio .	0－500
P60	filter coefficient	adopt to remove the motor voice lead by speed loop gain too big	0—9
P61	Drive current type	10 refers to QS7AA010M ; 20 refers to QS7AA020M; 30 refers to QS7AA030M ; 50 refers to QS7AA050M;	10,20,30, 50
P62	V-phase current zero correction	It refers to drift value of V-phase current zero	2008－2088
P63	W-phase current zero correction	It refers to drift value of W-phase current zero	2008－2076

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:

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

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.	JOG Running ↓ Check if the cable connected well ↓ P4=1, P5=1 P34 set speed ↓ Press" MODE" to display status ↓ Press "INC" motor forward; Press "DEC" motor reverses
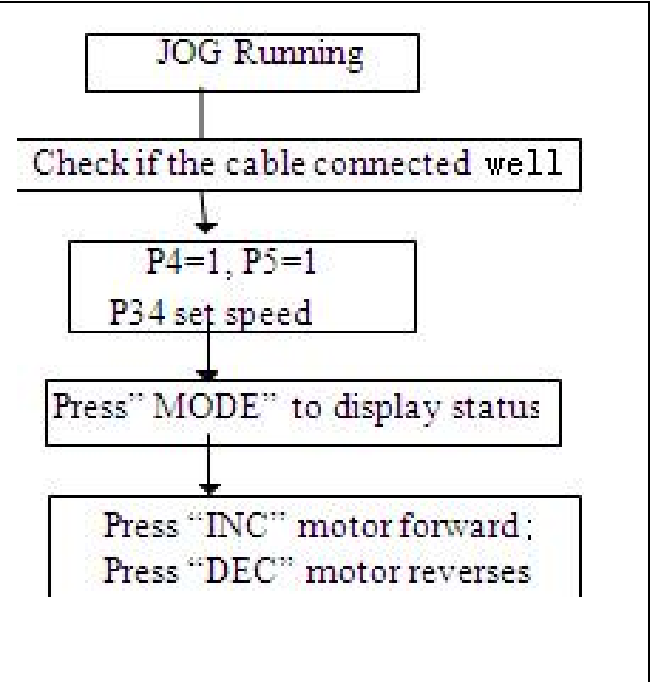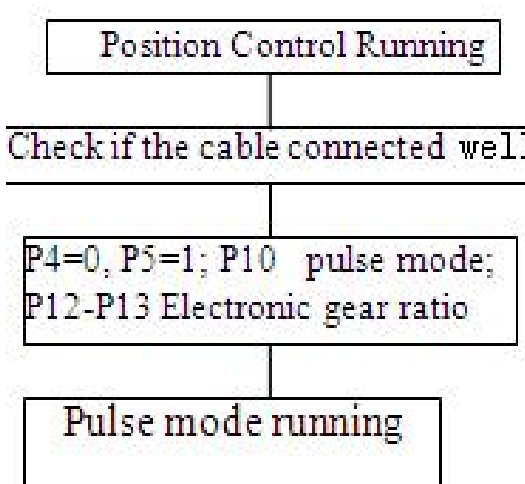
6.2 Position Control of Servo System

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.

Position Control Running

Check if the cable connected well

P4=0, P5=1; P10 pulse mode; P12-P13 Electronic gear ratio

Pulse mode running

6.3 Speed Control of Servo System

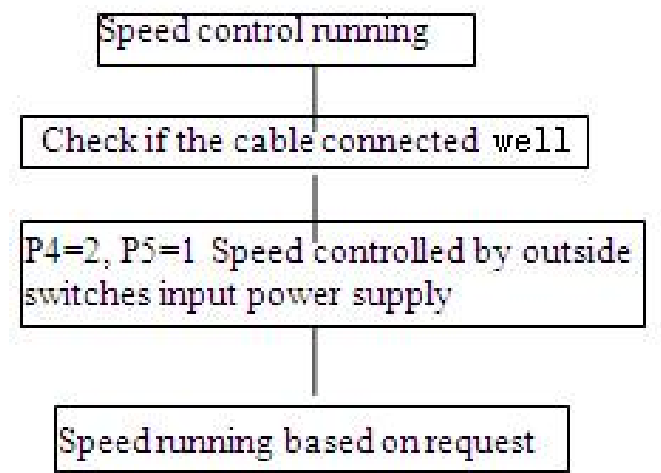When the system parameters are set to be P4 = 2, or P4 = 4, and MODE is valid, servo system is in the speed control mode. The maximum operating speed is determined by the parameters P26 and P31. The maximum operating speed refers to the operating speed when input voltage is 10V. Operating speed is determined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

Speed control running

Check if the cable connected well

P4=2, P5=1 Speed controlled by outside switches input power supply

Speed running based on request

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.

Torque control running

↓

Check if the cable connected well

↓

P4=3, P5=1 Torque control led by outside switches input power supply

↓

Torque running based on request
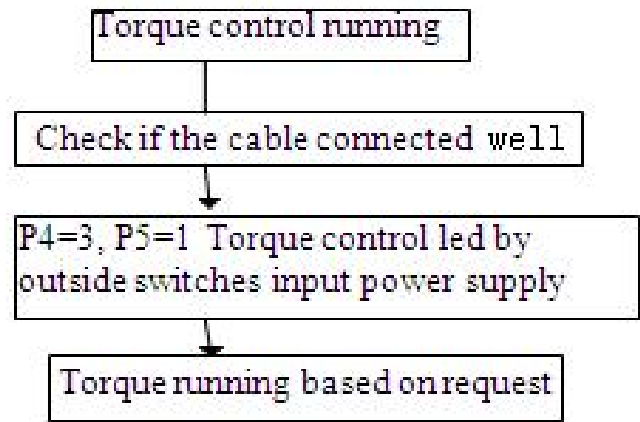
6.5 Internal Speed Control Servo System

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	P39*(P12/13)
1	0	1	P36	P40*(P12/P13)
1	1	0	P37	P41*(P12/P13)
1	1	1	P38	P42*(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	Encoder wiring error Encoder damage Encoder cable is too long, resulting in the low encoder supply voltage Running too fast Input pulse frequency is too high Electronic gear ratio too big Servo system instability causes overshooting 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	Mechanical choked to death Input pulse frequency is too high Encoder zero change in Encoder wiring error P16 position loop gain is too small Less torque P15 parameter setting is too small P15 = 0 shields this feature, resulted in no alarm
ER0-05	Drive temperature is too high	The ambient temperature is too high Bad cooling fan Broken temperature sensor Motor current is too big Internal regenerative braking circuit failure Broken internal regenerative braking transistor 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 & ER0-19	Encoder fault	Encoder damage Encoder wiring is damaged or broken P33 = 1 shields this feature, resulted in no alarm Encoder cable is too long, resulting in low encoder supply voltage The encoder received interference error accumulated over the alarm limit

| 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	Over-current Voltage is too low Motor insulation is damaged Gain parameter is set incorrectly Overload Temperature is too high Module is damaged Interference Short-circuits occurs among motor cables U, V, and W.
ER0-12	Over-current	Short-circuits occurs among motor cables U, V, and W. Imperfect grounding 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 minutes 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.
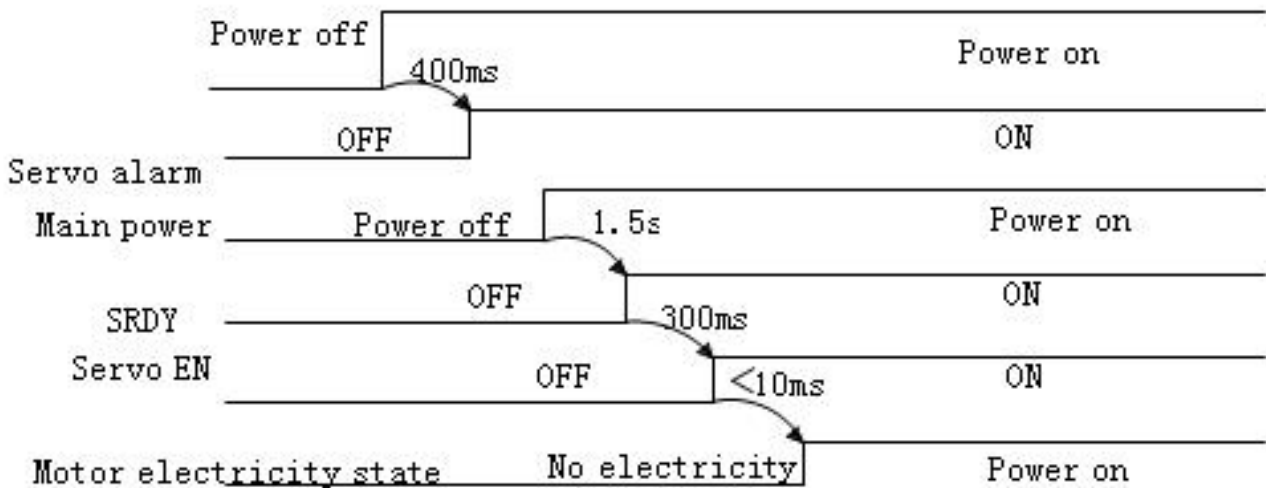
8.1.3 Sequence of servo off

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.
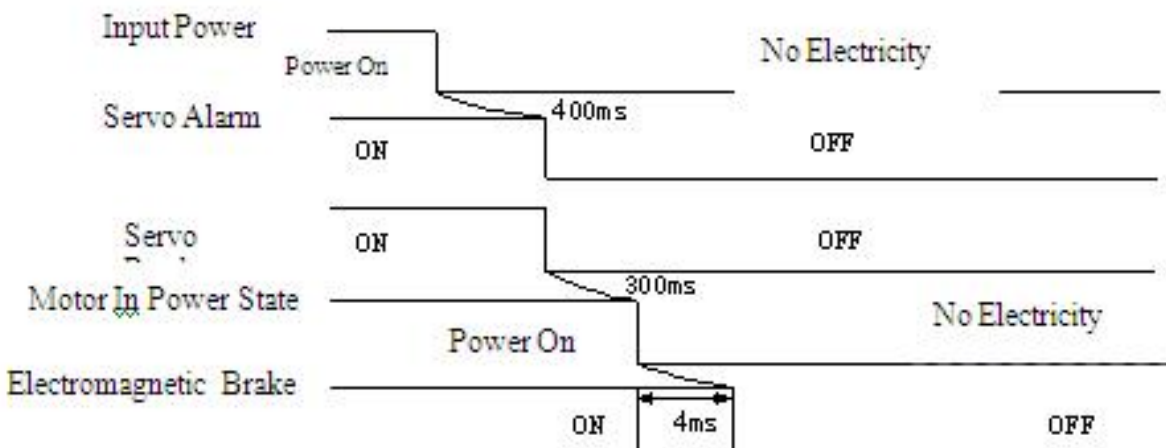

8.2 Usage of Mechanical Brake " BRAKE"

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 intermediate relay (Braking power provide by user). Brake signal are valid when delay time is P47 after 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-wheeling diode as surge absorber.
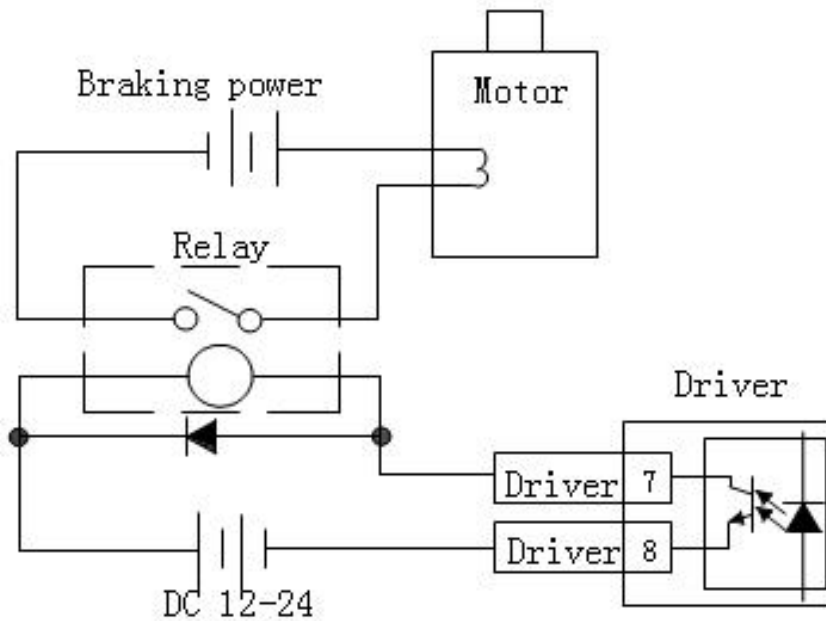
8.3 Debugging

Before power on, it must check the correctness of the parameters Incorrect parameter setting 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
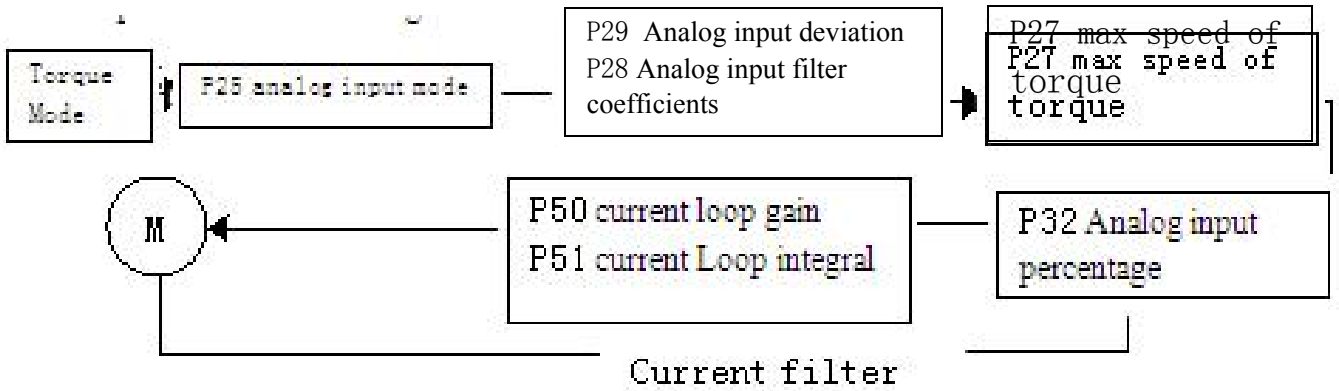
● Speed Control Flow Diagram
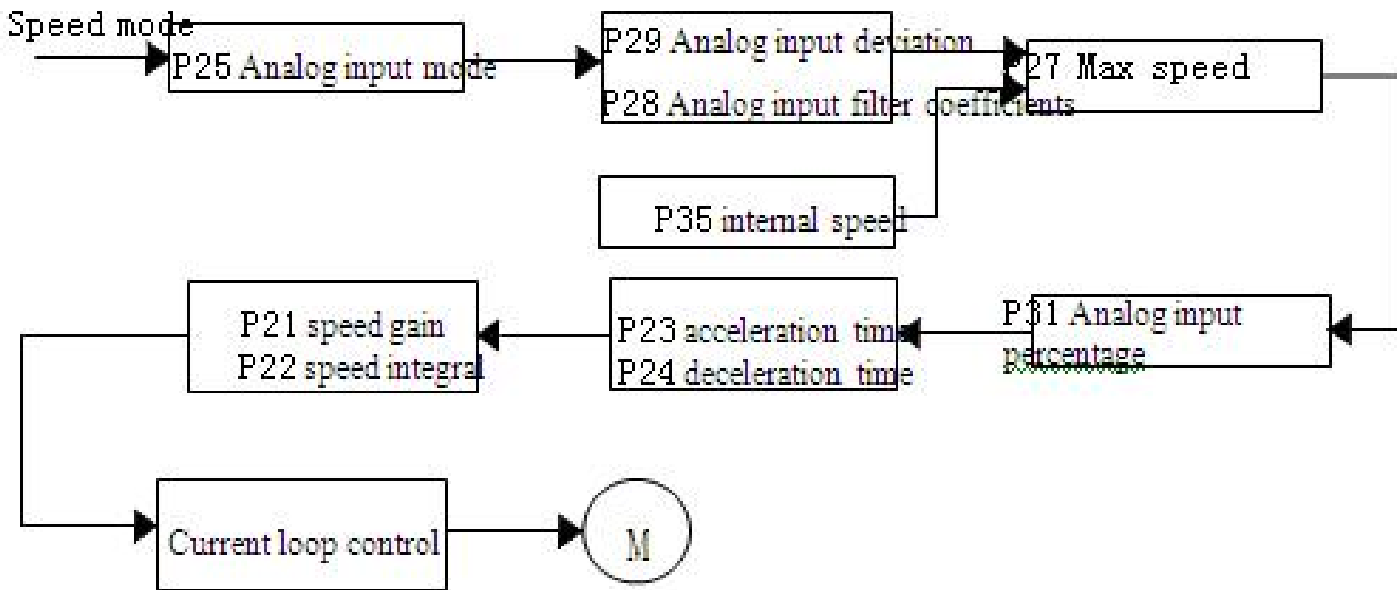
● Position Control Flow Diagram

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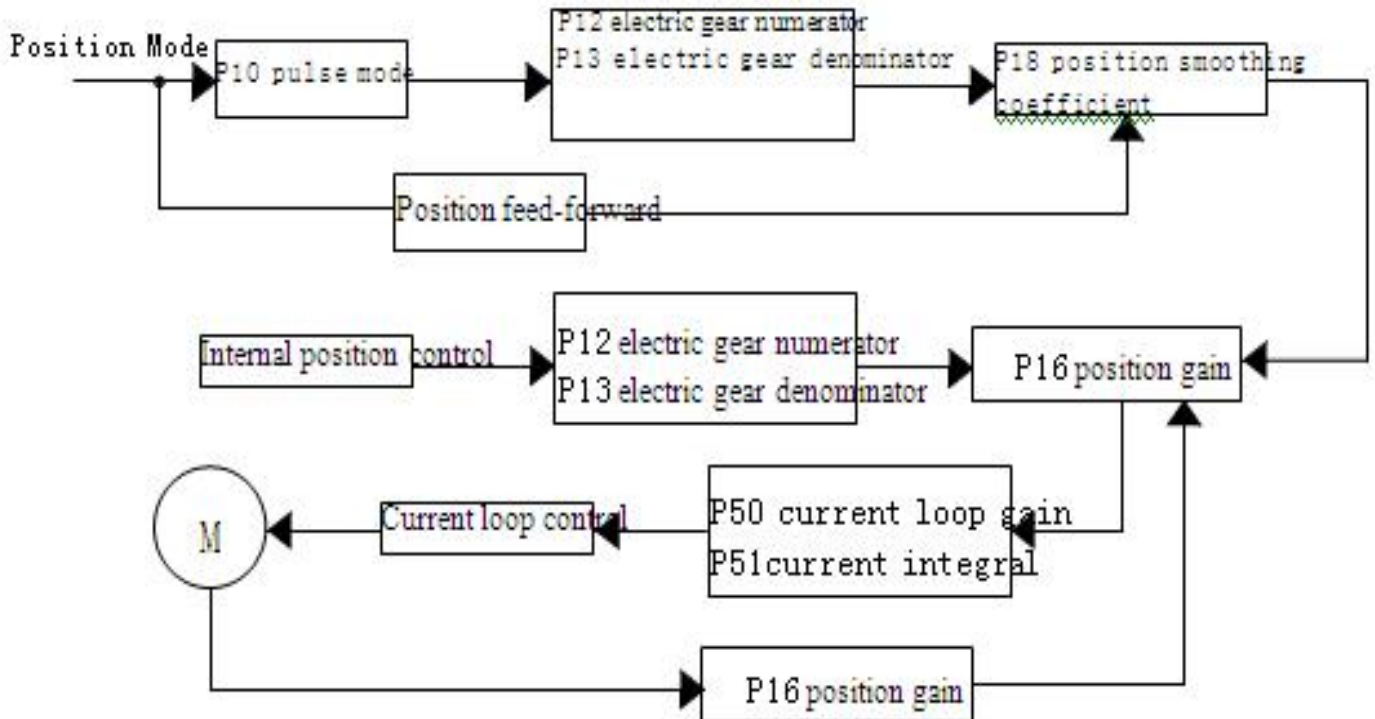
Position resolution (an impulse travel) determines the stroke per turn on the servo motor and encoder feedback pulses per turn Pt, which can be expressed with the below formulation:

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

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

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

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

General CNC pulse equivalent: 0.001mm

8.3.4 Servo Start-Stop Character Debugging

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, over voltage 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.

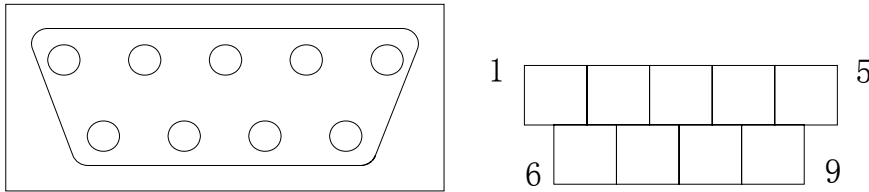Reduce the internal torque limit value and lower current limit.

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

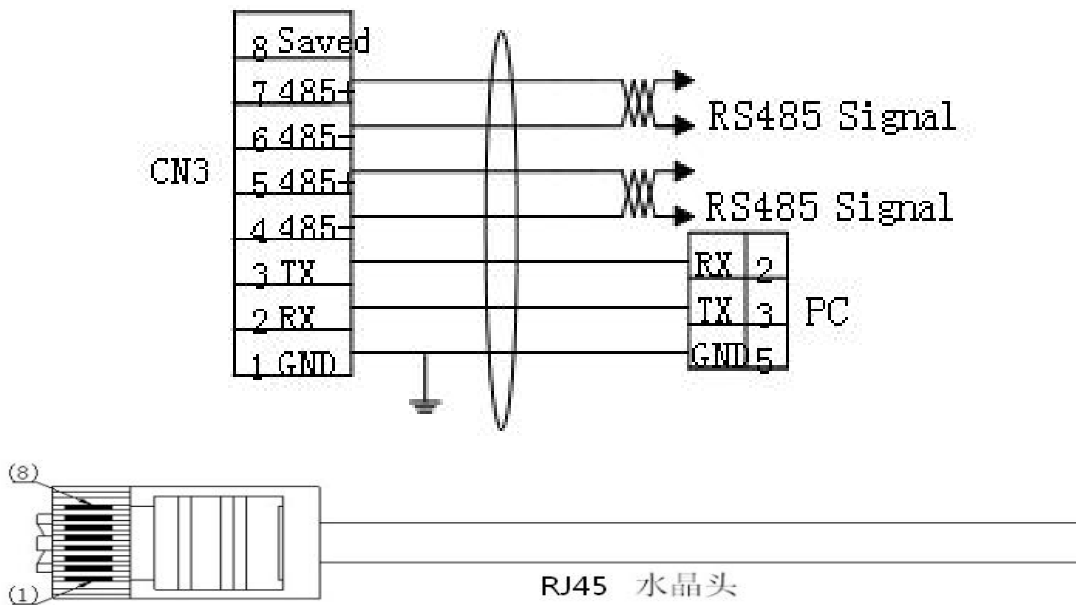The PC terminal uses standard DB9, as following diagram:

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.

RJ45 Connector	ConnectUT884 non-standard type definition	Connect standard serial port definition
1(GND)	3(GND)	5(GND)
2(RX)	4(TX)	3(TX)
3(TX)	8(RX)	2(RX)
4(485-)	1(485-)	Customize(485-)
5(485+)	2(485+)	Customize(485+)
	Shield	Shield

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

（1）Open SEVERSOFT.EXE software; choose language and the interface come out as below:
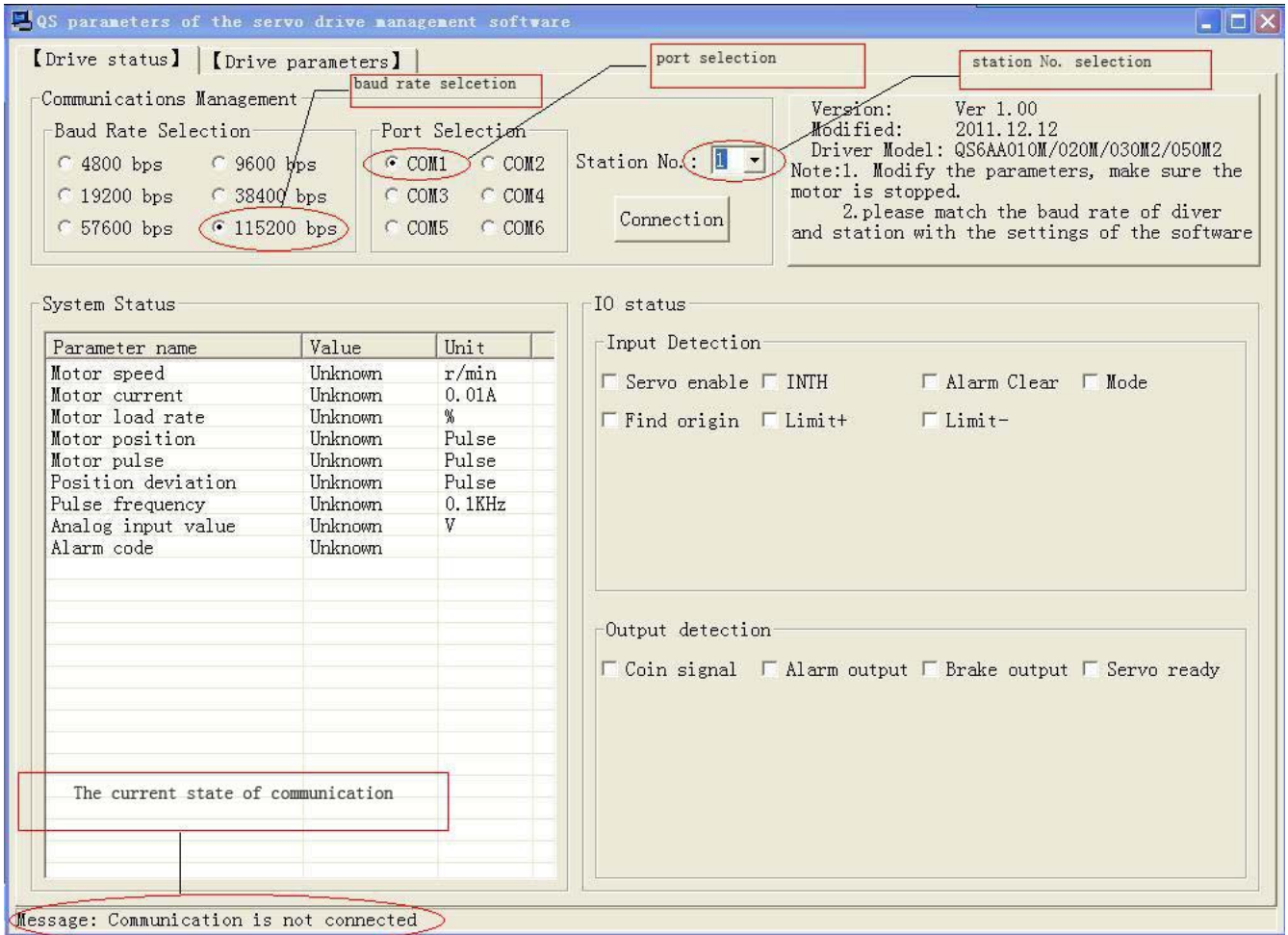
(2)According to drive's parameters to change the communication baud rate (P44 parameters of driver),

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"

（3）Click on driver's parameters, the parameters interface will come out as below:
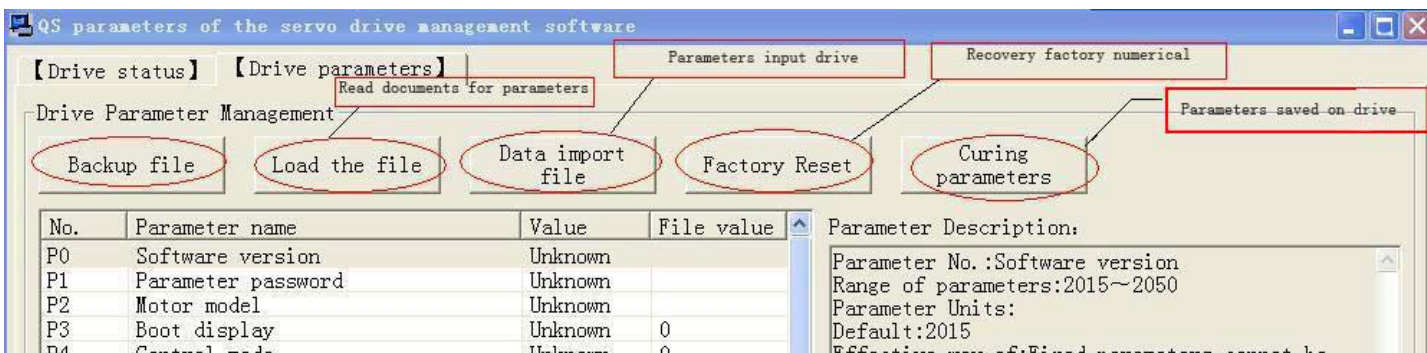
After this interface come out, you can set up parameters.

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

QS7 series drive have three different types of terminals, and different definitions of motor lead wire, as follows.

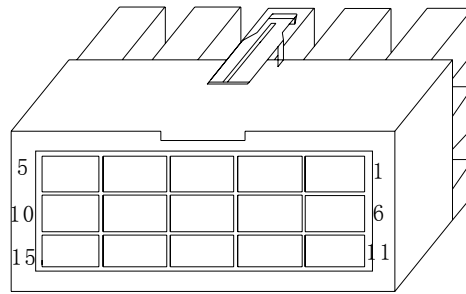## 1. Aviation plug model electrical motor defined (motor side):
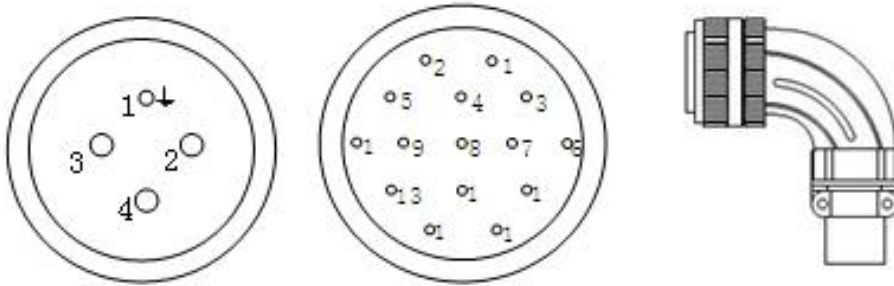
Note: Welding line from the side view

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
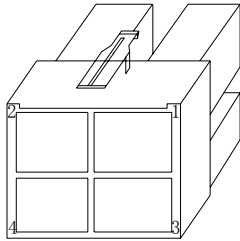
Power line terminal   encoder Terminal 15 pin

Note: Welding ling from the side view

Power lines 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

3. Economical encoder mode and motor lead wire definition
（QS7AA010M/020M/030M）
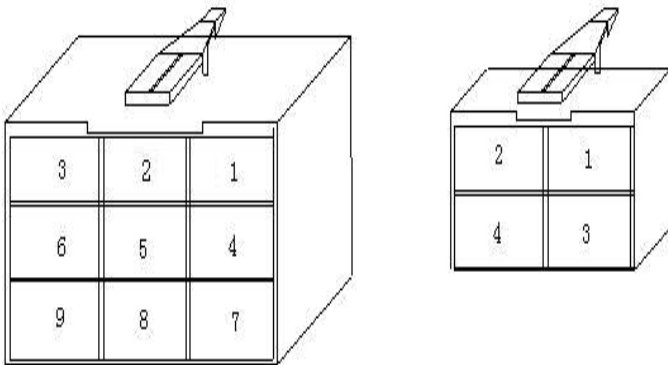
Encoder 9 pin   Power connector 4 pin
Note: Welding ling from the side view

Aviation plug the definition of power lines			
Pin No.	Name	Color	Remark
1	U	Red	Motor U Phase
2	V	White	Motor V Phase
3	W	Black	Motor W Phase
4	PE	Yellow/Green	Ground wire
Aviation plug the definition of Encoder line			
Pin No.	Name	Color	Remark
1	5V	Red	Voltage 5V
2	0V	Black	Voltage 0V
3	A+	Blue	Encoder A +Signal
4	A-	Blue/Black	Encoder A - Signal
5	B+	Green	Encoder B + Signal
6	B-	Green/Black	Encoder B - Signal
7	Z+	Yellow	Encoder Z + Signal
8	Z-	Yellow/Black	Encoder Z - Signal
9	Shield		