User Manual: NexBot Safety STP113-012 Stepper Motor 1.2 Nm

SKU: NXB-SRV-STP113-012 | 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: Risk of electric shock. The associated motor driver and power supply operate at hazardous voltages. Disconnect and lock out all power before servicing.

WARNING: Unexpected motion can cause serious injury. Keep hands, clothing, and tools clear of the motor and coupled machinery during power-up and operation.

WARNING: Burn Hazard. The motor surface can reach high temperatures during operation. Allow the motor to cool completely before handling.

CAUTION: Do not connect or disconnect the motor from the driver while power is applied. This can cause a high voltage spike that will permanently damage the driver electronics.

NOTICE: The IP40 rating indicates protection against solid objects over 1mm but no protection against liquids. Do not expose the NexBot Safety STP113-012 motor to moisture or fluids.

2. Product Overview

The NexBot Safety STP113-012 is a high-performance stepper motor designed for precise motion control in automated systems and robotic applications. This motor provides an optimal balance of torque, speed, and resolution, making it a versatile component for tasks requiring accurate positioning and consistent performance. Its robust construction ensures long-term reliability in continuous-duty industrial environments. The core of the STP113-012 is its ability to deliver a substantial holding torque of 1.2 Nm, which securely maintains the load position even when the motor is stationary, preventing drift and ensuring process integrity. With a standard 1.8° step angle (200 steps per revolution), this motor offers fine control over movement, which is critical for applications like automated assembly, material handling, and positioning of end-of-arm tooling. The low-inertia rotor design facilitates rapid acceleration and deceleration, reducing cycle times and increasing overall system throughput. Engineered for compatibility with microstepping drivers, the STP113-012 operates with reduced vibration and acoustic noise, contributing to a smoother motion profile and a quieter work environment. This feature is particularly beneficial in collaborative robot applications or in facilities where noise reduction is a priority. The motor is built to a standard NEMA 23 frame size, ensuring straightforward mechanical integration with a wide range of existing mounts and hardware. Its 24VDC operating voltage is common in industrial control cabinets, simplifying power supply requirements. The motor's thermal characteristics are managed to ensure stable performance across a range of operating temperatures. Installation is simplified by its standard mounting pattern and pre-wired leads, allowing for quick connection to a compatible motor driver.

3. Getting Started

1. Product Overview

The NexBot Safety STP113-012 is a 2-phase hybrid stepper motor providing a holding torque of 1.2 Nm. Its design is optimized for precise, repeatable positioning in industrial automation. The anodized aluminum body aids in heat dissipation for reliable performance in continuous duty applications.

2. Unpacking and Inspection

Upon receipt, carefully unpack the motor and inspect it for any physical damage that may have occurred during transit. Verify that the product name on the label reads 'NexBot Safety STP113-012' and the SKU is 'NXB-SRV-STP113-012'. Report any discrepancies or damage to your supplier immediately.

3. Driver and Power Supply Selection

This motor is designed for use with a 24VDC power supply. Select a stepper motor driver capable of handling the motor's required phase current and compatible with 24VDC input. Using an incorrect voltage or a driver with insufficient current capacity will result in poor performance and may damage the motor or driver.

4. Operation

Configuring Driver Current

Set the output current on your stepper driver to match the motor's specifications. Setting the current too low will result in reduced torque and potential stalling. Setting it too high will cause the motor to overheat, reducing its lifespan.

> **Tip:** For applications not requiring the full 1.2 Nm torque, you can reduce the driver current to lower motor temperature and power consumption.

Understanding Microstepping

Use a driver that supports microstepping to achieve smoother rotation and higher positional resolution. While full-stepping provides the highest torque, microstepping (e.g., 1/8, 1/16, or higher) reduces vibration and audible noise, which is critical in many applications.

Thermal Management

The STP113-012 is designed to dissipate heat through its aluminum casing. Ensure adequate airflow around the motor. In high duty-cycle applications or warm environments, consider mounting the motor to a metal plate or frame that can act as an additional heat sink.

Managing Resonance

Stepper motors can experience mechanical resonance at certain speeds, leading to increased vibration and lost steps. If you observe resonance, try changing the operating speed, increasing the microstepping resolution, or enabling an anti-resonance feature on your driver if available.

> **Tip:** Adding a small amount of friction or inertia to the system, such as a viscous damper, can also effectively mitigate resonance issues.

5. Maintenance Schedule

Interval	Task	Notes
Weekly	Listen for any changes in operational noise. An increase in grinding or whining sounds can indicate bearing wear or mechanical misalignment.	Perform this check while the machine is running its typical cycle.
Monthly	Perform a visual inspection of the motor housing and cables. Look for signs of damage, dirt/debris accumulation, or cable insulation wear.	Ensure machine is powered down before performing close inspection.
Quarterly	Check the tightness of the motor mounting screws. Vibrations over time can cause fasteners to loosen.	Use a torque wrench to verify screws are tightened to the original specification.
Quarterly		

Interval	Task	Notes
	Inspect all electrical connections at the driver terminal block. Ensure they are secure and free of corrosion.	Power must be off. A loose connection can cause arcing and erratic motor performance.
Annually	Clean the exterior of the motor. Use a soft brush or compressed air to remove any dust buildup from the housing, which can impede heat dissipation.	Do not use liquid solvents, as the motor is not sealed against fluid ingress (IP40).
As Needed	Verify shaft coupling alignment. If the system has been subject to a crash or significant mechanical shock, re-check the alignment between the motor and the load.	Misalignment is a leading cause of premature failure.

6. Troubleshooting

Symptom	Possible Cause	Solution
Motor does not move when commanded.	No power to driver; incorrect wiring; enable signal on driver is inactive.	Verify 24VDC power supply is on and connected correctly. Check all motor phase and control signal wiring against the driver manual. Ensure the driver's 'Enable' input is in the correct state.
Motor vibrates or hums loudly but does not rotate.	One motor phase is disconnected or miswired.	Power down the system. Check the continuity of all four motor wires from the motor to the driver. Verify the A+/A- and B+/B- pairs are correctly wired to the driver terminals.
Motor stalls or loses steps during operation.	Load exceeds the motor's 1.2 Nm torque capacity; acceleration/deceleration ramp is too aggressive; driver current is set too low.	Reduce the mechanical load or implement gear reduction. Decrease the acceleration value in the motion controller. Increase the driver current setting, but do not exceed motor specification.
Motor housing is excessively hot to the touch.	Driver current setting is too high; insufficient ventilation around the motor; motor is operating in a high ambient temperature.	Reduce the driver current setting to the lowest value that provides adequate performance. Improve airflow around the motor or add a heat sink. Confirm ambient temperature is within operating range.
Motor rotates in the wrong direction.	One motor phase winding is connected in reverse.	Power down the system. Swap the two wires for one of the phases (e.g., swap the connections for B+ and B-).

Symptom	Possible Cause	Solution
		Do not swap wires between different phases.
Motor movement is jerky or rough, especially at low speeds.	Driver is set to full-step or half-step mode; mechanical resonance.	Set the driver to a higher microstepping resolution (e.g., 1/8 or 1/16) for smoother motion. If resonance is suspected, try operating at a different speed.
Motor has weak holding torque when stopped.	Driver current is set too low; driver is configured with a high idle current reduction.	Increase the driver's run current setting. Check the driver's manual to disable or reduce the amount of idle current reduction (sometimes called 'auto standby').

7. Technical Specifications

Parameter	Value	Unit
Weight	1.1	kg
Material	Anodized Aluminum	
Voltage	24VDC	
IP Rating	IP40	
Country of Origin	JP	
Dimensions	76 x 57 x 57 mm	
Torque	1.2 Nm	