User Manual: NexBot Robotics AC111-001 Ac Servo Motor 4.5 Nm

SKU: NXB-SRV-AC111-001 | Version: 1.0 | Brand: NexBot Robotics

Table of Contents

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 fatal electric shock. The motor operates at 400VAC. Disconnect and lock out all power sources before installation, inspection, or maintenance. Wait at least 5 minutes for drive capacitors to discharge.

WARNING: Risk of unexpected movement. The motor can produce high torque (4.5 Nm) instantly. Keep all body parts and loose clothing away from the motor shaft and connected machinery during operation.

WARNING: Hot surfaces. The motor housing can reach high temperatures during operation, causing severe burns. Allow the motor to cool completely before handling.

CAUTION: Heavy object. The motor weighs 3.8 kg. Use proper lifting techniques to avoid personal injury. Ensure the motor is securely mounted before releasing it.

NOTICE: The IP65 rating requires all connector covers and seals to be properly installed. Failure to do so will void the environmental protection and may lead to equipment damage from dust or moisture ingress.

2. Product Overview

The NexBot Robotics AC111-001 is a high-performance AC servo motor engineered for demanding industrial automation and robotics applications requiring precise and dynamic motion control. This motor provides a robust solution for driving robot joints and auxiliary axes where accuracy and responsiveness are critical. Built with a high-energy permanent magnet rotor, the AC111-001 servo motor delivers a continuous torque of 4.5 Nm from a compact frame, offering excellent torque density to minimize weight and space requirements on the robot arm. Its low-inertia design enables rapid acceleration and deceleration, which is essential for reducing cycle times in applications like high-speed pick-and-place, automated assembly, and material handling. The motor's construction ensures smooth, cog-free operation even at very low speeds, providing the fluid motion necessary for tasks such as dispensing and welding. Durability is central to its design. The motor is housed in a rugged die-cast aluminum body and is environmentally sealed to an IP65 rating, protecting it against dust ingress and low-pressure water jets from any direction. This makes it suitable for deployment in challenging factory environments. The integrated high-resolution position feedback system allows for precise closed-loop control, ensuring that the robot's movements are consistently accurate and repeatable. This AC servo motor operates on a standard 400VAC supply. Integration is streamlined through standardized mounting flanges and power terminals, facilitating straightforward installation and replacement during scheduled maintenance.

3. Getting Started

1. Product Overview

The NexBot Robotics AC111-001 is a brushless AC servo motor designed for high-performance motion control. It features a compact design, a continuous torque rating of 4.5 Nm, and integrated PROFINET communication capabilities for seamless integration into modern automation systems.

2. System Requirements

This motor must be operated with a compatible NexBot Robotics servo drive or a third-party drive that supports the motor's electrical characteristics and feedback type. The drive must be capable of supplying the required current for the 400VAC motor windings. Refer to the servo drive's documentation for configuration details.

3. Initial Drive Configuration

Before operation, the controlling servo drive must be parameterized for the AC111-001. This involves loading the motor's electronic data sheet (EDS) file or manually entering key parameters such as torque constant, inertia, pole pairs, and encoder resolution into the drive's software.

4. Operation

Operating Modes

The AC111-001 can be controlled in various modes, including position, velocity, and torque control, as determined by the servo drive. Proper tuning of the control loops within the drive is critical to achieve the desired performance and stability for your specific application.

> **Tip:** Start tuning with lower gain values and incrementally increase them to find the optimal balance between responsiveness and stability, avoiding oscillation.

PROFINET Communication

The integrated PROFINET interface allows for real-time control and diagnostics over an industrial Ethernet network. The motor's status, position, and fault codes can be monitored directly by a PLC or other network master. Ensure the device has a unique name and IP address assigned on the network.

Thermal Management

While designed for industrial environments, the motor's performance depends on effective heat dissipation. Ensure adequate airflow around the motor housing and avoid mounting it in enclosed spaces with high ambient temperatures, which could lead to derating of the continuous torque.

> **Tip:** For high-duty-cycle applications, consider mounting the motor on a large metal plate or machine frame which can act as an additional heat sink.

Understanding IP65 Protection

The IP65 rating indicates the motor is fully protected against dust ingress and can withstand low-pressure water jets from any direction. This makes it suitable for environments with washdown requirements or high levels of airborne particulates, provided all connectors and seals are correctly installed and maintained.

5. Maintenance Schedule

Interval	Task	Notes
Weekly	Visually inspect the motor housing for any buildup of dirt or debris that could	Cleaning should be done with a dry cloth or compressed air.

Interval	Task	Notes
	impede heat dissipation. Check for any signs of physical damage or fluid leaks around the shaft seal.	Avoid using high-pressure washers directly on the shaft seal.
Monthly	Listen for any changes in operational noise, such as grinding or whining, which could indicate bearing wear. Check for any increase in vibration levels.	Use a vibration analysis tool for quantitative assessment if available.
Quarterly	Inspect all power, encoder, and network cables for signs of wear, abrasion, or cracking. Ensure all connectors are securely fastened.	Pay close attention to cables in high-flex applications.
Annually	Verify the torque of the motor's mounting bolts to ensure they have not loosened due to vibration.	Follow the torque specifications outlined in the installation guide.
Annually	Inspect the motor shaft seal for signs of drying, cracking, or damage. A compromised seal can lead to internal contamination and failure.	Replace the seal if any degradation is observed.
Every 20,000 Operating Hours	The motor bearings should be professionally inspected for wear. Replacement is recommended to ensure continued reliability and prevent catastrophic failure.	This is a guideline; actual bearing life depends heavily on application load and speed.

6. Troubleshooting

Symptom	Possible Cause	Solution
Motor does not enable or move	No power to drive; drive in fault state; enable signal missing; motor cable disconnected.	Verify 400VAC power is supplied to the drive. Check the servo drive for any fault codes and reset if necessary. Confirm the physical or software enable signal is active. Inspect all motor cable connections.
Motor is excessively hot to the touch	Continuous operation beyond the 4.5 Nm torque	Reduce the load or duty cycle of the application. Ensure free

Symptom	Possible Cause	Solution
	rating; insufficient cooling; incorrect drive parameters causing high current draw; ambient temperature too high.	airflow around the motor. Verify drive current and tuning parameters match the AC111-001 specifications. Improve ventilation in the machine cabinet.
Excessive noise or vibration	Poor mechanical alignment with the load; unbalanced load; worn motor bearings; unstable servo tuning (oscillation).	Re-align the motor and load shafts using a dial indicator. Balance the connected load. If noise persists, inspect bearings for wear. Re-tune the servo drive's position and velocity loops.
Inaccurate or inconsistent positioning	Encoder cable connection is loose or damaged; high electrical noise interfering with encoder signal; mechanical backlash in the driven system; incorrect servo tuning.	Check and secure the encoder cable connector. Ensure cable shielding is properly grounded. Inspect the connected mechanics for looseness. Adjust servo loop gains and feedforward parameters.
Servo drive reports an overcurrent fault	Mechanical binding or jam in the driven load; short circuit in the motor power cable; aggressive acceleration/ deceleration parameters.	Check the mechanical system for any obstructions or binding. Inspect the motor power cable for damage or shorts between phases or to ground. Reduce the acceleration/ deceleration rates in the drive profile.
PROFINET communication is lost	PROFINET cable is disconnected or damaged; network switch issue; IP address conflict or incorrect device name.	Inspect the PROFINET cable and its connections. Check the status of the network switch port. Verify the motor's PROFINET configuration settings are correct for your network.
Motor 'hunts' or oscillates around the target position	Position loop gain (Kp) is set too high in the servo drive.	Gradually reduce the position loop gain in the drive's tuning parameters until the oscillation stops while

Symptom	Possible Cause	Solution
		maintaining acceptable stiffness.

7. Technical Specifications

Parameter	Value	Unit
Weight	3.8	kg
Material	Die-cast Aluminum	
Voltage	400VAC	
IP Rating	IP65	
Country of Origin	JP	
Protocol	PROFINET	
Dimensions	182 x 100 x 100 mm	
Torque	4.5 Nm	