

User Manual: NexBot Robotics ELC412-001 Electric Gripper 120mm Stroke

SKU: NXB-GEN-ELC412-001 | 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: This equipment contains powerful, high-speed moving parts. Keep hands and body clear of the gripper's operating envelope at all times to prevent severe crushing injuries.

WARNING: Disconnect and lock out all power sources before performing any installation, maintenance, or repair. Stored electrical energy can cause severe shock or burns.

WARNING: Unexpected motion can occur due to programming errors or system faults. Always remain outside the robot's maximum reach during operation.

CAUTION: The gripper housing, particularly near the motor, may become hot during continuous operation. Allow the unit to cool before handling.

NOTICE: The NexBot ELC412-001 is rated IP54. Do not expose the gripper to direct jets of water or submerge it, as this will damage internal electronics.

2. Product Overview

The NexBot Robotics ELC412-001 is a versatile electric gripper designed for precision handling and pick-and-place applications in automated manufacturing environments. This end-of-arm tooling component provides reliable, software-defined performance for tasks requiring consistent and adaptable part manipulation. The core of the ELC412-001 is its servo-electric drive system, which enables precise, independent control over finger position, speed, and gripping force. With an adjustable gripping force range from 50N to 400N, this gripper can securely handle both delicate electronic components and heavier, ruggedly machined parts without causing damage or slippage. This wide force range eliminates the need for tool changes between tasks involving different part sensitivities, increasing production uptime. The parallel-acting fingers provide a generous 120 mm total stroke, accommodating a diverse range of part sizes and geometries. Engineered for high-throughput applications, the ELC412-001 features exceptional positioning repeatability of ± 0.02 mm. This level of precision ensures that parts are consistently placed in the correct orientation, which is critical for success in automated assembly, machine tending, and quality inspection processes. The gripper's integrated controller simplifies system architecture, connecting directly via IO-Link for streamlined communication and real-time diagnostics on grip status, position, and force. The housing is machined from durable 6061-T6 aluminum and is rated to IP54, providing protection against dust and light water spray in typical industrial settings. Installation is straightforward, utilizing a standard ISO 9409-1-50-4-M6 tool mounting flange for direct attachment to compatible robot wrists.

3. Getting Started

1. Product Overview

The NexBot Robotics ELC412-001 is a servo-electric gripper designed for high-precision automated tasks. Its key features include a 120mm adjustable stroke, software-controlled gripping force and speed, and high repeatability, all managed through its integrated IO-Link communication protocol.

2. Understanding the IO-Link Interface

IO-Link is a powerful communication protocol that allows for detailed control and diagnostics. Through your IO-Link master, you can send commands to control jaw position, speed, and force, while also receiving real-time feedback on the gripper's status, motor temperature, and cycle count.

3. Initial Software Configuration

Before operation, you must load the ELC412-001's IODD (IO-Link Device Description) file into your PLC's engineering software. This file acts as a driver, informing the master of all the gripper's capabilities, parameters, and data structures, which is essential for proper programming.

4. First Movement Check

After successful installation and configuration, use your software's manual control functions to command the gripper. Start by sending a command to open the jaws to 100% (120mm) and then to close them to 0%. This basic test confirms that the hardware and software are communicating correctly.

4. Operation

Position Control

The primary mode of operation involves commanding the gripper jaws to a specific absolute position within the 120mm stroke. This is ideal for applications handling parts of varying, but known, sizes. The gripper will move to and hold the commanded position with a repeatability of ± 0.02 mm.

Tip: For faster cycle times, program the gripper to open only as far as necessary to clear the part, rather than to its full 120mm stroke every time.

Speed Control

The velocity of the gripper jaws can be adjusted via an IO-Link parameter. Lower speeds are recommended for handling fragile components or when precise final positioning is critical. Higher speeds can be used to reduce cycle times for robust, non-sensitive parts.

Force Control

The gripping force can be precisely set to match the application's requirements, preventing damage to delicate workpieces. The gripper will close until it detects the part and achieves the specified force. This is essential for handling items that are sensitive to pressure or have inconsistent dimensions.

Tip: Start with the lowest possible gripping force and incrementally increase it until a secure grip is achieved. This minimizes stress on both the part and the gripper mechanism.

Part Detection Feedback

The gripper can provide feedback confirming that a part has been successfully gripped. This is achieved by monitoring the motor current and jaw position. Your control program can use this data to verify a successful pick before proceeding with the robot's motion path.

Accessing Diagnostic Data

The ELC412-001 continuously monitors its internal status. Through IO-Link, you can read diagnostic information such as internal temperature, bus voltage, total cycle count, and error flags. This data is invaluable for predictive maintenance and rapid troubleshooting.

Tip: Set alarms in your PLC to monitor the gripper's temperature and cycle count to proactively schedule maintenance before a failure occurs.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Perform a visual inspection of the gripper, fingers, and cabling. Look for any loose fasteners, signs of physical damage, or frayed wires.	This check should be part of the operator's pre-shift startup procedure.
Weekly	Wipe down the exterior of the gripper with a clean, dry, lint-free cloth. Ensure the area around the moving jaws is free from dust, chips, or other contaminants.	Do not use compressed air, as it can force debris into the mechanism. The unit is rated IP54, so avoid solvents or excessive liquids.
Quarterly	Inspect the leadscrew and guide rails for signs of wear or contamination. Apply a small amount of the manufacturer-specified lubricant if the mechanism appears dry.	Refer to the ELC412-001 service manual for the approved lubricant type. Over-lubrication can attract contaminants.
Annually	With power off (LOTO), check the tightness of the M12 electrical connector and the gripper mounting bolts. Re-torque the mounting bolts if necessary.	Vibration during normal operation can cause fasteners to loosen over time.
Every 2 Million Cycles	Perform a detailed inspection of the drive mechanism and jaw slides for excessive wear. Re-calibrate the gripper's zero position to maintain accuracy.	This is a preventative maintenance task. Contact NexBot Robotics support for the detailed procedure.

6. Troubleshooting

Symptom	Possible Cause	Solution
Gripper is unresponsive and status LED is off.	Loss of power or faulty cable.	Verify the 24VDC power supply is on. Check the M12 cable for secure connections at both ends. Inspect the cable for damage.
Status LED is flashing red.	An internal fault has occurred (e.g., over-temperature, over-current, stall).	Check the diagnostic code via IO-Link. Allow the gripper to cool if overheated. Inspect for any mechanical obstructions causing the motor to stall.
Gripper fails to establish IO-Link communication.	Incorrect wiring, faulty IO-Link master port, or incorrect IODD file.	Confirm the IO-Link wiring (Pin 4). Try a different port on the IO-Link master. Ensure the IODD file for the NXB-GEN-ELC412-001 is correctly installed.
Gripper is dropping parts intermittently.	Insufficient gripping force, worn finger surfaces, or incorrect speed settings.	Increase the gripping force parameter in the software. Inspect gripper fingers for wear and replace if necessary. Reduce acceleration/ deceleration of the robot arm.
An audible grinding or clicking noise is heard during operation.	Debris in the drive mechanism or internal gear wear.	Immediately stop operation. Power down and clean any visible debris from the jaw mechanism. If the noise persists, the unit may require service.
Poor positioning accuracy; not meeting ± 0.02 mm repeatability.	Loose mounting bolts, worn gripper fingers, or internal mechanical wear.	Verify the gripper is securely mounted to the robot by checking bolt torque. Check for any play in the gripper fingers. If the issue remains, perform a zero-point calibration.
Gripper crushes or damages parts.	Gripping force parameter is set too high.	Reduce the force setting in the control program. Implement a test procedure with a sample part to find the minimum force required for a secure grip.

7. Technical Specifications

Parameter	Value	Unit
Weight	3.2	kg
Material	Aluminum 6061-T6	
Voltage	24VDC	
IP Rating	IP54	
Country of Origin	JP	
Protocol	IO-Link	
Dimensions	185 x 110 x 95 mm	
Repeatability	± 0.02 mm	
Torque	1 Nm	