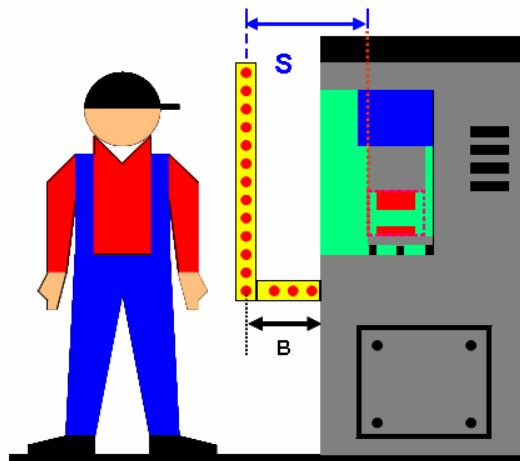




### Formula for calculation of the required minimum distance: $S = (K \times T) + C$

- S:** Minimum distance in mm between the start of a danger zone and the detection zone, but not less than 100 mm
- K:** Approach speed in mm/s of the body or parts of the body (for  $S \leq 500\text{mm}$  then  $K = 1600\text{mm/s}$ ; for  $S > 500\text{mm}$  then  $K = 2000\text{mm/s}$ )
- T:** Total reaction time in s of the protective equipment and machine control system, including overtravel
- C:** Additional distance in mm defining the penetration of the danger zone before the protective equipment is tripped

*Note: for details, refer to ISO 13855*



If it is possible to stand undetected between the AOPD & the hazard point (distance B) additional means like restart interlock or other devices, are required

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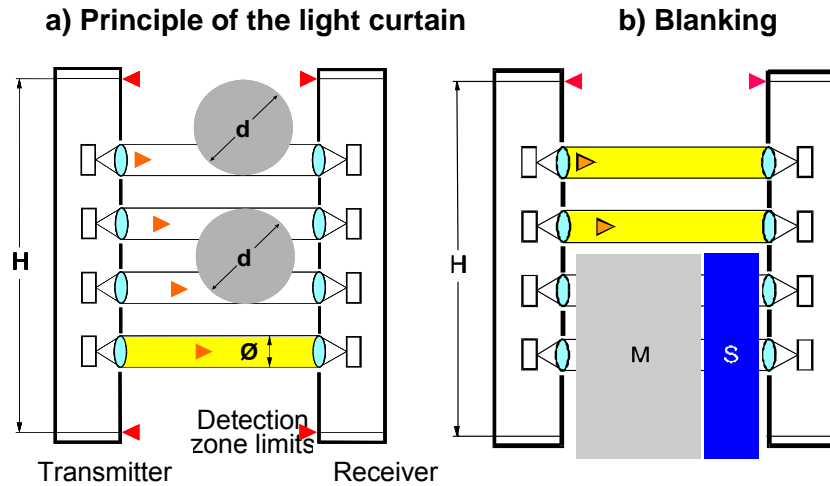
## Light curtains

### Applications

Finger and hand protection and safeguarding of danger zones on machines such as presses, pick-and-place machines, wood and paper processing and printing machines, and machines for use in warehousing and handling applications.



A press safeguarded by a light curtain



- ∅: Effective diameter of the light beam
- d: Test piece diameter
- H: Height of detection zone
- M: Permanently fixed machine component
- S: Additional mechanical protection

A light curtain consists of a transmitter and a receiver and the detection zone between them, which is limited in its height and width. According to the part of the body to be protected, the detection capability must for example be 14 mm for finger protection and 20 mm for hand protection.

For such kind of equipment IEC 61496-1/-2 defines two categories described as Type 2 and Type 4. Optional functions such as contactor monitoring, start and restart interlocking, blanking, and muting may be implemented within the light curtain. Following the results of a risk assessment of the machine according to ISO 12100:2010 (or ISO 14121-1), the light curtain must be of Type 2 or Type 4 and accordingly integrated electrically into the machine.

### Example of blanking of light beams:

A fixed machine component penetrates the detection zone of the light curtain.

The contiguously interrupted discrete beams are ignored internally within the light curtain. Reaching from the side past the machine component into the danger zone is prevented by a fixed mechanical guard. The continuous interruption of the blanked light beams is monitored in the light curtain. Unblocking of a light beam again leads to the hazardous movement of the machine being stopped.

### Testing of the function on the machine

- Is the relevant test piece detected at any random point and angle in the detection zone?
- Is it possible to circumvent the detection zone by reaching over, under or around it or by stepping behind it?
- Are reflective surfaces and devices of the same type sufficiently separated?
- Is the danger zone observable from the command point from which the machine is first started?
- Is the safety distance to the danger zone sufficient, also taking into account the greatest possible overtravel?
- Does the protective equipment disrupt the work process; is any incentive for defeating evident?
- Does electrical integration into the machine control system correspond (for example) to the required Category / Performance Level of ISO 13849-1?
- Is a manufacturer's declaration of conformity with the requirements of IEC 61496 standards series available? Is a type testing certificate (e.g. EC Type examination) from a recognized third party (testing laboratory) body available for the protective equipment?