User Manual: NexBot Robotics DC112-001 DC Servo Motor 48VDC 1.5 Nm

SKU: NXB-SRV-DC112-001 | 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: RISK OF ELECTRIC SHOCK. The motor operates at 48VDC. Disconnect and lock out all power before installation or servicing. Contact with energized terminals can cause severe injury or death.

WARNING: UNEXPECTED MOTION. The motor can move unexpectedly during configuration and testing. Keep personnel and foreign objects clear of the mechanical system during operation.

WARNING: HOT SURFACE. The motor housing can reach high temperatures during operation, presenting a burn hazard. Allow the motor to cool completely before handling.

> **CAUTION:** HEAVY COMPONENT. The motor weighs 2.8 kg. Use proper lifting techniques to avoid personal injury or damage to the motor if dropped.

> **NOTICE:** The internal electronics are sensitive to electrostatic discharge (ESD). Always wear an anti-static wrist strap when handling the motor's connectors and terminals.

2. Product Overview

The NexBot Robotics DC112-001 is a high-precision DC servo motor engineered for reliable, dynamic performance in demanding industrial automation applications. This component is specifically designed to integrate seamlessly into NexBot Robotics systems, providing the power and accuracy required for complex motion profiles. Its core function is to convert electrical energy into precise mechanical motion, enabling robotic joints to achieve their programmed positions with high fidelity. The key benefit of the DC112-001 servo motor is its high torque density, which delivers a continuous torque of 1.5 Nm from a compact and lightweight package. This allows for the design of smaller, more agile robotic arms without compromising on power, which is critical for applications in confined spaces. The motor's design emphasizes smooth operation, featuring low cogging torque to ensure fluid, consistent motion even at very low speeds. This characteristic is essential for tasks requiring delicate handling, such as electronics assembly or intricate material finishing. Constructed with a rugged, anodized aluminum housing, the motor is built to withstand the rigors of industrial environments. It carries an IP65 rating, certifying its resistance to dust ingress and low-pressure water jets, ensuring operational longevity and reducing downtime for maintenance. The motor operates on a standard 48VDC power supply, making it compatible with common industrial power systems. Its integrated high-resolution position feedback system provides accurate real-time data to the robot's motion system, enabling closed-loop control for superior accuracy and repeatability. Typical applications for this servo motor include wrist and end-of-arm tooling axes in pick-and-place, assembly, dispensing, and inspection robots where precision and speed are paramount.

3. Getting Started

1. Unpacking and Initial Inspection

Carefully unpack the NXB-SRV-DC112-001 motor from its protective packaging. Inspect the motor housing, shaft, and connectors for any signs of damage that may have occurred during transit. Verify the nameplate details match your order.

2. System Requirements

This motor requires a compatible NexBot Robotics servo drive capable of providing a regulated 48VDC supply and interpreting its feedback signals. The control system must support PROFINET I/O for communication. Ensure your power supply can accommodate the peak current draw of the motor under full load.

3. PROFINET Network Configuration

Before operation, the motor must be configured on the PROFINET network. Use your engineering software to assign a unique device name and IP address to the motor, then download the configuration to your PLC or motion controller.

4. Operation

Operating Modes

The DC112-001 can be commanded in various control modes, including position, velocity, and torque. The appropriate mode should be selected in the servo drive's configuration based on the specific requirements of your application, such as point-to-point positioning or constant-force pressing.

Servo Tuning

For optimal performance, the servo control loops (proportional, integral, derivative gains) must be tuned for the specific inertia of the connected load. Use the auto-tuning function in your NexBot controller software as a starting point, followed by fine-tuning to minimize position error and settling time.

> **Tip:** Always save a backup of your initial tuning parameters before making significant changes. This allows you to revert to a known stable state if the system becomes unstable.

Monitoring Motor Status

Real-time operational data such as motor position, velocity, current, and temperature can be monitored over the PROFINET network. Regularly monitoring these parameters can help predict maintenance needs and diagnose system-level issues.

Fault Handling

The integrated electronics will report fault conditions such as over-temperature, over-current, or encoder errors to the servo drive. Refer to the servo drive's manual for a detailed list of fault codes and their meanings to expedite troubleshooting.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Perform a visual inspection of the motor and connected cables. Look for any signs of physical damage, loose connections, or fluid leaks in the vicinity.	This check can be integrated into the machine operator's pre-start checklist.
Weekly	Listen for any unusual sounds such as grinding or whining during operation,	

Interval	Task	Notes
	which could indicate bearing wear or mechanical misalignment.	Document any changes in the motor's audible characteristics.
Monthly	Wipe down the motor's anodized aluminum housing with a dry, lint-free cloth to remove dust and debris. Ensure cooling fins are clear to maintain proper heat dissipation.	Do not use solvents or high-pressure liquids, as this can damage seals and violate the IP65 rating.
Quarterly	Inspect power, encoder, and network cables for signs of chafing, cracking, or abrasion, especially at flex points.	Replace any damaged cables immediately to prevent signal loss or short circuits.
Annually	With power locked out, use a torque wrench to verify that the motor's mounting bolts are tightened to the original specification.	Vibration over time can cause fasteners to loosen.
Annually	Inspect the integrity of the motor shaft seal for any signs of cracking or degradation.	This is especially important in environments with high exposure to dust or fluids.

6. Troubleshooting

Symptom	Possible Cause	Solution
Motor does not enable; drive shows a fault.	Power is not connected, wiring has incorrect polarity, or the encoder cable is disconnected.	Verify 48VDC is present at the motor power connector with correct polarity. Ensure the encoder cable is securely plugged in at both the motor and drive ends.
Motor vibrates or makes a high-pitched humming noise.	Servo tuning gains are too high, or there is a mechanical resonance in the system.	Reduce the proportional (P) and derivative (D) gains in the servo drive configuration. If the problem persists, analyze the mechanical system for sources of resonance.
Motor overheats and triggers a thermal fault.	The commanded torque or duty cycle exceeds the motor's 1.5 Nm continuous rating. It could also be	Reduce the load on the motor or adjust the motion profile to lower the RMS torque. Ensure the area around the

Symptom	Possible Cause	Solution
	due to high ambient temperature or blocked airflow.	motor is clear for adequate air cooling.
Motor does not appear on the PROFINET network.	Incorrect IP address, faulty network cable, or a network configuration error in the controller.	Verify the motor's PROFINET device name and IP settings. Test the network cable with a cable tester. Check the PLC's hardware configuration for errors.
Motor has poor accuracy or a large following error.	Mechanical system is binding, the load inertia is mismatched in the drive parameters, or servo gains are poorly tuned.	Disconnect the load and check if the motor shaft spins freely by hand. Verify the load inertia parameter in the drive. Perform the auto-tuning procedure again.
Motor moves in the wrong direction.	Motor power phases are swapped, or a configuration parameter in the drive is set incorrectly.	Check motor wiring against the schematic. In the servo drive parameters, find the setting for motor direction and invert it.
Drive reports an encoder or feedback fault.	The encoder cable is damaged, not fully seated, or there is significant electrical noise.	Inspect the entire length of the encoder cable for damage. Reseat the connector. Ensure the cable shield is properly grounded at the drive end only.

7. Technical Specifications

Parameter	Value	Unit
Weight	2.8	kg
Material	Anodized Aluminum 6061-T6	
Voltage	48VDC	
IP Rating	IP65	
Country of Origin	CH	
Protocol	PROFINET	
Dimensions	185 x 90 x 90 mm	
Torque	1.5 Nm	