User Manual: NexBot Robotics STP113-001 Stepper Motor 3.2 Nm

SKU: NXB-SRV-STP113-001 | Version: 1.0 | Brand: NexBot Robotics

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1. Safety Information

READ ALL SAFETY INSTRUCTIONS BEFORE OPERATION. Failure to follow safety procedures may result in serious injury or equipment damage.

DANGER: This motor operates at 48VDC, which can be hazardous. Always disconnect and lock out all power sources before installation or service. Failure to comply may result in fatal electrical shock.

WARNING: The motor surface can exceed 80°C (176°F) during normal operation. Avoid touching the motor until it has had sufficient time to cool to prevent severe burns.

WARNING: The motor can produce powerful and rapid movements. Keep hands, clothing, and tools clear of the operating area to prevent entanglement and crushing injuries.

CAUTION: Do not connect or disconnect the motor from the driver while the driver is powered. This can cause a high-voltage surge that will permanently damage both components.

NOTICE: The STP113-001 is rated IP54. This rating protects against dust ingress and water splashes but does not protect against submersion or high-pressure jets. Ensure proper installation of cable glands to maintain the rating.

2. Product Overview

The NexBot Robotics STP113-001 is a high-performance stepper motor designed for precision motion control applications within industrial robotic systems. This component provides reliable, open-loop positioning for a variety of tasks requiring high accuracy and repeatability without the complexity of a closed-loop servo system. Its robust construction ensures long operational life in demanding manufacturing environments. Engineered for high torque density, the STP113-001 stepper motor delivers a substantial holding torque of 3.2 Nm, enabling it to maintain static positions under load and resist external forces, which is critical for end-of-arm tooling and auxiliary axis stability. The motor features a standard 1.8-degree step angle (200 steps per revolution), providing fine resolution for smooth and precise movements. This level of control is essential for applications such as automated inspection, component assembly, and dispensing, where even minor positional errors can impact product quality. The motor's low-inertia rotor design facilitates rapid acceleration and deceleration, reducing cycle times and increasing overall system throughput. The motor housing is constructed from black anodized aluminum, which provides excellent thermal dissipation to maintain performance during continuous operation. This efficient heat management prevents overheating and ensures consistent torque output over extended periods. The STP113-001 operates on a standard 48VDC power supply, making it compatible with a wide range of industrial power systems and motor drivers. Its NEMA 34 frame size and standardized mounting face allow for straightforward integration into existing machine designs and NexBot Robotics systems. Installation is simplified with a pre-wired cable lead, ensuring secure and reliable electrical connections. Regular inspection of the motor's mounting and connections is recommended, but the unit itself is designed for minimal maintenance throughout its service life.

3. Getting Started

1. Product Identification

The NexBot Robotics STP113-001 is a NEMA 34 frame stepper motor designed for high-performance industrial automation. It features a holding torque of 3.2 Nm and is intended for use in open-loop positioning systems. Its 86 x 86 x 113 mm dimensions make it suitable for a wide range of machinery.

2. Driver and Power Supply Selection

This motor requires a stepper driver compatible with its electrical characteristics and a stable 48VDC power supply. Ensure your selected driver can provide the necessary phase current to achieve the rated

torque. Refer to the motor's speed-torque curve to match performance to your application.

3. Initial Motion Test

After completing the installation, configure your controller for a simple, low-speed motion profile. Command a short move in one direction and then the other to verify correct wiring and system response. During this test, listen for any abnormal sounds and watch for excessive vibration.

4. Operation

Torque and Speed Characteristics

The STP113-001 provides 3.2 Nm of holding torque when stationary. This torque value decreases as rotational speed increases. Always operate the motor within the limits shown on its speed-torque curve to prevent stalling and loss of position.

> **Tip:** For applications requiring high torque at high speeds, ensure your motion profile includes smooth acceleration ramps to avoid abrupt torque demands.

Microstepping for Smooth Operation

For improved resolution and smoother, quieter motion at low speeds, configure your driver to use microstepping. While settings like 1/16 or 1/32 step reduce vibration, they can also slightly reduce effective torque. Choose a setting that provides the best balance for your specific application's needs.

Thermal Management

The motor is designed to dissipate heat through its aluminum body and mounting flange. Mounting the motor to a large, thermally conductive metal plate or machine frame is critical for effective cooling. If operating near the motor's maximum performance limits, monitor its case temperature to ensure it stays within the specified range.

> **Tip:** In high-temperature environments or high duty-cycle applications, adding a dedicated fan or other active cooling method can improve reliability and lifespan.

Avoiding Resonance

Like all stepper motors, the STP113-001 may exhibit mechanical resonance at certain speeds, leading to increased noise and vibration. If this occurs, try changing the operating speed, adjusting driver current settings, or enabling any anti-resonance features available on your stepper driver.

5. Maintenance Schedule

Interval	Task	Notes
Monthly	Visually inspect motor cable for signs of chafing, cracking, or damage, especially at flex points. Ensure cable is properly secured.	Critical for applications involving frequent motion, such as CNC machines or robotic arms.
Quarterly	Clean dust and debris from the motor's housing using a dry cloth or low-pressure compressed air. A clean housing dissipates heat more effectively.	Do not use liquid cleaners or solvents, as they can damage seals and compromise the IP54 rating.
Quarterly	Check the tightness of the motor's mounting bolts. Use a torque wrench to verify they are secured to the original specification.	Vibration can cause fasteners to loosen over time, leading to misalignment.
Annually	Inspect the shaft coupling for any signs of wear, fatigue, or backlash. Ensure its set screws are tight.	A worn coupling can degrade positioning accuracy and should be replaced.
Annually	Listen for any changes in the motor's operating sound. Grinding, squealing, or rumbling noises may indicate internal bearing wear.	The motor's bearings are sealed for life and are not user-serviceable. Contact support if bearing failure is suspected.

6. Troubleshooting

Symptom	Possible Cause	Solution
Motor hums but does not rotate.	One motor phase is disconnected or the load is jammed.	Power down. Check wiring for all four motor leads. Manually check if the connected mechanism can be moved.
Motor runs excessively hot.	Driver current is set too high or there is insufficient heat sinking.	Reduce the driver current setting to match the motor's rating. Ensure the motor is mounted securely to a large metal surface.
	The wires for one phase are reversed.	Power down. At the driver, swap the two wires for a single phase

Symptom	Possible Cause	Solution
Motor rotates in the wrong direction.		(e.g., reverse the B+ and B- connections).
Motor stalls or loses steps during a move.	Load exceeds motor torque capacity at the commanded speed, or acceleration is too aggressive.	Reduce the acceleration and velocity settings in the controller. Verify there is no binding in the mechanics.
Motor is very loud and vibrates at specific speeds.	Operation at a natural resonant frequency.	Adjust the operating speed to be higher or lower than the resonant point. If available, enable the anti-resonance feature on the driver.
Movement is jerky and not smooth.	Driver is set to full-step or half-step mode.	Configure the driver for a higher microstepping resolution (e.g., 1/8 or 1/16 step) to smooth out motion.
Motor has no holding torque and shaft spins freely.	No power to the driver, or the driver's 'enable' signal is inactive.	Check the 48VDC power supply to the driver. Verify the controller is sending the 'enable' signal to the driver.

7. Technical Specifications

Parameter	Value	Unit
Weight	3.5	kg
Material	Anodized Aluminum	
Voltage	48VDC	
IP Rating	IP54	
Country of Origin	KR	
Dimensions	86 x 86 x 113 mm	
Torque	3.2 Nm	