

# SAFETY LIGHT CURTAINS

## Product selection guide and installation tips

The safety of plant personnel must be maintained as the top priority in any working environment. Those who work with and on machines, automated equipment and robots are often unaware of the dangers involved. However, the potential impact on the health and safety of all users can be devastating. As is so often the case, prevention is the best protection! You need the right safety technology. In this guide, you will learn why safety light curtains are the best solutions for bodily protection and which important selection criteria and installation instructions must be taken into account.

### Why is it important to use safety light curtains to protect hazardous areas?

In manufacturing processes, **hazards from machines lurk** around almost every corner. Manual **workstations and test stations** such as presses, cutting, bending and punching machines pose a particularly high risk. Without appropriate protective measures, users can all too quickly come into contact with moving machine parts. The consequences are cuts, bruises, fractures, sprains – or even worse.

To prevent this from happening in the first place, it is essential to **safely detect when fingers, hands and other limbs enter hazardous areas**. In this way, dangerous **machine movements can be switched off** automatically. Safety light curtains are an ideal solution!



Fig. 1: The risk of injury in manufacturing processes is very high

### What are safety light curtains and how do they work?

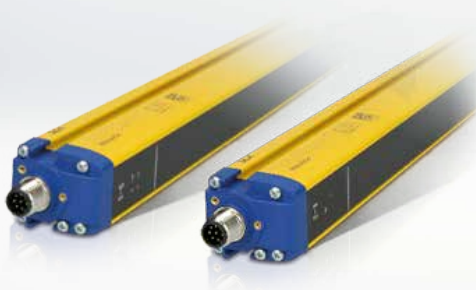


Fig. 2: Safety light curtains consist of a transmitter and a receiver unit.  
Example: Datalogic 957901130 - SG4-30-030-00-E

Safety light curtains are optoelectronic safety sensors. They consist of a transmitter unit and a receiver unit and operate on the same principle as through-beam photoelectric sensors, which are used especially for position detection.

Unlike conventional light barriers, however, safety light curtain transmitters send a **large number of light beams** at defined distances to the receiver module. This creates a virtual and **very tightly meshed barrier** for protecting hazardous areas. As soon as fingers, hands or other limbs penetrate this barrier and interrupt the light beams, the **dangerous machine movements can be automatically switched off**. This explains why safety light curtains belong to the category of electro-sensitive protective equipment (ESPE).

Another important difference from standard photoelectric sensors is that, as **safety sensors**, safety light curtains have the necessary features to **prevent unexpected failures**. For example, they have redundant OSSD outputs that transmit switching states to the corresponding safety controllers or safety switching devices. OSSD stands for Output Signal Switching Device. These outputs send out periodic test pulses to **detect potential short circuits**. In addition, safety light curtains have **self-test functions** that also counteract system failure.

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### What are the selection criteria for choosing the right safety light curtain?

Selecting the right safety light curtain is very simple. You'll be on the safe side if you consider the following three or four selection criteria:

| Criteria                  | Description   |
|---------------------------|---|
| ❶ Resolution              | Describes the <b>distance between the light beams</b> . This defines which part of the body can be accurately detected.<br>Finger protection: 14 mm<br>Hand protection: 30 mm   |
| ❷ Protection field height | Indicates the <b>height of the area to be protected</b> by the safety light curtain. This depends on the size of the accessible hazardous area.   |
| ❸ Protection type         | Provides information about the <b>internal structure of the light curtain</b> for protection against unexpected failures. In particular, there is a distinction between <b>Type 2 and Type 4 safety light curtains</b> (rarely Type 3).<br>The higher the type number, the higher the Performance Level (PL) that can be met according to the DIN EN ISO 13849 standard. Type 4 light curtains meet the requirements up to PL <sub>e</sub> .<br>Nowadays, <b>Type 4 light curtains</b> have become the standard and light curtains with lower type numbers are increasingly being pushed out of the market. |
| ❹ Range (optional)        | Describes the maximum <b>distance between transmitter and receiver</b> . However, the maximum range of most safety light curtains is usually so large that there are very few applications in which this is a factor. Therefore, this <b>criteria is considered to be optional</b> .  |

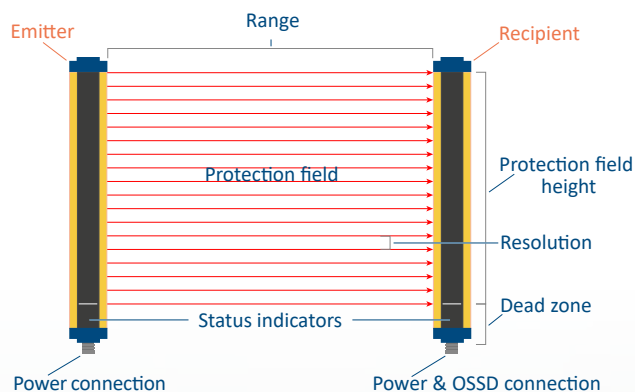


Fig. 3: Safety light curtain – construction and selection criteria

Safety light curtains have other design features which may cause them to differ from one another. These include, for example, an extremely narrow design or the absence of a dead zone. However, these distinguishing features are **relevant for very few applications**, which is why they are intentionally not discussed in detail here. In most cases, **standard light curtains** are perfectly adequate.

### In comparison: safety light curtains and safety light grids

The terms safety light curtain and safety light grid are often **mistakenly used interchangeably**. However, this is incorrect. Although they differ very little from each other externally, there are **significant differences** in their characteristics and their suitable areas of application.

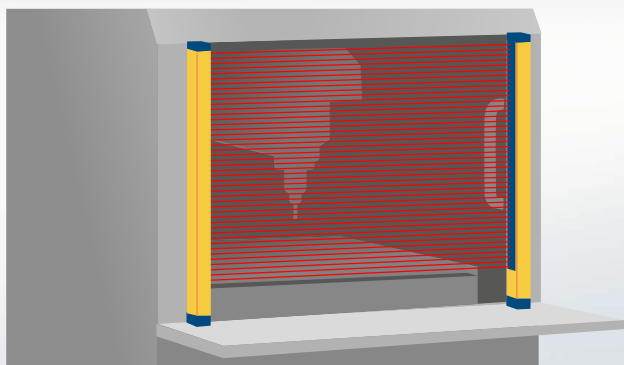


Fig. 4: Protecting hazardous areas with a safety light grid

One of the most significant differences is their resolution. While light curtains generate a large number of light beams at **small distances**, light grids usually generate only two to four light beams at significantly larger distances. This is because of the different applications for which they are designed. While safety light curtains are used for finger and hand protection detection in hazardous areas, light grids are used to protect larger areas, where body detection using fewer light beams is sufficient.

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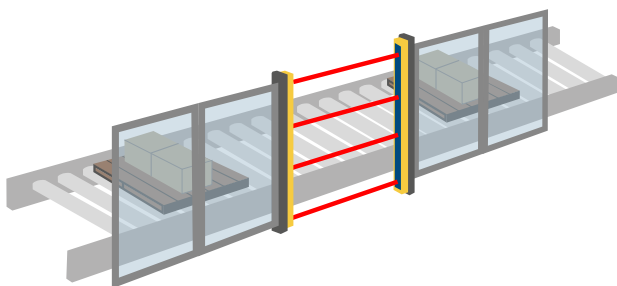


Fig. 5: Area protection with a safety light curtain

Area protection is often important for **logistics applications**. In this context, muting is also an important requested feature. **Muting** makes it possible to **temporarily bypass** light curtains, for example, to move pallets out of the hazardous area **without bringing system processes to a standstill**. Immediately after the pallets have been moved, the light curtain is reactivated to detect people entering the hazardous area again.

When protecting hazardous areas with light curtains, a muting feature is not usually needed because **materials are rarely moved out of the hazardous area**.

### How do you properly install and test safety light curtains?

Before they can be used, it is important to install safety light curtains correctly and test their performance.

#### Choosing the correct minimum distance

It is very important to maintain the **correct minimum distance between the light curtain and the hazardous area**. The rules for this are clearly defined in the **DIN EN ISO 13855** standard.

Light curtain safety distance – calculation formula:

$$S = K * (t_1 + t_2) + C$$

S = Min. safety distance

K = Approach speed

$t_1$  = Light curtain reaction time

$t_2$  = Machine reaction time until standstill

C = Maximum distance of undetected movement behind light curtain

**K and C set the standard.**

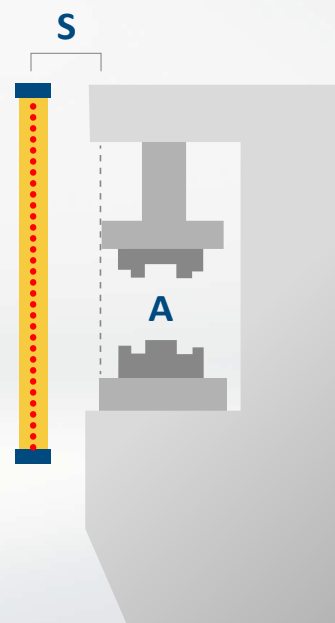
**K as gripping speed = 2,000 mm/s,**  
if the result of this formula is > 500 mm,  
K = 1,600 mm/s (step speed) may be used.

**C equals 8 \* (resolution (d) - 14 mm),**  
i.e., when using a 14 mm light curtain, C = 0 mm,  
and when using a 30 mm light curtain, C = 128 mm.

The following formulas are derived from this:

**For 14 mm resolution light curtains:  $S = 2,000 \text{ mm/s} * (t_1 + t_2)$**

**For 30 mm resolution light curtains:  $S = 2,000 \text{ mm/s} * (t_1 + t_2) + 128 \text{ mm}$**



**S = Minimum safety distance**

**A = Danger zone**

Fig. 6: According to DIN EN ISO 13855, a minimum distance must be maintained

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### How do you properly install and test safety light curtains?

#### Bypass protection

When properly installing a safety light curtain, it is imperative that all limbs entering hazardous areas are **detected without exception**. The prerequisite is the correct selection of the **appropriate protective field height** so that it is **not even possible to reach past the light curtain** into the hazardous area.

It is also necessary to make sure that no one can **remain undetected behind the light curtain**. Therefore, if an application requires a very high safety distance, it is essential to install an additional **horizontal light curtain**.

#### Correct vs. incorrect types of mounting

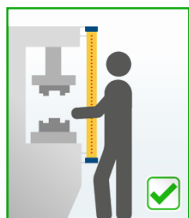


Fig. 7: Installation at low safety distance.



Fig. 7.1: It must not be possible to reach past a safety light curtain.



Fig. 8: If the safety distance is very high, a safety light curtain must be installed horizontally.

Fig. 8.1: It must not be possible to be behind the light curtain without being detected.

#### Alignment guide

Because the light beams emitted by the light curtain are **not visible**, it can be very difficult to align the transmitter and receiver over long ranges. Mounting laser pointers on the transmitter **can help with alignment**.

#### Protection against vibration

Safety light curtains are designed to cause machines to shut down as soon as the light beam sent by the transmitter cannot reach the receiver. However, machines that vibrate strongly can disrupt the light beam, because the vibration can cause the transmitter and receiver **not to be aligned with one another momentarily**. As a result, vibration-heavy applications require the use of **special vibration dampers** to prevent unnecessary triggering.

#### Daily operational tests with test rods

Trust is good, monitoring is better. This also applies to safety light curtains! To check for correct operation and **to reduce the risk of liability** in the event of a malfunction, it is recommended to perform a **daily operational test** on each safety light curtain.

For this purpose, a test rod is passed through the protective field to check that the light curtain beams are interrupted correctly. The test rod must have the same **diameter as the resolution** of the light curtain.

### Protect yourself and your employees with light curtains

Now you know how important it is to provide **adequate protection for hazardous areas** and why safety light curtains are an especially good solution for this purpose. You can find designs for every need and budget in many online stores. Basic light curtains can be used for most applications. For example, **Automation24** offers an **attractive selection of light curtains from Datalogic** for standard requirements. This offer includes **exceptionally good prices and fast delivery times**.

Security technology should not be a luxury. Don't take your health or the **health of your employees** lightly. Rely on **dependable safety light curtains** for your protection!

With this compact guide, you are now ideally equipped to select the right safety light curtain for your application and to install it in compliance with standards.