User Manual: NexBot Robotics MA012-004 6-Axis Robot Arm 25kg Payload

SKU: NXB-ROB-MA012-004 | 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 restricted operating space while it is in automatic mode. Unexpected motion can occur at any time, resulting in fatal injury.

WARNING: Do not exceed the maximum rated payload of 25 kg. Overloading the robot can lead to motor failure, mechanical damage, and unpredictable behavior.

WARNING: Always disconnect and lock out all electrical power sources before performing any maintenance, cleaning, or repairs on the MA012-004 robot arm.

CAUTION: The robot's motors and gearboxes can reach high temperatures during operation. Avoid direct skin contact to prevent burns.

> **NOTICE:** The IP65/IP67 rating protects against dust and low-pressure water jets. Do not use high-pressure washers or submerge the robot, as this can damage seals and electronics.

2. Product Overview

The NexBot Robotics MA012-004 is a high-performance 6-axis articulated robot arm engineered for complex automation tasks in demanding industrial environments. This robot provides an ideal balance of payload capacity, reach, and speed, making it a flexible solution for a wide range of applications. Its robust construction ensures reliable operation and a long service life, even under continuous use cycles. The core of the MA012-004 is its powerful and precise drive system, which delivers exceptional motion control across all six axes. With a maximum payload capacity of 25 kg, this arm can handle not only the workpiece but also complex end-of-arm tooling, such as multi-part grippers or welding heads. The generous horizontal reach of 1600 mm provides a large, accessible work envelope, suitable for serving multiple machines or working around large fixtures. This combination of strength and reach allows for efficient integration into existing production lines without significant layout changes. Precision is critical in modern manufacturing, and the MA012-004 robot arm delivers outstanding position repeatability of ±0.03 mm. This level of accuracy ensures consistent quality for tasks like intricate assembly, precise part insertion, and dispensing applications where deviation is not an option. The articulated design of the robot arm offers maximum dexterity, enabling it to maneuver in tight spaces and access difficult-to-reach points on a workpiece. Common applications for the MA012-004 include: - CNC machine tending - High-speed material handling and transfer - Palletizing and depalletizing - Automated assembly and inspection - Arc welding and sealant application support Designed for ease of integration, the robot arm features an ISO 9409-1 standard tool flange for broad compatibility with end-effectors. Internal routing for air and electrical lines helps to minimize interference and wear, simplifying installation and maintenance. The robot is constructed from high-strength cast aluminum alloy and features an IP65 rating (with an IP67-rated wrist), ensuring protection against dust and water ingress in typical factory settings. This durable robot arm is a dependable asset for increasing productivity and improving process consistency.

3. Getting Started

1. Understanding the Teach Pendant

The teach pendant is the primary interface for controlling the NexBot Robotics MA012-004. It is used for manual jogging, creating and editing programs, system configuration, and viewing diagnostics. Key features include the E-stop button, dead-man switches for safety during manual operation, and a full-color touchscreen.

2. Coordinate Systems

The robot operates in several coordinate systems (frames), including World, Joint, and Tool. The World frame is fixed relative to the robot's base, while the Tool frame is relative to the end-of-arm tooling. Selecting the correct frame is essential for intuitive jogging and precise programming.

3. Performing a Master/Calibration

Before its first use, the robot must be 'mastered' to establish the precise home position for all 6 axes. This is a one-time procedure guided by software on the teach pendant. Remastering is only necessary if an axis motor or encoder is replaced.

4. Operation

Defining a Tool Center Point (TCP)

An accurate TCP definition is critical for precision. The system includes a guided routine to define the TCP by touching a fixed point from multiple orientations. A correct TCP ensures that programmed linear moves and rotations occur around the actual tip of the tool.

> **Tip:** Redefine the TCP any time you replace or adjust the end-of-arm tooling to maintain accuracy.

Setting Payload Data

For optimal performance and longevity, you must configure the payload data in the system settings. This includes the mass (up to 25 kg), center of gravity, and moments of inertia for the installed tooling and workpiece. This data allows the controller to optimize motion profiles and prevent excessive vibration.

> **Tip:** Use the built-in Payload Identification routine for an automated way to estimate payload data if exact values are unknown.

Running in Automatic Mode

Automatic mode is used for production. After selecting a program, ensure all safety gates are closed and personnel are clear of the work cell. The cycle is typically started from an external PLC or operator panel. The teach pendant can be used to monitor production counts, cycle times, and I/O status.

Fault Recovery Procedure

If the robot stops due to an error, a fault code and description will appear on the teach pendant. First, ensure the situation that caused the fault is resolved (e.g., remove an obstruction). Then, press the 'RESET' button on the teach pendant to clear the fault before resuming operation.

> **Tip:** For recurring faults, record the error code and operating conditions to assist with troubleshooting.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the robot arm, cables, and connectors for any signs of wear, damage, or fluid leaks. Listen for any unusual noises during operation.	This should be part of a pre-shift checklist for the cell operator.
Weekly	Clean the exterior of the robot arm using a cloth dampened with a mild, approved cleaning solution. Ensure cooling vents on the controller are clear of dust.	Do not spray cleaning solution directly onto joints or electrical connectors.

Interval	Task	Notes
Quarterly	Test the functionality of all Emergency Stop buttons and safety interlocks in the robot cell.	Document the date and result of each safety circuit test in a maintenance log.
Annually	Check the torque of the robot base mounting bolts and the end-of-arm tooling mounting bolts.	Refer to the technical manual for specific torque values.
Annually (or 4000 hours)	Replace the batteries for the absolute encoder backup located in the robot base.	This procedure must be performed while the robot controller is powered on to prevent loss of mastering data.
Every 10,000 Hours	Perform a complete regreasing of all 6 axis gearboxes. This is a complex procedure that involves draining old grease and applying a precise amount of new, specified lubricant.	It is highly recommended that this service be performed by a NexBot Robotics certified technician.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot fails to power on; teach pendant is blank.	No incoming power to the controller or main breaker is off.	Verify the main power disconnect is ON. Check the facility circuit breaker. Use a multimeter to confirm 400-480VAC 3-Phase power is present at the controller's input terminals.
Positioning is inaccurate and drifts over time.	TCP is not defined correctly, payload data is wrong, or base mounting bolts are loose.	Recalibrate the Tool Center Point (TCP). Verify the configured payload matches the installed tooling. Check the torque on the robot's base mounting bolts.
Motion Supervision Fault (Error Code 501).	The robot's actual path deviated from the programmed path due to a collision, incorrect payload settings, or excessive speed/ acceleration.	Check for any obstructions in the robot's path. Ensure payload data is accurate. Reduce the programmed speed or acceleration for the move that causes the fault.
E-Stop Fault cannot be cleared.	An E-Stop button is still pressed, or there is a fault in the external safety circuit.	Twist all E-Stop buttons on the teach pendant and controller to release them. If the fault persists, check the wiring for all external safety devices (gates, light curtains).

Symptom	Possible Cause	Solution
Encoder Battery Low Warning.	The backup batteries for the absolute position encoders are nearing end-of-life.	Schedule maintenance to replace the encoder batteries immediately. If main power is lost before replacement, the robot will lose its mastering data.
Excessive vibration or whining noise from one axis.	Potential internal gearbox damage or bearing failure.	Stop robot operation immediately to prevent catastrophic failure. Contact NexBot Robotics technical support for service.
EtherCAT Communication Lost (Error Code 822).	The communication cable between the controller and robot is damaged, disconnected, or there is network interference.	Inspect the EtherCAT cable for damage and ensure it is securely connected at both ends. Cycle power to the robot and controller. Ensure no high-power cables are routed directly next to the communication cable.

7. Technical Specifications

Parameter	Value	Unit
Weight	275.0	kg
Material	High-Strength Cast Aluminum Alloy	
Voltage	400-480VAC 3-Phase	
IP Rating	IP65 (IP67 for wrist)	
Country of Origin	DE	
Protocol	EtherCAT	
Reach	1600 mm	
Payload	25 kg	
Axes	6	
Repeatability	±0.03 mm	