User Manual: NexBot Safety MA012-012 6-Axis Robot Arm 25kg Payload

SKU: NXB-ROB-MA012-012 | 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: HIGH VOLTAGE. Risk of severe injury or death from electric shock. All service work on the controller cabinet must be performed by qualified personnel with power disconnected and locked out.

WARNING: UNEXPECTED ROBOT MOTION. The robot may move unexpectedly during programming or automatic operation. Maintain a safe distance and stay out of the robot's work envelope unless it is safely stopped and locked out.

WARNING: CRUSH HAZARD. The robot arm can generate extreme forces. Keep all body parts away from the robot arm and any pinch points between the robot and other equipment.

CAUTION: Exceeding the 25 kg maximum payload can cause premature wear, motor overloads, and damage to the robot's mechanical systems. Always verify payload and EOAT weight before operation.

NOTICE: The IP67 rating requires that all connector caps and seals are properly installed and maintained. Failure to do so will compromise the robot's protection against dust and water ingress.

2. Product Overview

The NexBot Safety MA012-012 is a high-performance 6-axis articulated robot arm engineered for medium-payload applications requiring precision, speed, and reliability. This robot is designed to automate repetitive and demanding tasks, improving productivity and consistency in manufacturing environments. Its robust construction and advanced motion control make it an excellent choice for a wide range of industrial processes. Key Features: With a substantial 25 kg payload capacity, this robot arm can handle a variety of parts and end-of-arm tooling, making it versatile for tasks from pick-and-place to machine tending and dispensing. Its horizontal reach of 1710 mm provides an extensive work envelope, allowing it to service multiple stations or large workpieces without requiring complex cell layouts. The arm achieves a position repeatability of ±0.05 mm, ensuring consistent and accurate execution of programmed paths, which is critical for quality-sensitive assembly and inspection processes. The MA012-012 is built with a rigid yet lightweight cast aluminum body, providing excellent vibration damping and thermal stability for continuous, high-duty-cycle operation. Internal routing for pneumatics and I/O signals minimizes interference and wear on external lines, simplifying installation and reducing maintenance downtime. The streamlined design of the arm allows for operation in confined spaces while maximizing its operational range. This robot is an adaptable automation solution for applications including material handling, packaging, palletizing, and automated assembly. Its combination of payload, reach, and precision offers a capable platform for enhancing manufacturing efficiency.

3. Getting Started

1. System Components Overview

The NexBot Safety MA012-012 system consists of three main components: the 6-axis robot arm manipulator, the NXC-200 series controller cabinet, and the NXP-10 touch-screen teach pendant. Familiarize yourself with each component and the location of key features like the emergency stop buttons and status indicators.

2. Power On and Off Procedure

To power on the system, first turn the main disconnect on the controller cabinet to the ON position, then press the power button. To power down, ensure the robot is in a safe, parked position, then follow the shutdown procedure on the teach pendant before turning off the main disconnect.

3. Navigating the Teach Pendant

The teach pendant is the primary interface for controlling the robot. Use the touchscreen to navigate menus for programming, configuration, and diagnostics. The physical enabling switch and joystick are used for manual robot movement (jogging).

4. Manual Robot Jogging

To move the robot manually, select the desired jog mode (e.g., Joint, Cartesian, Tool) on the teach pendant. While holding the enabling switch, use the joystick to move the robot along the selected axes or coordinates. Always start at a very low speed.

4. Operation

Defining a Tool Center Point (TCP)

The TCP is the focal point of your end-of-arm tool. Accurately defining the TCP is critical for precise linear and circular movements. Use the built-in 4-point or 6-point teaching wizard to define the X, Y, and Z dimensions and orientation of your tool.

> **Tip:** For tools with a sharp point, using the 4-point method with different approach angles will yield a highly accurate TCP.

Creating a Motion Program

A program is a sequence of taught points and logic instructions. To create a program, open a new file, move the robot to a desired position, and record the point. Select the motion type (e.g., Joint, Linear) and speed for moving to that point.

Setting Up Payloads

Properly defining the payload data, including the weight (up to 25 kg) and center of gravity, is essential for optimal performance and robot life. The system uses this data to calculate dynamics and optimize acceleration, preventing excessive vibration and motor strain.

> **Tip:** Always create separate payload schedules for different parts the robot will handle and switch between them in the program.

Configuring Safety Zones

The integrated safety functions allow you to define safe working zones that restrict robot motion. Configure these zones to protect operators and peripheral equipment. These settings are password-protected and should only be modified by trained safety personnel.

Running in Automatic Mode

Once a program is tested and finalized, it can be run in automatic mode. Select the program, reset any alarms, and provide a start signal from the teach pendant or an external PLC over PROFINET. The safety guards must be closed for the robot to move at full speed.

> **Tip:** Perform a dry run of new programs at low speed to verify the entire path is clear of obstructions before running at 100% speed.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the robot arm and cables for any signs of damage, leaks, or wear. Check the teach pendant for any active error messages.	This should be performed by the operator at the start of each shift.
Weekly	Clean the exterior surfaces of the robot arm and controller with a soft,	Do not use high-pressure water or

Interval	Task	Notes
	dry cloth. Verify that all safety guarding and interlocks are functioning correctly.	harsh solvents, as this may damage seals.
Quarterly	Check the torque of the robot's base mounting bolts to ensure they have not loosened due to vibration. Inspect the end-of-arm tooling for wear and secure mounting.	Reference the manual for specific torque values.
Annually	Replace the batteries for the absolute encoder backup located in the robot base. Failure to replace these can result in the loss of mastering data.	The robot must be powered on during this procedure to avoid losing position data.
Annually	Inspect and clean the controller cabinet's cooling fans and filters to ensure proper airflow and prevent overheating.	Accumulated dust can significantly reduce cooling efficiency.
Every 4,000 Hours	Perform a lubrication check. Inspect specified joints for grease leakage and re-apply grease as needed according to the lubrication chart in the service manual.	Use only the NexBot-specified grease type.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot will not move in manual mode	Emergency stop is active, enabling switch not engaged, or a fault condition is present.	Release all E-stop buttons, fully engage the enabling switch on the teach pendant, and check the alarm screen to reset any active faults.
Positioning is not accurate or repeatable	Incorrect Tool Center Point (TCP) data, incorrect payload settings, or loose mounting bolts.	Re-teach the TCP accurately. Verify the correct payload schedule is active. Check the torque on the robot base and EOAT mounting bolts.
Error: 'Singularity approach'	The robot's path is too close to a wrist singularity, where axes 4 and 6 align, making linear path calculation impossible.	Slightly change the angle of the tool or the programmed point to move away from the singularity. A small change in wrist orientation is often sufficient.
Error: 'Axis limit J5'	The program commands Axis 5 to move beyond its designed mechanical or software limit.	Jog the robot away from the limit and modify the program point to be within the valid working range of the axis.

Symptom	Possible Cause	Solution
PROFINET communication loss	Network cable is disconnected or damaged, incorrect IP address configuration, or an issue with the master PLC.	Check the physical Ethernet cable and connections. Verify the robot's network settings match the PLC configuration. Ping the robot's IP address from the network.
Error: 'Payload Mismatch'	The detected motor torque is inconsistent with the currently selected payload data.	Ensure the correct payload schedule is selected in the program. If the payload is correct, run the payload identification routine to refine the dynamic properties.
Robot seems to vibrate or shudder during movement	Acceleration settings are too aggressive for the payload, or the payload data is incorrect.	Reduce the acceleration/deceleration parameters for the motion instruction. Verify the payload mass and center of gravity are defined correctly.

7. Technical Specifications

Parameter	Value	Unit
Weight	285.0	kg
Material	Cast Aluminum Alloy	
Voltage	400-480VAC 3-Phase	
IP Rating	IP67	
Country of Origin	KR	
Protocol	PROFINET	
Reach	1710 mm	
Payload	25 kg	
Axes	6	
Repeatability	±0.05 mm	