Color, contrast and luminescence sensors

A broad spectrum

FT 25-C
RGB color sensor
from Page 263

- *Smallest RGB color sensor with high switching frequency of ≤ 10 kHz*
- Precise *detection of "non-colors", e. g. black, white and grey*
- *Small, precise light spot for the detection of smallest marks*
- *IO-Link*

FT 50 C –
white-light color sensor
from Page 267

- *Color detection with simplest teach-in*
- *Patented optical technology ensures reliable detection with fluctuating scanning distances*

FT 55-CM –
Full-spectrum color
sensor from Page 281

- *Stable processes thanks to intelligent color detection regardless of distance*
- *Economical solutions through up to twelve storable colors or jobs*
- *Dependable switching behaviour through reliable glare suppression (depending on model)*
- *IO-Link*

FT 25-W/-RGB
contrast sensor
from Page 253

- *Miniature contrast sensor – 15-times smaller than standard housing*
- *Detection of minimum contrast differences through multi-color RGB evaluation or white-light illumination*
- *Automatic selection of ideal transmission color after teach-in*
- *High positioning accuracy thanks to minimum response time (≤ 20 µs) and very precise light spot*
- *IO-Link*

5 operation principles for color detection

The attachment of color marks that are then evaluated with a color or contrast sensor is a proven method for identifying objects in industrial production. Even objects with differing shapes and surface properties can be very reliably detected in this way. SensoPart offers sensors with five different functional principles for color and contrast detection.

FT 25/50 C

SensoPart offers the FT 25/50 C color sensors for the "classic" color detection of objects and printed marks. The FT 25-RGB is well suited for the detection of one color in fast processes. The FT 50 C can not only differentiate between individual colors, but also user-defined color ranges. Thanks to its high level of color selectivity, this sensor is suitable for almost all industrial color detection tasks.

FT 55-CM

The high-end FT 55-CM color sensor offers impressive features, such as intuitive use, up to 12 colors and a long operating range of max. 150 mm. Suitable applications are in the plastics, pharmaceutical and automotive industries as well as in many other sectors.

FT 25-W/-RGB

The F 25 series also includes contrast sensors which, with their small and precise light spot, can differentiate between the slightest of contrast differences on objects or printed marks at high process speeds. The FT 25-RGB, with its multi-color RGB evaluation, can even automatically select the ideal transmission color (red, green or blue) for the contrast that is present.

FT 50 C-UV –
luminescence sensor
from Page 277

- *High flexibility through large scanning range*
- *Small, precise light spot for maximum positioning accuracy*
- *Robust reflection-resistant operation*

VISOR® Color
from Page 95

V10C-CO-S2-W12
- *Standard version for color detection with up to 8 inspection tasks and up to 32 evaluations*

>> *Page 101*

V20C-CO-A2-W12
- *Advanced version for color detection and object detection with up to 255 inspection tasks and up to 255 evaluations*

>> *Page 97*

made in Germany

FT 50 C-UV

Finally, the FT 50 C-UV luminescence sensor is a special product: this innovative sensor detects features that are invisible to the human eye by irradiating the target object with ultraviolet light. This sensor has a highly varied range of applications because luminophores are not only attached to labels, but can also be mixed with different materials (e.g. paint, chalk, glue and lubricants).

VISOR® Color

With the VISOR® Color you can exploit the color feature economically and thus open up numerous new application potentials. It is now just as possible to automate inspections previously carried out visually as it is to add the evaluation of the color feature to an existing process – because the VISOR® Color is not just a color sensor, but also offers a wide range of additional functions for object detection.

SENSOPART IN COLORS

- Five different sensor principles for a wide range of uses
- Precise detection of the finest color or grey value differences and non-colors
- Detection of self-illuminating colors and luminophores
- Numerous outputs and interfaces for simple integration in machine control systems
- Comfortable operation by means of teach-in or configuration software
- Maximum positioning accuracy, even at high process speeds
- Automatic transmission LED color selection; communication via light spot – simple, comprehensible, clearly defined

Color sensors

System description

Functional description

Color sensors operate according to the energetic reflection principle, whereby the partial spectra of red, green and blue are evaluated separately. Either the three colors are emitted sequentially and the quantity of light reflected from the target object is individually registered (FT 25-C), or the sensor emits white light that is first split into the RGB partial spectra in the receiver (FT 50 C). The RGB intensity values thus determined are compared with previously taught-in reference values. The switching output is activated if the color values are within the defined tolerance range.

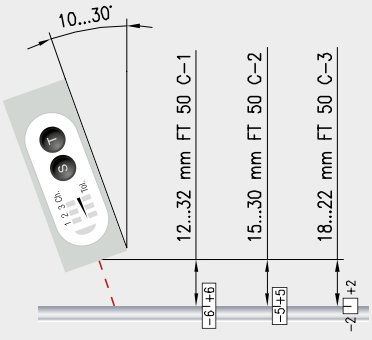
A special feature of the FT 25-C color sensor is teach-in with a "communicating" light spot: the quality of the color detection is signalled to users by the blinking of the light spots in the various colors.

The FT 50 C color sensor operates according to the passive three-range process with white-light LED and an optical "funnel" that we developed. This patented sensor concept allows very fine color selection – so that even minimal color differences can be detected – and an above-average depth of field that ensures the reliable function of the color sensor, even with fluctuating scanning distances.

High process speed

The FT 25-C miniature color sensor reliably switches with 10 kHz with the taught-in color (including black and white) and is particulary suitable for use in rapid processes, e.g. in labeling machines.

Depth of field

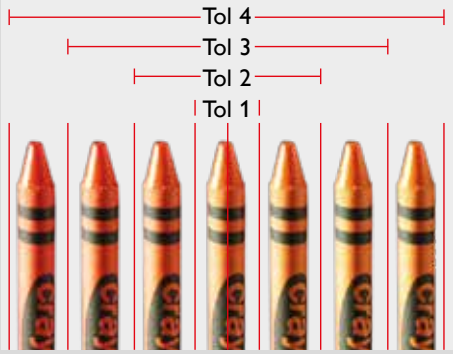


The depth of field of the FT 50 C also varies depending on the light spot geometry:
+/– 6 mm (with default setting)
+/– 5 mm (with default setting)
+/– 2 mm (with default setting)

Scan function

In the case of heterogeneously colored surfaces, the Scan function of the FT 50 C allows the scanning-in and storage of color gradients. The colors within the scanned color range are then detected.

Tolerance ranges

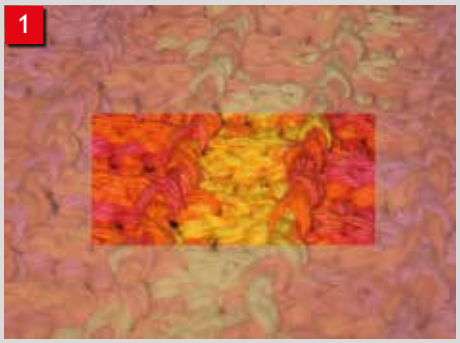


The detection window can be adapted by adjusting color selectivity.

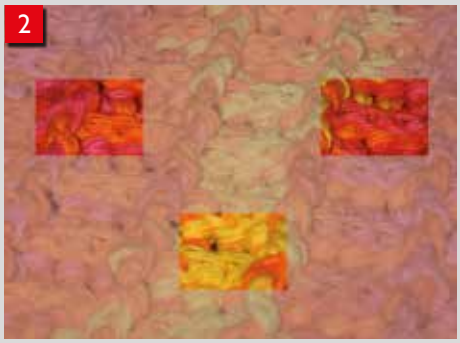
Versatile color settings

The FT 50 C color sensor offers very comprehensive opportunities for teaching-in and administrating colors. Additional reference colors can be taught-in, or the color range expanded, in up to four steps. In practice, this function proves helpful when, for example, labels with fluctuating print quality require reliable detection. Larger color ranges, as well as heterogeneously colored surfaces or color gradients, can be detected using the "ColorScan" function (see Figs. 1 and 2 below). In this case, high color selectivity can be achieved with the "Scanplus" function so that the sensor reliably detects incorrect or missing colors.

1



2



ColorScan (FT 50 C)

Heterogeneously colored surfaces can be taught-in (scanned in) with the help of the integrated Scan or Scanplus functions. If a larger color range is scanned-in and assigned to a single channel, the sensor switches with all colors that lie within this color spectrum (Fig. 1). An improved selectivity is achieved with the Scanplus function, with which this range can be split into several parts (Fig. 2).

Contrast sensors

System description

Functional description

Contrast sensors operate on the energetic reflection principle and detect grey value differences on matt, glossy or transparent objects and surfaces.

Switching frequency

As a result of the high switching frequency (25 kHz) of the FT 25-W and FT 25-RGB contrast sensors, the front edges of printed marks are very precisely detected, achieving maximum position accuracy. This also ensures reliable sensor switching behaviour even at very high process speeds.

White-light contrast sensors

The FT 25-W contrast sensor uses white light and has a very small and precise rectangular light spot (1 × 4 mm^2). This also allows the detection of very small printed marks and colored objects with weak contrast differences. The sensor can be parameterised during running operation and, during the teach-in process, automatically adapts the switching threshold to the object color and background.

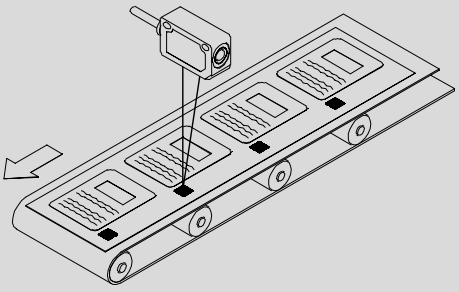
Laser contrast sensors

These sensors operate with red laser light (Laser Class 1) and also have a very small light spot (Ø 0.7 mm in focus). This permits even very small printed marks of differing colors to be read at longer distances. During the teach-in process, the sensor automatically adapts the switching threshold to the mark color and background.

RGB contrast sensors

The FT 25-RGB contrast sensor has three different transmission LEDs (red, green and blue). During teach-in, the sensor evaluates the taught-in contrast and then automatically selects the ideal transmission color (red, green or blue) for the contrast present. As a result, even extremely low contrast differences can be reliable detected.

Application example



Detection of printed marks
The contrast difference between the printed marks and the unprinted paper is evaluated here.

Functional description

The detection process is based on the luminescence of certain materials, called luminophores. The sensor transmits invisible UV light at a wavelength of 375 nm. This excites the luminophores contained in the object so that they emit light in the visible range of the electromagnetic spectrum. The sensor energetically evaluates these precisely taught-in, material-specific frequencies and compares them with the taught-in value.

Luminophores can be attached to labels or mixed with a variety of materials (e.g. paints, chalk, glue and lubricants) for detection purposes. Thus, for example, paper contains optical brighteners that are excited by the UV light and reflect light (mostly blue) to the sensor.

Applications

Examples of applications include the detection of labels on glass bottles, invisible printed marks for object alignment, and the presence of oils to which luminescent materials have been added. Fluorescent chalks, paints and dyes; text markers; glues; sealants; lubricants; and optical brighteners in paper, textiles and plastics are examples of luminescent materials.

Universal
- One variant for all types of luminescence (red, blue, etc.)
- Competitors require several variants for this, because they need supplementary filters!

RGB-3 range reception system
- Reliable detection even with low quantity of luminophores in the object
- Extremely reliable detection thanks to high signal reserves
- Immune to reflections (e.g. on glass or glossy metals)
- Differentiation between different luminophores

Very good depth of field
- Detection at varying object distances, even with fluttering objects such as paper
- No fine adjustment necessary, e.g. with batch changes

Small, precise light spot
- Accurate detection of the smallest of invisible printed marks

Easy teach-in
(on device or comfortably via external connection)
- Single channel: ready-to-run