

#### Installation and Wiring for SV-D3E Series Servo Drive

Manual Number	Manual Version	Date
HPPD12200EN	V1.4	May, 2022



Thank you for purchasing this product. This manual mainly describes the safety use, installation and wiring for SV-D3E series servo drive. For more details, please refer to <SV-D3E Series Servo Drive User Manual>.

■ Confirm the following items(for 100W) when unpacking:

Number	Name	Quantity	
1	Servo drive	1	
2	Accessories	Connecting terminal	1
		Straight screwdriver	1
3	This manual	1	
4	Qualified certificate	1	

■ Confirm the following items(for 200W~750W) when unpacking:

Number	Name	Quantity	
1	Servo drive	1	
2	Accessories	Connecting terminal	1
		4pin power input terminal	1
		4pin power output terminal	1
		Crowbar	1
		Straight screwdriver	1
3	This manual	1	
4	Qualified certificate	1	

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

#### SAFETY PRECAUTIONS

Please pay attention to the following 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"

<b>⚠ DANGER</b>	Indicates that incorrect handling may result in death or severe injury. Indique qu'une manipulation incorrecte peut entraîner la mort ou la mort grave
<b>⚠ CAUTION</b>	Indicates that incorrect handling may result in medium or slight personal injury or physical damage. Indique qu'une manipulation incorrecte peut entraîner des dommages corporels ou physiques moyens ou légers.
<b>⊘</b>	Indicates "Prohibitions"(Indicates what must not be done.)
<b>⚠</b>	Indicates "Prohibitions"(Indicates what must not 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.

⚠ DANGER		
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.

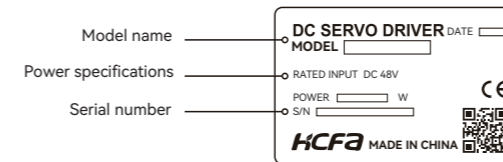
Transportation and storage		
⊘	Do not subject the equipment to the place with rain, waterdrop, poisonous gases or liquids.	To prevent malfunction.
⊘	Do not carry the servo motor by the cables, shaft or encoder during transportation.	To prevent injury or malfunction.
⊘	Do not drop or dump the motor during 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 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

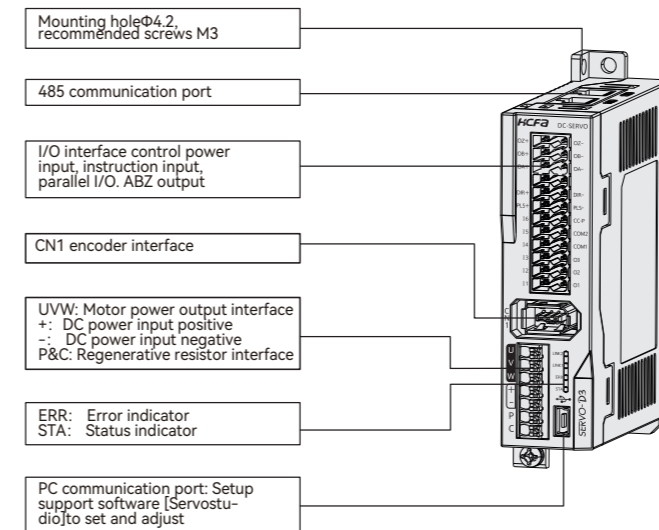
### 1.1 introduction for drive nameplate



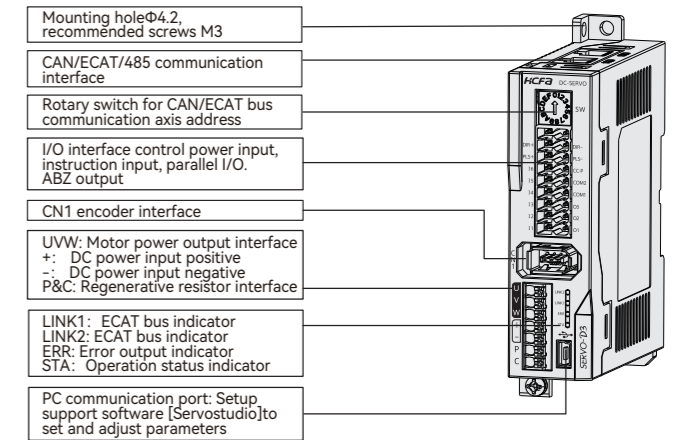
### 1.2 Model name identification

Series name	Series type	Rated power		Voltage type		
	Symbol	Type	Symbol	Power	Symbol	Voltage
SV-D3E	A	Pulse	010	100W	L	48V
	B	Ethercat	020	200W	M	24V
	N	Canopen	040	400W		
			075	750W		

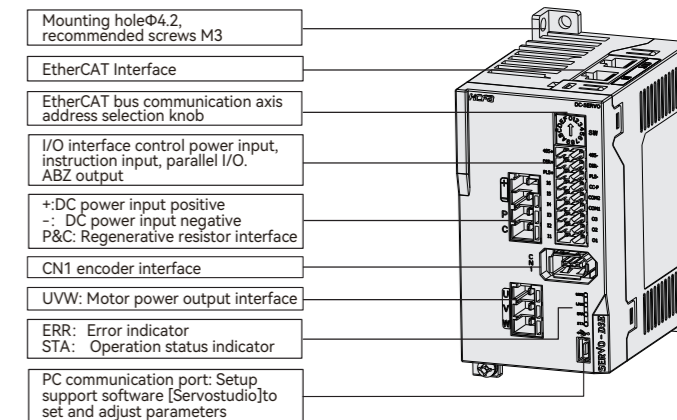
### 1.3 Pulse-type (100W)



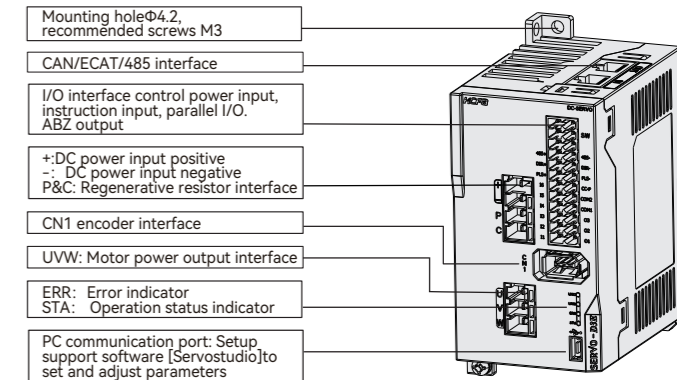
### 1.4 Bus-type (100W)



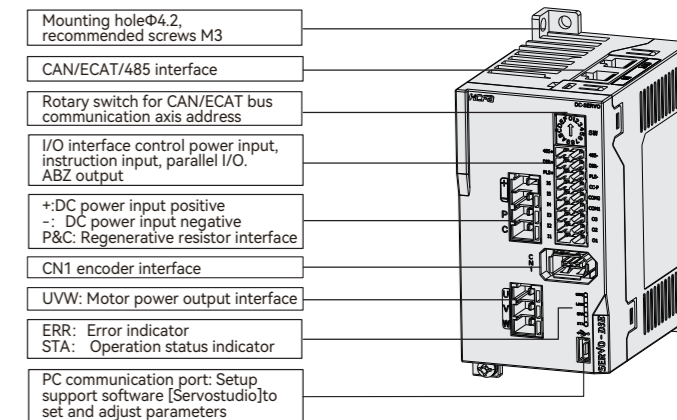
### 1.5 D3EB 010M Bus-type



### 1.6 Pulse-type (200W/400W/750W)



### 1.7 Bus-type (200W/400W/750W)



### 1.7 Model selection of peripheral braking resistor

Rated output	100W	200W	400W	750W
Resistance	10Ω	10Ω	10Ω	10Ω
Capacity	30W	30W	30W	30W

## 2. Product specification

Items	Specification			
	010	020	040	075
Model Name: SV-D3EA□□□-A	010	020	040	075
Applicable motor	100W	200W	400W	750W
Dimension W(mm)	25	50	50	50
H(mm)	104	104	104	104
D(mm)	76.5	76.5	76.5	76.5
Weight(Kg)	0.17	0.37	0.37	0.37
Input power	Main circuit power	DC 48V		
	I/O Control power	DC 24V		
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 (no condensation)		
	Ambient humidity for storage	20~85% RH or less (no condensation)		
Environmental requirements:	Opentype and indoor use			
Pollution Degree (IEC60664-1):	Pollution Degree 2			
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 <sup>2</sup> (0.6G) or less, 10~60Hz (No continuous operation allowed at frequency of resonance)			
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)			
Control signal	Input	6 inputs (24VDC, photo-coupler insulation) Switch by control mode		
	Output	3 outputs (24VDC, photo-coupler insulation, open-collector output) 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)		
	Bus	Supporting CAN, ECAT and 485 communication		
Regeneration function	External regenerative resistor possible			
Dynamic brake	Not built-in			
Control mode	6 control modes: Position control, speed control, torque control, position/speed control, position/torque control, speed/torque control			

Functions		Position control		
		Control input	Control output	
Position control	Control input	Servo ON, alarm reset, deviation counter clear, positive/negative direction over-travel, command input reversal, internal command selection, internal position command input enabled, homing start etc.		
	Control output	Alarm state, servo ready, brake off, torque limiting, homing proximity, position reached, homing return completion, motor rotation output, 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	
		Input pulse form	Pulse+ direction, A-Phase + B-Phase, CW+CCW	
	Electronic gear	A/B A: 1~1073741824 B: 1~1073741824, Encoder resolution/10000000 < A/B < Encoder resolution/2.5		
Command filter	Smoothing filter, FIR filter			
Pulse output	Output pulse form	A-Phase, B-Phase: Differential output Z-Phase: Differential output		
	Division ratio	Arbitrary frequency division		
	Output pulse	Encoder pulse or position pulse instruction (can be set)		
Speed control	Control input	Servo ON, alarm reset, speed instruction negation, zero-speed clamp, internal command selection, external forward/reverse torque limit, emergency stop etc.		
	Control output	Alarm state, servo ready, brake off, speed reached, torque limiting, speed limiting, zero-speed output, speed coincidence, motor rotation output etc.		
	Internal speed instruction	0~16 segment speed selection by using DI terminal combination		
Torque control	Control input	Servo ON, alarm reset, torque instruction negation, zero-speed clamp etc.		
	Control output	Alarm state, servo ready, brake off, torque limiting, speed limit output, emergency stop etc.		
Common	Speed limit	Positive/ negative speed limit P03.27, P03.28		
	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			
Protective functions	Overvoltage, power supply error, overcurrent, overheat, overload, encoder error, over speed, position deviation too large, parameter error			

**CAUTION**

- Regenerative resistors are required for quick start/stop applications. Please select the resistor with higher resistance and power when the temperature is too high. For input pulse forms, refer to the User Manual.

## 3. Installation and size of servo motor and drive

### 3.1 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.

### 3.2 Installation direction and space

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

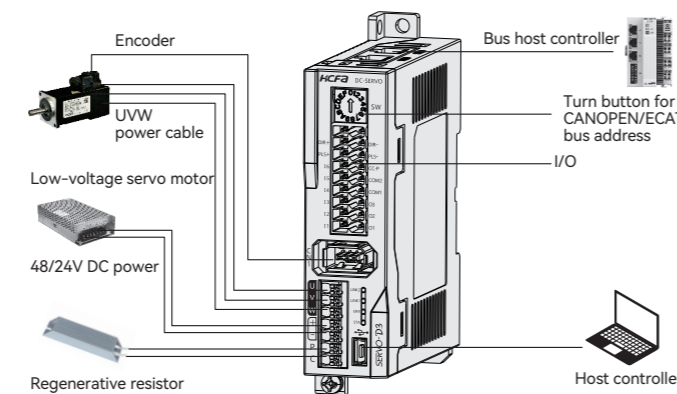
- In order to ensure that surrounding temperature between internal boards is not more than 55°C, cooling fan or cooler is needed to reduce the temperature, when the drives are installed in the sealed cabinet.
- The temperature on the surface of cooling plate would be 30°C higher than the surrounding temperature.
- Use heat-resistant material for the wiring and isolate wiring from the machine and other cables which are easily affected by the temperature.
- The service life of servo drive depends on the temperature around the electrolytic capacitor. When the electrolytic capacitor is close to the service life, the static capacity will decrease and internal resistance will increase. Consequently, it will lead to overvoltage alarm, malfunction caused by noise and components damage. The service life of electrolytic capacitor is approx.
- To 6 years under the condition 「average annual temperature 30°C, load rate 80% and operation of less than 20 hours a day on average」

### 3.3 Drive dimension

Model:SV-D3E□□□	Dimension			Weight
	W(mm)	H(mm)	D(mm)	
010	25	104	76.5	0.17
020	50	104	76.5	0.17
040	50	104	76.5	0.17
075	50	104	76.5	0.17

## 4. Wiring explanation for servo motor and drive

### 4.1 Wiring diagram for low-voltage servos



[Points for correct wiring]

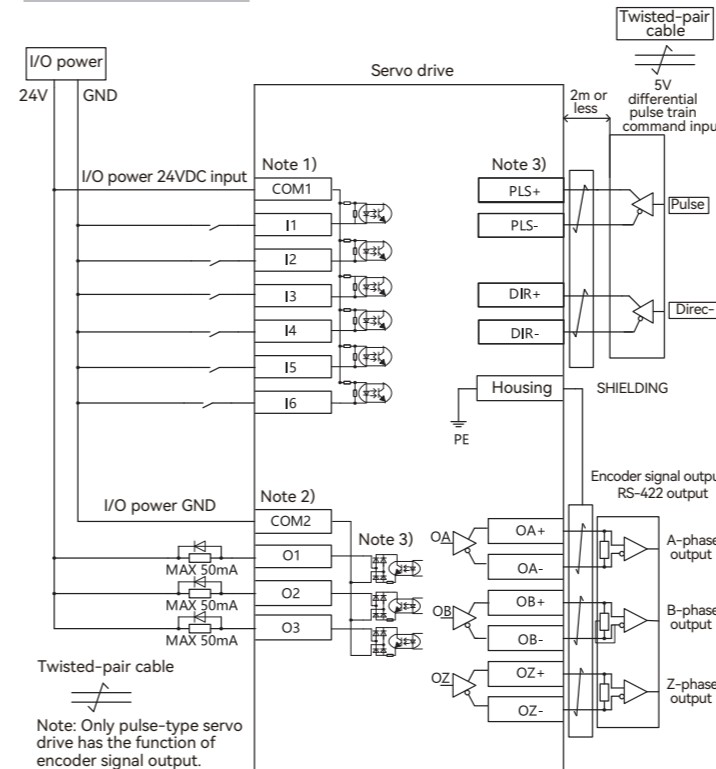
**CAUTION**

- 24VDC power is needed for Inputs/outputs interface.
- When using the Ethercat bus-type driver, confirm the connection sequence of the network ports and distinguish between IN/OUT.
- Do not hot-plug the power supply or connect the main power cable while the power is ON, or it may cause malfunction to the servo drive.

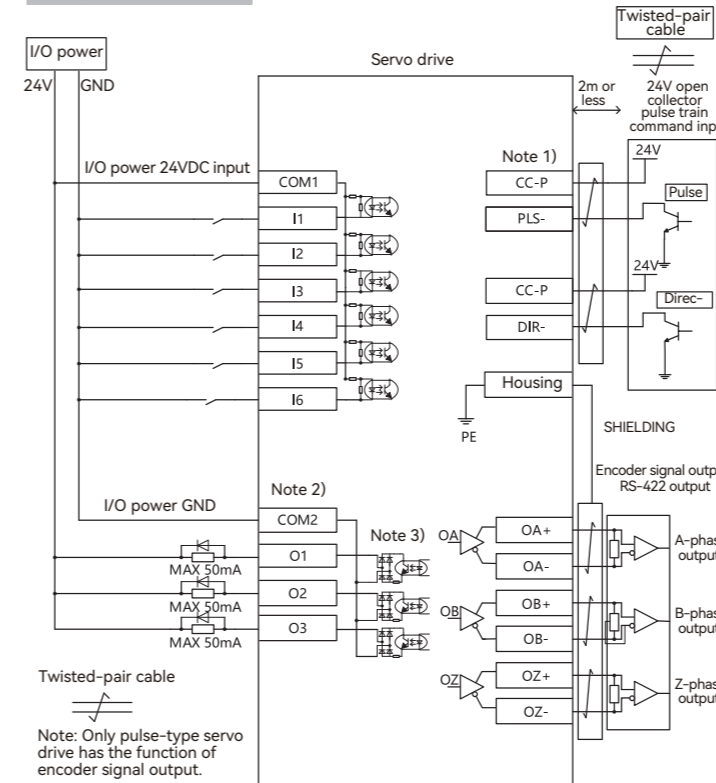
## 5. Wiring

### 5.1 Wiring for user I/O connector (CN1)

#### 5V differential pulse input



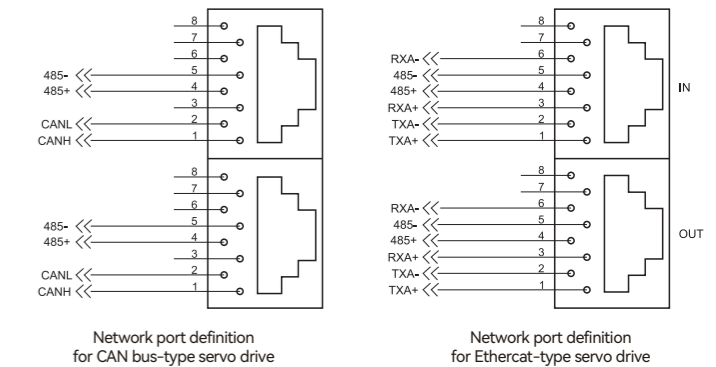
#### 24V open collector input



### 5.2 I/O terminal arrangements

I/O terminal arrangements for pulse-type servo drive				I/O terminal arrangements for bus-type servo drive			
OZ+	●	●	OZ-	SW	1	2	3
OB+	●	●	OB-	4	5	6	7
OA+	●	●	OA-	8	9	10	11
DIR+	●	●	DIR-	12	13	14	15
PLS+	●	●	PLS-	16	17	18	19
I6	●	●	CC-P	20	21	22	23
I5	●	●	COM2	24	25	26	27
I4	●	●	COM1	28	29	30	31
I3	●	●	O3	32	33	34	35
I2	●	●	O2	36	37	38	39
I1	●	●	O1	40	41	42	43

### 5.3 Network port definition



## 6. Combination of servo drive and motor

Servo motor	Voltage classes	Motor power	Rated current of motor	Rated torque of motor	Recommended servo drive
SV-X6MN001A-N6PA(N)	DC 48V	10W	2.04A	0.032N.M	SV-D3EA010L SV-D3EB010L SV-D3EN010L
SV-X6MN002A-N6PA(N)	DC 48V	20W	1.82A	0.064N.M	
SV-X6MN003A-N6PA(N)	DC 48V	30W	2.7A	0.095N.M	
SV-X6MN004A-N6PA(N)	DC 48V	40W	3.64A	0.127N.M	
SV-X6MN005A-N6PA(N)	DC 48V	50W	3.02A	0.159N.M	
SV-X2MH010A-N(B)6L	DC 48V	100W	3.5A	0.32N.M	
SV-X2MA020A-N(B)6L	DC 48V	200W	8A	0.64N.M	SV-D3EA020L SV-D3EB020L SV-D3EN020L
SV-X2MA040A-N(B)6L	DC 48V	400W	11A	1.27N.M	SV-D3EA040L SV-D3EB040L SV-D3EN040
SV-X2MA075A-N(B)6L	DC 48V	750W	21A	2.39N.M	SV-D3EA040L SV-D3EB040L SV-D3EN040

### 7. Recommended wire diameter for external wiring of D3E series models

Specifications	Cable name	AWG	Wire diameter/mm	Heat-resisting/°C	Remarks
100W	Motor power	18	1.02	105	100W driver for 48V input models only
	DC input power supply	18	1.02	105	
	Regenerative connection resistance	18	1.02	105	
Below 400W	Motor power	13	1.82	105	100W driver for 48V input models only
	DC input power supply	13	1.82	105	
	Regenerative connection resistance	13	1.82	105	
750W	Motor power	10	2.59	105	For all D3E series drives
	DC input power supply	10	2.59	105	
	Regenerative connection resistance	10	2.59	105	
User I/O		26	0.404	80	

Note: in the 100W model, the input voltage is 48V and 24V and the output current is also different. Therefore, the recommended wires of the two drivers need to be used differently