

## STEPPERONLINE 17HS24-2004D-E1K, CL42T V4.1

# STEPPERONLINE Closed Loop Stepper Motor 1 Axis CNC Kit Instruction Manual

Models: 17HS24-2004D-E1K (Motor), CL42T V4.1 (Driver)

## 1. INTRODUCTION

This manual provides essential instructions for the installation, operation, and maintenance of your STEPPERONLINE Closed Loop Stepper Motor 1 Axis CNC Kit. This kit is designed for precision motion control applications, offering enhanced accuracy and reliability compared to open-loop systems. Please read this manual thoroughly before using the product to ensure correct setup and optimal performance.

## 2. PRODUCT OVERVIEW

The STEPPERONLINE Closed Loop Stepper Motor 1 Axis CNC Kit combines a high-torque Nema 17 stepper motor with an integrated encoder and a compatible closed-loop stepper driver. This system provides real-time position feedback, preventing step loss and ensuring precise positioning for various applications such as 3D printers, CNC machines, carving machines, dispensers, and other automation equipment.

### 2.1 Kit Components

- 1 x Nema 17 Closed Loop Stepper Motor (Model: 17HS24-2004D-E1K) with Encoder 1000PPR (4000CPR)
- 1 x Closed Loop Stepper Driver (Model: CL42T-V4.1) 0-3.0A, 24-48VDC
- 1 x RS232 Debugging Cable (Model: CABLE-PC-1)



**Figure 1:** Complete STEPPERONLINE Closed Loop Stepper Motor 1 Axis CNC Kit. This image displays all components included in the kit: the Nema 17 closed-loop stepper motor, the CL42T closed-loop stepper driver, and the RS232 debugging cable.

### 3. SPECIFICATIONS

#### 3.1 Motor Specifications (17HS24-2004D-E1K)

- **Number of Phases:** 2
- **Step Angle:** 1.8 degrees
- **Holding Torque:** 80 Ncm (113.29 oz.in)
- **Rated Current/Phase:** 2.0 A
- **Phase Resistance:** 1.3 ohms
- **Inductance:** 2.7 mH  $\pm$  20% (1KHz)
- **Frame Size:** 42 x 42 mm
- **Body Length:** 80 mm
- **Shaft Diameter:**  $\Phi$ 5 mm
- **Shaft Length:** 24 mm
- **D-Cut Shaft Length:** 15 mm
- **Lead Length:** 500 mm



**Figure 2:** Nema 17 Closed Loop Stepper Motor (17HS24-2004D-E1K). This image shows the stepper motor with its integrated encoder and output shaft.



**Figure 3:** Nema 17 Closed Loop Stepper Motor highlighting the highly flexible cable. This image emphasizes the durability and flexibility of the motor's connecting cable, designed to withstand repeated bending.

### 3.2 Encoder Specifications

- **Output Circuit Type:** Differential type
- **Encoder Type:** Optical Incremental
- **Encoder Resolution:** 1000 PPR (4000 CPR)
- **Output Signal Channels:** 2 channels
- **Supply Voltage:** 5V (Min/Max)
- **Output High Voltage:** <4V
- **Output Low Voltage:** <1V

### 3.3 Driver Specifications (CL42T-V4.1)

- **Output Peak Current:** 0~3A
- **Input Voltage:** +24~48VDC (Typical 24VDC)
- **Logic Signal Current:** 7~16mA (Typical 10mA)
- **Pulse Input Frequency:** 0~200kHz

- **Pulse Width:** 2.5  $\mu$ S
- **Debugging Interface:** RS232 available
- **Features:** Low noise and vibration, smooth motion
- **Protections:** Over voltage, over current, position following error



**Figure 4:** CL42T Closed Loop Stepper Driver. This image displays the driver unit, showing its various input/output terminals and DIP switches for configuration.

### 3.4 General Specifications

- **Package Dimensions:** 9.84 x 7.09 x 3.54 inches
- **Weight:** 2.4 Pounds
- **Manufacturer:** STEPPERONLINE

## 4. SETUP AND INSTALLATION

### 4.1 Power Supply Requirements

- The driver requires a DC power supply between 24VDC and 48VDC. A typical operating voltage is 24VDC.
- Ensure the power supply can provide sufficient current for the motor's peak current requirements (up to 3A).
- Connect the power supply to the +VDC and GND terminals on the driver. Observe polarity.

### 4.2 Wiring Connections

Carefully connect the motor, encoder, and control signals to the CL42T driver as described below. Refer to Figure 4 for terminal locations on the driver.

- **Motor to Driver:** Connect the motor phase wires (A+, A-, B+, B-) to the corresponding terminals on the driver. Ensure correct phase matching.
- **Encoder to Driver:** The motor's integrated encoder connects directly to the driver's encoder input port. This connection is crucial for closed-loop operation.

- **Control Signals:** Connect your controller's pulse (PUL+ / PUL-), direction (DIR+ / DIR-), and enable (ENA+ / ENA-) signals to the driver. Use differential connections for noise immunity.
- **Alarm Output:** The ALM/P and COM terminals provide an alarm output for error conditions.
- **Brake Output:** The BRK and COM terminals provide a brake output, if applicable to your system.



**Figure 5:** RS232 Debugging Cable (CABLE-PC-1). This cable is used to connect the CL42T driver to a computer for advanced configuration and debugging via RS232 interface.

## 5. OPERATION

### 5.1 Driver Configuration (DIP Switches)

The CL42T driver features DIP switches (SW1-SW8) for configuring microstep resolution, output current, and control mode. Ensure the power is off before changing DIP switch settings.

#### 5.1.1 Microstep Resolution Setting (SW1-SW4)

Set the desired microstep resolution using DIP switches SW1 to SW4 according to the table below. 'on' typically means the switch is down, 'off' means up.

Pulse/rev	SW1	SW2	SW3	SW4
Default	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on

Pulse/rev	SW1	SW2	SW3	SW4
25600	on	off	off	on
51200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
8000	off	off	on	off
10000	on	on	off	off
20000	off	on	off	off
40000	on	off	off	off
80000	off	off	off	off

### 5.1.2 Output Current Setting (SW5-SW7)

Adjust the output peak current using DIP switches SW5 to SW7. Select a current setting appropriate for your motor to prevent overheating and ensure optimal performance.

Peak Current	RMS Current	Code	SW5	SW6	SW7
0.8A	0.6A	0-3	on	on	on
1.4A	1A	4-7	off	on	on
2.1A	1.5A	8-B	on	off	on
2.8A	2A	C-F	off	off	on

### 5.1.3 Control Mode Setting (SW8)

SW8 configures the control mode and pulse input type. For closed-loop operation, ensure SW8 is set to 'ON'.

SW8 Setting	Control Mode	Direction Mode	Pulse Input Mode
ON	Closed Loop	CCW	Pulse/Direction
OFF	Open Loop	CW	CW/CCW

## 5.2 Control Signals

- **PUL (Pulse):** Input signal for motor movement. Each pulse corresponds to a microstep.
- **DIR (Direction):** Input signal for motor rotation direction. High or low state determines direction.
- **ENA (Enable):** Input signal to enable or disable the driver. When disabled, the motor is free-spinning.

## 6. MAINTENANCE

- **Cleaning:** Keep the driver and motor free from dust and debris. Use a soft, dry cloth for cleaning. Avoid liquid cleaners.
- **Ventilation:** Ensure adequate airflow around the driver to prevent overheating. Do not obstruct ventilation

holes.

- **Connections:** Periodically check all wiring connections for tightness and integrity. Loose connections can lead to intermittent operation or damage.
- **Environment:** Operate the kit within its specified temperature and humidity ranges.

## 7. TROUBLESHOOTING

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- **Motor Not Moving:**
  - Check power supply voltage and current.
  - Verify PUL, DIR, and ENA signal connections and levels from the controller.
  - Ensure DIP switch settings for current and microsteps are correct.
  - Check motor wiring for correct phase connections.
- **Motor Overheating:**
  - Reduce the output current setting via DIP switches (SW5-SW7).
  - Ensure adequate heat dissipation and ventilation.
  - Verify the motor load is within its torque capabilities.
- **Motor Vibrates/Makes Noise:**
  - Check for loose mechanical connections.
  - Verify microstep settings. Higher microsteps generally lead to smoother operation.
  - Ensure motor phase wiring is correct.
- **Loss of Steps/Position Error:**
  - Confirm SW8 is set to 'ON' for closed-loop operation.
  - Check encoder connections for integrity.
  - Ensure the motor is not overloaded.
  - Use the RS232 debugging interface to check for specific error codes if available.

## 8. WARRANTY AND SUPPORT

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