



Installation and Wiring for SV-X3E Series Servo Drive
Hardware Instruction

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http://www.hcfa.com.cn

Thank you for purchasing this product. This manual mainly describes the safety use, installation and wiring for SV-X3E series servo drive. For more details, please refer to <SV-X3E Series Servo Drive User Manual>.

Confirm the following items when unpacking:

Number	Name	Quantity	
1	Servo drive	1	
2	Accessories	Connecting terminal	3
		Cold-pressed terminal	8
		Crowbar	1
		Straight screwdriver	1
3	Installation and Wiring for SV-X3E Series Servo Drive Hardware Instruction	1	
4	Certificate of Quality	1	

- Check if there are some damage to the products during transportation. Any questions, please contact the HCFA Technology.

Safety precautions

Please pay attention to the flowing safety precautions anywhere and any time 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		
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.	
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.	

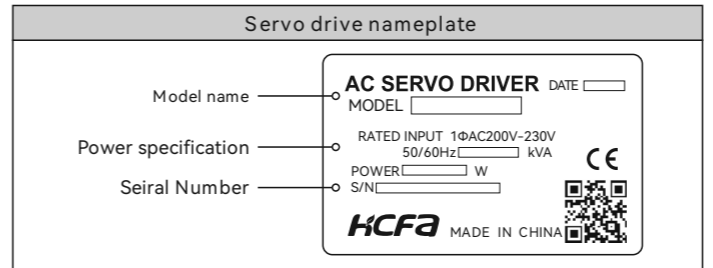
Do not use it at the location with great vibration and shock.	To prevent electric shock, injury or fire.
Do not use the servo motor with its cable soaked in oil or water.	To prevent electric shock, malfunction or damage
Operate the switches and wiring with dry hand.	To prevent electric shock, injury 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.
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.
Before wiring or inspection, turn off the power and wait for 5 minutes or more.	To prevent electric shock.

CAUTION		
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.	
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.	
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.	
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.	
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.	
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.	
Store the unit in a place in accordance with the instruction manual.	To prevent malfunction.	
Other safety instructions		
Please dispose the battery according to your local laws and regulations.		
When disposing of the product, handle it as industrial waste.		
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.	
Do not touch the servo drive heat sink, regenerative resistor, servo motor etc. Their temperatures may be high while power is on or for some time after power-off.	To prevent burns or electric shock.	
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.	

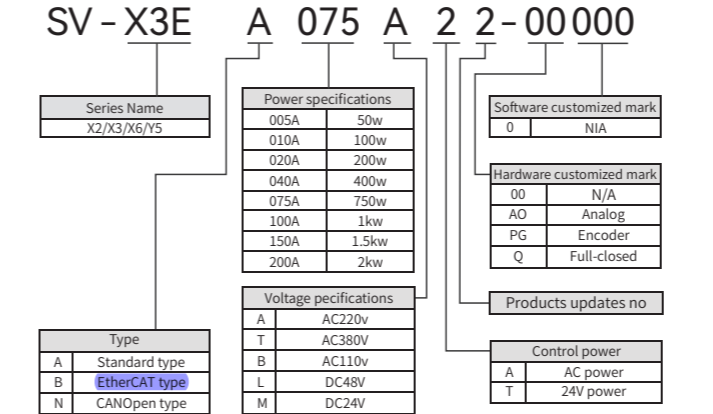
About maintenance and inspection	
<Warranty period> The term of warranty for the product is 18 months from the date of manufacture. It's exceptional to brake motors as they are warranted when acceleration /deceleration times is not beyond the specified service life	
<Warranty coverage > This warranty 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 A 4) 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

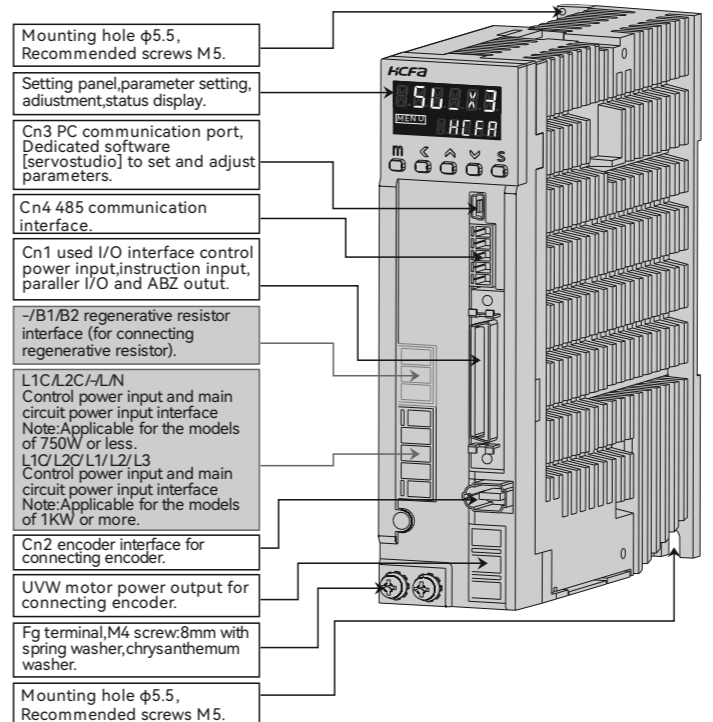
Introduction for drive nameplate



Model name identification



Drive parts name



Model selection of peripheral braking resistor

Rated output	50W	100W	200W	400W	750W	1kW	15kW	2kW
Resistance	40 ~ 50Ω	40 ~ 50Ω	40 ~ 50Ω	40 ~ 50Ω	40 ~ 50Ω	30Ω	30Ω	20Ω
Capacity	40W	40W	40W	40W	40W	50W	60W	80W

2. Product specification

Servo drive specification

Items	Specification							
Model Name SV-X3DA □□□□	005	010	020	040	075	100	150	200
Applicable motor	50W	100W	200W	400W	750W	1kW	1.5kW	2kW
Dimension W(mm)	42			49			84	
H(mm)	160			160			160	
D(mm)	135			135			135	
Weight(Kg)	0.7			0.8			1.6	
Input power	Main	Single-phase 200~240V±10% 50/60Hz						
	Control power	Three-phase 200~240V±10% 50/60Hz						
Dielectric strength	1 minute at 1500 VAC across the primary and FG							
Control type	Three-phase PWM inverting sine-wave							
Encoder feedback	Single-turn absolute 17-bit (multi-turn absolute with battery)							
Digital signal	Input	9 inputs (24VDC, photo-coupler insulation) Switch by control mode						
	output	9 outputs (24VDC, photo-coupler insulation, open-collector output) Switch by control mode						
Digital signal	Input	2 inputs (±10V) Switch by control mode						
Pulse signal	Input	2 inputs (photo-coupler insulation, RS-422 differential, open-collector)						
	output	4 outputs (A/B/Z-phase RS-422 differential, Z-phase open collector output)						
Communication function	USB	Connection with PC (with "Servostudio" software)						
	RS-485	Remote communication(1: n)						
Regeneration function	External regenerative resistor possible							
Dynamic brake	Not built-in							
Control mode	7 control modes: Position control, speed control, torque control, position/speed control, position/torque control, speed/torque control, fully closed-loop control (optional part needed)							
Position control	Digital input signals	Servo ON, alarm reset, deviation counter clear, positive/negative direction over-travel, internal command selection, homing start etc.						
	Digital output signals	Alarm state, servo ready, brake off, homing complete, position reached, servo state, torque limiting, speed limiting zero-speed output, etc.						
Pulse input	Max input pulse frequency	Differential input: Up to 2Mpps, pulse width larger than 0.25us; Open-collector input: Up to 200Kpps, pulse width larger than 2.5us						
	Input pulse type	Differential input; open-collector						
Pulse output	Input pulse form	Pulse+ direction, A-Phase + B-Phase, CW+CCW						
	Electronic gear	A/B A: 1~1073741824 B: 1~1073741824, Encoder resolution/1000000 < A/B < Encoder resolution/2.5						
Speed control	Smoothing	Smoothing filter, FIR filter.						
	Output pulse form	A-Phase, B-Phase: Differential output Z-Phase: Differential output or open collector output						
Torque control	Division ratio	Arbitrary frequency division.						
	Output pulse	Encoder pulse or position Pulse instruction (can be set).						
Digital input signals	Digital input signals	Servo ON, alarm reset, speed instruction negation, zero-speed clamp, internal speed control, external forward/reverse torque limit etc.						
	Digital output signals	Alarm state, servo ready, brake off, speed reached, torque limiting, speed limiting, zero-speed output, etc.						
Analog input	Speed input	Input voltage -10V to +10V (Maximum speed at ±10V). 1) Internal torque limit by P03.09, P03.10 2) External torque limit by P03.11, P03.12 enabled by P.CL/N.CL signals 3) TLMT i.e. A1 or A12 as external forward/reverse torque limit 4) TLMT as forward limit; TLMTN as reverse limit						
	Torque limit source	1) Internal torque feedforward 2) TFFD, A11 or A12						
Torque feedforward	Torque feedforward	1) Internal torque feedforward 2) TFFD, A11 or A12						
	Digital input signals	Servo ON, alarm reset, torque instruction negation, zero-speed clamp etc.						
Digital output signals	Digital output signals	Alarm state, servo ready, brake off, speed reached, torque limiting etc.						
	Analog input	DC±10V as to rated torque (adjustable by function codes)						
Speed limit	Torque input	DC±10V as to rated torque (adjustable by function codes)						
	Speed limit	1) Positive/negative speed limit P03.27, P03.28 2) SPL i.e. A1 input						

Items		Specification	
Functions	Speed monitoring	Provided	
	Vibration control	Provided	
	Adaptive notch filter	Provided	
	Auto-tuning	Provided	
	Encoder output division and multiplication	Provided	
	Internal position control	Provided	
	PC setting	Servostudio software	
Environmental specifications	Protective functions		
	Temperature	Ambient temperature for use	0~55°C
		Ambient temperature for storage	-20~65°C
	Humidity	Ambient humidity for use	20~85% RH or less (Without condensation)
		Ambient humidity for storage	20~85% RH or less (Without condensation)
	Atmosphere for use & storage		Indoors (Not subject to direct sunlight); free from corrosive gas, flammable gas, oil mist, or dust.
	Altitude		1000m or less above sea level
Vibration		5.8m/s ² (0.6G) or less, 10~60Hz (No continuous operation allowed at frequency of resonance)	

Note 1) The installation of regenerative resistor is decided by setting panel. For details, refer to 「selection of external regenerative resistors」. Please select the resistor with higher resistance and power when the temperature is too high.
 Note 2) For input pulse forms, refer to the User Manual.

3. Installation and size of servo motor and drive

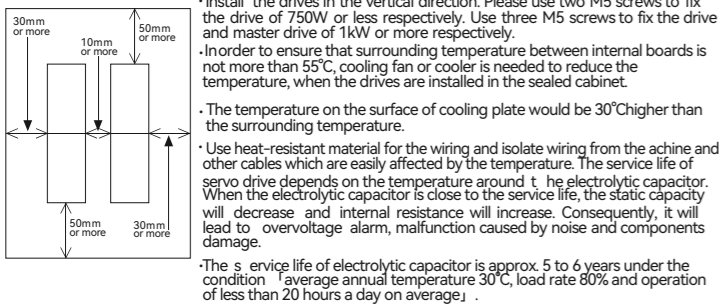
Installation environment conditions

About the environmental conditions, make sure to follow the company's instructions. If you need to use the product outside the scope of the environmental conditions, please consult HCFA Corporation in advance.

- Keep it away from the direct sunlight.
- Drive must be installed in the cabinet.
- Keep it away from the water, oil (cutting oil, oil mist) and moisture.
- Do not install the equipment under the conditions with water, corrosive and flammable gas.
- Free from the dust, iron powder, cutting powder and so on.
- Keep it away from the area with high temperature, excessive vibration and shock.

Installation direction and space

Leave sufficient space around the drive to ensure the heat dissipation and convection in the cabinet when installing the drive.

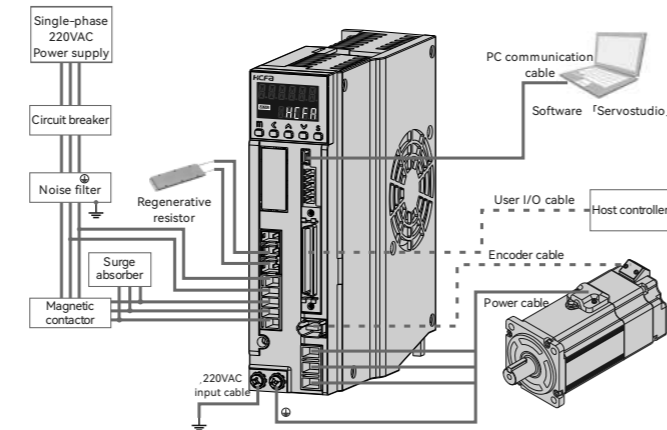


Drive dimension

Model/ISV-X3DA□□□A	Dimension			Weight (kg)
	W(mm)	H(mm)	D(mm)	
005 010 020	42	160	135	0.7
040 075	49	160	135	0.8
100 150 200	84	160	135	1.6

4. Wiring explanation for servo motor and drive

Wiring diagram



[Points for correct wiring]
 ※ Control power input (L1C, L2C) and main circuit power supply (L, N or L1, L2, L3) should be wired from the same 200VAC main power supply.
 ※ A twisted-pair shielded cable should be used when I/O cable length is over 50cm.
 ※ The encoder cable should be less than 20m.

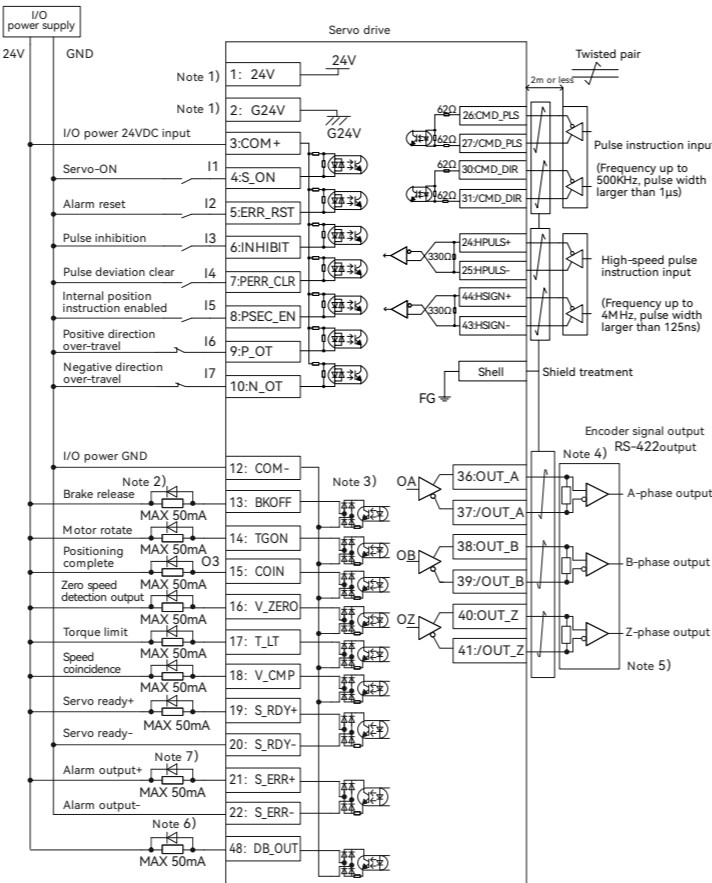


- Please note that there is high voltage in the solid line of wiring diagram when wiring and using.
- The broken lines in the wiring diagram indicates the non-dangerous voltage circuit.

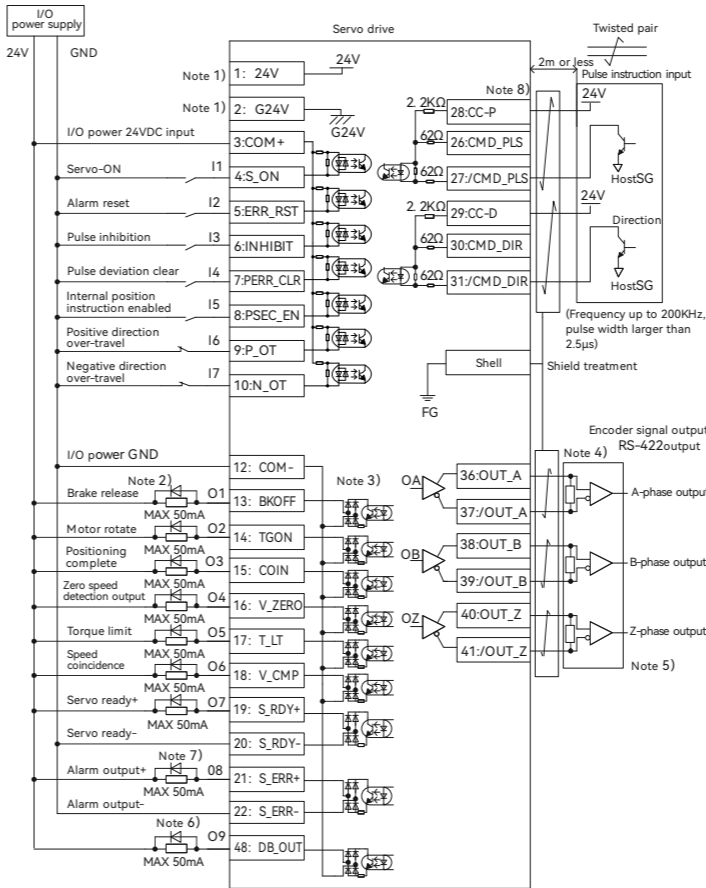
5. Wiring

Wiring for user I/O connector (CN1)

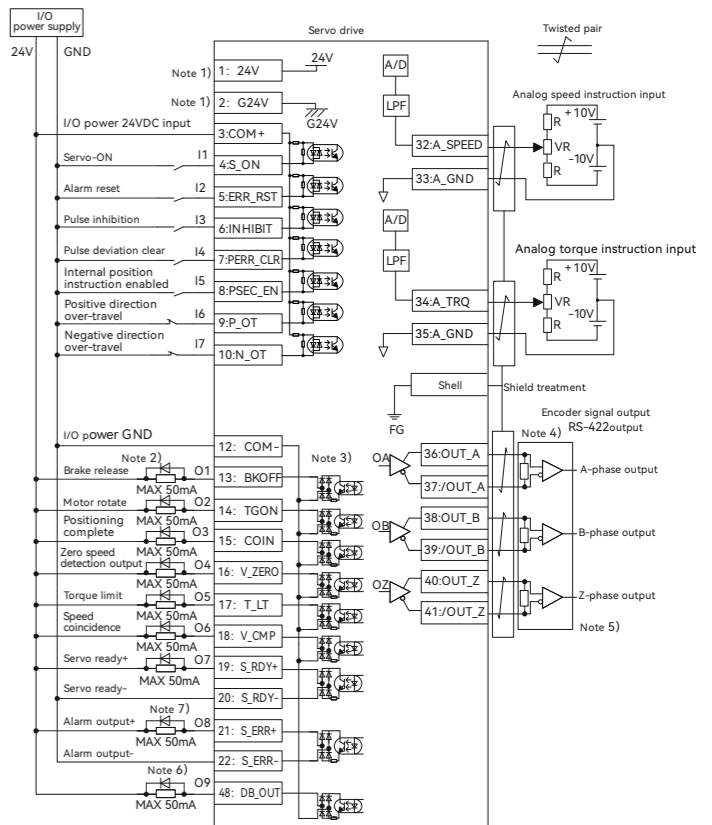
Pulse instruction differential input



Pulse instruction 24V open collector input



Analog instruction input



- Note 1: Control power output (24V, G24V) can be used as I/O power (COM+, COM-). But the maximum output current is 150mA, and when driving the output such as relay and brake, please use external independent power.
 Note 2: Please connect protective circuit (diode) when driving load with inductive component such as relay.
 Note 3: The output circuit is the transistor output mode of the Darlington-connected method of the collector open circuit, which is connected with relay or optocoupler. Please don't connect transistor directly because the voltage VCE (SAT) between collector and emitter is about 1V which cannot meet the required voltage VIL of TTL IC when transistor is ON.
 Note 4: The differential pulse output and 485 communication circuits need to connect the terminal resistor.
 Note 5: Connect the signal ground on the host control device of output signal of the encoder. The connection of signal ground and power supply GND may cause malfunction.
 Note 6: O9 does not configure any functions by default, but can be used as the DO output and the OC output of Z-pulse. In this case, do not configure any DO function to O9 that is P04. 29 is set to 0, and P04. 54 is set to 1.
 Note 7: The default function of O8 is the fault output, and the default output logic state is normally closed output.
 Note 8: Two types according to the pulse generation method: NPN and PNP.
 Note 9: Two types according to the pulse generation method: NPN and PNP.
 ※ DI function can be configured by function code flexibly. DI becomes valid when connected and the positive/negative logic can be changed by function code.
 ※ DO function can be configured by function code flexibly. DO becomes valid when connected and the positive/negative logic can be changed by function code.

Description of User I/O connector (CN1) terminal arrangements

Terminal arrangements									
26	27	28	29	30	31	32	33	34	35
CMD_PLS	/CMD_PLS	CC-P	CC-D	CMD_DIR	A_SPEED	A_TRQ	A_GND	A_OUT_A	A_OUT_B
36	37	38	39	40	41	42	43	44	45
OUT_Z	OUT_Z	HSIGN+	SG	G24	G24	HSIGN+	SG	G24	HSIGN+
46	47	48	49	50	51	52	53	54	55
CC-P.5V	CC-P.5V	HPULS+	HPULS+	HPULS+	HPULS+	HPULS+	HPULS+	HPULS+	HPULS+

