2020 年

Low Voltage Servo Drive Manuals

Notice before using

●The power supply voltage used by the low voltage servo driver is 20-90v dc.

Please install 20-90v DC power supply for the servo system. The specific voltage depends on the model.

It is strictly forbidden to connect the servo motor directly to the power grid.

●It is forbidden to connect the servo motor directly to the power grid, which is easy to damage the servo motor. The servo motor cannot rotate without the support of the servo driver.

●Do not plug in or pull out the connector on the driver after power on. It is easy to damage the internal circuit of the driver and the motor encoder by inserting or pulling the connector when it is charged eletricity.

●Please plug or pull the connector after the power is cut off.

Check the servo system after power off.

The installation interval between the servo driver and other equipment in the cabinet should be kept at more than 10 mm.

The servo driver is easy to heat, so the installation layout that is near to heat source should be selected as far as possible. The horizontal spacing between the servo driver and other equipment in the electric cabinet should be more than 10 mm, and the longitudinal spacing should be more than 50 mm. The installation environment should not be affected by condensation, vibration and impact.

Anti interference processing and grounding.

The interference on the signal line is easy to cause mechanical vibration and abnormal operation. The following regulations must be strictly observed:

1. Separate the strong current cable and weak current cable.
2. Shorten the cable length as much as possible.
3. The installation of servo motor and driver shall adopt single point grounding, and the grounding impedance shall be less than 10 Ω.
4. It is forbidden to use power input interference filter between servo motor and driver.

Leakage protector, quick response leakage protector should be used.

Use the quick response leakage protector or the PWM inverter specified by the supplier for leakage protection. It is strictly forbidden to use the delay leakage protector.

Avoid extreme adjustments or changes.

It is not suitable to adjust or change the parameters of the servo driver, otherwise it is easy to cause severe mechanical vibration and unnecessary property loss.

Do not use the power on / off to run the servo motor directly.

Frequent on / off of the power supply will lead to the rapid aging of the internal components of the servo driver and reduce the service life of the driver. The command signal should be used to control the operation of the servo motor.

1. Product specifications and installation

1.1 confirmation of product arrival

When unpacking, please confirm the following items carefully:

Whether there is damage during transportation?

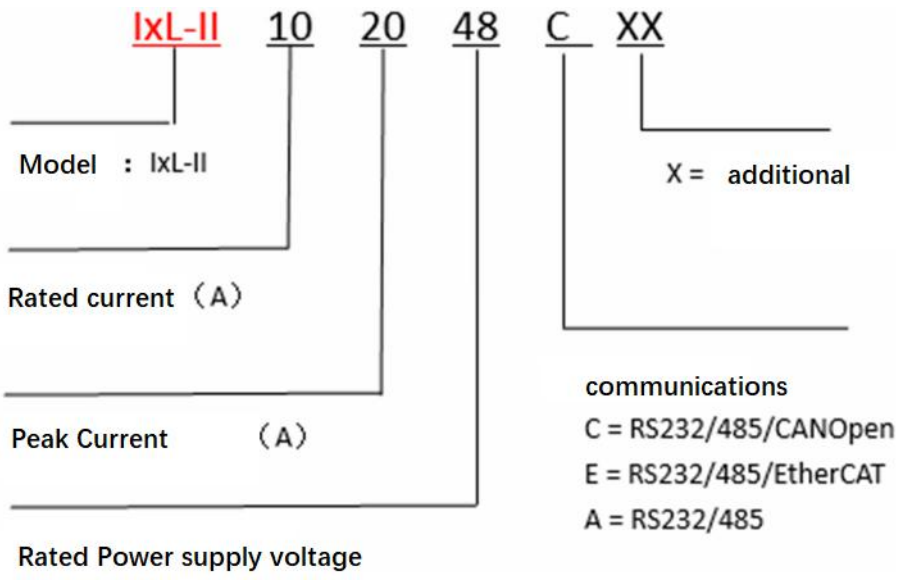
Is the driver model consistent with your order requirements?

Are the accessories complete or the following devices are installed in the packing box?

	Item name	Quantity
	Driver	1
	25 core signal interface terminal	1
	15 core encoder interface terminal	1
6	New mx3.0 terminals and pins	1
	Main circuit terminal block	1
	Power off brake terminal block	1

Note: please contact our company immediately if you find any of it missing.

1. 2 driver model and specification



1.2.1 Series servo driver specifications

Item name	IxL-II 10.20	IxL-II 20.40	IxL-II 30.60
Power input voltage	20-60/90V DC		
Maximum power input current	20 Arms	40Arms	60 Arms
Rated power	480W/800W	960W/1600W	1400W/2100W
Heat capacity coefficient	720 J/C		
Maximum speed < 100RPM Continuous output current	10Arms	20Arms	30Arms
Maximum speed continuous current at maximum speed	8Arms	17Arms	26Arms
Maximum Output current	20 Arms	40 Arms	60 Arms
Maximum output voltage	Vin * 0.95 VDC		
PWM frequency	10 KHz		
Rated power efficiency	97%		
Dimensions	SIZE 1		SIZE2
Weight	0.72KG		0.8KG
Cooling	Nature cooling		

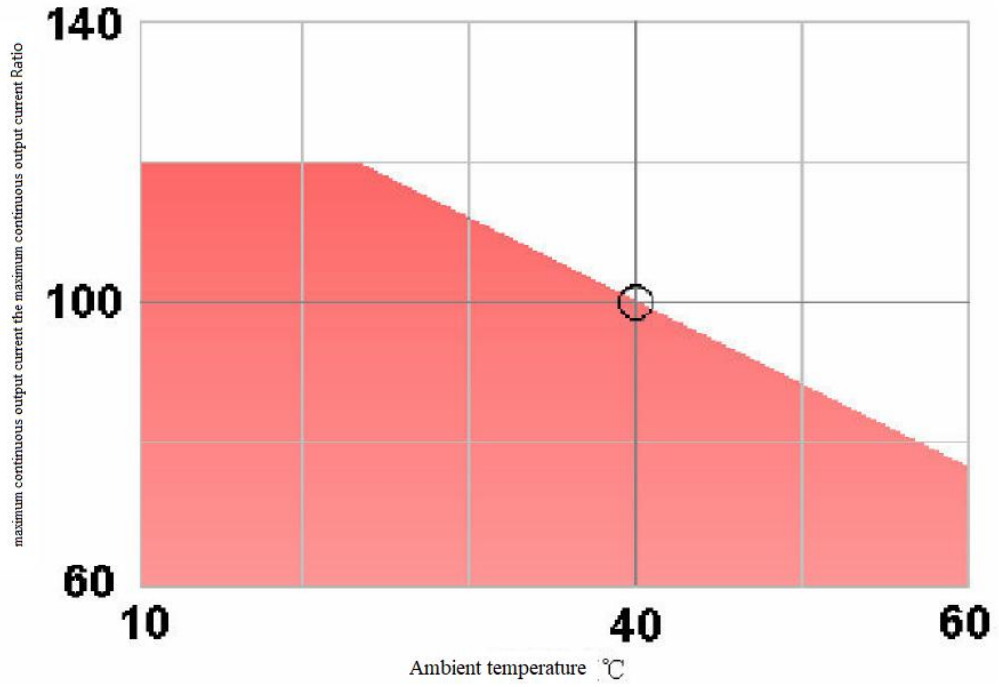
Item name	IxL-II 50.100	IxL-II 80.160	IxL-II 150.300
Power input voltage	20-60/90V DC		
Maximum power input current	100 Arms	160A	300A
Rated power	2400W/4000W	4000W/7000W	5500W/1 1kW
Heat capacity coefficient	720 J/C		
Maximum speed < 100RPM Continuous output current	50Arms	80Arms	1 50Arms
Maximum speed continuous current at maximum speed	45Arms	70Arms	130Arms
Maximum Output current	100 Arms	160 Arms	300 Arms
Maximum output voltage	Vin * 0.95 VDC		
PWM frequency	10KHz		
Rated power efficiency	97%		
Dimensions	SIZE 3		SIZE 4
Weight	1.86KG		3.0KG
Cooling	Nature cooling		

1.3 Driver electrical characteristics

Item		Function
Control	control mode	Speed control (PV), torque control (PT), position control (PP), IP, CSP, CSV, CST
	Support motor	Permanent magnet synchronous motor, brushless DC motor, brushless DC motor
	Position control accuracy	±1Pulse (16bits)
	Speed control accuracy	±0.05%
Control input and output signal	Analogy input	Two analog inputs, - 10V - + 10V
	Digital input	8-channel digital input, 12-30vdc
	Digital output	4 digital output, open collector output
communication interface	RS-232/485	Standard Modbus Protocol
	CanOpen	Standard CANopen protocol, cia301 / 402
	EtherCAT	Standard COE protocol
Encoder interface	Encoder port E1	Incremental encoder, SSI / bissb / bissc absolute encoder, NRZ Tamakawa absolute encoder, Hall signal position feedback
indicator light	Working status display	Reflect the current working state of the driver and alarm indication code
Environment	Place of use	Indoor, no direct sunlight, no dust, no corrosive gas, no combustible gas, no oil mist, no water vapor, etc
	Operating ambient temperature	-When the temperature is between 20 ℃ and 50 ℃, it can be used with derating when the temperature is higher than
	Altitude	The altitude of the place of use is lower than 1000m, and the altitude of the place of use is higher than 1000m
	humidity	Below 95% RH, no condensation
	Vibration	Less than 0.5g (4.9M / S2), less than 10Hz
	Storage temperature	-40℃—70℃
Strrucuture	Cooling	Nature cooling
Protection level		IP20
Installation method		Wall mounted

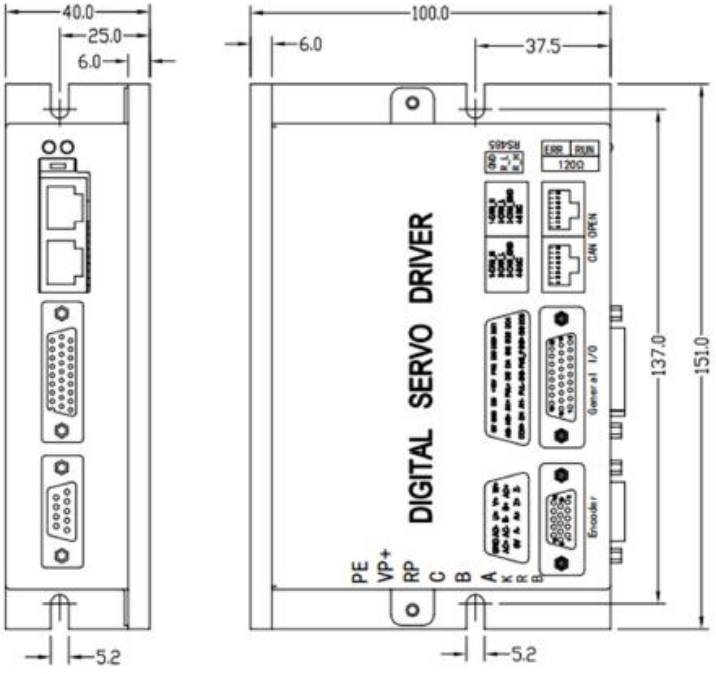
1.3.1 attenuation of ambient temperature and maximum continuous output current the maximum continuous output current of the driver will decrease with the increase of ambient temperature,

Users should consider reducing the maximum continuous output current of the driver. The variation of specific ambient temperature and maximum continuous output current is shown in the figure.



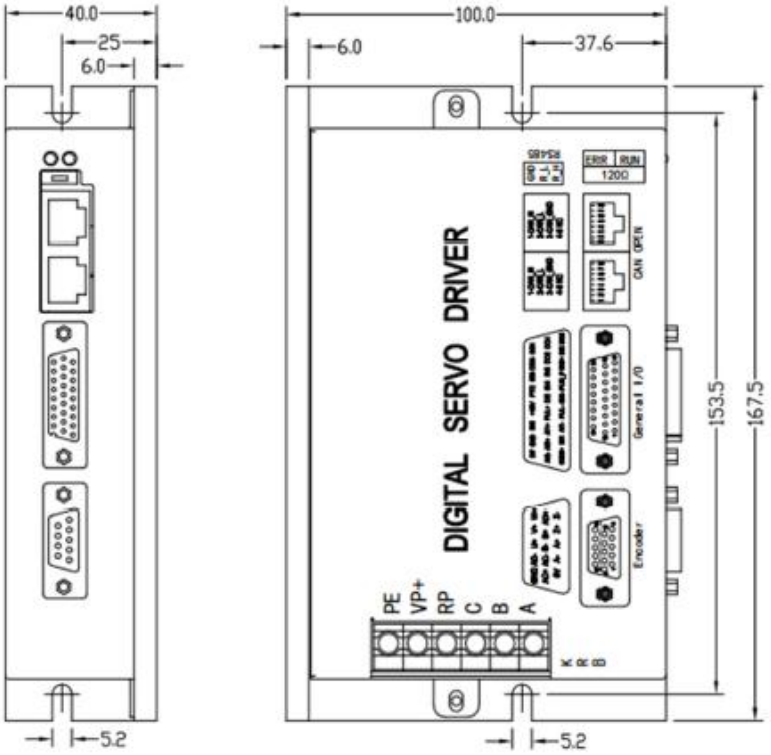
1.4 Drive Size1 dimensions

Dimension size 1



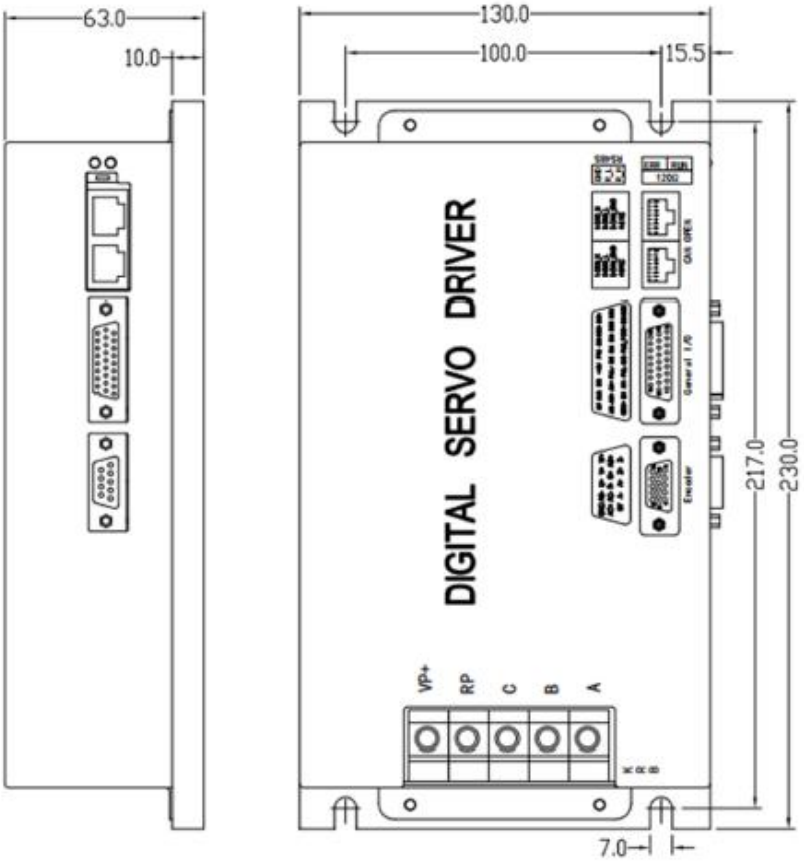
外形尺寸 SIZE 1

Dimension size 2



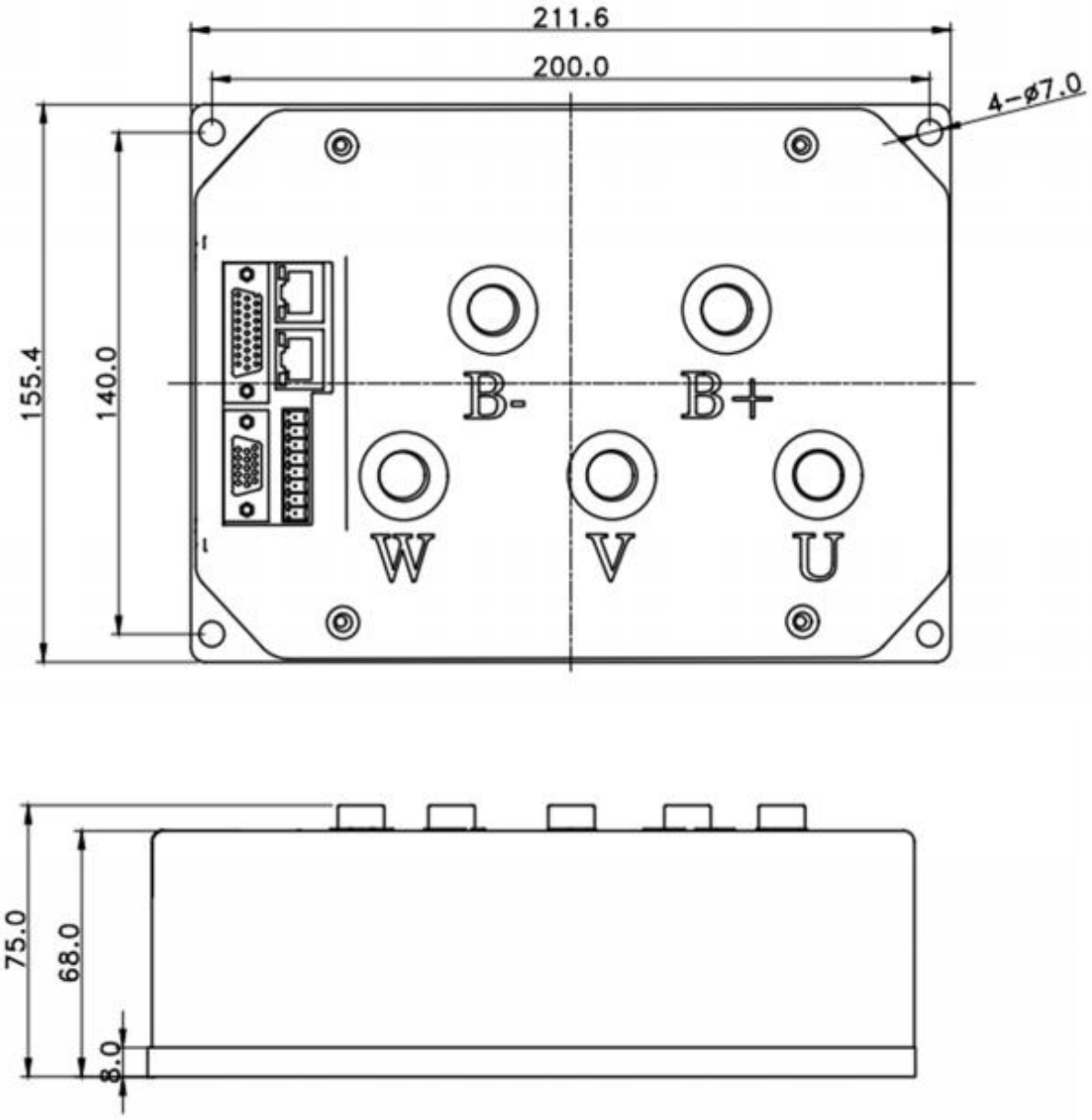
外形尺寸 SIZE 2

Dimension size 3



外形尺寸 SIZE 3

Dimension size 4



外形尺寸 SIZE 4

1.5 Installation precautions

The servo driver is a base mounted servo driver. If the installation is not correct, there may be faults. Please install correctly according to the following precautions.

Please install it in a well ventilated place. In order to facilitate the heat dissipation of the drive, the vertical installation mode should be generally adopted;

The allowable ambient temperature of the driver is 0 ℃ - 50 ℃, but if the ambient temperature is higher

than 40 ℃, the maximum continuous output current should be reduced by 20% for every 10 ℃ increase, and the ventilation and heat dissipation should be strengthened;

The humidity of the installation site should be lower than 95% without condensation;

It is not allowed to be installed in places with dust and metal powder;

It is not allowed to be installed in places with corrosive and explosive gas;

It is installed in the place where the vibration is less than 0.5g (4.9M / S2), and the vibration frequency is less than 10Hz;

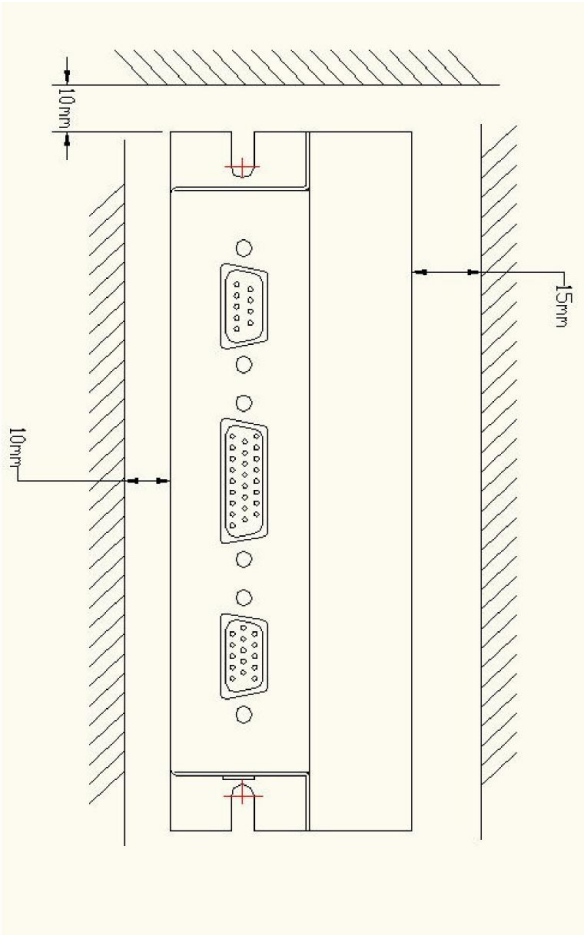
Install in a place without direct sunlight;

Using under altitude is lower than 1000m, when it is higher than 1000m, the maximum continuous output current of the driver should be reduced by 3% for every 100m increase.

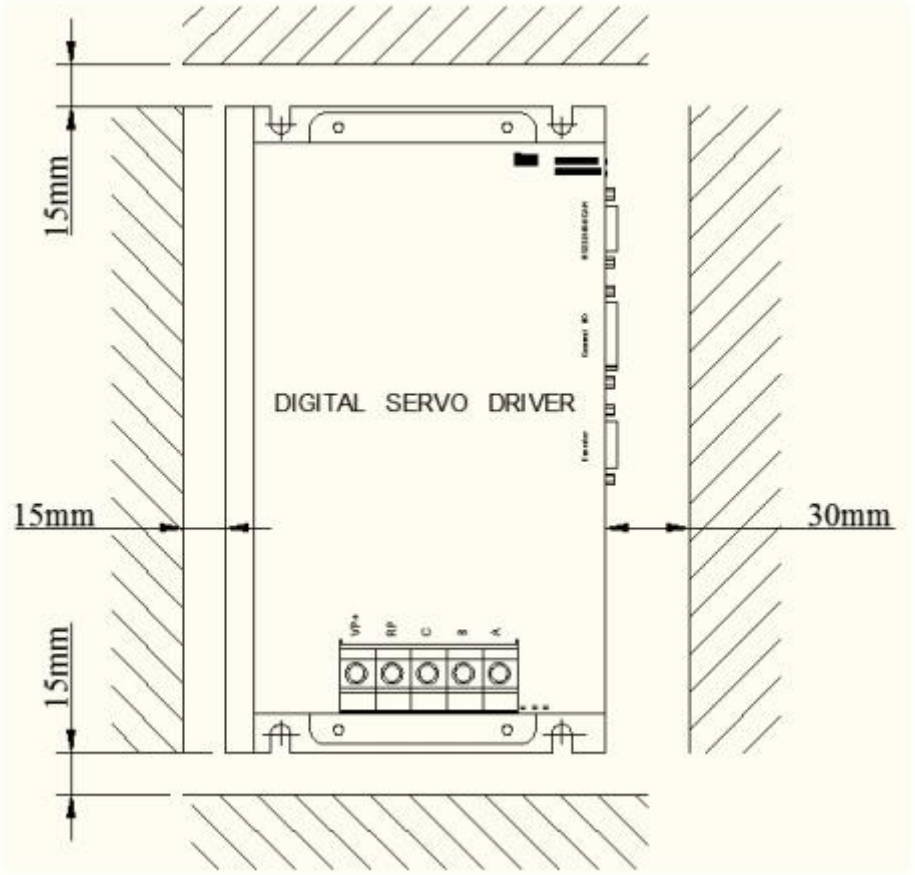
(9) When the continuous operating current of Size1 / size2 driver exceeds 15a, size3 driver exceeds 30A and size4 driver exceeds 50a, it is necessary to provide external heat sink or install the driver on the metal shell, and the heat sink silica gel or heat pad should be coated between the driver and the shell

1.6 Installation of drive

The installation space requirements of Size1 / size2 driver are shown in the figure



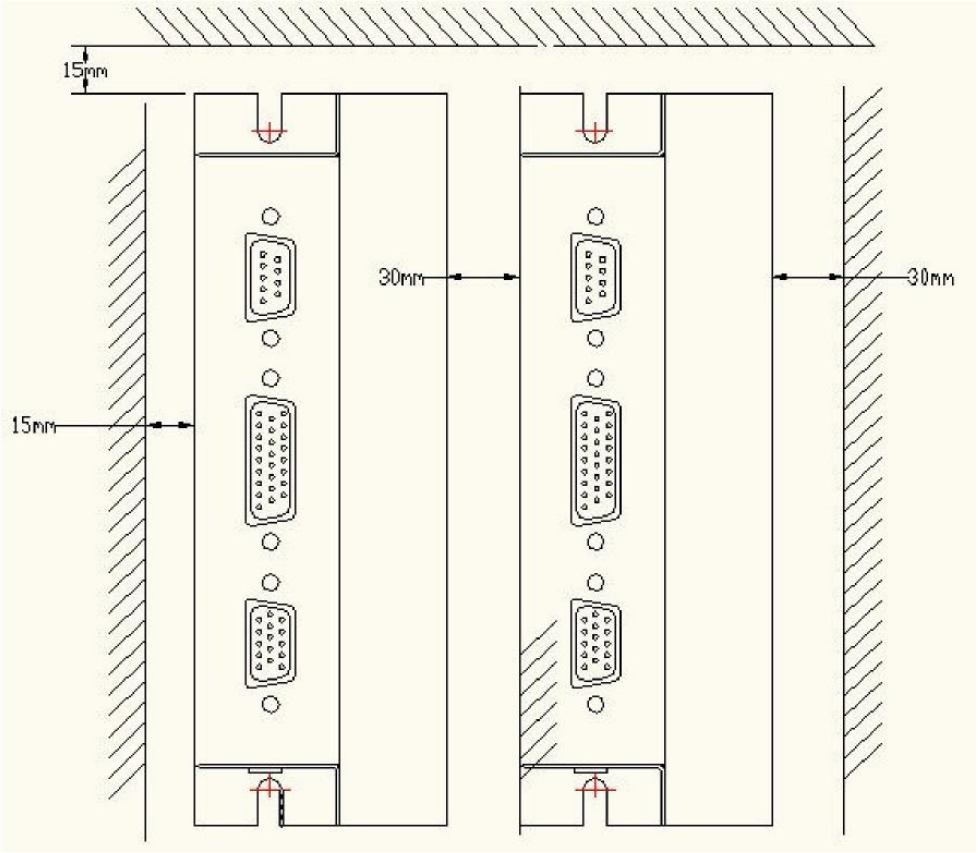
The installation space requirements of Size3 / size4 driver are shown in the figure



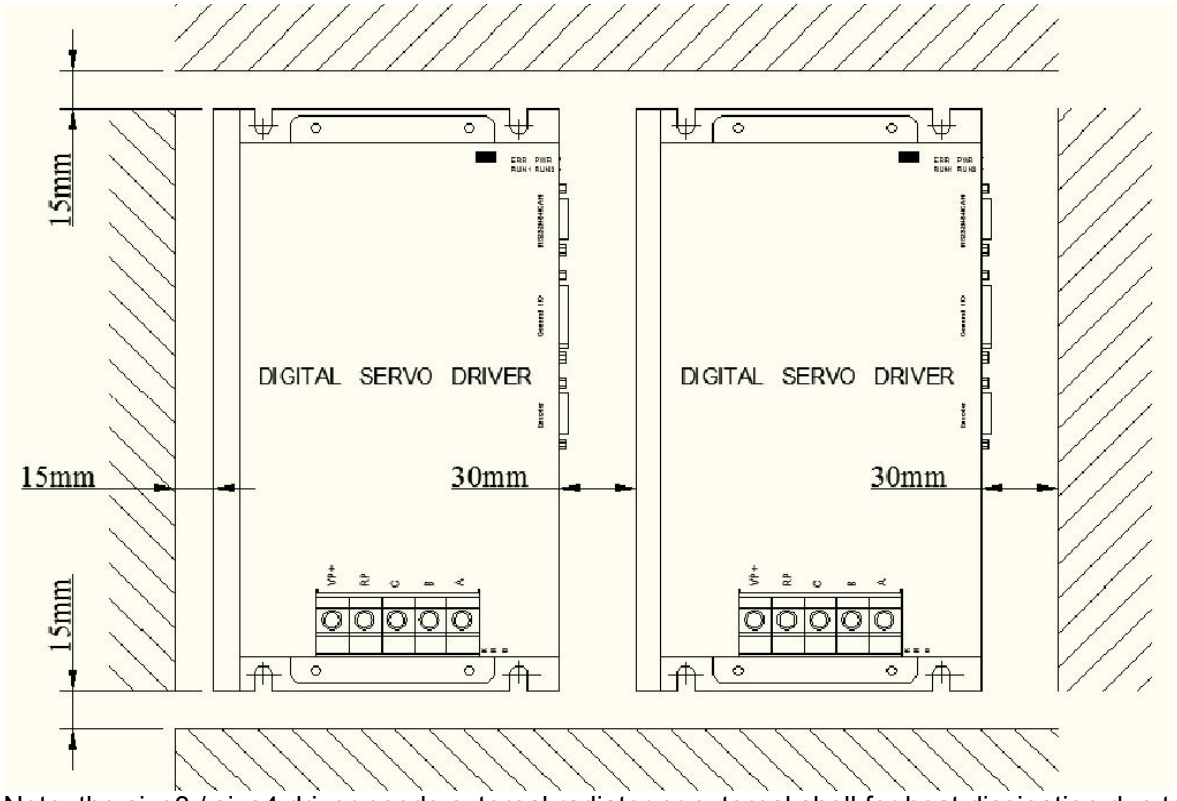
Note: the size3 / size4 driver needs external radiator or external shell for heat dissipation due to high current. When installing, pay attention to installing external radiator, and apply heat dissipation silicone or paste heat pad between the driver and external radiator

When multiple controllers are installed in the mechanical device, they should be installed side by side and equipped with air inlet, air outlet and special cooling fan.

The Size1 / size2 driver is shown in the figure



SIZE3/SIZE4：



Note: the size3 / size4 driver needs external radiator or external shell for heat dissipation due to high current. When installing, pay attention to installing external radiator, and apply heat dissipation silicone or

paste heat pad between the driver and external radiator.

2.Wiring

2.1 wiring precautions

2.1.1 Wiring safety precautions

Wiring must be carried out by qualified personnel, otherwise there is a risk of electric shock;

Please make sure that the input power supply is completely disconnected before wiring, otherwise there is a risk of electric shock;

The grounding terminal of the controller must be reliably connected with the ground wire of the corresponding device (the ground wire should use more than 2.5mm2 copper core wire, and the grounding resistance should be less than 10 Ω), otherwise there is a risk of electric shock;

Do not short circuit between the lines, otherwise there is a risk of fire and damage to the equipment;

It is strictly forbidden to connect the input power to the output side of the driver, otherwise the equipment may be damaged;

All wiring connections must be reliably and firmly connected, otherwise there is a risk of damage to the equipment;

The power supply of the control panel terminal shall not be higher than the specified range (DC 22v-90v), otherwise the equipment may be damaged;

The exposed part of the wire at each wiring connection must be wrapped with insulating tape, otherwise there is a risk of short circuit and damage to the equipment; (9) after completing the wiring, please check whether the wiring is correct.

2.1.2 Wiring electrical precautions

It is not suitable to pass the power line and signal line through the same pipe or bind them together. When wiring, the power line and signal line should be separated by more than 10cm.

The signal line and encoder feedback line shall be twisted pair with overall shielding, and the shielding layer shall be connected to the connector shell. Wiring length: the maximum length of command signal input line is 3M, and the maximum length of encoder feedback line is 20m.

Even if the power supply is turned off, there may still be high voltage in the servo driver. Please check the wiring or work after 5 minutes of turning off the power.

Please do not turn on or off the power frequently. If you need to turn on or off the power repeatedly, it should be controlled below once a minute. There is a capacitor installed inside the servo driver, when the power is turned on, a large charging current will flow (charging time is tens of milliseconds); therefore, if the power is turned on / off frequently, the components inside the servo driver will accelerate aging.

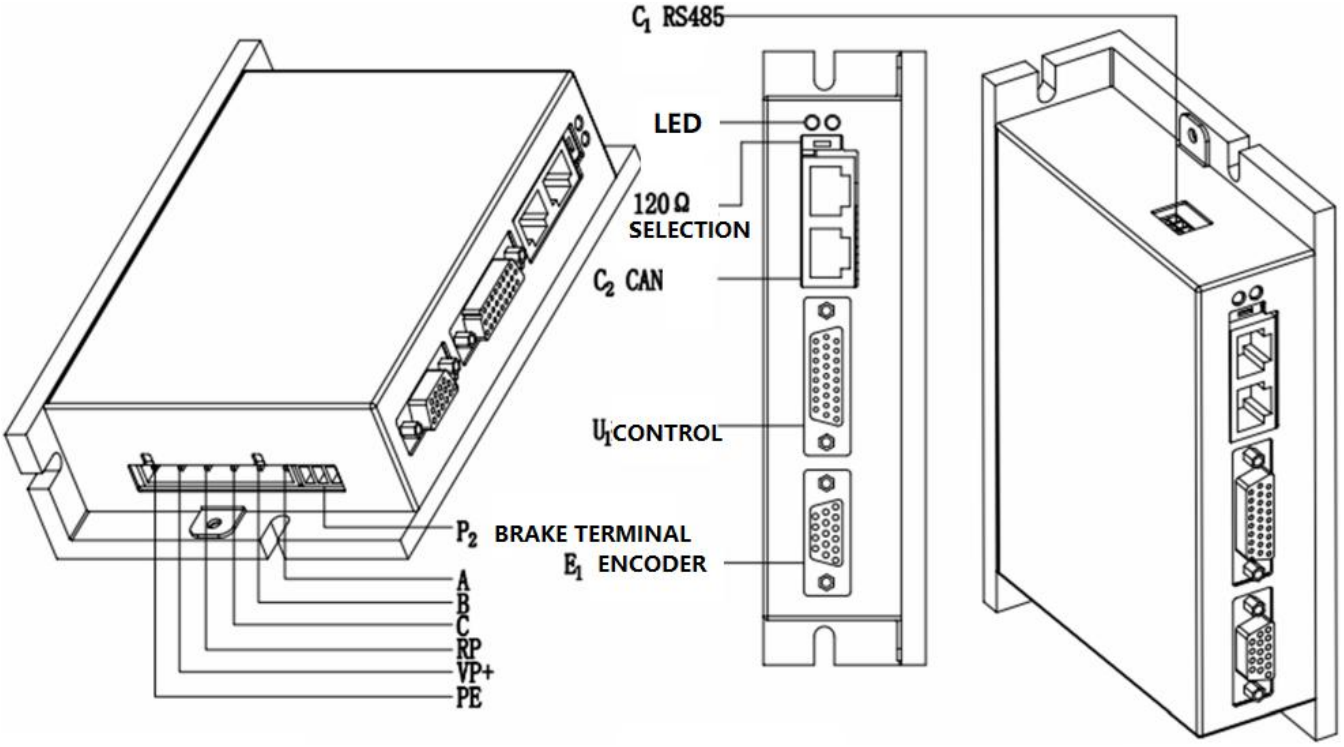
2.1.3 Recommended specification table of wires for wiring.

Drive model	Main curcuit cable（**mm²**）	Note
IxL-II 1020	2	It is suggested that the conductor for main circuit using High temperature resistant wire
IxL-II 2040	4	

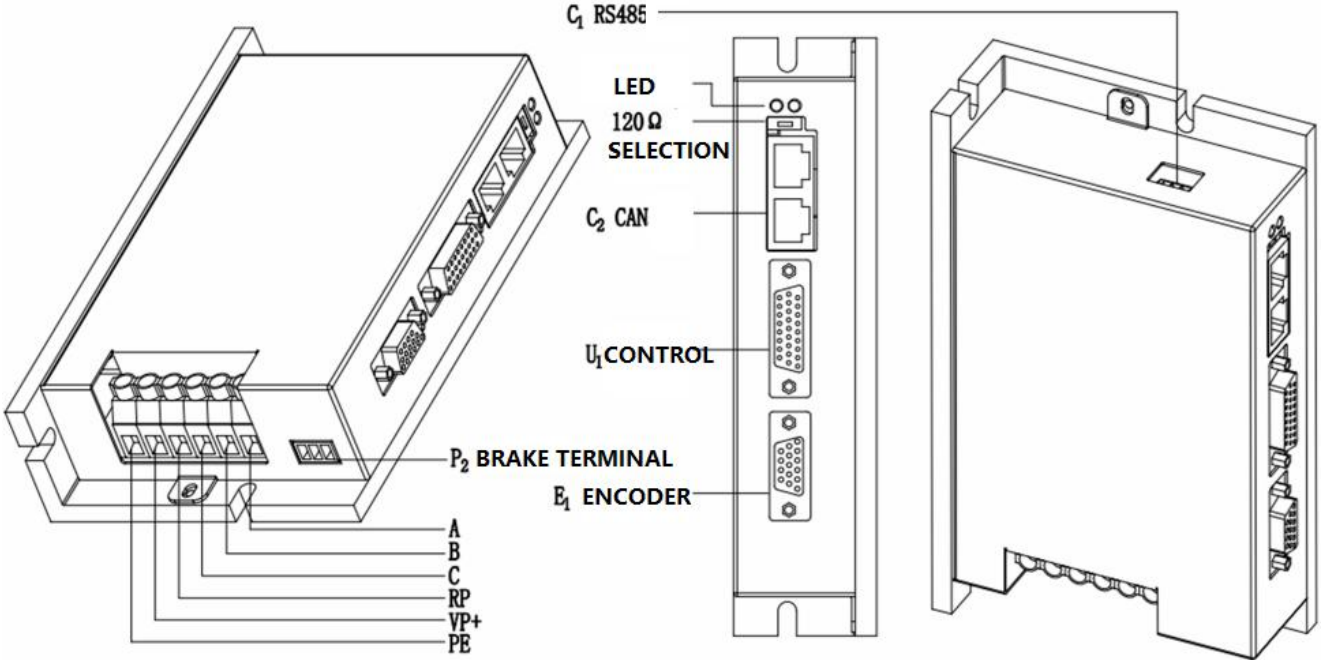
IxL-II 3060	6	
IxL-II 50100	10	
IxL-II 80160	16	
IxL-II 150300	25	

2.2 Electrical wiring diagram

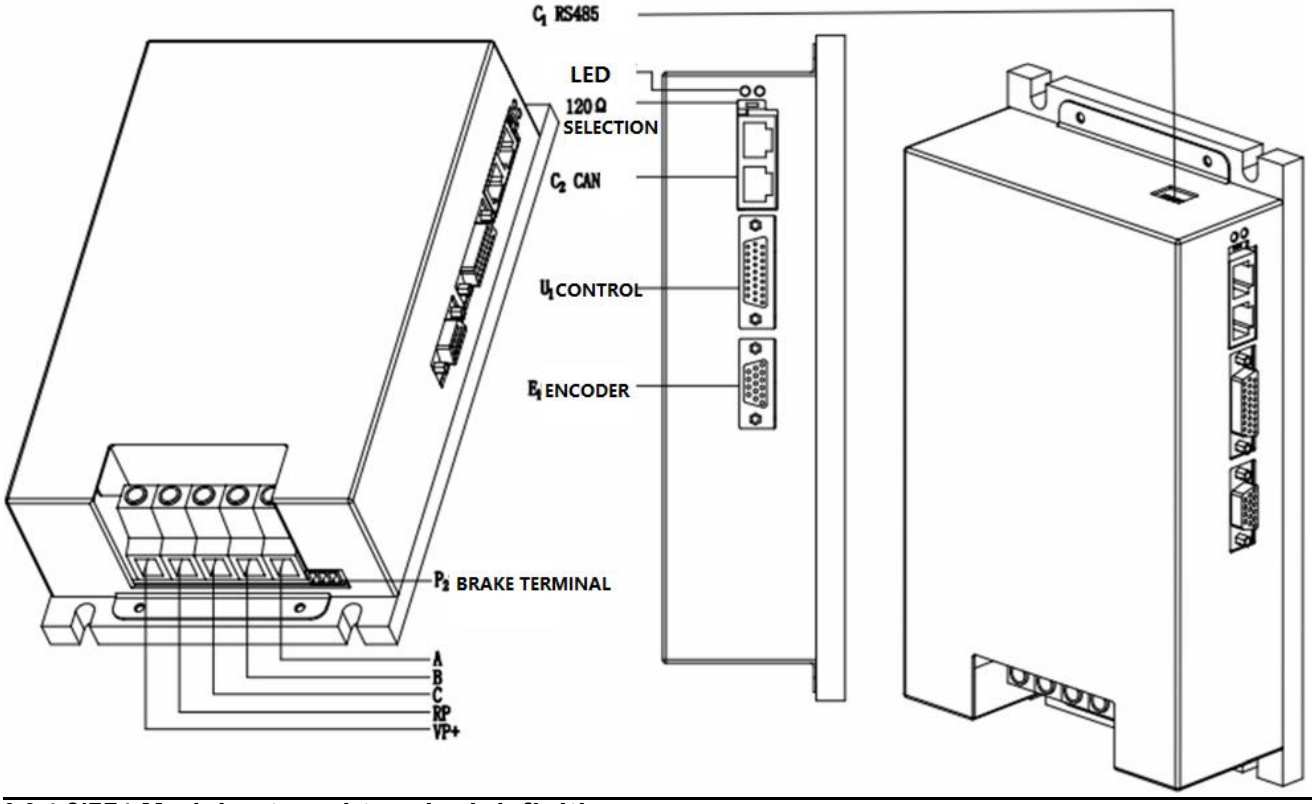
2.2.1 SIZE1 Model external terminal definition



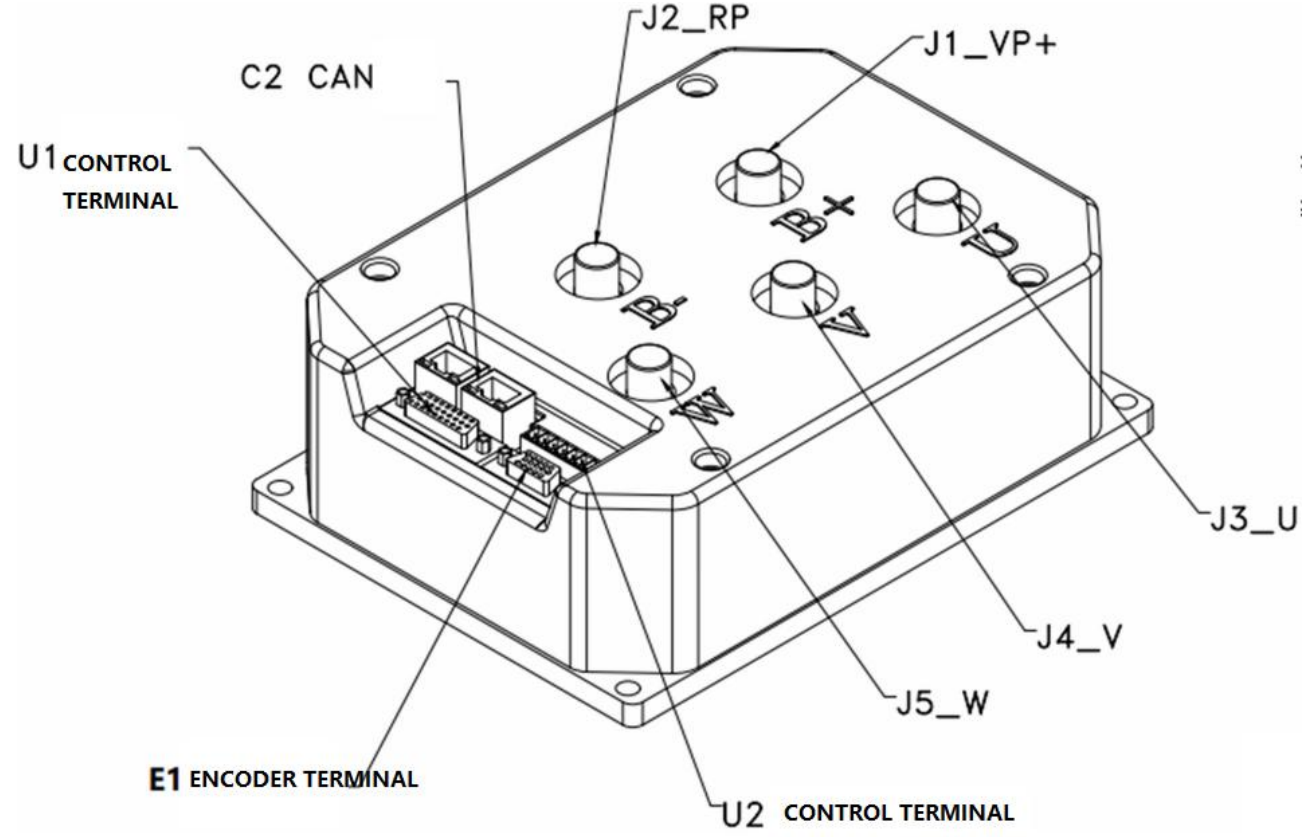
2.2.2 SIZE2 Model external terminal definition



2.2.3 SIZE3 Model external terminal definition



2.2.4 SIZE4 Model external terminal definition



2.3 Main circuit terminal P1

SIZE1/2 Drive main circuit terminal：

PIN	Name	Function	Description
J1	PE	Ground wire	
J2	VP+	Power supply positive	20-90VDC
J3	RP	Power supply negative	
J4	C	Motor U-phase input / brush positive	RED
J5	B	Motor V-phase input	YELLOW
J6	A	Motor w-phase input / brush negative ground wire	BLUE

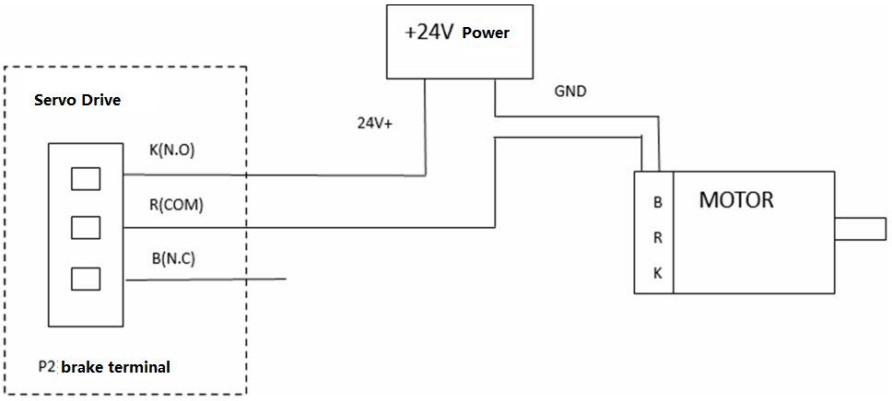
SIZE3/4 Drive main circuit terminal

PIN	Name	Function	Description
J1	VP+	Power supply positive	20-90VDC
J2	RP	Power supply negative	
J3	C	Motor U-phase input / brush positive	RED
J4	B	Motor V-phase input	YELLOW
J5	A	Motor w-phase input / brush negative ground wire	BLUE

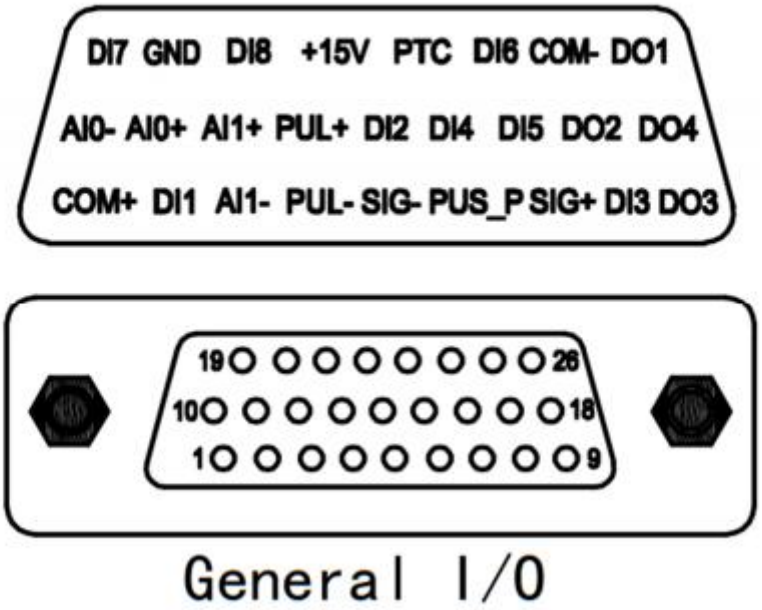
2.4 Brake holding / brake terminal P2

Pin	name	type	function
1	K(N.O)	Relay normally open interface	When power failure braking is needed, connect the power failure brake of motor
2	R(Com)	Relay common terminal	
3	B(N.C)	Relay normally closed interface	

Note: the maximum bearing current of internal relay is 2A. If the continuous current is greater than 2a, please use external relay to transfer, otherwise there is a risk of damage to internal relay.



2.5 Control signal terminal U1



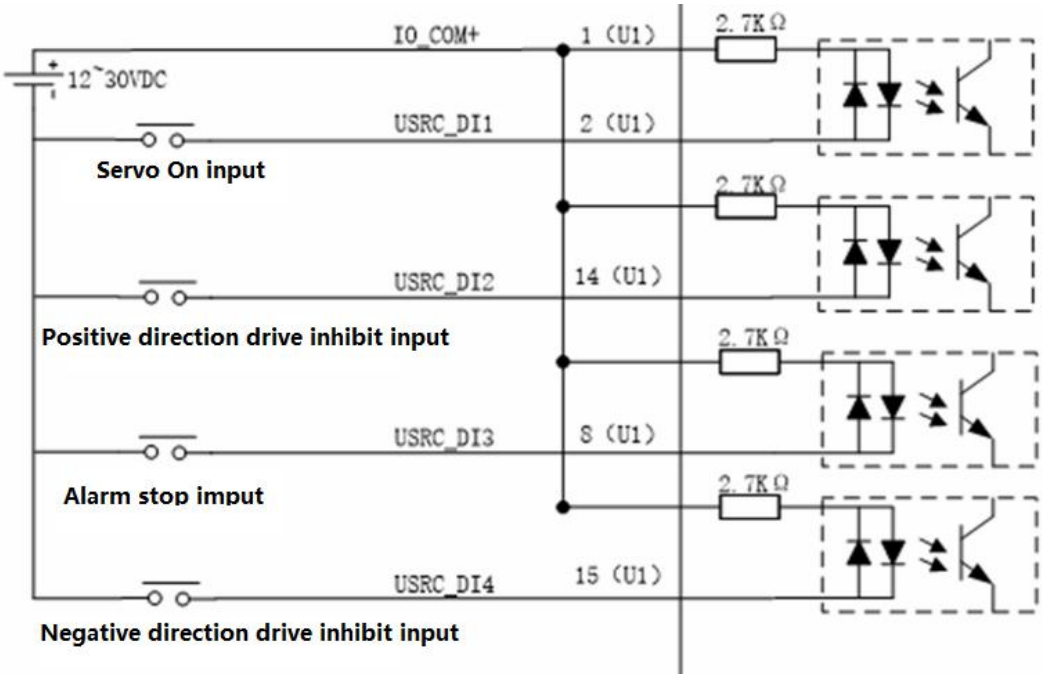
General I/O

Pin	name	type	function
01	IO_COM+	IO Input power	Input common
02	USRC _DI1	Digital input	Servo ON，Out DI effective
03	USRC _ AI1 _N	Analog input negative	Torque / speed limit input
12	USRC_AI1_P	Analog input positive	
04	ORD_PUL_L	Pulse input interface	Command pulse signal input, Input current: > 10mA
05	ORD _ SIG _L	Pulse input interface	
06	ORD _ PUS _ POW	Pulse input power supply	
07	ORD_SIG_H	Pulse input interface	
13	ORD_PUL_H	Pulse input interface	
08	USRC_DI3	Digital input	Alarm cleared, external Di active
09	USRC_DO3	Digital output	Servo alarm output， <50mA
10	USRC _AI0 _N	Analog input negative	Current reference input / speed reference input
11	USRC_AI0_P	Analog input positive	
14	USRC_DI2	Digital input	Positive direction drive inhibit input

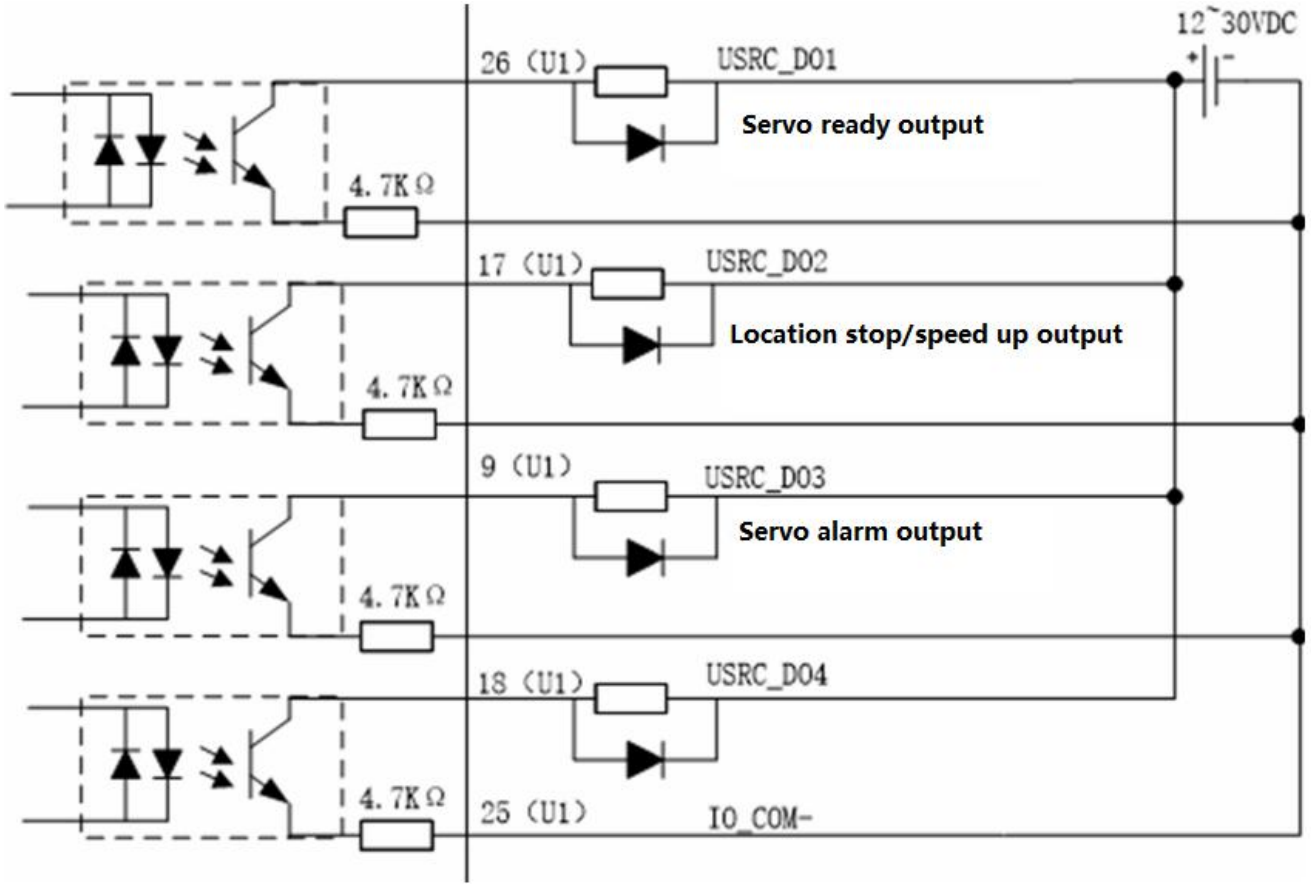
15	USRC_DI4	Digital input	Negative direction drive inhibit input
16	USRC_DI5	Digital input	Home origin signal, external Di is enabled effectively
17	USRC_DO2	Digital output	Positioning end / speed reaching output, < 50mA
18	USRC_DO4	Digital output	spare
19	USRC_DI7	Digital input	Motor stop quickly
20	GND_DIG	Digitally ground	
21	USRC_DI8	Digital input	Start motor returns to zero, external Di is effectively enabled
22	+15V _DIG	Power output	<100mA
23	MOTOR _PTC	Analog input	Motor temperature sensor positive
24	USRC_DI6	Digital input	Control mode switching
25	IO_COM-	IO output power supply	Output common
26	USRC_DO1	Digital output	Servo ready for output, < 50mA

2.5.1 Digital Di wiring

Note:
power Input terminal positive/negative no directions

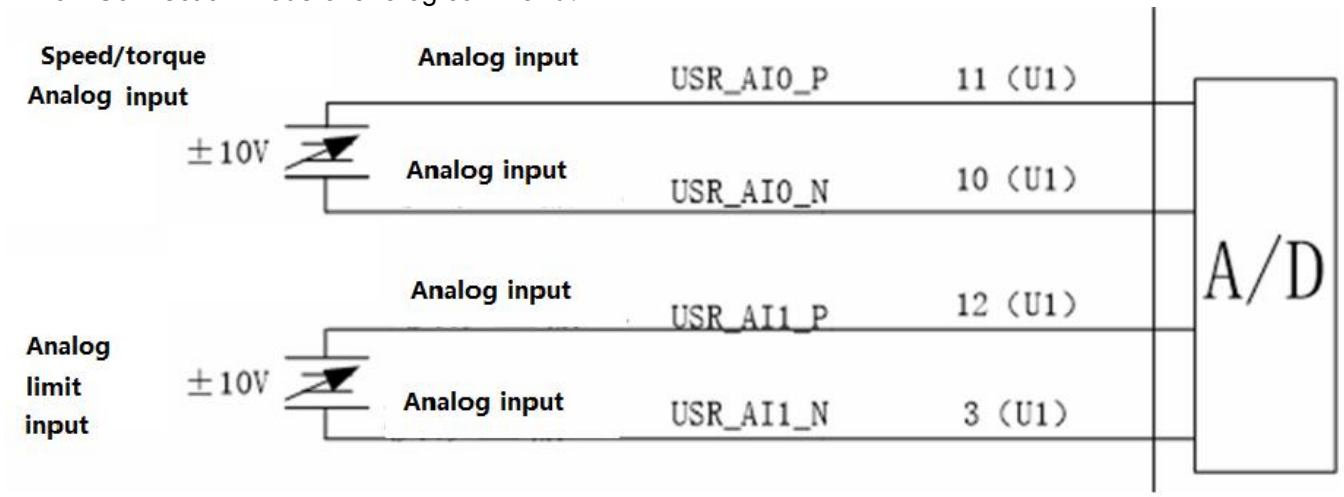


2.5.2 Digital DO Wiring

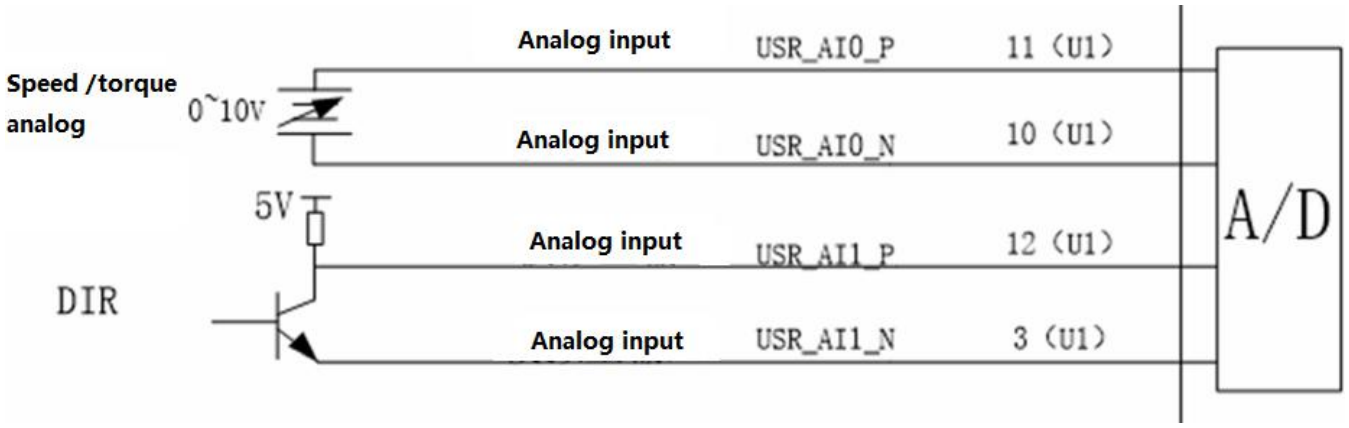


2.5.3 Analogy AI Wiring

+/-10V Connection mode of analog command：

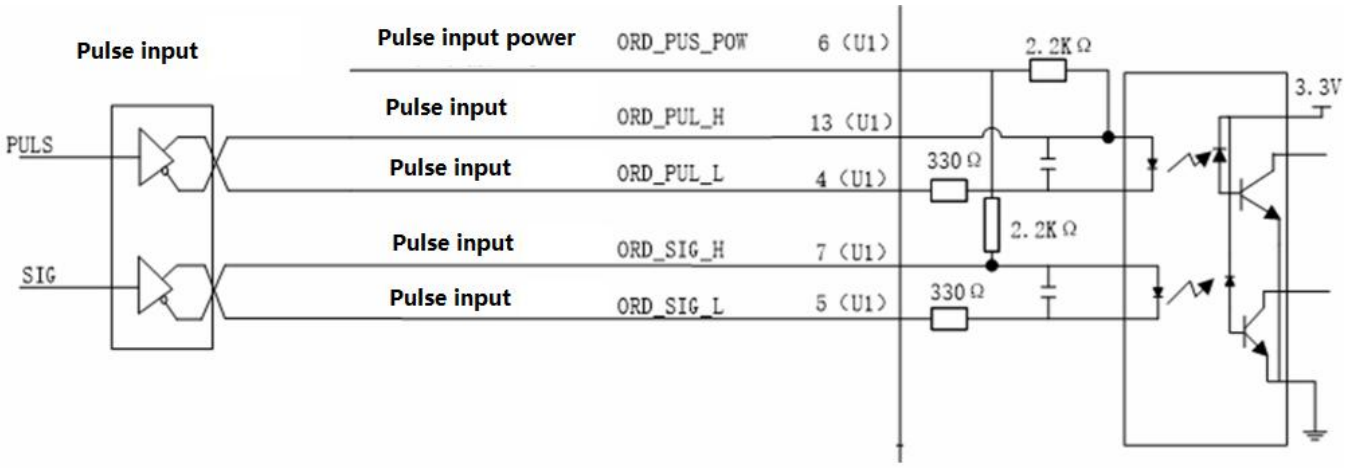


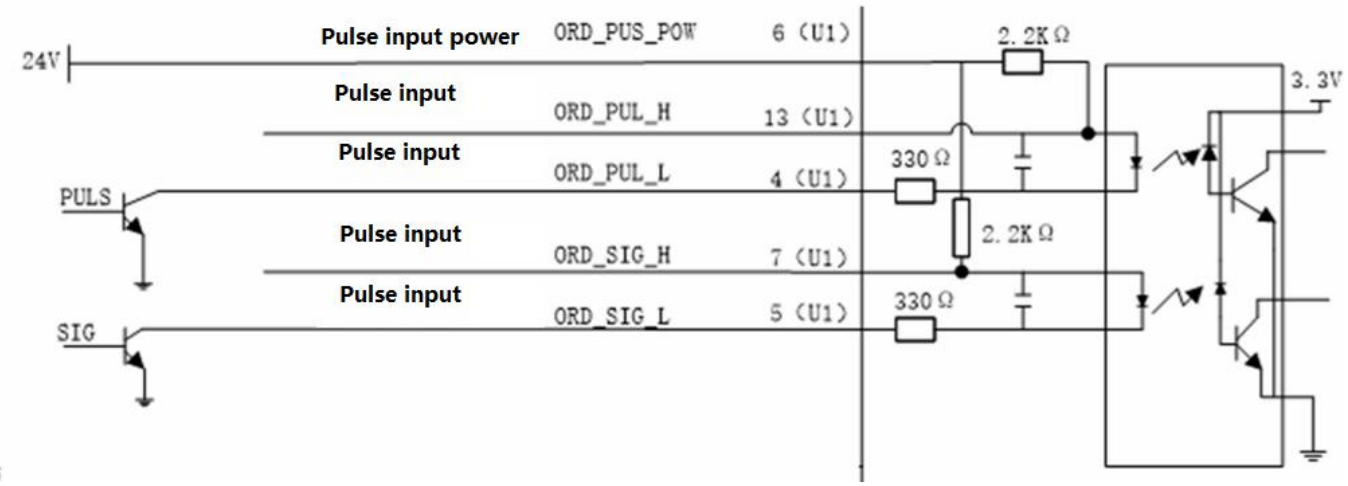
0-10V Analog quantity + direction signal command wiring mode:



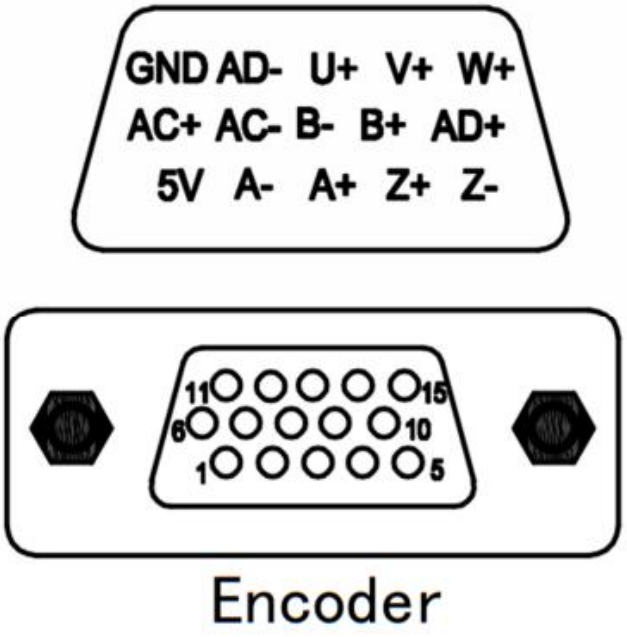
2.5.4 Pulse input wiring

Differential pulse input wiring:





2.6 Encoder E1

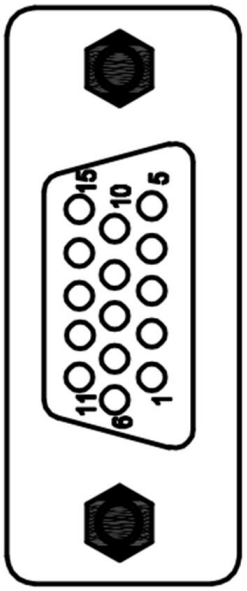


Encoder

Pin	Name	type	function
01	VDD_5V		Encoder 5V power supply
02	IPHA_N	Input	Incremental encoder A phase difference sub negative /Single ended incremental encoder connected to VDD_ 5V Resolver Sin-
03	IPHA_P	input	Incremental encoder A phase difference positive /Single ended incremental encoder A signal Rotary encoder Sin+
04	IIDX_P	input	Incremental encoder, Z differential input, positive /Single ended incremental encoder Z signal Positive EXC+ excited by resolver+
05	IIDX_N	input	Incremental encoder, Z differential input negative /Single ended incremental encoder connected to VDD_ 5V Negative EXC- excited by resolver

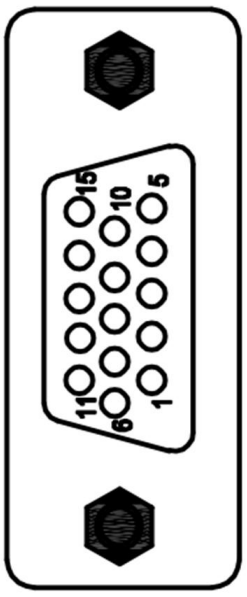
06	ABS _ECLK_P	Output	Absolute value encoder, clock output positive
07	ABS _ECLK_N	output	Absolute value encoder, clock output negative
08	IPHB_N	input	Incremental encoder B phase difference sub negative /Single ended incremental encoder connected to VDD_ 5V Resolver COS-
09	IPHB_P	input	Incremental encoder B phase difference positive /Single ended incremental encoder B signal Resolver COS+
10	ABS _DATA _P	input/output	Absolute value encoder, data positive
11	GND_DIG		Digitally ground
12	ABS _DATA _N	input/output	Absolute value encoder, data negative
13	HULL_U	input	Hall u
14	HULL_V	input	Hall V
15	HULL_W	input	Hall w

2.6.1 Incremental encoder wiring



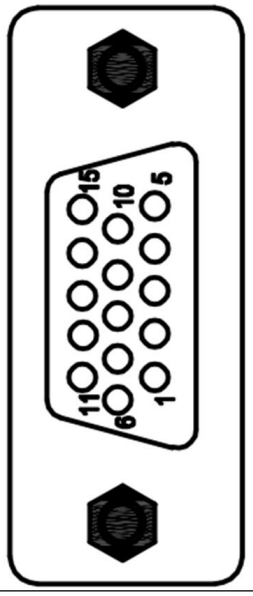
Encoder

Encoder Pin		Differential incremental encoder
01、 VDD_5V		+5V
11、GND_DIG		GND
03、IPHA_P		A+
02、IPHA_N		A-
09、IPHB_P		B+
08、IPHB_N		B-
04、IIDX_P		Z+
05、 IIDX_N		Z-
13、HULL_U		HULL_U+
14、HULL_V		HULL_V+
15、HULL_W		HULL_W+
		HULL_U- （no connection）
		HULL_V- （no connection）
		HULL_W- （no connection）



Encoder

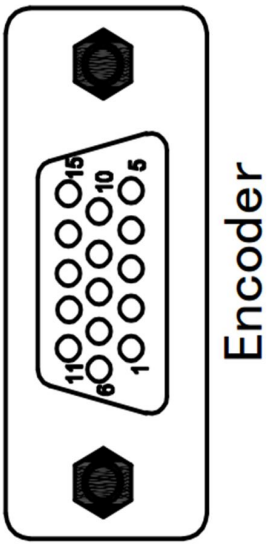
Encoder pin		Single ended incremental encoder
01	VDD_5V	+5V
11	GND_DIG	GND
03	IPHA_P	A
02	IPHA_N	
09	IPHB_P	B
08	IPHB_N	
04	IIDX_P	Z
05	IIDX_N	
13	HULL_U	HULL_U
14	HULL_V	HULL_V
15	HULL_W	HULL_W



Encoder

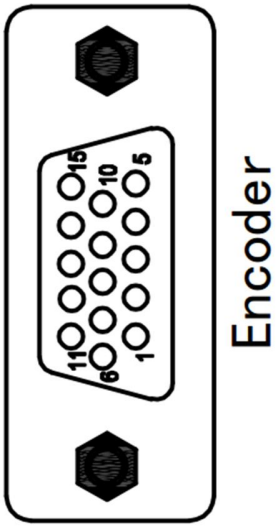
Encoder Pin		Single ended incremental encoder without Z
01	VDD_5V	+5V
11	GND_DIG	GND
03	IPHA_P	A
02	IPHA_N	
09	IPHB_P	B
08	IPHB_N	
04	IIDX_P	
05	IIDX_N	
13	HULL_U	HULL_U
14	HULL_V	HULL_V
15	HULL_W	HULL_W

2.6.2 SSI/BISS Encoder wiring



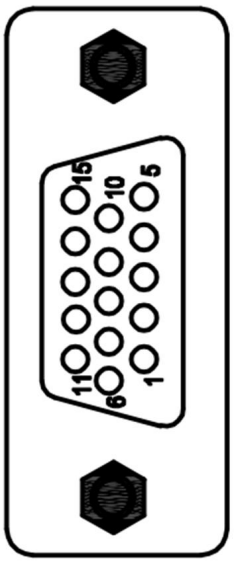
Encoder pin			SSI/BISS Encoder
01	VDD_5V		+5V
11	GND_DIG		GND
10	ABS_DATA_P		DATA+
12	ABS_DATA_N		DATA-
06	ABS_ECLK_P		CLK+
07	ABS_ECLK_N		CLK-

2.6.3 Tamakawa NRZ encoder wiring



Encoder pin			Tamakawa NRZ encoder wiring
01	VDD_5V		+5V
11	GND_DIG		GND
10	ABS_DATA_P		DATA+
12	ABS_DATA_N		DATA-

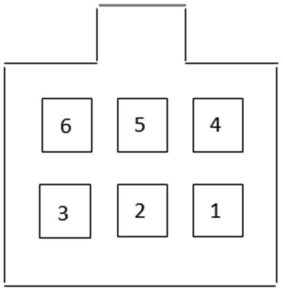
2.6.4 Resolver wiring



Encoder P i n		Rotary transformer
2、IPHA_N		SIN-
3、IPHA_P		SIN+
4、IIDX_P		EXC+
5、IIDX_N		EXC-
8、IPHB_N		COS-
9、IPHB_P		COS+

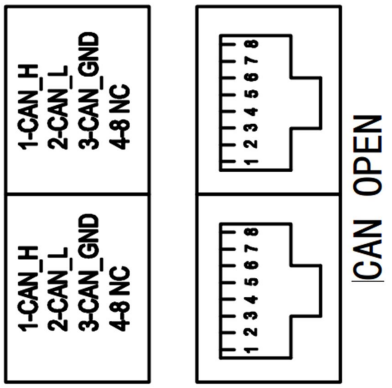
2.7 RS485 Communication terminal C1

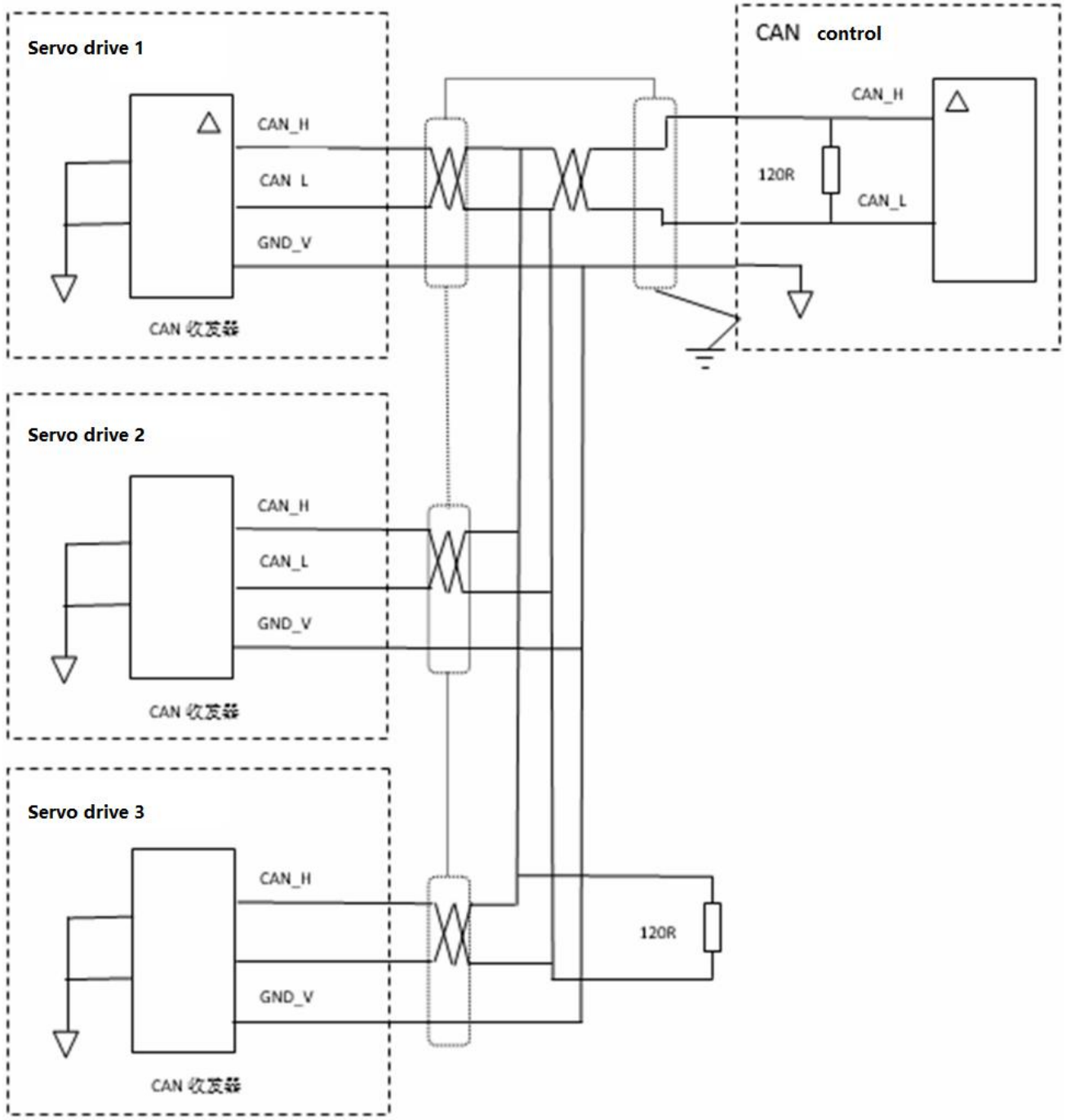
Definition of RS485 communication terminal C1 port:

Pin	name	function
01	RS485_H	
02	RS485_L	
03	COM_GND	
04	RS485_H	
05	RS485_L	
06	COM_GND	

2.8 CAN Communication terminal C2

Can communication terminal C2 interface definition

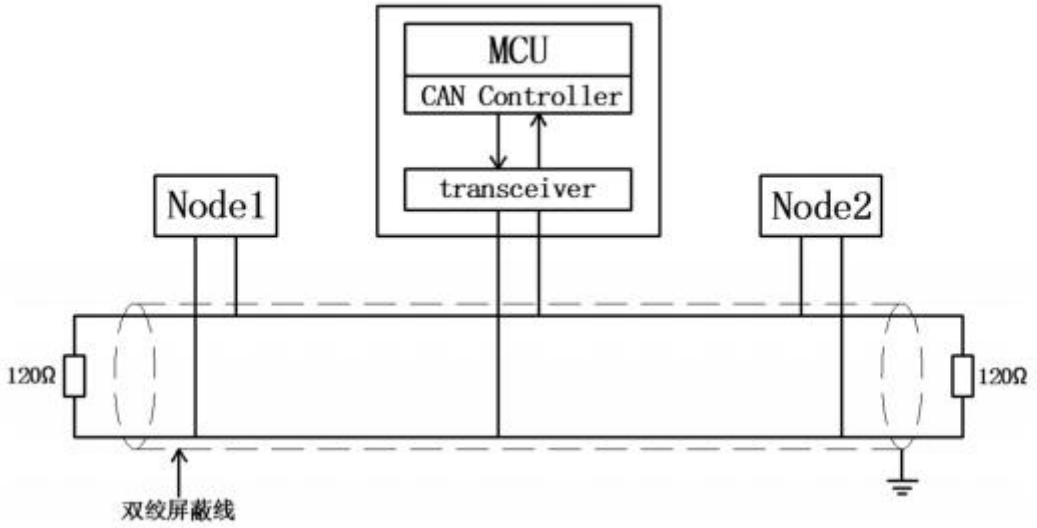
Pin	name	schematic diagram
01	CAN_H	
02	CAN_L	
03	CAN _GND	
04	NC	
05		
06		
07		
08		



Note: when multiple drives are connected to the bus, each drive needs to be set at a unique address, otherwise communication will fail.

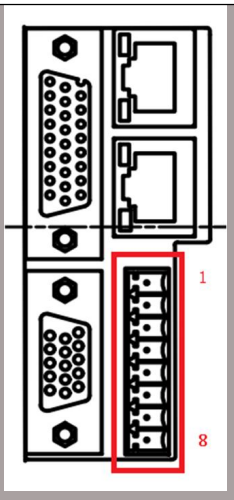
Can bus connection and performance characteristics

Can bus control is a local control network, which is a real-time control communication protocol. The operating rate is 1MHz, and the typical application is 500KHz. The two terminals of CAN bus must be connected with 120r resistance, and the total resistance between CAN buses is 60R.



Note: in order to enhance the anti-interference ability of the bus, it is recommended to use twisted pair shielded wire for can connecting wire, and the shielding layer should be grounded reliably.

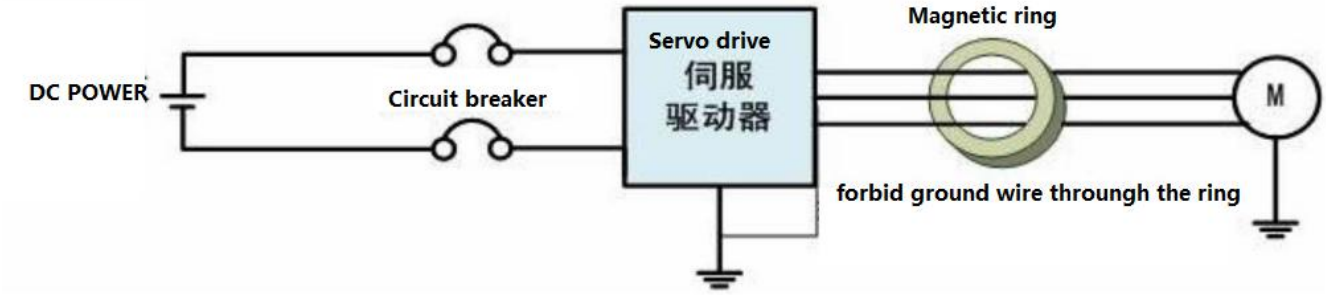
2.9 SIZE4 Control terminal U2

Pin	Name	description	schematic
01	CAN_120R_H	Can bus 120r terminal resistance selection, effective after short circuit	
02	CAN_120R_L		
03	RS485_H	RS485 port, used for Modbus communication and connection debugging software	
04	RS485_L		
05	GND		
06	K(N.O)	Refer to Section 2.4 for the port description	
07	R(Com)		
08	B(N.C)		

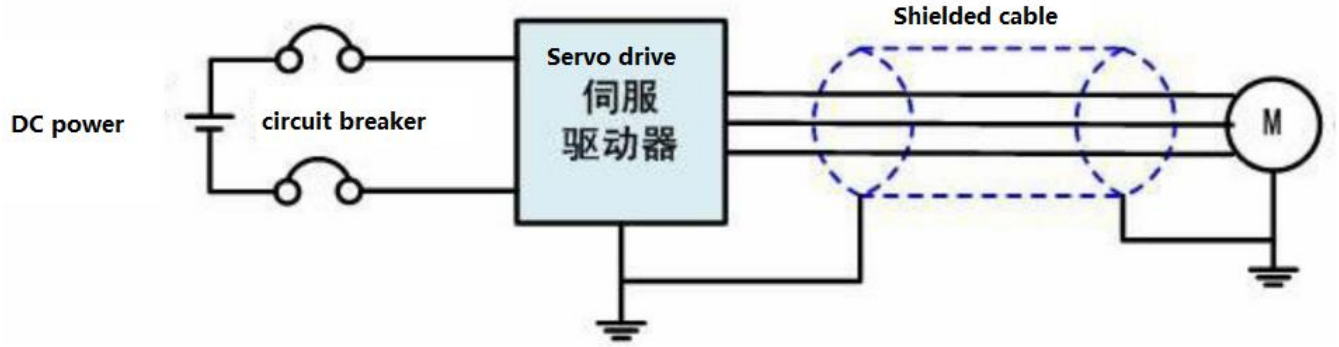
2.10 Anti interference measures for wiring

1. The logic electric lines such as control signal and encoder signal must be separated from power line and motor power line. It is suggested that cross wiring can minimize interference.

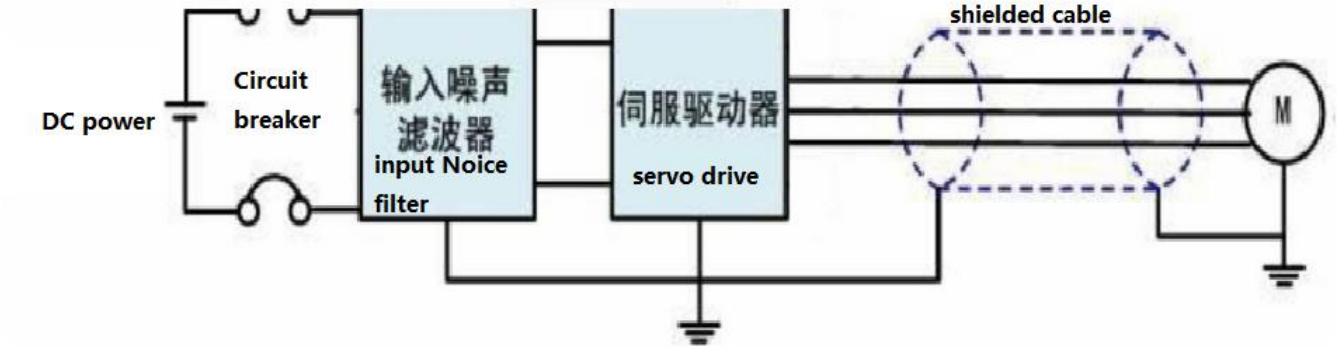
2. The filter magnetic ring is installed near the output side of the driver, which can effectively suppress the common mode interference on the output side.



3.The output line of servo driver adopts shielded cable, which can effectively suppress radio interference and inductive interference. When using shielded cable, both ends of shielding layer should be grounded.



4.The input filter can resist the input side interference of the driver.



3、 Maintenance and maintenance

3.1 overview

Due to the influence of the temperature, humidity, pH, dust, vibration and other factors of the environment, as well as the aging, wear and other reasons of the internal components of the servo driver, there are hidden dangers that may lead to the failure of the driver. Therefore, it is necessary to carry out daily inspection and regular maintenance of the drive and drive system during storage and use.

If the driver is transported for a long distance, routine inspection should be carried out before use, such as whether the components are in good condition and whether the screws are tight. During normal use, clean the dust inside the drive regularly and check whether the screw is loose. If the driver is not used for a long time, it is recommended to power on every half a year during the storage period for more than half an hour to prevent

the failure of internal electronic components.

Danger:

★ there is dangerous high voltage in the operation process of the drive, and the wrong operation may cause serious personal injury

★ there is still dangerous high voltage in the drive for a period of time after the power is cut off

★ only trained and authorized qualified professionals can repair the drive Before operation, the maintenance personnel must take off all metal items such as watches and rings, and use qualified tools

3.2 daily maintenance

When using the drive normally, daily maintenance should be done to ensure a good operating environment, daily operation data, parameter setting data, parameter change records should be recorded, and equipment use files should be established and improved. Through the daily maintenance and inspection, we can find out all kinds of abnormal conditions in time, find out the causes of the abnormal conditions in time, eliminate the hidden trouble as soon as possible, ensure the normal operation of the equipment, and extend the service life of the driver.

The daily inspection items mainly include:

1. Inspection of operation environment:

The ambient temperature is lower than 50 ℃

No dust, no leakage, no condensation

No abnormal color gas, no peculiar smell

2. Driver check

check the driver vibrate

check the heat dissipation of the drive good

check the driver heating abnormally

check the abnormal noise

3. motor inspection

Is the motor vibrating

Whether the motor has abnormal heat

Whether there is abnormal noise

4. drive operation status check

Whether the input voltage of the driver meets the standard

Is the output voltage of the driver normal

Is the output current of the driver normal

3.3 regular maintenance

According to the usage, the drive can be checked regularly in a short period or 3-6 months to eliminate the potential trouble and ensure long-term high performance and stable operation.

Danger: ★ only trained and authorized professionals can maintain the drive ★ do not leave metal items inside the drive, otherwise, it is dangerous to damage the drive ★ it is absolutely impossible to modify the drive without authorization, otherwise, it will affect the normal operation of the drive

The items of routine inspection are as follows:

Is there any abnormal noise

Is the driver terminal screw loose?

Whether the main circuit terminal has poor contact, and whether the cable connection and screw have overheating traces

Whether the power cable and control wire are damaged, especially whether the external insulation layer is cracked or cut

Clean the dust in the printed circuit board and air duct, and take anti-static measures when cleaning

3.4 Storage of drive

The storage environment of the drive shall meet the following requirements:

Environmental characteristics	requirements	Note
ambient temperature	-20℃—70℃	The ambient temperature should be lower during long-term storage
relative humidity	20%—95%	
Storage environment	No direct sunlight, no dust, no corrosive combustible gas, no oil mist, steam, dripping,	can use plastic film sealing and desiccant measures

3.5 Driver warranty

The company will provide warranty service in case of the following conditions:

In normal use, if the driver fails or is damaged, it shall be responsible for the warranty within 12 months from the date of delivery; if it exceeds 12 months, a reasonable maintenance fee will be charged

Even within the scope of 12-month warranty, a certain maintenance fee shall be charged in case of the following situations: 1) damage to the drive caused by incorrect operation and use according to the instructions of the user's manual; 2) damage to the drive caused by incorrect wiring

3) Driver damage caused by fire, flood, abnormal voltage, etc. 4) damage caused by using the driver for abnormal functions