

# **FV5 Series Rotary Pulse Servo Drive**

## **Installation Guide**

**Document Version: 01**

**Publication Date: 2024-07-18**



Any textual descriptions, text formatting, illustrations, photographs, methods, and other content in this document, unless otherwise specified, are the property of Shanghai Flexem Technology Co., Ltd. (herein after referred to as “Flexem”) and are protected by intellectual property and copyright laws. No individual or organization may reproduce or quote any part of this document in any way without the written authorization and permission of Flexem.

Any organization or individual authorized to use the content in this document should use it within the authorized scope and indicate the source as “Source: Flexem”. Flexem reserves the right to pursue legal action against anyone who violates the above statement.

Except for the trademarks of Shanghai Flexem Technology Co., Ltd., other trademarks, product logos and product names appearing in this manual are owned by their respective rights holders.

## Revision Hisotry

Date	Version	Revision History
2024-07-18	01	Initial publication

# Contents

<b>Preface .....</b>	<b>I</b>
<b>Safety Precautions .....</b>	<b>1</b>
Safety Disclaimer.....	1
Safety Symbols .....	1
Safety Precautions .....	1
Safety Guidelines .....	1
Installation Precautions.....	1
Operating Precautions.....	2
<b>1 Product Information.....</b>	<b>3</b>
1.1 Servo Drive.....	3
1.1.1 Drive Model Description .....	3
1.1.2 Drive Nameplate Description.....	3
1.1.3 Product Appearance .....	4
1.1.4 Product Specifications .....	5
1.2 Servo Motors .....	12
1.2.1 Servo Motor Model Description .....	13
1.2.2 EAM-W Series Servo Motors .....	13
1.3 Matching Instructions for Servo Drive and Servo Motor .....	17
<b>2 Installation Operation .....</b>	<b>19</b>
2.1 Install the Servo Drive.....	19
2.1.1 Installation Location .....	19
2.1.2 Installation Environmental Conditions .....	19
2.1.3 Installation Methods and Precautions .....	19
2.2 Install the Servo Motor .....	21
2.2.1 Installation Location .....	21
2.2.2 Environmental Conditions .....	21
2.2.3 Installation Precautions.....	22
<b>3 Peripheral Devices and Wiring.....</b>	<b>24</b>
3.1 Peripheral Device Wiring Illustration.....	24
3.1.1 SIZE-A/SIZE-B Type .....	24
3.1.2 SIZE-C/SIZE-D/SIZE-E Type .....	25
3.1.3 System Wiring and Key Points Explanation.....	26

3.1.4 Wiring Key Points.....	27
3.2 Cable and Peripheral Accessories Selection .....	29
3.2.1 Overview of Cables and Accessories for Drives and Motors .....	29
3.2.2 Servo Accessories .....	32
3.2.3 Communication Cable Accessories.....	33
3.2.4 Control Cable Accessories .....	33
3.3 Wiring of Connector CN1 .....	33
3.3.1 Connector CN1 Terminal Definitions .....	33
3.3.2 Connect to the Upper Controller.....	38
3.3.3 Control Input Signal Connection .....	39
3.3.4 Pulse Command Input Signal Connection .....	40
3.3.5 Analog Command Input Signal Connection .....	42
3.3.6 Control Output Signal Connection.....	43
3.3.7 Connection of Frequency Division Pulse Output Signal .....	43
3.3.8 Connection of Brake Signal .....	45
3.4 Wiring of Connector CN2.....	46
3.5 Wiring of Connector CN3.....	46
3.5.1 Connect to Bus Encoder.....	46
3.5.2 Communication Type Encoder Wiring Key Points .....	48
3.6 Wiring of Connector CN4.....	48
3.6.1 Connect to Incremental Encoder.....	48
3.7 Wiring of Connector CN5.....	49
3.7.1 Interface Definition of SIZE-A/SIZE-B Connector CN5 .....	49
3.7.2 Interface Definition of SIZE-C/SIZE-D Connector CN5/CN6/CN7 .....	50
3.7.3 Interface Definition of SIZE-E Connector CN5 .....	51
3.7.4 Brake Resistor Selection and Wiring Precautions.....	52
3.8 Wiring of Connector CN8.....	52
3.8.1 Connect to RS485 Communication Signal .....	52
3.9 Wiring of Motor-side Connector.....	53
3.9.1 Connection of EAM-W Series Bus Type Motor Encoder Cable.....	53
3.9.2 Connection of EAM-W Series Incremental Motor Encoder Cables .....	54
3.9.3 Connection of EAM-W Series Motor Power Cables .....	55
3.10 Electromagnetic Interference Suppression .....	56

3.10.1 Example of Interference Wiring.....	56
3.10.2 Grounding .....	57
3.10.3 How to Use Input Power Filter and Noise Filter.....	57
3.10.4 Other Recommendations for Electromagnetic Interference Suppression .....	58

# Preface

## Overview

Thank you for choosing Flexem products. The FV5 series rotary pulse servo drive is an essential component of servo systems. By receiving and responding to commands from the host controller, it accurately controls the position, speed, and output torque of the rotary motor, meeting the application needs of customers in various production scenarios. The FV5 series rotary pulse servo drive is rich in features, excellent in performance, has a high control bandwidth, and supports various command formats such as pulse command and analog input. It supports user-friendly functions such as automatic adjustment, adaptive vibration suppression, inertia recognition, low-frequency jitter suppression, error compensation, etc. It can also be optimized through backend software debugging, making it widely applicable in fields such as consumer electronics, semiconductors, lithium batteries, photovoltaics, and more.

This manual provides detailed instructions to the hardware specifications and installation methods of the FV5 series rotary pulse servo drive.

The content provided in this manual only serves as general guidance and does not guarantee coverage of all usage scenarios for all product models. Due to reasons such as version upgrades, different device models and configuration files, the content provided in the manual may not match the actual device interface used by the user. Please refer to the actual information displayed on the user's device interface. The manual will not provide a detailed explanation of the differences caused by the aforementioned situations.

For the purpose of functional introduction and configuration examples, the manual may use IP addresses, URLs, domain names, etc. Unless otherwise specified, the aforementioned content is for illustration only and does not represent any actual significance.

## Intended Audience

This document is primarily intended for readers who wish to understand the usage of the FV5 series rotary pulse servo drive, including electrical engineers, mechanical engineers, etc. It is assumed that readers have a certain level of knowledge in the following areas:

- ◆ Principles of automatic control
- ◆ Basic electrical knowledge
- ◆ Principles of servo system's functionalities
- ◆ Applications of sensors

## Getting Help

If you encounter any problems during use, please call our service hotline at 4008-033-022.

For more documents, please visit <https://www.flexem.com/download>.

### Contact Information

Address: 9th Floor, Building A, INNO Business Park, No. 386 Guo'an Road, Yangpu District, Shanghai

Zip Code: 200043





Website: <https://www.flexem.com>

# Safety Precautions

## Safety Disclaimer

To ensure the safety of personnel and equipment, please read and follow these safety precautions carefully before installing, operating, and maintaining the product. It is strictly prohibited for non-professionals to perform equipment installation, wiring, maintenance, inspection, or component replacement. This product should be used in an environment that meets the design specifications; otherwise, malfunctions may occur. Any abnormal function or component damage caused by failure to comply with relevant regulations is not covered by the product quality guarantee. Flexem shall not be held liable for any personal injury accidents or property damage caused by unauthorized operation of the product.

## Safety Symbols

Symbol	Meaning	Description
	Warning	Content following this icon requires special attention; failure to do so may result in personal injury or equipment damage.
	Hazardous Voltage	Indicates a potential hazard of high voltage.
	Protective Ground	Connection provides protection against electric shock in case of external conductor failure or protects ground electrode terminals.
	Warning, Hot Surface	Indicates that the marked object is hot; caution should be exercised when touching.

## Safety Precautions

### Safety Guidelines

Servo drives must be used in accordance with all applicable safety regulations, directives, and all technical specifications!



Servo drives use voltage at the hazardous level and must be properly grounded.



Only qualified personnel who have received sufficient technical training and possess adequate knowledge are allowed to perform installation, operation, maintenance, and repair procedures.

### Installation Precautions

Please strictly follow the precautions during installation to prevent personal and property damage.



- ◆ The servo drive must be grounded through the ground wire of the AC main power.
- ◆ The ground wire connected to the upper device connected to the servo drive must be the same as the ground wire of the servo drive.
- ◆ Non-professionals are strictly prohibited from performing various operations on the servo drive!
- ◆ Operate strictly according to the installation instructions in this document.
- ◆ Wiring is prohibited while the power is on. Wait at least 15 minutes after power off before making any contact.



- 
- ◆ Please wear an anti-static wristband for wiring and other operations to prevent damage to internal electronic components.
  - ◆ The cables used for wiring must meet the corresponding requirements for wire diameter and shielding. The shielding layer of the shielded cable used for wiring needs to be reliably grounded at one end.
- 

## Operating Precautions

---

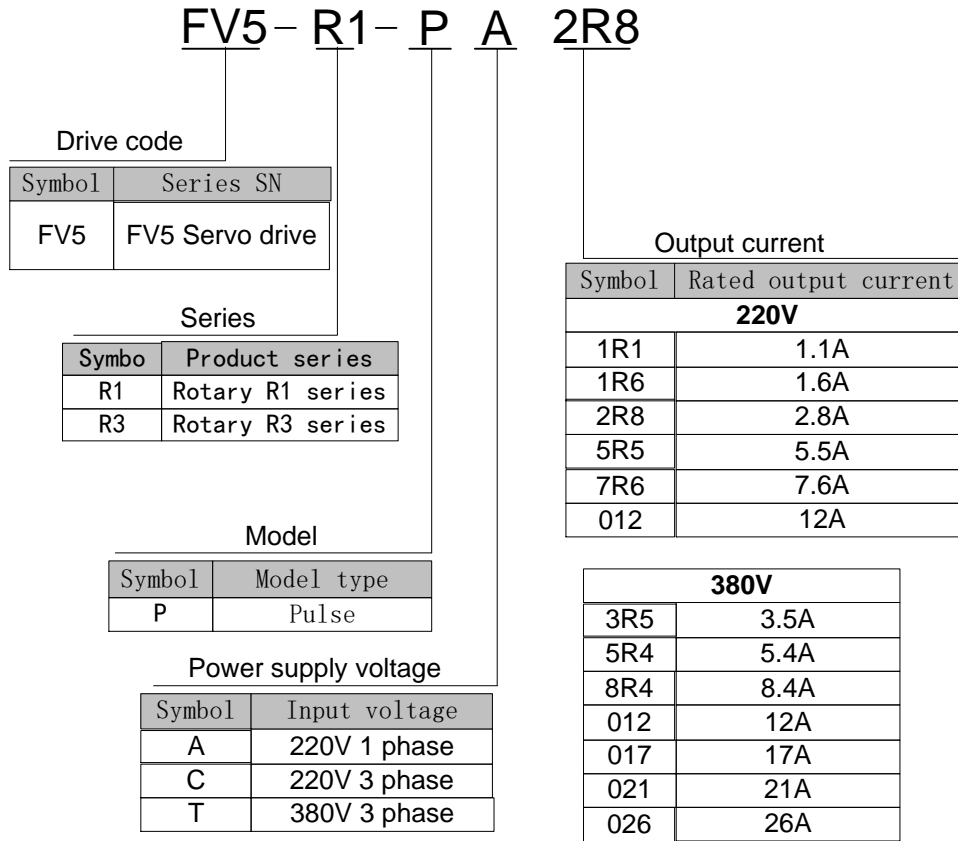


- ◆ Before powering on, please ensure that the power supply meets the equipment requirements and the wiring is secure to avoid equipment damage.
  - ◆ When the equipment is powered on, mechanical devices may suddenly operate, so please stay away from the mechanical devices.
  - ◆ Touching the equipment terminals or dismantling any components while the power is on is strictly prohibited to prevent electric shock.
  - ◆ Do not touch the equipment housing, discharge resistors, etc., to avoid personal injury.
  - ◆ Avoid dropping other items or metals into the equipment, as this may cause equipment damage.
  - ◆ Machine owners and operators must ensure that personnel are prohibited from entering hazardous areas when the machine is powered on.
-

# 1 Product Information

## 1.1 Servo Drive

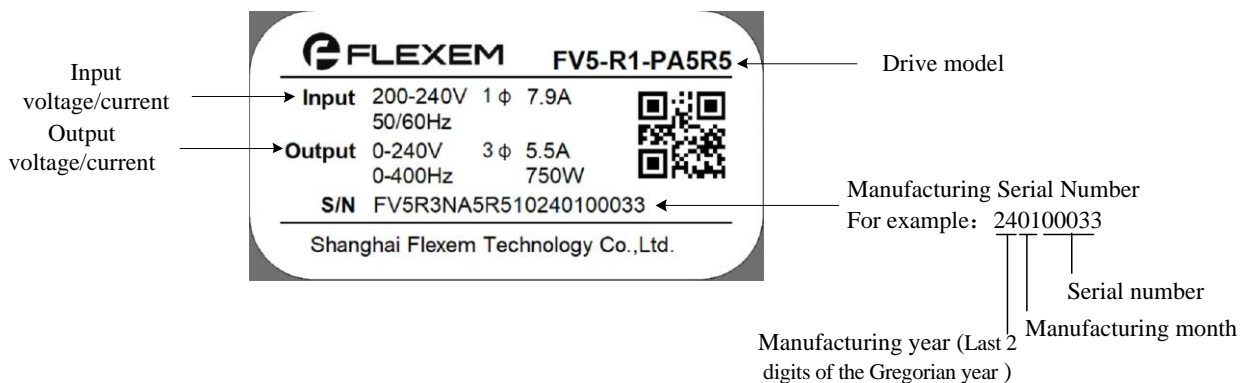
### 1.1.1 Drive Model Description



Notice: The suffix of the drive model is either A00 or absent, indicating that the drive is a standard model.

The main difference between the R1 series and R3 series lies in the supported encoder types. The R1 series drive supports a 17-bit absolute encoder, while the R3 series drive supports a 17-bit absolute encoder, a 23-bit absolute encoder, and an ABZ encoder.

### 1.1.2 Drive Nameplate Description



### 1.1.3 Product Appearance

#### 1.1.3.1 SIZE-A/SIZE-B Type

M ▲ ▼ ◀ ◀ S

- Save parameters
- Current flicker bit shift left, long press to turn page
- Current flicker bit parameter decreases
- Current flicker bit parameter increases
- Switch function code

UVW motor — U  
— V  
— W

CN5 connector — Main circuit power input — L1  
— Do not connect — L2  
— Connect braking resistor — P  
— C  
— PE

- ① CN8 connector:RS485 interface
- ② Digital display panel
- ③ Key operator
- ④ CN1 connector:Control signal connecting terminal
- ⑤ CN2 connector:USB Type-C interface
- ⑥ CN3 connector:communication encoder connecting terminal
- ⑦ CN4 connector:Encoder without UVW connecting terminal
- ⑧ CN5 connector
- ⑨ CHARGE:Bus voltage indicator
- ⑩ Nameplate
- ⑪ PE ground terminal ⊕

#### 1.1.3.2 SIZE-C/SIZE-D Type

M ▲ ▼ ◀ ◀ S

- Save parameter
- Current flicker bit shift left, long press to turn page
- Current flicker bit parameter decreases
- Current flicker bit parameter increases
- Switch function code

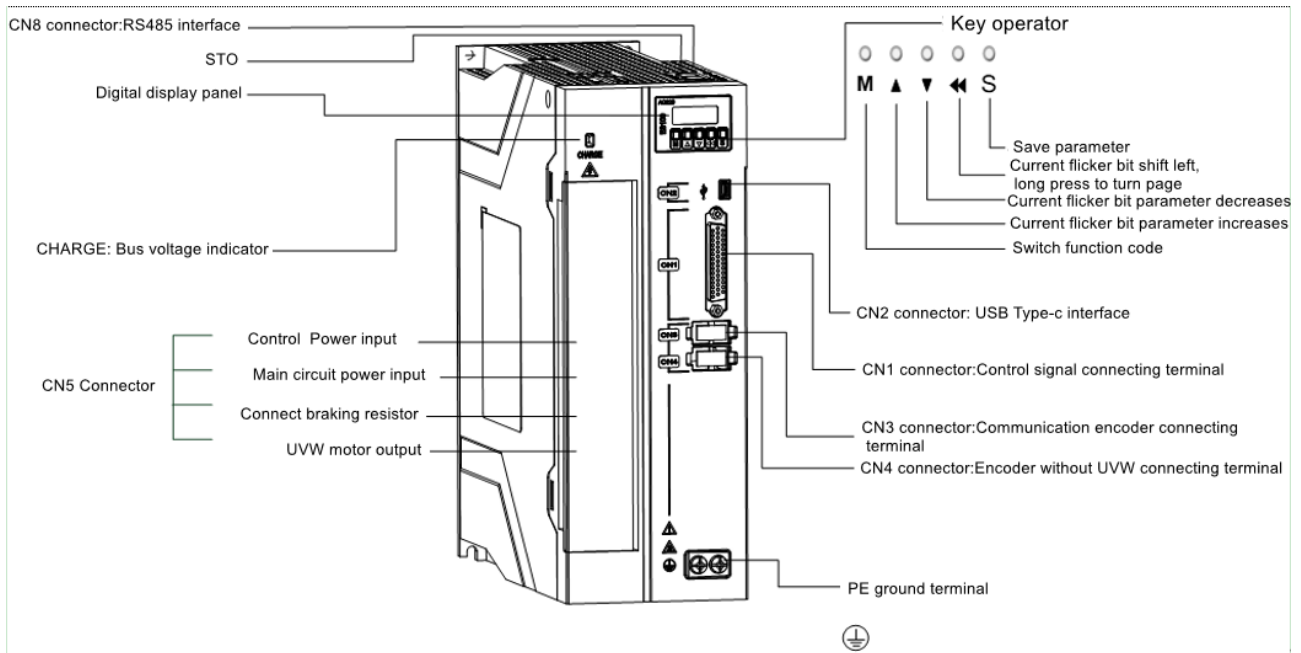
CN5 connector: — L1C  
— L2C  
— R  
— S  
— T  
— Do not connect — ⊕

CN6 connector: — P  
— D  
— C  
— resistor

CN7 connector: — U  
— V  
— UVW motor output — W

- ① CN8 connector:RS485 interface
- ② Digital display panel
- ③ Key operator
- ④ CN2 connector:USB Type-C interface
- ⑤ CN1 connector:Control signal connecting terminal
- ⑥ CN3 connector:Communication encoder connecting terminal
- ⑦ CN4 connector:Encoder without UVW connecting terminal
- ⑧ CN5 connector
- ⑨ CN6 connector
- ⑩ CN7 connector
- ⑪ PE ground terminal ⊕
- ⑫ CHARGE:Bus voltage indicator ⊕
- ⑬ Nameplate

### 1.1.3.3 SIZE-E Type



### 1.1.3.4 Indicator Status Description

Indicator	Status	Meaning
RUN	Off	Servo is disabled
	On	Servo is enabled
ERR	Off	In normal state
	On	In fault state
FUN1	Off	Homing operation is not completed
	On	Homing operation is completed
FUN2	Off	No brake output
	On	Brake output
LINK	Off	Bluetooth is not connected
	On	Bluetooth is connected

## 1.1.4 Product Specifications

### 1.1.4.1 Electrical Specifications

Model	FV5-R*- PA1R1- ***	FV5-R*- PA1R6- ***	FV5-R*- PA2R8- ***	FV5-R*- PA5R5- ***	FV5-R*- PC7R6- ***	FV5-R*- PC012- ***
Input power	Single-phase/Three-phase AC 200V~240V, -15%~+10%, 50/60Hz					

Model	FV5-R*- PA1R1- ***	FV5-R*- PA1R6- ***	FV5-R*- PA2R8- ***	FV5-R*- PA5R5- ***	FV5-R*- PC7R6- ***	FV5-R*- PC012- ***
Rated current (ARMS)	1.1	1.6	2.8	5.5	7.6	12
Peak current (ARMS)	3.9	5.9	10.1	16.9	23	32
Output power (W)	100	200	400	750	1000	1500
Heat dissipation Method	Natural cooling			Fan cooling		
Power-off brake	Built-in					
Braking resistor	Externally connected brake resistor			Built-in braking resistor, can be connected externally		
Minimum resistance of external braking resistor ( $\Omega$ )	40	40	40	40	20	15
Installation dimensions	SIZE-A			SIZE-B	SIZE-C	SIZE-D

Note: FV5-R1-PA5R5 has no built-in brake resistor.

Model	FV5-R*- PT3R5- ***	FV5-R*- PT5R4- ***	FV5-R*- PT8R4- ***	FV5-R*- PT012- ***	FV5-R*- PT017- ***	FV5-R*- PT021- ***	FV5-R*- PT026- ***
Input power	Three phase AC 380V~440V, +10~15%, 50/60Hz						
Rated current(ARMS)	3.5	5.4	8.4	12	17	21	26
Peak current(ARMS)	11	14	20	30	42.5	52.5	65
Output power(W)	1000	1500	2000	3000	5000	6000	7500
Heat dissipation Method	Fan cooling						
Power-off brake	Built-in						
Braking resistor	Built-in braking resistor, can be connected externally						

Model	FV5-R*- PT3R5- ***	FV5-R*- PT5R4- ***	FV5-R*- PT8R4- ***	FV5-R*- PT012- ***	FV5-R*- PT017- ***	FV5-R*- PT021- ***	FV5-R*- PT026- ***
Minimum resistance of external braking resistor ( $\Omega$ )	80	60	45	40	35	25	25
Installation dimensions	SIZE-C		SIZE-D		SIZE-E		

### 1.1.4.2 Basic Specifications

Item		Description		
Basic specifications	Control method		IGBT PWM control, sine wave current driving method	
	Rotary servo motor encoder feedback		<ul style="list-style-type: none"> <li>◆ R1 series: Incremental encoder without UWV: 17bit(absolute/incremental encoder)</li> <li>◆ R3 Series: Bus-type serial encoder: 23-bit (absolute/incremental encoder), BISS-C, Endat</li> </ul>	
	Control signal	DI	8 general-purpose inputs General input functions are selectable via parameters	
		DO	5 general-purpose inputs General input functions are selectable via parameters	
	Analog Signal	Input	1 channel 12 Bit A/D input	
	Communication functions	USB		Connect to a computer, etc.
		RS485		Up to a maximum of 247 axes in a 1:n communication
		Axis address setting		As set by the user
	Dynamic brake		Built-in	
Control mode		Velocity mode, torque mode, position mode, position/velocity mode, position/torque mode, velocity/torque mode, full closed loop mode The above 7 control modes can be switched by setting parameters		
Performance	Velocity change rate *1	Load change rate	Within $\pm 0.1\%$ of rated velocity (load fluctuation: 0~100%)	
		Voltage change rate	0.1% of rated velocity (voltage fluctuation: $\pm 10\%$ )	
		Temperature change rate	Within $\pm 0.1\%$ of rated velocity (temperature fluctuation: 0~50°C)	
	Velocity control range		1~6000RPM	

Item		Description		
	Velocity loop frequency response range	3.0kHz		
	Torque control accuracy	$\pm 1\%$		
Velocity mode	Soft start time setting	0~60s (can separately set acceleration and deceleration)		
	Control input	Enable switch, overtravel switch, command prohibition switch, internal mode switch, internal command switch, etc.		
	Control output	Servo ready, positioning completed, brake output, velocity reached, torque reached, etc.		
	Analog command input	Command voltage	Maximum input voltage: $\pm 12V$ (motor rotates forward when positive voltage command is applied) 3000RPM at DC 10 V, corresponding velocity can be set freely	
		Input impedance	About $9k\Omega$	
Circuit time parameter		About $47\mu s$		
Torque mode	Analog command input	Command voltage	Maximum input voltage: Maximum $\pm 12V$ (motor outputs torque when positive voltage command is applied) 100% torque at DC 10V , corresponding torque can be set freely	
		Input impedance	About $9k\Omega$	
		Circuit time parameter	About $47\mu s$	
Position mode	Filtering setting		Various command processing such as smoothing filtering, low-pass filtering, low-frequency jitter suppression, etc.	
	Feedforward compensation		0~100.0%	
	Position deviation is within the set range, determined for positioning completed		Command unit and encoder unit can be set independently	
	Input signal	Pulse command	Input pulse form	Select any of the following: "Direction + Pulse", "90° Phase A/B quadrature Pulse", "CW+CCW Pulse"
Input form			Differential input, open collector	
Input pulse frequency			<ul style="list-style-type: none"> <li>◆ Differential input: Maximum 4 Mpps, pulse width cannot be less than <math>0.125\mu s</math>;</li> <li>◆ Open collector: Maximum 200 Kpps, pulse width cannot be less than <math>2.5\mu s</math>.</li> </ul>	

Item		Description	
	Electronic gear ratio	$\frac{\text{Encoder resolution}}{10^8} \leq \frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ratio denominator}}$ $\leq \frac{\text{Encoder resolution}}{2.5}$	
		Power supply for built-in open collector *2	+24V (built-in 2.4 kΩ resistor)
		Clear signal	Clear position deviation Supports linear drive, open collector
	Encoder frequency division pulse output	Output form	Phase A, Phase B: Differential output Phase Z: Differential output or open collector output
		Frequency Division Ratio	Any
Input and output signal	Digital input signal	Changeable signal assignments 8 channels DI DI functions: Servo enablement, alarm reset, gain switching, zero position fixed function enable, position command inhibit, positive over-travel switch, negative over-travel switch, positive jog, negative jog, electronic gear selection, home position switch, homing enable, clear position deviation, internal velocity limit selection, inhibit pulse	
	Digital output signal	Changeable signal assignments 5 channels DO DO functions: Servo ready, motor rotation, zero velocity signal, velocity consistent, positioning completed, torque limit, velocity limitation, brake output, warning output, fault output, homing completed, torque reached, velocity reached.	
Built-in function	Overtravel (OT) prevention function	Stop immediately when P-OT or N-OT occurs.	
	Protection function	Overcurrent, overvoltage, undervoltage, overload, main circuit detection abnormality, heatsink overheating, power phase loss, overspeed, encoder abnormality, CPU abnormality, parameter abnormality, etc.	
	LED display function	Main power CHARGE, 5-digit LED display	
	Analog monitoring function for observation	Built-in analog monitoring connector for observing velocity, torque command signals, etc.	
	Vibration suppression	Supports 0~100Hz low-frequency suppression Supports 100~5000Hz mid-to-high-frequency suppression	



Item		Description
	Other	Gain adjustment, alarm logs, JOG operation

Note\*1: The velocity variation rate is defined by the following equation:

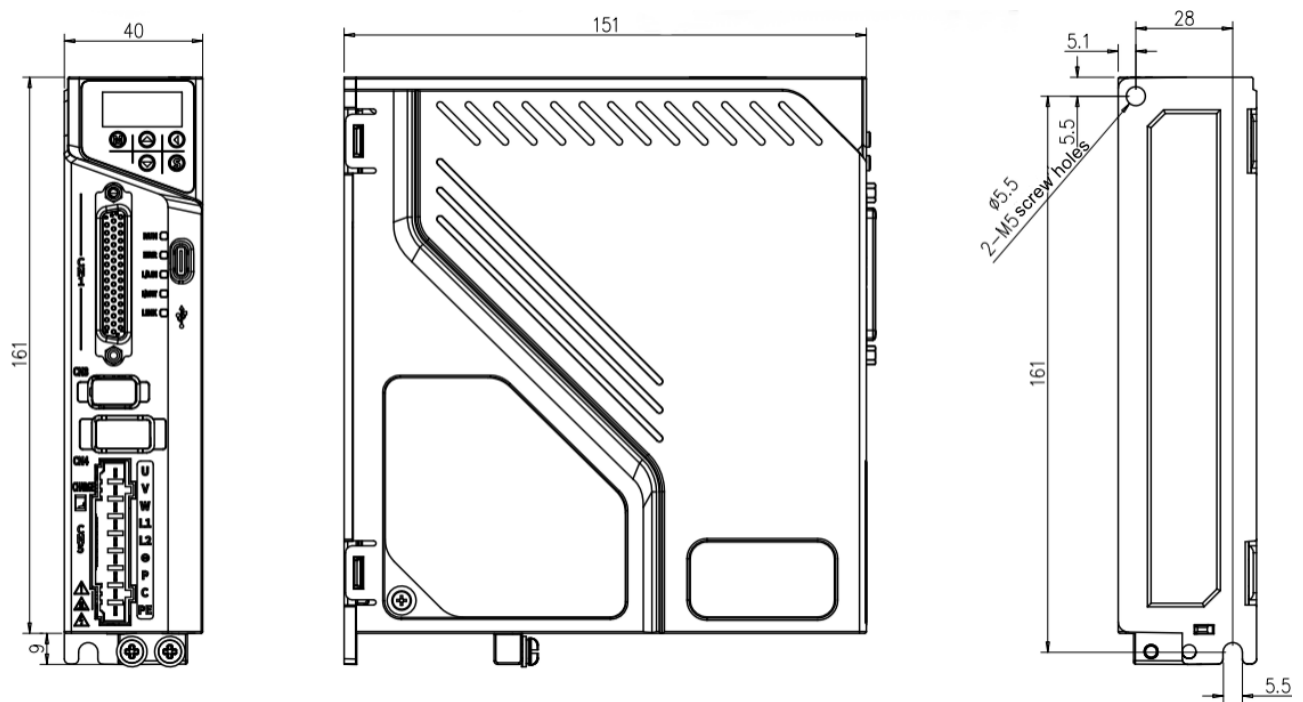
$$\text{Velocity variation rate} = (\text{No-load velocity} - \text{Full-load velocity}) / \text{Rated velocity} * 100\%$$

In fact, amplifier deviation due to voltage and temperature changes can cause changes in the hydrochloric resistance. Therefore, this effect will manifest as velocity changes. The velocity changes are expressed as a ratio of the rated velocity, representing the velocity change rates caused by voltage and temperature changes.

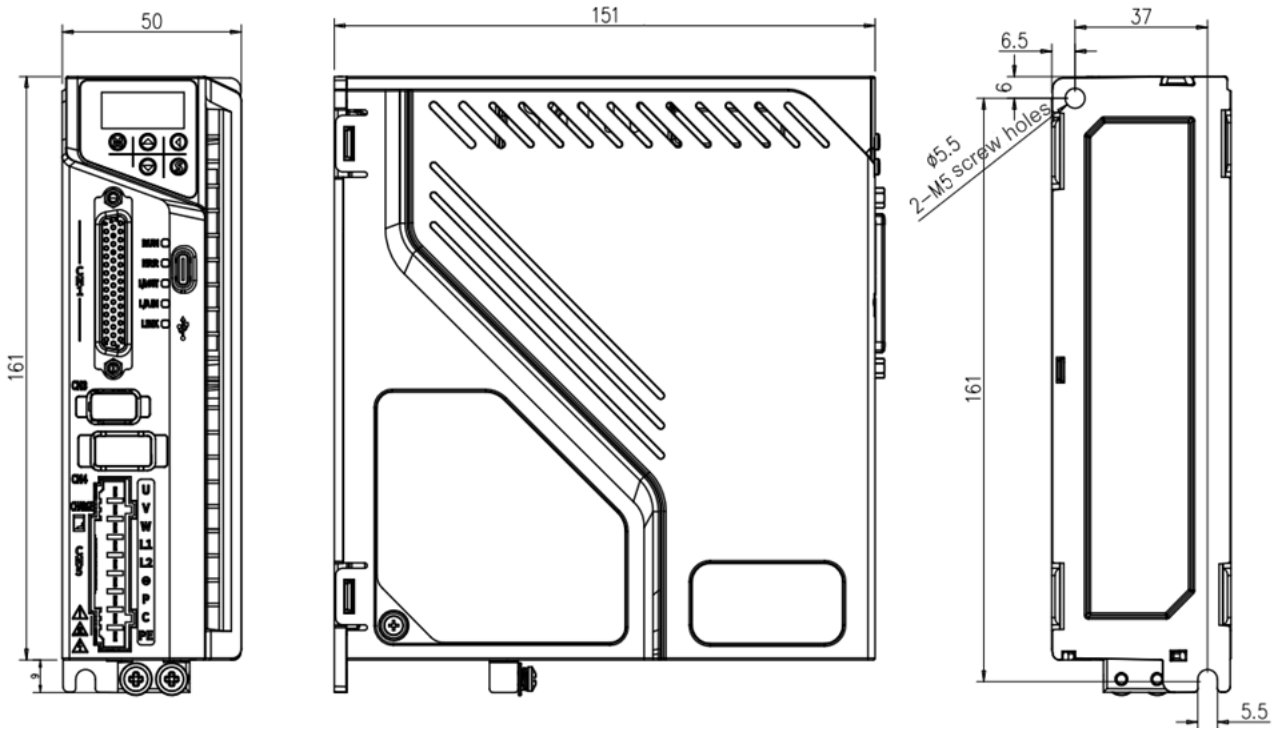
Note \*2: The built-in open collector power supply is not electrically insulated from the control circuitry inside the servo drive.

### 1.1.4.3 Servo Drive Installation Dimensions

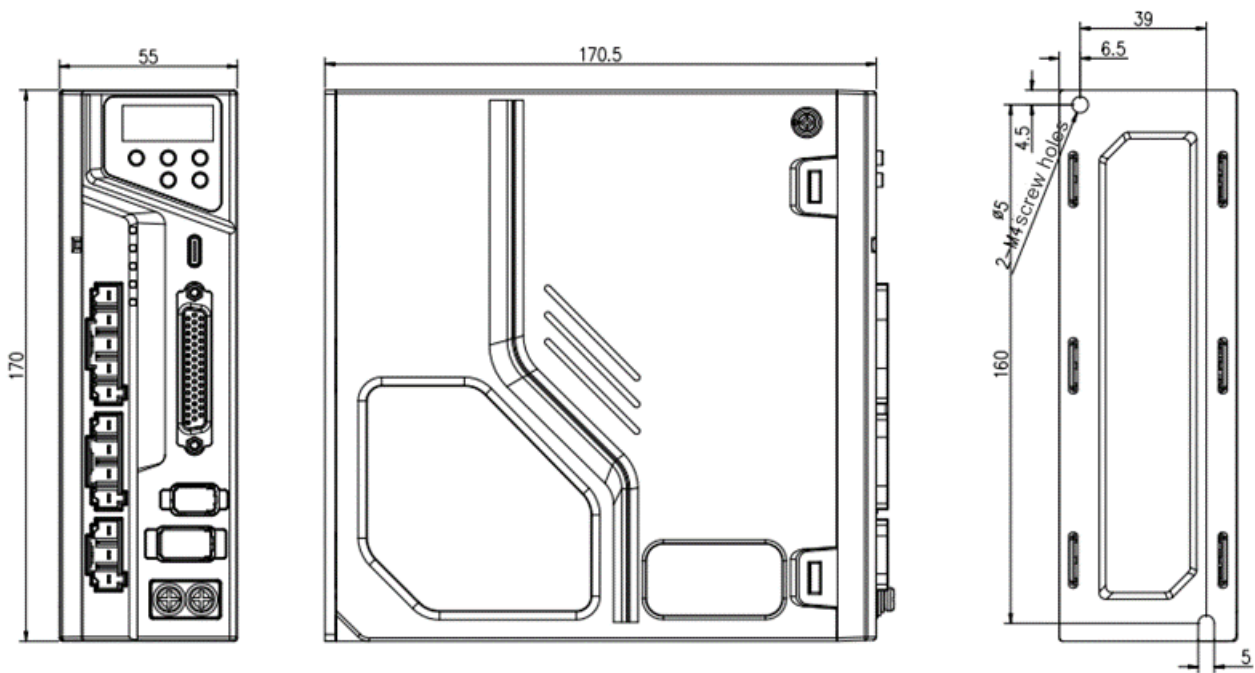
◆ SIZE-A installation dimensions illustration (unit: mm)



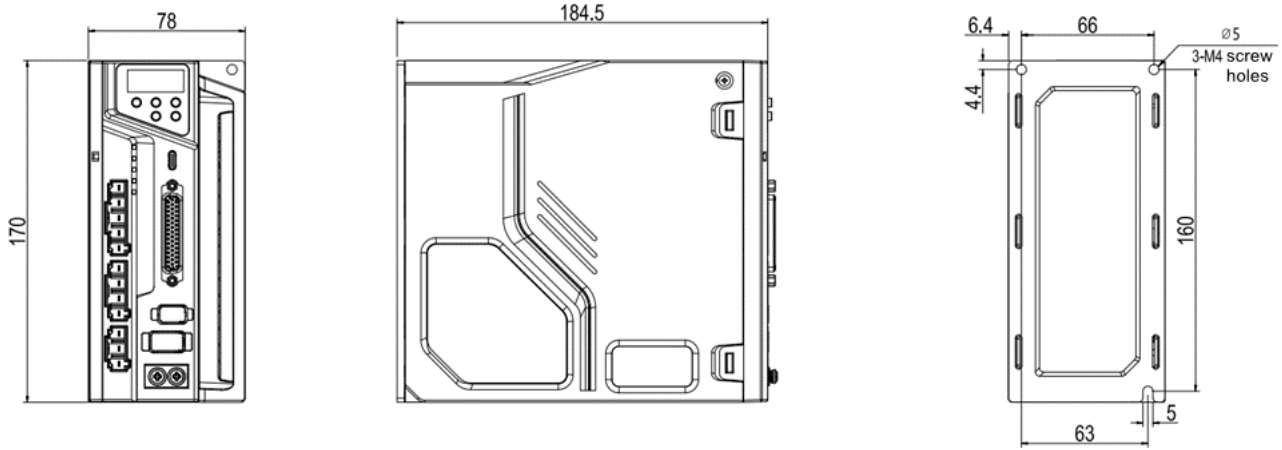
◆ SIZE-B installation dimensions illustration (unit: mm)



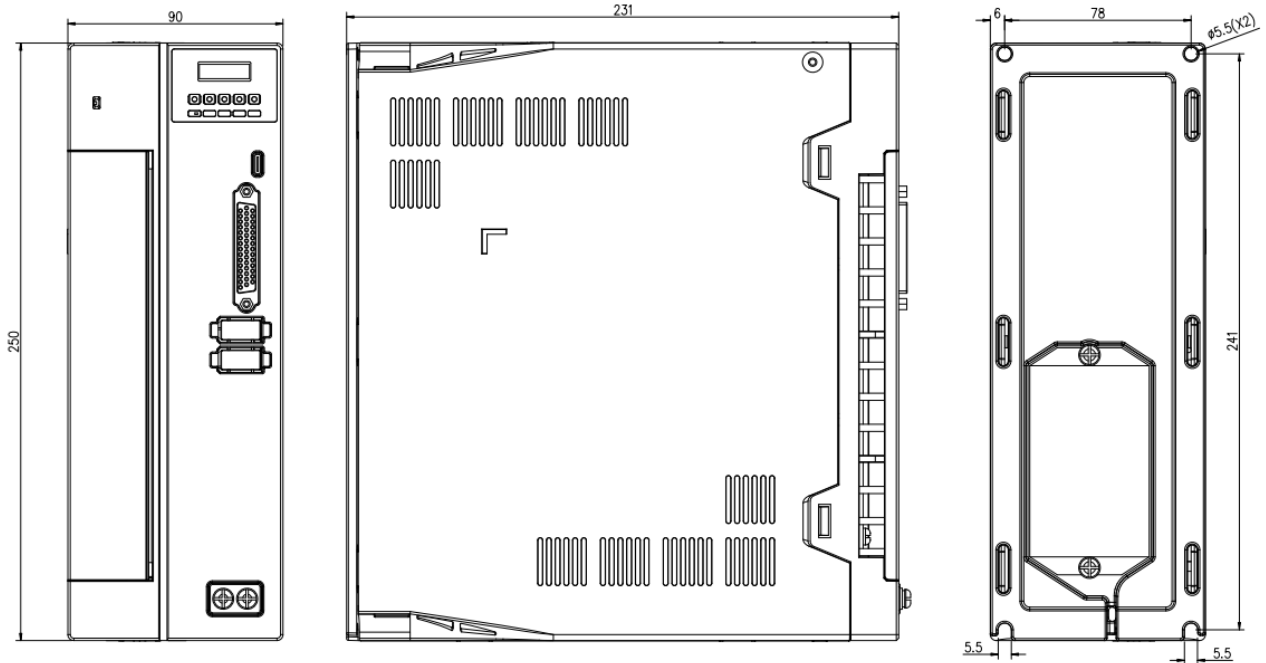
◆ SIZE-C installation dimensions illustration (unit: mm)



◆ SIZE-D installation dimensions illustration (unit: mm)

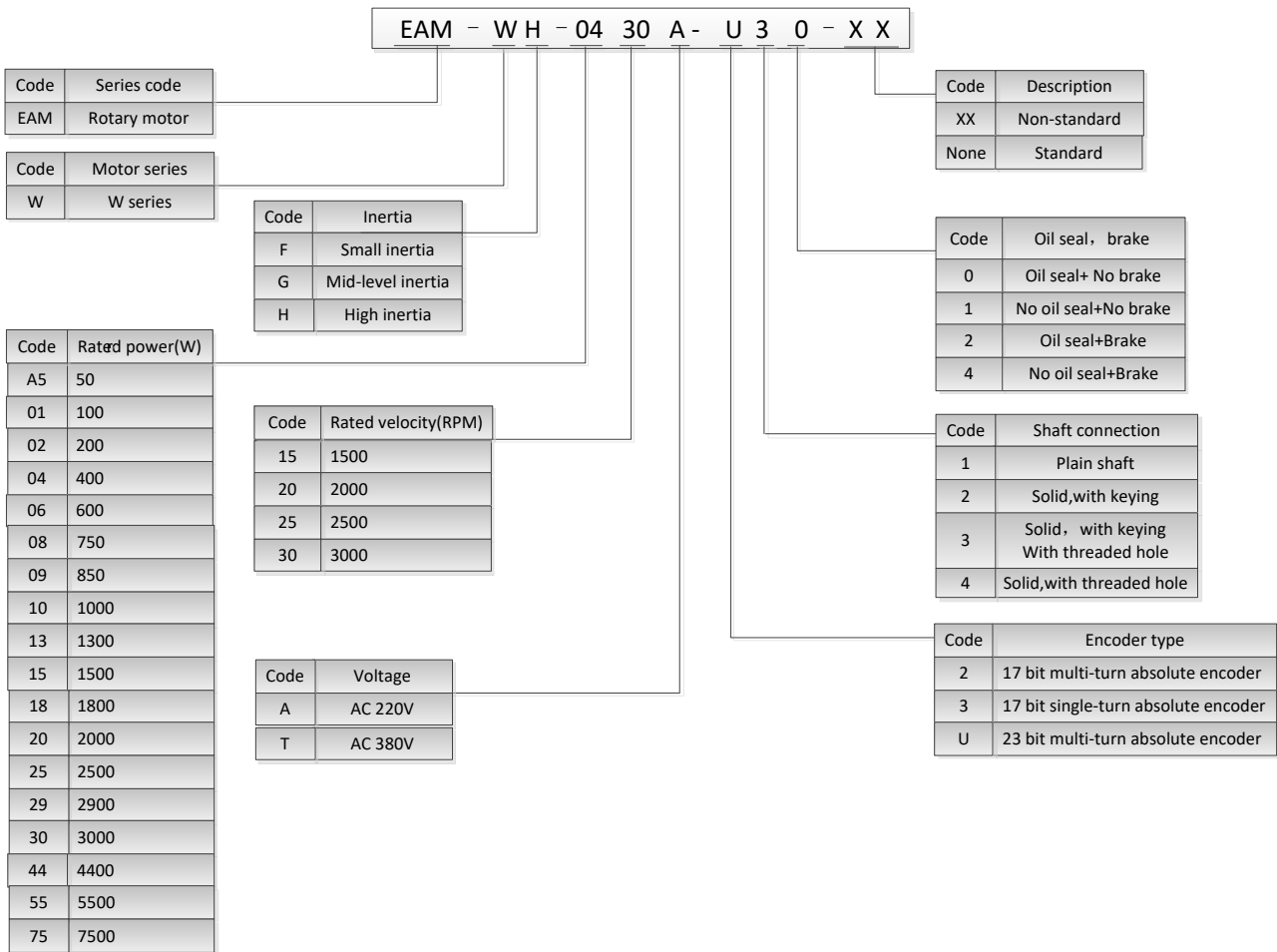


◆ SIZE-E installation dimensions illustration (unit: mm)



## 1.2 Servo Motors

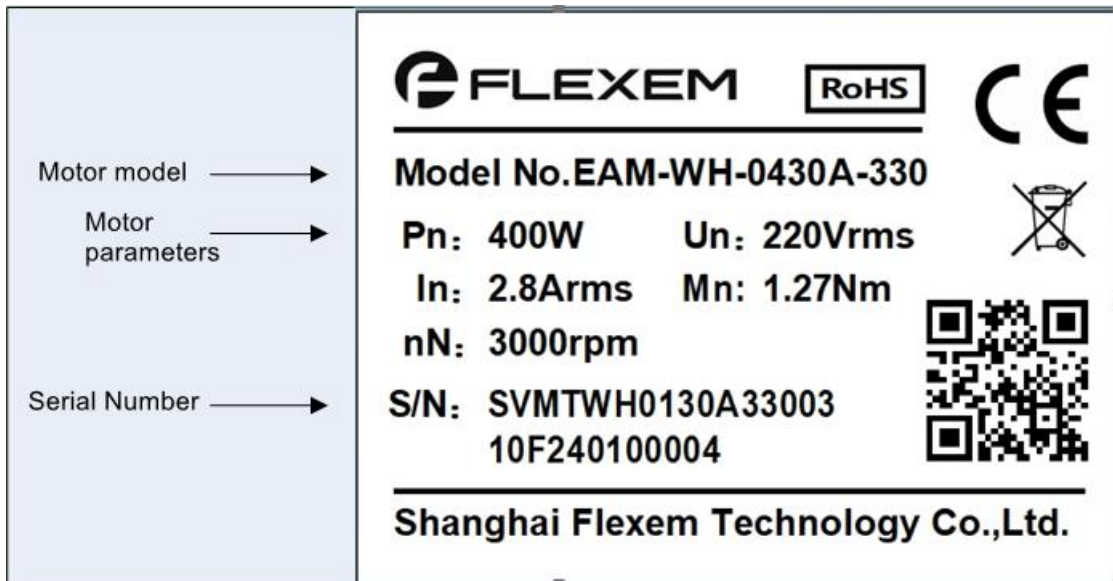
### 1.2.1 Servo Motor Model Description



Note: If the servo motor model code has no suffix, the servo motor is a standard model.

### 1.2.2 EAM-W Series Servo Motors

#### 1.2.2.1 EAM-W Series Servo Motors Nameplate Description



### 1.2.2.2 EAM-W EAM-W Series Servo Motor Mechanical Characteristics

Item	Description
Work mode	Continuous duty
Vibration level	V15
Insulation Resistance	DC500V, $\geq 10M\Omega$
Operating ambient temperature	-20~50°C
Excitation method	Permanent magnet
Installation method	Flange mounting
Thermal class	F
Insulation voltage	AC1500V for 1minute(200V rating) AC1800V for 1minute(400V rating)
Enclosure protection level	IP65
Ambient humidity	<90% (non-condensing)
Wiring method	Direct connection
Rotation direction	Counterclockwise (CCW) rotation when viewed from the load side under positive rotation command

### 1.2.2.3 EAM-W Series Servo Motors Specifications

Model	Flange size (mm)	Rated power (kW)	Rated torque (N·m)	Maximum torque (N·m)	Rated current (ARMS)	Rated velocity (RPM)	Maximum velocity (RPM)	Rotor rotation inertia(10 <sup>-4</sup> kg·m <sup>2</sup> )	Voltage (V)
EAM-WH-A530A-□3▲	40	50	0.16	0.48	0.6	3000	6000	0.035 (0.038)	220
EAM-WH-0130A-□3▲	40	100	0.32	0.96	1	3000	6000	0.053 (0.056)	220
EAM-WH-0230A-□3▲	60	200	0.64	1.92	1.4	3000	6000	0.29 (0.32)	220
EAM-WH-0430A-□3▲	60	400	1.27	3.81	2.8	3000	6000	0.53(0.56)	220
EAM-WH-0830A-□3▲	80	750	2.4	7.2	3.8	3000	6000	1.62(1.72)	220
EAM-WH-1030A-□3▲	80	1000	3.2	9.6	5.5	3000	6000	2.1(2.2)	220

Model	Flange size (mm)	Rated power (kW)	Rated torque (N·m)	Maximum torque (N·m)	Rated current (ARMS)	Rated velocity (RPM)	Maximum velocity (RPM)	Rotor rotation inertia (10 <sup>-4</sup> kg·m <sup>2</sup> )	Voltage (V)
EAM-WG-1230A-□3▲	110	1200	4	12	5	3000	3500	7.3(7.4)	220
EAM-WH-1530A-□3▲	110	1500	5	15	6	3000	3500	9.2(9.3)	220
EAM-WH-1830A-□3▲	110	1800	6	18	7.7	3000	3500	10.8(10.9)	220
EAM-WG-0915A-□3▲	130	850	5.39	16.17	6.9	1500	3000	10.9(12.13)	220
EAM-WG-1315A-□3▲	130	1300	8.34	25.02	10.7	1500	3000	16.9(18.13)	220
EAM-WG-1515A-□3▲	130	1500	10	25	6	1500	2000	18.8(20.28)	220
EAM-WG-1815A-□3▲	130	1800	11.5	28.7	13.8	1500	3000	21.4(22.63)	220
EAM-WG-0915T-□3▲	130	850	5.39	16.17	4	1500	3000	10.9(12.13)	380
EAM-WG-1315T-□3▲	130	1300	8.34	25.02	6	1500	3000	16.9(18.13)	380
EAM-WG-1515T-□3▲	130	1500	10	25	4	1500	2000	18.8(20.28)	380
EAM-WG-1815T-□3▲	130	1800	11.5	34.5	8.5	1500	3000	21.4(22.63)	380
EAM-WG-3030T-□3▲	130	3000	10	23	8	3000	3500	25.5(27)	380
EAM-WG-2915T-O3▲	180	2900	18.6	55.8	11.9	1500	3000	62.5(69.5)	380
EAM-WG-4415T-O3▲	180	4400	28.4	85.2	16.5	1500	3000	88.5(94.5)	380
EAM-WG-5515T-□3▲	180	5500	35	105	20.8	1500	3000	114.4(120.4)	380

Model	Flange size (mm)	Rated power (kW)	Rated torque (N·m)	Maximum torque (N·m)	Rated current (ARMS)	Rated velocity (RPM)	Maximum velocity (RPM)	Rotor rotation inertia(10 <sup>-4</sup> kg·m <sup>2</sup> )	Voltage (V)
EAM-WG-7515T-□3▲	180	7500	48	120	26	1500	3000	136.6(142.6)	380

Note: When □ is U: Supports 23-bit optical encoder, requires matching FV5-R3 drive

When □ is 3: Supports 17-bit magnetic encoder, requires matching FV5-R1 drive

When ▲ is 0: The motor without brake

When ▲ is 2: The Motor with brake

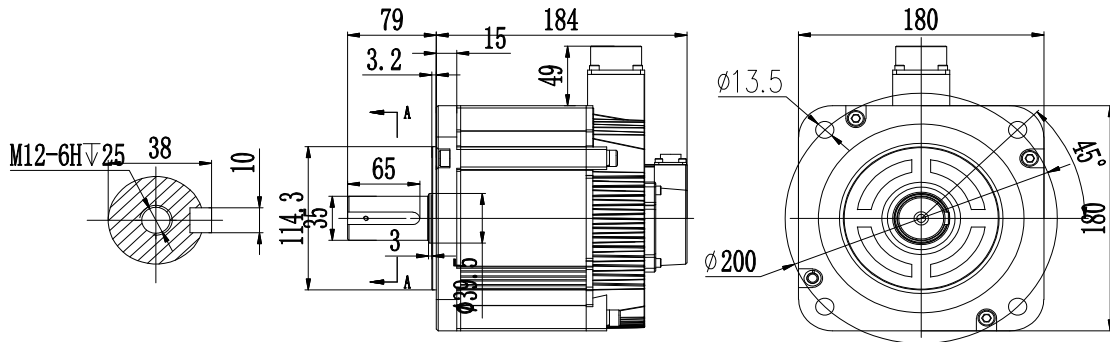
Flange size is 40mm, indicating the mounting panel size as 40mm\*40mm; Flange size is 60mm, indicating the mounting panel size as 60mm\*60mm; Other sizes follow this pattern

The data in parentheses in the inertia column is for motors with brake, and the data outside the parentheses is for motors without brake

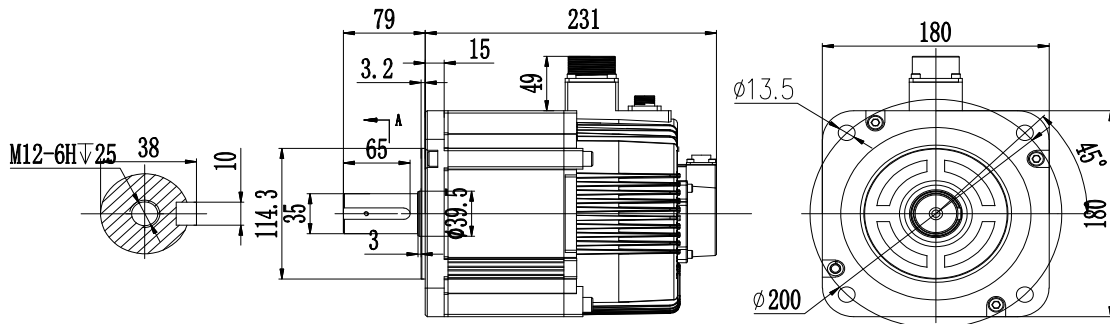
For specifications of other servo motor models, please consult Flexem technical support engineers

### 1.2.2.4 EAM-W Series Servo Motors Installation Dimensions

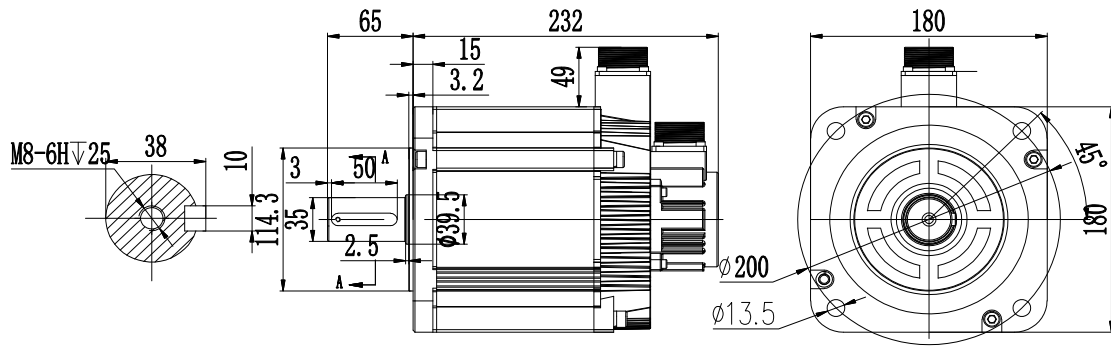
◆ EAM-WG-2915T-U30 2.9kW Servo motor without brake installation dimension(unit: mm)



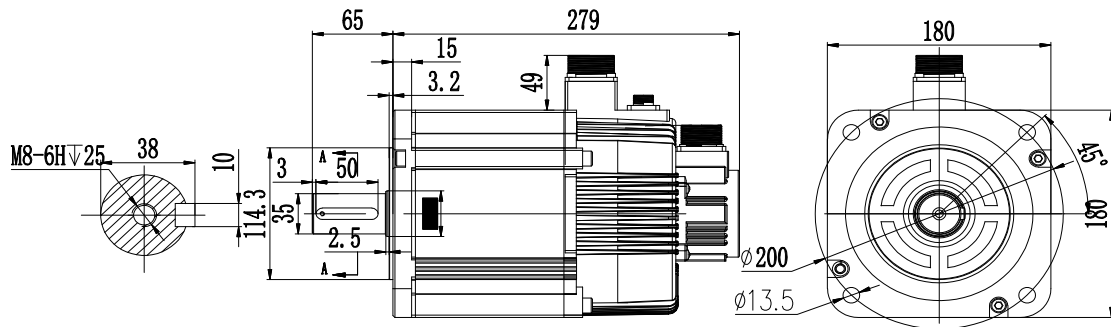
◆ EAM-WG-2915T-U32 2.9kW Servo motor with brake installation dimension(unit: mm)



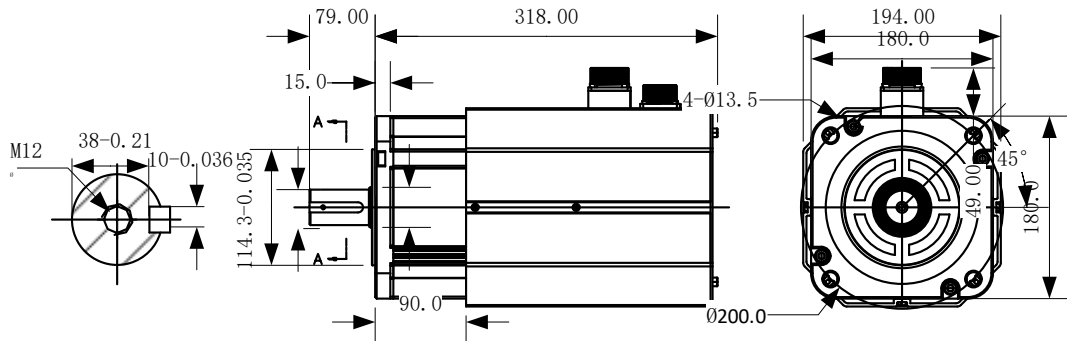
◆ EAM-WG-4315T-U30 4.3kW Servo motor without brake installation dimension(unit: mm)



◆ EAM-WG-4315T-U32 4.3kW Servo motor with brake installation dimension(unit: mm)



◆ EAM-WH-7515T-U30 7.5kW Servo motor with brake installation dimension(unit: mm)



Note: For installation dimensions of other models of servo motors, please consult Flexem technical support engineers.

### 1.3 Matching Instructions for Servo Drive and Servo Motor

Flange size (mm)	Motor power	Motor model	Drive model
40	50	EAM-WH-A530A-□3 ▲	FV5-R*-*A1R1
40	100	EAM-WH-0130A-□3 ▲	FV5-R*-*A1R1
60	200	EAM-WH-0230A-□3 ▲	FV5-R*-*A1R6
60	400	EAM-WH-0430A-□3 ▲	FV5-R*-*A2RB
80	750	EAM-WH-0830A-□3 ▲	FV5-R*-*A5R5



Flange size (mm)	Motor power	Motor model	Drive model
80	1000	EAM-WH-1030A-□3▲	FV5-R*-*A6R0
110	1200	EAM-WG-1230A-□3▲	FV5-R*-*C7R6
110	1500	EAM-WH-1530A-□3▲	FV5-R*-*C012
110	1800	EAM-WH-1830A-□3▲	FV5-R*-*C012
130	850	EAM-WG-0915A-□3▲	FV5-R*-*C7R6
130	1300	EAM-WG-1315A-□3▲	Fv5-R*-*C012
130	1500	EAM-WG-1515A-□3▲	FV5-R*-*C7R6
130	1800	EAM-WG-1815A-□3▲	FV5-R*-*C012
130	850	EAM-WG-0915T-□3▲	FV5-R*-*T5R4
130	1300	EAM-WG-1315T-□3▲	FV5-R*-*T5R4
130	1500	EAM-WG-1515T-□3▲	FV5-R*-*T5R4
130	1800	EAM-WG-1815T-□3▲	FV5-R*-*TBR4
130	3000	EAM-WG-3030T-□3▲	FV5-R*-*T012
180	2900	EAM-WG-2915T-□3▲	FV5-R*-*T012
180	4400	EAM-WG-4415T-□3▲	FV5-R*-*T017
180	5500	EAM-WG-5515T-□3▲	Fv5-R*-*T021
180	7500	EAM-WG-7515T-□3▲	Fv5-R*-*T026

Note: When □ is U: Supports 23-bit optical encoder, requires matching FV5-R3 drive

When □ is 3: Supports 17-bit magnetic encoder, requires matching FV5-R1 drive

When ▲ is 0: The motor with brake

When ▲ is 2: The motor without brake

## 2 Installation Operation

### 2.1 Install the Servo Drive

#### 2.1.1 Installation Location

- ◆ Please install inside control box that are protected from rain and direct sunlight, and ensure that no flammable materials are placed around. This unit does not have waterproof construction.
- ◆ Do not use this product in environments with corrosive gases or liquids.
- ◆ Do not use this product near flammable gas environments or combustible materials.
- ◆ Do not install in high-temperature, humid, dusty, cutting fluid, oil mist, metal dust environments, etc.
- ◆ Install in a well-ventilated, dry, and dust-free location.
- ◆ Install in a place without vibration.
- ◆ Do not use gasoline, diluent, alcohol, acidic or alkaline cleaners to prevent discoloration or damage to the housing.

#### 2.1.2 Installation Environmental Conditions

Item	Description
Altitude	Altitude below 1000m, please derate when above 1000m (10% derating for every additional 500 meters in altitude)
Atmospheric pressure	86kPa ~ 106kPa
Operating temperature	0°C ~ 55°C (ambient temperature from 40°C ~ 55°C, average load rate should not exceed 80%) (non-condensing*2)
Storage temperature *1	-20~85°C (non-condensing*2)
Humidity	Below 90%RH (non-condensing*2)
Vibration	Below 10~60 Hz 5.88 m/s <sup>2</sup> (0.6G), below 20Hz 9.80665 m/s <sup>2</sup> (1G)
Impact	19.6m/s <sup>2</sup>
Protection level	IP20
Pollution level	PD2

\*1: Short-term permissible temperature including transportation factors.

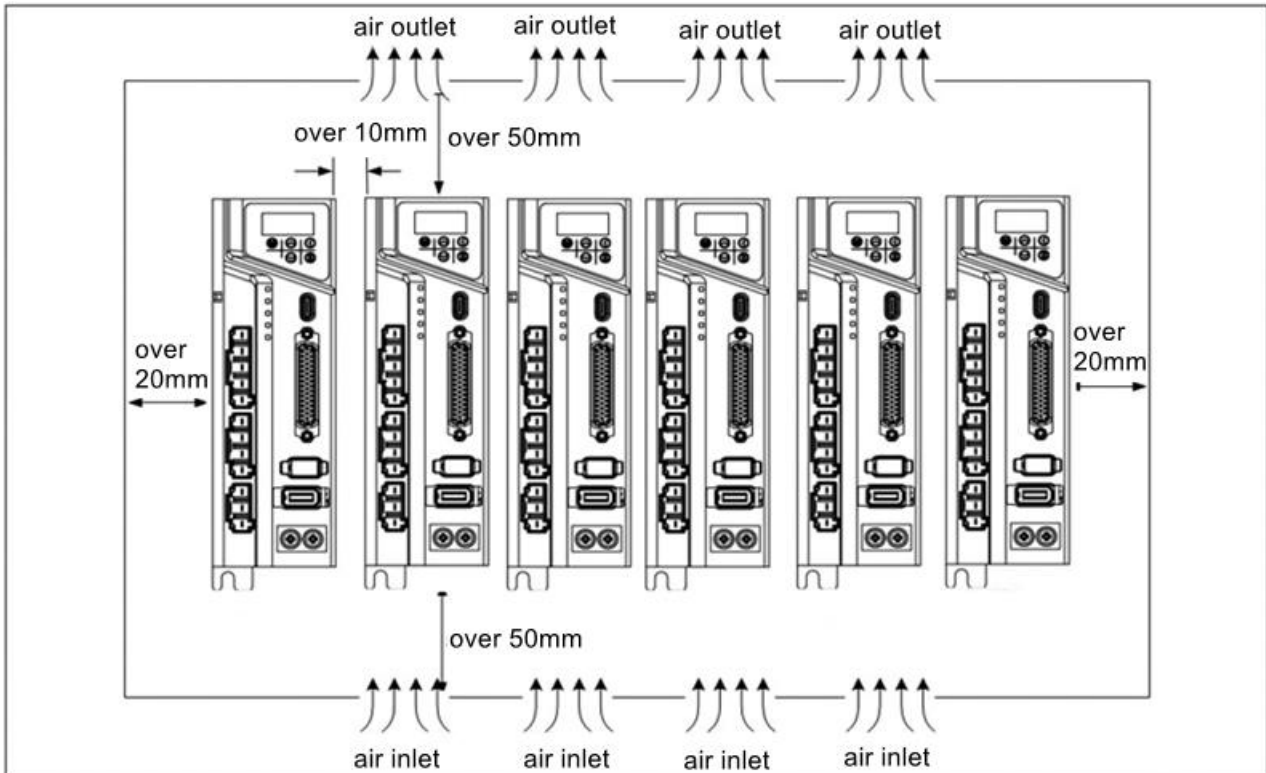
\*2: Please note that condensation may occur when temperature decreases and humidity rises.

#### 2.1.3 Installation Methods and Precautions

##### 2.1.3.1 Installation Methods

- ◆ This drive has a vertical structure, please ensure that the drive is installed vertically.

- ◆ Securely fasten the drive to the mounting surface using the circular mounting hole at the top and the semi-elliptical mounting hole at the bottom (use M4 screws(SIZE-C/SIZE-D) or M5 screws (SIZE-A/SIZE-B/SIZE-E) for installation , recommended torque is 1.7~2N\*m)



### 2.1.3.2 Heat Dissipation

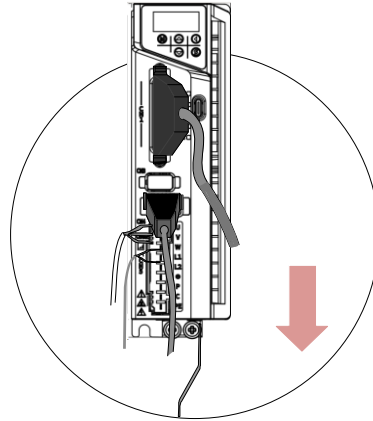
- ◆ Ensure there is sufficient space around the drive for effective cooling. Refer to the diagram above: maintain a spacing of at least 50mm above and below; when installing side by side, maintain a lateral spacing of at least 10mm.
- ◆ Using the drive in a sealed control box may cause abnormal temperature rise inside the box. To meet the operating temperature range around the drive, consider installing cooling devices.

### 2.1.3.3 Grouding

- ◆ Ensure the grounding terminal is properly grounded. Incorrect grounding may not only prevent the drive from fully functioning but may also result in safety issues such as electric shock or interference-related errors.
- ◆ When installing the drive in a location with coatings, remove the coatings before installation to help prevent noise.

### 2.1.3.4 Wiring

- ◆ Ensure correct wiring. wrong wiring can result in motor loss of control or burnout. Also, during installation and wiring work, do not let conductive debris such as wire scraps fall into the drive.
- ◆ When bundling wires into a metal conduit, note that the allowable current of the wires decreases as temperature rises, potentially causing burns. Select wires after confirming the allowable current.
- ◆ When using twisted wires, neatly arrange the wires with insulated rod terminals or insulated round terminals. Using them in an unorganized state may lead to unexpected accidents or injuries such as electric shock or leakage.
- ◆ When wiring the drive, bend the cables downwards (refer to the following figure) to prevent liquid from flowing into the drive along with the cables, which could damage the drive.



### 2.1.3.5 Others

- ◆ Do not subject to vibrations or impacts exceeding 5.88 m/s<sup>2</sup>. Do not place in areas where dust, metal scraps, oil mist, or other foreign objects accumulate. Avoid placing in water, oil, cutting fluids, etc. Do not place near combustible materials, corrosive gases ( H<sub>2</sub>S, SO<sub>2</sub>, NO<sub>2</sub>, Cl<sub>2</sub> , etc. ), and avoid storing or using in environments with combustible gases.
- ◆ A power supply with a molded case circuit breaker (MCCB) must be installed. Additionally, the ground terminal or ground wire must be grounded.
- ◆ Errors may occur when the power is turned on, so do not approach the motor or the machine driven by the drive.
- ◆ During high-speed operation with the dynamic brake in operation, set a stopping time of about 10 minutes.
- ◆ Ensure that the terminal block screws and ground screws are tightly fastened.

## 2.2 Install the Servo Motor

### 2.2.1 Installation Location

The lifespan of the motor depends on the quality of the installation location. Please install in places that meet the following conditions.

- ◆ Install indoors, keep away from rain and direct sunlight.
- ◆ Do not use this product in environments with corrosive gases or liquids.
- ◆ Do not use this product near combustible gases or combustible materials.
- ◆ Do not install in high-temperature places, places with cutting fluids, oil mist, metal dust, etc.
- ◆ Ensure good ventilation, no moisture, oil, or water ingress, and keep away from heat sources.
- ◆ Place in an environment easily accessible for inspection and cleaning.
- ◆ Place not subject to vibration.

### 2.2.2 Environmental Conditions

Item	Parameters
Altitude	Altitude below 1000m, please derate when above 1000m.
Operating temperature	0°C to 40°C (Non condensing*1)
Storage temperature	-20°C ~ 60°C (Maximum temperature guaranteed: 80°C, 72 hours, Non Condensing*2)
Humidity	Below 90% RH (Non condensing*2)

Item	Parameter
Vibration	During rotation: below 49m/s <sup>2</sup> (5G), during stop: below 24.5m/s <sup>2</sup> (2.5G)
Impact	Below 98m/s <sup>2</sup> (10G)
Protection level	IP67 (shaft through part, exclude the the motor connector terminal part)

- ◆ \*1: The ambient temperature refers to the temperature at a distance of 5cm from the motor.
- ◆ \*2: Short-term permissible temperature, including transportation factors.

## 2.2.3 Installation Precautions

### 2.2.3.1 Installation Direction

The motor can be installed vertically or horizontally, but the following requirements must be met.

- ◆ Horizontal installation

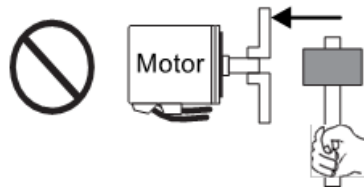
Mount the cable outlet facing downwards to prevent oil or water from entering the motor.

- ◆ Vertical installation

When installing a motor with a reducer oil, please use a motor with oil seals to prevent reducer oil from entering the motor.

### 2.2.3.2 Mechanical Connection

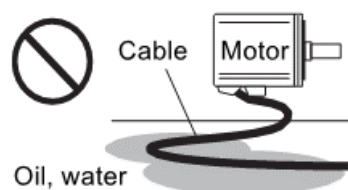
- ◆ When installing or removing a coupling at the motor shaft end, do not use a hammer to directly strike the shaft end (doing so may damage the encoder, especially when installed on the load side of the shaft).



- ◆ Ensure proper coaxial alignment (otherwise it may cause vibration or damage to bearings and encoders)
- ◆ When the motor shaft is operating without being grounded, depending on the motor and installation environment, it may cause electrical corrosion of the motor bearings and excessive bearing noise. Please verify and inspect accordingly.

### 2.2.3.3 Oil-Water Protection

- ◆ Do not use cables that have been immersed in oil or water.



- ◆ Bend the cable outlet downwards.

- ◆ Avoid using the motor in environments where oil and water frequently splash onto the motor body.
- ◆ When used in conjunction with a reducer, use a motor with oil seals to prevent oil from penetrating into the motor from the extended part of the shaft.

#### **2.2.3.4 Cable Stress**

- ◆ Avoid applying stress to the outlet and connection parts of the cable due to bending and its own weight.
- ◆ When moving the motor, use relay cables that can be stored in the cable reel to minimize bending stress on the cable.
- ◆ Increase the bending radius of the cable as much as possible, ensuring it is at least 10 times the outer diameter of the cable during processing.

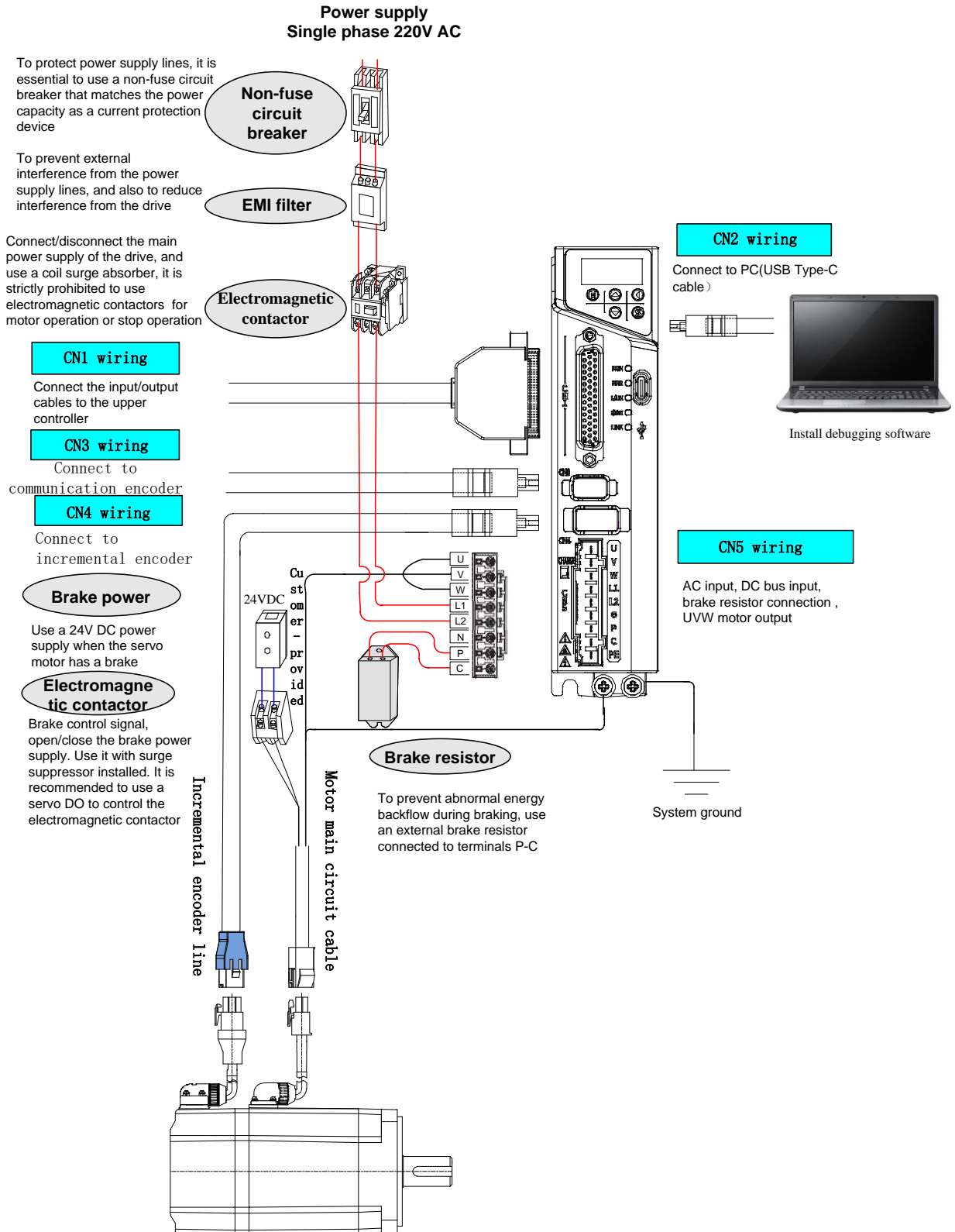
#### **2.2.3.5 Wiring**

- ◆ During installation and wiring, avoid letting conductive particles such as wire chips fall into the connector.
- ◆ When wiring, ensure that the connector pins are arranged correctly.
- ◆ Avoid applying stress to the connector portion due to cable bending, otherwise, it may cause connector damage.
- ◆ Ensure that the motor grounding is reliably connected to the drive to prevent safety issues such as noise or erroneous actions due to electric shock.

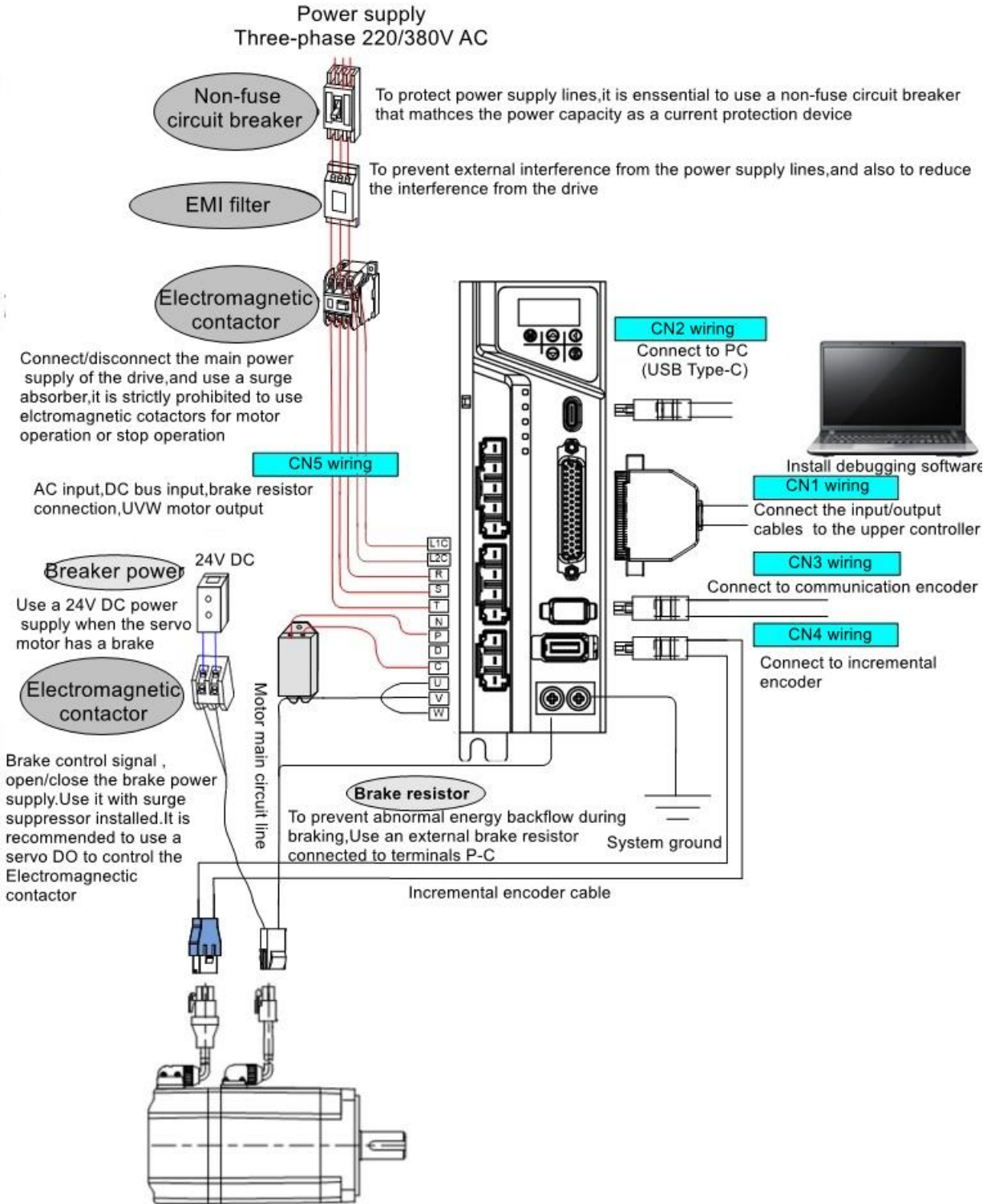
# 3 Peripheral Devices and Wiring

## 3.1 Peripheral Device Wiring Illustration

### 3.1.1 SIZE-A/SIZE-B Type



### 3.1.2 SIZE-C/SIZE-D/SIZE-E Type

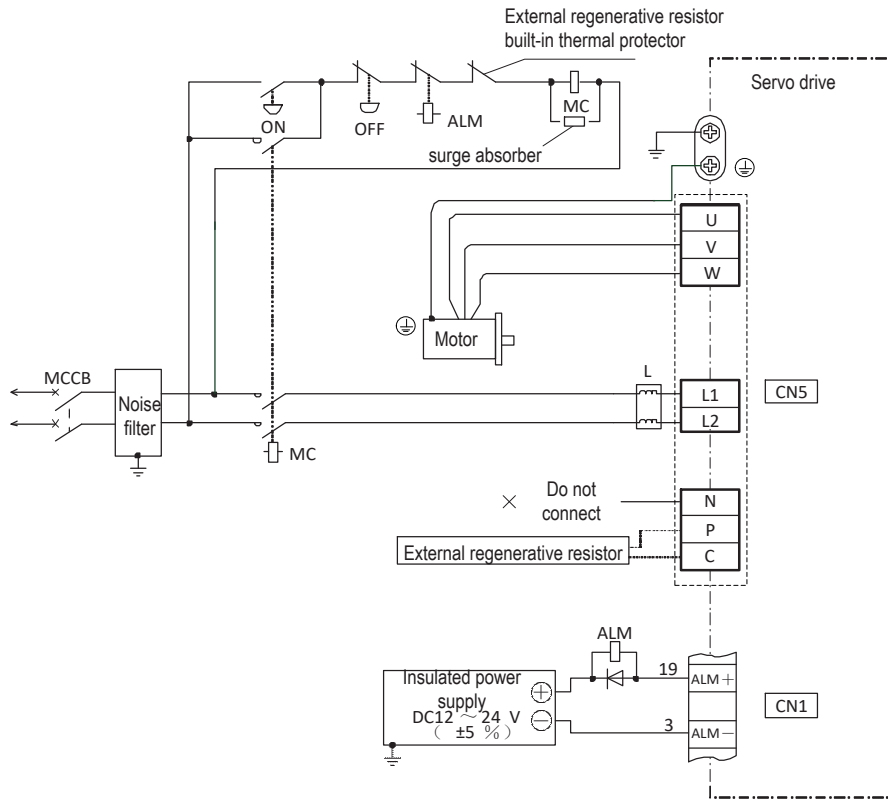


Note: The figure above showcases the wiring for SIZE-C/SIZE-D drives as an example. The wiring method for SIZE-E is the same as for SIZE-C/SIZE-D, but there may be differences in the appearance and positioning of the terminals.

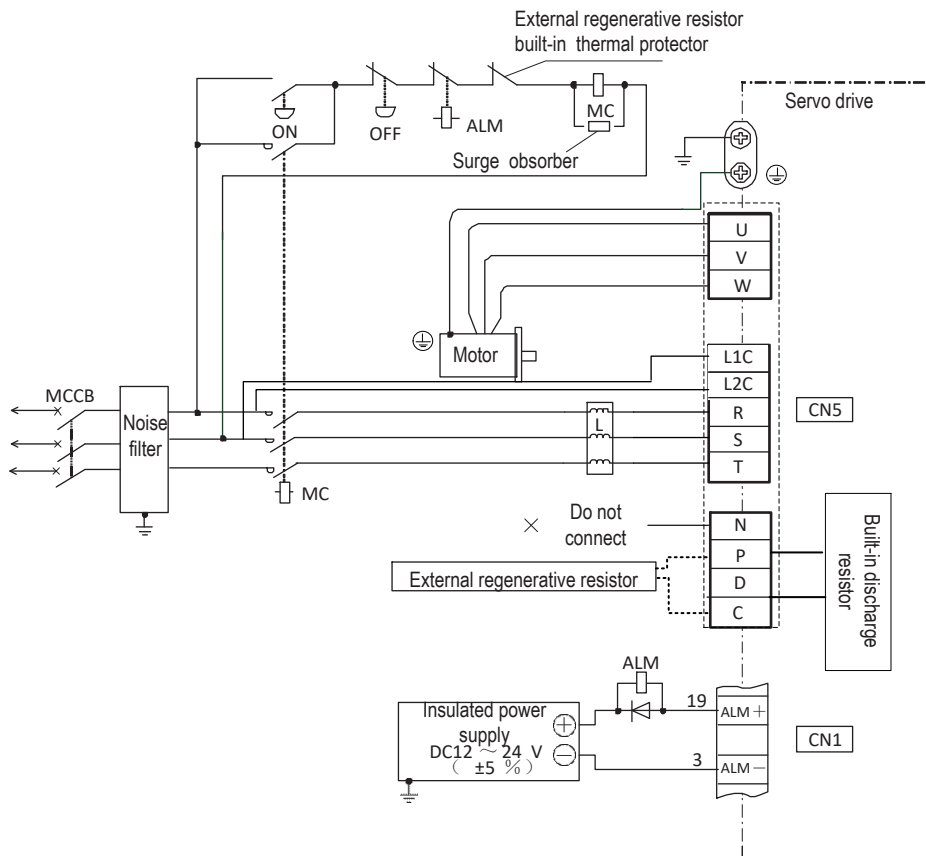


### 3.1.3 System Wiring and Key Points Explanation

#### 3.1.3.1 SIZE-A/SIZE-B Type Main Circuit Wiring



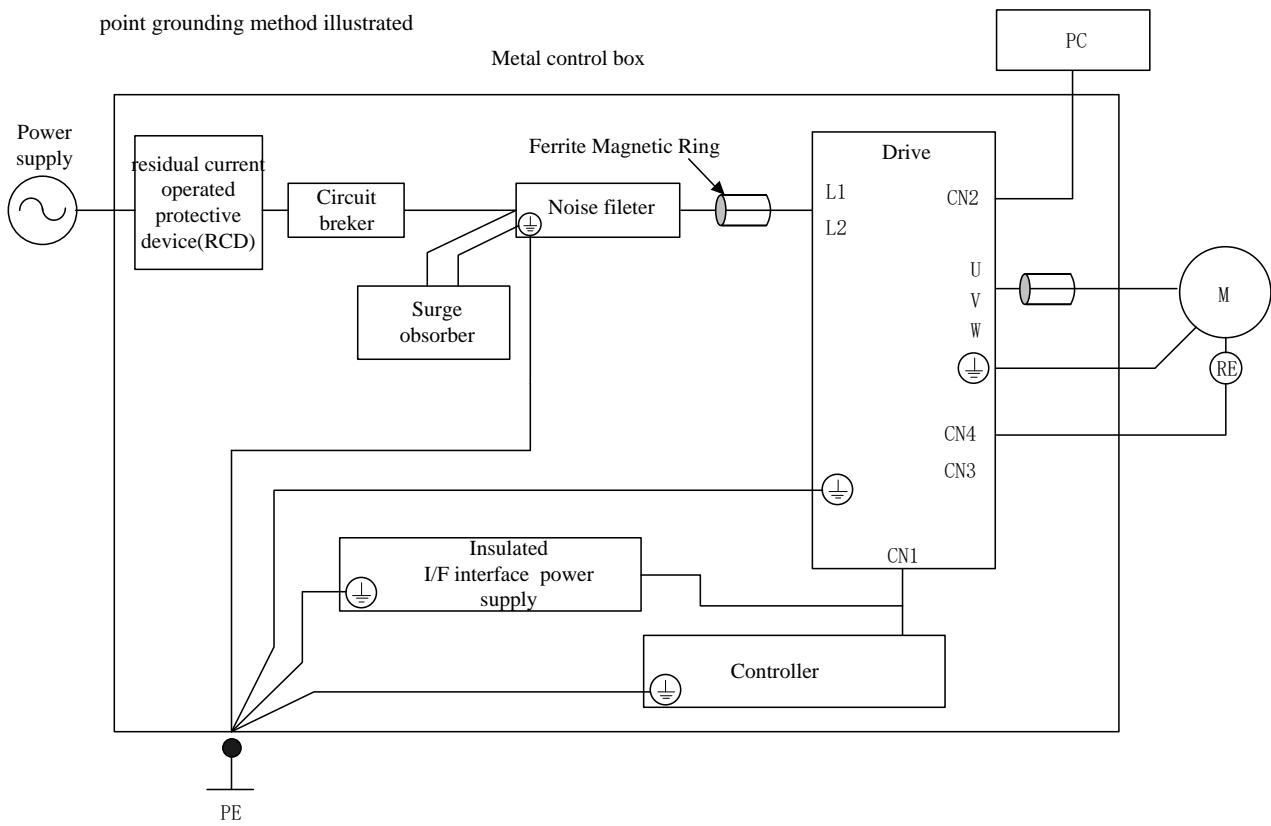
### 3.1.3.2 SIZE-C/SIZE-D/SIZE-E Type Main Circuit Wiring

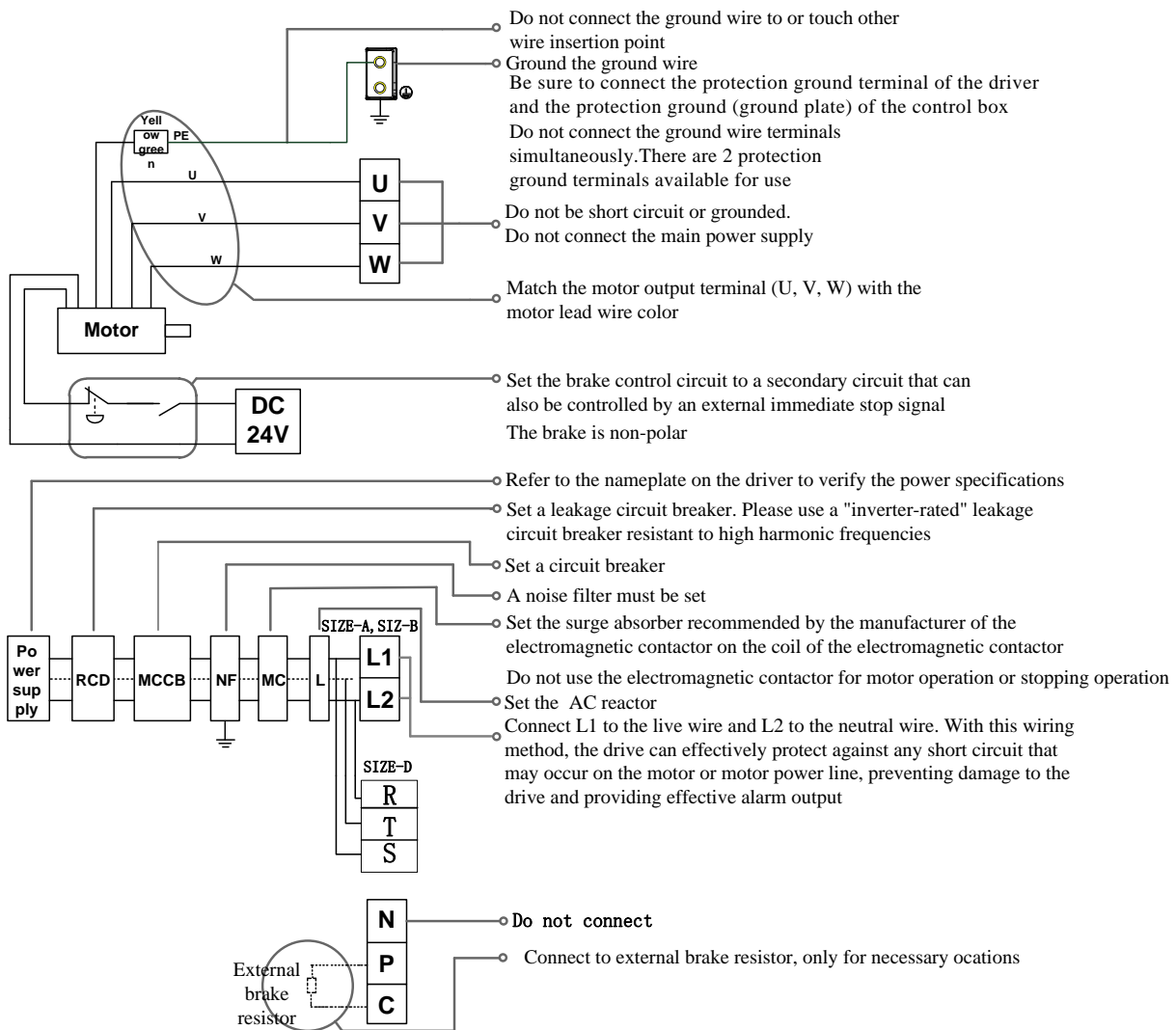


### 3.1.4 Wiring Key Points

- ◆ Wiring tasks should be carried out by electrical engineering experts.
- ◆ Do not power on the system until the wiring is complete to prevent electrical accidents.
- ◆ Note that connector CN5 carries high voltage. Do not touch it to avoid electrical accidents.
- ◆ Ensure connectors are inserted until a clicking sound is heard.

To ensure a good electromagnetic compatibility environment, ground the system using the single-point grounding method illustrated





Note: Dashed lined parts are used when three-phase input is used.

## 3.2 Cable and Peripheral Accessories Selection

### 3.2.1 Overview of Cables and Accessories for Drives and Motors

#### 3.2.1.1 Drives and Motor

Please refer to [Matching Instructions for Servo Drive and Servo Motor](#).

#### 3.2.1.2 Motor Cable

Flange Size (mm)	Motor	Name	Motor Type	Length	Cable model
40/60/80	EAM-WH-A530A-□3▲	Power cable	Motor with brake	3m	FVL-MBA00-03-E(-T)
				5m	FVL-MBA00-05-E(-T)
				10m	FVL-MBA00-10-E(-T)
	EAM-WH-0130A-□3▲		Motor without brake	3m	FVL-MMAD0-03-E(-T)
				5m	FVL-MMA00-05-E(-T)
EAM-WH-					

Flange Size (mm)	Motor	Name	Motor Type	Length	Cable model
	0230A-□3▲ EAM-WH-0430A-□3▲ EAM-WH-0830A-□3▲ EAM-WH-1030A-□3▲	Encoder cable	Single-turn absolute encoder	10m	FVL-MMA00-10-E(-T)
				3m	FVL-P1700-03-E(-T) to CN4
					FVL-P1720-03-E(-T) to CN3
				5m	FVL-P1700-05-E(-T) to CN4
					FVL-P1720-05-E(-T) to CN3
				10m	FVL-P1700-10-E(-T) to CN4
		FVL-P1720-10-E(-T) to CN3			
		Multi-turn absolute encoder (with battery)	3m	FVL-PA700-03-E(-T) to CN4	
				FVL-PA720-03-E(-T) to CN3	
			5m	FVL-PA700-05-E(-T) to CN4	
				FVL-PA720-05-E(-T) to CN3	
			10m	FVL-PA700-10-E(-T) to CN4	
FVL-PA720-10-E(-T) to CN3					
110/130	EAM-WG-1230A-□3▲ EAM-WH-1530A-□3▲ EAM-WH-1830A-□3▲ EAM-WG-3030A-□3▲	Power cable	Motor with brake	3m	FVL-MMC01-03-E(-T) power cable
					FVL-MSA02-03-E(-T) brake cable
				5m	FVL-MMC01-05-E(-T) power cable
					FVL-MSA02-05-E(-T) brake cable
				10m	FVL-MMC01-10-E(-T) power cable
					FVL-MSA02-10-E(-T) brake cable
		Motor without brake	3m	FVL-MMC01-03-E(-T)	
			5m	FVL-MMC01-05-E(-T)	
			10m	FVL-MMC01-10-E(-T)	
110/130	EAM-WG-0915A-□3▲ EAM-WG-1315A-□3▲ EAM-WG-1515A-□3▲ EAM-WG-1815A-□3▲ EAM-WG-	Power cable	Motor with brake	3m	FVL-MBC01-03-E(-T) power cable with brake
				5m	FVL-MBC01-05-E(-T) power cable with brake
				10m	FVL-MBC01-10-E(-T) power cable with brake
			Motor without brake	3m	FVL-MMC01-03-E(-T)
				5m	FVL-MMCO1-05-E(-T)

Flange Size (mm)	Motor	Name	Motor Type	Length	Cable model		
180	0915T-□3▲ EAM-WG-1315T-□3▲ EAM-WG-1515T-□3▲ EAM-WG-1815T-□3▲			10m	FVL-MMC01-10-E(-T)		
	EAM-WG-1230A-□3▲ EAM-WH-1530A-□3▲ EAM-WH-1830A-□3▲	Encoder cable	Single-turn absolute encoder	3m	FVL-P1701-03-E(-T) to CN4 FVL-PI721-03-E(-T) to CN3		
	EAM-WH-1530A-□3▲ EAM-WH-1830A-□3▲			5m	FVL-P1701-05-E(-T) to CN4 FVL-PI721-05-E(-T) to CN3		
	EAM-WG-0915A-□3▲ EAM-WG-1315A-□3▲ EAM-WG-1515A-□3▲ EAM-WG-1815A-□3▲			10m	FVL-P1701-10-E(-T) to CN4 FVL-P1721-10-E(-T) to CN3		
	EAM-WG-0915A-□3▲ EAM-WG-1315A-□3▲ EAM-WG-1515A-□3▲ EAM-WG-1815A-□3▲			Multi-turn absolute encoder (with battery)	3m	FVL-PA701-03-E(-T) to CN4 FVL-PA721-03-E(-T) to CN3	
	EAM-WG-0915T-□3▲ EAM-WG-1315T-□3▲ EAM-WG-1515T-□3▲ EAM-WG-1815T-□3▲ EAM-WG-3030T-□3▲		5m		FVL-PA701-05-E(-T) to CN4 FVL-PA721-05-E(-T) to CN3		
			10m		FVL-PA701-10-E(-T) to CN4 FVL-PA721-10-E(-T) to CN3		
	180		EAM-WG-2915T-□3▲ EAM-WG-4415T-□3▲ EAM-WG-5515T-□3▲ EAM-WG-7515T-□3▲	Power cable	Motor with brake	3m	FVL-MMC02-03-E(-T) power cable
			FVL-MSA01-03-E(-T) brake cable				
			5m			FVL-MMC02-05-E(-T) power cable	
						FVL-MSA01-05-E(-T) brake cable	
						FVL-MMC02-10-E(-T)	

Flange Size (mm)	Motor	Name	Motor Type	Length	Cable model		
				10m	power cable		
					FVL-MSA01-10-E(-T) brake cable		
				Motor without brake	3m	FVL-MMC02-03-E(-T)	
					5m	FVL-MMC02-05-E(-T)	
					10m	FVL-MMC02-10-E(-T)	
				Encoder cable	Single-turn absolute encoder	3m	FVL-PI701-03-E(T) to CN4 FVL-PI721-03-E(-T) to CN3
						5m	FVL-PI701-05-E(-T) to CN4 FVL-PI721-05-E(-T) to CN3
		10m	FVL-PI701-10-E(-T) to CN4 FVL-PI721-10-E(-T) to CN3				
		Multi-turn absolute encoder (with battery)	3m		FVL-PA701-03-E(-T) to CN4 FVL-PA721-03-E(-T) to CN3		
			5m		FVL-PA701-05-E(-T) to CN4 FVL-PA721-05-E(-T) to CN3		
			10m		FVL-PA701-10-E(-T) to CN4 FVL-PA721-10-E(-T) to CN3		

### 3.2.2 Servo Accessories

Flange size (mm)	Accessory type		Accessory model
40/60/80	Combination accessory for motor without brake	FVU-T10	FVU-M00
			FVU-P00
	Combination accessory for motor with brake	FVU-T11	FVU-M00
			FVU-P00
			FVU-M01
	Power Cable Connector		FVU-M00
	Brake Cable Connector		FVU-M01
	AMP-9P encoder cable connector		FVU-P00
	1394-10P encoder cable connector		FVU-P02

Flange size (mm)	Accessory type	Accessory model
	1394-6P encoder cable connector	FVU-P03
110/130	Power cable connector	FVU-M02
180	Power cable connector	FVU-M03
180	Brake Cable Connector	FVU-M04
110/130	Brake Cable Connector	FVU-M05
110/130/180	Aviation plug encoder cable connector	FVU-P01
Applicable to all motor models	Battery accessory	FVU-B00
Only for 130 flange motors with brake (WG-0915, WG-1315, WG-1815)	Power Cable Connector (7-core with brake)	FVU-M06

### 3.2.3 Communication Cable Accessories

Model	Description
FVL-CA702-01-E	Communication cable to connect Servo drive to PC
FVL-CN701-A3-E	Servo drive multi-unit parallel communication cable (0.3m)

### 3.2.4 Control Cable Accessories

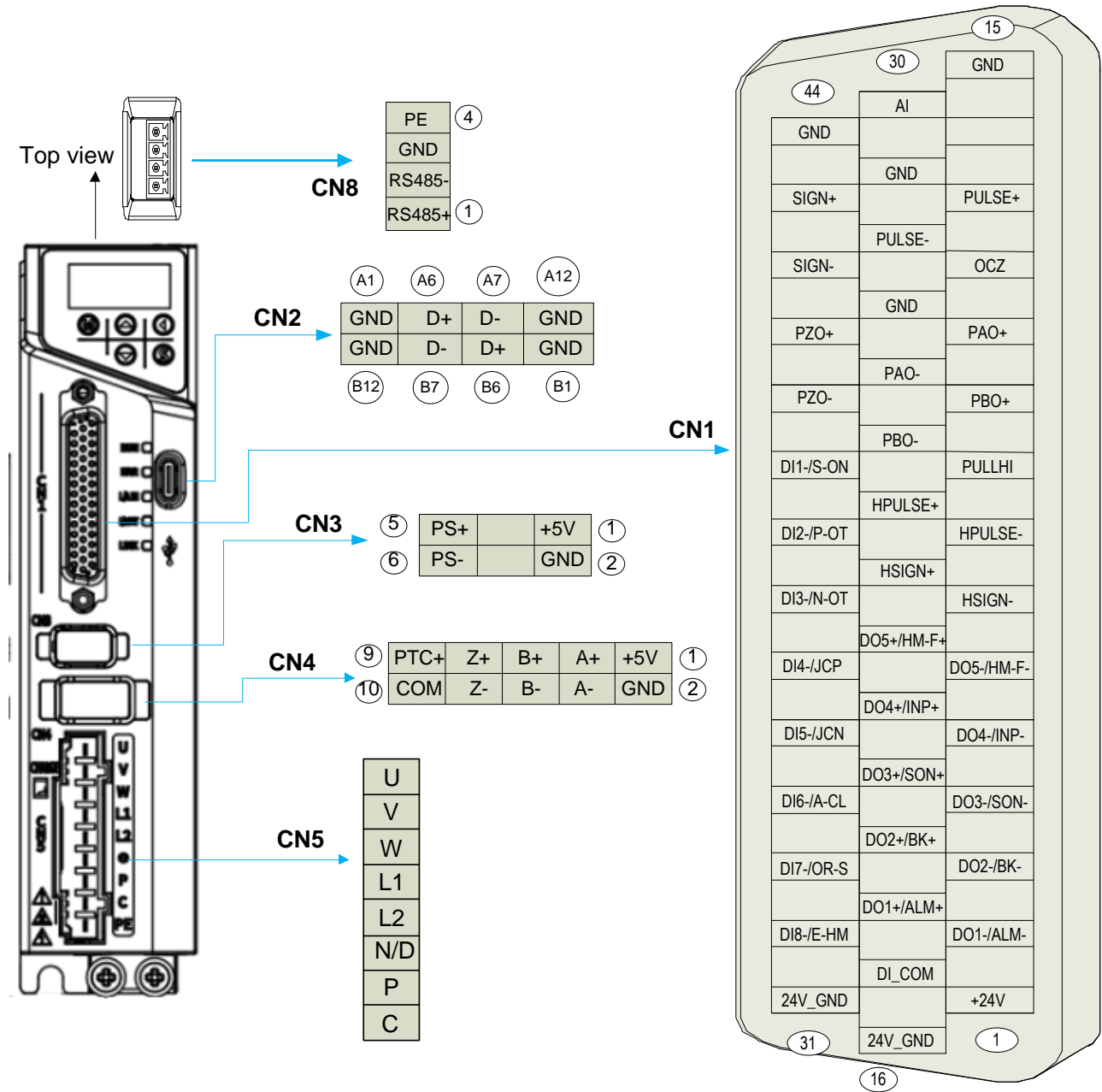
Model	Description
FVL-CA700-01-E	Servo CN1 input/output signal cable (1m)
FVU-C01	Servo CN1 terminal accessory

## 3.3 Wiring of Connector CN1

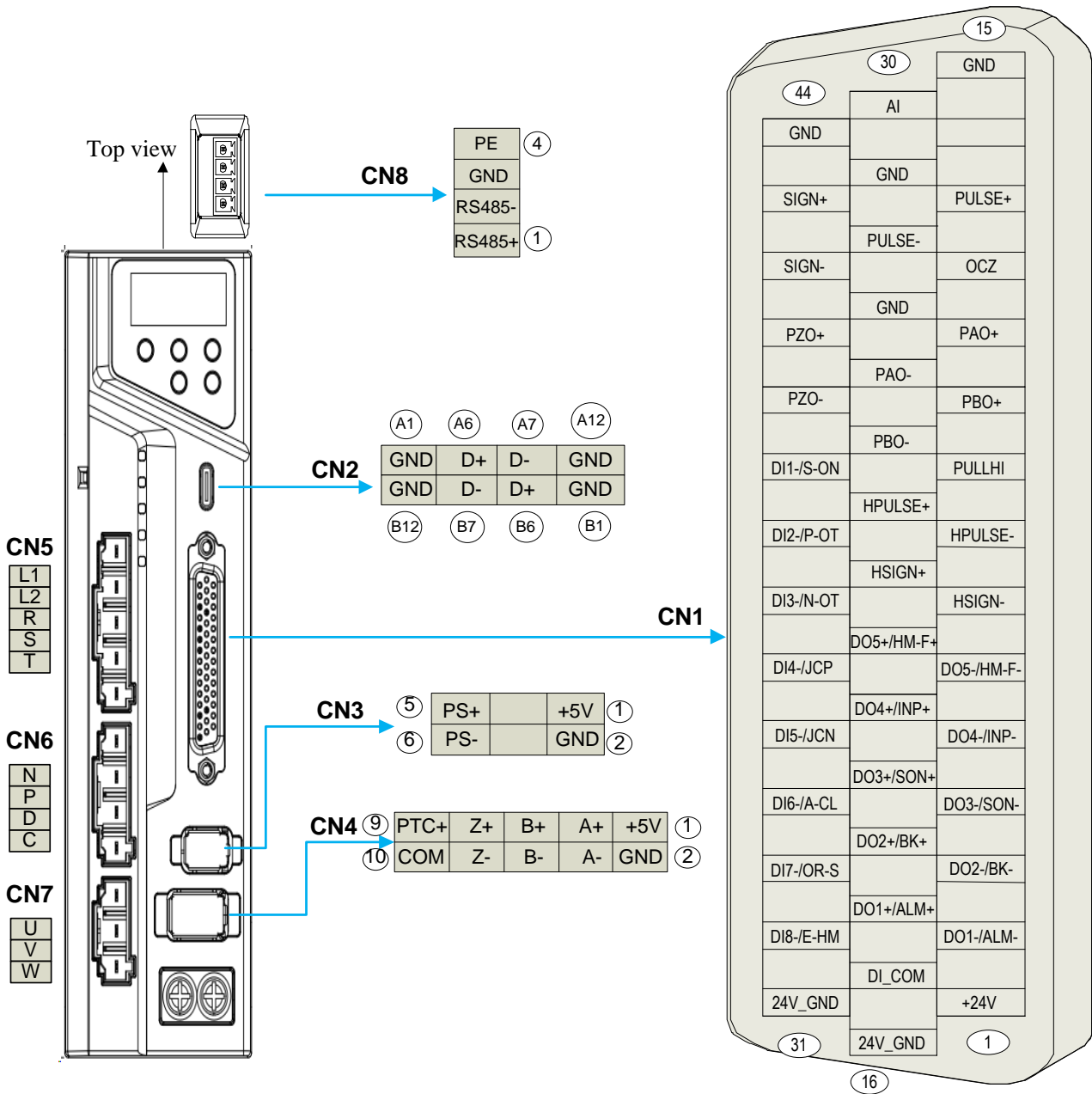
### 3.3.1 Connector CN1 Terminal Definitions

- ◆ Terminals of SIZE-A/SIZE-B Types





◆ Terminals of SIZEC/SIZE-D/SIZE-E Types



Note: The illustration above takes SIZE-C/SIZE-D as an example. The pin names and definitions for SIZE-E are the same as for SIZE-C/SIZE-D, but the appearance and position may differ.

Please refer to the table below for the pins of CN1.

Pin number	Name	Abbreviation	Description
1	Internal 24V power supply positive	+24V	Only for internal DI and pulse input pull-up use, cannot be used to power external relays, brakes, etc.
2	Digital output 1 (negative)	DO1-	Digital outputs can be freely configured for functions and output logic according to user requirements. When wiring, if relays need to be
3	Digital output	DO2-	

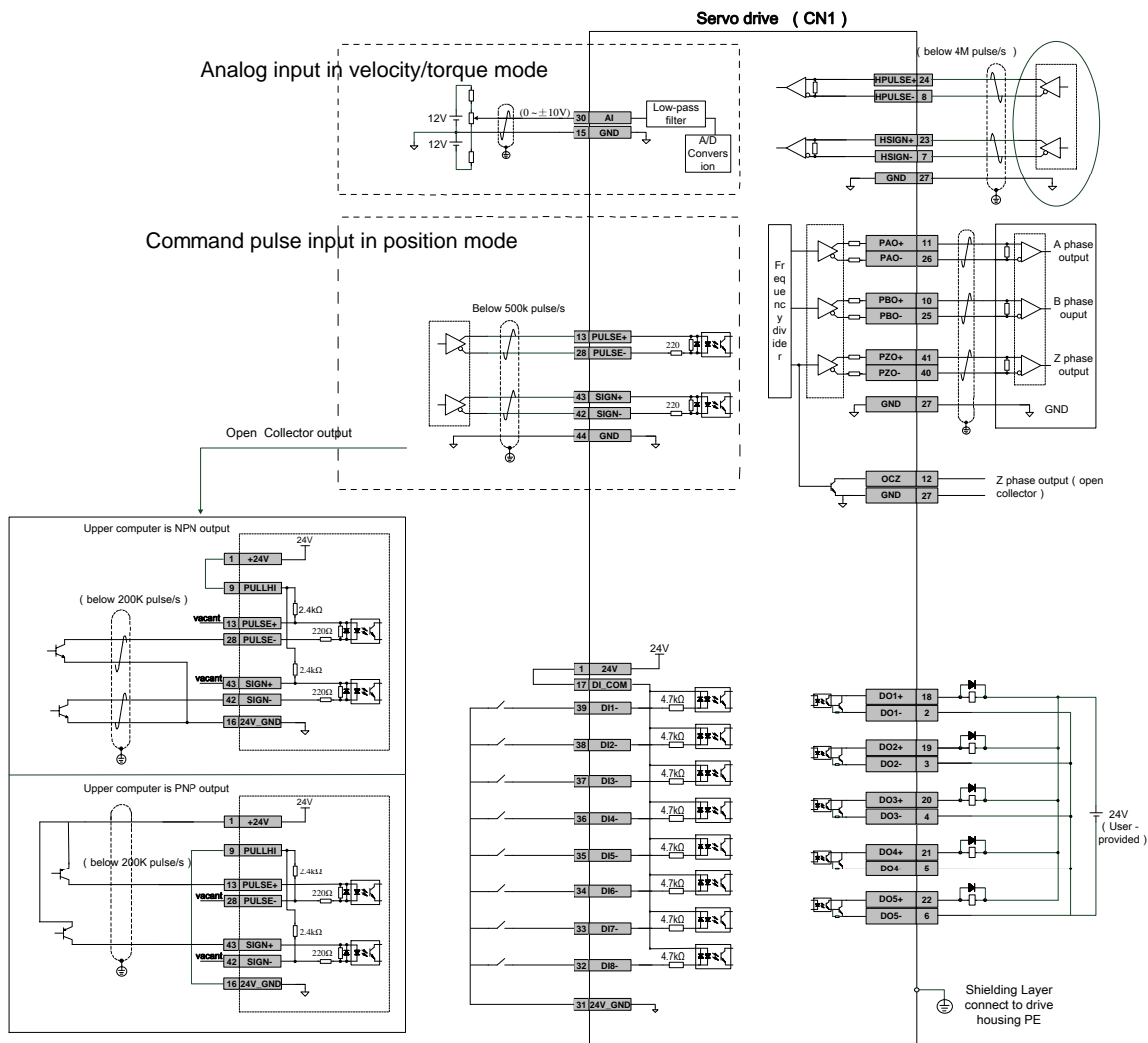
Pin number	Name	Abbreviation	Description
	2(negative)		added, freewheeling diodes should be included. Similarly, if optocouplers are used for reception, current-limiting resistors should be connected. Wiring errors can result in hardware damage to the DO port
4	Digital output 3 (negative)	DO3-	
5	Digital output 4 (negative)	DO4-	
6	Digital output 5 (negative)	DO5-	
7	High-Speed Pulse Direction Signal (Negative)	HSIGN-	Differential inputs, with a maximum frequency of 4MHz
8	High-Speed Pulse Counting Signal (Negative)	HPULSE-	
9	Pulse Command Input Built-in Resistor Common Terminal	PULLHI	Used for open collector, connect to COM- when open collector type is PNP, connect to 24V when open collector type is NPN
10	Frequency Divided Output Phase B (Positive)	PBO+	The number of pulses output per motor revolution is set by P02.03. Set the number of divided output pulses to 4 times the original frequency
11	Frequency Divided Output Phase A (Positive)	PAO+	
12	Z Phase Open Collector Output	OCZ	Z phase Outputs one pulse per revolution, level set by P02.05, output is open collector
13	Low-Speed Pulse Counting Signal (Positive)	PULSE+	Low-speed pulse counting signals support differential, collector input mode, with a maximum frequency of 500kHz
15	Analog Input Reference Ground	GND	The analog input reference ground
16	24V Reference Ground	24V_GND	Internal 24V power supply reference ground
17	DI Common Input Terminal	DI_COM	When DI uses the internal 24V power supply, short this pin to the internal 24V pin (1)
18	Digital Output 1 (Positive)	DO1+	Digital outputs can be freely configured for functions and output logic according to user requirements. When wiring, if relays are used, include freewheeling diodes. Similarly, if optocouplers are used, include current-limiting resistors. Incorrect wiring can result in hardware damage to the DO port
19	Digital Output 2 (Positive)	DO2+	
20	Digital Output 3 (Positive)	DO3+	
21	Digital Output 4 (Positive)	DO4+	

Pin number	Name	Abbreviation	Description
22	Digital Output 5 (Positive)	DO5+	
23	High-Speed Pulse Direction Signal (Positive)	HSIGN+	Differential inputs, with a maximum frequency of 4MHz
24	High-Speed Pulse Counting Signal (Positive)	HPULSE+	
25	Frequency Division Output Phase B (Negative)	PBO-	The number of pulses output per motor revolution is set by P02.03. Set the number of divided output pulses to 4 times the original frequency
26	Frequency Division Output Phase A (Negative)	PAO-	
27	Signal ground	GND	When the pulse command input is in differential mode, connect this signal ground to the upper computer signal ground. For pulse frequency output signal ground, connect this signal ground to the upper computer signal ground.
28	Low-Speed Pulse Counting Signal (Negative)	PULSE-	Low-speed pulse counting signal supports differential, collector input mode, with a maximum frequency of 500kHz
29	Analog Output Reference Ground	GND	Analog output reference ground
30	Analog Input	AI	Analog input channel, connect the other end to pin 15
31	Internal 24V Power Supply Reference Ground	24V_GND	Internal 24V power supply reference ground
32	Digital Input 8	DI8	Digital Input can be freely configured for functionality and input logic levels. When wiring, different operating conditions may require selecting either the internal 24V or external 24V option, and can also be divided into PNP and NPN types, selecting different wiring methods
33	Digital Input 7	DI7	
34	Digital Input 6	DI6	
35	Digital Input 5	DI5	
36	Digital Input 4	DI4	
37	Digital Input 3	DI3	
38	Digital Input 2	DI2	
39	Digital Input 1	DI1	
40	Frequency Division Output Z Phase (Negative)	PZO-	The Z phase outputs one pulse per revolution, with the level set by P02.05 and outputting a differential 5V signal

Pin number	Name	Abbreviation	Description
41	Frequency Division Output Z Phase (Positive)	PZO+	
42	Low-speed Direction (Negative)	SIGN-	Low-speed pulse direction signal supports differential, collector input mode, with a maximum frequency of 500kHz
43	Low-speed Direction (Positive)	SIGN+	Low-speed pulse direction signal supports differential, collector input mode, with a maximum frequency of 500kHz
44	RS485 Communication Signal Ground	GND	RS485 communication signal ground

### 3.3.2 Connect to the Upper Controller

For typical wiring examples of connector CN1, please refer to the diagram below.

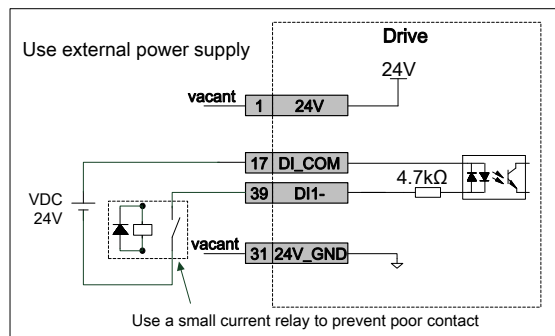
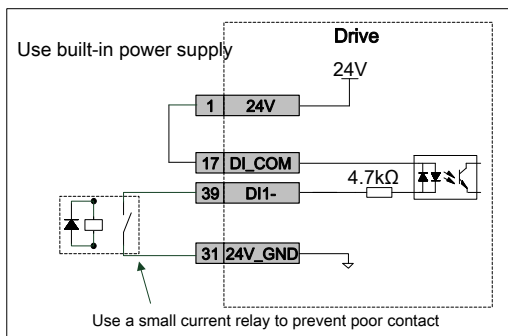


### 3.3.3 Control Input Signal Connection

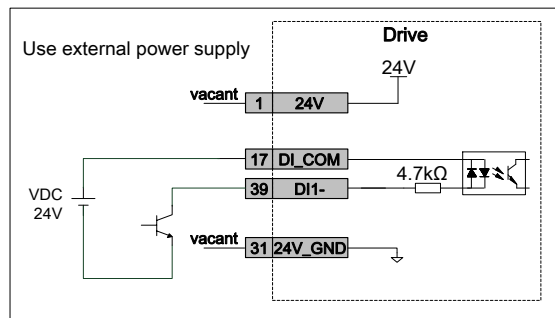
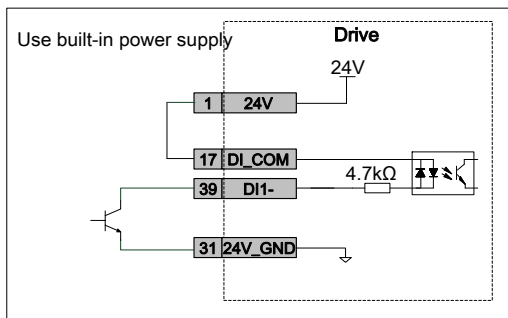
Symbol	Function	Pin	Description
DI1	SRV_ON	39	Servo enabled
DI2	POT (non-default)	38	Positive over travel
DI3	NOT (non-default)	37	Negative over travel
DI4	JogCmdP(non-default)	36	Positive jog
DI5	JogCmdN (non-default)	35	Negative jog
DI6	A_Clr (non-default)	34	Fault reset
DI7	ORGP(non-default)	33	Origin switch
DI8	Execute_Homing(non-default)	32	Trigger homing enabled
+24V	+24V	1	Internal 24V power supply, voltage range +20~28V, maximum output current 200mA
24V_GND	Reference ground for 24V	31	
DI_COM	COM	17	Power supply input terminal (12V~24V)

Taking DI1 as an example, the connection method for other DIs is the same.

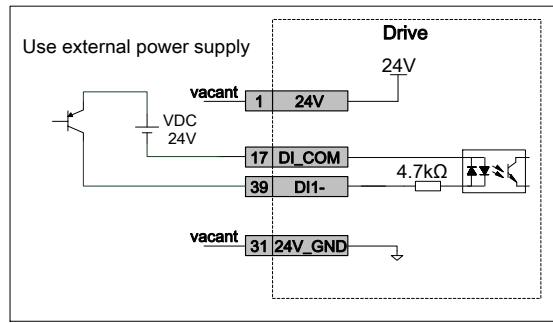
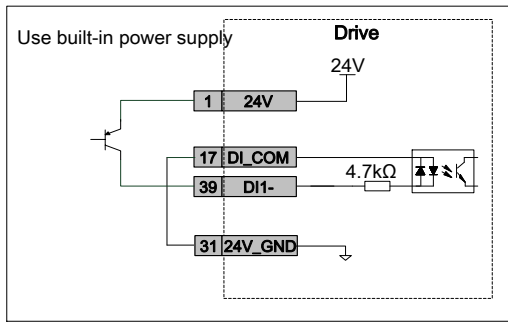
◆ When the upper-level device is a relay output



◆ When the upper-level device is NPN open collector output



◆ When the upper-level device is PNP open collector output



Note: PNP and NPN inputs cannot be mixed.

### 3.3.4 Pulse Command Input Signal Connection

Refer to the table below for the pulse pin definitions.

Symbol	Connector pin number	Description
PULLHI	9	Collector input built-in resistor common terminal
PULSE+	13	Low-speed pulse input +
PULSE-	28	Low-speed pulse input -
SIGN+	43	Low-speed direction input +
SIGN-	42	Low-speed direction input -
GND	27	Signal ground
HPULSE+	24	High-speed pulse input +
HPULSE-	8	High-speed pulse input -
HSIGN+	23	High-speed direction input +
HSIGN-	7	High-speed direction input -
GND	27	Signal ground

The drive supports two input modes: high-speed and low-speed. The high-speed input port only supports high-speed differential outputs from the upper device. The low-speed input port supports both differential and collector outputs from the upper device. The maximum frequency and minimum pulse width for each input mode are shown in the following table:

Function code Pn0305 for selecting high or low-speed pulses:

When it is 0: High-speed pulse

When it is 1: Low-speed pulse

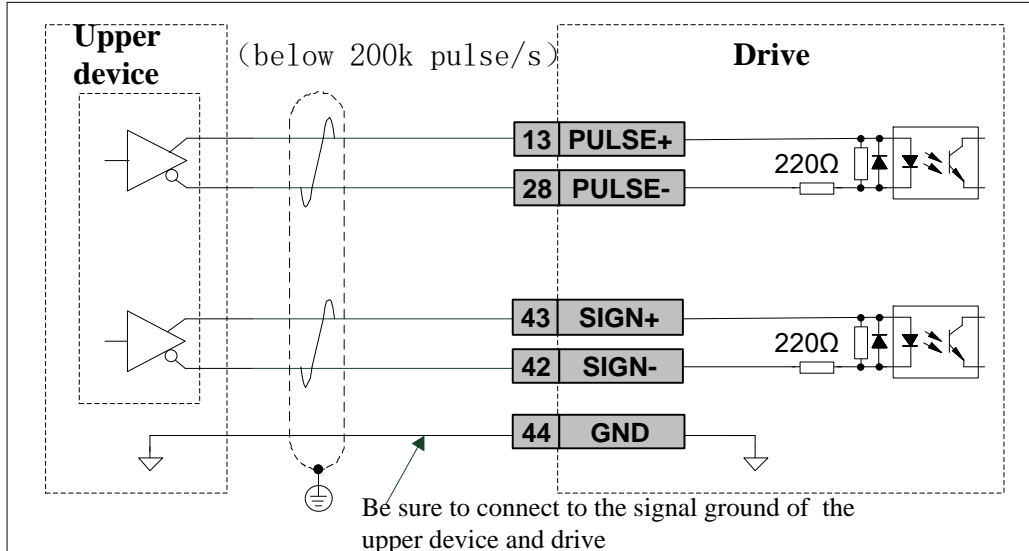
PULSE/SIGN Signal Pulse Input Method	Maximum Allowed Input Frequency	Minimum Necessary Pulse Width (μs)
Low-speed Input Port	200 kpulse/s	2.5
High-speed Differential Input Port	5 Mpulse/s	0.1

Note: If the pulse width output by the upper-level device is less than the minimum pulse width value, it will cause the drive to receive wrong pulse. To reduce the impact of noise, please use double twisted shielded cables, and keep the wiring length within 1m.

### 3.3.4.1 Low-speed Pulse Input

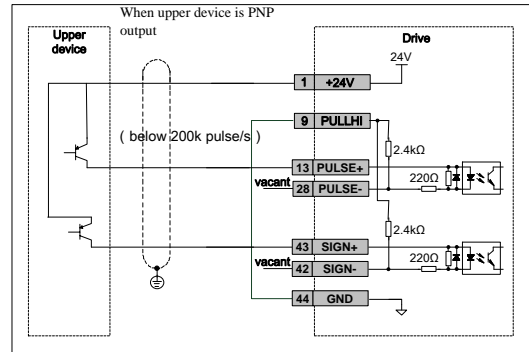
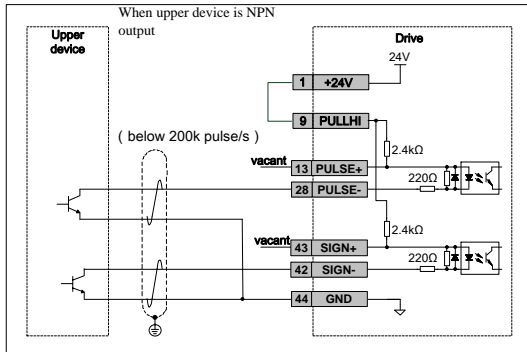
- ◆ When the upper-level device is set to four-channel differential signal output

For a less susceptible to noise signal transmission method, this method is recommended for improving signal transmission accuracy.

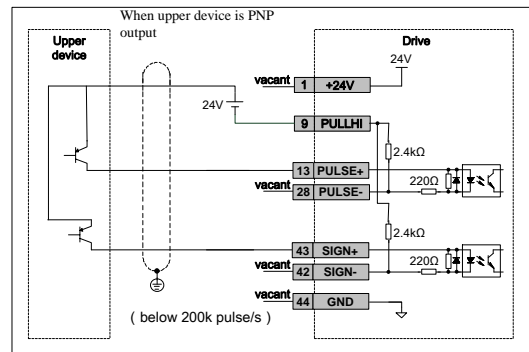
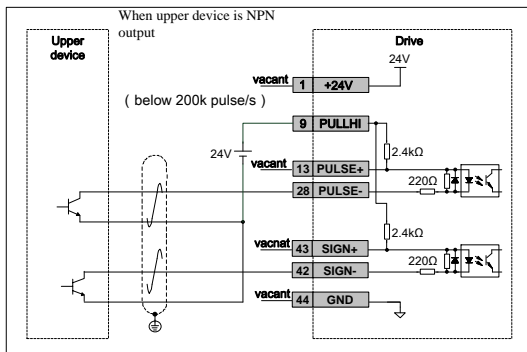


- ◆ When the upper-level device is set to open collector output

- When using the built-in 24V power supply of the drive

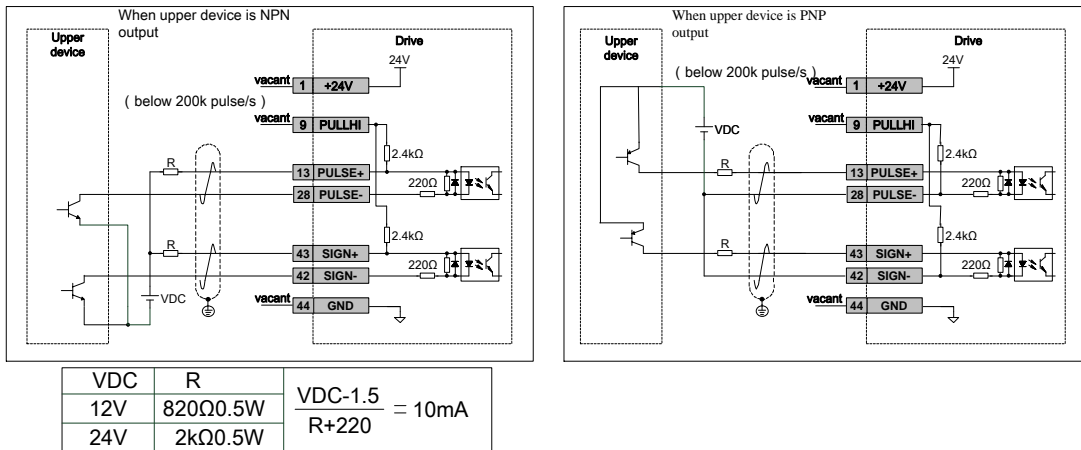


- When using an external 24V power supply and the built-in resistor of the drive



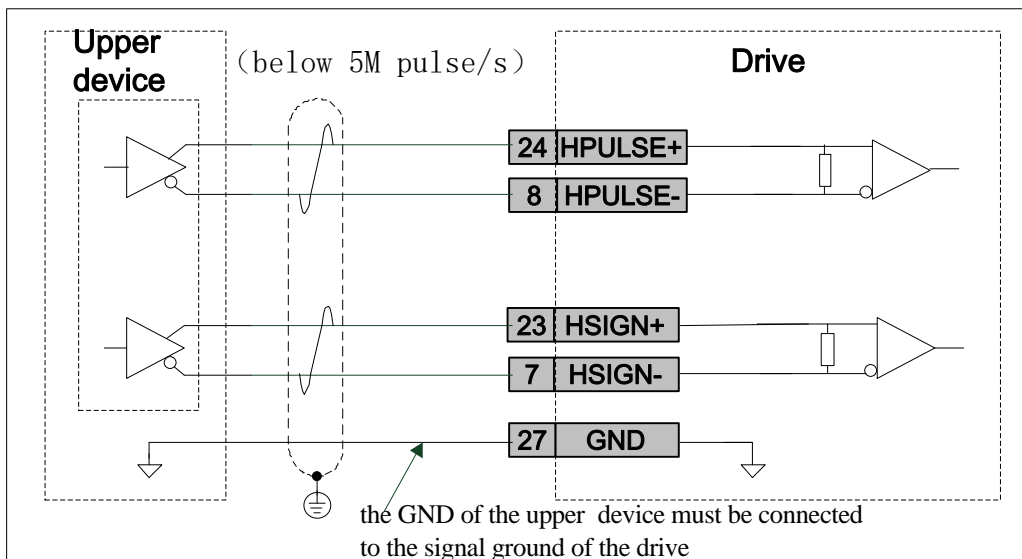


- When using external 12V, 24V power supply and external resistor



### 3.3.4.2 High-speed Pulse Input

When the upper-level device outputs high-speed pulses, please output them to the high-speed pulse input of the servo drive in differential output mode.



Note: It is essential to ensure that the differential output is within a 5V system; the GND of the upper device must be connected to the signal ground of the drive.

### 3.3.5 Analog Command Input Signal Connection

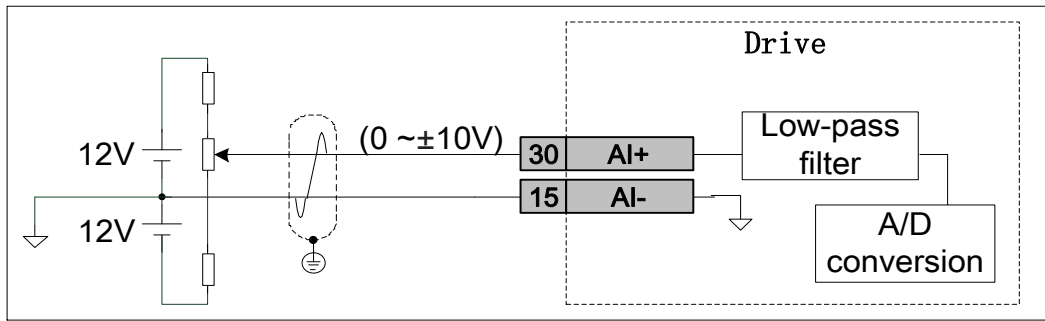
Symbol	Connector Pin Number	Description
AI	30	Common analog input signal, 12-bit resolution, input voltage: -10V~+10V
GND	15	Analog input signal ground

The voltage value corresponding to the analog input command is set by group P05.

The maximum allowable input voltage range is -10V to +10V;

A/D conversion resolution: 12-bit;

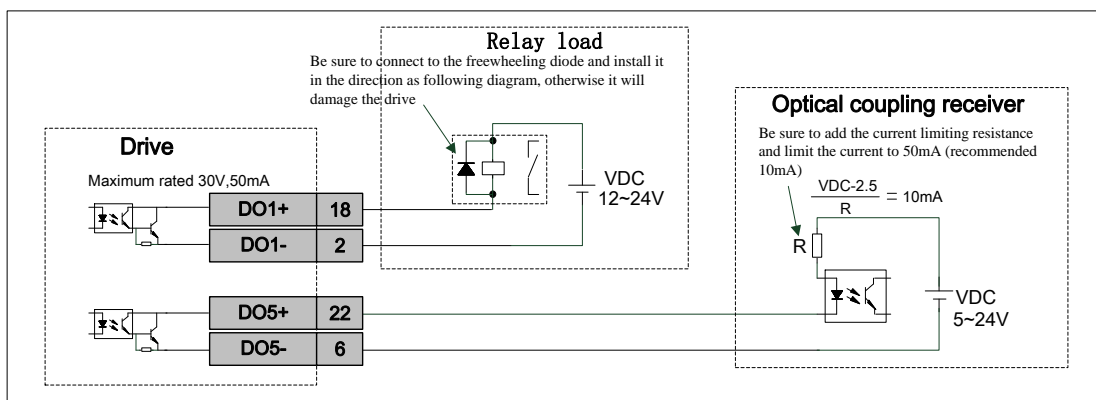
Input impedance: approximately 9kΩ.



### 3.3.6 Control Output Signal Connection

Symbol	Function	Connector Pin Number	Description
DO1+	Alm+	18	Fault output signal
DO1-	Alm-	2	
DO2+	Blk+	19	Brake signal
DO2-	Blk-	3	
DO3+	Son +	20	Servo enabled status output
DO3-	Son -	4	
DO4+	INP+	21	Positioning completed output
DO4-	INP-	5	
DO5+	HomeOK+	22	Homing completed output
DO5-	HomeOK-	6	

Taking DO1 and DO5 as an example, other DO connections are the same.



### 3.3.7 Connection of Frequency Division Pulse Output Signal

Symbol	Connector Pin number	Function
PAO+	11	A Phase Frequency Division Output Signal+

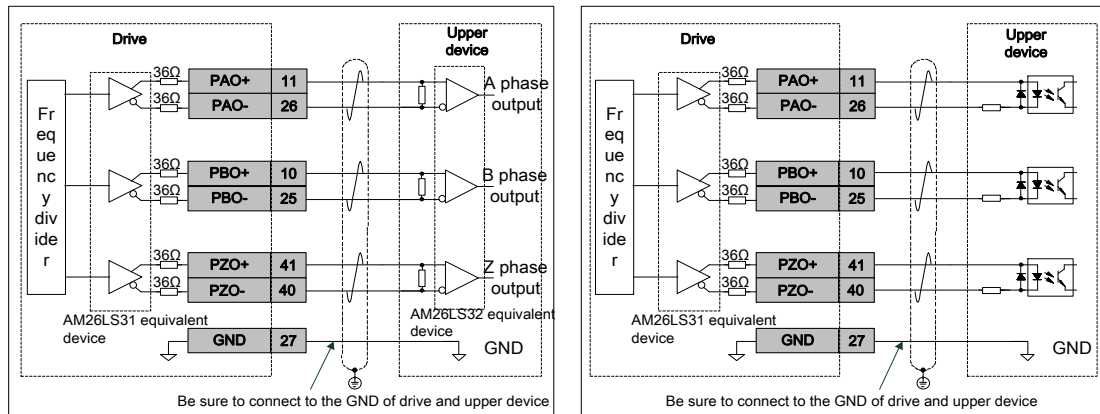
Symbol	Connector Pin number	Function
PAO-	26	A Phase Frequency Division Output Signal-
PBO+	10	B Phase Frequency Division Output Signal+
PBO-	25	B Phase Frequency Division Output Signal-
PZO+	41	Z Phase Frequency Division Output Signal+
PZO-	40	Z Phase Frequency Division Output Signal-
OCZ	12	Z Phase Frequency Division Output Signal
GND	27	Origin Pulse Open Collector Output Signal Ground

The drive provides two types of interfaces: the differential drive interface and the Z-phase pulse open collector output interface.

### 3.3.7.1 Differential Drive Output

The frequency-divided-processed encoder signals (A phase, B phase, Z phase) are differentially output through long-line drives.

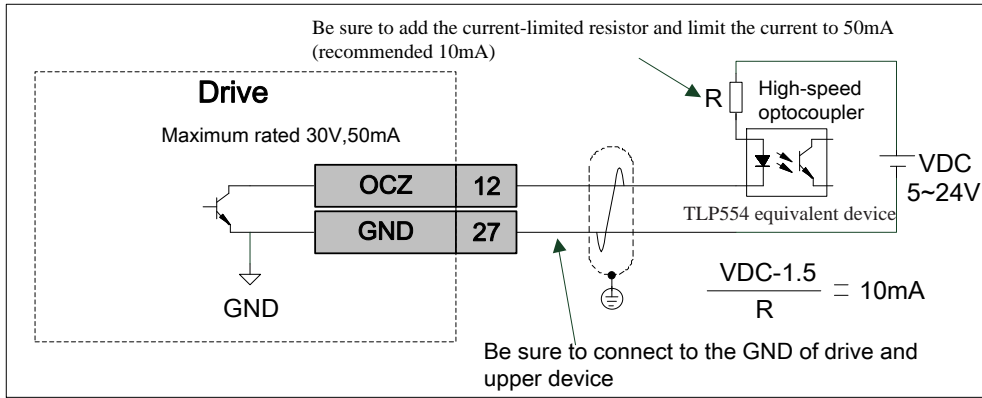
When using a receiver on the upper device side, be sure to install terminal resistors (recommended around 330 Ω) at the inputs of the long-line receiver. When using an optocoupler circuit for reception, use a high-speed optocoupler and limit the line current to within 20mA.



### 3.3.7.2 Open Collector Output

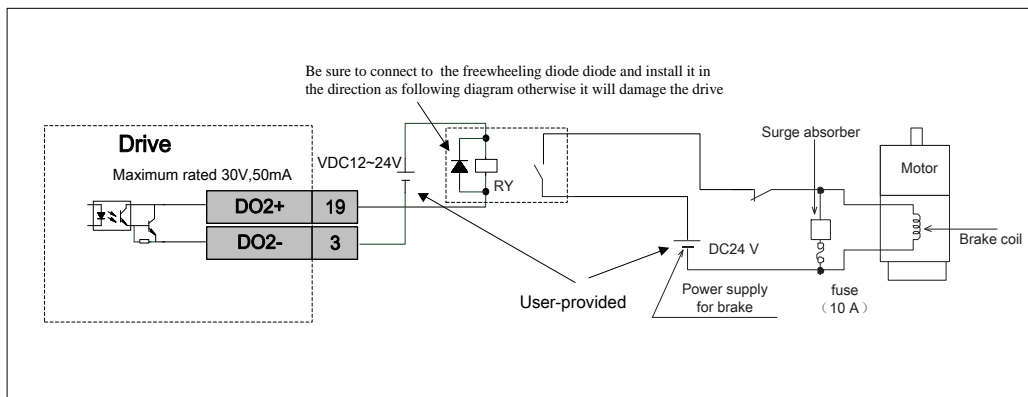
This interface serves as the open collector interface for the Z-phase frequency-divided output signal of the encoder and is a non-insulated interface.

Due to the narrow pulse width of the Z-phase signal, use a high-speed optocoupler to receive the signal on the upper device side.



### 3.3.8 Connection of Brake Signal

Symbol	Function	Connector pin number	Description
DO2+	Blk+	19	Brake signal
DO2-	Blk-	3	



Note: User should provide 24V power supply

Brake usage and wiring precautions:

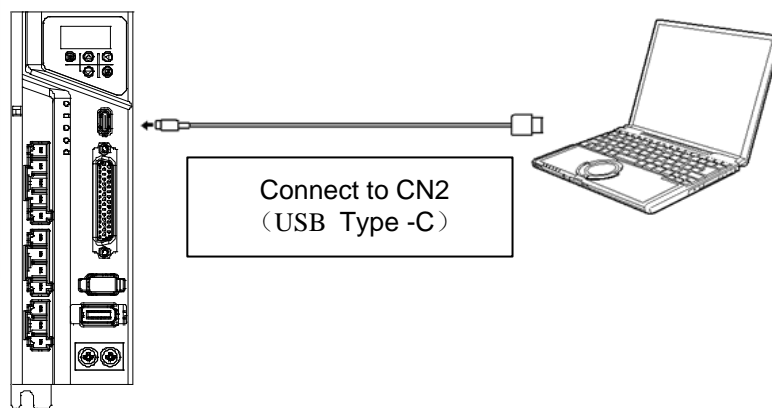
- ◆ The length of the motor brake cable should consider the voltage drop caused by cable resistance. The brake operation needs to ensure that the input voltage is at least 21.6V.
- ◆ It is preferable not to share the brake with other appliances to prevent voltage or current reduction due to the operation of other appliances, ultimately leading to brake misoperation.
- ◆ It is recommended to use cables with a cross-sectional area of 0.5mm<sup>2</sup> or above.
- ◆ For the timing diagram of the brake enable sequence and related function code settings, please refer to the *FV5 Series Rotary Pulse Servo Drive User Manual*.
- ◆ The built-in brake mechanism in the servo motor is a fixed dedicated mechanism that operates without electricity and should not be used for braking purposes. It should only be used when the servo motor is stayed in stop state.
- ◆ After the servo motor stops, the servo enablement (S-ON) should be disabled.
- ◆ When the motor with the built-in brake is running, the brake may make a clicking sound, which has no effect on its function.
- ◆ When the brake coil is powered up (brake open state), magnetic flux leakage may occur at the shaft end and other parts. Pay attention when using magnetic sensors or other instruments near the motor.

### 3.4 Wiring of Connector CN2

CN2 is the communication interface between the drive and the PC, using a USB cable to connect the drive and PC for parameter setting and monitoring.

PC side communication cable: standard USB Type-C cable

Symbol	Connector pin number	Description
GND	A1、 B1、 A12、 B12	Signal ground
D+	A6、 B6	Data signal line
D-	A7、 B7	

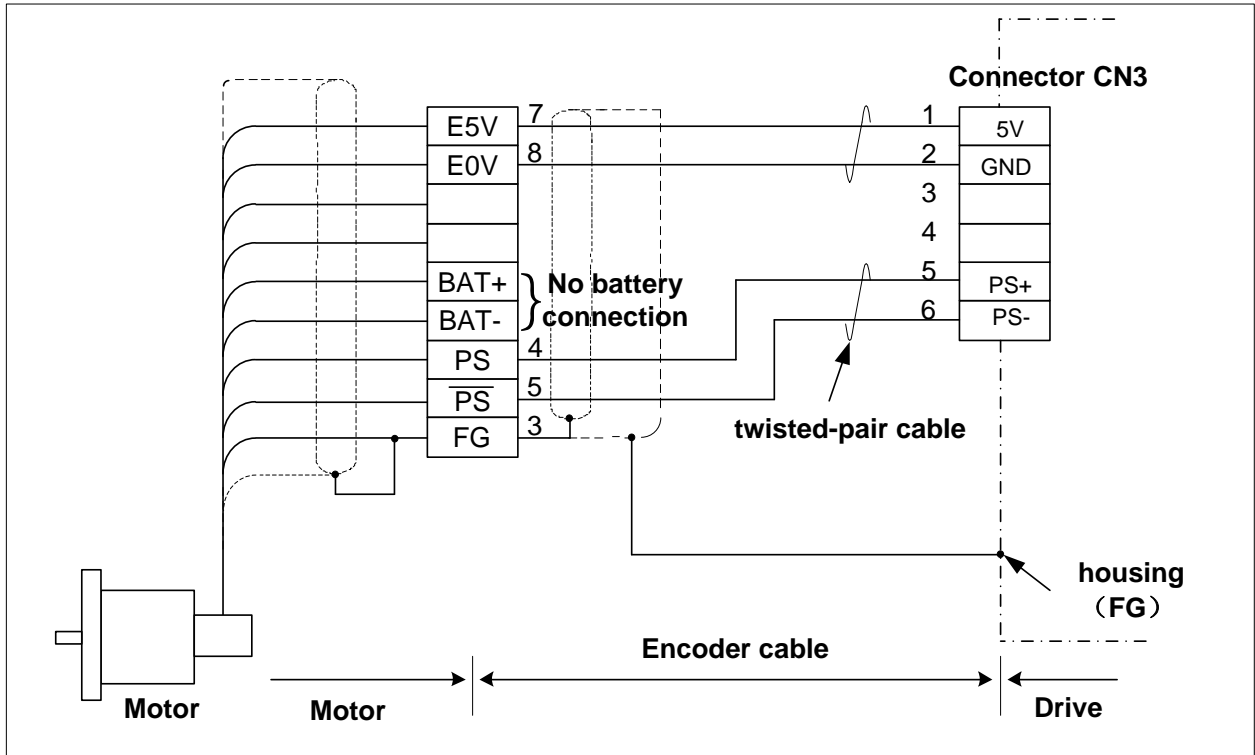


### 3.5 Wiring of Connector CN3

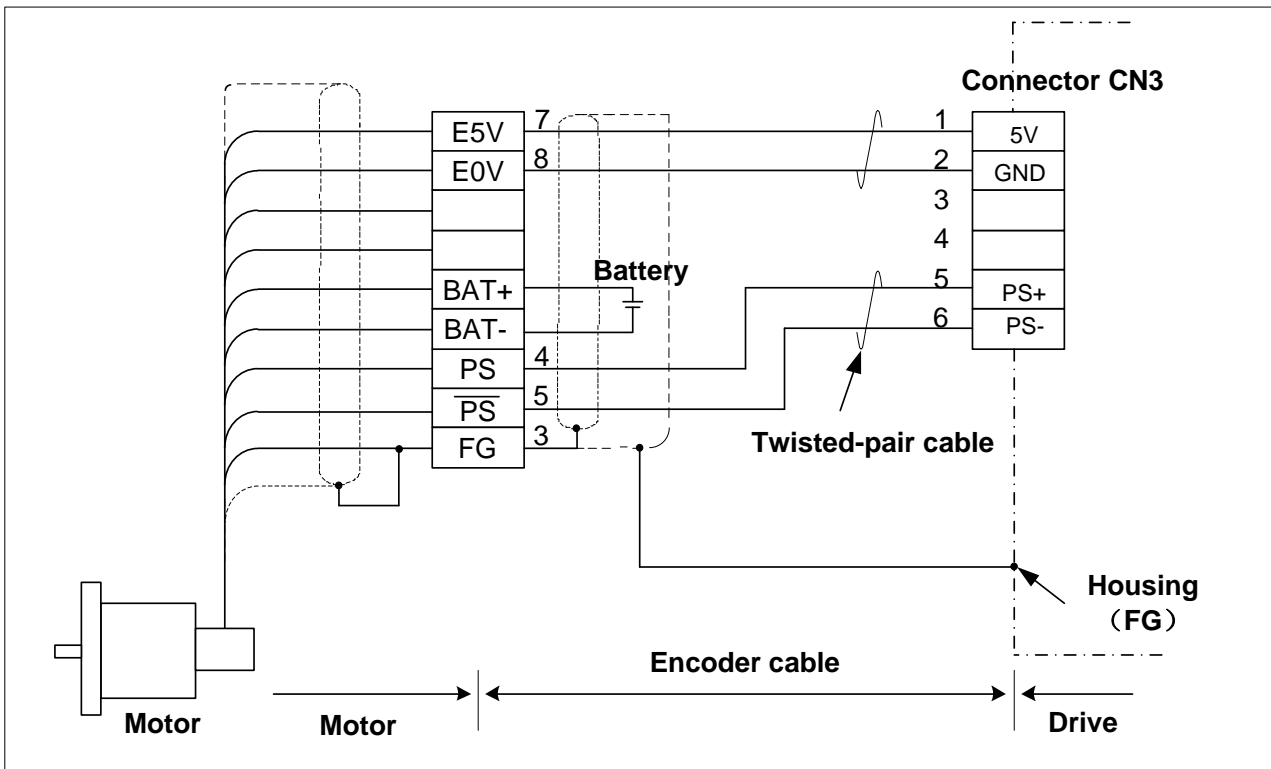
Connector	Connector pin number	Symbol	Description
	1	5V	Encoder +5V power supply
	2	GND	
	3		Serial data sending/reception signal
	4		
	5	PS+	
	6	PS-	
	Enclosure	PE	Connection between the drive's internal and PE terminals

#### 3.5.1 Connect to Bus Encoder

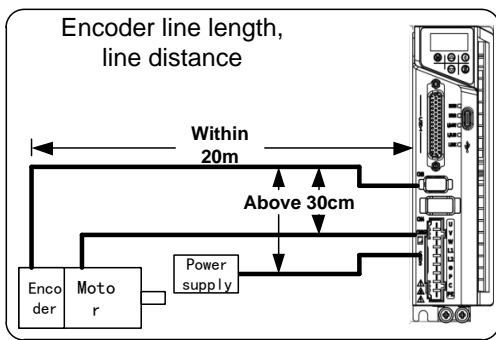
- ◆ When using a single-turn absolute position encoder



◆ When using a multi-turn absolute position encoder



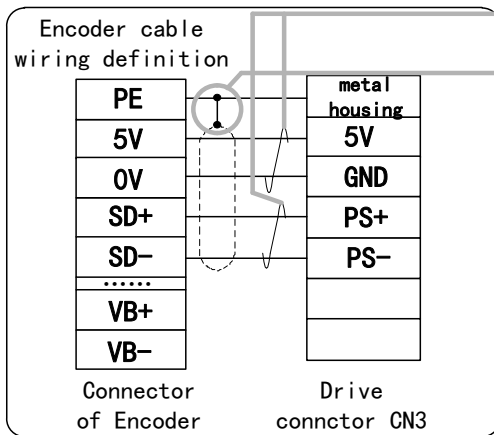
### 3.5.2 Communication Type Encoder Wiring Key Points



- The cable length between the driver and the motor should be within 20 meters
- Keep a distance of at least 30cm from the main circuit wiring. Do not bundle it together with conduit.

○ Tips for making encoder cables

- ① Refer to the wiring illustration
- ② Material: Use wires with a core diameter of at least 0.18mm<sup>2</sup> (AWG 24) and configure them with shielded twisted pair cables that are resistant to bending.



- ③ Use twisted-pair cables for wiring relative signals/power

④ Shield layer handling

Shield layer on the driver side: solder to the enclosure of connector CN3

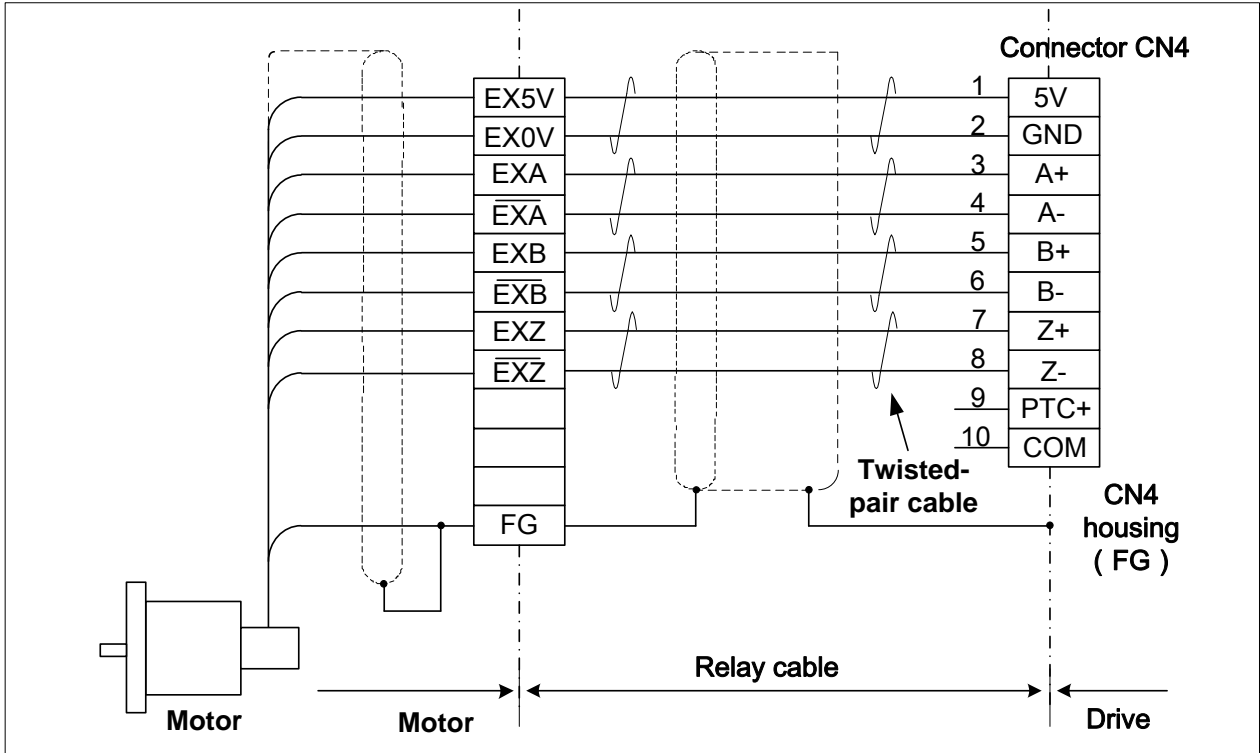
- ⑤ Do not make any connections to the unused terminals of each connector

### 3.6 Wiring of Connector CN4

#### 3.6.1 Connect to Incremental Encoder

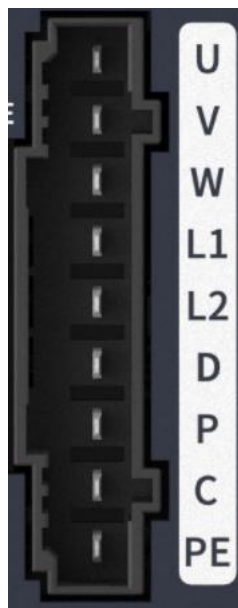
Connector	Connector pin number	Symbol	Description
	1	5V	Encoder power supply
	2	GND	Power and encoder signal ground connected to the internal signal ground of the drive
	3	A+	Encoder A phase signal (twisted-pair)
	4	A-	
	5	B+	Encoder B phase signal (twisted-pair)
	6	B-	
	7	Z+	Z phase zero pulse signal (twisted-pair)
	8	Z-	
	9	PTC+	Temperature sampling signal (not necessary if no PTC signal)
	10	COM	Temperature sampling signal reference ground (not necessary if no PTC signal)

Connector	Connector number	pin	Symbol	Description
	Housing		PE	Connected to the PE terminal and the internal of the drive



### 3.7 Wiring of Connector CN5

#### 3.7.1 Interface Definition of SIZE-A/SIZE-B Connector CN5





Symbol	Name	Function
U、V、W	Servo motor connection Terminal	The servo motor connection terminal, connected to the U, V, W phases of the motor.
L1、L2	Main circuit power input terminal	The main circuit single-phase power input, connected to AC 220V power supply between L1 and L2
N/D	Negative voltage terminal of DC bus	<ul style="list-style-type: none"> <li>◆ SIZE-A: Terminal for the DC bus of the drive. Do not connect when running standalone.</li> <li>◆ SIZE-B: Terminal for internal discharge resistor connection. Short D and P to use the built-in discharge resistor.</li> </ul>
P、C	Brake resistor connection terminal	Terminal for connecting an external brake resistor
⊕	Ground	Two grounding terminals connected to the power supply ground terminal and the motor ground terminal. Be sure to ground the entire system.

### 3.7.2 Interface Definition of SIZE-C/SIZE-D Connector CN5/CN6/CN7



- ◆ CN5 connector terminals

Symbol	Name	Function
L1C、L2C	Auxiliary power input terminal	Refer to nameplate information to connect to the corresponding voltage level auxiliary power supply.
R、S、T	Main circuit power input terminal	Refer to nameplate information to connect to the corresponding voltage level main circuit power supply.

◆ CN6 connector terminals

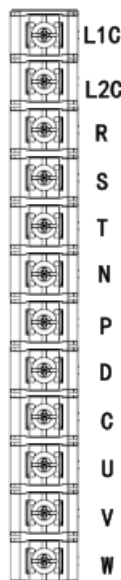
Symbol	Name	Function
N	DC bus negative voltage terminal	The DC bus terminal of the drive. Do not connect when operating as a stand-alone unit.
P、D	Internal brake resistor connection terminal	When P and D is short circuit, connect a internal brake resistor.
C	External brake resistor connection terminal	When connecting an external brake resistor, connect the resistor to P and C.

◆ CN7 connector terminals

Symbol	Name	Function
U、V、W	Servo motor connection terminal	Servo motor connection terminal, connects to the U, V, and W phases of the motor.

Main circuit wiring and precautions, please refer to the [System Wiring and Key Points Explanation](#).

### 3.7.3 Interface Definition of SIZE-E Connector CN5



The definition of the terminals of the CN5 connector for SIZE-E is the same as that of the CN5/CN6/CN7 connectors for SIZE-C/SIZE-D. Please refer to the [Interface Definition of SIZE-C/SIZE-D Connector CN5/CN6/CN7](#).

### 3.7.4 Brake Resistor Selection and Wiring Precautions

- ◆ Do not directly connect the external brake resistor to the positive and negative terminals P and N of the bus bar, as it may cause machine explosions and fires.
- ◆ Before using the drive, please ensure that the brake resistor parameters P02-20, P02-21, and P02-22 are correctly set.
- ◆ Install the external brake resistor on a non-flammable material such as metal.

## 3.8 Wiring of Connector CN8

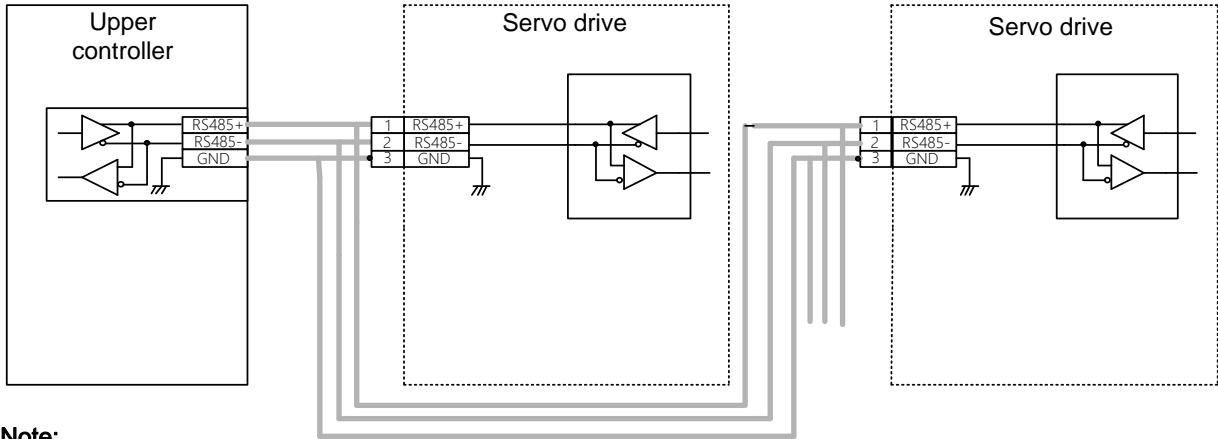
### 3.8.1 Connect to RS485 Communication Signal

RS485 communication signals are connected via the RS485 interface on CN8, with pin definitions as follows.



Symbol	Connector pin number	Function
485+	1	RS485 input/output signal
485-	2	
GND	3	RS485 communication signal ground
PE	4	Shield ground PE

Using the RS485 interface to connect one host and multiple servo drives, set the P09.00 parameter of each servo drive to a value from 0 to 127.



**Note:**

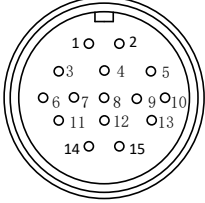
To verify the potential of the signal between drives, connect the GND of each drive.

### 3.9 Wiring of Motor-side Connector

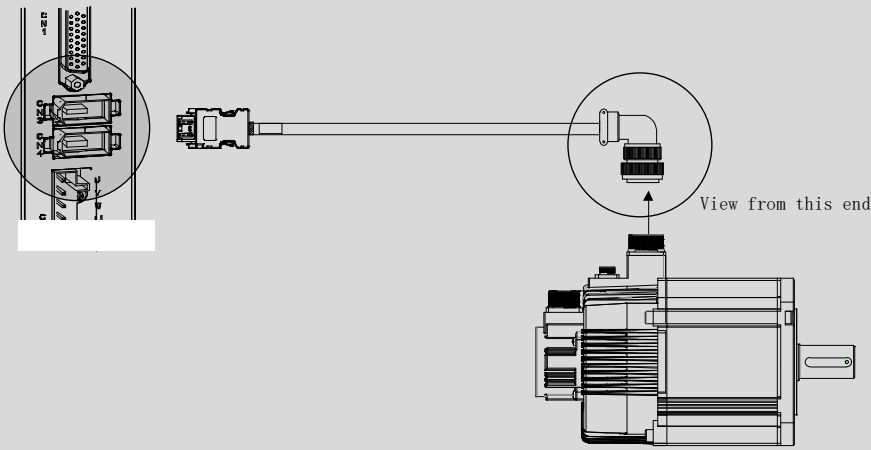
#### 3.9.1 Connection of EAM-W Series Bus Type Motor Encoder Cable

<p><b>Connector Appearance Illustration</b></p>																																										
<p><b>Encoder Cable Terminal Pin Distribution</b></p>		<table border="1"> <thead> <tr> <th>Pin</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>PE</td> <td>Shielding</td> </tr> <tr> <td>2</td> <td>+5V</td> <td>+5V Power Supply</td> </tr> <tr> <td>3</td> <td>0V</td> <td>Reference Ground</td> </tr> <tr> <td>4</td> <td>Empty</td> <td></td> </tr> <tr> <td>5</td> <td>Empty</td> <td></td> </tr> <tr> <td>6</td> <td>Empty</td> <td></td> </tr> <tr> <td>7</td> <td>Empty</td> <td></td> </tr> <tr> <td>8</td> <td>Empty</td> <td></td> </tr> <tr> <td>9</td> <td>Empty</td> <td></td> </tr> <tr> <td>10</td> <td>PS+</td> <td>Serial Data Line</td> </tr> <tr> <td>11</td> <td>Empty</td> <td></td> </tr> <tr> <td>12</td> <td>VB+</td> <td>DC Bias Voltage</td> </tr> </tbody> </table>	Pin	Name	Description	1	PE	Shielding	2	+5V	+5V Power Supply	3	0V	Reference Ground	4	Empty		5	Empty		6	Empty		7	Empty		8	Empty		9	Empty		10	PS+	Serial Data Line	11	Empty		12	VB+	DC Bias Voltage	
Pin	Name	Description																																								
1	PE	Shielding																																								
2	+5V	+5V Power Supply																																								
3	0V	Reference Ground																																								
4	Empty																																									
5	Empty																																									
6	Empty																																									
7	Empty																																									
8	Empty																																									
9	Empty																																									
10	PS+	Serial Data Line																																								
11	Empty																																									
12	VB+	DC Bias Voltage																																								

	13	PS-	Serial Data Line
	14	空	
	15	VB-	DC Bias Voltage



### 3.9.2 Connection of EAM-W Series Incremental Motor Encoder Cables

<b>Encoder Cable Terminal Pin Distribution</b>		<b>Pin</b>	<b>Name</b>	<b>Description</b>
		1	PE	Shielding
		2	+5V	+5V Power Supply
		3	0V	Reference Ground
		4	A+	Encoder Data A+
		5	B+	Encoder Data B+
		6	Z+	Encoder Data Z+
		7	A-	Encoder Data A-
		8	B-	Encoder Data B-
		9	Z-	Encoder Data Z-
		10	Empty	
		11	Empty	
		12	Empty	
		13	Empty	
		14	Empty	
		15	Empty	



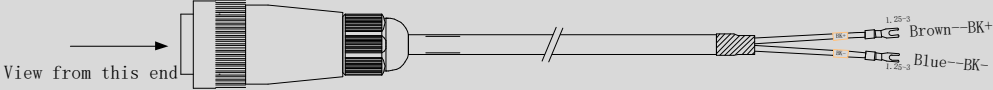
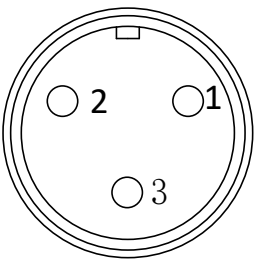
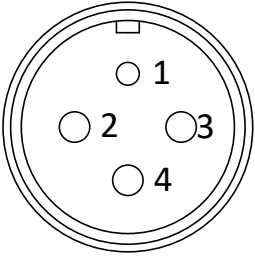
### 3.9.3 Connection of EAM-W Series Motor Power Cables

**Connector Appearance Illustration**

**Power Cable Terminal Pin Distribution**

Pin	Name	Description
2	U	Motor power cable
3	V	
4	W	
1	PE	Ground cable

### 3.9.3.1 Connection of EAM-W Series Motor Brake Cables

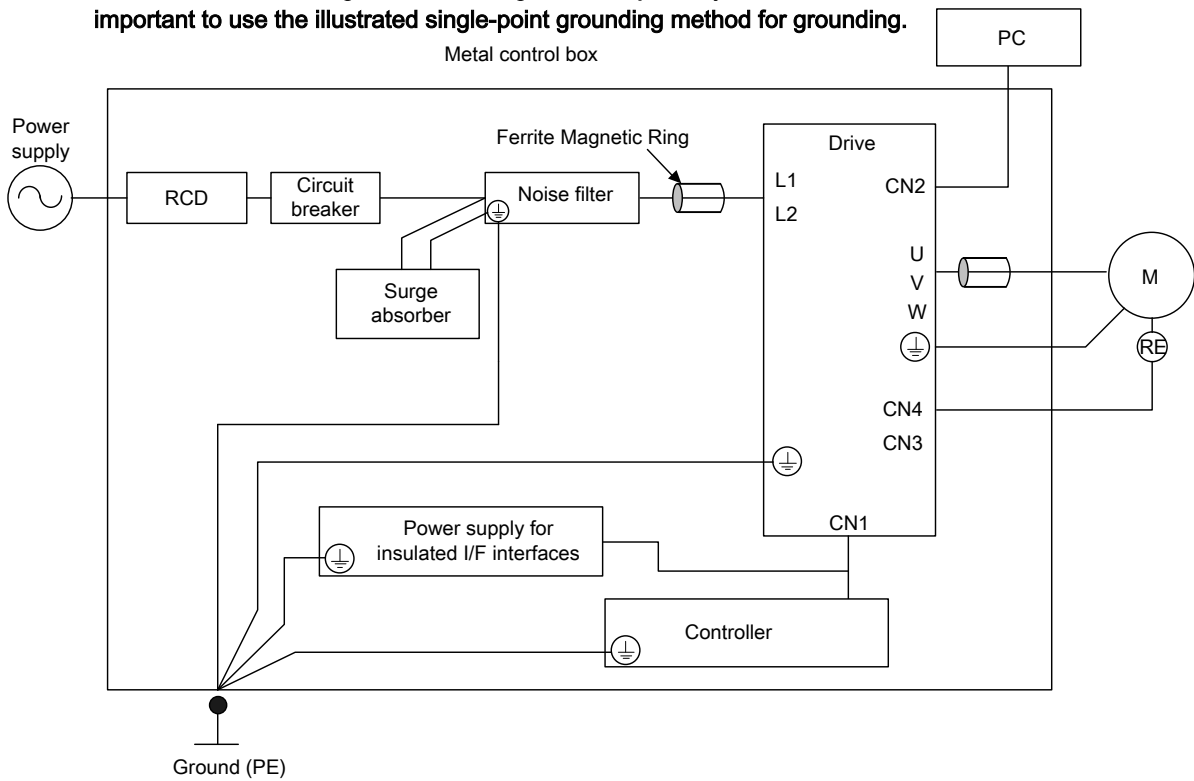
<p><b>Connector Appearance Illustration</b></p>															
<p><b>Brake Cable Terminal Pin Distribution (3-core)</b></p>	 <table border="1" data-bbox="657 660 1257 873"> <thead> <tr> <th>Pin</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>24V</td> <td rowspan="2">Brake output cable</td> </tr> <tr> <td>2</td> <td>0V</td> </tr> <tr> <td>3</td> <td>Empty</td> <td></td> </tr> </tbody> </table>	Pin	Name	Description	1	24V	Brake output cable	2	0V	3	Empty				
Pin	Name	Description													
1	24V	Brake output cable													
2	0V														
3	Empty														
<p><b>Brake Cable Terminal Pin Distribution (4-core)</b></p>	 <table border="1" data-bbox="657 1025 1257 1294"> <thead> <tr> <th>Pin</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>24V</td> <td rowspan="2">Brake output cable</td> </tr> <tr> <td>2</td> <td>0V</td> </tr> <tr> <td>3</td> <td>Empty</td> <td></td> </tr> <tr> <td>4</td> <td>Empty</td> <td></td> </tr> </tbody> </table>	Pin	Name	Description	1	24V	Brake output cable	2	0V	3	Empty		4	Empty	
Pin	Name	Description													
1	24V	Brake output cable													
2	0V														
3	Empty														
4	Empty														

## 3.10 Electromagnetic Interference Suppression

### 3.10.1 Example of Interference Wiring

The main circuit of this servo drive uses "high-speed switching elements". Depending on the peripheral wiring of the servo drive and local processing, it may cause switch noise to affect the normal operation of the system. Therefore, the correct grounding method and local processing must be adopted, and noise filters must be added when necessary.

In order to ensure a good electromagnetic compatibility environment, it is important to use the illustrated single-point grounding method for grounding.



### 3.10.2 Grounding

To avoid potential electromagnetic interference issues, please ground as follows:

- ◆ Ensure that the servo drive is reliably grounded with the grounding cable of the main power supply, and tighten the grounding screws.
- ◆ The grounding wire of the controller connected to the servo drive must ultimately connect to the same grounding point as the servo drive's grounding wire.
- ◆ Connect the ground of the servo motor to the grounding screw of the servo drive and ensure reliable grounding to reduce potential electromagnetic interference issues.
- ◆ Ground the shield metal conduit at both ends of the motor's main circuit. It is recommended to use crimping to ensure a good connection.

### 3.10.3 How to Use Input Power Filter and Noise Filter

To prevent interference from the power cable, add an EMI filter to the input power cable of the servo drive. Choose an appropriate noise filter at the power input end based on the input current. When installing and wiring the noise filter, please observe the following precautions.

- ◆ Separate the input and output wiring of the noise filter and avoid bundling them or placing them in the same cable slot.
- ◆ Separate the ground wire of the noise filter from its output power cable.
- ◆ It is recommended to mount the noise filter on the same metal plate as the servo drive and ensure good electrical contact with the metal plate. Ground the metal plate separately with thick wires as much as possible, and place the filter near the drive as close as possible to prevent coupling noise.



### 3.10.4 Other Recommendations for Electromagnetic Interference Suppression

To suppress electromagnetic interference, take the following measures:

- ◆ Keep power and control cables separate. It is recommended to maintain a distance of at least 30cm to improve interference resistance.
- ◆ If power supply and wires need to cross, ensure they cross at a 90° angle.
- ◆ Keep wiring as short as possible to prevent shield interruption and potential signal interference.
- ◆ Use thick wires for grounding (2.0mm<sup>2</sup> or above).
- ◆ Ensure single-point grounding.
- ◆ Avoid sharing power sources with welding machines, discharge processing equipment, etc.