Thank you for using our AC Servo System.

Do read this manual before implementation of this product, for avoidance and correct operations.
Caution: incorrect operations may cause unpredictable consequenceIn this manual, NOTES

FOR SAFE OPERATION are classified as “WARNING” or “CAUTION”

Pre-statement:

1. This product was not designed to be capable of protecting operator from peril mechanical system can evoke. Users are required to present necessary shelter from mechanical system peril.
2. The right to verifying this manual without informing current users is hold.
3. Any modification to this product is not accredited. Warranty is abolished automatically by any occurrence of unaccredited modification.

Pay particular attention when following sighs show up:

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

Indicates a potentially hazardous situation which, may result in minor or moderate injury to personnel, and possible damage to equipment if not avoided. It may also be used to alert against unsafe practices.

Note for Safe Operation

Inspection	Don’t use driver when it is impacted.
	If the products accessories are not completed or not the same as noted, don’t use it.
	Never use the equipment where it may be exposed to splashes of water, corrosive or flammable gases, or near flammable materials.(Failure to observe this warning may lead to electric shock or fire)
transportation	The storage and transportation should accord with environment condition request
	Don’t put it highly and prevent from falling off.
	Keep package perfect during transshipment.
	Don’t drag out the leads, motor shaft and encoder when transportation.
	Keep drivers and motors from impact.
installation	The machine must be installed in the control cabinet with enough safety production

	level.
	Enough space must be kept between other equipments.
	Prevent dust, caustic gas, electric conduction objects, liquid or flammable explosive materials getting in.
	Operation makes heat so installation should be keep far away from tinder
	Environment should reach up to the request level.
	Installation for motor and driver should be firm and prevent from miss out.
	Any Knock to the motors or motor shafts is forbidden to avoid damage on the encoders.
	The motor shafts can't bear the load pasts the limit.
Connection	Never connect, install or discharge when power on.
	Never connect ,install or discharge within 5 minutes when power off.
	Keep the connection firm and prevent falling down when operation.
	Make sure to ground the ground terminal.
	The electric wire and the heat non-resistant body cannot draw close to radiator of the servo driver and the servo machinery.
	Servo motors and drivers should be connected directly, and electric capacity, the inductance or the filter can't be put in.
	Don't apply the reverse polarity to U、V、W terminators or connect alternating current.
	When the power supply is single phase AC power, make sure to connect R,S terminals.
Test	Before electrify make should again that servo driver and motor are install firmly,and correct connection.
	Do the no-load running to make sure the parameters right and then take load debugging.
usage	An emergency free circuit is required
	Shut down the pulses or any running signals before reset, or motor may run immediately after power on.
	A third part motor is not suitable for the driver
	Continual power on and power off may damage the driver
	No reach to the driver and motor immediately after continual running, it may burn.
	Modifications are forbidden.

Chapter 1:product introduction

1.1 product characters

this product is suitable for numerical control machine、printing machine, casing machine, automation product line, and so on.

Here are the main characters of this product:

1. peak rotation is up to 3000r/min，and the lowest one is 0.6 r/min. between the range from the lowest rotation to the peak rotation, this product hold stable torque characteristic. The servo motor carries a incremental encoder, which sendes out 2500 pulses per round. The pulses come from the incremental encoder are multiplied by four inside the driver. So one single round of the motor'rotor is marked by 10 thousand pulses. That's to say, if one pulse is detected by the driver, a rotation of 0.036° has just happened.
2. A load there times more than rating load is ok for the motor to tolerate for a small moment. This trait is useful when the motor has a inertia load.
3. easy to operate. Suitable for ether an analog voltage input or a pulse input.

Caution: do not make the driver work with overload, although it can carry there times load at one time.

Environment condition for storage and usage of this product.

Certain environment conditions are required when store, transport, and use this product. Beyond the conditions, inaction may occur. Constantly exposed to beyond the conditions, the serviceable life may be shortened. Followings are the required environment conditions:

Item	Driver	Motor
Temperature and humidity conditions for usage	0～55℃（no frost） under 90%RH（no condensation）	-20～50℃(no frost) under 90%RH（no condensation）
Temperature and humidity conditions for transportation	-20～80℃（no frost） under 90%RH（no condensation）	-25～70℃(no frost) under 80%RHno condensation）
Air conditions	In container, no etched gas、 no inflammable gas、no oil mist, no dust.	No expose to open air，no etched gas、no inflammable gas、no oil mist,

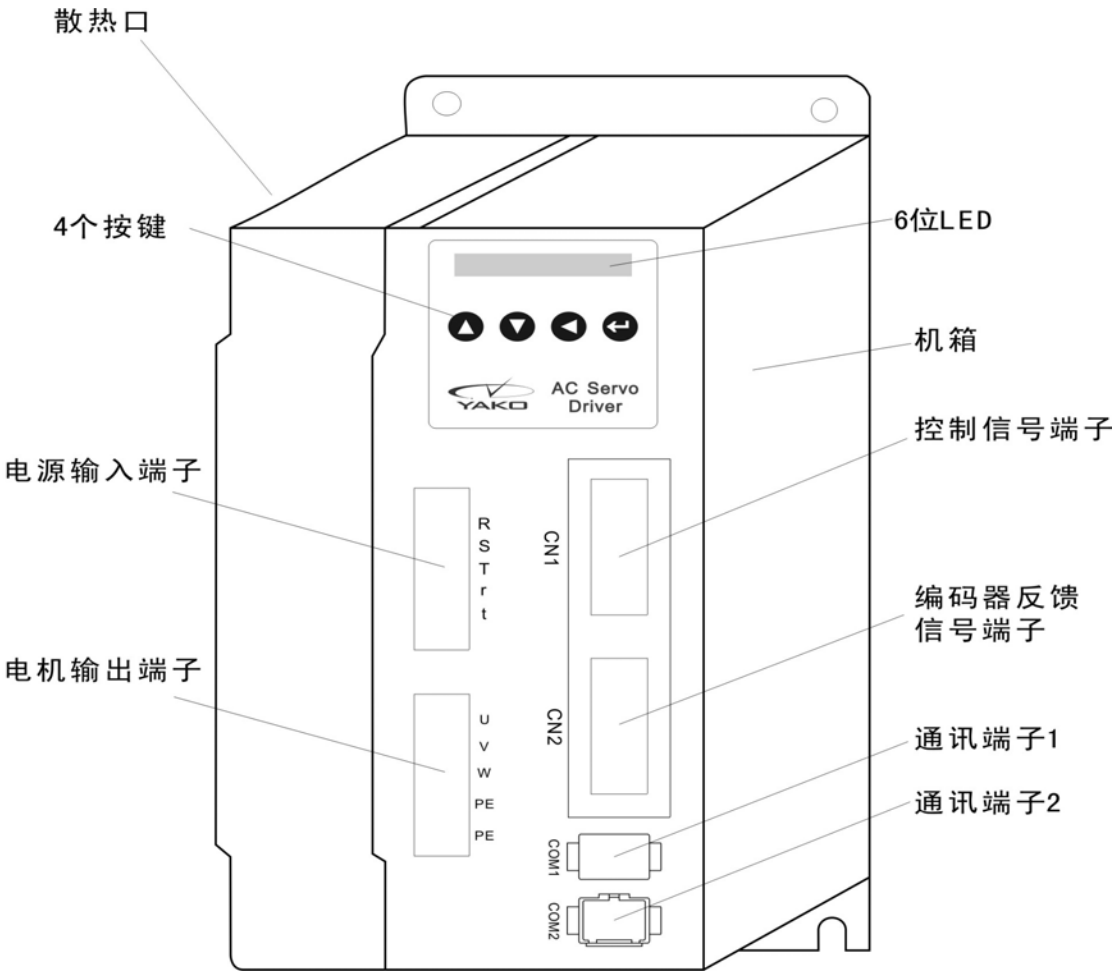
		no dust.
Altitude	Below 1000m	Below 2500m
Vibration	Under 0.5G（4.9m/s2）10-60HZ	
Guard level	IP00	IP65

1.3 arrival check

After arrival，please check the following items：

1) Whether the package and the objects inside the package are in good condition?
2) Whether the nameplate is in line with your order?
3) Whether every object in the package has its name in the list and every name in the list can refer to an unique object in the package?

caution：no implementation of crusher and wrong product.



Specification

POWER（Kw）	0.4	0.75	1.2	1.5
Power	Control Power	220V～,±10%，50/60Hz ,Single phase		
	Main Power	220V～,±10%，50/60Hz ,Single phase/3 phases		
Suitable for	Motor	Permanent magnetism synchronous servo motor,power<=1000W,rotate speed<=3000r/min.		
	Encoder	15pin,2500ppr,encremental encoder,5V differential driving output.		
	Load inertia	less than 5 times of motor inertia		
	Motor	AC permanent magnet servo motor		
	Encoder	15 pin，2500PPR,incremental encoder,		
	Load inertia	Less than five times motor inertia		
Operation	Mode	Position control mode	Control	Speed command pulse deviation signal
			Pulse	5V differential drive input,0~500Kpps
		Speed control mode	-10~+10V anolog voltage ,according rotation speed -3000~+3000r/min	
		Speed trial run mode	keyboard input,operating in speed control mode.	
		JOG Running mode	Keyboard input.operating in JOG mode.	
		Encoder zero adjustment mode	After use it for a long time,the zero of encoder may missed,this mode helped to adjust it to zero again.	
		Motor testing	Keyboard input,operating in position control mode.	
	Protect function	Over-current,Over-voltage,Under-voltage,Encoder abnormal,Over-speed,IPM abnormal,Internal abnormal,Braking abnormal,Current sampling abnormal,position deviation,encoder pulse Z		

		phase loss,position deviation calculator overflow.	
	Monitor function	Speed ,torque,current,linear speed,current position,position deviation,rotor absolute position,alarm state,running state,I/O state.	
	Brake	Dynamic braking	
Performance	Timing ratio	1:5000	
	Control resolution	0.036°	
	Electronic gear ratio	1/50~50,can suit to different pulse creating equipment.	
	Speed response frequency	>200Hz	
	Speed fluactuation rate	when 0<load<100%	<±3%
		Power fluctuation :-15~+10%	<±2%
I/O	Differential driving input	Servo enable,inpsut pulse disable.	
	Open collector circuit output	Servo ready,servo alarm,encoder pulse	
Interface	Display	6-bit LED numerical indicator tube	
	Operate	4 keys	
Environment	Termperature	0~55℃(no freezing); Below 90%RH (no dewing)	
	Vibration	<0.5G(4.9m/s2)10-60Hz (no continuous running)	
	Air condition	Keep from dust,corrosive gas,conductive objects,liquids and flammable or explosible material.	

1.4 driver operation modes introduction

The driver has six operation modes:

1) Position control mode

Under this mode, two sets of pulses are needed. One is for rotation, and the other is for direction. A pulse generating device is absolutely necessary. The pulse frequency is at most 500KHz. But the pulse generating device is unnecessary to be capable of generate 500KHz pulse. The driver carried a electronic gear, whose ratio is between a wide range from 50 to 1/50. the pulses from pulse generating device plus the electronic ratio equals the pulses identified by the driver.

2) Rotation control mode

Under this mode, an analog voltage is needed rotation. The rotation voltage has a upper limit of 10V, which is in accordance with 3000r/min, and a lower limit of -10V, which is in accordance with -3000r/min.

3) Test mode one

Under this mode, no extra device is required. Rotation instruction is input through the keys panel of the driver. This mode is used to test the rotation mode.

4) JOG mode

Under this mode, the certain key of the keys panel down, the motor set off to run, up, the motor stop.

5) Encoder reset mode

The motor carried a photoelectric encoder. The encoder gives out a set of pulses, one of which is called zero

pulse. With every round, a zero pulse is detected as the beginning signal of a new round. After long time of operation, the zero pulse may have a deviation. This mode is built up to diminish the deviation.

6) Test mode two

Just like test mode one, this mode is used to test the position control mode.

Chapter 2 installation

2.1 waring:

1) No installation when power on

2) Connection after installation, not the opposite.

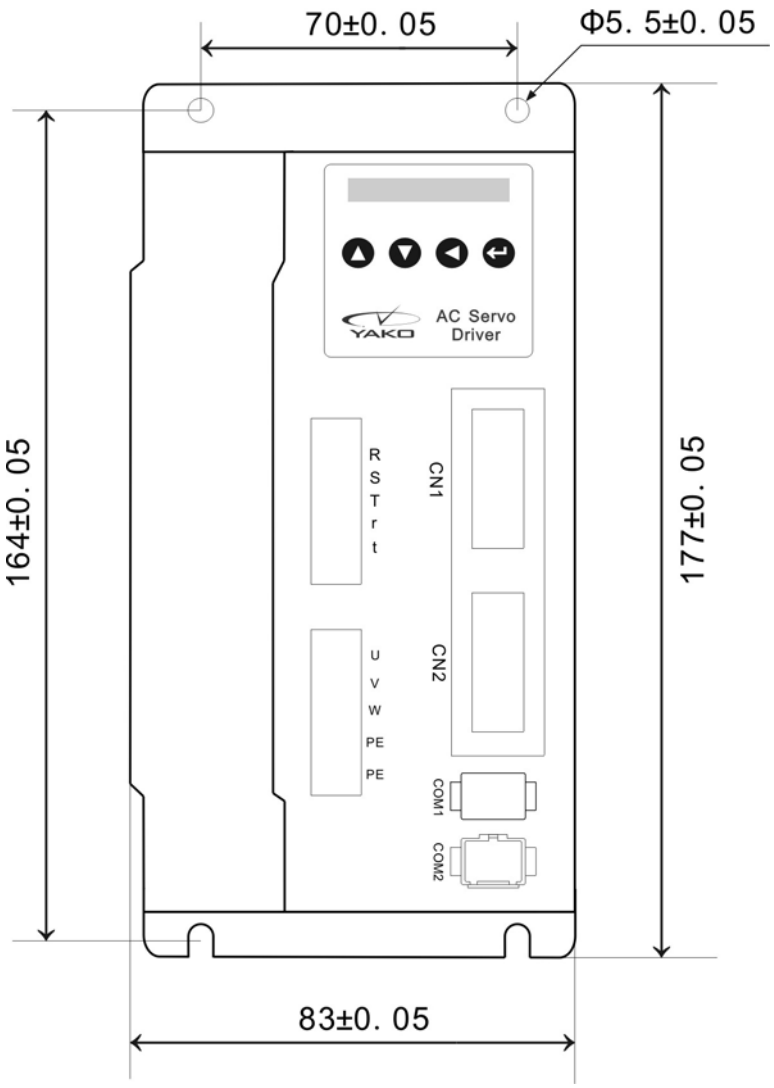
3) Installation firmly, in case loose for vibration.

4) 请在紧固部位加装止松垫片

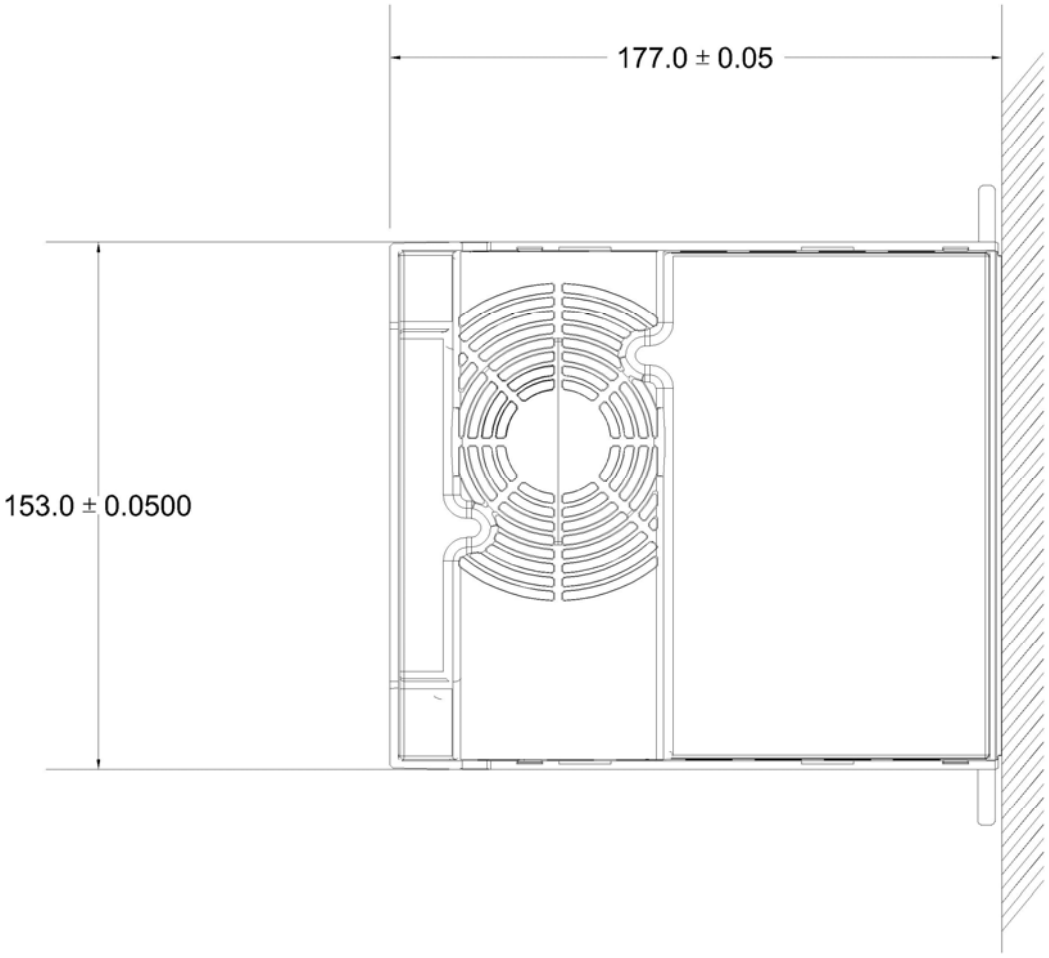
5) Do not hammer the shaft, encoder or the body of the motor in installation

2.2 installation size of the driver\

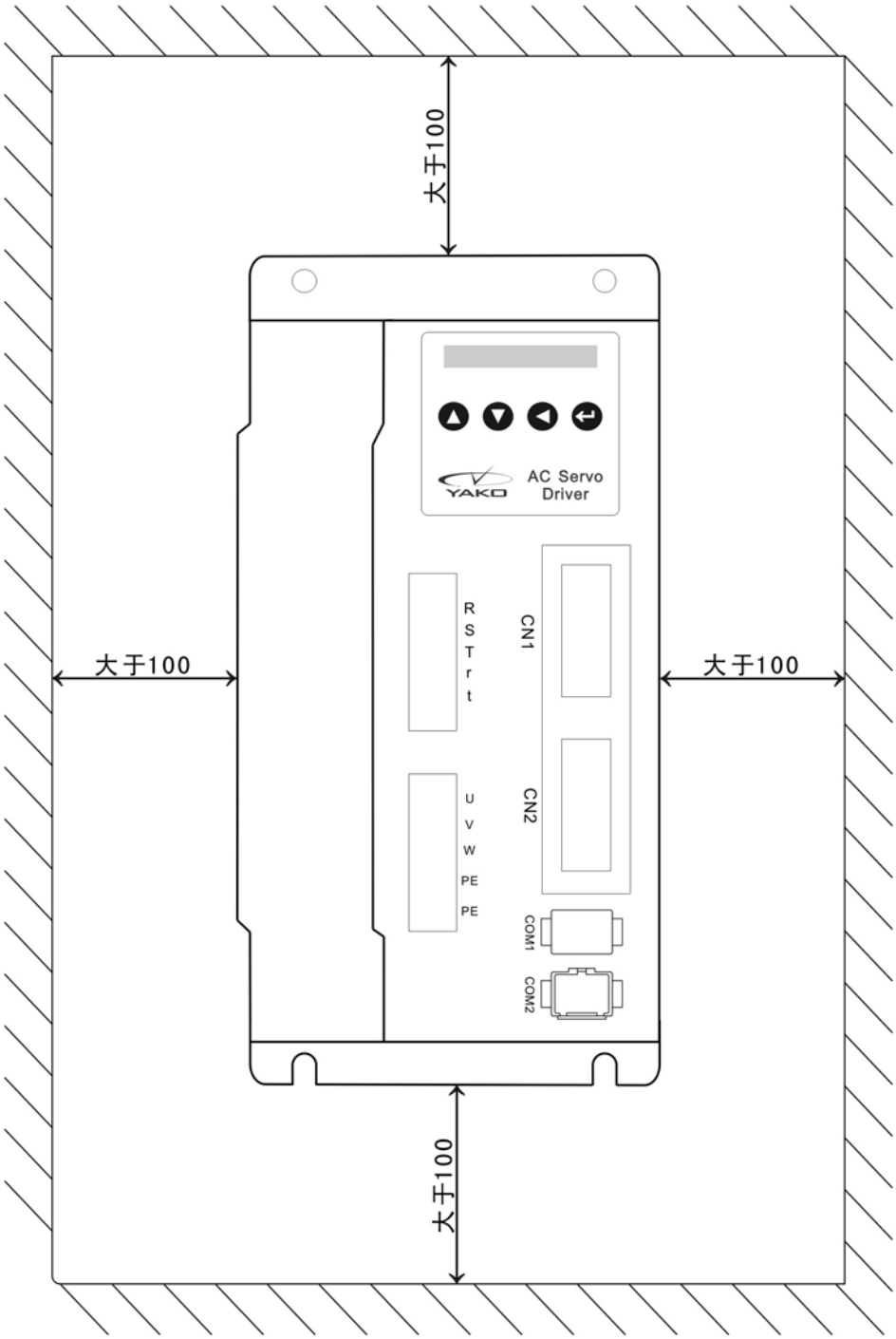
Front view of the driver



side view of the driver


177.0 ± 0.05
153.0 ± 0.0500

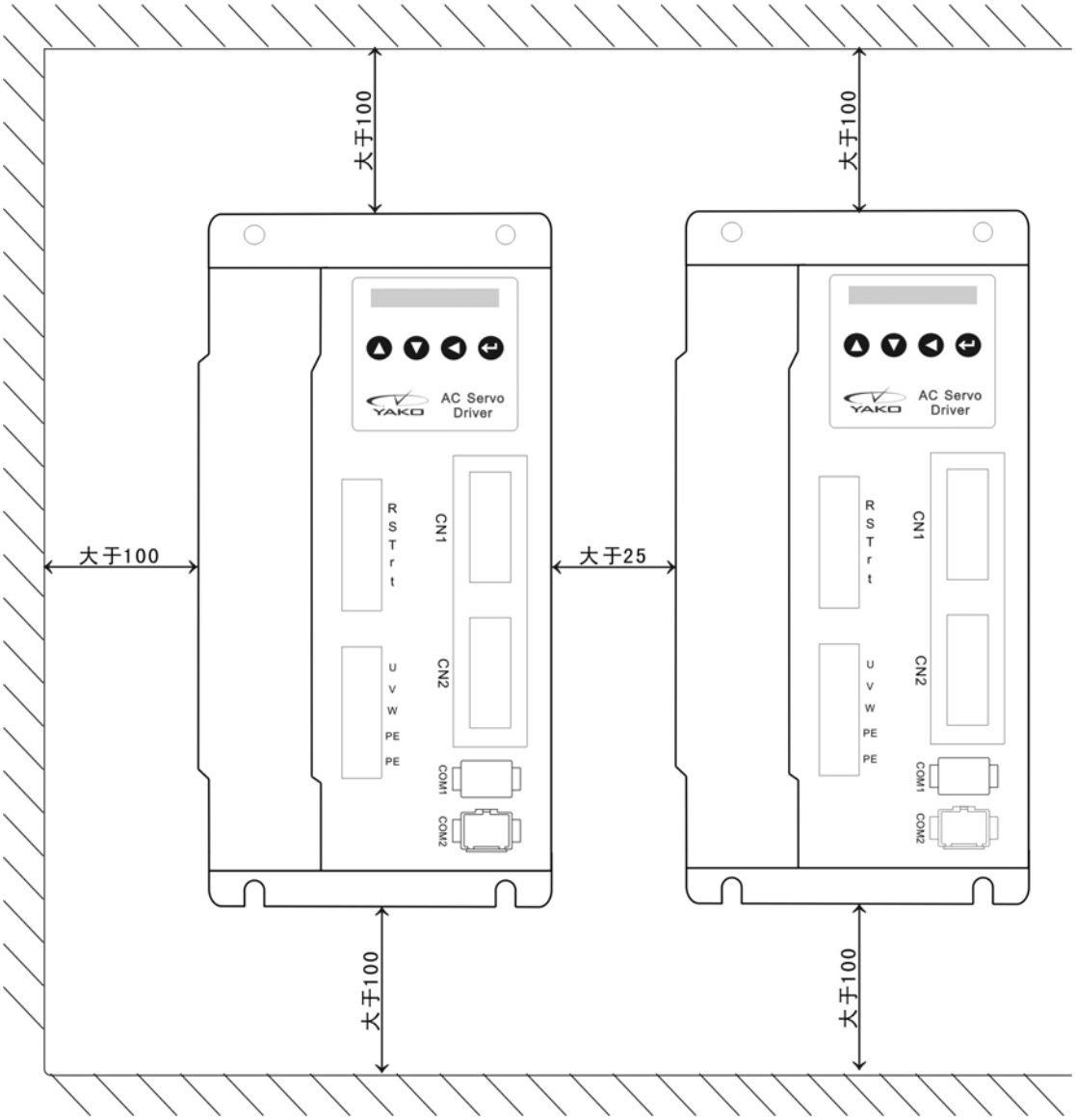
2.3 single driver installation



Caution:

1. The driver must be under fine protection from the container.
2. The driver need enough space to emanate the quantity of heat emitted during operation.

2.4 multi drivers installation



Chapter 3 connection

Waring:

1) the connection operator must qulified enough

2) no connection with power on

3) conncetion come after installation

4) do not leave earth terminal unconncected.

5) The u,v,w windings of the motor must be connceted to the u,v,w terminals in the driver one by one.

3.1 power terminal connection

3.1.1 caution：

1) The diameter of the wires connected to terminals R、S、T、PE、U、V、W must exceed 1.5mm^2(AWG14-16). The diameter of the wires connected to terminals r、t must exceed 1.0 mm^2(AWG16-18).
2) The earthing resistance must below 100Ω.
3) 端子采用弹片压接的方式，连接完成后，用手轻拉电线，确保端子夹紧电线。
4) 电线铜丝必须剥出 5mm 以上。如果剥出太短，弹片可能压到电线的绝缘外皮，造成不通电的现象。另外，也不可剥出太长，否则，铜丝露出端子以外，存在安全隐患。
5) It's suggested to supply power through a three phase isolation transformer for personnel safety.
6) It's suggested to use a noise filter in the power supply circuit for anti-interference.
7) It's suggested to use a NFB in the power supply circuit for emergent turnoff.

3.1.2 terminal illustration

1. power in terminal

there are five terminals for power in, which are listed in the followed table(R、S、T、r、t). of the five terminals, three are for motor power(R、S、T), the other two are for control power(r、t). applying three phase ac220v to R、S、T, or single phase ac220v to any two of the R、S、T, both way can supply motor power. Motor power is transformed and conveyed to motor through power out terminals. Control power is supplied by applying single phase ac220v to r、t. control power supply power to the inner control circuit of the driver. Be careful, never apply ac380v to any power in terminals.

No.	Terminal name	Terminal function	remark
1	R	Power circuit power input terminals AC220V，50/60Hz	Ether single phase or three phases AC power is ok. when single phase, any two of the three is ok.
2	S		
3	T		

4	r	Control circuit power input terminals AC220V，50/60Hz	Single phase AC power
5	t		

2. power out terminal

power is supplied to motor through the power out terminals.power out terminals are consist of U,V,W terminals and two PE terminals. the u,v,w windings of the motor must be connected to the U,V,W terminals of the driver one by one. If not, the motor will rotate abnormally, even worse, damage the driver.

No.	Terminal name	Terminal function	remark
1	U	Output terminals	Must be in line with the motor U、V、W terminals.
2	V		
3	W		
4	PE	Earth terminal	Earthing resistance below 100Ω
5	PE	Earth terminal	Earthing resistance below 100Ω

Caution：the driver is designed to match the appointed motor. Don't try to match with other motors.

3.2 Control terminal CN1

3.2.1CAUTION：

1) Wire size≥0.12mm2(AWG24-26)
2) Control cable should be no longer than 3m
3) The control cable and the feedback cable should be apart from the power wire for anti-interference.
4) Place a surge absorbing element for the inductive components(coil): parallel freewheeling diode with dc coil and RC absorption circuit with AC coil.

Every pin of control terminal CN1 reponsible for one signal. These signals are composed of input signals and output signals, which is listed in the following table. Some pin is excluded in the table. They are reserved by the producer, just leave them alone.

3.2.2CN1 terminal definition

No.	mark	name	description
CN1-16	X4Z-	Z minus	Differential pulse of encoder Z phase
CN1-17	X4Z+	Z positive	
CN1-36	X4A-	A minus	Differential pulse of encoder A phase
CN1-34	X4A+	A positive	
CN1-35	X4B-	B minus	Differential pulse of encoder B phase
CN1-18	X4B+	B positive	
CN1-9	X4SON	Enable signal	When the signal is on, the motor is available to run. Otherwise, the motor dose not recognize any instruction.
CN1-19	X4Z	Zero position signal	For Every round of the shaft of the motor, a pulse emerged to mark the start of a new round or the end of last round. The

			pulse is named X4Z and can be captured on the pin of CN1-19.
CN1-6	X4SRDY	Ready signal	When the signal on, the motor is ready to receive instructions; otherwise, there must be something wrong.
CN1-4	X4ALM	Alarm signal	When the signal on, no alarm occur; otherwise, an alarm must have happened.
CN1-12	X4INH	Pulse disable signal	When the signal on, input pulses are ignored.
CN1-5	X4INP+	Pulse positive	Rotation pulse input terminals
CN1-7	X4INP-	Pulse minus	
CN1-1	X4IND+	Direction positive	Direction pulse input terminals
CN1-3	X4IND-	Direction minus	
CN1-21	VCMDIN	Anolog voltage input port 1	-10V <VCMDIN-VCMDINC<10V, in line with speed add from -3000r/min to 3000r/min
CN1-23	VCMDINC	Anolog voltage input port 2	
CN1-26	+15	DC power positive	DC power supply
CN1-20	GND	Analog ground	
CN1-22	GND	Analog ground	
CN1-24	-15	DC power minus	
CN1-29	X4COM+	Common positive	Signal common terminals
CN1-31	X4COM+		
CN1-25	X4GND	Common ground	
CN1-27	X4GND		
CN1-28	FG	Shield ground	The power line ground
CN1-30	FG	Shield ground	The power line ground

Ps. Some spare terminals are not listed in the above table.

3.2.3 control signals introduction

By function, the pins of CN1 can be cataloged into two groups: pins for power and pins for signals.

First, pins for power. Between X4COM+ and **pins named** X4GND, a dc voltage varied from 12V to 24V can be applied to. Notice that pin no. 29 and pin no. 31 both are named X4COM+. They are totally the same. Choosing any one of them or both of them is ok. Through pins no. 24,20,22,26, output a pair of dc voltages: ±15V.

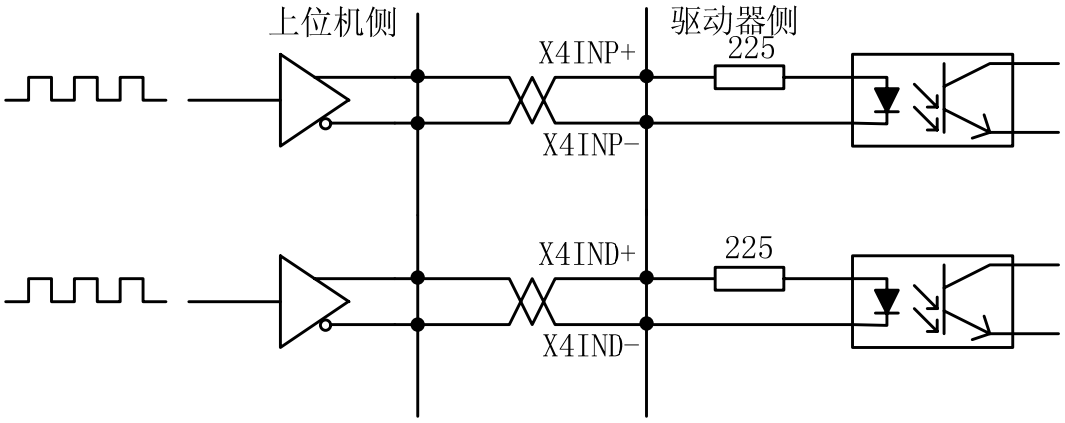
Second, pins for signals. These signals can be further cataloged into two groups: pulse signals and analog signals.

There are only one pair of analog signals:VCMDIN and VCMDINC. They can not be separate. In speed control mode, VCMDIN and VCMDINC are the speed instruction input port. When VCMDIN minus VCMDINC vary from -10V to +10V, the speed of the motor vary from -3000r/min to +3000r/min in response. Be careful, the voltage between VCMDIN and VCMDINC must be confined between -10V and +10V, or the driver may be damaged. In other control mode, VCMDIN and VCMDINC are unavailable.

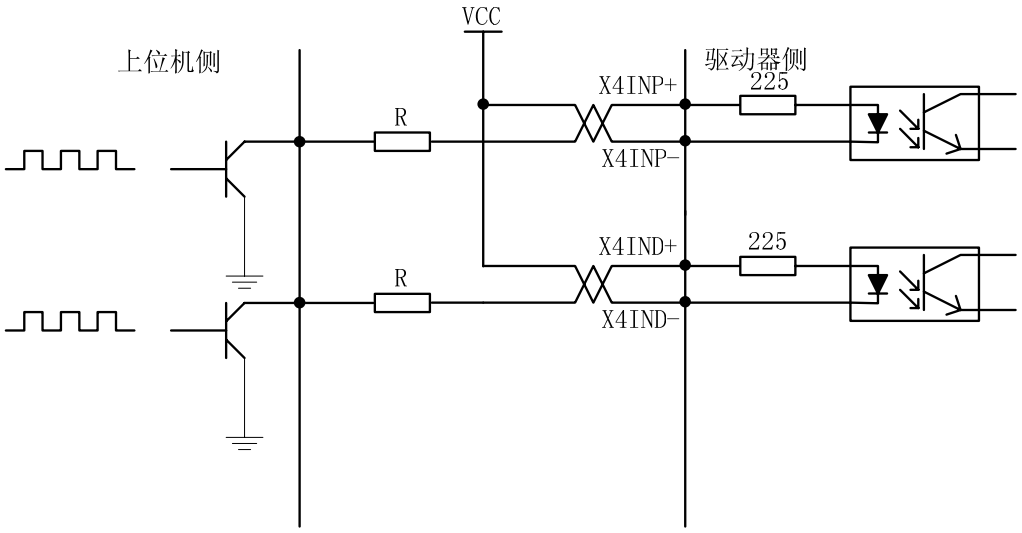
Pulse signals can be cataloged as and I/O pulse. differiential pulse come up as a pair of signals, like X4INP+ and X4INP-. Together, they make one meaning. Other differiential pulses are X4IND+ and X4IND-, X4A+ and X4A-, X4B+ and X4B-, X4C+ and X4C-. X4INP+ and X4INP-, X4IND+ and X4IND-, are input signals. X4A+ and X4A-, X4B+ and X4B-, X4C+ and X4C-, are output signals. There are five I/O signals: X4Z, X4SON, X4INH, X4SRDY, X4ALM. X4SON and X4INH, the two of the five is input signal. The other three are output signals.

In position control mode, X4INP+ and X4INP- are the position and speed instruction; are the rotation direction instruction. The number of the pulse applied to X4INP+ and X4INP- decide the angle of rotation; the frequency of the pulse applied to X4INP+ and X4INP- decide the speed of rotation.

There are two kinds of connection about X4INP+ , X4INP-, X4IND+, X4IND-, depending on what kind of pulse the user's controller give out. For detail, look at the following two pictures.



Picture 3.1

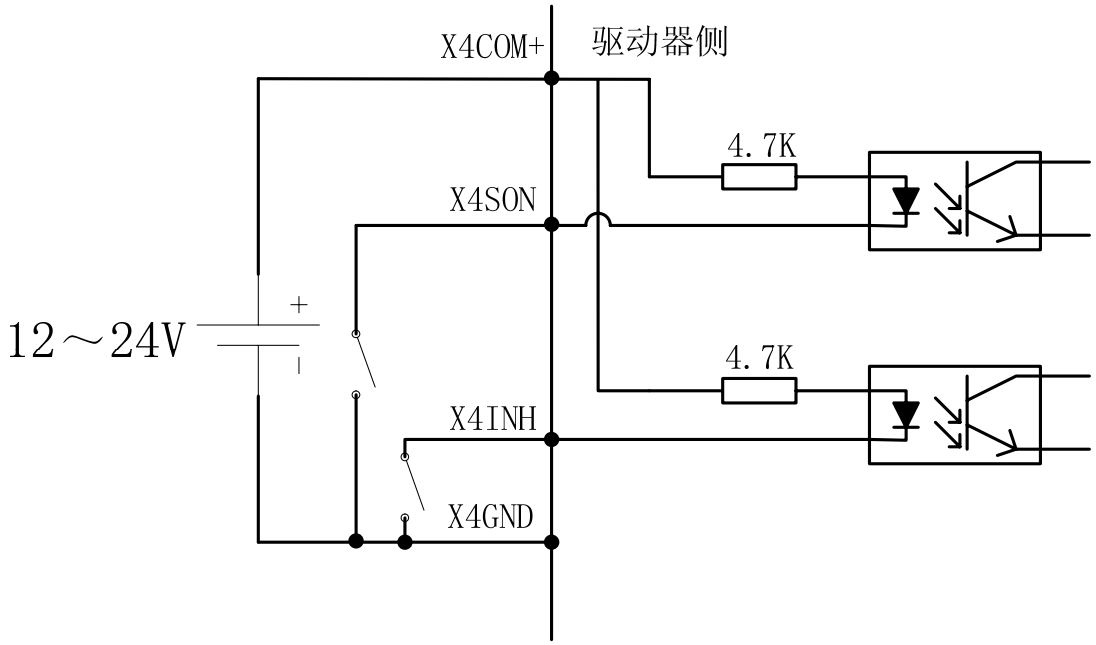


Picture 3.2

In picture 3.2, there are resisters R between controller and driver. The value of resister R depends on VCC. The function is as followed:

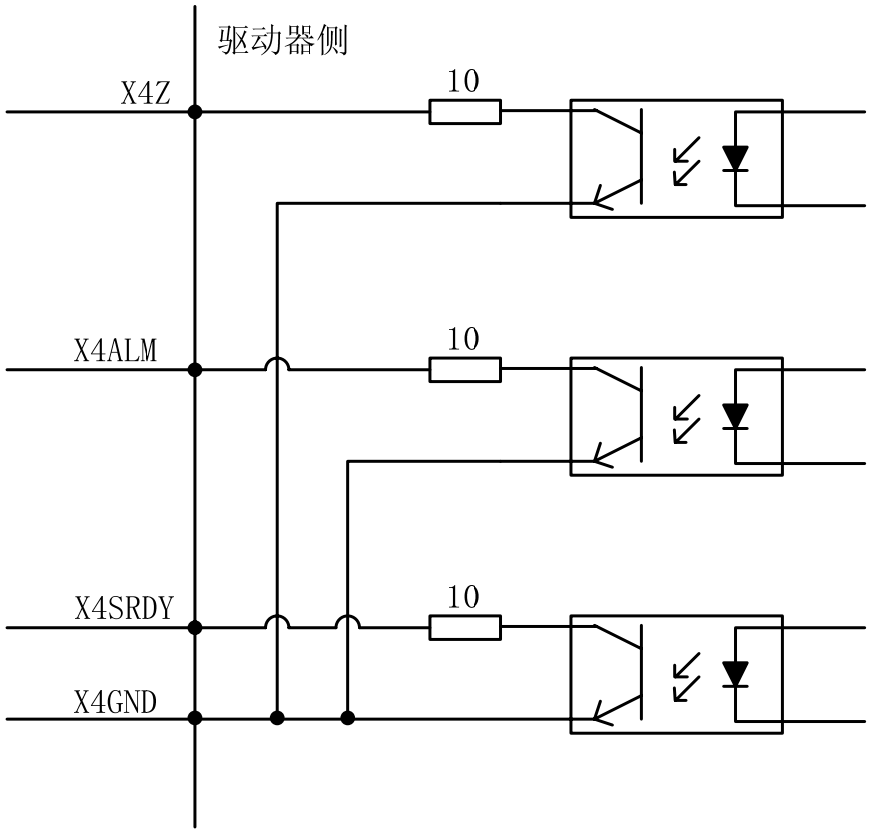
7mA<VCC/(R+225)<15mA

As to input I/O signals: X4SON and X4INH, a dc power is needed to enable the I/O signals. The connection diagram is shown in picture 3.3.

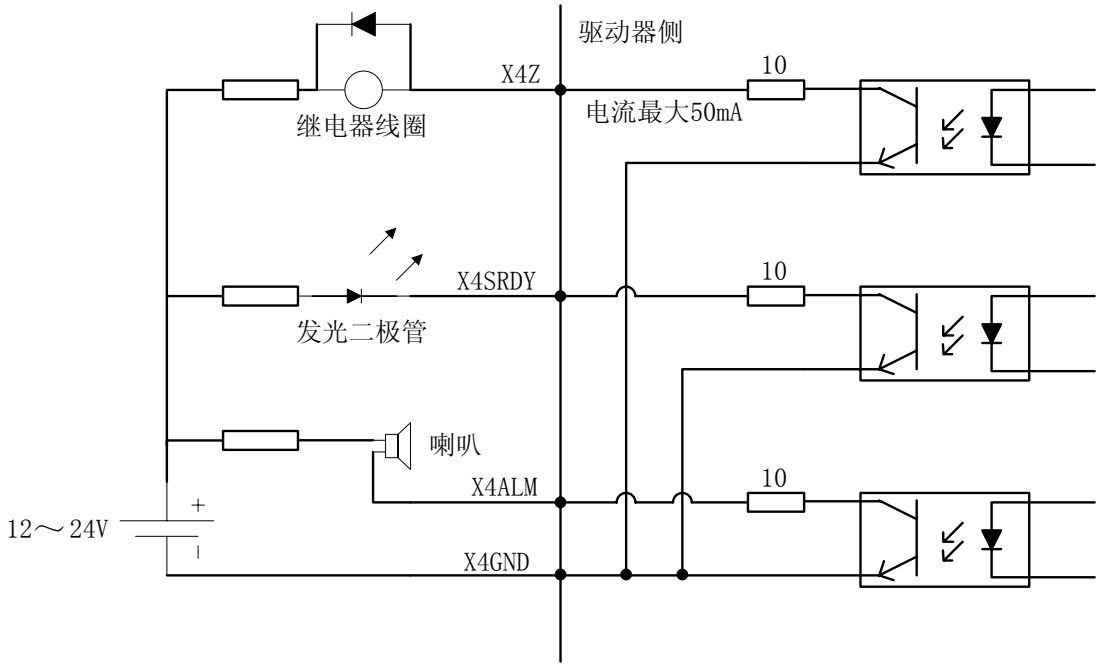


picture 3.3

There are also three output I/O signals: X4Z, X4ALM, X4SRDY. The diagram about these three I/O signals is shown in picture 3.4. how to use them, depends on user's purpose. An example is shown in picture 3.5.



Picture 3.4



Picture 3.5

3.3 feedback terminal CN2

3.2.1CAUTION：

1) Wire size≥0.12mm2(AWG24-26)
2) Control cable should be no longer than 20m
3) The control cable and the feedback cable should be apart from the power wire for anti-interference.

根据电机的不同，编码器接口形式有两种：对于法兰为110和130的电机，编码器接口为航空插头；对于法兰小于110的电机，编码器接口采用引出线的形式。

1、带航空插头的电机编码器接线图

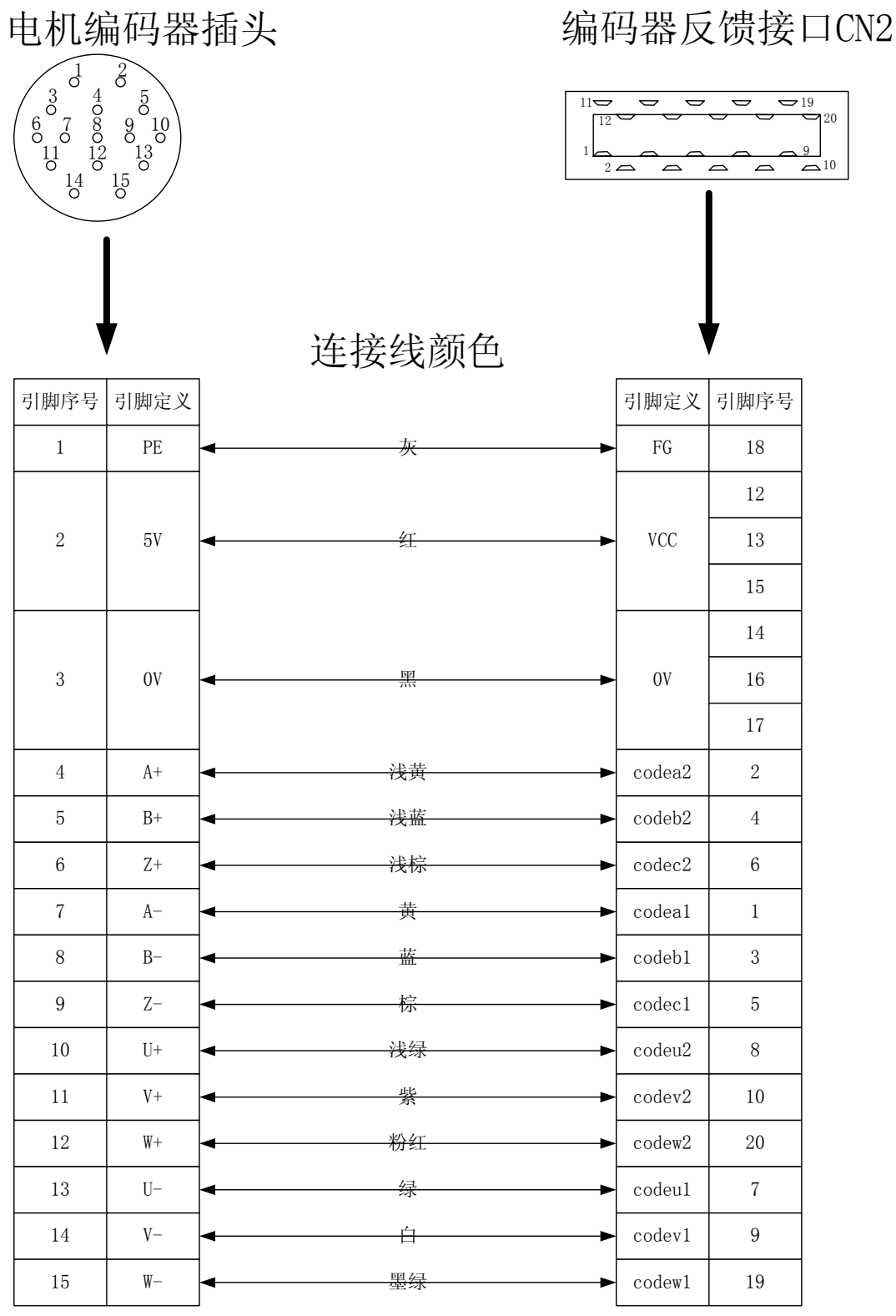
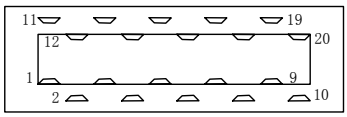


图 3-3-1 反馈接口 CN2 接线图

2、带引出线的电机编码器接线图

电机编码器引出线

编码器反馈接口CN2



连接线颜色

引出线颜色	引出线定义		引脚定义	引脚序号
黑（热缩管）	PE	灰	FG	18
红	5V	红	VCC	12
				13
				15
黑	0V	黑	0V	14
				16
				17
蓝	A+	浅黄	codea2	2
绿	B+	浅蓝	codeb2	4
黄	Z+	浅棕	codec2	6
蓝黑	A-	黄	codea1	1
绿黑	B-	蓝	codeb1	3
黄黑	Z-	棕	codec1	5
棕	U+	浅绿	codeu2	8
灰	V+	紫	codev2	10
白	W+	粉红	codew2	20
棕黑	U-	绿	codeu1	7
灰黑	V-	白	codev1	9
白黑	W-	墨绿	codew1	19

Chapter 4 operation

Warning!

check the following items before power on：

1、make sure the driver and the motor were installed firmly?

2、make sure every wire went to the right terminal.

3、make sure enable signal is off and pulse disable signal is on.

4、make sure the operators are under proper sheild.

Rotation direction definition:

Looking at the shaft of the motor, clock direction is defined as negative, the other direction is defined as positive.

How X4IND+ and X4IND- decide direction:

1) X4IND+ > X4IND-, speed is read as positive;

2) X4IND+ < X4IND-, speed is read as negative;

3) X4IND+、X4IND-短接, speed is read as negative;

4) X4IND+、X4IND-不接, speed is read as negative;

How VCMDIN and VCMDINC decide rotation direction:

1) 0<VCMDIN-VCMDINC<10V, speed is read as positive;

2) -10V<VCMDIN-VCMDINC<0, speed is read as negative;

4.1.2 power on sequence

Switch on control circuit first, then switch on power circuit in five second, or switch on both circuits together. But switching on power circuit before control circuit is not allowed.

After power on, the LEDs will display following mark if everything is ok:

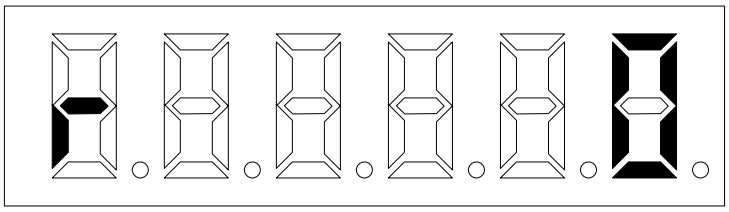
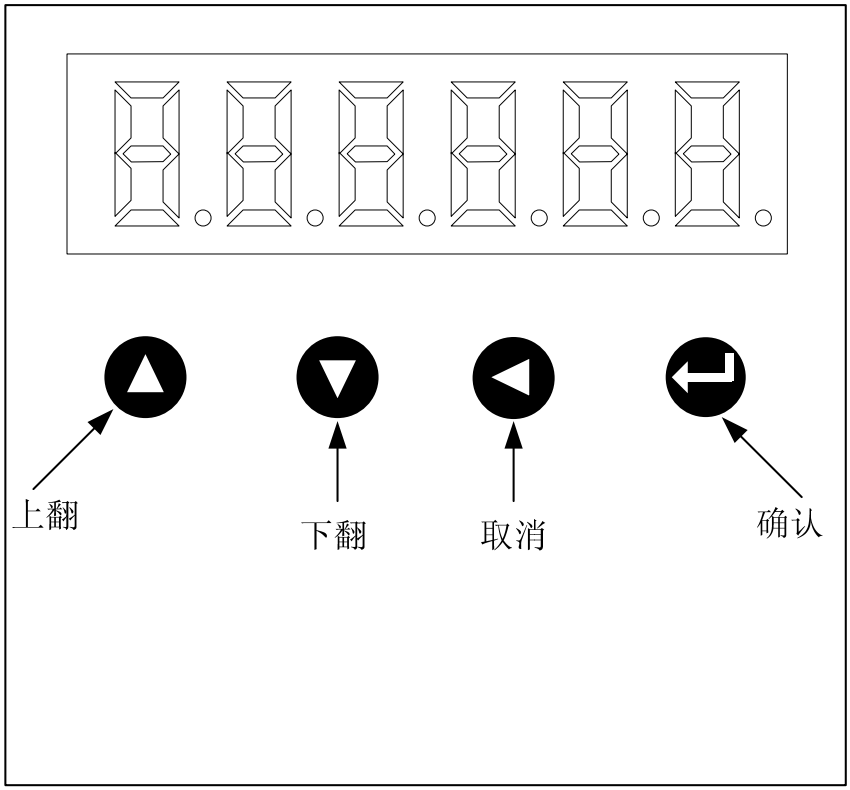


Fig. 4-1-1

The mark in figure 4-1-1 is the default display when the driver is first powered on. Many other choices are available of what to display when power on.

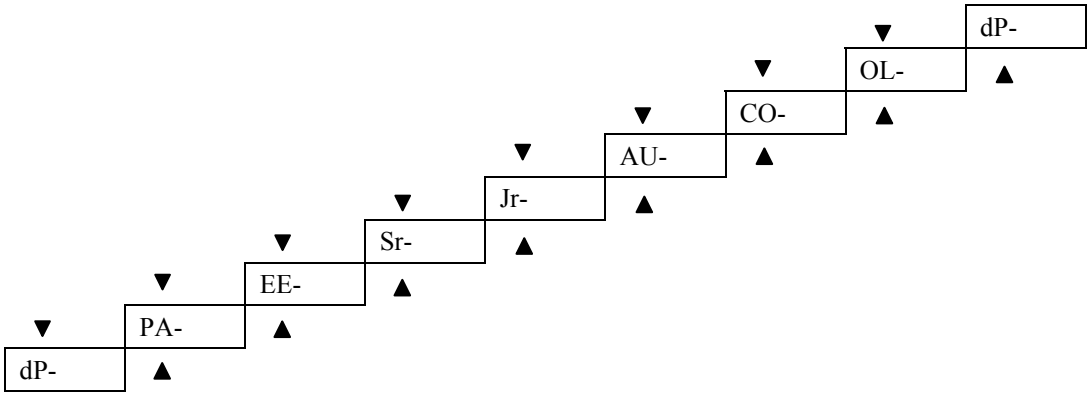
4.2 Operation interface



Key name	Function
Up	Switch up in menus or increase parameters
Down	Switch down in menus or decrease parameters
Cancel	Back to upper menu or cancel operation
Enter	Go down to next menu or activate operation

4.3 menu introduction

The software system consists of there level menus. The first one has 8 items as following:



4.3.1display item dP-

dP- item has 21sub-items, witch display 17 states of the driver and the motor. Chose dP- item in the first level menu through keys ▲ and ▼, press key ↵, and the leds will display the first one of the sub-items of dP- item. The following table lists all the sub-item of dP- item.

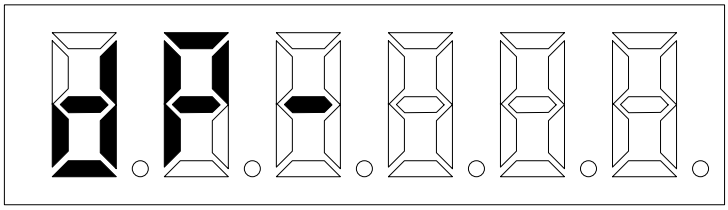
dP-	dP-SPd	The motor rotation
	dP-PoS	lower 4 bits of current position register
	dP-PoS.	upper 4 bits of current position

		register
	dP-CPo	lower 4bits of position pulses counter
	dP-CPo.	upper 4bits of position pulses counter
	dP-EPo	lower 4bits of position deviation
	dP-Epo.	upper 4bits of position deviation
	dP-trq	electric torque
	dP-I	phase current
	dP-LSP	line speed
	dP-Cnt	current operation mode
	dP-Frq	current pulse frequency
	dP-CS	speed instruction
	dP-Ct	torque instruction
	dP-Apo	absolute position of rotor per round
	dP-In	input terminal state
	dP-oUt	output terminal state
	dP-Cod	encoder input signal
	dP-rn	run state
	dP-Err	alarm code
	dP-rEs	reserved

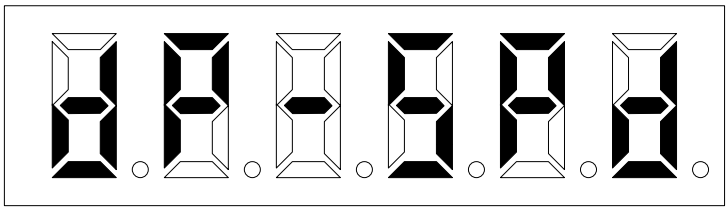
After entry to the second level menu, select interested item through keys ▲ and ▼. Then press key ↵, the leds will display value of the item.

For instance, current speed of the motor can be checked with the following steps.

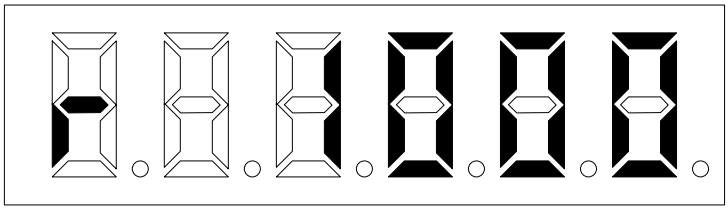
1) Select dP- item, as the leds display：



2) Press ↵ once，enter the second level menu, select dP-SPd item through ▲ and ▼, as the leds display:

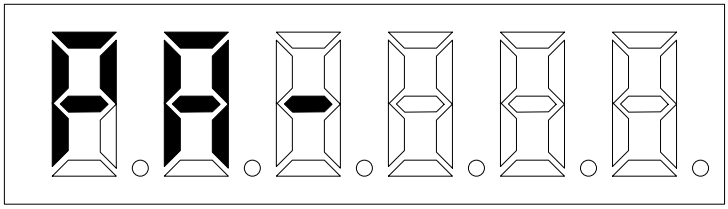


3) Press ↵ once, as the leds display means current rotation is 1000r/min:



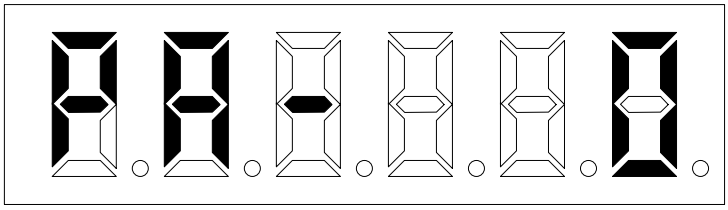
4.3.2 Parameter setting item PA-

PA- item consists of 38 sub-items: PA-0～PA-37. every sub-item refers to a parameter. Select PA- item through ▲ and ▼ in the first level menu, press ↵ once, as the leds display:

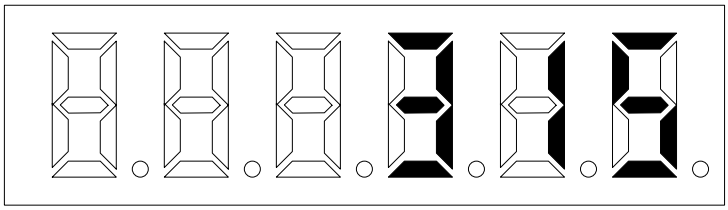


For example, following steps have PA-0 parameter set.

1) Press ↵ once, as the leds display:



2) Press ↵ Once, as the leds display:



Change the value of PA-0 through ▲ and ▼. Each press of ▲ make the number displayed by the leds add one. Oppositely, every press of ▲ make the number decrease one. Press ↵ once to make the change active.

No.	Name	Password needed	Parameter range	Default value
0	Password		0-9999	315
1	Driver version	336	0-400	58
2	Software version	Read only		10
3	Power on display	315	0-19	0
4	Operation mode	336	0-5	0
5	velocity proportional gain	315	5-400	23
6	Speed integral time constant	315	50-3000	230
7	Speed regulator input saturation	315	1-300	70
8	Speed detection low-pass filter constant	315	20-300	100
9	Position proportional gain	315	1-1000	128
10	Magnetic pole position offset	336	0-1024	0
11	Speed instruction low-pass filter constant	315	1-1200	16
12	Electronic gear molecular	315	1-9999	1
13	Electronic gear denominator	315	1-9999	1
14	Standby	315	0-2	0
15	Pulse reversal switch	315	0-1	0
16	Positioning completed tolerance	315	0-9999	8

17	Position out-of-tolerance detection range	315	0-9999	200
18	Position out-of-tolerance alarm	315	0-2	0
19	Standby	336	0-3000	0
20	Standby	336	0-200	0
21	JOG mode speed	315	-3000-3000	200
22	Current integral time constant	336	0-9999	240
23	Speed maximum	315	0-5050	2550
24	Test mode2 speed	315	-3000-3000	100
25	Standby	315	1-9999	10
26	Standby	315	-3000-3000	0
27	Standby	315	10-3000	250
28	Standby	315	0-1	1
29	Current proportional gain	336	0-9999	2500
30	Standby	315	0-1	0
31	Standby	315	1-9999	10
32	Standby	315	0-5	0
33	Over load saturation	336	0-500	187
34	Max torque limit	336	0-480	181
35	Actual carrying capacity	336	-480-0	-181
36	Current low-pass filter cut-off frequency	336	20-300	110
37	Standby	315	0-1	0

4.3.3parameter management item EE-

EE- item consists of five sub-items, as shown in the following table:

EE－SEt	Parameter writing. It means to write the parameters in the memory into EEPROM parameter zone. The parameters modified by user only change the parameter values in the memory that they will recover to their previous values after power on again. If the parameter values are changed permanently, parameter writing operation is executed, and the parameters in the memory are written into the EEPROM parameter zone so the modified parameter values are valid after power on again.
EE－rd	Parameter reading. It means to read the data in EEPROM parameter zone into the memory. The process will be executed automatically when power on. At the beginning, the parameters in the memory are the same as that of EEPROM parameter zone. If the parameters are modified by user, the parameter values in the memory will change. If the user is not satisfied with the modified parameter values or the parameters are disordered, the parameter reading operation is executed to read data in EEPROM parameter zone into the memory to recover the previous parameters which are in the state of power on.

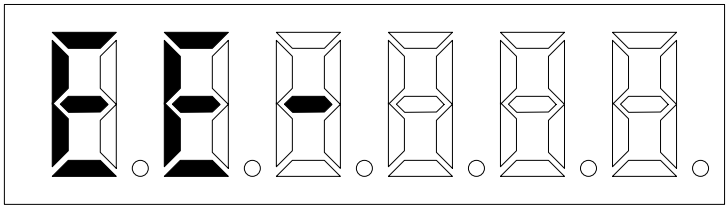
EE－bA	Parameters backup. It means to write the parameter in the memory into EEPROM backup zone. The whole EEPROM zone consists of parameter zone and backup zone that can store two sets of parameter. EEPROM parameter zone is used for power on, parameter writing and reading, and EEPROM backup zone for parameter backup and backup recovering. If user is satisfied with one set of parameters with further modification, he can save the memory parameters into the EEPROM backup zone by executing the parameter backup operation in advance, then modify the parameters. If the result is not satisfied, recover the backup to read the parameters which are saved in EEPROM backup zone last time into the memory for further modification or completion. Besides, after the user set parameters, execute the reading and backup to ensure data in EEPROM parameter and backup zero are the same to avoid parameter to be modified by mistaken, and also use the recovering backup operation to read the data in EEPROM backup zone into the memory and write operations by parameters, and write parameter in the memory into EEPROM parameter zone.
EE－rS	Recovering copy. It means to read the data in EEPROM backup zone into the memory, which does not execute the parameter writing and reading the data in EEPROM parameter zone into the memory when power on again. If the user permanently uses parameter in EEPROM backup zone, execute the parameter writing operation again.
EE－dEF	Recovering default value. It means to read all default values of parameters into memory and write them into EEPROM parameter zone that it will be used when power on again. Execute the above operation to recover all parameter to their original before delivery if the user adjusts parameter by mistaken to cause the system cannot run normally. Because the different driver type corresponds to different parameter default value, ensure the driver type is right (parameter No.1) when using the recovering default parameters.

4.3.4 parameter backup operation

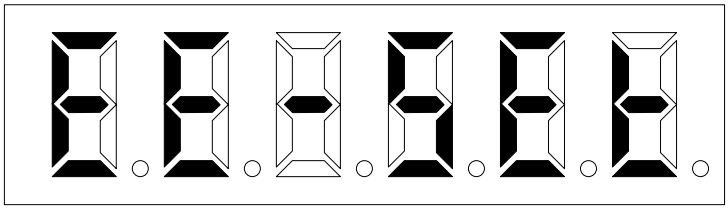
Backup parameters to keep them permenently. If parameters is changed, without backup, the change will disappair on power off. Following steps make parameters stored in flash, so the parameters can maintain even without power.

1） Whatever the led display, keep press◀ untill display freeze

2） Keep press▲ untill following picture appair.

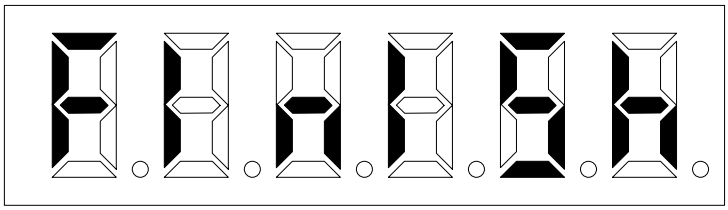


3） press↵ once, the display will turn to:



Notice: if the display is other picture, keep press▲, untill the display turn to the above picture.

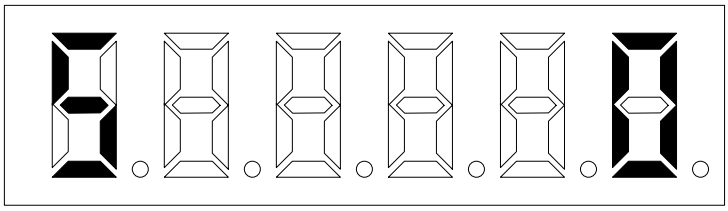
4） hlod ↵ for 3 second，the display will turn to:



So far, the parameters have been backuped.

4.3.5 test mode 1: item Sr-

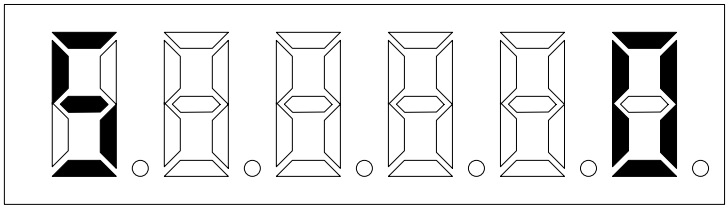
Sr- item is triggered by parameter PA-4. When PA-4 is set 2, Sr- item is available. Press ↵ once, as the leds display：



The number displayed by the leds can be changed through ▲ and ▼ .

4.3.5JOG mode item Jr-

Jr- item is triggered by parameter PA-4. When PA-4 is set 3, Jr- item is available. Press ↵ once, as the leds display：



The number displayed by the leds can be changed through ▲ and ▼ .

4.3.6 Automatic gains adjustment item AU-

4.3.7 Encoder reset item CO-

4.3.8 Test mode2 item OL-

4.4operation example

Caution: cut off enable signal before power on.

Step 1: power on

1、it's not allowed to switch on power circuit before control circuit.

2、it's in five seconds to switch on power circuit after control circuit gets power. Or, an error will be informed. Simply, control circuit and power circuit can be switched on together.

After power on, as the leds display:

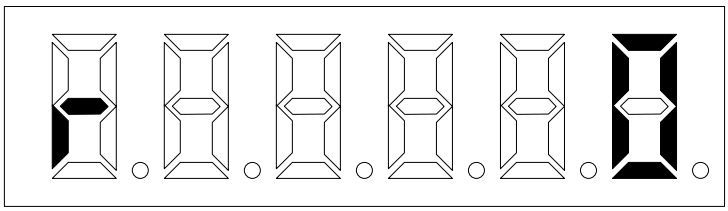


Fig. 6-1-1

step 2 set parameters

1) press ◀ once, as the leds display:

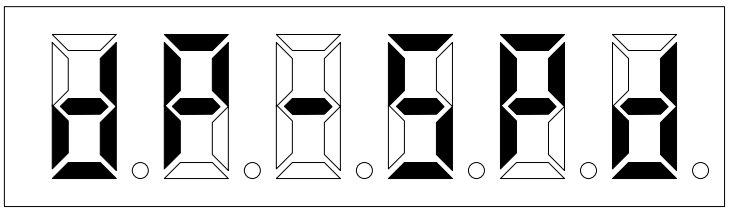


Fig.6-1-2

2) ◀ once, as the leds display:

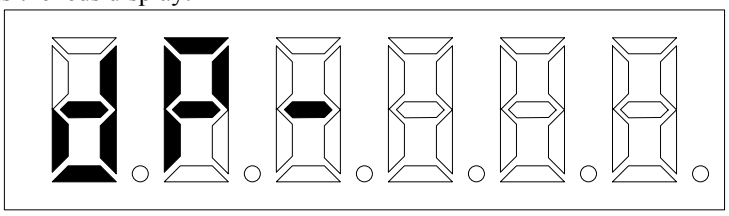


Fig.6-1-3

3) ▲ once, as the leds display:

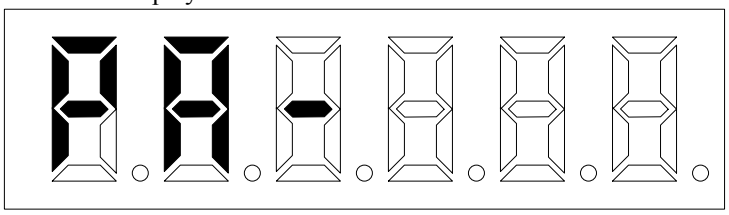


Fig.6-1-4

4) press ↵ once, as the leds display:

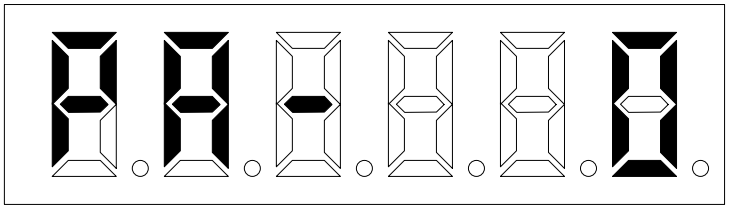


Fig.6-1-5

5) press ↵ once, as the leds display:

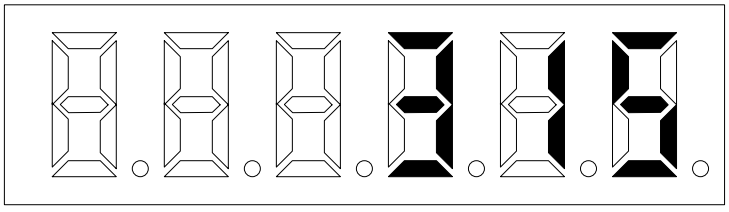


Fig.6-1-6

6-1-6 shows the current value of pa-0 is 315. pa-0 represents the password.

6) ▲ until the number displayed by the leds grow to 336:

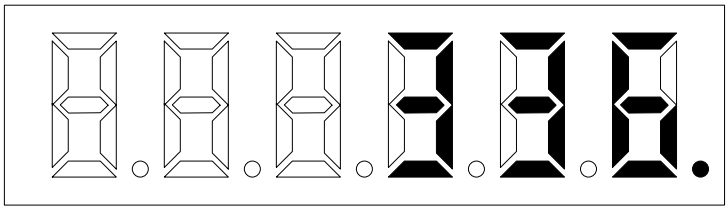


Fig.6-1-7

Caution： if the number overrun 336, press ▼ to reduce it.

2、the number of 336 is not applied to pa-0 until a press of key ↵. Note the dot at the end of the number, a mark that the change is not active yet.

7) Press ↵ once to actuate the change. Note the dot disappearance, which marks that the current value of pa-0 has been 336.

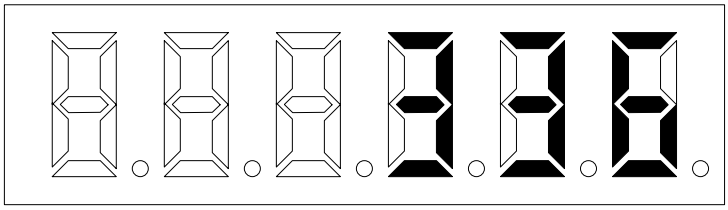


Fig.6-1-8

caution：some parameter modification are under password 336, and the others are under 315. switch between 315 and 336 is needful depending on the parameter to modify.

8) ◀ once, as the leds display:

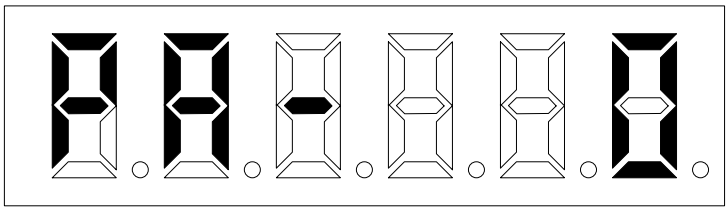


Fig.6-1-9

9) ▲ four times. If more than four presses occur, use ▼ to come back. As the leds display:

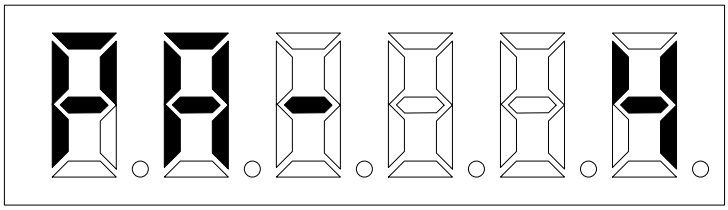


Fig.6-1-10

10) ↵ once, as the leds display:

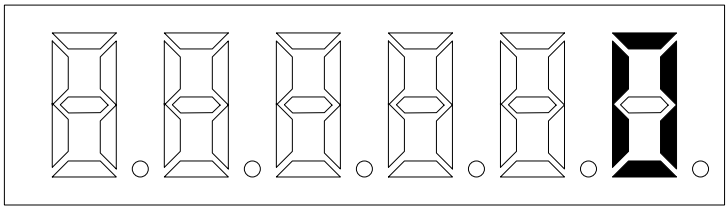


Fig.6-1-11

figure 6-1-11 shows the current value of pa-4 is 0.

11) ▲ twice, as the leds display:

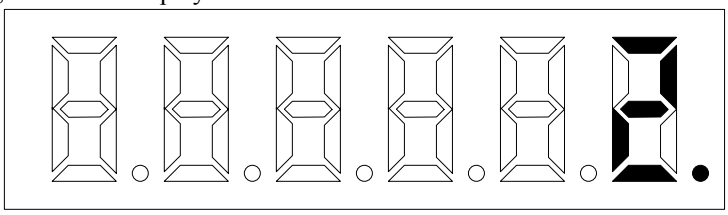


Fig.6-1-12

Caution：parameter pa-4 is accessible only if the password is 336.

12) ↵ once to actuate the change to pa-4. as the leds display:

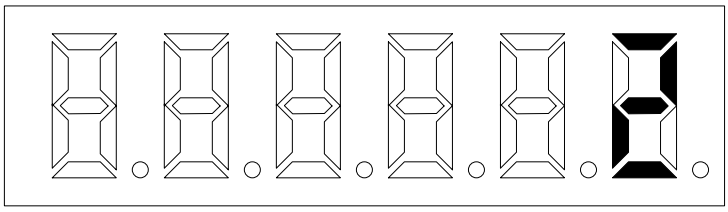


Fig.6-1-13

dp-4 has been set 2. dp-4 represent driver operation mode. Since dp-4 is 2, the driver has been set to work under test mode 1.

step 3：enable the driver

refer to chapter 3 for the method how to enable the driver

step 4：input speed instruction

Current noise can be heard after the driver enabled. The driver is ready to receive speed instructions. Go through the following steps to input speed instruction.

6-1-13ended.

13) ◀ once, as the leds display:

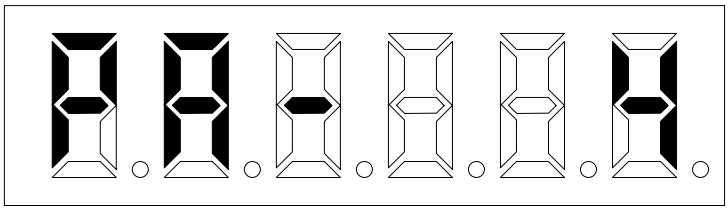


Fig.6-1-14

14) ◀once, as the leds display:

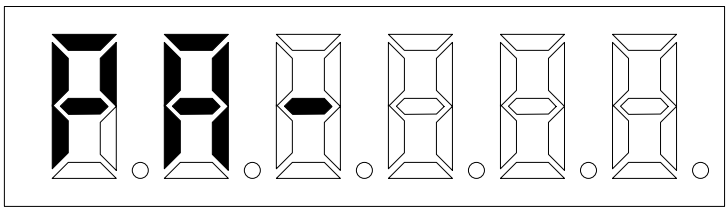


Fig.6-1-15

15) ▲ twice, switch from pa- item to sr- item, as the leds display:

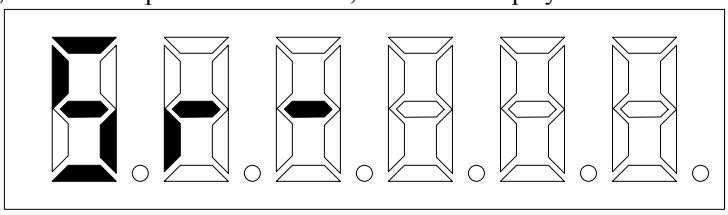


Fig.6-1-16

16) ↵ once, as the leds display:

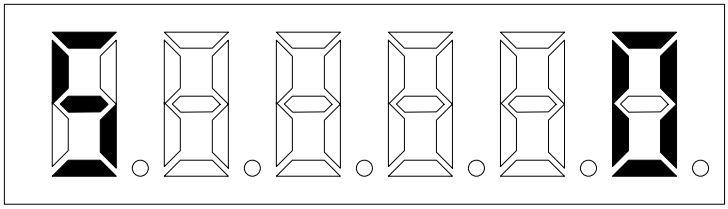


Fig.6-1-17

▲ and ▼. One press on ▲ add 1r/min to speed. Oppositely one press on ▼ add -1r/min to speed.

17) ▲ 10 times, as the leds display:

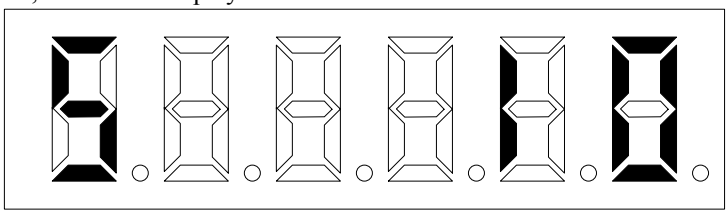


Fig.6-1-18

Fig.6-1-18 show the current speed is 10r/min.

18) ▼ 20 times, as the leds display:

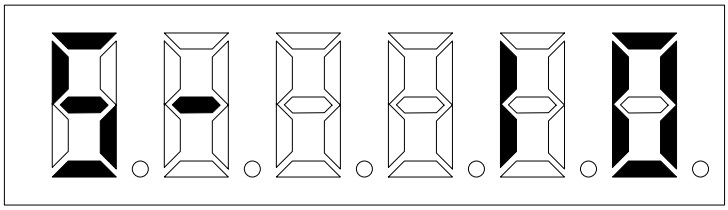


Fig.6-1-19

Fig.6-1-19 show the current speed is -10r/min.

Quit test mode 1

19) ◄ once, quit test mode 1 as the leds display:

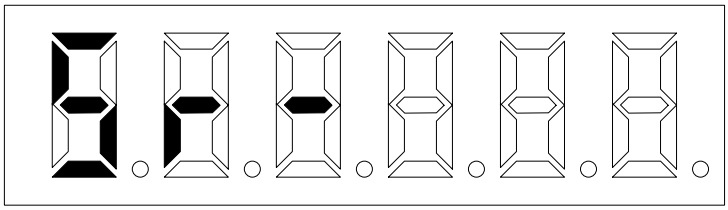


Fig.6-1-20

Chapter 5 parameter introduction

Caution：

1、 Make sure operators know the meaning of parameters.

2、 Check the password before modification of parameters.

3、 Leave reserved parameters and standby parameters alone.

5.1 parameter table

No.	YK AC servo driver

	Name	Description	Password for modification	Parameter value arrange	Default value
PA-0	Password	It is used to protect parameters from unconscious modification. Under wrong password, any modification to parameters is ignored. There are two alternatives of 315 and 336. It's strongly suggested to set password 0 at every end of modification in case parameters vary by misoperation.		0-9999	315
PA-1	Driver version	Marks the version of driver.	336	0-400	58
PA-2	Software version	Marks the version of software	Readonly		10
PA-3	Power on display	Select what the leds display when power on: 0: The motor rotation 1: lower 4 bits of current position register 2: upper 4 bits of current position register 3: lower 4bits of position pulses counter 4: upper 4bits of position pulses counter 5: lower 4bits of position deviation 6: upper 4bits of position deviation 7: electric torque 8: phase current 9: line speed 10: current operation mode 11: current pulse frequency 12: speed instruction 13: torque instruction 14: absolute position of rotor per round 15: input terminal state 16: output terminal state 17: encoder input signal 18: run state 19: alarm code	315	0-19	0
PA-4	Operation mode	Select operation mode: 0：position control mode 1: rotation control mode 2：test mode 1 3：JOG mode 4：encoder reset mode 5：test mode 2	336	0-5	0

PA-5	velocity proportional gain	① Set proportional gain of speed regulator. ② The bigger the setting value is, the higher the gain is and the bigger the rigidity is. Parameter value is defined by specific servo driver system type and load. Generally, the bigger the load inertia， the bigger the setting value is. ③ Set the bigger value if there is no vibration for system.	315	5-400	23
PA-6	Speed integral time constant	① Set integraltion time constant of speed loop controller. ④ The bigger the setting value is, the faster the speed integration is and the bigger the rigidity is. Parameter value is defined by specific servo driver system type and load. Generally, the bigger the load inertia， the smaller the setting value is. ② Set the bigger value if there is no vibration for system.	315	50-3000	230
PA-7	Speed regulator input saturation	The smaller the setting value is, the smoother the timing is.	315	1-300	70
PA-8	Speed detection low-pass filter constant	① Set speed detecting lowpass filter characteristics. ② The smaller the setting value is, the lower the cutoff frequency and the smaller the noise is. Properly reduce setting value if the load inertia is large. If the setting value is too small, the response will be slow as to cause surging. ③ The bigger the value is, the higher the cutoff frequency is and the quicker the response is. Increase properly setting value if quick response is needed.	315	20-300	100

PA-9	Position proportional gain	① Set proportional gain of position loop regulator. ② The bigger the setting value is, the higher the gain is, the bigger the rigidity is and the smaller the position lag is in the same frequency instruction pulse. If the numerical value is too big, the surging or overshoot may occur ③ Parameter numerical value is set according to specific servo driver and load.	315	1-1000	128
PA-10	Magnetic pole position offset		336	0-1024	0
PA-11	Speed instruction low-pass filter constant	① Set the cutoff frequency of lowpass filter of position loop. feedforward value. The filter is used for increasing the stability of complex position control.	315	1-1200	16
PA-12	Electronic gear molecular	PA-12 together with PA-13 makes up the electronic gear ratio. PA-12 presents the molecular, and PA-13 presents the denominator. Both the molecular and the denominator can vary from 1 to 9999, but the ratio has a upper limitation of 50 and a lower limitation of 1/50.	315	1-9999	1
PA-13	Electronic gear denominator	See PA-12	315	1-9999	1
PA-14	Standby		315	0-2	0
PA-15	Pulse reversal switch	0：no action 1：reverse the input rotation pluse	315	0-1	0

PA-16	Positioning completed tolerance	① Set positioning complete pulse range in position control mode. ② The parameter provides factors the driver judges whether the positioning is completed in position control. When remainder pulses in position deviation counter is less than or equal to setting value by the parameter, the driver defaults that the positioning is completed and the signal for it is COIN ON, otherwise, it is COIN OFF. ③ Output positioning completing signal COIN in position control mode, and output speed in-position signal SCMP in other control mode.	315	0-9999	8
PA-17	Position out-of-tolerance detection range	① Set the alarm range of position out-of-toleration detection. ② In position control mode, servo driver alarms position out-of-toleration when the counting value of position deviation counter exceeds the parameter value.	315	0-9999	200
PA-18	Position out-of-tolerance alarm	Set: 0：The alarm of position out-of-toleration detection is valid. 1：The alarm of position out-of-toleration detection is invalid, and stop the detection of position out-of-toleration error. 2：Stop the detection of all alarm errors.	315	0-2	0
PA-19	Standby		336	0-3000	0
PA-20	Standby		336	0-200	0
PA-21	JOG mode speed	Set the running speed in J0G mode.	315	-3000-3000	200

PA-22	Current integral time constant	① Set the integration time constant of current loop regulator. ② The bigger the setting value is, the faster the integration speed is and the smaller the error of current track is. If the integration time is too long, noise or vibration may occure. ③ It is related to the servo driver and motor and is not related to the load. Generally, the bigger the electromagnetism time constant is, the samller the integration time constant. ④ Set the bigger load inertia if there is no vibration for system.	336	0-9999	240
PA-23	Speed maximum	① Set max. limit speed of servomotor. ② It is irrelevant to rotatory direction. ③ If the setting value exceeds the rated speed, the actual max. limit speed is the rated speed.	315	0-5050	2550
PA-24	Test mode 2 speed	Set running speed under test mode 2	315	-3000-3000	100
PA-25	Standby		315	1-9999	10
PA-26	Standby		315	-3000-3000	0
PA-27	Standby		315	10-3000	250
PA-28	Standby		315	0-1	1
PA-29	Current proportional gain	① Set proportional gain of current loop regulator. ② The bigger the setting value is, the higher the gain is and the smaller the error of current track is. If the gain is too high, there is noise or vibration. ③ It is related to the servo driver and motor and is not related to the load. ④ Set the bigger load inertia if there is no vibration for system.	336	0-9999	2500
PA-30	Standby		315	0-1	0
PA-31	Standby		315	1-9999	10
PA-32	Standby		315	0-5	0

PA-33	Over load saturation	① Set torque initial detecting point of motor heat overloading.。 ② Setting value is percent of rated torque. ③ When the motor torque is lower than the intial detecting point, the electronic relay in the system cannot work, namely, it does not detect the motor heat overloading; when the motor torque is higher than the intial detecting point, the electronic relay starts to work, and when it exceeds its threshold, the motor heat overloading alarming will occur. The bigger the motor overloading multiple is, the shorter the alarm occurring time is. The threshold is defined by the motor electrothermal characteristics. The motor heat overloading alarm indicates the motor is overheated. It is set by the manufacturer and cannot be modified.	336	0-500	187
PA-34	Max torque limit	① Set limit value of max. load of servomotor. ② Setting value is the limit constant value of max. load. ③ The limit value is valid anytime	336	0-480	181
PA-35	Actual carrying capacity	① Set limit value of servomotor internal torque. ② Setting value is the rated torque constant. ③ The limit value is valid anytime. If the setting value exceeds the permissive max. load capacity of the system, the actual torque limit is permissive max. load capacity of the system.	336	-480-0	-181

PA-36	Current low-pass filter cut-off frequency	① Set cutoff frequency of current instruction lowpass filter ② It is used for limiting current instruction frequency band to avoid current impact and vibration and to keep current response smooth.	336	20-300	110
PA-37	Standby		315	0-1	0

5.2 Critical parameter setup

（1）[velocity proportional gain]（PA-5）: the parameter is expected to be as big as possible in condition of no oscillation. The bigger the rotor inertia, the bigger should be the parameter.

（2）[Speed integral time constant]（PA-6）: As the parameter grow，response speed will rise, but the bad side is a risk of oscillation rise too. the parameter is expected to be as big as possible in condition of no oscillation. The bigger the rotor inertia, the smaller should be the parameter.

（3）[Position proportional gain]（PA-9）: As the parameter grow, the rotor follows the position instruction closer and a smaller lag error appear, but the bad side is when stop, the rotor may vibrate.

Note1: when [postion propotion gain] setting value is small, the system is stable, but characteristic of position track is bad and the lag error is big. To use the high setting value (postion propotionGain), reduce the setting value [speed instruction filter time constant](parameter No.11) to avoid the overshoot.

Note 2: Refer to [position proportional gain] setting values as follows:

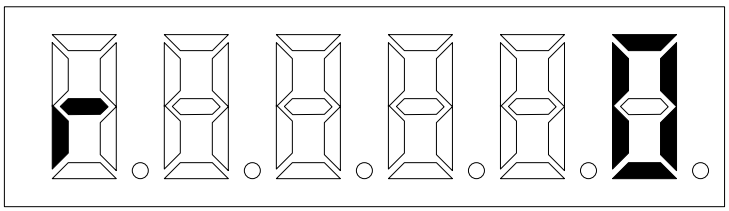
Rigidity	position proportional gain
Low	58～118
Middle	118～138
High	138～198

5.3 Electronic gear set

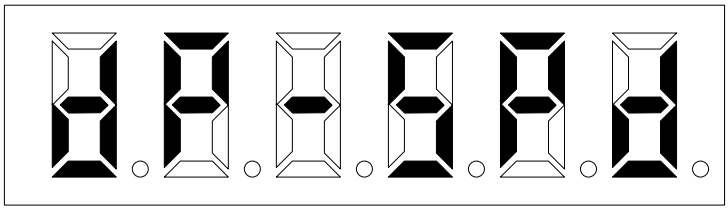
Electronic gear is an important function. To calculate Electronic gear, suppose after N pulses the shalft complete a round; G standfor electronic gear, then G=10000/N.

There are two parameters related to **electronic gear: PA-12 and PA-13. for example, if electronic gear is expected to be 2/3, following steps will fullfill it:**

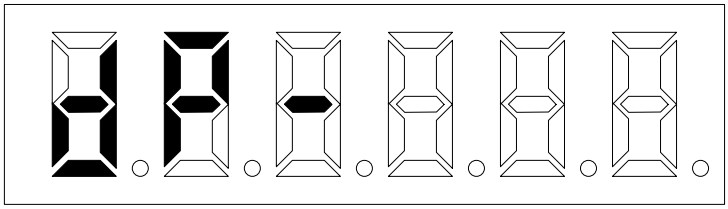
1) Power on, the display shows the following picture:



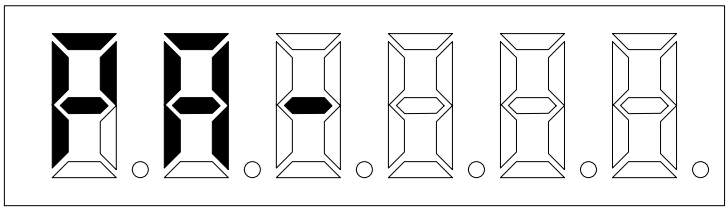
2) After press ◀once, the display shows the following picture:



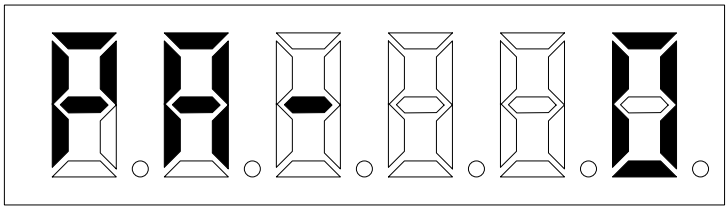
3) After press ◀ once, the display shows the following picture:



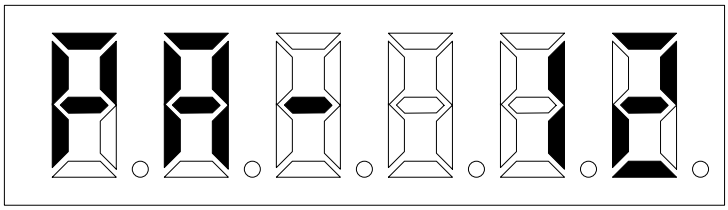
4) After press ▲ once, the display shows the following picture:



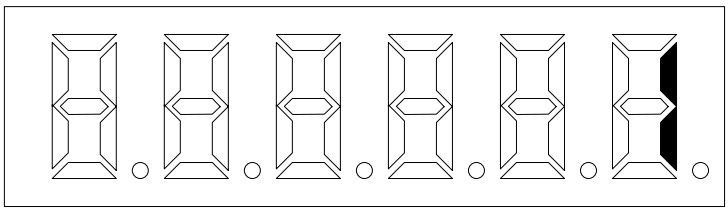
5) After press ↵ once, the display shows the following picture:



6) After press ▲ 12 times, the display shows the following picture:

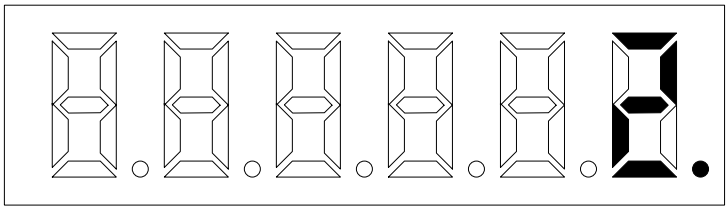


7) After press ↵ once, the display shows the following picture:

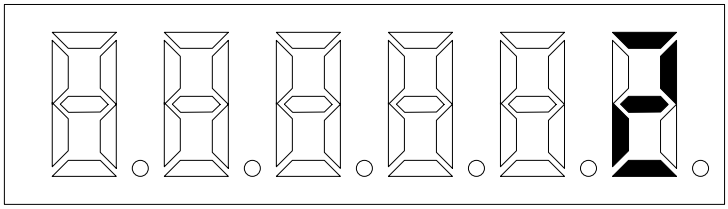


The above picture dedicates the current value of PA-12. press ▲ to increase the value, or press ▼ to decrease the value.

8) Change the value of PA-12 by pressing ▲ and ▼, untill PA-12 turns to 2. (notice: there is a dot at the end):

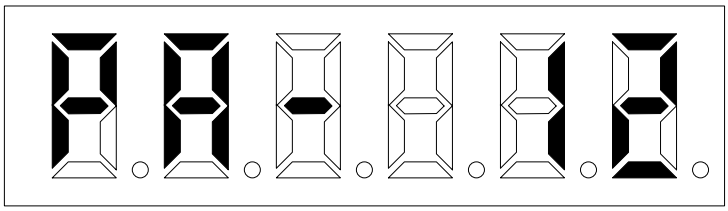


9) After press ↵ once, the display shows the following picture:

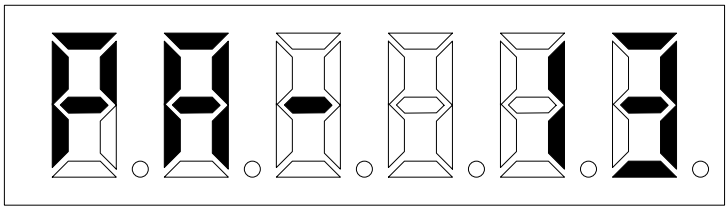


This step is to confirm. It's very important.notcie the dot at the end vanished, which means operation has been confirmed.

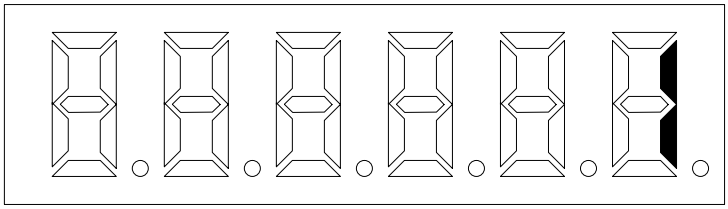
10) After press ◀ once, the display shows the following picture:



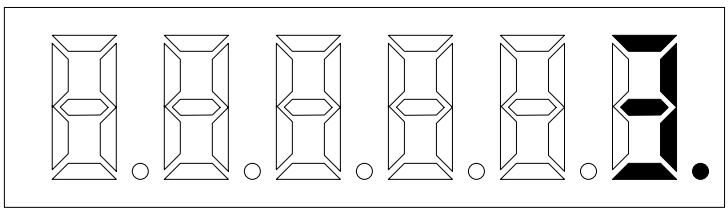
11) After press ▲ once, the display shows the following picture:



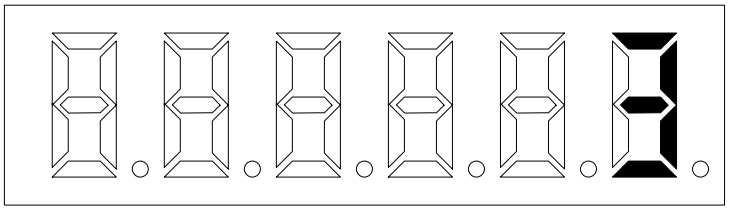
12) After press ↵ once, the display shows the following picture:



13) Change the value of PA-13 by pressing ▲ and ▼, untill PA-13 turns to 3. (notice: there is a dot at the end):



14) After press ↵ once, the display shows the following picture:



So far, the electronic gear has been changed to 2/3. backup parameters as shown above, to make the change available forever.

		Motor is running	① Brake resistance connection is switched off.	① Connect it again.
			① Brake transistor is damaged. ② Internal brake resistance is damaged.	① Change servo driver.
			① Capacity of brake loop is not enough.	① Reduce on-off frequency. ② Increade acceleration/ deceleration time constant. ③ Reduce torque limit value. ④ Reduce load inertia. ⑤ Change it with driver and motor with big power.
3	Main circuit is short of voltage	Connect with main power supply	① Circuit board fault ② Fuse of power supply is damaged. ③ Soft starting circuit fault ④ Rectifier is damaged.	① Change servo driver
			① Power voltage is low. ② Temporary power cut is more than 20mS.	① Check power supply.
		Motor is runnin	① Power capacity is not enough. ② Instantaneous power down	① Check power supply.
			① Radiator is overheated.	① Check loading.
4	Position is out-of-toleration.	Connect with control power supply	① Circuit board fault	①Change the servo driver.
		Connecting with main power supply and control circuit, inputting instruction pulse and the motor doesn't rotate	① Motor lead wire U, V, W is not connected correctly. ② Cable lead wire of encoder is not connected correctly.	① Connect the wire correctly.
			① Encoder fault	① Change the servo driver.
		Motor is runnig	① The position out-of-toleration detecting setting range is too small.	① Increase the detecting range.
			① The position proportional gain is too small.	① Increase the gain.
			① Torque is not enough..	① Check the torque limit value. ② Reduce the load capacity.. ③ Change it with driver and motor with big power.
			① Instruction pulse frequency is too high.	① Reduce the frequency.
5	Motor is	Connect with	① Circuit board fault	① Change the servo driver.

5.2 Alarm troubleshootings

Table 5.2 Alarm troubleshootings

Alarm code	Alarm name	Running state	Cause	Troubleshooting
1	Overspeed	Connect with control power supply	① Control circuit board fault ② Encoder fault	① Change servo driver ② Change servomotor
		Motor is running	① The input instruction pulse frequency is overhigh	① Set correctly the input instruction pulse.
			① Acceleration/deceleration time constant is tool small to cause the overshoot is too big.	① Increase acceleration/ deceleration time constant.
			① The input electronic gear ratio is too big.	① Set correctly.
			① Encoder fault	① Change the servo driver.
			① Encoder cable is inferior.	① Change the encoder cable.
			① Servo system is not stable to cause the overshooting.	① Set the related gain again. ② If the gain can not be set to proper value, reduce inertia ratio of load rotation.
		Motor is started	① The load inertia is too big.	① Reduce load inertia. ② Change driver and motor with big power.
			① Encode zero fault	① Change servomotor. ② Adjust encoder zero by the manufacturer.
			① Motor lead wire U, V, W is not connected correctly. ② Cable lead wire of encoder is not connected correctly.	① Connect wire correctly.
2	Main circuit is excess voltage	Connect with control power supply	① The circuit board fault	① Change servo driver.
		Connect with main power supply	① Power voltage is too high. ② Waveform of power voltage is normal.	① Check power supply

	overheated	control power supply	① Cable is broken. ② Internal temperature relay of motor is damaged.	① Check the cable. ② Check the motor.
		Motor is running	① Motor is overloaded.	① Reduce the load. ② Reduce the on-off frequency. ③ Reduce the torque limit value. ④ Reduce the related gain. ⑤ Change it with driver and motor with bigger power.
			① Motor internal fault	① Change the servo motor.
			① Load is too big.	① Reduce the load. ② Change it with a driver and motor with bigger power.
8	Position Out-of-toleration counter overflow		① Motor is blocked to stop by machine. ② Input instruction pulse is abnormal.	① Check the load of machine. ② Check the instruction pulse. ③ Check whether the motor rotates according to instruction pulse.
9	Encoder is fault		① Encoder connection is wrong.	① Check the connection.
			① Encoder is damaged.	① Change the motor.
			① Encoder cable is inferior erfect.	① Change the cable.
			① Encoder cable is too long to cause the encoder voltage is too low.	① Shorten the cable. ② Employ with multi-core parallel power-up.
10	Control power supply is undervoltage		① Input control power supply is low.	① Check the control power supply.
			① Internal connector assembly of driver is inferior. ② Switch power supply is abnormal. ③ Core is damaged.	① Change the driver. ② Check the connector assembly. ③ Check the switch power supply.
11	IPM module is fault	Connect with control power supply	① Circuit board is fault	① Change the servo driver.

		Motor is running	① Power-up voltage is too low. ② Overheated.	① Check the driver. ② Power on again. ③ Change the driver.
			① Driver U, V, W are short circuit.	① Check the connection.
			① Ground is inferior.	① Be grounded correctly.
			① Motor insulation is damaged.	① Change the motor.
			① It is interfered.	① Increase the circuit filter. ② Be far away from the interference source.
13	Overload	Connect with control power supply	① Circuit board is fault.	①Change the servo driver.
		Motor is running	① Running exceeds rated torque to run.	① Check the load. ② Reduce the on-off frequency. ③ Reduce the torque limit value. Change with a driver and motor with bigger power.
			① Hold brake is not switched on.	① Check the hold brake.
			① Motor vibrates unstablely.	① Regulate the gain. Increase the acceleration/ deceleration time. ② Reduce the load inertia.
			① One of U, V, W is switched off. ② The connection of encoder is mistaken.	① Check the connection.
14	Brake fault	Connect with control power supply	① Circuit board is fault.	① Change the servo driver.
		Motor is running	①Brake resistance connection is switched off.	① Connect the wire again.
			① Brake transistor is damaged. ② Internal brake resistance is damaged.	① Change the driver.

			① Brake loop capacity is not enough.	① Reduce the on-off frequency. ② Increase the acceleration/ deceraltion time constant. ③ Reduce the torque limit value. ④ Reduce the load inertia. Change with a driver and a motor with bigger power.
			① Main circuit power supply is too high.	① Check the main power supply.
			① Parameter setting is wrong.	① Set correctly the related parameter.
		Motor is running	① Long-term rated torque runs.	① Check the load. ② Reduce the on-off frequency. ③ Reduce the torque limit value. ④ Change with a driver and a motor with bigger power.
			① Machine transmission is inferior.	① Check the mechanical device .
21	IC2(EPLD core) error		① Core or circuit board is damaged.	① Change the servo driver.
24	Current collection circuit is fault		① Core or circuit board is damaged.	① Change the servo driver.
31	Z-axis pulse of encoder is lost		① There is no pulse in Z direction and the encoder is damaged. ② Cable is inferior. ③ Cable shield is inferior. ④ Shield ground wire is not connected well. ⑤ Encoder interface circuit is fault.	① Change the encoder ② Check the interface circuit of encoder.