

## **Series HSV-180AD AC Servo Drive**

# **User's Manual**



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**Wuhan Huazhong Numerical Control Co., LTD**

**Wuhan China**

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# 1 Safety Precautions

Thank you very much for buying AC servo drive, HSV-180AD AC servo drive unit and servo motor are applicable to the general industrial environment, not to the strong vibrating environment. Pay attention to the followings:

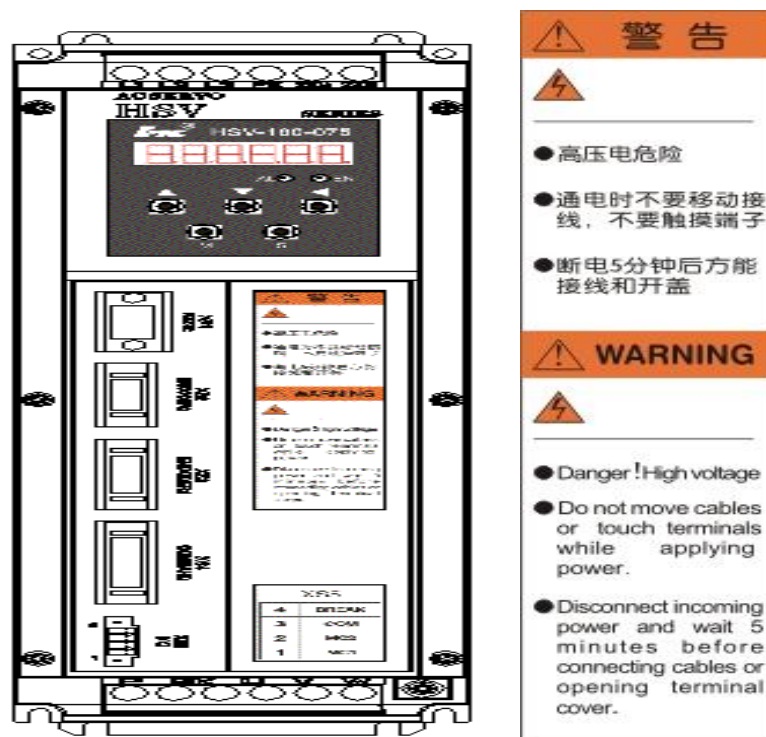
- It is inapplicable to the medical equipment which related to life safety .
- The servo drive is not water proof. It must be avoid moisture and direct sunlight.
- Do not perform any change to the servo drive and drive motor.

Before installation and wiring, read through this manual. Before operation, understand the safety information, safety precautions and operating instruction of this equipment.

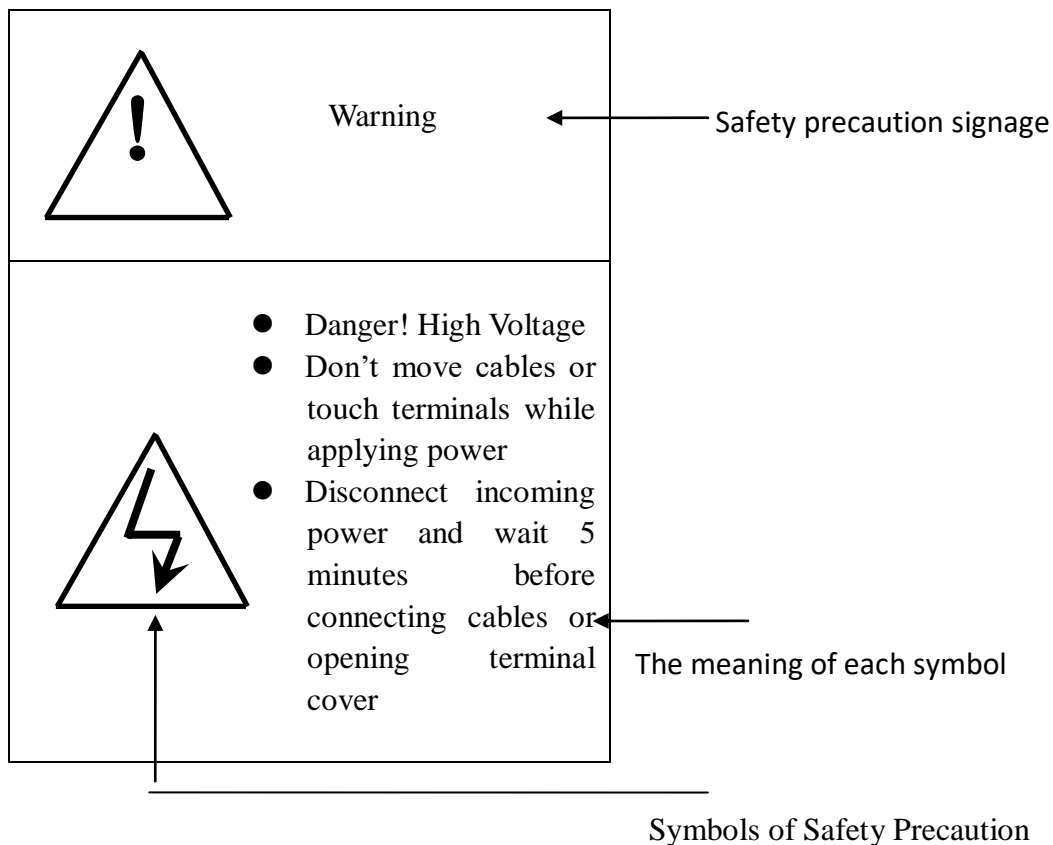
## 1.1 Symbols of Safety Precautions

Symbols of safety precautions are displayed on the front panel of the servo drive.

Figure 1-1 Symbol of safety precaution for HSV-180AD-035, 050, 075



## 1.2 Meaning of Safety Precaution Symbols



## 1.3 Explanation of Safety Precaution Symbols



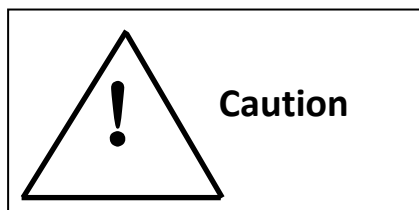
It indicates a potentially hazardous situation which, if not avoided, will result in death.



It indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury or death and damage to the machine.

## **1.4 Safety Regulations**

### **1. Products Confirmation**



Do not install damaged drive units.

Failure to follow this instruction could result in injury.

### **2. Installation**



- Hold the bottom of the machine.

If only hold the panel, the main engine may fall off which may result in injury.

- Fit to noncombustible such as metal.

Failure to follow this instruction could result in fire hazard.

- If necessary, set a cooling fan and keep the inlet air at 45°C or less.

Overheating may result in fire and other hazards.

- Don't block the inlet and outlet. Avoid foreign matter entering into the internal part of the machine.

It may cause the aging of internal components, which can result in malfunction or fire hazard.

- When installing, make sure a specified intervals between drive unit and control cabinet or other machines.

Failure to follow this instruction could result in fire hazard or malfunction.

### **3. Wiring**



- Before wiring, confirm whether the power is off.  
Failure to follow this instruction could result in electric shock and fire hazard.
- Only electrical engineer can do the wiring.  
Failure to follow this instruction could result in electric shock and fire hazard.
- Make sure the ground terminal is grounded.  
Failure to follow this instruction could result in electric shock and fire hazard.
- After the wiring of the emergency stop circuit, check whether the wiring is effective.  
Failure to follow this instruction could result in injury. (Users shall be responsible for the wiring.)
- Do not touch the output terminal directly nor connect external shield to the output wire of a servo drive unit. Avoid short circuit of output wires.  
Failure to follow this instruction could result in electric shock and short circuit.



- Confirm whether the power voltage of the main AC circuit is subject to the rated voltage of the servo drive unit.  
Failure to follow this instruction could result in injury and fire hazard.
- Do not make withstand test for the servo drive unit.  
Failure to follow this instruction could result in damage to components such as semi-conductor.



- Do not connect power cable to the output U, V, W terminals so as to avoid damage of servo drive unit internal parts.



- Do not connect capacitance and LC or LR noise filter to the output circuit so as to avoid damage of servo drive.
- Do not connect electromagnetic switch and electromagnetic contactor to the U, V, and W output circuit. When the servo drive running with load, surging current could activate over-current protection of the servo drive unit.

#### 4. Testing and Commissioning



- Do not remove or modify anything when the external wirings are made, or the power is on.

Failure to follow this instruction could result in electric shock.

- Do not approach to the machine on the trial-operations, after resetting of servo drive unit (Take physical safety into consideration when perform electrical and mechanical design).

- Arrange an external emergency stop device.

Failure to follow this instruction could result in injury.



- Before operating, reconfirm some information such as the use range of the motor and machines.

Failure to follow this instruction could result in injury.

- Do not touch the machine while operating or just cut off the power, because the radiator, brake resistor motor etc. may be at high temperature.

Failure to follow this instruction could result in burn.

- If necessary, arrange external brake. Do not touch the machine.

Failure to follow this instruction could result in injury.

- Do not check signal while operating to avoid damage to the equipment.

## 5. Troubleshooting



- Do not remove wiring within 5 minutes nor touch terminals after power-off of a servo drive unit, because the high voltage will last for a while.

Failure to follow this instruction could result in electric shock.

- Operations (such as wiring, installation, operation, remove and maintenance) must be performed by the specified professional personnel.

Failure to follow this instruction could result in electric shock and damage to the servo drive unit.



- The control circuit board adopts the CMOS IC. When maintaining, do not touch it directly with your fingers, because electrostatic induction could damage the control circuit board.

## 6. System Configuration



- The rated torque of the servo motor must be larger than continuous effective load torque. Otherwise, the servo motor could be damaged by long-time overload operation.
- The ratio of load inertia and servo motor inertia must be less than the recommended value.
- Make sure that the motor is properly matching the servo drive unit.

Failure to follow this instruction could result in damage of the equipment.

## 7. Others



- Do not make alterations independently.

Failure to follow this instruction could result in electric shock and injury.

## 2 Overview

Series HSV-180AD AC servo motor drive is a new generation of full digital AC servo servo drive developed by Wuhan Huazhong Numerical Control Co., Ltd.. This product features high performance, compact structure, easy-to-use operation, and high reliability.

### 2.1 Introduction

Series HSV-180AD AC servo motor drive adopts the latest technologies such as special motion control digital signal processor (DSP), and intelligent power module (IPM), and achieves the closed-loop servo control of servo motor. It has various specifications such as 035、050、075、100、150、200、300、450A and different ranges of power options. Users can configure various types of servo drive motor and AC servo motor to form high reliability and performance AC servo drive systems.

#### **Characteristics of Series HSV-180AD:**

### 1. Easy and flexible operation

By modifying the parameter, you can modify the control methods of the servo drive and the interior parameters so as to meet the requirements for different environment and conditions, and can be compatible with various types of servo motors.

### 2. Full display of status

Series HSV-180S provide a series of status display, which enables users to view related status parameters of the servo drive during commissioning and operation. In addition, it provides a range of troubleshooting information.

### 3. Various interfaces, and flexible control methods

HSV-180S servo drive can provide various interfaces and flexible control methods as follows:

- Pulse input interface
- Analog input interface
- Feedback interface of servo motor optical -electrical encoder
- Feedback interface of servo motor encoder
- Serial communication interface
- Programmable I/O interface

### 4. Servo orientation function

Series HSV-180AD can provide an independent function for servo orientation. Through feedback devices such as servo motor optic-electrical encoder, servo encoder and zero switch, it can realize the servo orientation control independently.

## ***2.2 Introduction to Control Modes***

Series HSV-180AD servo drive motor provides four control modes:

#### **1. Position control mode (pulse interface)**

Under this mode, HSV-180AD servo drive can set to external position control mode by setting internal parameters. It can receive three types of external pulse

command such as orthogonal pulse command, pulse + direction command, and positive and negative pulse command.

## **2. External speed control mode (pulse interface)**

Under this mode, HSV-180AD servo drive can set to external speed control mode by setting internal parameters. It can receive three types of external pulse command such as orthogonal pulse command, pulse + direction command, and positive and negative pulse command.

## **3. External speed control mode (analog interface)**

Under this mode, HSV-180AD servo drive can set to external speed control mode by setting internal parameters. It can receive external analog command with amplitude varies from -10V to 10V or from 0V to 10V.

## **4. JOG mode**

Under this mode, HSV-180S servo drive can run based on the key setting (instead of external instruction). This mode is provided for users to test whether the servo drive system is correctly installed and connected.

## **5. Internal speed control mode**

Under this mode, HSV-180AD servo drive can run at a present speed in the system without external instruction. This mode is provided for users to test whether the servo drive system is correctly installed and connected.

### 3 Order Information

#### 3.1 Specifications of Servo Drive

##### 3.1.1 Specification for HSV-180AD

The following figure shows the specification of HSV-180AD.

Figure 3-1 Current type of HSV-180AD

HSV-180AD	-□□□
Servo drive	current type
	035 050 075
	100 150
	200 300 450

##### 3.1.2 Current Type of HSV-180AD

Table 3-1 Current Types of HSV-180AD servo drives

Type		HSV-180AD -035	HSV-180AD-050	HSV-180AD-075
Maximum power of applicable Motor (KW)		3.7KW	5.5KW	7.5KW
Rated output current (A)		12.5	16	23.5
Short-time Peak Current (A)		22	28	42
Circute breaker (A)		25	32	40
conector (A)		18	25	32
Input exchange reactor	Current (A)	10	15	20
	Inductance (mH)	1.4	0.93	0.7
Input filter(A)		10	15	20
Maximum braking resistor (A)		25	25	40
Recommended Braking resistor	Resistor ( $\Omega$ )	51 $\Omega$	51 $\Omega$	27 $\Omega$
	Power (W)	1500W	1500W	2000W
	Quanlity	1	1	1
Recomand value of main circute cable ( $\text{mm}^2$ )		4	4	4

Type		HSV-180AD-100	HSV-180AD-150	
Maximum power of applicable Motor (KW)		11KW	15KW	
Rated output current (A)		32	47	
Short-time Peak Current (A)		56	84	
Circute breaker (A)		63	100	
conector (A)		40	63	
Input exchange reactor	Current (A)	30	50	
	Inductance (mH)	0.47	0.28	
Input filter(A)		30	50	
Maximum braking resistor (A)		50	75	
Recommended Braking resistor	Resistor ( $\Omega$ )	33 $\Omega$	27 $\Omega$	
	Power (W)	1500W	2000W	
	Quanlity	2	2	
Recomand value of main circute cable ( $\text{mm}^2$ )		10	16	

Type		HSV-180AD-200	HSV-180AD-300	HSV-180AD-450
Maximum power of applicable Motor (KW)		30KW	37KW	51KW
Rated output current (A)		64.3	94	128
Short-time Peak Current (A)		110	168	224
Circute breaker (A)		125	200	400
conector (A)		95	150	250
Input exchange reactor	Current (A)	80	150	250
	Inductance (mH)	0.17	0.095	0.056
Input filter(A)		80	150	250
Maximum braking resistor (A)		100	100	150
Recommended Braking resistor	Resistor ( $\Omega$ )	30 $\Omega$	30 $\Omega$	30 $\Omega$
	Power (W)	2500W	2500W	2500W
	Quanlity	3	4	6
Recomand value of main circute cable ( $\text{mm}^2$ )		35	70	120

### 3.1.3 Technical Specification of HSV-180AD

The following table describes the technical specification of HSV-180AD

Table 3-2 Technical specification of HSV-180AD servo drives

Input power	Rated voltage、 Range of voltage fluctuation Frequency	150A and below specifications: Three-phase AC380V -15% ~ +10% 50/60Hz 200A and above Specifications: 1.Single phase AC220V control power -15% ~ +10% 50/60Hz 2.Three-phase AC380V strong power -15% ~ +10% 50/60Hz
Control modes		Position control、 External speed control、 JOG control、 Internal speed control
Characteristic	Speed frequency response	300Hz or higher
	Speed volatility	Lower than $\pm 0.1$ (load 0% ~ 100%); Lower than $\pm 0.2$ (power supply -15% ~ +10%)
	Speed range	1:10000
Position control	Types of pulse command	① Direction + pulse train ② CCW pulse + CW pulse ③ Two-phase A / B quadrature pulse
	Form of pulse command	Non-insulated wire drive (about +5V)
	Frequency of pulse command	$\leq 500\text{kHz}$
Speed control	Types of pulse command	② Direction + pulse train ② CCW pulse + CW pulse ③ Two-phase A / B quadrature pulse
	Form of pulse command	Non-insulated wire drive (about +5V)
	Frequency of pulse command	$\leq 500\text{kHz}$
	Electron gear	$1 \leq \alpha/\beta \leq 32767$
	Analog command	DC 0 ~ +10V or DC -10V ~ +10V
	Acceleration and deceleration function	1 ~ 32000ms (0 ~ 1000r/min or 1000 ~ 0r/min)



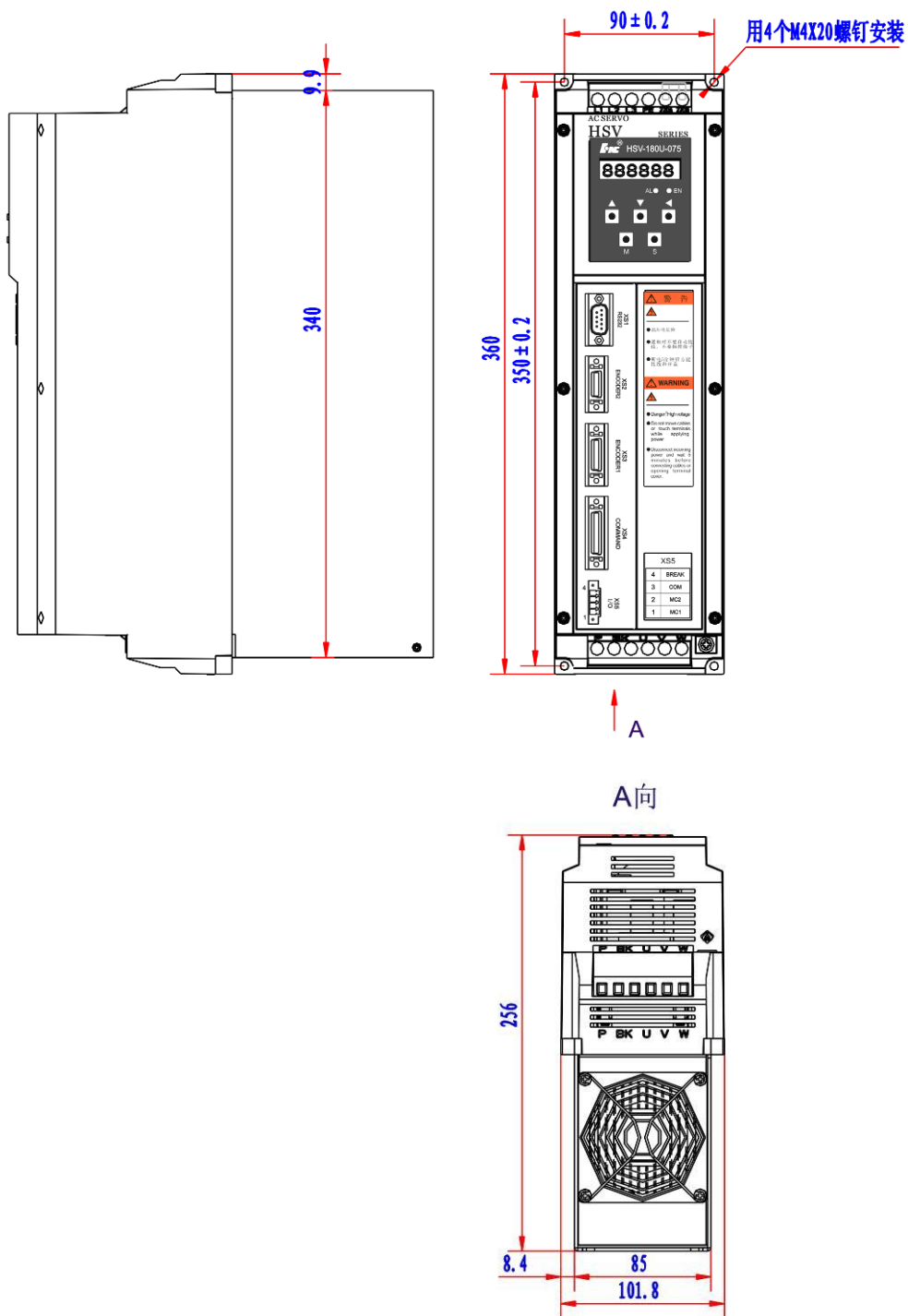
Type of servo motor encoder		TTL composite incremental photoelectric encoder:1024line、2048line、2500 line、6000 line
Servo encoder encoder type		Optical encoder (TTL) Sine and cosine analog signal (1Vpp)
Input and output Signal	Control input	Run enable Alarm clear Forward and reverse running enable Servo orientation ready Control modes switch Indexing incremental orientation ratio input selection
	Control output	Servo ready Servo alarm Servo orientation-finished Speed-reached Zero-speed reached
Servo function	Servo orientation	Accuracy: $\pm 1$ pulse; Position adjustment: Parameter setting
	Rigid tapping	Tapping deviation: $\pm 2\%$
	Other function	C-axis control, Thread cutting
Communication function		RS232 use MODBUS protocol
Monitoring function		Speed Flux current Torque current Motor load current Switch-value input status display Switch-value output status display Control mode display
Protecting function		Provides protection against: Over speed Main power over-voltage and under-voltage Over current Overload Motor over heat Big speed error IPM fault etc.

Operation		Six LED digital tubes, two light-emitting diodes(LED), five bottoms
Adaptive motor		2.2KW~75KWAC servo motor
Use Environment	Use place	Non-corrosive, flammable gas, prevent conductive objects, metal dust, oil mist and liquid from entering inside the drive unit.
	Use Temperature Storage Temperature	Use temperature :0℃~+40℃ , More than 40 ℃ shall be derated。 Storage temperature :-20℃~+60℃ 。
	Use humidity Storage humidity	Below 90% RH, non-condensing.
	Altitude	Below 1000m, Altitude above 1000m shall be derated。
	Vibration / impact resistance	Vibration Resistance $4.9\text{m/S}^2$ , Impact resistance $19.6\text{m/S}^2$

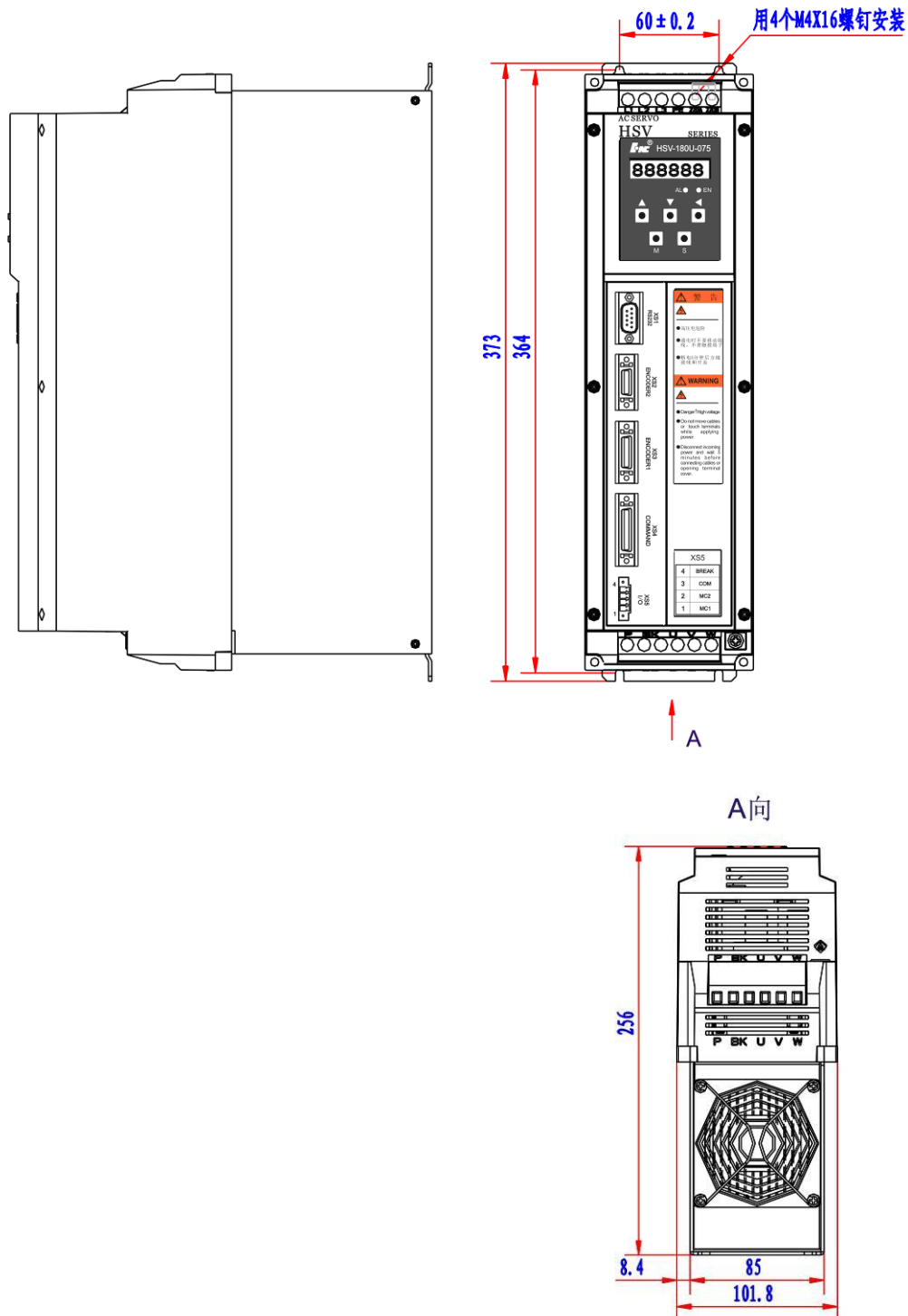
### 3.1.4 Dimension and Size of Servo Drive

The following figures show the installation dimension of series HSV-180AD servo drives.

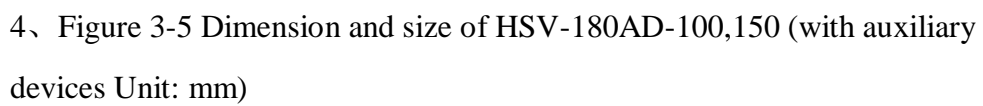
1、Figure 3-2 Dimension and size of HSV-180AD-, 035, 050, 075 (without auxiliary devices Unit: mm)

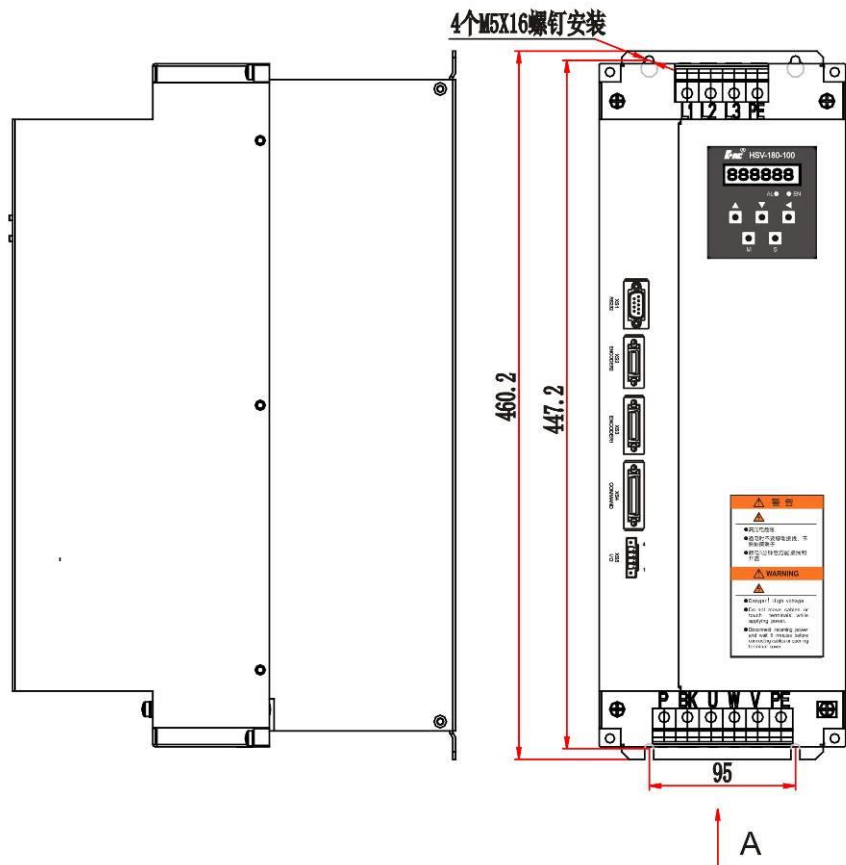


2、 Figure 3-3 Dimension and size of HSV-180AD-035, 050, 075 (with auxiliary devices Unit: mm)

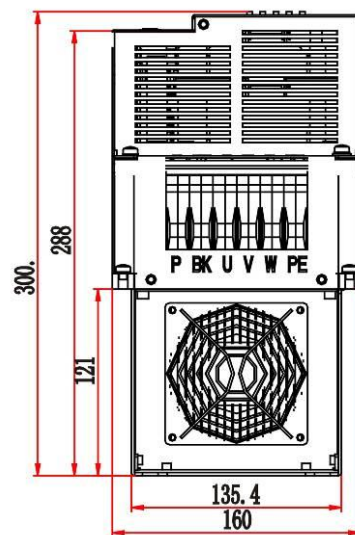


3、 Figure 3-4 Dimension and size of HSV-180AD-,100, 150 (without auxiliary devices Unit: mm)

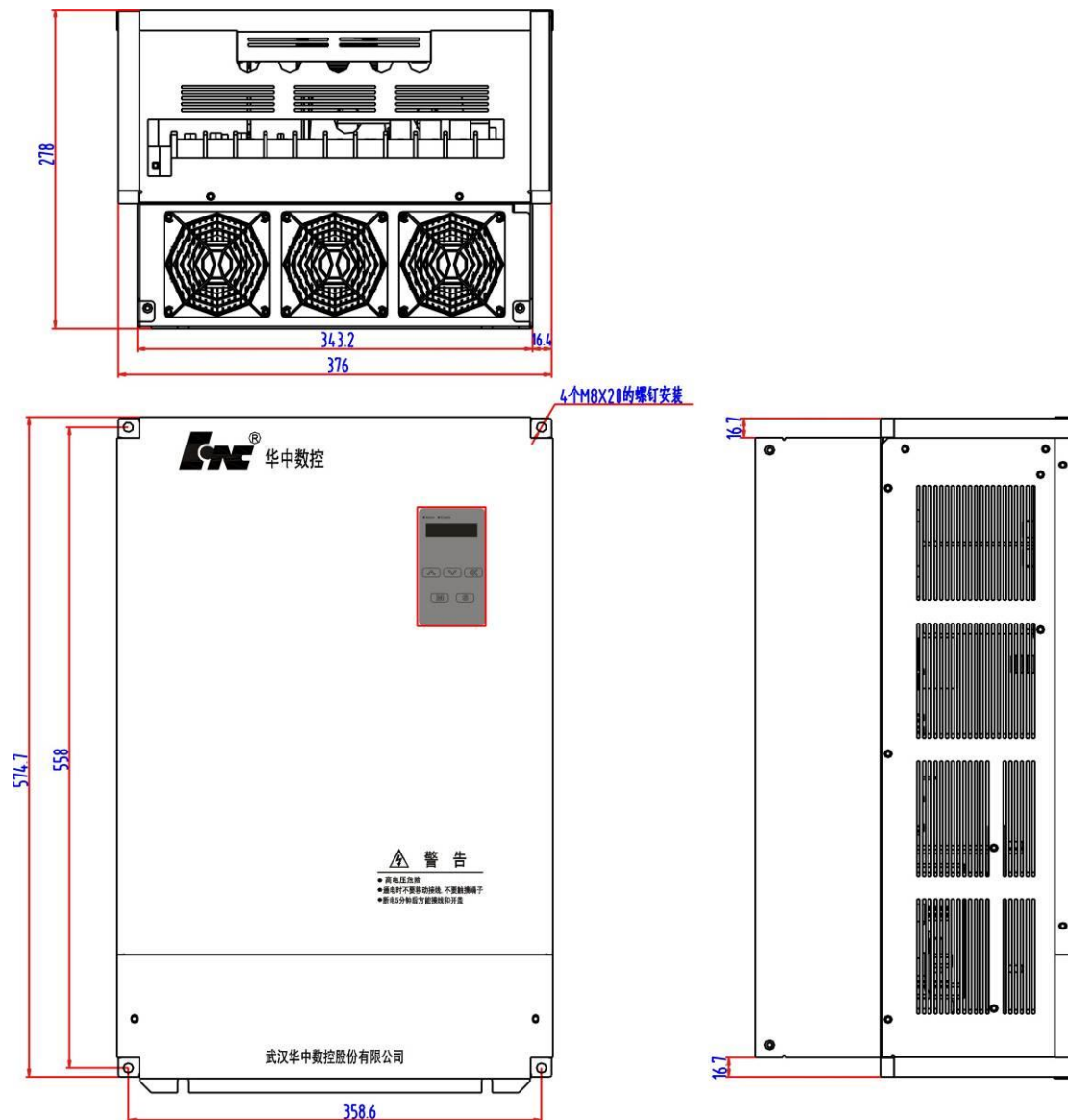




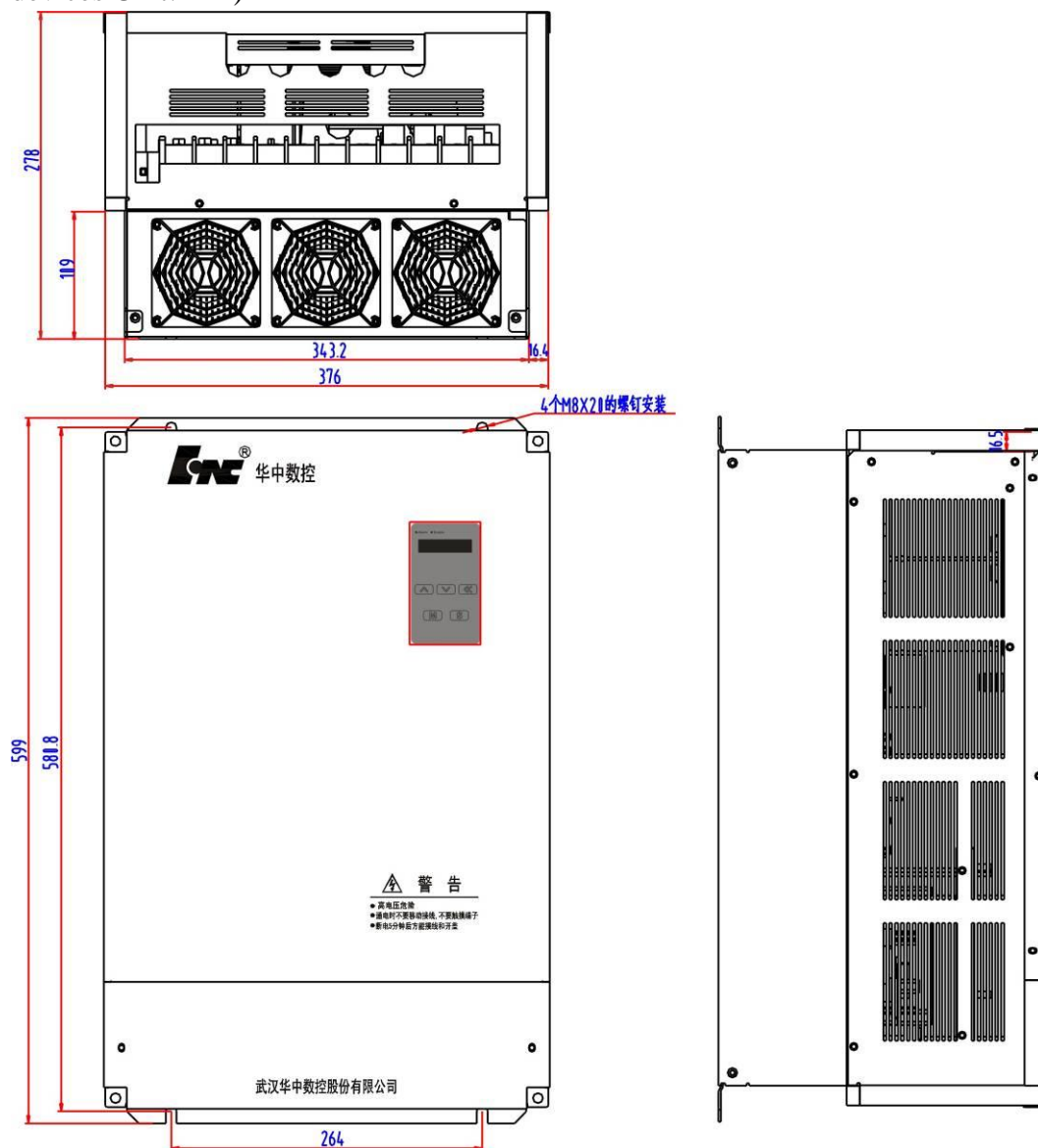
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5、Figure 3-6 Dimension and size of HSV-180AD-,200, 300,450 (without auxiliary devices Unit: mm)



6、Figure 3-7 Dimension and size of HSV-180AD-,200, 300,450 (with auxiliary devices Unit: mm)



### 3.2 Specification of Servo Motor

#### 3.2.1 Introduction to Series GK6 AC Servo Motor

GK6 series of AC servo motors and servo drives can be widely used in various fields such as machine tools, textile, printing, and building materials.

GK6 AC servo motor uses self-cooling motor, and its protection class reaches IP64-IP67. GK6 AC servo motor is a three-phase AC permanent magnet synchronous motor that uses high-performance rare earth permanent magnetic materials to form air gap magnetic field. Pulse width modulation (PWM) inverter is used to control



operation to achieve good torque performance and wide speed range. A temperature sensor is installed in the stator windings of the servo motor, which is used for overheating protection. GK6 series of AC servo motors consist of stator, rotor, and high-precision feedback devices (such as optical encoder and resolver).

### 3.2.2 Features of Series GK6 AC Servo Motor

- Compact architecture and high power density
- Small rotor inertia and rapid response
- Super high coercively rare earth permanent magnet
- Overheat protection capability
- Strong anti-demagnetization capability
- Various frame installation size
- Full-closed design

Figure 3-4 Series **GK6** AC servo motor



### 3.2.3 Technical index of Series GK6 AC servo motor

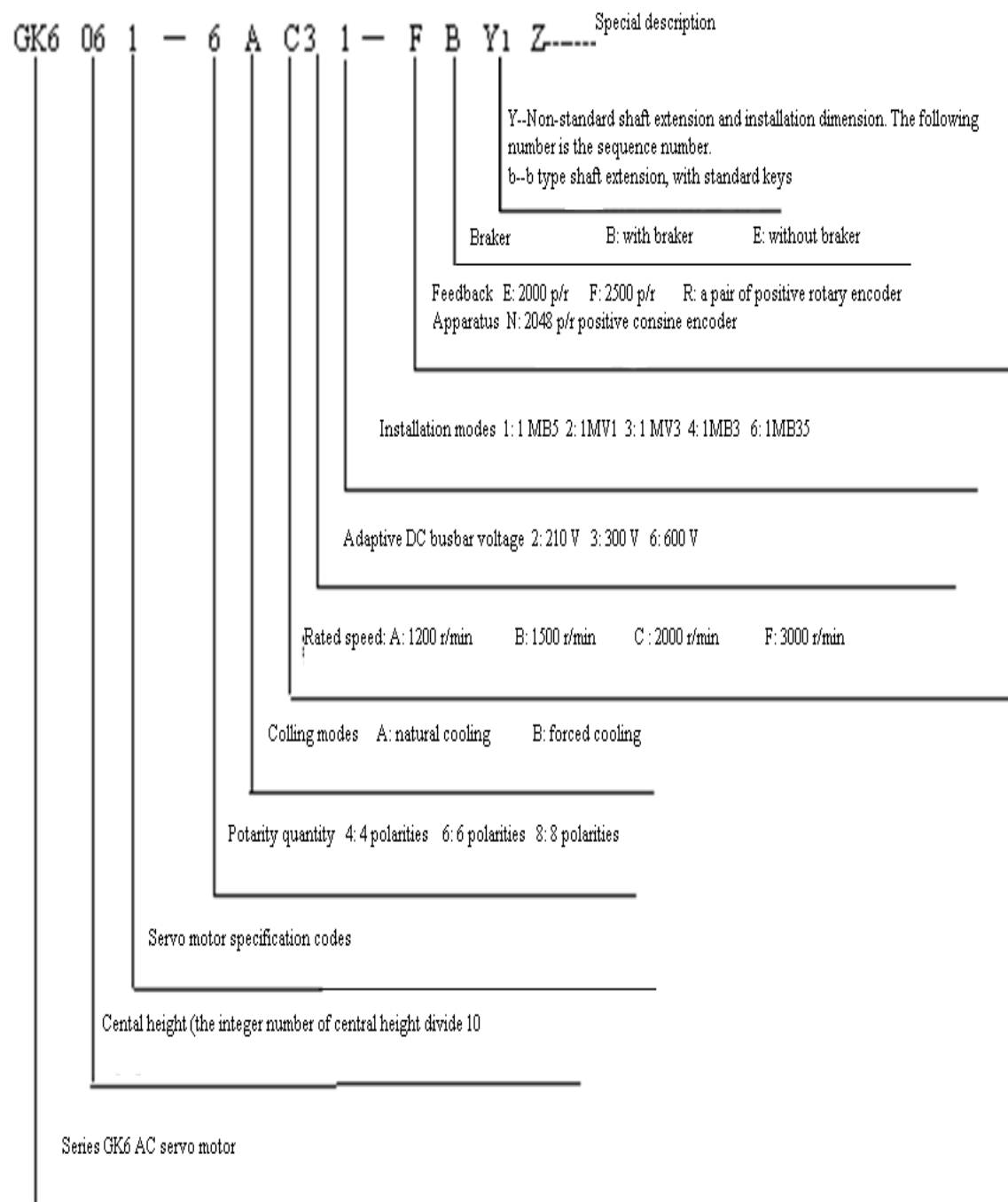
The following table describes the technical index of series AC **GK6** servo motor.

Table 3.3 Technical index of series GM7AC servo motor:

Item	Description
Magnetic material Insulation level	<ul style="list-style-type: none"> <li>● Super high coercively rare earth permanent magnetic material.</li> <li>● Class <b>F</b> insulation level</li> </ul> <p>When the environmental temperature is +40℃, the rotor winding temperature can reach 100 K (<math>\Delta T=100</math> K). Class H or Class C insulation level is optional, in which case the rotor</p>
Feedback system  Temperature protection	<p>Winding temperature can reach 125 K or 145 K respectively.</p> <ul style="list-style-type: none"> <li>● Standard: square-wave optic-electrical encoder (with U, V, and W signal)</li> </ul> <p>Options:</p> <ul style="list-style-type: none"> <li>● Resolver, used in the environment with big vibration and impacts</li> <li>● Sine and cosine optic-electrical encoder, which resolution can reach 220</li> <li>● Absolute encoder</li> <li>● Positive temperature coefficient (PTC) thermistor</li> </ul> <p>When the temperature is 20 °, the resistance cannot greater than 250 <math>\Omega</math> (<math>R \leq 250 \Omega</math>).</p> <p>Option: Heat-sensitive switch</p>
Temperature protection	positive temperature coefficient(PTC) thermistor
Types of mounting Protection level Cooling  Surface paint	<ul style="list-style-type: none"> <li>●MB5</li> </ul> <p>Options: IMV1, IMV3, and IMB35 IMB5</p> <ul style="list-style-type: none"> <li>●IP64</li> </ul> <p>Options: IP 65 and IP67</p> <ul style="list-style-type: none"> <li>●Natural cooling</li> <li>●Flat grey paint</li> </ul> <p>Options: customized paint</p>
Bearing Radial shaft seal Shaft	<ul style="list-style-type: none"> <li>●Double row deep groove ball bearing</li> <li>●Drive shaft seal</li> <li>●Standard:</li> </ul> <p>Type a: Plain shaft, no keys</p> <p>Option:</p> <ul style="list-style-type: none"> <li>● Type b: Shaft with keyway, keys, or customized shaft</li> </ul>
Vibration level& Rotation accuracy	<ul style="list-style-type: none"> <li>●N</li> </ul> <p>Options: R and S</p> <ul style="list-style-type: none"> <li>●N</li> </ul> <p>Option: R and S</p>
Noise	<p>GK603<math>\leq</math>55dB(A);      GK604<math>\leq</math>55dB(A);</p> <p>GK605<math>\leq</math>60dB(A);      GK606<math>\leq</math>65dB(A);</p>

	GK607≤65dB(A);      GK608≤70dB(A); GK610≤70dB(A);      GK613≤70dB(A); GK618≤76dB(A);
Connection	●Socket connector (GK603-GK610) Option: Outlet box (GK603-GK610) ●Outlet box (GK613 or a later version) Option: Socket connector
Options	●Maintenance-free high-reliability permanent magnet safe brake (made in Germany) ●High-precision planetary gear reducer or other reducers

### 3.2.4 Order information of series GK6 AC Permanent Magnet Servo



### 3.2.5 Technical Specification of Series GK6 AC Permanent Magnet Servo Motor

Adhere to the following principles when choosing servo drives:

- Generally, the maximum current or rated current of the servo drive must be equal or greater than 2.
- For the situation that requires great dynamic response characteristics, the

maximum current or rated current must be equal or greater than 3.

The following tables describe the technical specification of series GK6 AC permanent magnet servo motor

Table 3-4 Technical specification of series GK6 AC permanent magnet servo motor

Table 3-4 Technical specification of series GK6 AC permanent magnet servo motor

1. Natural cooling:

Type	Rated Speed r/min	Static Torque M0 Nm	Phase Current I0 A	Rotational Inertia $10^{-4}\text{Kgm}^2$	Weight Kg	Adaptive Motor /Overload Ratio
GK6040-6 AC61	2000	1.6	0.9	1.87	3.7	HSV-180D-25/16.6
GK6040-6 AF61	3000		1.4			HSV-180D-25/10.7
GK6041-6 AC61	2000	2.5	1.4	2.67	4.3	HSV-180D-25/10.7
GK6041-6 AF61	3000		2.2			HSV-180D-25/6.8
GK6042-6 AC61	2000	3.2	1.9	3.47	5.0	HSV-180D-25/7.8
GK6042-6 AF61	3000		2.8			HSV-180D-25/5.3
GK6060-6 AC61	2000	3	1.5	4.4	8.5	HSV-180D-25/10
GK6060-6 AF61	3000		2.3			HSV-180D-25/6.5
GK6061-6 AC61	2000	6	3.0	8.7	10.6	HSV-180D-25/5
GK6061-6 AF61	3000		4.5			HSV-180D-25/3.3
GK6062-6 AC61	2000	7.5	3.8	12.9	12.8	HSV-180D-25/3.9
GK6062-6 AF61	3000		5.7			HSV-180D-35/3.6
GK6063-6 AC61	2000	11	5.6	17	14.5	HSV-180D-25/2.6
GK6063-6 AF61	3000		8.3			HSV-180D-35/2.5
GK6064-6 AC61	2000	4.5	2.2	6.7	9	HSV-180D-25/6.8
GK6064-6	3000		3.2			HSV-180D-

AF61						25/4.6
GK6070-6 AC61	2000	3	1.5	4.4	8.5	HSV-180D-25/10
GK6070-6 AF61	3000		2.3			HSV-180D-25/6.5
GK6071-6 AC61	2000	6	3.0	8.7	10.6	HSV-180D-25/5
GK6071-6 AF61	3000		4.5			HSV-180D-25/3.3
GK6072-6 AC61	2000	7.5	3.8	12.9	12.8	HSV-180D-25/3.9
GK6072-6 AF61	3000		5.7			HSV-180D-35/3.6
GK6073-6 AC61	2000	11	5.6	17	14.5	HSV-180D-25/2.6
GK6073-6 AF61	3000		8.3			HSV-180D-35/2.5
GK6074-6 AC61	2000	4.5	2.2	6.7	9	HSV-180D-25/6.8
GK6074-6 AF61	3000		3.2			HSV-180D-25/4.6
GK6080-6 AC61	2000	16	6.8	26.7	16.5	HSV-180D-35/3
GK6080-6 AF61	3000		10.2			HSV-180D-50/2.9
GK6081-6 AA61	1200	21	6.1	35.7	19.5	HSV-180D-25/2.5
GK6081-6 AC61	2000		10			HSV-180D-50/3
GK6081-6 AF61	3000		15			HSV-180D-75/2.8
GK6083-6 AA61	1200	27	8.1	44.6	22.5	HSV-180D-35/2.5
GK6083-6 AC61	2000		13.3			HSV-180D-75/3.2
GK6085-6 AA61	1200	33	9.9	53.5	25.5	HSV-180D-50/3
GK6085-6 AC61	2000		16.5			HSV-180D-75/2.6
GK6087-6 AA61	1200	37	11.1	62.4	28.5	HSV-180D-50/2.7
GK6087-6 AC61	2000		18.5			HSV-180D-75/2.3

GK6089-6 AA61	1200	42	12.6	71.3	31.5	HSV-180D- 50/2.4
GK6100-8 AA61	1200 1500 2000 3000	18	4.7 5.9 7.8 11.7	57.2	21	HSV-180D- 25/3.1
GK6100-8 AB61						HSV-180D- 25/2.5
GK6100-8 AC61						HSV-180D- 35/2.7
GK6100-8 AF61						HSV-180D- 50/2.5
GK6101-8 AA61						HSV-180D- 35/3
GK6101-8 AB61	1200 1500 2000 3000	27	7.0 8.8 11.7 17.5	89.5	26	HSV-180D- 35/2.4
GK6101-8 AC61						HSV-180D- 50/2.5
GK6101-8 AF61						HSV-180D- 75/2.4
GK6103-8 AA61						HSV-180D- 50/3.1
GK6103-8 AB61	1200 1500 2000	36	9.4 11.8 15.7	121.5	30	HSV-180D- 50/2.5
GK6103-8 AC61						HSV-180D- 75/2.7
GK6105-8 AA61	1200 1500	45	11.7 14.5	153.5	34	HSV-180D- 50/2.5
GK6105-8 AB61						HSV-180D- 75/2.9
GK6107-8 AA61	1200 1500	55	14.3 17.9	185.5	38	HSV-180D- 75/3
GK6107-8 AB61						HSV-180D- 75/2.4
GK6109-8 AA61	1200	70	18.5	233.5	45	HSV-180D- 75/2.3

## 2. Forced cooling

Type	Rated Speed r/min	Static Torque M0 Nm	Phase Current I0 A	Rotational Inertia $10^{-4}\text{Kgm}^2$	Weight Kg	Adaptive Motor /Overload Ratio
GK6130-8S W61	500 750 1000 1200	75	7.5 11 15 18	451	53	HSV-180D -35/2.8
GK6130-8S V61						HSV-180D -50/2.7
GK6130-8S E61						HSV-180D -75/2.8
GK6130-8S A61						HSV-180D -75/2.4
GK6131-8S W61	500 750 1000	90	9 14 18	509	60	HSV-180D -50/3.3
GK6131-8S V61						HSV-180D -70/3
GK6131-8S E61						HSV-180D -75/2.4
GK6132-8S W61	500 750	120	12 18	664	79	HSV-180D -50/2.5
GK6132-8S V61						HSV-180D -75/2.4
GK6133-8S W61	500	150	15	819	98	HSV-180D -75/2.8
GK6135-8S W61	500	180	18	975	117	HSV-180D -75/2.4

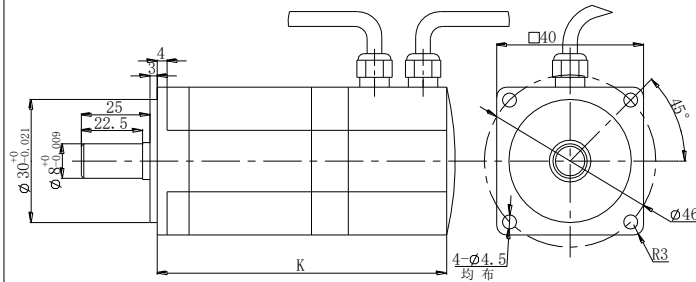
## 3.2.6 Installation Dimension of the Motor

This section describes the installation dimension of series GK6 AC permanent magnet servo motors.

Figure 3-10 Dimension and size of series GK6 AC permanent magnet servo motors.

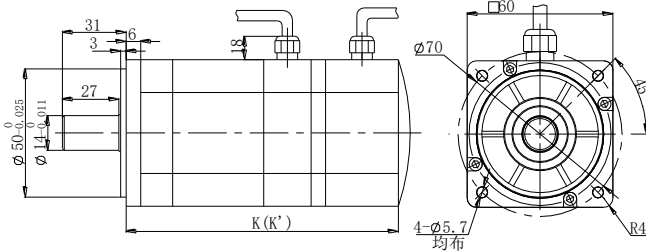


GK601外形尺寸图



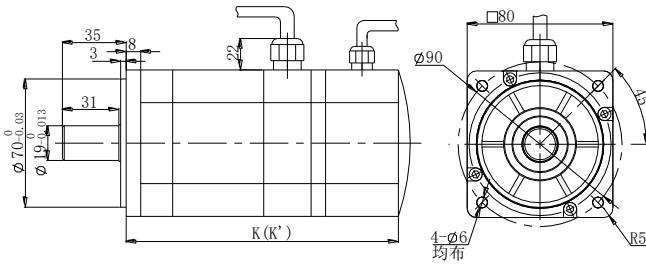
型 号	K (mm)
GK6011	83.5
GK6013	98.5
GK6015	133.5

GK602形尺寸图



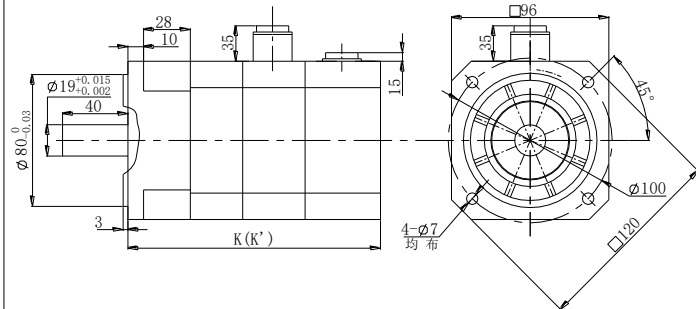
型 号	K(mm)	K'(mm) (带制动器)
GK6021	110.5	139.5
GK6023	120.5	149.5
GK6025	140.5	169.5

GK603形尺寸图



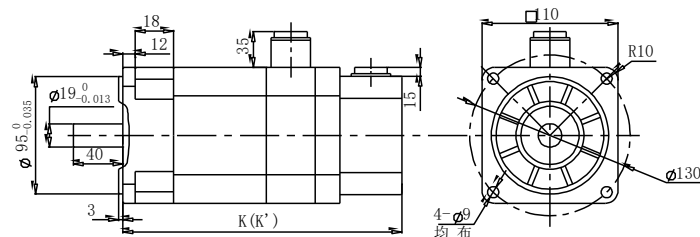
型 号	K(mm)	K'(mm) (带制动器)
GK6031	149.5	180.5
GK6032	169.5	200.5

GK604外形尺寸图



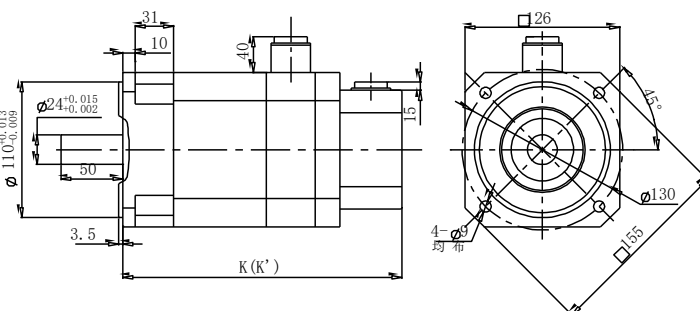
型 号	K(mm)	K'(mm) (带制动器)
GK6040	169.5	176
GK6041	185.5	192
GK6042	201.5	208

GK605外形尺寸图



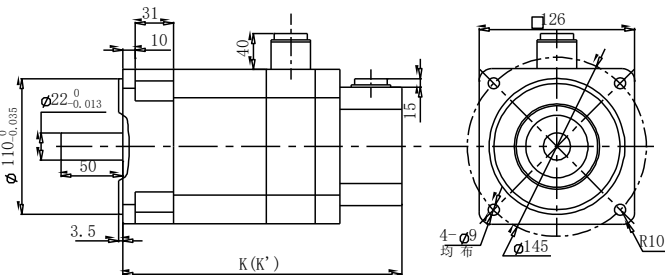
型 号	K(mm)	K'(mm) (带制动器)
GK6051	153.5	166
GK6052	168.5	181
GK6053	183.5	196
GK6054	198.5	211
GK6055	213.5	226

GK606外形尺寸图



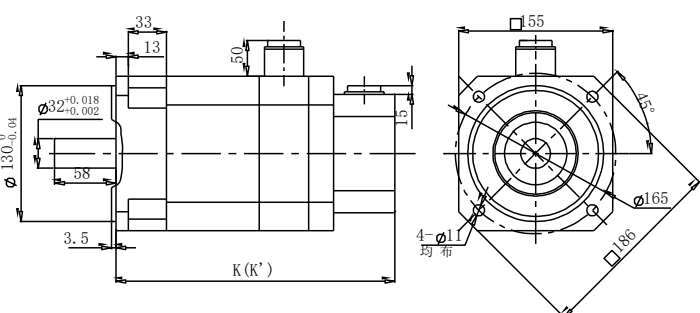
型 号	K(mm)	K'(mm) (带制动器)
GK6060	167.5	182.5
GK6061	192.5	207.5
GK6062	217.5	232.5
GK6063	242.5	257.5
GK6064	180	195
GK6065	282.5	297.5

GK607外形尺寸图

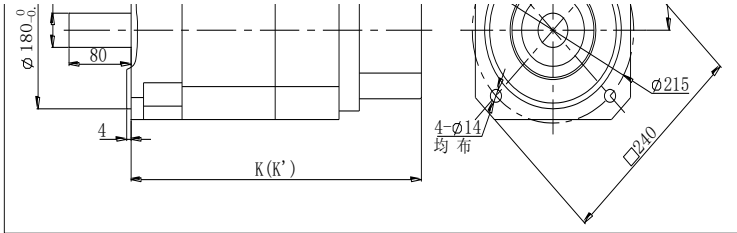


型 号	K(mm)	K'(mm) (带制动器)
GK6070	167.5	182.5
GK6071	192.5	207.5
GK6072	217.5	232.5
GK6073	242.5	257.5
GK6074	180	195
GK6075	282.5	297.5

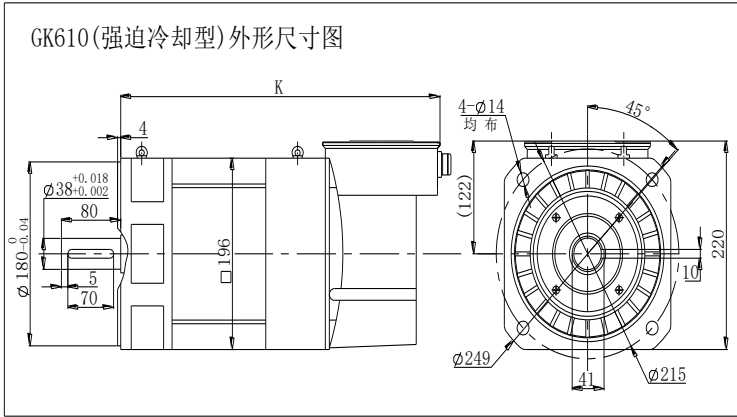
GK608外形尺寸图



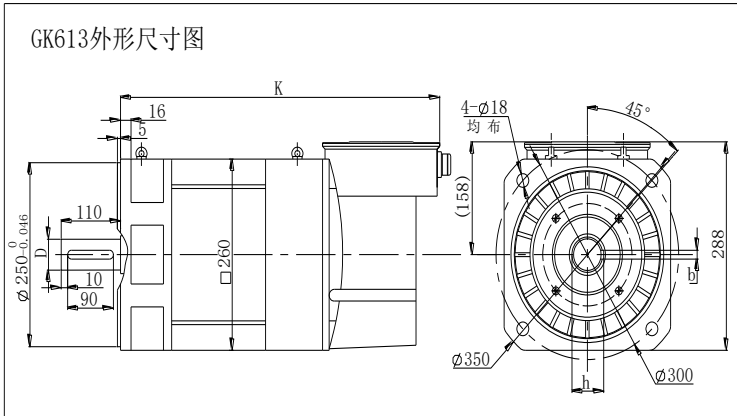
型 号	K(mm)	K'(mm) (带制动器)
GK6080	251.5	251.5
GK6081	276.5	276.5
GK6083	301.5	301.5
GK6085	326.5	371.5
GK6087	351.5	396.5
GK6089	376.5	421.5



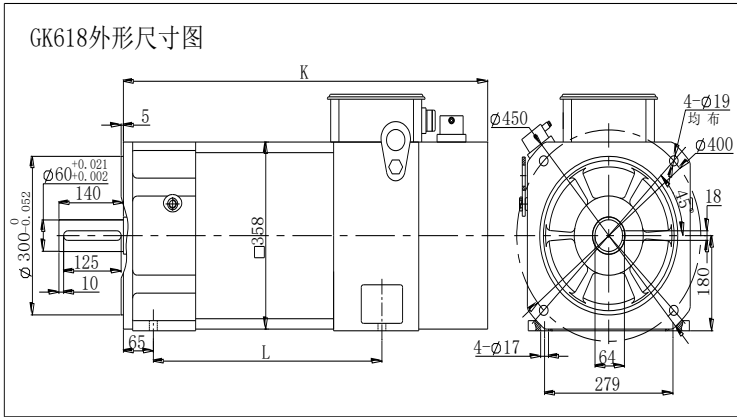
GK6103	289.5	289.5
GK6105	315.5	315.5
GK6107	341.5	341.5
GK6109	380.5	380.5



型 号	K <sup>⊙</sup> (mm)
GK6100 (强迫冷却型)	336.5
GK6101 (强迫冷却型)	362.5
GK6103 (强迫冷却型)	388.5
GK6105 (强迫冷却型)	414.5
GK6107 (强迫冷却型)	440.5
GK6109 (强迫冷却型)	479.5
GK61011 (强迫冷却型)	531.5



型 号	K <sup>⊙</sup> (mm)	D(mm)	h(mm)	b(mm)
GK6130	458.5	42	45	12
GK6131	473.5	42	45	12
GK6132	513.5	42	45	12
GK6133	553.5	42	45	12
GK6135	593.5	42	45	12
GK6137	633.5	42	45	12
GK6138	658.5	55	59	16
GK61310	683.5	55	59	16

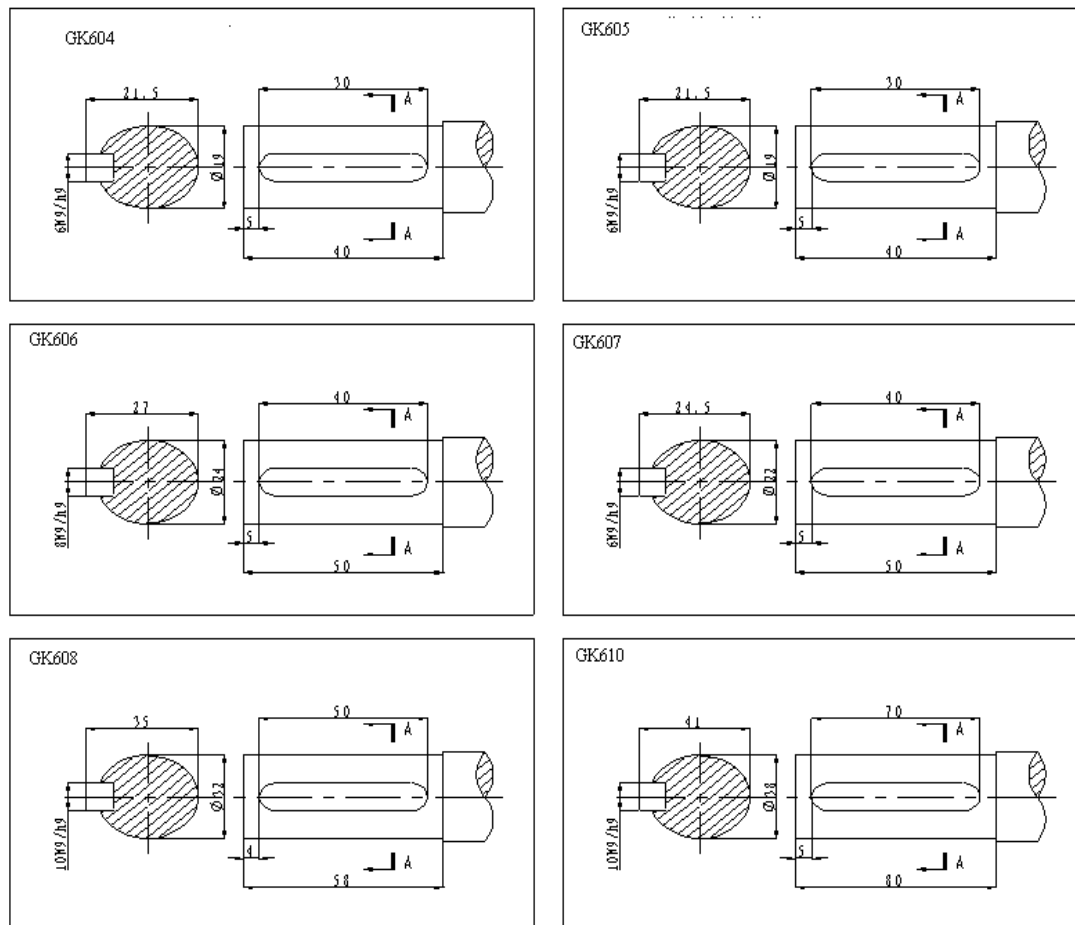


型 号	L (mm)	K (mm)
GK6180	359	693
GK6181	389	723
GK6182	419	753
GK6183	449	783
GK6184	509	843
GK6185	569	903
GK6186	629	963
GK6187	689	1023
GK6188	749	1083
GK6189	809	1143

NOTE: After GK610、GK613 assembling well, total length is K+61

### 3.2.7 Recommended shaft keyway

Figure 3-11 Connect terminal of series GM7 AC servo servo motor

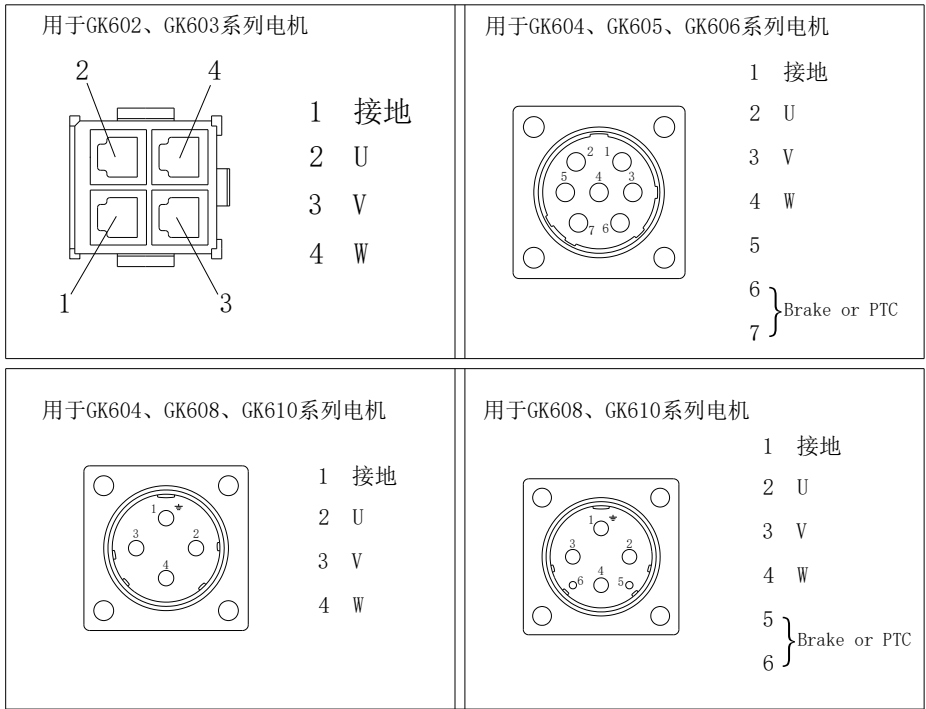


### 3.2.8 Recommended C-type center hole

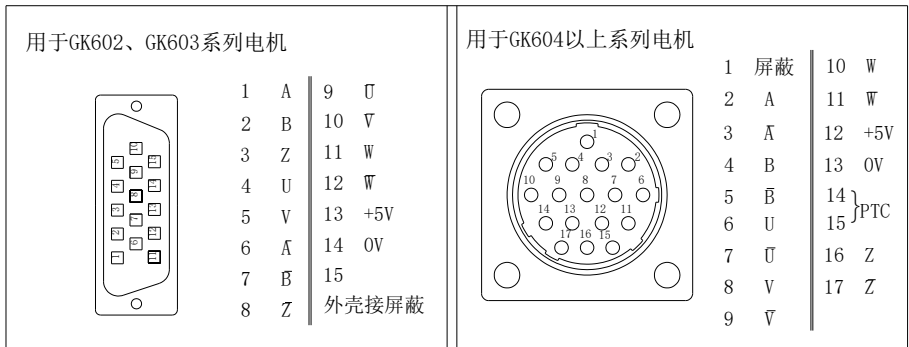
Type	GK603	GK604	GK605	GK606	GK607	GK608	GK610	GK613	GK618
Center Hole	M5	M6	M6	M8	M8	M10	M12	M16	M24
Thread Depth	12	12	12	14	14	18	22	26	34

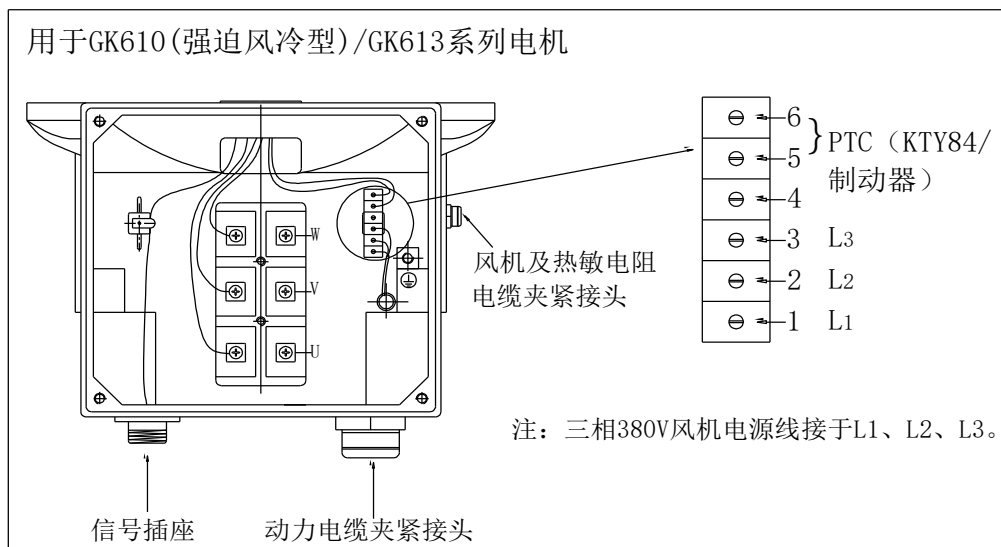
### 3.2.9 GK6 Series AC permanent magnet servo motor interface definition

动力插座接线定义图:



信号插座接线定义图:





**Note:** If the motor without the brake or internal thermistor, the corresponding pin is empty.

## 4 Installation

### 4.1 Products Check

After receiving products, users must check the items as the following table.

Item	Reference
Whether the product is damaged	Check the product appearance to make sure that the product is not damaged during transportation.
Whether the product type is in accordance with that in order	Check and make sure the type of the servo drive unit and motor is in accordance with that in order
Whether the accessories are complete	Check the packing list and make sure that the accessory type and quantity is correct.
Whether the motor shaft can be easily turned by hand	Check and make sure that the motor shaft can be easily turned by hand, except motors with brakes.

If there are any problems, contact directly with the applier or our company.

Warning
<ul style="list-style-type: none"><li>● Do not install servo drive which are damaged or with incomplete parts.</li><li>● The servo drive units must be matched with the compatible servo motor.</li><li>● Do not touch the servo motor shaft directly, which can cause corrosive.</li></ul>

## ***4.2 Installation Environment***

### **4.2.1 Environment Temperature**

The working environment temperature is between 0℃ to 40℃. If the temperature over 40℃, de-rating required.

### **4.2.2 Humidity**

Air relative humidity is equal or less than 90%. No condensation.

### **4.2.3 Altitude**

Servo drive units must be installed below 1000m altitude. If over 1000m altitude, de-rating required.

### **4.2.4 Vibration and Impulsion**

Servo drive is not load bearing and anti-collision. When installing and working, it must be free from oscillation and impact, and take measures to control the oscillation below 0.5G (4.9m/S<sup>2</sup>) .

### **4.2.5 Water**

Servo drive cannot be installed in the water spray or condensation location.

### **4.2.6 Air Pollution**

The servo drive must be free from air pollution. It must be installed in the electric cabinet which is resistant to corrosive and flammable gas, as well as prevent conductive object, mental dust, oil mist and liquid from entering to the interior of the equipment.

## ***4.3 Installation of Servo Drive***

Warning
<ul style="list-style-type: none"><li>● The servo drive must be installed in the electric cabinet with fine protective function.</li><li>● The servo drive must be installed in accordance with the specified direction and interval to ensure enough cooling.</li></ul>



- The servo drive cannot be installed near combustibles that may cause fire hazard.

### **4.3.1 Installation Methods of HSV-180AD-035,050,075**

#### **1.Installation methods**

There are three types of wall installation: directly installed without auxiliary devices, with auxiliary devices, and external heat sink installation. For their installation diagrams, see Figure 4.-1, Figure 4-2, and Figure 4-3. You can use any of the three methods, and install the servo drive vertically.

#### **2.Installation Interval**

For the installation interval of single servo drive, see Figure 4-4 and Figure 4-5.

For the installation interval of multiple servo drives, see Figure 4-6.

During installation, leave enough intervals to ensure good heat emission.

#### **3.Cooling**

In the electric cabinet, there must be air blew through the radiator to prevent the ambient temperature of the servo drive from overheating.

Figure 4-1 Wall installation of HSV-180AD-035, 050, 075 servo drive (without auxiliary devices)

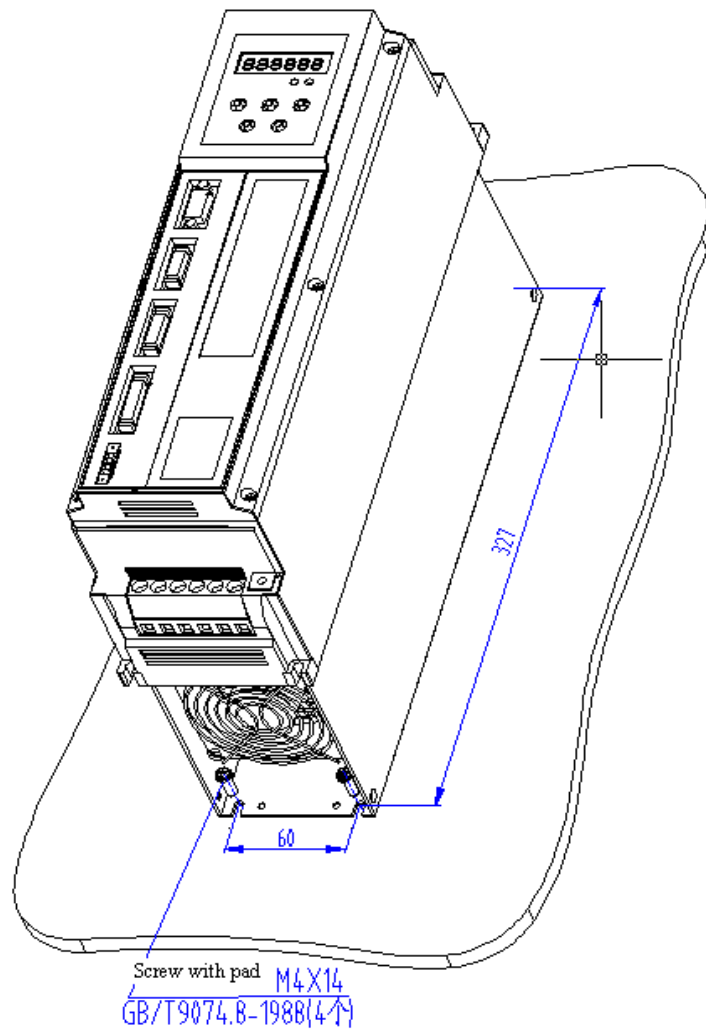


Figure 4-2 Wall installation of HSV-180AD- 035, 050, 075 servo drive (with auxiliary devices)

Figure 4-3 Installation diagram of HSV-180AD- 035, 050, 075 (with external heat sink)

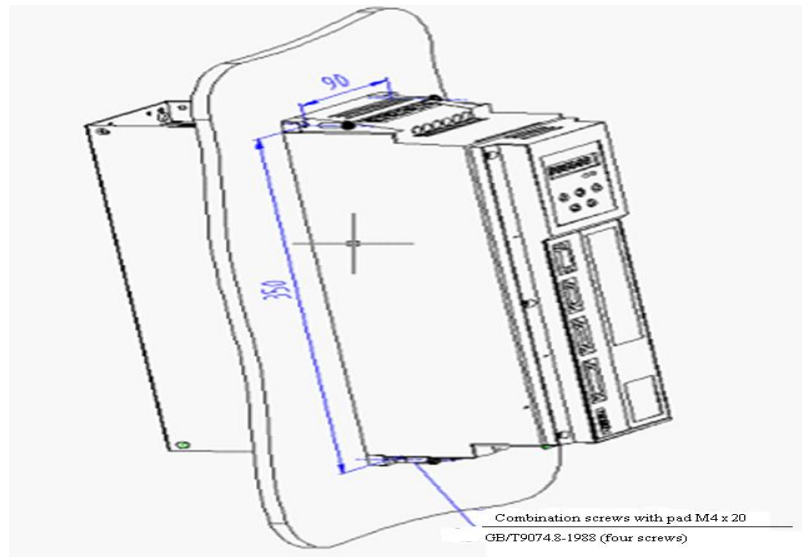


Figure 4-4 Installation interval of HSV-180AD- 035, 050, 075 servo drive  
(Wall installation)

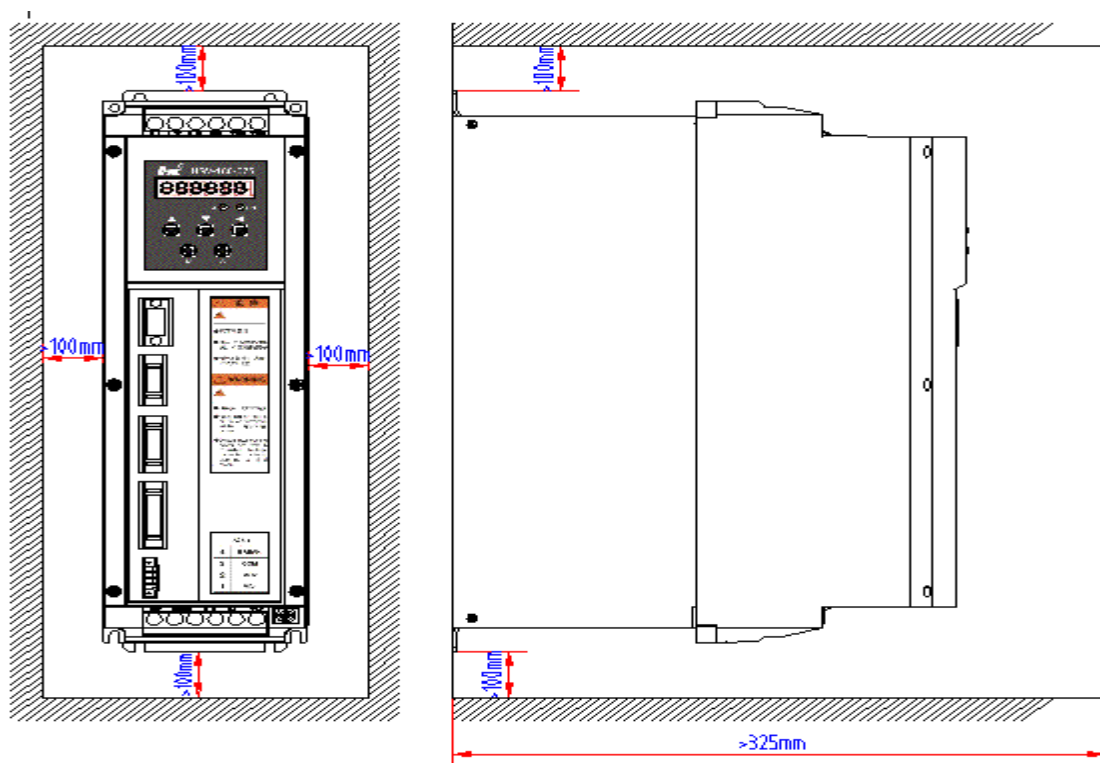


Figure 4-5 Installation interval of HSV-180AD- 035, 050, 075 single servo drive

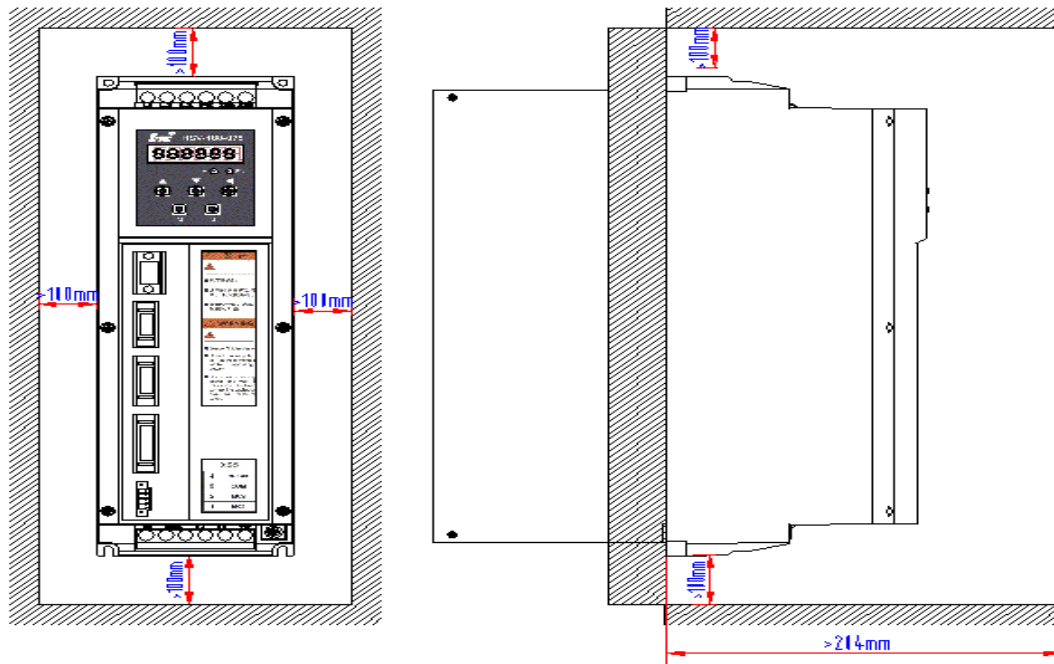
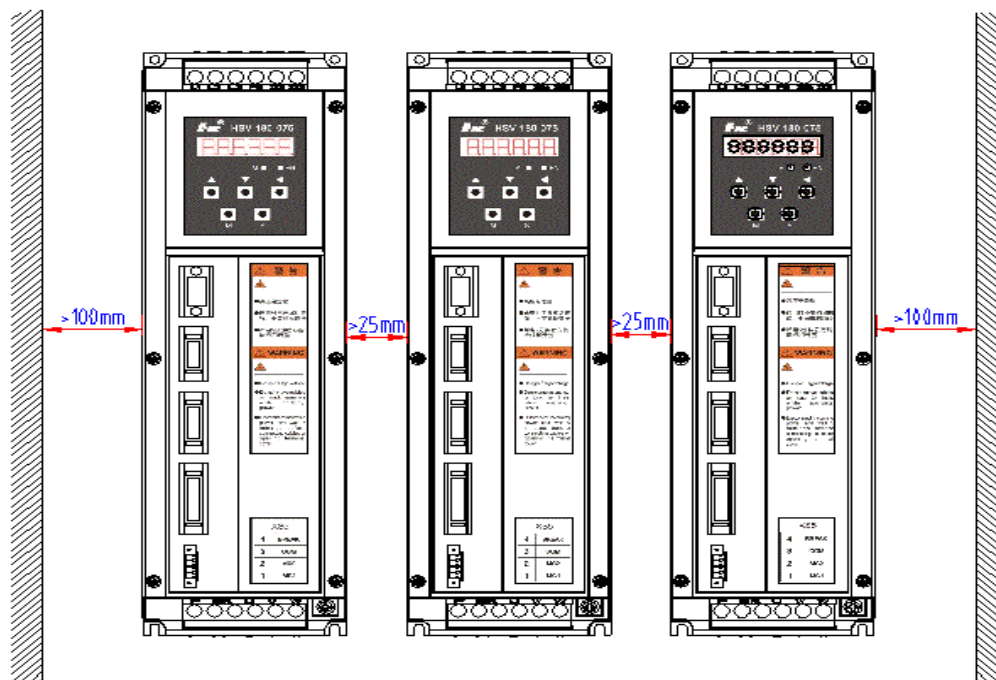


Figure 4-6 Installation intervals of HSV-180AD-035,050,075 multiple servo drives



### 4.3.2 Installation Methods of HSV-180AD-100,150

#### 1. Installation Methods

There are two types of wall installation: directly installed with auxiliary devices, and external heat sink installation. For their installation diagrams, see Figure 4-7, Figure 4-8. You can use any of the three methods, and install the servo drive vertically.

## 2. Installation Interval

For the installation interval of single servo drive, see Figure 4-9 and Figure 4-10

For the installation interval of multiple servo drive, see Figure 4-11

During installation, leave enough intervals as possible to ensure a good heat emission.

## 3. Cooling

In the electric cabinet, there must be air blew through the radiator to prevent the ambient temperature of the servo drive from overheating.

Figure 4-7 Wall installation diagram of HSV-180AD-100,150 servo drive (with auxiliary devices)

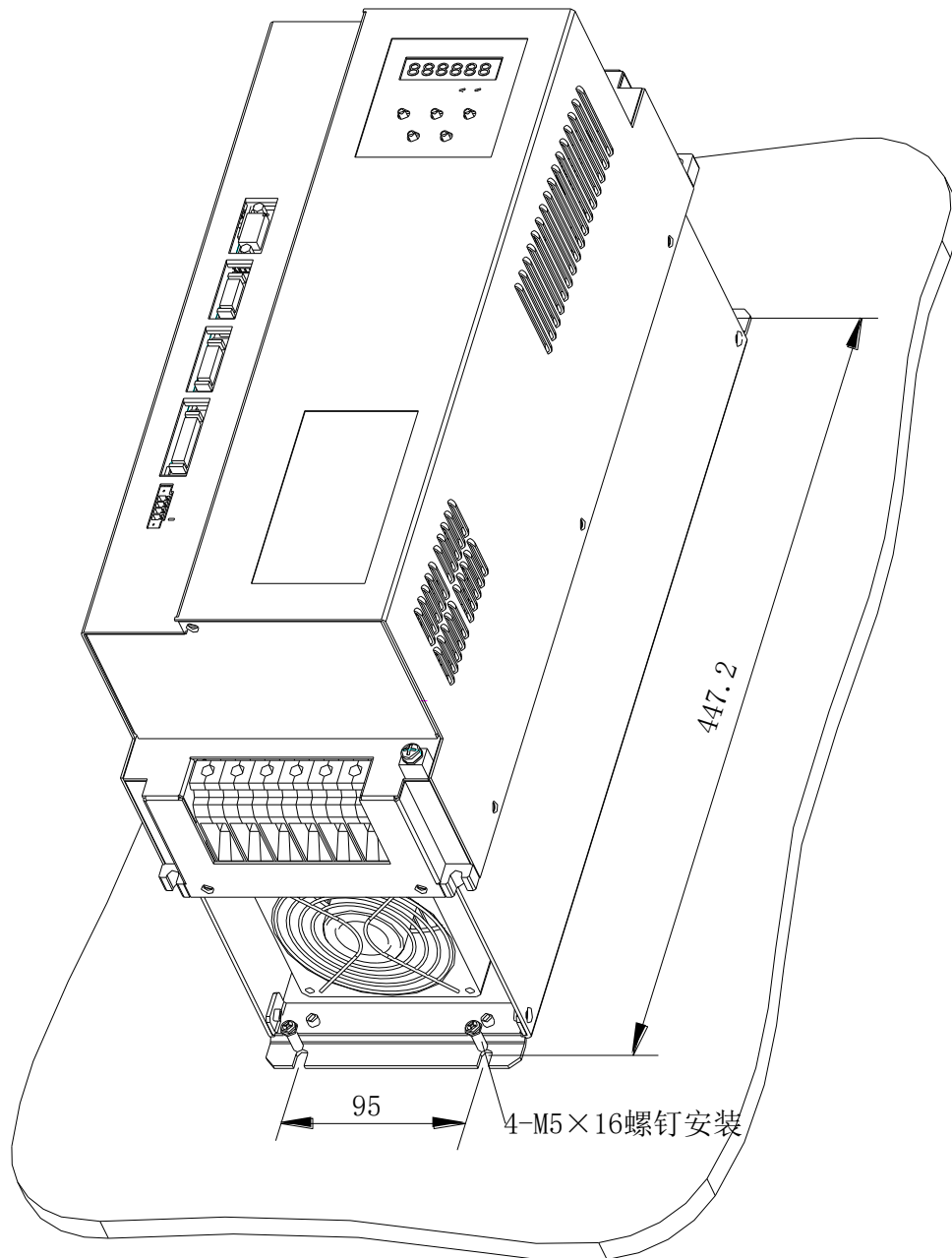
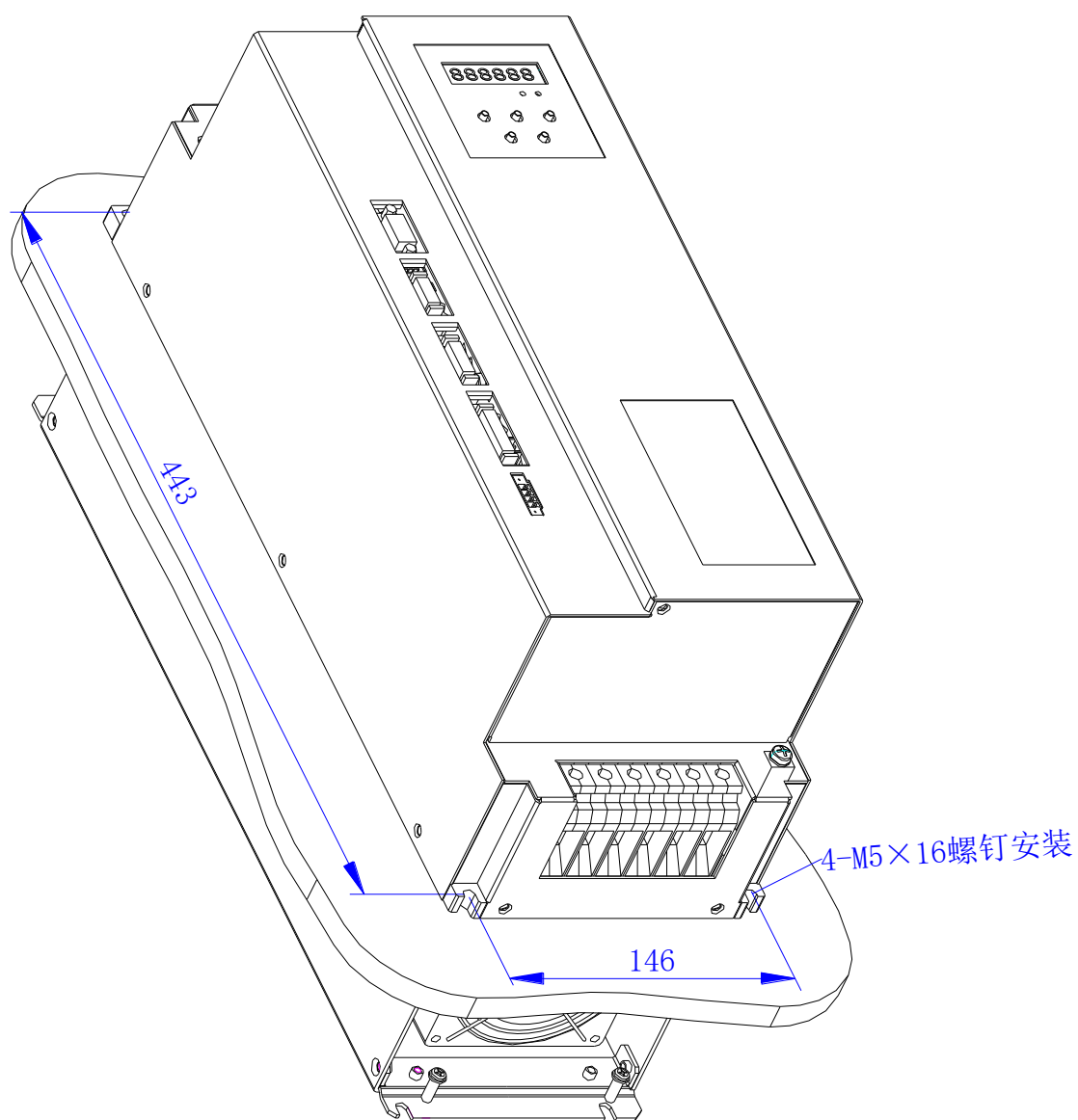


Figure 4-8 Wall installation diagram for external heat sink of HSV-180AD- 100, 150servo drive



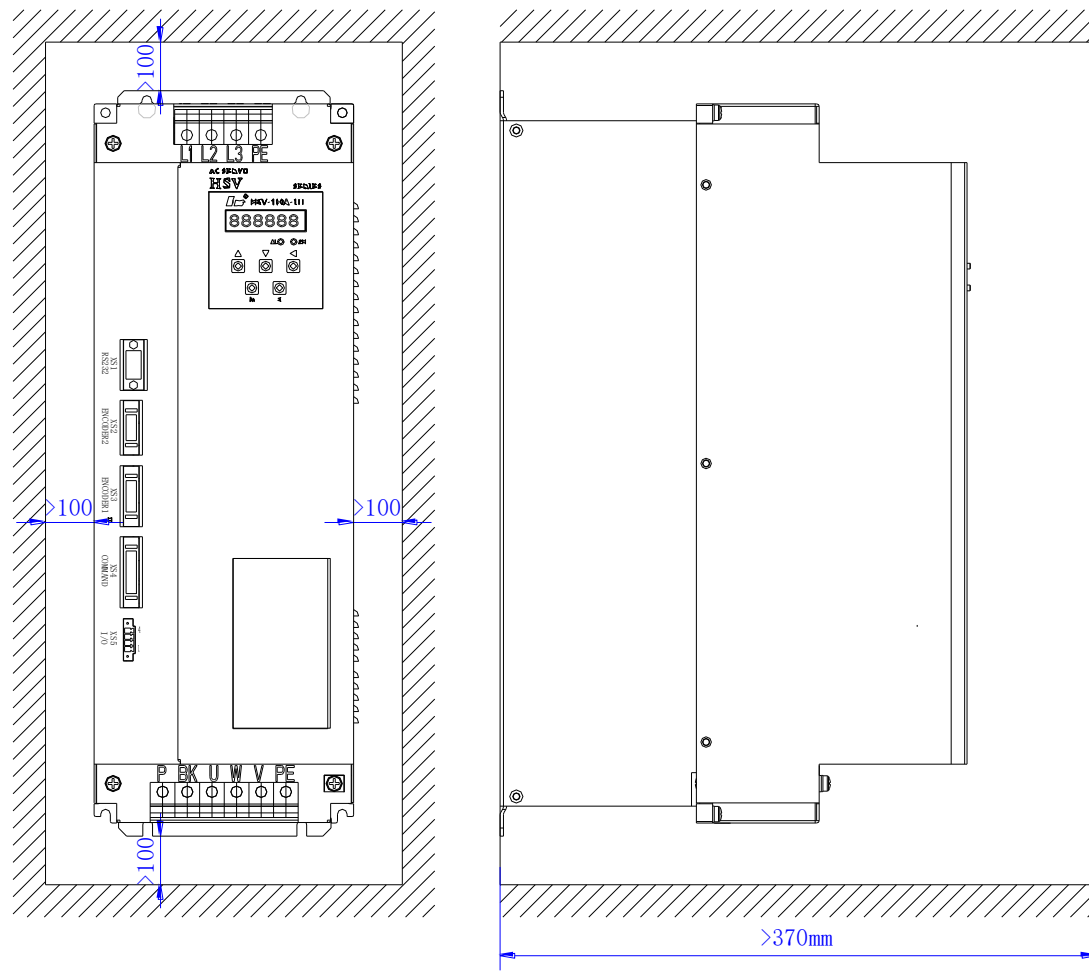


Figure 4-10 Installation interval of HSV-180AD- 100,150 single servo drive  
( wall station )



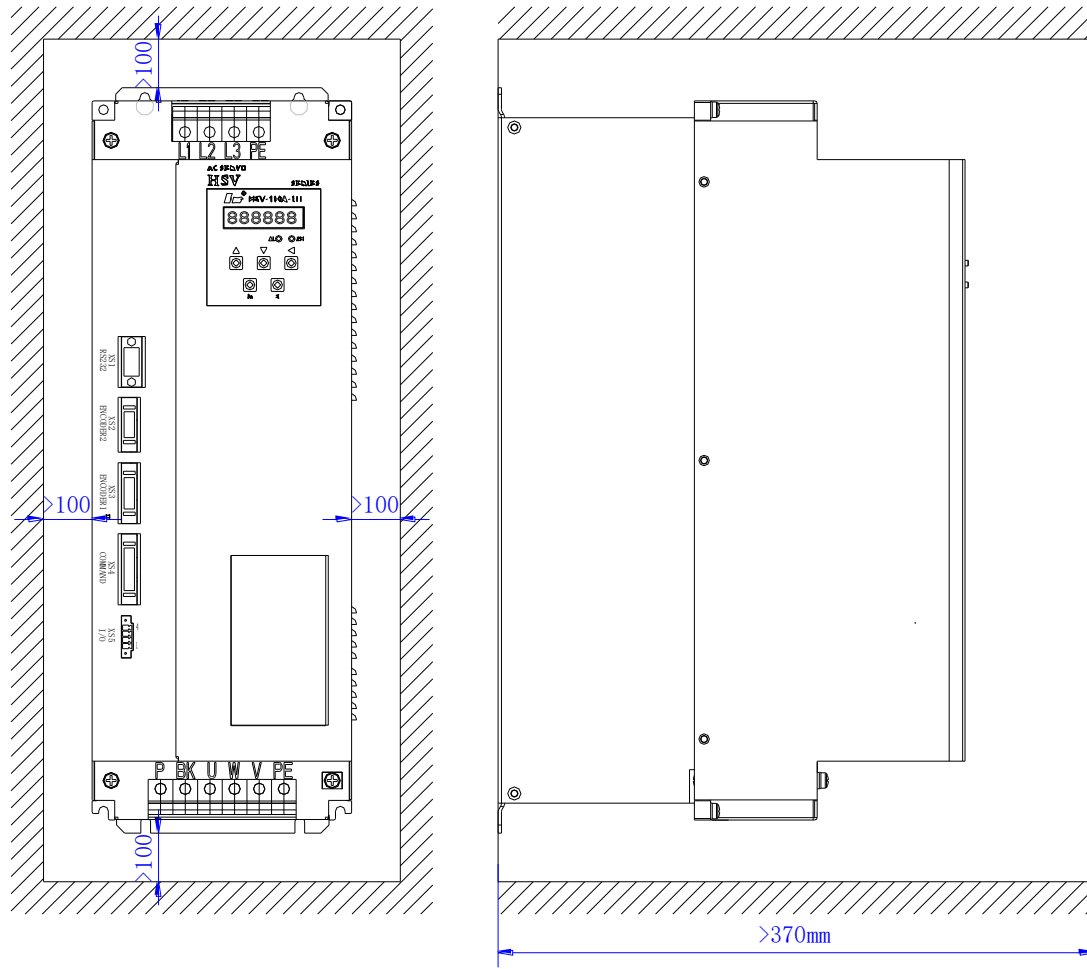


Figure 4-11 Installation interval of HSV-180AD- 100,150 single servo drive

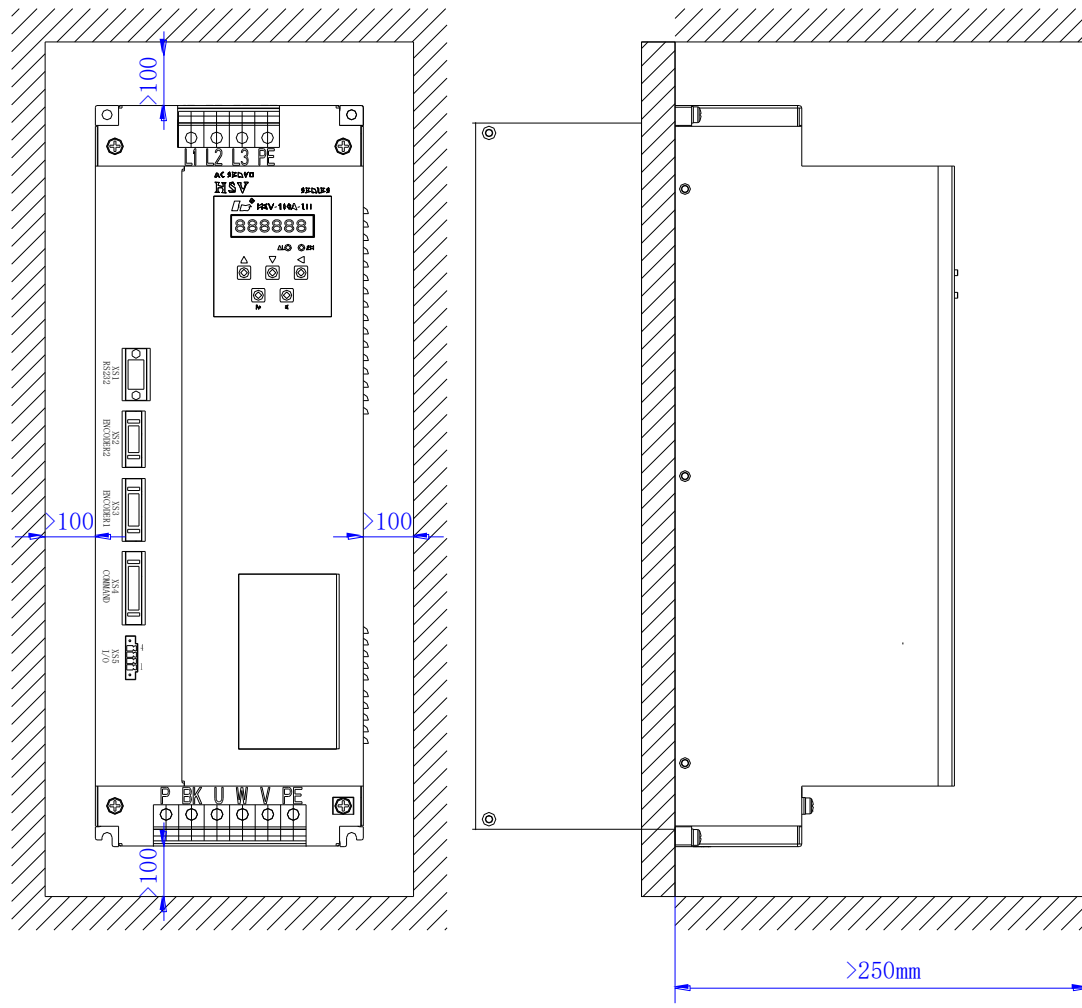
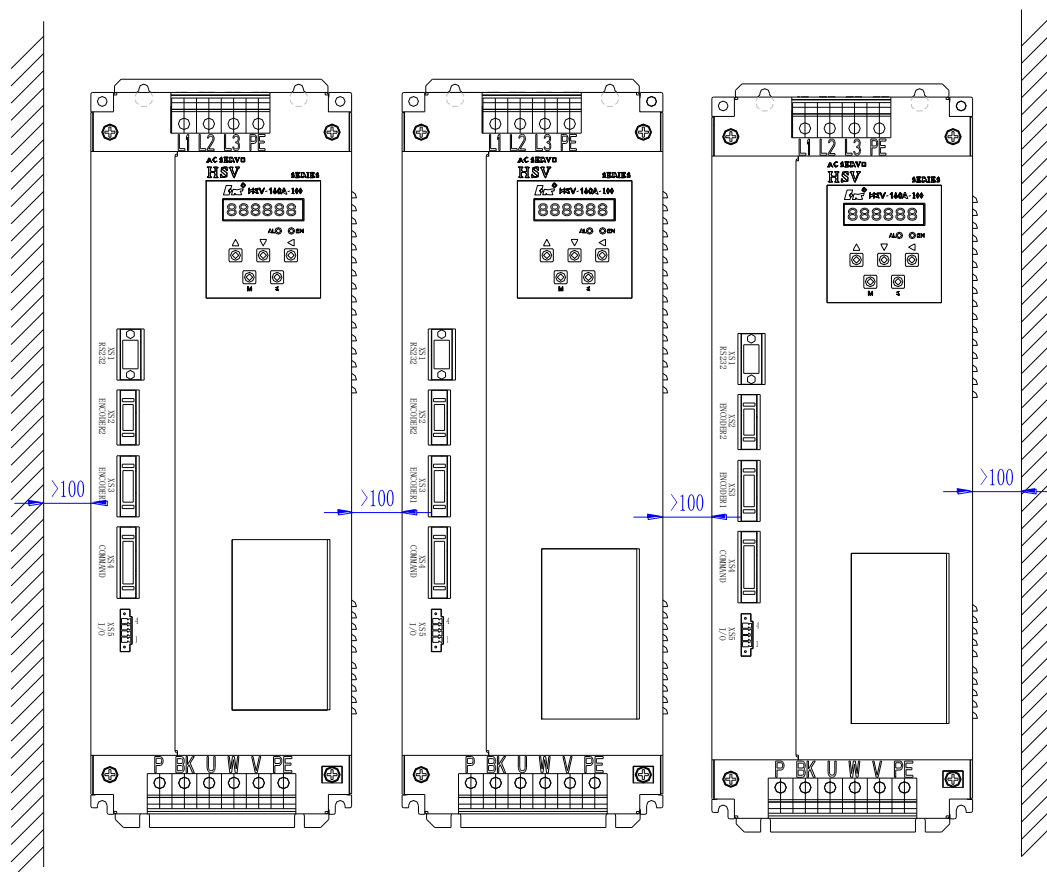


Figure 4-11 Installation interval of HSV-180AD- 100,150 multiple servo drive



### 4.3.3 Installation method of HSV-180AD-200,300,450

#### 1. Installation Methods

There are two types of wall installation: directly installed with auxiliary devices, and external heat sink installation. For their installation diagrams, see Figure 4-12, Figure 4-13. You can use any of the three methods, and install the servo drive vertically.

#### 2. Installation Interval

For the installation interval of single servo drive, see Figure 4-14 and Figure 4-15

For the installation interval of multiple servo drive, see Figure 4-16

During installation, leave enough intervals as possible to ensure a good heat emission.

#### 3. Cooling

In the electric cabinet, there must be air blew through the radiator to prevent the ambient temperature of the servo drive from overheating.

Figure 4-12 Wall installation diagram of HSV-180AD-200,300,450 servo drive (with auxiliary devices)

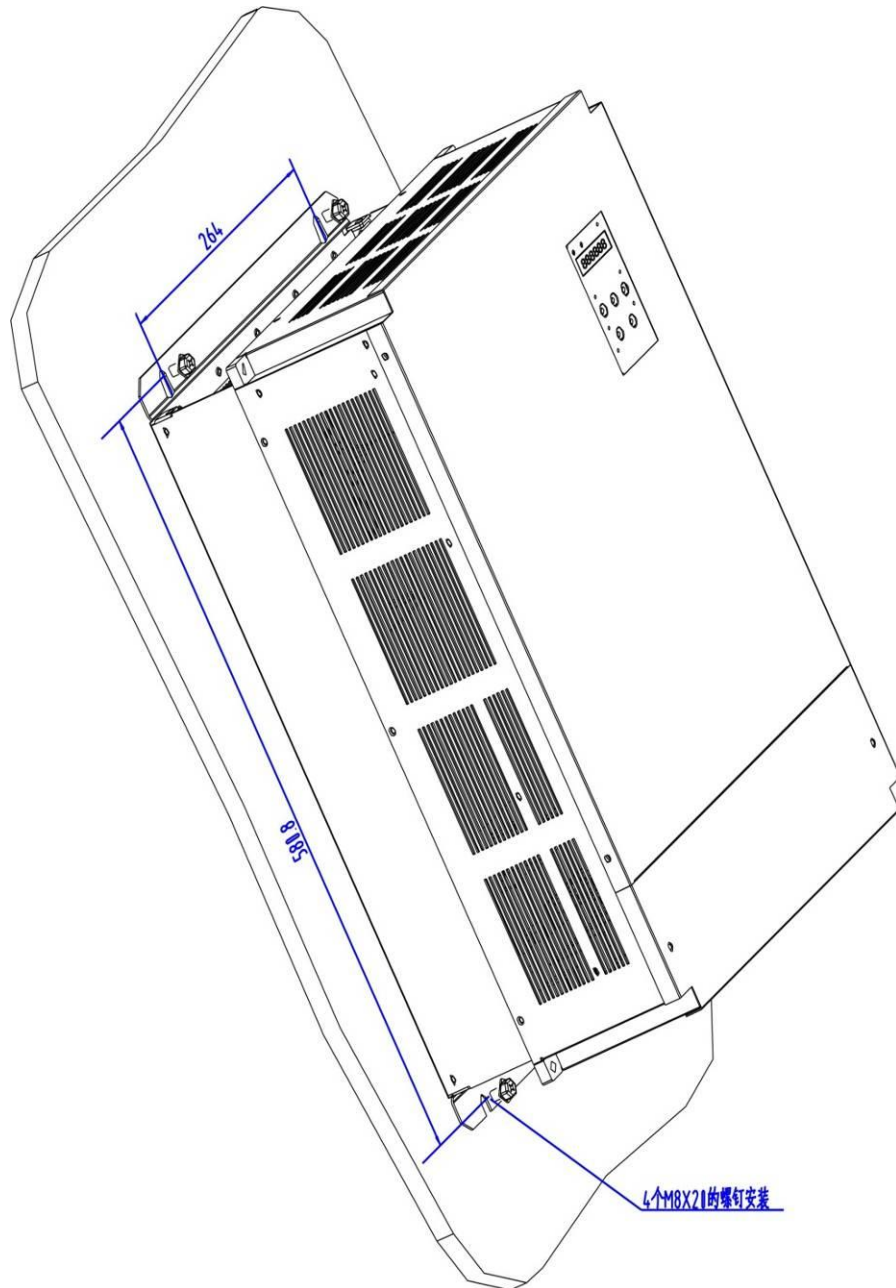


Figure 4-13 Wall installation diagram for external heat sink of HSV-180AD- 200, 300,450 servo drive

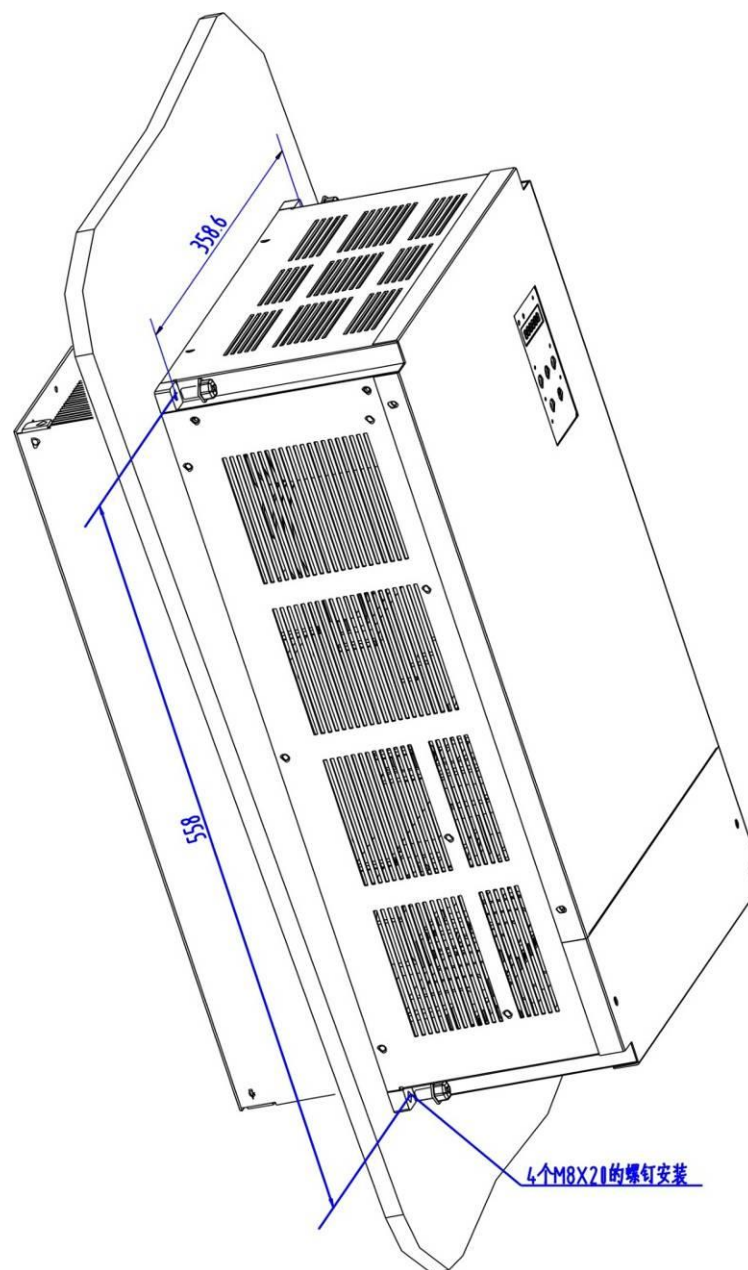


Figure 4-14 Installation interval of HSV-180AD- 200,300, 450 single servo drive  
(wall station)

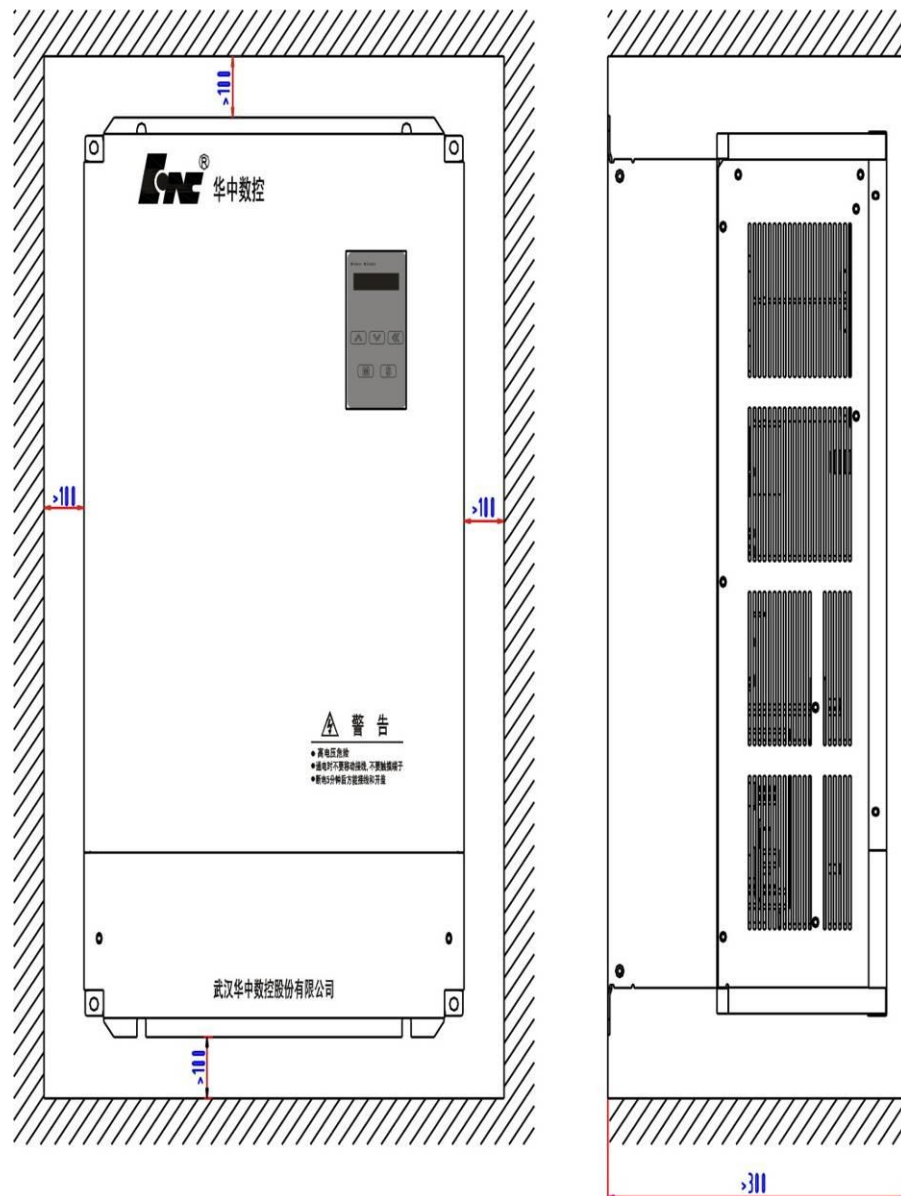


Figure 4-15 Installation interval of HSV-180AD- 200,300,450 single servo drive

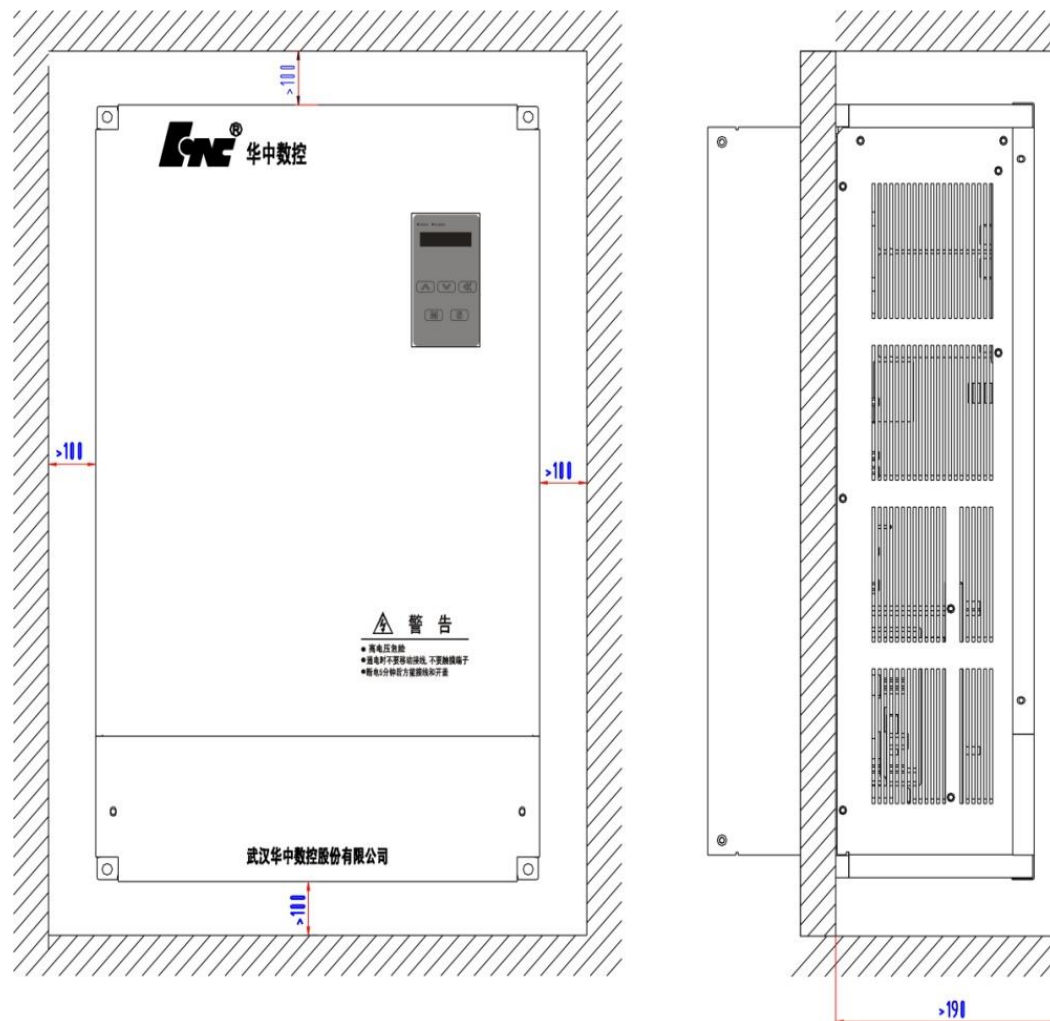
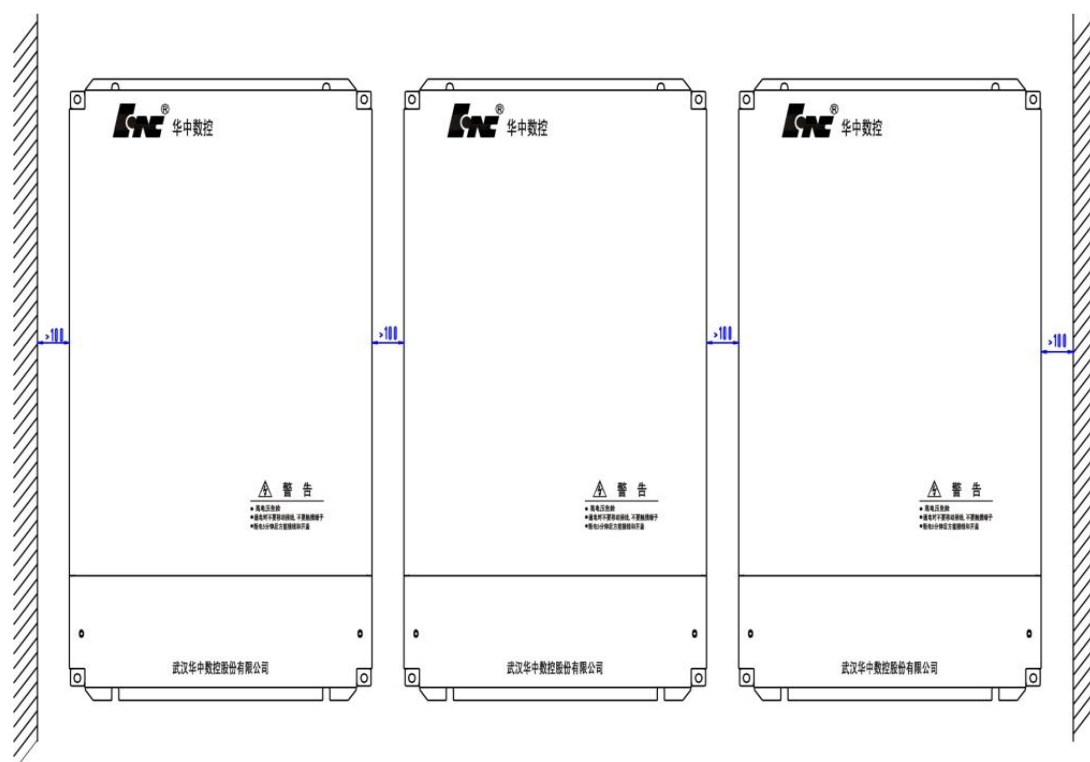


Figure 4-16 Installation interval of HSV-180AD- 200,300,450 multiple servo drive



## 4.4 Installation of Servo Motor

### Warning

- Do not knock the motor or encoder so as to prevent the motor from oscillation or impact.
- When carrying the motor, do not drag the motor shaft, leading-out wire or encoder.
- Do not overload motor shaft, otherwise the motor may be damaged.
- The motor must be firmly installed and prevent loosening.

### 4.4.1 Installation Environment

#### 1. Prevention

The servo motor is not water-proof. When installing and operating, the motor must be guard against liquid spilling and prevent oil mist from entering the motor through motor leads and motor shaft. If users need water-proof motor, make it clear when ordering.

#### 2. Temperature and Humidity

The environmental temperature must be between 0 degree Celsius and 40 degree Celsius. Humidity cannot greater than 90% RH and there is no condensation.

After long-time operation, the motor will heat up. It is recommended that you use forced cooling or use derating motors if there is less space or the motor is closed to heating equipments

#### 3. Oscillation

The motor must be free from oscillation, and take measures to control the oscillation below 0.5 G ( $4.9\text{m/S}^2$ ) .

### 4.4.2 Installation Method

#### 1. Installation Method

The GK6 series can be installed vertically and horizontally.



## 2. Installation Notes

- During installing and removing pulley, do not knock the motor or motor shaft to prevent damaging the encoder. Use the spiral drawing tools to install and remove the thermal expansion expansion-type coupling.
- Series GK6 servo motors cannot withstand large axial load or radial load. It is recommended that you use flexible couplings to connect it with the load.
- When fixing the motor, use spring washer to tighten the bolts to prevent loosening

## 5 Wiring

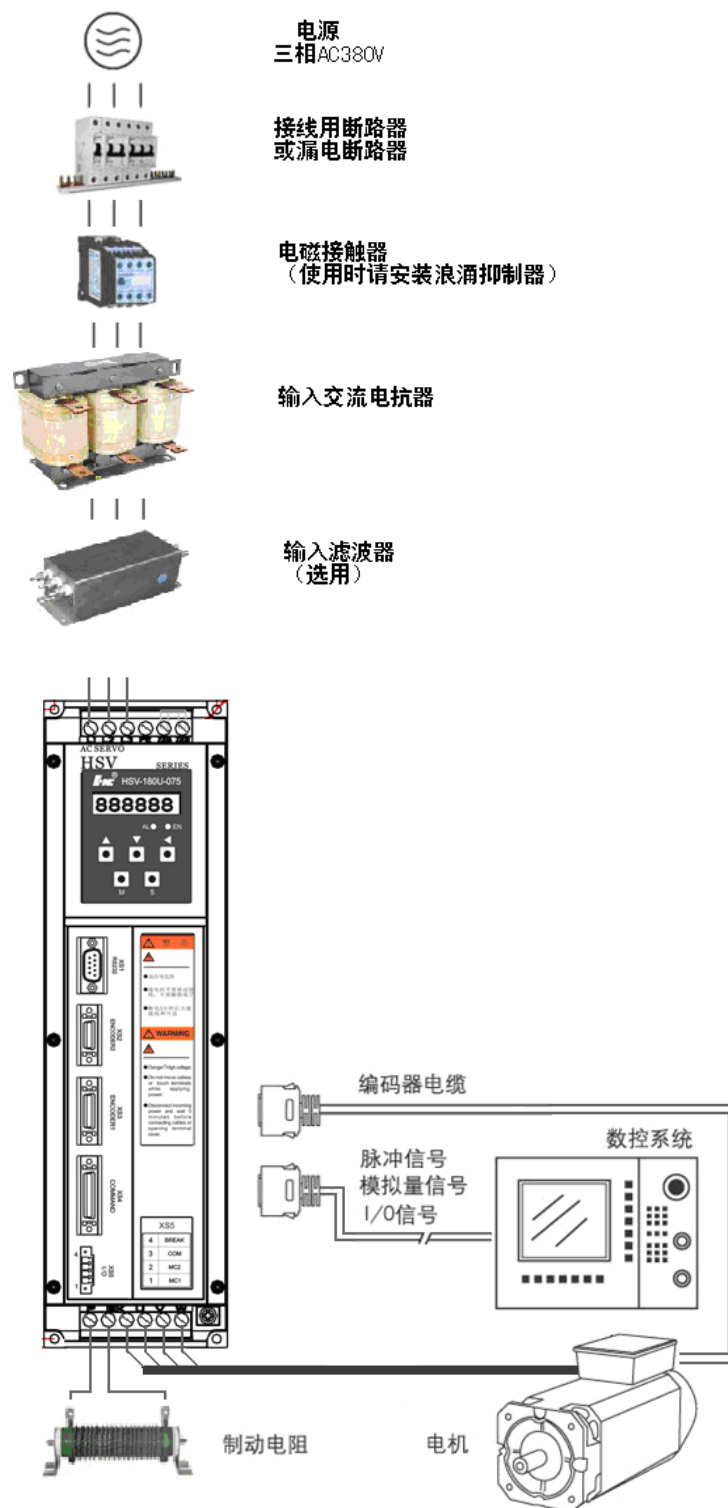
Warning
<ul style="list-style-type: none"><li>● Wiring and wiring inspection personnel must have required capabilities.</li><li>● Wiring and wiring inspection personnel must wait 5 minutes after power off for all wiring or wiring check to prevent from electronic shock.</li></ul>
Caution
<ul style="list-style-type: none"><li>● Must be wiring in accordance with the terminal voltage and the polarity to prevent from equipment damage or personal injury.</li><li>● Servo drive unit and servo motor must be reliably grounded.</li></ul>
<ul style="list-style-type: none"><li>● Do not directly hammer at the motor shaft when connect or disconnect its mechanic part to protect encoder from being damaged.</li><li>● Try to align the motor shaft to the optimum level to prevent from oscillation or bearing damage.</li></ul>






### 5.1 connectors

Figure 5-1 shows the interface configuration of HSV-180AD



## 5.2 Terminal Configuration

Figure 5-2 shows the interface configuration of HSV-180AD. In the figure, XT1 and XT2 are the terminal blocks; XS1 is a DB9 socket; XS2, XS3, and XS4 are high-density sockets; XS5 is a wiring terminal.

Figure 5-2 Interface configuration of HSV-180AD





## 5.3 Terminal Configuration

### 5.3.1 Terminals of HSV-180AD-035, 050, 075, 100, 150

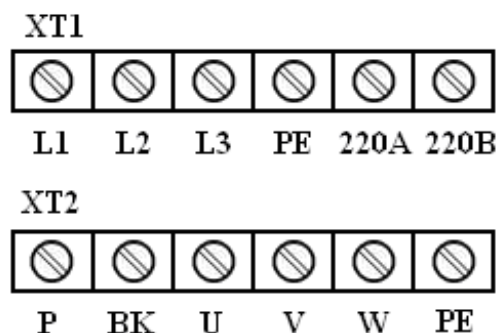


Figure 5-3 Soldering terminal of HSV-180AD-035,050,075

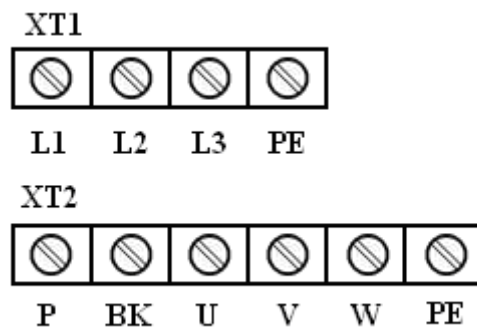


Figure 5-4 Soldering terminal of HSV-180AD-100,150

Gram5.1 XT1 power input terminal of HSV-180AD-035, 050, 075

XT1 power input terminal of HSV-180AD-035, 050, 075			
NO.	Terminal Symbol	Signal	Function
1	220B		Reserved
2	220A		
3	PE	Ground terminal	Ground terminal, and the ground resistance is less than 4Ω
4	L3	Three-phase main circuit power input terminal	Main circuit power supply input terminal  Three phase AC380V/ 50Hz <b>Note:</b>
5	L2		
6	L1		


			Do not connect to the output terminal U, V, W.
--	--	--	---

**Gram5.2 XT1 power input terminal of HSV-180AD-100, 150**

XT1 power input terminal of HSV-180AD-100, 150			
NO.	Terminal Symbol	Signal	Function
1	PE	Ground terminal	Ground terminal, and the ground resistance is less than 4Ω
2	L3	Three-phase main circuit power input terminal	Main circuit power supply input terminal
3	L2		Three phase AC380V/ 50Hz
4	L1		<b>Note:</b> Do not connect to the output terminal U, V, W.

**Gram 5.3 Heavy Current Output Terminal of HSV-180AD-035,050,075,100,150**

HSV-180AD-035, 050, 075,100,150 XT2 heavy current output terminal			
NO.	Terminal Symbol	Signal	Function
1	P	Connection terminal for external	<ul style="list-style-type: none"> <li>● Build-in 70Ω/500W braking resistors.</li> <li>● If only use the braking resistor, the</li> </ul>

2	BK	braking resistor	<p>terminal P and BK must be disconnected to avoid short-circuit.</p> <ul style="list-style-type: none"> <li>If an external braking resistor is used, terminal P and BK must be connected to an external braking resistor.</li> </ul> <p><b>Note:</b> Terminal P and BK cannot be shorted. Otherwise, the servo drive may be damaged.</p>
3	U	Three-phase output terminal of the servo drive	It must be linked to the motor U, V, and W terminals correspondingly.
4	V		
5	W		
6	PE	Ground terminal	<p>Ground terminal</p> <p>Ground resistance is less than 4Ω</p>
		Ground terminal	<p>Ground terminal</p> <p>Ground resistance is less than 4Ω</p> <p>Servo drive housing ground terminal</p>

### 5.3.2 Terminal Configuration HSV-180AD-200,300,450

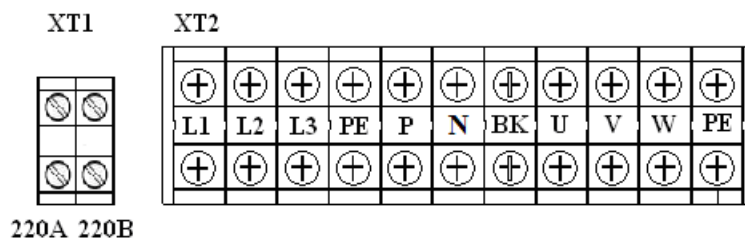


Figure 5-5 Soldering terminal of HSV-180AD-200,300,450

Gram5.4 XT1 power input terminal of HSV-180AD-200,300,450


XT1 power input terminal of HSV-180AD-035, 050, 075



NO.	Terminal Symbol	Signal	Function
1	220A	single-phase input terminal of control power	single-phase input terminal of main circuit power AC220V/50Hz Main circuit power supply input terminal Three phase AC380V/ 50Hz
2	220B		

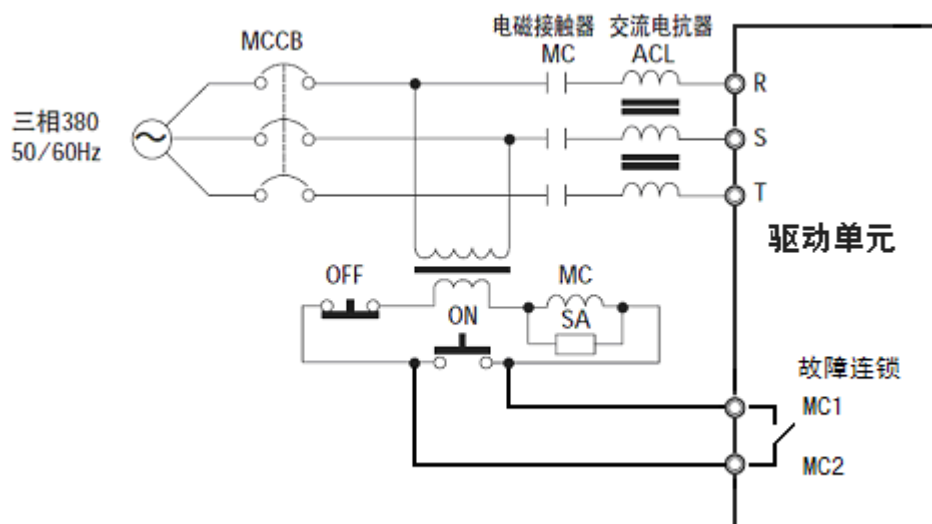
**Gram 5.5 XT2 Heavy Current Output Terminal of HSV-180AD-200,300,450**

HSV-180AD-200,300,450 XT2 heavy current input/output terminal			
NO.	Terminal Symbol	Signal	Function
1	L3	Three-phase main circuit power input terminal	Main circuit power supply input terminal Three phase AC380V/ 50Hz <b>Note:</b> Do not connect to the output terminal U, V, W.
2	L2		
3	L1		
4	PE	Ground terminal	Ground terminal Ground resistance is less than 4Ω
5	P	Positive Of generator	Terminal P and BK is used to DC current input or an external braking resistor. <b>Note:</b> Terminal P and BK cannot be shorted. Otherwise, the servo drive may be damaged.
6	N	Negative of	Terminal P and BK is used to DC

		generator	current input <b>Note:</b> Terminal P and BK cannot be shorted. Otherwise, the servo drive may be damaged.
7	BK	Connection terminal for external braking resistor	There is no build-in braking resistors, must use an external braking resistor, terminal P and BK must be connected to an external braking resistor. <b>Note:</b> Terminal P and BK cannot be shorted. Otherwise, the servo drive may be damaged.
8	U	Three-phase output terminal of the servo drive	It must be linked to the motor U, V, and W terminals correspondingly.
	V		
	W		
9	PE	Ground terminal	Ground terminal Ground resistance is less than $4\Omega$
10		Ground terminal	Ground terminal Ground resistance is less than $4\Omega$ Servo drive housing ground terminal

### 5.3.3 Side wiring of main circuit input

Figure 5-6 Soldering terminal of main circuit input



### 1、Circuit Breaker (MCCB)

- Circuit breaker must be connected between the three-phase AC power supply and power input terminals L1, L2, L3 on XT1 so as to cut off the power when the servo drive motor is over circuited or short circuited.
- MCCB capacity is generally 1.5 to 2 times of the rated motor current, refer to Table 3.1
- MCCB's time characteristics should considerate the drive unit (motor rated current 1.5 to 2 times, 1 min) and time characteristics.
- Each drive unit must be corresponding to a MCCB; when multiple drive unit share a MCCB, In order to cut off the power supply and prevent the failure expanding, suggest using the failure chain output relay of drive unit to control the line magnetic contactor to ensure safety。

### 2、leakage circuit breaker

- When choosing a specific leakage circuit breaker, please select Operating current of drive unit above 30mA.
- When choosing a general leakage circuit breaker, please select Operating current of drive unit above 200mA,time is above 0.1S。
- Installing isolation transformer between a general leakage circuit breaker and drive unit could effectively avoid the breaker malfunction

### 3、Line electromagnetic contactor

- Line electromagnetic contactor capacity is generally 1.5 to 2 times the rated motor current selection, please refer to Table 3.1
- Frequently using open / closed magnetic contactor will cause heating of the soft-start resistance, and even burning.
- Interval time of open / closed magnetic contactor should be more than 10 minutes

#### 4、 Surge Suppressors

In order to eliminate arc and damage, extend the life of the contactor connect a three-phase AC interrupter serve on output main contact of electromagnetic contactor

#### 5、 Input AC reactor

In order to protect the rectifier components from damage caused by the high-current's impacting to the input power circuit, the power input side need to connect to an input AC reactor and increase its power factor. It can effectively eliminate the influence of high harmonics, prevent other equipment from damage caused by the voltage wave changes, and eliminate the unbalanced input current caused by phase voltage unbalanced.

- Input AC reactor capacity is generally 1.5 to 2 times of the rated motor current, please refer to the Table 3.1.

#### 6、 Input filter

In order to reduce a high-frequency interference noise from source line coupling to drive unit, suggest install matching input filter on the current input of drive unit

- Input filter capacity is generally 1.5 to 2 times the rated motor current selection, please refer to Table 3.1.
- Please select the dedicated servo (inverter) input filter 。
- Input filter should be well grounded

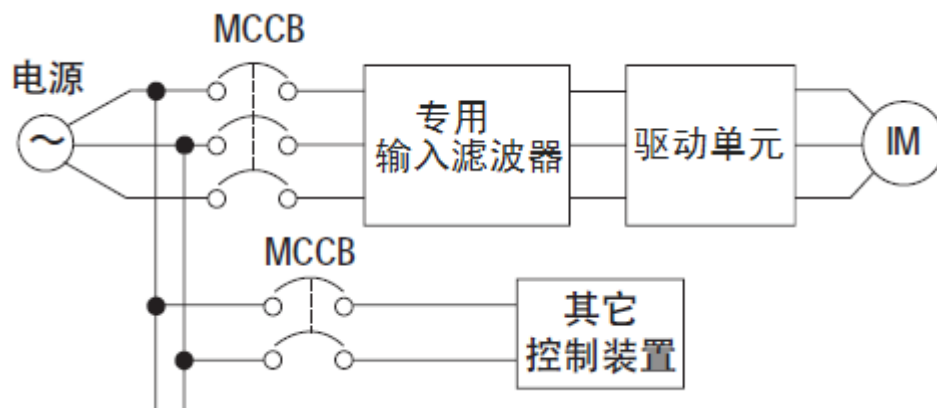


Figure 5-7 Input filter on the current input of drive unit

### 5.3.4 Control power wiring

HSV-180AD-200, 300, 450 drive unit must connect AC220V control power, during power-on process, you should connect AC220V control power firstly and then connect the AC380V strong electric power.

### 5.3.5 Output side wiring of main circuit

#### 1、motor connection

Output terminals U、V、W of drive unit should connected to terminals U、V、W of the three-phase AC motor according to the correct phase

- If A30 motor phase sequence error alarm appears at the first running,
- prompt users motor terminal phase sequence error will be wrong, you just need to exchange V,W
- Distance between drive unit and motor wiring should generally be less than 40 m

#### 2、External Braking Resistor

The braking voltage of HSV-180ADservo drive is DC700 V. For the maximum braking current, see Table 3.1.

(1)A 70  $\Omega$ /500 W braking resistor has been built in HSV-180AD-035, 050, 075 and a maximum of five times overload is allowed (continuing for one second). An external braking resistor is required when the drive unit's load or inertia is big. The braking time is shorter when the load or inertia is bigger, and the resistance value is smaller and its power is bigger. However, the maximum braking current cannot exceed the drive's maximum braking current. Generally, the total braking power of the braking resistor is 10% to 20% of the rated motor power.

Connect **P** and **BK** terminals of the servo drive with the external braking resistor if an external braking resistor is used. In this case, the internal resistor and the

external resistor are serial connected. Table 5.8 shows the recommended external braking resistor.

(2) There is no braking resistor built in HSV-180AD-100, 150, 200, 250, 300, 450, you have to connect to external braking resistor. The braking time is shorter when the load or inertia is bigger, and the resistance value is smaller and its power is bigger. However, the maximum braking current cannot exceed the drive's maximum braking current. Generally, the total braking power of the braking resistor is 10% to 20% of the rated motor power.

Connect P and BK terminals of the servo drive with the external braking resistor if an external braking resistor is used. In this case, the internal resistor and the external resistor are serial connected. Table 5.8 shows the recommended external braking resistor.

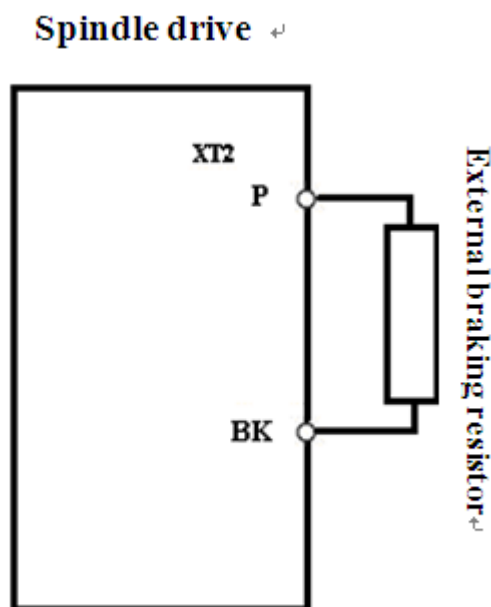


Figure 5-8 single external braking resistor standard wiring

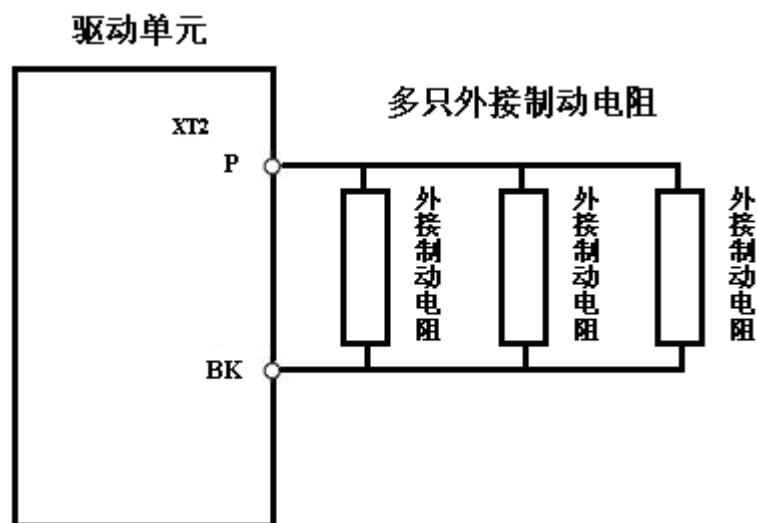



Figure 5-9 multiple external braking resistor standard wiring

### 3、Ground connection

- Ground terminal or PE 或  be sure to ground。
- Ground resistance is less than 4Ω
- Ground wire of drive unit can't use with welder and other power equipment at the same time.

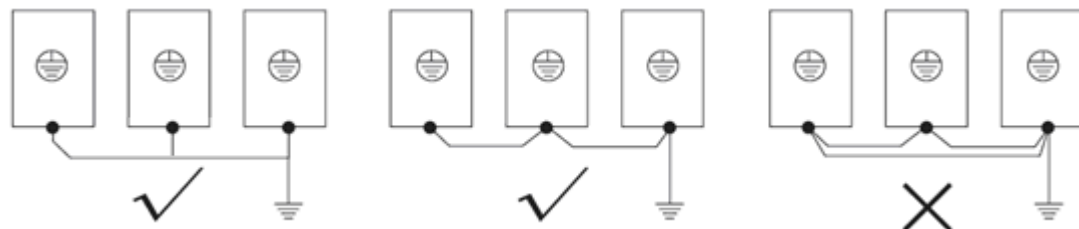


Figure 5.10 Ground connection

## 5.4 connection of control signal terminals

### 5.4.1 XS4 COMMAND input/ output terminals

Figure 5-11 XS4 command input/output interface

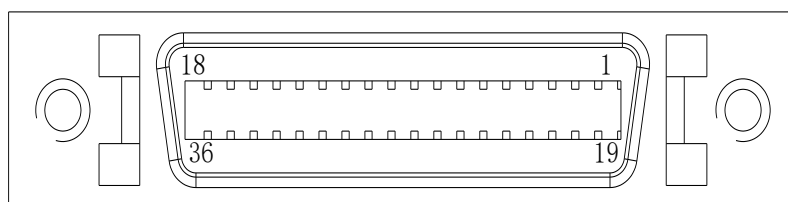


Figure 5-12 Plug of XS4 command input/output interface plug (looking from the plug)

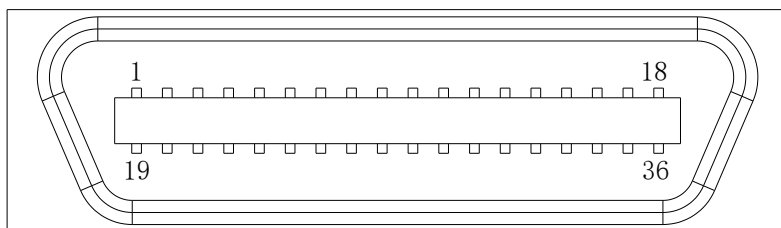
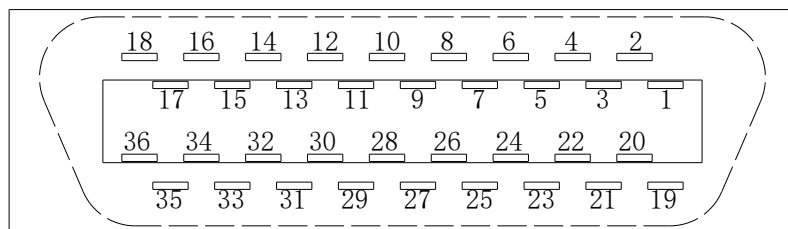


Figure 5-13 Soldering terminal of XS4 command input/output interface (looking from the soldering terminal)



#### 5.4.1.2 XS4 COMMAND Input/output Interface

Type	Terminal	Terminal Symbol	Function	Signal
Command pulse input	14	CP+	Input terminal for external command pulse Note: You can set the pulse input mode by setting the movement parameter <b>PA--22</b> . Command pulse + characters CCW/CW command pulse mode 2-phase command pulse mode	Line drive receiving RS422 standard
	15	CP-		
	16	DIR+		
	17	DIR-		
Servo motor optic-electrical encoder	32	A+	Encoder A output	line drive output RS422 standard
	33	A-		
	18	B+	Encoder B output	
	36	B-		
	35	Z+	Encoder Z output	
	34	Z-		
	21,22	Z_OUT	Z-phase pulse output	PNP output 100mA
	31	ZPLS_OUT	Z-phase pulse output	NPN output 100mA
	23,24	GNDDM	Digital signal ground	0V



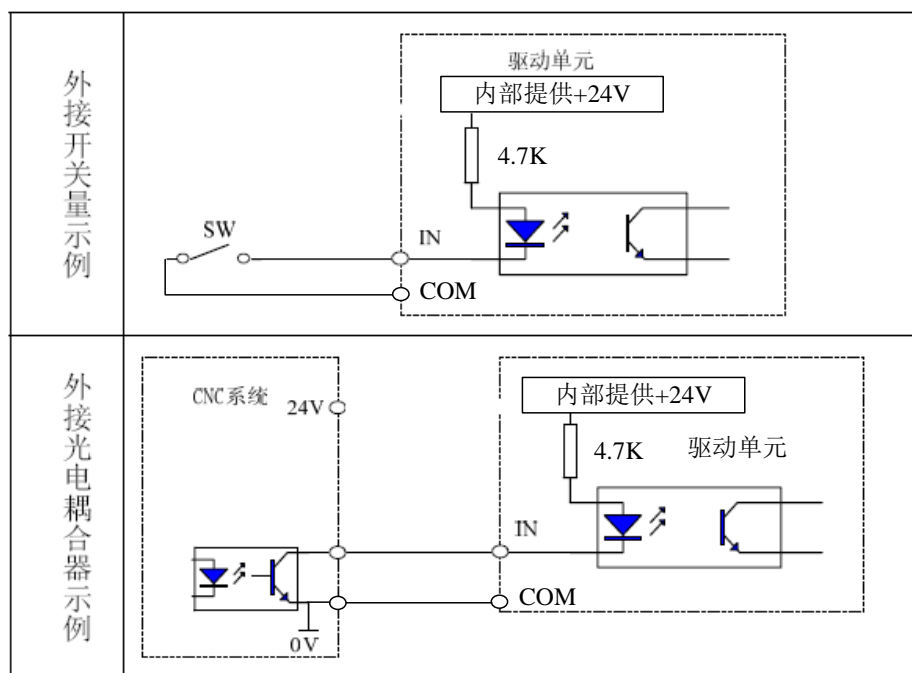
Analog output terminal	12	AN+	Analog output terminal	DC -10~+10V or 0~+10V
	13	AN-	Reference terminal for analog input	
	27,28	GNDAM	Analog signal ground	0V
SW input signal	1	EN	Servo enable input terminal <b>EN ON:</b> Enable the servo drive <b>EN OFF:</b> The servo drive stops working, and the motor is idle.	0V common point 0V input effective
	2	A_CL	Alarm clear input terminal <b>ACL ON:</b> Clear system alarm <b>ACL OFF:</b> Keep system alarm	
	3	CLEE	Position error counter clearance input terminal <b>CLEE ON:</b> In the position control mode, clear the position error counter.	
	4	INH	Command pulse prohibition Command pulse prohibition input terminal	
	5	L-CCW	CCW drive prohibition input terminal <b>OFF:</b> CCW drive is allowed. <b>ON:</b> CCW drive is not prohibited. cancelled。	
	6	L-CW	L-CW drive prohibition input terminal <b>OFF:</b> indicates that CW drive is allowed. <b>ON:</b> indicates that CW drive is prohibited.	
	25	PIN.7	Reserve	
	26	PIN.8	Reserve	
SW output signal	7 GET	Position finished	Position finished output terminal	NPN output 100

		output	When the position error is in the preset range, the signal is connected.	mA
		Speed reached output	Speed reached output terminal When the speed reaches or exceeds the preset speed, the signal is connected.	
	8	READY	Servo ready output terminal <b>ON:</b> indicates proper power supply, and no drive alarm. The signal is connected. <b>OFF:</b> indicates the main power is not switched on or a servo drive alarm is reported. The signal is disconnected.	
	9	ALM	Servo alarm output terminal <b>ALM ON:</b> indicates a servo drive alarm is reported. The signal is connected. <b>ALM OFF:</b> indicates no servo drive alarm. The signal is disconnected.	
	29	POU.5	Reserve	
	30	POU.6	Reserve	
	19,20	COM		

#### 5.4.1.3 XS4 COMMAND Input / Output Interface

##### 1、Switch-value Input Interface

Figure 5-14 Switch-value input interfaces of HSV-180AD



Note:

- Two common wiring example, IN means input point: (EN, ALM\_RST, FWD, REW, INC\_Sel1, INC\_Sel2, Mode\_SW, ORN)
- The COM signal of the XS4 command input/output interface must be connected to the power ground of the external DC24V power supply. Otherwise, the servo drive may work improperly.
- The Darlington transistor is served as the output transistor which needs to be connected to a relay or an optical coupler. The external power supply is provided by users. Make sure that the polarity is not reversed. Otherwise, it may damage the servo drive.
- XS4 command input / output interface of the COM signal must be connected with the ground signal of external DC24V, otherwise drive unit cannot work properly.

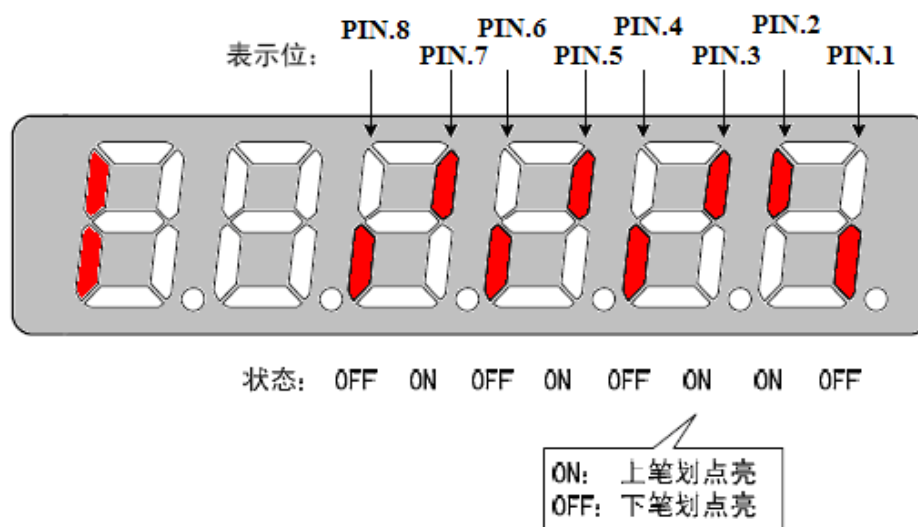


Figure 5-15 Status of switch output signal

## 2、Switch-value Output Interface

1.Two common wiring example, OUT means out point: (ZSP, READY, ALM, GET, ORN\_FIN)。

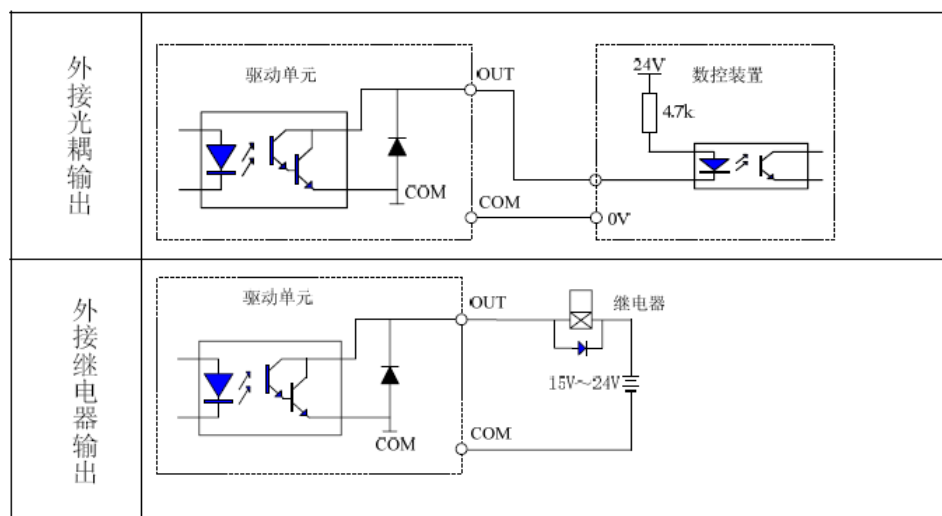
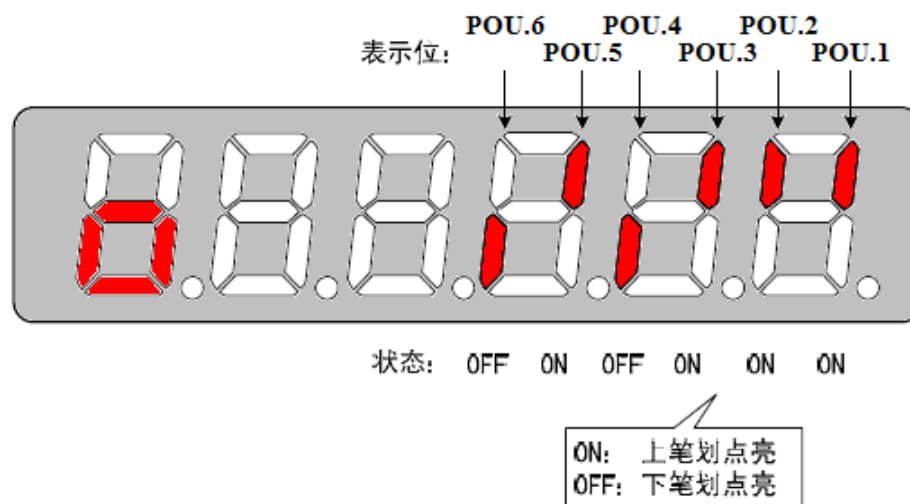


Figure 5-16 Connections of switch output signal

2.Input mode: NPN. The input switch-value state is determined by the servo drive. When the input of isolation optical coupler is conducted, the input switch -value state is **ON**. When the input of isolation optical coupler is turned off, the input switch-value state is **OFF**



3.It provides open-collector output, with a maximum of 100 mA current and 25 V external power supply voltage. Therefore, the load of the switch-value output signal must meet the requirements. If the value exceeds the maximum value or the output terminal is directly connected to the power supply, it may damage the servo drive.

4.If the load is an inductance load such as relay, it must be anti-parallel with the freewheeling diode (FWD) at both ends. The FWD cannot be reversed. Otherwise, it may damage the servo drive.

5. The output transistor is Darlington Transistor. When it is conducted, the voltage drop between the collector and the emitter ( $V_{ce}$ ) is about 1V, which cannot meet the requirement of the TTL low level. So it cannot be directly connected to the TTL.

### 3、Z-phase Pulse Open Collector Output Interface

(1) Incremental photoelectric encoder Z signal send to the CNC system by open collector, meanwhile providing two types of output :Z\_OUT(PNP)and ZPLS\_OUT (NPN)

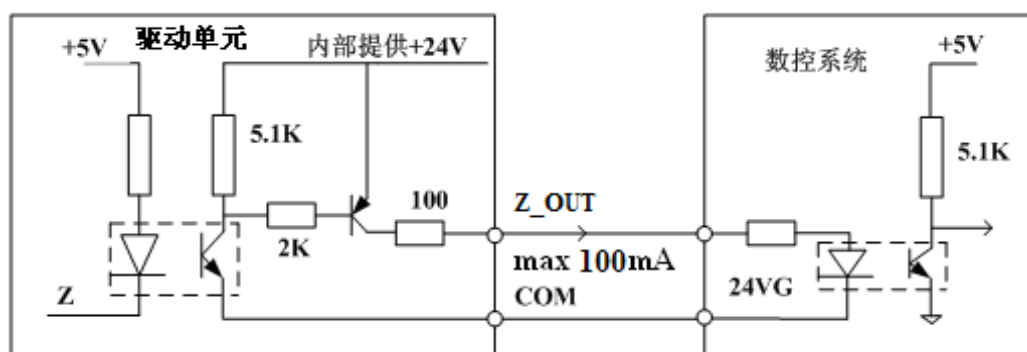


Figure 5-18 Z-phase pulse open-collector output interface (PNP)

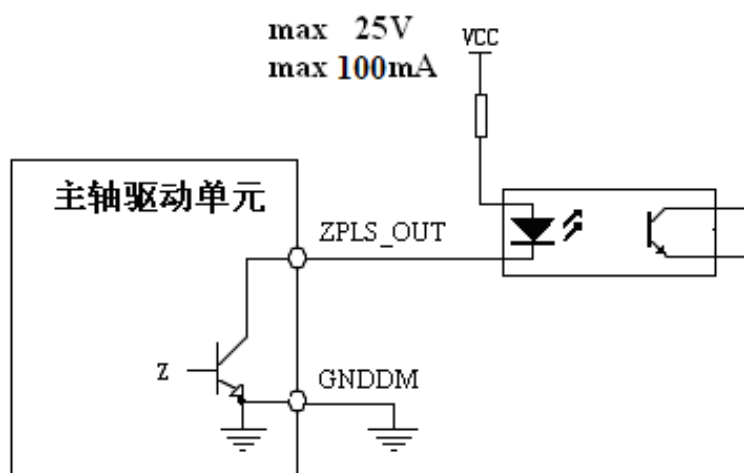


Figure 5-19 Z-phase pulse open-collector output interface (NPN)

(2) Z-phase pulse signal is outputted by the open-collector., with a maximum of 100mA current

(3) The Z-phase pulse signal is usually very narrow. Therefore the PC must use a high-speed optical coupler receiver, such as 6N137.

(4) The output must be non-isolated output (non-insulated).

### 4、Pulse Command Input Interface

Figure 5-20 Differential drive mode of the pulse input

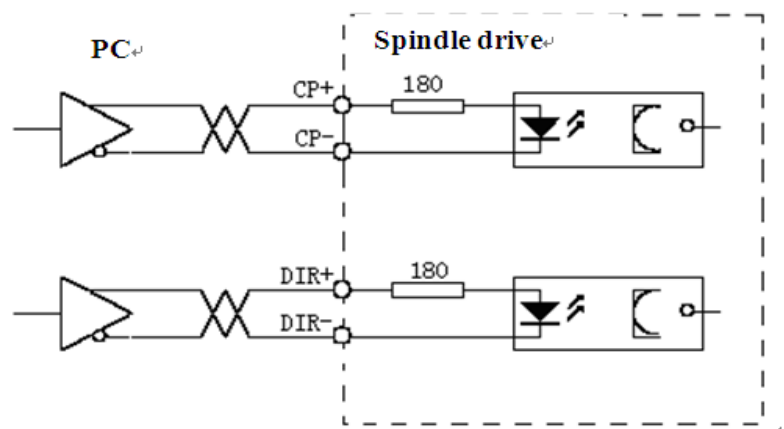
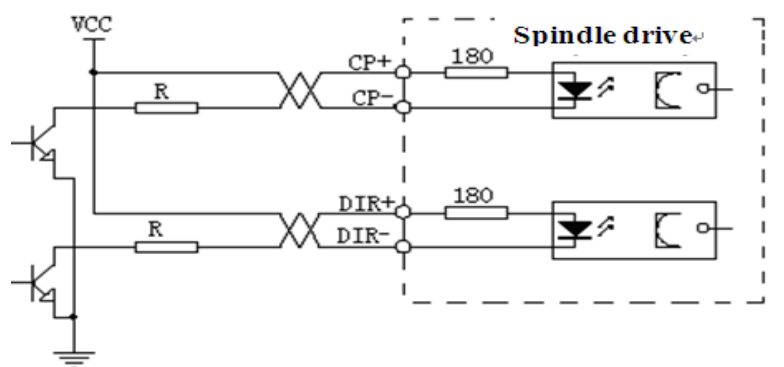


Figure 5-21 Single-ended drive mode of the pulse input



It is recommended that you use the differential drive mode (especially when the cable is too long) which uses AM26LS31, MC3487 drives or RS422 drives.

The single-ended drive mode can reduce the action frequency. You can determine the value of **R** according to a 10 to 15 mA drive current and a maximum of 25V external power supply voltage.

Generally, if the value of **VCC** is **24 V**, the value of **R** is **1.3 K** to **2 K** ( $VCC = 24\text{ V}$ ,  $R = 1.3\text{ K}$  to  $2\text{ K}$ );

If the value of **VCC** is **12 V**, the value of **R** is **510 Ω** to **820 Ω** ( $VCC = 12\text{ V}$ ,  $R = 510\text{ Ω}$  to  $820\text{ Ω}$ );

If the value of **VCC** is **5 V**, the value of **R** is **82 Ω** to **120 Ω** ( $VCC = 5\text{ V}$ ,  $R = 82\text{ Ω}$  to  $120\text{ Ω}$ ).

In the single-ended mode, users provide the external power supply. Make sure that the polarity is not reversed. Otherwise, it may damage the servo drive.

## 5、 Analog Command Input Interface

Figure 5-22 Differential analog input interface

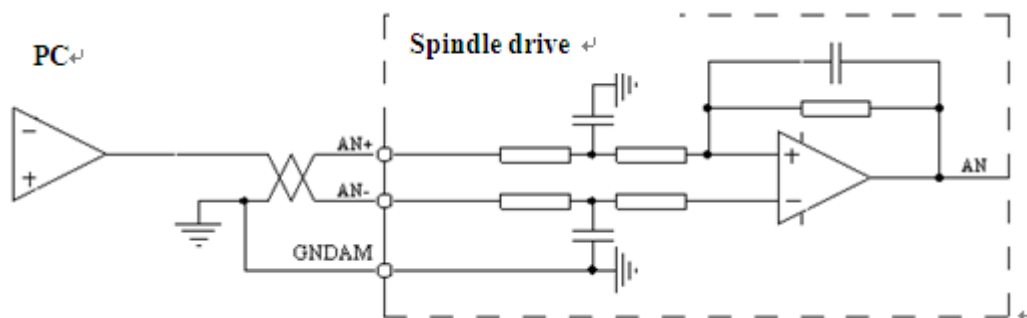


Figure 5-23 Single-ended analog input interface

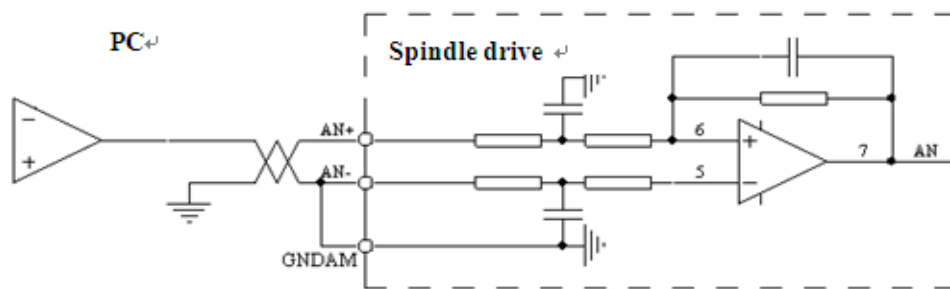


Figure 5-24 c Differential analog potentiometer input interface

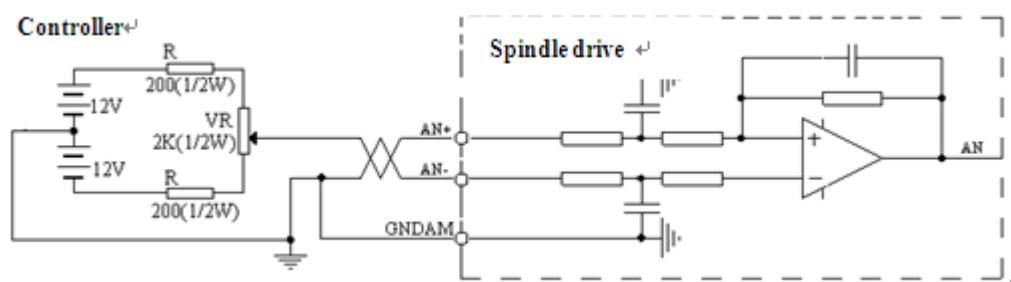
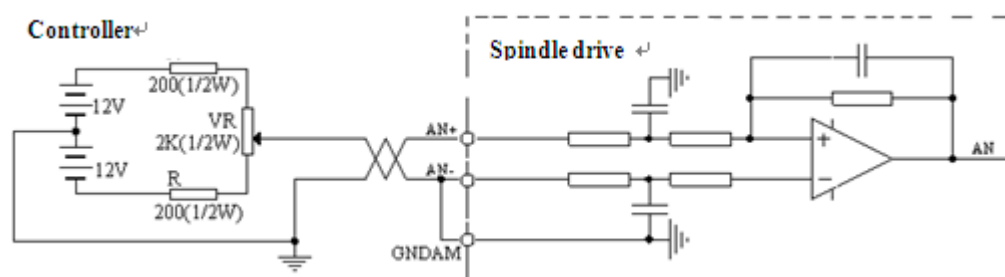


Figure 5-25 d Single-ended analog potentiometer input interface



The analog input interface is differential. According to different connection methods, it has two forms connection, differential connection and single-ended connection. The range of input voltage is -10V to +10V.

In the differential connection, the analog ground wire is connected to the input reference terminal at the side of controller. Therefore, it needs three wires to connect the controller and drive unit.(see Figure 5-13 a)

In the single-ended connection, the analog ground wire is connected to the input reference terminal at the side of the drive. Therefore, it needs two wires to connect the controller and the drive. (see Figure 5-13 b)

The differential connection is superior to the signal-ended connection for its good anti-common-mode interference characteristic.

The input voltage cannot exceed the range from -10V to +10V. Otherwise it may damage the servo drive.

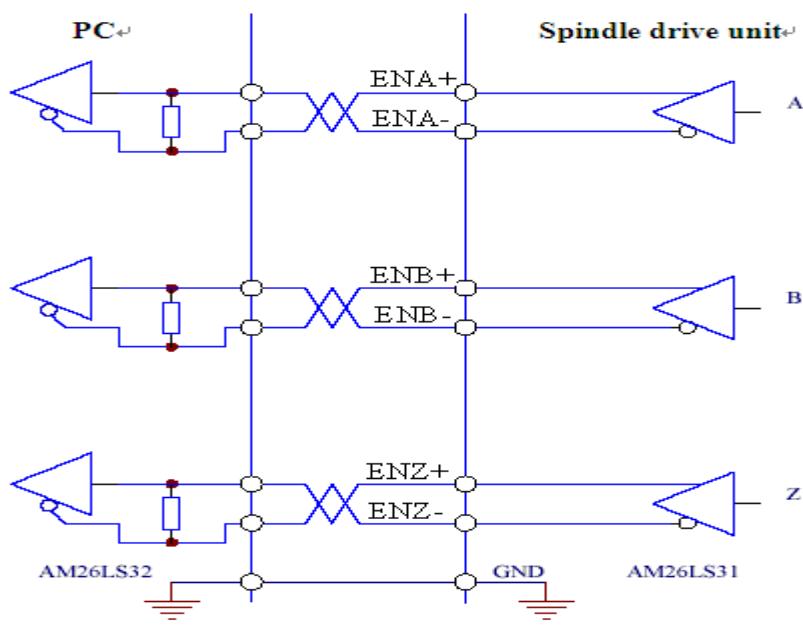
It is recommended that the shield cable be used to reduce the noise disturbance.

It is normal for the analog input interface has a zero bias which can be compensated by setting the movement parameter **PA-8**.

The analog interface is non-isolated.

## 6、 Servo Motor optic-electrical encoder/Servo Encoder Output Interface

Figure 5-26 Servo motor optic-electrical encoder/servo encoder output interface



The encoder signal is outputted by the differential drive (AM26LS31) .

The controller input terminal can adopt AM26LS32 receiver and must be connected to an approximate 330Ω termination resistor.

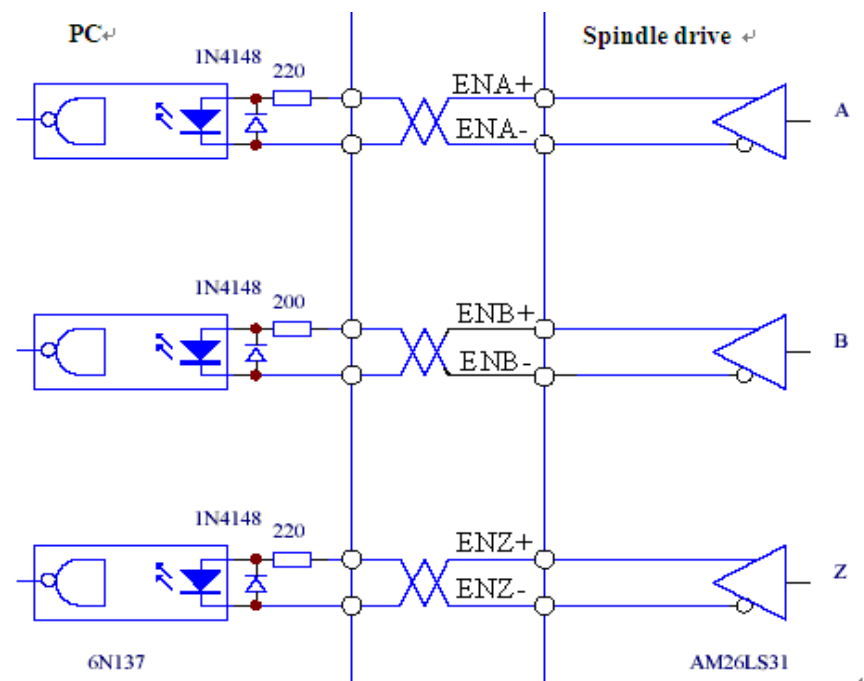
The controller ground wire and the drive ground wire must be reliably connected.

The output must be non-isolated output.

The controller input terminal can also adopt an optical coupler receiver. However, the receiver must be a high-speed optical coupler, such as 6N137.

Figure 5-27 Servo motor optic-electrical encoder/servo encoder output interface





## 5.4.2 XS5 Input/output Terminal

XS5 Input/output Terminal Figure

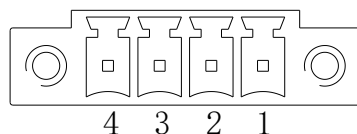


Figure 5.25 XS5 Input/output Terminal

### 5.4.2.2 XS5 I/O Input/output Terminal Function

NO.	Terminal Symbol	Signal	Description
1	MC1	Failure chain	Failure chain output terminal The relay is connected when the relay is in the Normal Open state and the servo drive runs properly. The relay is disconnected if there are any servo drive faults.
2	MC2		
3	COM	Common terminal	Public terminal connection terminal If the brake function is required, The COM signal of the XS4 command input/output interface must be connected to the external DC 24 V power ground signal. Otherwise, the servo drive may work improperly. Otherwise, the servo drive may work improperly.

4	BREAK	Brake output	Brake output terminal If the main power is proper and no servo drive fault is reported, the signal is connected after the servo enable signal is input. Otherwise, the signal is disconnected.
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#### 5.4.2.3 XS5 I/O Input/output Terminal Notations

(1) If the output terminal of the drive inductive loads, such as electromagnetic relays, electromagnetic contactor, should be retrofitted surge suppressor.

The surge suppressors should be nearby installed on end of electromagnetic relay or electromagnetic contactor coil

## 5.5 Connection of the encoder signal terminal

### 5.5.1 XS3 ENCODER1 Servo Motor Input Interface

HSV-180AD support three types of motor encoder: Incremental photoelectric encoder sine and cosine incremental encoder、ENDAT2.1/2.2of Absolute encoder。Details are as follows:

Incremental encoder	1. Number of encoder lines is 1024
	2. Number of encoder lines is 2048
	3. Number of encoder lines is 2500
	4. Sine and cosine incremental encoder
Absolute encoder	NDAT2.1/2.2of Absolute encoder
	BISS of Absolute encoder
	Hiper FACE of Absolute encoder
	TAMAGAWA of Absolute encoder

#### 5.5.1.1 XS3 ENCODER1 Servo Motor Input Interface Figure

Figure 5-29 XS3 Servo Motor Input interface plug

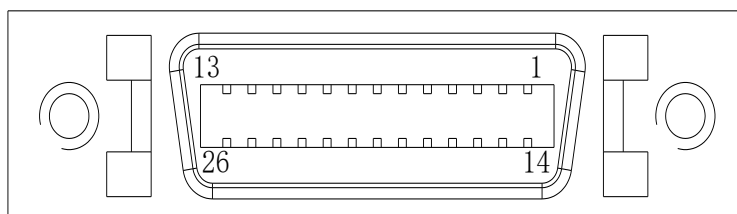


Figure 5-30 XS3 Servo Motor Input interface plug (looking from the plug)

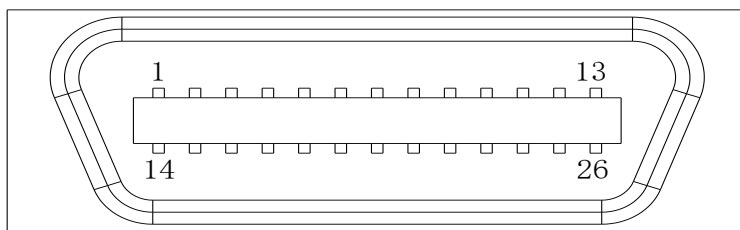
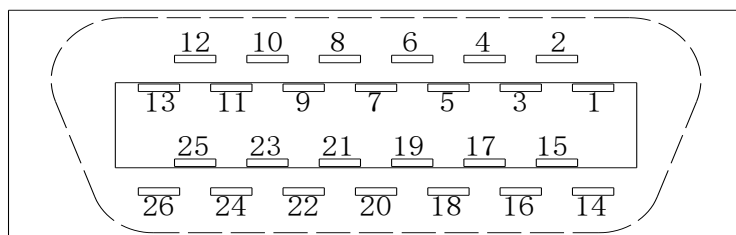


Figure 5-31 Soldering terminal of XS3 Servo Motor Input interface plug (looking from the soldering terminal)



#### 5.5.1.2 XS3 ENCODER1 Servo Motor Input Interface Function

1、 Servo drive unit connect incremental photoelectric encoder

Chart5.8 signal function of XS3 ENCODER1 connect Incremental photoelectric encoder

NO	Terminal Symbol	Function	Symbol standard
1	A+/SINA+	Servo motor encoder feedback A+ input	Line driver receive RS422 standard
2	A-/SINA-	Servo motor encoder feedback A- input	
3	B+/COS B+	Servo motor encoder feedback B+input	
4	B-/COSB -	Servo motor encoder feedback B- input	
5	Z+	Servo motor encoder feedback Z+(or R+) input	
6	Z-	Servo motor encoder feedback Z-(or R-) input	
7	U+/DAT A+	Servo motor encoder feedback U+ input	
8	U-/DAT A-	Servo motor encoder feedback U- input	
9	V+/CLO CK+	Servo motor encoder feedback V+ input	
10	V-/CLOC	Servo motor encoder feedback	

	K-	V- input	
11	W+	Servo motor encoder feedback W+ input	
12	W-	Servo motor encoder feedback W- input	
13	OH1	Motor overheat detection input terminal It is connected to the motor overheat detection sensor.	
26	OH2		
16,17 18,19	+5V	Servo motor encoder +5V power output terminal Connect the servo motor optical-electrical encoder with 5 V power supply. If the cable is too long, use multiple wires to form serial connection.	DC +5V/150mA
23,24,25	GNDD	Servo encoder power ground 0V	
20,22	Reserved		
21	Reserved		
14,15	PE	Shield ground It is connected to the motor housing	

**NOTE:** The homonyms pin connected has been shorting together in the internal circuit board

## 2、The servo drive unit connect with ENDAT2.1 encoder

Chart5.9 Signal function of XS3 ENCODER1 ENDAT2.1 encoder

NO	Terminal Symbol	Function	Symbol standard
1	A+/SINA +	Servo motor encoder feedback A+ input	Line driver receive RS422 standard
2	A-/SINA-	Servo motor encoder feedback A- input	
3	B+/COS B+	Servo motor encoder feedback B+input	
4	B-/COSB -	Servo motor encoder feedback B- input	
7	U+/DAT A+	Servo motor encoder feedback U+ input	

8	U-/DAT A-	Servo motor encoder feedback U- input	
9	V+/CLO CK+	Servo motor encoder feedback V+ input	
10	V-/CLOC K-	Servo motor encoder feedback V- input	
5,6	Reserved		
11,12	Reserved		
13	OH1	Motor overheat detection input	
26	OH2	terminal It is connected to the motor overheat detection sensor.	
16,17 18,19	+5V	Servo motor encoder +5V power output terminal Connect the servo motor optical-electrical encoder with 5 V power supply. If the cable is too long, use multiple wires to form serial connection.	DC +5V/150mA
23,24,25	GNDD	Servo encoder power ground 0V	
20,22	Reserved		
21	Reserved		
14,15	PE	Shield ground It is connected to the motor housing	

**NOTE:** The homonyms pin connected has been shorting together in the internal circuit board

### 3、Servo drive unit connect BISS agreement of Absolute encoder

**Chart5.10 Signal function of XS3 ENCODER1 connect BISS agreement of Absolute encoder**

NO	Terminal Symbol	Function	Symbol standard
7	U+/DAT A+	Servo motor encoder feedback U+ input	
8	U-/DAT A-	Servo motor encoder feedback U- input	

9	V+/CLO CK+	Servo motor encoder feedback V+ input	
10	V-/CLOC K-	Servo motor encoder feedback V- input	
1,2	Reserved		
3,4	Reserved		
5,6	Reserved		
11,12	Reserved		
13	OH1	Motor overheat detection input terminal It is connected to the motor overheat detection sensor.	
26	OH2		
16,17 18,19	+5V	Servo motor encoder +5V power output terminal Connect the servo motor optical-electrical encoder with 5 V power supply. If the cable is too long, use multiple wires to form serial connection.	DC +5V/150mA
23,24,25	GNDD	Servo encoder power ground 0V	
20,22	Reserved		
21	Reserved		
14,15	PE	Shield ground It is connected to the motor housing	

**NOTE:** The homonyms pin connected has been shorting together in the internal circuit board

#### 4、Servo drive unit connect HIPERFACE agreement of Absolute encoder

**Chart5.11 Signal function of XS3 ENCODER1 connect HIPERFACE agreement of Absolute encoder**

NO	Terminal Symbol	Function	Symbol standard
1	A+/SINA +	Servo motor encoder feedback A+ input	Line driver receive RS422 standard
2	A-/SINA-	Servo motor encoder feedback A- input	
3	B+/COS B+	Servo motor encoder feedback B+input	

4	B-/COSB -	Servo motor encoder feedback B- input	
7	U+/DAT A+	Servo motor encoder feedback U+ input	
8	U-/DAT A-	Servo motor encoder feedback U- input	
5,6	Reserved		
9,10	Reserved		
11,12	Reserved		
13	OH1	Motor overheat detection input terminal It is connected to the motor overheat detection sensor.	
26	OH2		
16,17 18,19	+9V	Servo motor encoder +9V power output terminal Connect the servo motor optical-electrical encoder with 5 V power supply. If the cable is too long, use multiple wires to form serial connection.	DC +9V/150mA
23,24,25	GNDD	Servo encoder power ground 0V	
20,22	Reserved		
21	Reserved		
14,15	PE	Shield ground It is connected to the motor housing	

**NOTE:** The homonyms pin connected has been shorting together in the internal circuit board

**5、 Servo drive unit connect TAMAGAWA agreement of Absolute encoder**  
**Chart5.12 Signal function of XS3 ENCODER1 connect TAMAGAWA**  
**agreement of Absolute encoder**

NO	Terminal Symbol	Function	Symbol standard
7	U+/DAT A+	Servo motor encoder feedback U+ input	
8	U-/DAT A-	Servo motor encoder feedback U- input	

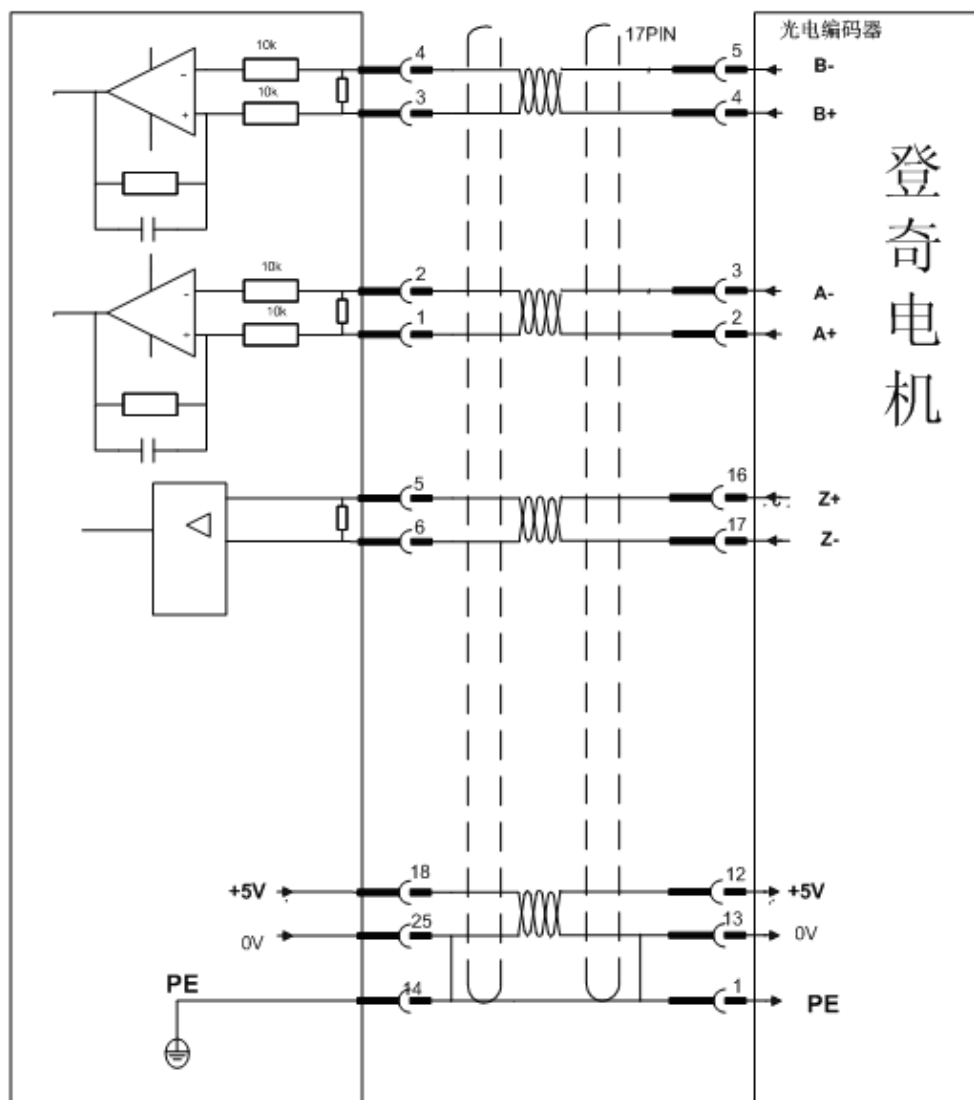
9	Reserved		
10	Reserved		
1,2	Reserved		
3,4	Reserved		
5,6	Reserved		
11,12	Reserved		
13	OH1	Motor overheat detection input terminal It is connected to the motor overheat detection sensor.	
26	OH2		
16,17 18,19	+5V	Servo motor encoder +5V power output terminal Connect the servo motor optical-electrical encoder with 5 V power supply. If the cable is too long, use multiple wires to form serial connection.	DC +5V/150mA
23,24,25	GNDD	Servo encoder power ground 0V	
20,22	Reserved		
21	Reserved		
14,15	PE	Shield ground It is connected to the motor housing	

**NOTE:** The homonyms pin connected has been shorting together in the internal circuit board

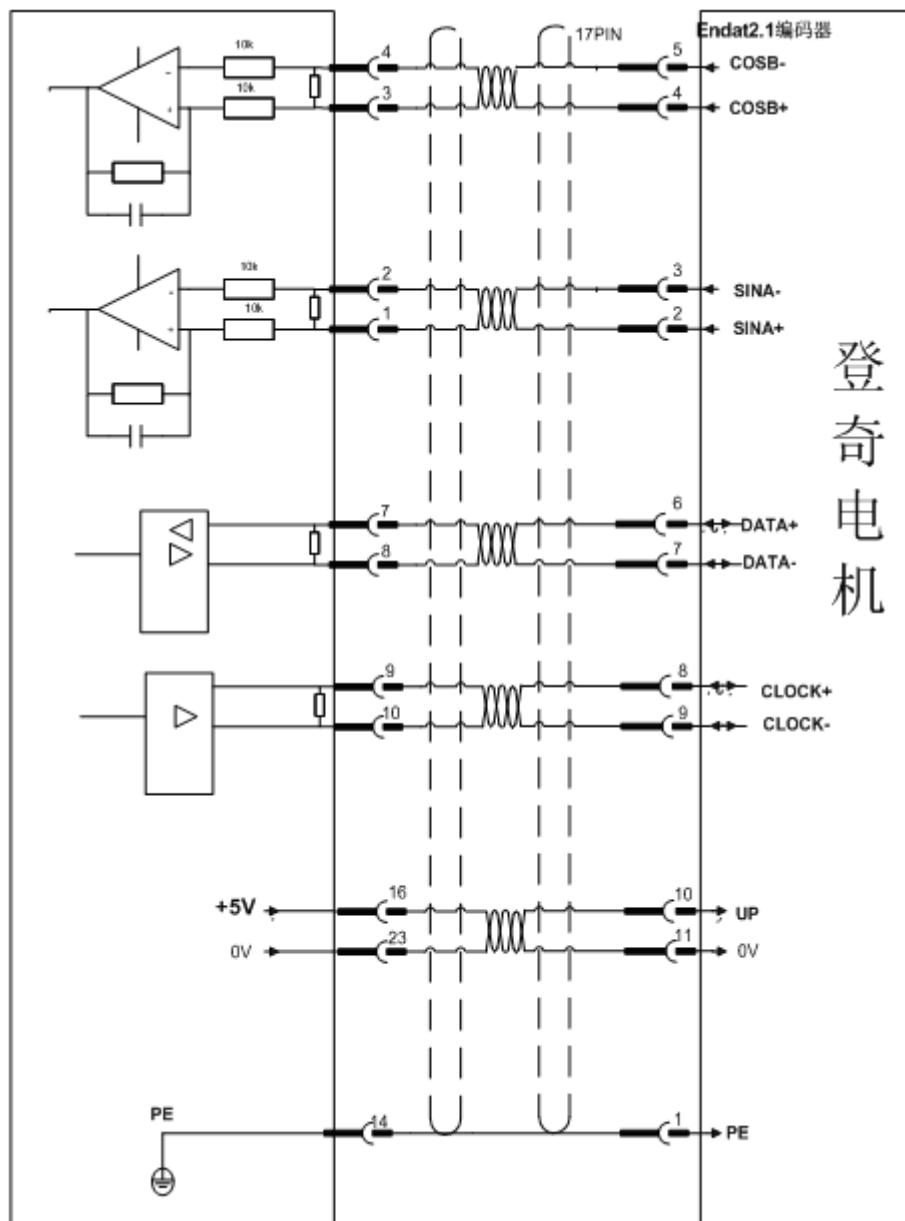


### 5.5.1.3 XS3 ENCODER1 servo motor encoder input interface wiring diagram

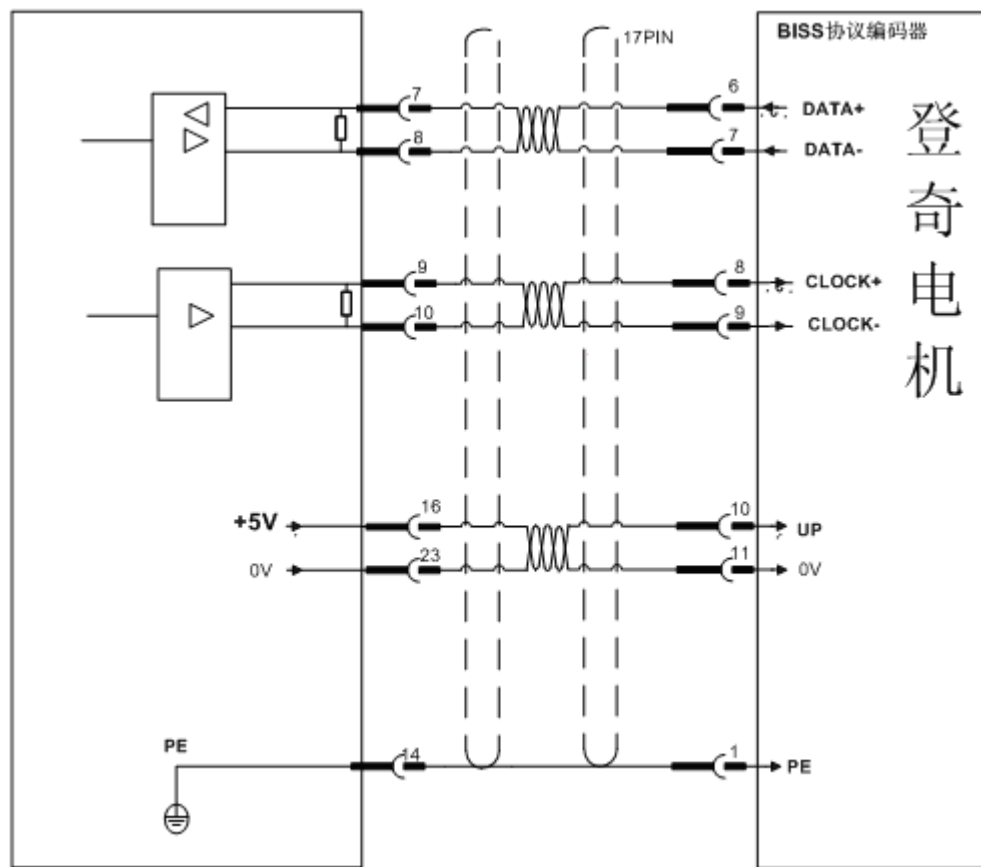
1、Servo drive connect with Incremental photoelectric encoder and Dench motor



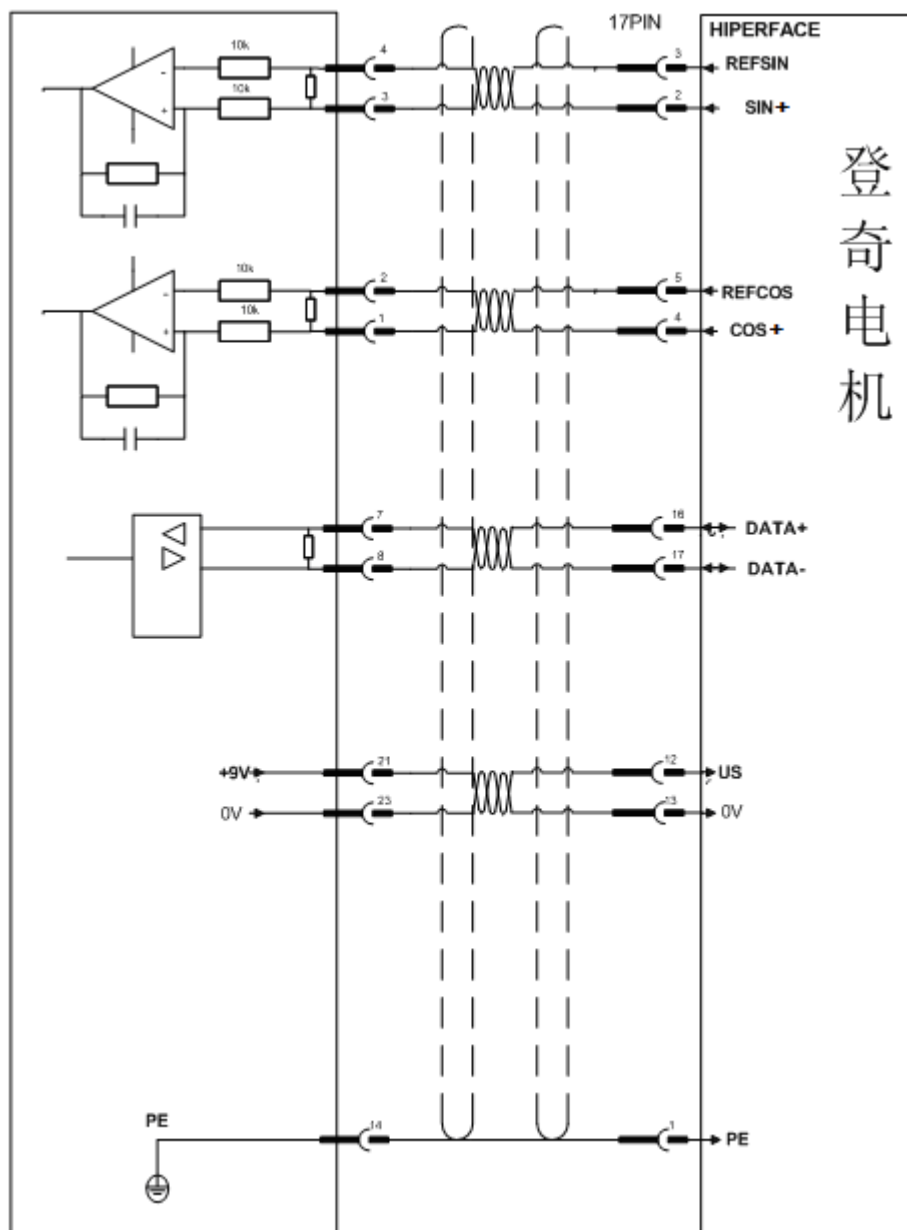
## 2、Servo drive connect with ENDAT2.1 agreement (EQN1325/1313) of Absolute encoder and Dench motor



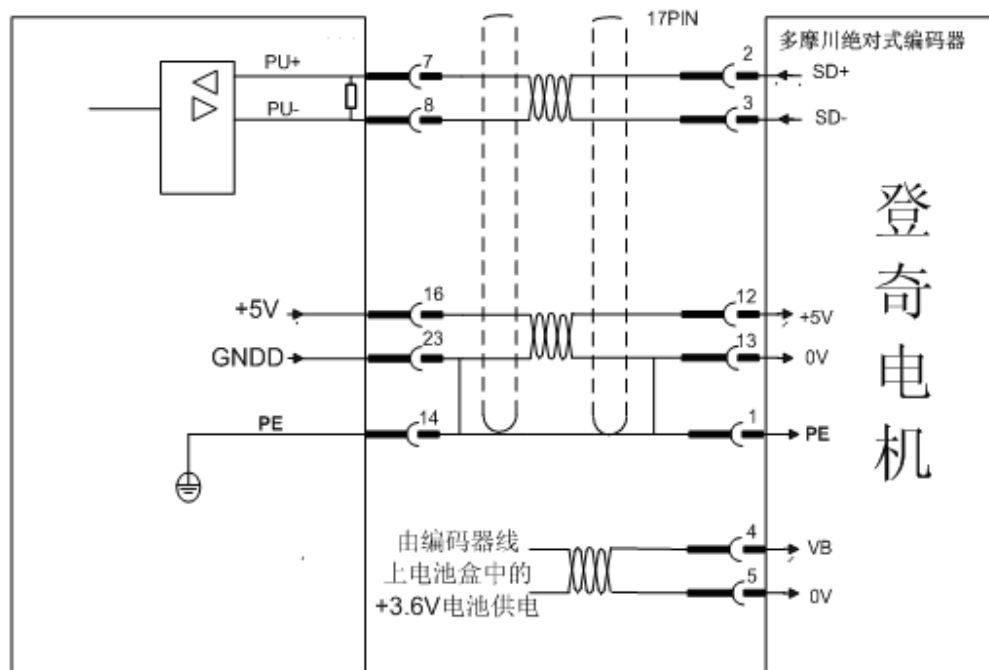
### 3、Servo drive connect with BISS Agreement of Absolute encoder



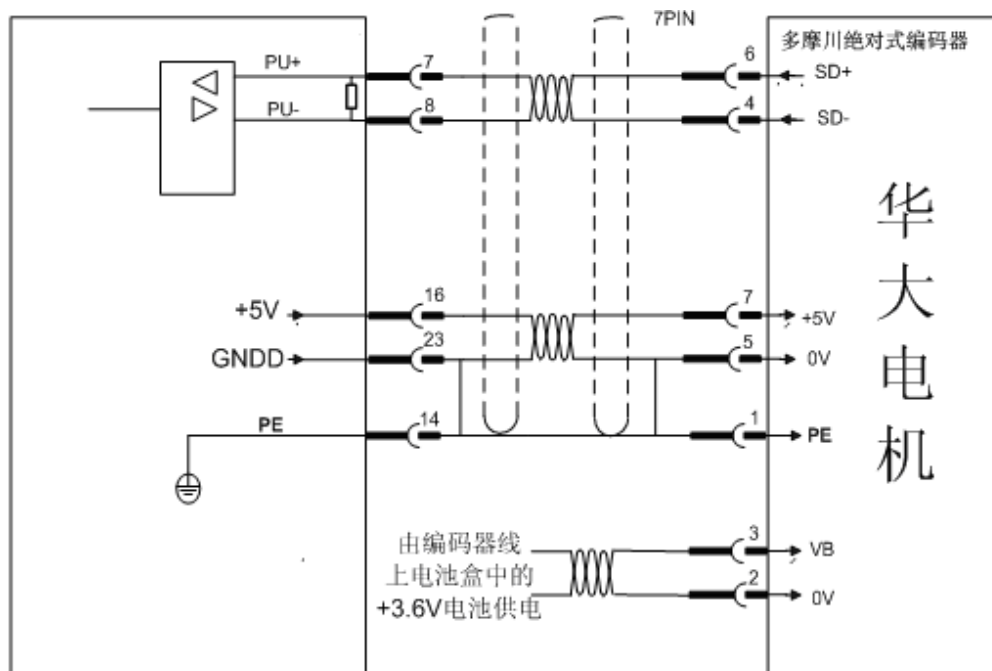
#### 4、Servo drive connect with Hiper FACE agreement of Absolute encoder



## 5、 Servo drive connect with Hiper FACE agreement of Absolute encoder and Dench motor



## 6、 Servo drive connect with Hiper FACE agreement of Absolute encoder and Huada motor



### 5.5.2.1XS2 ENCODER2 Servo Encoder Input Interface Figure

Figure 5-38 XS2 Servo Encoder Input interface plug

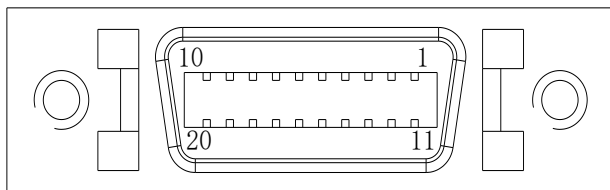


Figure 5-39 XS2 Servo Encoder Input interface plug(looking from the plug)

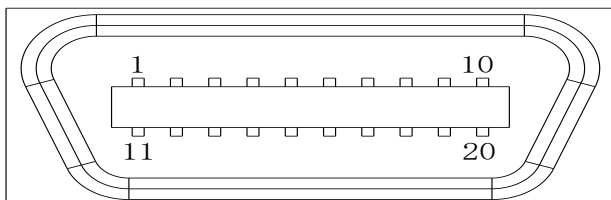
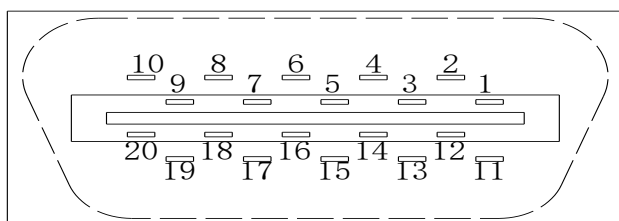


Figure 5-40 Soldering terminal of XS2 Servo Encoder Input interface plug (looking from the soldering terminal)



### 5.5.2.2 XS2 ENCODER2 Servo Encoder Input Interface Function

1、 Drive servo connect to Incremental photoelectric encoder

Figure 5.11 Signal function of XS2 ENCODER2 connect Incremental photoelectric encoder

NO	Terminal Symbol	Function	Symbol standard
11,12	A+/SINA+	Servo motor encoder feedback A+ input	Line driver receiver RS422 standard
1,2	A-/SINA-	Servo motor encoder feedback A- input	
13,14	B+/COSB+	Servo motor encoder feedback B+input	
3,4	B-/COSB-	Servo motor encoder feedback B- input	
15,16	Z+/DATA+	Servo motor encoder feedback Z+input	
5,6	Z-/DATA-	Servo motor encoder feedback Z-input	
7,8	+5V	Servo motor encoder +5V power output terminal Connect the servo motor optical-electrical encoder with 5 V power supply. If the cable	DC +5V/150mA

		is too long, use multiple wires to form serial connection.	
9,10	GNDD	Servo encoder power ground 0V	
19	CLOCK+	Reserved	
20	CLOCK-		
17,18	PE	Shield ground It is connected to PE	

## 5.6 Connection of the communication signal terminal

### 5.6.1 XS1 Serial Interface

Figure 5-41 XS1 Serial interface plug

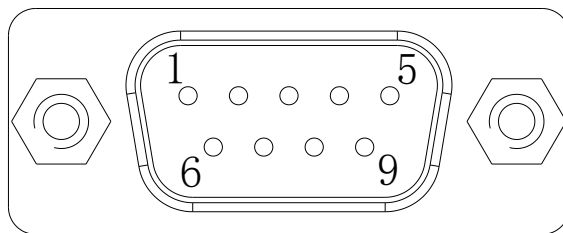


Figure 5-42 XS1 Serial interface plug (looking from the soldering plug)

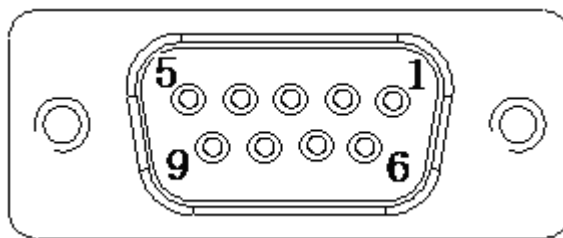
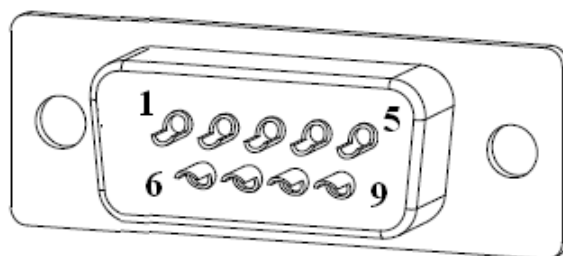


Figure 5-43 Soldering terminal of XS1 Serial interface plug (looking from the soldering terminal)



Figur5.12 Function of the communication signal terminal XS1

NO.	Terminal Symbol	Signal	Function
2	TX	RS232 Data transmission	It is connected to the serial data receiving interface (RX) of the controller or PC to achieve the serial communication.
3	RX	RS232 Data reception	It is connected to the serial data transmitting interface (TX) on the controller or PC to achieve the serial communication.
1, 5	GNDD	Signal ground	Data signal ground
4	CANL	Reserved	
6	CANH	Reserved	

## 5.7 Wiring

### 1、Power input terminal XT1, and heavy current power output terminal XT2

Diameter

The terminal diameters of L3, L2, L1 on XT1 of HSV-180AD-035, 050, 075, 100, 150.

The terminal diameters of P, BK, U, V, W, PE on XT2 of HSV-180AD-035, 050, 075, 100, 150.

The terminal diameters of P, BK, L3, L2, L1, U, V, W, PE on XT2 of HSV-180AD-200, 300, 450.

The terminal diameters 220A, 220B on XT1 of HSV-180AD-200, 300, 450  $\geq 1.5\text{mm}^2$  (3.0/3.7/5.5/7.5 kw).

Grounding

Grounding wire must be thick. The servo drive and servo motor must be connected to PE.

Grounding resistance  $< 4\Omega$

Use cold pre-insulated terminals to connect terminals and make sure that the connection is firm.

Install the non-fuse circuit breaker to promptly cut off the external power when a servo drive fault occurs.

It is recommended that shield cable be used to prevent other electrical equipments from interference.

### 2、Control signal XS4, feedback signal XS3 for servo motor optic-electrical encoder, servo encoder feedback signal XS2, and XS1 Serial Interface

Diameter

Shield cable is used (stranded shield cable is the best choice), and the cross-sectional area is greater than or equal to  $0.12\text{mm}^2$  (AWG24-26). The shielded layer must be connected to the metal shell of the connection plug.



### Cable length

The cable must be short. The length of the control signal cable XS4 is not greater than 10 meters, and the length of the feedback signal cable XS2, XS3 is no more than 40 meters.

### Wiring

The wiring must be away from the electric power circuit to prevent interference. Install surge absorbers with inductive components (coils) of related circuits. Freewheeling diodes are antiparallel connected to the DC coils, and RC absorbed circuits are paralleling connected to the AC coils.

### 3、I/O input/output terminal XS5

- (1) Diameter: use ordinary cable or shielded cable, wire cross-sectional area  $\geq 1.5\text{mm}^2$ .
- (2) Cable length: cable length as short as possible and not more than 10 meters.

## 5.8 Standard Wiring

### Caution

U, V, W on XT2 must be connected to the motor windings in corresponding order and cannot be reversed.

Cables and wires must be fixed and cannot be near the radiator of the servo drive or motor. Otherwise, the insulation properties may be reduced due to overheat.

In the servo drive, large-capacity of electrolytic capacitor exists, which leads to the remaining of high voltage even after power off. Therefore, do not touch the servo drive or motor within five minutes after the power off.

Terminals P, BK on XT2 are connected to the external braking resistor.

**Terminal P and BK cannot be shorted. Otherwise it will damage the servo drive.**

“Shell” in the wiring diagram refers to the metal shell of the wiring plug. The cable shield must be connected to the metal shell. First unravel the shield and avoid twisting together. Then loop part of the shield and cut off the rest. Last cover the looped shield with casing, and weld the exposed shield to the metal shell.

**Avoid too much solder to make sure the plug shield can be covered.**

**It will be better, if you use a metal cable clip to form a 360-degree access and perform nearby grounded.**

### 5.8.1 Standard Wiring for Position Control Mode (Pulse Interface)

Figure 5-44 Standard wiring for position control mode (pulse interface)

(Configured with Dench motor GK604, GK606, GK607, GK608, and GK610)

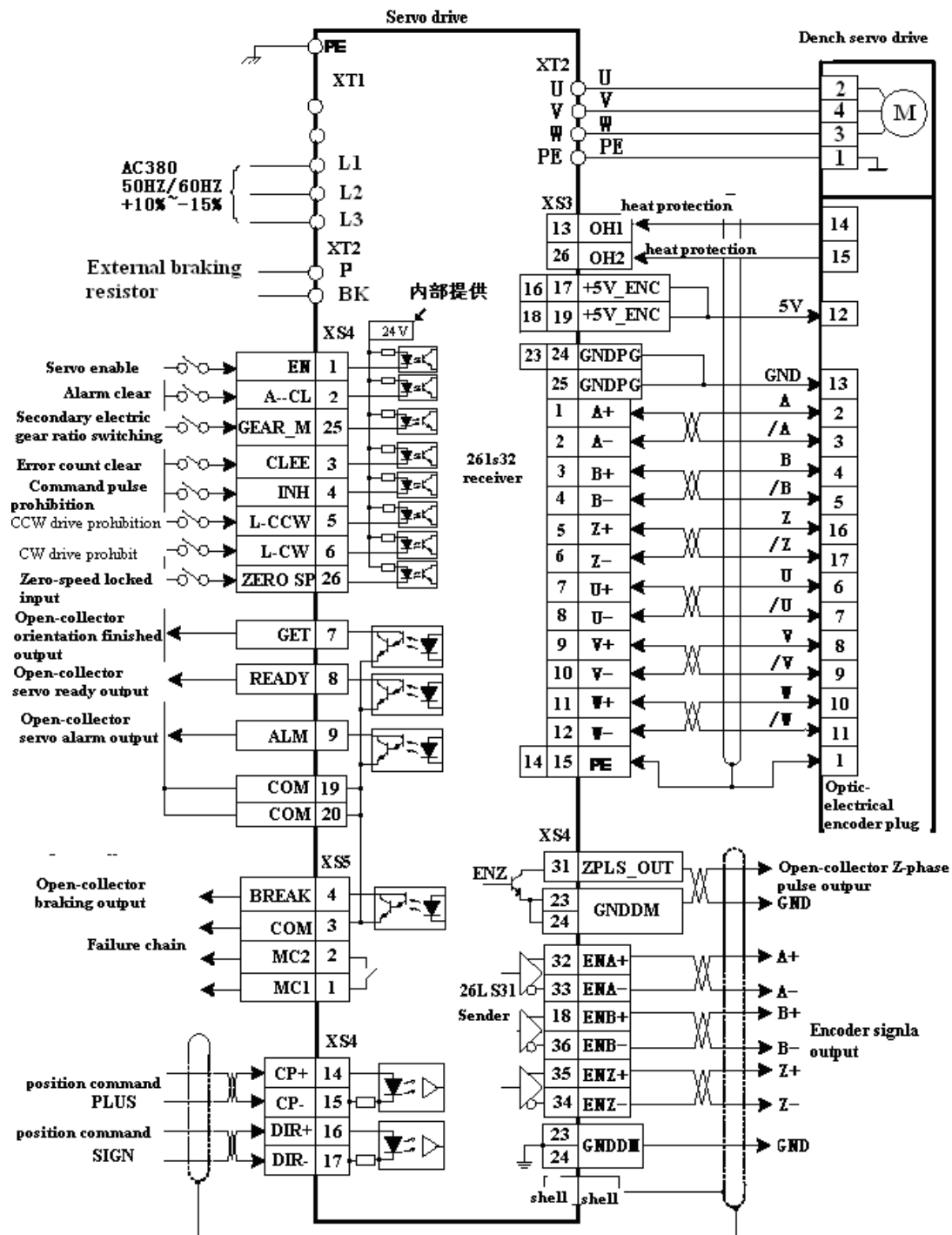
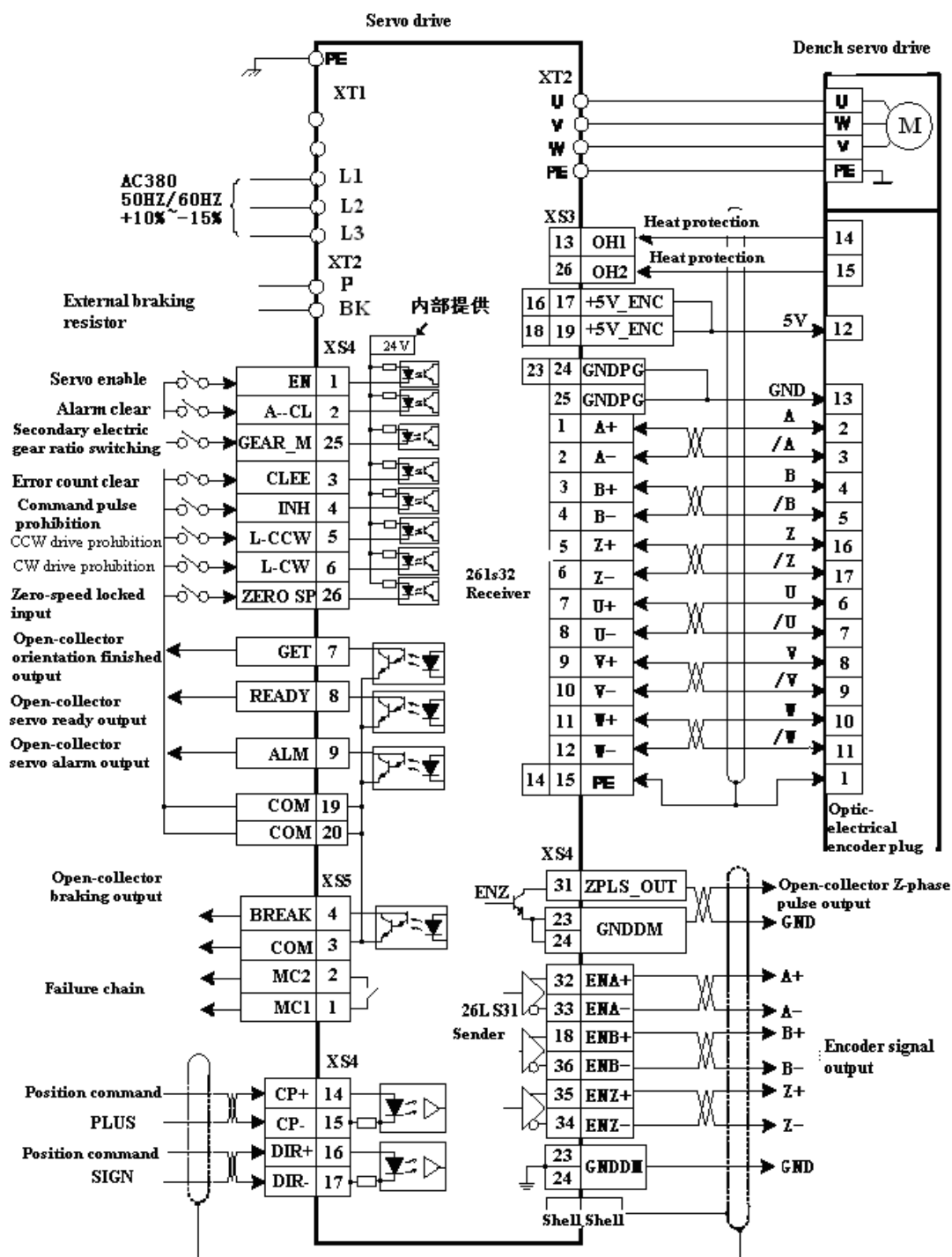


Figure 5-45 Standard wiring for position control mode (pulse interface)

(Configured with Dench motor force cooling GK610, GK613 and GK618)



## 5.8.2 Standard Wiring for External Speed Control Mode (Analog Interface)

Figure 5-46 Standard wiring for external speed control mode (analog interface)  
(configured with Dench motor GK604, GK606, GK607, GK608, and GK610)

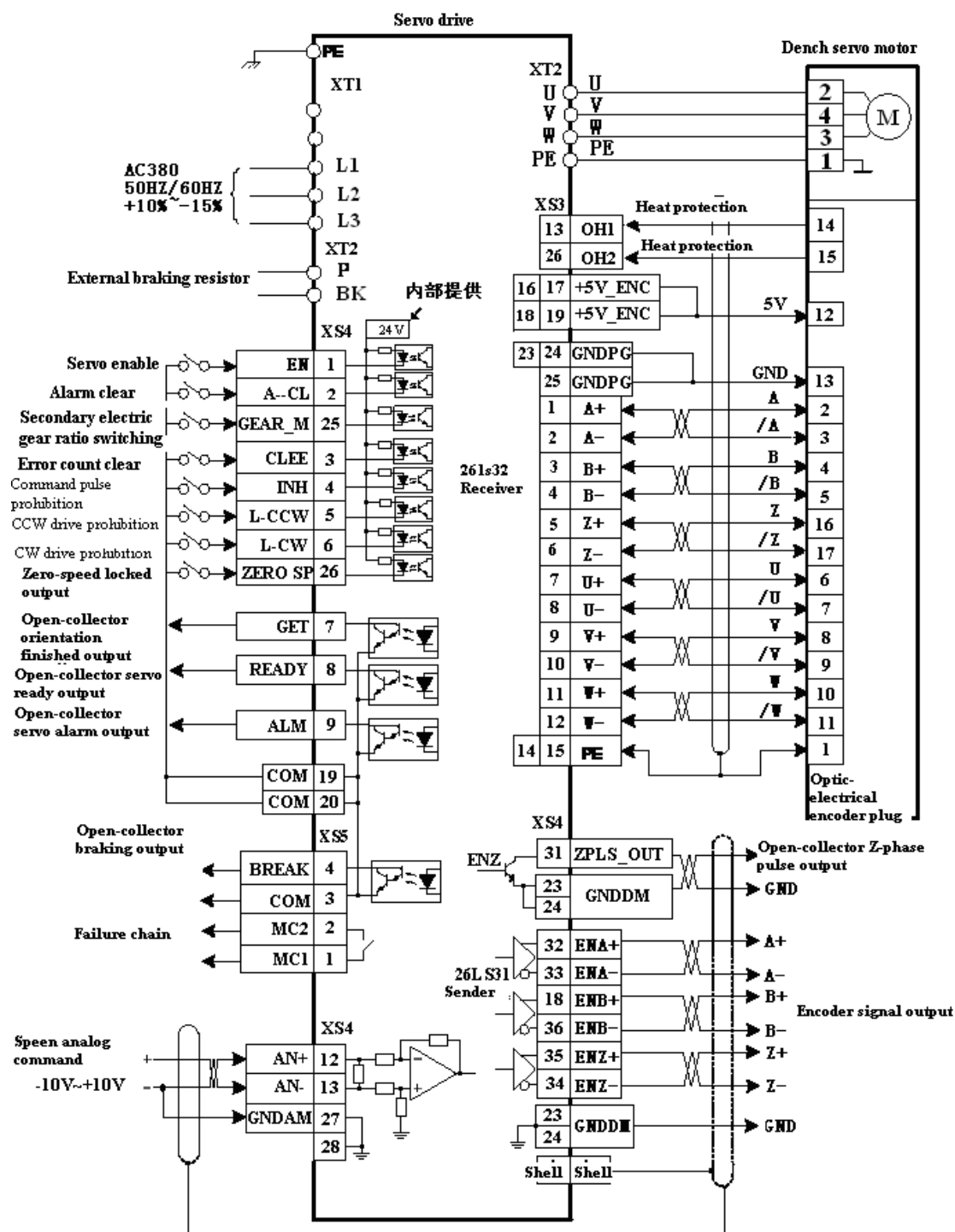
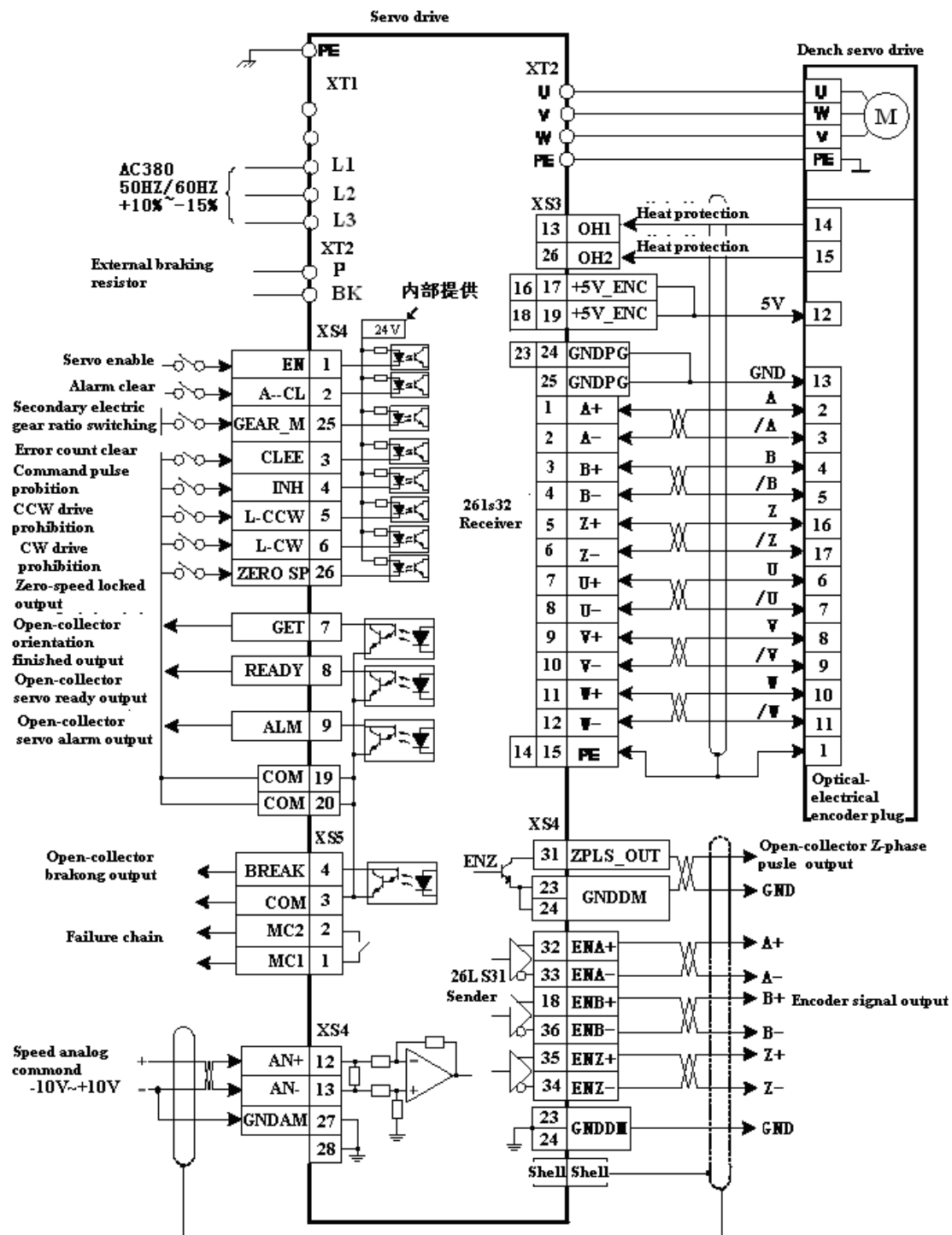


Figure 5-47 Standard wiring for external speed control mode (analog interface)

(Configured with Dench motor force coolingGK610, GK613 and GK618)



### 5.8.3 Standard Wiring for Closed-loop Control Mode (pulse interface)

Figure 5-48 Standard wiring for closed-loop control mode (pulse interface)  
(configured with Dench motor GK604, GK606, GK607, GK608, and GK610)

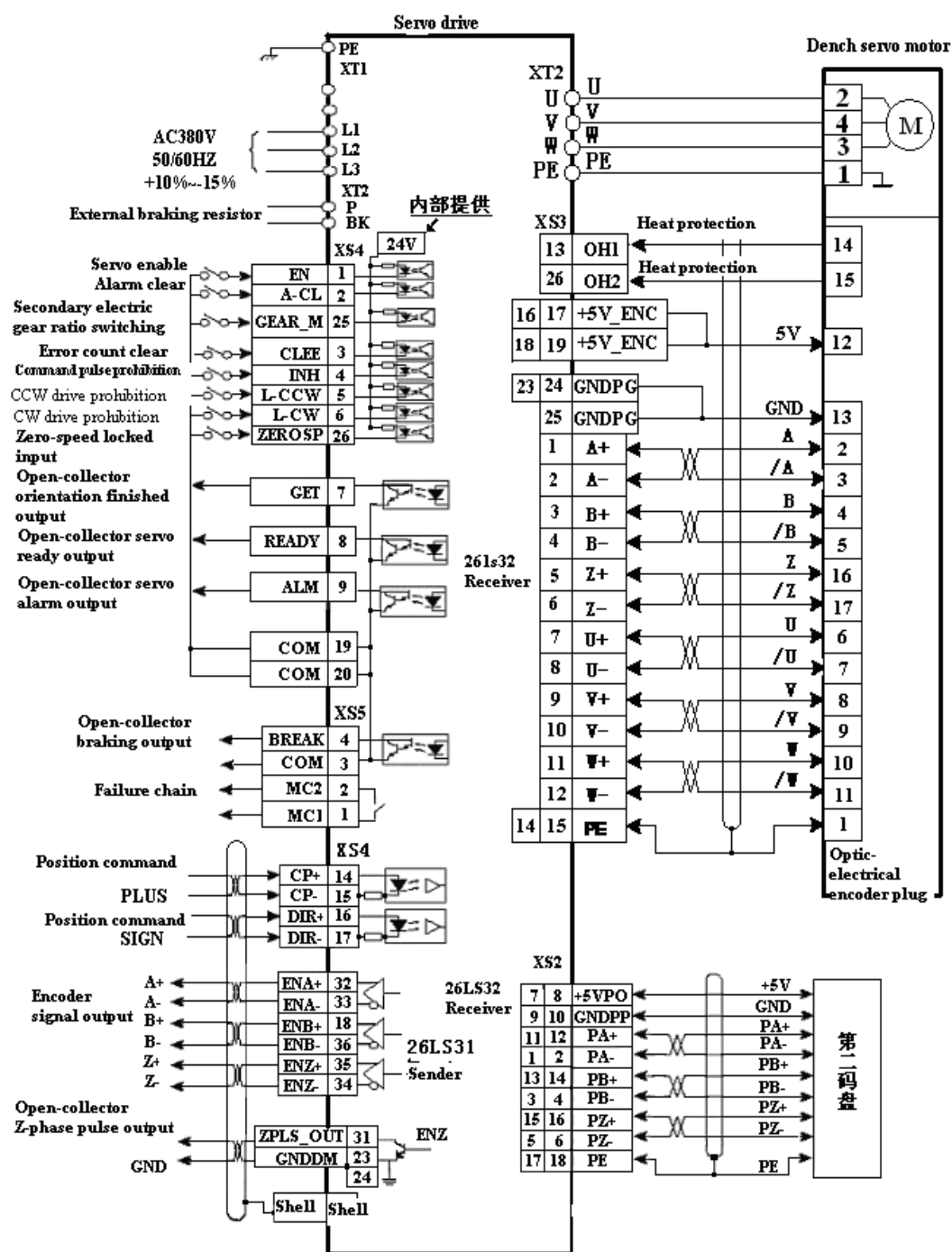
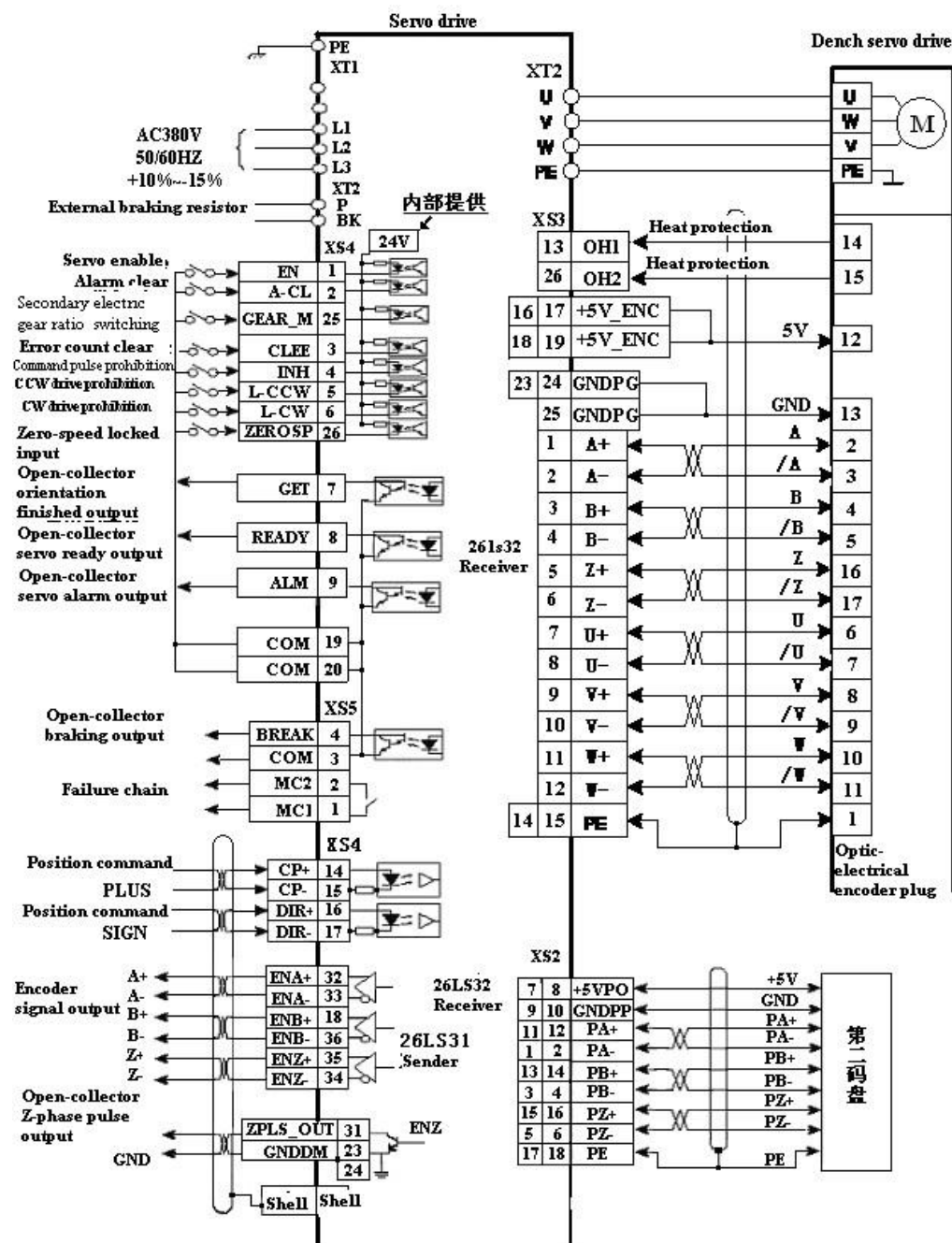







Figure 5-49 Standard wiring for closed-loop control mode (pulse interface)

(Configured with Dench motor force coolingGK610, GK613 and GK618)



## 6. Operation and Display

### 6.1 Overview

1. The drive unit panel consists of 6 LED digital displays, 5 buttons , , , , , and 2 light-emitting diodes.

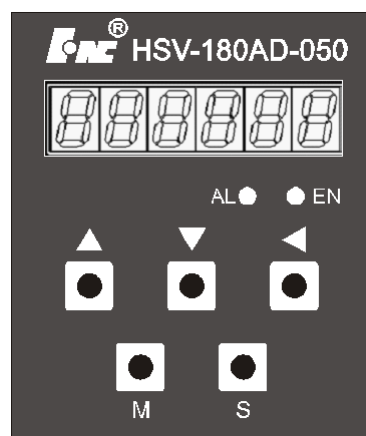





Figure 6-1 Digital display of series HSV-180AD servo drive unit


- The 6 LED digital displays are used to display various statuses and set parameters.
- The red light-emitting diode is an alarming lamp (AL). When it is on, it means "drive unit alarm". The green light-emitting diode is an enable lamp (EN). When it is on, it means "servo drive enable"
- The function of each button is as follows:

: used for main menu mode switching

: used for entering into the secondary menu, returning to the main menu mode, and input confirmation

: used for an increase in number and value, or moving to the next option

: used for a decrease in number and value, or moving back to the previous option

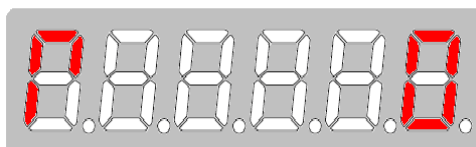
: used for shifting

2. After the control power supply of the servo drive is connected, the six LED digital displays on the panel all display "8", and change to "R O" a second later.



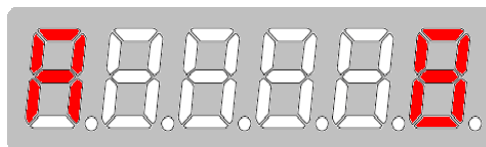
3. Users must operate based on the multi-level menus. The first-level menu is the main menu which includes five operation modes: display mode, movement parameter mode, auxiliary mode, control parameter mode, and alarm history display mode. Each operation mode contains a secondary menu.

Figure 6-2 **R 0** display



4. The 6-bit LED digital tube displays various status and data of the system. If the first bit of the digital tube displays A , and at the same time the red light-emitting diode is on, an alarm is generated. The follow-up bit of the digital tube displays the alarm code. After the process of fault diagnosis and troubleshooting, you can reset the system by the alarm reset mode under the auxiliary mode or cutting off the power and then re-power to the servo drive. When the red light-emitting diode is off, the system is reset.

Figure 6.3 **A8** Alarm display



## 6.2 Operation in the Display Mode

1. Press **M** to switch the operation mode on the main menu”, and press **↑** and **↓** to enter the secondary menu for the display mode.

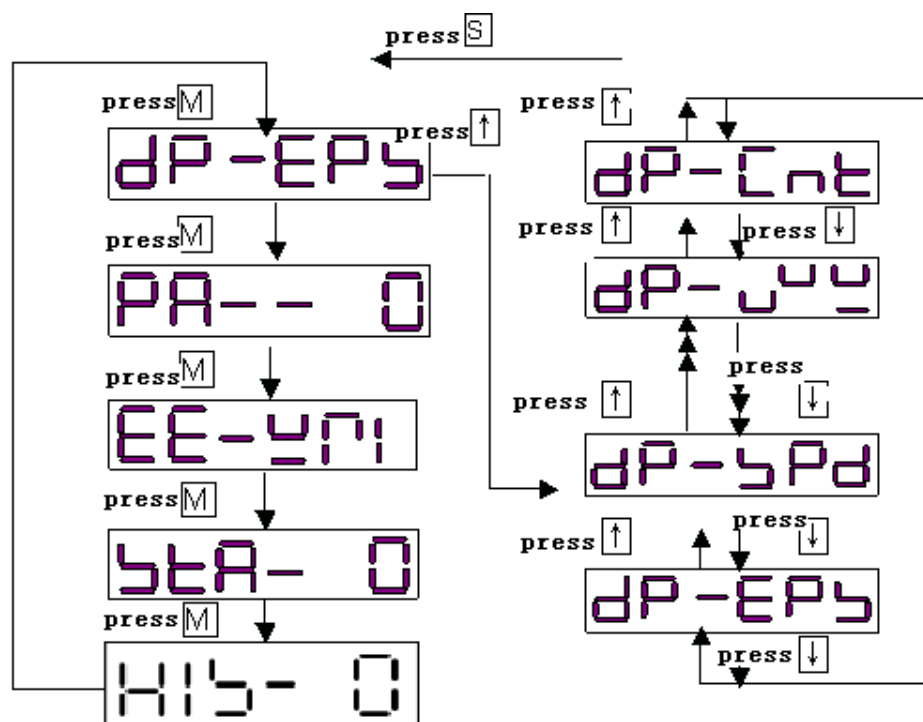
















Figure 6-4 Main menu for the display mode

### 6.3 state surveillance mode

HSV-180AD servo drive contains 20 types of display modes(see table 6.1). Press  $\uparrow$  and  $\downarrow$  to select a display mode as required. The display status can only be viewed and cannot be modified or set. Press  $S$  to display the detailed status, then press  $S$  to return to the secondary menu, and then press  $M$  to return to the main menu.

Table 6-1 Meaning of each symbol in the display mode

NO.	Symbol	Description
1		Display the speed tracking error unit: pulse
2		Display the actual speed (unit: 0.1r/m)
3		Display the actual torque current (Effective value ) unit: 0.1A
4		Display position command unit: pulse
5		Actual position = DP-PRM * 10000 + DP-PRL
6		Display the actual position of motor unit: pulse

7		Actual position = DP-PFM * 10000 + DP-PFL
4		Display the actual magnetic field current (Effective value) unit: 0.1A
5		Display the magnetic field current command unit: 0.1A
6		Display the actual position of motor unit: pulse
7		Actual position = DP-PFM * 10000 + DP-PFL
8		Display pulse frequency unit: 0.1KHz
9		Display speed command unit: 1r/min
10		Display magnetic current unit: 0.1A
11		Display alarm status
12		Display switch-value input status PIN.1: servo drive enable PIN.2: alarm status reset PIN.3: CW control PIN.4: CCW control PIN.5: INC_Sel1 PIN.6: INC_Sel2 PIN.7: servo orientation control PIN.8: control mode switch
11		Display the actual feedback value of the U-phase current
12		Display switch-value output status POU.1: zero-speed reached POU.2: drive system ready POU.3: alarm output POU.4: reserved POU.5: speed reached POU.6: servo orientation-finished
13		Display the actual load current (Effective value) unit: 0.1A
14		Display the number of the feedback pulse of the servo motor optic-electrical encoder

15	DP-SPR	Display the number of feedback pulse of the servo encoder
16	DP-DES	Display the speed deviation
17	DP-REF	Display voltage reference output
18	DP-PRM	Display position command unit: pulse
19	DP-PRL	Actual position = DP-PRM * 10000 + DP-PRL
20	DP-EPB	Display the single-turn absolute position value of Absolute encoder
21	DP-EPH	Reserved

## 6.4 Operation in the Movement Parameter Mode

1. On the main menu, select "PA--0", and press  $\uparrow$  and  $\downarrow$  to enter the secondary menu for the movement parameter mode.
2. Series HSV-180AD servo drive contains 44 movement parameters.

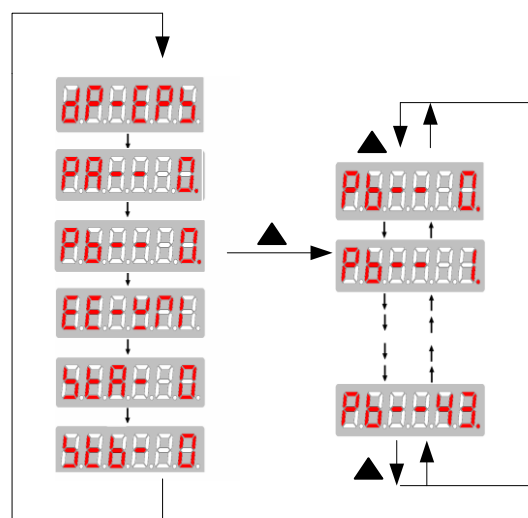


Figure 6-6 Secondary menu for the movement parameter mode

- Set  $PA-000$  to  $002003$ , could open extension movement parameter mode
- HSV-180AD servo unit have 44 extension parameters

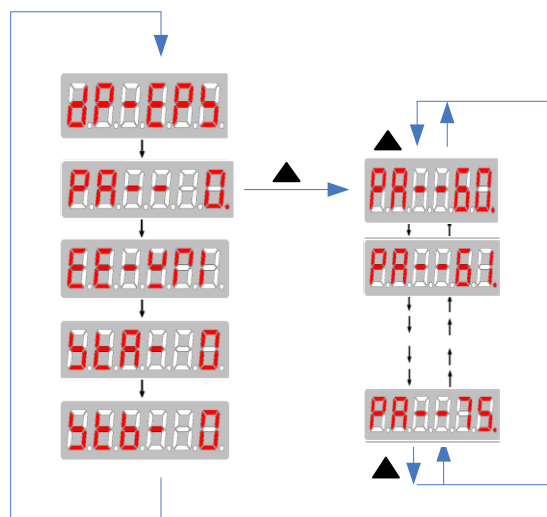


Figure 6-5 Secondary menu for extension movement parameter mode

### 6.5 Operation in the Auxiliary Mode

1. On the main menu, select “EE-WRI”, and press  $\uparrow$  and  $\downarrow$  to enter the secondary menu for the auxiliary mode.
2. Series HSV-180AD servo drive contains 8 types of auxiliary modes

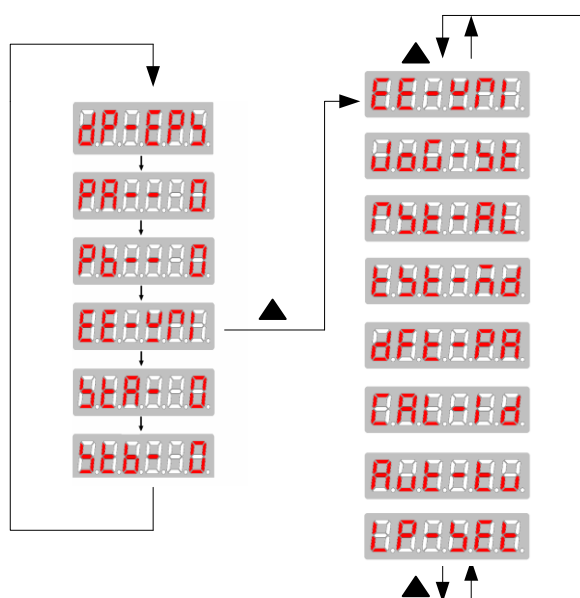


Figure 6-8 Secondary menu for the auxiliary mode

- A. **EEPROM mode:** This method is effective only during the parameter changes and settings. If changing or setting parameters, you should firstly set

**PR-184** to **0001230**, then save the new parameter values by pressing **S** in

this mode. When “**FINISH**” is displayed, the parameter change and setting is completed. Press **M** to switch to another mode, or press **↑** and **↓** to select other operations in the auxiliary mode.

- B. **JOG mode:** This mode is effective only in JOG running. When the JOG speed parameter PA-21 is a non-zero value, on the main menu, press **M** to select the auxiliary mode, and press **↑** and **↓** to select the JOG running mode. “**JOG---**” is displayed through the digital display. Press **S**, “**R ---**” is displayed, which indicates that the system enters into the running state. Press and hold **↑**, then the servo drive and motor run at the speed specified by **PA-21**. Press **↓**, then the motor run at the speed specified by **PA-21** in the opposite direction. Release the **↑** or **↓** to stop the motor. Press **S** to return to the auxiliary mode. Press **M** to switch to another mode, or press **↑** and **↓** to select other operations in the auxiliary mode.
- C. **Alarm resetting mode:** When the servo drive unit generates an alarm, press **S** to reset the system in this mode. If the fault is cleared, the servo drive unit returns to normal. Press **M** to switch to another mode, or press **↑** and **↓** to select other operations in the auxiliary mode.
- D. **Default restoration mode:** This mode is used to set the parameters to the default values. In this mode, press **S** to restore system parameters to default values. Press **M** to switch to another mode, or press **↑** and **↓** to select other operations in the auxiliary mode.
- E. **Alarm history clearance mode:** This mode is used to clear alarm history records. In this mode, press **S** to clear the alarm history records. Press **M** to switch to another mode, or press **↑** and **↓** to select other operations in the auxiliary mode.

F、Encoder zero calibration



Φ Auxiliary correct encoder zero calibration of the motor.

G、Parameter self-adjustment



Φ Automatically adjust parameters of the motor drive to match the inertia of load .

H、The encoder reset 

Φ Support automatic reset of several encoders.

## 6.6 Operations in the Control Parameter Mode



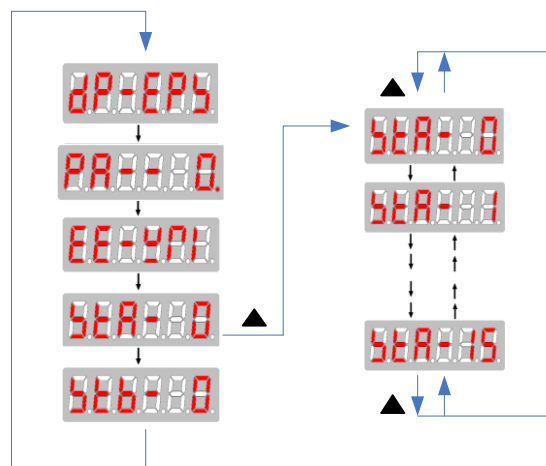


1. On the main menu, select “STA-0”, and press  and  to enter the secondary menu for the control parameter mode.
2. Series HSV-180AD servo drive contains 16 types of control parameters.

Figure 6-9 Secondary menu for the control parameter mode



1. On the main menu, select “STA-0”, and press  and  to enter the secondary menu for the control parameter mode.
2. Series HSV-180AD servo drive contains 16 types of control parameters.

## 6.7 Operation in the Auxiliary Mode



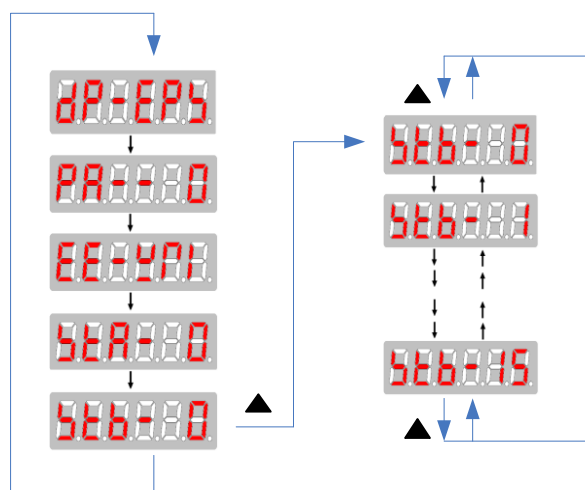
1. On the main menu, select “STA-0”, and press  and  to enter the secondary menu for the control parameter mode.
2. Series HSV-180 AD servo drive contains 16 types of control parameters.

Figure 6-10 Secondary menu for the auxiliary mode






## 6.8 Control Parameter Setting and Saving

### Caution

- The control parameter setting cannot take effect immediately. The new parameter can be confirmed by pressing **[S]** only in the "EE-WRI" of auxiliary mode, and it takes effect after restarting the servo drive.
- Wrong settings may cause improper operation that leads to accidents.


1. Select **PR-000** on the main menu, press **[↑]** and **[↓]** to select a control parameter number, and then press **[S]** to display the value of the parameter. Press **[↑]** and **[↓]** to change the parameter value.
2. The parameter value increase or decrease 1 every time you press **[↑]** or **[↓]** respectively.
3. After the parameter modification is completed, the corresponding decimal point on the LED digital tube light, press **[S]** to return to the control parameter mode menu.
3. The control parameter setting cannot take effect immediately. If changing or setting parameters, you should firstly set **PR0034** as **001230**, then save the parameter change by pressing **[S]** to return to the main menu and pressing **[M]** to



select the auxiliary mode. Then press  and  to select "**EE-WRI**", and then press  to save the changed parameter value to EEPROM. The wire control box displays **FINISH**, indicating that the parameter value is saved.

4. The changed control parameter takes effect as a default control parameter after restarting the servo drive.

NOTE:

If changing **PA—24** to **PA--28**, **PA--59**, you should firstly set  as

.

## 7. Parameter Setting

### Attention

- Personnel that set parameters must understand the meanings of the parameters. Wrong setting could result in damage to the equipment and injuries.
- It is recommended that parameter modification be performed under the condition that servo motor run without load.



### 7.1 Function Menu



#### 7.1.1 Parameters illustration

Users can set various parameters for series HSV-180AD servo drive to adjust or set the performances and functions of the drive unit. This section describes the purpose and functions of these parameters. Understanding these parameters is essential for a best use and operation of the drive unit.

Series HSV-180 AD servo drive parameters can be divided into four categories: movement parameter , expanding movement parameter control parameter and expanding control parameter. (applicable to movement parameter mode , expanding movement parameter mode,control parameter mode respectively and expanding control parameter mode). These parameters can be viewed, set and modified by keys or computer serial ports on the wire control box.

Table 7-1 Description of the three types of modes

Mode	Group	Parameter No.	Description
Movement parameter mode		0~43	Able to set speed regulator, specially modification, and motor related parameters.
Expanding movement parameter mode		0~43	Able to set parameters I/O, I/O interface function, notch filter ,the nominal motor current, speed etc

Control parameter mode		0~15	Able to set servo orientation speed, orientation position。
Expanding control parameter mode		0~15	Able to set control functions can be enabled or disabled etc.

### 7.1.2 Parameter operation instructions

This section describes the modify and view parameters during debugging and precautions, does not include the adjustment and adaptation of parameters

- 1、 Drive unit can only view the movement parameter PA, status monitoring, auxiliary parameters and control parameters STA parameters after power on.
- 2、 Set PA—34to 2003, you could view or modify parameters PA and STB.
- 3、 Any time, PA--23 、 PA--24、 PA—25、 PA—26 are effective only when saving parameters and restarting power.
- 4、 Before the drive unit running, you must modify parameter PA—43 (Notice: modify parameter PA--43 after setting PA--34 to 2003) .  
If the drive unit and motor code is not in Table 7.3, you need to set the parameters related to the motor manually, and refer to 7.2.7.Non-standard motor parameters
- 5、 The drive unit performance debugging please refer to the relevant sections of 7.2.
- 6、 The steps of trial operation of the drive unit, please reference the relevant sections of Chapter 8.

## 7.2 Movement Parameter Mode

### 7.2.1 Movement parameters

Series HSV-180AD servo drive can provide 44 movement parameters. For details about the movement parameters, see Table 7-2, and Table 7-3.

In the application control mode:

**P:** indicates position control

**S:** indicates speed control.

**T:** torque mode

Table 7-2 Movement parameters

No.	Parameter	Applic ation Contro l Mode	Value Range	Default Value	Unit
0	Position proportional gain	P	20~10000	1000	0.01 Hz

1	Position feed forward gain	P	0~150	0	1%
2	Speed proportional gain	P, S	20~10000	400	
3	Speed integral time constant	P, S	15~500	20	ms
4	Speed feedback filter factor	P, S	0~9	1	
5	Current amplitude limit for maximum torque	P, S, T	30~500	250	
6	Acceleration time constant	S	1~32000	200	1ms/1000rpm
7	Speed command input gain	S	100~9000	2000	
8	Speed command zero drift compensation	S	-6000~6000	0	
9	Torque command input gain	T	100~300	100	
10	Torque command zero drift compensation	T	-1023~1023	0	
	Inversion of Table position feedback signal	P	0 or 512	0	
11	Orientation-finished range	P	0~3000	100	0.0001 r
12	Position tolerance test range	P	1~100	20	0.1r
13	Position command pulse frequency molecular	P	1~32767	1	
14	Position command pulse frequency denominator	P	1~32767	1	
15	Maximum current amplitude limit for positive torque	P, S, T	0~500	280	1%
16	Maximum current amplitude limit for negative torque	P, S, T	-500~0	-280	1%
17	Maximum speed limitation	P, S	10~12000	2500	1r/min
18	Overload Torque setting	P, S, T	30~200	200	1%
19	Software overload time	P, S	40~32000	1000	0.01s
20	Internal speed	S	-3200~3200	0	0.1r/min
21	JOG operation speed	P, S	0~2000	300	1r/min
22	command pulse input mode	P	0~3	1	

23	Selection of control mode	P, S, T	0~7	0	0: Position control 1: Simulation speed 2: Analog torque 3: Internal rate 7: Encoder Zero calibration
24	Magnetic pole logarithm of the servo motor	P, S, T	1~20	3	
25	Encoder resolution	P, S, T	0~9	2	0: 1024 1: 2000 2: 2500 3: 6000 4: ENDAT2.1 5: BISS 6: HiperFACE 7:TAMAGAWA
26	The encoder zero offset	P, S, T	-32467~32767	0	
27	Current control proportional gain	P, S, T	10~32767	2000	
28	Current control integration time	P, S, T	1~2047	100	0.1ms
29	The second position command pulse frequency molecular	P	1~32767	1	
30	The third position command pulse frequency molecular	P	1~32767	1	
31	State control 1		-32467~32767	4096	STA15-STA0
32	Feed forward control filter time constant	P, S	0~3000	0	1ms
33	Torque command filter time constant	P, S	0~3000	0	1ms

34	User passport set	P, S, T	0~2806	240	
35	Position command filter time constant	P	0~3000	0	1ms
36	Communication baud rate		0~3	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
37	Position of serial communication axis	P, S	1~15	1	
36	Ratio of load inertia and rotary inertia	P, S	0 ~ 15	1	
37	Mechanical load rigidity	P, S	0~9	4	
38	Deceleration time constant	S	1~32000	200	1ms/1000rpm
39	The fourth position command pulse frequency molecular	P	1~32767	1	
39	Position of serial communication axis	P, S, T	1 ~ 63	1	
40	Brake Output Delay	P, S	0~2000	0	Unit: ms; Brake output delay time after the servo OFF
41	Permissible speed brake output threshold	P, S	10~300	100	Unit: 1rpm; Only below this setting allows the brake action
42	Speed reach range	P, S	1~500	10	Unit: 1rpm
43	Specifications and motor drive unit type code ◆	P, S	0~1999	101	thousand: 0: HSV-180AD hundred: 0: 35A 1: 50A 2: 75A 3: 100A 4: 150A 5: 200A 6: 300A 7: 450A

					Ten and a bit indicates the type of motor。 See form7.3
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**Note:**

If changing ◆ parameter, you should firstly set PA--34 to 881230, otherwise it's invalid.

Table 7-2 Movement parameters with Dench drive

Motor Type	Rated Power (KW)	Rated Torque (Nm)	Rated Electric current (A)	Adapter drive unit	PA-43 parameters	Adjusted drive unit
GK6073-6AC61	2000	11	5.6	00	0	HSV-180AD-035
GK6080-6AC61	2000	16	6.8	01	1	
GK6081-6AC61	2000	21	10	02	102	HSV-180AD-050
GK6083-6AC61	2000	27	13.3	03	103	
GK6085-6AC61	2000	33	16.5	04	204	HSV-180AD-075
GK6087-6AC61	2000	37	18.5	05	205	
GK6089-6AC61	2000	42	21	06	306	HSV-180AD-100
GK6105-8AC61	2000	45	19.5	07	307	
GK6107-8AB61	1500	55	17.9	08	308	
GK6109-8AB61	1500	70	23.1	09	309	

Table 7-3 Movement parameters with Huada drive

Motor Type	Rated Power (KW)	Rated Torque (Nm)	Rated Electric current (A)	Adapter drive unit	PA-43 parameters	Adjusted drive unit
110ST-M02515HMBB	1500	2.5	2.5	20	20	HSV-180AD-035
110ST-M03215HMBB	1500	3.2	2.5	21	21	
110ST-M05415HMBB	1500	5.4	3.5	22	22	
110ST-M06415HMBB	1500	6.4	4.0	23	23	
110ST-M02420HMBB	2000	2.4	2.5	24	24	
110ST-M04820HMBB	2000	4.8	3.5	25	25	
130ST-M03215HMBB	1500	3.2	2.5	26	26	

130ST-M05415HMBB	1500	5.4	3.8	27	27	
130ST-M06415HMBB	1500	6.4	4.0	28	28	
130ST-M09615HMBB	1500	9.6	6.0	29	29	
130ST-M14615HMBB	1500	14.3	9.5	30	30	
130ST-M04820HMBB	2000	4.8	3.5	31	31	
130ST-M07220HMBB	2000	7.2	5.0	32	32	
130ST-M09620HMBB	2000	9.6	7.5	33	133	HSV-180AD-050
130ST-M14320HMBB	2000	14.3	9.5	34	134	
150ST-M14615HMBB	1500	14.6	9.0	35	135	
150ST-M19115HMBB	1500	19.1	12.0	36	136	
150ST-M22315HMBB	1500	22.3	13.0	37	237	HSV-180AD-075
150ST-M28715HMBB	1500	28.7	17.0	38	238	
150ST-M14320HMBB	2000	14.3	9.0	39	239	
150ST-M23920HMBB	2000	23.9	14.0	40	240	
150ST-M26320HMBB	2000	26.3	15.5	41	241	

### 7.2.2 Extension movement parameters

Select PA—34 to 2003 in the PA motion parameters, could see the extension movement parameter model (PB parameter model), HSV-180AD have 44 extended motion control parameters.

Table 7-4 Extension movement parameters

NO.	Parameter	Applicable Method	Scope	Default value	Unit
0	The second position proportional gain	P	20~10000	400*	0.1Hz
1	Second speed proportional gain	P, S	20~10000	250*	
2	The second integration time constant speed	P, S	15~500	20*	ms
3	The second torque command filter time constant	P, S	0~500	0	0.1ms



4	Gain switching condition	P	0~5	0	0: Fixed for the first gain 1: Fixed to the second gain 2: Switch control cutover 3: Command frequency control 4: Bias pulse control 5: Motor speed control
5	Gain switching threshold	P	0~10000	10	Command frequency 0.1Kpps/unit Deviation pulse :pulse Motor speed :1rpm
6	Gain switching hysteresis width	P	1~10000	5	the same as above
7	Gain switching lag time	P	0~10000	2	Unit: ms Gain switching conditions are met to start switching time
8	Position gain switch delay time	P	0~1000	5	Unit: ms Set the position gain first-order low-pass filter when gain switching
9	Zero speed output detection range	P, S	1~100	10	Unit: 1rpm
10	Servo motor delay	P, S	0~3000	20	Unit: ms

	caused by power off				Time of input PWM after servo OFF delay
11	Weakening speed	P, S	1000~4500	1800	Unit: 1rpm
12	Torque inertia ratio value	P, S	10~20000	880	Unit: (Nm/Kgm <sup>2</sup> )
13	Load inertia ratio	P, S	10~300	10	Unit: 0.1
14	Digital output O4 function	P, S	-9~+9	8	Refer to function O1
15	Digital inputs I1 function	P, S	-16~+16	1	0: Invalid Input 1: Servo enable 2: Alarm Clear 3: Deviation Clear 4: Pulse ban 5: Reverse over travel 6: Forward over travel 7: Zero speed lock 8: Gain switch 9: Electronic gear switch 0 10: Electronic gear switch 1 11: Positive torque limit 12: Negative torque limit 13: Emergency stop switch 14: Internal speed selection 1 15: Internal speed selection 2 16: Internal speed selection 3

					The negative sign indicates input level negated
16	Digital inputs I2 function	P, S	-16~+16	2	the same as above
17	Digital inputs I3 function	P, S	-16~+16	3	the same as above
18	Digital inputs I4 function	P, S	-16~+16	4	the same as above
19	Digital inputs I5 function	P, S	-16~+16	-5	the same as above
20	Digital inputs I6 function	P, S	-16~+16	-6	the same as above
21	Digital Output O1 function	P, S	-9~+9	5	0: Invalid 1: Forced valid 2: Servo ready 3: Alarm Output 4: Reach zero speed 5: Positioning completed 6: Speed reached 7: Torque limits 8: Electromagnetic brake output 9: Zero speed Locking minus sign indicates that the output level is inverted.
22	Digital Output O2 function	P, S	-9~+9	2	the same as above
23	Digital Output O3 function	P, S	-9~+9	3	the same as above
24	Internal speed 1	S	-6000~6000	0	1r/min

25	Internal speed 2	S	-6000~ 6000	0	1r/min
26	Internal speed 3	S	-6000~ 6000	0	1r/min
27	Internal speed 4	S	-6000~ 6000	0	1r/min
28	Internal speed 5	S	-6000~ 6000	0	1r/min
29	Internal speed 6	S	-6000~ 6000	0	1r/min
30	Internal speed 7	S	-6000~ 6000	0	1r/min
31	State control 2		-32767~ 32767		STB15-STB0
32	The first notch frequency	P, S	100~2000	1500	Hz
33	The first notch width	P, S	0~20	2	
34	The first notch depth	P, S	0~100	0	
35	The second notch filter frequency	P, S	100~2000	1500	Hz
36	The second notch filter width	P, S	0~20	2	
37	The second notch filter depth	P, S	0~100	0	
38	Notch filter application mode	P, S	0~3	0	0: Notch filter is invalid 1: Notch filter 1 is valid 2: Notch filter2 is valid 3: Notch filter1,2 are valid

39	Position command smoothing factor	P	0~31	0	Moving Average number of position command FIR filter
40	Feedback pulse output divider factor	P, S	1000~15000	2500	Motor feedback output to the number of pulses per revolution of the PC (×4)
41	Command pulse input Corresponding motor Feedback pulse number	P	1000~25000	2500	Unit:Pulse PC output pulse number corresponding to the motor rotation lap (×4) When STB4 zero, electronic gear parameters PA13, PA14 valid When STB4 1, electronic gear for the servo motor revolution needed to command input pulse direct calculation. At this time, the electronic gear parameter is invalid.
42	◆Motor rated current	P, S	300~15000	680	0.01A
43	◆Rated motor speed	P, S	100~9000	2000	1r/min

Note: The label ◆ parameters will be automatically configured in the PA-43.

### 7.2.3 Description of the parameter setting:

#### PA--17

NO.	Parameter	Scope	Default value	Unit
PA--17	Maximum speed limit	100~12000	2500	1r/min

Function and setting:

- 1、 According to motor type set maximum speed of the servo motor.
- 2、 Regardless of the direction of rotation.

#### PA--24

NO.	Parameter	Scope	Default value	Unit
PA--24	Magnetic logarithm of servo motor	1~12	3	

Function and setting:

- 1、 According to motor type set maximum speed of the servo motor。

#### PA--25

NO.	Parameter	Scope	Default value	Unit
PA--25	Servo motor encoder optical -electrical resolution	0~7	4	

Function and setting:

- 1、 PA--25 must be filled in based on the technical data of the motor.
- 2、 Setting parameters:
  - 0: 1024pps
  - 1: 2000pps
  - 2: 2500pps
  - 3: 6000 Sine and cosine incremental encoder
  - 4: ENDAT2.1 encoder
  - 5: BISS encoder
  - 6: HiperFACE encoder
  - 7: TAMAGAWA encoder
  - 8,9: Reserved

#### PA--26

NO.	Parameter	Scope	Default value	Unit
PA--26	Encoder zero offset	-32767~32767	0	

## Function and setting:

- 1、 Set encoder zero offset
- 2、 Adapter Dench motor mounting incremental encoder  
(PA--25=0,1,2,3),the parameter is the number of pulses distance to zero pulse..
- 3、 When the motor encoder is absolute encoder, the parameters is the number of pulses at 16 bit resolution for conversion.

Dench GK6 (8) servo motor

GK6(8)-XXX-XXX61-JE(JB) JE(JB) means installation Heidenhain EQN1325 encoder

At this time: GK6(8)-XXX-XXX61-JE(JB) JE(JB);

**PA--42**

NO.	Parameter	Scope	Default value	Unit
PA--42	Motor rated current	300~15000	680	0.01A

## Function and setting:

- 1、 Set the motor rated current;
- 2、 The parameters will be adjusted automatically after matching PA—43.

**PA--43**

NO.	Parameter	Scope	Default value	Unit
PA--43	Motor rated speed	100~9000	2000	1r/min

## Function and setting:

- 1、 Set the motor rated speed;
- 2、 The parameters will be adjusted automatically after matching PA—43.

**7.2.4 Parameters Related to Movement Control****PA--0**

NO.	Parameter	Scope	Default value	Unit
PA--0	Position proportional gain	20~10000	400	0.1Hz

## Function and setting:

1. Set position proportional gain.

2. The greater of the parameter value, the greater of the gain and the rigidity, and the smaller of the position lag value at the same frequency of the command pulse. Note: the value is too large may cause oscillation or overshooting.

3. The parameter value is determined according to the type of servo drive and operating load.

**PA--1**

NO.	Parameter	Scope	Default value	Unit
PA--1	Position forward gain	0~150	0	1%

Function and setting:

1. Set Position forward gain
2. When setting 100%, position lag is always 0 in any frequency command pulse.
3. The greater of gain the position loop, the greater of the high speed response characteristic of the control system, but it will make the system more prone to oscillation.
4. The parameter is usually set to 0 when there is not need very high response characteristics

**PA--11**

NO.	Parameter	Scope	Default value	Unit
PA--11	Positioning complete range	0~3000	100	0.0001r

Function and setting:

- 1、Set the, positioning complete pulse range under position control mode  
 $PA--11 * 0.0001 * \text{motor pulses}$   
 If set  $PA--11 = 1000$ , motor runs 10000 pulses per revolution. Positioning complete range is  $1000 * 0.0001 * 10000 = 1000$  pulses.
- 2、This parameter judges whether driving unit complete positioning under the position control mode. when the remaining pulse in the deviation counter is less than or equal to the parameter setting range, it means the drive unit has been complete positioning. The positioning complete switch signal output ON, otherwise OFF.
- 3、Under the position control mode( $PA--23=0$ ), output positioning complete signal.



**PA--12**

NO.	Parameter	Scope	Default value	Unit
PA--12	Range of position tolerance	1~100	20	0.1 ring

Function and setting:

1、Set range of position tolerance:

PA--12 \* 0.1 ring

Or (PA--12 \* 0.1 \* motor pulses) pulse.

2、Under the position control mode (PA--23=0), when the position deviation counter exceeds the range of the parameter, the drive unit gives alarm.

If set PA--12 = 20, motor runs 10000 pulses per revolution. Then the Range of position tolerance:  $20 * 0.1 = 2$  or  $20 * 0.1 * 10000 = 20000$  pulses

**PA—13/14**

NO.	Parameter	Scope	Default value	Unit
PA--13	Position command pulse frequency molecular	1~32767	1	
PA--14	Position command pulse frequency denominator	1~32767	1	

Function and setting:

1、Set the position command pulse sub-octave (electronic gear)

2、Under position control mode (PA - 23 = 0), through setting the PA - 13 and PA - 14 parameter, could be easily matched with a variety of pulse source, in order to achieve ideal control resolution (angle / pulse)

3、 $P \times G = N \times C$

P: the number of pulses input commands

G: electronic gear ratio  $G = \text{Position command pulse frequency molecular} / \text{Position command pulse frequency denominator}$

N: motor rotation number;

C: the motor encoder pulses

4、If instruction input pulse is 6000, the servo motor rotates 1 circles, the motor encoder is 2500 lines of incremental photoelectric.

$$G = \frac{N \times C}{P} = \frac{1 \times 2500 \times 4}{6000} = \frac{5}{3}$$

Setting PA—13 to 5, PA—14 to 3

5、The range of electronic gear ratio is  $\frac{1}{50} \leq G \leq 50$








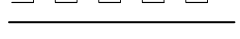

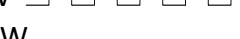
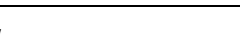
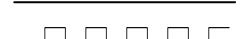
**PA--22**

NO.	Parameter	Scope	Default value	Unit
PA--22	Command pulse input mode	0~3	1	

Function and setting:

1. Set parameters to the command pulse mode
2. Set parameters to one of the 3 types of input mode.
  - 0: indicates two-phase positive pulse input
  - 1: indicates pulse + direction
  - 2: indicates CCW pulse/CW pulse
3. CCW is defined as forward for the servo rotating counterclockwise (looking from the axial direction).
4. CW is defined as reverse for the servo rotating clockwise (looking from the axial direction).

Table 7.5 Command pulse

Signal input pin	pulse		Command Pulse Input Mode (movement parameter <b>PA-22</b> ) Setting
	Forward	Reverse	
CP XS4-14 XS4-15 DIR XS4-16 XS4-17	A  B 	A  B 	0 (positive pulse)
	CP  DIR 	CP  DIR 	1 (pulse + direction)
	CW  CCW 	CW  CC 	2 (CW+CCW) (CW+CCW)

#### PA--23

NO.	Parameter	Scope	Default value	Unit
PA--23	Selection of control mode	0~7	0	

Function and setting:

This parameter is used to select control mode for the servo drive.

- 0: indicates the C-axis position control mode, receiving the position pulse input command.

- **1:** indicates the external speed control mode, receiving speed analog input command.
- **2:** indicates the external speed control mode, receiving speed pulse input command.
- **3:** indicates the internal speed control mode. The internal speed command is set by movement parameter **PA-20**.
- **4:** Multi-speed mode
- **7:** Motor encoder Zero calibration mode

**PA--29**

NO.	Parameter	Scope	Default value	Unit
PA--29	The second position command pulse frequency molecular	1~32767	1	

Function and setting:

- 1、 Set the second position command pulse frequency molecular
- 2、 This parameter is valid when STA-13 is 1。

**PA--30**

NO.	Parameter	Scope	Default value	Unit
PA--30	The third position command pulse frequency molecular	1~32767	1	

Function and setting:

- 1、 Set the third position command pulse frequency molecular

**PA--33**

NO.	Parameter	Scope	Default value	Unit
PA--33	Position forward filter time constant	0~3000	0	ms

Function and setting:

- 1、 Set position forward filter time constant.

- 2、 The smaller the time constant, the faster of response characteristics of the control system, make the system unstable, oscillation.

**PA--35**

NO.	Parameter	Scope	Default value	Unit
PA--35	Position command smoothing time	0~3000	1	

Function and setting:

- 1、 Set position command smoothing time.
- 2、 The smaller the time constant, the faster of response characteristics of the control system.
- 3、 The larger the filter time constant, the slower response of the control system, this parameter is usually set to 0.

**PA--39**

NO.	Parameter	Scope	Default value	Unit
PA--39	The fourth position command pulse frequency molecular	1~32767	1	

Function and setting:

- 1、 Set the fourth position command pulse frequency molecular.

## 7.2.5 Parameters Related to Speed Control Mode

Table 7.6 Parameters related to speed control mode

NO.	Parameter	Function	Value Range
PA--2	Speed proportional gain 1	1.Set parameters to the proportional gain for the speed regulator. 2.Gain and rigidity will be enhanced as the parameter value increases. This parameter is determined by the actual servo drive system type and the load. Generally, load inertia grows as the value increases. 3.It is recommended that the value be larger if no oscillation exists. 4.this parameter will be automatically adjusted after setting PA 43 .	20~10000
PA--3	Speed	1.Set this parameter to the speed regulator	5~500mS

	integral time constant 1	<p>integration time constant.</p> <p>2.Integration speeds up as the value decreases. This parameter is determined by the actual servo drive system type and the load. Generally, load inertia grows as the value increases.</p> <p>3.It is recommended that the value be smaller if no oscillation exists.</p> <p>4.this parameter will be automatically adjusted after setting PA 43 .</p>	
PA--4	Speed feedback filter factor	<p>1.Set this parameter to the features of low-pass filter for speed feedback.</p> <p>2.Noise produced by motors and cut-off frequency decreases as the value increases. If the load inertia is large, decrease the value to prevent from slow response or oscillation.</p> <p>3.The cut-off frequency increases and speed feedback response becomes faster as the value decreases. If high speed feedback response required, decrease the value.</p>	0 ~ 9
PA--38	Deceleration time constant	<p>1. The value indicates the time required for motor slow down from the 1000 speed to 0r/min.</p> <p>2. Deceleration features linearity.</p>	1~32000
PA--6	Acceleration time constant	<p>1. The value indicates time required for motor speed up from 0 r/min to 1000 speed.</p> <p>2. Acceleration features linearity.</p>	1~32000
PA--7	Analogue speed command input gain	<p>1.Set this parameter to the relationship between voltage and rotary speed under analogue speed command mode.</p> <p>2.The value is the speed corresponding to the + 10 V voltage ( unit: 1 r/min)</p> <p>3.The valve is effective under the external speed control mode.</p>	0~6000
PA--8	Speed command zero drift compensation	<p>1. In the speed control mode, this parameter is used to adjust zero drift input by external analogue speed command. The method of adjustment is as follows:</p> <ul style="list-style-type: none"> <li>● Perform short-connection between the analogue control input terminal and grounding wire for signal.</li> </ul>	-1023~+1023

		<ul style="list-style-type: none"> <li>● Set this parameter to the value that stops the operation of the motor.</li> </ul>	
PA— 20	Internal speed	1. Set parameters to the internal speed when PA--23=3. 2. In the internal control mode, select the internal speed as the speed command.	-32000～32000 (unit: 1r/min)
PA— 21	JOG operating speed	1. Set this parameter to the speed in the JOG mode.	0～2000 (unit: 1r/min)
PA— 23	Selection of control mode	4. This parameter is used to select the control mode for servo drive. <ul style="list-style-type: none"> <li>● <b>0</b>: Position control mode, receiving computer position command pulse.</li> <li>● <b>1</b>: indicates the external speed control mode, receiving speed analog input command.</li> <li>● <b>2</b>: indicates the external speed control mode, receiving speed pulse input command.</li> <li>● <b>3</b>: indicates the internal speed control mode. The internal speed command is set by movement parameter <b>PA-20</b>.</li> <li>● <b>4</b>: multi speed mode</li> <li>● <b>7</b>: the motor encoder zero mode</li> </ul>	0～7
PA— 42	speed reached range	1. Set parameters to speed reached. 2. In the speed control mode, if the motor speed is less than the set value, the rate reaches the switch signal to ON, otherwise OFF	1～500r/min

## 7.2.6 Parameters Related to Output Torque Regulation

### PA--5

NO.	Parameter	Scope	Default value	Unit
PA--5	Maximum torque output rate	30～500	250	1%

Function and setting:

- 1、 Set the maximum torque output rate.
- 2、 The value represents the maximum output torque is multiple of the motor torque
- 3、 Any time ,this limitation is effective.
- 4、 30~ 500 means the set range: 0.3~ 5 times of the rated torque.
- 5、 This parameter will be corresponding adjusted according to PA—43.

**PA--9**

NO.	Parameter	Scope	Default value	Unit
PA--9	Torque command input gain	80~32000	20000	

Function and setting:

- 1、Set the relationship of voltage and torque of external analog torque command.
- 2、Only in the torque control mode (PA--23=2) effectively.

**PA--10**

NO.	Parameter	Scope	Default value	Unit
PA--10	Torque command zero drift compensation	-1023~ +1023	0	

Function and setting:

- 1、In the torque control mode (PA--23=2), adjust the zero drift. of external analog torque.
- 2、Adjustment methods are as follows:

The external analog input terminal and the signal ground short circuit, set the parameters until the motor does not turn.

**PA--15/PA--16**

NO.	Parameter	Scope	Default value	Unit
PA--15	Positive maximum torque output rate	0~500	280	1%
PA--16	Negative maximum torque output rate	-500~0	-280	1%

Function and setting:

- 1、Set the internal torque limiting value in the CCW/CW direction of the servo
- 2、The value is the desired positive /negative maximum output torque.
- 3、When STA10 is set to 1, the two limit are effective.
- 4、If PA--15>PA 5(or |PA--16| >PA--5), the actual output rate is restricted to a maximum torque output rate permitted by PA—5.
- 5、The corresponding range: 0~ 5 times of the positive /negative output torque.
- 6、PA--15 ≤ PA--5; |PA--16| ≤ PA—5.

**PA--18**

NO.	Parameter	Scope	Default value	Unit
PA--18	overload torque	30~200	120	1%

Function and setting:

- 1、 Set the system overload torque.
- 2、 Any time, this limitation is effective.
- 3、 30~200 means the set range: 0.3~2times of overload torque.
- 4、 PA--18 ≤ PA—5.
- 5、 The parameter will be automatically adjusted after PA—43 set

#### PA--19

NO.	Parameter	Scope	Default value	Unit
PA--19	Overload time	40~32000	1000	10ms

Function and setting:

1. Set this parameter to the allowable overloading time of the system.
2. The value indicates the overloading time per time unit (unit: 0.1s). For example, if the value is **1000**, the allowable overloading time is **10s**.
- 3.The value is effective at any time.

#### PA--23

NO.	Parameter	Scope	Default value	Unit
PA--23	Control mode selection	0~7	0	

Function and setting:

- **0**: Position control mode, receiving computer position command pulse.
- **1**: indicates the external speed control mode, receiving speed analog input command.
- **2**: indicates the external speed control mode, receiving speed pulse input command.
- **3**: indicates the internal speed control mode. The internal speed command is set by movement parameter **PA-20**.
- **4**: multi speed mode
- **7**: the motor encoder zero mode

#### PA--27

NO.	Parameter	Scope	Default value	Unit
PA--27	Current control proportional gain	10~32767	2600	

Function and setting:

- 1、 Set this parameter to the proportional gain of current loop.
- 2、 Decrease the value to decrease the loud noise of current during motor operation.
- 3、 However, a small value will decrease the feedback response.



**PA--28**

NO.	Parameter	Scope	Default value	Unit
PA--28	Current control integration time	10~32767	2600	

Function and setting:

1. Set this parameter to the integration time of current loop.
2. Increase the value to decrease the loud noise of current during motor operation.
3. A big value will decrease the feedback response.

**PA--32**

NO.	Parameter	Scope	Default value	Unit
PA--32	Torque command filter time constant	0~500	0	0.1ms

Function and setting:

- 1、 Set the Torque command filter time constant.
- 2、 The greater of the time constant, the slower of response of the control system. it will make the system unstable, oscillation.

### 7.2.7 Non standard motor parameter settings

Select HSV-180AD series servo drive unit, refer to table 7.3.

If the code cannot be found in Table 7.3, or use other manufacturers IM servo motor, you must manually set the operating parameters. Details as follows:

1. Confirm whether the servo motor specifications match with the drive unit specifications
2. Confirm whether the servo drive unit is installed to support the servo motor encoder.

3. Setting parameters according to the type of IM servo motor:

Setting PA--34 to 2003

Setting PA--43 according to the type of servo motor

HSV-180AD-035: Setting PA—59 to 1

HSV-180AD-050: Setting PA—59 to 102

HSV-180AD-075: Setting PA—59 to 203

HSV-180AD-100: Setting PA—59 to 304

HSV-180AD-150: Setting PA—59 to 405

According to the actual requirement, set PA—17, PA—24, PA—25, PA--26, PB--42 and PB--43

4. Setting PA--34 to 1230, saving parameters in the secondary menu , and restart the drive unit.
5. Confirmation whether phase sequence of the servo motor is correct.
6. Drive unit access systems up to running after confirmation.

## 7.3 Control Parameter Mode

Series HSV-180AD servo drive unit provides 16 control parameters, see Table 7-6, 7-7. For the parameter operation, setting, modifying and saving.

### 7.3.1 Control Parameter

Table 7-6 Control Parameters(state control number is 1 )

NO.	Parameter	Function	Description
0	STA-0	Position command interface selection	0: Serial pulse 1: NCUC
1	STA-1	Reserved	
2	STA-2	This parameter is used to specify whether feedback break-off alarm is allowed.	0: Allow 1: Not allow
3	STA-3	This parameter is used to specify whether system overspeed alarm is allowed.	0: Allow 1: Not allow
4	STA-4	This parameter is used to specify whether position over-tolerance alarm is allowed.	0: Allow 1: Not allow
5	STA-5	This parameter is used to specify whether Software overheating alarm is allowed.	0: Allow 1: Not allow
6	STA-6	This parameter is used to specify whether the internal SVR-ON control start is allowed.	1: Internal enable 0: External enable
7	STA-7	This parameter is used to specify whether system main power undervoltage alarm is allowed.	1: Not allow 0: Allow
8	STA-8	This parameter is used to specify whether the forward over travel switch input is allowed.	1: Allow 0: Not allow
9	STA-9	This parameter is used to specify whether the reverse over travel switch	1: Allow 0: Not allow

		input is allowed.	
10	STA-10	This parameter is used to specify whether positive and negative torque limit is allowed.	<b>1:</b> Allow <b>0:</b> Not allow
11	STA-11	Reserved	
12	STA-12	This parameter is used to specify whether motor overheat alarm is allowed.	<b>1:</b> Not allow <b>0:</b> Allow
13	STA-13	Electronic gear ratio dynamic switching selection	<b>1:</b> Not allow <b>0:</b> Allow
14	STA-14	Gain switching enable.	<b>1:</b> Not allow <b>0:</b> Allow
15	STA-15	This parameter is used to specify whether the drive unit overheat alarm is allowed.	<b>1:</b> Not allow <b>0:</b> Allow

### 7.3.2 Extended control parameters

Set PA—34to2003 in the motion parameters, could open the extension control parameter mode. HSV-180AD have a total of 16 extended control parameters of STB

Figure 7-7 Description of the extended control parameters

(State control word 2)

NO.	Parameter	Function	Description
0	STB-0	Command pulse source	0: The position pulse from the computer
			1: The position pulse from the internal PA--20
1	STB-1	Zero speed switch enable	0: Not allowed
			1: Allowed
2	STB-2	Whether the output Z pulse width is expanded	0: No expansion
			1: Expansion
3	STB-3	Complete positioning output mode selection	0: The position tracking error is less than the limit value
			1: No position command input and the position tracking error is less than the limit value

4	STB-4	The electronic gear function selection	0: Select PA—13 and PA--14
			1: Select PB—4 command pulse corresponding feedback number calculation of electronic gear ratio
5	STB-5	Speed adaptive feature selection	0: Not select 1: Select
6	STB-6	Reserved	
7	STB-7	Position filter selection	0: Low pass filter
			1: Smoothing filter
8	STB-8	Whether the emergency stop function is allowed	0: Not allowed
			1: Allowed
9	STB-9	Torque motor mode selection	0: General servo motor
			1: Torque servo motor
10	STB-10	Pulse frequency divider output mode enable	0: Incremental encoder output directly
			1: Digital encoder output frequently
11	STB-11	Speed feedback filter selection	0: First order low pass filter
			1: Second order low pass filter
12 13	STB-12 STB-13	Full closed loop position feedback signal selection	Incremental encoder feedback STB-13 = 0 STB-12 = 0:
			ENDAT absolute encoder feedback STB-13 = 1 STB-12 = 0:
			Sine cosine 1Vpp analog signal feedback: STB-13 = 1 STB-12 = 1:
14	STB-14	Full closed loop position control enable	0: Not allowed
			1: Allowe
15	STB-15	Lock control of the operation keys	0: Do not lock the operation keys
			1: Lock keys (Unlock: SET+MODE)

## 8. Operation and Modification

### Caution

- The servo drive and motor must be reliably grounded, and PE terminal must be connected with the grounded terminal of the equipment reliably.
- The power can be connected only after the wiring is correct.
- Emergency stop circuit must be provided to make sure the power could be stopped at once in case of emergency.
- If a drive alarm is reported, make sure the alarm is cleared and the servo enable input signal (EN) is ineffective before restarting the drive unit.
- After the servo drive and motor are power off, do not touch the servo drive within 5 minutes to avoid electronic shock.
- Be cautious to prevent burning as the temperature may get higher after the servo drive and motor running for a period of time.

### 8.1 Power Connection

#### 8.1.1 Checking Before Running

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

- Whether the type of drive unit HSV-180AD-200 and above is correct and reliable? Whether the input voltage is correct?
- Whether the strong power terminal (L1、L2、L3、U、V、W、P、BK、PE) is correct and reliable? Whether the input voltage is correct?
- Whether the power lines or motor lines is short circuited or grounded.
- Whether the encoder cable connection is correct?
- Whether the control signal terminal connection is correct? Whether the polarity and size are proper?

- Whether the servo drive and motor are fixed firmly?

### **8.1.2 Power On Sequence**

- For HSV-180AD-035, 050, 075, 100, 150, connect the main circuit power (three-phase AC380V) and external DC 24V power supply. The digital tube of the servo drive is light, servo alarm (ALM) is disconnected, and the failure chain relay normally-open contact on interface XS5 closed. If an alarm is reported, power the servo drive off and check the trouble.
- For HSV-180AD-200, 300, 450, connect the drive unit control power (single-phase AC380V) and external DC 24V power supply. The digital tube of the servo drive is light, servo alarm (ALM) is disconnected, and the failure chain relay normally-open contact on interface XS5 closed. If an alarm is reported, power the servo drive off and check the trouble. If an alarm is not appear, connect the main circuit power (three-phase AC380V)
- After 1 second, the servo enable signal (EN) is received. If the servo drive have no faults and the servo enabling function is effective, the motor is activated and in the state for running. If an alarm is reported and the servo enabling function is ineffective, the motor is idle. At this time, power off the main circuit power and check the trouble.
- In the external speed running mode (analog interface), the PC outputs the servo forward (FWD) or servo reverse (REW) control signal to servo drive. And operate PC to send analog command to servo drive. The motor runs according to the command.
- In the position running mode (pulse interface) or the external speed running mode (pulse interface), the PC to send pulse command to servo drive. The motor runs according to the command.

### **8.1.3 power connection and alarm sequence**

Figure 8-1 HSV-180AD-035, 050, 075, 100, 150 Sequential diagram for power connection (analog command)

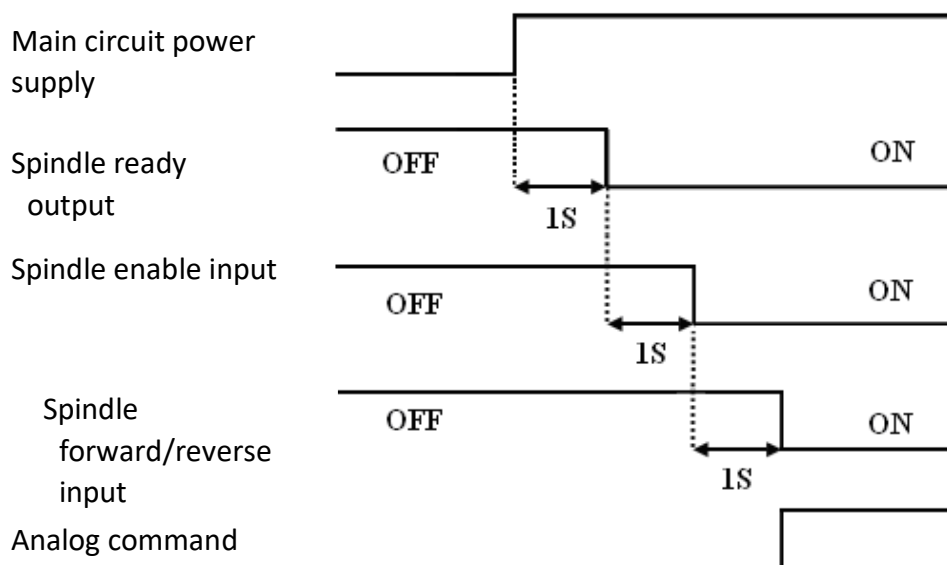


Figure 8-1 HSV-180AD-035, 050, 075, 100, 150 Sequential diagram for power connection (analog command)

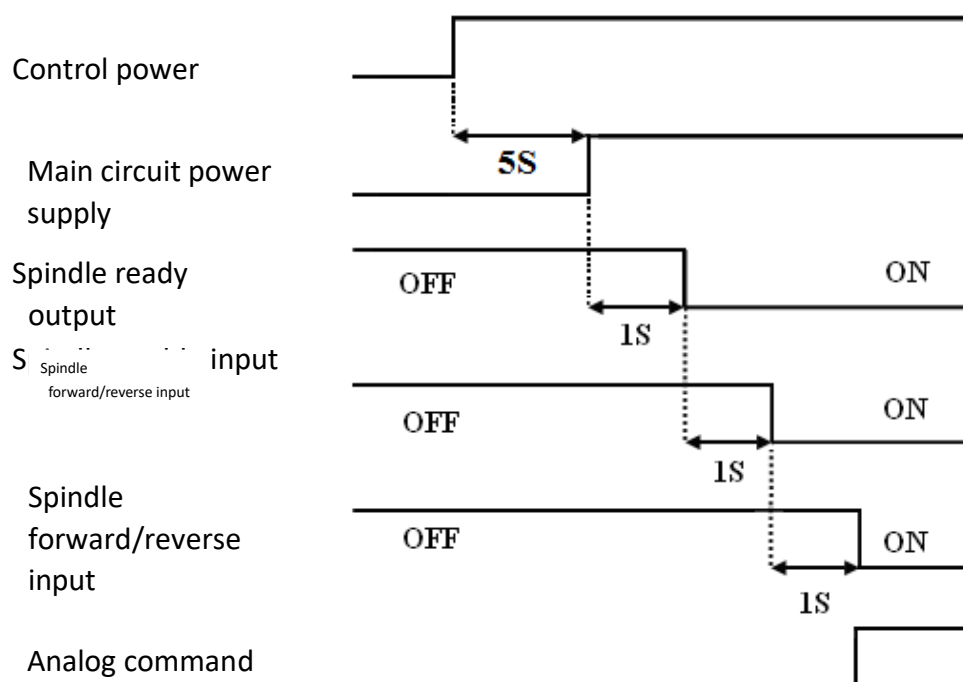


Figure 8-2 HSV-180AD-200, 300, 450 Sequential diagram for power connection (pulse command)

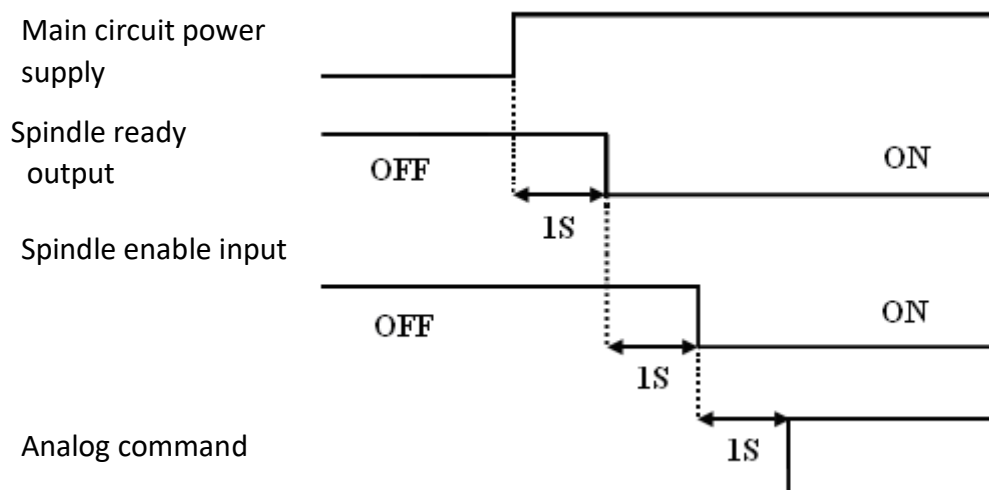


Figure 8-3 HSV-180AD-035, 050, 075, 100, 150 Sequential diagram for power connection (pulse command)

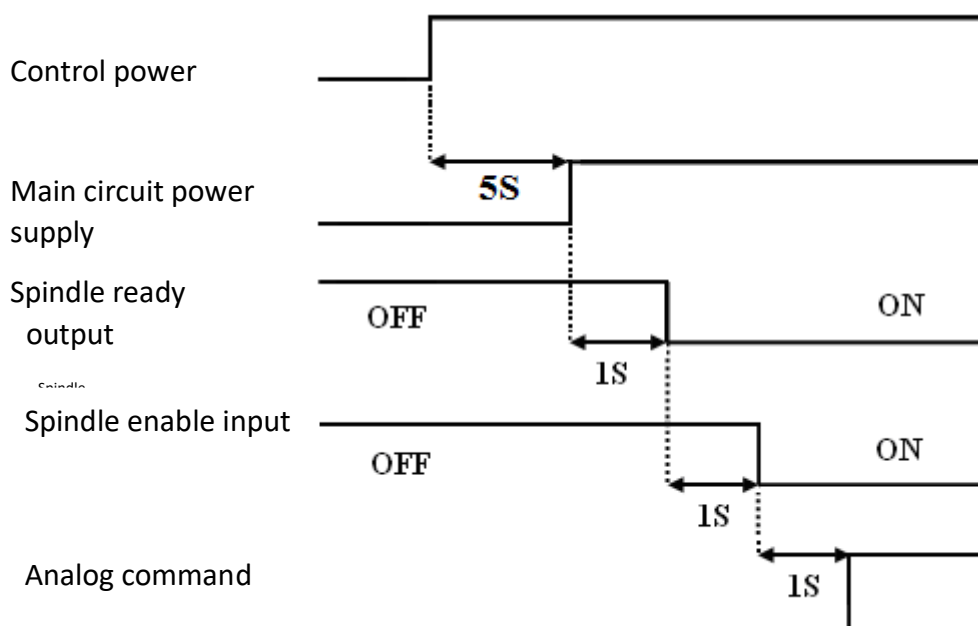


Figure 8-4 HSV-180AD-200, 300, 450 Sequential diagram for alarming

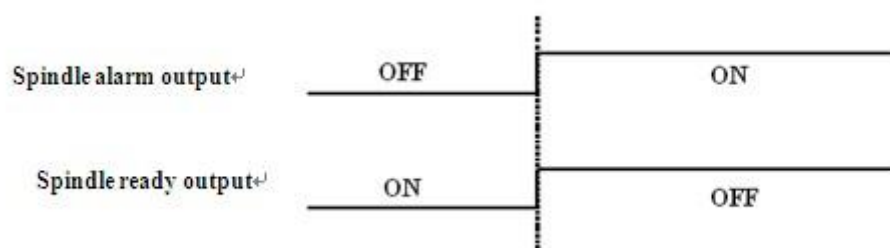


Figure 8-5 Time sequence alarm



When a servo drive alarm is reported, cut off the external control circuit power immediately based on the servo alarm output signal (ALM) or the failure chain input/output terminal XS5.

#### **8.1.4 Power Off Sequence**

- For HSV-180AD-035, 050, 075, 100, 150, disconnect the main circuit power (three-phase AC380V) of the servo drive. If the servo enable signal (EN) keep outputting "ON" signal, **A-1** (indicates main power low-voltage) is displayed, the green enable light (EN) on the drive unit panel is off, and the red alarm light (AL) is on (indicates alarm).
- For HSV-180AD-200, 300, 450, firstly disconnect the main circuit power (three-phase AC380V) of the servo drive, and then disconnect the drive unit control power (single-phase AC380V) and external DC 24V power supply. When servo detect heavy electricity disconnected, if the servo enable signal (EN) keep outputting "ON" signal, **A-1** (indicates main power low-voltage) is displayed, the green enable light (EN) on the drive unit panel is off, and the red alarm light (AL) is on (indicates alarm).
- After disconnect the main circuit power, the internal capacitor storage energy of the servo drive could not be released immediately. Do not connect nor disconnect wire within five minutes.
- Avoid frequently turning on and off the main circuit power in a short period of time, which may damage the soft-start circuit.

#### **8.1.5. Alarm Clear**

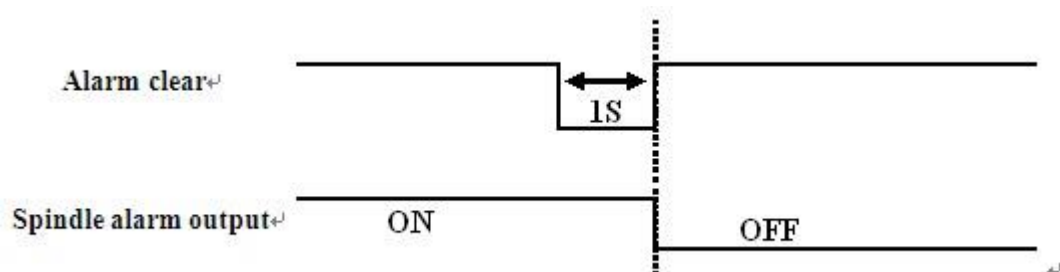
There are three methods to clear the alarm:

- Turn off the power (three-phase main power), after the fault source is cleared; repower the servo drive to clear the alarm. (Some alarm can only be cleared by this method).
- Do not turns off the power, after the fault source is cleared, and enter the auxiliary mode to reset the internal alarm to clear the alarm. After the alarm is

reset, the red alarm light is off (indicating the alarm is cleared), the servo alarm (ALM) output is disconnected and the failure chain relay normally-open contact on the input/output terminal XS5 is connected.

- Do not turn off the power, after the fault source is cleared, reset the external alarm to clear the alarm via the alarm clear input signal (ALM\_RST), see Figure 8-4. After the alarm is reset, the red alarm light is off (indicates the alarm is cleared), the servo alarm (ALM) output is disconnected and the failure chain relay normally-open contact on the input/output terminal XS5 is connected.

Figure 8-6 Sequential diagram for external alarm clear



## 8.2 Trial Operation

Before operating any modes as follows, you must check whether the motor parameter setting of servo drive and phase sequence of motor power line is right. Steps as follows:

- 1、 For HSV-180AD-150 servo drive and below, disconnect motor coding cable and motor power line, connect the main circuit power (three-phase AC380V) of the servo drive.
- 2、 For HSV-180AD-200 servo drive and above, disconnect motor coding cable and motor power line, connect the main circuit power (single-phase AC220V) of the servo drive.
- 3、 Modify control parameters and movement parameters:  
Setting STA—0 to 0, STA—6 to 1  
According to the servo drive and type of motor encoder, setting follow parameters: PA--34, PA--25, PA--26 and PA--43.
- 4、 Changing PA--34 to 1230 after completing setting,, enter auxiliary parameter setting mode to save parameter, and turn off at last.
- 5、 Connect encoder and power line of motor:  
For HSV-180AD-150 and below specifications: only need to connect the three-phase AC380V of strong electric。

For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric.

6、 After the drive unit digital display, select the auxiliary mode "TST-MD" (open-loop control mode), press S to enter, when display "FINISH", the green drive unit enable lights, look up the DP- PFL the actual status, if the value is increasing without decimal point, it indicates that the phase sequence of motor power line UVW is right. Otherwise, the motor power lines indicate the sequence is wrong, switch off the drive unit power, swap the motor power line V, W phase sequence can be.

**Note:**Operating steps above, the motor shaft must be no load.

### 8.2.1 JOG Running Mode

1、 For wiring, see Figure 5.8 in Chapter 5

2、 For HSV-180AD-150 servo drive and below, disconnect motor coding cable and motor power line, connect the main circuit power (three-phase AC380V) of the servo drive.

For HSV-180AD-200 servo drive and above, disconnect motor coding cable and motor power line, connect the main circuit power (single-phase AC220V) of the servo drive.

3、 Modify control parameters and movement parameters:

Setting STA—0 to 0; Setting STA—6to 1;

According to the type of servo drive, setting follow parameters STB--1 (IM: 0, PM:1) ;

Setting PA--34to 2003, PA—25 and PA—43






4、 Save the parameter to EEPROM after setting PA--34to 1230. Turn off the power, wait for 30seconds

5、 Connect encoder and power line of motor:


For HSV-180AD-150 and below specifications: only need to connect the three-phase AC380V of strong electric.

For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric.

6、 Connect the main circuit power (three-phase AC380V) of the servo drive. If there are no alarms or abnormal situation, the green enable lamp (EN) is light, which indicates the drive is working properly. The motor is activated and in the zero speed state.

7、 In the auxiliary mode, select the JOG mode, and JOG-- is displayed through the digital cube. Press  to enter into the JOG mode. RUN-- is displayed through the digital cube. Press and hold , the servo motor runs at the JOG speed. Release , and then the motor stops and enters the zero-speed state. Press and hold , the motor runs at the JOG speed in the opposite direction. Release , and then the motor stops and enters the zero-speed state.

### 8.2.2 Internal Speed Running Mode

- 1、 For wiring, refer to Figure 5.8 in Chapter 5
- 2、 For HSV-180AD-150 servo drive and below ,disconnect motor coding cable and motor power line, connect the main circuit power (three-phase AC380V) of the servo drive.  
For HSV-180AD-200 servo drive and above ,disconnect motor coding cable and motor power line, connect the main circuit power (single-phase AC220V) of the servo drive.
- 3、 Modify control parameters and movement parameters:  
Setting STA-0to 0; STA-6to 1  
Setting PA—34to 2003;  
Setting PA—23 to 3; Drive unit to work in the internal speed mode  
Setting PA—25,26,43;
- 4、 Save the parameter to EEPROM after setting PA--34to 1230. Turn off the power, wait for 30seconds
- 5、 Connect encoder and power line of motor:  
For HSV-180AD-150and below specifications: only need to connect the three-phase AC380V of strong electric。  
For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric6.
- 6、 If there are no alarms or abnormal situation, the green enable lamp (EN) is light, which indicates the servo drive is operating normal. The motor is activated and in the zero speed state.
- 7、 Set the movement parameter **PA-20** (internal speed). Press  to confirm, and then the motor will run at the specified speed.

### 8.2.3 External Speed Running Mode (Analog interface)

- 1、 For wiring, see Figure 5.8.2 in Chapter 5.
- 2、 For HSV-180AD-150 servo drive and below ,disconnect motor cable and motor power line, connect the main circuit power (three-phase AC380V) of the servo drive.  
For HSV-180AD-200 servo drive and above, disconnect motor coding cable and motor power line, connect the main circuit power (single-phase AC220V) of the servo drive.
- 3、 Modify control parameters and movement parameters:  
Setting STA-0to 0; STA-6to0; PA—34to2003  
Setting PA—25, PA—26,PA—43  
Setting PA—23 to 1, Drive unit in the external speed control mode  
According to the demand , setting the speed parameter PA—7 and PA--8
- 4、 Save the parameter settings to EEPROM after setting PA--34to 1230. Turn off the power, wait for 30seconds。
- 5、 Connect encoder and power line of motor:

For HSV-180AD-150 and below specifications: only need to connect the three-phase AC380V of strong electric.

For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric.

6、 Verify no alarm or abnormal condition is reported. The green enable lamp (EN) is on, which indicates the servo drive is working properly. The motor is activated and in the zero speed state.

7、 Use PC outputs forward or reverse control signal to the third pin (FWD) and the forth pin (REW) and outputs analog signal to the 27, 28, 12, 13 pin (GNDAM, AN+, AN-) on the command input/output interface XS4. The motor rotate forward or reverse.

### **8.2.4 Torque Running Mode (Analog interface)**

1、 For wiring, see Figure 5.8.2 in Chapter 5.

2、 For HSV-180AD-150 servo drive and below ,disconnect motor coding cable and motor power line, connect the main circuit power (three-phase AC380V) of the servo drive.

For HSV-180AD-200 servo drive and above ,disconnect motor coding cable and motor power line, connect the main circuit power (single-phase AC220V) of the servo drive.

3、 Modify control parameters and movement parameters:

Setting STA-0to 0; STA-6to0; PA—34to2003

Setting PA—25, PA—26,PA—43

Setting PA—23 to 2, Drive unit in the external speed control mode

According to the demand , setting parameter PA—9 and PA--10

4、 Save the parameter to EEPROM after setting PA--34to 1230. Turn off the power, wait for 30seconds

5、 Connect encoder and power line of motor:

For HSV-180AD-150 and below specifications: only need to connect the three-phase AC380V of strong electric.

For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric.

6、 If there are no alarms or abnormal situation, the green enable light (EN) is on which indicates the servo drive working properly. The motor is activated and in the zero speed state.

7、 PC sends pulse command to the 27、 28、 12、 13 (GNDAM、 AN+、 AN-) pins on the command input/output interface XS4. The motor runs according to the command.

### **8.2.5 Position Running Mode (Impulse interface)**

1、 For wiring, see Figure 5.8.1 in Chapter 5.

2、 For HSV-180AD-150 servo drive and below ,disconnect motor coding cable and motor power line, connect the main circuit power (three-phase AC380V) of the servo drive.

For HSV-180AD-200 servo drive and a above, disconnect motor coding cable and motor power line, connect the main circuit power (single-phase AC220V) of the servo drive.

3、 Modify control parameters and movement parameters:

Setting STA-0to 0; STA-6to0; PA—34to2003

Setting PA—25, PA—26,PA—43

Setting PA—23 to 0

According to the demand , setting parameter PA—22

4、 Save the parameter to EEPROM after setting PA—41to 1230. Turn off the power, wait for 30seconds

5、 Connect encoder and power line of motor:

For HSV-180AD-150 and below specifications: only need to connect the three-phase AC380V of strong electric。

For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric。

6、 If there are no alarms or abnormal situation, the green enable light (EN) is on, which indicates the servo drive is working properly. The motor is activated and in the zero speed state.

7、 The PC sends pulse command to the 14,15,16,17 pins on the command input/output interface XS4. The motor runs according to the command.

### **8.2.6 Full closed-loop**

1、 For wiring, see Figure 5.8.3Standard wiring diagram in Chapter 5.

2、 For HSV-180AD-150 servo drive and below , disconnect motor coding cable and motor power line, connect the main circuit power (three-phase AC380V) of the servo drive.

For HSV-180AD-200 servo drive and above, disconnect motor coding cable and motor power line, connect the main circuit power (single-phase AC220V) of the servo drive.

3、 Modify control parameters and movement parameters:

Setting STA-0to 0; STA-6to 0;

Setting STB-14 to 0,select forbid full closed-loop function

Setting PA—34 to 2003

Setting PA—25, PA—26, PA—43, PA--22

Setting PA—23 to 0

4、 Save the parameter to EEPROM after setting PA—34to 1230. Turn off the power, wait for 30seconds

5、 Connect encoder of motor:

For HSV-180AD-150 and below specifications: connect the three-phase AC380V of strong electric。

For HSV-180AD-200 and above specifications: connect single-phase AC220V of control power。

6、Manually rotate the servo motor, observe the value of DP-PFL, DP-PFM, confirm the count direction of feedback pulse when reversing.

7、Setting STB-14 to 1, select closed loop function

Setting STB-12、STB-13, select the second position encoder type

The second position encoder type	STB-13	STB-12
Square Incremental Encoder (TTL)	0	0
ENDAT2.1/2.2 Agreement absolute encoder	1	0
Cosine encoder (1Vpp Analog signals)	1	1

8、Save the parameter to EEPROM after setting PA—34to 1230. Turn off the power, wait for 30seconds

9、Connect the second position encoder:

For HSV-180AD-150 and below specifications: connect the three-phase AC380V of strong electric。

For HSV-180AD-200 and above specifications: connect single-phase AC220V of control power

10、Manually rotate the servo motor, observe the value of DP-PFL, DP-PFM, confirm the count direction of feedback pulse when reversing is consist with the direction as steps 6

If the count direction is not consist with the direction as steps 6,set PA-10 to 512,and invert servo encoder feedback pulse.

11、Save the parameter to EEPROM after setting PA—34to 1230. Turn off the power, wait for 30seconds

12、Connect power line of motor:

For HSV-180AD-150 and below specifications: connect the three-phase AC380V of strong electric。

For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric。

13、Adjust parameters PA-17, PA-21 to be smaller, test by JOG point dynamic. If tests are normal, turn off the power, and wait 30 seconds.

14、Connect command line of motor:

For HSV-180AD-150 and below specifications: connect the three-phase AC380V of strong electric。

For HSV-180AD-200 and above specifications: Firstly connect single-phase AC220V of control power, and then connect the three-phase AC380V of strong electric.

15 、 If there are no alarms or abnormal situation, the green enable light (EN) is on, which indicates the servo drive is working properly. The motor is activated and in the zero speed state.

16、 .Operate PC outputs pulse command to the 14, 15, 16, 17 pin (CP+、 CP-、 DIR+、 DIR-) on the XS4 interface. The motor run according to the command.

### 8.3 Running Modification

Note
<ul style="list-style-type: none"><li>● Wrong parameter setting may cause equipment failure or accidents. Make sure the parameter settings are correct before starting the servo drive.</li><li>■ It is recommended that the overload commissioning be performed after the non-load commissioning.</li></ul>

#### 8.3.1 Basic Gain

A: Speed Control

- **Speed proportional gain:** specified by the movement parameter **PA-2**. Gain and rigidity will be enhanced as the parameter value increases. The value is determined by the actual servo drive system type and the load. It is recommended that the value be larger if no oscillation exists. In general, the value of speed proportional gain increases as the loading inertia increases.
- **Speed integration time constant:** specified by the movement parameter PA-3. Integration speeds up as the value decreases. The response speed increases as the parameter value decrease, but oscillation may occur. It is recommended that the value be smaller if no oscillation exists. A big parameter value may leads to great changes in speed when the load changes. In general, the value increases as the load inertia increases.

B: Position control

- Set an appropriate value for speed proportional gain and speed integration time constant based on the information in Speed control.



- **Position forward feedback gain:** It is specified by the movement parameter **PA-1**. The system response enhanced as the value increases, but instability or oscillation may occur. It is recommended that the value be set to **0**.
- **Position proportional gain:** It is specified by the movement parameter **PA-0**. Gain and rigidity will be enhanced as the parameter value increases, but the position hysteresis decreases under the condition of the same pulse frequency. The value is determined by the actual servo drive system type and the load. It is recommended that a big value be set. The position command tracking feature is enhanced but the lag error decreases as the parameter value increases. However, oscillation easily occurs after the orientation is complete.
- If high position command tracking feature is required, set the parameter to a bigger value. However, it may cause overshoot or oscillations.

For the Position proportional gain parameter setting, see the following table.

Recommended values for Position proportional gain

Rigidity	Value
Low	500~1000
Middle	1000~2000
High	2000~3000

### 8.3.2 Electrical Gear Setting

In the position control mode, by changing the position command pulse frequency molecular (movement parameter **PA-13**) and position command pulse frequency denominator (movement parameter of **PA-14**), users can easily match with the pulse controller to achieve position control resolution as required.

The position resolution (a pulse travel  $\Delta l$ ) is determined by the servo motor travel per turn ( $\Delta S$ ) and encoder feedback pulses per revolution Pt. The formula is as follows:  $\Delta l = \frac{\Delta S}{P_t}$

In the formula,

$\Delta l$ : Indicates a pulse travel (mm)

$\Delta S$ : Indicates servo motor travel per turn (mm/turn)

Pt: indicates encoder feedback pulse per revolution (pulse/rev.)

Fourfold frequency circuit is provided for the servo drive:  $P_t = 4 \times C$ .

C indicates the number of encoder lines per revolution. In this system C is 2500 lines/turn (specified by encoder resolution and movement parameter PA-25), then  $P_t = 1000$  pulses/rev.

Multiply command pulse with the electronic gear ratio G to get the position control pulse. The formula for one command pulse travel  $\Delta l^*$  is as follows:

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

In the formula, G = position command pulse frequency molecular/position command pulse frequency denominator

### 8.3.3 Start and Stop Adjustment

The servo drive start and stop feature, namely, acceleration and deceleration time, is determined by the over-load inertia and start and stop frequency, and limited by the servo drive and servo motor performance. Frequent start and stop, short acceleration and deceleration time, large load inertia will cause over heat to the servo drive and motor and over voltage to the main circuit. You need to adjust them as required.

#### a. Overload inertia and start and stop frequency adjustment

The adjustment is required when the start and stop frequency is too high. Check whether the frequency is in the frequency range. The frequency range varies with different motor types, capacities, load inertias, and motor speeds. If the overload inertia is M times of the motor inertia, the start and stop frequency and recommended deceleration time (movement parameter **PA-6**) is as in the following table:

Load inertia ratio and allowed start and stop frequency

Load Inertia Times	Allowed Start-Stop Frequency
$m \leq 3$	>100 times/mins: acceleration and deceleration time is 60 ms or less
$m \leq 5$	60 to 100 times/mins: acceleration and deceleration time is 150 ms or less

$m > 5$	$< 60$ times/mines: acceleration and deceleration time is 150 ms or more
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**b. Impact of the servo motor**

Different type of servo motor allows different overload conditions, running times, loading rate, and environment temperature. See related manual and adjust the settings as required to prevent overheat or short service life.

**c. Adjustment method**

Generally, the overload inertia must be less than 5 times of the motor rotor inertia. The large overload inertia may cause overvoltage during deceleration or abnormal braking. Use the following methods to adjust it:

- Increasing the acceleration and deceleration time (movement parameter **PA-6** and **PA-38**)  
You can set the parameter to a bigger value and then gradually reduce it to the appropriate value.
- Reducing the maximum output torque value (movement parameter **PA-5**) to reduce the current limit value
- Reducing the maximum speed limit of the servo motor (movement parameter **PA-17**)
- Installing external braking device
- Changing the servo motor to one with larger power and inertia motor (the servo motor must match with the servo drive)

## 9 Fault Trouble shooting

### Caution

- Maintenance personnel must have related knowledge and abilities.
- Do not touch the servo drive or motor within five minutes after power-off to prevent electric shock or burns.
- If a servo drive alarm is reported, do not use the servo drive only after the alarm is cleared based on the alarm code.
- Before the alarm reset, make sure that the EN signal is ineffective to prevent accidents caused by a sudden start.

### 9.1 Protection and Fault Identification

1. Series HSV-180AD servo drive provides 30 different protection functions and fault identification. If one protection function is activated, alarm information can be displayed through the digital tube on the servo drive panel, the servo alarm output (ALM) is connected, and the failure chain relay normally-open contact on the input/output terminal XS5 is disconnected.
2. It is required to connect the alarm output (ALM) or XS5 terminal to the PC. When the protection function of the servo drive is activated, the PC can promptly take emergency measures.
3. After the fault source is cleared, you can turn off three-phase main power, and then re-power the servo drive to clear the alarm, or enter the auxiliary mode to reset the internal alarm to clear the alarm, or reset the external alarm to clear the alarm via the alarm clear input signal (ALM\_RST).
4. The protection function with "\*" cannot be cleared by resetting the external or internal alarm. It can only be cleared by cutting off the power, and then re-power the servo drive after the fault source is cleared.

Table 9.1 Alarm information:

No.	Alarm Type	Description
0	Normal	No alarming
1	Under-voltage supply	Whether the three-phase main voltage is c? Whether the three-phase main voltage is too low?
2	Over-voltage supply	Whether the built-in braking resistor of drive unit is intact? Whether external braking resistor specifications and wiring is correct? Whether the circuit power supply voltage is too high?
3	IPM failure◆	Whether the cooling of drive unit is normal? Whether the system is overload? Whether parameter settings are appropriate? Whether connection of motor power line is correct and reliable? Whether connection of Shielded cable is complete, and reliable?
4	Brake failure◆	Whether external braking resistor is correct? Whether external braking resistor specifications and wiring is correct?
5	Reserved	
6	Motor overheat	Temperature of motor is too high STA-12 is set to 1to shield alarm
7	The encoder data signal error	Whether encoder cable is connected and reliable? Whether the encoder cable is too long?
8	The type of encoder error	Whether encoder cable is connected? Whether setting of P-25 is correct ?
9	system software overheat	Whether the phase sequence of motor power line is correct?
10	Over current◆	Whether setting of PA--10、PA--18、PA--19 is correct? Whether setting of PA--26 is correct? Whether the drive unit is overload?
11	Motor over speed	Whether setting of PA--17 is correct? Whether the r feedback signal of encode is correct? If the system work in full closed loop mode: whether direction of full closed-loop feedback pulse is consistent with the direction of semi-closed loop feedback pulse?

12	Overlarge tracking deviation	Whether the phase sequence of motor is correct? Whether setting of P-12 is correct?
13	Motor overload for a long time	Whether setting of PA--18、PA--19 is correct? Whether the phase sequence of motor is correct?
14	Control parameters read fault ◆	Resave parameters
15	Instruction Over clocking	Whether PA17 parameter set is reasonable after given an instruction frequency more than it? Whether PA23 parameter set is reasonable? Whether the system of electronic gear ratio, the encoder type or operating mode is correct? Whether PB42andPB4 is reasonable?
16	Control board hardware failure ◆	DSP and FPGA communication failure Resave parameters
17	Drive unit overheat	Temperature of the drive unit exceeds the set value ( 100℃ ) STB--4 is set to 1to shield alarm
18	Reserved	
19	ADConversion failure ◆	ADconversion data communications failure or current sensor failure
20	Reverse over travel fault	Reverse over travel input switch input is active
21	Forward over travel fault	Forward over travel input switch input is active
22	Self-tuning error recognition system	Inertia recognition errors Check the operation parameters especially parameters such asPA18 Whether system inertia and motor is reasonable?
23	Reserved	
24	Reserved	
25	Reserved	
26	Motor encoder signals	Absolute encoder communication failure

	Communication fault	Whether the connection of encoder cable is correct? Whether parameter PA – 25 is consistent with the motor encoder?
27	Closed loop cosine encoder signal distortion	Whether connections of closed loop encoder are proper ? Whether settings of closed loop encoder type are correct?
28	Closed loop encoder signals Communication breakdown	Whether connections of closed loop encoder are proper ? Whether settings of closed loop encoder type are correct?
29	Drive and motor model code matching fault ◆	Whether setting of PA--43 is correct ?

Version history of HSV-180AD servo drive:

1 Series HSV-180AD servo drive User's Manual V1.00 2012.4

- a. Applicable to HSV-180AD-035, 050, 075, 100, 150, 200, 300, 450 servo drive
- b. Software version V 2.4