User Manual: NexBot Vision MA012-003 6-Axis Robot Arm 25kg Payload

SKU: NXB-ROB-MA012-003 | 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: This robot operates on high-voltage 400-480VAC 3-Phase power. Contact with energized components can cause electrocution and death. Always de-energize and use LOTO procedures before opening any electrical panel.

WARNING: The robot can move unexpectedly at high speed and force. The work envelope must be secured with safety-rated guarding. Never enter the robot's active work area during operation.

WARNING: An incorrect payload setting can lead to erratic motion, motor overload, or dropped parts. Always configure the exact payload (up to 25 kg) in the controller before running a program.

CAUTION: Pinch points exist at all 6 axes. Keep hands, clothing, and hair away from the robot arm during movement to prevent severe crushing injuries.

NOTICE: Operation and programming of the NexBot Vision MA012-003 must only be performed by personnel who have completed certified NexBot training. Unauthorized modifications to software or hardware will void the warranty.

2. Product Overview

The NexBot Vision MA012-003 is a high-performance six-axis articulated robot arm engineered for demanding industrial automation applications requiring a balance of payload capacity, reach, and precision. This robot arm is designed to enhance productivity and flexibility in manufacturing, logistics, and processing environments. Its robust construction and advanced motion control capabilities make it a reliable solution for complex, repetitive tasks. The primary benefit of the MA012-003 is its versatile performance envelope. With a substantial 25 kg payload capacity, it can handle a wide range of parts, components, and end-of-arm tooling, from heavy workpieces to complex multi-function grippers. The six degrees of freedom provide exceptional dexterity, allowing the arm to reach confined spaces and perform intricate movements that mimic human motion. This flexibility is crucial for applications like complex assembly, arc welding support, and machine tending where precise orientation is critical. The robot's impressive 1,700 mm horizontal reach creates a large, optimized work envelope, maximizing its utility within a workcell and reducing the need for additional linear tracks. Key to its performance is a position repeatability of ±0.03 mm, which ensures consistent and accurate execution of programmed paths, cycle after cycle. This level of precision is vital for quality-critical tasks such as dispensing, inspection, and intricate pick-and-place operations. The arm's structure is rated to IP67, providing complete protection against dust ingress and resistance to water immersion, making it suitable for deployment in harsh industrial settings that involve dust, debris, or fluids. The base of the robot is rated to IP54. The MA012-003 is engineered for durability and long service life, with a rigid mechanical design that minimizes vibration and ensures stable operation even at high speeds. Installation is streamlined with a standardized base mounting pattern, and the unit integrates seamlessly with NexBot Vision C-series controllers.

3. Getting Started

1. System Power-Up Sequence

To start the system, first turn on the main disconnect supplying power to the robot controller. Next, press the 'ON' button on the controller front panel. The system will initialize, which may take 1-2 minutes, after which the teach pendant will display the main home screen.

2. Understanding the Teach Pendant

The teach pendant is the primary human-machine interface. It features an emergency stop button, a 3-position deadman switch for enabling motion, axis jog keys, and a touchscreen for programming and

configuration. Always hold the pendant with both hands during manual operation.

3. Homing the Robot

Before running any program, the robot's absolute position must be established through a homing or 'mastering' procedure. Navigate to the 'Service' menu and select 'Mastering'. Follow the on-screen prompts to align each axis with its reference marks.

4. Operation

Manual Jogging

To move the robot manually, enable the motors by holding the deadman switch and pressing the 'MOTOR ON' button. Select a coordinate system (e.g., JOINT, WORLD, TOOL) and use the corresponding keys to jog the robot axes. This is fundamental for teaching program points.

> **Tip:** For precise linear movements, always use the WORLD or TOOL coordinate systems. Use JOINT mode for large, non-linear re-positioning.

Defining a Tool Center Point (TCP)

The TCP defines the exact working point of your end-of-arm tool. An accurate TCP is critical for the robot's path accuracy. Use the built-in 4-point or 6-point teaching utility to automatically calculate the TCP by approaching a fixed reference point from multiple angles.

Creating and Editing Programs

A program is a sequence of recorded points and instructions. To create a program, open a new file, jog the robot to a position, and record the point with a specific motion type (Linear, Joint, Circular). Add logic instructions, such as waiting for an input or setting an output, to control the application flow.

> **Tip:** Use descriptive names for points and programs to make future troubleshooting and modification much easier for your team.

Configuring Payload Settings

Properly defining the mass and center of gravity of your EOAT and workpiece is essential for optimal performance. Navigate to the 'Payload Settings' menu and enter the correct values for your application. The system uses this data to optimize motor torque and acceleration, ensuring smooth motion and longevity.

Using Digital I/O

The robot controller is equipped with digital inputs and outputs (I/O) for interfacing with external devices like sensors, grippers, and PLCs. Use the I/O configuration screen to map physical I/O points to system signals and integrate the MA012-003 into a larger automated cell.

> **Tip:** Simulate I/O signals directly from the teach pendant during program testing to verify logic without needing the external hardware to be active.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the robot arm, cables, and controller for any signs of damage, leaks, or loose connections. Confirm the work area is clean and free of debris.	This is a pre-operation check to be performed by the operator at the start of each shift.
Weekly	Wipe down the robot arm surfaces with a lint-free cloth and an approved cleaning solution. Do not use abrasive chemicals or high-pressure spray.	Maintaining cleanliness helps in early detection of oil leaks or other issues.
Monthly	Test the functionality of all Emergency Stop buttons and safety interlocks in the robot cell.	Log the results of each safety check in the machine's maintenance record.
Quarterly	Check the grease levels in the sight glasses of the axis gearboxes. If low, add the specified NexBot grease type.	Do not mix grease types. Refer to the maintenance manual for the correct lubricant SKU.
Annually	Replace the absolute encoder backup batteries located in the robot base. This prevents the loss of mastering data.	This procedure must be performed while the controller is powered ON to prevent data loss. Follow the specific procedure in the service manual.
Every 3 Years or 15,000 Hours	Complete grease replacement for all 6 axis gearboxes. This service should be performed by a certified NexBot technician.	Operating beyond this interval can lead to premature gearbox wear.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot will not move; 'Deadman	The 3-position deadman switch on	Ensure the deadman switch is held firmly

Symptom	Possible Cause	Solution
Switch Fault' on pendant.	the teach pendant is not fully pressed to the middle position, or it is released.	in its center-enabled position. If the error persists, inspect the teach pendant cable for damage.
Positioning is inaccurate, especially on angled movements.	The Tool Center Point (TCP) is not defined correctly or has been corrupted.	Re-run the TCP calibration procedure using a sharp, fixed reference point. Ensure the tool is rigidly mounted.
'Axis Collision Detected' alarm.	The robot arm has made physical contact with an object in its workspace.	Carefully jog the robot away from the obstruction. Inspect the robot and tooling for damage before resuming operation. Adjust the program path to avoid the collision.
EtherCAT communication error between controller and robot.	The EtherCAT protocol cable is disconnected, damaged, or there is significant electrical noise.	Check that the cable is securely connected at both the controller and robot base. Inspect the cable for cuts or kinks. Ensure the cable is routed away from high-voltage motor cables.
Robot motion is jerky or vibrates excessively.	Payload settings for mass or center of gravity are incorrect for the attached tool.	Weigh the EOAT and part accurately. Enter the correct mass and center of gravity coordinates into the active payload schedule.
Program stops with 'Singularity Point' error.	The program commands a linear move that causes two or more axes (typically J4 and J6) to align, making a specific orientation mathematically impossible.	Modify the program to use a 'Joint' move through the singularity zone, or add an intermediate point that changes the wrist orientation slightly to avoid the alignment.
Robot loses its home position after a complete power cycle.	The absolute encoder backup batteries are depleted.	Replace the encoder backup batteries located in the robot base. After replacement, the robot will need to be re-mastered.

7. Technical Specifications

Parameter	Value	Unit
Weight	275.0	kg
Material	High-Strength Cast Aluminum Alloy	
Voltage	400-480VAC 3-Phase	
IP Rating	IP67 (Arm) / IP54 (Base)	
Country of Origin	JP	
Protocol	EtherCAT	
Dimensions	680 x 550 mm (Base Footprint)	
Reach	1700 mm	
Payload	25 kg	
Axes	6	
Repeatability	±0.03 mm	