User Manual: NexBot Drives AC111-002 Ac Servo Motor

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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: Hazardous voltage (400VAC) is present during operation. Contact will cause death or severe injury. Always disconnect and lock out power before servicing.

WARNING: The motor surface can exceed 80°C (176°F) during operation, creating a severe burn hazard. Allow the unit to cool completely before touching.

WARNING: Unexpected rapid motion can occur. Keep personnel and equipment clear of the machine's range of motion before enabling the servo drive.

CAUTION: The motor weighs 2.8 kg. Use proper lifting techniques or mechanical assistance to prevent strain or injury during handling and installation.

NOTICE: The NexBot Drives AC111-002 contains components sensitive to Electrostatic Discharge (ESD). Follow proper ESD-safe procedures when handling connectors.

2. Product Overview

The NexBot Drives AC111-002 is a high-performance AC servo motor engineered for precision motion control in demanding industrial automation and robotics applications. This motor provides a robust and reliable solution for axes requiring dynamic response and high accuracy. Its core design focuses on maximizing torque density, delivering 2.1 Nm of continuous torque from a compact 86 mm frame. This allows for powerful and precise movements without adding excessive weight or inertia to the robot arm, which is critical for maintaining high acceleration rates and achieving shorter cycle times. A key feature of the AC111-002 is its low-cogging design, which ensures exceptionally smooth rotation, particularly at low speeds. This characteristic is essential for applications requiring fine control and steady motion, such as intricate assembly, precise dispensing, or detailed surface finishing. The motor is built for durability in industrial settings, featuring a rugged aluminum alloy housing with an IP65 rating. This level of protection safeguards internal components from dust ingress and low-pressure water jets, ensuring consistent performance even in challenging environments. Designed to operate on a 400VAC supply, this servo motor integrates seamlessly with NexBot Drives control systems. It is an ideal choice for driving the wrist and end-of-arm tooling axes (J4-J6) on collaborative and smaller articulated robots, where its combination of power, precision, and compact size provides significant advantages. The motor's standardized mounting flange and shaft simplify mechanical integration, reducing engineering and assembly time. For optimal performance, pair this motor with a compatible servo drive and correctly shielded power and feedback cabling.

3. Getting Started

1. Product Overview

The NexBot Drives AC111-002 is a compact, high-torque density AC servo motor designed for industrial automation. It delivers 2.1 Nm of continuous torque and integrates a high-resolution encoder and PROFINET interface for precise, networked motion control.

2. Drive Configuration

Before operation, the associated servo drive must be parameterized for the AC111-002. This involves entering the motor's electrical data, such as voltage, rated current, and encoder specifications, into the drive's software to ensure stable and efficient control.

3. PROFINET Network Setup

To establish communication, import the motor's GSDML file into your PLC engineering software. Assign a unique device name and IP address to the motor that corresponds with your network plan and PLC hardware configuration.

4. Operation

Control Loop Tuning

Achieving optimal performance requires tuning the position, velocity, and current loops within the servo drive. Use the drive's auto-tuning feature for a baseline configuration, then manually adjust gains to meet the specific dynamic requirements of the application, such as minimizing settling time and overshoot.

> **Tip:** Always save a backup of the default or a known-good set of tuning parameters before making significant changes.

Operating Modes

The AC111-002 can be operated in position, velocity, or torque mode via the servo drive. The selection of the mode depends entirely on the application's goal, whether it is precise positioning, constant speed regulation, or applying a specific force.

Thermal Management

The motor is designed to dissipate heat through its anodized aluminum alloy housing. Ensure there is adequate airflow around the motor and that the continuous torque does not exceed the 2.1 Nm rating for extended periods to prevent overheating.

> **Tip:** If operating near the motor's thermal limit, consider adding forced-air cooling or mounting to a larger heat-sinking surface to improve performance.

Fault Diagnosis

The servo drive continuously monitors the motor's status. In the event of a fault, the drive will provide a specific error code. Refer to the servo drive's manual to interpret these codes, which can indicate issues like overcurrent, overvoltage, or encoder signal loss.

5. Maintenance Schedule

Interval	Task	Notes
Weekly	Visually inspect the motor housing for any buildup of contaminants. Check for any new or unusual sounds during operation.	A clean housing is essential for proper heat dissipation.
Monthly	Inspect power, encoder, and PROFINET cables for signs of chafing, cracking, or loose connections, especially at points of flex.	Ensure all connector locking rings are still tight.
Quarterly	Check the motor mounting bolts to ensure they remain	

Interval	Task	Notes
	tightened to the correct torque specification.	Vibration can cause bolts to loosen over time.
Annually	Verify the integrity of the motor shaft seal. Look for any signs of grease or oil leakage, which could compromise the IP65 rating.	Replace the seal if any damage is detected.
Annually	Perform a backlash check on the coupled mechanical system to identify any wear in the downstream components.	This helps differentiate motor issues from mechanical system issues.
As Needed	Clean the motor housing using a cloth dampened with a mild, non-abrasive cleaning solution.	Do not spray cleaning fluids directly onto the motor or use harsh chemical solvents.

6. Troubleshooting

Symptom	Possible Cause	Solution
Motor is humming loudly but not turning.	One power phase is missing, or the motor shaft is mechanically seized.	Verify voltage on all three power phases (U, V, W). Power down and confirm the motor shaft can be turned by hand (with brake released, if equipped).
Motor overshoots target position.	Servo gain parameters (specifically Proportional gain) are too high, or system inertia is mismatched.	Reduce the proportional gain in the position loop. Run the drive's auto-tuning sequence again and verify the load inertia parameter is set correctly.
Drive reports 'Encoder Fault' or 'Position Error'.	Encoder cable is damaged, disconnected, or has electrical noise interference.	Inspect the full length of the encoder cable for damage. Reseat the connectors at both the motor and drive. Ensure the cable shield is properly grounded.
Motor feels excessively hot during normal operation.	Continuous load exceeds the 2.1 Nm rating, drive current limit is set too high, or ambient temperature is	Measure the application's true torque requirement. Verify drive parameters match the motor nameplate. Ensure adequate ventilation around the motor.

Symptom	Possible Cause	Solution
	above specification.	
Jerky or erratic motion at low speeds.	Poor servo tuning (low stiffness), mechanical backlash, or 'stiction' in the load.	Increase the proportional and integral gains to improve responsiveness. Inspect mechanical linkages for looseness. Verify the load is properly lubricated.
PROFINET communication drops intermittently.	Damaged network cable, poor shielding, or network switch issue.	Test the PROFINET cable with a certified tester. Ensure cable shielding is grounded at one end. Check the diagnostics on the network switch for port errors.
Drive trips on overcurrent fault immediately upon enable.	Shorted motor winding or short circuit in the power cable.	Disconnect the motor cable from the drive. Use a multimeter to measure resistance between phases (U-V, V-W, W-U) and from each phase to ground. Readings should be balanced and high resistance to ground.

7. Technical Specifications

Parameter	Value	Unit
Weight	2.8	kg
Material	Anodized Aluminum Alloy	
Voltage	400VAC	
IP Rating	IP65	
Country of Origin	CH	
Protocol	PROFINET	
Dimensions	185 x 86 x 86 mm	
Torque	2.1 Nm	