User Manual: NexBot Robotics MA012-001 6-Axis Robot Arm 25kg Payload

SKU: NXB-ROB-MA012-001 | 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 safeguarded work envelope while the system is in automatic mode. Unpredictable high-speed motion can cause fatal injury.

WARNING: Do not operate the robot with safety devices such as door interlocks or light curtains bypassed or disabled. All safety systems must be fully functional.

WARNING: The total weight of the end-of-arm tooling and the workpiece must not exceed the maximum rated payload of 25 kg. Overloading can cause component failure and hazardous conditions.

> **CAUTION:** The robot arm and joint motors can reach high temperatures during extended operation. Avoid direct skin contact and allow the unit to cool before performing maintenance.

> **NOTICE:** The IP65/IP67 ratings do not protect against high-pressure jets or submersion. Use only approved cleaning methods and protect the robot from direct, high-pressure washing.

2. Product Overview

The NexBot Robotics MA012-001 is a high-performance 6-axis articulated robot arm designed to automate medium-payload applications with exceptional precision and reliability. This versatile robot provides an ideal balance of speed, strength, and a generous work envelope, making it a core component for enhancing productivity and consistency in demanding manufacturing environments. Engineered for durability, the MA012-001 features a robust cast aluminum alloy construction. Its streamlined design minimizes interference within the work cell while providing maximum structural rigidity. The arm is sealed to an IP65 rating, with the wrist assembly achieving an IP67 rating, ensuring dependable operation in environments with dust, debris, and liquid splashes. This protection reduces downtime and lowers maintenance costs over the robot's lifespan. A key benefit of this robot arm is its impressive combination of payload and reach. With a maximum payload capacity of 25 kg, the MA012-001 can handle a wide variety of parts, fixtures, and end-of-arm tooling. This capability is complemented by a horizontal reach of 1710 mm, which creates a large, versatile work envelope. This extended reach allows the robot to service multiple machines, access large workpieces, or perform complex palletizing patterns without requiring additional linear tracks, simplifying cell design and reducing capital investment. The six axes of motion provide superior dexterity, enabling the arm to maneuver around obstacles and orient tooling with high precision for intricate tasks. This flexibility is critical for applications such as complex assembly, arc welding, and sealant application. Furthermore, the robot achieves a position repeatability of ±0.03 mm, a specification that guarantees consistent quality in high-precision processes. This level of accuracy is essential for tasks where even minor deviations can lead to product defects, such as electronics assembly or precise part insertion. Typical applications for the MA012-001 robot arm include: * Machine Tending: Loading and unloading CNC machines, injection molding presses, and stamping presses. * Material Handling: Transferring parts between conveyors, stacking, and sorting. * Palletizing and Depalletizing: Systematically arranging boxes, bags, or other products onto pallets. * Assembly: Performing multi-step assembly operations with high accuracy. * Welding and Dispensing: Executing consistent paths for welding, sealing, or gluing applications. Installation is streamlined through a standard ISO mounting flange, facilitating integration with existing or new automation cells. The robot arm is designed for straightforward integration into plant-wide automation systems.

3. Getting Started

1. Teach Pendant Overview

The teach pendant is your primary interface for controlling the MA012-001. It features a color touchscreen, an enabling (deadman)

switch for safety during manual operation, an emergency stop button, and a physical keypad for precise control and data entry. Become familiar with its layout before proceeding.

2. Power-On and Homing

Before powering on, ensure the workcell is clear of personnel and obstructions. Turn on the main controller power, then enable the servo motors using the teach pendant. If required, the system will prompt you to perform a homing routine to establish the robot's position.

3. Understanding Coordinate Systems

The robot can be moved (jogged) in various coordinate systems. 'Joint' mode moves one axis at a time, while 'World' and 'Tool' modes provide linear and rotational movement relative to a fixed point in the cell or the attached tool, respectively. Selecting the correct system is key for efficient programming.

4. Operation

Manual Jogging

To manually move the robot, select 'Teach' mode, choose a coordinate system and speed override, and press and hold the enabling switch. Use the joystick or direction keys to move the robot. Releasing the enabling switch or keys will immediately stop all motion.

> **Tip:** For fine-tuning a position, use a low speed override (e.g., 10%) and the 'Tool' coordinate frame for maximum precision at the point of interest.

Running in Automatic Mode

Select a program and ensure the mode selector is set to 'Auto'. Exit the safeguarded space and ensure all gates are closed. The program can be started using the 'Start' button on the controller or via an external signal from a PLC.

Defining Tool and Payload

Accurately defining your Tool Center Point (TCP) and payload mass is critical for precision. Use the built-in setup utilities to teach the TCP using a multi-point method. Enter the mass properties of your gripper and workpiece to allow the controller to optimize motion dynamics.

Program Flow and Logic

Beyond simple point-to-point motion, you can incorporate logic such as waits, loops, and conditional statements based on digital inputs. This allows the MA012-001 to interact intelligently with its environment, such as waiting for a part to be in position before picking it up.

Fault Handling and Reset

When a fault occurs, an alarm sounds and a message is displayed on the teach pendant. Identify and resolve the root cause of the issue. Once the

condition is corrected, press the 'Reset' button on the teach pendant or controller to clear the fault before resuming operation.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the robot arm, cables, and controller for any signs of wear, damage, or fluid leaks. Confirm the workcell is free of debris.	This check should be part of a pre-shift checklist.
Weekly	Perform a functional test of all emergency stop circuits and safety interlocks. Listen for any unusual noises from the axis gearboxes during a slow-speed test cycle.	Document the test results in a safety log.
Quarterly	Clean the robot's cast aluminum alloy surfaces with a mild, non-corrosive cleaner. Inspect and clean controller cabinet air filters to ensure proper cooling.	Do not use high-pressure air or water to clean the robot arm.
Annually (or 4,000 hours)	Replace the absolute encoder backup batteries located in the robot base. This prevents the loss of mastering data during a power outage.	This procedure must be performed while main power is supplied to the controller to avoid data loss.
Annually	Check the torque of the robot base mounting bolts and the end-of-arm tooling mounting bolts to ensure they remain secure.	Use a calibrated torque wrench.
Every 10,000 hours	Perform grease replacement for the reducers of axes 1, 2, and 3. Use only NexBot-specified NB-Lube G-11.	This is a significant service item that may require a certified technician.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot loses its position (mastering) after controller is powered off.	The absolute encoder backup batteries are depleted or have failed.	Replace the encoder backup batteries located in the robot base. The robot will need to be re-mastered after replacement.

Symptom	Possible Cause	Solution
Positioning is not accurate; robot does not reach the taught point correctly.	The Tool Center Point (TCP) or payload data is incorrect or has not been configured.	Redefine the TCP using the multi-point calibration utility. Verify that the mass, center of gravity, and inertia for the current payload are entered accurately.
Fault: 'Singularity Avoidance'. Robot stops or slows unexpectedly near certain poses.	The robot's path is too close to a wrist singularity (where axes 4 and 6 align), causing unpredictable motion.	Adjust the robot's path or the orientation of the end-of-arm tooling to avoid the singular position. A slight change in the wrist angle is often sufficient.
Fault: 'Collision Detection'. Robot stops and flags an error.	The robot has made unexpected contact with an object, or the sensitivity is set too high for the application's acceleration.	Inspect the workcell for obstructions. If no collision occurred, review the collision detection sensitivity settings and adjust them for the specific program dynamics.
Teach pendant screen is frozen or unresponsive.	Software glitch or communication interruption between the pendant and controller.	Attempt to cycle power to the teach pendant by disconnecting and reconnecting its cable. If the problem persists, cycle power to the entire robot controller.
EtherCAT communication link failure.	A communication cable is damaged, loose, or disconnected.	Power down the system. Inspect the entire length of the EtherCAT cables for damage. Reseat the connections at the controller and the robot base.
Overcurrent or Overload fault on a specific axis.	The motor is drawing too much current due to a jam, excessive payload, or high acceleration.	Check for any physical obstruction restricting axis movement. Verify the payload is within the 25 kg limit. Reduce the acceleration and speed values in the program.

7. Technical Specifications

Parameter	Value	Unit
Weight	285.0	kg
Material	Cast Aluminum Alloy	
Voltage	380-480VAC 3-Phase	
IP Rating	IP65 (Body), IP67 (Wrist)	
Country of Origin	KR	
Protocol	EtherCAT	
Reach	1710 mm	
Payload	25 kg	
Axes	6	
Repeatability	±0.03 mm	