

MISUMI

LMAC driver
E-RME Series (EtherCAT Type)

User Manual

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Version Update Record

- 1) Reproduction of part or all 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
1.0	01/2025	First release
1.1	01/2026	Revised some wrong information. Added parameter tables.

About obtaining the manual

This manual does not come 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/>

Preface

Thank you for purchasing E-RME series LMAC drivers!

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 reading 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 Rules	
 Danger	- The design of the product is not to be used in mechanical systems which may incur health hazards. - Users should be aware of the product safety precautions during design and installation of the equipment to prevent any unwanted accident.
Inspection	
 Warning	- 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.
 Caution	- Do not remove the package or place it violently to prevent damage to the internal components of the driver! - The use of damaged or faulty product(s) is prohibited
Storage and Transportation	
 Warning	- 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 driver circuit without electrostatic discharge precautions to avoid damaging the driver. - 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 driver. 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 driver and motor must be connected to ground.
- Incorrect voltage or power polarity may cause explosions or operational accidents.
- Connect the cables only after servo driver 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 driver.
- Prevent conductive fasteners and wire ends from entering the driver.
- Connecting wires or any non-heat resistant components should be put near to heat sink of the servo driver 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.

Tuning and Running

 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.

Debugging Operation

 Warning

- Make sure the wirings of servo driver and servo motor are installed and fixed properly before powering on, and within the rated input range of the driver.
- 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

 Warning

- 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 driver must be matched with specified motor.

• Frequent restart of the servo system might incur damage to the product. • Servo driver and motor will be hot to touch shortly after power off. Please be careful. • Modification(s) to servo system is prohibited.
Error Handling
 Warning • 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 • 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
 Caution • Servo driver 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 driver.

Safety Signs

To ensure safe operation, always follow the safety signs on the equipment.

The safety signs are explained as follows:



Warranty Terms

For products purchased from MISUMI (the “Company”) via official product catalogs or MISUMI’s official websites (including all global/regional domains, affiliated platforms, apps, and mini-programs—collectively, the “Official Website”), the warranty is governed by the usage guidelines and warranty terms stated on the Official Website or in the catalogs (“Warranty Terms”).

These Warranty Terms do not apply to custom-made products. Placing an order or using a product implies acceptance of the Warranty Terms.

If the product includes a manufacturer’s warranty, that warranty shall take precedence over these Warranty Terms.

Warranty Scope and Period

The warranty covers defects such as damage, deformation, or faults (collectively “defects”) attributable to the Company. The customer must document and notify the Company in writing within the warranty period (defined below). If the Company confirms the defect is its responsibility, it will repair or replace the defective product partially or fully at no cost.

However, if any of the following conditions apply, or if the Company’s website or product catalog states that repair or replacement is not authorized, the warranty will not apply.

- 1) Defects from use outside general industrial applications, excluding transport vehicles, medical devices, and household electronics.
- 2) Defects from use in aerospace, nuclear, military, or weapons applications.
- 3) Defects caused by customer’s careless or incorrect handling.
- 4) Defects caused by natural disasters (e.g., earthquakes, floods, fires).
- 5) Defects from not following specifications, usage instructions, or related documents on the website or catalog.
- 6) Defects caused by customer’s modification, repair, or disassembly.
- 7) Defects caused by other equipment.
- 8) Defects from use outside purchased Misumi Subsidiary and the areas it handles.
- 9) Defects due to inexperience or use beyond intended purpose or method.
- 10) Defects caused by customers violating usage rules or contracts.
- 11) Defects discovered or occurring after resale to third parties.
- 12) Other cases where repair or replacement is not accepted as stated on the website or catalog.

The warranty period for this product is one year from the date of shipment by the Company.

Minor scratches, stains, dents, or discoloration that do not affect use are not considered defects. However, if these are deemed severe by the Company, they will be treated as defects.

Customers must verify the product name, model, quantity, and condition within one week of receipt, and check against specifications on the website or catalog. Any defects must be reported in writing to MISUMI Customer Service within this period. If no notification is received, the product is considered accepted and free of defects. Repairs or replacements after the warranty period or outside the warranty scope will be charged.

Depending on the product’s nature, production date, or specifications, repairs or replacements may not be possible.

Disclaimer

Except as required by usage rules or product quality laws, the Company is not liable for any damages, losses, or costs caused by product defects, including defects in products made with it, recalls, or production stoppages.

If the customer violates usage precautions, they lose all rights to compensation from the Company.

Compensation for damage caused by product defects is limited to the purchase price of the damaged product.

Orders will not be accepted without the customers’ agreement to this limit.

If the Company is not the manufacturer as defined by product quality laws, the customer may seek liability directly from the actual manufacturer.

For damages caused by or related to the following reasons, the customer has no right to claim any compensation or reimbursement from the Company:

- 1) Damages caused by using defective products or resulting production line stoppages.
- 2) Damages caused by violating usage rules, product catalogs, or warranty terms.
- 3) Damages resulting from the customer’s intentional or negligent actions.
- 4) Damages caused by force majeure events beyond control.
- 5) Damages arising from intellectual property disputes related to product use.
- 6) Damages caused by export delays or prohibitions due to laws or regulations.
- 7) Losses resulting from defects found after the product is resold to third parties.

Precautions

Repairs or replacements must be made by returning the product, and no on-site service.

Product discontinuation may prevent replacement with the same item.

The Company may update warranty terms; continued orders mean acceptance.

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 driver 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 driver units must not be installed.
- The driver 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

Driver model number structure

<u>E-RM</u>	<u>E</u>	<u>30</u>
①	②	③
① Series No.	③ Current Rating 30: 2.8A 60: 6A	
② Product type A: Pulse + RS485 B: EtherCAT BUS		

1.3 Component Description

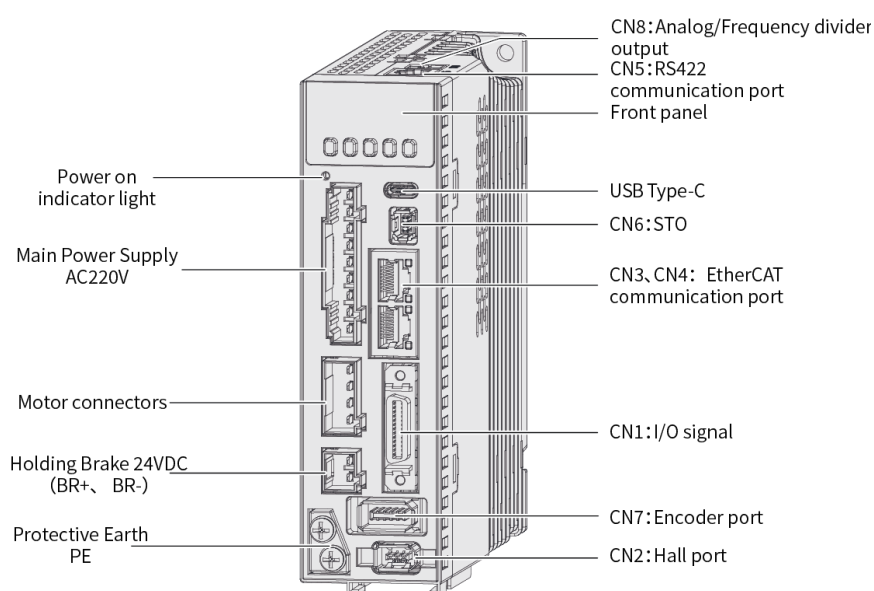


Figure 1-1 Driver and Component Diagram

Table 1-1 Driver Component Description

Parts & Connectors	Description
Front Panel	Including an LED display and 5 buttons. LED display is used to display servo driver status and parameter settings. 5 buttons : M: To switch between different modes and parameters ◀: Switch between value ▲: Switch between sub-menus/Increase ▼: Switch between sub-menus/Decrease S: Enter
Type-C Data Port	Connect to computer for tuning of servo driver. Parameters of the servo driver 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	EtherCAT communication port. CN3(IN) connects to Master or last Slave station. CN4(OUT) connects to next Slave station.
CN5 RS422 communication Port	RS422 communication Port
CN6 STO (Safety Torque Off)	STO connectors. Used for any application requiring STO functions.
CN7 Encoder Port	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 24VDC	BR+/BR- brake terminals
Power-on indicator light	Lights up when servo driver 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 220VAC	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 an external regenerative resistor is needed, connect it to P+ 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 drivers are equipped with built-in regenerative brake resistors. When using an external regenerative brake 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 Servo Driver Technical Specifications

1.4.1 Electrical Parameters

Table 1-2 E-RME30~E-RME60 Electrical Specifications

Driver Module		E-RMA30	E-RMA60
Power Rating (W)		400	1000
Rated Current (A)		2.8	7.0
Peak Current (A)		9.3	21.0
Control circuit power supply		1-Phase AC 200V~240V, -10%~+10%, 50/60Hz	
Main power supply		1-Phase/3-Phase AC 200V~240V, -10%~+10%, 50/60Hz	
Regenerative resistor	Resistance (Ω)	100	100
	Power rating (W)	50	50
	Braking 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 driver General Specifications Table

Interface Configuration		
Configuration Port		TYPE-C configuration port, support to modify or read driver parameters without connecting to main power supply.
Crossover Frequency Output		Supports phase A/B/Z differential crossover frequency output Supports phase Z open collector crossover frequency output
Analog Input		2 analog inputs (AI1~AI2) Input range: -10V~+10V, Max. voltage: $\pm 12V$
Analog Output		2 analog outputs (AO1/AO2), Output range: -10V~+10V
Digital Input		8 Digital Inputs DI1~DI8 (Supports common anode or cathode connection)
Digital Output		3 Digital output 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
Brake Output		Built-in brake output function, no external relay required
Communication Interface		EtherCAT Protocol, RJ45 port
Control Mode		
Control		• 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		
Driver Mode	IGBT SVPWM sinusoidal wave driver	
Feedback Method	Encoder: RS485 Protocol	
Standardized Parameters	Quick tuning of servo driver parameters through PC tuning tools.	
Easy-to-use	One-click tuning, Single parameter tuning, Black box, Zero tracking control	
Notch Filter	Mechanical resonance suppression. Supports up to 3 filters,50Hz~4000Hz	
Vibration suppression	End vibration suppression	
DI/DO settings	Digital inputs and outputs can be set accordingly	
Alarm	Overcurrent. Overvoltage. Undervoltage. Overheat. Overload. Overtravel. Single-Phasing. Regenerative resistor error. Position deviation error. Encoder feedback error. Excessive braking rate. EEPROM error	
Front Panel	5 push buttons, 8-segments display, 5 warning LEDs	
Software	Driver 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 driver with different motors or loads. Variables (velocity, position deviation, etc.) monitoring using step diagrams.	
Communication	USB Type-C: Based on the Modbus protocol (compliant with USB 2.0 specifications), it can connect to a computer for parameter configuration and status monitoring.	
	E-RME 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.	
Input signal		
General Mode	DI points: 8 (Supports common anode or cathode connection) Assignable input signals: • Clear Alarm (A-CLR), Positive limit switch (POT), Negative limit switch (NOT) • Homing switch (HOME-SWITCH), Emergency stop (E-STOP)	
Output Singal		
General Mode	DO points: 3 (3 double-ended) Assignable output signals: • 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	Installation: 0-55°C (Not frozen). Reduce the load when operating above 45°C. For every 1°C increases, reduce the load by 2%. ^[1] Storage: -20-80°C (Condensation free). Do not store for more than 72 hours at temperatures exceeding 65°C!
Humidity	Under 90%RH (Condensation free)
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 driver 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 driver, 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 driver'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 Driver Installation and Storage Environment Requirements

Item	Condition
Environment Temperature	0~+55°C - 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

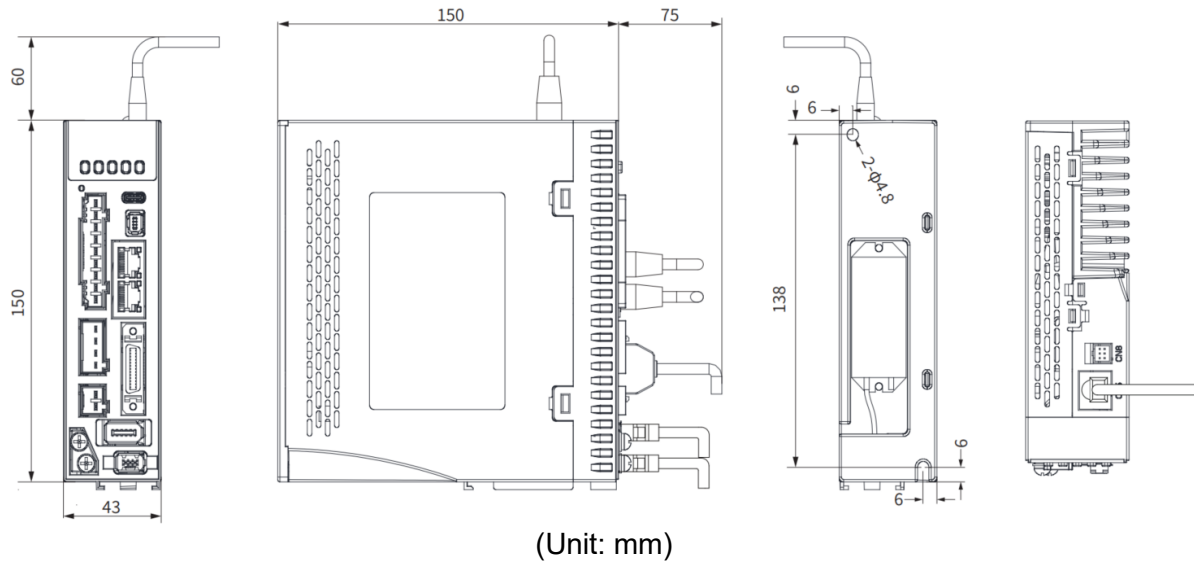
Note:

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

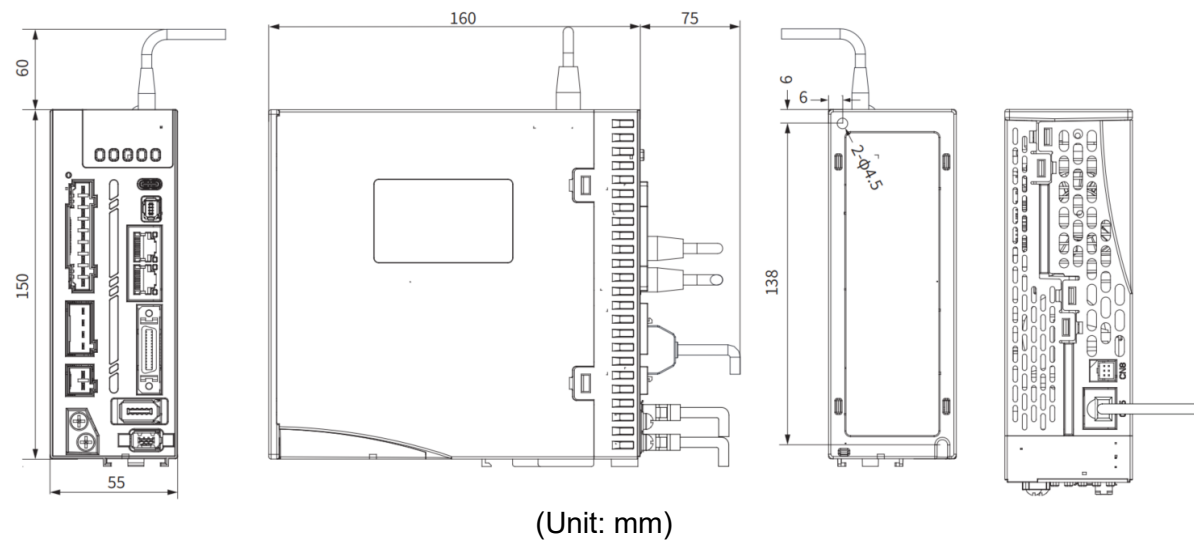
2.3 Servo driver Dimension

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

E-RME30



E-RME60



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 vertically to the mounting surface facing upwards. In order to ensure efficient heat dissipation, please leave at least 10mm of installation space between drivers. When reserving installation space, ensure a clearance of at least 50mm on each side in the longitudinal direction.

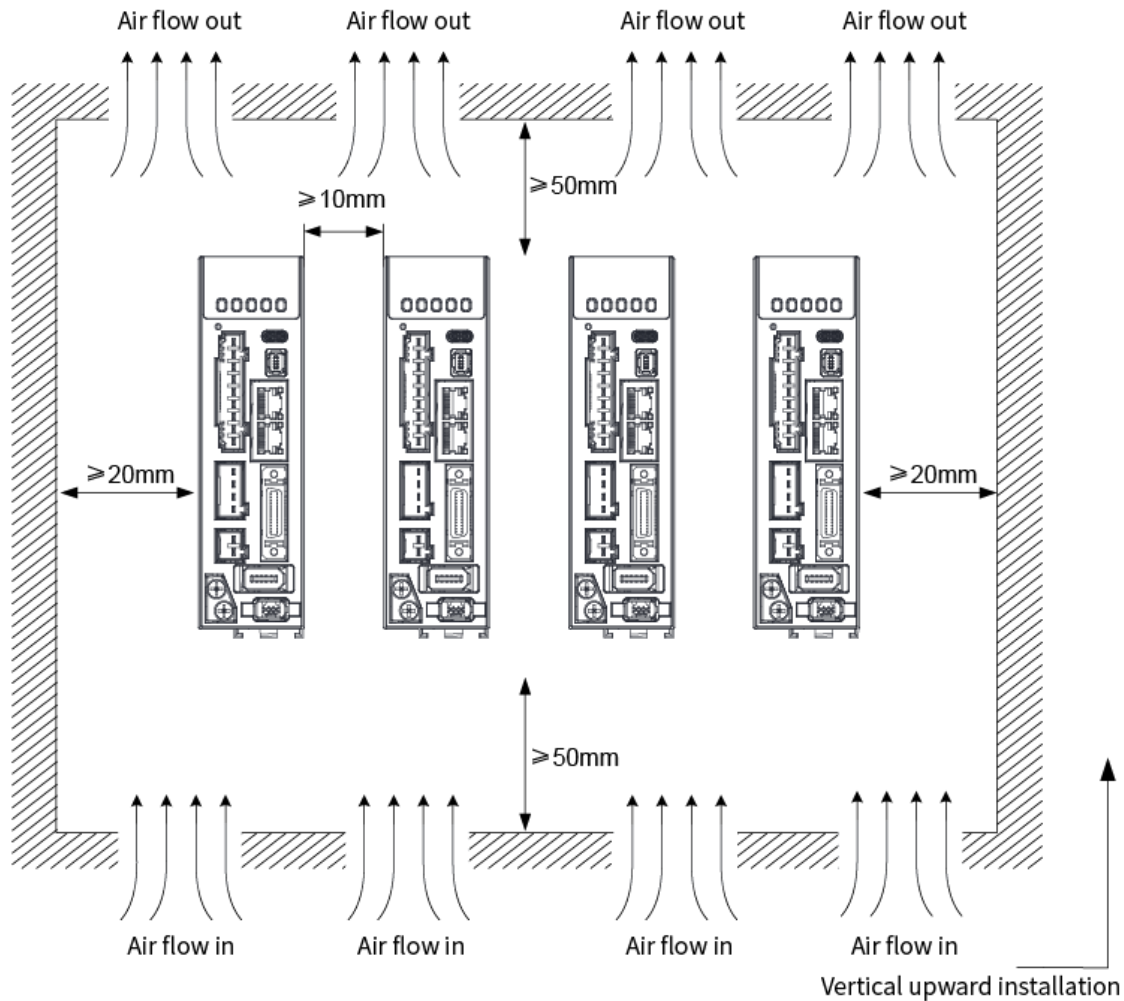


Figure 2-1 Installation Space Diagram with Reserved Clearance

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

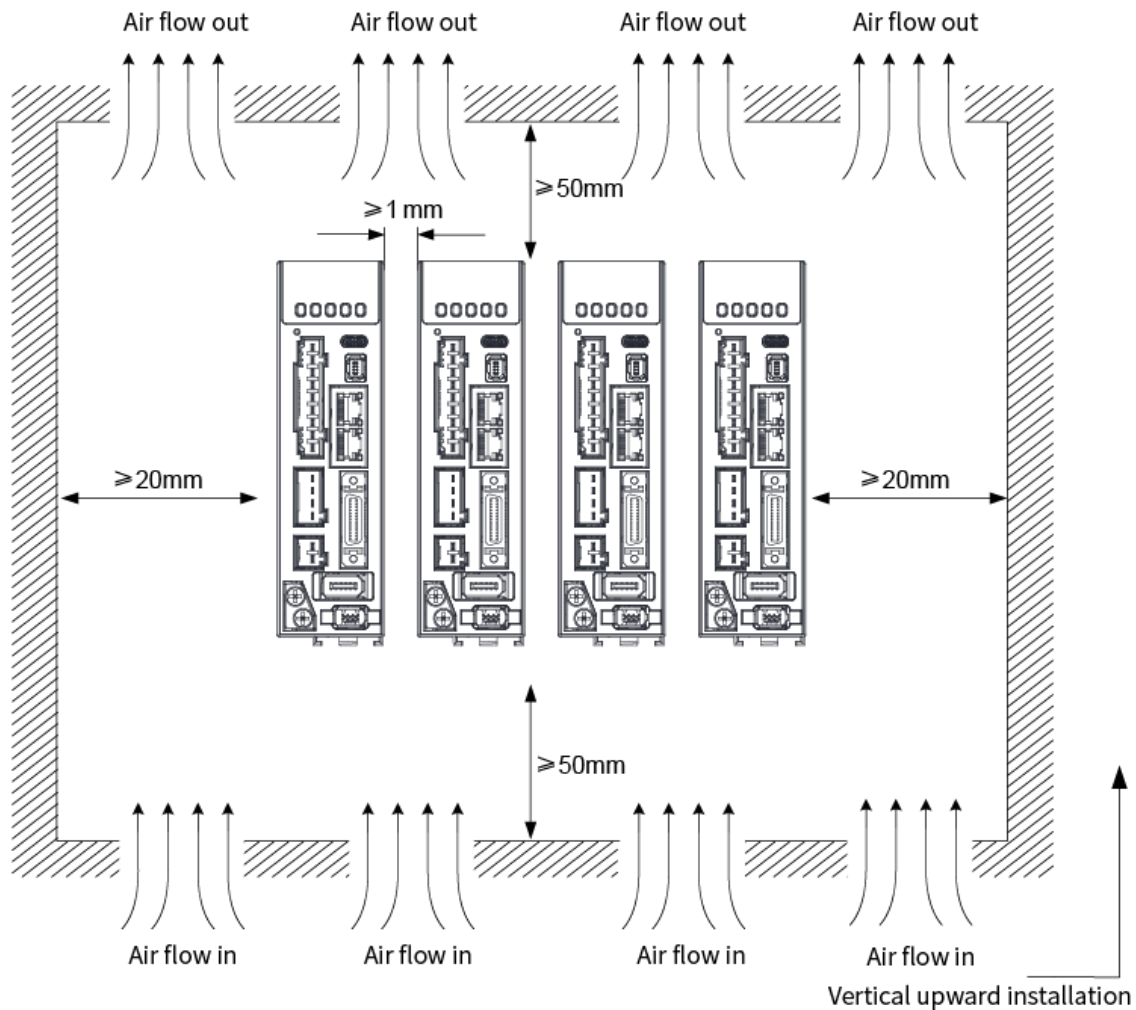


Figure 2-2 Compact Installation Space Diagram

Installation Precautions

1. Method

Please install the driver vertically 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 drivers.

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

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

2. Cooling

To ensure cooling through fans and natural convection, sufficient heat dissipation space must be left around the driver. Additionally, considering the heat dissipation of other components in the cabinet, please install a cooling fan above the driver. To prevent areas within the driver'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 driver, the cables connecting to the driver should be routed downwards. Please ensure there is no liquid around the wiring and connectors as liquid leakage may cause serious damage to the driver(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 driver 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 driver (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 driver from experiencing a fault and continuing to carry large currents, which could lead to a fire.
- Ensure that the input power to the driver is within the specified voltage fluctuation range, otherwise, it may lead to product failure.
- Do not connect the driver'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 driver'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 driver 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 driver 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 driver.
- The driver 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 E-RME Wiring Diagram

E-RME 220VAC Wiring Diagram

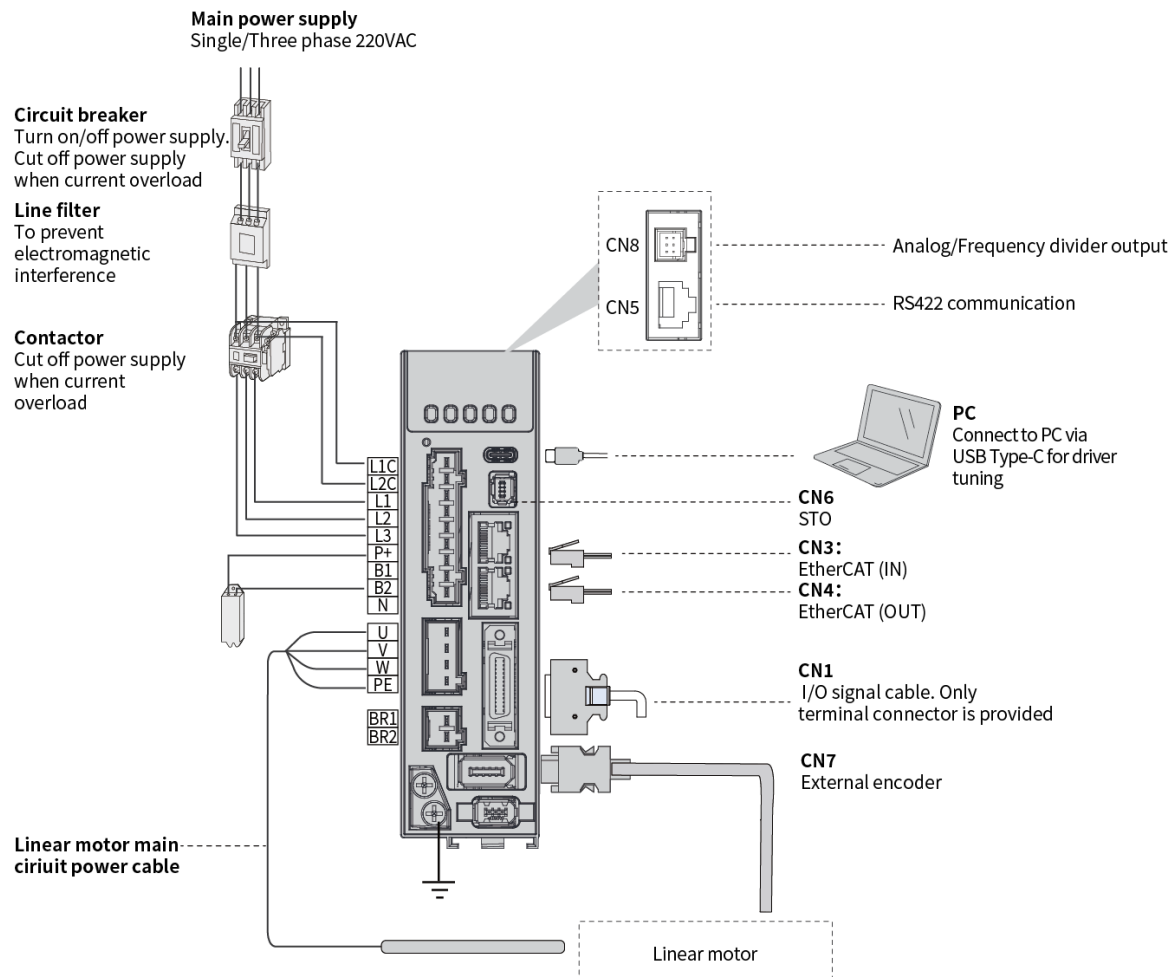


Figure 3-1 Single phase 220VAC Wiring Diagram

- 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 driver 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

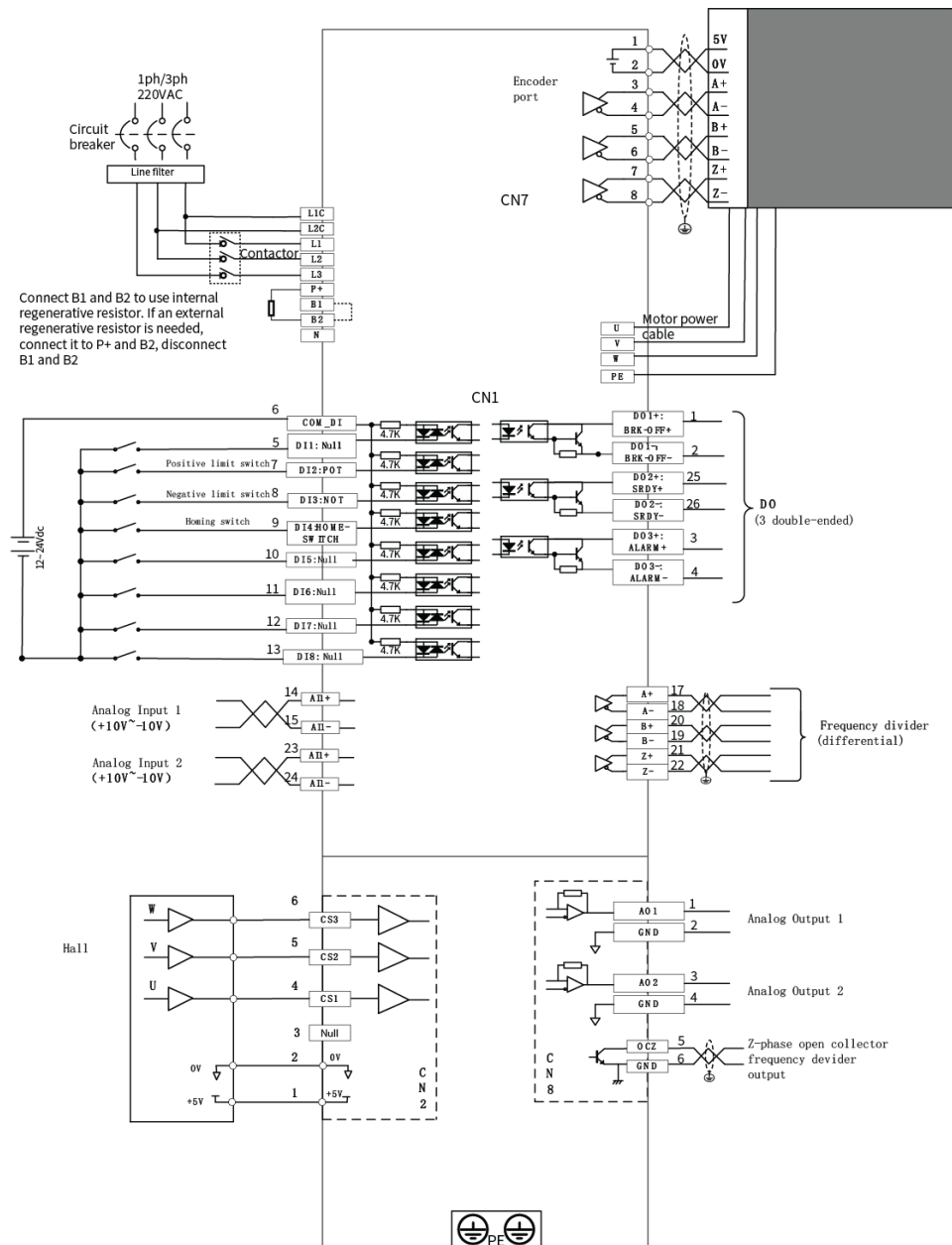


Figure 3-2 Standard wiring for position control mode

3.3 Ports Assignment

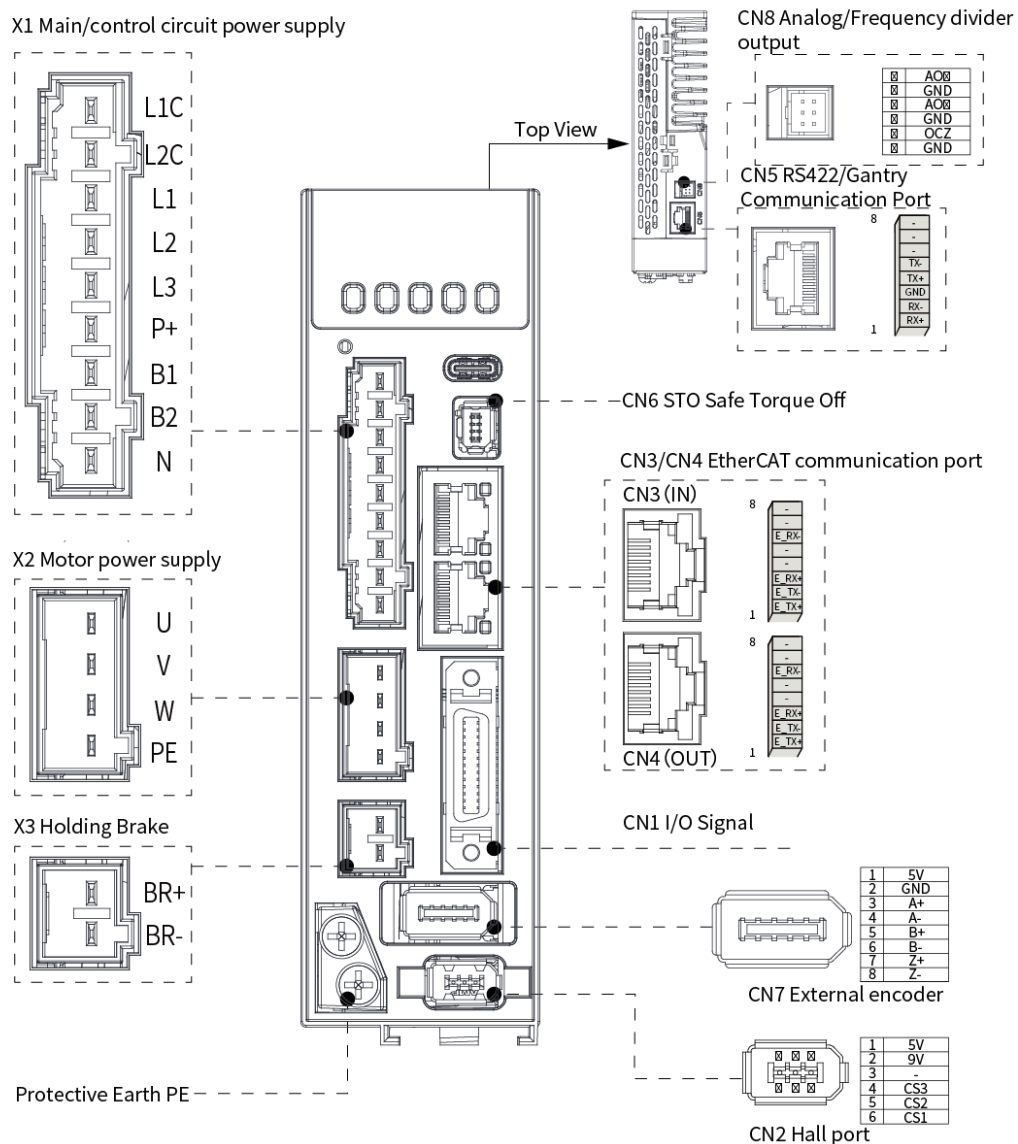


Figure 3-3 Ports pinout diagram

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

Table 3-1 Description of each port

Port	Description
CN1	I/O Signal (26 pins)
CN2	Hall port
CN3	EtherCAT communication port (IN)
CN4	EtherCAT communication port (OUT)
CN5	RS422 Communication Port
CN6	Safe Torque Off (STO)
CN7	External encoder
CN8	Analog/Frequency divider output
X1/X2	Main/Control circuit power supply; Motor power supply
X3	Holding Brake
USB	USB Type-C (Connect to PC)

3.4 X1 - Main/Control Circuit Power Supply

3.4.1 Main/Control Circuit Power Supply X1

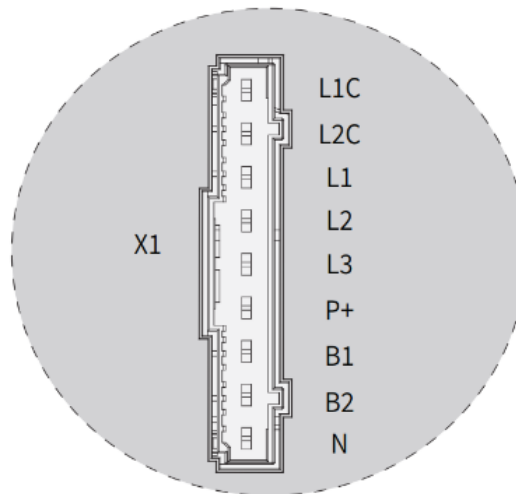


Figure 3-4 Main circuit port pinout diagram

Table 3-2 Main circuit port labels and function descriptions

Table 3-2 Main circuit port labels and terminal assignments			
Pin	Label	Explanation	Remarks
L1C	Control circuit L1	Control circuit power supply. Single phase 220VAC.	• Optional isolated switching power supply. • Connecting to 380VAC will cause damage to driver. • Line filter is suggested in environment with strong interference. • Use a fuse-less circuit breaker to turn on/off power supply to driver.
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.
B1	Regenerative resistor terminal	Internal regenerative resistant drawing terminal	If an external regenerative resistor is needed, connect it to P+ and B2, disconnect B1 and B2.
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

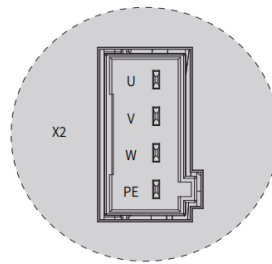


Figure 3-5 Motor power output port pinout diagram

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

Pin	Label	Explanation	Remarks
U	U terminal	To motor U terminal	- Please make sure U, V, W terminals of driver and motor are correctly connected. - Connect motor PE to driver 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 driver. This energy will first be stored in internal capacitors of the driver. When the energy stored in the capacitors reaches 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 resistors

E-RME series servo drivers 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	Internal regenerative resistor Resistance (Ω)	Internal regenerative resistor Power rating (W)	Minimum resistance allowed (Ω)	Minimum power allowed (W)
E-RME30	100	50	50	50
E-RME60	100	50	40	50

Regenerative resistor connection

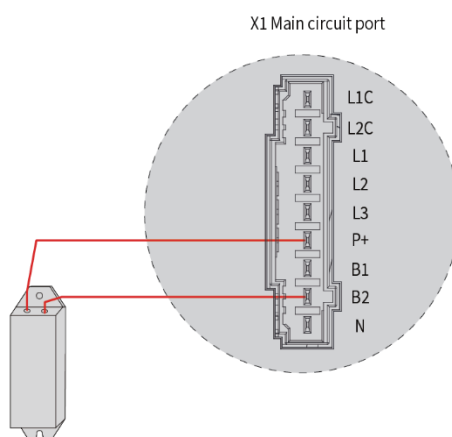


Figure 3-6 Regenerative resistor connection diagram

⚠ 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 driver. Please refer to "Table3-4 Regenerative Resistor Specifications Table".
- Please confirm PRO.16 and PRO.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 driver output current specifications

Model	Rated Current (Arms)	Peak Current (Arms)
E-RME30	2.8	9.3
E-RME60	6.0	21.0

Main power supply cable selection

- Wire gauge

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

Table 3-5 Main power supply wire gauge

Model	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

- 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 driver and servo motor together with resistance $<100\ \Omega$.
- 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 driver failure.

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

- Wire gauge
Recommend using stranded and shielded cables. For CN1, $\geq 0.14\text{mm}^2$, CN2 $\geq 0.25\text{mm}^2$ shielding layer needs to be grounded.
- Length
Cable length should be as short as possible. No more than 3m for CN1 and 15m for CN2.
- Placement
Place the cable away from power cables.

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

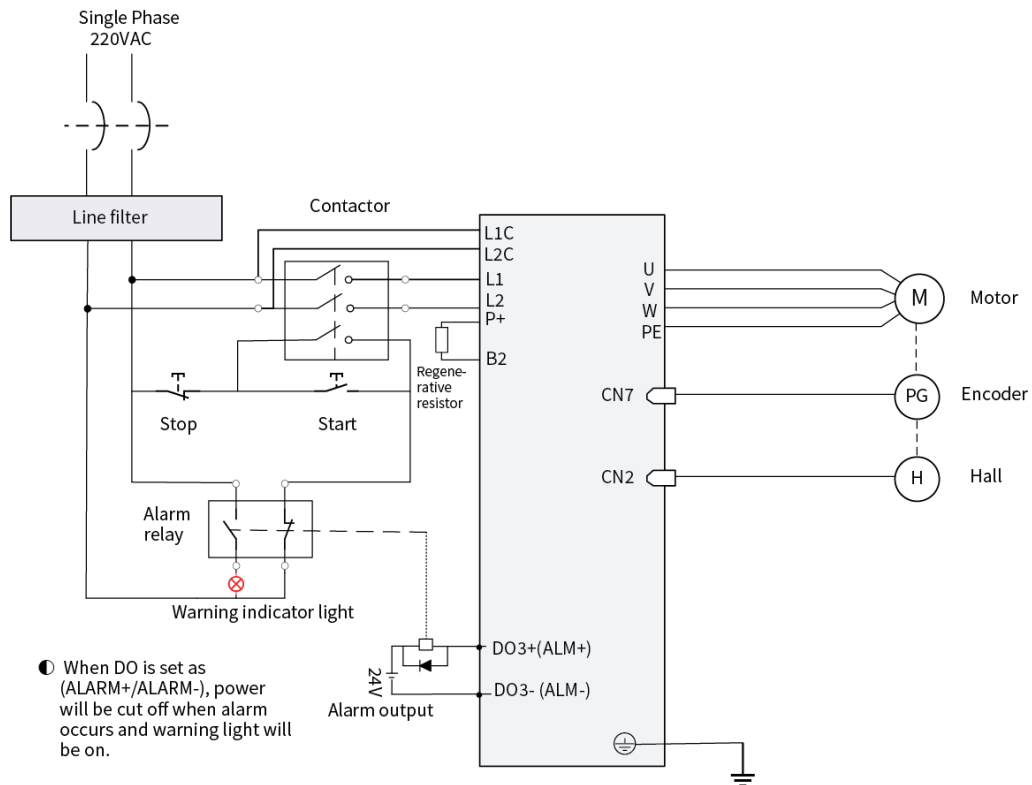
Install a surge suppressor in feedback circuit flyback diode inversely connected in parallel in DC coil and capacitor connected in parallel in AC coil.

Caution

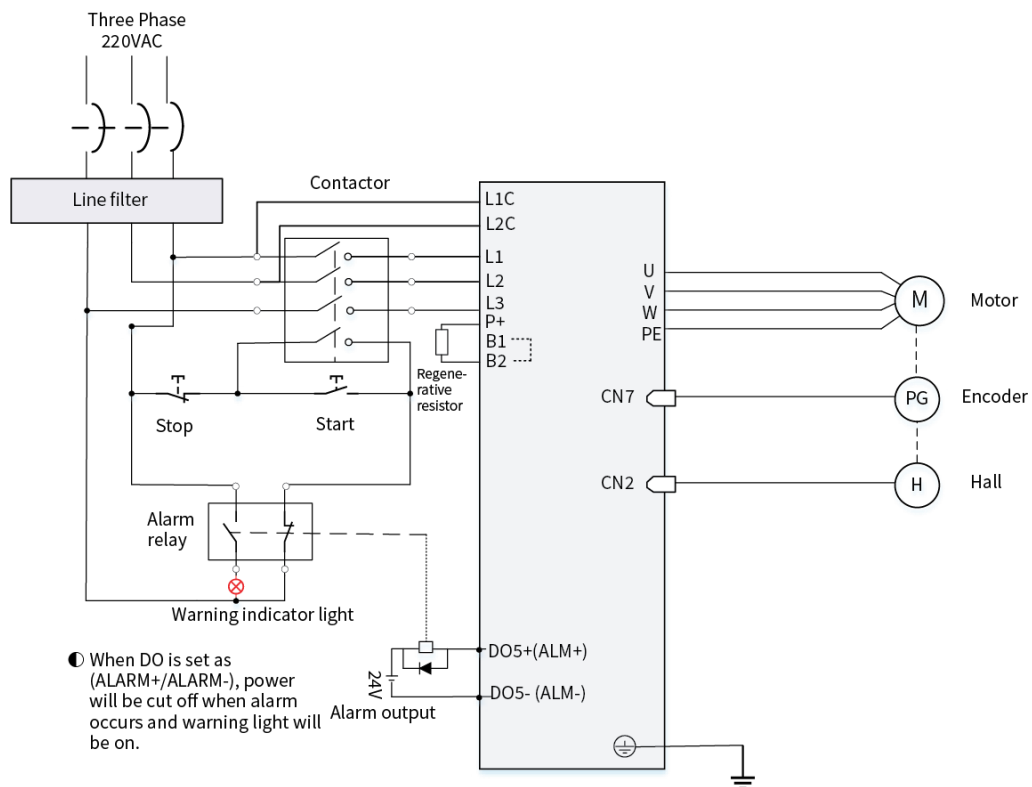
- U, V, and W must be connected to the motor windings correspondingly and must not be reversed.
- Cables and wires should be securely fixed and kept away from the driver's heat sink and the motor to prevent insulation degradation due to heat.
- The driver contains large-capacity electrolytic capacitors,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

3.4.5 Single/Three Phase Power Supply Wiring Diagram

Single Phase 220VAC



Three Phase 220VAC

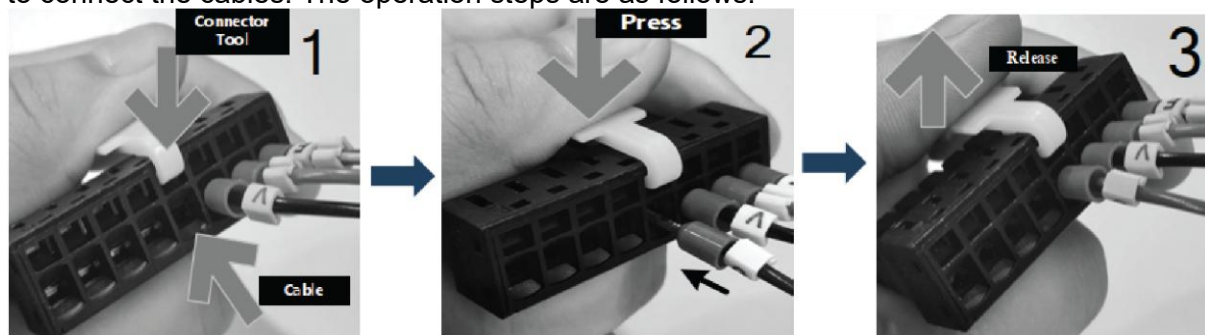


3.4.6 Precautions for Main Circuit Wiring

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

To fix wire cables into connectors

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 Driver and Linear Motor Power Cables

For motor power cables, MISUMI provides optional accessories:

- Cables are available in three selectable lengths: 1 meter, 3 meters, 5 meters, 8 meter and 10 meters.



Note:

- If other cable lengths are required, please contact our sales department in advance.
- When connecting the motor power cable to the driver, 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 driver's main circuit terminals.

3.6 CN1 - Control Signal Port Connection

E-RME series driver CN1 control signal connector uses SCSI 26 PIN connector. The specific definitions are as follows:

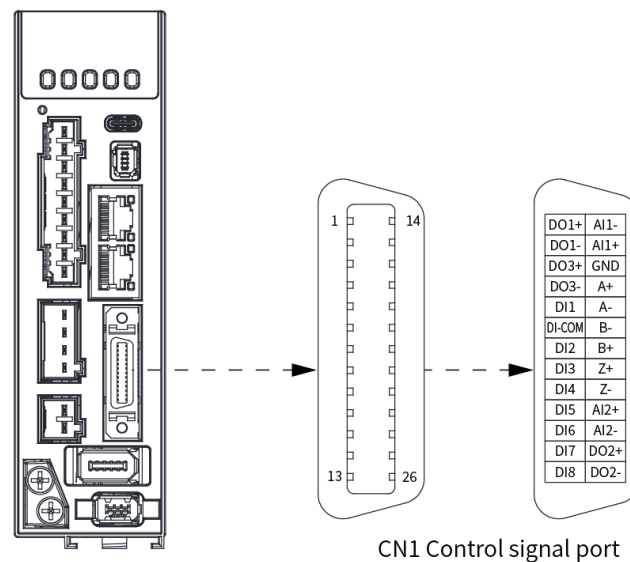
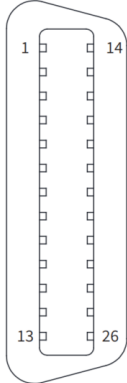


Figure 3-7 Control signal connector CN1 schematic diagram

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

Port	Diagram	Pin	Signal	Label	Description
CN1		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+	Release external brake
		2	DO1-	BRK-OFF-	
		25	DO2+	SRDY+	Servo ready
		26	DO2-	SRDY-	
		3	DO3+	ALM+	Servo driver alarm
		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	AI 1+	AI1	Analog input 1
		15	AI 1-		
		23	AI 2+	AI2	Analog input 2
		24	AI 2-		
		Frame	-	FG	Frame grounding

CN1 signal cable selection

To ensure I/O signals are not 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 50-pin connector.

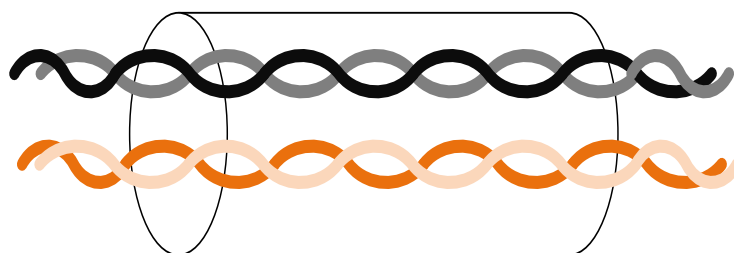


Figure 3-8 Shielded Twisted-Pair Cable Diagram

IO signal wiring

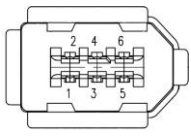
IO signals include digital input (DI), output (DO) signals, and relay output signals. When wiring control circuits, they should be kept at least 30 cm apart from main circuit wiring (L1C/L2C/L1/L2/L3, U/V/W) and other power lines, as placing them too close can cause interference with IO signals.

3.7 CN2 - Hall Port Connection

Hall connector CN2

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

Table 3-7 Hall connector - CN2 pin assignment

Port	Diagram	Pin	Signal	Description
CN2		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	Frame 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

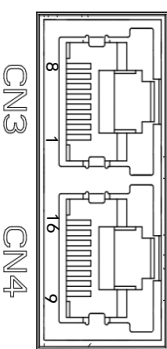
- Make sure to reliably ground the shielded layer on both the driver and motor sides to avoid false alarms in the driver!
- It is recommended to use twisted pair shielded cables for the Hall wires and avoid using excessively long cables.
- Hall wires and power cables must be routed separately to prevent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

3.8 CN3/CN4 - Ethercat Communication Port Connection

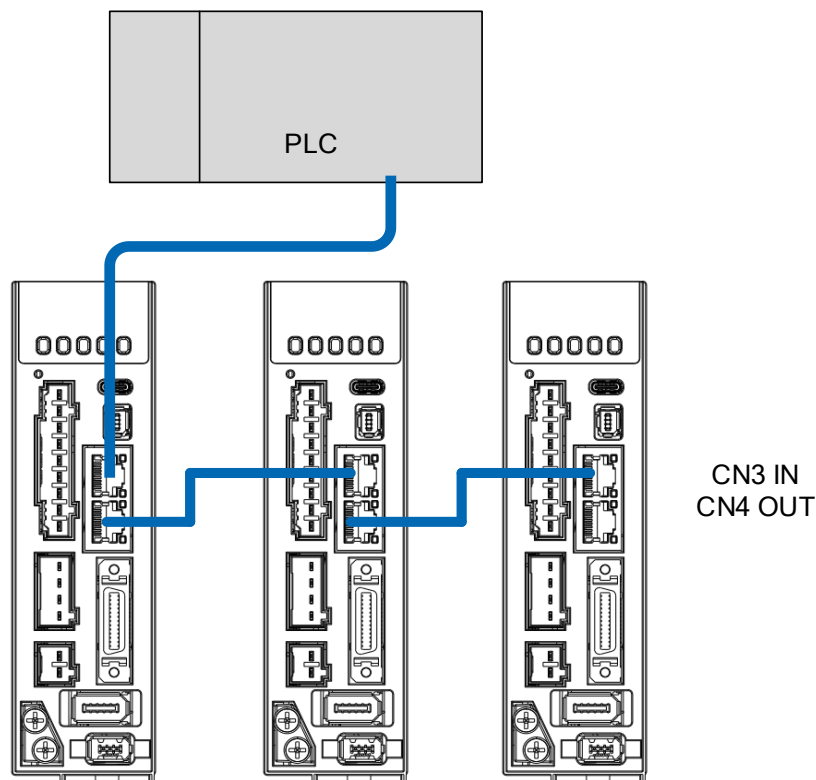
Communication port pin definition

The E-RME series drivers 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

Port	Diagram	Pin	Signal	Description
CN3 CN4		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 drivers feature EtherCAT communication functionality and support the following connection options:
 - Multiple drivers can communicate with the master device.
 - A single driver can communicate with the master device.



3.9 CN6 - Safe Torque Off (STO) Port

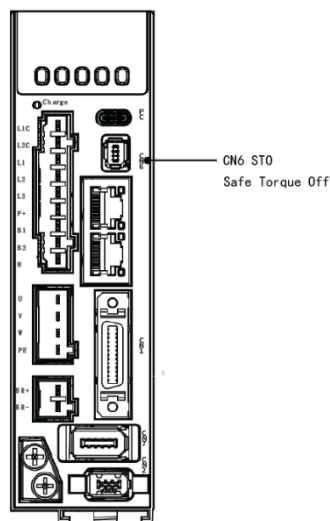


Table 3-9 STO port pin assignment

Port	Diagram	Pin	Signal	Description	Remarks
CN6		1	24V	24v power supply	Connect to SF1 and SF2 when not in use. Do not use to supply power.
		2	0V	Reference ground	
		3	SF1-	Control signal 1 negative input	When SF1 = OFF or SF2 = OFF, STO is enabled.
		4	SF1+	Control signal 1 positive input	
		5	SF2 -	Control signal 2 negative input	
		6	SF2+	Control signal 2 positive input	
		7	EDM-	External monitoring device (EDM) with differential double ended output	When SF1 = OFF and 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 PWM control signal from the power module. When the motor current is cut off, the motor will still move under inertia and stop 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 driver 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 driver 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 driver, so there is still a risk of electric shock. When performing maintenance on the driver, always disconnect the power supply and other devices.

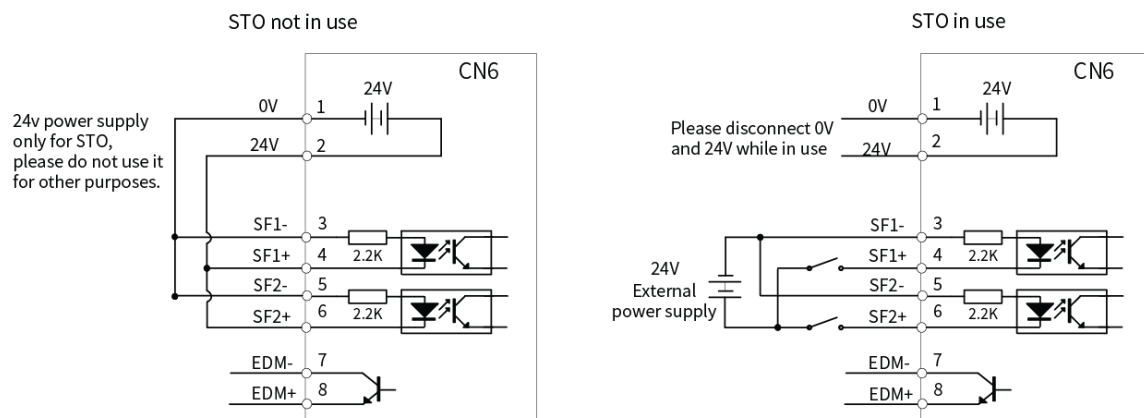
- 3) Please use a single power source to supply the STO signal input. Otherwise, leakage current may cause the STO function to malfunction, preventing the system from entering the STO OFF state.

STO functional principle

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

SF1 Input	SF2 Input	EDM Output	PWM Control	Alarm
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

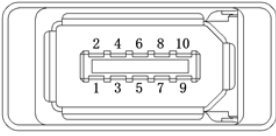


3.10 CN7 - Encoder Port Connection

Encoder port CN7

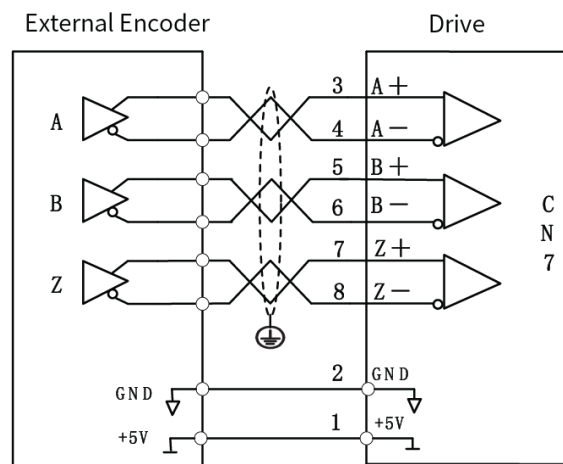
Encoder port CN7 uses 1394 10PIN connector and simultaneously supports two encoder feedback modes: incremental A, B, Z and BISS-C. Please connect according to the encoder feedback type supported by the motor.

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

Port	Diagram	Feedback type	Pin	Signal	Description
CN7		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.

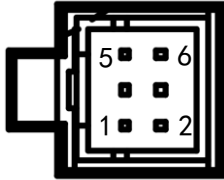


Note

- Please connect the encoder reference ground terminal to driver ground terminal. Recommended to use double winding cable with shielding foil, Connect the shielding foil to CN7 connector to reduce noise interference.

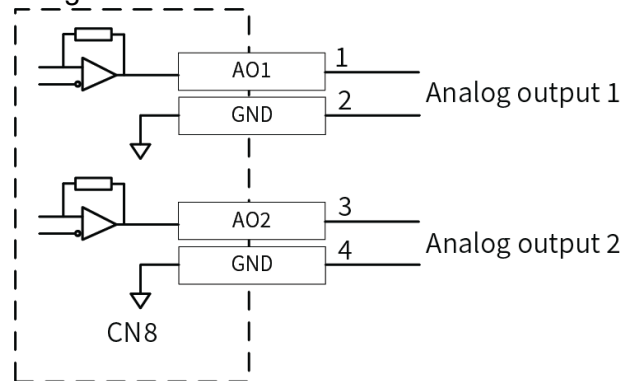
3.11 CN8 - Analog/Z-Phase Open Collector Output Port

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

Port	Diagram	Pin	Signal	Description	Remarks
CN8		1	AO1	Analog output 1	
		2	GND	Signal ground	
		3	AO2	Analog output 2	
		4	GND	Signal ground	
		5	OCZ	Z-Phase open collector output	Only NPN Open collector output
		6	GND	Signal ground	

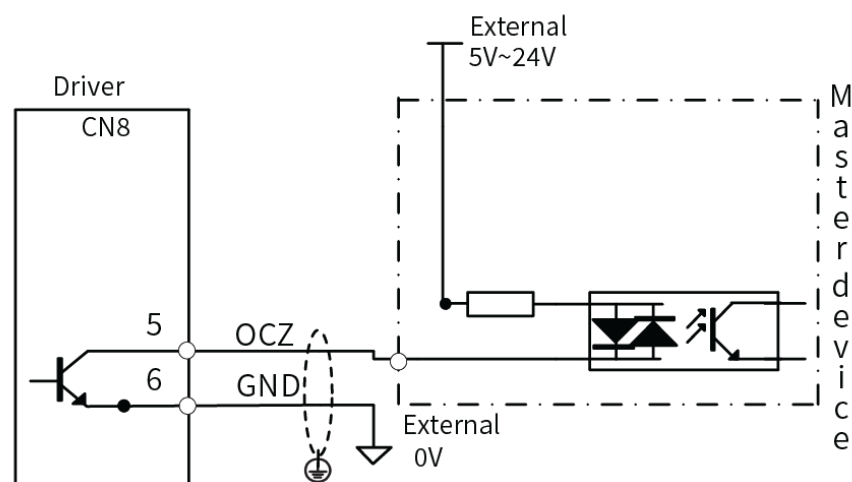
Analog outputs

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 USB Type-C Tuning Port

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

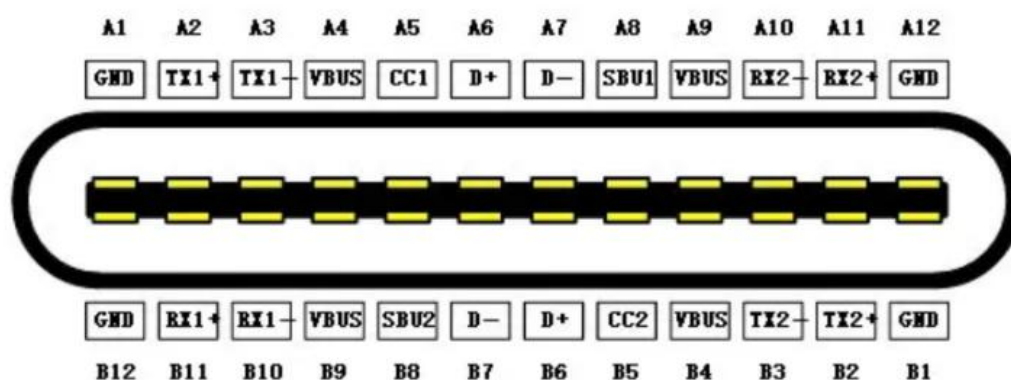


Figure 3-9 Driver TYPE-C pin assignment

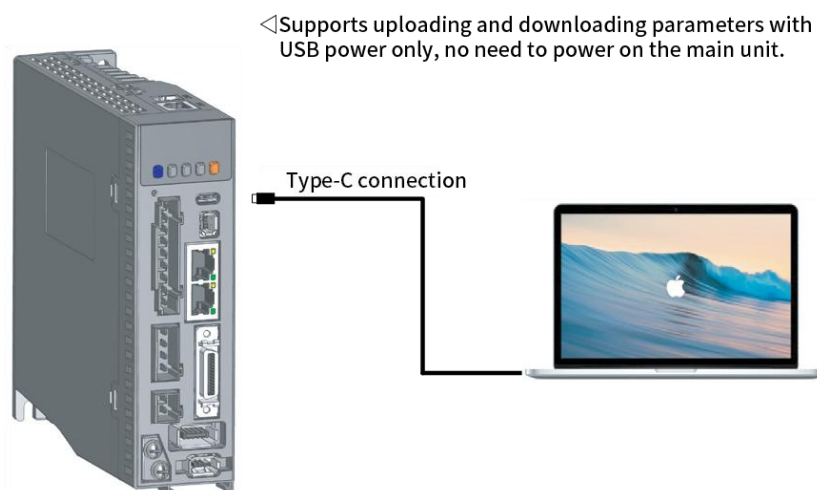
Table 3-11 TYPE-C communication port pin assignment

Port	Pin	Signal	Description
USB Type-C	A4, B4, A9, B9	VCC 5V	Power supply positive terminal 5V
	A12, B12, A1, B1	GND	Power supply negative terminal
	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 driver, 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 Turning Port Wiring Example



3.13 I/O Signal

3.13.1 Analog Input Circuit

Analog input signal

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

Table 3-12 Analog input signal pin assignment

CN1 Pin	Signal	Description
14	AI1+	Differential, Input voltage: $\pm 10\text{VDC}$, Input resistance: $20\text{k}\Omega$
15	AI1-	
23	AI2+	
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.

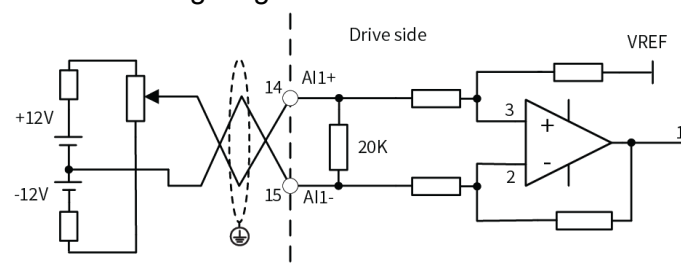


Figure 3-10 Analog AI1 input port

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.

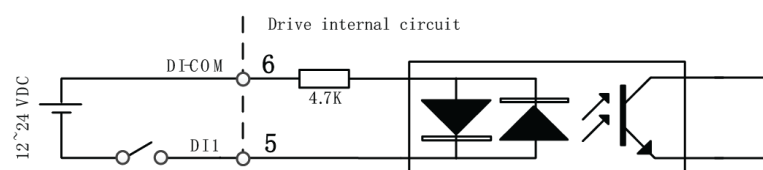
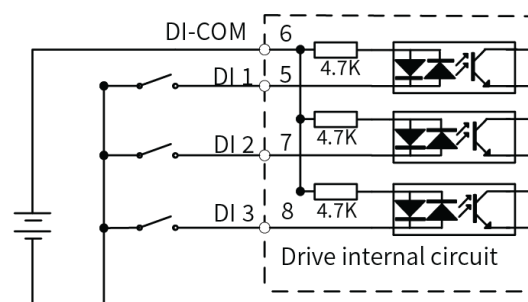


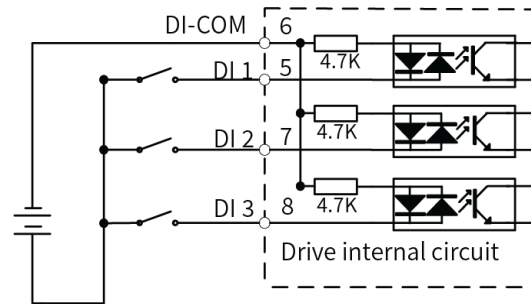
Figure 3-11 General digital IO input circuit

① Output from master device: Relay

Common anode:

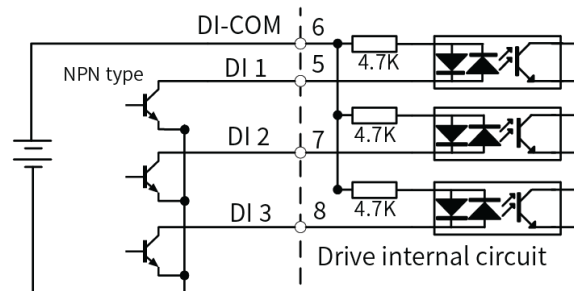


Common cathode:

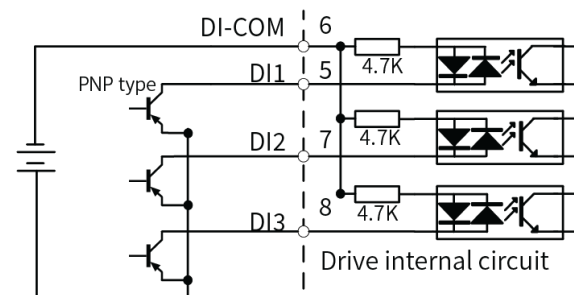


② Output from master device: Open Collector

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

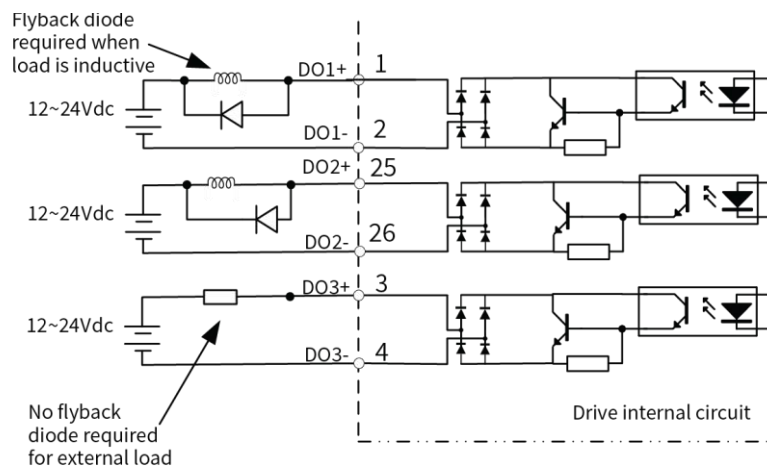
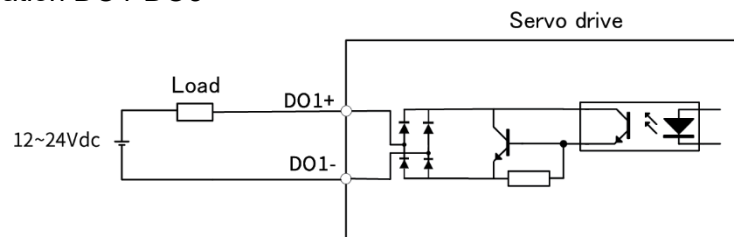
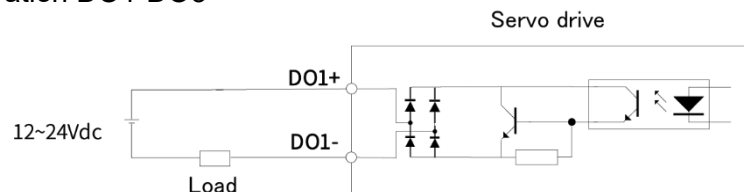


Figure 3-12 General digital IO double-end output circuit

- NPN configuration DO1-DO3



- PNP configuration DO1-DO3



⚠ Caution

- Power supply is provided by users. Please be aware that reversed power supply polarity might cause damage to the driver.
- 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. The wrong installation of the flyback diode might cause damage to the driver.
- Pins 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

E-RME driver reuses DI5 and DI6 as probe input terminals. Internal circuit is a bidirectional optocoupler.

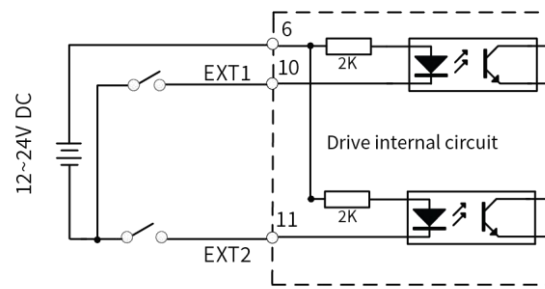


Figure 3-13 Probe function connector internal circuit

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 crossover frequency output	Differential, High≥2.5VDC, Low≤0.5VDC, Max current±20mA
18	A—		
20	B+	Motor encoder B-phase crossover frequency output	
19	B—		
21	Z+	Motor encoder Z-phase crossover frequency output	
22	Z—		
16	GND	Open collector signal ground	

Encoder frequency divider output (differential output method)

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

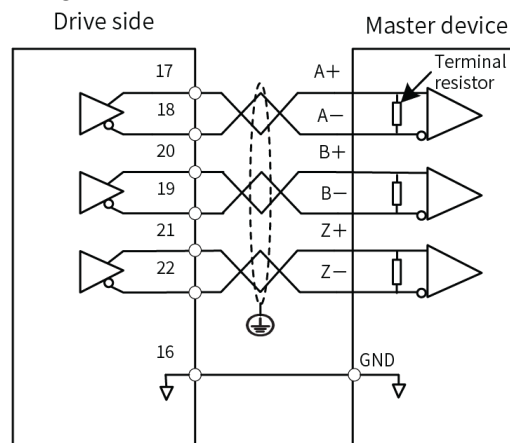


Figure 3-14 Encoder frequency divider output (differential output) circuit

⚠ 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 driver with the differential reception GND of the master device.

3.14 Digital Input/Output Signal**3.14.1 Digital Input Signal Settings****Control input****Default status**

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

Note

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

⚠ Caution

- When limit switch or emergency stop is used, POT, NOT and E-STOP signal will be normally closed (NC) by default. Please make sure there is no safety concern if these signals need to be set to normally open (NO)

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	Label	DI1			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2400	SubIndex	0x00	Attribute	R/W			
Digital input DI allocation using hexadecimal system											
Input	Symbol	Set Value				0x60FD (bit)					
		Normally open		Normally close							
Invalid	-	0h		-		x					
Positive limit switch	POT	1h		81h		Bit1					
Negative limit switch	NOT	2h		82h		Bit0					
Clear alarm	A-CLR	4h		-		x					
Forced alarm	E-STOP	14h		94h		x					
Home switch	HOME-SWITCH	16h		96h		Bit2					
Please don't set anything other than listed in table above. Normally open: Valid when input = ON Normally close: Valid when input = OFF. Er210 might occur if same function is allocated to different channels at the same time. Channel that has no value doesn't affect driver motion. Front panel is of hexadecimal system. P04.00 – P04.07 corresponds to DI1 – DI8. External sensors can be connected if the parameters are all set to 0. Controller will read 60FD bit4 – 11 to get DI1 – DI8 actual status.											

P04.01	Label	DI2			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x1	Unit	-					
	Valid	Immediate	Index	0x2401	SubIndex	0x00	Attribute		R/W		

P04.02	Label	DI3			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x2	Unit	-					
	Valid	Immediate	Index	0x2402	SubIndex	0x00	Attribute	R/W			

P04.03	Label	DI4			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x16	Unit	-					
	Valid	Immediate	Index	0x2403	SubIndex	0x00	Attribute	R/W			

P04.04	Label	DI5			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2404	SubIndex	0x00	Attribute	R/W			

P04.05	Label	DI6			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2405	SubIndex	0x00	Attribute	R/W			

P04.06	Label	DI7			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2406	SubIndex	0x00	Attribute	R/W			

P04.07	Label	DI8			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2407	SubIndex	0x00	Attribute	R/W			

3.14.2 Digital Output Signal Settings

Control output

Default status

CN1	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 PIN	Output	Parameters
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

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

Associated parameters and function allocation code overview table

P04.10	Label	DO1			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x3	Unit	-					
	Valid	Immediate	Index	0x2410	SubIndex	0x00	Attribute	R/W			
Digital output DO allocation using hexadecimal system.											
Output		Symbol	Set Value								
			Normally open			Normally close					
Master device control		-	00h			-					
Alarm		ALM	01h			81h					
Servo-Ready		S-RDY	02h			82h					
External brake released		BRK-OFF	03h			83h					
Positioning completed		INP	04h			84h					

At-speed	AT-SPEED	05h	85h
Torque limit signal	TLC	06h	86h
Zero speed clamp detection	ZSP	07h	87h
Velocity coincidence	V-COIN	08h	88h
Position command ON/OFF	P-CMD	0Bh	8Bh
Velocity limit signal	V-LIMIT	0Dh	8Dh
Velocity command ON/OFF	V-CMD	0Fh	8Fh
Servo status	SRV-ST	12h	92h
Homing done	HOME-OK	22h	A2h
Position comparison	CMP-OUT	14h	94h
Please don't set any other than the outputs listed in the table above. Normally open: Active low. Normally close: Active high. Front panel is of hexadecimal system. P04.10 – P04.12 corresponds to DO1 – DO3. If all parameters are set to 0, master device controls the outputs, object dictionary 0x60FE sub-index 01 bit16-18 corresponds to DO1-DO3.			

P04.11	Label	DO2			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x2	Unit	-					
	Valid	Immediate	Index	0x2411	SubIndex	0x00	Attribute		R/W		

P04.12	Label	DO3			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x81	Unit	-					
	Valid	Immediate	Index	0x2412	SubIndex	0x00	Attribute		R/W		

3.15 Measures Against Electromagnetic Interference

To reduce interference, please take the following measures:

- Encoder cable < 15m.
- Use cable with larger diameter for grounding
 - Grounding resistance < 100Ω.
 - When there are multiple drivers connected in parallel, PE terminal of the main power supply and ground terminal of servo drivers 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:
 - Install master device and line filter close to the servo driver.
 - Install surge suppressor for relay and contactor.
 - Please separate signal/encoder cable from power cable with a space of at least 30cm.
 - 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 Connection and Other Anti-Interference Wiring Connections

As a key device in motion control systems, the driver has high requirements for interference resistance. Differences in peripheral wiring and grounding of the driver 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 driver 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 driver, 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.

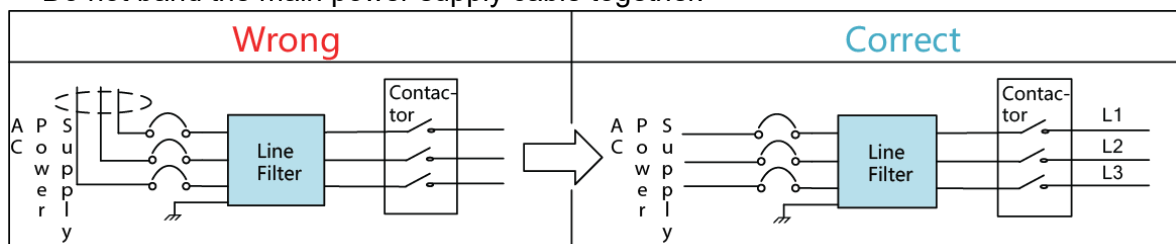


Figure 3-15 Line filter input wiring separation diagram

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

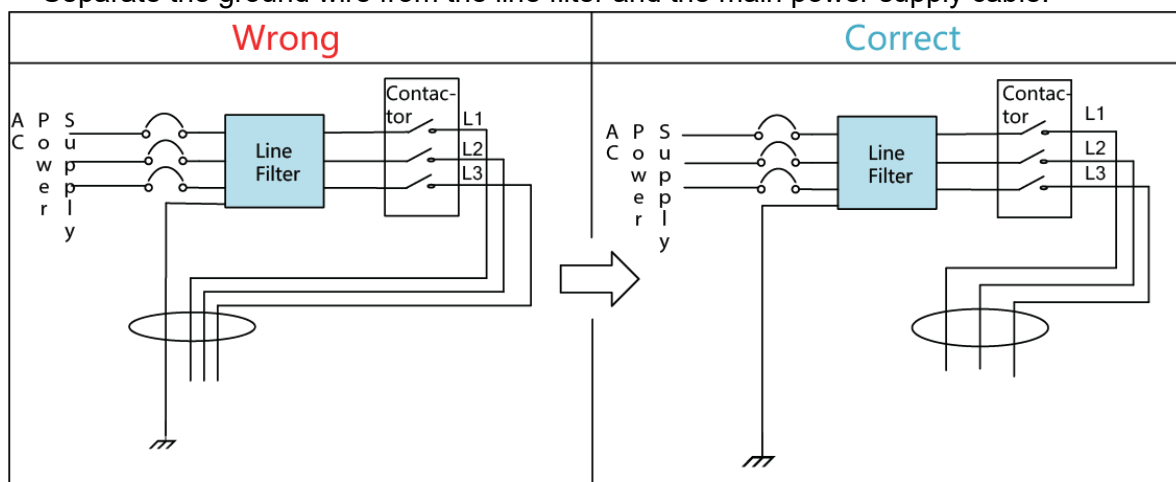


Figure 3-16 Line filter grounding and output wiring separation diagram

- Ground wires inside an electrical cabinet

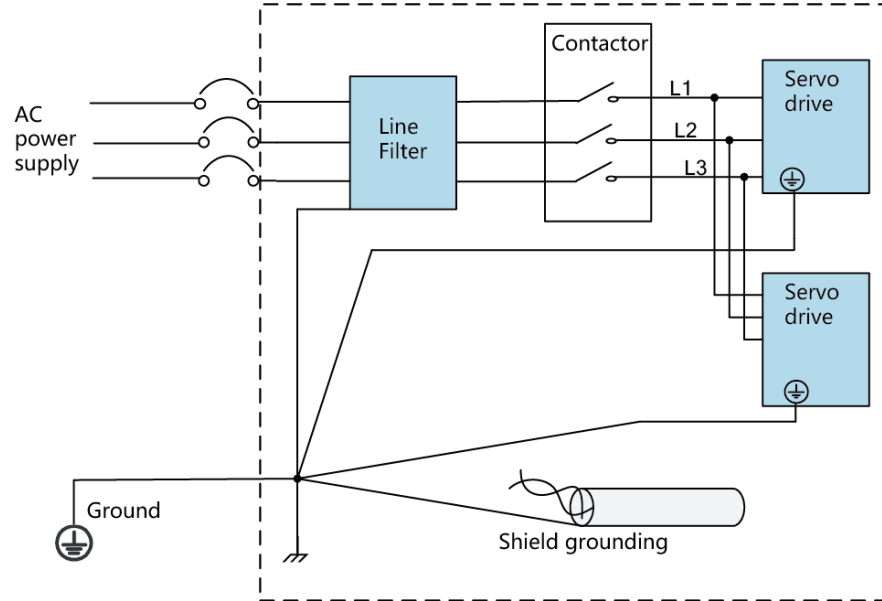


Figure 3-17 Line filter grounding handling illustration

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 driver panel consists of a 6-digit LED display and 5 buttons. It can be used for displaying status, alarms, functions, parameters setting and auxiliary functions.

Table 4-1 Buttons and functions

Label	Symbol	Function
Display	/	Consists of 5 push buttons, an 8-segments display and 5 green LED as warning indicators
Mode	M	To switch between 3 modes: 1. Data monitoring mode: To monitor changes of motion data values 2. Parameters setting mode: To set parameters 3. Auxiliary functions mode: To operate common functions, such as trial run, alarm clearing
Enter	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 driver 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 driver and the corresponding fault codes.

Panel operation process

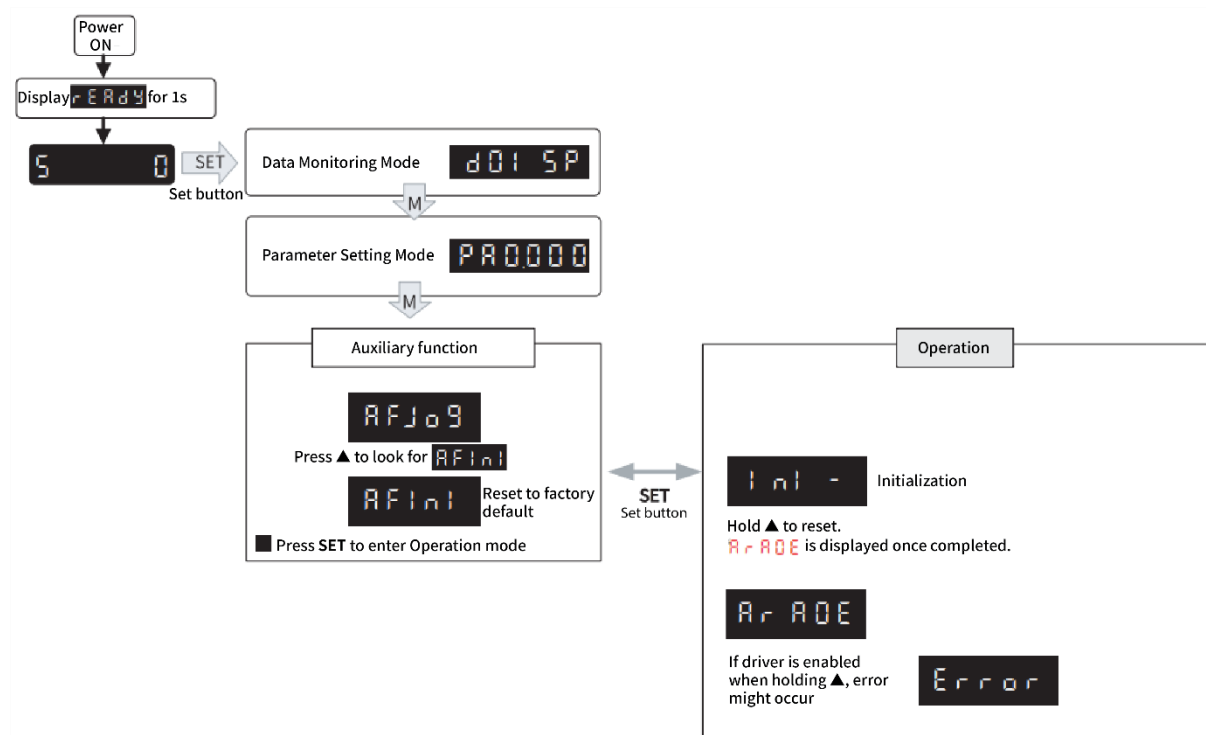


Figure 4-1 Flow diagram of panel operation

- 1) **READY** will be displayed for about 1 second after driver 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) and save the parameters.

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	EDrive
Lock	① Set P05.35 = 1. ② Restart driver. 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 EPROM. 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 driver 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 mode.

Data list in data monitoring mode

No.	Label	Descriptions	Display	Unit	Data Format (x = numerical value)
0	d00uE	Position command deviation		pulse	"xxxx"
1	d01SP	Motor velocity		r/min	" xxxx" – Motor actual velocity " xxxx" – External encoder feedback velocity
2	d02CS	Position control command velocity		r/min	"xxxx"
3	d03Cu	Velocity control command velocity		r/min	"xxxx"

4	d04tr	Actual feedback torque		%	"xxxx"
5	d05nP	Feedback pulse sum		pulse	"xxxx"
6	d06cP	Command pulse sum		pulse	"xxxx"
7	d07	Maximum torque during motion		/	"d xxxx" – Max torque % "V xxxx" – Average load ratio
8	d08FP	Internal command position sum		pulse	"xxxx"
9	d09cn	Control mode		/	Position: "Ct PoS" Velocity: "Ct SPd" Torque: "Ct trq"
10	d10Io	I/O signal status		/	-
11	d11Ai	Analog input		V	-
12	d12Er	Alarm cause and record		/	"Er xxx" Alarm code
13	d13rn	Warning		/	"H xxx" Warning code
14	d14r9	Regeneration load factor		%	"xxx"
15	d15oL	Overload factor		%	"L xxx" – Motor overload % "d xxx" – Driver 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	CSP position command sum		pulse	"xxxx"
21	d21AE	Single turn encoder data		pulse	"A xxxx" – motor encoder single turn data "F xxxx" – external encoder single turn data
22	d22rE	Multiturn encoder data		r	"xxxx"
23	d23 id	485 received frame		/	"d xxx" "Fr 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	Motor electrical angle		pulse	"xxxx"
26	d26hy	Motor mechanical angle		pulse	"xxxx"
27	d27 Pn	Voltage across PN		V	"xxxx"
28	d28 no	Software version		/	"d xxx" – Servo software "F xx" – Communication software "p xxx" – Servo power rating "C xx" – CPLD software
29	d29AS	Internal usage		/	"A xxxx" "F xxxx" – external encoder serial no.
30	d30NS	No. of times of encoder communication error		/	"A xxxx" – Motor encoder communication error count "F xxxx" – External encoder communication error count
31	d31 tE	Accumulated uptime		/	"xxxx"

32	d32Au	Automatic motor identification	d32Au	/	"r xxx" Motor no. "E xxx" Servo no.
33	d33At	Driver temperature	d33At	°C	"d xxx" – driver temperature "C xxx" – MCU temperature
34	d34St	Servo status	d34St	/	"xxxxx"
35	d35 SF	Internal usage	d35SF	/	"xxxxxx"
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.

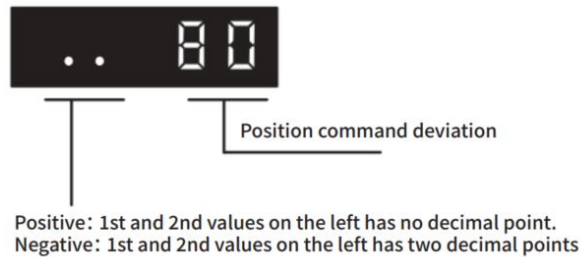
When the first and second decimal points on the far-left side are lit, it indicates a negative number. Otherwise, the number is positive.



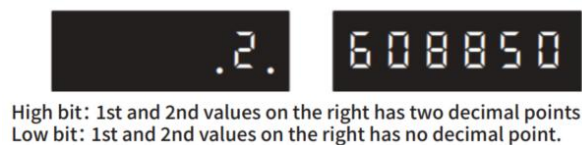
Positive: 1st and 2nd values on the left has no decimal point
Negative: 1st and 2nd values on the left has two decimal points

d00uE Position command deviation

Shows high bit and low bit of position deviation



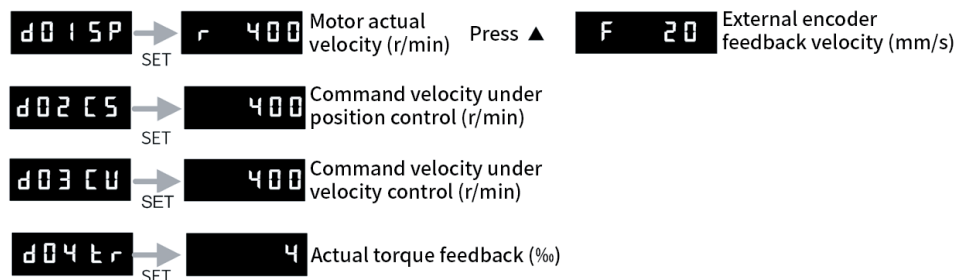
Press ◀ to switch between low and high bit
Example : Position command deviation=260885

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

After the driver is powered on normally, it displays **S 0**, indicating that the driver is in the disabled state. After the driver is enabled, the panel displays **r 0**.

When the motor is running normally, it displays **r-XXX**. The driver'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.

d04tr shows real-time torque feedback, reflecting the magnitude of instantaneous current.

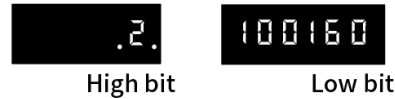


d05nP Feedback pulse sum d06CP Command pulse sum

Feedback pulse sum(Encoder feedback pulse)

Feedback pulse sum
(unit)

Press◀ to switch between high/low bit
 Example: Feedback pulse sum=2100160



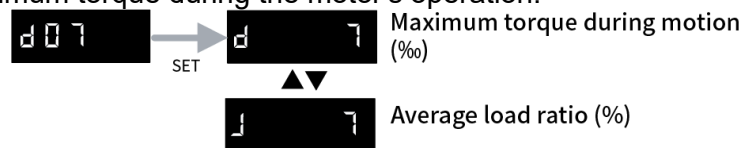
Command pulse sum (Command pulse)

Command pulse sum
(unit)

Press◀ to switch between high/low bit
 Example: Command pulse sum=210017

**d07 Maximum torque during motion**

Displays the maximum torque during the motor's operation.

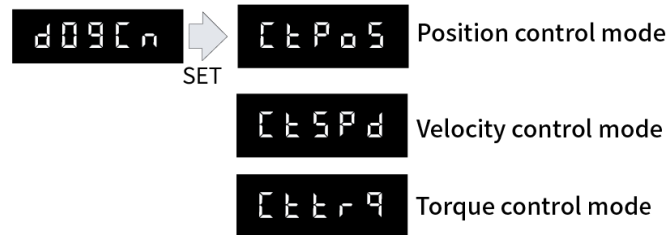
**d08FP Internal command pulse sum**

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



d09Cn Control mode

Displays the current control mode of the driver.

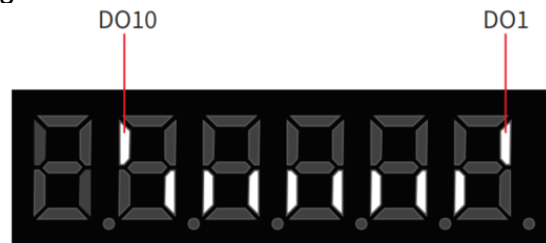
**d10Io I/O signal status**

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.

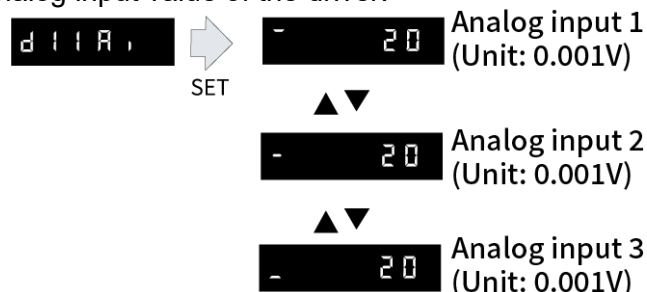
- Input: From low to high bit (Right to left) DI1, DI2.... DI10. Decimal point is lighted to represent input signals. In the example below, DI1, DI8 and DI10 input signal is valid; DI2-DI7, DI9 input signal is invalid.



- Output: From low to high bit (Right to left) DO1, DO2....DO10. Decimal points are 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 driver.



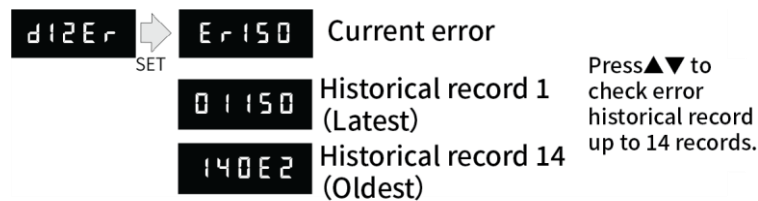
3 analog inputs can be monitored through d11. Left most bar at the top: 1st analog input; at the middle: 2nd analog input; at the bottom 3rd analog input.

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

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

-11.50

d12Er Alarm cause and historical record



Note

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

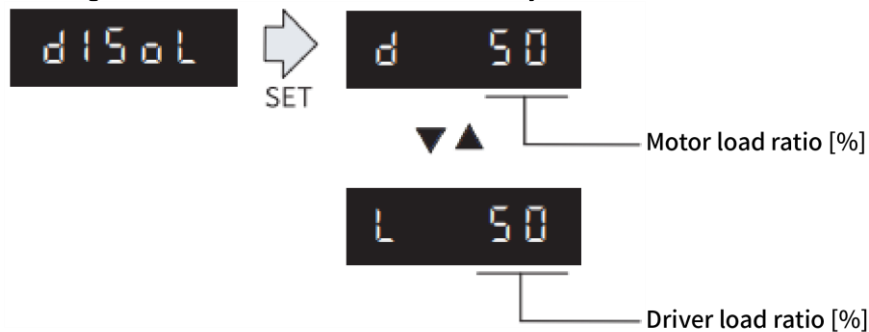
d14rg Regenerative load factor d15oL Overload factor

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

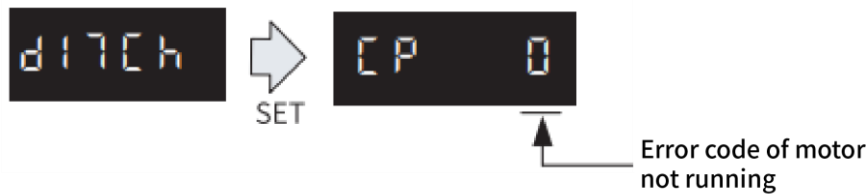


d16Vr Inertia ratio



Use auxiliary function **AF_GL** or EDrive to measure the inertia ratio. The result will be shown on **d16Jr**, hold M to write the value in P00.04.

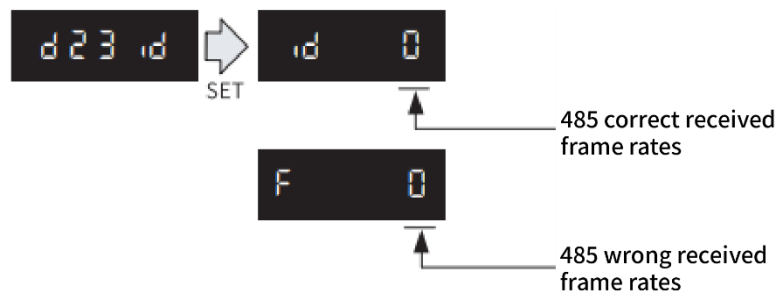
d17Ch Motor not running cause



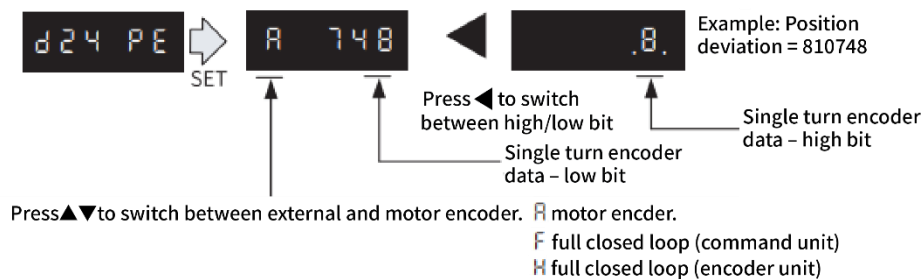
- “d17Ch” Motor No Running Cause - Codes & Descriptions

Code	Display Code	Description	Content
0	[P 0]	Normal	-
1	[P 1]	DC bus undervoltage	Check if DC bus voltage is too low on D27
2	[P 2]	No SRV-ON signal	Servo-ON input (SRV-ON) is not connected to COM-
3	[P 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	[P 4]	Driver alarm	-
5	[P 5]	Relay not clicked	Check input voltage
6	[P 6]	Pulse input prohibited (INH)	P05.18=0
8	[P 8]	CL valid	P05.17=0, deviation counter connected to COM-
9	[P 9]	Zero speed clamp valid	P03.15 = 1, Zero speed clamp input is open

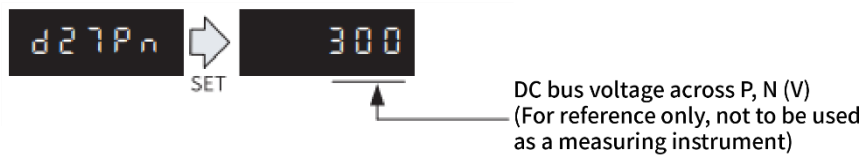
d23id 485 received frame



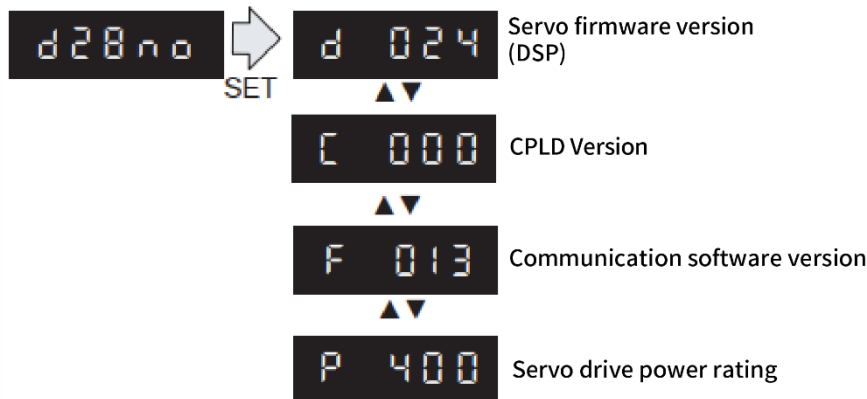
d24PE Position deviation



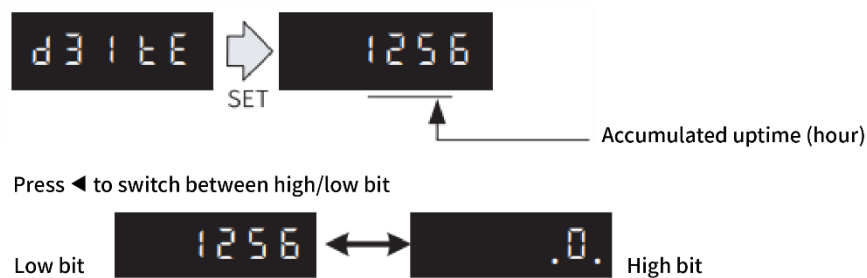
d27Pn DC bus voltage



d28no Software version

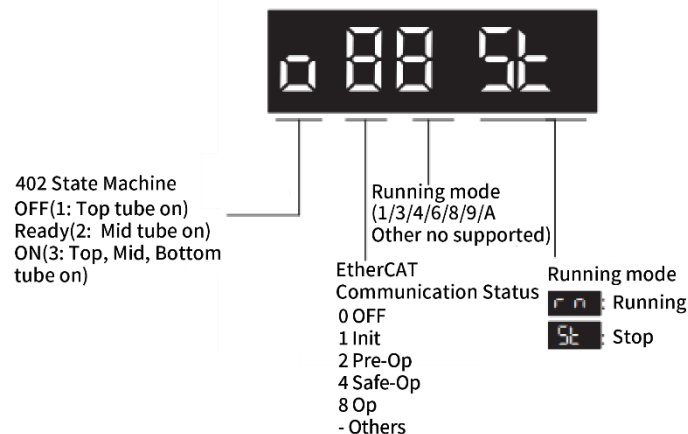


d31tE Accumulated operation time



d34 Servo driver status display

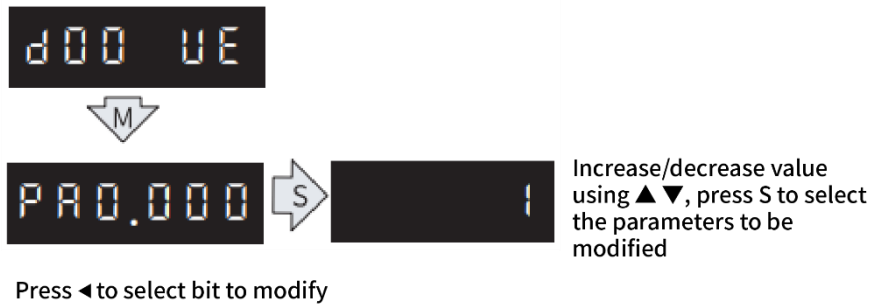
Driver status: 402 state machine, EtherCAT communication, running mode, running.
The specific meanings of the LED digits from left to right are as follows:



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.

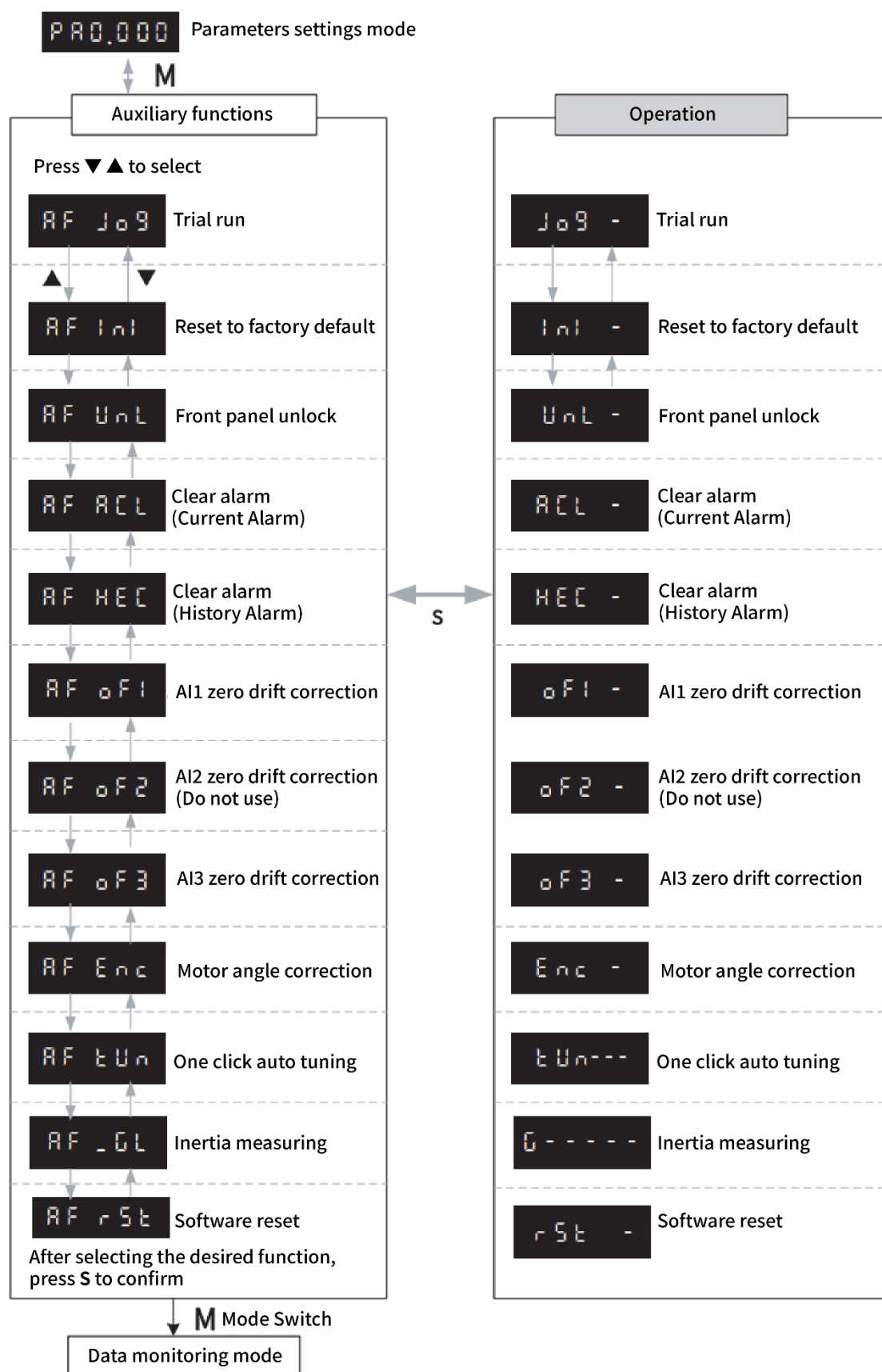
4.1.5 Parameters Saving

In parameter setting mode, when the panel is not locked, we can modify and save the parameters of the driver 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 driver is restarted.

4.1.6 Auxiliary Function



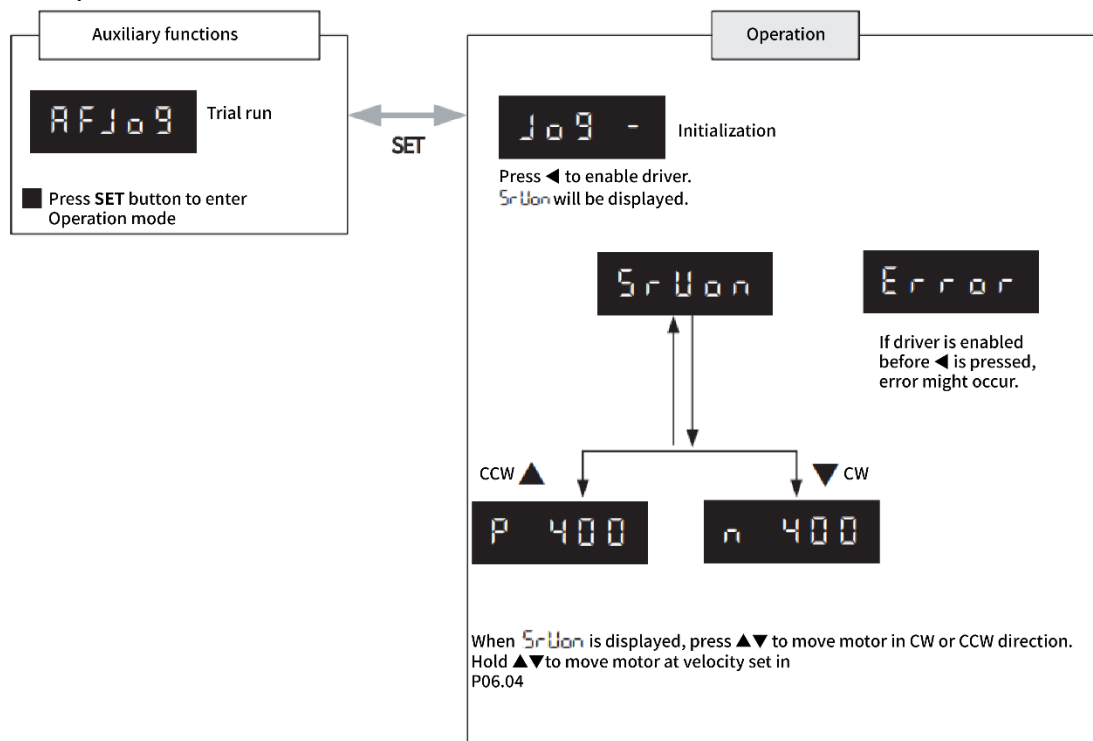
AF JOG Trial run

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

Requirements

- Be sure to remove the motor load and disconnect the CN1 connection wiring before using.
- 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

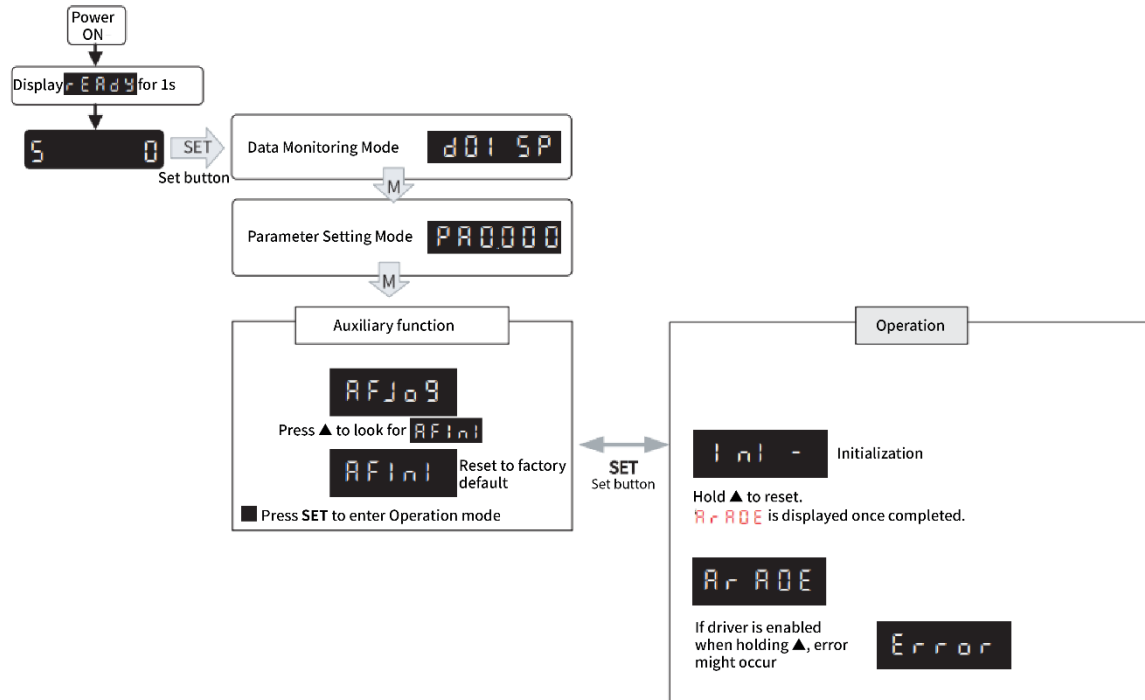


⚠ Caution

- 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.

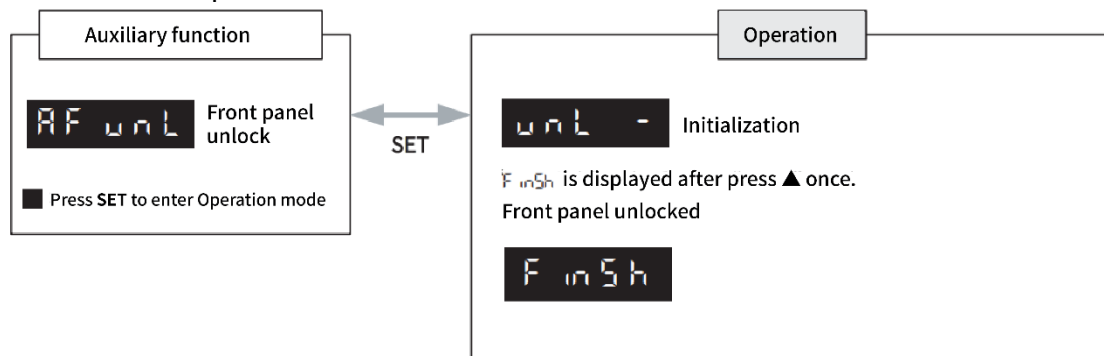
AF InI Reset to factory default

To reset parameters settings to factory default.



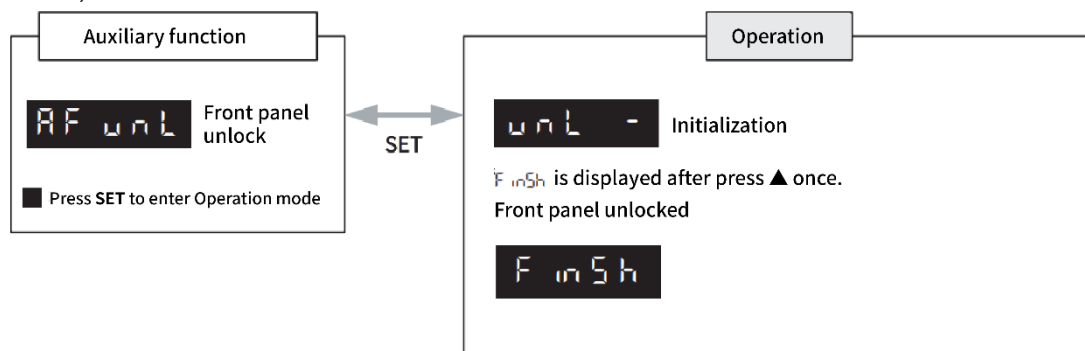
AF unL Front panel unlock

To unlock the front panel from the locked state.



AF ACL Clear alarm

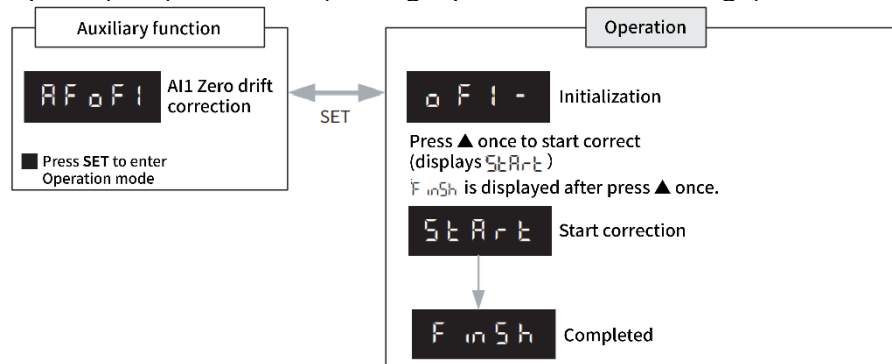
Alarm can be cleared using this auxiliary function **AFACL**. But before that, the error needs to be solved, and driver needs to be restarted.



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

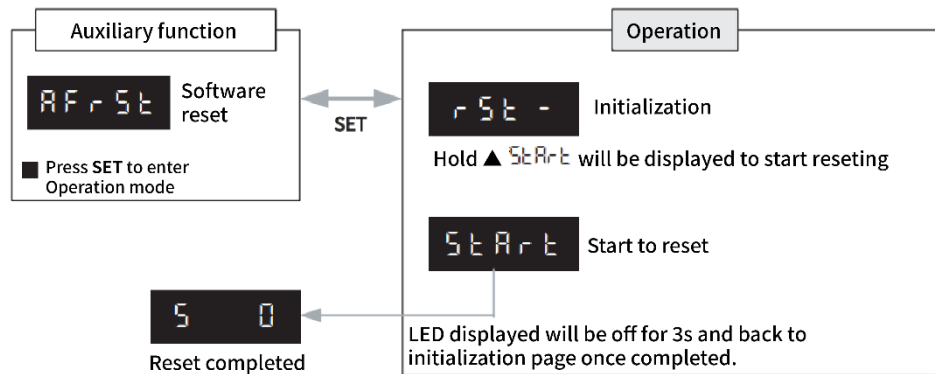
Auto adjustment of analog input zero drift settings.

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



AF rSt Software reset

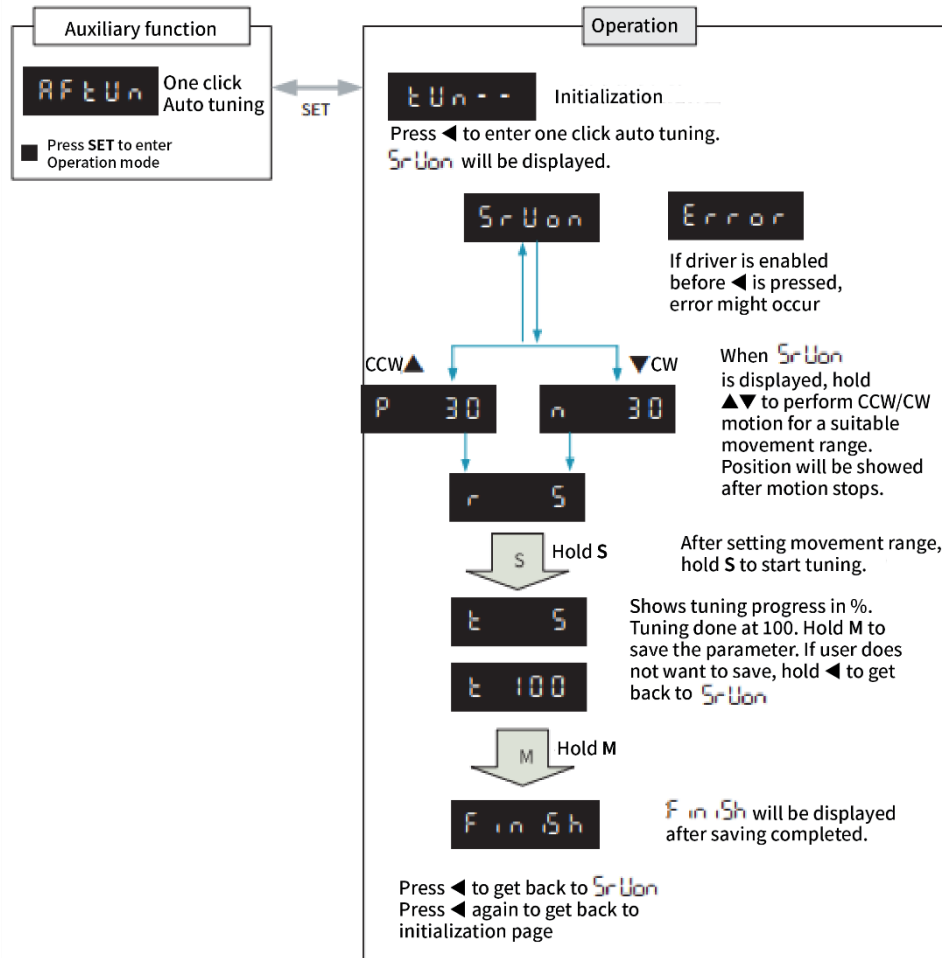
Perform a software reset on the driver.



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

AF_tun One click auto tuning

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



4.1.7 Alarm

When a driver error occurs, the front panel will automatically switch to abnormal alarm display mode, showing the corresponding error code.

- If the panel does not display anything, first check whether the main power supply voltage is faulty. If the power supply is within the correct range, the issue may be with the servo driver itself. Please consult MISUMI support staff for assistance.
- For clearable alarms, you can use the alarm reset function in the auxiliary menu to clear the alarm. For non-clearable alarms, you must resolve the root cause and then power cycle the system to clear the alarm.
- The servo stop method depends on the type of fault. Faults are categorized into Type 1 and Type 2, and the corresponding stop method is configured via parameter P05.10.

4.1.8 Parameter Save Mode

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

- Save using driver'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 driver detects 0x1010-01 data from master device as 0x65766173, driver 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 driver detects 0x1010-02 data from master device as 0x65766173, driver 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 driver detects 0x1010-03 data from master device as 0x65766173, driver 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 driver detects 0x1010-01 data from master device as 0x65766173, driver will save current parameters to EEPROM (including 0x2000 to 0x5FFF parameters and electronic gear ratio parameters)

4.1.9 Front Panel Warning Indicator

E-RME series driver 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 lit in accordance with 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.

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

4.2 Get Started with Driver Operation

4.2.1 Checklist Before Operation

No.	Description
Power supply	
1	The voltage of main and control circuit power supply is within rated values.
2	Power supply polarity is rightly connected.
Wiring	
1	Power supply input is rightly connected.
2	Driver's power output UVW matches UVW terminals on the main circuit.
3	No short circuit of driver's input and output UVW terminals.
4	Signal cables are correctly and well connected.
5	Drivers and motors are connected to ground
6	All cables under stress within recommended range.
7	No foreign conductive objects inside/outside the driver.
Mechanical	
1	Driver and external holding brake are not place near combustibles.
2	Installations of driver, motor and axis is fastened.
3	Movement of motors and mechanical axes are not obstructed.

4.2.2 Power On

Connect AC single/3 phases 200-240V power supply into main power supply L1, L2, L3 terminals and 220V power supply into control circuit power supply L1C, L2C. After power on, light indicator will light up and front panel will display **rESEt**, then LED initial status will be displayed. Driver is ready for operation if no alarm occurs.

For single phase 200-240V, connect L1 and L2

4.2.3 Trial Run

Servo driver must be disabled before performing trial run. For safety precautions, please JOG under minimal velocity.

Related Parameters

No	Parameters	Label	Set value	Unit
1	P00.01	Control mode settings	9	/
2	P06.04	JOG trial run command velocity	User defined	r/min
3	P06.25	Trial run acc-/deceleration time	User defined	ms/1000rpm

- Please make sure the mechanical axis is within the range of motion and travelled distance should not be too long to avoid collision.
- Set optimal velocity and acceleration for trial run (not too high!)
- Do not modify any gain related parameters during motion to avoid vibration.

Please refer to “Section 4.6 Auxiliary function/AF Jog Trial Run” for detailed explanations on how to perform trial run using front panel operation

4.2.4 Motor Rotational Direction Settings

Motor rotational direction can be changed through P00.06 without changing the polarity of the input command.

P00.06	Name	Command polarity inversion			Mode							F
	Range	0 ~ 1	Unit	—	Default	0	Index			2006h		
	Activation	After restart										
Used to change the rotational direction of the motor.												
Set value		Details										
0		Polarity of the command is not inversed. The direction of rotation is consistent with the polarity of command.										
1		Polarity of command is inversed. The direction of rotation is opposite to the polarity of command.										
Note: Rotational direction of the motor is recommended to be set through object dictionary 607E. However, P00.06 has higher priority than object dictionary 607E. 607E only takes effect when P00.06 = 0.												

4.2.5 Fron Panel Trial Run

JOG Test Run (Jogging Control) Operation Procedure

Set all parameters related to jogging control.

- 1) After successfully writing the parameters, power off and restart the driver.
- 2) Ensure the driver is in a disabled state to enter JOG control mode.
- 3) Enter the “AF Jog” submenu under Auxiliary Functions Mode.
- 4) Press the SET key once — the display should show “Jog -”.
- 5) Press ◀ key once — if there are no issues, the display should show “SrUon”. If “Error” appears, press the ▲ key again — it should then show “SrUon”. If it still shows “Error”, switch to the “d17Ch” submenu under Data Monitoring Mode to check why the motor is not rotating. Troubleshoot the issue and retry.
- 6) In Position JOG Mode, once “SrUon” is displayed, hold the ▲ key to increase motor speed up to the maximum set in P06.04, and the motor will run forward continuously. Release the ▲ key to decelerate and stop — the display should return to “SrUon”. Hold the ▼ arrow key to run the motor in reverse at increasing speed up to P06.04. Release the ▼ key to decelerate and stop — the display should return to “SrUon”. If the motor does not rotate, check the “d17Ch” submenu in Data Monitoring Mode to identify the issue and retry after resolving it.
- 7) During the JOG test run, press the SET key to exit JOG control mode.

4.2.6 Trial Run Using Debugging Software

Use the MISUMI EDrive debugging software to perform test runs on the servo driver and motor.

Debugging Software Trial Run Procedure

- 1) Wiring Check:
 - Confirm correct wiring for power input and motor output.
 - Use a Type-C cable to connect the servo driver to the PC for communication.
- 2) Confirm Power Supply Voltage, ensure it is within the rated range.
- 3) After establishing communication between the PC and the driver, open the test run function in MISUMI EDrive. The test run interface will appear.

- 4) Set to Reciprocating Motion Mode, choose positioning start/end point operation mode. After clicking Enable, the red OFF will turn green ON. Set the teaching motion attributes

- avoid high speeds to prevent collisions. Use the forward/reverse motion buttons to teach and set the desired start and end points.
- 5) STEP-2: Configure JOG motion attributes. Execute the set motion within the taught range. Set the number of repetitions for reciprocating motion based on the planned path.
- 6) During operation, use the monitoring panel on the right to view: Estimated inertia, Motor speed, Motor load rate and Limit status indicators.

Class	Label	EtherCAT Address	Panel display	Activation	Valid Mode						
[Class 0] P00. Basic settingsa	Model-following bandwidth	2000h	P0000	Immediate							F
	Control Mode Settings	2001h	P0001	After restart							F
	Real time Auto Gain Adjusting	2002h	P0002	Immediate							F
	Real time auto stiffness adjusting	2003h	P0003	Immediate							F
	Inertia ratio	2004h	P0004	Immediate							F
	Command polarity inversion	2006h	P0006	After restart							F
	Probe signal polarity settings	2007h	P0007	After restart							F
	Command pulse counts per revolution	2008h	P0008	After restart	P P	P V		H M	CSP	CSV	
	Encoder pulse output per revolution	2011	P0011	After restart							F
	Pulse output logic inversion	2012	P0012	After restart							F
	1 st Torque Limit	2013h	P0013	Immediate							F
	Excessive Position Deviation Settings	2014h	P0014	Immediate	P P			H M	CSP		
	Absolute Encoder settings	2015h	P0015	After restart							F
	Regenerative resistance	2016h	P0016	Immediate							F
	Regenerative resistor power rating	2017h	P0017	Immediate							F
	Friction compensation setting	2019h	P0019	Immediate							F
	EtherCAT slave ID	2023h	P0023	After restart							F
	Source of slave ID	2024h	P0024	After restart							F
	Synchronous compensation time 1	2025h	P0025	After restart					CSP		
	Synchronous compensation time 2	2026h	P0026	After restart					CSP		
	Synchronization mode command delay cycle counts	2027h	P0027	After restart					CSP		
	CSP mode safe self-running position setting	2028h	P0028	Immediate					CSP		
	Encoder feedback mode	2030h	P0030	Immediate							F
	External encoder type	2031h	P0031	After restart							F
	External encoder direction	2032h	P0032	After restart							F
	Excessive hybrid deviation	2033h	P0033	After restart							F
	Clear excess hybrid control deviation	2034h	P0034	After restart							F
	External encoder frequency divider numerator	2035h	P0035	After restart							F
	External encoder frequency divider denominator	2036h	P0036	After restart							F
	External encoder feedback pulse count per revolution	2037h	P0037	After restart							F
	Z-signal pulse input source	2038h	P0038	After restart							F
	1 st position loop gain	2100h	P0100	Immediate	P P			H M	CSP		
	1 st velocity loop gain	2101h	P0101	Immediate							F
	1 st Integral Time Constant of Velocity Loop	2102h	P0102	Immediate							F
	1 st velocity detection filter	2103h	P0103	Immediate							F
	1 st Torque Filter Time Constant	2104h	P0104	Immediate							F
	2 nd Position Loop Gain	2105h	P0105	Immediate	P P			H M	CSP		
	2 nd velocity loop gain	2106h	P0106	Immediate							F
	2 nd Integral Time Constant of	2107h	P0107	Immediate							F

Class	Label	EtherCAT Address	Panel display	Activation	Valid Mode						
[Class 1] P01. Gain adjustments	Velocity Loop										
	2 nd velocity detection filter	2108h	P0108	Immediate							F
	2 nd Torque Filter Time Constant	2109h	P0109	Immediate							F
	Velocity feed forward gain	2110h	P0110	Immediate	P P			H M	CSP		
	Velocity feed forward filter time constant	2111h	P0111	Immediate	P P			H M	CSP		
	Torque feed forward gain	2112h	P0112	Immediate	P P	P V		H M	CSP	CSV	
	Torque feed forward filter time constant	2113h	P0113	Immediate	P P	P V		H M	CSP	CSV	
	Position control gain switching mode	2115h	P0115	Immediate							F
	Position control gain switching level	2117h	P0117	Immediate							F
	Hysteresis at position control switching	2118h	P0118	Immediate							F
	Position gain switching time	2119h	P0119	Immediate							F
	External ABZ encoder filter time	2136h	P0136	Immediate	P P				CSP		
	Special function registry	2137h	P0137	Immediate							F
	Special function registry 1	2138h	P0138	Immediate							F
	Special function registry 2	2139h	P0139	Immediate							F
[Class 2] Vibration suppression	Adaptive filtering mode settings	2200h	P0200	Immediate							F
	1 st notch frequency	2201h	P0201	Immediate							F
	1 st notch bandwidth selection	2202h	P0202	Immediate							F
	1 st notch depth selection	2203h	P0203	Immediate							F
	2 nd notch frequency	2204h	P0204	Immediate							F
	2 nd notch bandwidth selection	2205h	P0205	Immediate							F
	2 nd notch depth selection	2206h	P0206	Immediate							F
	3 rd notch frequency	2207h	P0207	Immediate							F
	3 rd notch bandwidth selection	2208h	P0208	Immediate							F
	3 rd notch depth selection	2209h	P0209	Immediate							F
	1 st damping frequency	2214h	P0214	Immediate							F
	2 nd damping frequency	2216h	P0216	Immediate							F
	Position command smoothing filter	2222h	P0222	Keep stop							F
	Position command FIR filter	2223h	P0223	Disable	P P			H M	CSP		
	5 th resonant frequency	2231h	P0231	Immediate	P P			H M	CSP		
	5 th resonant Q value	2232h	P0232	Immediate							F
	5 th anti-resonant frequency	2233h	P0233	Immediate							F
	5 th anti-resonant Q value	2234h	P0234	Immediate							F
	6 th resonant frequency	2235h	P0235	Immediate							F
	6 th resonant Q value	2236h	P0236	Immediate							F
	6 th anti-resonant frequency	2237h	P0237	Immediate							F
	6 th anti-resonant Q value	2238h	P0238	Immediate							F
	Adjustment mode	2248h	P0248	Immediate							F
	MFC type	2250h	P0250	Immediate							F
	Velocity feedforward compensation coefficient	2251h	P0251	Immediate	P P			H M	CSP		
	Torque feedforward compensation coefficient	2252h	P0252	Immediate	P P	P V		H M	CSP	CSV	

Class	Label	EtherCAT Address	Panel display	Activation	Valid Mode						
	Dynamic friction compensation coefficient	2253h	P0253	Immediate							F
	Overshoot time coefficient	2254h	P0254	Immediate							F
	Overshoot suppression gain	2255h	P0255	Immediate							F
[Class 3] P03. Velocity control	Acceleration time settings	2312h	P0312	Immediate		P V				CSV	
	Deceleration time settings	2313h	P0313	Immediate		P V				CSV	
	Sigmoid acceleration/deceleration settings	2314h	P0314	Disable		P V				CSV	
	Zero speed clamp level	2316h	P0316	Immediate		P V				CSV	
	Position mode zero speed	2323h	P0323	Immediate		P V				CSV	
[Class 4] P04. I/O monitoring settings	Input selection DI1	2400h	P0400	Immediate							F
	Input selection DI2	2401h	P0401	Immediate							F
	Input selection DI3	2402h	P0402	Immediate							F
	Input selection DI4	2403h	P0403	Immediate							F
	Input selection DI5	2404h	P0404	Immediate							F
	Input selection DI6	2405h	P0405	Immediate							F
	Input selection DI7	2406h	P0406	Immediate							F
	Input selection DI8	2407h	P0407	Immediate							F
	Output selection DO1	2410h	P0410	Immediate							F
	Output selection DO2	2411h	P0411	Immediate							F
	Output selection DO3	2412h	P0412	Immediate							F
	Analog input 1 zero drift	2422h	P0422	Immediate							F
	Analog input 1 filter	2423h	P0423	Immediate							F
	Analog input 1 overvoltage	2424h	P0424	Immediate							F
	Analog input 2 zero drift	2425h	P0425	Immediate							F
	Analog input 2 filter	2426h	P0426	Immediate							F
	Analog input 2 overvoltage	2427h	P0427	Immediate							F
	Positioning complete range	2431h	P0431	Immediate	P P			H M	CSP		
	Positioning complete output setting	2432h	P0432	Immediate	P P			H M	CSP		
	INP positioning delay time	2433h	P0433	Immediate	P P			H M	CSP		F
	Zero speed	2434h	P0434	Immediate							F
	Velocity coincidence range	2435h	P0435	Immediate			P V			CSV	
	Arrival velocity	2436h	P0436	Immediate			P V			CSV	
	Motor power-off delay time	2437h	P0437	Immediate							F
	Delay time for holding brake release	2438h	P0438	Immediate							F
	Holding brake activation velocity	2439h	P0439	Immediate							F
	Emergency stop function	2443h	P0443	Immediate							F
	AO1 output	2464h	P0464	Immediate							F
	AO1 signal	2465h	P0465	Immediate							F
	AO1 amplification	2466h	P0466	Immediate							F
	AO1 communication settings	2467h	P0467	Immediate							F
	AO1 offset	2468h	P0468	Immediate							F
	AO2 output	2469h	P0469	Immediate							F
	AO2 signal	2470h	P0470	Immediate							F
	AO2 amplification	2471h	P0471	Immediate							F
	AO2 communication settings	2472h	P0472	Immediate							F

Class	Label	EtherCAT Address	Panel display	Activation	Valid Mode						
	AO2 offset	2473h	P0473	Immediate							F
	Warning indicator light 1 signal	2474h	P0474	Immediate							F
	Warning indicator light 2 signal	2475h	P0475	Immediate							F
	Warning indicator light 3 signal	2476h	P0476	Immediate							F
	Warning indicator light 4 signal	2477h	P0477	Immediate							F
	Warning indicator light 5 signal	2478h	P0478	Immediate							F
	Driver prohibition input settings	2504h	P0504	Immediate							F
	Servo-off mode	2506h	P0506	After restart							F
[Class 5] P05. Extension settings	Main power-off detection time	2509h	P0509	Immediate							F
	Servo-off due to alarm mode	2510h	P0510	After restart							F
	Servo braking torque setting	2511h	P0511	Immediate							F
	Overload level setting	2512h	P0512	Immediate							F
	Overspeed level settings	2513h	P0513	Immediate							F
	I/O digital filter	2515h	P0515	Immediate							F
	Counter clearing input mode	2517h	P0514	Immediate							F
	Position unit settings	2520h	P0520	After restart	P P			H M	CSP		
	Torque limit selection	2521h	P0521	Immediate							F
	2 nd torque limit	2522h	P0522	Immediate							F
	LED initial status	2528h	P0528	After restart							F
	Torque limit detection time during torque initialization	2537h	P0537	Immediate							F
	3 rd torque limit	2539h	P0539	Immediate							F
	D41 set value	2540h	P0540	Immediate							F
	Frequency divider output – Z-signal polarity	2542h	P0542	After restart							F
	Frequency divider output – Z-signal width	2543h	P0543	After restart							F
	Frequency divider output source	2544h	P0544	After restart							F
	External encoder overspeed feedback threshold	2545h	P0545	Immediate							F
	Vent overload level	2546h	P0546	Immediate							F
[Class 6] P06. Extra settings	Encoder zero position compensation	2601h	P0601	After restart							F
	JOG trial run torque command	2603h	P0603	Immediate							F
	JOG trial run velocity command	2604h	P0604	Immediate	P P			H M	CSP		
	Position 3 rd gain valid time	2605h	P0605	Immediate	P P			H M	CSP		
	Position 3 rd gain scale factor	2606h	P0606	Immediate	P P			H M	CSP		
	Torque command additional value	2607h	P0607	Immediate							F
	Positive direction torque compensation value	2608h	P0608	Immediate							F
	Negative direction torque compensation value	2609h	P0609	Immediate							F
	Current response settings	2611h	P0611	Immediate							F
	Max. time to stop after disabling	2614h	P0614	Immediate							F
	Trial run distance	2620h	P0620	Immediate							F
	Trial run waiting time	2621h	P0621	Immediate							F
	No. of trial run cycles	2622h	P0622	Immediate							F
	Trial run acceleration	2625h	P0625	Immediate							F
	Velocity observer gain	2628h	P0628	Immediate							F

Class	Label	EtherCAT Address	Panel display	Activation	Valid Mode						
	Velocity observer bandwidth	2629h	P0629	Immediate							F
	Frame error window time	2634h	P0634	Immediate							F
	Frame error window	2635h	P0635	Immediate							F
	Absolute value rotation mode denominator setting	2654h	P0654	After restart	PP			H M	CSP		
	Rotor blocked torque limit threshold	2656h	P0656	Immediate							F
	Z-signal sustaining time	2661h	P0661	Immediate							F
	Absolute multiturn data upper limit	2663h	P0663	After restart							F
[Class c] P0C. Position Comparison	Position Comparison Enable	27A4-01	P0C00	Immediate							F
	Position Comparison Mode Selection	27A4-02	P0C01	Immediate							F
	Pulse Width of Position Comparison Output	27A4-03	P0C02	Immediate							F
	Delay Compensation of Position Comparison Output	27A4-04	P0C03	Immediate							F
	Start Point of Position Comparison	27A4-05	P0C04	Immediate							F
	End Point of Position Comparison	27A4-06	P0C05	Immediate							F
	Cycle Count in Constant Loop Mode	27A4-07	P0C06	Immediate							F
	Use Current Position as Zero Point (Position Comparison)	27A4-08	P0C07	Immediate							F
	Offset of Zero Point in Position Comparison	27A4-09	P0C08	Immediate							F
	Target Value of Position Comparison Point 1~42	27A4-15~27A4-3E	P0C020~P0C061	Immediate							F
	Attributes of Position Comparison Point 1 & 2	27A4-47	P0C70	Immediate							F
[Class D] P0D. Gantry Settings	Gantry Configuration	27A5-01	P0D00	After restart							F
	Gantry Slave Axis Command Mode	27A5-02	P0D01	Disable							F
	Gantry Tuning Gain 1	27A5-03	P0D02	Disable							F
	Gantry Position Synchronization Deviation Threshold	27A5-04	P0D03	Immediate							F
	Gantry Torque Deviation Threshold	27A5-05	P0D04	Immediate							F
	Gantry Tuning Gain 2	27A5-06	P0D05	Keep stop							F
	Position Gain	27A5-07	P0D06	Immediate							F
	Velocity Gain	27A5-08	P0D07	Immediate							F
	Velocity Integral	27A5-09	P0D08	Immediate							F
	Homing Mode	27A5-0A	P0D09	After restart							F
	Alignment Mode	27A5-0B	P0D10	After restart							F
	Gantry Origin Offset	27A5-0C	P0D11	Disable							F
[Class 14] P11. Driver parameters	MCU 1 Version	27A9-01	P1100	After restart							F
	MCU 2 Version	27A9-02	P1101	After restart							F
	FPGA Version	27A9-03	P1102	After restart							F
	Death Zone Compensation Factor 1	27A9-13	P1112	Immediate							F
	Death Zone Compensation Factor 2	27A9-14	P1113	Immediate							F
	Analog 1 Zero Drift	27A9-17	P1116	Immediate							F
	Analog 2 Zero Drift	27A9-18	P1117	Immediate							F
	Analog 3 Zero Drift	27A9-19	P1118	Immediate							F
	Regenerative Vent Control Mode	27A9-32	P1131	After restart							F

Chapter 5 Control Mode

5.1 E-RME Series Driver Motion Control Step-By-Step

1. EtherCAT master device sends "control word (6040h)" to initialize the driver.
2. Driver 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 driver 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. Driver returns to home and sends feedback home 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 driver 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 driver must be guided according to the process specified in the 402 standard for it to operate in the designated state.

State machine switchover diagram

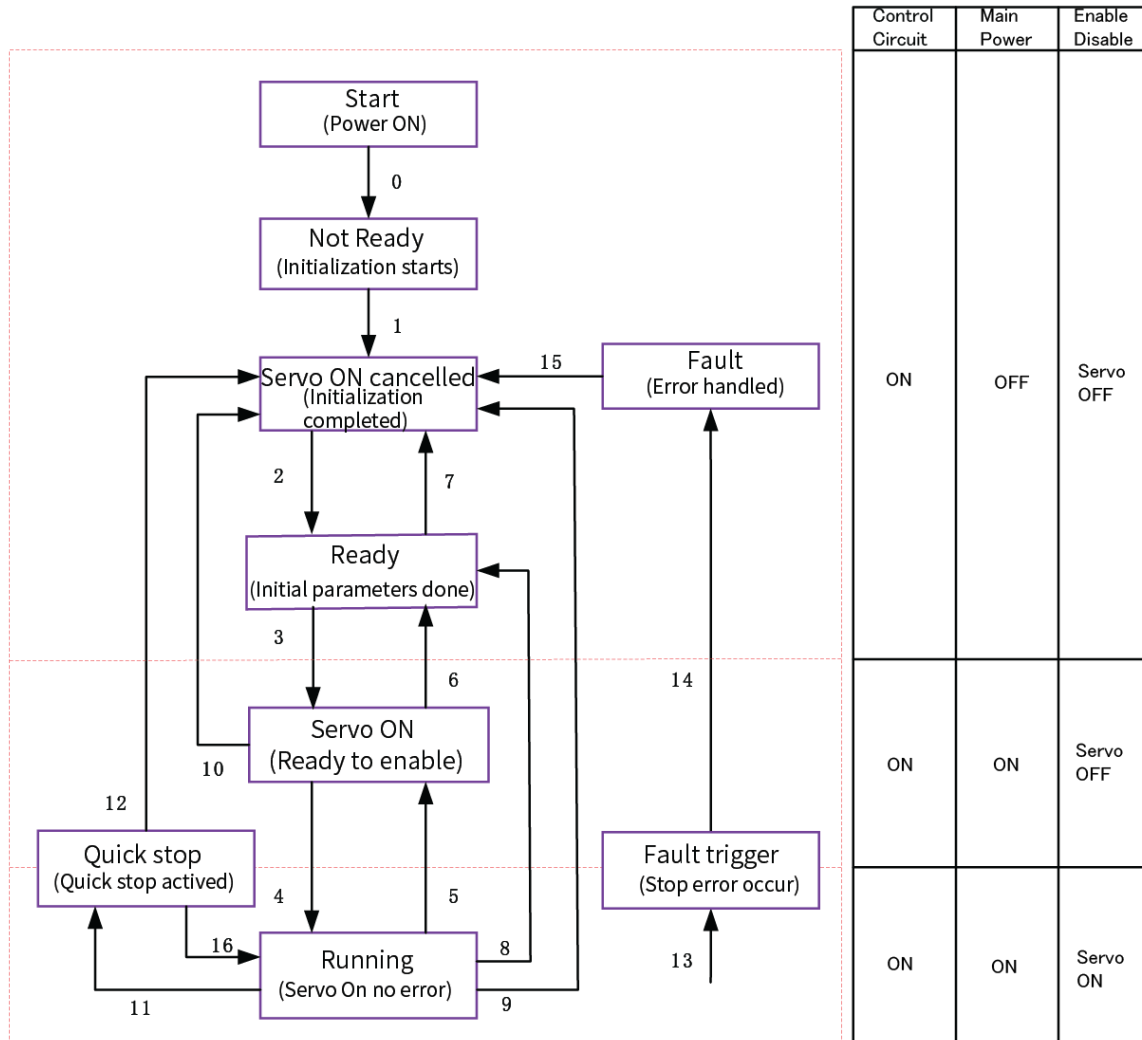


Figure 5-1 E-RME 402 State Machine switchover diagram

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

Table 5-1 Status description

Status	Description
Initialization starts	Driver 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 driver is ready to be enabled.
Running	Driver enabled, faultless
Quick stop	Quick stop activated
Fault triggered	Alarm not solved yet; Axis disabled.
Fault	Alarm solved. Waiting to switch from 402 state machine to Initialization starts; Axis disabled.

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

CiA402 status switching		Control word 6040h	Status word 6041h Bit1-Bit9
0	Power on -> Initialization	Transit automatically	0x0000
1	Initialization -> Faultless	Transit automatically, Enter 13 if fault occurs	0x0250
2	Faultless -> Ready	0x0006	0x0231
3	Servo 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 -> Fault	Transit automatically	0x021F
14	Fault stop -> Fault	Transit automatically	0x0218
15	Fault -> Faultless	0x80	0x0250
16	Quick stop -> Running	0x0F	0x0237

5.3 Driver 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 driver. 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	Reserved	CST	CSV	CSP	Reserved	HM	Reserved	PT	PV	Reserved	PP
1: Supported	0	1	1	1	0	1	0	1	1	0	1

Description	Abbr.
Profile position mode	PP
Profile velocity mode	PV
Profile Torque mode	PT
Homing mode	HM
Cyclic synchronous position mode	CSP
Cyclic synchronous velocity mode	CSV
Cyclic synchronous torque mode	CST

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.
1	Profile position mode	PP
3	Profile velocity mode	PV
4	Profile Torque mode	PT
6	Homing mode	HM
8	Cyclic synchronous position mode	CSP
9	Cyclic synchronous velocity mode	CSV
10	Cyclic synchronous torque mode	CST

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 driver.

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	Reserved	DO6 valid	DO5 valid	DO4 valid	DO3 valid	DO2 valid	DO1 valid	Reserved
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 128: Rotate in the opposite direction to the position command
	HM	
	CSP	
Velocity Mode	PV	0: Rotate in the same direction as the position command 64: Rotate in the opposite direction to the position command
	CSV	
Torque Mode	PT	0: Rotate in the same direction as the position command 32: Rotate in the opposite direction to the position command
	CST	
ALL Modes		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 605Ah	Name	Quick stop option code			Unit	-	Structure	VAR	Type	INT 16
	Access	RW	Mapping	RPDO	Mode	ALL	Range	0~7	Default	2
	Motor stops when quick stop command is given. PP, CSP, CSV, PV 0: To stop motor through P05.06. Status: Switch on disable, axis disabled. 1: Motor decelerates and stops through 6084h. Status: Switch on disable, axis disabled. 2: Motor decelerates and stops through 6085h. Status: Switch on disable, axis disabled. 3: Motor decelerates and stops through 60C6h. Status: Switch on disable, axis disabled. 5: Motor decelerates and stops through 6084h. Status: Quick stop 6: Motor decelerates and stops through 6085h. Status: Quick stop 7: Motor decelerates and stops through 60C6h. Status: Quick stop HM 0: To stop motor through P05.06. Status: Switch on disable, axis disabled. 1: Motor decelerates and stops through 609Ah. Status: Switch on disable, axis disabled. 2: Motor decelerates and stops through 6085h. Status: Switch on disable, axis disabled. 3: Motor decelerates and stops through 60C6h. Status: Switch on disable, axis disabled. 5: Motor decelerates and stops through 609Ah. Status: Quick stop 6: Motor decelerates and stops through 6085h. Status: Quick stop 7: Motor decelerates and stops through 60C6h. Status: Quick stop CST 0: To stop motor through P05.06. Status: Switch on disable, axis disabled. 1, 2: Motor decelerates and stops through 6087h. Status: Switch on disable, axis disabled. 3: Motor decelerates and stops through torque = 0. Status: Switch on disable, axis disabled. 5, 6: Motor decelerates and stops through 6087h. Status: Quick stop 7: Motor decelerates and stops through torque = 0. Status: Quick stop									

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: (Recommend)

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 is 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
Definition	-	-	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	Bit7 and Bit0 to Bit3					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	x	x	x	x	0080h	15
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x 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 deceleration	Stop with deceleration	Stop with deceleration	Stop with deceleration	-	-	-
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	Position 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
xxxx, xxxx, x0xx, 0000	Not ready to switch on
xxxx, xxxx, x1xx, 0000	Switch on disabled
xxxx, xxxx, x01x, 0001	Ready to switch on
xxxx, xxxx, x01x, 0011	Switch on
xxxx, xxxx, x01x, 0111	Operation enabled
xxxx, xxxx, x00x, 0111	Quick stop active
xxxx, xxxx, x0xx, 1111	Fault reaction active
xxxx, xxxx, x0xx, 1000	Fault

x is not affected by this bit state

5.4.8 Synchronous Cycle Time Setting

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

5.4.9 Driver 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. software limit	RW	RxPDO	Yes	Yes	/
	2	Max. software limit	RW	RxPDO	Yes	Yes	/
607F	0	Maximum protocol velocity	RW	RxPDO	Yes	/	Yes
6080	0	Maximum motor velocity	RW	RxPDO	Yes	Yes	Yes
6081	0	Profile velocity	RW	RxPDO	Yes	/	/
6083	0	Profile acceleration	RW	RxPDO	Yes	/	/
6084	0	Profile deceleration	RW	RxPDO	Yes	/	/
60C5	0	Protocol maximum acceleration	RW	RxPDO	Yes	/	Yes
60C6	0	Protocol maximum 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 command	RO	TxPDO	Yes	Yes	Yes
6063	0	Actual internal position	RO	TxPDO	Yes	Yes	Yes
6064	0	Actual position feedback	RO	TxPDO	Yes	Yes	Yes
6065	0	Position deviation window	RW	RxPDO	Yes	Yes	/
6066	0	Position deviation detection time	RW	RxPDO	Yes	Yes	/
606C	0	Velocity feedback	RO	TxPDO	Yes	Yes	Yes
6074	0	Internal command torque	RO	TxPDO	Yes	Yes	Yes
6076	0	Rated torque	RO	TxPDO	Yes	Yes	Yes
6077	0	Actual torque	RO	TxPDO	Yes	Yes	Yes
60F4	0	Actual following error	RO	TxPDO	Yes	Yes	Yes
60FA	0	Position loop velocity output	RO	TxPDO	Yes	Yes	Yes
60FC	0	Internal command position	RO	TxPDO	Yes	Yes	Yes

5.5.2 Cyclic Synchronous Position Mode (CSP)

CSP Block Diagram

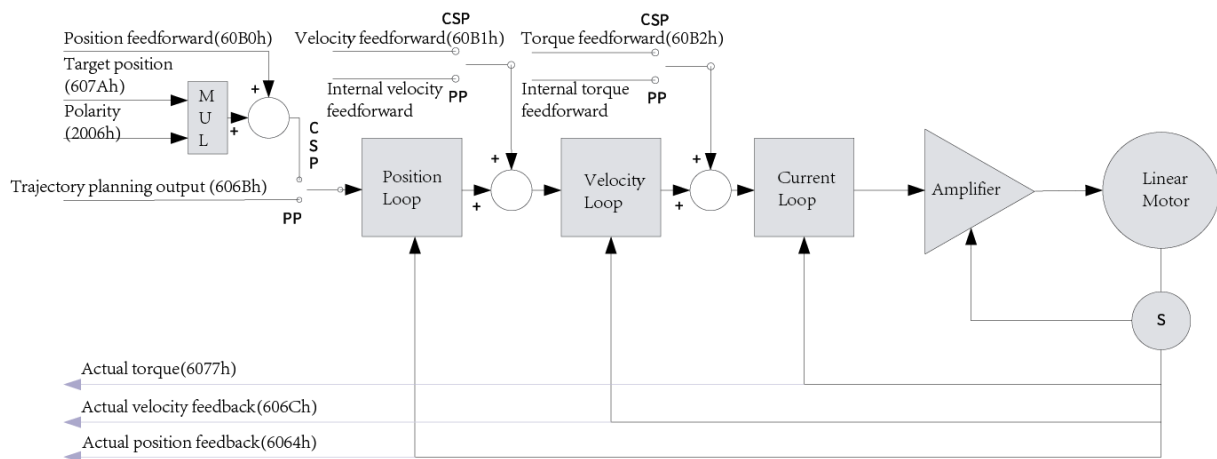


Figure 5-2 Cyclic Synchronous Position Mode structure

Related Objects

- Basic object (Recommend configuration objects)

Table 5-12 CSP mode basic object

Data Direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Notes
(RXPDO)	6040-00h	Control word	U16	RW	—	Required
	607A-00h	Target position	I32	RW	Unit	Required
	60B0-00h	Position feedforward	I32	RW	Unit	Optional
	60B1-00h	Velocity feedforward	I32	RW	Unit/s	Optional
	60B2-00h	Torque feedforward	I16	RW	0.1%	Optional
(TXPDO)	6041-00h	Status word	U16	RO	—	Required
	6064-00h	Actual feedback position	I32	RO	Unit	Required
	606C-00h	Actual feedback velocity	I32	RO	Unit/s	Optional
	60F4-00h	Actual following error	I32	RO	Unit	Optional
	6077-00h	Actual torque	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	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
6062-00h	Position demand value	I32	RO	Unit
606B-00h	Internal command speed	I32	RO	Unit
607D-01h	Min. software limit	I32	RO	Unit
607D-02h	Max. software limit	I32	RO	Unit
605A-00h	Quick stop option code	I16	RW	—
6085-00h	Emergency stop deceleration	U32	RW	Unit/s
608F-01h	Encoder resolution	U32	RO	P
608F-02h	Motor turns	U32	RO	—
6091-01h	Electronic gear ratio numerator	U32	RW	—
6091-02h	Electronic gear ratio denominator	U32	RW	—
6092-01h	Number of pulses per rotation	U32	RW	—
6092-02h	Number of physical axis turns	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 driver will plan motion route according to parameters. Under non-synchronous mode, motor motion between each axes are asynchronous.

From the perspective of servo driver 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.

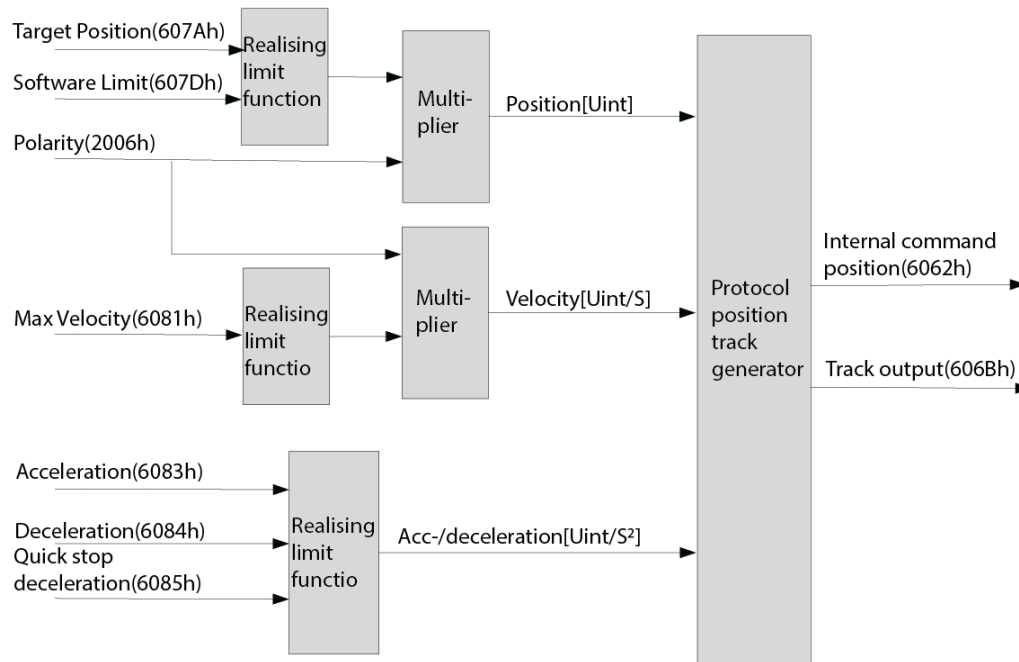


Figure 5-3 PP mode trajectory generator

Related Parameters

- Basic object (Recommend configuration objects)

Table 5-14 PP mode basic object

Data Direction ^[1]	Index + Sub-Index	Label	Data Type	Access	Unit	Notes
(RXPDO)	6040-00h	Control word	U16	RW	—	Required
	607A-00h	Target position	I32	RW	Unit	Required
	6081-00h	Max. velocity	U32	RW	Unit	Required
	6083-00h	Acceleration	I32	RW	Unit/s	Optional
(TXPDO)	6041-00h	Status word	U16	RO	—	Required
	603F-00h	Error code	U16	RO		Optional
	6064-00h	Actual position feedback	I32	RO	Unit	Required
	606C-00h	Actual velocity feedback	I32	RO	Unit/s	Optional
	60F4-00h	Actual following error	I32	RO	Unit	Optional
	6077-00h	Actual torque	I16	RO	0.1%	Optional

- 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	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
6062-00h	Position demand value	I32	RO	Unit
606B-00h	Internal command speed	I32	RO	Unit
607D-01h	Min. software limit	I32	RO	Unit
607D-02h	Max. software limit	I32	RO	Unit
605A-00h	Quick stop option code	I16	RW	—
6085-00h	Emergency stop deceleration	U32	RW	Unit/s ²
608F-01h	Encoder resolution	U32	RO	P
608F-02h	Motor turns	U32	RO	—
6091-01h	Electronic gear ratio numerator	U32	RW	—
6091-02h	Electronic gear ratio denominator	U32	RW	—
6092-01h	Number of pulses per rotation	U32	RW	—
6092-02h	Number of physical axis turns	U32	RO	—

Control and status words under PP mode

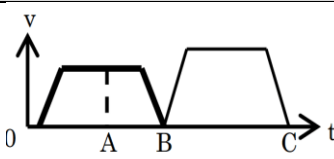
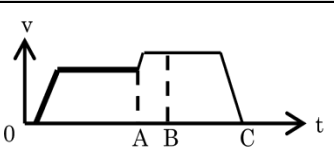
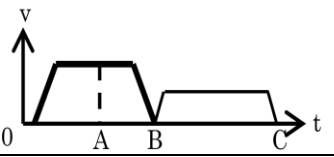
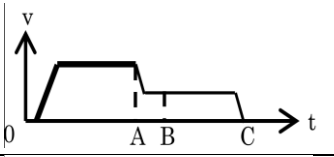
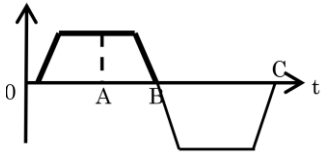
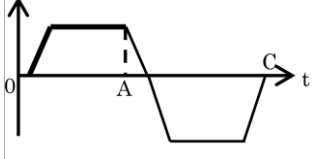
Control word(6040h) bits 4~6 definition under PP mode is shown as Table 5-16.

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), Acceleration/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

Control words bit 5	0	1
Accelerates/ constant velocity toward target position		
Decelerates towards target position		
Target position in inversed direction		

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 definitions under PP mode are shown as Table 5-18.

Table 5-18 Status word bits 12-15, 10, 8 definitions 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(Triple)	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 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 driver is now under PP mode.
- 2) Write motion parameters: Target position 607Ah, Max. velocity 6081h, acceleration 6083h, deceleration 6084h
- 3) Enable servo driver 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 driver supports every other homing method except for method 36. Output/Input parameters are as shown as Figure.

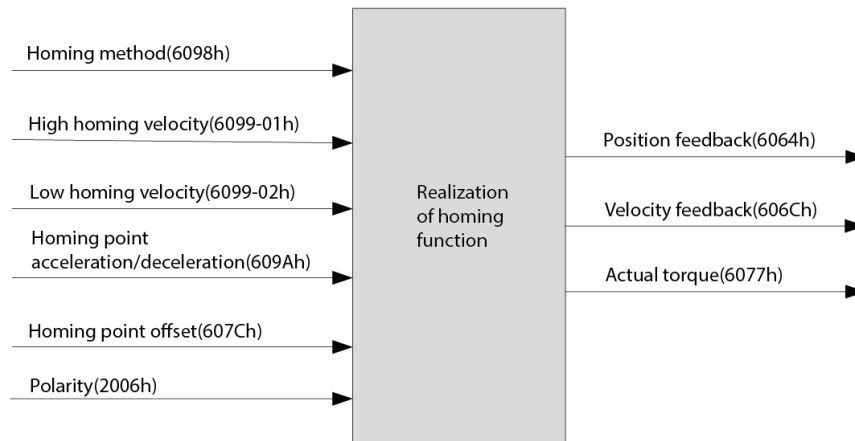


Figure 5-4 Homing mode output/input parameters

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 (Recommend configuration objects)

Table 5-19 HM mode basic object

Data Direction ^[1]	Index + Sub-Index	Name	Data Type	Access	Unit	Notes
(RXPDO)	6040-00h	Control word	U16	RW	—	Required
	6098-00h	Homing mode	I8	RW	—	Optional
	6099-01h	High homing velocity	U32	RW	Unit/s	Optional
	6099-02h	Low homing velocity	U32	RW	Unit/s	Optional
	609A-00h	Homing point acceleration	U32	RW	Unit/s ²	Optional
	607C-00h	Homing point offset	I32	RW	Unit	Optional
(TXPDO)	60-00h	Status word	U16	RO	—	Required
	603F-00h	Error code	U16	RO	—	Optional
	6064-00h	Actual position feedback	I32	RO	Unit	Optional
	606C-00h	Actual velocity feedback	I32	RO	Unit/s	Optional
	60F4-00h	Actual following error	I32	RO	Unit	Optional
	6077-00h	Actual torque	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	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
6062-00h	Position demand value	I32	RO	Unit
606B-00h	Internal command speed	I32	RO	Unit
608F-01h	Encoder resolution	I32	RO	Unit
608F-02h	Motor revolution	I32	RO	Unit
6091-01h	Electronic gear ratio numerator	U32	RW	—
6091-02h	Electronic gear ratio denominator	U32	RW	—
6092-01h	Number of pulses per rotation	U32	RW	—
6092-02h	Number of physical axis turns	U32	RO	—

Control and status words under HM mode

Control word bit 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	-
	1 -> 0	-
6 (Undefined)	0 -> 1	-
	1 -> 0	-

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

Bit	Value	Definition
8 (Abnormal Stoppage)	0	Normal motion.
	1	Abnormal stoppage triggered, motor stops. ^[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.

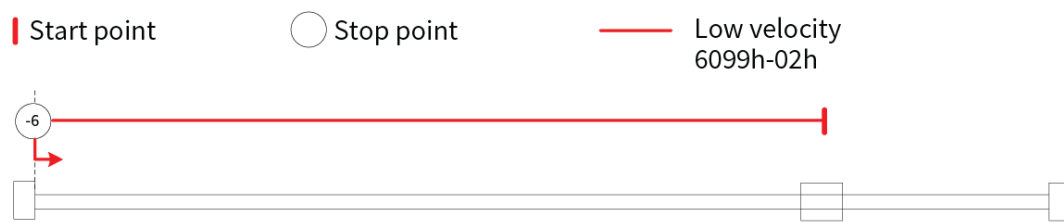
Table 5-23 HM motion error conditions table

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
Positive limit valid when negative 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

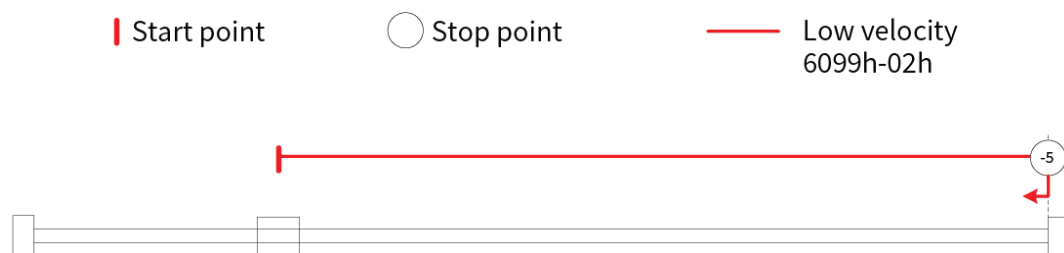
Homing mode

- Torque limiting mode

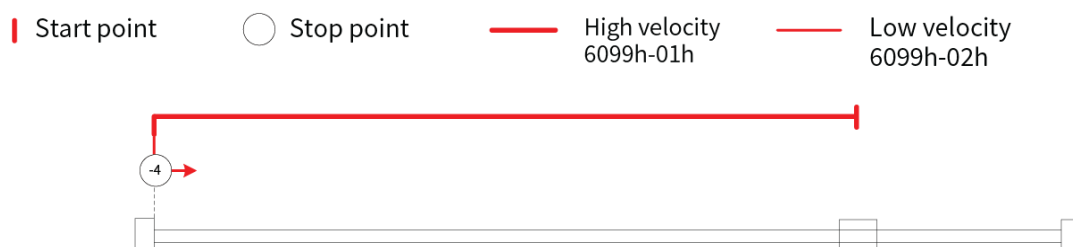
Mode -6: Search for homing point in negative direction at low velocity. Stop after torque reaches the value set in P05.39 and homing done signal delivers.



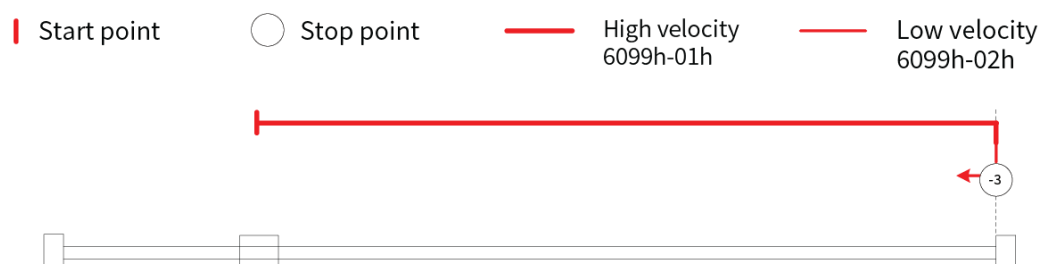
Mode -5: Search for homing point in positive direction at low velocity. Stop after torque reaches the value set in P05.39 and homing done signal delivers.



Mode -4: Search for homing point in negative direction at high velocity. Move in positive direction after torque reaches the value set in P05.39, stop when torque is gone. Homing done signal delivers.

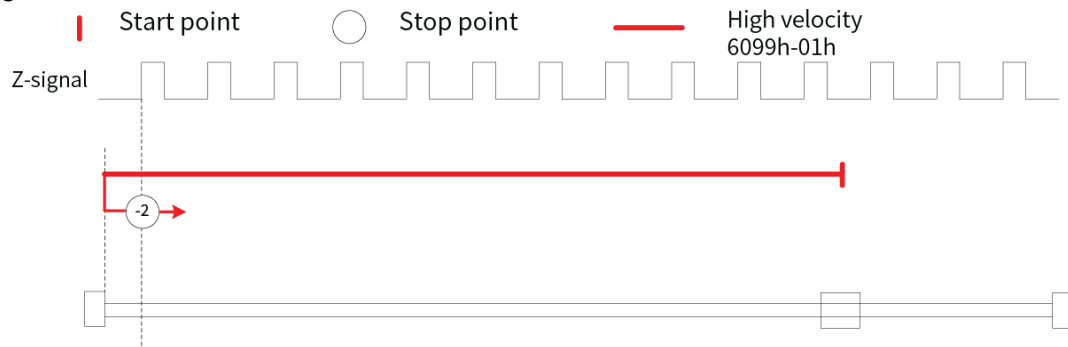


Mode -3: Search for homing point in positive direction at high velocity. Move in negative direction after torque reaches the value set in P05.39, stops when torque is gone. Homing done signal delivers.

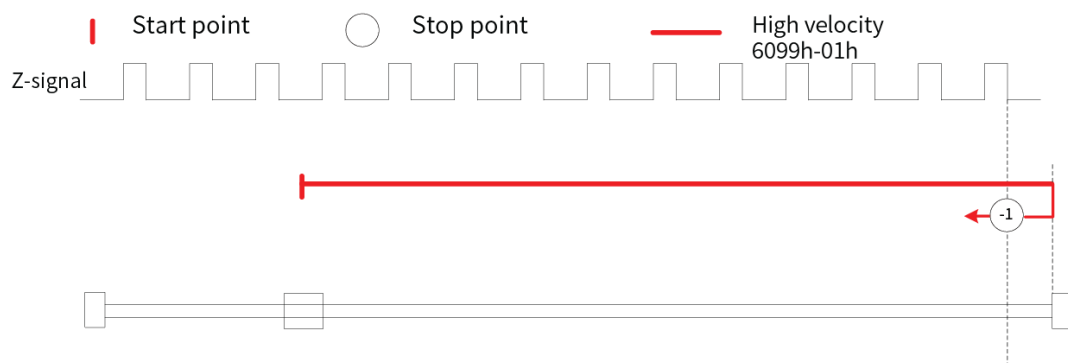


Torque limiting + Z-signal mode

Mode -2: Search for homing point in negative direction at high velocity. Move in positive direction after torque reaches the value set in P05.39, stops when torque is gone with the first Z-signal.



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 + Z-signal mode

Mode 1:

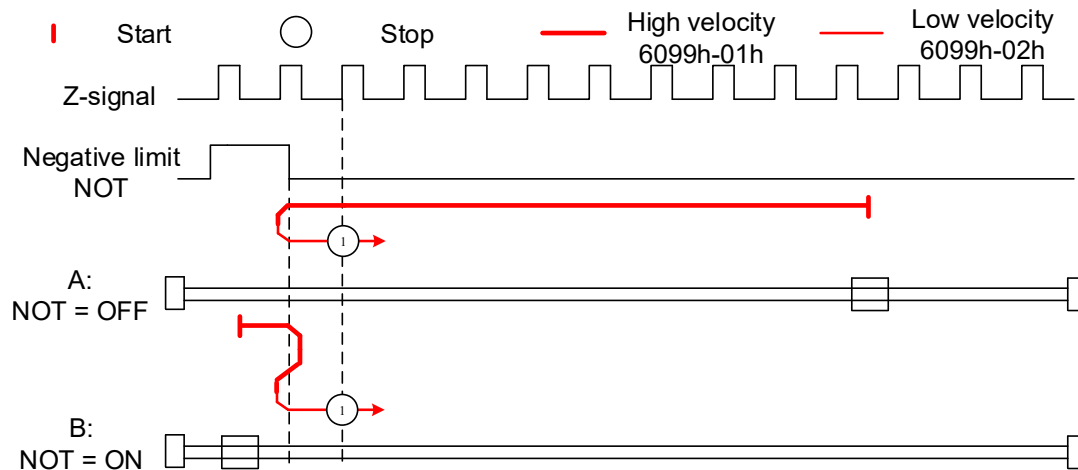
Diagram A: Negative limit switch = OFF

1. Move in negative direction at high velocity until negative limit switch valid.
2. Move in positive direction at low velocity and stop after negative limit switch and first encoder Z-signal valid

Diagram B: Negative limit switch = ON

1. Start to move at negative limit switch position in positive direction at high velocity until negative limit switch invalid.
2. Move in negative direction at high velocity until negative limit switch valid.
3. Move in positive direction at low velocity and stop after negative limit switch and first encoder Z-signal valid

If the positive limit signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 2:

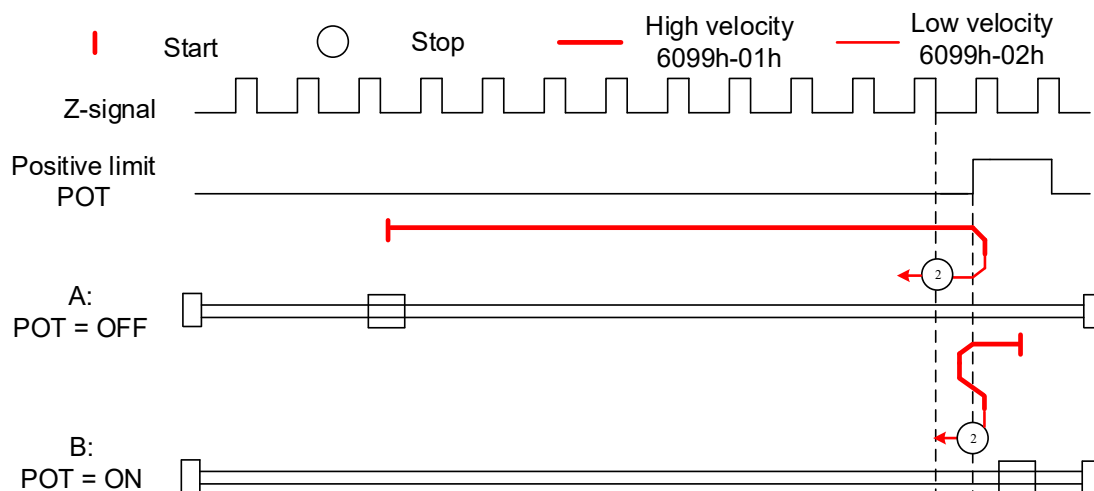
Diagram A: Positive limit switch = OFF

1. Move in positive direction at high velocity until positive limit switch valid.
2. Move in negative direction at low velocity and stop after positive limit switch and first encoder Z-signal valid

Diagram B: Positive limit switch = ON

1. Start to move at positive limit switch position in negative direction at high velocity until positive limit switch invalid.
2. Move in positive direction at high velocity until positive limit switch valid.
3. Move in negative direction at low velocity and stop after positive limit switch and first encoder Z-signal valid

If the negative limit signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Homing switch signal + Z-signal mode

Mode 3:

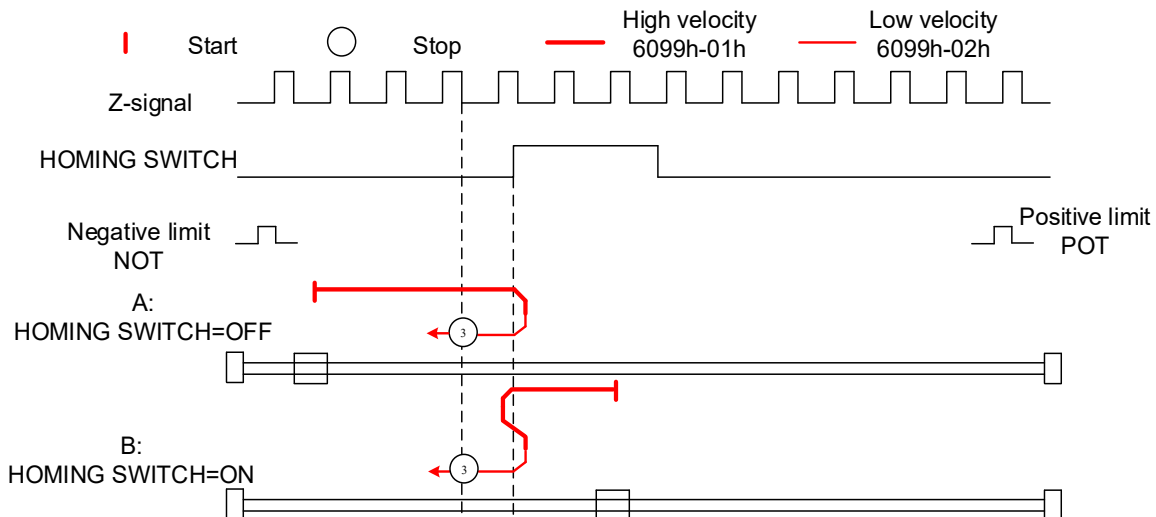
Diagram A: Homing switch = OFF

1. Move in positive direction at high velocity until homing switch valid.
2. Move in negative direction at low velocity and stop after homing switch and first encoder Z-signal valid

Diagram B: Homing switch = ON

1. Start to move at homing switch position in negative direction at high velocity until after homing switch.
2. Move in positive direction at high velocity until homing switch valid.
3. Move in negative direction at low velocity and stop after homing switch and first encoder Z-signal valid

If the positive/negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 4:

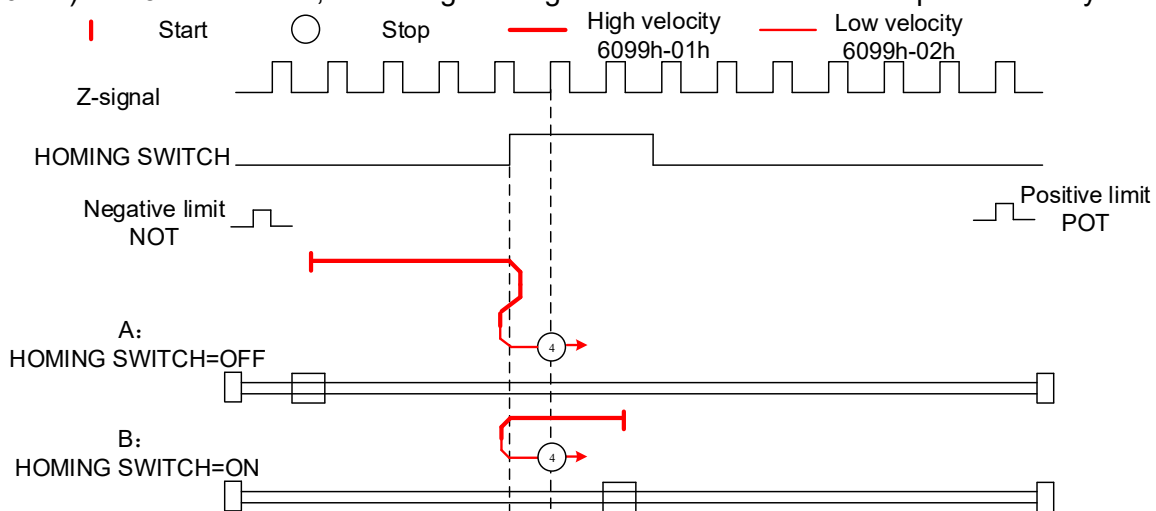
Diagram A: Homing switch = OFF

1. Move in positive direction at high velocity until homing switch valid.
2. Move in negative direction at high velocity until homing switch invalid.
3. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid

Diagram B: Homing switch = ON

1. Start to move at homing switch position in negative direction at high velocity until after homing switch.
2. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid

If the positive/negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 5:

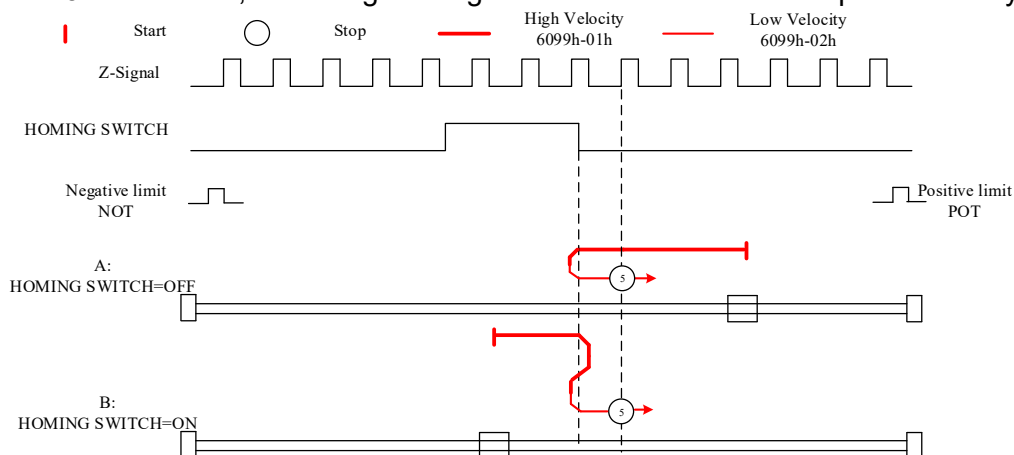
Diagram A: Homing switch = OFF

1. Move in negative direction at high velocity until homing switch valid.
2. Move in positive direction at low velocity and stop after homing switch and first encoder Z-signal valid

Diagram B: Homing switch = ON

1. Start to move at homing switch position in positive direction at high velocity until after homing switch.
2. Move in negative direction at high velocity until homing switch valid.
3. Move in positive direction at low velocity and stop after homing switch and first encoder Z-signal valid

If the positive/negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 6:

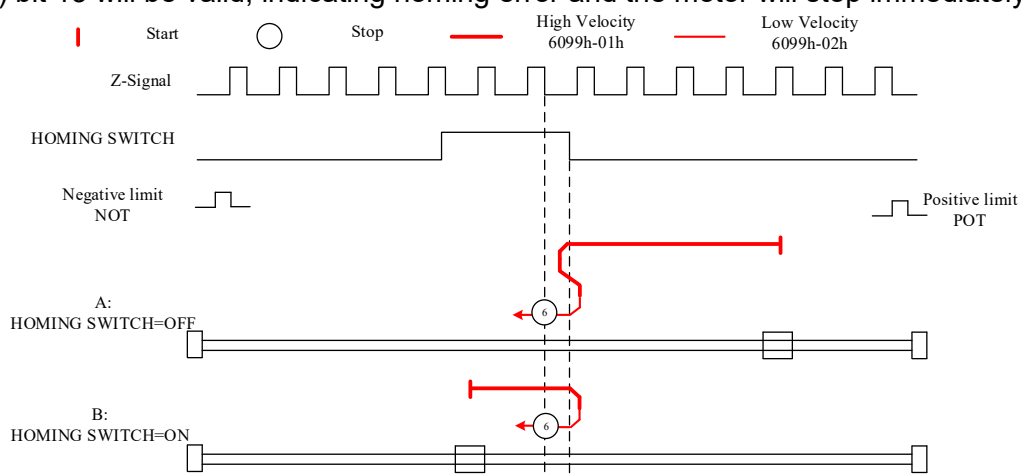
Diagram A: Homing switch = OFF

1. Move in negative direction at high velocity until homing switch valid.
2. Move in positive direction at high velocity until homing switch invalid.
3. Move in negative direction at low velocity and stop after homing switch valid and first encoder Z-signal valid

Diagram B: Homing switch = ON

1. Start to move at homing switch position in positive direction at high velocity until after homing switch.
2. Move in negative direction at low velocity and stop after homing switch valid and first encoder Z-signal valid

If the positive/negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Limit switch signal + homing switch signal + Z-signal mode

Mode 7

Diagram A: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until homing switch valid.
2. Move in negative direction at low velocity and stop after homing switch and first encoder Z-signal valid.

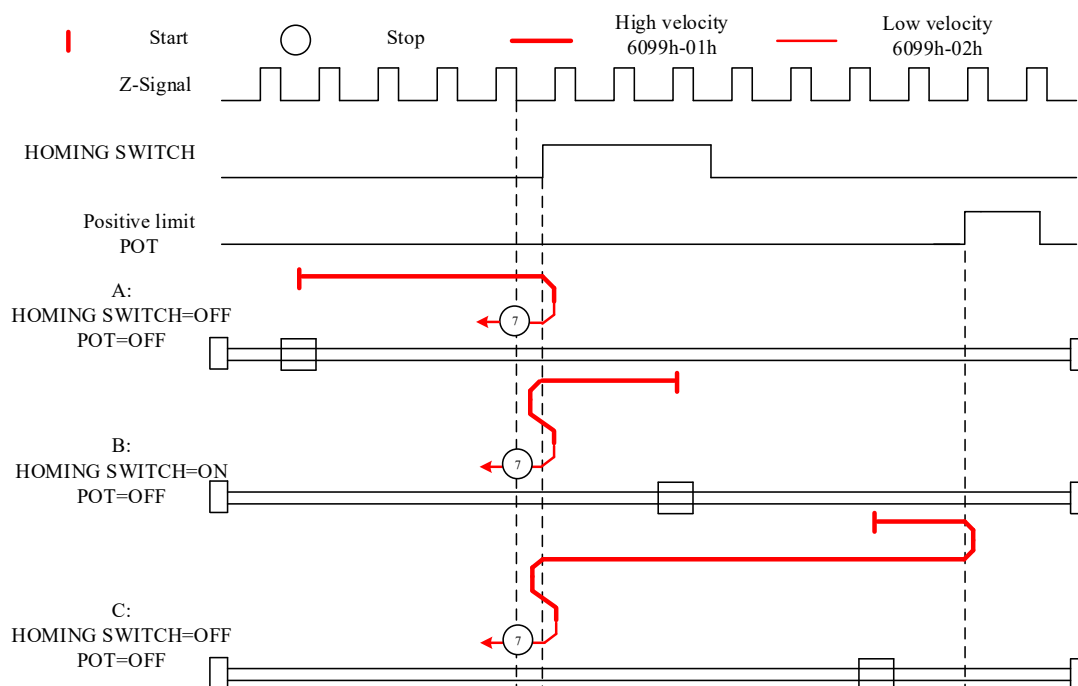
Diagram B: Homing switch = ON, positive limit switch = OFF

1. Start to move at homing switch position in negative direction at high velocity until after homing switch.
2. Move in positive direction at high velocity until homing switch valid.
3. Move in negative direction at low velocity and stop after homing switch and first encoder Z-signal valid

Diagram C: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until positive limit switch valid.
2. Move in negative direction at high velocity until after homing switch.
3. Move in positive direction at high velocity until homing switch valid.
4. Move in negative direction at low velocity and stop after homing switch and first encoder Z signal valid

If the negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 8

Diagram A: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until homing switch valid.
2. Move in negative direction at high velocity until after homing switch.
3. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

Diagram B: Homing switch = ON, positive limit switch = OFF

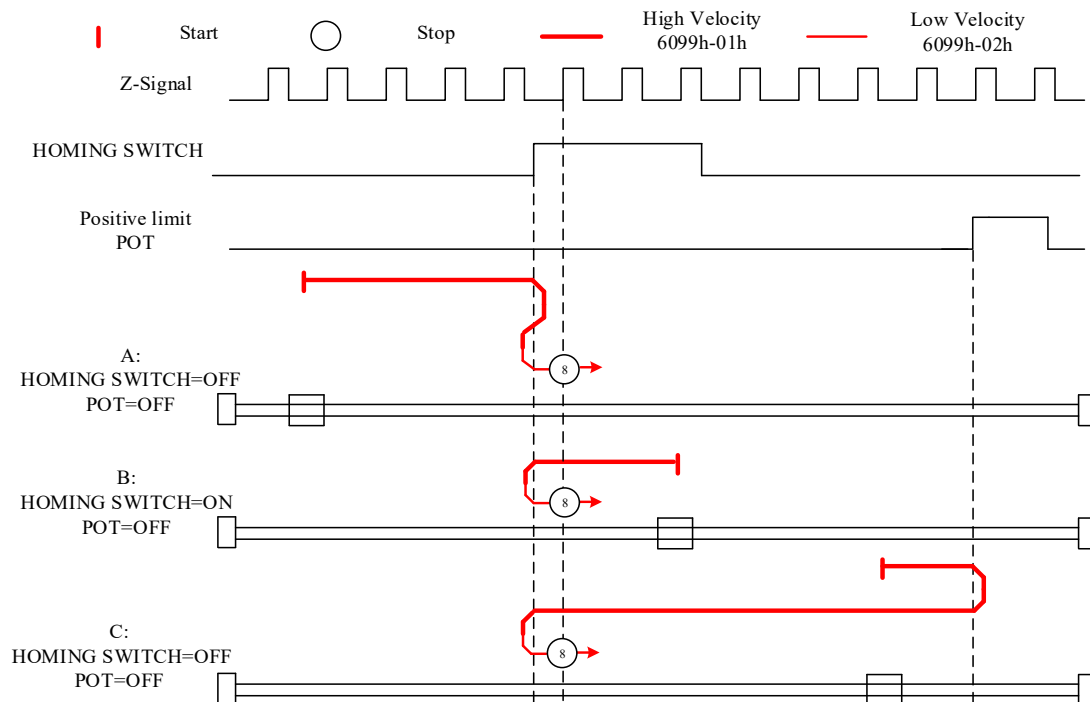
1. Start to move at homing switch position in negative direction at high velocity until after homing switch.
2. Move in positive direction at low velocity and stop after homing switch valid and first

encoder Z-signal valid

Diagram C: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until positive limit switch valid.
2. Move in negative direction at high velocity until after homing switch.
3. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

If the negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 9

Diagram A: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until after homing switch.
2. Move in negative direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

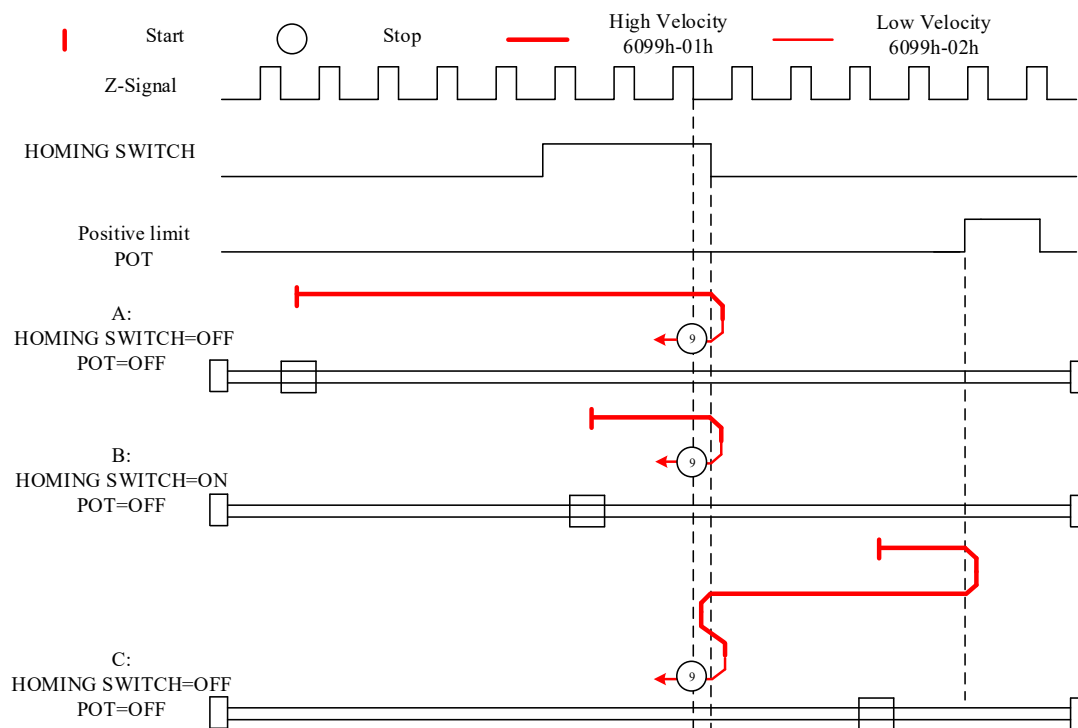
Diagram B: Homing switch = ON, positive limit switch = OFF

1. Start to move at homing switch position in positive direction at high velocity until homing switch invalid.
2. Move in negative direction at low velocity and stop after homing switch valid and first encoder Z-signal valid

Diagram C: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until positive limit switch valid.
2. Move in negative direction at high velocity until homing switch valid.
3. Move in positive direction at high velocity until after homing switch.
4. Move in negative direction at low velocity and stop after homing switch valid and first encoder Z signal valid

If the negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 10

Diagram A: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until after homing switch.
2. Move in negative direction at high velocity until homing switch valid.
3. Move in positive direction at low velocity and stop after homing switch and first encoder Z-signal valid.

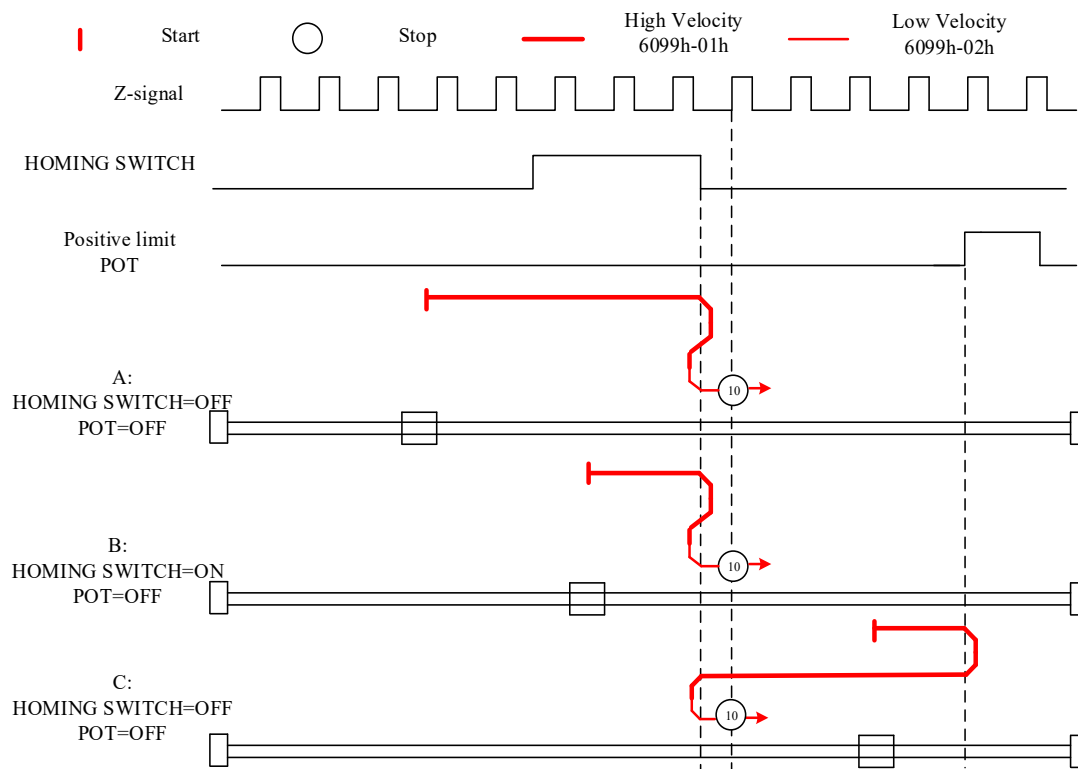
Diagram B: Homing switch = ON, positive limit switch = OFF

1. Start to move at homing switch position in positive direction at high velocity until after homing switch.
2. Move in negative direction at high velocity until homing switch valid.
3. Move in positive direction at low velocity and stop after homing switch and first encoder Z-signal valid

Diagram C: Homing switch & positive limit switch = OFF

1. Move in positive direction at high velocity until positive limit switch valid.
2. Move in negative direction at high velocity until homing switch valid.
3. Move in positive direction at low velocity and stop after homing switch and first encoder Z signal valid

If the negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 11

Diagram A: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until homing switch valid.
2. Move in positive direction at low velocity and stop after homing switch and first encoder Z-signal valid

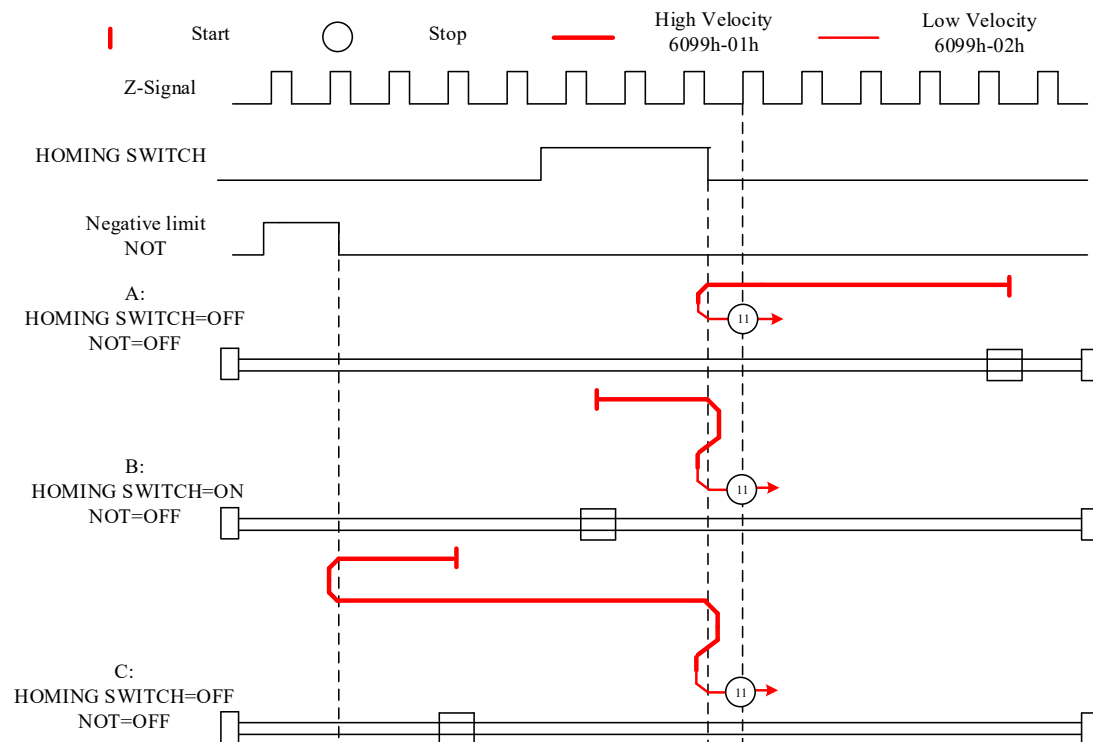
Diagram B: Homing switch = ON, negative limit switch = OFF

1. Start to move at homing switch position in positive direction at high velocity until after homing switch.
2. Move in negative direction at high velocity until homing switch valid.
3. Move in positive direction at low velocity and stop after homing switch and first encoder Z-signal valid

Diagram C: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until the negative limit switch valid.
2. Move in positive direction at high velocity until homing switch invalid.
3. Move in negative direction at high velocity until homing switch valid.
4. Move in positive direction at low velocity and stop after homing switch and first encoder Z signal valid

If the positive limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 12

Diagram A: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until homing switch valid.
2. Move in positive direction at high velocity until after homing switch.
3. Move in negative direction at low velocity and stop after homing switch valid and first encoder Z-signal valid

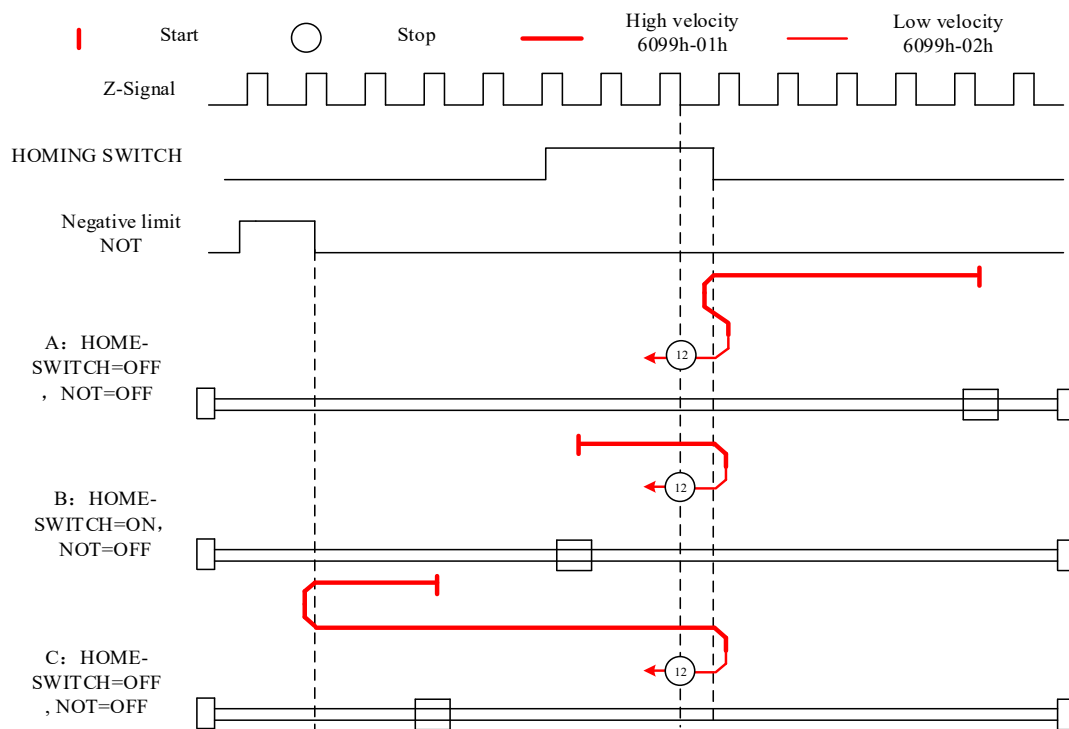
Diagram B: Homing switch = ON, negative limit switch = OFF

1. Move at homing switch position in negative direction at high velocity until after homing switch.
2. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

Diagram C: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until negative limit switch valid.
2. Move in positive direction at high velocity until after homing switch.
3. Move in negative direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

If the positive limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 13

Diagram A: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until after homing switch.
2. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

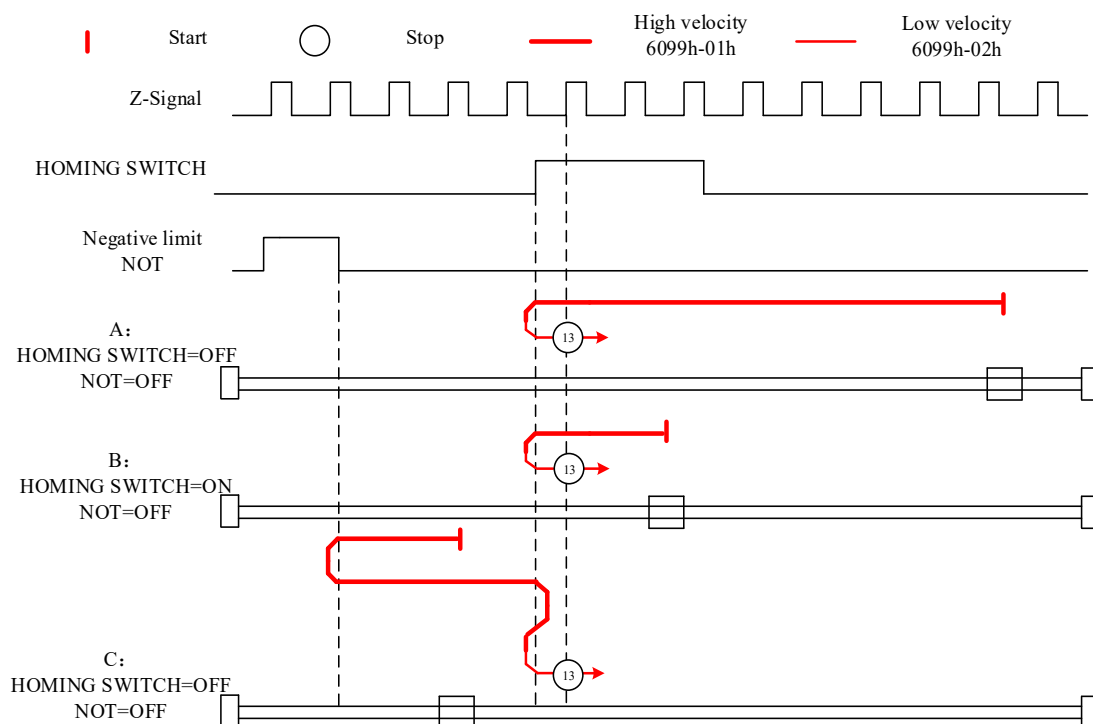
Diagram B: Homing switch = ON, negative limit switch = OFF

1. Start to move at homing switch position in negative direction at high velocity until after homing switch.
2. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

Diagram C: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until negative limit switch valid.
2. Move in positive direction at high velocity until homing switch valid.
3. Move in negative direction at high velocity until after homing switch.
4. Move in positive direction at low velocity and stop after homing switch valid and first encoder Z-signal valid.

If the positive limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 14

Diagram A: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until after homing switch.
2. Move in positive direction at high velocity until homing switch valid.
3. Move in negative direction at low velocity and stop after homing switch and first encoder Z-signal valid.

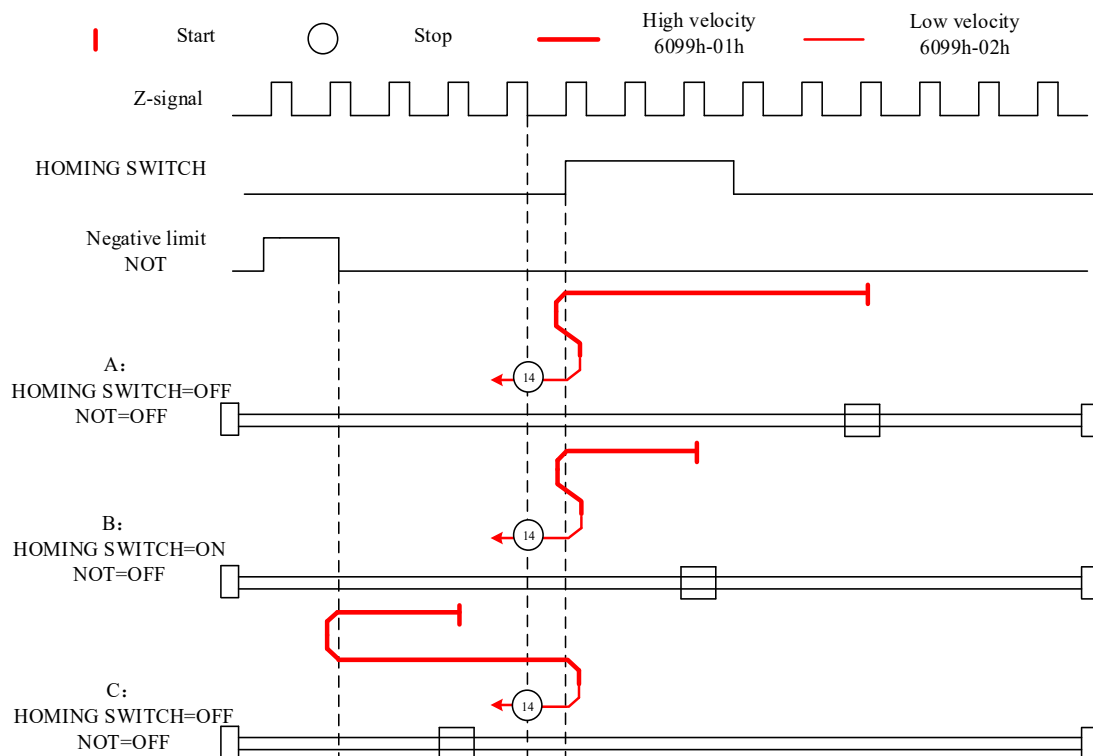
Diagram B: Homing switch = ON, negative limit switch = OFF

1. Start to move at homing switch position in negative direction at high velocity until homing switch invalid.
2. Move in positive direction until homing switch valid.
3. Move in negative direction at low velocity and stop after homing switch and first encoder Z signal valid.

Diagram C: Homing switch & negative limit switch = OFF

1. Move in negative direction at high velocity until negative limit switch valid.
2. Move in positive direction at high velocity until homing switch valid.
3. Move in negative direction at low velocity and stop after homing switch and first encoder Z-signal valid.

If the positive limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.

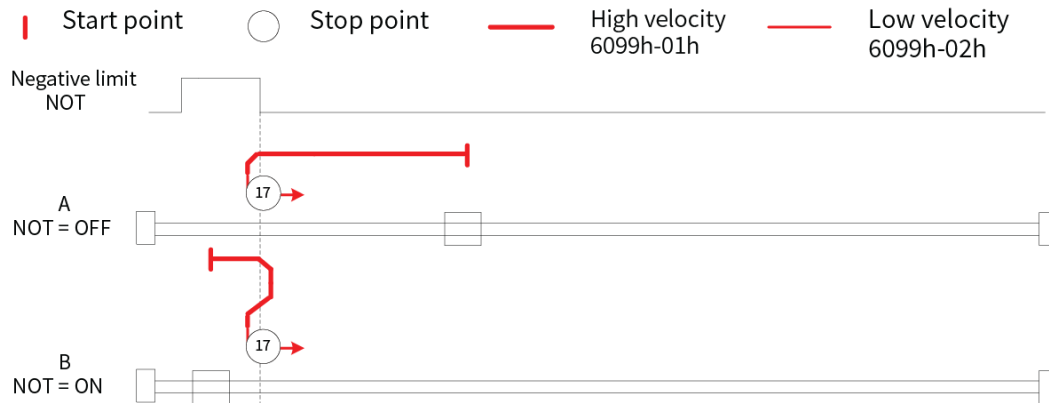


Limit switch signal triggering detection mode

Mode 17:

This mode is similar to mode 1. Only difference is that homing point detection is not through Z-signal but through triggering of negative limit switch signal.

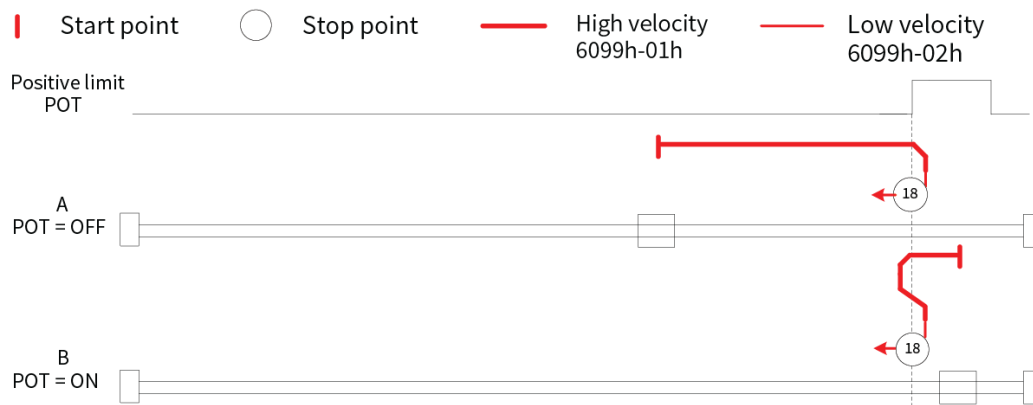
The triggering conditions for the error bit are the same as in Method 1.



Mode 18:

This mode is similar to mode 2. Only difference is that homing point detection is not through Z-signal but through switching of positive limit switch signal.

The triggering conditions for the error bit are the same as in Method 2.

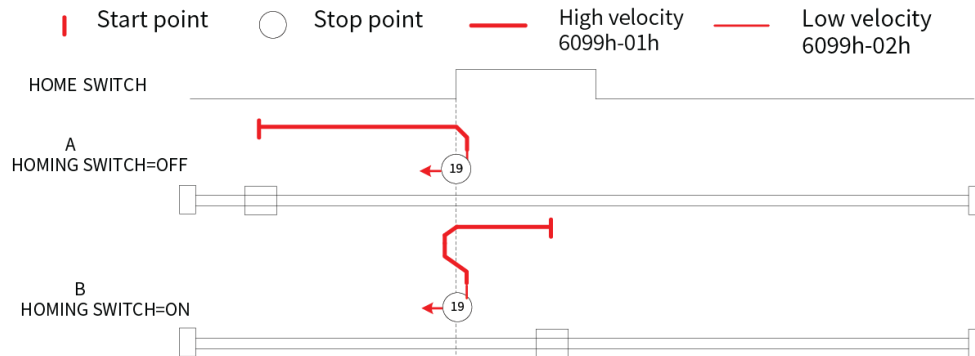


Homing switch signal triggering detection mode

Mode 19:

This mode is similar to mode 3. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

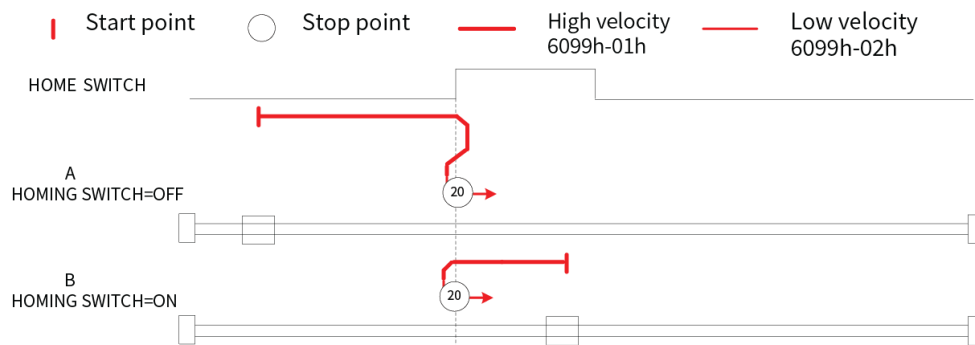
The triggering conditions for the error bit are the same as in Method 3.



Mode 20:

This mode is similar to mode 4. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

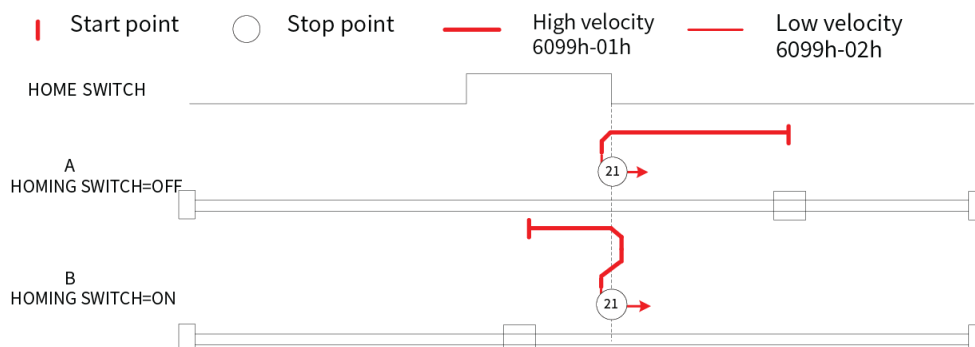
The triggering conditions for the error bit are the same as in Method 4.



Mode 21:

This mode is similar to mode 5. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

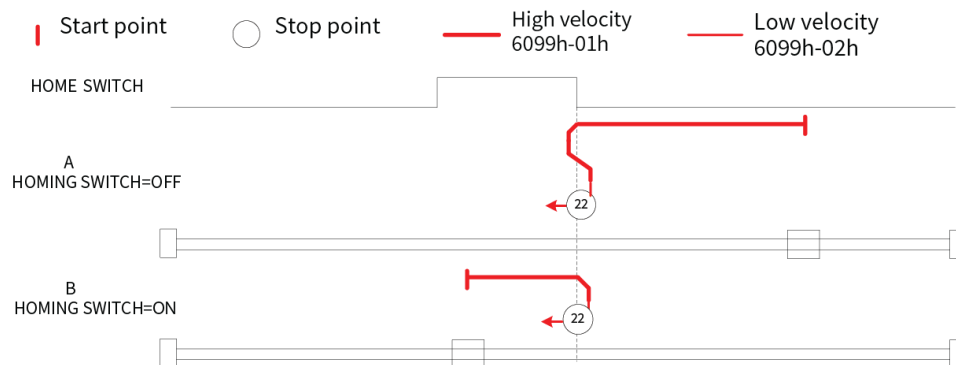
The triggering conditions for the error bit are the same as in Method 5.



Mode 22:

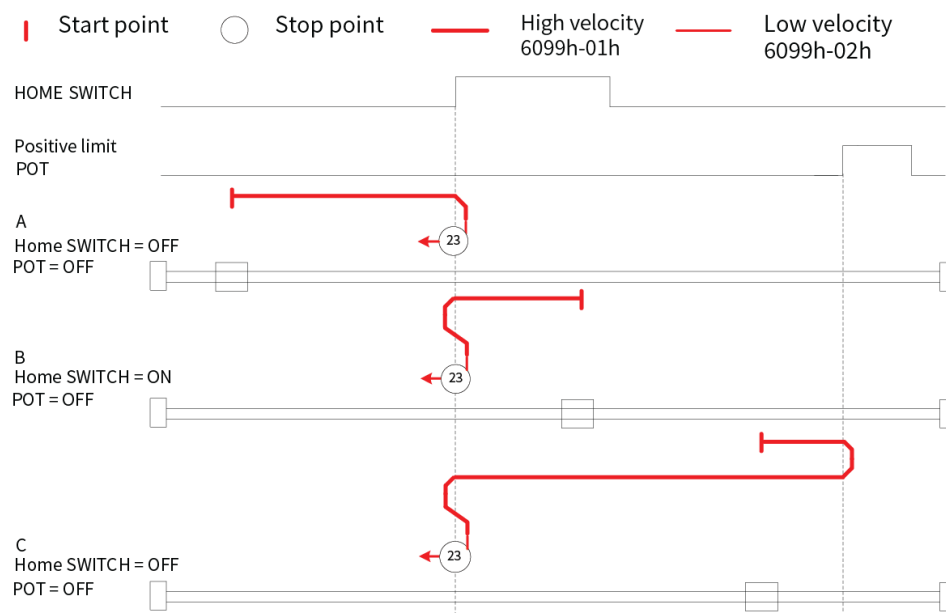
This mode is similar to mode 6. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

The triggering conditions for the error bit are the same as in Method 6.

**Mode 23:**

This mode is similar to mode 7. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

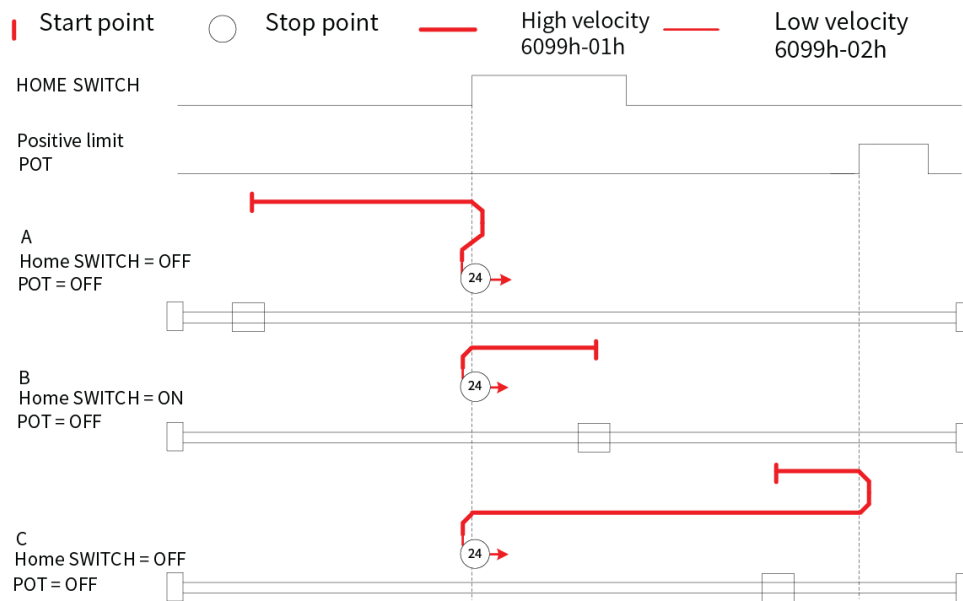
The triggering conditions for the error bit are the same as in Method 7.



Mode 24:

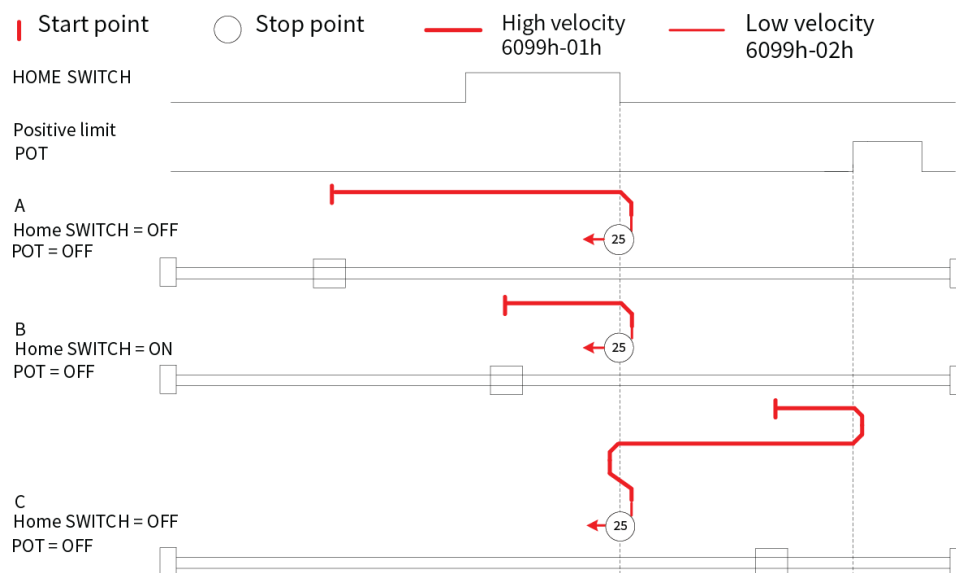
This mode is similar to mode 8. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

The triggering conditions for the error bit are the same as in Method 8.

**Mode 25:**

This mode is similar to mode 9. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

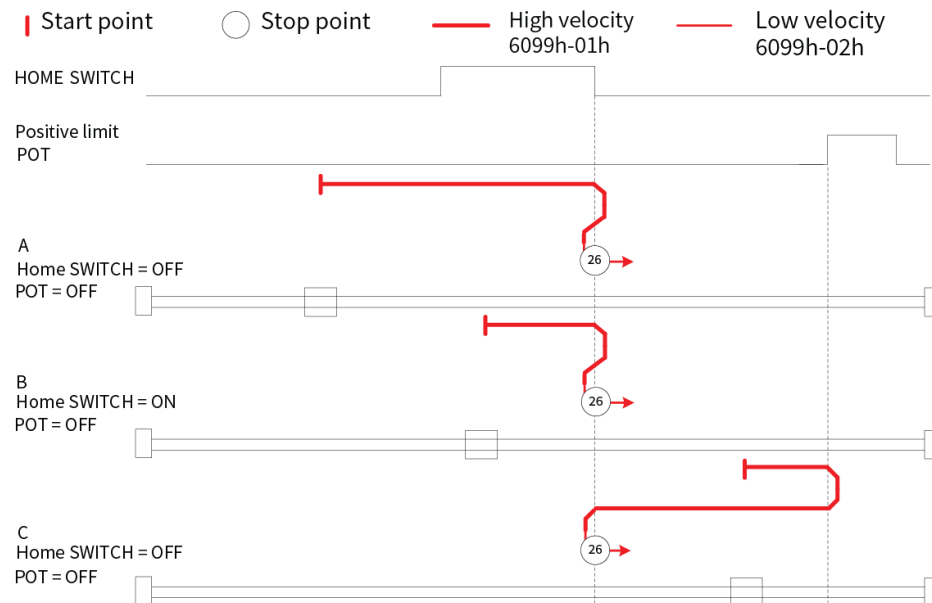
The triggering conditions for the error bit are the same as in Method 9.



Mode 26:

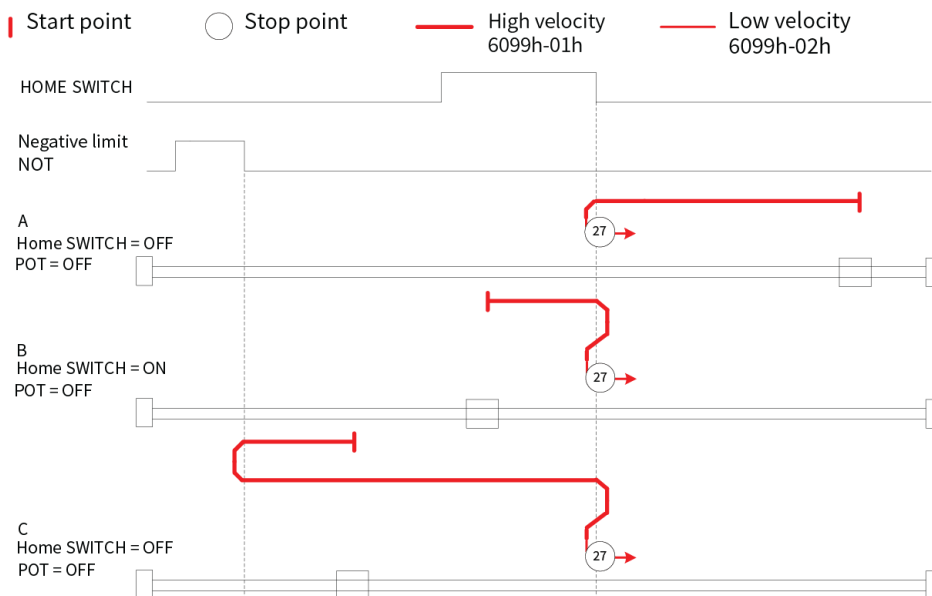
This mode is similar to mode 10. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

The triggering conditions for the error bit are the same as in Method 10.

**Mode 27:**

This mode is similar to mode 11. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

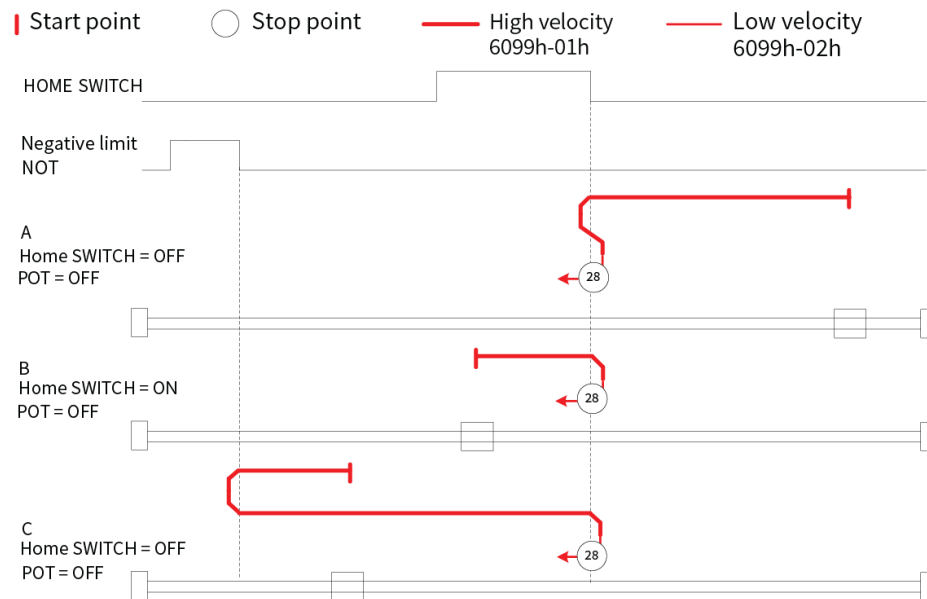
The triggering conditions for the error bit are the same as in Method 11.



Mode 28:

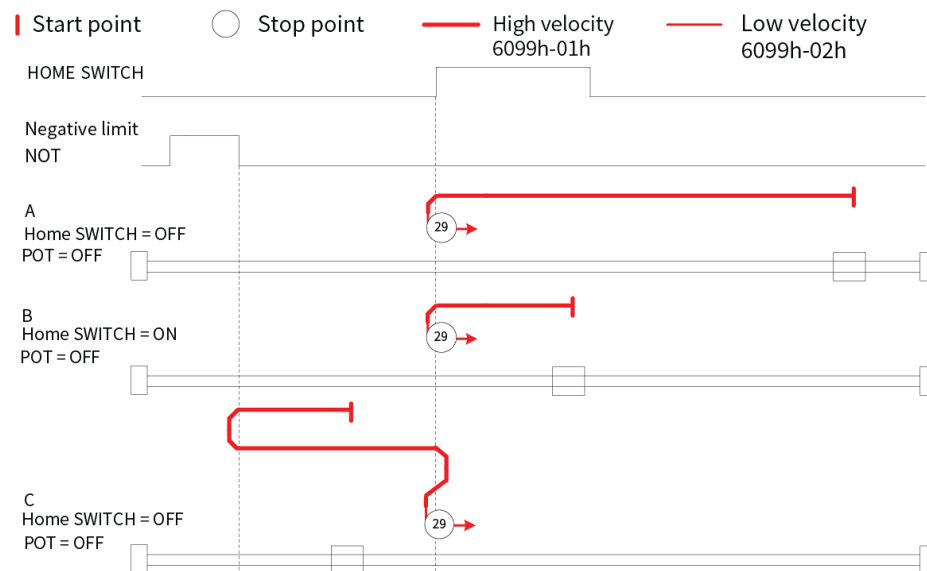
This mode is similar to mode 12. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

The triggering conditions for the error bit are the same as in Method 12.

**Mode 29:**

This mode is similar to mode 13. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

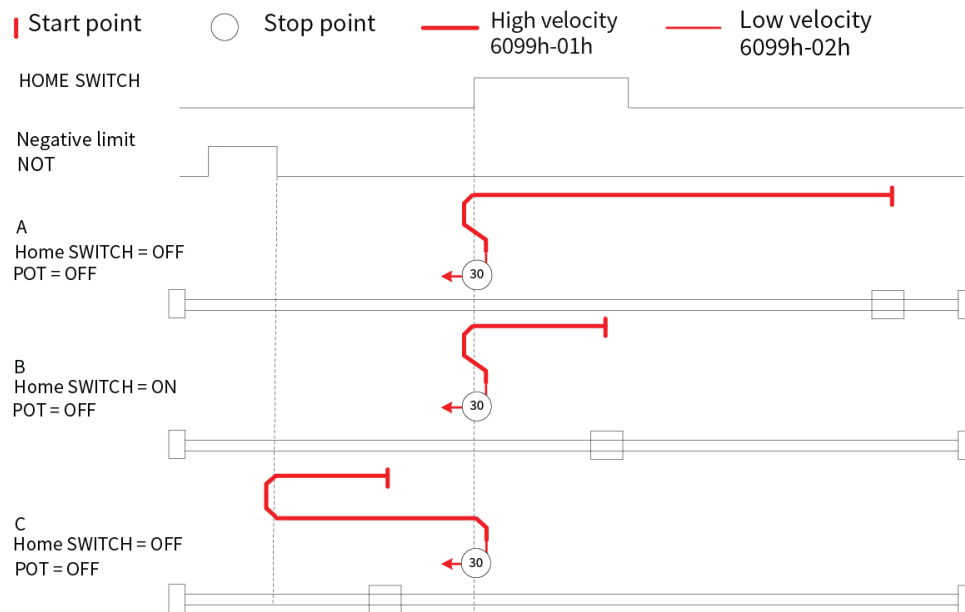
The triggering conditions for the error bit are the same as in Method 13.



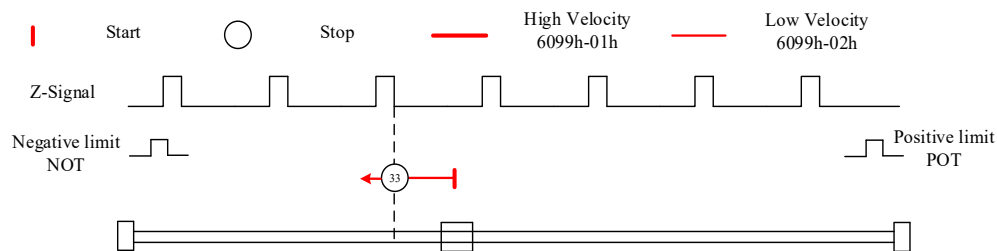
Mode 30:

This mode is similar to mode 14. Only difference is that homing point detection is not through Z-signal but through triggering of homing switch signal.

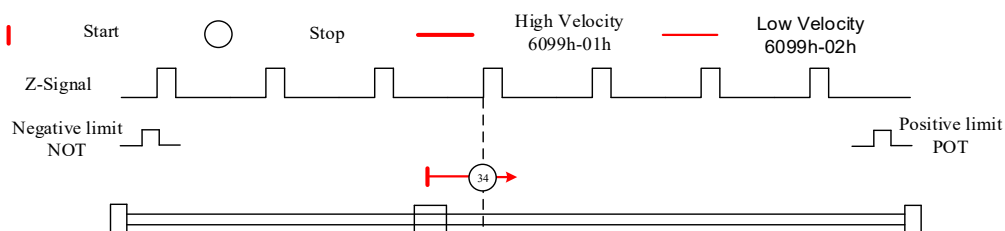
The triggering conditions for the error bit are the same as in Method 14.

**Other modes****Mode 33:**

The motor starts to move in negative direction and stops when the Z-signal is valid. If the positive/negative limit switch signal or homing switch is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.

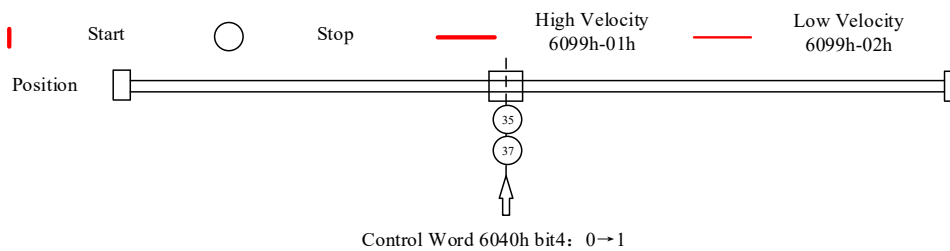
**Mode 34:**

The motor starts to move in positive direction and stops when the Z-signal is valid. If the positive/negative limit switch signal or homing switch is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 35/37:

Set the current position as homing point. Using this mode, motor doesn't have to be enabled.
Set control word 6040h bit 4 from 0 to 1.



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 driver 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 driver 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	Name	Access	PDO	Mode	
					CSV	PV
6040	0	Control word	RW	RxPDO	Yes	Yes
6072	0	Max torque	RW	RxPDO	Yes	Yes
6080	0	Maximum motor velocity	RW	RxPDO	Yes	Yes
60B1	0	Velocity feedforward (Restricted by 6080)	RW	RxPDO	Yes	Yes
60B2	0	Torque feedforward	RW	RxPDO	Yes	Yes
60FF	0	Target velocity (Restricted by 6080)	RW	RxPDO	Yes	Yes

Index	Sub Index	Name	Access	PDO	Mode	
					CSV	PV
6041	0	Status word	RO	TxPDO	Yes	Yes
6063	0	Actual internal position	RO	TxPDO	Yes	Yes
6064	0	Actual feedback position	RO	TxPDO	Yes	Yes
606B	0	Internal command velocity	RO	TxPDO	Yes	Yes
606C	0	Actual feedback velocity	RO	TxPDO	Yes	Yes
6074	0	Internal torque command	RO	TxPDO	Yes	Yes
6076	0	Rated torque	RO	TxPDO	Yes	Yes
6077	0	Actual torque	RO	TxPDO	Yes	Yes

5.6.2 Cyclic Synchronous Velocity Mode (CSV)

CSV Block Diagram

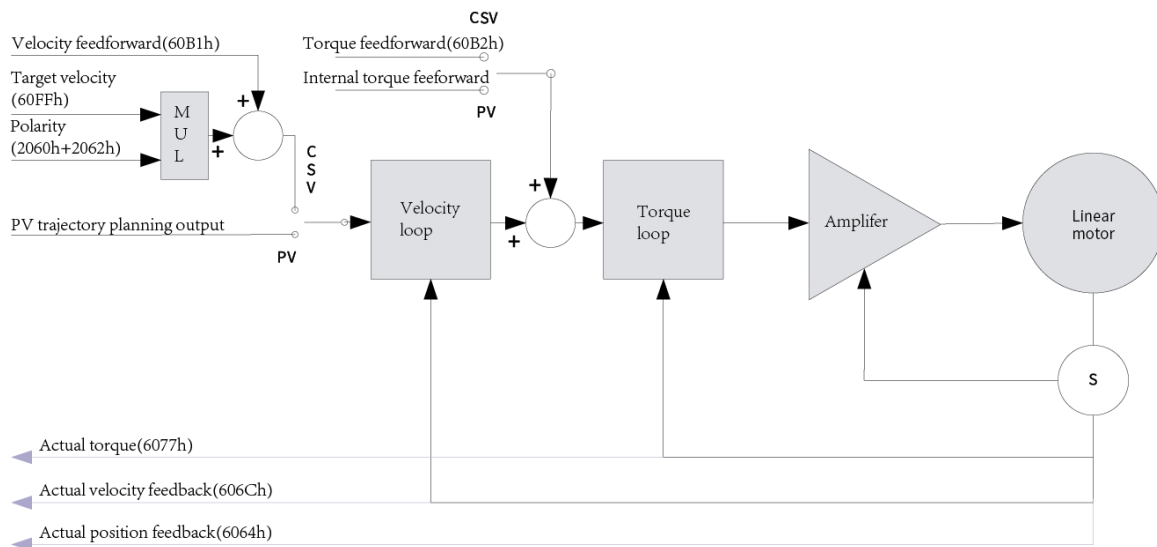


Figure 5-5 Cyclic Synchronous Velocity Mode structure

Related Objects

- Basic object (Recommend configuration objects)

Table 5-24 CSV mode basic object

Data Direction ^[1]	Index + Sub-Index	Name	Data Type	Access	Unit	Remarks
RXPDO	6040-00h	Control word	U16	RW	—	Required
	60FF-00h	Target velocity	I32	RW	Unit	Required
	60B1-00h	Velocity feedforward	I32	RW	Unit/s	Optional
	60B2-00h	Torque feedforward	I16	RW	0.1%	Optional
TXPDO	6041-00h	Status word	U16	RO	—	Required
	6064-00h	Actual position feedback	I32	RO	Unit	Optional
	606C-00h	Actual speed feedback	I32	RO	Unit/s	Optional
	60F4-00h	Actual following error	I32	RO	Unit	Optional
	6077-00h	Actual torque	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	Name	Data Type	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
606B-00h	Internal command velocity	I32	RO	Unit
605A-00h	Quick stop option	I16	RW	—
6085-00h	Quick stop deceleration	U32	RW	Unit/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. E-RME servo driver 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 axis 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.

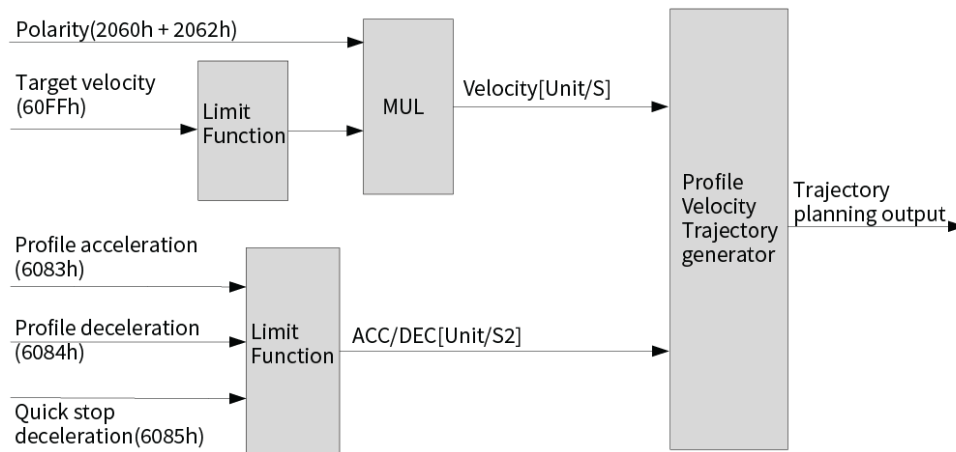


Figure 5-6 PV mode trajectory generation

Related Objects

- Basic object (Recommend configuration objects)

Table 5-26 PV mode basic object

Data Direction ^[1]	Index + Sub-Index	Name	Data Type	Access	Unit	Notes
(RXPDO)	6040-00h	Control word	U16	RW	—	Required
	60FF-00h	Target velocity	I32	RW	Unit	Required
	6083-00h	Acceleration	I32	RW	Unit/s ²	Optional
(TXPDO)	6041-00h	Status word	U16	RO	—	Required
	6064-00h	Position feedback	I32	RO	Unit	Optional
	606C-00h	Velocity feedback	I32	RO	Unit/s	Optional
	60F4-00h	Actual following error	I32	RO	Unit	Optional
	6077-00h	Actual torque	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	Name	Data Type	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
605A-00h	Quick stop option	I16	RW	—
6084-00h	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 bit 6~4 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 (Label)	Value	Details
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

The steps are as follows:

- 1) 6060h = 3, determine if 6061h = 3. Servo driver 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	Name	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	Maximum motor speed	RW	RxPDO	Yes	Yes
6087	0	Torque change rate	RW	RxPDO	Yes	Yes
60B2	0	Torque feedforward	RW	RxPDO	Yes	Yes

Index	Sub Index	Name	Access	PDO	Mode	
					CST	PT
6041	0	Status word	RO	TxPDO	Yes	Yes
6063	0	Actual internal position	RO	TxPDO	Yes	Yes
6064	0	Actual feedback position	RO	TxPDO	Yes	Yes
606C	0	Actual feedback velocity	RO	TxPDO	Yes	Yes
6074	0	Internal torque command	RO	TxPDO	Yes	Yes
6075	0	Rated current	RO	No	Yes	Yes
6076	0	Rated torque	RO	No	Yes	Yes
6077	0	Actual torque	RO	TxPDO	Yes	Yes
6079	0	Bus voltage	RO	TxPDO	Yes	Yes

5.7.2 Cyclic Synchronous Torque Mode (CST)

CST Block Diagram

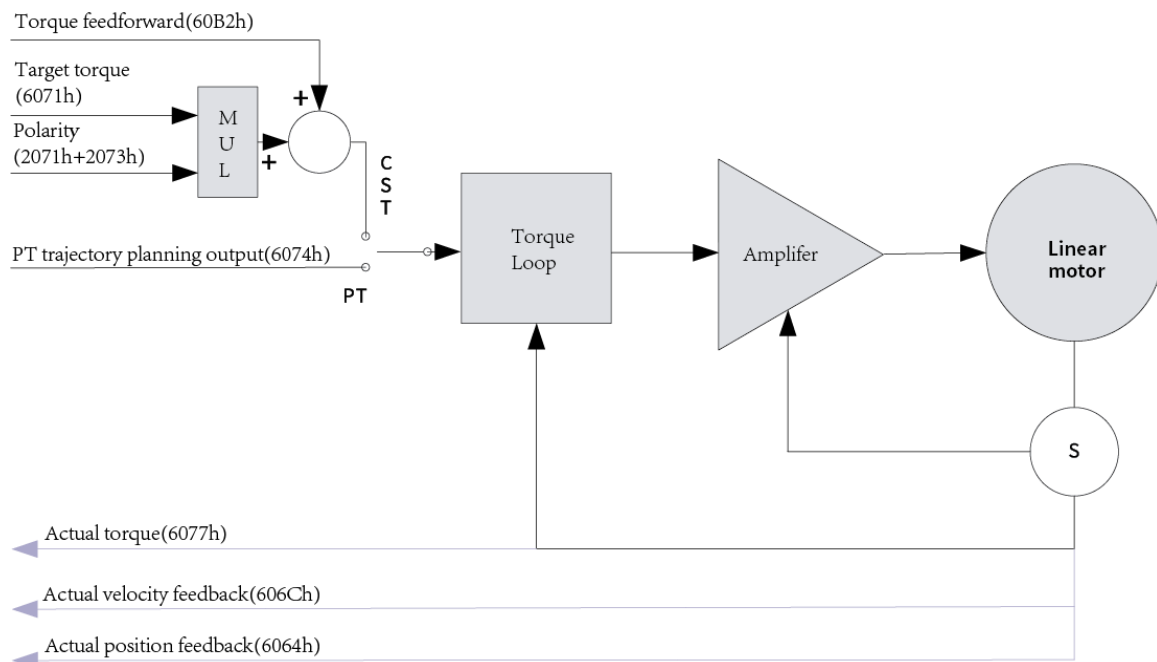


Figure 5-7 Cyclic Synchronous Torque Mode structure

Related Objects

- Basic object (Recommend configuration objects)

Table 5-29 CST mode basic object

Data Direction ^[1]	Index + Sub-Index	Name	Data Type	Access	Unit	Remarks
(RXPDO)	6040-00h	Control word	U16	RW	—	Required
	6071-00h	Target torque	I16	RW	Unit	Required
	6087-00h	Torque feed-forward	U32	RW	0.1%/s	Optional
(TXPDO)	6041-00h	Status word	U16	RO	—	Required
	6064-00h	Actual position feedback	I32	RO	Unit	Optional
	606C-00h	Actual velocity feedback	I32	RO	Unit/s	Optional
	60F4-00h	Actual following error	I32	RO	Unit	Optional
	6077-00h	Actual torque	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	Name	Data Type	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
6074-00h	Internal command torque	I16	RO	0.1%
605A-00h	Quick stop option	I16	RW	—
6080-00h	Maximum motor velocity	U32	RW	Unit/s
6085-00h	Quick stop deceleration	U32	RW	Unit/s ²
60B1-00h	Velocity feedforward	I32	RW	Unit/s
2077-00h	Velocity limit	I16	RW	Unit/s

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. Driver 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 axis 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.

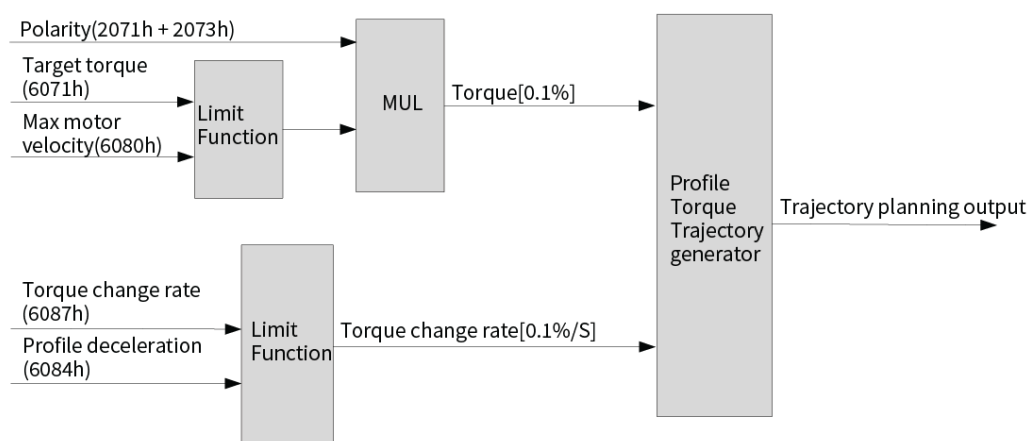


Figure 5-8 PT mode trajectory generation

Related Objects

- Basic object (Recommend configuration objects)

Table 5-31 PT mode basic object

Data Direction ^[1]	Index + Sub-Index	Name	Data Type	Access	Unit	Remarks
(RXPDO)	6040-00h	Control word	U16	RW	—	Required
	6071-00h	Target torque	I16	RW	0.1%	Required
	6087-00h	Torque change rate	U32	RW	0.1%/s	Optional
(TXPDO)	6041-00h	Status word	U16	RO	—	Required
	6064-00h	Actual feedback position value	I32	RO	Unit	Optional
	606C-00h	Actual feedback speed value	I32	RO	Unit/s	Optional
	60F4-00h	Actual following error	I32	RO	Unit	Optional
	6077-00h	Actual torque	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	Name	Data Type	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
6074-00h	Internal command torque	I16	RO	0.1%
6080-00h	Maximum motor velocity	U32	RW	Unit/S
605A-00h	Quick stop option	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 driver 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 Principal 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 Mbit/s ($>2 \times 100 \text{ Mbit/s} \times 90\%$).

ID number setting of EtherCAT slave station

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

P00.23	Label	Slave ID			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	2	Unit	-					
	Valid	Restart	Index	0x2023	SubIndex	0x00	Attribute	R/W			
Set ID number of the slave station under EtherCAT mode											

P00.24	Label	Slave IO Source			Valid mode(s)	-	-	-	-	-	F
	Range	0~1	Default	0	Unit	-					
	Valid	Restart	Index	0x2024	SubIndex	0x00	Attribute	R/W			
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, The Driver 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 driver.

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

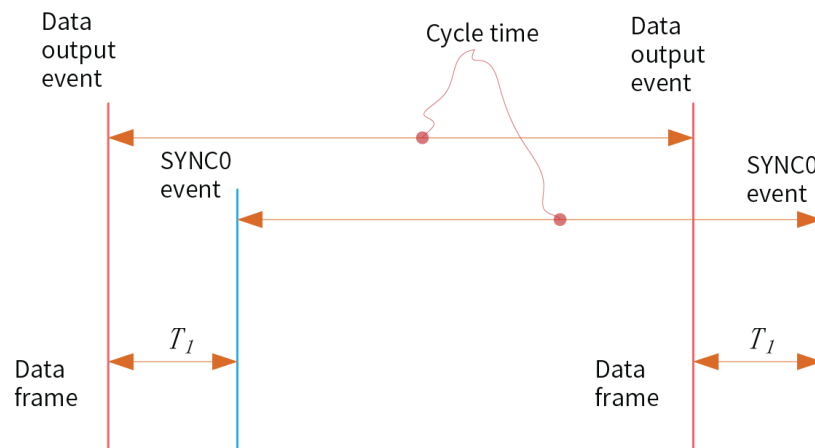


Figure 6-1 High performance synchronization mode

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.

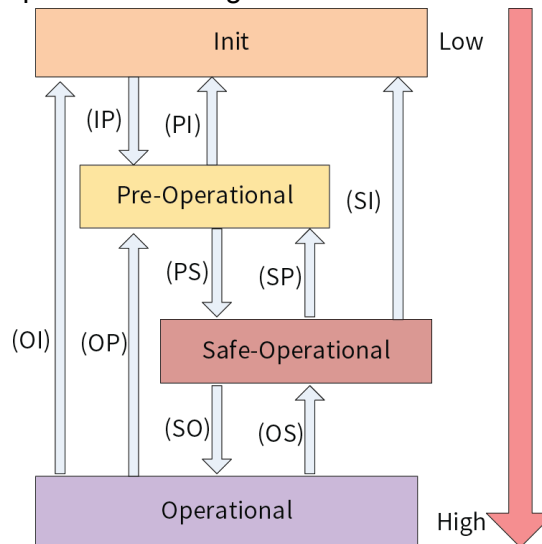


Figure 6-2 EtherCAT state machine transitions

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 mailbox or process data communication is possible.
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.

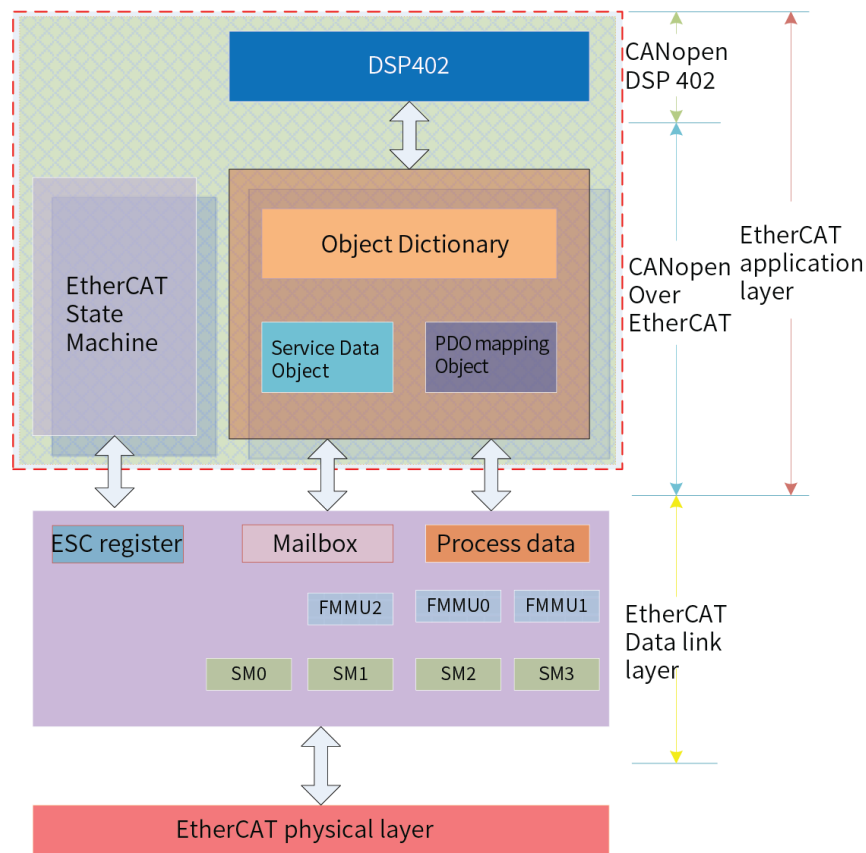


Figure 6-3 Structure of E-RME network module

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 driver, IO module.

6.4.2 Object Dictionary

EtherCAT master controls the E-RME driver by writing and reading device state/information. To do this, the driver 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 drivers 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

Bit	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 feedforward
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)	High homing velocity

	04h	60990220h	6099h	02h	20h (32 bit)	Low homing velocity
	05h	609A0020h	609Ah	00h	20h (32 bit)	Homing acceleration
	06h	607C0020h	607Ch	00h	20h (32 bit)	Homing position offset
	07h	60600008h	6060h	00h	08h (8 bit)	Operation mode
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 ^[1]
	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

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 Timing Chart

7.1 Power ON Sequence Diagram

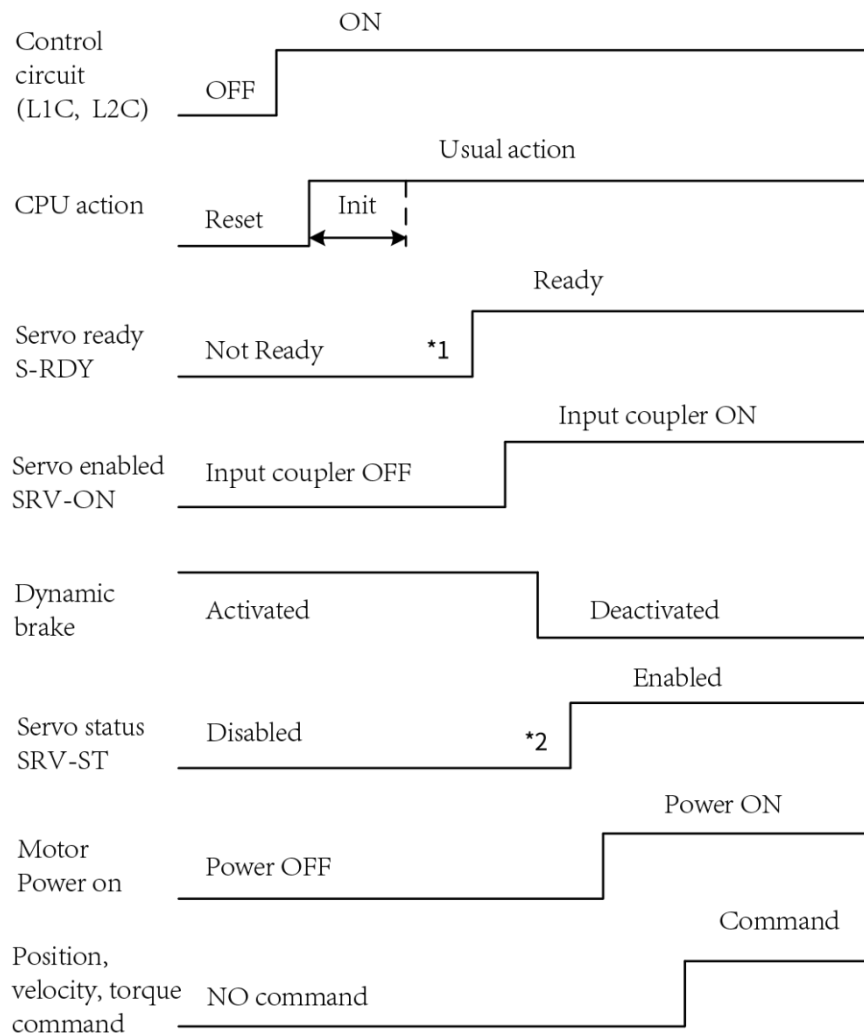


Figure 7-1 Driver Power on sequence diagram

Figure 7-1 shows the timing sequence for the driver, 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 driver 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 driver 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; block is free to rotate
Dynamic braking	Motor is powered OFF; block is not free to rotate

Motor stopping (Servo disabled) - Sequence Diagram

- Servo braking method. Status after stopping: Dynamic braking (P05.06=0)

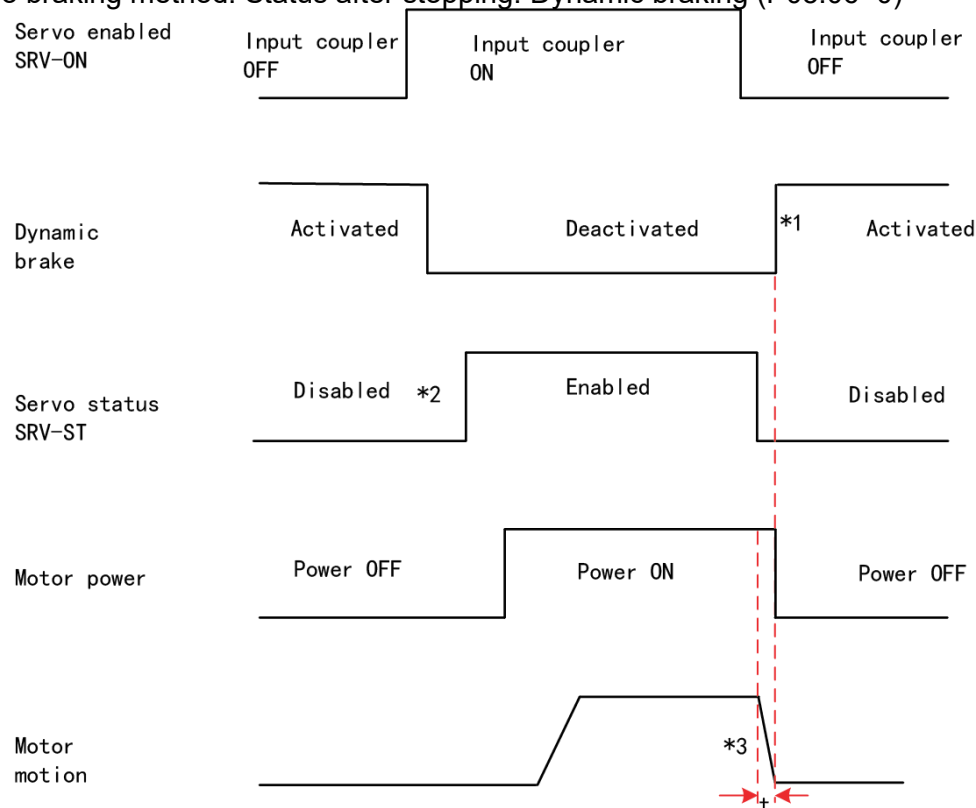


Table 7-3 Motor normal servo stop sequence 1

Note

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

*2: SRV-ST signal is received when servo driver 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 defined as 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)

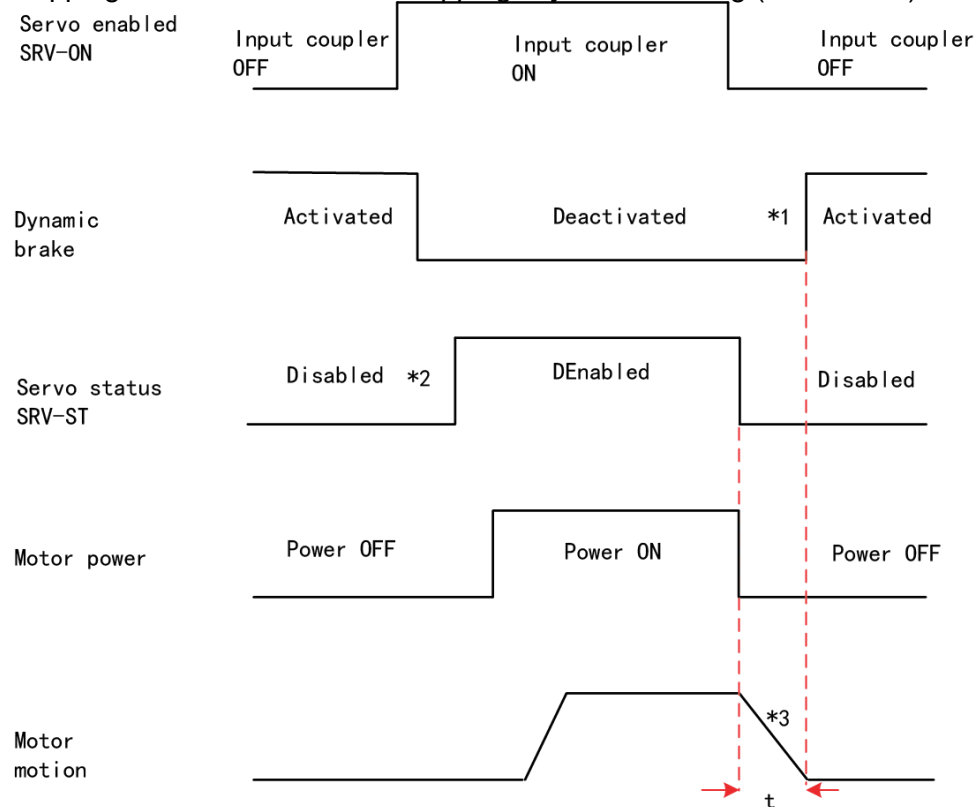


Figure 7-2 Motor normal servo stop sequence 2

Note

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

*2: SRV-ST signal is received when servo driver 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)

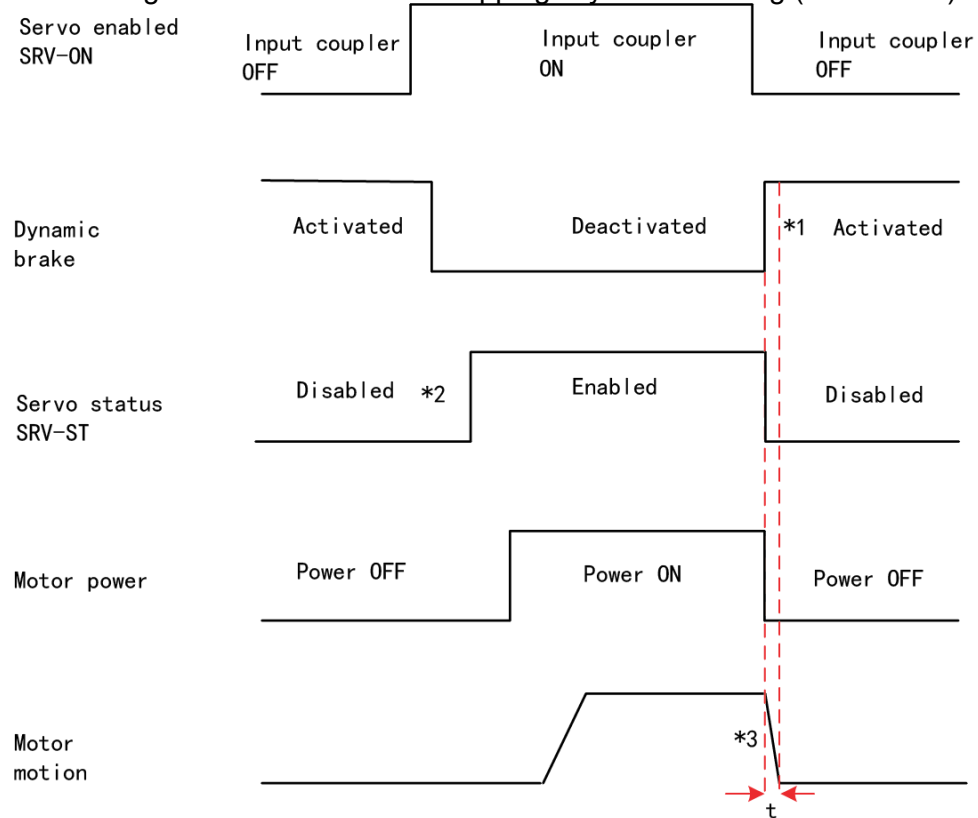


Figure 7-3 Motor normal servo stop sequence 3

Note

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

*2: SRV-ST signal is received when servo driver 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 running (P05.06 = 3)

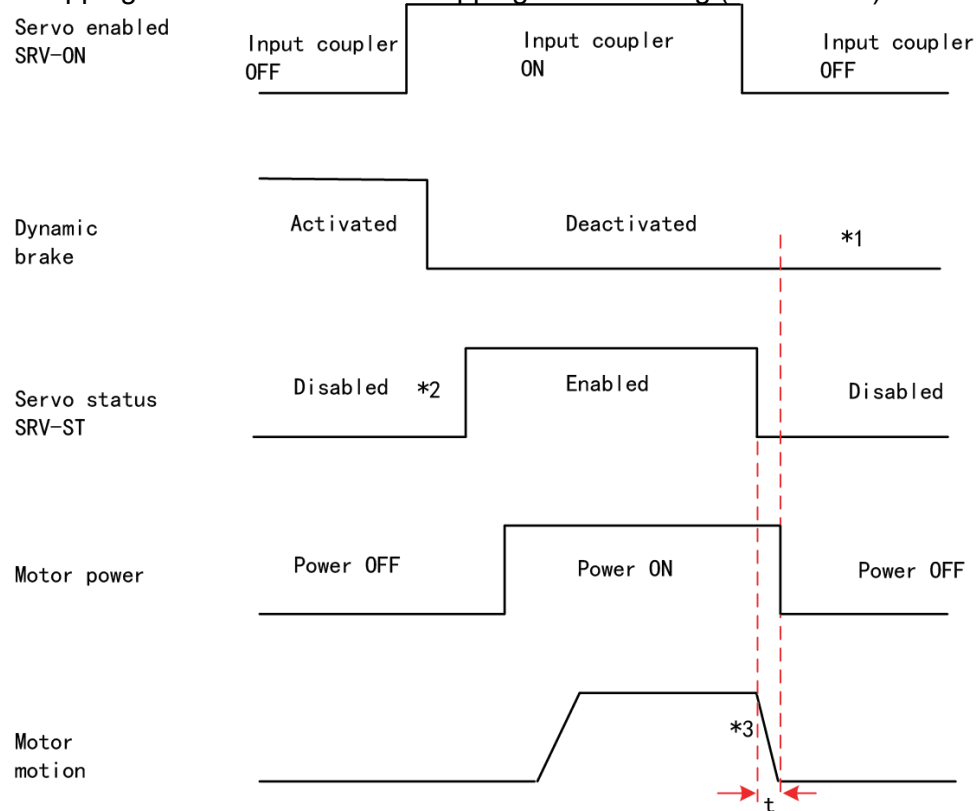


Figure 7-4 Motor normal servo stop sequence 4

Note

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

*2: SRV-ST signal is received when servo driver 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)

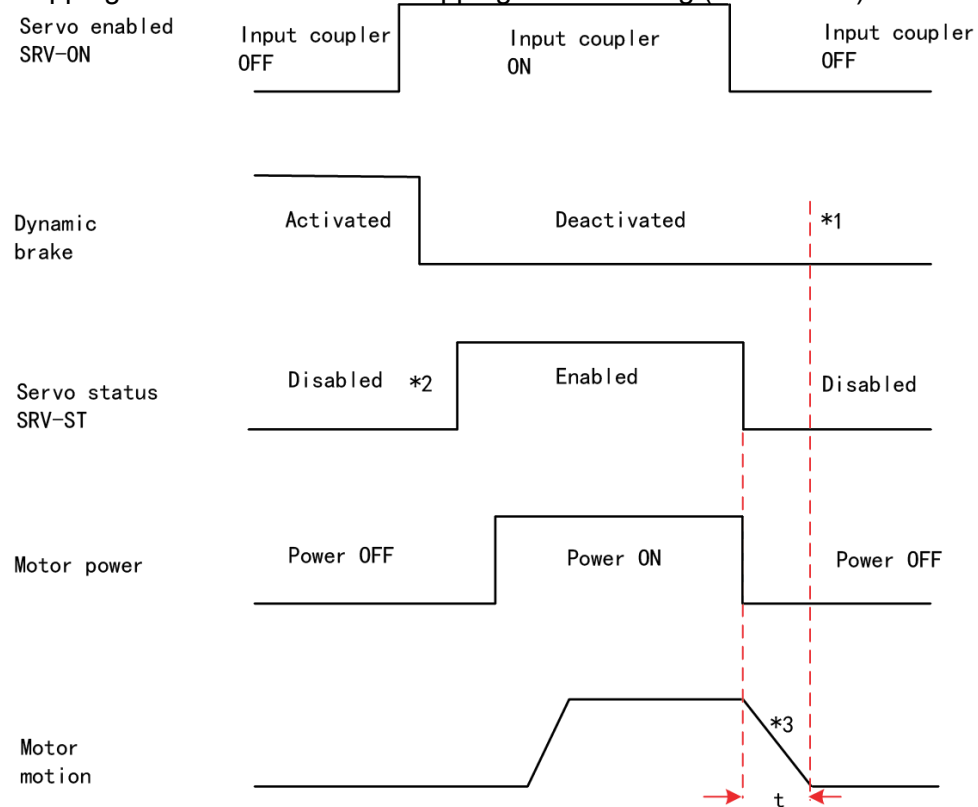


Figure 7-5 Motor normal servo stop sequence 5

Note

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

*2: SRV-ST signal is received when servo driver 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)

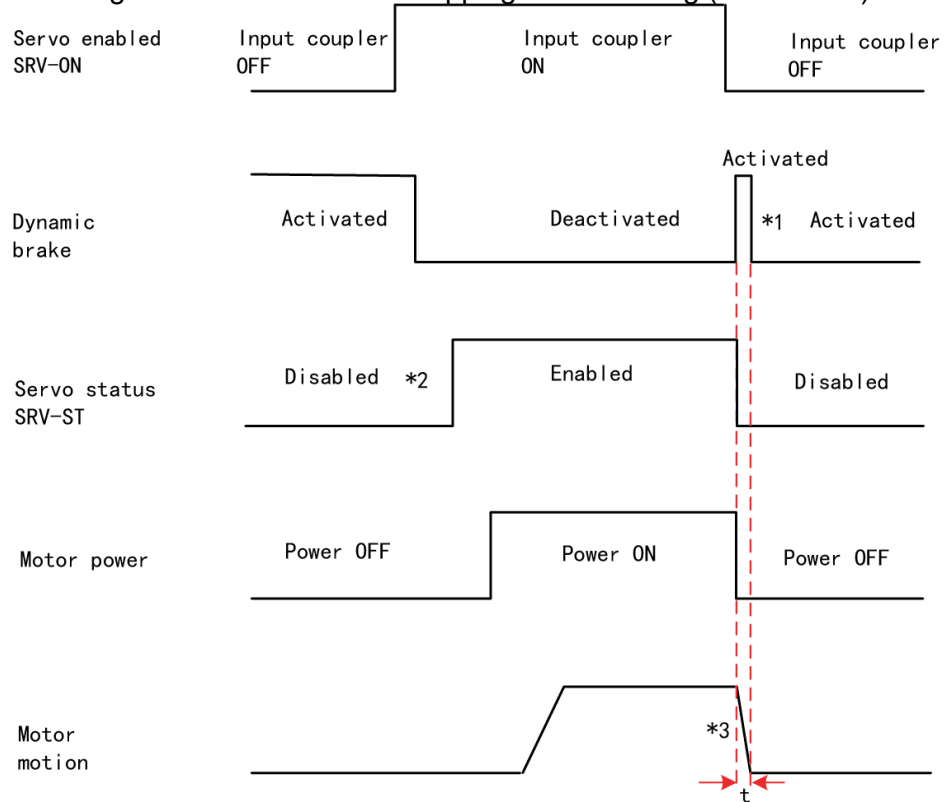


Figure 7-6 Motor normal servo stop sequence 6

Note

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

*2: SRV-ST signal is received when servo driver 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

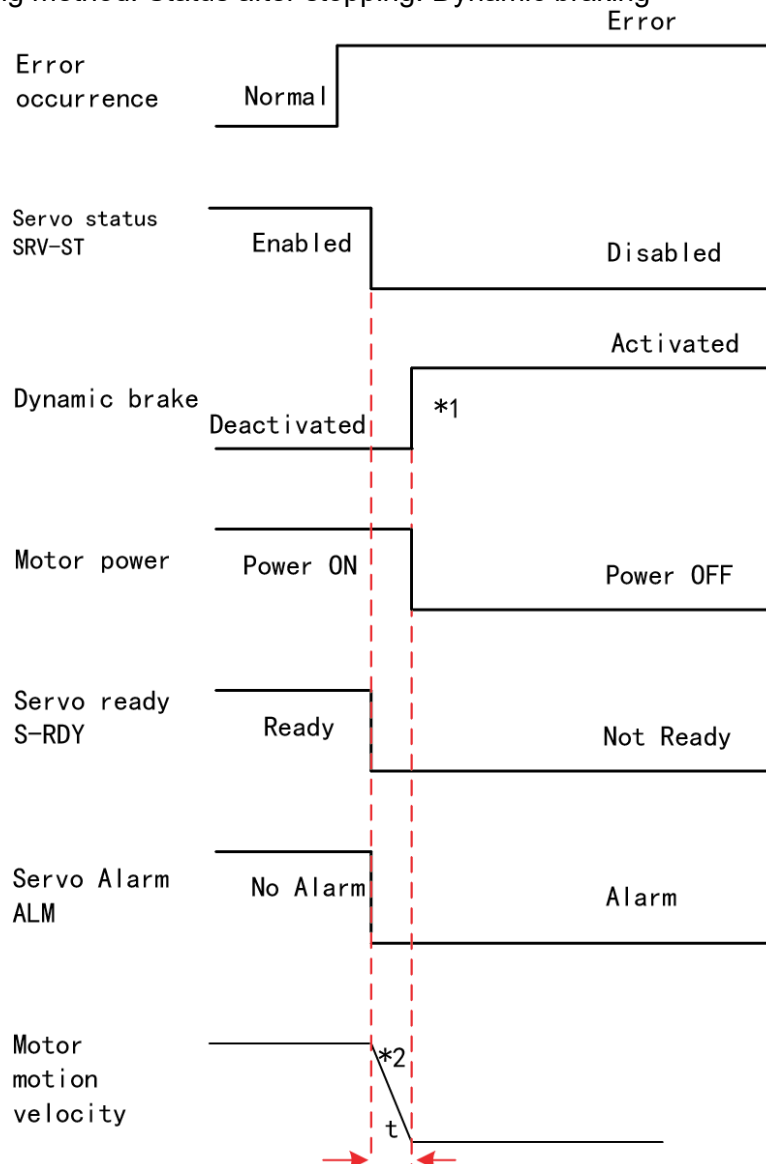


Figure 7-7 Alarm stop sequence 1

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 Error

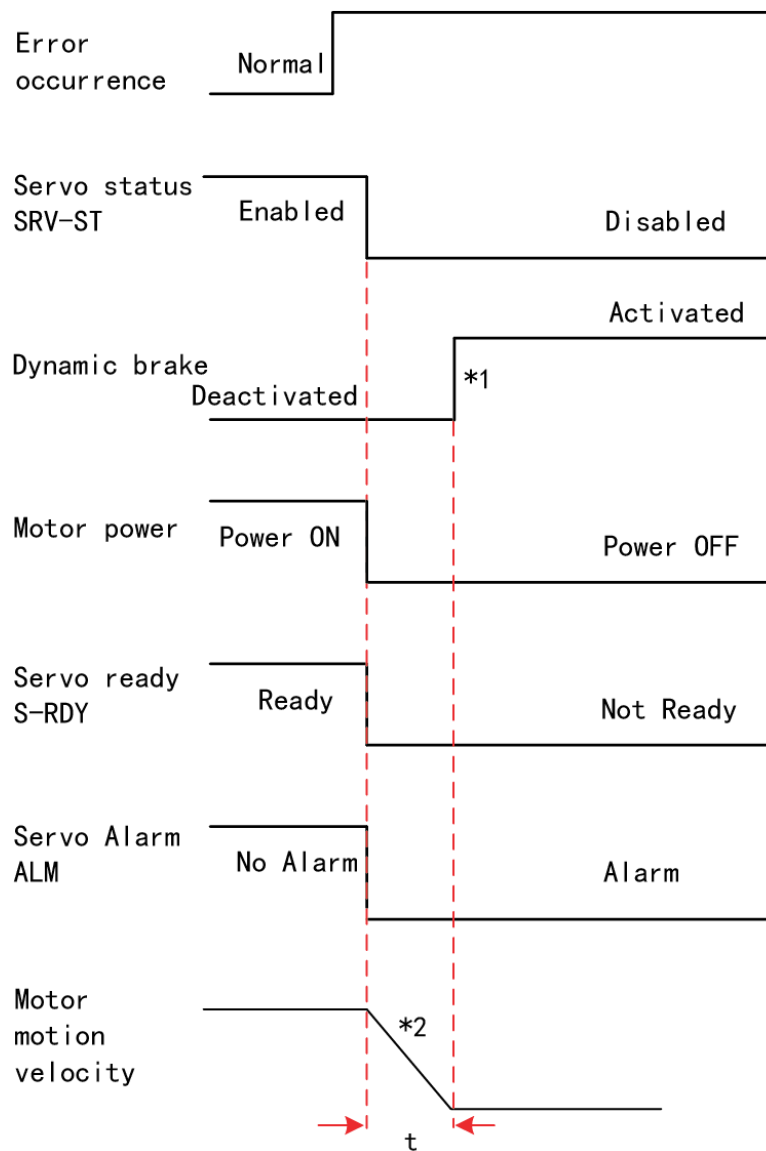


Figure 7-8 Alarm stop sequence 2

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 Error

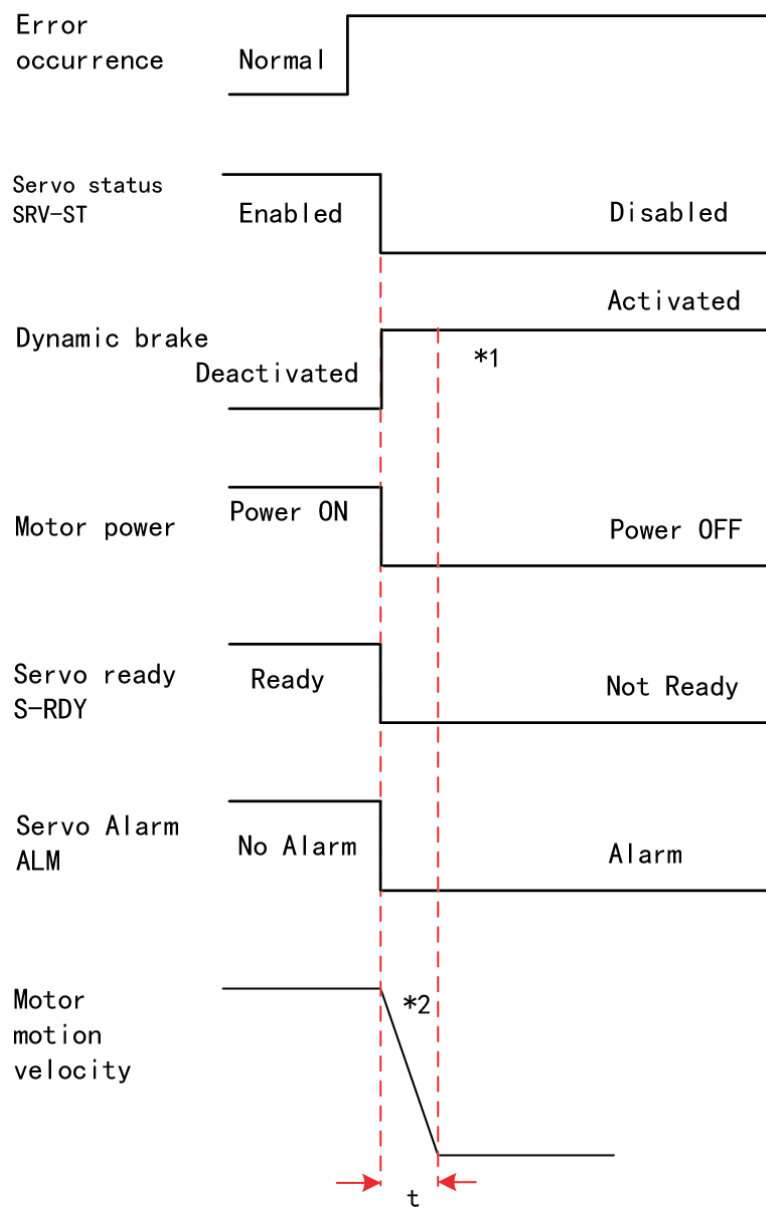


Figure 7-9 Alarm stop sequence 3

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

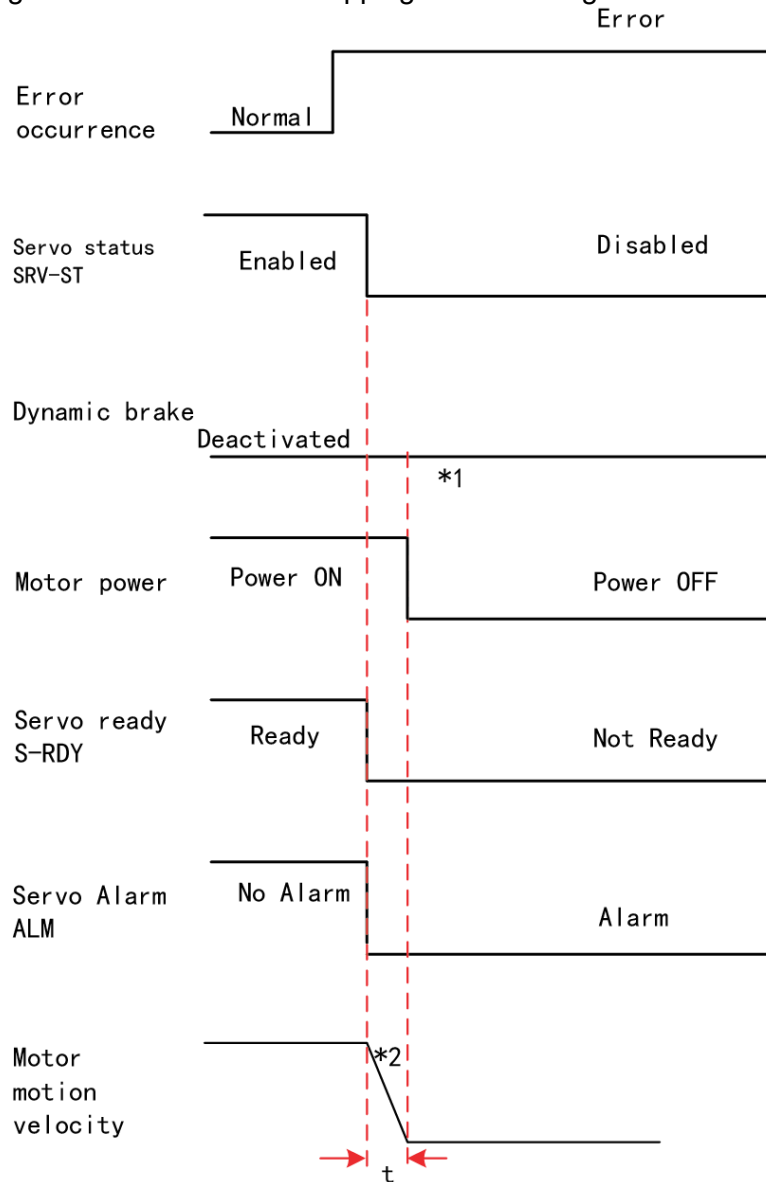


Figure 7-10 Alarm stop sequence 4

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 running

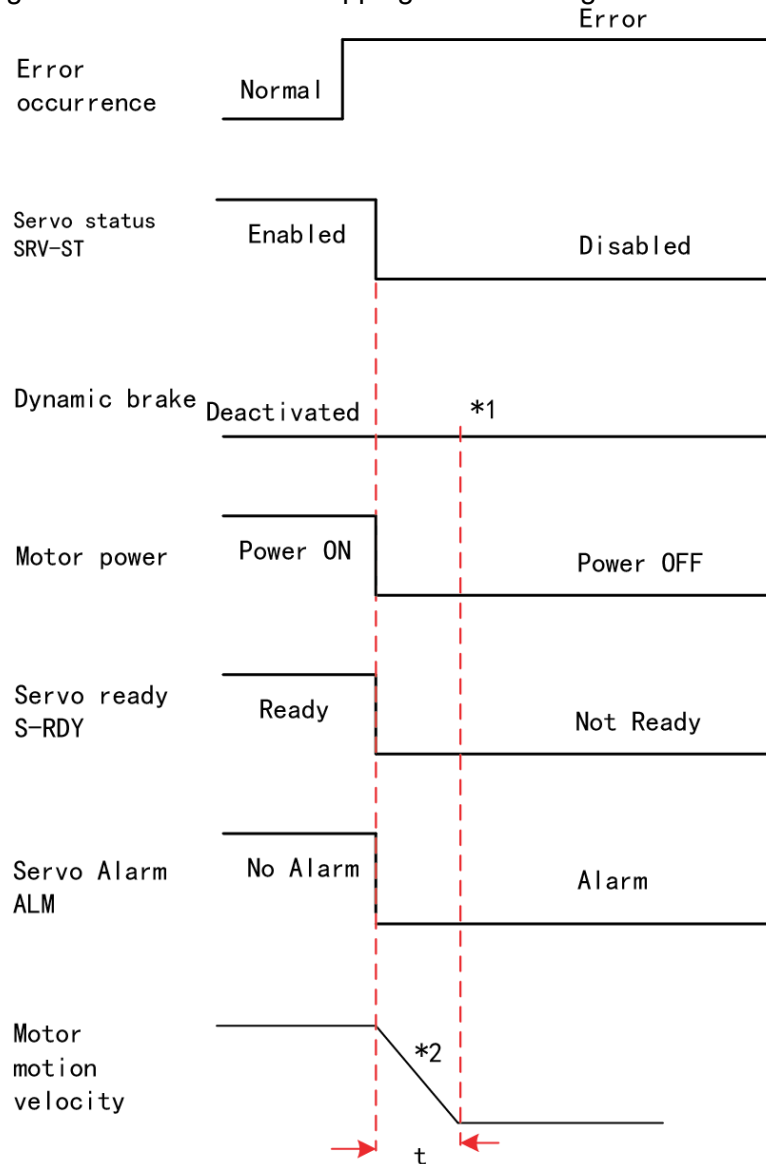


Figure 7-11 Alarm stop sequence 5

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 running

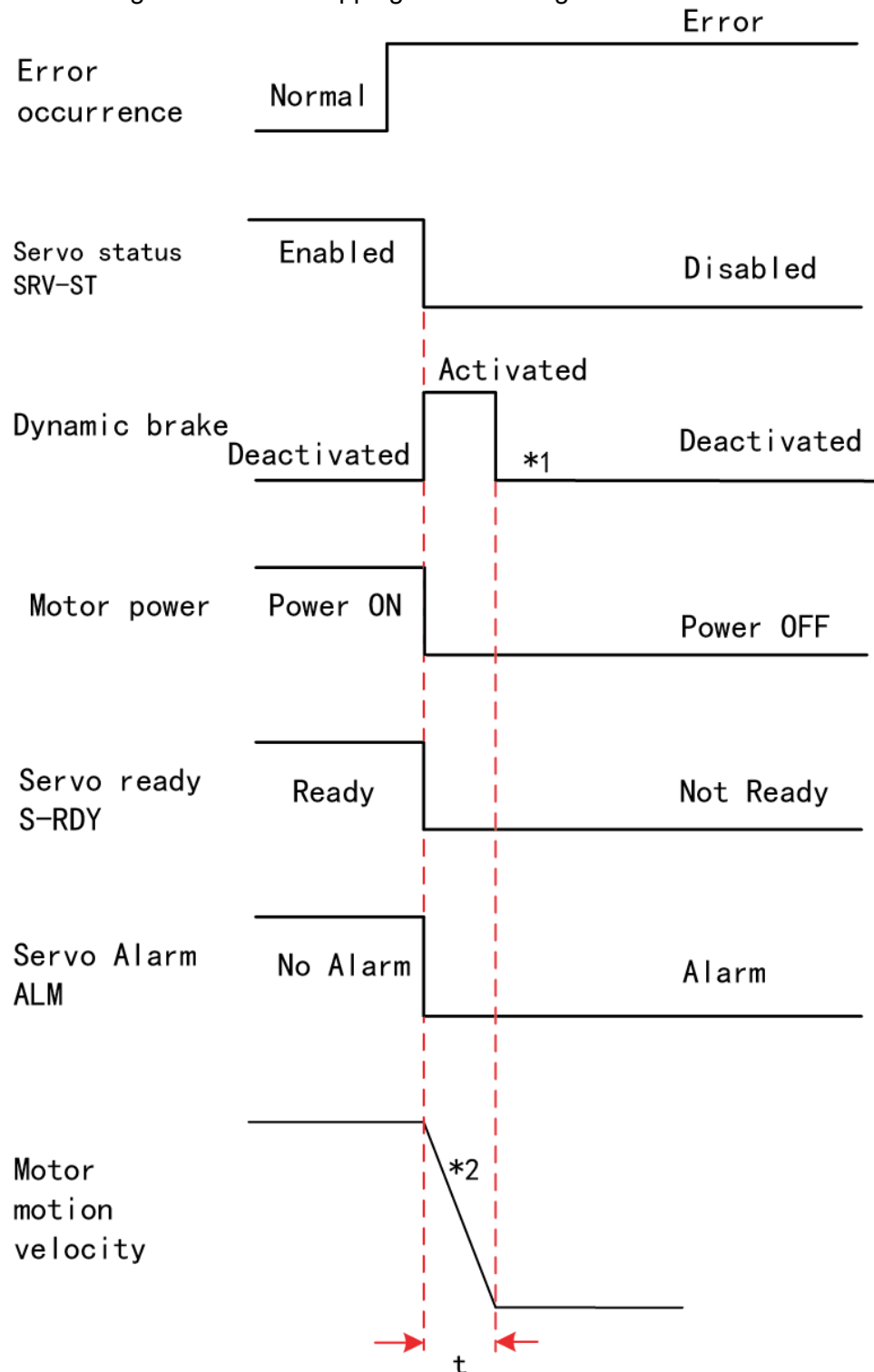


Figure 7-12 Alarm stop sequence 6

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

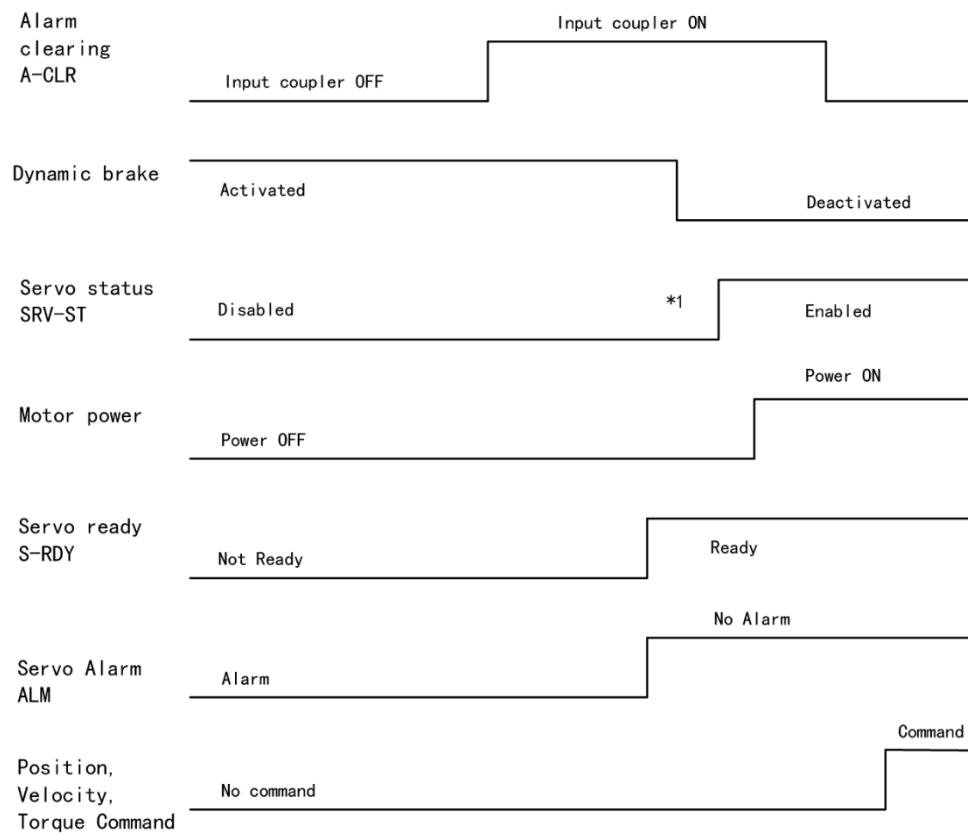


Figure 7-13 Alarm clear sequence

Note

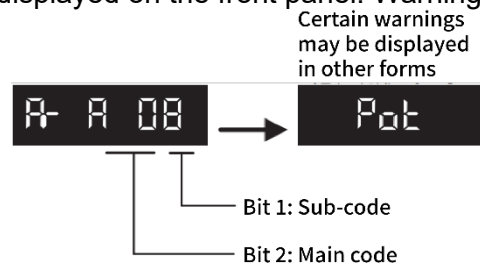
*1: SRV-ST signal is received when servo driver is enabled. Command input is not allowed yet

Chapter 8 Warning and Alarm

8.1 Warning

Servo driver warning

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



Warning Code		Content
Main	Code	
A0	1	Overload warning
	2	Regeneration energy overload warning (85% of the regeneration threshold)
	4	Change the parameter to a non-real time valid warning, alert to restart. (Under development)
	7	Low temperature warning (< 20°C)
	8	Positive limit switch valid. POT blinking on front panel
	9	Negative limit switch valid. NOT blinking on front panel
	A	Positive and negative limit switch valid. PNOT blinking on front panel
	B	Current position is beyond software positive limit. SPOT blinking on front panel
	C	Current position is beyond software negative limit. NPOT blinking on front panel
	D	Current position is beyond software negative, positive limit. SPNOT blinking on front panel
	E	Parameters reset to factory default. Restart needed
Ar	15	Communication fault when gantry is disabled
	16	Gantry axis fault, other axis warning Ar16
	17	Gantry axis emergency stop signal active, other axis warning Ar17
	18	Gantry axis limit active, other axis warning Ar18
	19	Slave axis PWM synchronization alarm when gantry is disabled
	1A	Gantry communication error too high
	1B	Gantry-related parameter settings error (gantry alignment offset setting exceeds 1/4 pulse, spindle warning Ar1b)

Servo driver warning handling

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

8.2 Alarm

Servo driver alarm

When alarm occurs, driver will set protective function and motor stops moving. Error code will be displayed on the front panel. Alarm history records can also be viewed in data

monitoring mode, with the alarm log sub-menu displaying d 12 Er.

Alarm code display:

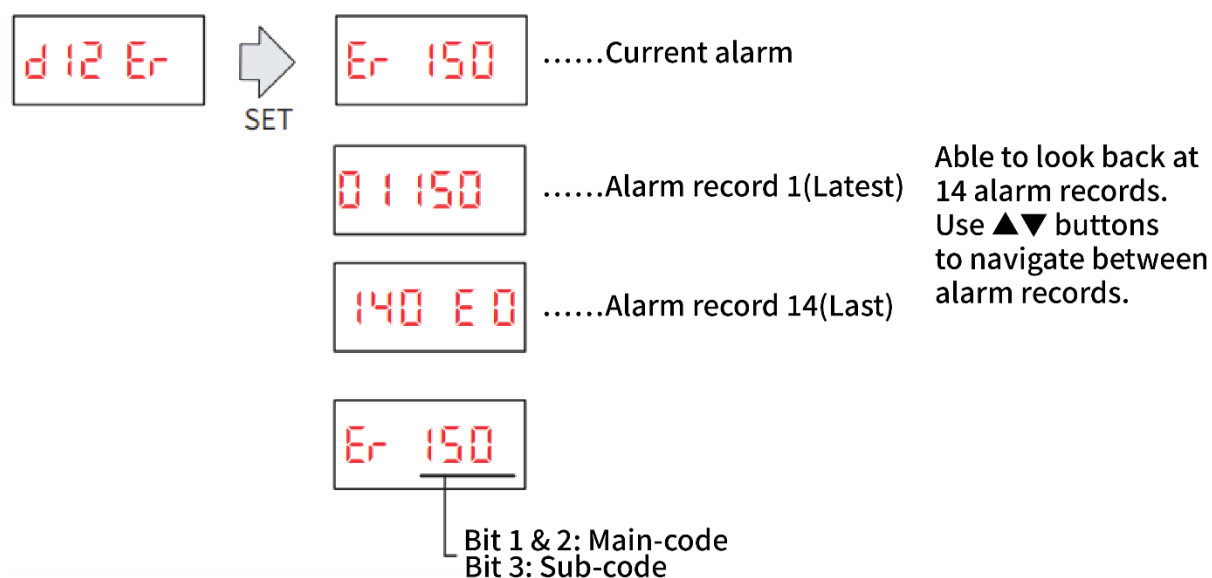


Figure 8-1 Panel Alarm display

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 P05.10 [Sequence at alarm].

Clearable: Alarms can be cleared (reset) through DI input, the front panel, or debugging software. However, the underlying fault may still exist.

Clearable alarm by operating the front panel and using auxiliary function **AFUnL**.

⚠ 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
9	0~F	FPGA communication error	●	2	
0A	0~1	Circuit current detection error	●	2	
	2	Analog input AI1 error	●	2	
	3	Motor power cable not connected	●	1	
	4	Analog input AI2 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	Power output to motor shorted to ground	●	1	
	4	Phase overcurrent	●	1	
0F	0	Driver overheated	●	2	
10	0	Motor overloaded	●	1	●
	1	Driver overloaded	●	1	●
	2	Motor rotor blocked	●	1	●
11	0	Soft start relay is not energized	●		
12	0	Regenerative resistor overvoltage	●	2	
	1	Holding brake error	●	1	
	2	Regenerative resistor value too low	●	2	
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 data overflow	●	2	●
	6	Encoder overheated	●	2	●
	7	Encoder counter error	●	2	●
	8	Encoder overspeed	●	1	
	A	Encoder wire broken (A)	●	1	
	b	Encoder wire broken (B)	●	1	
	c	Encoder wire broken (Z)	●	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	●	1	●
1A	0	Overspeed	●	2	●
	1	Velocity out of control	●	1	●
	2	Auxiliary encoder overspeed	●	2	●
1b	0	Bus input signal dithering	●	2	●
	1	Incorrect electronic gear ratio	●	2	●
	2	Encoder single-turn data overflow	●	1	●

	3	External encoder frequency divider parameter error	●	1	●
	5	Pulse and Direction input disconnection	●	1	
1c	0	Both STO failed	●	1	
	1	1 st STO failed	●	1	
	2	2 nd 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 alarm history record		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	Gantry slave axis is not enabled	●		●
	3	Gantry synchronous torque deviation is too high	●		●
	4	Gantry synchronization mode is in non-position control mode	●		●
	5	Gantry alignment failed	●		●
26	0	Positive/Negative position limit triggered under non-homing mode	●	2	●
27	0	Analog 1 input overrun limit	●	2	●
	1	Analog 2 input overrun limit	●	2	●
	2	Analog 3 input overrun limit	●	2	●
28	0	Pulse regeneration limit protection	●	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	Driver power module detection error		2	

60	0	Main 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		Motor power cable not connected
Er 0b0	0x04	0x3205		Control circuit power supply voltage too low
Er 0b1	0x04	0x3206		Control power supply voltage too high
Er 0C0	0x04	0x3211		DC bus overvoltage
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		Driver overheated
Er 100	0x02	0x8311		Motor overloaded
Er 101	0x02	0x8310		Driver overloaded
Er 102	0x02	0x8301		Motor rotor blocked
Er 120	0x80	0x7701		Regenerative resistor overvoltage
Er 121	0x80	0x7702		Holding 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	0x8611		Excessive position deviation
Er 190	0x20	0x8401		Motor vibration too strong
Er 1A0	0x20	0x8402		Overspeed
Er 1A1	0x20	0x8403		Velocity out of control
Er 1b0	0x20	0x8612		Bus input signal dithering
Er 1b1	0x20	0x8503		Incorrect electronic gear ratio
Er 1b2	0x20	0x8613		Encoder single-turn data overflow

Er 1c0	0x02	0x8313		Both STO failed
Er 1c1	0x02	0x8313		1 st STO failed
Er 1c2	0x02	0x8313		2 nd 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
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 parameter 402
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		Motor model no. detection error
Er 5f1	0x80	0x1100		Driver 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	Memory 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 driver 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		Watchdog configuration invalid
Er 821	0x10	0xA003	0x0021	Waiting for EtherCAT state machine Init state
Er 822	0x10	0xA004	0x0022	Waiting for the EtherCAT state machine Pre-Op state
Er 823	0x10	0xA005	0x0023	Waiting for master device for Safe-Op request
Er 824	0x10	0x8224	0x0024	Invalid process data input mapping
Er 825	0x10	0x8225	0x0025	RPDO mapping invalid (length, parameter not present, no this property)
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
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 Distribution Clock synchronization 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		Driver 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 it accordingly. Then restart.

Error code	Main	Sub	Display: "Er 090" -- "Er 09F"
	09	0~F	Content: FPGA communication error
Cause			Solution
L1, L2 terminal voltage too low			Make sure L1, L2 terminal voltage is within recommended range.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0A0" -- "Er 0A1"
	0A	0~1	Content: Circuit current detection error
Cause			Solution
Motor power cable wiring error			Make sure U, V, W terminal wired properly.
Main power supply undervoltage			Make sure L1, L2 terminal voltage is within recommended range.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0A2"
	0A	2	Content: Analog input AI1 error
Cause			Solution
Analog input wiring error			Make sure of analog input wiring connection.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0A3"
	0A	3	Content: Motor power cable not connected
Cause			Solution
Motor power cable not connected			Measure resistance values between U, V, W terminals, make sure the values are almost equal. If not, it might be due to damaged motor or motor winding open circuit.
Motor fault			Replace motor.
Driver damage			Replace with the new driver.
The deviation between current setting and feedback is too large			Increase the parameter P07.19 weak magnetic current appropriately.

Error code	Main	Sub	Display: "Er 0A4"
	0A	2	Content: Analog input AI2 error
Cause			Solution
Analog input wiring error			Make sure of analog input wiring connection.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0A5"
	0A	5	Content: DC Bus error
Cause			Solution
L1, L2 terminal voltage too low			Verify L1, L2 terminal voltage. Check if power on indicator light on servo driver is on and d27 DC bus voltage.
Internal driver fault.			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0A6"
	0A	6	Content: Temperature measuring error
Cause			Solution
L1, L2 terminal voltage too low			Verify L1, L2 terminal voltage.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0b0"
	0b	0	Content: Control circuit power supply voltage too low
Cause			Solution
Control circuit power supply voltage too low			Verify L1C, L2C terminal voltage; check if wiring connection is tight.
Power supply under capacity			Increase power supply capacity for L1C and L2C terminals.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0b1"
	0b	1	Content: Control circuit power supply abnormal
Cause			Solution
The control power voltage of the driver 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: "Er 0c0"
	0c	0	Content: DC bus overvoltage
Cause			Solution
Main power supply overvoltage			Verify L1, L2, L3 terminal voltage.
Acceleration/deceleration time too short			Verify if the time is too short.
Regenerative brake parameter anomaly			Verify P07.32/P07.33.
Inner brake circuit damaged			Replace with the new driver.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0d0"
	0d	0	Content: DC bus undervoltage
Cause			Solution
Main power supply undervoltage			Verify L1, L2, L3 terminal voltage.
Internal driver fault			Replace with the new driver.

Error code	Main	Sub	Display: "Er 0d1"
	0d	1	Content: Single phasing of main power supply
Cause			Solution
Main power supply undervoltage			Verify L1, L2, L3 terminal voltage. Increase main power supply voltage
Internal driver fault			/ Replace with the new driver.

Error code	Main	Sub	Display: "Er 0d2"
	0d	2	Content: No main power supply detected
Cause			Solution
No main power supply			Verify L1, L2, L3 terminal voltage. Check the main power supply circuit. Secure the wiring terminals. If the main power switch is off, turn it on.
Internal driver fault			/ Replace with the new driver.

Error code	Main	Sub	Display: "Er 0E0"
	0E	0	Content: Overcurrent
Cause			Solution
Driver 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 the servo driver to check for overcurrent. Replace with the new driver.
Control parameter anomaly			Verify if parameter exceeds recommended range. Set parameter within recommended range.
Control command anomaly			Verify if command motion is too acute. Modify control command. Use filter.

Error code	Main	Sub	Display: "Er 0E1"
	0E	1	Content: Intelligent Power Module (IPM) overcurrent
Cause			Solution
Driver 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 the servo driver to check for overcurrent. Replace with the new driver.
IGBT module undervoltage			/ Replace with the new driver.
Control parameter anomaly			Verify if parameter exceeds recommended range. Set parameter within recommended range.
Control command anomaly			Verify if command motion is too acute. Modify control command. Use filter.

Error code	Main	Sub	Display: "Er 0E2"	
	0E	2	Content: UVW shorted to PE	
Cause			Diagnosis	Solution
Driver U, V, W terminals shorted to ground			Disconnect motor power cable and check for short circuit between driver UVW and PE	Reconnect wiring or change UVW cable at driver side.
Motor shorted to ground			Connect motor power cable to driver power output. Verify if resistance value of UVW to PE is in the range of Megaohm (MΩ)	Replace with the new motor.
Driver failure			Disconnect the UVW cables on the driver side. After powering the driver multiple times, the fault still occurs.	Replace with the new driver.

Error code	Main	Sub	Display: "Er 0E4"	
	0E	2	Content: Phase overcurrent	
Cause			Diagnosis	Solution
Driver U, V, W terminals shorted to ground			Disconnect motor power cable and check for short circuit between driver UVW and PE	Reconnect wiring or change UVW cable at driver side.
Motor shorted to ground			Connect motor power cable to driver power output. Verify if resistance value of UVW to PE is equal and if there is short circuit	Replace with the new motor.
Internal driver fault			/	Replace with the new driver.

Error code	Main	Sub	Display: "Er 0F0"	
	0F	0	Content: Driver overheated	
Cause			Diagnosis	Solution
Temperature of power module exceeded upper limit			Measure the temperature of driver radiator.	Improve cooling conditions. Replace driver and motor with higher power rating. Increase duration time for acceleration and deceleration. Decrease load.

Error code	Main	Sub	Display: "Er 100"	
	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			Look for mechanical vibration from machine system.	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: "Er 101"	
	10	1	Content: Driver 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

		driver rated current. Please change to a driver with higher rated current.
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Error code	Main	Sub	Display: "Er 102"
	10	2	Content: Motor rotor blocked
Cause		Diagnosis	
Motor rotor blocked		Look for 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 P06.56 and stall time parameter P06.57 are set reasonably.

Error code	Main	Sub	Display: "Er 120"
	12	0	Content: Regenerative resistor overvoltage
Cause		Diagnosis	
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.
Power supply voltage too high		Check if the input voltage is too high or unstable.	Ensure the input voltage is stable and within the rated input range.
Regenerative energy discharge circuit damaged		/	Add an external regenerative resistor. Replace with the new driver.

Error code	Main	Sub	Display: "Er 121"
	12	1	Content: Holding brake error
Cause		Diagnosis	
Holding brake circuit damaged		Regenerative resistor disconnected.	Replace regenerative resistor.
		Holding 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: "Er 122"
	12	2	Content: Regenerative resistor value too low
Cause		Diagnosis	
External regenerative resistor value is less than the minimum value allowed by the driver		Measure the resistance of the external regenerative resistor and confirm whether it is lower than the resistor value supported by the driver.	Replace the regenerative resistor with the right resistance value which meets the specification of the driver.

Error code	Main	Sub	Display: "Er 150"
	15	0	Content: Encoder disconnected
Cause		Diagnosis	
Encoder cable disconnected		Verify encoder cable connection.	Make sure encoder cable is properly connected.
Encoder cable wiring error		Verify if the encoder wiring is correct.	Reconnect the encoder wiring.

Encoder damaged	/	Replace with the new motor.
Encoder measuring circuit damaged	/	Replace with the new driver.

Error code	Main	Sub	Display: "Er 151"
	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.

Error code	Main	Sub	Display: "Er 152"
	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 driver.

Error code	Main	Sub	Display: "Er 153"
	15	3	Content: Multiturn encoder error
Cause			Diagnosis Solution
Initial use			Is it the first time the multiturn function is enabled without performing origin calibration? Execute origin positioning and multiturn 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 driver. 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: “Er 154”	
	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: "Er 155"	
	15	5	Content: Encoder data overflow	
Cause			Diagnosis	Solution
Encoder data overflow			Verify if encoder is not damaged.	Initialize multiturn data.

Error code	Main	Sub	Display: “Er 156”	
	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: "Er 157"	
	15	7	Content: Multiturn data overflow	
Cause		Diagnosis		Solution
Encoder data overflow		Verify if encoder is not damaged.		Initialize multiturn data.

Error code	Main	Sub	Display: "Er 158"	
	15	8	Content: Encoder overspeed	
Cause			Diagnosis	Solution
The encoder feedback speed is too fast			Check if the motor speed is too fast.	Restart the driver to reduce speed.

Error code	Main	Sub	Display: "Er 15A"	
	15	A	Content: Encoder wire broken (A)	
Cause		Diagnosis		Solution
External encoder A phase wire break		Check external encoder wiring.		Ensure that the encoder A phase wiring is correct and there is no disconnect nor short circuit.

Error code	Main	Sub	Display: "Er 15b"	
	15	b	Content: Encoder wire broken (B)	
Cause		Diagnosis		Solution
External encoder B phase wire break		Check external encoder wiring.		Ensure that the encoder B phase wiring is correct and there is no disconnect nor short circuit.

Error code	Main	Sub	Display: "Er 15c"	
	15	c	Content: Encoder wire broken (Z)	
Cause		Diagnosis		Solution
External encoder Z phase wire break		Check external encoder wiring.		Ensure that the encoder Z phase wiring is correct and there is no disconnect nor short circuit.

Error code	Main	Sub	Display: "Er 15d"
	15	d	Content: Encoder wire broken (UVW)
Cause			Solution
External encoder power wire break			Ensure that the encoder 5V, 0V phase wiring is correct and there is no disconnect nor short circuit.

Error code	Main	Sub	Display: "Er 170"
	17	0	Content: Encoder data error
Cause			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.
Encoder damaged			Replace with the new motor.
Encoder measuring circuit damaged			Replace with the new driver.

Error code	Main	Sub	Display: "Er 171"
	17	1	Content: Encoder parameter initialization error
Cause			Solution
Driver and motor not matched			Replace with matching driver and motor.
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 driver and motor, change encoder cable if necessary.

Error code	Main	Sub	Display: "Er 180"
	18	0	Content: Excessive position deviation
Cause			Solution
Improper position deviation settings			Verify if value of P00.14 is too low. Increase value of P00.14.
Position 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: "Er 181"	
	18	1	Content: Excessive velocity deviation	
Cause		Diagnosis		Solution
Deviation between set velocity and actual velocity is too great		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: "Er 190"	
	19	0	Content: Vibration too strong	
Cause		Diagnosis		Solution
Resonance		Mechanical stiffness is too high, resonance occurs.		Reduce mechanical stiffness or use filter.
Current loop gain too high		Verify current loop gain value.		Reduce current loop gain.
Current vibration threshold too low		Use debugging software to check if the current feedback amplitude fluctuation exceeds 5%.		If the current level of vibration is acceptable, increase P06.36 to widen the torque detection vibration threshold.

Error code	Main	Sub	Display: "Er 191"	
	19	1	Content: Excessive hybrid position deviation	
Cause		Diagnosis		Solution
Driver 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 rotor 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
Driver 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 PRO.33 is set too low.		Increase PRO.33 set value accordingly but please be aware that doing so might cause the position deviation to be higher.

Error code	Main	Sub	Display: "Er 1A0"	
	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		Adjust velocity input command. Increase P03.21 value. Adjust pulse train input frequency and division frequency coefficient. Verify encoder wiring.

	wired correctly.	
Internal driver fault	/	Replace with the new driver.

Error code	Main	Sub	Display: "Er 1A1"
	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: "Er 1b0"
	1b	0	Content: Input pulse format is incorrect or frequency exceeds the limit
Cause		Diagnosis	Solution
Input pulse frequency too high		The input pulse frequency is too high (threshold parameter p05.32)	Input pulse frequency too high. Reduce the number of pulses per magnetic pitch or decrease the input pulse frequency. Ensure the command pulse frequency is lower than the value set in parameter p05.32.
Pulse signal interference		Check for interference and whether the pulse input lines are twisted shielded cables with proper grounding.	EMC improvement measures are needed. Use twisted shielded cables for pulse input lines and ensure the shield is effectively grounded.

Error code	Main	Sub	Display: "Er 1b1"
	1b	1	Content: Incorrect electronic gear ratio
Cause		Diagnosis	Solution
Values out of range		Numerator or denominator is zero/Set values out of range.	Reduce number of pulses per revolution.

Error code	Main	Sub	Display: "Er 1b2"
	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 command travel from exceeding one magnetic pitch of the motor.

Error code	Main	Sub	Display: "Er 1b3"
	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: "Er 1b5"	
	1b	5	Content: Pulse and Direction input disconnected	
Cause			Diagnosis	Solution
Pulse and Direction input disconnected			Check if high-speed differential pulse and direction signal lines are connected to the upper-level device.	Confirm if it is high-speed pulse wiring. If using low-speed pulse control, the pulse signal pin connections need to be changed.

Error code	Main	Sub	Display: "Er 1c0"	
	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.
			Disconnect switch connected to STO.	Close the switch.

Error code	Main	Sub	Display: "Er 1c1"	
	1c	1	Content: 1st STO failed	
Cause			Diagnosis	Solution
1 st STO input signal valid			Verify if STO power supply is normal.	Verify 24V STO power supply and power cable connection.
			Disconnect switch connected to STO.	Close the switch.

Error code	Main	Sub	Display: "Er 1c2"	
	1c	2	Content: 2 nd STO failed	
Cause			Diagnosis	Solution
2 nd STO input signal valid			Verify if STO power supply is normal	Verify 24V STO power supply and power cable connection
			Disconnect switch connected to STO	Close the switch.

Error code	Main	Sub	Display: "Er 1c3"	
	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: "Er 1c4"	
	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: "Er 1c5"	
	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: "Er 1c6"
	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: "Er 1c7"
	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: "Er 1c8"
	1c	8	Content: STO Inverter 3 fault
Cause		Diagnosis	Solution
STO Inverter 3 fault		Contact the manufacturer.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er 210"
	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: "Er 211"
	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: "Er 212"
	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: "Er 240"
	24	0	Content: CRC correction error 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: "Er 241"
	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 driver or upgrade software.

Error code	Main	Sub	Display: "Er 242"	
	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 driver or upgrade software.

Error code	Main	Sub	Display: "Er 243"	
	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 driver or upgrade software.

Error code	Main	Sub	Display: "Er 244"	
	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 driver or upgrade software.

Error code	Main	Sub	Display: "Er 245"	
	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 driver or upgrade software.

Error code	Main	Sub	Display: "Er 246"	
	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 driver or upgrade software.

Error code	Main	Sub	Display: "Er 250"	
	25	0	Content: Gantry communication error	
Cause		Diagnosis		Solution
Excessive Gantry drivers deviation			Verify if both drivers share the same set of parameters.	Unify the parameters of both drivers.
			Verify if control cables of the drivers are properly connected.	Connect control cable properly.
			Verify if gantry	Connect communication cable properly.

	communication cable is connected properly.	
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Error code	Main	Sub	Display: "Er 251"
	25	1	Content: Gantry communication error
Cause		Diagnosis	Solution
Gantry communication data error		Verify if gantry communication cable is connected properly.	Connect communication cable properly.

Error code	Main	Sub	Display: "Er 252"
	25	2	Content: Gantry communication error
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: "Er 253"
	25	3	Content: Gantry communication error
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: "Er 254"
	25	4	Content: Gantry communication error
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: "Er 255"
	25	5	Content: Gantry communication error
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: "Er 260"
	26	0	Content: Positive/Negative position limit triggered under non-homing mode
Cause		Diagnosis	Solution
Positive/negative		Verify position limit signal	Check wiring and parameter setting.

position limit triggered				
Error code	Main	Sub	Display: “Er 270” -- “Er 272”	
	27	0~2	Error description: Analog input 1-3 out of range	
Cause		Diagnosis		Solution
Analog value out of range		Verify if analog input value is out of range.		Adjust analog input voltage
Error code	Main	Sub	Display: “Er 280”	
	28	0	Error description: Pulse regeneration limit protection	
Cause		Diagnosis		Solution
Frequency divider output frequency exceeds 1MHz		Verify if motor rotational speed and the number of crossover output pulse frequency are too high.		Reduce the number of frequency divided pulse output or reduce rotational speed.
Error code	Main	Sub	Display: “Er 290”	
	29	0	Error description: Control mode does not match in 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: “Er 291”	
	29	1	Error description: Encoder mode does not match in full closed loop mode	
Cause		Diagnosis		Solution
Encoder mode does 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: “Er 550” -- “Er 553”	
	55	0~3	Error description: Encoder mode does not match in full closed loop mode	
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: “Er 570”	
	57	0	Error description: Forced alarm input valid	
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: "Er 5F0"
	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: "Er 5F1"
	5F	1	Error description: Driver power module detection error
Cause		Diagnosis	Solution
Driver power rating not within range.		Power cycle the driver.	Contact the manufacturer.

Error code	Main	Sub	Display: "Er 600"
	60	0	Error description: Main loop interrupted timeout
Cause		Diagnosis	Solution
The motor control loop calculation time overflow		Verify if encoder connection is and that the encoder cable is not too long (more than 20 meters)	Replace encoder cable if necessary.
		Power cycle the driver.	Replace with the new driver.

Error code	Main	Sub	Display: "Er 601"
	60	1	Error description: Velocity loop interrupted timeout
Cause		Diagnosis	Solution
Motor control loop calculation time overflow		Verify if encoder connection is and that the encoder cable is not too long (more than 20 meters)	Replace encoder cable if necessary.
		Restart driver	Replace the driver with a new one

Error code	Main	Sub	Display: "Er 700"
	70	0	Error description: Encryption error
Cause		Diagnosis	Solution
Encryption error during initialization upon power-on.		Restart driver	Please contact our technical support

Error code	Main	Sub	Display: "Er 890"
	89	0	Error description: Homing error
Cause		Diagnosis	Solution
Excess homing velocity. Homing mode is different from the 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	If electronic gear ratio cannot be changed, please set a suitable 609A. Increase electronic gear ratio

	be too low.	
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Error code	Main	Sub	Display: "Er 920"
	92	0	Error description: External encoder parameter initialization error
Cause		Diagnosis	Solution
Encoder parameter P00.37 setting error		Verify if P00.37 set value is out of range	Modify P00.37 set value, please use default value and see if the error 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 driver 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 driver 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.

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 driver has problem		Is it a single unit or multiple units together in the network	Switch driver
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 threshold value limit
Single-unit driver has problem		Is it a single unit or multiple units together in the network	Switch driver
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 device performance			-- Increase threshold value limit
Single-unit driver has problem			Is it a single unit or multiple units together in the network Replace driver
Interference			Check the grounding and network wiring quality Replace network cable

Error code	Main	Sub	Display: “Er 801”
	80	1	Error description: Unknown communication error
Cause			EtherCAT state machine transition failed
The status of the error can be detected			All ESM status
Network port LED			Blinking
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: Memory overflow
Cause			CPU failed to request memory
The status of the error can be detected			All ESM status
Network port LED			ON
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
The status of the error can be detected			All communication status
Network port LED			None
The result status			NO
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
The status of the error can be detected			BOOT
Network port LED			None

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 driver firmware
Cause			ESI file does not match driver firmware
The status of the error can be detected			INIT
Network port LED			None
The result status			Remain in the detection state
Solution			Burn matching firmware to driver

Error code	Main	Sub	Display: “Er 811”
	81	1	Error description: Invalid EtherCAT transition request
Cause			Driver received unconvertible request from EtherCAT state machine
The status of the error can be detected			All ESM Status
Network port LED			Blinking
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			Driver receives a transition request other than states of the EtherCAT state machine
The status of the error can be detected			All ESM Status
Network port LED			Blinking
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			Driver receives a transition request to boot state
The status of the error can be detected			Initialize the conversion to a boot
Network port LED			Flickering
The result status			initialization
Solution			Verify if driver software version supports this state transition

Error code	Main	Sub	Display: “Er 814”
	81	4	Error description: Invalid firmware
Cause			Firmware not matched with driver
The status of the error			BOOT/INIT

can be detected	
Network port LED	None
The result status	Keeping in the detection status
Solution	Return driver 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
The status of the error can be detected			Initialize the conversion to a boot
Network port LED			Blinking
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
The status of the error can be detected			pre-operation
Network port LED			Blinking
The result status			initialization
Solution			1. Verify if XML file version is consistent with software version 2. 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
The status of the error can be detected			Pre-op above
Network port LED			Single flash
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
The status of the error can be detected			All ESM status
Network port LED			Double flashing
The result status			The current state is maintained below the safe operation, and the operation state is switched to the safe operation state
Solution			1. Verify if TxPDO is valid 2. 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
The status of the error can be detected			All ESM status
Network port LED			Double flash
The result status			The current state is maintained below the safe operation, and the operation state is switched to the safe operation state
Solution			1. Verify if RxPDO is valid 2. 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
The status of the error can be detected			All ESM status
Network port LED			Single flash
The result status			The current state is maintained below the safe operation, and the operation state is switched to the safe operation state
Solution			1. Verify if PXPDO is valid 2. 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
The status of the error can be detected			Operation
Network port LED			Double flash
The result status			Safe operation
Solution			1. Verify if E-RME network is connected 2. 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: 1. Mailbox output 2. Mailbox input 3. Process data output 4. Process data input
The status of the error can be detected			Pre-operation
Network port LED			Blinking
The result status			Initialize
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
The status of the error can be detected			Pre-operation
Network port LED			Blinking
The result status			Initialize
Solution			1. Verify E-RME synchronization manager configuration 2. 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
The status of the error can be detected			Pre-operation
Network port LED			Blinking
The result status			Initialize
Solution			1. Verify E-RME synchronization manager configuration 2. 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			Driver waiting for master device to send Init request
The status of the error can be detected			All ESM status
Network port LED			Blinking
The result status			Keeping the current state
Solution			Verify transition request sent from master device

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

Error code	Main	Sub	Display: "Er 823"
	82	3	Error description: Waiting for master device for Safe-Op request
Cause			Process data output synchronization manager configuration is invalid
The status of the error can be detected			Operation
Network port LED			Blinking

The result status	Keeping the current state
Solution	Verify transition request sent from master device

Error code	Main	Sub	Display: "Er 824"
	82	4	Error description: Invalid process data input mapping
Cause			TxPDO is configured with non-mappable objects
The status of the error can be detected			Safe operation
Network port LED			Blinking
The result status			Pre-operation
Solution			Reconfigure the TxPDO mapping object

Error code	Main	Sub	Display: "Er 825"
	82	5	Error description: Invalid process data output mapping
Cause			RxPDO is configured with non-mappable objects
The status of the error can be detected			Safe operation
Network port LED			Blinking
The result status			Pre-operation
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
The status of the error can be detected			Safe operation
Network port LED			Single flash
The result status			Pre-operation
Solution			1. Verify E-RME software version 2. 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
The status of the error can be detected			All ESM status
Network port LED			Blinking
The result status			The current state is maintained below the safe operation, and the operation state is switched to the safe operation state
Solution			1. Verify if current RxPDO and TxPDO are invalid 2. Verify master device synchronization settings

Error code	Main	Sub	Display: "Er 82c"
	82	c	Error description: Fatal synchronization error
Cause			DC watchdog timer timeout
The status of the error can be detected			Safe operation, operation

Network port LED	Double flash
The result status	Safe operation
Solution	1. Verify if E-RME hardware is faulty 2. Verify DC setting and delay

Error code	Main	Sub	Display: "Er 82d"
	82	d	Error description: No synchronization error
Cause			Synchronization is invalid
The status of the error can be detected			operation
Network port LED			Single flash
The result status			Safe operation
Solution			1. Verify if "fatal synchronization error" has occurred. 2. 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
The status of the error can be detected			operation
Network port LED			Single flash
The result status			Pre-operation
Solution			Verify master device synchronization cycle time

Error code	Main	Sub	Display: "Er 830"
	83	0	Error description: Invalid Distributed Clock synchronization
Cause			Synchronization settings in sync mode are not valid
The status of the error can be detected			Safe operation
Network port LED			Blinking
The result status			Pre-operation
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
The status of the error can be detected			Safe operation, operation
Network port LED			Single flash
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 driver position loop
The status of the error can be detected			Safe operation
Network port LED			Flickering
The result status			Pre-operation
Solution			Refer to user manual to set a reasonable synchronization cycle time.

Error code	Main	Sub	Display: "Er 836"
	83	6	Error description: Invalid Distribution Clock synchronization cycle
Cause			The synchronization cycle time setting is not as the following 1: 125us 2: 250us 3: 500us 4: 750us 5: 1000us 6: 2000us 7: 4000us
The status of the error can be detected			Safe operation
Network port LED			Single flash
The result status			Pre-operation
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
The status of the error can be detected			All ESM status
Network port LED			Flickering
The result status			Keeping the current state
Solution			1. Verify if E-RME hardware is faulty 2. 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
The status of the error can be detected			All ESM status
Network port LED			Flickering
The result status			Keeping the current state
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
The status of the error can be detected			All ESM status
Network port LED			ON
The result status			Keeping the current state
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
The status of the error can be detected			All states
Network port LED			None
The result status			Keeping the detection state
Solution			Change to network cable with higher bandwidth / Replace driver

Error code	Main	Sub	Display: "Er 870"
	87	0	Error description: Driver can't be enabled under current control mode
Cause			Enable driver under unsupported mode
The status of the error can be detected			All status
Network port LED			None
The result status			Maintain status
Solution			Switch to the correct control mode

Error code	Main	Sub	Display: “Er 890”	
	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 logic.
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 Driver Alarm Clearing

Clearable alarms

Method 1:

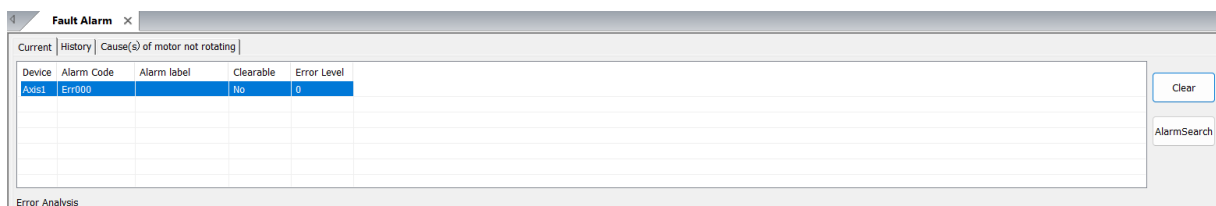
After confirming the issue, press M to select auxiliary function, Press 'S' to enter into "AF ACL". Press and hold to clear the alarm.

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 driver 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 driver 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 driver, 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 conform 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 Peripheral Device Overview Table

Component Type	Component Name	Installation Location	Compatible Models	Function Description
Peripheral Electronic Components	Fuse & Circuit Breaker	Driver input side	All models	Required for compliance with EN 61800-5-1 and UL61800-5-1 standards. Must be installed on the input side to prevent accidents caused by internal circuit short circuits.
	AC Input Reactor	Driver input side		Reduces high-frequency harmonics and improves power factor.
	EMC Filter	Driver input side		Reduces conducted and radiated interference from the driver.
	Magnetic Ring / Clamp	Driver output side		Reduces external interference and bearing current.
		Signal Cable		Enhances signal anti-interference performance.

9.2 Fuses, Contactors and Circuit Breakers

9.2.1 Fuses

To prevent accidents due to short circuits, fuses must be installed on the input side.

Table 9-1 Recommended Fuse selection table

Servo driver Model	Rated Input Current	Recommended Fuse		
		Manufacturer	Rated Current (A)	Model
Single phase 220V				
E-RME30	4.0	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 Contactors

Table 9-2 Recommended Electromagnetic contactor selection table

Table 5-2 Recommended Electromagnetic contactor selection table				
Servo driver Model	Rated Input Current	Recommended Contactor		
		Manufacturer	Rated Current (A)	Model
Single phase 220V				
E-RME30	4.0	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 Breakers

Table 9-3 Recommended Circuit breaker selection table

Servo driver Model	Rated Input Current	Recommended Breaker		
		Manufacturer	Rated Current (A)	Model
Single phase 220V				
E-RME30	4.0	Schneider	6	OSMC32N2C6
E-RME60	8.4		16	OSMC32N2C16
Three phase 220V				
E-RME30	2.5	Schneider	4	OSMC32N2C4
E-RME60	4.6		16	OSMC32N2C16

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

- The driver equipment may generate DC leakage current in the protective conductor, so be sure to use a Type B RCD.
- The driver 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 driver.
- When multiple drivers share a single RCD in parallel, choose an RCD with a tripping current of no less than 300mA.

9.3 AC Input Reactor

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)

Driver 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 EMC filters available 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

Filter Model		Appearance
SCHAFFNER	FN2090 Series	
	FN3258 Series	

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

Servo driver Model	Rated Input Current (A)	Recommended Filter
Single phase 220V		
E-RME30	4.0	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 Rings and Clamps

Magnetic rings are suitable for the input or output side of the driver. During installation, place them as close to the driver as possible. Installing magnetic rings on the input side can suppress noise in the driver's power input system. Installing magnetic rings on the output side primarily reduces external interference from the driver 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 driver 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 drivers and various signal lines. They are low-cost and aesthetically pleasing to install.

Chapter 10 Parameter

10.1 Parameter List

Panel Display as follows:

P00.00
 number

Parameter Valid Mode

CSP: Valid in cyclic synchronous position mode

CSV: Valid in cyclic synchronous velocity mode

CST: Valid in cyclic synchronous torque mode

HM: Valid in homing mode

PP: Valid in profile position mode

PV: Valid in profile velocity mode

PT: Valid in profile torque mode

F: Valid in ALL modes

10.1.1 Servo Driver Parameter

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 00												
P00. Basic Settings	00	Model Following Control	1	Immediate	0x2000	0x00	-	-	-	-	-	F
	01	Control Mode	9	Restart	0x2001	0x00	-	-	-	-	-	F
	02	Auto Gain Tuning Mode	0x1	Immediate	0x2002	0x00	-	-	-	-	-	F
	03	Stiffness Level	13	Immediate	0x2003	0x00	-	-	-	-	-	F
	04	Inertia Ratio	250	Immediate	0x2004	0x00	-	-	-	-	-	F
	06	Command Pulse Polarity	0	Restart	0x2006	0x00	-	-	-	-	-	F
	07	Command Pulse Mode	3	Restart	0x2007	0x00	-	-	-	-	-	F
	08	1st Command Pulse Count per Revolution	0	Re-enable	0x2008	0x00	PP	PV	HM	CSP	CSV	-
	09	1st Command Frequency Divider/Multiplier Numerator	1	Re-enable	0x2009	0x00	-	-	-	-	-	-
	10	1st Command Frequency Divider/Multiplier Denominator	1	Re-enable	0x2010	0x00	-	-	-	-	-	-
	11	Encoder Pulse Count per Revolution	2500	Restart	0x2011	0x00	-	-	-	-	-	F
	12	Pulse Output Logic Inversion	0	Restart	0x2012	0x00	-	-	-	-	-	F
	13	1st Torque Limit	500	Immediate	0x2013	0x00	-	-	-	-	-	F
	14	Position Deviation Threshold	30	Immediate	0x2014	0x00	PP	-	HM	CSP	-	-
	15	Absolute Encoder	0	Restart	0x2015	0x00	-	-	-	-	-	F
	16	Eternal Regenerative Resistance	100	Immediate	0x2016	0x00	-	-	-	-	-	F
	17	Eternal Regenerative Resistor Power Rating	50	Immediate	0x2017	0x00	-	-	-	-	-	F
	19	Friction Compensation	0	Immediate	0x2019	0x00	-	-	-	-	-	F
	23	Slave ID	2	Restart	0x2023	0x00	-	-	-	-	-	F
	24	Slave IO Source	0	Restart	0x2024	0x00	-	-	-	-	-	F
	25	Reserved	10	Immediate	0x2025	0x00	-	-	-	CSP	-	-
	26	Reserved	50	Restart	0x2026	0x00	-	-	-	CSP	-	-
	27	Synchronous Mode Command Delay Cycle	0	Immediate	0x2027	0x00	-	-	-	CSP	-	-
	28	CSP Mode Safety Position	10000	Immediate	0x2028	0x00	-	-	-	CSP	-	-
	38	Z-signal Pulse Input Source	0x0	Immediate	0x2038	0x00	-	-	-	-	-	F
	58	STO Version	0	Immediate	0x2058	0x00	-	-	-	-	-	-
	59	STO Actual Time Stamp	0	Immediate	0x2059	0x00	-	-	-	-	-	-

	64	STO Dual Input Delay Detection Buffer Time	200	Immediate	0x2064	0x00	-	-	-	-	-	-
	65	STO Buffer Diagnosis and Filter Time	2	Immediate	0x2065	0x00	-	-	-	-	-	-
	66	STO Power Supply & Optocoupler Diagnosis & Filter Time	1	Immediate	0x2066	0x00	-	-	-	-	-	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 01												
P01. Gain Adjustment	00	1st Position Loop Gain	480	Immediate	0x2100	0x00	PP	-	HM	CSP	-	-
	01	1st Velocity Loop Gain	270	Immediate	0x2101	0x00	-	-	-	-	-	F
	02	1st Velocity Loop Integral Time Constant	210	Immediate	0x2102	0x00	-	-	-	-	-	F
	03	1st Velocity Detection Filter	15	Immediate	0x2103	0x00	-	-	-	-	-	F
	04	1st Torque Filter	84	Immediate	0x2104	0x00	-	-	-	-	-	F
	05	2nd Position Loop Gain	570	Immediate	0x2105	0x00	PP	-	HM	CSP	-	-
	06	2nd Velocity Loop Gain	270	Immediate	0x2106	0x00	-	-	-	-	-	F
	07	2nd Velocity Loop Integral Time Constant	10000	Immediate	0x2107	0x00	-	-	-	-	-	F
	08	2nd Velocity Detection Filter	15	Immediate	0x2108	0x00	-	-	-	-	-	F
	09	2nd Torque Filter	84	Immediate	0x2109	0x00	-	-	-	-	-	F
	10	Velocity Feedforward Gain	300	Immediate	0x2110	0x00	PP	-	HM	CSP	-	-
	11	Velocity Feedforward Filter	50	Immediate	0x2111	0x00	PP	-	HM	CSP	-	-
	12	Torque Feedforward Gain	0	Immediate	0x2112	0x00	PP	PV	HM	CSP	CSP	-
	13	Torque Feedforward Filter	0	Immediate	0x2113	0x00	PP	PV	HM	CSP	CSP	-
	15	Position Control Parameter Switching Mode	0	Immediate	0x2115	0x00	-	-	-	-	-	F
	16	Position Control Parameter Switching Delay	0	Immediate	0x2116	0x00	-	-	-	-	-	F
	17	Position Control Parameter Switching Level	50	Immediate	0x2117	0x00	-	-	-	-	-	F
	18	Position Control Parameter Switching Hysteresis	33	Immediate	0x2118	0x00	-	-	-	-	-	F
	19	Position Control Parameter Switching Time	33	Immediate	0x2119	0x00	-	-	-	-	-	F
	23	Speed Regulator-kr	100	Immediate	0x2123	0x00	-	-	-	-	-	-
	34	Velocity Feedback Filter Level	1	Immediate	0x2134	0x00	-	-	-	-	-	-
	36	Encoder Feedback Pulse Digital Filter	5	Immediate	0x2136	0x00	-	-	-	-	-	F
	37	Special Function Register	0x0	Immediate	0x2137	0x00	-	-	-	-	-	F
	38	Special Function Register 1	0x1008	Immediate	0x2138	0x00	-	-	-	-	-	F
	39	Special Function Register 2	0x40000	Immediate	0x2139	0x00	-	-	-	-	-	F
	45	Reserved	0	Immediate	0x2145	0x00	-	-	-	-	-	-
	64	2nd Segment Q-axis Current Filter Time constant	0	Immediate	0x2164	0x00	-	-	-	-	-	-
	65	3rd Segment D-axis Current Filter Time constant	0	Immediate	0x2165	0x00	-	-	-	-	-	-
	66	Torque Filter Type	0	Re-enable	0x2166	0x00	-	-	-	-	-	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 02												
P02. Vibration Suppression	00	Adaptive Filter Mode Setting	0	Immediate	0x2200	0x00	-	-	-	-	-	F
	01	1st Notch Frequency	4000	Immediate	0x2201	0x00	-	-	-	-	-	F
	02	1st Notch Width	4	Immediate	0x2202	0x00	-	-	-	-	-	F
	03	1st Notch Depth	0	Immediate	0x2203	0x00	-	-	-	-	-	F
	04	2nd Notch Frequency	4000	Immediate	0x2204	0x00	-	-	-	-	-	F
	05	2nd Notch Width	4	Immediate	0x2205	0x00	-	-	-	-	-	F
	06	2nd Notch Depth	0	Immediate	0x2206	0x00	-	-	-	-	-	F
	07	3rd Notch Frequency	4000	Immediate	0x2207	0x00	-	-	-	-	-	F
	08	3rd Notch Width	4	Immediate	0x2208	0x00	-	-	-	-	-	F
	09	3rd Notch Depth	0	Immediate	0x2209	0x00	-	-	-	-	-	F
	14	1st Damping Frequency	0	Immediate	0x2214	0x00	-	-	-	-	-	F
	16	2nd Damping Frequency	0	Immediate	0x2216	0x00	-	-	-	-	-	F
	22	Position Command Smoothing Filter	0	Halt	0x2222	0x00	PP	-	HM	CSP	-	-
	23	Position Command FIR Filter	0	Halt	0x2223	0x00	PP	-	HM	CSP	-	-
	31	5th Resonant Frequency	4000	Immediate	0x2231	0x00	-	-	-	-	-	F
	32	5th Resonant Q Value	0	Immediate	0x2232	0x00	-	-	-	-	-	F
	33	5th Anti-resonant Frequency	4000	Immediate	0x2233	0x00	-	-	-	-	-	F
	34	5th Anti-resonant Q Value	0	Immediate	0x2234	0x00	-	-	-	-	-	F
	35	6th Resonant Frequency	4000	Immediate	0x2235	0x00	-	-	-	-	-	F
	36	6th Resonant Q Value	0	Immediate	0x2236	0x00	-	-	-	-	-	F
	37	6th Anti-resonant Frequency	4000	Immediate	0x2237	0x00	-	-	-	-	-	F
	38	6th Anti-resonant Q Value	0	Immediate	0x2238	0x00	-	-	-	-	-	F
	48	Tuning Mode	0	Immediate	0x2248	0x00	-	-	-	-	-	F
	50	MFC Type	0	Re-enable	0x2250	0x00	-	-	-	-	-	F
	51	Velocity Feedforward Compensation Coefficient	0	Immediate	0x2251	0x00	PP	-	HM	CSP	-	-
	52	Torque Feedforward Compensation Coefficient	0	Immediate	0x2252	0x00	PP	PV	HM	CSP	CSV	-
	53	Friction Compensation Coefficient	0	Immediate	0x2253	0x00	-	-	-	-	-	F
	54	Overshoot Time Constant	0	Immediate	0x2254	0x00	-	-	-	-	-	F
	55	Overshoot Suppression Constant	0	Immediate	0x2255	0x00	-	-	-	-	-	F
	56	One-Click Tuning	0x0	Immediate	0x2256	0x00	-	-	-	-	-	-
	57	One-Click Tuning Control	0x0	Immediate	0x2257	0x00	-	-	-	-	-	-
	58	One-Click Tuning Progress	0	Immediate	0x2258	0x00	-	-	-	-	-	-
59	One-Click Tuning Error Code	0x0	Immediate	0x2259	0x00	-	-	-	-	-	-	
60	One-Click Tuning Velocity Limit	1500	Immediate	0x2260	0x00	-	-	-	-	-	-	
64	Reserved	0	Immediate	0x2264	0x00	-	-	-	-	-	-	
65	Reserved	0	Immediate	0x2265	0x00	-	-	-	-	-	-	

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 03												
P03. Velocity/ Torque Control	12	Acceleration Time	0	Immediate	0x2312	0x00	-	PV	-	-	CSV	-
	13	Deceleration Time	0	Immediate	0x2313	0x00	-	PV	-	-	CSV	-
	14	Sigmoid Acceleration/Deceleration	0	Re-enable	0x2314	0x00	-	PV	-	-	CSV	-
	16	Zero Speed Clamp Level	30	Immediate	0x2316	0x00	-	PV	-	-	CSV	-
	23	Zero Speed Static Delay in Velocity Mode	0	Immediate	0x2323	0x00	-	PV	-	-	CSV	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 04												
P04. I/O Monitoring Settings	00	DI1	0x0	Immediate	0x2400	0x00	-	-	-	-	-	F
	01	DI2	0x1	Immediate	0x2401	0x00	-	-	-	-	-	F
	02	DI3	0x2	Immediate	0x2402	0x00	-	-	-	-	-	F
	03	DI4	0x16	Immediate	0x2403	0x00	-	-	-	-	-	F
	04	DI5	0x0	Immediate	0x2404	0x00	-	-	-	-	-	F
	05	DI6	0x0	Immediate	0x2405	0x00	-	-	-	-	-	F
	06	DI7	0x0	Immediate	0x2406	0x00	-	-	-	-	-	F
	07	DI8	0x0	Immediate	0x2407	0x00	-	-	-	-	-	F
	10	DO1	0x3	Immediate	0x2410	0x00	-	-	-	-	-	F
	11	DO2	0x2	Immediate	0x2411	0x00	-	-	-	-	-	F
	12	DO3	0x81	Immediate	0x2412	0x00	-	-	-	-	-	F
	23	Analog Input 1 (AI-1) Filter	0	Immediate	0x2423	0x00	-	-	-	-	-	-
	24	Analog Input 1 (AI-1) Overvoltage	100	Immediate	0x2424	0x00	-	-	-	-	-	-
	26	Analog Input 2 (AI-2) Filter	0	Immediate	0x2426	0x00	-	-	-	-	-	-
	27	Analog Input 2 (AI-2) Overvoltage	100	Immediate	0x2427	0x00	-	-	-	-	-	-
	31	In Position Tolerance	20	Immediate	0x2431	0x00	PP	-	HM	CSP	-	-
	32	In position Output	1	Immediate	0x2432	0x00	PP	-	HM	CSP	-	-
	33	INP Holding Time	0	Immediate	0x2433	0x00	PP	-	HM	CSP	-	-
	34	Zero Speed Settings	50	Immediate	0x2434	0x00	-	-	-	-	-	F
	35	Speed Coincidence Range	50	Immediate	0x2435	0x00	-	PV	-	-	CSV	-
	36	AT-SPEED Settings	1000	Immediate	0x2436	0x00	-	PV	-	-	CSV	-
	37	Brake OFF Delay Time	150	Immediate	0x2437	0x00	-	-	-	-	-	F
	38	Brake ON Delay Time	0	Immediate	0x2438	0x00	-	-	-	-	-	F
	39	Brake OFF Speed	30	Immediate	0x2439	0x00	-	-	-	-	-	F
	43	E-Stop Settings	0	Immediate	0x2443	0x00	-	-	-	-	-	F
	48	Torque Compensation Delay	0	Immediate	0x2448	0x00	-	-	-	-	-	-
	62	Position/Velocity/Torque Feedback Polarity	0	Immediate	0x2462	0x00	-	-	-	-	-	-
	64	AO1 Output	0	Immediate	0x2464	0x00	-	-	-	-	-	F
	65	AO1 Signal	0x4	Immediate	0x2465	0x00	-	-	-	-	-	F
	66	AO1 Amplification	100	Immediate	0x2466	0x00	-	-	-	-	-	F
	67	AO1 Communication Settings	0	Immediate	0x2467	0x00	-	-	-	-	-	F
	68	AO1 Offset	0	Immediate	0x2468	0x00	-	-	-	-	-	F
	69	AO2 Output	0	Immediate	0x2469	0x00	-	-	-	-	-	F
	70	AO2 Signal	0x1	Immediate	0x2470	0x00	-	-	-	-	-	F
	71	AO2 Amplification	100	Immediate	0x2471	0x00	-	-	-	-	-	F
	72	AO2 Communication Settings	0	Immediate	0x2472	0x00	-	-	-	-	-	F
73	AO2 Offset	0	Immediate	0x2473	0x00	-	-	-	-	-	F	
74	Warning Indicator Light 1	1	Immediate	0x2474	0x00	-	-	-	-	-	F	
75	Warning Indicator Light 2	2	Immediate	0x2475	0x00	-	-	-	-	-	F	
76	Warning Indicator Light 3	3	Immediate	0x2476	0x00	-	-	-	-	-	F	
77	Warning Indicator Light 4	4	Immediate	0x2477	0x00	-	-	-	-	-	F	
78	Warning Indicator Light 5	5	Immediate	0x2478	0x00	-	-	-	-	-	F	

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 05												
P05.Extended Settings	00	2nd Command Pulse Count per Revolution	1000	Restart	0x2500	0x00	PP	PV	HM	CSP	CSV	-
	04	Position Limit Settings	0	Immediate	0x2504	0x00	-	-	-	-	-	F
	06	Servo OFF Mode	0	Restart	0x2506	0x00	-	-	-	-	-	F
	09	Main Power-OFF Detection Time	50	Immediate	0x2509	0x00	-	-	-	-	-	F
	10	Servo Off due to Alarm Mode	0	Restart	0x2510	0x00	-	-	-	-	-	F
	11	Servo Braking Torque	0	Immediate	0x2511	0x00	-	-	-	-	-	F
	12	Overload Level	0	Immediate	0x2512	0x00	-	-	-	-	-	F
	13	Overspeed Level	0	Immediate	0x2513	0x00	-	-	-	-	-	F
	15	I/O Digital Filter	10	Immediate	0x2515	0x00	-	-	-	-	-	F
	17	Counter Clearing Input Mode	0x13	Immediate	3x2517	0x00	-	-	-	-	-	-
	20	Position Unit Settings	0	Restart	0x2520	0x00	PP	-	HM	CSP	-	-
	21	Torque Limit Settings	0	Immediate	0x2521	0x00	-	-	-	-	-	F
	22	2nd Torque Limit	350	Immediate	0x2522	0x00	-	-	-	-	-	F
	27	Analog 3 torque limit gain	30	Immediate	0x2527	0x00	-	-	-	-	-	-
	28	LED Initial Status	34	Restart	4x2528	0x00	-	-	-	-	-	F
	32	Max Command Pulse Input Frequency	4100	Immediate	0x2532	0x00	-	-	-	-	-	-
	37	Torque Limit Alarm Delay Time	500	Immediate	0x2537	0x00	-	-	-	-	-	F
	39	3rd Torque Limit	80	Immediate	0x2539	0x00	-	-	-	-	-	F
	40	D41 Data Monitor	0x30C	Immediate	Cx2540	0x00	-	-	-	-	-	F
	42	Frequency Divider Output Z-Signal Polarity	0x0	Restart	0x2542	0x00	-	-	-	-	-	F
	43	Frequency Divider Output Z-Signal Bandwidth	0	Restart	0x2543	0x00	-	-	-	-	-	F
	44	Frequency Divider Output Source	0	Restart	0x2544	0x00	-	-	-	-	-	F
	45	External Encoder Feedback Velocity Threshold	0	Immediate	0x2545	0x00	-	-	-	-	-	-
	46	Regenerative Vent Overload Level	0	Immediate	0x2546	0x00	-	-	-	-	-	F
	53	Auto Homing	0	Immediate	0x2553	0x00	-	-	-	-	-	-
	58	Frequency Divider Output Delay Compensation	0	Immediate	0x2558	0x00	-	-	-	-	-	-
	70	Reached Velocity Hysteresis Bandwidth	0	Immediate	0x2570	0x00	-	-	-	-	-	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 06												
P06. Special Settings	01	Encoder Zero Position Compensation	0	Restart	0x2601	0x00	-	-	-	-	-	F
	03	JOG Torque	100	Immediate	0x2603	0x00	PP	-	HM	CSP	-	-
	04	JOG Speed	50	Immediate	0x2604	0x00	PP	-	HM	CSP	-	-
	05	Position 3rd Gain Valid Time	0	Immediate	0x2605	0x00	PP	-	HM	CSP	-	-
	06	Position 3rd Gain Scal Factor	100	Immediate	0x2606	0x00	-	-	-	-	-	F
	07	Torque Command Additional Value	0	Immediate	0x2607	0x00	-	-	-	-	-	F
	08	Positive Direction Torque Compensation	0	Immediate	0x2608	0x00	-	-	-	-	-	F
	09	Negative Direction Torque Compensation	0	Immediate	0x2609	0x00	-	-	-	-	-	F
	10	Function Expansion	0x0	Immediate	0x2610	0x00	-	-	-	-	-	F
	11	Current Response Settings	100	Immediate	0x2611	0x00	-	-	-	-	-	F

14	Stop Time upon Alarm	500	Immediate	0x2614	0x00	-	-	-	-	-	F
20	Trial Run Distance	10	Immediate	0x2620	0x00	-	-	-	-	-	F
21	Interval Time	300	Immediate	0x2621	0x00	-	-	-	-	-	F
22	Trial Run Cycle	5	Immediate	0x2622	0x00	-	-	-	-	-	F
25	Trial Run Acceleration	200	Immediate	0x2625	0x00	-	-	-	-	-	F
27	Current Loop Tuning	0	Immediate	0x2627	0x00	-	-	-	-	-	
28	Velocity Observer Gain	160	Immediate	0x2628	0x00	-	-	-	-	-	F
29	Velocity Observer Bandwidth	0	Immediate	0x2629	0x00	-	-	-	-	-	F
34	Fram Error Window Time	100	Immediate	0x2634	0x00	-	-	-	-	-	F
35	Fram Error Window	50	Immediate	0x2635	0x00	-	-	-	-	-	F
54	Absolute Rotary Denominator	0	Restart	0x2654	0x00	PP	-	HM	CSP	-	-
56	Rotor Blocked Alarm Torque Threshold	300	Immediate	0x2656	0x00	-	-	-	-	-	F
59	In Position Threshold - Origin Mode	8	Immediate	0x2659	0x00	-	-	-	-	-	-
61	Z-signal Holding Time	10	Immediate	0x2661	0x00	-	-	-	-	-	F
63	Absolute Multiturn Data Limit	0	Restart	0x2663	0x00	-	-	-	-	-	F
80	Clash Detection	0	Restart	0x2680	0x00	-	-	-	-	-	-
81	Clash Detection Positive Current Threshold	100	Immediate	0x2681	0x00	-	-	-	-	-	-
82	Clash Detection Negative Current Threshold	100	Immediate	0x2682	0x00	-	-	-	-	-	-
83	Clash Detection Velocity Threshold	0	Immediate	0x2683	0x00	-	-	-	-	-	-
84	Holding Current After Clash (Positive)	0	Immediate	0x2684	0x00	-	-	-	-	-	-
85	Holding Current After Clash (Negative)	0	Immediate	0x2685	0x00	-	-	-	-	-	-
86	Clash Detection Start Position (Positive)	0	Restart	0x2686	0x00	-	-	-	-	-	-
87	Clash Detection Start Position (Negative)	0	Restart	0x2687	0x00	-	-	-	-	-	-
88	Clash Detection Positive Current Filter Factor	0	Immediate	0x2688	0x00	-	-	-	-	-	-
89	Clash Detection Negative Current Filter Factor	0	Immediate	0x2689	0x00	-	-	-	-	-	-
90	Clash Detection Time	0	Immediate	0x2690	0x00	-	-	-	-	-	-
92	Clash BLF Delay Time	200	Immediate	0x2692	0x00	-	-	-	-	-	-
93	Clash BLF Threshold	0	Immediate	0x2693	0x00	-	-	-	-	-	-
94	Clash BLF Center Frequency	10000	Immediate	0x2694	0x00	-	-	-	-	-	-
95	Clash BLF Q-Value	1000	Immediate	0x2695	0x00	-	-	-	-	-	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 07												
P07. Motor Parameters	00	Current Loop Gain	1000	Immediate	0x2700	0x00	-	-	-	-	-	-
	01	Current Loop Integral Time	500	Immediate	0x2701	0x00	-	-	-	-	-	-
	02	Rotor Initial Angle Compensation	0	Restart	0x2702	0x00	-	-	-	-	-	-
	03	Current Differential Coefficient	0	Immediate	0x2703	0x00	-	-	-	-	-	-
	04	Reserved	0	Immediate	0x2704	0x00	-	-	-	-	-	-
	15	Motor Model	0x140	Restart	0x2715	0x00	-	-	-	-	-	-
	16	Encoder Model	0x7F	Restart	0x2716	0x00	-	-	-	-	-	-
	23	Encoder Lines	0	Immediate	0x2723	0x00	-	-	-	-	-	-
	54	Grating Ruler Resolution	100	Restart	0x2754	0x00	-	-	-	-	-	-
	55	Distance between Magnetic Poles	1200	Restart	0x2755	0x00	-	-	-	-	-	-
	57	Motor Overheat Threshold	0	Immediate	0x2757	0x00	-	-	-	-	-	-
	60	Encoder Communication Protocol	0	Immediate	0x2760	0x00	-	-	-	-	-	-
	77	BISS-C Encoder Single Turn Data	32	Restart	0x2777	0x00	-	-	-	-	-	-
	78	BISS-C Encoder Multi Turn Data	0	Restart	0x2778	0x00	-	-	-	-	-	-
	79	BISS-C Baud Rate	25	Restart	0x2779	0x00	-	-	-	-	-	-
	80	BISS-C Encoder Pin Configuration	0x0	Restart	0x2780	0x00	-	-	-	-	-	-

	83	Motor Zero Pt Single Turn Position	0	Restart	0x2783	0x00	-	-	-	-	-	-
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Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 0C												
POC. Position Comparison	00	Enable Position Comparison	0	Immediate	0x27A4	0x01	-	-	-	-	-	F
	01	Position Comparison Mode	0	Re-enable	0x27A4	0x02	-	-	-	-	-	F
	02	Position Comparison Pulse Output Bandwidth	1	Immediate	0x27A4	0x03	-	-	-	-	-	F
	03	Position Comparison Output Delay	0	Restart	0x27A4	0x04	-	-	-	-	-	F
	04	Position Comparison Starting Point	1	Immediate	0x27A4	0x05	-	-	-	-	-	F
	05	Position Comparison End Point	1	Immediate	0x27A4	0x06	-	-	-	-	-	F
	06	No. of cycle for N-cycle Comparison	1	Immediate	0x27A4	0x07	-	-	-	-	-	F
	07	Position Comparison - Set Current Position as Origin	0	Immediate	0x27A4	0x08	-	-	-	-	-	F
	08	Position Comparison - Offset to Origin	0	Immediate	0x27A4	0x09	-	-	-	-	-	-
	09	Position Comparison Actual Status	0x0	Immediate	0x27A4	0x0A	-	-	-	-	-	-
	10	Position Comparison Actual Position	0	Immediate	0x27A4	0x0B	-	-	-	-	-	-
	11	Position Comparison Actual Comparison Points	0	Immediate	0x27A4	0x0C	-	-	-	-	-	-
	12	Position Comparison Output	0	Immediate	0x27A4	0x0D	-	-	-	-	-	-
	13	Position Comparison Cycle	0	Immediate	0x27A4	0x0E	-	-	-	-	-	-
	20	Position Comparison 1 Target Value	0	Immediate	0x27A4	0x15	-	-	-	-	-	F
	21	Position Comparison 2 Target Value	0	Immediate	0x27A4	0x16	-	-	-	-	-	F
	22	Position Comparison 3 Target Value	0	Immediate	0x27A4	0x17	-	-	-	-	-	F
	23	Position Comparison 4 Target Value	0	Immediate	0x27A4	0x18	-	-	-	-	-	F
	24	Position Comparison 5 Target Value	0	Immediate	0x27A4	0x19	-	-	-	-	-	F
	25	Position Comparison 6 Target Value	0	Immediate	0x27A4	0x1A	-	-	-	-	-	F
	26	Position Comparison 7 Target Value	0	Immediate	0x27A4	0x1B	-	-	-	-	-	F
	27	Position Comparison 8 Target Value	0	Immediate	0x27A4	0x1C	-	-	-	-	-	F
	28	Position Comparison 9 Target Value	0	Immediate	0x27A4	0x1D	-	-	-	-	-	F
	29	Position Comparison 10 Target Value	0	Immediate	0x27A4	0x1E	-	-	-	-	-	F
	30	Position Comparison 11 Target Value	0	Immediate	0x27A4	0x1F	-	-	-	-	-	F
	31	Position Comparison 12 Target Value	0	Immediate	0x27A4	0x20	-	-	-	-	-	F
	32	Position Comparison 13 Target Value	0	Immediate	0x27A4	0x21	-	-	-	-	-	F
	33	Position Comparison 14 Target Value	0	Immediate	0x27A4	0x22	-	-	-	-	-	F
	34	Position Comparison 15 Target Value	0	Immediate	0x27A4	0x23	-	-	-	-	-	F
	35	Position Comparison 16 Target Value	0	Immediate	0x27A4	0x24	-	-	-	-	-	F
	36	Position Comparison 17 Target Value	0	Immediate	0x27A4	0x25	-	-	-	-	-	F
	37	Position Comparison 18 Target Value	0	Immediate	0x27A4	0x26	-	-	-	-	-	F
	38	Position Comparison 19 Target Value	0	Immediate	0x27A4	0x27	-	-	-	-	-	F
	39	Position Comparison 20 Target Value	0	Immediate	0x27A4	0x28	-	-	-	-	-	F
	40	Position Comparison 21 Target Value	0	Immediate	0x27A4	0x29	-	-	-	-	-	F
	41	Position Comparison 22 Target Value	0	Immediate	0x27A4	0x2A	-	-	-	-	-	F
	42	Position Comparison 23 Target Value	0	Immediate	0x27A4	0x2B	-	-	-	-	-	F
	43	Position Comparison 24 Target Value	0	Immediate	0x27A4	0x2C	-	-	-	-	-	F

44	Position Comparison 25 Target Value	0	Immediate	0x27A4	0x2D	-	-	-	-	-	F
45	Position Comparison 26 Target Value	0	Immediate	0x27A4	0x2E	-	-	-	-	-	F
46	Position Comparison 27 Target Value	0	Immediate	0x27A4	0x2F	-	-	-	-	-	F
47	Position Comparison 28 Target Value	0	Immediate	0x27A4	0x30	-	-	-	-	-	F
48	Position Comparison 29 Target Value	0	Immediate	0x27A4	0x31	-	-	-	-	-	F
49	Position Comparison 30 Target Value	0	Immediate	0x27A4	0x32	-	-	-	-	-	F
50	Position Comparison 31 Target Value	0	Immediate	0x27A4	0x33	-	-	-	-	-	F
51	Position Comparison 32 Target Value	0	Immediate	0x27A4	0x34	-	-	-	-	-	F
52	Position Comparison 33 Target Value	0	Immediate	0x27A4	0x35	-	-	-	-	-	F
53	Position Comparison 34 Target Value	0	Immediate	0x27A4	0x36	-	-	-	-	-	F
54	Position Comparison 35 Target Value	0	Immediate	0x27A4	0x37	-	-	-	-	-	F
55	Position Comparison 36 Target Value	0	Immediate	0x27A4	0x38	-	-	-	-	-	F
56	Position Comparison 37 Target Value	0	Immediate	0x27A4	0x39	-	-	-	-	-	F
57	Position Comparison 38 Target Value	0	Immediate	0x27A4	0x3A	-	-	-	-	-	F
58	Position Comparison 39 Target Value	0	Immediate	0x27A4	0x3B	-	-	-	-	-	F
59	Position Comparison 40 Target Value	0	Immediate	0x27A4	0x3C	-	-	-	-	-	F
60	Position Comparison 41 Target Value	0	Immediate	0x27A4	0x3D	-	-	-	-	-	F
61	Position Comparison 42 Target Value	0	Immediate	0x27A4	0x3E	-	-	-	-	-	F
70	Position Comparison 1 & 2 Attribute Value	0x0	Immediate	0x27A4	0x47	-	-	-	-	-	F
71	Position Comparison 3 & 4 Attribute Value	0x0	Immediate	0x27A4	0x48	-	-	-	-	-	F
72	Position Comparison 5 & 6 Attribute Value	0x0	Immediate	0x27A4	0x49	-	-	-	-	-	F
73	Position Comparison 7 & 8 Attribute Value	0x0	Immediate	0x27A4	0x4A	-	-	-	-	-	F
74	Position Comparison 9 & 10 Attribute Value	0x0	Immediate	0x27A4	0x4B	-	-	-	-	-	F
75	Position Comparison 11 & 12 Attribute Value	0x0	Immediate	0x27A4	0x4C	-	-	-	-	-	F
76	Position Comparison 13 & 14 Attribute Value	0x0	Immediate	0x27A4	0x4D	-	-	-	-	-	F
77	Position Comparison 15 & 16 Attribute Value	0x0	Immediate	0x27A4	0x4E	-	-	-	-	-	F
78	Position Comparison 17 & 18 Attribute Value	0x0	Immediate	0x27A4	0x4F	-	-	-	-	-	F
79	Position Comparison 19 & 20 Attribute Value	0x0	Immediate	0x27A4	0x50	-	-	-	-	-	F
80	Position Comparison 21 & 22 Attribute Value	0x0	Immediate	0x27A4	0x51	-	-	-	-	-	F
81	Position Comparison 23 & 24 Attribute Value	0x0	Immediate	0x27A4	0x52	-	-	-	-	-	F
82	Position Comparison 25 & 26 Attribute Value	0x0	Immediate	0x27A4	0x53	-	-	-	-	-	F
83	Position Comparison 27 & 28 Attribute Value	0x0	Immediate	0x27A4	0x54	-	-	-	-	-	F
84	Position Comparison 29 & 30	0x0	Immediate	0x27A4	0x55	-	-	-	-	-	F

		Attribute Value										
	85	Position Comparison 31 & 32 Attribute Value	0x0	Immediate	0x27A4	0x56	-	-	-	-	-	F
	86	Position Comparison 33 & 34 Attribute Value	0x0	Immediate	0x27A4	0x57	-	-	-	-	-	F
	87	Position Comparison 35 & 36 Attribute Value	0x0	Immediate	0x27A4	0x58	-	-	-	-	-	F
	88	Position Comparison 37 & 38 Attribute Value	0x0	Immediate	0x27A4	0x59	-	-	-	-	-	F
	89	Position Comparison 39 & 40 Attribute Value	0x0	Immediate	0x27A4	0x5A	-	-	-	-	-	F
	90	Position Comparison 41 & 42 Attribute Value	0x0	Immediate	0x27A4	0x5B	-	-	-	-	-	F

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 0D												
P0D. Gantry Settings	00	Gantry Configuration	0	Restart	0x27A5	0x01	-	-	-	-	-	F
	01	Gantry Slave Axis Command Mode	0	Re-enable	0x27A5	0x02	-	-	-	-	-	F
	02	Gantry Tuning Gain 1	100	Re-enable	0x27A5	0x03	-	-	-	-	-	F
	03	Gantry Position Synchronization Deviation Threshold	10000	Immediate	0x27A5	0x04	-	-	-	-	-	F
	04	Gantry Torque Deviation Threshold	500	Immediate	0x27A5	0x05	-	-	-	-	-	F
	05	Gantry Tuning Gain 2	0	Immediate	0x27A5	0x06	-	-	-	-	-	F
	06	Position Gain	0	Immediate	0x27A5	0x07	-	-	-	-	-	F
	07	Velocity Gain	0	Immediate	0x27A5	0x08	-	-	-	-	-	F
	08	Velocity Integral	0	Immediate	0x27A5	0x09	-	-	-	-	-	F
	10	Homing Mode	0	Immediate	0x27A5	0x0B	-	-	-	-	-	F
	11	Alignment Mode	0	Immediate	0x27A5	0x0C	-	-	-	-	-	F
	12	Gantry Origin Offset	0	Re-enable	0x27A5	0x0D	-	-	-	-	-	-
	13	Alignment Speed	10	Immediate	0x27A5	0x0E	-	-	-	-	-	-
	15	Offset Measurement	0	Re-enable	0x27A5	0x10	-	-	-	-	-	-
	16	Alignment Measurement Command	0	Immediate	0x27A5	0x11	-	-	-	-	-	-
	17	Offset Measurement Value	0	Immediate	0x27A5	0x12	-	-	-	-	-	-
	21	Gantry Command Type	0	Restart	0x27A5	0x16	-	-	-	-	-	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 0E												
P0E. Precision Compensation	00	Precision Compensation	0	Re-enable	0x27A6	0x01	PP	-	HM	CSP	-	-
	01	Precision Compensation Unit	0	Immediate	0x27A6	0x02	PP	-	HM	CSP	-	-
	02	Precision Compensation Total	2	Immediate	0x27A6	0x03	PP	-	HM	CSP	-	-
	03	Precision Compensation Start Point	0	Immediate	0x27A6	0x04	PP	-	HM	CSP	-	-
	04	Precision Compensation Data Interval	100000	Immediate	0x27A6	0x05	PP	-	HM	CSP	-	-
	05	Precision Compensation Phase Sequence and Command Direction	0x0	Immediate	0x27A6	0x06	PP	-	HM	CSP	-	-
	06	Precision Compensation Enable Source	0	Immediate	0x27A6	0x07	PP	-	HM	CSP	-	-
	07	Position Feedback	0	Immediate	0x27A6	0x08	PP	-	HM	CSP	-	-
	08	Reserved	0	Immediate	0x27A6	0x09	-	-	-	-	-	-
	09	Reserved	0	Immediate	0x27A6	0x0A	-	-	-	-	-	-
	10	Reserved	0	Immediate	0x27A6	0x0B	-	-	-	-	-	-
	11	Reserved	0	Immediate	0x27A6	0x0C	-	-	-	-	-	-
	12	Reserved	0x0	Re-enable	0x27A6	0x0D	-	-	-	-	-	-
	20	Position Mode	0	Re-enable	0x27A6	0x15	PP	-	HM	CSP	-	-
	21	First Target	0	Re-enable	0x27A6	0x16	PP	-	HM	CSP	-	-

	22	Last Target	100000	Re-enable	0x27A6	0x17	PP	-	HM	CSP	-	-
	23	Gap	100000	Re-enable	0x27A6	0x18	PP	-	HM	CSP	-	-
	24	Target Laps	2	Re-enable	0x27A6	0x19	PP	-	HM	CSP	-	-
	25	Laps	1	Re-enable	0x27A6	0x1A	PP	-	HM	CSP	-	-
	26	Overstep	20000	Re-enable	0x27A6	0x1B	PP	-	HM	CSP	-	-
	27	Interval Time	5000	Re-enable	0x27A6	0x1C	-	-	-	-	-	-
	28	Velocity	0	Re-enable	0x27A6	0x1D	-	-	-	-	-	-
	29	Acceleration	500000	Re-enable	0x27A6	0x1E	-	-	-	-	-	-
	30	Deceleration	500000	Re-enable	0x27A6	0x1F	-	-	-	-	-	-
	31	Homing Mode	0	Re-enable	0x27A6	0x20	-	-	-	-	-	-
	32	Homing High Velocity	5000000	Re-enable	0x27A6	0x21	-	-	-	-	-	-
	33	Homing Low Velocity	1000000	Re-enable	0x27A6	0x22	-	-	-	-	-	-
	34	Homing Precision Compensation Velocity	500000	Re-enable	0x27A6	0x23	-	-	-	-	-	-
	35	Homing Acceleration	500000	Re-enable	0x27A6	0x24	-	-	-	-	-	-
	36	Homing Deceleration	500000	Re-enable	0x27A6	0x25	-	-	-	-	-	-
	37	Homing Torque Reached Target Value	0	Re-enable	0x27A6	0x26	-	-	-	-	-	-
	38	Homing Torque Reached Target Value	50	Re-enable	0x27A6	0x27	-	-	-	-	-	-
	39	Homing Torque Holding Time	100	Re-enable	0x27A6	0x28	-	-	-	-	-	-
	40	Homing In Position Tolerance	500	Re-enable	0x27A6	0x29	-	-	-	-	-	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 10												
P10. Linear Driver Setting	00	Magnetic Poles Detection	0x0	Restart	0x27A8	0x01	-	-	-	-	-	F
	01	Magnetic Poles Position Determining Time Limit	10000	Immediate	0x27A8	0x02	-	-	-	-	-	F
	02	Magnetic Poles Position Determining Command Torque	100	Immediate	0x27A8	0x03	-	-	-	-	-	F
	03	Magnetic Poles Position Determining Static Pulse Width	0	Immediate	0x27A8	0x04	-	-	-	-	-	F
	04	Magnetic Poles Position Determining Motor Stop Pulse Count	0	Immediate	0x27A8	0x05	-	-	-	-	-	F
	05	Magnetic Poles Position Determining Motor Stop Time	200	Immediate	0x27A8	0x06	-	-	-	-	-	F
	06	Magnetic Poles Position Determining Torque Filter Time	800	Immediate	0x27A8	0x07	-	-	-	-	-	F
	07	Magnetic Poles Position Determining Gain	180	Immediate	0x27A8	0x08	-	-	-	-	-	F
	08	Magnetic Poles Position Determining Integral Time Constant	310	Immediate	0x27A8	0x09	-	-	-	-	-	F
	38	Encoder connection to Modbus Port	0	Restart	0x27A8	0x27	-	-	-	-	-	-

Parameter		Label	Default	Activation	EtherCAT Address		Valid Mode					
Class	No.				Index	SubIndex						
Class 11												
P11. Driver parameters	00	MCU 1 Version	0	Immediate	0x27A9	0x01	-	-	-	-	-	F
	01	MCU 2 Version	0	Immediate	0x27A9	0x02	-	-	-	-	-	F
	02	FPGA Version	0	Immediate	0x27A9	0x03	-	-	-	-	-	F
	06	Driver Voltage Level	0	Immediate	0x27A9	0x07	-	-	-	-	-	F
	07	Driver Rated Power	0	Immediate	0x27A9	0x08	-	-	-	-	-	F
	08	Driver Rated Current	0	Immediate	0x27A9	0x09	-	-	-	-	-	F
	09	Driver Max. Current	0	Immediate	0x27A9	0x0A	-	-	-	-	-	F
	12	Death Zone Compensation Factor 1	0	Immediate	0x27A9	0x0D	-	-	-	-	-	F
	13	Death Zone Compensation Factor 2	0	Immediate	0x27A9	0x0E	-	-	-	-	-	F
	16	Analog 1 Zero Drift	0	Immediate	0x27A9	0x11	-	-	-	-	-	-

	17	Analog 2 Zero Drift	0	Immediate	0x27A9	0x12	-	-	-	-	-	-
	31	Regenerative Vent Control Mode	0	Restart	0x27A9	0x20	-	-	-	-	-	-

10.1.2 Object Dictionary (5000h)- Manufacturer Parameter

Index	Sub index	Label	Unit	Default	Min	Max	Details
5004	01	RPDO length		8	0	64	
	02	TPDO length		17	0	64	
	03	The number of RPDO		1	0	4	
	04	The number of TPDO		1	0	2	
	05	Sync0 Watchdog counter		0	0	65535	
	06	Reserved			0	65535	
	07	Sync0 Watchdog limit		4	0	65535	73B alarm threshold value, set to zero shield
	08	Sync0 Drift watchdog counter		0	0	65535	
	09	Sync0 Drift watchdog limit		4	0	65535	73C alarm threshold value, set to zero shield
	0A	SM2 watchdog counter		0	0	65535	
	0B	SM2 Watchdog limit		4	0	65535	73A alarm threshold value, set to zero shield
	0C	Application layer SM2/Sync0 watchdog counter		0			
	0D	Application layer SM2/Sync0 watchdog limit		4			
	0E	Reserved			0	500	
	0F	Time interval between SM2 and Sync0	ns	0	0	10000 00000	832h Alarm detection
5006	00	Synchronous alarm setting		0xFFFF F	0	0xFFFF F	Bit0:818h Alarm enable switch Bit1: 819h Bit2: 81Ah Bit3: 824h Bit4: 825h Bit5: Reserved Bit6: Reserved Bit7: 82Ch Bit8: 82Dh Bit9: 832h Bit10~15: Reserved Notes: 0 invalid; 1 valid
5010	00	PDO watchdog overtime	ms	0	0	60000	0: invalid. > 0: valid. Unit: ms. Such as RPDO timeout alarm 818h, TPDO timeout alarm 819h
5012	04	Homing setting	-	5	Bit0: Abnormal signal protection 0: invalid; 1: valid Bit1: pull back if overtravel while final stop 0: invalid; 1: valid		

					Bit2/Bit3:				
					Bit2	Bit 3	Positive limit position	Negative limit position	Feedback after the homing process
					0	0	607D-02+607C	607D-01 + 607C	6064 = 607C
					0	1	607D-02-607C	607D-01 - 607C	6064 = -607C
					1	-	607D-02	607D-01	6064 = 0
					Bit4: Deal with Overtravel between the high speed and low speed during homing process 0: Homing process error (set 6041h bit13=1); 1: As normal, continue homing process				
5400	01	Set synchronization cycle minimum value	us	250	125	1000			
5400	02	Set synchronization cycle maximum value	us	10000	4000	20000			
5500	01	Absolute encoder multiturn number	r	-	-	-	-		
	02	Encoder single turn position	Pulse	-	-	-	-		
	03	Encoder feedback position 32 bit low	Pulse	-	-	-	-		
	04	Encoder feedback position 32 bit high	Pulse	-	-	-	-		
	05	The actual mechanical position 32 bit low	Unit	-	-	-	-		
	06	The actual mechanical position 32 bit high	Unit	-	-	-	-		
	07	Number of encoder communication exceptions		-	-	-	-		
5501	01	Motor Speed	r/min	-	-	-	-		
	02	Speed of position command	r/min	-	-	-	-		
	03	Speed command	r/min	-	-	-	-		
	04	Actual torque	0.1%	-	-	-	-		
	05	Torque	0.1%	-	-	-	-		

		command					
	06	Relative position error	Pulse	-	-	-	-
	07	Internal position command	Pulse	-	-	-	-
	08	Overload ratio	0.1%	-	-	-	-
	09	Discharge load rate	0.1%	-	-	-	-
	0A	Inertia ratio	%	-	-	-	-
	0B	Actual positive torque limit value	0.1%	-	-	-	-
	0C	Actual negative torque limit value	0.1%	-	-	-	-
	0D	U phase current detect value	0.1%	-	-	-	-
	0E	W phase current detect value	0.1%	-	-	-	-
5502	01	DI input signal	-	-	-	-	-
	02	SO output signal	-	-	-	-	-
	03	Reserved	-	-	-	-	-
	04	Reserved	-	-	-	-	-
	05	Bus voltage	V	-	-	-	-
	06	Temperature	°C	-	-	-	-
	07	Power on time	S	-	-	-	-

10.1.3 Object Dictionary(6000h)-Motion Parameter

Index	Sub-index	Label	Unit	Default	Min	Max	Mode
603F	0	Error code	-	0x0	0x0	0xFFFF	F
6040	0	Control word	-	0x0	0x0	0xFFFF	F
6041	0	Status word	-	0x0	0x0	0xFFFF	F
605A	0	Quick stop option code	-	2	0	7	F
605B	0	Motor deceleration-stopping mode selection	-	0	0	1	F
605C	0	Axis disabled-stopping mode selection	-	0	0	1	F
605D	0	Pause-stopping mode selection	-	1	1	3	F
605E	0	Alarm - stopping mode selection	-	0	0	2	F
6060	0	Operation mode selection	-	8	1	11	F
6061	0	Operation mode display	-	0	0	10	F
6062	0	Position command	Command unit	0	- 21474 83648	214748 3647	CSP/P P/HM
6063	0	Actual internal position	Encoder unit	0	- 21474 83648	214748 3647	F
6064	0	Actual position feedback	Command unit	-	- 21474 83648	214748 3647	F
6065	0	Position deviation window	Command unit	30000	0	214748 3647	PP/CS P/HM

6066	0	Position deviation detection time	ms	10	0	65535	PP/CS P/HM
6067	0	Position window	Command unit/s	0	0	214748 3647	PP/CS P/HM
6068	0	Position window time	ms	0	0	65535	PP/CS P/HM
606B	0	Internal command velocity	Command unit/s	0	- 21474 83648	214748 3647	CSV/P V
606C	0	Velocity feedback	Command unit/s	0	- 21474 83648	214748 3647	PP/CS P/HM
606D	0	Velocity window	Command unit /s	10	0	65535	PV/CS V
606E	0	Velocity window time	ms	0	0	65535	PV/CS V
606F	0	Zero-speed threshold	Command unit/s	10	0	65535	PV/CS V
6071	0	Target torque	0.001	0	-32768	32767	CST/P T
6072	0	Maximum torque	0.001	3000	0	65535	F
6073	0	Maximum current	0.001	3000	-	65535	F
6074	0	Internal command torque	0.001	0	-32768	32767	F
6075	0	Motor current rating	mA	3000	0	214748 3647	F
6077	0	Actual torque	0.1%	0	-32768	32767	F
6079	0	DC bus voltage	mV	0	0	214748 3647	F
607A	0	Target position	Command unit	0	- 21474 83648	214748 3647	CSP/P P
607C	0	Homing position offset	Command unit	0	- 21474 83648	214748 3647	HM
607D	1	Min. software limit	Command unit	0	- 21474 83648	214748 3647	CSP/P P
	2	Max. software limit	Command unit	0	- 21474 83648	214748 3647	CSP/P P
607E	0	Motor rotational direction	-	0x0	0x0	0xFF	F
607F	0	Maximum protocol velocity	Command unit/s	214748 3647	0	214748 3647	PP/HM /PV/C ST
6080	0	Maximum motor velocity	r/min	6000	0	214748 3647	F
6081	0	Profile velocity	Command unit/s	10000	0	214748 3647	PP
6083	0	Profile acceleration	Command unit/s ²	10000	1	214748 3647	PP/PV/
6084	0	Profile deceleration	Command unit/s ²	10000	1	214748 3647	PP/PV
6085	0	Emergency stop deceleration	Command unit/s ²	100000 00	1	214748 3647	CSP/C SV/PP/ PV/HM
6087	0	Torque slope	0.001/s	5000	1	214748	PT

						3647	
608F	1	Encoder resolution	Encoder unit	0	0	214748 3647	F
6091	1	Electronic gear ratio numerator	-	1	1	214748 3647	F
	2	Electronic gear ratio denominator	-	1	1	214748 3647	F
6092	1	Number of pulses per rotation	Command unit/r	10000	1	214748 3647	F
6098	0	Homing method	-	19	-6	37	HM
6099	1	High velocity homing	Command unit/s	10000	0	214748 3647	HM
	2	Low velocity homing	Command unit/s	5000	0	214748 3647	HM
609A	0	Homing acceleration /deceleration	Command unit/s ²	500000	1	214748 3647	HM
60B0	0	Position feedforward	Command unit	0	- 21474 83648	214748 3647	CSP
60B1	0	Velocity feedforward	Command unit/s	0	- 21474 83648	214748 3647	CSP/C SV/PP/ PV/HM
60B2	0	Torque feedforward	0.001	0	-32768	32767	F
60B8	0	Probe function	-	0x0	0x0	0xFFFF	F
60B9	0	Probe status	-	0x0	0x0	0xFFFF	F
60BA	0	Probe 1 rising edge captured position	Command unit	0	- 21474 83648	214748 3647	F
60BB	0	Probe 1 falling edge captured position	Command unit	0	- 21474 83648	214748 3647	F
60BC	0	Probe 2 rising edge captured position	Command unit	0	- 21474 83648	214748 3647	F
60BD	0	Probe 2 falling edge captured position	Command unit	0	- 21474 83648	214748 3647	F
60C5	0	Protocol maximum acceleration	Command unit s ²	100000 000	1	214748 3647	F
60C6	0	Protocol maximum deceleration	Command unit s ²	100000 000	1	214748 3647	F
60D5	0	Probe 1 rising edge captured count(s)	-	0	0	65535	F
60D6	0	Probe 1 falling edge captured count(s)	-	0	0	65535	F
60D7	0	Probe 2 rising edge captured count(s)	-	0	0	65535	F
60D8	0	Probe 2 falling edge captured count(s)	-	0	0	65535	F
60E0	0	Max. torque in positive direction	0.001	3000	0	65535	F
60E1	0	Max. torque in negative direction	0.001	3000	0	65535	F
60F4	0	Actual following error	Command unit	0	- 21474	214748 3647	CSP/P P/HM

					83648		
60FA	0	Position loop velocity output	Command unit/s	0	- 21474 83648	214748 3647	CSP/P P/HM
60FC	0	Internal command position	Encoder unit	0	- 21474 83648	214748 3647	CSP/P P/HM
60FD	0	Input status	-	0x0	0x0	0x7FFF FFFF	F
60FE	1	Output valid	-	0x0	0x0	0x7FFF FFFF	F
	2	Output enabled	-	0x0	0x0	0x7FFF FFFF	F
60FF	0	Target velocity	Command unit/s	0	- 21474 83648	214748 3647	CSV/P V
6502	0	Supported operation modes	-	0x0	0x0	0x7FFF FFFF	F

10.2 Details of Parameter

10.2.1 [Class 0] Basic Settings

P00.00	Label	Model Following Control			Valid mode(s)	-	-	-	-	-	F
	Range	0~5000	Default	1	Unit	0.1Hz					
	Valid	Immediate	Index	0x2000	SubIndex	0x00	Attribute		R/W		
Model-following bandwidth, also known as model-following control (MFC), is used to control the position loop to improve the responsiveness to commands, speed up positioning time and reduce following error. The effect is obvious especially in low and medium mechanical stiffness.											
Value		Description									
0		Disable model following/zero tracking control									
1		Set bandwidth automatically									
2~9		Reserved									
10~2000		Manually set control bandwidth. 30~100 recommended for belt application									
P00.00>9: Model-following bandwidth value set by P00.00. 10<P00.00<5000: Specifies the bandwidth. *Recommended settings for belt application: 30<P00.00<100.											

P00.01	Label	Control Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~9	Default	9	Unit	model					
	Valid	Restart	Index	0x2001	SubIndex	0x00	Attribute		R/W		
Set value to use following control modes:											
Value	Content		Details								
0~8	Reserved		Reserved								
9	EtherCAT mode		PP/PV/PT/HM/CSP/CSV/CST								

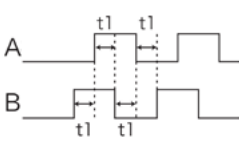
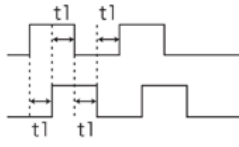
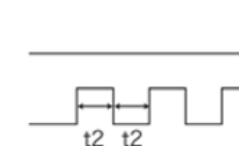
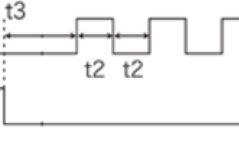
P00.02	Label	Auto Gain Tuning Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF	Default	0x1	Unit	-					
	Valid	Immediate	Index	0x2002	SubIndex	0x00	Attribute	R/W			
Data bits	Category	Settings		Application							
0x00_	Motion setting mode	Used to set motion setting mode, which can be selected according to the motion characteristics or setting requirements. Generally, it is recommended to select mode 1 with good generality when there is no special requirement, mode 2 when rapid positioning is needed. If mode 1 and mode 2 cannot meet the requirements, please choose mode 0.									
		0: Manual		P00.03 invalid. Gain value must be adjusted manually and accordingly.							
		1: Standard		P00.03 valid. Quick gain adjusting can be achieved by changing P00.03 stiffness value. Gain switching is not used in this mode, suitable for applications with requirements for stability.							
		2: Positioning		P00.03 valid. Quick gain adjusting can be achieved by changing P00.03 stiffness value. This mode is suitable							

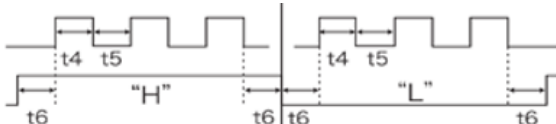
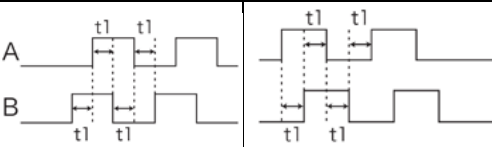
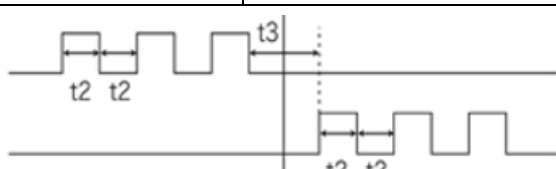
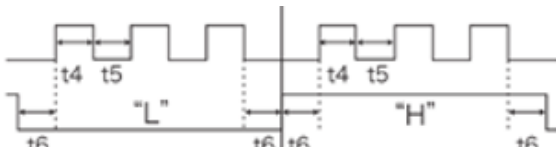
			for applications requiring quick positioning. Not recommended for load mounted vertical to ground, or please compensate for the load using P06.07
0x0_0	Load type setting	Used to select the load type, choose according to load-inertia ratio and mechanical structure.	
		0: Rigid structure	This mode prioritizes system responsiveness. Use this mode when there is a relatively rigid structure with low load inertia. Typical application including directly connected high-precision gearbox, lead screw, gears, etc.
		1: High inertia	For applications with higher load inertia (10 times or above), gain settings take into account both machine stability and responsiveness. Not recommended to set stiffness above 15 for high load inertia.
		2: Flexible structure	This mode prioritizes system stability. Use this mode when there is low rigidity structure with high load inertia. Typical applications included belts and chains.
0x_00	reserved		
The setting type combination is a hexadecimal standard, as follows:			
Setting type combination		Application type	
0X000		Rigid structure + Manual	
0X001		Rigid structure +Standard	
0X002		Rigid structure +Positioning	
0X010		High inertia + Manual	
0X011		High inertia + Standard	
0X012		High inertia + Positioning	
0X020		Flexible structure + Manual	
0X021		Flexible structure +Standard	
0X022		Flexible structure +Positioning	

P00.03	Label	Stiffness Level			Valid mode(s)	-	-	-	-	-	F
	Range	0~31	Default	13	Unit	-					
	Valid	Immediate	Index	0x2003	SubIndex	0x00	Attribute		R/W		
Valid when P00.02 = 1,2											
Low -> Mechanical stiffness -> High											
Low -> Servo gain -> High											
0·1.....11·12·13.....30·31											
Low -> Responsiveness -> High											
Lower values ensure better system responsiveness and mechanical stiffness but machine vibration might occur, please set accordingly. Recommend to set to around 15 with motor with high inertia.											

P00.04	Label	Inertia Ratio			Valid mode(s)	-	-	-	-	-	F
	Range	0~200000	Default	250	Unit	%					
	Valid	Immediate	Index	0x2004	SubIndex	0x00	Attribute		R/W		
P00.04=(load inertia/motor rotational inertia)×100%											
Set inertia ratio according to actual load inertia. When both are uniform, actual motor velocity loop responsiveness and gain settings will be consistent. If inertia ratio is greater than actual value, velocity loop gain settings will be higher and vice versa.											

P00.06	Label	Command Pulse Polarity			Valid mode(s)	-	-	-	-	-	F
	Range	0~7	Default	0	Unit	-					
	Valid	Restart	Index	0x2006	SubIndex	0x00	Attribute		R/W		
Used to change the motion direction of the motor.											
Set value	Details										
0	Polarity of the command is not inversed. The direction of rotation is consistent with the polarity of command.										
1	Polarity of command is inversed. The direction of rotation is opposite to the polarity of command.										
Note: Rotational direction of the motor is recommended to be set through object dictionary 607E. However, P00.06 has higher priority than object dictionary 607E. 607E only takes effect when P00.06 = 0.											

P00.07	Label	Command Pulse Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~3	Default	3	Unit	-					
	Valid	Restart	Index	0x2007	SubIndex	0x00	Attribute		R/W		
Probe signal polarity settings take effect when P00.01 = 9											
Set value	Details										
0	Probe 1 & 2 polarity inversion										
1	Probe 2 polarity inversion										
2	Probe 1 polarity inversion										
3	No polarity inversion for probe 1 & 2										
If P00.01 ≠ 9, P00.07 = Command pulse input mode settings.											
Command pulse input											
P00.06	P00.07	Command Pulse Mode			Positive signal		Negative signal				
0	0 or 2	90°phase difference 2 phase pulse (Phase A+ Phase B)									
	1	CW pulse sequence + CCW pulse sequence									

	3	Pulse sequence + Directional symbol	
1	0 or 2	90° phase difference 2 phase pulse (Phase A+ Phase B)	
	1	CW pulse sequence + CCW pulse sequence	
	3	Pulse sequence + Directional symbol	

Command pulse input signal max. frequency and min. duration needed

Command pulse input interface		Max. Frequency	Min. duration needed (μs)					
			t1	t2	t3	t4	t5	t6
Pulse sequence interface	Differential driver	500 kHz	1	1	1	1	1	1
	Open collector	200 kHz	2.5	2.5	2.5	2.5	2.5	2.5

Please set >0.1μs for the duration between rising and falling edge of command pulse input signal.

1 revolution with 2500 pulses 2-phase pulse input when P00.07=0 or 2, P00.08 = 10000

1 revolution with 10000 pulses 1-phase pulse input when P00.07=1 or 3, P00.08 = 10000

P00.08	Label	1st Command Pulse Count per Revolution			Valid mode(s)	PP	PV	HM	CSP	CSV	-
	Range	0~2^26	Default	0	Unit	-					
	Valid	Re-enable	Index	0x2008	SubIndex	0x00	Attribute		R/W		
Pulses per revolution can be set using object dictionary 608F, 6091, 6092. However, P00.08 has higher priority.											

P00.09	Label	1st Command Frequency Divider/Multiplier Numerator			Valid mode(s)	-	-	-	-	-	-
	Range	1~2 ³¹ -1	Default	1	Unit	-					
	Valid	Re-enable	Index	0x2009	SubIndex	0x00	Attribute		R/W		

P00.10	Label	1st Command Frequency Divider/Multiplier Denominator			Valid mode(s)	-	-	-	-	-	-
	Range	1~2 ³¹ -1	Default	1	Unit	-					
	Valid	Re-enable	Index	0x2010	SubIndex	0x00	Attribute		R/W		

P00.11	Label	Encoder Pulse Count per Revolution			Valid mode(s)	-	-	-	-	-	F
	Range	0~2 ²¹	Default	2500	Unit	P/pitch					
	Valid	Restart	Index	0x2011	SubIndex	0x00	Attribute		R/W		

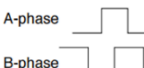
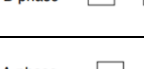
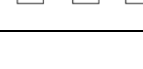
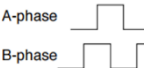
Including rising and falling edge of phase A and B, so encoder actual differential output pulse count = P00.011 x 4

Please make sure: Motor rotational speed x P00.11 x 4 ≤ 1MHz. If exceeds, alarm Er280 might occur.

P00.12	Label	Pulse Output Logic Inversion			Valid mode(s)	-	-	-	-	-	F
	Range	0~1	Default	0	Unit	-					
	Valid	Restart	Index	0x2012	SubIndex	0x00	Attribute		R/W		

To set phase B logic and output source from encoder pulse output. To inverse B-Phase pulse logic and change the relation between Phase A and Phase B

Pulse output logic inversion

P00.12	Phase B logic	CCW direction	CW direction	
0	Not inverted	A-phase  B-phase 	A-phase  B-phase 	
1	Inverted	A-phase  B-phase 	A-phase  B-phase 	

P00.13	Label	1st Torque Limit			Valid mode(s)	-	-	-	-	-	F
	Range	0~750	Default	500	Unit	%					
	Valid	Immediate	Index	0x2013	SubIndex	0x00	Attribute		R/W		

1st torque limit is set according to ratio percentage of motor rated current. Do not exceed max driver output current.

Actual torque limit is the smaller value of P00.13 and object dictionary 6072

P00.14	Label	Position Deviation Threshold			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~310	Default	30	Unit	0.1pitch					
	Valid	Immediate	Index	0x2014	SubIndex	0x00	Attribute		R/W		

Please set threshold value for position deviation accordingly. Default factory setting = 30, Er180 will be triggered if positive deviation is in excess of 3 revolutions.

P00.15	Label	Absolute Encoder			Valid mode(s)	-	-	-	-	-	F
	Range	0~15	Default	0	Unit	-					
	Valid	Restart	Index	0x2015	SubIndex	0x00	Attribute		R/W		
Value	Description										
0	Doesn't retain position data on power off. Unlimited travel distance.										
1	Retrain position data on power off. For applications with fixed travel distance and no multiturn data overflow.										
2	Retrain position data on power off. Actual data feedback in between 0-(P06.63+1). Unlimited travel distance.										
3	Used when travel distance is within 1 revolution of the encoder. Data overflow will trigger alarm.										
5	Clear multiturn alarm and activate multiturn absolute function. Will switch to multiturn mode once alarm cleared, if remains at 5 after 3s, please solve according to Er153.										
9	Clear multiturn position, reset multiturn alarm and activate multiturn absolute function. Will switch to multiturn mode once alarm cleared, if remains at 9 after 3s, please solve according to Er153. Please disable axis before setting to 9 and home the axis before using.										

P00.16	Label	Eternal Regenerative Resistance			Valid mode(s)	-	-	-	-	-	F
	Range	25~500	Default	100	Unit	Ω					
	Valid	Immediate	Index	0x2016	SubIndex	0x00	Attribute		R/W		
To set resistance value of regenerative resistor											

P00.17	Label	Eternal Regenerative Resistor Power Rating			Valid mode(s)	-	-	-	-	-	F
	Range	20~5000	Default	50	Unit	W					
	Valid	Immediate	Index	0x2017	SubIndex	0x00	Attribute	R/W			
To set power rating of regenerative resistor. P00.16 and P00.17 determines the threshold value of Er 120. Please set accordingly or it might trigger false alarm or damage to servo driver. Note: If external regenerative resistor is used, please set according to its labelled power rating.											

P00.19	Label	Friction Compensation			Valid mode(s)	-	-	-	-	-	F
	Range	0~1000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2019	SubIndex	0x00	Attribute		R/W		
Friction compensation setting = 0, default = 1. Friction compensation setting = x, indicating x+1/10000 of friction compensation runway.											

P00.23	Label	Slave ID			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	2	Unit	-					
	Valid	Restart	Index	0x2023	SubIndex	0x00	Attribute	R/W			
Set ID number of the slave station under EtherCAT mode											

P00.24	Label	Slave IO Source			Valid mode(s)	-	-	-	-	-	F
	Range	0~1	Default	0	Unit	-					
	Valid	Restart	Index	0x2024	SubIndex	0x00	Attribute		R/W		
0: Master device automatically assigns a slave address. 1: The slave ID = P00.23.											

P00.25	Label	Reserved			Valid mode(s)	-	-	-	CSP	-	-
	Range	1~100	Default	10	Unit	-					
	Valid	Immediate	Index	0x2025	SubIndex	0x00	Attribute		R/W		
Synchronous dithering compensation range. Used for master device with poor synchronization.											

P00.26	Label	Reserved			Valid mode(s)	-	-	-	CSP	-	-
	Range	1~2000	Default	50	Unit	-					
	Valid	Restart	Index	0x2026	SubIndex	0x00	Attribute		R/W		
Synchronous dithering compensation range. Used for master device with poor synchronization.											

P00.27	Label	Synchronous Mode Command Delay Cycle			Valid mode(s)	-	-	-	CSP	-	-
	Range	0~50	Default	0	Unit	-					
	Valid	Immediate	Index	0x2027	SubIndex	0x00	Attribute		R/W		
Driver delays N position loop cycle counts to receive position command from master device. To solve motor jitter caused by master device with poor synchronization.											

P00.28	Label	CSP Mode Safety Position			Valid mode(s)	-	-	-	CSP	-	-
	Range	500~30000	Default	10000	Unit	-					
	Valid	Immediate	Index	0x2028	SubIndex	0x00	Attribute		R/W		
Synchronous dithering compensation range. Used for master device with poor synchronization.											

P00.38	Label	Z-signal Pulse Input Source			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0x3	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2038	SubIndex	0x00	Attribute		R/W		
Value	Bit 1 (Probe Z-signal)			Bit 0 (Homing Z-Signal)							
0	Motor Z-signal			Motor Z-signal							
1	Motor Z-signal			External encoder Z-signal							
2	External encoder Z-signal			Motor Z-signal							
3	External encoder Z-signal			External encoder Z-signal							

P00.58	Label	STO Version			Valid mode(s)	-	-	-	-	-	-
	Range	0~32767	Default	0	Unit	-					
	Valid	Immediate	Index	0x2058	SubIndex	0x00	Attribute		R		

P00.59	Label	STO Actual Time Stamp			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x2059	SubIndex	0x00	Attribute		R		

P00.64	Label	STO Dual Input Delay Detection Buffer Time			Valid mode(s)	-	-	-	-	-	-
	Range	150~300	Default	200	Unit	-					
	Valid	Immediate	Index	0x2064	SubIndex	0x00	Attribute		R/W		

P00.65	Label	STO Buffer Diagnosis and Filter Time			Valid mode(s)	-	-	-	-	-	-
	Range	1~10	Default	2	Unit	ms					
	Valid	Immediate	Index	0x2065	SubIndex	0x00	Attribute		R/W		

P00.66	Label	STO Power Supply & Optocoupler Diagnosis & Filter Time			Valid mode(s)	-	-	-	-	-	-
	Range	1~2	Default	1	Unit	ms					
	Valid	Immediate	Index	0x2066	SubIndex	0x00	Attribute		R/W		

10.2.2 [Class 1] Gain Adjustments

P01.00	Label	1st Position Loop Gain			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~30000	Default	480	Unit	0.1/s					
	Valid	Immediate	Index	0x2100	SubIndex	0x00	Attribute		R/W		
Higher position loop gain value improves the responsiveness of the servo driver and lessens the positioning time. Position loop gain value shouldn't exceed responsiveness of the mechanical system and take in consideration velocity loop gain, if not it might cause vibration, mechanical noise and overtravel. As velocity loop gain is based on position loop gain, please set both values accordingly. Recommended range: 1.2≤P01.00/P01.01≤1.8											

P01.01	Label	1st Velocity Loop Gain			Valid mode(s)	-	-	-	-	-	F
	Range	1~32767	Default	270	Unit	0.1Hz					
	Valid	Immediate	Index	0x2101	SubIndex	0x00	Attribute		R/W		
To determine the responsiveness of the velocity loop. If inertia ratio of P00.04 is uniform with actual inertia ratio, velocity loop responsiveness = P01.01. To increase position loop gain and improve responsiveness of the whole system, velocity loop gain must be set at higher value. Please notice that if the velocity loop gain is too high, it might cause vibration.											

P01.02	Label	1st Velocity Loop Integral Time Constant			Valid mode(s)	-	-	-	-	-	F
	Range	1~10000	Default	210	Unit	0.1ms					
	Valid	Immediate	Index	0x2102	SubIndex	0x00	Attribute		R/W		

If auto gain adjusting function is not enabled, P01.02 is activated.

The lower the set value, the closer the lag error at stop to 0 but might cause vibration. If the value set is overly large, overshoot, delay of positioning time duration and lowered responsiveness might occur.

Set 10000 to deactivate P01.02.

Recommended range: $50000 \leq P01.01 \times P01.02 \leq 150000$

For example: Velocity loop gain $P01.01 = 500(0.1\text{Hz})$, which is 50Hz. Integral time constant of velocity loop should be $100(0.1\text{ms}) \leq P01.02 \leq 300(0.1\text{ms})$

P01.03	Label	1st Velocity Detection Filter			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	15	Unit						
	Valid	Immediate	Index	0x2103	SubIndex	0x00	Attribute	R/W			
This filter is a low pass filter. It blocks high frequencies which cause system instability from velocity feedback data. The higher the set value, lower frequencies will be blocked and velocity responsiveness will also be lowered. P01.03 needs to match velocity loop gain. Please refer to the following table.											
Value	Velocity Detection Filter Cut-off Frequency(Hz)			Value	Velocity Detection Filter Cut-off Frequency(Hz)						
0	2500			16	750						
1	2250			17	700						

2	2100	18	650
3	2000	19	600
4	1800	20	550
5	1600	21	500
6	1500	22	450
7	1400	23	400
8	1300	24	350
9	1200	25	300
10	1100	26	250
11	1000	27	200
12	950	28	175
13	900	29	150
14	850	30	125
15	800	31	100

P01.04	Label	1st Torque Filter			Valid mode(s)	-	-	-	-	-	F
	Range	0~2500	Default	84	Unit	0.01ms					
	Valid	Immediate	Index	0x2104	SubIndex	0x00	Attribute		R/W		

To set torque command low-pass filter, add a filter delay time constant to torque command and filter out the high frequencies in the command.

Often used to reduce or eliminate some noise or vibration during motor operation, but it will reduce the responsiveness of current loop, resulting in undermining velocity loop and position loop control.

P01.04 needs to match velocity loop gain.

Recommended range: $1,000,000/(2\pi \times P01.04) \geq P01.01 \times 4$

For example: Velocity loop gain P01.01=180(0.1Hz) which is 18Hz. Time constant of torque filter should be $P01.01 \leq 221(0.01ms)$

If mechanical vibration is due to servo driver, adjusting P01.04 might eliminate the vibration. The smaller the value, the better the responsiveness but also subjected to machine conditions. If the value is too large, it might lower the responsiveness of current loop.

With higher P01.01 value settings and no resonance, reduce P01.04 value;

With lower P01.01 value settings, increase P01.04 value to lower motor noise.

P01.05	Label	2nd Position Loop Gain			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~30000	Default	570	Unit	0.1/s					
	Valid	Immediate	Index	0x2105	SubIndex	0x00	Attribute		R/W		

P01.06	Label	2nd Velocity Loop Gain			Valid mode(s)	-	-	-	-	-	F
	Range	1~32767	Default	270	Unit	0.1Hz					
	Valid	Immediate	Index	0x2106	SubIndex	0x00	Attribute		R/W		

P01.07	Label	2nd Velocity Loop Integral Time Constant			Valid mode(s)	-	-	-	-	-	F
	Range	1~10000	Default	10000	Unit	0.1ms					
	Valid	Immediate	Index	0x2107	SubIndex	0x00	Attribute		R/W		

P01.08	Label	2nd Velocity Detection Filter			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	15	Unit	-					
	Valid	Immediate	Index	0x2108	SubIndex	0x00	Attribute		R/W		

P01.09	Label	2nd Torque Filter			Valid mode(s)	-	-	-	-	-	F
	Range	0~2500	Default	84	Unit	0.01ms					
	Valid	Immediate	Index	0x2109	SubIndex	0x00	Attribute		R/W		

Position loop, velocity loop, velocity detection filter, torque command filter each have 2 pairs of gain or time constant (1st and 2nd).

P01.10	Label	Velocity Feedforward Gain			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~1000	Default	300	Unit	0.001					
	Valid	Immediate	Index	0x2110	SubIndex	0x00	Attribute		R/W		

Used for decreasing following error caused by low responsiveness of velocity loop. Might cause overshoot or increase in noise if set value is too high.

P01.11	Label	Velocity Feedforward Filter			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~6400	Default	50	Unit	0.01ms					
	Valid	Immediate	Index	0x2111	SubIndex	0x00	Attribute		R/W		

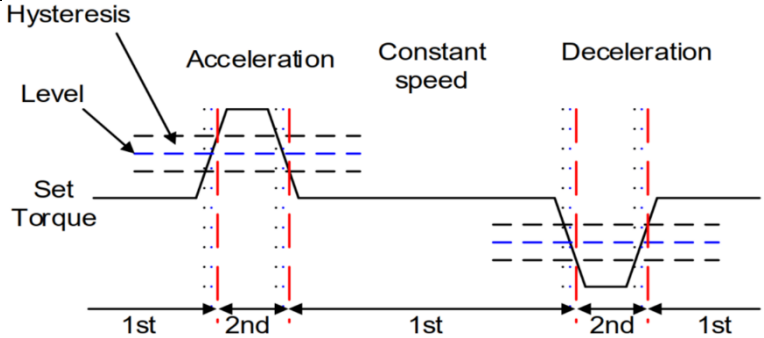
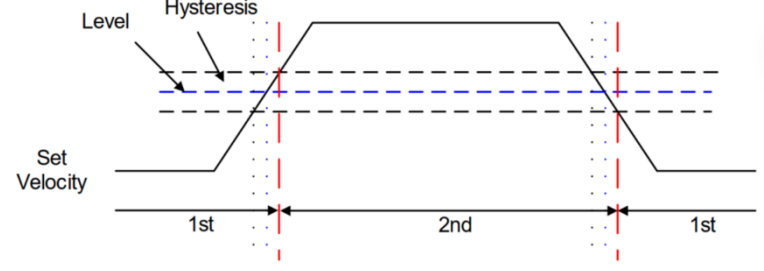
Set velocity feed forward low pass filter to eliminate high or abnormal frequencies in velocity feed forward command. Often used when position command with low resolution or high electronic gear ratio to smoothen velocity feed forward.
Position deviation under constant velocity can be lowered with higher velocity feed forward gain. Please to refer to the equation below.

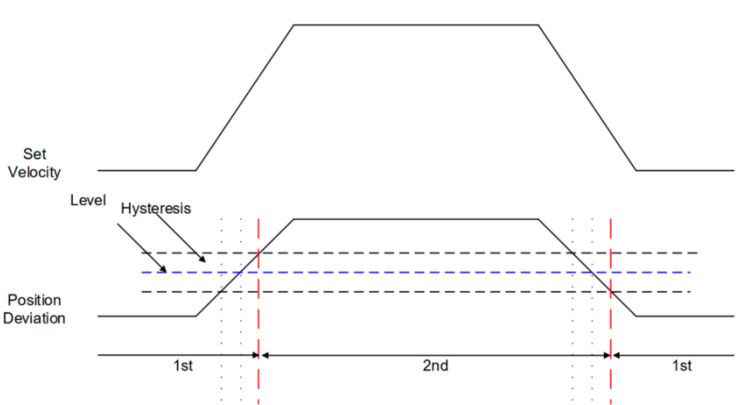
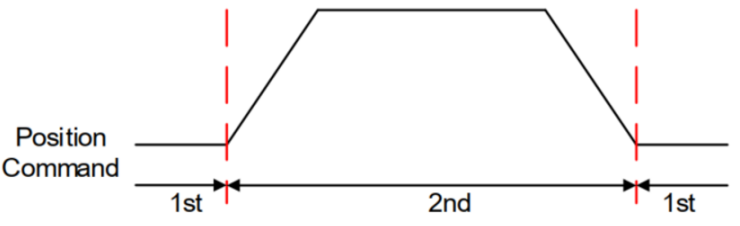
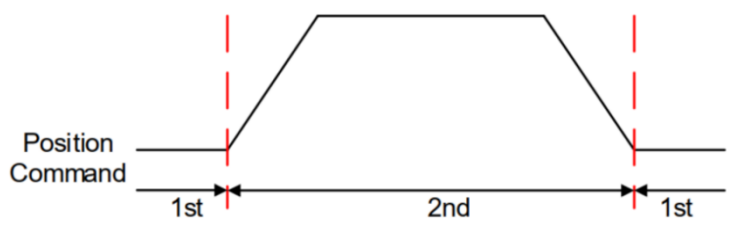
$$Position\ deviation\ [Unit] = \frac{Set\ velocity[\frac{Unit}{s}]}{Position\ loop\ gain\ [Hz]} \times \frac{100 - Velocity\ feed\ forward\ gain\ [%]}{100}$$

P01.12	Label	Torque Feedforward Gain			Valid mode(s)	PP	PV	HM	CSP	CSP	-
	Range	0~1000	Default	0	Unit	0.001					
	Valid	Immediate	Index	0x2112	SubIndex	0x00	Attribute		R/W		

Before using torque feed forward, please set correct inertia ratio P00.04. By increasing torque feed forward gain, position deviation on constant acceleration/deceleration can be reduced to close to 0. Under ideal condition and trapezoidal speed profile, position deviation of the whole motion can be reduced to close to 0. In reality, perturbation torque will always exist, hence position deviation can never be 0.

P01.13	Label	Torque Feedforward Filter			Valid mode(s)	PP	PV	HM	CSP	CSP	-
	Range	0~6400	Default	0	Unit	0.01ms					
	Valid	Immediate	Index	0x2113	SubIndex	0x00	Attribute		R/W		
Low pass filter to eliminate abnormal or high frequencies in torque feed forward command. Usually used when encoder has lower resolution or precision. Noise reduces if torque feed forward filter time constant is set higher but position deviation will increase at acceleration varied points.											

P01.15	Label	Position Control Parameter Switching Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~12	Default	0	Unit	-					
	Valid	Immediate	Index	0x2115	SubIndex	0x00	Attribute		R/W		
Set Value	Condition	Gain switching condition									
0	1st gain fixed	Fixed on using 1st gain(P01.00-P01.04)									
1	2nd gain fixed	Fixed on using 2nd gain (P01.05-P01.09)									
2	Reserved										
3	High set torque	Switch to 2nd gain when set torque command absolute value larger than (level + hysteresis)[%] Switch to 1st gain when set torque command absolute value smaller than (level + hysteresis)[%]									
											
4	Reserved										
5	High set velocity	Valid for position and velocity control. Switch to 2nd gain when set velocity command absolute value larger than (level + hysteresis)[r/min] Switch to 1st gain when set velocity command absolute value smaller than (level-hysteresis)[r/min]									
											

6	Large position deviation	Valid for position control. Switch to 2nd gain when position deviation absolute value larger than (level + hysteresis)[pulse] Switch to 1st gain when position deviation absolute value smaller than (level-hysteresis)[pulse] 
7	Pending position command	Valid for position control. Switch to 2nd gain if position command $\neq 0$ Switch to 1st gain if position command remains = 0 throughout the duration of delay time. 
8	Not yet in position	Valid for position control. Switch to 2nd gain if position command is not completed. Switch to 1st gain if position command remains uncompleted throughout the duration of delay time. 
9	High actual velocity	Valid for position control. Switch to 2nd gain when actual velocity absolute value larger than (level + hysteresis)[r/min] Switch to 1st gain when actual velocity absolute value remains smaller throughout the duration of delay time than (level-hysteresis)[r/min]

10	Pending position command + actual velocity	Valid for position control. Switch to 2nd gain if position command $\neq 0$ Switch to 1st gain if positional command = 0 throughout the duration of delay time and absolute value of actual velocity remains smaller than (level - hysteresis) (r/min)
For position control mode, set P01.15=3,5,6,9,10 For velocity control mode, set P01.15=3,5,9		
** Above 'level' and 'hysteresis' are in correspondence to P01.17 Position control gain switching level and P01.18 Hysteresis at position control switching.		

P01.16	Label	Position Control Parameter Switching Delay			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	0	Unit	0.1ms					
	Valid	Immediate	Index	0x2116	SubIndex	0x00	Attribute		R/W		

P01.17	Label	Position Control Parameter Switching Level			Valid mode(s)	-	-	-	-	-	F
	Range	0~20000	Default	50	Unit	model					
	Valid	Immediate	Index	0x2117	SubIndex	0x00	Attribute		R/W		

Set threshold value for gain switching to occur.

Unit is mode dependent.

Switching condition	Unit	
Position	Encoder pulse count	
Velocity	pulse/s	
Torque	%	
Please set level $\geq$ hysteresis		

P01.18	Label	Position Control Parameter Switching Hysteresis			Valid mode(s)	-	-	-	-	-	F
	Range	0~20000	Default	33	Unit	model					
	Valid	Immediate	Index	0x2118	SubIndex	0x00	Attribute	R/W			
To eliminate the instability of gain switching. Used in combination with P01.17 using the same unit. If level< hysteresis, driver will set internally hysteresis = level.											

P01.19	Label	Position Control Parameter Switching Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	33	Unit	0.1ms					
	Valid	Immediate	Index	0x2119	SubIndex	0x00	Attribute	R/W			

During position control, to ease torque changes and vibration due to rapid changes in position loop gain, set suitable P01.19 value

For example: 1st (P01.00) <-> 2nd (P01.05)

2nd (Pr1.05)

1st (Pr1.00)

Position gain switching time (ms) (Pr1.19)

Result of switching

1st

2nd

1st

P01.23	Label	Speed Regulator-kr			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	100	Unit	%					
	Valid	Immediate	Index	0x2123	SubIndex	0x00	Attribute	R/W			

P01.34	Label	Velocity Feedback Filter Level			Valid mode(s)	-	-	-	-	-	-
	Range	1~8	Default	1	Unit	-					
	Valid	Immediate	Index	0x2134	SubIndex	0x00	Attribute	R/W			

P01.36	Label	Encoder Feedback Pulse Digital Filter			Valid mode(s)	-	-	-	-	-	F
	Range	0~300	Default	5	Unit	-					
	Valid	Immediate	Index	0x2136	SubIndex	0x00	Attribute		R/W		
To set filter time for external ABZ encoder											

P01.37	Label	Special Function Register			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2137	SubIndex	0x00	Attribute	R/W			

P01.38	Label	Special Function Register 1			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x1008	Unit	-					
	Valid	Immediate	Index	0x2138	SubIndex	0x00	Attribute	R/W			

P01.39	Label	Special Function Register 2			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x4000 0	Unit	-					
	Valid	Immediate	Index	0x2139	SubIndex	0x00	Attribute		R/W		
Value	Description										
0	Reserved										
1	=1, activate full closed loop during trial run										
2	=1, hybrid position deviation clearing										

P01.45	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	0~200	Default	0	Unit	-					
	Valid	Immediate	Index	0x2145	SubIndex	0x00	Attribute	R/W			

P01.64	Label	2nd Segment Q-axis Current Filter Time constant			Valid mode(s)	-	-	-	-	-	-
	Range	0~2500	Default	0	Unit	0.01ms					
	Valid	Immediate	Index	0x2164	SubIndex	0x00	Attribute	R/W			

P01.65	Label	3rd Segment D-axis Current Filter Time constant			Valid mode(s)	-	-	-	-	-	-
	Range	0~2500	Default	0	Unit	0.01ms					
	Valid	Immediate	Index	0x2165	SubIndex	0x00	Attribute	R/W			

P01.66	Label	Torque Filter Type			Valid mode(s)	-	-	-	-	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Re-enable	Index	0x2166	SubIndex	0x00	Attribute	R/W			

10.2.3 [Class 2] Vibration Suppression

P02.00	Label	Adaptive Filter Mode Setting			Valid mode(s)	-	-	-	-	-	F
	Range	0~4	Default	0	Unit	-					
	Valid	Immediate	Index	0x2200	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Adaptive filter: invalid		Parameters related to 3rd notch filter remain unchanged								
1	Adaptive filter: 1 filter valid for once		1 adaptive filter becomes valid. 3rd notch filter related parameters updated accordingly. P02.00 switches automatically to 0 once updated.								
2	Adaptive filter: 1 filter remains valid		1 adaptive filter becomes valid. 3rd notch filter related parameters will keep updating accordingly.								
3~4	Reserved		-								

P02.01	Label	1st Notch Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	50~4000	Default	4000	Unit	Hz					
	Valid	Immediate	Index	0x2201	SubIndex	0x00	Attribute		R/W		
Set center frequency of 1st torque command notch filter. Set P02.01 to 4000 to deactivate notch filter.											

P02.02	Label	1st Notch Width			Valid mode(s)	-	-	-	-	-	F
	Range	0~20	Default	4	Unit	-					
	Valid	Immediate	Index	0x2202	SubIndex	0x00	Attribute	R/W			
Set notch bandwidth for 1st resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with P02.01 and P02.03, P02.02 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings.											

P02.03	Label	1st Notch Depth			Valid mode(s)	-	-	-	-	-	F
	Range	0~99	Default	0	Unit	-					
	Valid	Immediate	Index	0x2203	SubIndex	0x00	Attribute		R/W		
Set notch depth for 1st resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with P02.01 and P02.02, P02.03 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings.											

P02.04	Label	2nd Notch Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	50~4000	Default	4000	Unit	Hz					
	Valid	Immediate	Index	0x2204	SubIndex	0x00	Attribute	R/W			
Set center frequency of 2nd torque command notch filter. Set P02.04 to 4000 to deactivate notch filter.											

P02.05	Label	2nd Notch Width			Valid mode(s)	-	-	-	-	-	F
	Range	0~20	Default	4	Unit	-					
	Valid	Immediate	Index	0x2205	SubIndex	0x00	Attribute	R/W			
Set notch bandwidth for 2nd resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with P02.04 and P02.06, P02.05 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings.											

P02.06	Label	2nd Notch Depth			Valid mode(s)	-	-	-	-	-	F
	Range	0~99	Default	0	Unit	-					
	Valid	Immediate	Index	0x2206	SubIndex	0x00	Attribute	R/W			
Set notch depth for 1st resonant notch filter. When P02.06 value is higher, notch depth becomes shallow, phase lag reduces. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with P02.04 and P02.05, P02.06 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings.											

P02.07	Label	3rd Notch Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	50~4000	Default	4000	Unit	Hz					
	Valid	Immediate	Index	0x2207	SubIndex	0x00	Attribute		R/W		
Set center frequency of 3rd torque command notch filter. Set P02.07 to 4000 to deactivate notch filter.											

P02.08	Label	3rd Notch Width			Valid mode(s)	-	-	-	-	-	F
	Range	0~20	Default	4	Unit	-					
	Valid	Immediate	Index	0x2208	SubIndex	0x00	Attribute		R/W		
Set notch bandwidth for 3rd resonant notch filter. Under normal circumstances, please use factory default settings.											

P02.09	Label	3rd Notch Depth			Valid mode(s)	-	-	-	-	-	F
	Range	0~99	Default	0	Unit	-					
	Valid	Immediate	Index	0x2209	SubIndex	0x00	Attribute		R/W		
Set notch depth for 1st resonant notch filter. When P02.09 value is higher, notch depth becomes shallow, phase lag reduces.											

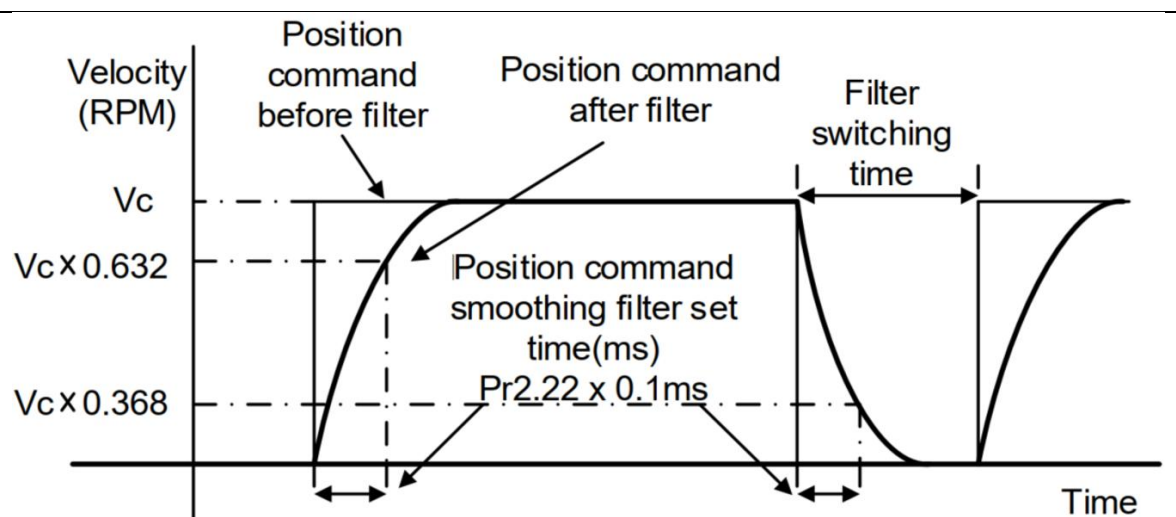
P02.14	Label	1st Damping Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	0~2000	Default	0	Unit	0.1Hz					
	Valid	Immediate	Index	0x2214	SubIndex	0x00	Attribute		R/W		
0: Deactivate To suppress wobble at load end. Often used when wobble of flexible structure due to high deceleration upon stopping. Especially effective for wobble with frequencies under 100Hz. Set P02.15 to wobble frequency (wobble frequency can be determined using tracing function of EDrive)											

P02.16	Label	2nd Damping Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	0~2000	Default	0	Unit	0.1Hz					
	Valid	Immediate	Index	0x2216	SubIndex	0x00	Attribute		R/W		
0: Deactivate To suppress wobble at load end. Often used when wobble of flexible structure due to high deceleration upon stopping. Especially effective for wobble with frequencies under 100Hz. Set P02.15 to wobble frequency (wobble frequency can be determined using tracing function of EDrive)											

P02.22	Label	Position Command Smoothing Filter			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~3000	Default	0	Unit	0.1ns					
	Valid	Halt	Index	0x2222	SubIndex	0x00	Attribute		R/W		

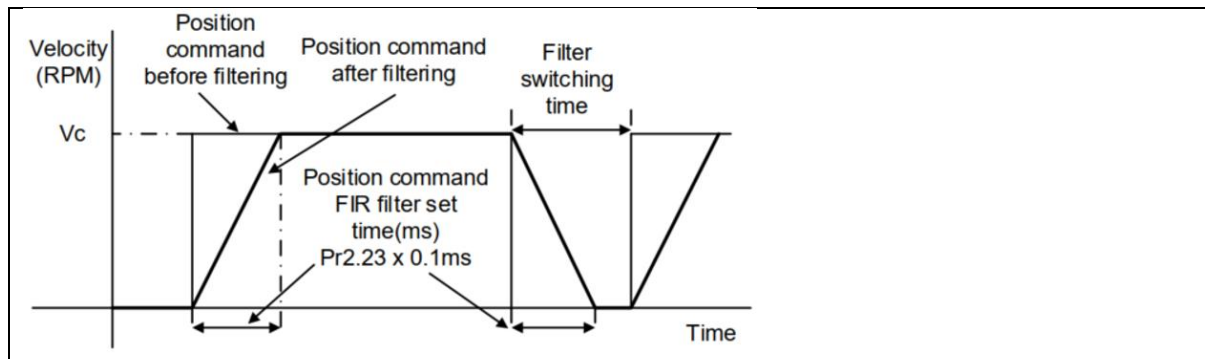
To set time constant of 1 time delay filter of position command.

To set time constant of 1 time delay filter, according to target velocity V_c square wave command as show below.

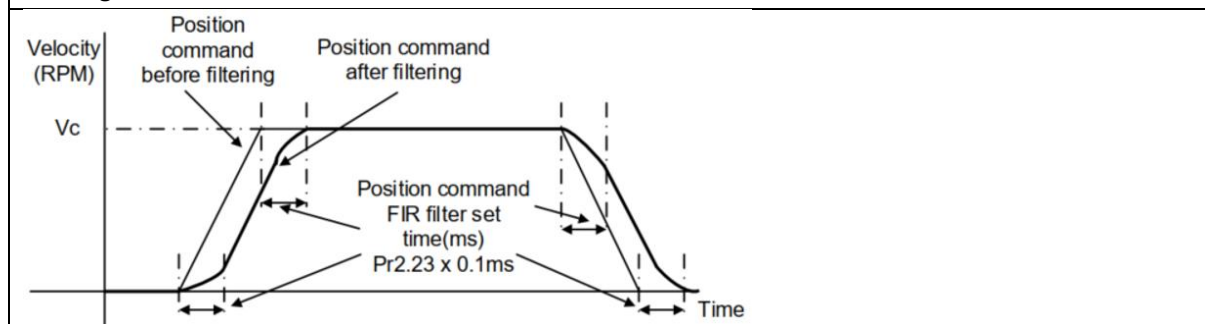


Usually applied when there is rather sharp acceleration which might cause motor overshoot or undershoot. To smoothen command signal, reduces impact to machines and eliminate vibration. If P02.22 is set too high, overall time will be lengthened.

P02.23	Label	Position Command FIR Filter			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~2500	Default	0	Unit	0.1ns					
	Valid	Halt	Index	0x2223	SubIndex	0x00	Attribute		R/W		
As shown below, when target velocity Vc square wave command reaches Vc, it becomes trapezoidal wave after filtering.											



As shown below, when target velocity V_c trapezoidal command reaches V_c , it becomes S wave after filtering.



Usually applied when there is rather sharp acceleration which might cause motor overshoot or undershoot. To smoothen command signal, reduces impact to machines and eliminate vibration. If P02.23 is set too high, overall time will be lengthened.

Note: Please wait for command to stop and after filter idle time to modify P02.23.

Filter switching time = (P02.23 set value x 0.1ms + 0.25ms)

P02.31	Label	5th Resonant Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	50~4000	Default	4000	Unit	-					
	Valid	Immediate	Index	0x2231	SubIndex	0x00	Attribute		R/W		

To set zero-valued eigenfrequency of 5th resonant notch filter. P02.31 corresponds to machine specific resonant frequency.

Notch filter deactivated if P02.31 is set to any value.

P02.32	Label	5th Resonant Q Value			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2232	SubIndex	0x00	Attribute		R/W		

To set notch Q value of 5th resonant notch filter.

P02.33	Label	5th Anti-resonant Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	50~4000	Default	4000	Unit	-					
	Valid	Immediate	Index	0x2233	SubIndex	0x00	Attribute		R/W		

To set zero-valued eigenfrequency of 5th resonant notch filter. P02.31 corresponds to machine-specific anti-resonant frequency.

P02.34	Label	5th Anti-resonant Q Value			Valid mode(s)	-	-	-	-	-	F
	Range	0~9900	Default	0	Unit	-					
	Valid	Immediate	Index	0x2234	SubIndex	0x00	Attribute		R/W		
To set resonant Q value of 5th resonant notch filter.											

P02.35	Label	6th Resonant Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	50~4000	Default	4000	Unit	-					
	Valid	Immediate	Index	0x2235	SubIndex	0x00	Attribute		R/W		
To set zero-valued eigenfrequency of 6th resonant notch filter. P02.35 corresponds to machine-specific resonant frequency. Notch filter deactivated if P02.31 is set to any value.											

P02.36	Label	6th Resonant Q Value			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2236	SubIndex	0x00	Attribute		R/W		
To set notch Q value of 6th resonant notch filter.											

P02.37	Label	6th Anti-resonant Frequency			Valid mode(s)	-	-	-	-	-	F
	Range	50~4000	Default	4000	Unit	-					
	Valid	Immediate	Index	0x2237	SubIndex	0x00	Attribute	R/W			
To set zero-valued eigenfrequency of 6th resonant notch filter. P02.37 corresponds to machine-specific anti-resonant frequency											

P02.38	Label	6th Anti-resonant Q Value			Valid mode(s)	-	-	-	-	-	F
	Range	0~9900	Default	0	Unit	-					
	Valid	Immediate	Index	0x2238	SubIndex	0x00	Attribute		R/W		
To set resonant Q value of 6th resonant notch filter.											

P02.48	Label	Tuning Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x2248	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Turn off automatic adjustments										
1	Activate automatic adjustments, real time inertia measuring and vibration suppression. Inertia measuring deactivated after reaching 4 times in 5 minutes, triggering conditions: changes in mechanical stiffness.										

P02.50	Label	MFC Type			Valid mode(s)	-	-	-	-	-	F
	Range	0~3	Default	0	Unit	-					
	Valid	Re-enable	Index	0x2250	SubIndex	0x00	Attribute		R/W		
Value	Description										

0	Model following control			
1				
2				
3				

P02.51	Label	Velocity Feedforward Compensation Coefficient			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	-10000 ~10000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2251	SubIndex	0x00	Attribute		R/W		
To compensate for velocity feedforward											

P02.52	Label	Torque Feedforward Compensation Coefficient			Valid mode(s)	PP	PV	HM	CSP	CSV	-
	Range	-10000 ~10000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2252	SubIndex	0x00		Attribute	R/W		
To compensate for torque feedforward											

P02.53	Label	Friction Compensation Coefficient			Valid mode(s)	-	-	-	-	-	F
	Range	0~1000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2253	SubIndex	0x00	Attribute		R/W		

To set ratio of rated torque/rated rotational speed, to compensate for dynamic friction during motion and have better control over acceleration/deceleration.

$$\text{Dynamic friction coefficient} = \left| \frac{\text{Torque (Speed 1)} - \text{Torque (Speed 2)}}{\text{Speed 1} - \text{Speed 2}} \times \text{Rated speed} \right|$$

When there is an excess position deviation during acceleration/deceleration, please adjust P02.53 to reduce the deviation to 0.

P02.54	Label	Overshoot Time Constant			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2254	SubIndex	0x00	Attribute		R/W		
To set overtravel time coefficient											

P02.55	Label	Overshoot Suppression Constant			Valid mode(s)	-	-	-	-	-	F
	Range	0~1000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2255	SubIndex	0x00	Attribute		R/W		
Suppression improves with larger set value but might affect the performance of MFC. Please use with caution for any value above 100.											

P02.56	Label	One-Click Tuning			Valid mode(s)	-	-	-	-	-	-
	Range	0x0 ~0xFFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2256	SubIndex	0x00	Attribute	R/W			

P02.57	Label	One-Click Tuning Control			Valid mode(s)	-	-	-	-	-	-
	Range	0x0 ~0xFFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2257	SubIndex	0x00	Attribute	R			

P02.58	Label	One-Click Tuning Progress			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	0	Unit	-					
	Valid	Immediate	Index	0x2258	SubIndex	0x00	Attribute	R			

P02.59	Label	One-Click Tuning Error Code			Valid mode(s)	-	-	-	-	-	-
	Range	0x0 ~0xFFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2259	SubIndex	0x00	Attribute	R			

P02.60	Label	One-Click Tuning Velocity Limit			Valid mode(s)	-	-	-	-	-	-
	Range	10~6000	Default	1500	Unit	-					
	Valid	Immediate	Index	0x2260	SubIndex	0x00	Attribute	R/W			

P02.64	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	0~30000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2264	SubIndex	0x00	Attribute	R/W			

P02.65	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	0~10000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2265	SubIndex	0x00	Attribute	R/W			

10.2.4 [Class 3] Velocity/Torque Control

P03.12	Label	Acceleration Time			Valid mode(s)	-	PV	-	-	CSV	-
	Range	0~10000	Default	0	Unit	ms/1000mm/s					
	Valid	Immediate	Index	0x2312	SubIndex	0x00	Attribute		R/W		

P03.13	Label	Deceleration Time			Valid mode(s)	-	PV	-	-	CSV	-
	Range	0~10000	Default	0	Unit	ms/1000mm/s					
	Valid	Immediate	Index	0x2313	SubIndex	0x00	Attribute		R/W		

Set max acceleration/deceleration for velocity command.

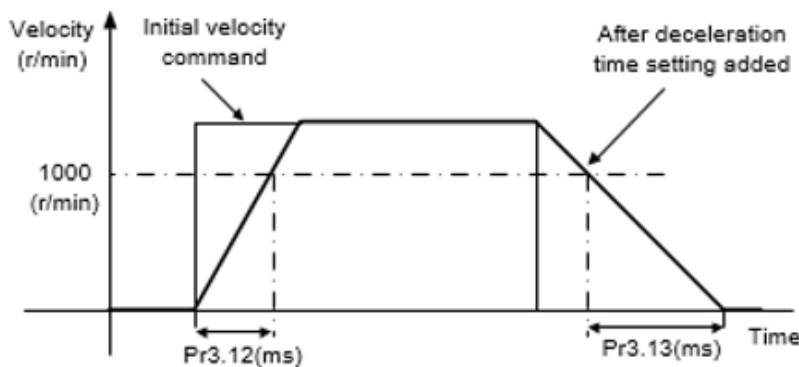
If target velocity = x [rpm], max acceleration = a [unit: rpm/ms], acceleration time = t [ms]

$P03.12 = 1000/a$

$P03.13 = 1000/a$

For example: If motor is to achieve 1500rpm in 30s, $a = 1500/30 = 50 \text{ rpm/ms}$

$P03.12 = 1000/a = 20$. Hence when $P03.12 = 20$, motor can achieve 1500rpm in 30s.

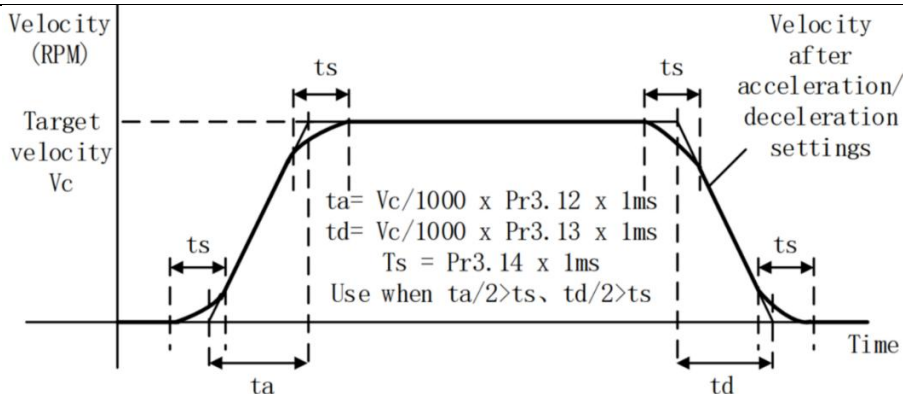


Usually used when there is rapid acceleration or trapezoidal wave velocity command due to many different internal speed segments under velocity control mode which causes instable while motor in motion.

Under velocity control mode, 6083 and 6084 is limited by P03.12 and P03.13 correspondingly.

P03.14	Label	Sigmoid Acceleration/Deceleration			Valid mode(s)	-	PV	-	-	CSV	-
	Range	0~1000	Default	0	Unit	ms					
	Valid	Re-enable	Index	0x2314	SubIndex	0x00	Attribute		R/W		

To set sigmoid acceleration and deceleration turning point in accordance to P03.12 and P03.13.



P03.16	Label	Zero Speed Clamp Level			Valid mode(s)	PP	PV	-	-	CSV	-
	Range	0~2000	Default	30	Unit	mm/s					
	Valid	Immediate	Index	0x2316	SubIndex	0x00	Attribute		R/W		
Velocity command is forced to 0 when actual velocity is lower than P03.16 and after static time set in P03.23											

P03.23	Label	Zero Speed Static Delay in Velocity Mode			Valid mode(s)	PP	PV	-	-	CSV	-
	Range	0~2000	Default	0	Unit	ms					
	Valid	Immediate	Index	0x2323	SubIndex	0x00	Attribute		R/W		
To set delay time for zero speed clamp. To prevent creeping at low speed, velocity command forced to 0 when velocity goes under P03.16 after time set in P03.											

10.2.5 [Class 4] I/O Monitoring Settings

P04.00	Label	DI1			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2400	SubIndex	0x00	Attribute		R/W		
Digital input DI allocation using hexadecimal system											
Input	Symbol	Set Value				0x60FD (bit)					
		Normally open		Normally close							
Invalid	-	0h		-		x					
Positive limit switch	POT	1h		81h		Bit1					
Negative limit switch	NOT	2h		82h		Bit0					
Clear alarm	A-CLR	4h		-		x					
Forced alarm	E-STOP	14h		94h		x					
Home switch	HOME-SWITCH	16h		96h		Bit2					
Please don't set anything other than listed in table above. Normally open: Valid when input = ON Normally close: Valid when input = OFF. Er210 might occur if same function is allocated to different channels at the same time. Channel that has no value doesn't affect driver motion. Front panel is of hexadecimal system. P04.00 – P04.07 corresponds to DI1 – DI8. External sensors can be connected if the parameters are all set to 0. Controller will read 60FD bit4 – 11 to get DI1 – DI8 actual status.											

P04.01	Label	DI2			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x1	Unit	-					
	Valid	Immediate	Index	0x2401	SubIndex	0x00	Attribute		R/W		

P04.02	Label	DI3			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x2	Unit	-					
	Valid	Immediate	Index	0x2402	SubIndex	0x00	Attribute		R/W		

P04.03	Label	DI4			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x16	Unit	-					
	Valid	Immediate	Index	0x2403	SubIndex	0x00	Attribute		R/W		

P04.04	Label	DI5			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2404	SubIndex	0x00	Attribute		R/W		

P04.05	Label	DI6			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2405	SubIndex	0x00	Attribute		R/W		

P04.06	Label	DI7			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2406	SubIndex	0x00	Attribute		R/W		

P04.07	Label	DI8			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2407	SubIndex	0x00	Attribute		R/W		

P04.10	Label	DO1			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x3	Unit	-					
	Valid	Immediate	Index	0x2410	SubIndex	0x00	Attribute		R/W		

Digital output DO allocation using hexadecimal system.

Output	Symbol	Set Value	
		Normally open	Normally close
Master device control	-	00h	-
Alarm	ALM	01h	81h
Servo-Ready	S-RDY	02h	82h
External brake released	BRK-OFF	03h	83h
Positioning completed	INP	04h	84h
At-speed	AT-SPEED	05h	85h
Torque limit signal	TLC	06h	86h
Zero speed clamp detection	ZSP	07h	87h
Velocity coincidence	V-COIN	08h	88h
Position command ON/OFF	P-CMD	0Bh	8Bh
Velocity limit signal	V-LIMIT	0Dh	8Dh
Velocity command ON/OFF	V-CMD	0Fh	8Fh
Servo status	SRV-ST	12h	92h
Homing done	HOME-OK	22h	A2h
Position comparison	CMP-OUT	14h	94h

Please don't set any other than the outputs listed in the table above.

Normally open: Active low.

Normally close: Active high.

Front panel is of hexadecimal system.

P04.10 – P04.12 corresponds to DO1 – DO3. If all parameters are set to 0, master device controls the outputs, object dictionary 0x60FE sub-index 01 bit16-18 corresponds to DO1-DO3.

P04.11	Label	DO2			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x2	Unit	-					
	Valid	Immediate	Index	0x2411	SubIndex	0x00	Attribute		R/W		

P04.12	Label	DO3			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x81	Unit	-					
	Valid	Immediate	Index	0x2412	SubIndex	0x00	Attribute		R/W		

P04.23	Label	Analog Input 1 (AI-1) Filter			Valid mode(s)	-	-	-	-	-	-
	Range	0~6400	Default	0	Unit	0.01ms					
	Valid	Immediate	Index	0x2423	SubIndex	0x00	Attribute		R/W		

To set a delay filter time coefficient for AI1 input voltage. When filter time takes effect, input voltage will be smoothen.

P04.24	Label	Analog Input 1 (AI-1) Overvoltage			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	100	Unit	0.1V					
	Valid	Immediate	Index	0x2424	SubIndex	0x00	Attribute		R/W		

P04.24 is invalid when set to 0. Er270 might occur when the input voltage of AI1 is higher than the voltage after zero drift correction.

P04.26	Label	Analog Input 2 (AI-2) Filter			Valid mode(s)	-	-	-	-	-	-
	Range	0~6400	Default	0	Unit	0.01ms					
	Valid	Immediate	Index	0x2426	SubIndex	0x00	Attribute		R/W		

To set a delay filter time coefficient for AI2 input voltage. When filter time takes effect, input voltage will be smoothen.

P04.27	Label	Analog Input 2 (AI-2) Overvoltage			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	100	Unit	0.1V					
	Valid	Immediate	Index	0x2427	SubIndex	0x00	Attribute		R/W		

When P04.27 = 0, P04.27 invalid. Er270 might occur when the input voltage of AI2 is higher than the voltage after zero drift correction.

P04.31	Label	In Position Tolerance			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~2^23	Default	20	Unit	Pulse					
	Valid	Immediate	Index	0x2431	SubIndex	0x00	Attribute		R/W		

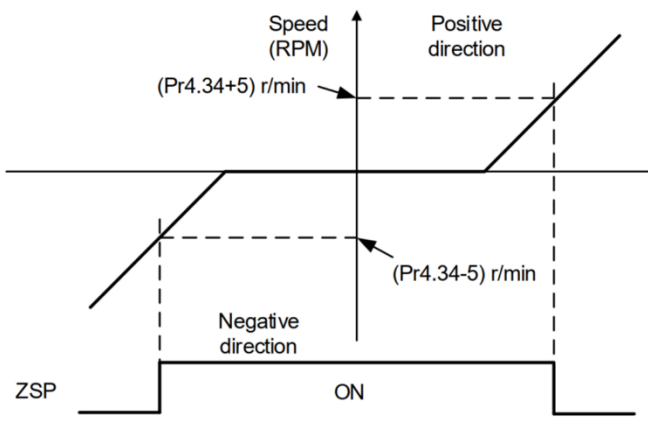
To set position deviation range of INP1 positioning completed output signal.

P04.32	Label	In position Output			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~4	Default	1	Unit	-					
	Valid	Immediate	Index	0x2432	SubIndex	0x00	Attribute		R/W		
To set conditions for INP1 output signal to be valid.											
Value	Positioning completed signal										
0	Signal valid when the position deviation is smaller than P04.31										
1	Signal valid when there is no position command and position deviation is smaller than P04.31										
2	Signal valid when there is no position command, zero-speed clamp detection (ZSP) signal is ON and the positional deviation is smaller than P04.31										
3	Signal valid when there is no position command and position deviation is smaller than P04.31. Signal ON when within the time set in P04.33 otherwise OFF.										
4	When there is no command, position detection starts after the delay time set in P04.33. Signal valid when there is no position command and positional deviation is smaller than P04.31.										

P04.33	Label	INP Holding Time			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~15000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2433	SubIndex	0x00	Attribute		R/W		
Valid when P04.32 = 3.											
Set value	Positioning completed signal										
0	Indefinite delay time, signal ON until next position command.										
1~15000	OFF within the time set; ON after time set. Switch OFF after receiving next position command.										

P04.34	Label	Zero Speed Settings			Valid mode(s)	-	-	-	-	-	F
	Range	1~2000	Default	50	Unit	mm/s					
	Valid	Immediate	Index	0x2434	SubIndex	0x00	Attribute		R/W		

To set threshold value for zero speed clamp detection.
Zero speed clamp detection (ZSP) output signal valid when motor speed goes under the value set in P04.34

Disregard the direction of rotation, valid for both directions. Hysteresis of 5RPM. Please refer H219to diagram on the right side.	 The diagram illustrates the Zero Speed Clamp Detection (ZSP) logic. It shows a speed profile with a ramp up (Positive direction) and a ramp down (Negative direction). The ZSP signal is ON when the speed is below the threshold (Pr4.34-5) r/min and above the threshold (Pr4.34+5) r/min. The hysteresis is 5RPM.
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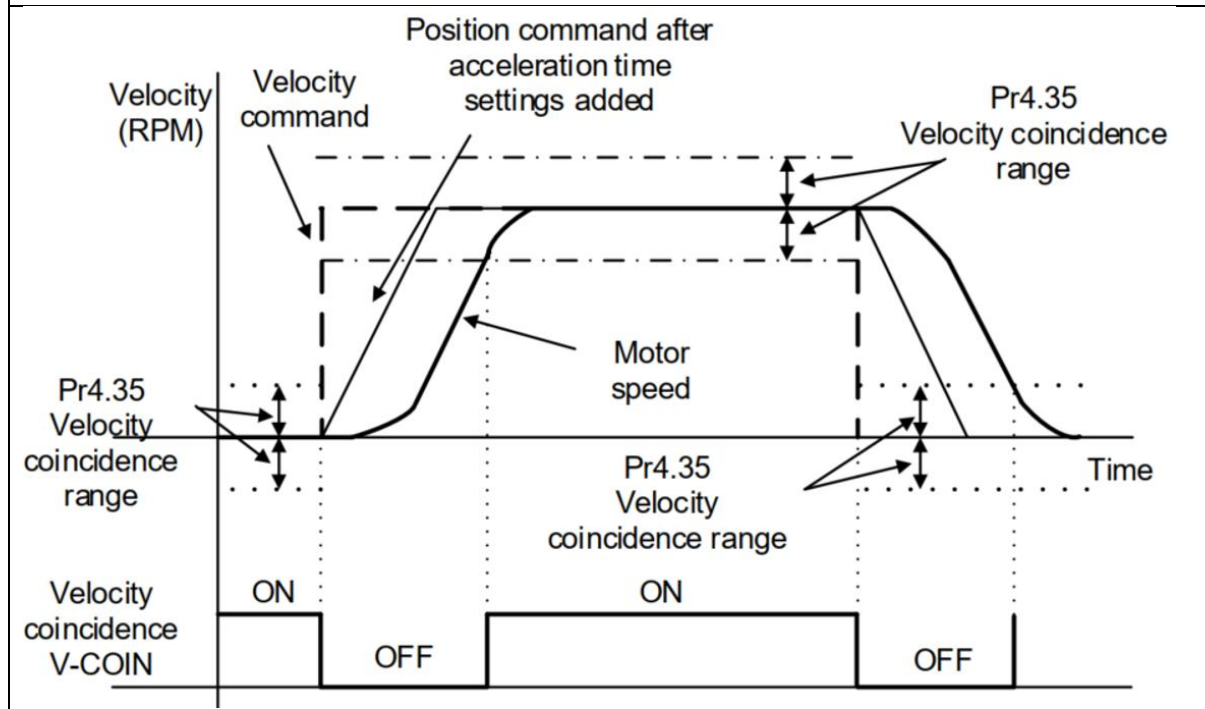
P04.35	Label	Speed Coincidence Range			Valid mode(s)	-	PV	-	-	CSV	-
	Range	10~2000	Default	50	Unit	mm/s					
	Valid	Immediate	Index	0x2435	SubIndex	0x00	Attribute		R/W		

If the difference between velocity command and motor actual speed is below P04.35, Velocity coincidence (V-COIN) output signal valid.

Due to 10RPM hysteresis:

Velocity coincidence output OFF -> ON timing (P04.35 -10) r/min

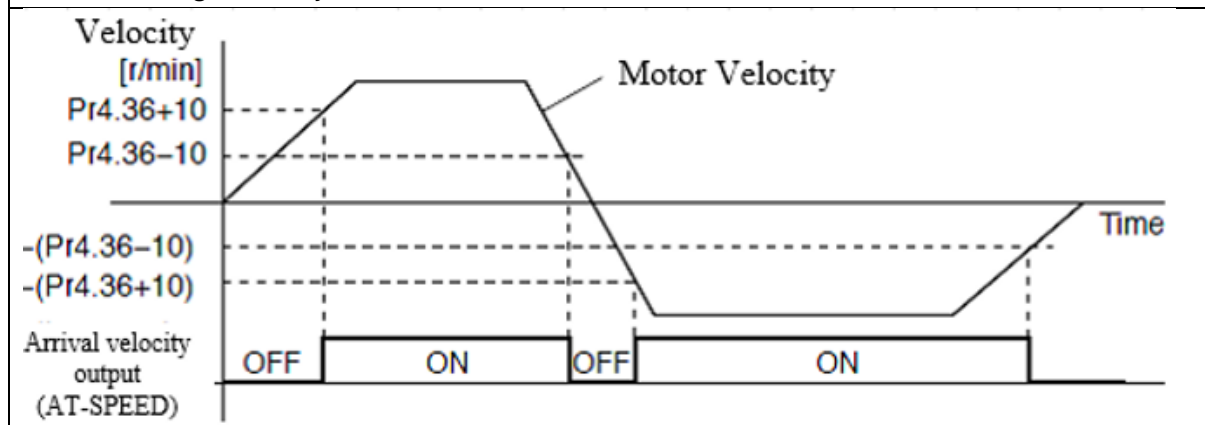
Velocity coincidence output ON -> OFF timing (P04.35 +10) r/min



P04.36	Label	AT-SPEED Settings			Valid mode(s)	-	PV	-	-	CSV	-
	Range	10~2000	Default	1000	Unit	mm/s					
	Valid	Immediate	Index	0x2436	SubIndex	0x00	Attribute		R/W		

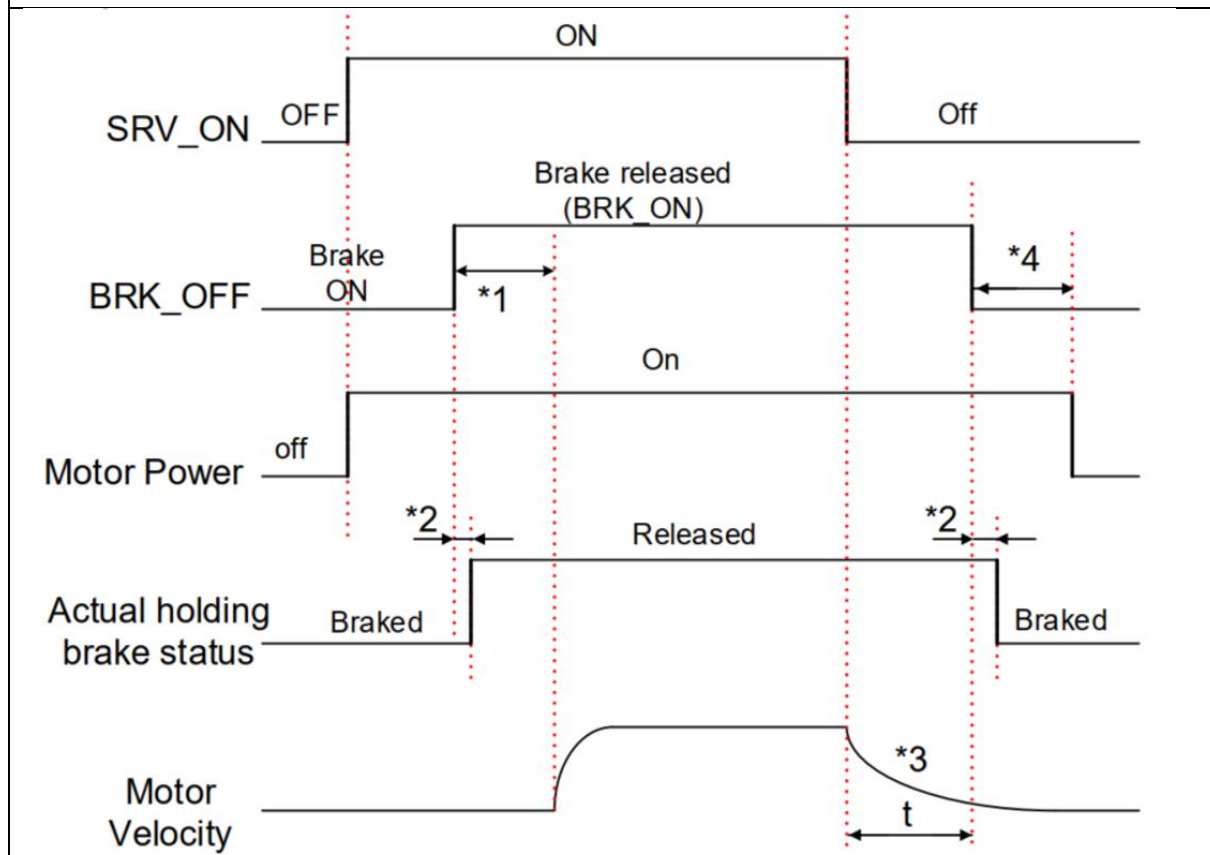
When motor velocity > P04.36, AT-speed output signal is valid.

Detection using 10RPM hysteresis.



P04.37	Label	Brake OFF Delay Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~3000	Default	150	Unit	ms					
	Valid	Immediate	Index	0x2437	SubIndex	0x00	Attribute		R/W		
To set delay time for holding brake to be activated after motor power off to prevent axis from sliding.											

P04.38	Label	Brake ON Delay Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~3000	Default	0	Unit	ms					
	Valid	Immediate	Index	0x2438	SubIndex	0x00	Attribute	R/W			
To set delay time for holding brake to be released after motor power on. Motor will remain at current position and input command is masked to allow holding brake to be fully released before motor is set in motion.											



*1: Delay time set in P04.38

*2: Delay time from the moment BRK_OFF signal is given until actual holding brake is released or BRK_ON signal is given until actual holding brake is activated. It is dependent on the holding brake of the motor.

*3: Deceleration time is determined by P06.14 or if motor speed goes below P04.39, whichever comes first. BRK_OFF given after deceleration time.

*4: P04.37 set time value.

Delay time from the moment SRV_ON is given until BRK_OFF switch to BRK_ON, is less than 500ms.

P04.39	Label	Brake OFF Speed			Valid mode(s)	-	-	-	-	-	F
	Range	30~3000	Default	30	Unit	mm/s					
	Valid	Immediate	Index	0x2439	SubIndex	0x00	Attribute	R/W			
To set the activation speed for which holding brake will be activated. When SRV-OFF signal is given, motor decelerates, after it reaches below P04.39 and P06.14 is not yet reached, BRK_OFF is given. BRK_OFF signal is determined by P06.14 or if motor speed goes below P04.39, whichever comes first.											
Application: 1. After disabling axis, P06.14 has been reached but motor speed is still above P04.39, BRK_OFF signal given. 2. After disabling axis, P06.14 has not been reached but motor speed is below P04.39, BRK_OFF signal given. Deceleration max duration: 2s. Servo disabled after 2s.											

P04.43	Label	E-Stop Settings			Valid mode(s)	-	-	-	-	-	F
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x2443	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Emergency stop is valid, servo driver will be forced to STOP and Err570 occurs.										
1	Emergency stop is invalid, servo driver will not be forced to STOP. Servo can be enabled once E-STOP signal is cleared.										

P04.48	Label	Torque Compensation Delay			Valid mode(s)	-	-	-	-	-	-
	Range	0~3000	Default	0	Unit	ms					
	Valid	Immediate	Index	0x2448	SubIndex	0x00	Attribute		R/W		

P04.62	Label	Position/Velocity/Torque Feedback Polarity			Valid mode(s)	-	-	-	-	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x2462	SubIndex	0x00	Attribute		R/W		

P04.64	Label	AO1 Output			Valid mode(s)	-	-	-	-	-	F
	Range	0~10	Default	0	Unit	-					
	Valid	Immediate	Index	0x2464	SubIndex	0x00	Attribute		R/W		
Value	Description										
0	Negative/Positive value: -10~10V										
1	Absolute value output: 0~10V										
Other	Reserved										

P04.65	Label	AO1 Signal			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x4	Unit	-					
	Valid	Immediate	Index	0x2465	SubIndex	0x00	Attribute		R/W		
Bit 0 – 15: AO signal source; Bit 16 – 31: DO extension channel											
Bit0~Bit15		Signal source									
0x0		-									
0x1		Motor rotational speed (V/m/s)									
0x2		Position command velocity (V/m/s)									
0x3		Internal position command velocity (V/m/s)									
0x4		Torque command (0.03V/0.01)									
0x5		Position command deviation (mV/Command unit)									
0x6		Position command deviation (mV/Encoder unit)									
0x7		Analog 1 (V/V)									
0x8		Analog 2 (V/V)									
0x9		Analog 3 (V/V)									
0xA		Extension DO (0V/5V)									
0xB		As per P04.67									
Bit 16 – 31: Only available when AO signal source = 0xA											
Bit16~Bit31		Channel									
01h		Alarm output									
02h		Servo ready									
01h		External brake released									
02h		Positioning completed									
...		Please refer to P04.10 for other signal channels									

P04.66	Label	AO1 Amplification			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	100	Unit	0.01					
	Valid	Immediate	Index	0x2466	SubIndex	0x00	Attribute		R/W		
To set the amplification of AO1, actual voltage output = amplification x theoretical voltage.											

P04.67	Label	AO1 Communication Settings			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	0	Unit	mV					
	Valid	Immediate	Index	0x2467	SubIndex	0x00	Attribute		R/W		
Available when AO1 = 0xB, AO1 output = output setting of P04.67.											

P04.68	Label	AO1 Offset			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	0	Unit	mV					
	Valid	Immediate	Index	0x2468	SubIndex	0x00	Attribute		R/W		
To set AO1 offset value.											

P04.69	Label	AO2 Output			Valid mode(s)	-	-	-	-	-	F
	Range	0~10	Default	0	Unit	-					
	Valid	Immediate	Index	0x2469	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Negative/Positive value: -10~10V										
1	Absolute value output: 0~10V										
Other	Reserved										

P04.70	Label	AO2 Signal			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x1	Unit	-					
	Valid	Immediate	Index	0x2470	SubIndex	0x00	Attribute		R/W		
Bit 0 – 15: AO signal source; Bit 16 – 31: DO extension channel											
Bit0~Bit15		Signal source									
0x0		-									
0x1		Motor rotational speed (V/m/s)									
0x2		Position command velocity (V/m/s)									
0x3		Internal position command velocity (V/m/s)									
0x4		Torque command (0.03V/0.01)									
0x5		Position command deviation (mV/Command unit)									
0x6		Position command deviation (mV/Encoder unit)									
0x7		Analog 1 (V/V)									
0x8		Analog 2 (V/V)									
0x9		Analog 3 (V/V)									
0xA		Extension DO (0V/5V)									
0xB		As per P04.72									
Bit 16 – 31: Only available when AO signal source = 0xA											
Bit16~Bit31		Channel									
01h		Alarm output									
02h		Servo ready									
01h		External brake released									
02h		Positioning completed									
...		Please refer to P04.12 for other signal channels									

P04.71	Label	AO2 Amplification			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	100	Unit	0.01					
	Valid	Immediate	Index	0x2471	SubIndex	0x00	Attribute		R/W		
To set the amplification of AO2, actual voltage output = amplification x theoretical voltage.											

P04.72	Label	AO2 Communication Settings			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	0	Unit	mV					
	Valid	Immediate	Index	0x2472	SubIndex	0x00	Attribute		R/W		
Available when AO1 = 0xB, AO1 output = output setting of P04.72.											

P04.73	Label	AO2 Offset			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	0	Unit	mV					
	Valid	Immediate	Index	0x2473	SubIndex	0x00	Attribute		R/W		
To set AO2 offset value.											

P04.74	Label	Warning Indicator Light 1			Valid mode(s)	-	-	-	-	-	F
	Range	0~100	Default	1	Unit	-					
	Valid	Immediate	Index	0x2474	SubIndex	0x00	Attribute	R/W			
To select warning signal for warning indicator light 1, as the table in P04.78.											

P04.75	Label	Warning Indicator Light 2			Valid mode(s)	-	-	-	-	-	F
	Range	0~100	Default	2	Unit	-					
	Valid	Immediate	Index	0x2475	SubIndex	0x00	Attribute	R/W			
To select warning signal for warning indicator light 2, as the table in P04.78.											

P04.76	Label	Warning Indicator Light 3			Valid mode(s)	-	-	-	-	-	F
	Range	0~100	Default	3	Unit	-					
	Valid	Immediate	Index	0x2476	SubIndex	0x00	Attribute	R/W			
To select warning signal for warning indicator light 3, as the table in P04.78.											

P04.77	Label	Warning Indicator Light 4			Valid mode(s)	-	-	-	-	-	F
	Range	0~100	Default	4	Unit	-					
	Valid	Immediate	Index	0x2477	SubIndex	0x00	Attribute	R/W			
To select warning signal for warning indicator light 4, as the table in P04.78.											

P04.78	Label	Warning Indicator Light 5			Valid mode(s)	-	-	-	-	-	F
	Range	0~100	Default	5	Unit	-					
	Valid	Immediate	Index	0x2478	SubIndex	0x00	Attribute	R/W			
To select warning signal for warning indicator light 5											
Value	Signal										
0	None										
1	Negative limit										
2	Battery low voltage										
3	Overload										

4	Torque limit
5	Positive limit
Other	Reserved
During normal operation, warning indicator light will be lighted in a cycle.	

10.2.6 [Class 5] Extension Settings

P05.00	Label	2nd Command Pulse Count per Revolution			Valid mode(s)	PP	PV	HM	CSP	CSV	-
	Range	0~2^26	Default	1000	Unit	-					
	Valid	Restart	Index	0x2500	SubIndex	0x00	Attribute		R/W		

P05.04	Label	Position Limit Settings			Valid mode(s)	-	-	-	-	-	F
	Range	0~2	Default	0	Unit	-					
	Valid	Immediate	Index	0x2504	SubIndex	0x00	Attribute		R/W		

To set driver prohibition input (POT/NOT)

Value	Description
0	POT -> Positive direction driver prohibited NOT -> Negative direction driver prohibited
1	POT and NOT invalid
2	Any single sided input from POT or NOT might cause Er260
In homing mode, POT/NOT invalid, please set object dictionary 5012-04 bit0=1	

P05.06	Label	Servo OFF Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~5	Default	0	Unit	-					
	Valid	Restart	Index	0x2506	SubIndex	0x00	Attribute		R/W		

To set servo driver disable mode and status.

Value	Description	
	Mode	Status
0	Servo braking	Dynamic braking
1	Free stopping	Dynamic braking
2	Dynamic braking	Dynamic braking
3	Servo braking	Free-run
4	Free stopping	Free-run
5	Dynamic braking	Free-run

P05.09	Label	Main Power-OFF Detection Time			Valid mode(s)	-	-	-	-	-	F
	Range	50~200	Default	50	Unit	ms					
	Valid	Immediate	Index	0x2509	SubIndex	0x00	Attribute		R/W		

To set duration time for detection of main power-off or low voltage supply.

P05.10	Label	Servo Off due to Alarm Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~5	Default	0	Unit	-					
	Valid	Restart	Index	0x2510	SubIndex	0x00	Attribute		R/W		

To set servo driver disable mode and status if alarm is triggered.

Alarm type 2:

Value	Description	
	Mode	Status
0	Servo braking	Dynamic braking

1	Free stopping	Dynamic braking
2	Dynamic braking	Dynamic braking
3	Servo braking	Free-run
4	Free stopping	Free-run
5	Dynamic braking	Free-run
Alarm type 1:		
Value	Description	
	Mode	Status
0	Dynamic braking	Dynamic braking
1		
2		
3	Servo braking	Free-run
4	Free stopping	Free-run
5	Dynamic braking	Free-run

P05.11	Label	Servo Braking Torque			Valid mode(s)	-	-	-	-	-	F
	Range	0~500	Default	0	Unit	%					
	Valid	Immediate	Index	0x2511	SubIndex	0x00	Attribute	R/W			
To set torque limit for servo braking mode. If P05.11 = 0, use torque limit as under normal situation. Between max. torque 6072 and P05.11, actual torque limit will take smaller value.											

P05.12	Label	Overload Level			Valid mode(s)	-	-	-	-	-	F
	Range	0~115	Default	0	Unit	%					
	Valid	Immediate	Index	0x2512	SubIndex	0x00	Attribute	R/W			
If P05.12 = 0, overload level = 115%. Use only when overload level degradation is needed.											

P05.13	Label	Overspeed Level			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	0	Unit	mm/s					
	Valid	Immediate	Index	0x2513	SubIndex	0x00	Attribute	R/W			
If motor speed exceeds P05.13, Er1A0 might occur. When P05.13 = 0, overspeed level = max. motor speed x 1.2.											

P05.15	Label	I/O Digital Filter			Valid mode(s)	-	-	-	-	-	F
	Range	0~255	Default	10	Unit	0.1ms					
	Valid	Immediate	Index	0x2515	SubIndex	0x00	Attribute	R/W			
Digital filtering of I/O input. Overly large value set will cause control delay.											

P05.17	Label	Counter Clearing Input Mode			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0xFF	Default	0x13	Unit	-					
	Valid	Immediate	Index	3x2517	SubIndex	0x00	Attribute		R/W		

To set the clearing conditions for deviation counter clearing input signal.

Value	Condition	
0/2/4	Invalid	
1	Always clear	
3	Clear only once (Rising edge trigger)	

P05.20	Label	Position Unit Settings			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~2	Default	0	Unit	-					
	Valid	Restart	Index	0x2520	SubIndex	0x00	Attribute		R/W		

Value	Unit	
0	Encoder unit	
1	Command unit	
2	0.0001rev	

Command unit: Pulse from host (Affected by electronic gear ratio)
Encoder unit: Pulse from encoder (Related to encoder resolution)
P05.20 only changes the unit use on host tracing function, has no relation with any position related parameters.

P05.21	Label	Torque Limit Settings			Valid mode(s)	-	-	-	-	-	F
	Range	0~6	Default	0	Unit	-					
	Valid	Immediate	Index	0x2521	SubIndex	0x00	Attribute		R/W		

Set Value	Positive limit value	Negative limit value	
0	P00.13	P00.13	
1	P00.13	P05.22	
2	6.00E+01	6.00E+02	

Between max. torque 6072 and P05.21, actual torque limit will take smaller value.

P05.22	Label	2nd Torque Limit			Valid mode(s)	-	-	-	-	-	F
	Range	0~500	Default	350	Unit	%					
	Valid	Immediate	Index	0x2522	SubIndex	0x00	Attribute		R/W		

Limited by motor max. torque.
Between max. torque 6072 and P05.22, actual torque limit will take smaller value.

P05.27	Label	Analog 3 torque limit gain			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	30	Unit	-					
	Valid	Immediate	Index	0x2527	SubIndex	0x00	Attribute		R/W		

P05.28	Label	LED Initial Status			Valid mode(s)	-	-	-	-	-	F
	Range	0~50	Default	34	Unit	-					
	Valid	Restart	Index	4x2528	SubIndex	0x00	Attribute		R/W		
To set content display on front panel of the servo driver at servo driver power on.											
Value	Content		Value	Content		Value	Content				
0	Position deviation		15	Overload rate		30	No. of encoder communication error				
1	Motor speed		16	Inertia load ratio		31	Accumulated operation time				
2	Position command velocity		17	Cause(s) of non-motion		32	Automatic motor identification				
3	Velocity control command		18	No. of I/O changes		33	Driver temperature				
4	Actual feedback torque		19	Internal usage		34	Servo status				
5	Feedback pulse sum		20	Absolute encoder data		35	/				
6	Command pulse sum		21	Encoder single turn data		36	Synchronous period				
7	Max. torque		22	Encoder multiturn data		37	No. of synchronous loss				
8	/		23	Communication axis address		38	Synchronous type				
9	Control mode		24	Encoder position deviation		39	Whether DC is running or not				
10	I/O status		25	Motor electrical angle		40	Acceleration/Deceleration status				
11	/		26	Motor mechanical Angle		41	Sub-index of OD index				
12	Error cause and history record		27	PN Voltage		42	Value of sub-index of OD index				
13	Alarm code		28	Software version							
14	Regenerative load rate		29	/							

P05.32	Label	Max Command Pulse Input Frequency			Valid mode(s)	-	-	-	-	-	-
	Range	0~8000	Default	4100	Unit	KHz					
	Valid	Immediate	Index	0x2532	SubIndex	0x00	Attribute		R/W		

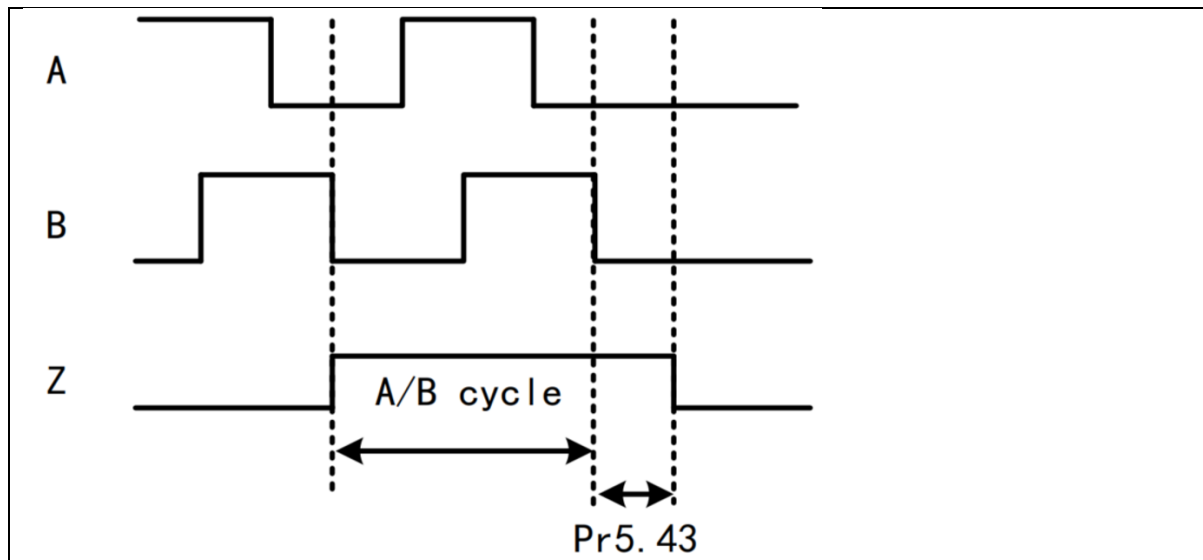
P05.37	Label	Torque Limit Alarm Delay Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~5000	Default	500	Unit	ms					
	Valid	Immediate	Index	0x2537	SubIndex	0x00	Attribute	R/W			
To set time threshold for output torque to reach limit under torque initialization mode. Only applicable for torque initialization method -6 to -1. Under torque initialization mode, motor torque reached P05.39 and the duration reaches P05.37 before moving into next step.											

P05.39	Label	3rd Torque Limit			Valid mode(s)	-	-	-	-	-	F
	Range	0~500	Default	80	Unit	%					
	Valid	Immediate	Index	0x2539	SubIndex	0x00	Attribute	R/W			
To set torque limit during torque initialization. Between max. torque 6072 and P05.22, actual torque limit will take smaller value.											

P05.40	Label	D41 Data Monitor			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFFF	Default	0x30C	Unit	-					
	Valid	Immediate	Index	Cx2540	SubIndex	0x00	Attribute	R/W			
Set object word monitored by D41, index (left 4 bits) + sub-index (right 1 bit), if monitoring 0x6092-01, set P05.40 to 0x60921.											

P05.42	Label	Frequency Divider Output Z-Signal Polarity			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0x7	Default	0x0	Unit	-					
	Valid	Restart	Index	0x2542	SubIndex	0x00	Attribute	R/W			
Bit	Polarity		Description								
Bit0	0 = Positive		Z polarity setting of frequency divider output and position comparison								
	1 = Negative										
Bit1	0 = Positive		Only valid in position comparison. Polarity setting when phase A frequency divider as position comparison output								
	1 = Negative										
Bit2	0 = Positive		Only valid in position comparison. Polarity setting when phase B frequency divider as position comparison output								

P05.43	Label	Frequency Divider Output Z-Signal Bandwidth			Valid mode(s)	-	-	-	-	-	F
	Range	0~500	Default	0	Unit	-					
	Valid	Restart	Index	0x2543	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Z bandwidth equivalent to 1 cycle of A/B										
1~500	Delay setting on top of A/B cycle width										
When P05.43 = 0, width of frequency divider output Z-signal is equivalent to width of 1 cycle of A/B, value set in P05.43 + A/B cycle width = delay setting.											



P05.44	Label	Frequency Divider Output Source			Valid mode(s)	-	-	-	-	-	F
	Range	0~4	Default	0	Unit	-					
	Valid	Restart	Index	0x2544	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Position feedback of encoder #1(motor encoder)										
1	Position feedback of encoder #2(external encoder)										
2	Reserved										
3	Pulse input command position synchronous output; position comparison not available in this mode										
4	Frequency divider output prohibited										

P05.45	Label	External Encoder Feedback Velocity Threshold			Valid mode(s)	-	-	-	-	-	-
	Range	0~10000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2545	SubIndex	0x00	Attribute	R/W			
To set external encoder overspeed feedback threshold.											

P05.46	Label	Regenerative Vent Overload Level			Valid mode(s)	-	-	-	-	-	F
	Range	0~115	Default	0	Unit	-					
	Valid	Immediate	Index	0x2546	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Default level: 80%										
1~115	Set vent overload level accordingly										

P05.53	Label	Auto Homing			Valid mode(s)	-	-	-	-	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x2553	SubIndex	0x00	Attribute	R/W			

P05.58	Label	Frequency Divider Output Delay Compensation			Valid mode(s)	-	-	-	-	-	-
	Range	-10000 ~10000	Default	0	Unit	0.1us					
	Valid	Immediate	Index	0x2558	SubIndex	0x00	Attribute	R/W			

P05.70	Label	Reached Velocity Hysteresis Bandwidth			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	0	Unit	-					
	Valid	Immediate	Index	0x2570	SubIndex	0x00	Attribute	R/W			
Value	Description										
0	Disable										
1	Enable (Rising edge)										

10.2.7 [Class 6] Special Settings

P06.01	Label	Encoder Zero Position Compensation			Valid mode(s)	-	-	-	-	-	F
	Range	0~360	Default	0	Unit	Electrical angle					
	Valid	Restart	Index	0x2601	SubIndex	0x00	Attribute	R/W			
Angle of the encoder after zero position calibration.											

P06.03	Label	JOG Torque			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~750	Default	100	Unit	%					
	Valid	Immediate	Index	0x2603	SubIndex	0x00	Attribute		R/W		
To set torque for JOG trial run command.											

P06.04	Label	JOG Speed			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~10000	Default	50	Unit	mm/s					
	Valid	Immediate	Index	0x2604	SubIndex	0x00	Attribute		R/W		
To set velocity for JOG trial run command.											

P06.05	Label	Position 3rd Gain Valid Time			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~10000	Default	0	Unit	0.1pitch					
	Valid	Immediate	Index	0x2605	SubIndex	0x00	Attribute		R/W		
To set time for 3rd gain to be valid. When not in use, set P06.05=0, P06.06=100.											

P06.06	Label	Position 3rd Gain Scale Factor			Valid mode(s)	-	-	-	-	-	F
	Range	1~1000	Default	100	Unit	%					
	Valid	Immediate	Index	0x2606	SubIndex	0x00	Attribute	R/W			

Set up the 3rd gain by multiplying factor of the 1st gain

Position command velocity (RPM)

Effective time $Pr6.05 \times 0.1ms$

2nd gain $Pr1.05 \sim Pr1.09$

3rd gain

1st gain $Pr1.00 \sim Pr1.04$

Position loop gain = $Pr1.00 \times Pr6.06/100$
Velocity loop gain = $Pr1.01 \times Pr6.06/100$
Velocity loop integral time constant, Velocity detection filter,
Torque filter time constant still uses 1st gain

3rd gain= 1st gain * P06.06/100

Only effective under position control mode. 3rd gain valid when P06.05 ≠ 0. Set 3rd gain value in P06.06. When 2nd gain switches to 1st gain, it will go through 3rd, switching time is set in P01.19.

P06.07	Label	Torque Command Additional Value			Valid mode(s)	-	-	-	-	-	F
	Range	-100~100	Default	0	Unit	%					
	Valid	Immediate	Index	0x2607	SubIndex	0x00	Attribute		R/W		
To set torque forward feed additional value of vertical axis. Applicable for loaded vertical axis, compensate constant torque. Application: When load move along vertical axis, pick any point from the whole motion and stop the load at that particular point with motor enabled but not rotating. Record output torque value from d04, use that value as torque command additional value (compensation value)											

P06.08	Label	Positive Direction Torque Compensation			Valid mode(s)	-	-	-	-	-	F
	Range	-100~100	Default	0	Unit	%					
	Valid	Immediate	Index	0x2608	SubIndex	0x00	Attribute		R/W		

P06.09	Label	Negative Direction Torque Compensation			Valid mode(s)	-	-	-	-	-	F
	Range	-100~100	Default	0	Unit	%					
	Valid	Immediate	Index	0x2609	SubIndex	0x00	Attribute		R/W		
To reduce the effect of mechanical friction in the movement(s) of the axis. Compensation values can be set according to needs for both rotational directions.											

Applications:

1. When motor is at constant speed, d04 will deliver torque values.

Torque value in positive direction = T1;

Torque value in negative direction = T2

$$\frac{P06.08}{P06.09} = T_f$$

P06.10	Label	Function Expansion			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x2610	SubIndex	0x00	Attribute		R/W		

P06.11	Label	Current Response Settings			Valid mode(s)	-	-	-	-	-	F
	Range	50~100	Default	100	Unit	%					
	Valid	Immediate	Index	0x2611	SubIndex	0x00	Attribute		R/W		
To set driver current loop related effective value ratio.											

P06.14	Label	Stop Time upon Alarm			Valid mode(s)	-	-	-	-	-	F
	Range	0~3000	Default	500	Unit	ms					
	Valid	Immediate	Index	0x2614	SubIndex	0x00	Attribute		R/W		

To set the max. time allowed for the axis to stop on emergency stop or normal axis disabling.
After disabling axis, if motor speed is still higher than P04.39 but the time set in P06.14 is reached, BRK_ON given and holding brake activated.
BRK_ON given time is determined by P06.14 or when motor speed goes below P04.39, whichever comes first.

Applications:

1. After disabling axis, if motor speed is still higher than P04.39 but the time set in P06.14 is reached, BRK_ON given and holding brake activated.
2. After disabling axis, if motor speed is already lower than P04.39 but the time set in P06.14 is not yet reached, BRK_ON given and holding brake activated.

P06.20	Label	Trial Run Distance			Valid mode(s)	-	-	-	-	-	F
	Range	0~1200	Default	10	Unit	0.1r					
	Valid	Immediate	Index	0x2620	SubIndex	0x00	Attribute		R/W		

JOG (Position control) : Distance travel of each motion.

P06.21	Label	Interval Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~30000	Default	300	Unit	ms					
	Valid	Immediate	Index	0x2621	SubIndex	0x00	Attribute		R/W		

JOG (Position control) : Waiting time after each motion.

P06.22	Label	Trial Run Cycle			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	5	Unit	Second-rate					
	Valid	Immediate	Index	0x2622	SubIndex	0x00	Attribute		R/W		

JOG (Position control) : No. of cycles.

P06.25	Label	Trial Run Acceleration			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	200	Unit	ms/(m/s)					
	Valid	Immediate	Index	0x2625	SubIndex	0x00	Attribute		R/W		

To set the acceleration/deceleration time for JOG command between 0 rpm to 1000 rpm

P06.27	Label	Current Loop Tuning			Valid mode(s)	-	-	-	-	-	0
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x2627	SubIndex	0x00	Attribute		R/W		

P06.28	Label	Velocity Observer Gain			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	160	Unit	-					
	Valid	Immediate	Index	0x2628	SubIndex	0x00	Attribute		R/W		
0: Default stable gain; Modifications are not recommended.											

P06.29	Label	Velocity Observer Bandwidth			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	0	Unit	ms					
	Valid	Immediate	Index	0x2629	SubIndex	0x00	Attribute		R/W		
0: Default stable bandwidth; Modifications are recommended.											

P06.34	Label	Fram Error Window Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	100	Unit	-					
	Valid	Immediate	Index	0x2634	SubIndex	0x00	Attribute		R/W		
To set EtherCAT data frame error detection window time											

P06.35	Label	Fram Error Window			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	50	Unit	-					
	Valid	Immediate	Index	0x2635	SubIndex	0x00	Attribute		R/W		
To set EtherCAT data frame error detection window											

P06.54	Label	Absolute Rotary Denominator			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~32766	Default	0	Unit	-					
	Valid	Restart	Index	0x2654	SubIndex	0x00	Attribute		R/W		
To set denominator of absolute encoder in rotational mode. When PRO.15 = 2 and use in combination with P06.54: Feedback load position 6064 = P06.54/P06.63 x Electronic gear ratio											

P06.56	Label	Rotor Blocked Alarm Torque Threshold			Valid mode(s)	-	-	-	-	-	F
	Range	0~300	Default	300	Unit	%					
	Valid	Immediate	Index	0x2656	SubIndex	0x00	Attribute	R/W			
To set the torque threshold of blocked rotor to trigger alarm. (Alarm triggered if torque output% larger than threshold value & under 10rpm) If P06.56 = 0, blocked rotor alarm deactivated. (This applicable only to 220VAC drivers) If motor speed is 10rpm or above, Er102 won't be triggered.											

P06.59	Label	In Position Threshold - Origin Mode			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	8	Unit	-					
	Valid	Immediate	Index	0x2659	SubIndex	0x00	Attribute		R/W		
To set position threshold for homing mode.											

P06.61	Label	Z-signal Holding Time			Valid mode(s)	-	-	-	-	-	F
	Range	1~1000	Default	10	Unit	ms					
	Valid	Immediate	Index	0x2661	SubIndex	0x00	Attribute		R/W		
To set the holding time for Z signal to maintain active high.											
Application: 1. Z signal for 60FDH 2. Z signal for homing process 3. Z-phase frequency output pulse width. Unit = 0.1ms											
Please set P06.61≥0.2ms if used for 3 applications as above											

P06.63	Label	Absolute Multiturn Data Limit			Valid mode(s)	-	-	-	-	-	F
	Range	0~32766	Default	0	Unit	pitch					
	Valid	Restart	Index	0x2663	SubIndex	0x00	Attribute	R/W			
To set upper limit of multiturn data with absolute encoder set as rotational mode.											
When PRO.15 = 2 and use in combination with P06.54:											
Feedback load position 6064 = P06.54/P06.63 x Electronic gear ratio											

P06.80	Label	Clash Detection			Valid mode(s)	-	-	-	-	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Restart	Index	0x2680	SubIndex	0x00	Attribute		R/W		

P06.81	Label	Clash Detection Positive Current Threshold			Valid mode(s)	-	-	-	-	-	-
	Range	0~750	Default	100	Unit	%					
	Valid	Immediate	Index	0x2681	SubIndex	0x00	Attribute		R/W		

P06.82	Label	Clash Detection Negative Current Threshold			Valid mode(s)	-	-	-	-	-	-
	Range	0~750	Default	100	Unit	%					
	Valid	Immediate	Index	0x2682	SubIndex	0x00	Attribute		R/W		

P06.83	Label	Clash Detection Velocity Threshold			Valid mode(s)	-	-	-	-	-	-
	Range	0~10000	Default	0	Unit	rpm					
	Valid	Immediate	Index	0x2683	SubIndex	0x00	Attribute		R/W		

P06.84	Label	Holding Current After Clash (Positive)			Valid mode(s)	-	-	-	-	-	-
	Range	0~750	Default	0	Unit	%					
	Valid	Immediate	Index	0x2684	SubIndex	0x00	Attribute		R/W		

P06.85	Label	Holding Current After Clash (Negative)			Valid mode(s)	-	-	-	-	-	-
	Range	0~750	Default	0	Unit	%					
	Valid	Immediate	Index	0x2685	SubIndex	0x00	Attribute		R/W		

P06.86	Label	Clash Detection Start Position (Positive)			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	Command unit					
	Valid	Restart	Index	0x2686	SubIndex	0x00	Attribute		R/W		

P06.87	Label	Clash Detection Start Position (Negative)			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	Command unit					
	Valid	Restart	Index	0x2687	SubIndex	0x00	Attribute		R/W		

P06.88	Label	Clash Detection Positive Current Filter Factor			Valid mode(s)	-	-	-	-	-	-
	Range	0~1000	Default	0	Unit	Command unit					
	Valid	Immediate	Index	0x2688	SubIndex	0x00	Attribute		R/W		

P06.89	Label	Clash Detection Negative Current Filter Factor			Valid mode(s)	-	-	-	-	-	-
	Range	0~1000	Default	0	Unit	0.1ms					
	Valid	Immediate	Index	0x2689	SubIndex	0x00	Attribute		R/W		

P06.90	Label	Clash Detection Time			Valid mode(s)	-	-	-	-	-	-
	Range	0~10000	Default	0	Unit	0.01ms					
	Valid	Immediate	Index	0x2690	SubIndex	0x00	Attribute		R/W		

P06.92	Label	Clash BLF Delay Time			Valid mode(s)	-	-	-	-	-	-
	Range	0~10000	Default	200	Unit	-					
	Valid	Immediate	Index	0x2692	SubIndex	0x00	Attribute		R/W		

P06.93	Label	Clash BLF Threshold			Valid mode(s)	-	-	-	-	-	-
	Range	0~5000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2693	SubIndex	0x00	Attribute		R/W		

P06.94	Label	Clash BLF Center Frequency			Valid mode(s)	-	-	-	-	-	-
	Range	100 ~400000	Default	10000	Unit	-					
	Valid	Immediate	Index	0x2694	SubIndex	0x00	Attribute		R/W		

P06.95	Label	Clash BLF Q-Value			Valid mode(s)	-	-	-	-	-	-
	Range	1~5000	Default	1000	Unit	-					
	Valid	Immediate	Index	0x2695	SubIndex	0x00	Attribute		R/W		

10.2.8 [Class 7] Motor Parameters

P07.00	Label	Current Loop Gain			Valid mode(s)	-	-	-	-	-	-
	Range	100~5000	Default	1000	Unit	Hz					
	Valid	Immediate	Index	0x2700	SubIndex	0x00	Attribute	R/W			

P07.01	Label	Current Loop Integral Time			Valid mode(s)	-	-	-	-	-	-
	Range	1~10000	Default	500	Unit	0.1ms					
	Valid	Immediate	Index	0x2701	SubIndex	0x00	Attribute	R/W			

P07.02	Label	Rotor Initial Angle Compensation			Valid mode(s)	-	-	-	-	-	-
	Range	-360~360	Default	0	Unit	-					
	Valid	Restart	Index	0x2702	SubIndex	0x00	Attribute	R/W			

P07.03	Label	Current Differential Coefficient			Valid mode(s)	-	-	-	-	-	-
	Range	0~30000	Default	0	Unit	-					
	Valid	Immediate	Index	0x2703	SubIndex	0x00	Attribute	R/W			

P07.04	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	0~32767	Default	0	Unit	-					
	Valid	Immediate	Index	0x2704	SubIndex	0x00	Attribute	R/W			

P07.15	Label	Motor Model			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0xFFFF	Default	0x140	Unit	-					
	Valid	Restart	Index	0x2715	SubIndex	0x00	Attribute	R/W			

Motor Parameter Source Settings

Value	Description	
0x100	Read all parameters from EEPROM	
0x200	Read all parameters from the encoder	

When P07.15 is set to 0x200 (2xx), the following motor parameters are automatically identified:
P07.00 Current loop gain, P07.01 Current loop integration time, P07.05 Number of motor pole pairs,
P07.06 Motor phase resistance, P07.07 Motor D/Q inductance, P07.08 Motor back EMF coefficient,
P07.09 Motor torque coefficient

P07.16	Label	Encoder Model			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0xFFFF FFFF	Default	0x7F	Unit	-					
	Valid	Restart	Index	0x2716	SubIndex	0x00	Attribute	R/W			
Encoder Type Selection. Encoder type is usually automatically detected from the encoder. Bit 16: UV phase swap — 1: Swap, 0: No swap Bit 17: VW phase swap — 1: Swap, 0: No swap Bit 18: UW phase swap — 1: Swap, 0: No swap Bit 19: HALL U polarity — 1: Inverted, 0: Normal Bit 20: HALL V polarity — 1: Inverted, 0: Normal Bit 21: HALL W polarity — 1: Inverted, 0: Normal Bit 22: HALL signal — 1: Present, 0: Not present											

P07.23	Label	Encoder Lines			Valid mode(s)	-	-	-	-	-	-
	Range	0~2 ²⁴	Default	0	Unit	-					
	Valid	Immediate	Index	0x2723	SubIndex	0x00	Attribute	R/W			

P07.54	Label	Grating Ruler Resolution			Valid mode(s)	-	-	-	-	-	-
	Range	0~1000000	Default	100	Unit	nm					
	Valid	Restart	Index	0x2754	SubIndex	0x00	Attribute		R/W		
Set external magnetic scale resolution, unit: nm											

P07.55	Label	Distance between Magnetic Poles			Valid mode(s)	-	-	-	-	-	-
	Range	0~32767	Default	1200	Unit	0.01mm					
	Valid	Restart	Index	0x2755	SubIndex	0x00	Attribute	R/W			

P07.57	Label	Motor Overheat Threshold			Valid mode(s)	-	-	-	-	-	-
	Range	0~150	Default	0	Unit	-					
	Valid	Immediate	Index	0x2757	SubIndex	0x00	Attribute	R/W			

P07.60	Label	Encoder Communication Protocol			Valid mode(s)	-	-	-	-	-	-
	Range	0~32767	Default	0	Unit	-					
	Valid	Immediate	Index	0x2760	SubIndex	0x00	Attribute	R/W			

P07.77	Label	BISS-C Encoder Single Turn Data			Valid mode(s)	-	-	-	-	-	-
	Range	0~32	Default	32	Unit	-					
	Valid	Restart	Index	0x2777	SubIndex	0x00	Attribute	R/W			
Set Biss-C encoder single-turn bit count											

P07.78	Label	BISS-C Encoder Multi Turn Data			Valid mode(s)	-	-	-	-	-	-
	Range	0~16	Default	0	Unit	-					
	Valid	Restart	Index	0x2778	SubIndex	0x00	Attribute		R/W		
Set Biss-C encoder multi-turn bit count											

P07.79	Label	BISS-C Baud Rate			Valid mode(s)	-	-	-	-	-	-
	Range	0~100	Default	25	Unit	0.1MHz					
	Valid	Restart	Index	0x2779	SubIndex	0x00	Attribute		R/W		
Set Biss-C encoder communication speed											

P07.80	Label	BISS-C Encoder Pin Configuration			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0x7FF	Default	0x0	Unit	-					
	Valid	Restart	Index	0x2780	SubIndex	0x00	Attribute	R/W			
Bit 0: CLK pin polarity Bit 1: DATA pin polarity Bit 2: CLK and DATA pin swap Bit 3–10: DATA pin filter time constant, unit: 0.01 μs											

P07.83	Label	Motor Zero Pt Single Turn Position			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	Encoder unit					
	Valid	Restart	Index	0x2783	SubIndex	0x00	Attribute	R/W			

10.2.9 [Class C] Position Comparison

P0C.00	Label	Enable Position Comparison			Valid mode(s)	-	-	-	-	-	F
	Range	0~3	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x01	Attribute		R/W		
Value	Description										
0	Disable										
1	Enable (Rising edge valid)										

P0C.01	Label	Position Comparison Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~255	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A4	SubIndex	0x02	Attribute		R/W		
Value	Description										
0	Single comparison mode										
1	Constant cycle comparison mode										
2	Cyclic comparison mode										

P0C.02	Label	Position Comparison Pulse Output Bandwidth			Valid mode(s)	-	-	-	-	-	F
	Range	1~4095	Default	1	Unit	0.1ms					
	Valid	Immediate	Index	0x27A4	SubIndex	0x03	Attribute	R/W			
Set the pulse width of the signal output when the position comparison point is reached, in milliseconds (ms).											

P0C.03	Label	Position Comparison Output Delay			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	0	Unit	0.1us					
	Valid	Restart	Index	0x27A4	SubIndex	0x04	Attribute		R/W		
Set the delay compensation for position comparison output. This compensates for delays caused by the DO/division output circuit.											

P0C.04	Label	Position Comparison Starting Point			Valid mode(s)	-	-	-	-	-	F
	Range	1~42	Default	1	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x05	Attribute	R/W			
Set the starting point for position comparison.											

P0C.05	Label	Position Comparison End Point			Valid mode(s)	-	-	-	-	-	F
	Range	1~42	Default	1	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x06	Attribute	R/W			
Set the ending point for position comparison.											

P0C.06	Label	No. of cycle for N-cycle Comparison			Valid mode(s)	-	-	-	-	-	F
	Range	0~60000	Default	1	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x07	Attribute	R/W			
Set the number of cycles for position comparison in constant cycle mode.											

P0C.07	Label	Position Comparison - Set Current Position as Origin			Valid mode(s)	-	-	-	-	-	F
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x08	Attribute	R/W			
Set the zero point for position comparison. When the rising edge is enabled, the current position can be set as the zero point.											
Value	Description										
0	Disable										
1	Enable (Rising edge valid)										

P0C.08	Label	Position Comparison - Offset to Origin			Valid mode(s)	-	-	-	-	-	-
	Range	-2^31 ~2^31-1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x09	Attribute		R/W		
Set the position offset after setting the current position as the zero point for position comparison.											

P0C.09	Label	Position Comparison Actual Status			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0A	Attribute	R			

P0C.10	Label	Position Comparison Actual Position			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0B	Attribute	R			

P0C.11	Label	Position Comparison Actual Comparison Points			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0C	Attribute	R			

P0C.12	Label	Position Comparison Output			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0D	Attribute	R			

P0C.13	Label	Position Comparison Cycle			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0E	Attribute	R			

P0C.20	Label	Position Comparison 1 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x15	Attribute	R/W			

Set the target values for position comparison points 1 to 42. When the position reaches a comparison point, the output is determined based on the attribute values of comparison points 1 to 42.

P0C.21	Label	Position Comparison 2 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x16	Attribute	R/W			

P0C.22	Label	Position Comparison 3 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x17	Attribute	R/W			

P0C.23	Label	Position Comparison 4 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x18	Attribute	R/W			

P0C.24	Label	Position Comparison 5 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x19	Attribute	R/W			

P0C.25	Label	Position Comparison 6 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1A	Attribute	R/W			

P0C.26	Label	Position Comparison 7 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1B	Attribute	R/W			

P0C.27	Label	Position Comparison 8 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1C	Attribute	R/W			

P0C.28	Label	Position Comparison 9 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1D	Attribute	R/W			

P0C.29	Label	Position Comparison 10 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1E	Attribute	R/W			

P0C.30	Label	Position Comparison 11 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1F	Attribute	R/W			

P0C.31	Label	Position Comparison 12 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x20	Attribute	R/W			

P0C.32	Label	Position Comparison 13 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x21	Attribute	R/W			

P0C.33	Label	Position Comparison 14 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x22	Attribute	R/W			

P0C.34	Label	Position Comparison 15 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x23	Attribute		R/W		

P0C.35	Label	Position Comparison 16 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x24	Attribute		R/W		

P0C.36	Label	Position Comparison 17 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x25	Attribute		R/W		

P0C.37	Label	Position Comparison 18 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x26	Attribute		R/W		

P0C.38	Label	Position Comparison 19 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x27	Attribute		R/W		

P0C.39	Label	Position Comparison 20 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x28	Attribute		R/W		

P0C.40	Label	Position Comparison 21 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x29	Attribute		R/W		

P0C.41	Label	Position Comparison 22 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2A	Attribute		R/W		

P0C.42	Label	Position Comparison 23 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2B	Attribute		R/W		

P0C.43	Label	Position Comparison 24 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2C	Attribute		R/W		

P0C.44	Label	Position Comparison 25 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2D	Attribute		R/W		

P0C.45	Label	Position Comparison 26 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2E	Attribute		R/W		

P0C.46	Label	Position Comparison 27 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2F	Attribute		R/W		

P0C.47	Label	Position Comparison 28 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x30	Attribute		R/W		

P0C.48	Label	Position Comparison 29 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x31	Attribute		R/W		

P0C.49	Label	Position Comparison 30 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x32	Attribute		R/W		

P0C.50	Label	Position Comparison 31 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x33	Attribute		R/W		

P0C.51	Label	Position Comparison 32 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x34	Attribute		R/W		

P0C.52	Label	Position Comparison 33 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x35	Attribute		R/W		

P0C.53	Label	Position Comparison 34 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x36	Attribute		R/W		

P0C.54	Label	Position Comparison 35 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x37	Attribute		R/W		

P0C.55	Label	Position Comparison 36 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x38	Attribute		R/W		

P0C.56	Label	Position Comparison 37 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x39	Attribute		R/W		

P0C.57	Label	Position Comparison 38 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3A	Attribute		R/W		

P0C.58	Label	Position Comparison 39 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3B	Attribute	R/W			

P0C.59	Label	Position Comparison 40 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3C	Attribute	R/W			

P0C.60	Label	Position Comparison 41 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3D	Attribute	R/W			

P0C.61	Label	Position Comparison 42 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3E	Attribute	R/W			

P0C.70	Label	Position Comparison 1 & 2 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x47	Attribute	R/W			

Set the attribute values for position comparison points 1 and 2 (bit 0–15 for point 1 attributes):

bit	Position Comparison Point 1 Attributes
0	= 0 No forward crossing comparison; = 1 Forward crossing comparison
1	= 0 No reverse crossing comparison; = 1 Reverse crossing comparison
2~5	Reserved
6	Output mode setting: = 0 Pulse mode; = 1 Toggle mode
7	DO1 output
8	DO2 output
9	DO3 output
10~12	Reserved
13	Divided A-phase output
14	Divided B-phase output
15	Divided Z-phase output
Bit 16~31 for Position Comparison Point 2 Attributes:	
bit	Position Comparison Point 2 Attributes
16	= 0 No forward crossing comparison; = 1 Forward crossing comparison
17	= 0 No reverse crossing comparison; = 1 Reverse crossing comparison

18~21	Reserved
22	Output mode setting: = 0 Pulse mode; = 1 Toggle mode
23	DO1 output
24	DO2 output
25	DO3 output
26~28	Reserved
29	Divided A-phase output
30	Divided B-phase output
31	Divided Z-phase output

P0C.71	Label	Position Comparison 3 & 4 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x48	Attribute	R/W			

P0C.72	Label	Position Comparison 5 & 6 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x49	Attribute	R/W			

P0C.73	Label	Position Comparison 7 & 8 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4A	Attribute	R/W			

P0C.74	Label	Position Comparison 9 & 10 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4B	Attribute	R/W			

P0C.75	Label	Position Comparison 11 & 12 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4C	Attribute	R/W			

P0C.76	Label	Position Comparison 13 & 14 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4D	Attribute	R/W			

P0C.77	Label	Position Comparison 15 & 16 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4E	Attribute	R/W			

P0C.78	Label	Position Comparison 17 & 18 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4F	Attribute	R/W			

P0C.79	Label	Position Comparison 19 & 20 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x50	Attribute	R/W			

P0C.80	Label	Position Comparison 21 & 22 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x51	Attribute	R/W			

P0C.81	Label	Position Comparison 23 & 24 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x52	Attribute	R/W			

P0C.82	Label	Position Comparison 25 & 26 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x53	Attribute	R/W			

P0C.83	Label	Position Comparison 27 & 28 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x54	Attribute	R/W			

P0C.84	Label	Position Comparison 29 & 30 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x55	Attribute	R/W			

P0C.85	Label	Position Comparison 31 & 32 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x56	Attribute	R/W			

P0C.86	Label	Position Comparison 33 & 34 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x57	Attribute	R/W			

P0C.87	Label	Position Comparison 35 & 36 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x58	Attribute	R/W			

P0C.88	Label	Position Comparison 37 & 38 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x59	Attribute	R/W			

P0C.89	Label	Position Comparison 39 & 40 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x5A	Attribute	R/W			

P0C.90	Label	Position Comparison 41 & 42 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x5B	Attribute	R/W			

10.2.10 [Class D] Gantry Settings

P0C.00	Label	Enable Position Comparison			Valid mode(s)	-	-	-	-	-	F
	Range	0~3	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x01	Attribute		R/W		
Value	Description										
0	Disable										
1	Enable (Rising edge valid)										

P0C.01	Label	Position Comparison Mode			Valid mode(s)	-	-	-	-	-	F
	Range	0~255	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A4	SubIndex	0x02	Attribute		R/W		
Value	Description										
0	Single comparison mode										
1	Constant cycle comparison mode										
2	Cyclic comparison mode										

P0C.02	Label	Position Comparison Pulse Output Bandwidth			Valid mode(s)	-	-	-	-	-	F
	Range	1~4095	Default	1	Unit	0.1ms					
	Valid	Immediate	Index	0x27A4	SubIndex	0x03	Attribute	R/W			
Set the pulse width of the signal output when the position comparison point is reached, in milliseconds (ms).											

P0C.03	Label	Position Comparison Output Delay			Valid mode(s)	-	-	-	-	-	F
	Range	-10000 ~10000	Default	0	Unit	0.1us					
	Valid	Restart	Index	0x27A4	SubIndex	0x04	Attribute		R/W		
Set the delay compensation for position comparison output. This compensates for delays caused by the DO/division output circuit.											

P0C.04	Label	Position Comparison Starting Point			Valid mode(s)	-	-	-	-	-	F
	Range	1~42	Default	1	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x05	Attribute	R/W			
Set the starting point for position comparison.											

P0C.05	Label	Position Comparison End Point			Valid mode(s)	-	-	-	-	-	F
	Range	1~42	Default	1	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x06	Attribute	R/W			
Set the ending point for position comparison.											

P0C.06	Label	No. of cycle for N-cycle Comparison			Valid mode(s)	-	-	-	-	-	F
	Range	0~60000	Default	1	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x07	Attribute	R/W			
Set the number of cycles for position comparison in constant cycle mode.											

P0C.07	Label	Position Comparison - Set Current Position as Origin			Valid mode(s)	-	-	-	-	-	F
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x08	Attribute	R/W			
Set the zero point for position comparison. When the rising edge is enabled, the current position can be set as the zero point.											
Value	Description										
0	Disable										
1	Enable (Rising edge valid)										

P0C.08	Label	Position Comparison - Offset to Origin			Valid mode(s)	-	-	-	-	-	-
	Range	-2^31 ~2^31-1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x09	Attribute		R/W		
Set the position offset after setting the current position as the zero point for position comparison.											

P0C.09	Label	Position Comparison Actual Status			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0A	Attribute	R			

P0C.10	Label	Position Comparison Actual Position			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0B	Attribute	R			

P0C.11	Label	Position Comparison Actual Comparison Points			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0C	Attribute	R			

P0C.12	Label	Position Comparison Output			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0D	Attribute	R			

P0C.13	Label	Position Comparison Cycle			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x0E	Attribute	R			

P0C.20	Label	Position Comparison 1 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x15	Attribute	R/W			

Set the target values for position comparison points 1 to 42. When the position reaches a comparison point, the output is determined based on the attribute values of comparison points 1 to 42.

P0C.21	Label	Position Comparison 2 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x16	Attribute	R/W			

P0C.22	Label	Position Comparison 3 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x17	Attribute	R/W			

P0C.23	Label	Position Comparison 4 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x18	Attribute	R/W			

P0C.24	Label	Position Comparison 5 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x19	Attribute	R/W			

P0C.25	Label	Position Comparison 6 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1A	Attribute	R/W			

P0C.26	Label	Position Comparison 7 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1B	Attribute	R/W			

P0C.27	Label	Position Comparison 8 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1C	Attribute	R/W			

P0C.28	Label	Position Comparison 9 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1D	Attribute	R/W			

P0C.29	Label	Position Comparison 10 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1E	Attribute	R/W			

P0C.30	Label	Position Comparison 11 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x1F	Attribute	R/W			

P0C.31	Label	Position Comparison 12 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x20	Attribute	R/W			

P0C.32	Label	Position Comparison 13 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x21	Attribute	R/W			

P0C.33	Label	Position Comparison 14 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x22	Attribute	R/W			

P0C.34	Label	Position Comparison 15 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x23	Attribute	R/W			

P0C.35	Label	Position Comparison 16 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x24	Attribute	R/W			

P0C.36	Label	Position Comparison 17 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x25	Attribute	R/W			

P0C.37	Label	Position Comparison 18 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x26	Attribute	R/W			

P0C.38	Label	Position Comparison 19 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x27	Attribute	R/W			

P0C.39	Label	Position Comparison 20 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x28	Attribute	R/W			

P0C.40	Label	Position Comparison 21 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x29	Attribute	R/W			

P0C.41	Label	Position Comparison 22 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2A	Attribute	R/W			

P0C.42	Label	Position Comparison 23 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2B	Attribute	R/W			

P0C.43	Label	Position Comparison 24 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2C	Attribute	R/W			

P0C.44	Label	Position Comparison 25 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2D	Attribute	R/W			

P0C.45	Label	Position Comparison 26 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2E	Attribute	R/W			

P0C.46	Label	Position Comparison 27 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x2F	Attribute	R/W			

P0C.47	Label	Position Comparison 28 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x30	Attribute	R/W			

P0C.48	Label	Position Comparison 29 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x31	Attribute	R/W			

P0C.49	Label	Position Comparison 30 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x32	Attribute	R/W			

P0C.50	Label	Position Comparison 31 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x33	Attribute	R/W			

P0C.51	Label	Position Comparison 32 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x34	Attribute	R/W			

P0C.52	Label	Position Comparison 33 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x35	Attribute	R/W			

P0C.53	Label	Position Comparison 34 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x36	Attribute	R/W			

P0C.54	Label	Position Comparison 35 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x37	Attribute	R/W			

P0C.55	Label	Position Comparison 36 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x38	Attribute	R/W			

P0C.56	Label	Position Comparison 37 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x39	Attribute	R/W			

P0C.57	Label	Position Comparison 38 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3A	Attribute	R/W			

P0C.58	Label	Position Comparison 39 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3B	Attribute	R/W			

P0C.59	Label	Position Comparison 40 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3C	Attribute	R/W			

P0C.60	Label	Position Comparison 41 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3D	Attribute	R/W			

P0C.61	Label	Position Comparison 42 Target Value			Valid mode(s)	-	-	-	-	-	F
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x3E	Attribute	R/W			

P0C.70	Label	Position Comparison 1 & 2 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x47	Attribute	R/W			

Set the attribute values for position comparison points 1 and 2 (bit 0–15 for point 1 attributes):

bit	Position Comparison Point 1 Attributes									
0	= 0 No forward crossing comparison; = 1 Forward crossing comparison									
1	= 0 No reverse crossing comparison; = 1 Reverse crossing comparison									
2~5	Reserved									
6	Output mode setting: = 0 Pulse mode; = 1 Toggle mode									

7	DO1 output
8	DO2 output
9	DO3 output
10~12	Reserved
13	Divided A-phase output
14	Divided B-phase output
15	Divided Z-phase output
Bit 16–31 for Position Comparison Point 2 Attributes:	
bit	Position Comparison Point 2 Attributes
16	= 0 No forward crossing comparison; = 1 Forward crossing comparison
17	= 0 No reverse crossing comparison; = 1 Reverse crossing comparison
18~21	Reserved
22	Output mode setting; = 0 Pulse mode; = 1 Toggle mode
23	DO1 output
24	DO2 output
25	DO3 output
26~28	Reserved
29	Divided A-phase output
30	Divided B-phase output
31	Divided Z-phase output

P0C.71	Label	Position Comparison 3 & 4 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x48	Attribute		R/W		

P0C.72	Label	Position Comparison 5 & 6 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x49	Attribute		R/W		

P0C.73	Label	Position Comparison 7 & 8 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4A	Attribute		R/W		

P0C.74	Label	Position Comparison 9 & 10 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4B	Attribute		R/W		

P0C.75	Label	Position Comparison 11 & 12 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4C	Attribute		R/W		

P0C.76	Label	Position Comparison 13 & 14 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4D	Attribute		R/W		

P0C.77	Label	Position Comparison 15 & 16 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4E	Attribute		R/W		

P0C.78	Label	Position Comparison 17 & 18 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x4F	Attribute		R/W		

P0C.79	Label	Position Comparison 19 & 20 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x50	Attribute		R/W		

P0C.80	Label	Position Comparison 21 & 22 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x51	Attribute		R/W		

P0C.81	Label	Position Comparison 23 & 24 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x52	Attribute		R/W		

P0C.82	Label	Position Comparison 25 & 26 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x53	Attribute		R/W		

POC.83	Label	Position Comparison 27 & 28 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x54	Attribute	R/W			

POC.84	Label	Position Comparison 29 & 30 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x55	Attribute	R/W			

POC.85	Label	Position Comparison 31 & 32 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x56	Attribute	R/W			

POC.86	Label	Position Comparison 33 & 34 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x57	Attribute	R/W			

POC.87	Label	Position Comparison 35 & 36 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x58	Attribute	R/W			

POC.88	Label	Position Comparison 37 & 38 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x59	Attribute	R/W			

POC.89	Label	Position Comparison 39 & 40 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x5A	Attribute	R/W			

P0C.90	Label	Position Comparison 41 & 42 Attribute Value			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFFFF FFFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A4	SubIndex	0x5B	Attribute	R/W			

10.2.11 [Class E] Precision Compensation

P0E.00	Label	Precision Compensation			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x01	Attribute		R/W		
0: Disable position accuracy compensation 1: Enable position accuracy compensation											

P0E.01	Label	Precision Compensation Unit			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~2	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x02	Attribute		R		
0: μm 1: mm											

P0E.02	Label	Precision Compensation Total			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	-2~2048	Default	2	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x03	Attribute		R		

P0E.03	Label	Precision Compensation Start Point			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	-2^{31} $\sim 2^{31}-1$	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x04	Attribute		R		

P0E.04	Label	Precision Compensation Data Interval			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~200000000	Default	100000	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x05	Attribute		R		

P0E.05	Label	Precision Compensation Phase Sequence and Command Direction			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x06	Attribute		R		

P0E.06	Label	Precision Compensation Enable Source			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x07	Attribute		R/W		
0: Activate after automatic homing is completed 1: Force activation											

P0E.07	Label	Position Feedback			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x08	Attribute		R/W		
0: Position after compensation 1: Position before compensation											

P0E.08	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	0~2047	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x09	Attribute		R		

P0E.09	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x0A	Attribute		R		

P0E.10	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	0~2047	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x0B	Attribute		R		

P0E.11	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	-2 ³¹ ~2 ³¹ -1	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A6	SubIndex	0x0C	Attribute		R		

P0E.12	Label	Reserved			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x0D	Attribute		R/W		

P0E.20	Label	Position Mode			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~3	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x15	Attribute		R/W		
0: Linear 1~3: Reserved											

P0E.21	Label	First Target			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	-2^31 ~2^31-1	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x16	Attribute		R/W		
Set the starting position for collecting precision error data											

P0E.22	Label	Last Target			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	-2^31 ~2^31-1	Default	100000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x17	Attribute		R/W		
Set the ending position for collecting precision error data											

P0E.23	Label	Gap			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~200000000	Default	100000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x18	Attribute		R/W		
Set the interval between adjacent points during data collection											

P0E.24	Label	Target Laps			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	2~32767	Default	2	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x19	Attribute		R/W		
Total number of target points for collecting precision error data — automatically generated based on parameters P0E.21, P0E.22, and P0E.23											

P0E.25	Label	Laps			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~32767	Default	1	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x1A	Attribute		R/W		
Set the number of motor runs during precision error data collection											

P0E.26	Label	Overstep			Valid mode(s)	PP	-	HM	CSP	-	-
	Range	0~1000000	Default	20000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x1B	Attribute		R/W		
Set the offset of the starting position during precision error data collection											

P0E.27	Label	Interval Time			Valid mode(s)	-	-	-	-	-	-
	Range	0~100000	Default	5000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x1C	Attribute		R/W		

P0E.28	Label	Velocity			Valid mode(s)	-	-	-	-	-	-
	Range	0~500000000	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x1D	Attribute		R/W		

P0E.29	Label	Acceleration			Valid mode(s)	-	-	-	-	-	-
	Range	1~100000000	Default	500000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x1E	Attribute	R/W			

P0E.30	Label	Deceleration			Valid mode(s)	-	-	-	-	-	-
	Range	1~100000000	Default	500000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x1F	Attribute	R/W			

P0E.31	Label	Homing Mode			Valid mode(s)	-	-	-	-	-	-
	Range	-6~37	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x20	Attribute	R/W			

P0E.32	Label	Homing High Velocity			Valid mode(s)	-	-	-	-	-	-
	Range	0~50000000	Default	5000000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x21	Attribute	R/W			

P0E.33	Label	Homing Low Velocity			Valid mode(s)	-	-	-	-	-	-
	Range	0~50000000	Default	1000000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x22	Attribute	R/W			

P0E.34	Label	Homing Precision Compensation Velocity			Valid mode(s)	-	-	-	-	-	-
	Range	0~50000000	Default	500000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x23	Attribute	R/W			

P0E.35	Label	Homing Acceleration			Valid mode(s)	-	-	-	-	-	-
	Range	1~100000000	Default	500000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x24	Attribute	R/W			

P0E.36	Label	Homing Deceleration			Valid mode(s)	-	-	-	-	-	-
	Range	1~100000000	Default	500000	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x25	Attribute	R/W			

P0E.37	Label	Homing Torque Reached Target Value			Valid mode(s)	-	-	-	-	-	-
	Range	0~1500	Default	0	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x26	Attribute		R/W		

P0E.38	Label	Homing Torque Reached Target Value			Valid mode(s)	-	-	-	-	-	-
	Range	0~1000	Default	50	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x27	Attribute		R/W		

P0E.39	Label	Homing Torque Holding Time			Valid mode(s)	-	-	-	-	-	-
	Range	0~1000	Default	100	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x28	Attribute		R/W		

P0E.40	Label	Homing In Position Tolerance			Valid mode(s)	-	-	-	-	-	-
	Range	0~10000	Default	500	Unit	-					
	Valid	Re-enable	Index	0x27A6	SubIndex	0x29	Attribute		R/W		

10.2.12 [Class 10] Direct Driver Parameters

P10.00	Label	Magnetic Poles Detection			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0x0	Unit	-					
	Valid	Restart	Index	0x27A8	SubIndex	0x01	Attribute	R/W			
Bit Settings for Magnetic Pole Detection Method (bit 0–bit 3): 0: Magnetic pole position estimation method 1 (micro-movement phase finding) 1: Magnetic pole position estimation method 2 (binary micro-movement phase finding) 2: Magnetic pole position estimation method 3 (PI micro-movement phase finding) 3: Magnetic pole position estimation method 3 (pre-positioning phase finding) 4: Magnetic pole position estimation method 3 (Hall sensor phase finding) 5: Magnetic pole position recovery method (reserved)											
Magnetic Pole Estimation Timing Selection (bit 4–bit 5): 0: Automatic phase finding on first enable after power-up 1: Automatic phase finding immediately after power-up 2: Automatic phase finding before each enable 3: Manual phase finding											

P10.01	Label	Magnetic Poles Position Determining Time Limit			Valid mode(s)	-	-	-	-	-	F
	Range	0~20000	Default	10000	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x02	Attribute	R/W			
Total phase finding time display: If the phase finding time exceeds this value, the driver will report an error.											

P10.02	Label	Magnetic Poles Position Determining Command Torque			Valid mode(s)	-	-	-	-	-	F
	Range	0~150	Default	100	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x03	Attribute		R/W		
Default is rated current; maximum can be set to 1.5 times the rated current. It is recommended to keep the default.											

P10.03	Label	Magnetic Poles Position Determining Static Pulse Width			Valid mode(s)	-	-	-	-	-	F
	Range	0~2^23	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x04	Attribute		R/W		
Rotor movement threshold during phase finding: The larger the value, the more rotor displacement is required during phase finding. Default corresponds to the pulse count for 5° of electrical angle.											

P10.04	Label	Magnetic Poles Position Determining Motor Stop Pulse Count			Valid mode(s)	-	-	-	-	-	F
	Range	0~2^23	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x05	Attribute	R/W			
Rotor stationary pulse threshold during phase finding: The larger the value, the easier it is to determine that the motor is stationary.											

P10.05	Label	Magnetic Poles Position Determining Motor Stop Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	200	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x06	Attribute	R/W			
Stationary determination: If rotor displacement is less than the threshold set in P10.04 for the duration set in P10.05, the motor is considered stationary.											

P10.06	Label	Magnetic Poles Position Determining Torque Filter Time			Valid mode(s)	-	-	-	-	-	F
	Range	0~2500	Default	800	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x07	Attribute	R/W			
Torque ramp-up rate during phase finding.											

P10.07	Label	Magnetic Poles Position Determining Gain			Valid mode(s)	-	-	-	-	-	F
	Range	0~32767	Default	180	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x08	Attribute		R/W		
Speed loop gain: Corresponds to rigidity level “11” during phase finding.											

P10.08	Label	Magnetic Poles Position Determining Integral Time Constant			Valid mode(s)	-	-	-	-	-	F
	Range	0~10000	Default	310	Unit	-					
	Valid	Immediate	Index	0x27A8	SubIndex	0x09	Attribute	R/W			
Phase finding integration time constant setting.											

P10.38	Label	Encoder connection to Modbus Port			Valid mode(s)	-	-	-	-	-	-
	Range	0~1	Default	0	Unit	-					
	Valid	Restart	Index	0x27A8	SubIndex	0x27	Attribute		R/W		

10.2.13 [Class 11] Driver Parameters

P11.00	Label	MCU 1 Version			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x01	Attribute	R/W			

P11.01	Label	MCU 2 Version			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x02	Attribute	R/W			

P11.02	Label	FPGA Version			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x03	Attribute	R/W			

P11.06	Label	Driver Voltage Level			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x07	Attribute	R/W			

P11.07	Label	Driver Rated Power			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x08	Attribute	R/W			

P11.08	Label	Driver Rated Current			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x09	Attribute	R/W			

P11.09	Label	Driver Max. Current			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x0A	Attribute	R/W			

P11.12	Label	Death Zone Compensation Factor 1			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x0D	Attribute	R/W			

P11.13	Label	Death Zone Compensation Factor 2			Valid mode(s)	-	-	-	-	-	F
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Immediate	Index	0x27A9	SubIndex	0x11	Attribute	R/W			

P11.16	Label	Analog 1 Zero Drift			Valid mode(s)	-	-	-	-	-
	Range	0x0~0xFF	Default	0	Unit	-				
	Valid	Immediate	Index	0x27A9	SubIndex	0x12	Attribute	R/W		
Set the zero drift compensation value for analog input 1 voltage — this is the zero drift calibration function.										

P11.17	Label	Analog 2 Zero Drift			Valid mode(s)	-	-	-	-	-
	Range	0x0~0xFF	Default	0	Unit	-				
	Valid	Immediate	Index	0x27A9	SubIndex	0x12	Attribute	R/W		
Set the zero drift compensation value for analog input 1 voltage — this is the zero drift calibration function.										

P11.31	Label	Regenerative Vent Control Mode			Valid mode(s)	-	-	-	-	-	-
	Range	0x0~0xFF	Default	0	Unit	-					
	Valid	Restart	Index	0x27A9	SubIndex	0	Attribute	R/W			
Discharge Mode Setting For motors 400W and below, regenerative resistors are not included by default											
Power		Default value		Description							
100/400		1		Regenerative energy is absorbed only by the internal bus capacitors of the driver.							
750 and above		0		Regenerative energy can also be discharged through an external regenerative resistor if available.							

10.2.14 402 Observer

Parameter Valid mode Description

CSP: Valid in cyclic synchronous position mode

CSV: Valid in cyclic synchronous velocity mode

CST: Valid in cyclic synchronous torque mode

HM: Valid in homing mode

PP: Valid in profile position mode

PV: Valid in profile velocity mode

PT: Valid in profile torque mode

F: Valid in all modes

Index 603Fh	Label	Error code			Unit	-	Structure	VAR	Type	Uint 16
	Access	RO	Mapping	TPDO	Mode	F	Range	0x0~0xFFFF	Default	0X0
Please refer to Chapter 9 for more details on error codes.										

Index 6040h	Label	Control word			Unit	-	Structure	VAR	Type	Uint 16
	Access	RW	Mapping	RPDO	Mode	F	Range	0x0-0xFFFF	Default	0X0
	Bit	Label			Description					
	0	Start			1 - valid, 0 - invalid					
	1	Main circuit power on			1 - valid, 0 - invalid					
	2	Quick stop			0 - valid, 1 - invalid					
	3	Servo running			1 - valid, 0 - invalid					
	4-6	Running mode related			Related to each servo running mode					
	7	Fault reset			Reset resettable fault alarm. Rising edge of Bit7 is valid, bit7 remains at 1, and all other instructions are invalid					
	8	Pause			For more information on how to pause in each mode, refer to Object Dictionary 605Dh					
	9	No definition			Undefined					
	10	Reserved			Undefined					
	11-15	Reserved			Undefined					

Index 6041h	Label	Status word			Unit	-	Structure	VAR	Type	Uint 16
	Access	RO	Mapping	TPDO	Mode	ALL	Range	0x0~ 0xFF FF	Default	0x0
	Bit	Label				Description				
	0	Servo ready				1 - valid, 0 - invalid				
	1	Start				1 - valid, 0 - invalid				
	2	Servo running				1 - valid, 0 - invalid				
	3	Fault				1 - valid, 0 - invalid				
	4	Main circuit power on				1 - valid, 0 - invalid				
	5	Quick stop				0- valid, 1 - invalid				
	6	Servo cannot run				1 - valid, 0 - invalid				
	7	Warning				1 - valid, 0 - invalid				
	8	Reserved				Reserved				
	9	Remote control				1 - valid, 0 - invalid				
	10	Arrived at position				1 - valid, 0 - invalid				
	11	Internal limit valid				1 - valid, 0 - invalid				
	12-13	Mode related				Related to each servo operation mode				
	14	Reserved				Reserved				
	15	Origin found				1 - valid, 0 - invalid				

Index 605Ah	Label	Quick stop option code			Unit	-	Structure	VAR	Type	INT 16
	Access	RW	Mapping	-	Mode	ALL	Range	0~7	Default	2
Motor stops when quick stop command is given. PP, CSP, CSV, PV 0 : To stop motor through P05.06. Status: Switch on disable, axis disabled. 1 : Motor decelerates and stops through 6084h. Status: Switch on disable, axis disabled. 2 : Motor decelerates and stops through 6085h. Status: Switch on disable, axis disabled. 3 : Motor decelerates and stops through 60C6h. Status: Switch on disable, axis disabled. 5 : Motor decelerates and stops through 6084h. Status: Quick stop 6 : Motor decelerates and stops through 6085h. Status: Quick stop 7 : Motor decelerates and stops through 60C6h. Status: Quick stop HM 0 : To stop motor through P05.06. Status: Switch on disable, axis disabled. 1 : Motor decelerates and stops through 609Ah. Status: Switch on disable, axis disabled. 2 : Motor decelerates and stops through 6085h. Status: Switch on disable, axis disabled. 3 : Motor decelerates and stops through 60C6h. Status: Switch on disable, axis disabled. 5 : Motor decelerates and stops through 609Ah. Status: Quick stop 6 : Motor decelerates and stops through 6085h. Status: Quick stop 7 : Motor decelerates and stops through 60C6h. Status: Quick stop CST, PT 0 : To stop motor through P05.06. Status: Switch on disable, axis disabled. 1, 2 : Motor decelerates and stops through 6087h. Status: Switch on disable, axis disabled. 3 : Motor decelerates and stops through torque = 0. Status: Switch on disable, axis disabled. 5, 6 : Motor decelerates and stops through 6087h. Status: Quick stop 7 : Motor decelerates and stops through torque = 0. Status: Quick stop										

Index 605Bh	Label	Shutdown option code			Mode						F
	Range	RW	Unit	-	Range	0~1	Default		0		
PP, CSP, CSV, PV 0 : To stop motor through P05.06, P05.06 = 0(Emergency stop), P05.06=1(Free stop) 1 : Motor decelerates and stops through 6084h HM 0 : To stop motor through P05.06, P05.06 = 0(Emergency stop), P05.06=1(Free stop) 1 : Motor decelerates and stops through 609Ah CST, PT 0 : To stop motor through P05.06, P05.06 = 0(Emergency stop), P05.06=1(Free stop) 1 : Motor decelerates and stops through 6087h											

Index 605Ch	Label	Disable operation option code			Mode						F
	Range	RW	Unit	-	Range	0~1	Default			0	
PP, CSP, CSV, PV											
0 : To stop motor through P05.06, P05.06 = 0(Emergency stop), P05.06=1(Free stop)											
1 : Motor decelerates and stops through 6084h											
HM											
0 : To stop motor through P05.06, P05.06 = 0(Emergency stop), P05.06=1(Free stop)											
1 : Motor decelerates and stops through 609Ah											
CST, PT											
0 : To stop motor through P05.06, P05.06 = 0(Emergency stop), P05.06=1(Free stop)											
1 : Motor decelerates and stops through 6087h											

Index 605Dh	Label	Halt option code			Unit	-	Structure	VAR	Type	INT 16
	Access	RW	Mapping	-	Mode	F	Range	1~3	Default	1
For deceleration mode settings during mode switching PP, CSP, CSV, PV 1 : Motor decelerates and stops through 6084h. Status: Operation enabled, axis enabled. 2 : Motor decelerates and stops through 6085h. Status: Operation enabled, axis enabled. 3 : Motor decelerates and stops through 60C6h. Status: Operation enabled, axis enabled. HM 1 : Motor decelerates and stops through 609Ah. Status: Operation enabled, axis enabled. 2 : Motor decelerates and stops through 6085h. Status: Operation enabled, axis enabled. 3 : Motor decelerates and stops through 60C6h. Status: Operation enabled, axis enabled. CST, PT 1, 2 : Motor decelerates and stops through 6087h. Status: Operation enabled, axis enabled. 3 : Motor decelerates and stops through torque = 0. Status: Operation enabled, axis enabled.										

Index 605Eh	Label	Fault reaction option code			Unit	-	Structure	VAR	Type	INT 16
	Access	RW	Mapping	-	Mode	F	Range	0~2	Default	0
Select stopping mode when servo alarm (Err 8xx) occurs. PP, CSP, CSV, PV 0 : Select motor stopping mode according to alarm properties. Status: Fault, axis disabled. 1 : Motor decelerates and stops through 6084h. Status: Fault, axis disabled. 2 : Motor decelerates and stops through 6085h. Status: Fault, axis disabled. HM 0 : Select motor stop by the alarm attribute for emergency stop, the fault state and disable 1 : After the 609Ah motor is decelerated and stopped, the fault state and disable 2 : After the 6085h motor is decelerated and stopped, the fault state and disable CST, PT 0, 1 : Select motor stop by the alarm attribute for emergency stop, the fault state and disable 2 : After the 6087 motor is decelerated and stopped, the fault state and disable When other alarms, i.e. driver-side alarms: Select motor stop by the alarm attribute for emergency stop, the fault state and disable										

Index 6060h	Label	Mode of operation			Unit	-	Structure	VAR	Type	Int 8																								
	Access	RW	Mapping	RPDO	Mode	F	Range	1~11	Default	8																								
<table><tr><th>No.</th><th>Mode</th><th>Abbr.</th></tr><tr><td>1</td><td>Profile position mode</td><td>PP</td></tr><tr><td>3</td><td>Profile velocity mode</td><td>PV</td></tr><tr><td>4</td><td>profile Torque mode</td><td>PT</td></tr><tr><td>6</td><td>Homing mode</td><td>HM</td></tr><tr><td>8</td><td>Cyclic synchronous position mode</td><td>CSP</td></tr><tr><td>9</td><td>Cyclic synchronous velocity mode</td><td>CSV</td></tr><tr><td>10</td><td>Cyclic synchronous torque mode</td><td>CST</td></tr></table>											No.	Mode	Abbr.	1	Profile position mode	PP	3	Profile velocity mode	PV	4	profile Torque mode	PT	6	Homing mode	HM	8	Cyclic synchronous position mode	CSP	9	Cyclic synchronous velocity mode	CSV	10	Cyclic synchronous torque mode	CST
No.	Mode	Abbr.																																
1	Profile position mode	PP																																
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4	profile Torque mode	PT																																
6	Homing mode	HM																																
8	Cyclic synchronous position mode	CSP																																
9	Cyclic synchronous velocity mode	CSV																																
10	Cyclic synchronous torque mode	CST																																

Index 6061h	Label	Mode of operation display			Unit	-	Structure	VAR	Type	Int 8																								
	Access	RW	Mapping	RPDO	Mode	F	Range	1~11	Default	8																								
<table><tr><th>No.</th><th>Mode</th><th>Abbr.</th></tr><tr><td>1</td><td>Profile position mode</td><td>PP</td></tr><tr><td>3</td><td>Profile velocity mode</td><td>PV</td></tr><tr><td>4</td><td>profile Torque mode</td><td>PT</td></tr><tr><td>6</td><td>Homing mode</td><td>HM</td></tr><tr><td>8</td><td>Cyclic synchronous position mode</td><td>CSP</td></tr><tr><td>9</td><td>Cyclic synchronous velocity mode</td><td>CSV</td></tr><tr><td>10</td><td>Cyclic synchronous torque mode</td><td>CST</td></tr></table>											No.	Mode	Abbr.	1	Profile position mode	PP	3	Profile velocity mode	PV	4	profile Torque mode	PT	6	Homing mode	HM	8	Cyclic synchronous position mode	CSP	9	Cyclic synchronous velocity mode	CSV	10	Cyclic synchronous torque mode	CST
No.	Mode	Abbr.																																
1	Profile position mode	PP																																
3	Profile velocity mode	PV																																
4	profile Torque mode	PT																																
6	Homing mode	HM																																
8	Cyclic synchronous position mode	CSP																																
9	Cyclic synchronous velocity mode	CSV																																
10	Cyclic synchronous torque mode	CST																																

Index 6062h	Label	Position demand value			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	PP/CSP/HM	Range	- 2147483648 ~2147483647	Default	0
Reflects position command when servo driver is enabled.										

Index 6063h	Label	Position actual internal value			Unit	Encoder unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	F	Range	- 2147483648 ~2147483647	Default	0
Reflects motor absolute position (Encoder unit)										

Index 6064h	Label	Position actual value			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	F	Range	- 2147483648 ~2147483647	Default	0

Reflects user's real time absolute position

6064h*Gear ratio = 6063h

Index 6065h	Label	Follow error window			Unit	Command unit	Structure	VAR	Type	UInt 32
	Access	RO	Mapping	TPDO	Mode	PP/CSP/HM	Range	0~2147483647	Default	0

To set an acceptable deviation for requested position.

When actual position exceed position deviation window, error might occur.

Index 6066h	Label	Follow error time out			Unit	ms	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	PP/CSP/HM	Range	0~65535	Default	0

To set position deviation detection time

Index 6067h	Label	Position window			Unit	Command unit/s	Structure	VAR	Type	UInt 32
	Access	RO	Mapping	TPDO	Mode	PP/CSP/HM	Range	0~2147483647	Default	0

To set an acceptable extent of arrival position

Index 6068h	Label	Position window time			Unit	Command unit/s	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	PP/CSP/HM	Range	0~65535	Default	0

To set the time between arrival to the output of INP (In position) signal.

Index 606Bh	Label	Velocity demand value			Unit	Command unit/s	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	ALL	Range	- 2147483648 ~2147483647	Default	0

To set the time between arrival to the output of INP (In position) signal.

Index 606Ch	Label	Velocity actual value			Unit	Command unit/s	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	CSV/PP	Range	- 2147483648 ~2147483647	Default	0

Reflects user's internal command velocity feedback value

Index 606Dh	Label	Velocity window			Unit	Command unit/s	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	RPDO	Mode	PV/CSV	Range	0~65535	Default	10

Set the range of velocity

Index 606Eh	Label	Velocity window time			Unit	ms	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	RPDO	Mode	PV/CSV	Range	0~65535	Default	0

To set the time between velocity reached and status word set to Target Reached.

Index 606Fh	Label	Velocity threshold			Unit	Command unit/s	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	RPDO	Mode	PV/CSV	Range	0~65535	Default	10
To set to zero-speed threshold.										

Index 6070h	Label	Velocity threshold time			Unit	ms	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	RPDO	Mode	PV/CSV	Range	0~65535	Default	100
To set the time until status word – zero speed detection is canceled.										

Index 6071h	Label	Target torque			Unit	0.1%	Structure	VAR	Type	UInt 16
	Access	RW	Mapping	RPDO	Mode	PT/CST	Range	- 32768~3 2767	Default	0
To set target torque for protocol and cyclic torque mode.										

Index 6072h	Label	Maximum torque			Unit	0.1%	Structure	VAR	Type	UInt 16
	Access	RW	Mapping	RPDO	Mode	F	Range	0~65535	Default	3000
To set max. torque for servo driver. Limited by motor max. torque.										

Index 6073h	Label	Maximum current			Unit	0.1%	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	F	Range	0~65535	Default	3000
To set max. current for servo driver.										

Index 6074h	Label	Torque demand			Unit	0.1%	Structure	VAR	Type	Int 16
	Access	RO	Mapping	TPDO	Mode	F	Range	- 32768~3 2767	Default	0
Internal command torque										

Index 6075h	Label	Motor rated current			Unit	mA	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	F	Range	0~21474 83647	Default	3000
Shows motor rated current.										

Index 6077h	Label	Torque actual value			Unit	0.1%	Structure	VAR	Type	Int 16
	Access	RO	Mapping	TPDO	Mode	F	Range	- 32768~3 2767	Default	0
Shows servo driver actual torque feedback										

Index 6079h	Label	DC link circuit voltage			Unit	mV	Structure	VAR	Type	UInt 32
	Access	RO	Mapping	TPDO	Mode	F	Range	0~21474 83647	Default	0
Shows DC bus voltage across P, N terminals										

Index 607Ah	Label	Target position			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RW	Mapping	TPDO	Mode	PP/CSP	Range	- 2147483647 ~2147483647	Default	0
To set the target position under protocol and cyclic position mode.										

Index 607Ch	Label	Home offset			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RW	Mapping	TPDO	Mode	HM	Range	- 2147483647 ~2147483647	Default	0

To set position offset to compensate for the deviation of mechanical origin from motor origin under homing

Index 607Dh-01	Label	Min. position limit			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RW	Mapping	TPDO	Mode	HM	Range	- 2147483647~ 2147483647	Default	0

To set lower limit with calculated position and actual position using absolute position after homing.

Index 607Dh-02	Label	Max. position limit			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RW	Mapping	TPDO	Mode	HM	Range	- 2147483647~ 2147483647	Default	0

To set upper limit with calculated position and actual position using absolute position after homing.

Index 607Eh	Label	Polarity			Unit	-	Structure	VAR	Type	UInt 8
	Access	RW	Mapping	RPDO	Mode	HM	Range	0x0 – 0xFF	Default	0x0

Mode		Value
Position mode	PP	0: Rotate in the same direction as the position command 128: Rotate in the opposite direction to the position command
	HM	
	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 mode		0: Rotate in the same direction as the position command 224: Rotate in the opposite direction to the position command

Sets the input polarity of the command.

Index 607Fh	Label	Maximum profile velocity			Unit	Command unit/s	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	PP/HM/PV/CST	Range	0~214 74836 47	Default	2147483647

To set maximum allowable velocity. Limited by 6080.

Index 6080h	Label	Maximum motor speed			Unit	R/min	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	F	Range	0~214 74836 47	Default	6000

To set the maximum allowable motor speed.

Index 6081h	Label	Profile velocity			Unit	Command unit/s	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	PP	Range	0~214 74836 47	Default	10000

To set target velocity. Limited by 607Fh.

Index 6083h	Label	Profile acceleration			Unit	Command unit/s ²	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	PP/PV	Range	1~214 74836 47	Default	10000
To set motor acceleration										

Index 6084h	Label	Profile deceleration			Unit	Command unit/s ²	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	CSP/CSV/ PP/PV/HM	Range	1~214 74836 47	Default	10000000
To set motor deceleration										

Index 6085h	Label	Quick stop deceleration			Unit	Command unit/s ²	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	PP/PV	Range	1~214 74836 47	Default	10000
To set the deceleration during an emergency stop										

Index 6087h	Label	Torque slope			Unit	%1/s	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	PT	Range	1~214 74836 47	Default	5000
To set values for tendency torque command										

Index 608Fh-01	Label	Encoder increments			Unit	Encoder unit	Structure	VAR	Type	UInt 32
	Access	RO	Mapping	TPDO	Mode	F	Range	1~214 74836 47	Default	0
To set encoder resolution										

Index 6091h-01	Label	Electronic gear ratio numerator			Unit	r	Structure	VAR	Type	Dint 32
	Access	RW	Mapping	RPDO	Mode	F	Range	1- 2147483 647	Default	1
To set electronic gear ratio numerator										

Index 6091h-02	Label	Electronic gear ratio denominator			Unit	r	Structure	VAR	Type	Dint 32
	Access	RW	Mapping	RPDO	Mode	F	Range	1- 2147483 647	Default	1
To set electronic gear ratio denominator										

Index 6092h-01	Label	Number of pulses per rotation			Unit	Comman d unit/r	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	F	Range	1~21474 83647	Default	10000
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										

Index 6098h	Label	Homing method			Unit	-	Structure	VAR	Type	UInt 8
	Access	RW	Mapping	RPDO	Mode	F	Range	-6-37	Default	19
The table below describes the velocity, direction and stopping conditions of each homing methods.										
Value	Description									
	Velocity	Direction	Stop							
-6	Low	Negative	When torque reached							
-5	Low	Positive	When torque reached							
-4	High	Negative	Inversed when torque reached, after torque is gone							
-3	High	Positive	Inversed when torque reached, after torque is gone							
-2	High	Negative	Inversed when torque reached, received 1 st Z-signal after torque is gone							
-1	High	Positive	Inversed when torque reached, received 1 st Z-signal after torque is gone							
	Direction	Deceleration point		Home		Before Z-signal				
1	Negative	Negative limit switch		Motor Z-signal		Negative limit switch falling edge				
2	Positive	Positive limit switch		Motor Z-signal		Positive limit switch falling edge				
3	Positive	Homing switch		Motor Z-signal		Falling edge on same side of homing switch				
4	Positive	Homing switch		Motor Z-signal		Rising edge on same side of homing switch				
5	Negative	Homing switch		Motor Z-signal		Falling edge on same side of homing switch				
6	Negative	Homing switch		Motor Z-signal		Rising edge on same side of homing switch				
7	Positive	Homing switch		Motor Z-signal		Falling edge on same side of homing switch				
8	Positive	Homing switch		Motor Z-signal		Rising edge on same side of homing switch				
9	Positive	Homing switch		Motor Z-signal		Rising edge on same side of homing switch				
10	Positive	Homing switch		Motor Z-signal		Falling edge on same side of homing switch				
11	Negative	Homing switch		Motor Z-signal		Failling edge on same side of homing switch				
12	Negative	Homing switch		Motor Z-signal		Rising edge on same side of homing switch				
13	Negative	Homing switch		Motor Z-signal on other side of homing switch		Rising edge on other side of homing switch				
14	Negative	Homing switch		Motor Z-signal on other side of homing switch		Falling edge on other side of homing switch				
15										
16										
17-32	Similar with 1-14, but deceleration point = homing point									
33	Home in negative direction, Homing point = motor Z-signal									
34	Home in positive direction, Homing point = motor Z-signal									
35-37	Set current position as homing point									

Index 6099h-01	Label	Speed during search for switch			Unit	Command unit/s	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	HM	Range	0~214 74836 47	Default	10000
To set the speed used in homing										

Index 6099h-02	Label	Speed during search for zero			Unit	Command unit/s	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	HM	Range	0~2147483647	Default	5000
To set the speed used in homing										

Index 609Ah	Label	Homing acceleration /deceleration			Unit	Command unit/s ²	Structure	VAR	Type	UInt 32
	Access	RO	Mapping	TPDO	Mode	HM	Range	1~2147483647	Default	500000
To set acceleration and deceleration used in homing										

Index 60B0h	Label	Position offset			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	HM	Range	-2147483647~2147483647	Default	0
To set servo driver position command offset value under CSP mode (Position feedforward) Servo target position=607A+60B0										

Index 60B1h	Label	Velocity offset			Unit	Command unit/s	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	CSP/CSV/PP/PV/HM	Range	-2147483647~2147483647	Default	0
To deviate velocity command										

Index 60B2h	Label	Torque offset			Unit	0.1%	Structure	VAR	Type	Int 16
	Access	RW	Mapping	RPDO	Mode	CSP/CSV/PP/PV/HM	Range	0x0~0xFFFF	Default	0x0
To add or deviate torque command										

Index 60B8h	Label	Probe function			Unit	-	Structure	VAR	Type	UInt 16
	Access	RW	Mapping	RPDO	Mode	F	Range	0x0-0xFFFF	Default	0x0
		Bit	Description		Details					
		0	Probe 1		0--Disable 1--Enable					
		1	Probe 1 trigger mode		0--Single trigger, triggered only when trigger signal is valid 1--Continuous trigger					
		2	Probe 1 trigger signal selection		0--Probe 1 captured 1--Z signal					
		3	Reserved		-					
		4	Probe 1 rising edge enabled		0--Disable 1--Enable					
		5	Probe 1 falling edge enabled		0--Disable 1--Enable					
		6-7	Reserved		-					
		8	Probe 2		0--Disable 1--Enable					
		9	Probe 2 trigger mode		0--Single trigger, triggered only when trigger signal is valid 1--Continuous trigger					
		10	Probe 2 trigger signal selection		0--Probe 2 captured 1--Z signal					
		11	Reserved		-					
		12	Probe 2 rising edge enabled		0--Rising edge not latched 1--Rising edge latched					
		13	Probe 2 falling edge enabled		0--Falling edge not latched 1--Falling edge latched					
		14-15	Reserved		-					

Index 60B9h	Label	Probe status			Unit	-	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	F	Range	00x-0xFFFF	Default	0x0
		Bit	Definition		Details					
		0	Probe 1		0--Disable 1--Enable					
		1	Probe 1 rising edge latching		0--Rising edge not latched 1--Rising edge latched					
		2	Probe 1 falling edge latching		0--Falling edge not latched 1--Falling edge latched					
		3-5	-		-					
		6-7	-		-					
		8	Probe 2		0--Disable 1--Enable					
		9	Probe 2 rising edge latching		0--Rising edge not latched 1--Rising edge latched					
		10	Probe 2 falling edge latching		0--Falling edge not latched 1--Falling edge latched					
		11-13	-		-					
		14-15	-		-					

Index 60BAh	Label	Probe 1 positive position			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	F	Range	- 2147483647~ 2147483647	Default	0
Shows position feedback at rising edge of probe 1 signal										

Index 60BCh	Label	Probe 2 positive position			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	F	Range	- 2147483647~ 2147483647	Default	0
Shows position feedback at rising edge of probe 2 signal										

Index 60BDh	Label	Probe 2 negative position			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	F	Range	- 2147483647~ 2147483647	Default	0
Shows position feedback at falling edge of probe 2 signal										

Index 60C5h	Label	Maximum acceleration			Unit	Command unit/s ²	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	F	Range	1~2147483647	Default	100000000
To set upper limit of acceleration.										

Index 60C6h	Label	Maximum deceleration			Unit	Command unit/s ²	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	F	Range	1~2147483647	Default	100000000
To set lower limit of acceleration.										

Index 60D5h	Label	Probe 1 positive edge counter			Unit	-	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	F	Range	0~65535	Default	0
Shows the number of times probe 1 rising edge latched.										

Index 60D6h	Label	Probe 1 negative edge counter			Unit	-	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	F	Range	0~65535	Default	0
Shows the number of times probe 1 falling edge latched.										

Index 60D7h	Label	Probe 2 positive edge counter			Unit	-	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	F	Range	0~65535	Default	0
Shows the number of times probe 2 rising edge latched.										

Index 60D8h	Label	Probe 2 negative edge counter			Unit	-	Structure	VAR	Type	UInt 16
	Access	RO	Mapping	TPDO	Mode	F	Range	0~65535	Default	0
Shows the number of times probe 2 falling edge latched.										

Index 60E0h	Label	Positive torque limit			Unit	0.1%	Structure	VAR	Type	UInt 16
	Access	RW	Mapping	RPDO	Mode	F	Range	0~65535	Default	3000
To set the maximum torque of servo driver in positive direction										

Index 60E1h	Label	Negative torque limit			Unit	0.1%	Structure	VAR	Type	UInt 16
	Access	R W	Mapping	RPDO	Mode	F	Range	0~65535	Default	3000
To set the maximum torque of servo driver in negative direction										

Index 60F4h	Label	Actual following error			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	CSP/PP/H M	Range	- 2147483647 ~2147483647	Default	0
Shows position following error										

Index 60FAh	Label	Control effort			Unit	Command unit/s	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	CSP/PP/H M	Range	- 2147483647 ~2147483647	Default	0
Shows internal command velocity (Position loop output)										

Index 60FCh	Label	Position demand value			Unit	Encoder unit	Structure	VAR	Type	Int 32
	Access	RO	Mapping	TPDO	Mode	CSP/PP/H M	Range	- 2147483647 ~2147483647	Default	0
Shows internal command position of servo driver.										

Index 60FDh	Label	Digital Input status			Unit	-	Structure	VAR	Type	UINT 32
	Access	RO	Mapping	TPDO	Mode	CSP/PP/H M	Range	- 2147483648 ~214748364 7	Default	0
The bits of 60FDh object are functionally defined as follow:										
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24			
Z signal	Reserved	Reserved	Reserved	Probe 2	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			

Index 60FEh-01	Label	Physical outputs			Unit	-	Structure	VAR	Type	UInt 32
	Access	RW	Mapping	RPDO	Mode	F	Range	0x0~0x7FFF FFFF	Default	0x0

The bits of 60FEh object are functionally defined as follow:

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

Index 60FEh-02	Label	Bit mask			Unit	-	Structure	VAR	Type	UInt 32
	Access	R W	Mapping	RPDO	Mode	F	Range	0x0~0x7FFFFFFF	Default	0xFFFF0000

The bits of a 60FEh object are functionally defined as follow:

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

Index 60FFh	Label	Target velocity			Unit	Command unit	Structure	VAR	Type	Int 32
	Access	RW	Mapping	RPDO	Mode	CSV/PV	Range	- 2147483647~2147483647	Default	0

Shows set target velocity. Limited by 6080h

Index 6502h	Label	Supported operation modes			Unit	-	Structure	VAR	Type	UInt 32
	Access	RO	Mapping	TPDO	Mode	F	Range	0x0~0x7FFFFFFF	Default	0x0

Shows the control modes supported by the servo driver.