
Maxsine
EP3E Series
EtherCAT bus
AC servo drive
User manual

(The third edition)

Servo drive

GL1A0/GL1A8/GL3A0/GL5A5/GL7A5/GL120/GL160/GL190/GL240
GH2A0/GH3A5/GH5A4/GH8A5/GH130/GH170/GH210

Wuhan Maxsine Electric Co., Ltd

DECLARATION

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Because improves and so on the reasons, the product specification or dimension has the change, not separate informs even slightly.

Safety Precautions

In order to use this product safely, the user should be familiar with and observes the following important items before proceeding with storage, installation, wiring, operation, inspection or maintenance for the product.



Indicates a disoperation possibly can cause danger and physical injure or death.



Indicates a disoperation possibly can cause danger and physical injure, and may result in damage to the product.



Indicates a prohibited actions, otherwise can cause damage, malfunction to the product.

1. Service conditions



- Do not expose the product in moisture, caustic gas, and ignitable gas situation. Otherwise can cause an electric shock or fire.
- Do not use the product in direct-sunlight, dust, salinity and metal powder places.
- Do not use the product in the places that has water, oil and drugs drops.

2. Wiring



- Connect the earth terminal (PE) to earth reliably, otherwise can cause an electric shock or fire.
- Never connect the input power terminals (L1, L2, L3) to 380V power supply, otherwise can result in the equipment damage and an electric shock or fire.
- Do not connect the servo motor output terminals (U, V, W) to 3 phase AC power supply, otherwise can cause personnel casualty or fire.
- The output terminals (U, V, W) must be connected with the servo motor connections (U, V, W) correspondently, otherwise can result in the servomotor flying speed that may cause equipment damage and the personnel casualty
- Please fasten the input power terminals (L1, L2, and L3) and the output terminals (U, V, W). Otherwise may cause fire.
- Referring to wire selection guide, please install all wires with an adequate cross-section. Otherwise may cause fire.

3. Operations

注意

- Before operating the mechanical device, it is necessary to set the parameters with appropriate values. Otherwise, can cause the mechanical device to out of control or break down.
- Before running the mechanical device, make sure the emergency stop switch can work at any time.
- Performing trial run without load, make sure that the servomotor is in normal operation. Afterwards joins again the load.
- Please do not turn on and off the main power supply more frequently, otherwise can cause the servo driver overheat.

4. Running

禁止

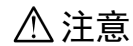
- Do not touch any moving parts of the mechanical device while the servomotor is running, otherwise can cause personnel casualty.
- Do not touch servo driver and servomotor while the equipment is operating, otherwise can result in an electric shock or in burn.
- Do not move any connection cables while the equipment is operating, otherwise can result in physical injure or equipment damage.

5. Maintenance and inspection

禁止

- Do not touch any portion inside of the servo driver and servomotor, otherwise can cause an electric shock.
- Do not remove the front cover of the servo driver while power is on, otherwise can cause an electric shock.
- Please wait at least 5 minutes after power has been removed before touching any terminal, otherwise the remaining high voltage possibly can cause an electric shock
- Do not change the wiring while the power is on, otherwise can cause an electric shock.
- Do not disassemble the servomotor, otherwise can cause an electric shock.

6. Service ranges



This handbook involves the product for the general industry use, please do not use in some equipment which may directly harm the personal safety, such as nuclear energy, spaceflight, aeronautic equipment, and life safeguard, life-support equipment and each kind of safety equipment. Please make contact with the company if have the need of use mentioned above.

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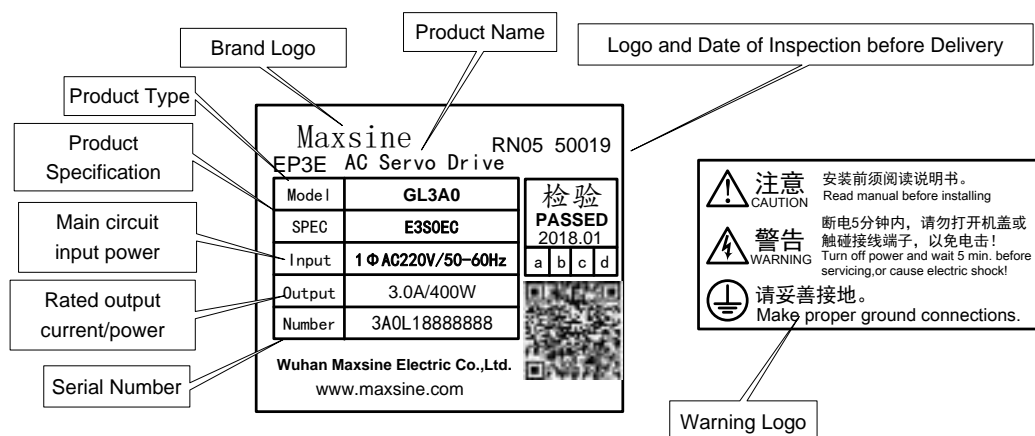
Chapter 1 Product inspection and installment

1.1 Product inspection

This product has made the complete function test before delivery, for prevented the product to be abnormal owing to shipping process, please make detail inspection as the following items after breaking the seal:

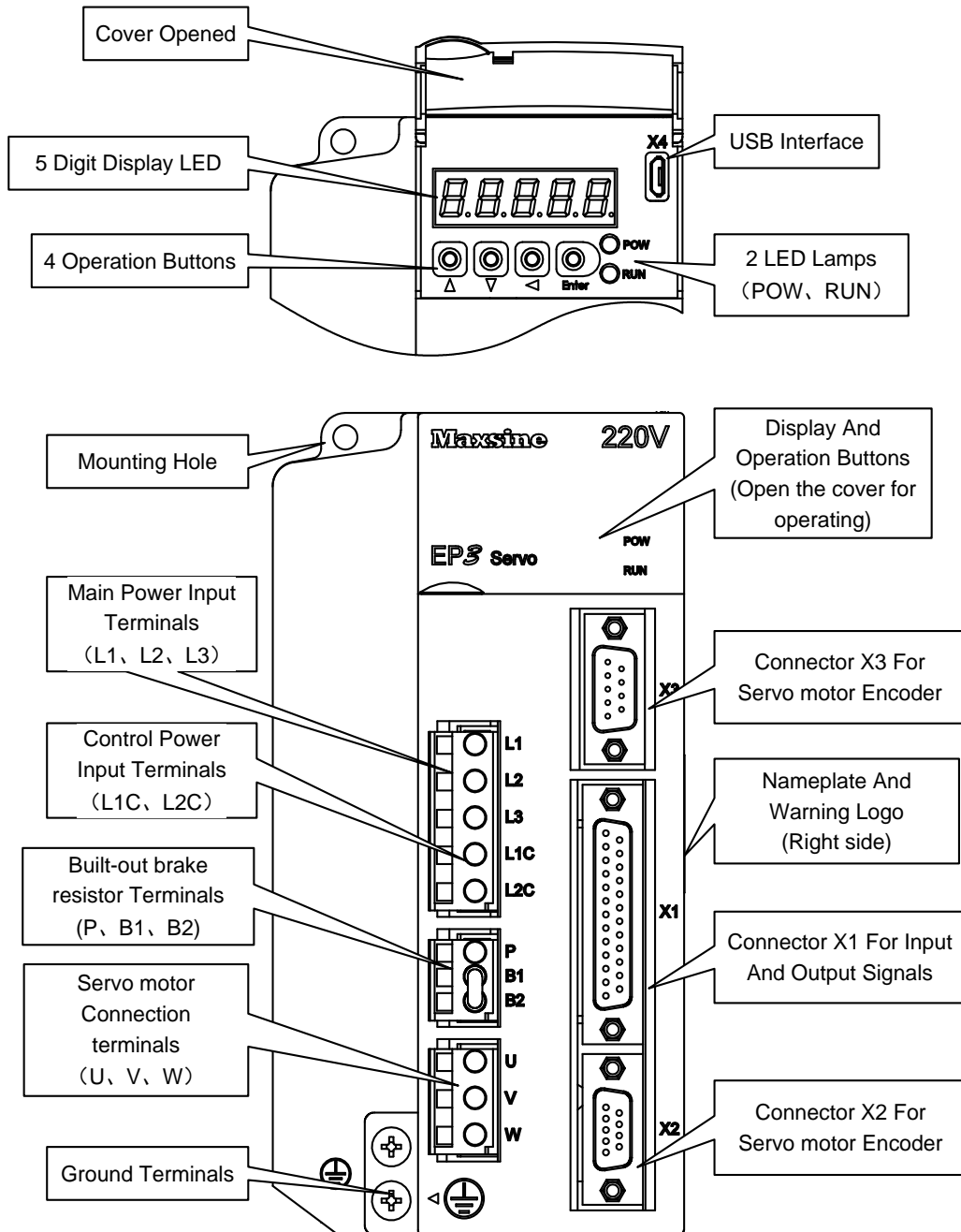
- Inspect the types of servo driver and servomotor and ensure that are the same types in the order form.
- Inspect the outward appearance of servo driver and servomotor to see any abrasion or damage; if so please do not wire to the power supply.
- Inspect the parts of servo driver and servomotor to see any loosen parts such as loosened or fallen off screw.
- Rotate the servomotor shaft by hand and should be smooth rotation. However, the servomotor with holding brake is unable to rotate directly.
- If there is any break down item or abnormal phenomenon mentioned above, please contact with the dealer immediately.

1.2 Product nameplate

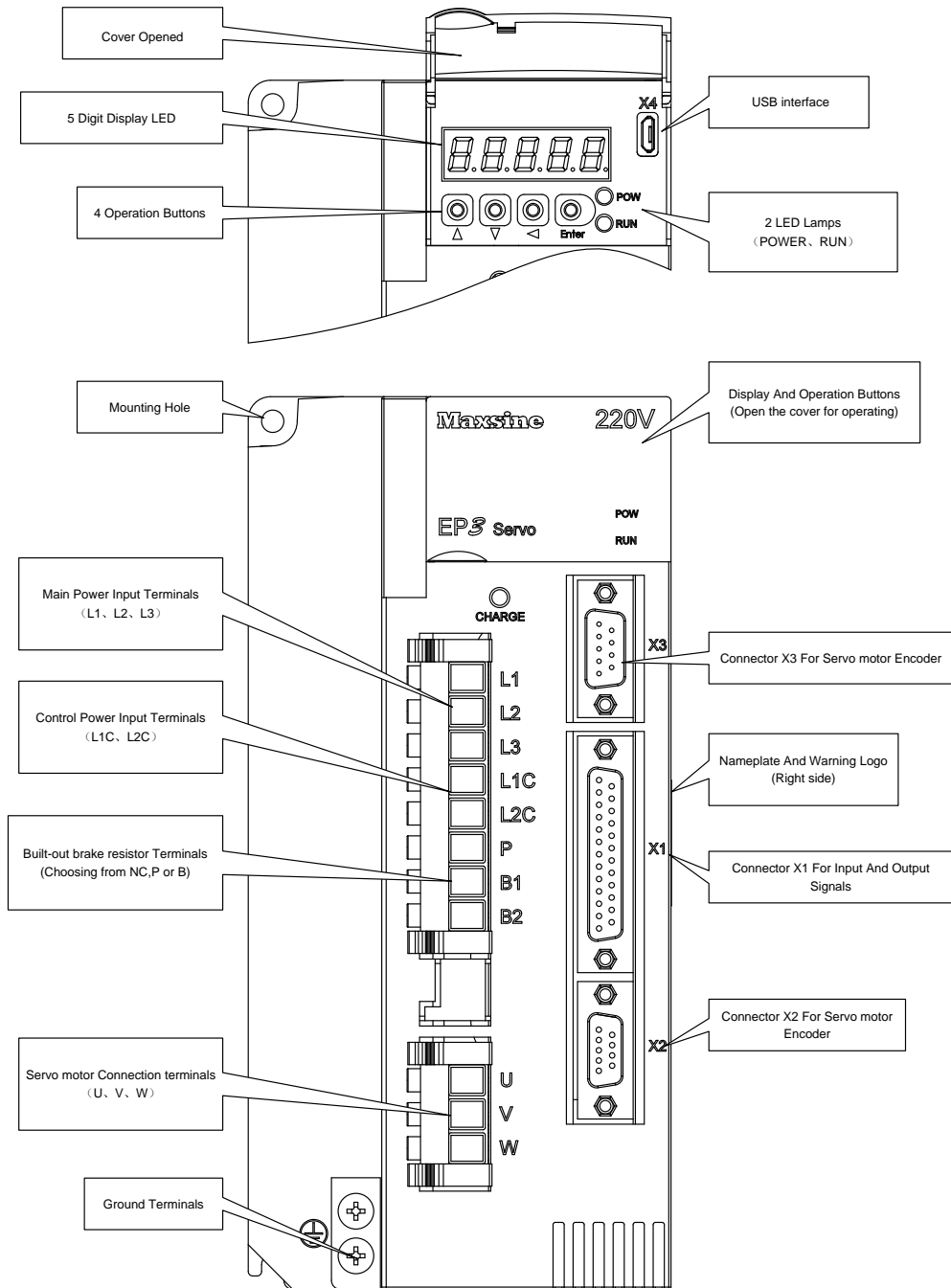


1.3 Product front panel

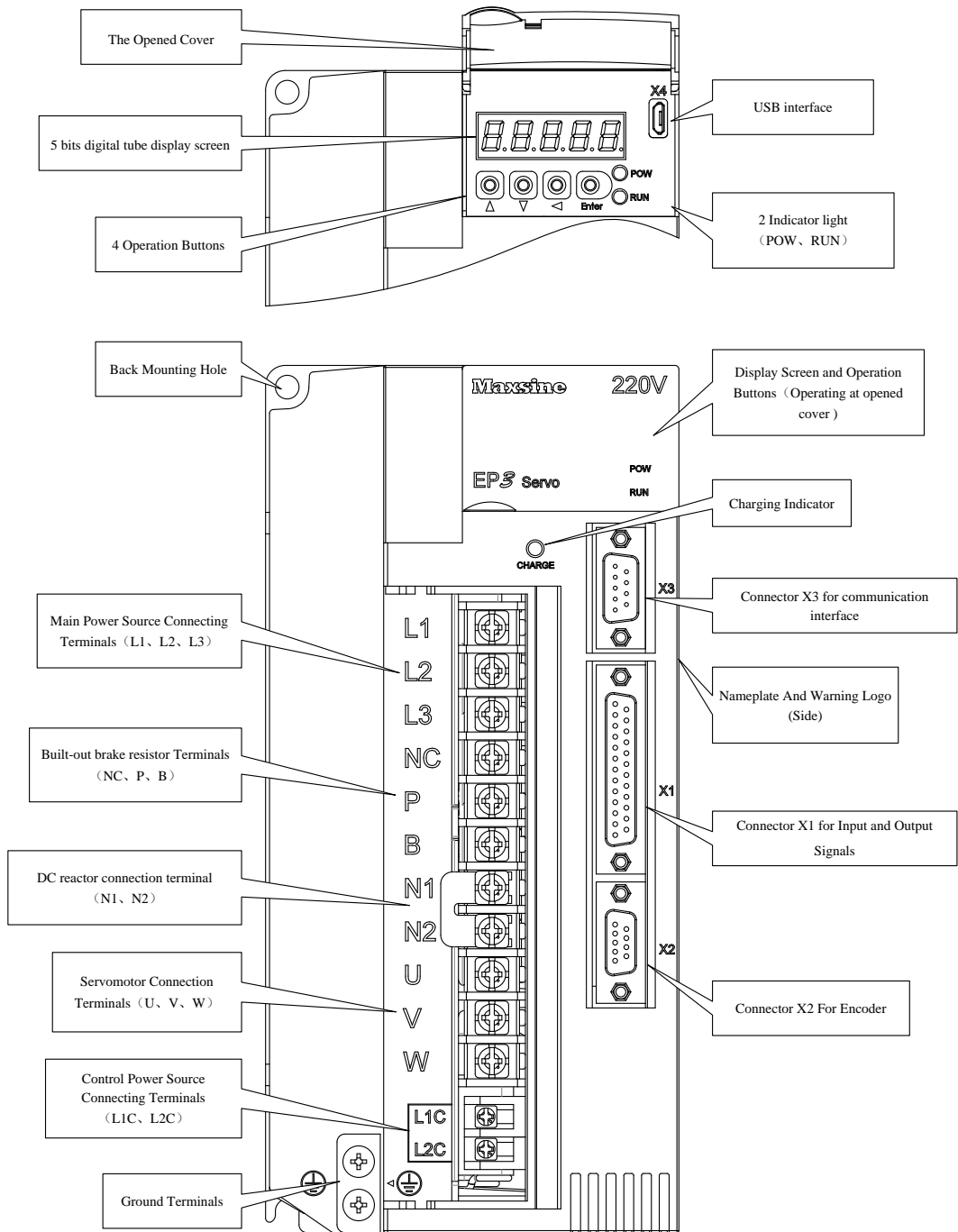
Applicable models: GL1A0、GL1A8、GL3A0、GL5A5、GL7A5、GL120



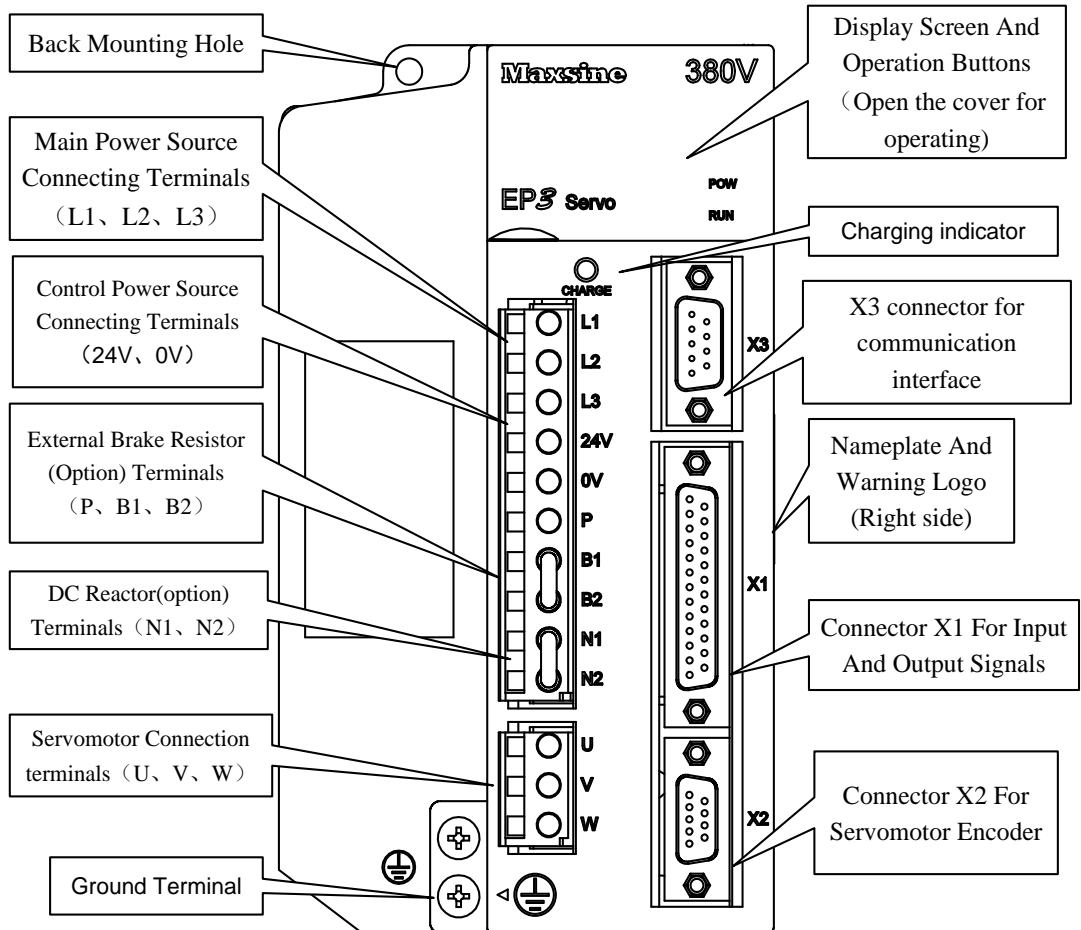
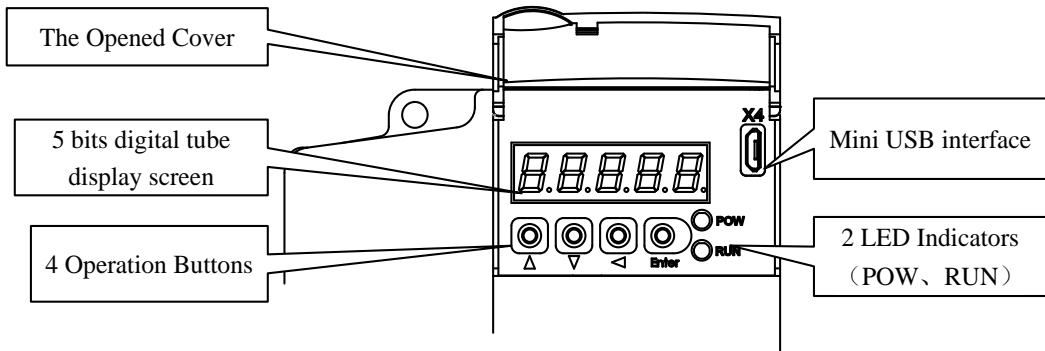
Applicable models: GL160



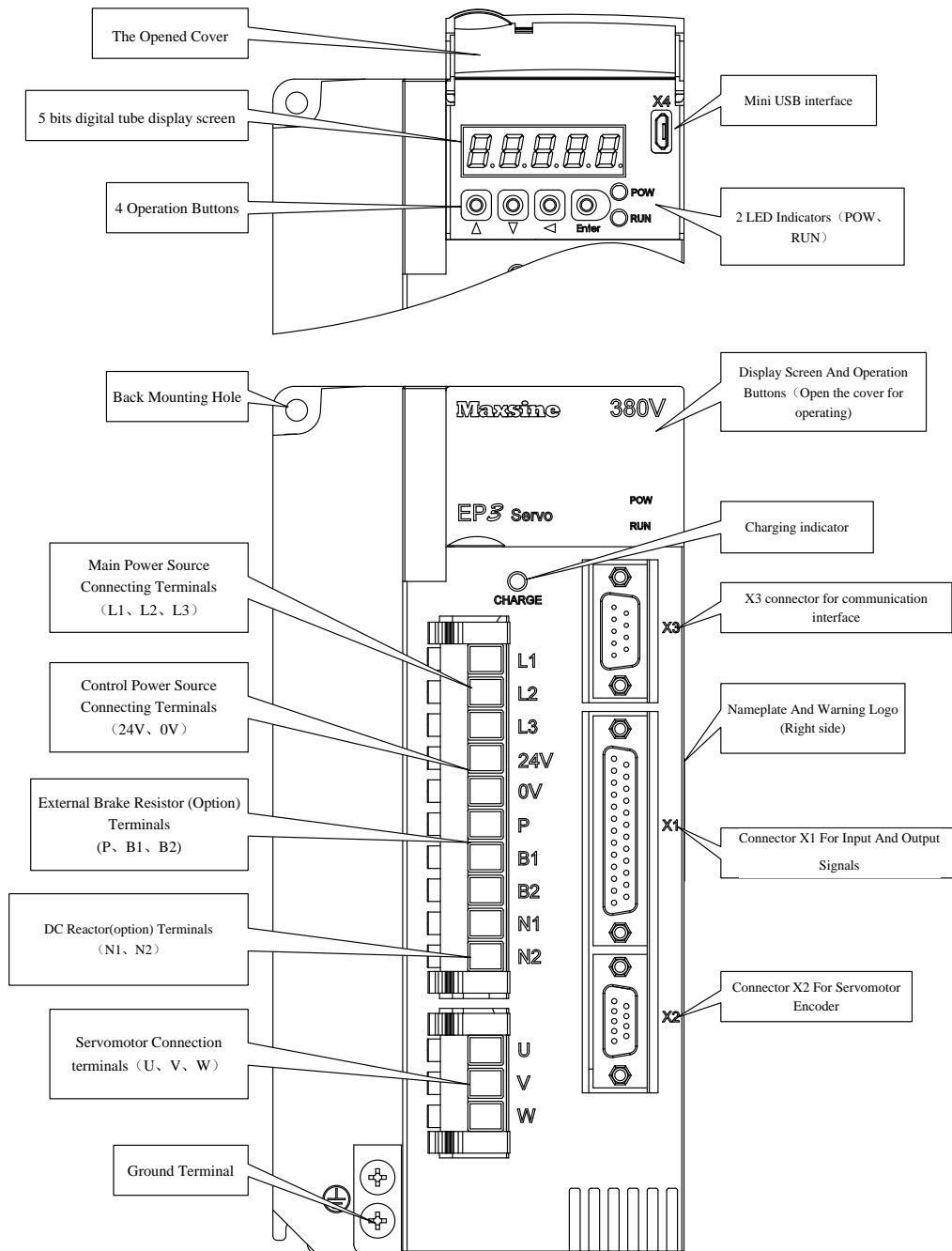
Applicable models: GL190、GL240



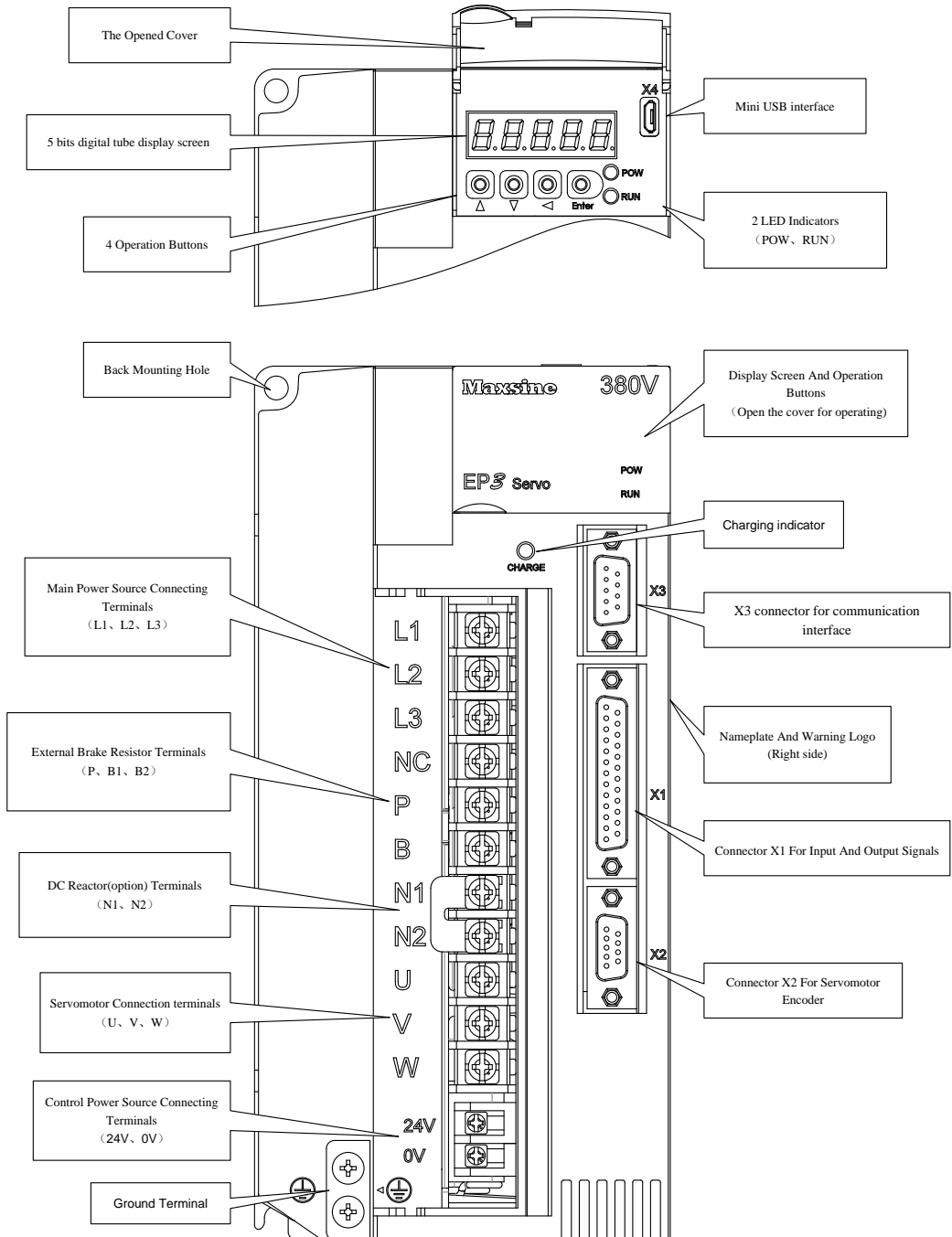
Applicable models: GH2A0、GH3A5、GH5A4



Applicable models: GH8A5



Applicable models: GH130、GH170、GH210



1.4 Servo driver installation

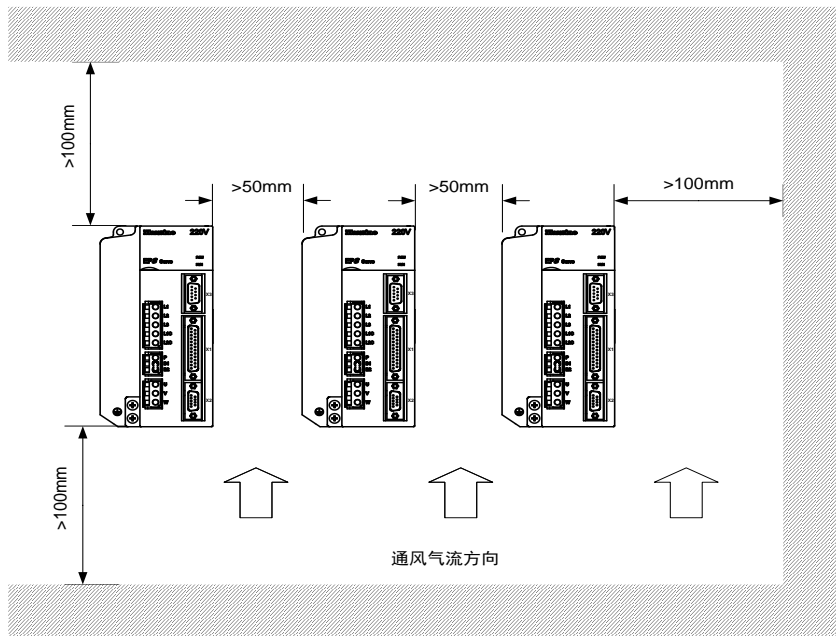
1.4.1 The environmental conditions for installation

Since the environment conditions for servo driver installation have the direct influence to the normal function and service life of the servo driver, therefore the environment conditions must be conformed to the following conditions:

- Ambient temperature: 0 to 40°C; ambient humidity: less than 80% (no dew).
- Storage temperature: -40 to 50°C; Storage humidity: less than 93% (no dew).
- Vibration: less than 0.5G.
- Preventive measure shall be taken against raindrop or moist environment.
- Avoid direct sunlight.
- Preventive measure shall be taken against corrosion by oil mist and salinity.
- Free from corrosive liquid and gas.
- Preventive measure shall be taken against entering the servo driver by dust, cotton fiber and metal tiny particle.
- Keep away from radioactive and inflammable substances.
- When several driver installments in a control cubicle, for good ventilation please reserve enough space around each driver, install fans to provide effective cooling, keep less than 40°C for long-term trouble-free service.
- If there are vibration sources nearby (punch press for example) and no way to avoid it, please use absorber or antivibration rubber filling piece.
- If there is disturbance from interferential equipment nearby along the wirings to the servo driver can make the servo driver misoperation. Using noise filters as well as other antijamming measure guarantee normal work of the servo driver. However, the noise filter can increase current leakage, therefore should install an insulating transformer in the input terminals of power supply.

1.4.2 The method of installation

- In order to get good cooling the servo driver should normally mount in vertical direction with the topside upward.
- For installing the servo driver, fasten the backboard of the servo driver with M5 screw bolt.
- Reserve enough space around the servo drivers as shown in the reference diagram. In order to guarantee the performance of the servo driver and the lifetime, please make the space as full as possible.
- To provide vertical wind to the heat sink of the servo driver should install ventilating fans in the control cubicle.
- Prevent the dust or the iron filings entering the servo driver when install the control cubicle.



1.5 Servo motor installation

1.5.1 The environmental conditions for installation

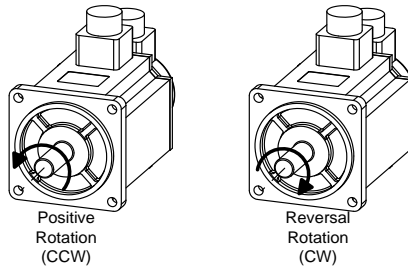
- Ambient temperature: 0 to 40°C; Ambient humidity: less than 80 % (no dew).
- Storage temperature: -40 to 50°C; Storage humidity: less than 93 % (no dew).
- Vibration: less than 0.5G.
- Install the servomotor in well-ventilated place with less moisture and a few dusts.
- Install the servomotor in a place without corrosive liquid, flammable gas, oil vapor, cutting cooling liquid, cutting chips, iron powder and so on.
- Install the servomotor in a place without water vapor and direct sunlight.

1.5.2 The method of installation

- For horizontal installation: In order to prevent water, oil, etc. from entering inside of the servomotor, please put the cable connector downward.
- For vertical installation: if the shaft of the servo motor is in upward direction with a speed reducer, some prevention measure shall be taken against entering inside of the servomotor by oil come from the speed reducer.
- Motor shaft extension should be long enough, or may cause vibration while motor is in running
- In case of installation or removing the servomotor, please do not hit the servomotor with a hammer, otherwise the shaft and the encoder can be damaged.

1.6 The definition of rotating direction for servomotor

The motor rotating direction description in this handbook is defined as facing the shaft of the servomotor, if the rotating shaft is in counter clockwise direction will be called as positive direction, or in clockwise as reversal direction.



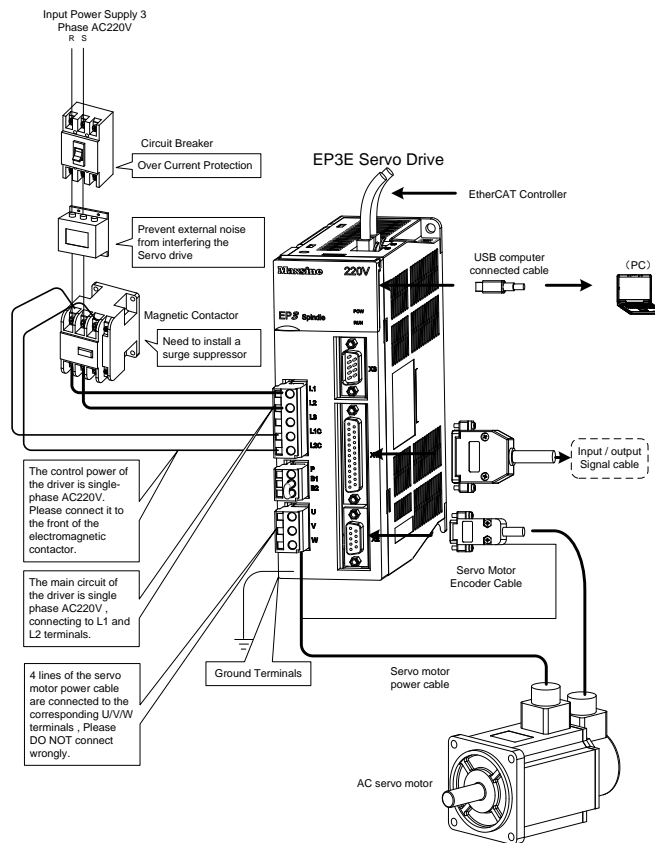
Chapter 2 Wiring

2.1 System construction and wiring

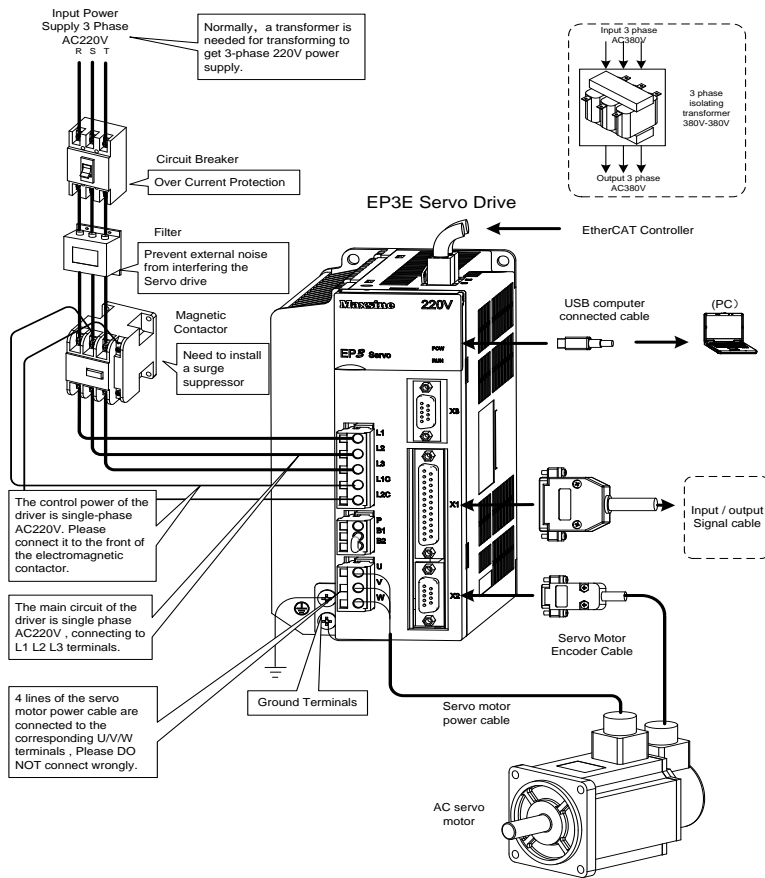
2.1.1 Servo driver wiring diagram

1 EP3E-GL series Servo driver wiring

Applicable models: GL1A0、GL1A8、GL3A0

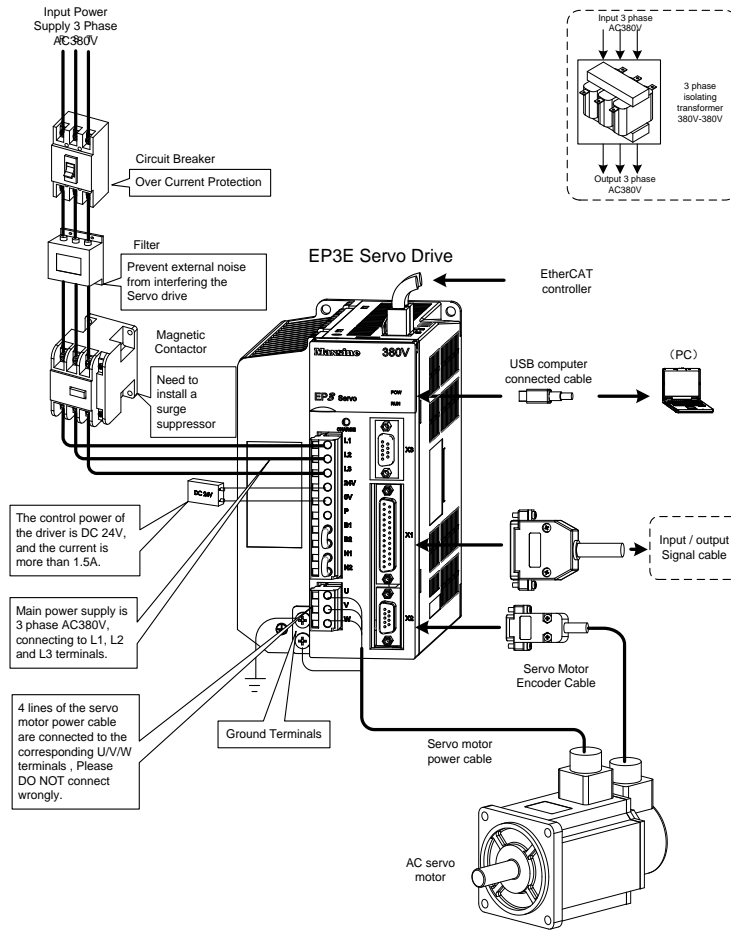


Applicable models: GL5A5、GL7A5、GL120、GL160



Note: GL190 and GL240, please refer to chapter 2.1.5.

2 EP3E-GH series Servo driver wiring



Note: This wiring method is only suitable for GH2A0、GH3A5 and GH5A4, For GH8A5、GH130、GH170、GH210 please refer to chapter 2.1.5

2.1.2 Wiring explanations

Wiring Notes:

- According to electric wire specification, use the wiring materials.
- The control cable length should be less than 3 meters and the encoder cable length 20 meters.
- EP3-GL series: check that the power supply and wiring of L1, L2, L3 and L1C, L2C terminals are correct. Please do not connect to 380V power supply.
- EP3-GH series: check that the power supply and wiring of L1, L2, L3 and 0V, 24V terminals are correct.
- The output terminals(U,V,W) must be connected with the servo motor connections(U,V,W) correspondently, otherwise the servo motor will stop or over speed. However, by exchanging three-phase terminal cannot cause the motor to reverse; this point is different from an asynchronous motor.
- Earthed wiring must be reliable with a single-point connection.
- Pay attention to the correct direction of freewheel diode which is connected with the relay at the output terminal, otherwise can cause the output circuit breakdown.
- In order to protect the servo driver from noise interference that can cause malfunction, please use an insulation transformer and noise filter on the power lines.
- Wiring the power lines (power supply line, main circuit lines, etc.) at a distance above 30cm from the control signal wires, do not lay them in one conduit.
- Install a non-fuse circuit breaker that can shut off the external power supply immediately for in case of the servo driver fault.

2.1.3 Electric wire specifications

Connect terminal		symbol	Wire specification
Main power supply		L1、L2、L3	1.5~4mm ²
Control Power supply	GL series	L1C、L2C	0.75~1.0mm ²
	GH series	24V、0V	0.75~1.0mm ²
Servo motor connection terminal		U、V、W	0.75~4mm ²
Ground terminal		⊕	0.75~4mm ²
Control signals terminal		X1	≥0.14mm ² (AWG26) , shielded
Encoder signal terminal		X2	≥0.14mm ² (AWG26) , shielded
brake resistor terminal		P、B1/P、B	1.5~4mm ²

Must use a twisted pair wire cable for the encoder signal wiring. If the encoder signal cable is too long (>20m), in which the encoder power supply can be insufficient, may use multi-wire or thick wire for the power supply wiring.

2.1.4 Main circuit terminal explanation

Terminal name	Symbol	Model	Detailed explanation
Main power supply	L1、L2	GL1A0、GL1A8、GL3A0	1 phase 220VAC -15% ~ +10% 50/60Hz
	L1、L2、L3	GL5A5、GL7A5、GL120、GL160、GL190、GL240	3 phase 220VAC -15% ~ +10% 50/60Hz
		GH series	3 phase 380VAC -15% ~ +10% 50/60Hz
Control power supply	L1C、L2C	GL series	1 phase 220VAC -15% ~ +10% 50/60Hz
	24V、0V	GH series	Connect DC 24V externally
Brake resistor	P、B1、B2	GL1A0【Note 1】、GL1A8、GL3A0、GL5A5、GL7A5、GL120、GL160、GH2A0、GH3A5、GH5A4	When the external brake resistor is needed, disconnect the short wires between B1 and B2 [note 2] and crossover the external brake resistor to terminals P and B1. Leave B2 unconnected.。
	NC、P、B	GL190、GL240【Note 1】、GH8A5、GH130、GH170、GH210	When the external brake resistor is needed, it must disconnect the internal brake resistor wire between terminals P and B firstly, connect those two wires to NC at the same time, and then crossover the external brake resistor to terminals P and B.
Power supply higher order harmonics restrain-use	N1、N2	GL190、GL240、GH series	When the power supply higher order harmonics needs to be restrained, connect the DC reactor between N1 and N2[note 2]
DC reactor connection terminals	U	EP3E series	Output to U phase of servo motor
	V		Output to V phase of servo motor
	W		Output to W phase of servo

			motor
Ground	⊕	EP3E series	Ground terminal of servomotor
	⊕		Ground terminal of servo driver

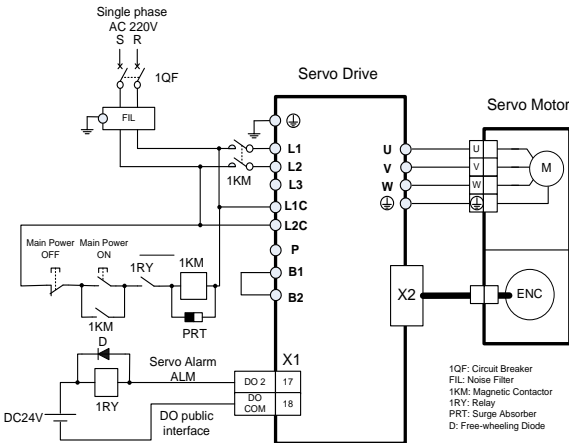
Note 1: There is no internal brake resistor in GL1A0 and GL240. It is no necessary to connect brake resistor for GL1A0 normally. But for GL240, it is necessary to connect built-out brake resistor, please connect to the terminal P and B, leave the NC alone.

Note 2: The factory default connection of internal brake resistor: B1 and B2 are in the state of short-circuited; N1 and N2 are in the state of short-circuited.

2.1.5 Main circuit wiring diagram

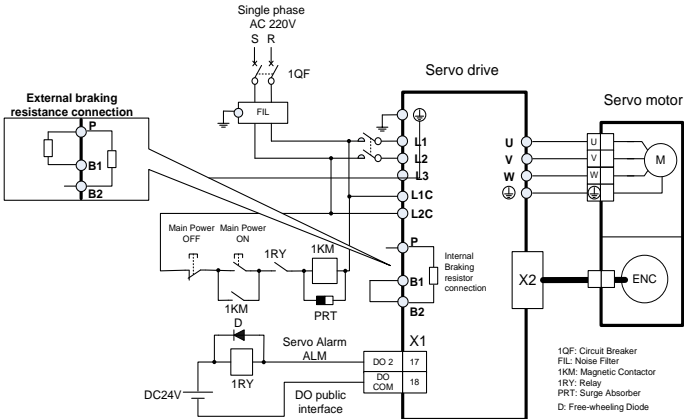
1. The power supply for the servo driver GL series is a three-phase AC 220V which generally come from three-phase AC380V power supply through a transformer.

Applicable models: GL1A0 **【Note】**

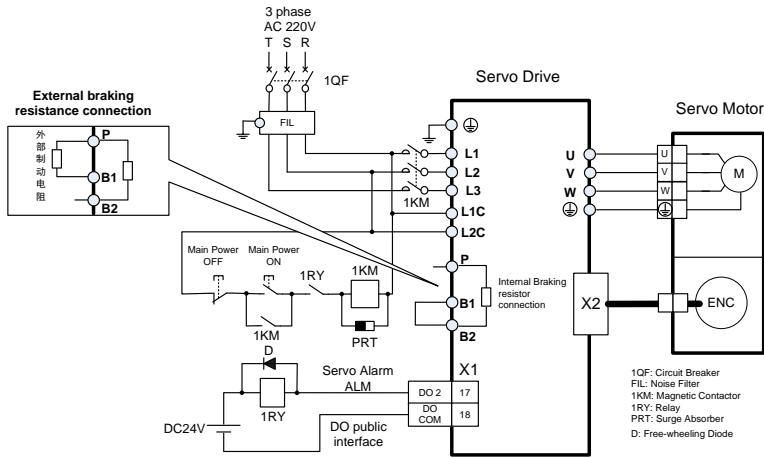


Note: There is no internal brake resistor of GL1A0, which does not need to connect the brake resistor generally.

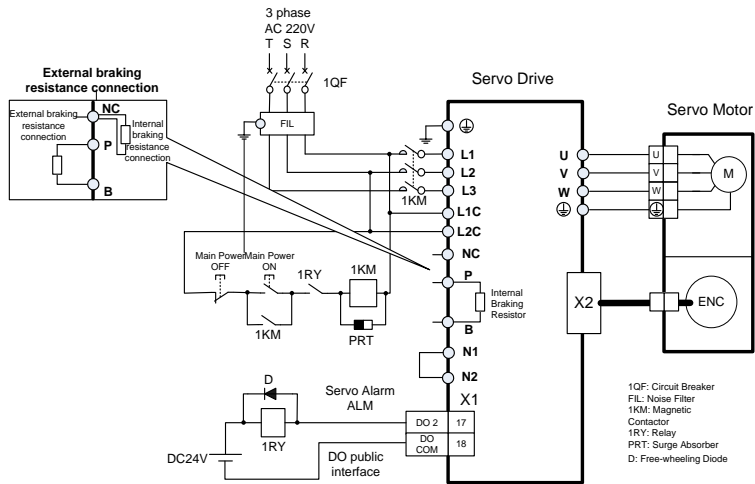
Applicable models: GL1A8、 GL3A0



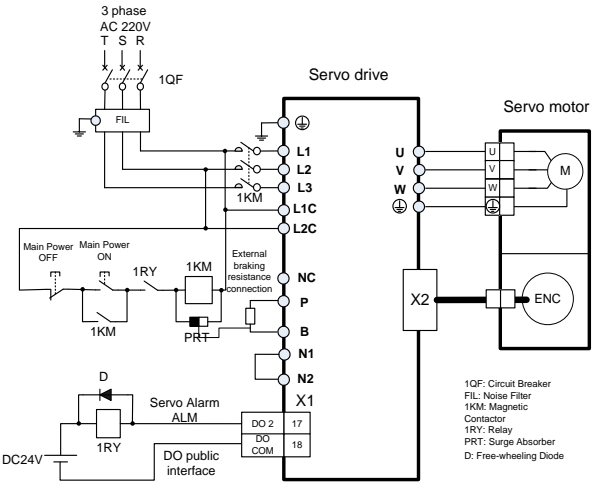
Applicable models: GL5A5、GL7A5、GL120、GL160



Applicable models: GL190



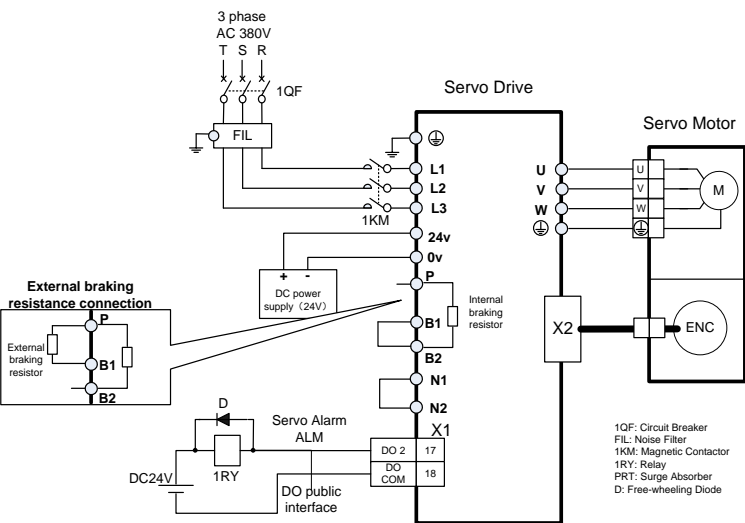
Applicable models: GL240 【Note】



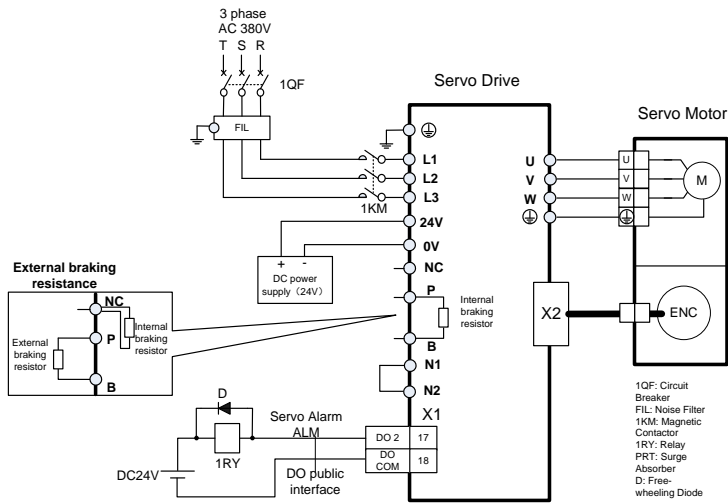
Note: There is no internal brake resistor of GL240, which need to connect the brake resistor generally.

2.GH series:

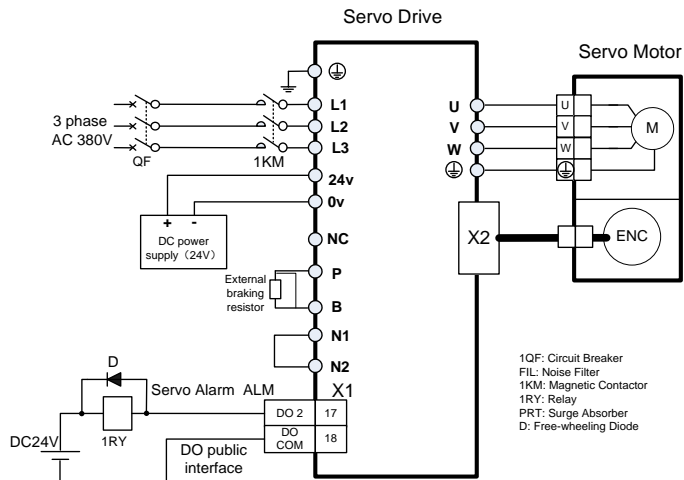
Applicable models: GH2A0、GH3A5、GH5A4、GH8A5



Applicable models: GH130



Applicable models: GH170、GH210 【Note】



Note: There is no internal brake resistor of GL240, which need to connect the brake resistor generally.

2.2 Adaptation of brake resistance

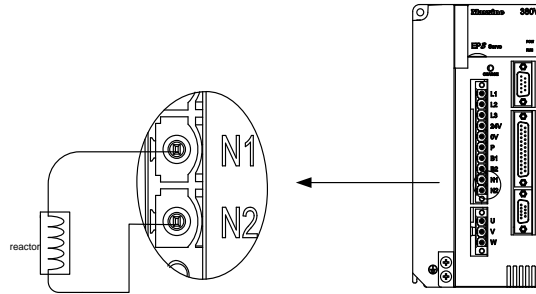
Drive series		Internal brake Resistance specification	External brake resistor recommendation	External brake resistor (Min. resistance)
AC220V	GL1A0	N/A	Min.47Ω /100W	30Ω
	GL1A8	47Ω /100W	Min.36Ω /200W	30Ω
	GL3A0	47Ω /100W	Min.36Ω /200W	30Ω
	GL5A5	47Ω /100W	Min.36Ω /200W	25Ω
	GL7A5	47Ω /100W	Min.36Ω /200W	25Ω
	GL120	47Ω /100W	Min.25Ω /200W	20Ω
	GL160	47Ω /100W	Min.25Ω /200W	20Ω
	GL190	47Ω /100W	Min.20Ω /500W	12Ω
	GL240	N/A	Min.20Ω /500W	12Ω
AC380V	GH2A0	117Ω /100W	Min.50Ω /500W	45Ω
	GH3A5	117Ω /100W	Min.50Ω /500W	45Ω
	GH5A4	117Ω /100W	Min.50Ω /500W	45Ω
	GH8A5	47Ω /100W	Min.50Ω /500W	40Ω
	GH130	47Ω /100W	Min.36Ω /750W	30Ω
	GH170	N/A	Min.36Ω /750W	30Ω
	GH210	N/A	Min.20Ω /1000W	15Ω

Note 1. The resistance recommended in the table can be applied to most occasions. If it can't meet the demand in practical applications, please contact the manufacturer.

Note 2. When all the drivers are changed to the external brake resistance, the parameter P084/P085/P086 should be modified accordingly. For specific modifications, please refer to the corresponding parameter description in Chapter 5.4.1.

2.3 The connection of reactor

When it needs to be restrained to the power supply higher order harmonics, connect the direct current reactor between N1 and N2.



Note: There is the function of connecting external reactor only in GL190、GL240、GH2A0、GH3A5、GH5A4、GH8A5、GH130、GH170、GH210 servo drive.

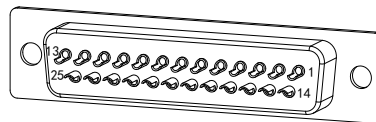
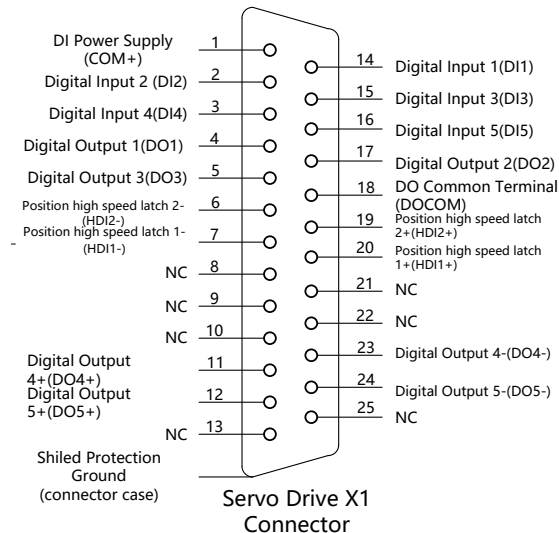
2.4 X1 Control signal terminal

The X1 control signal terminal provides the signal which need to connect with external IO, and uses the DB25 socket. The signal includes::

- 5 programmable inputs;
- 5 programmable outputs;
- 2 way high speed latch input. ◦

2.4.1 X1 terminal connector

The X1 connector plug uses DB25 male head, the contour and pin disposition charts are as the followings:



Connector X1 Soldering Lug Disposition

2.4.2 X1 terminal signal explanation

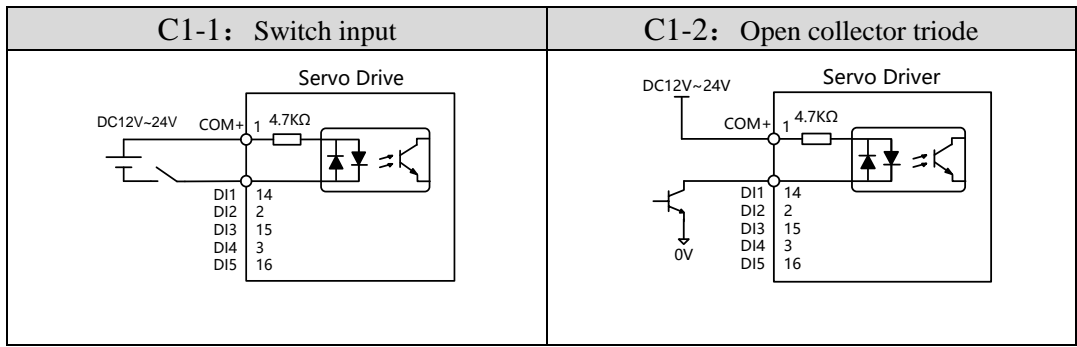
Name of signals		pin number	function	connector
digital inputs	DI1/DI2/DI3 DI4/DI5	14/2/15 3/16	Photo isolation input; function is programmable; defines by parameter P100 to P104.	C1
	COM+	1	DI power supply (DC12V~24V)	
digital output	DO1/DO2/DO3	4/17/5	Photo isolation output; maximum output: 50mA/25V; function is programmable; defines by parameter P130~P132.	C2
	DOCOM	18	DO common terminal	
	DO4+/DO4- DO5+/DO5-	11/23 12/24	Optoelectronic isolated output, maximum output capacity of 50mA/25V, function programmable, digital differential output defined by parameters	
Position high speed latch	HDI1+/HDI1- HDI2+/HDI2-	20/7 19/6	High speed photoelectric isolation input	
Shield protection ground	Metal case of connector		Shielded wire for connection with shielded cable.	

2.4.3 X1 terminal interface type

The followings introduce the X1 various interface circuits and the wiring ways with the host-controller.

1. Digital input interfaces (C1)

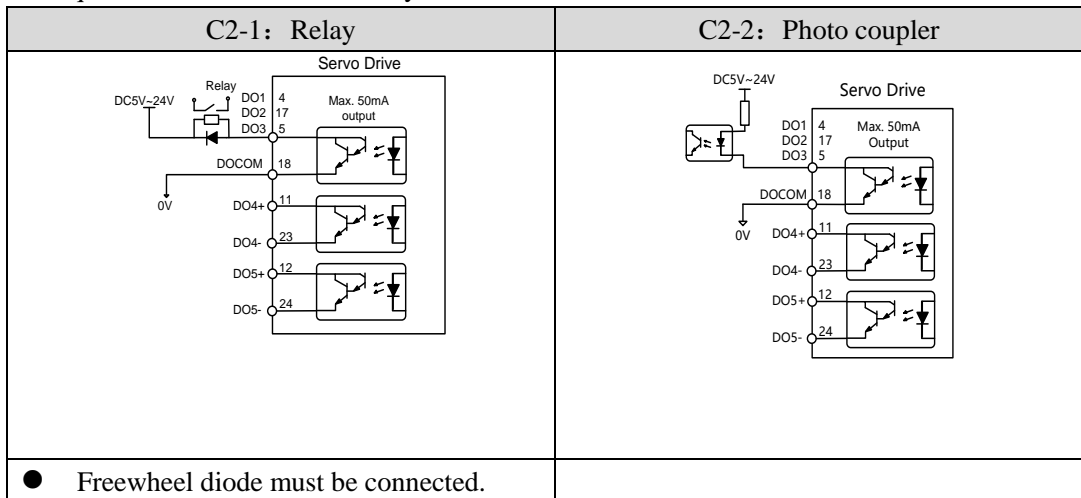
For carrying on a control, the digital input interface circuit can be constructed by switch, relay, open-collector triode, and photo-coupler and so on. To avoid contacting problem the relay must be chosen with low current operation. External voltage is in the range of DC12V~24V.



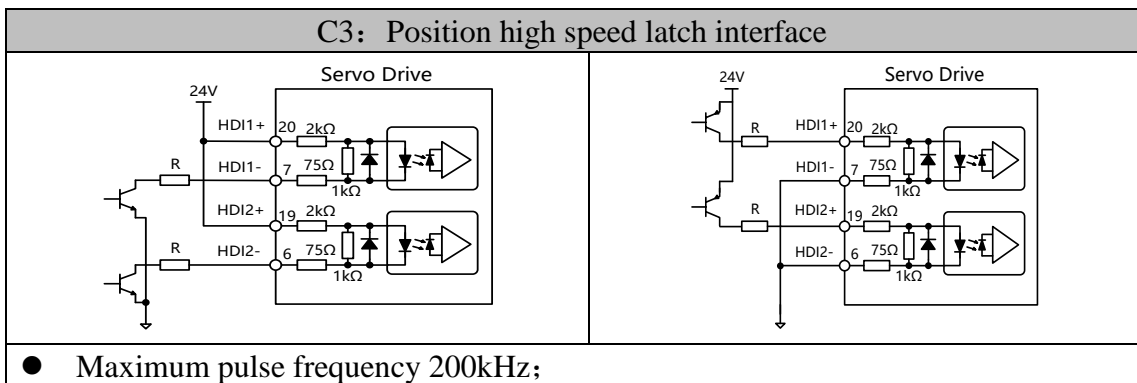
2. Digital output interfaces (C2)

The digital outputs use Darlington photo-coupler. It can be connected with relay, photo-coupler. Please notice the following:

- Inverting the polarity of DC power source, which is provided by the user, can cause the servo driver damage.
- The maximum voltage of external DC power supply is 25V, the maximum output current is 50mA, and the total current for three channels is not in excess of 100mA.
- When using relay like inductive loads, a free-wheel diode must be connected with the inductive load in parallel. If the diode connects in wrong direction can cause damage to the output circuit.
- Owing to the low level of output is approximately 1V and cannot satisfy the TTL low-level request, therefore cannot directly connect with the TTL circuit.



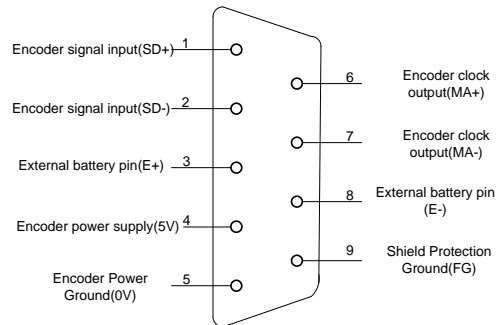
3. Position high speed latch interface (C3)



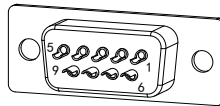
2.5 X2、X3 Encoder signal terminal

2.5.1 X2 terminal connector

The following diagram are the connection between X2 encoder signal terminals and motor encoders, using double row DB9 sockets. The shape and pin distribution as follows:



X2 connector for servo drive(absolute communication encoder)



Connector X2 Soldering Lug Disposition

2.5.2 X2 Terminal signal description

Absolute communication encoder definition:

Signal name		Pin number / signal line color		Function
		Absolute (10 core)		
Encoder power supply	5V	4	Red + Red and white	The encoder uses a 5V power supply (provided by the drive), when the cable is above 20m, in order to prevent the encoder voltage from decreasing, the power supply and ground wire can be connected by multiple wires or using thick wires.
	0V	5	Black + black and white	
Signal input	SD+	1	Brown	Connect with absolute encoder signal output
	SD-	2	Brown White	
Clock output	MA+	6	Green	Connect with absolute clock input
	MA-	7	Green white	
Outer battery pin	E+	3	Yellow	External connection with battery pin
	E-	8	Yellow and white	
Shielded line	FG	9	Naked wire	Connect with the shield line of the signal cable.

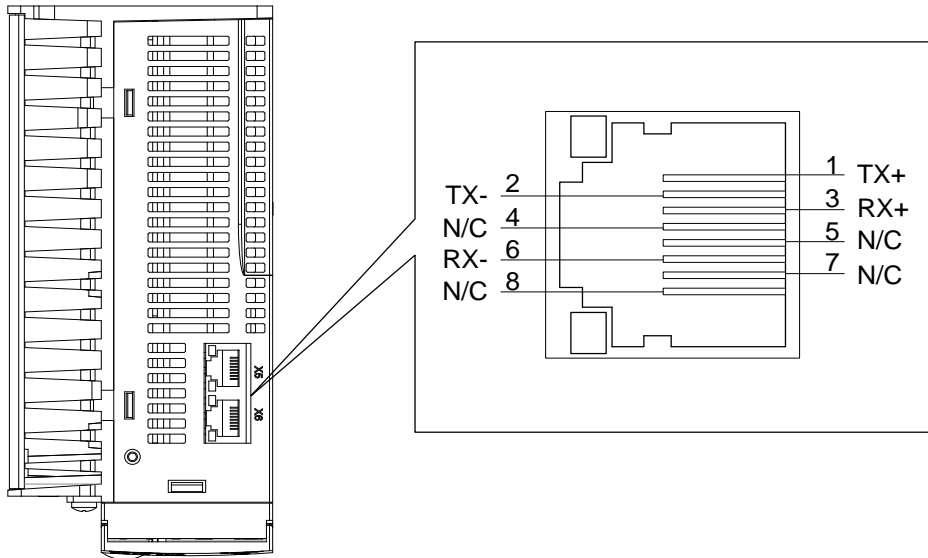
2.5.3 X3 terminal

Reserve

2.6 X5、X6 EtherCAT port

X5 is EtherCAT input port, X6 is EtherCAT output port, please make sure to connect as required.

2.6.1 X5、X6 terminal socket

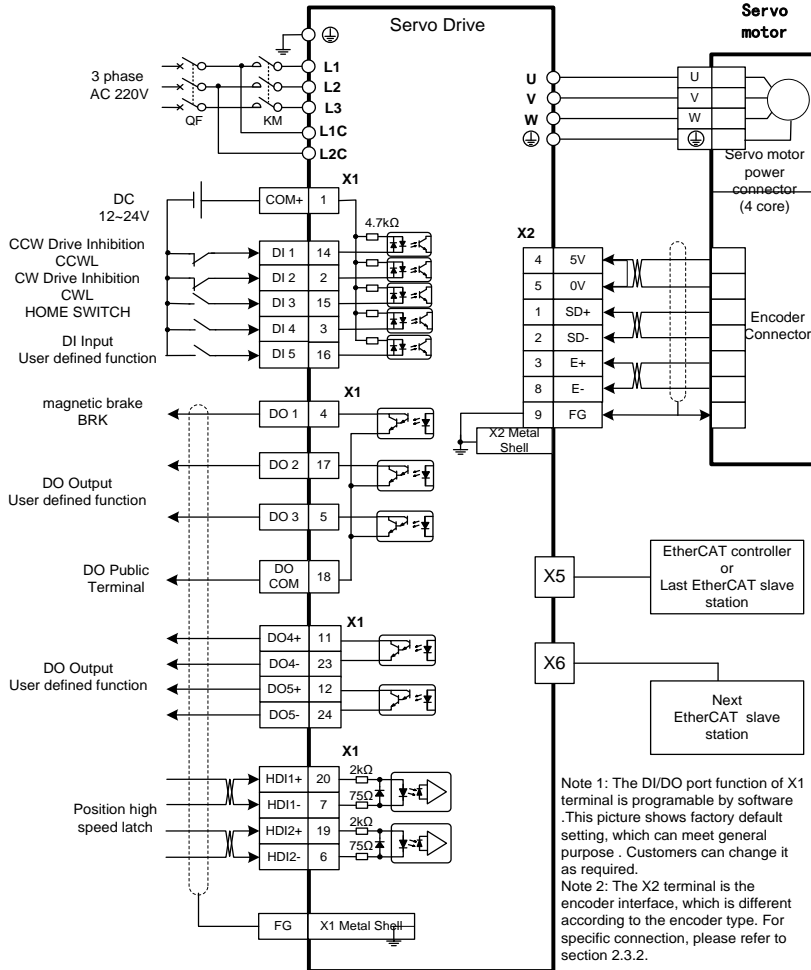


2.6.2 X5、X6 terminal signal description

Signal name	Pin number	Function
TX+	1	Send signal +
TX-	2	Receive signal -
RX+	3	Receive signal +
RX-	6	Receive signal -

2.7 Standard wiring diagram

2.7.1 Standard wiring diagram



Note: The above wiring diagram is an example of GL7A5.