



# Colour, contrast & mark detection



# Colour, contrast and mark detection with **SensoPart**

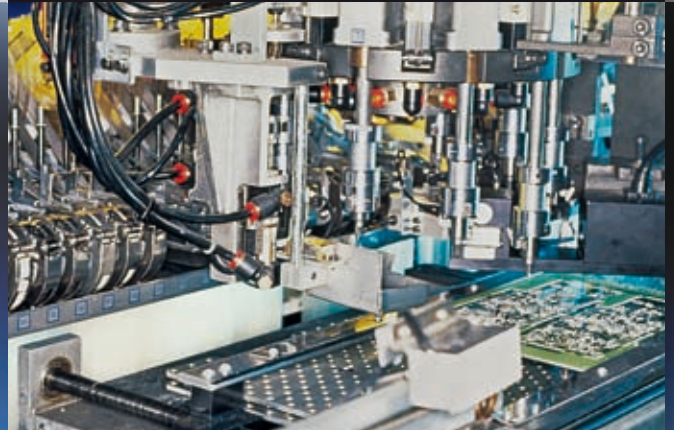
If products are to be automatically detected or sorted in an industrial process, object colours or coloured markings can be detected using SensoPart contrast or colour sensors.

Our products have repeatedly set new standards in this field: The prize-winning FT 50 C (our compact white light colour sensor) and the FA 45 vision sensor for reliable detection of active LED lights.

Assembly/Handling



Electrical manufacturing



Packaging industry



Food industry



Printing industry



Pharmaceutical industry



# CONTRAST SENSOR

Contrast sensors operate according to the principle of energetic reflection and detect differences in grey scale values on mat, glossy or transparent objects and surfaces.



- ❖ Scanning range 40 to 150 mm
- ❖ Detection of small printing marks
- ❖ Laser red light
- ❖ Miniature sensor series
- ❖ Teach-in
- ❖ N.O./N.C. reversible output
- ❖ High switching frequency (4 kHz)

## FT 20 RL

These sensors function with a red light laser light source and have a very small light spot. This makes it possible to detect very small, different coloured printing marks even at greater distances.

The sensor adapts the switching threshold automatically to the marking colour and background during the teach-in process.



- ❖ Reliable printing mark detection
- ❖ High switching frequency (10 kHz)
- ❖ Automatic selection of transmitted light (red/green)
- ❖ Antivalent signal outputs
- ❖ Replaceable lens: beam direction and scanning range (9mm or 18 mm) thus freely adjustable
- ❖ Timer functions
- ❖ External teach-in function (cable version)
- ❖ NPN-/PNP reversible output

The high speed and precision of these sensors make them ideal for detecting printing marks in the printing or packaging industry.

The widest variety of products with markings can thus be detected, sorted and controlled.



### Interchangeable lens

The beam direction can be rotated by 90° thanks to an interchangeable lens (focal distance 9 or 18 mm).



### Rotatable connector

The connector can be easily rotated to facilitate assembly.

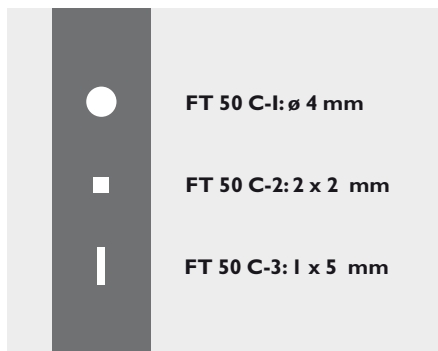
# COLOUR SENSOR FT 50 C

The winner of the Baden-Württemberg Prize for Innovation excels due to its compactness and excellent colour selectivity.



All-purpose, compact device for on-line colour detection in industrial sequences and processes.

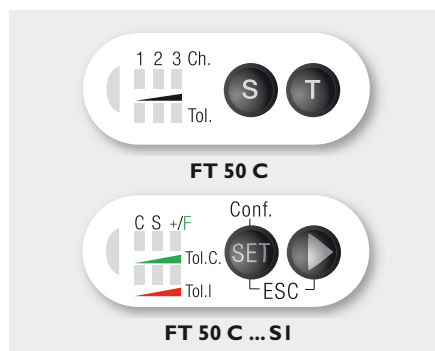
- ❖ Teach-in of single colours or scanning of colour ranges
- ❖ Storage of reference colours in teach-in mode, either by pressing a key on the sensor or via an external input cable
- ❖ High colour selectivity, insensitive to fluctuating scanning distances
- ❖ Colour selectivity can be adjusted separately for each colour
- ❖ Three different sized light spots available
- ❖ FT 50 C standard: 3 separate colour channels and signal outputs for separation of objects.



## Light spots

In order to cover as many application possibilities as possible, the FT 50 C is available with three different sized light spots:

- Ø 4 mm (at scanning distance 22 mm)
- 2 x 2 mm (at scanning distance 22 mm)
- 1 x 5 mm (at scanning distance 22 mm)



## Keypad

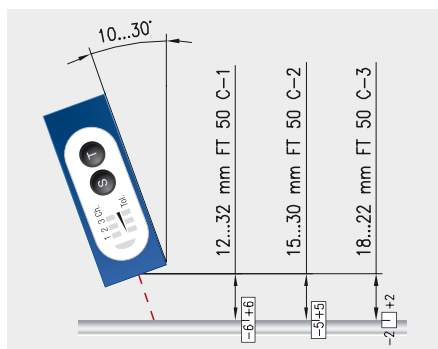
All the sensor settings can be carried out using 2 keys.

7 LEDs provide a visual aid during teach-in and provide information on the signal status of the outputs.



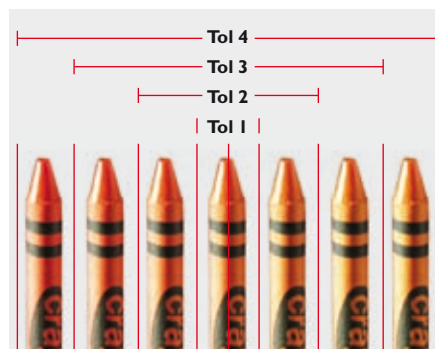
## Scan function

With inhomogeneous colour surfaces, colour sequences can be scanned and stored using the scan function. Colours within the scanned colour spectrum are subsequently detected.



## Depth of focus

The depth of focus alters according to the size of the light spot:  
 +/- 6 mm (factory setting)  
 +/- 5 mm (factory setting)  
 +/- 2 mm (factory setting)



## Tolerance ranges

The detection window can be adjusted by setting the colour selectivity.

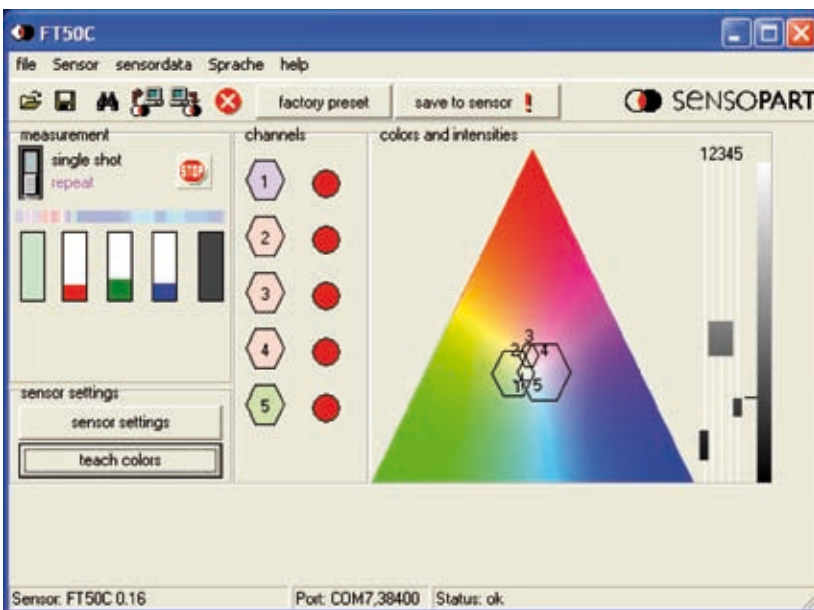
# COLOUR SENSOR FT 50 C ... SI WITH SERIAL INTERFACE

The FT 50 C ... SI barely differs from the standard model in appearance, but has an integrated RS485 interface and other additional functions.



- ❖ **With switching output, control input and bus-compatible RS485 interface**
- ❖ **Interface enables transmission of colour channel or colour value as well as reading, modification and storage of sensor parameters**
- ❖ **Reference colours can be added or the colour range extended in up to 4 steps**
- ❖ **Colour and grey selectivity can be adjusted separately for every colour**

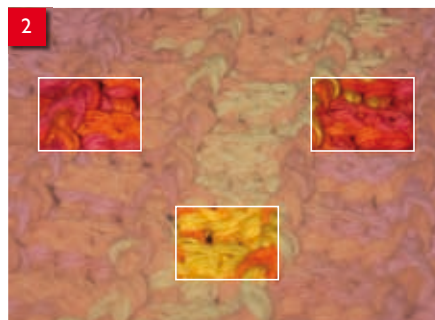
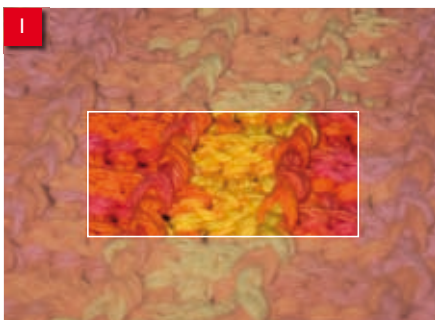
Any number of colours can be taught in via the interface and stored in the control system in the form of colour vectors (data string with reference value incl. tolerances) and recalled later.



## PC-based software

A combination of serial interface and PC software also makes it possible to control the entire scope of sensor functions from the PC. Interactive settings are possible and sensors can be easily adjusted to the respective application. Colour samples can also be stored after teach-in and reloaded again when required. Renewed teach-in is not necessary.

The latest software version can be found on the Internet under [www.sensopart.com](http://www.sensopart.com).



## Colour scan

Inhomogeneous colour surfaces can be taught-in (scanned) with the aid of the integrated scan or scanplus function.

If a large colour range is scanned and allocated to a single channel, the sensor switches at every colour in the created colour spectrum (figure 1).

Improved selectivity is achieved with the scanplus function which can split this range into several parts (figure 2).

## VISION SENSOR FA 45 COLOR

The FA 45 vision sensor offers highly selective colour detection by using camera technology in a heavy-duty housing with user-friendly, intuitively operated set-up software. Sensor, lighting, evaluation and result output form one compact unit.



Full size Vision Sensor FA 45 COLOR

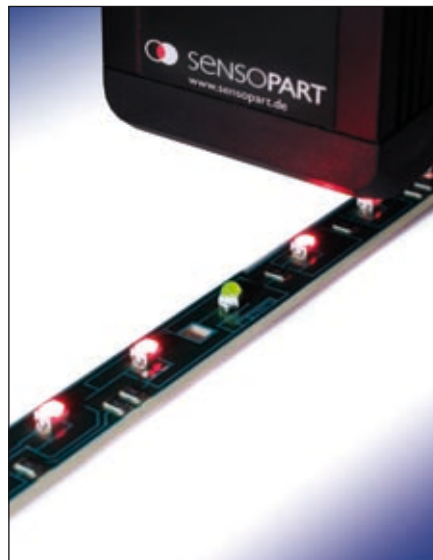
### General applications:

❖ **Position-independent detection of colours in a surface area**



Presence check using colour detection:  
"Is the O ring seal present?"  
"Does the O ring seal fit perfectly?"  
The questions and applications can be diverse – the answer is simple and reliable:  
FA 45 COLOR.

❖ **Detection of active luminous objects**



Detection of active, luminous objects such as LEDs or displays are no problem for the FA 45 colour sensor. It checks whether the LED is on and checks its colour.

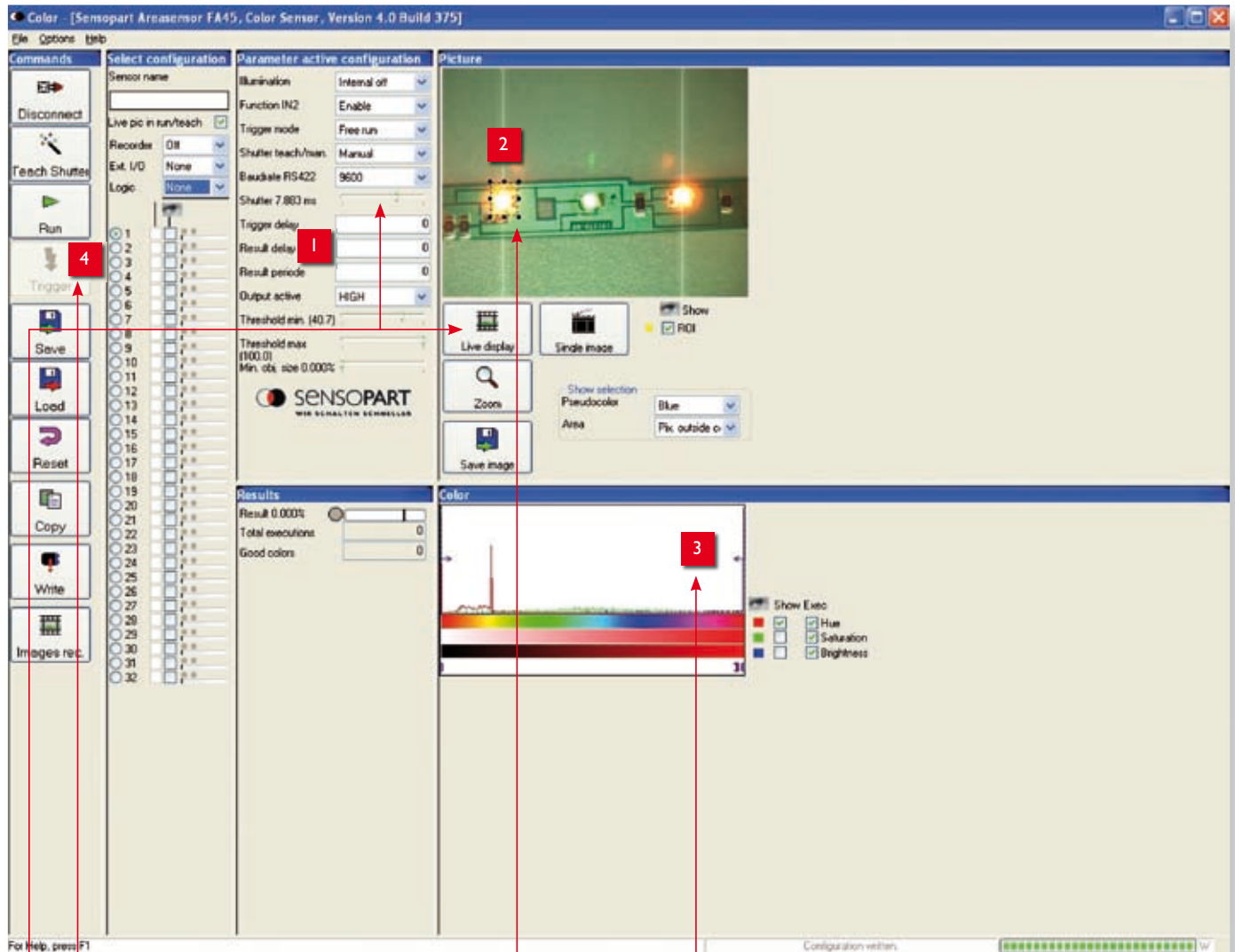
❖ **High selectivity: Also detects "non-colours" such as white, grey, black**



"Is the right cable in the allocated place on the connector?" The FA 45 identifies, sorts and inspects up to 32 taught colours – even "non-colours" such as grey, white, black.

# VISION SENSOR FA 45 COLOR SOFTWARE APPLICATION

The FA 45 is not only the cheapest alternative to complex image processing systems, it also guarantees a fast return on investment due to full use of previously economically-unexploitable optimisation potential.



## Step 1: Live display

Improvement of picture using a live display. Adjustment of brightness (shutter = slider in interface) and focus (focus = set screw on back of sensor).  
Aim: a sharp and high-contrast picture.

## Step 2: Selecting operating zone

The zone in which the coloured object to be detected should be situated, also allowing for deviations in position which can occur in operating mode.

## Step 3: Colour setting

Set required colour in histogram. The "visualised" colour value can be read from the progression of the curve. The limits of the required colour range are set graphically using two sliders. (Saturation and brightness can also be indicated for more precise characterisation).

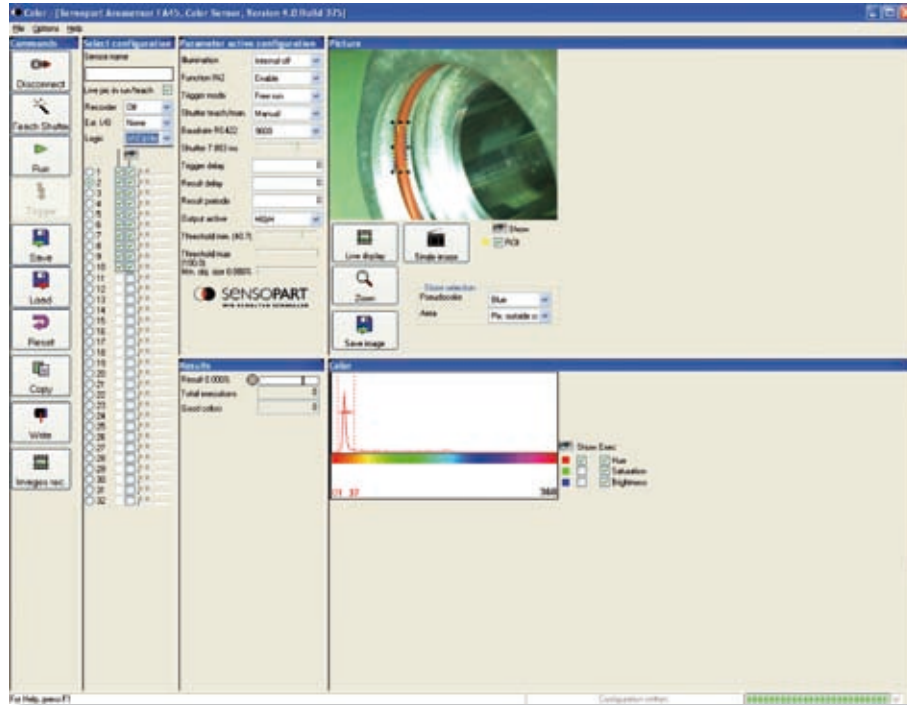
## Step 4: Configuration test

Adjustment of switching threshold and checking through change-over in run mode

**Plug and play.**

# VISION SENSOR FA 45 COLOR APPLICATION EXAMPLES

## Position-independent detection of colours in a surface area: Detection of a sealing ring

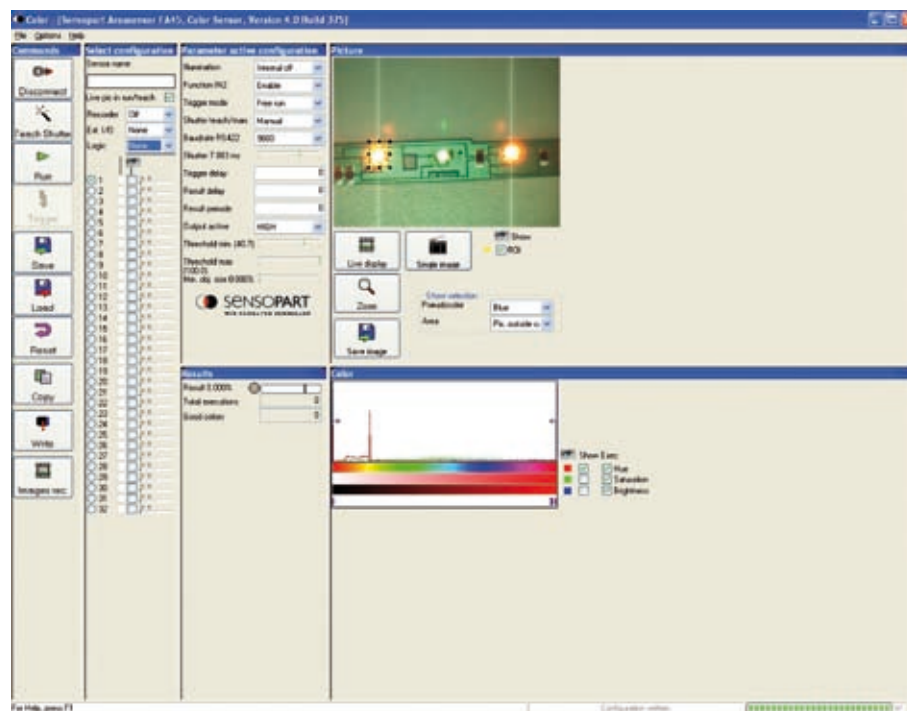


In an automated assembly process, the presence of a sealing ring (O-ring) in a cast part is to be checked.

Whilst it is necessary to reliably check whether the O-ring is sitting in the intended groove, the position of the part can strongly fluctuate vertically. For this reason a slim, vertical rectangle is selected as the shape and position of the inspection zone (yellow frame). If the O-ring is not in the groove, it will be to the left or right, outside the inspection zone. If the part is vertically offset, the O-ring will still always be within the inspection zone.

The required colour only has to constitute a fraction of the inspection zone.

## Detection of active, luminous objects: Checking that active LEDs are the correct colour



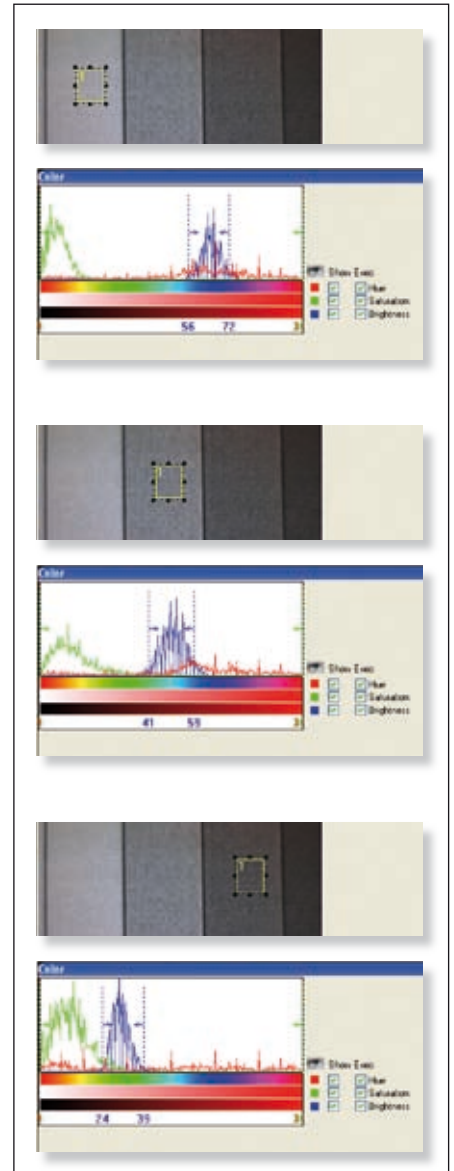
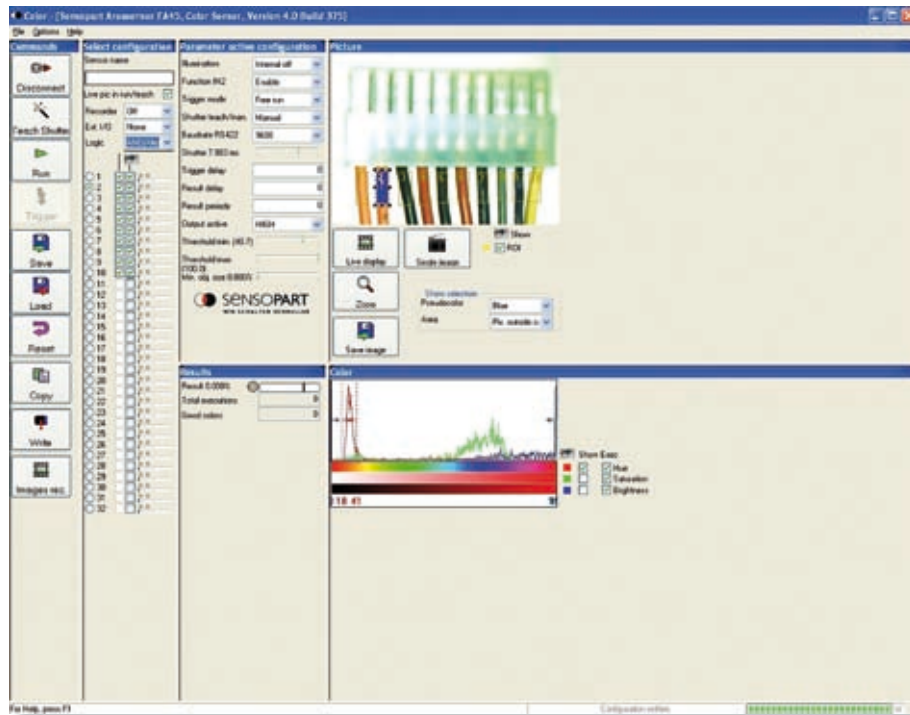
Colour shade can be used to determine whether a LED has been fitted in the right place in the right colour. Brightness determines whether a LED is on or not.



# VISION SENSOR FA 45 COLOR APPLICATION EXAMPLES

Detection of “non-colours“ such as white, grey, black:

## Detection of conductor colours



Evaluating coloured objects in the HSV colour model (colour value, saturation and brightness) achieves a high selectivity.

The colour value itself is, with true colours, largely independent of brightness and saturation fluctuations. Characterisation using these three parameters also enables a reliable distinction of so-called non-colours such as white, black and various shades of grey.



The Vision Sensor FA 45 is also available as an object detection sensor and as a 2D code reader.

More information can be found in our brochure “Vision Sensor FA 45“ or under [www.sensopart.com](http://www.sensopart.com)

### Object detection



### Code reader



## FIBRE OPTIC SENSORS FOR COLOUR DETECTION

Thanks to the compact dimensions of the fibre-optic head, colours can be detected everywhere where tight installation conditions hinder use of sensors.



FL 64 C

- ❖ One colour channel and switching output
- ❖ Settings per teach-in
- ❖ Three separate light sources red LED 660 nm, green LED 525 nm and blue LED 470 nm
- ❖ Switching frequency 550 Hz
- ❖ Operating range 5 to 10 mm
- ❖ Connectable pulse lengthening
- ❖ Control input for programming

### FL 64 C for colour detection

The FL 64 C is a fibre optic colour sensor for detection of a colour in very cramped spaces. It is attached with screws or by snapping on to a DIN rail.



### Beam path

The mixture of the three primary colours, red, green and blue creates white light in the focus range which is reflected by the object and returned to the sensor via the receiving fibre-optic.

## FIBRE OPTIC SENSORS FOR CONTRAST DETECTION



FL 70

- ❖ High user comfort with teach-in
- ❖ Also has display and intelligent additional functions
- ❖ High switching frequency
- ❖ No mutual interference thanks to automatic communication
- ❖ Assembly on DIN rails
- ❖ Robust – IP 64 protection standard
- ❖ First rate price/performance ratio
- ❖ Reversible operating mode (standard, fine, high)

### FL 70 for contrast detection

Fibre optics with a focussed light beam are particularly suitable for contrast detection. The switching threshold is easily taught via teach-in.

The version with analogue output enables output of an analogue value (0 to 10V).



### Large choice of fibre optics

# ACCESSORIES

A reliable mode of function is not guaranteed by the sensor alone. The peripheral accessories used for installation, set-up and user support are also of significant importance.

## Fixtures



for F 20  
Robust fixing bracket to protect the sensor



for F 50  
Standard fixing bracket for universal assembly and fast adjustment



for F 50  
Robust fixing bracket to protect the sensor



for FA 45  
Stand for flexible installation and alignment of the FA 45 vision sensor; swivels in every direction, quick and easy to clamp

## External lighting for FA 45



Surface lights for all FA 45 models. A series of several surface lights can be activated in a row to enable flexible and economic lighting of components. Also suitable for use as dark field light.



Ring-shaped front light for all FA 45 models with an excellent cost/performance ratio. Provides uniform lighting of objects.



Surface light/backlight for all FA 45 models. Background lighting for better contrast display of the external profile of components.



Ring light for all FA 45 models for front lighting. Highlights edges on strongly contoured components as a dark field light.

## Cables



Cables such as connection cables (power and I/O), Ethernet cables, RS422 cables and lighting cables for all FA 45 models with M12 standard connectors, drag-chain compatible.

## C mount lenses



C mount lenses for all FA 45 C mount models with different focal widths for flexible component display in different reproduction scales. These are heavy-duty industrial lenses; an IP 65 outer casing is available.

## Switch modules and interface modules



Switch module and interface module for all FA 45 sensors for I/O extension with up to eight additional inputs and up to 32 additional outputs. Connection to vision sensor via RS422.



Demonstration and text box for all FA 45 models. Enables test mode with simulation of inputs (trigger or similar) and display of outputs as well as power supply of vision sensor. All I/Os are through-wired, so parallel operation with control system possible.

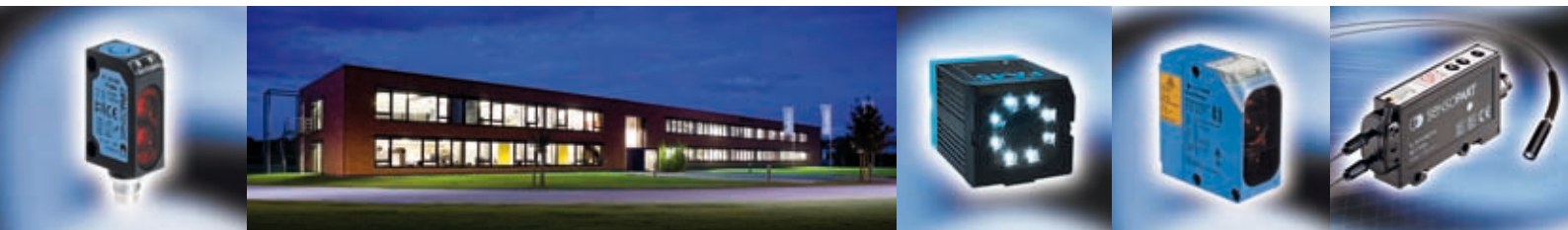


Profibus adapter for FA 45 and FT 50 C ... S1 for connection of sensor to a Profibus. Other interface converters are available (e.g. RS485 to RS232).

## From our product range

- » Anti-collision sensors
- » Capacitive sensors
- » Colour sensors
- » Contrast sensors
- » Distance sensors
- » Fibre optics
- » Inductive sensors
- » Laser sensors
- » Line cameras
- » Miniature sensors
- » Optical windows
- » Proximity switches
- » Retroreflective sensors
- » SmartPlug
- » Slot sensors
- » Through-beam sensors
- » Ultrasonic sensors
- » Vision sensors

**Our concept: Speed combined with innovation, quality and customer awareness**



Since the day we were founded, our investments in research and development have been way above average for this branch, and have laid the foundation for customer satisfaction and continuous growth. Today SensoPart is one of the leading suppliers of industrial sensors – including **distance sensors, vision sensors, laser sensors and colour sensors.** Recognition by independent experts is prominent evidence of our work. Indeed SensoPart has received numerous distinctions and prizes over the past years. We have been rewarded for the clear goal behind of our innovations – achieving customer satisfaction with convincing performance data and clever ideas.

- » Dr Rudolph-Eberle Prize for Innovation 2001
- » Baden Württemberg Sponsorship award for Young Companies 2002
- » German Sensor Application Prize 2003
- » German Sensor Application Prize 2004
- » Dr Rudolph-Eberle Prize for Innovation 2006



SensoPart  
Industriesensorik GmbH  
Nägelseestraße 16  
D-79288 Gottenheim  
Tel. +49 (0) 7665 94769-0  
Fax +49 (0) 7665 94769-765  
www.sensopart.de

SensoPart France SARL  
11, rue Albert Einstein  
Espace Mercure  
F-77420 Champs - Marne la Vallée  
Tél. +33 (0) 1 64 73 00 61  
Fax +33 (0) 1 64 73 10 87  
www.sensopart.fr

SensoPart UK Limited  
G8 The Arch  
48 - 52 Floodgate Street  
Birmingham B5-5SL  
Tel. +44 (0) 121 772 51 04  
Fax +44 (0) 121 772 51 26  
www.sensopart.com

SensoPart Inc.  
1531 E. Highwood Ave  
Pontiac, Michigan 48340 USA  
Tel. +(1) 866 282 - 7610  
Fax +(1) 248 292 - 0239  
www.sensopart.com