

STEPPERONLINE 23HS45-4204S1

STEPPERONLINE Nema 23 Stepper Motor Instruction Manual

Model: **23HS45-4204S1**

1. INTRODUCTION

Thank you for choosing the STEPPERONLINE Nema 23 Stepper Motor, Model 23HS45-4204S1. This manual provides essential information for the proper installation, operation, and maintenance of your stepper motor. Please read this manual thoroughly before using the product to ensure safe and efficient performance.

2. PRODUCT OVERVIEW

The STEPPERONLINE Nema 23 Stepper Motor (Model 23HS45-4204S1) is a high-performance bipolar stepper motor designed for various applications, including CNC machines, 3D printers, and engraving equipment. It features a robust construction and delivers significant holding torque for precise motion control.

- **High Torque:** 3.0Nm (425oz.in) holding torque for demanding applications.
- **Standard Nema 23 Frame:** 57x57mm frame size for compatibility.
- **8mm Shaft:** Features an 8mm diameter shaft, differing from standard 10mm shafts.
- **4-Wire Bipolar:** Simple and reliable 4-wire connection for bipolar operation.
- **Precision Step Angle:** 1.8 degrees per step, providing 200 steps per revolution.

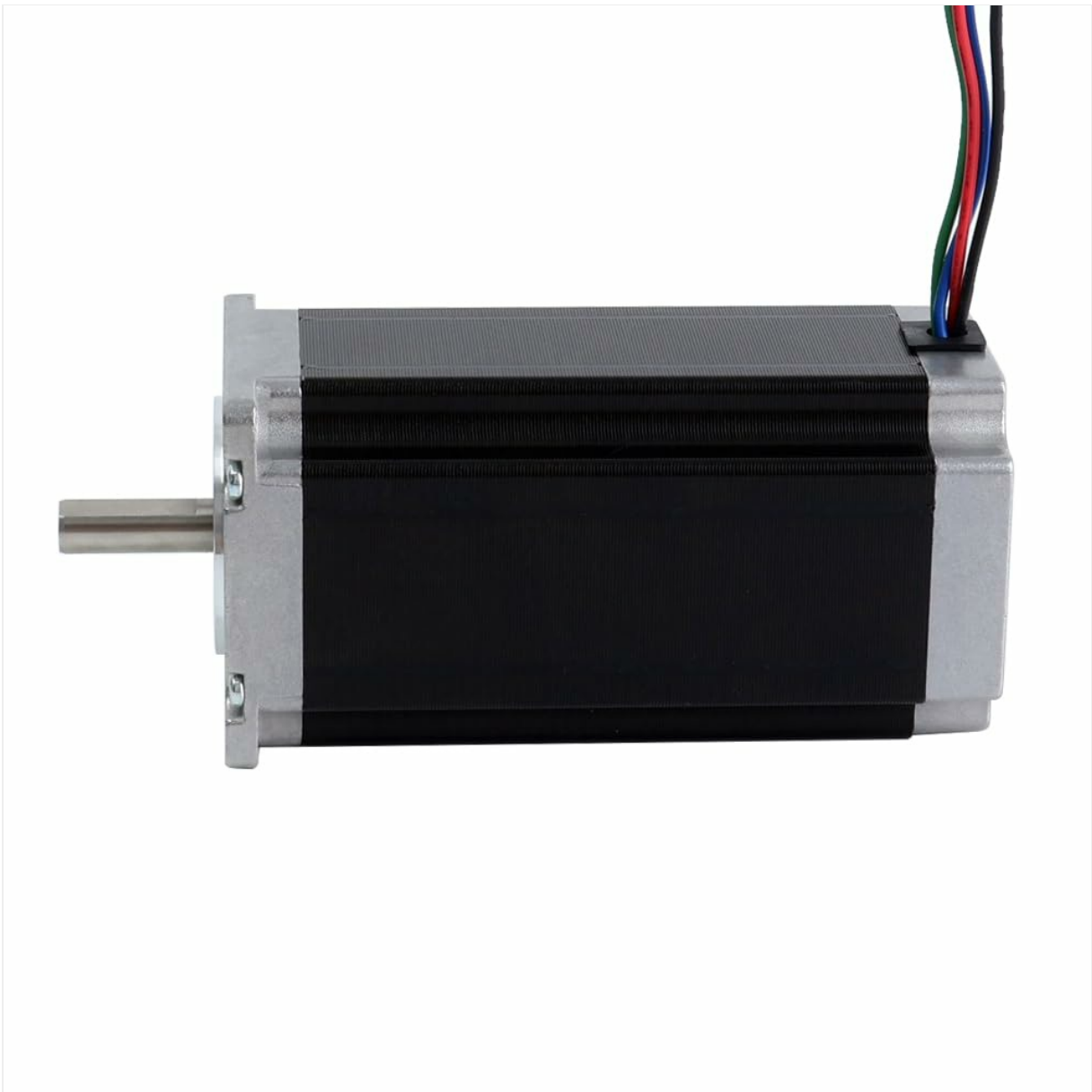


Figure 2.1: Side view of the STEPPERONLINE Nema 23 Stepper Motor, showing the motor body and shaft.



Figure 2.2: Front view of the STEPPERONLINE Nema 23 Stepper Motor, highlighting the shaft and mounting plate.

3. SPECIFICATIONS

Detailed electrical and physical specifications for the 23HS45-4204S1 stepper motor are provided below.

3.1 Electrical Specifications

Parameter	Value
Manufacturer Part Number	23HS45-4204S1
Motor Type	Bipolar Stepper
Step Angle	1.8 degrees
Holding Torque	3.0 Nm (425 oz.in)
Rated Current/Phase	4.2 A
Phase Resistance	0.88 ohms
Inductance	3.4 mH $\pm$ 20% (1KHz)

Parameter	Value
Voltage	12 Volts (Typical operating voltage, actual voltage depends on driver)

3.2 Physical Specifications

Parameter	Value
Frame Size	57 x 57 mm (Nema 23)
Body Length	113 mm
Shaft Diameter	φ8 mm
Shaft Length	24 mm
D-cut Length	20 mm
Number of Leads	4
Lead Length	400 mm
Weight	1.668 kg
Material	Metal

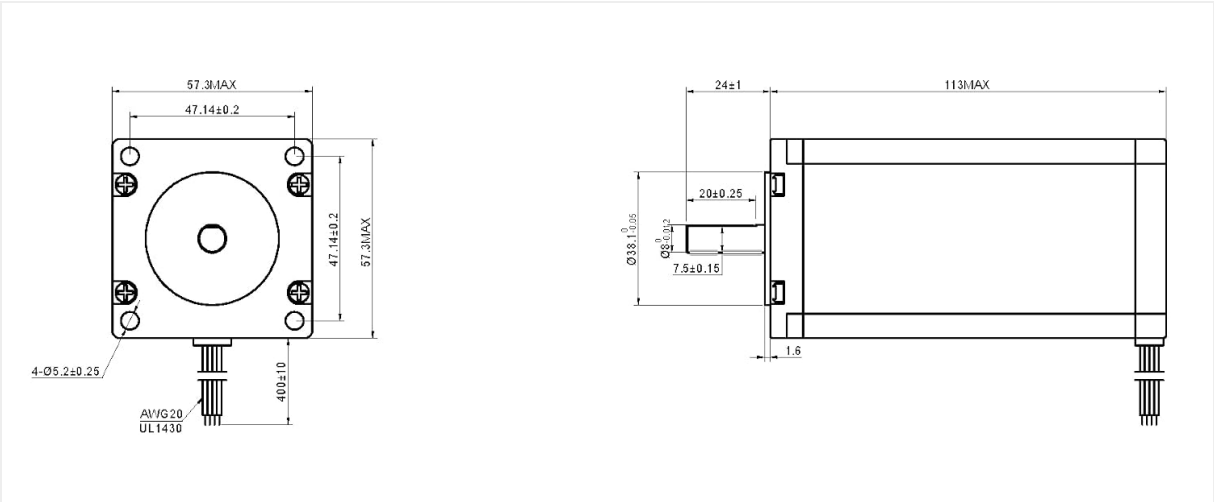


Figure 3.1: Technical dimension drawing of the STEPPERONLINE Nema 23 Stepper Motor, showing key measurements.

4. SETUP

- Proper setup is crucial for the optimal performance and longevity of your stepper motor. Follow these general guidelines for installation:
- Mounting:** Securely mount the motor to a stable surface using appropriate fasteners. Ensure the mounting surface is flat to prevent stress on the motor housing.
 - Shaft Alignment:** When connecting the motor shaft to a load (e.g., coupling, pulley), ensure precise alignment to avoid excessive radial or axial loads, which can damage the motor bearings.
 - Environment:** Operate the motor in a clean, dry environment within its specified temperature range. Avoid exposure to dust, moisture, and corrosive gases.
 - Heat Dissipation:** Ensure adequate ventilation around the motor, especially during continuous operation, to prevent overheating. Consider using a heatsink if operating at high currents or in enclosed spaces.

5. WIRING DIAGRAM

The 23HS45-4204S1 is a 4-wire bipolar stepper motor. Correct wiring to a compatible stepper motor driver is essential. Refer to the connection details below:

- **Phase A+:** Black Wire
- **Phase A-:** Green Wire
- **Phase B+:** Red Wire
- **Phase B-:** Blue Wire

Connect these wires to the corresponding terminals on your stepper motor driver. Always consult your driver's manual for specific wiring instructions and power supply requirements. Incorrect wiring can damage both the motor and the driver.



Figure 5.1: Rear view of the STEPPERONLINE Nema 23 Stepper Motor, showing the wire connections.

6. OPERATING INSTRUCTIONS

Operating a stepper motor requires a compatible stepper motor driver and a controller (e.g., microcontroller, CNC controller) to generate step and direction signals.

1. **Driver Selection:** Use a stepper motor driver capable of supplying the rated current (4.2A per phase) to the

motor. Microstepping drivers are recommended for smoother operation and reduced resonance.

2. **Power Supply:** Provide a stable DC power supply to the stepper driver. The voltage should be within the driver's recommended range and sufficient for the motor's performance requirements.
3. **Control Signals:** Connect the step, direction, and enable signals from your controller to the stepper driver. Configure your controller software to match the motor's step angle (1.8 degrees) and desired microstepping settings.
4. **Current Setting:** Set the current limit on your stepper driver to the motor's rated current (4.2A) or slightly below to prevent overheating.
5. **Testing:** Before full operation, perform a low-speed test to verify correct wiring and motor movement. Gradually increase speed and load as needed.

6.1 Performance Curve

The pull-out torque curve illustrates the motor's available torque at different speeds (RPM) and frequencies (KPPS). This curve is crucial for selecting the appropriate motor for your application's speed and load requirements.

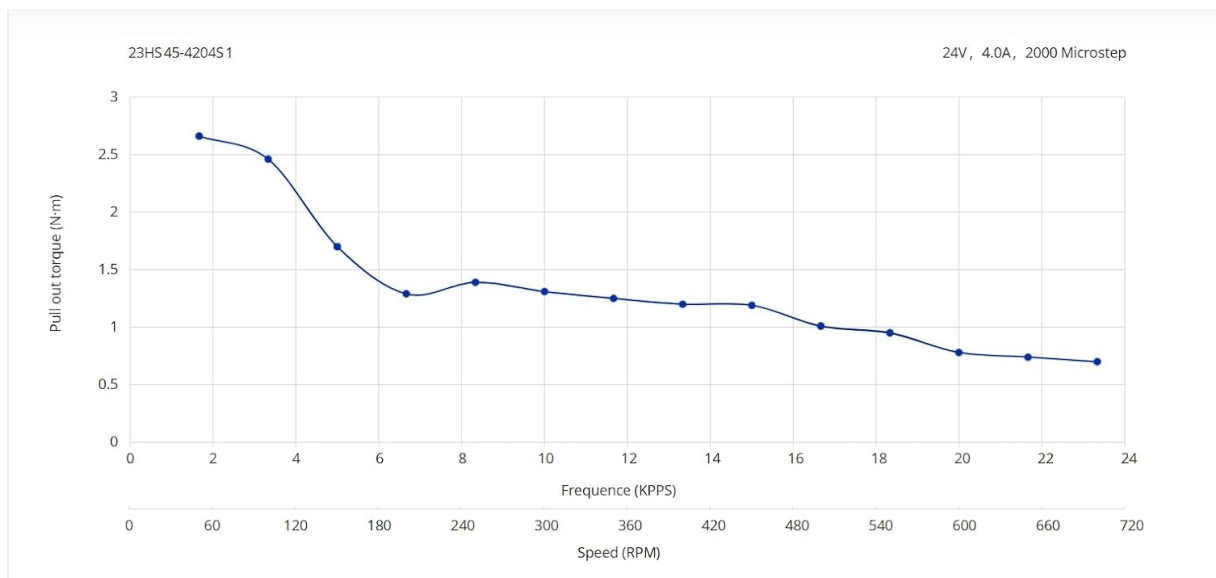


Figure 6.1: Pull-out torque vs. speed/frequency curve for the 23HS45-4204S1 motor (24V, 4.0A, 2000 Microstep).

7. MAINTENANCE

Stepper motors are generally low-maintenance devices. However, periodic checks can help ensure long-term reliability:

- **Cleanliness:** Keep the motor free from dust, debris, and liquids. A build-up of contaminants can affect heat dissipation and potentially damage internal components.
- **Connections:** Periodically check all electrical connections for tightness and signs of corrosion. Loose connections can lead to intermittent operation or damage.
- **Temperature:** Monitor the motor's operating temperature. If it consistently runs hot, investigate potential issues such as excessive load, insufficient current limiting, or poor ventilation.
- **Vibration:** Check for unusual vibrations or noises during operation, which could indicate mechanical issues or misalignment.

8. TROUBLESHOOTING

This section addresses common issues you might encounter with your stepper motor.

Problem	Possible Cause	Solution
Motor does not move or vibrates	Incorrect wiring, insufficient current, driver fault, excessive load.	Verify wiring against Section 5. Check driver current settings. Reduce load. Inspect driver for errors.
Motor loses steps or stalls	Excessive load, insufficient current, high speed, poor acceleration/deceleration settings.	Reduce load. Increase driver current (within motor limits). Lower acceleration/deceleration rates. Check power supply stability.
Motor overheats	Current set too high, insufficient heat dissipation, continuous high load.	Reduce driver current. Ensure adequate ventilation. Consider a heatsink or fan. Reduce duty cycle if possible.
Noisy operation	Resonance, mechanical misalignment, driver microstepping settings.	Adjust microstepping settings on the driver. Check mechanical alignment. Consider anti-resonance features if available on driver.

9. WARRANTY AND SUPPORT

STEPPERONLINE products are manufactured to high-quality standards. For warranty information, technical support, or service inquiries, please refer to the official STEPPERONLINE website or contact your authorized distributor. Keep your purchase receipt as proof of purchase.

For further assistance, visit the [STEPPERONLINE Store on Amazon](#).