

USER MANUAL

STEMpower Ethiopia

DIY CNC ROUTER MACHINE

Model: SRM-2026

1. Introduction

Thank you for choosing the STEMPower Ethiopia DIY CNC Router Machine. This machine is designed for precision cutting, engraving, and profiling of materials such as wood, MDF, plywood, acrylic, PVC, foam board, and similar non-ferrous materials.

The CNC Router is controlled using an Arduino Uno with a CNC Shield V3 running GRBL firmware and is operated through CNCjs.

2. Machine Specifications

Item	Specification
Machine Type	DIY CNC Router
Working Area	600 × 600 × 100 mm
X-Axis	NEMA 23 Stepper Motor
Y-Axis	Dual NEMA 23 Stepper Motors
Z-Axis	NEMA 23 Stepper Motor
Motion Controller	Arduino Uno + CNC Shield V3
Stepper Drivers	DM556 Stepper Motor Driver
Firmware	GRBL 1.1
Communication	USB
Operating Software	CNCjs
Spindle Power	1.5 kW Air-Cooled Spindle
Spindle Speed	Up to 24,000 RPM (VFD controlled)

Item	Specification
Limit Switches	X+, X-, Y+, Y-, Z+
Power Supply	As configured for your machine
Position Accuracy	Depends on calibration and machine rigidity

3. Safety Instructions

Read all instructions before operating the machine.

- Wear approved safety glasses and hearing protection.
 - Keep hands away from moving parts.
 - Ensure the workpiece is securely clamped.
 - Verify that the spindle tool is properly tightened.
 - Never leave the machine unattended while running.
 - Keep the work area clean and free of debris.
 - Disconnect power before performing maintenance.
 - Test all emergency stop and limit switches before operation.
-

4. Main Components

- Machine frame
 - X-axis assembly
 - Y-axis assembly
 - Z-axis assembly
 - Linear rails
 - Lead screws or ball screws (as installed)
 - NEMA 23 stepper motors
 - DRV8825 stepper drivers
 - Arduino Uno
 - CNC Shield V3
 - Power supply
 - Limit switches
 - Emergency stop switch
 - 1.5 kW spindle motor
 - VFD (Variable Frequency Drive)
 - USB communication cable
-

5. Electrical System

Controller: Arduino Uno

Motion Driver: CNC Shield V3

Motor Drivers: DM556 Stepper Motor Driver

Communication: USB

Control Software: CNCjs

Firmware: GRBL 1.1

6. Machine Setup

1. Inspect the machine for loose hardware.
 2. Verify all wiring connections.
 3. Connect the Arduino Uno to the computer via USB.
 4. Switch on the power supply.
 5. Power on the VFD.
 6. Launch CNCjs.
 7. Connect to the correct COM port.
 8. Confirm communication with GRBL.
 9. Home the machine.
 10. Verify all axis movements.
-

7. Homing Procedure

1. Power on the machine.
 2. Open CNCjs.
 3. Connect to GRBL.
 4. Press the Home button.
 5. The machine will reference the X, Y, and Z limit switches.
 6. Wait until homing is complete before jogging.
-

8. Loading G-Code

1. Generate G-code using your CAM software.
2. Open CNCjs.
3. Click Open File.
4. Select the G-code file.
5. Verify the toolpath.
6. Set the work origin (X, Y, Z).
7. Start the spindle.
8. Press Run.

9. Maintenance

Daily

- Clean chips and dust.
- Inspect cutting tools.
- Check limit switches.
- Verify cable connections.

Weekly

- Lubricate linear guides.
- Inspect lead screws.
- Tighten mounting bolts.
- Check motor couplings.

Monthly

- Inspect spindle bearings.
 - Verify GRBL settings.
 - Check driver temperatures.
 - Clean the electrical enclosure.
-

10. Troubleshooting

Machine does not connect

Possible causes:

- USB cable disconnected
- Wrong COM port
- Missing USB driver

Stepper motors vibrate

Possible causes:

- Incorrect motor wiring
- Low current setting
- Incorrect microstepping

Lost steps

Possible causes:

- Feed rate too high
- Acceleration too high
- Loose couplings

Limit switch alarm

Possible causes:

- Faulty switch
- Wiring issue
- Incorrect GRBL configuration

Poor cutting quality

Possible causes:

- Dull cutter
- Incorrect spindle speed
- Excessive feed rate
- Loose workpiece

11. Recommended Operating Parameters

Material	Feed Rate	Spindle Speed
MDF	1000–2000 mm/min	18,000 RPM
Plywood	1200–2500 mm/min	18,000 RPM
Hardwood	800–1800 mm/min	20,000 RPM
Acrylic	600–1200 mm/min	16,000 RPM
Foam Board	2000–3500 mm/min	14,000 RPM

Actual cutting parameters should be adjusted according to tool diameter, cutter type, material, and machine rigidity.

12. Warranty

The warranty covers manufacturing defects under normal operating conditions. Damage caused by misuse, improper wiring, unauthorized modifications, crashes, or accidents is not covered.

13. Technical Support

STEMpower Ethiopia

For software updates, manuals, spare parts, maintenance information, demonstration videos, and technical support, scan the product QR code attached to the machine.

Revision

Document Version: 1.0

Machine: STEMPower DIY CNC Router Machine

Prepared by: STEMPower Ethiopia