User Manual: NexBot Vision 212-011 Safety Controller SIL3/PLe

SKU: NXB-CTL-212-011 | Version: 1.0 | Brand: NexBot Robotics

Table of Contents

1. Safety Information

READ ALL SAFETY INSTRUCTIONS BEFORE OPERATION. Failure to follow safety procedures may result in serious injury or equipment damage.

DANGER: This equipment contains hazardous voltages. All installation, maintenance, and troubleshooting must be performed by qualified personnel with all power sources de-energized and locked out.

WARNING: Improper configuration of the safety logic can lead to a failure of the safety function, resulting in serious injury or death. The final configuration must be validated by a qualified safety engineer.

WARNING: Never bypass, bridge, or otherwise disable any safety inputs or outputs. Doing so will defeat the protective measures and create an uncontrolled hazard.

CAUTION: This device is sensitive to electrostatic discharge (ESD). Use proper ESD handling procedures, such as wearing a wrist strap, when handling the controller with its cover removed or during installation.

NOTICE: The NexBot Vision 212-011 has an IP20 rating and must be installed within a suitable enclosure that protects it from dust, moisture, and corrosive substances to prevent damage.

2. Product Overview

The NexBot Vision 212-011 is a dedicated safety controller designed to manage and monitor safety-related functions within automated robotic work cells. This controller serves as the core of a robot's safety system, processing inputs from devices like emergency stops, light curtains, and safety mats to ensure the immediate and safe cessation of hazardous motion. Its primary function is to provide a reliable and certified safety architecture for applications where human-robot collaboration or interaction is necessary. The controller is engineered for high-reliability applications, achieving a Safety Integrity Level of SIL3 (IEC 62061) and Performance Level 'e' (ISO 13849-1). This is made possible through its dual-channel, monitored architecture which provides internal redundancy to protect against single points of failure. The unit features 24 configurable safe digital inputs and 8 safe digital outputs, allowing for flexible integration of a wide range of safety devices. With a processing response time under 10 ms, the controller ensures that safety commands are executed with minimal latency, a critical factor in preventing accidents. Key applications include fenceless collaborative robot setups, high-speed packaging lines, and complex machine tending operations where operators frequently enter the workspace. The 212-011 controller simplifies the implementation of safety zones, muting functions, and safe-speed monitoring. Integration into the broader factory network is streamlined via its built-in PROFINET interface with PROFIsafe support, allowing for both safety and standard communication over a single network. Configuration is performed through a dedicated, intuitive software environment that allows for logic programming and diagnostics. The compact, DIN rail mountable design ensures easy installation within standard control cabinets, minimizing footprint and simplifying wiring.

3. Getting Started

1. Product Overview

The NexBot Vision 212-011 is a programmable safety controller that serves as the central component of a machine's safety system. It monitors safety input devices and, based on its user-defined logic, controls safety output devices to bring machinery to a safe state. Its PROFINET interface allows for seamless integration and diagnostics with the primary machine controller.

2. Software Installation

To configure the controller, you must install the NexBot SafetyLogic software on a Windows-based PC. The software provides a graphical interface for creating safety logic, setting network parameters, and monitoring the system in real-time. Ensure you are using the latest version available from the NexBot Robotics support portal.

3. Establishing a Connection

Connect your PC to the same network as the controller or directly via an Ethernet cable. Use the NexBot SafetyLogic software to scan the network for devices or connect directly using the default IP address printed on the device label. Once connected, you can upload, download, and monitor the safety application.

4. Operation

Understanding Status LEDs

The front panel LEDs provide a quick visual diagnostic of the controller's status. A solid green 'PWR' LED indicates power is on, while a solid green 'RUN' LED shows the safety logic is executing. A red 'FAULT' LED indicates a system error that must be investigated using the diagnostic tools in the software.

> **Tip:** A flashing 'RUN' LED typically indicates the controller is in a pre-operational or standby state, waiting for a reset signal or for startup checks to complete.

Developing Safety Logic

Safety applications are created in the NexBot SafetyLogic software using certified function blocks. Users can drag and drop blocks for E-Stops, Light Curtains, and Two-Hand Controls, then logically connect them to safety outputs. Each configuration must be compiled and downloaded to the controller to become active.

Monitoring and Diagnostics

While online with the controller, the software provides a live view of the logic and the status of all physical I/O points. This is an invaluable tool for commissioning and troubleshooting. The diagnostics buffer stores a history of faults and events, which can be saved for detailed analysis.

> **Tip:** You can assign custom tags or names to I/O points in the software to make monitoring more intuitive during commissioning.

System Reset Procedures

After a safety device is activated and the hazard is cleared, the system may require a manual reset. This is typically done by pressing a designated, non-safety rated reset button wired to a standard input. The reset logic is configured within the software to ensure it can only occur when all safety inputs are in a safe state.

PROFINET Diagnostics

The controller provides extensive diagnostic data to the PROFINET master (PLC). This includes the status of the controller itself, the state of individual safety I/O, and any active faults. Integrating this data into the HMI can provide operators with clear information about the safety system's status.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the controller's status LEDs to ensure they indicate normal operation (e.g., green RUN, no red FAULT).	This should be part of the operator's pre-shift machine checklist.
Monthly	Check all terminal block connections for tightness. If a torque screwdriver is available,	Perform this task with the system de-energized.

Interval	Task	Notes
	verify they are tightened to the specified value.	
Quarterly	Inspect the controller and surrounding area inside the cabinet for dust and debris accumulation. Clean with low-pressure, dry compressed air if necessary.	Ensure ventilation slots on the enclosure are clear to prevent overheating.
Annually	Perform a full functional test of every connected safety device and validate the complete safety function against the original risk assessment.	This validation is a critical regulatory requirement in many regions and must be documented.
Annually	Connect to the controller with the NexBot SafetyLogic software and save a complete backup of the current safety configuration and parameter settings.	Store the backup file in a secure, version-controlled location.
As Needed	Check the NexBot Robotics support website for any firmware updates for the controller. Apply updates according to the release notes and re-validate the safety function.	Firmware updates may be required to address bugs or add new features.

6. Troubleshooting

Symptom	Possible Cause	Solution
The 'POWER' LED is off.	No 24VDC power is supplied to the unit, or the polarity is reversed.	Verify the 24VDC power supply is on. Use a multimeter to check for correct voltage and polarity at the controller's power terminals.
The 'FAULT' LED is solid red.	An internal, non-recoverable hardware fault or a critical configuration error has occurred.	Cycle power to the controller. If the fault persists, connect with the diagnostic software to read the error code and contact NexBot technical support.
A safety output will not turn on, even though all inputs are safe.	The safety logic requires a manual reset, or a discrepancy fault (e.g., between dual-channel inputs) is active.	Activate the manual reset input. Check the diagnostic software for any input discrepancy or cross-fault errors that may be inhibiting the output.
Cannot establish communication with the controller over PROFINET.	Incorrect IP address, faulty Ethernet cable, network configuration issue, or mismatched device name.	Verify the controller's IP address is on the correct subnet. Check cable connections and link/activity lights on the port. Ensure the PROFINET device name in

Symptom	Possible Cause	Solution
		the PLC project matches the name set in the controller.
An input LED does not light when the connected sensor is activated.	A wiring error (open circuit), a faulty sensor, or an incorrect sensor type (e.g., PNP vs NPN).	De-energize and check the wiring between the sensor and the controller terminal. Test the sensor's output independently to confirm it is functioning.
Controller reports a 'cross-circuit fault' between two input channels.	A short circuit has occurred between the two wires of a dual-channel safety device.	Power down the system and inspect the entire length of the sensor cable for damage, crushing, or moisture ingress that could cause a short.
Configuration download from SafetyLogic software fails.	The controller is in an error state, there is a network interruption, or the software version is incompatible with the controller's firmware.	Reset any faults on the controller. Ensure a stable network connection. Verify that you are using a compatible version of the configuration software.

7. Technical Specifications

Parameter	Value	Unit
Weight	0.8	kg
Material	Polycarbonate/ABS Blend	
Voltage	24VDC	
IP Rating	IP20	
Country of Origin	CH	
Protocol	PROFINET	
Dimensions	220 x 120 x 45 mm	