This user manual describes all items concerning the operation of this CNC system in detail. However, it is impossible to give particular descriptions for all unnecessary or unallowable operations due to length limitation and products application conditions； Therefore, the items not presented herein should be considered impractical or unallowable.

Preface

Your Excellency,

We are honored by your purchase of products from GSK CNC Equipment Co., Ltd.

This manual introduces property, installation, connection, debugging, operation and maintenance of DAT Series AC Servo Driver in detail. To ensure safe and efficient work, please read this manual carefully before installation and operation.

New products of DAT Series AC Servo Drive Unit include DAT2030, DAT2050, DAT2075, DAT2100 and bus-type ones such as DAT2030C, DAT2050C, DAT2075C and DAT2100C.

This manual applies to the software version: V1.05 of DAT2000 series and V1.05 of DAT2000C series.

Please read the manual carefully before installation and using the product to ensure it works safely, normally and efficiently.

To avoid operator and other personal injury and machine damage, please pay special attention to the following warning label while you read the manual.

 **Danger**	If the motor operates incorrectly, it will cause damage or death.
 **Caution**	If the motor operates incorrectly, it will cause medium or slight injury, even property loss.
 **Note**	If this label is not noticed, unexpected result and situation will occur.

Remind important requirements and instructions to user during the operation.

It indicates prohibition (mustn't do)

It indicates forced execution (must do)

Danger

Please tighten each terminal of the main circuit with appropriate force.

If the user does not obey the instruction, it will cause connection loosing, wire spark and even a fire.

Please mount the drive unit on nonflammable subject, and keep it far away from inflammable materials.

If the user does not obey the instruction, it will cause a fire.

Please make sure the power is off before wiring.

If the user does not obey the instruction, it will cause electric shock.

Ground terminal PE of the servo unit must be earthed.

If the user does not obey the instruction, it will cause electric shock.

Wiring and overhaul must be done by electric engineering professionals.

If the user does not obey the instruction, it will cause electric shock or a fire.

Operations of moving, wiring, checking and maintenance can be done 5 minutes after power off.

If the user does not obey the instruction, it will cause electric shock.

Strictly obey the wiring method of the manual.

If the user does not obey the instruction, it will cause equipment damage and electric shock.

Please tight the power terminal and motor output terminal.

If the user does not obey the instruction, it will cause a fire.

Please don't touch the switch with wet hand.

If the user does not obey the instruction, it will cause electric shock.

Please don't put hands into the servo unit.

If the user does not obey the instruction, it will cause electric shock.

Please don't open the cover of the terminal board at power on or at run time.

If the user does not obey the instruction, it will cause electric shock.

Please don't directly contact connection terminal of main circuit of the drive unit.

If the user does not obey the instruction, it will cause electric shock.

Note

The drive unit may startup when the power is recovered, the user don't operate the shaft device of the servo motor.

If the user does not obey the instruction, it will cause personal injury.

Don't prevent heat diffusion or put object on radiator fan or radiator.

If the user does not obey the instruction, it will cause damage or a fire.

Don't put the cable on sharp edge. Don't make the cable bear heavy load or tension.

If the user does not obey the instruction, it will cause electric shock, trouble or damage.

When removing the cover on the terminal board, the user don't operate drive device during power is on.

If the user does not obey the instruction, it will cause electric shock.

Caution

Match the motor with proper servo unit.

If the user does not obey the instruction, it will cause equipment damage.

The power level added to each terminal should correspond to the one specified in the user manual.

If the user does not obey the instruction, it will cause equipment damage.

Load running can be done after no-load operation is successful.

If the user does not obey the instruction, it will cause equipment damage.

Troubleshooting before operation when the alarm occurs.

If the user does not obey the instruction, it will cause equipment damage.

Don't hold the cable and motor shaft during motor transportation.

If the user does not obey the instruction, it will cause equipment damage.

If the elements of the spindle drive unit is missed or damaged, please don't operate and contact the seller immediately.

If the user does not obey the instruction, it will cause equipment damage.

Caution

Don’t connect power input wire R, S, T to motor output terminal U, V, W.

If the user does not obey the instruction, it will cause equipment damage.

Please don’t turn on/off the power frequently.

If the user does not obey the instruction, it will cause equipment damage.

Please don’t touch the motor and radiator of the servo unit. It generates heat.

If the user does not obey the instruction, you will be burnt.

The parameters cannot be altered and changed extremely.

If the user does not obey the instruction, it will cause equipment damage.

Please don’t change, dismantle or repair the drive unit.

If the user does not obey the instruction, it will cause equipment damage.

For the abandoned drive unit, the internal electronic device is taken as industrial waste.

it can not be recycled. If the user does not obey the instruction, it will cause accident.

Safety responsibility

Manufacturer Responsibility

——Be responsible for the danger which should be eliminated and/or controlled on design and configuration of the provided servo unit and accessories.
——Be responsible for the safety of the provided servo unit and accessories.
——Be responsible for the provided information and advice for the users.

User Responsibility

——Be trained with the safety operation of servo unit and familiar with the safety operation procedures.
——Be responsible for the dangers caused by adding, changing or altering to the original servo unit and the accessories.
——Be responsible for the failure to observe the provisions for operation, adjustment, maintenance, installation and storage in the manual.

This manual is kept by final user.

We are full of heartfelt gratitude to you for supporting us in the use of GSK's products.

contents

CHAPTER 1 PRODUCT INTRODUCTION

1.1 Basic Knowledge

- **Basic principle of AC servo drive device**

The AC servo drive unit consists of AC servo unit and AC servo motor (three-phase permanent magnet synchronous servo motor, hereafter referred to as the servo motor). Approximate sine wave current with 120° phase difference (namely: DC—AC) are generated in three-phase stator winding of the servo motor through controlling on/off of the power switch tube after three-phase alternating current is rectified to direct current by the servo unit (namely: AC—DC). Rotary magnetic field is formed by the sine wave current and the rotor of the servo motor is made of rare earth permanent materials that with fine anti-degaussing property, therefore, the interaction between the field of motor rotor and rotary field generates electromagnetic torque to rotate the rotor. The higher the current frequency flowing through the motor winding is, the faster speed will be. The bigger the current amplitude flowing through the motor winding is, the bigger the output torque (Torque=force × arm length of the force) will be.

The diagram of main return current, see Fig. 1-1, PG in the figure represents encoder.

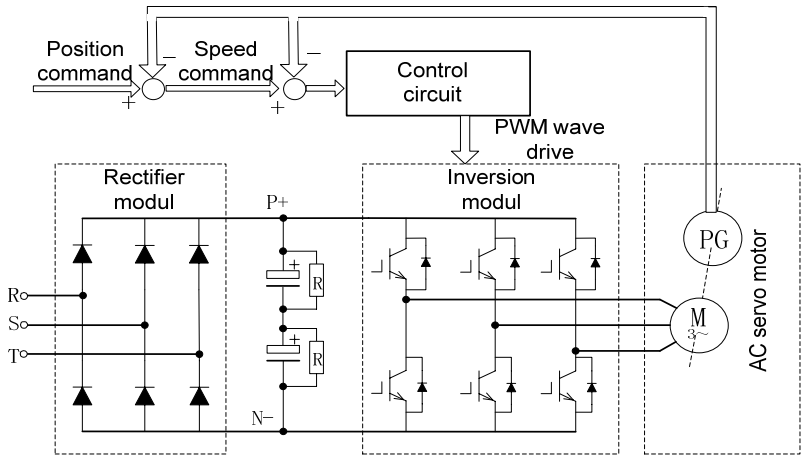


Fig.1-1 Main return current diagram of the AC servo drive unit

- **Basic configuration of AC servo drive device**

The servo unit receives the speed (or position) command from a control unit（PC）like computerized numerical control system (CNC) to control the frequency and magnitude of the motor winding current, and make the speed (or rotor angle) of motor rotor approach to the speed (or position) command value. The deviation between the actual value of motor rotor speed (or rotor angle) and the command value is obtained through the feedback signal from the encoder. In addition, the servo unit constantly adjusts frequency and magnitude of the motor winding current to make the deviation between the actual value of motor speed (or rotor anger) and the command value within a required range. The basic configuration of the servo system is shown in Fig 1-2.

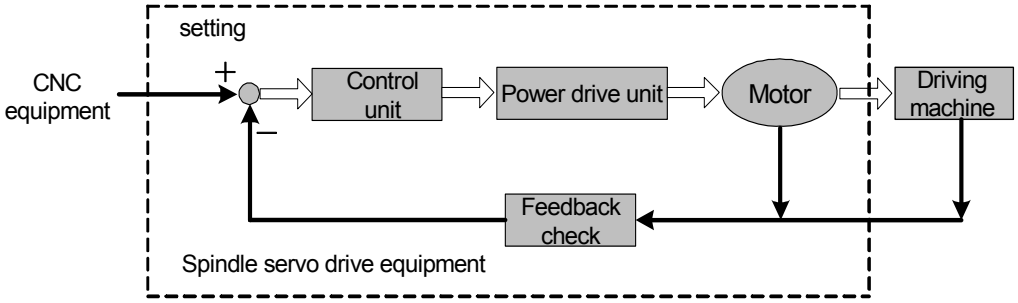


Fig.1-2 Basic configuration of AC servo drive device

- **General concept of control**
- **Control**: The process of making the property (eg. Speed) of the object (eg. Servo motor) get or close to the predicted value is called control. The forementioned object is called **controlled object**. **Controlled quantity (Variable): T**he property of the controlled object. **Control unit (controller)**: The device to achieve control. **Setting**: The predicted value (command value) of the controlled quantity that is received by the control unit. **Feedback**: The controlled quantity is taken as input of the controller to affect itself. **Feedback device**: The device to detect the controlled quantity. According to the vary direction of controlled quantity and setting to the controller output, the feedback is divided into positive feedback (the same direction) and negative feedback (opposite direction). Control system consists of the controller used to achieve the controlled quantity control, the controlled object and the feedback device. The drive device is divided into closed-loop control and open-loop control according to the presence and absence of feedback device, and the position of feedback unit .The closed loop introduced in this manual are all closed loop of negative feedback.

In the AC servo drive unit introduced by this manual, servo unit is a controller, the servo motor is controlled object, the motor speed (or rotor angle) is a controlled quantity, the encoder of the servo motor is a feedback device. The actual speed is detected by the encoder and it is used to speed control to achieve speed feedback. Therefore, the AC servo drive unit belongs to closed loop control system.

- **Open loop control**: There is no feedback device in the control system, and the actual value of the controlled quantity does not affect the controller output. Example: Drive unit of step motor. After output current phase sequence of servo unit of step motor is changed, the rotation of rotor of the step motor should vary with it. Because the step motor are not usually installed speed or position feedback device, the rotation of motor rotor may not vary accurately with the changing of the current phase sequence, which causes so-called “step out”.

Open loop control is shown in Fig. 1-3.

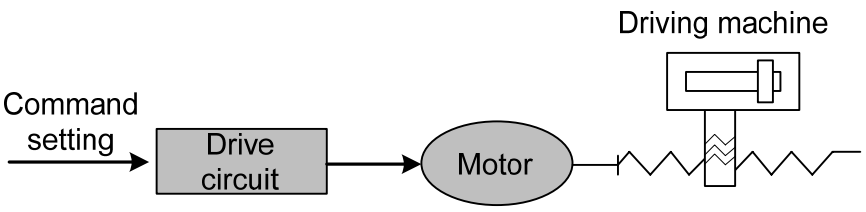


Fig. 1-3 Open loop control

- **Closed loop control**: The controlled quantity of the control system is detected by feedback device and is output to the controller. This process affects the output of the controller and then changes the controlled quantity. According to the detection point of the feedback device, the closed loop control id divided into **entirely closed loop control** and **semi closed loop control**. Entirely closed loop control (Fig. 1-4): The controlled quantity is detected directly by the feedback device and it is used for feedback. Mechanical position is used as controlled quantity, grating ruler fixed on the machine as position feedback device, and the encoder of the servo motor is taken as a speed feedback device, realizing the entirely closed loop control of machine position. If the grating ruler is not fixed, the encoder of the servo motor is used as speed feedback device (Fig. 1-5), therefore, this is a semi-closed loop control of a mechanical position.

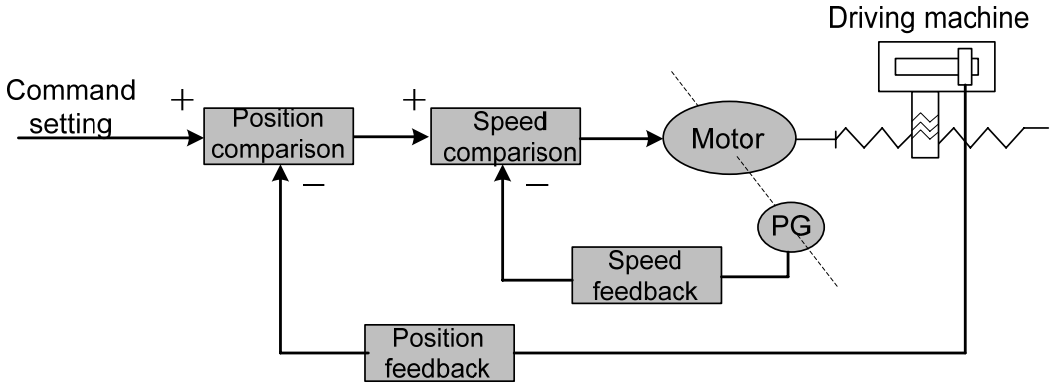


Fig. 1-4 Full-closed loop control

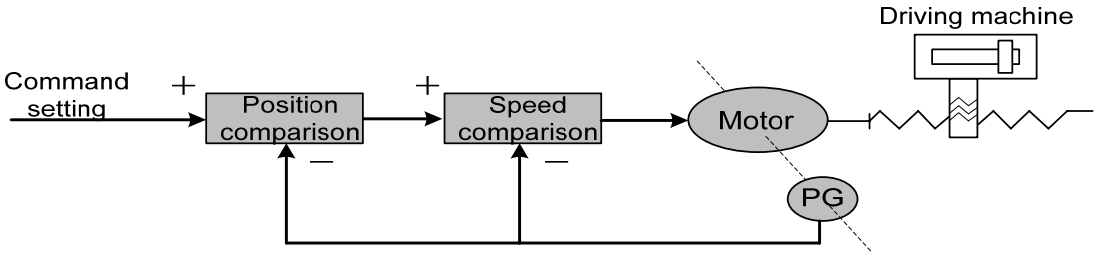


Fig. 1-5 semi-closed loop control

- **PID Control**: also called PID adjustment, is a common algorithm the controller adopted to mathematically deal with input data (setting, feedback). P stands for proportional, which means the input of the controller is to be linearly proportional to the output, the larger the adjustment coefficient is, the more sensitive the system will react and smaller the error is (can not completely eliminated), however, over larger adjustment coefficient will result in system oscillation and instability. I stands for integral, means time integral of system input affects the output (input gradually affects output), the larger the integration time constant is, the more stable the system will be, which can eliminate steady-state error but slows system response at the same time. D stands for differential, which means input differential (slope of input change) affects output, differential control may predict deviation and produce advanced correction action to decrease tracking error and improve dynamic performance; while over large differential coefficient will also result in system oscillation and instability. Along with the adjustment of PID control coefficient at specific control system, the proportional, integral and differential adjustment are mutually affected to make a balance between system reaction speed, control accuracy and stability. As differential adjustment is prone to produce impact and oscillation, the servo system introduced in this manual adopts PI adjustment, that is, proportional and differential adjustment.

➢ **Concepts of servo control**

There are three basic control models in servo system: location control, speed control and torque control. The system chart is shown in Fig. 1-6.

- **Position control:** set the direction and angle of motor rotation through digital pulse or data communication, the motor rotor controlled by servo unit will rotate to the corresponding angle in accordance with the preset direction. The rotary angle (position) and speed are both controllable.
- **Speed control:** set the direction and angle of motor rotation through analog voltage or data communication, the motor rotor controlled by servo unit will rotate in accordance with the set direction and speed.
- **Torque control:** set the value and direction of the motor output torque through analog voltage or data communication, the servo unit controls the motor rotor's rotation direction and the value of output torque.

The servo device introduced in this manual does not receive signals set by torque at present and the torque control operational mode is not available for the time being.

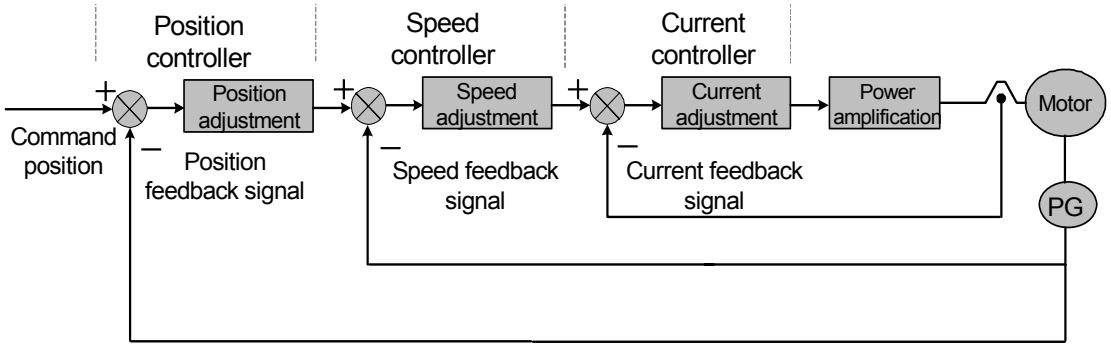


Fig. 1-6 Three-loop control diagram

➢ **Servo performance index**

Servo dynamic reaction characteristics: refers to the reaction speed, dynamic control error and stable control error of the servo system with set signal or load change. Fig. 1-7 indicates reaction characteristics of the servo system set with step signals (solid line represents the setting signal and dashed line represents the output signal of the servo system).

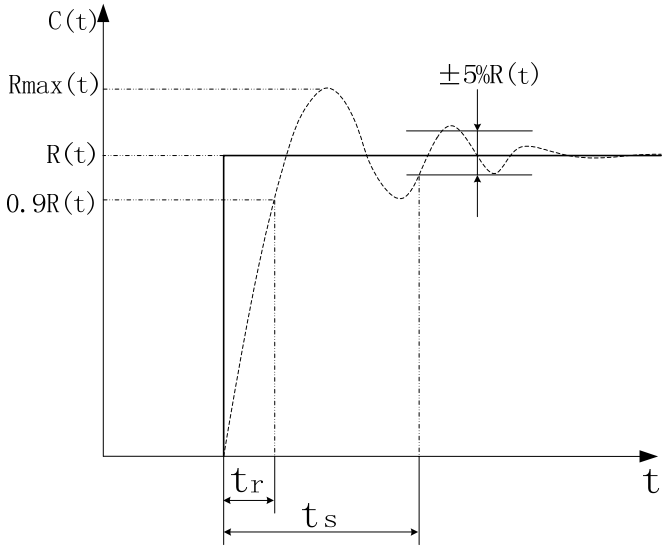


Fig. 1-7 Servo dynamic reaction curve

Rise time t_r: the length of time of the speed quantity rise for the first time from zero to 90% of a stable value R (t), which shows the rapidity of dynamic reaction.

Adjustment time t_s： The minimum time needed to make the reaction curve reach but not exceed error interval which is used to measure the whole adjustment tempo of the device. The allowed interval refers to plus or minus 5% of the stable value proximal to the step reaction curve stable value R (t).

Overshoot σ： The ratio between the maximum D-value that the rotation output quantity overpasses the stable value（Rmax(t)- R (t)）and the stable value R (t), which reflects the relative stability of the servo device and expressed as percentages, i.e.:

$$\sigma(\%) = \frac{R_{\max}(t) - R(t)}{R(t)} \times 100\%$$

Steady-state error: the difference between the expected output steady-state value and the practical output value after the system rotation speed turned into stable.

Servo static performance: Stability is the most important issue of the servo control system. Servo static performance index, mainly the position accuracy, refers to deviation degree between the practical state and expected state when the system transient process comes to cease. Not only errors from the position measurement device and from the system will affect servo steady-state accuracy, but the internal structure and parameters of the system can also matter. Fig.1-8 shows the position servo static curve.

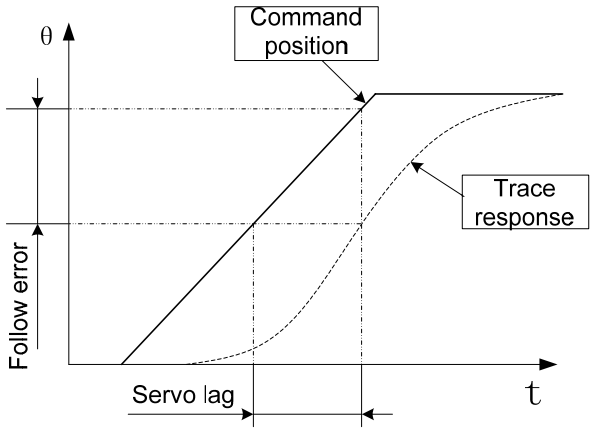


Fig. 1-8 Position servo static curves

Tracking error: The difference between the movable position of the workbench requested by the command signals (commanding position) and the practical movable position, i.e., tracking error equals to the value of commanding position minus the value of practical position.

Servo rigidity: servo system's capability to resist the position deviation resulted from load interference.

1.2 Confirmation of the Arrived Goods

Please promptly inspect the received goods in accordance with the following items, any question, please feel free to contact suppliers or our company.

Inspected Items	Notes
Check and confirm if the servo units and servo motors are the ordered.	Please check by the nameplates on the servo units and servo motors
Accessories complete or not	Please check accessories according to packing list, any unmatched ones, refer to order instruction 1.4.
Damaged or not in transport	Check the general appearance of goods to ensure products intact and with no damage.
Screw loose or not	Please check if there is any screw loose with screwdrivers.

Note: 1. Damaged AC servo unit or the ones without integrated parts can not be installed.

2. AC servo unit should be matched with servo motor with proper property.

1.2.1 Instruction of Servo Motor Model

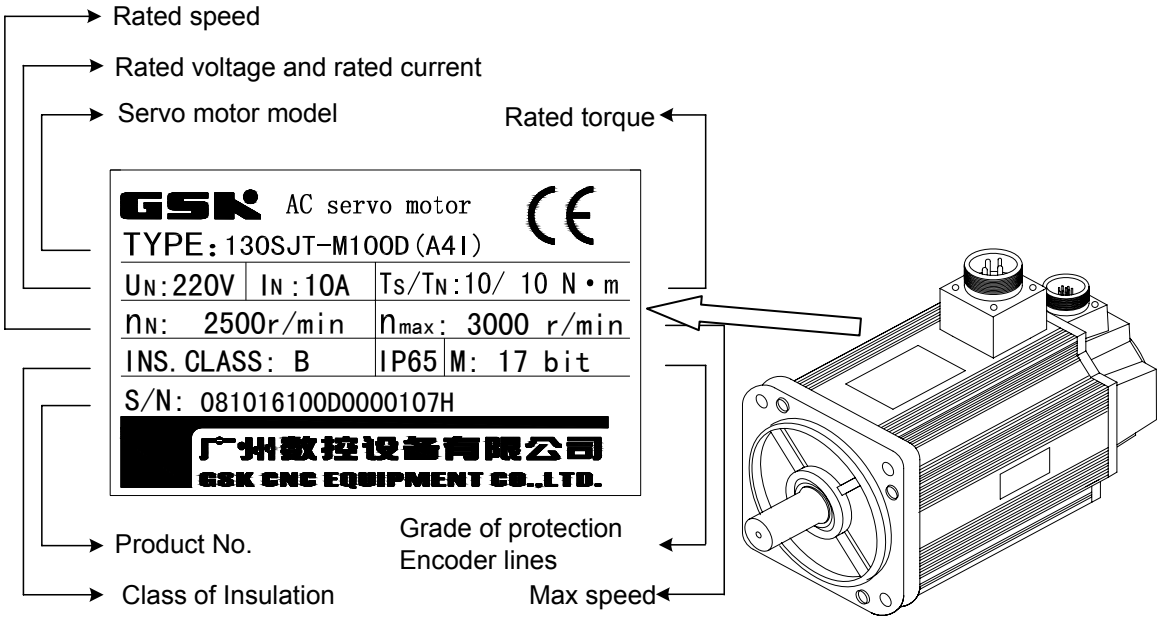
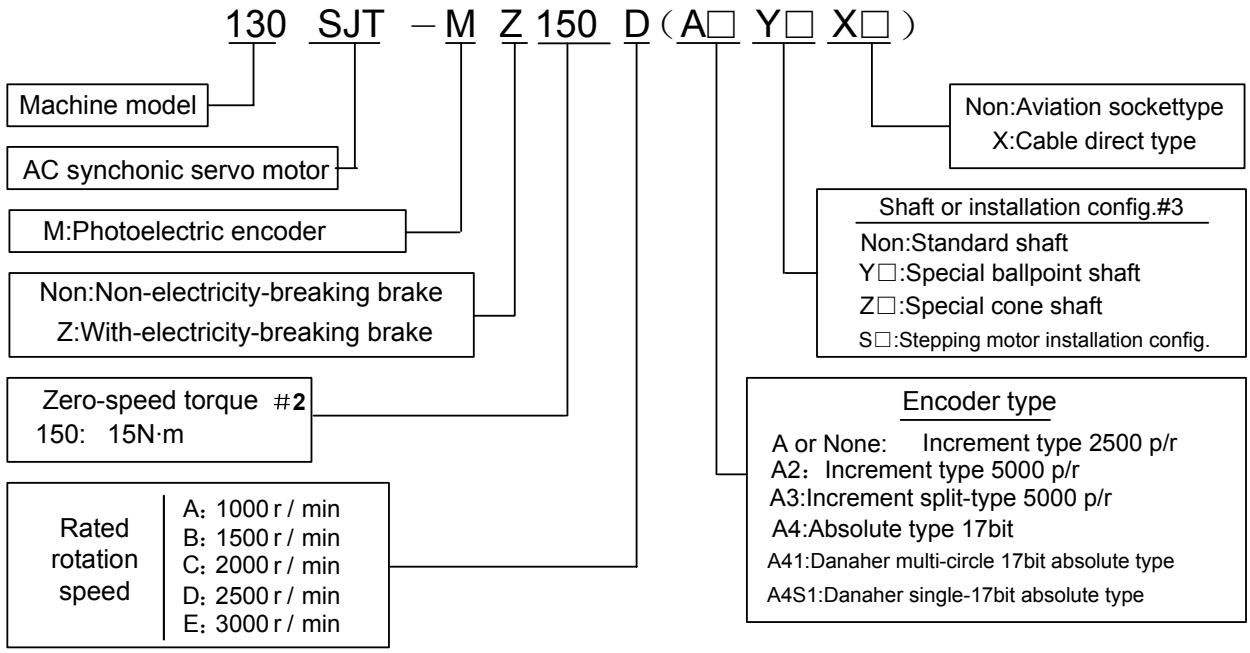


Fig. 1-9 Instruction of servo motor models:



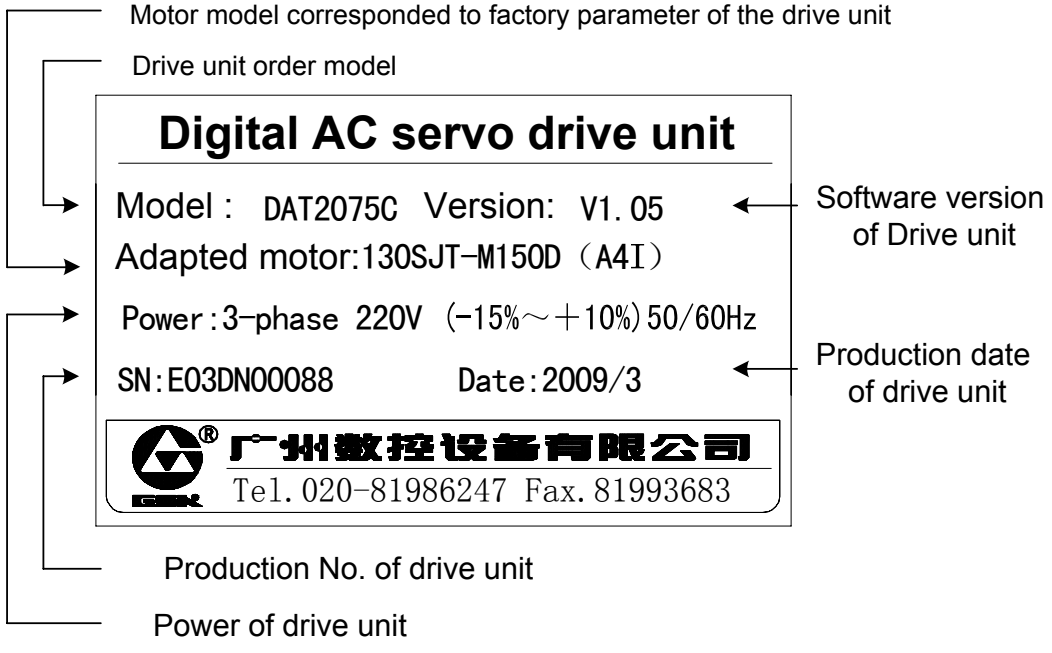
#1：Working power of electricity-breaking brake: DC（0.9～1.1）×24V, interface: triax socket, 1,2 pin are power terminals (have no polarity), 3 pin is the earth terminal. When the 1 and 2 pin plug in power, the electricity-breaking brake doesn't work, while when the power is disconnected, it will brake and the operating time is less or equal to 0.1s.

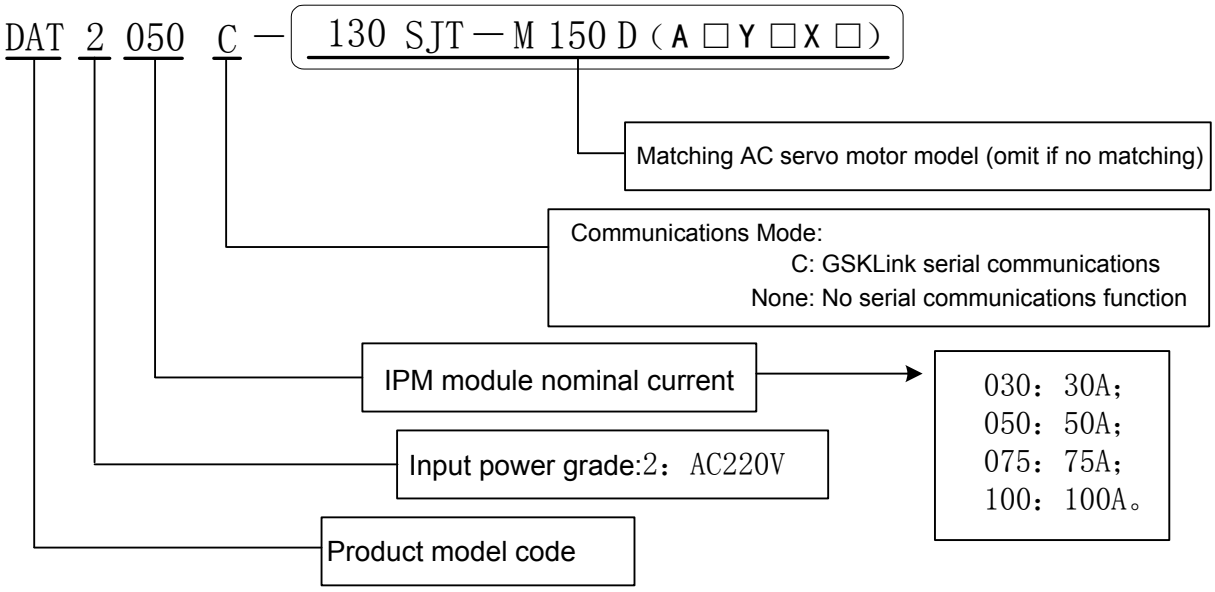
#2：A three-digital number "150" is used to show its value: 150×10^{-1}=15, unit: N.m.

#3：'□' is a numeric codes, please refer to the installation outline drawing of the motor for the special shaft represented by a certain number.

1.2.2 Instruction of Servo Motor Models Unit

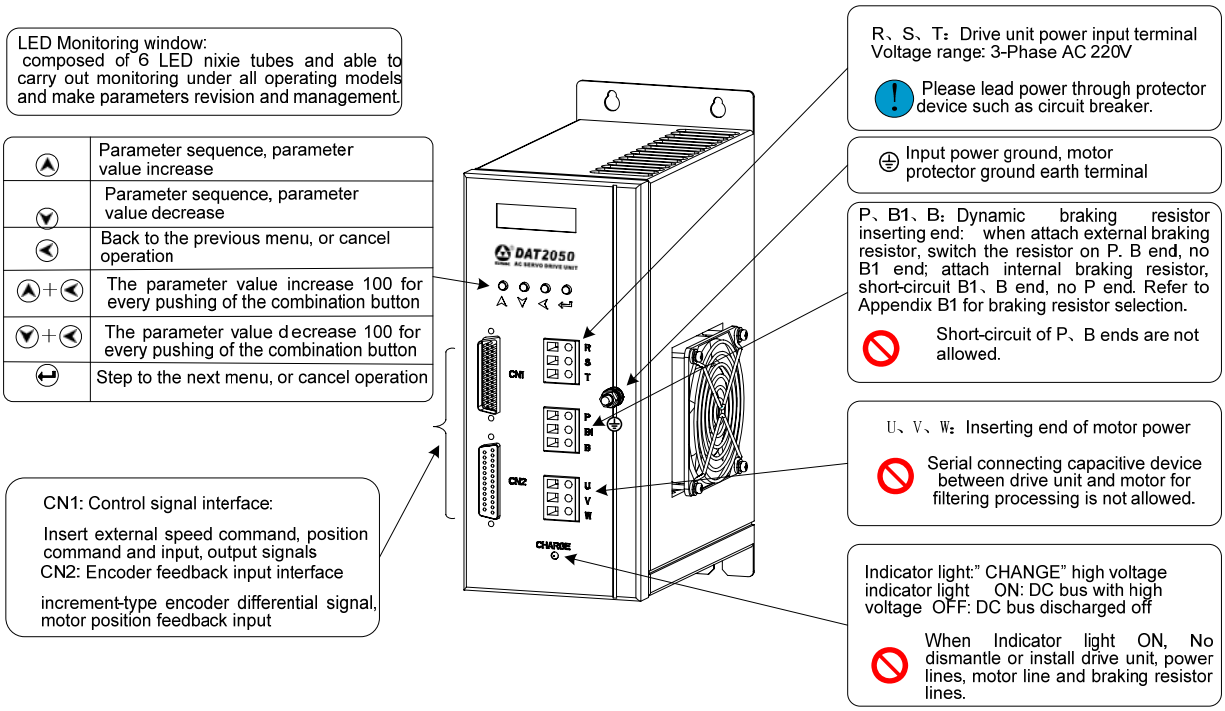
Nameplate examples:



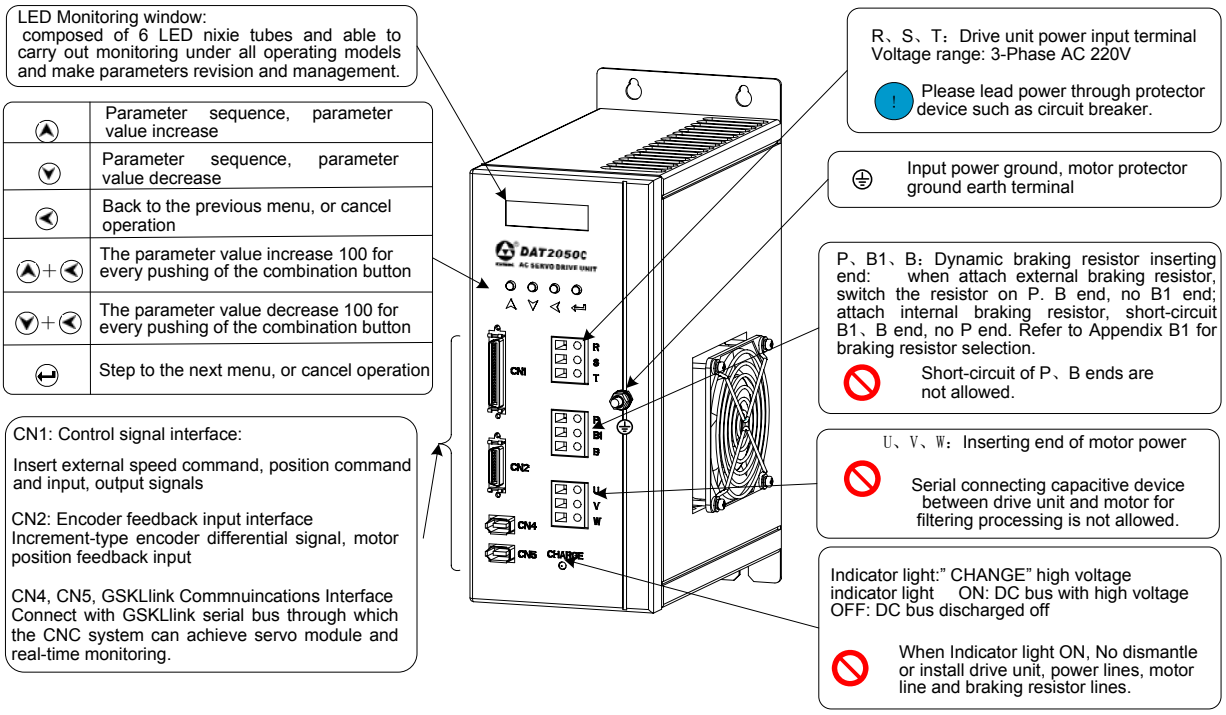


1.2.3 Appearance of servo unit

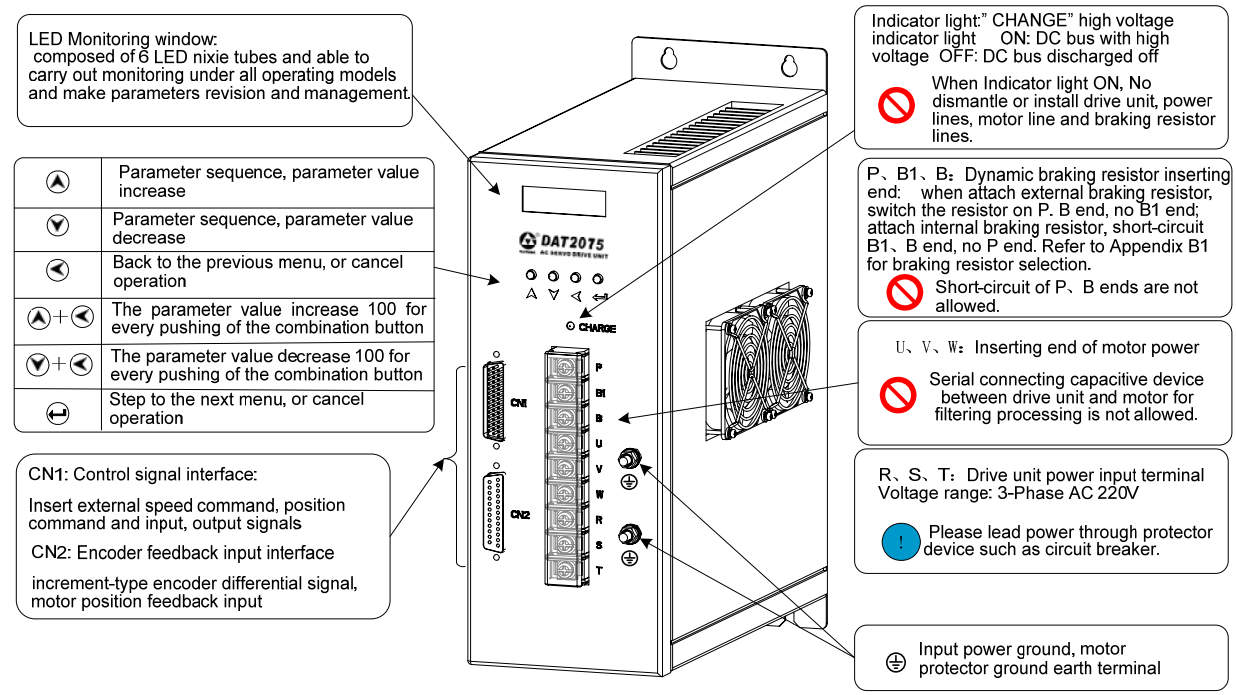
- **Appearance of DAT2030 and DAT2050**



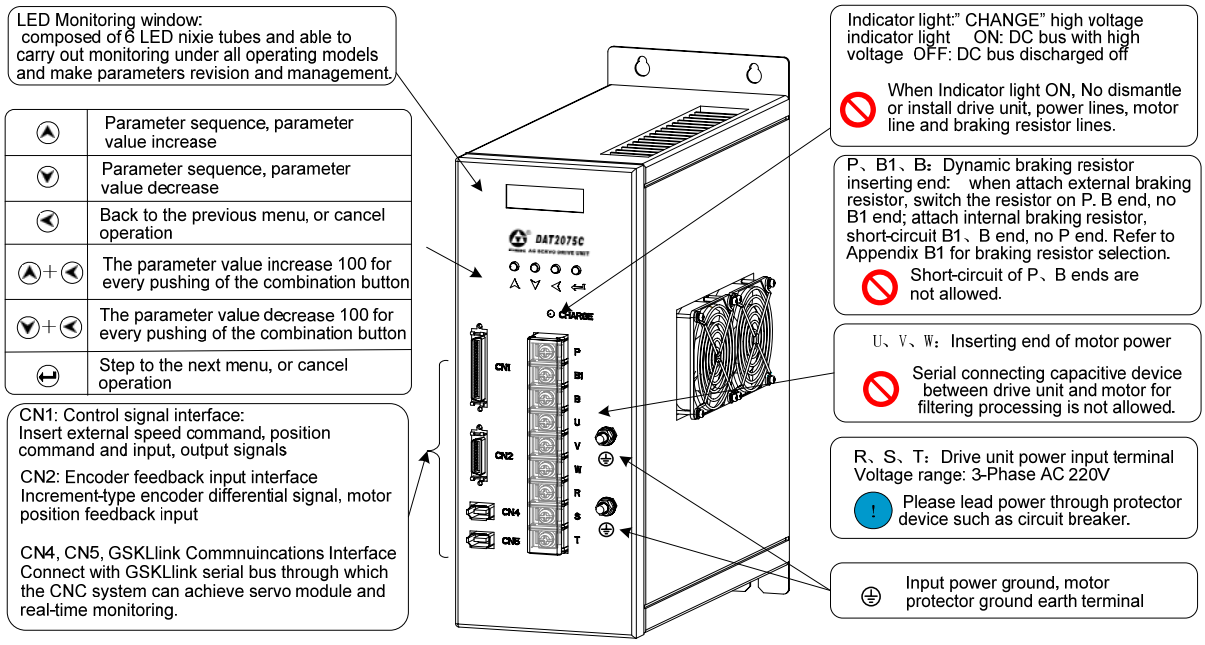
Appearance of DAT2030C and DAT2050C



Appearance of DAT2075 and DAT2100



- **Appearance of DAT2075C,DAT2100C**



1.3 Technical Specifications

1.3.1 Servo motor technical specifications

Table 1-1 Principle Technical Parameters of 80SJT Series Motor

Project \ Model	80SJT-M024C (A□)	80SJT-M024E (A□)	80SJT-M032C (A□)	80SJT-M032E (A□)
Rated Voltage（kW）	0.5	0.75	0.66	1.0
Pole-pairs	4			
Rated Current（A）	3	4.8	5	6.2
Zero-speed Torque（N·m）	2.4	2.4	3.2	3.2
Rated Torque（N·m）	2.4	2.4	3.2	3.2
Maximum Torque （N·m）	7.2	7.2	9.6	9.6
Rate Rotary speed（r/min）	2000	3000	2000	3000
Maximum Rotary speed（r/min）	2500	4000	2500	4000
Moment of Inertia（kg·m^2）	0.83×10^{-4}	0.83×10^{-4}	1.23×10^{-4}	1.23×10^{-4}
Weight（kg）	2.8	2.9	3.4	3.5
Insulation Grade	F（GB 755—2008）			
Oscillation Grade	R（GB 10068—2008）			
Protection Grade	IP65（GB 4208—2008/IEC 60529：2001，GB/T 4942.1—2006）			
Installation Type	IMB5（Flange installation）（GB/T 997—2008 / IEC 60034-7:2001）			
character of service	S1（Continuous duty）（GB 755—2008）			
electricity-breaking brake	Not available			
Adaptive Encoder	Increment-type 2500 p/r,5000 p/r etc，absolute encoder17bit single-circuit or multi-coil。			

Table 1-2 Principle Parameters of 110SJT Series, 130SJT Series Motor

Project \ Model	110SJT-M 040D(A□)	110SJT-M 040E(A□)	110SJT-M 060D(A□)	110SJT-M 060E(A□)	130SJT-M 040D(A□)	130SJT-M 050D(A□)
Rated Voltage（kW）	1.0	1.2	1.5	1.8	1.0	1.3
Pole-Pairs	4					
Rated Current （A）	4.5	5	7	8	4	5
Zero-speed Torque （N·m）	4	4	6	6	4	5
Rated Torque （N·m）	4	4	6	6	4	5
Maximum Torque (N·m）	12	10	12	12	10	12.5
Rated Rotary speed （r/min）	2500	3000	2500	3000	2500	2500
Maximum Rotary speed （r/min）	3000	3300	3000	3300	3000	3000
Moment of Inertia （kg·m^2）	0.68×10^{-3}	0.68×10^{-3}	0.95×10^{-3}	0.95×10^{-3}	1.1×10^{-3}	1.1×10^{-3}
Weight（kg）	6.1	6.1	7.9	7.9	6.5	6.5
Weight of motor with electricity-breaking brake（kg）	7.7	7.7	9.5	9.5	8.1	8.1
Insulation Grade	B（GB 755-2008）					
Oscillation Grade	R（GB 10068-2008）					
Protection Grade	IP65（GB/T4942.1-2006）					
Installation Type	IMB5（Flange Installation）（GB/T 997-2008 / IEC 60034-7:2001）					
Character of Service	S1（Continuous Duty）（GB 755-2008）					
Adaptive Encoder	Increment-type 2500 p/r,5000 p/r etc，absolute encoder17bit single-circuit or multi-coil。					

Table 1-2 Principle Parameters of 110SJT Series, 130SJT Series Motor（continue）

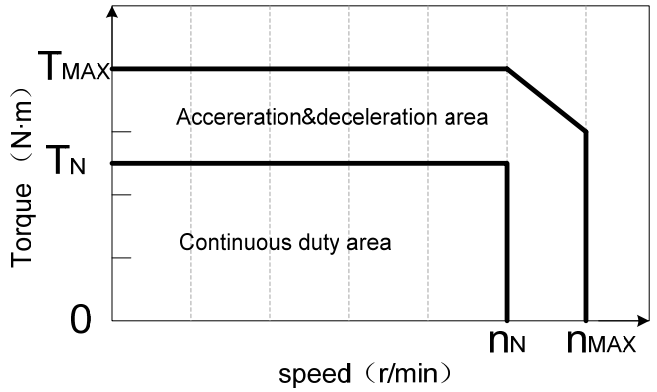
Project \ Model	130SJT-M 060D(A□)	130SJT-M 075D(A□)	130SJT-M 100B(A□)	130SJT-M 100D(A□)	130SJT-M 150B(A□)	130SJT-M 150D(A□)
Rated Voltage（kW）	1.5	1.88	1.5	2.5	2.3	3.9
Pole-Pairs	4					
Rated Current （A）	6	7.5	6	10	8.5	14.5
Zero-speed Torque （N·m）	6	7.5	10	10	15	15
Rated Torque （N·m）	6	7.5	10	10	15	15
Maximum Torque (N·m）	18	20	25	25	30	30

Rated Rotary speed（r/min）	2500	2500	1500	2500	1500	2500
Maximum Rotary speed（r/min）	3000	3000	2000	3000	2000	3000
Moment of Inertia（kg·m^2）	1.33×10^{-3}	1.85×10^{-3}	2.42×10^{-3}	2.42×10^{-3}	3.1×10^{-3}	3.6×10^{-3}
Weight（kg）	7.2	8.1	9.6	9.7	11.9	12.7
Weight of motor with electricity-breaking brake（kg）	10.1	11	12.5	12.6	14.8	15.6
Insulation Grade	B（GB 755-2008）					
Oscillation Grade	R（GB 10068-2008）					
Protection Grade	IP65（GB/T4942.1-2006）					
Installation Type	IMB5（Flange Installation）（GB/T 997-2008 / IEC 60034-7:2001）					
Character of Service	S1（Continuous Duty）（GB 755-2008）					
Adaptive Encoder	Increment-type 2500 p/r,5000 p/r etc，absolute encoder17bit single-circuit or multi-coil					

Table 1-3 Principle Parameters of 175SJT Series Motor

Model / Project	**175SJT-M 180B(A□)**	**175SJT-M 180D(A□)**	**175SJT-M 220B(A□)**	**175SJT-M 220D(A□)**	**175SJT-M 300B(A□)**	**175SJT-M 300D(A□)**
Rated Voltage（kW）	2.8	3.8	3.5	4.5	3.8	6
Pole-Pairs	3					
Rated Current （A）	15	16.5	17.5	19	19	27.5
Zero-speed Torque （N·m）	18	18	22	22	30	30
Rated Torque （N·m）	18	14.5	22	17.6	24	24
Maximum Torque (N·m）	36	29	44	35.2	48	48
Rated Rotary speed（r/min）	1500	2500	1500	2500	1500	2500
Maximum Rotary speed（r/min）	2000	3000	2000	3000	2000	3000
Moment of Inertia（kg·m^2）	6.5×10^{-3}	6.5×10^{-3}	9.0×10^{-3}	9.0×10^{-3}	11.2×10^{-3}	11.2×10^{-3}
Weight（kg）	22.8	22.9	28.9	29.2	34.3	34.4
Weight of motor with electricity-breaking brake（kg）	28.4	28.5	34.5	36.8	42	42.1
Insulation Grade	F（GB 755-2008）					
Oscillation Grade	R（GB 10068-2008）					
Protection Grade	IP65（GB/T4942.1-2006）					
Installation Type	IMB5（Flange Installation）（GB/T 997-2008 / IEC 60034-7:2001）					
Character of Service	S1（Continuous Duty）（GB 755-2008）					
Adaptive Encoder	Increment-type 2500 p/r,5000 p/r etc，absolute encoder17bit single-circuit or multi-coil。					

Mechanical Properties of Servo Motor



TMAX— Maximum torque
TN — Rated torque
nMAX— Maximum Rotary speed
nN — Rated Rotary speed

1.3.2 Technical Specification of Servo Unit

Servo unit model	**DAT2030 DAT2030C**	**DAT2050 DAT2050C**	**DAT2075 DAT2075C**	**DAT2100 DAT2100C**
Rated current of adaptive servo current（A）	<6	6～10.5	11～21	22～28
Dimension（mm）（width*height*depth）	263×115×197		300×105×240	
Main power	3-phase AC（0.85～1.1）×220 V， 50Hz/60Hz			
speed regulation ratio	5000：1			
Speed fluctuation ratio	DAT2000 adaptive to 5000p/r increment encoder，＜0.03%；			
	DAT2000C adaptive to 17bit absolute encoder，＜0.01%；			
Speed frequency response	≥300Hz			
Position accuracy	DAT2000 adaptive to 2500p/rspeed regulation ratio， Position error：±0.036°			
	DAT2000 adaptive to 5000p/rspeed regulation ratio， Position error：±0.018°			
	DAT2000C adaptive to 17bit absolute encoder，Position error：±0.005°			
Work mode	As manual operation, jog, internal speed, external speed, position, zero setting etc.			
Internal speed pattern	Servo motor operates at the 4-stage speed set in accordance with parameters and selected by input signals.			
External speed pattern Position pattern	Servo motor operated at the speed corresponding to VCMD input（-10V～+10V or 0V～+10V） analog voltage）.			

	Rotary angle of servo motor is controlled according to the pulse quantity of position command and the rotary speed determined by the pulse frequency of position command. Position command mode: pulse plus direction, CCW pulse/CW pulse, A/B two phase orthogonal pulse Maximum pulse frequency: 1MHz Command pulse frequency multiplication ratio and frequency demultiplication: 1～32767 Position command electric gear ratio $\frac{1}{50}$～50
Position feedback input	With DAT2000 standard adaptive increment type encoder as the position feedback input, A/B/Z/U/V/W differential signal， encoder resolution ratio: 2500 pixels or 5000 pixels.
	With DAT2000C standard adaptive absolute encoder as the position feedback input, i.e. 17bit absolute encoder, 12bit circles of power-down memory。
position feedback output	Carry out frequency division processing to the pulse data from electromotor encoder (PG or pulse generator) in drive unit and output them to upper computer through CN1 in accordance with the preset pulse number so as to realize function such as the positional closed-loop control of upper computer.
Communications bus	GSKLink Bus（V1.0）
Input signal	10 input points as servo enabling, alarming elimination, CCW prohibition, CW prohibition, Zero-speed clamping, internal speed option1,internal speed option 2,CCW torque limitation, CW torque limitation, general input etc.
Output signal	7 output points as S-RDY, servo alarming, position arrival/speed arrival, band-type brake release, zero-speed output, Z pulse(encoder zero point), general output, etc.
Protection function	With protection functions as overvoltage, undervoltage, overcurrent, overload, overspeed, position deviation, drive abnormality, encoder abnormality, etc.
Operation and display	4 buttons, manual operation, jog as well as parameter revision, setting, writing-in and back-up are available. 6 LEDs which display information as rotary speed, current position, pulse accumulation, position deviation, motor torque, motor current, absolute rotor position, input & output signal states.
braking mode	Dynamic braking, built-in braking resistor (DAT2100 or DAT2100C excluded) and can attach external braking resistor.

CCW indicates the main drive shaft of motor installation plane rotates counterclockwise when you see it from the shaft extension direction (CCW-Counter Clockwise).
CW indicates the main drive shaft of motor installation plane rotates clockwise when you see it from the shaft extension direction (CW- Clockwise).

1.4 Order instruction

1.4.1 Order model example

Order model examples of adaptive SJT series servo motor are listed on the following chart:

Order model	Principle motor parameters				
	Rated Voltage	Rated Current	Zero-speed Torque	Rated speed	Encoder
DAT2030-05-80SJT-M024C	0.5kW	3 A	2.4 N·m	2000r/min	2500p/r Incremental type
DAT2030-08-80SJT-M024E	0.75kW	4.8 A	2.4 N·m	3000r/min	2500p/r Incremental type
DAT2030-07-80SJT-M032C	0.66kW	5 A	3.2 N·m	2000r/min	2500p/r Incremental type
DAT2050-10-80SJT-M032E	1.0kW	6.2 A	3.2 N·m	3000r/min	2500p/r Incremental type
DAT2030-10-110SJT-M040D(A2) DAT2030-10-110SJT-MZ040D(A2)	1.0kW	4.5A	4N·m	2500r/min	5000p/r Incremental type
DAT2050-15-110SJT-M060D(A2) DAT2050-15-110SJT-MZ060D(A2)	1.5kW	7A	6N·m	2500r/min	5000p/r Incremental type
DAT2030-10-130SJT-M040D(A2) DAT2030-10-130SJT-MZ040D(A2)	1.0kW	4A	4N·m	2500r/min	5000p/r Incremental type
DAT2030-13-130SJT-M050D(A2) DAT2030-13-130SJT-MZ050D(A2)	1.3kW	5A	5N·m	2500r/min	5000p/r Incremental type
DAT2050-15-130SJT-M060D（A2）	1.5kW	6 A	6 N·m	2500r/min	5000p/r Incremental type
DAT2050-19B-130SJT-M075D（A2）	1.9kW	7.5 A	7.5 N·m	2500r/min	5000p/r Incremental type
DAT2050-15-130SJT-M100B（A2）	1.5kW	6 A	10 N·m	2500r/min	5000p/r Incremental type
DAT2050-25B-130SJT-M100D（A2）	2.5kW	10 A	10 N·m	2500r/min	5000p/r Incremental type
DAT2050-23B-130SJT-M150B（A2）	2.3kW	8.5 A	15 N·m	1500r/min	5000p/r Incremental type
DAT2075-39E-130SJT-M150D（A2）	3.9kW	14.5 A	15 N·m	2500r/min	5000p/r Incremental type
DAT2075-28E-175SJT-M180B（A2）	2.8kW	15 A	18 N·m	1500r/min	5000p/r Incremental type
DAT2075-38E-175SJT-M180D（A2）	3.8kW	16.5 A	18 N·m	2500r/min	5000p/r Incremental type
DAT2075-35-175SJT-M220B（A2）	3.5kW	17.5 A	22 N·m	1500r/min	5000p/r Incremental type
DAT2075-45-175SJT-M220D（A2）	4.5kW	19 A	22 N·m	2500r/min	5000p/r Incremental type

Order model	Principle motor parameters				
	Rated Voltage	Rated Current	Zero-speed Torque	Rated speed	Encoder
DAT2075-38-175SJT-M300B（A2）	3.8kW	19 A	30 N·m	1500r/min	5000p/r Incremental type
DAT2100-60-175SJT-M300D（A2）	6.0kW	27.5 A	30 N·m	2500r/min	5000p/r Incremental type
DAT2030C-10-110SJT-M040D(A4I) DAT2030C-10-110SJT-MZ040D(A4I)	1.0kW	4.5A	4N·m	2500r/min	17bit multi-coil absolute type
DAT2050C-15-110SJT-M060D(A4I) DAT2050C-15-110SJT-MZ060D(A4I)	1.5kW	7A	6N·m	2500r/min	17bit multi-coil absolute type
DAT2030C-10-130SJT-M040D(A4I) DAT2030C-10-130SJT-MZ040D(A4I)	1.0kW	4A	4N·m	2500r/min	17bit Multi-coil absolute type
DAT2030C-13-130SJT-M050D(A4I) DAT2030C-13-130SJT-MZ050D(A4I)	1.3kW	5A	5N·m	2500r/min	17bit Multi-coil absolute type
DAT2050C-15-130SJT-M060D(A4I)	1.5kW	6 A	6 N·m	2500r/min	17bit Multi-coil absolute type
DAT2050C-19B-130SJT-M075D(A4I)	1.9kW	7.5 A	7.5 N·m	2500r/min	17bit Multi-coil absolute type
DAT2050C-15-130SJT-M100B(A4I)	1.5kW	6 A	10 N·m	2500r/min	17bit Multi-coil absolute type
DAT2050C-25B-130SJT-M100D(A4I)	2.5kW	10 A	10 N·m	2500r/min	17bit Multi-coil absolute type
DAT2050C-23B-130SJT-M150B(A4I)	2.3kW	8.5 A	15 N·m	1500r/min	17bit Multi-coil absolute type
DAT2075C-39E-130SJT-M150D(A4I)	3.9kW	14.5 A	15 N·m	2500r/min	17bit Multi-coil absolute type
DAT2075C-28E-175SJT-M180B(A4I)	2.8kW	15 A	18 N·m	1500r/min	17bit Multi-coil absolute type
DAT2075C-38E-175SJT-M180D(A4I)	3.8kW	16.5 A	18 N·m	2500r/min	17bitMulti-coil absolute type
DAT2075C-35-175SJT-M220B(A4I)	3.5kW	17.5 A	22 N·m	1500r/min	17bit Multi-coil absolute type
DAT2075C-45-175SJT-M220D(A4I)	4.5kW	19 A	22 N·m	2500r/min	17bit Multi-coil absolute type
DAT2075C-38-175SJT-M300B(A4I)	3.8kW	19 A	30 N·m	1500r/min	17bit Multi-coil absolute type
DAT2100C-60-175SJT-M300D(A4I)	6.0kW	27.5 A	30 N·m	2500r/min	17bit Multi-coil absolute type

Attentions

1. When ordering motors, please select models according to the adaptive model lists offered by GSK and write down your confirmed model on the order so as to set the corresponding parameters of factory servo units.

2. Please contact our technician in time if you want to allocate motors on your own, otherwise we can not guarantee the AC servo unit drives the motor normally.

1.4.2 Standard Products Accessories

Following list shows the standard products accessories which are allocated on the basis that no special requirement asked by users. If users need other accessories not included in the list, please contact salesperson or consult our technicians for further information.

■ **DAT2000 series servo unit standard accessories list(allocated per each servo unit)**

Order Type	Accessories Name	Quantity	Description	Note
servo unit and servo motor kit	44DB cellular type plug and plastic box	1set	CN1 connection plug	welded cable wire are available
	motor encoder wire	1strip	standard length 3M	
	motor wire	1strip	standard length 3M	
	“Instruction Manual of DAT Series AC Servo Drive Unit”	1 PCS	Accompanying technical document	
	RXLG-1500W-10ΩJ braking resistor	1 PCS	Only DAT2100 adaptive to this accessory	
Servo unit and CNC Kit(without servo motor)	25DB pin-type plug and plastic box	1 set	CN2 connection plug	CN1-CNC signals. connection wires are available along with CNC products
	“Instruction Manual of DAT Series AC Servo Drive Unit	1PC	Accompanying technical document	
	RXLG-1500W-10ΩJ braking resistor	1PC	Only DAT2100 adaptive to this accessory	
Servo unit, servo motor and CNC Kit	motor encoder wire	1strip	standard length 3M	CN1-CNC signals connection wires are available along with CNC products
	motor wire	1 strip	standard length 3M	
	“Instruction Manual of DAT Series AC Servo Drive Unit	1PC	Accompanying technical document	
	RXLG-1500W-10ΩJ braking resistor	1PC	Only DAT2100C adaptive to this accessory	

Note: Please mark on the order if you need other length of wire except for the standard 3M.

■ **DAT2000C Series Servo Unit Standard Accessories List(allocated per each servo unit)**

Order Type	Accessory Name	Quantity	Description	Note
Servo unit and CNC Kit(without servo motor)	26P high density plug and plastic box	1set	CN2 connection plug	CN1-CNC, GSKLinK signals connection wire and terminal socket are available along with CNC products
	"Instruction Manual of DAT Series AC Servo Drive Unit	1 pc	Accompanied technical document	
	RXLG-1500W-10ΩJ braking resistor	1 pc	Only DAT2100C adaptive to this accessory	
servo unit, servo motor and CNC Kit	motor encoder wire	1strip	standard length 3M	CN1-CNC, GSKLinK signals connection wire and terminal socket are available along with CNC products
	motor wire	1 strip	standard length 3M	
	"Instruction Manual of DAT Series AC Servo Drive Unit	1 pc	Accompanied technical document	
	RXLG-1500W-10ΩJ braking resistor	1 pc	Only DAT2100C adaptive to this accessory	

■ **DAT Series Selective Accessories**

Accessory Name	Description	Note
Braking resistor RXLG-300W-30ΩJ	Power:300W,resistivity: 30Ω； DAT2030 or DAT2030C external selective	Refer to Appendix B1 "Outlay Braking Resistor" for detailed the installation dimension.
Braking resistor RXLG-500W-22ΩJ	Power 500W,resistivity: 22Ω；DAT2050 or DAT2050C external selective	
Braking resistor RXLG-1000W-15ΩJ	Power 1000W,resistivity:15Ω； DAT2075 or DAT2075C external selective	
4*1.5mm2 BVVB	4-core wire, wire diameter:1.5mm^2； DAT2030 or DAT2030C for motor wire	
4*2.5mm^2 BVVB	4-core wire, wire diameter:2.5mm^2； DAT2050 or DAT2050C for motor wire	
4*4.0mm^2 BVVB	4-core wire, wire diameter:4.0mm^2； DAT2075,DAT2075C,DAT2100,DAT2100C for motor wire	
10-core twinning shielding wire	matching motor encoder wire	

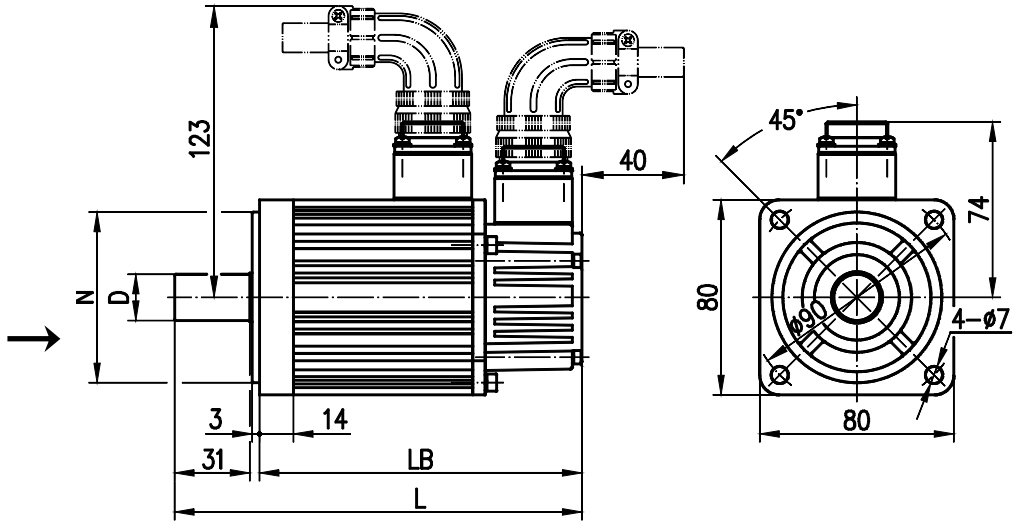
CHAPTER 2 INSTALLATION

2.1 Servo Motor

2.1.1 Mounting Dimension of the Servo Motor

- For external dimensions and installation of 80SJT series motor, see figure 2-1, table 2-1.

Industrial (aviation)
Socket mount



Cable type

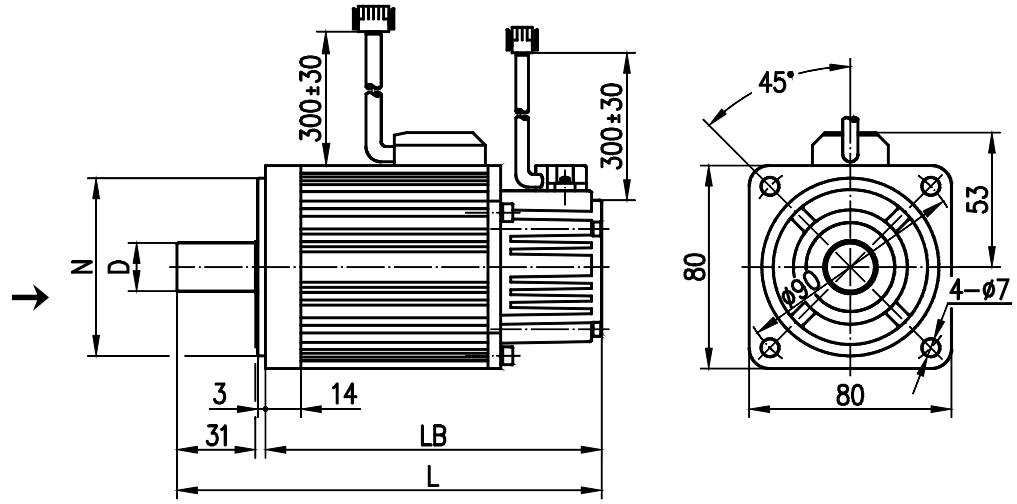


Fig. 2-1

Table 2-1

Type	D(mm)	N(mm)	LB(mm)	L(mm)
80SJT—M024C (A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 70^{0}_{-0.03}$	171	206
80SJT—M024E(A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 70^{0}_{-0.03}$	171	206
80SJT—M032C(A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 70^{0}_{-0.03}$	189	224
80SJT—M032E(A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 70^{0}_{-0.03}$	189	224

- For external dimensions of 110SJT series motor, see figure 2-2, table 2-2.

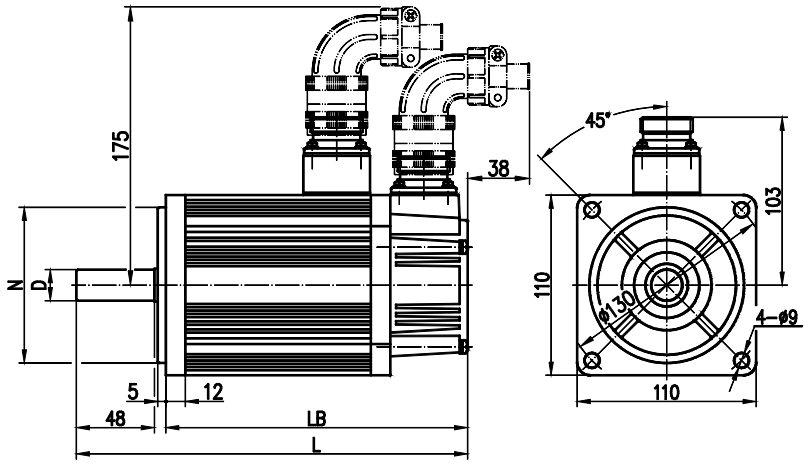


Fig. 2-2

Table 2-2

Type	D(mm)	N(mm)	LB(mm)	L(mm)
110SJT—M040D(A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 95^{0}_{-0.035}$	186 (237)	241 (292)
110SJT—M040E(A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 95^{0}_{-0.035}$	186 (237)	241 (292)
110SJT—M060D(A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 95^{0}_{-0.035}$	212 (263)	267 (318)
110SJT—M060E(A□)	$\varphi 19^{0}_{-0.013}$	$\varphi 95^{0}_{-0.035}$	212 (263)	267 (318)
Note: LB, L values in the brackets are the length of corresponding motor that with safe brake.				

- For external dimensions of 130SJT series motor, see figure 2-3, table 2-3.

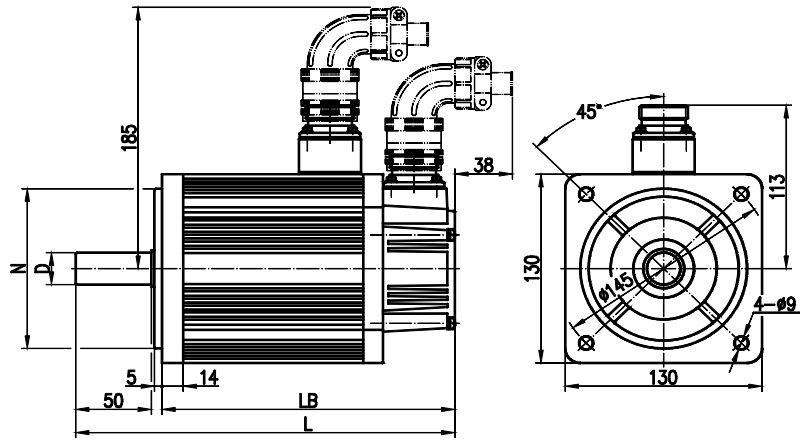


Fig. 2-3

Table 2-3

Type	D(mm)	N(mm)	LB(mm)	L(mm)
130SJT—M040D(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	168 (227)	225 (284)
130SJT—M050D(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	168 (227)	225 (284)
130SJT—M060D(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	176 (235)	233 (292)
130SJT—M075D(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	188 (247)	245 (304)
130SJT—M100B(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	208 (267)	265 (324)
130SJT—M100D(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	208 (267)	265 (324)
130SJT—M150B(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	238 (297)	295 (354)
130SJT—M150D(A□)	$\varphi 22^{0}_{-0.013}$	$\varphi 110^{0}_{-0.035}$	248 (307)	305 (364)
Note: LB, L values in the brackets are the length of corresponding motor that with safe brake.				

➢ For external dimensions of 175SJT series motor, see figure 2-4, table 2-4.

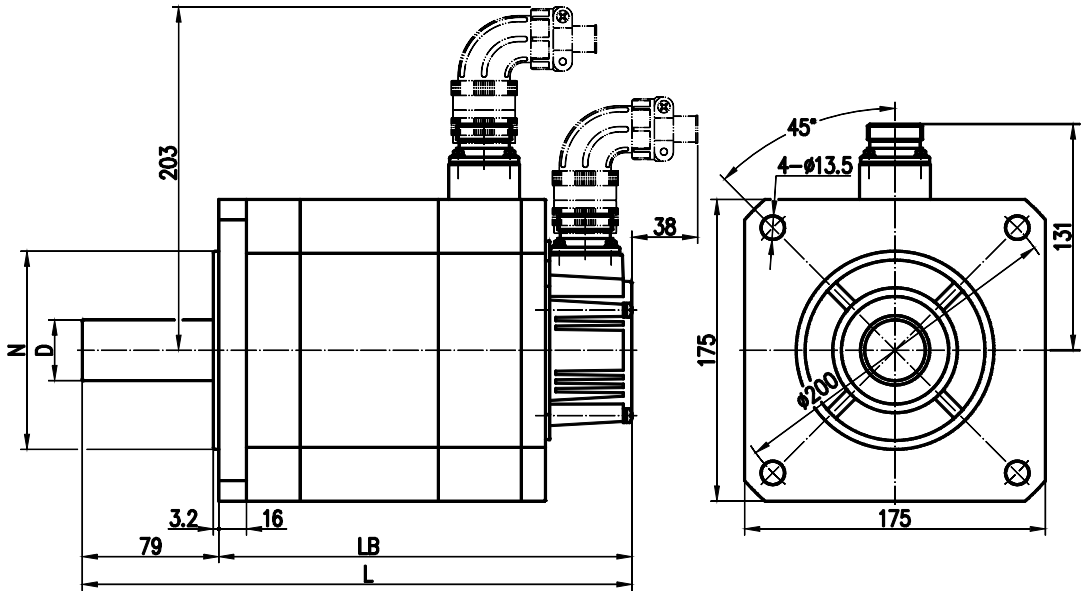


Fig. 2-4

Table 2-4

Type	D(mm)	N(mm)	LB(mm)	L(mm)
175SJT—M150D(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	224 (291)	303 (370)
175SJT—M180B(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	244 (311)	323 (390)
175SJT—M180D(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	244 (311)	323 (390)
175SJT—M220B(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	279 (346)	358 (425)
175SJT—M220D(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	279 (346)	358 (425)
175SJT—M300B(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	309 (382)	388 (461)
175SJT—M300D(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	309 (382)	388 (461)
175SJT—M380B(A□)	$\varphi 35_0^{+0.01}$	$\varphi 114.3^0_{-0.025}$	359 (432)	438 (561)
Note: LB, L values in the brackets are the length of corresponding motor that with safe brake.				

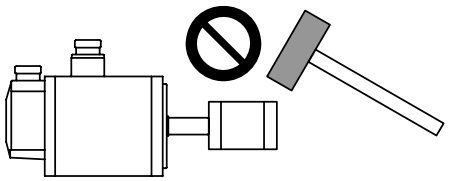
2.1.2 Servo Motor Installation

Servo motor installation, storage and transportation environment

Item	Parameter and requirement
Operation temperature	0℃～40℃
Storage and transportation temperature	-40℃～70℃
Operation humidity	30%～95%（no dewing）
Storage and transportation humidity	≤95%（40℃）
Atmosphere environment	There is no corrosive or flammable gas, oil mist or dust etc. in the control cabinet
Altitude	Altitude of below 1000m

Attentions

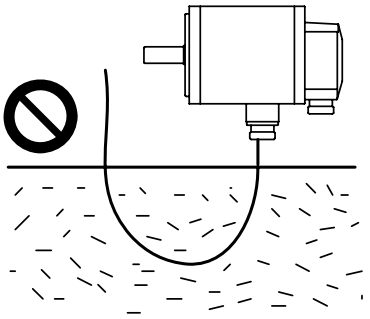
1. When install the belt pulley, do not strike the motor or the motor axis to avoid damage to internal encoder. Spiral insert and pull out tools should be used for dismounting.



2. The servo motor can not bear axial and radial load. Spring coupling is recommended to connect the load.

3. Stop washer should be used to fix the motor to avoid motor loosening.

4. The motor mounting position should be protected against water and oil. The cable will bring water and oil to the motor if it immerses in water and oil. Therefore, this situation should be prevented from happening.



2.2 Servo Unit

The installation environment of the servo motor has direct effect on its functions and service life. Please install it correctly under the instructions below.

Attentions

- Prevent water and direct sunlight.
- Please put on electrical cabinet to prevent dust, corrosive gas, conductive and flammable materials.
- The installation place should be well ventilated, moisture proof and dust proof.
- Do not install it on the surface or near the flammable materials to prevent fire.
- The mounting place should be facilitating maintenance and checking.

Item	Parameter and requirement
Operation temperature	0℃～40℃
Storage and transportation temperature	-40℃～70℃
Operation humidity	30%～95%（no dewing）
Storage and transportation humidity	≤95%（40℃）
Atmosphere environment	There is no corrosive or flammable gas, oil mist or dust etc. in the control cabinet
Altitude	Altitude of below 1000m
Vibration	≤0.6G(5.9m/s^2)
Atmosphere pressure	86kPa～106kPa

2.2.1 Installation Dimension

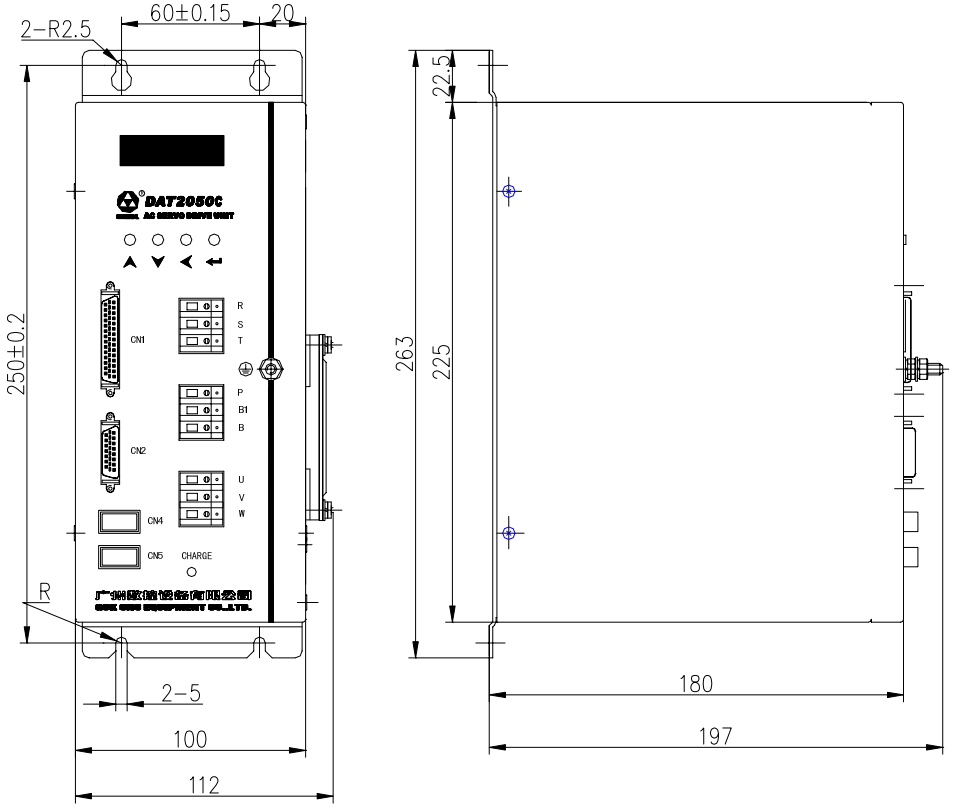


Fig. 2-5 DAT2030,DAT2030C,DAT2050,DAT2050C installation dimension (unit：mm)

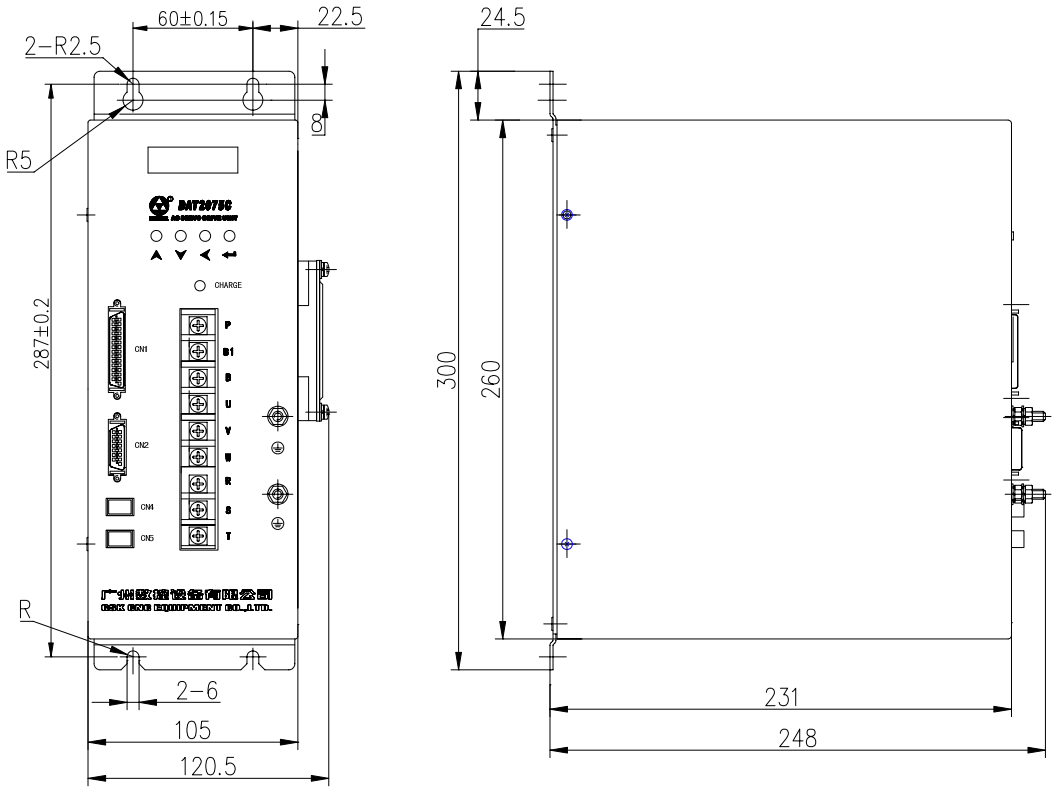


Fig. 2-6 DAT2075,DAT2075C,DAT2100,DAT2100C installation dimension (unit：mm)

2.2.2 Mounting Interval

DAT series servo unit adopts base-plate installation mode, install direction is perpendicular to the mounting surface. Put the front side of the servo unit forward, and top side upward to dissipate heat. Please leave space around it.

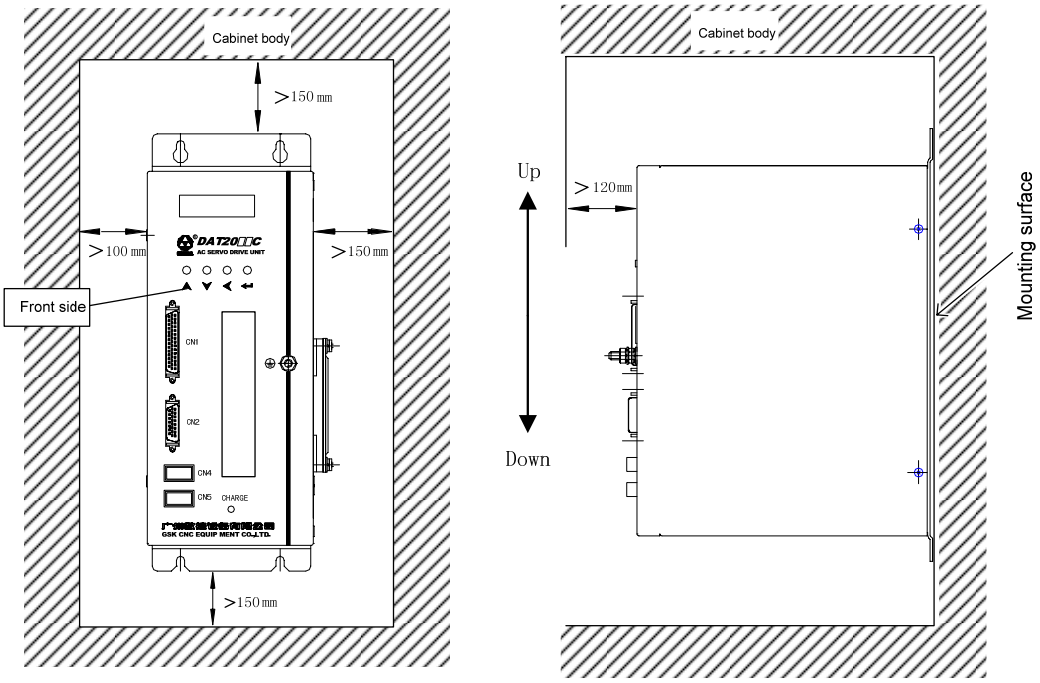


Fig. 2-7 DAT servo unit mounting interval

Fig. 2-8 shows intervals between servo units, more space should leave in actual installation to ensure well heat elimination.

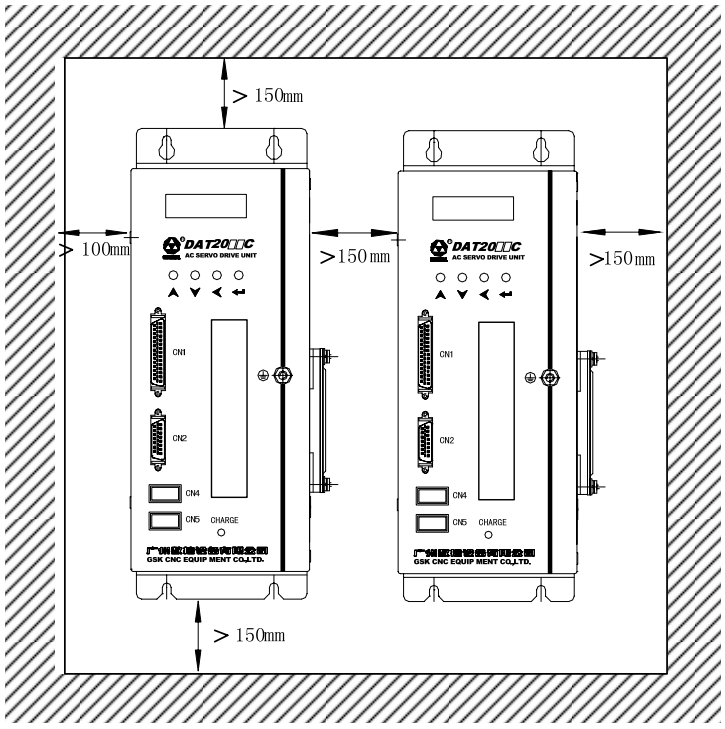


Fig. 2-8 Mounting intervals between DAT servo units

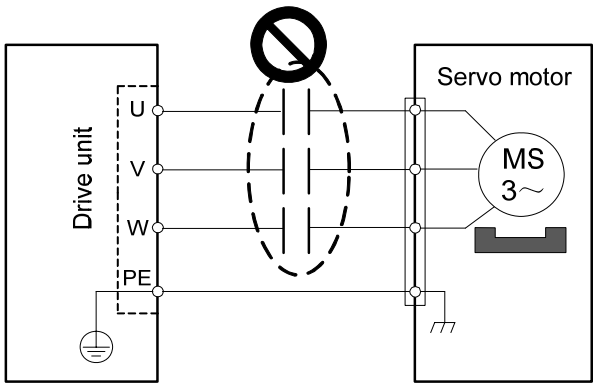
To prevent environment temperature continuously from being increased, ensure convection current flows to radiator of the servo unit in the electric cabinet.

Chapter 3 CONNECTION

Please read the following notes carefully and follow it to get safe and smooth operations.

Attentions

- Wiring can only be done by professional technical persons according to corresponding instructions.
- Do wiring and maintenance operation at least 5 minutes after the servo unit is power off. Ensure the voltage that each main circuit terminal to ground is safe voltage, or you will be electrocuted.
- Please confirm that servo unit and servo motor are earthed correctly.
- When you wiring, do not damage the cable by a sharp object, do not pull the cable lustily, otherwise, it will cause electric shock or poor contact.
- Do not cross the main return circuit and signal wire through the same pipe, and do not tie them together. When wiring, the user separates or crosses the main return circuit and signal wire, and leaves an interval of 30cm to prevent interference (from high current wire to signal wire) that makes the servo unit unable to work properly.
- Do not switch on or off the servo unit frequently, because high capacitance in it will generate high charging current when power on. Power on or off frequently will decrease the performance of internal components of the servo unit. Recommended power on or off interval is above 3 minutes.
- Power capacity, surge absorber, radio noise filter and other devices should not be installed at output side of the servo unit or between servo motors.



- Keep the main return circuit wire and signal line away from heat abstractor and motor to avoid insulation property decreasing by heat.
- After connection of the main return circuit wire, the terminal protective cap is covered to avoid electric shock.

3.1 Connection of Peripherals

Servo unit must be equipped with some peripherals. Proper peripheral ensures the servo unit works stably. Otherwise, service life will be shortened and even the servo unit will be damaged.

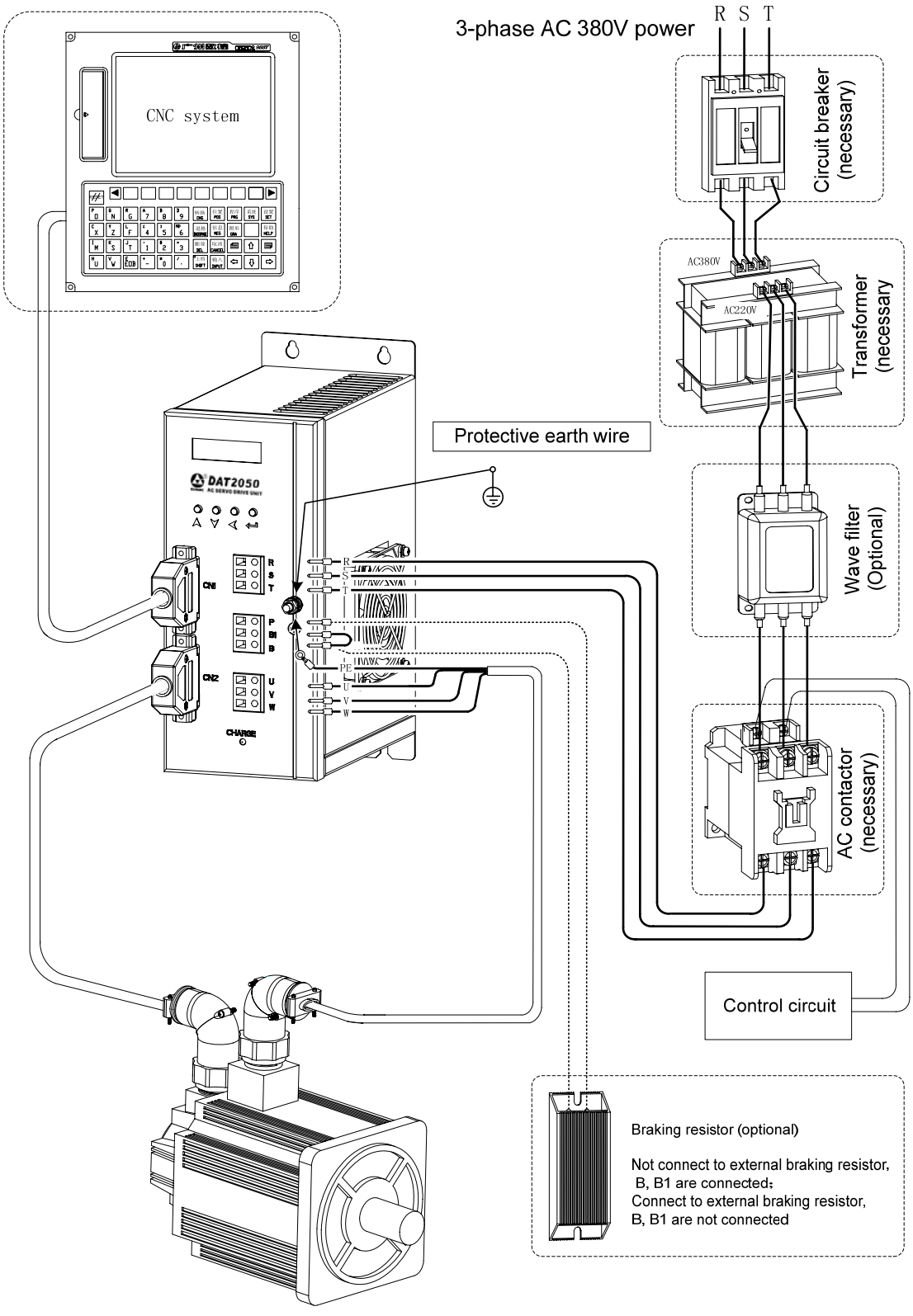


Fig. 3-2 Connection of peripheral DAT2030, DAT2050

For circuit breaker, isolation transformer, AC wave filter, AC contactor selection, please refer to appendix B.

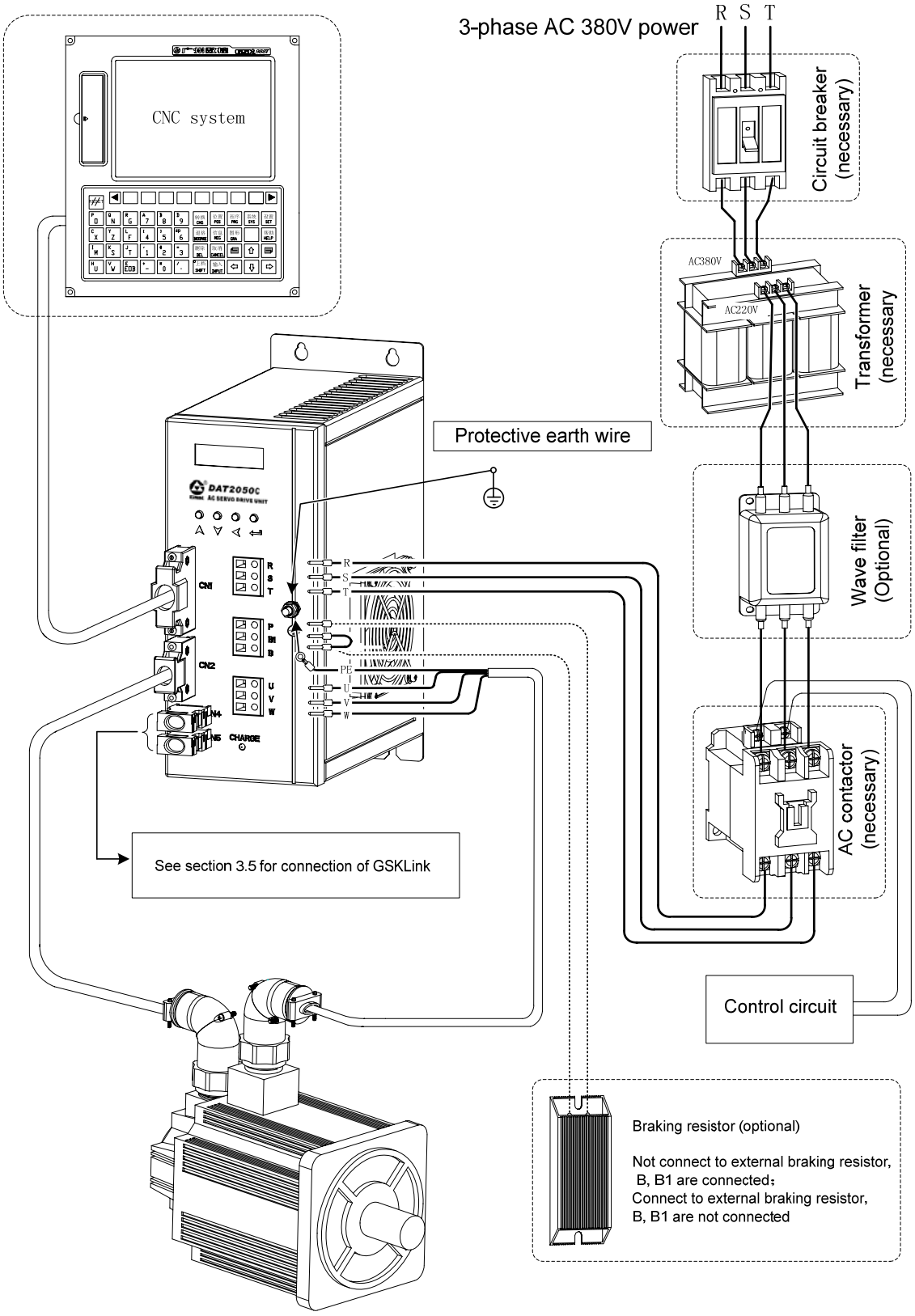


Fig. 3-3 Connection of peripheral DAT2030C, DAT2050C

For circuit breaker, isolation transformer, AC wave filter, AC contactor selection, please refer to appendix B.

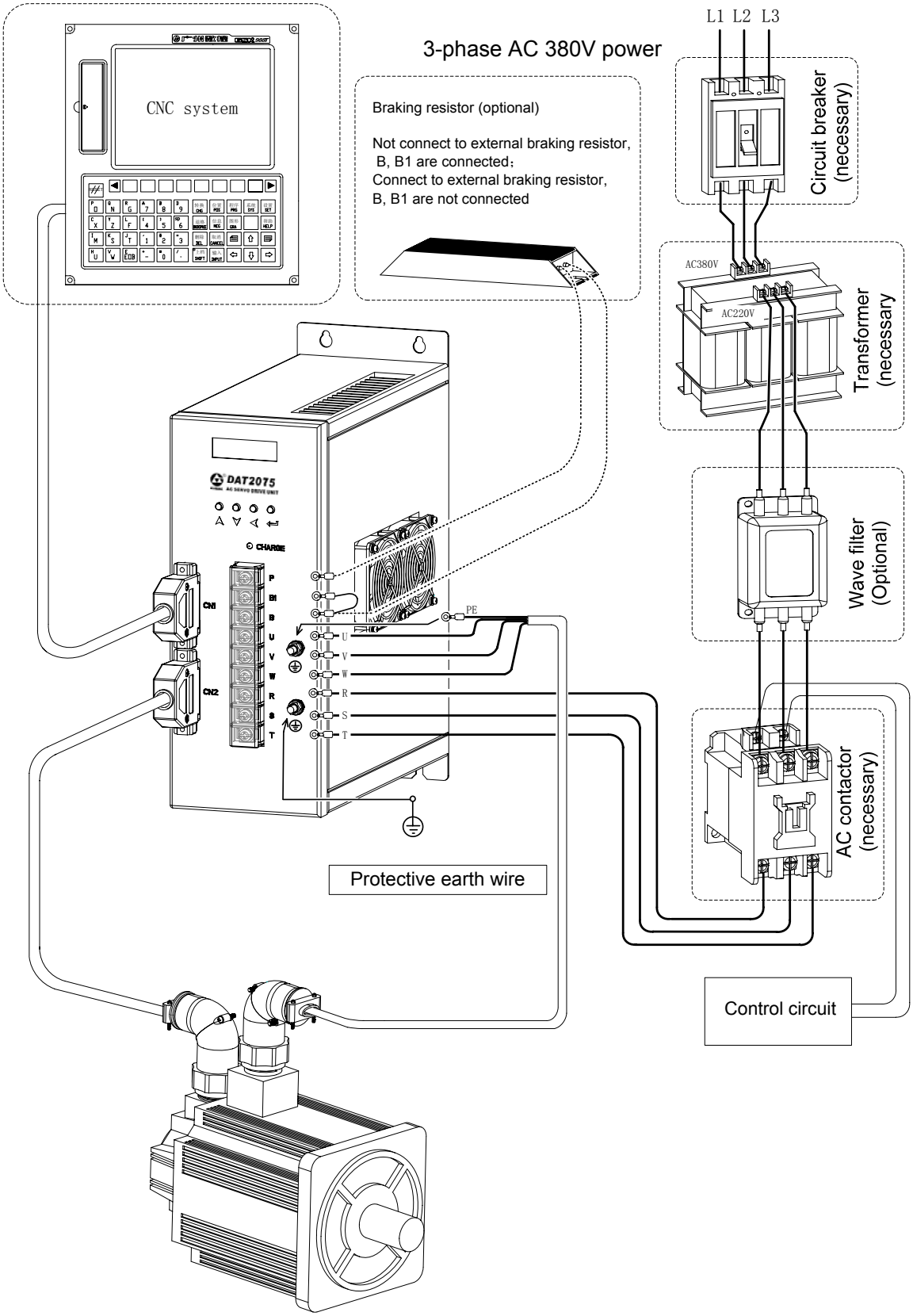


Fig. 3-4 Connection of peripheral DAT2075, DAT2100

For circuit breaker, isolation transformer, AC wave filter, AC contactor selection, please refer to appendix B.

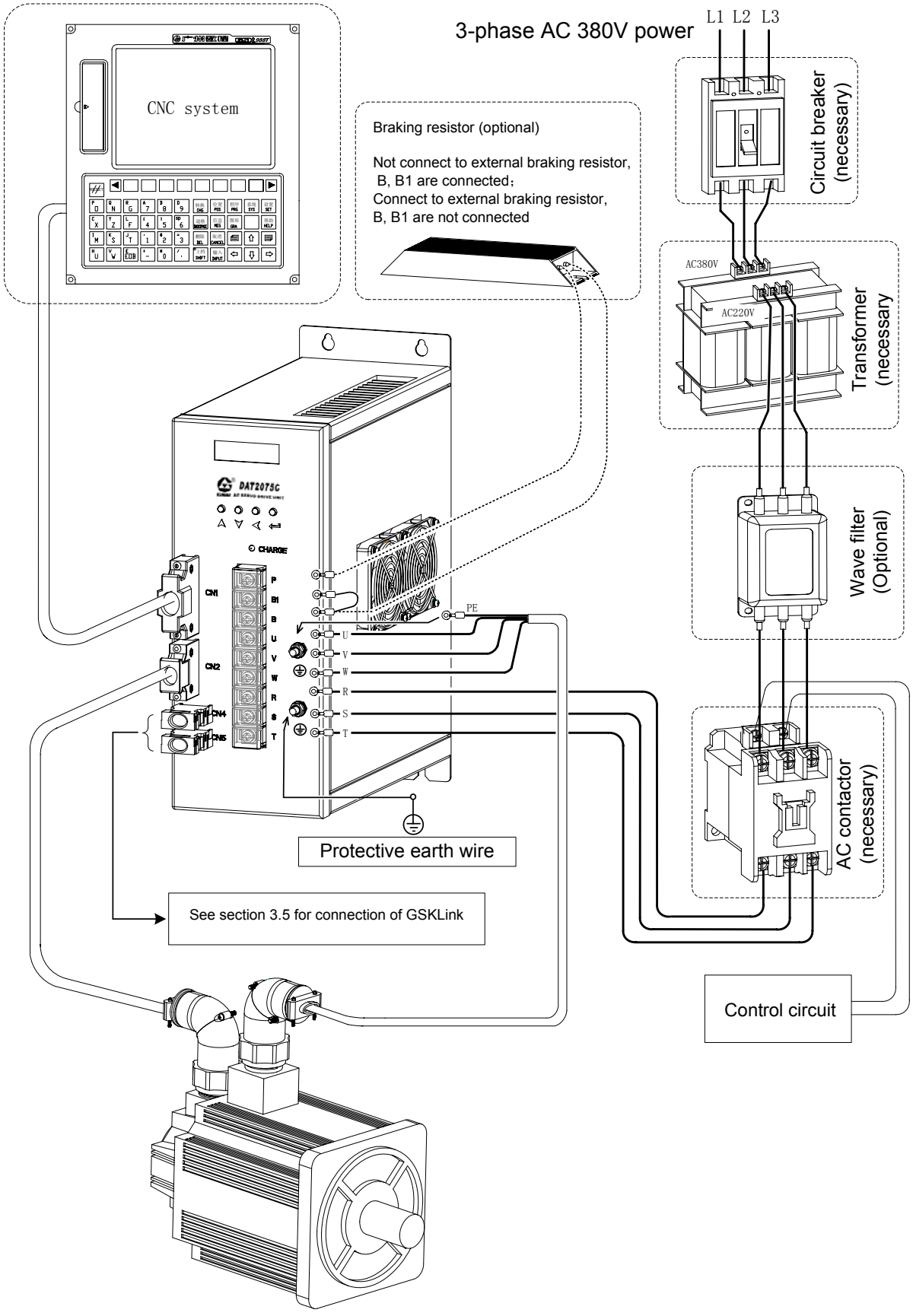


Fig. 3-5 Connection of peripheral DAT2075C, DAT2100C

For circuit breaker, isolation transformer, AC wave filter, AC contactor selection, please refer to appendix B.

3.2 Terminal Connection of Main Circuit

3.2.1 Terminal Connection of Servo Unit

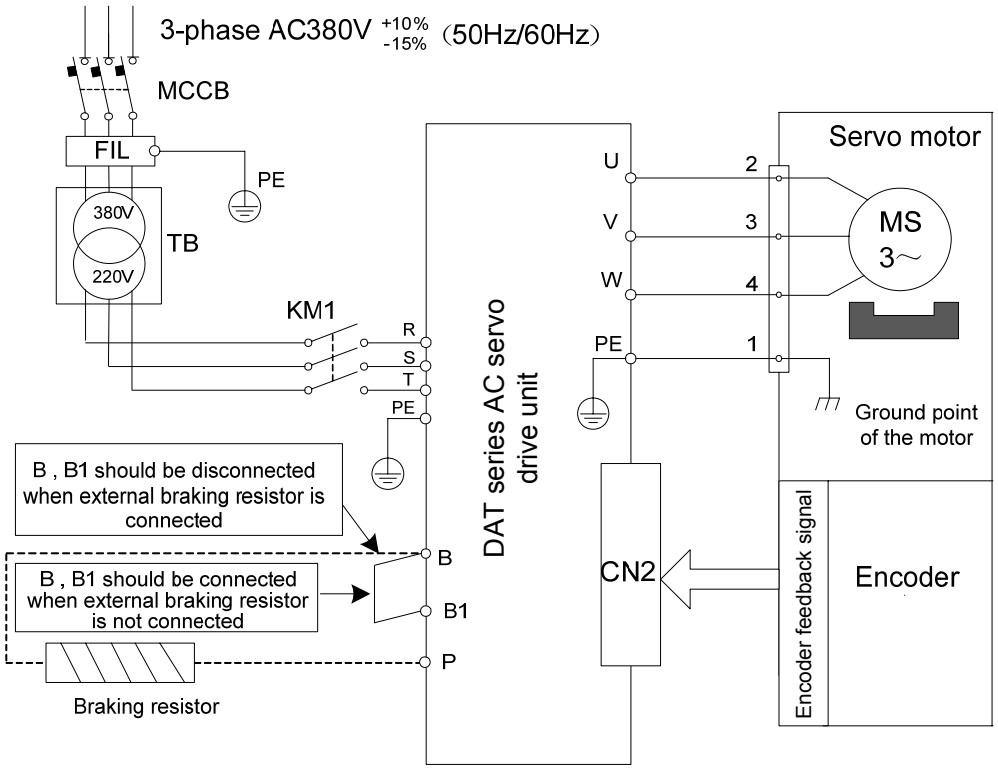
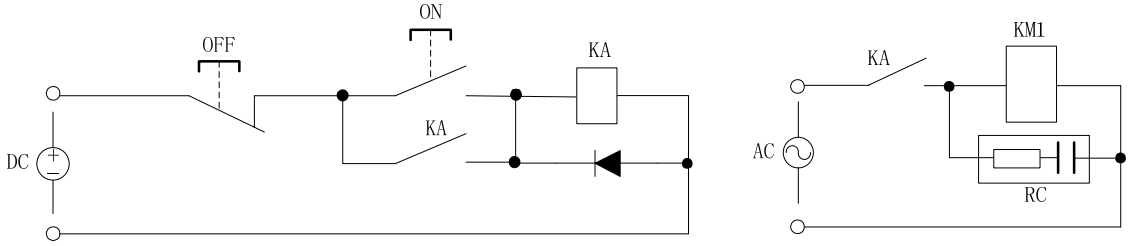


Fig. 3-6 Main circuit connection of DAT series products

Attentions

- B , B1 should be shorted when external braking resistor is not connected. B , B1 should be disconnected when external braking resistor is connected
- U, V, W, PE terminals of the motor cable provided by our company are marked, which should one-to-one correspondent to U, V, W, PE terminals of the servo unit. Otherwise, the motor will not work normally.
- The system must be earthed correctly, and its resistance must be less than 10Ω.

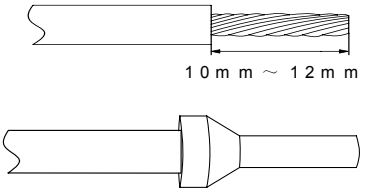
The following circuit diagram is recommended for connection of KM1 control circuit in Fig. 3-5:

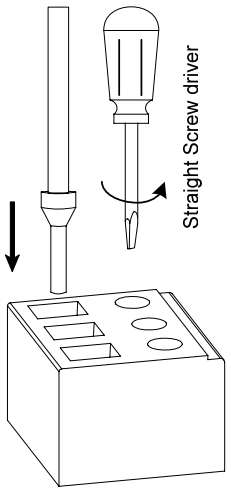


Section selection of main circuit wiring:

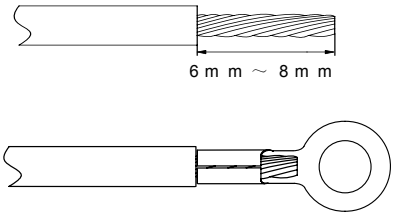
Current of the adapted motor	R	S	T	PE ⏚	U	V	W	P	B1	B
	Input terminal of AC current			Protective ground end	Power output end			Connection terminal of external, internal brake resistor		
≤6A	1.5 mm^2			≥1.5 mm^2	1.5 mm^2			1.5mm^2		
6A～10.5A	2.5 mm^2			≥2.5 mm^2	2.5 mm^2			2.5 mm^2		
11A～21A	4 mm^2			≥ 4 mm^2	4 mm^2			4 mm^2		
22A～28A	4 mm^2			≥ 4 mm^2	4 mm^2			4 mm^2		

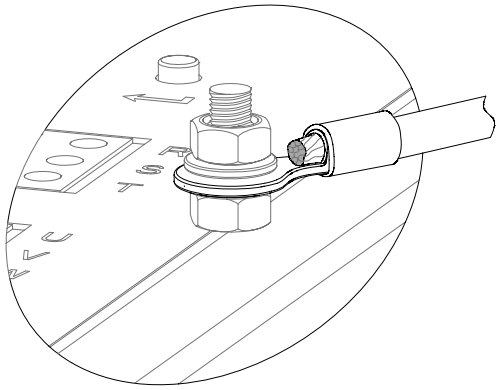
For DAT2030 or DAT2030C, DAT2050 or DAT2050C terminal, its insulation covering is stripped off and the exposed copper wire is twisted according to the following figure. Press wiring (press terminal with special tools) with H2.5/18D type tubular terminal (Weidmuller Company). Insert terminal as the figure, and tighten up terminal screw.



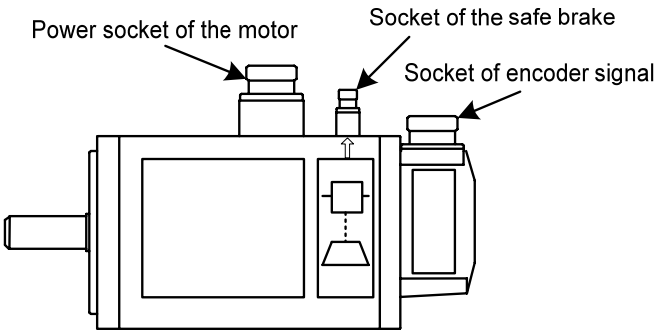


For DAT2075 or DAT2075C, DAT2100 or DAT2100C terminal and DAT series PE terminal connections, insulation covering is stripped off and exposed copper wire is twisted according to the following figure. Press wiring (press terminal with special tools) with HRV 2—5S type round pre-insulation terminal. (Huxi Electric Apparatus co., Ltd), and tighten it up to the ground screw at the front of the shell.



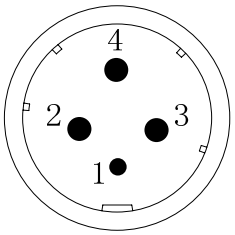


3.2.2 Instructions for Servo Motor Interface



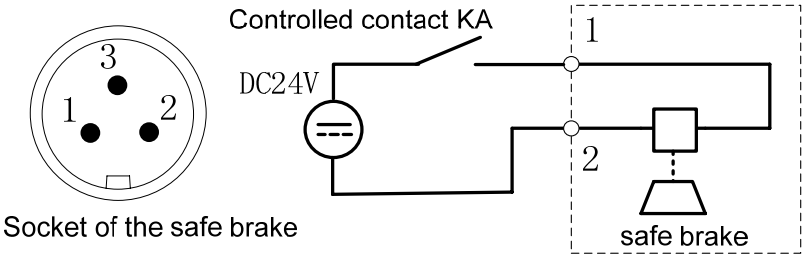
- Corresponding relationship between pins of motor power socket and output terminal of the servo unit

Pin No. of the motor power socket	1	2	3	4
Terminal tab the servo unit	PE	U	V	W



Power socket of the motor

- Pins connection of safe brake socket



Socket of the safe brake

- Pin1, Pin 2 is connected to DC24V, and their positive and negative poles are not distinguished, pin 3 is earthed.
- For controlling of controlled contact KA, refer to section 6.2 :application of release signal of band-type brake.

For motor with different power is adapted to the safe brake with different power. When selecting 24V switch power supply, please refer to the following technical parameters of arrester brakes adapted to different motors.

Seat No. of the motor	**Rated torque**	**Supply voltage**	**Coil power of the brake at 20℃ (unit: W)**	**Release time（s）**
110	4	24V DC	20	0.037
130	8	24V DC	25	0.042
175	32	24V DC	40	0.135

- For connection of pins of encoder signal socket, please refer to section 3.4.3.

3.3 Connection of Control Signal

3.3.1 Definition of Pin CN1 of DAT Series Products

- The control signal interface CN1 of DAT2000 series products is Pin 44 male, the connector for making control wire is Pin 44 female (the type is G3150-44FBNS1X1, provided by WIESON Company). See the following figure for the definition of the pins.

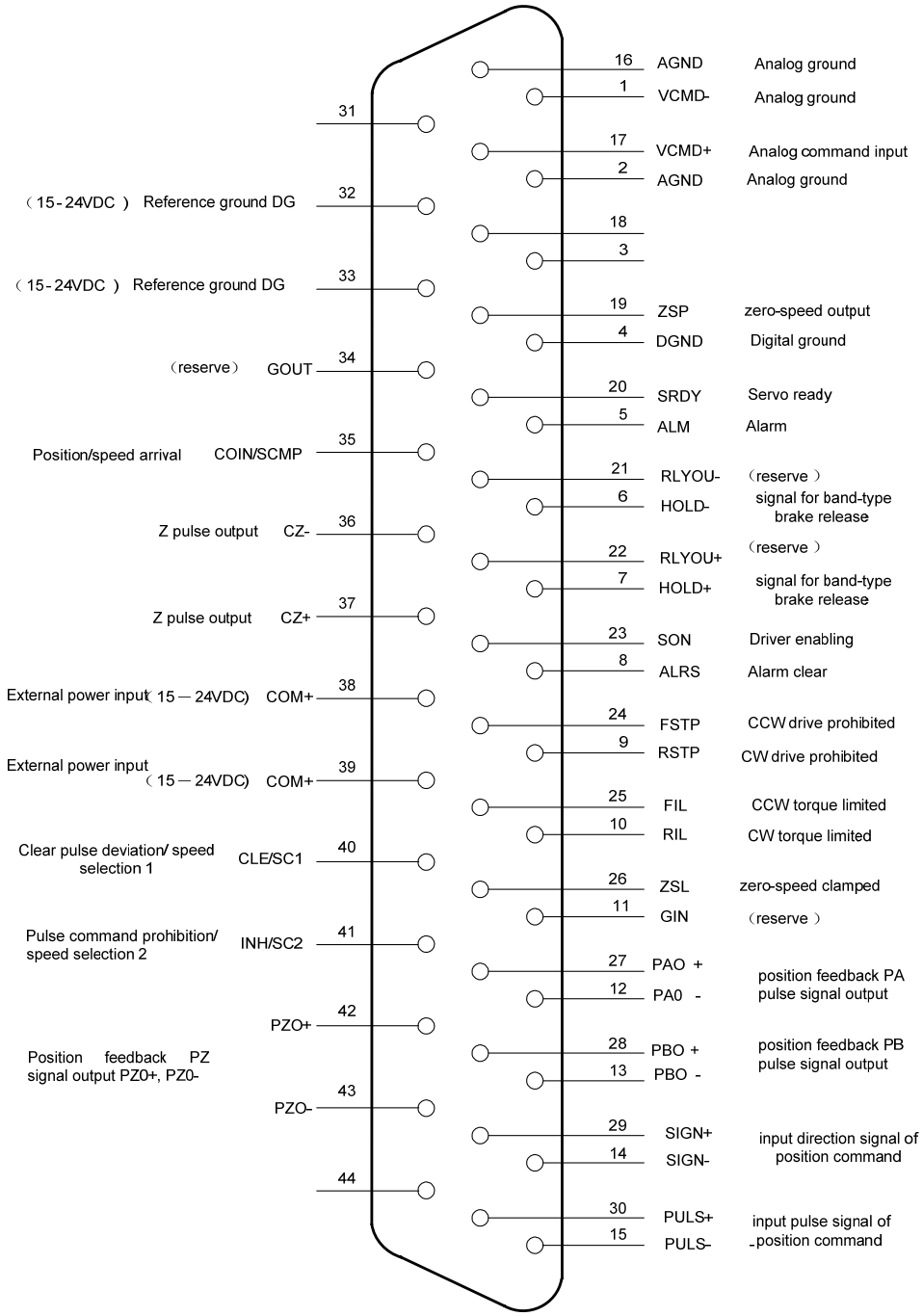


Figure 3-13 Pin CN1 of DAT2000

In the above figure, pins with the same name are connected and shorted in the inner circuit board.

- Control signal interface CN1 of DAT2000C series products is high-density socket with 50 cores (type: MDR50-10250-55H3JL, provided by 3M company), which pin layout is as follows:

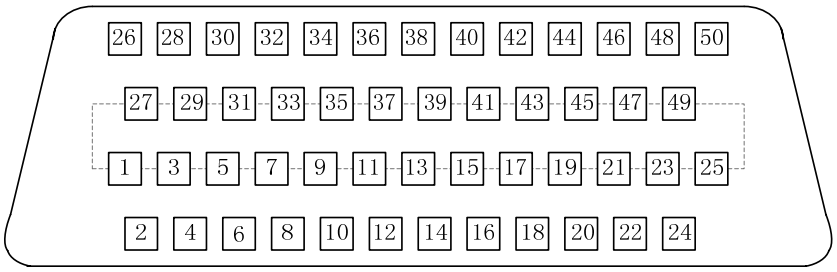


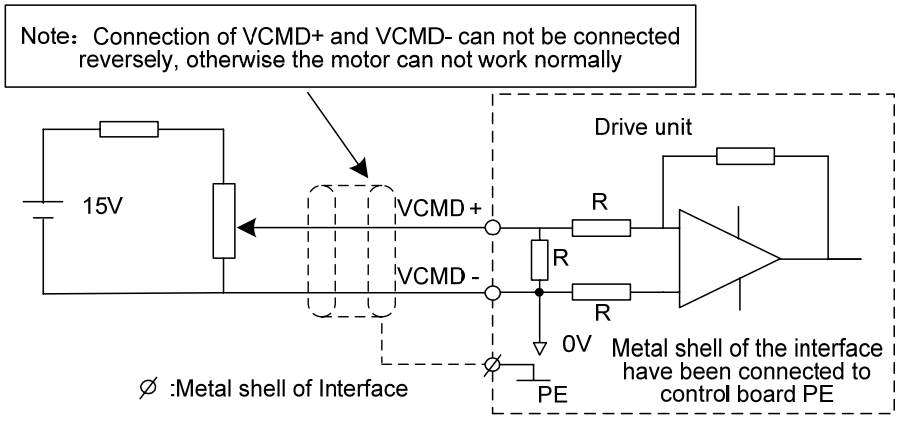
Fig. 3-14 Pin CN1

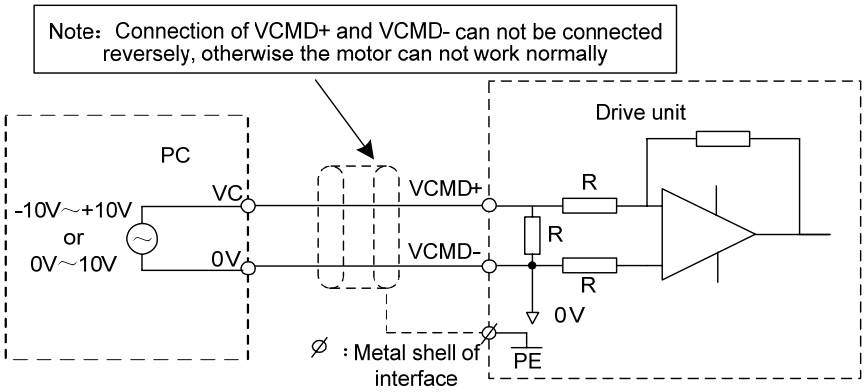
Pin No.	Name	Meaning	Reference item	Pin No.	Name	Meaning	Reference item
1	PBO－	Position feedback output signal A pase	**6.4**	26	PZO－	Position feedback output signal Z pase	**6.4**
2	PBO＋			27	PZO＋		
3	PAO－	Position feedback output signal B pase	**6.4**	28	GND	digital ground	
4	PAO＋			29	NC		
5	PULS－	Position command pulse input	**3.3.3**	30	SIGN－	Input direction of position command	**3.3.3**
6	PULS＋			31	SIGN＋		
7	SC2/INH	Speed selection 2/pulse prohibited	**5.2.2** **6.5.4**	32	RIL	CW torque limit	**3.3.4**
8	SC1/CLE	Speed selection 1/ pulse clearing	**5.2.2** **6.5.3**	33	FIL	CCW torque limit	**3.3.4**
9	NC			34	ZSL	Zero-speed clamped	**6.6.3**
10	RSTP	CW drive prohibited	**3.3.4**	35	GIN	reserve	
11	FSTP	CCW drive prohibited	**3.3.4**	36	NC		
12	ALRS	Alarm clearing	**3.3.4**	37	NC		
13	SON	Enabling	**3.3.4**	38	**COM－**	Input power of control signal (15～24VDC)	
14	NC			39	**COM＋**		
15	COIN＋	Speed arrival ＋/ position arrival＋	**6.6.2** **6.5.2**	**41**	**COM＋**		

16	SRDY－	Servo be ready to output	**3.3.5**	**40**	COIN－	Speed arrival ＋/ position arrival＋	**6.6.2 6.5.2**
17	SRDY＋			42	HOLD－	Release signal of safe brake output	**6.2**
18	NC			43	HOLD＋		
19	NC			44	NC		
20	ZSP－	Motor zero-speed output	**3.3.5**	45	NC		
21	ZSP＋			46	CZ－	Zero-point signal of encode output	**3.3.5**
22	ALM－	Alarm output	**3.3.5**	47	CZ＋		
23	ALM＋			48	0VA		
24	VCMD＋	Simulated command input	**3.3.2**	49	NC		
25	VCMD－			50	NC		

3.3.2 Input of Speed Command

VCMD+/ VCMD- are input terminals of speed command input, which receives max. 10V DC voltage signal, and its terminal input resistance is 20KΩ.



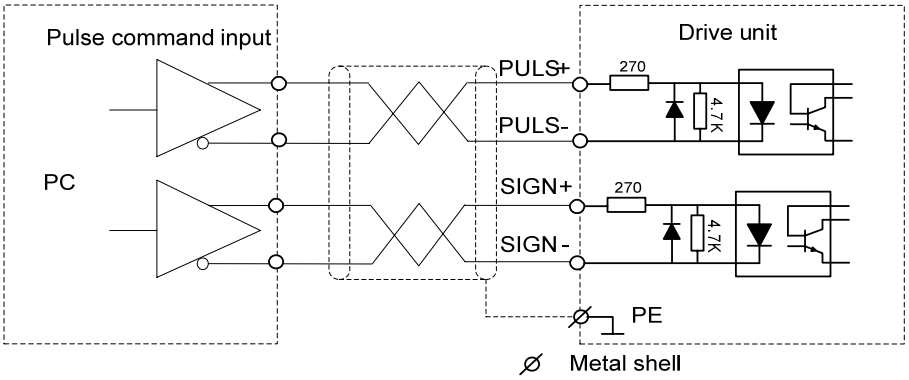


Note: The signal cable uses a shielded line, and the differential signal must use a twisted-pair line.

3.3.3 Input of Position Command

Position commands PULS+/PULS-，SIGN+/SIGN- can use differential drive method or use single-end drive method. See example as follows:

- Differential drive method



- Single-end drive method

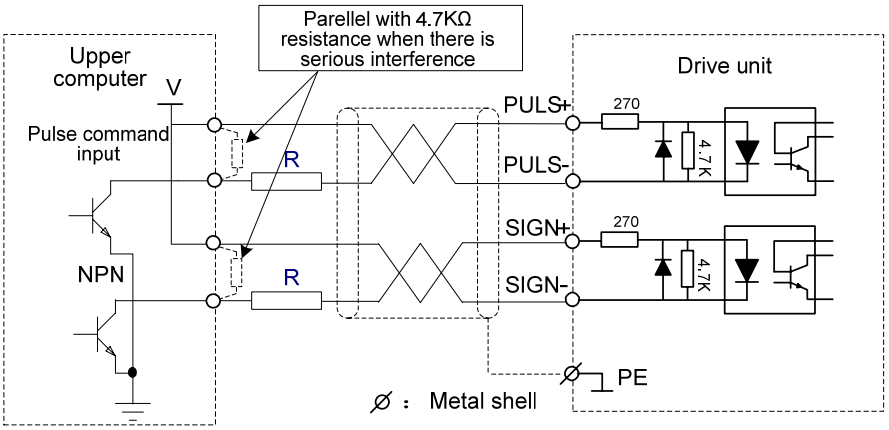


Fig. 3-18 Wiring of NPN type single-end drive

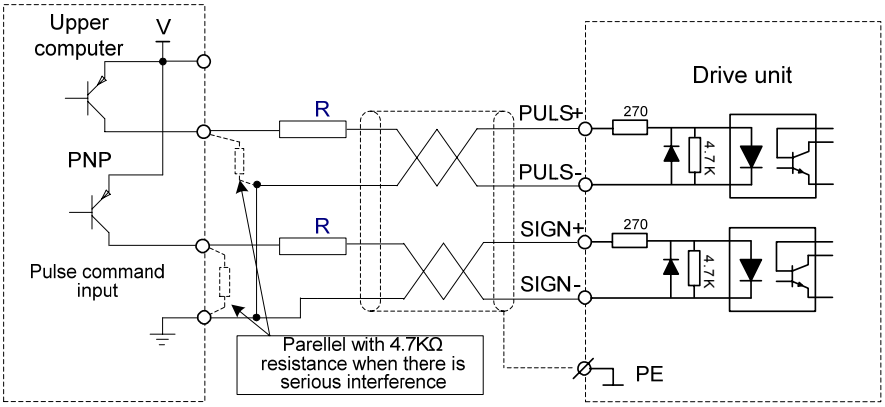
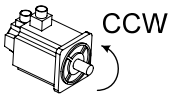
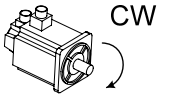
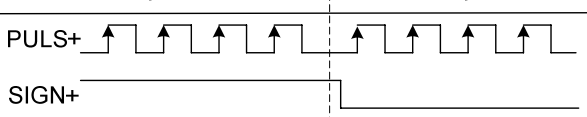
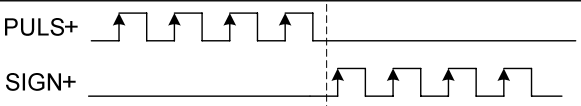
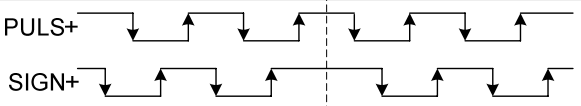
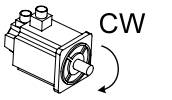
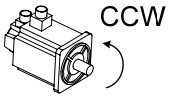
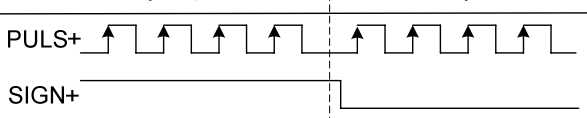
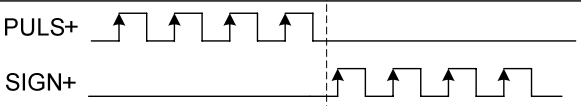
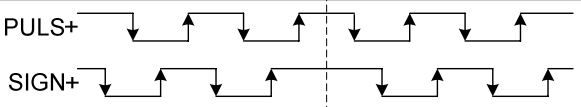


Fig. 3-19 Wiring of PNP type single-end drive

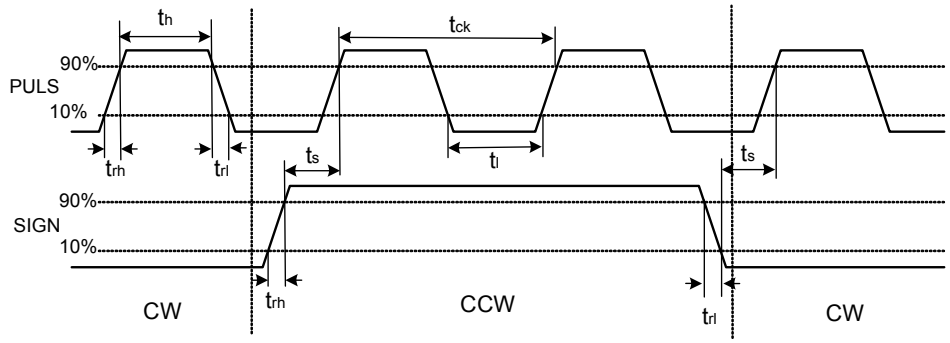
1. Differential drive method is recommended to use in order to avoid high interference; In differential drive mode, AM26LS31, MC3487 or similar RS422 drive chip are recommended.
2. Single-end drive method will decrease action frequency. Under the condition that the pulse input to circuit, drive current is 10 mA～15mA, external max. power voltage is limited to 25V, resistance R value is defined. Experiential data: VCC=24V，R=1.3kΩ～2kΩ；VCC=12V，R=510Ω～820Ω；VCC=5V，R=0Ω

There are three kinds of position command input modes, which are set by parameter PA14, can be received. See the table bellow, and arrow represents the counting edge.

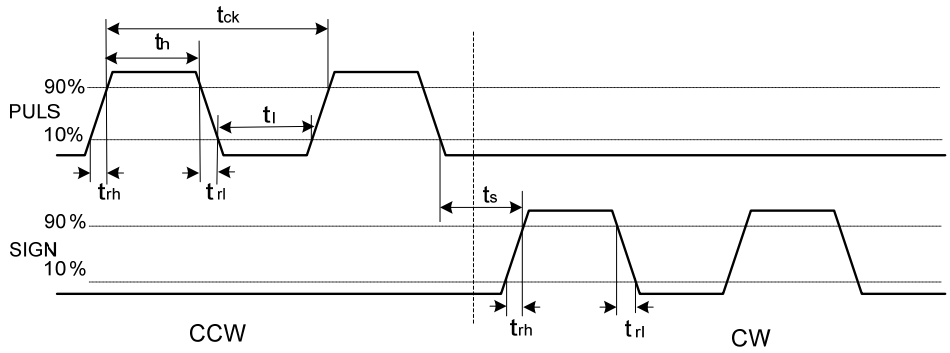
Reverse mode：PA15=0		
Pulse command mode	 	PA14 setting value
Direction of pulse group		0 pulse + direction
CCW pulse group CW pulse group		1 CCW＋CW pulse
A-phase pulse group B-phase pulse group		2 2-phase pulse group

Reverse mode：PA15=1		
Pulse command mode	 	PA14 setting value
Direction of pulse group		0 pulse + direction
CCW pulse group CW pulse group		1 CCW＋CW pulse
A-phase pulse group B-phase pulse group		2 2-phase pulse group

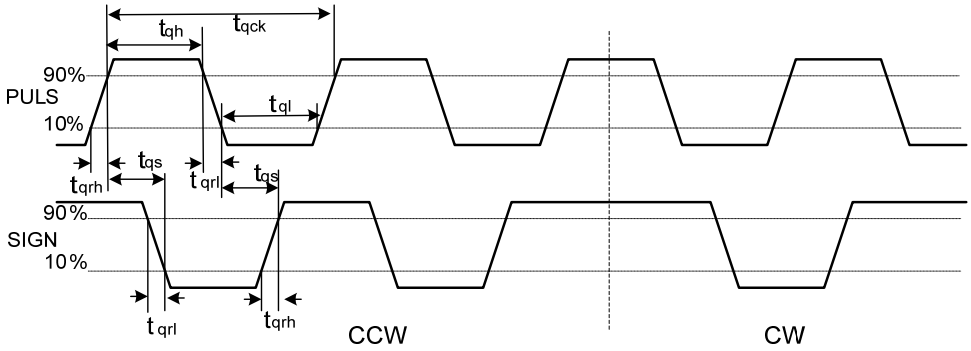
a. Input interface sequence diagram of pulse + symbol (max. pulse frequency 1MHz)



b. Input interface sequence diagram of CCW pulse/CW pulse (max. pulse frequency 1MHz)



c. Input interface sequence diagram of 2-phase command pulse (max. pulse frequency 1MHz)

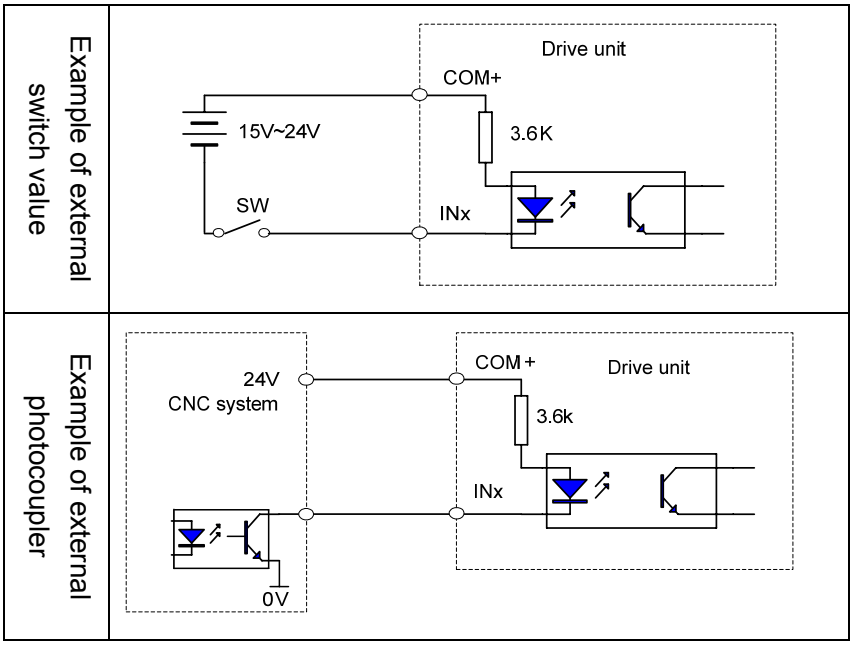


Sequence parameters of pulse input are listed bellow.

Parameter	t_{ck}	t_h	t_l	t_{rh}	t_{rl}	t_s	t_{qck}	t_{qh}	t_{ql}	t_{qrh}	t_{qrl}	t_{qs}
Differential drive input (μs)	>1	>0.3	>0.3	<0.2	<0.2	>2	>1	>0.3	>0.3	<0.2	<0.2	>0.2
Single-end drive input (μs)	>5	>2.5	>2.5	<0.3	<0.3	>2.5	>10	>5	>5	<0.3	<0.3	>2.5

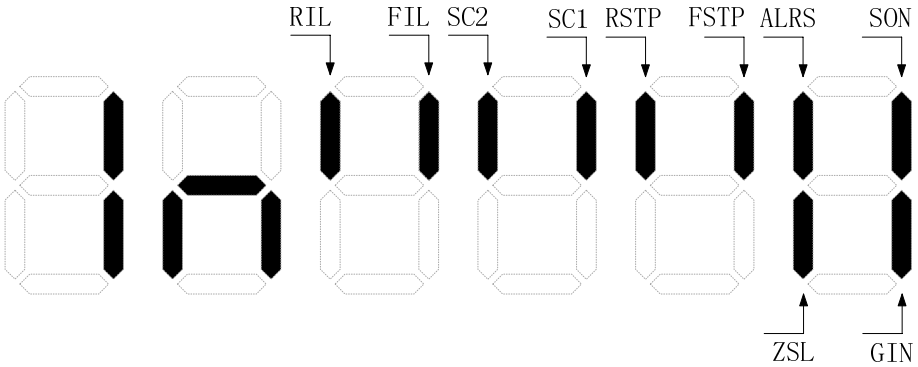
3.3.4 Switching Value Input

Two examples of wiring are provided bellow, Inx represents input point: (SON, ALRS, FSTP, RSTP, SC1/CLE, SC2/INH, ZSL, FIL, RIL, GIN).



DC15V～24V power (above 1A) should be provided for servo unit. It is suggested the same power with output circuit should be used.

Input coupler is on when Inx connects to 0V, and the signal is ON, input is active. Monitor window dP- In can be used for judgment, when the input point is ON, corresponding LED lights up. When the input point is OFF, corresponding LED is not work. This monitor window is used for debugging and examining the control signal of the servo unit.



Detailed instructions for input signals:

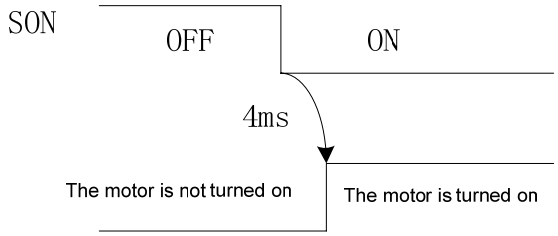
- COM＋, COM－ are input ports of external specified power (15V～24V).

Attentions

Polar of the power can not be connected reversely, otherwise the servo unit cannot work.

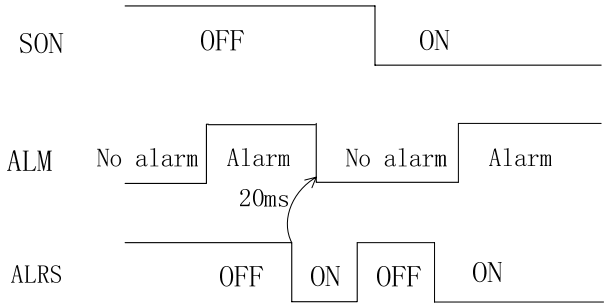
➢ Servo enable is operated when SON is ON. Check the monitor window dP- rn and dP- on is displayed.

Related parameters	Meaning	Unit	Default value	Applicable modes
PA54	When there is no external SON signal input, motor enable is enforced in the servo unit. PA54=0：When external input signal SON is ON, the motor is enabled. PA54=1：Motor enable is enforced in the servo unit, and the external SON signal is not needed.		0	P，S



The motor is turned on when the servo unit works normally. If the servo unit has troubles, the alarm code occurs. Please refer to chapter 8 troubles and troubleshooting.

➢ When ALRS is ON, alarms that smaller than No. 9 alarm are cleared by ALRS signal after trouble clearing. Alarms that bigger than No. 9 alarm can only be cleared after trouble clearing and power on again. When SON is ON, the function of alarm clearing is invalid.



➢ FSTP, RSTP: Drive prohibition signal is usually matched with stroke switch to avoid over travel.

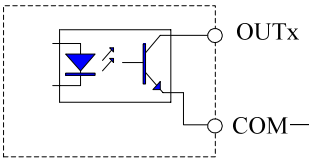
Input signal		**Operation**	
FSTP	RSTP	CCW	CW
ON	ON	O	O
ON	OFF	O	Prohibited
OFF	ON	Prohibited	O
OFF	OFF	Prohibited	Prohibited

Note: O represents normal. When drive prohibition function is not used, PA20 is set to 1 to shield drive prohibition function.

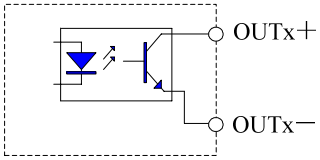
- FIL: CCW torque limit. When FIL is ON, the maximum torque of the motor is limited by the setting of PA36.
- RIL: CW torque limit. When RIL is ON, the maximum torque of the motor is limited by the setting of PA37.

3.3.5 Output of Switch Value

1. In DAT2000 series product, except signal HOLD, CZ, other output signals are single-end transistor output. Emitter of the coupler has been connected to COM-.



2. Switching value output of DAT2000C series product is double-end transistor output:

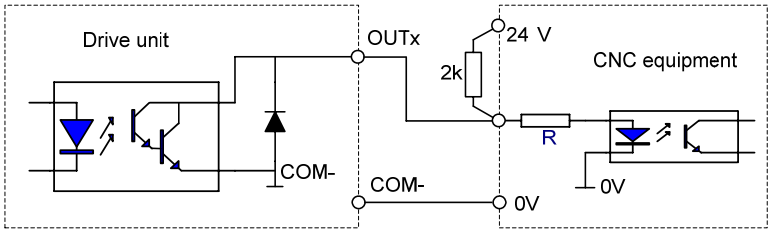


OUTx represents output points (ALM, SRDY, ZSP, COIN, HOLD, CZ)

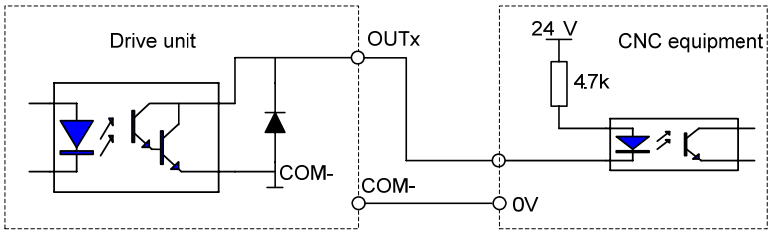
- Wiring diagram of single-end transistor output

External controller

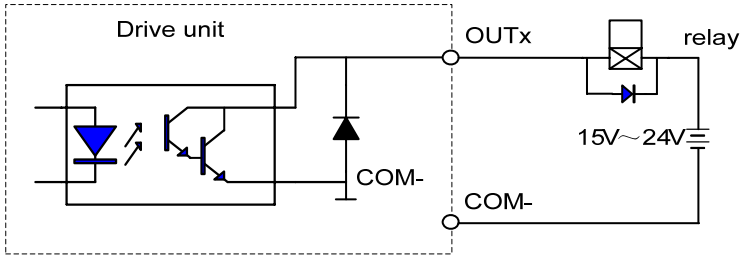
Example 1: Servo unit matches with system GSK980TDb



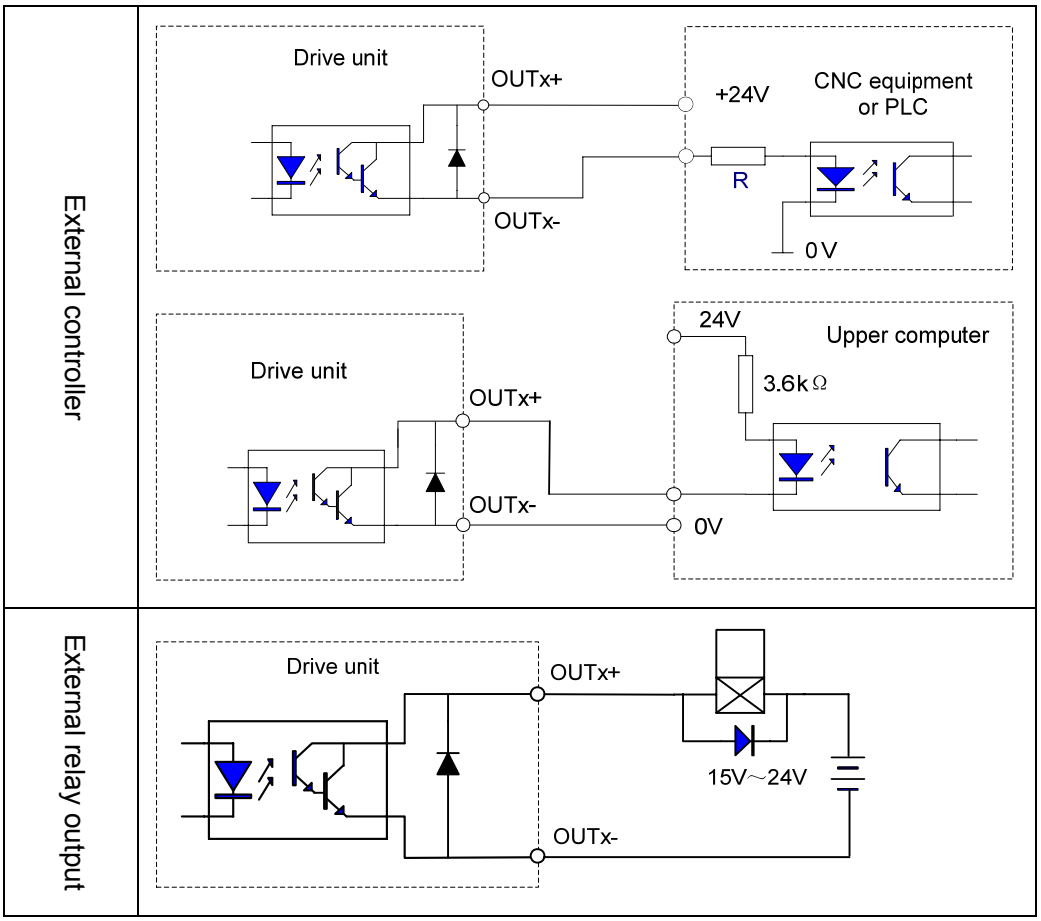
Example 2: Servo unit matches with system 983M



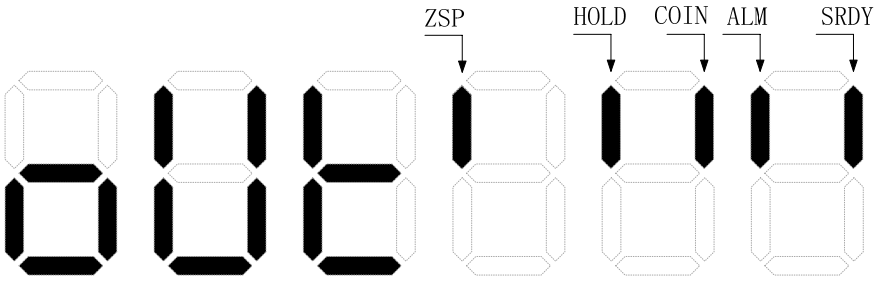
Output of external relay



- Wiring diagram of double-end transistor output

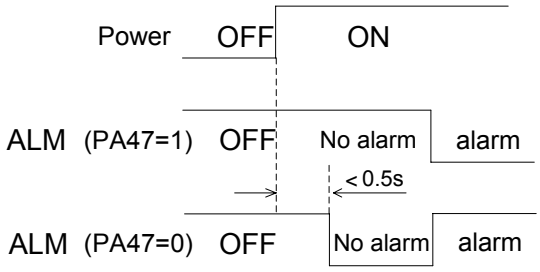


When OUTx is connected to COM－ or OUTx＋ is connected to OUTx, input point is ON. Monitor window dP-OUt can be used for judgment, when input point is ON, corresponding LED lights up. When input point is OFF, corresponding LED does not light.

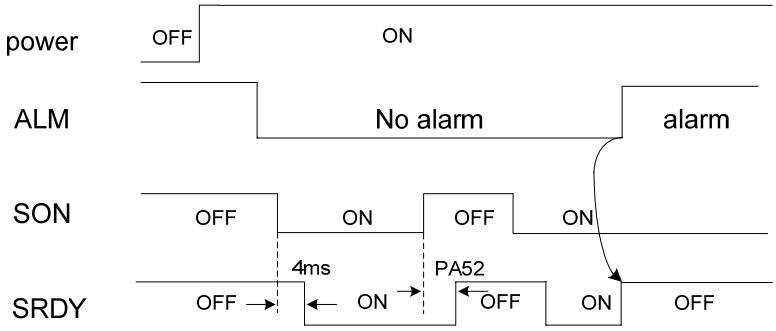


➢ ALM of the servo unit is output when abnormity is detected. Output state is relevant to PA47.

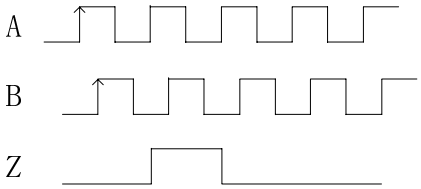
PA47=0	ALM signal output coupler is OFF when alarm occurs
PA47=1	ALM signal output coupler is ON when alarm occurs



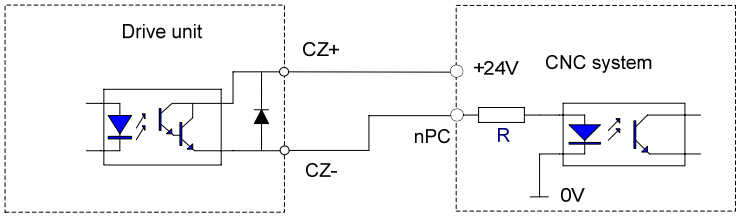
- SRDY represents servo unit is ready. SRDY signal output photo coupler is connected when the motor power-on is excited.



- ZSP represents zero-speed output, i.e. when the speed of the motor is zero, photo coupler of ZSP signal output is ON.
- CZ represents zero point signal of encode: For incremental encoder, sequence is in accordance with Z signal (one-rotation signal) feedback from motor encoder, as shown below:



For absolute type encoder, AB-phase pulse number per circle is set by servo parameter, zero point signal CZ is output at the same time.



- HOLD：Release signal of safe brake of the motor with a band-type brake. Refer to 6.2 for output logic of this signal.

Attentions

1. When output signal is open collector type, its maximum load current is 100mA, maximum voltage of external DC current is 25V. If it exceeds the specific requirement or output end directly connect to the power, servo unit will be damaged.

2. If the load is inductive load, freewheeling diode should be paralleled with two ends of the load. If the freewheeling diode is connected reversely, the servo unit will be damaged.

3.4 Connection of Feedback Signal

3.4.1 Introductions for CN2 of DAT2000

The encoder interface CN2 of the motor of the DAT2000 servo unit is Pin 25 female. The connector for making control wire is Pin 25 male (the type is G3150-44FBNS1X1, provided by WIESON Company). See the following figure for the definition of the pins.

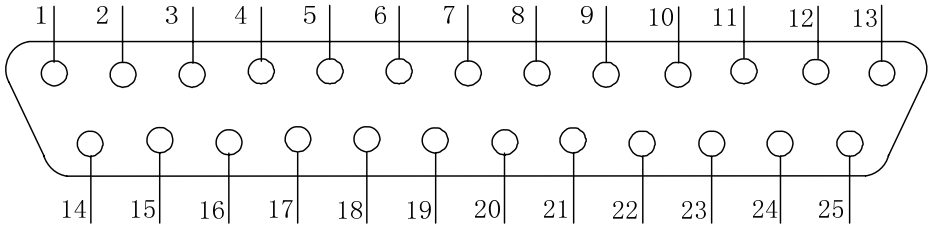
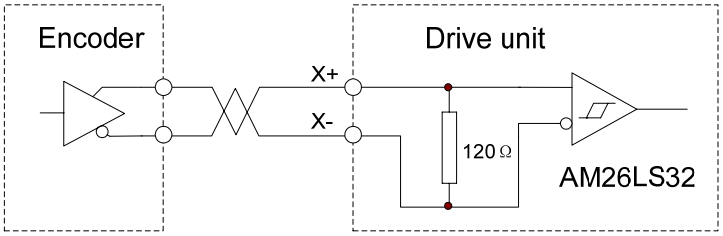


Fig. 3-42 CN2 DB 25 female socket

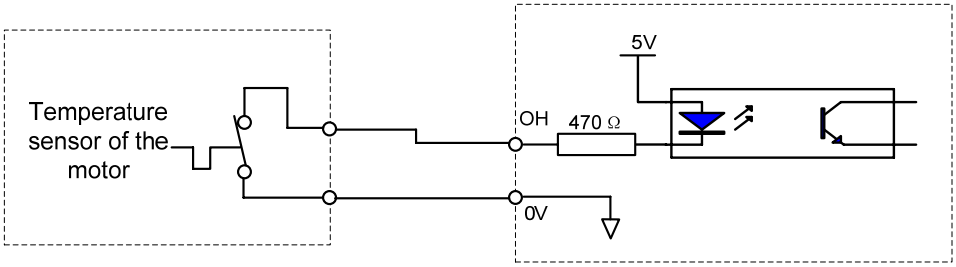
Pin No.	Name	Meaning	Pin No.	Name	Meaning
1	0V	Encoder power（－）	14	FG	Frame ground
2	0V		15	FG	
3	0V		16	0V	Encoder power（－）
4	0V		17	5V	Encoder power（＋）
5	5V	Encoder power（＋）	18	5V	
6	5V		19	W＋	Feedback of incremental type encoder W＋
7	W－	Feedback of incremental type encoder W－	20	V＋	Feedback of incremental type encoder V＋
8	V－	Feedback of incremental type encoder V－	21	U＋	Feedback of incremental type encoder U＋
9	U－	Feedback of incremental type encoder U－	22	Z＋	Feedback of incremental type encoder Z＋
10	Z－	Feedback of incremental type encoder Z－	23	B＋	Feedback of incremental type encoder B＋
11	B－	Feedback of incremental type encoder B－	24	A＋	Feedback of incremental type encoder A＋
12	A－	Feedback of incremental type encoder A－	25	NC	
13	OH	Input terminal of motor temperature sensor			

This interface is only applicable for feedback signal of incremental encoder. The signal wire uses differential drive connection. The wiring diagram is shown below:



X=A、B、Z、U、V、W

OH1（CN2-13）is used for connecting overheating detector in the servo motor, which makes the servo unit have overheating protective function. Internal wiring diagram is shown below:



After connection, set PA 57 of the servo motor according to properties of overheating detector. If the servo motor has no overheating detector, PA57 is set to 0 and the shielding alarm occurs, OH1, 0V can not be connected.

Related parameter	Name	Unit	Parameter scope	Default value	Application mode
PA57	Alarm shielding for motor overheating		0～2	0	P，S
	PA57=0：shielding alarm PA57=1：logic alarm when the check switch is the normally-closed in the appropriate motor's temperature PA57=2：logic alarm when the check switch is the normally-open in the appropriate motor's temperature				

3.4.2 Introductions for CN2 OF DAT2000C

Feedback signal interface CN2 of the encoder of the DAT2000C series products are high-density socket with 26 cores (type: MDR26-10226-55H3JL, provided by 3M company), which pin layout is shown below:

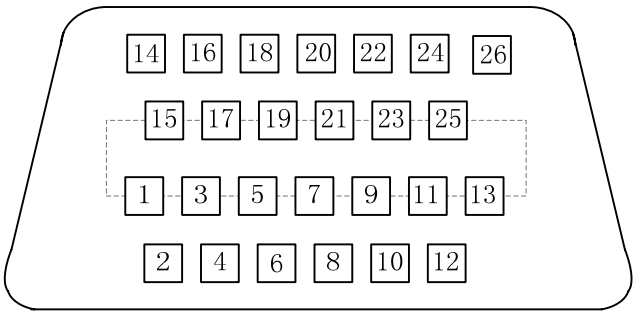


Fig. 3-45 Pin CN2

Pin No.	Name	Meaning	Pin No.	Name	Meaning
1	OH1	Input terminal of the motor temperature sensor	14	NC	
2	W+	Connect incremental encoder feedback signal	15	NC	
3	W−		16	0V	Encoder power（−）
4	V+		17	0V	
5	V−		18	NC	
6	U+		19	5V	Encoder power（+）
7	U−		20	5V	
8	Z+		21	5V	
9	Z−		22	NC	
10	B+		23	MA+	Feedback signal of absolute encoder
11	B−		24	MA−	
12	A+		25	SL+	
13	A−		26	SL−	

1～13 pins combine CN2 interface of DAT2000 series products, which applies to feedback signal of incremental encoder. Other pins apply to feedback signal of absolute encoder. OH1（CN2-1）is used for connecting overheating detector in the servo motor, its connection is the same that of DAT2000 series products.

3.4.3 Connection to Encoder Signal of the Motor

The following diagram is a standard wiring of incremental encoder motor matched DAT2000 series products. When users use motors of other company or make encoder cable by themselves, refer to the standard wiring bellow. (If the motor is with a thermostat, connect the thermostat to OH1, 0V ports)

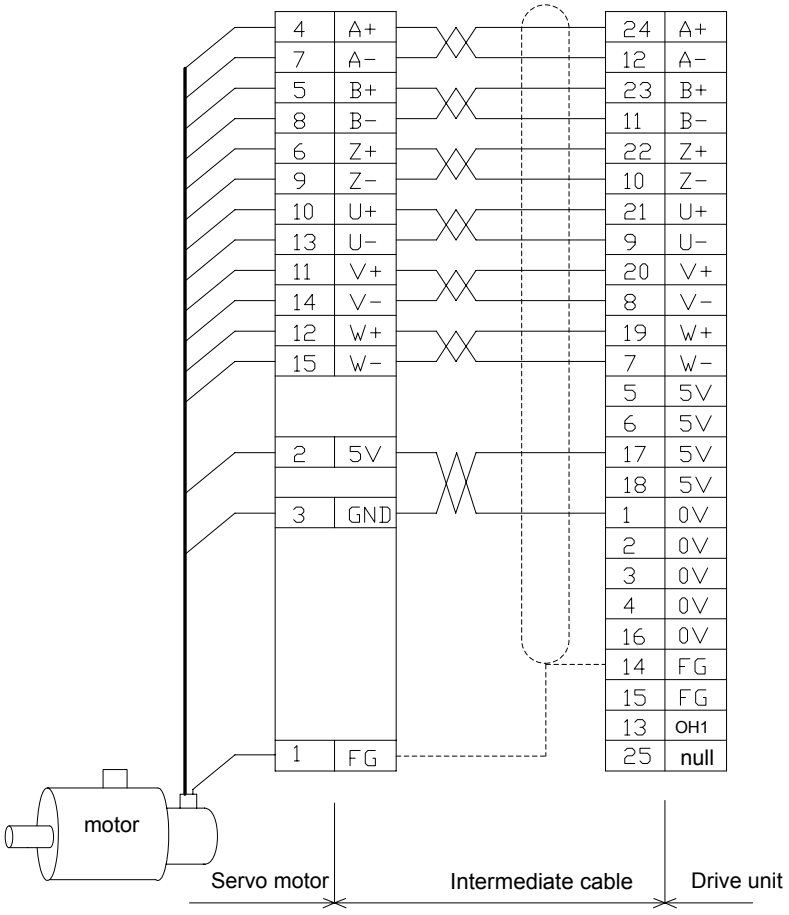


Fig. 3-46 Encoder wiring of SJT servo motor

The following diagram is a standard wiring of absolute encoder motor matched DAT2000C series products. When users use motors of other company or make encoder cable by themselves, refer to the standard wiring bellow. (If the motor with a thermostat, connect the thermostat to OH1, 0V ports)

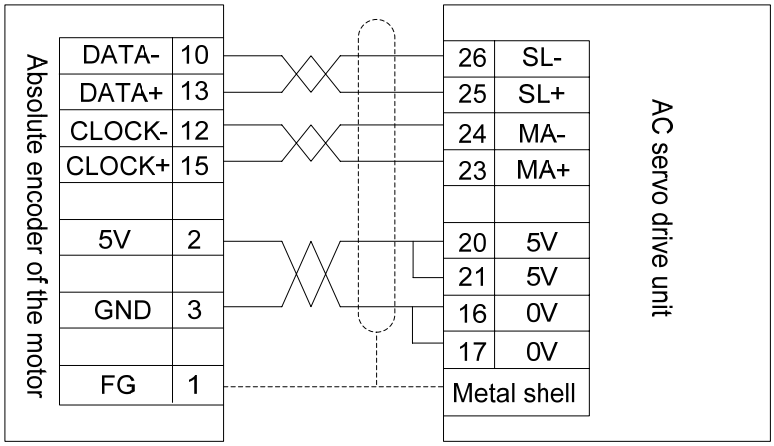
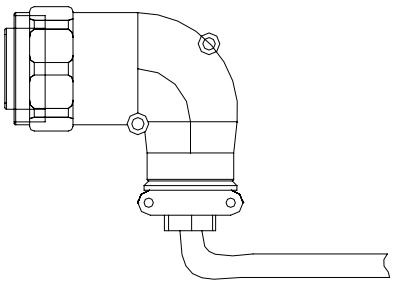
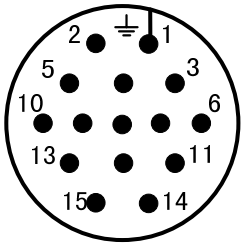


Fig. 3-47 Wiring of absolute encoder

Encoder signal socket of SJT series servo motor are all Pin15 male aviation socket, please select Pin 15 female aviation plug to make signal cable. Exterior of aviation plug of the encoder signal cable is as follows:





Plug(Wire bond side)

Attentions

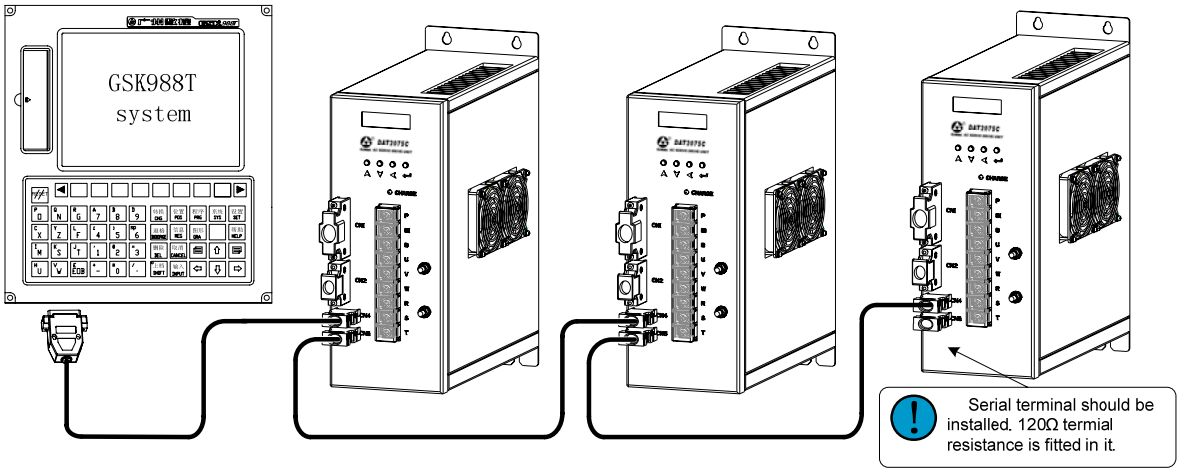
1. The length of power cable and feedback signal cable of the motor shall be within 20m, the distance between two cables shall be more than 30cm. Two cables can not be crossed through the same pipe or tied them together.

2. Signal cable uses stranded shielding cable, cross-section is 0.15mm^2～0.20mm^2, connect shielding layer to PE terminal.

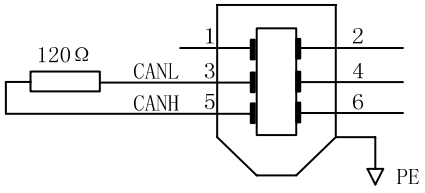
3.5 GSKLink Communication Function

DAT2000C series servo unit has GSKLink serial communication function. Connect CN4 or CN5 interfaces to GSKLink to realize real-time communication of the CNC. The servo unit can manage parameters through GSKLink (including parameter storage, parameter alteration, and parameter backup) or monitor the position, speed, current, humidity and I/O state information.

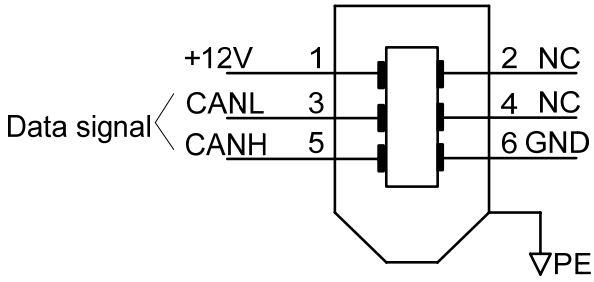
- Connection between CNC and servo unit is as follows:



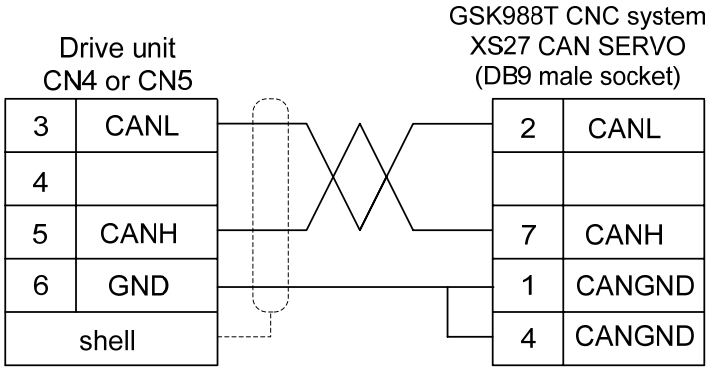
There is a spare commnunication interface on the servo unit that is for GSKLink link. Serial terminal is to connect a resistor matched with 120Ω/0.25W between CANL of the interface and CHNH signal terminal.



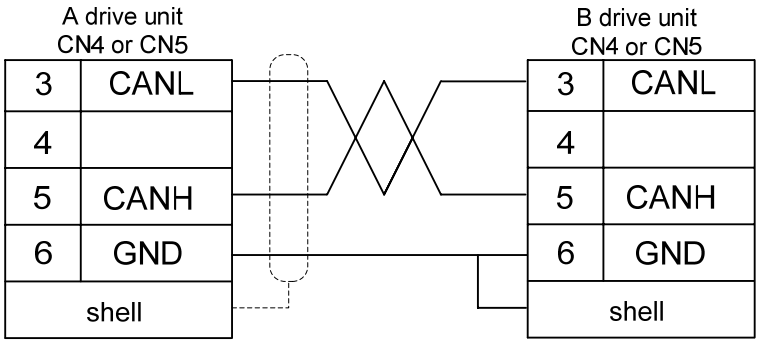
- Circuit diagram of bus interface CN4, CN5 of GSKLink is as follows:



- Communication diagram between GSK988T CNC system and servo unit



- Communication connection between servo units



- Set related parameters after connecting the communication cable correctly:

Related parameter	Name	Unit	Parameter scope	Default value	Application mode
PA58	Servo unit slave No.		0～5	1	P，S
	Note: Set number to servo unit that connected to GSKLINK communication bus, and the number cannot be repeated.				
PA59	Selection of GSKLINK communication baudrate		0～4	0	P，S
	PA59=0：Shield GSKLINK communication function； PA59=1：Set baudrate to 500k； PA59=2：Set baudrate to 600k； PA59=3：Set baudrate to 800k； PA59=4：Set baudrate to 1M。				

3.6 Examples for Different Working Mode

3.6.1 Speed Mode Wiring of DAT2000 Series Products

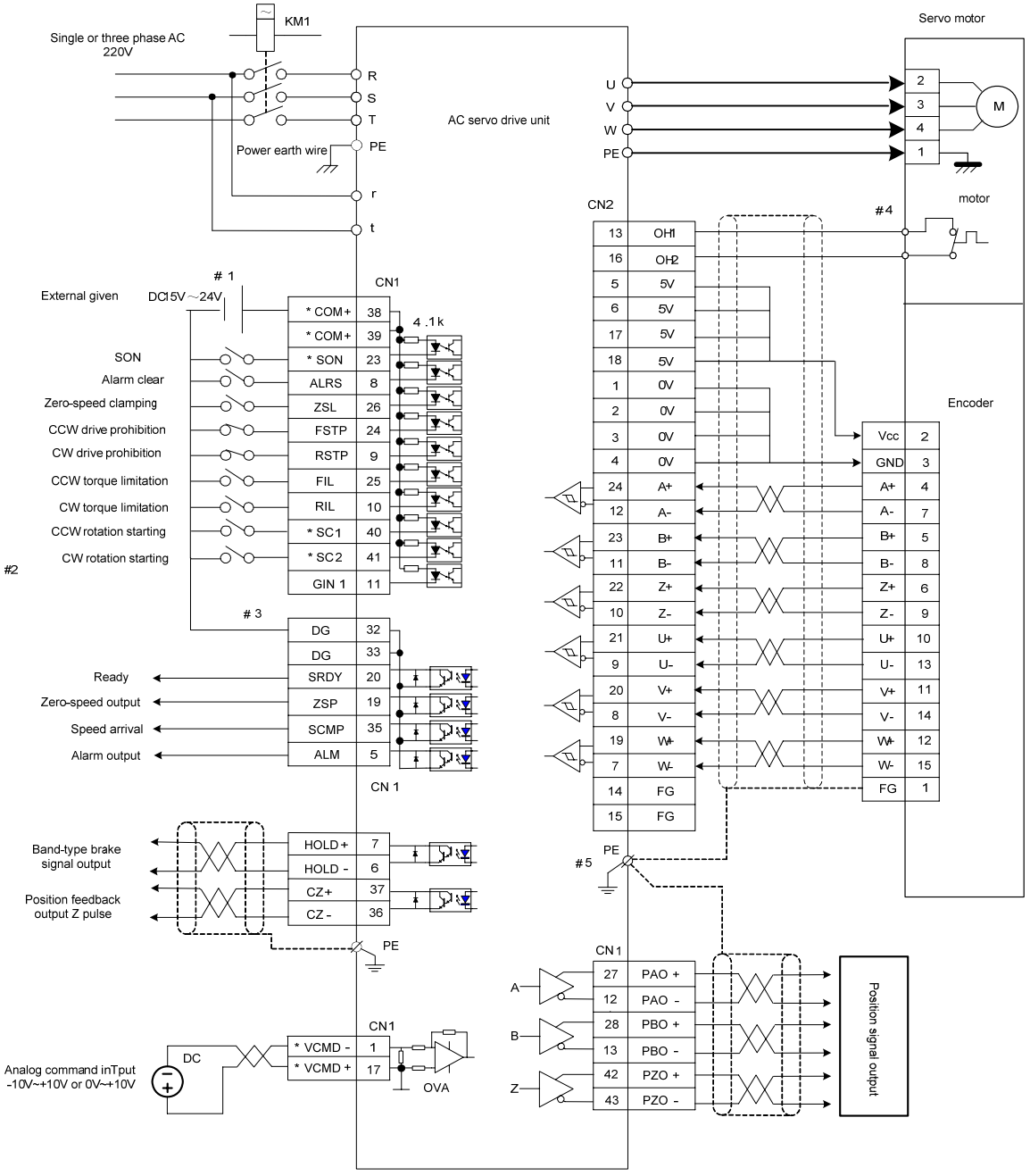


Fig. 3-54 DAT2000 speed mode wiring

Signals with mark * in the figure are necessary connection signal.

#1：Minimum power of external given switch power (DC 15V~24V) should not less than 35W.

#2：When speed command is 0V～10V, and PA4=1，PA46=1, SC1, SC2 are taken as CCW, CW rotation start signal. It is a necessary connection signal at this moment. When PA4=2, it is taken as an internal speed selection signal.

#3：DG is an output common port. Please connect it to power earth wire of output signal.

#4：OH is not connected to the servo motor without temperature control sensor. Set PA57=0 to shield motor overheating alarm.

#5：The metal shell of CN1, CN2 interfaces are connected to PE of servo unit, which can be taken as bonding point of shield line.

3.6.2 Position Mode Connection of DAT2000 Series Products

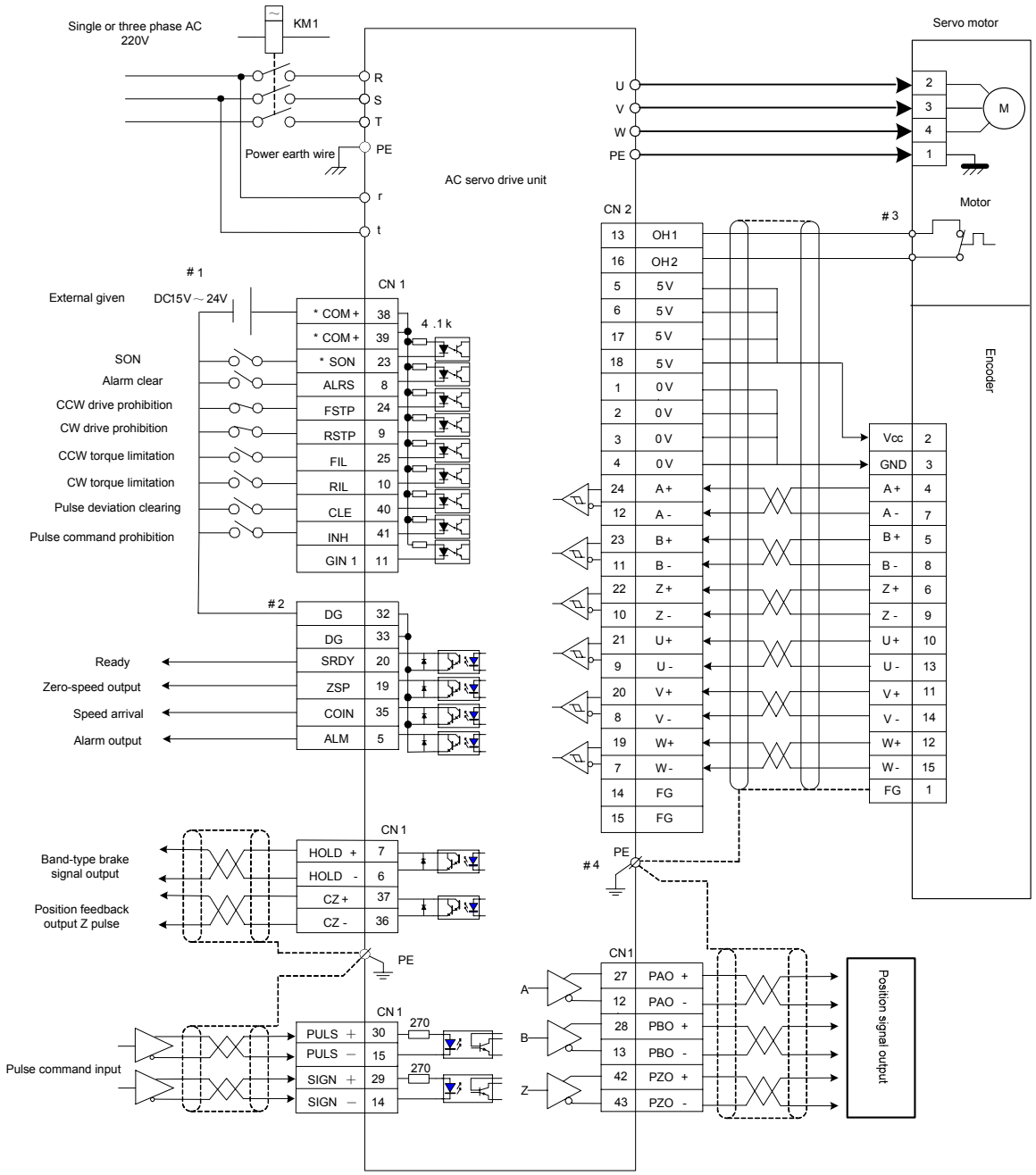


Fig. 3-55 Position mode connection of DAT2000

Signals with mark * in the figure are necessary connection signals.

#1：Minimum power of external given switch power (DC 15V~24V) should not less than 35W.

#2：DG is output common port. Please connect it to power earth wire of output signal.

#3：OH is not connected to the servo motor that without temperature control sensor. Set PA57=0 to shield motor overheating alarm.

#4：The metal shells of CN1, CN2 interfaces are connected to PE of servo unit, which can be taken as bonding point of shield line.

3.6.3 Speed Mode Connection of DAT2000C Series Products

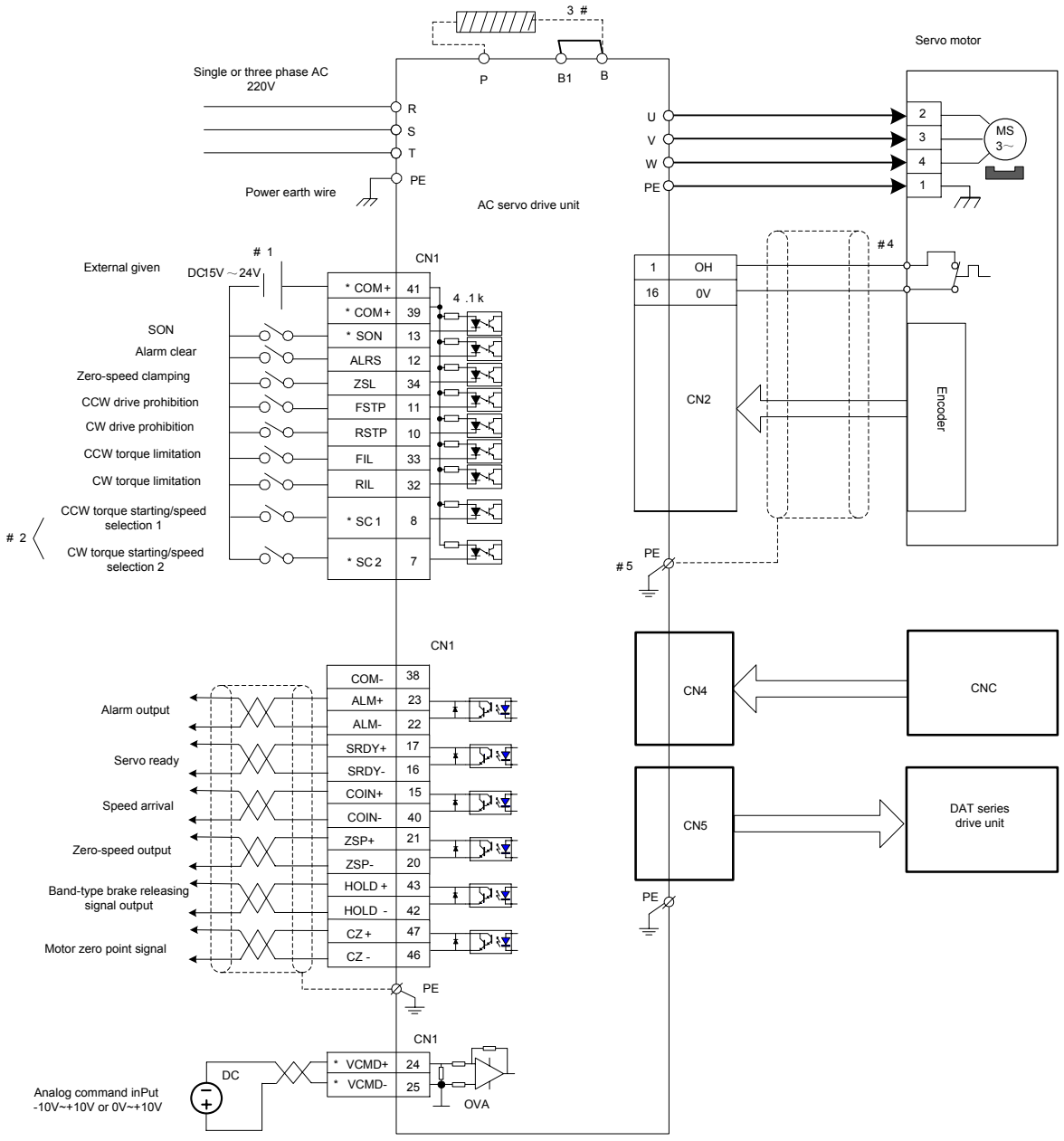


Fig.3-56 Speed mode connection of DAT2000C

Signals with mark * in the figure are necessary connection signals.

#1：Minimum power of external given switch power (DC 15V~24V) should not less than 35W.

#2：When speed command is 0V～10V, and PA4=1，PA46=1, SC1, SC2 are taken as CCW, CW rotation start signal. It is a necessary connection signal at this moment. When PA4=2, it is taken as an internal speed selection signal.

#3：Short circuit B1 and B terminals when braking resistor is not needed to connect.Connect resistance to P, B ends when external resistance is needed. Disconnect B1 and B at the same time.

#4：OH is not connected to the servo motor that without temperature control sensor. Set PA57=0 to shield motor overheating alarm.

#5：The metal shell of CN1, CN2 interfaces are connected to PE of servo unit, which can be taken as bonding point of shield line.

3.6.4 Position Mode Connection of DAT2000C Series Products

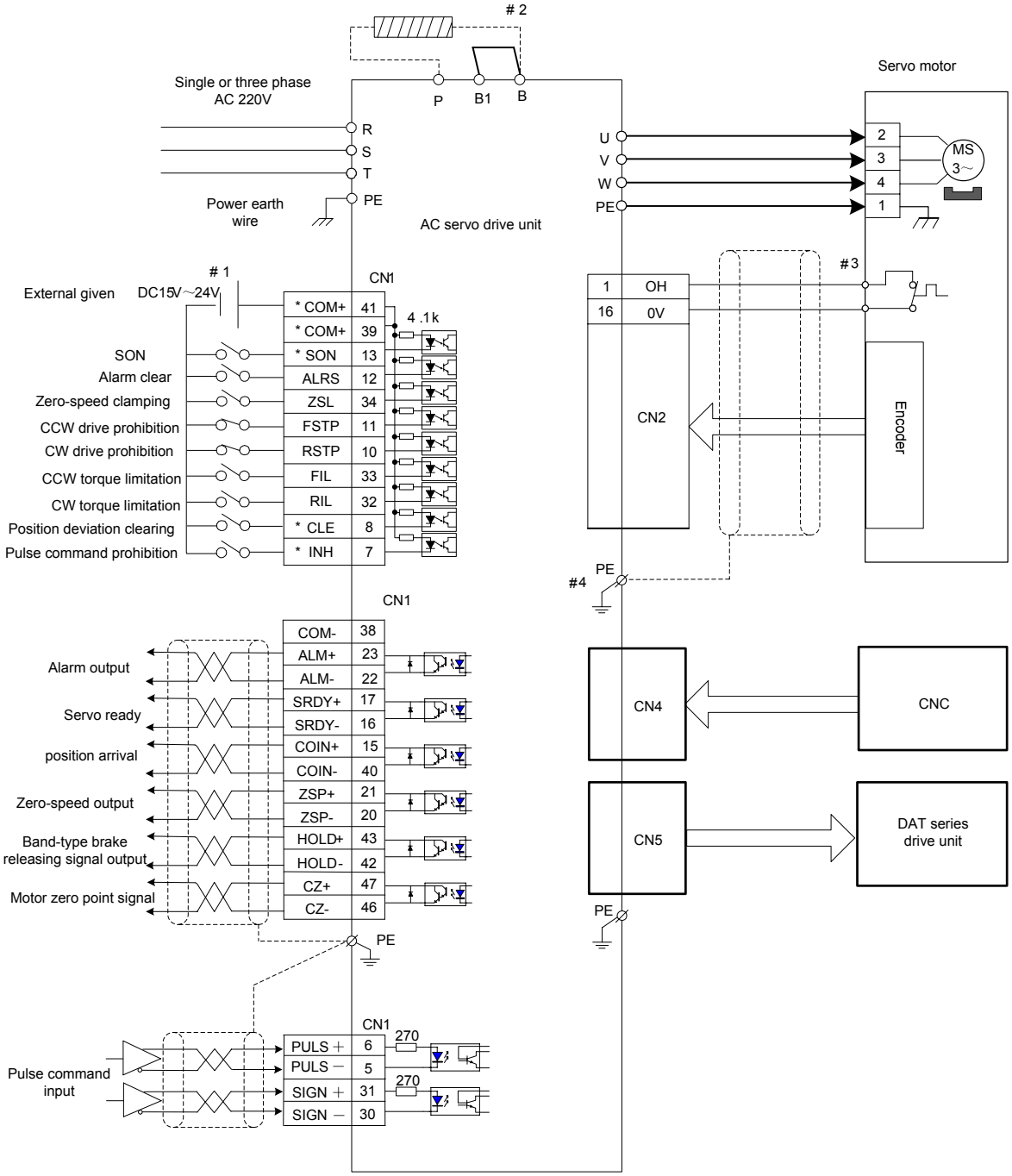


Fig.3-57 Position mode connection of DAT2000C

Signals with mark * in the figure are necessary connection signals.

#1：Minimum power of external given switch power (DC 15V~24V) should not less than 35W.

#2：Short circuit B1 and B terminals when braking resistor is not needed to connect.

Connect resistance to P, B ends when external resistance is needed. Disconnect B1 and B at the same time.

#3：OH is not connected to the servo motor that without temperature control sensor. Set PA57=0 to shield motor overheating alarm.

#4：The metal shell of CN1, CN2 interfaces are connected to PE of servo unit, which can be taken as bonding point of shield line.

CHAPTER 4 DISPLAY AND OPERATION

4.1 Operation Panel

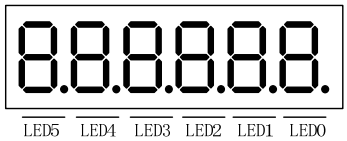
Detailed functions of keys are as follows:

Key	Name	Function explanation
▲	Plus	1. Parameter No. or parameter value is increased 2. Upturn1-level menu 3. Increase motor speed when manual operation 4. CCW rotation starting when jog operation
▼	Minus	1.Parameter No. or parameter value are reduced 2.Page down 2-level menu 3. Decrease motor speed when manual operation 4. CW rotation starting when jog operation
◄	Return	Return to previous level menu or cancel the operation
▲ + ◄	Multiplication combination key	Parameter increases 100 by pressing this combination key once
▼ + ◄	Demultiplication combination key	Parameter decreases 100 by pressing this combination key once
↵	Confirmation key	Enter next lower menu or confirm data alteration

When modifying the parameter, decimal light in the lower right corner of 6-section LED lights up, which indicates the value is confirmed to valid, and it can be turned off by pressing ↵. If exit by pressing ◄ when the decimal light is not off, the setting of parameter is invalid .

4.2 Display Menu

6-section LED is composed of monitor window of DAT series products. Manage the contents with the form of menu.



First level menu comprises condition monitoring, parameter setting, manual operation, jog operation. See Fig. 4-1 for the selection and operation of the first level menu.

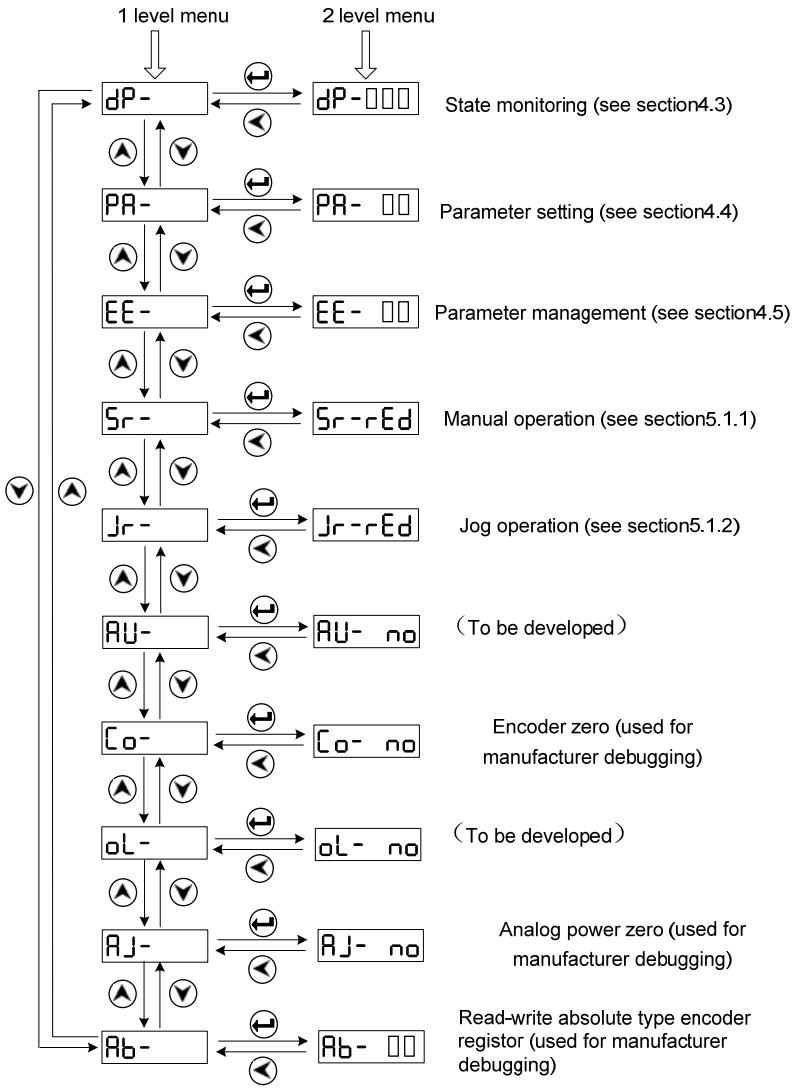


Fig.4-1 Operation of display menu

4.3 State Monitoring

dP- is state monitoring, and the user can select different monitor state on this menu. Set value of parameter PA03 here or set initial monitoring state when power on.

Parameter value	Initial monitor when power-on	Operation	Monitor data	Explanation
PA3=0	dP-SPd		r 1000.0	Current motor speed 1000r/min 【1】
PA3=1	dP-PoS		P45806	Current motor position lower five-order (pulse) 【2】
PA3=2	dP-PoS.		P. 18	Current motor position higher five-order(×100000 pulse)

Parameter value	Initial monitor when power-on	Operation	Monitor data	Explanation
PA3=3	dP-CPo		C458 10	Position command lower five-order (pulse) 【2】
PA3=4	dP-CPo.		C. 18	Position command higher five-order (×100000 pulse)
PA3=5	dP-EPo		E 213	Position deviation lower five-order (pulse) 【2】
PA3=6	dP-EPo.		E. 0	Position deviation higher five-order (×100000 pulse)
PA3=7	dP-tr9		t 70	Motor torque 70%
PA3=8	dP-I		I 2.3	Motor current 2.3A
PA3=9	dP-LSP			Reserve
PA3=10	dP-Cnt		0	Position mode is current control mode
PA3=11	dP-Fr9		283.8	Pulse current of position command is 283.8KHZ
PA3=12	dP- CS		r 210.0	Speed command is 210r/min
PA3=13	dP- Ct		t 20	Torque command 20%
PA3=14	dP-APo			Reserve
PA3=15	dP-In		In''''''11	Input terminal state 【4】
PA3=16	dP-oUt		oUt''''''1	Output terminal state 【4】
PA3=17	dP-Cod		Cod 0	Reserve
PA3=18	dP-rn		cn- on	Operating 【5】
PA3=19	dP-Err		Err- 9	Display No.9 alarm
PA3=20	dP-rES			Reserve
PA3=21	dP-AJH		5 10	Sample value of analog voltage of high speed section

Parameter	Initial monitor	Operation	Monitor data	Explanation
PA3=22	dP-AJL		S 10	Sample value of analog voltage of low speed section
PA3=23	dP-dSP		uEr 1.05	Software version No.
PA3=24	dP-CPL		uEr2.06	Hardware version No.
PA3=25	dP-nt		nt- 15.0	Rated torque of the motor is 15N·m
PA3=26	dP-nI		nI - 14.5	Rated current of the motor is 14.5A
PA3=27	dP- Jn		Jn5000	Rotation inertia of the motor
PA3=28	dP-Por		Pr 1.00	Input power is 1Kw
PA3=29	dP-tEP		C 32	Radiator temperature is 32 centigrade degrees
PA3=30	dP-dC		dC 318	Voltage of DC bus line is 318V
PA3=31	dP-Ab5		b 15038	Single-turn position of the motor 【3】
PA3=32	dP-Hb5		H 38	Lower digit of absolute position of the motor 【3】
PA3=33	dP-Hb5.		H. 12	Higher digit of absolute position of the motor 【3】

【1】In r 1000.0, r is motor speed code, 1000 indicates that CCW speed of the motor is 1000r/min. If it rotates in CW direction, negative rotational speed - 1000.0 is displayed. Unit: r/min.

【2】Feedback position value of the motor encoder consists of two parts: POS．(higher-five-order)＋POS(lower-five-order).

Example：P. 18 × 100000 ＋ P45806 ＝1845806 pulses

As the same principle, pulse value of the position command is composed of two parts: CPO．(higher-five-order)＋CPO (lower-five-order).

Example：C. 18 × 100000 ＋ C4581 0 ＝1845810 pulses

Relationship between CPO and POS：

$$P.\square\square\square\square\square \times 100000 + P\square\square\square\square\square = \frac{PA12}{PA13}\left(C.\square\square\square\square\square \times 100000 + C\square\square\square\square\square\right)$$

Calculation formular of position deviation（EPO）when electronic gear ratio is 1：1：

C. 18 − P. 18 = E. 0

C458 10 − P45806 = E 4

【3】When 17-digit absolute encoder is used, dP-Ab5 displays the position of motor rotor at each rev, the display scope is 0~131071. If multi-coil absolute encoder (if 12-17 digit absolute encoder) is selected, that is, the counting scope of each rev is 17-digit (0~131071),coil counting is 12-digit (0~4095). The motor position includes two parts dP-Hb5. + dP-Hb5 during rotation, displayed value scope is 0~536870911.

> In single-circle absolute encoder, displays of dP-Ab5 and dP-Hb5. + dP-Hb5 are consistent.

【4】Refer to section 3.3.4 for states of input terminal, section 3.3.5 for states of output terminal.

rn- on : Main circuit of the servo unit is charged and enabled.

rn- CH : Main circuit of the servo unit is charged but not enabled.

【5】Display of operation state

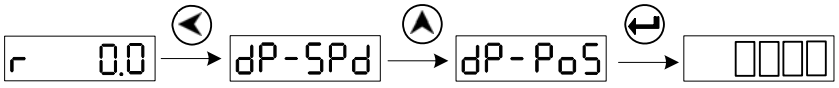
rn- on : Main circuit of the servo unit is charged and enabled.

rn- CH : Main circuit of the servo unit is charged but not enabled.

Operation methods for monitor state selection are introduced bellow.

Example: There are two ways to enter low five-digit dP-PoS state of current position.

Method 1: Select state monitoring directly.



Method 2: Select state monitoring with parameters.

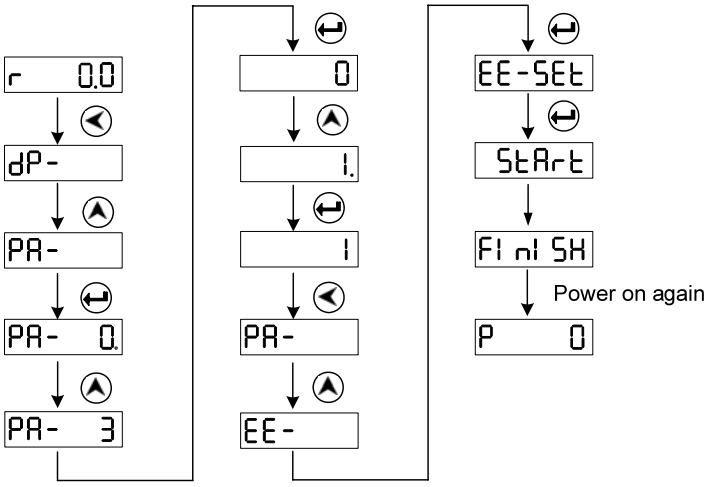


Fig.4-2 Select state monitoring with parameters

4.4 Parameter Setting

Default value: After set PA1 according to motor type, and execute operation EE-dEF, corresponding value becomes the default value.

Operations for motor default value recovery:

1. Input specific code for altering motor parameters, that is PA0=385.
2. Search for corresponding type code of current motor according to code list in Appendix A.
3. Input motor type code to PA1, press ↵ to enter parameter management menu, and execute EE-dEF to complete the operation of defaulted valued recovery.

Related parameter	Name	Unit	Parameter scope	Default value	Application mode
PA0	Parameter altering code		0～9999	315	P，S
	When PA0＝315, parameters except PA1, PA2 can be altered				
PA1	Motor type code		0～185	0	P，S

Taking example of recovering default parameter of 130SJT-M100D（A□）（motor type is 50）below:

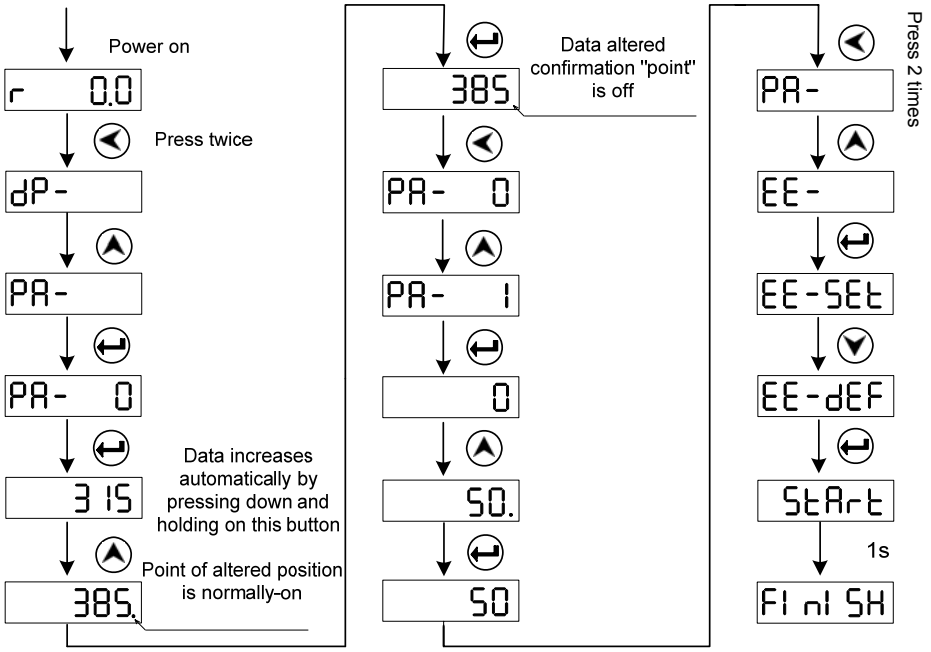


Fig.4-3 Alter default parameter of the motor

1. 385 is specific code for setting default parameter of the motor. PA1 can be altered when PA0=385.

2. User can evaluate whether the default parameter of the servo unit is suitable for the motor through the operation of setting motor default parameter and related parameters that are written into default value or PA1 parameter value (see appendix A). If PA1 parameter value without a corresponding motor type code, the motor may not work

normally.

3. Press ↵ key to validate the parameter after alteration. Now, the altered value is reflected on the controller. If you are not satisfy with the parameters that is being altered, don't press ↵ key, press ◀ key to exit, and the parameter value is restored to the one before alteration. If you hope the altered parameter is valid after power off, please execute parameter writing operation.

On parameter setting, combination keys ▲+◀ makes parameter increases hundred-fold or decreases hundred-fold. Take the operation of changing the value of PA24 from 100 to 1800 as example.

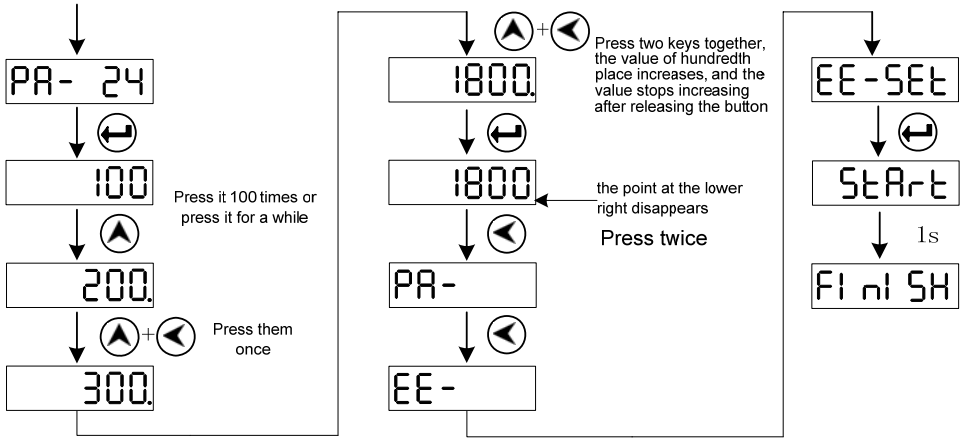


Fig.4-4 Usage of key combination

4.5 Parameter Management

This part introduced operations for parameter write, reading, backup, recovery and default value recovery of DAT series servo unit in details. See the following figure for data storage relationship of parameter management.

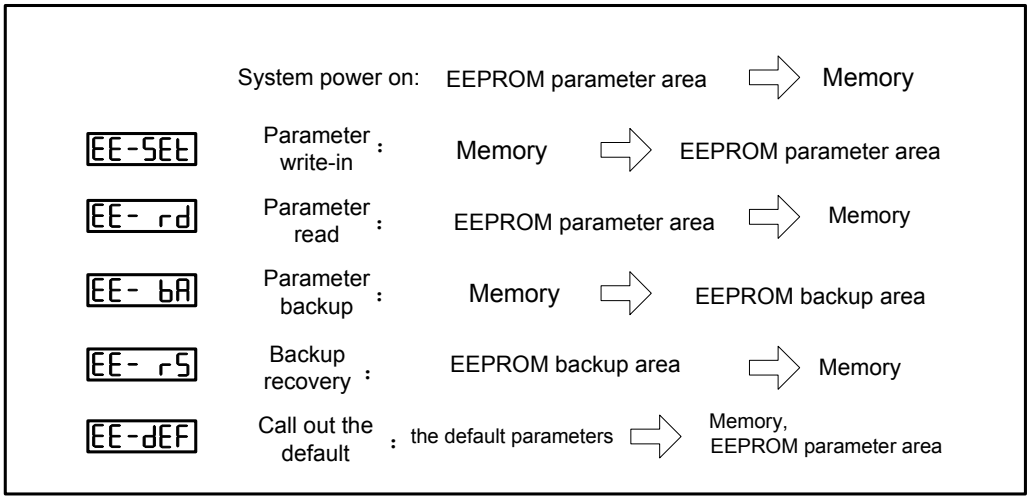


Fig.4-5 Storage diagram of parameter management

- **EE—SEt** Parameter write indicates that write the parameters in the memory to EEPROM parameter area. Parameter alteration only changes the parameter value. It will change into original value after power on again. If the parameter value is needed to be changed forever,

parameter write operation is used. Write parameter in the memory to EEPROM parameter area, and the altered value will be used after power on again.

- **EE－rd** Parameter reading indicates that read data from EEPROM parameter area into memory. This process will be done once after power on. At the beginning, parameter values in the memory are the same as the ones in the EEPROM parameter areas. Parameter value in the memory will be changed after altering the parameter. If user is not satisfy with the altered parameter or the parameter is disarrayed, execute parameter reading operation. Read the data from EEPROM parameter area into memory again, recover original parameter at power on.
- **EE－bA** Parameter backup. Write parameter in the memory to EEPROM backup area. This function used to prevent incorrect alteration and the original parameter can not be recovered.
- **EE－rS** Backup recovery. Read parameters from EEPROM backup area to the memory. Write operation is needed, otherwise, the parameter will not change after power on.
- **EE－dEF** Default value recovery. It indicates that default value of corresponding parameter is read to the memory, and it is written to parameter area of EEPROM. The default parameter of the motor will be used at power on again. (See section 4.4 for parameter setting)

Operations for parameter management are as follows:

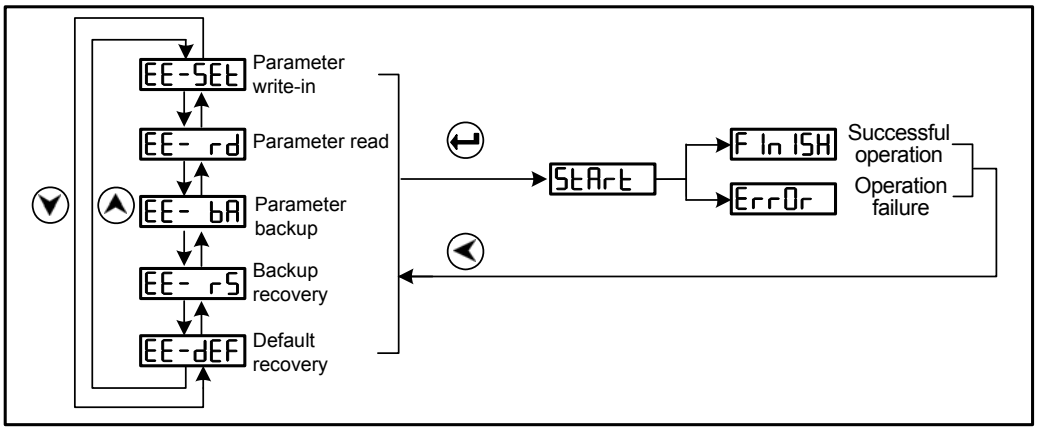


Fig. 4-6 Parameter management

Parameter writing example:

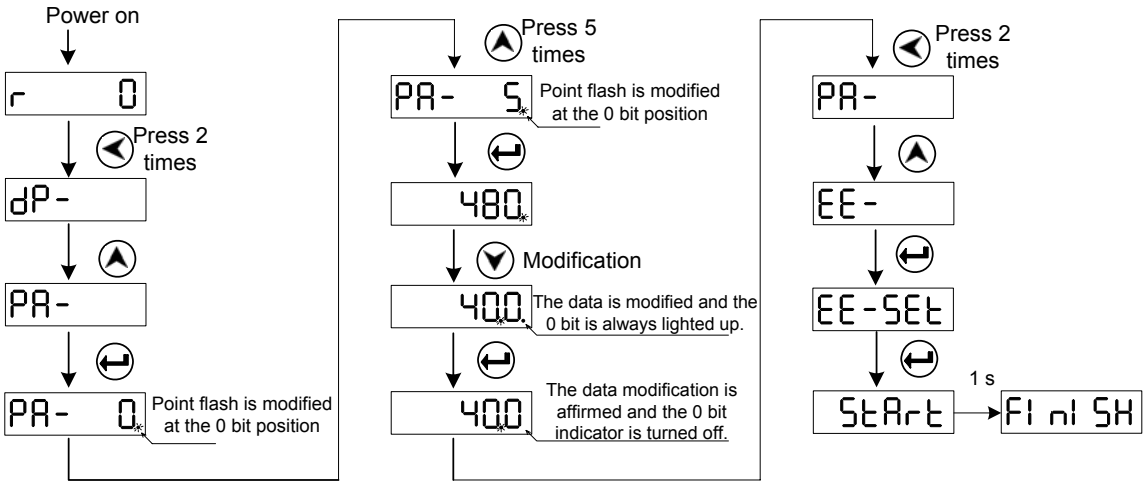


Fig. 4-7 Steps of parameter writing

CHAPTER 5 DEBUGGING AND OPERATION

Attentions

Attention: When using the servo unit first time, users should page out the monitoring window of motor current after the first power on. Once SON turns into ON, please monitor in time the amount of motor current. If the current exceeds the rated amount, cut off the power immediately and check the parameter setting of the wiring and servo unit, or the motor is very likely to be damaged.

Debugging and operation modes will be introduced in this chapter in accordance with the values of PA4 parameter.

Relevant parameter	Name	Unit	Parameter range	Default Value	Application modes
PA4	Work mode choice		0～6	1	P，S

- PA4=0：Position mode；

Set the direction and angle of motor rotation through digital pulse, the motor rotor controlled by servo unit will rotate to the corresponding angle in accordance with the preset direction. The rotary angle (position) and speed are both controllable.

- PA4=1： External analog voltage command speed mode

Set the direction and angle of motor rotation through analog voltage, the motor rotor controlled by servo unit will rotate to the corresponding angle in accordance with the preset direction and speed. This mode can not only enhance motor's fast action capability, but also strengthen its turbulence-resist ability of operation speed

- PA4=2：Internal digital command speed mode

Users should set the values of PA24～PA27 which will be chosen as the internal speed command corresponding to the rotary speed of motor through status combination of input points SC1 and SC2 in CN1,

- PA4=3：Manual mode

Operate under the menu Sr-, accelerate or decelerate by pressing '▲ or ▼'.

- PA4=4：Jog mode

Operate under the menu Jr-, set the Jog speed value of PA21 first, then proceed CCW, CW revolving operation by pressing '▲ or ▼'.

- PA4=5: Encoder Zero-setting, preset well in production, no need to set again.
- PA4=6: Analog Zero-setting, preset well in production, no need to set again.

There are normally the following four steps in the operation of a new servo unit.

Correct wiring ⟹ Parameter setting ⟹ Basis debugging ⟹ Function debugging

The first three steps will be illustrated to facilitate users for a faster operation of the servo drive device. Users with different requirements may refer to “Function Debugging” of Chapter Six for detailed information.

- When using the servo unit first time, manual operation or JOG operation without connected load is recommended. Make sure the servo unit and motor function normally after moving, oscillating or assembling.
- After confirming the drive device work properly without connected load, users connect CN1 control signal and proceed debugging and operating in speed mode or position mode according to users’ practical needs.
- After the debugging of signal connection, parameter setting and motor operation run regularly, connect the load for loaded operation.

5.1 Manual and Jog operation

First of all, wire correctly according to the following figure, **do NOT connect motor load**.

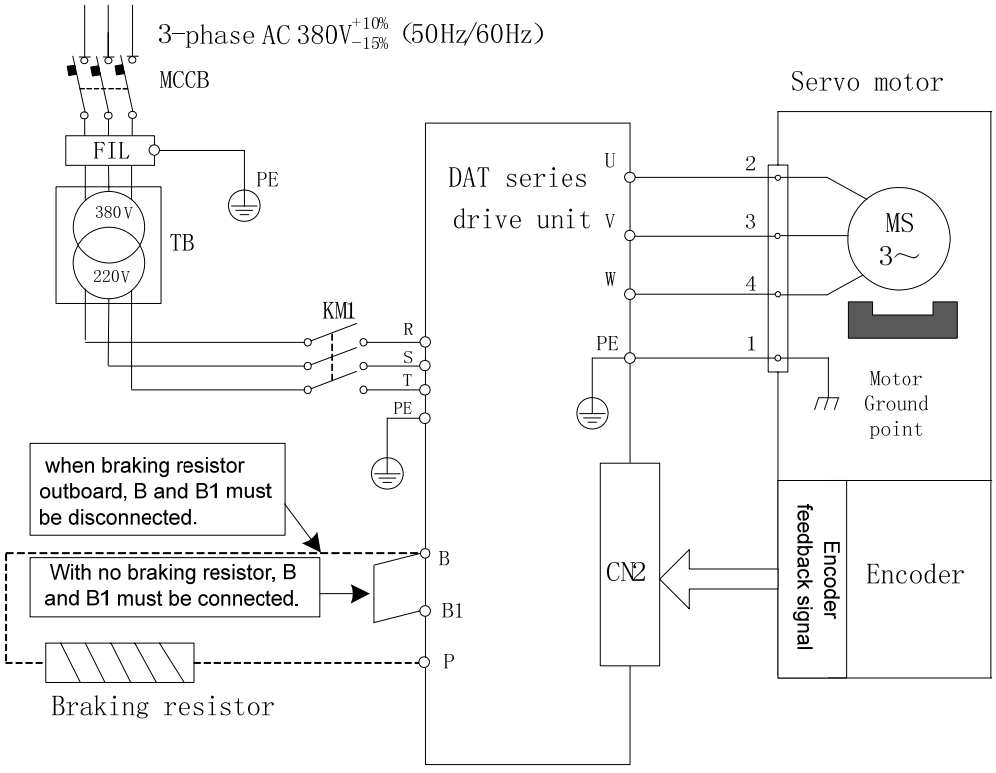
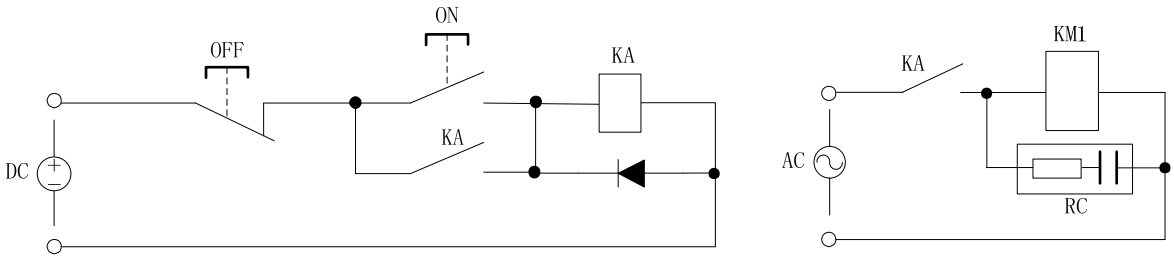


Fig. 5-1 Major loops connection illustration

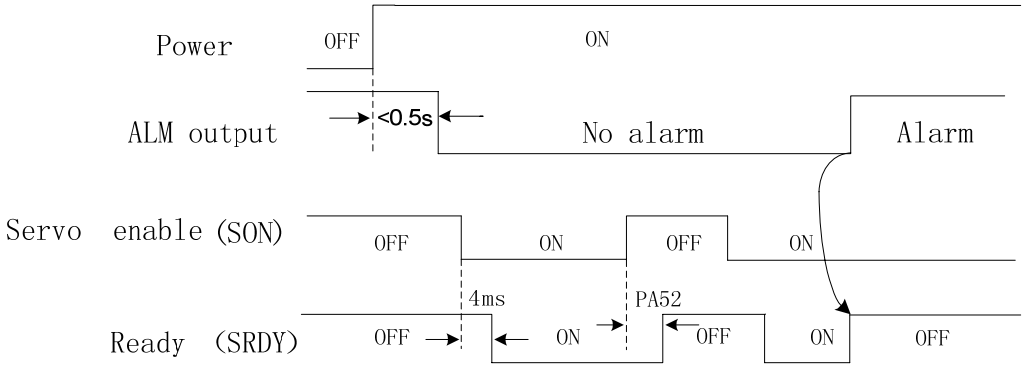
The following schematic diagram is recommended to wire the control circuit of KMI.



After wire correctly, check according to the following illustrations before power on:

Items to be examined	Examine methods
The specification of servo unit and motor matching or not.	Refer to instruction manual to check nameplates of servo unit and motor
Breaker, contactor and isolation transformer connected correctly or not.	Refer to “Choose of Peripheral Equipments” on Appendix B.
R, S, T, PE, P, B1, B and U, V, W, PE connected correctly or not。	Make sure field power circuit, if necessary, use multimeter for measurement.
Motor encoder feedback signal wire connected correctly or not.	Refer to Manual 3.4
Major loop terminal screw fixed firmly or not.	Check if any loose with screwdriver.

Make sure connect normally, and then turn on the power as the following time sequence.

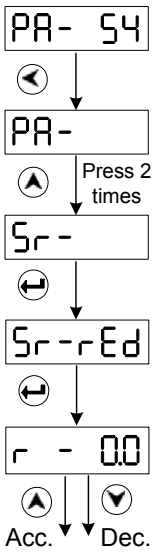


5.1.1 Manual Operation

After the servo unit turned on, r 0.0 will show as in normal condition; if the servo unit is out-of-action, alarming code Err-□□ will show, in this condition please refer to Chapter Eight (Abnormal and Managing) for solution.

Essential Parameter	Name	Unit	Parameter range	Default Value	Application Mode
PA4	Work mode choice		0～6	0	P，S
PA54	Interior enabling		0～1	0	P，S

Steps of manual operation (PA4=3) as follows:



1. Just after the servo unit is turned on, r 0.0 will show, it's the monitoring window of motor operation speed.

2. Check if PA1 corresponds to the right motor (refer to Appendix A), if PA1 is correct, the step is skipped, otherwise the user output the default parameters which corresponds to the servo motor of the servo unit (see section 4.4 for operation methods).

3. Set PA4=3 and choose the manual operation mode.

4. Set PA54=1, interior enabling (before enabling, make sure no danger to rotate the motor shaft); (If the user wants to cancel interior enabling, set PA54=0)

5. Enter manual operation manual per the left operation drawing. (previous parameter setting omitted)

6. Keep pressing ▲, motor begins accelerating, release the button, speed remains unchanged;

keep pressing ▼, and motor begins decelerating till zero speed, the motor will reverse-accelerate.

If there is abnormal condition in manual operation, such as oscillating or noisy in motor, it's necessary to debug the speed loop parameters of PA5,PA6 and PA8. Refer to 6.1 for specific debugging methods.

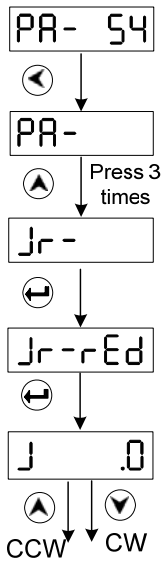
5.1.2 Jog Operation

After the servo unit is turned on, r 0.0 will show as in normal condition; if the servo unit is out-of-action, alarming code Err-□□ will show, in this condition please refer to Chapter Eight (Abnormal and Managing) for solution.

Essential Parameter	Name	Unit	Parameter range	Default Value	Application Mode
PA4	Work mode choice		0～6	0	P，S
PA21	JOG operation speed	r/min	-3000～3000	120	S
PA54	Interior enabling		0～1	0	P，S

Like manual operation, Jog operation also proceeds through operation panel.

Steps of Jog operation (PA4=4) as follows:



1. Just after the servo unit turned on, r 0.0 will show, it's the monitoring window of motor operation speed.

2. Check if PA1 corresponds to the right motor (refer to Appendix A), if PA1 is correct, the step is skip, otherwise the user outputs the default parameters which corresponds to the servo motor of the servo unit (see section 4.4 for operation methods).

3. Set PA4=4 and choose the Jog operation mode.
Set PA21=500, Jog speed: 500 r/min.

4. Set PA54=1, interior enabling (before enabling, make sure no danger to rotate the motor shaft); (If the user wants to cancel interior enabling, set PA54=0)

5. Enter manual operation manual per the left operation drawing. (previous parameter setting omitted)

6. Keep pressing ▲, motor will operate at the speed of 500 r/min preset per PA21;

keep pressing ▼, motor will reverse-operate per the speed set per PA21. Release the button, motor stops rotating and remains zero-speed.

If there is abnormal condition in Jog operation, such as oscillating or noisy in motor, it's necessary to debug the speed loop parameters of PA5,PA6 and PA8. Refer to 6.1 for specific debugging methods.

.

5.2 Speed mode operation

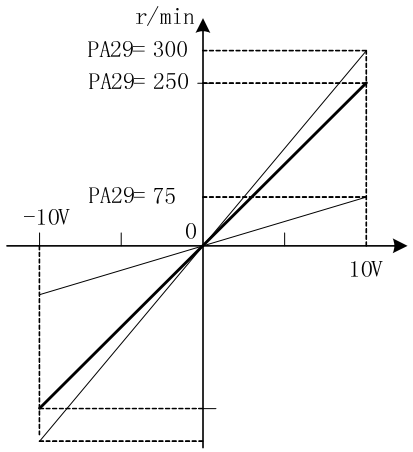
5.2.1 External analog voltage command

① First, refer to the wiring diagrams in section 3.61 (DAT 2000 series) or section 3.6.3 (DAT2000C series) for correct wiring, and pay attention to the essential input signals in the following chart which must be connected to.

②,After correct connection, all of the input signals must be OFF, the power is turned on and the essential parameters are set .

Essential parameter	Parameter illustration
PA4	PA4=1 Choose external analog voltage command speed mode
PA46	Voltage range of analog control signal under speed mode: PA46= 0：（－10V～＋10V）effective, voltage command is positive, motor CCW rotates; Voltage command is negative, motor CW rotates. PA46= 1：（0～＋10V）Effective, SC1, SC2 are the rotating start signals of CCW,

	CW respectively.
PA19	PA46= 0：（－10V～＋10V）effective： PA19= 0：Motor CCW rotates when voltage command is positive. PA19= 1：Motor CW rotates when voltage command is positive. PA46= 1：（0～＋10V）effective： PA19= 0：Motor CCW rotates when SC1 is ON, or motor CW rotates when SC2 is ON. PA19= 1：Motor CW rotates when SC1 is ON，or motor CCW rotates when SC2 is ON.
PA29	Analog command gain: PA29 sets the motor rotating speed corresponding to 1V analog voltage. Different motors have different rated rotating speeds, so the value should be set according to motor models. E.g.: The responding rated rotating speed of GSK110SJT-M060D (A□) is 2500r/min. Set PA29=250. 10V command corresponds to motor at 2500r/min. 5V command corresponds to motor at 1250r/min, 1V command corresponds to motor at 250r/min.



③. Basic debugging operation

1. After the essential parameters is set completely, the user enters into the step of parameter-read-in operation. (Refer to Section 4.5 for the operation illustration of EE-SEt on parameter management)

2. Set a minor analog command to make the input signal SON turns ON, the motor will rotates following the command.

- PA46=0, analog command -10V～+10V effective; take the following diagram for example: input analog command n（r/min), the on-off control motor of SON will operate or stop; Command unchanged, if the motor direction reverse, the value of parameter PA19 will change.

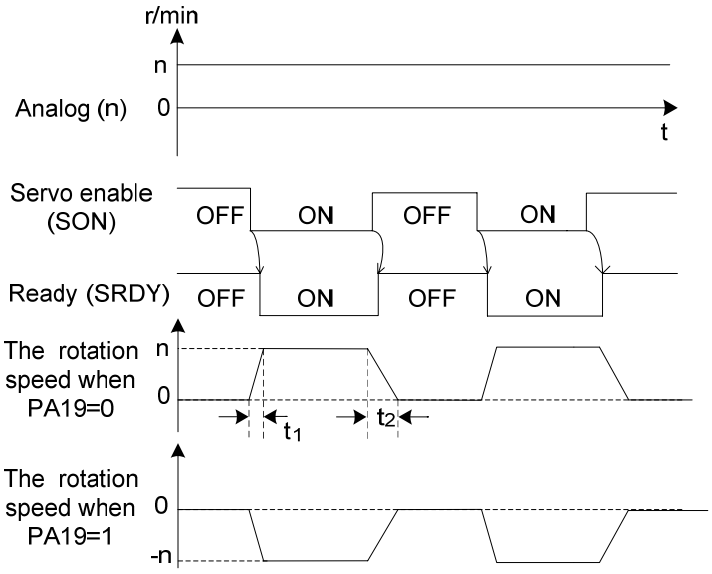


Fig 5-2 Time sequence of motor operation when PA46=0

➢ PA46=1, analog command 0～10V effective, set SC1, SC2 as the positive-and-negative rotating signals. If analog voltage turns to be negative, the motor will not function.

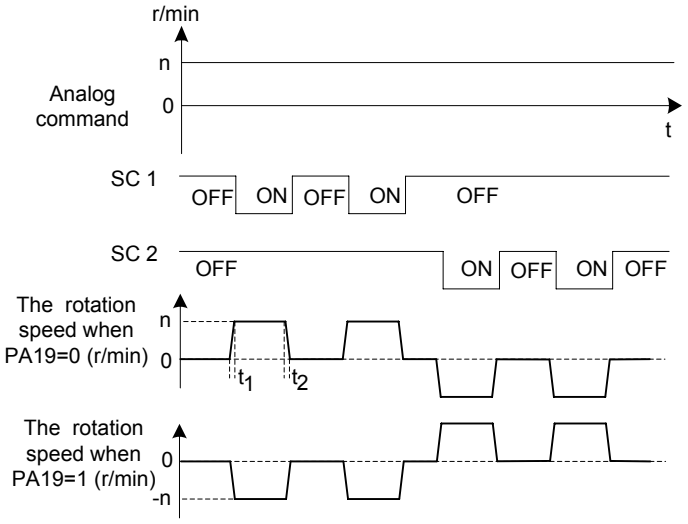


Fig 5-3 Time sequence of motor operation when PA46=1

t1, t2 represents the accelerating and decelerating time of motor respectively, the larger the motor load inertia is, the longer the accelerating & decelerating time will be.

3. Gently increase the analog command to fasten the operation speed of motor. Meanwhile monitor the motor's operation condition and check if oscillation or noise occurs, the speed is stable as well as motor current exceed the rated value. Observe the value of motor current by monitoring dP-I. In normal condition, the displayed current value won't exceed the rated one.

4. If the motor rotates from zero-speed to the maximum positive rotating speed, or from the maximum negative rotating speed to the maximum positive speed in normal condition, users can proceed the debugging of other functions.

Troubleshooting of abnormal often met during the operation when the analog command speed

mode are introduced in the following chart:

Number	Abnormality during the debugging operation	Troubleshooting
1	Motor rotating direction is inconsistent;	Refer to Chapter 6.3 for the switchover of motor rotating direction
2	Oscillation or noise occur in motor	1. Check if the shielding wire is connected correctly. 2. Refer to Chapter 6.1 for debugging illustration of fundamental performance parameters.
3	Motor can only run in one direction;	1. Inspect the command source mode, and test the setting of PA46, PA19; 2. Check if the analog command input wire connected reversely.
4	Set OV command, motor will still move slightly;	Refer to Chapter 6.6.1 for offset adjustment.

5.2.2 Internal digital command

① The essential input signal in the following chart must be connected.

Essential input signal	Functions
*COM＋	The input point common terminal is the control supply input terminal.
*SON	Servo enabling signal can individually control motor enabling.
*SC1	speed choice 1
*SC2	speed choice 2

②,Confirm the connection is correct, all input signals must be OFF, the power supply is turned on and the essential parameter must be set.

Essential parameter	Name	Unit	Parameter range	Default value	Application mode
PA4=2	Choose the internal digital command speed mode		0～6	0	P，S

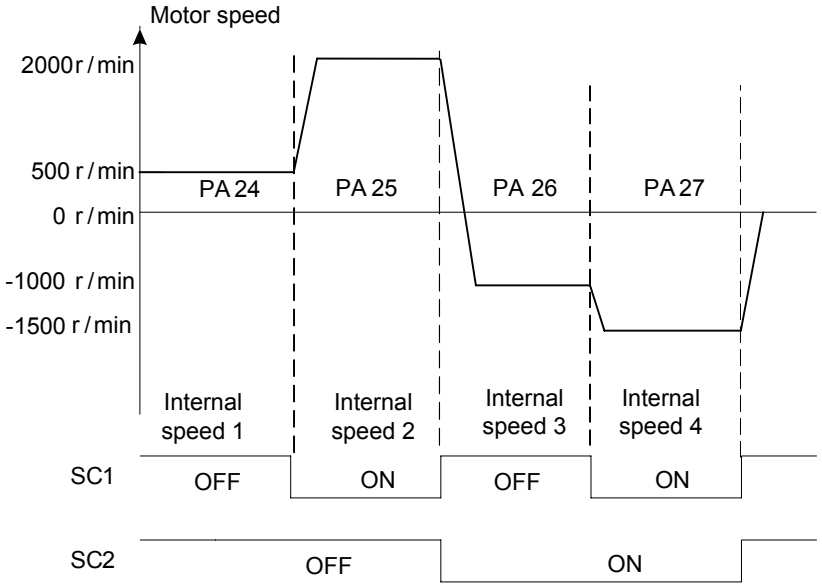
Digital command default value	Operation speed	I/O status of selection speed	
		SC2	SC1
PA24＝500	Internal speed 1	OFF	OFF
PA25＝2000	Internal speed 2	OFF	ON
PA26＝-1000	Internal speed 3	ON	OFF
PA27＝-1500	Internal speed 4	ON	ON

③ Basic debugging operation

1. After the essential parameters is set completely, the drive unit enters into the step of parameter-read-in operation. (Refer to Section 4.5 for the operation illustration of EE-SEt on parameter management)

2. Set input signal SC1 and SC2 turn OFF, the motor will rotate at the internal speed, i.e. 500.0r/min when SON turns ON. Observe the value of motor current by monitoring dP-I. In normal condition, the displayed current value won't exceed the rated one.

3. Switch over the four different internal speeds by changing the combination status of SC1 and SC2. Meanwhile monitor the motor's operation condition and check if oscillation or noise occurs, the speed is stable as well as motor current exceed the rated value. Following figure shows the successive switch-over time sequence of the four speeds.



4. When motor operates normally at the four-phase internal speed, users can proceed the debugging of other functions.

Troubleshooting of abnormality during the operation under the internal speed command mode introduced in the following chart:

NO.	Abnormality during the debugging operation	Troubleshooting
1	Motor rotating direction is inconsistent;	Refer to Chapter 6.3 for the switchover of motor rotating direction
2	Oscillation or noise occurs in motor;	Refer to Chapter 6.1 for debugging illustration of fundamental performance parameters.
3	The status of speed choice input signal is inconsistent with motor speed	Check dP- In to judge if the input signal correct. (refer to Chapter 3.3.4 for switching value input points)

5.3 Position Mode Operation

① First, refer to the wiring diagrams in section 3.61 (DAT 2000 series) or section 3.6.3 (DAT2000C series) for correct wiring, and pay attention to the essential input signals in the following chart which

Essential input signals	Function
*COM＋	Input point common terminal is the control supply input terminal.
*SON	Servo enabling signal can individually control motor enabling in this mode.
*PULS＋ *PULS－	position command input Input model: 1. pulse + direction 2. CCW pulse+ CW pulse 3. orthogonal pulse A/B phase
*SIGN＋ *SIGN－	

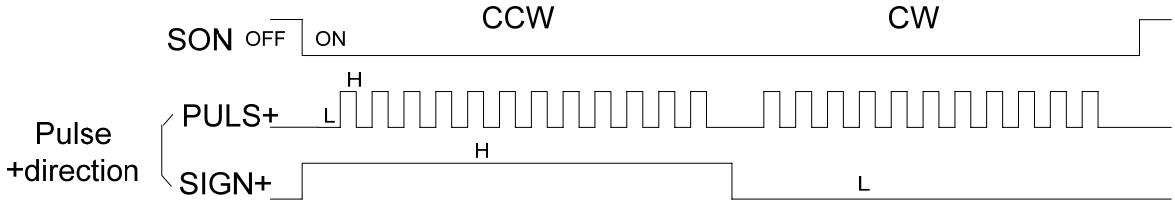
② After correct connection, all of the input signals must be OFF, the power supply is turned on and the essential parameters must be set.

Essential parameter	Parameter illustration
PA4	Choose position mode
PA12 PA13	Position command E-gear function: PA12 is the pulse command multiplying factor PA13 is the pulse command frequency-division factor
	Set the E-gear ratio of position command to match various pulse commands. The calculating formula of E-gear ratio is as follows: $S=\frac{I}{\delta}\cdot\frac{CR}{CD}\cdot\frac{PA12}{PA13}\cdot\frac{L}{4C}\cdot\frac{ZD}{ZM}$, （refer to Chapter 6.4.1 for detailed calculation method.）
PA14	position command pulse model choice
	PA14=0：pulse + direction PA14=1：CCW pulse + CW pulse PA14=2：Two-phase orthogonal pulse input; (refer to Chapter 3.3.3 for position command input)
PA15	Position command reverse direction
	PA15＝0：Maintain the original command direction PA15＝1: Take the reverse direction of input pulse command. (see also Chapter 6, Section 3)

③ Basic debugging operation

1. After the essential parameters is set completely, the motor enters into the step of parameter-read-in operation. (Refer to Section 4.5 for the operation illustration of EE-SEt on parameter management)

2. Turn SON to ON and keep zero-speed, set the position pulse command with small frequency and then the motor will run. Observe the value of motor current by monitoring dP-I. In normal condition, the displayed current value won't exceed the rated one:



3. Gently increase the analog command to fasten the operation speed of motor. Meanwhile monitor the motor's operation condition and check if oscillation or noise occurs, the speed is stable as well as motor current exceed the rated value.

4. When the motor can operate along with command within the rated rotating speed, and that the number of position command pulse dP-PoS showed equals to the ones that dP-CPo $\times \frac{PA12}{PA13}$ showed, users can proceed debugging of other functions.

Troubleshooting of abnormality during the operation under the position command mode are introduced in the following chart:

No.	Abnormality during the debugging operation	Troubleshooting
1	dP-CPo No data is displayed, motor does not function after enabling;	Test command wiring and upper computer
2	dP-CPo Data is displayed, motor does not function;	Test enabling signal and the setting of essential parameter
3	Motor rotating direction is inconsistent	Refer to Section 6.3 for the switch-over of motor rotating direction
4	Oscillation or noise occurs in motor	Refer to Chapter 6.1 for debugging illustration of fundamental performance parameters.
5	Motor does not function	Test the mode of command source and correctly set based on PA14.
6	Data showed on dP-CPo is inconsistent with the pulse number of command source	1. Check the mask processing of control signal wire 2. Keep away from strong interference source.
7	The pulse value of dP-CPo $\times \frac{PA12}{PA13}$ is inconsistent with the pulse number showed on dP-PoS	When position command available, SON signal is not always effective, i.e. SON may turn OFF sometimes even if there is position command.

Chapter 6 FUNCTION DEBUGGING

6.1 Fundamental performance parameter debugging illustration

Attentions

The figure below shows the adjustment of fundamental performance parameters. For dIfferent motors or loads, it's likely that users need to moderately adjust some parts of parameters according to the following schematic diagram to achieve the best working condition of the servo motor. While over adjustment may lead to unstable operation of the servo unit.

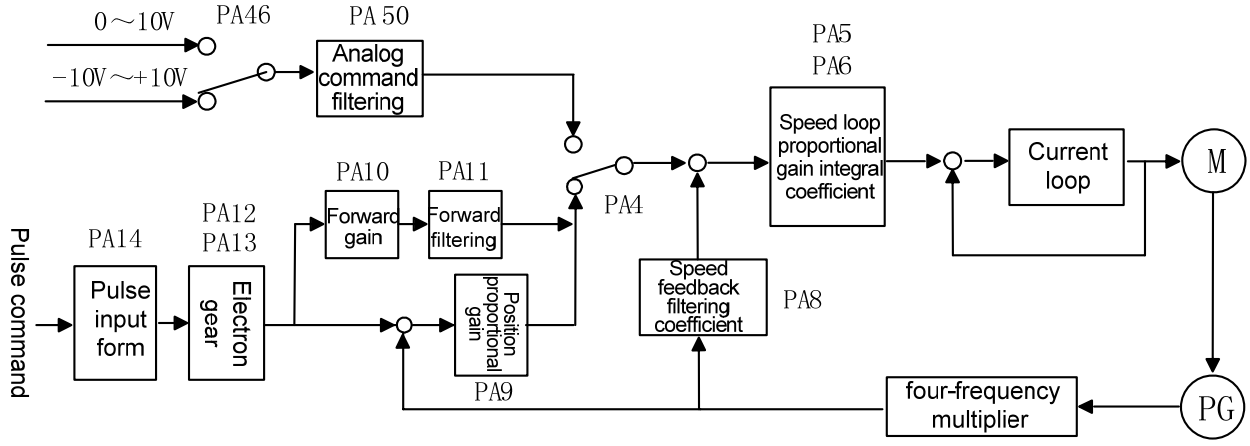


Fig 6-1 Fundamental performance parameter adjustment diagram

When debugging motor parameters, users can first output the default parameters according to the corresponding motor model codes in Appendix A. If abnormal situations, such as oscillation, noise, creeping or insufficient force, occur during the operation, and the fundamental performance parameters need to be adjusted. Generally speaking, parameters in above diagram should first be adjusted in the inner-ring speed loop, and then the out-ring speed loop.

- PA5 (Speed loop proportional gain):

The larger the PA5 speed loop proportional gain value is, the higher the servo rigidity will be; while if the value is over large, the motor is liable to oscillate (motor generates abnormal sound) when starting up or stopping running; the smaller the value is, the slower the motor responds. The user can add or decrease 5o each time on the basis of the default values for adjustment, and observe the effect. Please note the general value range of PA5 is 150～900.

- PA6 (Speed loop integral time factor)

The larger the value of PA6 speed loop integral time factor is, the faster the system will respond; While the system will turn unstable if the preset value is over large, and even oscillation occurs; the smaller the value is, the slower the motor responds. The integral action may weaken and the steady-state error can not be decreased if the value is too small. The user can add or decrease 5o each time on the basis of the default values for adjustment, and observe the effect. Please note the general value range of PA6 is 20～500.

The proportional gain and integral time constant of speed loop should be proportionally adjusted

according to specific servo models and load condition. In general, the larger the load inertia is, the bigger the speed loop proportional gain and integral time factor will be. In the case of no oscillation occurs in the system, speed loop proportional gain is to be set as bigger as possible.

Fig 6-2 below shows the response curve of phase-step command input of a driven motor with certain inertia load.

Curve 1 shows the speed phase-step input curve when PA5, PA6 are relatively small; with quite soft motor character, slow dynamic response and comparatively large steady-state error.

Curve 2 shows the speed step-phase input curve when the value of PA5, PA6 are relatively proper. The rigidity of motor is moderate and dynamic respond fast.

Curve 3 shows the speed phase-step e input curve when PA5, PA6 are relatively large; instantaneous overshoot is to be the largest and the motor is liable to oscillate.

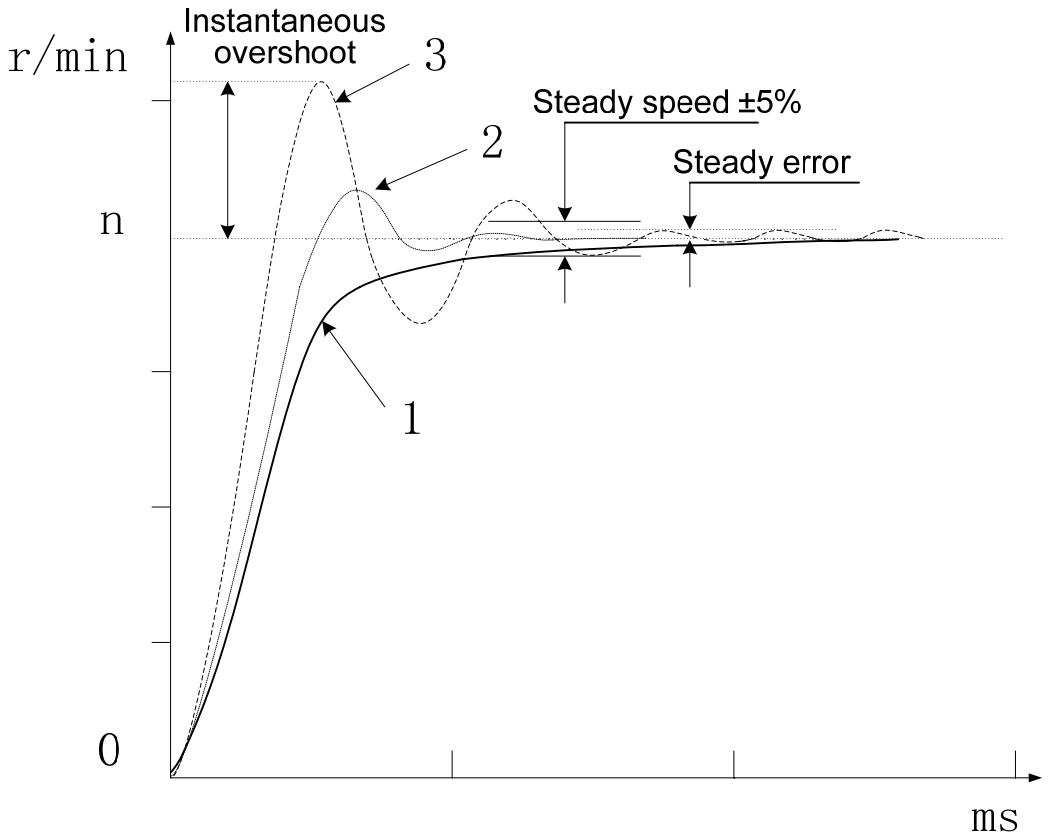


Fig. 6-2 Response curve of phase-step command input

- PA8（Speed feedback filtering factor）

The larger the speed feedback filtering factor value is, the faster the speed feedback responds. The motor will generate big electromagnetic noise if the value is overlarge; the speed feedback will respond slower as the value decreases, and the speed will fluctuates more which may lead to oscillation if the value is over small. The user can add or decrease 5o each time on the basis of the default values for adjustment, and observe the effect. Please note the minimum value of PA8 should not less than 50.

- PA9 (Position loop proportional gain)

The closed position loop will work when the servo unit position loop adopts simple P adjustment, position mode and the speed mode orientation function. The larger the position loop proportional gain is, the faster the position command responds and the bigger the rigidity will be. With overlarge gain value, the motor will generate position overshoot and even oscillation when it starts or stop working;

the smaller the value is, the slower the response will be and tracking error will thereby increase. The user can add or decrease 5o each time on the basis of the default values for adjustment, and observe the effect. Please note Please note the general value range of PA9 is 25～60.

- PA10（Position loop feed-forward gain）, PA11(Position loop feed-forward filtering factor)：

PA10 adjust the speed loop through the speed information of position command, tracking error will decrease as the value increases, while the motor is liable to generate overshoot and oscillation if the value is overlarge.

PA11 actually carries on smoothing processing of the position command feedforward control. The lager the value is, the faster the phase-step speed command will be responded to, thereby better restraining the position overshoot and oscillation resulted from the sudden change of command speed. The smaller the value is, the less obvious the effect of feedforward control will be, while the control will generate bigger oscillation.

Generally speaking, PA10（Position loop feed-forward gain） and PA11(Position loop feed-forward filtering factor) may not be used.

- PA50 (Analog command filtering factor)

The smaller the analog command filtering factor value is, the higher interference signal-resistant ability is. The response to speed command will be too slow if the value is too small. The larger the value is, the lower interference signal-resistant ability will be, while the response will faster. The user can add or decrease 50 each time on the basis of the default values for adjustment, and observe the effect. Please note the minimum of PA50 is no less than 50.

6.2 Application of brake releasing signal

In order to lock the vertical or tilting workbench linked with motor shaft and prevent the falling off of the table if the servo warning or power absent, the servo motor with electricity-breaking brake, i.e. brake servo, is usually used. To effectively control the motion of brake motor, brake releasing signal (HOLD) is furnished in this servo unit.

Electricity-breaking brake can only be used to maintain workbench, definitely can not to decelerate or to stop machine’s running compulsively.

1. Correctly wire according to fig.6-3, and note the prerequisite connection of essential input signal in the following chart.

Essential input signal	Function
*COM＋	Input point common terminal, is the control supply input terminal.
*SON	Servo enabling signal
*HOLD＋ *HOLD－	Brake releasing signal

Figure 6-3 shows the wiring theory of practical application of brake releasing signal controlling brake servo. Users offer 24V power and pay attention to the polarity of leading power when

connecting brake releasing signal (HOLD±). See the detailed wiring in the diagram below.

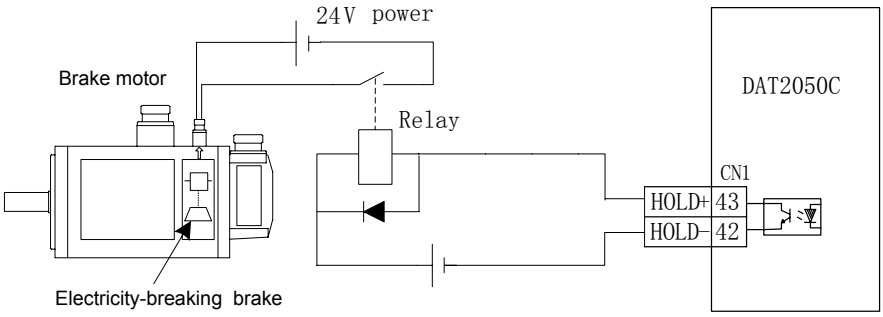


Fig. 6-3 Typical example of HOLD± brake releasing signal

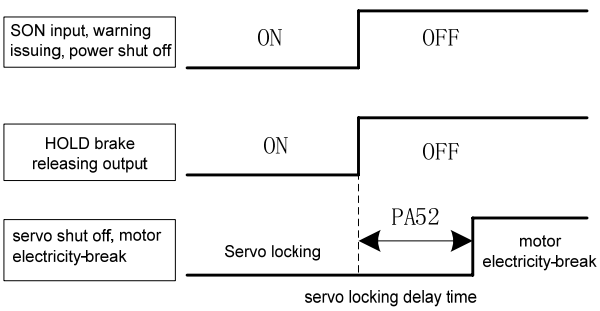
Motors with different power will be configured with the electricity-breaking brakes with different power. So users can refer to the following chart listing the technical parameters of brakes configured to motors of different specifications when choosing 24V power.

Motor base number	Rated torque	Rated voltage	20℃ Brake power （Unit W）	Releasing time （s）
110	4	24V DC	20	0.037
130	8	24V DC	25	0.042
175	32	24V DC	40	0.135

2. After correctly wiring, switch on the power and set the essential parameters. Considering the time sequence of HOLD signal, please use the following parameters related to braking action to adjust the time if there is some tiny movement of the machine or workbench because of the gravity.

Related parameters	Name	Unit	Parameter range	Default value	Application mode
PA51	The maximum decelerating time of motor before the action of electricity-breaking brake	ms	0～30000	50	P，S
PA52	servo locked delay time	ms	0～30000	50	P，S
PA53	Motor speed when electricity-breaking brake acting	r/min	5～3000	30	P，S

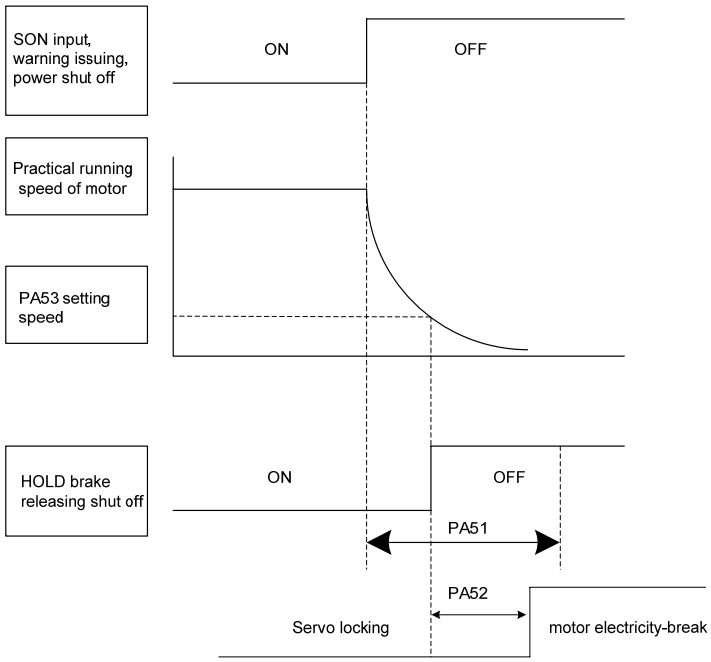
Situation 1: when motor is in the state of rest, power supply of servo unit is turned off suddenly.



Generally, when HOLD is turned off, the servo unit will turned off at the same time. Users can adjust PA52 to delay the turned-off of servo unit to avoid tiny movement that machine or workbench occurs due to the gravity.

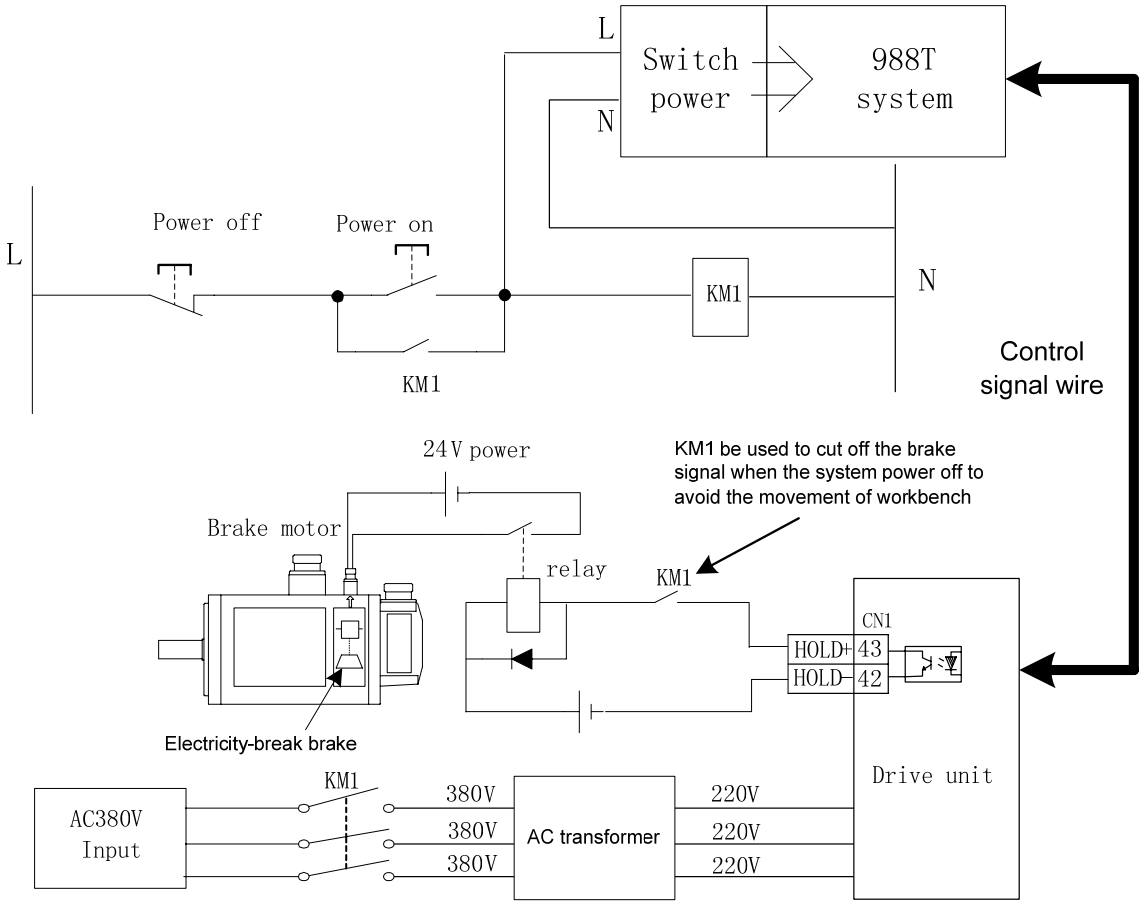
When the servo is turned off, the energy will be released through dynamic braking circuit in a short time. So if the value of PA52 is set big, the practical servo locking delay time will not exceed the time released by energy.

Situation 2: the motor is in operation, the servo unit is turned off suddenly.



Do not brake suddenly when the servo unit runs at a high speed, otherwise the brake will be damaged easily. The HOLD brake releasing signal should be shut off at the right time. PA51, PA53 should be properly adjusted first to decelerate the motor and then brake. PA53 is recommended to be set at 30r/min. The value of PA51 should be set according to the practical machinery movement.

If movement of machinery or workbench occurs because of the delaying of periphery switch power and relay coil when the power is unexpectedly shut off, the solution below is shown.



KM1 AC contactor is a control switch connected with servo unit power. A normally-open contacts of KM1 is connected to circuit of brake releasing signal, and when the power supply is turned off manually or suddenly, KM1 is turn off first and the normally-open contact is shut off thereby, then the brake of motor loses power and brake immediately to eliminate the delay of other source and to further guarantee that there is no movement of machinery or workbench.

6.3 The switchover of motor rotating direction

■ Standard mode

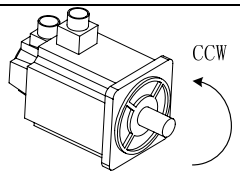
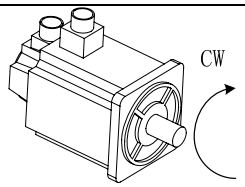
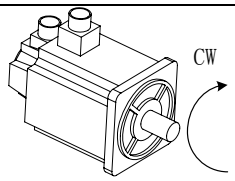
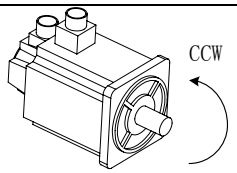
When all of the parameters of servo unit are set to be the default values, the relationship between speed/position command and motor rotating direction is the standard mode.

■ Reversal mode

If the servo motor wiring and speed/position command are unchanged, there is a “reversal mode” on servo unit which can make the servo motor rotate reversely.

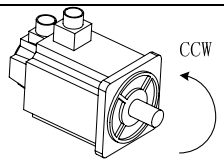
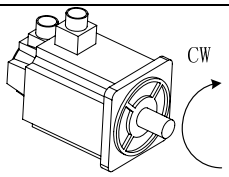
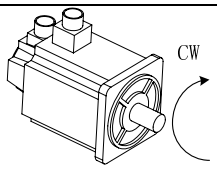
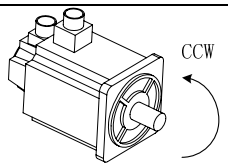
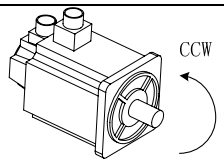
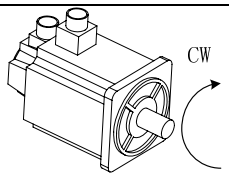
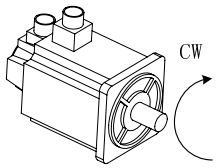
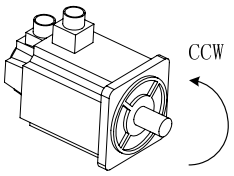
1. Position mode

Related parameter	Name	Unit	Parameter range	Default value	Application mode
PA15	Reverse position command direction		0～1	0	P
	PA15＝0：remain the original command direction PA15＝1：reverse input pulse command				

Command	Standard setting（PA15=0）	Reversal mode（PA15=1）
CCW command		
CW command		

2. Speed mode

Related parameter	Name	Unit	Parameter range	Default value	Application mode
PA19	Reverse analog command/reverse rotation start of CCW, CW		0～1	0	S
	1. If analog command is －10V～+10V: （PA46＝0） PA19＝0: analog command positive，motor CCW rotates，analog command negative，motor CW rotates； PA19＝1: analog command positive，motor CW rotates，analog command negative，motor CCW rotates； 2. If analog command is: 0～10V （PA46＝1） PA19＝0，Set the CCW rotating start signal，motor CCW rotates, Set the CW rotating start signal，motor CW rotates PA19＝1，Set the CW rotating start signal，motor CW rotates, Set the CCW rotating start signal，motor CCW rotates				

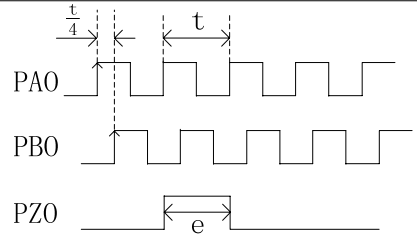
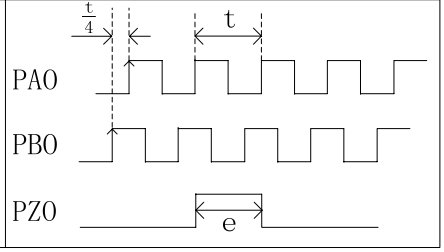
	Standard setting（PA19=0）	Reversal mode（PA19=1）
(PA46=1) CCW command (PA46=1)		
CW command (PA46=1)		
Positive voltage (PA46=0)		
Negative voltage (PA46=0)		

6.4 Output of position feedback signal

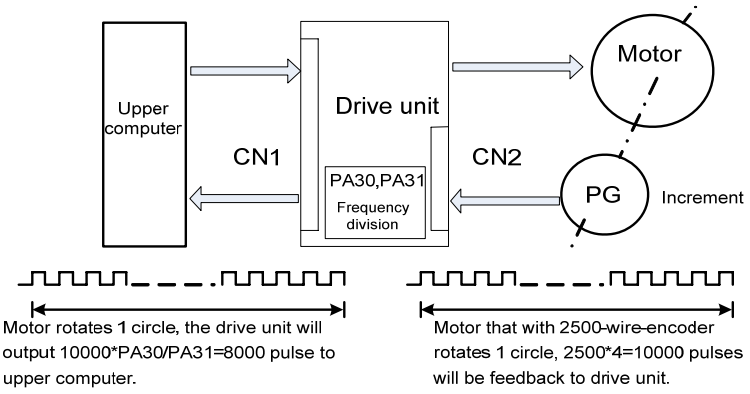
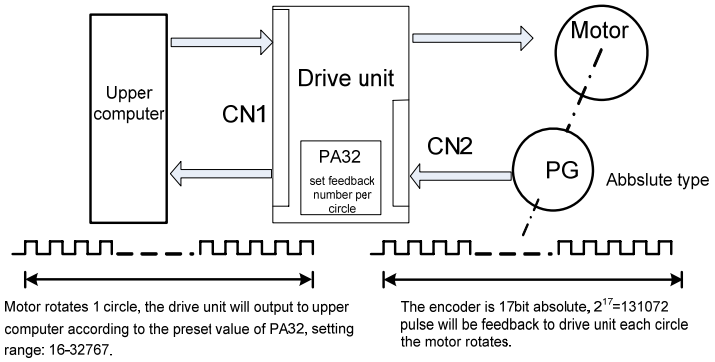
Position feedback signal is to conduct within the servo unit frequency division with the pulse data from motor encoder (PG) and output them to upper computer through CN1 according to the preset shift pulses to achieve the functions as upper computer position closed loop control.

Output mode	Output signal names	Function
Differential output	*PAO＋ *PAO－	Position feedback output signal A phase
Differential output	*PBO＋ *PBO－	Position feedback output signal B phase
Differential output	*PZO＋ *PZO－	Position feedback output signal Z phase

Two forms of output wave form as below:

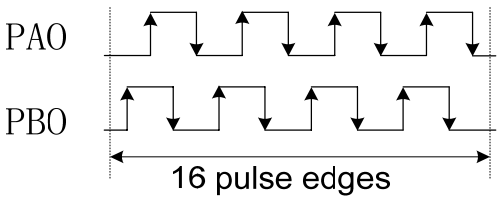
Standard mode（PA22=0）	reverse modePA22=1）
	

The pulse number of position feedback signal is set by the parameters of drive unit. Set the parameters as the following chart and according to the different types of encoders corresponding to the servo motors driven by drive unit (refer to this manual Section 1.2.1 to check the encoder types).

<table>
<tr><th>Motor encoder type</th><th>Related parameter</th><th>Illustration</th></tr>
<tr><td>Incremental type</td><td>PA30
PA31
PA22</td><td>Position feedback output pulse gear ratio should be set in PA31≥PA30, if PA31<PA30, it will output per PA31=PA3.
The setting will not effect unless they are saved and re-power on after PA30,PA31 well set each time.
E.g.: as the figure shows, when PA30：PA31= 4：5, the corresponding pulse number is
 
</td></tr>
<tr><td>Absolute type</td><td>PA32
PA22</td><td>PA32：Position feedback signal frequency division ratio. Set the pulse number that drive unit feedback to upper computer each circle the motor rotates.
 
</td></tr>
</table>

Counting issue of AB phase pulse:

AB phase pulse counting takes 2 phase edge signal as the triggering signal, i.e. it counts 1 once 1 edge signal is acquired. E.g., if set PA32=16, the whole wave form of the upper computer reported back by drive unit each circle the motor rotates will be as follows:



6.5 Function Debugging of Position Mode

6.5.1 Position Command E-gear Ratio

Based on the relative machinery change gear, E-gear function refers to the function that can set the amount of motor movement which equals to the input command as any value through the adjustment of servo parameter in the controlling process, without any considering to the machinery reduction ratio or the encoder wiring.

Relative parameter	Name	Unit	Parameter range	Default value	Application mode
PA12	Position pulse command multiplying factor		1～32767	1	P
PA13	Position pulse command frequency division factor		1～32767	1	P

Set the parameter of PA12 and PA13, it'll be convenient to match various pulse sources and achieve the expected control resolution (i.e. mm/pulse)

The practical load speed=command pulse speed ×G× machinery reduction ratio

The practical minimum displace =minimum command pulse route ×G× machinery reduction ratio

If E-gear ratio G is not 1, the result of division may have remainder, and there will be position deviation, the maximum deviation is the motor's minimum rotating amount (the minimum resolution).

Below is the formula of position command E-gear ratio adapting to absolute-type encoder motor

$$S = \frac{I}{\delta} \cdot \frac{CR}{CD} \cdot \frac{PA12}{PA13} \cdot \frac{L}{C} \cdot \frac{ZD}{ZM}$$

$$\Rightarrow \quad G = \frac{PA12}{PA13} = \frac{C}{L} \cdot \frac{ZM}{ZD} \cdot \frac{\delta}{I} \cdot \frac{CD}{CR} \cdot S$$

G： E-gear ratio, recommended range:

C： Motor encoder wiring

L： Screw rod lead (mm)

ZM： Number of gear teeth of the screw rod end (if reduction gearbox exists)

ZD： Number of gear teeth of motor end

δ： The minimum output command unit of the system (mm/pulse)

I： Command displacement

S： Practical displacement

CR： Upper computer command multiplying factor

CD： Upper computer command frequency division factor

【e.g.】: Machine system: GSK988T, the motor directly connect with X-axis screw rod, the screw rod lead: 6mm, motor encoder: 17 bit absolute, leave out the system's command multiplying and

frequency division factors, what is the E-gear ratio of the servo unit.

Solution: As the motor directly connect with X-axis screw rod, then ZM ： ZD＝1; as a rule, S=1 and the command displacement equals to the practical displacement; also, if system GSK988T chooses0.1μ as its machine accuracy，in the diameter programming, the minimum output command unit of the X-axis, $\delta = \frac{0.0001}{2}$ mm ， substitute “δ” into the formula and get:

$$G = \frac{PA12}{PA13} = \frac{2^{17}}{6} \times 0.00005 = \frac{2048}{1875}$$

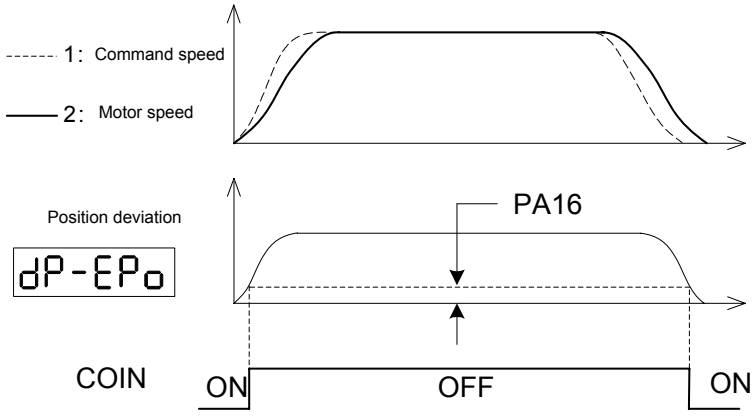
Then set PA12=2048, PA13=1875.

6.5.2 Position arrival signal （COIN）

COIN is the position arrival signal under the position mode.

If the position tracking error is less than or equals to the preset value of PA16, servo unit output position arrival signal, COIN signal output optocoupler conducts.

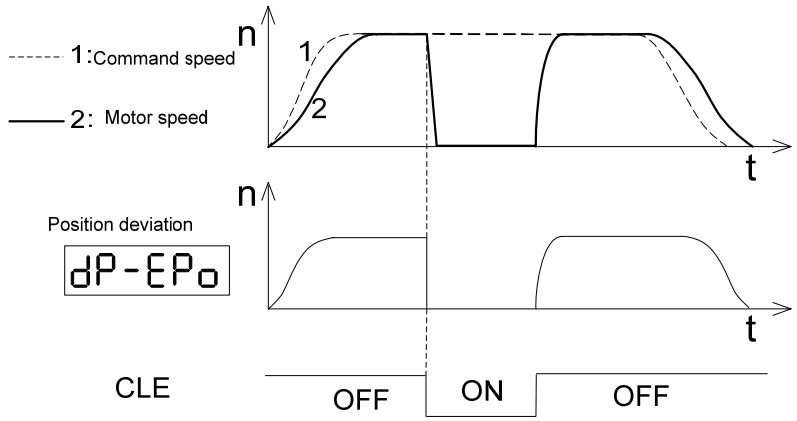
Relative parameter	Name	Unit	Parameter range	Default	Application mode
PA16	Position arrival range	Pulse	0～30000	20	P
	If the position tracking error（DP－EPO of the display menu）is less than or equals to the preset value of PA16, the servo unit regards the position has arrived, and the position arrival signal COIN outputs ON, otherwise outputs OFF.				



Relative parameter	Name	Unit	Parameter range	Default	Application mode
PA17	Position over-proof test range		0～30000	400	P
	Under the position mode, if the position tracking error exceeds the parameter of PA17, the servo unit position over-proof alarm issues Err-4.				

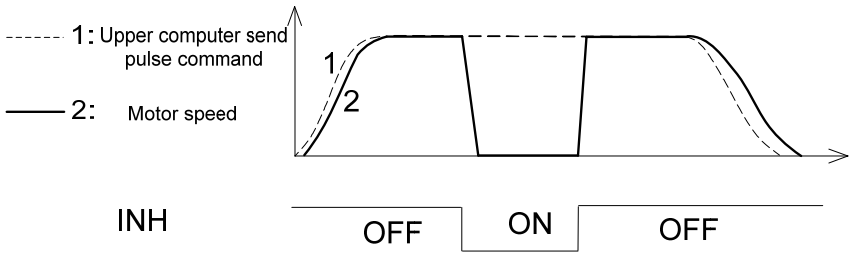
6.5.3 Pulse deviation zero clearing（CLE）

CLE is the signal of pulse deviation zero clearing, if it displays ON under position mode, the pulse remained in the position deviation counter of the servo unit will be cleared.



6.5.4 Pulse command inhibition （INH）

INH is the signal of pulse command inhibition, if it displays ON under position mode, servo unit inhibits receiving pulse command.

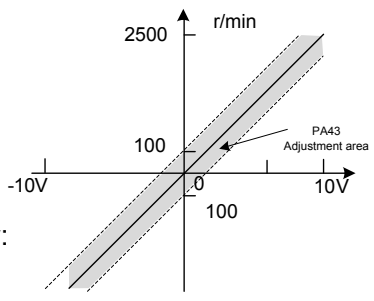


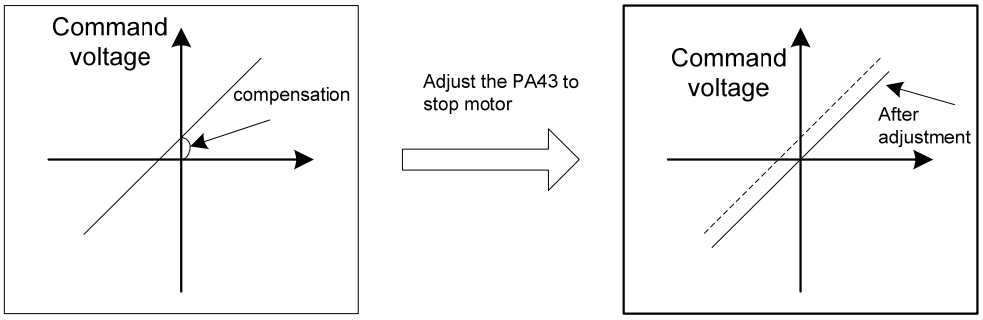
6.6 Function debugging under speed mode

6.6.1 Adjustment of analog command

The following parameters should be adjusted if the speed commands inconsistent with practical motor rotating speed.

Parameter	Name	Unit	Parameter range	Default
PA43	Analog command null shift compensation	-30000～30000	0	S
	If command voltage is “0V”, the motor sometimes can still rotates at a tiny speed, which is caused by the little (Mv unit) “excursion (=command excursion) from upper computer or external command voltage. PA43 may compensate this excursion in such way: If the motor excurse to CCW, decrease the value to PA43 till the motor get zero speed.			



	If the motor excurse to CW, increase the value to PA43 till the motor get zero speed 

The adjusting sequence of the analog value is recommended as follows:

1. First fix the value of PA29 which can be seen as the corresponded motor rotating speed when PA 29 sets 1V.

2. Adjust PA34 and revise the “excursion” to “0V” to stop the motor.

3. Finally set some speed commands, such as 500r/min, 1500r/min and 2500r/min, then judge if the motor speed slope consistent with the command according to the motor rotating speed displayed on LED.

6.6.2 Speed arrival signal（COIN）

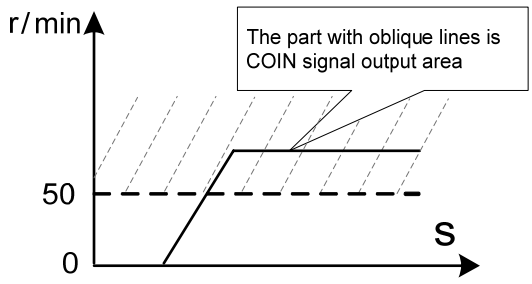
COIN is the speed arrival signal under the speed mode.

If the absolute value of practical speed equals to or greater than the setting, COIN signal outputs optocoupler conducts.

Relative parameter	Name	Unit	Parameter range	Default	Application mode
PA28	Speed arrival signal output threshold value	r/min	0～3000	50	S

e.g.: Set PA28=50, refers to the output speed arrival signal (COIN) when the practical speed greater than or equals to 50r/min.

As the diagram below: speed greater than 50r/min, output COIN signal.



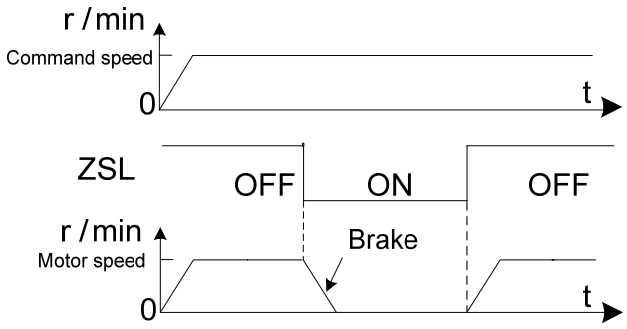
6.6.3 Zero speed clamping（ZSL）

When the upper computer controls servo unit by analog voltage command, the zero speed clamping function can be used if the analog voltage command is required not to be “0V”, the motor should be stopped and the servo being locked.

The “zero speed clamping” function can be achieved in this way:

ZSL zero speed clamping input point control.

Under speed mode, speed command is not 0 and ZSL displays ON to lock the motor.



CHAPTER 7 PARAMETERS

7.1 Parameter List

P: Position Control Mode S: Speed Control Mode

No.	Name	Range	Default Value	Unit	Applicable Mode
PA0	Password	0～9999	315		P, S
PA1	Motor model code	0～185	0		P, ,S
PA2	Software version (read only)		105		P, S
PA3	Monitoring setting at initialization	0～33	0		P, S
PA4	Working mode selection	0～6	0		P, S
PA5	Speed loop proportional gain	5～2000	200	Hz	P, S
PA6	Speed loop integral time coefficient	50～4000	100		P, S
PA7	Low-pass filter on current command	1～4000	1000	ms	P, S
PA8	Speed feedback filter coefficient	10～4000	1000		P, S
PA9	Position loop proportional gain	20～1000	40	1/s	P
PA10	Position loop feedforward gain	0～100	0	%	P
PA11	Position feedforward filter coefficient	10～3000	2000	Hz	P
PA12	Position pulse command multiplying ratio	1～32767	1		P
PA13	Position pulse command frequency division ratio	1～32767	1		P
PA14	Position command mode selection	0～2	0		P, S
PA15	Position command direction reversed	0～1	0		P
PA16	Position reach range	0～30000	20	Pulses	P
PA17	Position excess error detection range	0～30000	400		P
PA18	Position excess error detection validity selection	0～1	0		P
PA19	Analog speed command inverted	0～1	0		S
PA20	Drive unit input prohibition validity selection	0～1	1		P, S
PA21	JOG running speed	-3000～3000	120	r/min	S
PA22	Position feedback output inverted	0～1	0		P, S
PA23	Maximum speed limit	1～4000	2500	r/min	P, S
PA24	Internal speed 1	-3000～3000	500	r/min	S
PA25	Internal speed 2	-3000～3000	2000	r/min	S
PA26	Internal speed 3	-3000～3000	-1000	r/min	S

No.	Name	Range	Default Value	Unit	Applicable Mode
PA27	Internal speed 4	-3000～3000	-1500	r/min	S
PA28	Speed arrival signal output valve value	0～3000	50	r/min	S
PA29	Analog input gain	0～400	250		P, S
PA30	Position output pulse multiplying ratio	1～32	1		
PA31	Position output pulse frequency division ratio	1～32	1		
PA32	Position feedback signal frequency division ratio	16~32767	20000	Pulses	P, S
PA33	Reserved				
PA34	Internal CCW torque limit	0～300	300	%	P, S
PA35	Internal CW torque limit	-300～0	-300	%	P, S
PA36	External CCW torque limit	0～300	100	%	P, S
PA37	External CW torque limit	-300～0	-100	%	P, S
PA38	Manual operation, JOG running torque limit	0～300	100	%	S
PA39	Reserved				
PA40	Reserved				
PA41	Reserved				
PA42	Reserved				S
PA43	Analog command zero drift compensation	-30000～30000	0	0.1r/min	S
PA44	Reserved				
PA45	Reserved				S
PA46	Analog command mode selection	0～1	0		S
PA47	Alarm output inverted	0～1	0		P, S
PA48	Reserved				
PA49	Reserved				
PA50	Analog command filter coefficient	1～3000	1000		S
PA51	The maximum deceleration time before the safety brake enabled	0～30000	50	ms	P, S
PA52	Servo lock delay time	0～30000	50	ms	P, S
PA53	Motor speed when safety brake is enabled	5～3000	30	r/min	P, S
PA54	Inner enable	0～1	0		P, S
PA55	Reserved				
PA56	Reserved				
PA57	Motor overheat alarm shielded	0～2	0		P, S
PA58	GSKLINK servo axis number	1～5	1		P, S
PA59	GSKLINK communication baudrate selection	0～4	1		P, S

The default settings of shaded parameter are related to the motor models; therefore, the default values vary with motors.

7.2 Parameter Description

Para.	Name	Range	Default Value	Unit	Applicable Mode
PA0	Password	0～9999	315		P, S
	When PA=315, parameters other than PA1,PA2 are modifiable; To modify PA1, it is needed to set PA0 to 385.				
PA1	Motor model code	0～185	0		P, S
	Set the model code of the drive motor according to *Motor Model Code List* (see APPENDIX A for details), then the default values of the motor can be restored. Do not modify this default value in general condition.				
PA2	Software version (read only)	\	105		P, S
PA3	Monitoring setting at initialization	0～33	0		P, S

Value	Monitoring setting at initialization	Instruction	Value	Monitoring setting at initialization	Instruction
PA3=0	dP-SPd	Motor speed	PA3=17	dP-Cod	Reserved
PA3=1	dP-PoS	Current motor position low-order 5 digits (pulse)	PA3=18	dP-rn	Servo unit working status
PA3=2	dP-PoS.	Current motor position high-order 5 digits ×100000 (pulse)	PA3=19	dP-Err	Alarm display
PA3=3	dP-CPo	Position command low-order 5 digits (pulse)	PA3=20	dP-rES	Reserved
PA3=4	dP-CPo.	Position command high-order 5 digits ×100000 (pulse)	PA3=21	dP-AJH	High-speed segment voltage sampling value
PA3=5	dP-EPo	Position difference low-order 5 digits (pulse)	PA3=22	dP-AJL	Low-speed segment voltage sampling value

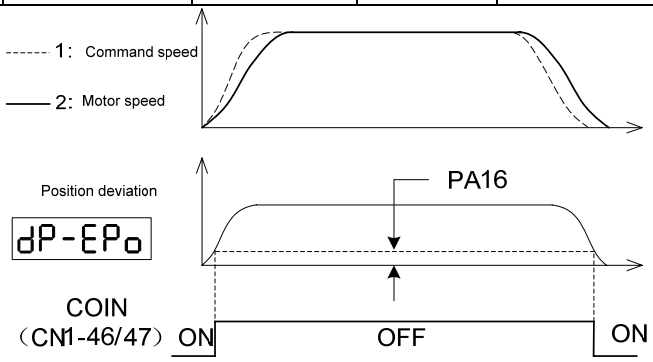
Para.	Value	Monitoring setting at initialization	Instruction	Value	Monitoring setting at initialization	Instruction
PA3	PA3=6	dP-EPo.	Position difference high-order 5 digits ×100000 (pulse)	PA3=23	dP-dSP	Software version No.
	PA3=7	dP-trq	Motor torque	PA3=24	dP-CPL	Hardware version No.
	PA3=8	dP-I	Motor current	PA3=25	dP-nt	Rated torque
	PA3=9	dP-LSP	Reserved	PA3=26	dP-nI	Rated current
	PA3=10	dP-Cnt	Current control mode	PA3=27	dP-Jn	Rotational inertia
	PA3=11	dP-Frq	Position command pulse frequency	PA3=28	dP-Por	Input power
	PA3=12	dP- CS	Speed command	PA3=29	dP-tEP	Radiator temperature
	PA3=13	dP- Ct	Torque command	PA3=30	dP-dC	DC bus voltage
	PA3=14	dP-APo	Motor one-rotation signal position	PA3=31	dP-Abs	Single-ring position
	PA3=15	dP-In	Input terminal status	PA3=32	dP-Hbs	Absolute position low order digits
	PA3=16	dP-oUt	Output terminal status	PA3=33	dP-Hbs.	Absolute position high order digits

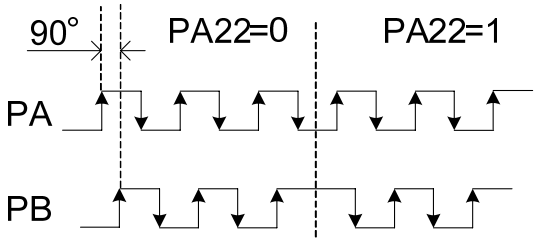
The shaded items in this table are just for the motor with absolute encoder.

Continued:

Relevant Parameter	Name	Range	Default Value	Unit	Applicable Mode
PA4	Working mode selection	0～6	0		P, S
	PA4=0: position mode (mode 1); Digital pulses determine the rotation direction and angle. The servo unit makes the rotor rotates in the determined direction and at specified angle. In position mode, the rotation angle (position) and speed are controllable. PA4=1: External analog voltage specifies speed (mode 2); The rotation direction and speed are determined by the analog voltage. The servo unit makes the rotor rotates in the determined direction and speed. This mode not only improves the motor response capability, but also enhances the capability of anti-disturbance. PA4=2: Internal digit specifies speed (mode 3); The values of PA24~PA27 set by user are used as speed command. The motor running speed is selected through the combination of input point SC1 and SC2' status. PA4=3: Manual mode (mode 4) It is operated in Sr— menu. Acceleration/deceleration can be performed through keys ▲ or ▼. PA4=4: JOG mode (mode 5); It is operated in Jr—menu. The motor works at the JOG speed set by parameter. CCW/ CW rotation can be selected through keys ▲ or ▼. PA4=5: Encoder zeroing. (It is adjusted already.) PA4=6: Analog zeroing (it is adjusted already.)				
PA5	Speed loop proportional gain	5～2000	200	Hz	P, S
	The bigger the speed loop proportional gain, the greater the servo rigidity is. However, excessive value may easily lead to vibration (abnormal sound in the motor) during motor start or stop. The smaller the value is, the slower response is.				
PA6	Speed loop integral time coefficient	50～4000	100		P, S
	The greater the speed loop integral time constant value is, the quicker the system responds. However, excessive value may lead to instability of the system, or even cause vibration. Smaller value results in slower response, so, set the value as great as possible on condition that no vibration is generated.				
PA7	Current command low pass filter	1～4000	1000	ms	P, S
	It is used to limit the current command belt, and avoid current rush and vibration. Set the value as great as possible on condition that on vibration is generated.				
PA8	Speed feedback filter coefficient	10～4000	1000		P, S
	The greater the speed feedback filter coefficient is, the quicker the speed feedback responds. However, excessive value may lead to electromagnetic noise. Smaller value results in slower response, larger speed fluctuation, or even vibration.				

Relevant Parameter	Name	Range	Default Value	Unit	Applicable Mode
PA9	Position loop proportional gain	20～1000	40	1/s	P
	The greater the position loop proportional gain is, the quicker the response is and the greater the rigidity is. However, excessive value may lead to vibration during the motor start or stop. Smaller value results in slower response and greater following error.				
PA10	Position loop feedforward gain	0～100	0	%	P
	Position loop feedforward gain is to adjust the speed loop according to the speed information of position command. The greater the value is, the quicker the response is, and the smaller the following error is. However, excessive setting value may lead to instantaneous overshoot and vibration. When PA10 is set to 0, the position feedforward function is invalid.				
PA11	Position loop feedforward filter coefficient	10～3000	2000	Hz	P
	Position loop feedforward filter coefficient is used in the smoothing process of position command feedforward control. The greater the value is, the quicker the step response is, which will suppress the overshoot and vibration caused by sudden speed change. It is valid when PA10 is not set to 0.				
PA12	Position pulse command multiplying ratio	1～32767	1		P
PA13	Position pulse command frequency division ratio	1～32767	1		P
	Refer to section 6.4.1 Electronic Gear Ratio for details.				
PA14	Position command mode selection	0～2	0		P, S
	Position command pulse input mode: PA14=0: pulse + direction PA14=1: CCW /CW pulse input PA14=2: AB phase orthogonal pulse input; Refer to section 3.3.3 Position Command Input for details.				
PA15	Position command direction reversed	0～1	0		P
	PA15=0: remains the original commanded direction; PA15=0: the input pulse direction is reversed.				
PA16	Position reach range	0～30000	20	Pulses	P

<table>
<tr><th>Relevant Parameter</th><th>Name</th><th>Range</th><th>Default Value</th><th>Unit</th><th>Applicable Mode</th></tr>
<tr><td></td><td colspan="5">When the position following error (displayed as DP-EPO in the menu) is less than or equal to the setting value of PA16, it means the position
 
</td></tr>
<tr><td rowspan="2">PA17</td><td>Position excess error detection range</td><td>0～30000</td><td>400</td><td></td><td>P</td></tr>
<tr><td colspan="5">In position mode, when the position following error exceeds the value set by parameter PA17, servo unit issues an alarm.</td></tr>
<tr><td rowspan="2">PA18</td><td>Position excess error detection validity selection</td><td>0～1</td><td>0</td><td></td><td>P</td></tr>
<tr><td colspan="5">PA18＝0: Detects the position excess error alarm;
PA18＝1: does not detect for the excess error alarm;</td></tr>
<tr><td rowspan="2">PA19</td><td>Analog speed command inverted</td><td>0～1</td><td>0</td><td></td><td>S</td></tr>
<tr><td colspan="5">On the condition that the external analog voltage is -10~10V (PA46=0),
PA19=0: when analog voltage is positive, motor CCW rotation is performed; when negative, motor CW rotation is performed.
PA19=1: when analog voltage is negative, motor CCW rotation is performed; when negative, motor CW rotation is performed.
On the condition that the external analog voltage is 0~10V (PA46=1):
PA 19=0: when SC1 is ON, motor CCW rotation is performed; when SC2 is ON, motor CW rotation is performed;
PA=1: when SC1 is ON, motor CW rotation is performed; when SC2 is ON, motor CCW is performed.</td></tr>
<tr><td rowspan="2">PA20</td><td>Drive unit input prohibition validity selection</td><td>0～1</td><td>1</td><td></td><td>P, S</td></tr>
<tr><td colspan="5">PA20=0: when FSTP is OFF, the motor forward rotation is prohibited; when RSTP is OFF, the motor reverse rotation is prohibited;
When FSTP, RSTP are OFF at the same time, Err-7 occurs.
PA20=1: drive unit prohibit function is invalid.</td></tr>
<tr><td rowspan="2">PA21</td><td>JOG running speed</td><td>-3000～3000</td><td>120</td><td>r/min</td><td>S</td></tr>
<tr><td colspan="5">Set the speed in JOG running (Jr) mode. The running mode is selected by PA4.</td></tr>
<tr><td rowspan="2">PA22</td><td>Position feedback output inverted</td><td>0～1</td><td>0</td><td></td><td>P, S</td></tr>
<tr><td colspan="5">Change the phase relationship between PA, PB in position feedback output signal, so as to meet the requirement of PC.</td></tr>
</table>

<table>
<tr><th>Relevant Parameter</th><th>Name</th><th>Range</th><th>Default Value</th><th>Unit</th><th>Applicable Mode</th></tr>
<tr><td></td><td colspan="5">PA22=0: maintain the original relationship in CN1 position feedback output signal;
PA22=1: invert the relationship between phases PA, PB in position feedback output signal. Shown is the following figure:
 
</td></tr>
<tr><td rowspan="2">PA23</td><td>Maximum speed limit</td><td>1～4000</td><td>2500</td><td>r/min</td><td>P, S</td></tr>
<tr><td colspan="5">Limit the maximum running speed of servo motor. In analog command speed control mode, when PA23≥PA29×10, the maximum speed is set by PA29; when PA29×10≥PA23, the maximum speed is set by PA23.
Note: PA29 specifies the rotation speed per analog command voltage (1V).</td></tr>
<tr><td rowspan="2">PA24～
PA27</td><td>Internal speed 1~4</td><td>-3000～3000</td><td></td><td>r/min</td><td>S</td></tr>
<tr><td colspan="5">In internal digital command speed mode, the parameters which set the speed are selected by combination of servo unit input points SC1, SC2.
<table>
<tr><th>SC2</th><th>SC1</th><th>Internal Speed</th><th>Default Value</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Internal speed 1 (PA24)</td><td>500</td></tr>
<tr><td>OFF</td><td>ON</td><td>Internal speed 2(PA25)</td><td>2000</td></tr>
<tr><td>ON</td><td>OFF</td><td>Internal speed 3(PA26)</td><td>-1000</td></tr>
<tr><td>ON</td><td>ON</td><td>Internal speed 4(PA27)</td><td>-1500</td></tr>
</table></td></tr>
<tr><td rowspan="2">PA28</td><td>Speed arrival signal output valve value</td><td>0～3000</td><td>50</td><td>r/min</td><td>S</td></tr>
<tr><td colspan="5">When the absolute value of actual speed is equal to or greater than the valve value, the speed arrival signal COIN is output.</td></tr>
<tr><td rowspan="2">PA29</td><td>Analog input gain</td><td>0～400</td><td>250</td><td></td><td>S</td></tr>
<tr><td colspan="5">This value is the motor speed per analog voltage; When the motor rated speed corresponding to 10V is 2500r/min, this value is set to 250.</td></tr>
<tr><td rowspan="2">PA30</td><td>Position output pulse multiplying ratio</td><td>1～32</td><td>1</td><td></td><td>S</td></tr>
<tr><td colspan="5">When the incremental encoder is used, it sets the pulses of position feedback signal (PA+, PA-, PB+, PB-) output from servo unit. When the closed-loop system is formed, the position feedback signal output from CN1 interface to PC is converted into electronic gear ratio, so as to adapt to devices with different gear ratio or to different leadscrew. Refer to section 6.4 for details.</td></tr>
<tr><td rowspan="2">PA31</td><td>Position output frequency division ratio</td><td>1～32</td><td>1</td><td></td><td>S</td></tr>
<tr><td colspan="5">Refer to PA30 for the usage of this parameter. The setting of gear ratio requires PA31≥PA30. If PA31<PA30, it is regarded as PA31=PA30.</td></tr>
</table>

Relevant Parameter	Name	Range	Default Value	Unit	Applicable Mode
PA32	Position feedback signal frequency division ratio	16～32767	20000		P,S
	When the absolute encoder is used, it sets the pulses feedbacked from the drive unit to PC per circle the motor rotates. Refer to section 6.4 for details.				
PA34	Internal CCW torque limit	0～300	300	%	P,S
	It sets the internal torque limit when the servo motor performs CCW rotation. The setting value is the percentage of the rated torque. In any working mode, both two torque limit are valid. When the setting value exceeds the system permitted overload capacity, the actual torque limit is the magnification of permitted maximum overload.				
PA35	Internal CW torque limit	-300～0	-300	%	P,S
	It sets the internal torque limit when the servo motor performs CW rotation. The setting value is the percentage of the rated torque. In any working mode, both two torque limit are valid. When the setting value exceeds the maximum overload capacity, the actual torque limit is the permitted maximum overload magnification.				
PA36	External CCW torque limit	0～300	100	%	P,S
	It sets the external torque limit when the servo motor performs CCW rotation. PA36 is valid only when the input point FIL is ON; When the setting value exceeds the maximum overload capacity, the actual torque limit is the permitted maximum overload capacity.				
PA37	External CW torque limit	-300～0	-100	%	P,S
	It sets the external torque limit when the servo motor performs CW rotation. PA37 is valid only when the input point RIL is ON; When the setting value exceeds the maximum overload capacity, the actual torque limit is the permitted maximum overload capacity.				
PA38	Torque limit in MANUAL, JOG mode	0～300	100	%	S
	It sets the torque limit when the servo is in MANUAL or JOG mode. When the setting value exceeds the maximum overload capacity, the actual torque limit is the permitted maximum overload capacity.				
PA43	Analog command zero drift compensation	-30000～30000	0	0.1r/min	S
	Sometimes, when the command voltage is 0V, the motor still rotates at slowest speed. This is due to the slight “drift” of the PC or external command voltage. If zero-drift phenomenon occurs on a motor, count in the reversed voltage value in PA43.				
PA46	Analog command mode selection	0～1	0		S
	PA46=0: When PA4=1 (external analog voltage speed control mode), and the input analog range is -10V~10V, positive voltage corresponds to motor CCW rotation, negative voltage corresponds to motor CW rotation.				

Relevant Parameter	Name	Range	Default Value	Unit	Applicable Mode
	PA46=1: When PA4=1 (external analog voltage speed control mode), and the input analog range is 0V~10V, the input points SC1, SC2 are for the CCW, CW rotation respectively.				
PA47	Alarm output inverted	0～1	0		S
	PA47=0: when servo unit is faulty, the alarm signal ALM output opto-coupler is disconnected. PA47=0: when the servo unit is faulty, the alarm signal ALM output opto-coupler is connected.				
PA50	Analog command filter coefficient	1～3000	1000	HZ	
	The smaller the analog command filter coefficient value is, the stronger the anti-disturbance capability is. However, when the value is too small, the response to the speed command will be slower; the greater the value is, the weaker the anti-disturbance capability is, and the quicker the response is.				
PA51	The maximum deceleration time before the safety brake enabled	0～30000	50	ms	P,S
	When it is needed to lock a running motor through safety brake, deceleration should be performed in advance. The deceleration time is set by PA51. If the motor speed exceeds the speed set by PA53 when the time ends, the motor axis is locked by force. Refer to section 6.2 for details.				
PA52	Servo lock delay time	0～30000	50	ms	P,S
	When the safety brake is needed to lock the motor, the SON signal should be turned OFF after the motor stops. In the process of status transition from servo lock to safety brake lock, the safety brake is enabled only after the delay time set by PA52 ends. The position of motor axis does not change. Refer to section 6.2.				
PA53	Motor speed when safety brake is enabled	5～3000	30	r/min	P,S
	The maximum rotation speed when the safety brake is enabled; Refer to section 6.2.				
PA54	Inner enable	0～1	0		P, S
	When there is no SON signal, the motor is enabled through the servo inner. PA54=0: when the external input signal SON is ON, the motor is enabled. PA54=1: the motor is enabled through the servo inner rather than signal SON.				
PA57	Motor overheat alarm shielded	0～2	0		P,S
	PA57=0: shield alarm PA57=1: comply with the alarm logic, namely, the motor temperature detection switch is normally-closed switch PA57=2: comply with the alarm logic, namely, the motor temperature detection switch is normally-open switch				
PA58	GSKLINK servo axis number	1～5	1		P,S

Relevant Parameter	Name	Range	Default Value	Unit	Applicable Mode
	The servo unit which sets up serial communication with CNC system is more than one. Set the servo axis number corresponding to CNC system. The number should not be repeated.				
PA59	GSKLINK communication baudrate selection	0～4	1		P,S
	Set the communication baudrate of servo drive unit and PC. Only when the baudrates are consistent, can the communication be performed. PA59=0: Shield GSKLink communication; PA59=1: baudrate is set to 500k; PA59=2: baudrate is set to 600k; PA59=3: baudrate is set to 800k; PA59=4: baudrate is set to 1M.				

CHAPTER 8 ABNORMALITIES AND REMEDIES

cautions

1. When the servo drive unit or motor is needed to bE dismantled for inspection or maintenance, please contact our technical personnel or operate under guidance of professionals.
2. Once an abnormality occurs in servo drive unit, cut off the power for more than 5min before inspection or maintenance to avoid residual voltage.

8.1 Abnormalities Caused by Misuse

8.1.1 Speed Mode

Abnormality	Possible Reason	Inspection and Remedy
In analog command speed mode, the motor does not work when a speed command is specified.	1. Wrong working mode is selected.	Check the setting of PA4.
	2. No enable signal is input.	Check whether the SON connection is correct. Check dP- In to see whether the enable signal is connected, or set PA54 to 1, to enable the motor by force.
	3. No 24V for the I/O connection line.	Check whether the GND and COM+ ends are 24V with a universal meter.
Large vibration occurs when the motor is running. (no load connected)	1. Improper speed loop gain setting	Restore the motor default parameter or manually set the PA5, PA6, PA7, PA8.
	2. Incorrect shielding line connection	Connect the line connection according to the connection diagram in speed mode described in section 3.6.
Alarm Err-5 occurs after power-on	There is no temperature sensor in the servo motor, or the PA57 sets the sensor type incorrectly.	A. When there is no temperature sensor, set PA57=0; B. When there is temperature sensor, set the PA57 according to section 7.2.
Alarm Err-7 occurs after power-on	FSTP, RSTP drive unit input prohibition terminals are OFF.	A. Check whether the FSTP, RSTP is connected to COM-. B. When the prohibition function is not used, set PA20 to 1 to shield this alarm.
Motor high-speed running disabled	Parameter PA23 or PA29 is set incorrectly.	Refer to section 7.2 and set the parameter according to the motor nameplate.
Motor cannot stop	Parameters PA51, PA52, PA53 are set incorrectly.	Refer to section 7.2 and increase the setting value of PA51, PA52, reduce that of the PA53.

8.1.2 Position Mode

Abnormality	Possible Reason	Inspection and Remedy
In position mode, when a pulse command is specified, the motor does not work.	1. Wrong working mode or command mode is selected.	Check the setting of PA4, PA14.
	2. No enable signal is input.	Check whether the SON connection is correct. Check dP- In to see whether the enable signal is connected, or set PA54 to 1 to enable the motor by force.
	3. No 24V for the I/O connection line.	Check whether the GND and COM+ ends are 24V with a universal meter.
Large vibration occurs when the motor is running.	Speed loop proportional gain, integral time constant value are set incorrectly; (PA5, PA6) Position loop proportional gain is set incorrectly. (PA9).	Restore the default motor parameter or manually set the parameters PA5, PA6, PA9.
Inaccurate position control	1. Electronic gear ratio is set incorrectly.	Correct the electronic gear ratio.
	2. External interference causes the received pulses inaccurate.	When the command pulses are less than pulses displayed on dP-CPo, it means there is external interference. A. Use difference circuit as far as possible; B. Connect the shielding line correctly. C. Keep far away from the interference source.
	3. When the pulse command is input (the drive unit is connected to single end), the current-limit resistance is not connected in series.	Refer to the position command wiring diagram.
	4. Machine connection fault	When the command pulses equal to the pulses displayed on dP-CPo (the pulses after electronic gear ratio calculation), it means the system controlled side is normal. Check whether the machine connection is loose or faulty.
The motor swings greatly during start or stop.	The load inertia is great. The acceleration/deceleration time corresponding to PC commands are too small.	Increase the acceleration/deceleration time for smooth start or stop, or reduce the position loop proportional gain.

8.2 Alarms and Remedies

The servo drive unit is provided with multiple protection functions. When a fault is detected after power-on, the servo will stop the motor, and Err-□□ will be displayed on the operation panel. The alarm code can also be viewed under menu dP-Err. This section also offers remedies for troubleshooting.

No.	Meaning	Main Reason	Remedy
Err-1	AC current motor speed exceeds the value set by PA23 (refer to the speed upper limit set by parameter PA23)	1, encoder feedback signal abnormal	Check the motor encoder and its signal connection status.
		2. The specified command exceeds the limit set by PA23.	Check the electronic gear ratio and PA23 setting.
Err-2	Main circuit DC bus voltage excessive	1. Braking resistor is disconnected or damaged.	Check braking resistor and its connection.
		2, Braking resistor is unmatched (resistance value is excessive) Note: Smaller resistance means greater current, which will easily cause damage to the braking pipe of the braking circuit.	A, Change to a new braking resistor whose resistance is matched with the power. B, Reduce the ON/OFF frequency according to actual usage.
		3, Power supply voltage instable;	Check the power supply.
		4. Internal braking circuit damaged.	Change the drive unit.
Err-3	Main circuit DC bus voltage too low	1. If it occurs when the motor is running, the line of input power is cut off or the connection is improper.	Check the input power line
		2. If it occurs when the motor is running, it means the input power voltage is lower than AC130V.	Check the power voltage
		3. If it occurs when the power is turned ON, it means the braking transistor of drive unit is damaged.	Change the drive unit
Err-4	The value in position difference counter exceeds the setting value (refer to the	1. The pulse command frequency is too high or the electronic gear ratio is too large.	Check the command frequency of principal PC; check the electronic gear ratio set by PA12/PA13.

No.	Meaning	Main Reason	Remedy
	range set by parameter PA17); (When PA18=0, detects the position difference alarm, when PA18=1, does not detects the position difference alarm)	2. The load inertial is excessive or the drive unit torque is insufficient.	A, Check the setting of motor torque limit. B, Improve the drive unit and motor power. C, Lighten the load.
		3. Motor encoder fault or encoder zeroing error.	A, Check the motor encoder and its connection. B, re-zeroing the encoder.
		4. In position mode, the motor U, V, W phase sequence is wrong.	Correct the connection.
		5. position loop or speed loop gain setting is too small (refer to parameter PA5, PA6, PA9)	Adjust the speed loop or position loop gain.
		6. The valid range of position difference is set too small.	Set the PA17 correctly.
Err-5	Motor overheat alarm; the drive unit detects the overheat alarm signal output by the motor. (when PA57=0, the motor overheat alarm is not detected)	1. No temperature detection device in the motor.	Set PA57=0, shield the motor overheat alarm.
		2. The temperature detection device type is different with the one set by parameter PA57.	Set the temperature detection device type correctly by PA57.
		3. Overload leads to severe heat of the motor.	Increase the power of drive unit or reduce the load.
		4. In case of severe load, the start/stop frequency is too high.	Reduce the start/stop frequency, and improve the heat radiation condition.
		5. The temperature detection device in the motor is damaged, or the motor inner fault occurs.	Change the AC servo motor.
		6. If the motor temperature detection signal is normal, the drive unit is faulty.	Change the drive unit.
Err-6	Speed amplifier saturation fault	1. Insufficient motor rigidness due to small torque limitation.	Increase the toque limitation value so as to increase the rigidness.
		2. In speed mode, U, V, W phase sequence is reversed.	Connect the U, V, W correctly.
Err-7	Drive prohibition abnormal	The drive prohibition input terminal terminals FSTP, RSTP are cut OFF.	A. Check the connection and the 24V power of input point.
Err-9	Motor encoder signal feedback abnormal	1. Then motor encoder signal is poor connectedly or the connection is wrong.	Check the connection and signal line welding status.

No.	Meaning	Main Reason	Remedy
		2. Motor encoder signal feedback cable is too long, which reduces the signal voltage.	Shorten the cable length within 30m.
		3. Motor encoder is damaged.	Change the motor or encoder.
		4. Drive unit fault.	Change the drive unit.
Err-11	Drive unit inner IPM module fault	1. It occurs when the power is ON, and the drive unit is not enabled. It cannot be removed after power-on. A, drive unit fault B, Short circuit occurs when braking resistor terminal is grounding	Remedy for reason A is to change to a new drive unit. Remedy for reason B is to check the correct the braking resistor connection.
		2. It occurs when the power is ON, and the drive unit is not enabled. It is removed after power-on again.	It may be caused by external interference or poor grounding. Check the grounding status and interference source.
		3. It occurs when the power is turned ON, and the drive unit is enabled. It cannot be removed after power-on. A. short circuit occurs among motor power line U, V, W, or between U, V, W and PE. B. Drive unit IPM module is damaged. C. Current sampling circuit of drive unit is cut off.	The remedy for reason A is to change the motor line or the motor. The remedy for reasons B, C is to change the drive unit.
		4. It occurs when the motor is starting or stopping and it can be removed after power-on. A, The default parameter of the motor set by drive unit is wrong. B. Then load inertial is too large, the commanded accelerated speed is too large when starting or stopping.	The remedy for reason A is to recover the motor default parameter. The remedy for reason B is to increase the acceleration/deceleration time, lower down the accelerated speed or load inertial.
Err-12	Overcurrent alarm	1. The motor is running with excessive torque for a long time.	Reduce the load or change a higher power motor.
		2. Poor grounding status	Make sure the grounding resistance is less than 10Ω.
		3. The insulation is faulty.	Change a new motor.

No.	Meaning	Main Reason	Remedy
Err-14	Braking circuit fault	1. The braking circuit is low in capacity.	A. Reduce the load. B. Change to a new drive device of higher power. C, Lower down the braking frequency.
		2. Then inner braking circuit is damaged.	Change to a new drive unit.
		3. Braking resistor is cut off.	Re-connect the braking resistor line.
Err-16	Motor thermal overheat	1. The rated current parameter is set incorrectly.	Set the parameter according to the motor nameplate.
		2. The motor is running with excess current for a long time.	A. Reduce the load. B. Change to a drive device and motor of higher power. C Check whether the mechanical part is abnormal.
Err-20	When the power is ON, EEPROM alarm occurs in the inner driver unit.	1. When the power is ON, the drive unit fails to read the data in EEPROM.	Recover the motor default parameter.
		2, EEPROM chips or circuit board fault;	Change the servo drive unit.
Err-21	Power open-phase alarm	Power open phase occurs.	Check the input power.
Err-23	Current sampling error	1. The current sensor's working voltage is abnormal or the device is damaged.	Change the drive unit.
		2. Current sampling circuit resistor is damaged.	
Err-25	Power failure alarm	1. The main power is cut OFF after it is ON.	Check the power supply line.
		2. The rectification part of the drive unit is damaged.	Change the drive unit.
Err-32	Illegal code of encoder signals U,V,W	1. Then interface is poorly contacted or the cable is poorly shielded.	Check the encoder interface and shielding line.
		2. Encoder U,V,W signals are damaged.	Chang a new encoder.
		3. Encoder interface circuit fault.	Change to a new drive unit.
Err-33	Power charging fault	The charging circuit is damaged.	Change the drive unit.
Err-34	Pulse electronic gear ratio	The parameter setting of pulse electronic gear ratio is irrational.	Set the PA12/PA13 correctly.
Err-35	Alarm for the absence of external brake pipe	The external brake pipe is loose, or the external brake pipe is faulty.	Re-connect the brake pipe, or change the brake pipe.

No.	Meaning	Main Reason	Remedy
Err-36	Three-phase main power OFF	1. The three-phase power is OFF or voltage dip.	Check the main power and ensure the three-phase AC220V input.
		2. The power detection circuit is faulty.	Change the drive unit.
Err-37	Alarm occurs when the temperature of radiator is below -30℃.	The environmental temperature is too low.	Improve the environmental temperature.
Err-38	Alarm occurs when the temperature is higher than 75℃.	1. The motor overload running for a long time.	Reduce the load.
		2. The environmental temperature is too high.	Improve the ventilation condition.
		3. The drive unit is damaged.	Change the drive unit.
Err-39	Data read error in sensor mode of absolute encoder	1. PA1 parameter setting error;	Set the value of PA1 according to the matched encoder type of the motor, then, adjust to the default value.
		2. Encoder feedback signal CN2 is disconnected or poorly connected.	Check the CN2 line connection status.
		3. The absolute encoder is damaged.	Change the motor.
Err-41	Encoder type configuration error	The encoder type set by the drive unit is inconsistent with the actual type.	Change the encoder or change the encoder type of drive unit.
Err-42	EEPROM error read in absolute encoder	1. PA1 parameter setting error.	Set the value of PA1 according to the matched encoder type of the motor, then, adjust to the default value.
		2. When the power is ON, the drive unit reads encoder EEPROM error.	Check the CN2 line connection status.
		3. Motor encoder EEPROM is damaged.	Change the motor.
Err-43	Check error when EEPROM is read	1. PA1 parameter setting error;	Set the value of PA1 according to the matched encoder type of the motor, then, adjust to the default value.
		2. After the drive unit reads the encoder EEPROM, data check error occurs.	Execute the Ab-Set encoder write operation.
Err-44	Encoder single-ring/multi-ring configuration error	PA1 parameter setting error;	Set the value of PA1 according to the matched encoder type of the motor, then, adjust to the default value.

No.	Meaning	Main Reason	Remedy
Err-45	Encoder data check error	In sensor mode, data check error occurs when the encoder current position is read.	Check the grounding status.

8.3 Inspection and Maintenance

NOTE!

Do NOT use resistance meter or the like to make insulation inspection to the servo unit, otherwise, the servo unit may be damaged!

Do NOT dismantle or repair the servo unit by yourself!

Make sure that the average load rate of drive device is below 80%.

Category	Item	Period	Daily Maintenance
Electric cabinet environment	Abnormal odor	Every day	Properly eliminate the odor in time. If it is caused by aging equipment, make a replacement.
	Dust, vapor and oil	Once every month at least	Remove it with dry clean cloth or filtered high-pressure air gun.
	Power cable, connection terminals	Once every half-year at least	When the external insulation layer and insulation joints are damaged or aging, make a replacement soon; tighten the loose connection terminals with screw driver.
Servo unit	Radiation fan	Once every week at least	Check whether the wind speed and ventilation amount is normal, and whether the abnormal heating exists. Change the fan if any.
	Dirt retention on cooling plate	Once every month at least	Remove it with dry clean cloth or filtered high-pressure air gun.
	Loose screw	Once every half-year at least	Tighten the terminal strip, connector, and installation screw with screw driver.
Servo motor	Noise, vibration	Every day	When the noise or vibration is obviously greater than usual, check the machine connection and repair it.
	Dust, vapor and oil	Once every month at least	Remove it with dry clean cloth or filtered high-pressure air gun.
	Measure the insulation resistance	Once every half-year	Measure it with a 500V resistance meter. When the resistance is below 10 MΩ, please contact our technical personnel.
	Motor and load connection	Once every half-year	Check the device wear status, connection and sundries with proper tools.

APPENDIX A MODEL CODE PARAMETERS AND FEED SERVO MOTOR TABLE

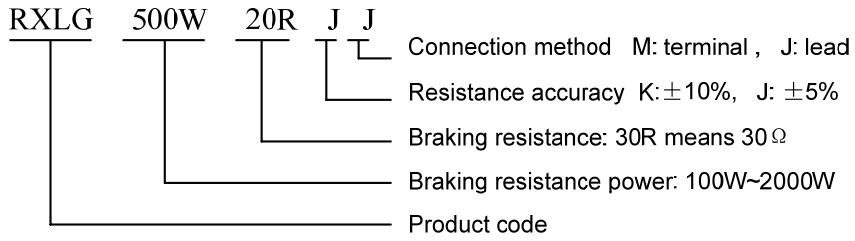
Model Code (set by PA01)	Servo Motor Model	Model Code (set by PA01)	Servo Motor Model
3	130SJT-M075D(A)	49	130ST-M10015H
4	130SJT-M100D(A)	50	130ST-M10025H
5	110SJT-M040D(A)	51	130ST-M15015H
6	110SJT-M060D(A)	60	150ST-M27020H
7	130SJT-M050D(A)	65	80SJT-M024C
8	130SJT-M100B(A)	66	80SJT-M024E
9	130SJT-M150B(A)	67	80SJT-M032C
10	110SJT-M020E	68	80SJT-M032E
11	110SJT-M040D	76	110SJT-M040E(A2)
12	110SJT-M060D	77	110SJT-M060E(A2)
13	130SJT-M040D	81	130SJT-M150D(A)
14	130SJT-M050D	82	130SJT-M040D(A)
15	130SJT-M060D	83	130SJT-M060D(A)
16	130SJT-M075D	85	130SJT-M040D(A2)
17	130SJT-M100D	86	130SJT-M050D(A2)
18	130SJT-M100B	87	130SJT-M060D(A2)
19	130SJT-M150B	88	130SJT-M075D(A2)
20	130SJT-M150D	89	130SJT-M100D(A2)
21	130SJT-MZ150B	90	130SJT-M100B(A2)
22	175SJT-M180B	91	130SJT-M150B(A2)
23	175SJT-M180D	92	130SJT-M150D(A2)
24	175SJT-M220B	93	175SJT-M180B(A2)
25	175SJT-M220D	94	175SJT-M180D(A2)
26	175SJT-M300B	95	175SJT-M220B(A2)
27	175SJT-M300D	96	175SJT-M220D(A2)
34	110ST-M02030H	97	175SJT-M300B(A2)
35	110ST-M04030H	98	175SJT-M300D(A2)
36	110ST-M05030H		
39	130ST-M04025H		
45	130ST-M05025H		
46	130ST-M06025H		
47	130ST-M07720H		

Model Code (set by PA01)	Servo Motor Model	Model Code (set by PA01)	Servo Motor Model
The model codes listed below are corresponding to **absolute encoder.**			
104	80SJT-M024C(A4I)	148	130SJT-M100B(A4I)
105	80SJT-M024C(A4SI)	149	130SJT-M100B(A4SI)
106	80SJT-M024E(A4I)	150	130SJT-M100D(A4I)
107	80SJT-M024E(A4SI)	151	130SJT-M100D(A4SI)
108	80SJT-M032C(A4I)	152	130SJT-M150B(A4I)
109	80SJT-M032C(A4SI)	153	130SJT-M150B(A4SI)
110	80SJT-M032E(A4I)	154	130SJT-M150D(A4I)
111	80SJT-M032E(A4SI)	155	130SJT-M150D(A4SI)
122	110SJT-M040D(A4I)	168	175SJT-M150D(A4I)
123	110SJT-M040D(A4SI)	169	175SJT-M150D(A4SI)
124	110SJT-M040E(A4I)	170	175SJT-M180B(A4I)
125	110SJT-M040E(A4SI)	171	175SJT-M180B(A4SI)
126	110SJT-M060D(A4I)	172	175SJT-M180D(A4I)
127	110SJT-M060D(A4SI)	173	175SJT-M180D(A4SI)
128	110SJT-M060E(A4I)	174	175SJT-M220B(A4I)
129	110SJT-M060E(A4SI)	175	175SJT-M220B(A4SI)
		176	175SJT-M220D(A4I)
140	130SJT-M040D(A4I)	177	175SJT-M220D(A4SI)
141	130SJT-M040D(A4SI)	178	175SJT-M300B(A4I)
142	130SJT-M050D(A4I)	179	175SJT-M300B(A4SI)
143	130SJT-M050D(A4SI)	180	175SJT-M300D(A4I)
144	130SJT-M060D(A4I)	181	175SJT-M300D(A4SI)
145	130SJT-M060D(A4SI)	182	175SJT-M380B(A4I)
146	130SJT-M075D(A4I)	183	175SJT-M380B(A4SI)
147	130SJT-M075D(A4SI)		

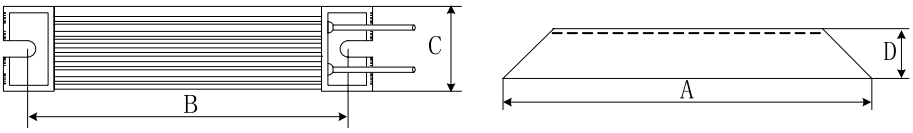
APPENDIX B PERIPHERAL EQUIPMENTS

B. 1 External Braking Resistor (Optional)

①. Braking resistor model instruction:

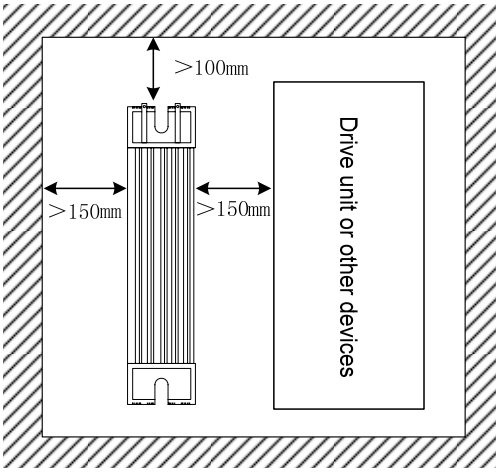


②. Braking resistor dimension:



Servo Unit	Specification (W/Ω)	Dimension (mm)				Wiring (mm2)	Lead Length (m)	Terminal
		A	B	C	D			
DAT2030C	300/30	215	205	60	30	2.5	1	M5
DAT2050C	500/22	335	325	60	30	2.5	1	M5
DAT2075C	1000/15	420	410	61	59	2.5	1	M5
DAT2100C	1500/10	485	473	50	107	2.5	1	M5

③. Braking resistor installation space



Dangerous

1. When the servo is turned ON or is running, high voltage and temperature exists on the surface of braking resistor, Do NOT touch it!
2. Please install a protection cover!
3. Inspection and maintenance can be done only after the servo unit is cut OFF for 10mim, and the braking resistor surface temperature decreases to the room temperature.
4. The temperature of braking resistor with aluminum case drops relatively slowly.

B. 2 Circuit Breaker and Contactor (Necessary)

Circuit breaker and contactor should be installed between input power and AC servo unit. They are not just the power switch of servo unit but also a protection method of the power.

- Circuit breaker is a protection switch which can cut off the faulty circuit automatically. It can protect the circuit in case of overload, short circuit or undervoltage. To fully exert the servo unit overload capability, it is advised to choose the power distribution protection circuit breaker.
- AC contactor is to control the ON/OFF of the drive unit through electric protection circuit. It can cut off the power once a system fault is detected, so as to prevent the fault from expanding.

The following technical data table is for your consideration.

Servo Unit	DAT2030C	DAT2050C	DAT2075C	DAT2100C
Motor current (A)	＜6	6～10.5	11～21	22～28
Rated current of circuit breaker (AC380V)	6	9	20	25
Rated current of contactor (AC220V)	9	15	30	42

Attentions

The rated current of circuit breaker complies with the AC380V voltage classification. When three-phase AC220V current already exists, and AC isolation transformer is not needed, the circuit breaker should be selected according to AC220V voltage classification. The rated current data should be consistent with the class of rated current of contactor.

B.3 Three-Phase AC Filter (Recommended)

Three-phase AC filter is a passive low-pass filter. The frequency range is 10kHz～30MHz. It is used to suppress the high-frequency noise from the power end of servo unit. When other equipments are interfered by this noise, the three-phase AC filter is recommended.

The following technical data table is for your consideration.

Motor Power (kw)	0.5～1.2	1.5～2.3	2.3～3.9	4～6
Rated Current (A)	9	15	30	42
Rated Current (V)	220			
Leakage Current (mA)	≤0.5	≤0.5	≤0.5	≤0.5

Cautions for filter installation:

- Make sure the metal shell of the filter and electric cabinet is well connected and grounded.
- There should be a certain distance between filter input and output lines (parallel connection is forbidden) in case that the effectiveness of the filter is reduced.
- The filter should be installed at the entrance of power line to the device, and the filter input line in the cabinet should be as short as possible, so as to lower down the radiation interference.

B.4 Isolation Transformer (Necessary)

It is used to reduce interference of power and electromagnetic field. The type should be selected according to the rated capacity, load rate and duty cycle.

①. When servo motor power ≥1kW, three-phase isolation transformer should be adopted;
When single axis is used, it is advised to select the capacity of isolation transformer ≥ servo motor power × 80％(70%~100% are available).

②. When more than two axes are used, it is advised to select the capacity of isolation transformer ≥ servo motor power × 70％ (60%~80% are available).

Table B-1 Specification of isolation transformer

Model	**Capacity (kVA)**	**Phase**	**Input voltage (V)**	**Output voltage (V)**
BS-120	1.2	Three-phase	380	220
BS-200	2.0			
BS-300	3.0			
BS-400	4.0			
BD-80	0.8	Single-phase		
BD-120	1.2			

The following drawings show the dimensions of isolation transformer. (unit: mm)

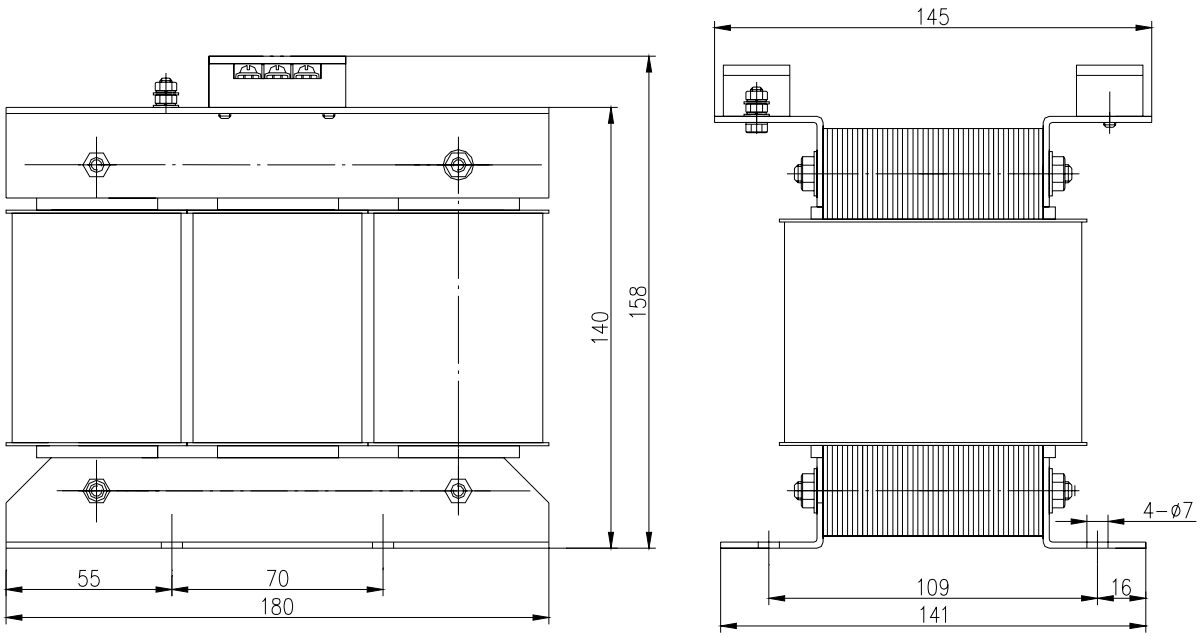


Fig. B-1 Outline dimension of BS-120

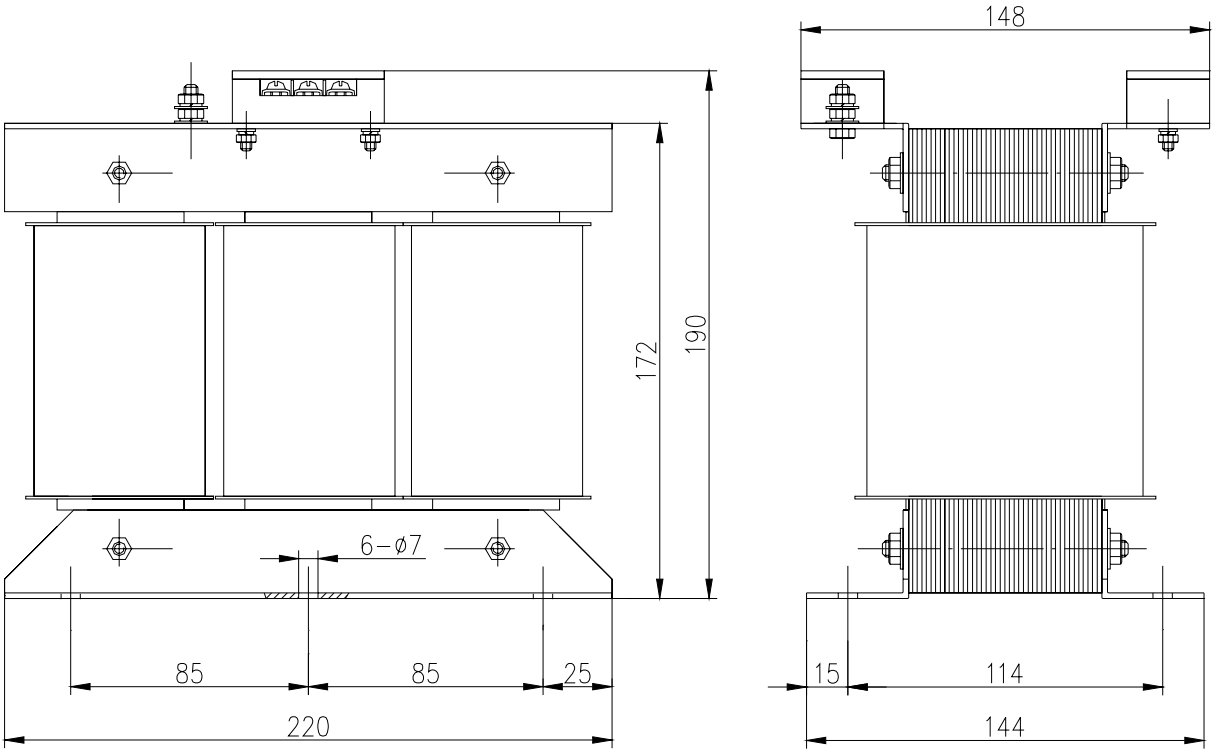


Fig. B-2 Outline dimension of BS-200

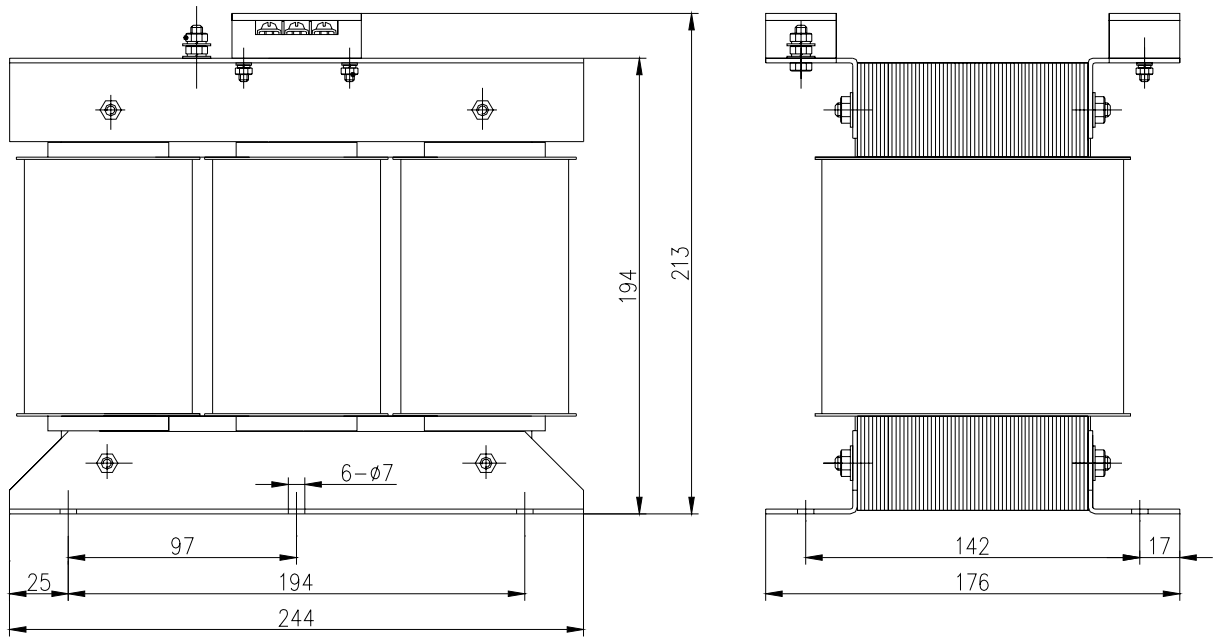


Fig. B-3 Outline dimension of BS-300

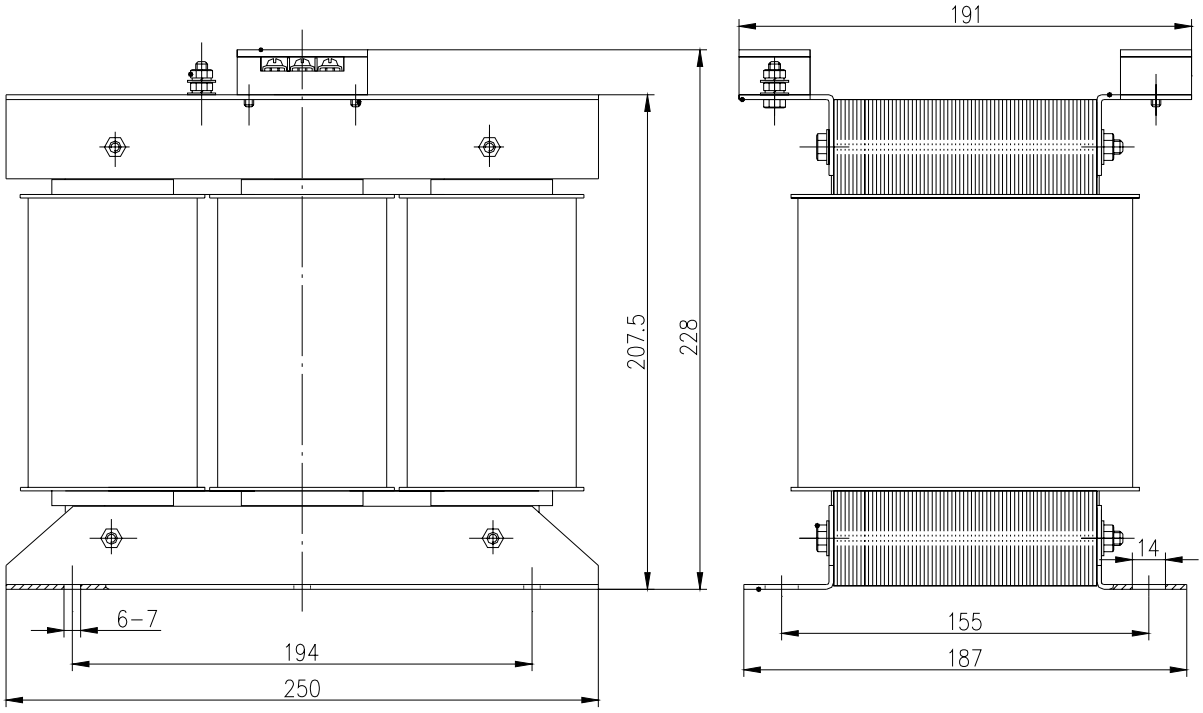


Fig. B-4 Outline dimension of BS-400

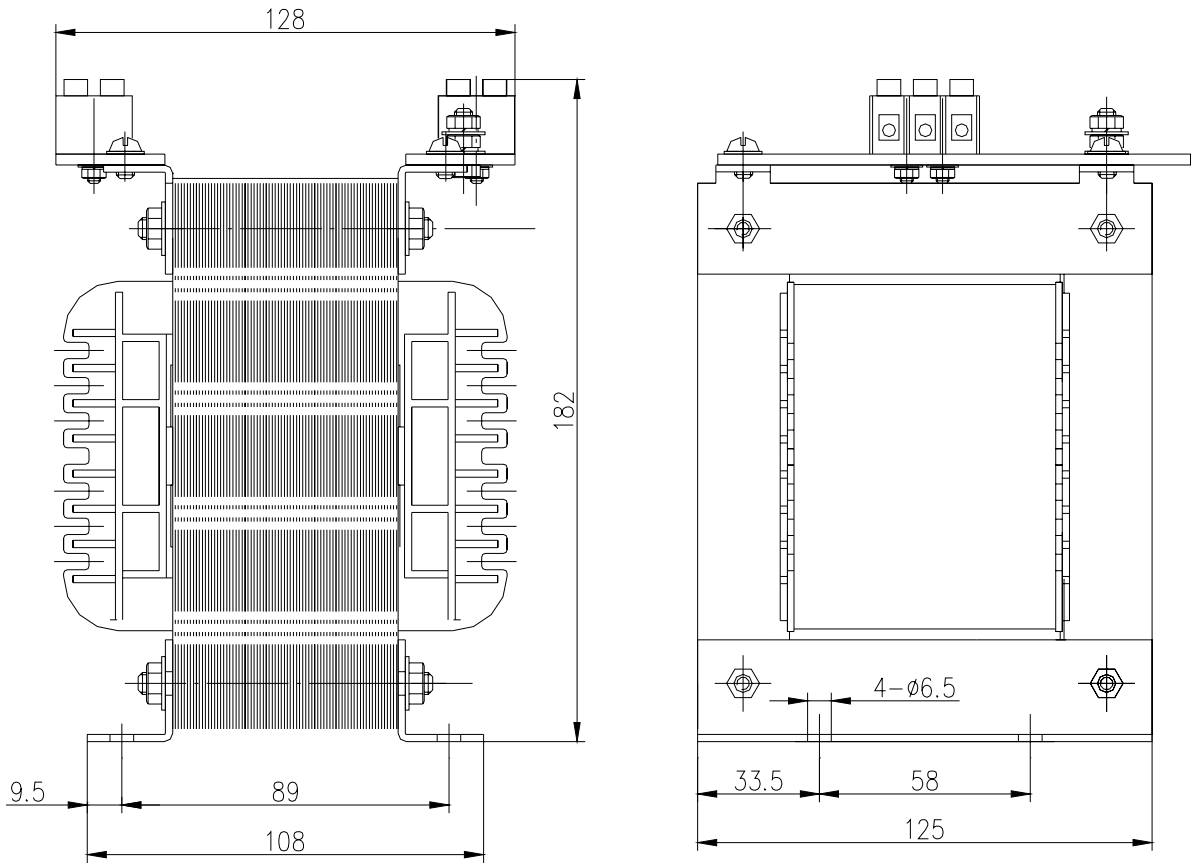


Fig. B-5 Outline dimension of BD-80

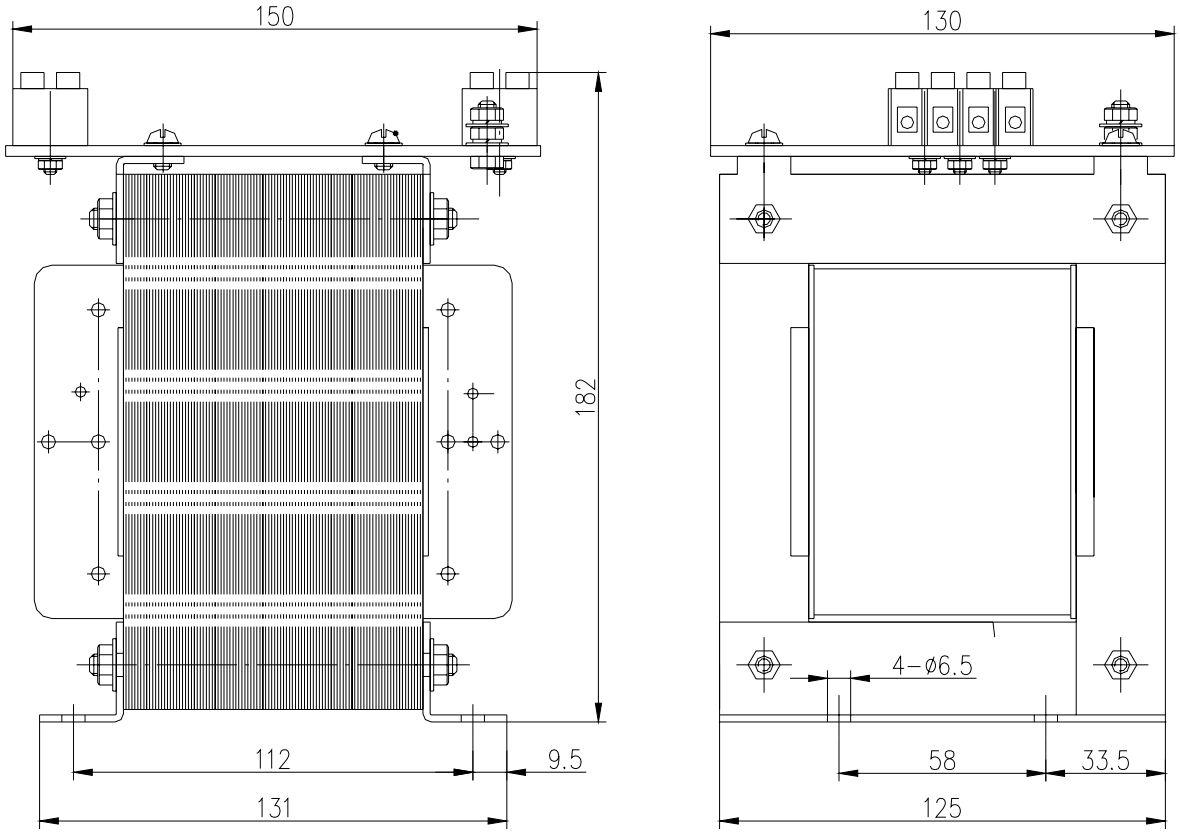


Fig. B-6 Outline dimension of BD-120

APPENDIX C VERSION UPGRADE INSTRUCTION

The parameters described in this manual can be applied for DAT2000 Series V1.05 Version and DAT 2000C Series V1.01 Version (version can be viewed through PA2). The DAT2000 Series V1.05 is issued for the first time; DAT2000C Series V1.05 is adjusted version based on DAT2000C V1.03.

- Parameters upgrade instruction:

No.	Parameter Meaning (V1.03)	Parameter Meaning (V1.05)
PA2	Software version (default value is 103)	Software version (default value is 105)
PA6	Speed loop integral time constant	Speed loop integral time coefficient
PA19	Reserved	Analog speed command inverted
PA22	Encoder zero point signal (CZ) output position	Pulse feedback output inverted
PA29	Zero speed output valve value	Analog input gain
PA30	Reserved	Position output pulse multiplying ratio
PA31	Reserved	Position output pulse frequency division coefficient
PA32	Reserved	Drive unit feedback pulses
PA42	Analog command mode selection	Reserved
PA45	Analog speed command inverted	Reserved
PA46	Analog command filter coefficient	Analog command mode selection
PA47	Analog input gain	Alarm output inverted
PA49	Inner enable	Reserved
PA50	Reserved	Analog command filter coefficient
PA51	Alarm output inverted	The maximum deceleration time before the safety brake enabled
PA52	Reserved	Servo lock delay time
PA54	Servo lock delay time	Inner enable
PA55	The maximum deceleration time before the safety brake enabled	Reserved

- Motor model upgrade instruction:

Servo Motor Model	V1.03 Motor Model Code	V1.05 Motor Model Code
80SJT-M024C(A4I)	4	104
80SJT-M024C(A4SI)	5	105
80SJT-M024E(A4I)	6	106
80SJT-M024E(A4SI)	7	107
80SJT-M032C(A4I)	8	108
80SJT-M032C(A4SI)	9	109
80SJT-M032E(A4I)	10	110
80SJT-M032E(A4SI)	11	111

Servo Motor Model	V1.03 Motor Model Code	V1.05 Motor Model Code
110SJT-M040D(A4I)	22	122
110SJT-M040D(A4SI)	23	123
110SJT-M040E(A4I)	24	124
110SJT-M040E(A4SI)	25	125
110SJT-M060D(A4I)	26	126
110SJT-M060D(A4SI)	27	127
110SJT-M060E(A4I)	28	128
110SJT-M060E(A4SI)	29	129
130SJT-M040D(A4I)	40	140
130SJT-M040D(A4SI)	41	141
130SJT-M050D(A4I)	42	142
130SJT-M050D(A4SI)	43	143
130SJT-M060D(A4I)	44	144
130SJT-M060D(A4SI)	45	145
130SJT-M075D(A4I)	46	146
130SJT-M075D(A4SI)	47	147
130SJT-M100B(A4I)	48	148
130SJT-M100B(A4SI)	49	149
130SJT-M100D(A4I)	50	150
130SJT-M100D(A4SI)	51	151
130SJT-M150B(A4I)	52	152
130SJT-M150B(A4SI)	53	153
130SJT-M150D(A4I)	54	154
130SJT-M150D(A4SI)	55	155
175SJT-M150D(A4I)	68	168
175SJT-M150D(A4SI)	69	169
175SJT-M180B(A4I)	70	170
175SJT-M180B(A4SI)	71	171
175SJT-M180D(A4I)	72	172
175SJT-M180D(A4SI)	73	173
175SJT-M220B(A4I)	74	174
175SJT-M220B(A4SI)	75	175
175SJT-M220D(A4I)	76	176

Servo Motor Model	V1.03 Motor Model Code	V1.05 Motor Model Code
175SJT-M220D(A4SI)	77	177
175SJT-M300B(A4I)	78	178
175SJT-M300B(A4SI)	79	179
175SJT-M300D(A4I)	80	180
175SJT-M300D(A4SI)	81	181
175SJT-M380B(A4I)	82	182
175SJT-M380B(A4SI)	83	183