User Manual: NexBot Robotics CLR032-001 SCARA Robot 5kg Payload 450mm Reach

SKU: NXB-ROB-CLR032-001 | 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: Never enter the robot's operating envelope while power is applied. Unexpected motion can cause fatal injury. Always engage lock-out/tag-out procedures before performing service.

WARNING: Do not modify or bypass any safety circuits, such as emergency stops or guard interlocks. Doing so creates an unsafe operating condition and voids the product warranty.

WARNING: The CLR032-001 has a maximum payload of 5 kg. Exceeding this limit can cause motor overloads, reduced accuracy, and premature mechanical failure.

CAUTION: Use only approved cleanroom-compatible cleaning agents (e.g., 70% IPA solution) on the robot's surface. Harsh

chemicals can damage the special coating and compromise cleanroom compliance.

NOTICE: Ensure the EtherCAT communication protocol settings match the master controller's configuration. Mismatched settings will prevent the robot from operating.

2. Product Overview

The NexBot Robotics CLR032-001 is a high-performance 4-axis SCARA robot designed specifically for automated tasks within controlled cleanroom environments. This robot delivers an effective combination of speed, precision, and payload capacity, making it an ideal solution for applications where particle generation must be minimized. Engineered for ISO Class 4 (Class 10) cleanroom compliance, the CLR032-001 features a specialized, non-porous surface coating and an internal vacuum system to actively prevent contamination of the surrounding workspace. Its streamlined design, with internally routed cabling and air lines, eliminates external sources of particulate, ensuring the integrity of sensitive manufacturing processes. This makes the robot particularly well-suited for semiconductor wafer handling, sterile medical device assembly, and pharmaceutical packaging. With a maximum payload of 5 kg and a horizontal reach of 450 mm, the CLR032-001 provides a versatile work envelope for a wide range of tabletop automation tasks. The robot's powerful servo system enables rapid acceleration and high-speed cycle times, directly contributing to increased production throughput. Despite its speed, it maintains exceptional accuracy, offering a position repeatability of ±0.01 mm. This level of precision is critical for tasks such as micro-electronics assembly, component testing, and precise fluid dispensing, where even minor deviations can impact product quality. The compact base and small footprint allow for flexible cell layouts and seamless integration into existing production lines where space is at a premium. The bottom-exit configuration for all electrical and pneumatic connections further simplifies installation and maintains a clean, uncluttered operational area. The CLR032-001 robot is built for reliability and sustained performance in demanding, 24/7 industrial settings, providing a robust automation platform for advanced manufacturing.

3. Getting Started

1. System Power-Up Sequence

To begin operation, first ensure the main 220VAC breaker is on. Next, rotate the main switch on the controller to the 'ON' position. Release any engaged Emergency Stop buttons; the controller's status light will turn from red to green when the system is ready.

2. Understanding Robot Coordinate Systems

The robot can be manually moved (jogged) in several coordinate systems. 'Joint' mode moves each axis individually. 'World' mode moves the tool in a straight line relative to the robot's base, which is useful for general positioning. 'Tool' mode moves the tool relative to its own orientation, ideal for tasks like dispensing or insertion.

3. Loading and Running a Program

Programs created in the NexBot Studio software can be loaded to the controller. From the main menu, select 'Load Program' and choose the desired file. Before running in automatic mode, always perform a single-step or low-speed dry run to verify the path is clear and correct.

4. Operation

Manual Jogging

Manual jogging is used for teaching points or recovering from a stopped position. Select the desired axis or coordinate system on the teach pendant, and enable the deadman switch. Use the directional controls to move the robot at a controlled speed.

> **Tip:** For fine adjustments, decrease the jog speed override to 10% or less for maximum precision.

Defining a Tool Center Point (TCP)

The TCP defines the exact point on your end-of-arm tooling that the robot's motion is based on. The software includes a guided 4-point calibration routine that automatically calculates the TCP offset. An accurate TCP is essential for achieving the robot's ±0.01 mm repeatability.

Setting Payload and Inertia

For optimal performance, the control system must know the mass properties of the installed EOAT. In the system configuration menu, enter the payload weight (up to 5 kg) and its center of gravity. This allows the controller to optimize acceleration and deceleration profiles for smooth, fast motion.

> **Tip:** If you notice vibration or overshoot during fast moves, re-check that the payload data is entered accurately.

Monitoring Cleanroom System Status

The CLR032-001's internal vacuum system is actively monitored. The system status can be viewed on the controller's diagnostic screen. Any alarms related to low vacuum pressure should be addressed immediately to prevent compromising the cleanroom environment.

Using Digital I/O

The robot controller provides configurable digital inputs and outputs for interfacing with external equipment like sensors, grippers, or PLCs. These I/O points can be controlled and monitored within your robot program to sequence tasks and verify process steps.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Wipe down the robot's exterior surfaces with a lint-free wipe dampened with 70% Isopropyl Alcohol (IPA). Visually inspect cables for any signs of abrasion or damage.	Ensure robot power is off before cleaning. Do not spray liquids directly onto the robot.
Weekly	Perform a slow-speed manual movement through the robot's full range of motion. Listen for any unusual noises from the joints.	This helps in early detection of potential mechanical issues.
Monthly	Check the tightness of the End-of-Arm Tooling mounting bolts.	Vibration during operation can cause bolts to loosen over time.
Quarterly	Inspect the cleanroom-rated coating for any chips, cracks, or peeling. Verify the integrity of the seals around moving joints.	Any damage to the coating should be reported to NexBot service to maintain ISO Class 4 compliance.
Annually	Replace the absolute encoder backup battery located inside the robot controller.	This is a critical step to prevent loss of position data in case of a complete power loss. Must be performed by a qualified technician.
Every 10,000 Hours	Inspect and re-grease the harmonic drives for J1 and J2 axes using NexBot-specified NG-2 cleanroom grease.	Requires specialized tools and procedures outlined in the service manual.
Every 20,000 Hours	Replace the Z-axis (J3) and wrist-axis (J4) timing belts.	Belt replacement is a major service task that should be scheduled with a certified NexBot technician.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot will not move, and a	An emergency stop is active, a safety gate	Reset all E-Stop buttons and ensure safety gates are closed. Check the

Symptom	Possible Cause	Solution
'Servo Off' error is displayed.	is open, or a motor is in an error state.	error log for specific motor faults and cycle power to the controller.
Positioning is not accurate or repeatable.	Incorrect Tool Center Point (TCP) definition, incorrect payload settings, or loose EOAT mounting.	Recalibrate the TCP. Verify the payload mass is set correctly in the configuration. Check and re-torque the EOAT mounting bolts.
An 'Axis Overtravel' or 'Soft Limit' error occurs.	The program is commanding a move outside the physically reachable area or the software-defined work envelope.	Manually jog the robot back into the safe working area. Review the program points to ensure they are all reachable and within the configured limits.
EtherCAT communication is lost.	A communication cable is disconnected or damaged, or there is a network configuration issue on the master controller.	Inspect the EtherCAT cables at both the robot controller and the master device. Verify the network topology and node addresses are correct.
A loud grinding or whining noise is coming from a joint.	Internal gear or bearing failure.	Immediately stop the robot and power down the system. Do not attempt to operate. Contact NexBot Robotics technical support for service.
The robot stops mid-cycle with a 'Motor Overload' error.	Payload exceeds the 5 kg limit, acceleration is set too high for the current load, or the robot is binding mechanically.	Verify the total weight of the EOAT and workpiece. Reduce the acceleration parameters in the program. Check for any physical obstructions in the robot's path.
Controller displays 'Cleanroom Vacuum Fault'.	The external vacuum source is off, the exhaust line is kinked or disconnected, or an internal seal has failed.	Confirm the facility vacuum is active. Inspect the full length of the vacuum exhaust line. If the line is clear, schedule a service call to inspect internal seals.

7. Technical Specifications

Parameter	Value	Unit
Weight	25.5	kg
Material	Die-cast Aluminum with Cleanroom-rated Coating	
Voltage	220VAC Single-Phase	
IP Rating	IP65	
Country of Origin	SE	
Protocol	EtherCAT	
Dimensions	220 x 220 x 750 mm	
Reach	450 mm	
Payload	5 kg	
Axes	4	
Repeatability	±0.01 mm	