MiSUMi

AC Servo Driver
E-DFAS□□E Series (EtherCAT Type)

User Manual

Ver1.0

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Preface

Thank you for purchasing the E-DFAS□□E Series AC Servo Driver.
This product series covers a power range from 100W to 1kW and supports the EtherCAT communication protocol. With the corresponding communication interface, it can be connected to an upper-level controller (including controllers and PLCs) to enable multi-axis networked servo driver operations.
The driver features one-click auto-tuning, stiffness table setup, inertia identification, vibration suppression, and Type-C debugging—making setup and adjustment easy.

Standard features include dynamic braking and a black box function. It is ideal for automation in semiconductors, lithium battery, photovoltaics, electronics, and machine tools—offering high performance and improved efficiency.
This manual provides essential usage instructions, installation guidelines, tuning, maintenance, function descriptions, and parameter settings.

First-time users should read carefully. For any questions, please contact our technical support team.
Thank you for choosing us!

How to Obtain the Manual
This manual is not included with the product shipment.
To obtain the PDF electronic version, please visit the official MISUMI website:
Vietnam: *http://vn.misumi-ec.com*
Thailand: *https://th.misumi-ec.com*
Malaysia: *https://my.misumi-ec.com*
India: *https://in.misumi-ec.com*
Singapore: *https://sg.misumi-ec.com*
Indonesia: *https://id.misumi-ec.com*
and download it from the corresponding product series page.

Caution!
Improper operation may cause unexpected accidents. Please read this manual carefully before using the system.
Due to product improvements, the contents of this manual are subject to change without prior notice.
Our factory will not be responsible for any changes made by the user to the product, and the product warranty will be invalidated.

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

About This Manual

Purpose and Scope

This manual provides the information required to safely install, wire, configure, commission, operate, maintain, and troubleshoot the Servo Drive and Servo Motor system.
It is intended to help users achieve reliable operation while minimizing commissioning time and preventing equipment damage caused by incorrect installation or parameter settings.

This manual covers the following topics:

- Product overview and system configuration
- Installation requirements
- Electrical wiring
- Connector descriptions
- Control modes and operating principles
- Parameter configuration
- Commissioning procedures
- EDrive software operation
- Communication setup
- Built-in functions
- Maintenance
- Alarm diagnosis and troubleshooting

Intended Readers and Required Competence

This manual is intended for:

- Machine builders
- System integrators
- Electrical design engineers
- Mechanical engineers
- Commissioning engineers
- Maintenance engineers
- Technical support personnel

Readers should have basic knowledge of:

- Industrial electrical systems
- Servo motors and motion control
- AC power distribution
- Industrial wiring practices

Installation, commissioning, and maintenance shall be performed only by qualified personnel familiar with applicable electrical safety regulations.

How to Use This Manual

This manual is organized according to the typical engineering workflow, from product selection through commissioning and maintenance.
For first-time users, it is recommended to follow the chapters in sequence.
Experienced users may refer directly to the relevant chapters using the table of contents or index.
Important safety information should always be read before performing installation or commissioning.
Whenever a parameter or function is referenced, the corresponding chapter provides detailed descriptions, operating limitations, and related settings.

Safety precautions

In order to prevent personal injury and property damage, the following statements are made for matters that must be followed. When reading this manual, please pay special attention to the following warning signs:

⚠Warning: “Warning” Incorrect operation may cause death or serious injury.
⚠Caution: “Caution” Incorrect operation may cause injury or equipment damage.
⚠Notice: “Notice” Improper use may damage the product or equipment.

Safety Rules
⚠Warning This product is not intended for safety-critical machinery or systems. Users must implement proper safety measures to prevent accidents.
Inspection
⚠Caution Do not install if the product or accessories are damaged or rusted upon unpacking. Do not install if there is water inside, missing parts, or damaged components. Check the packing list carefully; do not install if it does not match the product.
⚠Notice Do not forcibly remove packaging or handle roughly to avoid damage to components. Do not use damaged or faulty products.
Storage and Transportation
⚠Caution Store and transport the product according to specified environmental conditions. Do not stack too high to prevent falls. Ensure proper packaging during transit. Do not drag cables, motor shafts, or encoders when handling servo motors. Avoid applying external force or impacts to servo drivers and motors.
⚠Notice Handle the product with care, lift and place gently, and watch your footing to prevent trips or drops, which may cause injury or damage. During storage or transport, avoid direct contact with terminals or driver circuits without electrostatic protection to prevent damage. Avoid storing or transporting in places exposed to water, rain, direct sunlight, strong electric or magnetic fields, or severe vibration. Do not store the product for more than 3 months; if stored longer, apply stricter protection and inspections. Do not mix-pack this product with items that could affect or damage it during transport.
Installation
⚠Warning Only trained professionals with electrical knowledge are allowed to operate. Operation by unqualified personnel is strictly prohibited

⚠Caution
Servo Driver and Servo Motor:
Do not install on or near flammable materials to prevent fire.
Avoid vibration and strictly prohibit impacts.
Do not install if the unit is damaged or has missing parts.
Discharge static electricity before operating buttons or switches on the driver, or equipment damage may occur.
Servo Driver:
Must be installed inside a control cabinet with sufficient protection rating.
Maintain adequate clearance from other devices.
Ensure proper heat dissipation. If installed in a sealed environment, use cooling devices (fans or air conditioners) to meet environmental requirements, or overheating/fire may result.
Prevent the entry of dust, corrosive gases, conductive materials, liquids, and flammable or explosive substances.
Servo Motor：
Must be mounted securely to prevent loosening due to vibration.
Prevent liquid ingress to avoid motor or encoder damage.
Do not strike the motor or shaft to avoid encoder damage.
The motor shaft must not be subjected to loads beyond its rated limits.

Wiring
⚠Caution Only qualified personnel may perform wiring or inspection. Wait at least 10 minutes after power-off before starting. Properly ground the servo driver and motor to avoid electric shock. Incorrect voltage or polarity may cause accidents or explosions. Connect wires only after installation is complete. Ensure wire insulation and avoid pinching to prevent shock. Never wire, open covers, or touch circuits with power on.
⚠Caution Wiring must be correct and secure to avoid malfunction or damage Do not reverse U/V/W motor terminals or connect to AC power Connect motor directly to the servo driver—no capacitors, inductors, or filters Prevent conductive parts or wire ends from entering the driver Keep wires and heat-sensitive parts away from heatsinks and motors Do not reverse the flyback diode on output signal relays Use cables with proper gauge and shielding; ground shield at one end Follow ESD precautions and wear an anti-static wrist strap For control circuits, use twisted shielded wire and ground the shield to the terminal

Power-On
⚠Warning Before power-on, ensure proper installation and secure wiring of control, main power, and motor output circuits. Do not touch any terminals while the product is powered on.
Debugging Operation
⚠Caution Before power-on, confirm proper installation, secure wiring, and correct power within rating. During setup, run motor unloaded first; verify settings before load testing to avoid damage.
Usage

⚠Caution An emergency stop circuit must be installed to immediately stop operation and cut power in case of an accident. Before resetting an alarm, ensure the run signal is off to prevent sudden restart. Use the servo driver only with the specified servo motor. Avoid frequently turning the servo system power on and off to prevent damage. The servo driver and motor may become hot during and shortly after operation; do not touch the heatsink or motor. Do not modify the servo system.
Troubleshooting
⚠Caution High voltage may remain in the servo driver for some time after power off; do not disconnect wires or touch terminals within 5 minutes. Only qualified personnel with proper knowledge should perform disassembly and maintenance.
⚠Caution After an alarm, troubleshoot and clear the cause, then reset the alarm before restarting. Keep away from the machine when power returns after a blackout, as it may start unexpectedly (the design should prevent hazards on restart).
System Matching
⚠Notice The servo motor's rated torque must exceed the effective continuous load torque. The load inertia to servo motor inertia ratio should be below the recommended value. The servo driver and motor must be used as a matched pair.

Other Notes **Dynamic brake**

- The dynamic brake should only be used for emergency stops during faults or sudden power loss. Do not trigger faults or power loss frequently.
- At high speeds, ensure the dynamic brake has at least a 5-minute interval between activations to prevent damage to the internal brake circuit.
- In rotating machinery, after dynamic braking stops the motor, the motor may be driven by the load on the shaft and act as a generator. Continuous external rotation for a long time can cause short-circuit current in the dynamic brake, potentially leading to smoke, fire, or motor damage.

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 customer 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 damages caused by product defects is limited to the purchase price of the damaged product.
Orders will not be accepted without the customer’s 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 done by returning the product; 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 Introduction

1.1 Incoming Inspection

Upon receipt, the following inspections must be performed:
The packaging box is intact, and the goods are not damaged during transportation.
Verify the nameplates on the servo driver and servo motor to ensure the received goods match the order.
Check the packing list to confirm all accessories are included.
Note:
Do not install any servo system that is damaged or has missing parts.
The servo driver must be used with a servo motor matching specifications.
If you have any questions after receiving the goods, please contact the supplier or our company.

1.2 Model Identification

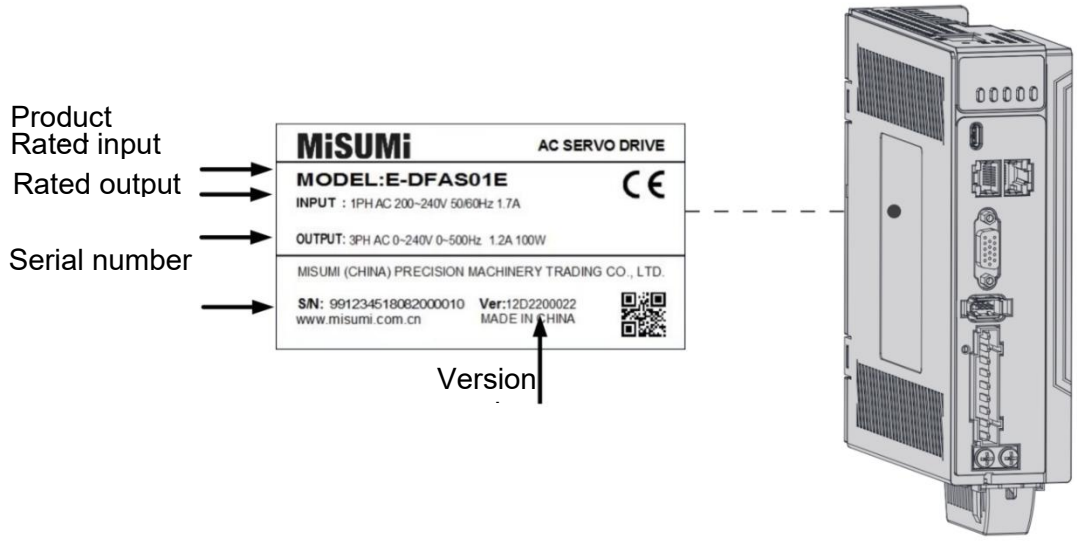
1.2.1 Servo Driver

Servo Driver Model Identification Method

E-DFAS ① 01 ② E ③ - □ ④ □ ⑤

① Product Series E-DFAS: Economy AC Servo Driver	② Power Rating (W) 01：100W 04：400W 08：750W 10：1000W	③ Product Type P: Pulse Train + RS485 E: EtherCAT
④ Design Version Blank: Standard version		⑤ Voltage Level (V) Blank: 220V

Driver Nameplate



1.2.2 Servo Motor

E-MAS Series Servo Motor Model Identification

E-MAS H 2 - 04 01 □ B □

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Product Category E-MAS: MISUMI E-MAS series Servo Motor	④ Frame Size (mm) 04: 40mm 06: 60mm 08: 80mm	⑦ Brake Type Blank: No brake B: With brake
② Inertia Type S: Low Inertia H: High Inertia	⑤ Power Rating (W) 01：100W 02：200W 04：400W 08：750W 10：1000W	⑧ Connector Type Blank: Straight plug
③ Product Series 2: General type, 23-bit encoder	⑥ Voltage Level (V) Blank: 220V	

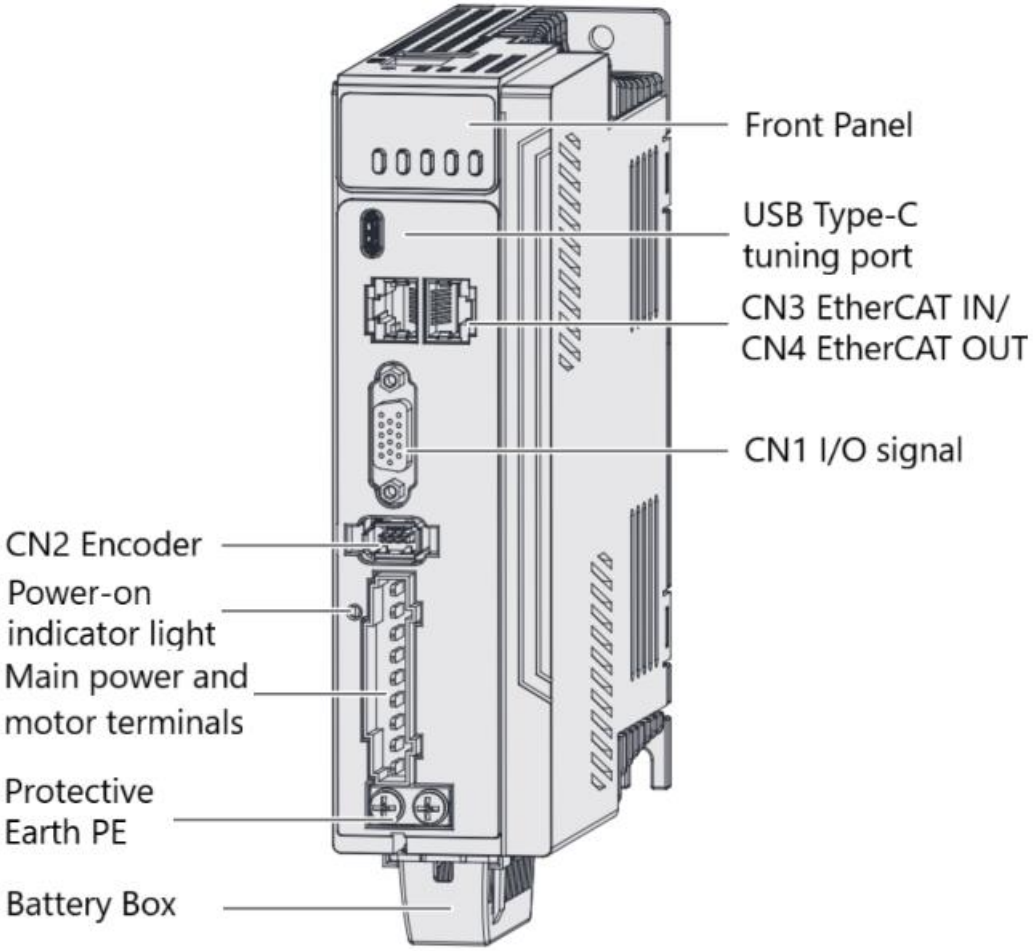
Servo Motor Nameplate Overview



1.3 Component Description

1.3.1 Servo Driver Ports and Connectors

E-DFAS01E~E-DFAS10E



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*
USB Type-C tuning port	Connect to computer for tuning of servo driver. Parameters of the servo driver can be modified without connecting to main power supply.
CN3 EtherCAT IN/ CN4 EtherCAT OUT	Connect to master device or next/previous slave station
CN1 I/O signal	Probe input signal & other I/O signals terminals
CN2 Encoder	Connect to motor encoder
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.
L1, L2	Main power supply 220VAC
P+, Br	Connect to regenerative resistor
P+, N	Common DC bus terminals for multiple drivers
U, V, W	Motor connector: Connect to U, V, W power terminals on servo motor
PE	PE motor earth terminal: Connect to motor PE terminal
Protective Earth PE	Connect to PE of main power supply. For grounding
Battery Box	When using an absolute encoder, install the battery box in this position.

Note

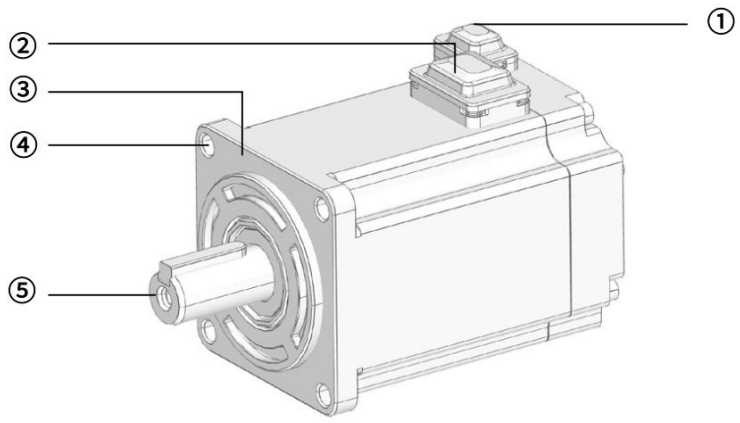
- For the E-DFAS□□E series drivers, 100W and 400W models do not have built-in regenerative braking resistors. All other power levels include built-in regenerative braking resistors. If need to use an external regenerative resistor, connect it between terminals P+ and Br.
- Thickness may vary between different power levels, but the components remain consistent.

1.3.2 Motor Ports and Connectors

Servo motor appearance and components description

Motor (40&60&80 Frame size)

Direct plug-in servo motor (40&60&80 Frame size)



No.	Component Name
①	Encoder connector
②	Power connector
③	Motor flange
④	Mounting hole
⑤	Motor shaft

1.4 Driver Technical Specification

1.4.1 Electrical Specification

E-DFAS□□E series		E-DFAS01E	E-DFAS04E	E-DFAS08E	E-DFAS10E
Rated power (W)		100	400	750	1000
Rated Current (Arms)		1.2	3.5	5.5	7.0
Peak Current (Arms)		4.8	9.5	16.6	21.0
Single Phase Continuous Input Current (Arms)		1.7	5.0	7.9	8.8
Control Circuit Power Supply		Single phase AC 200V~240V, -10%~+10%, 50/60Hz			
Main Power Supply		Busbar power supply, shared power input and rectification			
Regenerative Resistor	**Resistance (Ω)**	-		50	50
	Power (W)			75	75
Cooling method		Natural cooling		Fan cooling	
Dimension H*L*W (mm)		175*156*40		175*156*50	

1.4.2 General Specification

Interface Configuration		
Communication Interface	Supports EtherCAT, enabling real-time motion command transmission, parameter configuration, and status monitoring	
Debug Port	TYPE-C debug interface, supports USB power-only operation for parameter modification and import/export	
Probe Function	Supports DI4/DI5 probe inputs. Captures position data when external DI signals or motor Z signals change.	
Digital Inputs	4 points (supports both sinking and sourcing types) DI1, DI2, DI3, DI6	
Digital Outputs	3 points (dual-ended DO1 ~ DO3) 50mA, voltage range 12V ~ 24V	
Control Mode		
Control Mode	PP: Position mode (via protocol) PV: Velocity mode PT: Torque mode HM: Homing mode	CSP: Cyclic synchronous position mode CSV: Cyclic synchronous velocity mode CST: Cyclic synchronous torque mode
Control Characteristics		
Control Method	IGBT SVPWM sine wave control	
Feedback Method	Bus-type encoder using RS485 protocol	
Normalized Servo Parameters	PC debugging tool supports quick servo tuning using parameters like rigidity	
Ease-of-Use Features	Auto tuning, Single-parameter tuning, Super-following function	
Notch Filters	Suppress mechanical resonance, supports 3 notch filters, frequency range: 50Hz ~ 4000Hz	
Oscillation Suppression	End-point vibration suppression	
DI/DO Configuration	Digital input/output functions can be freely assigned	
Alarm Functions	Overvoltage, Undervoltage, Overcurrent, Overload, Overheating, Overspeed, Missing main power phase, Regenerative braking fault, Excessive position deviation, Encoder feedback error, Excessive braking rate, Travel limit exceeded, EEPROM error, .etc.	
Operation & Display	5 buttons, 5 digits LED with decimal point	
Debugging Software	Using MISUMI EDrive software to adjust current loop, position loop, and speed loop parameters, modify input/output signal logic levels, import/export motor and driver parameters via file, monitor waveform data such as speed and position error during trapezoidal test runs	
Communication Functions	USB Support: Based on Modbus protocol (USB 2.0 spec), allows PC connection for parameter setting and status monitoring.	
	EtherCAT Support: E-DFAS□□E model supports EtherCAT bus communication via RJ45 interface	
Dynamic Brake	Built-in dynamic brake	
Black Box	Supports black box data capture. Records data before and after preset conditions. Compatible with MISUMI EDrive software for data reading and analysis.	
Applicable Load Inertia	Recommended for loads with inertia less than 30× motor inertia	
Digital Input		

Digital Input	4 points (supports both sinking and sourcing types) DI1, DI2, DI3, DI6 Configurable input signals: Clear Alarm (A-CLR), Positive limit switch (POT), Negative limit switch (NOT), Homing switch (HOME-SWITCH), Emergency stop (E-Stop)
Digital Output	
Digital Output	3 points (dual-ended) Configurable input 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), Dynamic brake output, Z phase output
Environment	
Temperature	Operating Temperature: 0°C to 55°C (non-freezing). If temperature exceeds 45°C, apply derating[1]. Reduce by 2% for every 1°C above 45°C Storage Temperature: -40°C to 80°C (no condensation). If storage temperature exceeds 65°C, do not store for more than 72 hours!
Humidity	Under 90%RH (Condensation free)
Altitude	Maximum altitude: 2000 meters No derating required below 1000 meters Above 1000 meters, derate by 1% for every 100 meters For usage above 2000 meters, please contact the manufacturer
Vibration	Less than 0.5G (4.9m/s^2) 10-60Hz (non-continuous working)
IP ratings	IP20

Note
[1] Please install the servo driver within the specified ambient temperature range. If stored inside an electrical cabinet, ensure that the internal cabinet temperature does not exceed this specified range.

1.5 Motor General Specifications

1.5.1 Mechanical Characteristic Specifications

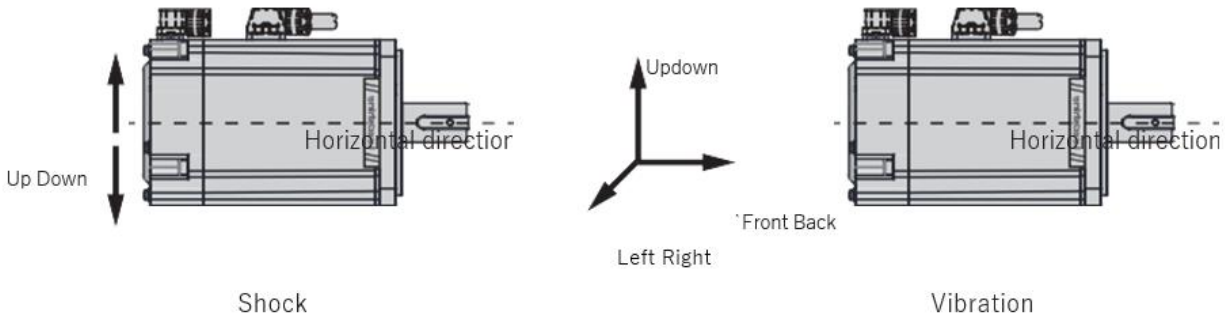
Item		Description
Duty Cycle		Continuous
Vibration Class		V15
Insulation Resistance		DC500V, over 100 MΩ
Excitation Method		Permanent Magnet
Mounting Method		Flange Type
Thermal Class		Class F
Insulation Voltage		AC1500V for 1 minute
Enclosure Protection		IP67 (excluding shaft end and cable outlet)
Rotation Direction		CCW (counterclockwise) when viewed from the load side under forward command
Environmental Conditions	Temperature	0℃ ~40℃（No Freezing）
	Humidity	20%~80%（No condensation）
	Installation Location	• Indoor, free from corrosive or explosive gases • Well-ventilated, minimal dust, debris, or humidity • Easy to inspect and clean • Operate normally below 1000m; derate above 1000m • Free from strong magnetic fields • Away from heat sources such as furnaces • For environments with grinding fluid, oil mist, iron dust, or cutting debris, select models with oil seal
	Storage Environment	When storing the motor unpowered, comply with the following: • Storage temperature: -20°C ~ +60°C (non-freezing) • Storage humidity: 20% ~ 80% RH (non-condensing)
Shock Resistance [1]	Shock acceleration (measured at flange face):	$490 m/s^2$
Vibration Resistance [2]	Vibration acceleration (measured at flange face)	$49 m/s^2$

Note

[1] Shock resistance applies in the vertical direction when the motor is mounted horizontally.

[2] Vibration resistance applies in all three directions (up/down, left/right, front/back) for horizontal mounting.

Actual vibration levels vary by application; verify with real-world use.



1.5.2 Electrical Specifications of Motor's Brake

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC)±10 %	Closing Voltage (V)	Release Voltage (V)	Release Time (ms)	Closing time (ms)	Rotary clearance (°)
E-MASH2-0401B	≥ 0.4	24	≤ 16	≥ 1	≤ 20	≤ 40	＜ 1.5
E-MASH2-0602B	≥ 1.5		≤ 16	≥ 1	≤ 20	≤ 50	≤ 1
E-MASH2-0604B	≥ 1.5		≤ 16	≥ 1	≤ 20	≤ 50	≤ 1
E-MASH2-0808B	≥ 3.2		≤ 16	≥ 1	≤ 40	≤ 60	≤ 1
E-MASH2-0810B	≥ 3.2		≤ 16	≥ 1	≤ 40	≤ 60	≤ 1

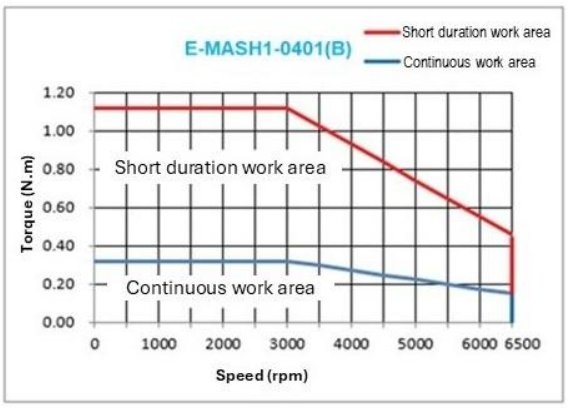
1.5.3 Load Moment of Inertia

Load inertia is the inertia of the load. Larger load inertia reduces responsiveness and may cause instability. Servo motors have limits on allowable load inertia, which vary by drive conditions.
Exceeding this limit can trigger an overvoltage alarm during deceleration or an overload alarm if the servo has a built-in braking resistor.
If alarms occur, take appropriate corrective actions:
Reduce the torque limit.
Decrease the deceleration rate.
Lower the maximum speed.
If alarms persist after these measures, use an external braking resistor.
⚠Caution
Even when using a built-in braking resistor, under certain regenerative drive conditions, the generated energy may exceed the allowable dissipation capacity (W) of the built-in resistor. In such cases, an external braking resistor is required.

1.6 Motor Specifications

Motor Model	Power (W)	Rated torque (N·m)	Rated speed (rpm)	Maximum speed (rpm)	Moment of inertia ($kgm^2 \times 10^{-4}$)	Voltage (V)
E-MASH1-0401	100	0.32	3000	6000	0.062	220
E-MASH1-0401B (With Brake)					0.072	
E-MASH1-0602	200	0.64			0.28	
E-MASH1-0602B (With Brake)					0.3	
E-MASH1-0604	400	1.27			0.56	
E-MASH1-0604B (With Brake)					0.58	
E-MASH1-0808	750	2.39			1.5	
E-MASH1-0808B (With Brake)					1.65	
E-MASH1-0810	1	3.18			2	
E-MASH1-0810B (With Brake)					2.15	

E-MASH1-0401(B)

Motor Specifications			Torque-speed characteristics
Frame size(mm)	40		
Inertia	High inertia		
Rated power (kW)	0.1		
Rated voltage (V)	220		
Rated torque (N·m)	0.32		
Maximum torque (N·m)	1.11		
Rated current (A)	0.92		
Maximum current (A)	3.36		
Rated speed (rpm)	3000		
Maximum speed (rpm)	6000		
Torque coefficient	0.383		
(Nm/A (rms))	Without brake	0.062	
	With brake	0.072	

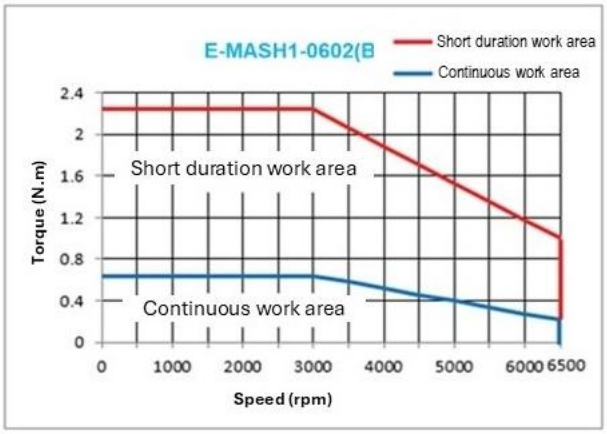
Brake specifications

Holding Torque (N·m)	Supply Voltage (VDC)	Rated Power (W)	Excitation current (A)	Release Time (ms)	Closing time (ms)	Rotary clearance (°)
> 0.4	24	6.9	0.25	≤ 40	≤ 20	< 1.5°

Allowable load

Shaft length (mm)	Radial allowable load (N)	Axial allowable load (N)
25	78	54

E-MASH2-0602(B)

Motor Specifications			Torque-speed characteristics
Frame size(mm)	60		
Inertia	High inertia		
Rated power (kW)	0.2		
Rated voltage (V)	220		
Rated torque (N·m)	0.64		
Maximum torque (N·m)	2.23		
Rated current (A)	1.5		
Maximum current (A)	5.4		
Rated speed (rpm)	3000		
Maximum speed (rpm)	6000		
Torque coefficient	0.447		
(Nm/A (rms))	Without brake	0.28	
	With brake	0.30	

Brake specifications

Holding Torque (N·m)	Supply Voltage (VDC)	Rated Power (W)	Excitation current (A)	Release Time (ms)	Closing time (ms)	Rotary clearance (°)
> 1.5	24	8.3	0.31	≤ 50	≤ 20	< 1°

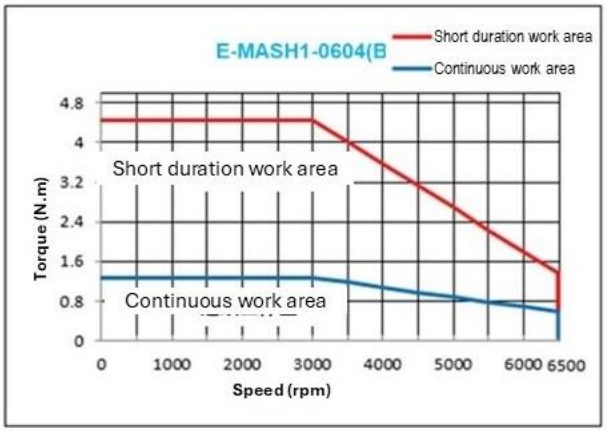
Allowable load

Shaft length (mm)	Radial allowable load (N)	Axial allowable load (N)
30	245	74

E-MASH2-0604(B)

Motor Specifications		
Frame size(mm)	60	
Inertia	High inertia	
Rated power (kW)	0.4	
Rated voltage (V)	220	
Rated torque (N·m)	1.27	
Maximum torque (N·m)	4.46	
Rated current (A)	2.1	
Maximum current (A)	7.6	
Rated speed (rpm)	3000	
Maximum speed (rpm)	6000	
Torque coefficient	0.645	
(Nm/A (rms))	Without brake	0.56
	With brake	0.58

Torque-speed characteristics



Brake specifications

Holding Torque (N·m)	Supply Voltage (VDC)	Rated Power (W)	Excitation current (A)	Release Time (ms)	Closing time (ms)	Rotary clearance (°)
> 1.5	24	8.3	0.31	≤ 50	≤ 20	≤ 1°

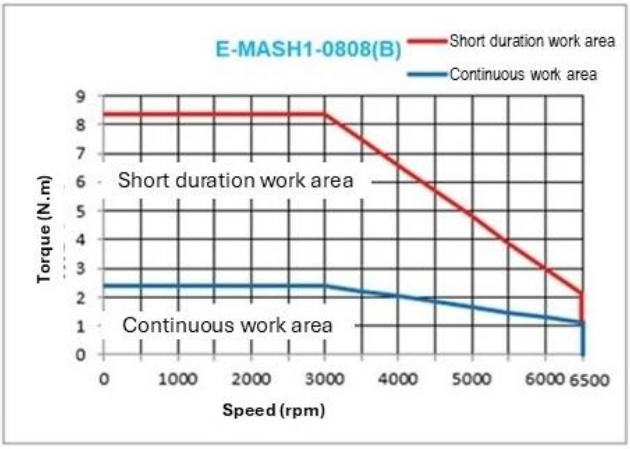
Allowable load

Shaft length (mm)	Radial allowable load (N)	Axial allowable load (N)
30	245	74

E-MASH2-0808(B)

Motor Specifications		
Frame size(mm)	80	
Inertia	High inertia	
Rated power (kW)	0.75	
Rated voltage (V)	220	
Rated torque (N·m)	2.39	
Maximum torque (N·m)	8.36	
Rated current (A)	4.1	
Maximum current (A)	15.4	
Rated speed (rpm)	3000	
Maximum speed (rpm)	6000	
Torque coefficient	0.645	
(Nm/A (rms))	Without brake	1.5
	With brake	1.65

Torque-speed characteristics



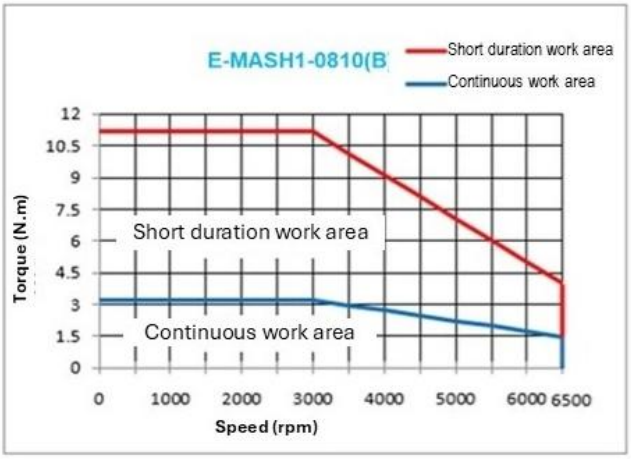
Brake specifications

Holding Torque (N·m)	Supply Voltage (VDC)	Rated Power (W)	Excitation current (A)	Release Time (ms)	Closing time (ms)	Rotary clearance (°)
> 3.2	24	11.5	0.48	≤ 60	< 40	< 1°

Allowable load

Shaft length (mm)	Radial allowable load (N)	Axial allowable load (N)
35	392	147

E-MASH2-0810(B)

Motor Specifications			Torque-speed characteristics
Frame size(mm)	80		
Inertia	High inertia		
Rated power (kW)	1		
Rated voltage (V)	220		
Rated torque (N·m)	3.18		
Maximum torque (N·m)	11.2		
Rated current (A)	5.7		
Maximum current (A)	21		
Rated speed (rpm)	3000		
Maximum speed (rpm)	6000		
Torque coefficient	0.634		
(Nm/A (rms))	Without brake	2	
	With brake	2.13	

Brake specifications

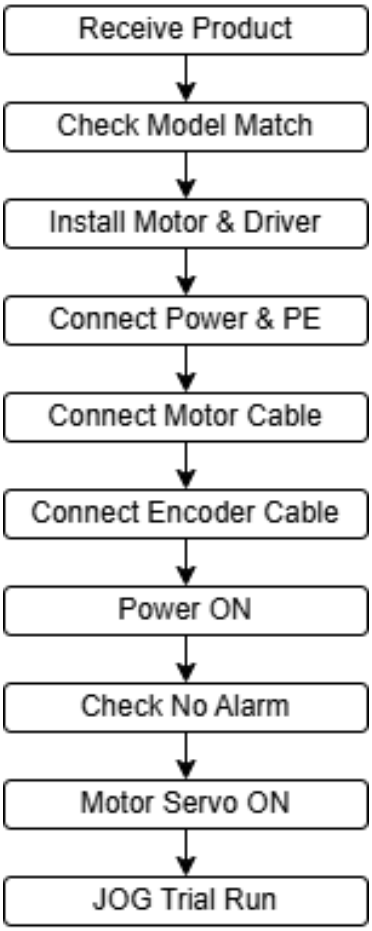
Holding Torque (N·m)	Supply Voltage (VDC)	Rated Power (W)	Excitation current (A)	Release Time (ms)	Closing time (ms)	Rotary clearance (°)
➢ 3.2	24	11.5	0.48	≤ 60	≤ 40	< 1

Allowable load

Shaft length (mm)	Radial allowable load (N)	Axial allowable load (N)
35	392	147

Chapter 2 Quick Start Guide

2.1 Commissioning Workflow



2.2 Unpacking Checklist

Check	Status
Driver model matches order	□
Motor model matches order	□
No physical damage	□
Connectors included	□
Motor and driver are matched pair	□

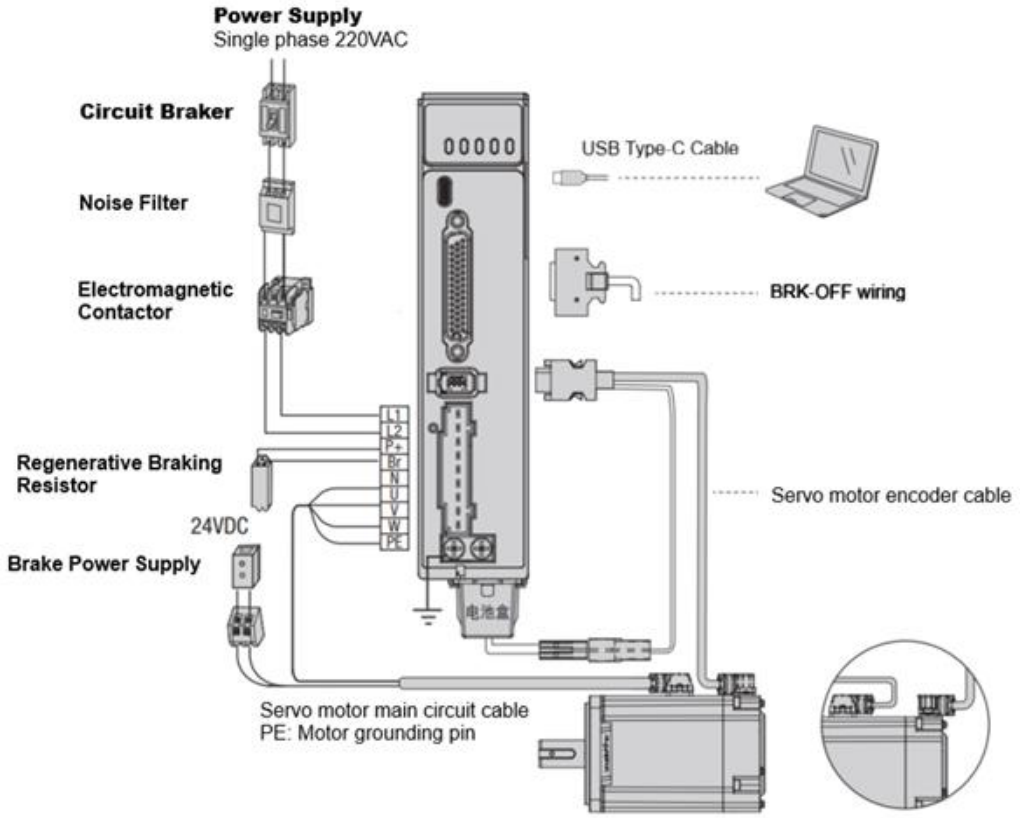
2.3 Installation Checklist

Driver:
□ Installed vertically
□ Ventilation space available
□ Cabinet temperature below specification
□ PE grounded

Motor:
□ Securely mounted
□ Flexible coupling used
□ Shaft not overloaded

2.4 Wiring Checklist

Minimum wiring that needs to perform trial run as below:



□ AC Power (L1/L2/L3)
□ Control Power (L1C/L2C)
□ PE Ground
□ Motor U/V/W Cable
□ Encoder Cable
□ USB cable to PC
□ Brake wiring (if brake motor)
□ Battery box wiring (if absolute encoder)

Note: For first trial run, external controller wiring is not required.

2.5 First Power-On

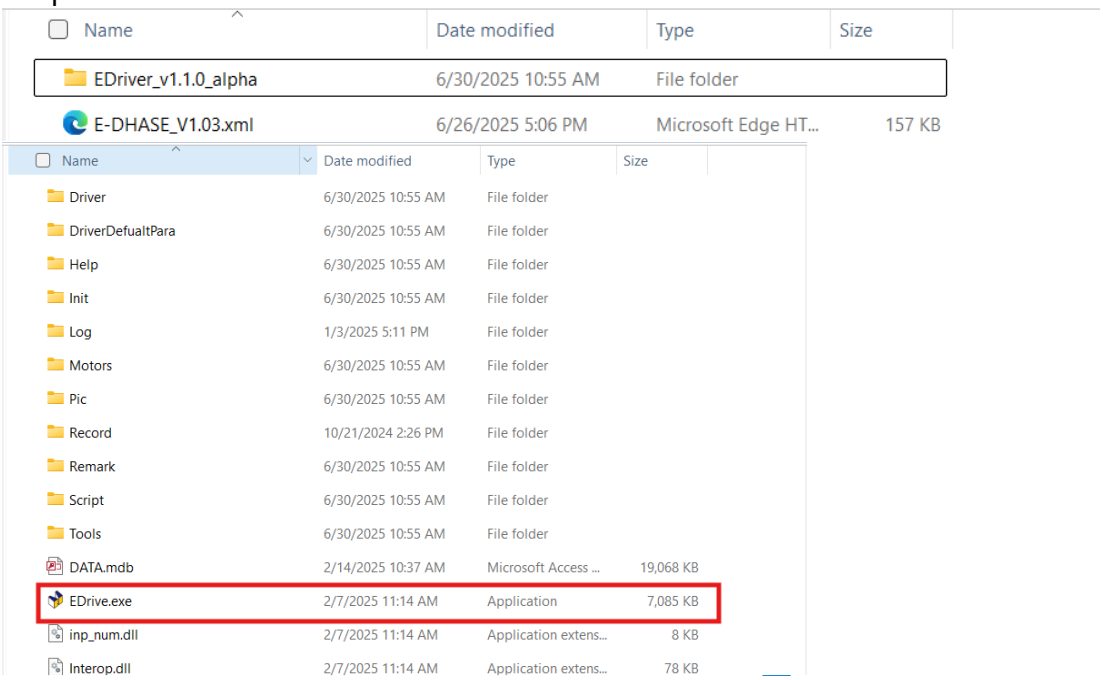
Apply control power and main power.
Expected:

- 'Charge' LED ON
- Front panel active
- No alarm displayed

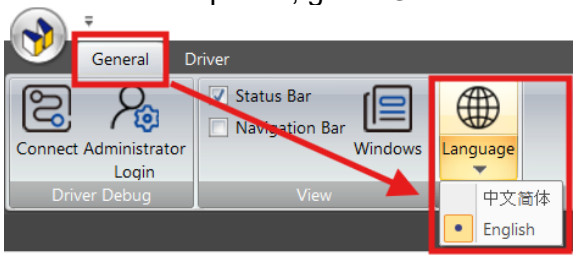
2.6 Servo ON and Trial Run

The EDrive software can be downloaded from the link below:
https://sg.misumi-ec.com/linked/material/mech/MSM1/CAD/3D/10311229039/E-DHAS.zip

After unzip or pull the 'EDriver_v1.2.0_alpha' folder to the desktop, double click 'EDrive.exe' to open the software.



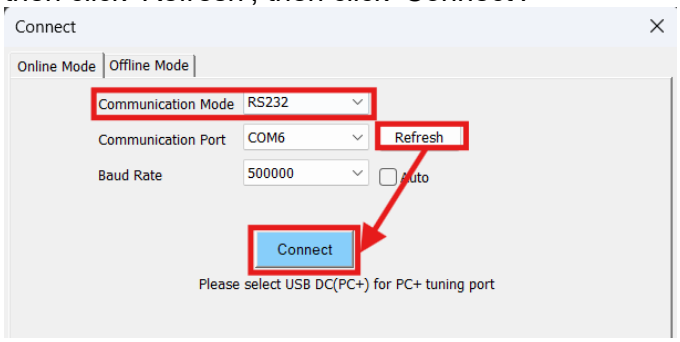
After software opened, go to 'General' and change language to 'English'.



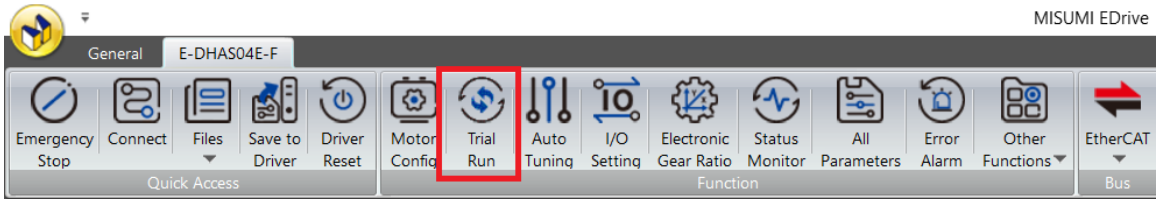
Please use cable with one side USB type-A and the other side USB type-C.



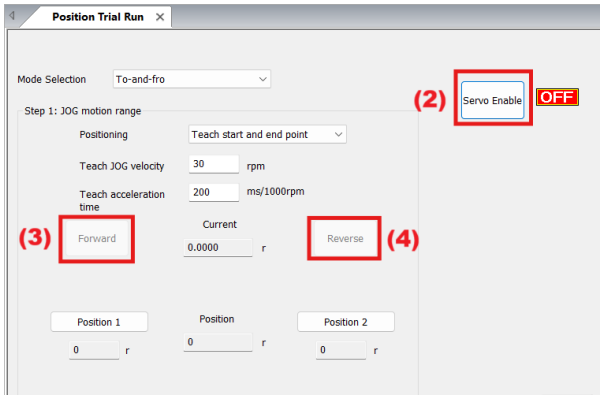
Open EDrive software and start connection. ‘Communication Mode’ please choose ‘RS232’, then click ‘Refresh’, then click ‘Connect’.



Click ‘Trial Run’.



Click (2) ‘Servo Enable’, then click (3) ‘Forward’ or (4) ‘Reverse’, to move the motor.



2.7 Commissioning Completion Checklist

□ Driver power ON normally
□ No alarm present
□ Servo ON successful
□ Forward rotation verified
□ Reverse rotation verified
□ Brake function verified

2.8 Troubleshooting Quick Check

Symptom	**Check**
No display	Control power wiring
Alarm after power ON	Encoder / motor cable
Servo ON impossible	DI assignment / SRV-ON
Motor vibrates	U/V/W wiring
Wrong direction	Motor direction parameter
Brake not releasing	CN1 BRK-OFF wiring

Chapter 3 Installation

3.1 Servo Driver Installation

3.1.1 Installation Location

1. Install the servo driver indoors, inside a control cabinet, away from rain and direct sunlight. Do not place flammable materials nearby. The unit is not waterproof.
2. Do not use the product in environments containing corrosive gases such as Hydrogen sulfide, Sulfur dioxide, Chlorine, Ammonia, Chlorinated gases, Acids, alkalis, salts, or in areas with flammable gases or combustible materials.
3. Avoid installing in environments that are Hot, humid, dusty or contain metal dust.
4. Install in a location with minimal vibration.
5. Preferably install in a well-ventilated, dry, and dust-free area. Ensure no oil, metal dust, or water enters the product.

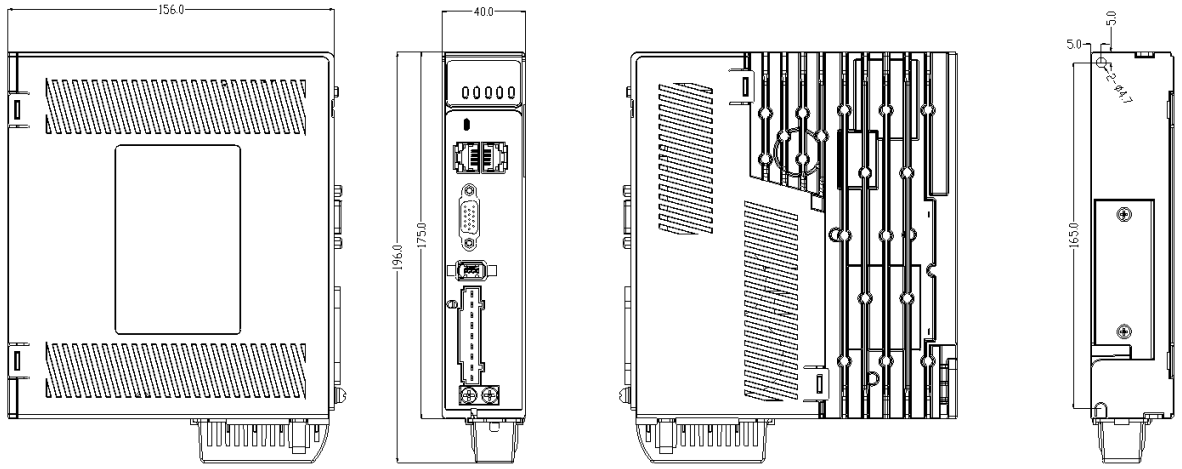
3.1.2 Servo driver installation environment

Item	E-DFAS□□E series driver
Operating Temperature	0~+55℃ (no derating is required from 0℃ to +45℃, derating is required when the temperature exceeds 45℃) (Condensation is more likely to occur when the temperature drops and the humidity rises) [1]
Operating Humidity	Below 90% RH, non-condensing
Storage Temperature	-40°C to +80°C (non-freezing)
Storage Humidity	Below 90% RH, non-condensing
Atmospheric Conditions	Indoor use only (No direct sunlight) No corrosive gases, flammable gases, oil, or dust
Altitude	Maximum altitude: 2000 meters No derating required below 1000 meters Above 1000 meters, derate by 1% for every 100 meters For usage above 2000 meters, please contact the manufacturer
Vibration Resistance	Less than 0.5G (4.9m/s^2) 10-60Hz (non-continuous working)
Protection Rating	IP20 (except terminals, which are IP00)

Note
[1] Please install the servo driver within the specified ambient temperature range. If stored inside an electrical cabinet, ensure that the internal cabinet temperature does not exceed this specified range.

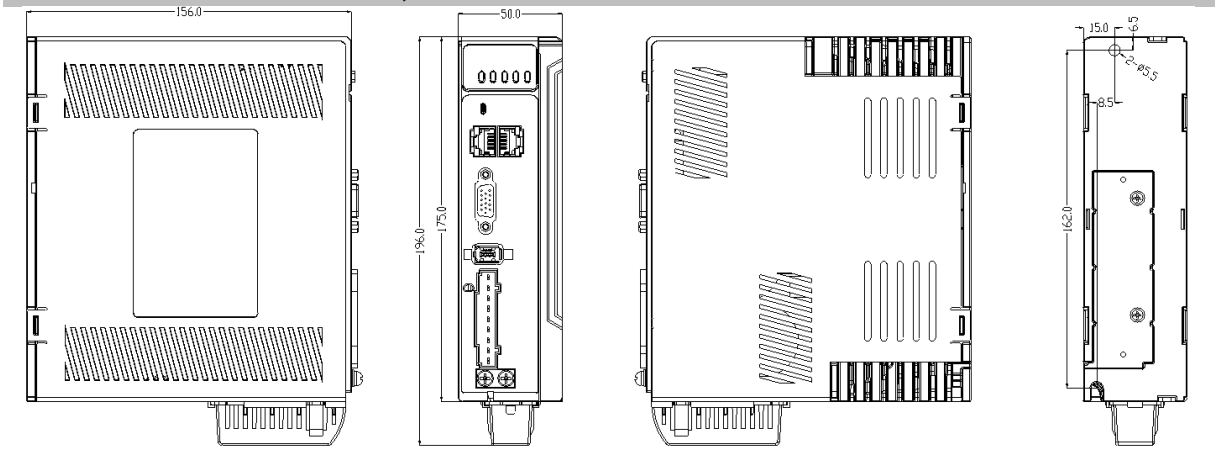
3.1.3 Servo Driver Dimension

Dimension 1： E-DFAS01E, E-DFAS04E



40mm x 175mm x 156mm

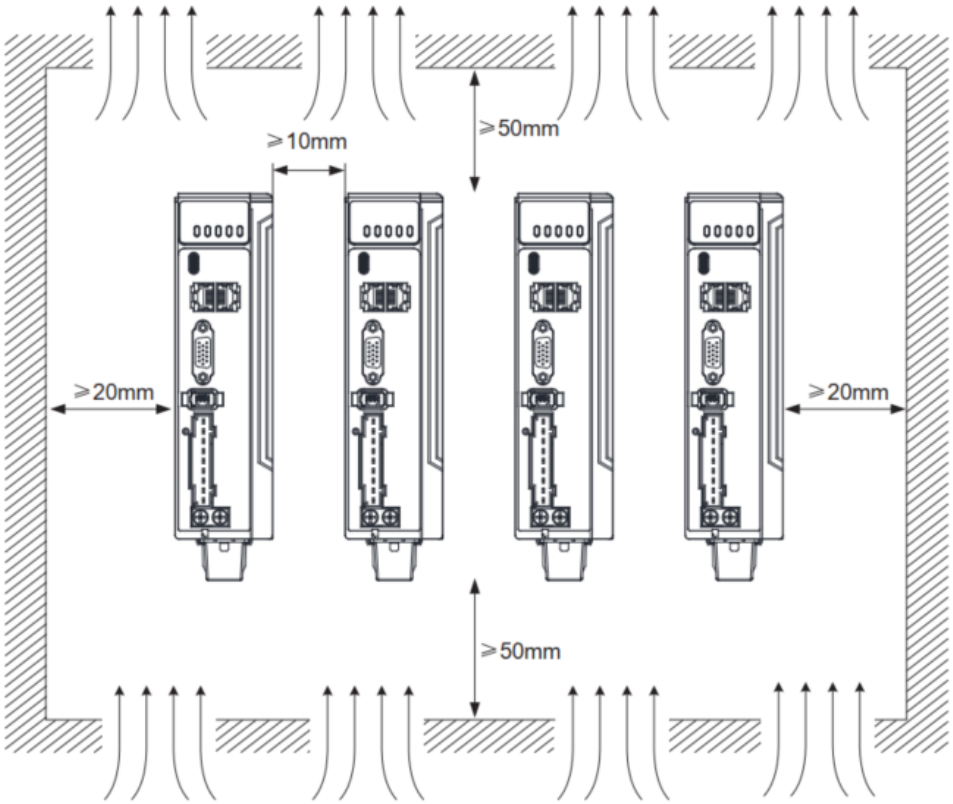
Dimension 2： E-DFAS08E, E-DFAS10E



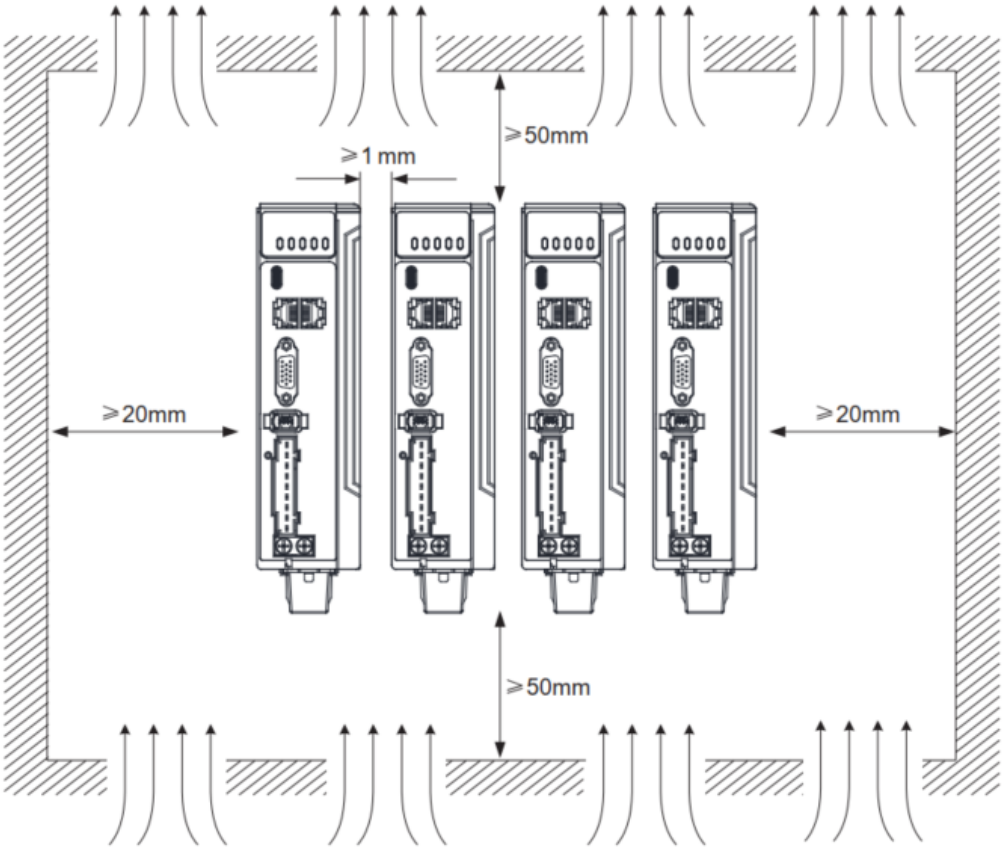
50mm x 175mm x 156mm

Space requirement for installation

The servo driver can be installed using either base mounting or panel mounting. The installation orientation must be vertically upward, perpendicular to the mounting surface. To ensure proper heat dissipation:
Leave at least 10 mm of clearance around the unit.
Leave at least 50 mm of clearance on both vertical sides.



For compact installations, allow at least 1 mm of spacing between each pair of drivers to account for installation tolerances. In this case, operate the drivers at no more than 75% actual load rate.



Installation Precautions

1. Installation Method

   Ensure the installation direction is perpendicular to the wall, with the product mounted vertically upward to allow heat to dissipate effectively. If multiple units are installed inside a cabinet, arrange them side by side. For vertical stacking, install a heat insulation and airflow guide plate between units.

   Use natural convection or fans to cool the servo driver.

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

   During installation, the front panel of the servo driver should face the operator, and the unit should be vertically aligned with the wall.

2. Cooling

   To ensure effective cooling via fans or natural airflow, leave sufficient space around the servo driver and consider the heat dissipation of other components in the cabinet.

   Install a cooling fan above the servo driver. Maintain uniform temperature inside the cabinet to avoid localized overheating.

3. Grounding

   Be sure to ground the grounding terminal. Failure to do so may result in electric shock, interference, or malfunction.

4. Wiring Requirements

   When wiring the servo driver, route cables downward. This prevents liquids from flowing along the cables into the driver, which could cause damage or accidents.

5. Absolute Encoder Battery Box

   If using a battery box, reserve installation space for it inside the cabinet.

3.2 Servo Motor Installation

3.2.1 Installation conditions

Installation conditions may affect the lifespan of a motor

- Please keep away from corrosive fluid and combustibles.
- If dusty working environment is unavoidable, please use motors with oil seal.
- Please keep away from heat source.
- If motors are used in enclosed environments without heat dissipation, motor lifespan will be short.
- Please check and clean the installation spot before installation.

3.2.2 Installation Environment

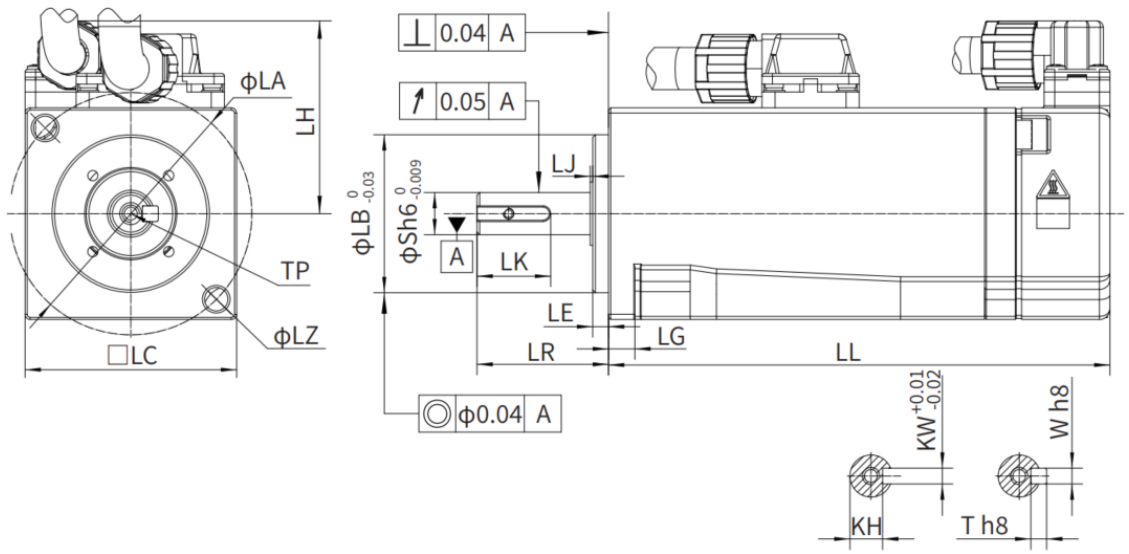
Item	Condition
Operating Temperature	0°C to +40°C (up to +60°C with derating; non-freezing)
Operating Humidity	Below 90% RH (no condensation or icing)
Storage Temperature	-20°C to +60°C (max 85°C for up to 72 hours)
Storage Humidity	Below 90% RH (no condensation or icing)
Atmosphere	Indoor (no direct sunlight), free of corrosive or flammable gases
Altitude	Below 1000m for normal use; derating required above 1000m (up to 2000m)
Vibration Grade	Less than 5G (49 m/s²)
Shock Resistance	Less than 50G (490 m/s²)
Protection Rating	IP65 (E-MASH2 series motors up to IP67)

Note:

Operating temperature: 0 to +60 °C. Derating is required when operating above 40 °C.
When temperature decreases and humidity increases, condensation is likely to occur.
If storage temperature exceeds +60 °C, do not store continuously at this temperature for more than 72 hours.

3.2.3 Motor Dimensions

40 Motor Frame (Unit: mm)



Shaft End

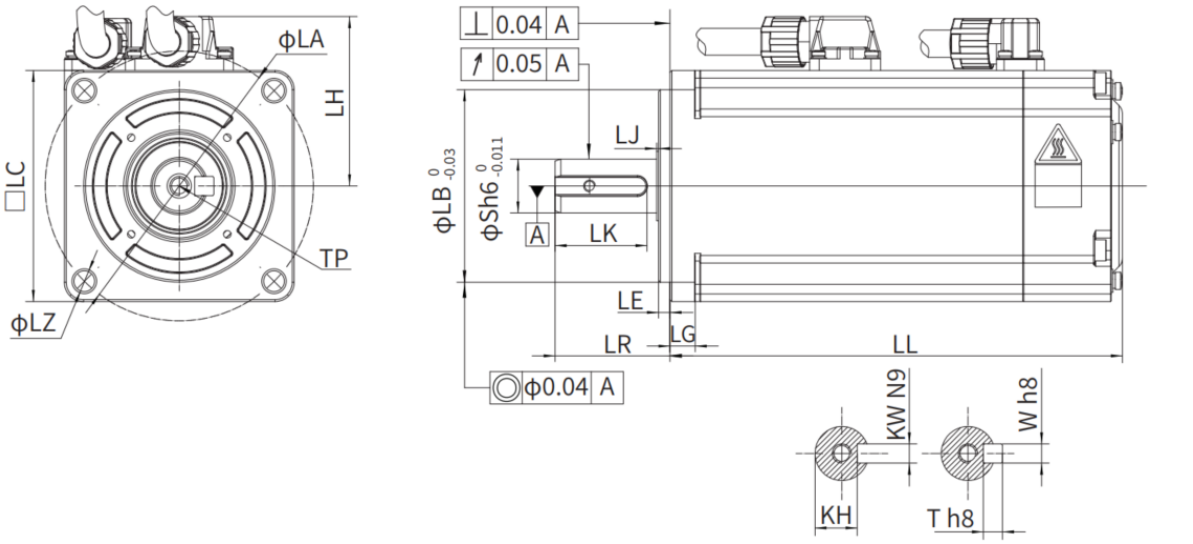
Shaft End with Key

The above diagrams are for reference only. Please refer to the actual dimensions for installation.

Motor Model	LL	LC	LR	LA	LZ	LH	LG	LE	LJ	S	LB	TP	LK	KH	KW	W	T	Weight (kg)
E-MASH1-0401	67.7	40	25	46	4.5	38MAX	5	3	3	8	30	M3X8	14	6.2	3	3	3	0.46
E-MASH1-0401B	95	40	25	46	4.5	38MAX	5	3	3	8	30	M3X8	14	6.2	3	3	3	0.68

Note: In the motor model, “B” indicates a brake-equipped motor.

60/80 Motor Frame (Unit: mm)



Shaft End Shaft End with Key

The above diagrams are for reference only. Please refer to the actual dimensions for installation.

Motor Model	LL	LC	LR	LA	LZ	LH	LG	LE	LJ	S	LB	TP	LK	KH	KW	W	T	Weight (kg)
E-MASH1-0602	71.8	60	30	70	5.5	37.5MAX	6.6	3	3	14	50	M5X12	22.5	11	5	5	5	0.9
E-MASH1-0602B	101.1	60	30	70	5.5	37.5MAX	6.6	3	3	14	50	M5X12	22.5	11	5	5	5	1.3
E-MASH1-0604	88.8	60	30	70	5.5	37.5MAX	6.6	3	3	14	50	M5X12	22.5	11	5	5	5	1.3
E-MASH1-0604B	118.1	60	30	70	5.5	37.5MAX	6.6	3	3	14	50	M5X12	22.5	11	5	5	5	1.55
E-MASH1-0808	90.9	80	35	90	6.5	57.5MAX	8.1	3	3	19	70	M5X15	25	15.5	6	6	6	2.12
E-MASH1-0808B	121.9	80	35	90	6.5	57.5MAX	8.1	3	3	19	70	M5X15	25	15.5	6	6	6	2.7
E-MASH1-0810	103.9	80	35	90	6.5	57.5MAX	8.1	3	3	19	70	M5X15	25	15.5	6	6	6	2.7
E-MASH1-0810B	134.9	80	35	90	6.5	57.5MAX	8.1	3	3	19	70	M5X15	25	15.5	6	6	6	3.2

Note: In the motor model, “B” indicates a brake-equipped motor.

3.2.4 Installation Method and Precautions

Installation Method

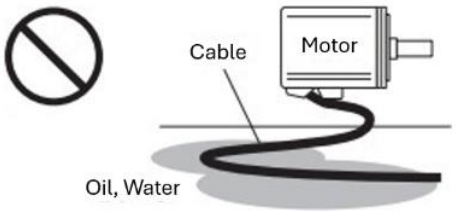
The motor can be installed vertically or horizontally, but the following requirements must be observed:

- Horizontal Installation
  Position the cable outlet facing downward to prevent oil or water from entering the motor.

- Vertical Installation
  When installing a motor with a reducer in the axial direction, use a motor with an oil seal to prevent reducer oil from leaking into the motor.

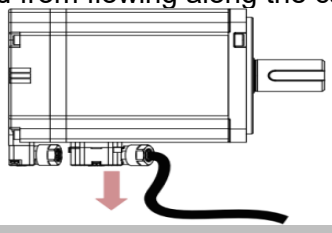
Oil- and waterproofing

- Do not submerge motor/cable under oil/water
- Please use a motor with oil seal when paired with a reducer to prevent reducer oil from leaking into the motor.



Conditions for use of servo motors with oil seals:
— Make sure the oil level is below the lip of the oil seal during use.
— When installing the servo motor vertically upward, do not allow oil to enter the lip of the oil seal.

- When using in places with water dripping, please use it after confirming the protection level of the servo motor.
- In applications with liquid, please install the motor with the wiring port facing downward
- Do not use in an environment where oil and water often splash onto the motor body. (As shown below), prevent liquid from flowing along the cable to the motor body.



Cable stress

Do not bend the cable, especially at each end of the connectors.
Make sure not to let the cables be too tight and under tremendous stress especially thinner cables such as signal cables

Connectors

Please remove any conductive foreign objects from the connectors before installation
The connectors are made of resin. May not withstand impact.
Please hold the driver during transportation, not the cables.
Leave enough “bend” on the connector cables to ensure less stress upon installation.

Encoder & coupling

During installation or removal of coupling, please do not hit the motor shaft with a hammer as it would cause damage to internal encoder.
Please make sure to centralize the motor shaft and coupling, it might cause damage to motor or encoder due to vibration.
Please make sure axial and radial load are within the limits specified as it might affect the lifespan of the motor or cause damage to it.

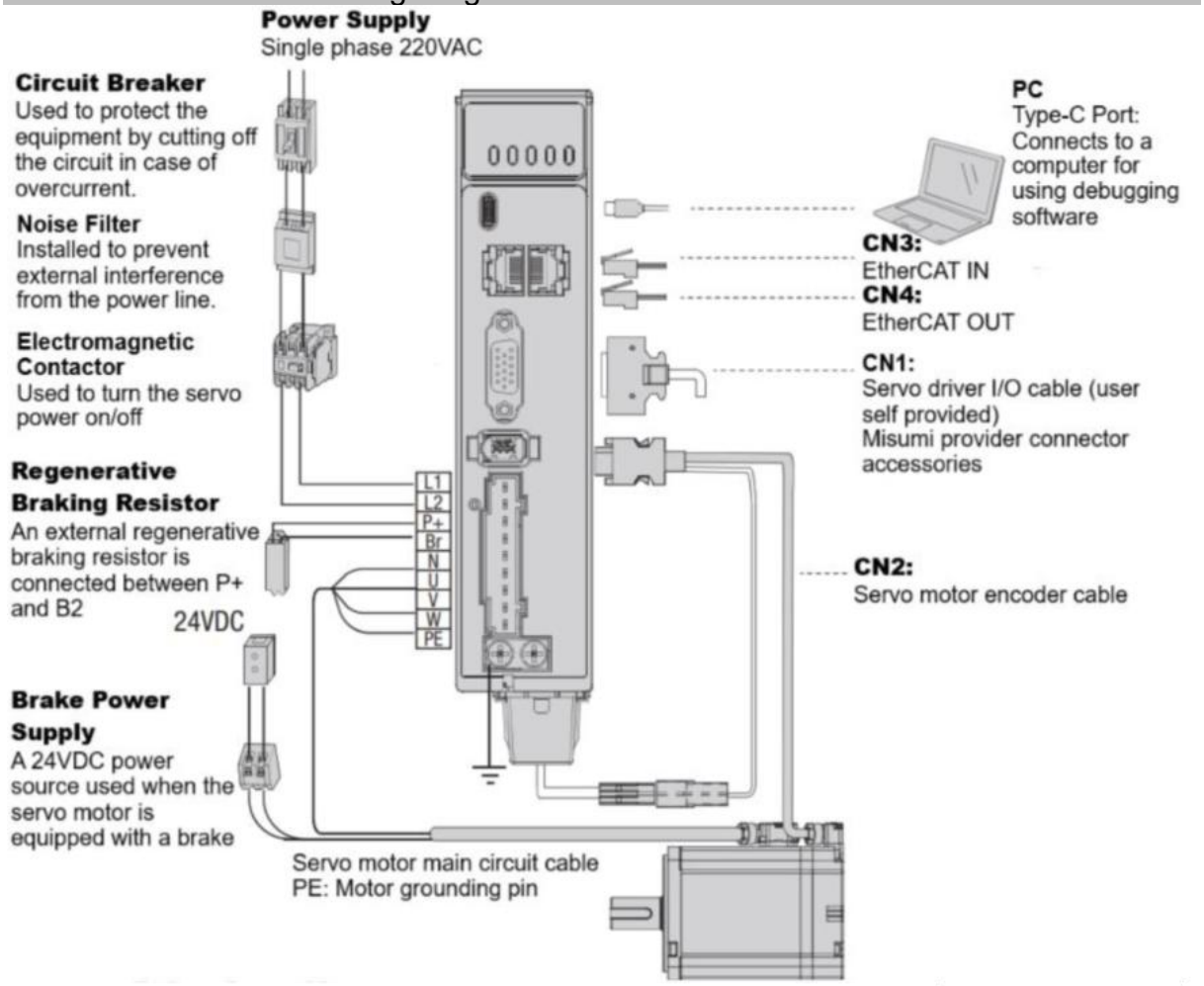
Motor brake cable connection precautions

For motors with a brake and a magnetic encoder, brake wiring must respect polarity to avoid interference that can cause alarms, accuracy loss, or vibrations. For motors with a photoelectric encoder, polarity in brake wiring doesn’t matter.

Chapter 4 Wiring

4.1 E-DFAS□□E Wiring Diagram

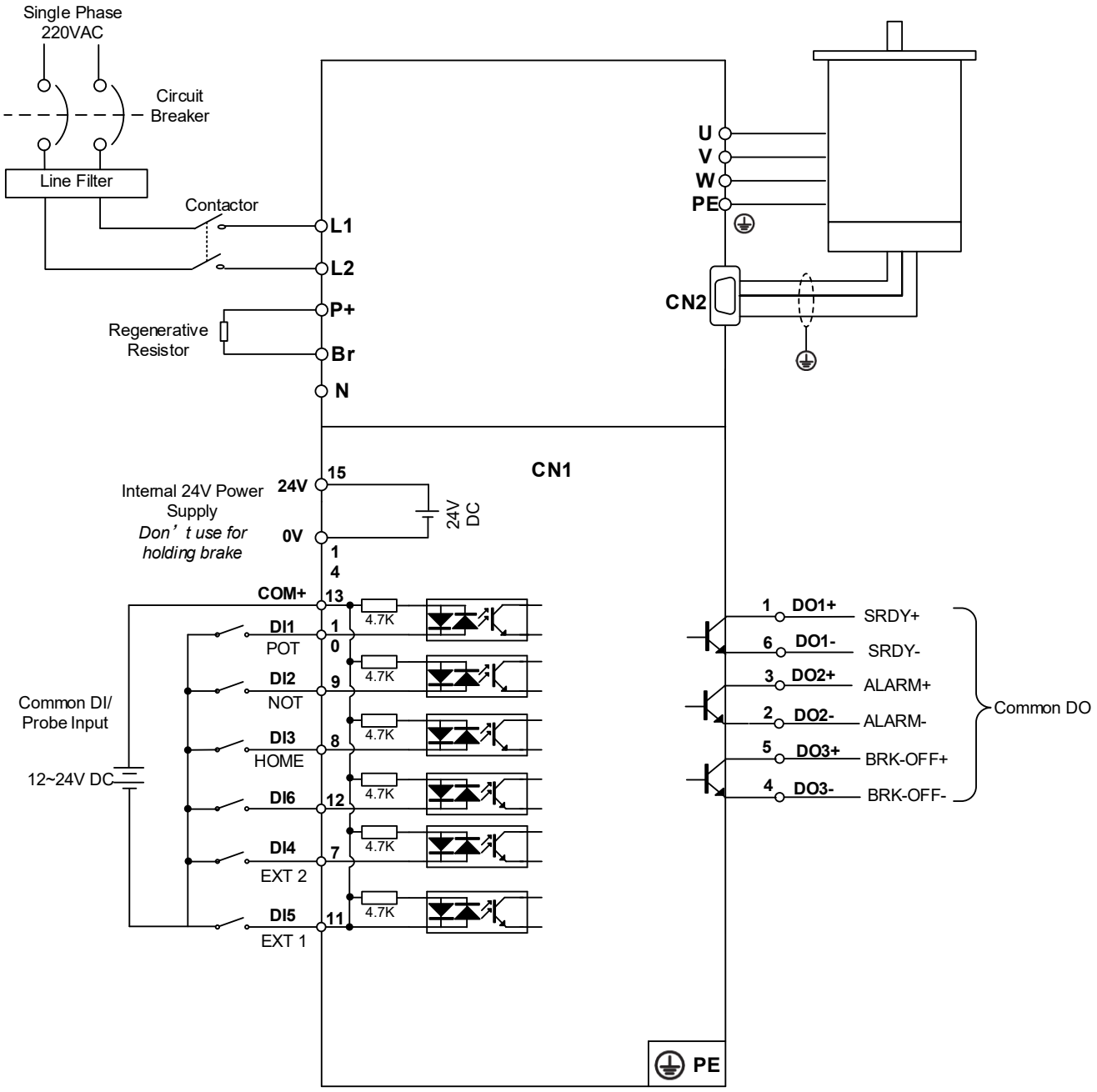
E-DFAS□□E 220VAC Wiring Diagram



- The E-DFAS□□E series (models from E-DFAS01E to E-DFAS10E) only support single-phase 220V power supply.
- The servo driver is directly connected to industrial power without isolation via a transformer. To prevent electrical cross-contact accidents, use fuses or circuit breakers on the input power supply. For enhanced system safety, use leakage circuit breakers that provide overload and short-circuit protection, or dedicated ground fault protection breakers.
- Do not use electromagnetic contactors for motor start/stop operations. Motors are high-inductance components and may generate instantaneous high voltage, which can damage contactors.
- When using external control power or 24VDC power, ensure the power capacity is sufficient, especially when powering multiple drivers or multiple brake units simultaneously. Insufficient power capacity may result in inadequate current supply, causing driver or brake failure. The brake power supply should be a 24VDC voltage source, with power rating matched to the motor model and compliant with the brake power requirements.

4.2 Electrical Wiring Diagram

E-DFAS01E~E-DFAS10E Wiring Diagram



4.3 Servo Driver Ports

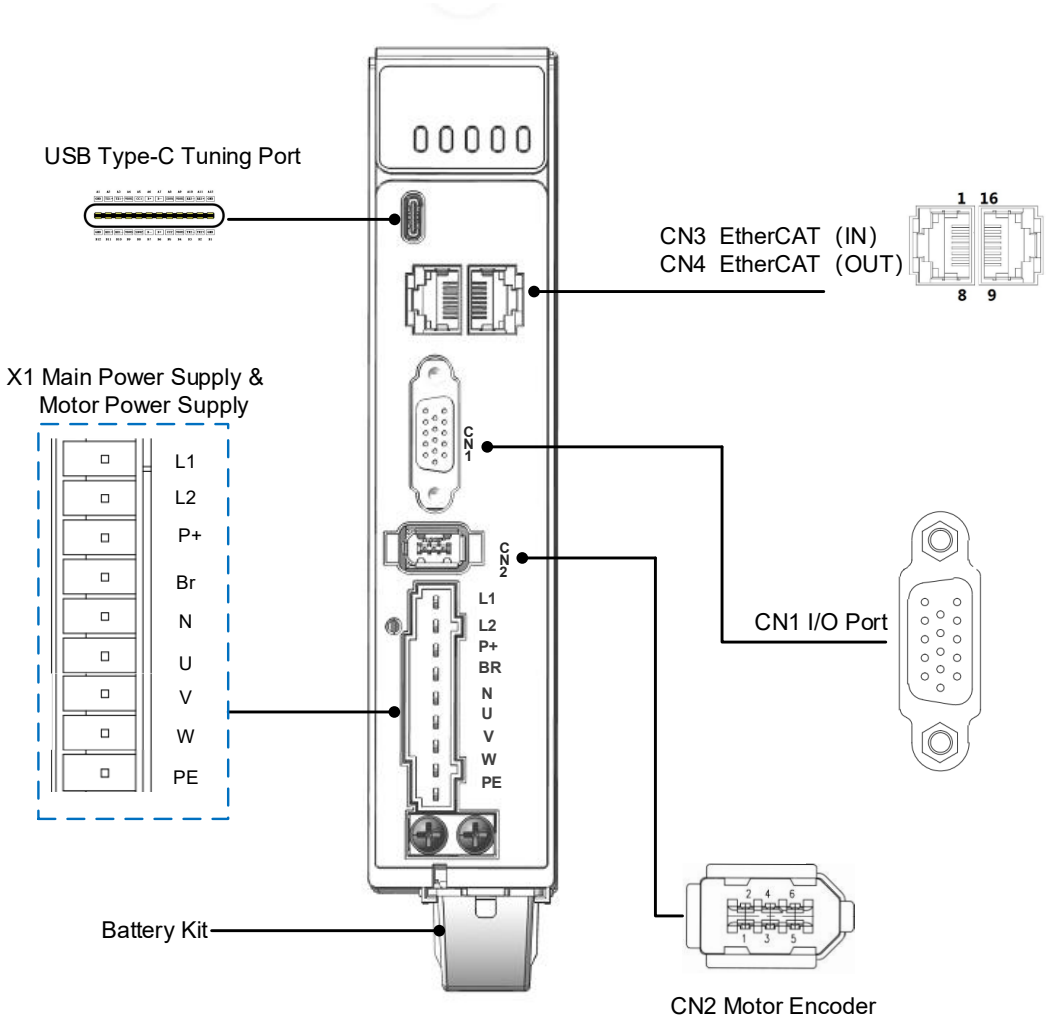


Table 3-1 Functions of driver port

Port	Function
CN1	I/O Signal Port
CN2	Encoder port
USB	USB Type-C Tuning Port
CN3	EtherCAT IN Communication Port
CN4	EtherCAT OUT Communication Port
X1	Main Power Supply

4.4 Main Circuit Connection

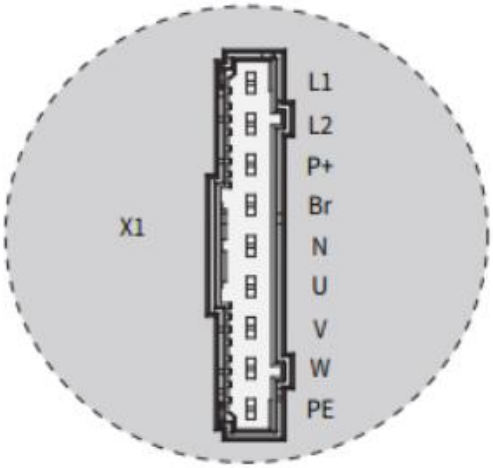


Table 3-2 X1 port descriptions

Port	Pin	Functions	Remarks
X1	L1	Single phase 220VAC，+10～-15%，50/60Hz	① Optional isolation transformer ② Do not connect to 380VAC directly to prevent damage to driver. ③ In case of serious interference, it is recommended to connect a line filter to main power supply. *It is recommended to install a fuse-less circuit breaker to cut off power supply in time when the driver fails.*
	L2		
	P +	① Internal DC bus positive terminal ② External regenerative resistor P terminal	If an external regeneration resistor is required, connect the regeneration resistor between P+ and Br.
	Br	External regenerative resistor terminal	
	N		Please do not connect
	U	Motor U terminal	Please ensure proper wire connection on motor.
	V	Motor V terminal	
	W	Motor W terminal	
	PE	Motor Protective Earth	Please ground PE of driver and motor together

4.4.1 Recommended Wiring Specifications for Main Circuit

Main power supply wire gauge

The wire gauge for connecting drivers varies depending on power rating. Recommended values are shown in the table below:

Driver	Wire diameter (mm^2/AWG)				
	Rated input current (A)	L1, L2, L3	P+, (B2) Br	U, V, W	PE
Single phase 220V					
E-DFAS01E	2	1.3/AWG16	2.1/AWG14	0.52/AWG14	0.52/AWG14
E-DFAS04E	5	1.3/AWG16	2.1/AWG14	0.52/AWG14	0.52/AWG14
E-DFAS08E	7.9	1.3/AWG16	2.1/AWG14	0.52/AWG14	0.52/AWG14
E-DFAS10E	9.6	2.1/AWG14	2.1/AWG14	0.52/AWG14	0.52/AWG14

Notice:
If 3-phase 220VAC is used, wire diameter could be smaller than the listed above.

- For 3-phase 220V, L1/L2/L3 wires can be thinner than single-phase.
- Use a thick ground wire and ground the PE terminals of both driver and motor at one point (resistance < 100 Ω).
- Use a 3-phase isolation transformer to reduce electric shock risk.
- Add a noise filter to improve interference resistance.
- Install a non-fuse breaker (NFB) to cut power during driver faults.

CN1 is used for control signal wiring, CN2 is encoder feedback signal wiring.

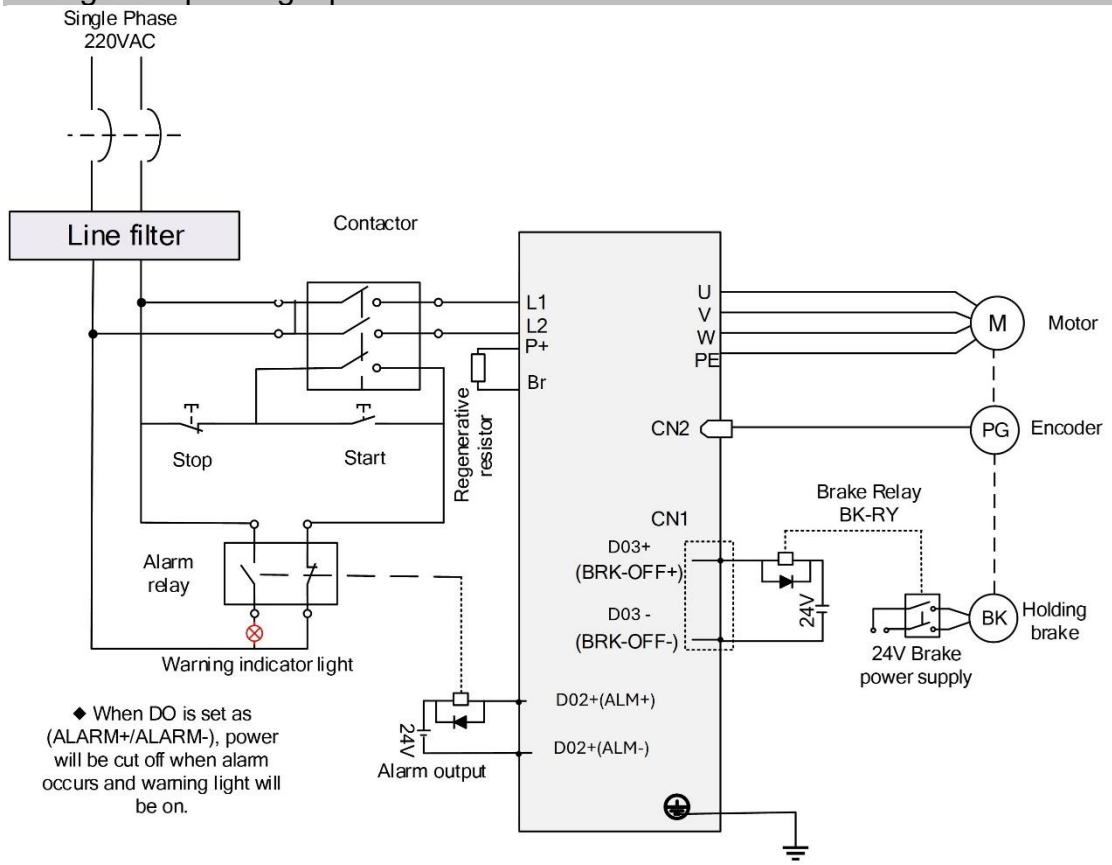
■ Wire Gauge
Use shielded cables (preferably twisted shielded cables). CN1: ≥ 0.14 mm², CN2: ≥ 0.25 mm². The shield layer must be grounded.
■ Cable Length
Keep cables as short as possible. CN1 (Control Signals): ≤ 3 meters, CN2 (Encoder Feedback): ≤ 20 meters.
■ Routing
Route cables away from power lines to prevent signal interference.
■ Surge Protection
Install surge suppression components for inductive elements (e.g., coils).
For DC coils: connect a flyback diode in reverse parallel.
For AC coils: use an RC snubber circuit.

Notes

- U, V, W must be connected to the motor windings in the correct order — do not reverse the connections.
- Secure all cables and wires properly, and avoid placing them near the driver's heat sink or motor, as heat may degrade insulation performance.
- The servo driver contains large electrolytic capacitors. Even after power is turned off, high voltage remains — do not touch the driver or motor within 5 minutes after power-off.

4.4.2 Main Circuit Power Wiring Examples

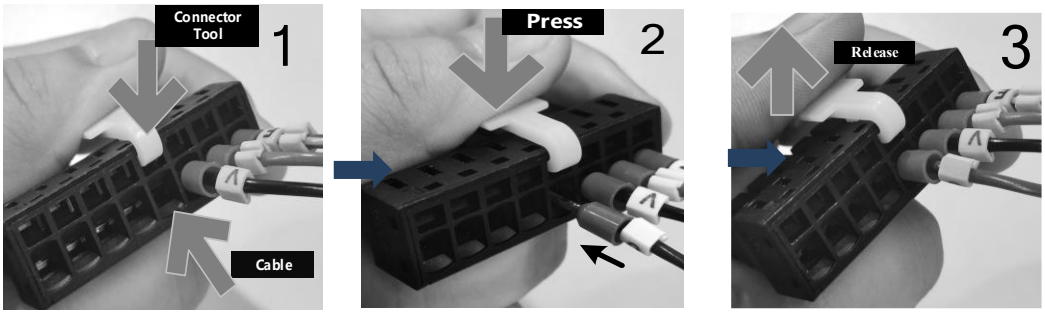
Wiring example single phase 220VAC: E-DFAS01E~E-DFAS10E



- E-DFAS□□E series servo driver 220VAC models support single phase and three phase 220VAC. Only drivers with power rating above 1500W support three phase 220VAC.

To fix wire cables into connectors

An operating lever is provided on the main circuit terminal connector for wiring:



1. Select the terminal hole and insert the lever into its slot.
2. Press the lever vertically to open the spring, then insert the cable conductor fully.
3. Release the lever to lock the cable in place.

Notes:

- To remove the cable, press the lever the same way.
- Only one wire per terminal hole is allowed.
- Keep the lever properly after use for future needs.

4.4.3 Regenerative resistor selection and connections

Selection of regenerative resistor

In the E-DFAS□□E series, models below 400W do not include built-in regenerative braking resistors. If external braking is required, customers must independently configure an external braking resistor. To connect an external resistor, wire it between terminals P+ and Br.

Table 3-3 Recommended selection of regenerative resistor

Model no.	Internal resistance (Ω)	Internal resistor power rating (W)	Minimum resistance (Ω)	Minimum power rating (W)
E-DFAS01E	-	-	50	50
E-DFAS04E	-	-	50	50
E-DFAS08E	50	75	30	50
E-DFAS10E	50	75	30	75

If detailed motion parameters such as acceleration/deceleration time, torque, and load inertia are not available on-site, you can skip the detailed selection steps and use the recommended method below to choose a suitable regenerative braking resistor.

Calculation of regenerative resistance under normal operation

Steps:

1. Determine if driver comes with a regenerative resistor. If not, please prepare a regenerative resistor with resistance value higher than might be required.
2. Monitor the load rate of the regenerative resistor using front panel (d14). Set the driver on high velocity back and forth motions with high acceleration/deceleration.
3.Please make sure to obtain the value under following conditions: Driver temperature < 60℃, d14<80(Won't trigger alarm), Regenerative resistor is not fuming, No overvoltage alarm (Err120).

Pb (Regenerative power rating) = Resistor power rating x Regenerative load rate (%)

Please choose a regenerative resistor with power rating Pr about **2-4 times the value of Pb** in considered of harsh working conditions and some 'headroom'.
If the calculated Pr value is less than internal resistor power rating, external resistor is not required.

$$R \text{ (Max. required regenerative resistance)} = (380^2 - 370^2) / Pr$$

Problem diagnostics related to regenerative resistor:

- If driver temperature is high, reduce regenerative energy power rating or use an external regenerative resistor.
- If regenerative resistor is fuming, reduce regenerative energy power rating or use an external regenerative resistor with higher power rating.
- If d14 is overly large or increasing too fast, reduce regenerative energy power rating or use an external regenerative resistor with higher power rating.
- If driver overvoltage alarm (Er120) occurs, please use an external regenerative resistor with lower resistance or connect another resistor in parallel.

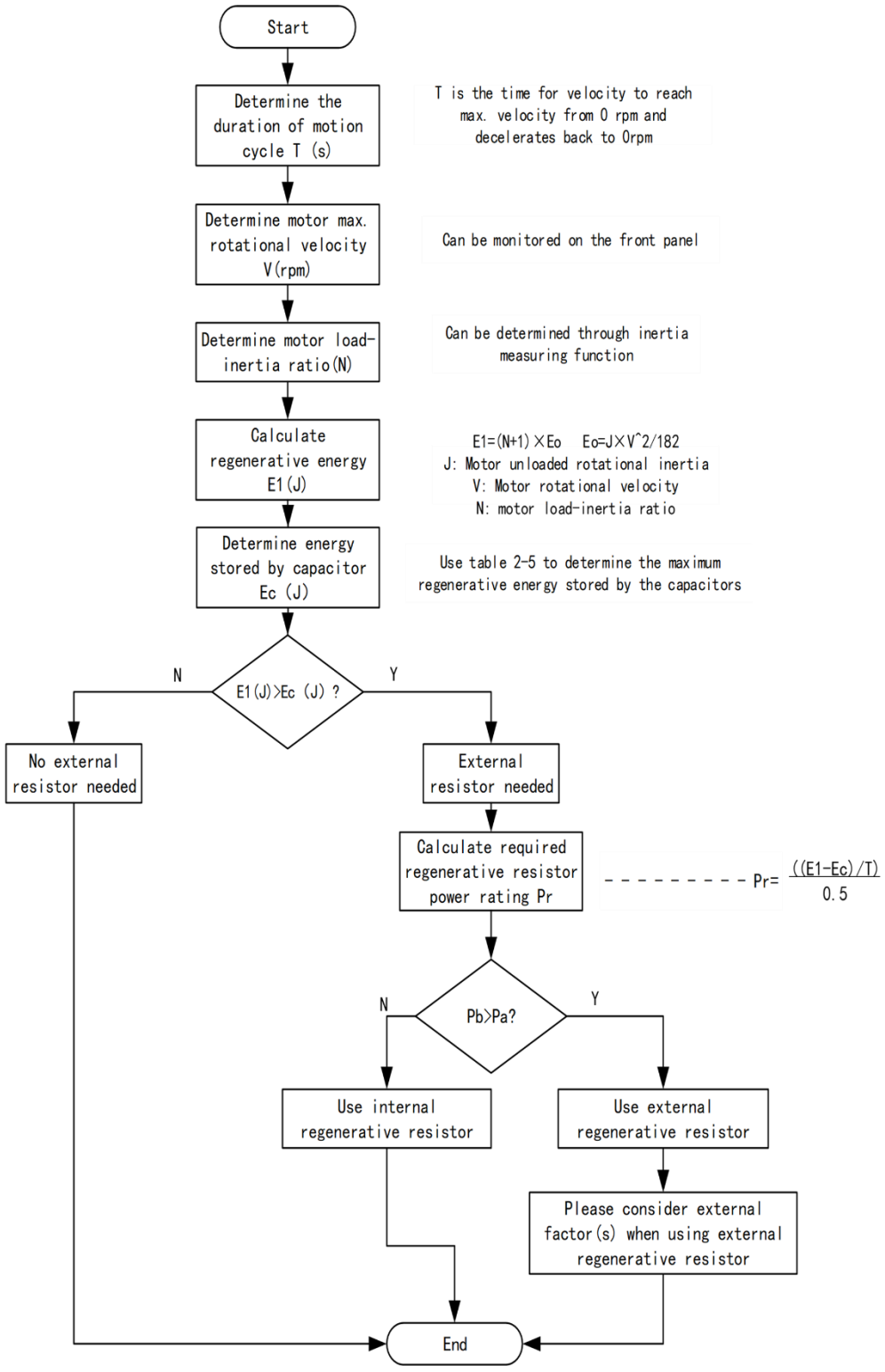
Please take following precautions before installing an external regenerative resistor.

1. Please set the correct resistance value in P00.16 and resistor power rating P00.17 for the external regenerative resistor.
2. Please ensure the resistance value is higher or equals to the recommended values in table 3-3. Regenerative resistors are generally connected in series but they can also be connected in parallel to lower the total resistance.
3. Please provided enough cooling for the regenerative resistor as it can reach above 100℃ under continuous working conditions.

4. The min. resistance of the regenerative resistor is dependent on the IGBT of the holding brake. Please refer to table

Theoretical selection of regenerative resistor

Without external loading torque, the need for an external regenerative resistor can be determined as the flow chart below



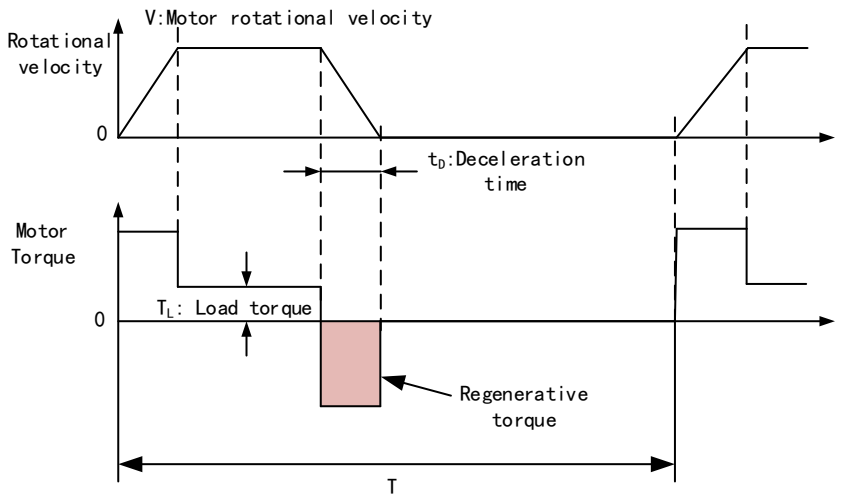


Table 3-4 Steps to calculate capacity of regenerative resistor

Steps	Calculation	Symbol	Formula
1	Servo system regenerative energy	E1	$E1=(N+1)\times J\times V^2/182$
2	Depleted energy from loss of load system during acceleration	E_L	$E_L = (\pi/60)\ V\times T_L\times tD$ *If loss is not determined, please assume E_L = 0.*
3	Depleted energy due to motor coil resistance.	E_M	$E_M=(U^2/R)\times tD$ R= coil resistance, U = operating voltage *If R is not determined, please assume E_M = 0.*
4	Energy stored by internal DC capacitors	Ec	Please refer to table 3-5
5	Depleted energy due to regenerative resistance	E_K	E_K=E1-(EL+EM+EC), If loss is ignored, EK=E1-EC
6	Required power rating of regenerative resistor	Pr	$Pr=E_K/(0.5\times T)$

Theoretical selection of regenerative resistor

Table 3-5 Internal capacitor capacity and rotor inertia

E-DFAS□□E	Servo Motor	Rotor Inertia (× 10-4kg.m^2)	Max. regenerative energy stored in capacitor Ec(J)
E-DFAS01E	E-MASH1-0401	0.048	13.46
E-DFAS04E	E-MASH1-0604	0.58	13.47
E-DFAS08E	E-MASH1-0808	1.66	22.85
E-DFAS10E	E-MASH1-0810	2.03	27.74

Calculation examples:
Servo driver: E-DFAS08E, Servo Motor: E-MASH1-0808. When T = 2s, rotational velocity = 3000rpm, load inertia is 5 times of motor inertia.

E-DFAS□□E Drivers	Servo motor	Rotor Inertia (× 10^{-4}kg.m^2)	Max. regenerative energy stored in capacitor Ec(J)
750W	E-MASH1-0808	1.66	22.85

Regenerative energy produced:

$$E1 = \frac{(N+1) \times J \times V^2}{182} = \frac{(5+1) \times 1.66 \times 3000^2}{182} = 49.3J$$

If E1<Ec, internal capacitors can't take in excessive regenerative energy, regenerative resistor is required.
Required regenerative resistor power rating Pr:

$$Pr = \frac{(E1 - Ec)}{0.5T} = \frac{49.3 - 22.85}{0.5 \times 2} = 26.45W$$

Hence, with the internal regenerative resistor Pa = 75W, Pr<Pa, no external regenerative resistor is required.

Let's assume if the load inertia is 15 times of motor inertia, Pr = 108.6W, Pr>Pa, external regenerative resistor is required. And to consider for harsh working environment,

Pr(external)=108.6/(1-40%)=181 W

When selecting the resistance of the regenerative resistor, please be higher than the minimum value recommended in table 3-3 but lower than Rmax

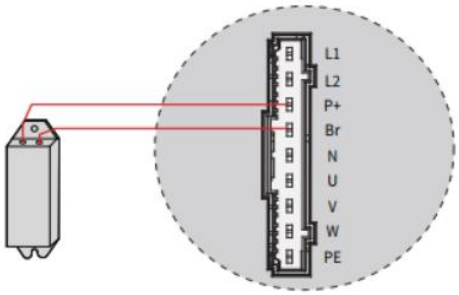
Rmax =(380^2-370^2)/Pr=7500/108.6=69Ω

In conclusion, a regenerative resistor with resistance 40Ω - 70Ω and power rating 110W to 180W can be chosen.

Please take note that theoretical calculations of the regenerative resistance is not as accurate as calculations done under normal operation.

Connection of a regenerative resistor

External Resistor Note:



- If no external brake resistor is used, short B1 and B2 to use the built-in one.
- To use an external resistor, remove the B1-B2 short and connect between P+ and B2. Set P11.31 to enable brake drain.
- Do not connect the resistor directly across the bus (P+/N), risk of fire!
- Refer to Table 3-3 for resistor specs.
- Set P00.16 and P00.17 correctly before use.
- Mount external resistor on non-flammable material (e.g., metal).
- Do not connect anything to N.

4.5 X2 Motor Power Supply

The power cable from the driver is labeled with U, V, W, PE. Please connect the wires accordingly to the power cable extending from the servo motor.

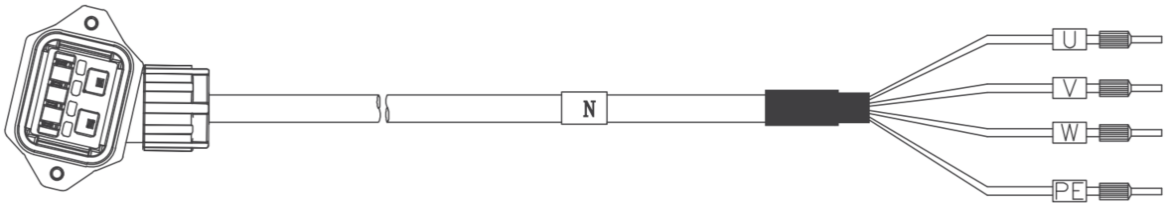
Motor power cable selection

Motor winding power cable

- Wire length available: 1.5m, 3m and 5m
- Connectors type available: Direct connectors
- Please contact Misumi sales team or any Misumi certified local retailers for any customized needs.

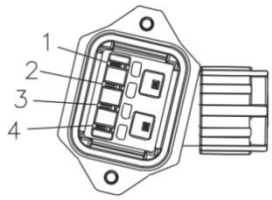
**M*: Length of the cable*

Direct connector E-CASP*M*-N without holding brake



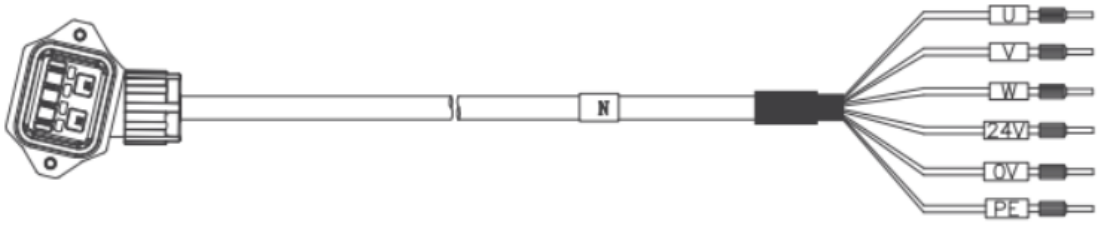
Motor side Driver side

Driver cable pin	Pins



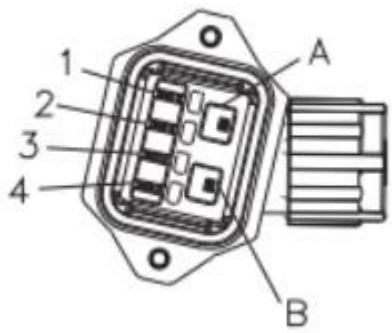
Motor	Color	Driver
1	Blue	U
2	Black	V
3	Red	W
4	Yellow-green	PE

Direct connector E-CASPB*M*-N with holding brake



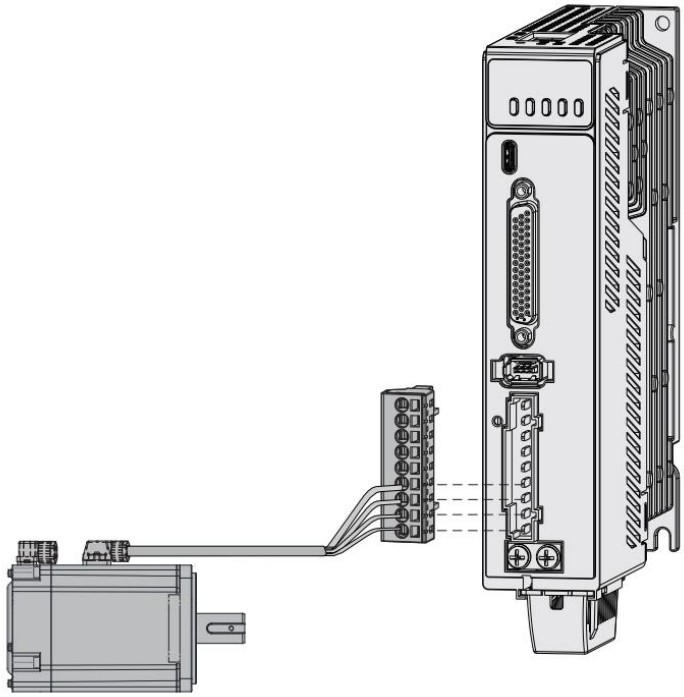
Motor side Driver side

Driver cable pin	Pins



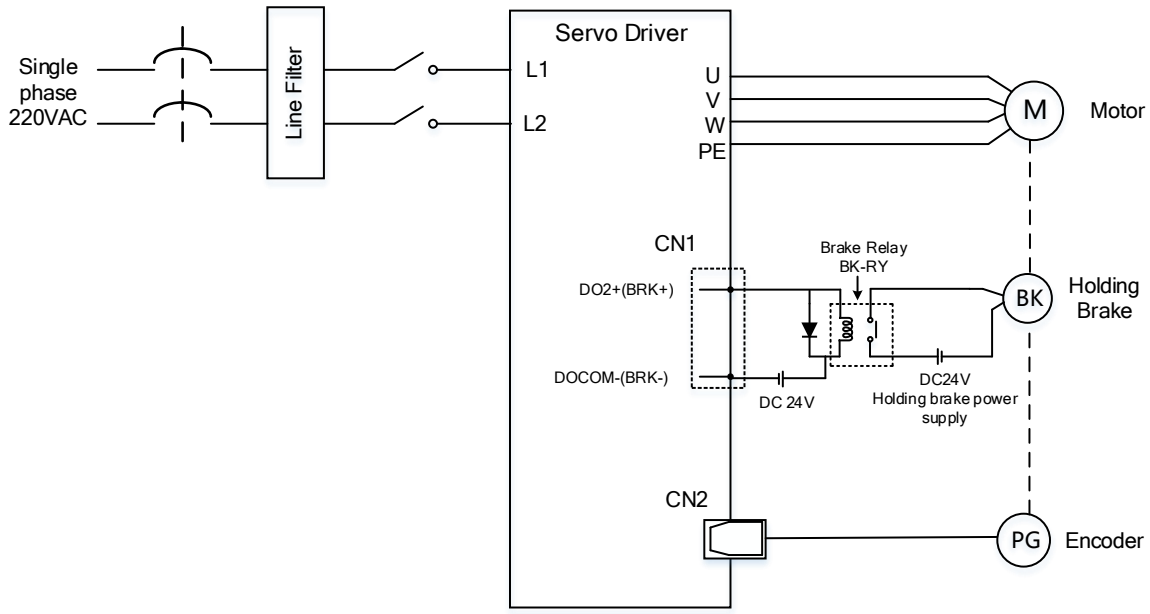
Motor	Color	Driver
1	Blue	U
2	Black	V
3	Red	W
4	Yellow-green	PE
A	Black	0V
B	Red	24V

Example of connecting motor's power cable to servo driver



4.6 Holding brake connection

Holding brake is activated when servo driver is not powered on to prevent axis from moving due to gravitational pull or other external forces by locking the motor in place. Usually used on axis mounted vertically to the ground so that the load would not drop under gravitational force when the driver is powered off or when alarm occurs.

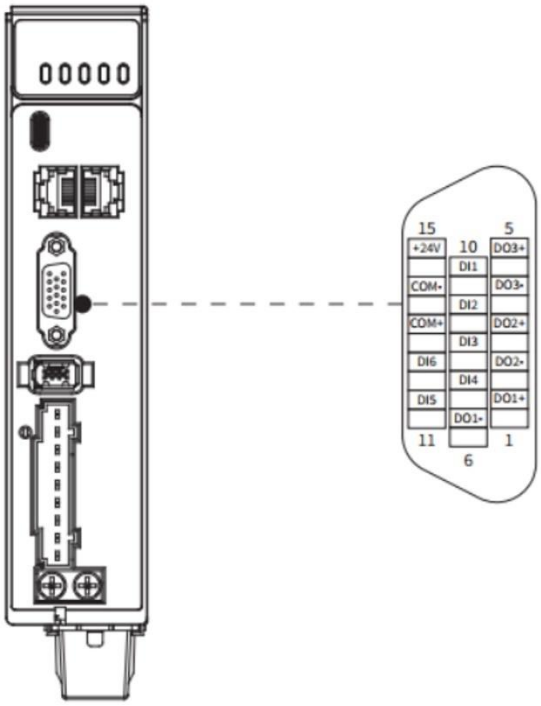


Holding brake wiring diagram

- Mechanical noise might exist when motor with holding brake is in operation but it doesn't affect the functionality of the motor.
- When the holding brake circuit is closed (holding brake deactivated), there might be magnetic flux leakage. Please be aware not to use magnetic sensor around motor with holding brake.
- 24V operating voltage for the holding brake has to be ensured to maintain the functionality of the holding brake. Please consider the voltage dropped over lengthy motor cables due to increase in cable resistance.
- It is recommended to have an isolated switching power supply for the holding brake to prevent malfunctioning of the holding brake in case of voltage drop.
- If the motor is using a magnetic encoder, holding brake wires need to be differentiated between positive and negative terminal to prevent interference to the magnetic encoder due to wrong polarity. It might cause alarm, loss in encoder accuracy or abnormal vibration, etc.
- Motor with optical encoder has no such problem, so holding brake circuit can be connected in anyway.

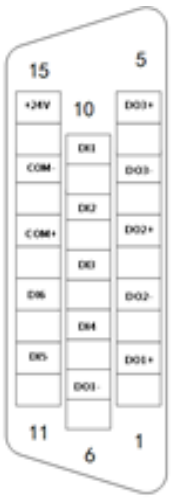
4.7 CN1 I/O Signal Port

CN1 connector is a DB15 female connector.



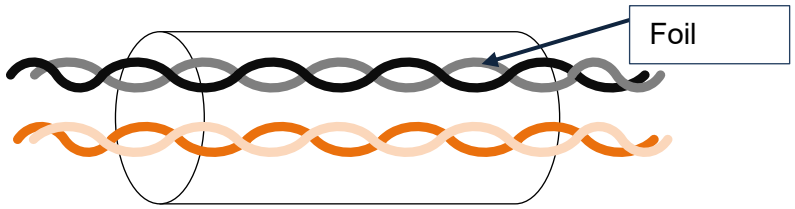
Note: It is recommended to use 24-26AWG cables for CN1

4.7.1 CN1 Full Pin Assignment Table

Port	Pin	Signal	Description	Remarks
	1	DO1+	SRDY+	Servo Ready Output Signal
	6	DO1-	SRDY-	
	3	DO2+	ALM+	Alarm Output Signal
	2	DO2-	ALM-	
	5	DO3+	BRK-OFF+	Break Off Output Signal
	4	DO3-	BRK-OFF-	
	10	DI1	POT	Positive limit switch
	9	DI2	NOT	Negative limit switch
	8	DI3	HOME	Homing switch
	7	DI4	EXT 2	Touch Probe 2
	11	DI5	EXT 1	Touch Probe 1
	12	DI6	-	Up to user configuration
	13	COM+	Common DI	Common digital input terminal
	14	COM-	Internal 24V Power Supply	Output voltage: 20~28VDC, max current output: 200mA
	15	24V+		

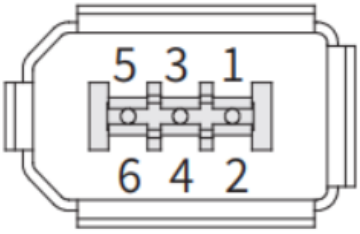
4.7.2 CN1 Control Signal Cable Selection

To ensure I/O signal is not affected by electromagnetic interference, a **shielded twisted pair cable** is recommended for this application.



- Wire diameter ≥ 0.14mm^2, foil shielded should be connected to PE terminal.
- Wire length should be as short as possible, not more than 3m.
- Install a surge suppressor in feedback circuit; flyback diode inversely connected in parallel in DC coil and capacitor connected in parallel in AC coil.
- Recommended wire gauge: 24 - 26AWG
- I/O signal included DI, DO and relay output signal
- Please keep 30cm away from main power supply cable or motor power cable to avoid electromagnetic interference.

4.8 CN2 Encoder Connection Port

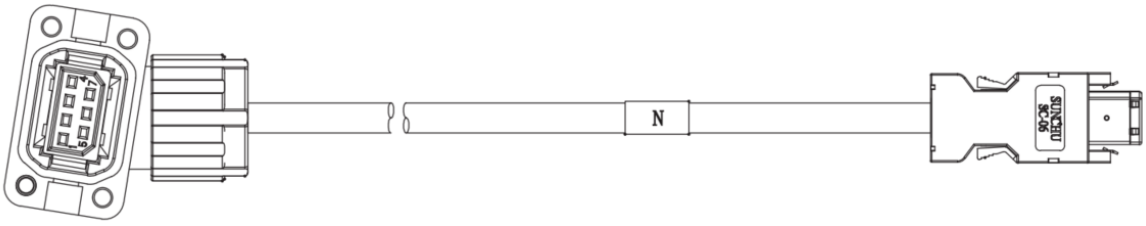


Connector	Pin	Signal	Description
CN2	1	VCC5V	Power supply 5V
	2	GND	Power supply ground
	3	BAT+	Battery positive terminal
	4	BAT-	Battery negative terminal
	5	SD+	SSI Data+
	6	SD-	SSI Data-
	Frame	PE	Shield grounding

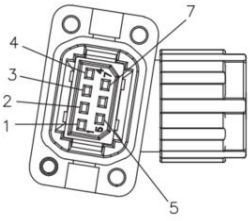
- Please ground both driver and motor PE terminals to avoid any servo alarms.
- It is recommended to use a shielded twisted pair cable not longer than 20m.
- Please leave a space of min. 30cm between motor power cable and encoder to avoid interference.

Motor encoder cable selection

Direct connector E-CAS1E*M*-N Incremental encoder

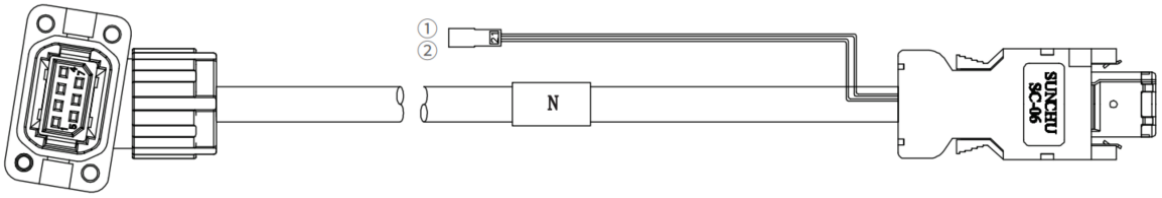


Motor side Driver side

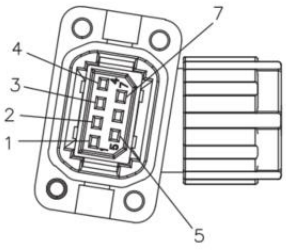
Motor cable pin	Pin
	

Motor	Color code	Driver
1	Frame	Shielded
2	White	1 (+5V)
3	Black	2 (0V)
4	Blue	5 (SD+)
5	Purple	6 (SD-)

Direct connector E-CAS2E*M*-N Absolute encoder

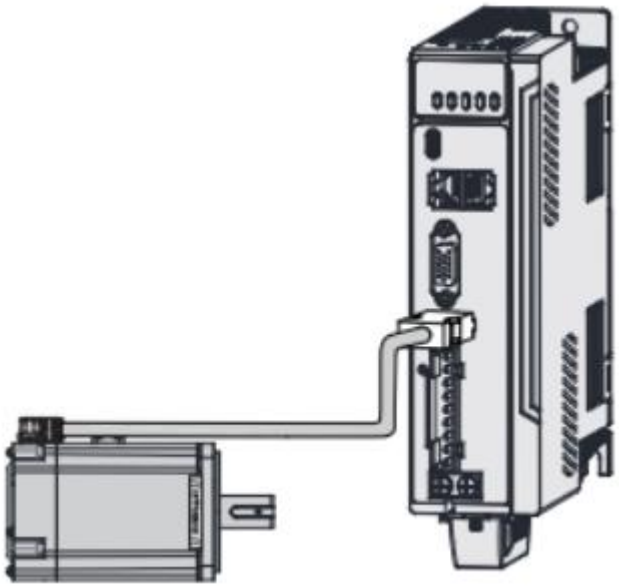


Motor side Driver side

Motor cable pin	Pin
	

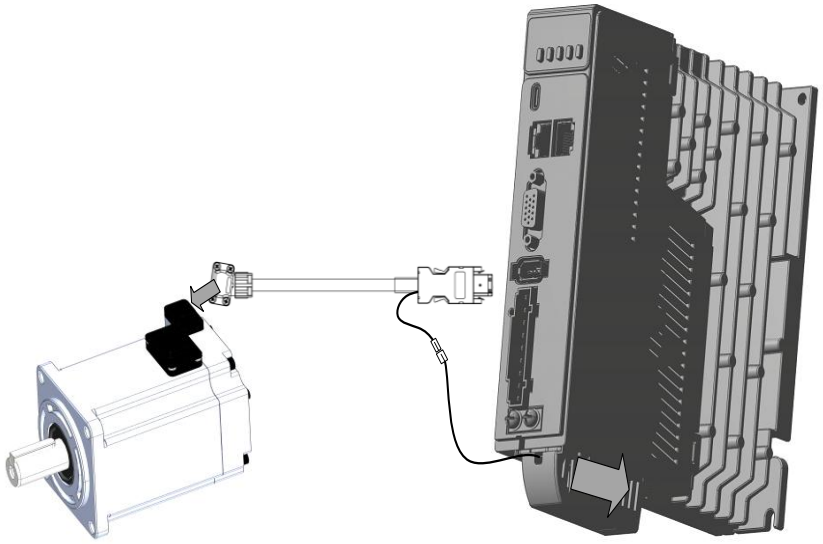
Motor	Color code	Driver
1	Frame	Shielded
2	White	1 (+5V)
3	Black	2 (0V)
4	Blue	5 (SD+)
5	Purple	6 (SD-)
6	Red	① (BAT+)
7	Black	② (BAT-)

Example of connecting motor's encoder cable to servo driver



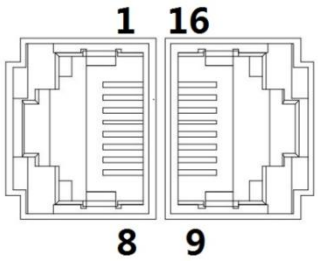
Battery box for absolute encoder

E-DFAS□□E series servo drivers come with battery kit installed on the driver or on the encoder cable.



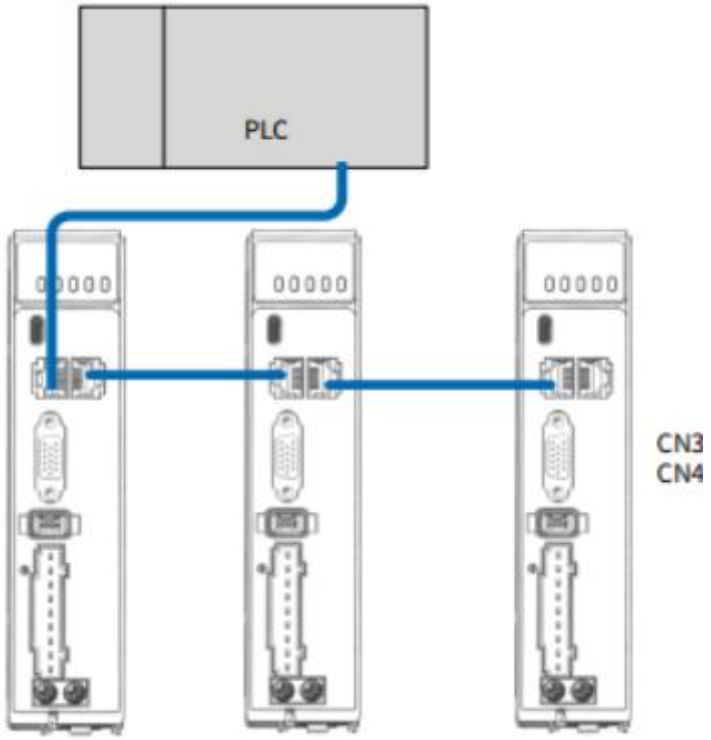
4.9 CN3/CN4 EtherCAT Communication Port

CN3 and CN4 are communication ports for EtherCAT protocol. LAN cable from master device will be connected to CN3 (IN) and CN4 (OUT) will be connected to the next slave device.

Connector	Port	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	Shielded ground

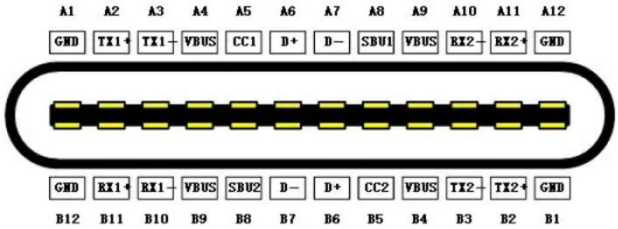
■ E-DFAS□□E models support EtherCAT communication and offer the following connection options:

1. Communication between multiple drivers and the host.
2. Communication between a single driver and the host.



4.10 USB Type-C Tuning Port

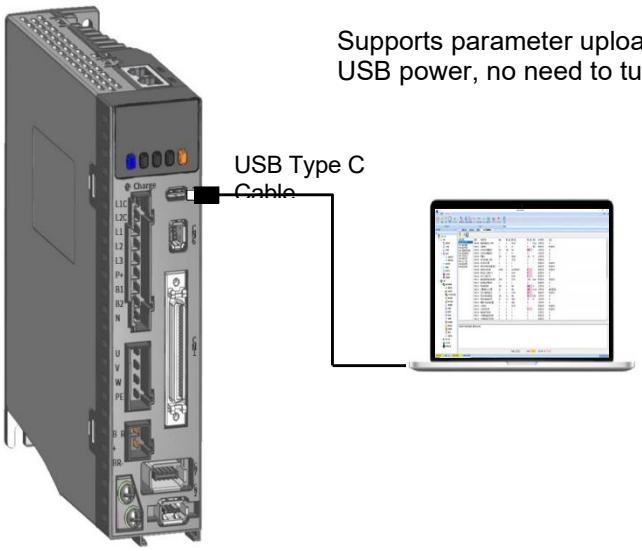
E-DFAS□□E series servo driver can be connected to PC for performance tuning, data monitoring and parameters modifying using a **USB Type-C data cable**. Can be done without the servo driver connecting to main power supply.



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

- Without main power, the driver can be connected to a PC via a debug cable for parameter configuration using MISUMI EDrive software.
- If connection issues occur due to interference, it is recommended to use a debug cable with ferrite core, which can effectively resolve such problems.

PC Turning Port Wiring Example



Supports parameter upload and download using only USB power, no need to turn on main power.

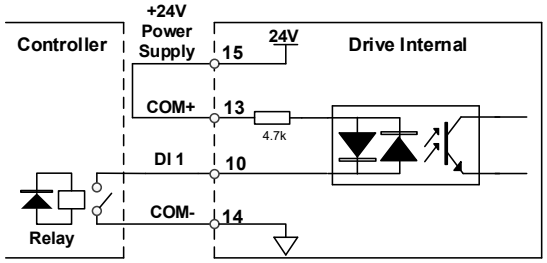
4.11 I/O Signal

4.11.1 Common input circuit

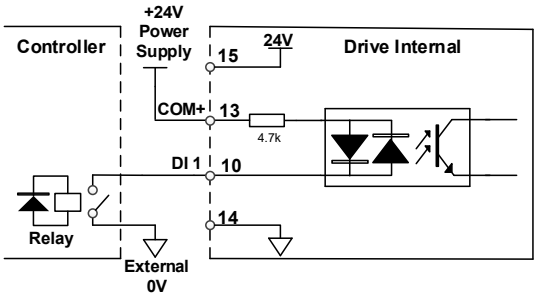
The internal circuit of common input is a bidirectional optocoupler which supports common anode and common cathode configurations. There are 2 types of outputs from master device: Relay output and Open Collector output as shown below.

① Output from master device: Relay

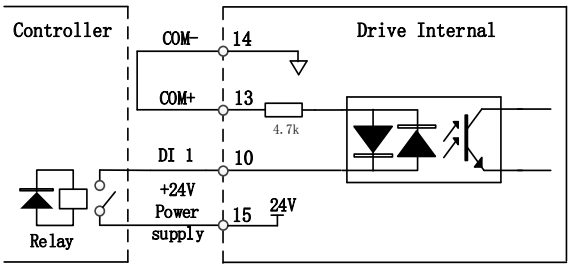
Common Anode (Internal 24V):



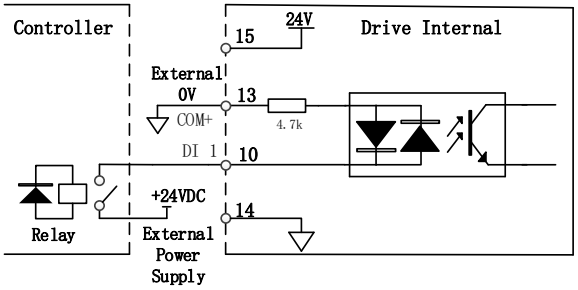
Common Cathode (Internal 24V):



Common Anode (External 24V):

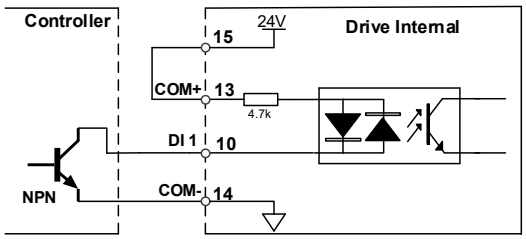


Common Cathode (External 24V):

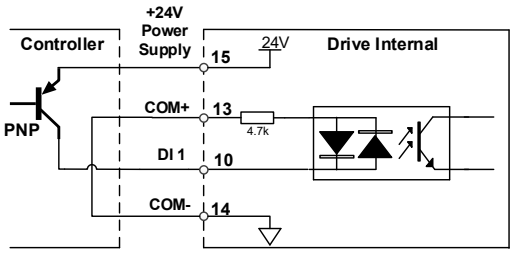


② Output from master device: Open Collector

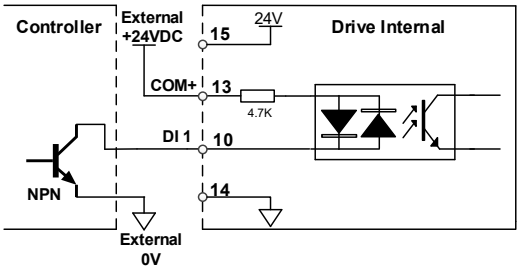
Common Anode (Internal 24V):



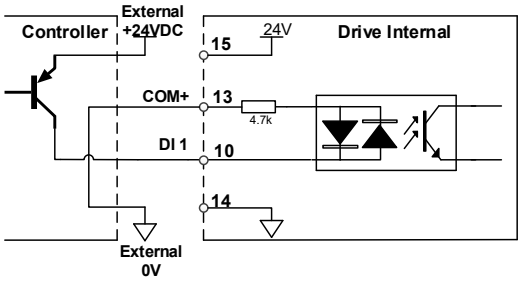
Common Cathode (Internal 24V):



Common Anode (External 24V):



Common Cathode (External 24V):



Please prepare switching power supply with output of 12-24VDC, current ≥ 100mA.

Digital input DI (1 to 6) default function

CN1 Pin	Signal	Parameter	Default function	Factory default		
				Set Value	Polarity	Status
13	DI COM	-	Common Digital Input	0x0	-	-
10	DI1	P04.00	Positive limit switch (POT)	0x1	NO	OFF
9	DI2	P04.01	Negative limit switch (NOT)	0x2	NO	OFF
8	DI3	P04.02	Home switch (HOME)	0x16	NO	OFF
12	DI6	P04.05	User configurable	-	-	-

***NO: Normally Open*

- 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).

- **Relevant parameters**

P04.00	**Label**	Input selection DI1	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2400h
P04.01	**Label**	Input selection DI2	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2401h
P04.02	**Label**	Input selection DI3	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2402h
P04.03	**Label**	Input selection DI4	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2403h
P04.04	**Label**	Input selection DI5	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2404h
P04.05	**Label**	Input selection DI6	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2405h

Digital input DI allocation using hexadecimal system

Input	Symbol	Set value		0x60FD(bit)
		Normal open	Normal close	
Invalid	—	0h	-	×
Positive limit switch	POT	1h	81h	Bit1
Negative limit switch	NOT	2h	82h	Bit0
Clear alarm	A-CLR	4h	-	×
Forced alarm	E-STOP	14h	94h	×
Home switch	HOME-SWITCH	16h	96h	Bit2

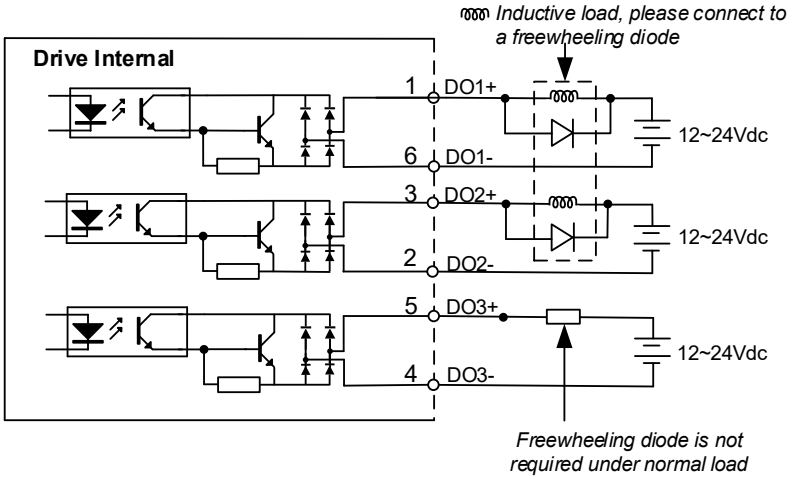
- Please don't set anything other than listed in the table above.
- Normally open: Valid when input = ON Normally close: Valid when input = OFF
- Er210 might occur if same function is allocated to different channels at the same time
- Channel that has no value doesn't affect driver motion.
- Front panel is of hexadecimal system.

P04.00 – P04.05corresponds to DI1 – DI6. External sensors can be connected if the parameters are all set to 0. Controller will read 60FD bit4 – 11 to get DI1 – DI6 actual status.

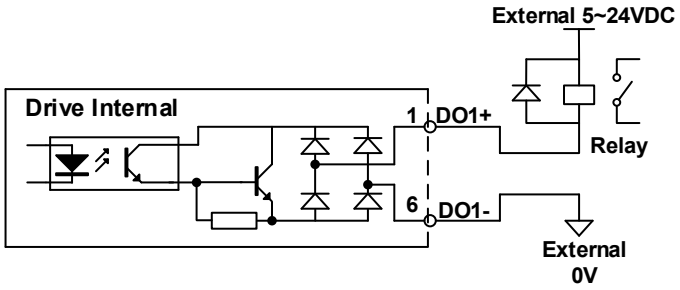
4.11.2 Common output circuit

There are 3 common outputs: DO1 ~ DO3 are double-ended, having an isolated 24v power supply.

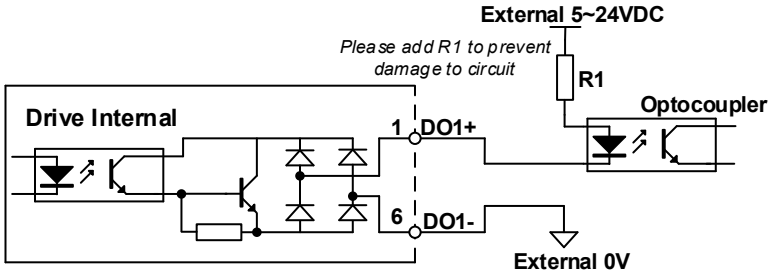
Double-ended Digital Outputs (supports PNP or NPN connection)



When connected to a relay (NPN connection):



When connected to optocoupler (PNP connection):



- 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. A wrong installation of the flyback diode might cause damage to the driver.

DO signal function configuration

CN1 Pin	Signal	Parameter	Default function	Factory default		
				Set Value	Polarity	Status
1	DO1+	P04.10	Servo Ready (S-RDY)	0x01	NO	OFF
6	DO1+					
3	DO1+	P04.11	Alarm (ALM)	0x03	NO	OFF
2	DO1+					
5	DO1+	P04.12	External brake released (BRK-OFF)	0x04	NO	OFF
4	DO1+					

*** NO: Normally Open*

Relevant parameters

P04.10	**Label**	Output selection DO1	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2410h
P04.11	**Label**	Output selection DO2	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2411h
P04.12	**Label**	Output selection DO3	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2412h

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

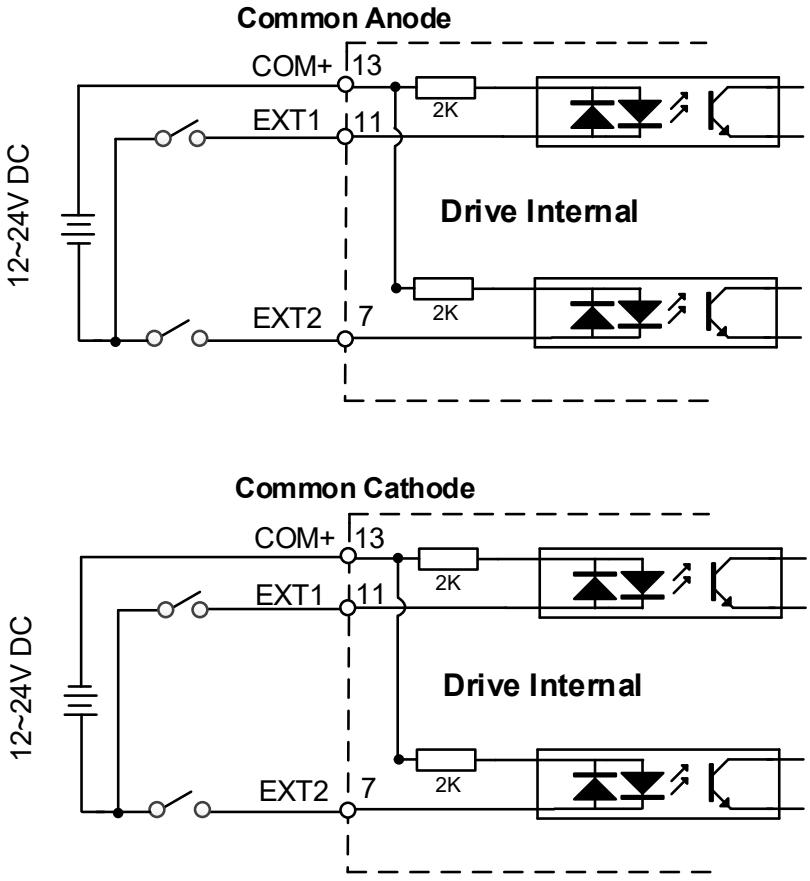
Please don't set any other than the outputs listed in the table above.

- 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.

4.11.3 Probe input circuit

The E-DFAS□□E driver shares the probe interface with DI4 and DI5, using bidirectional optocoupler input circuitry.



4.12 Measures against electromagnetic interference

To reduce interference, please take the following measures:

- I/O signal cable > 3m; Encoder cable > 20m
- Use cable with larger diameter for grounding

① Grounding resistance > 100Ω

② 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.
- In order to prevent malfunctions caused by electromagnetic interference, please take following measures:

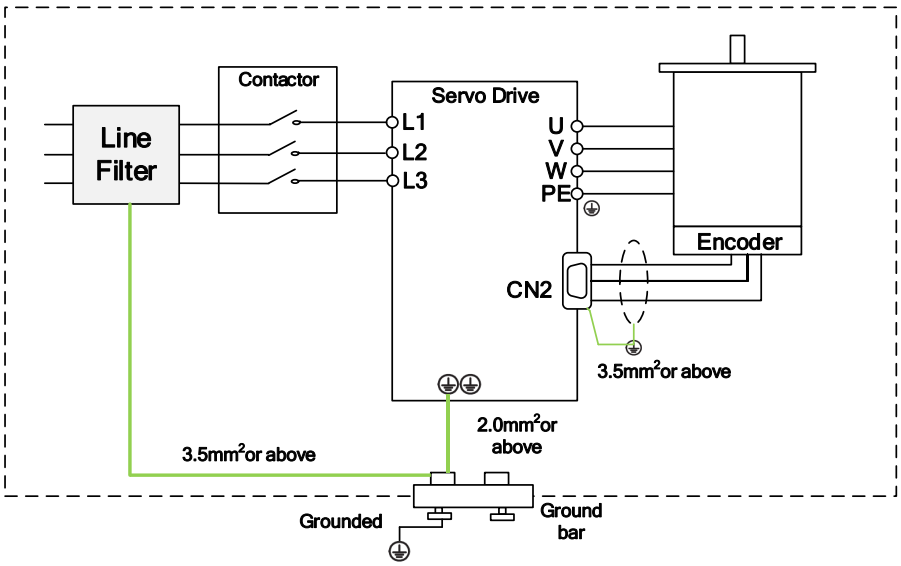
①Install master device and line filter close to the servo driver

②Install surge suppressor for relay and contactor

③Please separate signal/encoder cable from power cable with a space of at least 30cm

④Install a line filter for the main power supply if a device with high frequency generation such as a welding machine exists nearby

4.12.1 Grounding connection and other anti-interference wiring connections

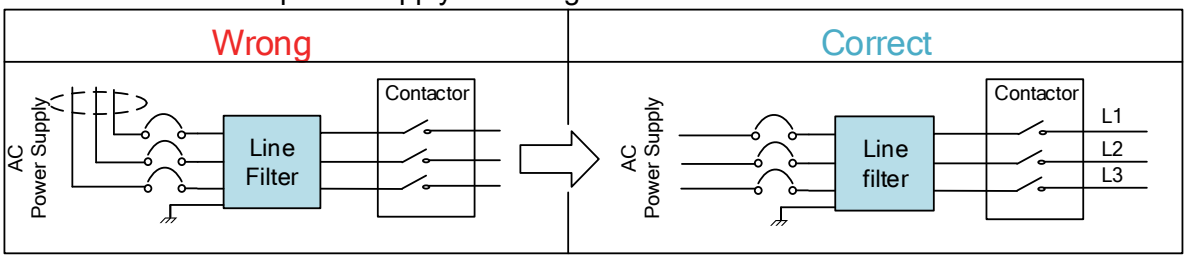


- Servo motor frame should be grounded. Please connect the PE terminal of servo motor and servo driver and ground them together to reduce interference.
- Ground both ends of the foil shield of encoder cable.

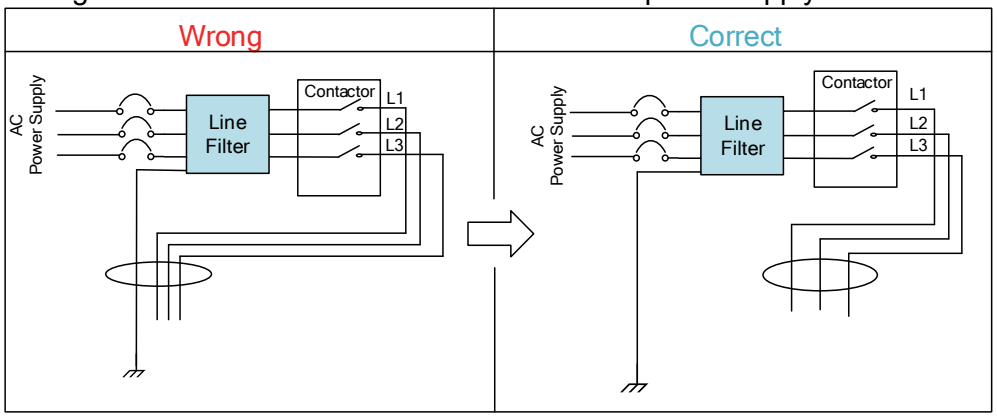
4.12.2 Using line filter

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.

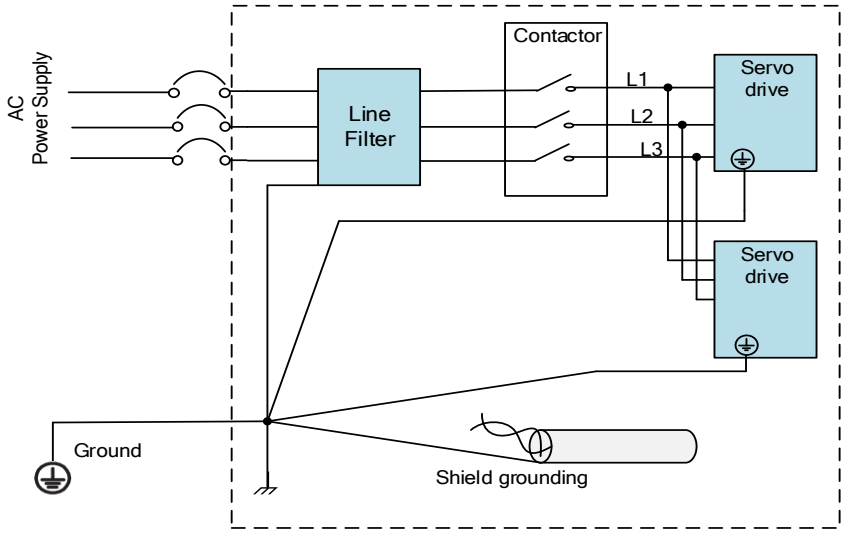
Do not band the main power supply cable together.



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



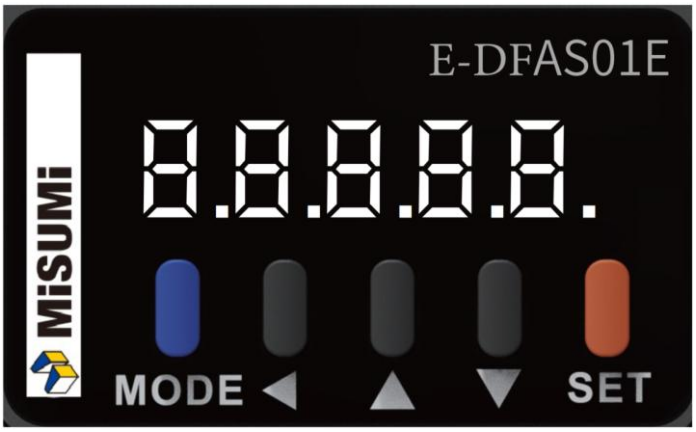
Ground wires inside an electrical cabinet



Chapter 5 Servo Driver Operation

5.1 Front Panel

Servo Driver front panel consists of 5 push buttons and a 8-segments display. It can be used for displaying status, alarms, functions, parameters setting and auxiliary functions.



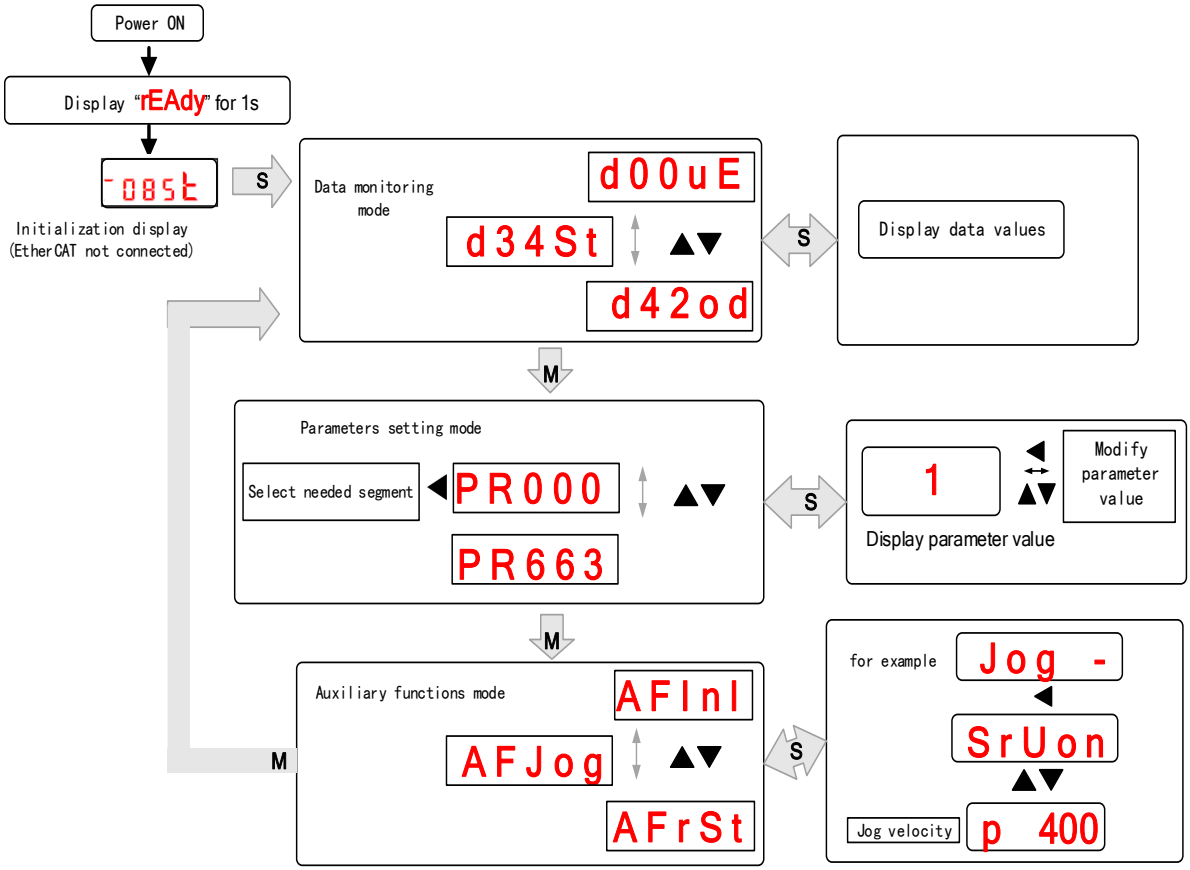
Front panel

Buttons and functions

Label	Symbol	Function
Display	/	Consists of 5 push buttons and a 8-segments display
Mode	**M**	To switch between 4 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

5.2 Panel Display and Operation

5.2.1 Panel Operation



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
Alarm code will be displayed regardless of any mode if alarm occurs. Press **M** to switch to other modes.
(3) Press ▲ or ▼ to select the type of parameters in data monitoring mode. Press **S** to confirm.
(4) 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.

5.2.2 Front Panel Locking

To P0Event any misuse of the front panel, it can be locked. Limitations when locked are as shown below.

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

To lock and unlock the front panel

	Front Panel	EDrive
Lock	①Set P05.35 = 1. ②Restart driver. ③Front panel is now locked.	
Unlock	① Please refer to auxiliary function **AF UnL** ② Front panel is now unlocked.	① Set P05.35 = 0. ② Front panel is now unlocked.

5.2.3 Data Monitoring Mode

E-DFAS□□E series servo 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**. Press **S** again to get back to data monitoring mode and **M** to switch to any other modes.

Data list in data monitoring mode

No.	Label	Descriptions	Display	Unit	Data Format (x = numerical value)
0	d00uE	Position command deviation	**d00uE**	pulse	"xxxx"
1	d01SP	Motor velocity	**d01SP**	r/min	"r xxxx"
2	d02CS	Position control command velocity	**d02CS**	r/min	"xxxx"
3	d03Cu	Velocity control command velocity	**d03Cu**	r/min	"xxxx"
4	d04tr	Actual feedback torque	**d04tr**	%	"xxxx"
5	d05nP	Feedback pulse sum	**d05nP**	pulse	"xxxx"
6	d06cP	Command pulse sum	**d06CP**	pulse	"xxxx"
7	d07	Maximum torque during motion	**d07**	/	"xxxx"
8	d08FP	Internal command position sum	**d08FP**	pulse	"xxxx"
9	d09cn	Control mode	**d09Cn**	/	EtherCAT: "**CtPoS**"
10	d10Io	I/O signal status	**d10 Io**	/	-
11	d11Ai	Internal usage	**d11Ai**	V	-
12	d12Er	Error cause and record	**d12Er**	/	"Er xxx"
13	d13rn	Warning	**d13rn**	/	"xxx"
14	d14r9	Regeneration load factor	**d14r9**	%	"xxx"

15	d15oL	Overload factor	**d15oL**	%	“xxx”
16	d16Jr	Inertia ratio	**d16Jr**	%	“xxx”
17	d17ch	Motor not running cause	**d17Ch**	/	“CP xxx”
18	d18ic	No. of changes in I/O signals	**d18ic**	/	“xxx”
19	d19	No. of times of overcurrent	**d19**	/	“xxxx”
20	d20Ab	CSP position command sum	**d20Ab**	pulse	“xxxx”
21	d21AE	Single turn encoder data	**d21AE**	pulse	“xxxx”
22	d22rE	Multiturn encoder data	**d22rE**	r	“xxxx”
23	d23 id	Communication axis address	**d23id**	/	“id xxx” “Fr xxx”
24	d24PE	Position deviation	**d24PE**	Unit	“xxxx”
25	d25PF	Motor electrical angle	**d25PF**	pulse	“xxxx”
26	d26hy	Motor mechanical angle	**d26hy**	pulse	“xxxx”
27	d27 Pn	Voltage across PN	**d27Pn**	V	“xxxx”
28	d28 no	Software version	**d28no**	/	“d xxx Servo software” “F xxx Communication software” “p xxx Servo power rating”
29	d29AS	Internal usage	**d29AS**	/	“xxx”
30	d30NS	No. of times of encoder communication error	**d30sE**	/	“xxx”
31	d31 tE	Accumulated operation time	**d31tE**	/	“xxxx”
32	d32Au	Automatic motor identification	**d32Au**	/	“r xxx Motor no.” “E xxx Servo no.”
33	d33At	Driver temperature	**d33At**	℃	“xxx”
34	d34	Servo status	**d34**	/	“xxx”
35	d35 SF	Internal usage	**d35SF**	/	“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**	freeru n/DC	“xxxxxx”
39	d39der	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.



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.



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

1. d00uE Position command deviation

Shows high bit and low bit of position deviation



Position command deviation

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

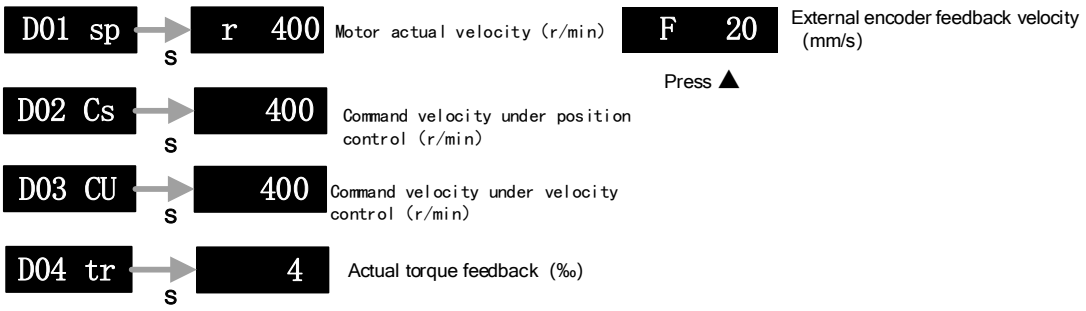
Press ◀ to switch between low and high bit
Example : Position command deviation=260885



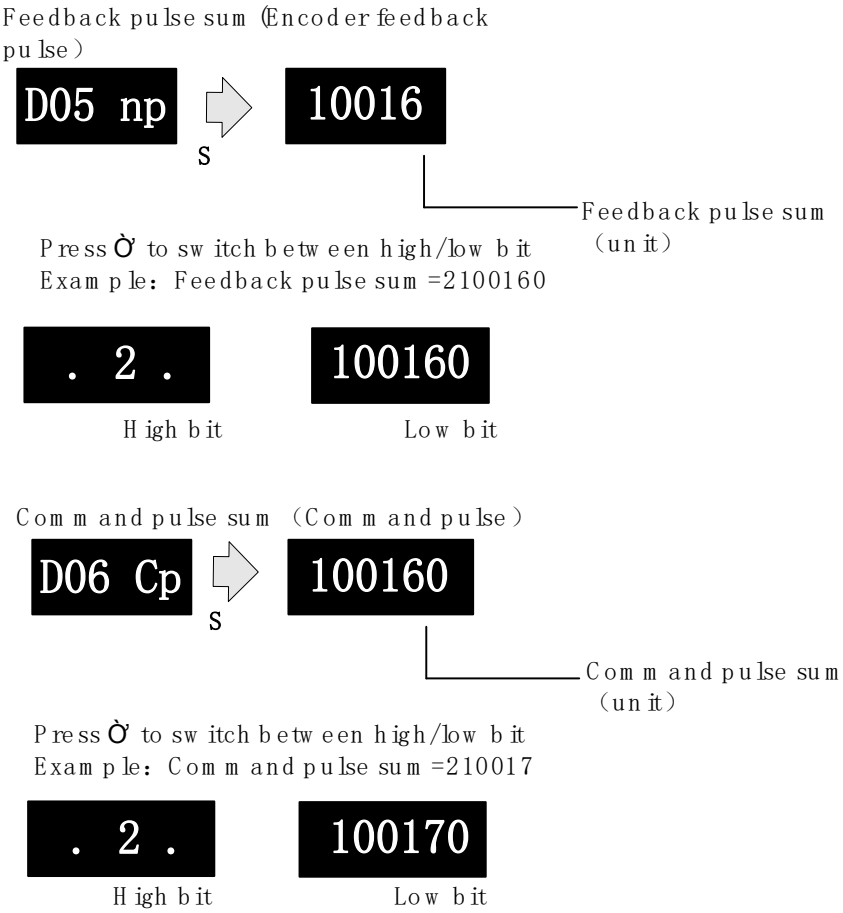
High bit: 1st and 2nd values on the right has two decimal points
Low bit: 1st and 2nd values on the right has no decimal point.

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

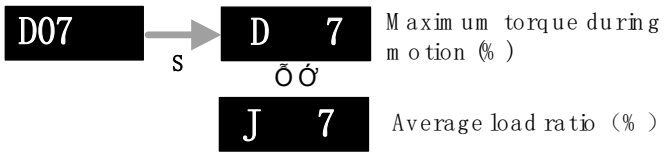
d04 tr reflects actual current.



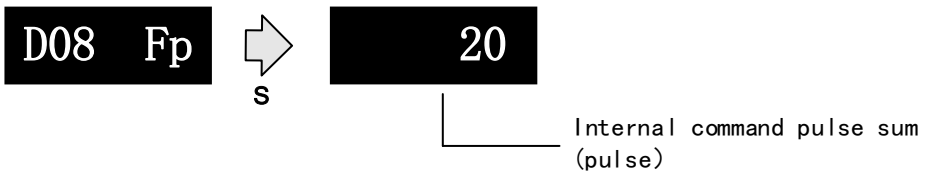
3. d05nP Feedback pulse sum d06CP Command pulse sum



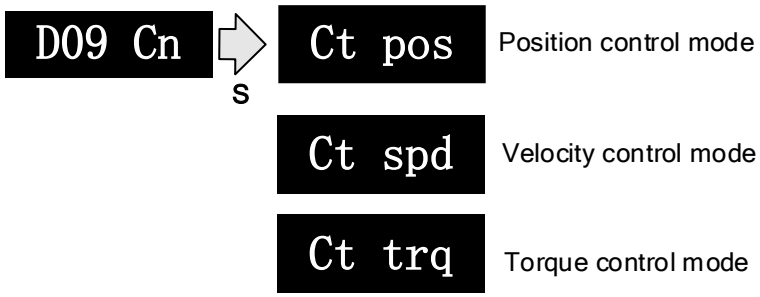
4. d07 Maximum torque during motion



5. d08FP Internal command pulse sum



6. d09Cn Control mode

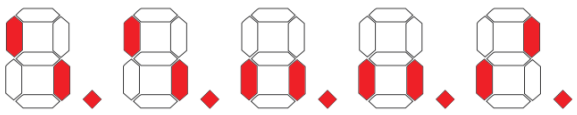


7. d10Io I/O signal status

When the top half of the digital tube is lit, the signal is valid; when the bottom half of the digital tube is lighted, the signal is not valid. Decimal points reP0Esent I/O status, input when lighted, output when not lighted.

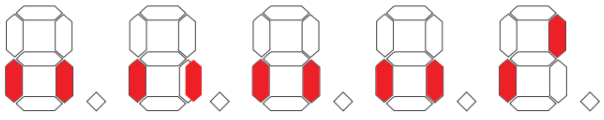
■ **Input:** From low to high bit (Right to left) DI1, DI2, ... DI10. Decimal point is lighted to reP0Esent input signals.

In the example below, DI1, DI8 and DI10 input signal is valid; DI2-DI7, DI9 input signal is invalid.

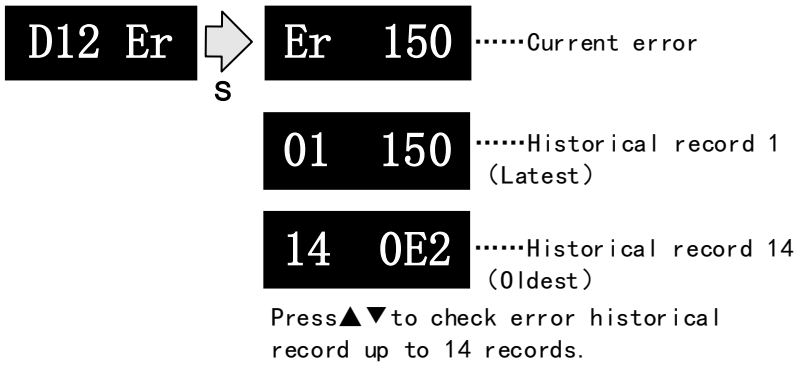


■ **Output:** From low to high bit (Right to left) DO1, DO2, … DO10. Decimal point is not lighted to reP0Esent output signals.

In the example below, DO1 output signal is valid; DO2-DO10 output signal is invalid.

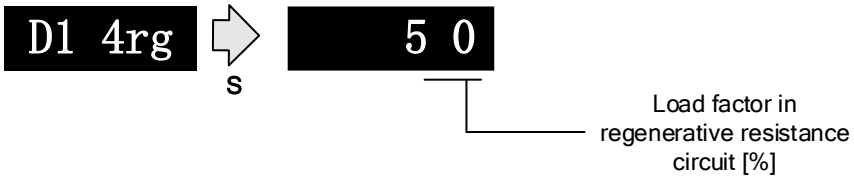


8. d12Er Alarm cause and historical record



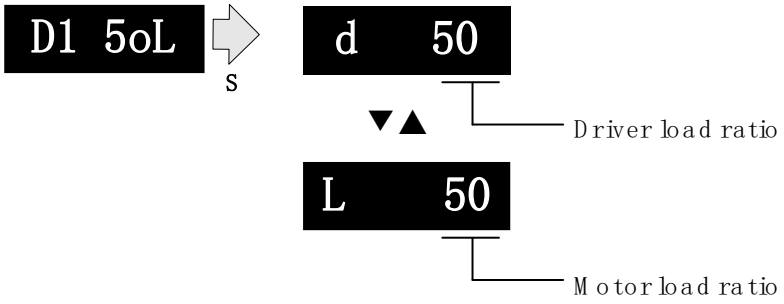
9. d14rg Regenerative load factor d15oL Overload factor

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



Overload factor（Er101 might occur, if d increases indefinitely

Er100 might occur, if L increases indefinitely）

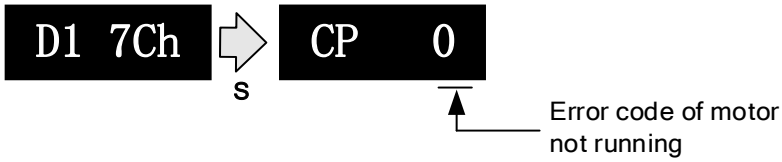


10. d16Jr Inertia ratio



Use auxiliary function **AF_GL** or EDrive to measure the inertia ratio. The result will be shown on **D1 6Vr**, hold M to write the value in P00.04.

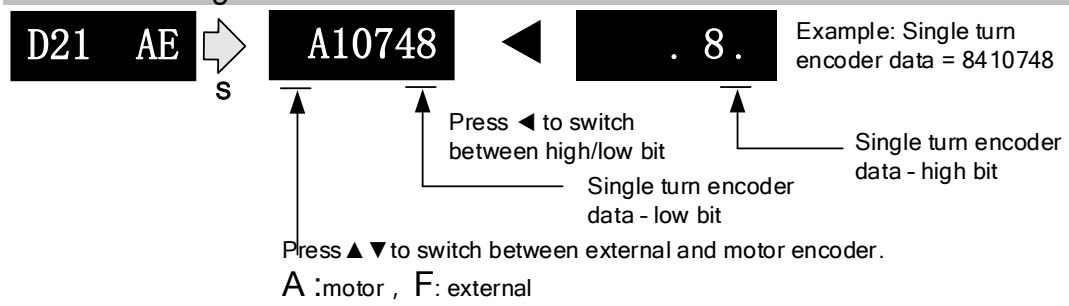
11. d17Ch Motor not running cause



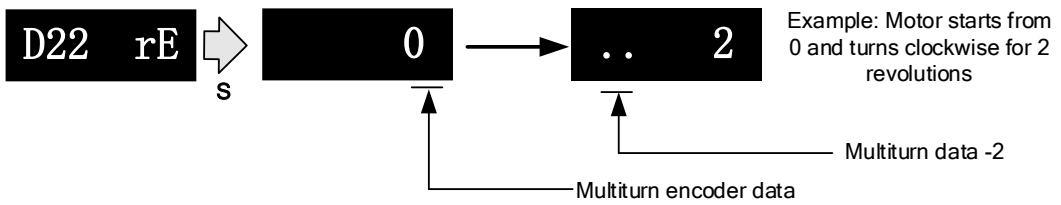
"d17Ch" Motor No Running Cause - Codes & Descriptions

Display Code	Description	Content
CP 0	Normal	
CP 1	DC bus undervoltage	Check if DC bus voltage is too low on D27
CP 2	No SRV-ON signal	Servo-ON input (SRV-ON) is not connected to COM-
CP 3	POT/NOT input valid	P05.04 = 0, POT is in open circuit, velocity command is in positive direction NOT is in open circuit, velocity command is in negative direction
CP 4	Driver alarm	/
CP 5	Relay not clicked	Check input voltage
CP 6	Pulse input prohibited (INH)	P05.18=0
CP 7	Position command too low	No command or too low
CP 8	CL valid	P05.17=0, deviation counter connected to COM-
CP 9	Zero speed clamp valid	P03.15 = 1, Zero speed clamp input is open

12. d21AE Single turn encoder data d22rE Multiturn encoder data

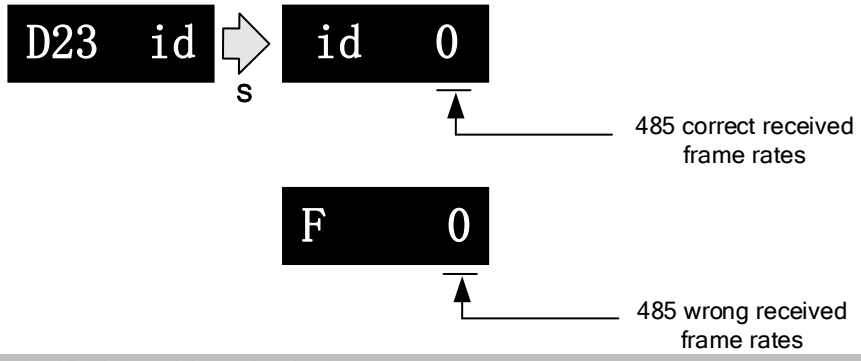


For 23-bit encoder, single turn encoder data = 0~8388607. Each value corresponds to certain position in a single revolution of the rotor, clockwise motion as negative, counter clockwise motion as positive. When counter clockwise single turn data > 8388607, multiturn data +1, clockwise single turn data < 0, multiturn data -1.

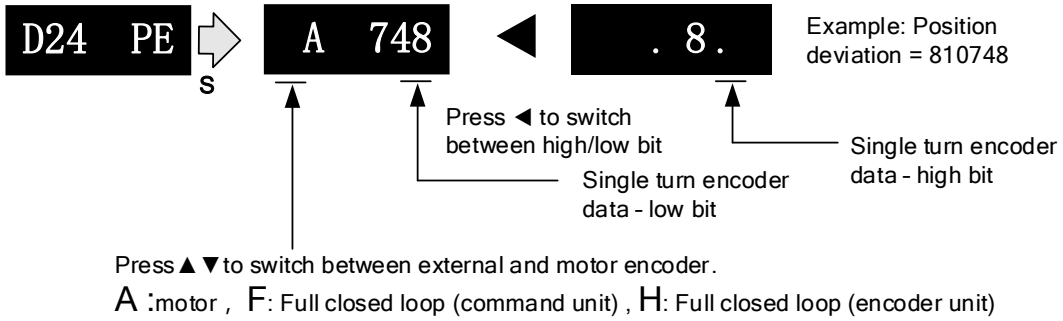


Multiturn encoder data range: -32768~+32767, As no. of revolution goes over range, 32767 will jump to -32768, -32767(counter clockwise); -32768 will jump to 32767, 32766 (clockwise)

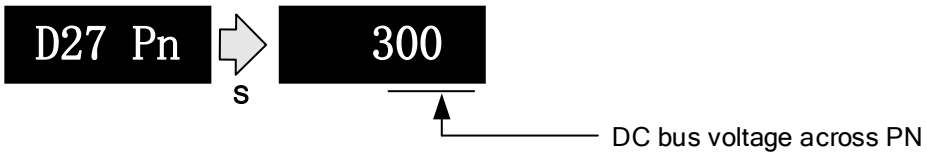
13.d23id 485 received frame



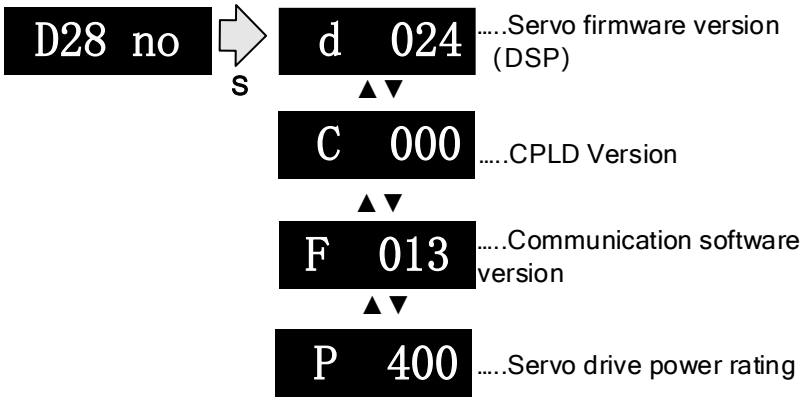
14. d24PE Position deviation



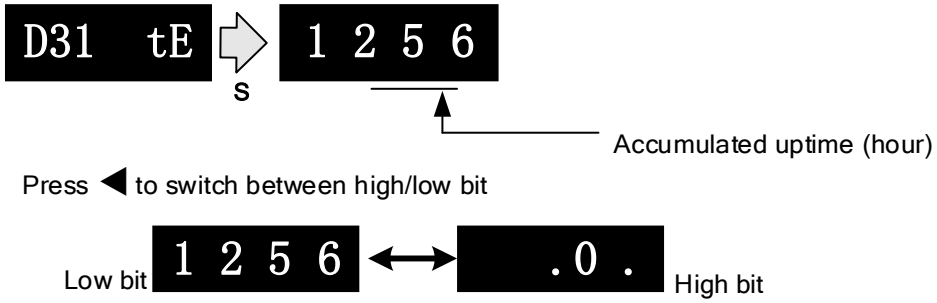
15. d27Pn DC bus voltage



16. d28no Software version



17. d31tE Accumulated operation time



Display setting at power on

■ Default setting for initialization display settings at power on is **d34**, if any other display is required, please set on P05.28.

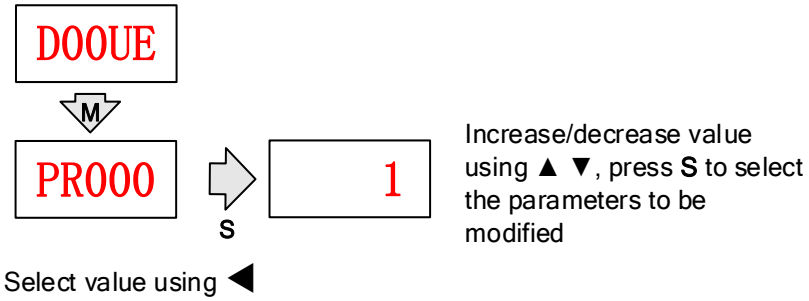
Please refer to P05.28 for any display content required on the front panel during initialization

P05.28	Label	LED initial status			Valid mode(s)	P	S	T
	Range	0~35	Unit	—	Default	1		
	Byte length	16bit	Attribute	R/W	485 address	0x0539		
	Valid	Immediate						

To set content display on front panel of the servo driver at servo driver power on.

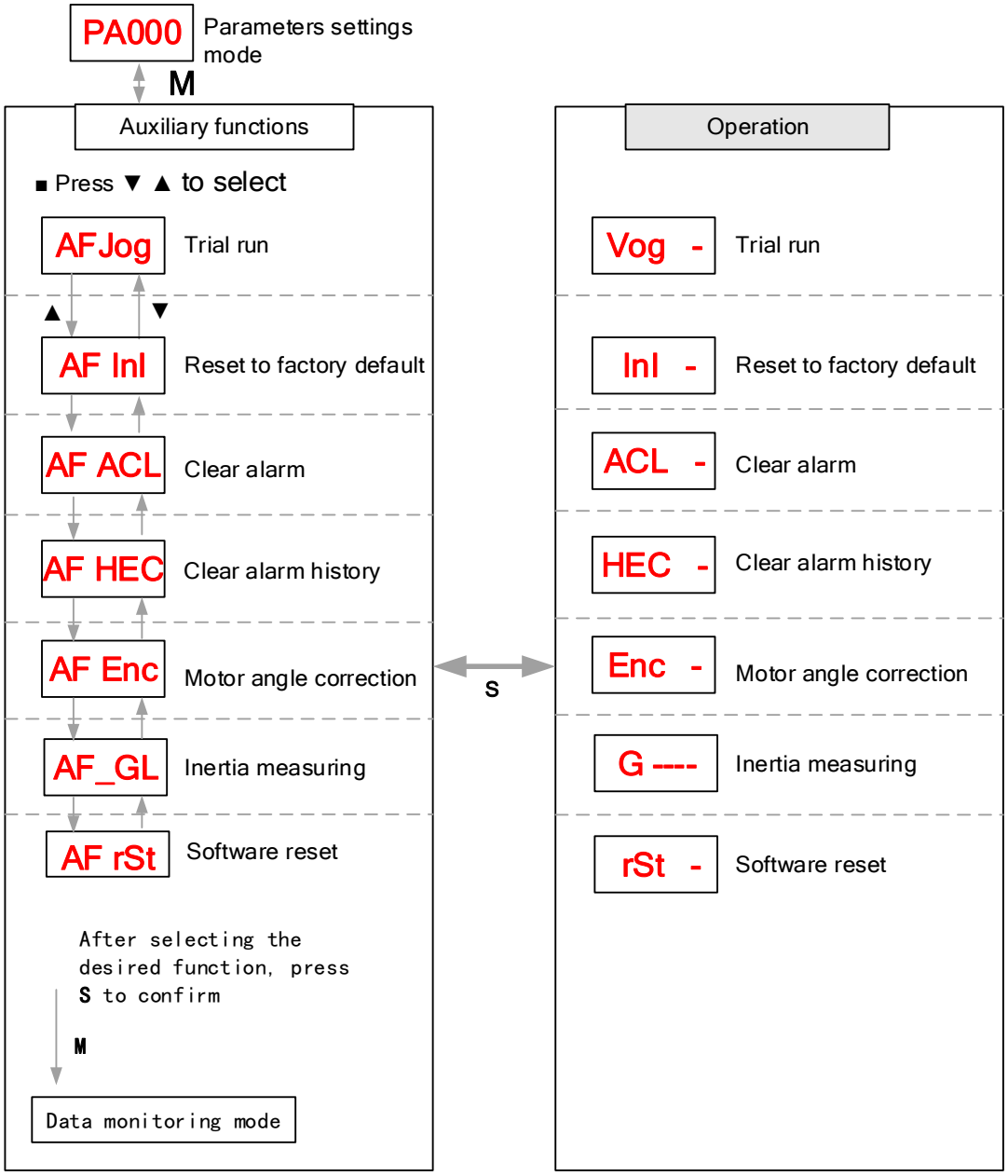
Value	Status	Value	Status	Value	Status
0	Position deviation	14	Regenerative load rate	28	Software version
1	Motor speed	15	Overload rate	29	Internal usage
2	Position command deviation	16	Inertia load ratio	30	Encoder communication failure counts
3	Velocity control command	17	Cause(s) of non-rotation	31	Accumulated uptime
4	Actual feedback torque	18	No. of I/O changes	32	Internal usage
5	Feedback pulse sum	19	Internal usage	33	Driver temperature
6	Command pulse sum	20	Absolute encoder data	34	Servo status
7	Max. torque	21	Encoder single turn data	35	Internal usage
8	Position command frequency	22	Encoder multiturn data		
9	Control mode	23	485 receive frame		
10	I/O status	24	Encoder position deviation		
11		25	Internal usage		
12	Alarm cause & history record	26	Internal usage		
13	Warning ID	27	PN Voltage		

5.2.4 Parameter Setting Mode



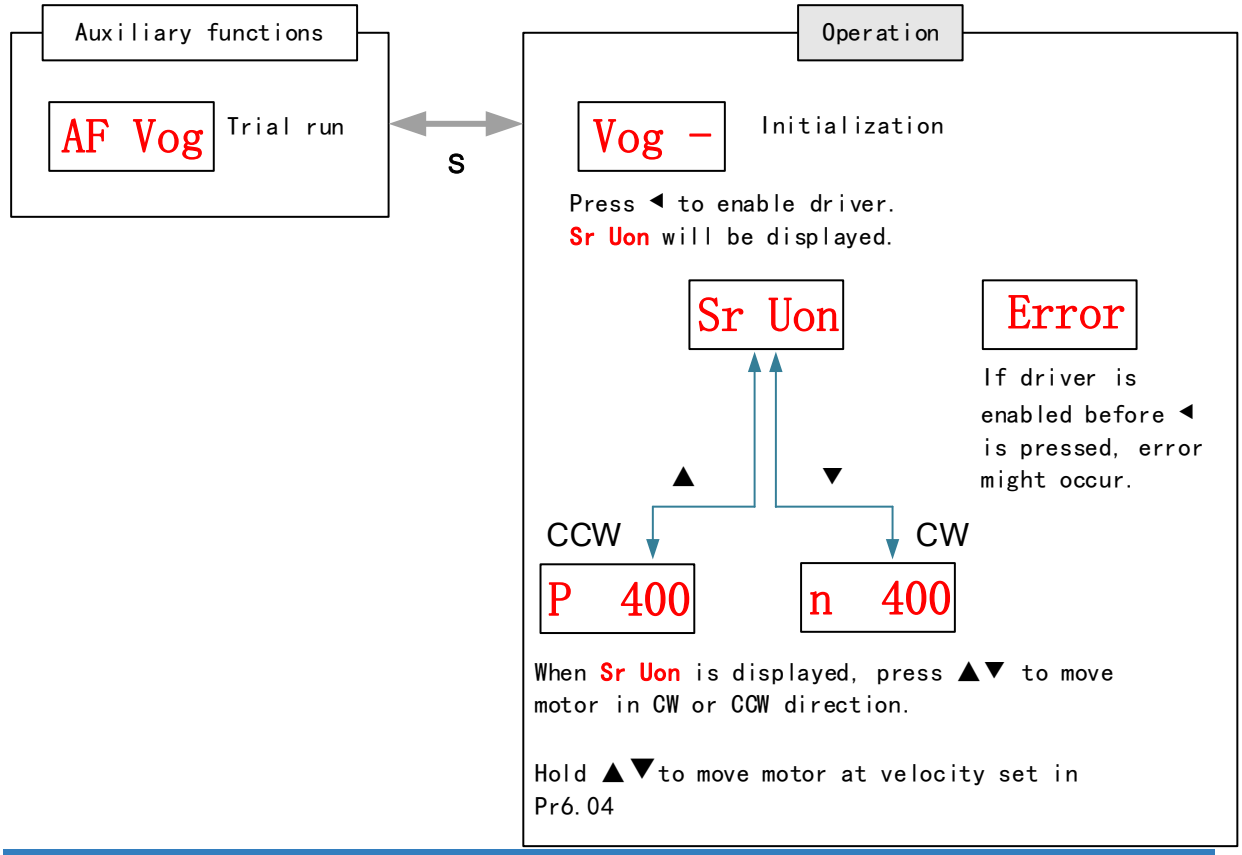
After modifying the selected parameter to desired values, press **S** to confirm and save the changes.

5.2.5 Auxiliary functions



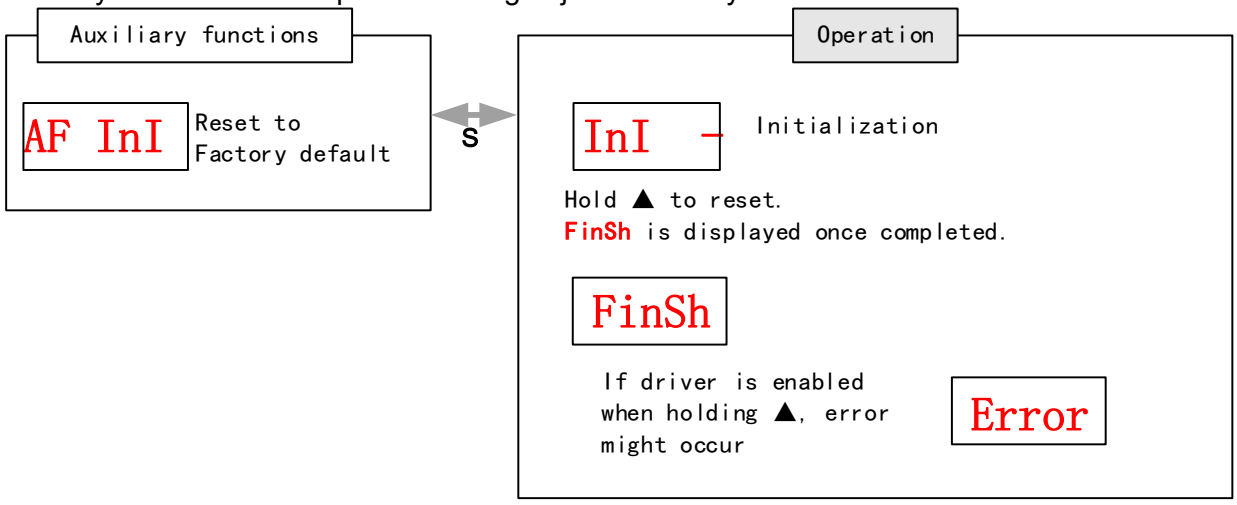
AF jog Trial run

Please disable servo driver before performing any trial run. Please don't modify gain related parameters during trial run to prevent any occurrence of mechanical vibrations. Press **S** to exit trial run.



AF Inl Reset to factory default

To reset parameters settings to factory default. Can be used to reset parameters using auxiliary function on front panel or using object dictionary.

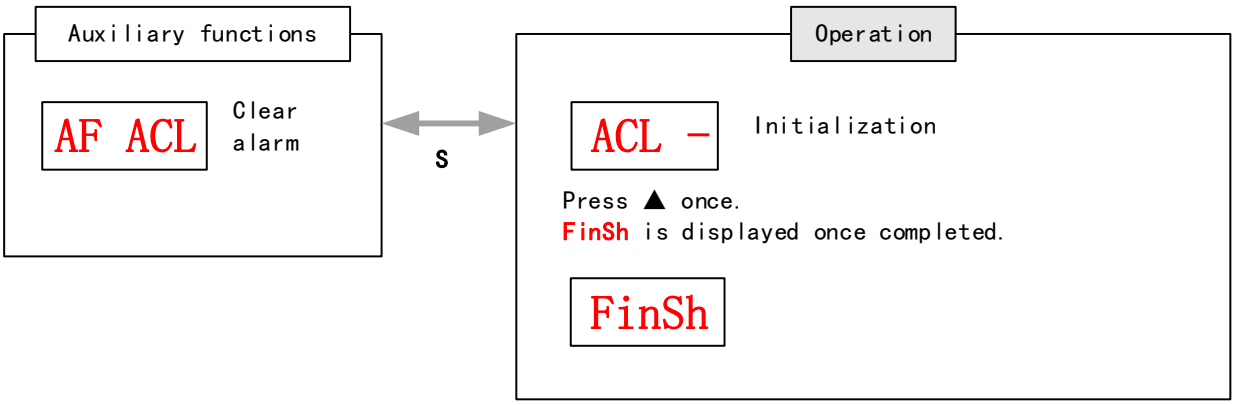


Reset to factory default using object dictionary

Object dictionary	Parameters to reset	Method
0x1011-01	All parameters	Controller can reset all parameters using 0x1011-01. If driver receives the data of 0x1011-01 as 0x64616f6c, all parameters will be reset to factory default and 1011-01=1 after saving.
0x1011-02	Communication parameters	Controller can reset communication parameters using 0x1011-02. If driver receives the data of 0x1011-02 as 0x64616f6c, communication parameters will be reset to factory default and 1011-02=1 after saving.
0x1011-03	402 parameters	Controller can reset 402 parameters using 0x1011-03. If driver receives the data of 0x1011-03 as 0x64616f6c, 402 parameters will be reset to factory default and 1011-03=1 after saving.
0x1011-04	Drivers' supplier parameters	Controller can reset drivers' supplier parameters using 0x1011-04. If driver receives the data of 0x1011-04 as 0x64616f6c, drivers' supplier parameters will be reset to factory default and 1011-04=1 after saving.

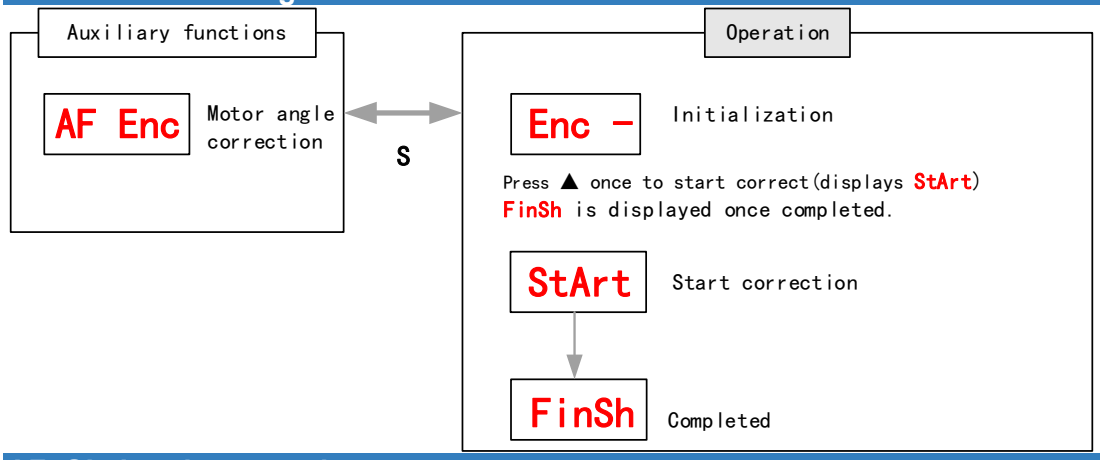
AF ACL Clear alarm

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



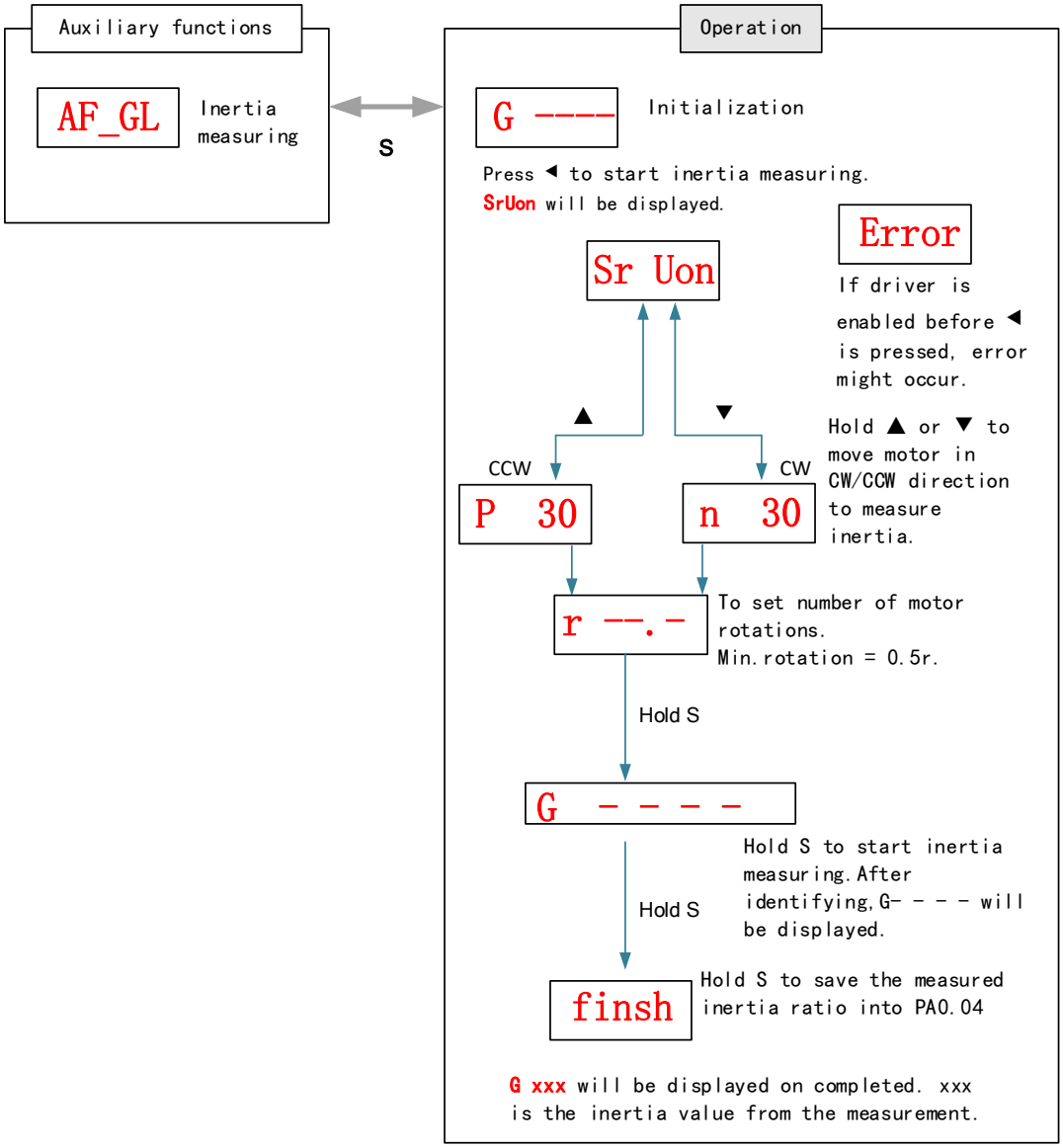
For alarms that can be cleared using this function, please refer to table in Chapter 9.

AF Enc Motor angle correction



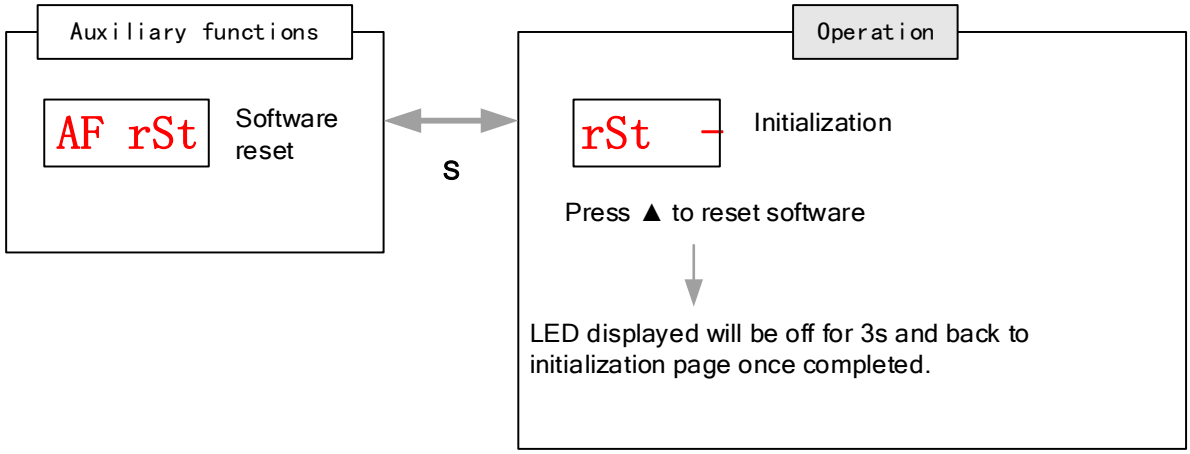
AF_GL Inertia measuring

Please make sure to use suitable velocity and acceleration for the measuring process. Press **S** to exit and disable the driver once completed.



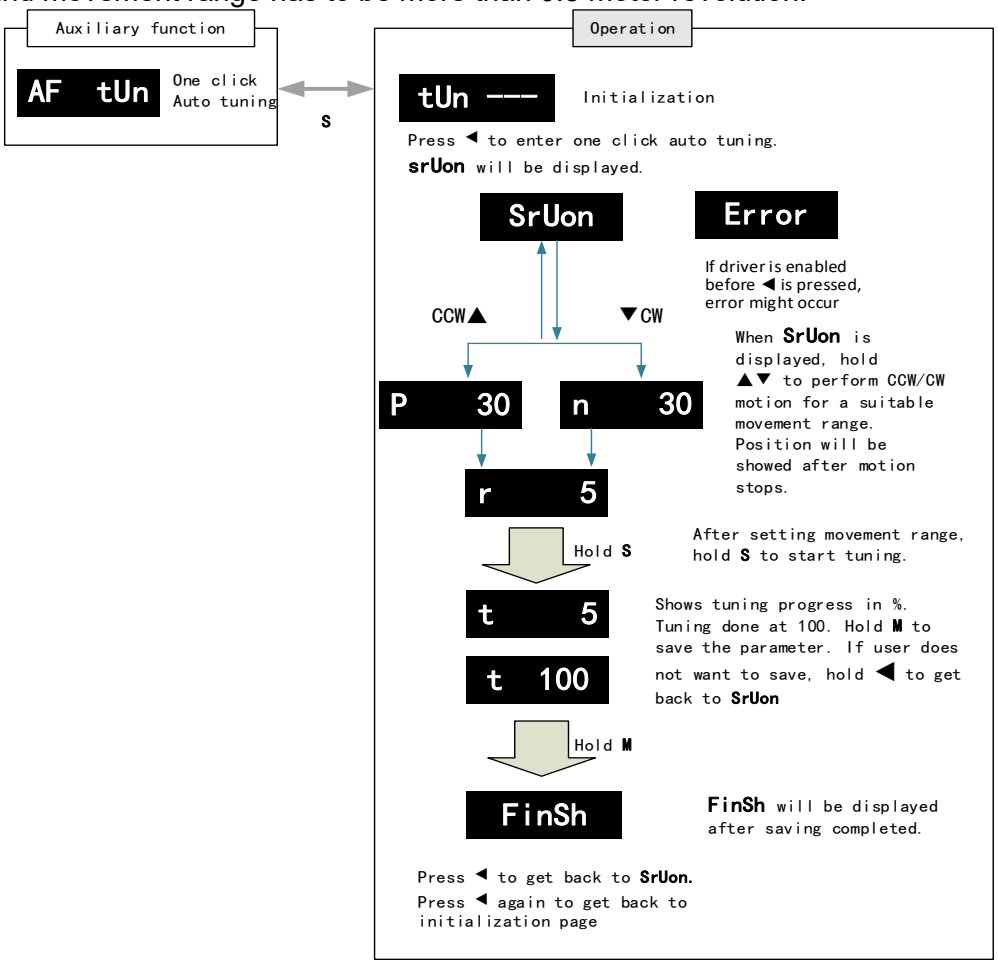
AF rSt Software reset

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 0.5 motor revolution.



5.2.6 Abnormal 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 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.

5.2.7 Parameters saving

Parameter save mode, also known as EEPROM write mode, writes the modified data into the EEPROM. Parameters can be saved via the driver operation panel or through 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)

5.3 Get Started with Driver Operation

5.3.1 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.

5.3.2 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 **rEAdY**, then LED initial status will be displayed. Driver is ready for operation if no alarm occurs.

5.3.3 Trial Run

Servo driver must be disabled before performing trial run. For safety precautions, please JOG at 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 5.6.5 Front Panel Trial Run" for detailed explanations on how to perform trial run using front panel operation. Or refer to EDrive user manual for details guide on how to perform trial run using EDrive.

5.3.4 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.

5.3.5 Front Panel Trial Run

JOG Test Run (Jogging Control) Operation Procedure

Set all parameters related to jogging control.

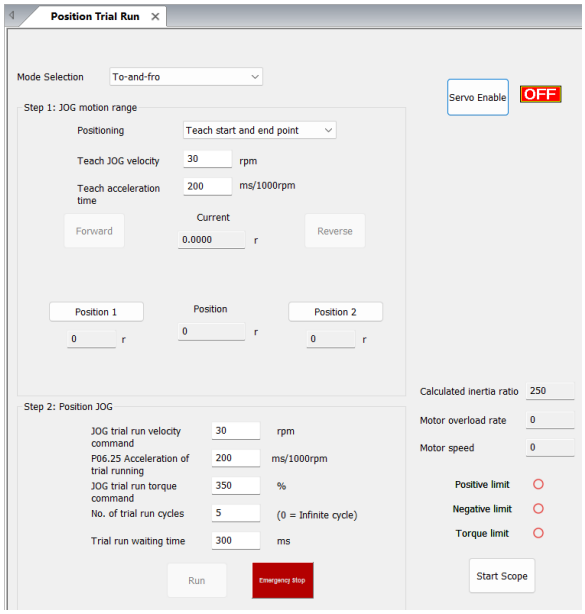
1) After successfully writing the parameters, power off and restart the driver.
2) Ensure the driver is in a disabled state to enter JOG control mode.
3) Enter the "AF Jog" submenu under Auxiliary Functions Mode.
4) Press the SET key once — the display should show "Jog -".
5) Press ◄ key once — if there 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.

5.3.6 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.



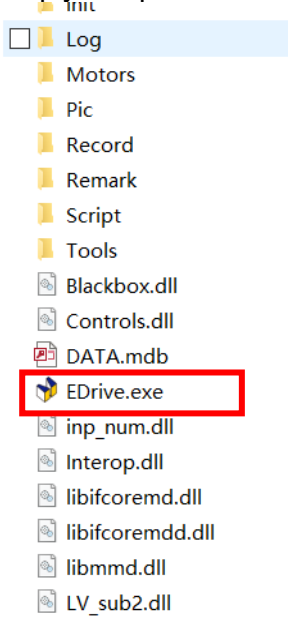
4) Set to Reciprocating Motion Mode, choose positioning start/end point operation mode. After clicking Enable, the red OFF will turn green ON. Set the teaching motion attributes — avoid high speeds to prevent collisions. Use the forward/reverse motion buttons to teach and set the desired start and end 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.

Chapter 6 EDrive Quick Commissioning Guide

6.1 Software Installation

EDrive software can be downloaded from Misumi website for free.
https://sg.misumi-ec.com/linked/material/mech/MSM1/CAD/3D/10311229039/E-DHAS.zip

Simply unzip the ZIP file and double-click the EXE file in the folder to open it.



6.2 Connect to Drive

A serial USB type A to type C cable is required for commissioning the drive through EDrive.

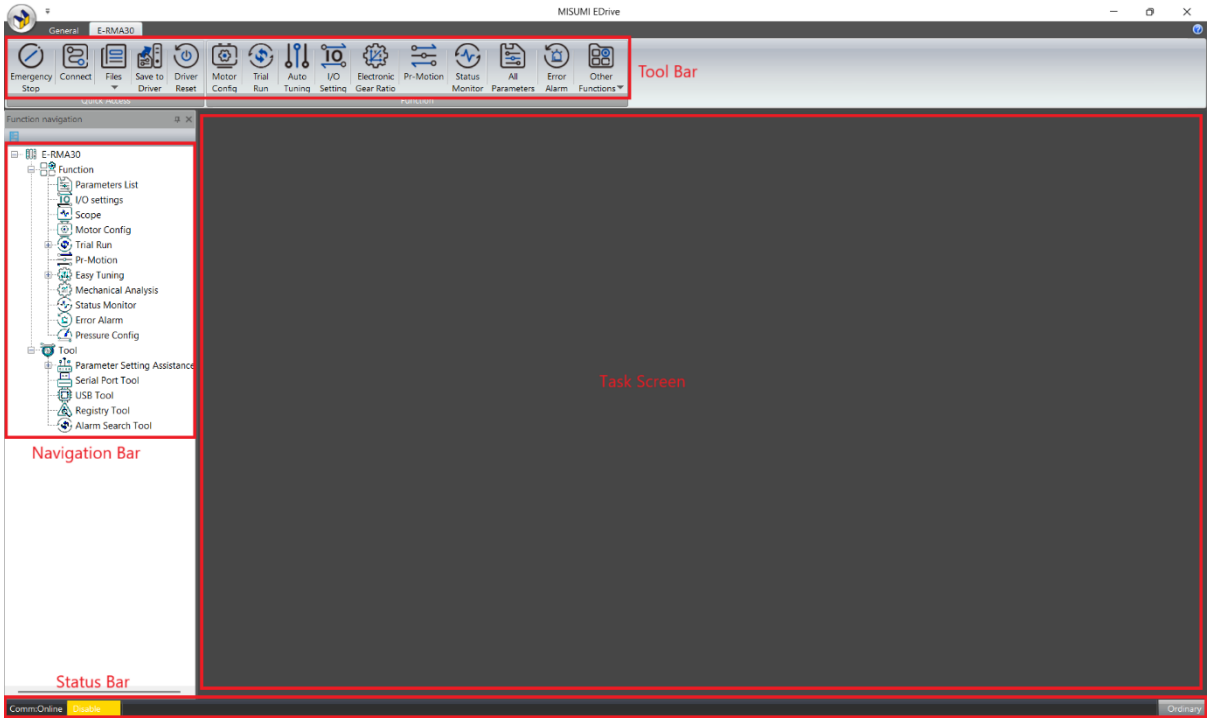


When the drive software is started with the USB plugged in, it is automatically identified, and when you press the connect button, it is connected.

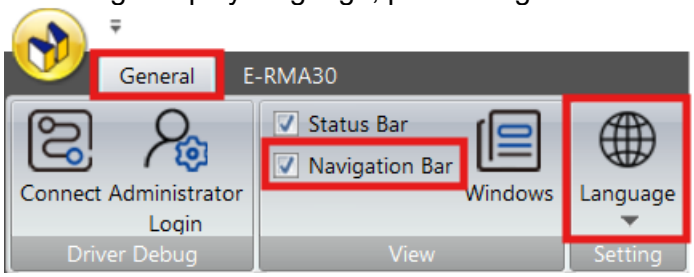


EDrive Screen Components

Tool Bar: Select various common functions and execute operations or enter related function interfaces.
Navigation Bar: Fully displays the functions and tools of the servo drive.
Status Bar: Displays the current connection status, emergency stop status, enable status, and alarm status of the servo.
Task Screen: Displays the interface of the selected function.
General Bar: Allows for administrator login, display mode switching, and debugging software reset.

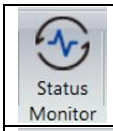


The Navigation Bar is hidden by default. To open it, please go to ‘General’ and check ‘Navigation Bar’.
To change display language, please to go to ‘General’ -> ‘Language’.



Can open the operation windows of various functions through the function names displayed on the Tool Bar and the Navigation Bar in the main window.

Icon	Name	Description
Emergency Stop	**Emergency Stop**	Emergency stop during motion.
Connect	**Connect**	Connect or disconnect the drive from PC. Check Drive’s information.
Files	**Files**	Open parameter file or download to drive.
Save to Driver	**Save to Driver**	Save parameters to drive.
Driver Reset	**Driver Reset**	Soft restart drive.
Motor Config	**Motor Config**	Select built in Misumi LMAC motor configuration parameters or create user's motor parameters. Modify motor parameters.
Trial Run	**Trial Run**	To do jog motion or point to point debug motion.
Auto Tuning	**Auto Tuning**	Set and execute auto tuning process.
I/O Setting	**I/O Setting**	Configure physical I/O and virtual I/O. Monitor I/O functions and status.
Electronic Gear Ratio	**Electronic Gear Ratio**	Set Electronic Gear Ratio.
Pr-Motion	**Pr Motion (Pulse drive only)**	Set Pr motion parameters. Set Pr motion paths. Manual trigger Pr motion paths.

	**Status Monitor**	Select monitoring values. Set monitoring rate.
	**All Parameters**	Check and modify all the parameters. Read/Save parameters from/to drive/PC. Compare parameters values.
	**Error Alarm**	Check, read or search Alarm. Check cause(s) of motor not moving.
	**Other Functions**	Open configuration page for Gantry Function and Position Comparison
	**EtherCAT (EtherCAT drive only)**	Open Object Dictionary, 402 Observer, Diagnostics and Object Dictionary Tool. Download ESI file.

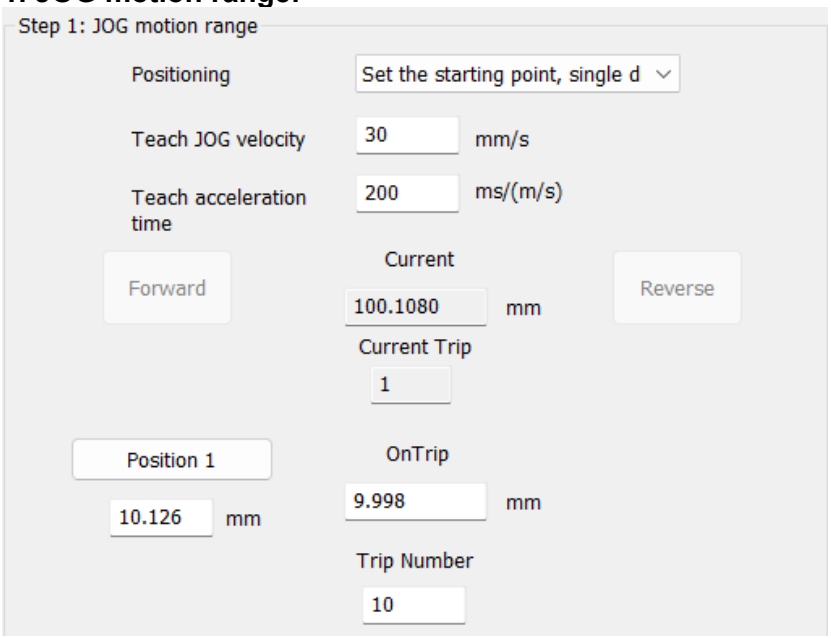
6.3 First Motor Movement

Trial Run is divided into Position Trial Run and Velocity Trial Run.
Position Trial Run: Perform reciprocating or unidirectional motion at the set operating speed within the defined positioning range.
Velocity Trial Run: Perform continuous unidirectional motion or jog at the set speed.

Position Trial Run

There are 4 kinds of JOG motion mode:
To-and-fro: The motor moves back and forth within the start and end positions.
One way motion (Positive direction): The motor uses the absolute value of the start and end position difference as the distance for each unidirectional movement, maintaining forward motion.
One way motion (Negative direction): The motor uses the absolute value of the start and end position difference as the distance for each unidirectional movement, maintaining reverse motion.
Multiple round trip motion: The motor uses the absolute value of the start and end position difference as the distance for each unidirectional movement. Moves back and forth based on set trip numbers.

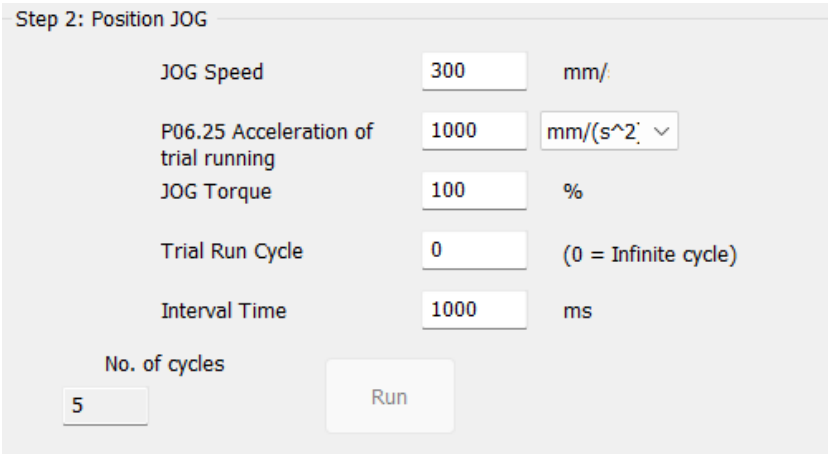
1. JOG motion range:



You can use the trial run function to configure the operating path, speed, and acceleration to make the motor move.
Currently, there are three ways to teach the operating range for E-RMA/RME position trial run:
Teach start and end point: After enabling the servo, use the forward and reverse buttons to adjust the position. Click the Set Current Position as Start/End button to complete the start and end position settings.
Input start and end points: Select this mode to directly input the positions in the start and end input boxes. The motor will move to the start point and then perform reciprocating motion.
Input distance: Select this mode to input the operating distance in the position difference. The motor will perform reciprocating motion at the current position.

Note: The teaching speed should not be too fast to avoid collision!

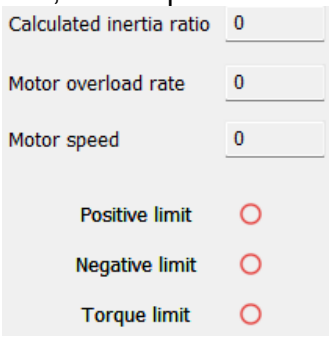
2. Position JOG:



After setting the operating range, the motor will operate differently based on the Position JOG mode.
Before operation, you can set the JOG Speed and Acceleration/Deceleration of trial running.
JOG Torque: You can limit the maximum torque during operation.
Trial Run Cycle Set the number of runs.
Interval Time: Set the interval time for Position JOG.

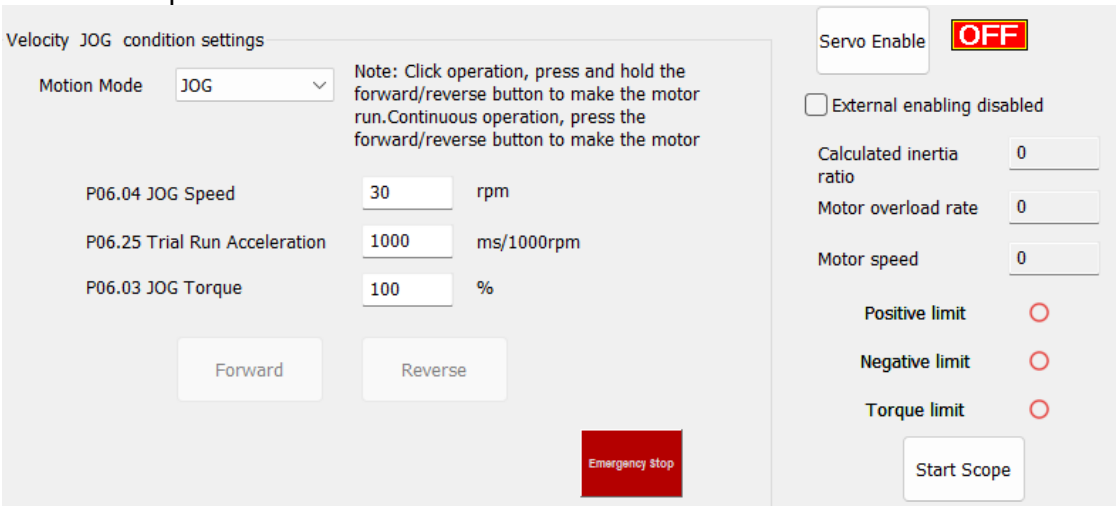
3. Trial Run Status Monitoring:

The status on the right side allows you to view the Calculated inertia ratio, Motor overload rate, Motor speed and some limit states.



Velocity Trial Run

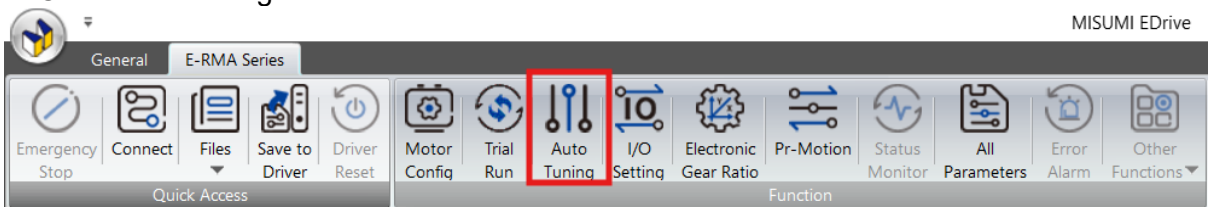
Velocity Trial Run primarily operates at the set speed and is divided into jog operation and continuous operation.



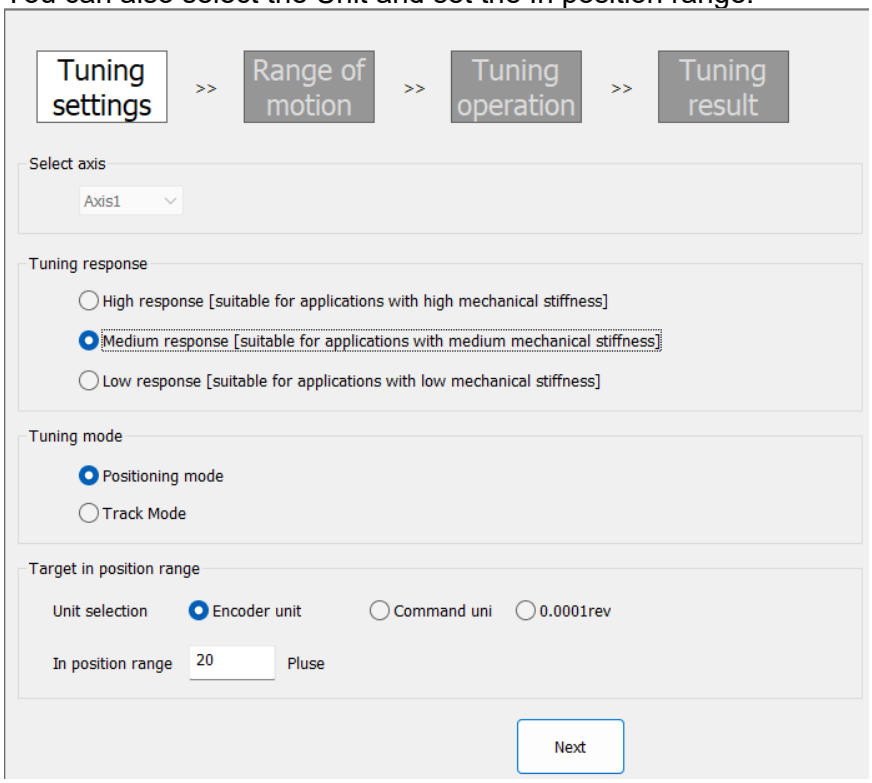
JOG:
The motor runs only while holding the forward/reverse button. When the button is released, the motor stops.
Continuous:
For continuous operation, pressing the forward/reverse button once will make the motor run continuously.

6.4 Auto Tuning

1. Click ‘Auto Tuning’ in the Tool Bar.



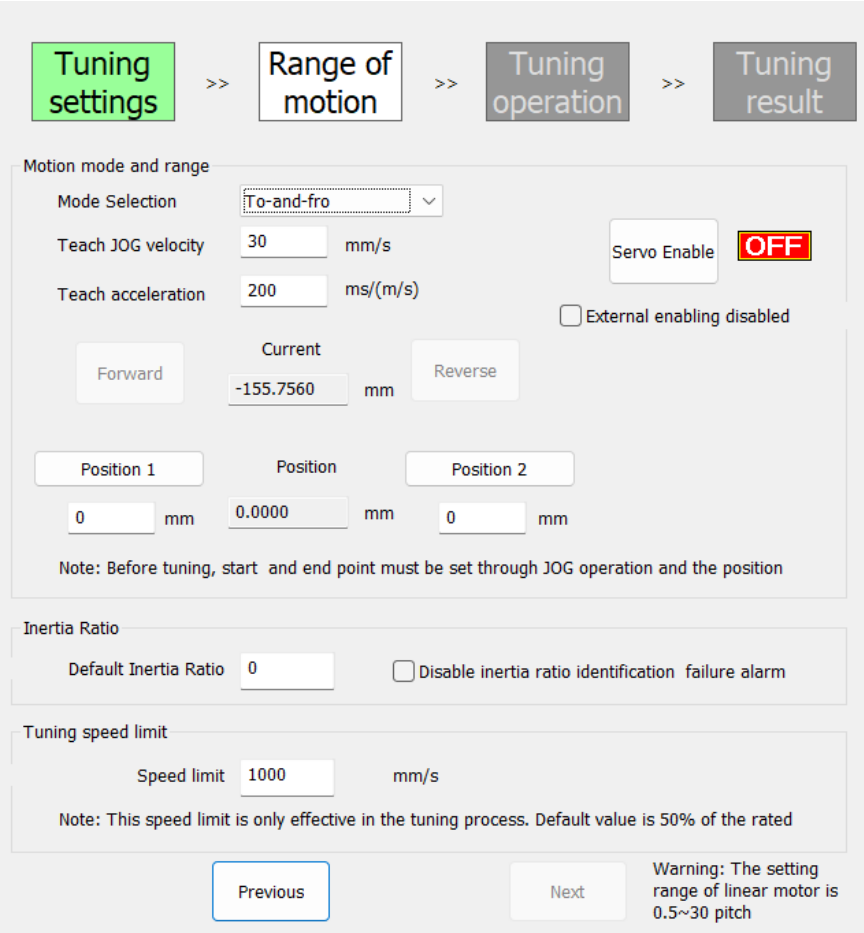
2. Enter the “Auto Tuning” interface. The first screen is for tuning adjustments. The main purpose is to set the execution standards for the auto-tuning process.
‘Tuning response’ is divided into three situations, selected based on the actual mechanical conditions.
‘Tuning mode’ is divided into Positioning mode and Track mode.
You can also select the Unit and set the In position range.



3. Click ‘Next’ to enter the operating range setting interface, where you can set the operating range for one-click auto-tuning.
There are three operating modes, chosen based on the allowable movement direction of the actual machinery:

- To and fro: The motor moves back and forth within the start and end positions.
- One way motion (Positive): The motor uses the absolute value of the start and end position difference as the distance for each unidirectional movement, maintaining forward motion.

- One way motion (Negative): The motor uses the absolute value of the start and end position difference as the distance for each unidirectional movement, maintaining reverse motion.



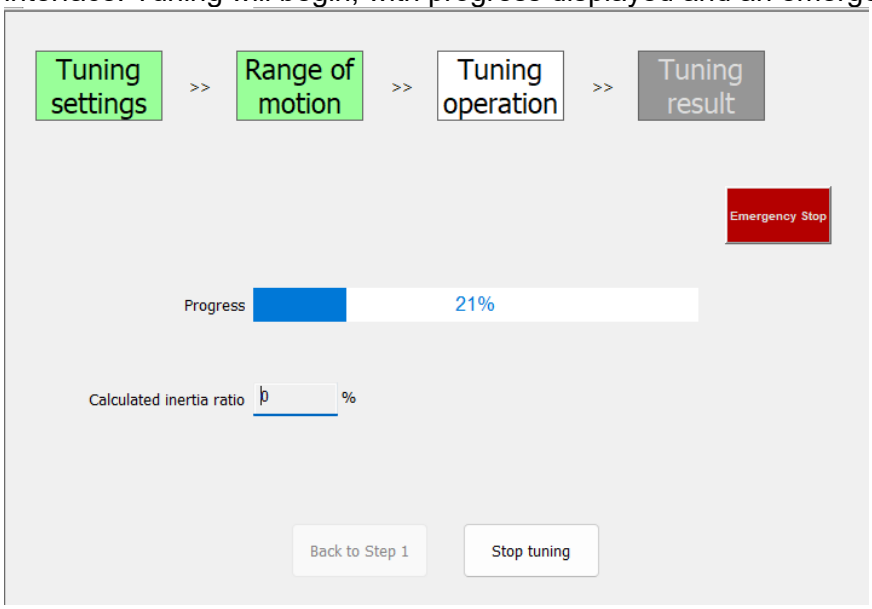
After enabling the servo, use the Forward and Reverse buttons to adjust the position. Click the 'Position 1(2)' button to complete the setting.

Note: The closer the start and end positions are to the actual application travel difference, the better the tuned parameters will adapt, although the adjustment time may increase.

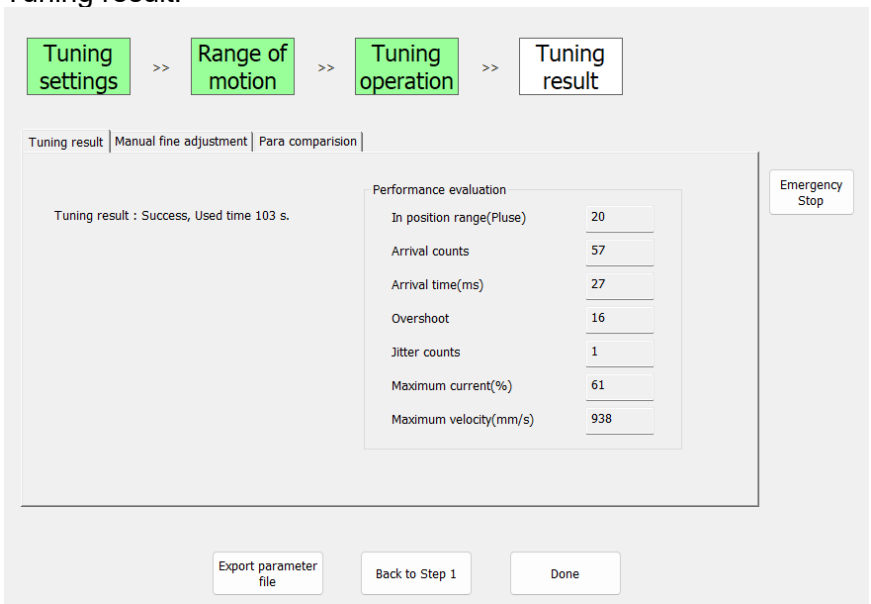
After setting the operating range, you need to set the 'Inertia Ratio'. You can choose whether to mask inertia recognition failures to avoid unsuccessful tuning due to inertia recognition failures. The inertia ratio can be manually entered or preset to a suitable value to avoid equipment shaking in belt applications due to low inertia.

Tuning Speed Limit: Please use the highest speed that will be used in application.

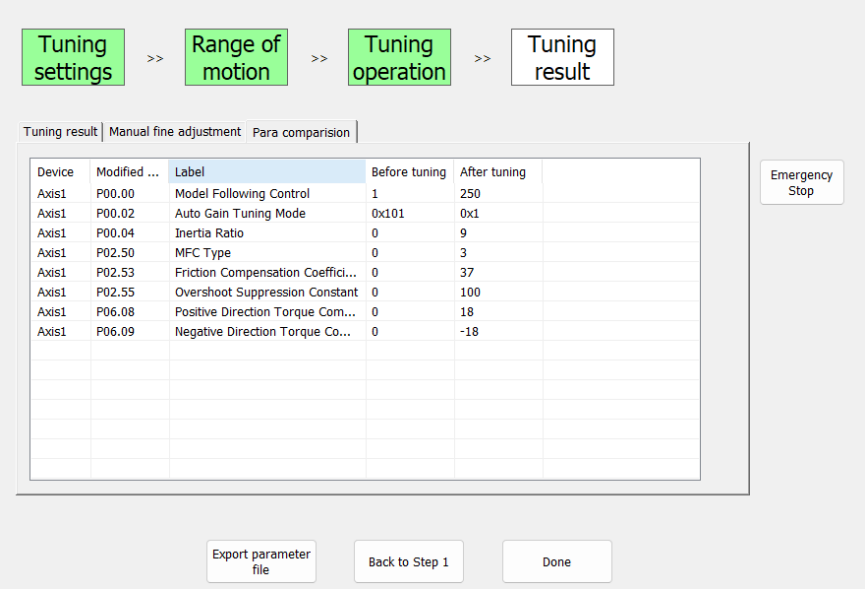
4. Click 'Next' and confirm the safety of the movement to enter the tuning operation interface. Tuning will begin, with progress displayed and an emergency stop button provided.



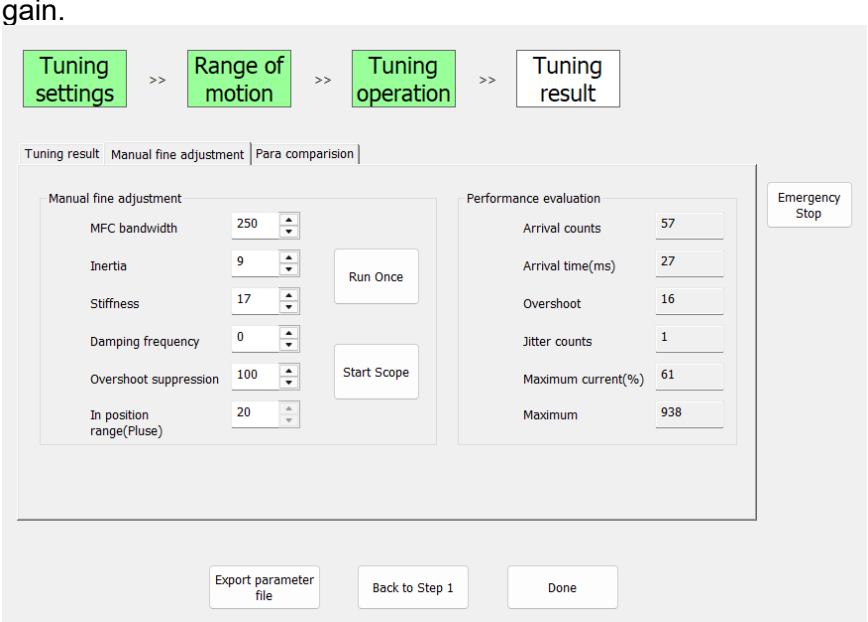
5. After tuning is completed, it will jump to the tuning results interface, showing the Tuning result, Manual fine adjustment and Para comparison.
Tuning result:



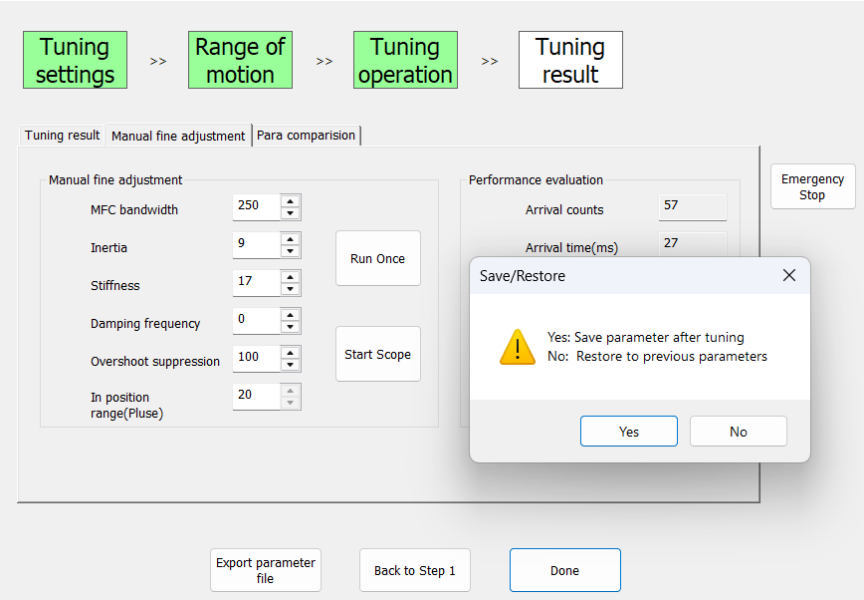
Para comparison:



Manual fine adjustment:
If you need to fine-tune the tuning effect, you can enter the manual fine-tuning to modify the gain.



After fine-tuning the parameters, run it again to check the performance evaluation or use the Scope to see if it meets the actual needs.
If you are satisfied with the tuning results, click ‘Done’, and a prompt will ask if you want to save the parameters. Click ‘Yes’ to save the tuned parameters, or ‘No’ to restore the parameters before tuning.

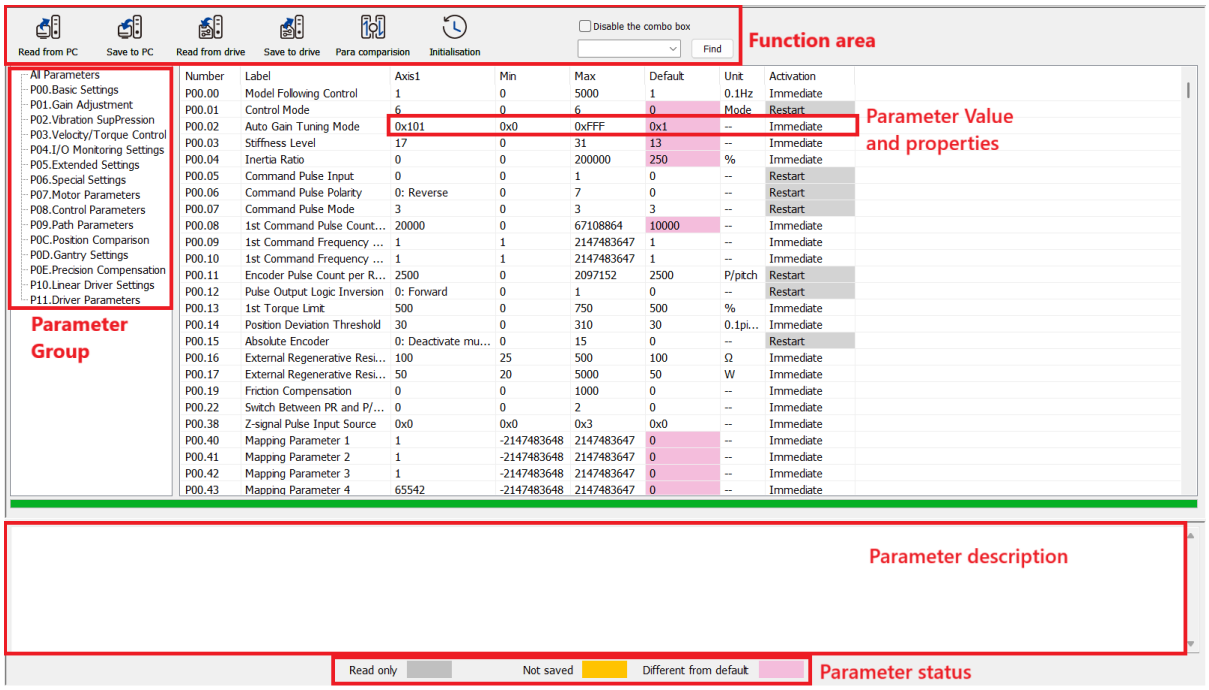


Note: After clicking 'Done', regardless of whether you click 'Yes' or 'No', you will exit the one-click auto-tuning interface.

6.5 Read & Save Parameters

Parameter Management includes 'All Parameters', 'Parameter Download', 'Parameter file open' and 'Offline Parameter file modification'.

6.5.1 All Parameters



Function area:



Read from PC: Open a saved parameter file.
Save to PC: Save the current parameter recipe as a file to the computer.

Read from drive: Read and refresh the current drive parameters.
Save to drive: Save the current parameters to the drive EEPROM.
Para comparison: Compare current values with factory default values, current values with parameter files, parameter files with default values, and parameter files with each other.
Initialization: Restore the current axis parameters to the default factory settings. After restoring factory settings, the drive needs to be restarted.

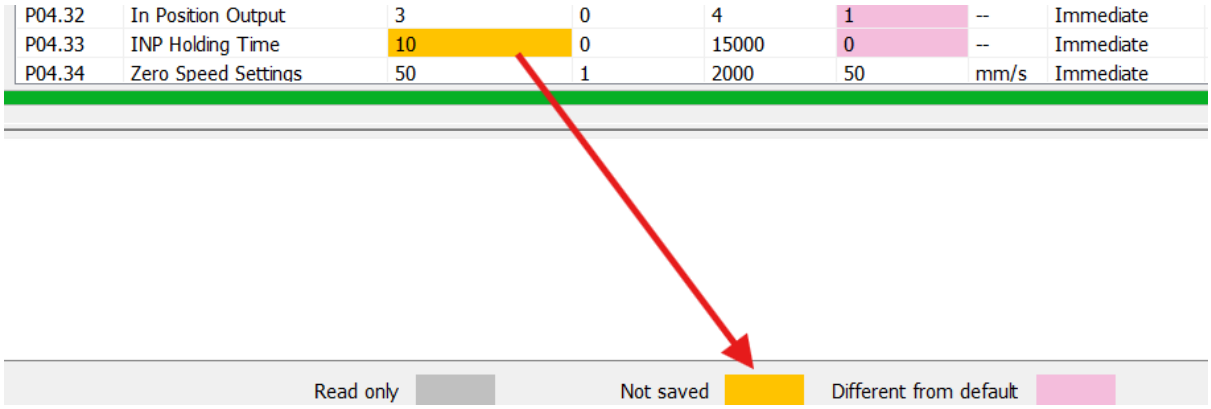
Parameter Group: Displays the current servo's parameter group. You can select a parameter group to display all parameters of that group.
Parameter value and properties: The parameter status will show the current set value, the parameter's range, default value, unit, effective mode, etc. Additionally, after modifying the axis set value, it will display the parameter save status. The default value will show whether the current set value matches the default value.
Parameter description: Clicking on a parameter with the mouse will display the description of the current parameter.

6.5.2 Parameter Modification and Download

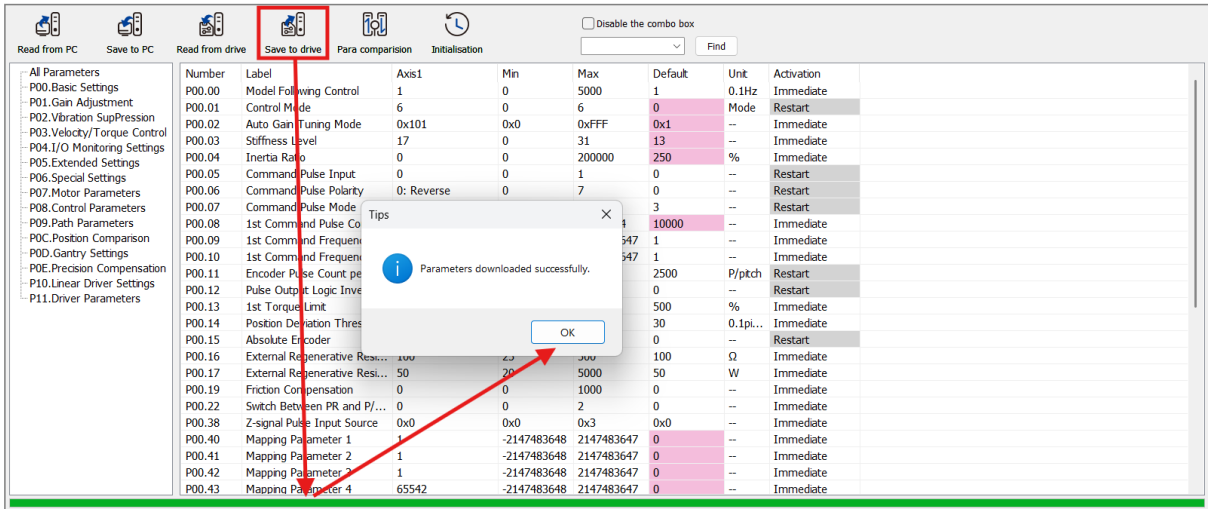
1. Parameter modification:
Select the parameter you want to modifying and click the current value to modify it.

Number	Label	Axis1	Min	Max	Default	Unit	Activation
P00.00	Model Following Control	1	0	5000	1	0.1Hz	Immediate
P00.01	Control Mode	6	0	6	0	Mode	Restart
P00.02	Auto Gain Tuning Mode	0x101	0x0	0xFFF	0x1	--	Immediate
P00.03	Stiffness Level	17	0	31	13	--	Immediate

2. After setting, exiting the edit or pressing Enter will directly send the parameter to the drive, but it will not be saved to the EEPROM. After powering on again, the parameter will revert to the value saved in the EEPROM.
When the parameter value is sent but not saved, an orange background will notify the user that the current set value is not saved.



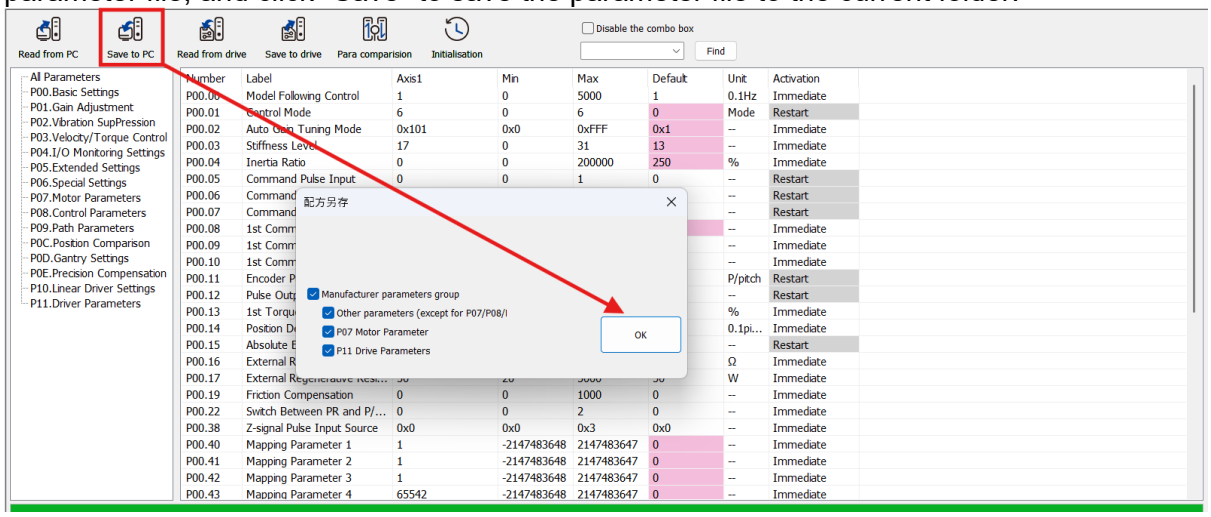
3. Save to drive:
After modifying, if you need to save the parameter to the drive EEPROM to prevent loss due to power failure, or if the effective mode is a power-off effective parameter, you must save the parameter. Click "Parameter Save" to save the parameter to the EEPROM. A green progress bar will show the save progress, and a prompt will indicate that the parameter has been successfully sent.



6.5.3 Parameter Save to PC

Save to PC allows you to save the servo drive's parameters to a file, enabling you to confirm drive parameters without connecting to the servo drive or import parameters into another servo drive.

Clicking " Save to PC " in the function area allows you to save the servo drive's parameter recipe as a file. After clicking "Save to PC," select all the check box in the pop out window then click ‘OK’. A save dialog box will pop up. Choose an appropriate path, name the parameter file, and click "Save" to save the parameter file to the current folder.

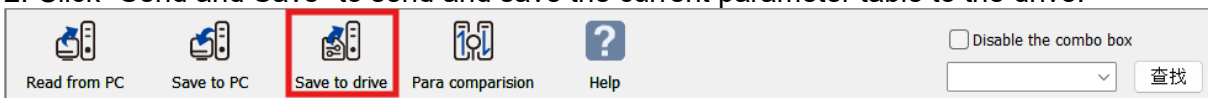


6.5.4 Read Parameter File From PC

Open the parameter file saved on the PC (with the .msm file extension). After opening, you can view the parameter settings in the parameter file and send the parameter recipe file to the currently connected drive.

1. Click "Read from PC" in the Function area to open the parameter file.

2. Click "Send and Save" to send and save the current parameter table to the drive.

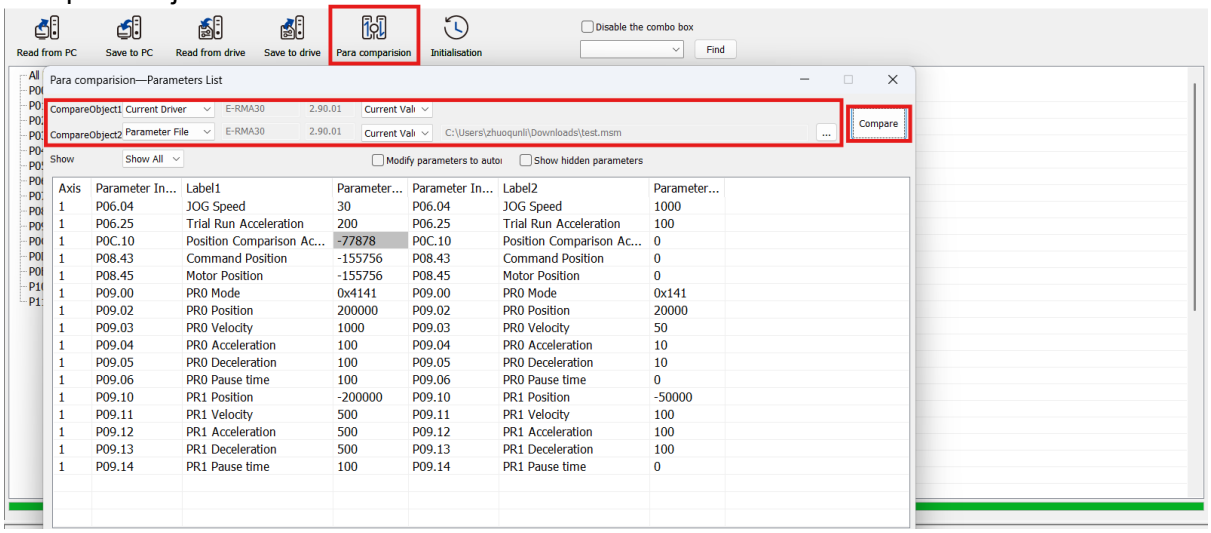


3. To prevent confusion and operational errors or risks, there are corresponding restrictions on sending and saving parameters:

1. If the drive series of the parameter file does not match the drive series to be sent: Sending is not allowed.
2. If the drive series matches but the software version does not: Differences are indicated, but sending is allowed.

6.5.5 Compare Parameters

Click the “Para comparison”, and a comparison box will pop up. You can select parameters to compare. It provides comparisons between the current parameter table, default values, and parameter files.
After clicking “Compare”, it will display the parameters where Compare Object 1 and Compare Object 2 are inconsistent.



Axis	Parameter In...	Label1	Parameter...	Parameter In...	Label2	Parameter...
1	P06.04	JOG Speed	30	P06.04	JOG Speed	1000
1	P06.25	Trial Run Acceleration	200	P06.25	Trial Run Acceleration	100
1	P0C.10	Position Comparison Ac...	-77878	P0C.10	Position Comparison Ac...	0
1	P08.43	Command Position	-155756	P08.43	Command Position	0
1	P08.45	Motor Position	-155756	P08.45	Motor Position	0
1	P09.00	PR0 Mode	0x4141	P09.00	PR0 Mode	0x141
1	P09.02	PR0 Position	200000	P09.02	PR0 Position	20000
1	P09.03	PR0 Velocity	1000	P09.03	PR0 Velocity	50
1	P09.04	PR0 Acceleration	100	P09.04	PR0 Acceleration	10
1	P09.05	PR0 Deceleration	100	P09.05	PR0 Deceleration	10
1	P09.06	PR0 Pause time	100	P09.06	PR0 Pause time	0
1	P09.10	PR1 Position	-200000	P09.10	PR1 Position	-50000
1	P09.11	PR1 Velocity	500	P09.11	PR1 Velocity	100
1	P09.12	PR1 Acceleration	500	P09.12	PR1 Acceleration	100
1	P09.13	PR1 Deceleration	500	P09.13	PR1 Deceleration	100
1	P09.14	PR1 Pause time	100	P09.14	PR1 Pause time	0

6.5.6 Initialization

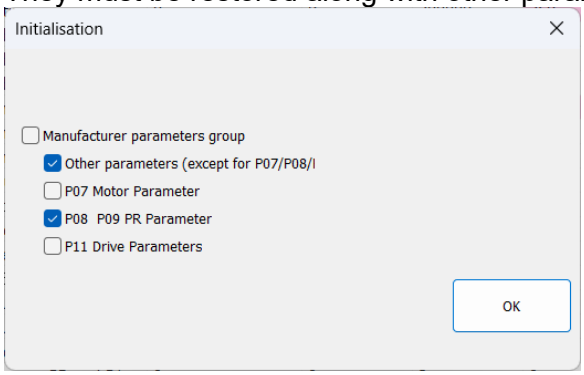
Click the “Initialization”, and a restore factory settings popup will appear. You can select the parameter groups you want to restore to factory settings:
Manufacture parameters group:

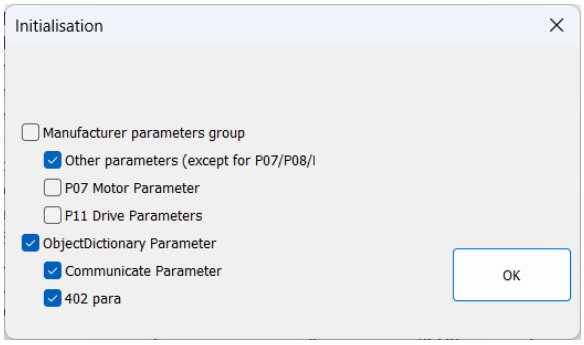
Other parameters (except for P07/P08(P011))
P07 Motor Parameter
P08 P09 RE Parameter (For Pulse drive only)
P11 Drive Parameters

Objection Dictionary Parameter: (For EtherCAT drive only)

Communicate Parameter
402 para

Note: Manufacturer group parameters do not support resetting only P07 or P11 parameters. They must be restored along with other parameters.





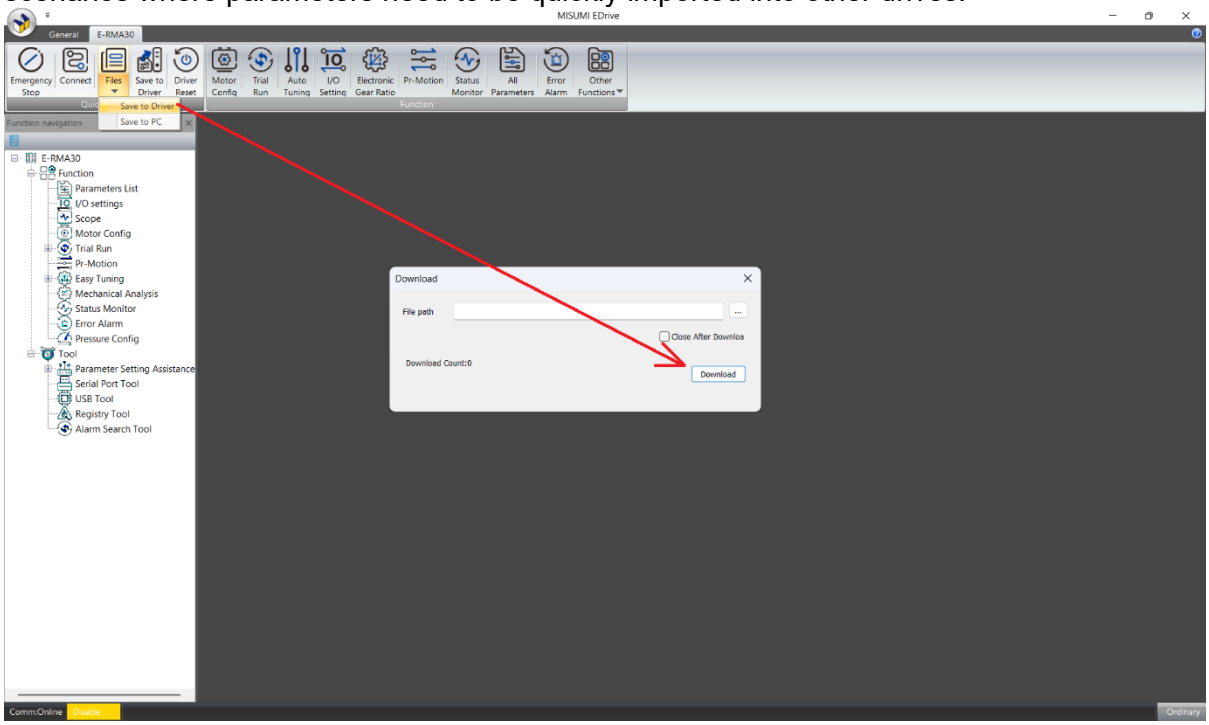
After the progress bar is completed, the factory reset is successful. If unsuccessful, a failure prompt will appear.

Note:

1. Factory reset is not allowed in the enabled state.
2. After restoring factory settings, please perform a soft reset/power-off restart of the drive.

6.5.7 Save to Drive

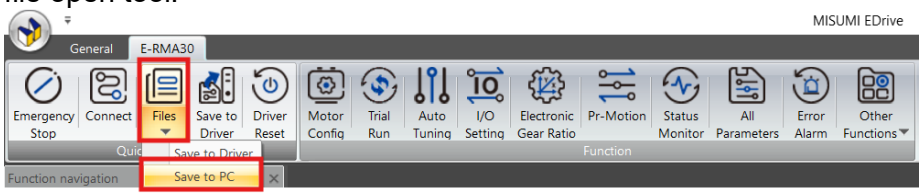
There is no need to open the parameter summary table for sending and counting. This is for scenarios where parameters need to be quickly imported into other drives.



6.5.8 Open Parameter File, Object Dictionary File and Scope File

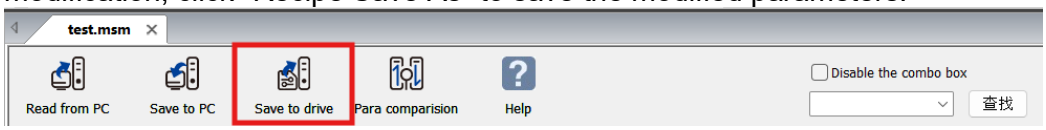
In offline mode, you need to switch to offline mode and select the corresponding series to open the relevant parameter file.

If you must open parameters in offline mode without selecting offline mode, you can use the file open tool.



6.5.9 Offline Parameter File Modification

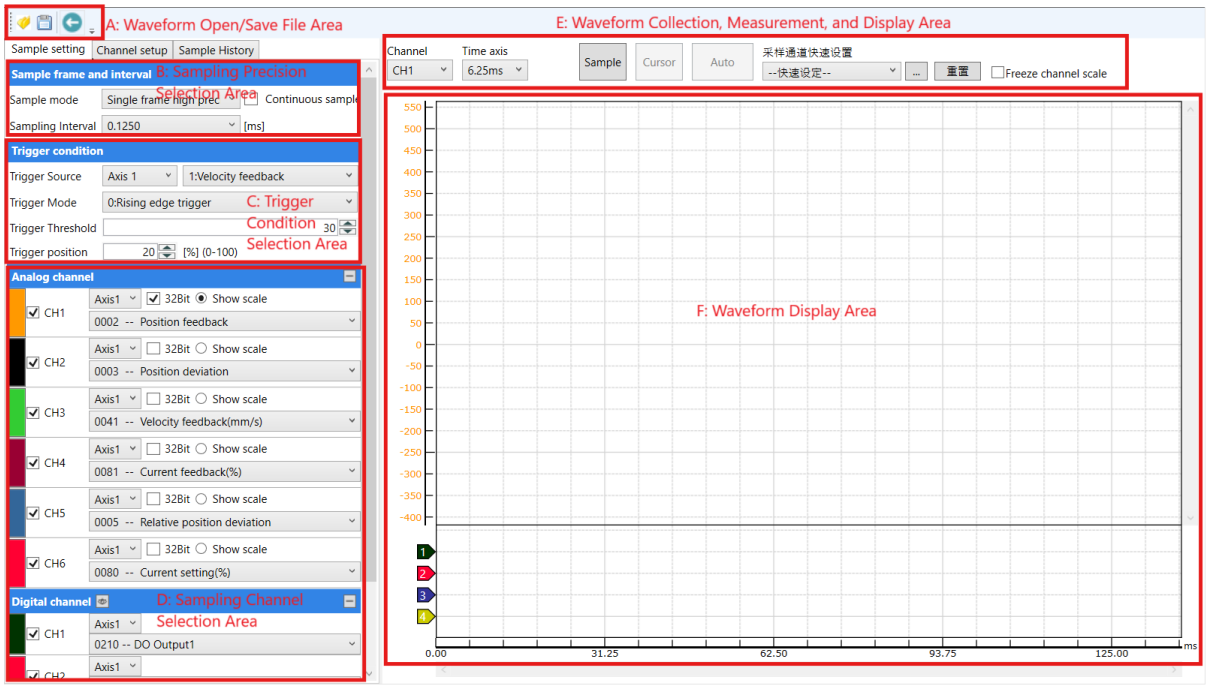
After opening the offline parameter file, you can modify the parameter settings. After modification, click "Recipe Save As" to save the modified parameters.



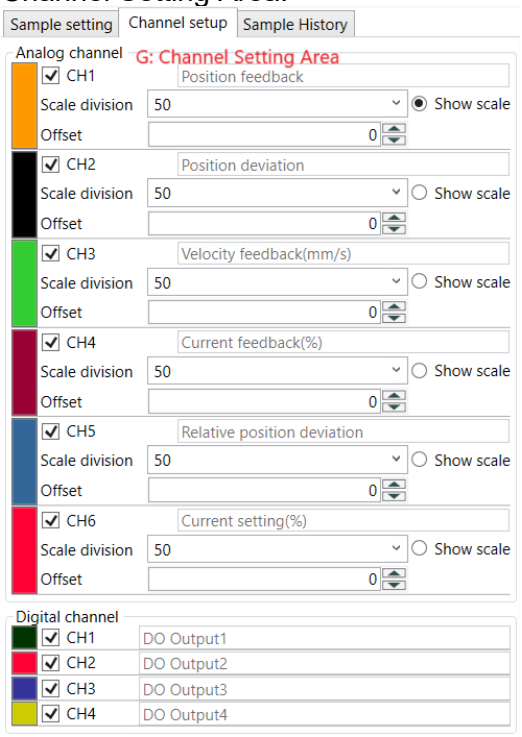
6.6 Scope Measurement

Display the operating status as waveform images on the scope to monitor the action status during servo adjustment.
Double click “Scop’ under Navigation Bar to open it. The scope's functional areas are as follows:

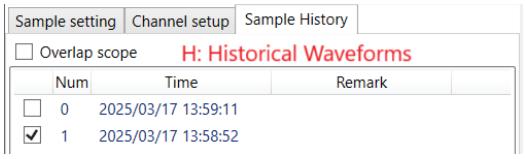
Area	**Function description**
A: Waveform Open/Save File Area	Supports opening waveform files and saving waveforms as files.
B: Sampling Precision Selection Area	Mode: Options include single-frame high precision and multi-frame high/low precision. Sampling Interval: With 1024 sampling points, the larger the sampling interval, the longer the total sampling time. Continuous Sampling: When continuous sampling is selected, waveform sampling will occur as long as the trigger conditions are met after clicking Collect.
C: Trigger Condition Selection Area	Allows setting trigger conditions, with options for axis signals and channel signals.
D: Sampling Channel Selection Area	Can set six groups of analog channels and four groups of digital signal channels.
E: Waveform Collection, Measurement, and Display Area	Includes scale display, time axis, collect button, cursor function, and adaptive features.
F: Waveform Display Area	Displays the collected waveforms.
G: Channel Setting Area	Allows changing the scale value and offset of each channel waveform.
H: Historical Waveforms	View the waveforms from the last 16 collections, and perform waveform overlay and comparison of multiple waveforms.



Channel Setting Area:



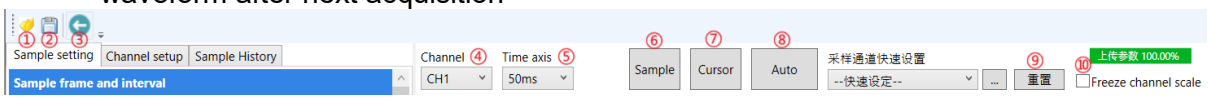
H: Historical Waveforms



Buttons Introduction:

① Open offline files
② Save graph data
③ Hide configuration bar
④ Select simulation channel Y-axis
⑤ Set X-axis interval

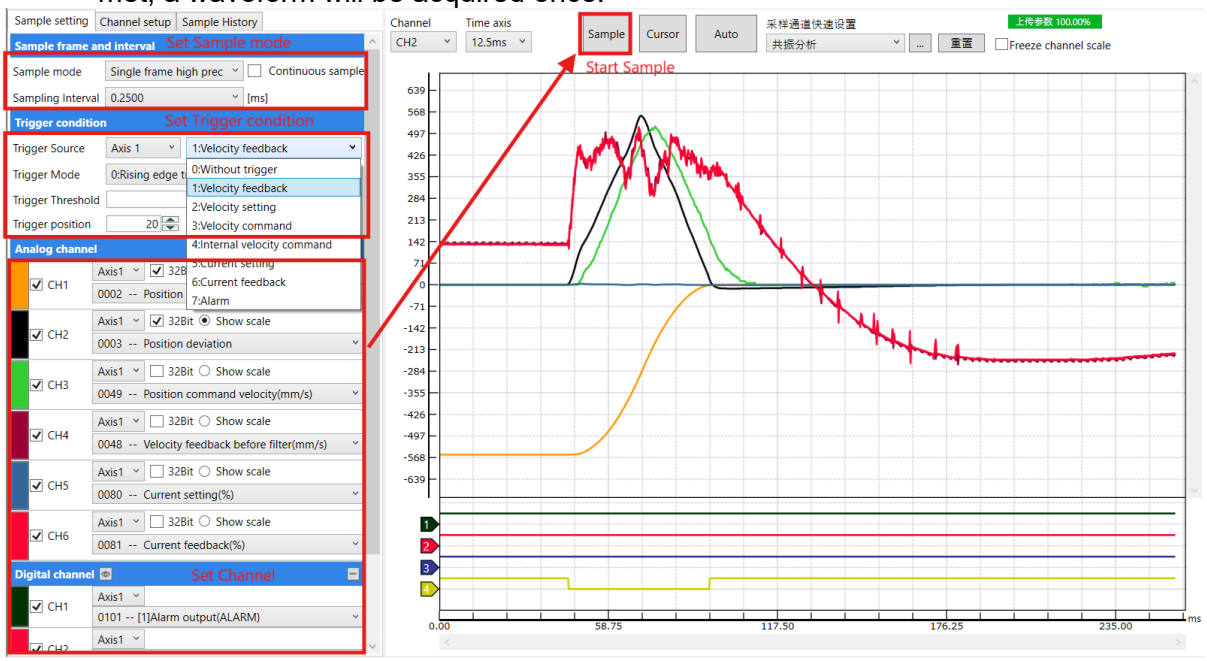
⑥ Start acquisition
⑦ Open cursor
⑧ Automatically calculate suitable simulation channel scale value and offset to fit waveform to screen size
⑨ Reset sampling settings
⑩ Maintain channel display ratio. Do not perform auto-adaptation when drawing waveform after next acquisition



6.6.1 Single Capture

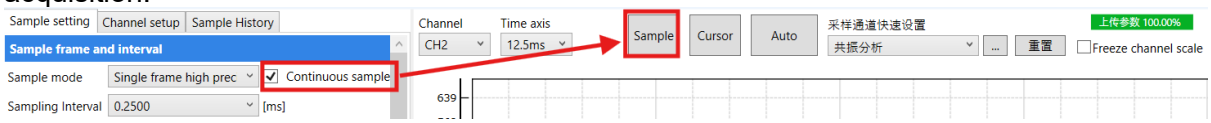
Single frame high precision:

(1) Set the sampling mode to Single frame high precision and adjust the sampling interval according to actual needs. The larger the sampling interval, the longer the total sampling time, and the worse the precision.
(2) Set the trigger conditions. The trigger source can be selected as either an axis or a channel. The trigger mode can be set to rising edge or falling edge. Position setting: For example, when the position is set to 50%, the trigger point is at 50% of the entire waveform.
(3) Channel settings: Set the desired sampling channels according to your needs.
(4) After completing the settings, click "Acquire." As long as the trigger conditions are met, a waveform will be acquired once.



6.6.2 Continuous Capture

After selecting ‘Continuous sampling’, click ‘Sample’. As long as the trigger conditions are met, waveforms can be acquired without needing to click ‘Sample’ before each waveform acquisition.

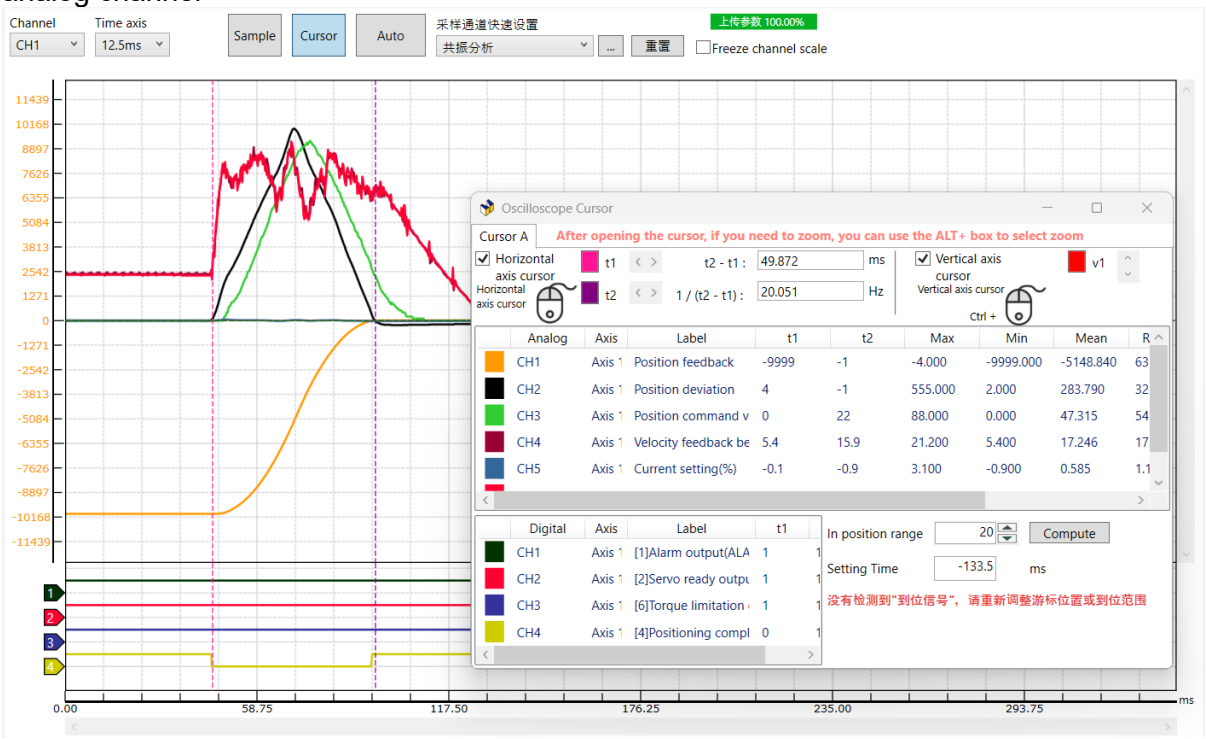


6.6.3 Zoom In/Out

This supports quick zooming of Scope waveforms.
Simply select the waveform area to be enlarged, and it will be magnified to fit the entire waveform interface.
Forward selection enlarges the waveform, reverse selection reduces it, and double-clicking the waveform returns it to the initial state.

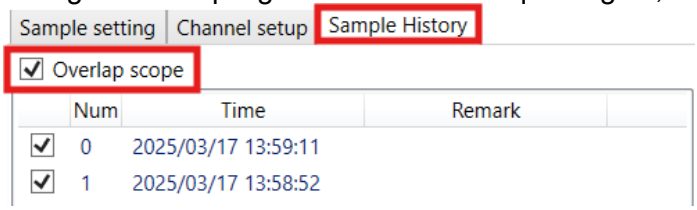
6.6.4 Cursor Function

After data acquisition is complete, click the cursor button to open the cursor window. The cursor includes the following functions:
Supports two X-axis cursors: t1, t2, placed using the left and right keys
Supports two Y-axis cursors: v1, v2, placed using Ctrl + left and right keys
Displays the amplitude corresponding to t1, t2, v1, v2 for each channel
Calculates the maximum, minimum, average, and effective values between t1 and t2 for the analog channel



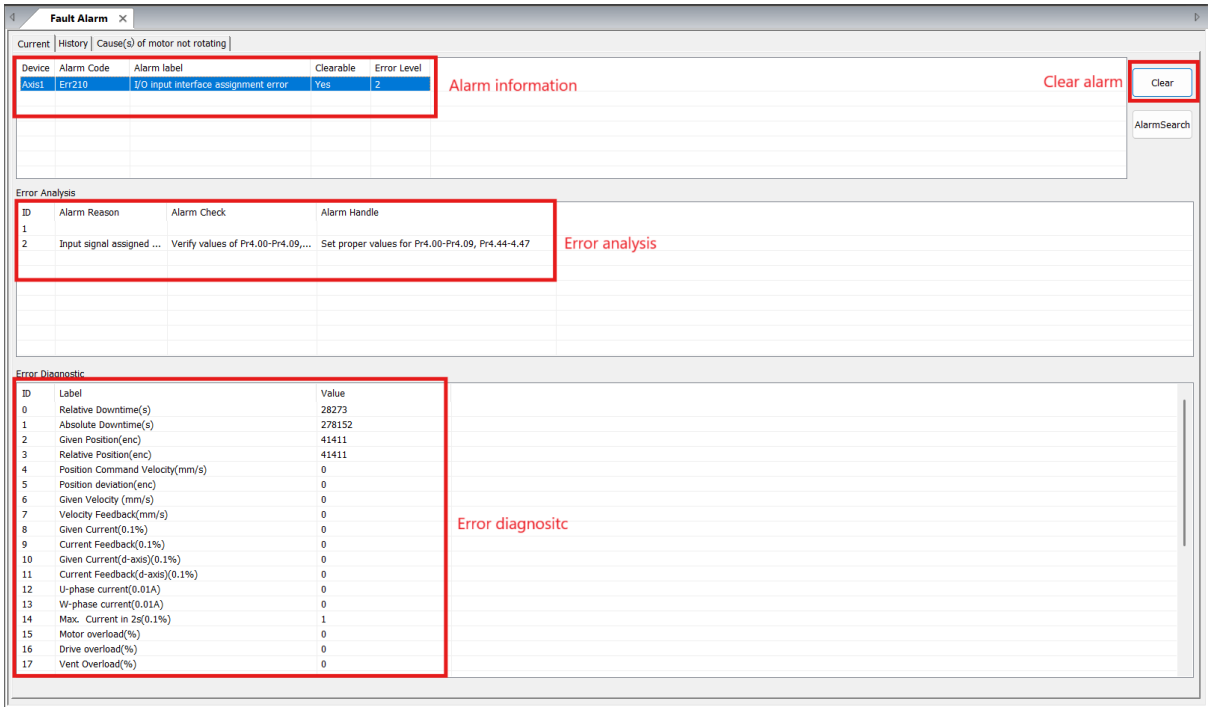
6.6.5 Overlap Scop

Switch to the ‘Sample History’, which records the last 16 waveforms acquired. At this point, you can select ‘Overlap scop’ to compare multiple sets of waveforms.
Note: ‘Sample History’ only saves waveforms with the same sampling conditions. If you change the sampling conditions and acquire again, the historical waveforms will be cleared!

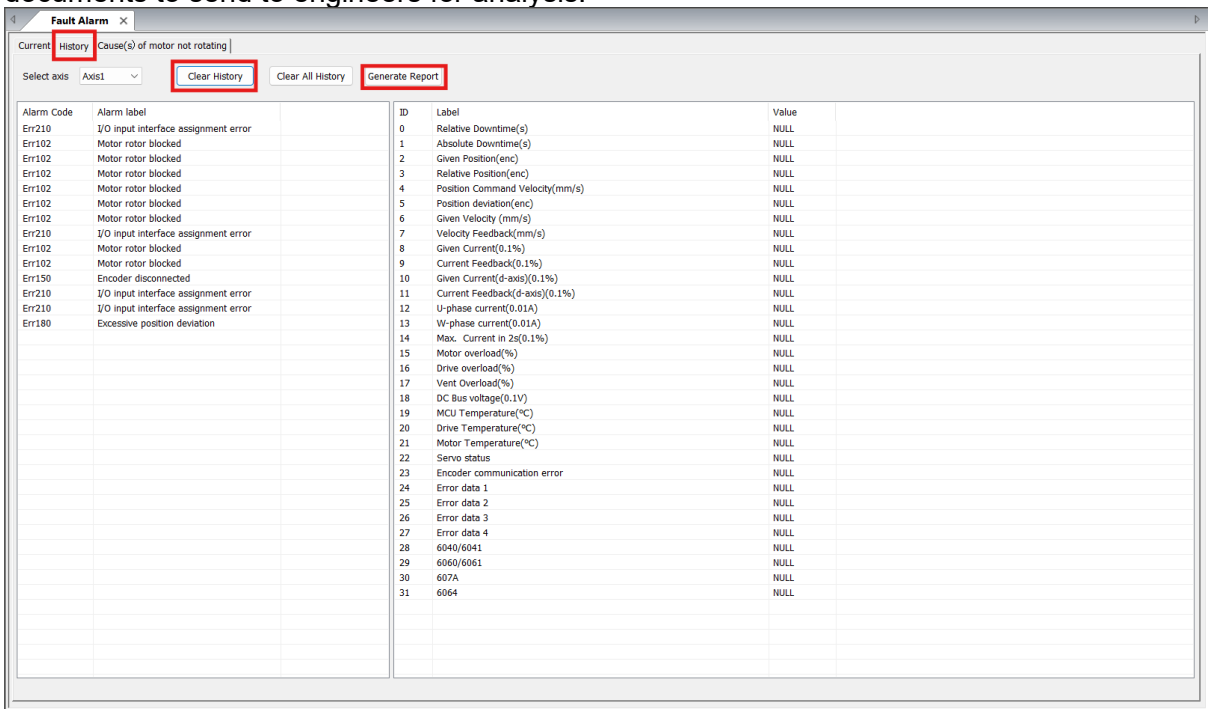


6.7 Fault Diagnosis

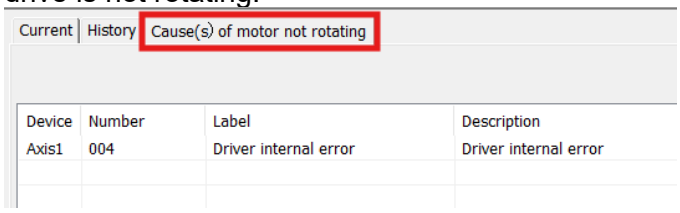
Fault analysis currently includes two methods: Error Alarms and Black Box.
When a fault alarm occurs, an alarm message will appear in the status bar below. You can double-click the alarm message in the Status bar to enter the fault alarm function or click the 'Error Alarm' button in the Tool Bar to enter.
Clicking on the current alarm allows you to view the current alarm information, fault type, fault analysis, and some information at the time of the fault, making it convenient for diagnosing and analysing the alarm.
If the current fault is clearable, after eliminating the cause of the fault, click "Clear" to remove the alarm status.



Clicking "History" allows you to view previous alarm information, saving up to the last 14 alarm messages. If there are more than 14 alarms, the alarm information will be overwritten in order of occurrence.
Clear Historical Alarms: You can clear the alarm history of the drive. Generate Report: You can generate a file of historical alarms, making it convenient for customers to create fault documents to send to engineers for analysis.



Clicking "Cause(s) of motor not rotating" allows you to view the current reasons why the drive is not rotating.



Chapter 7 Adjustment & Functional Features

Motor feedback position latching function can be realized through input signal with probe function. E-DFAS□□E supports up to 2 inputs with probe function and can be used simultaneously, to record the position information corresponding to probe signal rising and falling edge. Probe 1 signal comes from CN1 terminal pin 1 and 5 differential signal. Probe 2 signal comes from CN1 terminal pin 2-6 differential signal.

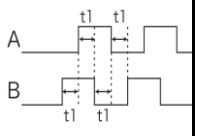
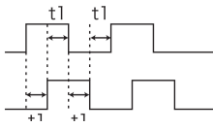
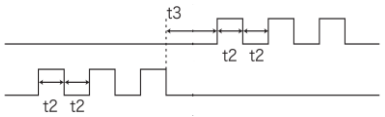
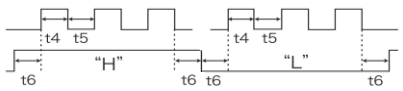
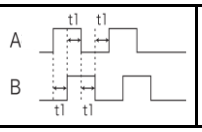
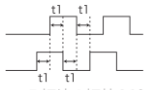
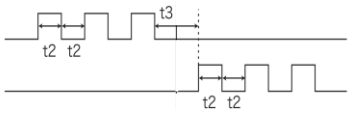
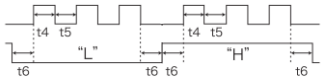
P00.07	Label	Probe signal polarity settings	Mode	F		
	Range	0 ~ 3	Default	3	Unit	—
	Activation	After restart			Index	2007h

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

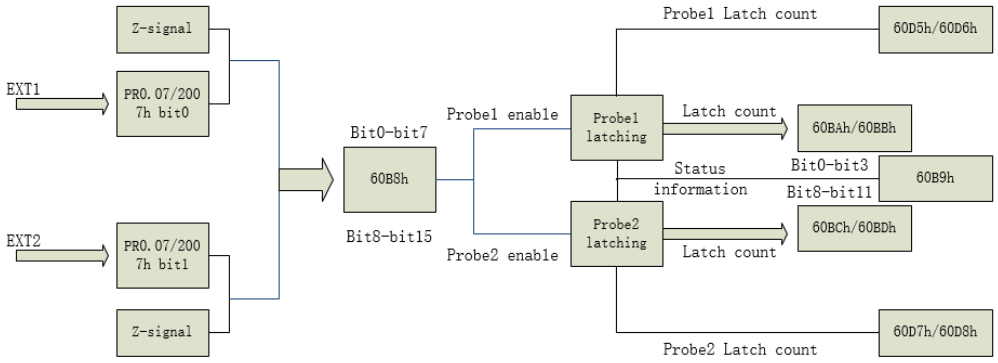
Command Polarity inversion (P00.06)	Command pulse input mode settings (P00.07)	Command Pulse Mode	Positive signal	Negative signal
【0】	0 *or* 2	90°phase difference 2 phase pulse （Phase A+ Phase B）		
	1	CW pulse sequence ＋ CCW pulse sequence		
	【3】	Pulse sequence ＋ Directional symbol		
1	0 *or* 2	90°phase 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	500 kHz	2	1	1	1	1	1
	Open collector	200 kHz	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

7.1 Probe function



When using EXT1 or EXT2 as probe, please set as following:
a）Set polarity of EXT 1 or EXT 2 as probe. Set the level polarity of the probes using 0x2007 / Pr0.07. Bit 0 for EXT1 signal, bit 1 for EXT2 signal
b）Probe function is set through 0x60B8 (Bit 0-7 is for probe 1, bit8-15 is for probe 2). Functions including activation trigger signal selection, triggering mode and triggering signal edge.
Please take note:
（i）Triggering mode: Single trigger, rising signal edge = valid; triggering mode: Continuous trigger, rising and falling edge = valid
（ii）After activation, trigger signal selection, triggering signal edge settings, counter will be reset and 0x60B9 status will change as well.
（iii）Probe signal level is shown in 60FD: EXT1 -> bit 26, EXT2 -> bit 27.

7.2 Related Objects

Index	Sub Index	Label	Access	Data Type	Units	Range	Default
2007h	00h	Probe 1 polarity setting	RW	Uint16		0~0xFFFF	1
2007h	01h	Probe 2 polarity setting	RW	Uint16		0~0xFFFF	1
60B8h	00h	Probe control word	RW	Uint16		0~65535	0
60B9h	00h	Probe status word	RO	Uint16		0~65535	0
60BAh	00h	Probe 1or Z-signal rising edge latching position	RO	int32	Command unit	-2147483648~2147483647	0
60BBh	00h	Probe 1 or Z-signal falling edge latching position	RO	int32	Command unit	-2147483648~2147483647	0
60BCh	00h	Probe 2 or Z-signal rising edge latching position	RO	int32	Command unit	-2147483648~2147483647	0
60BDh	00h	Probe 2 or Z-signal falling edge latching position	RO	int32	Command unit	-2147483648~2147483647	0
60D5h	00h	Probe 1 or Z-signal rising edge counter	RO	Uint32		0~4294967296	0
60D6h	00h	Probe 1 or Z-signal falling edge counter	RO	Uint32		0~4294967296	0
60D7h	00h	Probe 2 or Z-signal rising edge counter	RO	Uint32		0~4294967296	0
60D8h	00h	Probe 2 or Z-signal falling edge counter	RO	Uint32		0~4294967296	0

7.3 Signal Input of EXT1 and EXT2

EXT1：Pin1 and Pin5 of CN1 terminal
EXT2：Pin2 and Pin6 of CN1 terminal

7.4 Probe Control Word 60B8h

Bit	Definition	Details
0	Probe 1 enable	0--Disable 1--Enable
1	Probe 1 mode	0--Single trigger mode 1--Continuous trigger mode
2	Probe 1 trigger signal selection	0—EXT1 signal 1--Z signal
3	Reserved	-
4	Probe 1 rising edge trigger	0--Disable 1--Enable
5	Probe 1 falling edge trigger	0--Disable 1--Enable
6-7	Reserved	-
8	Probe 2 enable	0--Disable 1--Enable
9	Probe 2 mode	0--Single trigger mode 1--Continuous trigger mode
10	Probe 2 trigger signal selection	0—EXT2 signal 1--Z signal
11	Reserved	-
12	Probe 2 rising edge trigger	0--Disable 1--Enable
13	Probe 2 falling edge trigger	0--Disable 1--Enable
14-15	Reserved	-

7.5 Probe Status Word 60B9h

Bit	Definition	Details
0	Probe 1 enable	0--Disable 1--Enable
1	Probe 1 or Z-signal rising edge trigger	0-- not executed 1-- executed
2	Probe 1 or Z-signal falling edge trigger	0-- not executed 1-- executed
3-5	Reserved	-
6-7	Reserved	-
8	Probe 2 enable	0--Disable 1--Enable
9	Probe 2 or Z-signal rising edge trigger	0-- not executed 1-- executed
10	Probe 2 or Z-signal falling edge trigger	0-- not executed 1-- executed
11-13	Reserved	-
14-15	Reserved	-

7.6 Latch Position Register

Index	Details
60BAh	Probe 1 or Z-signal rising edge latch position
60BBh	Probe 1 or Z-signal falling edge latch position
60BCh	Probe 2 or Z-signal rising edge latch position
60BDh	Probe 2 or Z-signal falling edge latch position

7.7 Latch Counter Register

Index	Details
60D5h	Probe 1 or Z-signal rising edge counter
60D6h	Probe 1 or Z-signal falling edge counter
60D7h	Probe 2 or Z-signal rising edge counter
60D8h	Probe 2 or Z-signal falling edge counter

7.8 Probe Operation Trigger

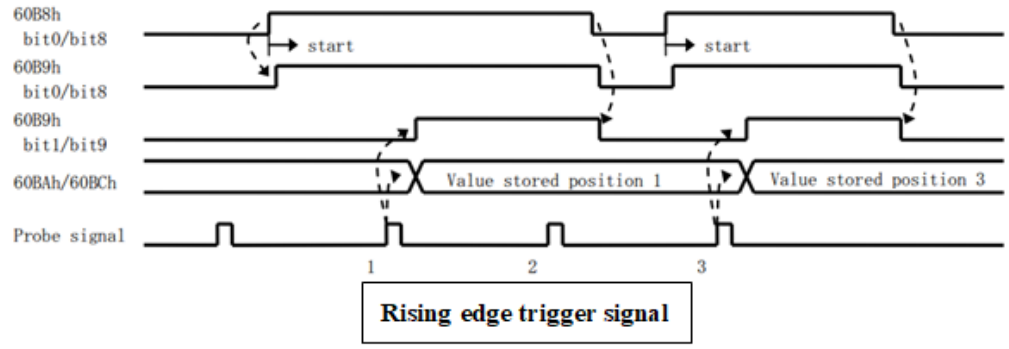
When bit0/bit8 of the probe function control parameter **6088h** changes from “0 (Stop)” → “1 (Start)”, the probe action is triggered under the set conditions (6088h: bit1~7 / bit9~15). For the change of each set condition to take effect, bit0/bit8 must return once to “0 (Stop)” and then switch again to “1 (Start)”.

7.9 Probe Event Mode

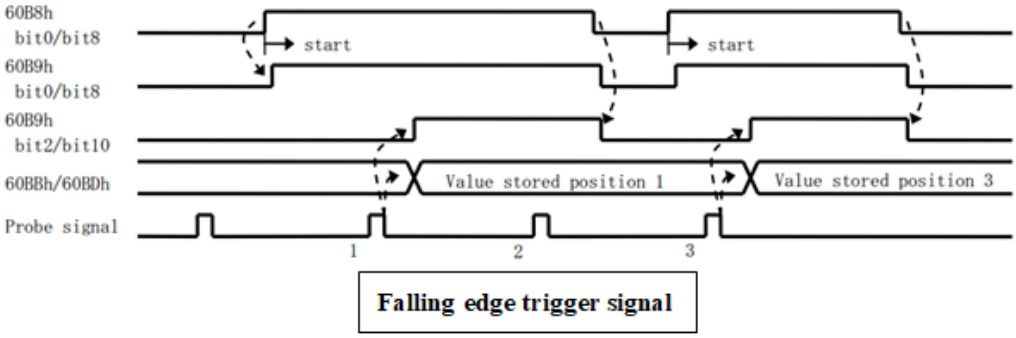
Set bit1/bit9 of 60B8h (Probe mode), 0 = Single trigger mode, 1 = Continuous trigger mode.

（1）Single trigger mode

Triggers only when the trigger signal is valid for the first time. In order to latch the position, users need to set bit0/bit8 of 60B8h to 0, then set bit0/bit8 of 60B8h to 1. The sequence diagram is as shown below:



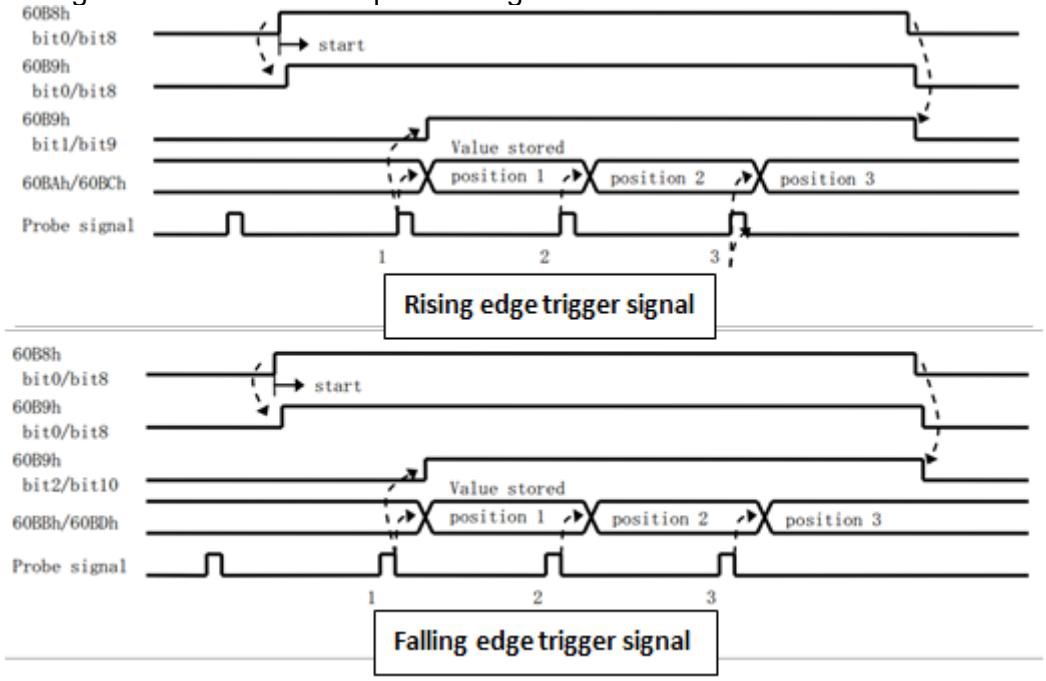
Rising edge trigger signal



Falling edge trigger signal

（2）Continuous trigger mode

The data saved from signal triggering will be saved until the next trigger signal. Enabling the probe again is not needed. Sequence diagram as shown below:



Chapter 8 Control Mode

8.1 Driver Control Mode Setting

8.1.1 Supported control mode (6502h)

E-DFAS□□E supports seven modes, as defined in 6502h.

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

8.1.2 Operational mode setting (6060h) and Operational mode display (6061h)

The operation mode of the servo driver is set in 6060h. The operation mode of the servo driver is viewed in 6061h.

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

8.2 Common Functions for All Modes

8.2.1 Digital Input / Output Setting and Operation

Digital input setting and status display

Please refer to chapter 5 for more details on digital I/O input and polarity settings.60FDh object complies with IEC61800-200 standard input I/O status mapping object. 60FDh is set according to function as the table below shows.

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 status display

In addition to the internal operation of the servo system, E-DFAS□□E 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 servo driver digital I/O output through 60FEh object

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	

8.2.2 Motor Rotational Direction

Rotational direction is defined in 607Eh.

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

8.2.3 Stop Settings

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

Index 605Ah	Label	Quick stop option code			Mode	F		
	Range	0~7			Default	2	Unit	-
	Structure	VAR	Type	INT16	Mapping	-	Access	RW

Motor stops when quick stop option code 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 6084. Status: Switch on disable, axis disabled.

2：Motor decelerates and stops through 6085. Status: Switch on disable, axis disabled.

3：Motor decelerates and stops through 60C6. Status: Switch on disable, axis disabled.

5：Motor decelerates and stops through 6084. Status: Quick stop

6：Motor decelerates and stops through 6085. Status: Quick stop

7：Motor decelerates and stops through 60C6. Status: Quick stop

HM

0：To stop motor through P05.06. Status: Switch on disable, axis disabled.

1：Motor decelerates and stops through 609A. Status: Switch on disable, axis disabled.

2：Motor decelerates and stops through 6085. Status: Switch on disable, axis disabled.

3：Motor decelerates and stops through 60C6. Status: Switch on disable, axis disabled.

5：Motor decelerates and stops through 609A. Status: Quick stop

6：Motor decelerates and stops through 6085. Status: Quick stop

7：Motor decelerates and stops through 60C6. 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.

8.2.4 CiA DSP40 Control Word

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

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	×	×	×	×	0080h	15

× Is not affected by this bit state
* Indicates that this transition is performed in the device start state
** Indicates that it has no effect on the start state and remains in the start state
*1) The state machine switch corresponds to figure 7.1

The definition of bit 8 and bit 6~4 in different operation modes are shown in the following table

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	-	-	-

8.2.5 CiA DSP402 Status Word

Bit definition of Status Word 6041h.

Bit	Definition
15~14	Reserved
13~12	Related to modes
11	Position limit valid
10	Position arrival
9	Distance
8	Related to modes
7	Reserved

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 following table

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

× is not affected by this bit state

8.3 Position Mode（CSP、PP、HM）

8.3.1 Common Functions of Position Mode

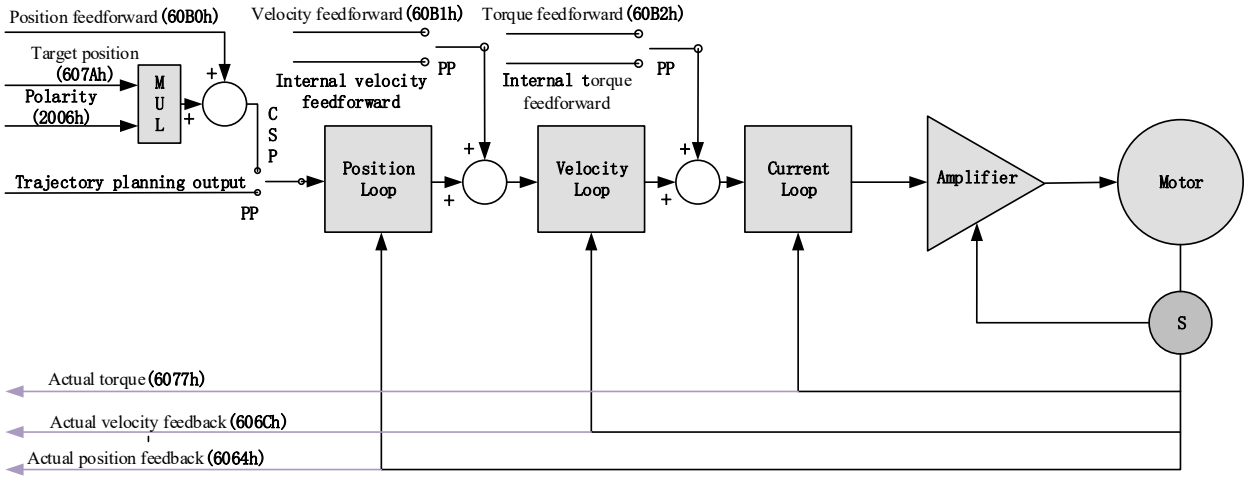
Index	Sub-Index	Label	Access	PDO	Mode		
					PP	CSP	HM
6040	0	Control word	RW	RxPDO	Yes	Yes	Yes
6072	0	Max torque	RW	RxPDO	Yes	Yes	Yes
607A	0	Target position	RW	RxPDO	Yes	Yes	/
607D	1	Min. software limit	RW	RxPDO	Yes	Yes	/
	2	Max. software limit	RW	RxPDO	Yes	Yes	/
607F	0	Maximum protocol velocity	RW	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

8.3.2 Cyclic Synchronous Position Mode (CSP)

CSP Block Diagram



Related Objects

Basic object

PDO	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

Extended object

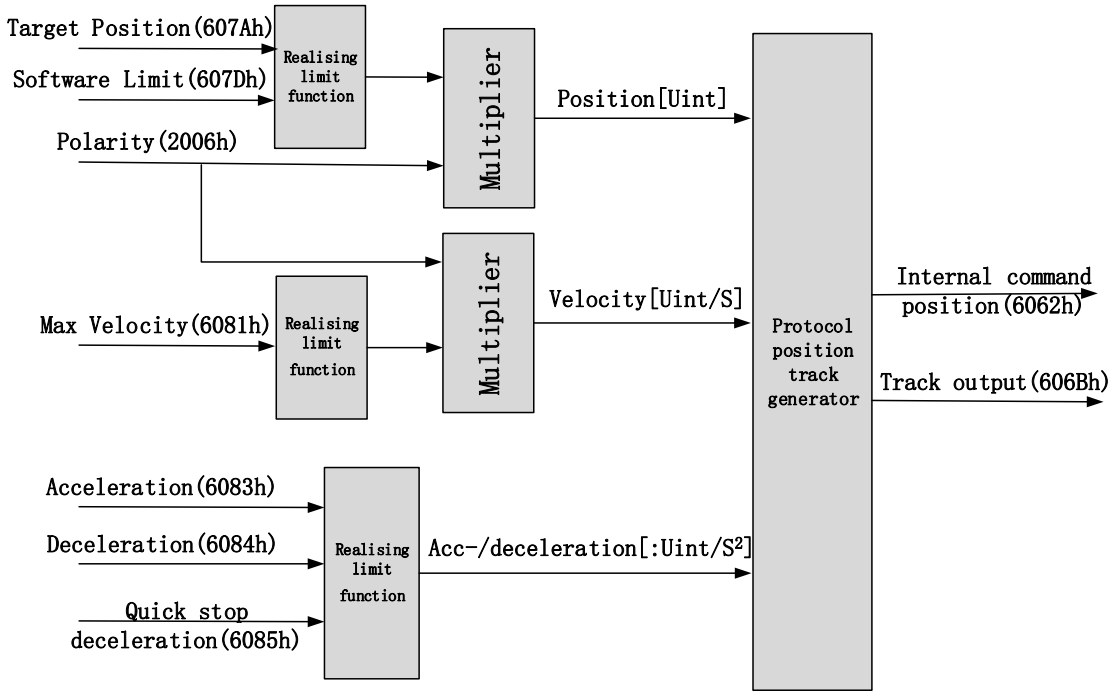
Index+Sub-Index	Label	Data Type	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
6062-00h	Position demand value	I32	RO	Unit
606B-00h	Internal command speed	I32	RO	Unit
607D-01h	Min. software limit	I32	RO	Unit
607D-02h	Max. software limit	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	—

8.3.3 Protocol Position Mode (PP)

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 axis is asynchronous.

From the perspective of servo driver functions, the difference between PP and CSP mode is that PP mode requires track generator function from E-DFAS□□E



Related Parameters

Basic object

PDO	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/s²	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

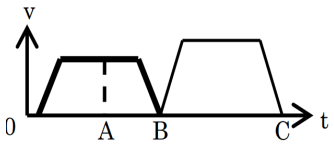
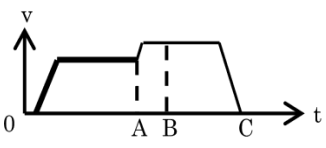
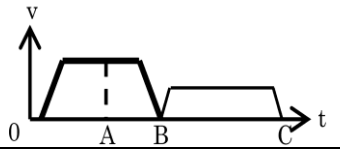
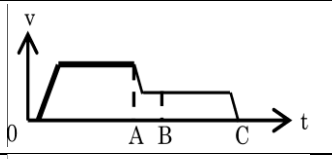
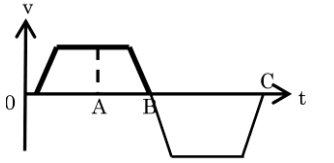
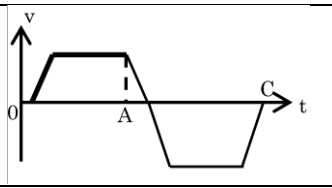
Index+Sub-Index	Label	Data Type	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
6062-00h	Position demand value	I32	RO	Unit
606B-00h	Internal command speed	I32	RO	Unit
607D-01h	Min. software limit	I32	RO	Unit
607D-02h	Max. software limit	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 bits 4~6 definition under PP mode

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

5 motion structures under 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 definition under PP mode

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

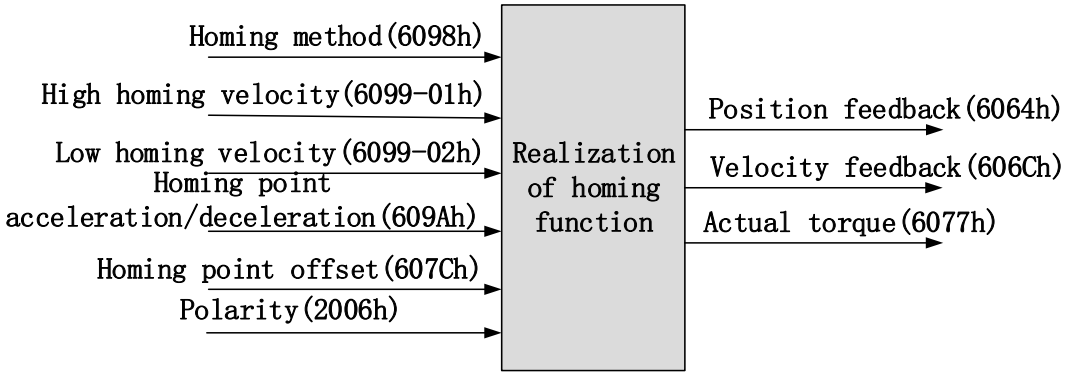
*1) Bit 8 abnormal stoppage is usually valid when hardware limit, deceleration stoppage and quick stop are triggered.
*2) Bit 12 under control word(6040h) bit 5 valid and bit 4 invalid, motion interruptible.
*3) Bit 15 and bit 12 have inversed logic under PP mode.

Application: Realization of relative position motion

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

8.3.4 Homing mode (HM)

E-DFAS□□E servo system supports every other homing method except for method 36. Output/input parameters of E-DFAS□□E are as shown below.



Related Parameters

Basic object

PDO	Index+Sub-Index	Name	Data Type	Access	Unit	Notes
(RXPDO)	6040-00h	Control word	U16	RW	—	Required
	6098-00h	Homing mode	I8	RW	Unit	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

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

Bit	Value	Definition
4(Homing motion starts/stops)	0—>1	Homing motion starts
	1 —>0	Homing motion stops, motor stops

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

Bit	Value	Definition
8(Abnormal Stoppage)	0	Normal motion
	1	Abnormal stoppage triggered, motor 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	bit=1 when the motion parameters satisfy any of the following: 1. origin fast (6099-01h) and origin slow (6099-02h) are both 0; 2. the origin method (6098h) is 0; 3. origin acceleration/deceleration (609Ah) is 0; Except for the above conditions, bit=0.
	1	
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 10/12 is occupied.
*3) Use to indicate if homing is able to trigger or already triggered.

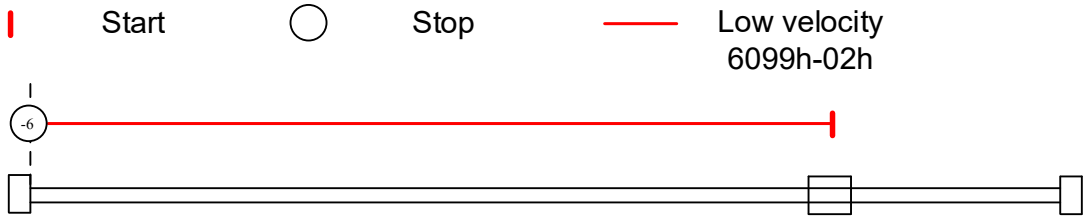
Incorrect position triggering conditions

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

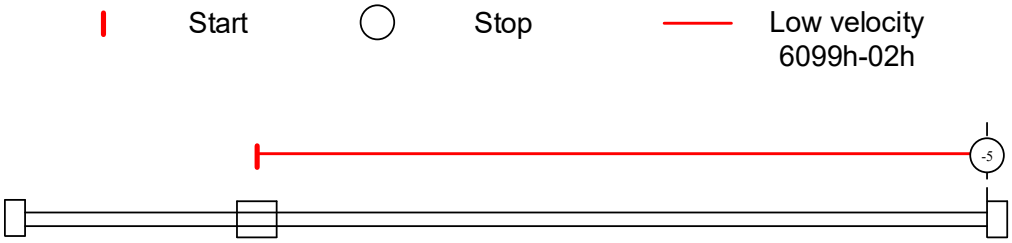
Homing mode

Torque limiting mode

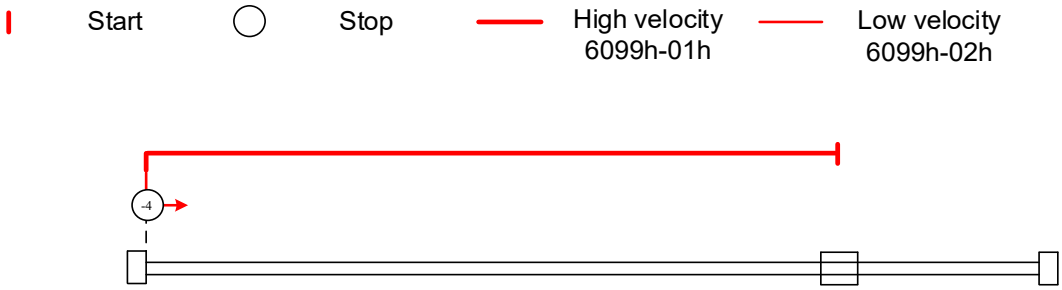
Mode-6： Search for homing point in **negative direction** at **low velocity**. Stop after torque reaches the value set in P05.39 and homing done signal is delivered.



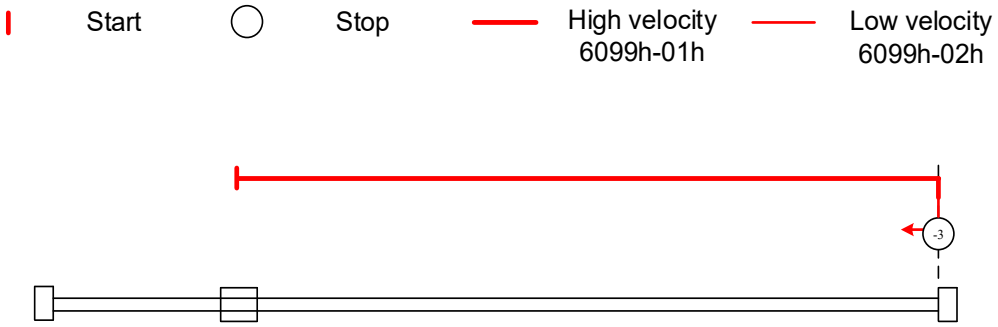
Mode -5： Search for homing point in **positive direction** at **low velocity**. Stop after torque reaches the value set in P05.39 and homing done signal is delivered.



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, stops when torque is gone. Homing done signal delivers after the time value set in P05.37

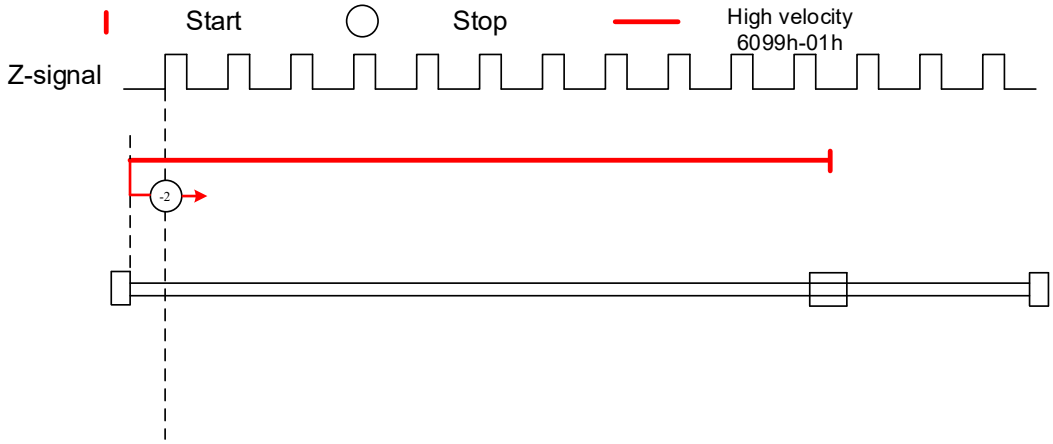


Mode -3：Search for homing point in **positive direction** at **high velocity**. Move in **negative direction** after torque reaches the value set in P05.39, stops when torque is gone. Homing done signal delivers after the time value set in P05.37

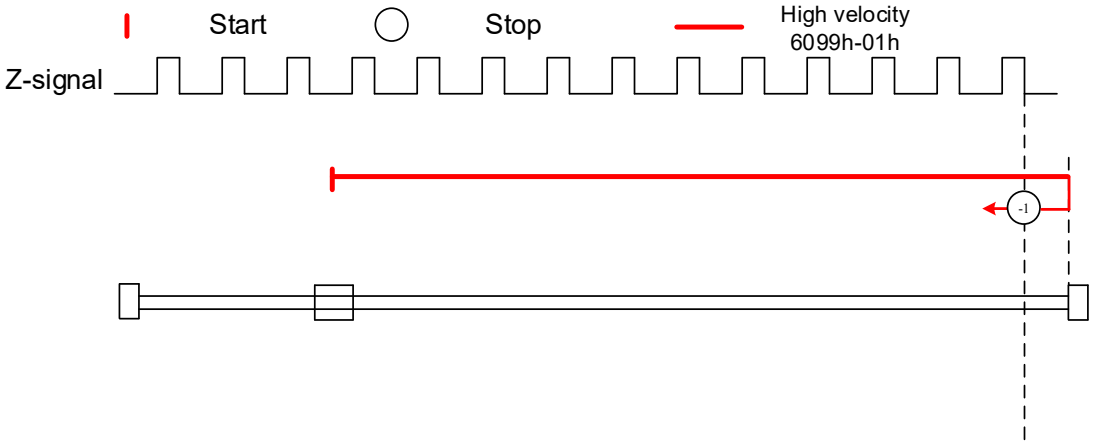


Torque limiting + Z-signal mode

Mode -2：Search for homing point in **negative direction** at **high velocity**. Move in **positive direction** after torque reaches the value set in Pr5.39, 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 Pr5.39, stops when torque is gone with the **first Z-signal**.



Limit switch signal + Z-signal mode

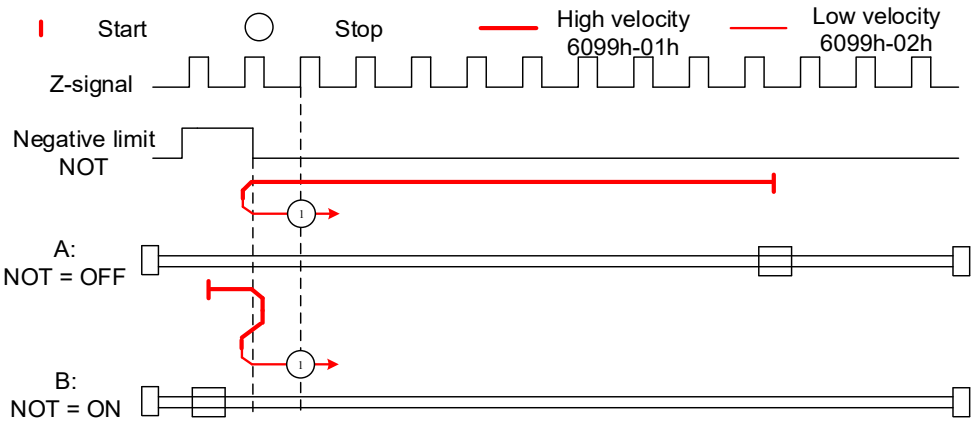
Mode 1:

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**

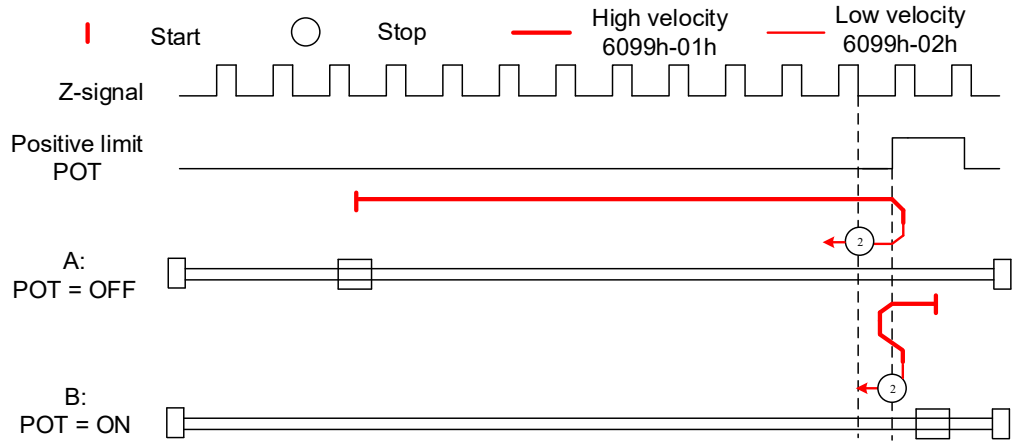
If the positive limit signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



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:

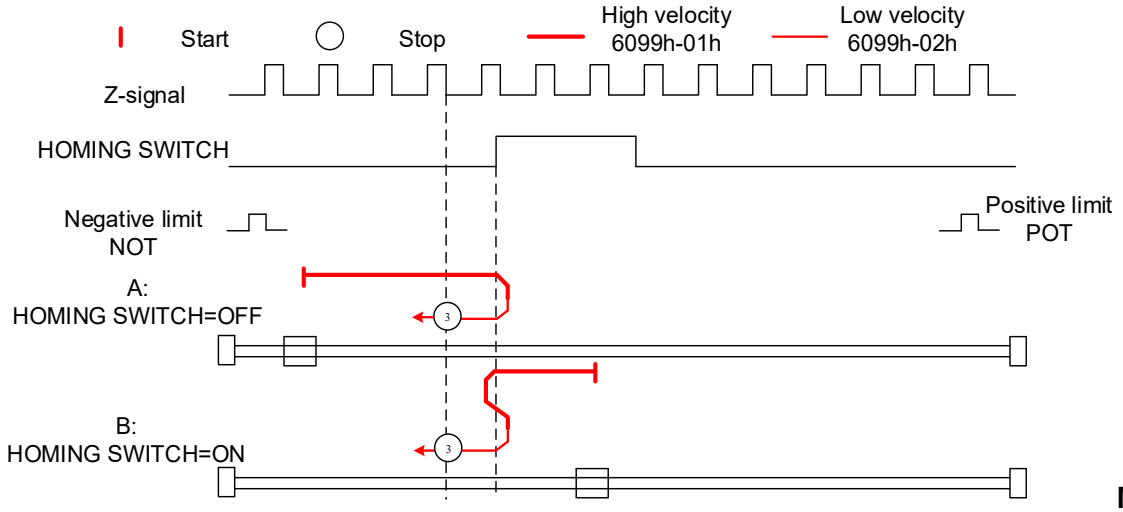
Diagram A: *Homing switch = OFF*

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:

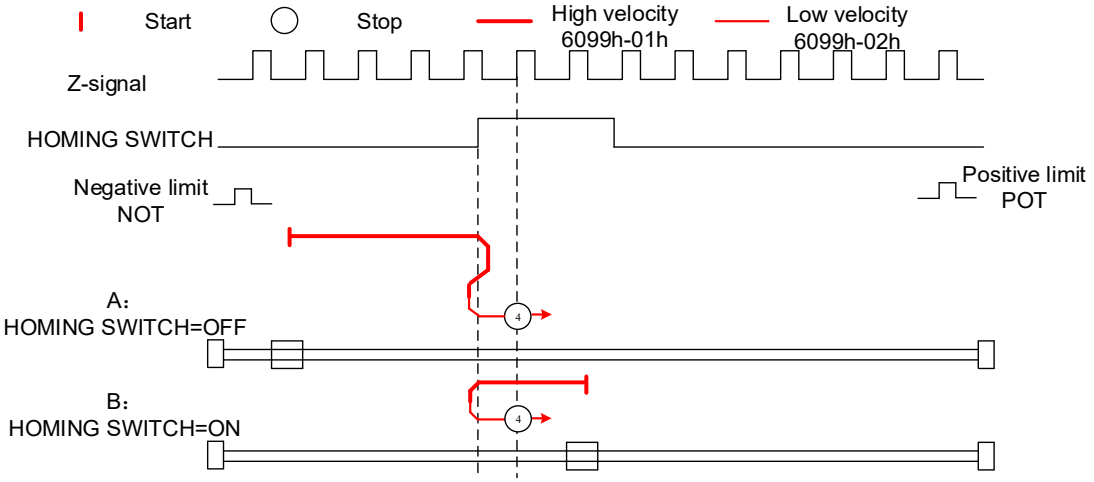
Diagram A: *Homing switch = OFF*

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**

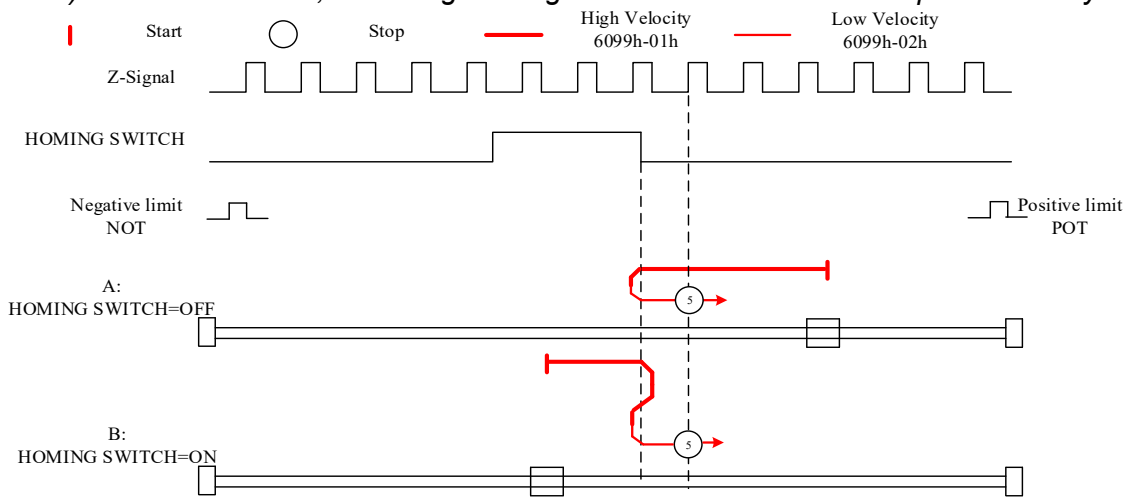
If the positive/negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



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**

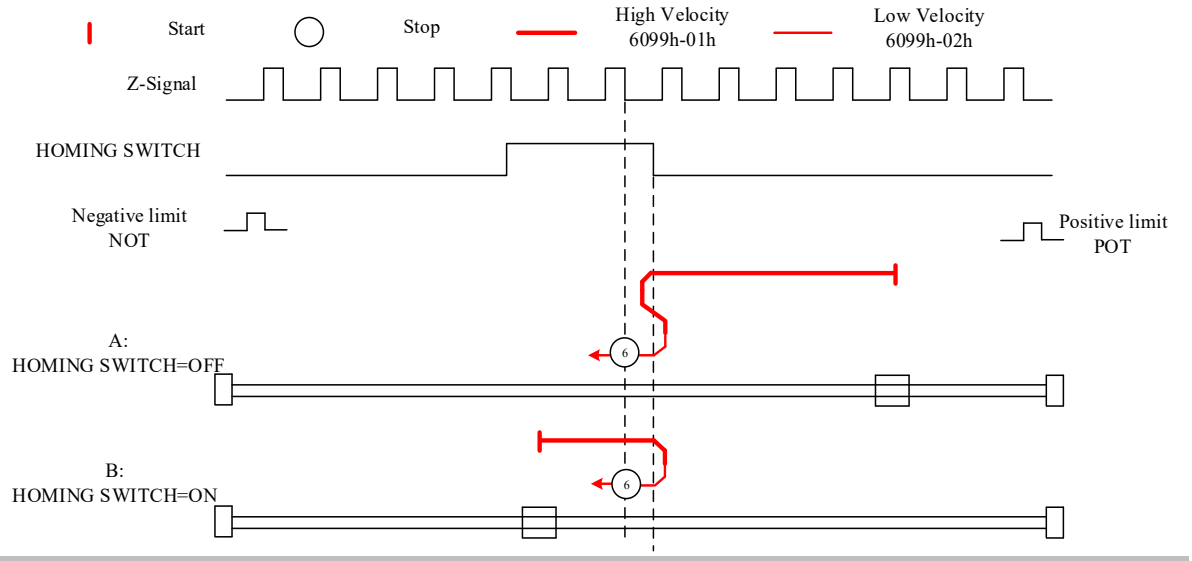
If the positive/negative limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



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.



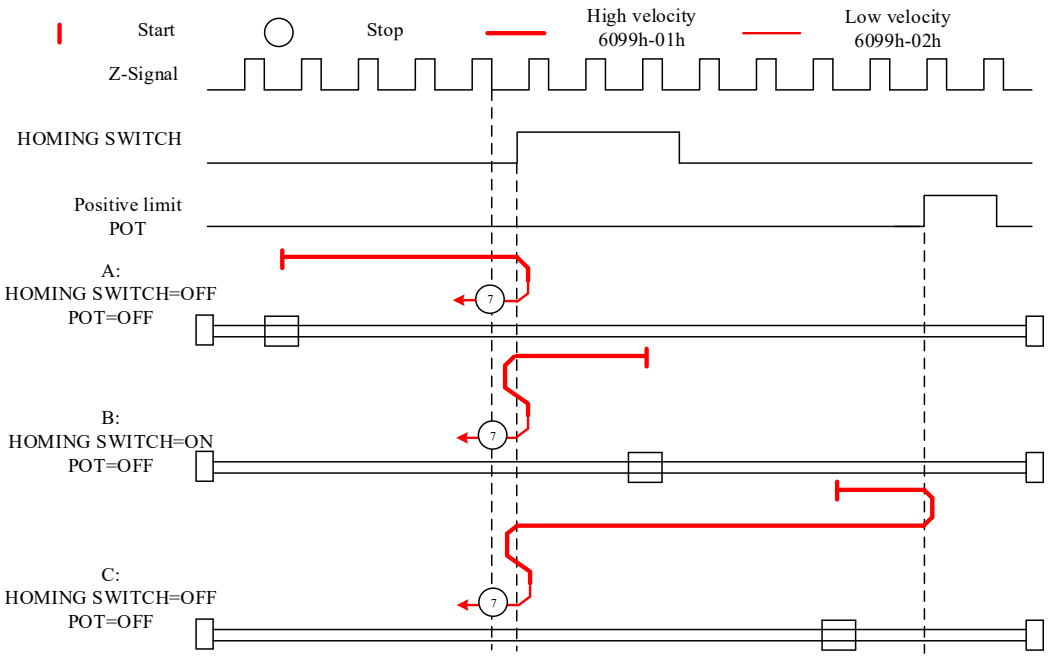
Limit switch signal + homing switch signal + Z-signal mode

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.**

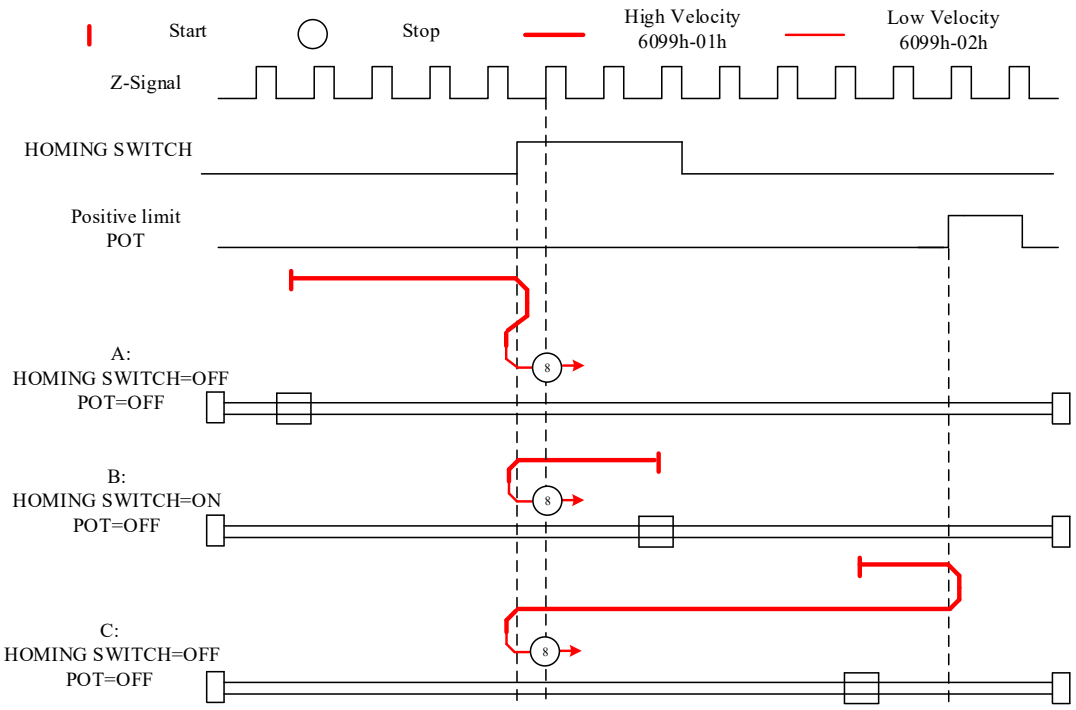
Diagram B: *Homing switch = ON, positive limit switch = OFF*

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.

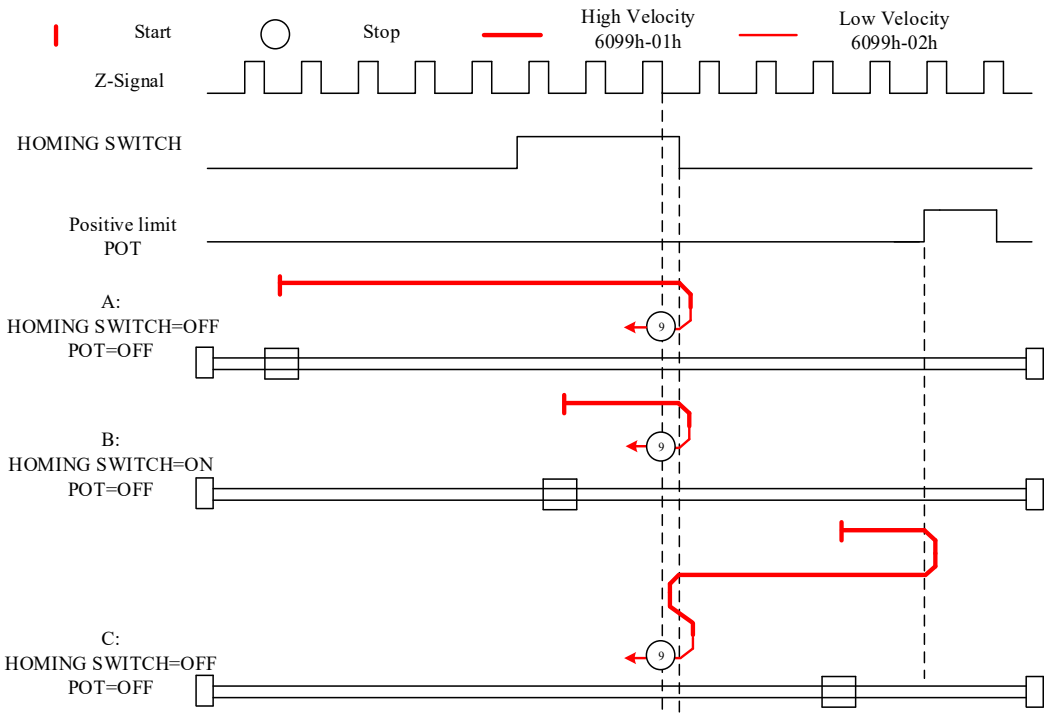


Mode 9
Diagram A: *Homing switch & positive limit switch = OFF*
1. Move in **positive direction** at **high velocity** until **after homing switch.**
2. Move in **negative direction** at **low velocity** and stop after **homing switch valid** and **first encoder Z-signal valid.**

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.**

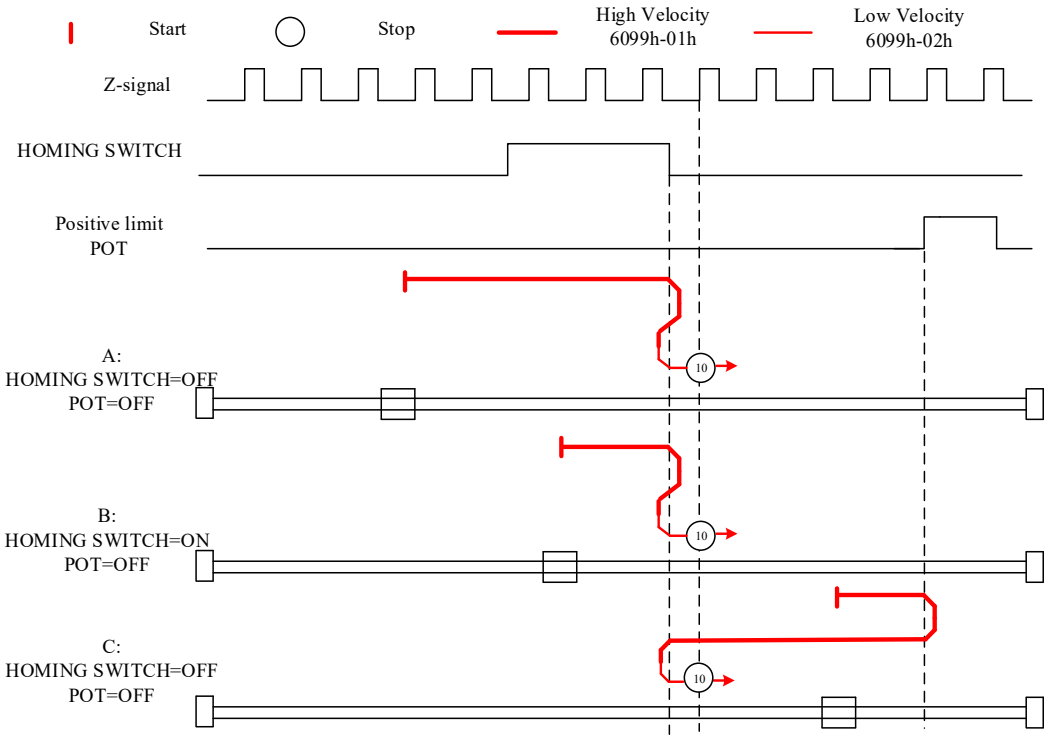
Diagram B: *Homing switch = ON, positive limit switch = OFF*

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.

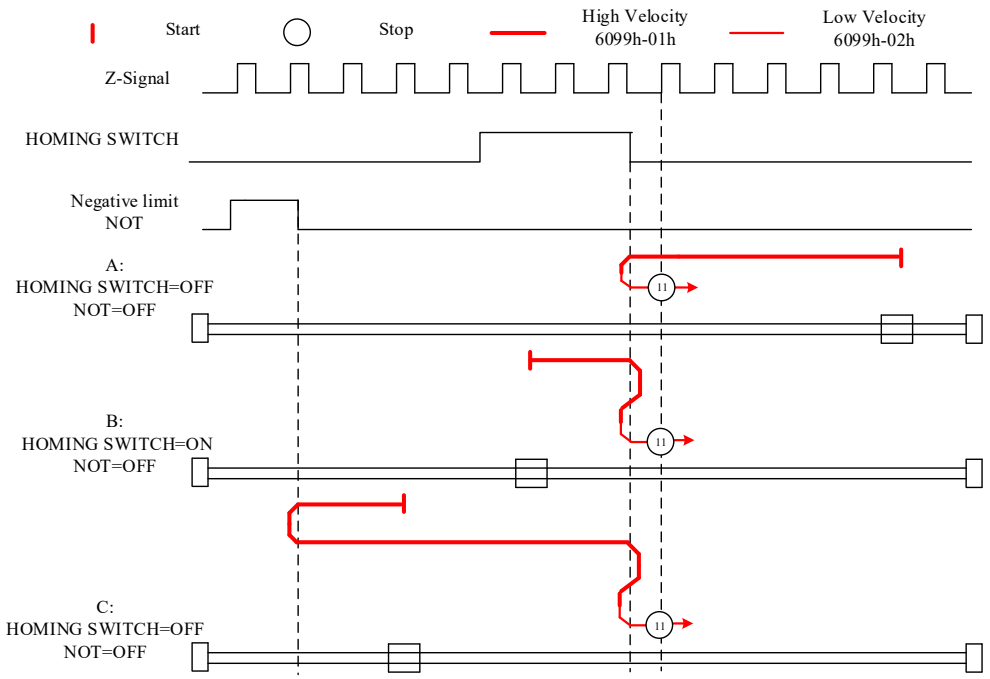


Mode 11
Diagram A: *Homing switch & negative limit switch = OFF*
1. Move in **negative direction** at **high velocity** until **homing switch valid.**
2. Move in **positive direction** at **low velocity** and stop **after homing switch** and **first encoder Z-signal valid**

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.

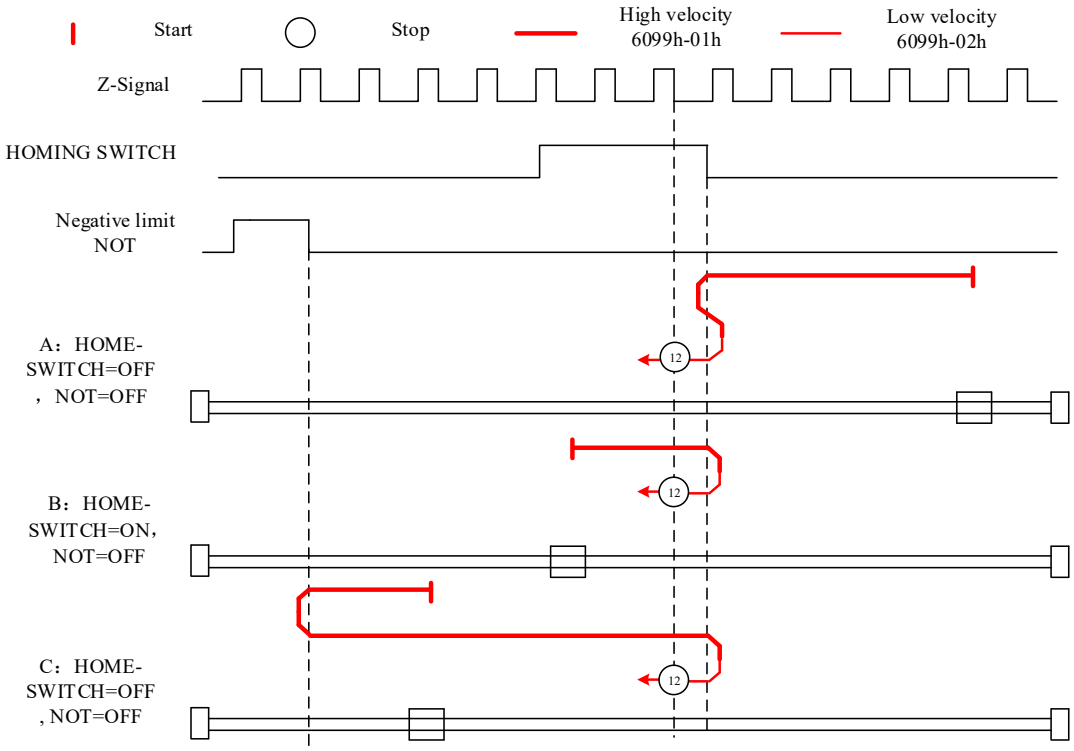


Mode 12
Diagram A: *Homing switch & negative limit switch = OFF*
1. Move in **negative direction** at **high velocity** until **homing switch valid.**
2. Move in **positive direction** at **high velocity** until **after homing switch.**
3. Move in **negative direction** at **low velocity** and stop after **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.

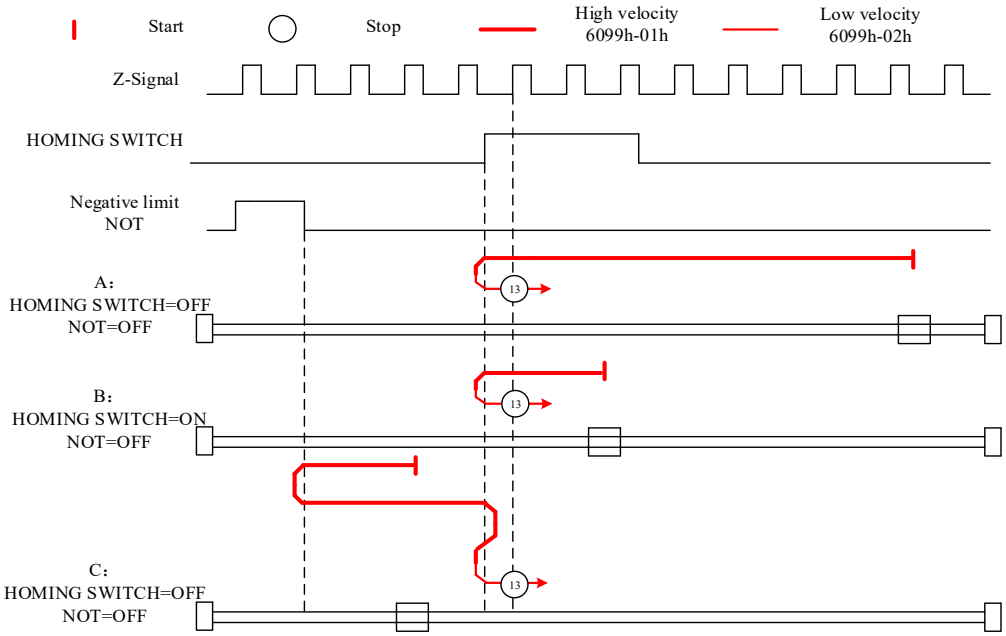


Mode 13
Diagram A: *Homing switch & negative limit switch = OFF*
1. Move in **negative direction** at **high velocity** until **after homing switch**.
2. Move in **positive direction** at **low velocity** and stop after **homing switch valid** and **first encoder Z-signal valid**.

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.**

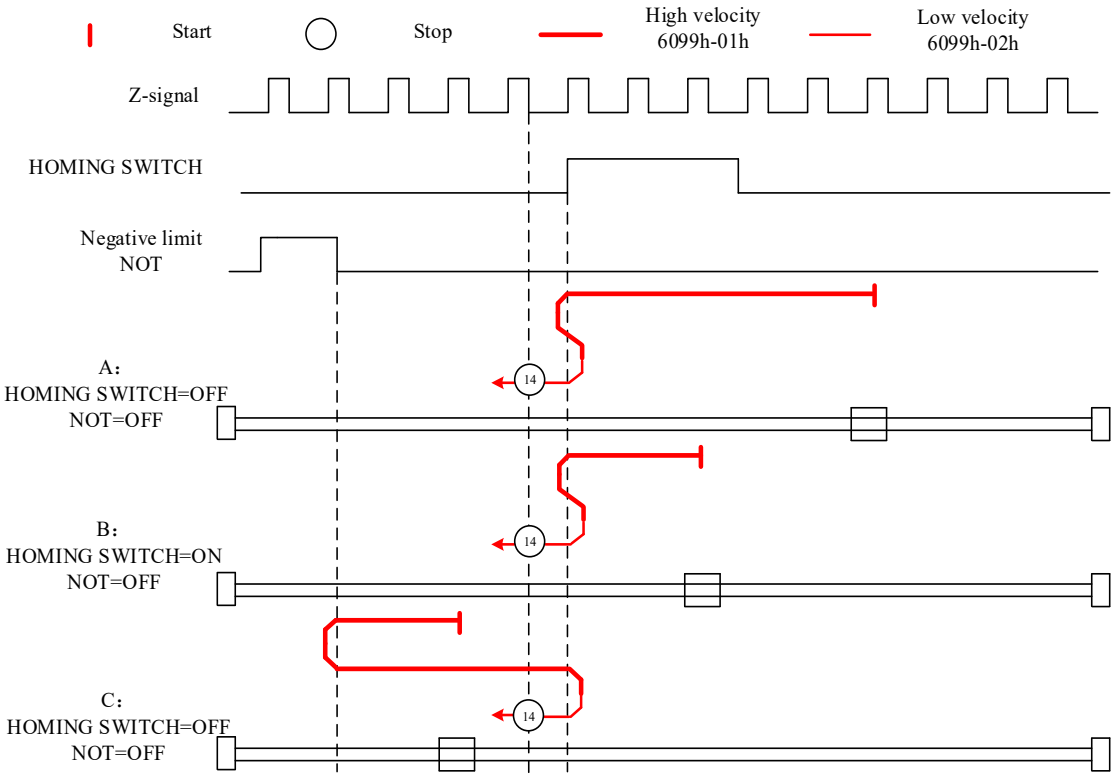
Diagram B: *Homing switch = ON, negative limit switch = OFF*

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.**

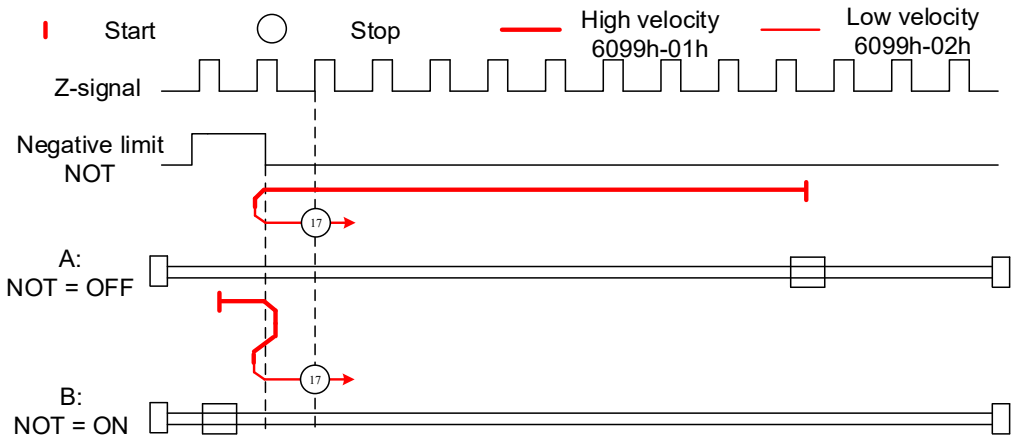
If the positive limit switch signal is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Limit switch signal triggering detection mode

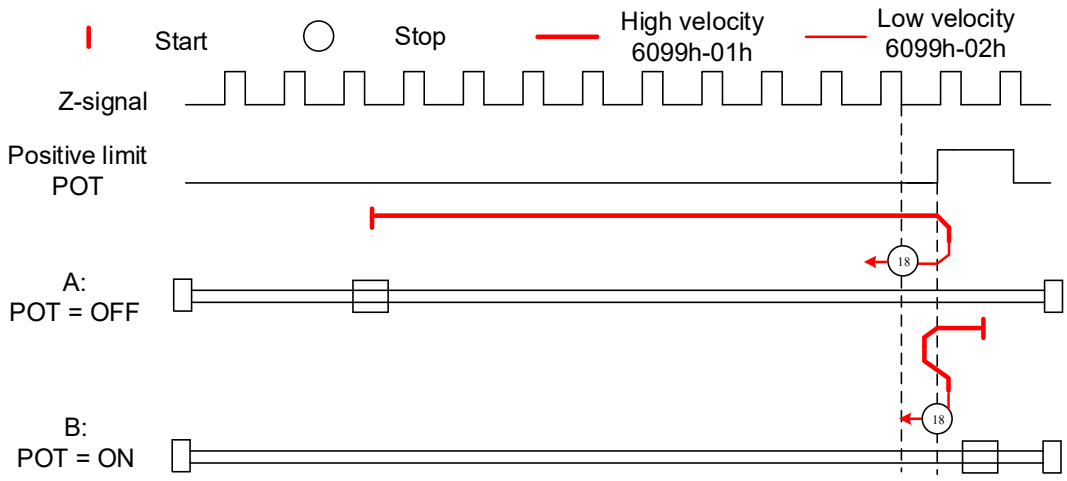
Mode 17:

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



Mode 18:

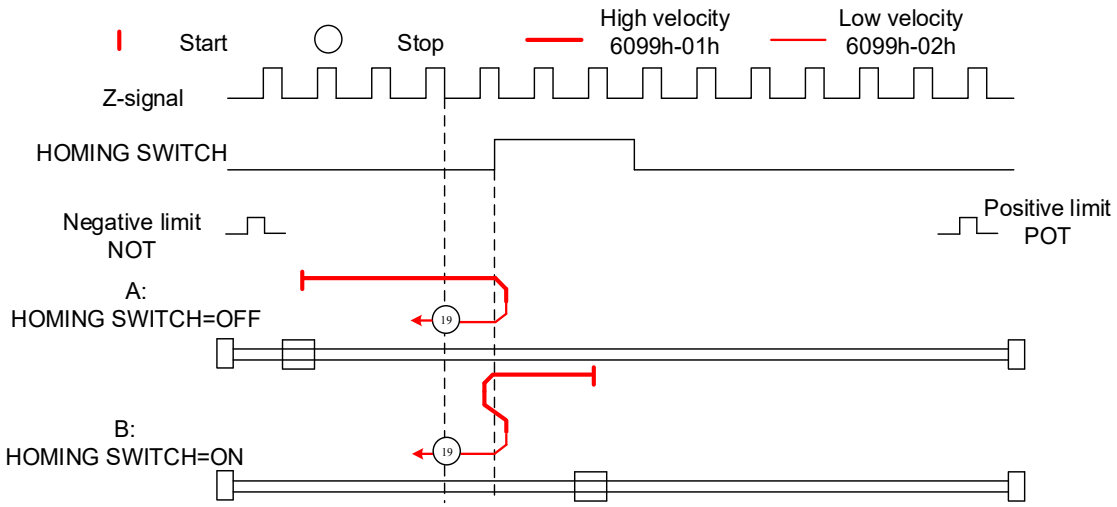
This mode is similar to mode 2. Only difference is that homing point detection is not through Z-signal but through switching of positive limit switch signal



Homing switch signal triggering detection mode

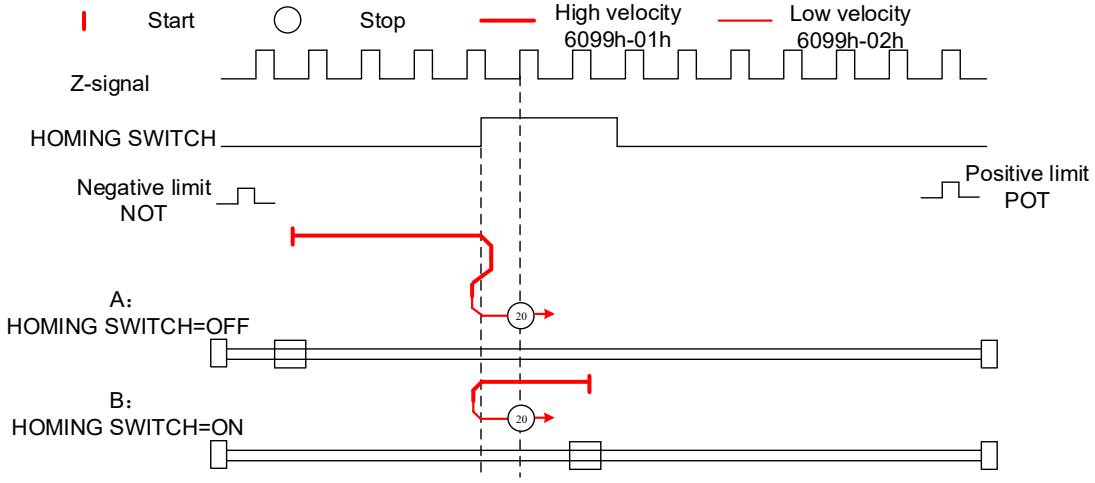
Mode 19：

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



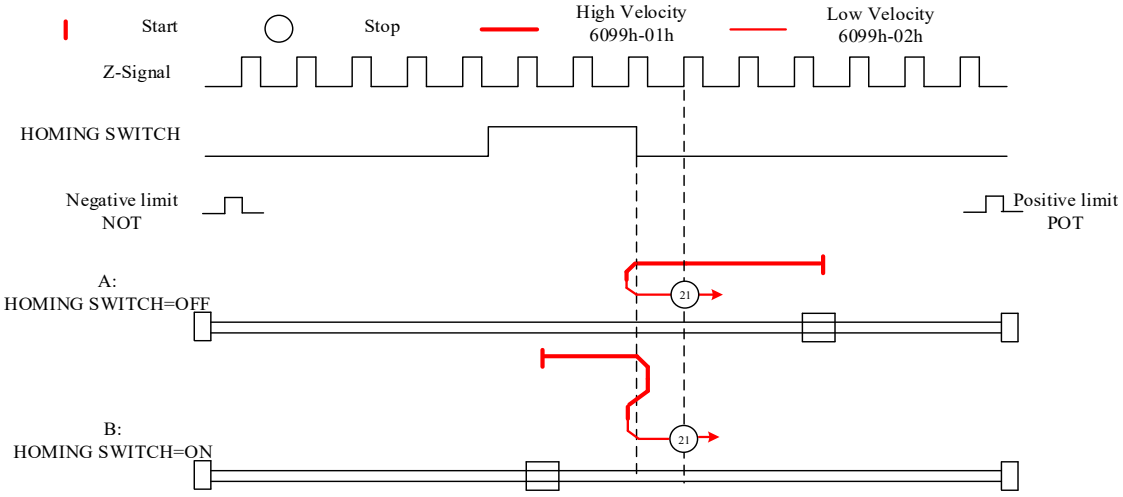
Mode 20：

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



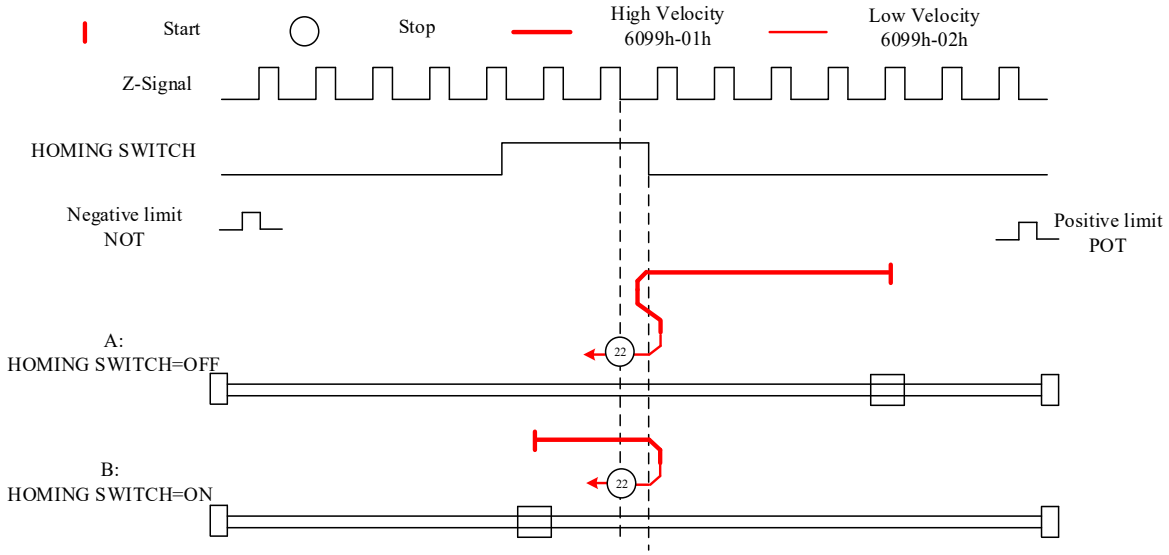
Mode 21：

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.



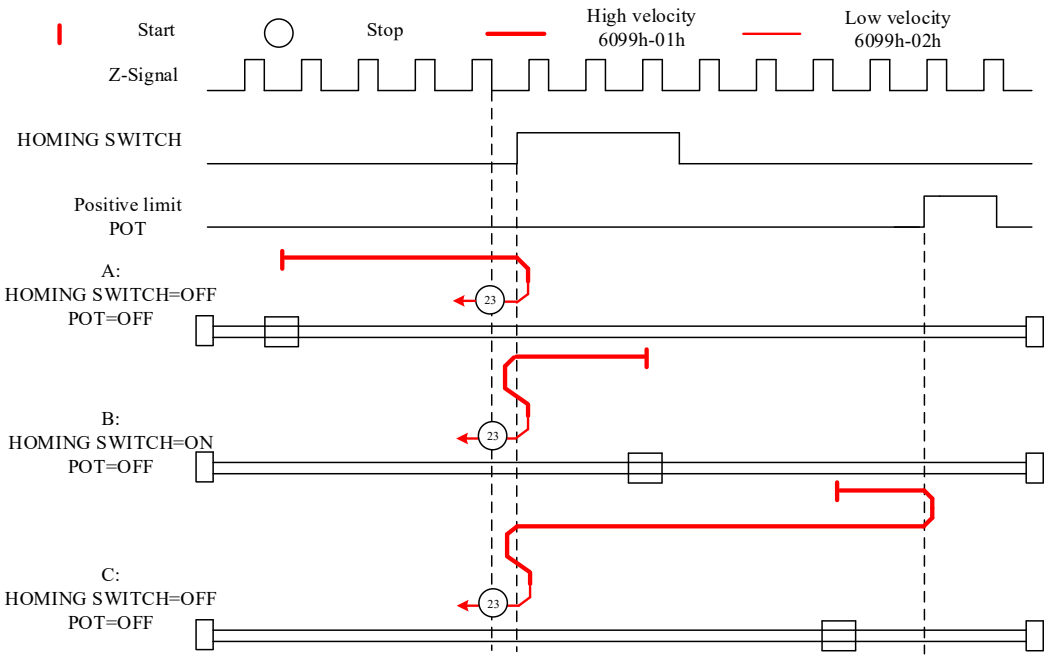
Mode 22:

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.



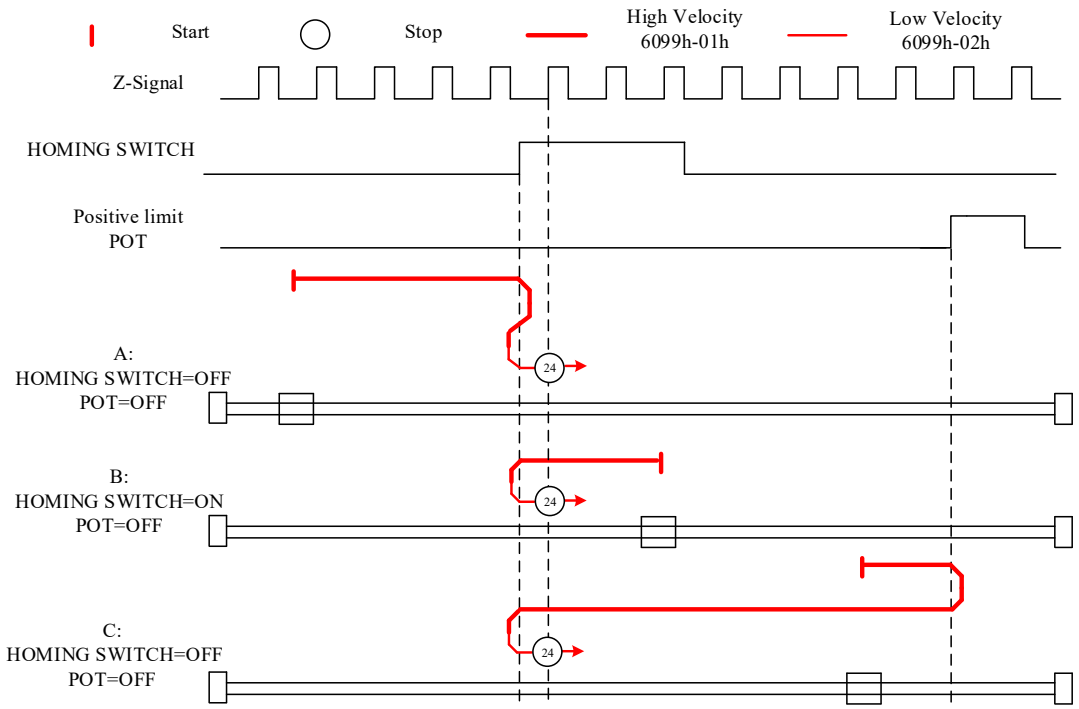
Mode 23:

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.



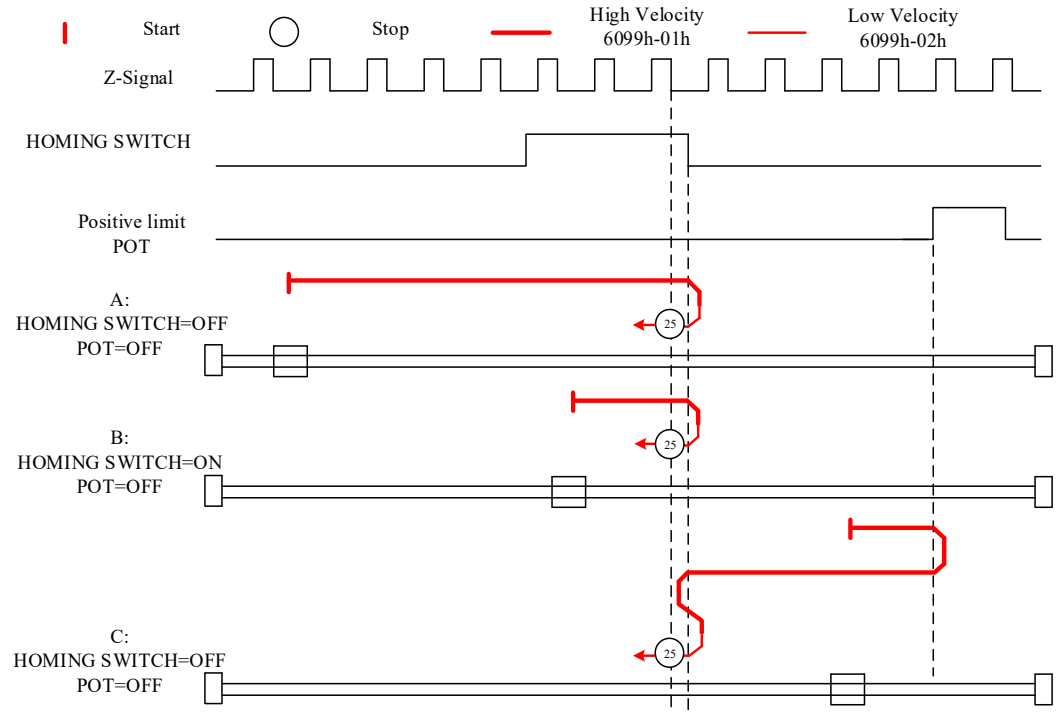
Mode 24:

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.



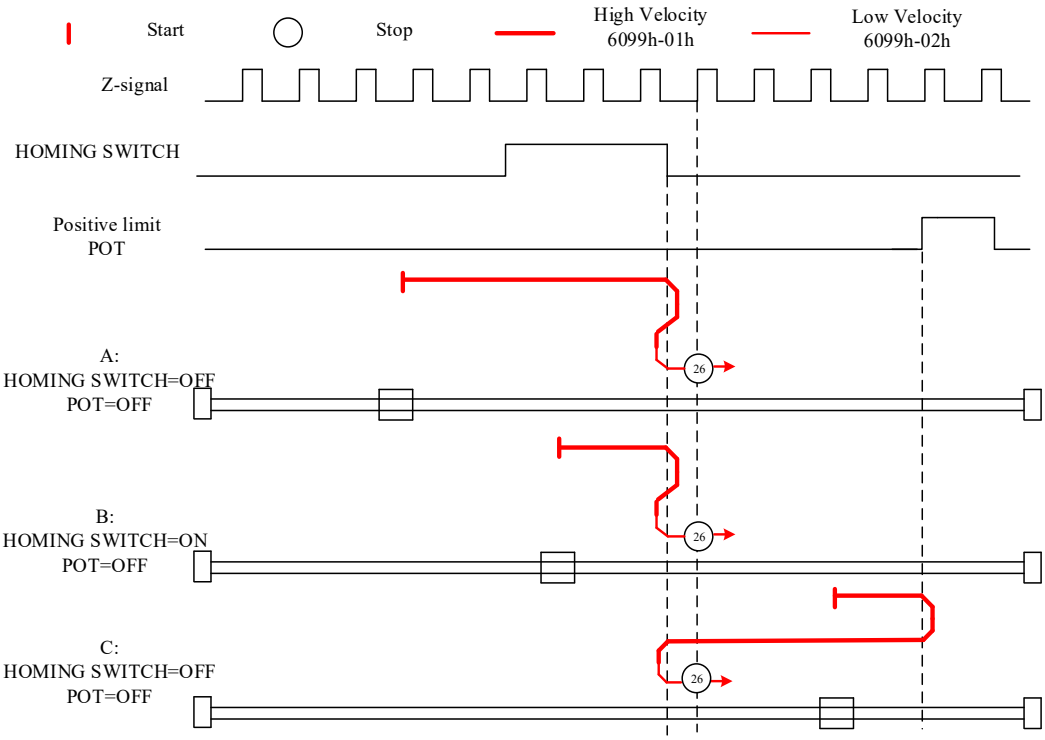
Mode 25:

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



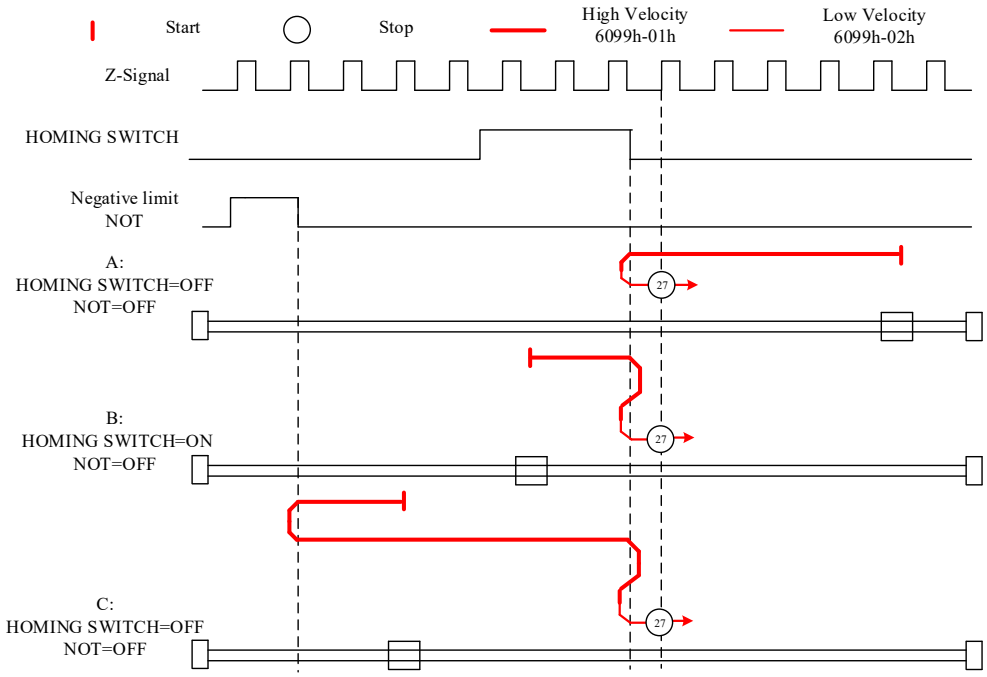
Mode 26:

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



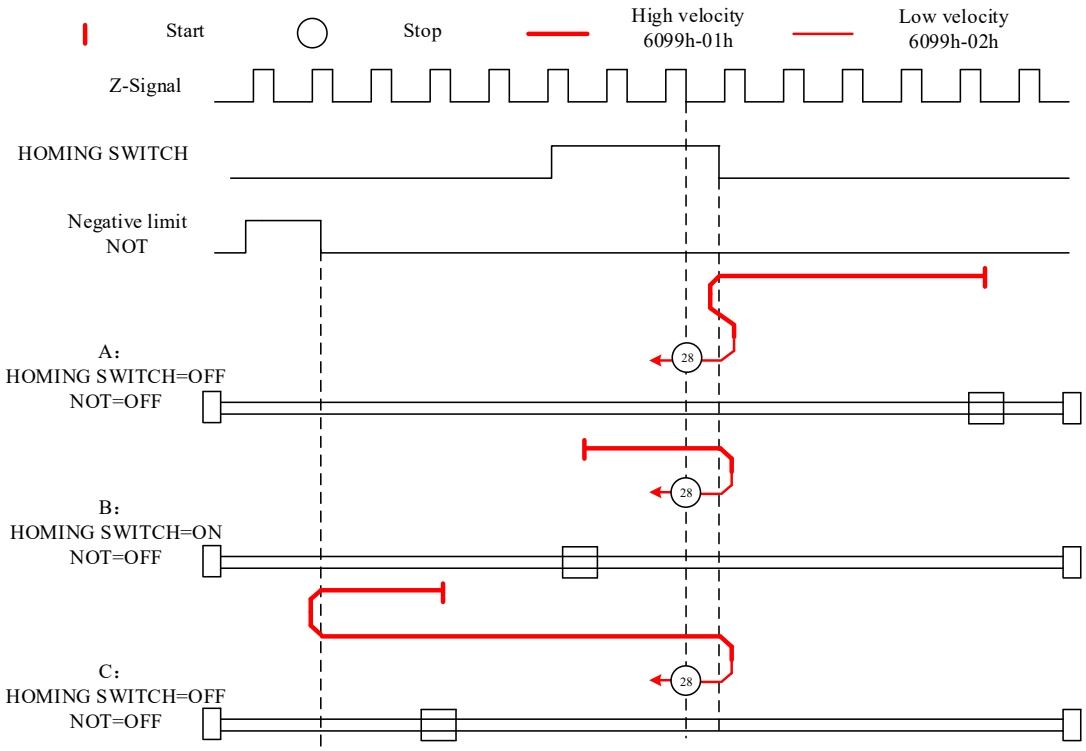
Mode 27:

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



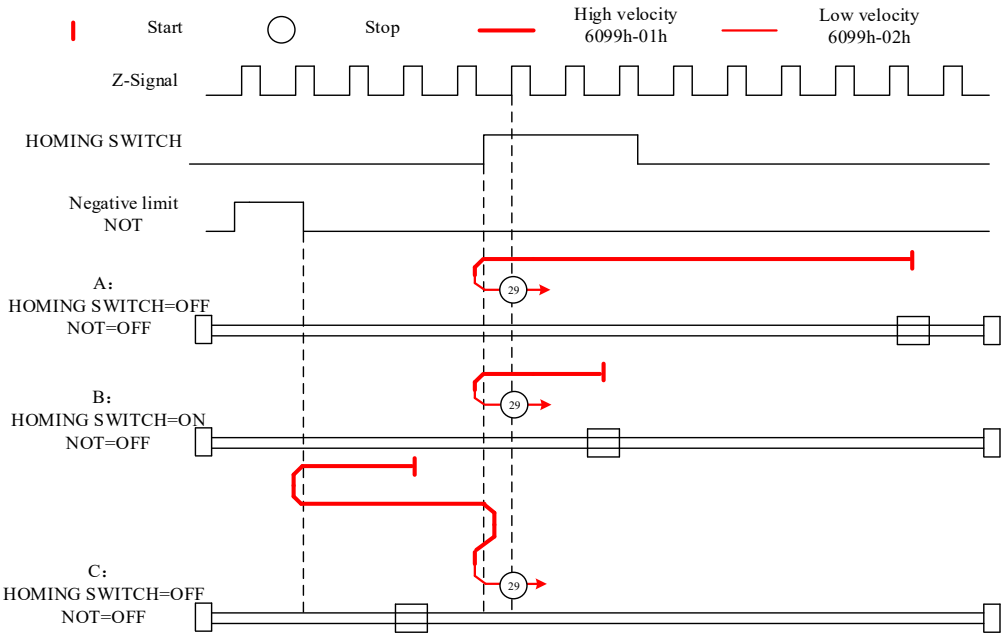
Mode 28:

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



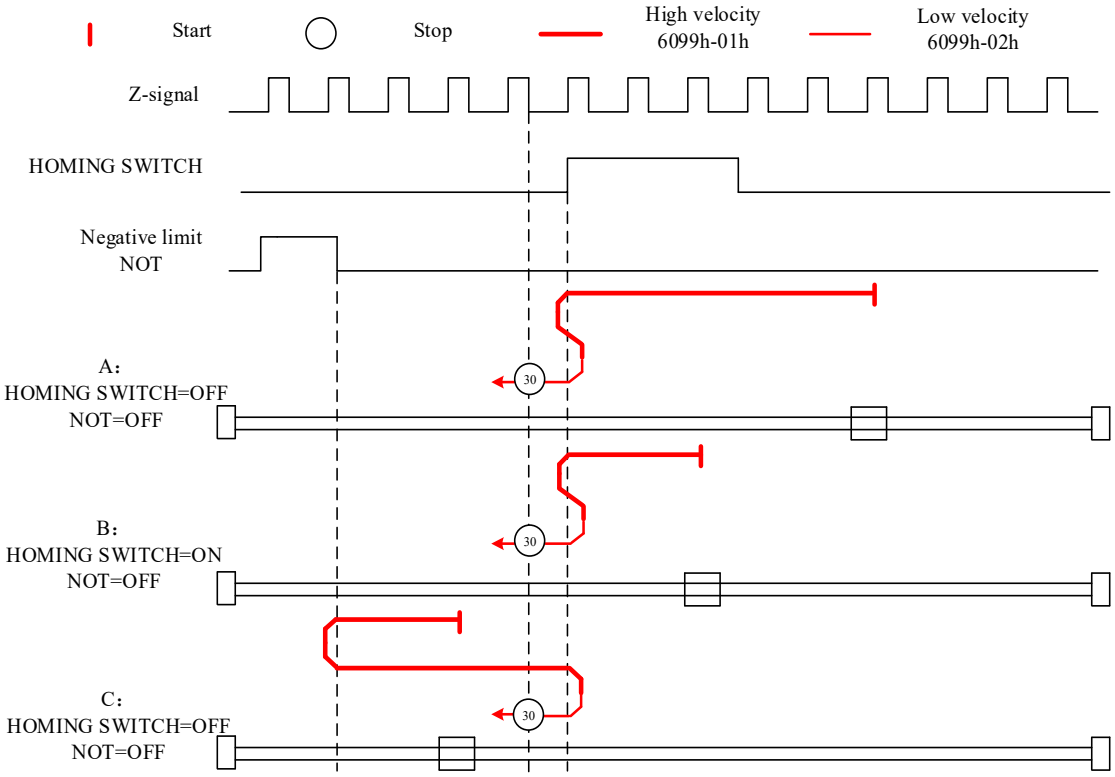
Mode 29:

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



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

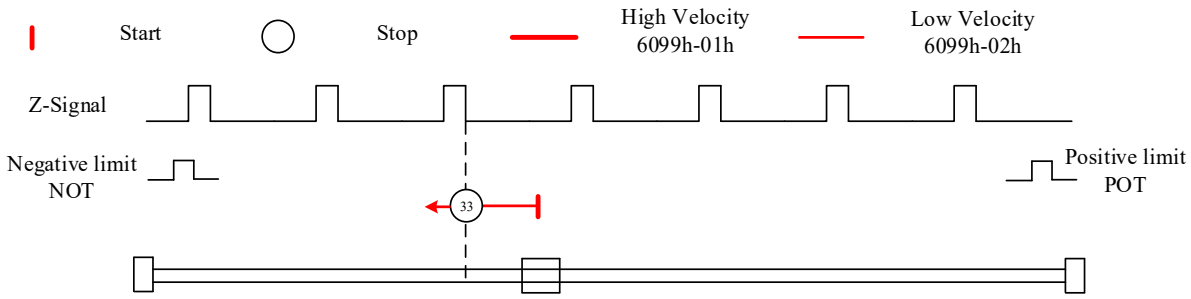


Other modes

Mode 33:

The motor starts to move in **negative direction** and stops when the **Z-signal is valid**.

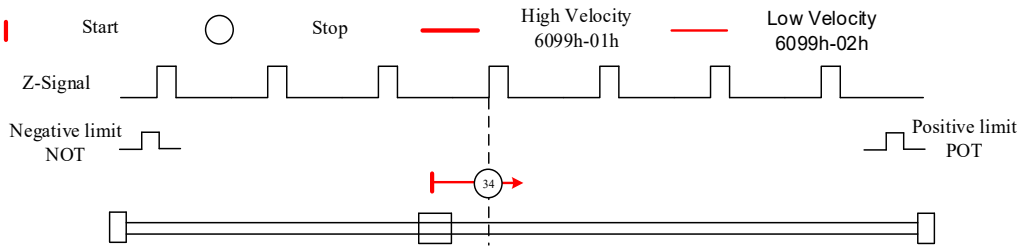
If the positive/negative limit switch signal or homing switch is valid during the homing process, the status word (6041h) bit 13 will be valid, indicating homing error and the motor will stop immediately.



Mode 34：

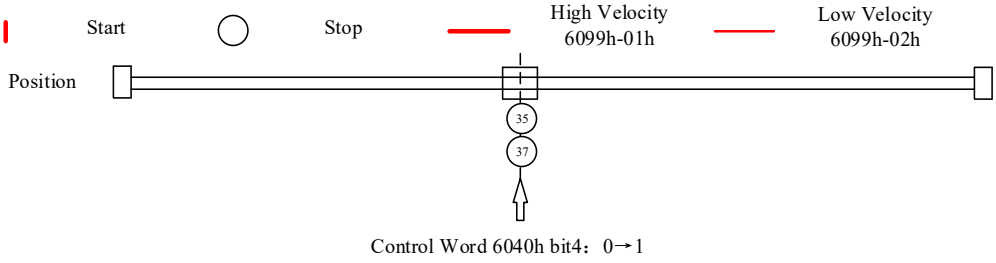
The motor starts to move in **positive direction** and stops when the **Z-signal is valid**.

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

Step 1: 6060h = 6, determine if 6061h = 6. Servo driver is now under HM mode.

Step 2: Write motion parameters: Homing method 6098h, Homing velocity 6099h-01/6099h-02 and acceleration/deceleration 609Ah.

Step 3: Enable servo driver and switch bit 4 from 0 to 1 to start homing motion.

8.4 Velocity Control Mode（CSV、PV）

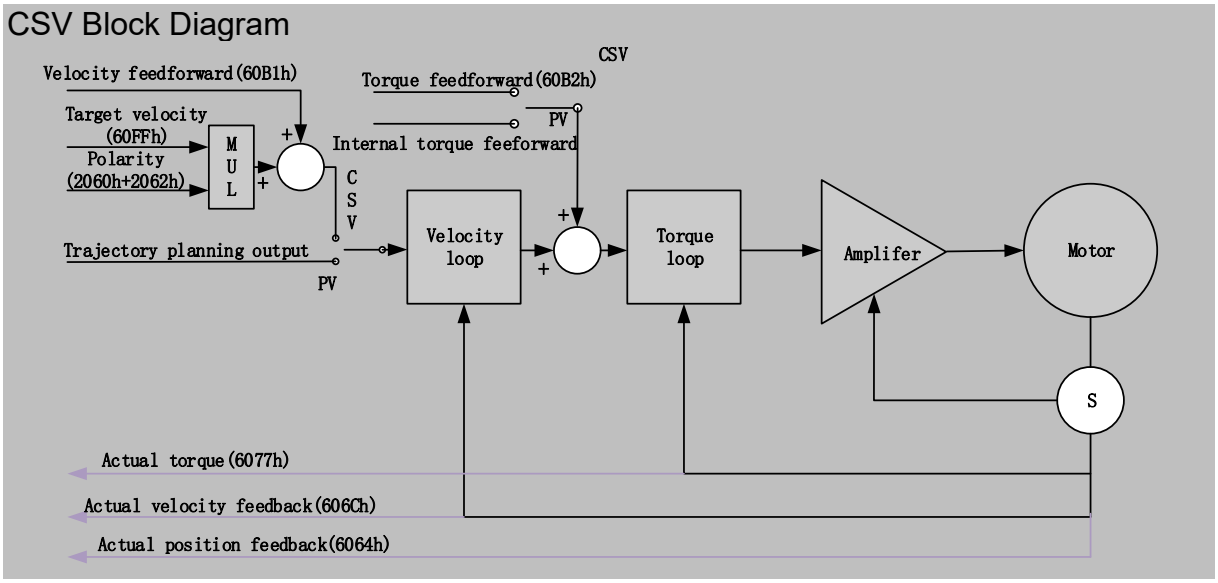
8.4.1 Common Functions of Velocity Control

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

8.4.2 Cyclic Synchronous Velocity Mode (CSV)

CSV Block Diagram



Related Objects

Basic object

PDO	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

Extended object

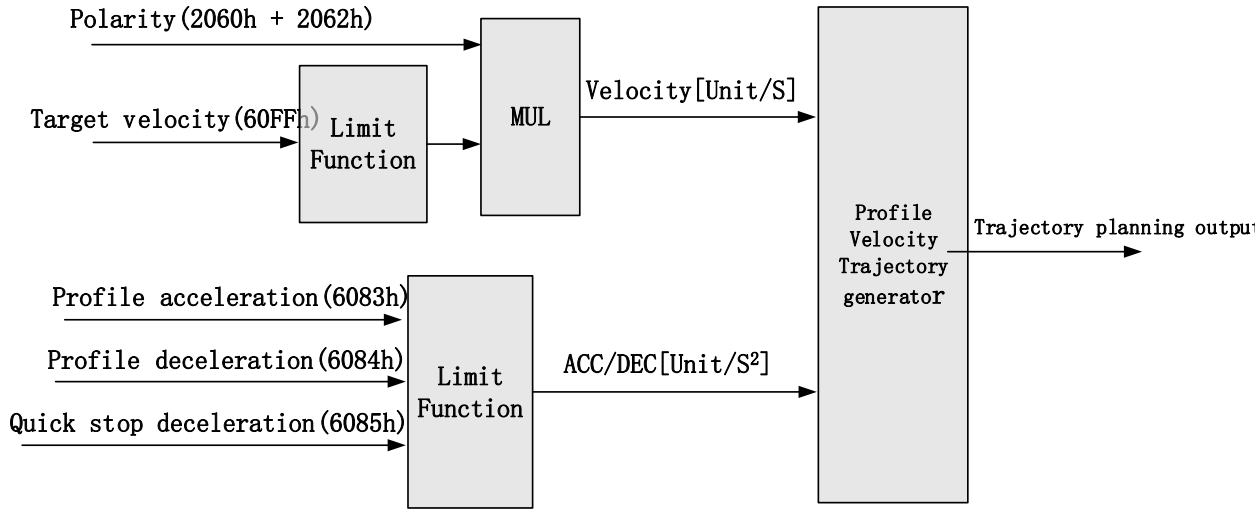
Index+Sub-Index	Name	Data Type	Access	Unit
603F-00h	Error code	U16	RO	—
6060-00h	Operation mode	I8	RW	—
6061-00h	Displayed operation mode	I8	RO	—
606B-00h	Internal command velocity	I32	RO	Unit
605A-00h	Quick stop option	I16	RW	—
6085-00h	Quick stop deceleration	U32	RW	Unit/s^2

8.4.3 Profile Velocity Mode (PV)

In asynchronous motion mode, master device is only responsible for sending motion parameters and control commands. E-DFAS□□E 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.

PV Block Diagram

The difference between PV and CSV mode is that PV needs E-DFAS□□E to have the function of trajectory generator. The input and output structure of the trajectory generator is shown in figure 7.8



Related Objects

Basic object

PDO	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

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

Table7. 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

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

8.5 Torque Control Mode（CST、PT）

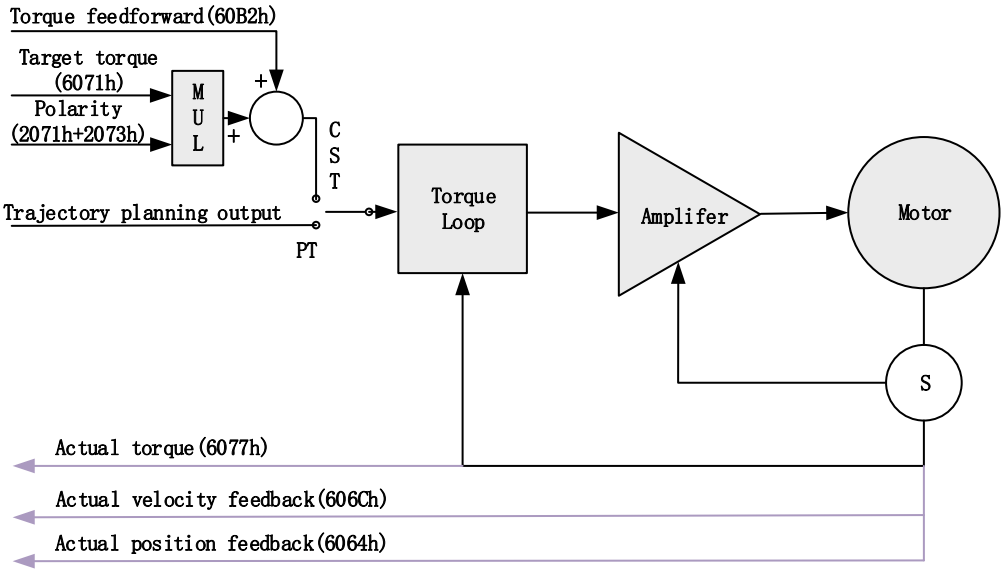
8.5.1 Common Functions of Torque Mode

Index	Sub Index	Label	Access	PDO	Mode	
					CST	PT
6040	0	Control word	RW	RxPDO	Yes	Yes
6071	0	Target torque	RW	RxPDO	Yes	Yes
6072	0	Max torque	RW	RxPDO	Yes	Yes
6080	0	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	Label	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

8.5.2 Cyclic Synchronous Torque Mode (CST)

CST Block Diagram



Related Objects

Basic object

PDO	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

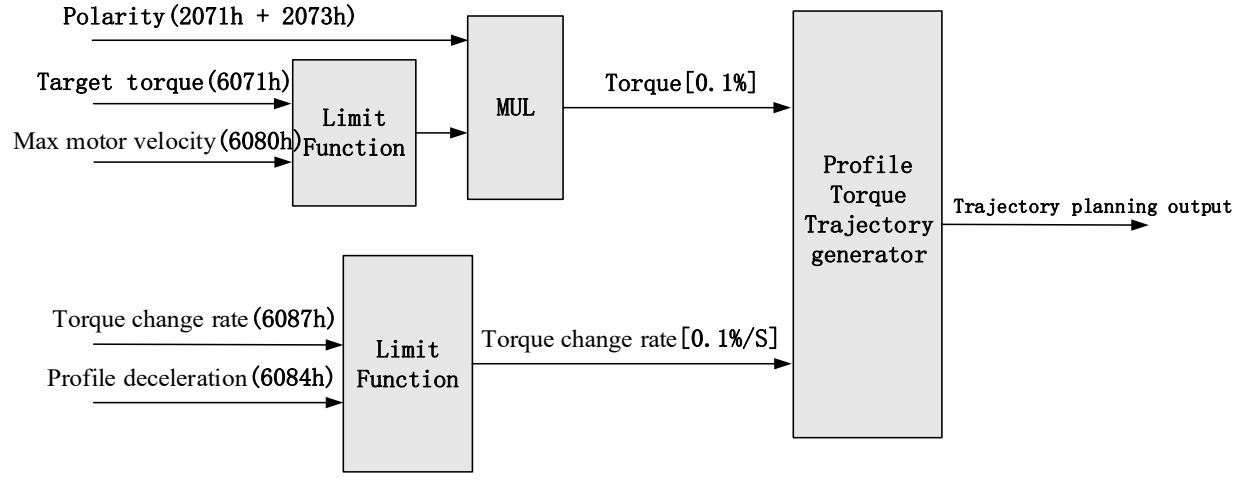
Extended object

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	RPM

8.5.3 Profile Torque Mode (PT)

In asynchronous motion mode, master device is only responsible for sending motion parameters and control commands. E-DFAS□□E 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 axes is asynchronous.

PT Block Diagram



Related Objects

Basic object

PDO	Index+Sub-Index	Label	Data Type	Access	Unit	Notes
(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

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	—
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

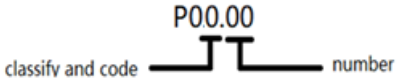
Application: Realization of profile torque motion

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

Appenxid I Parameter

Parameter List

Panel Display as follows:



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

Servo driver parameter

【Class 0】Basic Settings

Label	EtherCAT Address	Panel display	Default	Activation
Model-following bandwidth	2000h	P0000	1	Immediate
Control Mode Settings	2001h	P0001	9	After restart
Real time Auto Gain Adjusting	2002h	P0002	0x001	Immediate
Real time auto stiffness adjusting	2003h	P0003	70	Immediate
Inertia ratio	2004h	P0004	250	Immediate
Command polarity inversion	2006h	P0006	0	After restart
Probe signal polarity settings	2007h	P0007	3	After restart
Command pulse counts per revolution	2008h	P0008	0	After restart
1st command frequency divider/multiplier numerator	2009h	P0009	1	After restart
1st command frequency divider/multiplier denominator	2010h	P0010	1	After restart
Encoder pulse output per revolution	2011	P0011	2500	After restart
Pulse output logic inversion	2012	P0012	0	After restart
1st Torque Limit	2013h	P0013	300	Immediate
Excessive Position Deviation Settings	2014h	P0014	30	Immediate
Absolute Encoder settings	2015h	P0015	0	After restart
Regenerative resistance	2016h	P0016	100	Immediate
Regenerative resistor power rating	2017h	P0017	50	Immediate
Friction compensation setting	2019h	P0019	1000	Immediate
EtherCAT slave ID	2023h	P0023	2	After restart
Source of slave ID	2024h	P0024	1	After restart
Synchronous compensation time 1	2025h	P0025	10	After restart
Synchronous compensation time 2	2026h	P0026	50	After restart
Synchronization mode command delay cycle counts	2027h	P0027	0	After restart
CSP mode safe self-running position setting	2028h	P0028	10	Immediate
Probe 1 Compensation value	2040h	P0040	0	Immediate
Probe 2 Compensation value	2041h	P0041	0	Immediate

【Class 1】Gain Adjustments

Label	EtherCAT Address	Panel display	Default	Activation
1st position loop gain	2100h	P0100	320	Immediate
1st velocity loop gain	2101h	P0101	180	Immediate
1st Integral Time Constant of Velocity Loop	2102h	P0102	310	Immediate
1st velocity detection filter	2103h	P0103	15	Immediate
1st Torque Filter Time Constant	2104h	P0104	126	Immediate
2nd Position Loop Gain	2105h	P0105	380	Immediate
2nd velocity loop gain	2106h	P0106	180	Immediate
2nd Integral Time Constant of Velocity Loop	2107h	P0107	10000	Immediate
2nd velocity detection filter	2108h	P0108	15	Immediate
2nd Torque Filter Time Constant	2109h	P0109	126	Immediate
Velocity feed forward gain	2110h	P0110	300	Immediate
Velocity feed forward filter time constant	2111h	P0111	50	Immediate
Torque feed forward gain	2112h	P0112	0	Immediate
Torque feed forward filter time constant	2113h	P0113	0	Immediate
Position control gain switching mode	2115h	P0115	0	Immediate
Position control gain switching level	2117h	P0117	50	Immediate
Hysteresis at position control switching	2118h	P0118	33	Immediate
Position gain switching time	2119h	P0119	33	Immediate
Unique registry	2137h	P0137	0	Immediate
Unique registry 1	2138h	P0138	0x0	Immediate
Unique registry 2	2139h	P0139	0x0	Immediate

【Class 2】Vibration Suppression

Label	EtherCAT Address	Panel display	Default	Activation
Adaptive filtering mode settings	2200h	P0200	0	Immediate
1st notch frequency	2201h	P0201	4000	Immediate
1st notch bandwidth selection	2202h	P0202	4	Immediate
1st notch depth selection	2203h	P0203	0	Immediate
2nd notch frequency	2204h	P0204	4000	Immediate
2nd notch bandwidth selection	2205h	P0205	4	Immediate
2nd notch depth selection	2206h	P0206	0	Immediate
3rd notch frequency	2207h	P0207	4000	Immediate
3rd notch bandwidth selection	2208h	P0208	4	Immediate
3rd notch depth selection	2209h	P0209	0	Immediate
1st damping frequency	2214h	P0214	0	Immediate
2nd damping frequency	2216h	P0216	0	Immediate
Position command smoothing filter	2222h	P0222	300	After stopping
Position command FIR filter	2223h	P0223	0	Disable
5th resonant frequency	2231h	P0231	4000	Immediate
5th resonant Q value	2232h	P0232	0	Immediate
5th anti-resonant frequency	2233h	P0233	4000	Immediate
5th anti-resonant Q value	2234h	P0234	0	Immediate
6th resonant frequency	2235h	P0235	4000	Immediate
6th resonant Q value	2236h	P0236	0	Immediate
6th anti-resonant frequency	2237h	P0237	4000	Immediate
6th anti-resonant Q value	2238h	P0238	0	Immediate
Adjustment mode	2248h	P0248	0	Immediate
MFC type	2250h	P0250	0	Immediate
Velocity feedforward compensation coefficient	2251h	P0251	0	Immediate
Torque feedforward compensation coefficient	2252h	P0252	0	Immediate
Dynamic friction compensation coefficient	2253h	P0253	0	Immediate
Overtravel time coefficient	2254h	P0254	0	Immediate
Overtravel suppression gain	2255h	P0255	0	Immediate

【Class 3】Velocity Control

Label	EtherCAT Address	Panel display	Default	Activation
Acceleration time settings	2312h	P0312	0	Immediate
Deceleration time settings	2313h	P0313	0	Immediate
Sigmoid acceleration/ deceleration settings	2314h	P0314	0	Disable
Zero speed clamp function	2315h	P0315	0	Immediate
Zero speed clamp level	2316h	P0316	30	Immediate
Zero speed clamp static time	2323h	P0323	0	Immediate

【Class 4】I/O Interface Setting

Label	EtherCAT Address	Panel display	Default	Activation
Input selection DI1	2400h	P0400	0x0	Immediate
Input selection DI2	2401h	P0401	0x0	Immediate
Input selection DI3	2402h	P0402	0x0	Immediate
Input selection DI4	2403h	P0403	0x0	Immediate
Input selection DI5	2404h	P0404	0x0	Immediate
Input selection DI6	2405h	P0405	0x0	Immediate
Output selection DO1	2410h	P0410	0x0	Immediate
Output selection DO2	2411h	P0411	0x0	Immediate
Output selection DO3	2412h	P0412	0x0	Immediate
Positioning complete range	2431h	P0431	20	Immediate
Positioning complete output setting	2432h	P0432	1	Immediate
INP positioning delay time	2433h	P0433	0	Immediate
Zero speed	2434h	P0434	50	Immediate
Velocity coincidence range	2435h	P0435	50	Immediate
Arrival velocity	2436h	P0436	1000	Immediate
Motor power-off delay time	2437h	P0437	100	Immediate
Delay time for holding brake release	2438h	P0438	0	Immediate
Holding brake activation velocity	2439h	P0439	30	Immediate
Emergency stop function	2443h	P0443	0	Immediate
Torque compensation time upon enabling	2448h	P0448	0	Immediate

【Class 5】Extension settings

Label	EtherCAT Address	Panel display	Default	Activation
Driver prohibition input settings	2504h	P0504	0	Immediate
Servo-off mode	2506h	P0506	0	After restart
Main power-off detection time	2509h	P0509	50	Immediate
Servo-off due to alarm mode	2510h	P0510	0	After restart
Servo braking torque setting	2511h	P0511	0	Immediate
Overload level setting	2512h	P0512	0	Immediate
Overspeed level settings	2513h	P0513	0	Immediate
I/O digital filter	2515h	P0515	10	Immediate
Position unit settings	2520h	P0520	2	After restart
Torque limit selection	2521h	P0521	0	Immediate
2nd torque limit	2522h	P0522	300	Immediate
LED initial status	2528h	P0528	34	After restart
Torque saturation detection time	2537h	P0537	500	Immediate
3rd torque limit	2539h	P0539	80	Immediate
D41 set value	2540h	P0540	0x30C	Immediate

Vent overload level	2546h	P0546	0	Immediate
Velocity arrival hysteresis loop width	2570h	P0570	0	Immediate

【Class 6】Other settings

Label	EtherCAT Address	Panel display	Default	Activation
Encoder zero position compensation	2601h	P0601	0	After restart
JOG trial run torque command	2603h	P0603	350	Immediate
JOG trial run velocity command	2604h	P0604	30	Immediate
Position 3rd gain valid time	2605h	P0605	0	Immediate
Position 3rd gain scale factor	2606h	P0606	100	Immediate
Torque command additional value	2607h	P0607	0	Immediate
Positive direction torque compensation value	2608h	P0608	0	Immediate
Negative direction torque compensation value	2609h	P0609	0	Immediate
Torque compensation upon enabling	2610h	P0610	0x0	Immediate
Current response settings	2611h	P0611	100	Immediate
Max. time to stop after disabling	2614h	P0614	500	Immediate
Trial run distance	2620h	P0620	10	Immediate
Trial run waiting time	2621h	P0621	300	Immediate
No. of trial run cycles	2622h	P0622	5	Immediate
Trial run acceleration	2625h	P0625	200	Immediate
Velocity observer gain	2628h	P0628	0	Immediate
Velocity observer bandwidth	2629h	P0629	0	Immediate
Frame error window time	2634h	P0634	100	Immediate
Frame error window	2635h	P0635	50	Immediate
Absolute value rotation mode denominator setting	2654h	P0654	0	After restart
Rotor blocked torque limit threshold	2656h	P0656	300	Immediate
Blocked rotor alarm delay time	2657h	P0657	400	Immediate
Homing mode position deviation threshold	2659h	P0659	8	Immediate
Z-signal sustaining time	2661h	P0661	10	Immediate
Absolute multiturn data upper limit	2663h	P0663	0	After restart

【Class 7】Factory settings

Label	EtherCAT Address	Panel display	Default	Activation
Motor model	-	P0715	0x200	After restart
Encoder	-	P0716	*Encoder*	After restart
External grating ruler precision	-	P0754	100	After restart

Manufacturer parameter

Index	Sub index	Label	Unit	Default	Min	Max
5004h	01h	RPDO length		8	0	64
	02h	TPDO length		17	0	64
	03h	The number of RPDO		1	0	4
	04h	The number of TPDO		1	0	2
	05h	Sync0 Watchdog counter		0	0	65535
	06h	Reserved			0	65535
	07h	Sync0 Watchdog limit		4	0	65535
	08h	Sync0 Drift watchdog counter		0	0	65535
	09h	Sync0 Drift watchdog limit		4	0	65535
	0Ah	SM2 watchdog counter		0	0	65535
	0Bh	SM2 Watchdog limit		4	0	65535
	0Ch	Application layer SM2/Sync0 watchdog counter		0		
	0Dh	Application layer SM2/Sync0 watchdog limit		4		
	0Eh	Reserved			0	500
	0Fh	Time interval between SM2 and Sync0	ns	0	0	1000000000
5006h	00h	Synchronous alarm setting		0xFFFF	0	0xFFFF
5010h	00h	PDO watchdog overtime	ms	0	0	60000
5012h	04h	Homing setting	-	5		
5400h	01h	Set synchronization cycle minimum value	us	250	125	1000
5400h	02h	Set synchronization cycle maximum value	us	10000	4000	20000
5500h	01h	Absolute encoder multiturn number	r	-	-	-
	02h	Encoder single turn position	Pulse	-	-	-
	03h	Encoder feedback position 32 bit low	Pulse	-	-	-
	04h	Encoder feedback position 32 bit high	Pulse	-	-	-
	05h	The actual mechanical position 32 bit low	Unit	-	-	-
	06h	The actual mechanical position 32 bit high	Unit	-	-	-
	07h	Number of encoder communication exceptions		-	-	-
5501h	01h	Motor Speed	r/min	-	-	-
	02h	Speed of position command	r/min	-	-	-
	03h	Speed command	r/min	-	-	-
	04h	Actual torque	0.1%	-	-	-
	05h	Torque command	0.1%	-	-	-
	06h	Relative position error	Pulse	-	-	-
	07h	Internal position command	Pulse	-	-	-
	08h	Overload ratio	0.1%	-	-	-
	09h	Discharge load rate	0.1%	-	-	-
	0Ah	Inertia ratio	%	-	-	-
	0Bh	Actual positive torque limit value	0.1%	-	-	-
	0Ch	Actual negative torque limit value	0.1%	-	-	-
	0Dh	U phase current detect value	0.1%	-	-	-
	0Eh	W phase current detect value	0.1%	-	-	-
5502h	01h	DI input signal	-	-	-	-
	02h	SO output signal	-	-	-	-
	03h	Reserved	-	-	-	-
	04h	Reserved	-	-	-	-
	05h	Bus voltage	V	-	-	-
	06h	Temperature	℃	-	-	-
	07h	Power on time	S	-	-	-

CiA 402 Motion Parameters starting with Object Dictionary 6000h

Index	Sub-index	Label	Unit	Default
603Fh	00h	Error code	-	0x0
6040h	00h	Control word	-	0x0
6041h	00h	Status word	-	0x0
605Ah	00h	Quick stop option code	-	2
605Bh	00h	Shutdown Option Code	-	0
605Ch	00h	Disable Operation Option Code	-	0
605Dh	00h	Halt Option Code	-	1
605Eh	00h	Fault Reaction Option Code	-	0
6060h	00h	Mode of Operation	-	8
6061h	00h	Mode of Operation display	-	0
6062h	00h	Position Demand Value	Command unit	0
6063h	00h	Position Actual Internal Value	Encoder unit	0
6064h	00h	Position Actual Value	Command unit	-
6065h	00h	Follow Error Window	Command unit	30000
6066h	00h	Follow Error Time Out	ms	10
6067h	00h	Position window	Command unit/s	0
6068h	00h	Position window time	ms	0
606Bh	00h	Velocity Demand Value	Command unit/s	0
606Ch	00h	Velocity Actual Value	Command unit/s	0
606Dh	00h	Velocity window	Command unit/s	10
606Eh	00h	Velocity window time	ms	0
606Fh	00h	Velocity Threshold	Command unit/s	10
6070h	00h	Velocity Threshold Time	ms	100
6071h	00h	Target torque	0.001	0
6072h	00h	Maximum torque	0.001	3000
6073h	00h	Maximum current	0.001	3000
6074h	00h	Torque Demand	0.001	0
6075h	00h	Motor Rated Current	mA	3000
6076h	00h	Motor Rated Torque	mN.m	0
6077h	00h	Torque Actual Value	0.1%	0
6078h	00h	Current Actual Value	0.1%	0
6079h	00h	DC Link Circuit Voltage	mV	0
607Ah	00h	Target position	Command unit	0
607Ch	00h	Home Offset	Command unit	0
607Dh	01h	Min Position Limit	Command unit	0
	02h	Max Position Limit	Command unit	0
607Eh	00h	Polarity	-	0x0
607Fh	00h	Max Profile Velocity	Command unit/s	2147483647
6080h	00h	Max Motor Speed	r/min	6000
6081h	00h	Profile velocity	Command unit/s	10000
6083h	00h	Profile acceleration	Command unit/s²	10000
6084h	00h	Profile deceleration	Command unit/s²	10000
6085h	00h	Quick Stop Deceleration	Command unit/s²	10000000
6087h	00h	Torque slope	0.001/s	5000
608Fh	01h	Encoder Increments	Encoder unit	0
6091h	01h	Motor Revolutions	r	1
	02h	Shaft Revolutions	r	1
6092h	01h	Feed	Command unit/r	10000
6098h	00h	Homing method	-	19
6099h	01h	Speed During Search for Switch	Command unit/s	10000

	02h	Speed During Search for Zero	Command unit/s	5000
609Ah	00h	Homing acceleration	Command unit/s²	500000
60B0h	00h	Position Offset	Command unit	0
60B1h	00h	Velocity Offset	Command unit/s	0
60B2h	00h	Torque Offset	0.001	0
60B8h	00h	Touch Probe function	-	0x0
60B9h	00h	Touch Probe status	-	0x0
60BAh	00h	Touch Probe 1 Positive Position	Command unit	0
60BBh	00h	Touch Probe 1 Negative Position	Command unit	0
60BCh	00h	Touch Probe 2 Positive Position	Command unit	0
60BDh	00h	Touch Probe 2 Negative Position	Command unit	0
60C5h	00h	Max Acceleration	Command unit/s²	100000000
60C6h	00h	Max Deceleration	Command unit/s²	100000000
60D5h	00h	Touch Probe 1 Positive Edge Counter	-	0
60D6h	00h	Touch Probe 1 Negative Edge Counter	-	0
60D7h	00h	Touch Probe 2 Positive Edge Counter	-	0
60D8h	00h	Touch Probe 2 Negative Edge Counter	-	0
60E0h	00h	Positive Torque Limit	0.001	3000
60E1h	00h	Negative Torque Limit	0.001	3000
60F4h	00h	Following Error Actual Value	Command unit	0
60FAh	00h	Control Effort	Command unit/s	0
60FCh	00h	Position Demand Internal Value	Encoder unit	0
60FDh	00h	Digital Inputs	-	0x0
60FEh	01h	Physical Outputs	-	0x0
	02h	Bit Mask	-	0x0
60FFh	00h	Target velocity	Command unit/s	0
6502h	00h	Supported Drive Modes	-	0x0

Parameter Function

[Class 0] Basic Settings

P00.00	Label	Model-following bandwidth	Mode	F		
	Range	0~5000	Default	1	Unit	0.1Hz
	Activation	Immediate			Index	2000h

Model-following bandwidth, also known as model-following control (MFC), is used to control the position loop to improve responsiveness to commands, speed up positioning time and reduce following errors. The effect is obvious especially in low and medium mechanical stiffness. Use mainly for MFC or ZTC tuning.

Value	Description
0	Disable the function.
1	Enable the function to set bandwidth automatically, recommended for most applications. P00.00=P01.01
2-9	Reserved
10-5000	Invalid

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 Settings	Mode	F		
	Range	0~9	Default	9	Unit	-
	Activation	After restart			Index	2001h

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	Real time Auto Gain Adjusting	Mode	F		
	Range	0x0~0xFFF	Default	0x001	Unit	—
	Activation	Immediate			Index	2002h

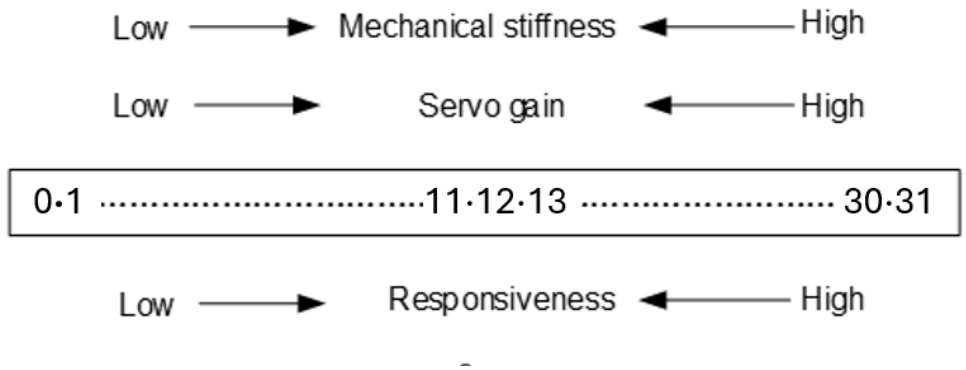
Data bits	Category	Settings	Application
0x00_	Motion setting mode	Used to set motion setting mode, which can be selected according to the motion characteristics or setting requirements. Generally, it is recommended to select mode 1 with good generality when there is no special requirement, mode 2 when 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 vertically 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 is selected when the load is a less rigid flexible structure and the load inertia is larger, the inertia ratio P00.04 needs to be set accurately using this mode. Typical structures are long belts, chains and other structures.
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	Real time auto stiffness adjusting	Mode	F		
	Range	0 ~ 31	Default	11	Unit	—
	Activation	Immediate			Index	2003h

Valid when P00.03 = 1,2



- Lower values ensure better system responsiveness and mechanical stiffness but machine vibration might occur, please set accordingly. Please stop the motor before doing any changes to the stiffness settings.
- When P00.02 = 0x010, please set stiffness level to around 15.

P00.04	Label	Inertia ratio	Mode	F		
	Range	0~20000	Default	250	Unit	%
	Activation	Immediate			Index	2004h

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.
For motors with high inertia, P00.04 can be left unfilled but optimal setting of P00.04 could improve system performance.

P00.06	Label	Command polarity inversion	Mode	F		
	Range	0 ~ 1	Default	0	Unit	—
	Activation	After restart			Index	2006h

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.

P00.07	Label	Probe signal polarity settings	Mode	F		
	Range	0 ~ 3	Default	3	Unit	—
	Activation	After restart			Index	2007h

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

P00.08	Label	Command pulse counts per revolution	Mode	F		
	Range	0~8388608	Default	0	Unit	P-
	Activation	After restart			Index	2008h

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	Mode	F		
	Range	0~2147483647	Default	1	Unit	P-
	Activation	After restart			Index	2009h

This parameter corresponds to object dictionary 6091-01. Modifying this parameter is the same as changing object dictionary 6091-01 value.
Valid when P00.08 = 0.

P00.10	Label	1st command frequency divider/multiplier denominator	Mode	F		
	Range	0~2147483647	Default	1	Unit	P-
	Activation	After restart			Index	2010h

This parameter corresponds to object dictionary 6091-02. Modifying this parameter is the same as changing object dictionary 6091-02 value.
Valid when P00.08 = 0.

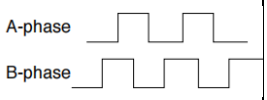
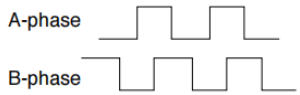
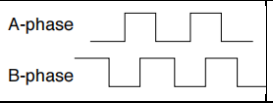
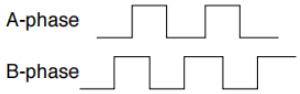
P00.11	Label	Encoder pulse output per revolution	Mode	F		
	Range	1~65535	Default	2500	Unit	P/r
	Activation	After restart			Index	2011h

Including rising and falling edge of encoder phase A and B,
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	Mode	F		
	Range	0~1	Default	0	Unit	-
	Activation	After restart			Index	2012h

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

Pulse output logic inversion

P00.12	Phase B logic	CW direction	CCW direction
[0]	Not inverted		
[1]	Inverted		

P00.13	Label	1st Torque Limit	Mode	F		
	Range	0~500	Default	300	Unit	%
	Activation	Immediate			Index	2013h

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	Excessive Position Deviation Settings	Mode	PP	HM	CSP
	Range	0~500	Default	30	Unit	0.1rev
	Activation	Immediate			Index	2014h

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 settings	Mode	PP	HM	CSP
	Range	0~32767	Default	0	Unit	-
	Activation	Immediate			Index	2015h

Set the type of absolute encoder and how to use it.

0: Incremental mode: No power off position memory function. There is no restriction on the device load travelling range required.

1: Multi-turn linear mode: Enables multi-turn absolute function with position memory. It is used in the case where the travelling range of the equipment load is fixed and the data of the encoder will not be overflowed in multi-turns.

2: Multi-turn rotary mode: Enable multi-turn absolute value function, with position power off memory function, the actual feedback multi-turn data cycling back and forth between 0~(P06.63+1); used for the occasions where the load range of the equipment is not limited.

3: Single-turn absolute value mode: this mode is mainly used for equipment loads only need to remember the position of the motor within one turn. The initial position of the feedback after each power-on is the current position feedback calculated by the coordinate system after the last back to the original operation 6064. no need to carry out the back to the original operation.

5: Clear the multi-turn alarm. After normal clearing, it will change to the original multi-turn mode automatically, if it is still 5 after 3s, it will be processed according to 153 alarm.

9: Clear multiturn position and reset multiturn alarm. Automatically changes to original multiturn mode after normal clearing, if it is still 9 after 3s, then process according to 153 alarm.

Note: Use after mechanical zeroing, and only respond to clearing multiturn data under disable condition!

Other: Do not set.

P00.16	Label	Regenerative resistance	Mode	F		
	Range	25~500	Default	100	Unit	Ohm
	Activation	Immediate			Index	2016h
	To set resistance value of regenerative resistor					

P00.17	Label	Regenerative resistor power rating	Mode	F		
	Range	20~10000	Default	50	Unit	W
	Activation	Immediate			Index	2017h

To set power rating of regenerative resistor.

Driver	Resistance(Ω)	Power Rating(W)
E-DFAS01E	100	50
E-DFAS04E	100	50
E-DFAS08E	50	75
E-DFAS10E	50	75

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 labeled power rating.

P00.19	Label	Friction compensation setting	Mode	F		
	Range	0~1000	Default	0	Unit	-
	Activation	Immediate			Index	2019h
	Friction compensation setting = 0, default = 1; Friction compensation setting = x, indicating x+1/10000 of friction compensation runway;					

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

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

P00.25	Label	Synchronous compensation time 1	Mode	CSP		
	Range	1~100	Default	10	Unit	0.1us
	Activation	After restart			Index	2025h
	Synchronous dithering compensation range. Used for master device with poor synchronization.					

P00.26	Label	Synchronous compensation time 2	Mode	CSP		
	Range	1~2000	Default	50	Unit	0.1us
	Activation	After restart			Index	2026h
	Synchronous dithering compensation range. Used for master device with poor synchronization.					

P00.27	Label	Synchronization mode command delay cycle counts	Mode	CSP		
	Range	0~50	Default	0	Unit	-
	Activation	After restart			Index	2027h
	Driver delays N position loop cycle counts to receive position command from master device. To solve motor jitters caused by master devices with poor synchronization.					

P00.28	Label	CSP mode safe self-running position setting	Mode	CSP		
	Range	500~30000	Default	0	Unit	10000-
	Activation	Immediate			Index	2028h
	Synchronous dithering compensation range. Used for master device with poor synchronization.					
P00.40	Label	Probe 1 compensation value	Mode	F		
	Range	-2147483648~- 2147483648	Default	0	Unit	μs
	Activation	Immediate			Index	2040h
	Action time when compensation probe 1 is turned on/off					
P00.41	Label	Probe2 compensation value	Mode	F		
	Range	-2147483648~- 2147483648	Default	0	Unit	μs
	Activation	Immediate			Index	2041h
	Action time when compensation probe 2 is turned on/off					

[Class 1] Gain Adjustments

P01.00	Label	1st position loop gain	Mode	PP	HM	CSP
	Range	0~30000	Default	320	Unit	0.1hz
	Activation	Immediate			Index	2100h
	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	Mode	F		
	Range	1~32767	Default	180	Unit	0.1Hz
	Activation	Immediate			Index	2101h

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 note that if the velocity loop gain is too high, it might cause vibration.

P01.02	Label	1st Integral Time Constant of Velocity Loop	Mode	F		
	Range	1~10000	Default	310	Unit	0.1ms
	Activation	Immediate			Index	2102h

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 ≤ P01.01xP01.02 ≤ 150000

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

P01.03	Label	1st velocity detection filter	Mode	F		
	Range	0~10000	Default	15	Unit	-
	Activation	Immediate			Index	2103h

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 Time Constant	Mode	F		
	Range	0~2500	Default	126	Unit	0.01ms
	Activation	Immediate			Index	2104h

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/(2π×P01.04) ≥P01.01×4

For example: Velocity loop gain P01.01=180(0.1Hz) which is 18Hz. Time constant of torque filter should be P01.01≤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	Mode	PP	HM	CSP
	Range	0~30000	Default	380	Unit	0.1/s
	Activation	Immediate			Index	2105h
P01.06	Label	2nd velocity loop gain	Mode	F		
	Range	1~32767	Default	180	Unit	0.1Hz
	Activation	Immediate			Index	2106h
P01.07	Label	2nd Integral Time Constant of Velocity Loop	Mode	F		
	Range	1~10000	Default	10000	Unit	0.1ms
	Activation	Immediate			Index	2107h
P01.08	Label	2nd velocity detection filter	Mode	F		
	Range	1~31	Default	15	Unit	-
	Activation	Immediate			Index	2108h
P01.09	Label	2nd Torque Filter Time Constant	Mode	F		
	Range	0~2500	Default	126	Unit	0.01ms
	Activation	Immediate			Index	2109h

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 feed forward gain	Mode	PP	HM	CSP
	Range	0~1000	Default	300	Unit	0.10%
	Activation	Immediate			Index	2110h

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 feed forward filter time constant	Mode	PP	HM	CSP
	Range	0~6400	Default	50	Unit	0.01ms
	Activation	Immediate			Index	2111h

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 ration 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]= $\frac{Set\ velocity[\frac{Uint}{s}]}{Position\ loop\ gain[Hz]} x \frac{100 - Velocity\ feed\ foward\ gain[\%]}{100}$

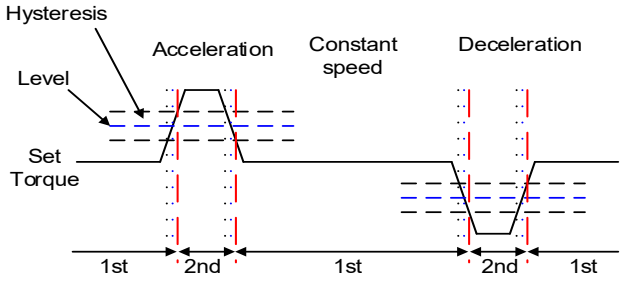
P01.12	Label	Torque feed forward gain	Mode	PP	PV	HM	CSP	CSV
	Range	0~1000	Default	0		Unit	0.1%	
	Activation	Immediate				Index	2112h	

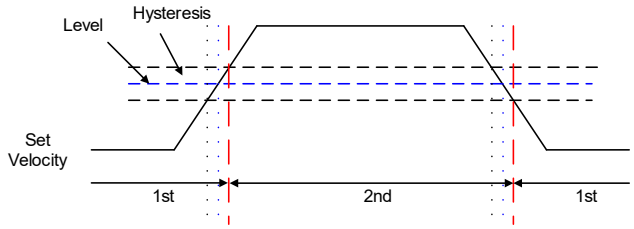
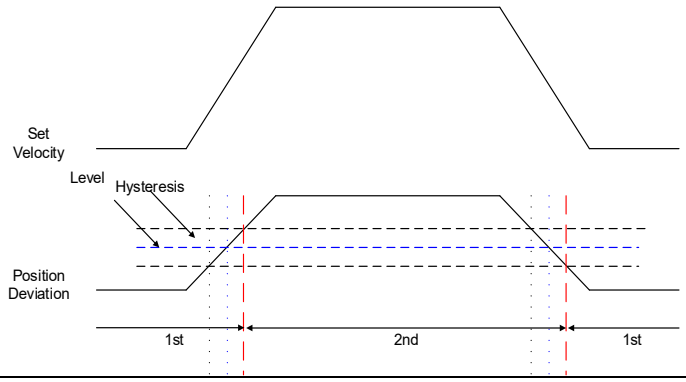
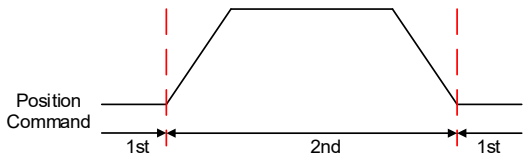
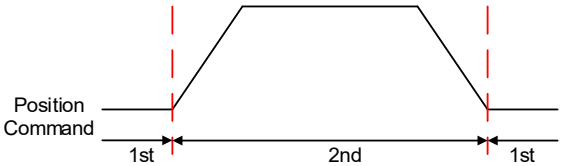
Before using torque feed forward, please set correct inertia ratio P00.04. By increasing torque feed forward gain, position deviation on constant acceleration/deceleration can be reduced to close to 0. Under ideal condition and trapezoidal speed profile, position deviation

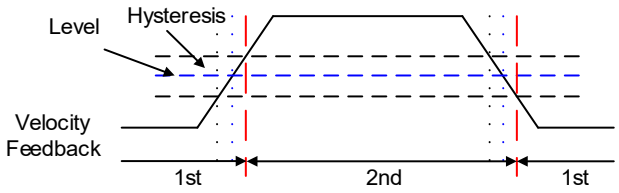
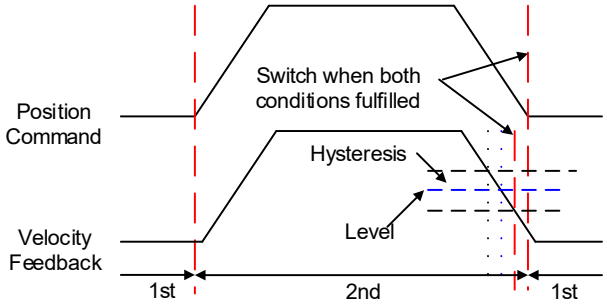
of the whole motion can be reduced to close to 0. In reality, perturbation torque will always exist, hence position deviation can never be 0.

P01.13	Label	Torque feed forward filter time constant	Mode	PP	PV	HM	CSP	CSV
	Range	0~6400	Default	0		Unit	0.01ms	
	Activation	Immediate				Index	2113h	
	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 gain switching mode	Mode	F		
	Range	0~11	Default	0	Unit	-
	Activation	Immediate			Index	2115h

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 ≠ 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 ≠ 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.*

P01.17	Label	Position control gain switching level	Mode	F		
	Range	0~20000	Default	50	Unit	*As set*
	Activation	Immediate			Index	2117h

Set threshold value for gain switching to occur.

Unit is mode dependent.

Switching condition	Unit
Position	Encoder pulse count
Velocity	RPM
Torque	%

Please set level ≥ hysteresis

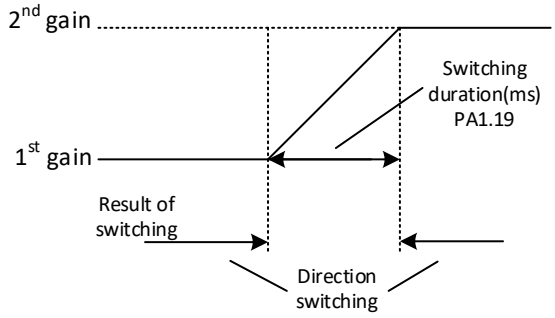
P01.18	Label	Hysteresis at position control switching	Mode	F		
	Range	0~20000	Default	33	Unit	*As P01.17*
	Activation	Immediate			Index	2118h

To eliminate the instability of gain switching. Used in combination with P01.17 If level< hysteresis, driver will set internally hysteresis = level.

P01.19	Label	Position gain switching time	Mode	F		
	Range	0~10000	Default	33	Unit	0.1ms
	Activation	Immediate			Index	2119h

During position control, if 1st and 2nd gain difference is too large, 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)



P01.39	Label	Special Registers 2	Mode	F		
	Range	0~0xFFFFFFFF	Default	0x40008	Unit	-
	Activation	Immediate			Index	2139h

Bit	Description
0	reserved
2	= 1, Mixed position deviation clearance
18	= 0, positioning completion using relative position deviation
	= 1, positioning completion using absolute position deviation

[Class 2] Vibration Suppression

P02.00	Label	Adaptive filtering mode settings	Mode	F		
	Range	0~4	Default	0	Unit	-
	Activation	Immediate			Index	2200h

Set value	Description	
0	Adaptive filter: invalid	Parameters related to 3rd and 4th 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	Mode	F		
	Range	50~4000	Default	4000	Unit	Hz
	Activation	Immediate			Index	2201h

Set center frequency of 1st torque command notch filter.
Set P02.01 to 4000 to deactivate notch filter

P02.02	Label	1st notch bandwidth	Mode	F		
	Range	0~20	Default	4	Unit	-
	Activation	Immediate			Index	2202h

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	Mode	F		
	Range	0~99	Default	0	Unit	-
	Activation	Immediate			Index	2203h

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	Mode	F		
	Range	50~4000	Default	4000	Unit	Hz
	Activation	Immediate			Index	2204h

Set center frequency of 2nd torque command notch filter.
Set P02.04 to 4000 to deactivate notch filter

P02.05	Label	2nd notch bandwidth	Mode	F		
	Range	0~20	Default	4	Unit	-
	Activation	Immediate			Index	2205h

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	Mode	F		
	Range	0~99	Default	0	Unit	-
	Activation	Immediate			Index	2206h

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	Mode	F		
	Range	50~4000	Default	4000	Unit	Hz
	Activation	Immediate			Index	2207h

Set center frequency of 3rd torque command notch filter.
Set P02.07 to 4000 to deactivate notch filter

P02.08	Label	3rd notch bandwidth	Mode	F		
	Range	0~20	Default	4	Unit	-
	Activation	Immediate			Index	2208h

Set notch bandwidth for 3rd resonant notch filter.
Under normal circumstances, please use factory default settings.

P02.09	Label	3rd notch depth	Mode	F		
	Range	0~99	Default	0	Unit	-
	Activation	Immediate			Index	2209h

Set notch depth for 3rd resonant notch filter.
When P02.09 value is higher, notch depth becomes shallow, phase lag reduces.

P02.14	Label	1st damping frequency	Mode	F		
	Range	0~2000	Default	0	Unit	0.1Hz
	Activation	Immediate			Index	2214h

Set the first damping frequency to suppress the shaking at the end of the vibration. Please measure the vibration frequency at the end of the load and set it in 0.1[Hz].
Note: Suppresses sloshing at the end of the load. It is generally used to suppress the shaking of the elastic end of the load caused by the high deceleration impact when the motor is stopped. For the frequency within 100Hz shaking suppression effect is obvious. When in use, set this parameter to the frequency of shaking

Value	Description
0	Turn off the low frequency suppression function
10~2000	Set the damping frequency (0.1Hz in unit)

P02.16	Label	2nd damping frequency	Mode	F		
	Range	0~2000	Default	0	Unit	0.1Hz
	Activation	Immediate			Index	2216h

Set the second damping frequency to suppress the shaking at the end of the vibration. Please measure the vibration frequency at the end of the load and set it in 0.1[Hz].
Note: Suppresses sloshing at the end of the load. It is generally used to suppress the shaking of the elastic end of the load caused by the high deceleration impact when the motor is stopped. For the frequency within

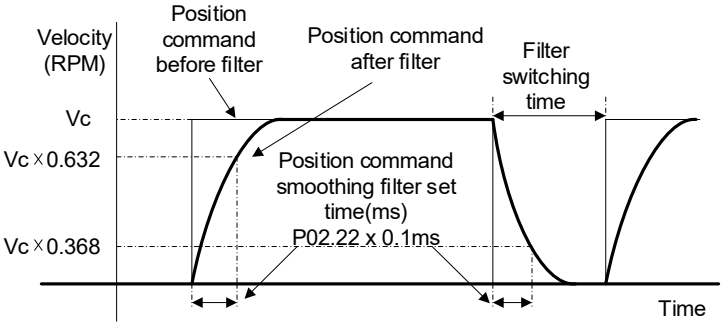
100Hz shaking suppression effect is obvious. When in use, set this parameter to the frequency of shaking

Value	Description
0	Turn off the low frequency suppression function
10~2000	Set the damping frequency (0.1Hz in unit)

P02.22	Label	Position command smoothing filter	Mode	PP	HM	CSP
	Range	0~32767	Default	300	Unit	0.1ms
	Activation	After stopping			Index	2222h

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

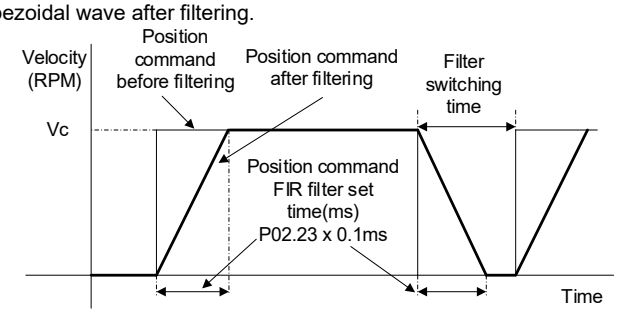
To set time constant of 1 time delay filter, according to target velocity Vc square wave command as show below.



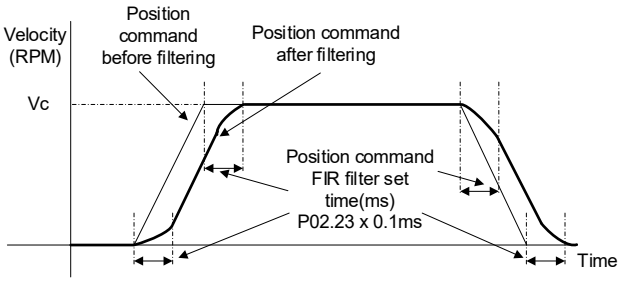
Usually applied when there is rather sharp acceleration which might cause motor overshoot or undershoot. To smoothen command signal, reduces impact to machines and eliminate vibration. If P02.22 is set too high, overall time will be lengthened.

P02.23	Label	Position command FIR filter	Mode	PP	HM	CSP
	Range	0~10000	Default	0	Unit	0.1ms
	Activation	After disabling			Index	2223h

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



As shown below, when target velocity Vc trapezoidal command reaches Vc, 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.

***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	Mode	F		
	Range	50~4000	Default	4000	Unit	Hz
	Activation	Immediate			Index	2231h
	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	Mode	F		
	Range	0~10000	Default	0	Unit	Hz
	Activation	Immediate			Index	2232h
	To set notch Q value of 5th resonant notch filter					

P02.33	Label	5th anti-resonant frequency	Mode	F		
	Range	50~4000	Default	4000	Unit	Hz
	Activation	Immediate			Index	2233h
	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	Mode	F		
	Range	0~9900	Default	0	Unit	Hz
	Activation	Immediate			Index	2234h
	To set resonant Q value of 5th resonant notch filter					

P02.35	Label	6th resonant frequency	Mode	F		
	Range	50~4000	Default	4000	Unit	Hz
	Activation	Immediate			Index	2235h
	To set zero-valued eigenfrequency of 6th resonant notch filter. P02.35 corresponds to machine-specific resonant frequency. Notch filter deactivated if P02.35 is set to any value.					

P02.36	Label	6th resonant Q value	Mode	F		
	Range	0~10000	Default	0	Unit	Hz
	Activation	Immediate			Index	2236h
	To set notch Q value of 6th resonant notch filter					

P02.37	Label	6th anti-resonant frequency	Mode	F		
	Range	50~4000	Default	4000	Unit	Hz
	Activation	Immediate			Index	2237h
	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	Mode	F		
	Range	0~9900	Default	0	Unit	Hz
	Activation	Immediate			Index	2238h
	To set resonant Q value of 6th resonant notch filter					

P02.48	Label	Adjustment mode	Mode	F		
	Range	0~1	Default	0	Unit	-
	Activation	Immediate			Index	2248h

To turn on/off automatic adjustments

Set 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	Mode	PP		CSP
	Range	0~3	Default	0	Unit	Hz
	Activation	After restart			Index	2250h

Set value	Description
【0】	Model following control
1	Zero tracking control
2	*3 inertia (future upgrade)*
3	*Path following (future upgrade)*

P02.51	Label	Velocity feedforward compensation coefficient	Mode	PP		CSP
	Range	-10000~ 10000	Default	0	Unit	-
	Activation	Immediate			Index	2251h

To compensate for velocity feedforward

P02.52	Label	Torque feedforward compensation coefficient	Mode	PP	PV	CSP	CSV
	Range	-10000~ 10000	Default	0	Unit	-	
	Activation	Immediate			Index	2252h	

To compensate for velocity feedforward

P02.53	Label	Dynamic friction compensation coefficient	Mode	F		
	Range	0~1000	Default	0	Unit	%
	Activation	Immediate			Index	2253h

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

$$\text{Dynamic friction coefficient} = \left| \frac{\text{Torque(Rotational speed 1)} - \text{Torque(Rotational speed 2)}}{\text{Rotational speed 1} - \text{Rotational speed 2}} * \text{rated rotational speed} \right|$$

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

P02.54	Label	Overtravel time coefficient	Mode	F		
	Range	0~10000	Default	0	Unit	-
	Activation	Immediate			Index	2254h

To set overtravel time coefficient

P02.55	Label	Overtravel suppression gain	Mode	F		
	Range	0~1000	Default	0	Unit	-
	Activation	Immediate			Index	2255h

Suppression improves with larger set value but might affect the performance of MFC. Please use with caution for any value above 100.

[Class 3] Velocity Control

P03.12	Label	Acceleration time		Mode	PV	CSV
	Range	0~10000	Default	0	Unit	ms/(1000RPM)
	Activation	Immediate			Index	2312h

P03.13	Label	Deceleration time		Mode	PV	CSV
	Range	0~10000	Default	0	Unit	ms/(1000RPM)
	Activation	Immediate			Index	2313h

Set max acceleration/deceleration for velocity command.

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

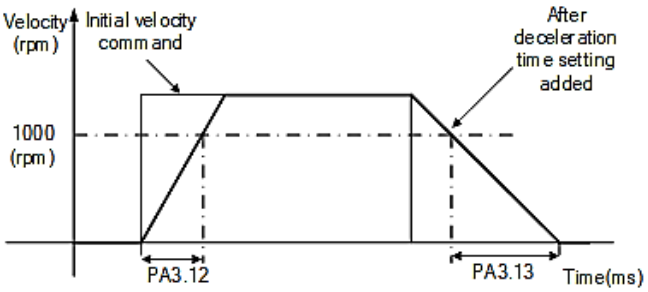
P03.12 = *1000*/*a*

P03.13 = *1000*/*a*

a = x/t

For example: If motor is to achieve 1500rpm in 30s, *a=1500/30=50rpm/ms*

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

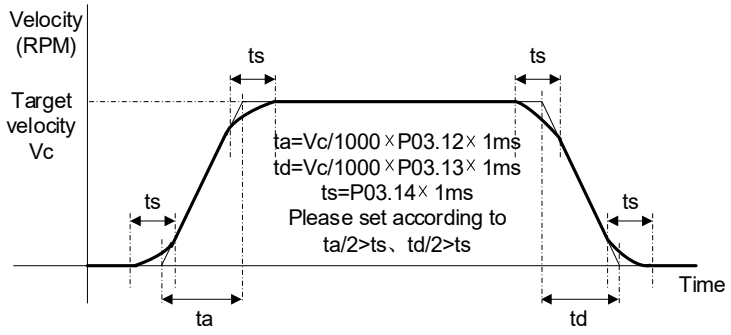


Usually used when there is rapid acceleration or trapezoidal wave velocity command due to many different internal speed segments under velocity control mode which causes instable while motor in motion.

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

P03.14	Label	Sigmoid acceleration/deceleration settings	Mode	PV	CSV
	Range	0~1000	Default	0	Unit	ms
	Activation	After disabling			Index	2314h

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



P03.15	Label	Zero speed clamp function selection	Mode	F	
	Range	0~3	Default	0	Unit	-
	Activation	Immediate			Index	2315h

Set value	Zero speed clamp function

0	Invalid: zero speed clamp deactivated
1	Velocity command is forced to 0 when the zero speed clamp (ZEROSPD) input signal is valid.
2	Velocity command is forced to 0 when actual velocity is lower than P03.16.
3	Includes conditions from 1 and 2

P03.16	Label	Zero speed clamp level	Mode	PV		CSV
	Range	0~2000	Default	30	Unit	rpm
	Activation	Immediate			Index	2316h
	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 clamp static time	Mode	PV		CSV
	Range	0~32767	Default	0	Unit	ms
	Activation	Immediate			Index	2323h
	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 P03.23					
P03.24	Label	Maximum motor speed limit	Mode	PV		CSV
	Range	0~10000	Default	0	Unit	r/min
	Activation	Immediate			Index	2324h
	Sets the maximum allowable motor speed. Set "0" as the default maximum speed limit of the motor parameter maximum speed, compare with the value of 6080h limit, and take the minimum value of the two as the maximum speed limit value					

[Class 4] I/O Interface Setting

P04.00	Label	Input selection DI1	Mode	F		
	Range	0x0~0xFF	Default	0x0	Unit	-
	Activation	Immediate			Index	2400h
P04.01	Label	Input selection DI2	Mode	F		
	Range	0x0~0xFF	Default	0x0	Unit	-
	Activation	Immediate			Index	2401h
P04.02	Label	Input selection DI3	Mode	F		
	Range	0x0~0xFF	Default	0x0	Unit	-
	Activation	Immediate			Index	2402h
P04.03	Label	Input selection DI4	Mode	F		
	Range	0x0~0xFF	Default	0x0	Unit	-
	Activation	Immediate			Index	2403h
P04.04	Label	Input selection DI5	Mode	F		
	Range	0x0~0xFF	Default	0x0	Unit	-
	Activation	Immediate			Index	2404h
P04.05	Label	Input selection DI6	Mode	F		
	Range	0x0~0xFF	Default	0x0	Unit	-
	Activation	Immediate			Index	2405h

Digital input DI allocation using hexadecimal system

Input	Symbol	Set value		0x60FD(bit)
		Normally open	Normally close	
Invalid	—	00h	-	×
Positive limit switch	POT	01h	81h	Bit1
Negative limit switch	NOT	02h	82h	Bit0
Clear alarm	A-CLR	04h	-	×
Forced alarm	E-STOP	14h	94h	Bit23
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~P04.05 corresponds to DI1~DI6, which can be connected to external sensor signals, and the master control can read bit4~bit9 of 60FDh directly to get the real status of DI1~DI6. P04.03/P04.04 corresponds to DI4/DI5, the default setting is 0x0, which is used as probe signal input.

P04.10	**Label**	Output selection DO1	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2410h
P04.11	**Label**	Output selection DO2	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2411h
P04.12	**Label**	Output selection DO3	**Mode**	**F**		
	Range	0x0~0xFF	**Default**	0x0	**Unit**	-
	Activation	Immediate			**Index**	2412h

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
DB brake output	-	2Dh	AD
Z-phase output	-	2Eh	AE

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.

P04.31	**Label**	Positioning complete range	**Mode**	**PP**	**HM**	**CSP**
	Range	0~10000	**Default**	20	**Unit**	*Command*
	Activation	Immediate			**Index**	2431h

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

P04.32	Label	Positioning complete output settings	Mode	PP	HM	CSP
	Range	0~4	Default	1	Unit	-
	Activation	Immediate			Index	2432h

Output conditions of INP1 positioning completed output signal

Set 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 positioning delay time	Mode	PP	HM	CSP
	Range	0~15000	Default	0	Unit	1ms
	Activation	Immediate			Index	2433h

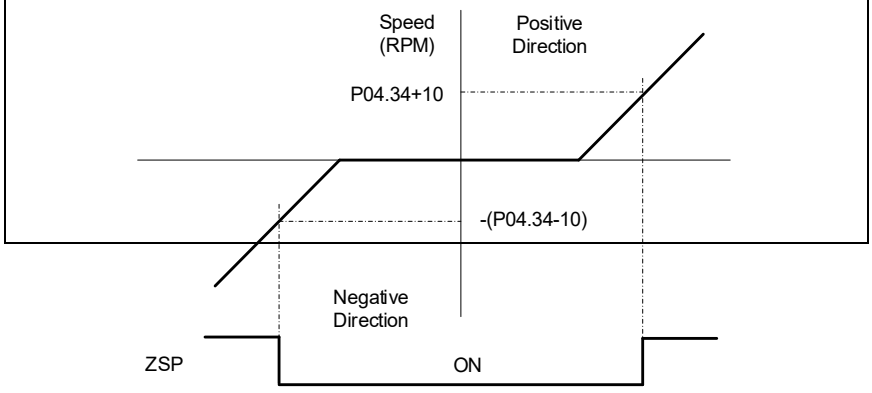
To set delay time when P04.32 = 3

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	Mode	F		
	Range	1~2000	Default	50	Unit	RPM
	Activation	Immediate			Index	2434h

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

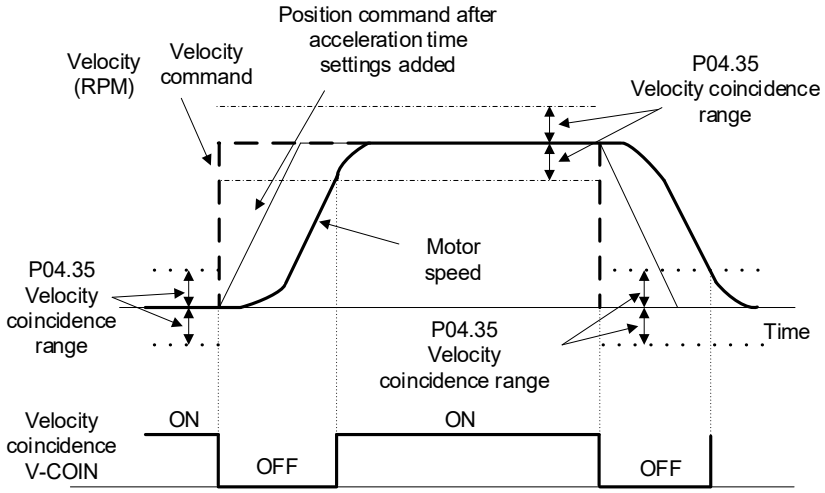
- Disregard the direction of rotation, valid for both directions.
- Hysteresis of 10RPM. Please refer to diagram on the right side.



P04.35	Label	Velocity coincidence range	Mode	PV		CSV
	Range	10~2000	Default	50	Unit	RPM
	Activation	Immediate			Index	2435h

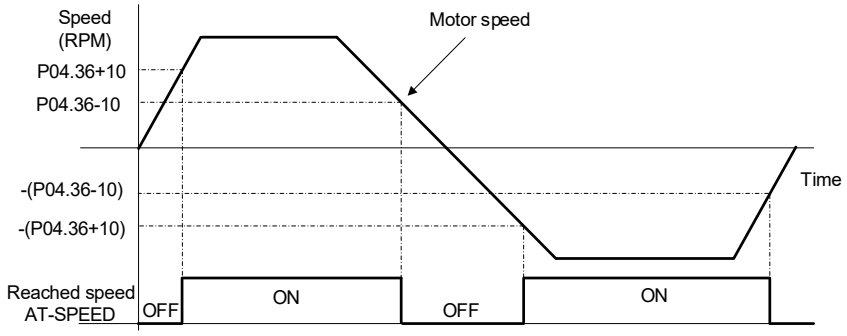
If the difference between velocity command and motor actual speed is below P04.35, Velocity coincidence (V-COIN) output signal valid.

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	Reached speed (AT-speed)	Mode	PV		CSV
	Range	10~2000	Default	1000	Unit	RPM
	Activation	Immediate			Index	2436h

When motor velocity > P04.36, AT-speed output signal is valid.
Detection using 10RPM hysteresis

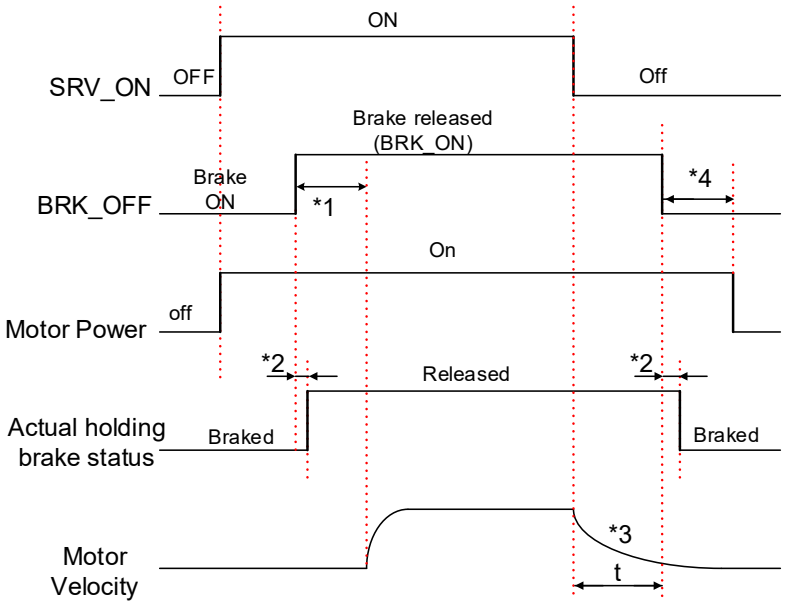


P04.37	Label	Motor power-off delay time	Mode	F		
	Range	0~3000	Default	100	Unit	1ms
	Activation	Immediate			Index	2437h

To set delay time for holding brake to be activated after motor power off to prevent axis from sliding.

P04.38	Label	Delay time for holding brake release	Mode	F		
	Range	0~3000	Default	0	Unit	1ms
	Activation	Immediate			Index	2438h

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	Holding brake activation speed	Mode	F		
	Range	30~3000	Default	30	Unit	RPM
	Activation	Immediate			Index	2439h

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.

P04.43	Label	Emergency stop function	Mode	F		
	Range	0~1	Default	0	Unit	-
	Activation	Immediate			Index	2443h

0：Emergency stop is valid, servo driver will be forced to STOP and alarm occurs.
1：Emergency stop is invalid, servo driver will not be forced to STOP.

P04.48	Label	Torque compensation time upon enabling	Mode	F		
	Range	0~3000	Default	0	Unit	ms
	Activation	Immediate			Index	2448h

Torque compensation at the enabling of the servo driver can be turned on through P06.10. Torque compensation time is set using P04.48. Torque will increase as the motor is enabled and reduce until diminished in the time duration set in P04.48.
When P04.48 is set at default of 0s, continuous torque compensation duration will be 1000ms

[Class 5] Extension settings

P05.04	Label	Driver prohibition input settings	Mode	F		
	Range	0~2	Default	0	Unit	-
	Activation	Immediate			Index	2504h

To set driver prohibition input (POT/NOT): If set to 1, no effect on homing mode.

Set value	Description
0	POT → Positive direction drive prohibited, positive limit valid (output warning A08) NOT →Negative direction drive prohibited, negative limit valid (output warning A09)
1	POT, NOT Invalid, i.e., positive and negative limits are invalid
2	Either POT/NOT input will alarm Er260 'Positive/negative overrun input valid', when positive/negative limit is valid.

P05.06	Label	Servo-off mode	Mode	F		
	Range	0~5	Default	0	Unit	-
	Activation	After restart			Index	2506h

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	Mode	F		
	Range	50~200	Default	50	Unit	ms
	Activation	Immediate			Index	2509h

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

P05.10	Label	Servo-off due to alarm mode	Mode	F		
	Range	0~5	Default	0	Unit	-
	Activation	After restart			Index	2510h

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 setting	Mode	F		
	Range	0~500	Default	0	Unit	%
	Activation	Immediate			Index	2511h

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 setting	Mode	F		
	Range	0~115	Default	0	Unit	%
	Activation	Immediate			Index	2512h

If P05.12 = 0, overload level = 115%
Use only when overload level degradation is needed.

P05.13	Label	Overspeed level setting	Mode	F		
	Range	0~10000	Default	0	Unit	RPM
	Activation	Immediate			Index	2513h

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	Mode	F		
	Range	0~255	Default	10	Unit	0.1ms
	Activation	Immediate			Index	2515h

Digital filtering of I/O input. Overly large value set will cause control delay.

P05.20	Label	Position unit setting	Mode	PP	HM	CSP
	Range	0~2	Default	2	Unit	-
	Activation	After restart			Index	2520h

Set value	Unit
0	Encoder unit
1	Command unit
2	10000 pulses/revolution

Command unit: Pulse from host (Affected by electronic gear ratio)
Encoder unit: Pulse from encoder (Related to encoder resolution)
P05.20 can only be modified when axis is disabled as it will clear position data.

P05.21	Label	Torque limit selection	Mode	F		
	Range	0~6	Default	0	Unit	-
	Activation	Immediate			Index	2521h

Set value	Positive limit value	Negative limit value
0	P00.13	P00.13
1	P00.13	P05.22
2	60E0h	60E1h
6	60E1h	60E0h
3~5	Reserved	

Compared with the maximum torque 6072h, the actual torque limit value is smaller.

P05.22	Label	2nd Torque limit	Mode	F		
	Range	0~500	Default	300	Unit	%
	Activation	Immediate			Index	2522h

A second limit value of the motor output torque is provided. Furthermore, the parameter value is limited by the maximum torque of the applicable motor. Compared with the maximum torque 6072h, the actual torque limit value is smaller.

P05.28	Label	LED initial status	Mode	F		
	Range	0~42	Default	34	Unit	-
	Activation	After restart			Index	2528h

To set content display on front panel of the servo driver at servo driver power on.

Set value	Content	Set value	Content	Set value	Content
0	Position command deviation	15	Overload rate	30	No. of encoder communication error
1	Motor speed	16	Inertia ratio	31	Accumulated operation time
2	Position command velocity	17	No rotation cause	32	Automatic motor identification
3	Velocity control command	18	No. of changes in I/O signals	33	Driver temperature
4	Actual feedback torque	19	Number of over current signals	34	Servo status
5	Sum of feedback pulse	20	Absolute encoder data	35	/
6	Sum of command pulse	21	Single turn position	36	Synchronous period
7	Maximum torque during motion	22	Multiturn position	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 signal 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	Voltage across PN	42	Value of sub-index of OD index
13	Alarm code	28	Software version		
14	Regenerative load rate	29	/		

P05.37	Label	Torque limit duration during homing	Mode	F		
	Range	0~5000	Default	500	Unit	ms
	Activation	Immediate			Index	2537h

1. Set the detection time when the torque reaches the output in PT/CST mode. When the torque reaches the set value and the set time passes, the output torque reaches the signal.
2. Set the detection time of the torque limit signal (TCL) after the output torque reaches the limit value in the torque return mode. Only applicable to torque return method -6 ~ method -1

In the torque return-zero mode, when the motor output torque reaches the limit value of P05.39 and the duration reaches the set value of this parameter, the next return to zero operation is entered.

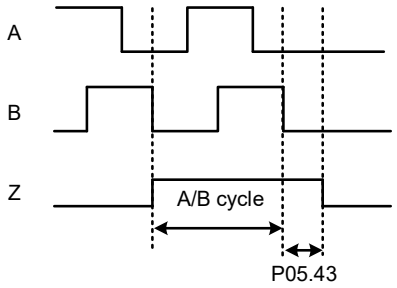
P05.39	Label	3rd torque limit	Mode	F		
	Range	0~500	Default	80	Unit	%
	Activation	Immediate			Index	2539h
	Sets the torque limit when the torque returns to zero. Compared with the maximum torque 6072h, the actual torque limit value is smaller.					

P05.40	Label	D41 set value	Mode	F		
	Range	0x0~0xFFFFF	Default	0X30C	Unit	%
	Activation	Immediate			Index	2540h
	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 - ABZ signal polarity	Mode	F		
	Range	0~1	Default	0	Unit	-
	Activation	After restart			Index	2542h
	Set the polarity of the frequency division output Z signal: 0: positive polarity 1: negative polarity					

P05.43	Label	Frequency divider output – Z-signal width	Mode	F		
	Range	2-100	Default	2	Unit	μs
	Activation	After restart			Index	2543h

Set the level holding time of the frequency division output Z signal
frequency division output Z signal = A phase or B phase period P05.43 Set time



P05.46	Label	Vent overload level	Mode	F		
	Range	0~115	Default	0	Unit	%
	Activation	Immediate			Index	2546h

Set value	Description
【0】	Default level: 80%
1~115	Set vent overload level accordingly

P05.70	Label	Velocity reaches hysteresis width	Mode	F		
	Range	0~100	Default	0	Unit	0
	Activation	Immediate			Index	2570h
	Sets the hysteresis for speed reaching and speed matching.					

[Class 6] Other settings

P06.01	Label	Encoder zero position compensation	Mode	F		
	Range	0~360	Default	0	Unit	°
	Activation	After restart			Index	2601h

Angle of the encoder after zero position calibration

P06.03	Label	JOG trial run torque command	Mode	F		
	Range	0~350	Default	350	Unit	%
	Activation	Immediate			Index	2603h

To set torque for JOG trial run command.

P06.04	Label	JOG trial run velocity command	Mode	F		
	Range	0~10000	Default	30	Unit	r/min
	Activation	Immediate			Index	2604h

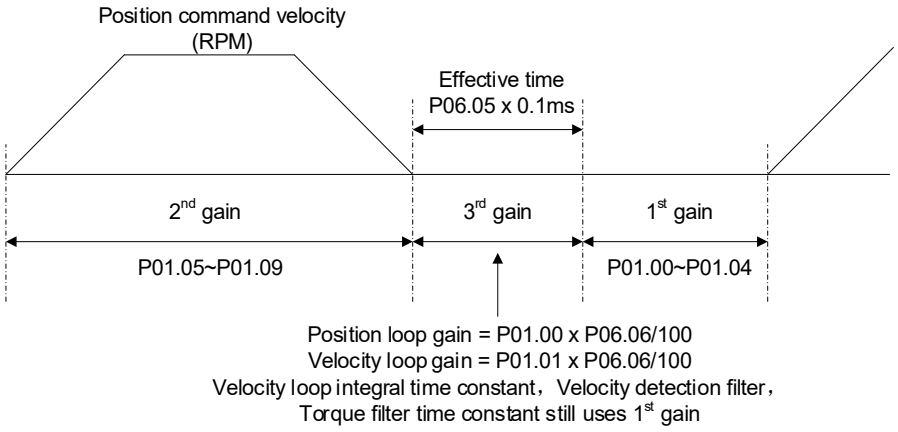
To set velocity for JOG trial run command.

P06.05	Label	Position 3rd gain valid time	Mode	PP	HM	CSP
	Range	0~10000	Default	0	Unit	0.1ms
	Activation	Immediate			Index	2605h

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	Mode	PP	HM	CSP
	Range	0~1000	Default	100	Unit	100%
	Activation	Immediate			Index	2606h

Set up the 3rd gain by multiplying factor of the 1st gain
Above diagram is illustrated using P01.15 = 7.



Position loop gain = P01.00 x P06.06/100
Velocity loop gain = P01.01 x P06.06/100
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	Mode	F		
	Range	-100~100	Default	0	Unit	%
	Activation	Immediate			Index	2607h

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 value	Mode	F		
	Range	-100~100	Default	0	Unit	%
	Activation	Immediate			Index	2608h
P06.09	Label	Negative direction torque compensation value	Mode	F		
	Range	-100~100	Default	0	Unit	%
	Activation	Immediate			Index	2609h

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

P06.08/P06.09 = T_f = $\frac{|T1 - T2|}{2}$

P06.10	Label	Torque compensation upon enabling	Mode	F		
	Range	0x0 ~ 0xFFFF	Default	0x0	Unit	-
	Activation	Immediate			Index	2610h

In applications with vertical load axis, servo driver will automatically increase the motor torque to compensate for the gravitational force at enabling of the drive. In order to prevent the axis from having a slight drop and back to initial position behavior, P06.10 can be set to turn on torque compensation.

Set 0x0010 ： ON

Set 0x0 ： OFF

P06.11	Label	Current response setting	Mode	F		
	Range	50~100	Default	100	Unit	%
	Activation	Immediate			Index	2611h

To set driver current loop related effective value ratio

P06.14	Label	Max. time to stop after disabling	Mode	F		
	Range	0~3000	Default	500	Unit	ms
	Activation	Immediate			Index	2614h

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	Mode	F		
	Range	0~1200	Default	10	Unit	0.1rev
	Activation	Immediate			Index	2620h

JOG (Position control) : Distance travel of each motion

P06.21	Label	Trial run waiting time	Mode	F		
	Range	0~30000	Default	300	Unit	ms
	Activation	Immediate			Index	2621h
JOG (Position control): Waiting time after each motion						

P06.22	Label	No. of trial run cycles	Mode	F		
	Range	0~32767	Default	5	Unit	-
	Activation	Immediate			Index	2622h
JOG (Position control): No. of cycles						

P06.25	Label	Trial run acceleration	Mode	F		
	Range	0~10000	Default	200	Unit	ms/ (1000rpm)
	Activation	Immediate			Index	2625h
To set the acceleration/deceleration time for JOG command between 0 rpm to 1000 rpm						

P06.28	Label	Velocity observer gain	Mode	F		
	Range	0~32767	Default	0	Unit	-
	Activation	Immediate			Index	2628h
0: Default stable gain; Modifications are not recommended.						

P06.29	Label	Velocity observer bandwidth	Mode	F		
	Range	0~32767	Default	0	Unit	-
	Activation	Immediate			Index	2629h
0: Default stable bandwidth; Modifications are not recommended.						

P06.34	Label	Frame error window time	Mode	F		
	Range	0~32767	Default	100	Unit	-
	Activation	Immediate			Index	2634h
To set EtherCAT data frame error detection window time						

P06.35	Label	Frame error window	Mode	F		
	Range	0~32767	Default	50	Unit	-
	Activation	Immediate			Index	2635h
To set EtherCAT data frame error detection window						

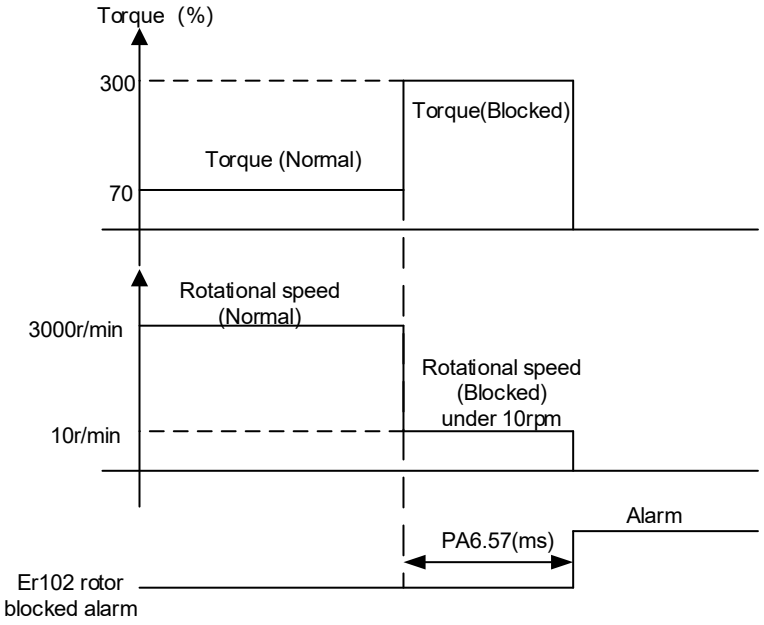
P06.54	Label	Absolute value rotation mode denominator setting	Mode	PP	HM	CSP
	Range	0~32766	Default	0	Unit	-
	Activation	After restart			Index	2654h
Used for denominator setting when the absolute encoder is set to rotary mode. Used in conjunction with P06.63 for rotary mode when P00.15=2, feedback position 6064h ranges from 0 to [(P06.63+1)/P06.54] x pulses per revolution; calculated as 1 when P06.54=0 (Note: When P00.08 ≠ 0, pulses per revolution = P00.08; when P00.08 = 0, pulses per revolution = encoder resolution × electronic gear ratio.)						

P06.56	Label	Blocked rotor alarm torque threshold	Mode	F		
	Range	0~300	Default	300	Unit	%
	Activation	Immediate			Index	2656h
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. If motor speed is 10rpm or above, Er102 won't be triggered.						

P06.57	Label	Blocked rotor alarm delay time	Mode	F		
	Range	1~1000	Default	400	Unit	ms
	Activation	Immediate			Index	2657h

To set delay time for blocked rotor alarm to trigger, if rotor blocked duration is not longer than time set in P06.57, Er102 won't be triggered.

Please look at the following diagram to set up Er102 alarm trigger.



**if rotational speed is more than 10rpm when motor rotor is blocked, Er100 will be triggered.*

P06.59	Label	Homing mode position threshold	Mode	F		
	Range	0~100	Default	8	Unit	0.00001rev
	Activation	Immediate			Index	2659h

To set position threshold for homing mode.

P06.61	Label	Z signal holding time	Mode	F		
	Range	1~20	Default	10	Unit	ms
	Activation	Immediate			Index	2661h

Z signal high level holds time setting.
Applied to: Z signal in 60FDh and Z signal of DO output

P06.63	Label	Absolute multiturn data upper limit	Mode	F		
	Range	0~32766	Default	0	Unit	rev
	Activation	Immediate			Index	2663h

Used for denominator setting when the absolute encoder is set to rotary mode.
Used in conjunction with P06.63 for rotary mode when P00.15=2, feedback position 6064h ranges from 0 to [(P06.63+1)/P06.54] x pulses per revolution; calculated as 1 when P06.54=0

(Note: When P00.08 ≠ 0, pulses per revolution = P00.08; when P00.08 = 0, pulses per revolution = encoder resolution × electronic gear ratio.)

[Class 7] Factory settings

Please take precaution when modifying Class 7 parameters. Might cause driver errors

P07.15	Label	Motor model		Mode	F		
	Range	0x0~0x7FFF		Default	0x200	Unit	-
	Activation	After restart	Data length		16 bit	Index	2715h

Set value	Description
0x100	Read from EEPROM
[0x200]	Read from Encoder

When P07.15 = 0x200(2xx):

Parameter	Label
P07.00	Current loop gain
P07.01	Current loop integral time
P07.05	No. of motor pole pairs
P07.06	Motor phase resistance
P07.07	Motor D/Q induction
P07.08	Motor back EMF coefficient
P07.09	Motor torque coefficient
P07.10	Motor rated rotational speed
P07.11	Motor max. rotational speed
P07.12	Motor rated current
P07.13	Motor rotor inertia
P07.14	Driver power rating
P07.16	Encoder
P07.17	Motor max. current
P07.18	Encoder index angle compensation

P07.16	Label	Encoder	Mode	F		
	Range	0x0~0xFFFF	Default	*Encoder*	Unit	-
	Activation	After restart	Data length	16 bit	Index	2716h

Set value	Description
0x0	17-bit encoder
0x7	23-bit encoder

P07.31	Label	Vent release mode	Mode	F		
	Range	0~1	Default	-	Unit	-
	Activation	After restart			Index	2731h

Firmware version 1.06 and above, please use P11.31

To set vent release mode

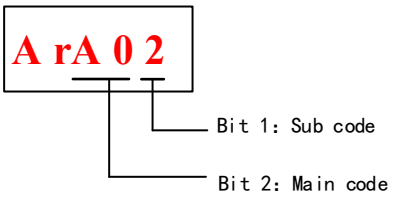
Power Rating(W)	Default	Description
100/400	1	Regenerative electricity absorbed by **internal capacitor**
750 or above	0	Regenerative electricity absorbed by **regenerative resistor**

Appendix II Warning and Alarm

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.

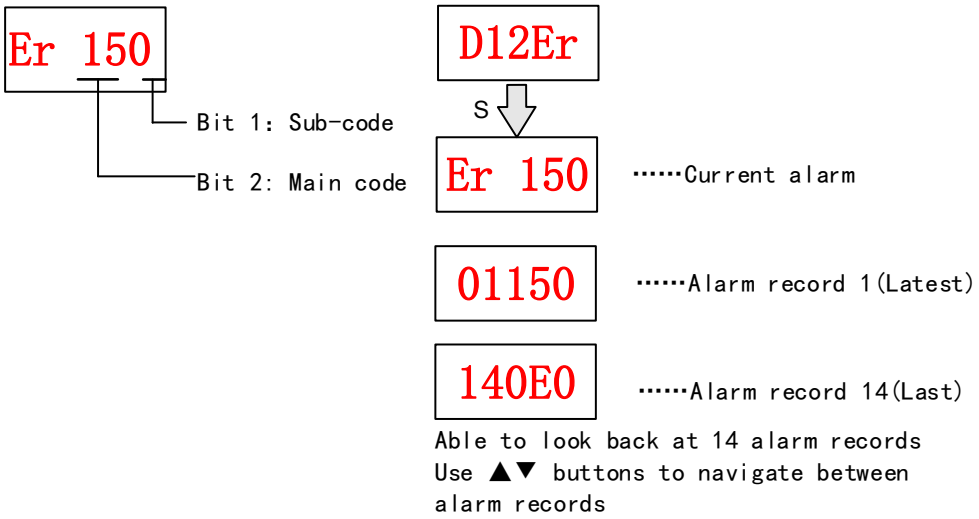
Example of warning code:



Warning Code		Content
Main	Code	
A	00	emergency stop warning
	01	Overload warning
	02	Regeneration energy overload warning (**85% of the regeneration threshold**)
	03	Absolute encoder **battery voltage low (<3.1V)**. Valid when Pr0.15 is set to 1.
	04	Change the parameter to a non-real time valid warning
	05	**Pr0.01 is not 9** under current control mode, please correct this parameter
	06	Driver over-temperature warning
	08	Positive limit switch valid. **POT** blinking on front panel
	09	Negative limit switch valid. **NOT** blinking on front panel
	0A	Positive and negative limit switch valid. **PNOT** blinking on front panel
	0B	Current position is beyond the positive software limit. **SPOT** blinking on front panel
	0C	Current position is beyond software negative limit. **NPOT** blinking on front panel
	0D	Current position is beyond software negative, positive limit. **SPNOT** blinking on front panel
	0E	Parameters reset to factory default. Restart needed
	13	Encoder multiturn data cannot be cleared in the enabled status.
POFF		Main power off, check whether L1/L2/L3 or R/S/T are correctly connected
COFF		Control power off, check whether L1C/L2C are correctly connected

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 "d12Er".

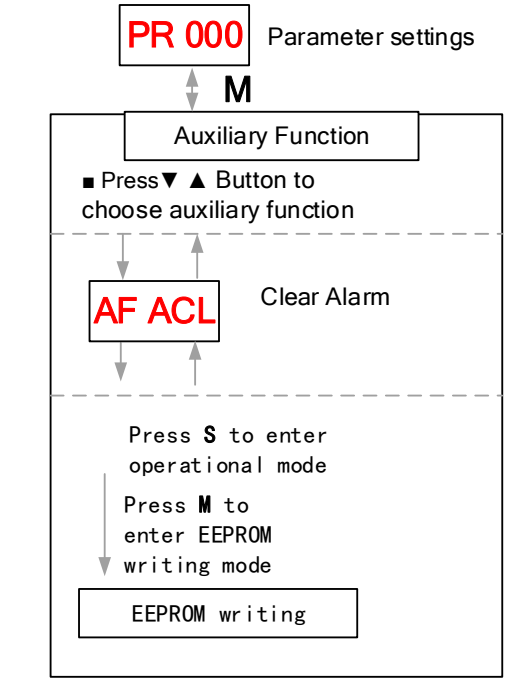


Error Code List

Error code		Content	Attribute		
Main	Sub		Save	Type	Clearable
0A	0~1	Circuit current detection error	●	2	
	3	Motor power cable not connected	●	1	●
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	●
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	●
17	0	Encoder data error	●	1	
	1	Encoder parameter initialization error	●	1	
18	0	Excessive position deviation	●	2	●
	1	Excessive velocity deviation			
19	0	Motor vibration too strong	●	2	●
1A	0	Overspeed	●	2	●
	1	Velocity out of control	●	1	●
1b	0	Bus input signal dithering	●	2	●
	1	Incorrect electronic gear ratio		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	EEPROM parameters initialization error		2	
	1	EEPROM hardware error		2	
	2	Error saving alarm history record		2	
	3	Error occurred when saving vendor parameters		2	
	4	Error occurred when saving communication parameters		2	
	5	Error occurred when saving parameter 402		2	
	6	Data saving error during power-off			
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	●
28	0	Output pulse frequency too high	●	2	●
57	0	Forced alarm input valid	●	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	

[Note:]
Save: Save error messages to alarm history.
Type: The type 1 and type 2 fault stop mode can be set via Pr5.10 [Sequence at alarm].
Clearable: Clearable alarm by operating the front panel and use auxiliary function **AFACL** as below. Besides clearable alarms, please first solve the error and restart the servo driver to clear alarm.


PR 000
Parameter settings
M
Auxiliary Function
■ Press▼ ▲ Button to choose auxiliary function
AF ACL
Clear Alarm
Press S to enter operational mode
Press M to enter EEPROM writing mode
EEPROM writing

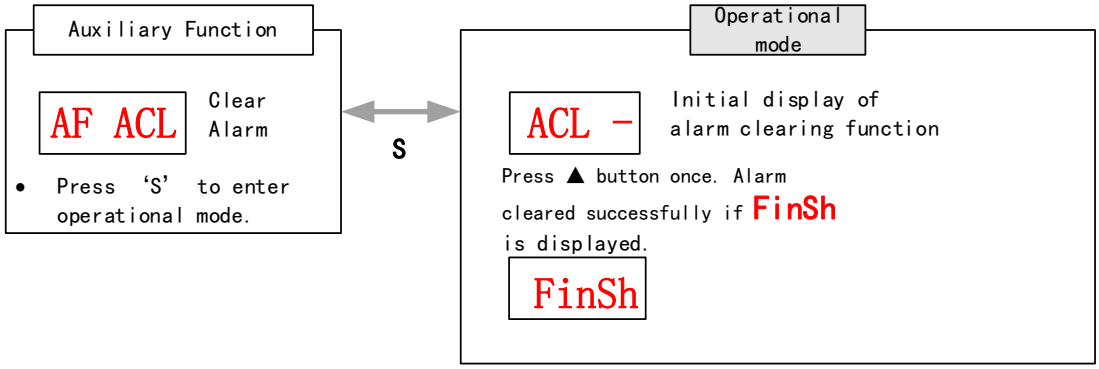

Auxiliary Function
AF ACL
Clear Alarm
Press 'S' to enter operational mode.
S
Operational mode
ACL -
Initial display of alarm clearing function
Press ▲ button once. Alarm cleared successfully if FinSh is displayed.
FinSh

Table 8.2 Alarm and 603F correspondence

Error Code Display	1001 h	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				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	0x 8611		Excessive position deviation
Er 181				Excessive velocity deviation
Er 190	0x20	0x 8401		Motor vibration too strong
Er 1A0	0x20	0x 8402		Overspeed
Er 1A1	0x20	0x 8403		Velocity out of control
Er 1b0	0x20	0x 8612		Bus input signal dithering
Er 1b1	0x20	0x 8503		Incorrect electronic gear ratio
Er 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 270				Analog 1 input overrun limit
Er 271				Analog 2 input overrun limit
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

Alarm Handling

***When error occurs, please solve accordingly. Then, restart.*

Error code	Main	Sub	**Display:** "Er 0A0"--"Er 0A1"	
	0A	0~1	**Content:** Circuit current detection error	
Cause			Diagnosis	Solution
Motor power cable wiring error			Verify motor power cable wiring	Make sure U, V, W terminal wired properly
Main power supply undervoltage			Verify L1, L2, L3 terminal voltage	Increase main power supply voltage
Driver fault			/	Replace driver

Error code	Main	Sub	**Display:** "Er 0A3"	
	0A	3	**Content:** Motor power cable not connected	
Cause			Diagnosis	Solution
Motor power cable not connected			Verify motor power cable wiring	Measure **resistance values between U, V, W terminals**, make sure the values are almost equal. If not, it might be due to damaged motor or motor winding open circuit.
Motor fault			/	Replace motor
Driver fault			/	Replace driver

Error code	Main	Sub	**Display:** "Er 0b1"	
	0b	1	**Content:** Control circuit power supply abnormal	
Cause			Diagnosis	Solution
USB power supply too low			Verify if USB cable is properly connected and not damaged.	Replace USB mini cable
Driver fault			/	Replace driver

Error code	Main	Sub	Display: "Er 0c0"	
	0c	0	Content: DC bus overvoltage	
Cause			Diagnosis	Solution
Main power supply overvoltage			Verify L1,L2,L3 terminal voltage	Decrease main power supply voltage
Inner brake circuit damaged			/	Replace driver
Driver fault			/	Replace driver

Error code	Main	Sub	Display: "Er 0d0"	
	0d	0	Content: DC bus undervoltage	
Cause			Diagnosis	Solution
Main power supply undervoltage			Verify L1,L2,L3 terminal voltage	Increase main power supply voltage
L1C, L2C connected when USB cable is connected			Control circuit power on before driver initialization. Alarm might occur.	Please disconnect the USB cable before powering on control circuit.
Driver fault			/	Replace driver

Error code	Main	Sub	Display: "Er 0d1"	
	0d	1	Content: Single phasing of main power supply	
Cause			Diagnosis	Solution
Main power supply undervoltage			Verify L1, L2, L3 terminal voltage	Increase main power supply voltage
Main power supply wiring error			Loose connection of L1, L2, L3	Secure connections
Driver fault			/	Replace driver

Error code	Main	Sub	Display: "Er 0d2"	
	0d	2	Content: No main power supply detected	
Cause			Diagnosis	Solution
No main power supply			Verify L1, L2, L3 terminal voltage	1. Increase main power supply voltage 2. Secure connections
Driver fault			/	Replace driver

Error code	Main	Sub	Display: "Er 0E0"	
	0E	0	Content: Overcurrent	
Cause			Diagnosis	Solution
Driver power output short circuit			Verify if there is short circuit between UVW terminals, or shorted to PG.	1. Make sure there is no circuit. 2. Make sure motor is not damaged
Motor wiring error			Verify motor wiring	Reconnect motor wiring
IGBT module short circuit			Disconnect motor output cable. Then, enable servo driver to check for overcurrent	Replace driver
Excessive motor load			Verify if motor torque output is too high	1. Reduce load 2. Add a gearbox
Excessive acceleration and deceleration			Verify if acceleration and deceleration duration time are too low	Increase acceleration and deceleration duration time
Motor wiring short circuit			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 motor

Error code	Main	Sub	Display: "Er 0E1"	
	0E	1	Content: Intelligent Power Module (IPM) overcurrent	
Cause			Diagnosis	Solution
Driver power output short circuit			Verify if there is short circuit between UVW terminals, or shorted to PG.	1. Make sure there is no circuit. 2. Make sure motor is not damaged
Motor wiring error			Verify motor wiring	Reconnect motor wiring
IGBT module short circuit			Disconnect motor output cable. Then, enable servo driver to check for overcurrent	Replace driver
IGBT module undervoltage			/	Replace driver
Excessive motor load			Verify if motor torque output is too high	1. Reduce load 2. Add a gearbox
Excessive acceleration and deceleration			Verify if acceleration and deceleration duration time are too low	Increase acceleration and deceleration duration time
Motor wiring short circuit			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 motor

Error code	Main	Sub	Display: "Er 0E2"	
	0E	2	Content: Power output to motor shorted to ground	
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	1. Reconnect wiring. 2. Change motor power cable.
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 motor
Driver fault			/	Replace 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	1. Reconnect wiring. 2. Change motor power cable.
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 motor
Driver fault			/	Replace 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.	1. Improve cooling conditions. Please check installation guide. 2. Replace driver and motor with higher power rating. 3. Increase duration time for acceleration and deceleration. 4. 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	1. Decrease load 2. Adjust limit values
Strong mechanical vibration			Look for mechanical vibration from machine system	1. Adjust gain value of control loop 2. Increase duration time for acceleration and deceleration
Motor or encoder cable wiring error			Verify motor and encoder wiring	1. Reconnect wiring 2. Replace motor and encoder cable
Holding brake engaged			Verify holding brake terminal voltage	Cut off holding brake

Error code	Main	Sub	Display: "Er 102"
	10	2	Content: Motor rotor blocked

Cause	Diagnosis	Solution
Motor rotor blocked	Look for mechanical blockages	Check the machinery
Motor rotor blocking time threshold value too low	Verify value of Pr6.57	Adjust value of Pr6.57

Error code	Main	Sub	Display: "Er 120"	
	12	0	Content: Regenerative resistor overvoltage	
Cause			Diagnosis	Solution
Regenerative energy exceeded capacity of regenerative resistor			1. Verify if velocity is too high 2. Verify if load is too large	1. Decrease motor rotational velocity; 2. Decrease load inertia; 3. Add an external regenerative resistor;
Power supply voltage too high			1. Verify if power supply voltage is within the rated range. 2. Interval regenerative resistor value is too low	1. Decrease power supply voltage 2. Increase regeneration resistance value(add external regenerative resistor)
Unstable power supply voltage			Verify if power supply voltage is stable	Add a surge suppressor to main power supply.
Regenerative energy discharge circuit damaged			/	1. Add an external regenerative resistor; 2. Replace driver

Error code	Main	Sub	Display: "Er 121"	
	12	1	Content: Holding brake error	
Cause			Diagnosis	Solution
Holding brake circuit damaged			Regenerative resistor disconnected	Replace regenerative resistor
			Holding brake IGBT damaged	Replace driver

Error code	Main	Sub	Display: "Er 122"	
	12	2	Content: Regenerative resistor value too low	
Cause			Diagnosis	Solution
External regenerative resistor value is less than the minimum value allowed 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	Solution
Encoder cable disconnected			Verify encoder cable connection	Make sure encoder cable properly connected
Encoder cable wiring error			Verify if encoder wiring is correct	Reconnect encoder wiring
Encoder damaged			/	Replace motor
Encoder measuring circuit damaged			/	Replace 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 motor

Error code	Main	Sub	Display: "Er 152"	
	15	2	Content: Encoder initial position error	
Cause			Diagnosis	Solution
Communication data abnormal			1. Verify if encoder power supply voltage is DC5V ± 5%; 2. Verify if encoder cable and shielded layer is not damaged; 3. Verify if encoder cable is close to high-powered power supply cable	1. Make sure encoder power supply voltage is stable 2. Make sure encoder cable is not damaged. 3. Make sure encoder cable shielded layer is grounded to frame 4. Make sure encoder cable is away from high-powered power supply cable
Encoder damaged			/	Replace motor
Encoder measuring circuit damaged			/	Replace driver

Error code	Main	Sub	Display: "Er 153"	
	15	3	Content: Multiturn encoder error	
Cause			Diagnosis	Solution
Initial use			Origin calibration not performed	Perform origin positioning and multiturn position initialization, calibrate the origin of coordinate system.
Encoder without multiturn absolute function used			Verify if encoder has multiturn absolute function	1. Replace the motor with a multiturn absolute encoder. 2. Set Pr0.15 = 0 to deactivate multiturn absolute function.
Low battery power			Replace battery and restart driver to clear alarm	Replace battery
Battery has no power or has been dismantled			Alarm not cleared after replacing battery and restart	Absolute position lost. Return to origin and perform multiturn initialization, calibrate the origin of coordinate system

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
Absolute value applications, motor rotates in one direction			Verify if encoder is not damaged	Adjust absolute value application mode, set to turntable mode

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: Encoder counter error	
Cause			Diagnosis	Solution
Encoder data overflow			Verify if encoder is not damaged	Initialize multiturn data
Absolute value applications, motor rotates in one direction			Verify if encoder is not damaged	Adjust absolute value application mode, set to turntable mode

Error code	Main	Sub	Display: "Er 170"	
	17	0	Content: Encoder data error	
Cause			Diagnosis	Solution
Communication data abnormal			1. Verify if encoder power supply voltage is DC5V ± 5%; 2. Verify if encoder cable and shielded layer is not damaged; 3. Verify if encoder cable is close to high-powered power supply cable	1. Make sure encoder power supply voltage is stable 2. Make sure encoder cable is not damaged. 3. Make sure encoder cable shielded layer is grounded to frame 4. Make sure encoder cable is away from high-powered power supply cable
Encoder damaged			/	Replace motor
Encoder measuring circuit damaged			/	Replace driver

Error code	Main	Sub	Display: "Er 171"	
	17	1	Content: Encoder parameter initialization error	
Cause			Diagnosis	Solution
Driver and motor not matched			Verify driver and motor models.	Replace with matching driver and motor
Error while getting parameters from encoder			1. Verify if encoder cable is standard. 2. 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	Diagnosis	Solution
Improper position deviation settings	Verify if value of Pr_014 is too low	Increase value of Pr_014
Position gain setting too low	Verify if values of Pr1.00 & Pr1.05 are too low	Increase values of Pr1.00 & Pr1.05
Torque limit too low	Verify if values of Pr0.13 & Pr5.22 are too low	Increase values of Pr0.13 & Pr5.22
Excessive external load	1. Verify if acceleration and deceleration duration time is too low. 2. Verify if rotational velocity is too high 3. Verify if load is too large	1. Increase duration time for acceleration and deceleration 2. Decrease rotational velocity 3. 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 Pr6.02 is too low	1. Increase value of Pr6.02; 2. Set Pr6.02 to 0, position error detection off.
Acceleration and deceleration duration time for set velocity is too low	Verify if value of Pr3.12 and Pr3.13 are too low	1. Increase value of Pr3.12, Pr3.13; 2. Adjust velocity gain to reduce velocity lag error

Error code	Main	Sub	Display: "Er 190"
	19	0	Content: Motor vibration too strong

Cause	Diagnosis	Solution
Motor velocity fluctuates too much	Verify if Pr0.03 is too large	Decrease value of Pr0.03

Error code	Main	Sub	Display: "Er 1A0"
	1A	0	Content: Overspeed

Cause	Diagnosis	Solution
Motor velocity exceeded first speed limit (Pr3.21)	1. Verify if velocity command is too high; 2. Verify if simulated velocity command voltage is too high; 3. Verify if parameter value of Pr3.21 is too low; 4. Verify if input frequency and division frequency coefficient of pulse train is proper; 5. Verify if encoder is wired correctly	1. Adjust velocity input command; 2. Increase Pr3.21 value; 3. Adjust pulse train input frequency and division frequency coefficient; 4. Verify encoder wiring;

Error code	Main	Sub	Display: "Er 1A1"	
	1A	1	Content: Velocity out of control	
Cause		Diagnosis		Solution
Motor velocity out of control, Excessive velocity error		Verify encoder phase sequence; Verify if UVW cable is connected to the right terminal		Reconnect UVW if wrongly connected. If still remains unsolved, please contact technical support.

Error code	Main	Sub	Display: "Er 1b0"	
	1b	0	Content: Bus input signal dithering	
Cause		Diagnosis		Solution
Controller synchronization dithering		Synchronization offset on the controller is set too high		Set synchronization offset to 0 and check if dithering stops
		Synchronization cycle is too short due to large number of slave stations		Set a reasonable synchronization cycle time.
		Tune synchronization dithering range		Increase P00.25, P00.26, P00.28
		Command delay cycle counts in sync mode needs to be adjusted		Set P00.27 = 2 to increase delay time

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 210"	
	21	0	Content: I/O input interface assignment error	
Cause		Diagnosis		Solution
Input signal assigned with two or more functions.		Verify values of Pr4.00-Pr4.09, Pr4.44-4.47		Set proper values for Pr4.00-Pr4.09, Pr4.44-4.47

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, P04.44-4.47		Set proper values for P04.00-P04.09, P04.44-4.47

Error code	Main	Sub	Display: "Er 212"	
	21	2	Content: I/O output interface function assignment error	
Cause		Diagnosis		Solution

Input signal assigned with two or more functions.	Verify values of P04.10-P04.15	Set proper values for P04.10-P04.15
Input signal not assigned	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:** EEPROM parameters initialization error	
Cause			Diagnosis	Solution
Error during initial reading of EEPROM parameters			Restart after changing any parameter. Verify if the parameter is saved.	If parameter not saved after several restarts, please change driver

Error code	Main	Sub	**Display:** "Er 241"	
	24	1	**Content:** EEPROM hardware error	
Cause			Diagnosis	Solution
EEPROM damaged			Verify if multiple storages are the same	Replace driver/Upgrade software

Error code	Main	Sub	**Display:** "Er 242"	
	24	2	**Content:** Error saving alarm history record	
Cause			Diagnosis	Solution
Power-off during saving			Verify alarm during power-off	Power lost after alarm appears
Several different alarms in a row			Verify alarm code	Figure out other alarm causes
EEPROM damaged			Verify if it is the same over several times	Replace driver/Upgrade software

Error code	Main	Sub	**Display:** "Er 243"	
	24	3	**Content:** Error occurred when saving vendor parameters	
Cause			Diagnosis	Solution
Power-off before data saved			--	Wait until data saved successfully before powering off
EEPROM damaged			Restart driver for a few times	Restart driver for a few times

Error code	Main	Sub	**Display:** "Er 244"	
	24	4	**Error description:** Error occurred when saving communication parameters	
Cause			Diagnosis	Solution
Power-off before data saved			--	Wait until data saved successfully before powering off
EEPROM damaged			Restart driver for a few times	Restart driver for a few times

Error code	Main	Sub	**Display:** "Er 245"	
	24	5	**Error description:** Error occurred when saving parameter 402	
Cause			Diagnosis	Solution
Power-off before data saved			--	Wait until data saved successfully before powering off
EEPROM damaged			Restart driver for a few times	Restart driver for a few times

Error code	Main	Sub	**Display:** "Er 246"
	24	6	**Error description:** Data saving error during power-off
Cause		Diagnosis	Solution
Power off too fast		--	Upgrade software
EEPROM damaged		Restart driver for a few times	Restart driver for a few times

Error code	Main	Sub	**Display:** "Er 260"
	26	0	**Error description:** Positive/Negative position limit triggered under non-homing mode
Cause		Diagnosis	Solution
Positive/negative position limit triggered		Verify position limit signal	/

Error code	Main	Sub	**Display:** "Er 280"
	28	0	**Error description:** Output pulse frequency too high
Cause		Diagnosis	Solution
Frequency divided pulse output exceeds 1MHz		Verify if motor rotational speed and the number of frequency divided pulse output are too high	Reduce the number of frequency divided pulse output or reduce rotational speed

Error code	Mai n	Sub	**Display:** " Er 570"
	57	0	**Error description:** Forced alarm input valid
Cause		Diagnosis	Solution
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
Automatically detected motor doesn't match set motor		/	Please contact our technical support

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.		Restart driver	Please contact our technical support

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	Check for interference from devices releasing electromagnetic field	Ground driver and motor to reduce interference
	Restart driver	Replace 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 too not 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

EtherCAT Communication Alarm

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.
EtherCAT communication alarm however, relies on register clearance from the main station. Can be solved according to following steps:

1. Set bit 4 of ESC control register 0x120 (error responder) to 1.
2. The communication alarm can be cleared until the feedback of the ESC status code register 0x134~0x135 is 0.
3. By setting bit 7 of 6040h to 1, switches state machine from fault to initialization completion , No fault(Switch on disabled).

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
interfere			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
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
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-DFAS□□E 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
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
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
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
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
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
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 can be detected			BOOT/INIT
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
The result status			Initialization
Solution			Verify if E-DFAS□□E 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
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
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
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
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
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
The result status			Safe operation
Solution			1. Verify if E-DFAS□□E 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. Email output 2. Email input 3. Process data output 4. Process data input
The status of the error can be detected			Pre-operation
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
The result status			Initialize
Solution			1. Verify E-DFAS□□E 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
The result status			Initialize
Solution			1. Verify E-DFAS□□E 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
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
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
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
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
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
The result status			Pre-operation
Solution			1. Verify E-DFAS□□E 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
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
The result status			Safe operation
Solution			1. Verify if E-DFAS□□E 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
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
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 settings
Cause			Synchronization settings in sync mode are not valid
The status of the error can be detected			Safe operation
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
The result status			Safe operation
Solution			Verify master device Distribution Clock settings and network transmission delay

Error code	Main	Sub	Display: "Er 835"
	83	5	**Error description:** Distribution Clock cycle time is invalid
Cause			Set synchronization cycle time is not proportional to drive position loop
The status of the error can be detected			Safe operation
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
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
The result status			Keeping the current state
Solution			1. Verify if E-DFAS□□E 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
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
The result status			Keeping the current state
Solution			Verify if E-DFAS□□E 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 status
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
Cause			Enable driver under unsupported mode
The status of the error can be detected			All status
The result status			Maintain status
Solution			Switch to the correct control mode

Error code	Main	Sub	**Display:** "Er 890"	
	89	0	**Error description:** Homing Error	
Cause			Diagnosis	Solution
Homing velocity is too high. Passed homing sensor before signal is captured			Verify if homing velocity is too high. Or set lower homing velocity	Decrease homing velocity or increase homing acceleration
Homing mode does not coincide with input signals			Verify if input signals from sensors are corresponding to the demands of chosen homing mode	Set up the signal input in accordance to homing mode settings
Unsupported homing mode			Verify if improper homing mode is set in object dictionary 6098h	Re-select homing mode

Alarm clearing

Servo Driver Alarm

For alarm can be cleared，There are 3 methods.

Method 1:

By setting bit 7 of 6040h to 1, switches state machine from fault to initialization completion, No fault (Switch on disabled).

Method 2:

Use auxiliary function “AF_ACL”
Press M to select auxiliary function, Press SET to enter into “AF_ACL”, Press and hold to clear the alarm

Method 3:

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

Communication Alarm Reset

All communication-related alarms of **E-DFAS□□E** are clearable and not stored in the history record.
They are cleared mainly by the master: first clear the alarm itself, then switch the 402 state machine.
Step 1: The master writes bit4 (Error Acknowledge) of ESC control register **0x120** to 1.
Step 2: When ESC status code register **0x134–0x135** returns 0, the alarm is cleared.
Next, as in driver alarm reset, toggle bit7 of object **6040h** from 0 → 1 to switch the 402 state machine from *Fault* to *Switch on Disabled*.
When a network fault occurs, the panel displays the fault code, the **ERR LED** lights, and error info (objects **1001h, 603Fh**) is sent to the master via emergency messages. The master can identify the fault through these messages or the error codes.