



Light Curtain or Safety Laser Scanner?

How to Choose an Optical Safety Device

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Sensor Intelligence.

There were hundreds of fatalities and thousands of injuries in 2014 in manufacturing, according to the [Bureau of Labor Statistics](#). From machine building to parts manufacturing to industrial vehicles, safeguarding machinery is a critical step to ensuring the safe and smooth operation of any manufacturing facility. Safety light curtains and safety laser scanners are two common safeguarding devices, and both can be used for many safety applications, including point-of-operation guarding, area guarding, perimeter protection, and entry/exit safeguarding.

But how do you choose the right technology for your safety application? While we strongly recommend consulting a safety professional about your specific application requirements, we have compiled some general considerations that can help you identify an appropriate safety technology.

Point-of-Operation Guarding

The point-of-operation refers to the area of the machine where work is performed. In protecting points of operation, a person's approach is detected within a very close proximity to the hazardous point. The advantage of using an optical device for point-of-operation protection is that it allows for a short minimum distance, and the operator can work more ergonomically (for example, during loading work on a press).

How does a light curtain solve point of operation guarding?

With a safety light curtain, the sender unit emits pulses of infrared light beams to a receiver unit. The light curtain can then detect interruptions to one or more light beams within the sensing field. Safety light curtains are ideal for point-of-operation protection due to their slim profile that can easily be mounted close to the hazard and their small resolution between beams. For example, the resolution can be set small enough to detect a hand or even one finger. This allows the safety system to respond quickly when the sensor is tripped.



How does a safety laser scanner solve point of operation guarding?

A safety laser scanner most likely would not be used for this type of application, since laser scanners generally require a greater minimum distance from the hazard due to the longer response time of the device. Instead, another option for point-of-operation guarding would be a safety-rated vision system.

Important considerations

When choosing a safety technology, you must always consider the [minimum safety distance calculation](#). This is especially important for point-of-operation applications because people are working so close to the hazard that you must ensure that the machine can be stopped before injury occurs. It is also important to consider the size and discreteness of the optical safety device. The device should be able to protect a worker from injury while also maintaining an ergonomic workspace.

Area Protection and Perimeter Guarding

While area guarding and perimeter protection are similar, there are important differences that can help determine an appropriate optical safety device.

Area protection generally refers to safeguarding a hazard point on a single side of the machine, especially when there is close interaction with the machine. The approach of the person is detected by sensing the person's presence in an area. Area protection is necessary for machines that have a hazardous area that cannot be viewed completely from the position of the reset device. If the hazard area is entered, a stop signal is initiated—stopping the machine and preventing restart. Hazard area protection is also important for AGVs (automated guided vehicle) and cranes and stackers in order to protect people while the vehicles are in motion or docking to a fixed station.



Perimeter guarding refers to safety measures that guard multiple sides of the machine. If the perimeter is breached, a stop signal is initiated and the machine is stopped. Typically, safety laser scanners are used more in area protection, and safety light curtains are used more in perimeter guarding applications. You should always discuss your specific application needs with a qualified safety professional.

How does a light curtain solve area and perimeter guarding applications?

Since the light curtain uses the sender/receiver concept, it can easily be used in conjunction with mirrors to guard multiple sides of a machine. Depending on the setup, you could also potentially mount light curtains very close to the machine, saving valuable floor space.

How does a safety laser scanner solve area and perimeter guarding applications?

Using time-of-flight technology, a safety laser scanner emits a pulse of light that is then reflected by a target, if present. The time required for the pulse to travel between the scanner and the reflector and back again is proportional to the distance. This allows the scanner to detect objects in the defined safeguarding area.

Because the safety laser scanner is based on freely defined fields, it may be able to be tucked into the machine for discrete mounting. Additional benefits of a safety laser scanner include the ability to switch between zones and the ability to segment field types for different outputs—for example, safety (protective) field or warning field.

Important considerations

As with all safety applications, minimum safety distance calculation is an essential step. In addition, for both area and perimeter guarding, it is important to consider whether optical guarding or hard-guarding (completely preventing access to the area) is the most appropriate safety measure. You should also weigh the [benefits of fenceless safety](#), while also taking into account foot and AGV traffic in the area. For example, in some factory floor configurations with high traffic and narrow separation between

guarding areas, hard-guarding may be more ideal to prevent frequently tripping the optical safety devices and causing the machines to come to a stop.

Entry / Exit

How does a light curtain solve entry / exit applications?

Traditionally, if there aren't access points covered by doors or hard guarding, muting is used to detect entry/exit. Muting is a function used to temporarily deactivate the protective function of a protective device. This can be done using two- or four-muting sensors, such as inductive sensors or photoelectric sensors, which are logically evaluated to determine the sequence of the object moving through. If the sequence is correct, and all other parameters within the logic are met, the object will be allowed through the safety light curtain without stopping the work routine.

Another way of moving material into a safeguarded area with a light curtain is active differentiation between person and machine. For this application, horizontally arranged safety light curtains are applied. The ability to evaluate each light beam individually allows the light curtain to differentiate the interruption pattern of the material or material carrier (e.g., pallet) from a person. This differs from muting, because muting sensors are not required, so there are less mechanical mounting efforts and less wiring needed.



By using self-teaching dynamic blanking, as well as other differentiation criteria such as direction of movement, speed, entry and exit in the protective field, etc., a safety-relevant distinction can be made. In this way, undetected entry into the hazard zone can be reliably prevented.

How does a safety laser scanner solve entry/exit applications?



Active switching of protective fields provides another way of moving material into a safeguarded area. For this application, safety laser scanners are normally used with vertical (or slightly tilted) protective fields.

The appropriate protective field, from a series of preprogrammed protective fields, is activated by corresponding signals from the machine controller and adequately positioned sensors. The contour of the protective field is designed so that passage of the material does not cause the protective device to activate and any unmonitored areas are small enough to prevent undetected access to the hazard zone.

Important Considerations

We most often see safety light curtains in entry/exit applications because it is an effective and economical solution in most cases; however, there are certain instances where you might want to use

a laser scanner instead. For example, if you do not have an appropriate space to mount two perpendicular devices, a laser scanner would be the more feasible choice.

This white paper is meant as a guideline only and is accurate as of the time of publication. When implementing any safety measures, we recommend consulting with a safety professional.

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