# Colour sensors

## System description

### Functional description

Colour sensors operate according to the energetic reflection principle, whereby the partial spectra of red, green and blue are evaluated separately. Either the three colours 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 colour values are within the defined tolerance range.

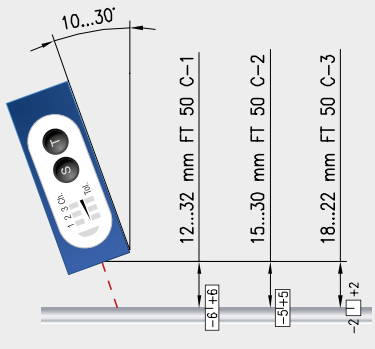
A special feature of the FT 25-C colour sensor is teach-in with a "communicating" light spot: the quality of the colour detection is signalled to users by the blinking of the light spots in the various colours.

The FT 50 C colour 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 colour selection – so that even minimal colour differences can be detected – and an above-average depth of field that ensures the reliable function of the colour sensor, even with fluctuating scanning distances.

### High process speed

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

### Depth of field

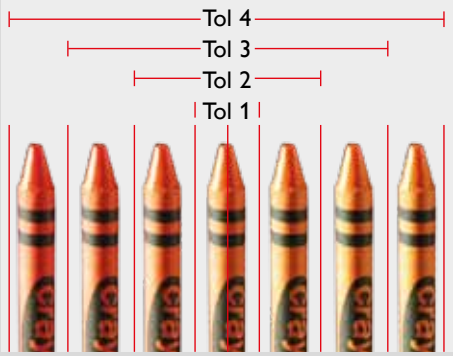



The depth of field of the FT 50 C also varies depending on the light spot geometry:
+/– 6 mm (with default setting)
+/– 5 mm (with default setting)
+/– 2 mm (with default setting)

### Scan function

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

### Tolerance ranges



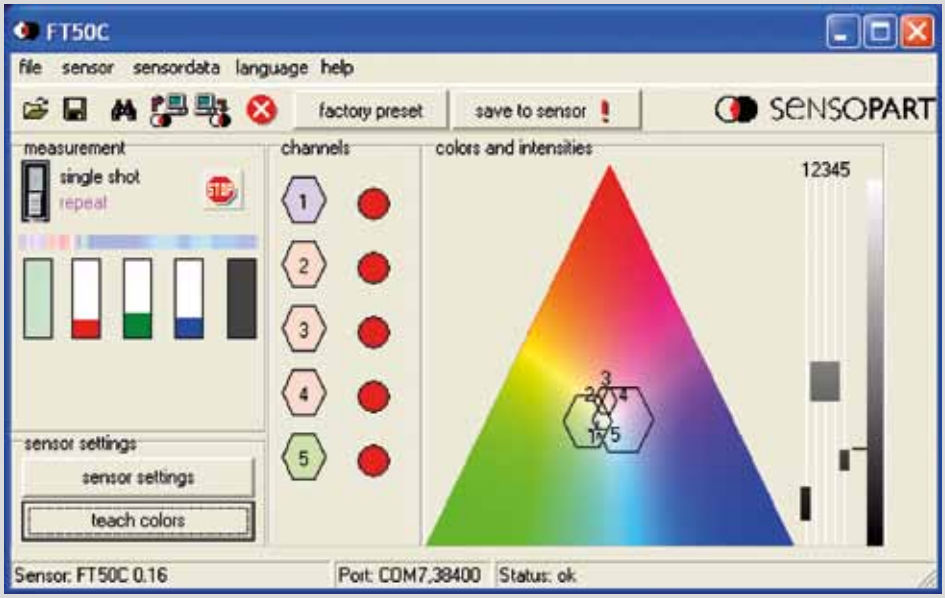

The detection window can be adapted by adjusting colour selectivity.

### Versatile colour settings

The FT 50 C colour sensor offers very comprehensive opportunities for teaching-in and administrating colours. Additional reference colours can be taught-in, or the colour 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 colour ranges, as well as heterogeneously coloured surfaces or colour gradients, can be detected using the "ColourScan" function (see Figs. 1 and 2 below). In this case, high colour selectivity can be achieved with the "Scanplus" function so that the sensor reliably detects incorrect or missing colours.

As many colours as desired can be taught-in via the interface and stored in the machine controller – and called up again in the form of colour vectors (data string with a target value incl. tolerance).

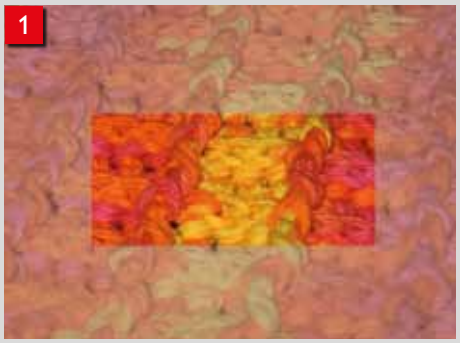


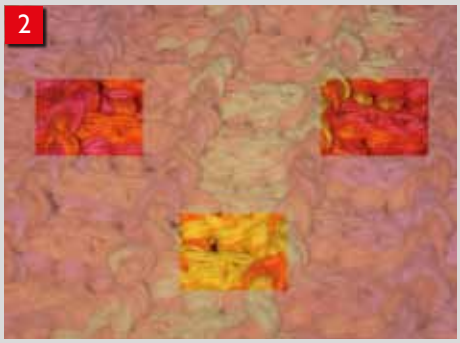



### PC-based software (FT 50 C)

The serial interface and PC software also allow the entire bandwidth of the sensor's functions to be controlled from the PC. Thus settings can be made interactively and the sensors easily adapted to the particular application. Colour patterns can also be stored after teach-in and, when necessary, reloaded. No renewed teach-in is necessary.

The current version of the software can be obtained at **www.sensopart.com**




### ColourScan (FT 50 C)

Heterogeneously coloured surfaces can be taught-in (scanned in) with the help of the integrated Scan or Scanplus functions. If a larger colour range is scanned-in and assigned to a single channel, the sensor switches with all colours that lie within this colour 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 coloured 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 colour and background.

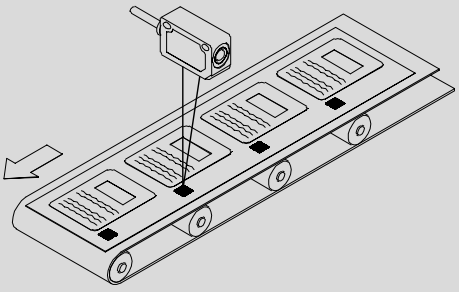
### Laser contrast sensors

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 colours to be read at longer distances. During the teach-in process, the sensor automatically adapts the switching threshold to the mark colour 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 colour (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 amounts 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