



LMAC Drive

E-RMA series (Pulse type)

User Manual

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Version Update Record

- 1) Reproduction of part or all of the contents of this book is prohibited.
- 2) The contents of this book are subject to change without prior notice.

Version	Update date	Update content
V1.0	2025-01	First release

About obtaining the manual

This manual does not come together with the product. If you need to obtain the electronic PDF file, you can obtain it by logging in to the official website of Misumi

- <https://sg.misumi-ec.com/>
- <https://my.misumi-ec.com/>
- <https://vn.misumi-ec.com/>
- <https://th.misumi-ec.com/>
- <https://id.misumi-ec.com/>
- <https://in.misumi-ec.com/>

Foreword

Thank you for purchasing E-RMA series LMAC drives!

This product supports the STO (Safe Torque Off) function, gantry synchronization, position comparison (flying capture), and other features. It is suitable for automation equipment in industries such as semiconductors, lithium batteries, photovoltaics, electronics manufacturing, and machine tools. With its high-performance solutions, it facilitates equipment upgrades and improves efficiency.

This manual will provide information on the E-RMA series products regarding product safety & specifications, installations & wiring, tuning & problem diagnostics.

For first-time users, please read this manual carefully. If you have any questions about some functions and performance, please consult our technical support staff for help! Thank you!

Explanation

- Incorrect operation may cause unexpected accident, please read this manual carefully before using product.
 - We reserve the right to modify equipment and documentation without prior notice
 - We won't undertake any responsibility with any customer's modification of product and the warranty of product will be canceled at the same time.
-

Safety Precautions

In order to prevent personal injury and property damage, the following statements are made regarding matters that must be observed.

When read this manual, please pay attention to the safety signs:

⚠ DANGER Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ WARNING Indicates a hazard with a medium risk level which, if not avoided, could result in death or serious injury.

⚠ CAUTION Indicates a hazard with a low risk level which, if not avoided, could result in minor or moderate injury.

Safety instructions
<p>⚠ DANGER</p> <ul style="list-style-type: none">◆ The design of the product is not to be used in mechanical system which may incur health hazard.◆ Users should be aware of the product safety precautions during design and installations of the equipment to prevent any unwanted accident.
Upon receiving
<p>⚠ WARNING</p> <ul style="list-style-type: none">◆ If you find that the product or accessories are damaged or rusted when unpacking, please do not install it!◆ If you find that the product has water inside, parts are missing or parts are damaged when unpacking, please do not install it!◆ Please refer to item checklist. If the labels don't match, please do not install.◆ The use of damaged or faulty product(s) is prohibited.
<p>⚠ CAUTION</p> <ul style="list-style-type: none">◆ Do not remove the package or place it violently to prevent damage to the internal components of the drive!◆ The use of damaged or faulty product(s) is prohibited
Transportation
<p>⚠ WARNING</p> <ul style="list-style-type: none">◆ Please provide storage and transportation under protected conditions.◆ Do not stack the products too high up to prevent toppling.◆ The product should be packaged properly during transportation.◆ The product should be protected from external forces and shock

⚠ CAUTION

- ◆ When handling products, always lift and place them gently, paying close attention to objects underfoot to prevent tripping or falling, as this may result in injury or product damage.
- ◆ During storage or transportation, do not directly touch terminals or the drive circuit without electrostatic discharge precautions to avoid damaging the drive.
- ◆ Avoid storing or transporting the product in environments exposed to splashing water, rain, direct sunlight, strong electric fields, strong magnetic fields, or intense vibrations.
- ◆ Do not store the product for more than three months. If storage exceeds this duration, ensure stricter protective measures and necessary inspections are conducted.
- ◆ It is strictly prohibited to transport this product together with equipment or items that may impact or damage it.

Installation

⚠ DANGER

- ◆ Only personnel who have received training related to electrical equipment and possess electrical knowledge are allowed to operate. Operation by non-professional personnel is strictly prohibited!

⚠ WARNING

- ◆ Do not install around combustibles to prevent fire hazard.
- ◆ Avoid vibration and impact.
- ◆ Do not install products that are damaged or incomplete.
- ◆ Please ensure proper removal of static electricity before operating the buttons, switches, or other components of the drive. Otherwise, it may cause damage to the equipment!
- ◆ Please install in electrical cabinet with sufficient protection from outside elements.
- ◆ Reserve sufficient gap as per the installation guide.
- ◆ Good heat dissipation conditions are essential. If the product is installed in an enclosed environment, use cooling devices (such as cooling fans or air conditioning units) to ensure adequate cooling and meet the installation environment requirements. Failure to do so may result in product overheating or fire!
- ◆ Avoid dust, corrosive gas, conductive object or fluid and combustibles

Wiring

⚠ WARNING

- ◆ Participate installation personals should have sufficient training in product installation safety.
- ◆ Please power off and wait for 10 minutes to make sure a full discharge of electricity.
- ◆ Servo drive and motor must be connected to ground.
- ◆ Incorrect voltage or power polarity may cause explosions or operational accidents.
- ◆ Connect the cables only after servo drive motor installed correctly
- ◆ Make sure the wires are properly managed and insulation layer is not torn to prevent electrocution.
- ◆ Perform wiring operations, remove the product's outer casing, or touch the circuit board only when the power is off. Otherwise, there is a risk of electric shock.
- ◆ Wiring must be correctly connected to prevent damage to product(s).
- ◆ Capacitor, inductor or filter shouldn't be installed between servo motor and servo drive.
- ◆ Prevent conductive fasteners and wire ends from entering the drive.
- ◆ Connecting wires or any non-heat resistant components should be put near to heat sink of the servo drive or motor
- ◆ The flyback diode which is connected in parallel to output signal DC relay must not be connected in reverse.
- ◆ The cables used during wiring must meet the corresponding requirements for wire gauge and shielding. The shielding layer of shielded cables must be reliably grounded at one end!
- ◆ Follow the procedures specified in electrostatic discharge (ESD) prevention measures and wear an anti-static wrist strap during wiring and other operations to avoid damaging the equipment or internal circuits of the product.
- ◆ When wiring the control circuit, use twisted-pair shielded cables, and connect the shielding layer to the grounding terminal of the product for grounding. Otherwise, the product may malfunction.

Powering

⚠ DANGER

- ◆ Before powering on, please check that the product is properly installed, the wiring is secure, and the control power, main power, and motor output circuits are all correctly wired.
- ◆ It is strictly prohibited to touch any terminals of the product while it is powered on.

Tuning and running
<p>⚠ WARNING</p> <ul style="list-style-type: none">◆ Make sure the wirings of servo drive and servo motor are installed and fixed properly◆ before powering on, and within the rated input range of the drive.◆ On the first time tuning of the product, it is recommended to run unloaded until all the◆ parameter settings are confirmed to prevent any damage to the product or machine.
Usage
<p>⚠ WARNING</p> <ul style="list-style-type: none">◆ Please install an emergency stop button on machine to stop operation immediately if there is an accident.◆ Please make sure machine is stopped before clearing an alarm.◆ Servo drive must be matched with specified motor.◆ Frequent restart of the servo system might incur damage to the product.◆ Servo drive and motor will be hot to touch shortly after power off. Please be careful.◆ Modification(s) to servo system is prohibited
Error Handling
<p>⚠ WARNING</p> <ul style="list-style-type: none">◆ Please wait for 5 minutes after powering off for the electricity to be fully discharged before uninstalling the cables.◆ Participate maintenance personals should have sufficient training in maintenance and operation of this product series
<p>⚠ WARNING</p> <ul style="list-style-type: none">◆ Please handle the error before clearing an alarm.◆ Keep away from machine after a restart upon alarm. Mechanical axis might suddenly move. Such hazard should be prevented during the utilization of the product.
Model Selection
<p>⚠ CAUTION</p> <ul style="list-style-type: none">◆ Servo drive must be matched with specified motor.



Other precautions

Dynamic brake

- 1) Dynamic braking should only be used in emergency situations such as faults or sudden power failure. Do not trigger faults or power failures frequently.
- 2) In high-speed situations, ensure there is a minimum 5-minute action interval between dynamic braking operations to prevent damage to the internal dynamic braking circuit of the drive.

Safety markings

To ensure safe operation, always comply with the safety markings on the equipment.
The safety marking explanations are as follows

Icon	Lable	Description
	危险 (DANGER)	请务必使用说明书指示操作，一定要接好接地端子！ Read the manual and follow the safety instruction before using, NEVER fail to connect Protective Earth(PE) terminal!
	高压注意 (Hazardous Voltage)	断电后 10 分钟内不要触碰端子，否则可能导致触电！ Do NOT touch the terminals within 10 minutes after disconnecting the power. Risk of electric shock!
	高温注意 (High Temperature)	接通电源后请勿触碰散热器，否则可能导致烫伤或触电！ Do NOT touch the heat sink when power is ON. Risk of bum!
	室内使用 (Indoor Only)	请将本产品置于室内使用！ Please use the product in an indoor environment!

Note:
The icons are for reference only please refer to the actual product.

Guarantee provisions

For products purchased by customers from Misumi South East Asia Pte. Ltd. (hereinafter referred to as "the Company") listed in various product catalogs published by the Company and posted on websites operated by the Company (including product catalogs in other languages such as Japanese versions, hereinafter collectively referred to as "Product Catalogs"), the warranty for products sold in the Southeast Asia region (hereinafter referred to as "the Products") is entirely based on the usage rules (hereinafter referred to as "Usage Rules") and warranty provisions (hereinafter referred to as "this Warranty Provisions") described on this website or in the Product Catalogs.

However, please note that this Warranty Provisions do not apply to specially ordered products. Additionally, regardless of whether there are other warranties for the Products agreed upon with the customer, by placing an order for the Products (an offer to contract) or using the Products, the customer will be deemed to have agreed to the contents of this Warranty Provisions. Please be aware of this. If the Products come with a manufacturer's warranty, the manufacturer's warranty shall take precedence over this Warranty Provisions and apply instead. We appreciate your understanding.

Warranty Scope and Period

- For any purchased product that experiences damage, deformation, defects, or other issues (hereinafter collectively referred to as "defects") attributable to the Company, the defect must be detailed and notified in writing to the Company within the warranty period (as defined below). If the Company recognizes the cause of the defect as being within its scope of responsibility, it will either partially or fully replace the defective product or repair it free of charge. However, the following cases, as well as situations stipulated on this website or in the product catalog where replacement or repair is not acknowledged by the Company, are excluded from the scope of this warranty:
 - (1) Defects caused by uses other than general industrial purposes.
General industrial purposes refer to components or related products for general commercial and industrial equipment. This excludes transportation vehicles such as cars, machinery, ships, or other means of conveyance; medical equipment intended for human health or diagnostics; and consumer electronics or appliances used in ordinary households.
 - (2) Defects resulting from applications in aerospace, atomic machinery, military equipment, weapons, or other military purposes.
 - (3) Defects caused by negligence or errors in usage or handling by the customer.
 - (4) Defects caused by natural disasters (including but not limited to earthquakes, floods, and fires).
 - (5) Defects resulting from non-compliance with specifications, purposes, precautions, usage conditions, drawings, or other related matters published on this website, product catalogs, or product documents (including accessories).
 - (6) Defects caused after the customer has processed, repaired, modified, or disassembled the product.
 - (7) Defects caused by other machinery.
 - (8) Defects that arise when the product is used outside mainland China.
 - (9) Defects caused by lack of experience or usage beyond the intended purpose or method of the product.
 - (10) Defects resulting from customer violations of usage rules or provisions in separate agreements signed with the Company regarding the product.
 - (11) Defects discovered or occurring after the product has been resold to a third party by the customer.
 - (12) Other cases stipulated on this website or in product catalogs where the Company does not acknowledge repair or replacement.
- The warranty period for this product is one year from the date of shipment by the Company.
- Minor scratches, stains, dents, discoloration, and similar issues that do not affect the functionality of the product will not be considered defects. However, if such issues are deemed particularly severe by the Company, they will be treated as defects.
- Customers should verify the product name, model, quantity, and conformity with the specifications listed on the website or product catalog, and check for defects within one week of receiving the product. If any defects are found, a written notice must be sent to the Misumi Customer Service Center within the specified period. Please note that if no notification is received within this period, it will be assumed that the product received by the customer has no defects requiring replacement or repair and that the product has passed the customer's inspection.
- Replacement or repair services for products beyond the warranty period, outside the warranty scope, or otherwise not covered by this warranty will be provided as paid services.
- Depending on the nature, production date, and specifications of the product, repair or replacement may not be available.

Disclaimer Provisions

- Except for obligations specified in the Usage Rules or the manufacturer's liability under product quality laws, the Company shall not be liable for any damages (whether indirect or direct, general or special), losses, or expenses (hereinafter referred to as "damages") caused by defects in the product. Damages caused by product defects include damages resulting from defective products produced using this product, damages due to the recall of such products or this product itself, and damages from production line stoppages in the customer's factories or production equipment.
- If the customer violates the usage precautions, they forfeit any right to request compensation or reimbursement from the Company. In the event of defects caused by the Company, the compensation for damages to the customer will be limited to the purchase price of the defective product. The Company will not accept orders or sign contracts with customers unless they agree to this compensation limit.
- If the Company is not the manufacturer as defined by product quality laws, the customer may pursue liability claims directly against the manufacturer.
- The customer shall not have any right to seek compensation or reimbursement from the Company for damages arising from or related to the following:
 - (1) Damages caused by defective products produced using this product or production line stoppages in the customer's factory or production equipment when using this product.
 - (2) Damages resulting from violations of usage precautions or prohibitions described in the website, Usage Rules, product catalogs, manufacturer's warranties, or warranty provisions.
 - (3) Damages caused by defects resulting from the customer's intentional acts or negligence.
 - (4) Damages due to force majeure events leading to defects in this product.
 - (5) Damages resulting from disputes with third parties over intellectual property rights (e.g., patents, utility models, designs, trademarks) related to the use of this product.
 - (6) Damages caused by export delays or prohibitions due to laws or regulations.
 - (7) Damages arising from defects discovered after the customer resells this product to third parties.

Precautions

- This warranty is applicable only when the product is purchased and used within the Southeast Asia region. It is not valid under other circumstances.
- Products requiring replacement or repair under the warranty must be returned to the Company. Please note that the Company does not provide on-site replacement or repair services.
- The production and sale of this product may be discontinued due to manufacturer decisions or other reasons. In such cases, replacing the product with the same model may not be possible. Your understanding is appreciated.
- The Company reserves the right to revise, modify, or amend (collectively referred to as "revisions") the warranty provisions. Any revisions will be promptly recorded in the product catalog or on the Company website. By placing an order for the product after the revisions, the customer is deemed to have accepted the updated warranty terms.

Chapter 1 Overview

1.1 Upon receiving

After receiving the products, the following checks must be performed:

- Ensure the packaging is intact, and the goods have not been damaged during transportation.
- Verify the drive nameplate to confirm that the received goods match the ordered items.
- Check the packing list to ensure all accessories are included.

⚠CAUTION

- Damaged or incomplete drive units must not be installed.
 - The drive must be used with a linear motor that matches its performance.
 - If you have any questions after receiving the products, please contact our company.
-

Parts List

Port No.	Parts Name	Quantities
X1	9 PIN Main power connector Comes with a compression stick	1
X2	4 PIN Motor power connector	1
X3	2 PIN Holding brake connector	1
CN1	SCSI 26PIN connector	1
CN2	1394 6PIN connector	1
CN7	1394 10PIN connector	1

Note:

The E-RMA series debugging software for the PC requires separate contact with MISUMI staff for provision.

1.2 Model number structure

Drive model number structure

<div>E-RMA A 30</div> <div>① ② ③</div>	
① Series No.	③ Current Rating
	30: 2.8A
	60: 6A
② Product type	
A: Pulse + RS485	
E: EtherCAT Bus	

1.3 Component Description

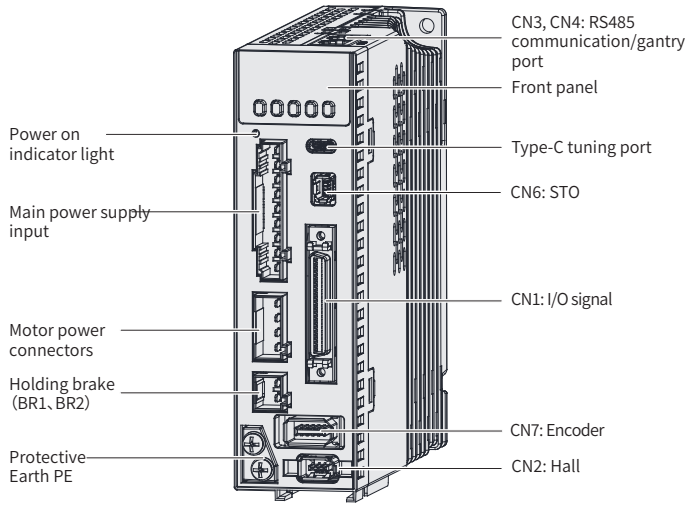


Figure 1-1 Drive Appearance and Component Diagram

Table 1-1 Drive Component Description

Parts & Connectors	Description												
Front Panel	<p>Including a LED display and 5 buttons. LED display is used to display servo drive status and parameter settings. 5 buttons:</p> <table border="1"> <thead> <tr> <th>Mark</th><th>Function</th></tr> </thead> <tbody> <tr> <td>MODE</td><td>To switch between different modes and parameters</td></tr> <tr> <td>◀</td><td>Move left</td></tr> <tr> <td>▲</td><td>Switch between sub-menus/ Increase</td></tr> <tr> <td>▼</td><td>Switch between sub-menus/ Decrease</td></tr> <tr> <td>SET</td><td>Confirm Input/Enter sub-menus</td></tr> </tbody> </table> <p>The warning status indicator can display the current status of the drive.</p>	Mark	Function	MODE	To switch between different modes and parameters	◀	Move left	▲	Switch between sub-menus/ Increase	▼	Switch between sub-menus/ Decrease	SET	Confirm Input/Enter sub-menus
Mark	Function												
MODE	To switch between different modes and parameters												
◀	Move left												
▲	Switch between sub-menus/ Increase												
▼	Switch between sub-menus/ Decrease												
SET	Confirm Input/Enter sub-menus												
TYPE-C Debugging Port	Connect to computer for tuning of servo drive. Parameters of the servo drive can be modified without connecting to main power supply.												
CN1 I/O signal	I/O signal connection terminals (SCSI-26PIN)												
CN2 Hall Port	Connect to motor Hall												
CN3 CN4 RS485 Communication Terminals	RS485 communication interface, connected to RS485 communication command devices.												
CN6 STO (Safety Torque Off)	STO connectors. Used for any application requiring STO functions.												
CN7 EncoderPort	Connect to motor encoder (Now only support ABZ incremental encoder and BISS-C absolute encoder)												
Holding Brake Port	BR1/BR2 Holding Brake Port												
Power-on indicator light (Bus Voltage)	Lights up when servo drive is connected to main power supply. Please do not touch the power terminal immediately after power off as the capacitor might require some time to discharge.												
Main power supply	<p>L1C, L2C: Control circuit power supply(Single phase 220VAC) L1, L2, L3: Main power supply 220VAC Note: E-RMA series supports 1P/3P 220VAC main power supply. P+, B1, B2: connect B1 and B2 to use internal regenerative resistor. if external regenerative resistor is needed, connect IT top+ and B2, disconnect B1 and B2.</p>												

Parts & Connectors	Description
Motor connectors	U, V, W Motor connector: Connect to U, V, W terminals on servo motor PE motor earth terminal: Connect to motor PE terminal
Protective Earth PE	Connect to PE of main power supply. For grounding

Note

- E-RMA series drives are equipped with built-in regenerative braking resistors. When using an external regenerative braking resistor, short the terminals B1 and B2. If an external regenerative braking resistor is required, remove the shorting piece and connect the external resistor between P+ and B2.
 - The thickness may vary depending on the current rating, but the components are consistent.
-

1.4 Technical Specifications

1.4.1 Electrical Specifications

Table 1-2 E-RMA30~E-RMA60 Electrical Specifications

Drive Module		E-RMA30	E-RMA60
Rated Current (Arms)		2.8	6.0
Peak Current (Arms)		9.3	21.0
Control circuit power supply		1-Ph AC 200V~240V, -10%~+10%, 50/60Hz	
Main power supply		1-Ph/3-Ph AC 200V~240V, -10%~+10%, 50/60Hz	
Regenerative resistor	Resistance (Ω)	100	100
	Power rating (W)	50	50
	Regenerative resistor function	All models in the series come with built-in regenerative braking resistors and also support the use of external braking resistors	
Cooling method		Air-cooled	Fan-cooled
Dimension H*L*W(mm)		150*150*43	150*160*55

1.4.2 General Specifications

Table 1-3 E-RMA Series drive General Specifications Table

Interface Configuration	
Configuration Port	TYPE-C configuration port, support to modify or read drive parameters without connecting to main power supply.
Low-Speed Pulse Input	5V differential signal, 0~500kHz 24V single-ended signal, 0~200kHz
High-Speed Pulse Input	5V differential signal, single channel up to 4MHz, quadrature up to 8MHz
Frequency divider Output	Supports phase A/B/Z differential frequency divider output Supports phase Z open collector frequency divider output
Analog Input	2 analog inputs (AI1/AI2), -10V~+10V, Max. voltage: $\pm 12V$
Analog Output	2 analog outputs (AO1/AO2), -10V~+10V
Digital Input	8 Digital Inputs (Supports common anode or cathode connection) DI1~DI8
Digital Output	3 Digital outputs (3 double-ended, DO1~DO3) The DO supports a load capacity of 50mA with a voltage range of 5V to 30V.
STO	Support
Hall	Support
Holding brake	Internal holding brake. External relay not needed

Communication Port		Support RS485 bus com, unication (RJ45 port), ModBus protocol
Control Mode		
Control Mode		<ul style="list-style-type: none"> • External pulse train position control • Velocity control • Torque controlJOG control • Hybrid control: Position-Torque/Position-Velocity/Velocity-Torque
Position	Pulse frequency	<ul style="list-style-type: none"> • 4Mhz(5V differential input) • 500kHz(5V differential input) • 200kHz(24V single-ended input)
	Electronic gear ratio	1 ~ 8388608/1 ~ 8388608
	Torque limit	Please refer to parameter setting
Control Features		
Drive Mode		IGBT SVPWM sinusoidal wave drive
Feedback Method		Encoder: RS485 Protocol
Easy-to-use		One-click tuning, Single parameter tuning, Zero tracking control
Notch Filter		Mechanical resonance suppression. Supports up to 3 filters, 50Hz~4000Hz
Vibration suppression		End vibration suppression
DI/DO settings		Digital inputs and outputs can be set accordingly
Alarm		Overcurrent. Overvoltage. Undervoltage. Overheat. Overload. Overtravel. Single-Phasing. Regenerative resistor error. Position deviation error. Encoder feedback error. Excessive braking rate. EEPROM error
Front Panel		5 push buttons, 8-segments display, 5 warning LEDs
Software		Drive tuning through EDrive. Parameters tuning in current loop, position loop, velocity loop. Modify I/O signal and motor parameters. Parameters can be imported and exported in file format, facilitating the matching of the drive with different motors or loads. Variables(velocity, position deviation, etc.) monitoring using step diagrams.
Communication		USB Type-C: Based on the Modbus protocol (compliant with USB 2.0 specifications), it can connect to a computer for parameter configuration and status monitoring. E-RMA supports RS485 bus communication (RJ45 interface), based on the Modbus protocol, with a maximum of 32 axes.
Dynamic Brake		Internal dynamic brake.

Position Comparison	42 position comparison outputs.
Black-box Function	Supports the black-box function, which can capture data before and after pre-set conditions. This data can be read using EDrive for further analysis.
Digital Input	
General Mode	<p>DI points: 10 (Supports common anode or cathode connection)</p> <p>Assignable output signals:</p> <ul style="list-style-type: none"> • Servo enabled (SRV-ON) • Clear Alarm (A-CLR) • Gain switching (GAIN) • Deviation counter clearing (CL) • Control mode switching (C-MODE) • Torque limit switching (TL-SEL) • Vibration suppression 1 (VS-SEL1) • Vibration suppression 2 (VS-SEL2) • Command prohibition (INH) • Internal command velocity 1 (INTSPD1) • Internal command velocity 2 (INTSPD2) • Internal command velocity 3 (INTSPD3) • Frequency divider input (DIV1) • Positive limit switch (POT) • Negative limit switch (NOT) • Zero speed clamp (ZEROSPD) • Velocity sign (VC-SIGN) • Velocity sign 2 (VC-SIGN) • Torque sign (TC-SIGN) • Emergency stop (E-STOP)
PR mode	<p>Assignable output signal under PR mode:</p> <ul style="list-style-type: none"> • Path trigger (CTRG) • Home switch (HOME) • Emergency stop trigger(STP) • Path 0-3 (ADD0-ADD3) • Positive JOG (PJOG) • Negative JOG (NJOG) • Positive limit switch (PL) • Negative limit switch (NL) • Origin (ORG)

Digital Output	
General mode	<p>DO points: 6 (2 single ended, 4 double-ended)</p> <p>Assignable output signals:</p> <ul style="list-style-type: none"> • Servo ready (SRDY) • External brake off (BRK-OFF) • Positioning completed (INP1) • Velocity at arrival (AT-SPEED) • Zero speed position (ZSP) • Alarm (ALARM) • Velocity coincidence (V-COIN) • Position command (P-CMD) • Velocity limit (V-LIMIT) • Velocity command (V-CMD) • Servo enabled (SRV-ST) • Positive limit switch(POT-OUT) • Negative limit switch (NOT-OUT)
PR mode	<p>Assignable output signal under PR mode:</p> <ul style="list-style-type: none"> • Command completed (CMD-OK) • Path completed (PR-OK) • Homing done (HOME-OK)
Environmental requirements	
Temp	<p>Installation: 0-55°C (Not frozen) . Reduce the load when operating above 45° C. For every 1° C increase, reduce the load by 2%.^[1]</p> <p>Storage: -20-80 °C (Condensation free). Do not store for more than 72 hours at temperatures exceeding 65° C!</p>
Humidity	Under 90%RH (Condensation free)
Altitude	<p>Maximum altitude: 2000m.</p> <p>For altitudes below 1000m, no derating is required.</p> <p>Above 1000m, reduce the load by 1% for every additional 100m.</p>
Vibration	Less than 0.5G (4.9m/s²) 10-60Hz (non-continuous working))
IP ratings	IP20

Note

[1] Please install the drive within this ambient temperature range. When stored in an electrical cabinet, ensure that the internal temperature of the cabinet does not exceed this value.

Chapter 2 Installation

Please carefully read the "Safety Precautions" chapter and the installation instructions provided in this section.

CAUTION

- Please strictly follow the installation requirements outlined in this section, as failure to do so may result in product malfunctions or damage.
 - Do not install or operate any equipment that is damaged or missing parts, as this may cause personal injury.
 - Do not install this product in areas where water may splash or in environments prone to corrosion, as this may lead to product failure.
 - Do not install this product near flammable gases or combustible materials, as it may cause fire or electric shock.
 - Install this product in a cabinet that provides fire protection and electrical protection, otherwise, it may lead to a fire.
 - Ensure that there is the required spacing between the drive, the control cabinet's surface, and other machines. Failure to do so may cause fire or product failure.
 - Do not place heavy objects on the product, as this may cause personal injury or product damage.
 - Do not apply excessive impact force to the equipment, as this may result in product damage.
 - Do not block the drive's intake or exhaust vents, and do not allow foreign objects to enter the product, as this could lead to fire or product malfunction.
-

2.1 Drive Installation

2.1.1 Installation Location

1. Please install the product in an indoor control cabinet, away from rain and direct sunlight. Do not place flammable materials around the product. This device does not have a waterproof design.
2. Do not use this product in environments containing hydrogen sulfide, sulfur dioxide, chlorine, ammonia, corrosive gases, acids, alkalis, salts, or near flammable gases and combustible materials.
3. Do not install this product in high-temperature, humid, dusty, or metal powder environments.
4. Install the product in a location with minimal vibration.
5. Install in a well-ventilated, dry, and dust-free area. Ensure that the product's interior is free from oil, metal dust, water, and other foreign substances.

2.1.2 Installation environment

Installation and Storage Environment Conditions

Table 2-1 Drive Installation and Storage Environment Requirements

Items	E-RMA series drive
Environment Temperature	0~+55°C <ul style="list-style-type: none">No derating is required between 0° C and +45° C. When the temperature exceeds 45° C, derating is required, with a 2% derating for every 1° C increase.As the temperature decreases and humidity increases, condensation is likely to occur.^[1]
Environment Humidity	Under 90%RH (Condensation free).
Storage Temperature	-20-80°C (Condensation free)
Storage Humidity	Under 90%RH (Condensation free).
Atmospheric	Indoor (no exposure to sunlight) No corrosive gas, combustibles, dirt or dust.
Altitude	Maximum altitude: 2000m. For altitudes below 1000m, no derating is required. Above 1000m, reduce the load by 1% for every additional 100m
Vibration	Less than 0.5G (4.9m/s ²) 10-60Hz (non-continuous working)
IP ratings	IP20

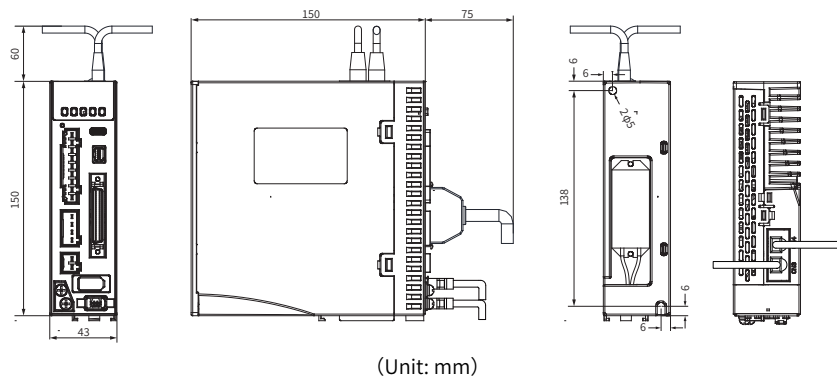
Note

[1]Please install the drive within this temperature range. When storing it in an electrical cabinet, the temperature inside the cabinet should not exceed this temperature value.

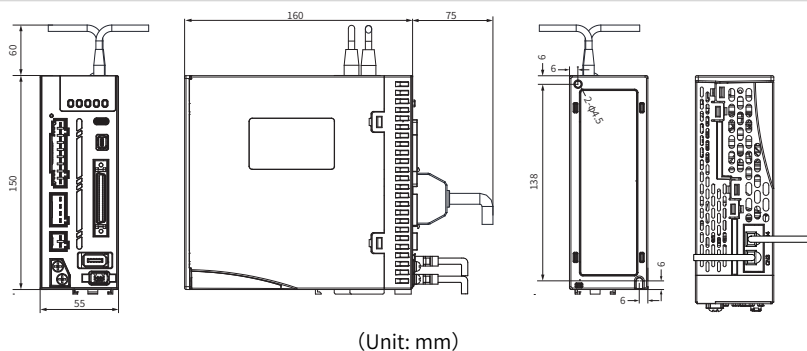
2.1.3 Installation dimension

The following provides the dimensions for each model of E-RMA. Please use the site wiring as the standard for installation dimensions.

E-RMA30



E-RMA60



2.1.4 Installation Method Precautions

Space requirement for installation

Users can install the device using either the base mounting method or the panel mounting method, with the installation direction vertical to the mounting surface facing upwards. In order to ensure efficient heat dissipation, please leave at least 10mm of installation space between drives. When reserving installation space, ensure a clearance of at least 50mm on each side in the longitudinal direction.

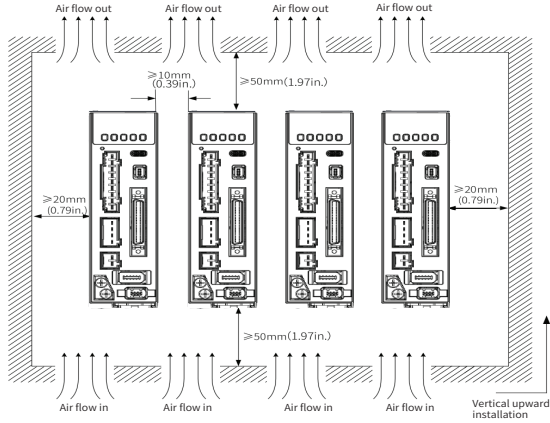


Figure 2-1 Installation Space Diagram with Reserved Clearance

When installing the drives in a compact arrangement, please consider the installation tolerances and leave at least 1mm of space between each pair of drives. In this case, please use the drives at an actual load rate of 75% or below.

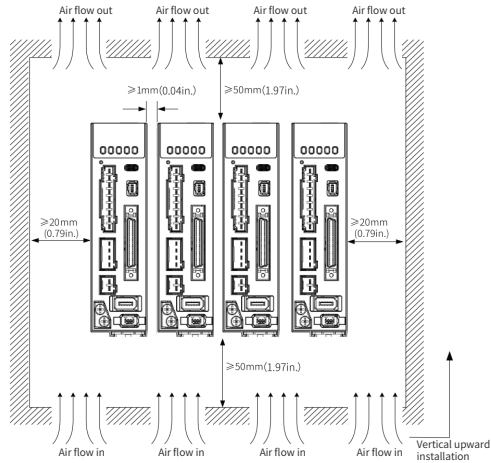


Figure 2-2 Compact Installation Space Diagram

Installation Precautions

1. Method

Please install the drive vertical to ground facing forward for better heat dissipation.

When there are multiple products in the cabinet, please install them side by side. In cases where vertical installation is required, please install insulation and diversion plates.

Use natural convection or fans to cool the drives.

Fix the drive to the mounting surface using the mounting holes on the drive.

During installation, ensure that the front of the drive faces the operator and that the drive is installed vertically to the wall!

2. Cooling

To ensure cooling through fans and natural convection, sufficient heat dissipation space must be left around the drive. Additionally, considering the heat dissipation of other components in the cabinet, please install a cooling fan above the drive. To prevent areas within the drive's environment from becoming too hot, it is necessary to maintain an even temperature throughout the electrical cabinet.

3. Grounding

PE terminals must be grounded to prevent electrocution hazard or electromagnetic interference.

4. Wiring

When wiring the drive, the cables connecting to the drive should be routed downwards. Please ensure there is no liquid around the wiring and connectors as liquid leakage may cause serious damage to the drive(s).

5. Port Dust Protection

When the top CN5 communication port is not in use, appropriate dust protection measures should be taken, such as inserting a dust cover into the port, to prevent foreign objects (solids, liquids, etc.) from falling inside and causing damage to the product.

Chapter 3 Wiring

Please carefully read the safety instructions in the "Safety Precautions" chapter. Violating these safety instructions may lead to serious consequences.

DANGER

- ◆ Personnel involved in wiring or inspection must have sufficient qualifications for this work.
- ◆ It is strictly forbidden to power the drive with an IT power grid. Please use TN/TT power grid supply, otherwise, it may result in electric shock.
- ◆ Be sure to connect the input power and the main circuit power of the drive (single-phase L1, L2, three-phase L1, L2, L3/R, S, T) to an electromagnetic contactor, forming a structure that can cut off the power supply. This will prevent the drive from experiencing a fault and continuing to carry large currents, which could lead to a fire.
- ◆ Ensure that the input power to the drive is within the specified voltage fluctuation range, otherwise, it may lead to product failure.
- ◆ Do not connect the drive's output terminals U, V, W to a three-phase power supply, as this may cause personal injury or fire.
- ◆ Use the ALM (fault signal) to cut off the main circuit power supply. If the brake transistor fails, it could cause the brake resistor to overheat abnormally, resulting in a fire.
- ◆ Connect the drive's protective earth (PE) terminal to the control cabinet's protective earth (PE) terminal. Otherwise, it may lead to electric shock.
- ◆ Ensure the entire system is grounded. Otherwise, it may cause incorrect operation of the product.
- ◆ After disconnecting the power supply, the internal capacitors may still have residual voltage. Please wait at least 5 minutes before performing wiring or other operations, otherwise, it may result in electric shock.

WARNING

When wiring the power supply and main circuit, please follow these precautions:

- ◆ It is strictly forbidden to connect the drive directly to a 380V input power supply.
- ◆ Install circuit breakers or other safety devices to prevent fires caused by potential short circuits in the external wiring.
- ◆ Wiring must be done according to the terminal voltage and polarity to prevent equipment damage or personal injury.
- ◆ The drive and linear motor must be properly grounded.
- ◆ Please use a power supply filter to reduce electromagnetic interference. Otherwise, it may interfere with electronic devices near the drive.
- ◆ The drive and linear motor must be directly connected. The use of electromagnetic contactors during wiring is strictly prohibited, as it may cause product failure.

3.1 System Wiring Diagram

System Wiring Diagram

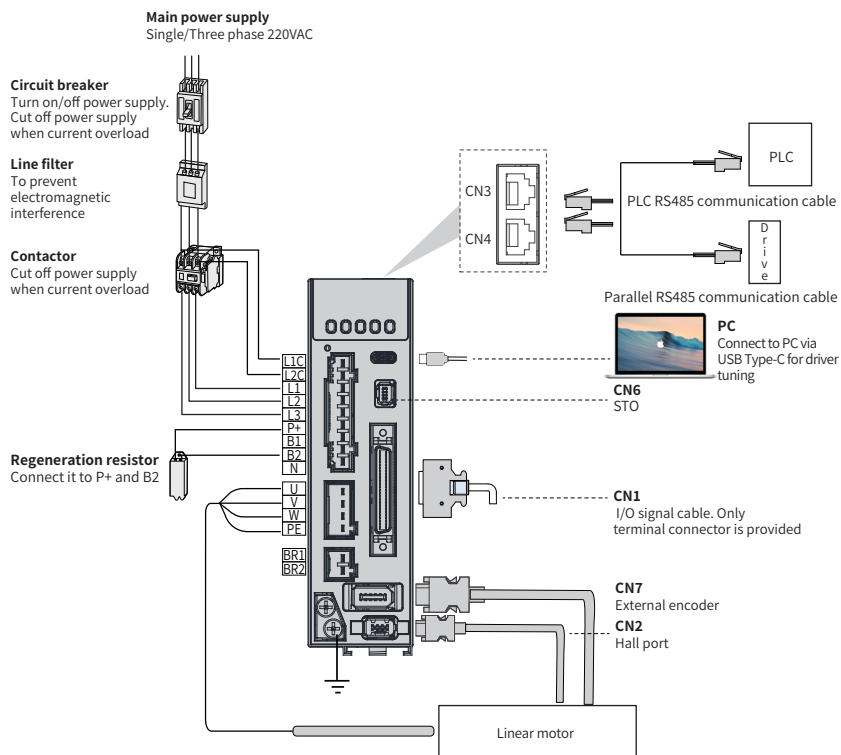


Figure 3-1 Single phase 220VAC Wiring Diagram

- E-RMA series supports single-phase/three-phase 220V power supply. For three-phase 220V, it needs to be connected to L1, L2, and L3.
- The drive is directly connected to the industrial power supply without going through a transformer or other power isolation devices. To prevent cross-electric shock accidents, please use a fuse or circuit breaker on the input power supply. For a safer system, please use a leakage circuit breaker with overload and short circuit protection, or a dedicated leakage circuit breaker with ground protection.
- It is prohibited to use an electromagnetic contactor for the operation and stopping of the motor. Since the motor is a large inductive component, the instantaneous high voltage generated may damage the contactor.

3.2 Electrical Wiring Diagram

3.2.1 Position control mode wiring diagram

Position control mode wiring diagram

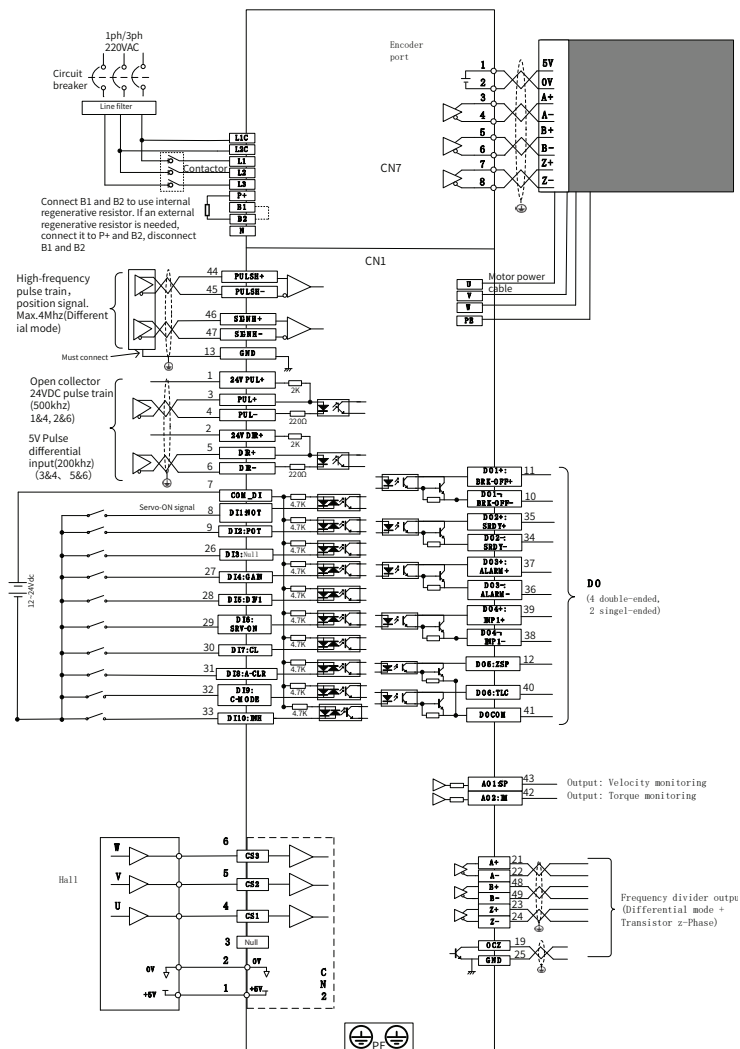


Figure 3-2 Position control mode standard wiring diagram

■ Please set P00.05 to 1 when using 4MHz high-frequency pulse train

3.2.2 Velocity/Torque control mode wiring diagram

Velocity control mode wiring diagram

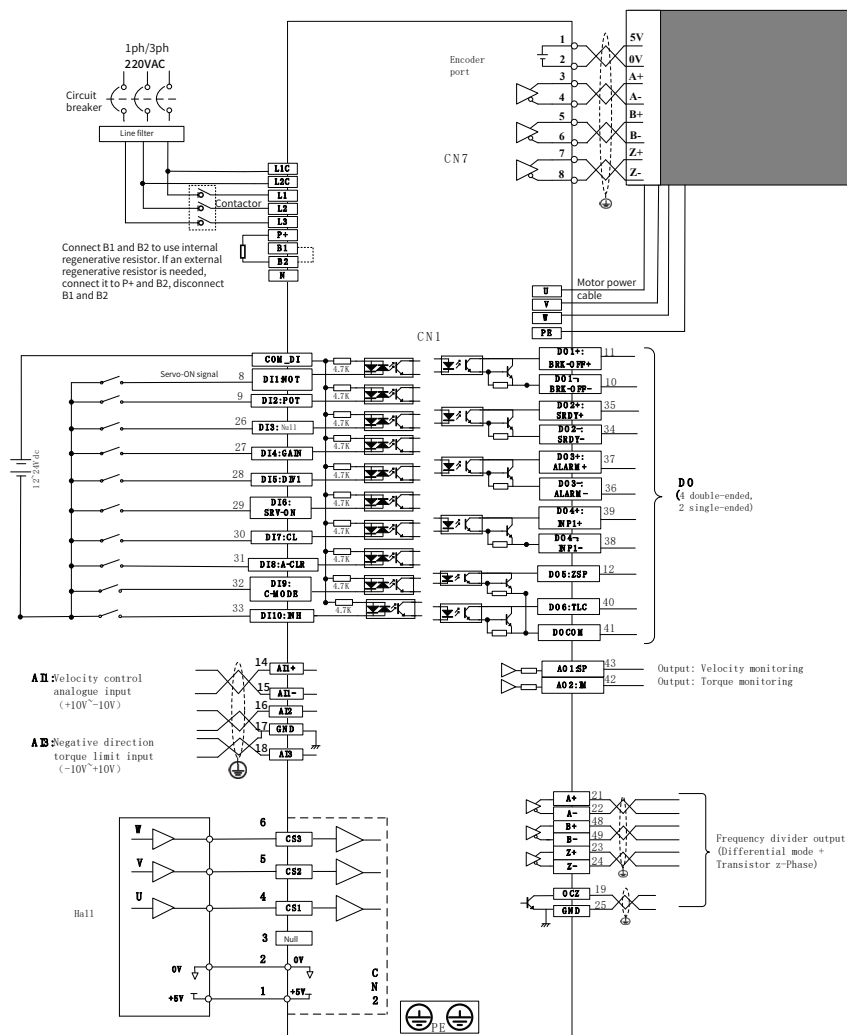


Figure 3-3 Velocity control mode standard wiring diagram

Torque control mode wiring diagram

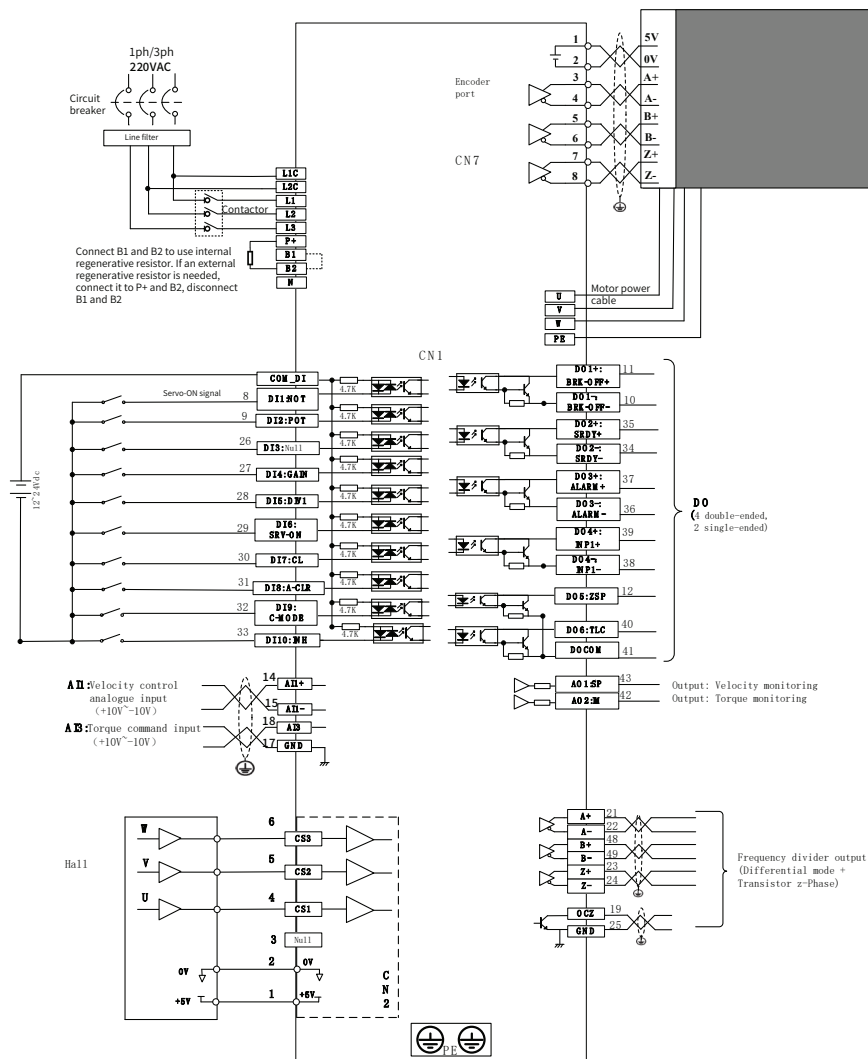


Figure 3-4 Torque control mode standard wiring diagram

3.3 Ports Assignment

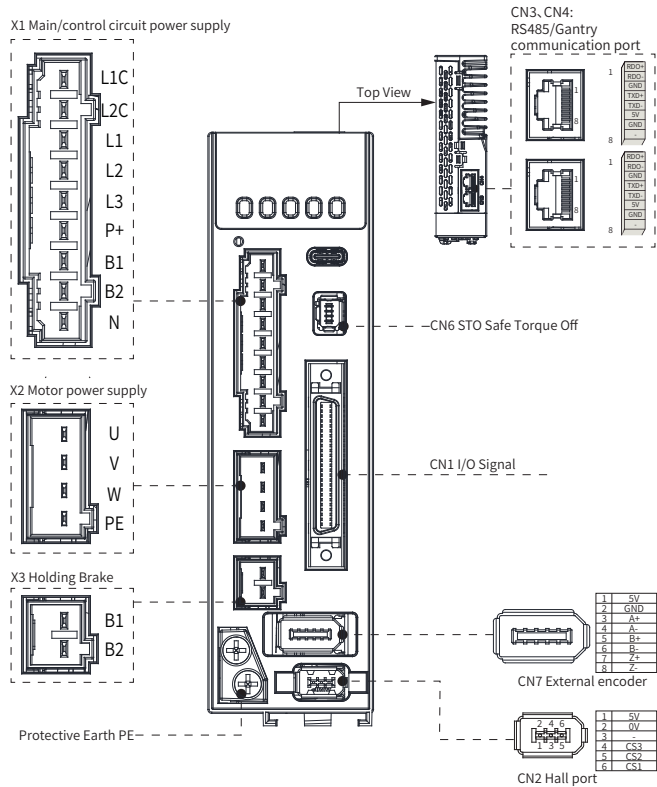


Figure 3-5 Ports pinout diagram

The pin layout shown in the above diagram represents the ports built into the drive body!

Table 3-1 Description of each port

Port	Description	Port	Description
CN1	I/O signal connector (50PIN)	X1	Main/Control circuit power supply
CN2	Hall port	X2	Motor power supply
CN3	RS485 communication port	X3	Holding Brake
CN4	RS485 communication port	PC	Type-C Serial communication interface
CN6	STO Safe Torque Off	PE	Connect to the power grounding terminal for grounding
CN7	External encoder	-	-

3.4 Main Circuit Wiring

3.4.1 Main circuit power supply X1

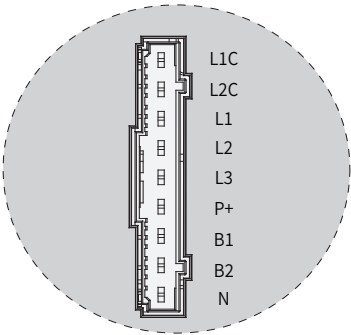


Figure 3-6 Main circuit port pinout diagram

Table 3-2 Main circuit port labels and function descriptions

Pin	Label	Function Description	Remark
L1C	Control circuit L1	Control circuit power supply. Single phase 220VAC	<ul style="list-style-type: none">• Optional isolated switching power supply.• Connecting to 380VAC will cause damage to drive.• Line filter is suggested in environment with strong interference.• Use a fuseless circuit breaker to turn on/off power supply to drive.
L2C	Control circuit L2		
L1	Main power supply L1	Single phase 220VAC. S u p p o r t s 1 p h / 3 p h 220VAC, -10% ~ +10%, 50/60Hz	
L2	Main power supply L2		
L3	Main power supply L3		
P +	DC Bus positive terminal	Internal DC bus positive terminal External regenerative resistor P terminal	Connect B1 and B2 to use internal regenerative resistor. If an external regenerative resistor is needed, connect it to P+ and B2, disconnect B1 and B2.
B1	Regenerative resistor terminal	Internal regenerative resistant drawing terminal	
B2	Regenerative resistor terminal	Internal IGBT transistor	
N	DC Bus negative terminal	Internal DC bus negative terminal	Please don't connect to any cable

3.4.2 Motor Power Supply X2

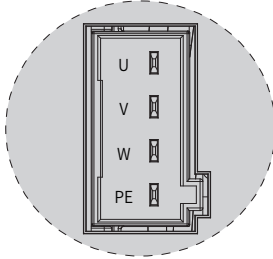


Figure 3-7 Motor power output port pinout diagram

Table 3-3 Motor power output port labels and function descriptions

Pin	Label	Function Description	Remark
U	U terminal	To motor U terminal	<ul style="list-style-type: none">• Please make sure U, V, W terminals of drive and motor are correctly connected.• Connect motor PE to drive PE and ground.
V	V terminal	To motor V terminal	
W	W terminal	To motor W terminal	
PE	PE	Motor frame	

3.4.3 Regenerative resistor selection and connections

The use of regenerative resistor

When the motor opposes the direction of rotation as in deceleration or vertical axis escalation, part of the regenerative energy will be delivered back to the drive. This energy will first be stored in internal capacitors of the drive. When the energy stored in the capacitors reach the maximum capacity, a regenerative resistor is required the excessive energy to prevent over-voltage.

Regenerative energy is related to multiple factors. Measures to reduce regenerative energy power include: reducing inertia, extending deceleration time, and reducing load, etc.

Selection of regenerative resistor

E-RMA series servo drives are equipped with internal regenerative resistor. If an external resistor is needed, please refer to the table below.

Table 3-4 Regenerative Resistor Specifications Table

Model no.	Internal regenerative resistor Resistance(Ω)	Internal regenerative resistor Power rating(W)	Minimum allowable Resistance(Ω)	Minimum allowable Power rating (W)
E-RMA30	100	50	50	50
E-RMA60	100	50	40	50

⚠CAUTION

- To connect an external braking resistor, configure the following parameters:
Set P07.31 Discharge Mode = 0 to enable the resistor discharge function.
Set P00.16/P00.17 to the correct regenerative resistor power and resistance values.

Regenerative resistor connection

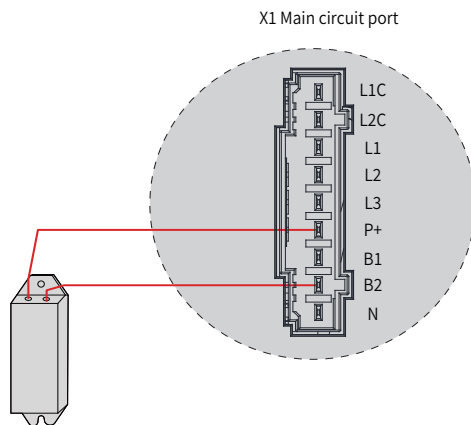


Figure 3-8 Regenerative resistor connection digram

⚠CAUTION

- If B1 and B2 are connected, internal regenerative resistor is now functional. If an external regenerative resistor is required, please disconnect B1 and B2 and connect P+ to B1 to prevent overcurrent.
- Please do not connect external regenerative resistor directly to N or it might cause fire hazard.
- Do not use a value lower than the minimum allowable resistance, as this may cause an alarm or damage the drive. Please refer to "Table3-4 Regenerative Resistor Specifications Table".
- Please confirm Pr0.16 and Pr0.17 before using any regenerative resistor.
- Do not set the regenerative resistor near any flammable object.
- Do not make any connections to N!

3.4.4 Recommended specifications for main circuit wiring

E-RMA Series drive output current specifications

Drive Module	Rated Current (Arms)	Peak Current (Arms)
E-RMA30	2.8A	9.3A
E-RMA60	6.0A	21.0A

Main power supply cable selection

■ Wire gauge

The wire gauge for connecting different power drives varies. The recommended values are shown in the table below:

Table 3-5 Main power supply wire gauge

Drive Module	Wire diameter (mm ² /AWG)			
	L1, L2	P+, BR	U, V, W	PE
E-RMA30	1.3/AWG16	2.1/AWG14	1.3/AWG16	2.1/AWG14
E-RMA60	1.3/AWG16	2.1/AWG14	1.3/AWG16	2.1/AWG14

CAUTION

- When using three-phase 220V, the wire gauge for L1/L2/L3 can be smaller than for single-phase 220V.
- Grounding wire should be thicker. Ground PE terminal of servo drive and servo motor together with resistance <100 Ω.
- A 3-phase isolation transformer is recommended to lessen the risk of electrocution.
- Connect a line filter to power supply to reduce electromagnetic interference.
- Please install a non-fusing breaker (NFB) to ensure that the external power supply is promptly cut off in the event of a drive failure.

Cable selection for I/O signal port CN1 and CN2 encoder feedback

■ Wire gauge

Recommended to use stranded and shielded cable. For CN1, $\geq 0.14\text{mm}^2$, CN2 $\geq 0.25\text{mm}^2$ shielding layer needs to be grounded.

■ Length

Cable length should be as short as possible. No more than 3m for CN1 and 15m for CN2.

■ Placement

Place the cable away from power cables.

■ Please install surge absorption components for the inductive elements (coils) in the relevant circuits.

Install a surge suppressor in feedback circuitm flyback diode inversely connected in parallel in DC coil and capacitor connected in parallel in AC coil.

⚠CAUTION

- U, V, and W must be connected to the motor windings correspondingly and must not be reversed.
- Cables and wires should be securely fixed and kept away from the drive's heat sink and the motor to prevent insulation degradation due to heat.
- The drive contains large-capacity electrolytic capacitors, which may still hold high voltage even after power is turned off. Do not touch the drive within 5 minutes after power-off.

3.4.5 Single/Three phase power supply wiring diagram

Single Phase 220VAC

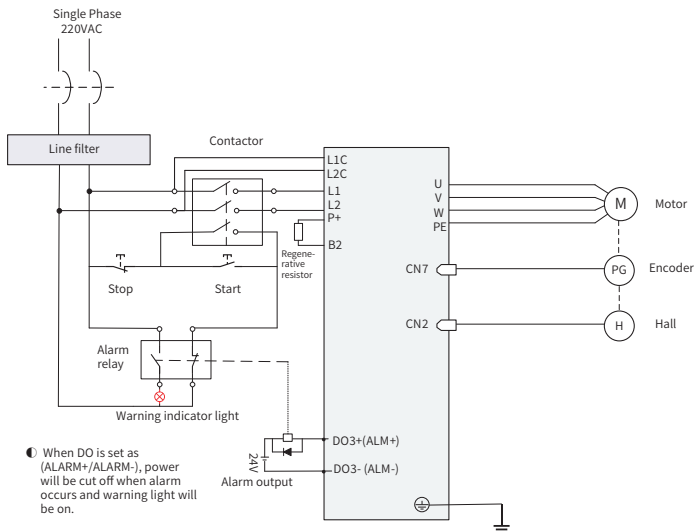


Figure 3-9 Single Phase 220VAC wiring diagram

Three Phase 220VAC

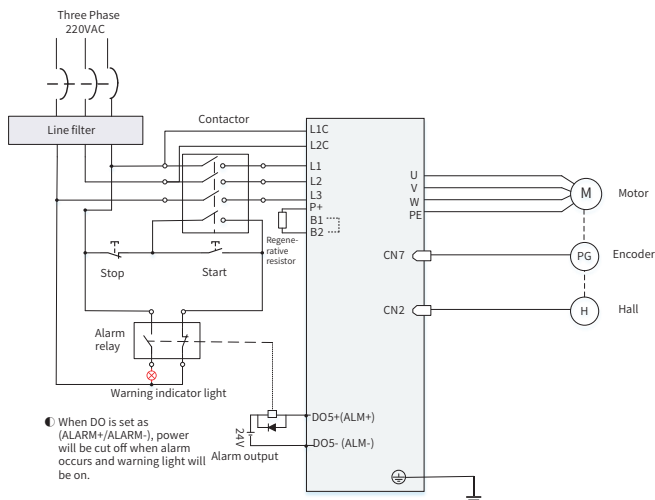


Figure 3-10 Three Phase 220VAC wiring diagram

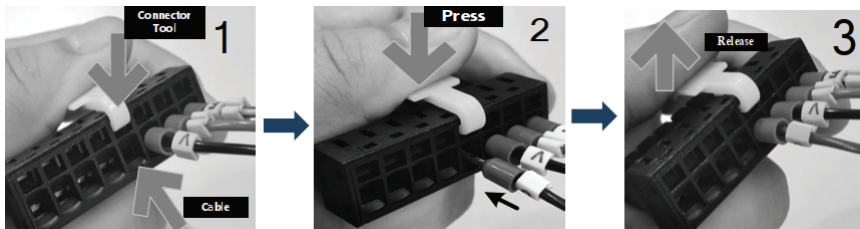
3.4.6 Precautions for Main Circuit Wiring

- Ensure the input power supply matches the rated voltage level indicated on the nameplate. Both control power and main power must be connected as specified.
- Do not connect the input power supply wires to the U, V, W motor output terminals. Otherwise, it may damage the drive.
- Do not route power cables and signal cables through the same conduit or bundle them together. To avoid interference, maintain a distance of at least 30 cm between them.
- The power input and motor cables of the drive generate strong electromagnetic interference. To prevent electromagnetic interference caused by coupling when high-interference cables run parallel to control circuits over long distances, ensure the distance between the main circuit cables and signal cables is greater than 30 cm. Common main circuit cables include control power input (L1C/L2C), main power input (L1/L2/L3), output (UVW), DC bus cables, and brake cables. Signal cables include I/O signal cables, communication cables, and encoder cables.
- Ensure good connections and grounding between cable troughs. Aluminum cable troughs can ensure equal potential across the equipment. Filters, drives, and motors should be properly grounded to the system (machinery or device). Protective coatings should be applied at installation points to ensure sufficient contact with conductive metals.

- Reliably ground the drive to the earth.
- Do not power on the device if terminal screws or cable connections are loose, as this could cause a fire hazard.
- Ensure the power supply is turned off and wait for at least 5 minutes before inspecting the drive to prevent electric shock from residual voltage.

To fix wire cables into connector

The main circuit terminal connector is equipped with an operation lever, which can be used to connect the cables. The operation steps are as follows:



- 1) Select the terminal hole where the cable will be connected, then insert the operation lever into the corresponding operation lever slot for that terminal hole.
- 2) Press the operation lever in the direction perpendicular to the connector. At this point, the spring clamp in the terminal hole will open, allowing the conductive part of the cable to be fully inserted into the terminal hole.
- 3) Release the operation lever. The spring clamp will lock the conductive part of the cable securely in place. The operation is now complete.

CAUTION

- The action to remove the cable is the same as inserting it: press the operation lever to remove the cable.
- Only one wire can be inserted into each connector terminal.
- After using the operation lever, please store it properly for future use!

3.5 Connection of Drive and Linear Motor Power Cables

For motor power cables, our company provides optional accessories:

- Cables are available in three selectable lengths: 1 meter, 3 meters, and 5 meters.



Note

- If other cable lengths are required, please contact our sales department in advance.
 - When connecting the motor power cable to the drive, the four wires at the end of the cable are marked as follows: M1, M2, M3, and PE. These should be matched one-to-one (M1 to U, M2 to V, M3 to W) and correctly connected to the plug slots of the drive's main circuit terminals.
-

3.6 CN1-Control signal port connection

E-RMA series drive CN1 **control signal connector** use SCSI 26PIN connector. The specific definitions are as follows:

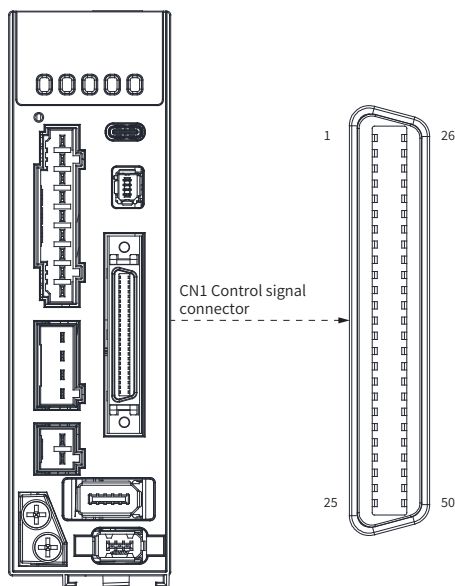
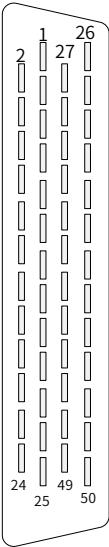


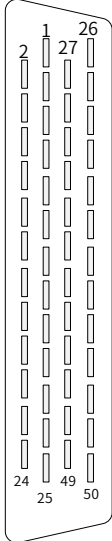
Figure 3-11 Control signal connector CN1 schematic diagram

Note

- It is recommended to use cables with a wire gauge of 24–26 AWG for connecting to CN1. The CN1 connector is an SCSI 26-pin connector.

Table 3-6 Control signal connector - CN1 pin assignment

Diagram (soldering side of the connector)	Pin	Label	Signal	Description (default function)
	1	PUL+24	Pulse input	Low-frequency pulse train direction signal: PUL+ and PUL-: 5V differentialinput (500KHz)
	3	PUL+	Pulse input	
	4	PUL-	Pulse input	
	2	DIR+24	Direction input	DIR+ and DIR-: 5Vdifferentialinput (500KHz) PUL+24 and PUL-: 24V single end (200KHz) DIR+24 and DIR-: 24V single end (200KHz)
	5	DIR+	Direction input	
	6	DIR-	Direction input	
	44	PULSH+	High frequency pulse input	4MHz High-frequency pulse train, 5V differential input
	45	PULSH-	High frequency pulse input	
	46	SIGNH+	High frequency direction input	4MHz High-frequency pulse train, 5V differential input
	47	SIGNH-	High frequency direction input	
	13	GND	GND	Ground
	7	DI-COM	Input	Common digital input
	8	DI1	NOT	Positive limit switch
	9	DI2	POT	Negative limit switch
	26	DI3	Null	-
	27	DI4	GAIN	Gain switching
	28	DI5	DIV1	Command multiplier switching
	29	DI6	SRV-ON	Servo on
	30	DI7	CL	Set deviation counter to zero
	31	DI8	A-CLR	Clear alarm(s)
	32	DI9	C-MODE	Control mode switching
	33	DI10	INH	Signal inhibit
	11	DO1+	BRK-OFF+	Release external brake
	10	DO1-	BRK-OFF-	
	35	DO2+	SRDY+	Servo ready signal output
	34	DO2-	SRDY-	
	37	DO3+	ALM+	Alarm output
	36	DO3-	ALM-	
	39	DO4+	INP1+	Position reached feedback signal
	38	DO4-	INP1-	
	41	DOCOM	Output	Common digital output (Max. current:50mA, Max. voltage 30V)
	12	DO5	ZSP	Velocity zero
	40	DO6	TLC	Limited torque

	14	Analog input 1	AI1	Velocity/Velocity limit(0 ~ ±10 V)
	15	GND	GND	Analog ground
	16	Analog input 2	AI2	-
	17	GND	GND	Analog ground
	18	Analog input 3	AI3	Torque/Torque limit in clockwise direction (0 ~ +10 V)
	42	AO1	IM	Analog output signal monitoring 1 (Configurable)
	43	AO2	SP	Analog output signal monitoring 1 (Configurable)
	21	A+	Differential output	Phase A frequency divider output
	22	A-	Differential output	
	48	B+	Differential output	Phase B frequency divider output
	49	B-	Differential output	
	23	Z+	Differential output	Phase Z frequency divider output
	24	Z-	Differential output	
	25	GND	GND	Internal ground
	19	OCZ	Channel Z output	Channel Z output (Open collector)
	20	GND	GND	Internal ground
	50	FG Shield ground	FG	-
	FG	-	FG	Frame ground

CN1 signal cable selection

To ensure I/O signal to not be affected by electromagnetic interference, a shielded twisted pair cable is recommended for this application. For different analog signals, separate shielded wires should be used. For digital signal wires, shielded twisted-pair cables are recommended, with the shield effectively grounded to PE. The cables connected to CN1 should be of 24–26 AWG wire gauge, and the CN1 terminal is a 26-pin connector.

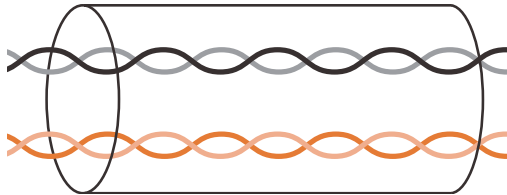


Figure 3-12 Shielded Twisted-Pair Cable Diagram

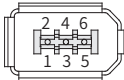
IO Signal Wiring

IO signals include digital input (DI), output (DO) signals, and relay output signals. When wiring control circuits, they should be kept at least 30 cm apart from main circuit wiring (L1C/L2C/L1/L2/L3, U/V/W) and other power lines, as placing them too close can cause interference with IO signals.

3.7 CN2-Hall port Connection

E-RMA series servo drive CN2 uses 1394 6PIN connector, with the following pin definitions:

Table 3-7 Hall connector - CN2 pin assignment

Diagram	Pin	Signal	Description
	1	5V	Power supply
	2	0V	
	3	-	Do Not Connect
	4	CS3	CS3 signal input (W)
	5	CS2	CS2 signal input(V)
	6	CS1	CS1 signal input(U)
	Frame	PE	Shield grounding

Note

- After inserting the Hall wires, bundle the cables together with the power cables to prevent the Hall connector from being damaged due to the weight of the wires.

⚠CAUTION

- Make sure to reliably ground the shielded layer on both the drive and motor sides to avoid false alarms in the drive!
- It is recommended to use twisted pair shielded cables for the Hall wires, and avoid using excessively long cables.
- Hall wires and power cables must be routed separately to prevent interference! Maintain a spacing of at least 30cm between them!

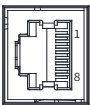
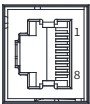
3.8 CN3, CN4 communication port connection

Communication port pin definition

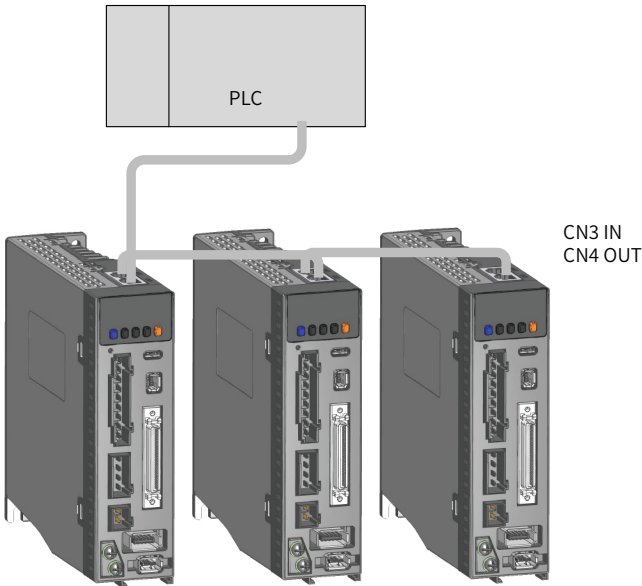
E-RMA series drives support RS485 communication.

When using multiple units simultaneously, connect to the master controller and multiple servos via the RS485 communication interface.

Table 3-8 RS485 communication port - CN3/CN4 pin assignment

Diagram	Pin	Signal	Description
 CN4	1	RDO+	RS485 Differential signal+
	2	RDO-	RS485 Differential signal-
	3	GND	Ground (RS485)
	4	TXD+	RS485 Differential signal+
	5	TXD-	RS485 Differential signal-
	6	5V	Reserved, 5V positive (50mA)
	7	GND	Ground
	8	-	-
 CN3	Frame	PE	Shield grounding

■ E-RMA series supports RS485 communication protocol which enables communication between single/multi axes and master device.



3.9 CN6 - Safe Torque Off (STO) Port

The CN6 terminal of the E-RMA series servo drive uses the TE 2013595-1 connector, with the specific definitions as follows:

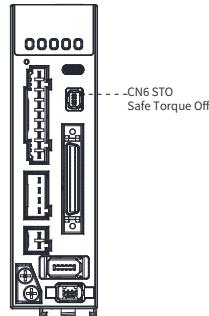
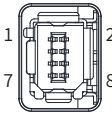


Table 3-9 STO port pin assignment

Diagram (drive side)	Pin	SIG	Description	Remarks
	1	0V	STO reference ground	Connect to SF1 and SF2 when not in use. Do not use to supply power
	2	24V	STO 24V power supply	
	3	SF1-	STO Control signal 1 negative input	When SF1 = OFF or SF2 = OFF, STO is enabled
	4	SF1+	STO Control signal 1 positive input	
	5	SF2-	STO Control signal 2 negative input	
	6	SF2+	STO Control signal 2 positive input	
	7	EDM-	EDM output	When SF1 = OFF or SF2 = OFF, EDM = ON
	8	EDM+		

Introduction to Safe Torque Off (STO)

Function: Cut off motor current supply physically (through mechanical means).

STO module (CN6 connector) consists of 2 input channels. It cuts off the motor current supply by blocking of PWM control signal from the power module. When the motor current is cut off, the motor will still move under inertia and stops gradually.

The STO function is set up ready to be used by factory default. Please remove STO connector if it is not needed.

⚠CAUTION

Once the STO (Safe Torque Off) function is activated, the drive will no longer have control over the motor. Therefore, before enabling the STO function, please assess the potential dangers that may still exist:

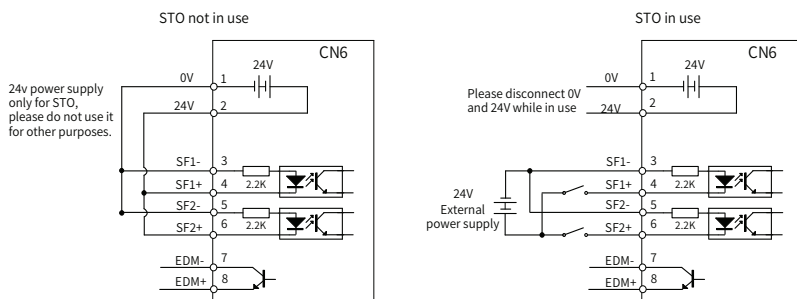
- After enabling the STO function, the drive cannot guarantee that the motor will not move due to external forces.
- The STO function does not cut off the power supply to the drive, so there is still a risk of electric shock. When performing maintenance on the drive, always disconnect the power supply and other devices.
- Please use a single power source to supply the STO signal input. Otherwise, leakage current may cause the STO function to malfunction, preventing the system from entering the STO OFF state.

STO functional principle

STO module cuts off the motor current supply and stops motor gradually by blocking of PWM control signal from the power module through 2 isolated circuits. When a STO error occurs, the actual status of STO can be determined by the EDM status feedback. Status Description Table as follows:

SF1 Input Status	SF2 Input Status	EDM Output Status	PWM control signal	Alarm code
ON	ON	OFF	Normal	-
ON	OFF	OFF	Blocked	Er 1C2
OFF	ON	OFF	Blocked	Er 1C1
OFF	OFF	ON	Blocked	Er 1C0

STO wiring diagram



STO Alarm clearing mechanism

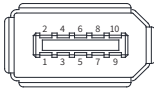
STO1 input state	STO2 input state	Alarm clear method
OFF → ON	ON	Er 1C1 can be cleared through the master station, upper computer, or by power cycling
ON	OFF → ON	Er 1C2 can be cleared through the master station, upper computer, or by power cycling.
OFF → ON	OFF → ON	Er 1C0 clear automatically

3.10 CN7 - Encoder port connection

Encoder port CN7

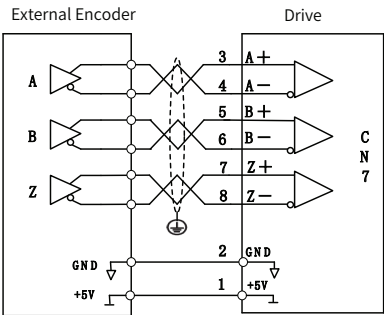
Encoder port CN7 uses 1394 10PIN connector and simultaneously supports two encoder feedback modes: incremental A, B, Z and BISS-C. Please connect according to the encoder feedback type supported by the motor.

Table 3-10 Encoder feedback signal port - CN7 pin assignmen

Diagram	Feedback type	Pin	signal	Description
	A, B, Z	1	5V	Power supply 5V
		2	GND	Power supply ground
		3	A+	Phase A+ pulse input
		4	A-	Phase A- pulse input
		5	B+	Phase B+ pulse input
		6	B-	Phase B- pulse input
		7	Z+	Phase Z+ pulse input
		8	Z-	Phase Z- pulse input
	BISS-C	1	5V	Power supply 5V
		2	GND	Power supply ground
		3	SLO+	Data+
		4	SLO-	Data-
		5	MA+	Clock+
		6	MA-	Clock-
	-	Fram	FG	Shield grounding

External encoder pulse input

Encoder pulse input must use twisted pair shielded cables, and the shield must be properly grounded.



Note

- Please connect the encoder reference ground terminal to drive ground terminal. Recommended to use double winding cable with shielding foil, Connect the shielding foil to CN7 connector to reduce noise interference.
- External encoder input method: Differential input.

3.11 PC - tuning port connection

By using a universal Type-C communication cable, the computer can be connected to the drive for parameter setting, changes, and monitoring. It supports parameter modification and uploading of alarm information without affecting the main power.

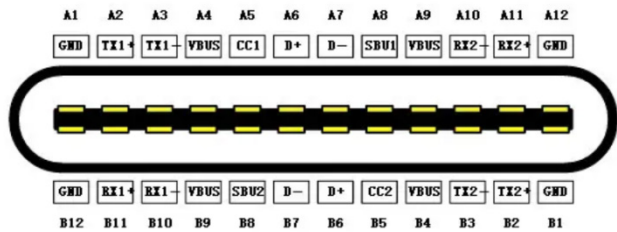


Figure 3-13 Drive TYPE-C pin assignment

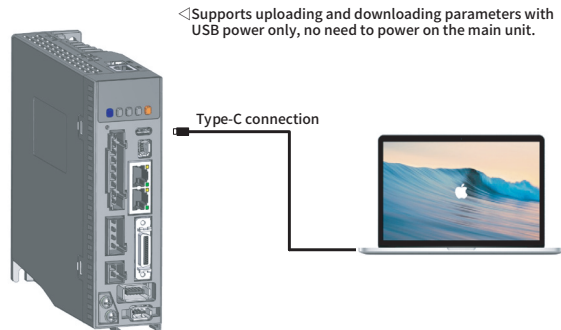
Table 3-11 TYPE-C communicatin port pin assignment

Pin	Singal	Description
A4, B4, A9, B9	VCC 5V	Power supply 5V
A12, B12, A1, B1	GND	Power supply GND
A6, B6	D+	USB data positive terminal
A7, B7	D-	USB data negative terminal
Frame	USB_GND	Ground through capacitor

Note

- Without powering on the main power, a debugging cable can be used to connect the computer to the drive, allowing the use of the debugging software EDrive to make relevant parameter settings and changes.
- When connecting to the computer for debugging, if there is significant interference, it may result in connection issues. In such cases, using a debugging cable with a magnetic ring can effectively solve the connection problem!

PC - tuning port connection example



3.12 I/O Signal

3.12.1 Pulse input circuit

When PLC or Motion Controller command pulse output circuits can be divided into 2 categories, namely differential output or open collector. Hence, on the side of servo drive, there are 2 types of command pulse input method as well: Differential drive input and open collector input.

Pulse input frequency:

- 1) High speed pulse input (4MHz)
- 2) Low speed pulse input (200kHz/500kHz)

Pulse input frequency can be set in P00.05.

The relationship between different pulse input frequencies and pulse widths:

Pulse Type		Max. Frequency (Hz)	Min pulse width(μs)
Low speed	Differential	500k	1
	Open collector (Single ended)	200k	2.5
High speed differential		4M	0.125

Note

- High-/low speed pulse cannot be used at the same time.
- If output pulse width is smaller than min pulse width, error might occur at pulse receiving end

5V differential drive input (Low Speed)

5V differential drive input (max. tolerable command input pulse frequency = 500kHz), input voltage of 3-6V with 50% duty ratio.

This input method will not be easily affected by noise with better delivery accuracy. Pin 3 and 4 of CN1 are for pulse signal input. Pin 5 and 6 are for direction signal input.

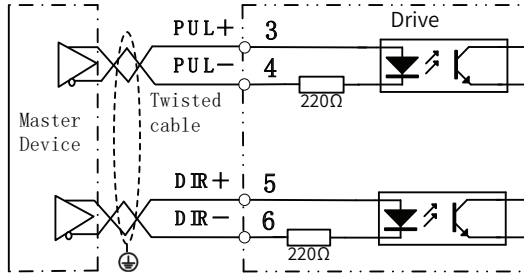


Figure 3-14 Low speed 5V differential drive mode for pulse input interface (3, 4, 5, 6)

Single ended open collector drive input (Low Speed)

Max. tolerable command pulse input frequency under open collector = 200kHz. Input voltage of 12-24V with 50% duty ratio

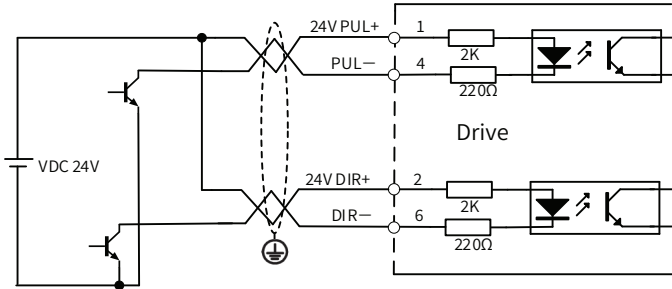


Figure 3-15 24V single-ended drive mode for pulse input interface (NPN)

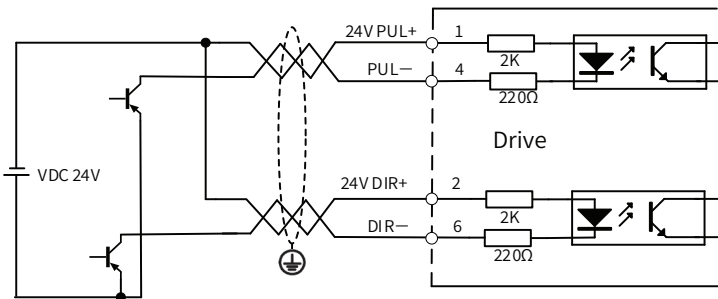


Figure 3-16 24V single-ended drive mode for pulse input interface (PNP)

Note

- 5V differential drive method is recommended for accurate delivery of pulse data.
- Drive supports 5V differential drive and 24V single ended open collector drive, different connection pins for both methods.
- External power supply needs to be provided externally when using single ended open collector drive method. Please note that reversed polarity might cause damage to the servo drive.

5V differential drive input (High Speed)

5V differential drive input (Max. tolerable command pulse input frequency: 4Mhz).

Due to high speed pulse input, it is highly recommended to use shielded cable and be isolated from power cable.

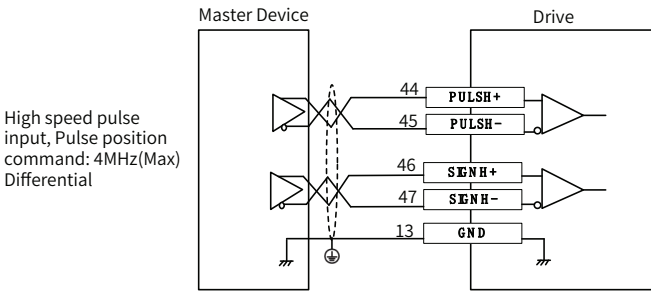


Figure 3-17 High speed 5V differential drive mode for pulse input interface (44, 45, 46, 47)

Please make sure that differential input is 5V or it might cause instability of input pulse.

- Pulse lost during command pulse input.
- Inversed pulse direction during direction command.
- Please connect 5V signal to GND on drive to lower noise interference.

3.12.2 Analog input circuit

Analog input signal

E-RMA series drives support three analog input channels. AI1, AI2, and AI3 use single-ended analog input.

Table 3-12 Analog input signal pin assignment

CN1 Pin	Signal	Description
14	AI1	Analog Input 1: Single-ended mode, input voltage range $\pm 10\text{VDC}$, input resistance $20\text{k}\Omega$.

CN1 Pin	Signal	Description
16	AI2	Analog Input 1: Single-ended mode, input voltage range $\pm 10\text{VDC}$, input resistance $20\text{k}\Omega$.
18	AI3	Analog Input 1: Single-ended mode, input voltage range $\pm 10\text{VDC}$, input resistance $20\text{k}\Omega$.
15	GND	Analog GND
17	GND	

Max tolerable input voltage for each AI is $\pm 10\text{VDC}$. If variable resistor (VR) or resistor (R) is used, please refer to the following circuit diagram (AI1 for example).

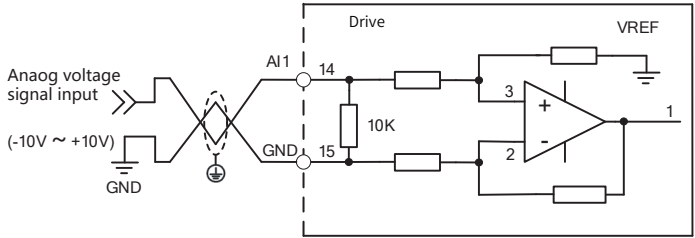


Figure 3-18 Analog AI1 input port

Analogue output signal

E-RMAseries servo drives support 2 analogue outputs, output voltage: $-10\text{V} \sim +10\text{V}$, Corresponding signals are set in P04.65/P04.70.

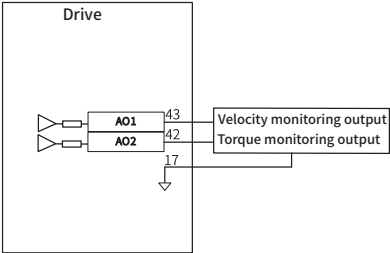


Figure 3-19 Analog AO1 output port

3.12.3 General digital input circuit

Use DI 1 for example, as the circuits of DI 1~DI 8 are the same. The internal circuit of common input is a bidirectional optocoupler which supports common anode and common cathode configurations. At the same time, the master devices for general IO signal inputs include relay outputs and open collector outputs.

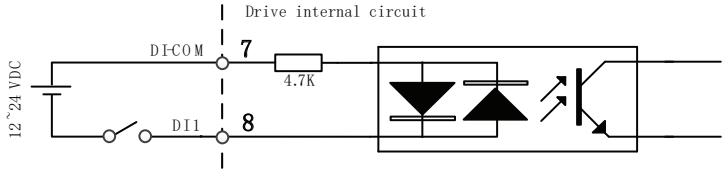
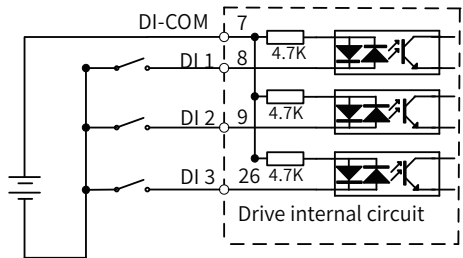


Figure 3-20 General digital IO input circuit

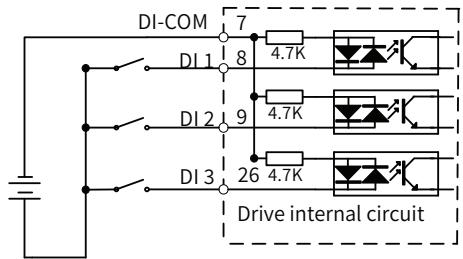
① Output from master device: Relay (only DI1~DI3 shown)

E-RMA support both common anode and common cathode connection:

Common anode:

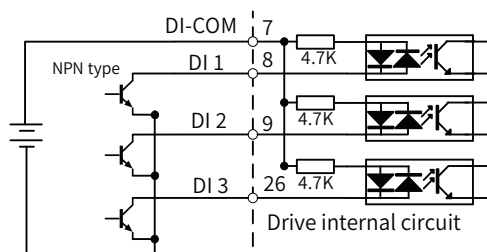


Common cathode:

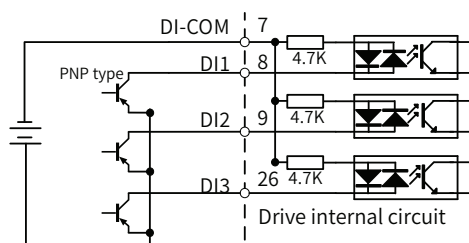


② Output from master device: Open Collector (only DI1~DI3 shown)

NPN configuration:



PNP configuration:



Note

- Please prepare switching power supply with output of 12-24VDC.
- For IO pin assignment, please refer to "3.6 CN1-Control signal port connection".

3.12.4 General digital output circuit

There are a total of 6 digital outputs with DO5/DO6 as single end outputs. Both of these outputs are connected to COM of control signal source, which means both use the same control signal source. DO1-DO4 are double end outputs. They can be connected to independent control signal source and reference ground can be different from other single ended output signals.

■ Double end outputs DO1-DO4

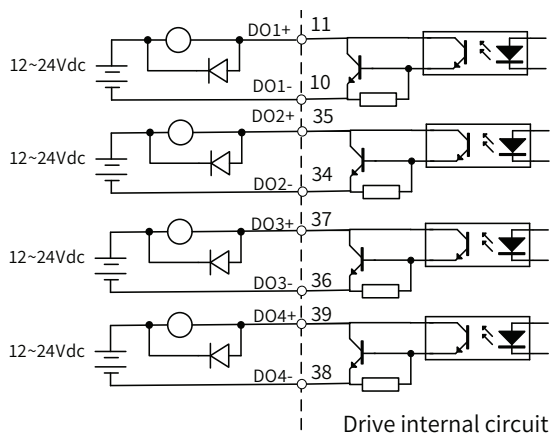


Figure 3-21 General digital IO output double end

■ Single ended output DO5-DO6

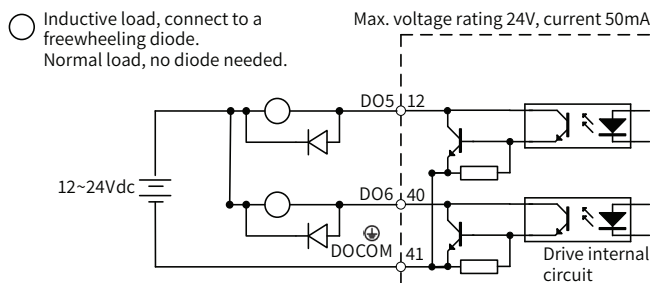


Figure 3-22 General digital IO output single end

⚠CAUTION

- Power supply is provided by user. Please be aware that reversed power supply polarity might cause damage to the drive.
- When it is an open collector output, max current: 50mA, max supplying voltage: 25V. Please ensure the switching power supply fulfills the conditions.
- If the load is an inductive load such as a relay, please connect a flyback diode in parallel in reverse. A wrong installation of the flyback diode might cause damage to the drive.
- For IO pin assignment, please refer to "3.6 CN1-Control signal port connection".

3.12.5 Encoder frequency divider output

E-RMA has frequency divider output in both differential mode and open collector mode

Table 3-13 Encoder frequency divider output signal pin assignment

Pin	Signal	Description	
21	A+	Motor encoder A-phase frequency divider output	Differential, High $\geq 2.5\text{VDC}$, Low $\leq 0.5\text{VDC}$, Max current $\pm 20\text{mA}$
22	A-		
48	B+	Motor encoder B-phase frequency divider output	
49	B-		
23	Z+	Motor encoder Z-phase frequency divider output	
24	Z-		
19	OCZ	Motor encoder Z-phase OC output	Only support NPN type OC output
25	GND	Encoder signal OC output ground	

Encoder frequency divider output (differential output method)

■ The encoder signal output, after frequency division processing, is differentially output through a differential drive. Typically, when the upper-level device forms a position control system, it provides feedback signals. On the upper-level device side, please use a differential or optocoupler receiving circuit. When using a differential receiver on the upper-level device side, make sure to install termination resistors between the differential input circuits, with the resistance value set according to the actual situation.

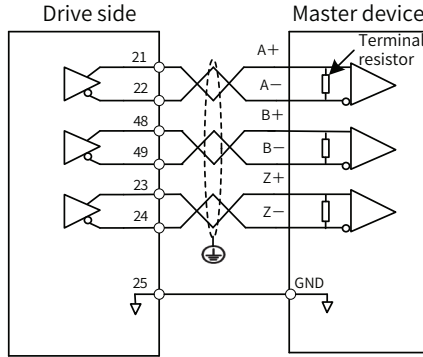


Figure 3-23 Encoder frequency divider output (differential output) circuit

CAUTION

- If the master device is not an optocoupler but a differential reception circuit, please be sure to short-circuit pin 16 (GND) of the drive with the differential reception GND of the master device.

Encoder frequency divider output (Open Collector)

Encoder signal after frequency division will be delivered through an open collector output.

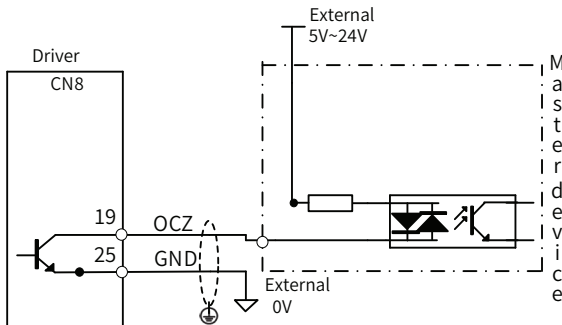


Figure 3-24 Encoder frequency divider output (Open Collector) circuit

CAUTION

- Please connect drive frequency divider signal GND to GND of external power supply. Use shielded twisted pair cable to lower noise interference.

3.13 Digital Input/Output Signal

3.13.1 Digital Input Signal Setting

Control input

Default status

CN1 PIN	Signal	Parameter	Default function	Default status
7	DI-COM	-	Common DI	-
8	DI1	P04.00	NOT	Normally opened OFF
9	DI2	P04.01	POT	Normally opened OFF
26	DI3	P04.02	-	Normally opened OFF
27	DI4	P04.03	GAIN	Normally opened OFF
28	DI5	P04.04	DIV1	Normally opened OFF
29	DI6	P04.05	SRV-ON	Normally opened OFF
30	DI7	P04.06	CL	Normally opened OFF
31	DI8	P04.07	A-CLR	Normally opened OFF
32	DI9	P04.08	C-MODE	Normally opened OFF
33	DI10	P04.09	INH	Normally opened OFF

Note

- Normally Opened (NO):
When the signal input is disconnected from the DI-COM loop → Function is inactive (OFF state)
When the signal input is connected to the DI-COM loop → Function is active (ON state)
- Normally Closed (NC):
When the signal input is disconnected from the DI-COM loop → Function is active (ON state)
When the signal input is connected to the DI-COM loop → Function is inactive (OFF state)

CAUTION

- When limit switch or emergency stop is used, POT, NOT and E-STOP signal will be normally close (NC) by default. Please make sure there is no safety concern if these signals need to be set to normally open (NO)
- Servo drive power on signal (SRV-ON) is set as normally open (NO) as default. Please make sure there is no safety concern if this signal needs to be set to normally close (NC).

How to set control input

Common input control signal:

CN1 PIN	Signal	Parameter	CN1 PIN	Signal	Parameter
8	DI1	P04.00	29	DI6	P04.05
9	DI2	P04.01	30	DI7	P04.06
26	DI3	P04.02	31	DI8	P04.07
27	DI4	P04.03	32	DI9	P04.08
28	DI5	P04.04	33	DI10	P04.09

This parameter is set in hexadecimal.

Please refer to the table below to configure the function number.

Signal	Sign	Setting value	
		NO	NC
Invalid	—	0	-
Positive limit switch	POT	1	81
Negative limit switch	NOT	2	82
Servo enabled	SRV-ON	3	83
Clear Alarm	A-CLR	4	-
Control mode switching	C-MODE	5	85
Gain switching	GAIN	6	86
Clear deviation count	CL	7	-
Command pulse prohibited	INH	8	88
Torque limit switching	TL-SEL	9	89
Command frequency divider/multiplier switching	DIV1	C	8C
Internal command velocity 1	INTSPD1	E	8E
Internal command velocity 2	INTSPD2	F	8F
Internal command velocity 3	INTSPD3	10	90
Zero speed clamp	ZEROSPD	11	91
Velocity command sign	VC-SIGN	12	92
Velocity command sign 2	VC-SIGN2	4A	CA
Torque command sign	TC-SIGN	13	93
Emergency stop	E-STOP	14	94
Inertia ratio switching input	J-SEL	15	95
Gantry disable	GTRY	17	97

⚠CAUTION

- Do not configure values outside the table above, as this will trigger an Er211 "I/F Input Port Function Setting Error." Configuring control input lines as invalid does not affect operation.
- The same function must not be assigned to multiple pins. Otherwise, an Er210 "I/F Input Port Assignment Duplication" error will occur.
- The servo enable signal (SRV-ON) must be assigned. If it is not assigned, the servo cannot be enabled.

Inputs related to Pr-mode:

Signal	Sign	Setting value	
		NO	NC
Trigger command	CTRG	20	A0
Home	HOME	21	A1
Forced stop	STP	22	A2
Positive JOG	PJOG	23	A3
Negative JOG	NJOG	24	A4
Positive limit	PL	25	A5
Negative limit	NL	26	A6
Origin	ORG	27	A7
Path address 0	ADD0	28	A8
Path address 1	ADD1	29	A9
Path address 2	ADD2	2A	AA
Path address 3	ADD3	2B	AB

⚠CAUTION

- CTRG, HOME are edge triggered, please make sure electronic bits last 1ms or above.

Configurable Input Signal

Label	Servo enabled			Mode	P	S	T
Signal	SRV-ON	Default assign.	29(DI6)	I/O circuit	Section 3.12.3 General digital input circuit		
Servo enabled (Motor ON/OFF control signal)							

Label	Positive position limit			Mode	P	S	T
Signal	POT	Default assign.	9 (DI2)	I/O circuit	Section 3.12.3 General digital input circuit		
To prevent axis from travelling in positive direction. Signal valid when P05.04 is set. If P05.04 is set to any value besides 1, POT signal invalid when axis moves in positive direction.							

Label	Negative position limit			Mode	P	S	T
Signal	NOT	Default assign.	8(DI1)	I/O circuit	Section 3.12.3 General digital input circuit		
To prevent axis from travelling in negative direction Signal valid when P05.04 is set. If P05.04 is set to any value besides 1, NOT signal invalid when axis moves in negative direction.							

Label	Clear deviation count			Mode	P	S	T
Signal	CL	Default assign.	30(DI7)	I/O circuit	Section 3.12.3 General digital input circuit		
To clear position deviation counter. Only clear once by default. Please modify on P05.17.							

Label	Clear alarm			Mode	P	S	T
Signal	A-CLR	Default assign.	31(DI8)	I/O circuit	Section 3.12.3 General digital input circuit		
To clear alarm. Only some of the alarms can be cleared.							

Label	Command pulse prohibited			Mode	P	S	T
Signal	INH	Default assign.	33(DI10)	I/O circuit	Section 3.12.3 General digital input circuit		
Ignore position command pulse Please set in P05.18 when needed When INH input is valid, position command from controller will deviate from servo drive internal command after filtering, which might cause the loss of position info before INH input. Please reset before making any further action requiring position management.							

Label	Control mode switching			Mode	P	S	T
Signal	C-MODE	Default assign.	32(DI9)	I/O circuit	Section 3.12.3 General digital input circuit		
When P00.01 = 3, 4, 5, control mode is hybrid mode, which is consists of 2 control modes. All control modes require this signal. Please set to a same logic when in position, velocity or torque mode to prevent error from occurring. When C-MODE is valid, select 2nd mode. When invalid, select 1st mode. Please do not enter any command 10ms before and after mode switching.							

Label	Command frequency divider/multiplier switching			Mode	P	S	T
Signal	DIV1	Default assign.	28(DI5)	I/O circuit	Section 3.12.3 General digital input circuit		
<p>When DIV1 is valid, frequency divider/multiplier numerator and denominator switch to 2nd command frequency divider/multiplier numerator and denominator.</p> <p>When DIV1 input is valid, position command from controller will deviate from servo drive internal command after filtering, which might cause the loss of position info before DIV1 input. Please reset before making any further action requiring position management.</p>							

Label	Vibration suppression 1			Mode	P	S	T
Signal	VS-SEL1	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		
To switch frequency used in vibration suppression							

Label	Vibration suppression 2			Mode	P	S	T
Signal	VS-SEL1	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		
To switch frequency used in vibration suppression							

Label	Gain switching			Mode	P	S	T
Signal	GAIN	Default assign.	(27)DI4	I/O circuit	Section 3.12.3 General digital input circuit		
To switch between 1st and 2nd gain							

Label	Torque limit switching			Mode	P	S	T
Signal	TL-SEL	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		
To switch between 1st and 2nd torque limit. Please refer to P05.21							
Value				Limit			
0				P00.13			
1				P05.22			
2	TL-SEL OFF			P00.13			
	TL-SEL ON			P05.22			
3~4				Reserved			
5				P00.13 Positive torque limit P05.22 Negative torque limit			

Label	Zero speed clamp			Mode	P	S	T
Signal	ZEROSPD	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		
To set velocity command to 0 When in use, please set P03.15 ≠ 0.							

Label	Velocity command sign			Mode	P	S	T
Signal	VC-SIGN	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		
Sign of velocity command input in velocity control mode. Please refer to Pr3.01							

Label	Torque command sign			Mode	P	S	T	
Signal	TC-SIGN	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit			
Sign of torque command input in torque control mode. Please refer to P03.18								
		Value	Direction settings					
		0	Torque command input 「+」 → Positive direction 「-」 → Negative direction					
		1	Use TC-SIGN ON/OFF status for torque direction OFF: Positive direction ON: Negatie direction					

Label	Internal command velocity 1			Mode	P	S	T
Signal	INTSPD1	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		

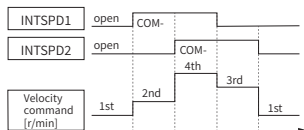
Label	Internal command velocity 2			Mode	P	S	T
Signal	INTSPD2	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		

Label	Internal command velocity 3			Mode	P	S	T
Signal	INTSPD3	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		

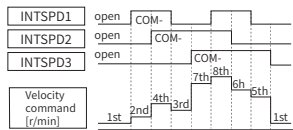
Select internal command speeds 1 to 8. When P03.00 is set to 0, the speed is determined based on the analog speed command and is not related to INTSPD1~3.
The relationship between P03.00, the INTSPD1~3 states, and the selected speed command are shown as below.

Value	Internal command velocity 1 (INTSPD1)	Internal command velocity 2 (INTSPD2)	Internal command velocity 3 (INTSPD3)	Velocity command
1	OFF	OFF	No effect	1st speed
	ON	OFF		2nd speed
	OFF	ON		3rd speed
	ON	ON		4th speed
2	OFF	OFF	No effect	1st speed
	ON	OFF		2nd speed
	OFF	ON		3rd speed
	ON	ON		Simulated speed
3	Similar to 「P03.00=1」		OFF	1st ~ 4th speed
	OFF	OFF	ON	5th speed
	ON	OFF	ON	6th speed
	OFF	ON	ON	7th speed
	ON	ON	ON	8th speed

Please change internal command velocity as per diagram below sequentially, as unexpected axis movement might occurs if 2 command velocities are changed at the same time.



Example 1) P03.00=1 or 2



Example 2) P03.00=3

Label	Emergency stop			Mode	P	S	T
Signal	E-STOP	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit		

When the forced alarm input is active, it can trigger an Er570 alarm and stop the machine, or stop the machine without triggering an alarm.

Signal input configurable only in PR mode

Label	Trigger command			Mode	PR
Signal	CTRG	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit
Select path address ID through ADD0-3, then trigger PR path motion using CTRG. Set rising edge/double edge trigger in P08.00.					

Label	Path address 0-3			Mode	PR
Signal	ADD0~3	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit
	IO combination trigger select path using ADD0~ADD3. Support maximum 15 paths. Trigger mode is set in P08.26.				
	ADD3	ADD2	ADD1	ADD0	Path selection
	OFF	OFF	OFF	OFF	Path 0 (Non-action)
	OFF	OFF	OFF	ON	Path 1
	OFF	OFF	ON	OFF	Path 2
	OFF	OFF	ON	ON	Path 3
	OFF	ON	OFF	OFF	Path 4
	OFF	ON	OFF	ON	Path 5
	OFF	ON	ON	OFF	Path 6
	OFF	ON	ON	ON	Path 7
	ON	OFF	OFF	OFF	Path 8
	ON	OFF	OFF	ON	Path 9
	ON	OFF	ON	OFF	Path 10
	ON	OFF	ON	ON	Path 11
	ON	ON	OFF	OFF	Path 12
	ON	ON	OFF	ON	Path 13
	ON	ON	ON	OFF	Path 14
	ON	ON	ON	ON	Path 15

Label	Home			Mode	PR
Signal	HOME	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit
Homing trigger, homing velocity and acceleration can be set in P08.15-P08.18					

Label	Forced stop			Mode	PR
Signal	STP	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit
Emergency stop trigger in PR motion. Deceleration can be set in P08.23					

Label	Positive/Negative JOG			Mode	PR
Signal	PJOG/NJOG	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit

To jog manually in PR mode

Label	Positive/Negative limit			Mode	PR
Signal	PL/NL	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit
PR mode positive/negative position limit					

Label	Origin			Mode	PR
Signal	ORG	Default assign.	-	I/O circuit	Section 3.12.3 General digital input circuit
Origin signal input					

3.13.2 Digital Output Signal Setting

Control output

Default status

CN1 PIN	Signal	Parameter	Function
11	DO1+	P04.10	External break released BRK-OFF
10	DO1-		
35	DO2+	P04.11	Servo Ready S-RDY
34	DO2-		
37	DO3+	P04.12	Servo Alarm (ALARM)
36	DO3-		
39	DO4+	P04.13	Positioning completed INP1
38	DO4-		
12	DO5	P04.14	Zero speed clamp detection ZSP
40	DO6	P04.15	Torque limit signal TLC

The functionality will vary depending on the parameter settings. Please refer to the following 「Control Output Setting Method」. Digital output functions can be assigned to multiple pins at the same time. Control output pins set to "None" will keep the output transistor in the OFF state.

Control Output Setting Method

CN1	Signal	Parameter
PIN		
11	DO1+	P04.10
10	DO1-	
35	DO2+	P04.11
34	DO2-	
37	DO3+	P04.12
36	DO3-	
39	DO4+	P04.13
38	DO4-	
12	DO5	P04.14
40	DO6	P04.15

The setting value is represented in hexadecimal. The front panel parameter modifications are also represented in hexadecimal format.

Refer to the table below for function numbers.

Normally Open Setting value	Signal Name	Sign
00h	Invalid	—
01h	Servo Alarm	ALARM
02h	Servo Ready	SRDY
03h	External break released	BRK-OFF
04h	In Position	INP
05h	At speed	AT-SPEED
06h	Torque limited output	TLC
07h	Zero speed clamping detection output	ZSP
08h	Velocity consistency output	V-COIN
12h	Servo enable active state output	SRV-ST
15h	Positive limit active output	POT-OUT
16h	Negative limit active output	NOT-OUT
0Bh	Position command presence output	P-CMD
0Fh	Velocity command presence output	V-CMD
0Dh	Velocity limit signal	V-LIMIT
14h	Position comparison output	CMP-OUT

PR mode output Signal	Symbol	Value	
		NO	NC
Command completed	CMD-OK	20h	A0h
Path completed	PR-OK	21h	A1h
Homing done	HOME-OK	22h	A2h

Note

- Same signal can be assigned to multiple different outputs.
- Control output pins set to "Invalid" will keep the output transistor in the OFF state.
- Do not assign values outside the table above.

Configurable DO signals

Label	Alarm			Mode	P	S	T
Signal	ALARM	Default assign.	(DO3)	I/O circuit	Section 3.12.4 General digital output circuit		
Signal output when drive alarm occurs							

Label	Servo Ready			Mode	P	S	T
Signal	S-RDY	Default assign.	(DO2)	I/O circuit	Section 3.12.4 General digital output circuit		
Signal output when servo is powered on							

Label	Positioning completed			Mode	P	S	T
Signal	INP	Default assign.	(DO4)	I/O circuit	Section 3.12.4 General digital output circuit		
Signal output when positioning completed within set range							

Label	External brake released			Mode	P	S	T
Signal	BRK-OFF	Default assign.	(DO1)	I/O circuit	Section 3.12.4 General digital output circuit		
Signal valid to hold braking action							

Label	Velocity reached			Mode	P	S	T
Signal	AT-SPEED	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
Velocity reached signal							

Label	Torque limit signal			Mode	P	S	T
Signal	TLC	Default assign.	(DO6)	I/O circuit	Section 3.12.4 General digital output circuit		
Torque limiting signal							

Label	Zero speed clamp detection			Mode	P	S	T
Signal	ZSP	Default assign.	(DO5)	I/O circuit	Section 3.12.4 General digital output circuit		
Zero speed clamp activation signa							

Label	Velocity coincidence			Mode	P	S	T
Signal	V-COIN	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
Signal output when velocity coincides							

Label	Servo Status			Mode	P	S	T
Signal	SRV-ST	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
Signal output when servo is enabled							

Label	Positive limit valid			Mode	P	S	T
Signal	POT-OUT	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
Signal output when positive position limit signal valid							

Label	Negative limit valid			Mode	P	S	T
Signal	NOT-OUT	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
Signal output when negative position limit signal valid							

Label	Position command ON/OFF			Mode	P	S	T
Signal	P-CMD	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
Signal valid when position command ON							

Label	Velocity command ON/OFF			Mode	P	S	T
Signal	V-CMD	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
Signal valid when velocity command ON in velocity control mode							

Label	Position comparison			Mode	P	S	T
Signal	CMD-OUT	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit		
When position comparison condition is satisfied, output according to selected method: Flip or pulse width output.							

DO signals configurable only in PR mode

Label	Command completed			Mode	PR
Signal	CMD-OK	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit
PR command is delivered but axis not yet in position					

Label	Path completed			Mode	PR
Signal	PR-OK	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit
PR command delivered and axis in position					

Label	Homing done			Mode	PR
Signal	HOME-OK	Default assign.	-	I/O circuit	Section 3.12.4 General digital output circuit
PR motion homing done					

3.14 Measures against electromagnetic interference

To reduce interference, please take the following measures:

- Encoder cable < 15m.
- Use cable with larger diameter for grounding
 - 1) Grounding resistance < 100Ω.
 - 2) When there are multiple drives connected in parallel, PE terminal of the main power supply and ground terminal of servo drives must be connected to copper ground bar in the electrical cabinet and the copper ground bar needs to be connected to the metal frame of the cabinet.
- Please install a line filter on main power supply cable to prevent interference from radio frequency. When used in residential environments or in environments with strong power supply noise interference, please install a power filter on the input side of the power supply line.
- In order to prevent malfunctions caused by electromagnetic interference, please take following measures:
 - 1) Install master device and line filter close to the servo drive.
 - 2) Install surge suppressor for relay and contactor.
 - 3) Please separate signal/encoder cable from power cable with a space of at least 30cm.
 - 4) Install a line filter for the main power supply if a device with high frequency generation such as a welding machine exists nearby.

3.14.1 Grounding and other anti-interference wiring connections

As a key device in motion control systems, the drive has high requirements for interference resistance. Differences in peripheral wiring and grounding of the drive may cause noise to affect the normal operation of the system. Therefore, correct grounding methods and wiring handling must be implemented.

Grounding Handling

To prevent potential electromagnetic interference problems, please ground according to the following methods.

- Servo motor frame should be grounded. Please connect the PE terminal of servo motor and servo drive and ground them together to reduce interference.
- Ground both ends of the foil shield of encoder cable.

When using a power filter, comply with the precautions described in the section

"Using line filter".

3.14.2 Using line filter

To reduce interference from main power supply cable and to prevent from affecting other sensitive components around the servo drive, please choose a line filter based on actual supply current. Please do be aware of the following mistake when installing a line filter. When installing and wiring the power filter, please follow the precautions below to avoid weakening the actual filtering effect.

- Do not band the main power supply cable together.

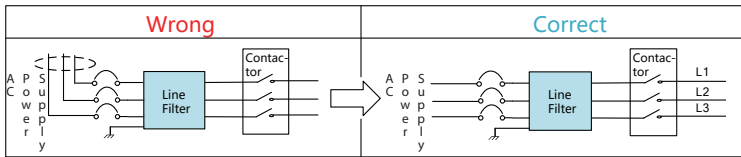


Figure 3-25 Power filter input wiring separation diagram

- Separate the ground wire from the line filter and the main power supply cable.

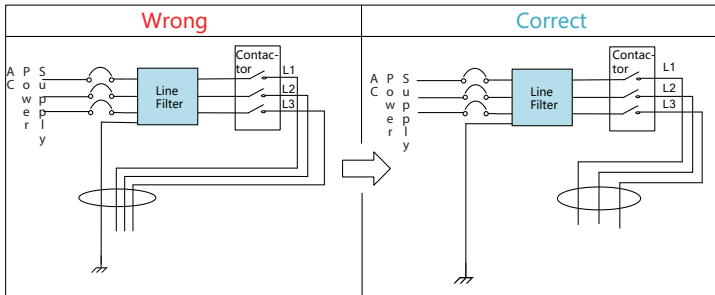


Figure 3-26 Power filter grounding and output wiring separation diagram

■ Ground wires inside an electrical cabinet

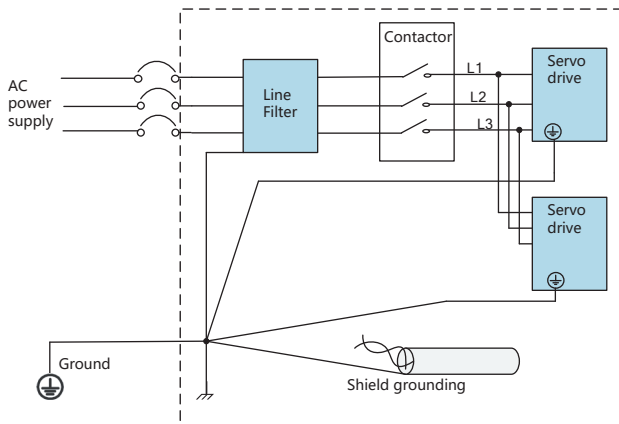


Figure 3-27 Power filter grounding handling illustration

Chapter 4 Display and Operation

4.1 Usage of the Front Panel

4.1.1 Structure of the front panel

Introduction to the front panel appearance and operation buttons

E-RMA drive panel consists of a 6-digit LED display and 5 buttons. Can be used for displaying of status, alarms, functions, parameters setting and auxiliary functions.

Table 4-1 Buttons and functions

Label	Symbol	Function
Display	/	The 6-digit LED display is used to show monitoring values, parameter values, and set values. Additionally, there are 5 green LED segments that serve as warning indicators.
Mode (M)	M	To switch between 3 modes: Data monitoring mode Parameters setting mode Auxiliary functions mode
Set (S)	S	To enter or confirm
Up	▲	To switch between sub-menus / Increase
Down	▼	To switch between sub-menus / Decrease
Left	◀	To switch between values

4.1.2 Panel Display and Operation

During operation, the drive panel can perform data monitoring, parameters setting, fault display, and auxiliary functions.

- Data monitoring: To monitor changes of motion data values
- Parameters setting: To set parameters
- Auxiliary functions: To operate common functions, such as trial run, alarm clearing
- Fault display: Displays the faults occurring in the drive and the corresponding fault codes
- EEPROM: Can save parameters after changing

Panel operation process

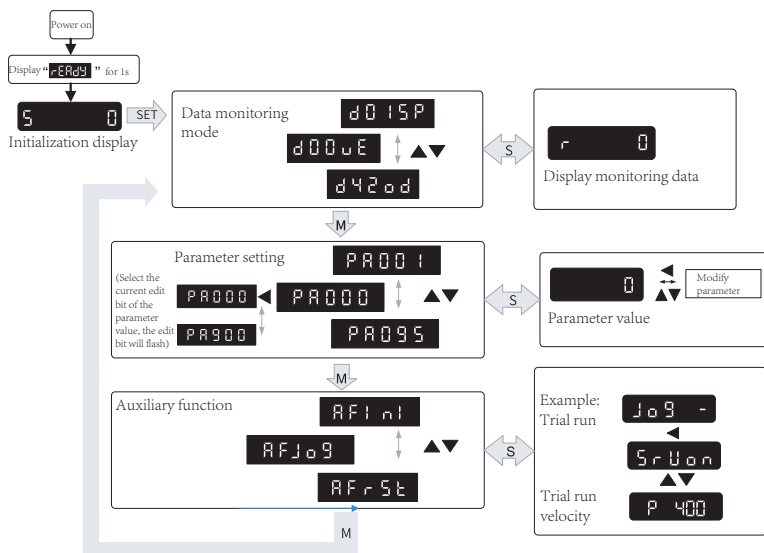


Figure 4-1 Flow diagram of panel operation

- 1) **rERRd** will be displayed for about 1 second after drive is powered on. Then, automatically enters data monitoring mode and displays initial data value. Otherwise, alarm code will be displayed if error occurs.
- 2) Press **M** key to switch between modes. Data monitoring mode → Parameters setting mode → Auxiliary functions mode
- 3) Alarm code will be displayed regardless of any mode if alarm occurs. Press **M** to switch to other modes
- 4) Press **▲** or **▼** to select the type of parameters in data monitoring mode. Press **S** to confirm.
- 5) Press **◀** to select current segment in parameters settings mode. Press **▲** or **▼** to increase/decrease the value of segment. Press **S** to confirm the modified value(s). When editing the parameter value, use the **◀** to select the current edit bit of the parameter value, and use the **▲** or **▼** to change the numerical value of the selected bit. After modifying the parameter value, press the **S** key to save the changes and return to the parameter selection interface

4.1.3 Front Panel Locking

Summary

To prevent any misuse of the front panel, it can be locked.

Limitations when locked are as shown below:

Table 4-2 Restricted operations in locked state

Mode	Limitation
Data monitoring	Not limited
Parameters setting	Parameters can only be read, not modified.
Auxiliary functions	Not limited.

How to operate

■ Related parameter

Parameter		Parameter Name	Function
Class	No.		
P05	35	Front panel lock	To lock or unlock front panel

■ To lock and unlock the front panel

Process	Front Panel	Misumi EDrive
Lock	① Set P05.35 = 1, write into EEPROM. ② Restart drive. ③ Front panel is now locked.	
Unlock	① Please refer to auxiliary function Front panel unlock function. ② Front panel is now unlocked.	① Set P05.35 = 0, write into EEPROM. ② Front panel is now unlocked.

For the operation of unlocking the front panel in the auxiliary functions, please refer to the **RFUnL** function introduction in "4.1.6 Auxiliary function".







4.1.4 Data Monitoring Mode

E-RMAseries servo drive offers the function to monitor different types of data in data monitoring mode. After entering this mode, press S to monitor any data that starts with d. Then can switch between different data using ▲▼, and press S to view the value of the selected data.

Press S again to get back to data monitoring mode and M to switch to any other modes.

Data names for Monitoring mode

Table 4-3 Data list in data monitoring mode

No.	Label	Descriptions	Display	Unit	Data Format (x = numerical value)
0	d00uE	Position command deviation		Pulse	"xxxx"
1	d01SP	Motor velocity		r/min	"r xxxx" Motor actual velocity "F xxxx" External encoder feedback velocity
2	d02CS	Position control command velocity		r/min	"xxxx"
3	d03Cu	Velocity control command velocity		r/min	"xxxx"
4	d04tr	Actual feedback torque		%	"xxxx"
5	d05nP	Feedback pulse sum		Unit	"xxxx"
6	d06CP	Command pulse sum		Unit	"xxxx"
7	d07	Maximum torque/ Average load ratio during motion		-	"d xxx" Max torque % "V xxx " Average load ratio %
8	d08FP	Internal command position sum		Pulse	"xxxx"
9	d09Cn	Control mode		/	Position: "Ct PoS" Velocity: "Ct SPd" Torque: "Ct trq"

10	d10Io	I/O signal status		/	-
11	d11Ai	Analog input		V	-
12	d12Er	Alarm cause and record		/	"Er xxx" Alarm code
13	d13rn	Warning		/	"H xxx" Warning code
14	d14rg	Regeneration load factor		%	"xxx"
15	d15oL	Overload factor		%	"L xxxx" Motor overload % "d xxxx" Drive overload %
16	d16Jr	Inertia ratio		%	"xxx"
17	d17Ch	Motor not running cause		/	"CP xxx" Error code
18	d18ic	No. of changes in I/O signals		/	"xxx"
19	d19	Internal use		/	"xxxx"
20	d20Ab	Absolute encoder feedback		Pulse	"xxxx"
21	d21AE	Internal use		/	"xxxx"
22	d22rE	Internal use		r	"xxxx"
23	d23id	485 received frame		/	"id xxx" "F xxx"
24	d24PE	Position deviation		Unit	"A xxxx" Position deviation "F xxxx" Full closed loop deviation (Command unit) "H xxxx" Full closed loop deviation (Encoder unit)
25	d25PF	Internal use		Pulse	"xxxx"
26	d26hy	Internal use		Pulse	"xxxx"
27	d27Pn	Voltage across PN		V	"xxx"

28	d28no	Software version	d28no	/	"d xxx Servo software" "p xxx Servo power rating" "F xx Communication software" "C xx CPLD software"
29	d29RS	Internal use	d29RS	/	"A xxxx" External encoder serial No. "F xxxx" External encoder serial No.
30	d30sE	No. of times of encoder communication error	d30sE	times	"A xxxx" Motor encoder communication error count "F xxxx" External encoder communication error count
31	d31tE	Accumulated uptime	d31tE	/	"xxxx"
32	d32Au	Automatic motor identification	d32Au	/	"r xxx" Motor No. "E xxx" Encoder No.
33	d33At	Drive temperature	d33At	°C	"d xxx" Drive temperature "C xxx" MCU temperature
34	d34St	Servo status	d34St	/	"xxxxx"
35	d35SF	Internal usage	d35SF	/	"xxxxx"
43	d43	External encoder Z-Phase counter	d43	/	"xxxxxx"
44	d44	External encoder pulse count per revolution	d44	Pulse	"xxxxxx"
45	d45	External encoder direction	d45	/	"xxxxxx"
46	d46	Position compared to current position	d46	/	"xxxxxx"

Description of data monitoring function

When using the front panel to monitor data, data is divided in low/high bit and positive/negative.

The display rules for the high and low bits, as well as positive and negative numbers,

are as follows:

When the first and second decimal points on the far-right side are lit, it indicates high-bit data. When these two decimal points are not lit, it indicates low-bit data.



High bit: 1st and 2nd values on the right has two decimal points
Low bit: 1st and 2nd values on the right has no decimal point.

When the first and second decimal points on the far-left side are lit, it indicates a negative number. Otherwise, the number is positive.



Positive: 1st and 2nd values on the left has no decimal point
Negative: 1st and 2nd values on the left has two decimal points

d00uE Position command deviation

Shows high bit and low bit of position deviation.



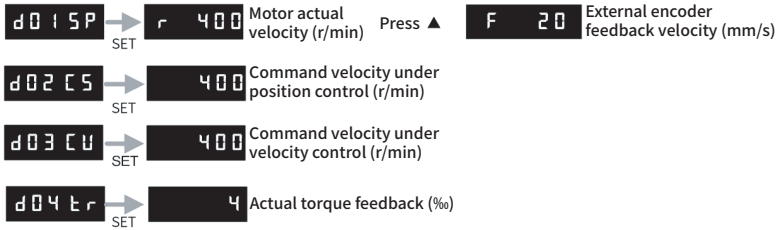
Positive: 1st and 2nd values on the left has no decimal point.
Negative: 1st and 2nd values on the left has two decimal points

Press ◀ to switch between low and high bit
Example : Position command deviation=260885

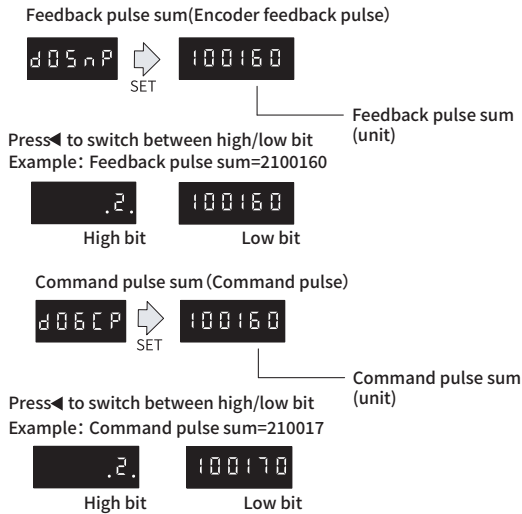


High bit: 1st and 2nd values on the right has two decimal points
Low bit: 1st and 2nd values on the right has no decimal point.

d01SP Motor velocity, d02CS Position control command velocity, d03CU Velocity control command velocity, d04tr Actual torque feedback



d05nP Feedback pulse sum d06CP Command pulse sum



d07 Maximum torque during motion

- Displays the maximum torque during the motor's operation.



d08FP Internal command pulse sum

- Displays the input pulse frequency of the command sent from the host device to the drive (pulses input in 1 second).



d09Cn Control mode

- Displays the current control mode of the drive.



d10Io I/O signal status

When the top half of the digital tube is lighted, the signal is valid. When the bottom half of the digital tube is lighted, the signal is not valid. Decimal points represent I/O status, input when lighted, output when not lighted. Press ▲▼ to toggle between displaying the DI input and DO output status.

- Input: From low to high bit(Right to left) DI1, DI2...DI10. Decimal point is lighted to represent input signals. In the example below, DI1, DI8 and DI10 input signal is valid. DI2-DI7, DI9 input signal is invalid.

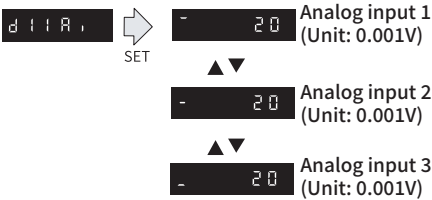


- Output: From low to high bit(Right to left) DO1, DO2...DO10. Decimal point is not lighted to represent output signals. In the example below, DO1 output signal is valid. DO2-DO10 output signal is invalid.



d11Ai Analog input

- Display the current analog input value of the drive.

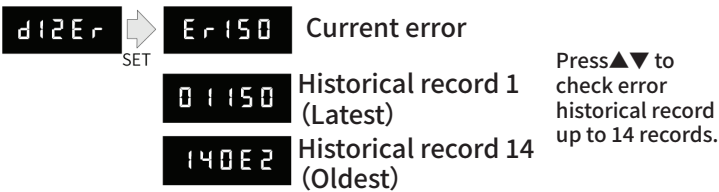


3 analog inputs can be monitored through d11. Left most bar at the top: 1st analog input, at the middle: 2nd analog input, at the bottom 3rd analog input.

The analog display unit is 0.001V, and the fifth and sixth decimal places on the right indicate the negative sign. The analog monitoring can be switched using ▲▼.

For example, the third analog input of -11.5V would be displayed as shown on the right: **-11.50**

d12Er Alarm cause and historical record

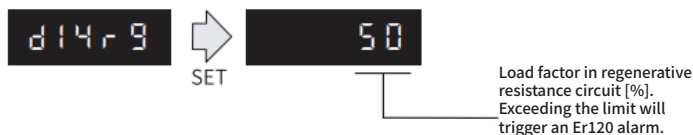


Note

- Save: Save error messages to alarm history.
- Clearable: Clearable alarm by operating the front panel and use auxiliary function **AF CLR**. For other alarms, the error cause must be eliminated before reconnecting the power to clear the alarm.
- Type: The type 1 and type 2 fault stop mode can be set

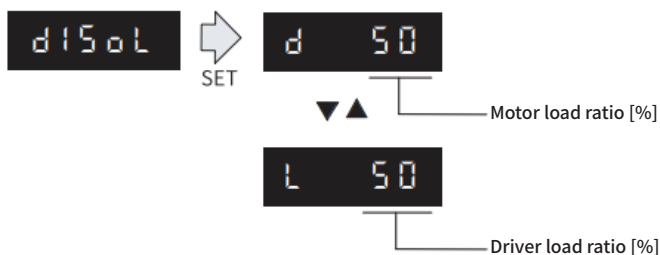
d14rg Regenerative load factor d15oL Overload factor

- Regenerative load factor (Er120 might occur, if the value increases indefinitely)



- Overload factor

- Er100 might occur, if d increases indefinitely
- Er101 might occur, if L increases indefinitely

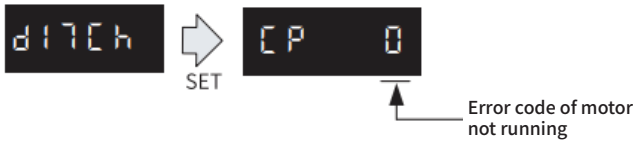


d16Jr Inertia ratio



Use auxiliary function **AF_GL** or EDrive software to measure the inertia ratio. The result will be shown on **d16Jr**, hold M to write the value in Pr0.04.

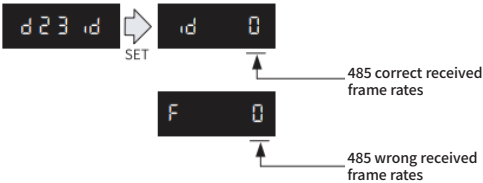
d17Ch Motor not running cause



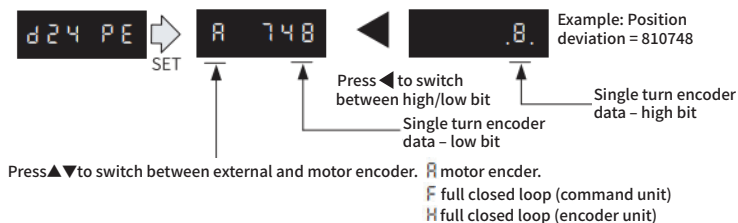
■ "d17Ch" Motor No Running Cause - Codes & Descriptions

Code	Display Code	Description	Content
0	CP 0	Normal	-
1	CP 1	DC bus undervoltage	Check if DC bus voltage is too low on D27
2	CP 2	No SRV-ON signal	Servo-ON input (SRV-ON) is not connected to COM-
3	CP 3	POT/NOT input valid	P05.04=0, POT is in open circuit, velocity command is in positive direction. NOT is in open circuit, velocity command is in negative direction.
4	CP 4	Drive alarm	-
5	CP 5	Relay not clicked	Check input voltage
6	CP 6	Pulse input prohibited (INH)	P05.18=0, INH input is activated, the command pulse input is prohibited.
8	CP 8	CL valid	P05.17=0, deviation counter connected to COM-
9	CP 9	Zero speed clamp valid	P03.15=1, zero-speed clamping input signal ZEROSPD is ON, the speed command is forcibly set to 0.

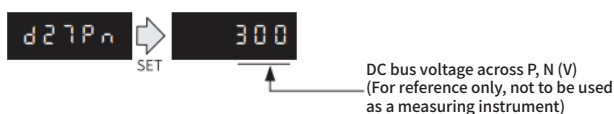
d23id 485 received frame



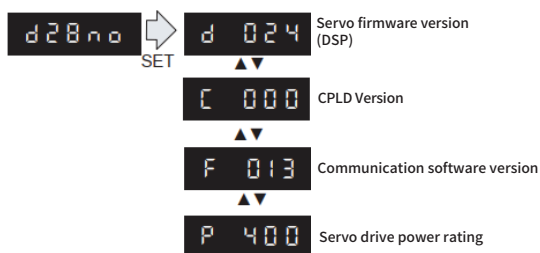
d24PE Position deviation



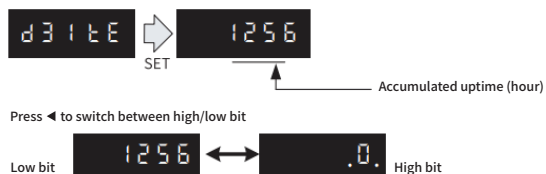
d27Pn DC bus voltage



d28no Software version

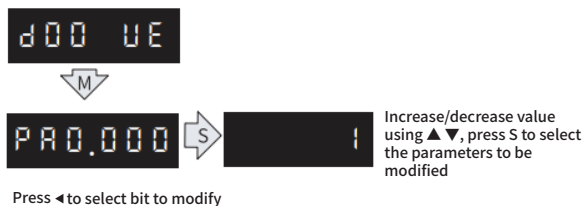


d31tE Accumulated operation time



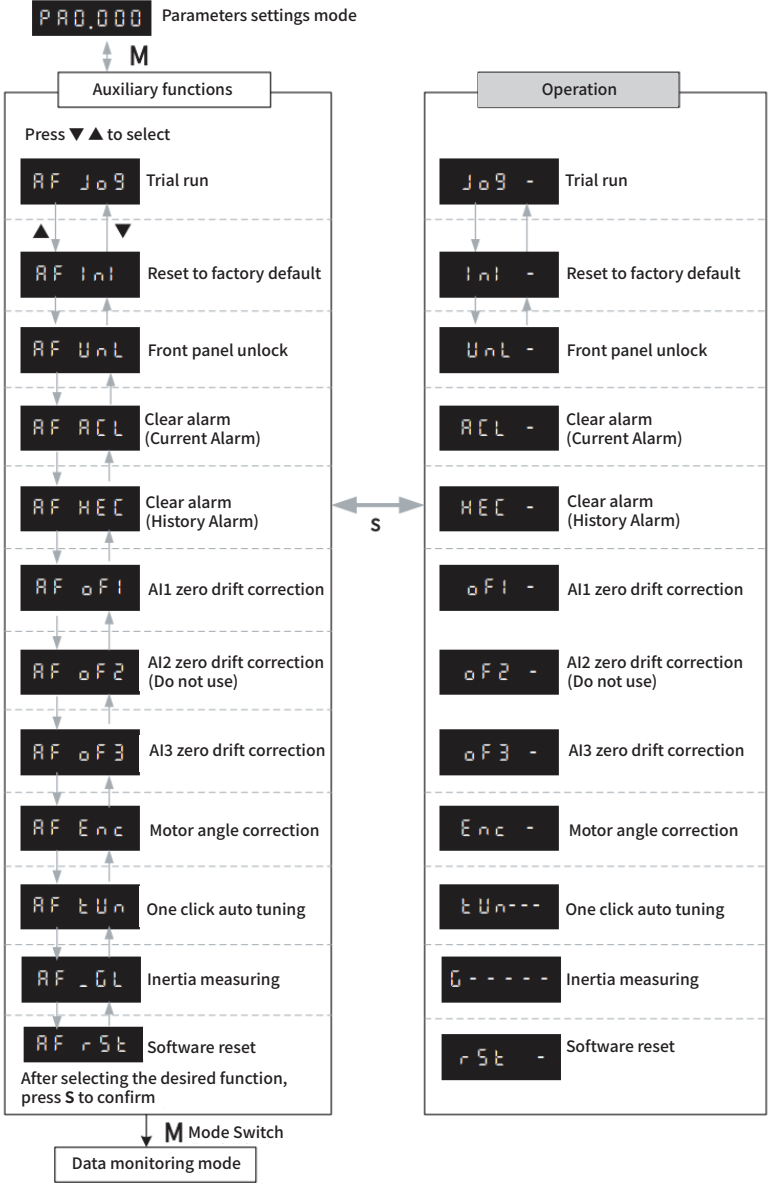
4.1.5 Parameters saving

In parameter setting mode, when the panel is not locked, we can modify and save the parameters of the drive through the front panel.



If the parameter is modified but user does not want to save the changes, press M to exit without saving. Some parameter modifications will only take effect after the drive is restarted.

4.1.6 Auxiliary function



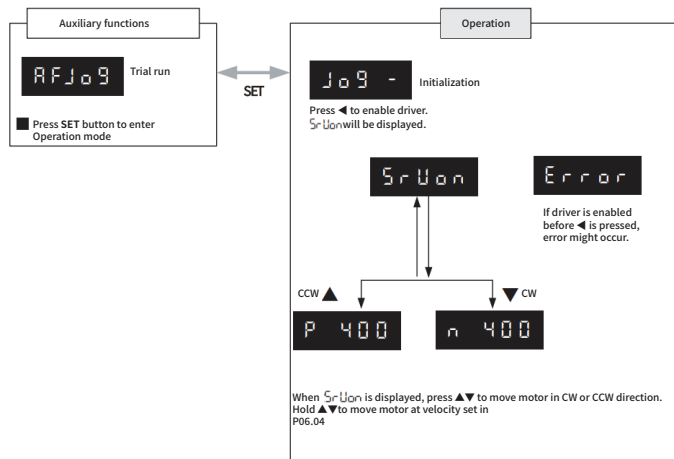
AF JOG Trial run

It is possible to perform a trial run without connecting the CN1 control signal terminal to a PLC or other master control device, in order to make an initial judgment on whether the drive and motor can function properly.

Requirements

- Be sure to remove the motor load and disconnect the CN1 connection wiring before use.
- Please initialize the user parameters (especially P00.04 and gain parameters) to prevent issues like oscillations.
- Before performing a trial run, please check the relevant parameters as follows:
 - P00.01 Control Mode: Set to 0, 1, or 6 to enable the trial run function.
 - P06.04 JOG Speed: The test speed should not be set too high to avoid collisions.
 - P06.25 Trial Run Acceleration: The acceleration should not be set too high to avoid collisions.

Trial run process

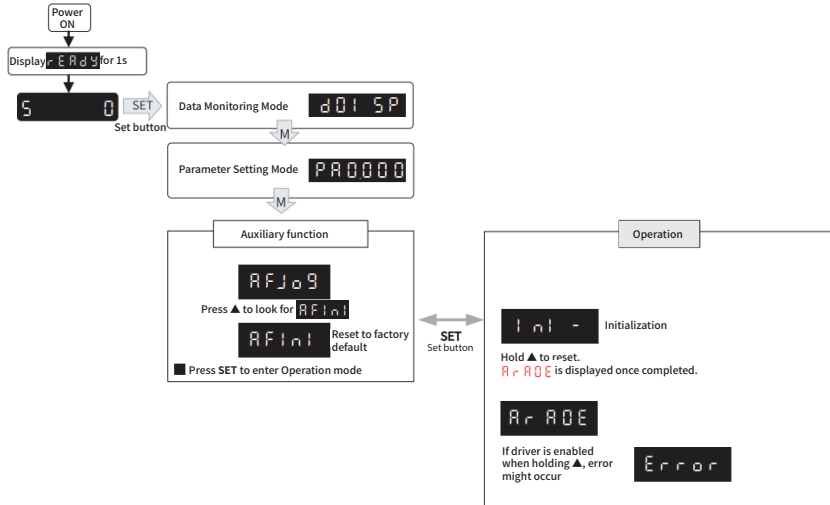


CAUTION

- Please don't modify gain related parameters during trial run to prevent any occurrence of mechanical vibrations.
- After the trial run is completed, press S to return to the selection state, and the internal servo ON for the trial run will be servo OFF.

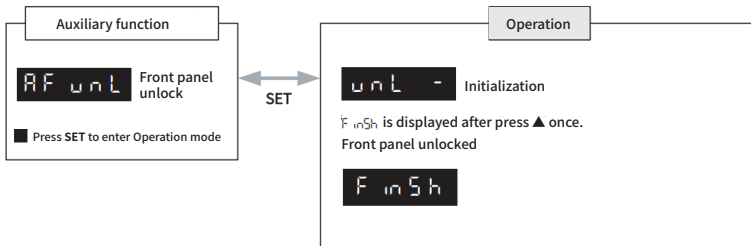
AF InI Reset to factory default

To reset parameters settings to factory default.



AF ACL Clear alarm

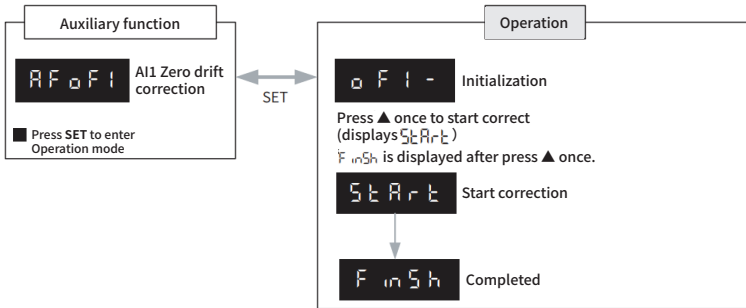
Alarm can be cleared using auxiliary function **AFACL**. But before that, the error needs to be solved and drive needs to be restarted.



AF of1 - AF of3 Analog input AI1-3 zero drift correction

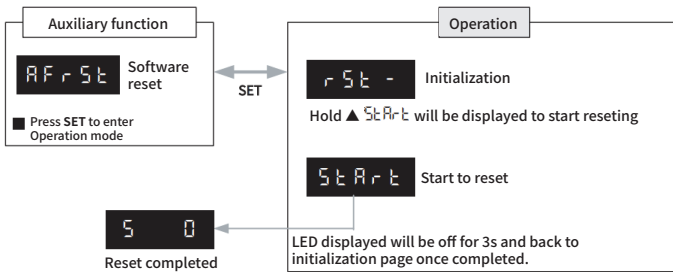
Auto adjustment of analog input zero drift settings

- Analog input 1 (AI 1)--- P04.22 (Analog input 1 Zero drift settings)
- Analog input 2 (AI 1)--- P04.25 (Analog input 2 Zero drift settings)
- Analog input 3 (AI 3)--- P04.28 (Analog input 3 Zero drift settings)



AF rSt Software reset

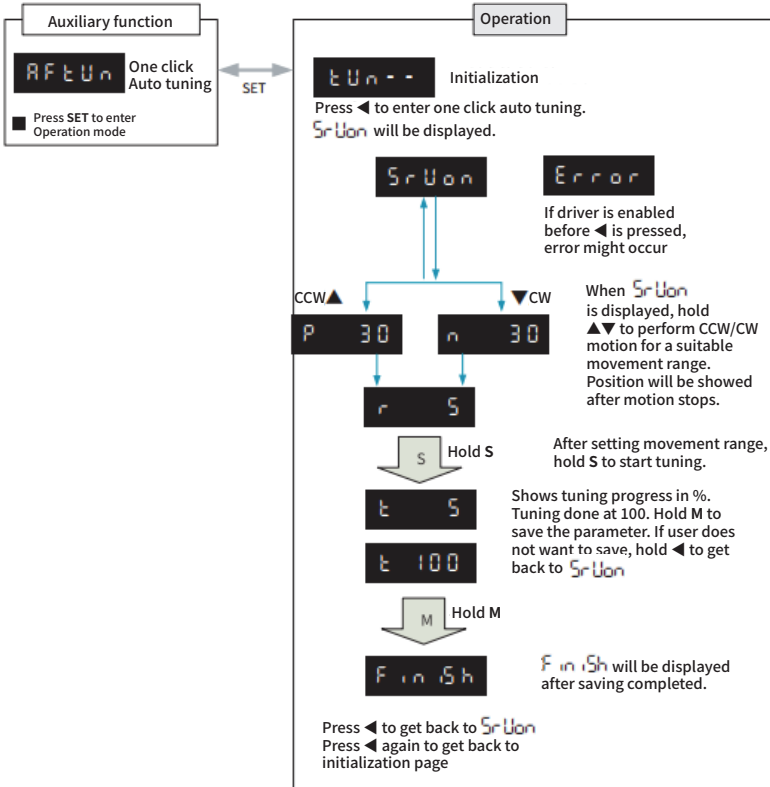
Perform a software reset on the drive.



- Software reset is used mainly on parameters modification that takes effect only after drive restart.

AF_tun One click auto tuning

One click auto tuning can be applied by operating the front panel. Set simple movement range and movement range has to be more than 20 mm !



4.1.7 Alarm

When a drive error occurs, the front panel will automatically enter the alarm display mode and show the corresponding error code.

- If the panel does not display anything directly, please check if there is an issue with the main power supply voltage. If the power supply is within the correct range, the issue may be with the drive itself. Please consult Misumi staff for assistance!
- For clearable abnormal alarms, they can be cleared using the alarm clearing function in the auxiliary functions. If the alarm is not clearable, the error must be corrected, and the power must be turned back on to clear the alarm.
- The servo alarm stop method corresponds to the fault type and is set by P05.10, which determines the shutdown method for class 1/2 faults.

4.1.8 Parameter Save Mode

The parameter save mode refers to the EEPROM write mode, where the modified data is written into the EEPROM. Parameters can be saved either through the drive's operation panel or via the object dictionary.

- Save using drive's front panel

After modifying the selected parameter to desired values, press S to confirm and save the changes.

4.1.9 Front panel warning indicator

E-RMA series drive has five segments of green LED lights on the front panel, which can be used to display warnings and operational status.

- LED indicator status
 - Servo powered on but disabled: All 5 LEDs off.
 - Servo powered on and enabled: All 5 LEDs lighted in cycles.
 - Warning status: All 5 LEDs lighted in accordance to assigned signals. For example, if configured as a negative limit, the negative limit signal will be active, and the corresponding LED light will turn on.

Parameter	Assignment
P04.74 Warning Indicator Light 1	0: Null
P04.75 Warning Indicator Light 2	1: Negative limit switch
P04.76 Warning Indicator Light 3	2: Battery low voltage
P04.77 Warning Indicator Light 4	3: Overload
P04.78 Warning Indicator Light 5	4: Torque limit
	5: Positive limit switch

Chapter 5 Sequence Diagram

5.1 Power on sequence diagram

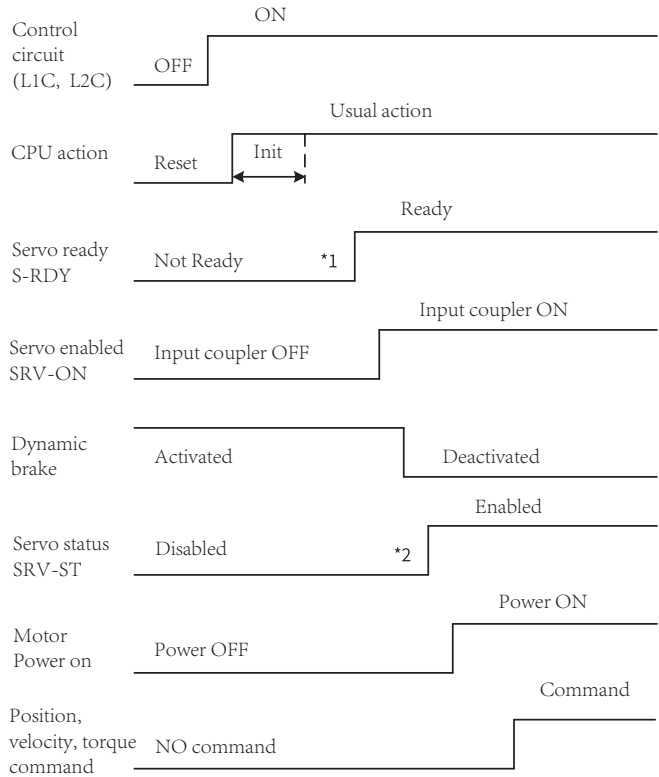


Figure 5-1 Drive pPower on sequence diagram

Please input servo status, position, velocity, torque command as sequence diagram above.

CAUTION

- *1: S-RDY signal is given after CPU initialization and main power supply powered on.
- *2: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet.

5.2 Servo stop

There are 3 different methods of servo stop: Servo braking method, free stopping method, dynamic braking method. In the manual, servo braking stop during an alarm is referred to as emergency stop. For alarms where the stop is not categorized as an emergency stop, the stopping time is shorter and the impact is smaller compared to an emergency stop, but it is not the same as free stop.

Table 5-1 Servo stop method

Stopping method	Description	Details
Servo braking	Servo drive delivers braking torque in opposite direction	Quick stopping but mechanical impact might exist
Free stopping	Motor power cut off. Free to move until velocity = 0. Affected inertia, friction and other factors	Smooth deceleration, low mechanical impact but slow stopping
Dynamic braking	The linear motor operates in the U/V/W short-circuit braking state	Quick stopping but mechanical impact might exist

Table 5-2 Servo status after stopped

Stopping status	Status after stopped
Free running	Motor is powered off, rotor is free to rotate
Dynamic braking	Motor is powered off, rotor is not free to rotate

Motor stopping (Servo disabled) - Sequence Diagram

■ Servo braking method. Status after stopping: Dynamic braking (P05.06=1)

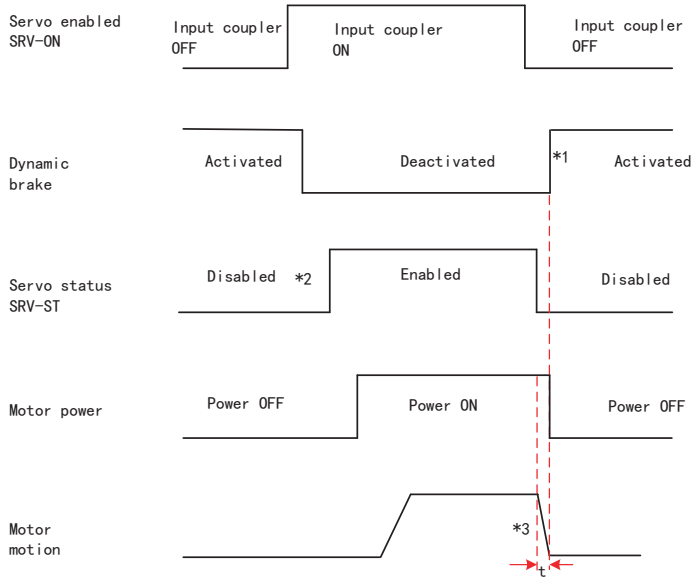


Table 5-3 Motor normal servo stop sequence 1

Note

- *1: Status after stopping is as defined in P05.06.
- *2: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet..
- *3: Servo stopping method is as defined in P05.06. Braking torque in opposite direction to decelerate the motor is as defined in P05.11. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39. After deceleration time t , dynamic braking will be ON.

■ Free stopping method. Status after stopping: Dynamic braking (P05.06=1)

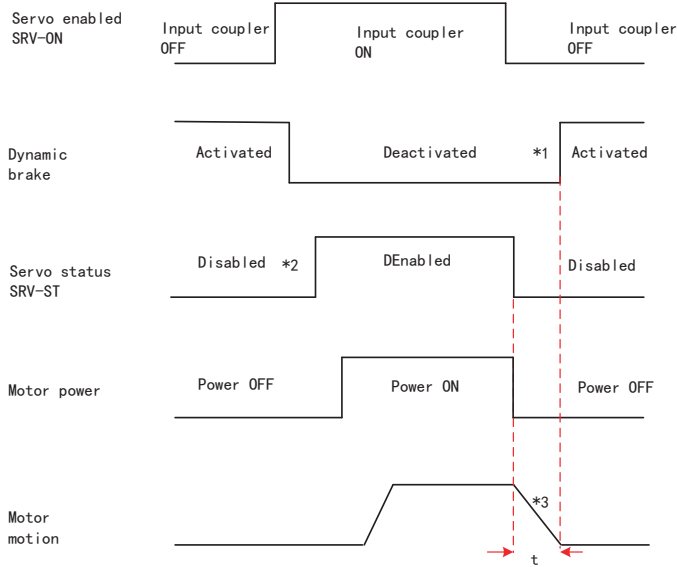


Figure 5-2 Motor normal servo stop sequence 2

Note

*1: Status after stopping is as defined in P05.06.

*2: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet.

*3: Servo stopping method is as defined in P05.06. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39. After time t is reached, dynamic braking is activated.

■ Dynamic braking method. Status after stopping: Dynamic braking (P05.06=2)

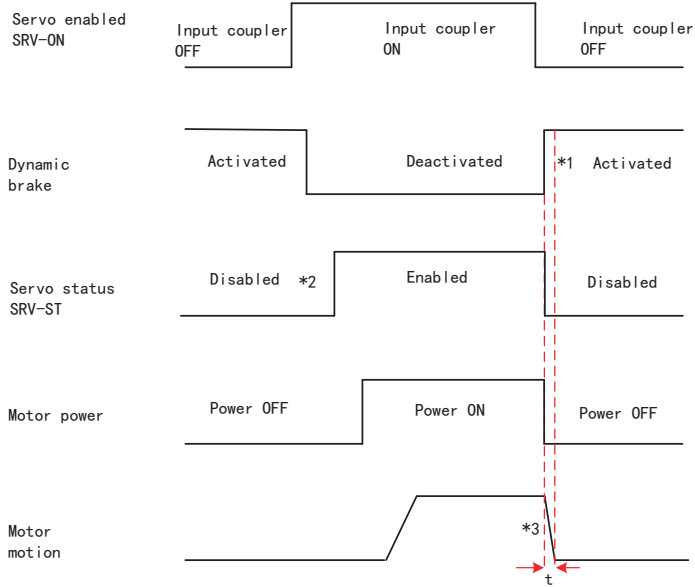


Figure 5-3 Motor normal servo stop sequence 3

Note

- *1: Status after stopping is as defined in P05.06.
- *2: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet.
- *3: Servo stopping method is as defined in P05.06. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

■ Servo stopping method. Status after stopping: Free runnin (P05.06=3)

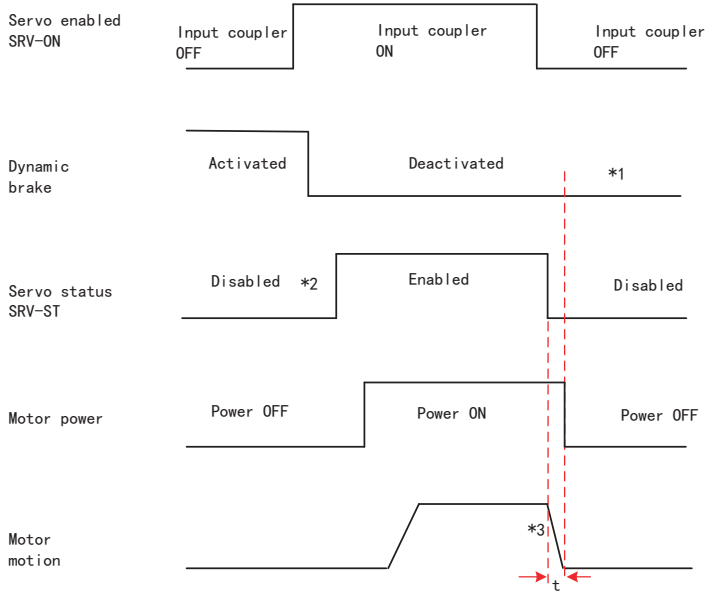


Figure 5-4 Motor normal servo stop sequence 4

Note

*1: Status after stopping is as defined in P05.06.

*2: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet.

*3: Servo stopping method is as defined in P05.06. Braking torque in opposite direction to decelerate the motor is as defined in P05.11. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

■ Free stopping method. Status after stopping: Free running (P05.06=4)

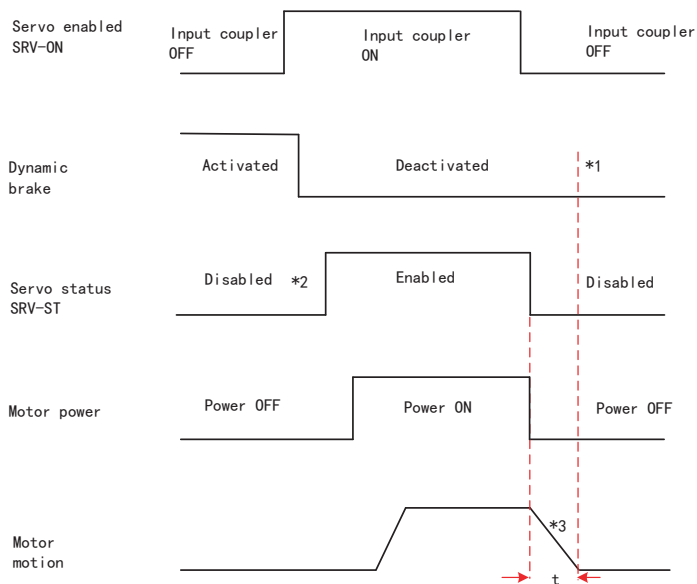


Figure 5-5 Motor normal servo stop sequence 5

Note

*1: Status after stopping is as defined in P05.06.

*2: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet.

*3: Servo stopping method is as defined in P05.06. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

■ Dynamic braking method. Status after stopping: Free running (P05.06=5)

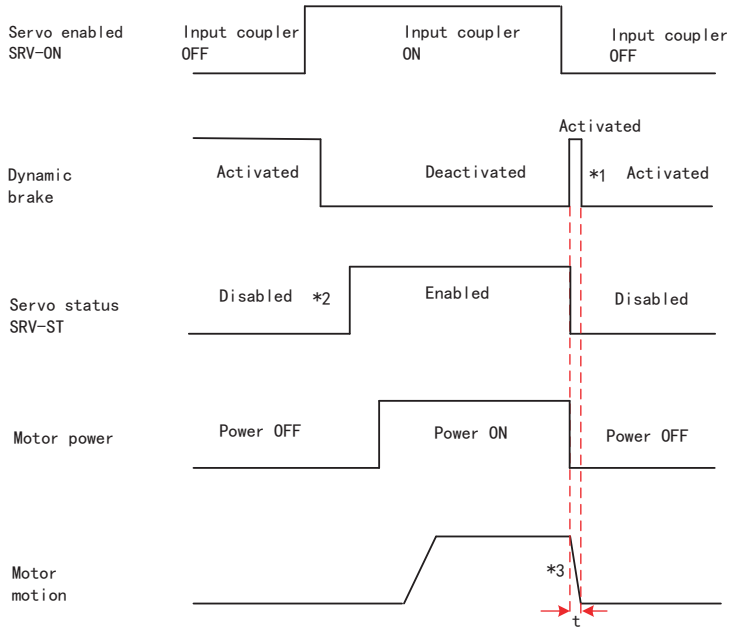


Figure 5-6 Motor normal servo stop sequence 6

Note

- *1: Status after stopping is as defined in P05.06.
- *2: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet.
- *3: Servo stopping method is as defined in P05.06. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

Stopping when alarm occurs – Sequence Diagram

■ Servo braking method. Status after stopping: Dynamic braking

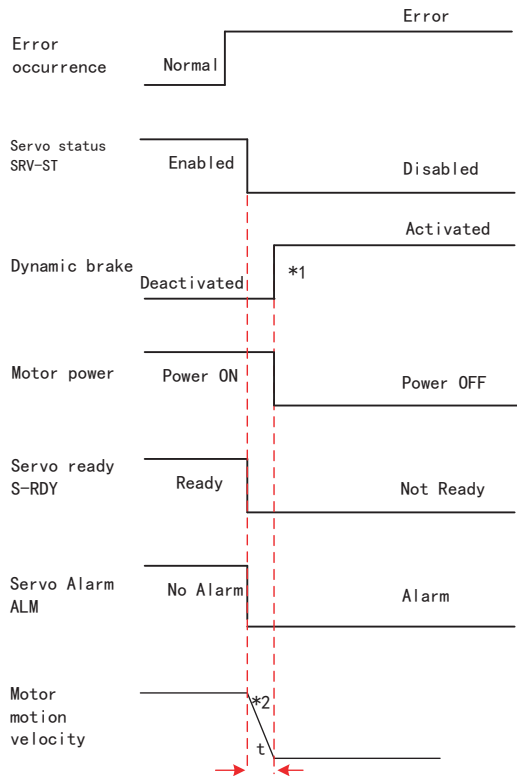


Figure 5-7 Alarm stopping sequence 1

Note

- *1: Status after stopping is as defined in P05.10.
- *2: Servo stopping method is as defined in P05.10. Braking torque in opposite direction to decelerate the motor is as defined in P05.11. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39. After deceleration time t , dynamic braking will be ON.

■ Free stopping method. Status after stopping: Dynamic braking

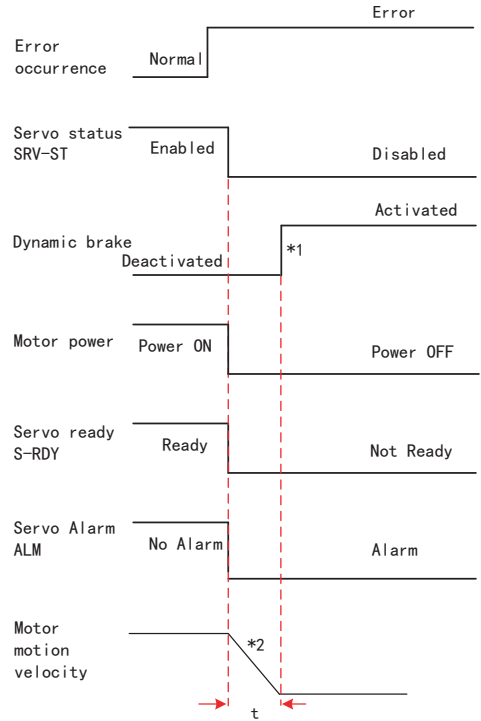


Figure 5-8 Alarm stopping sequence 2

Note

- *1: Status after stopping is as defined in P05.10.
- *2: Servo stopping method is as defined in P05.10. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39. After deceleration time t , dynamic braking will be ON.

■ Dynamic braking method. Status after stopping: Dynamic braking

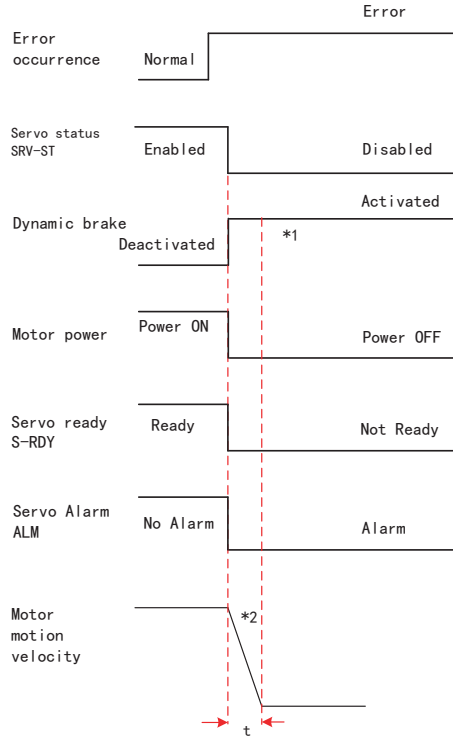


Figure 5-9 Alarm stopping sequence 3

Note

*1: Status after stopping is as defined in P05.10.

*2: Servo stopping method is as defined in P05.10. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

■ Servo braking method. Status after stopping: Free running

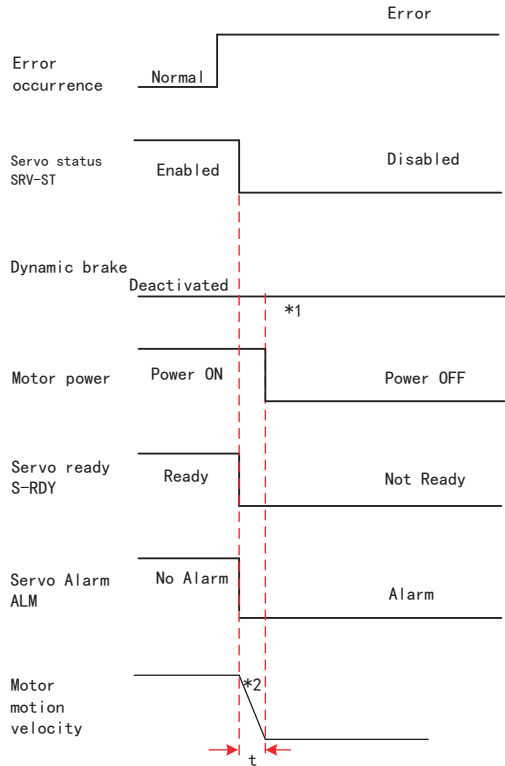


Figure 5-10 Alarm stopping sequence 4

Note

- *1: Status after stopping is as defined in P05.10.
- *2: Servo stopping method is as defined in P05.06. Braking torque in opposite direction to decelerate the motor is as defined in P05.11. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

■ Free stopping method. Status after stopping: Free moving

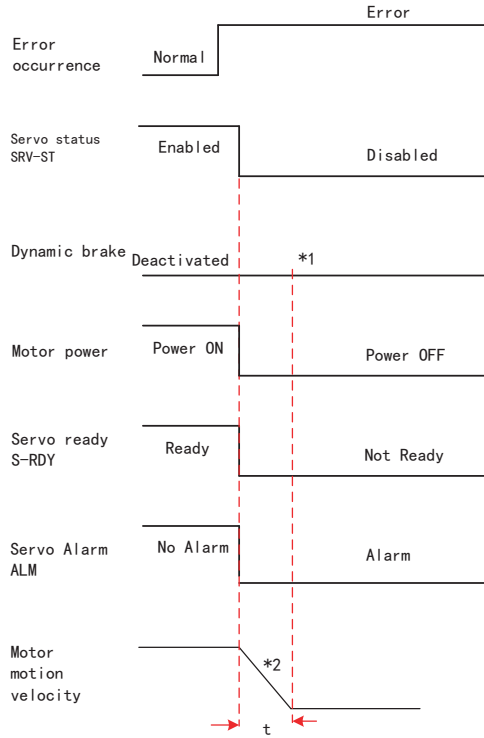


Figure 5-11 Alarm stopping sequence 5

Note

*1: Status after stopping is as defined in P05.10.

*2: Servo stopping method is as defined in P05.10. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

■ Dynamic braking. Status after stopping: Free moving

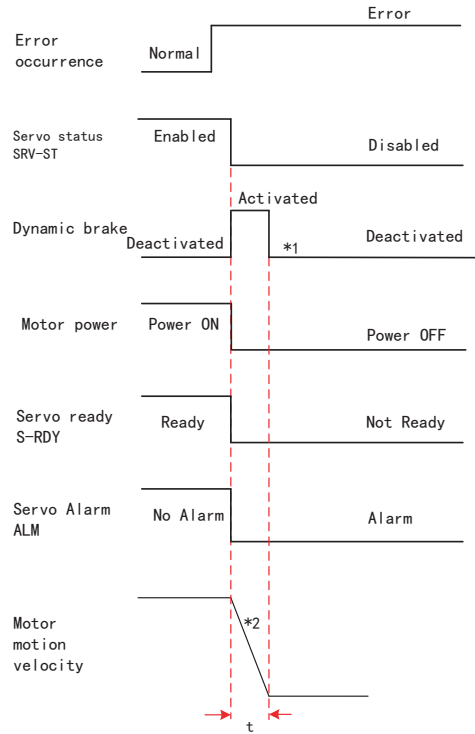


Figure 5-12 Alarm stopping sequence 6

Note

- *1: Status after stopping is as defined in P05.10.
- *2: Servo stopping method is as defined in P05.10. Deceleration time t is determined by whichever comes first between time set in P06.14 and time needed for motor to drop below velocity set in P04.39.

Alarm clearing - Sequence diagram

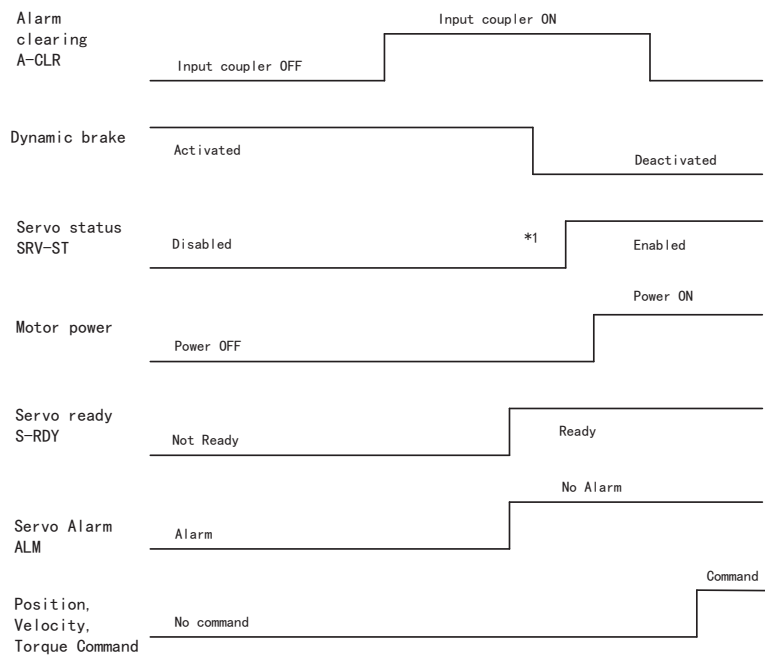


Figure 5-13 Alarm clear sequence

Note

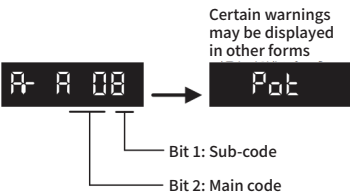
*1: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet

Chapter 6 Warning and Alarm Handling

6.1 Warning

Servo drive warning

When warning occurs, drive will set protective function but motor won't stop moving. Error code will be displayed on the front panel. Warning code example:



Warning Code		Content
Main	Sub	
A0	1	Overload warning
	2	Regeneration energy overload warning (85% of the regeneration threshold)
	4	Change the parameter to a non-real time valid warning, alert to restart. (Under development)
	7	Low temperature warning (< 20°C)
	8	Positive limit switch valid. POT blinking on front panel
	9	Negative limit switch valid. NOT blinking on front panel
	A	Positive and negative limit switch valid. PNOT blinking on front panel
	B	Current position is beyond software positive limit. SPOT blinking on front panel
	C	Current position is beyond software negative limit. SNOT blinking on front panel
	D	Current position is beyond software negative, positive limit. SPNOT blinking on front panel
	E	Parameters reset to factory default. Restart needed
Ar	15	Communication failure when the gantry is not enabled
	16	One axis of gantry fault, the other axis warning Ar16
	17	Emergency stop signal for one axis of gantry effective, the other axis warning Ar17
	18	Limit switch effective for one axis of gantry, the other axis warning Ar18
	19	PWM synchronization alarm for slave axis when gantry is not enabled
	1A	Excessive communication error for the gantry
	1B	Incorrect parameter setting for the gantry

Servo drive warning handling

When warning occurs, motor won't stop moving. Error code will be displayed on the front panel.

6.2 Alarm

Servo drive alarm

When alarm occurs, drive will set protective function and motor stops moving. Error code will be displayed on the front panel. Alarm history record can also be viewed in data monitoring mode, with the alarm log sub-menu displaying "**d12Er**".

Alarm code display:

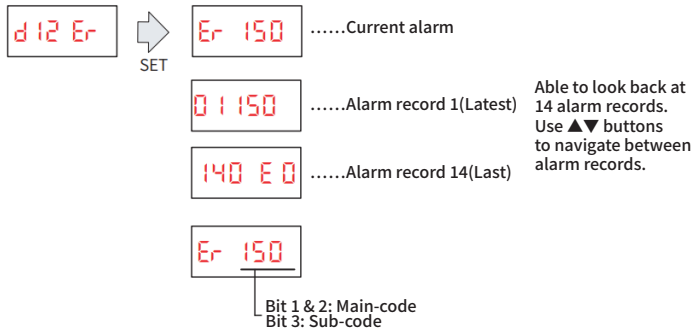


Figure 6-1 Panel Alarm display

Error code list is as below:

Save: Save error messages to alarm history.

Type: The type 1 and type 2 fault stop mode can be set via Pr5.10 [Sequence at alarm].

Clearable: Alarms can be cleared (reset) through DI input, the front panel, or debugging software. However, the underlying fault condition may still exist. Clearable alarm by operating the front panel and use auxiliary function "AFACL".

⚠ CAUTION

- For non-clearable alarms (alarms that cannot be reset), troubleshooting measures must be taken. After confirming that the fault has been eliminated, power must be reapplied to clear the alarm.

Table 6-1 Error code list

Error code		Content	Attribute		
Main	Sub		Save	Type	Clearable
09	0~F	FPGA communication error	●	2	
0A	0~1	Circuit current detection error	●	2	
	2	Analog input AI1 error	●	2	
	3	UVW power cable not connected	●	1	
	4	Analog input AI3 error	●	2	
	5	DC bus error	●	2	
	6	Temperature measuring error	●	2	
0b	0	Control circuit power supply voltage too low		2	●
	1	Control circuit power supply voltage too high		2	●
0c	0	DC bus overvoltage	●	1	●
0d	0	DC bus undervoltage		1	●
	1	Single phasing of main power supply		2	●
	2	No main power supply detected		2	●
0E	0	Overcurrent	●	1	
	1	Intelligent Power Module (IPM) overcurrent	●	1	
	2	UVW shorted to PE	●	1	
	4	Phase overcurrent	●	1	
0F	0	Drive overheated	●	2	
10	0	Motor overloaded	●	1	●
	1	Drive overloaded	●	1	●
	2	Motor motion blocked	●	1	●
11	0	Relay error	●	2	
12	0	Regenerative resistor overvoltage	●	2	
	1	Brake error	●	1	
	2	Regenerative resistor value too low	●	2	

Error code		Content	Attribute		
Main	Sub		Save	Type	Clearable
15	0	Encoder disconnected	●	1	
	1	Encoder communication error	●	1	
	2	Encoder initial position error	●	1	
	3	Multiturn encoder error	●	2	
	4	Encoder parameter settings error	●	2	
	5	Encoder counter error	●	2	●
	6	Encoder overheated	●	2	●
	7	Encoder data overflow	●	2	●
	8	Encoder overspeed	●	1	
	A	Encoder disconnection (A)	●	1	
	B	Encoder disconnection (B)	●	1	
	c	Encoder disconnection (C)	●	1	
	D	Encoder disconnection (UVW)	●	1	
17	0	Encoder data error	●	1	
	1	Encoder parameter initialization error	●	1	
18	0	Excessive position deviation	●	2	●
	1	Excessive velocity deviation	●	2	●
19	0	Motor vibration too strong	●	2	●
	1	Excessive hybrid position deviation (Closed loop)	●	1	●
1A	0	Overspeed	●	2	●
	1	Velocity out of control	●	1	●
	2	Auxiliary encoder overspeed	●	2	●
1b	0	Bus input signal dithering	●	2	●
	1	Incorrect electronic gear ratio	●	2	●
	2	Encoder single-turn data overflow	●	1	●
	3	External encoder frequency divider parameter error	●	1	●
	5	Pulse and Direction input disconnectin	●	1	

Error code		Content	Attribute		
Main	Sub		Save	Type	Clearable
1c	0	Both STO failed	●	1	
	1	1st STO failed	●	1	
	2	2nd STO failed	●	1	
	3	STO power supply 3.3v anomaly		2	
	4	STO power supply 5.0v anomaly		2	
	5~8	Faulty STO internal optocoupler, inverter		2	
21	0	I/O input interface assignment error	●	2	
	1	I/O input interface function assignment error	●	2	
	2	I/O output interface function assignment error	●	2	
24	0	CRC correction during EEPROM parameter saving		2	
25	0	Gantry deviation error	●	1	
	1	Gantry communication error	●	1	
	2	Slave axis not enabled	●	●	●
	3	Gantry synchronization torque deviation too large	●	●	●
	4	Gantry synchronization mode is not in position control mode	●	●	●
	5	Gantry alignment failure	●	●	●
26	0	Positive/Negative position limit triggered under non-homing mode	●	2	●
27	0	Analog 1 input overrun limit	●	2	●
	1	Analog 2 input overrun limit	●	2	●
	2	Analog 3 input overrun limit	●	2	●
28	0	Corssover output pulse frequency too high	●	2	●
29	0	Control mode not match under full closed loop mode	●	1	
	1	Encoder mode not match under full closed loop mode	●	1	
55	0	External ABZ encoder disconnected	●	1	
	1	External ABZ encoder Phase A disconnected	●	1	
	2	External ABZ encoder Phase B disconnected	●	1	
	3	External ABZ encoder Phase Z disconnected	●	1	
57	0	Forced alarm input valid(E-stop)	●	2	●
5F	0	Motor model no. detection error		2	
	1	Drive power module detection error		2	
60	0	Velocity loop interrupted timeout		2	
	1	Velocity loop interrupted timeout		2	
70	0	Encryption error		2	
89	0	Homing error		2	●

Error code		Content	Attribute		
Main	Sub		Save	Type	Clearable
92	0	External encoder parameter initialization error	●	1	

6.3 Alarm Handling

⚠ CAUTION

When un-clearable error occurs, please solve accordingly. Then, restart.

Error code	Main	Sub	Display: "Er090"--"Er09F"
	09	0~F	Content: FPGA communication error
Cause		Diagnosis	Solution
L1, L2 terminal voltage too low.		Verify L1, L2 terminal voltage.	Make sure L1, L2 terminal voltage is within recommended range.
Internal drive fault.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er0A0"--"Er0A1"
	0A	0~1	Content: Circuit current detection error
Cause		Diagnosis	Solution
Motor UVW cable wiring error.		Verify motor UVW cable wiring.	Make sure UVW terminal wired properly
Main power supply undervoltage.		Verify L1, L2, L3 terminal voltage.	Make sure L1, L2 terminal voltage is within recommended range.
Internal drive fault.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er0A2"
	0A	2	Content: Analog input AI1 error
Cause		Diagnosis	Solution
Analog input wiring error.		Verify analog input wiring.	Make sure of analog input wiring connection.
Internal drive fault.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er0A3"
	0A	3	Content: UVW power cable not connected
Cause		Diagnosis	Solution
Motor power cable not connected.		Verify motor power cable wiring.	Measure resistance values between U, V, W terminals, make sure the values are almost equal. If not, might be due to damaged motor or motor winding open circuit.
Motor winding open circuit.		/	Replace the servo motor.

Drive damage.	Check that the above two situations do not exist, and it is normal after replacing the drive.	Replace with the new drive.
The deviation between current setting and feedback is too large.	Check whether the current setting and feedback are too far apart.	Increase the parameter P07.19 weak magnetic current appropriately.

Error code	Main	Sub	Display: "Er0A4"
	0A	4	Content: Analog input AI1 error
Cause	Diagnosis		Solution
Analog input wiring error.	Verify motor power cable wiring.		Make sure of analog input wiring connection.
Internal drive fault.	/		Replace with the new drive.

Error code	Main	Sub	Display: "Er0A5"
	0A	5	Content: DC bus error
Cause	Diagnosis		Solution
L1, L2 terminal voltage too low.	Verify L1, L2 terminal voltage. Check if power on indicator light on servo drive is on and d27 DC bus voltage.		Make sure L1, L2 terminal voltage is within recommended range.
Internal drive fault.	Replace with the new drive.		Replace with the new drive.

Error code	Main	Sub	Display: "Er0A6"
	0A	6	Content: Temperature measuring error
Cause	Diagnosis		Solution
L1, L2 terminal voltage too low.	Verify L1, L2 terminal voltage.		Make sure L1, L2 terminal voltage is within recommended range.
Internal drive fault.	/		Replace with the new drive.

Error code	Main	Sub	Display: "Er0b0"
	0b	0	Content: Control circuit power supply voltage too low
Cause	Diagnosis		Solution
Control circuit power supply voltage too low.	Verify L1C, L2C terminal voltage. Check if wiring connection is tight.		Increase L1C, L2C terminal voltage. Tighten L1C, L2C terminal connection.
Power supply under capacity	/		Increase power supply capacity for L1C, L2C terminals
Drive failure.	/		Replace with the new drive.

Error code	Main	Sub	Display: "Er0b1"
	0b	1	Content: Control circuit power supply voltage too high
Cause		Diagnosis	Solution
The control power voltage of the drive input is unstable or too high.		Measure the input voltage of control cable to see if it meets the input specification.	Reconnect the power supply with a voltage that meets the left voltage specifications.

Error code	Main	Sub	Display: "Er0c0"
	0c	0	Content: DC bus overvoltage
Cause		Diagnosis	Solution
Main power supply overvoltage.		Verify L1, L2, L3 or R, S, T terminal voltage meets the rating inout voltage.	Decrease L1, L2, L3 or R, S, T terminal voltage.
Acceleration/ deceleration time too short		Verify if the time is actually too short	Increase the duration time or change to a regenerative resistor with higher resistance.
Regenerative brake parameter anomaly.		Verify P07.32/P07.33.	Modify vent overload parameter, so that discharge can be performed before the overvoltage point.
Internal braking circuit failure.		/	Replace with the new drive.
Drive failure.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er0d0"
	0d	0	Content: DC bus undervoltage
Cause		Diagnosis	Solution
Main power supply undervoltage.		Verify L1, L2, L3 or R, S, T terminal voltage or check drive bus voltage through d27.	Increase L1, L2, L3 or R, S, T terminal voltage. Fasten terminal wire connectin.
Drive failure.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er0d1"
	0d	1	Content: Single phasing of main power supply
Cause		Diagnosis	Solution
Main power supply undervoltage		Verify L1, L2, L3 or R, S, T terminal voltage. Check terminal connection.	Increase L1, L2, L3 or R, S, T terminal voltage. Fasten terminal wire connectin.
Drive failure.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er0d2"	
	0d	2	Content: No main power supply detected	
Cause		Diagnosis		Solution
No main power supply.		Check main power supply switch and measure the voltage.		Check the main power supply circuit. Secure the wiring terminals. If the main power switch is off, turn it on.
Drive failure.		/		Replace with the new drive.

Error code	Main	Sub	Display: "Er0E0"	
	0E	0	Content: Overcurrent	
Cause		Diagnosis		Solution
Drive power output short circuit.		Verify if there is short circuit between UVW terminals, or shorted to PG.		Make sure there is no short circuit. Make sure motor is not damaged.
Motor wiring error.		Verify motor wiring.		Reconnect motor wiring.
IGBT module short circuit.		Disconnect motor output cable. Then, enable servo drive to check for overcurrent.		Replace with the new drive.
Control parameter anomaly.		Verify if parameter exceeds recommended range.		Set parameter within recommended range.
Control command anomaly.		Verify if command motion is too acute.		Modify control command. Use filter.

Error code	Main	Sub	Display: "Er0E1"	
	0E	1	Content: Intelligent Power Module (IPM) overcurrent	
Cause		Diagnosis		Solution
Drive power output short circuit.		Verify if there is short circuit between UVW terminals, or shorted to PG.		Make sure there is no short circuit. Make sure motor is not damaged.
Motor wiring error.		Verify motor wiring.		Reconnect motor wiring.
IGBT module short circuit.		Disconnect motor output cable. Then, enable servo drive to check for overcurrent.		Replace with the new drive.
IGBT module undervoltage.		/		Replace with the new drive.
Control parameter anomaly.		Verify if parameter exceeds recommended range.		Set parameter within recommended range.
Drive failure.		/		Replace with the new drive.

Error code	Main	Sub	Display: "Er0E2"	
	0E	2	Content: UVW shorted to PE	
Cause		Diagnosis		Solution
Drive U, V, W terminals shorted to PE.		Disconnect motor power cable and check for short circuit between drive UVW and PE		Reconnect wiring or change UVW cable at drive side.
Motor shorted to ground.		Connect motor power cable to drive power output. Verify if resistance value of UVW to PE is in the range of MegaOhm (MΩ).		Replace with the new motor.
Drive failure.		Disconnect the UVW cables on the drive side. After powering the drive multiple times, the fault still occurs.		Replace with the new drive.

Error code	Main	Sub	Display: "Er0E4"	
	0E	4	Content: Phase overcurrent	
Cause		Diagnosis		Solution
Drive U, V, W terminals shorted to PE.		Disconnect motor power cable and check for short circuit between drive UVW and PE		Reconnect wiring or change UVW cable at drive side.
Motor shorted circuit..		Connect motor power cable to drive power output. Verify if resistance value of UVW to PE is equal and if there is short circuit.		Replace with the new motor.
Drive failure.		/		Replace with the new drive.

Error code	Main	Sub	Display: "Er0F0"	
	0F	0	Content: Drive overheated	
Cause		Diagnosis		Solution
Temperature of power module exceeded upper limit.		Measure the temperature of drive radiator.		Improve cooling condition. Replace drive and motor with higher power rating. Increase duration time for acceleration and deceleration. Decrease load.

Error code	Main	Sub	Display: "Er100"	
	10	0	Content: Motor overloaded	
Cause		Diagnosis		Solution
Load too heavy.		Verify if actual load exceeds maximum value allowed.		Decrease load. Adjust limit values.
Strong mechanical vibration.		Check mechanical vibration from machine system. Check if acceleration or deceleration is too high.		Adjust gain value of control loop. Increase duration time for acceleration and deceleration.
Motor or encoder cable wiring error.		Verify motor and encoder wiring.		Reconnect wiring. Replace motor and encoder cable.

Error code	Main	Sub	Display: "Er101"	
	10	1	Content: Drive overloaded	
Cause		Diagnosis		Solution
Motor power cable wiring error.		UVW terminals wiring error.		Make sure motor power cable wiring connection is correct.
Motor not matched.		Motor current is too high.		Motor rated current is higher than drive rated current. Please change to a drive with higher rated current.

Error code	Main	Sub	Display: "Er102"	
	10	2	Content: Motor motion blocked	
Cause		Diagnosis		Solution
Motor rotor blocked.		Check mechanical blockages.		Ensure the motor has not hit the hard limit. Check the mechanical structure.
Motor rotor blocking time threshold value too low.		Verify value of P06.56 and P06.57.		Verify that the stall torque parameter P0656 and stall time parameter P0657 are set reasonably.

Error code	Main	Sub	Display: "Er120"	
	12	0	Content: Regenerative resistor overvoltage	
Cause		Diagnosis		Solution
Regenerative energy exceeded capacity of regenerative resistor.		Verify if velocity is too high. Verify if load is too large.		Decrease motor rotational velocity. Decrease load inertia. Add an external regenerative resistor.
Regenerative energy discharge circuit damaged.		/		Add an external regenerative resistor. Replace with the new drive.

Error code	Main	Sub	Display: "Er120"
	12	0	Content: Regenerative resistor overvoltage
Power supply voltage too high or unstable.		Check if the input voltage is too high or unstable.	Ensure the input voltage is stable and within the rated input range.

Error code	Main	Sub	Display: "Er121"
	12	1	Content: Brake error
Cause		Diagnosis	Solution
Brake circuit damaged.	Regenerative resistor disconnected.		Replace regenerative resistor.
	Brake IGBT damaged.		Repair the IGBT.
External braking resistor wiring abnormal.		During regenerative discharge, check if the regenerative resistor is not connected or connected to the wrong terminal.	Connect the external regenerative braking resistor correctly.

Error code	Main	Sub	Display: "Er122"
	12	2	Content: Regenerative resistor value too low
Cause		Diagnosis	Solution
External regenerative resistor value is less than the minimum value allowed by the drive.		Measure the resistance of the external regenerative resistor and confirm whether it is lower than the resistor value supported by the drive.	Replace the regenerative resistor with the right resistance value which meets the specification of the drive.

Error code	Main	Sub	Display: "Er150"
	15	0	Content: Encoder disconnected
Cause		Diagnosis	Solution
Encoder cable disconnected.		Verify encoder cable connection.	Make sure encoder cable properly connected.
Encoder cable wiring error.		Verify if encoder wiring is correct.	Reconnect encoder wiring.
Encoder damaged.		/	Replace with the new motor.
Encoder measuring circuit damaged.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er151"
	15	1	Content: Encoder communication error

Cause	Diagnosis	Solution
Encoder Data Error.	Is there significant interference?	Implement anti-interference measures.

Error code	Main	Sub	Display: "Er152"
	15	2	Content: Encoder initial position error

Cause	Diagnosis	Solution
Communication data abnormal.	Verify if encoder power supply voltage is $DC5V \pm 5\%$. Verify if encoder cable and shielded layer is not damaged. Verify if encoder cable is close to high-powered power supply cable.	Make sure encoder power supply voltage is stable. Make sure encoder cable is not damaged. Make sure encoder cable shielded layer is grounded to frame. Make sure encoder cable is away from high-powered power supply cable.
Encoder damaged.	/	Replace with the new motor.
Encoder measuring circuit damaged.	/	Replace with the new drive.

Error code	Main	Sub	Display: "Er153"
	15	3	Content: Multiturn encoder error

Cause	Diagnosis	Solution
Initial use.	Is it the first time the multi-turn function is enabled without performing origin calibration?	Execute origin positioning and multi-turn position resetting to calibrate the origin of the coordinate system. Reset the multi-turn alarm and set P00.15 to 9 for multi-turn reset and alarm clearing.
Multi-turn absolute encoder low voltage or excessive disconnection.	Check if the battery voltage in the battery pack is below 2.5V or if the multi-turn data is missing or changes unexpectedly.	Replace the battery. After replacing, perform a multi-turn reset, clear the multi-turn alarm, and restart the drive. Reset the multi-turn alarm.
Encoder without multiturn absolute function used.	Verify whether the encoder supports the multi-turn absolute function.	Replace it with a motor that uses a multi-turn absolute encoder, or set P00.15 = 0 to disable the multi-turn absolute function.
Multi-turn data error or loss.	If none of the above causes are found, confirm whether the alarm occurred during operation.	Ensure the encoder cables are routed separately from the power cables. Check the cable connections for security. Confirm whether there is multi-turn overflow on-site.

Error code	Main	Sub	Display: "Er154"
	15	4	Content: Encoder parameter settings error
Cause		Diagnosis	Solution
Absolute encoder mode is incorrectly set.		Verify if encoder has multi-turn absolute value function.	Modify absolute encoder mode settings.

Error code	Main	Sub	Display: "Er155"
	15	5	Content: Multiturn data counter error
Cause		Diagnosis	Solution
Encoder data overflow.		Verify if encoder is not damaged.	Reset multiturn data.

Error code	Main	Sub	Display: "Er156"
	15	6	Content: Encoder overheated
Cause		Diagnosis	Solution
The encoder temperature is too high.		Verify if motor temperature is too high.	Reduce encoder temperature.

Error code	Main	Sub	Display: "Er157"
	15	7	Content: Multiturn data overflow
Cause		Diagnosis	Solution
Encoder data overflow.		Verify if encoder is not damaged.	Reset multiturn data.

Error code	Main	Sub	Display: "Er158"
	15	8	Content: Encoder overspeed
Cause		Diagnosis	Solution
Encoder feedback velocity too high.		Check if motor speed too high.	Restart drive, decrease speed.

Error code	Main	Sub	Display: "Er15A"
	15	A	Content: Encoder disconnection (A)
Cause		Diagnosis	Solution
Encoder phase A disconnected.		Check encoder wiring.	Make sure encoder phase A no disconnection or short circuit.

Error code	Main	Sub	Display: "Er15B"
	15	B	Content: Encoder disconnection (B)
Cause		Diagnosis	Solution
Encoder phase B disconnected.		Check encoder wiring.	Make sure encoder phase B no disconnection or short circuit.

Error code	Main	Sub	Display: "Er15c"
	15	c	Content: Encoder disconnection (Z)
Cause		Diagnosis	Solution
Encoder phase Z disconnected.		Check encoder wiring.	Make sure encoder phase Z no disconnection or short circuit. Check if phase Z is connected.

Error code	Main	Sub	Display: "Er15D"
	15	D	Content: Encoder disconnection (UVW)
Cause		Diagnosis	Solution
Encoder hall signal disconnected.		Check encoder hall signal wiring.	Make sure encoder hall signal 5V, 0V and UVW no disconnection or short circuit.

Error code	Main	Sub	Display: "Er170"
	17	0	Content: Encoder data error
Cause		Diagnosis	Solution
Communication data abnormal.		Verify if encoder power supply voltage is $DC5V \pm 5\%$. Verify if encoder cable and shielded layer is not damaged. Verify if encoder cable is close to high-powered power supply cable.	Make sure encoder power supply voltage is stable. Make sure encoder cable is not damaged. Make sure encoder cable shielded layer is grounded to frame. Make sure encoder cable is away from high-powered power supply cable.
Encoder damaged.		/	Replace with the new motor.
Encoder measuring circuit damaged.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er171"
	17	1	Content: Encoder parameter initialization error
Cause		Diagnosis	Solution

Motor was not initialized or drive and motor did not match.	Verify drive and motor models.	Replace with the new motor.Or key in parameters manually.
Error while getting parameters from encoder.	Verify if encoder cable is standard. Verify if encoder has no peeled insulator, broken connection or improper contact.	Use standard encoder cable, verify the connection of both sides of drive and motor, change encoder cable if necessary.

Error code	Main	Sub	Display: "Er180"
	18	0	Content: Excessive position deviation
Cause		Diagnosis	Solution
Improper position deviation settings.		Verify if value of P00.14 is too low.	Increase value of P00.14.
Gain setting too low.		Verify if values of P01.00 and P01.05 are too low.	Increase values of P01.00 and P01.05.
Torque limit too low.		Verify if values of P00.13 and P05.22 are too low.	Increase values of P00.13 and P05.22.
Excessive external load.		Verify if acceleration and deceleration duration time is too low. 2. Verify if rotational velocity is too high. Verify if load is too large.	Increase duration time for acceleration and deceleration. Decrease rotational velocity. Decrease load.

Error code	Main	Sub	Display: "Er181"
	18	1	Content: Excessive velocity deviation
Cause		Diagnosis	Solution
Deviation between set velocity and actual velocity is too high.		Verify if value of P06.02 is too low.	Increase value of P06.02. Set P06.02 to 0, position error detection off.
Acceleration and deceleration duration time for set velocity is too low.		Verify if value of P03.12 and P03.13 are too low	Increase value of P03.12, P03.13. Adjust velocity gain to reduce velocity error.

Error code	Main	Sub	Display: "Er190"
	19	0	Content: Motor vibration too strong
Cause		Diagnosis	Solution
Resonance.		Mechanical stiffness is too high, resonance occurs.	Reduce mechanical stiffness or use notch filter.
Current loop gain too high.		Verify current loop gain value.	Reduce current loop gain.

Current vibration threshold too low.	Use debugging software to check if the current feedback amplitude fluctuation exceeds 5%.	If the current level of vibration is acceptable, increase P06.36 to widen the torque detection vibration threshold.
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Error code	Main	Sub	Display: "Er191"
	19	1	Content: Excessive hybrid position deviation
Cause		Diagnosis	Solution
Drive UVW terminal output single phasing or wiring error.		Verify if UVW terminal wiring connection is correct, and wire is connected properly.	Make sure UVW terminals are correctly connected to UVW of motor. Change motor power cable.
Motor motion blocked.		Use the debugging software's status monitoring or the panel's monitoring feature to check whether the position feedback matches the position command.	Check the machinery.
Drive stiffness too low.		Verify if position loop and velocity loop gain is too low.	Increase position loop and velocity loop gain.
P00.33 setting is too low.		Verify if P00.33 is set too low	Increase P00.33 set value accordingly but please aware that doing so might cause the position deviation to be higher.

Error code	Main	Sub	Display: "Er1A0"
	1A	0	Content: Overspeed
Cause		Diagnosis	Solution
Motor velocity exceeded first speed limit.		Verify if velocity command is too high. Verify if simulated velocity command voltage is too high. Verify if parameter value of P03.21 is too low. Verify if input frequency and division frequency coefficient of pulse train is proper. Verify if encoder is wired correctly.	Adjust velocity input command. Increase P03.21 value. Adjust pulse train input frequency and division frequency coefficient. Verify encoder wiring.
Internal drive fault.		/	Replace with the new drive.

Error code	Main	Sub	Display: "Er1A1"	
	1A	1	Content: Velocity out of control	
Cause		Diagnosis		Solution
Out of control.		Check if UVW phases are connected incorrectly.		/
Encoder fault.		Monitor the increase in D30 counts.		Apply anti-interference measures./ Replace with the new motor.
Special applications.		Motor's actual movement direction is opposite to the output direction.		Evaluate the specificity of the application. Change P01.37 from 0 to 4 to suppress ER1A1 alarm.

Error code	Main	Sub	Display: "Er1b0"	
	1b	0	Content: Input pulse format is incorrect or frequency exceeds the limit	
Cause		Diagnosis		Solution
Input pulse frequency too high.		The input pulse frequency is too high (threshold parameter p05.32).		Reduce the number of pulses per magnetic pitch or decrease the input pulse frequency. Ensure the command pulse frequency is lower than the value set in parameter p05.32.
Pulse signal interference.		Check for interference and whether the pulse input lines are twisted shielded cables with proper grounding.		EMC improvement measures are needed. Use twisted shielded cables for pulse input lines and ensure the shield is effectively grounded.

Error code	Main	Sub	Display: "Er1b1"	
	1b	1	Content: Incorrect electronic gear ratio	
Cause		Diagnosis		Solution
Values out of rang.		Numerator or denominator is zero/Set values out of range.		Reduce number of pulses per revolution.

Error code	Main	Sub	Display: "Er1b2"	
	1b	2	Content: Encoder single-turn data overflow	
Cause		Diagnosis		Solution
In single-turn absolute mode, the motor runs beyond one magnetic pitch.		Check if the motor travel has reached one full turn.		Inspect instruction pulse count per magnetic pitch and electronic gear ratio settings and ensure these settings are reasonable to prevent the command travel from exceeding one magnetic pitch of the motor.

Error code	Main	Sub	Display: "Er1b3"	
	1b	3	Content: External encoder frequency divider parameter error	
Cause		Diagnosis		Solution
External encoder frequency divider parameter values out of range.		P00.35/P00.36 external encoder division ratio exceeds the range 1/40 ~ 125200.		Modify the values of P00.35 and P00.36 to ensure they fall within the allowable range of 1/40 to 125200.
Error code	Main	Sub	Display: "Er1b5"	
	1b	5	Content: Pulse and Direction input disconnected	
Cause		Diagnosis		Solution
Pulse and Direction input disconnected.		Check if high-speed differential pulse and direction signal lines are connected to the upper-level device.		Confirm if it is high-speed pulse wiring. If using low-speed pulse control, the pulse signal pin connections need to be changed.
Error code	Main	Sub	Display: "Er1c0"	
	1c	0	Content: Both STO failed	
Cause		Diagnosis		Solution
Both STO input signals valid.		Verify if STO power supply is normal.		Verify 24V STO power supply and power cable connection.
		Switch connected to STO is disconnected.		Close the switch.
Error code	Main	Sub	Display: "Er1c1"	
	1c	1	Content: 1st STO failed	
Cause		Diagnosis		Solution
1st STO input signal valid.		Verify if STO power supply is normal.		Verify 24V STO power supply and power cable connection.
		Switch connected to STO is disconnected.		Close the switch.
Error code	Main	Sub	Display: "Er1c2"	
	1c	2	Content: 2nd STO failed	
Cause		Diagnosis		Solution
2nd STO input signal valid.		Verify if STO power supply is normal.		Verify 24V STO power supply and power cable connection.
		Switch connected to STO is disconnected.		Close the switch.

Error code	Main	Sub	Display: "Er1c3"
	1c	3	Content: STO power supply 3.3v anomaly
Cause		Diagnosis	Solution
STO power supply internal 3.3v anomaly.		Contact the manufacturer.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er1c4"
	1c	4	Content: STO power supply 5.0v anomaly
Cause		Diagnosis	Solution
STO power supply internal 5.0v anomaly.		Contact the manufacturer.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er1c5"
	1c	5	Content: Faulty STO internal optocoupler
Cause		Diagnosis	Solution
Faulty STO internal optocoupler.		Contact the manufacturer.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er1c6"
	1c	6	Content: STO Inverter 1 fault
Cause		Diagnosis	Solution
STO Inverter 1 fault.		Contact the manufacturer.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er1c7"
	1c	7	Content: STO Inverter 2 fault
Cause		Diagnosis	Solution
STO Inverter 2 fault.		Contact the manufacturer.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er1c8"
	1c	8	Content: STO buffer fault
Cause		Diagnosis	Solution
STO buffer fault.		Contact the manufacturer.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er210"
	21	0	Content: I/O input interface assignment error
Cause		Diagnosis	Solution

Input signal assigned with two or more functions.		Verify values of P04.00-P04.09.	Set proper values for P04.00-P04.09.
Error code	Main	Sub	Display: " Er211 "
	21	1	Content: I/O input interface function assignment error
Cause		Diagnosis	Solution
Input signal assignment error		Verify values of P04.00-P04.09.	Set proper values for P04.00-P04.09.

Error code	Main	Sub	Display: " Er212 "
	21	2	Content: I/O output interface function assignment error
Cause		Diagnosis	Solution
Input signal assignment error		Verify values of P04.10-P04.15.	Set proper values for P04.10-P04.15.

Error code	Main	Sub	Display: " Er240 "
	24	0	Content: CRC correction during EEPROM parameter saving
Cause		Diagnosis	Solution
L1, L2 terminal voltage too low		Verify if L1, L2 terminal voltage too low.	Make sure L1, L2 terminal voltage is within recommended range.
Parameter saving anomaly.		Save parameter again and restart.	Save parameter again.

Error code	Main	Sub	Display: " Er250 "
	25	0	Content: Gantry deviation error
Cause		Diagnosis	Solution
Excessive Gantry drives deviation.		Verify if both drives share the same set of parameters.	Unify the parameters of both drives.
		Verify if control cable of the drives are properly connected.	Connect control cable properly.
		Verify if gantry communication cable is connected properly.	Connect communication cable properly.

Error code	Main	Sub	Display: " Er251 "
	25	1	Content: Gantry communication error
Cause		Diagnosis	Solution

Gantry communication data error when servo on.	Verify communication interference.	Ensure the slave axis status is normal.
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Error code	Main	Sub	Display: "Er252"
	25	2	Content: Slave axis not enabled
Cause		Diagnosis	Solution
After the main axis has been servo on for 2 seconds, the slave axis is still not servo on.		Check if the slave axis is connected to the debugging line.	Disconnect the slave axis debugging line.

Error code	Main	Sub	Display: "Er253"
	25	3	Content: Gantry synchronization torque deviation too large
Cause		Diagnosis	Solution
Under servo on conditions, if the gantry synchronization torque deviation exceeds the gantry torque deviation threshold for more than 5ms, an alarm will occur.		Check if the gantry torque deviation threshold parameter is set correctly.	Ensure that the gantry torque deviation threshold setting parameter is appropriate.

Error code	Main	Sub	Display: "Er254"
	25	4	Content: Gantry synchronization mode is not in position control mode
Cause		Diagnosis	Solution
Gantry synchronization is not in position mode, alarm 254.		Check the control mode of the gantry.	Adjust the parameters.

Error code	Main	Sub	Display: "Er255"
	25	5	Content: Gantry alignment failure
Cause		Diagnosis	Solution
After receiving the command, if the gantry alignment is not completed properly after 200ms, an alarm occurs.		Check if the gantry alignment enable and servo enable sequence are normal. After the gantry alignment action ends, check if the position error is within the end positioning range.	Servo on, follow the gantry alignment enable sequence. Set reasonable parameters to ensure the spindle movement distance and gantry alignment offset error are within the positioning end range.

Error code	Main	Sub	Display: "Er260"
	26	0	Content: Positive/Negative position limit triggered under nonhoming mode
Cause		Diagnosis	Solution
Positive/negative position limit triggered.		Verify position limit signal.	Check wiring and parameter setting.

Error code	Main	Sub	Display: "Er270"~"Er272"
	27	0~2	Content: Analog 1~3 input overrun limit
Cause		Diagnosis	Solution
Analog value out of range.		Verify if analog input value is out of range.	Adjust analog input voltage.

Error code	Main	Sub	Display: "Er280"
	28	0	Content: Frequency divider output frequency too high
Cause		Diagnosis	Solution
Frequency divider output frequency exceeds 1MHz		Verify if motor rotational speed and the number of crossover output pulse frequency are too high.	Reduce the number of frequency divided pulse output or reduce rotational speed.

Error code	Main	Sub	Display: "Er290"
	29	0	Content: Control mode not match under full closed loop mode
Cause		Diagnosis	Solution
Control mode is not position mode when full closed loop mode is on.		Verify if P00.01 is set to 0.	Make sure P00.01 is set to 0 – Position mode.

Error code	Main	Sub	Display: "Er291"
	29	1	Content: Encoder mode not match under full closed loop mode
Cause		Diagnosis	Solution
Encoder mode not match in full closed loop mode.		Only ABZ encoder is supported for the moment being.	For external ABZ encoder, please set P00.31 = 0.

Error code	Main	Sub	Display: "Er550"~"Er553"
	55	0~3	Content: External ABZ encoder disconnected
Cause		Diagnosis	Solution

Er550: External ABZ encoder disconnected.	Verify if encoder cable is connected properly.	Make sure encoder cable connection is tight. Change encoder cable. External encoder cable needs to be shielded.
Er551: External encoder Phase A disconnected.		
Er552: External encoder Phase B disconnected.		
Er553: External encoder Phase Z disconnected.		

Error code	Main	Sub	Display: "Er570"
	57	0	Content: Forced alarm input valid(E-stop)
Cause		Diagnosis	Solution
E-STOP forced alarm input signal occurred.		Verify forced alarm input signal.	Verify if the input wiring connection is correct.

Error code	Main	Sub	Display: "Er5F0"
	5F	0	Content: Motor model no. detection error
Cause		Diagnosis	Solution
Motor model no. is wrong.		Check if the motor model code P07.15 is correct.	Confirm the correct motor parameters.

Error code	Main	Sub	Display: "Er5F1"
	5F	1	Content: Drive power module detection error
Cause		Diagnosis	Solution
Drive power rating not within range.		Power cycle the drive.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er600"
	60	0	Content: Velocity loop interrupted timeout
Cause		Diagnosis	Solution
The motor control loop calculation time overflow.		Check for interference from devices releasing electromagnetic field.	Ground drive and motor to reduce interference.
		Power cycle the drive.	Replace with the new drive.

Error code	Main	Sub	Display: "Er601"
	60	1	Content: Velocity loop interrupted timeout
Cause		Diagnosis	Solution
Motor control loop calculation time overflow.		Verify if encoder connection is and that the encoder cable is too not long (more than 20 meters).	Replace encoder cable if necessary.
		Power cycle the drive.	Replace with the new drive.

Error code	Main	Sub	Display: "Er700"
	70	0	Content: Encryption error
Cause		Diagnosis	Solution
Encryption error during initialization upon power-on.		Power cycle the drive.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er890"
	89	0	Content: Homing error
Cause		Diagnosis	Solution
Excess homing velocity. Homing mode is different from given signal. Sensor signal edge inconsistent		Verify if homing velocity is too high. Verify if homing mode is set correctly. Verify if sensor signal edge is consistent.	Set an optimal homing velocity. Make sure sensor signal edge is consistent.
Inconsistent origin status.		Homing acceleration/ deceleration is set too low. Electronic gear ratio is low which causes acceleration/ deceleration to be too low.	If electronic gear ratio cannot be changed, please set a suitable 609A. Increase electronic gear ratio.

Error code	Main	Sub	Display: "Er920"
	92	0	Content: External encoder parameter initialization error
Cause		Diagnosis	Solution
Encoder parameter P00.37 setting error.		Verify if P00.37 set value is out of rang.	Modify P00.37 set value, please use default value and see if the error still persists.

6.4 Alarm Clearing

Clearable alarms

Method 1:

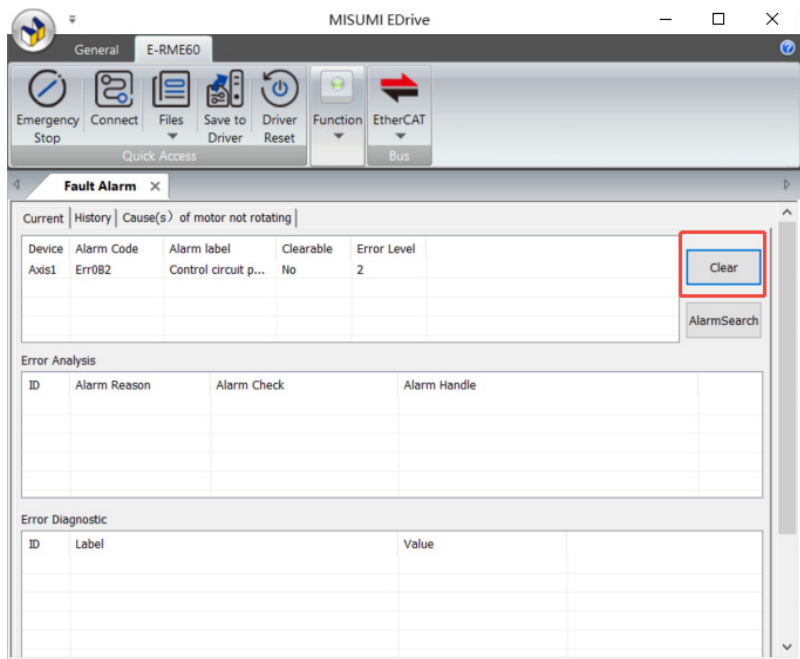
After confirming the issue, press M to select auxiliary function, Press 'S' to enter into "AF_ACL". Press and hold to clear the alarm.

Method 2:

Set IO input function as Alarm clear input "(A-CLR)", refer to switch input interface connection to clear the alarm.

Method 3:

After confirming the issue, can directly clear the alarm by using the 'Clear Alarm' button in the alarm information of the debugging software.



Non-clearable alarms

The drive needs to be powered off. After eliminating the cause of the fault, restart the system. If the alarm cannot be cleared after power cycling, please contact MISUMI staff.

Chapter 7 Peripheral Devices

7.1 List of Peripheral Devices

Component Type	Component Name	Installation Location	Compatible Models	Function Description
Peripheral Devices	Fuse and circuit breaker	Drive input side	All models	To comply with EN 61800-5-1 and UL 61800-5-1 standards, fuses/ circuit breakers must be connected on the input side to prevent accidents caused by internal circuit short circuits.
	AC input reactor	Drive input side		Effectively eliminate higher-order harmonics on the input side and improve the input side power factor.
	EMC filter	Drive input side		Reduce conducted and radiated interference from the drive to external devices.
	Magnetic ring and clamp	Drive output side		Reduce external interference and lower bearing currents.
		Singal calbe		Improve the anti-interference performance of signals.

7.2 Fuse and circuit breaker

7.2.1 Fuse

To prevent accidents caused by short circuits, fuses must be connected on the input side.

Table 7-1 Recommended Fuse selection table

Drive Model	Rated Input Current	Recommended Fuse		
		Manufacturer	Rated Current (A)	Model
Single pahse 220V				
E-RMA30	4	Bussmann	20	FWP-20B
E-RMA60	8.4		40	FWP-40C
Three phase 220V				
E-RMA30	2.5	Bussmann	15	FWP-15B
E-RMA60	4.6		35	FWP-35C

7.2.2 Electromagnetic contactor

Table 7-2 Recommended Electromagnetic contactor selection table

Drive Model	Rated Input Current	Recommended Electromagnetic contactor		
		Manufacturer	Rated Current (A)	Model
Single phase 220V				
E-RMA30	4	Schneider	9	LC1 D09
E-RMA60	8.4		12	LC1 D12
Three phase 220V				
E-RMA30	2.5	Schneider	9	LC1 D09
E-RMA60	4.6		9	LC1 D09

7.2.3 Circuit breaker

Table 7-3 Recommended Circuit breaker selection table

Drive Model	Rated Input Current	Recommended Circuit breaker		
		Manufacturer	Rated Current (A)	Model
Single phase 220V				
E-RMA30	4	Schneider	6	OSMC32N2C6
E-RMA60	8.4		16	OSMC32N2C16
Three phase 220V				
E-RMA30	2.5	Schneider	4	OSMC32N3C4
E-RMA60	4.6		16	OSMC32N3C16

If the equipment requires the use of a Residual Current Device (RCD), please follow the selection criteria below:

- The drive equipment may generate DC leakage current in the protective conductor, so be sure to use a Type B RCD.
- The drive generates a certain amount of high-frequency leakage current during operation. To avoid false triggering of the RCD, select an RCD with a tripping current of no less than 100mA for each drive.
- When multiple drives share a single RCD in parallel, choose an RCD with a tripping current of no less than 300mA.

7.3 AC input reactors

AC input reactors are primarily used to reduce harmonics in the input current and are configured as optional components. When the application environment has higher harmonic requirements, an external reactor can be used. Recommended manufacturers and models for input reactors are shown in the table below:

Table 7-4 Recommended AC input reactor selection table (Three phase 220V)

Drive Model	Rated Input Current (A)	Inductance (mH)
E-RMA30	2.5	5
E-RMA60	4.6	5

7.4 EMC filter

To ensure that this product meets the radiation and conducted emission requirements of the EN IEC 61800-3 standard, external EMC filters listed in the table below need to be connected. The available EMC filters for this product are the Schaffner FN2090 and FN3258 series. Please select according to the rated input current of this product, as shown in the table below:

Table 7-5 Standard EMC filter model and exterior



EMC filter model		Exterior
SCHAFFNER	FN2090 series	
	FN3258 series	

Table 7-6 Recommended EMC filter selection table (SCHAFFNER)

Drive Model	Rated Input Current (A)	Recommended EMC filter
Single phase 220V		
E-RMA30	4	FN 2090-4-06
E-RMA60	8.4	FN 2090-10-06
Three phase 220V		
E-RMA30	2.5	FN 3287-10-44-C28-R65
E-RMA60	4.6	FN 3287-10-44-C28-R65

7.5 Magnetic ring and clamp

Magnetic rings are suitable for the input or output side of the drive. During installation, place them as close to the drive as possible. Installing magnetic rings on the input side can suppress noise in the drive's power input system. Installing magnetic rings on the output side primarily reduces external interference from the drive and decreases bearing currents.

For issues such as leakage current or interference in signal lines in certain applications, magnetic rings or magnetic clamps can be used for suppression.

■ **Amorphous Magnetic Rings:** These have very high magnetic permeability below 1MHz, making them highly effective at reducing drive interference, but they are relatively costly.

■ **Ferrite Magnetic Clamps:** These perform better in frequency bands above 1MHz and are effective at suppressing interference in low-power drives and various signal lines. They are low-cost and aesthetically pleasing to install.

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Your Time, Our Priority

For product inquiries (e.g., technical issues), please contact:

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