User Manual: NexBot Robotics SA011-001 6-Axis Robot Arm 10kg Payload

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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: Hazardous voltage is present inside the controller. Disconnect and lock out all power before opening panels or performing service. Failure to do so will result in death or serious injury.

WARNING: The robot can move unexpectedly at high speed. Always remain outside the robot's work envelope during automatic operation. Ensure all safety guards and interlocks are in place and functional.

WARNING: The robot arm creates powerful pinch and crush points. Keep hands and body parts clear of all joints and tooling during operation to prevent severe injury.

CAUTION: Exceeding the 10 kg maximum payload can cause excessive wear, inaccurate performance, and may lead to motor faults or mechanical failure. Always verify payload calculations.

NOTICE: Only trained and authorized personnel should operate, program, or maintain the NexBot Robotics SA011-001 robot. Unauthorized modification of programs or hardware will void the warranty.

2. Product Overview

The NexBot Robotics SA011-001 is a high-performance 6-axis articulated robot arm engineered for complex automation tasks in space-constrained environments. This robot provides an excellent balance of speed, payload capacity, and working range, making it a versatile solution for a wide variety of industrial processes. Its six degrees of freedom offer maximum dexterity, enabling the arm to perform intricate movements and reach difficult-to-access points within a work cell, similar to the flexibility of a human arm. The SA011-001 features a substantial 10 kg payload capacity, which is ideal for handling a broad range of parts, components, and end-of-arm tooling (EOAT). This capability allows it to be deployed in applications from simple pick-and-place to more demanding tasks like light machining or dispensing. The robot arm's generous 1300 mm horizontal reach creates an expansive work envelope, providing significant operational flexibility for machine tending, palletizing, and assembly line integration. Precision is paramount in modern manufacturing, and the SA011-001 delivers with an exceptional position repeatability of ±0.02 mm. This high level of accuracy ensures that tasks are performed consistently cycle after cycle, which is critical for maintaining product quality and reducing defects in applications such as electronics assembly or precision insertion. Designed for reliability in industrial settings, the robot arm body is rated to IP54 standards, with the wrist assembly rated to IP67, providing protection against dust and water ingress. The streamlined design incorporates internally routed cabling and air lines, which minimizes interference, reduces wear, and simplifies integration. Common applications for the SA011-001 robot include CNC machine tending, injection molding machine unloading, intricate parts assembly, automated inspection, and packaging. Its compact footprint and flexible mounting options (floor, ceiling, or wall) allow for efficient use of factory floor space, making it an effective choice for both new automation projects and retrofitting existing production lines.

3. Getting Started

1. Power-Up Sequence

To start the system, first ensure the main power disconnect is switched on. Then, turn the key switch on the controller to the ON position. The system will initialize, which may take up to 60 seconds, after which the teach pendant will display the main menu.

2. Understanding the Teach Pendant

The teach pendant is the primary interface for controlling the robot. It allows for manual jogging, program creation and editing, system

configuration, and viewing diagnostic information. Familiarize yourself with the emergency stop button, deadman switch, and mode selection switch.

3. Homing the Robot

Before any operation, the robot must be homed to establish a known reference position for all axes. Navigate to the 'Homing' or 'Mastering' menu on the teach pendant and follow the on-screen prompts. This procedure ensures the robot's repeatability of ±0.02 mm.

4. Operation

Manual Jogging

Select 'T1' (Teach) mode to enable manual movement at a safe, reduced speed. Use the coordinate system selection keys (e.g., Joint, World, Tool) and the corresponding directional keys on the teach pendant to position the robot arm. The deadman switch must be engaged for any motion to occur.

> **Tip:** For precise linear movements, use the 'World' or 'Tool' coordinate systems. For repositioning individual joints, use the 'Joint' coordinate system.

Creating a Program

A program is a sequence of recorded points and instructions. In the program editor, use the jogging functions to move the robot to a desired position and then 'Record' the point. Add logic, delays, or I/O instructions between points to build a complete automation sequence.

Defining a Tool Center Point (TCP)

The TCP defines the focal point of the end-of-arm tool. Accurately defining the TCP is critical for precise path execution, especially for circular or tool-oriented movements. Use the built-in TCP calibration wizard to define the point's X, Y, and Z offset from the robot's J6 flange.

> **Tip:** Redefine the TCP whenever you change or adjust the end-of-arm tooling to maintain accuracy.

Setting Payloads

To ensure optimal performance and longevity, the robot's control system must be configured with the correct payload data. Enter the mass (up to 10 kg), center of gravity, and inertia moments of the attached tooling and workpiece in the payload settings menu. Incorrect settings can lead to vibrations and reduced accuracy.

Running in Automatic Mode

To execute a program in a production environment, select 'AUTO' mode. Ensure all personnel are outside the safety-fenced area and all doors are closed. Select the desired program and press the 'Cycle Start' button on the operator panel or via system I/O.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the robot arm, cables, and controller for any signs of damage, leaks, or loose connections. Check the work area for debris.	Perform this check before the start of each production shift.
Weekly	Inspect the main robot umbilical and tooling cables for signs of abrasion, chafing, or kinking. Ensure all cable management systems are secure.	Pay close attention to areas where the cable flexes repeatedly.
Monthly	Clean the robot arm and controller exterior using a lint-free cloth and approved cleaning solution. Do not use high-pressure water or harsh solvents.	A clean robot makes it easier to spot oil leaks or other issues.
Quarterly	Create a full backup of the robot controller's software, programs, and configuration settings onto a USB drive or network location.	Store backups in a safe, separate location.
Annually	Check the grease levels in the gearboxes for axes 1 through 6. Replenish with the specified NexBot Robotics grease if levels are low.	Refer to the service manual for specific grease port locations and procedures.
Every 2 Years	Replace the batteries for the absolute encoder memory within the robot arm. This must be done with the main power on to avoid losing mastering data.	This is a critical task to prevent the need for re-mastering the robot.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot fails to power on; teach pendant is blank.	No incoming power, E-Stop is engaged, or main circuit breaker is tripped.	Verify main power is supplied to the controller. Disengage all E-Stop buttons. Check and reset the main circuit breaker in the controller cabinet.
	Robot path is obstructed, payload settings	Check for any collisions or obstructions in the work cell. Verify that

Symptom	Possible Cause	Solution
Positioning Error' or 'Deviation' alarm.	are incorrect, or a motor brake has failed.	the configured payload data accurately matches the installed tooling. Check motor brake function.
EtherCAT Communication Error.	Damaged or disconnected EtherCAT cable, network configuration issue, or faulty hardware.	Inspect the EtherCAT cable for damage and ensure it is securely connected at both the controller and master device. Verify network settings. Cycle power to the controller.
Robot will not move in manual (T1) mode.	Deadman switch not engaged, mode switch in wrong position, an alarm is active, or drives are not enabled.	Ensure the mode switch is in T1. Fully depress the deadman switch. Clear any active alarms on the teach pendant. Press the 'Drives On' button.
Excessive vibration or 'chatter' during movement.	Incorrect payload settings, loose mounting bolts, or internal mechanical wear.	Accurately measure and configure the payload data. Re-torque all robot base mounting bolts. If the issue persists, contact NexBot Robotics technical support.
Lost mastering/ homing data after power loss.	The absolute encoder backup batteries are depleted.	Replace the encoder backup batteries following the procedure in the maintenance manual. The robot will need to be re-mastered using the calibration tools.
IP67 rated wrist shows signs of moisture ingress.	Seals are damaged or degraded, or the wrist was exposed to high-pressure jets beyond its rating.	Power down the robot immediately. Contact service to have the wrist seals inspected and replaced. Review cleaning procedures to ensure they are appropriate for the IP rating.

7. Technical Specifications

Parameter	Value	Unit
Weight	65.0	kg

Parameter	Value	Unit
Material	Cast Aluminum Alloy	
Voltage	400-480VAC 3-Phase	
IP Rating	IP54 (Body), IP67 (Wrist)	
Country of Origin	US	
Protocol	EtherCAT	
Reach	1300 mm	
Payload	10 kg	
Axes	6	
Repeatability	±0.02 mm	