Preface

We appreciate your support for choosing the AS100 Series AC Servo System of ALPHA. This Manual is formulated to help you apply this product in a correct manner. It introduces the naming rules, supporting recognition, wiring, utilization, parameter setting, precautions, and fault diagnosis of the servo drive and the motor.

AS100 Series AC Servo System consists of the AC drive and the permanent magnet synchronous servo motor. AS100 AC Servo Drive is equipped with Digital Signal Processor (DSP), Complex Programmable Logic Devices (CPLD) and latest IPM, giving its advantages of high integration, limited volume, comprehensive protection, great performance, etc. The optimum PID arithmetic is employed for regulation and control over the electric current loop, the speed loop and the position loop with high speed and great precision. AS100 is applicable to numerically-controlled machine tool, printing and packaging machinery, textile machinery, automatic production line, etc.

For any problem encountered during the operation, please contact us or our dealers.

For sake of safety of yours and the product, please read this Manual before using our product and preserve the Manual properly for future use.

Special attention should be paid to safety specifications and warnings in the Manual as well as warning signs attached on the equipment while you read it for your safety and proper operation of the equipment to prolong its servicing life. In the course of operation, please pay special attention to running state of the driving machinery and inform yourself of all safety precautions.

	**Danger!**
	◆ This equipment is with hazardous voltage. Operations against warnings or this Manual may incur life risk and personal injury. Therefore only professionals familiar with safety precautions are allowed to operate the equipment after completion of its installation.
	◆ Power off during wiring and inspection. Do not touch the circuit board or any part before the indication light on the printed circuit board goes out or within 5 minutes since the keyboard display goes out. Perform operations within the machine only when completion of discharging has been confirmed by the special instrument to exclude hazard of electric shock.
	◆ It is forbidden to connect the AC power supply to output terminal U, V, W of the servo drive. Please perform earth connection of the grounding terminals of the servo drive in a correct and reliable manner in accordance with electric safety regulations of IEC or other similar standards.
	◆ It is forbidden to connect the AC power supply to servo motor U, V, W, to avoid possible equipment damage or personal injury.
	**Warning!**
	◆ Unauthorized change to wiring within the machine or utilization of auxiliaries purchased from illegal manufacturers may incur fire disaster, electric shock or personal injury.
	◆ As the static electricity from human body will cause serious damage to static electricity susceptible device, please do not touch the printed circuit board and IGBT module with your hands when anti-static precautions are not taken, or there may be a fault.
	◆ Do not mount the servo drive and servo motor on incombustibles. If mounted on or around combustibles, the servo drive or servo motor may be exposed to fire disasters.
	**Caution!**
	◆ The servo drive shall be used along with compatible servo motor with supporting performance.
	◆ Users who intend to employ their own servo motor should contact our technicians to make sure that such motor will run normally.

	◆ Please make sure that all signs and tags are legible and fill in new tags for missing or worn ones.
	◆ Please place the Manual where it is easily accessible and disseminate it to all users for reading.

Our Company reserves the right to modify this Manual without notice; for any doubt or problem, please do not hesitate to contact us or our dealers; feedbacks are appreciated by us.

Contents

Chapter I Purchase Inspection

1.1 Unpacking Inspection

The servo drive system has been tested and checked strictly before delivery. However, please check the purchased product of the following items to avoid unnecessary mistakes during purchasing and transport.

- Whether the purchased product is the expected one: for this, the product model on the nameplates of the motor and drive should be checked with reference to model description outlined in the next section.
- Whether the motor shaft rotates in a smooth manner: for this, manually rotate the motor shaft to see whether it is able to run smoothly. If yes, it is deemed normal. However, the inspection manner of manual rotation is not applicable to the motor with an electromagnetic holding brake.
- Damage inspection: for this, conduct visual inspection on the product for damage or scratching.
- Unreliable screws: check whether any screw is not fixed in a reliable manner or is loosening.

In any of above mentioned cases, do not hesitate to contact the dealer for problem solving.

Operable complete servo components include:

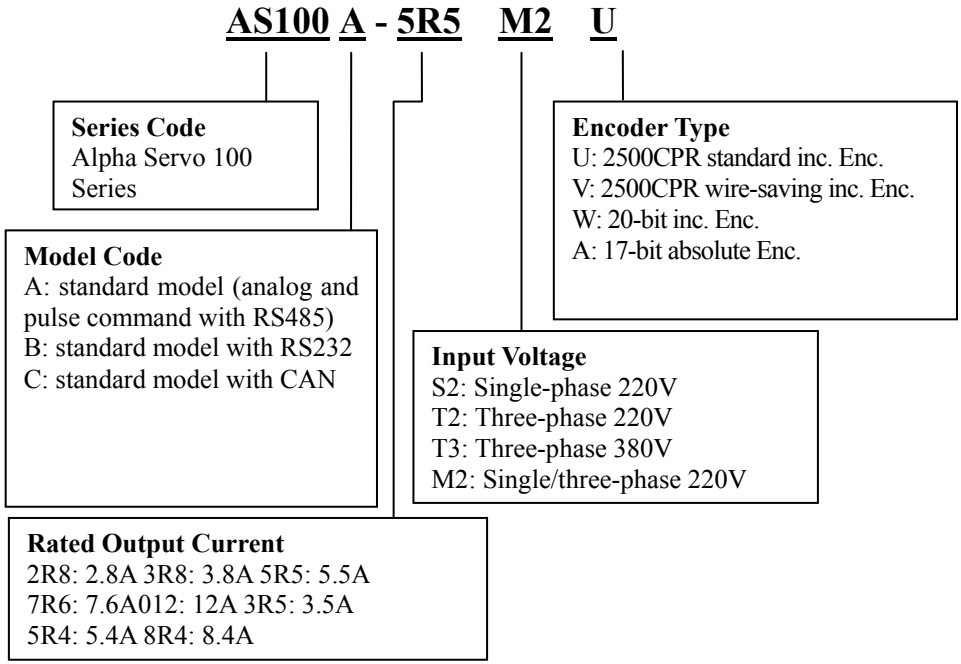
Name	Qty.	Unit	Remarks
Servo motor	1	Set	
Servo drive	1	Set	
Motor power line connector	1	Set	Standard configuration: one 4P aviation plug, one 4P quick connector. Optional power cable
Encoder signal line connector	1	Set	Standard configuration: one 15P aviation plug, one DB15 RP-SMA Male Optional coder signal line
Spring opener	2	Pcs.	Standard configuration: for spring connector wiring
Instruction Manual	1	Copy	

Name	Qty.	Unit	Remarks
SCSI 50P connector	1	Pcs.	Standard configuration: for I/O cable connection
5P quick connector	1	Pcs.	Standard configuration: for drive's input power supply wiring
MINI DIN 8P communication connector			Optional configuration: for communication cable wiring

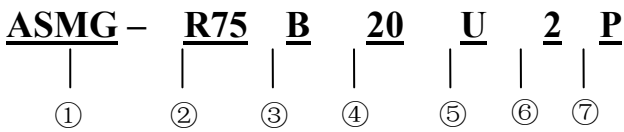
Note: aforesaid components may vary with different powers of the drives. The specific configuration should be determined based on the packing list within the packing box.

1.2 Naming Rules

Naming rules of the servo drive are as follows:



Naming rules of the servo drive are as follows:



① **Series Code**:

ASMG=Medium Inertia AC Servo Motor of Alpha

ASMH=High Inertia AC Servo Motor of Alpha

ASMS=Low Inertia AC Servo Motor of Alpha

② **Output Power**:

Three figures or two figures plus R (decimal point) are employed to represent the rated output power of the motor, which is in KW.

e.g.: R75 refers to 0.75KW, 1R0 to 1.0KW, and 1R5 to 1.5KW.

③ **Voltage class**:

One letter is used to represent the voltage class.

A=100V, B=220V, C=380V.

④ **Rated Speed**:

Two figures are used to express rated speed. To be specific, rated speed= the double digit × 100, in rpm.

⑤ **Encoder Type**:

Encoder type is represented by one letter.

U: 2500 CPR standard incremental encoder

V: 2500 CPR wire-saving incremental encoder

W: 20-bit serial incremental encoder

A: 17-bit serial absolute encoder

⑥ **Design Sequence:**

Design sequence is represented by a figure or a letter.

1=standard S-type design, 2=standard E-type design, others: non-standard designs

⑦ **Option**

Option is represented by a letter.

Option code	No oil seal No brake	No oil seal With brake	With oil seal No brake	With oil seal With brake
Circular shaft (with screw holes)	A	B	C	D
Keyway	E	F	G	H
Keyway (with screw holes)	P	Q	R	S

1.3 Servo Drive Nameplate

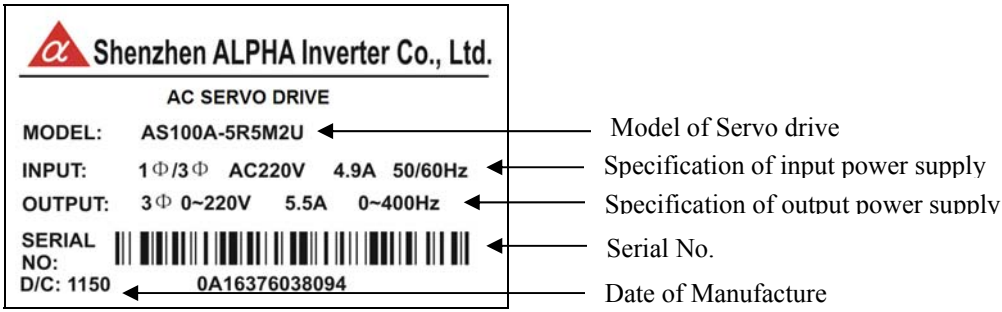


Fig. 1-1 Servo Drive Nameplate

1.4 Servo Motor Nameplate

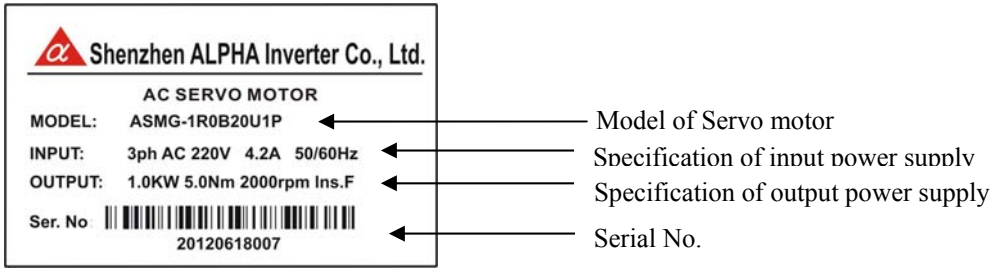


Fig. 1-2 Servo Motor Nameplate

1.5 Servo System Constitution

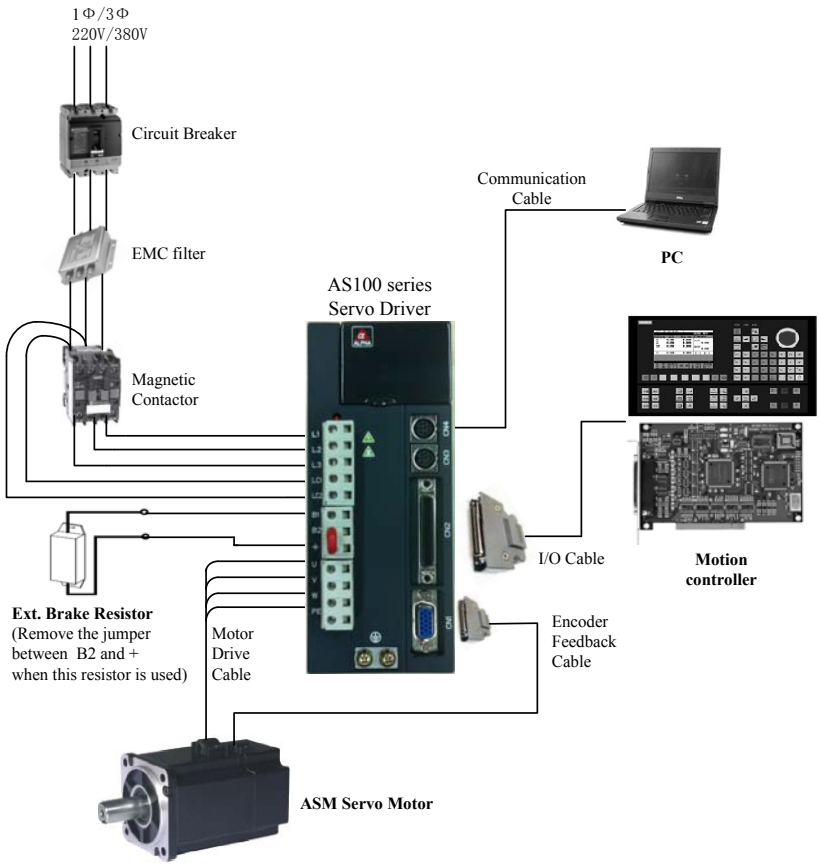


Fig. 1-3 Servo System Constitution

Chapter II Installation and Wiring

2.1 Outline Dimension and Installation Dimension of Servo Drive

See Appendix 1 for details on outline dimension and installation dimension of servo drive.

2.2 Installation Site Requirements and Management

Caution

- Do not exert any force on the operation panel and the cover plate in the course of handling; otherwise the falling of the servo drive will result in personal injury or property loss.
- The servo drive shall be installed in a position capable of bearing its weight; otherwise the falling of the servo drive will result in personal injury or property loss.
- Do not install the drive around a water pipe and other positions that may suffer water splashing; otherwise it may entail the risk of property loss.
- Do not make such foreign matters as screws, gaskets and metal bars fall into the servo drive; otherwise it may result in fire and property loss.
- Do not install or use the servo drive if it is damaged or its components are incomplete; otherwise it may result in fire and personal injury.
- Do not install the drive in a place with direct sunlight; otherwise it may entail the risk of property loss.
- The main circuit terminal and the conductor terminal must be firmly connected; otherwise it may entail the risk of property loss.
- Do not connect the input power cord to the output ends U, V and W; otherwise it may entail the risk of property loss.
- Please connect the output ends U, V and W to the three-phase input of the motor in proper phase sequence; otherwise the motor will operate in an abnormal manner.
- Do not directly connect the braking resistor between the (+) and (-) terminals of the DC bus; otherwise it may cause fire and property loss.
- The short circuit line must be connected between B2 and + terminal when using an internal braking resistor; otherwise it may cause fire.

2.2.1 Installation Site

The IP code of AS100 servo drive is IP20, and the installation site shall meet the following requirements:

- Keep the indoor environment well ventilated;
- Do not install the drive on a wood material or other combustibles;
- Avoid direct sunlight;
- Do not install the drive in a place with inflammable, explosive and corrosive gases or liquids;
- Keep it free of dust, oily dust, floating fiber and metal particles;
- The installation base shall be firmly secured to prevent vibration;
- Electromagnetic interference and other interference sources shall be avoided.
- If the altitude is over 1,000m, the thin air may result in poorer radiating effect, please lower the rated output. The altitude increases 1,000m, 6% of the rated output shall be lowered.

2.2.2 Ambient Conditions

- Temperature range: 0℃~45℃. Please lower the rated output if the temperature is above 45℃. The highest temperature is 60℃ (idle running);
- Humidity range: 5%~95% RH; no condensed water droplets or rainwater dripping;
- Vibration: below 4.9m/s^2.

2.2.3 Preventive Measures

During installation, please put a dust shield on the servo drive cover. Do not make any metal fragments produced during drilling and other operations fall into the servo drive. Upon the completion of installation, remove the dust shield.

2.3 Installation Direction and Space

The standard installation requirements are as follows: the drive shall be installed in a well-ventilated electric control cabinet. As for the installation modes, bottom plate installation or panel installation shall be selected. The structure of the servo drive is not protected, thus the drive must be installed in a well-protected electric cabinet; moreover, measures shall be taken to avoid contacting with corrosive and inflammable gases and to prevent conductive objects, metal dusts, oil fog, and liquid from entering the drive, as shown in Fig. 2-1:

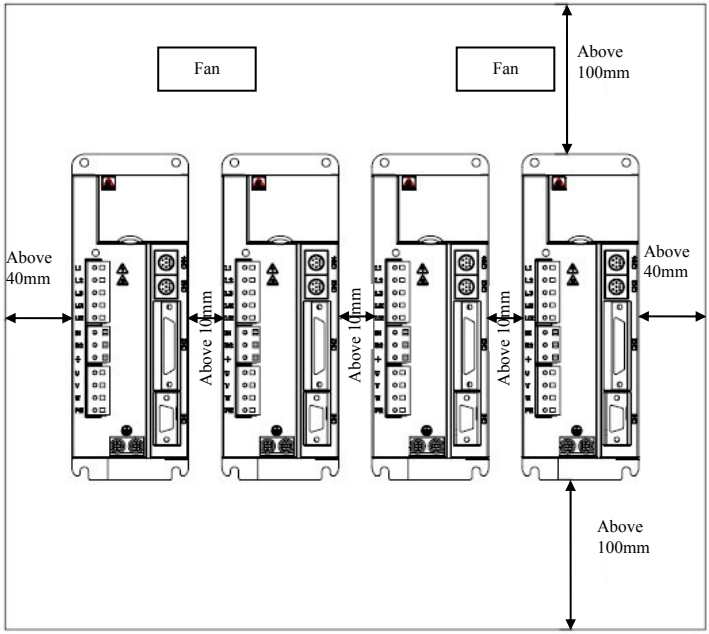


Fig. 2-1 Installation Direction and Space

- To achieve good cooling and circulation effects, adequate space must be reserved between the upper, lower, left and right parts and the adjacent objects or baffle plates (wall).
- If it is installed side by side, it is recommended to reserve a spacing of above 10mm between adjacent articles. A spacing of above 40mm should be reserved for two horizontal sides, and a spacing of above 100mm should be reserved for two longitudinal sides.
- The product is a precision device, so do not make it fall or suffer strong impact in the process of installation, please.
- Do not obstruct the air intake and air outlet; otherwise it will cause failure.
- Please install a fan for cooling in the upper part of the servo drive. To ensure that the temperature around the drive will not rise continuously, the temperature in the electric cabinet must be kept uniform.

2.4 EMC Installation Conditions

Before delivery, the servo drive has been strictly tested in accordance with the requirements of IEC61000-4, IEC61000-3-2-2000, IEC61000-3-4-1998 and

GB/T17626.2-6. In order to avoid any possible influence of external strong electromagnetic interference source, to ensure normal operation of the servo system, and to prevent the adverse impacts of the actions of the high -frequency electronic switch on the sensitive equipment nearby, the following EMC measures should be taken during the installation of the servo system:

- Install the servo drive in a shield box;
- Ensure that the servo drive and the servo motor are reliably grounded;
- The input and output signal cables shall be shielded twisted pair, and ferrite beads (winding two coils) shall be used;
- The encoder cables shall be shielded twisted pair, and ferrite beads (winding one coil) shall be used;
- The main circuit cables shall be shielded cables if possible, and the shielding layer shall be reliably grounded.

2.5 Main Circuit Terminal Wiring

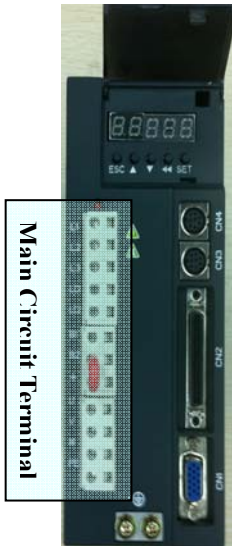


Fig. 2-2 Main Circuit Terminal Interface

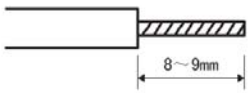
Table 2-1 Function and Description of Main Circuit Terminal

Terminal Code	Terminal Name and Function Description
L1, L2, L3	Main circuit power supply input terminal: The drive shall be connected to three-phase 220V or three-phase 380V or single-phase 220V power supply according to different models; as for single-phase input, it can only be connected to L1 and L2 terminals, and L3 shall not be wired; the drive of some model are applicable to three-phase 220V and single-phase 220V power supplies, and the single-phase power supply should be connected to L1 and L3 terminals. Refer to the nameplate of the drive for detailed information about the power supply specification.
LC1, LC2	Control power supply input terminal: 220V series drive: AC 220V (+/-15%), 50/60HZ 380V series drive: AC 380V (-15%~+10%), 50/60HZ
B1, B2, +	External braking resistor connecting terminal: If a built-in braking resistor is used, B2 and + are in short connection; If an external braking resistor is used, the external braking resistor is connected to B1 and + end, and the jumper between B2 and + shall be removed.
U, V, W	Three-phase AC output terminal: connected with U, V and W of the servo motor
PE, ⏚	Grounding terminal: connected with the power supply grounding terminal and the motor grounding terminal

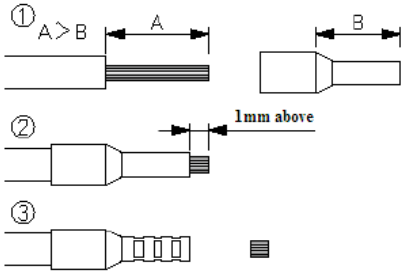
Notes: the figure shows the terminal arrangement for 220V5.5A drive; the terminal arrangement for drives of other specifications may be different from this; the actually marked terminal code shall prevail.

Wiring Steps for Spring Type Main Circuit Terminal:

- Take the spring type main circuit terminal from the servo drive.
- Strip the insulating layer of the wire to be connected as shown in the figure.



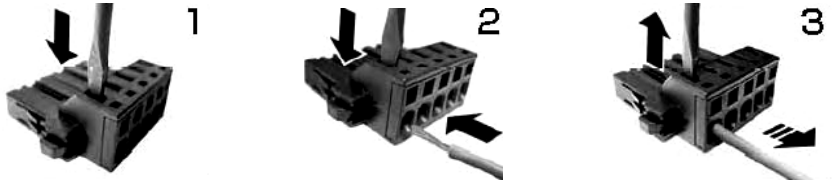
- Use proper wire noses, and press it on the wire of which the insulating layer is stripped with a proper crimping tool.



- Insert the wire of the terminal connector into the opening on the hole with a tool. Two methods may be applied:

■ Use a spring opener: operate as shown in the illustrations.

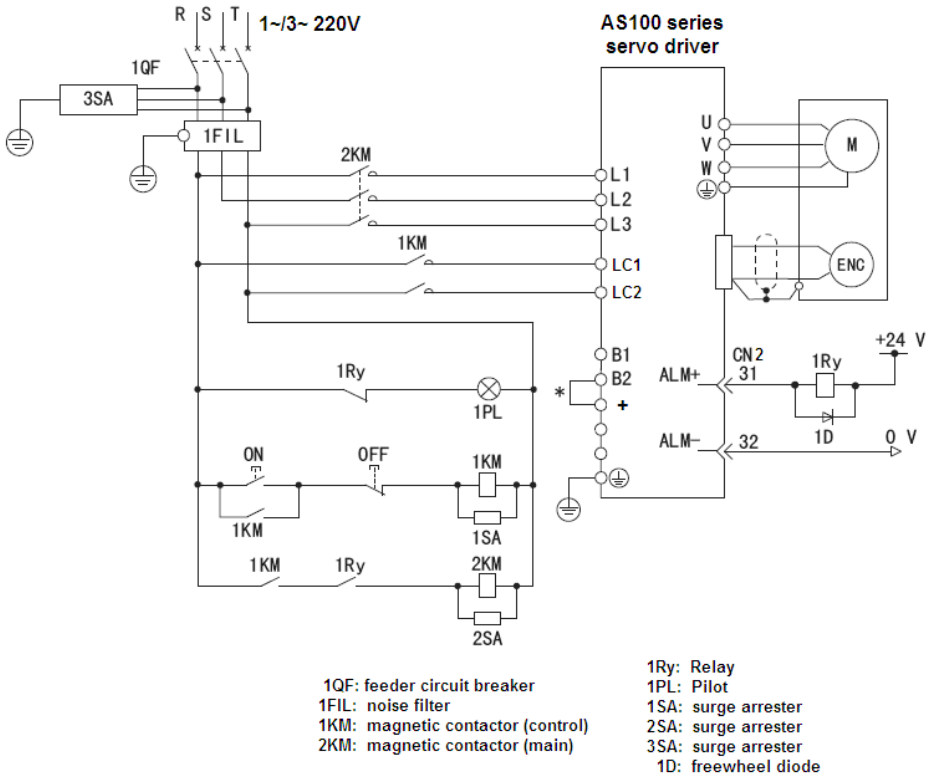
■ Use a slotted screwdriver: operate as shown in the illustrations.



Notes: the actually used connector may be totally different from that of the connector as shown in the figures in appearance. Please note that during the actual operation.

Typical Wiring Diagram of Main Circuit

- **Single-phase/three-phase 220V Power Supply**:

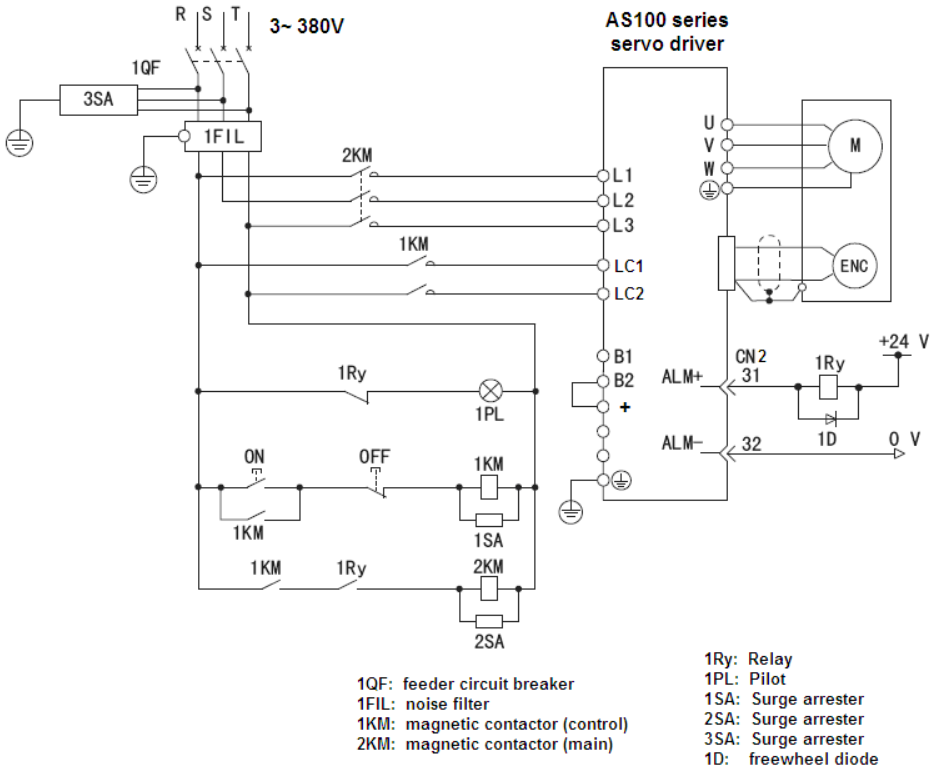


Notes: AS100A-1R6M2U and AS100A-2R8M2U do not have a jumper between B2 and +.

The above figure is applicable to the following drives:

AS100A-1R6M2U	AS100A-2R8M2U	AS100A-3R8M2U
AS100A-5R5M2U	AS100A-7R6T2U	AS100A-012T2U

- **Three-phase 380V Power Supply:**

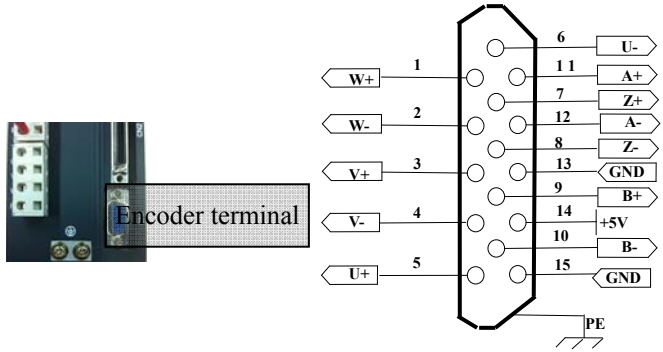


Notes: the above figure is applicable to the following drives:

AS100A-3R5T3U AS100A-5R4T3U AS100A-8R4T3U

2.6 Control Circuit Terminal Wiring

2.6.1 Encoder Single Wiring CN1



CN1 Plug Welding
Terminal Arrangement

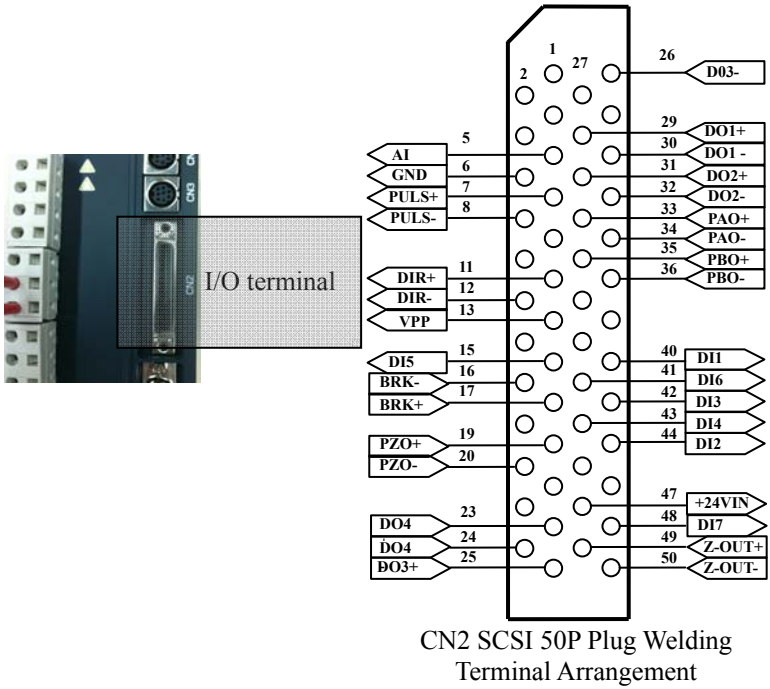
Fig. 2-3 Encoder Signal Interface (CN1)

Table 2-2 Function and Description of Encoder Signal Terminal

Classification	Terminal No.	Terminal Grade	Signal Name	Function
Pulse signal input	CN1-1	W+	Encoder W+ phase input	Motor encoder W+ signal interface
	CN1-2	W-	Encoder W- phase input	Motor encoder W- signal interface
	CN1-3	V+	Encoder V+ phase input	Motor encoder V+ signal interface
	CN1-4	V-	Encoder V- phase input	Motor encoder V- signal interface
	CN1-5	U+	Encoder U+ phase input	Motor encoder U+ signal interface
	CN1-6	U-	Encoder U- phase input	Motor encoder U- signal interface
	CN1-7	Z+	Encoder Z+ phase input	Motor encoder Z+ signal interface

Classification	Terminal No.	Terminal Grade	Signal Name	Function
Pulse signal input	CN1-8	Z-	Encoder Z- phase input	Motor encoder Z- signal interface
	CN1-9	B+	Encoder B+ phase input	Motor encoder B+ signal interface
	CN1-10	B-	Encoder B- phase input	Motor encoder B- signal interface
	CN1-11	A+	Encoder A+ phase input	Motor encoder A+ signal interface
	CN1-12	A-	Encoder A- phase input	Motor encoder A- signal interface
5V power supply ground	CN1-13	GND	Board +5V power supply ground	
5V power supply	CN1-14	+5V	The board supplies +5V power for the encoder	+5V 200mA
	CN1-15	GND	Board +5 V power supply ground	

2.6.2 I/O Signal Wiring CN2



CN2 SCSI 50P Plug Welding Terminal Arrangement

Fig. 2-4 I/O Signal Interface (CN2)

Table 2-3 Function and Description of I/O Signal Terminal

Classification	Terminal No.	Terminal Grade	Signal Name	Function
Digital Input	CN2-47	+24VIN	Input terminal power supply positive lectrode	Used to drive the input optocoupler, DC+12-24V, the current is larger than 100mA
	CN2-40	DI1	Default unction: Servo enable S-ON	DI1~DI7 are programmable digital inputs; the input functions and effective level can be adjusted
	CN2-44	DI2	Default Function:	

Classification	Terminal No.	Terminal Grade	Signal Name	Function
			Alarm clear ALM-RST	through parameter settings. The possible input functions include: 0: Servo enable (S-ON) 1: Alarm clear (ALM-RST) 2:Reverse travel limit (N-OT) 3: Forward travel limit (P-OT) 4: Clear position error (CLR) 5: Position pulse inhibit (PINH) 6: Second electronic gear ratio (GR2) 9: Zero clamp under analog speed mode (ZCLAMP) 10: Shift change under internal speed mode 11: Shift change under analog speed mode 13: Forward start under analog speed mode 14: Reverse start under analog speed mode 15-18: Multi-stage selection CMD1-CMD4 19: Origin search enable SHOM 20: Origin switch signal OrgNear
Digital Input	CN2-42	DI3	Default Function: Reverse travel limit N-OT	
	CN2-43	DI4	Default Function: Forward travel limit P-OT	
	CN2-15	DI5	Default Function: clear position error CLR	
	CN2-41	DI6	Default Function: position pulse inhibit PINH	
	CN2-48	DI7	Default Function: Second electronic gear ratio GR2	
Digital Output	CN2-29	DO1	Servo ready S-RDY+ / S-RDY -	DO1~DO4 are programmable digital outputs; the output functions and effective level can be adjusted through parameter settings. The possible
	CN2-30			
	CN2-31	DO2	Servo alarm ALM+ / ALM -	
	CN2-32			
	CN2-25	DO3	Positioning	

Classification	Terminal No.	Terminal Grade	Signal Name	Function
Digital Output	CN2-26		completion/speed coincidence P_CMP+ / P_CMP-	input functions include: 0: Servo ready 1: Servo alarm 2: Positioning completion/speed coincidence 3: Origin search completion Output form: OC output Maximum output: DC60V 40mA
	CN2-23	DO4	Origin search completion Home+/Home-	
	CN2-24			
	CN2-16	BRK-	Holding brake output	Used to control servo motor mechanical holding brake. Maximum rated value: DC100V 0.4A
	CN2-17	BRK+		
Pulse Input	CN2-7	PULS+	Command pulse PULS+	The external command pulse input terminal receives differential input signals. The following input methods can be used for parameter settings: 1) Command pulse + symbol pulse mode 2) CCW/CW command pulse mode 3) Two-phase (A,B) command pulse mode
	CN2-8	PULS-	Command pulse PULS-	
	CN2-11	SIGN+	Symbol pulse SIGN+	
	CN2-12	SIGN-	Symbol pulse SIGN-	
	CN2-13	VPP	External power supply when single-end pulse input	If the pulse input is single-end signal, the rated input voltage of the positive electrode of the external power supply is DC24V, and the maximum allowable value is DC35V

Classification	Terminal No.	Terminal Grade	Signal Name	Function
Pulse Output	CN2-49	Z-OUT+	Z pulse output	Encoder origin signal Z open collector signal output
	CN2-50	Z-OUT-		
	CN2-19	PZO+	Z pulse output	Encoder divider pulse output A,B (90°phase difference pulse) And Z (origin pulse) signal. Differential signal output
	CN2-20	PZO-		
	CN2-33	PAO+	A pulse output	
	CN2-34	PAO-		
	CN2-35	PBO+	B pulse output	
	CN2-36	PBO-		
Analog Input	CN2-6	GND	Analog input reference ground	Input 0~±10V, as external analog reference of rotating speed or torque. ±10V rated rotating speed of associated motor or rated torque of motor.
	CN2-5	AI	Analog command input +	

2.6.3 Communication Signal Wiring CN3/CN4

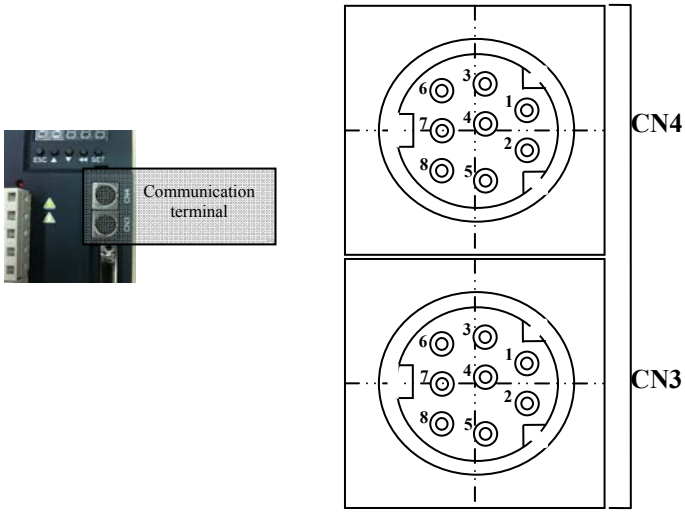


Fig. 2-5 Communication Signal Interface (CN3/CN4)

Table 2-4 Function and Description of Communication Signal Terminal

CN3 Pin No.	1	2	3	4	5	6	7	8	Shell
Definition	GND	Retain	Retain	RS485+	RS485-	Retain	Retain	+5V	PE
CN4 Pin No.	1	2	3	4	5	6	7	8	Shell
Definition	GND	NC	NC	RS485+	RS485-	NC	NC	+5V	PE

Notes:

1. The RS485 interfaces of CN3 and CN4 are actually in parallel connection, and have the same address and functions;

2. The retained pin of CN3 is used by the manufacturer as the CLPD programming interface. Please do not connect it with external circuits;

3. NC means “Not Connected”.

2.7 Basic Block Diagram of Servo System

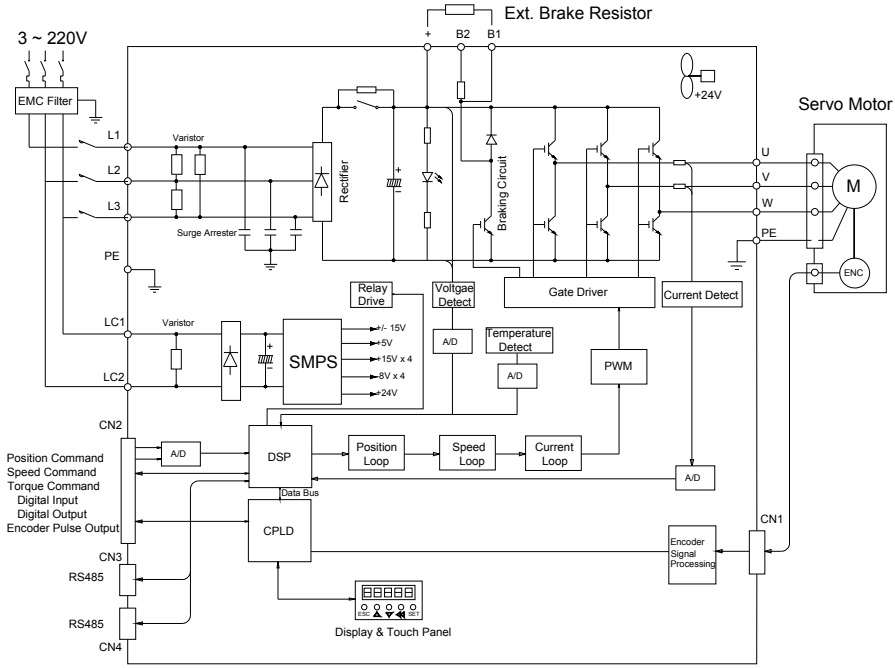


Fig. 2-6 Basic Block Diagram of Servo System

2.8 Standard Wiring Diagram of Servo Drive

The standard wiring diagrams of the servo system under position mode, speed mode and torque mode are as follows:

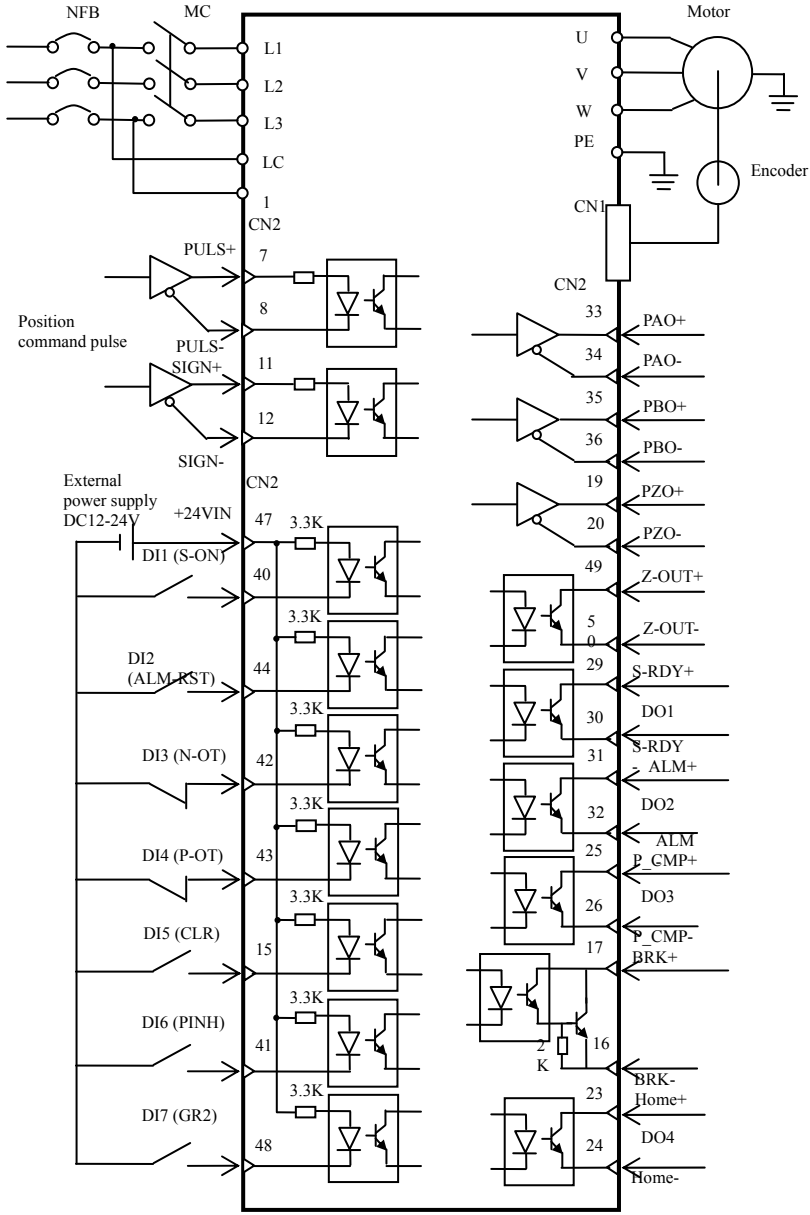


Fig. 2-7 Standard Wiring Diagram under Position Mode

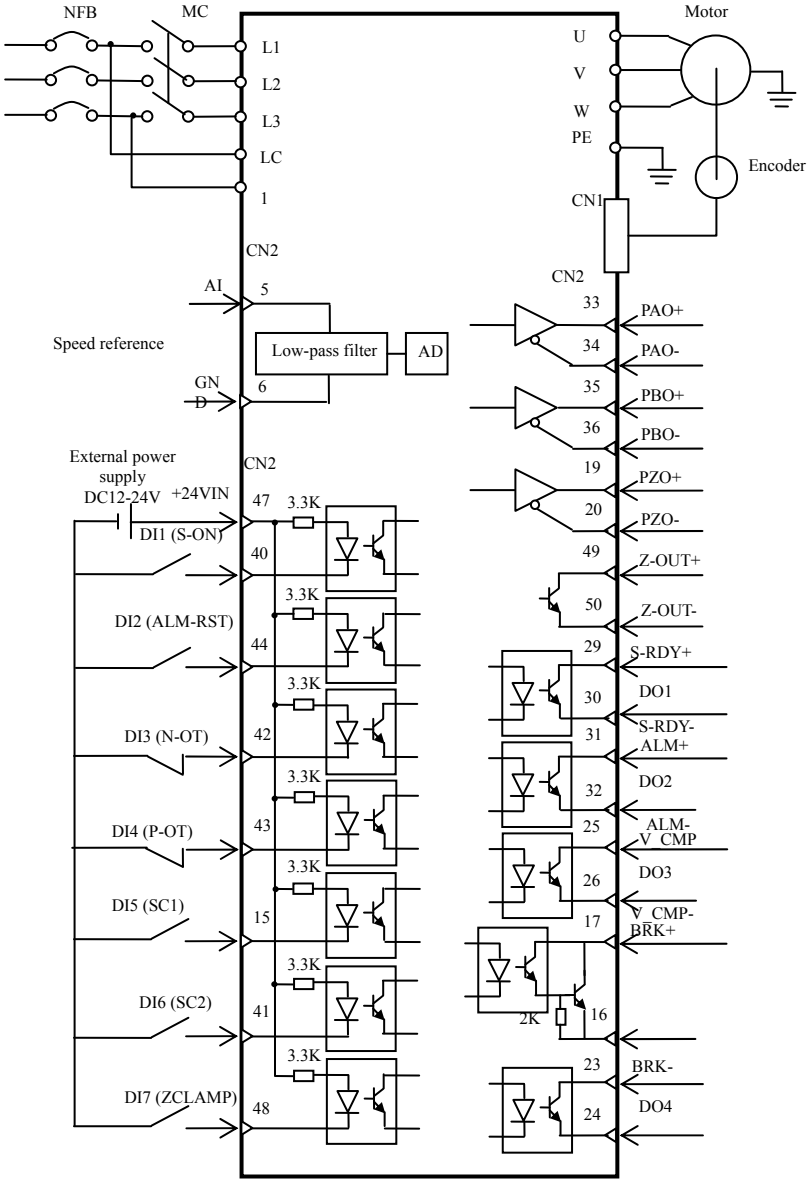


Fig. 2-8 Standard Wiring Diagram under Speed Mode

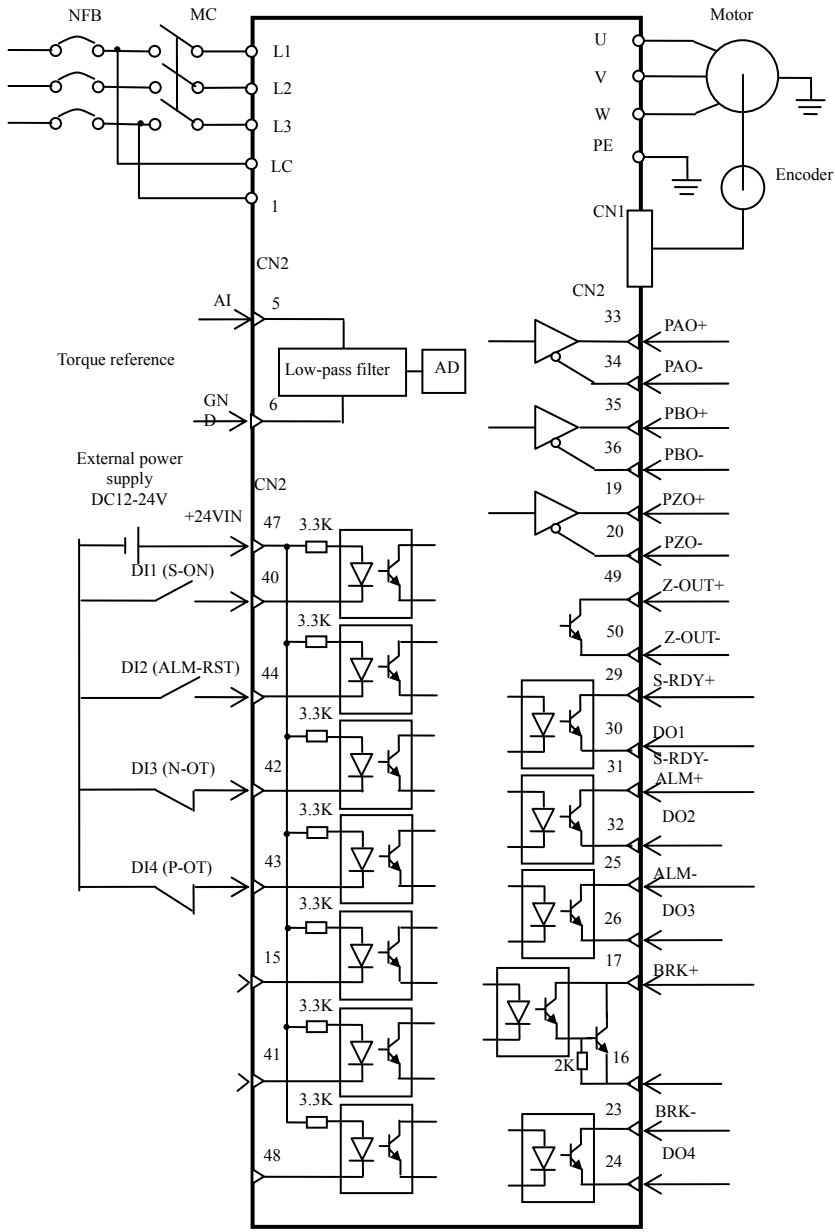


Fig. 2-9 Standard Wiring Diagram under Torque Mode

2.9 Interface Circuit Principle

The I/O signal of the servo drive and the interface circuit connection of the host device are as shown in Fig. 2-10 to Fig. 2-17:

Analog Input Circuit

The I/O interface CN2 of the drive has one loop of analog input (0~±10V), as the speed command or torque command signals; the signal specification is as follows:

The maximum allowable voltage is ±15V and the input impedance is approximately 30kΩ.

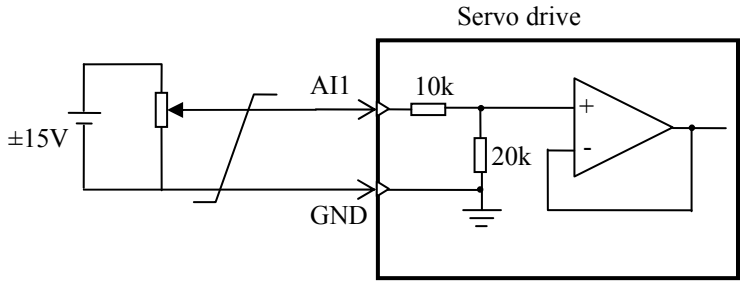


Fig. 2-10 Analog Input Circuit

Digital Input Circuit

If the host device is relay output:

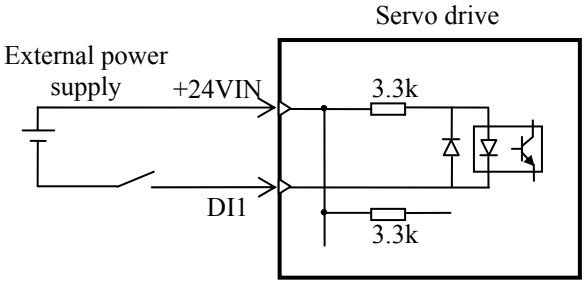


Fig. 2-11 Digital Input Circuit (a)

(1) The user shall provide the power supply DC12-24V >50mA

(2) If the polarity of the power supply is reversed, the drive will not respond to the signal.

If the host device is open collector output:

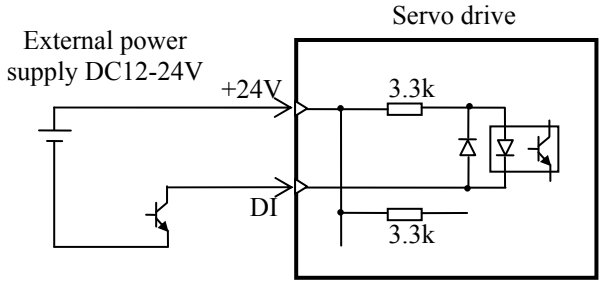


Fig. 2-12 Digital Input Circuit (b)

Digital Output Circuit

IF the host device is relay input:

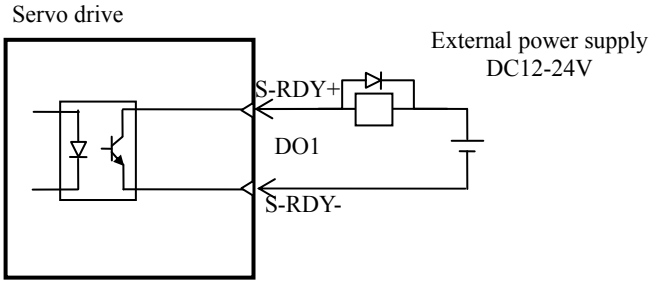


Fig. 2-13 Digital Output Circuit (a)

(1) The user shall provide the power supply DC12-24V. If the polarity of the power supply is reversed, the drive will damaged.

(2) The maximum rated value of the open collector output of the drive is DC60V 40mA.

(3) DO1~DO4 are open collector outputs.

(4) A freewheeling diode must be installed and the polarity must be correct; otherwise the drive will be damaged.

If the host device is OC input:

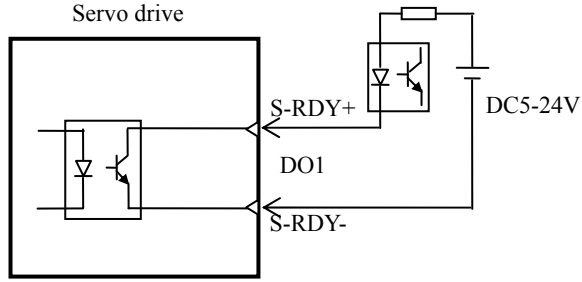


Fig. 2-14 Digital Output Circuit (b)

Pulse (Position Command) Input Circuit

The position command pulse of the host device has two types: differential drive (line drive) and open collector drive (single-end drive).

(1) The differential drive is a signal transmission mode that is not easy to be interfered by noise and the highest input pulse frequency is 500 kHz;

(2) To accurately transmit the quantity of pulse, differential drive is recommended;

(3) Under the differential drive mode, AM26LS31 or line drive circuit with similar functions should be used;

(4) If single-end drive mode is used, the highest frequency of the transmitted signal pulse is 200 kHz.

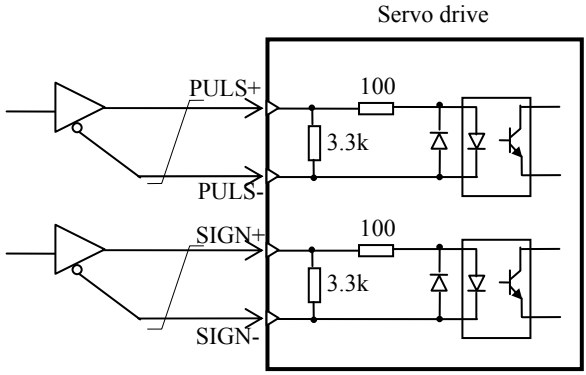


Fig. 2-15 Pulse Differential Drive Input Circuit (a)

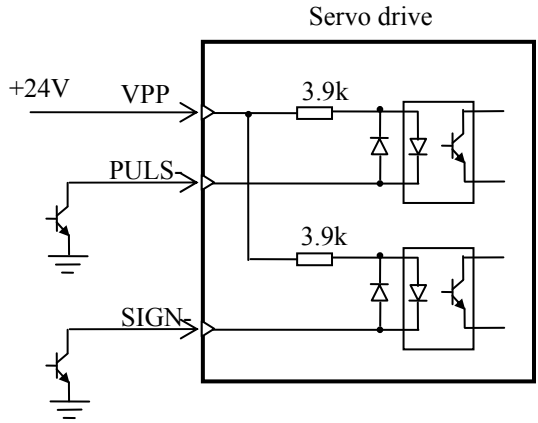
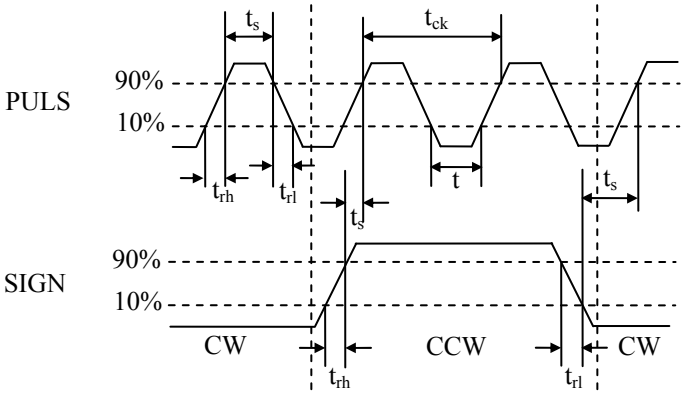


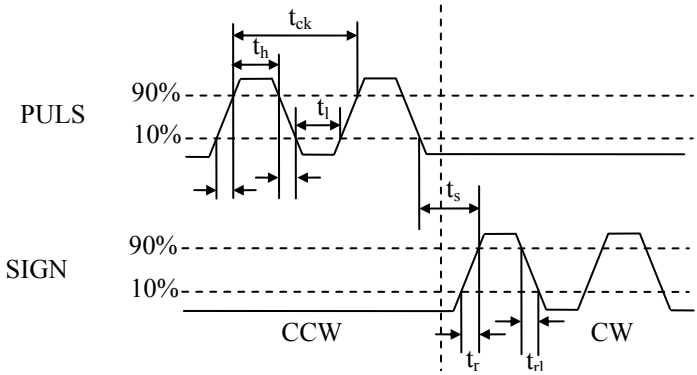
Fig. 2-16 Pulse Single-end Drive Input Circuit (b)

Timing Requirements for Pulse Input:

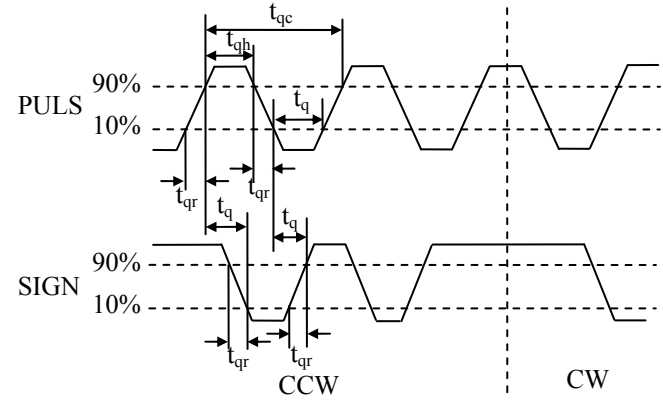
Parameters	Differential Drive Input	Single-end Input Drive
t_{ck}	>2μs	>5μs
t_h	>1μs	>2.5μs
t_l	>1μs	>2.5μs
t_{rh}	<0.2μs	<0.3μs
t_{rl}	<0.2μs	<0.3μs
t_s	>1μs	>2.5μs
t_{qck}	>8μs	>10μs
t_{qh}	>4μs	>5μs
t_{ql}	>4μs	>5μs
t_{qrh}	>0.2μs	<0.3μs
t_{qrl}	>0.2μs	<0.3μs
t_{qs}	>1μs	>2.5μs



Sequence Diagram of Pulse + Direction Input Interface (maximum frequency 500 KHz)



Sequence Diagram of CCW+CW Pulse Input Interface (maximum frequency 500 KHz)



Sequence Diagram of Two-phase Quadrature Pulse Input Interface (maximum frequency 300 KHz)

Encoder Pulse Divider Output Circuit

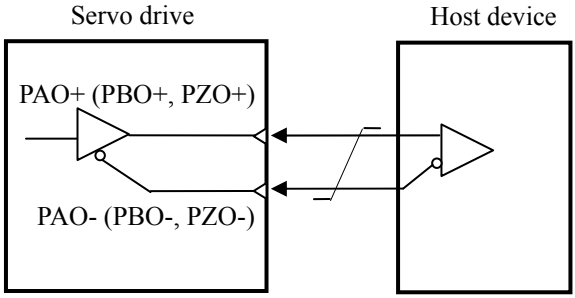


Fig. 2-17 Encoder Pulse Divider Output Circuit

2.10 Holding Brake Wiring

The power supply connection for the servo motor holding brake (mechanical brake) has no polarity requirements, the DC power supply shall be provided by users.

The standard wiring for brake signal (BRK) outputted by the drive and the brake power supply are shown in Fig. 2-17:

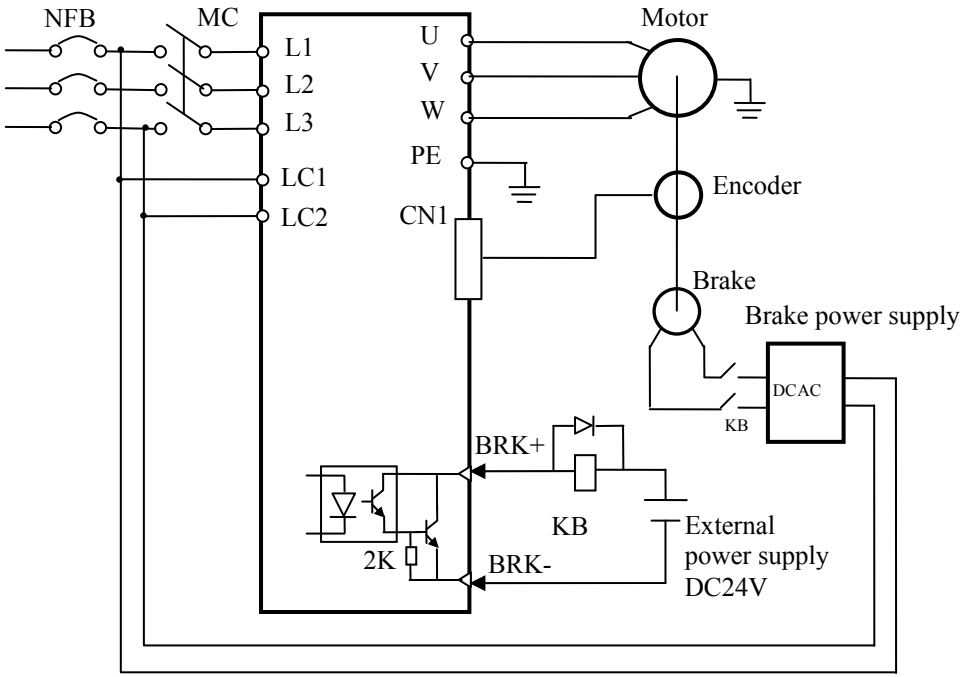


Fig. 2-18 Wiring Diagram of Brake

2.11 Wiring Precautions

- Ensure the voltage rating of the power supply to be connected is proper.
- Please do not connect the output ends U, V, and W of the servo drive with a power supply.
- Check the junction box after powering off for 5min to avoid electric shock.
- Perform wiring according to the terminal voltage and polarity to avoid equipment damage or personal injury.

- The drive and the servo motor must be reliably grounded, and the grounding wire should be thick wire (above 2.0mm^2) if possible.
- Do not bend the cable or make it bear any tension. The diameter of the core wire of cables for signal is extremely small, i.e. 0.2mm or 0.3mm.
- For signal cables and encoder feedback cables, please use shielded twisted pair.
- The length of cables for command input signal shall not exceed 3m, while the length of encoder feedback cables shall not exceed 30m.
- Only one wire can be inserted into one wire socket of the connector.
- Please use a noise filter to avoid radio frequency interference. Install the noise filter on the input side of the power cord when you are using it around residential houses or worrying about radio frequency interference. Since the servo drive is a set of industrial equipment, countermeasures are not taken to fight against radio frequency interference.
- Install the host device and noise filter around the servo drive if possible.
- Install a surge suppressor on the coils of the relay and the electromagnetic contactor.
- Please separate the strong power lines with the weak power lines during wiring, and keep a spacing of above 30cm. Do not put them in the same pipeline or bind them together.
- Do not share a power supply with the electric welding machine and electrical discharge machine, etc. Even if the power supply is not shared, please install a noise filter on the input side of the power cord when there is a high-frequency generator nearby.
- Use a circuit breaker or fuse for wiring to protect the power cord.
- The servo drive has no built-in ground protection circuit. To make the system safer, please install a leakage circuit breaker for overload and short circuit protection or a special leakage circuit breaker for ground protection with a circuit breaker.

Chapter III Display and Operation

 Danger	1. Close the input power supply upon completion of the terminal cover installation; please do not remove the terminal cover when the power is on to avoid electric shocks. 2. Please keep off the mechanical equipment to avoid personal injury possibly caused by the sudden start-up of the servo drive when electrified.
 Caution	1. Please do not touch the brake resistor, if any, to avoid any electric shock or burning for it may be of high temperature because of election. 2. Please check the application range of the motor and machinery before operation to avoid personal injury. 3. Please check the signal during operation to avoid equipment damage and electric shock.

3.1 Introduction to Operation and Display Interface

The keyboard is constituted with a 5-bit 7-segment LED display and 5 operation keys. It enables the user to perform function setting, parameter setting, state display, etc.

3.1.1 Key Functions

There are 5 keys on the servo drive keyboard, each with function indicated in Table 3-1.

Table 3-1 Key Functions

Key	Name	Function
ESC	Escape	Return to the previous menu
▲	Up	Increasing the set value; constant pressing for rapid increase of the set value Speeding up during speed trial operation Forwarding in JOG mode
▼	Down	Degreasing the set value; constant pressing for rapid decrease of the set value Speeding down during speed trial operation Reversal in JOG mode

Key	Name	Function
◀◀	Shift	One left shift of the flicker bit for each pressing during parameter setting
SET	Set	Proceeding to the next menu or saving the parameter value during setting

Notice: please find out the cause of the alarm prior to the alarm reset.

3.1.2 LED Display

There is a 5-bit 7-segment LED display on the operation panel of the servo drive which displays the state parameters, function code parameters, fault displays, etc.

It flickers at the function digit and stops flickering upon saving of the change. After the servo system is initialized, the operation panel will display the initial state variables (e.g. motor speed indicating "r 0.0") showing it is in the mode of servo system operation state monitoring. Press ESC to escape the status monitoring mode and press ESC to proceed to the parameter mode to review or change parameters. In the parameter mode, the Nixie tube presents a three-level menu: function code groups, function code numbers and function parameter values. The menu of function code groups displays function code groups from “P00” to “P07”; the menu of function code numbers displays function code numbers under each function code group; the menu of function code parameters displays parameter values.

3.2 Keyboard Operation

3.2.1 Shift between Function Code Groups

Press ▲ and ▲ to shift between function code groups from P00 to P07, as shown in Fig. 3-1.

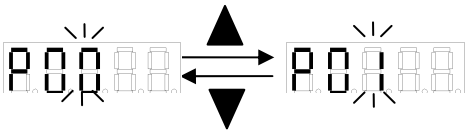


Fig. 3-1 Shift between Function Code Groups

3.2.2 Parameter Setting

Notice: Upon each power-on, adjust P00.00 to 356 and save it before changing other parameters.

Some parameters takes immediate effect upon setting; wrong parameter settings may lead to mal-operation and result in an accident.

Other parameter settings take effect after restarting.

Press SET in the primary menu to proceed to the secondary menu of "function code numbers"; press ▲ and ▼ to select among different function code numbers under different function code groups to check or set parameters. Press SET to proceed to the tertiary menu of corresponding parameters and it flickers at the LSB. Press SET to move the flicker bit to change the parameter. Press ▲ and ▼ to change parameter values and SET to save the final value which then stops flicker. Perform two actions along with the operation of saving: saving the parameter value in RAM and writing in EEPROM. Press ESC to return to the previous menu. The value setting of P05.10 is shown in Fig. 3-2 as an example of parameter setting.

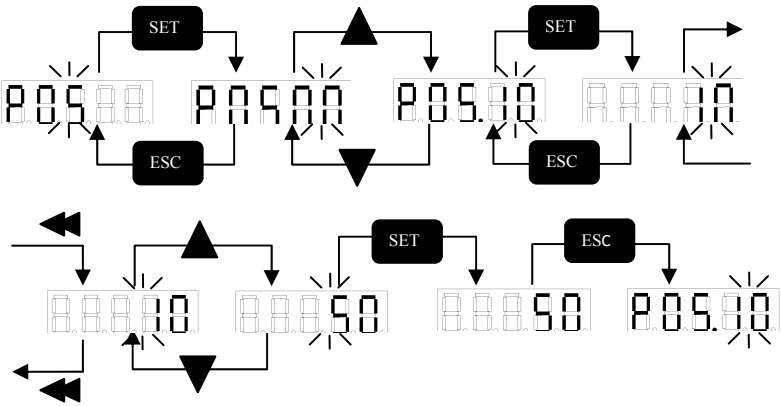


Fig. 3-2 Parameter Setting

In the tertiary menu of parameters displayed on the monitor, SET, ▲, ▼, ◀◀ are annul.

3.3 Monitor Display

The parameter of P02.04 “Pos” displayed on the monitor is shown in Fig. 3-3 as an example of monitor display. The servo motor is in 4 LSBs of a pulse of 2053.

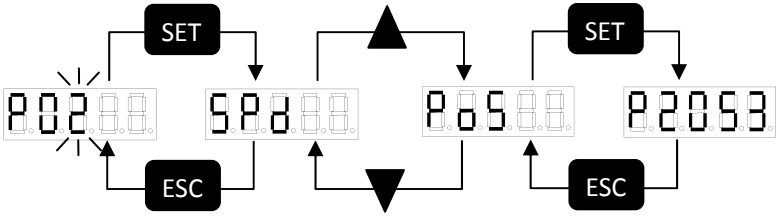


Fig. 3-3 Monitor Display

The monitor display refers to the display of the set command value, state of input/output signals, and internal state of the servo drive.

The function codes of monitor display are shown in Table 3-2.

Table 3-2 Monitor State

Function Code No.	Function Code	Name	Unit
P02.00 (SPd)	r	Actual motor speed	r/min
P02.01 (Cnt)	Cnt	Current control mode	\
P02.02 (tyP)	tyP	Drive model	\
P02.03 (Sof)	Sof	Software version	\
P02.04 (PoS)	P	Current position 4 LSBs	Pulse
P02.05 (PoS.)	P.	Current position 4 MSBs	10,000 pulses
P02.06 (CPo)	C	Position command 4 LSBs	Pulse
P02.07 (CPo.)	C.	Position command 4 MSBs	10,000 pulses
P02.08 (EPo)	E	Position error 4 LSBs	Pulse
P02.09 (EPo.)	E.	Position error 4 MSBs	10,000 pulses

Function Code No.	Function Code	Name	Unit
P02.10 (trq)	t	Actual motor torque	%
P02.11 (I)	I	Actual motor current	A
P02.12 (InH)	H	Input terminal high order state	\
P02.13 (InL)	L	Input terminal low order state	\
P02.14 (oUt)	o	Output terminal state	\
P02.15 (Frq)	F	Pulse frequency of position command	kHz
P02.16 (CS)	r.	Speed command	r/min
P02.17 (Ct)	t.	Torque command	%
P02.18 (Cod)	Cod	Coder UVW input signal	\
P02.19 (Err)	Er.	Error Fault Display	\
P02.20(APo)	A	Absolute position of motor rotor	Pulse
P02.21(rES)	O	Encoder zero pulse	Pulse
P02.22(Iq)	I.	Motor torque current	A
P02.23(bHS)		Instantaneous braking power	W
P02.24(bHL)		Average braking power	W
P02.25(n.tP)		Motor model code	\

Description of monitor display functions:

1. Values of position pulse and command pulse displayed on the monitor have been amplified through the input electronic gear. The pulse is in 10,000 pulses/revolution, which is the system pulse unit. Pulse value is expressed with 4 MSBs plus 4 LSBs:

Pulse value=4 MSBs*10000+ 4 LSBs

The pulse value indication range is ±99999999 (in accordance with actual 9999 motor revolutions).

2. Control mode: 0-position control; 1-analog speed control; 2-torque control;

3-internal speed control; 4-speed trial operation; 5-JOG trial operation; 6-factory mode.

3. The pulse frequency of the position command is the actual one which has not yet been amplified through the electric gear. The minimum unit of the pulse frequency is 0.1 kHz, and it is positive in the forward direction and negative in the reverse direction.

4. The absolute position of the rotor in one revolution refers to its relative position with that of the stator. One revolution is regarded as a cycle which ranges from 0 to 9999.

5. As for the alarm, “Er.” means everything is under control without any alarm. Other figures or letter groups indicate a certain kind of fault. Refer to Chapter 7 for fault information.

6. Display of terminal on-off input state:

The external control terminal involves 7 on-off inputs, which are displayed by inH (3 MSBs DI7~DI5) and by inL (4 LSBs DI4~DI1). From the high order to the low order, 4 LSBs LED indicates the input state, 1 indicates no input, and 0 indicates input. (Input means there is current input into optocoupler)

Display:

indicates input in D16, and no input in D17 and D15. (0 at the high order will not be displayed)

indicates input in D13 and D11, and no input in D14 and D12.

7. Display of terminal on-off output state:

The terminal involves 4 on-off outputs, the state of which are displayed by out from the high order and the low order, 1 indicates output, and 0 indicates no output.

Display:

indicates output in DO4, DO3, and DO4, and no output in DO1.

(Output means OC is outputting breakover)

8. The displayed speed is in (rpm).

9. The displayed current is in (A).

10. The displayed torque is in a percentage of the rated torque of the motor (%).

11. The drive model is displayed as a digit.

12. The software version is displayed as V plus three digits behind.

13. The motor model is displayed as a letter (S or E) plus 1 or 2 digits behind.

3.4 System Parameter Initialization

Restore the factory defaults according to the following steps:

In order to set the parameter of PP00.16 as 1, press SET . The system will begin the restoring of the defaults with the display of “start” and ends it with the display of “done”. Restart the system to get the default state. See Fig. 3-4.

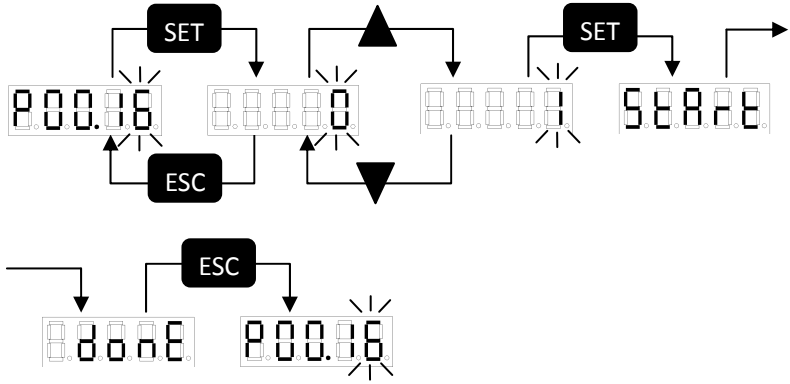


Fig. 3-4 Restore Defaults

In order to raise the parameter value of P00.16 to 2, press SET . The system will begin the operation of saving all current RAM parameter values with the display of “start” and ends it with the display of “done”. The system parameter values remain unchanged upon restarting.

Chapter IV Operation

Danger

- The drive and motor must be reliably connected to ground, PE terminal must be reliably connected to the equipment grounding end.
- It is recommended that the drive power supply is provided by the isolation transformer and power filter, to ensure the safety and anti-interference capability.
- Make sure the wires are connected correct after checking, and then connect to power.
- One emergency stop circuit must be installed to ensure the power can be immediately cut off when there is a failure (see Fig. 4-1).
- After the drive alarm sounded, make sure the failure is eliminated and the SON signal is invalid before restarting.
- The drive and motor shall not be touched for at least 5 minutes after power cut off to prevent electric shock.
- The drive and motor may have a higher temperature after running for a period of time, therefore, shall prevent burns.

4.1 Power Connection

Refer to Fig. 4-1 for power connection (three-phase 220V input), and connect the power in the following order:

1. The power is connected to the main circuit power input end (L1, L2, and L3) through electromagnetic contactor.

2. The power LC1 and LC2 for controlling the circuit shall be connected before or at the same time to the main circuit power. If only connected the control circuit power, the servo signal (S-RDY) is OFF.

3. After the main circuit power is connected, delay about 1.5 seconds, the servo signal (S-RDY) is ON. At this time, the servo enable (S-ON) signal can be accepted, the detected servo enable is effective, drive output is effective and motor is initiated, and the motor is in operating state. If the servo enable detected is invalid or alarmed, the drive inverter circuit is closed, and the motor is in free state.

4. When the servo enable is connected to power at the same time, the drive inverter circuit is opened after about 1.5 seconds.

5. Frequent connecting and disconnecting the power may damage the soft charging circuit and braking circuit, and the frequency of connecting and disconnecting of main

circuit shall be limited to 5 times per hour and 30 times per day. If the failure of servo system is due to overheating of drive or motor, it shall be cooled for 30 minutes before re-connecting to power.

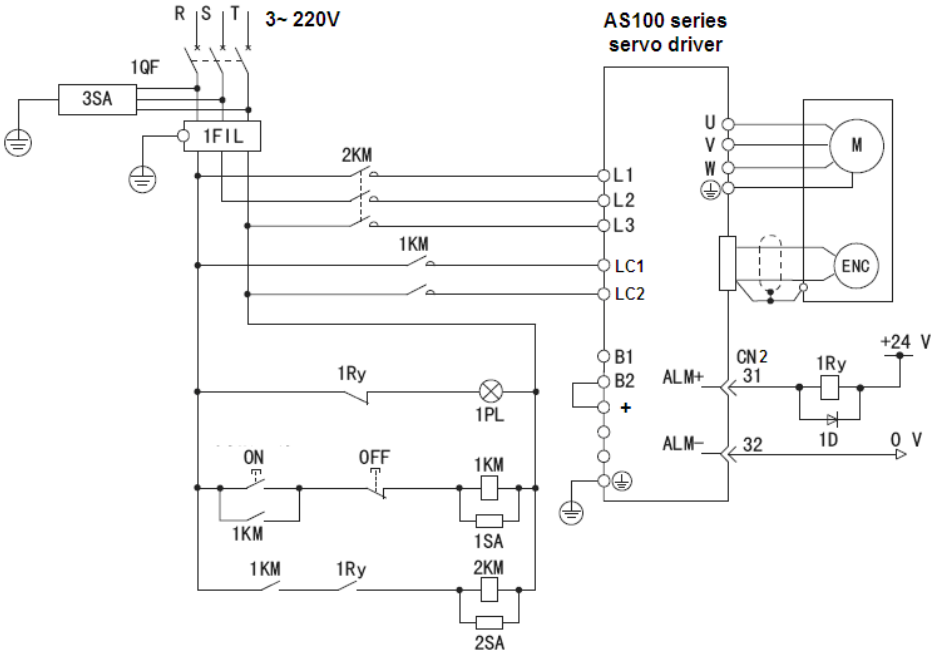


Fig. 4-1 The Power Wiring Diagram

·The Sequence Diagram of Power on

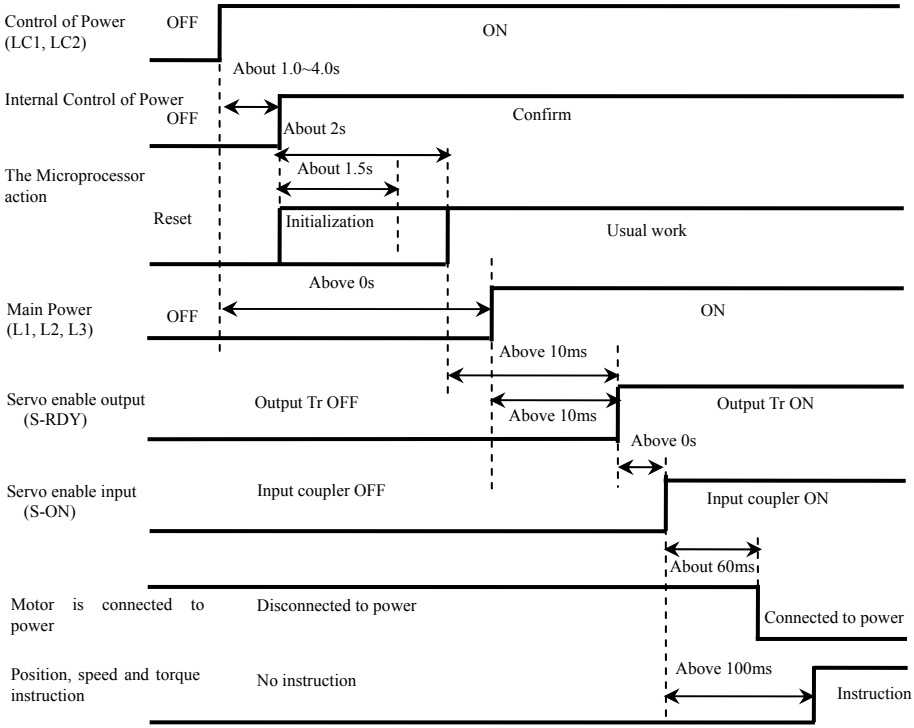


Fig. 4-2 The Sequence Diagram of Power on

·The Sequence Diagram of Alarm

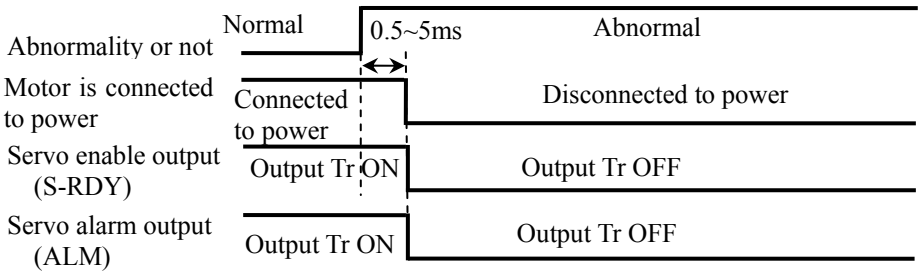


Fig. 4-3 The Sequence Diagram of Alarm

·The Sequence Diagram of Alarm Clearance

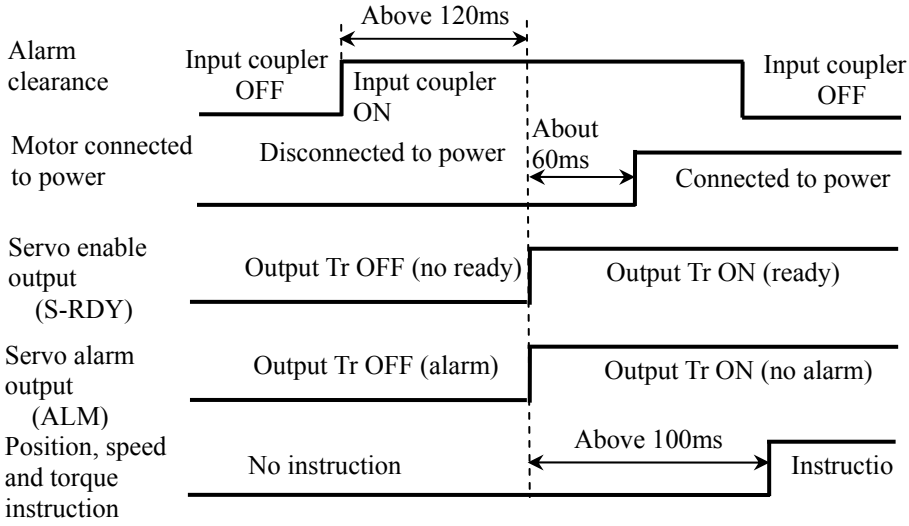


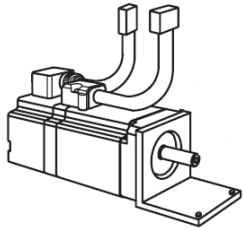
Fig. 4-4 The Sequence Diagram of Alarm Clearance

4.2 Trial Operation

4.1.1 The Checking Points Before Trial Operation

After the installation and connection of wires, the following shall be checked before connecting to power:

- Whether the power terminal connections are correct and reliable, and whether the input voltage is correct.
- Whether the power line and motor wiring is short circuit, whether the grounding is good.
- Whether the encoder cable connection is correct.
- Whether the control signal terminal is connected accurately.
- Whether the power supply polarity and voltage size are correct.
- If the motor is equipped with holding brake, need to make sure the holding brake has been released.
- Whether the drive and motor are firmly fixed.
- Whether the motor shaft is disconnected from load.



4.1.2 The Checking Points During Operation

- Whether the motor operation is stable.
- Whether the motor operation direction is correct.
- Whether the motor has abnormal vibration.
- Whether the motor is stable when increasing or decreasing speed.
- Whether the keyboard display is correct.

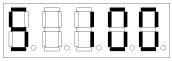
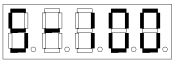
4.1.3 Commissioning When Connecting to Power

The servo drive has two kinds of special trial operation control mode which is used to determine whether the servo system is normal, namely, speed test run mode and JOG test run mode. No external control signal is required under the test run mode. The trial operation operating steps are briefly described below.

Note: the trial operation shall be performed when the motor is fixed and disconnected from load, to ensure no accident will occur.

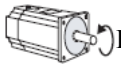
■ **Speed Trial Operation (P00.02=4)**

Steps	Operations	Reference Chapter
1	Connect the control circuit power supply (the main circuit power is disconnected temporarily), and the display of the drive is on. If there is an alarm, please check the connection. The input and output interface cable shall not be connected during test run.	2.4 The main circuit terminal wiring
2	Connect the main circuit power supply.	2.4 The main circuit terminal wiring

Steps	Operations	Reference Chapter
3	Set the control mode (P00.02) at speed test run (the setting is 4). At this time, the drive is at enabled state, the motor is initiated and at zero speed running state, gentle vibration can be felt when touching the motor with hand.	3.2 Keyboard operation method
4	Entering the speed test run setting (P01.00) through keypad operation, the indication sign of speed test run is S 0, the numerical unit is r/min. Use the ▲ and ▼ key to change the speed and direction, and the motor shall be operated in the given speed. If the speed display is positive (the first digital display is S), means the motor is rotating in clockwise, if the display is negative, means the motor is rotating in anti-clockwise.   Forward run   Reverse run	3.2 Keyboard operation method
5	If need to stop the motor rotating, the rotating speed can be set at 0, or also exit the test run speed setting interface, then re-entering (P01.00), the original set speed will be cleared and the motor will stop. Change operation mode (P00.02) can also stop the motor rotating.	3.2 Keyboard operation method

■ **JOG Trial Operation (P00.02=5)**

Steps	Operations	Reference Chapter
1	Connect the control circuit power supply (the main circuit power is disconnected temporarily), and the display of drive is on. If there is an alarm, please check the connection.	2.4 The main circuit terminal wiring
2	Connect the main circuit power supply.	2.4 The main terminal wiring

Steps	Operations	Reference Chapter
3	Set the control mode (P00.02) as the speed test run (the setting is 5). At the this time, the drive is at enabling state, the motor is initiated and at zero speed running state, gentle vibration can be felt when touching the motor with hand.	3.2 Keyboard operation method
4	Entering the JOG point move test run operation state (P01.01) through keypad operation, the speed test run indication sign is 0, the numerical unit is r/min, and the system is in JOG point move test run control mode. The speed and direction is determined by P05.01, press ▲ key, the motor will rotate in the speed and direction set by P05.01, and press ▼ key, the motor will rotate in reverse direction in the speed set by P05.01.  Forward run  Reverse run	3.2 Keyboard operation method

Also, the trial operation can be performed in the normal control mode, but need to connect to external control signal, and the servo operation is controlled by superior instruction. The trial operation steps of position mode and speed mode are described below.

Note: test run shall be performed when the motor is fixed and disconnected from load, to make sure no accident is occurred. Torque mode is not suitable for test run operation.

■ **Trial Operation Under Position Control Mode (P00.02=0)**

Steps	Operations	Reference Chapter
1	The drive is connected to host controller through CN2, and make sure the relevant signal wiring is correctly connected. Servo enable (S-ON) OFF, positive travel limit (P-OT) ON, and reversed travel limit (N-OT) ON is used.	2.5.2 Input and output signal wiring CN2
2	Connect the control circuit power supply (the main circuit power is disconnected temporarily), and the display of drive is on. If there is an alarm, please check the connection.	2.4 The main circuit terminal wiring

3	Set the control mode (P00.02) as the position control mode (the setting is 0), set the parameter position instruction pulse input mode (P00.05) according to the controller output signal, and set the appropriate electronic gear ratio (P04.04/P04.05). Confirm the relevant parameters setting of others and position control mode is correct. After confirmation of all parameters, disconnect the control power and re-connect the motor.	3.2 Keyboard operation method
4	Connect the main circuit power supply.	
5	Make sure there is no alarm and any abnormal situation, then use the servo enable (S-ON) ON, and the motor is initiated at the moment and at zero speed state.	
6	Operate the host control signal, set appropriate position pulse instruction to servo drive, so the motor is operated according to instruction. Observe the motor rotation direction and speed, and determine whether the motor operation is in line with the expectation.	

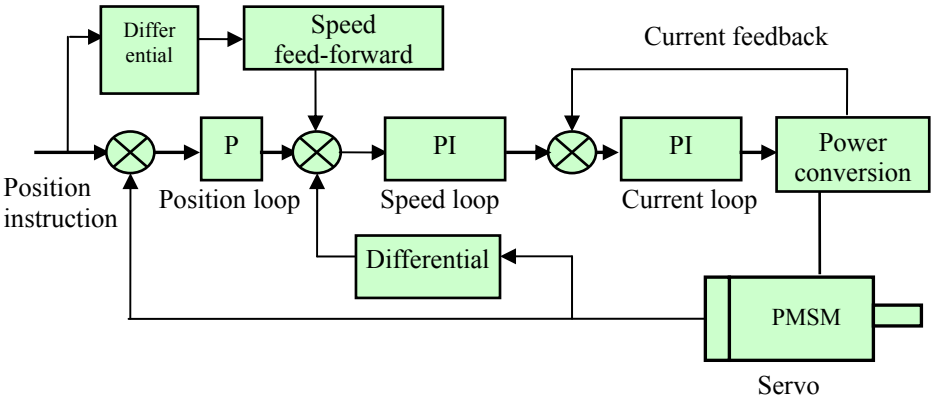
■ **Trial Operation Under Analog Speed Control Mode (P00.02=1)**

Steps	Operations	Reference Chapter
1	The drive is connected to host controller through CN2, and make sure the relevant signal wiring is correctly connected. Servo enable (S-ON) OFF, positive travel limit (P-OT) ON, and reversed travel limit (N-OT) ON is used.	2.5.2 Input and output signal wiring CN2
2	Connect the control circuit power supply (the main circuit power is disconnected temporarily), and the display of drive is on. If there is an alarm, please check the connection.	2.4 The main circuit terminal wiring
3	Set the control mode (P00.02) as the analog speed control mode (the setting is 1). Confirm the relevant parameters setting of others and analog speed control mode is correct. After confirmation, disconnect the control power and re-connect the motor.	3.2 Keyboard operation method
4	Connect the main circuit power supply.	
5	Make sure there is no alarm and any abnormal situation, then use servo enable (S-ON) ON, and the motor is initiated at the moment. Because of the influence of the analog channel zero	

Steps	Operations	Reference Chapter
	drift, and the motor is operated at low speed. If necessary, adjust the analog zero compensation value (P03.12) to make the motor stop running.	
6	Operate the host control signal, set appropriate speed instruction to the servo drive, so the motor is operated according to instruction. Observe the motor rotation direction and speed, and determine whether the motor operation is in line with the expectation.	

4.3 Adjustment

The servo system has three closed loop controls, they are position loop, speed loop and current loop (or torque loop) from outside to inside. The current loop is related to motor parameters, the drive has allocated the best current loop parameters for the matching motor, so the user do not need to adjust relevant parameters.. The speed loop and position loop parameters shall be adjusted according to the load condition.



Note: Wrong parameter setting may result in equipment failure and accidents, the correctness of parameter shall be confirmed before start up. It is recommended to perform empty load testing, and then perform load testing.

4.3.1 Basic Gain Adjustment

- **Parameters For Speed Loop**

The speed loop parameters include: speed loop gain (P00.08), speed loop integral time constant (P00.09), speed feedback low-pass filter coefficient (P00.10), and speed reference low-pass filter coefficient (P00.11).

1. The set value adjustment of speed loop gain P00.08:

Increase the speed loop gain can increase the bandwidth of speed loop response; the higher the speed loop bandwidth, the better the speed response. Under the condition of no oscillation, try to set a bigger value. In general, the larger the load inertia, the greater the speed loop gain set value. To increase the speed loop gain, at the same time, the motor noise will increase, and too large set of speed loop gain may cause system oscillation.

2. The set value adjustment of speed loop integral time constant P00.09:

The smaller the speed loop integral time, the faster the system response. In general, try to set a smaller value, but the smaller the integral time may easily cause oscillation. If the integral time constant setting is too large, the larger the speed changes of load change. The larger the load rotation inertia, the greater the speed loop integral time constant set value.

3. The set value adjustment of speed feedback low-pass filter coefficient P00.10:

If the motor noise is large, the set value of speed feedback low-pass filter coefficient P00.10 can be increased properly.

- **Parameters For Position Loop**

The position loop parameters include: position loop gain (P00.03), feed-forward gain (P00.04), and speed feed-forward low-pass filter coefficient (P04.01).

1. According to the above method, set the appropriate speed loop gain P00.08 and speed loop integral time constant P00.09.

2. The speed feed-forward gain P00.04 shall be set as 0%.

3. The set value of position loop gain P00.03: within the system stable scope, try to set a larger value.

A larger set value of position loop gain P00.03 will produce a better position instruction tracking and a smaller position following error, but too large gain will result in oscillation. In order to use a higher position loop gain, the set value of speed reference low-pass filter coefficient P00.11 can be increased to avoid overshooting.

The set value of position loop gain P00.03 may refer to the following table:

System rigidity	[Position loop gain]
Low rigidity	10~20 Hz
Medium rigidity	30~50 Hz
High rigidity	50~70 Hz

Note: the greater the rigidity means the faster the system response.

4. If the required position following characteristics is high, the set value of speed feed-forward gain P00.04 can be increased. But too large speed feed-forward gain will cause overshooting. When the syste m is unstable, the set value of speed reference low-pass filter coefficient P00.11 can be increased to avoid overshooting. Set the speed feed-forward low-pass filter coefficient P04.01 adequately can increase the stability of compound position control.

4.3.2 Basic Parameter Adjustment

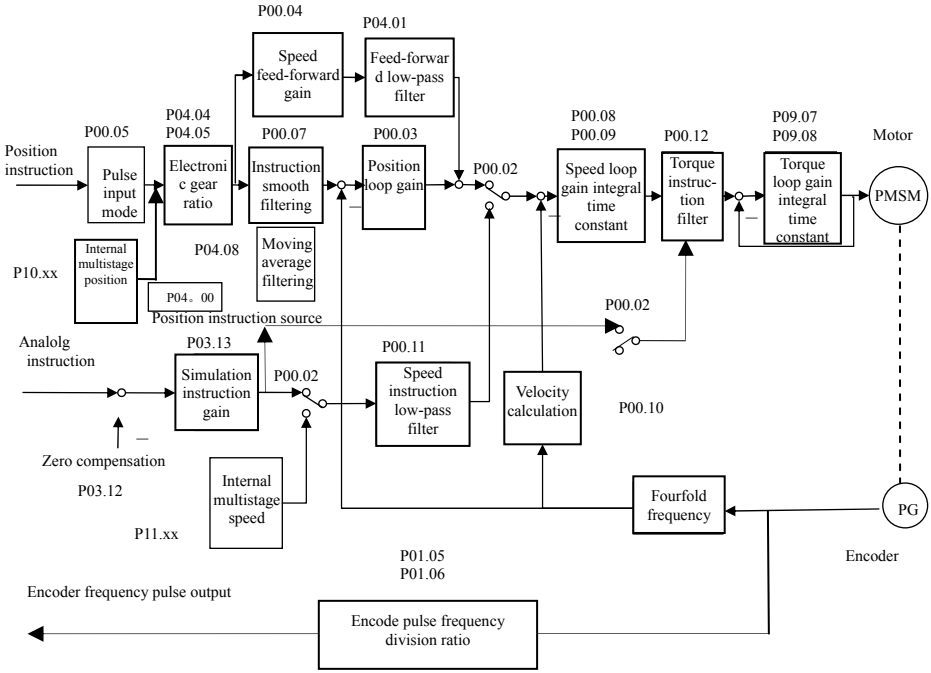
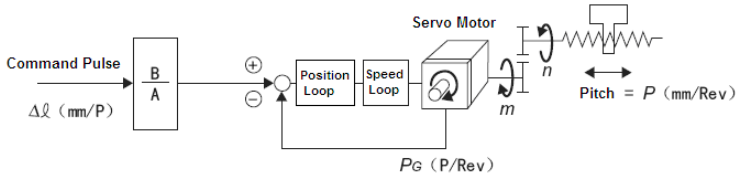


Fig. 4-5 The Diagram of Basic Parameter Adjustment

Note: optimization adjustment of torque loop parameters have been done before ex-factory, so the users do not need to adjust torque loop gain P09.07 and torque loop integral time constant P09.08.

4.3.3 The Setting of Electronic Gear Ratio

Electronic gear ratio (G=B/A) calculation formula:



$\Delta\ell$ (mm/P): command pulse equivalency

P_G (P/Rev): encoder resolution (encoder pulse number of one round of motor shaft rotation)

P (mm/Rev): helical pitch of ball screw

$\frac{n}{m}$: mechanical reduction ratio (the motor rotates m rounds, the load shaft rotates n rounds)

$$\frac{n \times P}{\Delta\ell} \times \left(\frac{B}{A}\right) = P_G \times m$$

Electronic gear ratio

$$\left(\frac{B}{A}\right) = \frac{P_G \times m \times \Delta\ell}{n \times P} = \frac{P_G}{\frac{P}{\Delta\ell}} \times \frac{m}{n}$$

P/Δl= number of instruction pulses required for one round of load shaft rotation

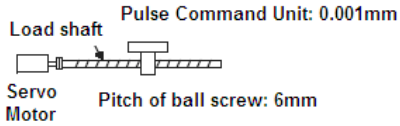
This system adopts for incremental encoder, because there is four-fold frequency circuit in the system, so P_G=4 x C, C is the pulse per rotation (also lines) of the encoder. In this system, C=2,500, so P_G=10,000 pulse/rotation.

The setting example of electronic gear ratio:

Example 1:

The mechanical composition is shown in the following figure:

Ball screw, the lead is 6mm, reduction ratio is 1, and the required command pulse equivalency is 0.001mm.



Encoder resolution P_G= 10,000 pulse/rotation

The command pulse amount of load shaft rotating one round = 6/0.001= 6,000

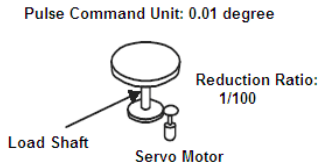
Electronic gear ratio B/A= 10,000/6,000= 5/3

The molecular set value of electronic gear ratio = 5, the denominator set value of electronic gear ratio = 3

Example 2:

The mechanical composition is shown in the following figure:

Circular truncated cone, reduction ratio n/m= 1/100, the required command pulse equivalency is 0.01^0



Encoder resolution P_G= 10,000 pulse/rotation

The command pulse amount of load shaft rotating one round= 360/0.01 = 36,000

Electronic gear ratio B/A= 10,000/36,000*100/1 = 250/9

The molecular set value of electronic gear ratio = 250, the denominator set value of electronic gear ratio = 9

Chapter V List of Functional Parameters

Parameter Schedule of Function Codes

Group P00	Basic functions
Group P01	Auxiliary Operation
Group P02	Monitor and display
Group P03	IO and analog control
Group P04	Position control parameters
Group P05	Speed control parameters
Group P06	Torque control parameters
Group P07	MODBUS communication
Group P08	Motor parameter
Group P09	Manufacturer parameter
Group P10	Parameters of origin search and multistage position
Group P11	Parameters of multistage speed function

Notes: The motor parameter and manufacturer parameter are not released to users;

Abbreviations of control modes: P – position control mode

S – speed control mode

T – torque control mode

Group P00: Basic Control Parameters

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P00.00	Password	0~9,999	370	\	P,S,T
P00.01	Selection of LED initial display status	0~25	0	\	P,S,T
P00.02	Control mode selection	0~6	0	\	P,S,T
P00.03	Position loop gain	1~2,000	100	Hz	P

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P00.04	Speed forward gain of the position loop	0~100	0	%	P
P00.05	Input mode of the command pulse	0~2	0	\	P
P00.06	Selection of rotation directions	0~1	1	\	P
P00.07	Smoothing filter coefficient of position commands	0~4,095	0	\	P
P00.08	Speed loop gain	5~1,000	Related to the motor model	Hz	S
P00.09	Integral time constants of the speed loop	1~1,000	20	ms	S
P00.10	Lowpass filtering coefficient of the speed feedback	1~100	80	%	P,S,T
P00.11	Lowpass filtering coefficient of the speed reference	0~100	100	%	S
P00.12	Lowpass filtering coefficient of the torque reference	0~100	65	%	P,S,T
P00.13	Strike limit control	0~1	1	\	P,S
P00.14	Selection of programmable I/O	0~1	0	\	-
P00.15	CPLD parameter	0~7	0	\	P,S,T
P00.16	Parameter initialization	0~2	0	\	P,S,T

Group P01: Auxiliary Operation

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P01.00	Speed trial operation function	0~1	0	\	S
P01.01	JOG trial operation function	0~1	0	\	S
P01.02	Limit value of software Over current	0~900	Related to the motor model	0.1A	T
P01.03	Permitted over current time	1~5,000	4,000	ms	S
P01.04	Limit value of times of alarm reset	1~20	5	\	P
P01.05	Numerator of dividing ratio for encoder pulse output	1~7	1	\	P
P01.06	Denominator of dividing ratio for encoder pulse output	1~32	1	\	P
P01.07	Reserved	0~1	0	\	P,S,T
P01.08	Reserved	0~1	1	\	P,S,T
P01.09	Control bit for holding brake and servo-ready signals	0~1	0	\	P,S,T
P01.10	Detection speed for motor standstill	0~1,000	5	rpm	P,S,T
P01.11	Delay time for holding brake released to servo-off	0~2,000	500	ms	P,S,T
P01.12	Detection speed for holding brake released	0~3,000	100	rpm	P,S,T
P01.13	Delay time for servo-off to holding brake released	0~2,000	0	ms	P,S,T

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P01.14	Broadened width of Z pulse	0~31	0	\	P,S
P01.15	Delay time for servo-on to holding brake released	0~2,000	0	\	-
P01.16	Selection of external brake resistors	0~1	0	\	P,S,T
P01.17	Power of external brake resistor	100~10,000	100	W	P,S,T
P01.18	Resistance value of external brake resistor	12~500	Related to the drive model	Ω	P,S,T

Group P02: Monitor and Display

Function Code No.	Function Code	Name	Unit
P02.00 (SPd)	r	Actual motor speed	rpm
P02.01 (Cnt)	Cnt	Current control mode	\
P02.02 (tyP)	tyP	Drive model	\
P02.03 (Sof)	Sof	Software version	\
P02.04 (PoS)	P	Current position 4 LSBs	Pulse
P02.05 (PoS.)	P.	Current position 4 MSBs	10,000 pulse
P02.06 (CPo)	C	Position instruction 4 LSBs	Pulse
P02.07 (CPo.)	C.	Position instruction 4 MSBs	10,000 pulse
P02.08 (EPo)	E	Position error 4 LSBs	Pulse
P02.09 (EPo.)	E.	Position error 4 MSBs	10,000 pulse
P02.10 (trq)	t	Actual motor torque	%
P02.11 (I)	I	Actual motor current	A
P02.12 (InH)	H	High order state of input terminal	\

Function Code No.	Function Code	Name	Unit
P02.13 (InL)	L	Low order state of input terminal	\
P02.14 (oUt)	o	Output terminal state	\
P02.15 (Frq)	F	Pulse frequency of position command	kHz
P02.16 (CS)	r.	Speed command	rpm
P02.17 (Ct)	t.	Torque command	%
P02.18 (Cod)	Cod	Encoder UVW input signal	\
P02.19 (Err)	Er.	Fault display	\
P02.20(APo)	A	Absolute position of motor rotor	Pulse
P02.21(rES)	O	Encoder zero calibration pulse	Pulse
P02.22(Iq)	I.	Motor torque current	A
P02.23(bHS)		Instantaneous braking power	W
P02.24(bHL)		Long time average braking power	W
P02.25(n.tP)		Motor model	\

Group P03: IO and Analog Control

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P03.00	DO1 function and enabled status setting	0~3 256~259	0	\	-
P03.01	DO2 function and enabled status setting		1	\	-
P03.02	DO3 function and enabled status setting		2	\	-

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P03.03	DO4 function and enabled status setting	0~3 256~259	3	\	-
P03.04	DI1 function and enabled status setting	0~20 256~276	0	\	-
P03.05	DI2 function and enabled status setting		1	\	-
P03.06	DI3 function and enabled status setting		2	\	-
P03.07	DI4 function and enabled status setting		3	\	-
P03.08	DI5 function and enabled status setting		4	\	-
P03.09	DI6 function and enabled status setting		5	\	-
P03.10	DI7 function and enabled status setting		6	\	-
P03.11	Zero deviation calibration for analog input	0~1	1	\	S
P03.12	Zero compensation value for analog input	-5.000~5.000	1	0.001V	S
P03.13	Analog input gain	0~500	100	%	S
P03.14	Threshold of analog input hysteresis	-5.000~5.000	10	0.001V	S

Group P04: Position Control Parameters

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P04.00	Position command source	0~1	0	\	P
P04.01	Speed feed-forward low-pass filter coefficient	1~4095	1	\	P
P04.02	Positioning completed width	0~30,000	1,000	Pulse	P
P04.03	Detection range of over position error	0~30,000	400	100 pulse	P
P04.04	Numerator of the first electronic gear ratio	1~32,766	5	\	P
P04.05	Denominator of the first electronic gear ratio	1~32,766	3	\	P
P04.06	Numerator of the second electronic gear ratio	1~32,766	10	\	P
P04.07	Denominator of the second electronic gear ratio	1~32,766	3	\	P
P04.08	Coefficient of Moving Average Filter for position command	0~500	0	\	P

Group P05: Speed Control Parameters

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P05.00	Speed command source	0~1	0	\	S
P05.01	Speed for JOG operation	-3,000~3,000	120	r/min	S
P05.02	Reserved	-	-	-	-
P05.03	Reserved	-	-	-	-
P05.04	Reserved	-	-	-	-
P05.05	Reserved	-	-	-	-
P05.06	Speed limit	0~6,000	Related to the motor model	r/min	P,S
P05.07	Reached speed	5~3,000	50	r/min	S
P05.08	Threshold for over speed error detection	0~100	0	%	P,S,T
P05.09	Permitted time for over speed error detection	0~30,000	5000	ms	P,S,T
P05.10	Deceleration ramp time of speed command	0~16,000	10	ms	S
P05.11	Acceleration ramp time of speed command	0~16,000	10	ms	S
P05.12	Zero-speed clamping selection	0~1	0	\	S
P05.13	Allowed time of zero speed clamping	1~2,000	100	ms	S

Group P06: Torque Control Parameters

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P06.00	Internal CCW torque limit	0~300	150	%	P,S
P06.01	Internal CW torque limit	-300~0	-150	%	P,S
P06.02	External CCW torque limit	0~300	150	%	P,S
P06.03	External CW torque limit	-300~0	-150	%	P,S
P06.04	Trial operation torque limit	0~300	100	%	S

Group P07: MODBUS Communication

Function Code No.	Name	Setting Range	Delivery Value	Unit	Mode of Application
P07.00	Baud rate selection	0~3	3	\	P,S,T
P07.01	Native address	0~31	1	\	P,S,T
P07.02	Selection of odd-even check	0~2	0	\	P,S,T
P07.03	Reserved				
P07.04	Reserved				
P07.05	EEPROM saving mode for communication data	0~1	1	\	P,S,T

Group P08: Motor parameter

The motor parameter is used and controlled by the manufacturer, and users have no right to change. This parameter group can only be accessed with the manufacturer code. It is not specified in detail here.

Group P09: Manufacturer Parameter

The manufacturer parameter is used and controlled by the manufacturer, and users have no right to change. This parameter group can only be accessed with the manufacturer code. It is not specified in detail here.

Group P10: Parameters of Origin Search and Multistage Position

P10.00	Action selection after the origin search	0~1	0	\	P
P10.01	Enable control of the origin search	0~2	0	\	P
P10.02	Origin search mode	0~3	0	\	P
P10.03	High speed set for origin searching operation	0~3,000	100	rpm	P
P10.04	Low speed set for origin searching operation	0~1,000	10	rpm	P
P10.05	Acceleration and deceleration time for origin searching operation	0~1,000	1,000	ms	P
P10.06	Limited time for origin searching operation	0~32,767	10,000	s	P
P10.07	reserved	0~30,000	0	\	P
P10.08	Operation mode for internal multistage position	0~3	0	\	P
P10.09	Effective segments selection	1~16	1	\	P
P10.10	Processing mode for residual command	0~1	0	\	P

P10.11	Displacement command type selection	0~1	0	\	P
P10.12	Waiting time unit selection	0~1	0	\	P
P10.13	Displacement 4 HSBs (decimal) of the first segment	-9,999~9,999	0	\	P
P10.14	Displacement 4 LSBs (decimal) of the first segment	-9,999~9,999	5,000	\	P
P10.15	speed of the first segment	0~3,000	500	rpm	P
P10.16	Acceleration and deceleration time of the first segment	0~1,000	100	ms	P
P10.17	Waiting time of the first segment	0~10,000	10	ms/s	P
P10.18	Displacement 4 HSBs (decimal) of the second segment	-9,999~9,999	0	\	P
P10.19	Displacement 4 LSBs (decimal) of the second segment	-9,999~9,999	5,000	\	P
P10.20	speed of the second segment	0~3,000	500	rpm	P
P10.21	Acceleration and deceleration time of the second segment	0~1,000	100	ms	P
P10.22	Waiting time of the second segment	0~10,000	10	ms/s	P
P10.23	Displacement 4 HSBs (decimal) of the third segment	-9,999~9,999	0	\	P

P10.24	Displacement 4 LSBs (decimal) of the third segment	-9,999~9,999	5,000	\	P
P10.25	Running speed of the third segment	0~3,000	500	rpm	P
P10.26	Acceleration and deceleration time of the third segment	0~1,000	100	ms	P
P10.27	Waiting time of the third segment	0~10,000	10	ms/s	P
P10.28	Displacement 4 HSBs (decimal) of the fourth segment	-9,999~9,999	0	\	P
P10.29	Displacement 4 LSBs (decimal) of the fourth segment	-9,999~9,999	5,000	\	P
P10.30	Running speed of the fourth segment	0~3,000	500	rpm	P
P10.31	Acceleration and deceleration time of the fourth segment	0~1,000	100	ms	P
P10.32	Waiting time of the fourth segment	0~10,000	10	ms/s	P
P10.33	Displacement 4 HSBs (decimal) of the fifth segment	-9,999~9,999	0	\	P
P10.34	Displacement 4 LSBs (decimal) of the fifth segment	-9,999~9,999	5,000	\	P
P10.35	speed of the fifth segment	0~3,000	500	rpm	P
P10.36	Acceleration and deceleration time of the fifth segment	0~1,000	100	ms	P

P10.37	Waiting time of the fifth segment	0~10,000	10	ms/s	P
P10.38	Displacement 4 HSBs (decimal) of the sixth segment	-9,999~9,999	0	\	P
P10.39	Displacement 4 LSBs (decimal) of the sixth segment	-9,999~9,999	5,000	\	P
P10.40	Speed of the sixth segment	0~3,000	500	rpm	P
P10.41	Acceleration and deceleration time of the sixth segment	0~1,000	100	ms	P
P10.42	Waiting time of the sixth segment	0~10,000	10	ms/s	P
P10.43	Displacement 4 HSBs (decimal) of the seventh segment	-9,999~9,999	0	\	P
P10.44	Displacement 4 LSBs (decimal) of the seventh segment	-9,999~9,999	5,000	\	P
P10.45	Speed of the seventh segment	0~3,000	500	rpm	P
P10.46	Acceleration and deceleration time of the seventh segment	0~1,000	100	ms	P
P10.47	Waiting time of the seventh segment	0~10,000	10	ms/s	P
P10.48	Displacement 4 HSBs (decimal) of the eighth segment	-9,999~9,999	0	\	P
P10.49	Displacement 4 LSBs (decimal) of the eighth segment	-9,999~9,999	5,000	\	P

P10.50	speed of the eighth segment	0~3,000	500	rpm	P
P10.51	Acceleration and deceleration time of the eighth segment	0~1,000	100	ms	P
P10.52	Waiting time of the eighth segment	0~10,000	10	ms/s	P
P10.53	Displacement 4 HSBs (decimal) of the ninth segment	-9,999~9,999	0	\	P
P10.54	Displacement 4 LSBs (decimal) of the ninth segment	-9,999~9,999	5,000	\	P
P10.55	speed of the ninth segment	0~3,000	500	rpm	P
P10.56	Acceleration and deceleration time of the ninth segment	0~1,000	100	ms	P
P10.57	Waiting time of the ninth segment	0~10,000	10	ms/s	P
P10.58	Displacement 4 HSBs (decimal) of the tenth segment	-9,999~9,999	0	\	P
P10.59	Displacement 4 LSBs (decimal) of the tenth segment	-9,999~9,999	5,000	\	P
P10.60	speed of the tenth segment	0~3,000	500	rpm	P
P10.61	Acceleration and deceleration time of the tenth segment	0~1,000	100	ms	P
P10.62	Waiting time of the tenth segment	0~10,000	10	ms/s	P

P10.63	Displacement 4 HSBs (decimal) of the eleventh segment	-9,999~9,999	0	\	P
P10.64	Displacement 4 LSBs (decimal) of the eleventh segment	-9,999~9,999	5,000	\	P
P10.65	speed of the eleventh segment	0~3,000	500	rpm	P
P10.66	Acceleration and deceleration time of the eleventh segment	0~1,000	100	ms	P
P10.67	Waiting time of the twelfth segment	0~10,000	10	ms/s	P
P10.68	Displacement 4 HSBs (decimal) of the twelfth segment	-9,999~9,999	0	\	P
P10.69	Displacement 4 LSBs (decimal) of the twelfth segment	-9,999~9,999	5,000	\	P
P10.70	speed of the twelfth segment	0~3,000	500	rpm	P
P10.71	Acceleration and deceleration time of the twelfth segment	0~1,000	100	ms	P
P10.72	Waiting time of the twelfth segment	0~10,000	10	ms/s	P
P10.73	Displacement 4 HSBs (decimal) of the thirteenth segment	-9,999~9,999	0	\	P

P10.74	Displacement 4 LSBs (decimal) of the thirteenth segment	-9,999~9,999	5000	\	P
P10.75	Speed of the thirteenth segment	0~3,000	500	rpm	P
P10.76	Acceleration and deceleration time of the thirteenth segment	0~1,000	100	ms	P
P10.77	Waiting time of the thirteenth segment	0~10,000	10	ms/s	P
P10.78	Displacement 4 HSBs (decimal) of the fourteenth segment	-9,999~9,999	0	\	P
P10.79	Displacement 4 LSBs (decimal) of the fourteenth segment	-9,999~9,999	5,000	\	P
P10.80	Speed of the fourteenth segment	0~3,000	500	rpm	P
P10.81	Acceleration and deceleration time of the fourteenth segment	0~1,000	100	ms	P
P10.82	Waiting time of the fourteenth segment	0~10,000	10	ms/s	P
P10.83	Displacement 4 HSBs (decimal) of the fifteenth segment	-9,999~9,999	0	\	P
P10.84	Displacement 4 LSBs (decimal) of the fifteenth segment	-9,999~9,999	5,000	\	P
P10.85	Speed of the fifteenth segment	0~3,000	500	rpm	P

P10.86	Acceleration and deceleration time of the fifteenth segment	0~1,000	100	ms	P
P10.87	Waiting time of the fifteenth segment	0~10,000	10	ms/s	P
P10.88	Displacement 4 HSBs (decimal) of the sixteenth segment	-9,999~9,999	0	\	P
P10.89	Displacement 4 LSBs (decimal) of the sixteenth segment	-9,999~9,999	5,000	\	P
P10.90	speed of the sixteenth segment	0~3,000	500	rpm	P
P10.91	Acceleration and deceleration time of the sixteenth segment	0~1,000	100	ms	P
P10.92	Waiting time of the sixteenth segment	0~10,000	10	ms/s	P

Group P11: Parameters of Multistage Speed Function

P11.00	Multi-stage speed instruction operation mode	0~2	0	\	S
P11.01	End segment selection of the speed command	1~8	8	\	S
P11.02	Runtime unit selection	0~2	0	\	S
P11.03	Acceleration time 1	0~10,000	50	ms	S
P11.04	Deceleration time 1	0~10,000	50	ms	S

P11.05	Acceleration time 2	0~10,000	100	ms	S
P11.06	Deceleration time 2	0~10,000	100	ms	S
P11.07	Acceleration time 3	0~10,000	1,000	ms	S
P11.08	Deceleration time 3	0~10,000	1000	ms	S
P11.09	The first segment speed	-3,000~3,000	10	rpm	S
P11.10	Runtime of the first segment speed	0~30,000	100		S
P11.11	ACC/DEC time selection of the first segment	0~3	0		S
P11.12	The second segment speed	-3,000~3,000	100	rpm	S
P11.13	Runtime of the second segment speed	0~30,000	100		S
P11.14	ACC/DEC time selection of the second segment	0~3	1		S
P11.15	The third segment speed	-3,000~3,000	500	rpm	S
P11.16	Runtime of the third segment speed	0~30,000	100		S
P11.17	ACC/DEC time selection of the third segment	0~3	2		S
P11.18	The fourth segment speed	-3,000~3,000	1,000	rpm	S
P11.19	Runtime of the fourth segment speed	0~30,000	100		S

P11.20	ACC/DEC time selection of the fourth segment	0~3	3		S
P11.21	The fifth segment speed	-3,000~3,000	2,000	rpm	S
P11.22	Runtime of the fifth segment speed	0~30,000	100		S
P11.23	ACC/DEC time selection of the fifth segment	0~3	0		S
P11.24	The sixth segment speed	-3,000~3,000	1,000	rpm	S
P11.25	Runtime of the sixth segment speed	0~30,000	100		S
P11.26	ACC/DEC time selection of the sixth segment	0~3	0		S
P11.27	The seventh segment speed	-3,000~3,000	500	rpm	S
P11.28	Runtime of the seventh segment speed	0~30,000	100		S
P11.29	ACC/DEC time selection of the seventh segment	0~3	0		S
P11.30	The eighth segment speed	-3,000~3,000	100	rpm	S
P11.31	Runtime of the eighth segment speed	0~30,000	100		S
P11.32	ACC/DEC time selection of the eighth segment	0~3	1		S

Chapter VI Specified Function Introduction

6.1 Basic Function (Group P00)

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.00	Password	Power up effective	0~9,999	-	370

Function Description:

The passwords are set to prevent unauthorized people to read the setting parameters and illegally modify them. After the power up of control power, the parameters can be read and modified only after inputting correct passwords under this function code. User password is 365.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.01	Selection of LED initial display status	Power up effective	0~25	-	0

Function Description:

The LED initial display contents after the power up of setting drive. The functions corresponding to setting values are as follows:

0: Motor rotate speed
1: Current control mode
2: Drive model
3: Software version
4: Current position with 4 levels low
5: Current position with 4 levels high
6: Position command with 4 levels low
7: Position command with 4 levels high
8: Position deviation with 4 levels low
9: Position deviation with 4 levels high
10: Actual torque of motor
11: Actual current of motor
12: High-order status of input terminal
13: Low-order status of input terminal
14: Status of output terminal
15: Pulse frequency of position command
16: Speed command
17: Torque command
18: Input signal of encoder UVW
19: Code display of fault alarm
20: Absolute position of motor rotor
21: Encoder zero calibration pulse

22: Motor torque current
23: Instantaneous braking power
24: Long-time average braking power
25: Motor model

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.02	Control mode selection	Immediately effective	0~6		0

Function Description:

Select servo system control mode. The meanings of setting values are as follows:

0: Position control mode
1: Analog speed control mode
2: Torque control mode
3: Internal speed control mode
4: Speed commissioning mode
5: JOG commissioning mode
6: Manufacturer mode

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.03	Position loop gain	Immediately effective	1~2,000	Hz	100

Function Description:

Set the proportional gain of position loop PI regulator. The responsiveness of the position control system is decided by setting value. A larger setting value determines higher gain and greater rigidity. Under the same frequency of command pulse, a larger setting value determines smaller position hysteresis. But an overlarge setting value may cause oscillation or overshooting.

Please determine the setting values based on specific models of servo drives and motor and load conditions.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.04	Speed feed-forward gain of position loop	Immediately effective	0~100	%	0

Function Description:

Set the speed feed-forward gain of position loop. When the setting value is 100%, this indicates that under the command pulse of any frequency, the position hysteresis is always 0. The feed-forward gain of position loop is higher and the high-speed responsiveness is developed, but a shock may be caused. When the setting value is 0, the position feed-forward function does not work.

Except that the higher responsiveness is needed, the feed-forward gain of position loop is always set as 0.

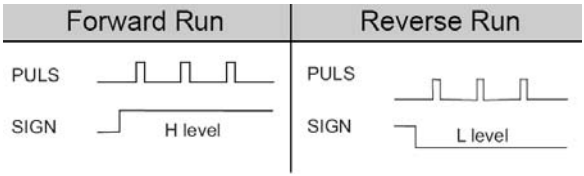
Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.05	Input mode of command pulse	Power up effective	0~2	-	0

Function Description:

Set the input mode of command pulse. Three kinds of command pulse modes can be set:

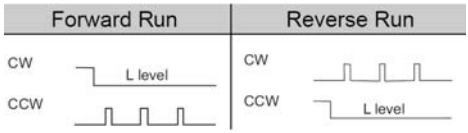
0: pulse + Direction signal

Input pulse signal into PULS port and direction signal into SIGN port.



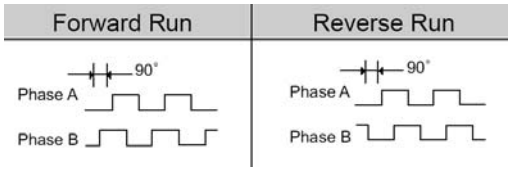
1: CCW pulse + CW pulse

Input CCW pulse signal into PULS port and CW pulse signal into SIGN port.



2: Two-phase pulse (Phase A + Phase B)

Input Phase A into PULS port and Phase B into SIGN port.



Note: The actual rotate direction of motor is related to the setting of Parameter P00.06 (rotate direction selection).

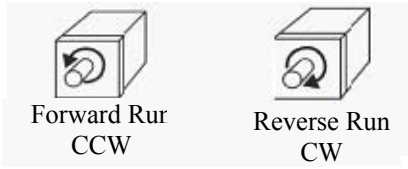
Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.06	Rotate direction selection	Power up effective	0~1	-	1

Function Description:

Set the relation between the command direction and motor rotate direction. This parameter is effective to the position control, speed control and torque control.

1: When in positive direction command, the motor rotate direction is CCW (Seen from the axle of the motor, it is counter-clockwise direction).

0: When in positive direction command, the motor rotate direction is CW (Seen from the axle of the motor, it is clockwise direction).



Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.07	Smoothing filter coefficient of position command	Immediately effective	0~4,095	\	0

Function Description:

Set the smoothing filter coefficient of position command. The filter would not lose the input pulse, but there may be a command delay phenomenon. This filter can give the servo motor a more stable running status and is more effective in the following situations:

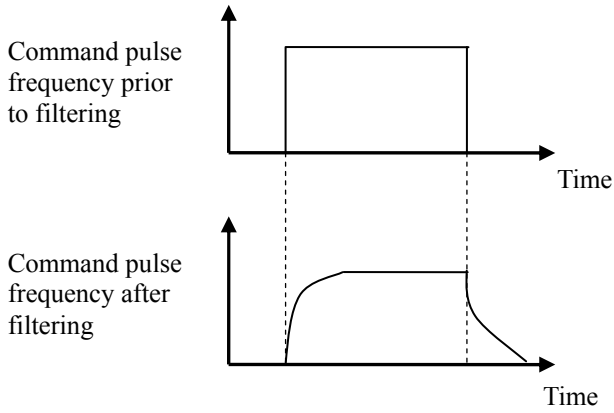
(1) Host controller does not have the deceleration function;

(2) the electronic gear ratio is above 10 times;

(3) the command frequency is lower;

(4) There are phenomena like stepping jump and unbalance during the running of motor.

When set as 0, filter doesn't work.



Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.08	Speed loop gain	Immediately effective	5~1,000	Hz	--

Function Description

Set the proportional gain of the speed loop. The responsiveness of the speed loop would be determined by this parameter.

A larger gain setting value of the speed loop determines higher speed control responsiveness of the system. In the general condition, a larger loading inertia determines larger setting value. Under a system without any shocks, the gain value shall be set larger as much as possible.

The responsiveness and rigidity of the speed loop are also influenced by the Parameter P00.09.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.09	Integration time constant of speed loop	Immediately effective	1~1,000	ms	20

Function Description:

Set the integration time constant of speed loop. The responsiveness of the speed loop would be determined by this parameter.

A smaller setting value determines faster integrating rate and greater rigidity of system. Without the system vibration, a smaller integration time constant shall be set as much as possible.

The responsiveness and rigidity of speed loop are also influenced by parameters P00.08.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.10	Coefficient of speed detection low-pass Filter	Immediately effective	1~100	%	80

Function Description:

Set the characteristic of speed detection low-pass filter.

A greater setting value determines lower cut-off frequency and lower electric motor noise. If the load inertia is large, the setting value can be increased appropriately.

However, the overlarge value would result in a slower response, and may cause an oscillation.

A smaller setting value determines higher cut-off frequency and faster speed response. If a higher speed response is required, the setting value can be reduced appropriately.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.11	Speed command low-pass filter coefficient	Immediately effective	0~100	%	100

Function Description:

Set the characteristic of speed command low-pass filter. It is effective for speed control mode and position control mode.

A greater value determines slower speed response; a smaller value determines faster speed response. The setting value 0 means the low-pass filter is invalid.

If the drive and external position loop are used in combination, this parameter shall be set as 0.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.12	Torque command low-pass filter coefficient	Immediately effective	0~100	%	65

Function Description:

Set the characteristic of torque command low-pass filter.

The setting of this parameter can restrain the resonance (the sharp vibration noise generated by the motor) generated by torque. This parameter is effective for the position control mode, speed control mode, and torque control mode.

If the motor generates sharp vibration noise, this parameter setting value shall be increased. A greater setting value determines lower cut-off frequency, smaller motor noise, lower system rigidity and slower system response.

A smaller setting value determines higher cut-off frequency, faster system response and higher system rigidity. If higher machine rigidity is required, the setting value shall be reduced appropriately. If the setting value is 0, the torque command low-pass filter is invalid.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.13	Control bit of over-travel limit	Power on effective	0~1	-	1

Function Description:

Set the valid of external input over-travel limit switch input.

0: positive over-travel limit (P-OT), negative over-travel limit (N-OT) input is valid.

1: positive over-travel limit (P-OT), negative over-travel limit (N-OT) input is invalid.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.14	Programmable I/O selection	Power on effective	0~1	-	0

Function Description:

The auxiliary setting of programmable I/O function.

When the input signal of programmable I/O needs to be set to the positive/negative start function under the analog speed mode, this parameter value shall be set as 1.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.15	Parameter of CPLD	Power on effective	0~7	-	0

Function Description:

Set CPLD parameter. This parameter value depends on host numerical control system, and decides the pulse counting method and the initial pulse level.

setting value	Up-down Count Pulse Edge	Ops Inverse of input pulse level	Side-mode Type of CNC
0	0 positive edge	0 unchanged	0 General system
1	0 positive edge	0 unchanged	1 Siemens system
2	0 positive edge	1 negative	0 General system
3	0 positive edge	1 negative	1 Siemens system
4	1 negative edge	0 unchanged	0 General system
5	1 negative edge	0 unchanged	1 Siemens system
6	1 negative edge	1 negative	0 General system
7	1 negative edge	1 negative	1 Siemens system

Normally, choosing the general system could be suitable for pulse form of most numerical control system, while the Siemens system is only for some models of Siemens numerical control system.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P00.16	Parameter initialization	Power up effective	0~2	-	0

Function Description:

0: No operation

1: All parameters except parameters of servo motor are initialized to their default values. Set the parameters to 1 and press confirm button. Then the system will begin to restore its default value. The LED is showing ‘start’ at first, when it’s turning into ’done’, the operation has been successfully completed and all the default values of

parameters have been written to EEPROM. The system will use factory set values after being powered up again.

2: Start the operation of save the overall parameters into EEPROM. During this operation, all the parameters currently kept in RAM will be written to EEPROM for saving.

6.2 Auxiliary Operation (Group P01)

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.00	Speed trial operation function	Immediately effective	-	-	0

Function Description

Enter this parameter and press SET button, then you can access into the speed commissioning interface. The servo drive will settle into forced enabled state and the servo motor is powered. Refer to Section 4.1.3 for detailed operation.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.01	JOG trial operation function	Immediately effective	-	-	0

Function Description:

Enter this parameter and press SET button, then you can access into the JOG commissioning interface. The servo drive will settle into forced enabled state and the servo motor is powered. Refer to Section 4.1.3 for detailed operation.

The rotate speed command of JOG commissioning is set by parameter P05.01.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.02	Limit value of software over current	Immediately effective	0~900	0.1A	--

Function Description:

Set current value for software over-current protection.

The default is in consistency with the over-current value of drive's hardware. If users want to use software over current protection function, he or she can set it according to the actual needs and use it together with parameter P01.03 (allow time limit for overcurrent).

The set value of this parameter shall be less than or equal to 5 times of motor rated current, to avoid the system error.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.03	Permitted overcurrent time	Immediately effective	1~5,000	ms	4,000

Function Description:

Set actuation time for software overcurrent protection. The values of this parameter and parameter P01.02 will determine the characteristic of software overcurrent protection of servo drive system.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.04	Limit value of times of alarm reset	Power up effective	1~20	-	5

Function Description:

Set the maximum permitted number for fault clearance. The set value regulates the maximum permitted number for operating the fault clearance signal. If the number of operation is over the set value and fault alarm occurs again, then it just can be cleared via power-off restart.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.05	Numerator of dividing ratio for encoder pulse output	Power up effective	1~7	-	1
P01.06	Denominator of dividing ratio for encoder pulse output	Power up effective	1~32	-	1

Function Description:

Set the dividing ratio for encoder pulse output.

Frequency of encoder output pulse= Incoming frequency of encoder pulse× (P01.05) ÷ (P01.06)

Note: In current version, only division in integral multiples can be outputted, which means the set value of P01.05 is invalid and the set value is fixed as 1.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.09	Control bit for holding brake and servo-ready signals	Immediately effective	0~1	-	0

Function Description:

This parameter set the logical relation between the holding brake output and servo-ready (S-RDY) signal.

0: When servo-ready signal S-RDY is outputted, the holding brake signal must not be outputted.

1: When servo-ready signal S-RDY is outputted, the holding brake signal must be outputted too.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.10	Detection speed for motor standstill	Immediately effective	0~1,000	rpm	5
P01.11	Delay time for holding brake released to servo-off	Immediately effective	0~2,000	ms	500
P01.12	Detection speed for Holding brake released	Immediately effective	0~3,000	rpm	100
P01.13	Delay time for servo-off to holding brake released	Power up effective	0~2,000	ms	0

Function Description:

The above parameters set holding brake (electromagnetic brake) action sequence.

P01.10:

This parameter sets the speed detection value for the purpose to judge if the motor is standstill. The setting value is used only for holding brake control. When actual speed of motor is below this setting, the motor is judged to be standstill, conversely the motor is judged to be in operation.

P01.11:

This parameter sets the delay time for holding brake released to servo off.

This parameter prevents tiny displacement or falling down of work piece due to motor shaft's movement during brake action. Setting value should be slightly greater than the mechanical brake's delay time.

P01.12:

This parameter sets the speed of running motor to activate holding brake., this parameter setting value should be greater than P01.10 setting value.

This parameter is to make the motor speed down to a low speed and then make the brake action to avoid damaging the brake.

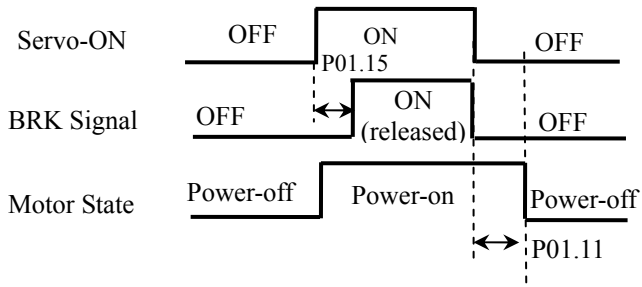
P01.13:

This parameter sets the waiting time from motor disenabled to brake action. This parameter is to make the motor speed down to a low speed and then make the brake action to avoid damaging the brake.

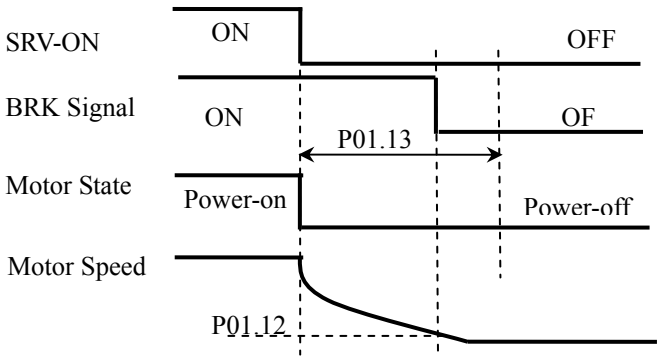
The actual action time of the brake is subject to the first meet the conditions of time in P01.12 and P01.13.

The brake action sequence diagram:

- The motor is in the stopping state (that the actual motor speed is lower than P01.10 setting value), the brake action sequence is as follows:



■ The motor is in the running state (that the actual motor speed is more than P01.10 setting value), the brake action sequence is as follows:



Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.14	Z pulse broadening width	Power up effective	0~31	1.6μs	0

Function Description:

Setting the zero Z pulse output broadening width.

With the motor speed increasing, Z pulse width becomes narrow. This parameter can adjust Z pulse output width to match with the demand of host controller.

Z pulse broadening width = setting value ×1.6μs

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.15	Delay time for servo-on to holding brake released	Immediately effective	0~2000	ms	0

Function Description:

Setting the delay time from servo-on to holding brake released.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.16	Brake resistor external selection	Power up effective	0~1	-	0

Function Description:

The default value is 0, namely to choose internal braking resistor. Choose external braking resistor for 1.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.17	Power of external brake resistor	Power up effective	100~10,000	W	Related to the capacity of drive.

Function Description:

There is a standard built-in braking resistor in the drive. See its specification in the related contents of appendix in this manual. It requires the external braking resistor when the specification of built-in braking resistor can't meet the requirements of actual working condition. The parameter should be set at P01.16 =1, then the external braking would be chosen. The power and resistance value of external resistor should be written in P01.17 and P01.18 respectively.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P01.18	Resistance value of the external brake resistor	Power up effective	12~500	Ω	Related to the capacity of drive.

Function Description:

Refer to P01.17 for description.

6.3 Monitor and Display (Group P02)

Refer to Section 3.3 for function description about monitor and display.

6.4 I/O and Analog Control (Group P03)

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.00	DO1 function and enabled status setting	Power up effective	0~3 256~259	-	0

Function Description:

Setting the function and enabled status of open collector OC output DO1..

The setting value can be obtained by adding enabled status settings and output function settings together. If the setting value is not in the setting range, the system will retain the last one.

Enabled status setting value:

0: Active High (Factory Defaults) 256: Active Low

Output Function Setting:

0: Servo Ready (S_RDY) 1: Servo Alarm (S_Alarm)

2: positioning completed/speed arrived (P_CMP/V_CMP 3: Home

Examples for setting:

The output function wants to be set to servo alarm and active low, then the setting value is 1+256=257.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.01	D02 function and enabled status setting	Power up effective	0~3 256~259	-	1

Function Description:

Refer to P03.00 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.02	D03 function and enabled status setting	Power up effective	0~3 256~259	-	2

Function Description:

Refer to P03.00 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.03	DO4 function and enabled status setting	Power up effective	0~3 256~259	-	3

Function Description:

Refer to P03.00 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.04	DI1 function and enabled status setting	Power up effective	0~20 256~276	-	0

Function Description:

Setting of function and enabled status of digital input DI1. The setting value can be obtained by adding enabled status settings and function setting together. If the setting value is not in the setting range, the system will retain the last one.

Enabled status setting value:

0: Active High　　256: Active Low

Setting Value of Input Function:

0: Servo Enabling (S-ON)　　1: Alarm Reset (ALM-RST)

2: Negative Over-travel Limit (N-OT)　　3: Positive Over-travel Limit (P-OT)

4: Deviation Counter Reset (CLR)　　5: Pulse Inhibit (PINH)

6: the second electronic gear ratio (GEAR2)　　7: Spare

8: Spare	9: Zero Speed Clamp in Analog speed Mode (ZCLAMP)
10: direction in Internal Speed Mode	11: direction in Analog speed Mode
12: Spare	13: Positive Start in Analog speed Mode
14: Negative Start in Analog speed Mode	15: Multi-Stage Operation Option 1 (CMD1)
16: Multi-Stage Operation Option 2 (CMD2)	17: Multi-Stage Operation Option 3 (CMD3)
18: Multi-Stage Operation Option 4 (CMD4)	19: Origin Search Enable (**SHOM**)
20: Origin Switch Signal (**OrgNear**)	

Examples for setting:

The input function should be set to negative over-travel limit, active-low and the setting value is 2+256=258

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.05	DI2 function and enabled status setting	Power up effective	0~20 256~276	-	1

Function Description:

Refer to P03.04 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.06	DI3 function and enabled status setting	Power up effective	0~20 256~276	-	2

Function Description:

Refer to P03.04 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.07	DI4 function and enabled status setting	Power up effective	0~20 256~276	-	3

Function Description:

Refer to P03.04 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.08	DI5 function and enabled status setting	Power up effective	0~20 256~276	-	4

Function Description:

Refer to P03.04 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.09	DI6 function and enabled status setting	Power up effective	0~20 256~276	-	5

Function Description:

Refer to P03.04 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.10	DI7 function and enabled status setting	Power up effective	0~20 256~276	-	6

Function Description:

Refer to P03.04 for function description.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.11	Zero deviation calibration for analog input	Immediately effective	0~1	-	1

Function Description:

Set the auto zero calibration for analog input. This setting is valid when Analog Speed Control mode or Torque Control mode is set in P00.02.

0: Start the Analog input Auto Zero Calibration (Make sure the actual analog input is zero prior to start auto zero calibration).

System will automatically check the analog input, and save the measured value in P03.12. Entering function code P03.12 and pressing SET button to save the measured value into EEPROM is needed. Only one auto zero calibration will be operated during each time when power up.

(After auto zero calibration is done, the set point must be 1, or otherwise exceptions will occur during power up next time).

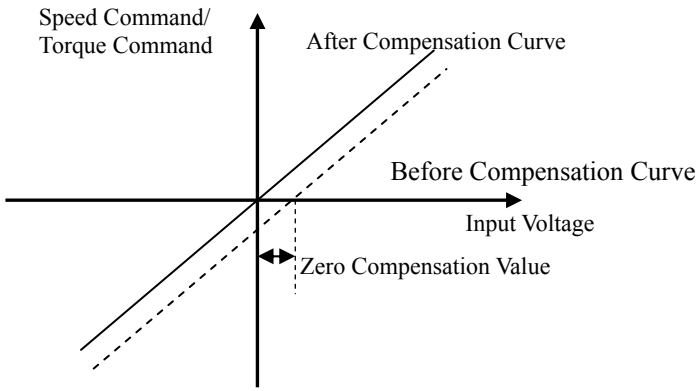
1: Analog Auto Zero Calibration Invalid

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.12	Analog input zero compensation value	Immediately effective	-5.000~+5.000	0.001V	0.01

Function Description:

Set the Analog Input Zero Compensation value. The setting is applying to Analog Speed Control Mode and Analog Torque Control Mode.

The Zero Compensation value can be acquired by operating the Analog Auto Zero Calibration in P03.11, and also it can be acquired by manual settings. The displaying of Zero Compensation value will be voltage style, which displayed three decimal places.



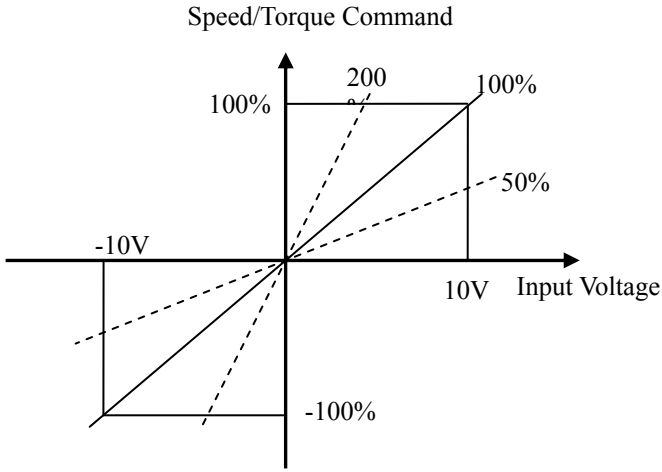
Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.13	Analog input gain	Immediately effective	0~500	%	100

Function Description:

In the analog speed control mode, it describes the proportional relationship between the set motor speed command value and rotation command input voltage.

In the torque control mode, it describes the proportional relationship between the set motor torque command value and torque command input voltage.

When the set value is 100%, the ±10V voltage is corresponding to motor rated speed, or motor rated torque.



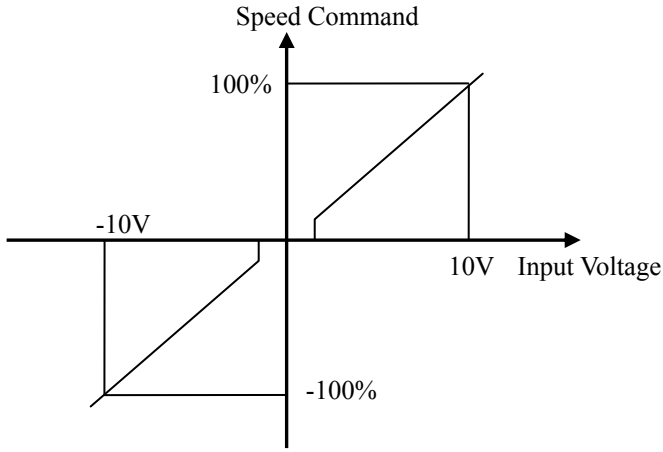
Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P03.14	Threshold of analog input hysteresis	Immediately effective	-5.000~5.000	0.001V	10

Function Description:

Set the Analog input hysteresis threshold. The parameter is effective in analog speed control mode and torque control mode.

1. In the analog speed control mode, only the given analog signal is above the 1.5x threshold that motor will rotate (the motor is locked-up before), and when the analog input is below the 0.5x threshold, the motor will be locked.

By proper setting this parameter, the function of zero speed clamp can be achieved.



2. In the torque control mode, it has the similar function in speed mode. Please be careful while using!

6.5 Position Control Parameters (Group P04)

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P04.00	Position command source	Power up effective	0~1	-	0

Function Description:

Set position command source.

0: Pulse setting. The position command originates from the pulse signals of PULS and SIGN ports of I/O. There are three kinds of pulse input modes of position command: pulse + direction command, CCW + CW, quadrature Encoder A/B Pulse. The pulse input modes are set by Parameter P00.05.

1: Internal memory setting: refer to the latter function parameter Group P10 of multi-stage position.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P04.01	Speed feed-forward low-pass filter coefficient	Immediately effective	1~4,095	Hz	1

Function Description:

Set the low-pass filter coefficient of speed feed-forward of position loop.

Appropriate use can increase the stability of the composite position control.

(Composite position control refers to the position control adopting speed feed-forward)

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P04.02	Positioning completed width	Immediately effective	0~30,000	Pulse	100

Function Description:

Set the pulse range of positioning complete under position control.

Under the position control mode, when the remaining pulses in the position deviation counter less than or equal to the setting value of this parameter, the drive identifies that the positioning has been completed and outputs the positioning complete signal (P_CMP).

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P04.03	Detection range of over position error	Immediately effective	0~30,000	100 pulses	0

Function Description:

Set detection range of over position error. Each unit corresponds to 100 encoder feedback pulses.

Under the position control mode, when the value of position error counter exceeds this parameter, the servo drive would output over position error alarm signal.

When set as 0, the position error detection is invalid.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P04.04	Numerator of the first electronic gear ratio	Power up effective	1~32,766	-	5
P04.05	Denominator of the first electronic gear ratio	Power up effective	1~32,766	-	3
P04.06	Numerator of the second electronic gear ratio	Power up effective	1~32,766	-	10
P04.07	Denominator of the second electronic gear ratio	Power up effective	1~32,766	-	3

Function Description:

Set electronic gear ratio.

Under the position control mode, conduct frequency doubling or frequency division on position command pulse to conveniently match with different position command pulse sources, thus the pulse resolution needed by users can be realized (i.e. angle/pulse or pulse command equivalency).

Please refer to Section 4.3.3 for the calculation method of electronic gear ratio.

The switch of electronic gear ratio is controlled by the second electronic gear ratio (GR2) signal input from external digital input.

The recommended range of electronic gear ratio is $1/50 \leq G \leq 50$.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P04.08	Coefficient of Moving Average Filter for position command	Power up effective	0~500	-	0

Function Description:

Position command moving average filtering function refers to that conduct the moving filtering averagely (MAF) on position command input to make the servo motor run more smoothly. This function is more effective in the following situations:

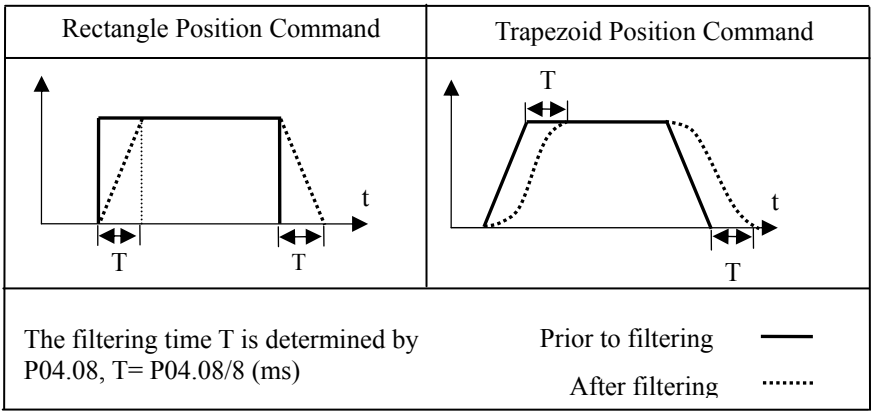
(1) Host controller does not have the deceleration function;

(2) The electronic gear ratio is above 10 times;

(3) The command pulse frequency is lower;

(4) There are phenomena like stepping jump and unbalance during the running of motor.

When set as 0, filter doesn't work.



6.6 Speed Control Parameters (Group P05)

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.00	Speed command source	Power up effective	0~1	-	0

Function Description:

Set the speed command source under speed control mode (including analog speed mode and internal speed mode).

0: port setting. Set by external analog value or switching value switch.

1: (Reserved).

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.01	Speed for JOG operation	Immediately effective	-3,000~3,000	rpm	120

Function Description:

Set the motor speed under JOG commissioning mode.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.06	Speed limit	Immediately effective	0~6,000	rpm	--

Function Description:

Set the maximum speed limit value of motor (unrelated to direction).

If the setting maximum speed limit value is higher than the rated speed of motor, the actual maximum speed limit value is the rated speed of motor.

The setting value of this parameter is also the maximum speed limit value under torque mode.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.07	Reached speed	Immediately effective	5~3,000	rpm	50

Function Description:

Set the speed threshold of reaching speed detection.

Under the non-position control mode, if the difference value between setting speed and feedback speed of motor is smaller than this setting value, the speed reaching signal (S_CMP) will be outputted. The speed reaching judgment has hysteresis function.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.08	Threshold for over speed error detection	Immediately effective	0~100	rpm	0

Function Description:

Set the speed error detection threshold.

Under the speed control mode, when the value of speed deviation exceeds the setting value of this parameter and the duration exceeds the time set by Parameter P05.09, the servo drive will give over speed error alarm.

When the setting value is 0, the over speed error alarm function is closed.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.09	Permitted time for over speed error detection	Immediately effective	0~30,000	ms	5,000

Function Description:

Set the allowed time of over speed error.

When the value of speed deviation exceeds the setting value of P05.08 and the duration exceeds the time set by this parameter, the servo drive would give over speed error alarm.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.10	Deceleration ramp time of speed command	Immediately effective	0~16,000	ms	10
P05.11	Acceleration ramp time of speed command	Immediately effective	0~16,000	ms	10

Function Description:

Set the deceleration and acceleration time of speed command signal.

The setting values correspond to the decoration and acceleration time from zero speed to rated speed of the motor. This is effective only in the speed control mode.

This parameter is used to convert speed command signal of larger changes (such as step signal) into smoother speed commands, thus the jump or violent vibration of the motor is prevented from harming the mechanical parts.

This parameter is generally set as 0 to reach the fastest speed responsiveness.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P05.12	Zero speed clamping selection	Immediately effective	0~1	-	0
P05.13	Allowed time of zero speed clamping	Immediately effective	1~2,000	ms	100

Function Description:

Under the analog speed control mode, input a zero clamping signal (ZCLAMP) while the analog value is set as 0 and after a delay period (zero speed clamping allowed time P05.13), the servo system enters the state of zero-speed-locking.

P05.12: Zero speed clamping selection

When set as 0, the zero speed clamping function is effective; while set as 1, the zero speed clamping function is invalid.

6.7 Torque Control Parameters (Group P06)

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P06.00	Internal CCW torque limit	Immediately effective	0~300	%	150
P06.01	Internal CW torque limit	Immediately effective	-300~0	%	-150

Function Description:

Set the servo motor internal torque limit values in CCW (positive) and CW (negative) direction. The setting value is the percentage of rated torque of the motor.

The set limit value is effective in internal speed control mode (P00.02=3).

If the set value is over the permitted maximum overload capacity of the system, the limit to actual torque will be the permitted maximum overload capacity of this system.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P06.02	External CCW torque limit	Immediately effective	0~300	%	150
P06.03	External CW torque limit	Immediately effective	-300~0	%	-150

Function Description:

Set the servo motor external torque limit values in CCW (positive) and CW (negative) direction. The setting value is the percentage of rated torque of motor.

The set limit value is effective in modes of position control, analog speed control and torque control.

The actual torque limit is the minimum value of maximum of overload capacity permitted by system, internal and external torque limit.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P06.04	Torque limit for trial operation	Immediately effective	0~300	%	100

Function Description:

Torque limits set under speed trial operation and JOG trial operation modes. This function is effective in both directions.

Set value is the percentage of rated torque of motor. The internal/ external torque limits are still effective.

6.8 MODBUS Communication (Group P07)

Function Code	Parameter Name	Function Description	Setting Range	Factory Defaults
P07.00	Baud rate selection	0: 1,200 bps 1: 2,400 bps 2: 4,800 bps 3: 9,600 bps	0~3	3

Note:

Communication rate of servo drive shall be the same as that of upper computer, or the communication cannot be established

P07.01	Native address	The function code is used to identify the address of this drive	0~31	1

Function Description:

You can appoint the drive address through P07.01 function code. When more than one servo drives participate in networking, the addresses of themselves must be unique. If not, it can lead to communication error or abnormity.

P07.02	Parity selection	0: even parity 1: odd parity 2: no parity	0~2	0

Function Description:

When you choose even parity or odd parity, the actual bits of every byte is 11. Among them, the one is start bit, 8 data bits, 1 check bit and 1 stop bit. When you choose no parity, the actual bits of every byte are also 11. 1 start bit, 8 data bits and 2 stop bits.

P07.03	Spare			
P07.04	Spare			

Function Description:

Standby parameters

P07.05	EEPROM saving mode for communication data	0: no deposit in EEPROM 1: direct deposit in EEPROM	0~1	0

Function Description:

The value of function codes may often be modified when communication is used. Many save values of function codes in EEPROM will be updated while the function codes' value has been changed. Frequent erasing and writing on EEPROM will reduce its service life. When there's no need to save function data via communication, we can set P07.05 to 0 to prohibit saving data to EEPROM to prolong its service life. .

Please refer to the relevant instructions in attachment to see the application methods of MODBUS Communication.

6.9 Parameters of Origin Search and Multistage Position (Group P10)

Origin Search Function Setting

(1) Function Description

The origin search function in position mode (P00.02=0) refers to the origin searching function accomplished by the servo driver. . The process of origin search as shown below is divided into two stages:

(a) When the origin search function of servo driver is enabled in servo on condition, the motor can search the decelerating point in the direction of deceleration point target at specified high search speed (P10.03) under the origin search mode（P10.02）. Then slow down at given deceleration time (P10.05) to zero speed after meeting the rising edge of origin switch signal (OrgNear).

(b) The motor searches the position of origin switch signal (OrgNear) at given low search speed (P10.04) in negative direction of high search speed. Search will be stopped suddenly when it meets the falling edge of origin switch. It indicates that the origin search is done and the completion signal (Home) is outputted. If it could not find the origin position in specified time (P10.06), it will report the time-out error of origin search.

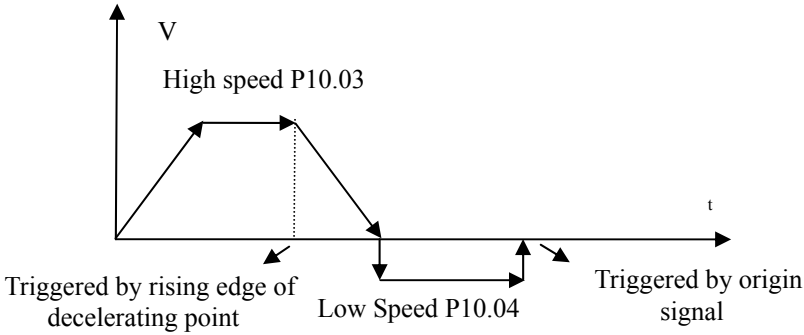


Diagram of the Origin Search Process

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.00	Action selection after origin search	Power up effective	0~1	-	0

Function Description:

Set the motion pattern after origin search is completed in position mode.

0: Perform the internal position instruction immediately after origin resets.

1: Do not perform the internal position instruction after origin resets.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.01	Enable control of the origin search	Immediately effective	0~2	-	0

Function Description:

Set the enabling conditions of origin search.

0: Shut down the origin search function.

1: Enable the origin search function by starting the origin search signal SHOM through digital input.

2: Enable the origin search function immediately after powering up and enabling the drive (in position mode).

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.02	The origin search mode	Immediately effective	0~3	-	0

Function Description:

Set the origin search action mode.

0: Positive search. Both deceleration point and original point are the origin switch signal (**OrgNear)**.

1: Negative search. Both deceleration point and original point are the origin switch signal (**OrgNear**).

2: Positive search. Both deceleration point and original point are Z signal of motor.

3: Negative search. Both deceleration point and original point are Z signal of motor.

Caution: the 'origin search enabling control' of parameter P10.01 can only be set as 1 to perform the origin search for many times in the condition that the drive is not power down. Enable the origin search through inputting the SHOM signal by DI. It is considered that the origin search is not finished if DI is in invalid state. And internal position command is invalid. One requirement for running the internal position after the origin search is finished is triggering DI of origin search and keeps it in valid state. If it is necessary to perform the origin search again after finished, the valid state of DI should turn into invalid state, and then turn into valid state.

Multi-Stages Position Function Setting

(1) Function Description

The multistage position function under position control mode (P00.02=0) refers to the position operation function accomplished by the driver based on internal stored 16 groups position related control parameters. Through using internal multi-stage position

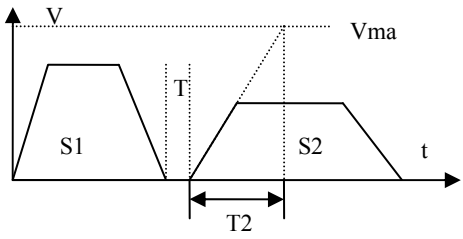
function, user can easily realize automatic multi-stage fixed-length operation, or through external inputting DI signal can realize the preset position control function. Because it is controlled by internal parameters, there is no need for external pulse command. The proper usage of this function can realize multi-point trajectory planning.

Using multi-stage position function, when enabling signal S-ON effective the drive runs at setting program, enabling signal invalid then stop running immediately. If it is in the process of execution stage internal position instruction, the enabling becomes invalid, and the enabling signal becomes effective drive again then based on the preset processing mode for residual command (P10.10) to choose from n+1 stage (P10.10=0) and continue to perform unfinished internal position stage or from stage 1 (P10.10=1) and start perform preset internal position instruction again.

There are four different internal positions operation modes:

▲ Single Sequence Operation Mode:

Under the situation that the enabling signal is effective, only to run setting internal position stage number once. If it needs running several times, it can make enabling effectively again after running only once. This mode can realize multi-point trajectory planning. Through the choice of P10.10 processing mode for residual command, user can set the operation mode of servo enabled again after interruption of servo enable signal.

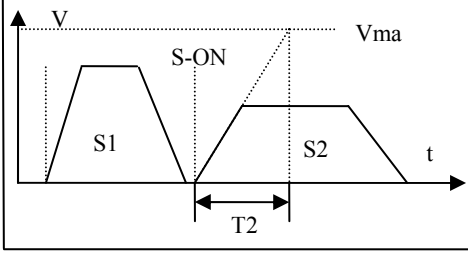
Mode Chart	Note
	**Single Sequence Operation Mode:** Vmax - Max. speed of motor T-Waiting time of Stage 1 T2-Time of ACC/DEC of Stage 2 S1-Displacement of Stage 1 S2- Displacement of Stage 2

▲ Cyclic Operation Mode:

This mode is similar to the single sequence operation mode; however, it will run in cycle from the beginning when running again until the enable signal turns into invalid. The processing mode for residual command is as same as the single sequence operation mode.

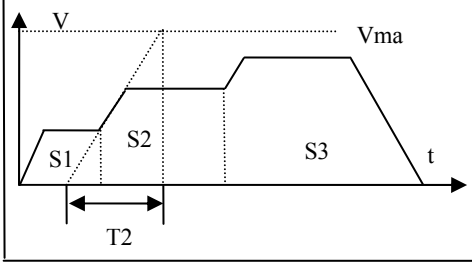
▲ DI Switching Operation Mode:

Trigger and change the stage for running by external digital input. One stage will be in run as enabling signal S-ON varies from invalid to valid once. Segment number of each running is confirmed by the signal combination of CMD1~CMD4 when enable signal changed from invalid to valid state.

Mode Chart	Note
	**DI Switching Operation Mode** Vmax - Max. speed of motor S-ON-Terminal valid by triggering S1, S2-Displacement of selected stage T2-TIime of ACC/DEC of selected stage

▲ Sequential Operation Mode:

The sequential operation mode is similar to the single sequence operation mode but there is not waiting time between the stages. This mode will start running at maximum speed of previous stage. The total displacement of overall sequential operation will be consistent with the setting.

Mode Chart	Note
	**Sequential Operation Mode** Vmax - Max. speed of motor T2-Time of ACC/DEC of Stage 2 S1-Displacement of Stage 1 S2- Displacement of Stage 2 S3- Displacement of Stage 3

Note: there are 32 displacement instructions of multi-stages position, such as P10.13 and P10.14. Select the relative displacement or absolute displacement by P10.11. Both relative displacement and absolute displacement should consider the electronic gear ratio. When P10.11=0 is chosen, the displacement instruction means the increased

displacement at current position. When P10.11=1 is chosen, the displacement instruction means the absolute position based on the original point.

(2) Explanation of Main Parameters

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.08	Internal position operation mode selection	Immediately effective	0~3	-	0

Function Description:

Set internal position operation mode. You can set four different operation modes.

0: **Single Sequence Operation Mode**: start running stages set by P10.09 from Stage 1 and the setting waiting time of each stage is used for the switch between two stages.

1: **Cyclic Operation Mode**: start running stages set by P10.09 from stage 1 repeatedly and the setting waiting time of each stage is used for the switch between two stages.

2: **DI Switching Operation Mode**: running stage is chosen by external digital input (CMD - CMD4), each stage's speed, acceleration and deceleration time and displacements are determined by the selected stage parameters. See the next section for signal distribution. (Required external terminal signal of DI mode)

3: **Sequential Operation Mode**: no waiting time between two stages and the starting speed for current stage is determined by the front stage's operation speed.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.09	Effective segments selection	Immediately effective	1~16	-	0

Function Description:

Set the effective maximum segment number for internal position mode, the segments after this number will not be executed. The setting value is void when P10.08=2.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.10	Processing mode for residual command	Immediately effective	0~1	-	0

Function Description:

Set the processing mode for residual position command when enable signal recovery after being interrupted.

0: Continue to run the rest of the segments 1: Start running again from segment 1

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.11	Displacement command type selection	Immediately effective	0~1	-	0

Function Description:

Set the type of internal displacement.

0: Relative displacement instructions 1: Absolute displacement instructions

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.12	Waiting time unit selection	Immediately effective	0~1	-	0

Function Description:

Set time unit for the waiting time value.

0: The unit of the waiting time is ms 1: The unit of the waiting time is s.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.13	Displacement 4 HSBs (decimal) of the first segment	Immediately effective	-9,999~9,999	-	0
P10.14	Displacement 4 LSBs (decimal) of the first segment	Immediately effective	-9,999~9,999	-	5,000

Function Description:

Combine P10.13 with P10.14 to set stage 1 displacement number (pulse number before electronic gear ratio). The 4 HSBs (decimal) of displacement is set by P10.13 and the 4 LSBs is set by P10.14. The total displacement of current segment = (4 HSBs set value) × 10,000+ (4 LSBs set value).
For example, set four figures high value -12 and four figures low value +5,000, the setting total displacement=-12×10,000 + (+5,000) =-115,000.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P10.15	Speed of the first segment	Immediately effective	0~3,000	rpm	500

Function Description:

Set the maximum speed for internal position segment 1..

Note: The setting method for other internal position segments is the same as that for segment 1 described above. See chapter 5 for reference.

(3) Required external signal for DI switching operation mode

Signal name	Function Description	Note
S-ON	Multi-stage position triggering signal	Share with enabling signal
CMD1	Choose 1 for multistage position command	See the table below for the relationship between CMD1~CMD4 signal combination and position instruction segment number.
CMD2	Choose 2 for multistage position command	
CMD3	Choose 3 for multistage position command	
CMD4	Choose 4 for multistage position command	

Table of relationship between CMD1~4 and position instruction segment number:

CMD4	CMD3	CMD2	CMD1	segment number of selected position command
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	5
0	1	0	1	6
0	1	1	0	7
0	1	1	1	8
1	0	0	0	9
1	0	0	1	10
1	0	1	0	11
1	0	1	1	12
1	1	0	0	13
1	1	0	1	14
1	1	1	0	15
1	1	1	1	16

(0 - inactive input; 1 - active input)

6.10 Parameters of Multistage Speed Function (Group P11)

(1) Function Description

The multi-stage speed function under speed control mode refers to the speed operation function accomplished by the driver alone based on the internal stored 8 groups of parameters related to speed control. User can setup maximum 8 speeds through this function and can easily carry out programmable speed operation or speed operation controlled by external digital input. This function is valid when the control mode of driver is set to internal speed control mode (P00.02=3).

(2) Explanation of Main Parameters

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.00	Multi-stage speed instruction operation mode	Immediately effective	0~2	-	0

Function Description:

Set multi-stage speed instruction operation mode. You can set three kinds of operation mode:

0: **single operation mode**. After the enable signal is valid, the driver starts to run one by one segment based on preset total segments and operation time for each segment in order of segment from small to large. The driver will stop when the end segment (set by P11.01) has been finished.

1: **Cyclic operation mode**.. After the enable signal is effective, the driver starts to run one by one segment based on preset total segments and operation time for each segment in order of segment from small to large. The driver will continue to run again from the first segment when the end segment (set by P11.01) has been finished until the enable signal becomes invalid.

2: **DI switching operation mode**. Under this mode, after the enable signal is valid, the driver will run according to the speed selected by external digital input signals CMD1~CMD3 and the running time is not subjected by the preset operation time for each segment.

The relationship between CDM1~CDM3 and speed instruction segment number is as follows:

CMD3	CMD2	CMD1	selected segment number of speed
0	0	0	1
0	0	1	2
0	1	0	3
0	1	1	4
1	0	0	5
1	0	1	6
1	1	0	7
1	1	1	8

(0 - inactive input; 1 - active input)

Note:

◇ In single operation or cyclic operation mode,, under the condition that the power for driver is applied continuously, the driver stops to run once the enable signal becomes invalid and the driver will starts to run from the first segment after the enable signal becomes valid again.

◇ Operation time for each segment can be set through parameters.

◇ In DI switching operation mode, the actual running time for each segment is not subjected by preset operation time for each segment.

◇ There are four ACC/DCC time values between segments available and the default ACC/DCC time is zero. See description of related parameters for reference.

Parameter Function Description:

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.01	End segment selection of the speed command	Immediately effective	1~8	-	0

Function Description:

Set the maximum effective segments for the single and cyclic operation mode. This setting is invalid when the DI switching operation mode is chosen.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.02	Runtime unit selection	Immediately effective	0~2	-	0

Function Description:

Set the unit of operation time for each speed segment.

0: millisecond 1: second 2: minute

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.03	Acceleration Time 1	Immediately effective	0~10,000	ms	50

Function Description:

Set acceleration time 1. Acceleration time is the ramp time that it takes for speed command to rise from zero to rated speed.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.04	Acceleration Time 1	Immediately effective	0~10,000	ms	50

Function Description:

Set deceleration time 1. Deceleration time is the ramp time that it takes for speed command to descend from rated speed to zero speed.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.05	Deceleration Time 2	Immediately effective	0~10,000	ms	100
P11.06	Deceleration Time 2	Immediately effective	0~10,000	ms	100
P11.07	Acceleration Time 3	Immediately effective	0~10,000	ms	500
P11.08	Deceleration Time 3	Immediately effective	0~10,000	ms	500

Function Description:

See the description of P11.03 and P11.04.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.09	The first segment speed	Immediately effective	-3,000~3,000	rpm	10

Function Description:

Set the speed of the first segment.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.10	Runtime of the first segment speed	Immediately effective	0~30,000	ms/s/min	100

Function Description:

Set the run time of first segment speed. The time unit is set in P11.02.

Function Code	Parameter Name	Attribute	Setting Range	Unit	Factory Defaults
P11.11	ACC/DEC time selection of the first segment	Immediately effective	0~3	-	0

Function Description:

Set the selection of ACC/DEC time for the first speed segment.

0: ACC/DEC time for the first segment is 0.

1: ACC/DEC time for the first segment is set by the parameters ‘Acceleration Time 1’ and ‘Deceleration Time 1’.

2: ACC/DEC time for the first segment is set by the parameters ‘Acceleration Time 2’ and ‘Deceleration Time 2’.

3: ACC/DEC time for the first segment is set by the parameters ‘Acceleration Time 3’ and ‘Deceleration Time 3’.

Note: The setting method for other speed segments is the same as that for the first speed segment described above. See Chapter 6 for reference. .

Chapter VII Diagnosis of Malfunctions

7.1 Alarm Display and Description

Table 7-1 Fault Alarm Table

Alarm Code	Alarm Content
Er.IPF	Short circuit and overcurrent on IPM module or the voltage of driving power is too low
Er.OCU	Hardware overcurrent
Er.LU	Undervoltage of busbar
Er.OU	Overvoltage of busbar
Er.IAF	Channel A failure for current sense
Er.IbF	Channel B failure for current sense
Er.OSE	Over Speed error Alarm
Er.OPE	Over Position error Alarm
Er.OCS	Software overcurrent
Er.PoF	Failure to read or write in EEPROM
Er.rLS	UVW combinational logic error (rotor signal loss)
Er.ELS	Encoder disconnection (encoder signal loss)
Er.0LS	Z-pulse loss of encoder (zero signal loss)
Er.OH1	Overheated heatsink
Er.SSr	Saturation alarm of speed regulator
Er.brS	Instantaneous braking power alarm
Er.brL	Long-time average braking power alarm
Er.oL	Overload for motor
Er.ot	Overtime home position return

7.2 Diagnosis of Malfunctions and Correction

Table 7-2 Fault Treatment Approaches

Alarm Code	Operating state	Possible Cause	Processing Methods
Er.IPF	When switched on control power	Circuit board fault	Change servo drives
	During the operation process of motor	Low service voltage	Check drive and power up again, changing drive if the failure didn't disappear
		Overheated drive	
		Short circuit between U, V and W output	Check and correct wiring
		Motor insulation damage	Change motor
		Imperfect earth	Perfect earth
		Disturbed	Add EMC line filter being isolated or away from interference resource
Er.OCU	During the operation process of motor or when starting the drive or when other conditions	Short circuit between drives U, V, and W	Modify wiring
		Wiring error or poor contact to motor cable	Modify wiring or replace motor cable
		Internal short circuit or earth short circuit to motor cable	Replace motor cable
		Internal short circuit or earth short circuit to motor	Maybe it's motor failure, replacing the motor
		Internal short circuit or earth short circuit to drive	Maybe it's drive failure, replacing the drive
		Malfunction caused by noise	Take measures to prevent noise interference, such as perfect earth and appropriate EMC measures.

Alarm Code	Operating state	Possible Cause	Processing Methods
		Servo unit failure	Repair or change drives
Er.LU	Switch on main power and start drive	Voltage of main power is too low, poor contact of power supply lines or power supply capacity is insufficient	Check the power supply and correct failure
		Interrupt power-supply happened to supply voltage	Interrupt and power up again
		drive fault	Repair or change drives
Er.OU	When switched on control power	Circuit board fault	Repair or change drives
	It appears while the main power is switched on	The supply voltage exceeds permitted input voltage range	Check whether the power supply matches drive or not
	During the operation process of motor	Wiring of braking resistor disconnected	Wiring again
		Mismatch of external braking resistor led to renewable energy can't be absorbed	Reduce the start-stop frequency; Add acceleration or deceleration time; lower limit value of torque; Reduce load inertia; Replace it with bigger power drive and motor
		drive fault	Repair or change drives
Er.IAF	When	±15V no voltage	Repair or change drives

Alarm Code	Operating state	Possible Cause	Processing Methods
Er.IbF	switched on control power During the operation process of motor	Fault of current testing channel	
Er.OSE	When switched on control power	Fault of control board	Change drives
		Encoder fault	Change motor
	During the operation process of motor	Pulse frequency of input order is too high	Set input pulse correctively
		Constant of acceleration or deceleration time is so low that the speed overshoot is too high	Add constant of acceleration or deceleration time
		Input electronic gear ratio is too high	Set correctly
		Encoder fault	Change motor
		Encoder cable defective	Replace encoder cable
		Servo system is not stable and causing overshoot	Reset relevant gain. If the gain can't be set to proper value, the load inertia ratio can be reduced
Er.OPE	When switched on control power	Circuit board fault	Change servo drives
	Switch on the main power and line of control, input pulse order, motor isn't	U, V and W leading wires of motor are connected in a wrong way Encoder lead cable is connected in wrong way	Correct connection
		Encoder fault	Change servo drives

Alarm Code	Operating state	Possible Cause	Processing Methods
	operating	Examination area of out of tolerance of setting position is too small	Expand examination area of out of tolerance of setting position
		Proportional gain of position is too low	Add proportional gain of position
		Torque is insufficient	Check the limit value of torque Reduce load capacity Replace it with larger drive and motor
Er.OCS	During the operation process of motor	U, V and W leading wires of motor are connected in a wrong way	Change wiring Change servo drives
Er.PoF	During the process of electricity	The control software failure to complete the right initial settings	Set the parameters such as drive capacity and motor type, then restoring the default action(usually performed by manufacturers)
		Damage of chip or circuit board	Change servo drives
Er.rLS	During the power up of control power During the operation process of motor	Encoder cable defective Inadequate shielding of encoder cable Unconnected shielding ground of encoder	Correct wiring Change power cable
		Z-pulse doesn't exist, encoder is damaged Control board fault Signals of encoders U, V and W are damaged	Change motor (encoder)
		Control panel fault	Change wiring

Alarm Code	Operating state	Possible Cause	Processing Methods
Er.ELS	During the power up of control power During the operation process of motor	Control board fault Encoder cable defective Overlong encoder cable causes the lower supply voltage of the encoder.	Check connection. Change power cable Shorten the cable and adopt multi-core parallel operation.
		Encoder destroyed	Change motor (encoder)
		Control panel fault	Change drives
Er.0LS	During the operation process of motor	Control board fault Encoder cable defective Overlong encoder cable causes the lower supply voltage of the encoder.	Check wiring Change power cable Shorten the cable and adopt multi-core parallel operation.
		Encoder destroyed	Change motor (encoder)
		Control panel fault	Change drives
		Gain of speed loop Kp is too low	Increase the setting value of Gain of speed loop
Er.OH1	During the operation process of motor	Operating temperature higher than specified value	Lower operating temperature or improve cooling condition
		Overload	Replace it with bigger power drive and motor Extent acceleration and deceleration time; Lower load.
Er.SSr	During the operation process of motor	Motor stalling	Find out the cause of stalling and correct it
		Heavy load	Change it with bigger power servo motor and drive
		Loss of encoder feedback pulse	Enhance anti-interference measure for encoder signal

Alarm Code	Operating state	Possible Cause	Processing Methods
Er.brS	During the operation process of motor	Servo system is in continuous energy feedback condition; network voltage is too high; drive failure	Use bigger power servo drive and servo motor; making sure the voltage is up to specifications; change drive
Er.brL	During the operation process of motor	Braking resistor is under-powering.	Use external high power braking resistor; Use bigger power servo drive and servo motor

7.3 Motor Failure and Corrective Action

If any of the following failures or abnormities occurred in motor, find out the problem and deal it with corresponding corrective action. When checking or corrective action fails to solve the problem, please seek the technical support.

Table 7-3 Motor Fault and Corrective Action

Fault	Possible Cause	Confirmation method	Processing Methods
Servo motor doesn't start	Access failure of control power	Measure the voltage between control power terminals LC1 and LC2.	Correct wiring to make the control power shows ON
	Access failure of main circuit power	Measure the voltage between main circuit power terminals L1, L2 and L3	Correct wiring to make the main circuit power shows ON
	Wiring error or omission of input/ output signals	Check the link status of all the CN2 signals	Wiring the terminals of input/output signals correctly
	Wiring of encoder drops off	Confirm the connection state	Correct wiring

Fault	Possible Cause	Confirmation method	Processing Methods
Servo motor doesn't start	Wiring of servo motor cable drops off	Confirm the connection state	Correct wiring
	Load of servo motor is too heavy	Try to empty running to confirm the load state	Lighten load or replace it with servo motor replace it with bigger power servo motor or drive
	Enabling signal S-ON shows OFF	Confirm the function sets of S-ON when it is inputted into DI channel and corresponding DI (P03.04~03.10)	Set input signal correctly
	Choose wrong mode of command pulse (position mode)	Confirm the setting of P00.05 and form of command pulse	Make the setting of parameter P00.05 and the form of command pulse keep consistent
	Incorrect input of speed command (speed mode)	Confirm whether the control mode and input are consistent	Set control modes and input methods correctly
	Incorrect input of torque command	Confirm whether the control mode and input are consistent	Set control modes and input methods correctly
	Clear signal of position deviation pulse CLR keeps showing ON	Confirm the CLR input signal (parameter)	Set CLR input signal to OFF

Fault	Possible Cause	Confirmation method	Processing Methods
Servo motor doesn't start	Positive stroke limit POT and negative stroke limit N-OT keep showing OFF	Confirm P-OT and N-OT input signal	Set P-OT and N-OT to ON
	drive fault (has display of fault)	Confirm if the fault can be cleared	If the fault is confirmed to be ineffaceable, change the drive
Servo motor stopped after instantaneous operation	Wiring error of servo motor	Confirm wiring	Correct wiring
	Control board fault	Confirm wiring	Correct wiring
Servo motor rotational instability	Poor wiring of servo motor cable	Power line UVW and cable of encoder may be unstable	Fix the terminals of connector, wiring in right way
Servo motor operates without any order	Incorrect input of speed command (speed mode)		Set control modes and input methods correctly
	Incorrect input of torque command		Set control modes and input methods correctly
	There is offset errors in speed command	P03.12 zero compensation value analog input is set incorrectly	Adjust the set value of P03.12 appropriately

Fault	Possible Cause	Confirmation method	Processing Methods
	Input incorrect command pulse		Set control modes and input methods correctly
	drive fault	-	Change drives
Servo motor has abnormal sound	Poor mechanical installation	Confirm the installation status of servo motor	Retighten the mounting screw
		Confirm if the coupling is eccentric	Keep the degree of eccentricity within permitted range
		Confirm the balance status of coupling	Keep balance of coupling
	Bearing fault	Confirm the sound and vibration near the bearing	Change servo motor
	There is noise interference because the specification of input/ output signal cable is not standard	Confirm if the specification of input/ output signal cable is standard. Cable specification: twisted unshielded pair or shielded pair (core wire above 0.12mm^2)	Use standard cables
	There is noise interference because the input/ output signal cable is too long	Confirm the length of input/ output signal cable.	Keep the length of input/ output signal cable within 3 meters.

Fault	Possible Cause	Confirmation method	Processing Methods
Servo motor has abnormal sound	There is noise interference because the specification of encoder cable is not standard	Confirm if the encoder cable is standard. Cable specification: twisted unshielded pair or shielded pair (core wire above 0.12mm^2)	Use standard cables
	There is noise interference because the encoder cable is too long	Confirm the length of encoder cable.	Limit the length of encoder cable within 20 meters
	There is excessive noise interference in encoder cable	Confirm if the encoder cable is tied together with or near the high current cable.	Change the environment of encoder cable casting
	The pulse of servo unit is miscounted because of noise interference	Confirm if there is noise interference between encoder and signal line	Take measures on encoder wiring to prevent noise interference
	Encoder is effected by excessive shock and vibration	Confirm if there is mechanical vibration and the installation status of motor	Reduce the mechanical vibration and improve the installation status of servo motor
	Encoder fault	-	Change servo motor
Overheated servo motor	Temperature of operating environment is too high	Measure the temperature of operating environment of servo motor	Control the temperature of operating environment under 40°C.

Fault	Possible Cause	Confirmation method	Processing Methods
Overheated servo motor	Dirty surface of servo motor	Determine the dirty surface of motor by visual inspection	Remove dirt, dust, oil fouling and so on
	Servo motor is under heavy lode	Confirm the load condition by monitoring	If it's overload, lightening the load or replacing it with bigger power drive or servo motor

Chapter VIII Maintenance

Danger

1. Please don't touch the rotating parts when the servo motor is running. Otherwise may cause hurts.
2. Please make sure that the servo motor can be stopped anytime in emergency when installed on the matched machine and began to run. Otherwise may cause hurts.
3. Please don't touch the internal servo drive. Otherwise may cause electric shock.
4. Please don’t touch the terminals within five minutes after power-off. Otherwise may cause electric shock by offset voltage.
5. Please carry out the trial operation according to the steps and instructions of this manual.
6. Operation mistake may cause mechanical defect and human injury when the servo motor is connected with the machine.
7. It is unnecessary to alter the maximum speed value except for special purpose. It will turn out to be in danger if the data was altered.
8. Please don’t remove the outer cover, cable, connector and optional accessories in power-on situation. Otherwise may cause electric shock.
9. Setup, disassembly and maintenance should be not allowed by anyone except specific person. Otherwise may cause electric shock or hurts.
10. Please do not damage, pull, or overburden the cable, and do not put it under the weight or pick it up. Otherwise may cause an electric shock, burn the product or cause it to stop the movement.
11. Please make sure that the stop-gear is installed at the side of the machine for safety.
12. The machine may restart suddenly when momentary outages and power restoration occurred subsequently, thus keep away from the machine.
13. Please take measures to make sure the personal safety when the machine restarts. Otherwise may cause hurts.
14. Please do not remold this product. Otherwise may cause hurts or machinery damage.

15. The ground terminal of the servo drive must be grounded. Otherwise may cause electric shock.

Caution

1. Please make sure that the user parameter of the replaced servo drive is sent to the new one when altering the servo drive, and then restart it. Otherwise may cause machinery damage.
2. Please do not alter the wiring and remove the terminal. Otherwise may cause electric shock.
3. Please do not check the signals when running. Otherwise may cause machinery damage.

8.1 Maintenance

The servo drive is characterized by commercial unit and microelectronic devices due to its combination of power electronic technology and microelectronic technology. The working environment changing, such as temperature, humidity, smog and so on, and the aging internal components may cause various faults of servo drive. Thus, daily inspection and regular maintenance (every three months or six months) will be needed in the process of storage and use for the long-term normal operation of this product.

8.1.1 Daily Maintenance

Please confirm the following issues when the servo drive starts normally:

- Check the motor for abnormal noise and vibration.
- Check the servo drive and motor for abnormal heating.
- Check the environment temperature for overtopping.
- Check the load current ammeter for usual value.
- Check the cooling fan of servo drive for normal running.
- Check the brake resistor for good ground insulation.

Daily maintenance inspections are illustrated in table 8-1.

Table 8-1 Contents of Daily Maintenance Inspection and Key Points of Precautions

No.	Inspection Items	Inspection Part	Inspection Items	Inspection Standard
1	Display	LED Monitor	Check whether display normally or not	Confirm in working condition (Check the brake resistor for good ground insulation.)
2	Cooling System	Fan	Check the rotation for flexibility; check the sound for abnormity; check whether dust blocks or not.	No exception

3	Body	In the chassis	temperature rise, abnormal sound, peculiar smell, dirt retention	No exception
4	Working Environment	surroundings	Temperature, humidity, dust and harmful gas, etc.	Refer to Appendix 2 Technical Regulation
5	Voltage	Input and output terminals	Input and output voltages	Refer to Appendix 2 Technical Regulation
6	Electrical Load	Motor	temperature rise, abnormal sound, vibration	No exception

8.1.2 Periodic Maintenance

When carry out the periodic maintenance of servo drive, check when the power is off, the monitor does not display and after 5-10 minutes after the main circuit power light is off, to avoid that the residual voltage of capacitor of servo drive hurts the maintenance staff.

Periodic maintenance inspections are illustrated in table 8-2.

Table 8-2 Contents of Periodic Maintenance Inspection

Inspection Items	Contents	Countermeasure
Main circuit terminals, control circuit terminals screws	Check whether the screws are loose	Screw up by screwdriver
Cooling Fin	Check whether there are dust	Blow off with dry compressed air (pressure 4~6kg/cm^2)
PCB Printed Circuit Board	Check whether there are dust	Blow off with dry compressed air (pressure 4~6kg/cm^2)

Cooling Fan	Check whether the rotation is flexible; check whether there are abnormal sound, vibration, dust and blocking.	Replace the cooling fan; remove the dust and foreign body.
Power Device	Check whether there are dust	Blow off with dry compressed air (pressure 4~6kg/cm^2)
Electrolytic Capacitor	Check whether there are discoloration, peculiar smell, bubble, leakage, etc.	Replace the electrolytic capacitor
Braking Resistor	Check whether there is good ground insulation.	Keep the braking resistor in a dry and insulated place

During the inspection, the device should not be dismantled or shook arbitrarily, and the connector should not be pulled up arbitrarily as well. Otherwise may cause abnormal operation of servo drive or display malfunction. Moreover, it may cause device failure, damage of main switching devices IGBT module or other devices.

8.1.3 Regular Replacement of Devices

Periodic Maintenance based on the service life of internal electronic components of servo drive is necessary for the long-term reliability service. The service life of electronic components may change according to the different working environments and working conditions. In general continuous using, they could be replaced according to the following table, and depended on the specific situations, such as the working environments, load conditions and current situation of servo drive.

The maintenance period of servo drive in table 8-4 is for reference only.

Table 8-4 Replacement Time of Wearing Parts in Servo drive

Device Name	Standard Replacement Time
Cooling fan	2-3 years
Electrolytic Capacitor	4-5 years
Printed Circuit Board	5-8 years

8.2 Storage and Protection

The servo drive shall not be used immediately after the purchase, and the followings shall be noticed for the temporary or long-term storage:

- The servo drive belongs in the stated scope of temperature and humidity. Ensure that there are no humidity, dust, metallic dust but with good ventilation.
- Charging test should be carried out if the servo drive has not been used more than 1 year in order to recover the properties of electrolytic capacitor in the main circuit. Use voltage regulator to increase the input voltage of servo drive up to nominal voltage when charging. Conduction time should be more than 1 or 2 hours.
- The above tests should be carried out at least once a year.
- Do not carry out the pressure test arbitrarily, otherwise may cause service life reduction and product components damage. 500 v Megger can be used in the measurement test for insulation test. The insulation resistance shall not be less than 4MΩ.

Chapter IX Quality Guarantee

The product's quality guarantee shall be in accordance with the following rules:

The warranty scope only refers to the noumenon of servo drives, and the warranty period begins to count at company's shipping date. The warranty period of the product is 12 months after purchase within 24 months after the manufacture date on the nameplate.

If the fault is caused by the following reasons, it would be a paid service regardless of warranty:

- The problems caused by incorrect operation or repair and renovation without permission;
- The problems caused by using the servo drives beyond the standard specification requirements;
- The damage caused by falling or barbarous transport after purchase.
- The component aging or fault caused by the use under the condition which does not meet the requirement of the user manual;
- The servo drives' damage caused by incoming foreign matters (e.g., insects);
- The servo drives' damage caused by incorrect connecting line;
- The fault caused by earthquake, fire, wind and flood disaster, lightning stroke, abnormal voltage or other natural disasters and causes accompanied by disasters.

  For fault products, our Company has right to entrust others to responsible for warranty issues.

  The quality guarantee matter belongs to our Company's responsibility, when used in the country:

- Guarantee for replacement, returns, repair within 1 month of shipment;
- Guarantee for replacement and repair within 3 months of shipment;
- Guarantee for repair within 12 months of shipment;

If shipping to overseas, guarantee for repair within 3 months after shipment. The relevant service charge is according to actual costs. But if there is any agreement, it should be deal with the principal of treaty override.

Our Company provides after-sales service at the sales organizations and agencies all over the country.

Additional Remarks:

About the exemption from liability

- Our Company could not responsibility for the liability caused or induced by the violation of the user manual's rules;
- Our Company shall not be held liable for your loss or diffusible, secondary damage caused by t+he product's faulty.

About User Instructions:

The user manual is only for the product of this series.

Our Company is long-life responsible for the product, and provides all services related the using of the product.

The product is designed and manufactured under the strict quality control, but if it is used for the following purpose which could endanger human or human life due to fault or operation mistake, be sure to ask our Company in advance.

- Use for transport and communication facilities;
- Medical device;
- Nuclear installations, electrical equipment;
- Aviation and aerospace devices;
- Various safety devices;
- Other special purposes.

About the Hope for the Users:

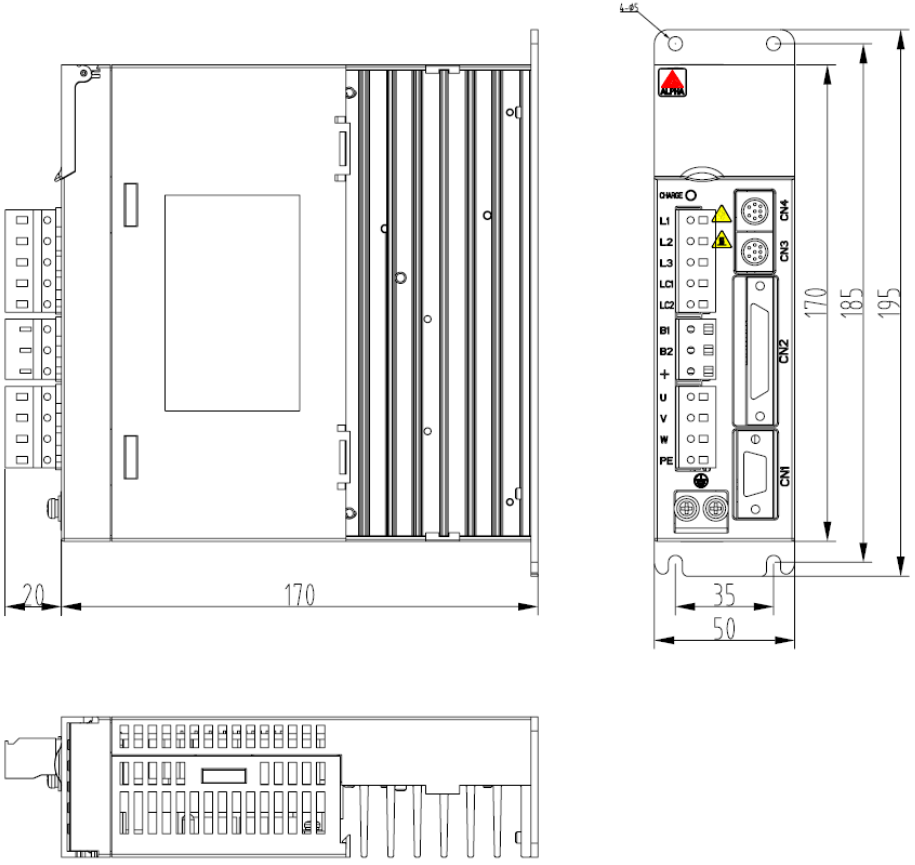
Our Company will appreciate that if users could put forward valuable opinions and suggestions to product's design, performance, quality and service.

Annex 1 Appearance Dimensions and Installation Dimensions of Drive

(Unit: mm)

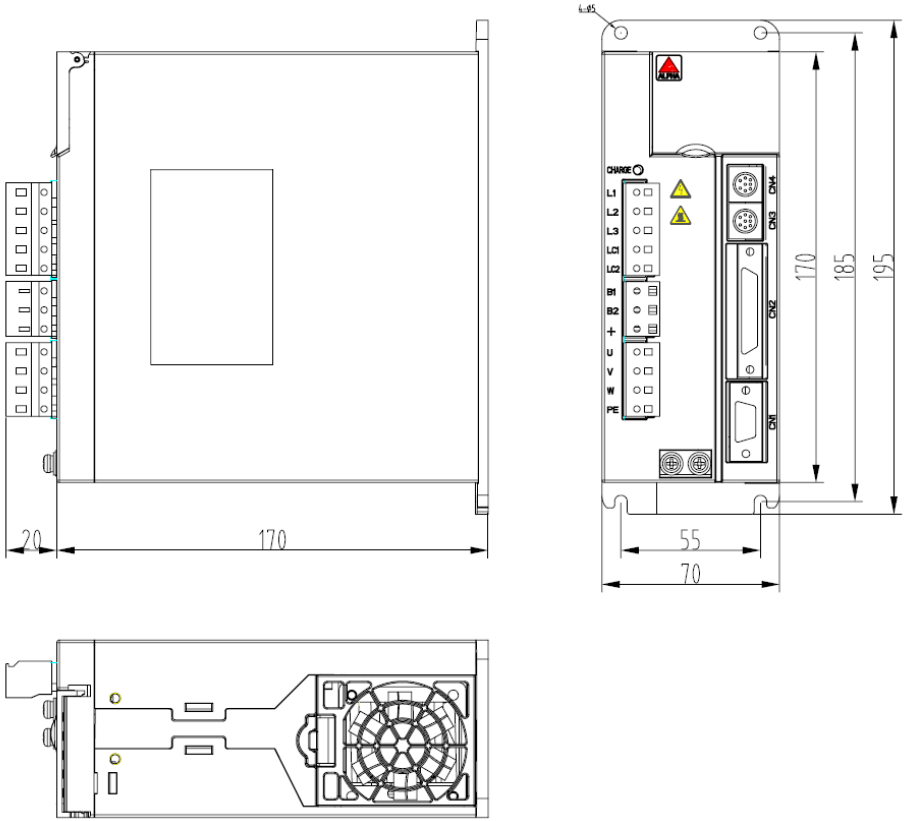
Type –A Structure: applicable to

Single-phase 220V grade: AS100A- 1R6M2U and AS100A-2R8M2U



Type-B Structure: applicable to

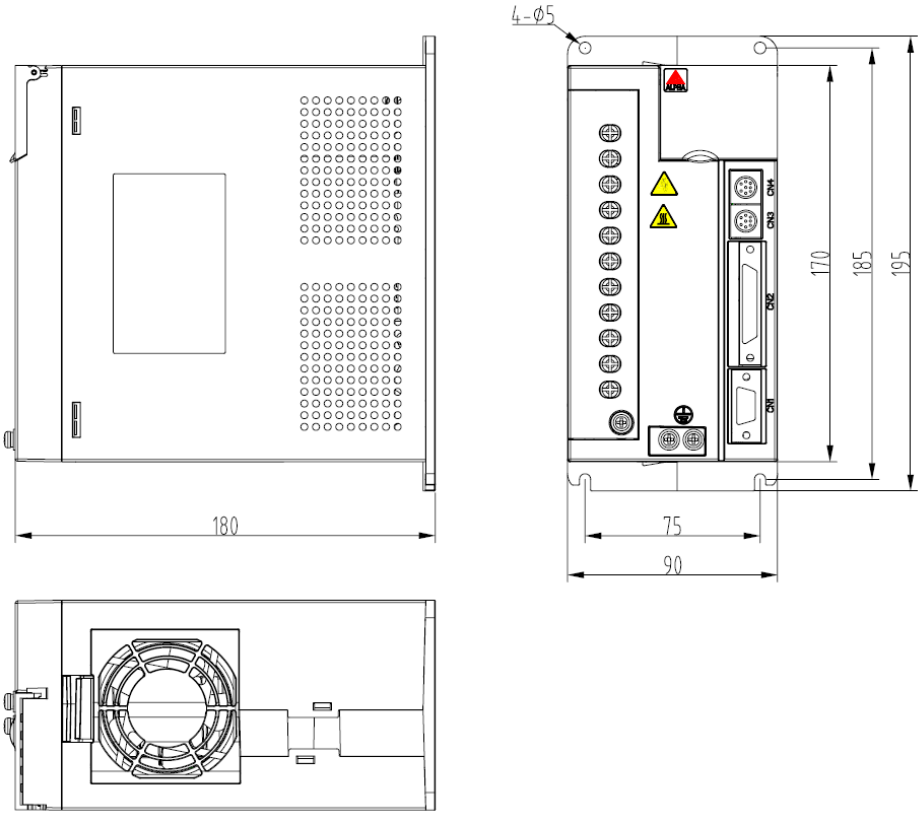
Three-phase 220V grade: AS100A-3R8M2U, AS100A-5R5M2U and AS100A-7R6T2U



Type-C Structure: applicable to

Three-phase 220V grade: AS100A-012T2U

Three-phase 380V grade: AS100A-3R5T3U, AS100A-5R4T3U and AS100A-8R4T3U



Annex 2 Technical Specification of Servo Drive

■ Specifications of 220V Series Servo Drive

Drive Model	**AS100A-1R6M2U**	**AS100A-2R8M2U**	**AS100A-3R8M2U**	**AS1000A-5R5M2U**	**AS100A-7R6T2U**	**AS100A-012T2U**
Feedback Type	Standard 2500 c/r Incremental Encoder					
Drive Model	**AS100A-1R6M2V**	**AS100A-2R8M2V**	**AS100A-3R8M2V**	**AS1000A-5R5M2V**	**AS100A-7R6T2V**	**AS100A-012T2V**
Feedback Type	Wire-saving 2500 c/r Incremental Encoder					
Rated Current	1.6A	2.8A	3.8A	5.5A	7.6A	12A
Max. Current	5.8A	9.3A	11A	16.9A	17A	28A
Structure Size	A		B			C
Main Circuit Power Supply	Single/three-phase AC220V ±15%, 50/60Hz					Three-phase AC220V ±15%, 50/60Hz
Control Loop Power Supply	Single-phase AC220V ±15%,, 50/60Hz					
Regenerative Braking Function	External braking resistor is required.		Standard built-in braking resistor.			

■ Specifications of 380V Series Servo Drive

Drive Model	**AS100A-3R5T3U**	**AS100A-5R4T3U**	**AS100A-8R4T3U**
Feedback Type	Standard 2500 c/r Incremental Encoder		
Drive Model	**AS100A-3R5T3V**	**AS100A-5R4T3V**	**AS100A-8R4T3V**
Feedback Type	Wire-saving 2500 c/r Incremental Encoder		
Rated Current	3.5A	5.4A	8.4A
Max. Current	8.5A	14A	20A
Structure Size	C		
Main Circuit Power Supply	Three-phase AC380V (-15~+10%), 50/60Hz		
Control Loop Power Supply	Single phase 380V (-15~+10%), 50/60Hz		
Regenerative Braking Function	Standard built-in braking resistor		

General Technical Specifications of Servo Drive

Service Environment	Temperature	Working: 0~45℃ Storage: -20~80℃	
	Humidity	Less than 90% (without condensation)	
	Vibration	Less than 4.9m/S^2(0.5G), 10~60Hz	
Control Mode		IGBT SVPWM current vector control	
Basic Control Mode		Position control, speed control, torque control, internal position control, internal speed control	
Control Characteristics		Speed frequency response: 400Hz (load rotational inertia= rotational inertia of motor)	
		Speed fluctuation rate: ＜±0.03 (load 0~100%); ＜±0.02 (power supply -15~+10%) (figures indicate the rated speed)	
		Speed ratio: 1:5,000	
		Input pulse frequency: ≤500 KHz	
Control Input		S-ON, ALM-RST, P-OT, N-OT, CLR, PINH, GR2, ZCLAMP; rotation change under internal speed mode; rotation change under analog speed mode; positive startup under analog speed mode; negative startup under analog speed mode; CMD1~4; SHOM; OrgNear	
Control Output		1) Servo preparation output; 2) servo alarm output; 3) positioning completion output/speed reaching output	
Position Control		Input mode	1) Pulse + symbol 2) CCW pulse / CM pulse 3) A/B 1uadrature pulse
		Electrical gear ratio	1~32,767/1~32,767
		Feedback pulse	10,000 pulse / rotation
Speed Control		Eight interior settings and outer analog speed are given.	
Accelerating/decelerating function		Set accelerating/decelerating time: 1~16,000ms	

Monitoring and display function	Motor speed, current position, position command, position deviation, motor torque, motor current, current control mode, position command pulse frequency, speed command, torque command, absolute position of rotor, input terminal status, output terminal status, Encoder UVW input signal, encoder zero pulse, fault code display, etc.
Protection Function	Module fault, over-voltage, under-voltage, hardware over-current, software over-current, no current of analog channel A, no current of analog channel B, speed tolerance, position tolerance, CPLD fault, encoder fault, speed regulator saturation fault, brake overload, current regulator saturation fault, etc.
Display operation	5 LED digital tube, 5 buttons
Applicable load inertia	Less than 5 times of motor inertia

Annex 3 Matching Selection of Servo Motor and Drive (220V series)

■ **Matching Selection of Series E 220V Servo Motor and Drive**

Power Supply	Rated Speed (rpm)	Motor Model	Rated Output	Rated Torque	Drive Model	Structure Model
Single-phase Three-phase 220V	3,000	ASMS-R20B30U2□	200W	0.64Nm	AS100A-1R6M2U	A
	3,000	ASMS-R40B30U2□	400W	1.3Nm	AS100A-2R8M2U	
	3,000	ASMS-R75B30U2□	750W	2.4Nm	AS100A-3R8M2U	B
	3,000	ASMG-R75B30U2□	750W	2.4 Nm		
	2,500	ASMS-1R0B25U2□	1,000W	4 Nm	AS100A-5R5M2U	
	2,500	ASMG-1R0B25U2□	1,000W	4 Nm		
	2,500	ASMH-1R0B25U2□	1,000W	4 Nm		
Three-phase 220V	3,000	ASMS-1R2B30U2□	1,200W	4 Nm		
	2,000	ASMG-1R2B20U2□	1,200W	6 Nm		
	2,500	ASMG-1R3B25U2□	1,300W	5 Nm		
	2,500	ASMS-1R5B25U2□	1,500W	5 Nm	AS100A-7R6T2U	
	2,500	ASMG-1R5B25U2□	1,500W	6 Nm		
	1,500	ASMH-1R5B15U2□	1,500W	10 Nm		
	2,500	ASMG-2R0B25U2□	2,000W	7.7 Nm		
	2,500	ASMG-2R6B25U2□	2,600W	10 Nm	AS100A-012T2U	C
	1,500	ASMG-2R7B15U2□	2,700W	17.2 Nm		
	1,500	ASMH-3R0B15U2□	3,000W	19Nm		
	2,000	ASMH-3R0B20U2□	3,000W	15 Nm		
	2,500	ASMG-3R8B25U2□	3800W	15 Nm		

Notes:

1 Performance parameters, installation size and other information of servo motor refer to relevant data of motor.

2. Following the motor model indicates the model options, please refer to the description of motor naming rules.

3. U in the motor model indicates that the standard 2500 c/r incremental encoder is adopted. If wire-saving 2500 c/r incremental encoder is adopted, U shall be replaced with V.

4. Servo software version over V109 supports the motor drive of wire-saving incremental encoder.

Annex 4 Matching Selection of Servo Motor and Drive (380V series)

■ **Matching Selection of Series E 380V Servo Motor and Drive**

Power Supply	Rated Speed (rpm)	Motor Model	Rated Output	Rated Torque	Drive Model	Structure Model
Three-phase 380V	2,000	ASMS-R80C20U2□	0.8KW	4Nm	AS100A-3R5T3U	C
	3,000	ASMS-1R2C30U2□	1.2KW	4Nm		
	3,000	ASMS-1R5C30U2□	1.5KW	5Nm		
	2,000	ASMG-1R2C20U2□	1.2KW	6Nm		
	2,500	ASMH-1R0C25U2□	1.0KW	4Nm		
	2,500	ASMG-1R3C25U2□	1.3KW	5Nm		
	1,000	ASMH-1R0C10U2□	1.0KW	10Nm		
	1,500	ASMG-1R5C15U2□	1.5KW	10Nm		
	2,500	ASMG-1R5C25U2□	1.5KW	6Nm	AS100A-5R4T3U	
	2,500	ASMG-2R0C25U2□	2.0KW	7.7Nm		
	2,000	ASMG-2R0C20U2□	2.0KW	10Nm		
	1,500	ASMG-2R3C15U2□	2.3KW	15Nm		
	2,500	ASMG-2R6C25U2□	2.6KW	10Nm	AS100A-8R4T3U	
	2,500	ASMG-3R8C25U2□	3.8KW	15Nm		
	1,500	ASMG-2R7C15U2□	2.7KW	17.2 Nm		
	1,000	ASMG-2R9C10U2□	2.9KW	27 Nm		

Notes:

1. Performance parameters, installation size and other information of servo motor refer to relevant data of motor.
2. Following the motor model indicates the model options, please refer to the description of motor naming rules.
3. U in the motor model indicates that the standard 2500 c/r incremental encoder is adopted. If wire-saving 2500 c/r incremental encoder is adopted, U shall be replaced with V.
4. Servo software version over V109 supports the motor drive of wire-saving incremental encoder.

Annex 5 Specification of Braking Resistor

220V series

Drive Model	Standard built-in braking resistor (resistance/ power)	Min. allowable braking resistance
AS100A-1R6M2U	No	40Ω
AS100A-2R8M2U	No	40Ω
AS100A-3R8M2U	40Ω/60W	40Ω
AS100A-5R5M2U	40Ω/60W	40Ω
AS100A-7R6T2U	40Ω/60W	40Ω
AS100A-012T2U	20Ω/100W	20Ω

380V series

Drive Model	Standard built-in braking resistor (resistance, power)	Min. Allowable Braking Resistance
AS100A-3R5T3U	100Ω/100W	80Ω
AS100A-5R4T3U	100Ω/100W	80Ω
AS100A-8R4T3U	**100Ω/100W**	40Ω

Notes

When average braking power is larger than the nominal power of built-in braking resistor, the drive will alarm;

When built-in braking resistor fails to meet the requirements, the external braking resistor may be selected.

The external braking resistor shall be provided by users themselves, or purchased from our company.

The external braking resistor shall no less than the minimal resistance listed in the table above; otherwise, the drive will be damaged.

If the external braking resistor will be used, the built-in braking resistor must be disconnected.

Annex 6 Main Input/Output Cable Selection

220V Series

Drive Model	Sectional Area of main Input Cable (mm^2)	Sectional Area of main Output Cable (mm^2)	Sectional Area of Control Power Cable (mm^2)
AS100A-1R6M2U	2.0	2.0	1.25
AS100A-2R8M2U	2.0	2.0	1.25
AS100A-3R8M2U	2.0	2.0	1.25
AS100A-5R5M2U	2.0	2.5	1.25
AS100A-7R6T2U	2.0	2.5	1.25
AS100A-012T2U	2.5	3.5	1.25

380V Series

Drive Model	Sectional Area of Input Cable (mm^2)	Sectional Area of Output Cable (mm^2)	Sectional Area of Control Power Cable (mm^2)
AS100A-3R5T3U	2.0	2.0	1.25
AS100A-5R4T3U	2.0	2.0	1.25
AS100A-8R4T3U	2.0	2.0	1.25

Annex 7 MODBUS Communication Protocol

The drive supports the MODBUS RTU protocol, with the functions of reading monitoring parameters (0X03) and writing function code parameter (0x06).

(1) Reading Monitoring Parameters (0x03)

Command frame format:

START	Greater than or equal to 3.5 characters idle time, indicating the start of a frame
ADDR	Drive address (1~32). 1~32 here are decimal numbers and shall be converted into hexadecimal numbers when entering ADDR.
CMD	Command: 0x03
ADD0	8 MSBs of MODBUS address of monitoring parameters (or function code)
ADD1	8 LSBs of MODBUS address of monitoring parameters (or function code)
DATA0	8 MSBs of numbers of monitoring parameters; 0x00 (Currently only supporting a single parameter reading)
DATA1	8 LSBs of numbers of monitoring parameters; 0x01 (Currently only supporting a single parameter reading)
CRCH	CRC high significant bytes
CRCL	CRC low significant bytes
END	Greater than or equal to 3.5 characters idle time, indicating the end of a frame

Response frame format:

START	Greater than or equal to 3.5 characters idle time, indicating the start of a frame
ADDR	Drive address (1~32). 1~32 here are decimal numbers and shall be converted into hexadecimal numbers when entering ADDR.
CMD	Command: 0x03
DATA0	Numbers of monitoring parameters; 0x02 (Currently only supporting a single parameter reading)
DATA1	8 MSBs of monitoring parameters (or function code)

DATA2	8 LSBs of monitoring parameters (or function code)
CRCH	CRC high significant bytes
CRCL	CRC low significant bytes
END	Greater than or equal to 3.5 characters idle time, indicating the end of a frame

(2) Writing Function Code Parameters (0x06)

Command frame format:

START	Greater than or equal to 3.5 characters idle time, indicating the start of a frame
ADDR	Drive address (1~32). 1~32 here are decimal numbers and shall be converted into hexadecimal numbers when entering ADDR.
CMD	Command: 0x06
DATA0	8 MSBs of MODBUS address of function codes
DATA1	8 LSBs of MODBUS address of function codes
DATA2	8 MSBs of read-in data
DATA3	8 LSBs of read-in data
CRCH	CRC high significant bytes
CRCL	CRC low significant bytes
END	Greater than or equal to 3.5 characters idle time, indicating the end of a frame

Response frame format:

START	Greater than or equal to 3.5 characters idle time, indicating the start of a frame
ADDR	Drive address (1~32). 1~32 here are decimal numbers and shall be converted into hexadecimal numbers when entering ADDR.
CMD	Command: 0x06
DATA0	8 MSBs of MODBUS address of function codes
DATA1	8 LSBs of MODBUS address of function codes
DATA2	8 MSBs of read-in data
DATA3	8 LSBs of read-in data

CRCH	CRC high significant bytes
CRCL	CRC low significant bytes
END	Greater than or equal to 3.5 characters idle time, indicating the end of a frame

For example, if you want to modify the function code P10.13 to 1,000 by means of communication, you should send the following frame data via the host computer:

ADDR	CMD	DATA0	DATA1	DATA2	DATA3	CRCH	CRCL
01	06	0B	0D	03	E8	1A	93

(3) Error Response Frame Format

START	Greater than or equal to 3.5 characters idle time, indicating the start of a frame
ADDR	Servo drive address (1~32)
CMD	Command: 0x03/0x06
DATA0	0x80
DATA1	0x01
DATA2	8 MSBs of error code
DATA3	8 LSBs of error code
CRCH	CRC high significant bytes
CRCL	CRC low significant bytes
END	Greater than or equal to 3.5 characters idle time, indicating the end of a frame

Error code list:

0x0002	The command is not 0x03/0x06
0x0004	CRC code error
0x0006	Reserved
0x0008	The function code does not exist
0x0010	The value of the read-in function code exceeds the upper and lower limits of the function code
0x0020	The function code read is a read-only function code

Monitoring Contents:

MODBUS ADDR	Name	Value	Description
0003H	Working Mode	0-6	0: Position mode 1: Analog speed mode 2: Torque mode 3: Internal speed mode 4: Test run mode 5: JOG mode 6: Factory mode
0004H	Faults	Bit0	Overtemperature
		Bit1	Current regulator saturation alarm
		Bit2	Speed regulator saturation alarm
		Bit3	Z pulse loss
		Bit4	Encoder disconnection
		Bit5	EEPROM fault
		Bit6	Software overcurrent
		Bit7	Position out-of-tolerance
		Bit8	Speed out-of-tolerance
		Bit9	UVW combinational logical fault
		Bit10	Excessive zero drift of IB current signal
		Bit11	Excessive zero drift of IA current signal
		Bit12	Hardware overcurrent OCU
		Bit13	VCE module alarm
		Bit14	Busbar overvoltage
		Bit15	Undervoltage
0006H	Busbar Voltage	M	Busbar voltage DCBUS (V)= 220V type: (M *3.3*198)/1024 380V type: (M *3.3*270)/1024
000CH	DI Status	Bit9	DI7
		Bit10	DI6

MODBUS ADDR	Name	Value	Description
000CH	DI Status	Bit11	DI5
		Bit12	DI4
		Bit13	DI3
		Bit14	DI2
		Bit15	DI1
000DH	DO Status	Bit12	DO4
		Bit13	DO3
		Bit14	DO2
		Bit15	DO1

Notes: Bit 15 represents the least significant bit of the parameter, and Bit 0 represents the most significant bit of the parameter. For example: if the drive send out an undervoltage alarm, the fault value read is 0x0001.

MODBUS ADDR	Name	Value	Description
0012H	Effective value of phase current	M	Effective value of phase current I (0.01A)=M/100 e.g.: If the real-time phase current is 4.2A, the data read is 0x01A4 (0x01A4 = 420)
0033H	Motor speed	M	Motor speed n (rpm)=M * P08.00/25,000 Note: P08.00 is the rated speed of the motor, M is s signed number e.g.: if M = 0xFEOC and P08.00 =2,000, the motor speed n = -500*2,000/25,000 = -40 rpm
0030H	Position feedback 16 LSBs	M2	The position feedback POS is indicated by a combination of two 16 digits. e.g.: if M1=0x0000 and M2=0x0520, POS = 0*

MODBUS ADDR	Name	Value	Description
0031H	Position feedback 16 MSBs	M1	65,536 + 0x520 = 1,312 e.g.: if M1=0x0101 and M2=0x0520, POS = POS = 0x101* 65,536 + 0x520 = 257*65,536 +1312 = 16,844,064 If the motor is negative, the pulse should be negative. And, if M1=0xFFFF and M2=0x0520, POS = - (0xFFFF- 0xFFFF)*65,536-(0xFFFF-0x520+1) = - 64,224
0035H	Position command 16 LSBs	M2	Similar to the position feedback
0036H	Position command 16 MSBs	M1	
0038H	Position error 16 LSBs	M2	Similar to the position feedback
0037H	Position error: 16 MSBs	M1	

For example, if you want to obtain the motor speed by means of communication, you should send the following frame data via the host computer:

ADDR	CMD	ADD0	ADD1	DATA0	DATA1	CRCH	CRCL
01	03	00	33	00	01	74	05

List of MODBUS address of function codes:

Function code number (DEC)	MODBUS address (HEX)
(Monitoring parameters)	(0003H~0038H)
P00.00 ~ P00.16	0100H~0110H
P01.00 ~ P01.18	0200H~0212H
P02.00 ~ P02.25	0300H~0319H

P03.00 ~ P03.14	0400H~040EH
P04.00 ~ P04.08	0500H~0508H
P05.00 ~ P05.13	0600H~060DH
P06.00 ~ P06.04	0700H~0704H
P07.00 ~ P07.05	0800H~0805H
P08.00 ~ P08.06	0900H~0906H
P09.00 ~ P09.35	0A00H~0A23H
P10.00 ~ P10.92	0B00H~0B5CH
P11.00 ~ P11.32	0C00H~0C20H

Annex 8 Parameters and Size of Servo Motor

■ Motor Wiring Connection

60, 80 and 90 flange motor wiring connection No.:

Winding lead	U	W	V	PE
Socket No.	1	2	3	4

110, 130, 150 and 180 flange motor winding connection No.:

Winding lead	U	V	W	PE
Socket No.	2	3	4	1

■ Encoder Connection

Standard 2500 c/r incremental encoder signal connection for 60, 80 and 90 flange motor:

Signal	5V	0V	B+	Z-	U+	Z+	U-	A+	V+	W+	V-	A-	B-	W-	PE
Socket No.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1

Wire-saving 2500 c/r encoder signal connection for 60, 80 and 90 flange motor:

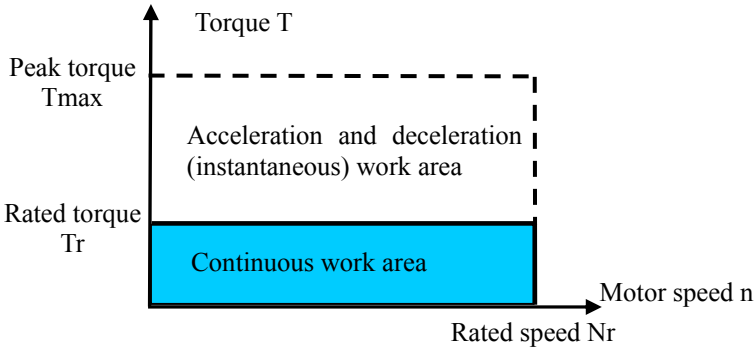
Signal	5V	0V	A+	A-	B+	B-	Z+	Z-	PE
Socket No.	1	2	3	4	5	6	7	8	9

Standard 2500 c/r incremental encoder signal connection for 110, 130, 150 and 180 flange motor:

Signal	5V	0V	A-	B+	Z+	A+	B-	Z-	U+	V+	W+	U-	V-	W-	PE
Socket No.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1

Note: wire-saving 2500 c/r encoder excludes Signal U, V and W, and other signal locations refer to the table above.

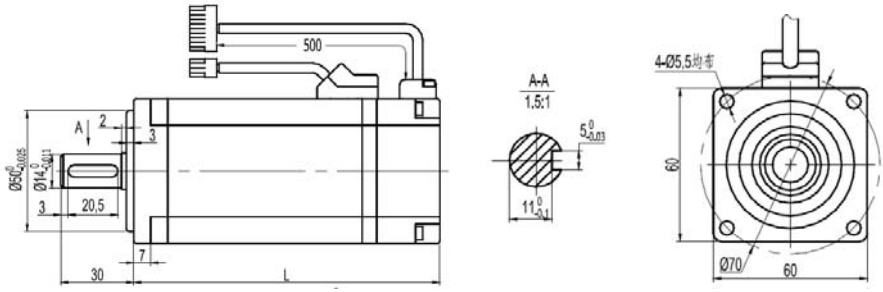
■ **Servo Motor Torque Characteristic Curves**



■ **Parameters of 60 Flange Series E 220V Motor**

Motor Model	**Series 60**	
	ASMS -R20B30U2□	**ASMS -R40B30U2□**
Rated Power KW	0.2	0.4
Rated Current	1.2	2.8
Rated Speed rpm	3,000	3,000
Rated Torque Nm	0.64	1.27
Peak Torque Nm	1.91	3.8
Rotor Inertia kg•m^2	0.17×10^{-4}	0.30×10^{-4}
Encoder Resolution C/R	2,500	
Insulation Grade of Motor	Class F	
Protection Level	IP64	
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)	

Installation Size:



Motor Length:

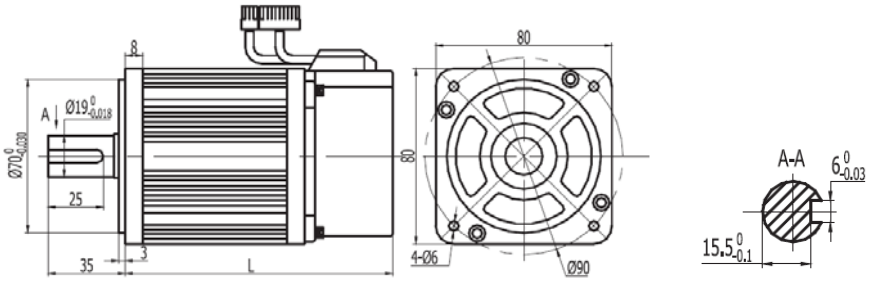
Spec.	0.64Nm	1.27Nm
Length L (mm)	111	137

Note: the length indicates the length of motor without brake, and the length of motor with a brake will increase 48mm.

■ **Parameters of 80 Flange Series E 220V Motor**

Motor Model	**Series 80**	
	ASMS -R75B30U2□	**ASMS -1R0B25U2□**
Rated Power KW	0.75	1.0
Rated Current	3.0	4.4
Rated Speed rpm	3,000	2,500
Rated Torque Nm	2.4	4.0
Peak Torque Nm	7.1	12.0
Rotor Inertia kg•m^2	1.82×10^{-4}	2.97×10^{-4}
Encoder Resolution C/R	2,500	
Insulation Grade of Motor	Class F	
Protection Level	IP65	
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)	

Installation Size:



Motor Length:

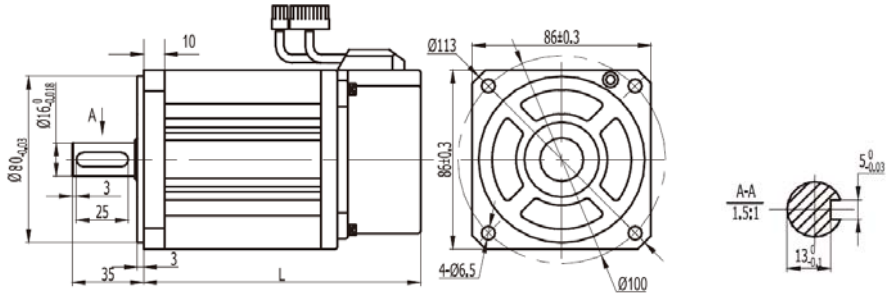
Spec.	2.4Nm	4.0Nm
Length L (mm)	151	191

Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 54mm.

■ **Parameters of 90 Flange Series E 220V Motor**

Motor Model	**Series 90**	
	ASMG -R75B30U2□	**ASMG -1R0B25U2□**
Rated Power KW	0.75	1.0
Rated Current	3.0	4.0
Rated Speed rpm	3,000	2,500
Rated Torque Nm	2.4	4.0
Peak Torque Nm	7.1	12.0
Rotor Inertia kg•m^2	2.45×10^{-4}	3.7×10^{-4}
Encoder Resolution C/R	2,500	
Insulation Grade of Motor	Class F	
Protection Level	IP65	
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)	

Installation Size:



Motor Length:

Spec.	2.4Nm	4.0Nm
Length L (mm)	150	182

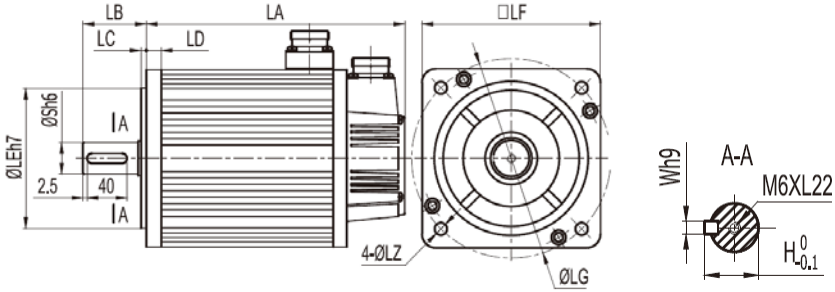
Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 57mm.

■ **Parameters of 110 Flange Series E 220V Motor**

Motor Model	**Series 110**		
	ASMS -1R2B30U2	**ASMG -1R2B20U2**	**ASMS -1R5B30U2**
Rated Power KW	1.2	1.2	1.5
Rated Current	5.0	4.5	4.0
Rated Speed rpm	3,000	2,000	2,500
Rated Torque Nm	4.0	6.0	4.0
Peak Torque Nm	12.0	12	12.0
Rotor Inertia kg•m^2	5.4×10^{-4}	7.6×10^{-4}	6.3×10^{-4}
Encoder Resolution C/R	2,500		
Insulation Grade of Motor	Class F		
Protection Level	IP65		

Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)

Installation Size:



Motor Torque Nm	4.0	5.0	6.0
LA	189	204	219
LB	55	55	55
LC	5	5	5
LD	12	12	12
LE	95	95	95
LF	110	110	110
LG	130	130	130
LZ	9	9	9
S	19	19	19
H	21.5	21.5	21.5
W	6	6	6

Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 74mm.

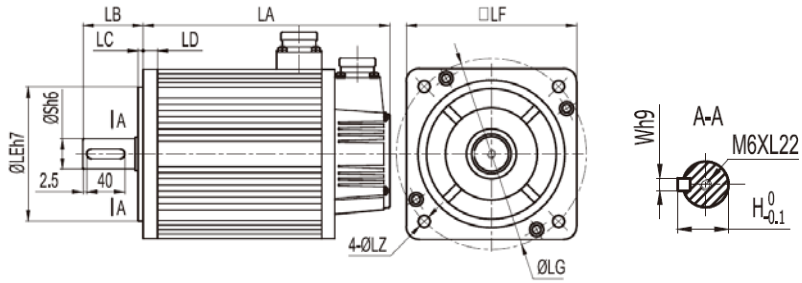
■ **Parameters of 130 Flange Series E 220V Motor**

Motor Model	Series 130		
	ASMH -1R0B25U2	**ASMG -1R3B25U2**	**ASMG -1R5B25U2**
Rated Power KW	1.0	1.3	1.5
Rated Current	4.0	5.0	6.0
Rated Speed rpm	2,500	2,500	2,500
Rated Torque Nm	4.0	5.0	6.0
Peak Torque Nm	12.0	15.0	18.0
Rotor Inertia kg•m^2	8.5×10^{-4}	10.6×10^{-4}	12.6×10^{-4}
Encoder Resolution C/R	2,500		
Insulation Grade of Motor	Class F		
Protection Level	IP65		
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)		

Motor Model	Series 130			
	ASMG-2R0B25U2	**ASMH-1R5B15U2**	**ASMG-2R6B25U2**	**ASMG-3R8B25U2**
Rated Power KW	2.0	1.5	2.6	3.8
Rated Current	7.5	6.0	10.0	13.5
Rated Speed rpm	2,500	1,500	2,500	2,500
Rated Torque Nm	7.7	10.0	10.0	15.0
Peak Torque Nm	22.0	25.0	25.0	30.0
Rotor Inertia kg•m^2	15.3×10^{-4}	19.4×10^{-4}	19.4×10^{-4}	27.7×10^{-4}
Encoder Resolution C/R	2,500			
Insulation Grade of Motor	Class F			
Protection Level	IP65			

Motor Model	Series 130			
	ASMG-2R0B25U2	ASMH-1R5B15U2	ASMG-2R6B25U2	ASMG-3R8B25U2
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)			

Installation Size:



Motor Speed rpm	2,500				1,500	2,500	
Motor Torque Nm	4.0	5.0	6.0	7.7	10	10	15
LA	166	171	179	192	213	209	231
LB	57	57	57	57	57	57	57
LC	5	5	5	5	5	5	5
LD	14	14	14	14	14	14	14
LE	110	110	110	110	110	110	110
LF	130	130	130	130	130	130	130
LG	145	145	145	145	145	145	145
LZ	9	9	9	9	9	9	9
S	22	22	22	22	22	22	22
H	24.5	24.5	24.5	24.5	24.5	24.5	24.5
W	6	6	6	6	6	6	6

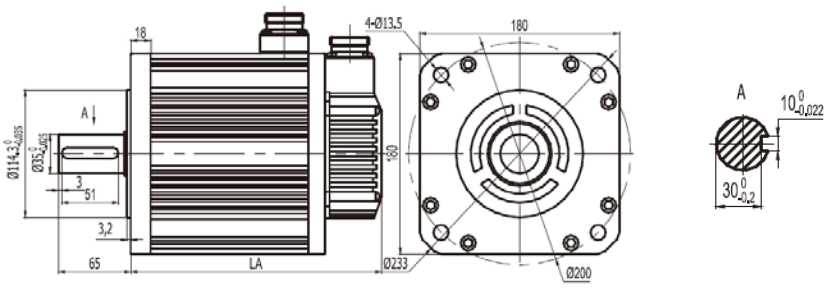
Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 57 or 81mm, see below for details.

Motor Spec. (Flange No., torque)	With a brake Increased length
130 flange, torque: 4~7.7Nm	57mm
130 flange, torque: 10~15Nm	81mm

■ **Parameters of 150/180 Flange Series E 220V Motor**

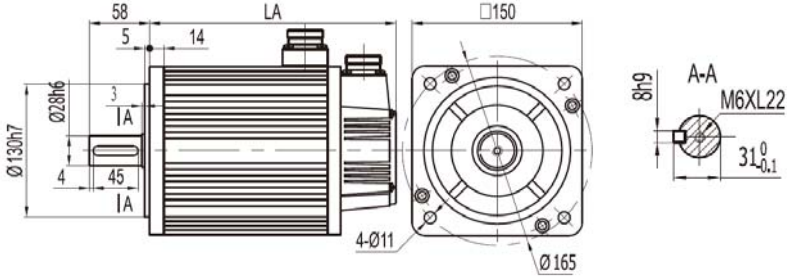
Motor Model	Series 150	Series 180	
	ASMH -3R0B20U2	ASMG -2R7B15U2	ASMH -3R0B15U2
Rated Power KW	3.0	2.7	3.0
Rated Current	14.0	10.5	12.
Rated Speed rpm	2,000	1,500	1,500
Rated Torque Nm	15.0	17.2	19.0
Peak Torque Nm	30.0	43.0	47.0
Rotor Inertia kg•m^2	38.8×10^{-4}	34.0×10^{-4}	38.0×10^{-4}
Encoder Resolution C/R	2,500		
Insulation Grade of Motor	Class F		
Protection Level	IP65		
Service Environment	Environment temperature: -20~+50 ℃, environment humidity: relative humidity < 90% (without condensation)		

Installation Size of 180 Flange:



Spec.	17.2Nm	19.0Nm
Length LA (mm)	226	232

150 Installation Size of Flange:



Spec.	15.0Nm
Length LA (mm)	230

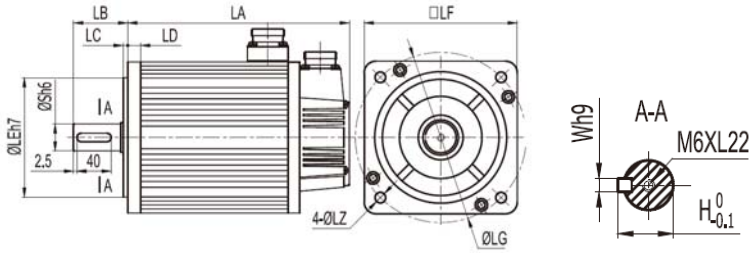
Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 73mm.

■ **Parameters of 110 Flange Series E 380V Motor**

Motor Model	Series 110			
	ASMS -R80C20U2	ASMS -1R2C30U2	ASMS -1R5C30U2	ASMG -1R2C20U2
Rated Power KW	0.8	1.2	1.5	1.2
Rated Current	2.0	3.0	4.5	3.0
Rated Speed rpm	2,000	3,000	3,000	2,000
Rated Torque Nm	4.0	4.0	5.0	6.0
Peak Torque Nm	12.0	12.0	15.0	12.0
Rotor Inertia kg•m^2	5.4×10^{-4}	5.4×10^{-4}	6.3×10^{-4}	7.6×10^{-4}

Motor Model	Series 110			
	ASMS -R80C20U2	ASMS -1R2C30U2	ASMS -1R5C30U2	ASMG -1R2C20U2
Encoder Resolution C/R	2,500			
Insulation Grade of Motor	Class F			
Protection Level	IP65			
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)			

Installation Size:



Motor Torque Nm	4.0	5.0	6.0
LA	189	204	219
LB	55	55	55
LC	5	5	5
LD	12	12	12
LE	95	95	95
LF	110	110	110
LG	130	130	130
LZ	9	9	9
S	19	19	19
H	21.5	21.5	21.5
W	6	6	6

Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 74mm.

■ **Parameters of 130 Flange Series E 380V Motor**

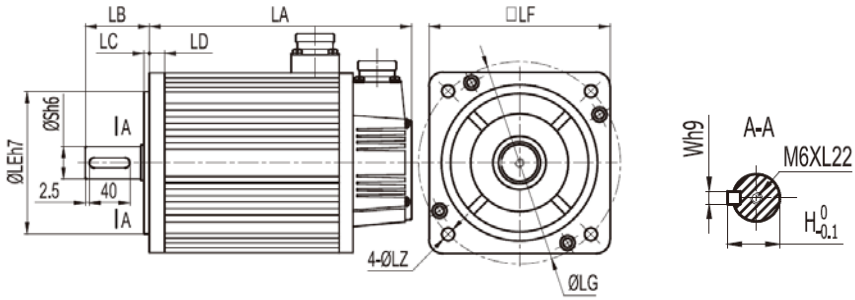
Motor Model	Series 130		
	ASMH -1R0C25U2	**ASMG -1R3C25U2**	**ASMH -1R0C10U2**
Rated Power KW	1.0	1.3	1.5
Rated Current	2.6	3.0	2.5
Rated Speed rpm	2,500	2,500	1,000
Rated Torque Nm	4.0	5.0	10.0
Peak Torque Nm	12.0	15.0	20.0
Rotor Inertia kg•m^2	8.5×10^{-4}	10.6×10^{-4}	19.4×10^{-4}
Encoder Resolution C/R	2,500		
Insulation Grade of Motor	Class F		
Protection Level	IP65		
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)		

Motor Model	Series 130		
	ASMG -1R5C15U2	**ASMG -1R5C25U2**	**ASMG -2R0C25U2**
Rated Power KW	1.5	1.5	2.0
Rated Current	3.5	3.7	4.7
Rated Speed rpm	1,500	2,500	2,500
Rated Torque Nm	10.0	6.0	7.7
Peak Torque Nm	25.0	18.0	22.0
Rotor Inertia kg•m^2	19.4×10^{-4}	10.6×10^{-4}	15.3×10^{-4}
Encoder Resolution C/R	2,500		

Motor Model	Series 130		
	ASMG -1R5C15U2	**ASMG -1R5C25U2**	**ASMG -2R0C25U2**
Insulation Grade of Motor	Class F		
Protection Level	IP65		
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)		

Motor Model	Series 130			
	ASMG -2R0C20U2	**ASMG -2R3C15U2**	**ASMG -2R6C25U2**	**ASMG -3R8C25U2**
Rated Power KW	2.0	2.3	2.6	3.8
Rated Current	5.1	5.0	5.9	7.4
Rated Speed rpm	2,000	1,500	2,500	2,500
Rated Torque Nm	10.0	15.0	10.0	15.0
Peak Torque Nm	25.0	30.0	25.0	30.0
Rotor Inertia $kg•m^2$	19.4×10^{-4}	27.7×10^{-4}	19.4×10^{-4}	27.7×10^{-4}
Encoder Resolution C/R	2,500			
Insulation Grade of Motor	Class F			
Protection Level	IP65			
Service Environment	Environment temperature: -20~+50℃, environment humidity: relative humidity < 90% (without condensation)			

Installation Size:



Speed rpm	2,500						1,500		1,000	2,000
Torque Nm	4.0	5.0	6.0	7.7	10	15	10	15	10	10
LA	166	171	179	192	209	231	213	241	213	209
LB	57	57	57	57	57	57	57	57	57	57
LC	5	5	5	5	5	5	5	5	5	5
LD	14	14	14	14	14	14	14	14	14	14
LE	110	110	110	110	110	110	110	110	110	110
LF	130	130	130	130	130	130	130	130	130	130
LG	145	145	145	145	145	145	145	145	145	145
LZ	9	9	9	9	9	9	9	9	9	9
S	22	22	22	22	22	22	22	22	22	22
H	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
W	6	6	6	6	6	6	6	6	6	6

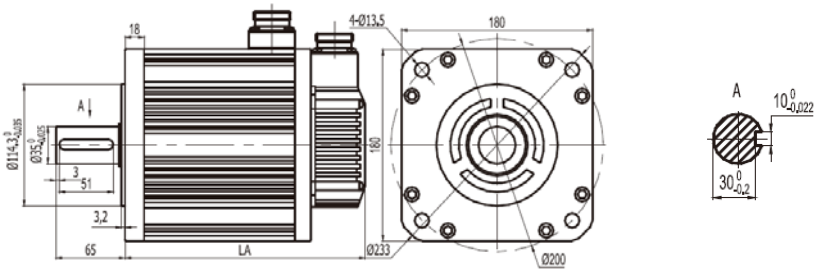
Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 57 or 81mm, see below for details.

Motor Spec. (Flange No., torque)	With a brake Increased length
130 flange, torque: 4~7.7Nm	57mm
130 flange, torque: 10~15Nm	81mm

■ **Parameters of 180 Flange Series E 380V Motor**

Motor Model	Series 180		
	ASMG -2R7C15U2	ASMG -2R9C10U2	ASMG -4R5C20U2
Rated Power KW	2.7	2.9	4.5
Rated Current	6.5	7.5	9.5
Rated Speed rpm	1,500	1,000	2,000
Rated Torque Nm	17.2	27.0	21.5
Peak Torque Nm	43.0	67.0	53.0
Rotor Inertia kg•m^2	34.0×10^{-4}	61.0×10^{-4}	47.0×10^{-4}
Encoder Resolution C/R	2,500		
Insulation Grade of Motor	Class F		
Protection Level	IP65		
Service Environment	Environment temperature: -20~+50 ℃, environment humidity: relative humidity < 90% (without condensation)		

Installation Size of Flange:



Spec.	17.2Nm	21.5Nm	27.0Nm
Length LA (mm)	226	243	262

Note: the length indicates the length of motor without a brake, and the length of motor with a brake will increase 72mm.

Annex 9 Servo Drive Warranty

Servo Drive Warranty

User:	
User Address:	
Contact:	Tel:
Post Code	Fax:
Drive Model:	Serial Number:
Date of purchase:	Date of fault:

Fault:

Motor: KW pole	Application:
Failure time: input power no-load load % Other:	
Symptom:	
Indication: none others:	
Use control terminals:	
Operation after reset: yes no	Output voltage: yes no
Total working hours:	Fault frequency:

Installation environment:

Power voltage: U-V: V, V-W: V, W-U: V	
Transformer capacity: KVA	Grounding of servo drive: yes no
Distance to power: m	Distance to power: m
Vibration: none general strong	Dust: none some much
Other conditions:	