Hardware Instruction for Y7-series EtherCAT Servo Drive

Preface

Thank you for purchasing Y7-series servo drive.

This manual mainly describes the safety use, installation and wiring for Y7- series EtherCAT servo drive.

For more details, please refer to < User Manual for Y7 Series EtherCAT Servo Drive >.

Confirm the following items when unpacking:

Item	Name		Quantity
1	Y7-series servo drive		1
2	Accessories	Straight screwdriver	1
		Crowbar	1
		50pin terminal（CN1）	1
3	Hardware Instruction for Y7-series EtherCAT Servo Drive		1
4	Qualified certificate		1

- Power supply input terminal *1 and power output terminal *1 for AC220V1.5kw and below models.
- Check if there are some damage to the products during transportation.
- Any questions, please contact the HCFA Technology.

Safety precautions

Safety symbols

Please pay attention to the flowing safety precautions anywhere and anytime during acceptance inspection, installation, wiring, operation and maintenance.

In this manual, the safety precautions are ranked as "DANGER" and "CAUTION"

DANGER ⚠	Indicates that incorrect handling may result in death or severe injury.
CAUTION ⚠	Indicates that incorrect handling may result in medium or slight personal injury or physical damage.

	Indicates “Prohibitions”(Indicates what must not be done).
	Indicates “Forced”(Indicates what must be done.)

⚠ DANGER		
About Installing and wiring		
	Do not connect the motor to the commercial power.	To prevent fire or malfunction.
	Do not place the combustibles around the servo motor and drive.	To prevent fire.
	Be sure to protect the drives through the case, and leave specified clearances between the case or other equipment and the drive.	To prevent electric shock, fire or malfunction.
	Install it at the place free from excessive dust and dirt, water and oil mist	To prevent electric shock, fire , malfunction or damage
	Install the equipment to incombustibles, such as metal.	To prevent fire.
	Any person who is involved in wiring and inspection should be fully competent to do the work.	To prevent electric shock.
	FG terminal of motor and drive must be grounded.	To prevent electric shock.
	Perform the wiring correctly after cut off the breaker.	To prevent electric shock, injury, malfunction or damage
	Have the insulation processing when connecting cables.	To prevent electric shock, fire or malfunction.
About operation and running		
	During operation, never touch the internal parts of the drive.	To prevent burns or electric shock.
	The cables should not be damaged, stressed loaded, or pinched.	To prevent electric shock, malfunction or damage.
	During operation, never touch the rotating parts of the servo motor.	To prevent injury.
	Do not install the equipment under the conditions with water, corrosive and flammable gas.	To prevent fire.
	Operate the switches and wiring with dry hand.	To prevent electric shock, injury or fire.
	Do not touch the keyway directly when using the motor with shaft-end keyway	To prevent injury.
	Do not touch the motor and drive heat sink, as they are very hot.	To prevent burns or parts damaged.
	Do not drive the motor by external drive.	To prevent fire.
About other safety instructions		
	Confirm the equipment’s safety after the earthquake happens.	To prevent electric shock, injury or fire.
	Installing and setting correctly to prevent the fire and personal injury when earthquake happens.	To prevent injury, electric shock, fire, malfunction or damage.

	Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.	To prevent injury, electric shock, fire, malfunction or damage.
About maintenance and inspection		
	Before wiring or inspection, turn off the power and wait for 5 minutes or more. And it’ s not allowed to disassemble the servo drive.	To prevent electric shock.

⚠ CAUTION		
About installing and wiring		
	Please follow the specified combination of the motor and drive.	To prevent fire or malfunction.
	Do not touch the terminals of connector directly.	To prevent electric shock or malfunction.
	Do not block intake and prevent the foreign matters from entering into the motor and drive.	To prevent electric shock or fire.
	Fix the motor and have the test run away from the mechanical system. After confirming the operation, the motor can be securely mounted to mechanical system.	To prevent injury.
	The servo motor must be installed in the specified direction.	To prevent injury or malfunction.
	Install the equipment correctly in accordance with its weight and rated output.	To prevent injury or malfunction.
About operation and running		
	Do not climb or stand on servo equipment. Do not put heavy objects on equipment.	To prevent electric shock, injury, fault or damage.
	The parameter settings must not be changed excessively. Operation will be instable.	To prevent injury.
	Keep it away from the direct sunlight.	To prevent malfunction.
	Do not put strong impact on the motor, drive and motor shaft.	To prevent malfunction.
	The electromagnetic brake on the servo motor is designed to hold the servo motor shaft and should not be used for ordinary braking.	To prevent injury or malfunction.
	When power is restored after an instantaneous power failure, keep away from the machine because the machine may be restarted suddenly (design the machine so that it is secured against hazard if restarted).	To prevent injury.
	Do not install or operate a faulty servo motor or drive.	To prevent injury, electric shock or fire

	Check the power specification.	To prevent fault.
	The electromagnetic brake may not hold the servo motor shaft. To ensure safety, install a stopper on the machine side.	To prevent injury.
	A sudden restart is made if an alarm is reset with the run signal on.	To prevent injury.
	Connect the relay for emergency stop and for brake in series.	To prevent injury or malfunction.
About transportation and storage		
	Do not subject the equipment to the place with rain, waterdrop, poisonous gases or liquids.	To prevent malfunction.
	Do not carry the servo motor by the cables, shaft or encoder during transportation.	To prevent injury or malfunction.
	Do not drop or dump the motor during transportation and installation.	To prevent injury or malfunction.
	When long-term storage is required, please consult HCFA Technology.	To prevent malfunction.
	Store the unit in a place in accordance with the instruction manual.	To prevent malfunction.
About other safety instructions		
	Please dispose the battery according to your local laws and regulations.	
	When disposing of the product, handle it as industrial waste.	
About maintenance and inspection		
	Do not disassemble and/or repair the equipment on customer side.	To prevent malfunction.
	Do not turn on or switch off the main power frequently.	To prevent malfunction.
	When the drive become faulty, switch off the control circuit and main power.	To prevent fire.
	If the servo motor is to be stored for a long time, switch off the power.	To prevent misoperation and injury.
About maintenance and inspection		
< Warranty period> The term of warranty for the product is 18 months from the date of manufacture. It’ s exceptional to brake motors as they are warranted when acceleration / deceleration times is not beyond the specified service life.		
< Warranty coverage > This warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are stated in the instruction manual and user manual for the Product. However, even during warranty period, the repair cost will be charged on customer in the following cases. 1) A failure caused by improper storing or handling, repair and modification. 2) A failure caused by the parts which have dropped down or damaged during transportation 3) A failure caused when the products have been used beyond the product specification		

4) A failure caused by external factors such as inevitable accidents, including but not limited to fire, earthquake, lightning stroke, windstorm disaster, flood, salt damage, abnormal fluctuation of voltage and other natural disaster.

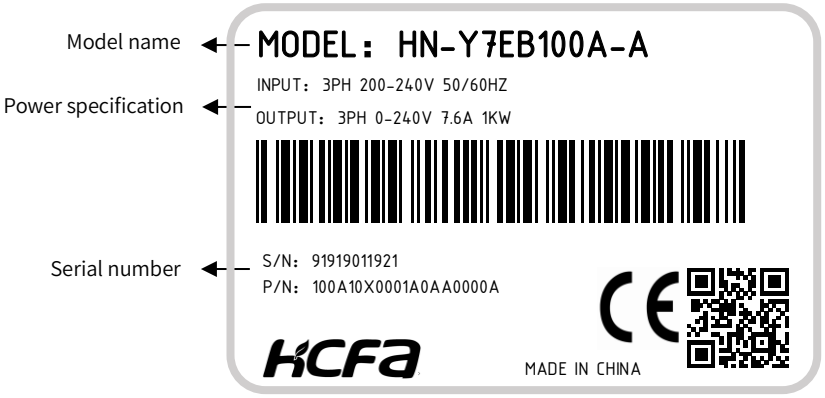
5) A failure caused by the intrusion of water, oil, metal and other foreign matters.

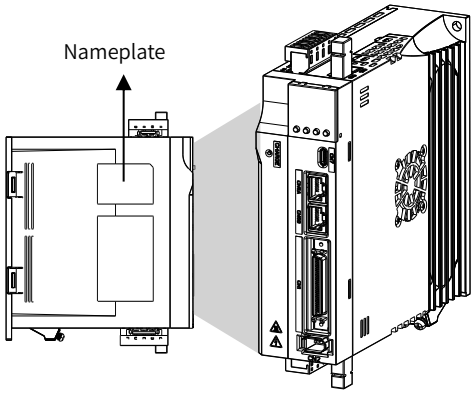
The warranty coverage is only for the product itself. We assume no responsibilities for any losses of opportunity and/or profit incurred by you due to a failure of the product

1 Product introduction and model selection

1.1 Introduction for servo drive nameplate

Description of side labels of Y7 series servo drives.





1.2 Model name identification

HN-Y7 E B 300 T-A *-** ***

Product family	
HN-Y7	Single axis

Functional classification	
E	Standard type
F	Fully functional
L	Direct drive type
T	STO type

Product type	
A	Pulse type
B	EtherCAT bus
K	MECHATROLINK-III bus
N	CANopen bus（Under planning）

Power specification	
010	100W
020	200W
040	400W
075	750W
100	1kW
150	1.5kW
200	2kW
300	3kW
500	5kW
600	6kW
750	7.5kW
111	11kW
151	15kW
221	22kW
371	37kW

Product iteration code	
0	无

Hardware definition ID	
00	无

Software definition ID	
000	无

Control power supply	
A	AC control Power

Power supply voltage specification	
A	AC220V
T	AC380V

2 Product specification

2.1 Environmental specifications

Items	Specifications
Environmental requirements	Open environment and indoor use
Environmental Temperature	0°C~50°C(Environmental Temperature above 45°C，Derate 10% for every 5 degree increase)/-20°C ～+70°C
Storage Temperature	-20～65°C（Maximum temperature guarantee：80°C 72h No condensation）
Ambient Humidity	20%～85%RH or less（No condensation）
Storage Humidity	20%～85%RH or less（No condensation）
Vibration Resistance	5.88m/s^2(0.6G) or less，10-60Hz（Do not connect at the resonance point）
Impact Strength	Acceleration 100m/s^2 or less(XYZ)
Protection level	IP20
Cleanliness	• Free from corrosive gas, flammable gas
	• Free from water, oil, chemical splash
	•Environment with less dust, salt and metal powders
Altitude	1000m or less （It can be used after derating at 1000 to 2000m）
Pollution level	2
Overvoltage classification	III
Short-circuit current	5Ka
Others	No electrostatic interference, strong electric field, strong magnetic field, radiation, etc.

2.2 Technical specifications

Items			Specifications
Common	Control signal	Input/output	7IN/5OUT
	Analog signal	Output	2OUT（Motor speed, for torque monitoring）
	STO function		Supported only for full-functional type
	Second encoder interface		Supported only for full-functional type
	Inertia self-estimation		Provided
	One-key setting function		Provided
	Friction compensation		Provided
	Vibration suppression frequency 1		Provided
	Vibration suppression frequency 2		Provided
	Adaptive notch filter		Provided
	Encoder output division and multiplication		Provided

	Dynamic brake		Built-in
	Regeneration function		Built-in braking resistor , external regenerative resistor possible
	Protective functions		Overvoltage, power supply error, overcurrent, overheat, overload, encoder error, over speed, position deviation too large, parameter error
	Communication	USB	Connection with PC（with「HCServoWorks.Y7」）
		Industrial network	EtherCAT

2.3 Basic specifications for models of 220VAC

Items			Specifications							
Models HN-Y7EA***A-A** ****			010	020	040	075	100	150	200	300
Maximum applicable motor capacity (kW)			0.1	0.2	0.4	0.75	1.0	1.5	2.0	3.0
Continuous output current（ Arms）			0.91	1.6	2.8	5.5	7.6	11.6	18.5	19.6
Instantaneous max. output current (Arms)			3.2	5.9	9.3	16.9	17	28	44	56
Main circuit	Power voltage（Arms）		1-/3-phase 200 ～ 240VAC, 50/60Hz				3-phase 200 ～ 240VAC, 50/60Hz			
	Current（Arms）		0.8	1.3	2.5	4.1	5.7	7.3	10	15
Control power			单相AC200 ～ 240V、50/60Hz							
Regenerative resistor	Built-in resistor	Resistance (Ω)	—	—	—	50	50	50	20	20
		Capacity (W)	—	—	—	40	80	80	100	100
	External mini. allowable resistance（Ω）		40	40	40	40	35	35	20	20
Overvoltage level			III							

2.4 Basic specifications for models of 380V AC

Items		Specifications										
Models HN-Y7EA***T-A** ****		100	150	200	300	500	600	750	111	151	221	371
Maximum applicable motor capacity (kW)		1	1.5	2	3	5	6	7.5	11	15	22	37
Continuous output current（ Arms）		3.5	5.4	8.4	11.9	16.5	20.8	25.7	28.1	37.2	52	—
Instantaneous max. output current (Arms)		10.5	17	24	31	44	52	65	70	88	105	—
Main circuit	Power voltage（Arms）	3-phase 330 ～ 440VAC, 50/60Hz										
	Current（Arms）	2.9	4.3	5.8	8.6	14.5	17.4	21.7	23.4	29.6	43.4	—

Control power			3-phase 330 ～ 440VAC, 50/60Hz										
Regenerative resistor	Built-in resistor	Resistance (Ω)	50	50	50	40	30	20	20	—	—	—	—
		Capacity (W)	80	80	80	100	100	100	100	—	—	—	—
	External mini. allowable resistance （Ω）			40	40	35	25	15	15	15	10	10	—
Overvoltage level			III										

Note 1）When using an external regenerative resistor at a normal rated load factor, be sure to lower the rating before using the resistor when the temperature of the resistor reaches 200°C to 300°C. For the load characteristics of the resistor, please consult HCFA Technology.

Note 2）For safety, it is recommended to use an external regenerative resistor with a temperature switch.

3 Installation and size of servo drive

3.1 Installation direction and space

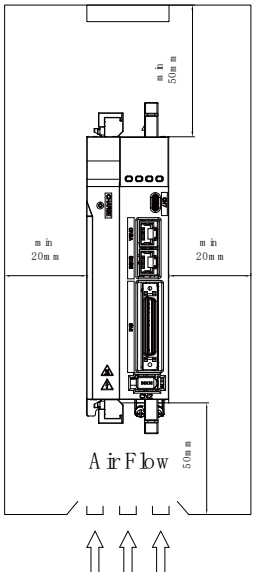
Notes

When installing the servo drive, do not seal its suction and exhaust holes, and overturned is not allowed, otherwise it will cause malfunction.

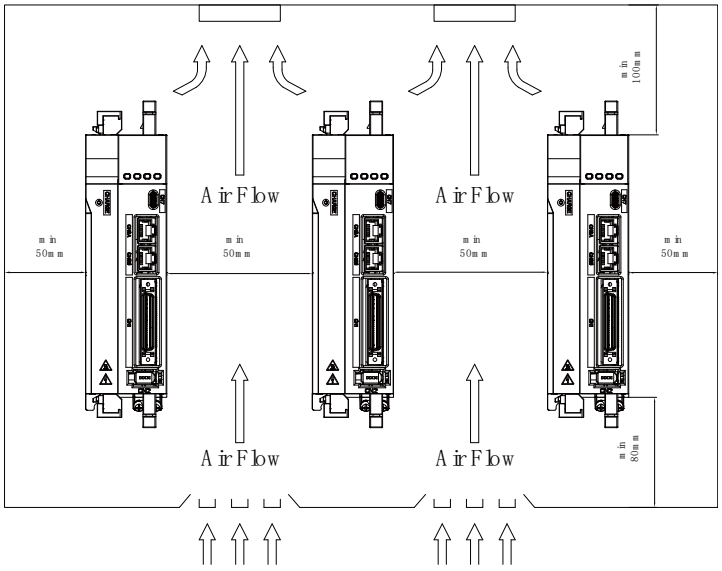
In order to make the cooling fan have a relatively low wind-resistance to effectively dissipate heat, when installing one or more servo drives, please follow the recommended distance between installations.

Please avoid installation up and down, because the heat generated by the lower servo driver during operation will rise, which may easily cause unnecessary temperature increase of the upper ones.

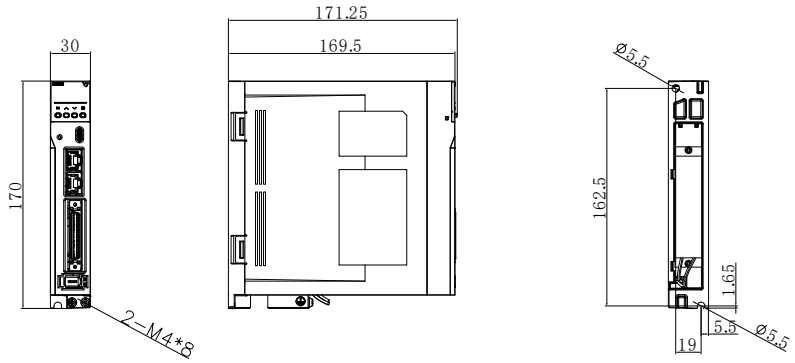
Stand-alone installation:



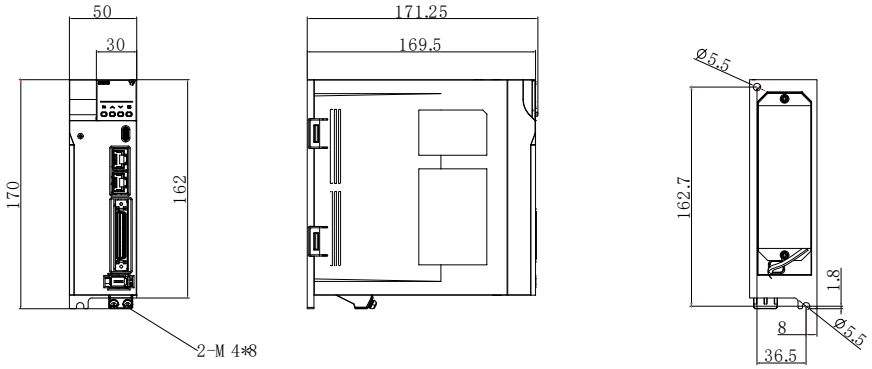
Side-by-side installation:



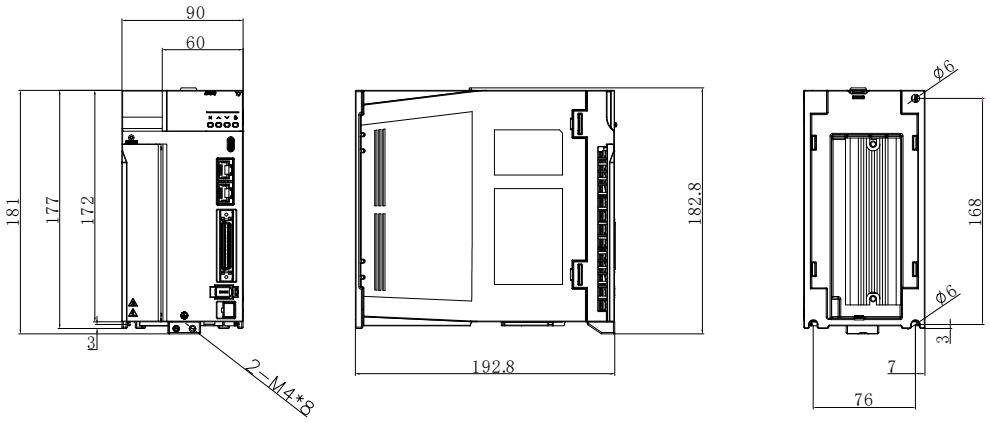
3.2 External dimensions for 100-750W models 220V（unit：mm）



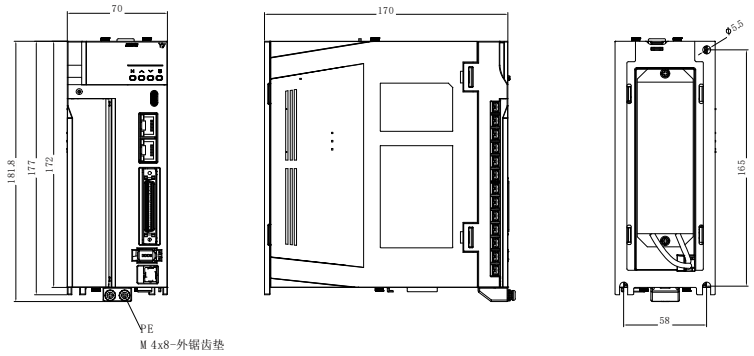
3.3 External dimensions for 1KW/1.5KW models 220V（unit：mm）



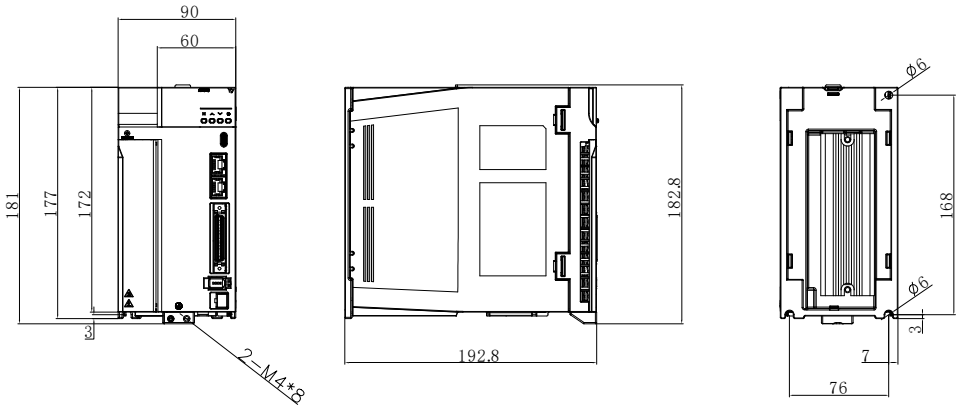
3.4 External dimensions for 2KW/3KW models 220V（unit：mm）



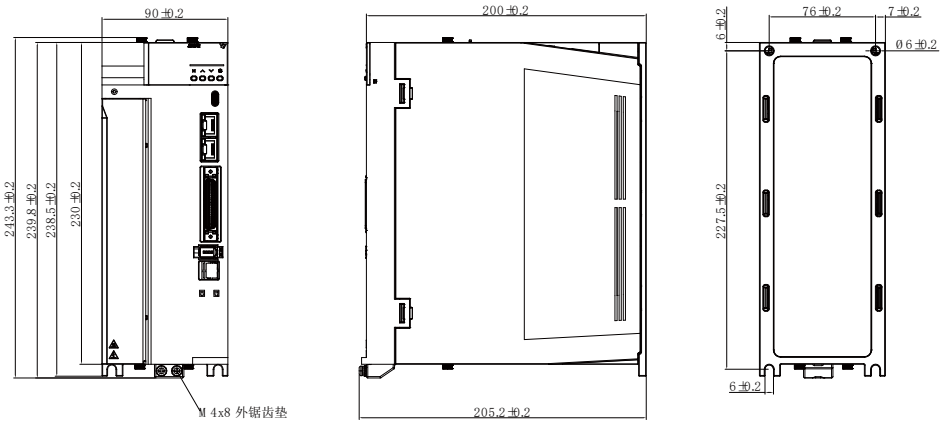
3.5 External dimensions for 1KW/1.5KW/2KW models 380V（unit：mm）



3.6 External dimensions for 3KW/5KW models 380V（unit：mm）



3.7 External dimensions for 6KW/7.5KW models 380V（unit：mm）



4 Wiring

4.1 Recommended cables

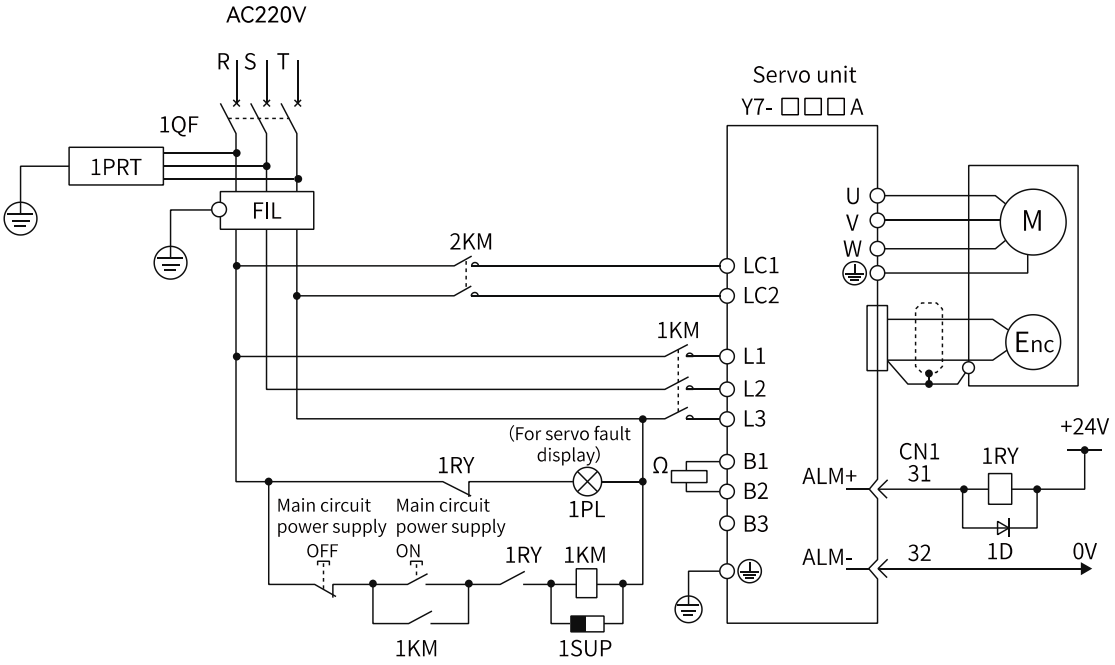
Terminals	Name	Models HN-Y7 □□□□□A							
		010	020	040	075	100	150	200	300
LC1, LC2	Control power input terminal	0.82mm²(AWG18)							
L1, L2, L3	Main circuit power input terminal	0.82mm²(AWG18)				1.318mm²(AWG16)		2.075mm² (AWG14)	3.332mm² (AWG12)
U, V, W	Terminal for servo motor	0.82mm²(AWG18)			1.318mm² (AWG16)		2.627mm² (AWG13)	4.17mm²(AWG11)	
B1 、B2	Terminal for external regenerative resistor	Determined according to the actual power of the external resistor, you can consult the resistor manufacturer or our technicians							
Ground terminal		＞2.075mm²(<AWG14)							

Terminals	Name	Models HN-Y7 □□□□□T									
		100	150	200	300	500	600	750	111	151	221
LC1、LC2	Control power input terminal	0.82mm²(AWG18)									
L1、L2、L3	Main circuit power input terminal	0.82mm² (AWG18)		1.646mm² (AWG15)		3.332mm² (AWG12)	4.17mm² (AWG11)	5.26mm² (AWG10)	6.63mm² (AWG9)	8.37mm² (AWG8)	10.55mm² (AWG7)
U、V、W	Terminal for servo motor	1.026mm² (AWG17)		1.646mm² (AWG15)	2.627mm² (AWG13)	3.332mm² (AWG12)	4.17mm² (AWG11)	6.63mm² (AWG9)	8.37mm² (AWG8)	10.55mm² (AWG7)	13.3mm² (AWG6)
B1、B2	Terminal for external regenerative resistor	Determined according to the actual power of the external resistor, you can consult the resistor manufacturer or our technicians									
Ground terminal		＞2.075mm²(<AWG14)									

Note 1）If used in a closed pipe, wire groove, etc., or the ambient temperature higher than 55 °C, please increase the size of the wires .

4.2 Main circuit for 220VAC power input

Models: Y7-010A、020A、040A、075A、100A、150A、200A、300A



1QF ：Circuit breaker for wiring

FIL ：Noise filter

1KM ：Electromagnetic contactor

Ω ：Braking resistance

1D ：bypass diode

1RY ：Electric relay

1PL ：Indicator light

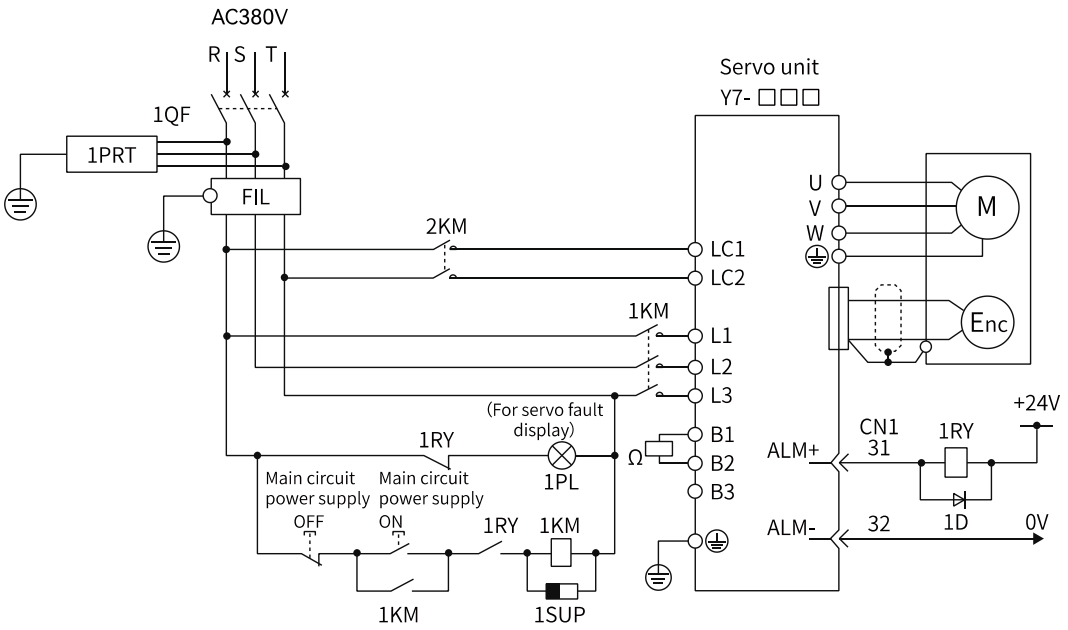
1PRT ：Surge suppressor (absorb switching surge)

1SUP ：Surge suppressor (absorbs lightning surge)

B3 ：No B3 interface for models for 1.5KW or less

4.3 Main circuit for 380V AC power input

Models：Y7-100T、150T、220T、300T、500T、600T、750T



1QF ：Circuit breaker for wiring

FIL ：Noise filter

1KM ：Electromagnetic contactor

Ω ：Braking resistance
(Connected to b1/b2 when using external resistance)
(Short circuit with internal brake resistor b2/b3)

1RY ：Electric relay

1PL ：Indicator light

1PRT ：Surge suppressor (absorb switching surge)

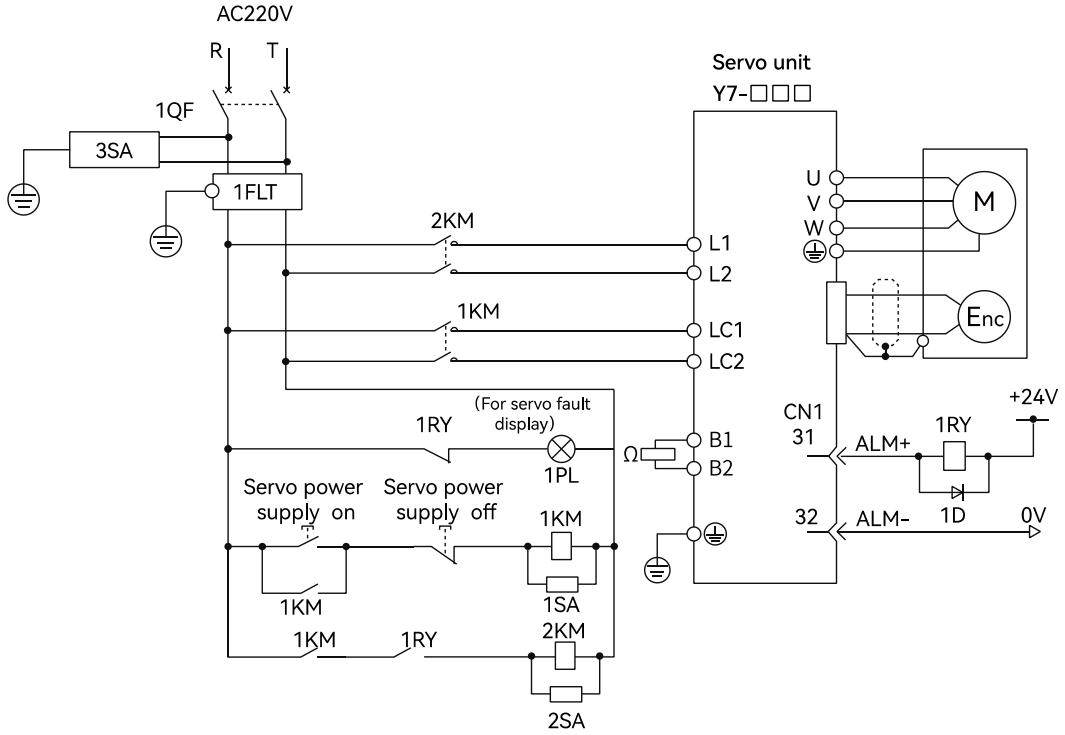
1D ：bypass diode

1SUP ：Surge suppressor (absorbs lightning surge)

4.4 Single-phase 220V power input

Y7 series servo drives of 220V power input have the three-phase power input, and there are also models under a single-phase 220V power supply. When using the main circuit power supply under the single-phase 220V power supply, please change to Pn00B.2=1 (Single-phase power supply input supported).

Models：Y7-010A、020A、040A、075A



1QF ： Circuit breaker for wiring　　1RY ： Electric relay　　3SA ： Surge suppressor

1FLT ： Noise filter　　1PL ： Indicator light　　1D ： bypass diode

1KM ： Electromagnetic contactor (Control power usage)　　1SA ： Surge suppressor

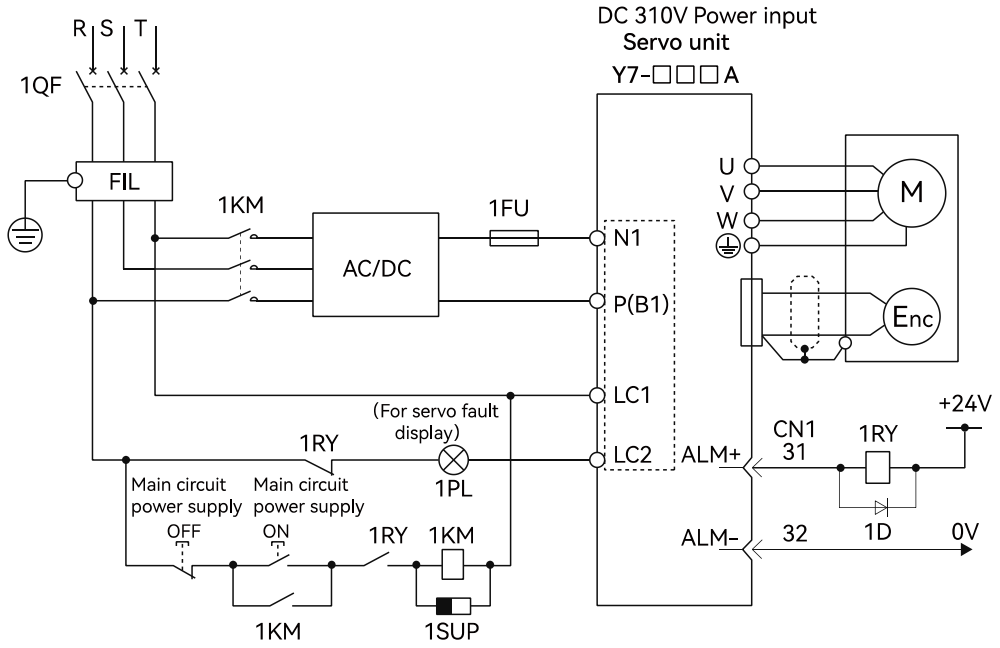
2KM ： Electromagnetic contactor (Main Circuit power supply)　　2SA ： Surge suppressor

4.5 Main circuit at DC power input

When using the servo unit with DC power, be sure to change the parameter to Pn001.2 = 1 before inputting the power supply (DC power input supported)

① Wiring for 310VDC power input Y7-□□□A

Models：Y7-010A、020A、040A、075A、100A、150A、200A、300A



1QF ： Circuit breaker for wiring

FIL ： Noise filter

1KM ： Electromagnetic contactor

1D ： bypass diode

P(B1)： B1 interface for models for 1.5KW or less

1RY ： Electric relay

1PL ： Indicator light

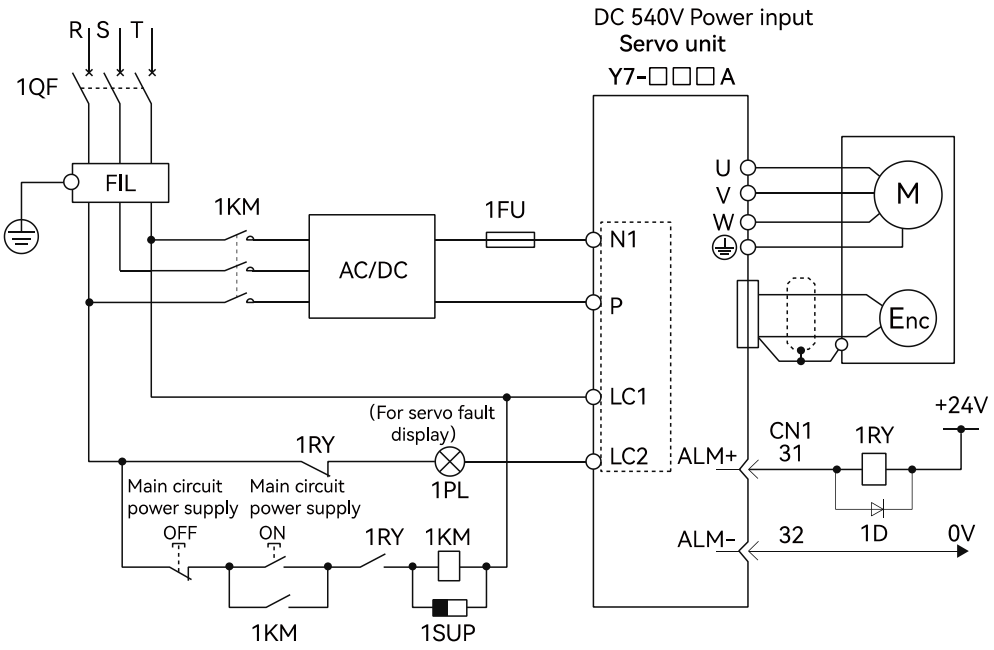
1PRT ： Surge suppressor (absorb switching surge)

1SUP ： Surge suppressor (absorbs lightning surge)

Note 1) The dotted box terminal varies according to the models of the servo drives, please refer to the models description for details.

② Wiring for 540V DC power input Y7-□□□T

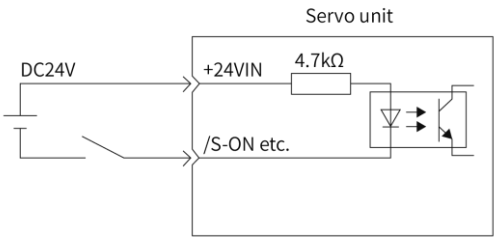
Models：Y7-100T、150T、220T、300T、500T、600T、750T



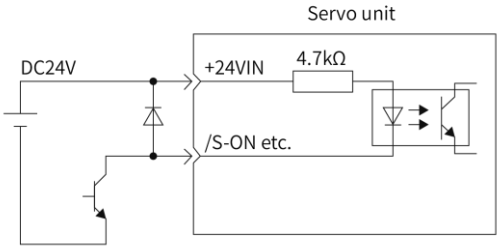
1QF	:	Circuit breaker for wiring	1RY	:	Electric relay
FIL	:	Noise filter	1PL	:	Indicator light
1KM	:	Electromagnetic contactor	1PRT	:	Surge suppressor (absorb switching surge)
1D	:	bypass diode	1SUP	:	Surge suppressor (absorbs lightning surge)

4.6 Relay/Open-collector input circuit（CN1）

Relay circuit

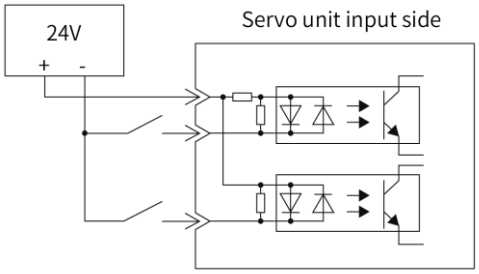


Open-collector circuit

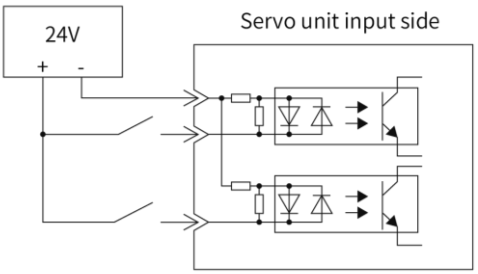


4.7 Optocoupler Input circuit（CN1）

Common Emitter (NPN) Connection



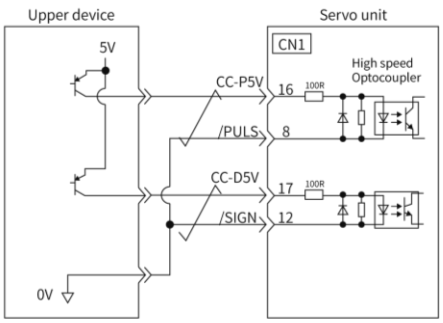
Common collector (PNP) connection



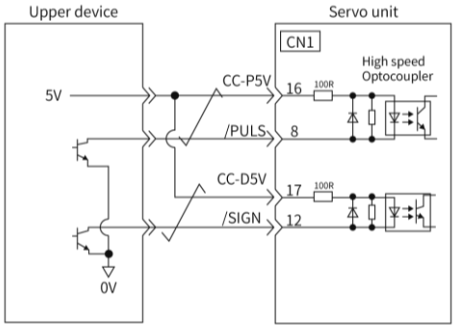
Note 1) Please note that the ON/OFF polarity is different for NPN circuit connection and PNP circuit connection.

4.8 Pulse input circuit（pulse-type CN1）

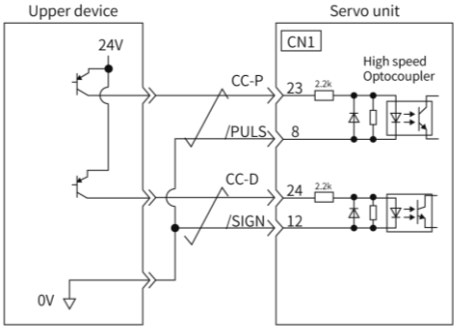
5VPNP connection



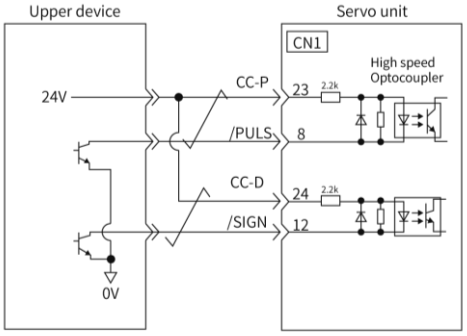
5VNPN connection



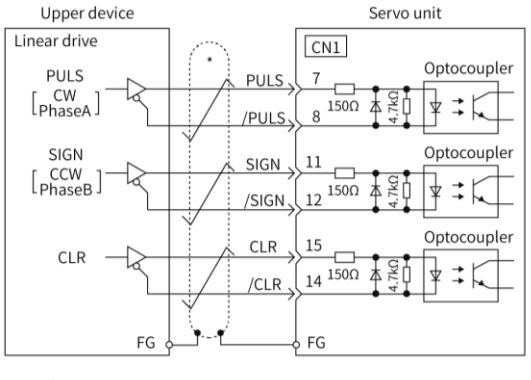
24V PNP connection



24V NPN connection

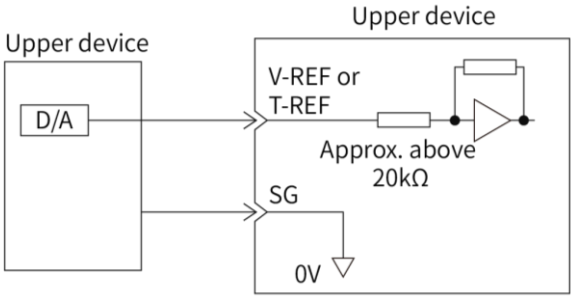


Differential input



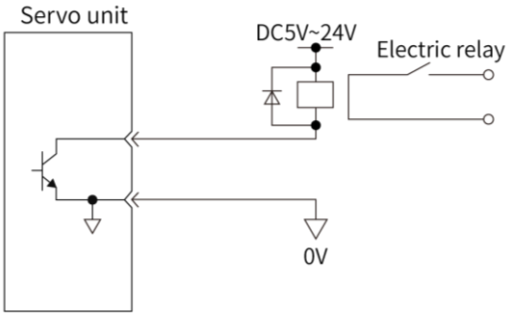
* Indicates double stranded shielded wire

4.9 Analog voltage command input circuit（pulse-type CN1）

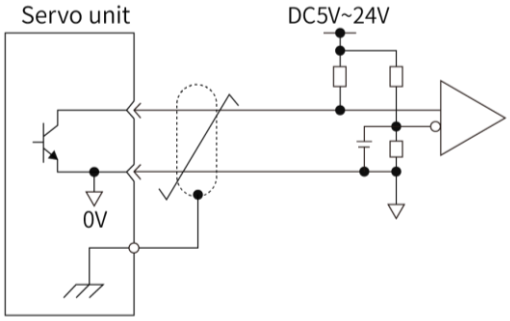


4.10 Optocoupler output circuit（CN1）

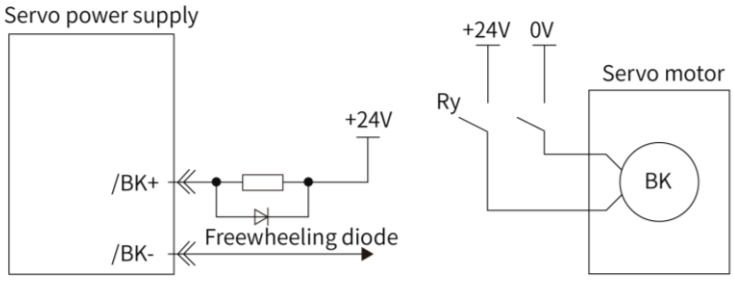
Example of relay circuit



Example of differential circuit



4.11 Brake signal（CN1）



Note 1) The brake signal (/BK) cannot be used in the factory default setting, and it is necessary to assign the output signal. Set it with "Assignment of brake signal (/BK)".

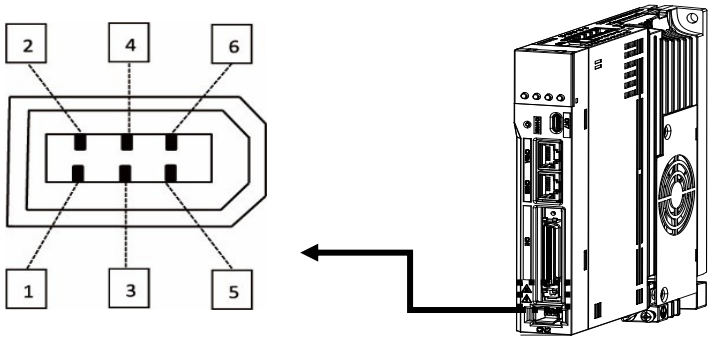
Note 2) When using a 24V brake, be sure to separate the DC24V power supply from the power supply for input and output signals (CN1), etc., and prepare another power supply. Otherwise, it may cause I/O signal malfunction.

4.12 CN1 terminal arrangements

			1	SG	GND				26	/V-CMP-(/COLN-)	Speed coincidence detection
2	SG	GND				27	/TGON+	Rotation detection			
			3	PL1	Internal power supply 12V for open collector command				28	/TGON-	Rotation detection output
4	SEN	SEN input				29	/S-RDW+	Servo ready output			
			5	V-REF	Speed command				30	/S-RDW-	Servo ready output
6	SG	GND				31	ALM+	Servo alarm output			
			7	PULS	Command pulse input				32	ALM-	Servo alarm output
8	/PULS	Command pulse input				33	PAO	Encoder frequency division pulse counts output A phase			
			9	T-REF	Torque command input				34	/PAO	Encoder frequency division pulse counts output A
10	SG	GND				35	PBO	Encoder frequency division pulse counts output BC phase			
			11	N/A	N/A				36	/PBO	Encoder frequency division pulse counts output BC phase
12	N/A	N/A				37	OUT5+	OUT5+			
			13	PL2	Internal power supply 12V for open				38	OUT5-	OUT5-
14	N/A	N/A				39	N/A	N/A			
			15	CLR	Clear input				40	Home	Return to origin signal Drive input
16	N/A	N/A				41	SI3	P operation input			
			17	CC-D 5V	External power supply 5V for open collector command				42	SI0	Forward rotation drive input prohibition
18	PL3	Open-collector with internal power supply 12V				43	SI2	Reversal drive input prohibition			
			19	PCO+	Encoder frequency division pulse				44	SI1	Probe

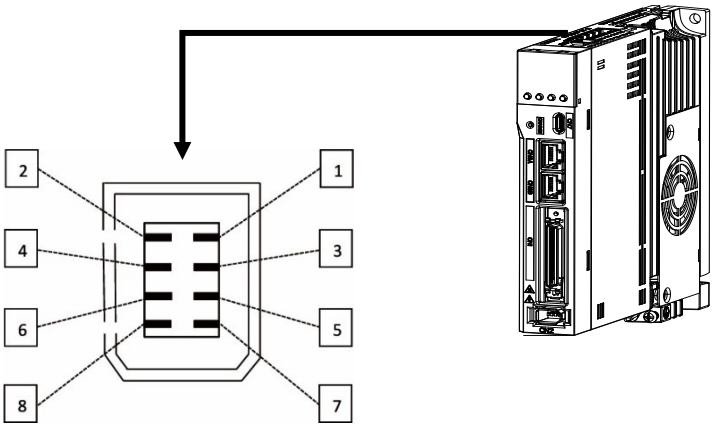
					counts output C phase						
20	/PCO	Encoder frequency division pulse counts output C phase	21	N/A	N/A	45	SI5	Probe	46	SI4	Probe
22	N/A	N/A	23	N/A	N/A	47	DI (COM)	External 24V power input	48	N/A	N/A
24	N/A	N/A	25	/V-CMP+ (/COLN+)	Speed coincidence detection	49	N/A	N/A	50	TH	External temperature detection

4.13 Encoder signal（CN2）



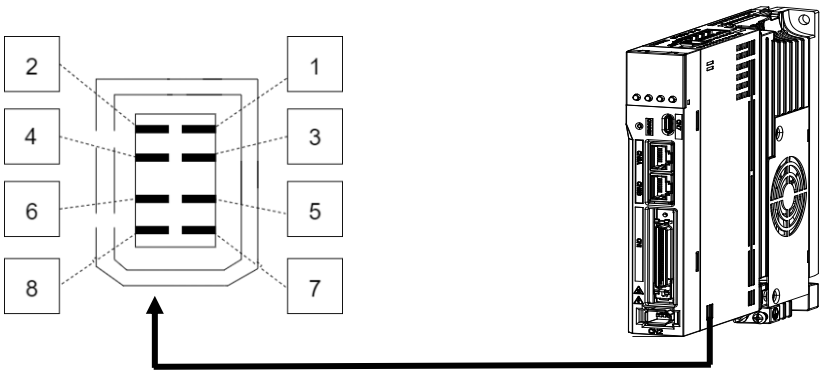
Signal name	Pin No.	Function
PG	1	Encoder power supply +5V
PG	2	Encoder power supply 0V
—	3	—
—	4	—
PS	5	Serial data（+）
/PS	6	Serial data（-）
Shield	Shell	—

4.14 Name and function for safety signal (CN3)



Signal name	Pin No.	Function
—	1	Do not connect.
—	2	
/HVBB1-	3	The hardware base block input is used to cut off the motor current, and the base block is performed by the signal OFF.
/HVBB1+	4	
/HVBB2-	5	
/HVBB2+	6	
EDM1-	7	The signal turns ON when the hardware base block function for monitoring circuit status output is normally valid.
EDM1+	8	The signal turns OFF when the hardware base block function for monitoring circuit status output is normally valid.

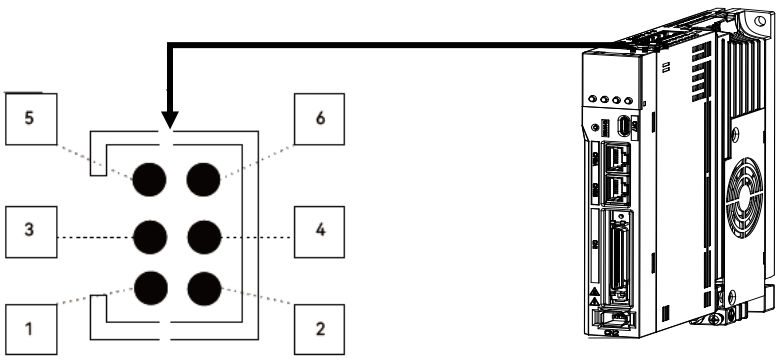
4.15 Second encoder（CN4）



Signal name	Pin No.	Function
5V	1	+5V ， current output≤300mA
GND	2	0V output
EXB+	3	B-phase signal

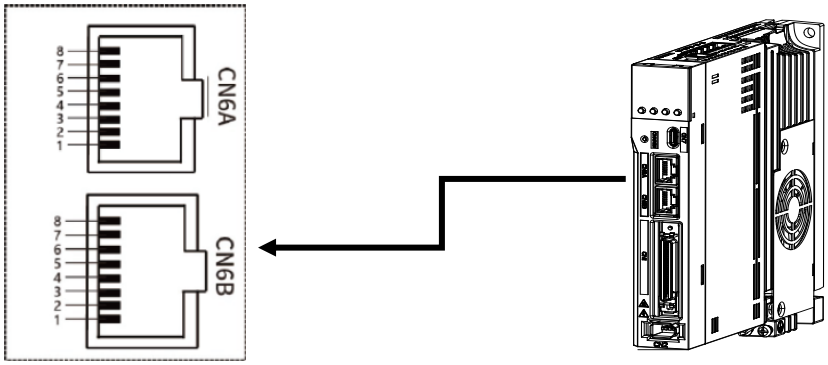
EXB-	4	B-phase signal
EXA+	5	A-phase signal
EXA-	6	A-phase signal
EXZ+	7	Z-phase signal
EXZ-	8	Z-phase signal

4.16 Analog output （CN5）



Signal name	Pin No.	Function
—	1	—
PE	2	Connect the shielded wire
—	3	—
DAC0	4	Digital - analog converter
DAC1	5	Digital - analog converter
GND	6	Grounding

4.17 Communication Interface（CN6）



Terminal	Signal	Pin	Function
CN6A	TD+	1	Data Send+

	TD-	2	Data Send-
	RD+	3	Data Send+
	-	4 和 5	-
	RD-	6	Data Send-
	-	7 和 8	-
CN6B	TD+	1	Data Send+
	TD-	2	Data Send-
	RD+	3	Data Send+
	-	4 和 5	-
	RD-	6	Data Send-
	-	7 和 8	-