User Manual: NexBot Drives 631-002 Pressure Safety Mat

SKU: NXB-GEN-631-002 | 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: Electrical Shock Hazard. Disconnect and lock out all power sources before servicing or wiring. The system operates on 24VDC, but may be integrated with high-voltage machinery.

WARNING: This device is a safety component. It must be installed, commissioned, and validated by a qualified safety professional in accordance with local and international safety standards. Failure to do so can result in serious injury or death.

WARNING: Never bypass, bridge, or otherwise defeat the safety mat's circuitry. Bypassing the device will render the safety function inoperative and create an immediate hazard.

CAUTION: Do not place or drop heavy objects, pallets, or equipment onto the mat. The NexBot Drives 631-002 is designed to detect

personnel, and point loads from heavy equipment can cause permanent damage.

NOTICE: The anti-slip surface requires periodic cleaning to maintain its effectiveness. Use only manufacturer-approved cleaning agents to avoid degrading the polyurethane material.

2. Product Overview

The NexBot Drives 631-002 is a robust, pressure-sensitive safety mat designed to detect the presence of personnel within a hazardous area, triggering an immediate stop command to robotic systems. This mat serves as a critical component in a comprehensive safety system, safeguarding operators and technicians who may need to enter a robot's work envelope during production, maintenance, or setup. Constructed from a high-durability, anti-slip polyurethane material, the 631-002 is engineered to withstand the rigors of industrial settings, including exposure to common coolants, oils, and foot traffic. Its key benefit lies in its reliable and immediate response. When a specified weight, such as an operator's footstep, is detected, the internal switching elements change state, sending a signal to the machine's safety circuit. The mat's IP67 rating ensures dependable performance even in environments with dust and liquid spray, a significant advantage over lower-rated alternatives that can fail prematurely. This level of protection minimizes downtime and maintenance associated with component failure. Common applications include placement at the entry points of robotic welding cells, machine tending stations, and automated palletizing or packaging lines. The mat provides a defined safety zone that is simple for personnel to understand. With dimensions of 1200 x 800 mm, it covers a standard access point effectively. Installation is straightforward, connecting to a safety monitoring unit via a standard 4-wire M12 connection. Multiple mats can be interconnected to create larger or more complex protected zones, offering scalable safety solutions for diverse floor layouts. Regular inspection for physical damage is recommended to ensure continued safety compliance and operational integrity.

3. Getting Started

1. Product Overview

The NexBot Drives 631-002 is a pressure-sensitive safety mat designed to be a primary safeguarding device for hazardous areas around automated machinery. When pressure from a person stepping on its surface is detected, it sends a stop signal to the machine's safety control system, preventing dangerous movement.

2. Principle of Operation

The mat contains two separate conductive plates held apart by non-conductive separators. When pressure is applied, the plates make contact, completing two independent electrical circuits. A connected safety controller monitors both circuits, ensuring that a single fault does not lead to a loss of the safety function.

3. System Integration

The 631-002 mat is a component within a larger safety system. It must be wired to a suitable safety monitoring device, such as a safety relay or a safety PLC, which is responsible for interpreting the mat's signals and safely stopping the connected machinery.

4. Operation

Normal State (Clear)

During normal operation, the mat surface must be kept completely clear of personnel, tools, and debris. In this state, the mat's internal circuits are open, and the safety controller permits the connected machinery to operate under its normal logic.

> **Tip:** Ensure operators are trained to recognize that the mat area is a restricted zone during machine operation.

Activating the Safety Stop

When an individual steps onto any part of the active surface of the mat, the internal circuits close. The safety controller detects this change and immediately issues a stop command (e.g., a Safe Torque Off) to the hazardous machinery, bringing it to a safe state.

Resetting the System

After the mat has been activated and the individual has completely left its surface, the machinery will not restart automatically. A deliberate action, such as pressing a manually-operated reset button located outside the hazardous area, is required to reset the safety circuit and allow the machine to be restarted.

Fault Detection

The 4-wire design allows the safety controller to continuously monitor for faults, such as a cut cable or a short circuit. If a fault is detected, the controller will issue a stop command and prevent a system restart until the fault is cleared, ensuring the integrity of the safety function.

> **Tip:** Familiarize yourself with the fault codes or indicator lights on your specific safety controller to quickly diagnose mat-related issues.

5. Maintenance Schedule

Interval	Task	Notes
Daily	Visually inspect the mat surface for debris, excessive dirt, or any signs of physical damage like cuts or tears.	This check should be part of the operator's pre-shift machine inspection.
Weekly	Perform a functional test by carefully stepping on the mat	Log the completion of this test in the

Interval	Task	Notes
	while the machine is in a safe, testable state. Confirm that the machine's safety circuit is correctly triggered.	machine's maintenance record.
Monthly	Inspect the integrity of the mat's cable, paying close attention to the entry point at the mat and the connection point in the control cabinet. Check for signs of abrasion, crushing, or loose connections.	Ensure all cabinet connections are secure and torqued to specification.
Quarterly	Clean the mat surface using a pH-neutral cleaner and a soft cloth or mop. Do not use harsh solvents, abrasives, or high-pressure washers.	Thorough cleaning helps maintain the anti-slip properties and allows for a better visual inspection.
Annually	A qualified safety technician must perform a full validation of the safety function. This includes testing response time, checking for dead zones, and verifying all components of the safety system are functioning as designed.	This is often required to maintain compliance with safety regulations.

6. Troubleshooting

Symptom	Possible Cause	Solution
Machine does not stop when the mat is stepped on.	Safety circuit is bypassed, mat is incorrectly wired to the safety controller, or the safety controller itself has failed.	Immediately remove power from the machine. Remove any unauthorized bypasses. Verify wiring against the schematic. Test the safety controller inputs and logic.
Machine will not start, even when the mat is clear.	Debris or fluid on the mat is causing activation, the mat has an internal short circuit, or the safety controller is in a faulted state.	Inspect mat for any objects, even small ones. Check the safety controller for fault indicators. Disconnect the mat and test its resistance with a multimeter to check for an internal short.
System shows an intermittent 'mat fault' error.	A loose wire connection at the controller, a damaged cable that makes intermittent	Power down the system. Check and re-torque all terminal connections. Carefully inspect the entire length of the

Symptom	Possible Cause	Solution
	contact, or fluid ingress into the mat's junction box.	cable for damage. Verify the IP67 seal is intact.
Safety controller indicates a cross-circuit fault.	The two independent safety channels within the mat's cable have been shorted together, typically due to the cable being crushed or cut.	De-energize the system. Inspect the cable run for signs of physical damage. If damage is found, the entire mat and cable assembly must be replaced.
The mat surface is physically cut, torn, or delaminating.	Impact from a sharp object, chemical exposure, or excessive wear and tear.	Immediately decommission the hazardous area and replace the NexBot Drives 631-002 mat. A damaged mat cannot be repaired and will not provide reliable protection.
System does not reset after the mat is cleared.	The reset button circuit is faulty, the safety controller logic requires a specific reset procedure, or the mat is not fully returning to its open-circuit state.	Verify the functionality of the reset button. Review the safety program logic for reset conditions. Check that the mat is not being slightly compressed by an object or uneven flooring.

7. Technical Specifications

Parameter	Value	Unit
Weight	15.5	kg
Material	Polyurethane	
Voltage	24VDC	
IP Rating	IP67	
Country of Origin	CH	
Dimensions	1200 x 800 x 15 mm	