VISIONIFY

AI-Powered Workplace Safety Analytics

INTEGRATION GUIDE

Audio-Visual Alert System

Stack Light Integration Guide

Visionify Platform | Industrial Safety Integration Series

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1. Overview

The Visionify Audio-Visual Alert System integration enables real-time physical notifications on the factory floor by connecting the Visionify AI safety platform to industrial stack lights (also called signal towers or andon lights). When the Visionify platform detects a safety violation — such as a missing hard hat, an unauthorized zone entry, or an ergonomic risk — it can immediately trigger a visible and audible alarm at the point of risk, without requiring any worker to monitor a screen.

This integration bridges the gap between digital AI-based detection and physical, human-perceptible alerts — completing the safety feedback loop on the shop floor in real time.

> **Key Benefit**
> Visionify's AI detects safety events in milliseconds. This integration ensures that the right people are notified immediately — at the right location on the floor — through universally understood visual signals, reducing response time and improving incident prevention.

1.1 How It Works — At a Glance

The system operates through a simple, reliable chain:

1. The Visionify Edge Server continuously analyzes camera feeds using AI models.
2. When a safety event is detected, Visionify sends an HTTP command over the local network.
3. The Axis A9210 Network I/O Relay Module receives the command and closes a hardware relay.
4. The closed relay completes a 24V DC circuit that powers the appropriate stack light segment (red, green, amber, etc.).
5. Workers on the floor see the light and respond accordingly.
6. When the event clears, Visionify sends a second command to de-energize the relay, turning off the light.

2. System Architecture

The diagram below illustrates the complete end-to-end wiring and control architecture of the Visionify Audio-Visual integration.

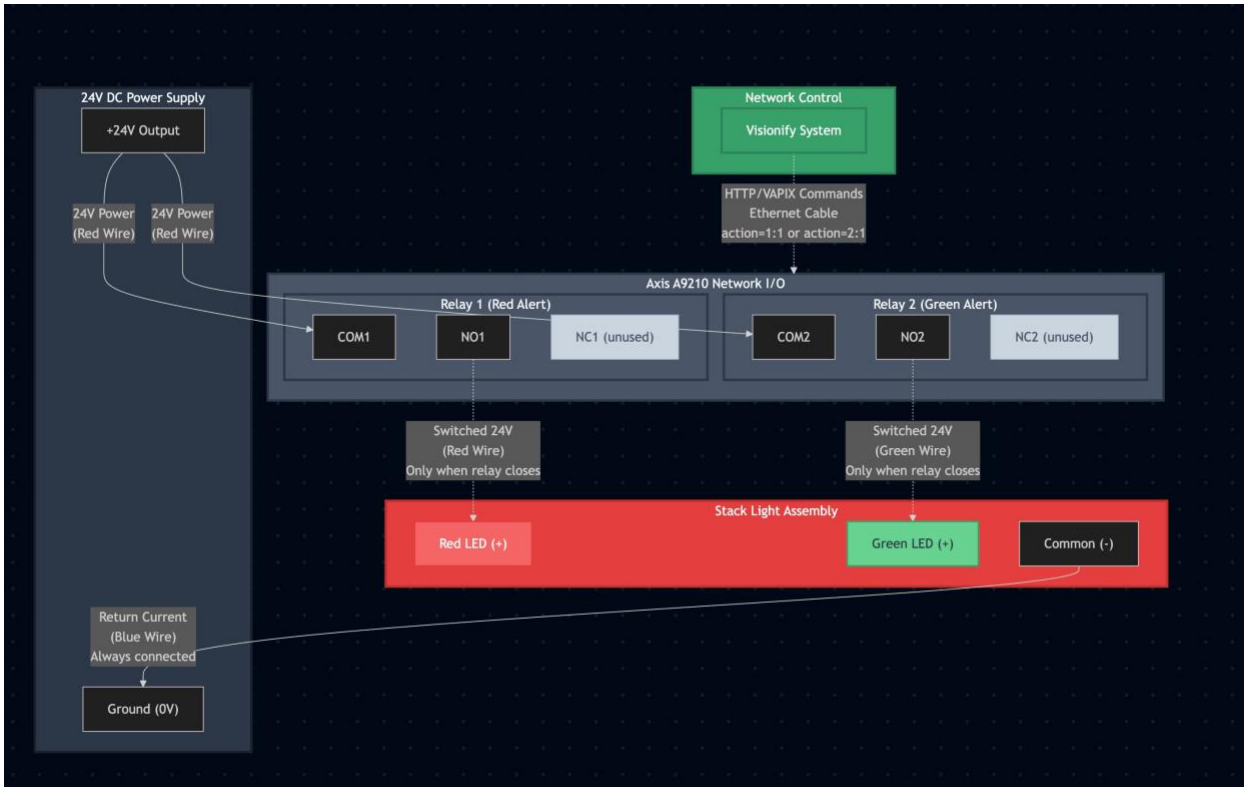

Figure: Visionify Audio-Visual System — End-to-End Wiring Architecture

The architecture consists of three logical layers:

Layer	Component	Role
Control	Visionify Edge Server	AI inference engine. Detects safety events and issues HTTP/VAPIX commands to the relay module via Ethernet on the OT VLAN.
Switching	Axis A9210 + A9910 (optional)	Network I/O relay module. Translates software commands into hardware relay closures that switch 24V DC power to the stack light.
Output	24V Stack Light Assembly	Industrial LED stack light with independently controlled segments (red, green, amber). Provides visible and audible floor-level alerts.

2.1 Network Topology

The Axis A9210 should be placed on the Operational Technology (OT) VLAN — isolated from the corporate IT network. The Visionify Edge Server bridges both VLANs (or resides on the OT VLAN),

allowing it to send control commands to the relay module while receiving camera feeds from IP cameras.

Network Security Note

Placing the Axis A9210 on the OT VLAN ensures that relay control commands are isolated from the corporate network. The Visionify Edge Server communicates with the A9210 using HTTP Basic Auth over the local LAN. No internet connectivity is required for this integration — all traffic is local.

3. Required Hardware

The following hardware components are required for a standard single-station Audio-Visual Alert System deployment. All components are commercially available and do not require specialized installation beyond standard industrial electrical work.

Component	Part Number	Qty	Notes
Axis A9210 Network I/O Relay Module	A9210	1	2-port relay module. Controls up to 2 stack light segments (e.g., red + green). PoE powered.
Axis A9910 Expansion Module (Optional)	A9910	1+	Adds 8 additional I/O ports to the A9210. Required only if more than 2 stack light segments or multiple stations are needed.
Signalworks 24V DC LED Stack Light	SW-SL-24V	1	Industrial LED stack light. Red, green, and amber segments. 24V DC, IP65 rated. Buzzer optional.
Axis 30W Midspan PoE Injector	T8120 (30W)	1	Provides PoE power to the Axis A9210 over standard Ethernet cable. Required if the switch is non-PoE.
MDR-60-24 DIN Rail Power Supply	MDR-60-24	1	Mean Well 24V DC, 2.5A DIN rail PSU. Powers the stack light via relay contacts.

Expansion Note

For multi-station deployments — for example, monitoring multiple production lines simultaneously — add one Axis A9910 expansion module per additional pair of stack light segments needed. Each A9910 connects to the A9210 and provides 8 additional relay-capable I/O ports.

3.1 Alternative Hardware Options

The architecture described in this guide is validated and recommended by Visionify. However, the following alternatives may be substituted depending on site requirements, existing infrastructure, or procurement constraints:

Component	Alternative	Considerations
Axis A9210	Moxa ioLogik E1212 or E1214	Uses Modbus TCP or REST instead of VAPIX. Requires custom Visionify integration script. Suitable for Modbus-heavy OT environments.
Axis A9210	Advantech ADAM-6060	6-channel relay module with Modbus TCP support. Cost-effective for budget-conscious deployments.

Signalworks Stack Light	Patlite LR5 or Banner K50	Any 24V DC stack light with discrete segment wiring is compatible. Ensure IP65 rating minimum for industrial environments.
MDR-60-24 DIN Rail PSU	Phoenix Contact QUINT PSU or IDEC PS5R	Any regulated 24V DC DIN rail PSU rated for the stack light load. Mean Well MDR-60-24 is cost-effective and widely available.

4. Wiring & Connections

The wiring of the Audio-Visual Alert System follows a straightforward DC circuit topology. The 24V DC power supply provides switched power through the relay contacts of the Axis A9210, which completes the circuit to the appropriate stack light segment when energized.

4.1 Wiring Overview

Wire	From	To	Notes
Red (+24V)	PSU +24V Output	A9210 COM1 & COM2	24V always-hot supply to relay Common terminals
Red (switched)	A9210 NO1 (Relay 1)	Stack Light Red (+)	Switched 24V — only live when Relay 1 is energized
Green (switched)	A9210 NO2 (Relay 2)	Stack Light Green (+)	Switched 24V — only live when Relay 2 is energized
Blue (return)	Stack Light Common (-)	PSU GND (0V)	Always connected — return current path for all segments

Wiring Safety Note

All wiring should be performed by a qualified electrician. Use appropriately rated wire gauge for the current draw of your stack light. The Axis A9210 relay contacts are rated for a maximum of 24V DC / 1A — verify that your stack light current draw does not exceed this rating. The MDR-60-24 DIN rail PSU provides up to 2.5A, which is sufficient for most standard stack light assemblies.

5. Alert Sequence — How It Works

The sequence diagram below illustrates the exact sequence of events from safety event detection through physical stack light activation and clearance.

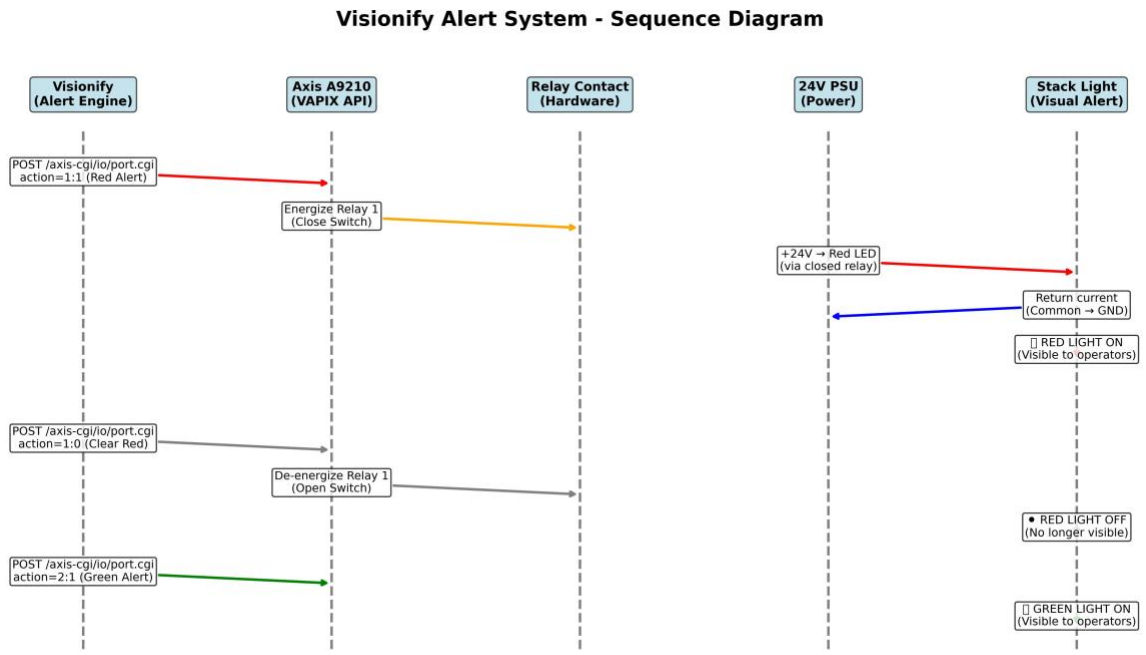

Figure: Visionify Alert System — Event Sequence Diagram

5.1 Red Alert Sequence (Safety Violation Detected)

7. Visionify AI detects a safety violation (e.g., worker without PPE in a restricted zone).
8. Visionify sends an HTTP POST to the Axis A9210 VAPIX endpoint:

```
POST /axis-cgi/io/port.cgi  action=1:1
```

9. The A9210 receives the command and energizes Relay 1 (closes the NO1 contact).
10. 24V DC from the PSU flows through the closed relay to the Red LED (+) terminal of the stack light.
11. The Red segment of the stack light illuminates — visible to all workers in the area.
12. Visionify simultaneously triggers an alert notification in the dashboard and any configured webhook integrations.

5.2 Alert Clearance Sequence

13. The safety event is resolved (worker corrects PPE, exits zone, or the event timer expires).
14. Visionify sends an HTTP POST to de-energize Relay 1:

```
POST /axis-cgi/io/port.cgi  action=1:0
```

15. Relay 1 opens — the 24V circuit to the Red LED is broken.
16. The Red segment turns off.

5.3 Green Alert Sequence (Area Clear / Safe)

An optional Green alert can be configured to indicate that an area is clear and safe to enter:

17. Visionify sends an HTTP POST to energize Relay 2:

```
POST /axis-cgi/io/port.cgi  action=2:1
```

18. Relay 2 closes — 24V flows to the Green LED (+) terminal.
19. The Green segment of the stack light illuminates.

6. Software Configuration

6.1 Axis A9210 Initial Setup

Before Visionify can control the A9210, the device must be configured with a static IP address on the OT VLAN and accessible from the Visionify Edge Server.

20. Connect the A9210 to your PoE switch or PoE injector via Ethernet.
21. Access the A9210 web interface via its DHCP-assigned IP address (shown in your network router's DHCP table).
22. Navigate to Setup > Network Settings and assign a static IP address on the OT VLAN (e.g., 192.168.10.50/24).
23. Navigate to Setup > System Options > Security > Users and create a dedicated user account for Visionify with Operator or Administrator rights.
24. Navigate to System Options > Ports & Devices > I/O Ports and verify that Relay 1 and Relay 2 are configured as output ports.
25. Test the relay by manually triggering it from the web interface: Basic Setup > I/O and confirm the stack light responds.

6.2 Visionify Platform Configuration

Once the A9210 is set up, configure the Visionify platform to send alerts to it:

26. In the Visionify dashboard, navigate to Settings > Integrations > Hardware Alerts.
27. Click Add Integration and select Axis A9210 Network I/O.
28. Enter the A9210's IP address, port (default: 80), username, and password.
29. Map each alert type to a relay action:
    - Safety Violation (Red Alert) → action=1:1 (energize Relay 1)
    - Alert Cleared → action=1:0 (de-energize Relay 1)
    - Area Clear (Green Alert) → action=2:1 (energize Relay 2)
30. Optionally configure alert persistence duration — how long the light stays on before auto-clearing if no resolution is detected.
31. Save and test using the Test Integration button. Verify the stack light responds.

6.3 VAPIX API Reference

The Visionify platform uses the Axis VAPIX I/O port control API. The commands are simple HTTP GET or POST requests:

Action	Command Parameter	Description
Red Alert ON	`action=1:1`	Energize Relay 1 — Red LED ON
Red Alert OFF	`action=1:0`	De-energize Relay 1 — Red LED OFF
Green Alert ON	`action=2:1`	Energize Relay 2 — Green LED ON
Green Alert OFF	`action=2:0`	De-energize Relay 2 — Green LED OFF

Full endpoint URL format:

`http://<A9210_IP>/axis-cgi/io/port.cgi?action=<relay>:<state>`

Authentication: HTTP Basic Auth with the Visionify user credentials configured on the A9210.

7. Multi-Station Expansion

For facilities that require Audio-Visual alerts across multiple production lines, workstations, or zones, the system can be scaled using the Axis A9910 Expansion Module.

7.1 Axis A9910 Expansion Module

The Axis A9910 is a dedicated expansion module for the A9210 that adds 8 additional I/O ports — configurable as relay outputs. It connects directly to the A9210 via a short cable and appears as additional port numbers in the VAPIX API.

- One A9210 + one A9910 = up to 10 relay channels (2 built-in + 8 expansion)
- Each relay channel can independently drive one stack light segment
- Multiple A9910 units can be daisy-chained for larger deployments
- All relay channels are controlled through the same A9210 VAPIX endpoint

Example Multi-Station Deployment

A facility with 4 production lines, each requiring a Red and Green stack light, would need: 1x Axis A9210 + 1x Axis A9910. This provides 10 relay channels — enough for 4 lines x 2 colors = 8 channels, with 2 spares. Each stack light connects to its assigned relay pair, and Visionify maps each camera zone to its corresponding relay channels in the integration configuration.

7.2 Expansion Port Addressing

When using the A9910 expansion module, port numbers in VAPIX commands continue from where the A9210's built-in ports end:

Port Number	Module	VAPIX Command	Use Case Example
Port 1	A9210 (built-in)	`action=1:1`	Line 1 — Red Alert
Port 2	A9210 (built-in)	`action=2:1`	Line 1 — Green Clear
Ports 3–10	A9910 (expansion)	`action=3:1 … 10:1`	Lines 2–5 — Red/Green alerts

8. Supported Safety Scenarios

The Visionify Audio-Visual integration can be triggered by any safety event that the Visionify AI platform is configured to detect. The following are common use cases validated in industrial deployments:

Safety Scenario	Alert Color	Recommended Configuration
PPE Non-Compliance (Hard Hat, Vest)	**Red**	Immediate alert; auto-clear after 30 seconds of compliance
Unauthorized Zone Entry	**Red**	Sustained alert until zone is vacated; supervisor acknowledge required
Forklift / Pedestrian Proximity	**Red + Amber**	Amber warning before 2m threshold; Red when threshold breached
Ergonomic Risk Detected (REBA score)	**Amber**	Amber for moderate risk; Red for high risk REBA/RULA scores
Machine Guarding Violation	**Red**	Immediate alert; requires supervisor manual clear
Area Clear / Inspection Complete	**Green**	Green activated on supervisor approval or automated clearance
Housekeeping / Spill Detected	**Amber**	Amber sustained until cleaned; auto-photo report generated

9. Troubleshooting

Symptom	Likely Cause & Resolution
Stack light does not respond to any alerts	Check: (1) A9210 is reachable from the Edge Server — ping the IP. (2) Username/password correct in Visionify integration settings. (3) Relay output port is configured as 'Output' in A9210 web interface.
Only Red works, Green does not	Confirm Relay 2 wiring (NO2 → Green LED +). Verify Green LED segment is functional by testing with a direct 24V test lead.
Light stays on after alert clears	Check Visionify alert clearance configuration — ensure the 'clear' command (action=1:0) is configured and being sent. Verify the alert auto-clear timer is set.
Intermittent or flickering light	Check wire connection quality at relay terminal and stack light connector. Loose terminals are the most common cause. Also verify 24V PSU output voltage is stable.
A9210 web interface not accessible	Verify the A9210 is on the correct VLAN and the Edge Server has a route to it. Check PoE injector is providing power (LED on A9210 should be solid).
VAPIX returns 401 Unauthorized	Visionify credentials on the A9210 are incorrect or the user account does not have Operator/Admin rights. Reset credentials in A9210 > System Options > Security > Users.
A9910 expansion ports not responding	Verify the A9910 is properly connected to the A9210 expansion port. Port numbering starts at 3 for the first A9910 port — confirm correct action=N:1 command.

10. Support & Professional Services

Visionify offers professional installation, commissioning, and ongoing support for all hardware integrations including the Audio-Visual Alert System.

Contact	info@visionify.ai
Website	www.visionify.ai

Visionify Professional Services can assist with:

- Site assessment and hardware specification for your specific facility layout
- Relay module installation and OT VLAN network configuration
- Stack light wiring, testing, and commissioning
- Visionify platform configuration, scenario mapping, and alert tuning
- Ongoing monitoring, firmware updates, and technical support