

# LBK System

LBK-S01 and LBK-C22 Tutorial

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# Get to know LBK system

LBK is an innovative active protection radar system that monitors the dangerous areas of a machinery. It is suitable for protecting the entire body.

It performs two safety functions:

- **detection:** it places the machinery in safe conditions when someone enters the dangerous area
- **restart:** it inhibits the machinery restart if there are people in the dangerous area



# What is seen by the system

- Every object, **still** or in **motion**, in the field of vision of the antenna
- LBK: is a motion system



Algorithms able to discriminate between moving and still objects



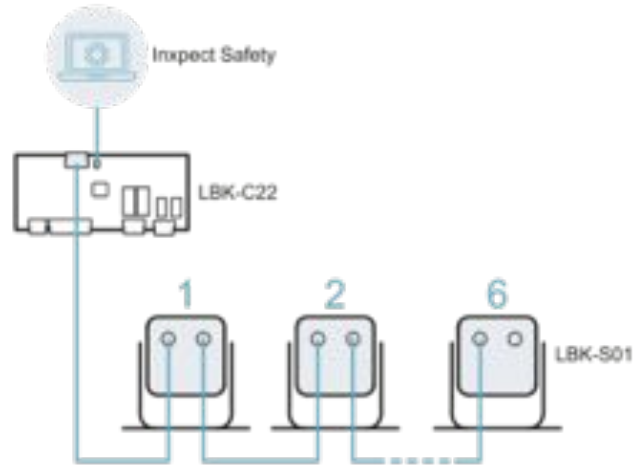
# Special features of LBK system

- resistant to dust, water, smoke and work waste
- SIL2 (IEC/EN 62061) and PLd certifications (EN ISO 13849-1)
- pre-alarm area to signal proximity or prepare the machinery for stopping
- three configurable sensitivity levels
- muting on the entire system or only on some sensors
- tampering detection



# Main components

One **controller** and up to six **sensors** in communication via CAN bus in compliance with standard EN 50325-5



# The Inxpect Safety software application

It allows configuration and inspection of system functioning.

LBKSystem Dashboard Configuration Maintenance

APPLY CHANGES

### Configuration

MACHINE AREA

SAFE AREA

1000 mm

Configuration solution 1/1

BARRIER LENGTH

4000 mm

ALARM DEPTH

1500 mm

PREALARM DEPTH

80 mm

RESULT VALUES

|                             |         |
|-----------------------------|---------|
| Number of installed sensors | 5       |
| Distance between sensors    | 950 mm  |
| Actual length               | 4623 mm |
| Alarm tolerance area        | 73 mm   |



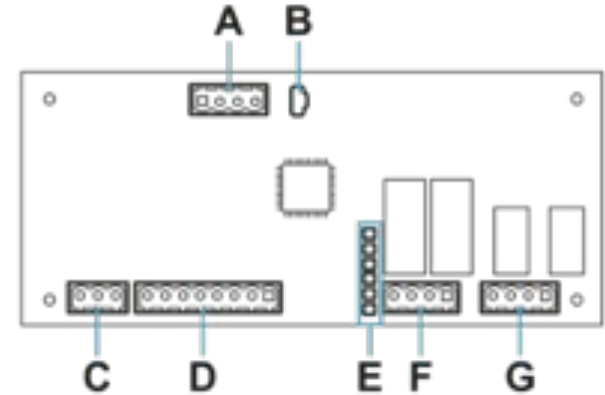
# The controller (LBK-C22)

- *Collects* info from all the sensors.
- Compares the *position of detected motion* with the stopping and pre-alarm thresholds.
- De-energizes the *safety output* relays when at least one sensor detects motion in the stopping area.
- Energizes the dedicated *auxiliary output* relay when at least one sensor detects motion in the pre-alarm area.
- *Communicates* with the Inxpect Safety software for all configuration and diagnostic functions.



# The controller (LBK-C22)

- A. Sensors CAN bus terminal block
- B. Micro USB port (PC connection)
- C. Power supply terminal block
- D. Digital inputs terminal block
- E. Status LED
- F. Safety outputs terminal block
- G. Auxiliary outputs terminal block





# Safety and Auxiliary Outputs

- The controller has one dual channel **safety output** realized with forced guided safety relays for alarms and, direct or indirect, safety of the machinery.
- It has two relay **auxiliary outputs**, which can be configured via the Inxpect Safety application, for:
  - pre-alarm
  - fault/diagnostic
  - muting status



# Digital inputs

- The controller has three dual channel **digital inputs** and common reference potential for:
  - *muting* (high logic level (1) = muting enabled)
  - *machinery emergency button* (low logic level (0) = stopping enabled)
  - *machinery restart button* enabled (high logic level (1) = restart enabled)
- The function of the inputs can be configured through the software.



# Status LED

The LEDs are each dedicated to a sensor and can display the following statuses:

- **green** -> Normal functioning and no motion detected
- **orange** -> Normal functioning and motion detected
- **red** -> error

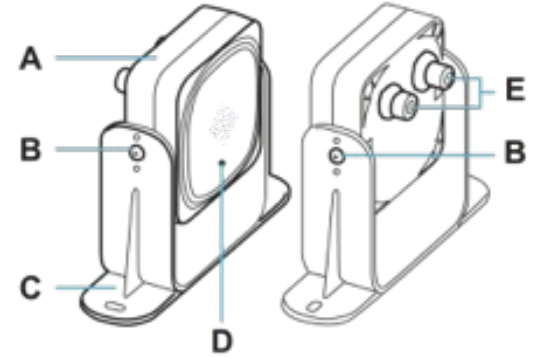


# The sensors (LBK-S01)

- Detect motion in their field of vision.
- Send the motion detection signal to the controller through CAN bus.



# The sensors (LBK-S01)



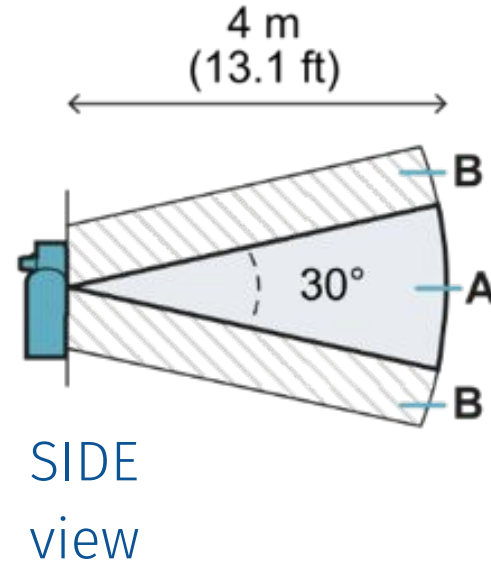
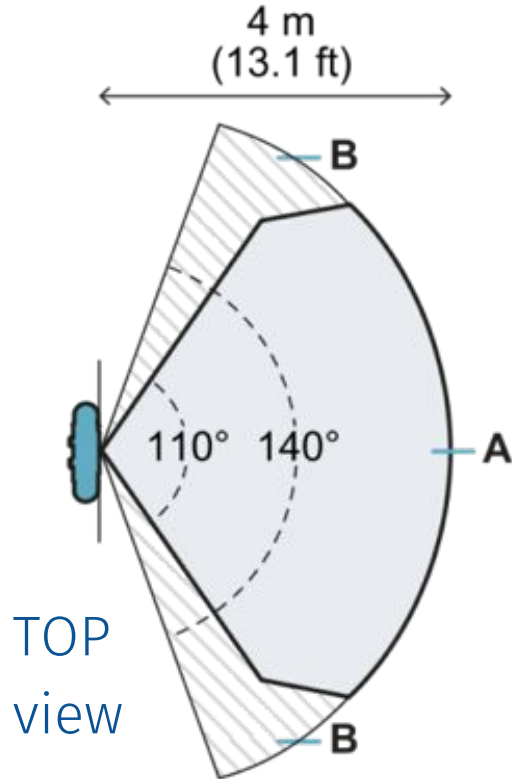
- A. Sensor
- B. Screws for fastening the sensor at a specific inclination
- C. Perforated bracket for installing the sensor on the ground or on the machinery
- D. Status LED
- E. Connectors for connecting the sensors in a chain and to the controller

# Status LED

- **Steady ON** -> Normal functioning and no motion detected
- **Rapid flashing ON** (100ms) -> Normal functioning and motion detected
- **Other conditions** -> error



# Radiation pattern of a sensor



# Factors that influence the field of vision

- sensor installation height
- sensor tilt

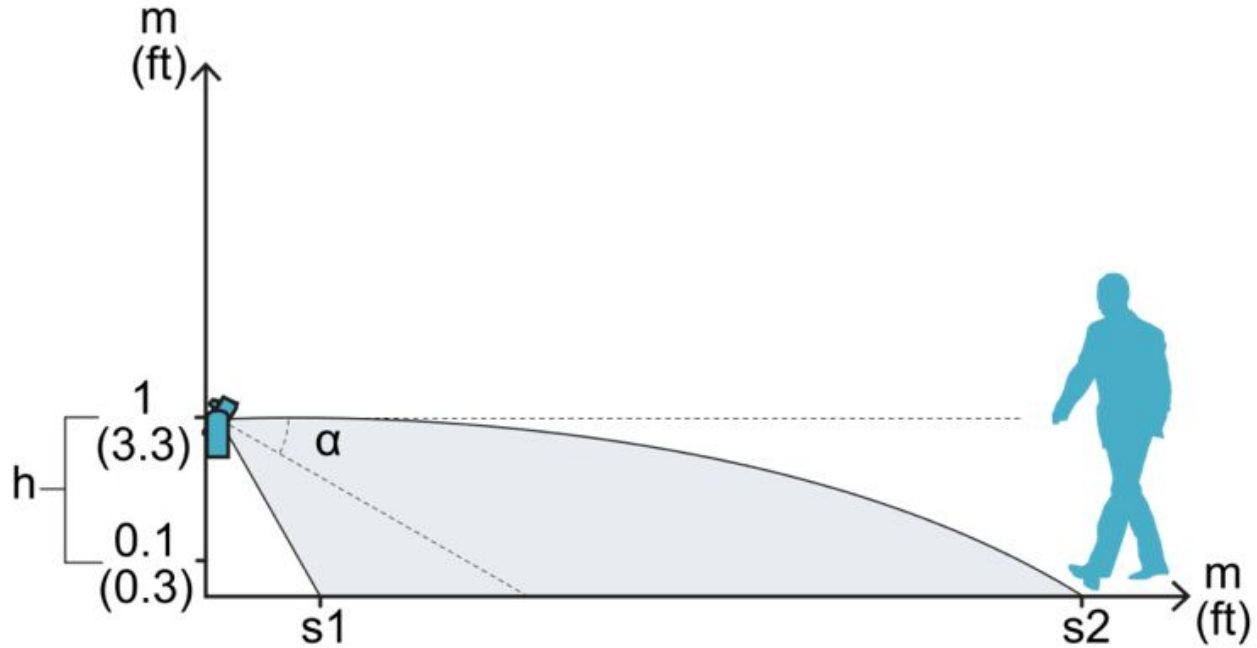
When installing the sensor, consider the risk of a blind spot:

- if the sensor is too high and tilted downwards -> the maximum detected distance is reduced.
- If the sensor is too low -> the blind spot is minimum but the effectiveness of the restart function is reduced.





# Actual field of vision



| $s_1   s_2$ (m) |     | $\alpha$ (°) |           |           |           |         |
|-----------------|-----|--------------|-----------|-----------|-----------|---------|
|                 |     | -20          | -10       | 0         | 10        | 20      |
| <b>h (m)</b>    | 0   | n/a          | n/a       | n/a       | 0.3   4.0 | 0.0 2.0 |
|                 | 0.1 | n/a          | n/a       | 0.2   4.0 | 0   4.0   | n/a     |
|                 | 0.2 | n/a          | 0   4.0   | 0.0   4.0 | 0   4.0   | n/a     |
|                 | 0.3 | n/a          | 0.1   4.0 | 0.3   4.0 | 1.3   4.0 | n/a     |
|                 | 0.4 | 0.1   2.0    | 0.3   4.0 | 0.7   4.0 | 2.4   4.0 | n/a     |
|                 | 0.5 | 0.3   3.2    | 0.5   4.0 | 1.0   4.0 | 3.6   4.0 | n/a     |
|                 | 0.6 | 0.4   4.3    | 0.7   4.0 | 1.4   4.0 | n/a       | n/a     |
|                 | 0.7 | 0.5   4.0    | 1.0   4.0 | 1.8   4.0 | n/a       | n/a     |
|                 | 0.8 | 0.7   4.0    | 1.2   4.0 | 2.2   4.0 | n/a       | n/a     |
|                 | 0.9 | 0.8   4.0    | 1.4   4.0 | 2.5   4.0 | n/a       | n/a     |
|                 | 1.0 | 1.0   4.0    | 1.6   4.0 | 3.0   4.0 | n/a       | n/a     |



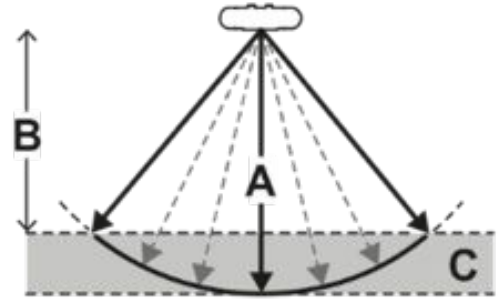
# Detection function

It de-energizes the safety relays, preventing the machinery from restarting if motion is detected in the system stopping area.

Moreover, a **Pre-alarm area** can be configured, where if the machinery is functioning and the system detects motion, the dedicated auxiliary output relay closes (e.g. for connecting a light or acoustic signal). The area is defined through the Inxpect Safety application.



# Tolerance area



It is the area [C] that exceeds the dangerous area to protect.

Why? Because:

- the depth of the area to protect is a *linear distance* (B)
- the sensor is based on *radial distances* (A)

In this area we could *have* or *not have* the detection of a movement.



# Restart function

It maintains safety relays de-energized, preventing the machinery from restarting if motion is detected in the system stopping area.

After motion is detected, further motion of only a few millimeters is sufficient (e.g. a person breathing) to prevent the machinery from restarting.



# Types of managed restart

- **Automatic** -> it takes into account only the time passed since the last motion detection
- **Semi-manual** -> it takes into account the time passed since the last motion detection and the status of the restart enable button (digital input)
- **Manual** -> it takes into account only the status of the restart enable button (digital input)

How to set a time interval for the restart function? Using the Inxpect Safety application



# Muting

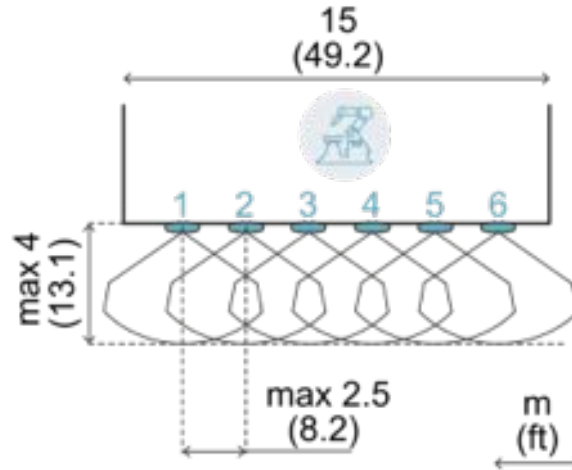
It temporarily **disables the motion detection**.

- **How to enable it?** Through digital input for all the sensors simultaneously or only for a group of sensors. Up to three groups can be configured (using the application), each associated to a digital input.
- **How to know if at least one of the groups of sensor is in muting?** Through the auxiliary output, if configured using the application.



# Linear barrier

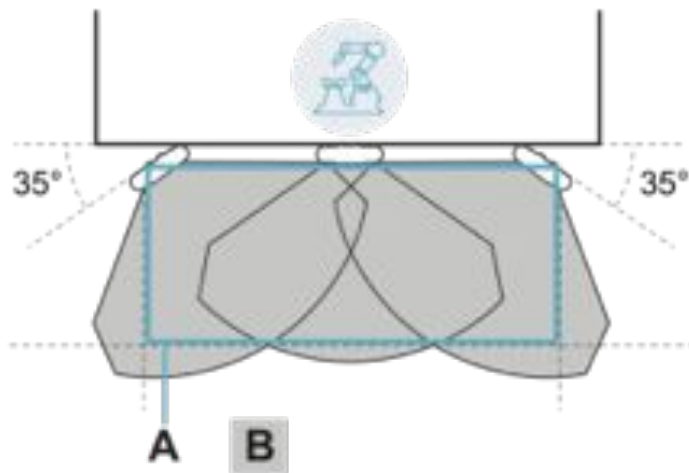
The max depth of the area that can be set is 4 meters. With six sensors aligned and at a max distance of 2.5 m, an area of 15 m total width can be monitored.





# Example of total coverage

- A. Dangerous area
- B. Stopping Area



# The Inxpect Safety Application

It is used to perform the following main functions:

- Configure the system
- Receive suggestion on number and disposal of the sensor
- Print configuration report
- Check system functioning
- Download system log

Some functions are password protected.

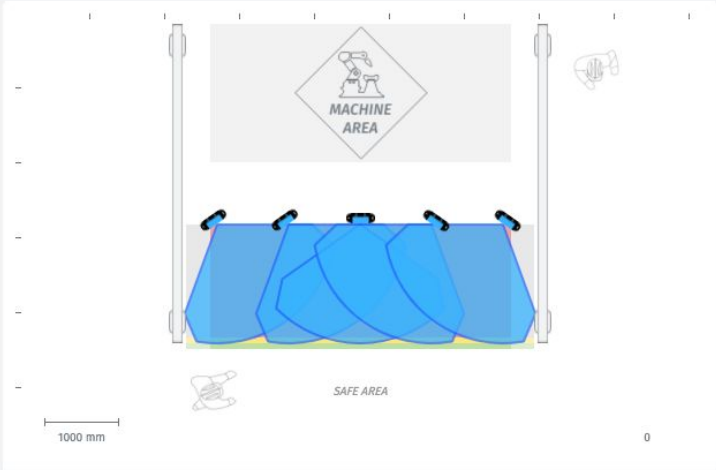


# The Inxpect Safety Application

LBKSystem Dashboard Configuration Maintenance

APPLY CHANGES

## Configuration



The diagram shows a top-down view of a machine area. A central diamond-shaped sign reads "MACHINE AREA" with an icon of a robotic arm. Below the sign, a barrier is represented by a blue shaded area with five sensors. A yellow shaded area below the barrier represents the "SAFE AREA". A scale bar indicates 1000 mm. Navigation arrows at the bottom of the diagram area show "Configuration solution 1/1".

**BARRIER LENGTH**  
4000 mm

**ALARM DEPTH**  
1500 mm

**PREALARM DEPTH**  
80 mm

**RESULT VALUES**

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# The Inxpect Safety Application

- drag and drop of each sensor to cover different shapes
- alarm and pre-alarm depths different for each sensor

