IPXAnalytics
Datasheet

# Handrail Module
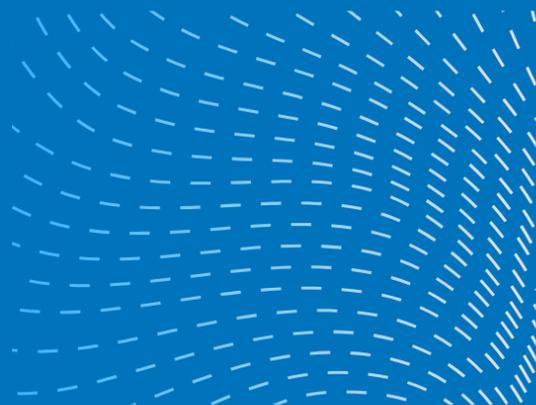
**IP**Extreme

# Content

# Handrail Module

Compatibility: IPXAnalytics PRO, 2.0 or higher.

## IPXAnalytics

IPXAnalytics is a software that uses artificial intelligence to learn and detect surveillance camera events. The artificial intelligence is based on neural networks and LLMs, which are algorithms designed to mimic the behavior of the human brain. Compared to existing video analytics software on the market today, IPXAnalytics significantly reduces the number of false alarms.

## Handrail Module

Our Handrail module offers advanced features to ensure worker safety and compliance with occupational safety standards, preventing risks and accidents in operational environments. Key highlights include:

- **Safe Position Analysis:**
  The system identifies when the worker keeps their hand correctly positioned on the handrail, ensuring stability and protection.

- **Unsafe Position Detection:**
  Our technology immediately alerts you when a worker is not holding their hand on the handrail, signaling a hazardous condition that needs to be corrected.

- **Dual Safety Verification (Grab):**
  The system activates the 'Grab' classification when it detects that the worker's hand is holding the handrail, providing an additional layer of safety verification.

- **Lack of Support Detection (Not Grabbing):**
  When there is no hand contact with the handrail, it is classified as 'Not Grabbing', indicating the absence of this additional safety measure.

- **Occlusion Detection :**
  The system also identifies when a worker is in front of another, enabling the analysis of interactions and preventing the risk of overlapping positions.

### Additional Benefits:

• Proactive prevention of accidents and falls;

• Significant reduction of operational risks ;

• Continuous improvement in employee safety and integrity ;

• Compliance with occupational safety standards and policies ;

• Data collection for analysis and improvement of safety protocols ;

## Examples of resources

### Safe Condition

- **Person with hand correctly positioned on the handrail**
  Confirmed by **Safe Position Analysis** . ( Safe)
- **Double Safety Check ( Grab )**
  Detection that the hand is **firmly holding** the handrail.
- **No occlusion**
  Hands are visible to the cameras, ensuring accurate reading.



### Unsafe Condition

- Lack **of contact with the handrail**
  Detected by **Unsafe Position Detection .**
- **Notgrabbing Check Confirmation**
  that the hand is not holding the handrail **.**
- **Possible occlusion**
  Hands may be **out of range** of the cameras, compromising verification.

## Integration

The software has an HTTP REST API that allows integration with any partner system. The software is integrated with the market-leading VMSs: Digifort, D-Guard, Milestone and Avigilon.

Please check with our team about any additional licenses required for third-party software integrations.

For more information: [www.ipextreme.com.br](www.ipextreme.com.br)

## Customizations

In addition to the various features mentioned here, the software can also assist in countless other situations. It is designed to be customized to meet the customer's needs. For example, in a production environment, the software can identify errors and critical failures in a specific part. To request a customization proposal, contact us through our website: www.ipextreme.com.br .

## Limitations and considerations

We understand the importance of reliability in critical applications. Therefore, it's crucial to note that no artificial intelligence software can guarantee 100% accuracy. Our solution offers robust and rapid detection, but we always recommend maintaining backup systems and additional security protocols to ensure a comprehensive response in emergency situations .
IPXAnalytics offers demo licenses and we recommend selling them to customers only after successful testing in the desired environment.

# Technical Sheet

Examples and descriptions of objects:

## Objects

The Handrail Module can identify the following objects:

• Safe

• Unsafe • Grab • Notgrabbing

• Occlusion

**Safe (Secure Position):**

The **Safe** object represents a person with their hand correctly positioned on the handrail, serving as the primary indicator of stability and safety during activities. This continuous detection allows the system to confirm that the worker is in compliance with established safety standards.



**Unsafe (Unsafe Position):**

The **Unsafe** object identifies when a person's hand is not on the handrail, signaling a risky condition. Upon detecting this situation, the system can trigger immediate alerts, allowing for quick posture correction to prevent accidents.

**Grab (Dual Verification):**

The **Grab** object is activated when the system detects that the worker's hand is holding the handrail. This functionality serves as a dual verification, providing an additional layer of safety.



**Not Grabbing (Releasing the Handrail):**

The **Not Grabbing** object is activated when the system detects that the worker's hand is not holding the handrail. This detection is crucial for real-time risk assessment and for the immediate implementation of corrective measures.

### Occlusion (occlusion)

The occlusion object is used to identify when a person's hands are no longer visible in the camera's view. This feature ensures accurate monitoring, even in environments with multiple employees, avoiding misinterpretations that could compromise safety.

# Recommended minimum sizes for detection

A common question is where to install a camera for optimal detection. It's difficult to say with complete certainty because cameras can have different lenses, angles, and zoom levels. The most important factors are the size of the object in the image and its visibility. The table below indicates the recommended minimum object size in the image as a percentage. The percentage refers to the relative size of the object, as there can be various resolutions and resizing options. So, when we say an object is 1% in size, we're indicating that, for example, in a 512x512 image, the object would be 5.12 pixels by 5.12 pixels. See the next chapter for instructions on how to check object size directly in IPXAnalytics.

| Object | Minimum percentage size for identification | Camera height |
|--------|--------------------------------------------|---------------|
| safe | 1% | 1.5-3 meters |
| unsafe | 1% | 1.5-3 meters |
| grab | 1% | 1.5-3 meters |
| Notgrabbing | 1% | 1.5-3 meters |
| occlusion | 1% | 1.5-3 meters |

## Camera Positioning

To ensure accurate detection of handrail use, the camera must be positioned facing the staircase, with a clear, unobstructed view of the side handrails.

This positioning allows the system to correctly identify whether the employee is using the handrail when ascending or descending. The frontal angle is essential for detecting hand interaction with the grab bar, reducing false positives caused by shadows, overlapping objects, or structural elements.
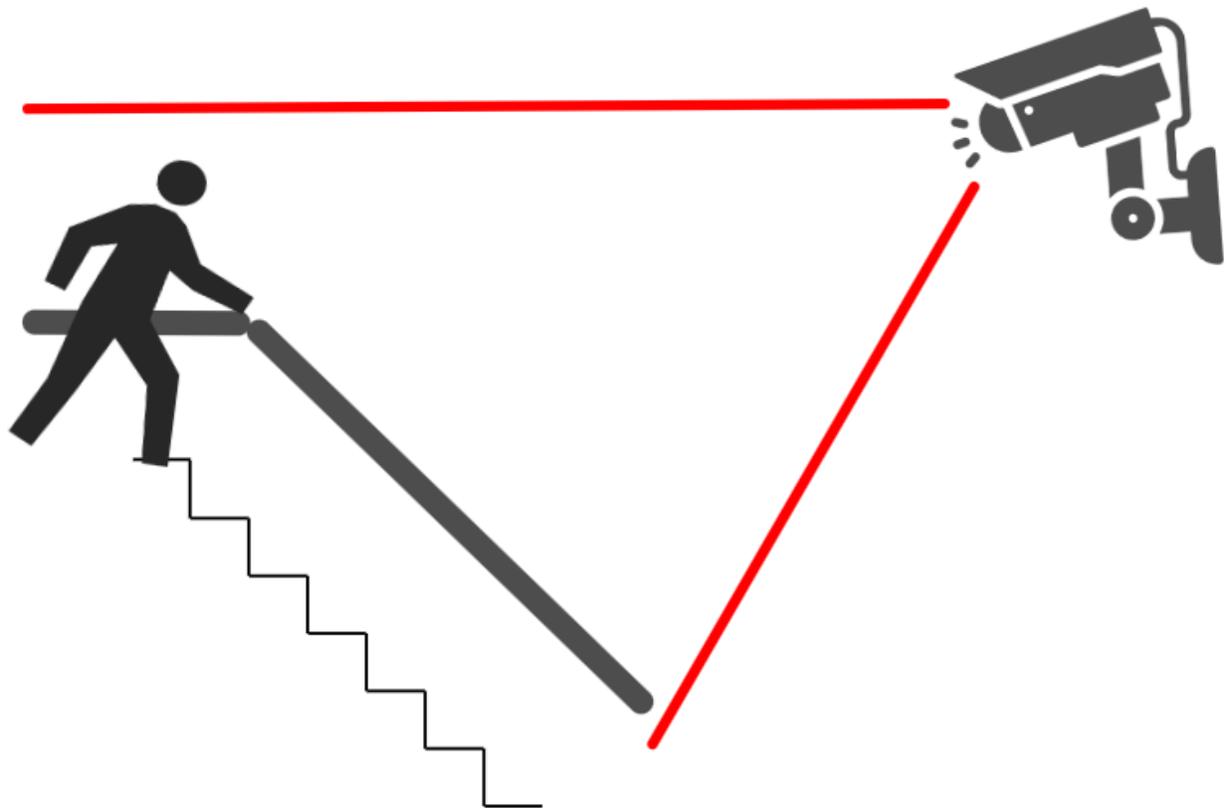


## Technical recommendations:

Average camera height: between 1.5m and 3m

Angle: facing the stairs, preferably with a slight downward slope

Lighting: must ensure good visibility of hands and handrails

# How to identify the size of an object

In IPXAnalytics, you can view the live image in two ways: using debug mode or clicking View in the admin client. When registering a camera, in the first tab, select the "show object information" option. This option will display the size of each object detected in the image and its orientation (vertical or horizontal).
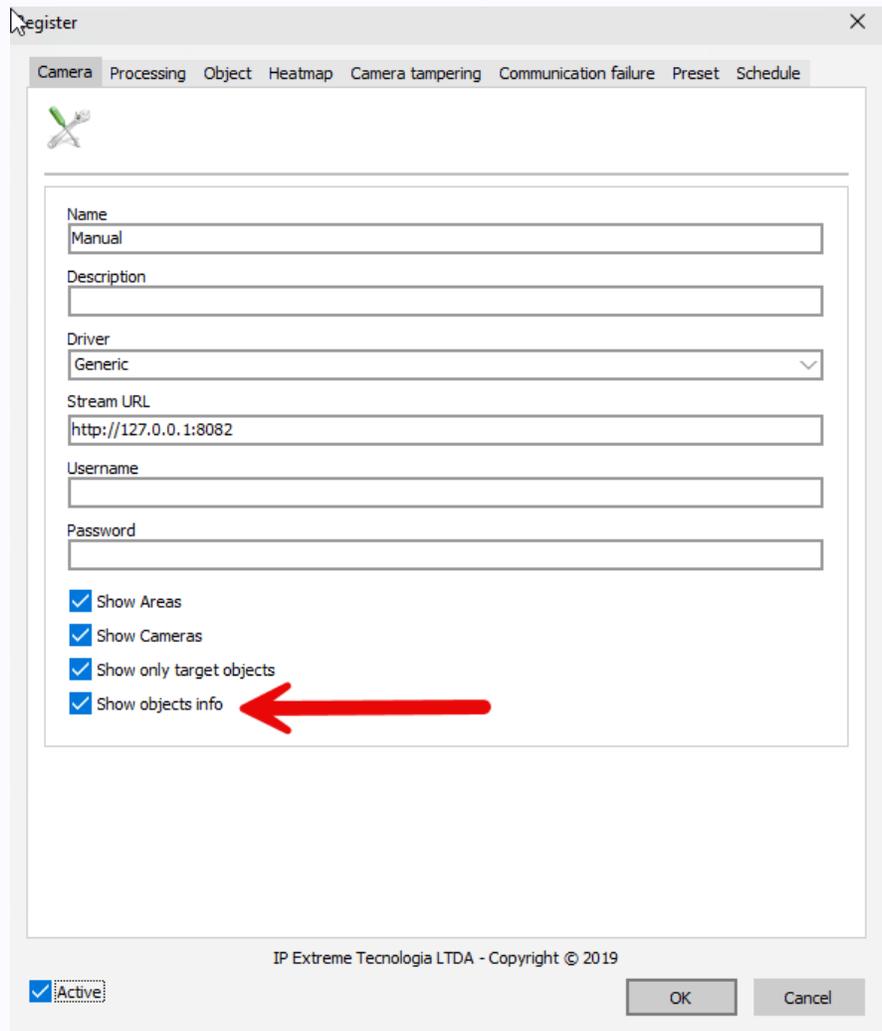
# Examples:

One person detected in the image with a total size of 4.0%.



Helmet detected in the image with a size of 0.69%.

The image was created to visually illustrate the proportion of an object relative to the overall screen. It divides the space into different percentage areas, making it easier to understand the minimum size required for computer vision software to accurately recognize an object.

Each rectangle represents a specific fraction of the total screen, starting at 50% and successively subdividing each area into halves. This way, the user can intuitively understand how different sizes affect detection and what minimum dimensions are recommended for effective recognition.
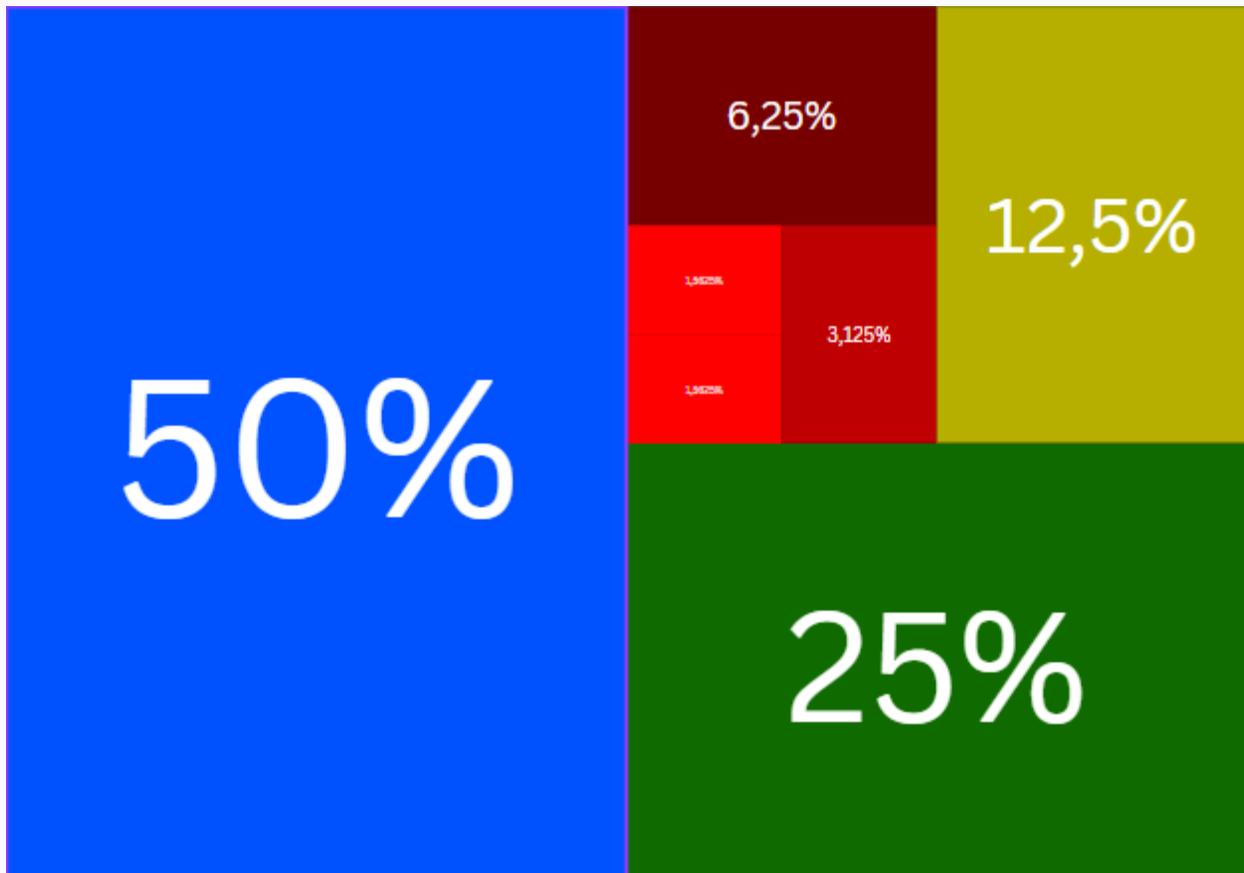
## Optimal camera resolution for object recognition

For effective object recognition, camera resolution is crucial. The minimum recommended resolution for optimal performance is **512x512** . This resolution provides sufficient detail for accurate detection and classification while balancing computational efficiency. Higher resolutions, such as 1080p or 4K, require more processing power without significantly improving accuracy and can lead to diminishing returns. Conversely, lower resolutions can result in blurry or distorted images, making object recognition more difficult. Therefore, a resolution of 512x512 is the ideal minimum for reliable and efficient object detection.

Low Resolution vs High Resolution Comparison: