



LMAC Drive

E-RME series (EtherCAT type)

User Manual

Ver1.0

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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-RME 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-RME 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
CN8	Analog/Frequency divider Output connector	1
	Analog/Frequency divider Output crimp tool	6
CN2	1394 6PIN connector	1
CN7	1394 10PIN connector	1

1.2 Model number structure

Drive model number structure

E-RM E 30
① ② ③

① Series No.	② Communication protocol	③ Current Rating
	A: Pulse train + RS485 E: EtherCAT	30: 2.8A 60: 6A

1.3 Component Description

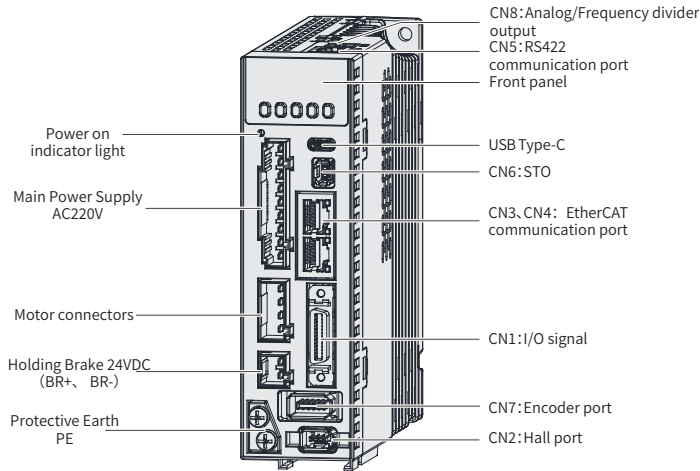


Figure 1-1 Drive and Component Diagram

Table 1-1 Drive Component Description

Parts & Connectors	Description												
Front Panel	Including a LED display and 5 buttons. LED display is used to display servo drive status and parameter settings. 5 buttons:												
	<table><tr><th>Mark</th><th>Function</th></tr><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></table>	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 EtherCAT communication Port	EtherCATcommunication port. CN3(IN) connects to Mastion station or last Slave station. CN4(OUT)connects to next Slave station.												

Parts & Connectors	Description
CN5 RS422 communication Port	RS422 communication Port
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)
CN8 Analog/Frequency divider Output Port	Used for analog and frequency divider outputs
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	L1C, L2C: Control circuit power supply(Single phase 220VAC) L1, L2, L3: Main power supply 220VAC Note: E-RME 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.
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-RME 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-RME30~E-RME60 Electrical Specifications

Drive Module		E-RME30	E-RME60
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-RME 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.
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	EtherCAT Protocol, RJ45 port

Control Mode		
Control Mode		<ul style="list-style-type: none"> • PP, Profile Position Mode • CSP, Cyclic Synchronous Position Mode • PV, Profile Velocity Mode • CSV, Cyclic Synchronous Velocity Mode • PT, Profile Torque Mode • CST, Cyclic Synchronous Torque Mode • HM Homing Mode
Position	Position commands	• The EtherCAT-type servo commands originate from the EtherCAT communication input.
	Torque limits	Parameter setting
Velocity Torque	Velocity commands Torque commands	• The EtherCAT-type servo commands originate from the EtherCAT communication input.
Control Features		
Drive Mode	IGBT SVPWM sinusoidal wave drive	
Feedback Method	Encoder: RS485 Protocol	
Easy-to-use	One-click tuning, Single parameter tuning, Black box, Zero tracking control, Oscilloscope function	
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.	
	Supports EtherCAT bus communication (RJ45 interface), based on the EtherCAT protocol, with a maximum of 65,535 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: 8 (Supports common anode or cathode connection)</p> <p>Assignable input signals:</p> <ul style="list-style-type: none"> • Clear Alarm (A-CLR), Positive limit switch (POT), Negative limit switch (NOT), • Homing switch (HOME-SWITCH), Emergency stop (E-STOP)
Digital Output	
General mode	<p>DO points: 3 (3 double-ended)</p> <p>Assignable output signals:</p> <ul style="list-style-type: none"> • Alarm (ALM), Servo ready (SRDY), External brake off (BRK-OFF) • Positioning completed (INP), Velocity at arrival (AT-SPEED), Torque limiting command (TLC) • Zero speed position (ZSP), Velocity coincidence (V-COIN), Position command (P-CMD) • Velocity limit (V-LIMIT), Velocity command (V-CMD), Servo enabled (SRV-ST), Homing done (HOME-OK), Position comparison (CMP-OUT)
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/s ²) 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 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.

2.2 Installation environment

Installation and Storage Environment Conditions

Table 2-1 Drive Installation and Storage Environment Requirements

Items	E-RME 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

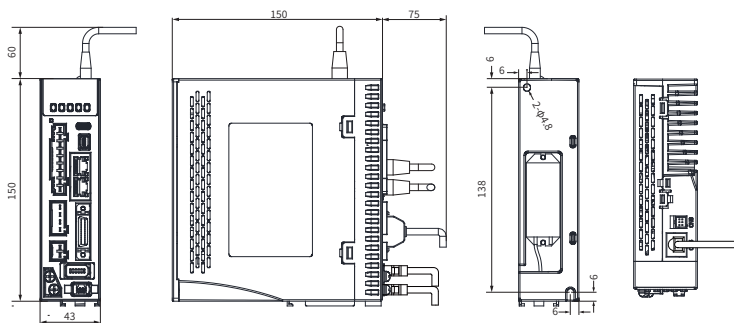
Note

[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.

2.3 Installation dimension

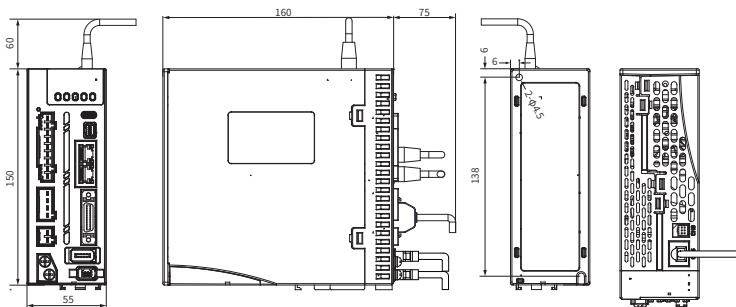
The following provides the dimensions for each model. Please use the site wiring as the standard for installation dimensions.

E-RME30



(Unit: mm)

E-RME60



(Unit: mm)

2.4 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.

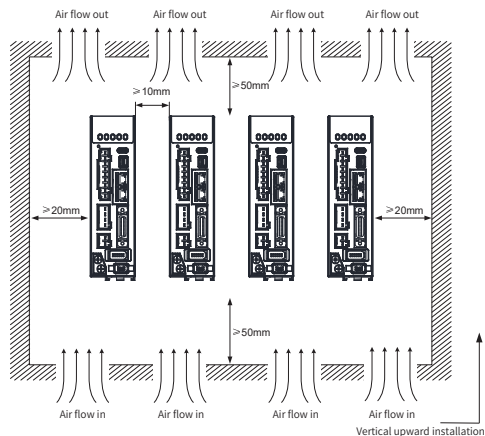


Figure 2-1 Installation Space Diagram with Reserved Clearance

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.

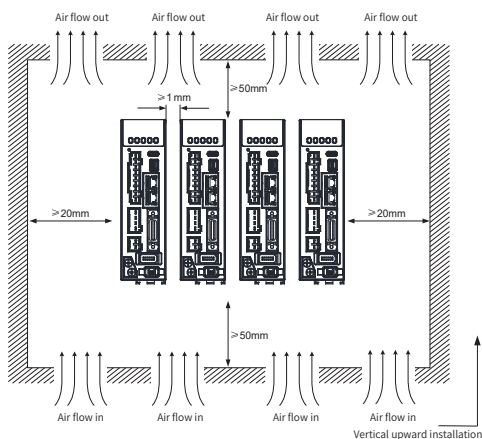


Figure 2-2 Compact Installation Space Diagram

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

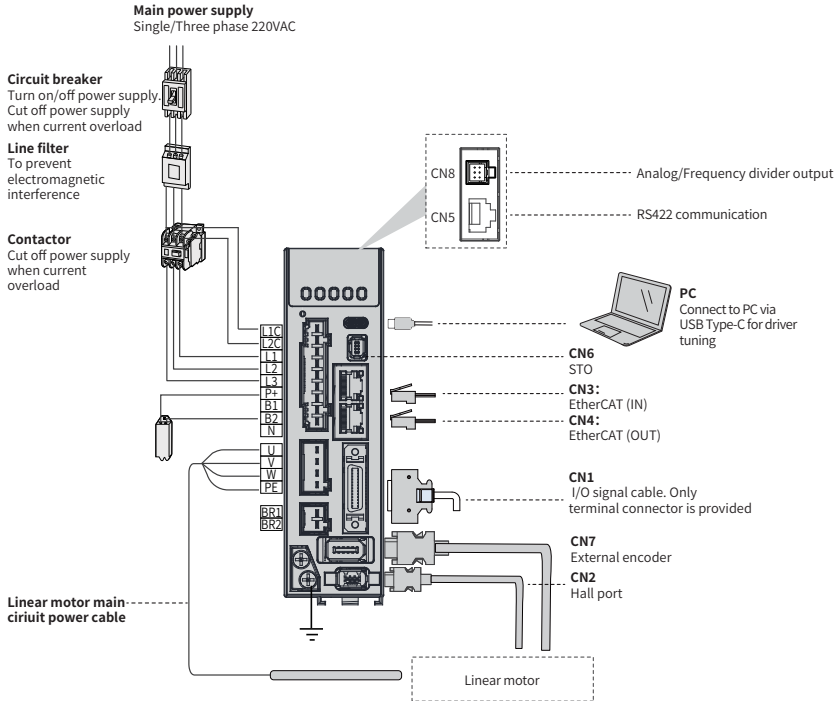


Figure 3-1 Single phase 220VAC Wiring Diagram

- E-RME 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

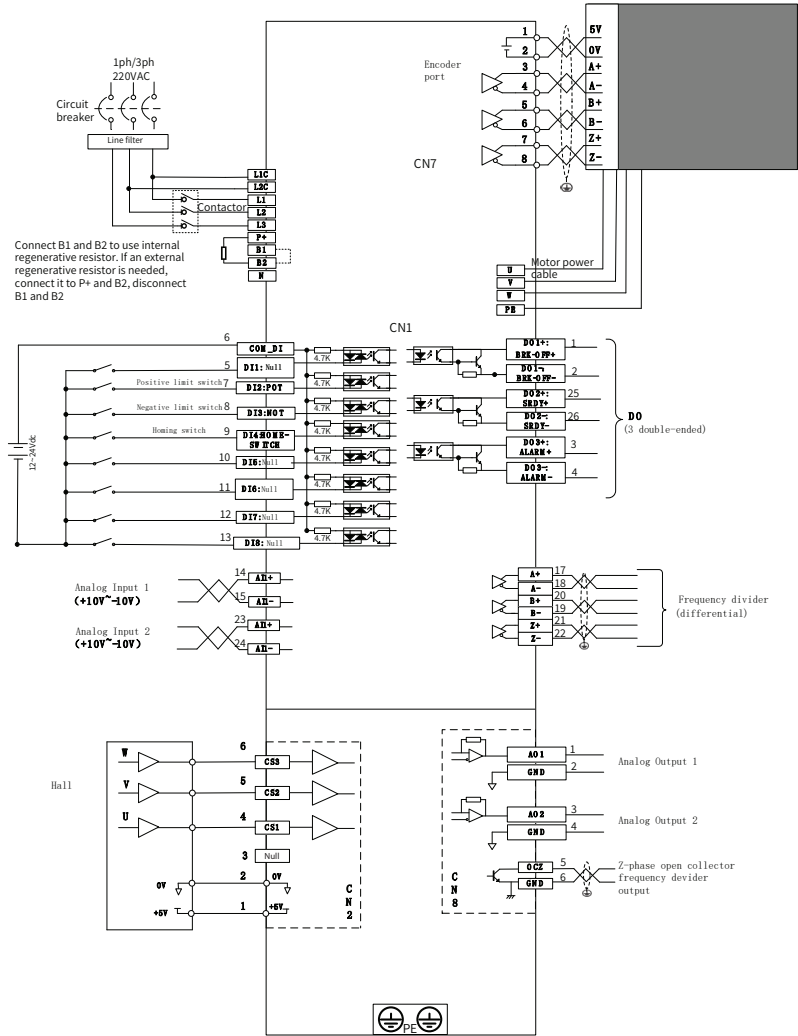


Figure 3-2 Standard wiring for position control mode

3.3 Ports Assignment

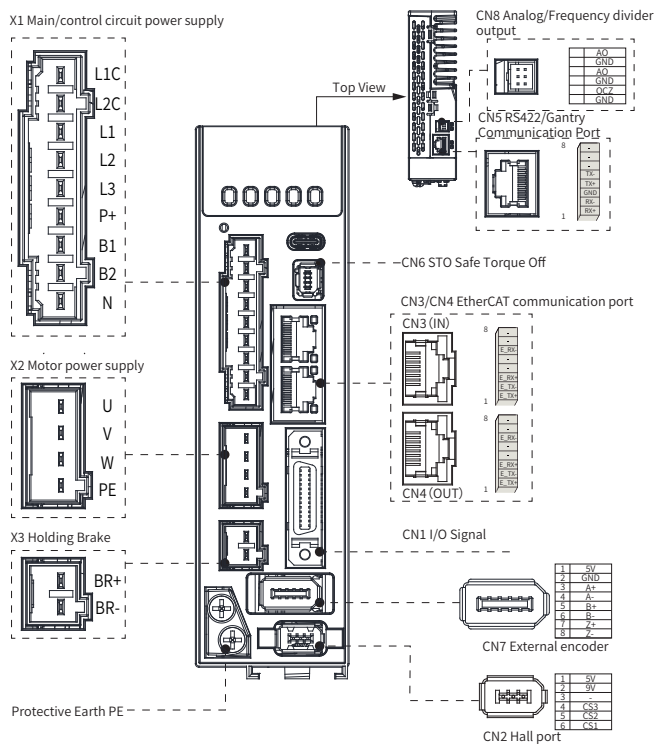


Figure 3-3 Ports pinout diagram

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
CN1	I/O Signal (26PIN)
CN2	Hall port
CN3	EtherCAT communication port (IN)
CN4	EtherCAT communication port (OUT)
CN5	RS422/Gantry communication port
CN6	STO Safe Torque Off
CN7	External encoder
CN8	Analog/Frequency divider output
X1/X2	Main/Control circuit power supply, Motor power supply
X3	Holding Brake
PC	Type-C Serial communication interface

3.4 Main Circuit Wiring

3.4.1 Main circuit power supply X1

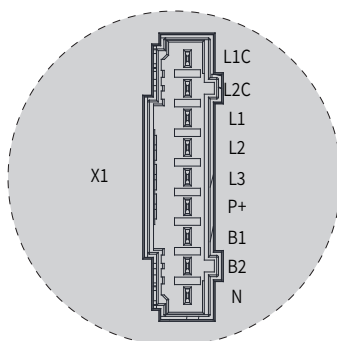


Figure 3-4 Main circuit port pinout diagram

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. Supports 1ph/3ph 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

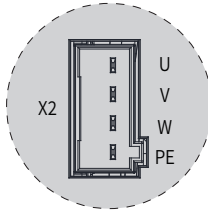


Figure 3-5 Motor power output port pinout diagram

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-RME 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-RME30	100	50	50	50
E-RME60	50	75	40	50

Regenerative resistor connection

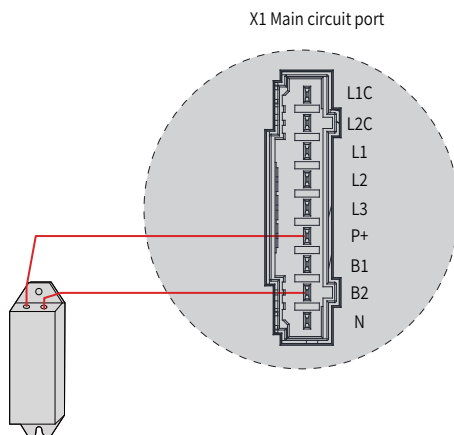


Figure 3-6 Regenerative resistor connection digram

⚠ 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-RME Series drive output current specifications

Drive Module	Rated Current (Arms)	Peak Current (Arms)
E-RME30	2.8A	9.3A
E-RME60	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-RME30	1.3/AWG16	2.1/AWG14	1.3/AWG16	2.1/AWG14
E-RME60	1.3/AWG16	2.1/AWG14	1.3/AWG16	2.1/AWG14

⚠ CAUTION

- Please connect to L1C/L2C (Control circuit) and L1/L2/L3 (Main power) to rated power supply voltage for the drive to operate under normal working condition. Drive will not function without both connected properly.
- 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.

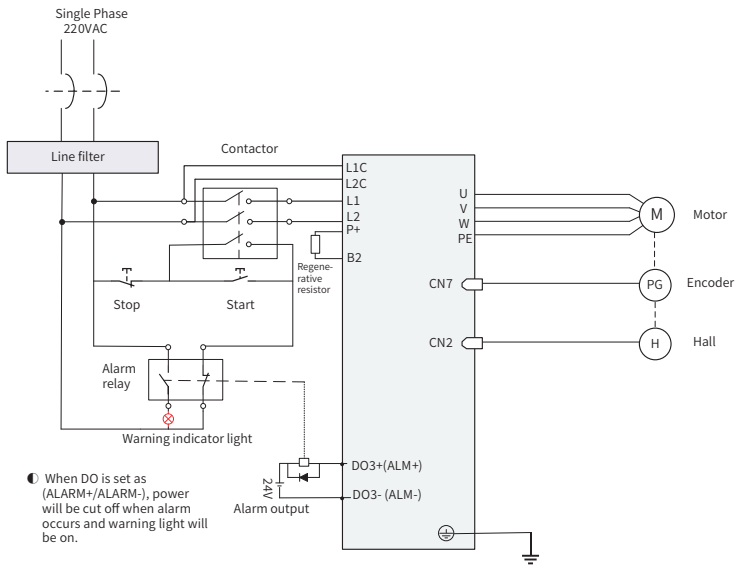
Install a surge suppressor in feedback circuitm flyback diode inversely connected in parallel in DC coil and capacitor connected in parallel in AC coil.

⚠ CAUTION

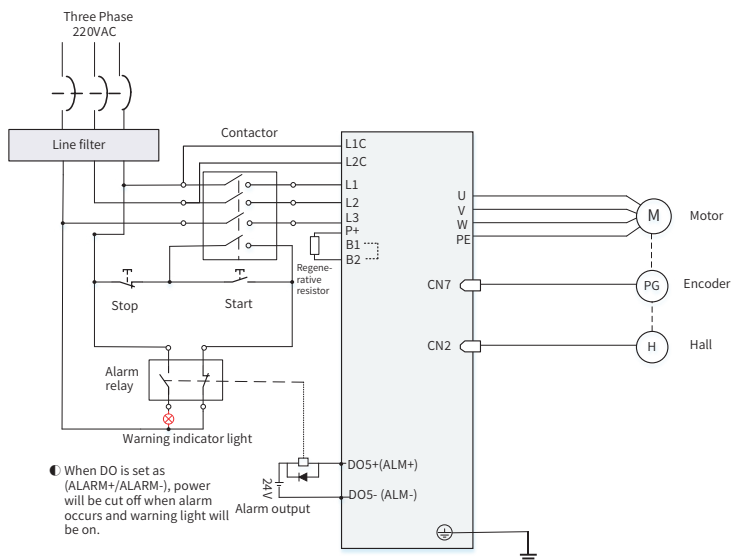
- U, V, and W must be connected to the motor windings correspondingly and must not be reversed.
- Cables and wires should be securely fixed and kept away from the drive's heat sink and the motor to prevent insulation degradation due to heat.
- The drive contains large-capacity electrolytic capacitors, 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



Three Phase 220VAC



3.4.6 Precautions for Main Circuit Wiring

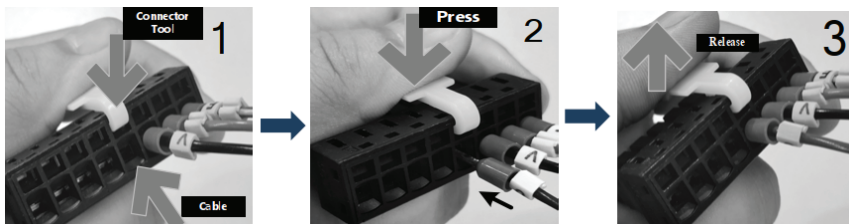
- Ensure the input power supply matches the rated voltage level indicated on the nameplate. Both control power and main power must be connected as specified.
- Do not connect the input power supply wires to the U, V, W motor output terminals. Otherwise, it may damage the drive.
- Do not route power cables 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-RME series drive CN1 **control signal connector** use SCSI 26PIN connector. The specific definitions are as follows:

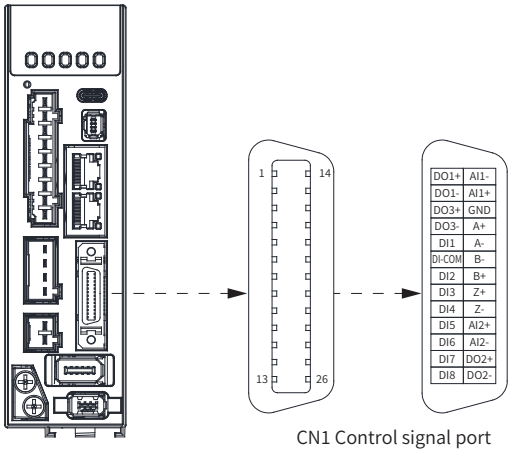
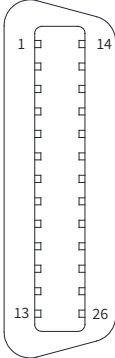


Figure 3-7 Control signal connector CN1 schematic diagram

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)
	6	DI-COM	Input	Common digital input
	5	DI1	-	Digital input 1
	7	DI2	POT	Positive limit switch
	8	DI3	NOT	Negative limit switch
	9	DI4	HOME-SWITCH	Homing switch
	10	DI5	-	Digital input 5
	11	DI6	-	Digital input 6
	12	DI7	-	Digital input 7
	13	DI8	-	Digital input 8
	1	DO1+	BRK-OFF+	External brake released signal
	2	DO1-	BRK-OFF-	
	25	DO2+	S-RDY+	Servo ready signal output
	26	DO2-	S-RDY-	
	3	DO3+	ALM+	Alarm output
	4	DO3-	ALM-	
	17	A+	Differential output	Phase A frequency divider output
	18	A-	Differential output	
	20	B+	Differential output	Phase B frequency divider output
	19	B-	Differential output	
	21	Z+	Differential output	Phase Z frequency divider output
	22	Z-	Differential output	
	16	GND	Signal ground	Signal ground
	14	AI1 -	Analog input 1-	Analog input 1
	15	AI1+	Analog input 1+	
	23	AI2+	Analog input 2+	Analog input 2
	24	AI2-	Analog input 2-	
	Frame	-	FG	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.

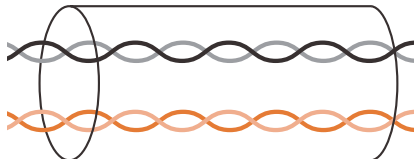


Figure 3-8 Shielded Twisted-Pair Cable Diagram

IO Signal Wiring

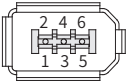
IO signals include digital input (DI), output (DO) signals, and relay output signals. When wiring control circuits, they should be kept at least 30 cm apart from main circuit wiring (L1C/L2C/L1/L2/L3, U/V/W) and other power lines, as placing them too close can cause interference with IO signals.

3.7 CN2-Hall port Connection

Hall connector CN2

E-RME 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

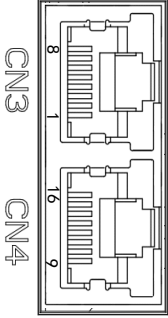
- Make sure to reliably ground the shielded layer on both the drive and motor sides to avoid false alarms in the drive!
- It is recommended to use twisted pair shielded cables for the Hall wires, and avoid using excessively long cables.
- Hall wires and power cables must be routed separately to prevent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

3.8 CN3, CN4-EtherCAT communication port connection

Communication port pin definition

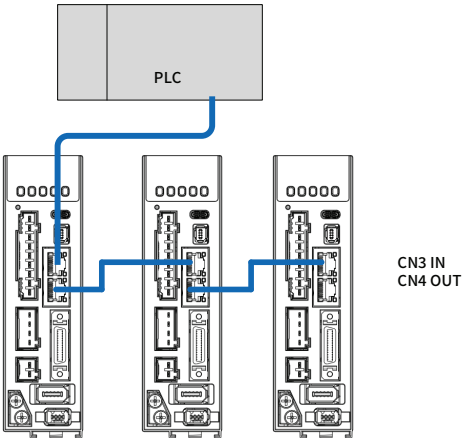
The E-RME series drives support EtherCAT communication. CN3 and CN4 are the EtherCAT connection ports, with CN3 (IN) connecting to the master station or the previous slave device, and CN4 (OUT) connecting to the next slave device.

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

Diagram	Pin	Signal	Description
	1, 9	E_TX+	EtherCAT Data sending positive terminal
	2, 10	E_TX-	EtherCAT Data sending negative terminal
	3, 11	E_RX+	EtherCAT Data receiving positive terminal
	4, 12	--	--
	5, 13	--	--
	6, 14	E_RX-	EtherCAT Data receiving negative terminal
	7, 15	--	--
	8, 16	--	--
	Frame	PE	Shielding grounded

■ The E-RME series drives feature EtherCAT communication functionality and support the following connection options:

- 1) Multiple drives can communicate with the master device.
- 2) A single drive can communicate with the master device.



3.9 CN6 - Safe Torque Off (STO) Port

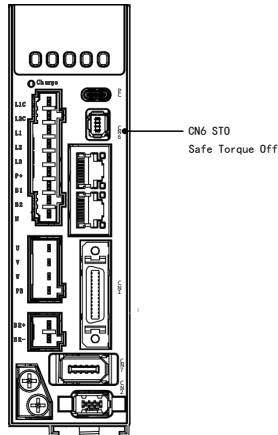
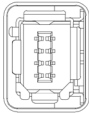


Table 3-9 STO port pin assignment

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.

STO function precautions

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:

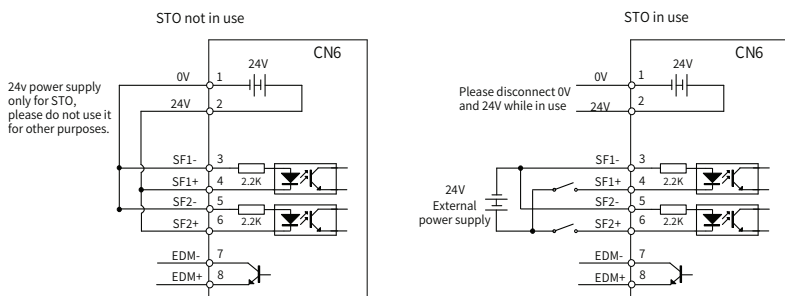
- 1) After enabling the STO function, the drive cannot guarantee that the motor will not move due to external forces.
- 2) The STO function does not cut off the power supply to the drive, so there is still a risk of electric shock. When performing maintenance on the drive, always disconnect the power supply and other devices.
- 3) 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

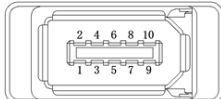


3.10 CN7 - Encoder port connection

Encoder port CN7

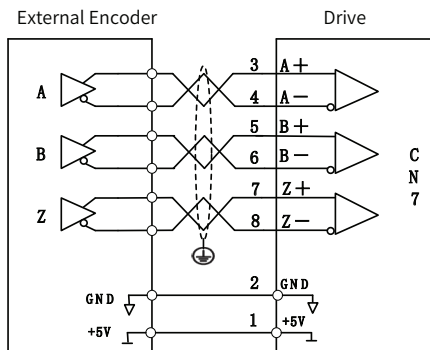
Encoder port CN7 uses 1394 10PIN connector and simultaneously supports two encoder feedback modes: incremental A, B, Z and BISS-C. Please connect according to the encoder feedback type supported by the motor.

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-	
-	Frame	FG	Shield grounding	

External encoder pulse input

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

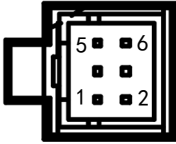


Note

- 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.

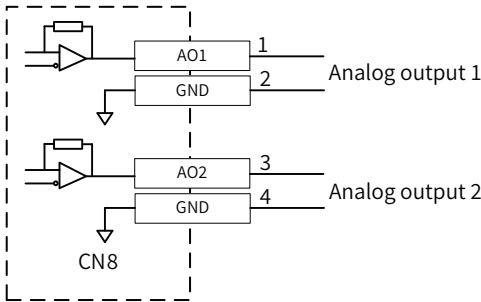
3.11 CN8 - Analog/Z-phase open collector output port

CN8 has 2 analog outputs and 1 Z-phase open collector output

Diagram	Pin	Signal	Description	Remarks
	1	AO1	Analog output 1	
	2	GND	Signal ground	
	3	AO2	Analog output 2	
	4	GND	Signal ground	
	5	OCZ	Z-phase output (open collector)	Only NPN Open collector output
	6	GND	Signal ground	

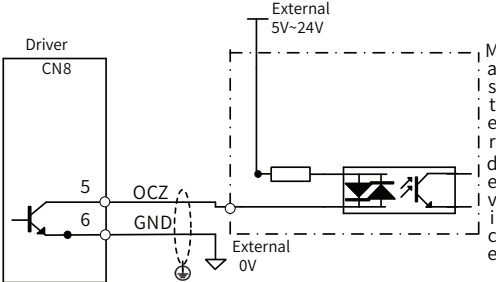
Analog outputs

- Both analog outputs settings can be modified in P04.65/ P04.70:



Encoder Z-phase frequency divider output (Open Collector)

- Encoder output signal will be through Open Collector after frequency division.



CAUTION

- Please connect ground terminal of external power supply to CN6 pin 6 signal ground using double winding shielded cable for better protection against interference.

3.12 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.

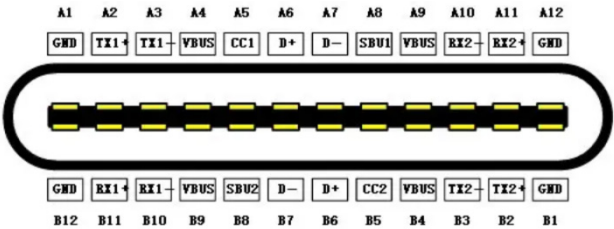


Figure 3-9 Drive TYPE-C pin assignment

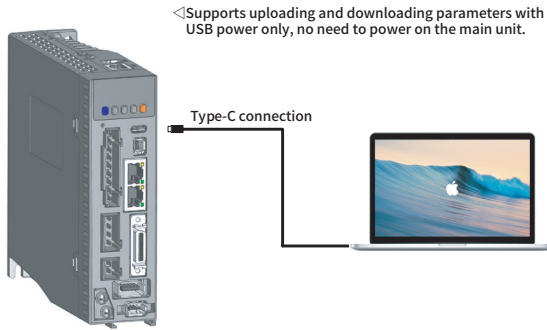
Table 3-11 TYPE-C communicatin port pin assignment

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



3.13 I/O Signal

3.13.1 Analog input circuit

Analog input signal

E-RME series drive supports two analog input functions (differential analog inputs).

Table 3-12 Analog input signal pin assignment

CN1 Pin	Signal	Description
14	AI1-	Analog input 1, differential, Input voltage: $\pm 10\text{VDC}$, Input resistance: $20\text{k}\Omega$
15	AI1+	
23	AI2+	Analog input 2, differential, Input voltage: $\pm 10\text{VDC}$, Input resistance: $20\text{k}\Omega$
24	AI2-	

The maximum allowable voltage for each analog input is $\pm 10\text{V}$. If variable resistor or resistor is needed, please refer to following diagram.

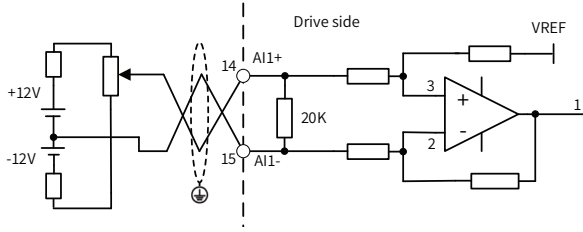


Figure 3-10 Analog AI1 input port

3.13.2 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.

For detailed pin assignments, refer to section 3.6 CN1 control terminal pin definition.

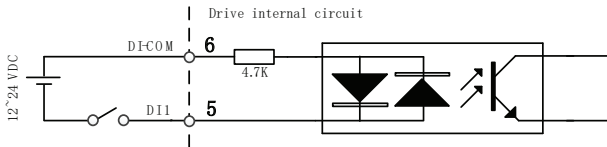
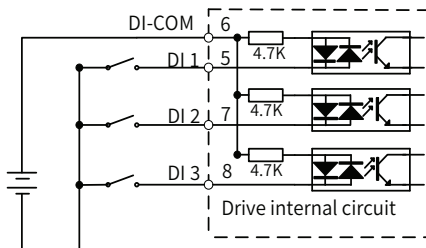


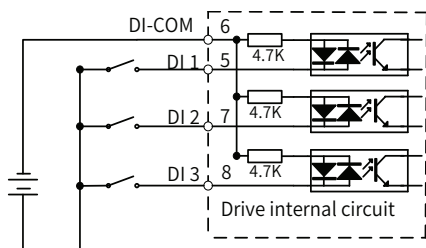
Figure 3-11 General digital IO input circuit

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

Common anode:

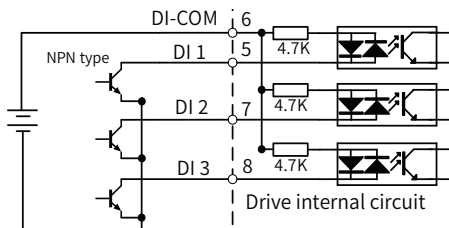


Common cathode:

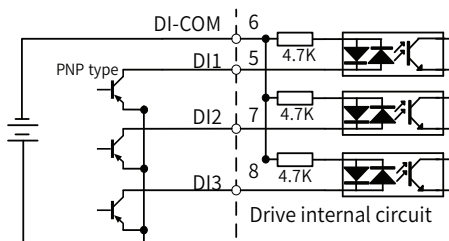


② Output from master device: Open Collector (only DI1~DI3 shown)

NPN configuration:



PNP configuration:



Please prepare switching power supply with output of 12-24VDC, current $\geq 100\text{mA}$.

3.13.3 General digital output circuit

There are 3 digital outputs which are double-end, having an isolated 24v power supply.

For detailed pin assignments, refer to section 3.6 CN1 control terminal pin definition.

Double-ended output DO1-DO3

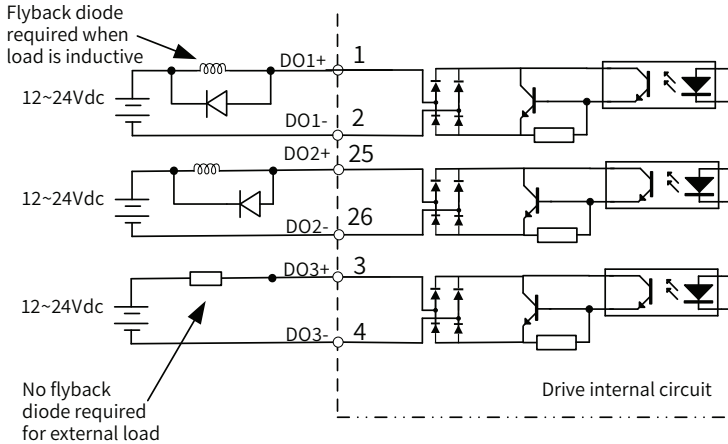
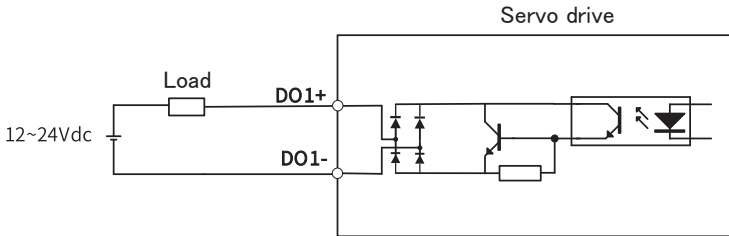
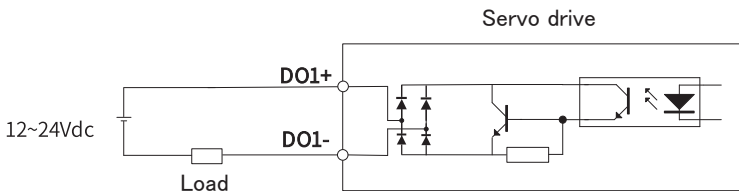


Figure 3-12 General digital IO double-end output circuit

■ NPN configuration DO1-DO3



■ PNP configuration DO1-DO3



⚠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.
 - Pin 12, 40 and 41 are 2 single ended outputs, Pin 11+10 and 35+34, pin 37+36 and 39+38 are 2 double ended outputs.
-

3.13.4 Probe input circuit

Drive reuse DI5 and DI6 as probe input terminals. Internal circuit is a bidirectional optocoupler.

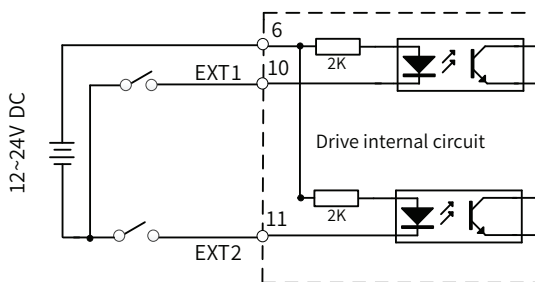


Figure 3-13 Probe function connector internal circuit

Note

- DI5/DI6 is default
 - as probe function if no other function is assigned to them.
-

3.13.5 Encoder frequency divider output

E-RME 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	
17	A +	Motor encoder A-phase frequency divider output	Differential, High $\geq 2.5\text{VDC}$, Low $\leq 0.5\text{VDC}$, Max current $\pm 20\text{mA}$
18	A –		
20	B +	Motor encoder B-phase frequency divider output	
19	B –		
21	Z +	Motor encoder Z-phase frequency divider output	
22	Z –		
16	GND	Encoder signal open collector signal ground	

Encoder frequency divider output (differential output method)

The encoder signal, after frequency processing, is output through a differential drive in differential mode. This is typically used when the master device forms a position control system and provides feedback signals. On the master device side, please use a differential or optocoupler reception circuit to receive the signal.

When master device uses differential receiving, please install terminal resistor between differential input circuits. Set resistance accordingly.

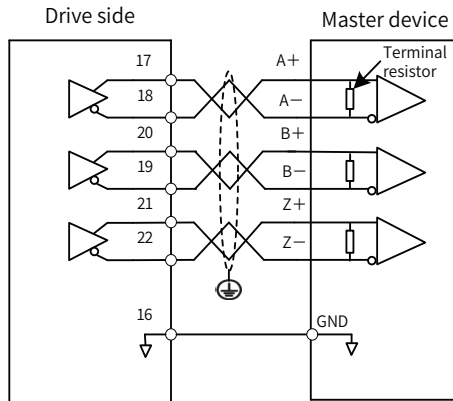


Figure 3-14 Encoder frequency divider output (differential output) circuit

⚠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.
-

3.14 Digital Input/Output Signal

3.14.1 Digital Input Signal Setting

Control input

Default status

CN1 PIN	Signal	Parameter	Default function	Default status
6	DI-COM	-	Common DI	-
5	DI1	P04.00	-	Normally opened OFF
7	DI2	P04.01	POT	Normally opened OFF
8	DI3	P04.02	NOT	Normally opened OFF
9	DI4	P04.03	HOME-SWITCH	Normally opened OFF
10	DI5	P04.04	-	Normally opened OFF
11	DI6	P04.05	-	Normally opened OFF
12	DI7	P04.06	-	Normally opened OFF
13	DI8	P04.07	-	Normally opened OFF

The description of NO and NC are as follows:

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
5	DI1	P04.00
7	DI2	P04.01
8	DI3	P04.02
9	DI4	P04.03
10	DI5	P04.04
11	DI6	P04.05
12	DI7	P04.06
13	DI8	P04.07

Signal	Sign	Setting value	
		NO	NC
-	—	0	-
Positive limit switch	POT	1	81
Negative limit switch	NOT	2	82
Clear Alarm	A-CLR	4	-
Emergency stop	E-STOP	14	94
Homing switch	HOME-SWITCH	16	96

This parameter is set in hexadecimal.

Please refer to the table on the right to configure the function number.

⚠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.
-

Associated parameters and function allocation code overview table

P04.00	Param.	DI1	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x1
	Effective method	Effective immediately			EtherCAT Address	2400h

Set the Digital Input function assignment.
The setting value is represented in hexadecimal.
Refer to the table below for function numbers. The logic configuration is also included in the function number.

Signal	Sign	Setting Value		Object Address 0x60FD(bit)
		NO	NC	
-	—	00h	-	×
Positive limit switch	POT	01h	81h	bit1
Negative limit switch	NOT	02h	82h	bit0
Clear Alarm	A-CLR	04h	-	-
Emergency stop	E-STOP	14h	94h	-
Homing switch	HOME-SWITCH	16h	96h	bit2

- Do not assign values outside the table above.
- Normally Open (NO): Effective when the input is ON (optocoupler conducts).
Normally Closed (NC): Effective when the input is OFF (optocoupler is disconnected).
- The same function cannot be assigned to multiple pins. Otherwise, Err210 will occur.
- Setting to an invalid control input line will not affect the operation.
- The front panel displays settings in hexadecimal, so please pay attention.
- The same function cannot be assigned to multiple pins. Otherwise, Err210 will occur. When the parameters are set to all 0, external sensor signals can be connected, and the controller can directly read the bit4 to bit11 of 60FD to obtain the real-time states of DI1 to DI8.

P04.01	Param.	DI2	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x2
	Effective method	Immediate			EtherCAT Address	2401h

P04.02	Param.	DI3	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x16
	Effective method	Immediate			EtherCAT Address	2402h

P04.03	Param.	DI4	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x0
	Effective method	Immediate			EtherCAT Address	2403h

P04.04	Param.	DI5	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x0
	Effective method	Immediate			EtherCAT Address	2404h

P04.05	Param.	DI6	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x0
	Effective method	Immediate			EtherCAT Address	2405h
P04.06	Param.	DI7	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x0
	Effective method	Immediate			EtherCAT Address	2406h
P04.07	Param.	DI8	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x0
	Effective method	Immediate			EtherCAT Address	2407h

3.14.2 Digital Output Signal Setting

Control output

Default status

CN1 PIN	Signal	Parameter	Function
1	DO1+	P04.10	External break released BRK-OFF
2	DO1-		
25	DO2+	P04.11	Servo Ready S-RDY
26	DO2-		
3	DO3+	P04.12	Servo Alarm (ALARM)
4	DO3-		

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		
1	DO1+	P04.10
2	DO1-	
25	DO2+	P04.11
26	DO2-	
3	DO3+	P04.12
4	DO3-	

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
14h	Position comparison output	CMP-OUT

Note

- Digital output functions can be assigned to multiple pins at the same time.
- Control output pins set to "Invalid" will keep the output transistor in the OFF state.
- Do not assign values outside the table above.

Associated parameters and function allocation code overview table

P04.10	Param	DO1	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x3
	Effective method	Immediate			EtherCAT Address	2410h
P04.11	Param	DO2	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x2
	Effective method	Immediate			EtherCAT Address	2411h
P04.12	Param	DO3	Effective mode		F	
	Range	0x0~0xFF	Unit	-	Default Value	0x1
	Effective method	Immediate			EtherCAT Address	2412h

Set the Digital Output function assignment.

The setting value is represented in hexadecimal.

Refer to the table below for function numbers. The logic configuration is also included in the function number.

Signal Name	Sign	Setting Value	
		NO	NC
Main control output	—	全 00h	-
Servo Alarm	AIM	01h	81h
Servo Ready	S-RDY	02h	82h
External break released	BRK-OFF	03h	83h
In Position	INP	04h	84h
At speed	AT-SPEED	05h	85h
Torque limited output	TLC	06h	86h
Zero speed clamping detection output	ZSP	07h	87h
Velocity consistency output	V-COIN	08h	88h
Position command presence output	P-CMD	0Bh	8Bh
Velocity limit signal output	V-LIMIT	0Dh	8Dh
Velocity command presence output	V-CMD	0Fh	8Fh
Servo enable active state output	SRV-ST	12h	92h
Homing Complete	HOME-OK	22h	A2h
Position comparison output	CMP-OUT	14h	94h

- Normally Open: Effective at low level (transistor conducts).
Normally Closed: Effective at high level (transistor disconnects).
- The output signal can assign the same function to multiple pins.
- For control output pins set as invalid, the output transistor remains in the OFF (disconnected) state.
- Do not assign values outside the table above.
- * 1 The front panel parameter modifications are represented in hexadecimal format.
- * 2 P04.10 ~ P04.12 correspond to DO1 ~ DO3 respectively. When the parameters are set to all 0, these function as main control outputs. In this case, the target object dictionary 0x60FE sub-index 01, bits 16 ~ 18, correspond to DO1 ~ DO3 respectively.

3.15 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.

3.15.1 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".

3.15.2 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.

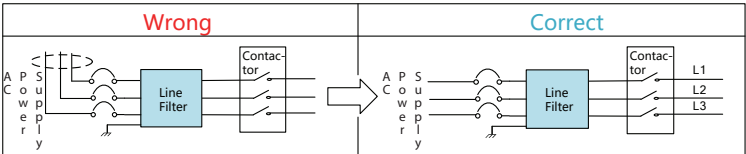


Figure 3-15 Line filter input wiring separation diagram

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

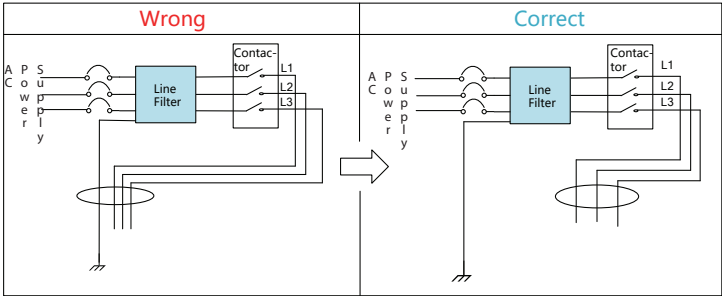


Figure 3-16 Line filter grounding and output wiring separation diagram

■ Ground wires inside an electrical cabinet

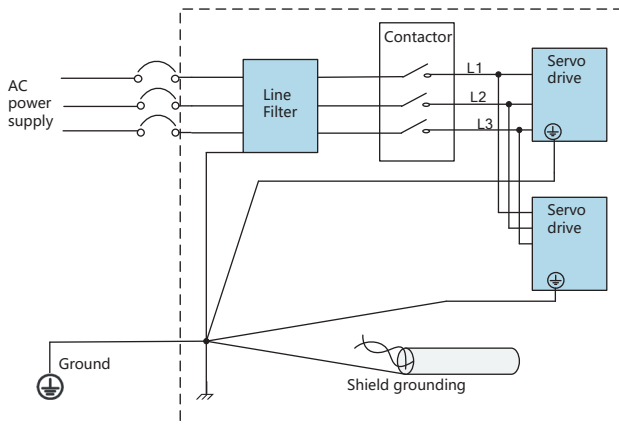


Figure 3-17 Line filter grounding handling illustration

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-RME 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

Panel operation process

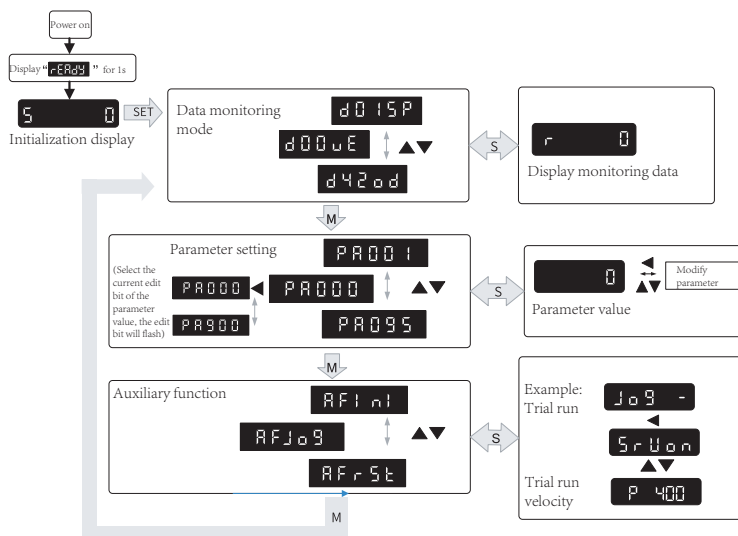


Figure 4-1 Flow diagram of panel operation

- 1) **rEAdy** 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-RME series 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	d00uE	Pulse	"xxxx"
1	d01SP	Motor velocity	d01SP	r/min	"r xxxx" Motor actual velocity "F xxxx" External encoder feedback velocity
2	d02CS	Position control command velocity	d02CS	r/min	"xxxx"
3	d03Cu	Velocity control command velocity	d03Cu	r/min	"xxxx"
4	d04tr	Actual feedback torque	d04tr	%	"xxxx"
5	d05nP	Feedback pulse sum	d05nP	Unit	"xxxx"
6	d06CP	Command pulse sum	d06CP	Unit	"xxxx"
7	d07	Maximum torque/ Average load ratio during motion	d07	-	"d xxx" Max torque % "V xxx " Average load ratio %
8	d08FP	Internal command position sum	d08FP	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"
Following are parameters related to EtherCAT bus					
36	d36dc	Synchronizing cycle	d36dc	ms	"xxxxxx"
37	d37sc	No. of times of synchronization loss	d37sc	/	"xxxxxx"

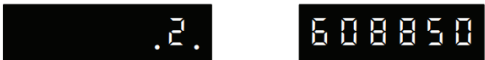
38	d38st	Synchronization Type	d38st	Freerun/ Dc	"xxxxxx"
39	d39dr	If DC is running	d39dr	/	"xxxxxx"
40	d40sn	Acceleration and deceleration status	d40sn	/	"xxxxxx"
41	d41od	Object dictionary address	d41od	/	"xxxxxx" Index (4 bit)+subindex(2 bit)
42	d42od	Object dictionary value	d42od	/	"xxxxxx" 1. If OD does not exist, ODNEXT is displayed. 2. If OD is out of range, ODRNG is displayed.

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.

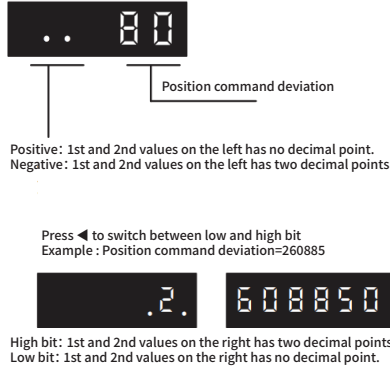
When the first and second decimal points on the far-left side are lit, it indicates a negative number. Otherwise, the number is positive.



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

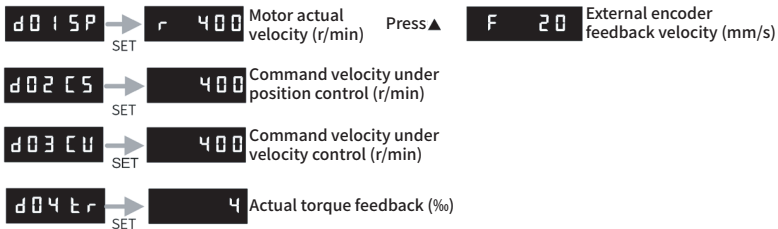
Shows high bit and low bit of position deviation.



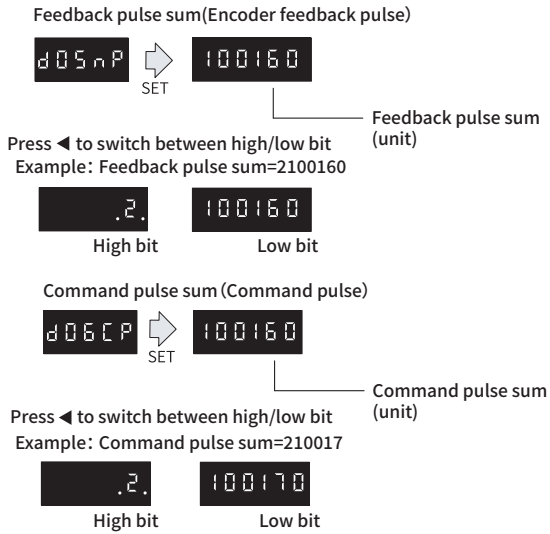
d01SP Motor velocity, d02CS Position control command velocity, d03CU Velocity control command velocity, d04 tr Actual torque feedback

After the drive is powered on normally, it displays **5 0**, indicating that the drive is in the disabled state. After the drive is enabled, the panel displays **r 0**. When the motor is running normally, it displays **r -XXX**. The drive's enable status can be determined by switching between the "s" or "r" on the panel. **d01SP** can be switched using the ▲ to toggle the external encoder feedback speed.

d04 tr shows real-time torque feedback, reflecting the magnitude of instantaneous current.



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.



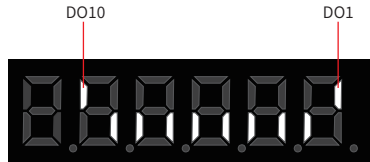
d10Io I/O signal status

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.

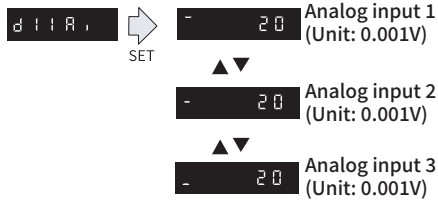


- Output: From low to high bit(Right to left) DO1, DO2...DO10. Decimal point is not lighted to represent output signals. In the example below, DO1 output signal is valid. DO2-DO10 output signal is invalid.



d11Ai Analog input

- Display the current analog input value of the drive.

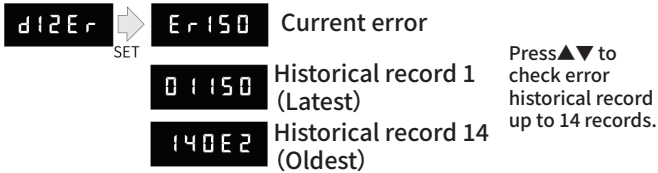


3 analog inputs can be monitored through d11. Left most bar at the top: 1st analog input, at the middle: 2nd analog input, at the bottom 3rd analog input.

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: **-1150**

d12Er Alarm cause and historical record

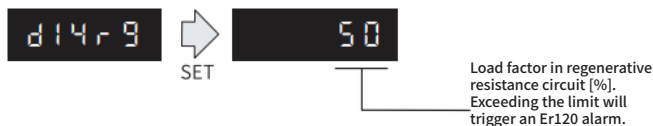


Note

- Save: Save error messages to alarm history.
 - Clearable: Clearable alarm by operating the front panel and use auxiliary function **RFACL**. 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
-

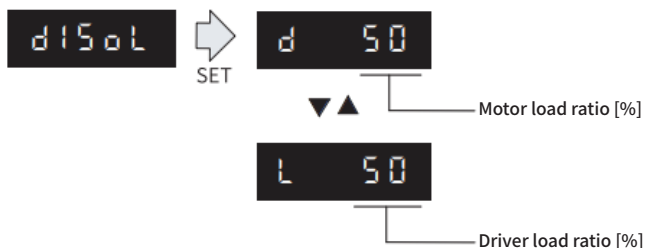
d14rg Regenerative load factor d15oL Overload factor

- 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

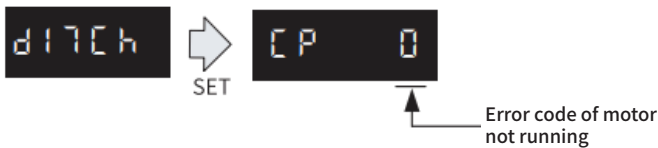


d16Jr Inertia ratio



Use auxiliary function **RF_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.

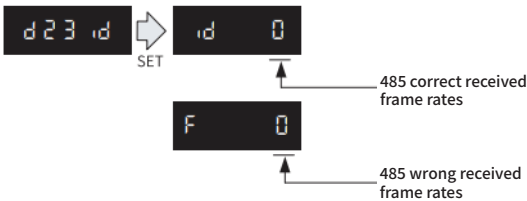
d17Ch Motor not running cause



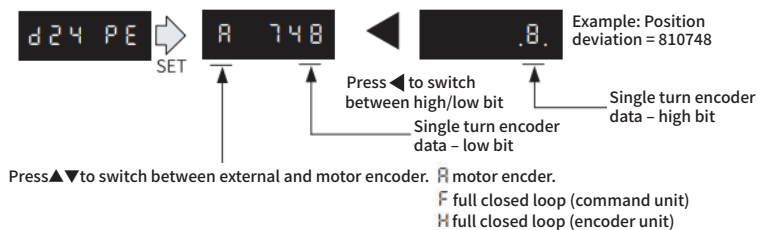
■ "d17Ch" Motor No Running Cause - Codes & Descriptions

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.

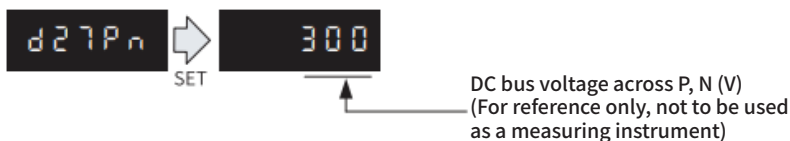
d23id 485 received frame



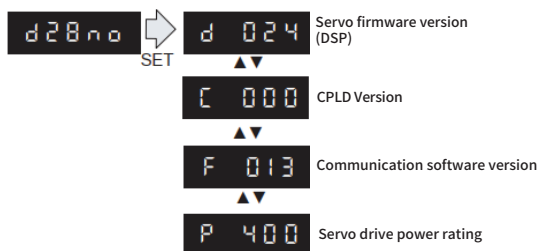
d24PE Position deviation



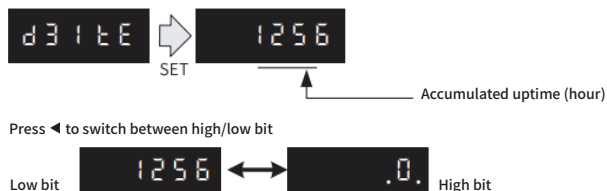
d27Pn DC bus voltage



d28no Software version



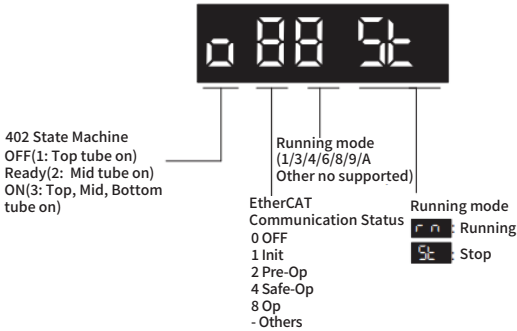
d31tE Accumulated operation time



d34 Servo drive status display

■ d34

Drive status: 402 state machine, EtherCAT communication, running mode, running.
The specific meanings of the LED digits from left to right are as follows:



The image example shows that the meaning is as follows: 402 state machine is in the allowed operation state. EtherCAT communication status is in operation state. Operating mode is 8. The servo is in the stopped state.

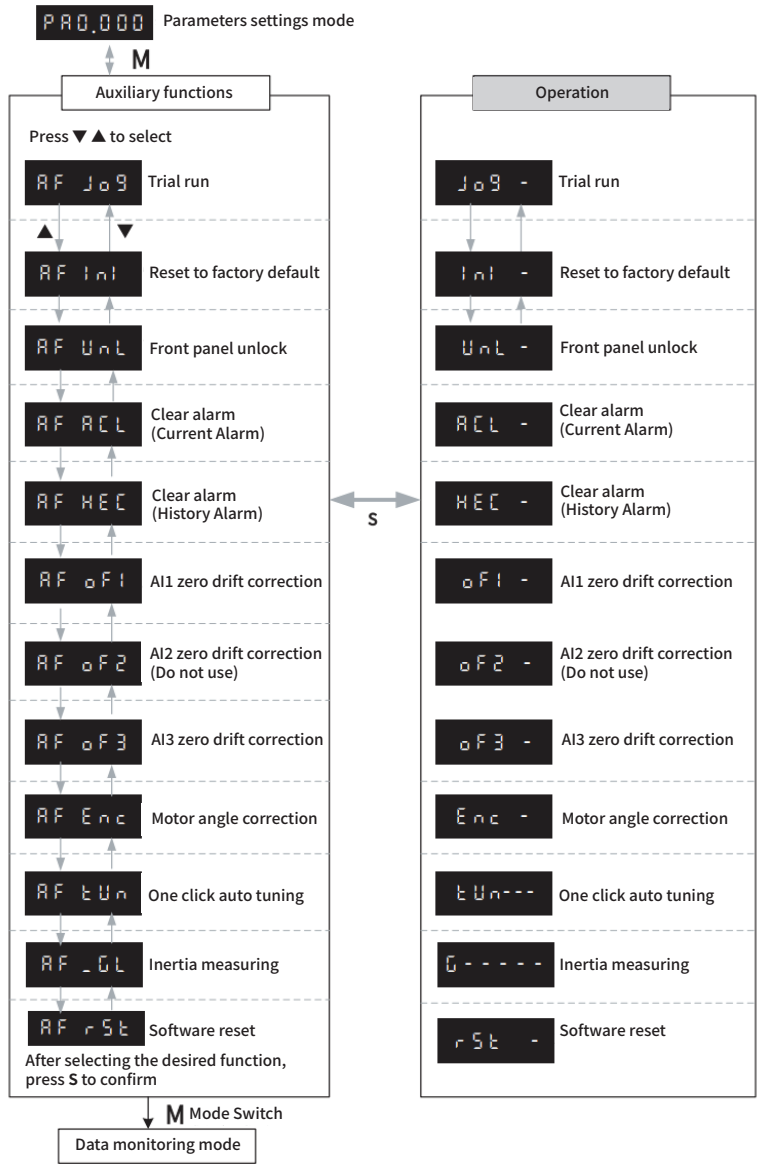
4.1.5 Parameters saving

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



■ Explanation and operation of auxiliary functions

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

■ Please initialize the user parameters (especially P00.04 and gain parameters) to prevent issues like oscillations.

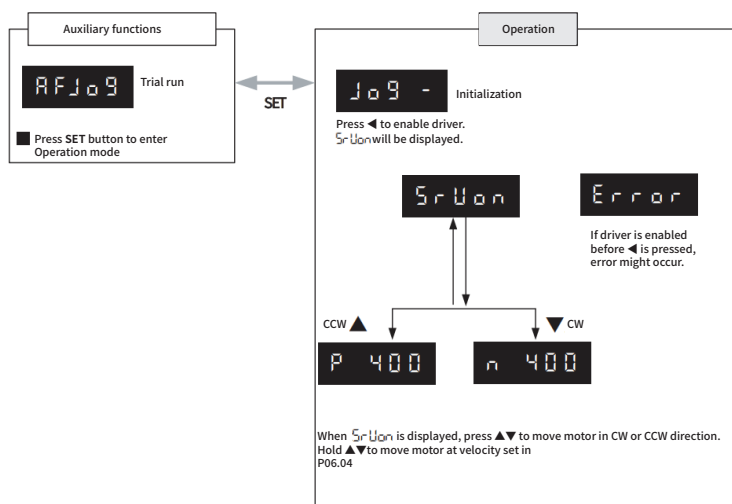
■ Before performing a trial run, please check the relevant parameters as follows:

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

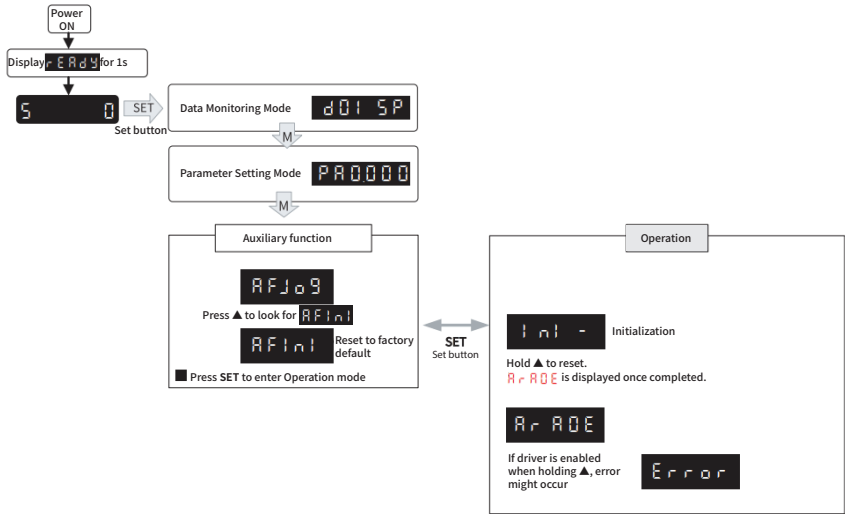


⚠ CAUTION

- 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.

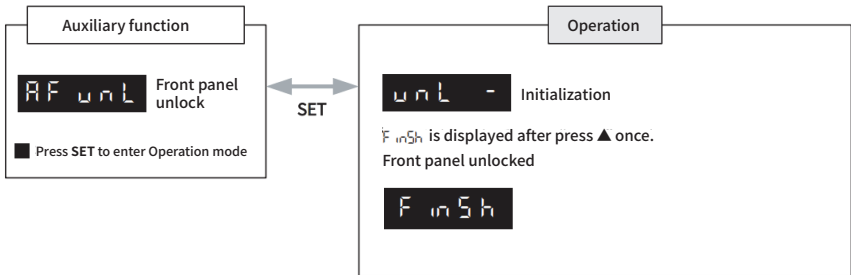
AF InI Reset to factory default

To reset parameters settings to factory default.



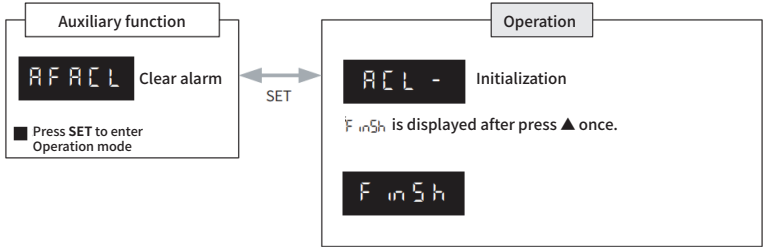
AF unL Front panel unlock

To unlock the front panel from the locked state.



AF ACL Clear alarm

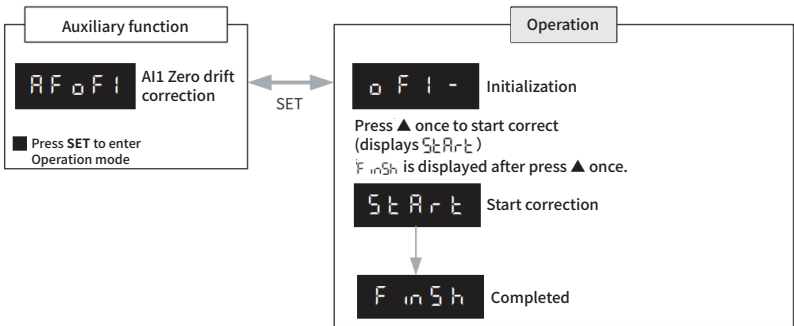
Alarm can be cleared using auxiliary function **AFACL** . But before that, the error needs to be solved and drive needs to be restarted.



AF oF1 - oF3 Analog input AI1-3 zero drift correction

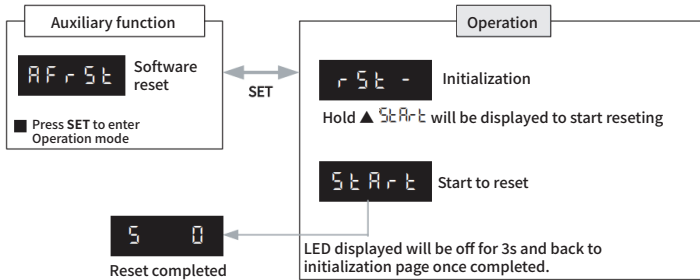
Auto adjustment of analog input zero drift settings

- 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

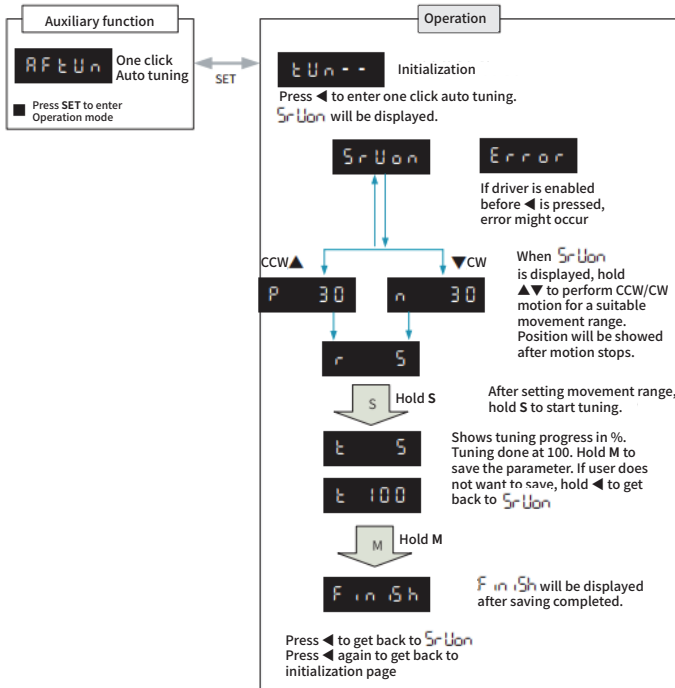
Perform a software reset on the drive.



■ 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 Front panel warning indicator

E-RME 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

4.1.8 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.

4.1.9 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.

■ Save using object dictionary

Objects	Types	Explanations
0x1010-01	ALL parameters	Master device can save all parameters to EEPROM using 0x1010-01. When the drive detects 0x1010-01 data from master device as 0x65766173, drive will save current parameters to EEPROM. After saving, 1010-01=1.
0x1010-02	Communication parameters	Master device can save communication parameters to EEPROM using 0x1010-02. When the drive detects 0x1010-02 data from master device as 0x65766173, drive will save current parameters to EEPROM. After saving, 1010-02=1.
0x1010-03	402 parameters	Master device can save 402 parameters to EEPROM using 0x1010-01. When the drive detects 0x1010-03 data from master device as 0x65766173, drive will save current parameters to EEPROM. After saving, 1010-03=1.
0x1010-04	Manufacturer's parameters	Master device can save manufacturer's parameters to EEPROM using 0x1010-01. When the drive detects 0x1010-01 data from master device as 0x65766173, drive will save current parameters to EEPROM (including 0x2000 to 0x5FFF parameters and electronic gear ratio parameters)

Chapter 5 Control Mode

5.1 E-RME series drive motion control step-by-step

1. EtherCAT master device sends "control word (6040h)" to initialize the drive.
2. Drive sends feedback "status word (6041h)" to the master device to indicate ready status (status word indication).
3. Master device sends enable command (control word switch).
4. The drive enables and sends feedback status to the master device.
5. The master station sends homing command to home the axis. (Homing parameter and control word switch)
6. Drive returns to home and sends feedback homed status to master device (status word indication)
7. The master station sends the position mode command for position movement (position motion parameters and control word switch) or sends the velocity command for velocity movement (velocity motion parameters and control word switch).
8. When the drive is finished executing the command (position command), E-RME feedbacks the position/velocity to the master device for monitoring during the motion.
9. The master device sends commands for the next motion.

5.2 CIA402 State Machine

The drive must be guided according to the process specified in the 402 standard for it to operate in the designated state.

5.2.1 State machine switchover diagram

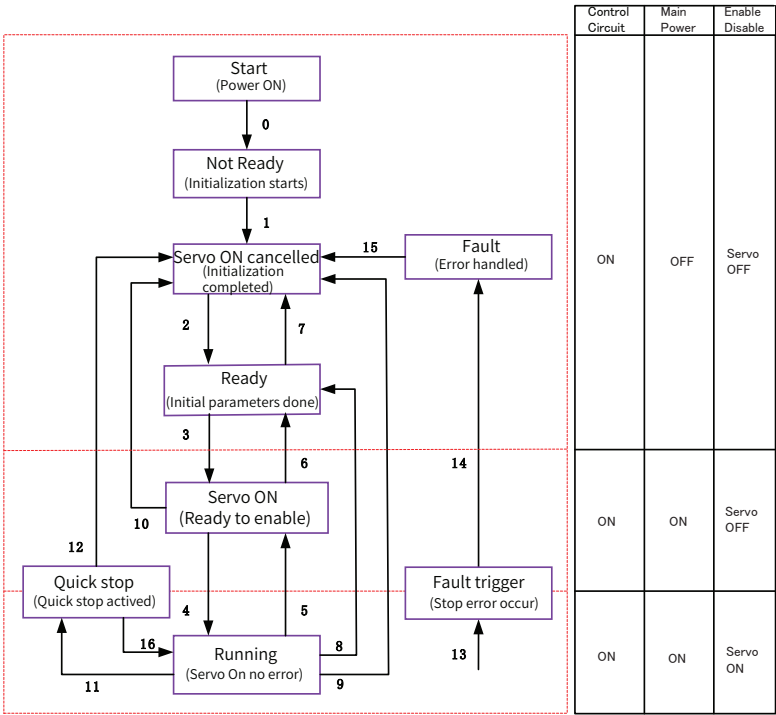


Figure 5-1 E-RME 402 State Machine switchover diagram

The states in Figure 5-1 correspond to the drive actions as listed in Table 5-1.

Table 5-1 Status description

Status	E-RME drive action
Initialization starts	Drive powered on, initialization starts. Holding brake activated. Axis disabled.
Initialization done	Initialization done. Parameters initialize, faultless. Axis disabled.
Ready	Parameter initialization done. Axis disabled.
Enable	Servo drive is ready to be enabled.
Running	Drive enabled, faultless.
Quick stop	Quick stop activated.
F a u l t triggered	Alarm not solved yet. Axis disabled.
Fault	Alarm solved. Waiting to switch from 402 state machine switch from Fault to Switch on disabled. Axis disabled.

402 state machine switching is dependent on master device controlled servo drive control word (6040h)

CiA402 status switching		Control word 6040h	Status word 6041h Bit1- Bit9 (bit10-bit15 default as 0)
0	Power on → Initialization	Transit automatically	0x0000
1	Initialization → Faultless	Transit automatically Enter 13 if fault occurs	0x0250
2	Faultless → Ready	0x0006	0x0231
3	Ready → Waiting to enable	0x0007	0x0233
4	Waiting to enable → Running	0x000F	0x0237
5	Running → Waiting to enable	0x0007	0x0233
6	Waiting to enable → Ready	0x0006	0x0231
7	Ready → Faultless	0x0000	0x0250
8	Running → Ready	0x0006	0x0231
9	Running → Faultless	0x0000	0x0250
10	Waiting to enable → Faultless	0x0000	0x0250
11	Running → Quick stop	0x0002	0x0217
12	Quick stop → Faultless	Transit automatically	0x0250
13	Fault stop	Transit automatically	0x021F
14	Fault stop → Fault	Transit automatically	0x0218
15	Fault → Faultless	0x80	0x0250
16	Quick stop → Running	0x0F	0x0237

5.3 Drive Control Mode Setting

5.3.1 Supported control mode (6502h)

The 6502h object is used to indicate the supported operation modes under the current software version of the E-RME drive. Its bit definitions are outlined in the following table:

Table 5-2 6502h object bit definition

bit	31~10	9	8	7	6	5	4	3	2	1	0
Mode	Resv.	CST	CSV	CSP	Resv.	HM	Resv.	PT	PV	Resv.	PP
Data	0	1	1	1	0	1	0	1	1	0	1

bit	31~10	9	8	7	6	5	4	3	2	1	0																					
<table><tr><th>Description</th><th>Abbr.</th><th>中文名称</th></tr><tr><td>Profile position mode</td><td>PP</td><td>协议位置模式</td></tr><tr><td>Profile velocity mode</td><td>PV</td><td>协议速度模式</td></tr><tr><td>profile Torque mode</td><td>PT</td><td>协议转矩模式</td></tr><tr><td>Homing mode</td><td>HM</td><td>原点模式</td></tr><tr><td>Cyclic synchronous position mode</td><td>CSP</td><td>循环同步位置模式</td></tr><tr><td>Cyclic synchronous velocity mode</td><td>CSV</td><td>循环同步速度模式</td></tr></table>												Description	Abbr.	中文名称	Profile position mode	PP	协议位置模式	Profile velocity mode	PV	协议速度模式	profile Torque mode	PT	协议转矩模式	Homing mode	HM	原点模式	Cyclic synchronous position mode	CSP	循环同步位置模式	Cyclic synchronous velocity mode	CSV	循环同步速度模式
Description	Abbr.	中文名称																														
Profile position mode	PP	协议位置模式																														
Profile velocity mode	PV	协议速度模式																														
profile Torque mode	PT	协议转矩模式																														
Homing mode	HM	原点模式																														
Cyclic synchronous position mode	CSP	循环同步位置模式																														
Cyclic synchronous velocity mode	CSV	循环同步速度模式																														

5.3.2 Modes of operation (6060h) and Modes of operation display (6061h)

The operation mode of E-RME is set in 6060h. The operation mode of E-RME is viewed in 6061h. The definition is same, as shown in Table 5-3.

Table 5-3 6060h/6061h Object definition

Bit	Description	Abbr.	中文名称
1	Profile position mode	PP	协议位置模式
3	Profile velocity mode	PV	协议速度模式
4	profile Torque mode	PT	协议转矩模式
6	Homing mode	HM	原点模式
8	Cyclic synchronous position mode	CSP	循环同步位置模式
9	Cyclic synchronous velocity mode	CSV	循环同步速度模式
10	Cyclic synchronous torque mode	CST	循环同步转矩模式

5.4 Common Functions for All Modes

5.4.1 Digital Input/Output Setting and Operation

■ Digital input setting and status display

The 60FDh object is the input IO status mapping object compliant with the IEC61800-200 standard. The bits of the 60FDh object are defined by their respective functions, as listed in Table 5-4.

Table 5-4 Digital IO input function status mapping – 60fdh definition.

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24
Z signal	Reserved	Reserved	Reserved	Touch Probe 2	Touch Probe 1	BRAKE	INP/V-COIN /TLC
Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
E-STOP	Reserved	Reserved	Reserved	Reserved	Reserved	DI14	DI13
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
DI12	DI11	DI10	DI9	DI8	DI7	DI6	DI5
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
DI4	DI3	DI2	DI1	Reserved	HOME	POT	NOT

■ Digital output setting and control operation method

For further details on the selection and polarity settings of digital IO output functions, please refer to the IO Settings section.

In addition to the internal operation of the servo system, E-RME also provides a function for the master device to operate digital I/O output of the servo drive.

If I/O output function is set up as master device control, master device can control E-RME digital I/O output through 60FEh object. Specific definition of 60FEh is shown as Table 5-5.

Table 5-5 60FEh Object definition

Bit Sub-index	31~21	21	20	19	18	17	16	15~0
01h	Resv.	DO6 valid	DO5 valid	DO4 valid	DO3 valid	DO2 valid	DO1 valid	Resv.
02h		DO6 enabled	DO5 enabled	DO4 enabled	DO3 enabled	DO2 enabled	DO1 enabled	

5.4.2 Motor rotational direction

The settings of the Motor rotational direction are shown in Table 5-6.

Table 5-6 Rotational direction defined in 607Eh

Mode		Set value
Position Mode	PP	0: Rotate in the same direction as the position command
	HM	128: Rotate in the opposite direction to the position command
	CSP	
Velocity Mode	PV	0: Rotate in the same direction as the position command
	CSV	64: Rotate in the opposite direction to the position command
Torque Mode	PT	0: Rotate in the same direction as the position command
	CST	32: Rotate in the opposite direction to the position command
ALL Modes	F	0: Rotate in the same direction as the position command
		224: Rotate in the opposite direction to the position command

5.4.3 Stop settings

E-RME provides quick stop function. Stopping is different under different modes. Controlled by using object dictionary 605A.

Index	Lable	Quick stop option code			Unit		Structure	VAR	Type	INT 16
605AH	Access	RW	Mapping	RPDO	Mode	ALL	Range	0-7	Default	0

pp, csp, ip, csv, pv

0: Motor stops through 3506h(Sequence at Servo-off). Status: Switch on disabled.

1: Motor stops through 6084h(Profile deceleration). Status: Switch on disabled.

2: Motor stops through 6085h(Quick stop deceleration). Status: Switch on disabled.

3: Motor stops through 60C6h(Max deceleration). Status: Switch on disabled.

5: Motor stops through 6084h(Profile deceleration). Status: Quick stop active.

6: Motor stops through 6085h(Quick stop deceleration). Status: Quick stop active.

7: Motor stops through 60C6h(Max deceleration). Status: Quick stop active.

hm

0: Motor stops through 3506h(Sequence at Servo-off). Status: Switch on disabled.

1: Motor stops through 609Ah(Homing acceleration). Status: Switch on disabled.

2: Motor stops through 6085h(Quick stop deceleration). Status: Switch on disabled.

3: Motor stops through 60C6h(Max deceleration). Status: Switch on disabled.

5: Motor stops through 609Ah(Homing acceleration). Status: Quick stop active.

6: Motor stops through 6085h(Quick stop deceleration). Status: Quick stop active.

7: Motor stops through 60C6h(Max deceleration). Status: Quick stop active.

cst

0: Motor stops through 3506h(Sequence at Servo-off). Status: Switch on disabled.

1, 2: Motor stops through 6087h(Torque slope). Status: Switch on disabled.

3: Motor stops through torque = 0. Status: Switch on disabled.

5, 6: Motor stops through 6087h(Torque slope). Status: Quick stop active.

7: Motor stops through torque = 0. Status: Quick stop active.

When 402 state machine is disabled, the motor will stop freely.

When bit8(Halt) of 6040h is 1, the motor will stop with deceleration set in

6083h/6084h.

5.4.4 Position mode – Electronic Gear

E-RME position mode consists of cyclic synchronous position mode (CSP), protocol position mode (PP) and homing mode (HM), only in these three modes is the electronic gear valid.

■ Method 1: (Recommand)

Electronic gear ratio setting is defined by 608Fh (Position encoder resolution), 6091h (Gear ratio), 6092h (Feed constant) to change the motor position. Only valid under pre-operational mode.

608Fh (Position encoder resolution) is the resolution of the encoder, which is read internally without additional setting. 6092h_01 represents the number of pulses that can be set for each revolution of the motor. 6091h_01/6091h_02 is real-time update effective.

Electronic gear subdivision method can be determined by modifying 6092h_01 (Feed constant):

If 6092h_01 (Feed constant) is not equal to 608Fh (Position Encoder resolution), then:

Electronic gear ratio = encoder resolution / 6092h_01

If 6092h_01(Feed constant) is equal to 608Fh(Position encoder resolution), then:

Electronic gear ratio = 6091_01/6092h_01

■ Method 2:

Electronic gear can be set through P00.08 If P00.08 \neq 0, P00.08 is valid. If P00.08 = 0, object dictionary 6092-01 is valid.

when the setting value exceeds this range, the error will be reported and automatically reset to the default value. The default values of 6091_01, 6091_02 and 6092_01 are 1, 1 and 10000.

5.4.5 Position limits

The E-RME limit function includes two parts: hardware limits and software limits. Hardware limits primarily use external digital signal inputs to restrict the motor's range of motion. Software limits restrict the motor's range of motion through software commands.

The hardware limit is valid in all operational modes, and the software limit is valid only in the absolute operational mode of cyclic synchronous position mode (CSP) and profile position mode (PP)

The limit of the software is defined by 607Dh. The maximum position in the negative direction is defined in 607d-01h and the maximum position in the positive direction is defined in 607d-02h, the unit is consistent with the command unit. The configured values are currently not supported for saving.

The setting of object dictionary 0x5012-04 not only affects the homing offset of 607C, but also affects the software limit, 607D needs to be modified before the operational state.

5012-04		Actual Positive Position Limit	Actual Negative Position Limit
Bit2	Bit3		
0	0	607D-02 + 607C	607D-01 + 607C
0	1	607D-02 - 607C	607D-01 - 607C
1	X	607D-02	607D-01

E-RME Software position limits valid conditions:

- 1) It can only be set in the pre-operational state of ESM. It is recommended to configure it by SDO when the system starts.
- 2) Only in the absolute mode of CSP and PP, in CSP mode, it is recommended to use the software limit function of the master station to achieve the fastest limit performance.
- 3) The incremental encoder motor is not effective until the homing process completed.
- 4) The setting rule is 607d-01h < 607d-02h, that is, the negative position limit value is less than the positive position limit value.

5.4.6 CiA DSP402 Control Word

Bit definition of Control Word 6040h is shown as Table 5-7.

Table 5-7 Bit definition of Control Word 6040h

Bit	15~11	10~9	8	7	6~4	3	2	1	0
Def.	-	-	Halt	Fault reset	Related to modes	Operation enable	Quick stop	Voltage output	Switch on

The combination of bit 7 and bits 3-0 can trigger the state machine transitions as shown in Table 5-8.

Table 5-8 State transition command for the combination of bit 7 and bits 3-0

Command	位 7 与 3~0 组合					6040 Value	402 State machine ^[1]
	7: Fault reset	3: Operation enable	2: Quick stop	1: Voltage output	0: Start		
Power off	0	×	1	1	0	0006h	2, 6, 8
Switch on	0	0	1	1	1	0007h	3*
Switch on	0	1	1	1	1	000Fh	3**
No voltage output	0	×	×	0	×	0000h	7, 9, 10, 12
Quick stop	0	×	0	1	×	0002h	7, 10, 11
Operation enable	0	0	1	1	1	0007h	5
Enable	0	1	1	1	1	000Fh	4, 16
Fault reset	Rising edge	×	×	×	×	0080h	15

× is not affected by this bit state

* indicates that this transition is performed in the device start state

** indicates that it has no effect on the start state and remains in the start state

[1] The state machine switch corresponds to Figure 5-1

Definition of bit 8 and bit 6~4 in different operation modes are shown in the following Table 5-9.

Table 5-9 Definition of bit 8 and bit 6~4 in different operation modes

Bit	Operation Mode						
	Profile Position (PP)	Profile Velocity (PV)	Profile Torque (PT)	Homing (HM)	Cyclic Sync Position (CSP)	Cyclic Sync Velocity (CSV)	Cyclic Sync Torque (CST)
8	Stop with decel.	Stop with decel.	Stop with decel.	Stop with decel.	-	-	-
6	Absolute/Increment	-	-	-	-	-	-
5	Immediately trigger	-	-	-	-	-	-
4	New Position	-	-	Start	-	-	-

5.4.7 CiA DSP402 Status Word

Bit definition of Status Word (6041h) is shown in Table 5-10.

Table 5-10 Bit definition of Status Word 6041h

Bit	Definition	Bit	Definition
15~14	Reserved	6	Not switch on
13~12	Related to modes	5	Quick stop
11	Limit valid	4	Voltage output
10	Position arrival	3	Fault
9	Distance	2	Operation enable
8	Reserved	1	Switch on
7	Reserved	0	Ready to switch on

Bit 11 is valid when the software or hardware limit is in effect.

The combination of bit 6 and bit 3~0 represents the device state shown in Table 5-11.

Table 5-11 Combination of bit 6 and bit 3~0

Combination of bit 6 and bit 3~0	Description
××××, ××××, ×0××, 0000	Not ready to switch on
××××, ××××, ×1××, 0000	Switch on disabled
××××, ××××, ×01×, 0001	Ready to switch on
××××, ××××, ×01×, 0011	Switch on
××××, ××××, ×01×, 0111	Operation enabled
××××, ××××, ×00×, 0111	Quick stop active
××××, ××××, ×0××, 1111	Fault reaction active
××××, ××××, ×0××, 1000	Fault

× is not affected by this bit state

5.4.8 Synchronous cycle time setting

The default synchronous cycle time range of E-RMEs eries is 250us – 10ms. Min value: 125us. Max value: 20ms. Please make sure the values set is the multiplier of 250us.

5.4.9 Drive servo ON

This section describes how to use control words 6040h/ status word 6041h command switching/status determination for E-RME controlled motor.

Steps:

- 1) Write 0 to the control word 6040h, and then AND 0x250 by bit, whether it is equal to 0x250
- 2) Write 6 to the control word 6040h, and then AND 0x231 by bit, whether it is equal to 0x231
- 3) Write 7 to the control word 6040h, and then AND 0x233 by bit, whether it is equal to 0x233
- 4) Write 15 to the control word 6040h, and then AND 0x237 by bit, whether it is equal to 0x237

5.5 Position Mode (CSP, PP, HM)

5.5.1 Common Functions of Position Mode

Index	Sub Index	Label	Access	PDO	Mode		
					PP	CSP	HM
6040	0	Control Word	rw	RxPDO	Yes	Yes	Yes
6072	0	Max Torque	rw	RxPDO	Yes	Yes	Yes
607A	0	Target Position	rw	RxPDO	Yes	Yes	-
607D	1	Min. Position Limit	rw	RxPDO	Yes	Yes	-
		Max. Position Limit	rw	RxPDO	Yes	Yes	-
607F	0	Max. Profile Velocity (Restricted by 6080)	rw	RxPDO	Yes	-	Yes
6080	0	Max. Motor Speed (Restricted by actual Max. motor velocity)	rw	RxPDO	Yes	Yes	Yes
6081	0	Profile Velocity (Restricted by 607F)	rw	RxPDO	Yes	-	-
6083	0	Profile Acceleration	rw	RxPDO	Yes	-	-
6084	0	Profile Deceleration	rw	RxPDO	Yes	-	-
60C5	0	Max. Acceleration	rw	RxPDO	Yes	-	Yes
60C6	0	Max. Deceleration	rw	RxPDO	Yes	-	Yes

Index	Sub Index	Label	Access	PDO	Mode		
					PP	CSP	HM
6041	0	Status Word	ro	TxPDO	Yes	Yes	Yes
6062	0	Position Demand Value	ro	TxPDO	Yes	Yes	Yes
6063	0	Position Actual Internal Value	ro	TxPDO	Yes	Yes	Yes
6064	0	Position Actual Value	ro	TxPDO	Yes	Yes	Yes
6065	0	Follow Error Window	rw	RxPDO	Yes	Yes	-
6066	0	Follow Error Time Out	rw	RxPDO	Yes	Yes	-
606C	0	Velocity Actual Value	ro	TxPDO	Yes	Yes	Yes
6074	0	Torque Demand	ro	TxPDO	Yes	Yes	Yes
6076	0	Rated torque	ro	TxPDO	Yes	Yes	Yes
6077	0	Torque Actual Value	ro	TxPDO	Yes	Yes	Yes
60F4	0	Following Error Actual Value	ro	TxPDO	Yes	Yes	Yes
60FA	0	Position loop velocity output	ro	TxPDO	Yes	Yes	Yes

Index	Sub Index	Label	Access	PDO	Mode		
					PP	CSP	HM
60FC	0	Position Demand Internal Value	ro	TxPDO	Yes	Yes	Yes

5.5.2 Cyclic Synchronous Position Mode (CSP)

CSP Block Diagram

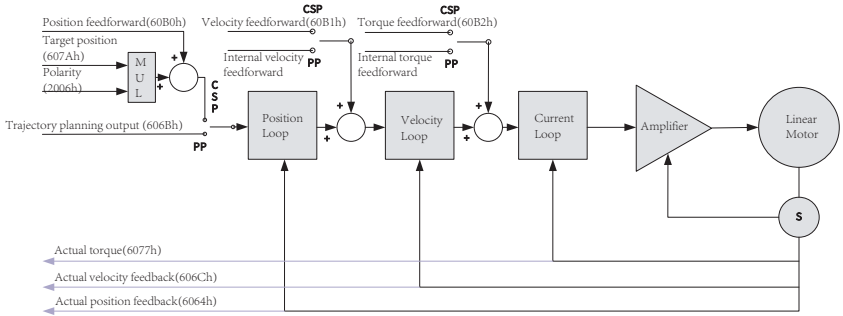


Figure 5-2 Cyclic Synchronous Position Mode structure

Related Objects

- Basic object (Recommand configuration objects)

Table 5-12 CSP mode basic object

Data direction ^[1]	Index + Sub-Index	Label	Data Type	Acc	Unit	Remarks
Output (RXPDO) ^[1]	6040-00h	Control Word	U16	RW	-	Required
	607A-00h	Target Position	I32	RW	Uint	Required
	60B0-00h	Position Offset	I32	RW	Uint	Optional
	60B1-00h	Veloc Offset	I32	RW	Uint/s	Optional
	60B2-00h	Torque Offset	I16	RW	0.1%	Optional
Input (TXPDO)	6041-00h	Status Word	U16	RO	-	Required
	603F-00h	Error Code	U16	RO	-	Optional
	6064-00h	Position Actual Value	I32	RO	Uint	Required
	606C-00h	Velocity Actual Value	I32	RO	Uint/s	Optional
	60F4-00h	Following Error Actual Value	I32	RO	Uint	Optional
	6077-00h	Torque Actual Value	I16	RO	0.1%	Optional

[1]: The data direction is referenced from the master station. Output refers to data from the master station to the slave, while input refers to data from the slave to the

master station.

■ Extended object

Table 5-13 CSP mode extended object

Index + Sub-Index	Label	Data Type	Acc	Unit
603F-00h	Error Code	U16	RO	-
6060-00h	Mode of Operation	I8	RW	-
6061-00h	Mode of Operation Display	I8	RO	-
6062-00h	Position Demand Value	I32	RO	Uint
606B-00h	Velocity Demand Value	I32	RO	Uint
607D-01h	Min. Position Limit	I32	RO	Uint
607D-02h	Max. Position Limit	I32	RO	Uint
605A-00h	Quick Stop Option Code	I16	RW	-
6085-00h	Quick Stop Deceleration	U32	RW	Uint/s ²
608F-01h	Encoder Increments	U32	RO	P
608F-02h	Motor Revolutions	U32	RO	-
6091-01h	Motor Revolutions	U32	RW	-
6091-02h	Shaft Revolutions	U32	RW	-
6092-01h	Feed	U32	RW	-
6092-02h	Shaft Revolutions	U32	RO	-

5.5.3 Protocol Position Mode (PP)

Mode description

Under non-synchronous mode, master device is responsible for only sending parameters and control command. After receiving enable command from master device, servo drive will plan motion route according to parameters. Under non-synchronous mode, motor motion between each axes are asynchronous.

From the perspective of servo drive functions, the difference between PP and CSP mode is that PP mode requires track generator function. So, the PP in the trajectory generation entry part of Figure 5-2 needs to add a trajectory generator. The input and output structure of the trajectory generator is shown in Figure 5-3.

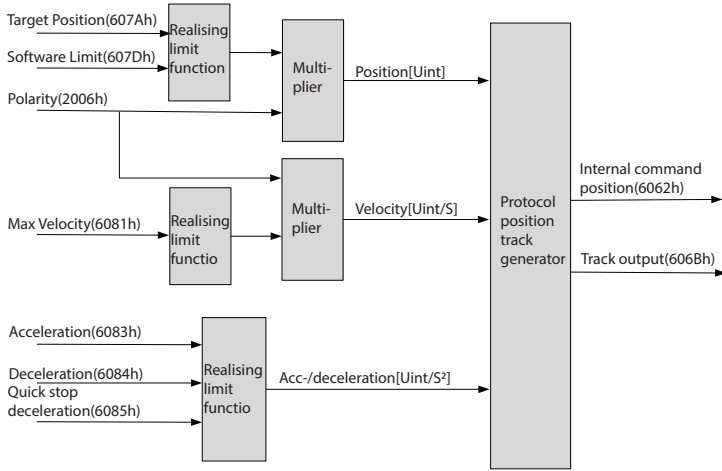


Figure 5-3 PP mode trajectory generator

Related Objects

■ Basic object (Recommand configuration objects)

Table 5-14 PP mode basic object

Data direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Remarks
Output (RXPDO)	6040-00h	Control Word	U16	RW	-	Required
	607A-00h	Target Position	I32	RW	Uint	Required
	6081-00h	Profile Velocity	U32	RW	Uint	Required
	6083-00h	Profile Acceleration	I32	RW	Uint/s ²	Optional
Input (TXPDO)	6041-00h	Status word	U16	RO	-	Required
	603F-00h	Status Word	U16	RO	-	Optional
	6064-00h	Position Actual Value	I32	RO	Uint	Required
	606C-00h	Velocity Actual Value	I32	RO	Uint/s	Optional
	60F4-00h	Following Error Actual Value	I32	RO	Uint	Optional
	6077-00h	Torque Actual Value	I16	RO	0.1%	Optional

[1]: The data direction is referenced from the master station. Output refers to data from the master station to the slave, while input refers to data from the slave to the master station.

■ Extended object

Table 5-15 PP mode extended object

Index + Sub-Index	Label	Data Type	Access	Unit
603F-00h	Error Code	U16	RO	-
6060-00h	Mode of Operation	I8	RW	-
6061-00h	Mode of Operation Display	I8	RO	-
6062-00h	Position Demand Value	I32	RO	Uint
606B-00h	Velocity Demand Value	I32	RO	Uint
607D-01h	Min. Position Limit	I32	RO	Uint
607D-02h	Max. Position Limit	I32	RO	Uint
605A-00h	Quick Stop Option Code	I16	RW	-
6084-00h	Profile Deceleration	U32	RW	Uint/s ²
6085-00h	Quick Stop Deceleration	U32	RW	Uint/s ²
608F-01h	Encoder Increments	U32	RO	P
608F-02h	Motor Revolutions	U32	RO	-
6091-01h	Motor Revolutions	U32	RW	-
6091-02h	Shaft Revolutions	U32	RW	-
6092-01h	Feed	U32	RW	-
6092-02h	Shaft Revolutions	U32	RO	-

Control and status words under PP mode

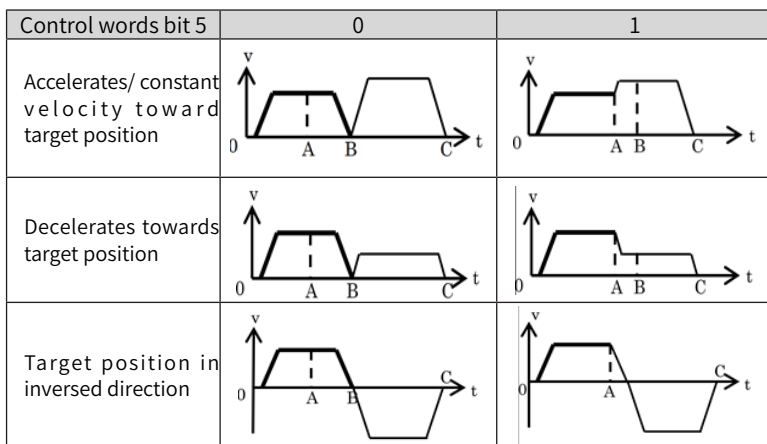
Control word(6040h) bits 4~6 definition under PP mode is shown as Table 5-16.

Table 5-16 Control word bits 4~6 definition under PP mode

Bit	Value	Definition
4 (New position)	0 → 1	Latest target position(607Ah), Max. Velocity(6081h), Acc / deceleration(6083h/6084h) Starts
5 (Instant trigger)	0	Trigger new position command once current one is completed.
	1	Interrupted current position command and trigger new position command
6 (Absolute/ relative)	0	Set target position(607Ah)as absolute position
	1	Set target position(607Ah) as relative position

Control words bit 5 under PP mode

Table 5-17 Control word bit 5 action model in PP mode



A: Command switching time from master device.

B: Arrival time before target position renewal.

C: Arrival time after target position renewal.

Thick line: Motion before command changed.

Thin line : Motion after command changed.

Status word bits 12-15, 10, 8 definition under PP mode is shown as Table 5-18.

Table 5-18 Status word bits 12-15, 10, 8 definition under PP mode

Bit	Value	Definition
8 (Abnormal Stoppage)	0	Normal motion
	1	Abnormal stoppage triggered, motor stopped ^[1]
10 (Arrived at position)	0	Motion not completed
	1	Target position reached
12 (New position)	0	Current motion completed/interruptible, able to execute new position command ^[2]
	1	Current motion not completed/interruptible, unable to execute new position command
14 (Motion Parameter = 0)	0	Motion parameters valid, necessary parameters all not set to 0
	1	Parameter = 0 under current motion. One of 3 parameters, Max. velocity (6081h), acceleration (6083h) and deceleration (6084h) = 0
15 (Trigger)	0	Current motion incomplete/uninterruptible, new target position cannot be renewed ^[3]
	1	Current motion completed/interruptible, new target position can be renewed

[1]:Bit 8 abnormal stoppage usually valid when hardware limit, deceleration stoppage and quick stop are triggered.

[2]: Bit 12 under control word(6040h)bit 5 valid and bit 4 invalid, motion interruptible.

[3]: Bit 15 and bit 12 have inversed logic under PP mode.

Application: Realization of relative position motion

This section provides an example of how to perform relative position motion.

The steps are as follows:

- 1) 6060h = 1, determine if 6061h =1. Servo drive is now under PP mode.
- 2) Write motion parameters: Target position 607Ah, Max. velocity 6081h, acceleration 6083h, deceleration 6084h.
- 3) Enable servo drive and switch bit 6 and 4 to realize relative position motion.

5.5.4 Homing mode (HM)

Function description

The implementation of the home position function is similar to the protocol position mode and falls under the category of position modes. The trajectory generation in home position mode can refer to the protocol position mode (Figure 5-2 for cyclic synchronous mode and Figure 5-3 for PP mode trajectory generation).

E-RME drive supports every other homing method except for method 36. Output/input parameters are as shown as Figure.

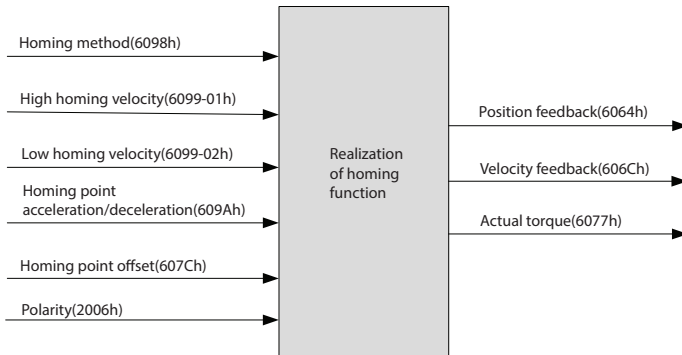


Figure 5-4 Homing mode output/input parameters

Generally speaking, home position motion is only required when using an

incremental encoder motor. After the home position motion, the point is set as the mechanical home position. Based on this, motion in other modes can be performed.

Related Objects

■ Basic object (Recommand configuration objects)

Table 5-19 HM mode basic object

Data direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Remarks
Output (RXPDO)	6040-00h	Control Word	U16	RW	-	Required
	6098-00h	Homing Method	I8	RW	-	Optional
	6099-01h	Speed During Search For Switch	U32	RW	Uint/s	Optional
	6099-02h	Speed During Search For Zero	U32	RW	Uint/s	Optional
	609A-00h	Homing Acceleration	U32	RW	Uint/s ²	Optional
	607C-00h	Home Offset	I32	RW	Uint	Optional
Input (TXPDO)	6041-00h	Status Word	U16	RO	-	Required
	603F-00h	Error Code	U16	RO	-	Optional
	6064-00h	Position Actual Value	I32	RO	Uint	Optional
	606C-00h	Velocity Actual Value	I32	RO	Uint/s	Optional
	60F4-00h	Following Error Actual Value	I32	RO	Uint	Optional
	6077-00h	Torque Actual Value	I16	RO	0.1%	Optional

[1]: The data direction is referenced from the master station. Output refers to data from the master station to the slave, while input refers to data from the slave to the master station.

■ Extended object

Table 5-20 HM mode extended object

Index + Sub-Index	Label	Data Type	Access	Unit
603F-00h	Error Code	U16	RO	-
6060-00h	Mode of Operation	I8	RW	-
6061-00h	Mode of Operation Display	I8	RO	-
6062-00h	Position Demand Value	I32	RO	Uint
606B-00h	Velocity Demand Value	I32	RO	Uint
608F-01h	Encoder Increments	U32	RO	P
608F-02h	Motor Revolutions	U32	RO	-
6091-01h	Motor Revolutions	U32	RW	-
6091-02h	Shaft Revolutions	U32	RW	-
6092-01h	Feed	U32	RW	-
6092-02h	Shaft Revolutions	U32	RO	-

Control and status words under HM mode

Control word bit 6~4 definition under HM mode is shown as Table 5-21.

Table 5-21 Control word bit 6~4 definition under HM mode

Bit	Value	Definition
4 (Homing motion starts/stops)	0 → 1	Homing motion starts
	1 → 0	Homing motion stops, motor stops
5 (Undefined)	0	-
	1	-
6 (Undefined)	0	-
	1	-

Table 5-22 Status word bits 12-15, 10, 8 definition under HM mode

Bit	Value	Definition
8 (Abnormal Stoppage)	0	Normal motion
	1	Abnormal stoppage triggered, motor stopped ^[1]
10 (Arrived at position)	0	Motion not completed
	1	Target position reached
12 (Homing done)	0	Homing not done
	1	Homing done, valid after reaching position(bit 10) ^[2]
14 (Motion Parameter = 0)	0	Motion parameters valid, necessary parameters all not set to 0
	1	Parameter = 0 under current motion. One of 4 parameters, Homing mode (6098h), high homing velocity(6099h-01), low homing velocity (6099h-02) and homing point acc-/deceleration (609Ah) = 0
15 (Trigger)	0	Homing triggered/completed ^[3]
	1	Homing triggers

[1]: Bit 8 abnormal stoppage usually valid when hardware limit, deceleration stoppage and quick stop are triggered.

[2]: Determine if homing is done, determine if bit 10 and 12 are occupied.

[3]: Use to indicate if homing is able to trigger or already triggered.

Incorrect position triggering conditions

In the home position mode, the error bit refers to bit 13 of the status word. The conditions under which this error occurs are listed in Table 5-23.

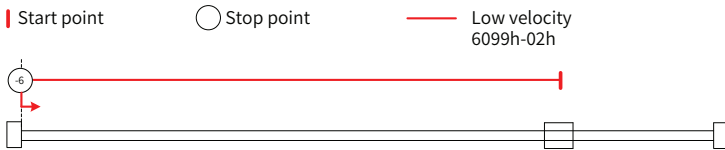
Table 5-23 HM motion error conditions table

Triggering condition	Remarks
Absolute encoder homing	Control words 6040h bit 4 from 0 to 1
2 limit switch signals detected	Positive and negative limit switches detected during homing
Negative limit valid when positive limit in used	Negative limit valid under 2, 7-10, 23-26 homing modes
Positi limit valid when positive limit in used	Positive limit valid under 1, 11-14, 27-30 homing modes
Limit switch valid when not in used	Limit switch valid under 3, 4, 19, 20 homing modes
Limit switch/homing signal valid when only z-signal in used	Limit switch and homing sensor valid under 33, 34 homing modes

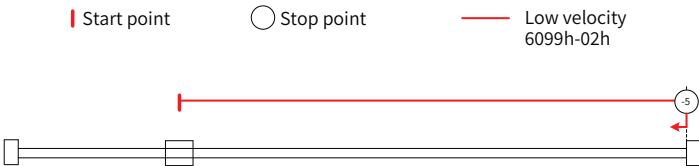
Homing mode

■ Torque limiting mode

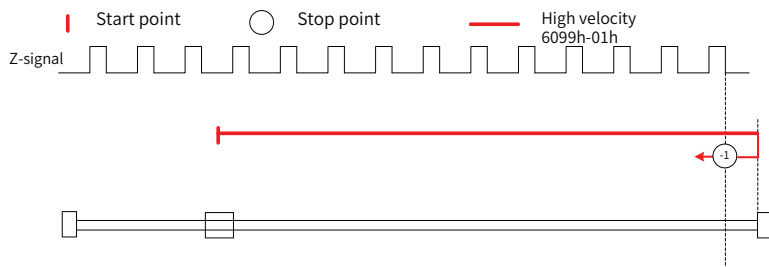
Mode-6: Search for homing point in negative direction at low velocity. Stop after torque reaches the value set in P05.39 and homing done signal delivers.



Mode-5: Search for homing point in positive direction at low velocity. Stop after torque reaches the value set in P05.39 and homing done signal delivers.

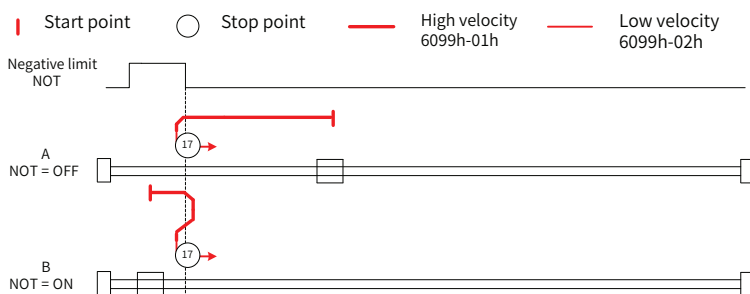


Mode-1: Search for homing point in positive direction at high velocity. Move in negative direction after torque reaches the value set in P05.39, stops when torque is gone with the first Z-signal.

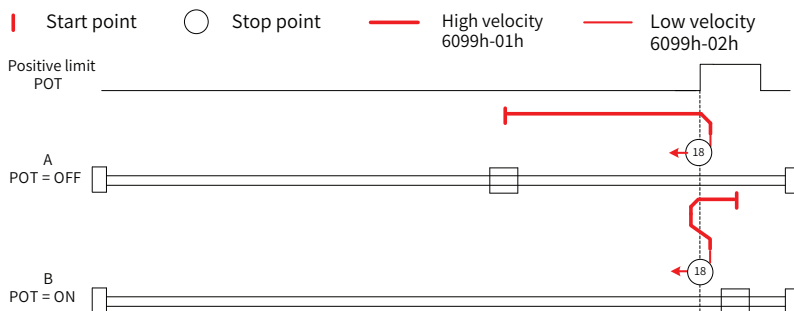


■ Limit switch signal

Mode-17:

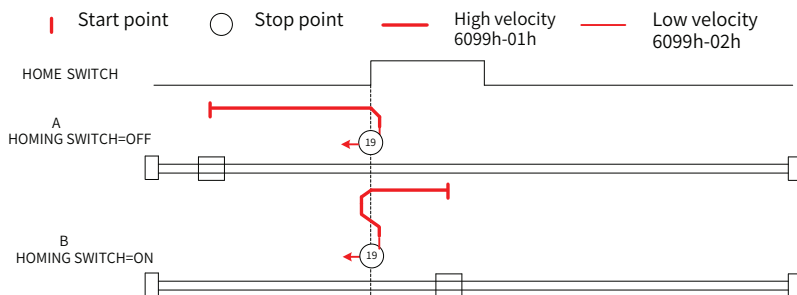


Mode-18:

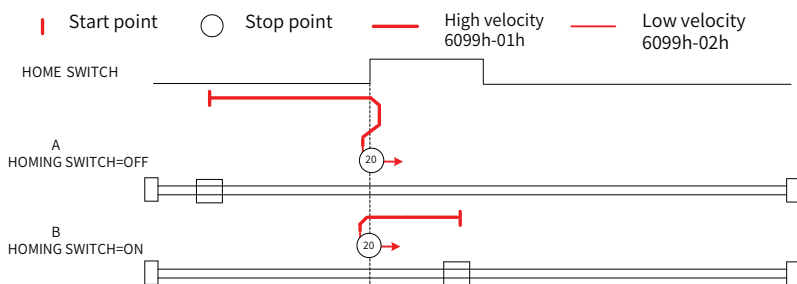


■ Homing switch signal

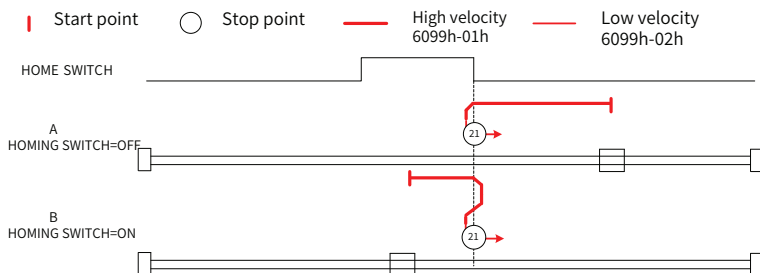
Mode-19:



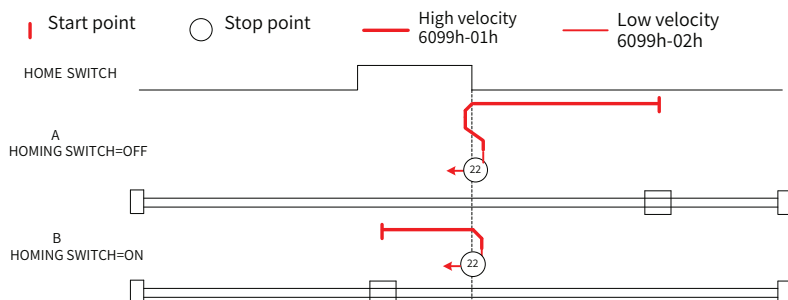
Mode-20:



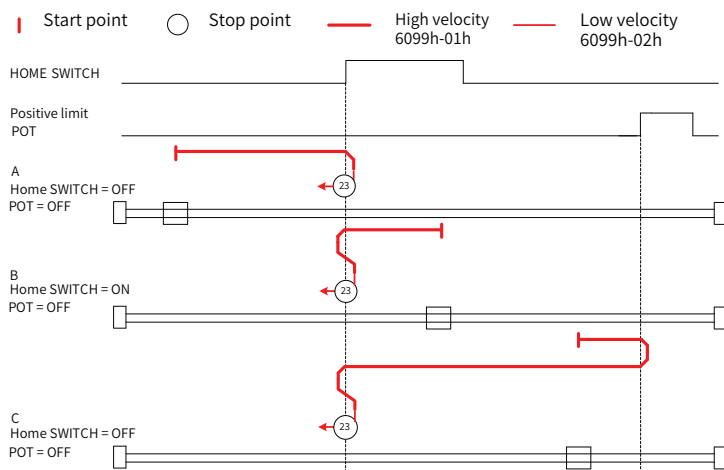
Mode-21:



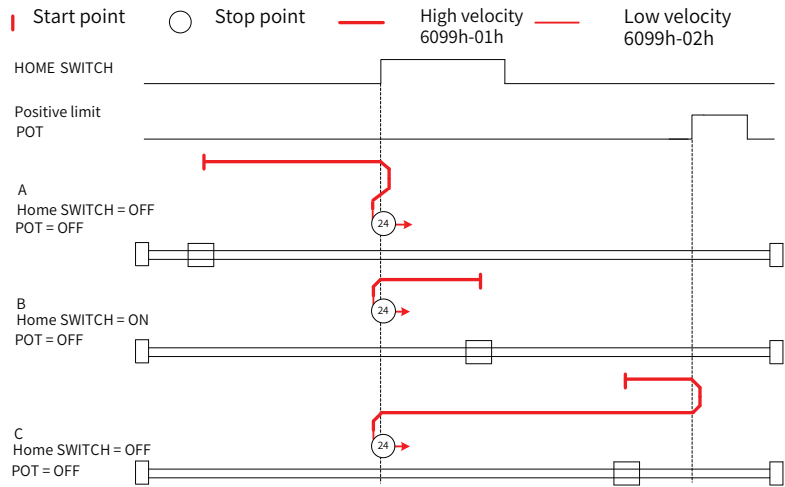
Mode-22:



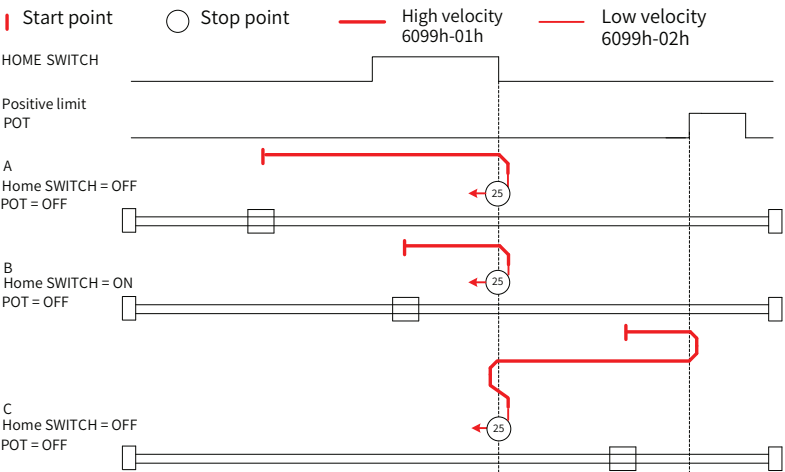
Mode-23:



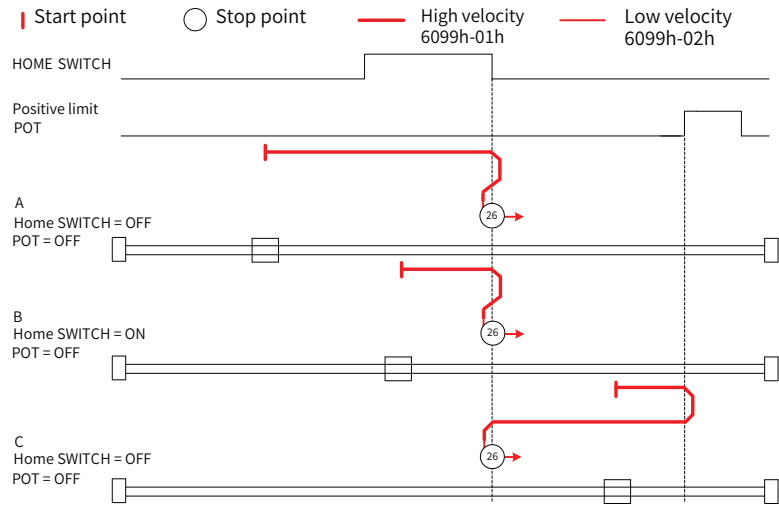
Mode-24:



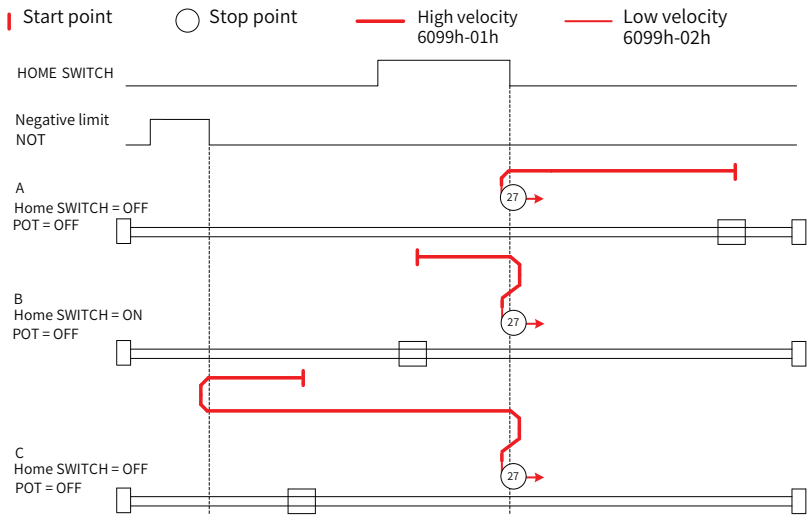
Mode-25:



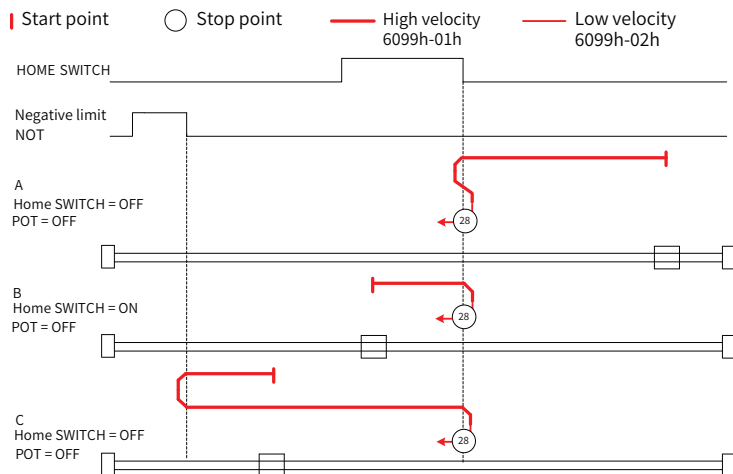
Mode-26:



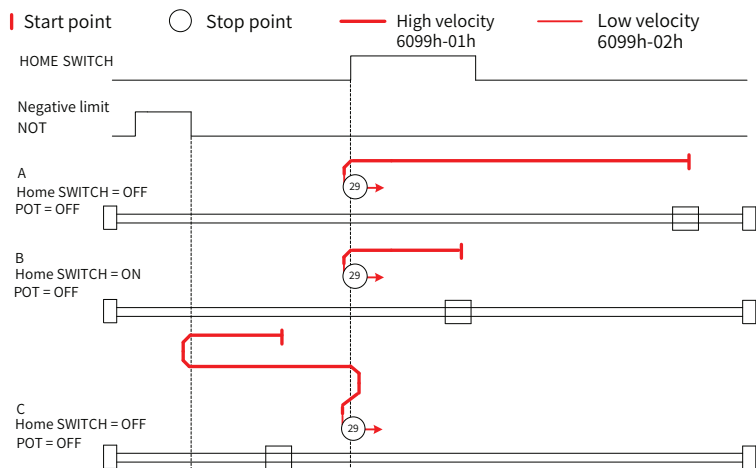
Mode-27:



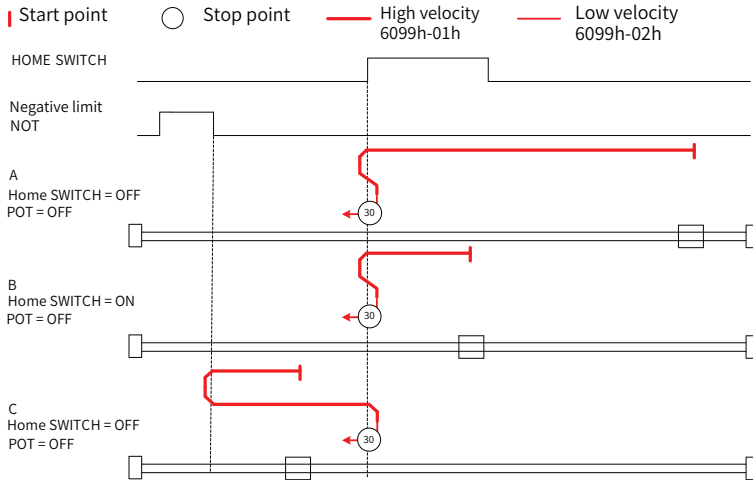
Mode-28:



Mode-29:



Mode-30:



Application: Realization of homing motion

This section provides an example of how to perform HM motion.

The steps are as follows:

- 1) 6060h = 6, determine if 6061h = 6. Servo drive is now under HM mode.
- 2) Write motion parameters: Homing method 6098h, Homing velocity. 6099h-01/6099h-02 and acceleration/deceleration 609Ah.
- 3) Enable servo drive and switch bit 4 from 0 to 1 to start homing motion.

5.6 Velocity Control Mode (CSV, PV)

5.6.1 Common Functions of Velocity Control

Index	Sub Index	Label	Access	PDO	Mode	
					CSV	PV
6040	0	Control Word	rw	RxPDO	Yes	Yes
6072	0	Max. Torque	rw	RxPDO	Yes	Yes
6080	0	Max. Motor Speed (Restricted by actual Max. motor velocity)	rw	RxPDO	Yes	Yes
60B1	0	Velocity Offset (Restricted by 6080))	rw	RxPDO	Yes	Yes
60B2	0	Torque Offset	rw	RxPDO	Yes	Yes
60FF	0	Target Velocity (Restricted by 6080)	rw	RxPDO	Yes	Yes

Index	Sub Index	Label	Access	PDO	Mode	
					CSV	PV
6041	0	Status Word	ro	TxPDO	Yes	Yes
6063	0	Position Actual internal Value	ro	TxPDO	Yes	Yes
6064	0	Position Actual Value	ro	TxPDO	Yes	Yes
606B	0	Velocity Demand Value	ro	TxPDO	Yes	Yes
606C	0	Velocity Actual Value	ro	TxPDO	Yes	Yes
6074	0	Ttorque Demand	ro	TxPDO	Yes	Yes
6076	0	Rated Torque	ro	TxPDO	Yes	Yes
6077	0	Torque Actual Value	ro	TxPDO	Yes	Yes

5.6.2 Cyclic Synchronous Velocity Mode (CSV)

CSV Block Diagram

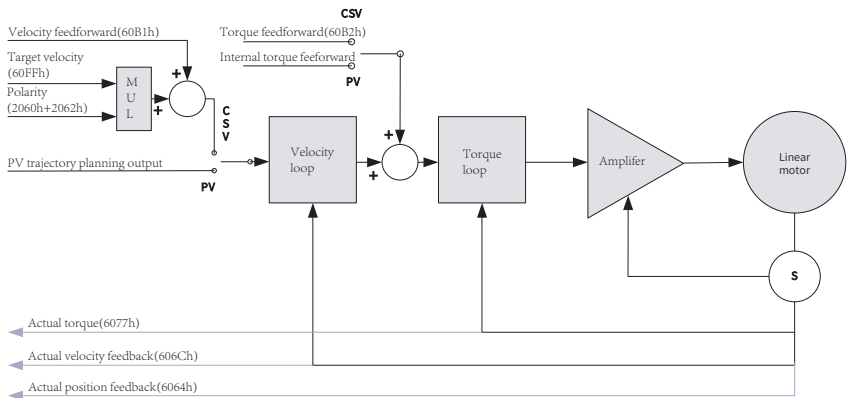


Figure 5-5 Cyclic Synchronous Velocity Mode structure

Related Objects

■ Basic object (Recommand configuration objects)

Table 5-24 CSV mode basic object

Data direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Remarks
Output (RXPDO)	6040-00h	Control Word	U16	RW	—	Required
	60FF-00h	Target Velocity	I32	RW	Uint	Required
	60B1-00h	Velocity Offset	I32	RW	Uint/s	Optional
	60B2-00h	Torque Offset	I16	RW	0.1%	Optional
Input (TXPDO)	6041-00h	Status Word	U16	RO	—	Required
	603F-00h	Error Code	U16	RO		Optional
	6064-00h	Position Actual Value	I32	RO	Uint	Optional
	606C-00h	Velocity Actual Value	I32	RO	Uint/s	Optional
	60F4-00h	Following Error Actual Value	I32	RO	Uint	Optional
	6077-00h	Torque Actual Value	I16	RO	0.1%	Optional

[1]: The data direction is referenced from the master station. Output refers to data from the master station to the slave, while input refers to data from the slave to the master station.

■ Extended object

Table 5-25 CSV mode extended object

Index + Sub-Index	Label	Data Type	Access	Unit
603F-00h	Error Code	U16	RO	-
6060-00h	Mode of Operation	I8	RW	-
6061-00h	Mode of Operation Displayed	I8	RO	-
606B-00h	Velocity Demand Value	I32	RO	Uint
605A-00h	Quick Stop Option Code	I16	RW	-
6085-00h	Quick Stop Deceleration	U32	RW	Uint/s ²

5.6.3 Profile Velocity Mode (PV)

Function description

In asynchronous motion mode, master device is only responsible for sending motion parameters and control commands. Drive will conduct trajectory planning according to the motion parameters sent by master device after receiving the motion start command from the master device. In asynchronous motion mode, the motion between each axes is asynchronous.

The difference between PV and CSV mode is that PV needs E-RME to have the function of trajectory generator. So, the PV in the trajectory generation entry part of Figure 5-5 needs to add a trajectory generator. The input and output structure of the trajectory generator is shown in Figure 5-6.

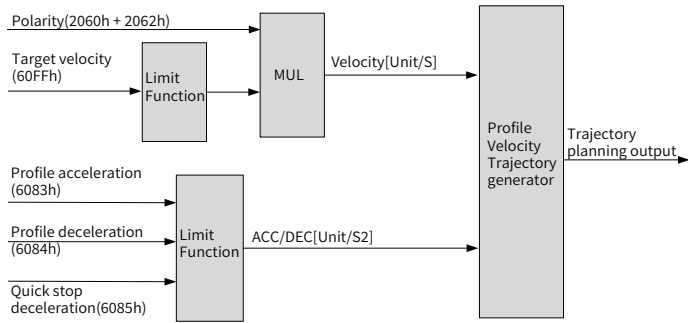


Figure 5-6 PV mode trajectory generation

Related Objects

■ Basic object (Recommand configuration objects)

Table 5-26 PV mode basic object

Data direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Remarks
Output (RXPDO)	6040-00h	Control Word	U16	RW	-	Required
	60FF-00h	Target Velocity	I32	RW	Unit	Required
	6083-00h	Profile Acceleration	I32	RW	Unit/s ²	Optional
Input (TXPDO)	6041-00h	Status Word	U16	RO	-	Required
	603F-00h	Error Code	U16	RO	-	Optional
	6064-00h	Position Actual Value	I32	RO	Unit	Optional
	606C-00h	Velocity Actual Value	I32	RO	Unit/s	Optional
	60F4-00h	Following Error Actual Value	I32	RO	Unit	Optional
	6077-00h	Torque Actual Value	I16	RO	0.1%	Optional

[1]: The data direction is referenced from the master station. Output refers to data from the master station to the slave, while input refers to data from the slave to the master station.

■ Extended object

Table 5-27 PV mode extended object

Index + Sub-Index	Label	Data type	Access	Unit
603F-00h	Error Code	U16	RO	-
6060-00h	Mode of Operation	I8	RW	-
6061-00h	Mode of Operation Displayed	I8	RO	-
605A-00h	Quick Stop Option Code	I16	RW	-
6084-00h	Profile Deceleration	U32	RW	Unit/s ²
6085-00h	Quick Stop Deceleration	U32	RW	Unit/s ²

Control Word and Status Word for Profile Velocity Mode

The bit6~4 of control words (6040h) associated with the control mode in PV mode are invalid. The motion in PV mode can be triggered as long as the motion parameters (target velocity (60FFh) ACC/DEC (6083h/6084h)) are given after the axis is enabled.

The definitions for bits 15~12, 10, and 8 of the status word (6041h) in PV mode are listed in Table 5-28.

Table 5-28 Bit15~12, 10, 8 of Status word (6041h) for Profile Velocity Mode

Bit	Value	Definition
8 (Quick stop)	0	Quick stop invalid
	1	Quick stop valid
10 (Velocity reached)	0	Velocity not yet reached
	1	Velocity reached
12 (Zero speed)	0	It's not zero speed. It's moving.
	1	Zero speed or it's going to slow down to zero speed ^[1]

[1]: Zero speed of bit 12 is generally effective when deceleration stop and hardware limit valid.

Application: Realization of profile velocity motion

This section provides an example of how to perform PV motion.

The steps are as follows:

- 1) 6060h = 3, determine if 6061h = 3. Servo drive is now under PV mode.
- 2) Write motion parameters: Target velocity 60FFh, acceleration 6083h and deceleration 6084h.

5.7 Torque Mode (CST, PT)

5.7.1 Common Functions of Torque Mode

Index	Sub Index	Label	Access	PDO	Mode	
					CST	PT
6040	0	Control Word	rw	RxPDO	Yes	Yes
6071	0	Target Torque	rw	RxPDO	Yes	Yes
6072	0	Max. Torque	rw	RxPDO	Yes	Yes
6080	0	Max. Motor Speed (Restricted by actual Max. motor velocity)	rw	RxPDO	Yes	Yes
6087	0	Torque Slope	rw	RxPDO	Yes	Yes
60B2	0	Torque Offset	rw	RxPDO	Yes	Yes

Index	Sub Index	Label	Access	PDO	Mode	
					CST	PT
6041	0	Status Word	ro	TxPDO	Yes	Yes
6063	0	Position Actual Internal Value	ro	TxPDO	Yes	Yes
6064	0	Position Actual Value	ro	TxPDO	Yes	Yes
606C	0	Velocity Actual Value	ro	TxPDO	Yes	Yes
6074	0	Torque Demand	ro	TxPDO	Yes	Yes
6075	0	Motor Rated Current	ro	No	Yes	Yes
6076	0	Rated torque	ro	No	Yes	Yes
6077	0	Torque Actual Value	ro	TxPDO	Yes	Yes
6079	0	DC Link Circuit Voltage	ro	TxPDO	Yes	Yes

5.7.2 Cyclic Synchronous Torque Mode (CST)

CST Block Diagram

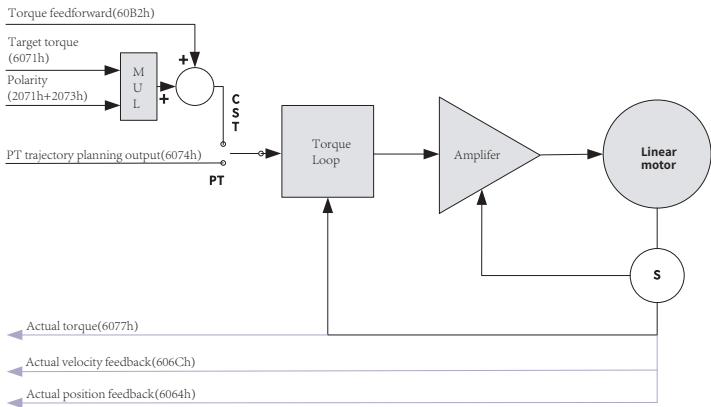


Figure 5-7 Cyclic Synchronous Torque Mode structure

Related Objects

■ Basic object (Recommand configuration objects)

Table 5-29 CST mode basic object

Data direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Remarks
Output (RXPDO)	6040-00h	Control Word	U16	RW	-	Required
	6071-00h	Target Torque	I16	RW	Uint	Required
	6087-00h	Torque Slope	U32	RW	0.1%/s	Optional
Input (TXPDO)	6041-00h	Status Word	U16	RO	-	Required
	603F-00h	Error Code	U16	RO	-	Optional
	6064-00h	Position Actual Value	I32	RO	Uint	Optional
	606C-00h	Velocity Actual Value	I32	RO	Uint/s	Optional
	60F4-00h	Following Error Actual Value	I32	RO	Uint	Optional
	6077-00h	Torque Actual Value	I16	RO	0.1%	Required

[1]: The data direction is referenced from the master station. Output refers to data from the master station to the slave, while input refers to data from the slave to the master station.

■ Extended object

Table 5-30 CST mode extended object

Index + Sub-Index	Label	Data Type	Access	Unit
603F-00h	Error Code	U16	RO	-
6060-00h	Mode of Operation	I8	RW	-
6061-00h	Mode of Operation Displayed	I8	RO	-
6074-00h	Torque Demand	I16	RO	0.1%
605A-00h	Quick Stop Option Code	I16	RW	-
6080-00h	Max. Motor Speed	U32	RW	Uint/s
6085-00h	Quick Stop Deceleration	U32	RW	Uint/s ²
60B1-00h	Velocity Offset	I32	RW	Uint/s
2077-00h	Velocity Limit	I16	RW	RPM

5.7.3 Profile Torque Mode (PT)

Function description

In asynchronous motion mode, master device is only responsible for sending motion parameters and control commands. Drive will conduct trajectory planning according to the motion parameters sent by master device after receiving the motion start command from the master device. In asynchronous motion mode, the motion

between each axes is asynchronous.

The implementation of PT functionality requires adding a trajectory generator on top of the CST mode. The input-output structure of the trajectory generator is shown in Figure 5-8.

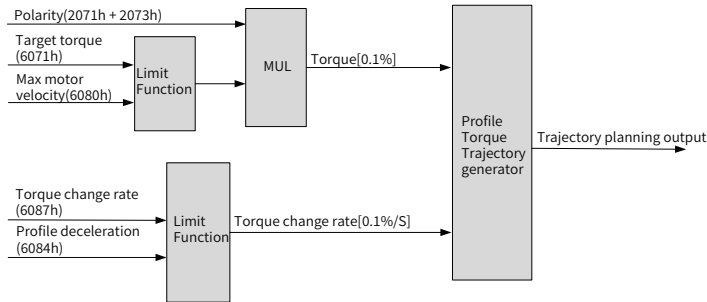


Figure 5-8 PT mode trajectory generation

Related Objects

■ Basic object (Recommand configuration objects)

Table 5-31 PT mode basic object

Data direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Remarks
Output (RXPDO)	6040-00h	Control Word	U16	RW	-	Required
	6071-00h	Target Torque	I16	RW	0.1%	Required
	6087-00h	Torque Slope	U32	RW	0.1%/s	Optional
Input (TXPDO)	6041-00h	Status Word	U16	RO	-	Required
	603F-00h	Error Code	U16	RO	-	Optional
	6064-00h	Position Actual Value	I32	RO	Uint	Optional
	606C-00h	Velocity Actual Value	I32	RO	Uint/s	Optional
	60F4-00h	Following Error Actual Value	I32	RO	Uint	Optional
	6077-00h	Torque Actual Value	I16	RO	0.1%	Optional

[1]: The data direction is referenced from the master station. Output refers to data from the master station to the slave, while input refers to data from the slave to the master station.

■ Extended object

Table 5-32 PT mode extended object

Index + Sub-Index	Label	Data Type	Access	Uni
603F-00h	Error Code	U16	RO	-
6060-00h	Mode of Operation	I8	RW	-
6061-00h	Mode of Operation Displayed	I8	RO	-
6074-00h	Torque Demand	I16	RO	0.1%
6080-00h	Max. Motor Speed	U32	RW	Unit/s
605A-00h	Quick Stop Option Code	I16	RW	-
6085-00h	Quick Stop Deceleration	U32	RW	Unit/s ²
2077-00h	Velocity Limit	I16	RW	RPM

Application: Realization of profile torque motion

This section provides an example of how to perform PT motion.

The steps are as follows:

- 1) 6060h = 4, determine if 6061h = 4. Servo drive is now under PT mode.
- 2) Write motion parameters: Target torque 6071h, Torque change rate 6087h, and Max. velocity limit 6080h.

Chapter 6 EtherCAT communication

6.1 EtherCAT principle function

In traditional Ethernet networks, every device can receive all data packets on the network, and the application layer must individually extract the relevant information for the specified device. This approach significantly reduces the execution efficiency of the application layer.

EtherCAT technology overcomes the system limitations of traditional Ethernet solutions. Unlike conventional Ethernet, where each connected node receives all data packets, EtherCAT slave devices read the addressed data directly from the data frame as it passes through the node. Similarly, input data can be inserted into the data frame as it passes by. As the frame is transmitted (with only a few nanoseconds of delay), the slave device recognizes and processes the relevant commands. This process is implemented through hardware in the slave controller, making it independent of the protocol stack processor's performance. Since the Ethernet frame reaches multiple devices in both the sending and receiving directions, the usable data rate increases to over 90%. This fully utilizes the full-duplex capability of 100BaseTX, enabling an effective data rate of $>100 \text{ Mbit/s}$ ($>2 \times 100 \text{ Mbit/s} \times 90\%$).

6.1.1 ID number setting of EtherCAT slave station

Set Pr0.24 = 1 and set required ID number to Pr0.23

P00.23	Name	Slave ID	Mode		F	
	Range	0~32767	Unit	-	Default	2
	Activation	After restart			Index	2023h
ESet ID number of the slave station under EtherCAT mode						

P00.24	Name	Slave ID Source	Mode		F	
	Range	0~1	Unit	-	Default	0
	Activation	After restart			Index	2024h
0: Master device automatically assigns a slave address. 1: The slave ID = P00.23.						

6.2 Synchronous Mode

6.2.1 Free Running Mode

In free running mode, E-RME processes the process data sent by the master asynchronously. It only applies to asynchronous motion mode such as homing mode, protocol position mode, etc

6.2.2 Distributed clock synchronization mode

E-RME adopts the synchronous mode of distributed clock as shown in Figure 6-1. When the master station sends process data to the slave station, the slave station immediately reads the process data, and then waits for the synchronization signal to trigger the process data to act on the drive.

The process data must arrive at the drive before the time of Sync0 signal T₁. The drive has completed the analysis of the process data and relevant control calculation before the arrival of Sync0 event. After receiving Sync0 event, drive immediately implements the control action which has a high synchronization performance.

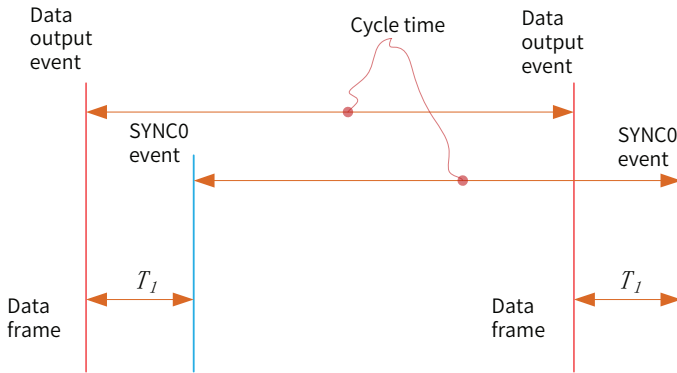


Figure 6-1 High performance synchronization mode

6.3 EtherCAT state machine

EtherCAT state machine, commonly known as "communication state machine", is mainly used to manage communication between master and slave stations. The communication function mainly includes mailbox and process data communication. The EtherCAT state machine transition relationship is shown in Figure 6-2.

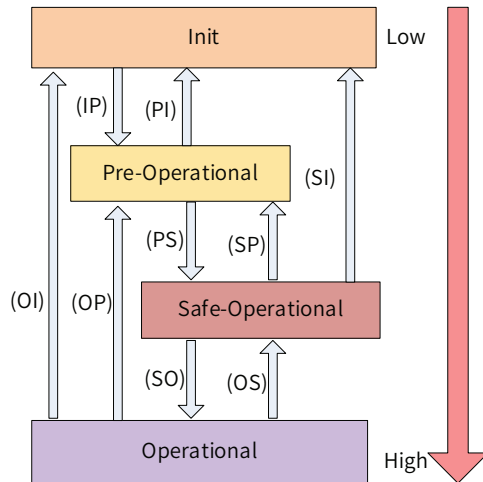


Figure 6-2 EtherCAT state machine transitions

EtherCAT state machine transitions have the following characteristics:

- From initialization to operational, the conversion must be carried out strictly in the order of initializing > pre-operational > safe operational > operational, from low to high, and no grade skipping is allowed
- When converting from high to low, grade skipping is allowed.
- The master station initiates all state transitions, and the slave station responds to the state transitions requested by the master.
- If state transition request to master station fails, slave station will send an error message to the master station.

Table 6-1 EtherCAT State Machine Communication function

State and transition	Communication function
Init	No communication between master station and slave station
Pre-Operational	Mailbox communication is effective, no process data communication, SDO function is valid
Safe-Operational	Mailbox communication and sending process data object is valid, SDO and TXPDO are valid
Operational	Mailbox communication, receive and send process data object valid, SDO, RXPDO and TXPDO valid

6.4 CANopen over EtherCAT (COE)

6.4.1 Network structure of E-RME

The structure of E-RME servo system network module is shown in Figure 6-3.

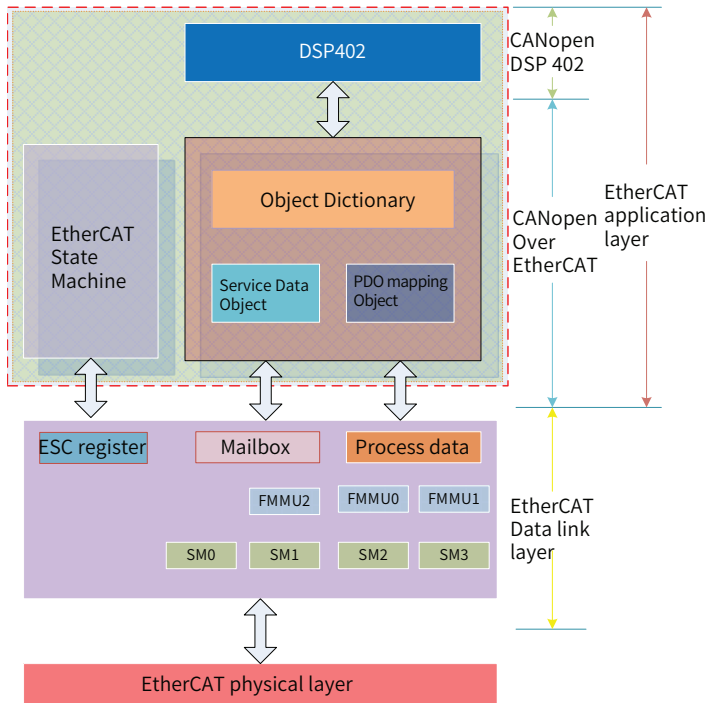


Figure 6-3 Structure of E-RME network module

The data link layer is mainly implemented by EtherCAT slave station controller (ESC). E-RME EtherCAT application layer protocol mainly includes application part (CANopen DSP402), object dictionary and communication function (red frame part), among which object dictionary and communication function can be jointly called CoE part.

Core part: Object dictionary—Bridge of communication function and application part.

Key part: Communication function—Implementation of communication rules (SDO, PDO, etc.)

Important part: Application part—Define the specific function of the device, such as the drive, IO module.

6.4.2 Object dictionary

EtherCAT master controls E-RME drive by writing and reading device state/information. To do this, the drive defines read-write parameters and read-only state values. Object dictionary is the collection of these parameters and states.

E-RME object dictionary contains all DSP402 and CoE related data objects in a standardized manner. It is a collection of E-RME parameter data structures.

E-RME object dictionary is the interface with which the controller communicates. EtherCAT master implements E-RME motion control through the interface of object dictionary.

6.4.3 Service Data Object (SDO)

E-RME series supports SDO services. EtherCAT master can configure, monitor and control E-RME drives by using SDO to read and write E-RME object dictionaries.

The SDO (Service Data Object) adopts a client/server model. In SDO operations, the master station acts as the client, and the E-RME slave station acts as the server. All transmissions must be initiated by the client, and the server responds accordingly.

In conventional CANopen DS301 mode, SDO protocol CAN only transfer 8 bytes at a time to match the data length of CAN message. In COE enhancement mode, only the payload data is expanded without changing the protocol head. In this way, the SDO protocol uses mailboxes with larger data lengths, thus improving the transmission efficiency of big data.

6.4.4 Process Data Object (PDO)

PDO Introduction

PDO is generally used for real-time data updates. It is divided into receiving PDO (RXPDO) and sending PDO (TXPDO). The data stream direction of receiving PDO is from master station to slave station, while sending PDO is from slave station to master station

The PDO function of E-RME supports both synchronous cycle mode and non-periodic update mode. When distributed clock synchronization mode is selected on master station, PDO will update according to the synchronization cycle. If free moving mode is selected, PDO data updates aperiodic.

PDO mapping

Through PDO mapping, the real-time transmission of mapped objects can be realized.

E-RME supports simultaneous transmission of 2 sets of RXPDO and 2 sets of TXPDO.

Each PDO object can map up to 8 object dictionary (maximum length 32 bytes). The format of PDO mapping content is shown in Table 6-2.

Table 6-2 Format of PDO mapping

位	31~16	15~8	7~0
Description	Index of mapped object	Subindex of mapped object	Bit length (Hex)
Example	6040h	00h	10h (16bit)

Default PDO mapping (consistent with the XML file) is shown in Table 6-3.

Table 6-3 Default PDO mapping

PDO Map object index	PDO Map object Sub-index	Mapping content	Mapped Object			Description
			Index	Sub-index	Bit length	
RXPDO1 (1600h)	01h	60400010h	-	00h	10h(16 bit)	01h
	02h	607A0020h	-	00h	10h(16 bit)	02h
	03h	60B80020h	-	00h	-	03h
RXPDO2 (1601h)	01h	60400010h	6040h	00h	10h(16 bit)	Control Word
	02h	60FF0020h	60FFh	00h	20h(32 bit)	Target Velocity
	03h	60B20010h	60B2h	00h	10h(16 bit)	Torque Offset
RXPDO3 (1602h)	01h	60400010h	6040h	00h	10h(16 bit)	Control Word
	02h	60710010h	6071h	00h	10h(16 bit)	Target Torque
	03h	60870020h	6084h	00h	20h(32 bit)	Profile Deceleration
RXPDO4 (1603h)	01h	60400010h	6040h	00h	10h(16 bit)	Control Word
	02h	60980008h	6098h	00h	08h(8 bit)	Homing Method
	03h	60990120h	6099h	01h	20h(32 bit)	Speed During Search For Switch
	04h	60990220h	6099h	02h	20h(32 bit)	Speed During Search For Zero
	05h	609A0020h	609Ah	00h	20h(32 bit)	Homing Acceleration
	06h	607C0020h	607Ch	00h	20h(32 bit)	Homing Offset
	07h	60600008h	6060h	00h	08h(8 bit)	Modes of Operation
TXPDO1 (1A00h)	01h	603F0000h	-	-	-	-
	02h	60410000h	-	-	-	-
	03h	60610000h	-	-	-	-
	04h	60640000h	-	-	-	-
	05h	60B90020h	-	-	-	-
	06h	60BA0020h	-	-	-	-
	07h	60FD0020h	-	-	-	-
TXPDO2 (1A01h)	No default mapping					

PDO dynamic mapping

Different from CIA DS301, CoE uses PDO specified objects (1C12h/1C13h) to configure PDO mapped objects (1600h~1603h/1A00h~1A01h) to PDO SyncManager (SyncManager 2/3). PDO specified objects are defined in Table 6-4.

Table 6-4 PDO specifies object definitions

Index	Sub-index	Range	Data Type	Access
RXPDO (1C12h)	00h	0~4	U8 ^[1]	RO ^[2]
	01h	1600h~1603h	U16	RW
	02h		U16	RW
	03h		U16	RW
	04h		U16	RW
TXPDO (1C13h)	00h	0~2	U8	RO
	01h	1A00h~1A01h	U16	RW
	02h		U16	RW

Note

[1]: U represents unsigned type, such as U8 for unsigned 8 bits and U16 for unsigned 16 bits

[2]: Access: RO = Read Only, RW = Read and Write, WO = Write Only

E-RME PDO dynamic mapping setup procedure

1. Switch EtherCAT state machine to pre-operational, then PDO map can be configured using SDO.
2. Clear the PDO mapping object of the PDO specified object by setting 1C12-00h / 1C13-00h to 0.
3. Invalidate the PDO mapping object by assigning 0 to the subindex 0 of 1600h~1603h/1A00h~1A01h.
4. Reconfigure PDO mapping content and write the mapping object into the objects in the range of 1600-01h~1600-08h, 1601-01h~1601-08h, 1602-01h~1602-08h, 03-01h~1603-08h (RXPDO mapping content as from 1600h-01), 00-01h ~ 1A00-08h or 1A01-01h~1A01-08h (TXPDO mapping content as from 1A00h-01) according to Table 6.3.
5. Set the total number of PDO mapping objects by writing the number of mapping objects into 1600-00h, 1601-00h, 1602-00h, 1603-00h, 1A00-00h or 1A01-00h. The total number of PDO mapping objects without mapping content will be set to 0.
6. Write valid PDO mapping object index to PDO specified object by writing valid

RXPDO mapping object index 1600h~1603h into 1C12-01h ~ 1C12-04h and writing valid TXPDO mapping object index 1A00h, 1A01h into 1C13-01h, 1C13-02h.

7. Set the total number PDO specified objects by writing the number of mapped objects to 1C12-00h and 1C13-00h.
8. Switch EtherCAT state to Safe-Operational or above, the configured PDO mapping will be valid.

Chapter 7 Sequence Diagram

7.1 Power on sequence diagram

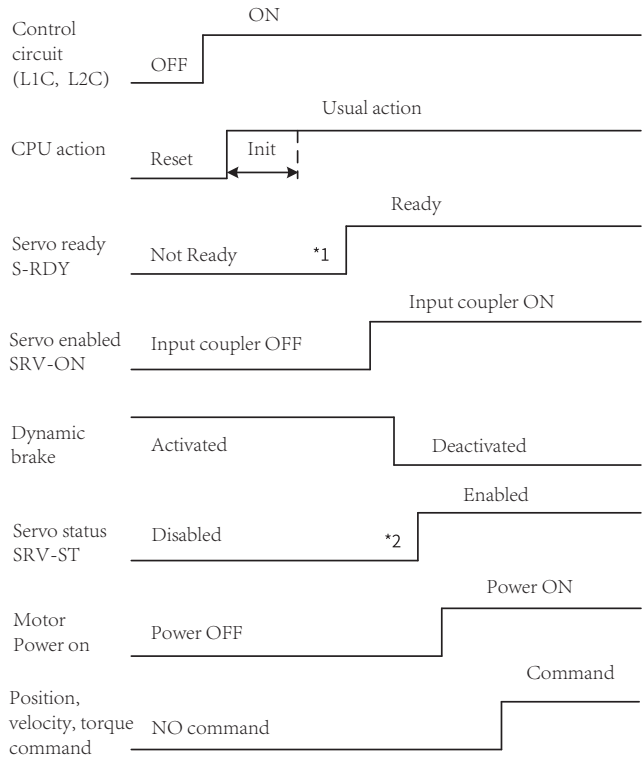


Figure 7-1 Drive Power on sequence diagram

Figure 7-1 shows the timing sequence for the drive, starting from when the AC power is connected to when the input command is issued.

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.

7.2 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 7-1 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 7-2 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)

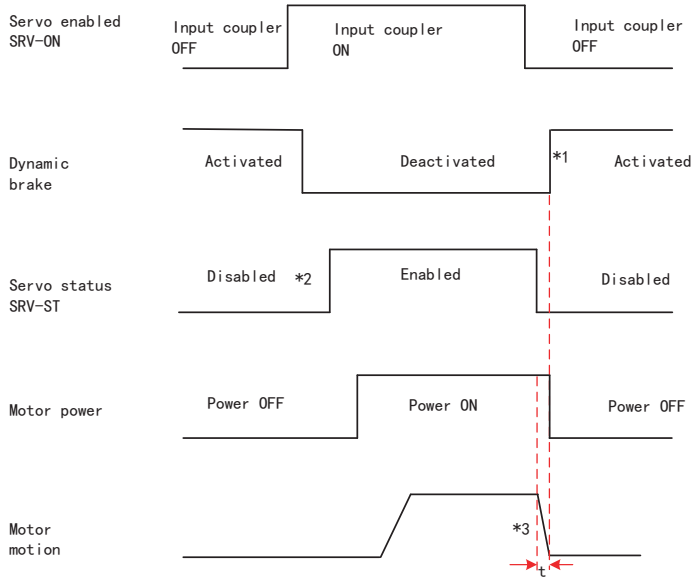


Table 7-3 Motor normal servo stop sequence 1

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)

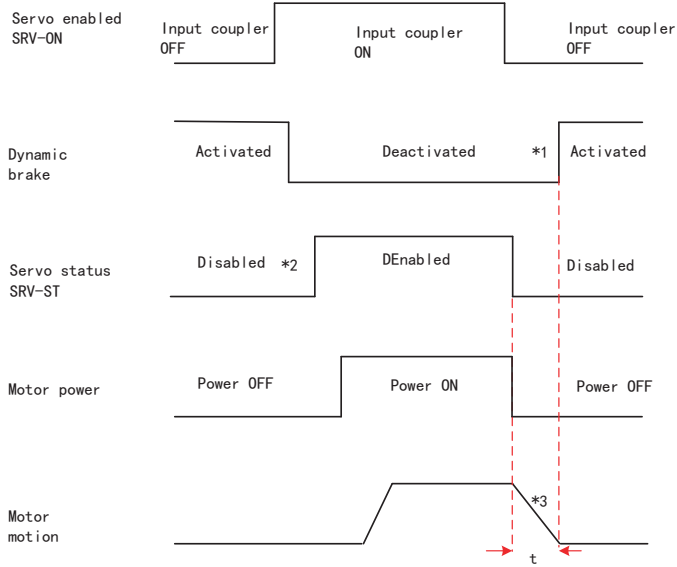


Figure 7-2 Motor normal servo stop sequence 2

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)

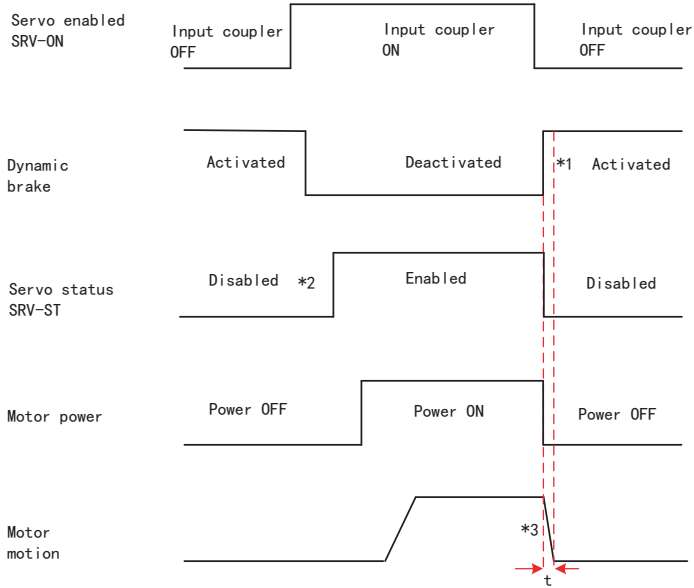


Figure 7-3 Motor normal servo stop sequence 3

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)

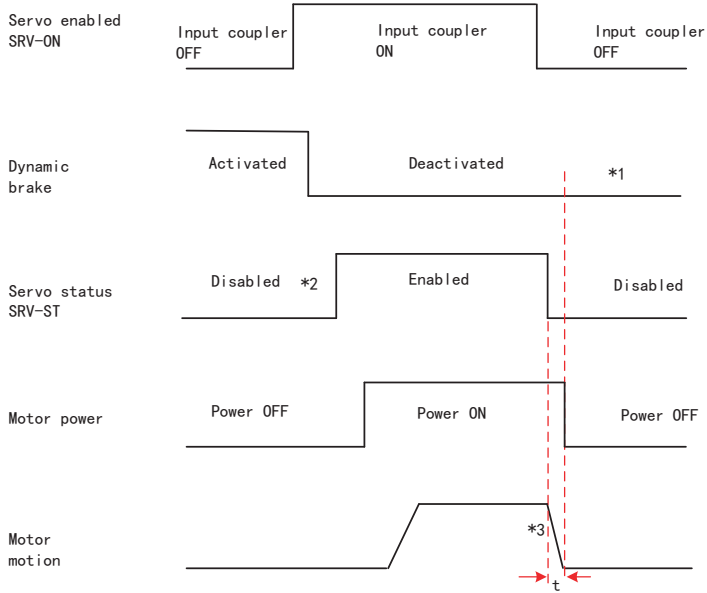


Figure 7-4 Motor normal servo stop sequence 4

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)

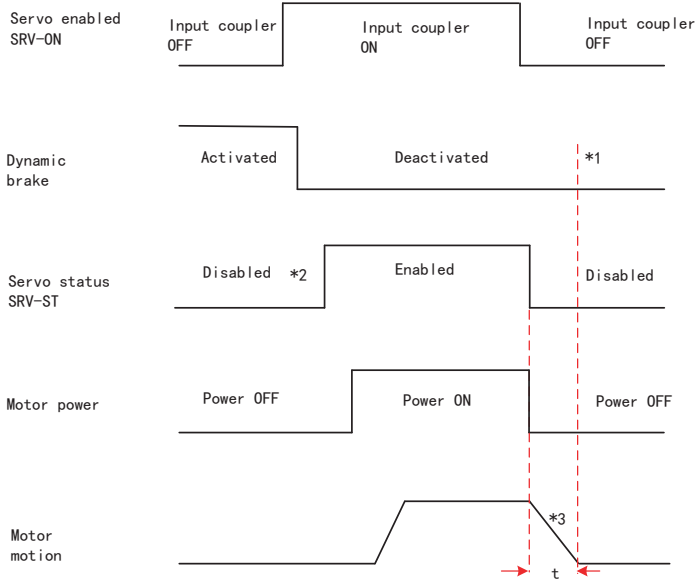


Figure 7-5 Motor normal servo stop sequence 5

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)

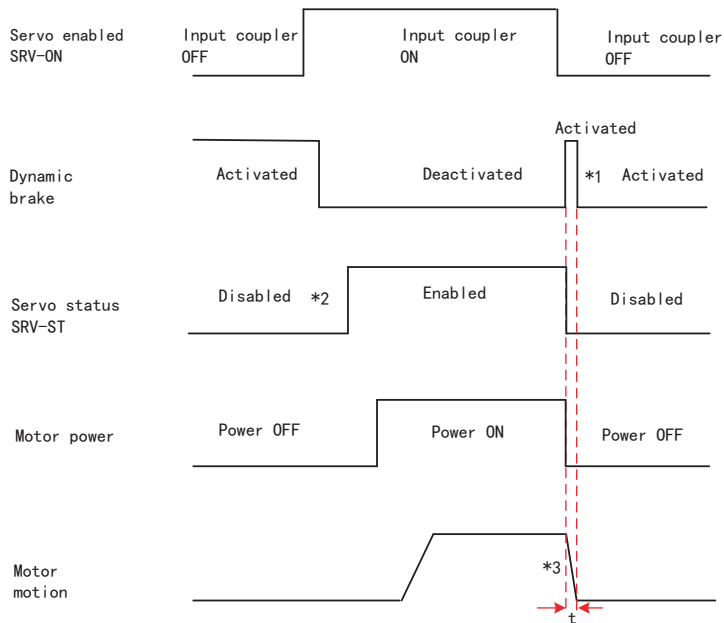


Figure 7-6 Motor normal servo stop sequence 6

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

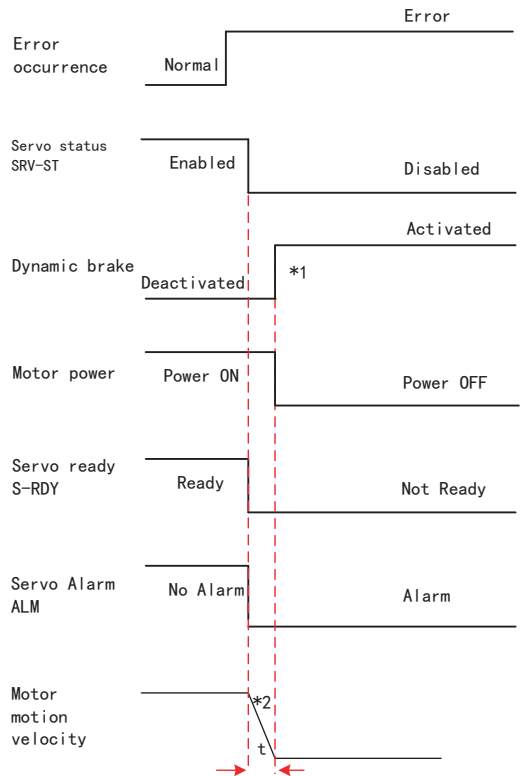


Figure 7-7 Alarm stop sequence 1

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

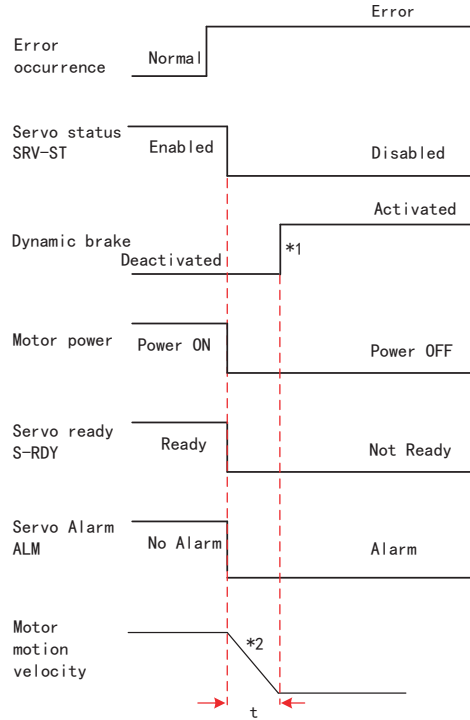


Figure 7-8 Alarm stop sequence 2

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

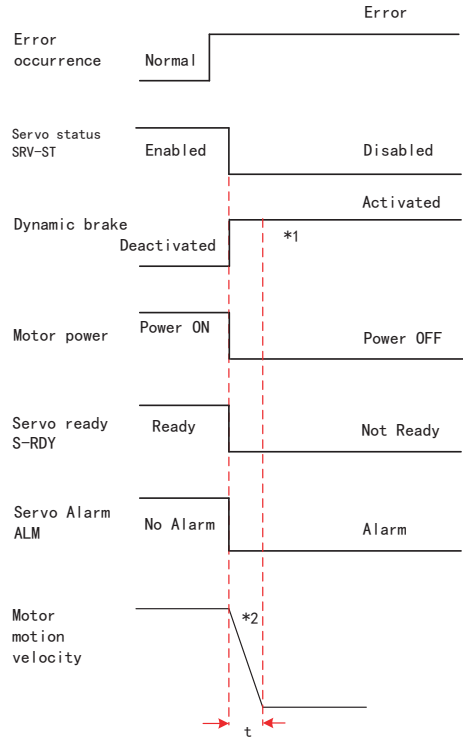


Figure 7-9 Alarm stop sequence 3

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

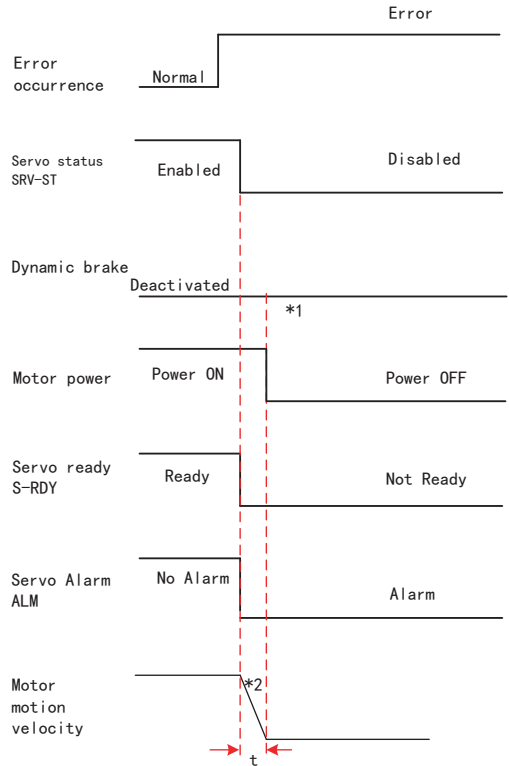


Figure 7-10 Alarm stop sequence 4

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

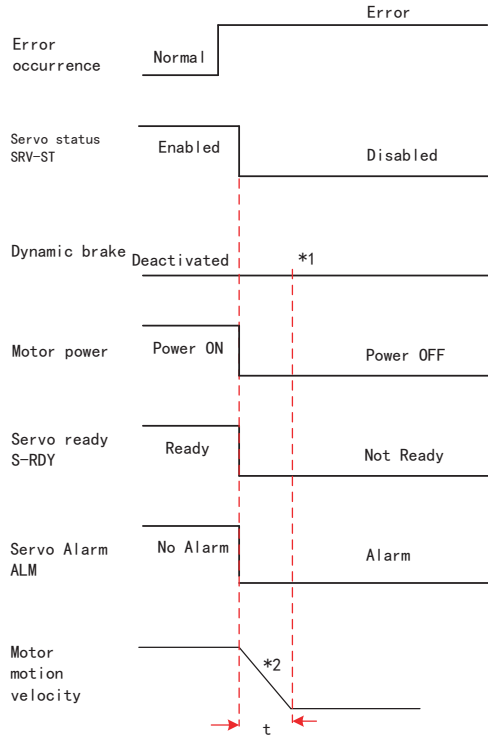


Figure 7-11 Alarm stop sequence 5

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

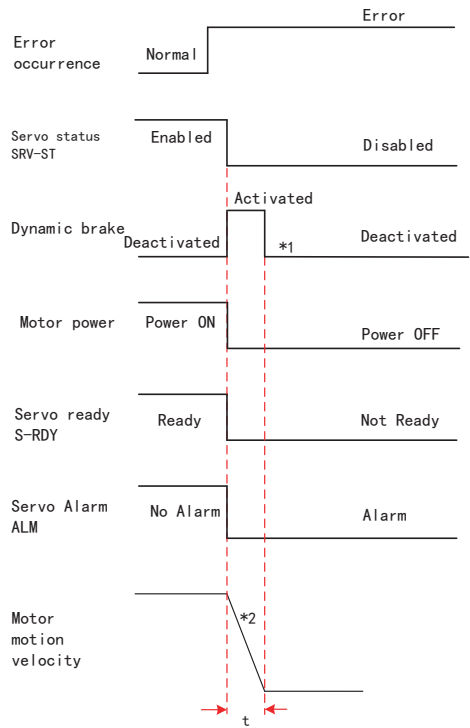


Figure 7-12 Alarm stop sequence 6

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

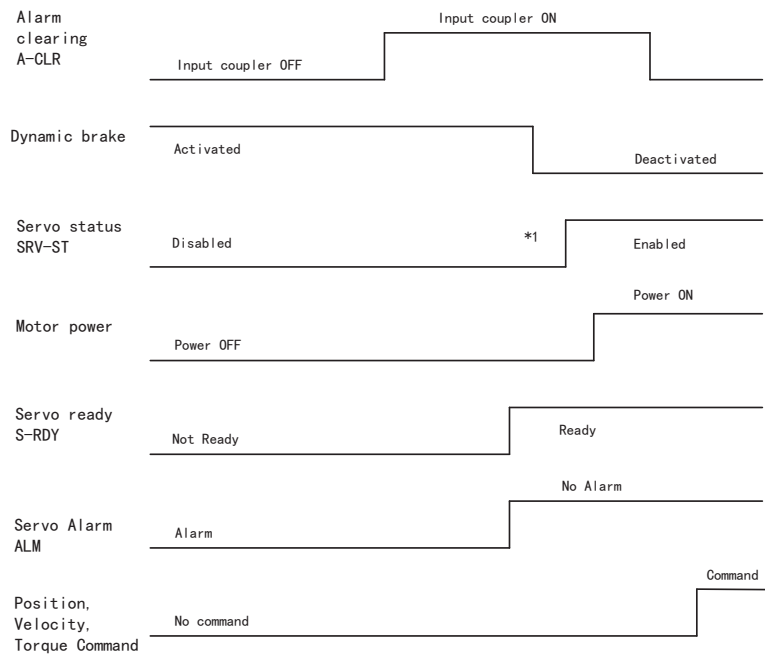


Figure 7-13 Alarm clear sequence

Note

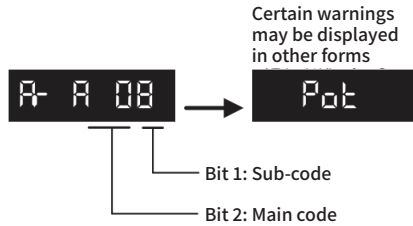
*1: SRV-ST signal is received when servo drive is enabled. Command input is not allowed yet

Chapter 8 Warning and Alarm Handling

8.1 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
A01	Overload warning
A02	Regeneration energy overload warning (85% of the regeneration threshold)
A04	Change the parameter to a non-real time valid warning, alert to restart. (Under development)
A05	The control mode parameter P00.01 is not 9. Please correct this parameter.
A07	Low temperature warning (< 20°C)
A08	Positive limit switch valid. POT blinking on front panel
A09	Negative limit switch valid. NOT blinking on front panel
A0A	Positive and negative limit switch valid. PNOT blinking on front panel
A0B	Current position is beyond software positive limit. SPOT blinking on front panel
A0C	Current position is beyond software negative limit. SNOT blinking on front panel
A0D	Current position is beyond software negative, positive limit. SPNOT blinking on front panel
A0E	Parameters reset to factory default. Restart needed
Ar15	Communication failure when the gantry is not enabled
Ar16	One axis of gantry fault, the other axis warning Ar16
Ar17	Emergency stop signal for one axis of gantry effective, the other axis warning Ar17
Ar18	Limit switch effective for one axis of gantry, the other axis warning Ar18
Ar19	PWM synchronization alarm for slave axis when gantry is not enabled
Ar1A	Excessive communication error for the gantry
Ar1B	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.

8.2 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:

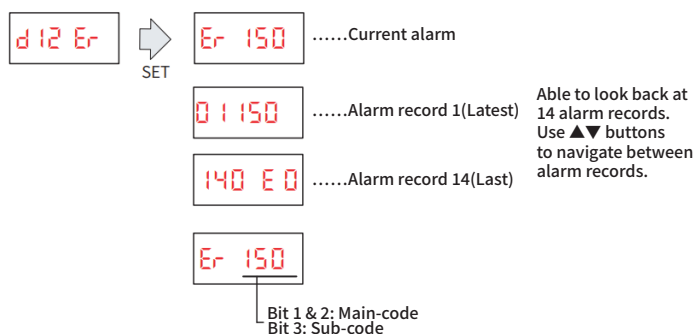


Figure 8-1 Panel Alarm display

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 8-1 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	
16	0	Phase finding failure	●	1	●
	1	Phase finding failure (motor not stationary before phase search)	●	1	●
	2	Phase finding failure (incorrect phase sequence)	●	1	●
	3	Phase finding failure (motor locked)	●	1	●
	4	Phase finding failure (angle compensation too large)	●	1	●
	5	Phase finding failure (timeout)	●	1	●
	6	Phase finding failure (phase search required before enabling)	●	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	●

Error code		Content	Attribute		
Main	Sub		Save	Type	Clearable
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	
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	
	1	I2C communication status error		2	
	2	Error r/w diagnostic data		2	
	3	Error r/w diagnostic data		2	
	4	Error r/w 402 parameters		2	
	5	Error r/w communication parameters		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	●

Error code		Content	Attribute		
Main	Sub		Save	Type	Clearable
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	
73	B	Excessive DC interrupt loss count	●	2	●
89	0	Homing error		2	●
92	0	External encoder parameter initialization error	●	1	
D0	0	Detected encoder line count does not match the set value			●
	1	Detected Hall signal does not match the settings			●
	2	Detected pole pair number does not match the set value			●
	3	Encoder parameter identification error			●
E0	3	Encoder parameter identification error			●

Table 8-2 Alarm and 603Fh correspondence

Error Code Display	1001h	603Fh	ETG code	Alarm Description
Er 0A0	0x04	0x3150	-	Phase A circuit current detection error
Er 0A1	0x04	0x3151	-	Phase B circuit current detection error
Er 0A3	0x04	0x3153	-	UVW cable not connected
Er 0C0	0x04	0x3211	-	DC bus overvoltage
Er 0b0	0x04	0x3205	-	Control circuit power supply voltage too low
Er 0b1	0x04	0x3206	-	Control power supply voltage too high
Er 0d0	0x04	0x3221	-	DC bus undervoltage
Er 0d1	0x04	0x3130	-	Single phasing of main power supply
Er 0d2	0x04	0x3222	-	No main power supply detected
Er 0E0	0x02	0x2211	-	Overcurrent
Er 0E1	0x02	0x2212	-	Intelligent Power Module (IPM) overcurrent
Er 0E2	0x02	0x2218	-	Power output to motor shorted to ground
Er 0E4	0x02	0x2230	-	Phase overcurrent
Er 0f0	0x08	0x4210	-	Drive overheated
Er 100	0x02	0x8311	-	Motor overloaded
Er 101	0x02	0x8310	-	Drive overloaded
Er 102	0x02	0x8301	-	Motor rotor blocked
Er 120	0x80	0x7701	-	Regenerative resistor overvoltage
Er 121	0x80	0x7702	-	Brake error
Er 122	0x80	0x7703	-	Regenerative resistor value too low
Er 150	0x80	0x7321	-	Encoder disconnected
Er 151	0x80	0x7322	-	Encoder communication error
Er 152	0x80	0x7323	-	Encoder initial position error
Er 153/Er 154	0x80	0x7325	-	Multiturn encoder error / Encoder parameter settings error
Er 155	0x80	0x7326	-	Encoder data overflow
Er 156	0x80	0x7327	-	Encoder overheated
Er 157	0x80	0x7328	-	Encoder count error
Er 170	0x80	0x7324	-	Encoder data error
Er 171	0x80	0x7325	-	Encoder parameter initialization error
Er 180	0x20	0x 8611	-	Excessive position deviation
Er 190	0x20	0x 8401	-	Motor vibration too strong
Er 1A0	0x20	0x 8402	-	Velocity out of control
Er 1A1	0x20	0x 8403	-	Velocity out of control
Er 1b0	0x20	0x 8612	-	Bus input signal dithering
Er 1b1	0x20	0x 8503	-	Incorrect electronic gear ratio
Er 1b2	0x20	0x 8613	-	Encoder single-turn data overflow
Er 1c0	0x02	8313	-	Both STO failed
Er 1c1	0x02	8313	-	1st STO failed
Er 1c2	0x02	8313	-	2nd STO failed
Er 210	0x80	0x6321	-	I/O input interface assignment error
Er 211	0x80	0x6322	-	I/O input interface function assignment error
Er 212	0x80	0x6323	-	I/O output interface function assignment error
Er 240	0x80	0x5530	-	EEPROM parameters initialization error

Error Code Display	1001h	603Fh	ETG code	Alarm Description
Er 241	0x80	0x5531	-	EEPROM hardware error
Er 242	0x80	0x5532	-	Error saving alarm history record
Er 243	0x80	0x5533	-	Error occurred when saving vendor parameters
Er 244	0x80	0x5534	-	Error occurred when saving communication parameters
Er 245	0x80	0x5535	-	Error occurred when saving 402 parameters
Er 246	0x80	0x5536	-	Data saving error during power-off
Er 260	0x80	0x7329	-	Positive/Negative position limit triggered under non-homing mode
Er 280	0x80	0x7201	-	Output pulse frequency too high
Er 570	0x80	0x5441	-	Forced alarm input valid
Er 5f0	0x80	0x7122	-	Drive power module detection error
Er 5f1	0x80	0x1100	-	Drive power module detection error
Er 600	0x80	0x6204	-	Main loop interrupted timeout
Er 601	0x80	0x6204	-	Velocity loop interrupted timeout
Er 700	0x80	0x7001	-	Encryption error
Er 73A	0x10	0x873A	-	SyncManager2 lost
Er 73b	0x10	0x873B	-	SYNC0 lost
Er 73c	0x10	0x873C	-	Excessive Distributed Clock error
Er 801	0x10	0x8201	0x0001	Unknown communication error
Er 802	0x80	0x5510	0x0002	RAM overflow
Er 803	0x80	0x5511	-	RAM out of bound
Er 805	0x80	0x6202	-	FOE firmware upgrade failed
Er 806	0x80	0x6201	-	Saved ESI file does not match drive firmware
Er 811	0x10	0xA001	0x0011	Invalid EtherCAT transition request
Er 812	0x10	0xA002	0x0012	Unknown EtherCAT state machine transition request
Er 813	0x10	0x8213	0x0013	Protection request from boot state
Er 814	0x80	0x6203	-	Invalid firmware
Er 815	0x10	0x8215	0x0015	Invalid mailbox configuration under boot state
Er 816	0x10	0x8216	0x0016	Pre-Op status is invalid for the mailbox configuration
Er 817	0x10	0x8217	-	Invalid SyncManager configuration
Er 818	0x10	0x8211	-	No valid input data
Er 819	0x10	0x8212	-	No valid output data
Er 81A	0x10	0xFF02	0x871A	Synchronization error
Er 81b	0x10	0x821B	0x001B	SyncManager2 watchdog timer timeout
Er 81C	0x10	0x821C	0x001C	Invalid SyncManager type
Er 81d	0x10	0x821D	0x001D	Invalid output configuration
Er 81E	0x10	0x821E	0x001E	Invalid input configuration
Er 81f	0x10	0x821F	-	Invalid watchdog configuration
Er 821	0x10	0xA003	0x0021	Waiting for EtherCAT state machine Init state
Er 822	0x10	0xA004	0x0022	Waiting for EtherCAT state machine Pre-Op state
Er 823	0x10	0xA005	0x0023	Waiting for EtherCAT state machine Safe-Op state
Er 824	0x10	0x8224	0x0024	Invalid TPDO mapping (length, parameter does not exist, no such attribute.)

Error Code Display	1001h	603Fh	ETG code	Alarm Description
Er 825	0x10	0x8225	0x0025	Invalid RPDO mapping (length, parameter does not exist, no such attribute.)
Er 827	0x10	0x8227	-	Free running mode is not supported
Er 828	0x10	0x8228	-	Sync mode not supported
Er 82b	0x10	0x8210	0x002B	Invalid inputs and outputs
Er 82C	0x10	0x872C	0x002C	Fatal synchronization error
Er 82d	0x10	0x872D	0x002D	No synchronization error (No master synchronization received when transitioning from Pre-Op to Safe-Op)
Er 82E	0x10	0x872E	0x002E	Synchronization cycle time is too short
Er 830	0x10	0x8730	0x0030	Invalid Distributed Clock synchronization settings
Er 832	0x10	0x8732	0x0032	Distribution Clock phase-locked loop failure
Er 833	0x10	0x8733	-	DC sync IO error
Er 834	0x10	0x8734	-	DC sync timeout
Er 835	0x10	0x8735	-	Distribution Clock cycle time is invalid
Er 836	0x10	0x8736	0x0036	Invalid sync0 cycle time
Er 850	0x80	0x5550	0x0050	EEPROM is inaccessible
Er 851	0x80	0x5551	0x0051	EEPROM error
Er 852	0x80	0x5552	0x0052	Hardware is not ready
Er 860	0x80	0xFF01	-	EtherCAT frame lost per unit time exceeds limit
Er 870	0x80	0x5201	-	Drive can't be enabled under current control mode
Er 890	0x80	0x8614	-	Homing error

8.3 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.
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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 shorr 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.
Motor overload.		Check if the motor output torque is too high.	Reduce the motor load or use a gearbox.
Excessive acceleration/ deceleration.		Verify whether the acceleration/deceleration time setting is too short.	Increase the acceleration/ deceleration time.
Motor short circuit.		Measure whether the resistance between any two phases of motor terminals UVW is balanced. Check for a short circuit between UVW and ground (PE).	Replace with the new motor.

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.
Motor overload.	Check if the motor output torque is too high.	Reduce the motor load or use a gearbox.
Excessive acceleration/ deceleration.	Verify whether the acceleration/deceleration time setting is too short.	Increase the acceleration/ deceleration time.
Motor short circuit.	Measure whether the resistance between any two phases of motor terminals UVW is balanced. Check for a short circuit between UVW and ground (PE).	Replace with the new motor.

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.	
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.
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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 wire shielding layer is missing.		Verify if encoder cable has shielding layer.	Replace with standard encoder cable.
Encoder cable wiring error.		Verify if encoder wiring is correct.	Reconnect encoder wiring.
Encoder damaged.		/	Replace with the new motor.
Excessive interference.		/	Enhance the anti-interference capability of the encoder cables.

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.
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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: "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 fram. 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.

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: Auxiliary encoder overspeed	
Cause		Diagnosis		Solution
Controller synchronization jitter too high.		Excessive synchronization offset on the master side.	Reduce synchronization jitter. Try setting the master-side synchronization offset to 0.	
		Synchronization jitter range needs adjustment.	Increase p00.25, p00.26, and p00.28 values.	
		Instruction delay cycle for synchronization mode requires adjustment.	Set p00.28 to 2 to increase the delay.	

Error code	Main	Sub	Display: "Er1b1"	
	1b	1	Content: Incorrect electronic gear ratio	
Cause		Diagnosis		Solution
Electronic gear ratio values out of range.		Numerator or denominator is zero or 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: "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: "Er241"
	24	1	Content: I2C communication status error
Cause	Diagnosis		Solution
EEPROM broken.	Save for few times to check if the issue is same.		Replace with the new drive or upgrade software.

Error code	Main	Sub	Display: "Er242"
	24	2	Content: Error r/w diagnostic data
Cause	Diagnosis		Solution
Power off during alarm.	Check the alarm during power failure.		Alarm after a short time, then power off.
Multiple different alarms occurring sequentially.	Inspect alarm codes.		Identify other alarm causes.
EEPROM broken.	Save for few times to check if the issue is same.		Replace with the new drive or upgrade software.

Error code	Main	Sub	Display: "Er243"
	24	3	Content: Error r/w diagnostic data
Cause	Diagnosis		Solution
Save operation interrupted by power failure.	--		Wait for the save process to complete fully before shutting off the power.
EEPROM broken.	Save for few times to check if the issue is same.		Replace with the new drive.

Error code	Main	Sub	Display: "Er244"
	24	4	Content: Error r/w 402 parameters
Cause	Diagnosis		Solution
Save operation interrupted by power failure.	--		Wait for the save process to complete fully before shutting off the power.
EEPROM broken.	Save for few times to check if the issue is same.		Replace with the new drive.

Error code	Main	Sub	Display: "Er245"
	24	5	Content: Error r/w communication parameters
Cause		Diagnosis	Solution
Save operation interrupted by power failure.		--	Wait for the save process to complete fully before shutting off the power.
EEPROM broken.		Save for few times to check if the issue is same.	Replace with the new drive.

Error code	Main	Sub	Display: "Er246"
	24	6	Content: Data saving error during power-off
Cause		Diagnosis	Solution
EEPROM broken.		Save for few times to check if the issue is same.	Replace with the new drive.

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.

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.
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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 corssover output pulse frequency are too high.	Reduce the number of requencey 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.
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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.

8.4 EtherCAT Communication Alarm

E-RME EtherCAT communication related alarms are erasable and will not be recorded in alarm history.

Clearing EtherCAT communication alarm is similar to clearing servo drive alarm. Please clear the alarm before switching to 402 machine state.

Step 1: Set bit 4 of ESC control register 0x120 (error responder) to 1

Step 2: The communication alarm can be cleared until the feedback of the ESC status code register 0x134~0x135 is 0.

Then, follow the second step of clearing the drive alarm. The bit 7 of the 6040h object is switched from 0 → 1 to change the 402 state machine from Fault to Switch on Disabled.

When the E-RME network failure occurs, the operation panel will display the fault code, and the ERR status indicator will show the corresponding signal. Additionally, the error information from object dictionary 1001h and 603Fh, which conforms to CIA/IEC standards, will be sent to the master station via an emergency message. The master station can determine the specific fault through the emergency message or the error codes from these two object dictionaries.

8.4.1 Details and causes of communication alarm

Error code	Main	Sub	Display: "Er 73A"
	73	A	Error description: SyncManager2 lost
Cause	Diagnosis		Solution
Poor master performance	-		Increase the alarm threshold
Single-unit drive has problem Is it a single unit or multiple units together in the network	Is it a single unit or multiple units together in the network		Switch or replace drive
Interfere	Check the grounding and network wiring quality		Replace the network cable

Error code	Main	Sub	Display: "Er 73b"
	73	b	Error description: SYNC0 lost
Cause	Diagnosis		Solution
Poor master performance	-		Increase the alarm threshold

Error code	Main	Sub	Display: "Er 73b"
	73	b	Error description: SYNC0 lost
Single-unit drive has problem Is it a single unit or multiple units together in the network	Is it a single unit or multiple units together in the network		Switch or replace drive
Interfere	Check the grounding and network wiring quality		Replace the network cable

Error code	Main	Sub	Display: "Er 73C"
	73	C	Error description: Excessive Distributed Clock error
Cause	Diagnosis		Solution
Poor master performance	-		Increase the alarm threshold
Single-unit drive has problem Is it a single unit or multiple units together in the network	Is it a single unit or multiple units together in the network		Switch or replace drive
Interfere	Check the grounding and network wiring quality		Replace the network cable

Error code	Main	Sub	Display: "Er 801"
	80	1	Error description: Unknown communication error
Cause	EtherCAT state machine transition failed		
EROR LED status	Blinking		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	Verify network connection and master device EtherCAT state machine transition order		

Error code	Main	Sub	Display: "Er 802"
	80	2	Error description: RAM overflow
Cause	CPU failed to request memory		
EROR LED status	ON		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	Verify if E-RME hardware is faulty		

Error code	Main	Sub	Display: "Er 803"
	80	3	Error description: RAM out of bound
Cause	EtherCAT state machine memory address access request from master device is out of bound		
EROR LED status	None		
The status of the error can be detected	All communication status		
The result status	None		
Solution	Verify master device configuration or replace master device		

Error code	Main	Sub	Display: "Er 805"
	80	5	Error description: FOE firmware upgrade failed
Cause	Firmware burn error		
EROR LED status	None		
The status of the error can be detected	BOOT		
The result status	Remain in the detection state		
Solution	Replace firmware/driver		

Error code	Main	Sub	Display: "Er 806"
	80	6	Error description: Saved ESI file does not match drive firmware
Cause	ESI file does not match drive firmware		
EROR LED status	None		
The status of the error can be detected	INIT		
The result status	Remain in the detection state		
Solution	Burn matching firmware to drive		

Error code	Main	Sub	Display: "Er 811"
	81	1	Error description: Invalid EtherCAT transition request
Cause	E-RME received unconvertible request from EtherCAT state machine		
EROR LED status	Blinking		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	Verify if the transition information from master device is correct		

Error code	Main	Sub	Display: "Er 812"
	81	2	Error description: Unknown EtherCAT state machine transition request
Cause	E-RME receives a transition request other than states of the EtherCAT state machine		
EROR LED status	Blinking		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	Verify transition information from master device		

Error code	Main	Sub	Display: "Er 813"
	81	3	Error description: Protection request from boot state
Cause	E-RME receives a transition request to boot state		
EROR LED status	Flickering		
The status of the error can be detected	Initialize the conversion to a boot		
The result status	Initialization		
Solution	Verify if E-RME software version supports this state transition		

Error code	Main	Sub	Display: "Er 814"
	81	4	Error description: Invalid firmware
Cause	Firmware not matched with drive		
EROR LED status	None		
The status of the error can be detected	BOOT/INIT		
The result status	Keeping in the detection status		
Solution	Return drive to supplier to update firmware		

Error code	Main	Sub	Display: "Er 815"
	81	5	Error description: Invalid mailbox configuration under boot state
Cause	Boot state action not supported under current configuration		
EROR LED status	Blinking		
The status of the error can be detected	Initialize the conversion to a boot		
The result status	Initialization		
Solution	Verify if E-RME software version supports action under this state		

Error code	Main	Sub	Display: "Er 816"
	81	6	Error description: Pre-Op status is invalid for the mailbox configuration
Cause	The synchronization manager configuration under Pre-Op is invalid		

Error code	Main	Sub	Display: "Er 816"
	81	6	Error description: Pre-Op status is invalid for the mailbox configuration
EROR LED status	Blinking		
The status of the error can be detected	Pre-Op		
The result status	Initialization		
Solution	<ul style="list-style-type: none"> Verify if XML file version is consistent with software version EtherCAT slave controller error, please contact technical support 		

Error code	Main	Sub	Display: "Er 817"
	81	7	Error description: Invalid SyncManager configuration
Cause	Synchronization manager configuration is invalid		
EROR LED status	Single flash		
The status of the error can be detected	Pre-Op above		
The result status	Pre-Op		
Solution	Verify master device configuration/ESI file version		

Error code	Main	Sub	Display: "Er 818"
	81	8	Error description: No valid input data
Cause	The input data is not updated for more than 1 second		
EROR LED status	Double flashing		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	<ul style="list-style-type: none"> Verify if TxPDO is valid Verify master device synchronization settings 		

Error code	Main	Sub	Display: "Er 819"
	81	9	Error description: No valid output data
Cause	Output data is not updated for more than 1 second		
EROR LED status	Double flashing		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	<ul style="list-style-type: none"> Verify if RxPDO is valid Verify master device synchronization settings 		

Error code	Main	Sub	Display: "Er 81A"
	81	A	Error description: Synchronization error
Cause	RxPDO and DC update order failed or one of them is not updated in sync		
EROR LED status	Single flash		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	<ul style="list-style-type: none"> • Verify if PXPDO is valid • Verify master device synchronization settings 		

Error code	Main	Sub	Display: "Er 81b"
	81	b	Error description: SyncManager2 watchdog timer timeout
Cause	The RxPDO update timeout in operational state		
EROR LED status	Double flashing		
The status of the error can be detected	Operation		
The result status	Safe Operation		
Solution	<ul style="list-style-type: none"> • Verify if E-RME network is connected • Verify RxPDO update time 		

Error code	Main	Sub	Display: "Er 81c"
	81	c	Error description: Invalid SyncManager type
Cause	Synchronization Manager configuration types other than the following: <ul style="list-style-type: none"> • Mailbox output • Mailbox input • Process data output • Process data input 		
EROR LED status	Blinking		
The status of the error can be detected	Pre-Op		
The result status	Initialization		
Solution	Verify if XML file version is consistent with software version		

Error code	Main	Sub	Display: "Er 81d"
	81	d	Error description: Invalid output configuration
Cause	Process data output synchronization manager configuration is invalid		
EROR LED status	Blinking		
The status of the error can be detected	Pre-Op		
The result status	Initialization		

Error code	Main	Sub	Display: "Er 81d"
	81	d	Error description: Invalid output configuration
Solution	<ul style="list-style-type: none"> Verify E-RME synchronization manager configuratio Verify if XML file version is consistent with software version 		

Error code	Main	Sub	Display: "Er 81E"
	81	E	Error description: Invalid input configuration
Cause	Process data input synchronization manager configuration is invalid		
EROR LED status	Blinking		
The status of the error can be detected	Pre-Op		
The result status	Initialization		
Solution	<ul style="list-style-type: none"> Verify E-RME synchronization manager configuratio Verify if XML file version is consistent with software version 		

Error code	Main	Sub	Display: "Er 821"
	82	1	Error description: Waiting for EtherCAT state machine Init state
Cause	E-RME waiting for master device to send Init reques		
EROR LED status	Blinking		
The status of the error can be detected	All ESM status		
The result status	Maintain status		
Solution	Verify transition request sent from master device		

Error code	Main	Sub	Display: "Er 822"
	82	2	Error description: Waiting for EtherCAT state machine Pre-Op state
Cause	E-RME waiting for master device to send Pre-Op request		
EROR LED status	Blinking		
The status of the error can be detected	Safe Operation, Operation		
The result status	Maintain status		
Solution	Verify transition request sent from master device		

Error code	Main	Sub	Display: "Er 823"
	82	3	Error description: Waiting for EtherCAT state machine Safe-Op state
Cause	Process data output synchronization manager configuration is invalid		
EROR LED status	Blinking		
The status of the error can be detected	Operation		
The result status	Maintain status		

Error code	Main	Sub	Display: "Er 823"
	82	3	Error description: Waiting for EtherCAT state machine Safe-Op state
Solution	Verify transition request sent from master device		

Error code	Main	Sub	Display: "Er 824"
	82	4	Error description: Invalid TPDO mapping
Cause	TxPDO is configured with non-mappable objects		
EROR LED status	Blinking		
The status of the error can be detected	Safe Operation		
The result status	Pre-Op		
Solution	Reconfigure the TxPDO mapping object		

Error code	Main	Sub	Display: "Er 825"
	82	5	Error description: Invalid RPDO mapping
Cause	RxPDO is configured with non-mappable objects		
EROR LED status	Blinking		
The status of the error can be detected	Safe Operation		
The result status	Pre-Op		
Solution	Reconfigure the RxPDO mapping object		

Error code	Main	Sub	Display: "Er 828"
	82	8	Error description: Sync mode not supported
Cause	Sync mode is not supported in the current configuration		
EROR LED status	Single flash		
The status of the error can be detected	Safe Operation		
The result status	Pre-Op		
Solution	<ul style="list-style-type: none"> • Verify E-RME software version • Verify XML version 		

Error code	Main	Sub	Display: "Er 82b"
	82	b	Error description: Invalid inputs and outputs
Cause	No RxPDO and TxPDO updates for more than 1 second		

Error code	Main	Sub	Display: "Er 82b"
	82	b	Error description: Invalid inputs and outputs
EROR LED status	Blinking		
The status of the error can be detected	All ESM status		
The result status	The current state is maintained below the safe operation, and the operation state is switched to the safe operation state		
Solution	<ul style="list-style-type: none"> Verify if current RxPDO and TxPDO are invalid Verify master device synchronization settings 		

Error code	Main	Sub	Display: "Er 82c"
	82	c	Error description: Fatal synchronization error
Cause	DC watchdog timer timeout		
EROR LED status	Double flashing		
Error code	Main	Sub	Display: "Er 82c"
	82	c	Error description: Fatal synchronization error
The status of the error can be detected	Safe Operation, Operation		
The result status	Safe Operation		
Solution	<ul style="list-style-type: none"> Verify if E-RME hardware is faulty Verify DC setting and delay 		

Error code	Main	Sub	Display: "Er 82d"
	82	d	Error description: No synchronization error
Cause	Synchronization is invalid		
EROR LED status	Single flash		
The status of the error can be detected	Operation		
The result status	Safe Operation		
Solution	<ul style="list-style-type: none"> Verify if "fatal synchronization error" has occurred Verify master device synchronization settings 		

Error code	Main	Sub	Display: "Er 82E"
	82	E	Error description: Synchronization cycle time is too short
Cause	Master device synchronization cycle time is set to less than 125 microseconds		
EROR LED status	Single flash		
The status of the error can be detected	Safe Operation		
The result status	Pre-Op		
Solution	Verify master device synchronization cycle time		

Error code	Main	Sub	Display: "Er 830"
	83	0	Error description: Invalid Distributed Clock synchronization settings
Cause	Synchronization settings in sync mode are not valid		
EROR LED status	Blinking		
The status of the error can be detected	Safe Operation		
The result status	Pre-Op		
Solution	Verify master device synchronization settings		

Error code	Main	Sub	Display: "Er 832"
	83	2	Error description: Distribution Clock phase-locked loop failure
Cause	Distribution Clock phase-locked loop setting is invalid		
EROR LED status	Single flash		
The status of the error can be detected	Safe Operation, Operation		
The result status	Safe Operation		
Solution	Verify master device Distribution Clock settings and network transmission delay		

Error code	Main	Sub	Display: "Er 835"
	83	5	Error description: Distribution Clock cycle time is invalid
Cause	Set synchronization cycle time is not proportional to drive position loop		
EROR LED status	Flickering		
The status of the error can be detected	Safe-op		
The result status	Pre-op		
Solution	Refer to user manual to set a reasonable synchronization cycle time		

Error code	Main	Sub	Display: "Er 836"
	83	6	Error description: Invalid sync0 cycle time
Cause	The master station synchronization cycle is not an integer multiple of 125us or exceeds the set value of 5400-02h		
EROR LED status	Single flash		
The status of the error can be detected	Safe Operation		
The result status	Pre-Op		
Solution	Verify master device synchronization cycle time		

Error code	Main	Sub	Display: "Er 850"
	85	0	Error description: EEPROM is inaccessible
Cause	EtherCAT slave controller failed to access EEPROM		
EROR LED status	Flickering		
The status of the error can be detected	All ESM status		
The result status	Maintain status		
Solution	<ul style="list-style-type: none"> • Verify if E-RME hardware is faulty • Verify if master device released access 		

Error code	Main	Sub	Display: "Er 851"
	85	1	Error description: EEPROM error
Cause	EEPROM operation of EtherCAT slave controller failed		
EROR LED status	Flickering		
The status of the error can be detected	All ESM status		
The result status	Maintain status		
Solution	Verify if master device released access		

Error code	Main	Sub	Display: "Er 852"
	85	2	Error description: Hardware is not ready
Cause	Data communication lost		
EROR LED status	ON		
The status of the error can be detected	All ESM status		
The result status	Maintain status		
Solution	Verify if E-RME hardware is faulty		

Error code	Main	Sub	Display: "Er 860"
	86	0	Error description: EtherCAT frame lost per unit time exceeds limit
Cause	EtherCAT frame lost per unit time exceeds the setting in 2635-00h		
EROR LED status	None		
The status of the error can be detected	All status		
The result status	Maintain status		
Solution	Change to network cable with higher bandwidth / Replace drive		

Error code	Main	Sub	Display: "Er 870"
	87	0	Error description: Drive can't be enabled under current control mode
Cause	Servo on under unsupported mode		
EROR LED status	None		

Error code	Main	Sub	Display: "Er 870"
	87	0	Error description: Drive can't be enabled under current control mode
The status of the error can be detected	All status		
The result status	Maintain status		
Solution	Switch to the correct control mode		

Error code	Main	Sub	Display: "Er890"
	89	0	Error description: Homing error
Cause	Diagnosis		Solution
The homing speed is too fast, causing the signal to pass the sensor too quickly, resulting in an invalid signal input	Check if the homing speed is set too high or the homing acceleration is set too low.		Reduce the homing speed or increase the homing acceleration
The homing method is inconsistent with the sensor input signal	Check if the logic of the sensor input signal required by the homing method matches the actual input		Adjust the homing method or adjust the sensor input signal logicAn unsupported homing method was selected
An unsupported homing method was selected	Check if an unsupported homing method is selected in object dictionary 6098h		Select a supported homing method

8.5 Alarm Clearing

8.5.1 Servo Drive Alarm clearing

Clearable alarms

Method 1:

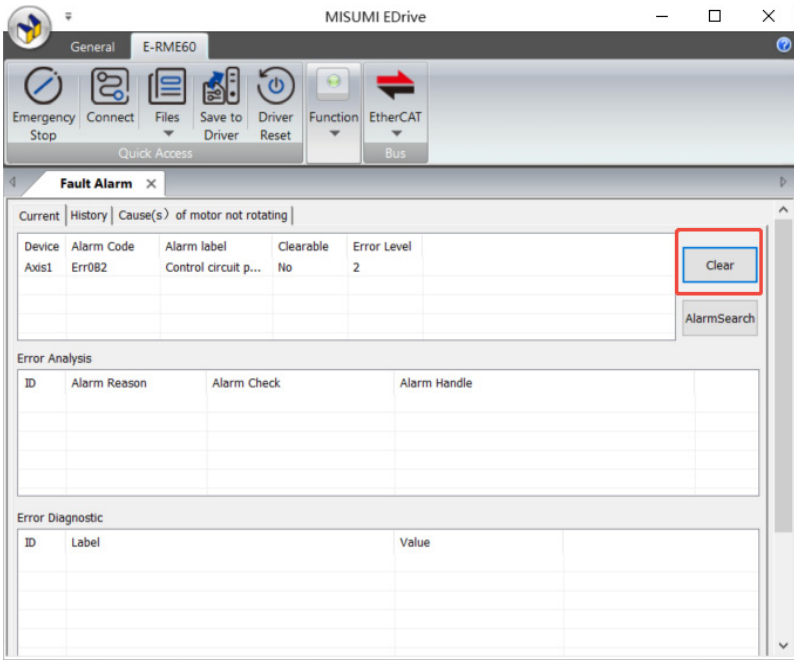
After confirming the issue, press M to select auxiliary function, Press 'S' to enter into "AF_ACL". Press and hold to clear the alarm.

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.

8.5.2 EtherCAT Communication Alarm clearing

EtherCAT communication related alarms are erasable and will not be recorded in alarm history.

Clearing EtherCAT communication alarm is similar to clearing servo drive alarm. Please clear the alarm before switching to 402 machine state. Can be solved according to following steps:

Step 1: Set bit 4 of ESC control register 0x120 (error responder) to 1.

Step 2: The communication alarm can be cleared until the feedback of the ESC status code register 0x134~0x135 is 0.

By setting bit 7 of 6040h to 1, switches state machine from Fault to Switch on disabled.

When a network failure occurs in the drive, the operation panel will display the fault code, and the ERR status indicator will show the corresponding signal. Additionally, error information from object dictionaries 1001h and 603Fh, which conforms to CIA/IEC standards, will be sent to the master station via an emergency message. The master station can determine the specific fault through the emergency message or the error codes from these two object dictionaries.

Chapter 9 Peripheral Devices

9.1 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.

9.2 Fuse and circuit breaker

9.2.1 Fuse

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

Table 9-1 Recommended Fuse selection table

Drive Model	Rated Input Current	Recommended Fuse		
		Manufacturer	Rated Current (A)	Model
Single pahse 220V				
E-RME30	4	Bussmann	20	FWP-20B
E-RME60	8.4		40	FWP-40C
Three phase 220V				
E-RME30	2.5	Bussmann	15	FWP-15B
E-RME60	4.6		35	FWP-35C

9.2.2 Electromagnetic contactor

Table 9-2 Recommended Electromagnetic contactor selection table

Drive Model	Rated Input Current	Recommended Electromagnetic contactor		
		Manufacturer	Rated Current (A)	Model
Single phase 220V				
E-RME30	4	Schneider	9	LC1 D09
E-RME60	8.4		12	LC1 D12
Three phase 220V				
E-RME30	2.5	Schneider	9	LC1 D09
E-RME60	4.6		9	LC1 D09

9.2.3 Circuit breaker

Table 9-3 Recommended Circuit breaker selection table

Drive Model	Rated Input Current	Recommended Circuit breaker		
		Manufacturer	Rated Current (A)	Model
Single phase 220V				
E-RME30	4	Schneider	6	OSMC32N2C6
E-RME60	8.4		16	OSMC32N2C16
Three phase 220V				
E-RME30	2.5	Schneider	4	OSMC32N3C4
E-RME60	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.

9.3 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 9-4 Recommended AC input reactor selection table (Three phase 220V)

Drive Model	Rated Input Current (A)	Inductance (mH)
E-RME30	2.5	5
E-RME60	4.6	5

9.4 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 9-5 Standard EMC filter model and exterior



EMC filter model		Exterior
SCHAFFNER	FN2090 series	
	FN3258 series	

Table 9-6 Recommended EMC filter selection table (SCHAFFNER)

Drive Model	Rated Input Current (A)	Recommended EMC filter
Single phase 220V		
E-RME30	4	FN 2090-4-06
E-RME60	8.4	FN 2090-10-06
Three phase 220V		
E-RME30	2.5	FN 3287-10-44-C28-R65
E-RME60	4.6	FN 3287-10-44-C28-R65

9.5 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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