User Manual: NexBot Vision FLR022-003 Collaborative Robot Arm 10kg Payload

SKU: NXB-ROB-FLR022-003 | 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 active workspace during automatic operation. High-speed motion can cause fatal injury. All safety guards and interlocks must be in place and verified before starting production.

WARNING: A thorough risk assessment must be performed for every application, even in collaborative mode. Payloads with sharp edges, high temperatures, or hazardous materials can introduce risks not mitigated by the robot's internal safety features.

WARNING: Disconnect and lock out the main 48VDC power supply before performing any maintenance, tool changes, or making physical adjustments to the robot arm. Stored energy can cause severe electrical shock or unexpected motion.

CAUTION: Do not exceed the maximum rated payload of 10 kg, which includes the weight of any end-of-arm tooling (EOAT). Overloading the robot can lead to inaccurate performance, premature wear, and motor faults.

NOTICE: The robot is rated IP54. While protected from dust and water splashes, it must not be subjected to high-pressure liquid jets or submersion. Operating outside these limits will void the warranty and can lead to equipment failure.

2. Product Overview

The NexBot Vision FLR022-003 is a six-axis collaborative robot arm engineered for flexible automation in environments shared with human operators. This cobot is designed to handle a variety of tasks that require precision and adaptability, making it an ideal solution for small to medium-sized enterprises seeking to enhance productivity without extensive infrastructure changes. Its core design philosophy balances performance with safety, allowing for direct collaboration between the robot and personnel without the need for traditional safety caging in many applications, following a comprehensive risk assessment. Key to its performance is a substantial 10 kg payload capacity, which allows the robot to manage a wide range of end-of-arm tooling and workpieces for applications such as machine tending, assembly, and packaging. The arm provides a generous working envelope with a maximum reach of 1300 mm, offering significant flexibility in cell layout and task execution. With a position repeatability of ±0.03 mm, the FLR022-003 executes tasks with the high degree of accuracy required for quality control inspections, precise part insertion, and intricate assembly processes. This level of precision ensures consistent output and reduces material waste. Integrated force-torque sensing in all joints provides immediate feedback and collision detection, enabling the robot to operate safely alongside human workers. The programming interface is intuitive, supporting hand-guiding for quick path teaching as well as an icon-based graphical environment for more complex logic. This accessibility lowers the technical barrier for deployment and operation, reducing integration time and training costs. The robot is built for industrial durability and is suitable for applications across manufacturing, logistics, and electronics assembly. The floor-mounted design ensures stability for high-payload and long-reach operations, providing a reliable platform for your automation needs.

3. Getting Started

1. Understanding the System Components

The NexBot Vision FLR022-003 system consists of three main components: the 6-axis robot arm, the system controller, and the teach pendant. The controller houses the main computer and power drivers, while the teach pendant provides the primary human-machine interface for direct control and programming.

2. First Power Up and Homing

After installation, turn on the controller. The robot will remain motionless while it boots up, indicated by a flashing status light. Once the light turns

solid green, use the teach pendant to initiate the homing sequence, which calibrates the position of all axes.

3. Defining a Tool Center Point (TCP)

The TCP defines the active point of your attached tool relative to the robot's mounting flange. Use the built-in TCP configuration wizard on the teach pendant to accurately define this point using a 4-point or direct entry method. An accurate TCP is critical for linear movements and overall program precision.

4. Creating a Simple Program

Programs are built by moving the robot to desired locations (waypoints) using the teach pendant and recording them in sequence. You can then define the type of motion (linear, joint) and speed between these points. Create a simple pick-and-place routine to familiarize yourself with the basic programming workflow.

4. Operation

Coordinate Systems

The robot can be jogged in several coordinate systems for intuitive control. 'Joint' mode moves each axis individually. 'World' mode moves the tool linearly along the X, Y, and Z axes of the robot's base, while 'Tool' mode moves it linearly relative to the TCP's own orientation.

> **Tip:** Use 'World' for large movements across the workspace and switch to 'Tool' for fine adjustments when interacting with a workpiece.

Configuring Payload

Accurately setting the payload mass and center of gravity in the software is critical for performance and safety. The system uses this data to optimize motion dynamics and to calculate forces for collaborative operation. Update these settings every time you change the end-effector or the part being handled.

Implementing Collaborative Safety

The FLR022-003 allows for setting speed and force limits to enable safe operation alongside humans. These settings must be configured based on your application's official risk assessment. The robot can be programmed to operate at higher speeds in unrestricted zones and automatically reduce speed when a human enters the collaborative workspace.

> **Tip:** When testing, begin with the most restrictive safety limits and gradually loosen them as your risk assessment allows, ensuring safety at every step.

Using Program Logic

Beyond simple waypoint-to-waypoint motion, you can add logic to your programs. Use 'Wait' instructions to pause for sensor inputs, 'If'

statements to make decisions based on I/O, and 'Pallet' functions to automate repetitive pick-and-place tasks in a grid pattern.

Monitoring System Status

The teach pendant and NexBot Control Suite provide real-time diagnostics on robot status. You can monitor axis positions, motor currents, I/O states, and system logs. Regularly checking these diagnostics can help you identify potential issues before they cause downtime.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the robot arm, cables, and controller for any signs of damage, wear, or loose connections. Clean the arm's surface with a dry, lint-free cloth.	Report any damage immediately. Do not use chemical solvents for cleaning.
Weekly	Check the freedom of movement for each axis by manually moving the arm (with brakes released). Ensure there is no binding or unusual resistance.	This check should be done with the system powered down.
Monthly	Verify the tightness of the base mounting bolts to ensure the robot is secure. Check the integrity of the end-of-arm tooling mount.	Use a torque wrench to confirm bolts are at the specified torque value from the installation guide.
Quarterly	Test all safety circuits, including the emergency stop buttons on the pendant and controller, and any external safety devices (light curtains, area scanners).	Document all safety test results as part of your machine safety program.
Annually	Inspect and clean the cooling fan filters on the robot controller. Obstructed airflow can lead to overheating and component failure.	Ensure the controller is powered off before opening any service panels.
Annually	Create a complete backup of all robot programs and system configuration files.	Store the backup on a secure network drive or external storage device.
Every 20,000 Hours	Schedule a preventative maintenance service with a certified NexBot Robotics technician for gearbox	Service interval may vary based on application duty cycle

Interval	Task	Notes
	lubrication and inspection of internal wear components.	and environmental conditions.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot triggers a 'Protective Stop' during operation.	The collaborative force sensor detected an impact with an object or person, or the motion exceeded configured safety limits.	Ensure the workspace is clear. Review the program for unexpectedly fast motions. Reset the fault from the teach pendant. If it persists, re-evaluate your application's safety settings.
A 'Singularity' fault occurs, stopping the robot.	The robot's wrist axes (4, 5, 6) are nearly aligned, making linear path calculation impossible.	Modify the robot's path to avoid this alignment. Slightly change the angle of the tool or the approach to the waypoint. Using a 'Joint' move through this area instead of 'Linear' can also resolve the issue.
Robot fails to power on; no status lights.	No incoming 48VDC power, controller's main breaker is tripped, or a faulty power cable.	Use a multimeter to verify 48VDC at the controller's input. Check and reset the main breaker. Inspect the power cable for any damage.
Positioning accuracy is poor or has degraded.	TCP is not defined correctly, the payload settings are wrong, or the base mounting has loosened.	Re-run the TCP definition wizard. Verify the payload mass and center of gravity are accurately entered. Check the torque on the robot's base mounting bolts.
Cannot establish communication via EtherCAT.	Faulty or incorrect cable, incorrect IP address/node ID setting, or an EtherCAT master configuration error.	Check the physical cable connections. Verify the robot's network settings in the NexBot Control Suite. Check the EtherCAT master's diagnostic tools for errors.
Excessive noise or vibration from a joint.	Potentially serious internal mechanical issue, such as	Immediately stop all robot operations. Power down the system. Do not attempt to run the

Symptom	Possible Cause	Solution
	gearbox wear or bearing failure.	robot again. Contact NexBot Robotics technical support for service.
Teach pendant is unresponsive or screen is blank.	Cable is not securely connected, or the pendant has an internal fault.	Power down the controller, then disconnect and securely reconnect the teach pendant cable. If the issue persists after powering back on, the pendant may require replacement.

7. Technical Specifications

Parameter	Value	Unit
Weight	35.5	kg
Material	Anodized Aluminum Alloy	
Voltage	48VDC	
IP Rating	IP54	
Country of Origin	SE	
Protocol	EtherCAT	
Reach	1300 mm	
Payload	10 kg	
Axes	6	
Repeatability	±0.03 mm	