Photoelectric sensors

Bernstein photoelectric sensors can be divided into four basic types:

- Through-beam
- Retro-reflective
- Diffuse reflective
- Fibre optic

The specifications of the above mentioned sensors are defined in the standard EN 60947-5-2.

The use of these systems depends primarily on the application and the operating environment. On the following pages you can find a number of application examples which demonstrate the advantages and disadvantages of the individual sensing types.

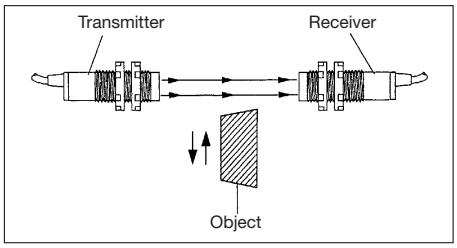
The division of photoelectric sensors into type/model helps make selection easier, the housing style and material distinguish the different type groups. You will find the available sensing options of the individual type groups in the data section of this catalogue.

In general, Bernstein photoelectric sensors operate using pulsating red or infrared light. This technology offers the following benefits:

- High immunity to ambient light
- Maximum sensing range
- Reduced temperature, resulting in longer operational life of transmitter diodes

Sensing types

Through-beam sensors (ES)

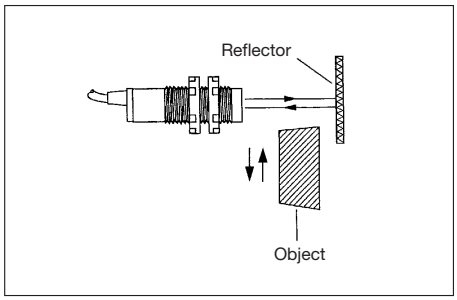


Through-beam sensors have the light source and receiver in separate heads. The light emitted by the source is analysed by the receiver. Interruption of the light path (caused by an object) is evaluated and results in switching of the output.

Advantages:
- Long sensing distance; the light beam needs only to travel in one direction from the transmitter to the receiver
- High operational safety, interference reflections rarely trigger the receiver
- Detection of very small objects, possible by the additional use of lenses or filters

Disadvantage:
- High installation cost with two devices having to be mounted, wired and adjusted

Retroreflective sensors (RS)



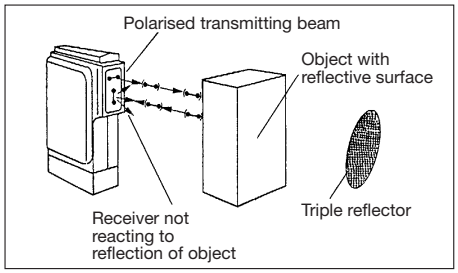
Retroreflective sensors have the light source and the receiver in the same head. The light beam emitted by the source is reflected back to the receiver by a reflector (e.g. triple reflector or reflective foil). Any break in the light path is evaluated by the receiver and in turn results in a change of the output mode.

Advantages:
- Easy installation of sensor head and reflector
- Reflector can be fixed to a moving target, e.g. conveyor belt installations

Disadvantages:
- Shorter sensing range than a through-beam system since the light beam has to travel from the light source to the reflector and back to the receiver
- High-gloss objects can function as reflectors and may cause malfunctions

Note:
The sensing ranges specified in the data section of this catalogue refer to use with a triple reflector with a diameter of 83 mm. Changes in the sensing range due to the use of other reflector types are available on request (see page 274).

Polarised retroreflective sensors (PS)



This device is a special type of retro-reflective sensor. Special linear or circular polarised filtering elements (foils) are mounted between the reception/transmission elements and the lens of the sensor.

Advantage:
- Reflections of mirroring or transparent objects are reliably ignored

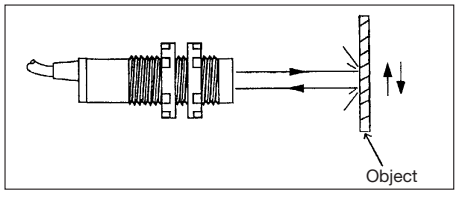
Disadvantage:
- The sensing distance is shorter compared to standard devices without polarisation filters

Special types with autocollimation

Transmission/reception channels use the same lens

Advantage:
No dead zone with reflectors in short distance ranges

Diffuse reflective sensors (RT)



Diffuse reflective sensors have the light source and receiver in the same head. The light emitted by the source is diffusely reflected by the detected object. A part of this reflection returns to the receiver and changes the switching status of the output when a certain intensity is exceeded. Thus the texture and colour of the object's surface has a great effect on the detection (presence/absence) of objects.

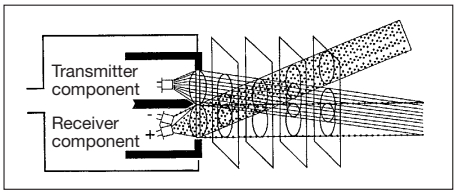
The sensing distances indicated in the data section of this catalogue are defined as follows in accordance with EN 60947-5-2. Sensing distances of up to 400 mm refer to a 100 x 100 mm white paper test card from Kodak. For sensing distances of more than 400 mm, 200 x 200 mm test cards are to be used.

The reflectivity of the object surface to be sensed effects the sensing distance, so that a correction factor or re-emission factor has to be specified. This value may vary from, less than 10% for matt-black plastic to 200% for raw aluminium sheet metal (special values on request). Usually we recommend an application-dependent test of the specific object to take ambient conditions, such as dust and humidity, into consideration for the selection of the optimum sensor.

Advantages:
- Easiest installation
- No reflector necessary

Disadvantage:
- Different sensing distances and sensitivity settings are required for different objects (surface, colour)

Diffuse reflective sensors with background suppression (RH)

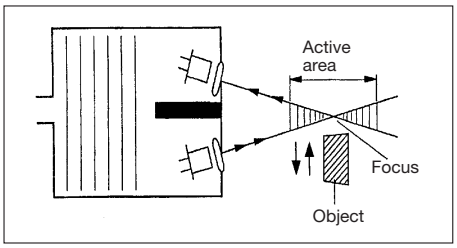


This type of sensor is a special type of diffuse reflective sensor. It is based on two receptive elements (segmented receivers). Using the triangulation principle, reflections of objects beyond the target do not reach the active surface of the receiver modules.

Advantage:
- No background effect on object detection (e.g. a faintly reflecting object may be detected in front of a high-gloss background)

Disadvantages:
- Short sensing distance
- Higher technical expense

Convergent beam sensors, fixed focus (FF)

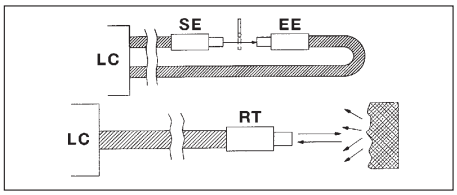


The transmission and reception elements of convergent beam sensors are arranged in a defined angle to each other. The light cone of the source and the receiver are joined in a fixed focal point. This results in the active zone for the detection of objects being defined around this focal point.

Advantages:
- Background/foreground suppression
- Defined active zone

Disadvantage:
- Short sensing distances (due to limited base width of sensor housing)

Fibre optic controls (LC) for the connection of fibre optics



Fibre optic controls with corresponding fibre optics can be used for the through-beam and diffuse reflective principle, fibre optics for sensor applications consist of bundled glass fibres or one or more transparent plastic fibres. The light falling below the limit angle of the total reflection forms the basis of the light transportation principle. In the interior of the fibre, which has a higher refraction index than the sleeve, the light is conducted in a zigzag course from the transmitter on the switching amplifier to the fibre end. The material of the surrounding sleeve can either be plastic or metal, depending on the application type, in addition, a wide selection of fibre ends of different types are available to the operator.

Advantages:
- Use in confined areas
- Not effected by electrical and magnetic fields
- High temperature range
- Detection of very small objects possible