User Manual: NexBot Drives SA011-002 6-Axis Robot Arm 10kg Payload

SKU: NXB-ROB-SA011-002 | 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 workspace during automatic operation. Unexpected movement can cause fatal injury.

WARNING: The maximum payload for this robot is 10 kg. Exceeding this limit can cause unpredictable behavior, component failure, and create a hazardous situation.

WARNING: Ensure all safety guards and interlocks are in place and functional before operating the robot. Bypassing safety systems can lead to severe injury.

CAUTION: The robot arm and motor surfaces can become hot during extended operation. Avoid direct skin contact to prevent burns.

NOTICE: Perform regular backups of robot programs and configuration data to prevent data loss in case of system failure or battery replacement.

2. Product Overview

The NexBot Drives SA011-002 is a high-performance 6-axis articulated robot arm engineered for applications requiring precision, speed, and a compact footprint. This robot provides an exceptional combination of payload capacity and agility, making it a suitable choice for automating a wide range of industrial processes. Its robust construction ensures reliable operation in demanding manufacturing environments, delivering consistent performance cycle after cycle. The key to the SA011-002's performance is its design. With six axes of motion, the arm offers maximum flexibility, capable of reaching challenging orientations and positions within its work envelope, similar to a human arm. This dexterity is critical for complex assembly, dispensing, and machine tending tasks. It supports a substantial 10 kg payload, allowing it to handle a variety of end-of-arm tooling and workpieces without compromising speed or accuracy. The arm's impressive reach of 1300 mm provides a generous work area, enabling it to service multiple machines or stations within a single automated cell. Furthermore, its position repeatability of ±0.02 mm ensures that tasks are performed with the highest degree of precision, which is essential for quality control in electronics manufacturing and intricate assembly operations. Typical applications for the SA011-002 robot arm include high-speed pick-and-place, CNC machine tending, parts transfer, precision assembly, and automated dispensing. The arm's rigid structure minimizes vibration, even during rapid movements, contributing to its high accuracy. Installation is streamlined with a standardized base mounting flange and integrated air and electrical lines, reducing setup time and potential points of failure. The smooth, sealed surfaces simplify cleaning and maintenance, making it suitable for various industrial settings.

3. Getting Started

1. Understanding the Teach Pendant

The teach pendant is the primary human-machine interface for the SA011-002. It allows for manual jogging, program creation and editing, and system diagnostics. Familiarize yourself with the emergency stop button, dead-man switch, and coordinate system selection keys before proceeding.

2. Coordinate Systems

The robot operates in several coordinate systems, including Joint, World, and Tool. Understanding how to select and use the appropriate coordinate system is fundamental for efficient programming and achieving the specified ±0.02 mm repeatability. The World frame is fixed to the robot's base, while the Tool frame is relative to the end-of-arm tooling.

3. Power-Up and Homing Sequence

Before any operation, the robot must be powered on and homed. The standard power-up sequence involves turning on the main disconnect, then the controller. The homing procedure calibrates the position of all 6

axes and must be completed successfully before any program can be executed.

4. Operation

Creating a Basic Program

Use the teach pendant in T1 (manual) mode to record a series of points defining a path. Combine motion commands (Linear, Joint) with I/O commands to control the end-of-arm tool. A simple program involves moving to a point, waiting for an input, and moving to another point.

> **Tip:** Use relative offsets and palletizing functions for repetitive tasks to simplify programming and reduce the number of taught points.

Defining a Tool Center Point (TCP)

The TCP defines the focal point of your end-of-arm tool, which is critical for precise linear and circular movements. Use the built-in 4-point or 6-point calibration wizard to define the tool's dimensions and orientation relative to the robot's flange. An accurate TCP is essential for achieving the robot's stated repeatability.

Setting Payload Data

To ensure optimal performance and longevity, the robot's control system must know the mass and center of gravity of the attached payload. Input the payload data, up to the 10 kg maximum, into the system configuration menu. Incorrect payload data can lead to excessive vibration, inaccurate movements, and motor overloads.

> **Tip:** If the payload changes during the process (e.g., picking up a part), use program instructions to switch between different defined payload schedules.

Switching Operating Modes

Manual mode (T1) is used for teaching and setup, limiting robot speed for operator safety. Automatic mode (AUTO) is for production runs, allowing the robot to execute programs at full speed. Always ensure all personnel are outside the safety enclosure before switching the key to AUTO mode.

Using PROFINET I/O

The SA011-002 uses PROFINET for integration with PLCs and other factory automation systems. Configure the robot's digital and analog I/O signals to communicate status, start and stop programs, and interact with other machinery in the work cell. The GSDML file provided by NexBot must be used to configure the network.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the robot arm, cables, and end-of-arm tooling for any signs of wear, damage, or loose connections. Check the controller for any active fault indicators.	This quick check should be part of the operator's pre-shift startup procedure.
Weekly	Clean the robot arm surfaces with a soft, dry cloth. Verify that safety equipment (e.g., E-stops, light curtains) is functioning correctly.	Do not use solvents or high-pressure water, as this can damage seals and violate the IP54 rating.
Monthly	Check teach pendant cable for signs of fraying or damage. Listen for any unusual noises from the axis gearboxes during slow manual movement.	Unusual grinding or whining noises may indicate a need for a more detailed inspection by a technician.
Quarterly	Inspect the integrity of the base mounting bolts and re-torque if necessary. Check the cooling fans on the controller for dust buildup and ensure they are spinning freely.	Refer to the installation guide for correct torque specifications.
Annually	Check and replace the controller backup battery. This battery preserves system memory (programs, configuration) when main power is off.	Perform a full system backup before replacing the battery to prevent any risk of data loss.
Every 10,000 Hours	Grease replenishment for axis gearboxes 1, 2, and 3. This is a critical task to ensure the longevity and performance of the main axes.	Use only NexBot-specified lubricant. This procedure should be performed by a certified technician.

6. Troubleshooting

Symptom	Possible Cause	Solution
Robot fails to power on; controller screen is blank.	No incoming power, main breaker is tripped, or E-Stop circuit is open.	Verify the 400-480VAC 3-Phase power source is active. Check and reset the main circuit breaker. Ensure all E-Stop buttons are released.

Symptom	Possible Cause	Solution
Position is inaccurate or repeatability is poor.	Incorrect Tool Center Point (TCP) or payload data; loose mounting bolts.	Recalibrate the TCP and verify the payload mass and center of gravity are correctly entered. Check the torque on the robot base mounting bolts and the end-of-arm tooling.
PROFINET communication error with PLC.	Incorrect IP address, damaged cable, or network configuration mismatch.	Verify the robot's IP address is unique and on the correct subnet. Inspect the PROFINET cable for damage. Check the PLC configuration to ensure it matches the robot's GSDML file.
Axis Overtravel Alarm is triggered.	A programmed point is outside the robot's mechanical limits.	In T1 mode, press the brake release and manually jog the robot away from the overtravel position. Review the program and re-teach the point to be within the valid working envelope.
Motor Overload Fault on a specific axis.	Payload exceeds 10 kg limit, incorrect payload data, or a mechanical obstruction.	Verify the total weight of the EOAT and workpiece is below the 10 kg limit. Check that payload data is entered correctly. Manually move the axis to check for any binding or collision.
Robot motion is jerky or vibrates excessively.	Incorrect payload definition or acceleration/ deceleration parameters are set too high.	Ensure the payload mass and center of gravity are accurately defined in the controller. Reduce the acceleration and smoothing values in the motion program.
Teach Pendant is unresponsive or shows connection error.	Damaged pendant cable or loose connector.	Power down the controller. Inspect the entire length of the pendant cable for damage. Disconnect and reconnect the cable at the controller, ensuring it is securely latched.

7. Technical Specifications

Parameter	Value	Unit
Weight	165.0	kg
Material	Cast Aluminum Alloy	
Voltage	400-480VAC 3-Phase	
IP Rating	IP54	
Country of Origin	KR	
Protocol	PROFINET	
Reach	1300 mm	
Payload	10 kg	
Axes	6	
Repeatability	±0.02 mm	