User Manual: NexBot Drives 442-002 Sanding And Polishing Tool

SKU: NXB-GEN-442-002 | 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: Rotating spindle and abrasive media can cause severe entanglement, laceration, or death. Never touch the tool while in motion. Ensure all guards are in place before operation.

WARNING: Disconnect and lock out all electrical power (24VDC) and pneumatic sources before performing any maintenance, media changes, or adjustments to prevent unexpected startup.

WARNING: Sanding and polishing operations generate dust and debris that can be hazardous. Always use appropriate personal protective equipment (PPE), including safety glasses, respirators, and gloves, and ensure proper ventilation.

CAUTION: The tool housing can become hot during extended operation. Allow the tool to cool down before handling to avoid burns.

NOTICE: Use only NexBot-approved or compatible abrasive media. Using unbalanced or improperly rated media can cause excessive vibration, poor performance, and may void the warranty.

2. Product Overview

The NexBot Drives 442-002 is an automated sanding and polishing tool designed to deliver consistent, high-quality surface finishes in robotic applications. This end-of-arm tool is engineered for demanding industrial environments where precision and repeatability are critical for processes like deburring, sanding, polishing, and cleaning on a variety of materials including metals, composites, plastics, and wood. Key to its performance is an active, software-controlled force compliance system. This feature allows the tool to maintain a constant, user-defined pressure against the workpiece, automatically compensating for surface variations and robot path inaccuracies. Unlike passive systems, this active compliance ensures a uniform finish across complex geometries and curved surfaces, significantly reducing rework and scrap rates. The ability to precisely control contact force, adjustable from 10 N to 100 N, protects delicate parts from damage while ensuring effective material removal. The tool is equipped with a high-performance, variable-speed spindle capable of reaching speeds up to 12,000 RPM. This wide operational range provides the flexibility to use a variety of abrasive media, from aggressive sanding discs for rapid material removal to fine polishing pads for achieving mirror-like finishes. The spindle's robust design ensures long-term reliability even under continuous, high-load operation. For simplified integration and operation, the tool communicates via an IO-Link interface, providing real-time data on speed, force, and temperature, and allowing for on-the-fly parameter adjustments. Installation is straightforward thanks to its standard ISO 9409-1 mounting flange, making it compatible with a wide range of NexBot robot models. An integrated dust extraction port with a 50 mm connection is a critical feature for maintaining a clean work environment and preventing abrasive dust from compromising the surface finish or damaging robot components. Typical applications include post-processing of 3D-printed parts, finishing of automotive body panels, polishing of aerospace components, and sanding of high-end wood furniture. The tool's rugged, IP65-rated housing protects internal components from dust and liquid ingress, ensuring reliable performance in harsh production settings.

3. Getting Started

1. First Power-Up

After successful installation, apply 24VDC power to the tool. A status indicator light on the tool body should illuminate, indicating it is powered on and ready to establish communication. No motion should occur until a command is received via IO-Link.

2. Establishing IO-Link Communication

Ensure the IO-Link master has the correct IODD file for the NXB-GEN-442-002 loaded. The tool will automatically begin communicating once connected. Use your PLC or robot controller software to monitor process data and confirm a stable connection.

3. Setting Active Force Compliance

The key feature of this tool is its active force compliance. Before running a program, set the desired contact force (in Newtons) via the IO-Link process data. Start with a low value for initial testing and increase as needed for your specific material and abrasive.

4. Basic Motion Test

Program a simple path that moves the tool near a test workpiece without making contact. Run the program at low speed to verify the robot's path and orientation are correct before enabling the spindle and performing the first finishing operation.

4. Operation

Programming Finishing Paths

For best results, program paths that maintain a consistent tool orientation relative to the workpiece surface. Use linear or contouring motions to ensure even abrasive wear and a uniform finish. Overlap consecutive paths by 30-50% to avoid visible lines.

> **Tip:** Utilize the robot's constant-speed motion commands (e.g., L_Vel) to ensure the abrasive moves across the surface at a steady rate, which is critical for a high-quality polish.

Adjusting Spindle Speed and Force

Spindle speed and contact force are the primary parameters for controlling material removal rate and surface finish. Higher speeds and forces generally remove material faster but may generate more heat. These parameters are adjustable on-the-fly via IO-Link.

Using the Force Compliance System

The active force compliance allows the tool to follow surface contours and absorb minor path deviations. Set a target force and the tool will automatically adjust its position to maintain it. Monitor the actual force feedback to ensure the process is stable.

> **Tip:** For delicate operations, program a 'search' routine where the robot slowly approaches the part until the tool's force sensor registers contact, ensuring a gentle start to the process.

Managing Heat and Debris

Industrial sanding generates significant heat and dust. Ensure any integrated dust extraction systems are active. For heat-sensitive

materials, consider programming cooling pauses or using lower speed and force settings to prevent workpiece damage.

Automated Media Wear Detection

Monitor the tool's current draw or changes in required force compliance over time via IO-Link. A gradual increase in motor current or force needed to achieve the same result can indicate that the abrasive media is worn and needs to be replaced.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the abrasive media for wear, tearing, or loading. Check the tool housing for any loose fasteners or visible damage.	This check should be performed at the beginning of each shift.
Weekly	Clean the exterior of the tool, paying special attention to cooling fins and vents, using low-pressure compressed air. Verify power and communication cables are secure and show no signs of abrasion.	Ensure power is disconnected before cleaning.
Monthly	Check the torque of the robot flange mounting bolts to ensure they have not loosened due to vibration. Inspect the backing pad for wear or damage.	Use a calibrated torque wrench for bolt checks.
Quarterly	Run the tool without a load and listen for any changes in bearing noise. An increase in noise or vibration may indicate bearing wear.	Document any changes in audible noise for trend analysis.
Annually	Perform a detailed inspection of all mechanical and electrical components. It is recommended to have the tool serviced by a qualified NexBot technician to replace spindle bearings and seals.	Contact NexBot Robotics support to schedule preventative maintenance service.

6. Troubleshooting

Symptom	Possible Cause	Solution
Inconsistent or poor surface finish	Worn abrasive media, incorrect spindle speed or force settings, or	Replace the abrasive media. Adjust speed and force parameters. Verify the robot

Symptom	Possible Cause	Solution
	inconsistent robot velocity.	program uses constant-speed motion.
Tool does not power on	No 24VDC power, loose connector, damaged cable, or faulty internal power supply.	Verify 24VDC is present at the connector using a multimeter. Reseat the power connector. Inspect cable for damage and replace if necessary.
No communication over IO-Link	Incorrect wiring, faulty IO-Link master port, incorrect IODD file loaded, or tool fault.	Check cable connections. Try a different port on the IO-Link master. Ensure the correct IODD file is being used in the engineering software.
Excessive vibration during operation	Abrasive media is unbalanced or improperly installed. Spindle bearings are worn.	Stop the operation immediately. Re-center or replace the abrasive media. If vibration persists, schedule maintenance for bearing inspection.
Tool overheats and faults	Cooling vents are blocked with debris. Duty cycle is too high for the application. Ambient temperature is too high.	Clean the cooling vents. Reduce the programmed spindle speed/force or add pauses to the program. Improve ventilation in the work cell.
Tool applies too much or too little force	Incorrect force parameter sent via IO-Link. The force compliance system requires calibration.	Verify the correct force value is being written to the tool. Perform the force sensor zeroing procedure as described in the advanced manual.
Spindle rotates in the wrong direction	Incorrect parameter setting in the IO-Link control data.	Check the control byte or parameter for spindle direction and send the correct value to reverse rotation.

7. Technical Specifications

Parameter	Value	Unit
Weight	6.8	kg
Material	Anodized Aluminum 6061-T6	

Parameter	Value	Unit
Voltage	24VDC	
IP Rating	IP65	
Country of Origin	KR	
Protocol	IO-Link	
Dimensions	255 x 150 x 150 mm	
Torque	2.5 Nm	