# User Manual: NexBot Vision CLR032-003 SCARA Robot 5kg Payload

SKU: NXB-ROB-CLR032-003 | 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 safeguarded work envelope while power is applied. Uncommanded motion can occur, leading to fatal injury.

**WARNING:** The total mass of the end-of-arm tooling and the workpiece must not exceed the 5 kg rated payload. Overloading the robot can cause premature failure and unpredictable motion.

**WARNING:** Do not operate the robot with safety interlocks, light curtains, or emergency stop circuits bypassed or disabled. All safety systems must be fully functional during operation.

**CAUTION:** Use only approved cleaning agents (e.g., isopropyl alcohol) and non-shedding wipes on the robot's surface. Harsh chemicals can damage the chemical-resistant coating.

**NOTICE:** Any unauthorized modification to the robot's hardware, software, or control system will void the manufacturer's warranty.

# 2. Product Overview

The NexBot Vision CLR032-003 is a four-axis SCARA robot engineered for high-precision assembly and handling tasks within demanding cleanroom environments. Specifically designed to meet ISO 14644-1 Class 3 standards, this robot minimizes particulate generation through its smooth, chemical-resistant surface coating, concealed cabling, and internally routed air lines, making it an ideal solution for semiconductor, pharmaceutical, and medical device manufacturing. At its core, the CLR032-003 delivers high performance with a compact footprint. It provides a horizontal reach of 320 mm and a vertical Z-axis stroke of 150 mm, enabling versatile operation within constrained work cells. The robot capably manages a maximum payload of 5 kg, suitable for a wide range of end-of-arm tooling and workpieces. Its design prioritizes speed and precision, achieving rapid cycle times that enhance throughput without compromising on accuracy. This performance is anchored by an outstanding position repeatability of ±0.01 mm, which is critical for intricate tasks like wafer handling, micro-assembly, and sterile packaging. The robot's robust construction ensures reliability and long service life in continuous-duty operations. Its four-axis configuration (J1, J2, Z, U) provides the flexibility needed for complex pick-and-place, sorting, and assembly sequences. Installation is streamlined with a standard bottom-mounting flange, allowing for straightforward integration into existing or new automation systems. The CLR032-003 is built for seamless connectivity with external systems, supporting common industrial communication protocols for easy integration with PLCs and other machine automation hardware. This combination of cleanroom compliance, precision, and speed makes the NexBot Vision CLR032-003 robot a highly effective tool for automating sensitive manufacturing processes.

# 3. Getting Started

## 1. System Components Overview

The NexBot Vision CLR032-003 system consists of the 4-axis robot arm, the robot controller, a teach pendant for manual control, and the necessary power and communication cables. The NexBot Studio software is used for programming, configuration, and diagnostics.

## 2. Understanding the Robot Axes

The CLR032-003 has four axes of motion. J1 (base rotation), J2 (arm extension), J3 (vertical Z-stroke), and J4 (wrist rotation) work together to position the end effector anywhere within its 320 mm reach.

### 3. First Power-On and Homing

Before any operation, the robot must be homed to establish a known reference for its absolute encoders. This is typically done automatically on power-up or can be initiated manually from the teach pendant after clearing any initial faults.

### 4. Using the Teach Pendant

The teach pendant allows for manual jogging of the robot, teaching points for a program, and monitoring system status. Always hold the pendant with both hands and be prepared to release the deadman switch or press the E-Stop to halt motion instantly.

## 4. Operation

### Manual Operation (Jogging)

In T1 (Teach) mode, the robot can be moved at a safe, limited speed using the jog keys on the teach pendant. You can select different coordinate systems (Joint, World, Tool) to make positioning the end effector more intuitive for different tasks.

> **Tip:** When teaching points near a fixture, use the 'Tool' coordinate system for precise, linear movements relative to the gripper's orientation.

### Automatic Operation

In Automatic mode, the robot executes the currently loaded program at its configured speed. The cycle is typically initiated by an external signal from a PLC or by pressing the 'Start' button on the operator panel after all safety conditions are met.

### Payload Configuration

Accurately defining the 5 kg maximum payload's mass, center of gravity, and inertia is critical for optimal performance. These parameters are set in the NexBot Studio software and directly affect the robot's acceleration, path accuracy, and motor life.

> **Tip:** Use the built-in payload estimation utility for simple geometries. For complex EOAT, use CAD data to determine the center of gravity precisely.

### Fault Recovery

When a fault occurs, servo power is cut, and a descriptive error message appears on the teach pendant. To recover, identify and resolve the root cause, then use the 'Reset' function to clear the fault before re-enabling servo power.

### Program Selection and Management

The robot controller can store multiple programs. The active program can be selected via the teach pendant, HMI, or digital I/O signals, allowing for

flexible manufacturing and quick changeovers between different products.

## 5. Maintenance Schedule

| Interval | Task | Notes |
|---|---|---|
| Daily | Visually inspect the robot arm, cables, and end-of-arm tooling for any signs of wear, damage, or loose connections. Wipe down the robot surface with an approved cleanroom wipe. | This should be performed as part of a pre-shift checklist. |
| Monthly | Check the teach pendant cable for damage or stress at the connection points. Verify the functionality of the E-Stop button and deadman switch. | A damaged teach pendant cable is a serious safety hazard and must be replaced immediately. |
| Quarterly | Inspect the condition and integrity of the internal pneumatic tubing and electrical wiring for the EOAT. | This requires partial removal of access covers and should be done by trained personnel. |
| Annually | Replace the absolute encoder backup batteries located in the robot base. This prevents the loss of position calibration during a complete power loss. | The controller will issue a 'Low Battery' warning several weeks before replacement is critical. |
| Annually | Inspect and re-grease the J3 (Z-axis) ball screw spline assembly using NexBot-specified cleanroom grease. | Use minimal grease to avoid contamination. Clean off all old grease before applying new lubricant. |
| Every 8,000 Hours | Perform a comprehensive inspection of the timing belts for the J1 and J2 axes. Check for proper tension, fraying, or tooth wear. | Belt replacement and tensioning are advanced procedures that should only be performed by a certified technician. |

## 6. Troubleshooting

| Symptom | Possible Cause | Solution |
|---|---|---|
| Robot will not move; 'Servo Power Off' status shown. | An E-stop is active, a safety gate is open, or the servo power-on command has not been issued. | Release all E-stop buttons, ensure all safety interlocks are satisfied, and then |

| Symptom | Possible Cause | Solution |
|---|---|---|
| | | press the servo power-on button. |
| Positioning is inaccurate or drifts over time. | Incorrect TCP or payload data; robot requires re-calibration; a hard collision has occurred. | Verify all TCP and payload parameters in the software. If the problem persists after a re-homing cycle, perform a full robot calibration. Inspect for mechanical damage. |
| EtherCAT network fault. | A communication cable is disconnected, damaged, or an EtherCAT device on the network has failed. | Check the status LEDs on all EtherCAT devices. Inspect all cables for secure connections and damage. Cycle power to the network devices. |
| Overload or Overcurrent fault on a specific axis. | Motion is obstructed; payload exceeds 5 kg limit; acceleration is set too high for the current payload. | Check the robot's path for obstructions. Verify the payload weight. Reduce the acceleration/ deceleration values in the motion program. |
| Robot arm drops slightly when servo power is disabled. | The brake on the J3 (vertical) axis is failing or requires adjustment. | Immediately cease operation. Manually support the arm and contact NexBot technical support. Do not use the robot until the brake is repaired. |
| 'Absolute Encoder Battery Low' warning. | The backup battery for the encoders is nearing its end-of-life. | Order a replacement battery. Schedule a maintenance window to replace the battery as per the annual maintenance procedure to avoid losing the robot's home position. |
| Teach pendant screen is blank or unresponsive. | Pendant cable is not fully connected, is damaged, or the pendant itself has failed. | Power down the controller, then disconnect and reconnect the teach pendant cable securely. Inspect the cable and pins for damage. If it still fails, the pendant may need replacement. |

## 7. Technical Specifications

| Parameter | Value | Unit |
|---|---|---|
| Weight | 22.5 | kg |
| Material | Cast Aluminum with Chemical-Resistant Coating | |
| Voltage | 200-240VAC Single Phase | |
| IP Rating | IP65 | |
| Country of Origin | KR | |
| Protocol | EtherCAT | |
| Reach | 320 mm | |
| Payload | 5 kg | |
| Axes | 4 | |
| Repeatability | ±0.01 mm | |