



MSD-PULSE-01 Series Rotary Pulse Servo Drive

Installation Guide

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Preface

Overview

Thank you for choosing MX On Corporation products. The MSD-PULSE-01 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 MSD-PULSE-01 series rotary pulse servo drive is rich in features, excellent in performance, has a high control bandwidth, and supports various command forms 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 servo commissioning software, 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 MSD-PULSE-01 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 MSD-PULSE-01 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 dial the service hotline at +82-31-465-3366.

For more documents, please visit https://www.mxon.co.kr/eng/service/download.php#link_point

Contact Information

Address: 11-35, Simin-daero 327 beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, Republic of Korea

Zip Code: 14055

Website: <https://www.mxon.co.kr/eng/>

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. MX On Corporation shall not be 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 Earthing	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.

Storage and Transportation Handling Precautions



- ◆ Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- ◆ Avoid storing the equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- ◆ Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.
- ◆ Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.

-
- ◆ Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
 - ◆ Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
 - ◆ Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage.
 - ◆ Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
 - ◆ When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.
-

Unpacking Precautions



-
- ◆ Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking.
 - ◆ Do not install the equipment if you find water seepage or missing or damaged components upon unpacking.
 - ◆ Do not install the equipment if you find the packing list does not conform to the equipment you received.
 - ◆ Unpack the package by following the unpacking sequence. Do not strike the package violently.
-

Installation Precautions Please install in strict accordance with the precautions to avoid personal and property damage.



-
- ◆ It is strictly prohibited to power the servo drive using an IT network. Use only TN/TT grid power.
 - ◆ The servo drive must be grounded through the AC mains ground wire.
 - ◆ The ground wire of the upper unit connected to the servo drive must be the same as the servo drive's ground wire.
 - ◆ The equipment must be operated only by professionals with electrical knowledge.
 - ◆ Read through the guide and safety instructions before installation.
 - ◆ Wiring with the power on is prohibited. Wait at least 15 minutes after disconnecting the power before making contact.
 - ◆ Wear an anti-static wrist strap during wiring and other operations to prevent damage to internal electronic components.
 - ◆ The cables used for wiring must meet the required wire diameter and shielding specifications. The shielding layer of shielded cables must be reliably grounded at one end.
-

Handling Precautions



-
- ◆ Before powering up, ensure that the supply voltage matches the rated voltage and that the wiring is secure to prevent injury to personnel or damage to the equipment.
 - ◆ Before powering up, verify that the wiring sequence is correct. Pay special attention to avoid misconnecting the input cable to the output, as this could damage the device.
 - ◆ When the unit is powered up, the mechanism may activate suddenly. Stay clear of the mechanism to avoid injury.
-

-
- ◆ Do not touch the terminals or disassemble any parts while the equipment is energized to prevent electric shock.
 - ◆ Do not touch the equipment casing, discharge resistors, or other components to avoid burns from high temperatures.
 - ◆ Avoid dropping objects or metal into the unit, as this may cause damage.
 - ◆ The machine owner and operator must ensure the machine is energized and prevent unauthorized personnel from entering the hazardous area.
-

Maintenance Precautions



-
- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
 - ◆ It is strictly prohibited to conduct equipment maintenance while the equipment is powered on. Otherwise, there is a risk of electric shock.
 - ◆ Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
 - ◆ In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.
 - ◆ Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.
-

Repair Precautions

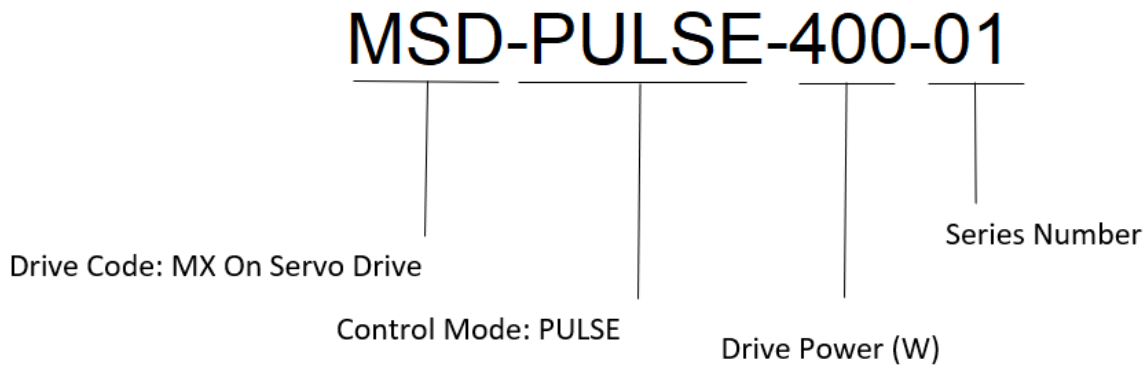


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- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
 - ◆ It is strictly prohibited to conduct equipment maintenance while the equipment is powered on. Otherwise, there is a risk of electric shock.
 - ◆ Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
 - ◆ When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
 - ◆ Do not use damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage.
 - ◆ After the equipment is replaced, check the wiring and set parameters again.
 - ◆ Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.
-

1 Product Information

1.1 Servo Drive

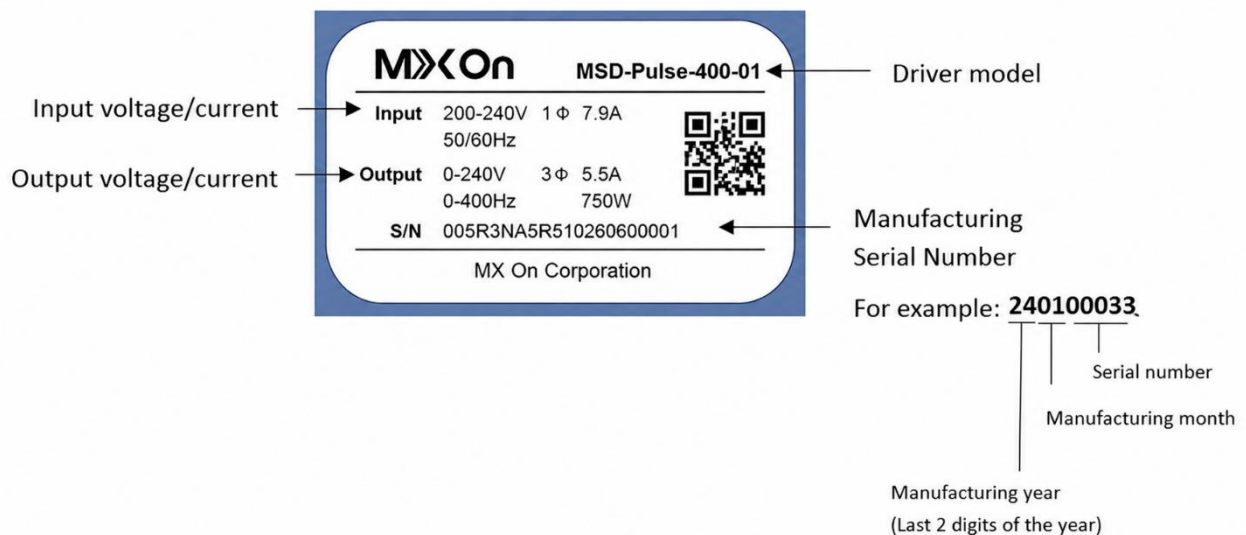
1.1.1 Drive Model Description



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

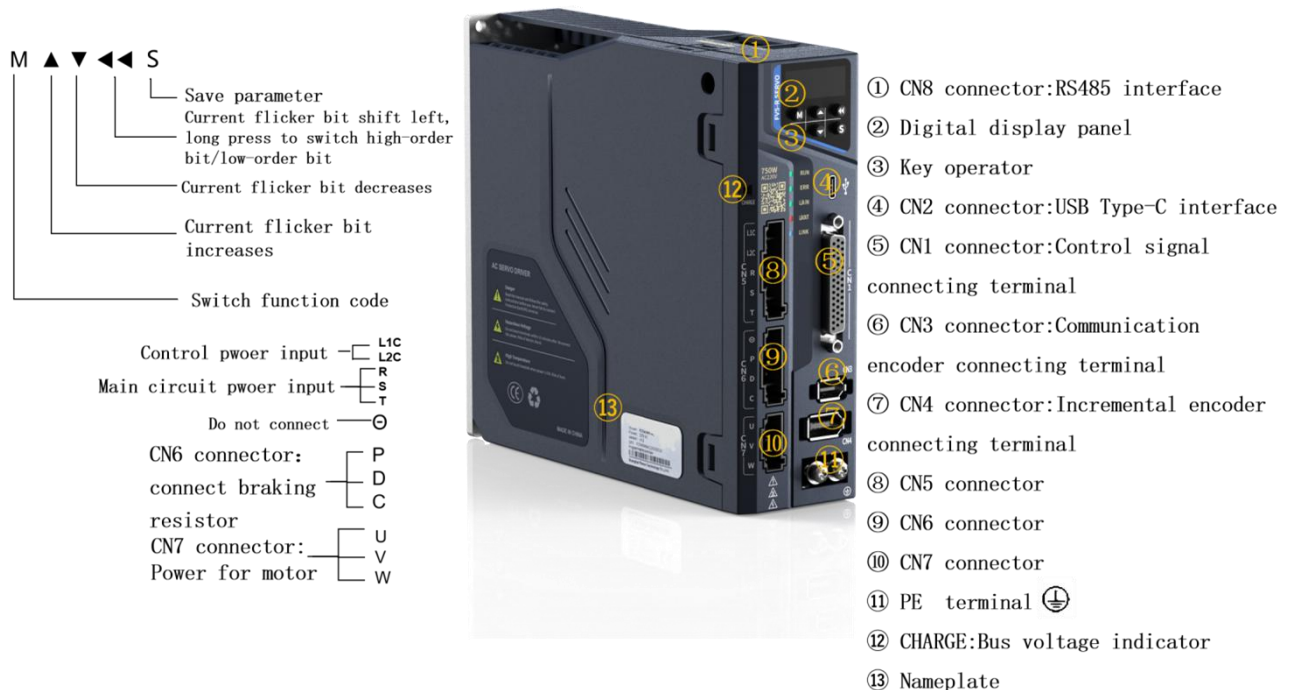


1.1.3 Product Appearance

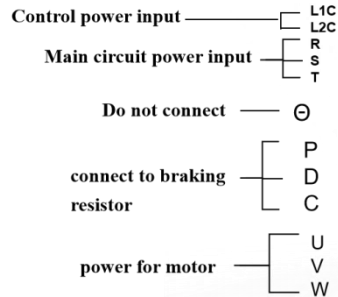
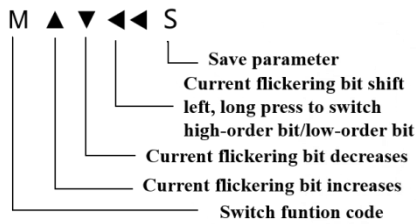
1.1.3.1 SIZE-A/SIZE-B Type



1.1.3.2 SIZE-C/SIZE-D Type



1.1.3.3 SIZE-E Type



- ① CN8 connector: RS485 interface
- ② Digital display panel
- ③ Key operator
- ④ CN2 connector: USB Type-C port
- ⑤ CN1 connector: Control signal connecting terminal
- ⑥ CN3 connector: Connect to communication encoder
- ⑦ CN4 connector: Connect to incremental encoder
- ⑧ CN5 connector
- ⑨ CN5 connector
- ⑩ CN5 connector
- ⑪ PE terminal $\oplus$
- ⑫ CHARGE: Bus voltage indicator
- ⑬ Nameplate

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	MSD-PULSE-100-01	MSD-PULSE-200-01	MSD-PULSE-400-01	MSD-PULSE-750-01	MSD-PULSE-1000-01(220)	MSD-PULSE-1500-01(220)
Input power	Single-phase/Three-phase AC 200V~240V， -10%~+10%， 50/60Hz					
Rated output current (ARMS)	1.1	1.6	2.8	5.5	7.6	12
Peak output 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		
Dynamic braking	Built-in					
Braking resistor	Externally connected brake resistor			Built-in braking resistor, can be connected externally		
Minimum resistance of external braking resistor (Ω)	40	40	40	40	20	15
Installation dimensions	SIZE-A			SIZE-B	SIZE-C	SIZE-D

Note: MSD-PULSE-01 has no built-in brake resistor.

Model	MSD-PULSE-1000-01(380)	MSD-PULSE-1500-01(380)	MSD-PULSE-2000-01	MSD-PULSE-3000-01	MSD-PULSE-5000-01	MSD-PULSE-6000-01	MSD-PULSE-7500-01
Input power	Three phase AC 380V~440V, -10%~10%, 50/60Hz						
Rated output current(ARMS)	3.5	5.4	8.4	12	17	21	26
Peak output current(ARMS)	11	14	20	30	42.5	52.5	65
Output power(W)	1000	1500	2000	3000	5000	6000	7500

Model	MSD-PULSE-1000-01(380)	MSD-PULSE-1500-01(380)	MSD-PULSE-2000-01	MSD-PULSE-3000-01	MSD-PULSE-5000-01	MSD-PULSE-6000-01	MSD-PULSE-7500-01
Heat dissipation Method	Fan cooling						
Dynamic braking	Built-in						
Braking resistor	Built-in braking resistor, can be connected externally						
Minimum resistance of external braking resistor (Ω)	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		◆ R1 series:17-bit absolute(Tamagawa) ◆ R3 Series: Bus-type serial encoder: 17-bit absolute, 23-bit absolute, ABZ , BISS-C, Endat
	Control signal	DI	8 general-purpose inputs General-purpose input functions are selectable via parameters
		DO	5 general-purpose inputs General-purpose 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/torque hybrid mode. The above 4 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	0.1% of rated velocity (voltage fluctuation: $\pm 10\%$)

Item			Description	
		rate		
		Temperature change rate	Within $\pm 0.1\%$ of rated velocity (temperature fluctuation: 0~50°C)	
	Velocity control range		1~6000RPM	
	Velocity loop frequency response range		3.5kHz	
	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	Approximately 9k Ω	
		Circuit time parameter	Approximately 47 μs	
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	Approximately 9k Ω	
		Circuit time parameter	Approximately 47 μs	
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

Item			Description
		Input pulse frequency	◆ Differential input: Maximum 5 Mpps, pulse width cannot be less than 0.1 μs; ◆ Open collector: Maximum 200 Kpps, pulse width cannot be less than 2.5 μs.
		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-channel 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-channel 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		Built-in analog monitoring connector for observing velocity, torque

Item		Description
	function for observation	command signals, etc.
	Vibration suppression	Supports 0~100Hz low-frequency suppression Supports 100~5000Hz mid-to-high-frequency suppression
	Other	Gain adjustment, alarm logs, JOG operation

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

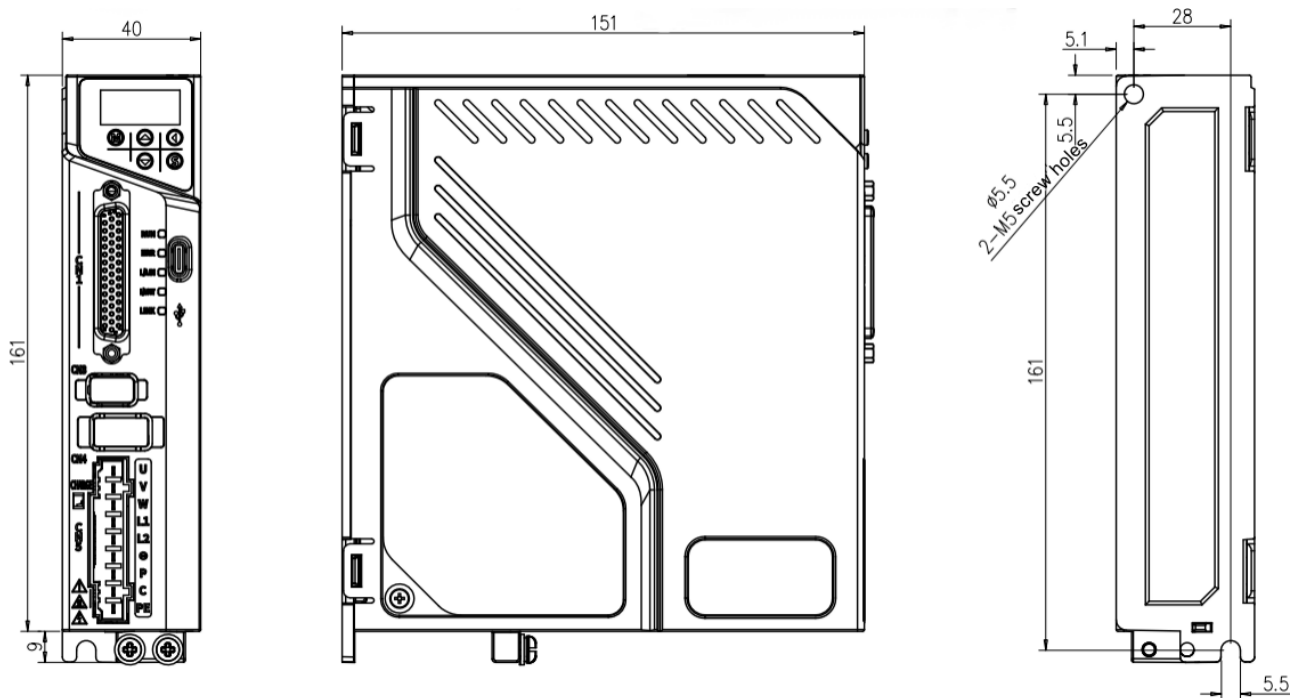
$$\text{Velocity variation rate} = (\text{No-load velocity} - \text{Full-load velocity}) / \text{Rated velocity} * 100\%$$

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.

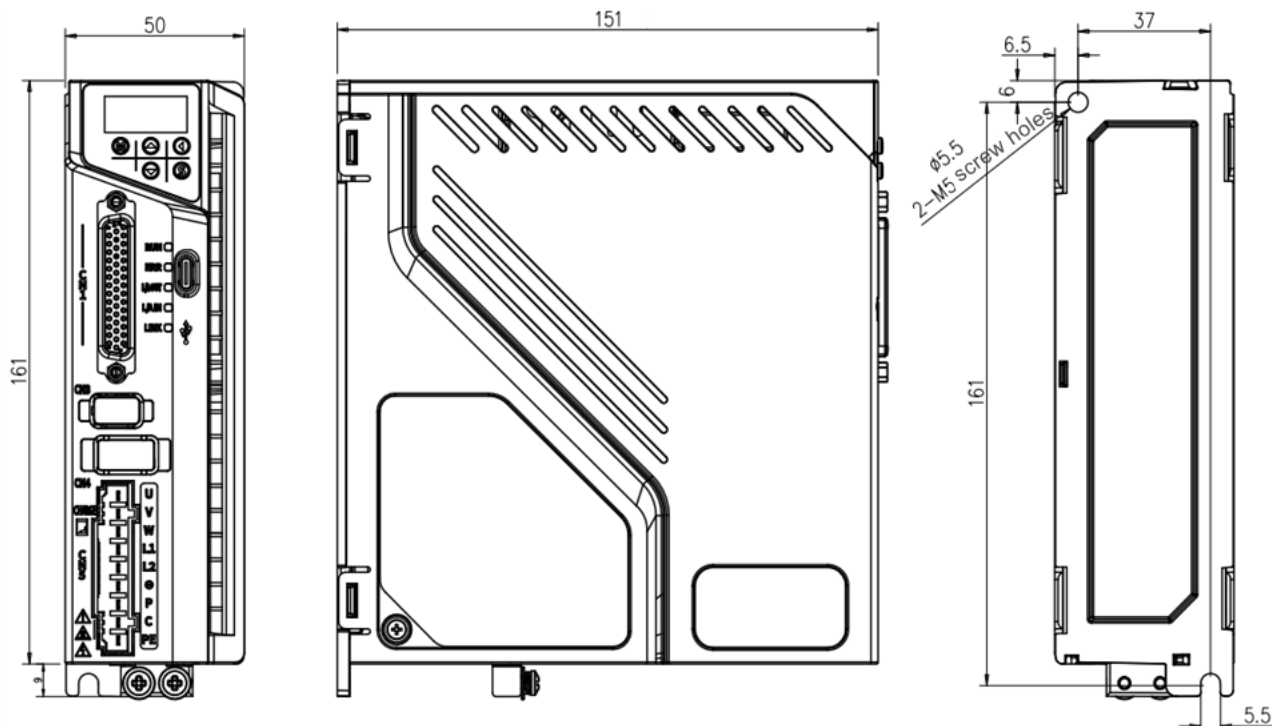
Note *2: The built-in open collector power supply is not electrically insulated from the control circuitry inside the servo drive.

1.1.4.3 Servo Drive Installation Dimensions

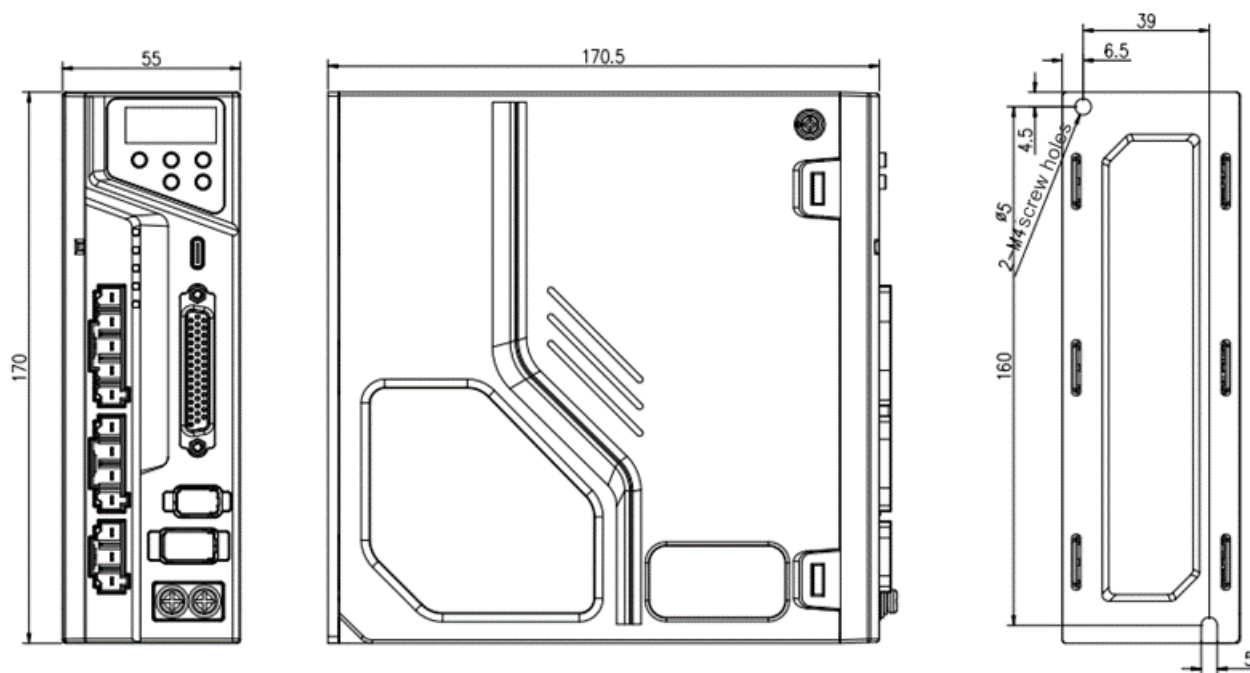
- ◆ The installation dimensions of Size -A (in mm) are shown below. It weighs 0.8 kg.



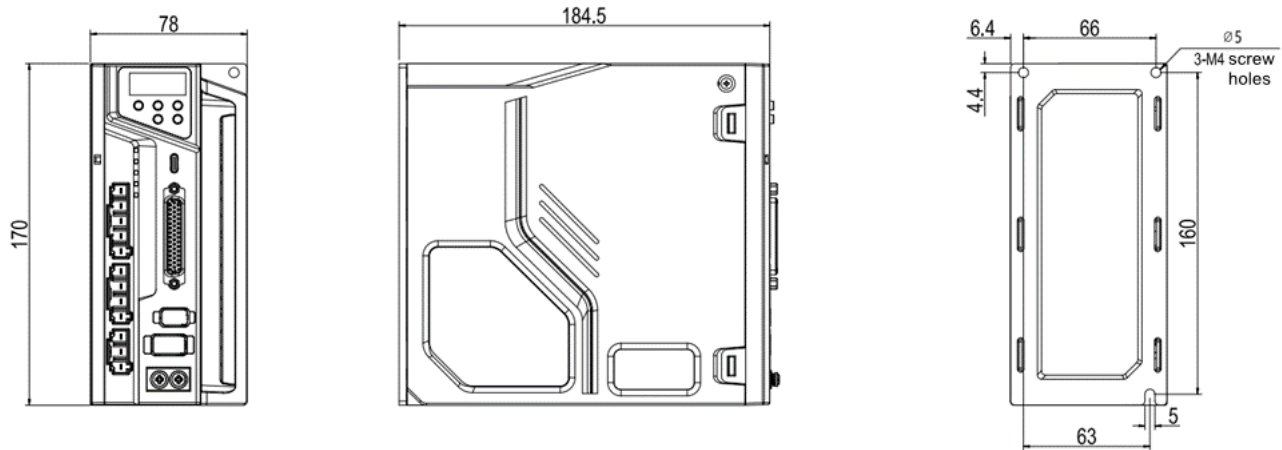
- ◆ The installation dimensions of Size-B (in mm) are shown below. It weighs 1 kg.



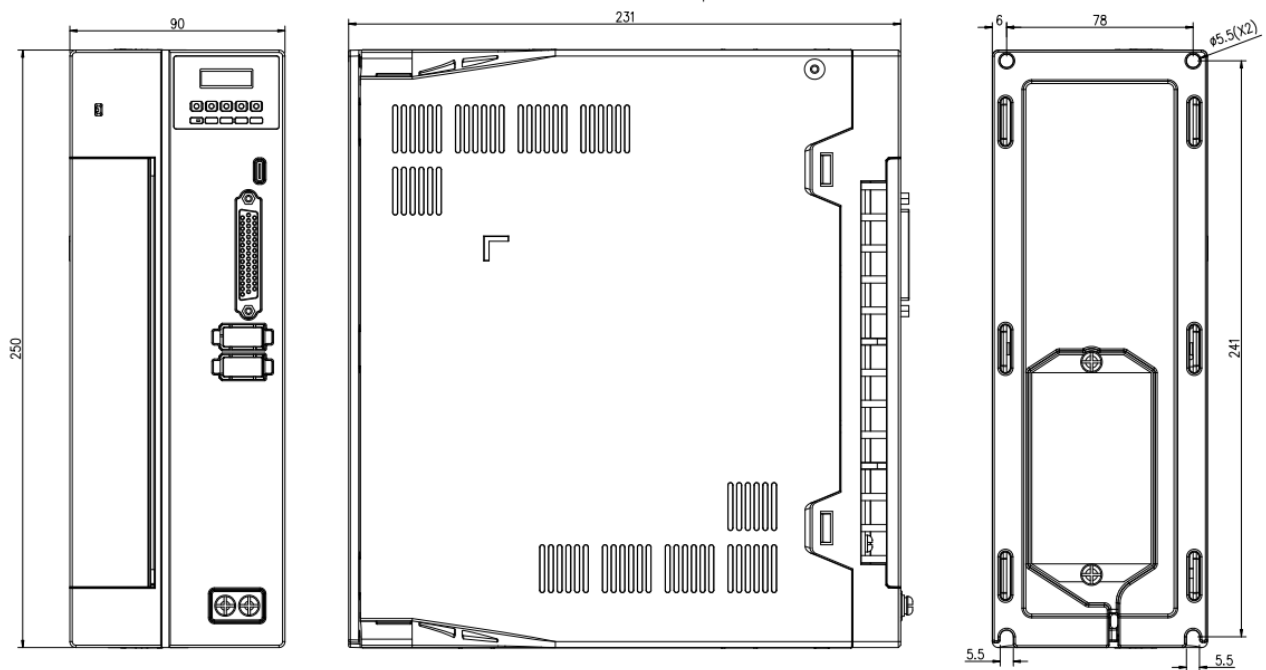
◆ The installation dimensions of Size-C (in mm) are shown below. It weighs 1.3 kg.



◆ The installation dimensions of Size-D (in mm) are shown below. It weighs 1.8 kg.

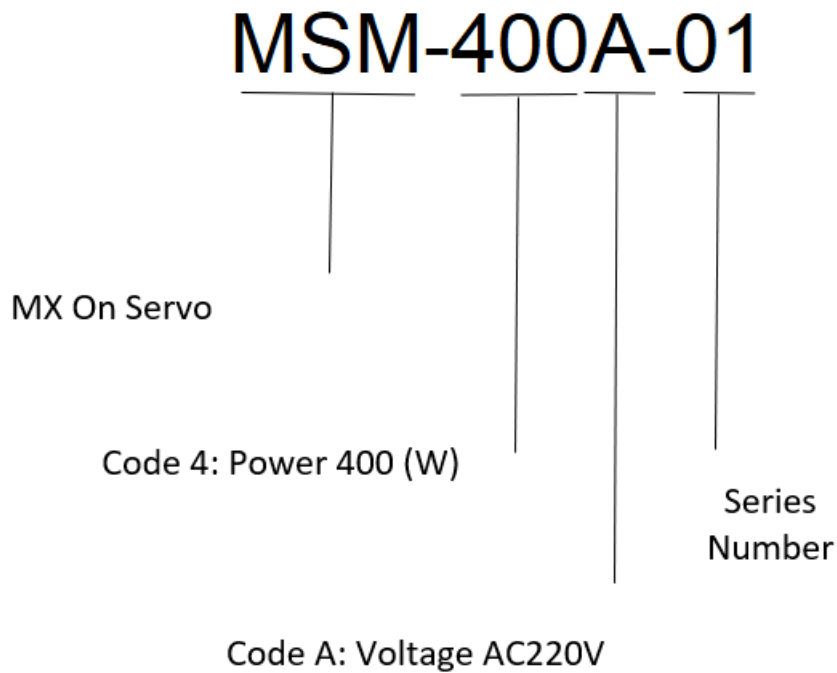


◆ The installation dimensions for Size-E (in mm) are shown below. It weighs 3.6 kg.



1.2 Servo Motors

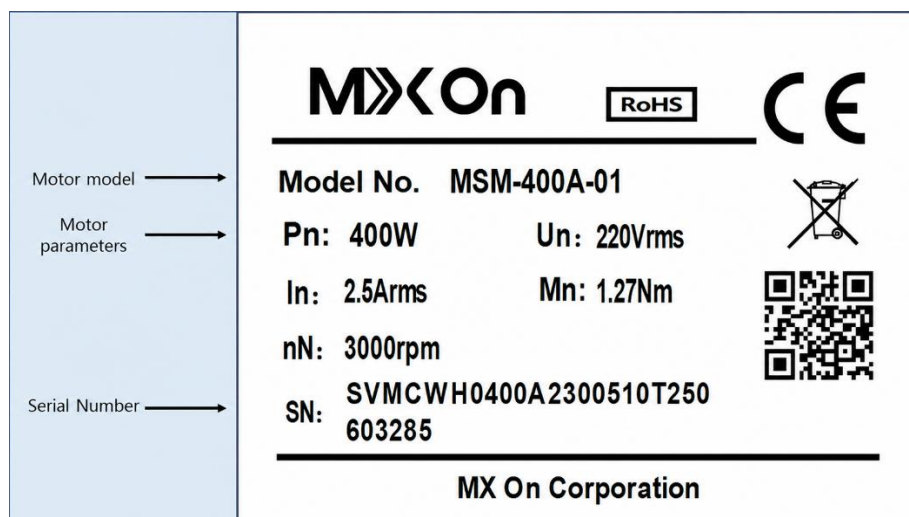
1.2.1 Servo Motor Model Description



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

1.2.2 MSD-PULSE-01 Series Servo Motors

1.2.2.1 MSD-PULSE-01 Series Servo Motors Nameplate Description



1.2.2.2 MSD-PULSE-01 Series Servo Motors Specifications

Model (High inertia)	Flangesize (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 ⁻⁴ kg • m ²)	Voltage (V)
MSM-100A-01	40	100	0.32	1.12	0.98	3000	6000	0.31(0.34)	220
MSM-200A-01	60	200	0.64	2.23	1.3	3000	6000	0.34(0.35)	220
MSM-400A-01	60	400	1.27	4.45	2.6	3000	6000	0.59(0.60)	220
MSM-750A-01	80	750	2.39	8.36	4.6	3000	6000	1.72(1.77)	220

Model (Medium inertia)	Flangesize (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 ⁻⁴ kg • m ²)	Voltage (V)
MSM-2900A-01	180	2900	18.6	46.5	10.26	1500	3000	46.19(51.94)	380
MSM-4400A-01	180	4400	28.4	78.1	15.6	1500	3000	67.22(72.97)	380
MSM-5500A-01	180	5500	35	102	19.77	1500	3000	89.57(96.57)	380
MSM-7500A-01	180	7500	48	119	26.45	1500	3000	125.26(132.6)	380

Model (Low inertia)	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 ⁻⁴ kg • m ²)	Voltage (V)
MSM-1000A-01(220)	100	1000	3.18	9.55	6.25	3000	6000	1.7(2.45)	220
MSM-1000A-01(380)	100	1000	3.18	9.55	3.44	3000	6000	1.7(2.45)	380
MSM-1500A-01(220)	100	1500	4.77	14.3	8.42	3000	6000	2.52(3.27)	220
MSM-1500A-01(380)	100	1500	4.77	14.3	4.85	3000	6000	2.52(3.27)	380
MSM-2000A-01(220)	100	2000	6.37	19.1	11.79	3000	6000	3.13(3.88)	220
MSM-2000A-01(380)	100	2000	6.37	19.1	7.05	3000	6000	3.65(4.4)	380

Note:

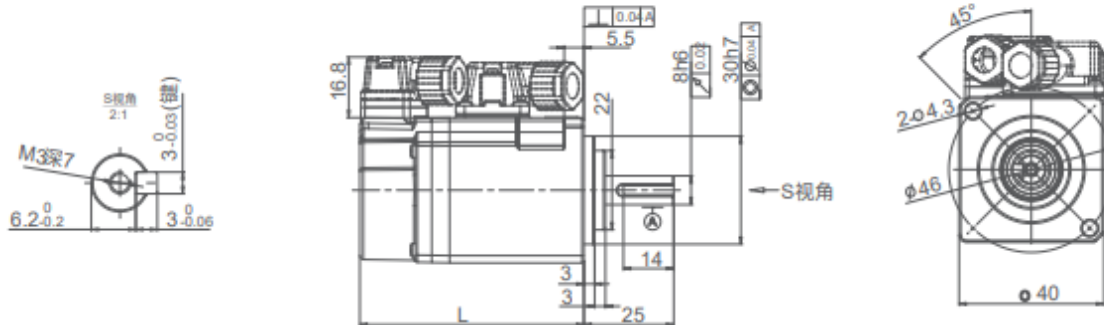
Flange size is 40mm, indicating the mounting panel size as 40mm*40mm; Flange size is 60mm, indicating the mounting panel size as 60mm*60mm; Other sizes follow this pattern

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

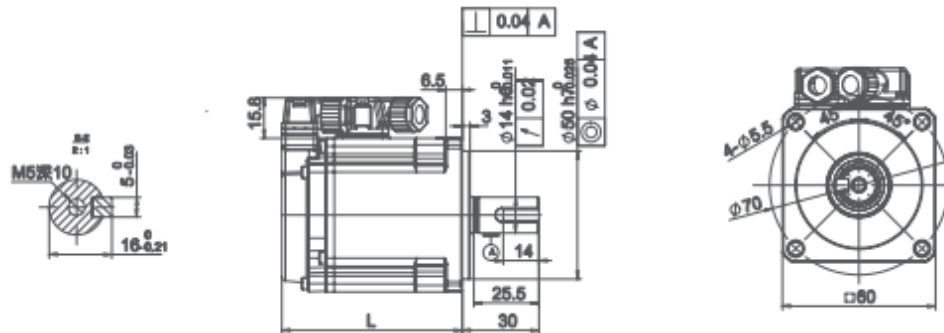
For specifications of other servo motor models, please consult MX On Corporation technical support engineers

1.2.2.3 MSD-PULSE-01 Series Servo Motors Installation Dimensions

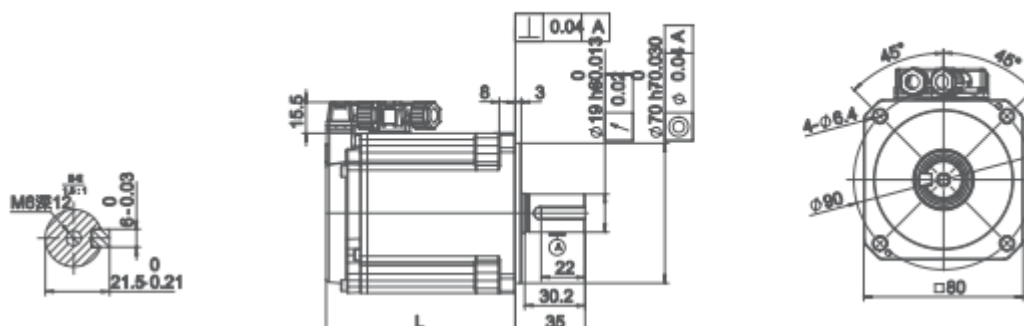
- ◆ 40 Flange Servo motor without brake installation dimension(unit: mm)



- ◆ 60 Flange Servo motor without brake installation dimension(unit: mm)



- ◆ 80 Flange Servo motor without brake installation dimension(unit: mm)



[illegible][illegible]

MSD-PULSE-01 Series Rotary Pulse Servo drive Installation Guide

1.3 Matching Instructions for Servo Drive and Servo Motor

Flange size (mm)	Motor power	Motor model	Drive model
40	100	MSM-100A-01	MSD-PULSE-100-01
60	200	MSM-200A-01	MSD-PULSE-200-01
80	400	MSM-400A-01	MSD-PULSE-400-01
80	750	MSM-750A-01	MSD-PULSE-750-01
100	1000	MSM-1000A-01(220)	MSD-PULSE-1000-01(220)
100	1000	MSM-1000A-01(380)	MSD-PULSE-1000-01(380)
100	1500	MSM-1500A-01(220)	MSD-PULSE-1500-01(220)
100	1500	MSM-1500A-01(380)	MSD-PULSE-1500-01(380)
100	2000	MSM-2000A-01(220)	MSD-PULSE-2000-01
100	2000	MSM-2000A-01(380)	MSD-PULSE-2000-01
180	2900	MSM-2900A-01	MSD-PULSE-3000-01
180	4400	MSM-4400A-01	MSD-PULSE-5000-01
180	5500	MSM-5500A-01	MSD-PULSE-6000-01
180	7500	MSM-7500A-01	MSD-PULSE-7500-01

2 Installation Operation

2.1 Install the Servo Drive

Carefully read the safety instructions in the [Safety Precautions](#) chapter to avoid personal injury and equipment damage.

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 Resistance	5.88 m/s ² (0.6G) at 10~60 Hz
Shock Resistance	19.6m/s ²
Protection level	IP20
Pollution level	PD2

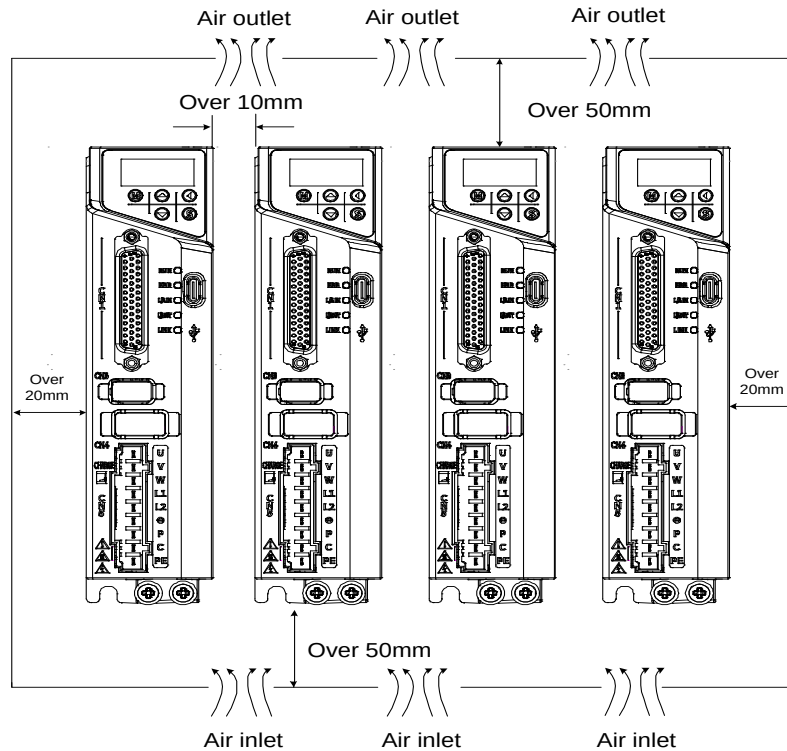
*1: Short-term permissible temperature including transportation factors.

*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.

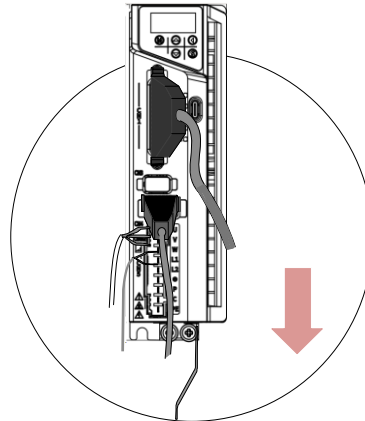
2.1.3.3 Grounding

- ◆ 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 Precautions

- ◆ Do not subject to vibrations or impacts exceeding 5.88 m/s^2 . 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_2S , SO_2 , NO_2 , Cl_2 , etc.), and avoid storing or using in environments with combustible gases.
- ◆ Do not block the servo drive's suction or exhaust ports, or allow foreign objects to enter the product, as this may cause fire or product failure.
- ◆ The power supply must be equipped with a molded case circuit breaker (MCCB) . 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)

Item	Parameters
Storage temperature	-20°C ~ 60°C (Maximum temperature guaranteed: 80°C, 72 hours, Non Condensing*2)
Humidity	Below 90% RH (Non condensing*2)
Vibration resistance	During rotation: below 49m/s ² (5G), during stop: below 24.5m/s ² (2.5G)
Shock resistance	Below 98m/s ² (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

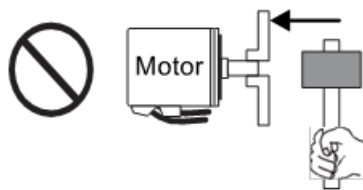
Mount the cable outlet facing downwards to prevent oil or water from entering the motor.

- ◆ 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

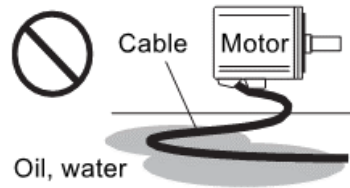
- ◆ When installing or removing a coupling at the motor shaft end, do not use a hammer to directly strike the shaft end (doing so may damage the encoder, especially when installed on the load side of the shaft).



- ◆ 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.

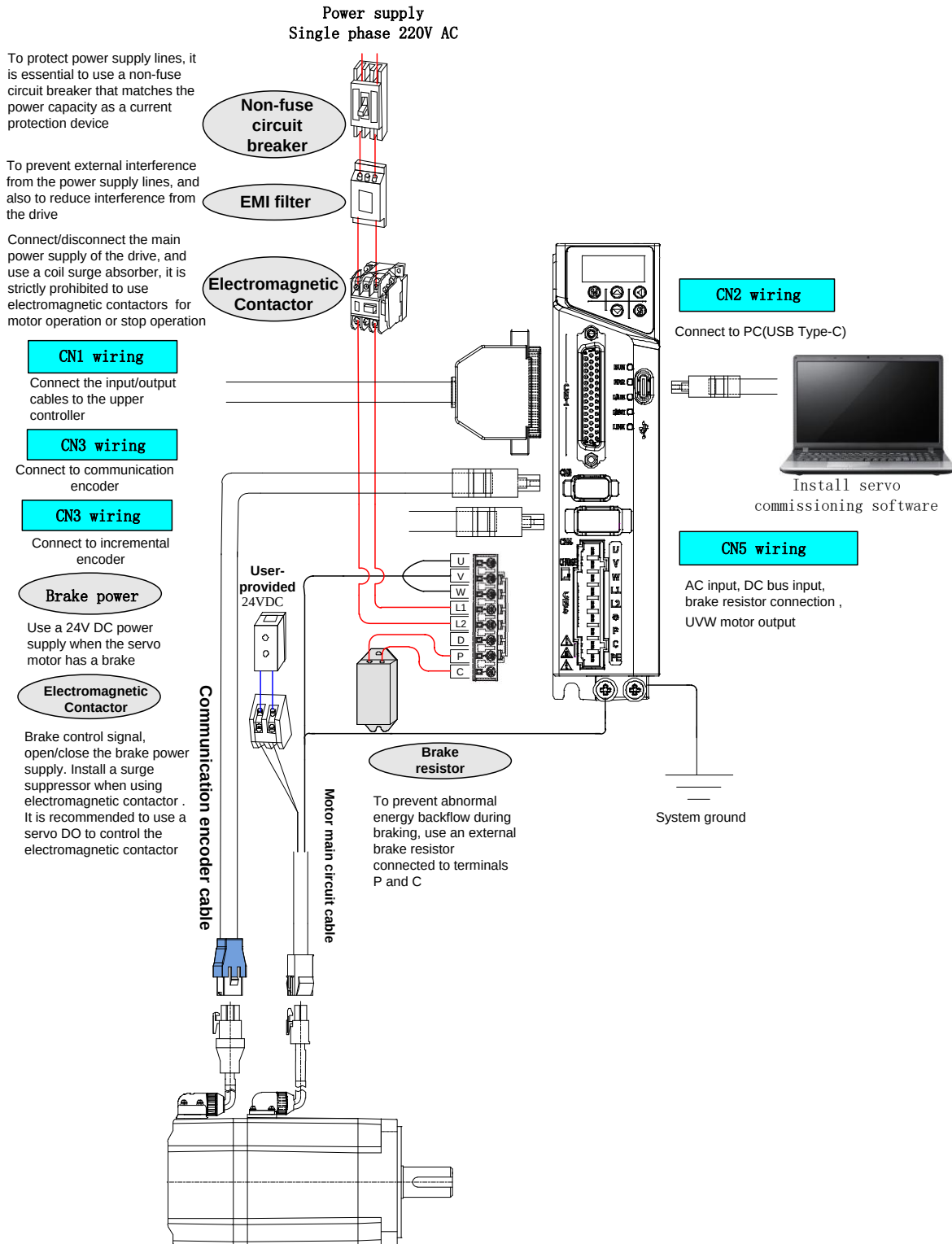
2.2.3.5 Wiring

- ◆ 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.

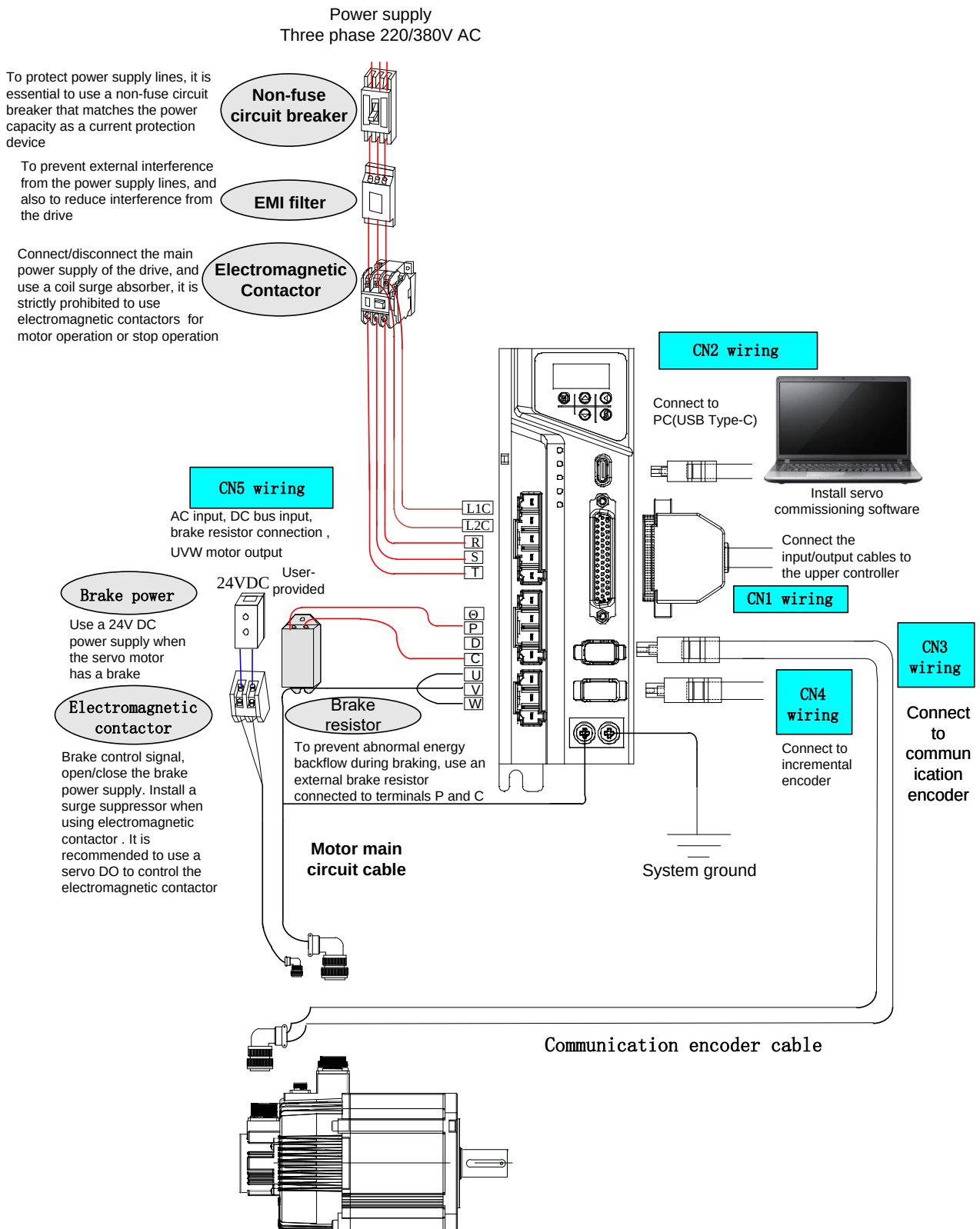
3 Peripheral Devices and Wiring

3.1 Peripheral Device Wiring Illustration

3.1.1 SIZE-A/SIZE-B Type



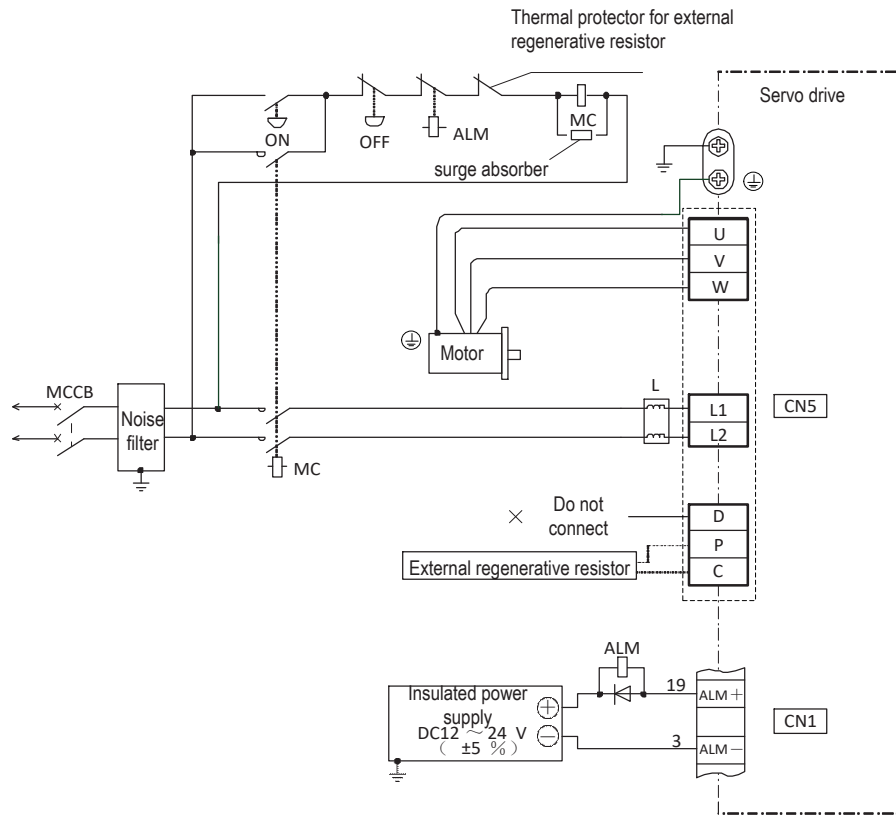
3.1.2 SIZE-C/SIZE-D/SIZE-E Type



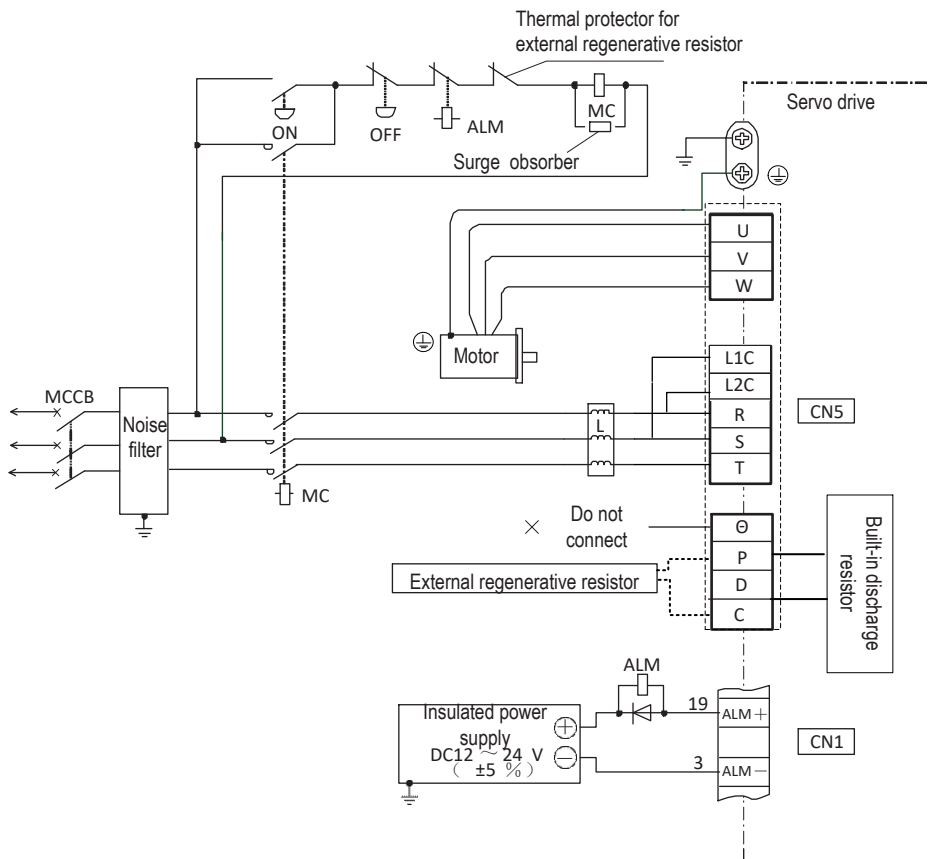
Note: The figure above showcases the wiring for SIZE-C/SIZE-D drives as an example. The wiring method for SIZE-E is the same as for SIZE-C/SIZE-D, but there may be differences in the appearance and positioning of the terminals.

3.1.3 System Wiring and Key Points Explanation

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



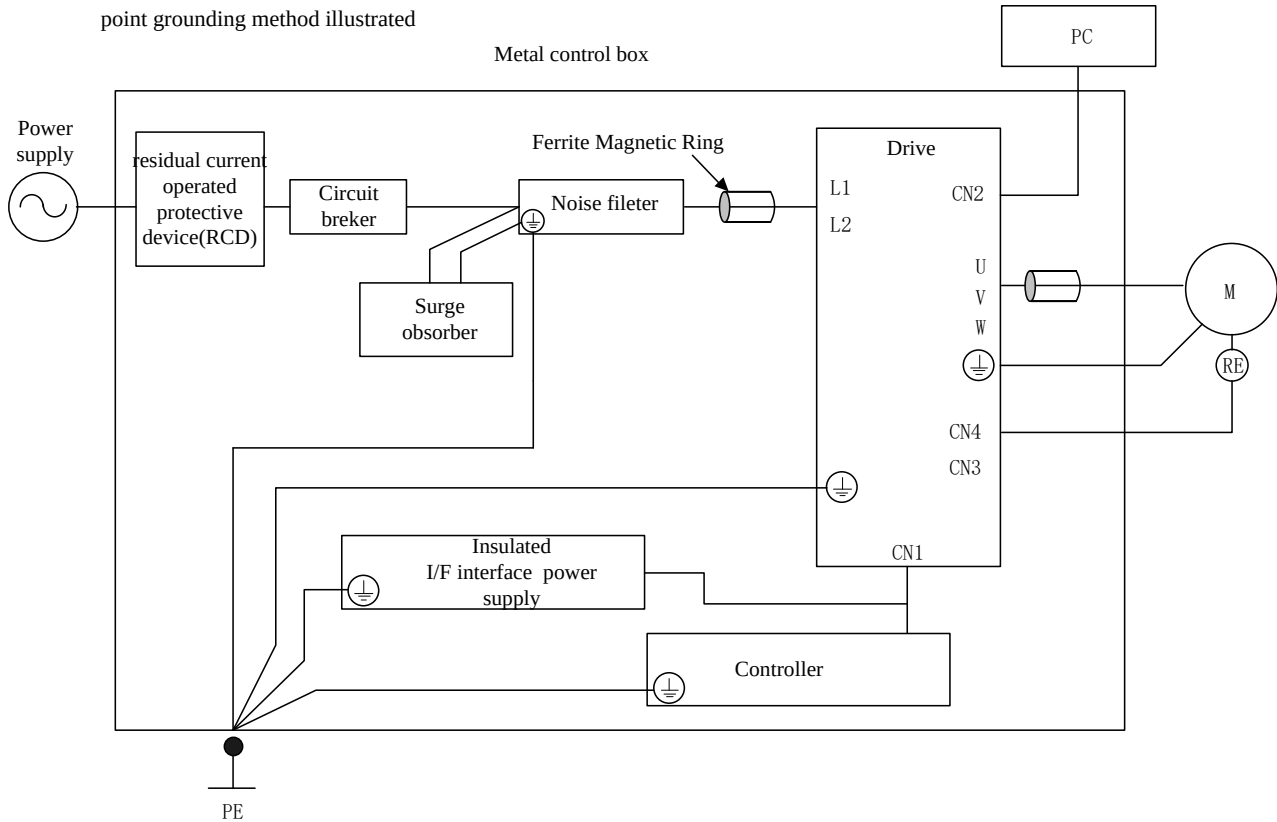
3.1.3.2 SIZE-C/SIZE-D/SIZE-E Type Main Circuit Wiring

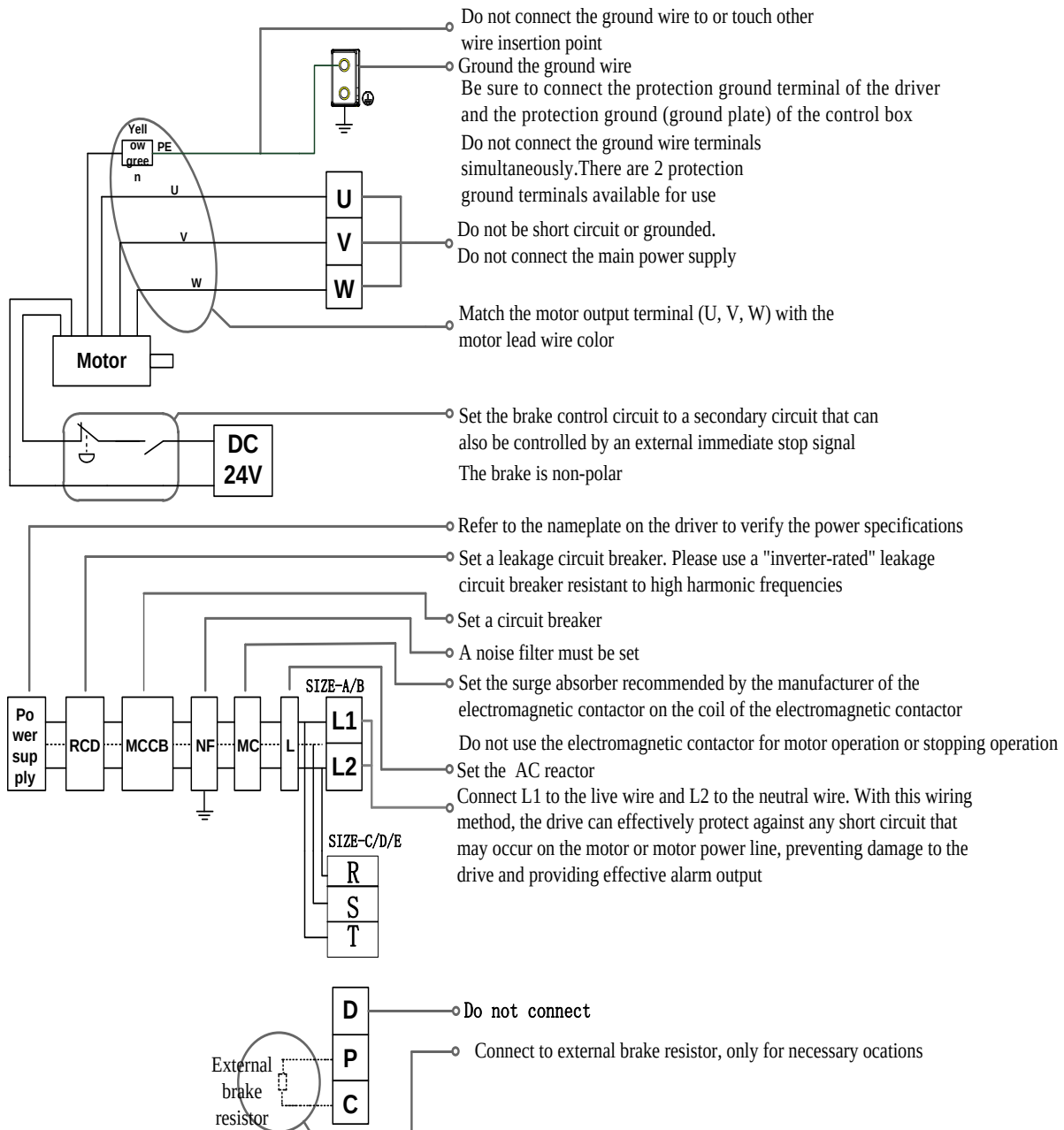


3.1.4 Wiring Key Points

- ◆ 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 that connector plug is 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 List of Matching Cables for Drives and Motors

Flange Dimensions	Motor	Cables	Motor Type	Length (L)	Cable Model
40 60 80	MSM-100A-01 MSM-200A-01 MSM-400A-01 MSM-750A-01 MSM-1000A-01	Power cable	Motor with brake	3m	MSD01-P-CBL-3M(406080/BRK)
				5m	MSD01-P-CBL-5M(406080/BRK)
				10m	MSD01-P-CBL-10M(406080/BRK)
			Motor without brake	3m	MSD01-P-CBL-3M(406080/nBRK)
				5m	MSD01-P-CBL-5M(406080/nBRK)
				10m	MSD01-P-CBL-10M(406080/nBRK)
		Encoder cable	single-turn absolute encoder (CN3)	3m	MSD01-E-CBL-3M(ST406080/nBATT)
				5m	MSD01-E-CBL-5M(ST406080/nBATT)
				10m	MSD01-E-CBL-10M(ST406080/nBATT)
			multi-turn absolute encoder (with battery) (CN3)	3m	MSD01-E-CBL-3M(MT406080/BATT)
				5m	MSD01-E-CBL-5M(MT406080/BATT)
				10m	MSD01-E-CBL-10M(MT406080/BATT)
			multi-turn absolute encoder (without battery) (CN3)	3m	MSD01-E-CBL-3M(MT406080/nBATT)
				5m	MSD01-E-CBL-5M(MT406080/nBATT)
				10m	MSD01-E-CBL-10M(MT406080/nBATT)

Flange Dimensions	Motor	Cables	Motor Type	Length (L)	Cable Model
100	MSM-1000A-01 MSM-1500A-01 MSM-2000A-01	Power cable	Motor with brake	3m	MSD01-P-CBL-3M(100/BRK)
				5m	MSD01-P-CBL-5M(100/BRK)
				10m	MSD01-P-CBL-10M(100/BRK)
			Motor without brake	3m	MSD01-P-CBL-3M(100/nBRK)
				5m	MSD01-P-CBL-5M(100/nBRK)
				10m	MSD01-P-CBL-10M(100/nBRK)
180	MSM-2900A-01 MSM-4400A-01 MSM-5500A-01 MSM-7500A-01	Power cable	Motor with brake	3m	MSD01-P-CBL-3M(180BRK)
				5m	MSD01-P-CBL-5M(180/BRK)
				10m	MSD01-P-CBL-10M(180/BRK)
			Motor without brake	3m	MSD01-P-CBL-3M(180/nBRK)
				5m	MSD01-P-CBL-5M(180/nBRK)
				10m	MSD01-P-CBL-10M(180/nBRK)
		Encoder cable	single-turn absolute encoder (CN3)	3m	MSD01-E-CBL-3M(ST180/nBATT)
				5m	MSD01-E-CBL-5M(ST180/nBATT)
				10m	MSD01-E-CBL-10M(ST180/nBATT)
			multi-turn absolute encoder (with battery) (CN3)	3m	MSD01-E-CBL-3M(MT180/BATT)
				5m	MSD01-E-CBL-5M(MT180/BATT)
				10m	MSD01-E-CBL-10M(MT180/BATT)
			multi-turn absolute encoder (without	3m	MSD01-E-CBL-3M(MT180/nBATT)
				5m	MSD01-E-CBL-5M(MT180/nBATT)

			battery) (CN3)	10m	MSD01-E-CBL- 10M(MT180/nBATT)
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Refer to the Matching Instructions for Servo Drive and Servo Motor for drive and motor selection.

3.2.2 Servo Accessories

Flange Dimensions	Attachment Type	Attachment Model
40/60/80	Motor-side Encoder Cable Terminal	MSA-P08
100/130/180	Motor-side Encoder Cable Connector	MSA -P05
40/60/80/100/130/180	Drive-side Encoder Cable 1394-10P Connector	MSA -P02
	Drive-side Encoder Cable 1394-6PConnector	MSA -P03
40/60/80	Motor-side (with/without brake) Power Cable Connector	MSA -M09
100/130	Motor-side Power Cable Connector (without Brake)	MSA -M10
	Motor-side Power Cable Connector (with Brake)	MSA -M11
180	Motor-side Power Cable Connector (without Brake)	MSA -M12
	Motor-side Power Cable Connector (with Brake)	MSA -M13
Universal Encoder Cable	Accessories for battery	MSA -B00

3.2.3 Communication Cable Accessories

Model	Description
MSA-CN702-01-E	Communication cable between servo drive and PC
MSA -CN701-A3-E	Multi-machine parallel communication cable for servo drive(0.3m)

Model	Description
MSA-PE730-01-E	MSD01 Series ABZ Functional interface (CN4) adapter, 1 m AMP plug 9P to H1258-2*6P
MSA-PE732-01-E	MSD01 Series ABZ Functional interface (CN4) adapter, 1 m DB15 Female head turn H1258-2*6P

3.2.4 Control Cable Accessories

Model	Description
MSA -CA601P-01-E	MSD01 Series P (Pulse Type) CN1-input output control signal cables (1m)

3.2.5 Options for Peripheral Electrical Components

3.2.5.1 Fuse Selection Guide

To comply with the EU safety standard EN 61800-5-1, ensure that a fuse or circuit breaker is installed on the input side to prevent accidents caused by internal short circuits.

The recommended fuses are shown as the table below.

Size	Servo Drive Model	Rated Input Current (A)	Recommended Fuse		
			Manufacturer	Rated Current (A)	Model
Single phase 220V					
A	MSD-PULSE-100-01	1.6	Eaton	5	MSA-5B
	MSD-PULSE-200-01	2.3		5	MSA-5B
	MSD-PULSE-400-01	4.0		10	MSA-10B
B	MSD-PULSE-750-01	7.9	Eaton	20	MSA-20B
Three phase 220V					
C	MSD-PULSE-1000-01	5.7	Eaton	15	MSA-15B
D	MSD-PULSE-1500-01	7.3	Eaton	20	MSA-20B
Three phase 380V					
C	MSD-PULSE-1000-01	2.5	Eaton	5	MSA-5B
	MSD-PULSE-1500-01	3.8		10	MSA-10B
D	MSD-PULSE-2000-01	5.4	Eaton	15	MSA-15B
	MSD-PULSE-3000-01	7.9		20	MSA-20B
E	MSD-PULSE-5000-01	12	Eaton	35	MSA-35B

Size	Servo Drive Model	Rated Input Current (A)	Recommended Fuse		
			Manufacturer	Rated Current (A)	Model
	MSD-PULSE-6000-01	16		35	MSA-35B
	MSD-PULSE-7500-01	21		40	MSA-40B

3.2.5.2 Electromagnetic Contactor Selection Guide

Refer to the peripheral unit wiring diagram for electromagnetic contactor installation details.

Refer to the table below for electromagnetic contactor selection:

Size	Servo Drive Model	Rated Input current (A)	Recommended Electromagnetic Contactor		
			Manufacturer	Rated Current (A)	Model
Single phase 220V					
A	MSD-PULSE-100-01	1.6	Schneider	9	LC1 D09
	MSD-PULSE-200-01	2.3		9	LC1 D09
	MSD-PULSE-400-01	4.0		9	LC1 D09
B	MSD-PULSE-750-01	7.9	Schneider	9	LC1 D09
Three phase 220V					
C	MSD-PULSE-1000-01	5.7	Schneider	9	LC1 D09
D	MSD-PULSE-1500-01	7.3	Schneider	9	LC1 D09
Three phase 380V					
C	MSD-PULSE-1000-01	2.5	Schneider	9	LC1 D09
	MSD-PULSE-1500-01	3.8		9	LC1 D09
D	MSD-PULSE-2000-01	5.4	Schneider	9	LC1 D09
	MSD-PULSE-3000-01	7.9		9	LC1 D09
E	MSD-PULSE-5000-01	12	Schneider	12	LC1 D12

Size	Servo Drive Model	Rated Input current (A)	Recommended Electromagnetic Contactor		
			Manufacturer	Rated Current (A)	Model
	MSD-PULSE-6000-01	16		18	LC1 D18
	MSD-PULSE-7500-01	21		25	LC1 D25

3.2.5.3 Circuit Breaker Selection Guide

Refer to the peripheral unit wiring diagram for breaker installation details.

Refer to the table below for Circuit Breaker Selection Recommendations:

Size	Servo Drive Model	Rated Input Current (A)	Recommended Circuit Breaker		
			Manufacture	Rated Current (A)	Model
Single phase 220V					
A	MSD-PULSE-100-01	1.6	Schneider	4	OSMC32N2D4
	MSD-PULSE-200-01	2.3		4	OSMC32N2D4
	MSD-PULSE-400-01	4.0		6	OSMC32N2D6
B	MSD-PULSE-750-01	7.9	Schneider	16	OSMC32N2D16
Single phase 220V					
C	MSD-PULSE-1000-01	5.7	Schneider	10	OSMC32N2D10
D	MSD-PULSE-1500-01	7.3	Schneider	16	OSMC32N2D16
Single phase 380V					
C	MSD-PULSE-1000-01	2.5	Schneider	4	OSMC32N2D4
	MSD-PULSE-1500-01	3.8		6	OSMC32N2D6
D	MSD-PULSE-2000-01	5.4	Schneider	10	OSMC32N2D10
	MSD-PULSE-3000-01	7.9		16	OSMC32N2D16
E	MSD-PULSE-5000-01	12	Schneider	20	OSMC32N2D20

	MSD-PULSE-6000-01	16		25	OSMC32N2D25
	MSD-PULSE-7500-01	21		32	OSMC32N2D32

If the equipment requires a residual current device (RCD), follow the selection criteria below:

- ◆ The drive may generate DC leakage current in the protective conductor. Be sure to use a Type B Residual Current Device (RCD).
- ◆ A certain amount of high-frequency leakage current will be generated during drive operation. To prevent RCD malfunction, select an RCD with an operating current of at least 100mA for each drive.
- ◆ When multiple drives are connected in parallel to share an RCD, select an RCD with an operating current of at least 300mA.
- ◆ It is recommended to use RCDs from brands such as Chint, Schneider, and others.

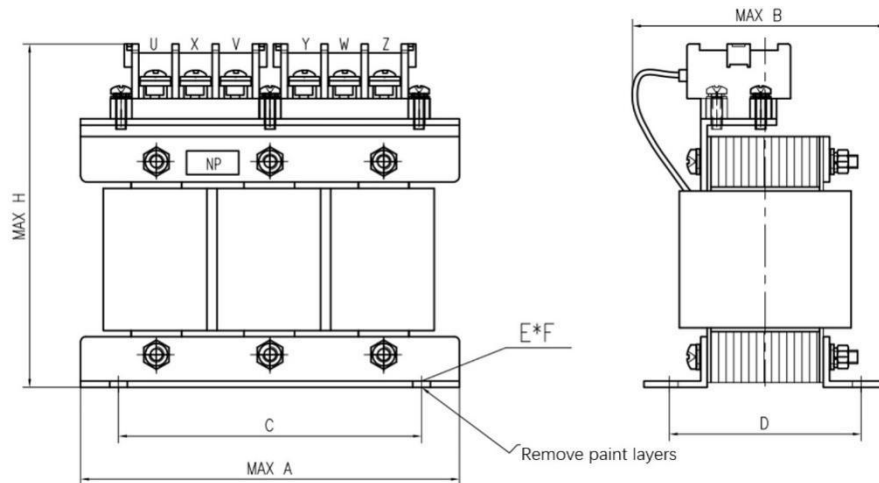
3.2.5.4 AC Input Reactor Selection Guide

The AC input reactor is primarily designed to reduce harmonics in the input current and is configured as an option. When the application environment requires higher levels of harmonic reduction, an external reactor can be installed.

The recommended AC input reactors are shown in the table below:

Size	Servo Drive Model	Rated Input Current (A)	Recommended AC Input Reactor		
			Manufacture	Inductance (mH)	Model
Three phase 220V					
C	MSD-PULSE-1000-01	5.7	Huayin (Shanghai)	5	SHD-800-9
D	MSD-PULSE-1500-01	7.3	Huayin (Shanghai)	5	SHD-800-9
Three phase 380V					
C	MSD-PULSE-1000-01	2.5	Huayin (Shanghai)	5	SHD-800-9
	MSD-PULSE-1500-01	3.8		5	SHD-800-9
D	MSD-PULSE-2000-01	5.4	Huayin (Shanghai)	5	SHD-800-9
	MSD-PULSE-3000-01	7.9		5	SHD-800-9
E	MSD-PULSE-5000-01	12	Huayin (Shanghai)	3	SHD-800-10
	MSD-PULSE-6000-01	16		1.45	SHD-800-13
	MSD-PULSE-7500-01	21		1.45	SHD-800-13

The size specifications for AC input reactors are shown in the table below.



Model	Input Current (A)	Inductance (mH)	A (mm)	B (mm)	H (mm)	C×D (mm)	Φ E×F (mm)
SHD-800-9	8	5	175	150	175	120×90	8×12
SHD-800-10	12	3	175	150	175	120×90	8×12
SHD-800-13	21	1.45	230	180	220	150×110	8×12

3.2.5.5 EMC Input Filters

In order to make the product meet the requirements of the ENIEC 61800-3 standard for radiated and conducted emissions, an external EMC filter is required.

The EMC filters available for this product are Schaffner's FN2090 and FN3258 series, and the EMC filter profiles are as follows:

Model		Appearances
Schaffner	FN2090 Series	

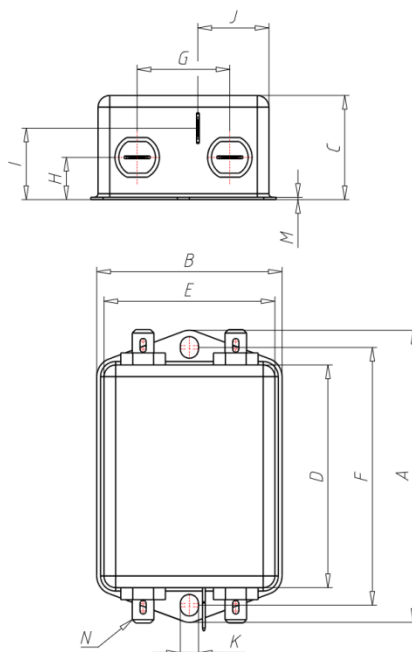
Model		Appearances
	FN3258 Series	

Please select according to the rated input current of this product as the table below:

Size	Servo Drive Model	Rated Input Current (A)	Recommended EMC Input Filters	
			Manufacture	Model
Single phase 220V				
A	MSD-PULSE-100-01	1.6	Schaffner	FN2090-3-06
	MSD-PULSE-200-01	2.3		FN2090-3-06
	MSD-PULSE-400-01	4.0		FN2090-4-06
B	MSD-PULSE-750-01	7.9	Schaffner	FN2090-8-06
Three phase 220V				
C	MSD-PULSE-1000-01	5.7	Schaffner	FN3258-7-44
D	MSD-PULSE-1500-01	7.3	Schaffner	FN3258-16-44
Three phase 380V				
C	MSD-PULSE-1000-01	2.5	Schaffner	FN3258-7-44
	MSD-PULSE-1500-01	3.8		FN3258-7-44
D	MSD-PULSE-2000-01	5.4	Schaffner	FN3258-7-44
	MSD-PULSE-3000-01	7.9		FN3258-16-44
E	MSD-PULSE-5000-01	12	Schaffner	FN3258-16-44
	MSD-PULSE-6000-01	16		FN3258-16-44

Size	Servo Drive Model	Rated Input Current (A)	Recommended EMC Input Filters	
			Manufacture	Model
	MSD-PULSE-7500-01	21		FN3258-30-44

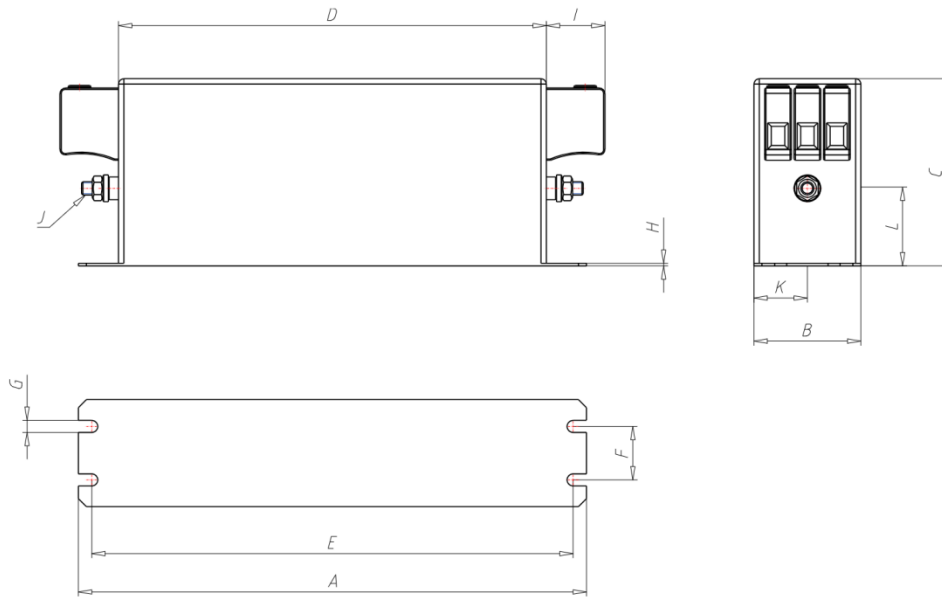
Schaffner FN 2090 Series Filter Dimensions Description:



Unit: mm

Input Current (A)	A	B	C	D	E	F	G	H	I	J	K	M	N
4	85	54	30.3	64.8	49.8	75	27	12.3	20.8	19.9	5.3	0.7	6.3 × 0.8
6	85	54	30.3	64.8	49.8	75	27	12.3	20.8	19.9	5.3	0.7	6.3 × 0.8
8	113.5	57.5	45.4	94	56	103	25	12.4	32.4	15.5	4.4	1	6.3 × 0.8

Schaffner FN 3258 Series Filter Dimensions Description:



Input Current (A)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	J	K (mm)	L (mm)
7	190	40	70	160	180	20	4.5	1	22	M5	20	29.5
16	250	45	70	220	235	25	5.4	1	22	M5	22.5	29.5
30	270	50	85	240	255	30	5.4	1	25	M5	25	39.5

3.2.5.6 Magnetic rings

Magnetic rings installed on the input side can suppress the noise entering the drive in the power supply system, while magnetic rings installed on the output side are mainly used to reduce the electromagnetic interference from the drive to the outside world, and can also reduce the bearing current, please try to place them as close as possible to the drive when installing magnetic rings.

For leakage current problems and other signal line interference problems in some applications, it is recommended to use amorphous magnetic rings for suppression. Amorphous magnetic rings have a very high permeability below 1 MHz and are particularly effective in suppressing drive interference.

Two sizes of amorphous magnetic rings are available for user selection:

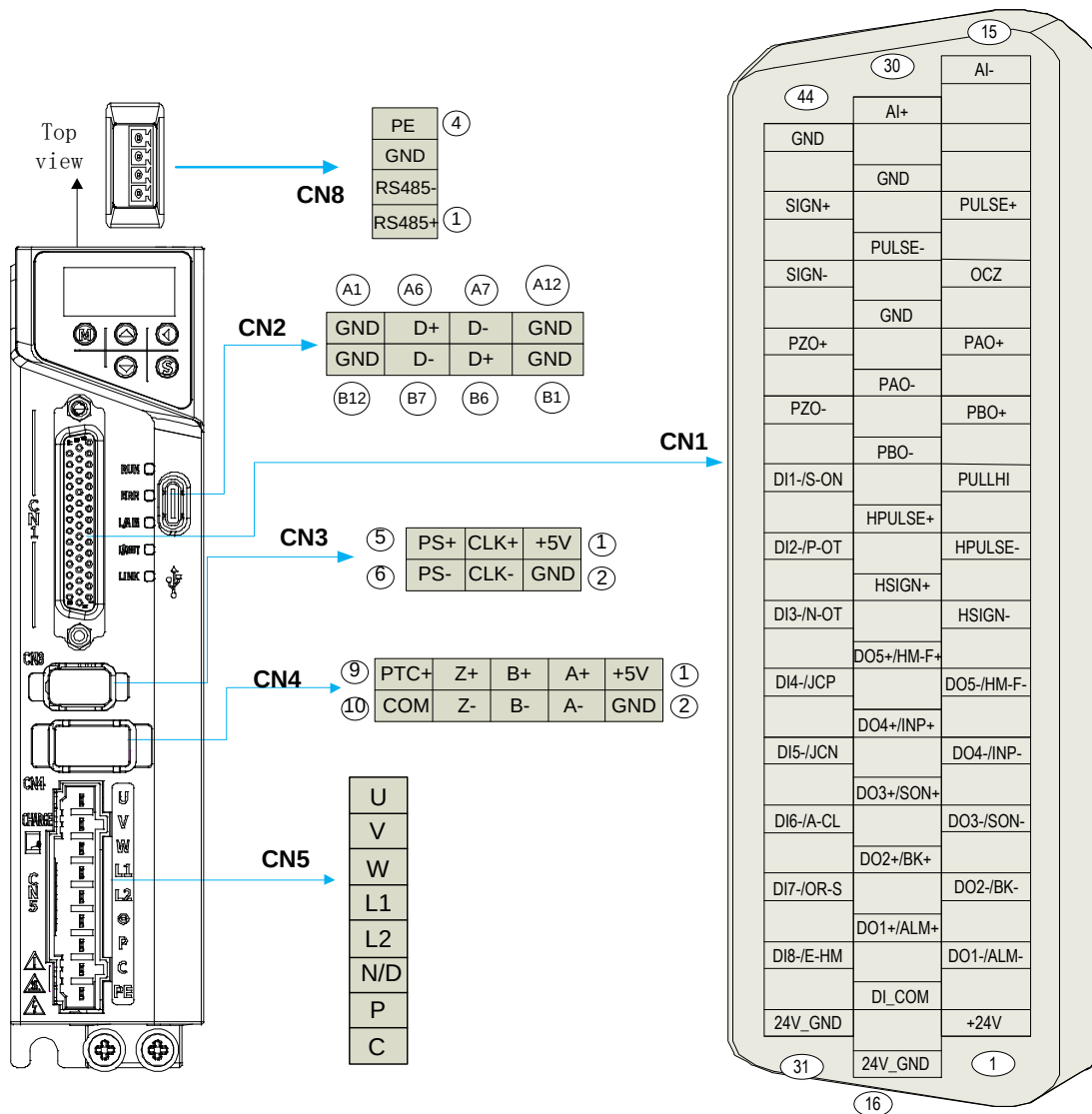
Material	Size (OD*ID*HT) (mm)	Appearance
Amorphous alloys	50×80×20	

Material	Size (OD*ID*HT) (mm)	Appearance
Amorphous alloys	64×40×20	

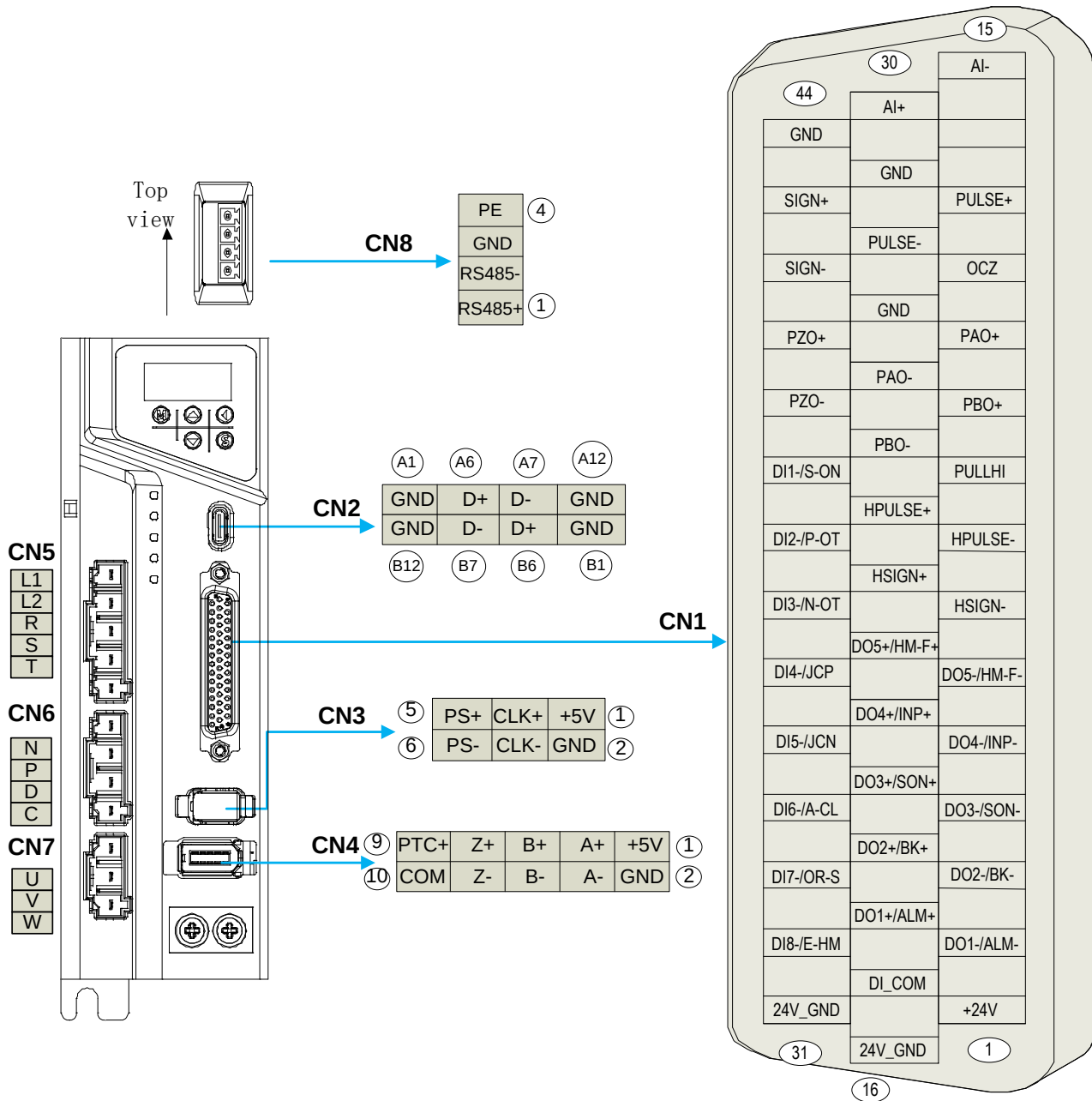
3.3 Wiring of Connector CN1

3.3.1 Definitions of Connector CN1 Terminals

- ◆ 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

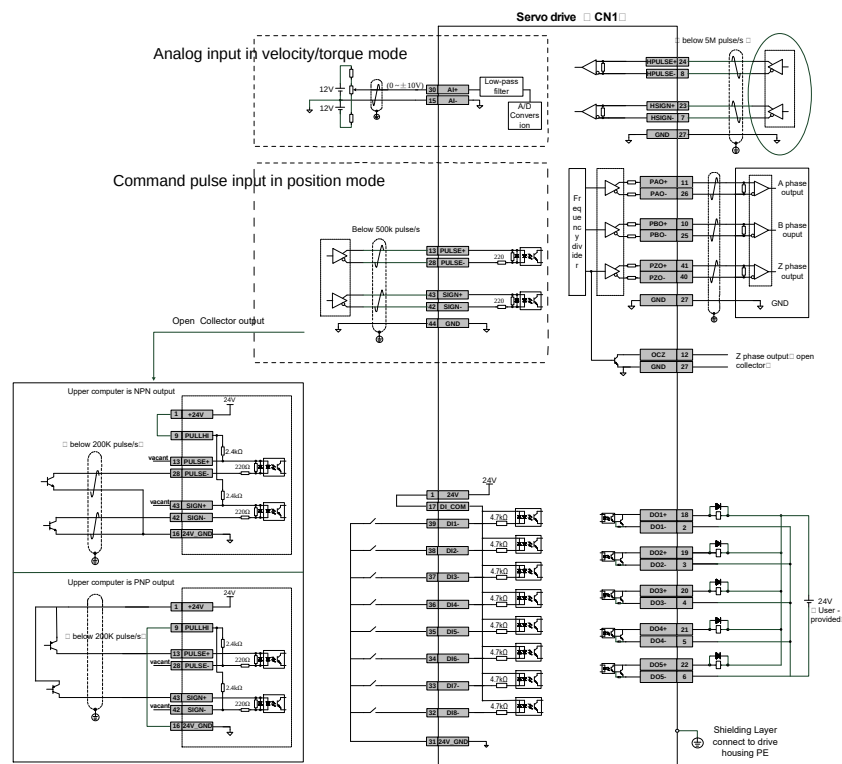
Pin number	Name	Abbreviation	Description
3	Digital output 2(negative)	DO2-	requirements. When wiring, if relays need to be added, freewheeling diodes should be included. Similarly, if optocouplers are used for reception, current-limiting resistors should be connected. Wiring errors can result in hardware 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 5 MHz
8	High-Speed Pulse Counting Signal (Negative)	HPULSE-	
9	Pulse Command Input Built-in Resistor Common Terminal	PULLHI	Used for open collector, connect to 24V_GND(pin 16) 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 direction signal, supports two modes: ◆ Differential mode, maximum frequency is 500kHz ◆ Open collector input modes, maximum frequency is 200kHz
15	Analog Input(Negative)	AI-	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
19	Digital Output 2 (Positive)	DO2+	
20	Digital Output 3	DO3+	

Pin number	Name	Abbreviation	Description
	(Positive)		in hardware damage to the DO port
21	Digital Output 4 (Positive)	DO4+	
22	Digital Output 5 (Positive)	DO5+	
23	High-Speed Pulse Direction Signal (Positive)	HSIGN+	Differential inputs, with a maximum frequency of 5M Hz
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 direction signal, supports two modes: ◆ Differential mode, maximum frequency is 500kHz ◆ Open collector input mode, maximum frequency is 200kHz
29	Signal Reference Ground	GND	Signal reference ground
30	Analog Input(Positive)	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-	

Pin number	Name	Abbreviation	Description
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
41	Frequency Division Output Z Phase (Positive)	PZO+	
42	Low-speed Direction (Negative)	SIGN-	Low-speed pulse direction signal, supports two modes: ◆ Differential mode, maximum frequency is 500kHz ◆ Open collector input modes, maximum frequency is 200kHz
43	Low-speed Direction (Positive)	SIGN+	
44	Signal Reference Ground	GND	Signal reference ground

3.3.2 Connect to the Upper Controller

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

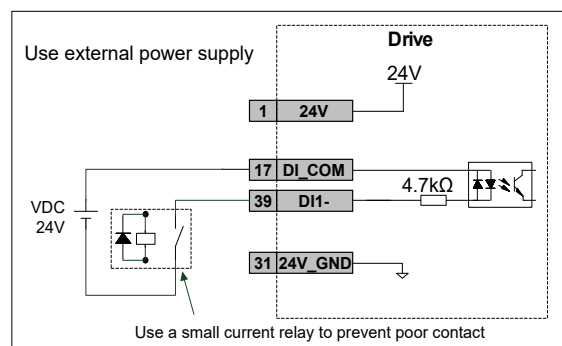
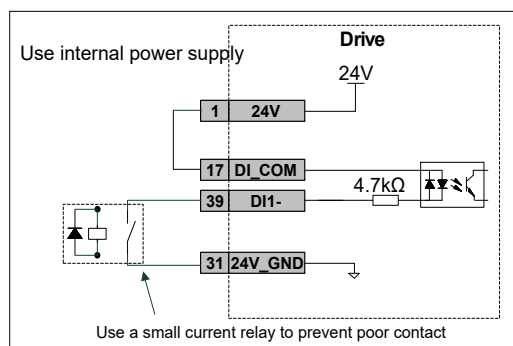


3.3.3 Control Input Signal Connection

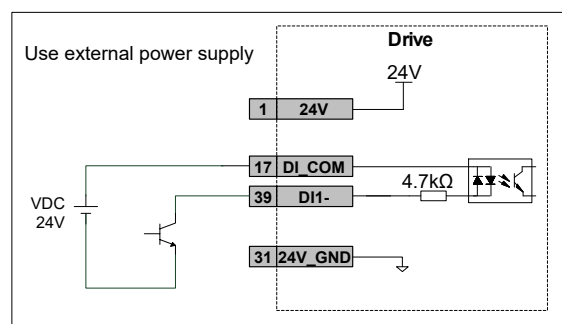
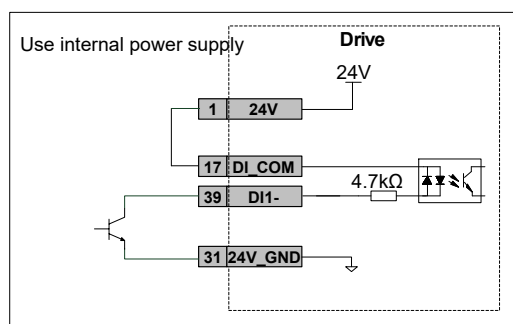
Symbol	Function	Pin	Description
DI1	Enablement (default)	39	Servo enabled
DI2	Positive over travel (default)	38	Positive over travel
DI3	Negative over travel (default)	37	Negative over travel
DI4	None(default)	36	None by default, function can be configured by P04.0A
DI5	None (default)	35	None by default, function can be configured by P04.0C
DI6	Fault reset (default)	34	Fault reset
DI7	Home position signal(default)	33	Home position signal
DI8	Enable homing(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 or 16	
DI_COM	COM for DIs	17	Power supply input terminal (12V~24V)

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

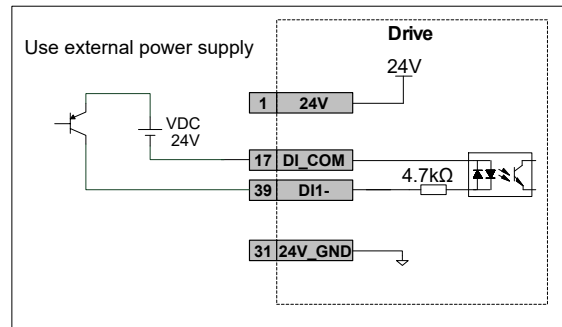
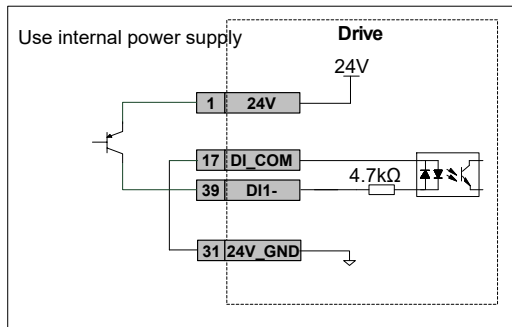
◆ When the upper-level device is a relay output



◆ 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	44	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	500k pulse/s (differential input) 200k pulse/s (Collector input)	1 (differential input) 2.5 (Collector input)
High-speed Differential Input Port	5M pulse/s	0.1

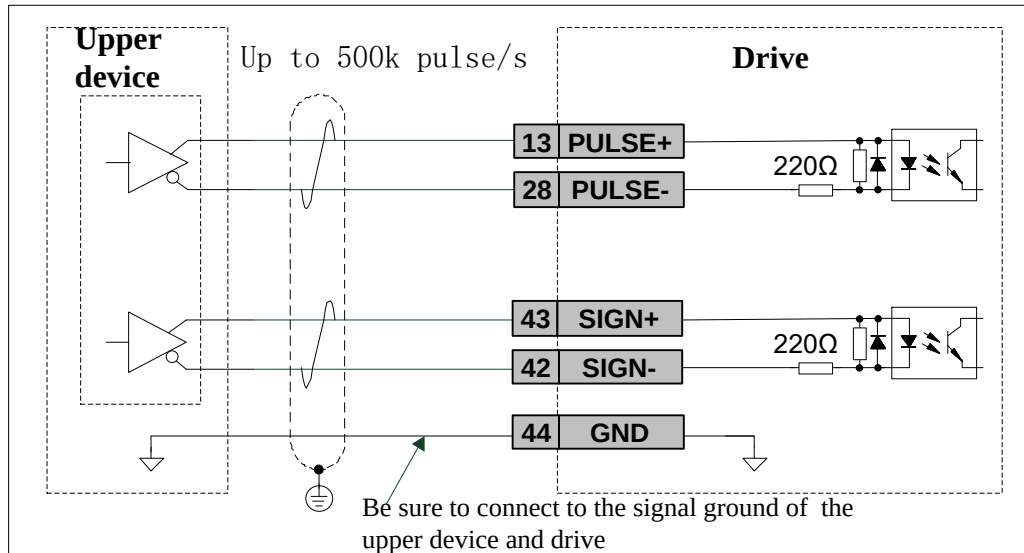
Note: If the pulse width output by the upper-level device is less than the minimum pulse width value, it will cause the drive

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

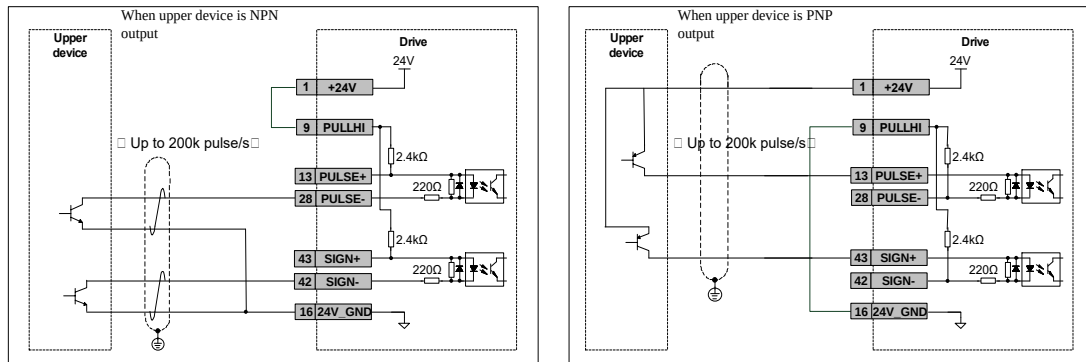
- ◆ When the upper-level device is set to four-channel differential signal output

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

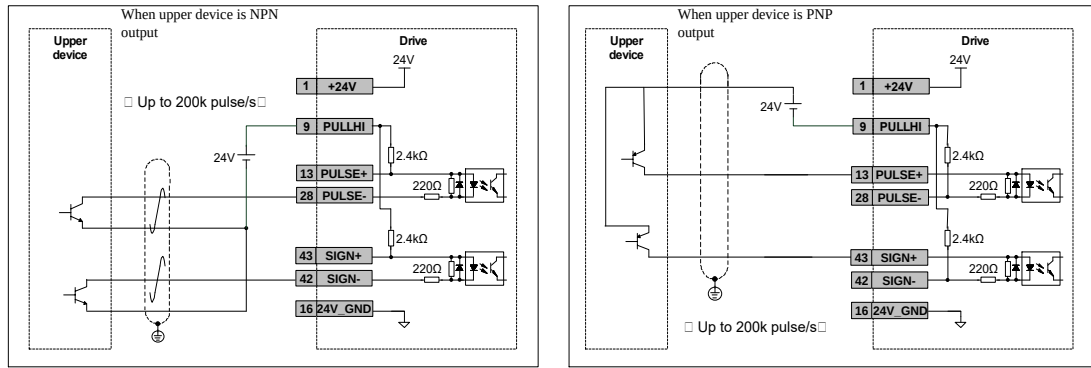


- ◆ When the upper-level device is set to open collector output

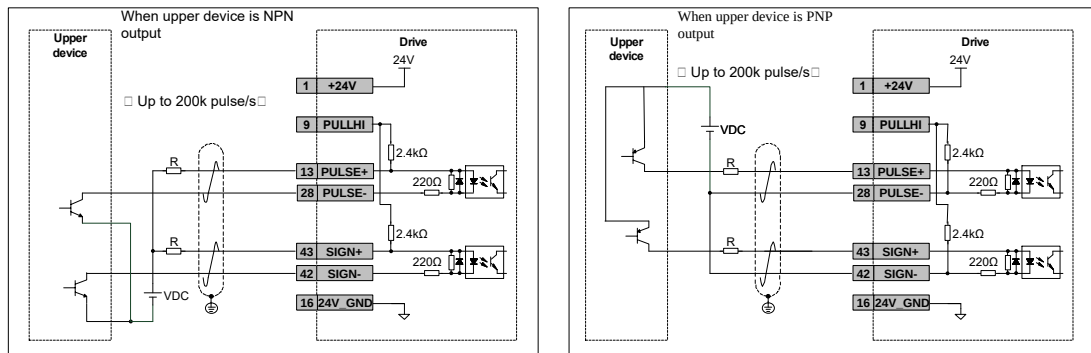
- When using the internal 24V power supply of the drive



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



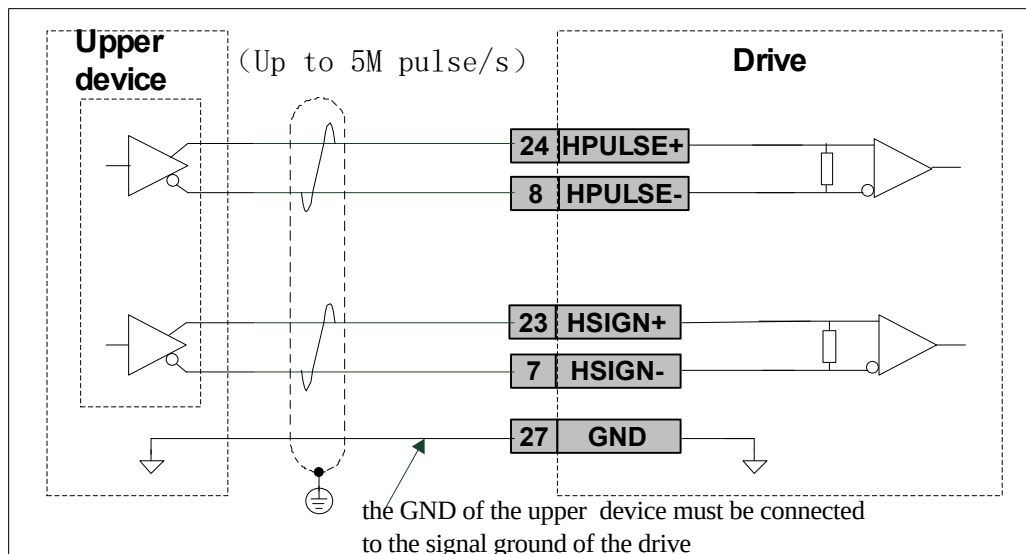
- When using external 12V, 24V power supply and external resistor



VDC	R	
12V	820Ω0.5W	$\frac{VDC-1.5}{R+220} = 10mA$
24V	2kΩ0.5W	

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

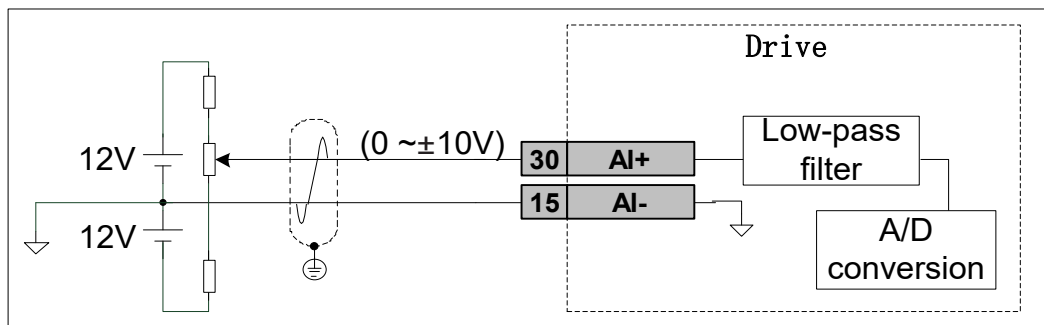
Symbol	Connector Pin Number	Description
AI+	30	Common analog input signal, 12-bit resolution, input voltage: -10V~+10V
AI-	15	Analog input signal ground

The voltage value corresponding to the analog input command is set by P03.47 and P03.4C.

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

A/D conversion resolution: 12-bit;

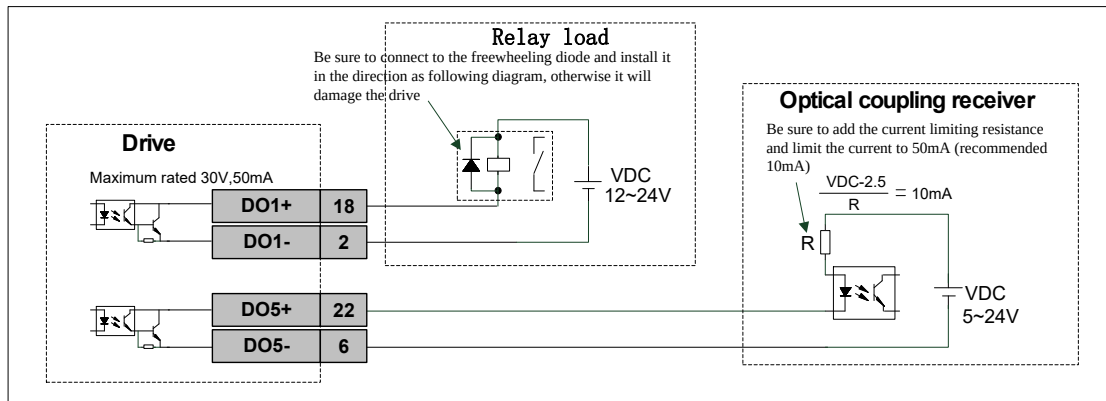
Input impedance: approximately 9k Ω .



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 Wiring of Frequency Division Pulse Output Signal

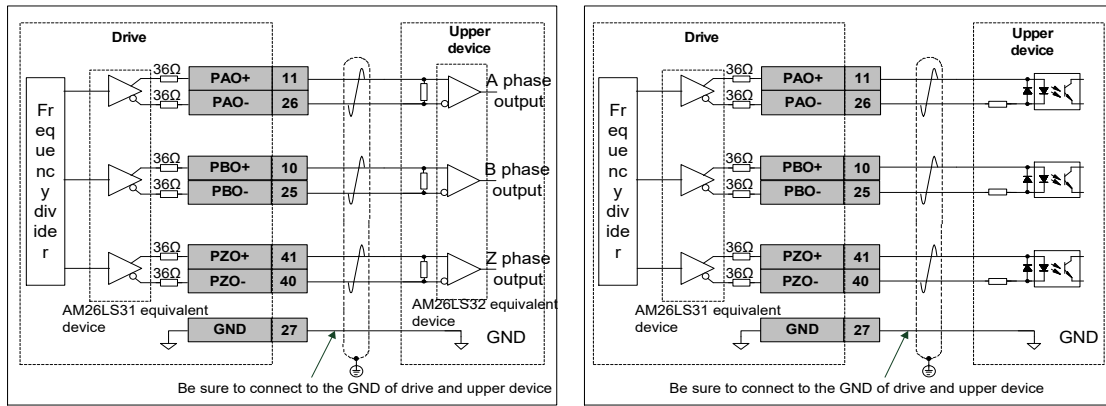
Symbol	Connector Pin number	Function
PAO+	11	A Phase Frequency Division Output Signal+
PAO-	26	A Phase Frequency Division Output Signal-
PBO+	10	B Phase Frequency Division Output Signal+
PBO-	25	B Phase Frequency Division Output Signal-
PZO+	41	Z Phase Frequency Division Output Signal+
PZO-	40	Z Phase Frequency Division Output Signal-
OCZ	12	Z Phase Frequency Division Open Collector Output Signal
GND	27	Z Phase Frequency Division 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 output signals (phase A, phase B, and phase Z) of the encoder after frequency division processing are differentially output through the long-line driver.

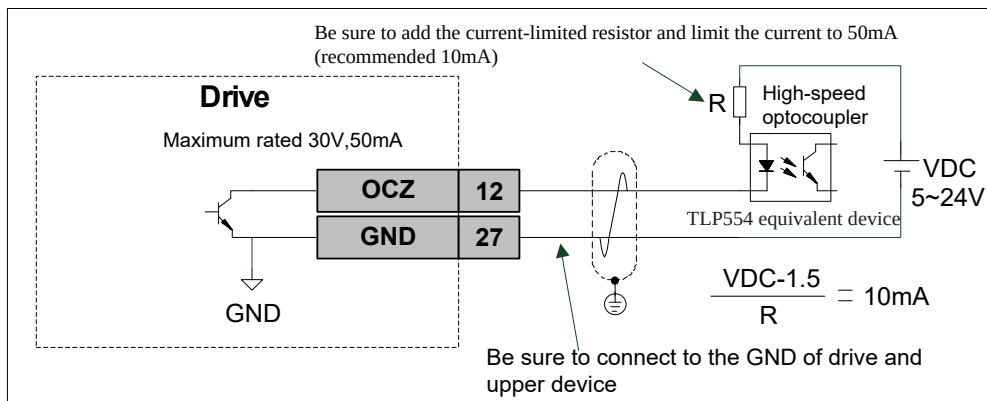
When using a receiver on the upper device side, be sure to install terminal resistors (recommended around 330 Ω) at the inputs of the long-line receiver. When using an optocoupler circuit for reception, use a high-speed optocoupler and limit the line current to within 20mA.



3.3.7.2 Open Collector Output

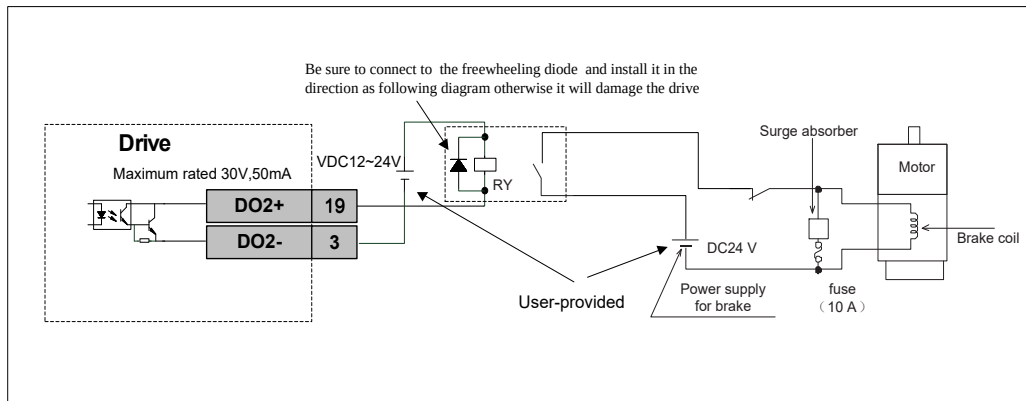
This interface serves as the open collector interface for the Z-phase frequency division output signal of the encoder and is a non-insulated interface.

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 Wiring 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:

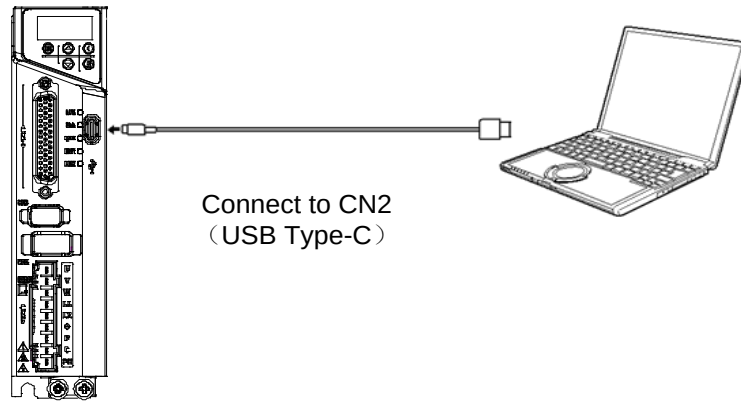
- ◆ The length of the motor brake cable should consider the voltage drop caused by cable resistance. The brake operation needs to ensure that the input voltage is at least 21.6V.
- ◆ It is preferable not to share the brake with other appliances to prevent voltage or current reduction due to the operation of other appliances, ultimately leading to brake misoperation.
- ◆ It is recommended to use cables with a cross-sectional area of 0.5mm² or above.
- ◆ For the timing diagram of the brake enable sequence and related function code settings, please refer to the *MSD-PULSE-01 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	

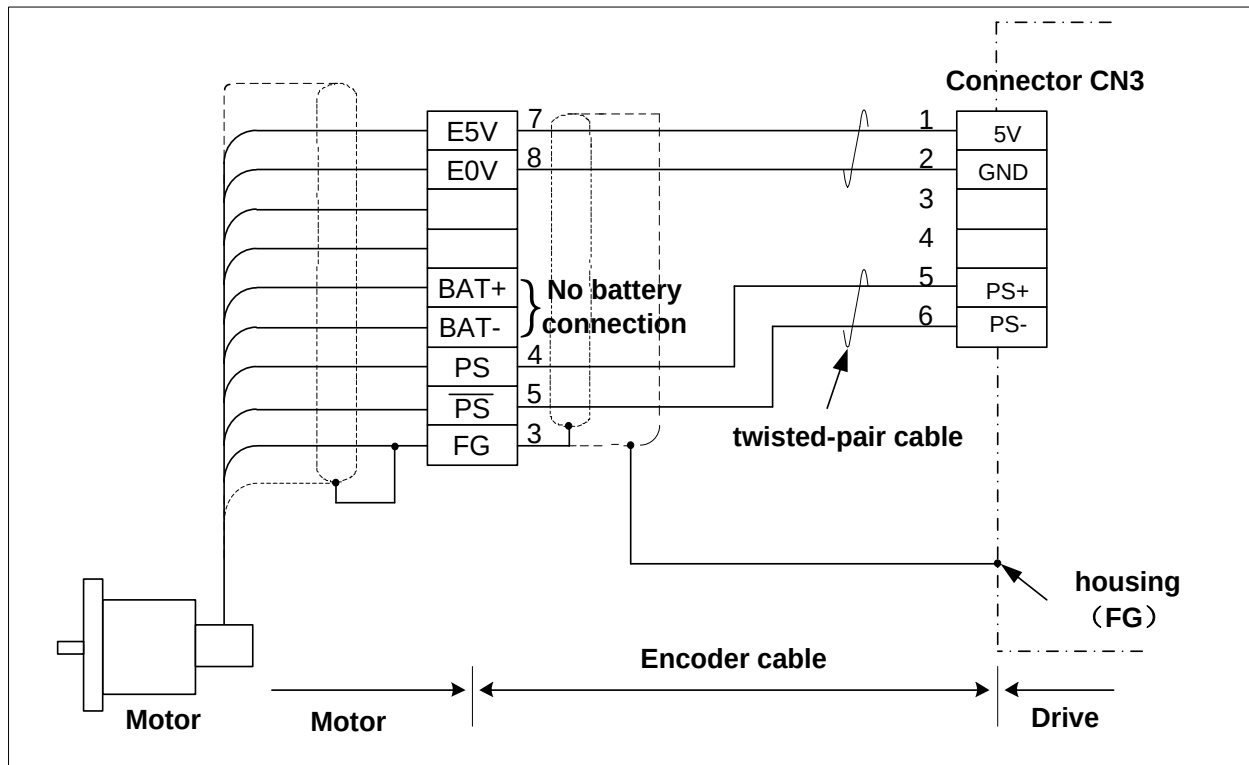


3.5 Wiring of Connector CN3

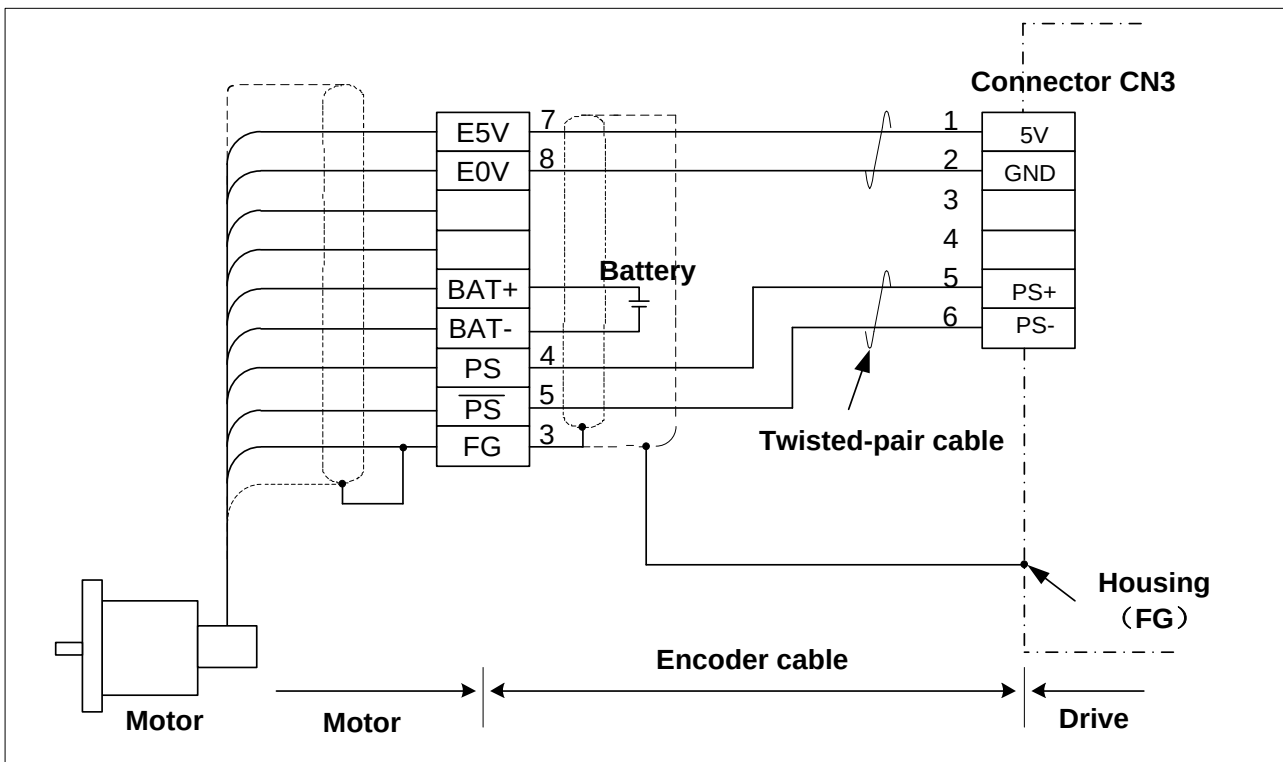
Connector	Connector number	pin	Symbol	Description
	1		5V	Encoder +5V power supply
	2		GND	
	3			
	4			
	5		PS+	Serial data sending/reception signal
	6		PS-	
	Enclosure		PE	Connection between the drive's internal and PE terminals

3.5.1 Wiring of Communication Encoder

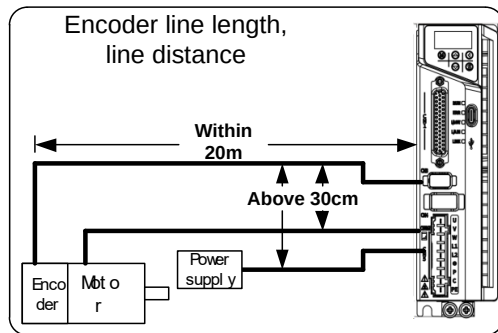
- ◆ When using a single-turn absolute position encoder



◆ When using a multi-turn absolute position encoder



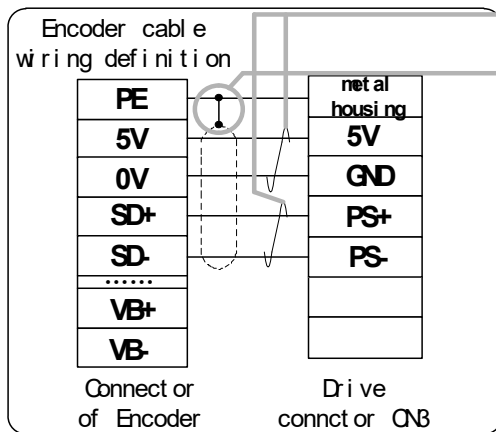
3.5.2 Communication Type Encoder Wiring Key Points



- 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

- ☐ Refer to the wiring illustration
- ☐ Material: Use wires with a core diameter of at least 0.18mm² (AWG 24) and configure them with shielded twisted pair cables that are resistant to bending.



- ☐ Use twisted-pair cables for wiring relative signals/power
- ☐ Shield layer handling
Shield layer on the driver side: solder to the enclosure of connector CN3
- ☐ 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 number	pin	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)

Motor

Motor

Relay cable

Drive

Connector CN4

1	5V
2	GND
3	A+
4	A-
5	B+
6	B-
7	Z+
8	Z-
9	PTC+
10	COM

CN4 housing

□ FG □

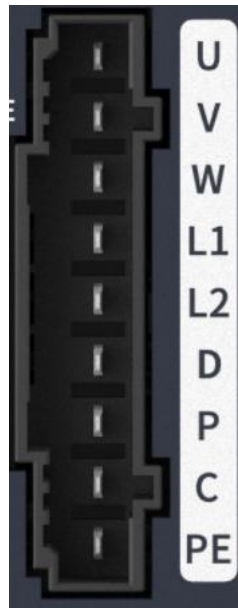
Twisted-pair cable

3.7.1 Main Circuit Terminal Connection Cable Recommendations

MSD-PULSE-01 Series Rotary Pulse Servo drive Installation Guide

SIZE	Servo Drive Model	Rated Input Current (A)	L1C、L2C		L1、L2、L3/R、S、T		P、D、C、 Θ		U、V、W、PE		Grounding Terminal	
	750-01											
C	MSD-PULSE-1000-01	5.7	2 × 0.52	20	2 × 0.52	20	2 × 0.52	20	4 × 0.81	18	0.52	20
	MSD-PULSE-1000-01	2.5	2 × 0.52	20	3 × 0.52	20	2 × 0.52	20	4 × 0.52	20	0.52	20
	MSD-PULSE-1500-01	3.8	2 × 0.52	20	3 × 0.52	20	2 × 0.52	20	4 × 0.52	20	0.52	20
D	MSD-PULSE-3000-01	7.3	2 × 1.31	16	3 × 1.31	16	2 × 1.31	16	4 × 1.31	16	0.81	18
	MSD-PULSE-2000-01	5.4	2 × 0.52	20	3 × 0.52	20	2 × 0.52	20	4 × 0.81	18	0.52	20
	MSD-PULSE-3000-01	7.9	2 × 1.31	16	3 × 1.31	16	2 × 1.31	16	4 × 1.31	16	0.81	18
E	MSD-PULSE-5000-01	12	2 × 2.08	14	3 × 2.08	14	2 × 2.08	14	4 × 2.08	14	1.31	16
	MSD-PULSE-6000-01	16	2 × 2.08	14	3 × 2.08	14	2 × 2.08	14	4 × 2.08	14	1.31	16
	MSD-PULSE-7500-01	21	2 × 3.33	12	3 × 3.33	12	2 × 3.33	12	4 × 3.33	12	2.08	14

3.7.2 Interface Definition of SIZE-A Connector CN5



Symbol	Name	Function
U、V、W	Servo Motor Connection Terminals	Connect to the U, V, W phases of the motor
L1、L2	Main Circuit Power Input Terminals	Main circuit single-phase power input, connect AC 220V power supply between L1 and L2.
D	-	Do not connect
P、C	External brake resistor connection terminal	Connect to the external brake resistor.
PE	Grounding	Two grounding terminals, connect to the power supply grounding terminal and motor grounding terminal. Please ensure that the entire system is grounded.

3.7.3 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, P02.23, and P02.24 are correctly set.
- ◆ Install the external brake resistor on a non-flammable material such as metal.

3.8 Wiring of Connector CN8

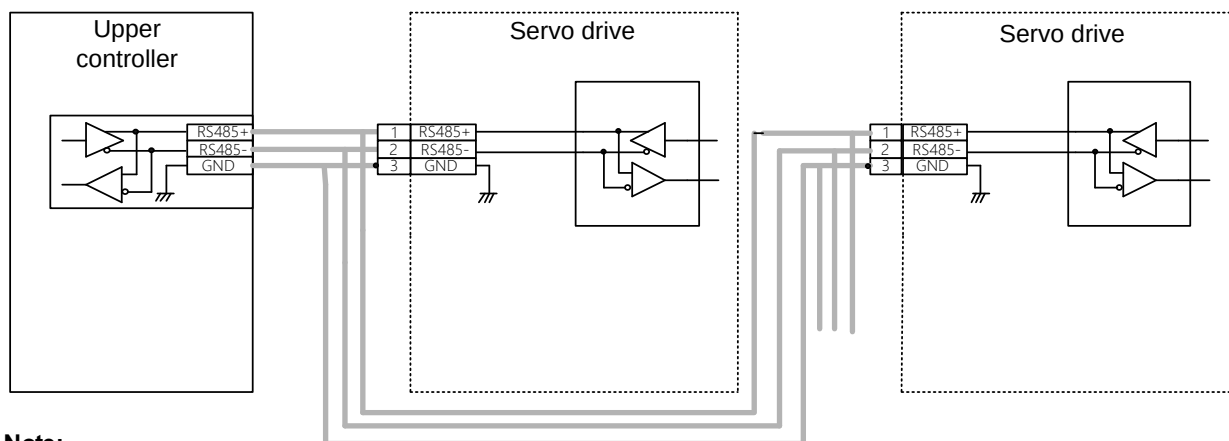
3.8.1 Connect to RS485 Communication Signal

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



Symbol	Connector number	pin	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 master station and multiple servo drives(act as slave stations), set the P08.00 parameter of each servo drive to a value from 1 to 127.



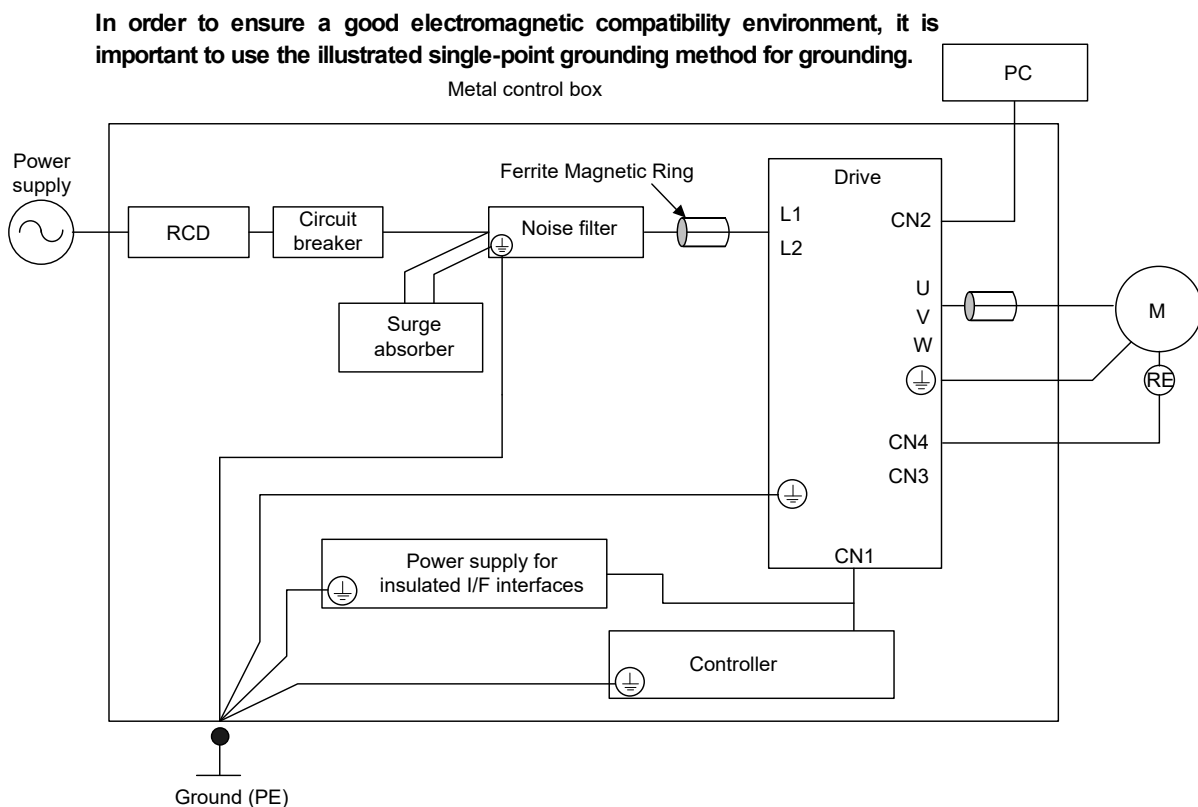
Note:

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

3.9 Electromagnetic Interference Suppression

3.9.1 Example of Anti-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.



3.9.2 Grounding

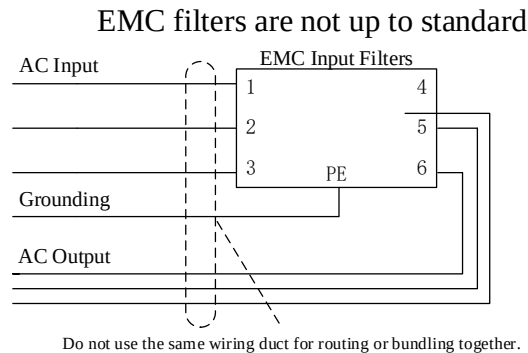
To avoid potential electromagnetic interference issues, please ground as follows:

- ◆ 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.

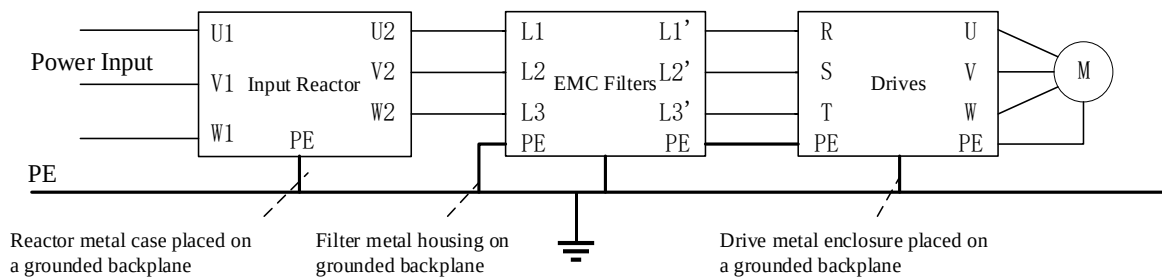
3.9.3 How to Use Input Power Filter and Noise Filter

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

- ◆ Separate the input and output wiring of the EMC filter and avoid bundling them or placing them in the same cable slot.
- ◆ Separate the ground wire of the EMC filter from its output power cable.
- ◆ It is recommended to mount the EMC 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.
- ◆ If multiple Servo Drives are used and a noise filter is to be shared in the power supply section, consult with the noise filter manufacturer.
- ◆ When using the same wiring duct for routing, the noise resistance function is reduced. As shown in the figure below:



The AC input reactor and EMC filter installation schematic is shown below:

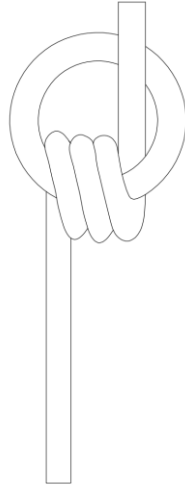


3.9.4 Magnetic Rings

To ensure that the magnetic ring is effective in suppressing electromagnetic interference (EMI) at the input and output of the drive, follow the installation guidelines below to fully utilize the magnetic ring:

- ◆ The magnetic ring should be mounted on the input or output side of the drive and as close to the drive as possible, up to a maximum of 30cm.
- ◆ The number of turns should not be too few or too many when winding the magnetic ring, usually 3 to 5 turns are recommended.
- ◆ Ensure that the cable is wrapped evenly and tightly around the magnetic ring, avoiding loose or cross-winding.
- ◆ When winding the magnetic ring for the RST cable or UVW cable, make sure that all three wires for RST or all three wires for UVW pass through the ring at the same time. Note that the PE wire (ground wire) should not be wound into the magnetic ring.
- ◆ Magnetic rings are fragile. Avoid violent impacts on the rings during use.

The following figure shows an example of winding of a magnetic ring:



3.9.5 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 (2.0mm² or above).
- ◆ Ensure single-point grounding.
- ◆ Avoid sharing power sources with welding machines, discharge processing equipment, etc.

4 Appendix

4.1 Compliance with Certifications and Standards

Certification	Directive Name		Standard
CE certification	EMC directive	2014/30/EU	EN IEC 61800-3
	LVD directive	2014/35/EU	EN 61800-5-1

The drive complies with the latest version of directives and standards for CE certifications.

4.1.1 CE Certification

- ◆ The CE mark indicates compliance with the Low Voltage Directive (LVD), Electromagnetic Compatibility (EMC), and Restriction of Hazardous Substances (RoHS) directives.
- ◆ The CE mark is required for engaging in commercial business (production, importation, and distribution) in Europe.
- ◆ The drive complies with LVD, EMC, and RoHS directives and carries the CE mark.
- ◆ Machines and devices integrated with this drive must also comply with CE requirements for distribution in Europe.
- ◆ The integrator who integrates this drive into other products and attaches CE mark to the final assembly has the responsibility of ensuring compliance with CE certification

4.1.1.1 Requirement for Compliance with EMC Directive

The MSD-PULSE-01 series servo drive, which is applicable to second environment, complies with EMC Directive 2014/30/EU and standard EN IEC 61800-3. As required by EMC Directive 2014/30/EU and standard EN IEC 61800-3, install an EMC filter on the input side of the drive and use shielded cables on the output side. Ensure the filter is grounded properly and the shield of the output cable is grounded 360 degrees

Introduction to EMC standards

Electromagnetic compatibility (EMC) describes the ability of electrical and electronic devices to work properly in the electromagnetic environment without introducing electromagnetic interferences that disturb the operation of other local devices or systems. In other words, EMC includes two aspects: 1) The electromagnetic interference generated by a device during normal operation cannot exceed a certain limit. 2) The device must have sufficient immunity to the electromagnetic interference in the environment.

ENIEC 61800-3 defines the following two types of environments.

- ◆ Category I environment: Environment that includes domestic premises, and establishments directly connected without intermediate transformers to a low voltage power supply network which supplies buildings used for domestic purposes.
- ◆ Category II environment: Environment that includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes.

Drives are divided into the following four categories based on the intended application environment.

- ◆ Category C1 drive: Power drive system (PDS) with rated voltage less than 1000 V, intended for use in the Category I environment

- ◆ Category C2 drive: PDS with rated voltage less than 1000 V, which is neither a plug in device nor a movable device and, when used in the Category I environment, is intended to be installed and commissioned only by professionals.
- ◆ Category C3 drive: PDS with rated voltage less than 1000 V, intended for use in the Category II environment and not intended for use in the Category I environment.
- ◆ Category C4 drive: PDS with rated voltage equal to or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the Category II environment.

4.1.1.2 Requirements for Compliance with LVD

The drive has been tested in accordance with EN61800-5-1 to determine compliance with LVD. Observe the following requirements to enable machines and devices integrated with this drive to comply with LVD.

- ◆ Installation location
Install the drive in a place with overvoltage category III and pollution degree 1 or 2 as specified by IEC 60664-1.
- ◆ Installation environment
For requirements of the installation environment, see [Installation Environmental Conditions](#).
- ◆ Protective requirements of installation
The drive must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations and relevant IEC standards. Drives (IP20) intended to be installed inside the cabinet must be installed in a structure that prevents intrusion of unwanted objects from the top and the front.
- ◆ Main circuit wiring requirements
For wiring requirements of main circuit terminals, see [Wiring of Main Circuit](#).
- ◆ Requirements of protective devices
To comply with EN61800-5-1, install a fuse/circuit breaker on the input side of the drive to prevent accidents caused by short circuit in the internal circuit.