DINGS'
Precision Motion Specialist

VER 1.2

TECHNICAL MANUAL

DS-CLBV1-FRS4

DINGS
Precision Motion Specialist

CONTENTS

1. Preface

1.1 Product Warranty

- If a product quality issue occurs within one year of purchase (excluding cases caused by improper customer operation or use outside specified conditions), the defective product may be returned to us for handling after confirmation.
- For failures caused by improper operation or use outside specified conditions, or for any failure occurring more than one year after purchase, repair fees will be charged accordingly. If this product is used in a critical application, we recommend purchasing spare units to ensure continuous and stable system operation.
- When sending products for repair by mail, please ensure proper packaging. We cannot be held responsible for any additional damage incurred during transit.
- Repair typically requires several business days. We appreciate your understanding.

The following situations are NOT covered under the product warranty :

- Failures caused by use under conditions, environments, or operating methods other than those specified in our User Manual.
- Failures caused by modification, repair, or unauthorized disassembly by any party other than our company.
- Failures caused by use in ways other than those specified in the product specifications.
- Failures caused by reasons that could not have been reasonably predicted based on the scientific and technical knowledge available at the time of shipment.
- Failures caused by force majeure (natural disasters, war, etc.).

1.2 Usage Precautions

- Observe product rated values and use the product within the environmental conditions stated in this manual.
- Our products are not designed or manufactured for use in life-safety applications. If purchasing for special purposes, please consult and confirm with our sales representative in advance.
- We continuously strive for higher quality and customer confidence; however, when using our products, please always incorporate safety design measures such as redundant backup design, fire prevention design, and malfunction prevention design to avoid personal injury, fire, or other social harm caused by system design failures.
- Product specifications and technical parameters listed in this manual are for reference only.
- Specifications may change or be upgraded without prior notice for the purpose of continuous improvement.

1.3 Safety Precautions

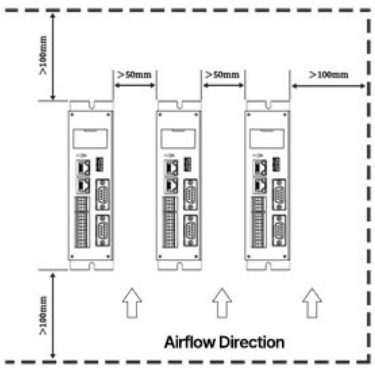
The following safety precautions are provided to ensure all users can operate the driver safely.

DANGER	Indicates that a hazardous situation exists which, if not avoided, WILL result in death or serious injury.
WARNING	Indicates that a hazardous situation exists which, if not avoided, COULD result in moderate or minor personal injury or property damage.
PROHIBITED	Indicates actions that MUST NOT be performed.
REQUIRED	Indicates actions that MUST be performed.

DANGER
• Do not touch the terminals or internal components while the unit is energized. Risk of electric shock.
• Do not forcibly pull, twist, or place heavy objects on cables. Risk of electric shock or fire.
• Do not touch any rotating parts while the motor is in operation. Risk of entanglement and injury.
• Do not touch the interior of the driver while powered on. Risk of electric shock.
• Do not touch terminal connections within 5 minutes of disconnecting power. Risk of electric shock.
• Always ground the driver and motor ground terminals. Risk of electric shock.
• Before moving, wiring, maintaining, or inspecting, confirm the power is off and all panel indicators are fully extinguished. Risk of electric shock.

WARNING
• Do not use in locations subject to water, oil, or chemical splatter, or where corrosive or flammable gases are present. Follow all requirements stated in this manual.
• Surfaces of the driver, motor, and peripheral equipment will become hot during operation. Do not touch them. Risk of burns.
• Use only the specified combination of motor and driver. Risk of fire.
• Do not touch the driver heatsink, motor, or other components immediately after power-off, as they may still be at high temperature. Risk of burns.
• Do not apply excessive pressure to the edges of the housing. Risk of deformation.
• Install the driver in a well-ventilated location that allows easy maintenance and inspection.
• If the ambient temperature exceeds 40°C, check ventilation or cooling equipment.

CAUTION
• Do not use or store the product in locations exposed to direct sunlight.
• Do not use or store the product where ambient temperature or humidity exceeds specified limits.
• Do not use or store the product in dusty environments.
• Do not use or store the product in locations subject to vibration or shock.
• Do not repair or modify the internal or external structure of the product without authorization.
• Do not install equipment with high heat generation or strong electromagnetic interference near the driver.

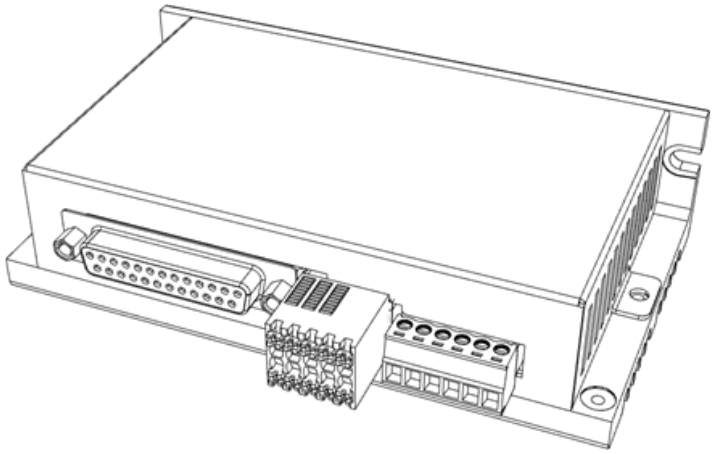
REQUIRED
• Before starting operation, confirm that the emergency stop switch can be activated at any time.
• Maintain a minimum installation clearance between drivers and other equipment. Provide as much space as possible.


2. Overview

2.1 Product Introduction

This high-performance, intelligent VCM motor driver offers simple control, ease of implementation, and broad applicability with stable, reliable quality and excellent performance. It features RS-485 communication supporting motion control and multiple digital I/O channels, with low heat generation, high speed, and low vibration and noise.

Product Overview



2.2 Features

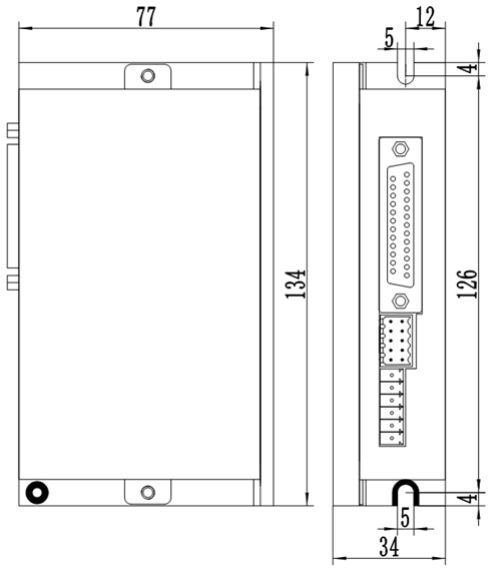
- Input power supply: DC 24V – 48V
- Maximum output current (peak): 4.5A
- 2-channel high-speed inputs (configurable as pulse/direction signals), 5 general-purpose input signals
- 4-channel outputs with photocoupler isolation
- RS-485 communication interface supporting MODBUS/RTU protocol
- Communication interface supports network configuration with up to 31 ID nodes
- Closed-loop control: supports pulse/direction mode, communication control mode, motion control, and multiple digital I/O
- Stable and precise current control with minimal motor heat generation
- Built-in protections: motor short-circuit, overcurrent, overvoltage, and undervoltage

2.3 Technical Specifications

Item		Details
Drive Model		DS-CLBV1-FRS4
Power Supply		DC 24V – 48V
Output Current		0.4A – 4.5A / phase
Input Signal	2-ch High speed Input signals	Configurable as pulse/direction signals. Optocoupler input voltage 3.5–26V, conduction current 5–8mA.
	5-ch General Input signals	Optocoupler input voltage 18–28V, conduction current 3–6mA.
Output Signal	4-ch Output signals	Photoelectric isolated output, max withstand voltage 30VDC, max saturation current 50mA.
Dimensions (excl. connectors)		134 × 77 × 34 mm
Weight		325g
Environment	Surrounding Air	Avoid corrosive gas
	Humidity	<85%RH, no condensation
	Operating Temperature	0 – 40°C
	Storage Temperature	-10 – 70°C
	Heat Dissipation	Install in a ventilated environment

2.4 External Dimensions

External Dimensions

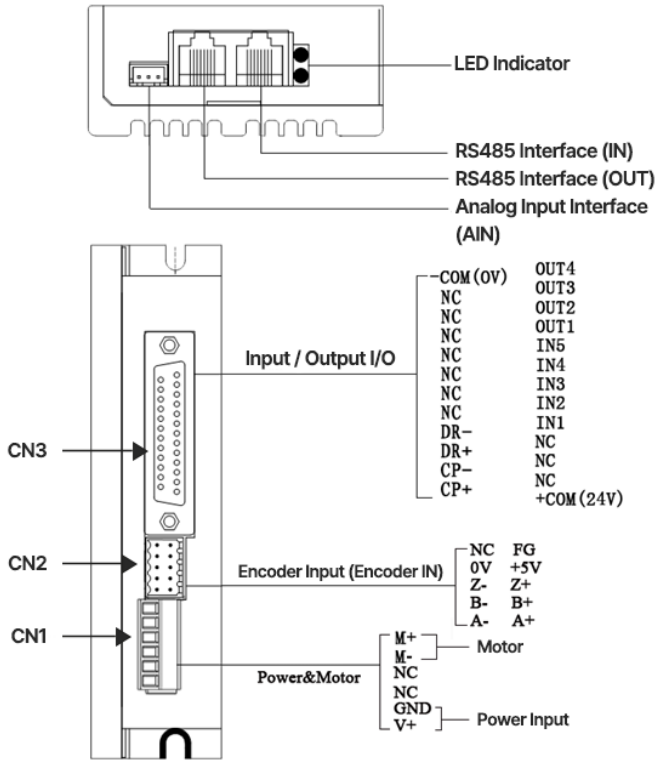


Note 1

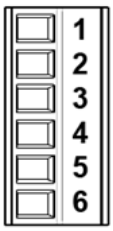
Mount on the narrow face using M3/M4 screws through the holes on both sides. Heat is generated by the driver power components. Under continuous operation at high input voltage and high output, enlarge the effective heat dissipation area or apply forced cooling. Do not use in locations without air circulation or where ambient temperature exceeds 40°C. Do not install the driver in humid or metal-dust-contaminated environments.

3. Interface Diagram and Definitions

Interface Diagram

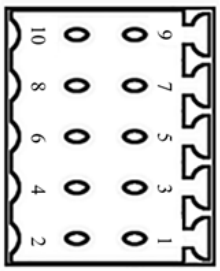


3.1 Power & Motor Interface — CN1 (Power & Motor)

Terminal	Diagram	Pin	Signal Name
CN1		1	Motor M+
		2	Motor M−
		3	NC
		4	NC
		5	Power GND
		6	Power V+

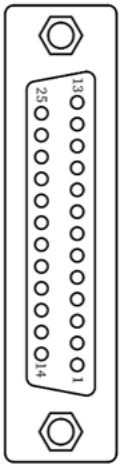
Note 2 Connect power and motor correctly. Pay attention to power supply polarity when wiring. (For wiring details, see Section 9.1 "Wiring Method 1")

3.2 Encoder Input Interface — CN2 (Encoder IN)

Terminal	Diagram	Pin	Signal Name
CN2		10	NC
		9	FG
		8	0V
		7	+5V
		6	Z-
		5	Z+
		4	B-
		3	B+
		2	A-
		1	A+

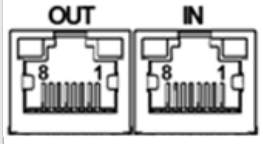
Note 3	Wire correctly and pay attention to power supply polarity. (For wiring details, see Section 9.2 "Wiring Method 2")
Note 4	The driver supplies +5V power to the encoder with a maximum current of 200mA.

3.3 Signal I/O Interface — CN3 (I/O)

Terminal	Diagram	Pin	Signal Name	Pin	Signal Name
CN3		1	+COM (24V)	2	NC
		3	NC	4	NC
		5	IN1	6	IN2
		7	IN3	8	IN4
		9	IN5	10	OUT1
		11	OUT2	12	OUT3
		13	OUT4	14	CP+
		15	CP−	16	DR+
		17	DR−	18	NC
		19	NC	20	NC
		21	NC	22	NC
		23	NC	24	NC
		25	−COM (0V)		

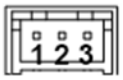
Note 5	Configure the required digital input and output signals. All general-purpose I/O are optocoupler-isolated. Prepare a separate +24V interface power supply.
Note 6	Encoder signals are differential output and are NOT optocoupler-isolated.

3.4 RS-485 Communication Interface — CN4 (IN) / CN5 (OUT)

Terminal	Diagram	Pin	Signal Name
CN4/5		1	NC
		2	GND
		3	A Input (RS485)
		4	NC
		5	GND
		6	B Input (RS485)
		7	120Ω Termination Resistor (CN5 RS485_OUT)
		8	120Ω Termination Resistor (CN5 RS485_OUT)

Note 7	Standard: RJ45 type ×2. The diagram shows pin positions as viewed facing the connector.
Note 8	When connecting multiple units in series, connect pins 3 and 8 of the last unit's CN5 together, and pins 6 and 7 together to enable termination resistor.
Note 9	CN4 does not include a termination resistor.
Note 10	Current via RS-485 communication setting (parameter 0241): 0.4–4.5A (peak). Default: 1.0A.
Note 11	Resolution via RS-485 communication setting (parameter 0242): 200–102400. Default: 10000.

3.5 Analog Input Interface — CN6 (Analog Input)

Terminal	Diagram	Pin	Signal Name
CN6		1	+5V
		2	AIN
		3	0V

Note 12	CN6 analog input interface — connect to the Hall feedback signal of the voice coil motor.

4. LED Indicators

This product has two LED indicators — one red, one green — to display operational status.

4.1 Status Display

Pattern: The indicator completes the corresponding number of blinks (0.5s low, 0.5s high) for each state, followed by a 2-second high level, then repeats.

Status	Indicator	Code	Description
Enable OFF	Green blinking	1	Enable disconnected; motor can run freely
Stopped	Green blinking	2	Enable active; motor is phase-locked but not running
Running	Green solid ON	3	Driver is in operation

4.2 Alarm Display

Pattern: The indicator completes the corresponding number of blinks (0.5s low, 0.5s high) for each alarm, followed by a 2-second high level, then repeats.

Alarm Type	Indicator	Code	Description
Motor Overcurrent	Red blink ×1	10	Motor phase current overcurrent or driver fault
Motor Phase Missing	Red blink ×2	11	Motor not connected
Motor Overcurrent (2)	Red blink ×5	12	Compensation count exceeded
Undervoltage	Red blink ×4	13	Supply input below 18V
Overvoltage	Red blink ×3	14	Supply input above 60V
Other Alarm	Other	Other	—

Warning Type	Indicator	Comm. Code	Description
Position Deviation	Red solid ON	25	Position deviation exceeds the set value

5. Input Power

5.1 Voltage

The maximum operating voltage range for this driver is 24–48VDC. A supply voltage of 24–48VDC is recommended.

A voltage-stabilizing capacitor can absorb current spikes on the power line and prevent erroneous driver protection trips. When operating at low voltage, it is recommended to connect a large stabilizing capacitor in parallel at the power input to prevent undervoltage alarms caused by power supply instability. Operation below 18V is not recommended as driver behavior may become unreliable.

When using a regulated power supply with a supply voltage close to 48V, voltage clamping at the power input is recommended to prevent the supply voltage from exceeding 48V and triggering an overvoltage alarm.

When using an unregulated power supply, ensure that the no-load output voltage does not exceed 34VDC. Since the rated current of an unregulated supply is the full-load current, the actual voltage at light load (e.g., when the motor is not running) can reach up to 1.4 times the rated voltage. Choose a lower supply voltage for smoother and quieter motor operation.

5.2 Current

The maximum supply current should equal the sum of both phase currents. In practice, the required current depends on the motor model, voltage, speed, and load conditions. The actual power supply current is significantly lower than this maximum because the driver uses a switching amplifier to convert a high-voltage, low-current signal into a low-voltage, high-current signal. Motor winding rated voltages are typically very low; the higher the driver supply voltage relative to the motor winding rated voltage, the lower the required supply current.

5.3 Regenerative Current

When a motor decelerates, it acts as a generator, converting kinetic energy from the load into electrical energy. Some energy is dissipated by the driver and motor. In applications with large loads operating at high speed, a considerable amount of kinetic energy may be converted to electrical energy. A simple linear power supply typically has a large capacitor to absorb this energy without damaging the system. A switching power supply may shut down under overvoltage conditions, and the excess energy fed back to the driver can trigger an overvoltage alarm or even damage the driver.

6. High-Speed Inputs

This driver provides IN6 and IN7 as 2-channel high-speed pulse input ports, configurable via communication as pulse or direction signals. Maximum pulse signal frequency: 200KHz; duty cycle: 50%; minimum pulse/direction signal width: 5μs. When an external pulse input signal is present, the communication function of IN6 and IN7 is disabled.

6.1 Pulse Signal: PUL

The driver port has a built-in optocoupler and can accept single-ended or differential signals from 5–24VDC. A transition from OFF to ON is interpreted as one valid pulse edge command. For common anode configuration, a low level is active; the driver will then drive the motor one step in accordance with the corresponding timing sequence. For normal operation, the active duty cycle of the valid level signal should not exceed 50%. To ensure reliable pulse response, the duration of the valid pulse level should be no less than 1μs. The signal response frequency of the driver is 500KHz; excessively high input frequencies may result in incorrect responses.

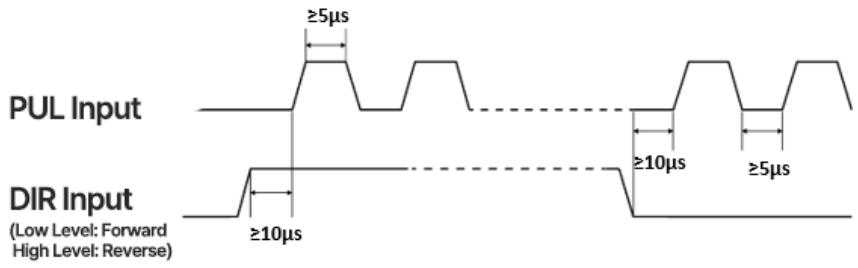
6.2 Direction Signal: DIR

Accepts single-ended or differential signals from 5–24VDC. The ON/OFF state of the internal optocoupler is interpreted as two motor rotation directions. A change in the direction signal causes the motor to reverse direction. A floating state on this terminal is equivalent to a high-level input. Note: the direction signal must be established at least 10μs before the pulse signal to prevent incorrect driver response. When reversing direction, always decelerate and stop the motor to the start frequency before reversing. The direction change signal must occur after the last PUL pulse of the previous direction and before the first PUL pulse of the new direction.

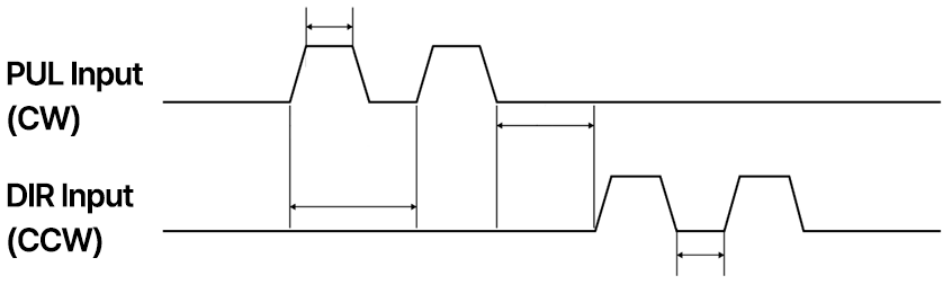
When no direction change is required, the direction signal terminal may be left floating.

6.3 Pulse/Direction Input Timing Diagram

Input Signal Waveform and Timing Diagram (Single-Pulse Mode)



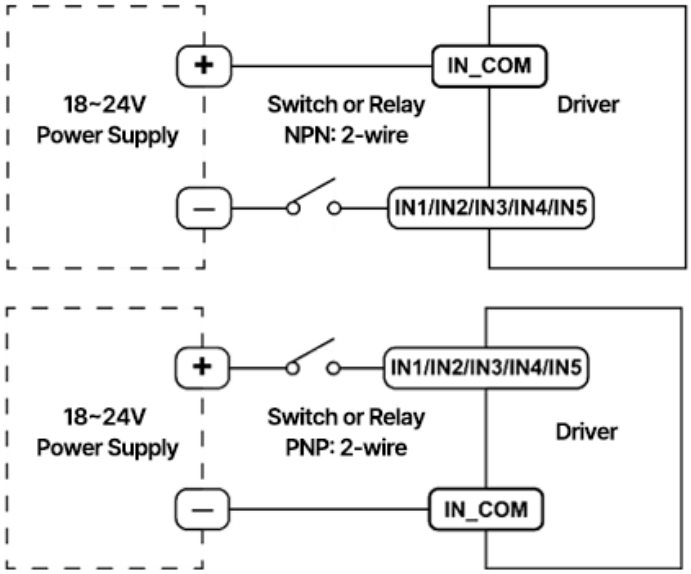
Input Signal Waveform and Timing Diagram (Dual-Pulse Mode)



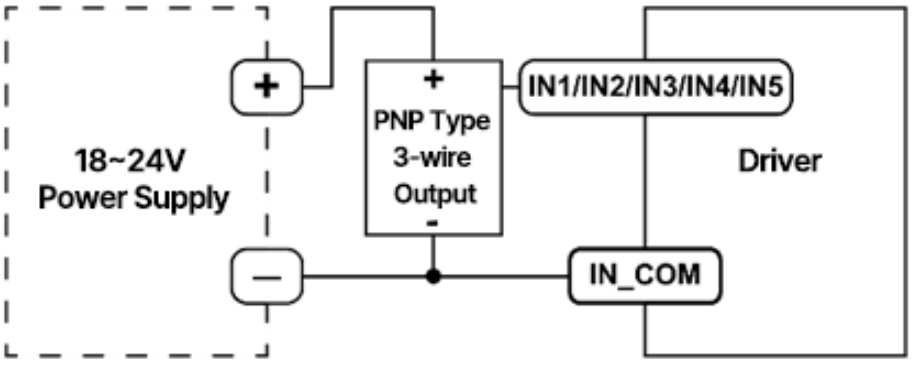
7. Typical Signal Wiring

7.1 Input Circuit Diagrams

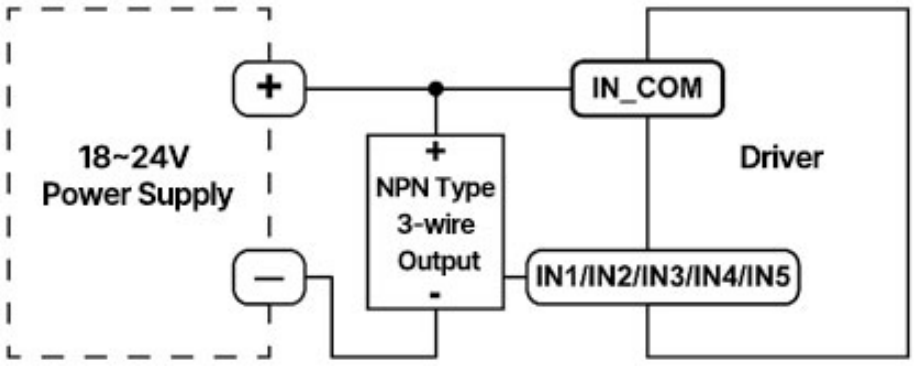
Switch / Relay Input Diagram



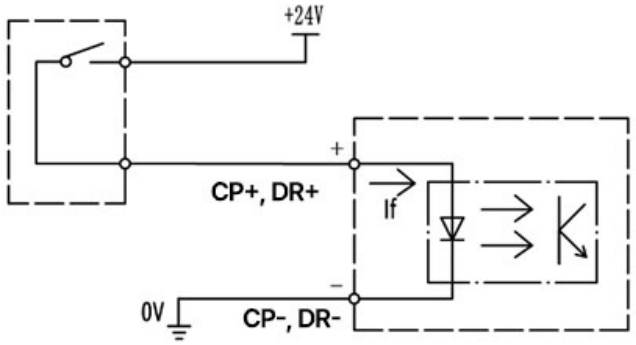
PNP Input Diagram



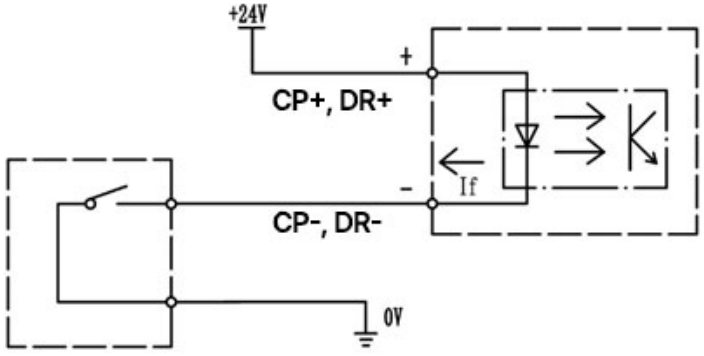
NPN Input Diagram



PNP Input Diagram



NPN Input Diagram

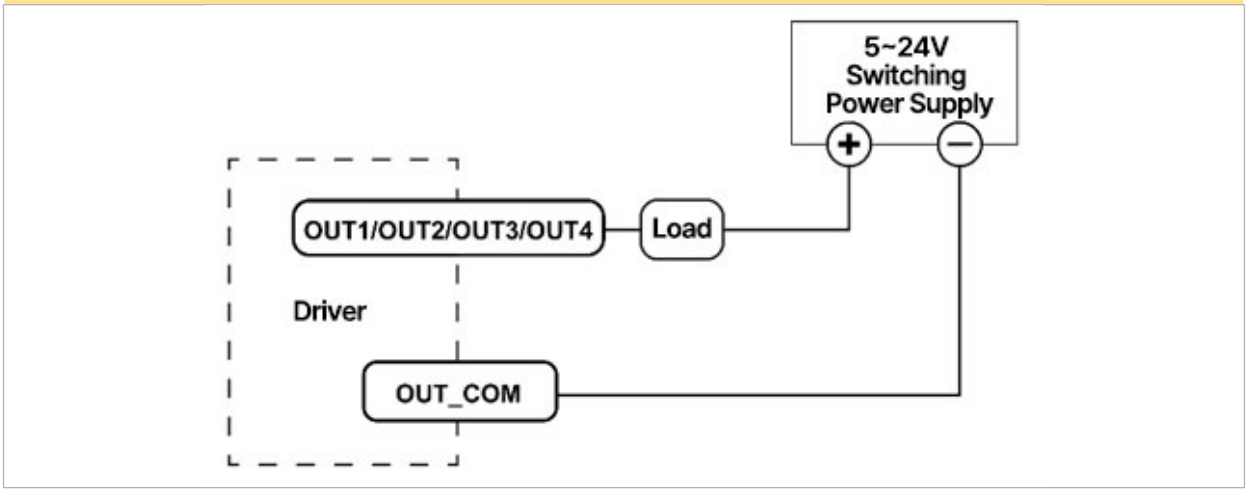


Note 13

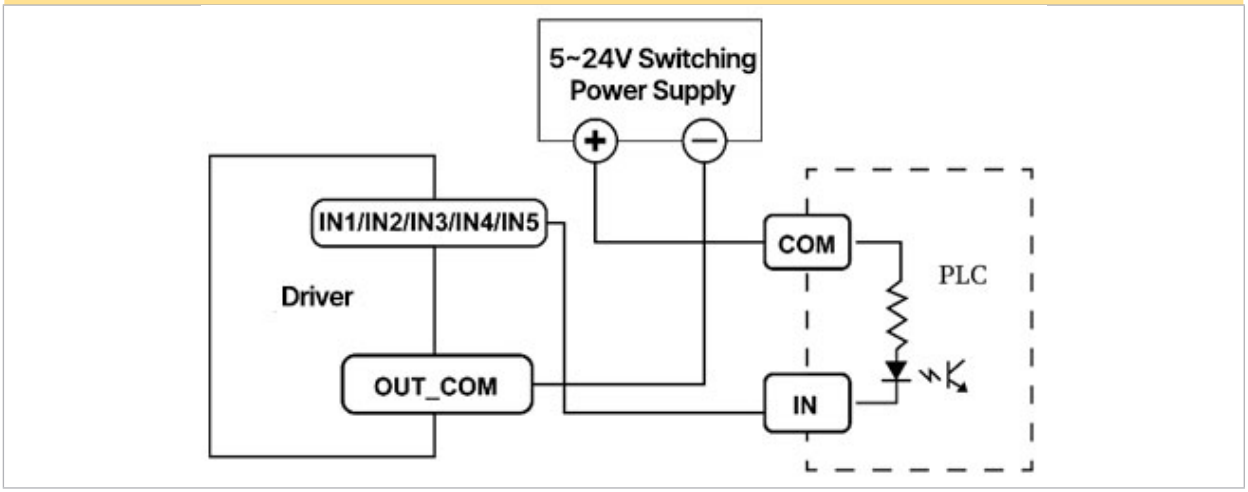
This product is compatible with +5V/+24V signals. No series current-limiting resistor is required when using 24V input.

7.2 Output Circuit Diagrams

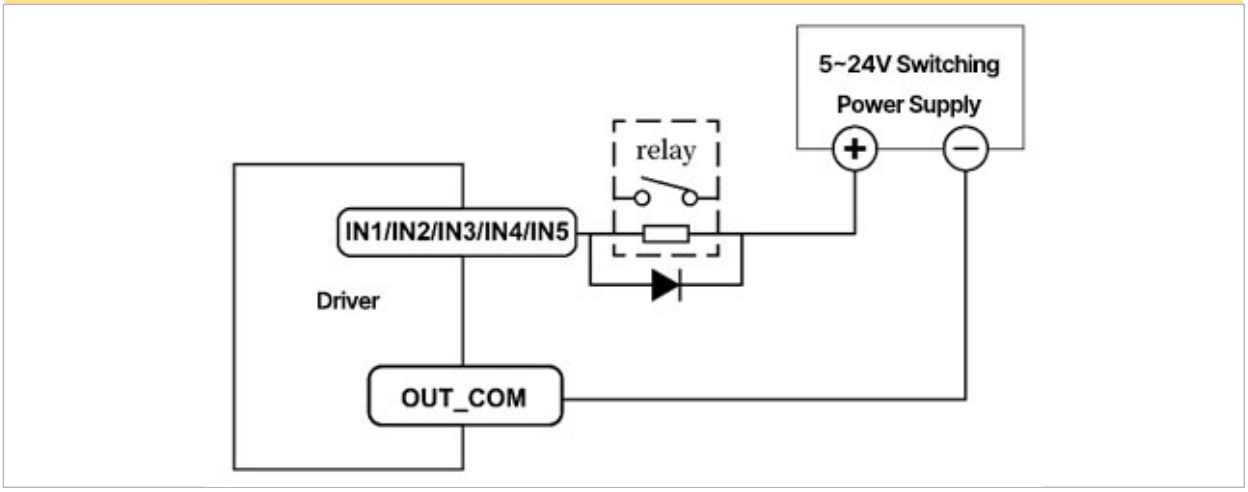
PNP Output Diagram



PNP Output Connected to PLC Input Terminal



Output Signal Connected to Relay



8. Motor Connection

WARNING: Before connecting a motor to the driver, confirm that the driver power is OFF. Confirm that unused motor leads are not short-circuited with other objects. Do NOT disconnect the motor while the driver is powered on.

This driver can ONLY drive VCM (voice coil) motors. It cannot drive other types of DC motors.

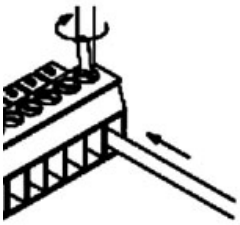
※ Wire colors shown in the connection diagrams are for reference only as they represent common industry conventions. Refer to the motor specification sheet for the actual wiring.

9. Wiring Requirements

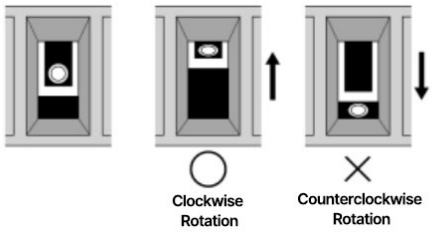
9.1 Wiring Method 1

Strip the wire insulation, insert the wire into the terminal until it contacts the terminal block, then tighten the screw clockwise to secure the wire.

Wiring Diagram



Counterclockwise Rotation

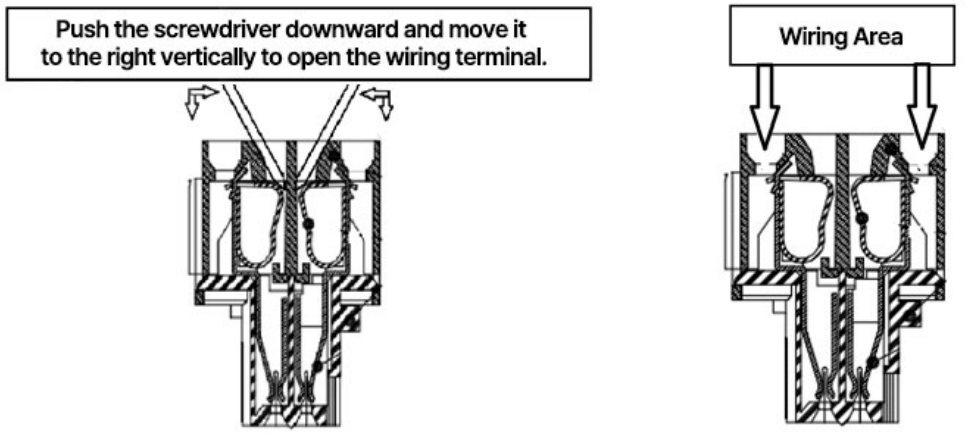


Note 14 Due to the terminal structure, tightening counterclockwise may result in poor contact. If this occurs, remove the wire, inspect the terminal hole, and re-wire.

9.2 Wiring Method 2

Strip the wire insulation, use a standard flat-head screwdriver to open the contact area, insert the wire, then remove the screwdriver — the wire will be secured automatically.

Wiring Diagram



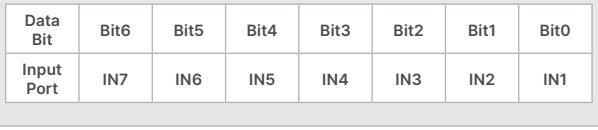
9.3 Precautions

- Connect the power supply correctly. Pay attention to polarity. Before energizing, confirm that all motor and power connectors are properly connected.
- Do not pre-tin wire ends with solder before stripping — this may prevent proper connection.
- When wiring, ensure the conductor strands are not twisted, and keep exposed conductors covered to prevent short circuits.
- Connect conductors directly without soldering — vibration can cause wire breakage in soldered connections.
- Strictly prohibit inserting tinned wire ends into terminal blocks — increased contact resistance may cause overheating and terminal damage.
- Do not allow wire ends to protrude outside the terminal — accidental short circuits may damage the driver.
- Strictly prohibit disconnecting or connecting the driver's high-power (motor and power) terminals while energized. Even when a powered motor is stationary, large current flows through the coil; disconnecting high-power terminals under power will generate a momentary back-EMF spike that can destroy the driver.
- Use dedicated tools to tighten terminal connections.
- Do not apply mechanical stress to wires after wiring.
- To prevent driver interference, use shielded cables for control signals. Connect the shielding layer to ground. Unless otherwise specified, ground the shield at the host controller end only, and leave the driver end floating. Within the same machine, connect to a single earth ground point only. If the connection is not a true earth ground, do not connect the shielding layer.
- When one power supply feeds multiple drivers, connect them in parallel from the supply. Daisy-chain (series) connections are not permitted.

10. Control Parameters

Note 15	These are unofficial communication parameters. Some parameters are fixed and not disclosed.
Note 16	The contents of Section 10 'Control Parameters' reflect factory default settings and are for reference only.

10.1 Controller Basic Status (Category 01)

Addr	Word	Content	Details	Range / Unit
0100	1	Motor Current	Real-time motor current value	0.1% A
0101	1	Input Voltage	Current input voltage	1% V
0104	2	Set Resolution	Configured resolution value	ppr
0106	1	Pulse Mode	1: Pulse+Direction; 2: Dual Pulse	1–2
0108	1	Fault Code	Alarm code (see Section 4.2); '0' = no fault	—
0109	1	Run Status	Driver run status (see Section 4.1)	—
0110	1	Hardware Version	Driver hardware version	—
0111	1	Software Version	Driver software version	—
0117	2	Current Position	Target position	pulse
0119	1	Actual Speed	—	0.01 rps
0126	1	Actual Position	Real-time position during operation	pulse
0174	1	IO-Selected Multi-Step Segment	—	—
0176	1	Multi-Step Write Error No.	—	—
0178	1	Multi-Step Run No.	—	—
0135	1	Input Port Status		—
0136	1	Output Port Status		—

10.2 Basic Parameter Settings (Category 02)

Addr	Word	Content	Details	Range / Unit
0201	1	Motor Direction	Select motor rotation direction	0–1
0213	1	Half-Current Ratio	Standstill current ratio (valid in open-loop mode)	10%–120%

Addr	Word	Content	Details	Range / Unit
0217	1	Motor Control Mode	0: Open-loop 1: Closed-loop Default: 1	0–1
0224	1	Angle Filter	Smaller value = smoother motion but higher latency	1–700
0234	1	Digital Filter	Input pulse filter coefficient; larger value = lower input frequency response	1–15
0241	1	Input Current	Current setting	400–4500 (0.4A–4.5A)
0242	2	Set Resolution	Pulses per revolution	200–102400 ppr
0244	1	Pulse Mode	1: Pulse+Direction 2: Dual Pulse	1–2
0296	1	Run Mode Selection	1: Internal pulse 0: External pulse 4: Analog speed control Default: 0 Note: Power cycle required after changing.	0–4
0298	1	Communication Address	Default: 1	1–255
0299	2	Communication Baud Rate	Default: 19200	1600–115200

10.3 Closed-Loop Parameter Settings (Category 04)

Addr	Word	Content	Details	Range / Unit
0246	1	Encoder Resolution	Resolution = encoder line count × 4	200–65535
0247	2	In-Position Pulse Width	Proximity distance to target position at which the in-position signal is output. Default: 0	1–1000 (encoder resolution)
0251	1	Velocity Loop Kp	Velocity loop proportional gain	0–30000
0252	1	Velocity Loop Ki	Velocity loop integral gain	0–30000
0255	1	Position Loop Kp	Position loop proportional gain	0–30000
0258	1	Position Deviation Threshold	In units of encoder resolution	0–30000 (encoder resolution)

10.4 Control Parameters (Category 05)

Addr	Word	Content	Details	Range / Unit
0274	1	Analog Speed Control Maximum	Maximum value for analog speed control	1–30000 (-0.1–3000.0Hz)
0301	1	Start Frequency	Default: 100	1–2000 (0.01–20 rps)
0302	1	Stop Frequency	Default: 100	1–2000 (0.01–20 rps)
0303	1	Acceleration	Default: 100	5–10000 rps²
0304	1	Deceleration	Default: 100	5–10000 rps²
0305	1	Homing Mode	0: CW homing 1: CCW homing 2: CW limit 3: CCW limit	0–4
0306	1	Fixed-Travel Run Speed	Default: 1000	1–5000 (0.01–50 rps)
0307	1	Velocity Mode Run Speed	Direction in velocity mode follows speed sign. Default: 1000	-5000–5000 (-50–50 rps)

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Precision Motion Specialist

Addr	Word	Content	Details	Range / Unit
0308	1	Jog Speed	Default: 100	1–5000 (0.01–50 rps)
0309	1	Homing Speed	Default: 200	1–5000 (0.01–50 rps)
0310	1	Homing Creep Speed	Speed after reaching origin. Default: 100	1–5000 (0.01–50 rps)
0311	2	Homing Offset	Default: 0	-2,000,000,000–2,000,000,000 pulse
0313	2	Output Pulses	Travel distance. Absolute mode: move to specified position. Relative mode: move by set offset. Default: 0	-2,000,000,000–2,000,000,000 pulse
0317	2	Positive Soft Limit	Default: 2,000,000,000. Invalid during homing.	-2,000,000,000–2,000,000,000 pulse
0319	2	Negative Soft Limit	Default: -2,000,000,000. Invalid during homing.	-2,000,000,000–2,000,000,000 pulse
0321	2	Set Current Position	Default: 0	-2,000,000,000–2,000,000,000 pulse
0323	1	Control Command	0: None 1: Absolute run — move to set distance; direction determined by sign; target position can be modified during run 2: Relative run — run set distance at set speed; direction determined by sign 3: Velocity mode 4: Forward jog 5: Reverse jog 6: Deceleration stop 7: Emergency stop 8: Set current position (motor must be stopped) 12: Return to home 13: Alarm reset 14: Multi-step data verify 15: Multi-step data save 16: Multi-step start 17: Multi-step pause 18: Multi-step end Default: 0	0–29
0324	1	Internal Control Switch	**Data Bit** / **Bit1** / **Bit0** **Function** / **Negative Soft Limit** / **Positive Soft Limit** 1: Enable, 0: Disable. Default: 0	0–65535
0327	1	Multi-Step Segment Count	Default: 1	1–32
0328	1	Multi-Step Selection	Default: 0. If IO port is configured for multi-step selection, IO configuration takes priority.	0–31

Note 17

The speed parameter range only indicates the data range accepted by the controller and does not represent the actual achievable speed (high-speed operation). The actual speed is limited by the following factors:

- Maximum response speed of the motor
- Maximum control frequency of the controller (automatically limited when exceeded)

Therefore, for high-speed operation, debugging should start with the minimum microstep setting. For ultra-low-speed operation, debugging should start with the maximum microstep setting.

10.5 Input Block Assignment (Category 06)

Addr	Word	Content	Details	Range / Unit
0400	1	IN1 Function	0: None 1: Absolute run 2: Relative run 3: Velocity mode 4: Forward jog 5: Reverse jog 6: Decel stop 7: Emergency stop 8: Set current position (motor stopped only) 9: Positive limit 10: Negative limit 11: Origin signal 12: Return to home 13: Alarm reset 14: Multi-step data verify 15: Multi-step data save 16: Multi-step start 17: Multi-step pause 18: Multi-step end 20: Enable 25: IO port multi-step select Bit0 26: IO port multi-step select Bit1 27: IO port multi-step select Bit2 28: IO port multi-step select Bit3 29: IO port multi-step select Bit4 Default: 0	0–30
0401	1	IN2 Function	Same options as IN1 (Default: 0)	0–30
0402	1	IN3 Function	Same options as IN1 (Default: 0)	0–30
0403	1	IN4 Function	Same options as IN1 (Default: 0)	0–30
0404	1	IN5 Function	Same options as IN1 (Default: 0)	0–30
0405	1	IN6 Function (CP Port)	Same options as IN1 (Default: 0). Port function disabled when external pulse is active.	0–30
0406	1	IN7 Function (DR Port)	Same options as IN1 (Default: 0). Port function disabled when external pulse is active.	0–30
0429	1	General Digital Input Logic	—	—
0410	1	Virtual Comm. IN1	0: OFF (initial: 0) 1: ON (triggers IN1 action)	0–1
0411	1	Virtual Comm. IN2	0: OFF (initial: 0) 1: ON (triggers IN2 action)	0–1
0412	1	Virtual Comm. IN3	0: OFF (initial: 0) 1: ON (triggers IN3 action)	0–1
0413	1	Virtual Comm. IN4	0: OFF (initial: 0) 1: ON (triggers IN4 action)	0–1
0414	1	Virtual Comm. IN5	0: OFF (initial: 0) 1: ON (triggers IN5 action)	0–1
0415	1	Virtual Comm. IN6	0: OFF (initial: 0) 1: ON (triggers IN6 action)	0–1
0416	1	Virtual Comm. IN7	0: OFF (initial: 0) 1: ON (triggers IN7 action)	0–1

10.6 Output Block Assignment (Category 07)

Addr	Word	Content	Details	Range / Unit
0420	1	OUT1 Function	100: General port 101: Alarm output — output signal when no alarm; no signal when alarm active 102: In-position signal 103: Enable control output — output signal when offline; no signal when enabled (Default: 101)	100–104
0421	1	OUT2 Function	Same as OUT1 (Default: 100)	100–104
0422	1	OUT3 Function	Same as OUT1 (Default: 100)	100–104
0423	1	OUT4 Function	Same as OUT1 (Default: 100)	100–104
0428	1	General Digital Output Control	For port function 100 **Data Bit** Bit3 Bit2 Bit1 Bit0 **Output Port** OUT4 OUT3 OUT2 OUT1	—
0430	1	Digital Output Logic	Corresponding output port logic **Data Bit** Bit3 Bit2 Bit1 Bit0 **Output Port** OUT4 OUT3 OUT2 OUT1	—

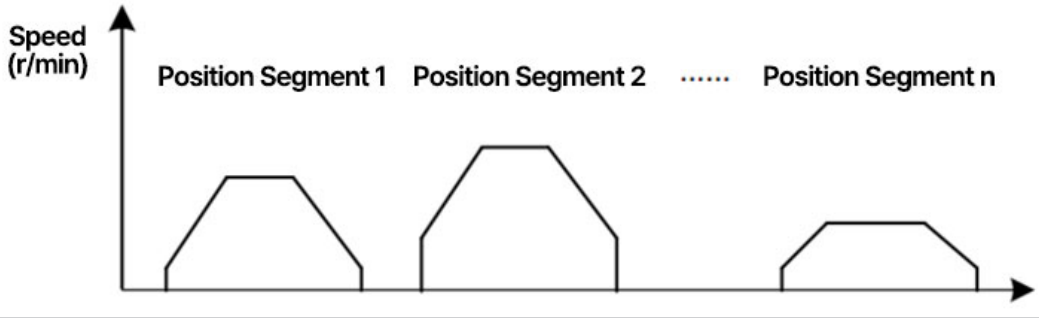
10.7 Multi-Step Position Mode (Category 08)

Multi-step address range: 1024–1536. Up to 256 data entries can be configured.

Cmd Code	Word	Content	Details	Range / Unit
1	2	Absolute Run	Param 1: Run position. Default: 0	-2,147,483,647 ~ 2,147,483,647 pulse
2	2	Relative Run	Param 1: Run distance. Default: 0	-2,147,483,647 ~ 2,147,483,647 pulse
51	1	Start Speed	Default: 100	1–2000 (0.01–20 rps)
53	1	Stop Speed	Default: 100	1–2000 (0.01–20 rps)
54	1	Fixed-Travel Speed	Default: 1000	1–5000 (0.01–50 rps)
61	1	Acceleration	Default: 100	5–10000 rps^2
62	1	Deceleration	Default: 100	5–10000 rps^2
65	2	Wait & Jump	A (high 8-bit) / B (low 8-bit) / C (low 16-bit): A = fixed 0; B = jump address; C = wait time	—
66	2	Jump Sequence	A (high 16-bit) / B (low 16-bit): A = loop count; B = jump address	—
100	1	Multi-Step End	Each segment must end with this termination code.	—

The multi-step position mode function combines multiple position segments in a defined sequence, triggered by external IO signals to complete a series of position operations. It can be regarded as a multi-segment combination of position mode; users can pre-store the description parameters for each segment (acceleration/deceleration, pulse count, etc.) in EEPROM, and a single trigger signal is sufficient to execute the sequence.

Multi-Position Operation Mode Diagram



Port-to-Multi-Step Mapping

Bit4	Bit3	Bit2	Bit1	Bit0	Segment
0	0	0	0	0	1
0	0	0	0	1	2
0	0	0	1	0	3
0	0	0	1	1	4
...	...	...	...	...	...
1	1	1	0	1	30
1	1	1	1	0	31
1	1	1	1	1	32

IO Port Selection

1. Configure the input port functions for multi-position selection (25~29): Assign multi-position selection Bit0 ~ Bit4 to the IO ports. Configure input port function 15 as the multi-position start function: Multi-position data start.
2. Select the corresponding multi-position through the ports

   Example:

   IN1 port function configuration 25 → Bit0

   IN3 port function configuration 26 → Bit1

   The functions of IN1 ~ IN7 can be configured as required.

IN3 Bit1	IN1 Bit0	Segment
0	0	1
0	1	2
1	0	3
1	1	4

Note 18	'1' in the table indicates an active maintained signal. Segment selection signals must be set at least 20ms before the start signal.

- **Example: Multi-Step Parameter Write, Verify, and Save**

Note 19	All data in this example is expressed in hexadecimal.

1. Multi-Step Parameter Configuration

Command 1 — Row 0: Set Fixed-Travel Speed to 1000 (= 10 rps)

01	10	04 00	00 02	04	00 36	03 e8	21 DF
①	②	③	④	⑤	⑥	⑦	⑧

① Communication address: 0×01

② MODBUS write command: 0×10

③ Register address: 0×0400 (decimal: 1024)

④ Number of data: 2

⑤ Byte count: 4

⑥ Data 1 — fixed-travel speed command: 0×0036 (decimal: 54)

⑦ Data 2 — fixed-travel speed value: 0×03E8 (decimal: 1000)

⑧ CRC checksum

Command 2 — Row 1: Relative run, distance = 10,000 pulses

01	10	04 02	00 03	06	00 02	27 10 00 00	20 CB
①	②	③	④	⑤	⑥	⑦	⑧

① Communication address: 0×01

② MODBUS write command: 0×10

③ Register address: 0×0402 (decimal: 1026)

④ Number of data: 3

⑤ Byte count: 6

⑥ Data 1 — relative run command: 0×0002 (decimal: 2)

⑦ Data 2 — run pulse count: 0×2710 (decimal: 10000)

⑧ CRC checksum

Command 3 — Row 2: Wait 1000ms

01	10	04 05	00 03	06	00 41	03 E8 00 03	1F DE
①	②	③	④	⑤	⑥	⑦	⑧

① Communication address: 0×01

② MODBUS write command: 0×10

③ Register address: 0×0405 (decimal: 1029)

④ Number of data: 3

⑤ Byte count: 6

⑥ Data 1 — wait & jump command: 0×0041 (decimal: 65)

⑦ Data 2: Convert data 03 E8 00 03 to 00 (A) 03 (B) 03E8 (C)

*Note: For 4-byte data, the lower 16 bits come first, followed by the upper 16 bits.
Parameter A: Reserved by system, default is 0. Do not set a value.
Parameter B: Jump to line 3; current wait command is at line 2.
Parameter C: Wait time 0×03E8 (decimal: 1000ms)

⑧ CRC checksum

Command 4 — Row 4: End operation

01	06	04 0B	00 64	F8 D3
①	②	③	④	⑤

① Communication address: 0×01

② MODBUS write command: 0×06

③ Register address: 0×040B (decimal: 1035)

④ Data: Segment end code = 0×64 (decimal: 100)

⑤ CRC checksum

2) Multi-Step Parameter Verification

01	06	01 43	00 0E	F8 26
①	②	③	④	⑤

① Communication address: 0×01

② MODBUS write command: 0×06

③ Register address: 0×0143 (decimal: 323, communication write command)

④ Data: Multi-step data verify = 0×0E (decimal: 14)

⑤ CRC checksum

3) Multi-Step Parameter Save

※ Data must be successfully verified before saving; otherwise data cannot be saved properly.

01	06	01 43	00 0F	39 E6
①	②	③	④	⑤

① Communication address: 0×01

② MODBUS write command: 0×06

③ Register address: 0×0143 (decimal: 323, communication write command)

④ Data: Multi-step data save = 0×0F (decimal: 15)

⑤ CRC checksum

11. Appendix

MODBUS/RTU Protocol Manual

12. Revision History

Version	Date	Change Details
V1.0	2025-05-19	—
V1.1	2025-05-22	—
V1.2	2025-05-26	—

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Catalog Issued: May 2026