Photoelectric sensors and diffuse sensors

Performance and quality made in Germany

F 10 – sub-miniature sensor family

from Page 293

FT 10-RLH IO-Link
- *The world's smallest adjustable diffuse laser sensor with background suppression*

>> Page 295

FS/FE 10-RL
- *Very precise front edge detection thanks to high scanning rate and fine laser beam*

>> Page 313

F 25 – miniature sensor family

from Page 315

FT 25-RLHP IO-Link
- *Diffuse laser sensor with adjustable background suppression*
- *Long range - up to 1.5 m - thanks to time-of-flight technology*

>> Page 319

FT 25-RHD IO-Link
- *Photoelectric diffuse sensor with adjustable background suppression*
- *Long scanning distance of 400 mm with miniature housing*

>> Page 325

F 55 – photoelectric sensors and diffuse sensors

from Page 377

FT 55-RLHP2 IO-Link
- *Diffuse laser sensor with background suppression*
- *Reliable object detection at long distances up to 5 m*

>> Page 383

FT 55-RL
- *Diffuse laser sensor*
- *Detection of the slightest contrast differences at a scanning distance of up to 1.2 m*

>> Page 391

Photoelectric sensors and diffuse sensors are the standard sensors in automation technology. At SensoPart you will find the right sensor for almost every conceivable application. Our product portfolio offers a comprehensive selection of differing sizes, ranges and switching variants. Regardless of whether you choose a sub-miniature sensor for restricted machine conditions or a large housing with a particularly long range or scanning distance – all our sensors share excellent performance data, high reliability and solid workmanship "made in Germany".

Our photoelectric sensors and diffuse sensors offer, for example, precise background suppression, extremely accurate small-part detection or reliable detection of transparent objects. And they operate extremely reliably in harsh industrial conditions: our current sensor series have tightly sealed (IP 69/IP 67) plastic housings and are immune to cleaning according to the Ecolab standard.

Mounting and alignment are easy and rapid with products from SensoPart: well thought-out, user-friendly accessories such as the dovetail mounting offered by some of our series, the adjustment possibilities via IO-Link, Teach-in button and control input, or the Auto-detect function (only available from SensoPart), with which sensors can automatically determine whether PNP or NPN wiring is present – so that only one sensor variant is required.

The SensoPart portfolio not only contains powerful, reliable and solid products for standard applications, but also real highlights. Our new FT 25-RHD diffuse sensor, for example: its highly precise background suppression, the lowest black/white shift currently available on the market, and the long scanning distance ensure absolutely reliable switching behaviour – without impairment by varying object surfaces and colors, or critical backgrounds. Or our FT 10-RLH sub-miniature laser scanner – the only one of its size with adjustable background suppression. Or … see for yourself on the following pages!

F 50 – photoelectric sensors and diffuse sensors in compact housings

from Page 353

FT 50 RLHD

- *Diffuse laser sensor with background suppression*
- *Long scanning distance of 300 mm with compact housing and extremely accurate small-part detection*

>> Page 357

F 88 – the photoelectric sensor and diffuse sensor family for harsh operating conditions

from Page 403

FT 88-IH

- *Diffuse infrared sensor with background suppression*
- *Relay output with toggle switch*
- *Very high scanning distance of 2 m*
- *Simple adjustment of time functions*

>> Page 411

Photoelectric sensors and diffuse sensors in barrel type housings

from Page 423

FMH 18

- *Best sensor in barrel type housing with background suppression*

>> Page 427

FR 18-2 RM

- *Photoelectric retro-reflective sensor*
- *Standard M18 sleeve in robust full-metal housing*

>> Page 445

made in Germany

TYPICAL SENSOPART

- SensoPart develops, produces and sells photoelectric diffuse sensors with the best background suppression on the market – thanks to SensoPart ASIC technology
- Highly developed laser technology – precise and small laser light spots for extremely accurate small-part detection
- Sensors with excellent black-/white shift for reliable switching behaviour regardless of object color and surface
- Patented sensor designs and mounting systems
- Differing transmission light sources for the most varied of requirements: laser, LED, or infrared light transmitters
- Wide variety of adjustment possibilities: IO-Link, potentiometer, teach-in, external control line or fixed pre-setting
- Cuboid or barrel type housing options
- Robust workmanship: glass-fibre-reinforced plastic housings (IP 69/IP 67), stable plug connections made of plastic and metal, as well as metal-reinforced drilled holes for mounting
- Internationally recognised UL-certification
- Ecolab-certification
- Safe operation thanks to Laser Class 1
- Intelligent mounting solutions for easy mounting and adjustment
- **IO**-Link

By far the best object detection

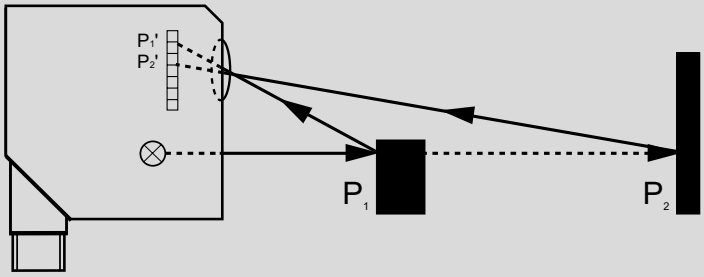
Our sensors detect almost any object in any surroundings thanks to the distance principle

A challenge for every sensor

Polished covering panels on machinery, blinking warning lamps on passing vehicles, moving machine parts, sunlight coming through a window – all these are background effects that can make detection of the actual target object considerably more difficult. So it is a major advantage if one uses sensors that one can rely on: diffuse sensors with background suppression from SensoPart. They only see what they are supposed to see: the object itself – regardless of the material, shape and color – and nothing else!

Object detection by means of distance measurement

SensoPart diffuse sensors with background suppression can always differentiate between object and background even in strongly reflective environments. The sensor measures the distance to the object, P_1, and to the possible background, P_2, according to the triangulation process and not the reflectivity of the object. The signal, P_2, coming from the background is then cut out. SensoPart has implemented the detection principle of distance measurement with incomparable precision. This high quality could be achieved because we have developed an optoelectronic, integrated circuit (an ASIC), in which the optical receiver cell and the evaluation electronics are integrated in the smallest of spaces.



Your advantages

- Reliable object detection
- High process stability
- An economical solution

Technology provides the technical edge

Thanks to its tiny dimensions, the ASIC microchip even fits into the sub-miniature sensors of the F 10 series. Thus SensoPart offers the world's smallest laser sensor with adjustable background suppression.

With the latest generation F 10, F 25, and F 55 series, SensoPart offers photoelectric diffuse sensors with the best background suppression currently available.

Your advantage is our priority

Reliable object detection

- Regardless of size, shape, color, material and surface properties of the target object
- Detection using the distance measurement principle: precise and reliable

High process stability

- Reliable suppression of undesirable reflections and ambient light
- Suppression of moving parts in the background (e.g. conveyor belts, machine parts, persons)
- Reliable detection of the target object even when close to the background

The economical solution

- Usable in all task areas
- Rapid commissioning thanks to simple teach-in
- High machine run-times through quality sensors from SensoPart, made in Germany

1 *Reliable detection of the thinnest tubes in front of metallic backgrounds thanks to focused laser light spot and precise background suppression.*

2 *Detection of black foam rubber pads against reflective backgrounds.*

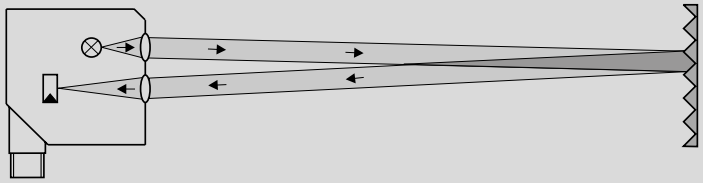
3 *Strongly reflective CDs are reliably detected against metallic backgrounds and with ambient light effects.*

4 *Solar wafers with shimmering blue surfaces against polished metal surfaces with ambient light reflections are reliably detected.*

Photoelectric sensors and diffuse sensors

System description

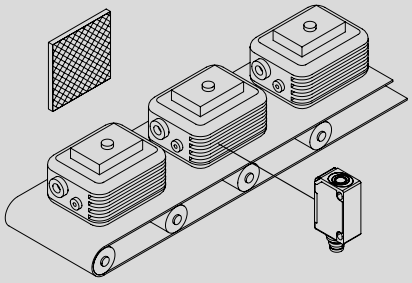
Photoelectric retro-reflective sensors



The transmitter and receiver are accommodated in a single housing in photoelectric retro-reflective sensors. The light emitted by the transmitter hits a reflector and is reflected. The receiver evaluates the reflected light. The advantage lies in the small size of the reflector. It is also easy to install because it is a passive element and thus requires no connections.

Like photoelectric through-beam sensors, photoelectric retro-reflective sensors are often selected according to the desired range. Because the light has to travel the path from the sensor to the reflector twice one also talks of the two-way photoelectric sensor. The light from the transmitter is, explained simply, emitted in a cone shape. This means that the cross-section of the light cone increases with rising range. This is also why a larger reflector is needed at longer ranges than at shorter distances. The range is therefore quoted in the data sheet in relation to the type of reflector.

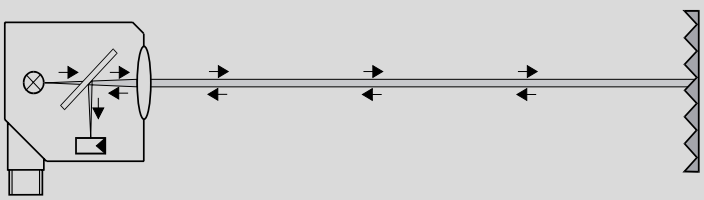
Laser sensors provide an almost parallel light beam. Whereby the light beam is extremely fine and parallel over the entire operating range. This advantage is, above all, used when the smallest of objects have to be detected along the entire operating range. Regardless of the physical principle, all photoelectric retro-reflective sensors from SensoPart have a so-called polarisation filter. Polarisation filters are optical filters that let the light beams through only in one direction. Use of a polarisation filter in combination with pyramidical reflectors can also allow the reliable detection of reflective objects by photoelectric retro-reflective sensors.



Checking completeness

The presence of the inserted components must be checked before further production steps.

The autocollimation principle

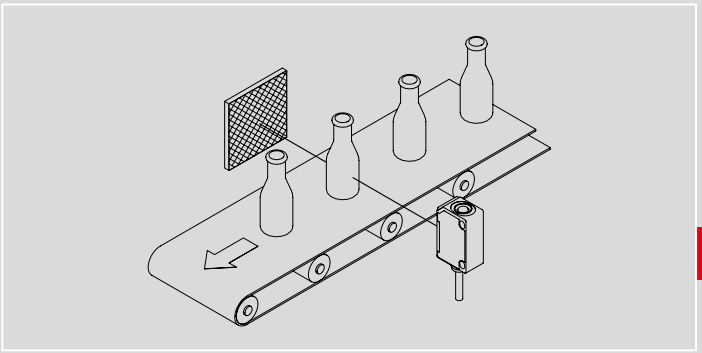


With photoelectric retro-reflective sensors one speaks of the autocollimation principle when the light reflected from the reflector travels parallel to itself (i.e. within itself). The light emitted by the sensor hits a reflector and is reflected. The reflected light is then deflected to a receiver by a semi-transparent mirror and evaluated.

The autocollimation principle

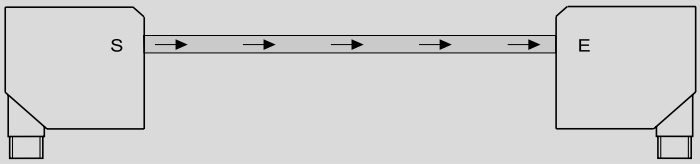
Unlike the double-lens system, a photoelectric retro-reflective sensor using the autocollimation principle has a very homogeneous and narrow optical path. Its switching point is largely independent of the entry direction of the target object.

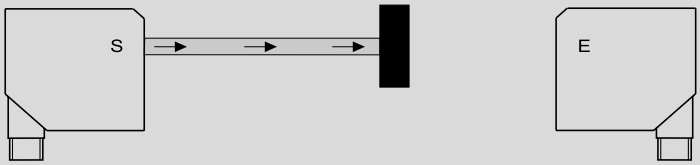
A major advantage of sensors with the autocollimation principle is detection from a range of 0 mm. There is thus, unlike the double-lens system, no blind zone.



Monitoring bottles
The photoelectric retro-reflective sensor specially developed for this purpose achieves reliable detection of transparent objects.

Photoelectric through-beam sensors

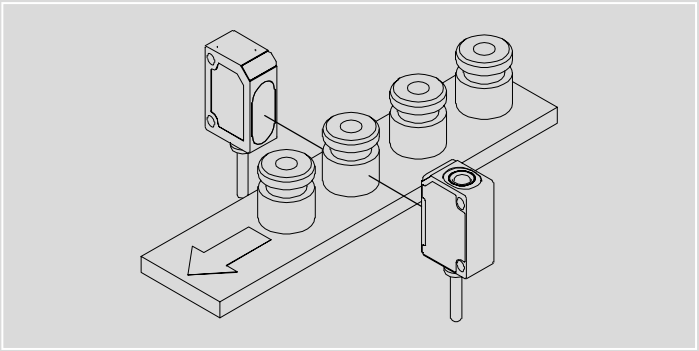




A photoelectric through-beam sensor has a separate transmitter and receiver. This means that light only travels the path between the transmitter and the receiver once. For this reason one speaks of photoelectric through-beam sensors.

The range is of decisive importance when using photoelectric through-beam sensors. Photoelectric sensors are principally selected according to their range. In the case of very critical operating conditions, such as high dust levels or intense steam generation, care must be taken to ensure that the photoelectric sensor is not operated at its limit range. Any clouds of steam would reduce the available range. The range quoted in the data sheet should not be exceeded – in order to ensure functionality in poor operating conditions.

When using deflector mirrors, the total path to be monitored should be less than the range quoted in the data sheet.

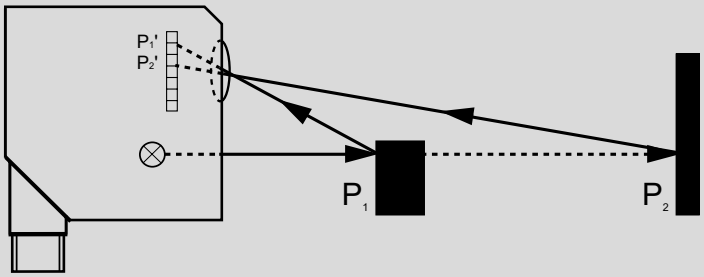


Detecting workpieces in harsh environments
Photoelectric through-beam sensors can also provide dependable detection even under poor conditions – thanks to their high level of reliability.

Photoelectric sensors and diffuse sensors

System description

Diffuse sensors with background suppression



Advantages

- Independent of object color and surface
- Reflections in the background are reliably suppressed
- Robust in sunshine
- Scanning distance adjustable according to applications

Differing object colors and surfaces can seriously affect the detection behaviour of a diffuse scanner. As a result of the purely energetic evaluation it is not possible, for example, to detect a black object against a white background. The white background reflects more light than the object itself.

The background suppression process was developed in order to be able to reliably master such tasks. Whereby both the light returning from the background as well as that reflected by the object are evaluated. The light hits two different positions (P_1' & P_2') on the receiver element.

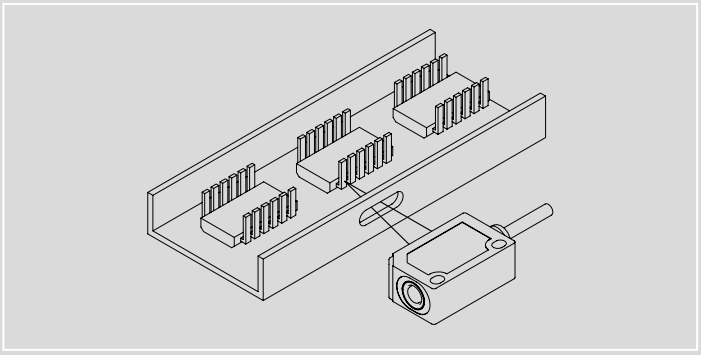
So it is not the returning energy, but the geometrical position of the target object that is evaluated (triangulation). With this process one can, for example, reliably detect a dark object on a light conveyor belt.

There are various ways to physically achieve background suppression. Generally one differentiates between a fixed and an adjustable background suppression.

In the case of fixed background suppression, the transmitter and receiver elements are fixed-mounted. The operating range is defined by the overlapping of the transmitter and receiver angles. Objects outside this operating range cannot be detected.

In the case of adjustable background suppression, the parameters for object detection can be set mechanically via a rotary switch or electronically via teach-in. This provides much more flexible use.

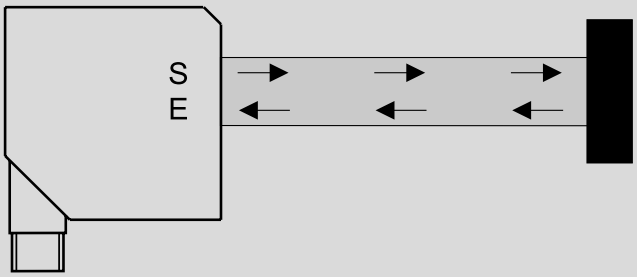
Laser devices are particularly suitable for detecting the smallest of objects. A red-light sensor should be employed for larger objects.



Monitoring pins

The fine light beam of the laser sensor permits the precise detection of even such small objects without any impairment by the background.

Diffuse sensors



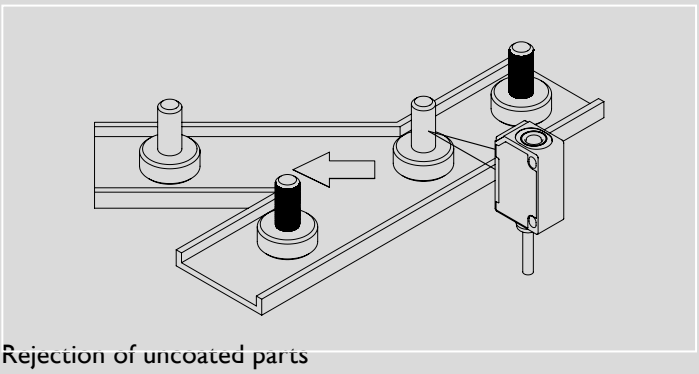
The transmitter and receiver of a diffuse sensor are accommodated in a single housing. The light emitted by the transmitter hits the target object, which reflects the light. This returning light is evaluated by the receiver. The advantage of this method is that no reflector is required.

Because the scanner evaluates the reflected light and its energy, the range of conventional scanners (also called energetic or diffuse scanners) is largely dependent on the object's color and its surface properties. Because black objects strongly absorb light, diffuse scanners can only achieve a very short range here. The surface structure is responsible for the type of reflection. Very rough, heterogeneous surfaces reflect diffusely, i.e. in all directions. Only a small percentage of the reflected light returns to the receiver. The scanning distance in this case is also low.

Diffuse sensors based on energetic evaluation are therefore particularly suitable for the detection of larger objects or of objects whose material color and surface properties remain constant.

One must also ensure that the quantity of light reflected back from the background is not greater than that reflected by the object itself. This effect occurs, for example, when a black object is in front of a white background. In this case detection with an energetic scanner is impossible. The use of a scanner with background suppression is recommended here.

The reliable detection of objects is possible if the background of the object is free, for example when an energetic scanner is mounted transversely over a conveyor belt. The setting of the sensor on the varying object surfaces and backgrounds takes place by means of a mechanical rotary switch on the sensor or via teach-in. The sensor can be set to a maximum scanning distance for a detection task without a background. A precise setting is necessary for applications with a background.



Rejection of uncoated parts
Brightness differences can be reliably detected by a diffuse scanner.