INXPECT

Application Note

Top-Down Safeguard



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Application Note — Top-Down Safeguard

1. Scope

This document provides guidance for the correct installation and commissioning of S201A and S203A Inxpect safety radar sensors used as **Top-Down Safeguard**.

It provides the mechanical installation requirements, dimensional constraints and configuration guidelines necessary to ensure that the detection field is correctly configured and that the safety function performs as intended.

The document also includes the recommended configuration procedure using Inxpect Safety and Inxpect Safety Studio tools.

Definition: For the purposes of this Application Note, an installation is considered Top-Down Safeguard when the sensor is installed above the monitored area and the sensing direction is oriented predominantly downward:

- installation height: 210 cm ≤ h ≤ 470 cm
- inclination angle (downward): -90° ≤ tilt ≤ -60°

Installations that do not clearly meet these installation conditions shall not be considered Top-Down Safeguard by default and shall be evaluated separately according to the actual mounting parameters.

Note: For installation heights, inclination angles, or other mounting conditions not explicitly covered by the values and ranges specified in this Application Note, the installation and the validation of the safety-related functions shall be performed in line with the requirements reported on the Instruction Manual of the product.

2. Introduction

Top-Down Safeguard is intended to detect personnel entering a hazardous area through an access opening. The radar sensors create a volumetric detection field directed towards the floor (Refer to Figure 1).



Figure 1 – Example of Top-Down Safeguard installation

The solution is suitable for industrial access gates, where people detection must comply with SIL2 PLd performance, while minimizing nuisance trips.

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3. Applicability

This document applies to Inxpect SRE 200 Series systems consisting of:

- Any control unit model (Core Line with FW 2.0.0 or later, or eXtended Line with FW 2.1.0 or later)
- S201A or S203A sensors (with FW 5.0 or later)

The recommended configuration procedure can be performed using one of the following tools:

- Inxpect Safety application v2.9.30 or later
- Inxpect Safety Studio v1.8.13 or later

4. Glossary

Installation Height (cm): the height above the ground, measured from the center of the sensor.

Detection Distance to be Set (cm): the distance of the detection field to be configured using the software..

Max Protected Lateral Width (cm): the maximum lateral distance, measured from the vertical axis of the sensor, at which an access of a person is detected.

Corridor Width to be Set (cm): the width of the corridor to be configured using the software.

5. Installation guidelines

The safety radar sensor generates a three-dimensional detection volume directed towards the floor.

Since the radar beam spreads according to the sensor radiation pattern, sufficient target illumination shall be ensured over the entire protected area. Therefore, the sensor radiation pattern shall be taken into account during sensor installation and configuration to ensure sufficient target illumination throughout the protected area.

Different geometrical characteristics of the sensor field of view may have a different impact on detection capability depending on the installation height. These characteristics shall be considered to identify the maximum lateral width that can be safely protected.

- For installation heights below 4 m, the effect of the lateral boundary of the radiation cone becomes predominant. This effect shall be taken into account to ensure sufficient illumination height at the maximum lateral width to be protected (Refer to Figure 2a);
- For installation heights above 4 m, the effect of the arc corresponding to the maximum detection range becomes predominant. This effect shall be taken into account to avoid the formation of lateral blind spots. Therefore, the maximum lateral width that can be safely protected shall be appropriately reduced (Refer to Figure 2b).

The appropriate maximum protected lateral width shall be determined during installation by considering the combined effect of these two geometrical factors.

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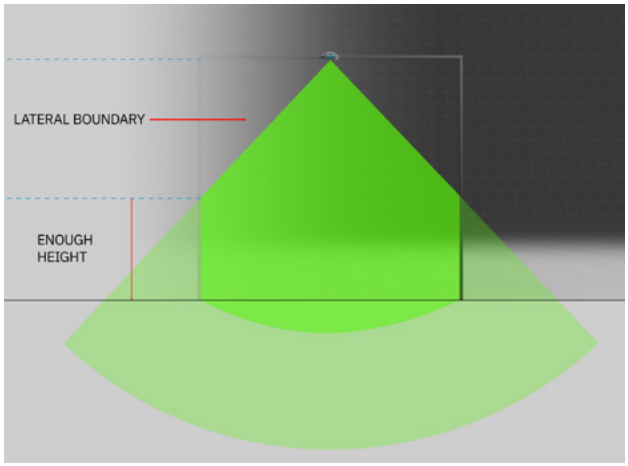

Figure 2a: lateral boundary effect

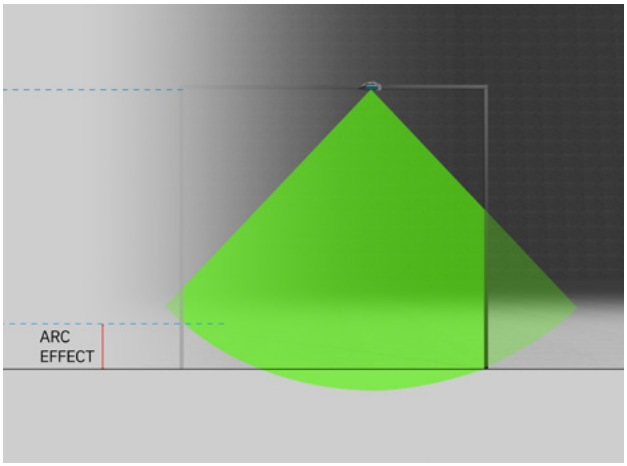

Figure 2b: arc effect

For this reason, the installation height and the maximum protected lateral width are strictly dependent and shall comply with the installation constraints specified in this document.

A proper configuration of these parameters ensures that the required detection performance is achieved throughout the complete safeguarded access (Refer to Figure 3).

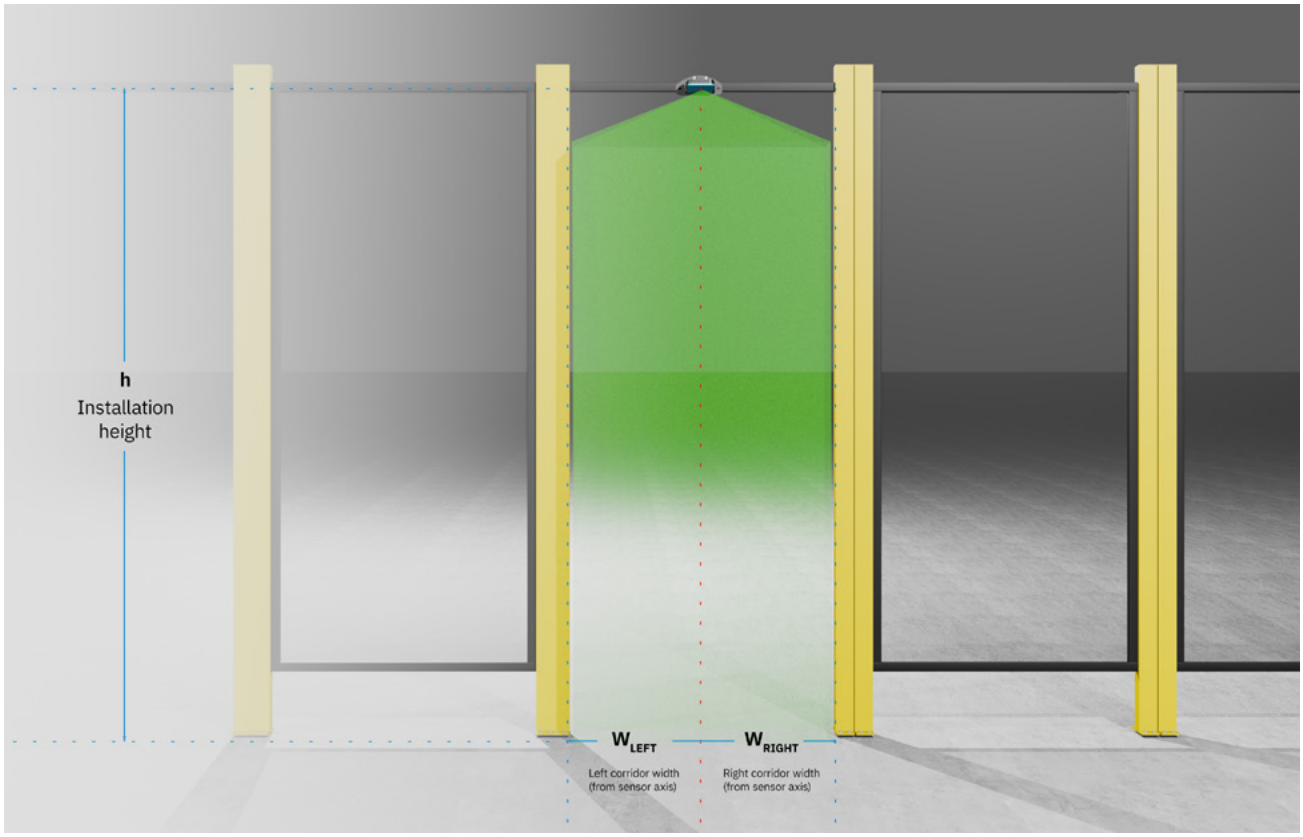

Figure 3 – Top-Down Safeguard installation parameters

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5.1 Installation parameters (floor included)

The maximum lateral width that can be protected from the sensor's vertical axis depends on the sensor installation parameters, specifically its installation height and inclination angle.

The ***"Max protected lateral width"*** column reports the values depending on the installation height.

Based on the selected installation parameters, the sensor range shall be configured so that the detection field includes the floor, as specified in the ***"Detection distance to be set"*** column.

The ***"Detection distance to be set"*** column reports the values depending on the installation height.

These parameters are valid for both S201A and S203A sensors.

5.1.1 Inclination -90° and -80°

Installation Height (cm)	Detection distance to be set (cm)	Max protected lateral width (cm)
210 ≤ h < 250	310	130
250 ≤ h < 300	390	175
300 ≤ h < 350	460	240
350 ≤ h ≤ 400	500	300
400 < h ≤ 430	500	240
430 < h ≤ 470	500	160

5.1.2. Inclination -70° and -60°

Installation Height (cm)	Detection distance to be set (cm)	Max protected lateral width (cm)
210 ≤ h < 250	350	130
250 ≤ h < 300	430	175
300 ≤ h ≤350	500	240

5.2 Installation parameters (floor excluded)

Although including the floor in the detection field improves the sensor detection capability, there may be specific installations where this is not possible (e.g., because of vibrations). In such cases, the sensor range shall be reduced according to the following tables (see the ***"Detection distance to be set"*** column).

The ***"Detection distance to be set"*** column reports the values depending on the installation height.

The ***"Max lateral protected width"*** column reports the values depending on the installation height.

This installation is valid only for the S201A sensor model.

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5.2.1 Inclination -90°

Installation Height (cm)	Detection distance to be set (cm)	Max protected lateral width (cm)
210 ≤ h < 250	h - 30	80
250 ≤ h < 300		100
300 ≤ h ≤ 350		130

5.2.2 Inclination -80°

Installation Height (cm)	Detection distance to be set (cm)	Max protected lateral width (cm)
210 ≤ h < 250	(h - 30) / cos(10°)	80
250 ≤ h < 300		100
300 ≤ h ≤ 350		130

5.2.3 Inclination -70°

Installation Height (cm)	Detection distance to be set (cm)	Max protected lateral width (cm)
210 ≤ h < 250	(h - 30) / cos(20°)	80
250 ≤ h < 300		100
300 ≤ h ≤ 350		130

5.2.4 Inclination -60°

Installation Height (cm)	Detection distance to be set (cm)	Max protected lateral width (cm)
210 ≤ h < 250	(h - 30) / cos(30°)	80
250 ≤ h ≤ 300		100

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5.3 Configuration recommendations

Two typical installation scenarios can be identified:

- Single sensor installation (Refer to Figure 4): When a sensor is installed to safeguard a gate bounded by physical guards, such as fences, the sensor corridor width shall be configured taking into account the maximum protected lateral width. The corridor width shall be set to a value equal to or less than the maximum protected lateral width, as specified in the previous tables.

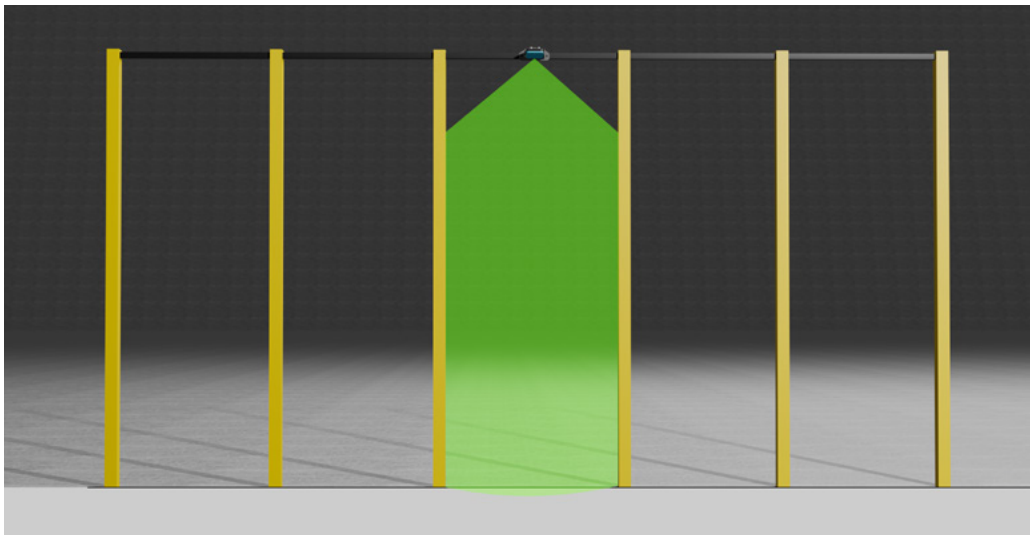

Figure 4: Single sensor installation

- Multiple sensors installation (Refer to Figure 5): When more than one sensor is installed side by side to safeguard a gate, a minimum 20 cm overlap shall be maintained between adjacent sensors. The sensors shall be correctly positioned by taking into account both the required overlap and the maximum lateral protected width, as specified in the previous tables.

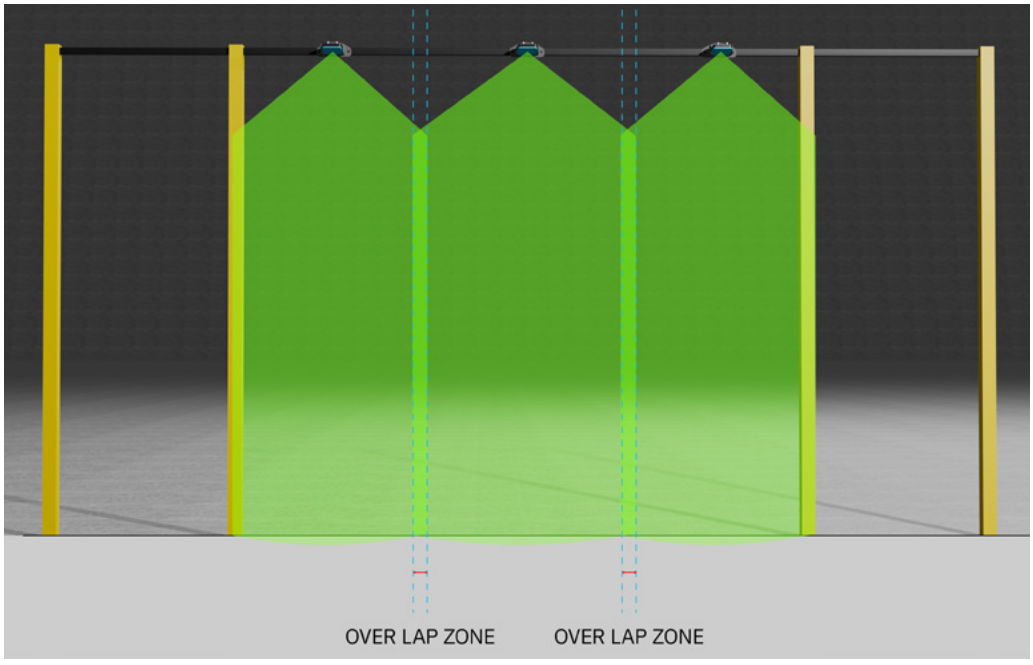

Figure 5: Multiple sensors installation

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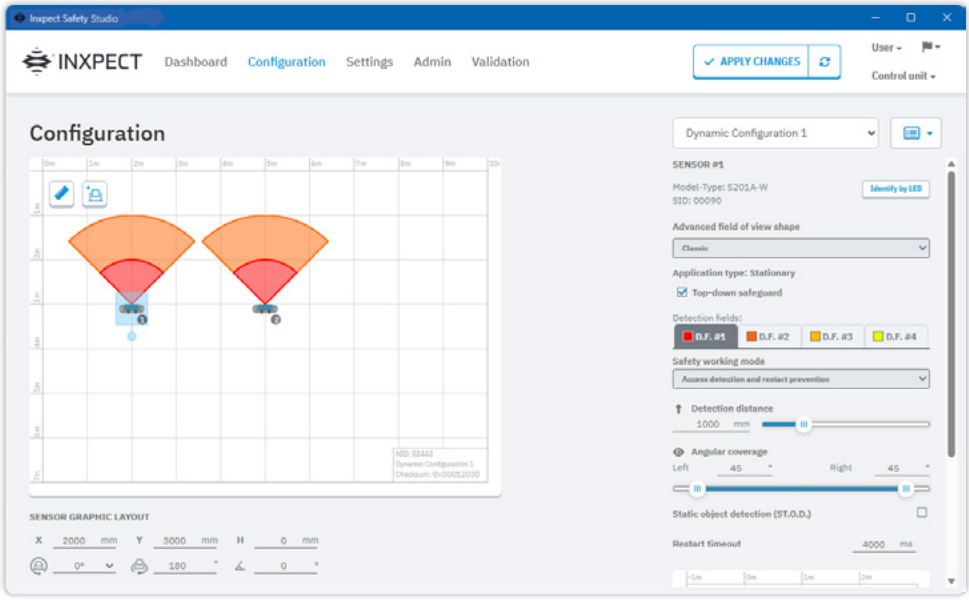
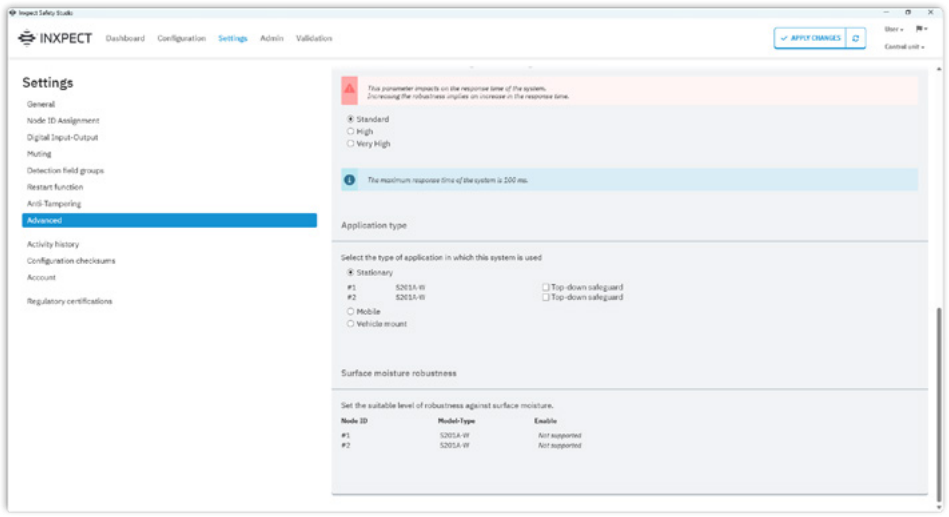
6. Configuration tools

6.1. Configuration using the Inxpect Safety application

Using the Inxpect Safety application, the **Top-Down Safeguard** installation can be selected individually for each sensor during their configuration.

Once the system has been installed, this option can also be changed in the **Advanced** settings.

First Start Wizard In the **Configuration tab**, once a sensor is selected, if the **Application Type** is set to **Stationary**, the **Top-down Safeguard** flag can be enabled or disabled in the side panel.	
After Installation After installation, the Application Type can be modified from the section. Setting > Advanced.	

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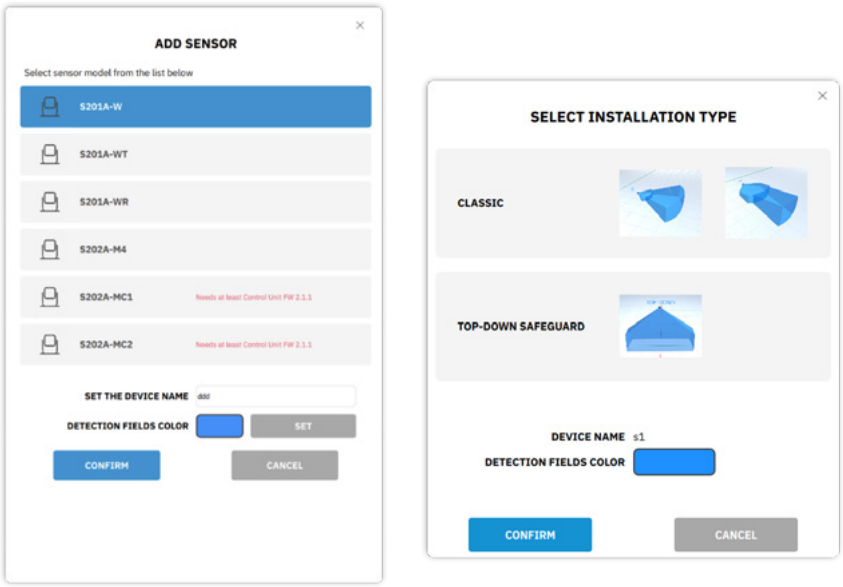
6.2 Configuration using Inxpect Safety Studio

Using Inxpect Safety Studio, the **Top-Down Safeguard** installation can be selected individually for each sensor when adding the sensor to the system.

Once the system has been installed, this option can also be changed in the **Other Options** tab.

First Start Wizard

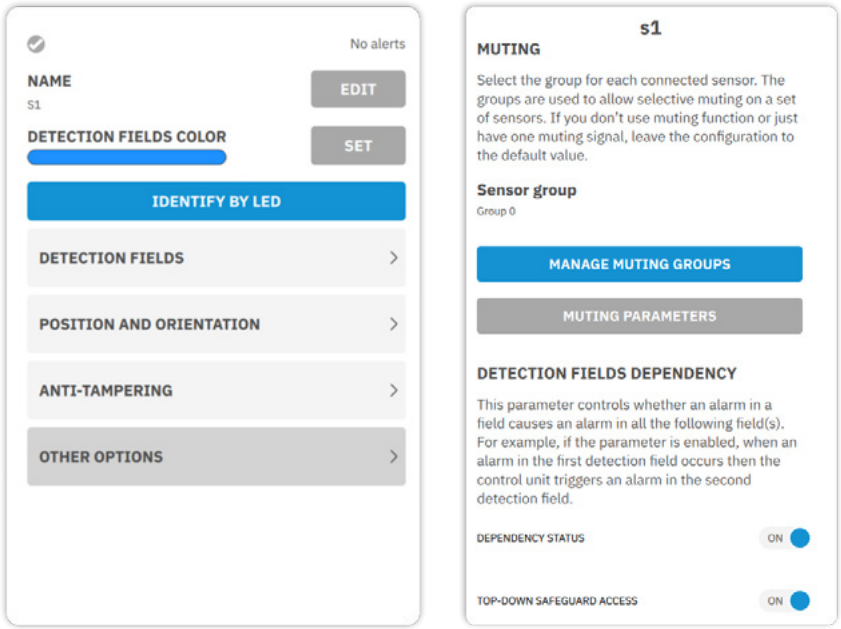
During the initial system installation, in the Application Type section of the First Start Wizard, after selecting the Stationary option, you can designate each connected sensor as a Top-down Safeguard installation.



After Installation

After installation, the Application Type can be modified from the section.

Setting > Advanced.



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