Colour, contrast and luminescence sensors

A broad spectrum

SENSOPART

FA 45 – colour sensor

from Page 162

FA 45-300-WCCC-C00012HS4

- *Offers high detection accuracy even with very slight colour nuances*
- *Detection of "non-colours"*

>> Page 164

FT 50 C – white-light colour sensor

from Page 168

- *Colour detection with simplest teach-in*
- *Patented optical technology ensures reliable detection with fluctuating scanning distances*
- *Parameterisation and online colour information via RS485*

FT 25 – contrast sensor

from Page 178

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

FT 50 C-UV – luminescence sensor

from Page 188

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

made in Germany

The attachment of colour marks that are then evaluated with a colour 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 four different functional principles for colour and contrast detection.

The colour sensors of the FA 45 series are particularly versatile: they are application-specific, pre-configured vision sensors that differentiate between even the finest of colour nuances with great precision and reproducibility, and are also capable of detecting the colours of self-illuminating objects such as LEDs or displays. SensoPart offers the FT 50 C colour sensor for the "classic" colour detection of objects and printed marks. It not only differentiates between individual colours, but also user-defined colour ranges. Thanks to its high level of colour selectivity, this sensor is suitable for almost all industrial colour detection tasks.

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-colour RGB evaluation, can even automatically select the ideal transmission colour (red, green or blue) for the contrast that is present.

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. If the object contains luminophorous substances it reflects light within a particular spectrum that can be evaluated by the luminescence sensor. 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).

Whichever sensor principle is best suited for a particular use: the reliable function and simple operation of colour, contrast and luminescence sensors from SensoPart are always convincing.

TYPICAL SENSOPART

- Four different sensor principles for a wide range of uses
- Precise detection of the finest colour or grey value differences
- Detection of self-illuminating colours (FA 45)
- Detection of luminophores (FT 50 C-UV)
- Comfortable operation by means of teach-in or configuration software (FA 45)
- Numerous outputs and interfaces for simple integration in machine control systems
- Maximum positioning accuracy, even at high process speeds
- Automatic transmission LED colour selection
- Communication via light spot (simple, comprehensible, clearly defined)

Colour, contrast and mark detection

Colours and grey values are important features for the detection and differentiation of objects in production processes. Whether colour marks in quality assurance; coloured imprints and labels; LEDs or display elements; the occupancy of cable harnesses; or the level of browning of baked goods – industry is much more colourful than is generally assumed.

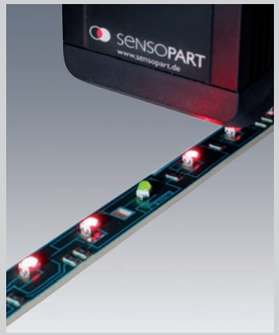
Whereby there's colour and colour: it is necessary to distinguish between passive and active (self-illuminating) colours, grey values, and ultraviolet marks that are invisible to the human eye. There are special sensor solutions for each of these applications:

- Colour sensors for the direct selection of objects according to (passive) colours
- Vision sensors for detecting passive and active colours and grey values
- Contrast sensors for detecting grey values
- Luminescence sensors for detecting UV marks (luminophores)

Vision colour sensors

Conventional colour sensors are limited to the detection of passive colours, i.e. object colours or colour marks – they cannot work with self-illuminating objects or even the "non-colours" white, grey and black.

SensoPart's Vision colour sensor knows no such restrictions – it not only "sees" objects of any shape and colour, but also provides additional information on colour intensity as well as on the position of the target object. It can also represent an alternative to conventional contrast scanners for determining grey values and contrast differences when additional object features require simultaneous evaluation.

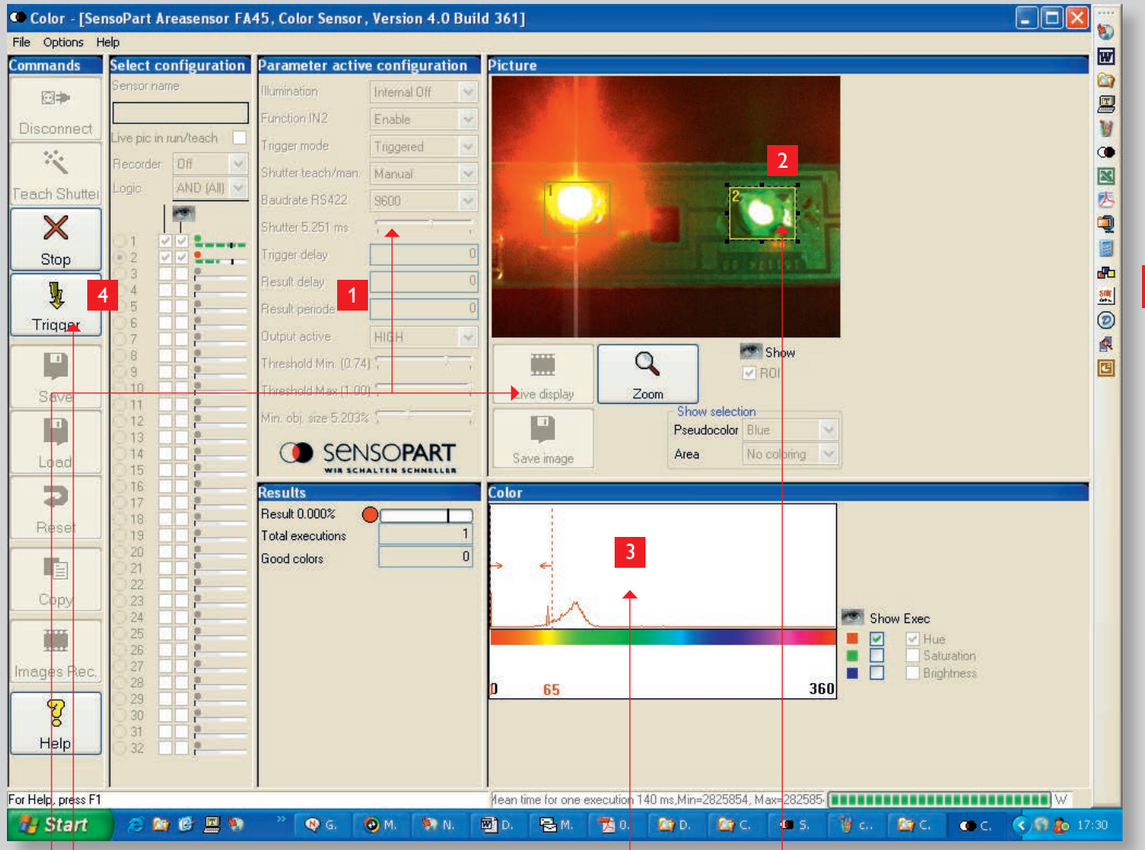


How it lights up:
Conventional colour sensors cannot detect active colours. Only the Vision colour sensor can find out whether the third LED in the fifth row really lights up green and not red, say, and whether the colour intensity meets the specification.

Is the O-ring present?
Is it perfectly fitted in the correct position? The Vision colour sensor monitors presence and position via the evaluation of colour features.

Correct assignment?
Is the right wire in the proper place in the connector? The Vision colour sensor identifies, sorts and monitors the taught-in colours, also detecting colourless wires.

Easy parameterisation of colour detection on the PC interface – in four steps:



Step 1: live picture
Optimisation of image capture on the basis of the live picture. Setting of image brightness (shutter = slider in the window) and focus (focus = adjusting screw on back of sensor). Goal: a sharp and high-contrast picture.

Step 2: selection of the operation range
The range within which the coloured target object should be located, also taking into account any position deviations during subsequent operation.

Step 3: colour setting
Set the target colour in the histogram. The "seen" colour value can be read out from the curve shape. The limits of the desired colour range are set graphically with two sliders. (Saturation and brightness can also be defined for more precise characterisation.)

Step 4: configuration test
Setting of threshold and practical test by switching to Run Mode.

Plug & Play.

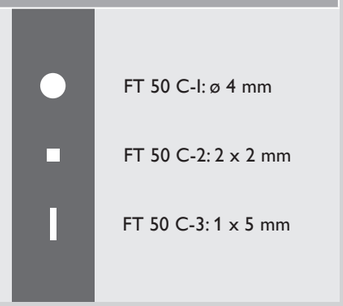
One-off setup for "colour detection" with intuitive programming **using the software provided**. Following parameterisation, the vision sensor operates autonomously in the production plant without a PC. So, for example, the diverting out of defective parts during production is controlled via the switching output on the back of the vision sensor.

Functional description

The sensor emits white light. The colour signal received is internally split according to the partial spectra red, green and blue, whose particular intensity is determined and compared with the previously taught-in colour value.

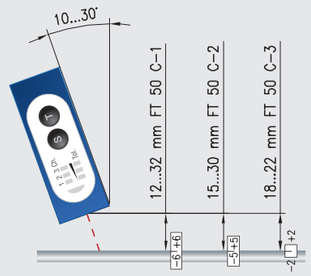
SensoPart's FT 50 C colour sensor operates according to the passive three-range process with white-light LED and an optical "funnel" that we developed. This patented sensor concept allows very fine colour selection so that even minimal colour differences can be detected. The above-average depth of field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

Light spots



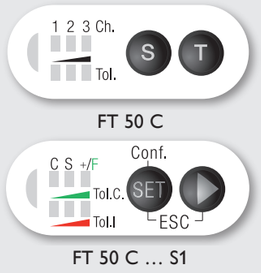
In order to cover as many potential areas of use as possible, the FT 50 C is available with three differing light spot geometries:
Ø 4 mm (scanning distance: 22 mm)
2 x 2 mm (scanning distance: 22 mm)
1 x 5 mm (scanning distance: 22 mm)

Depth of field



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

Control panel

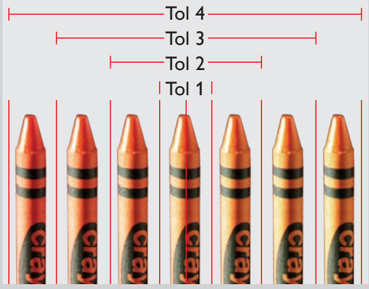


All settings can be carried out on the sensor with two buttons. 7 LEDs support teach-in and provide information on the switching state of the outputs. Clear feedback from the LEDs makes the teach-in process easy and comfortable.

Scanning function

In the case of heterogeneously coloured surfaces, colour gradients can also be scanned-in and stored with the help of the Scan function. The colours within the scanned colour range are then detected.

Tolerance ranges

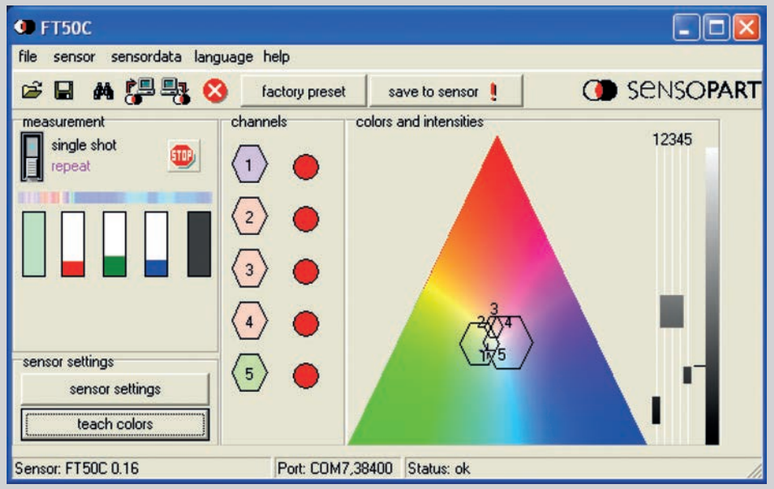


The detection window can be adapted by adjusting colour selectivity.

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.

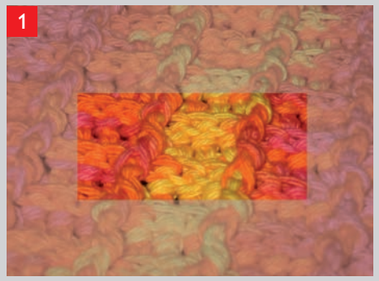
As many colours as desired can be taught in via the interface and stored in the machine controller – and called up again in the form of colour vectors (data string with a target value incl. tolerance).

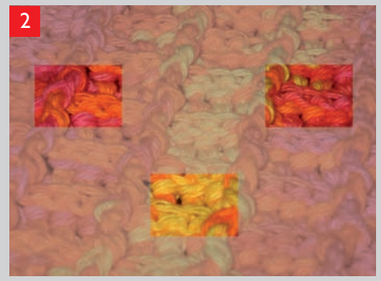


The current version of the software can be obtained at **www.sensopart.com**

PC-based software

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.





ColourScan

Heterogeneously coloured surfaces can be taught-in (scanned-in) with the help of the integrated Scan or Scanplus function. 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.

White-light contrast sensors

The FT 25-W contrast sensor uses white light and has a very small and precise rectangular light spot (1 x 4 mm²). 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.

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.

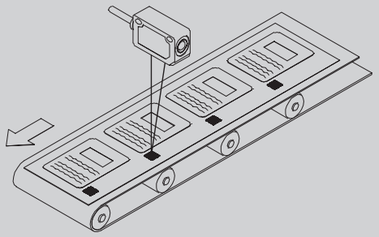
Switching frequency

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.

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.

Application example



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

Luminescence sensors

System description

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

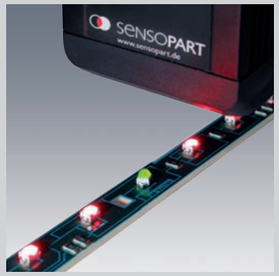
Very good depth of field
- Detection at varying object distances, even with fluttering objects such as paper
- No fine adjustment necessary, e.g. with batch changes

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

The FA 45 vision sensor for colour detection

The specialist for colours of all sorts



How it lights up:
Conventional colour sensors cannot detect active colours. Only the Vision colour sensor can find out whether the third LED in the fifth row really lights up green and not red, say, and whether the colour intensity meets the specification.

Is the O-ring present?
Is it perfectly fitted in the correct position? The Vision colour sensor monitors presence and position via the evaluation of colour features.

Correct assignment?
Is the right wire in the proper place in the connector? The Vision colour sensor identifies, sorts and monitors the taught-in colours, also detecting colourless wires.

VISION COLOUR SENSOR HIGHLIGHTS

- Powerful detection of colours and colour intensity
- Detection of active (i.e. self-illuminating) components
- Detection of "non-colours" (white, grey, black)
- Simple setup with user-friendly configuration software
- High detection accuracy even with very slight colour nuances

Colour is an important feature for the detection and differentiation of objects in production processes. Whether colour marks in quality assurance; coloured imprints and labels; LEDs or display elements; the occupancy of cable harnesses; or the level of browning of baked goods – industry is much more colourful than is generally assumed. Whereby there's colour and colour...

Self-illuminating or non-colour? Conventional colour sensors have to give up when faced with, in particular, self-illuminating objects or the "non-colours" white, grey and black. The Vision colour sensor from SensoPart has no such restrictions – it not only "sees" objects of any shape and colour, but also provides additional information on colour intensity and the position of the target object. It's perfectly clear: where conventional sensors can only see grey on grey, the Vision colour sensor from SensoPart is really colourful!

Applications
- Monitoring presence and positions
- Identifying and sorting products
- Monitoring cable assignment (wire colours)
- Inspecting LEDs, LC displays and monitors
- Quality assurance

Sectors
- Automotive and the supplier industries
- Electronics production
- Food industry
- Pharmaceutical and cosmetics industries
- Packaging industry and logistics

FA 45 Colour Sensor – Product Overview			
	Focal length	Integrated illumination	Page
FA 45-300-WCCC-COO6HS4	6	White LEDs	162
FA 45-300-WCCC-COO12HS4	12	White LEDs	164
FA 45-300-CCC-COOCSHS4	C-mount	None	166

FA 45 colour sensor

Vision sensor for colour detection

PRODUCT HIGHLIGHTS

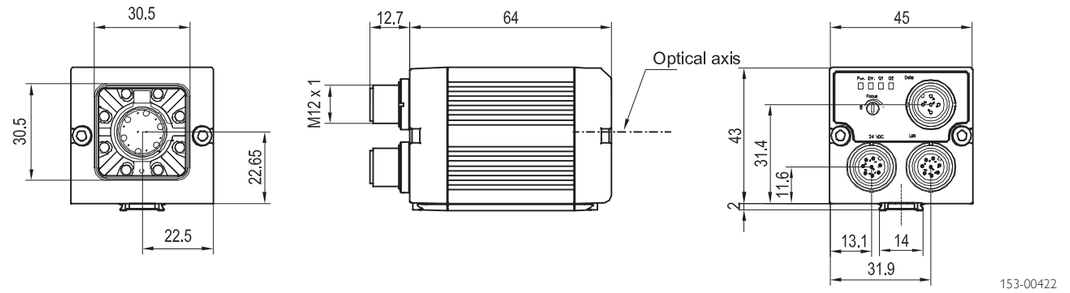
- Powerful detection of colours and colour intensity
- Detection of active (i.e. self-illuminating) components
- Detection of "non-colours" (white, grey, black)
- Simple setup with user-friendly configuration software
- High detection accuracy even with very slight colour nuances

Optical data		Functions	
Resolution	640 x 480 pixels	Number of configurations	32
CCD	1/4", colour	Functions	Colour
Integrated lens, focal length	6 mm or 12 mm, focal position adjustable	Properties	Area detection of colours and colour ranges
Adjustment range	20 mm to infinity	Typical cycle time	Typ. 80 ms
Integrated illumination	White LEDs		
Minimum field of view, X x Y	18 x 14 mm^2 (f = 6 mm), 8 x 6 mm^2 (f = 12 mm)		
Electrical data		**Mechanical data**	
Operating voltage, $+U_B$	18 … 30 V DC[1]	Dimensions	65 x 45 x 45 mm^3 (without plug)
Current consumption (without I/O)	≤ 200 mA	Enclosure rating	IP 67
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection of all outputs	Material, housing	Aluminium, plastic
		Material, front screen	Plastic
Readiness delay	Ca. 6 s after Power on	Ambient temperature: operation	0 … +50 °C[2]
Outputs	PNP (N.O.)	Ambient temperature: storage	-20 … +50 °C[2]
Max. output current (per output)	200 mA (max. 9.6 W)	Weight	Ca. 170 g
Inputs	High 10 … 24 V (+10 %), Low 0 … 3 V	Plug connection	Supply and I/O M12, 8-pin Ethernet M12, 8-pin Data M12, 5-pin
Input resistance	> 20 kOhm		
Interfaces, FA 45	Ethernet (LAN), RS422	Vibration and impact resistance	EN 60947-5-2
Inputs / outputs	2 inputs, 4 outputs		

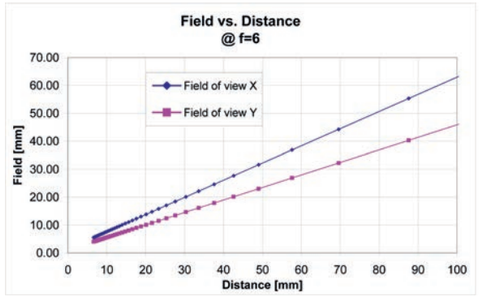
[1] Max. ripple < 5 V_{SS} [2] 80 % air humidity, non-condensing

Illumination	CCD	Part number	Article number
White	Colour	FA 45-300-WCCC-COO12HS4	522-91035
White	Colour	FA 45-300-WCCC-COO6HS4	522-91034

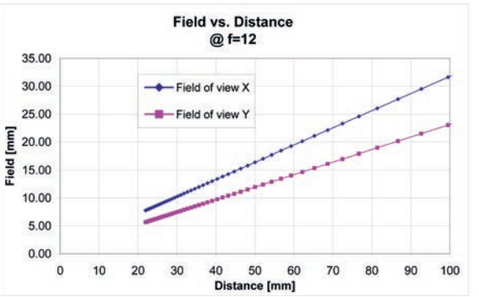
FA 45 vision sensor



Field of view (6 mm)



Field of view (12 mm)



Accessories	
Connection cables	From Page 670
Illumination	From Page 663
Brackets	From Page 642
Interface accessories	From Page 674

FA 45 colour sensor

Vision sensor for colour detection, C-mount

PRODUCT HIGHLIGHTS

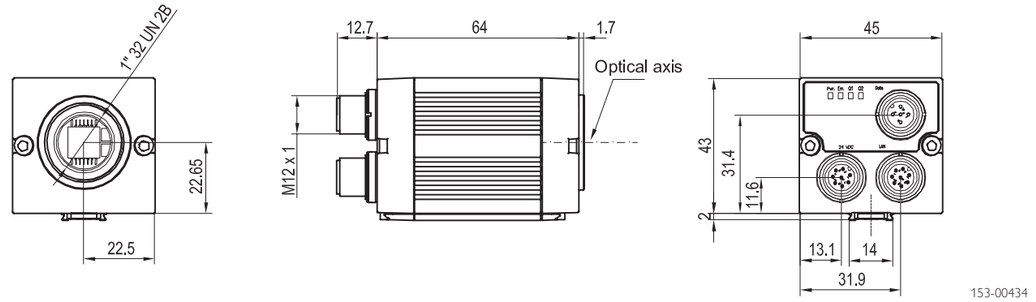
- Powerful detection of colours and colour intensity
- Detection of active (i.e. self-illuminating) components
- Detection of "non-colours" (white, grey, black)
- Simple setup with user-friendly configuration software
- High detection accuracy even with very slight colour nuances

Optical data		Functions	
Resolution	640 x 480 pixels	Number of configurations	32
CCD	1/4", colour	Functions	Colour
Integrated lens, focal length	C-mount	Properties	Area detection of colours and colour ranges
Adjustment range	Dependent on lens	Typical cycle time	Typ. 80 ms
Integrated illumination	None		
Minimum field of view, X x Y	Dependent on lens		
Electrical data		**Mechanical data**	
Operating voltage, $+U_B$	18 … 30 V DC[1]	Dimensions	65 x 45 x 45 mm³ (without plug)
Current consumption (without I/O)	≤ 200 mA	Enclosure rating	IP 65[2]
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection of all outputs	Material, housing	Aluminium, plastic
		Material, front screen	Plastic
Readiness delay	Ca. 6 s after Power on	Ambient temperature: operation	0 … +50°C[3]
Outputs	PNP (N.O.)	Ambient temperature: storage	-20 … +50°C[3]
Max. output current (per output)	200 mA (max. 9.6 W)	Weight	Ca. 170 g
Inputs	High 10 … 24 V (+10 %), Low 0 … 3 V	Plug connection	Supply and I/O M12, 8-pin Ethernet M12, 8-pin Data M12, 5-pin
Input resistance	> 20 kOhm		
Interfaces, FA 45	Ethernet (LAN), RS422	Vibration and impact resistance	EN 60947-5-2
Inputs / outputs	2 inputs, 4 outputs		

[1] Max. ripple < 5 V_{SS} [2] With LPT45 C-mount protective casing [3] 80 % air humidity, non-condensing

CCD	Part number	Article number
Colour	FA 45-300-CCC-COOCSHS4	522-91036

FA 45 vision sensor



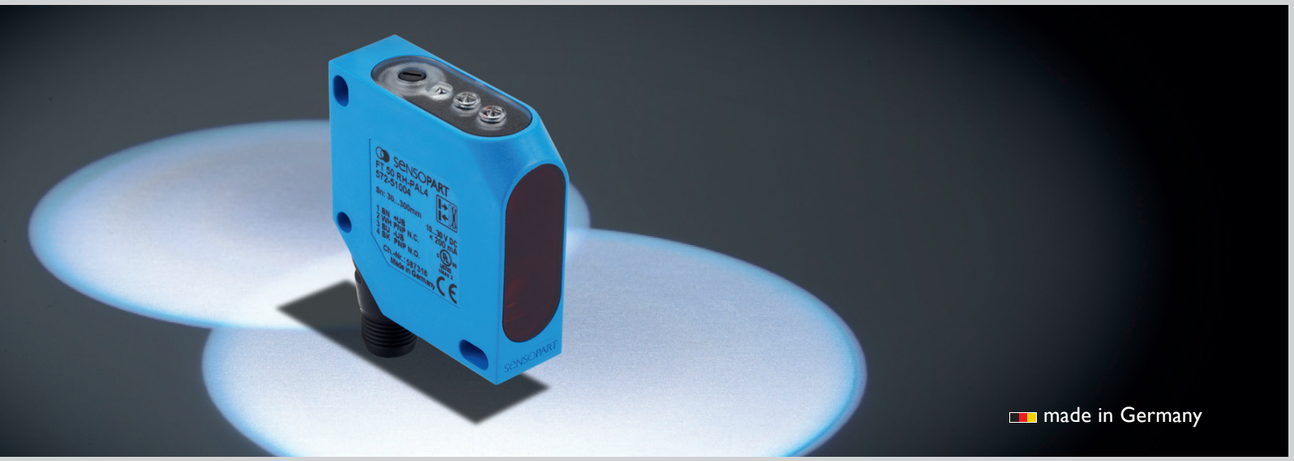
Lens

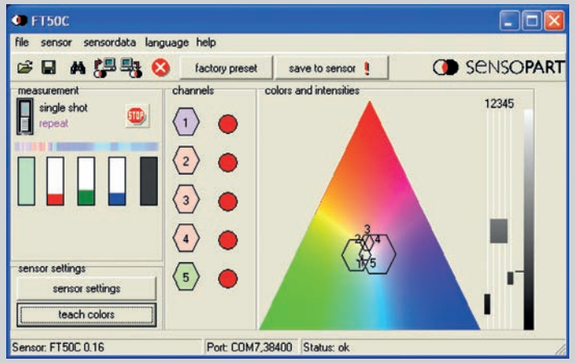
	LO C 8	LO C 12	LO C 16	LO C 25	LO C 50
Focal length	8 mm	12 mm	16 mm	25 mm	50 mm
Article number	526-51513	526-51514	526-51515	526-51516	526-51113

Accessories	
Connection cables	From Page 670
Illumination	From Page 663
Lenses	From Page 661
Brackets	From Page 642
Interface accessories	From Page 674

FT 50 C white-light colour sensor

Reliability despite varying object distances





PC-based software
The entire range of sensor functions can also be controlled from a PC, thanks to the serial interface and PC software.

TYPICAL FT 50 C

- High depth of field for reliable detection despite vibrations
- Up to 5 colours or colour ranges internally, or unlimited colours via RS485 serial interface
- Three different light spot geometries available
- High colour selectivity for reliable detection despite scanning distance fluctuations
- Simple teach-in or scan-in of colours
- Up to 3 result outputs
- IO Link on request

The FT 50 C white-light colour sensor is one of the most important innovations that SensoPart has placed on the sensor market in recent years. The scanner, awarded a prestigious innovation prize, offers a considerably expanded range of functions and particularly user-friendly operation compared to conventional colour sensors.

The compact sensor can administrate up to 5 reference colours or colour ranges internally. These can either be taught-in or, particularly easily, scanned-in. Separate tolerance values for colour and intensity can be defined for each taught-in reference colour. In practice, this function proves helpful when, for example, labels with fluctuating print quality must be reliably detected. The tolerances are automatically determined when the colours are scanned in. As a result of its special patented optical system – the optical "funnel" – the FT 50 C also achieves an above-average depth of field. It can thus easily detect even inexactly transported, moving or vibrating target objects, e.g. workpieces on a conveyor belt. Rapidly moving objects are also reliably detected thanks to the high switching frequency of up to 500 Hz.

The range of interfaces on the FT 50 C is also particularly varied: depending on the variant, it has up to three switching outputs, a serial RS485 interface or an IO-Link interface. The serial interface variant is not internally restricted to a maximum of five colours: as many reference colours as desired can be taught-in and transferred to the machine controller, where they can be stored – in the form of colour vectors (target values and tolerances) – for later retrieval. This range of functions, together with the high detection reliability and very user-friendly operation, is unique in this class of sensors!

FT 50 C – Product Overview

	Type of light	Scanning distance	Special features	Page
FT 50 C	LED, white	… 32 mm	1 switching output	170
FT 50 C	LED, white	… 32 mm	3 switching outputs	172
FT 50 C	LED, white	… 32 mm	Serial interface	174
IO Box for FT 50 C				176

FT 50 C

Colour sensor with a switching output

PRODUCT HIGHLIGHTS

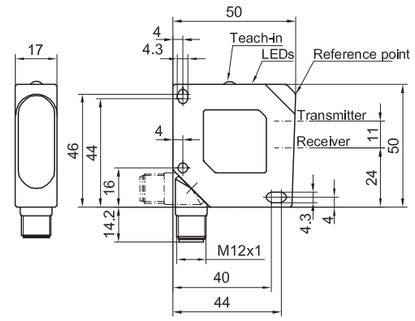
- Colours are reliably detected despite fluctuating scanning distances thanks to patented optical technology
- Very good depth of field
- Very simple setup (via button and control line)
- Even the smallest of colour differences are reliably detected due to pulsed white light
- Varying light spot sizes depending on task

Optical data		Functions	
Scanning distance	(See Selection Table)	Indicator LED, green	Operating voltage indicator
Scanning distance tolerance	(See Selection Table)	Indicator LED, yellow	Switching output indicator
Type of light	LED, white	Colour setting	Via teach-in button and control line
Light spot size	(See Selection Table)	Default setting	N.O.
Electrical data		**Mechanical data**	
Operating voltage, $+U_B$	12 … 28 V DC[1]	Dimensions	50 x 50 x 17 mm[3]
No-load current, I_0	≤ 40 mA	Enclosure rating	IP 67[2]
Output current, Ie	≤ 100 mA	Material, housing	ABS, impact-resistant
Voltage drop, U_D	≤ 2.4 V	Material, front screen	PMMA
Max. capacitive load	< 100 nF	Type of connection	Plug, M12, 5-pin, rotatable
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Ambient temperature: operation	-10 … +55 °C
Protection Class	2	Ambient temperature: storage	-20 … +80 °C
Standby time	≤ 300 ms	Weight (plug device)	40 g
Input IN ET (external teach-in)	> 12 V … 28 V: button locked < 3 V or open: normal operation Min. response time: 100 ms	Vibration and impact resistance	EN 60947-5-2
Input lock (button lock)	> 12 V … 28 V: button locked < 3 V or open: button free		
Switching output, Q	PNP		
Output function	N.O.		
Switching frequency, f (ti/tp 1:1)	≤ 500 Hz		

[1] Max. 10 % ripple, within U_B [2] With connected IP 67 plug [3] At scanning distance of 22 mm

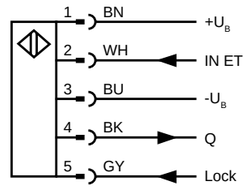
Scanning distance/Scanning distance tolerance/Light spot size	Switching output	Type of connection	Part number	Article number
12 … 32 mm / ± 6 mm / Ø 4 mm[3]	PNP	Plug, M12, 5-pin	FT 50 C-1-PSL5	575-11016
15 … 30 mm / ± 5 mm / 2 x 2 mm[3]	PNP	Plug, M12, 5-pin	FT 50 C-2-PSL5	575-11017
18 … 22 mm / ± 2 mm / 5 x 1 mm[3]	PNP	Plug, M12, 5-pin	FT 50 C-3-PSL5	575-11018

Plug connection



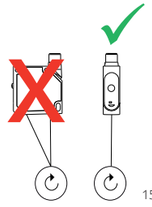
153-00826

Connection, 5-pin

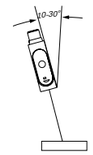


154-00262

Installation



155-01167



155-01228

Accessories

Connection cables	From Page 670
Brackets	From Page 642

Version: 06/2012. Subject to changes; diagrams similar

FT 50 C

Colour sensor with 3 switching outputs

PRODUCT HIGHLIGHTS

- Colours are reliably detected despite fluctuating scanning distances thanks to patented optical technology
- 3 colours distinguishable via 3 switching outputs
- Even the smallest of colour differences are reliably detected
- Easy teach-in of colours via Teach-in button or control line

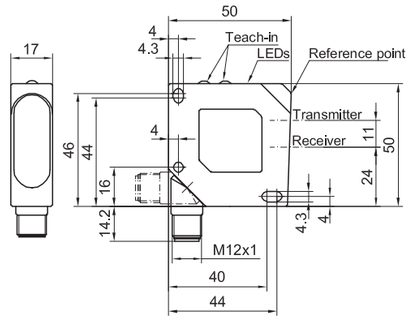
Optical data		Functions	
Scanning distance	(See Selection Table)	Indicator LED, green	Operating voltage indicator
Scanning distance tolerance	(See Selection Table)	Indicator LED, yellow	3 x switching output indicators
Type of light	LED, white	Indicator LED, red	3 x tolerance level indicators
Light spot size	(See Selection Table)	Colour and tolerance settings	Via teach-in button and control line
		Adjustment possibilities	Colours taught-in via Teach-in button and control line Pulse stretching via Teach-in button Button lock via control input
		Default setting	Normal operation, Tol. 3 for X01, typ. = Tol. 5

Electrical data		Mechanical data	
Operating voltage, $+U_B$	12 … 28 V DC[2]	Dimensions	50 x 50 x 17 mm[3]
No-load current, I_0	≤ 40 mA	Enclosure rating	IP 67[3]
Output current, Ie	≤ 100 mA	Material, housing	ABS, impact-resistant
Voltage drop, Ud	≤ 2.4 V	Material, front screen	PMMA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Type of connection	(See Selection Table)
Protection Class	2	Ambient temperature: operation	-10 … +55 °C
Standby time	≤ 300 ms	Ambient temperature: storage	-20 … +80 °C
Switching output, Q	3 x PNP	Weight (plug device)	40 g
Output function	N.O.	Vibration and impact resistance	EN 60947-5-2
Switching frequency, f (ti/tp 1:1)	500 Hz		
Response time	10 ms		
Control input, AT	> 12 V … 28 V = triggered < 3 V / open = free-running Response time: 10 ms		
Control input, KeyLock	> 12 V … 28 V = button locked < 3 V / open = normal operation Pulse stretching / release delay: 50 ms		
Control input, Ext. Teach-in (normal operation Q3)	> 12 V … 28 V = Teach-in < 3 V / open = normal operation Min. response time: 2 ms		

[1] At scanning distance of 22 mm [2] Max. 10 % ripple, within U_B [3] With connected IP 67 plug

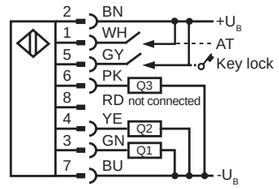
Scanning distance/Scanning distance tolerance/Light spot size	Switching output	Type of connection	Part number	Article number
12 … 32 mm / ± 6 mm / Ø 4 mm[1]	3 x PNP	Plug, M12, 8-pin	FT 50 C-1-PSL8	575-11000
15 … 30 mm / ± 5 mm / 2 x 2 mm[1]	3 x PNP	Plug, M12, 8-pin	FT 50 C-2-PSL8	575-11003
18 … 22 mm / ± 2 mm / 5 x 1 mm[1]	3 x PNP	Plug, M12, 8-pin	FT 50 C-3-PSL8	575-11004

Plug connection



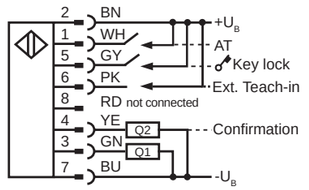
153-00350

Connection, 8-pin (normal operation)



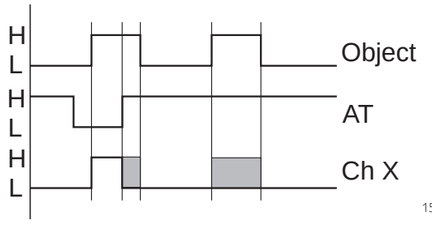
154-00197

Connection, 8-pin (external teach-in)



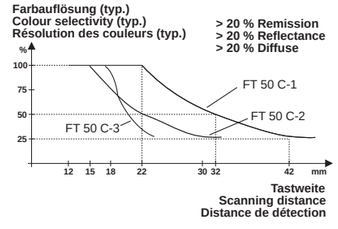
154-00198

Control input (AT)



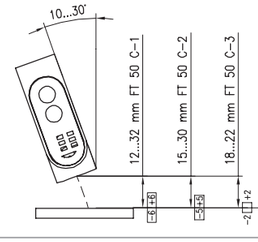
155-00085

Colour selectivity

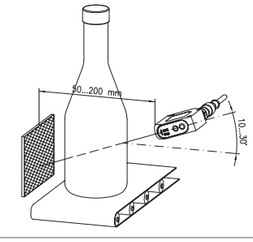


155-00926

Installation



155-00698



155-00925

Accessories

Connection cables	From Page 670
Brackets	From Page 642

FT 50 C

Colour sensor with serial switching interface

PRODUCT HIGHLIGHTS

- Colours are reliably detected despite fluctuating scanning distances thanks to patented optical technology
- Transfer of colour channel or colour value, as well as reading, modification and storage of sensor parameters, via RS485 interface
- Even the smallest of colour differences are reliably detected
- ColourScan function for detection of colour ranges
- Reliable detection of even the smallest of coloured objects

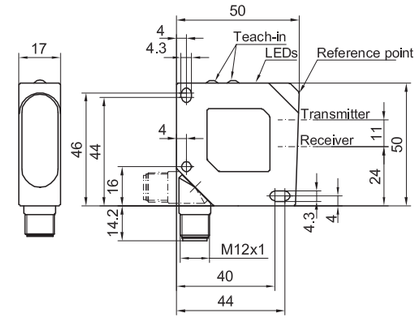
Optical data		Functions	
Scanning distance	(See Selection Table)	Indicator LED, green	Operating voltage indicator
Scanning distance tolerance	(See Selection Table)	3 x indicator LEDs, yellow	Switching output indicators
Type of light	LED, white	3 x indicator LEDs, red	Tolerance level indicators
Light spot size	(See Selection Table)	Colour & tolerance setting	Via teach-in button and control line
		Default setting	White, 90 %, taught-in, sensor address = 1 (RS485)
		Supplementary functions	ColourScan, triggering, teach-in, button lock

Electrical data		Mechanical data	
Operating voltage, $+U_B$	12 … 28 V DC[1]	Dimensions	50 x 50 x 17 mm[3]
No-load current, I_0	≤ 40 mA	Enclosure rating	IP 67[3]
Output current, Ie	≤ 100 mA	Material, housing	ABS, impact-resistant
Voltage drop, U_D	≤ 2.4 V	Material, front screen	PMMA
Max. capacitive load	< 100 nF	Type of connection	Plug, M12x1, 8-pin, rotatable
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q) (not RS485)	Ambient temperature: operation	-10 … +55 °C
Protection Class	2	Ambient temperature: storage	-20 … +80 °C
Standby time	< 300 ms	Weight (plug device)	40 g
Switching output, Q	(See Selection Table)	Vibration and impact resistance	EN 60947-5-2
Output function	N.O. / N.C.		
Switching frequency, f (ti/tp 1:1)	Max. 500 Hz		
Time stage for Q	50 ms release delay, adjustable		
Control input, KL / TR	Button lock input (KL) or triggering (TR), adjustable		
Control input, IN ET	PNP / NPN, input for external teach-in		
Min. response time	2 ms		
Control input, IN ES	PNP / NPN, input for external scanning		
Serial interface	RS 485 (half-duplex)		

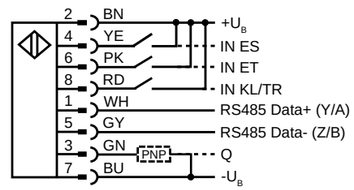
[1] At scanning distance of 22 mm [2] Max. 10 % ripple, within U_B [3] With connected IP 67 plug

Scanning distance/Scanning distance tolerance/Light spot size	Switching output	Type of connection	Part number	Article number
12 … 32 mm / ± 6 mm / Ø 4 mm[1]	PNP	Plug, M12, 8-pin	FT 50 C-1-PS1-L8	575-11007
12 … 32 mm / ± 6 mm / Ø 4 mm[1]	NPN	Plug, M12, 8-pin	FT 50 C-1-NS1-L8	575-11010
15 … 30 mm / ± 5 mm / 2 x 2 mm[1]	PNP	Plug, M12, 8-pin	FT 50 C-2-PS1-L8	575-11008
15 … 30 mm / ± 5 mm / 2 x 2 mm[1]	NPN	Plug, M12, 8-pin	FT 50 C-2-NS1-L8	575-11011
18 … 22 mm / ± 2 mm / 5 x 1 mm[1]	PNP	Plug, M12, 8-pin	FT 50 C-3-PS1-L8	575-11009
18 … 22 mm / ± 2 mm / 5 x 1 mm[1]	NPN	Plug, M12, 8-pin	FT 50 C-3-NS1-L8	575-11012

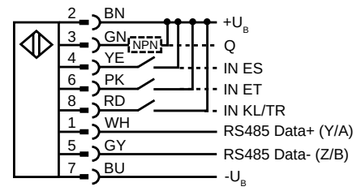
Plug connection



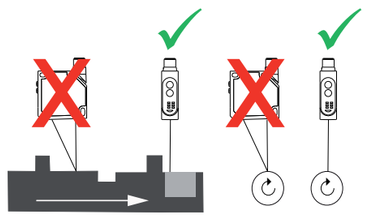
Connection, 8-pin

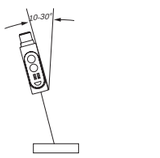


Connection, 8-pin



Installation





Accessories

Connection cables	From Page 670
Brackets	From Page 642
Progsensor software	www.sensopart.com

IO Box

Expansion box for FT50C

PRODUCT HIGHLIGHTS

- Input/output expansion for FT50C…-S1L8 colour sensors
- Up to 32 colours can be stored
- 32 output channels
- Definition of colour sequences
- ColourScan function
- Display for simple visualisation and operator guidance
- Time function selectable
- Rail mounting

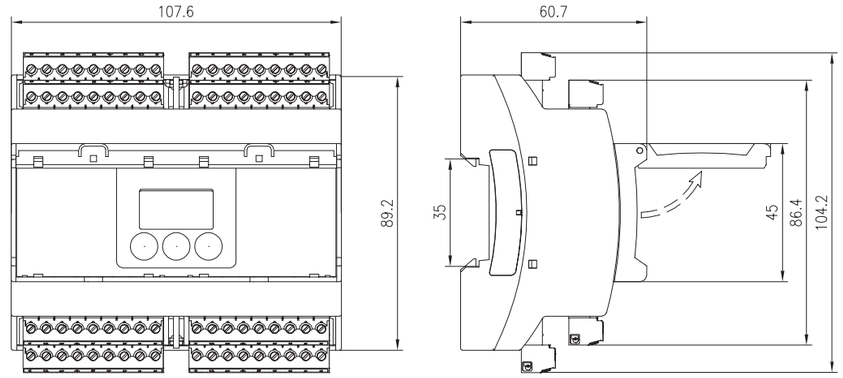
Functions	
Off-delay	5 ms to 2000 ms in increments
On-delay	5 ms to 2000 ms in increments
Wipe function (shot)	5 ms to 2000 ms in increments
Output function	Conversion between N.C. and N.O. for each individual switching output

Electrical data		Mechanical data	
Operating voltage, $+U_B$	24 V DC ± 10 %	Dimensions	107.6 x 104.2 x 60.7 mm^3 (lid closed)
No-load current, I_0	≤ 250 mA	Enclosure rating	IP 20
Switching output, Q	32 x PNP	Material, housing	Plastic
Switching frequency, f (ti/tp 1:1)	166 Hz in combination with colour sensor FT 50 C … S1L8	Connection system	Screw clamp contacts
		Ambient temperature: operation	0 … +50 °C
On-delay t_{On} switching output	≤ 2 ms	Ambient temperature: storage	0 … +50 °C
Off-delay t_{Off} switching output	≤ 2 ms	Vibration and impact resistance	EN 60947-5-2
Maximal permissible cable length	Power supply 3 m, otherwise 30 m		
Serial interface	RS 485 Z/B / RS 485 Y/A		

Part number	Article number
T-CS1T-12T34PRD	533-01007

Accessories (not included in scope of delivery of colour terminal)	
Part number	Article number
FT 50 C-1-PS1-L8	575-11007
FT 50 C-2-PS1-L8	575-11008
FT 50 C-3-PS1-L8	575-11009
FT 50 C-1-NS1-L8	575-11010
FT 50 C-2-NS1-L8	575-11011
FT 50 C-3-NS1-L8	575-11012

Dimensional drawing, IO Box

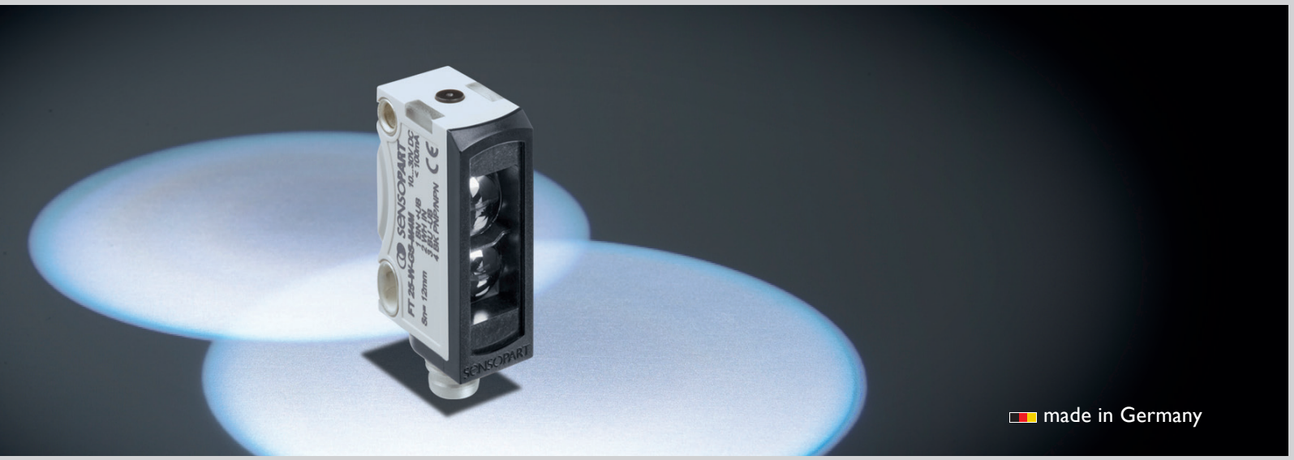


153-00795

Accessories	
Connection cables	From Page 670
Brackets	From Page 642

FT 25 – Contrast sensor

Extremely small sensor with high switching frequency



Rod mounting allows user-friendly and precise sensor alignment.

TYPICAL FT 25

- Precise detection of as many print marks as desired
- High positioning accuracy thanks to minimum response time
- High switching frequency of 25 kHz with miniature housing
- Small, precise light spot with sharp contour for easy sensor alignment and detection of even the smallest of print marks
- Feedback via light spot (simple, comprehensible, clearly defined)
- Dynamic, static or external teach-in
- White-light LED, red-light laser (Laser Class 1) or RGB diode options available
- High depth of field

Contrast sensors are mainly used for printed mark detection in very rapid processes in the print and packaging industries. So it is all the more important that the energetic scanner used is absolutely reliable and does its job without problems. SensoPart offers precisely such "mark" sensors – with white-light LED (FT 25-W, FT 20WT series), red-light laser (FT 25-RL) or RGB diode (FT 25-RGB) options.

All variants have their specific benefits: while the white-light and RGB scanners can detect even the smallest of contrast differences, the red-light laser offers the advantage of a particularly small light spot (Ø 0.7 mm in focus) in combination with a long scanning distance. The F 25 series is further characterised by a particularly high depth of field so that the sensors work very reliably even with vibrations or fluttering materials, e.g. during the detection of paper webs in the print industry.

During RGB multi-colour evaluation by the FT 25-RGB, the sensor automatically selects the ideal transmission colour (red, green or blue) for absolutely reliable detection of contrasts. The FT 25-W/RGB variant offers particularly high positioning accuracy and reliable detection – even at high process speeds – thanks to its minimal response time of ≤ 20 µs.

Moreover, all product variants offer the legendary SensoPart user-friendliness: the sensors can even be configured during running operation via teach-in, whereby the switching threshold is automatically adapted to object and mark colours and the background. After teach-in, the quality of the taught-in contrast is communicated via the light spot. Users thus receive unambiguous feedback on how reliable their process is.

FT 25 / FT 20 – Product Overview

	Type of light	Scanning distance	Special features	Page
FT 25-W	White LED	12 ± 2,5 mm	Minimal response time	180
FT 25-RGB	Red LED, green LED, blue LED	12 ± 3 mm	Automatic selection of ideal transmission colour, minimal response time	182
FT 25-RL	Red LED	250 mm	Long scanning distance	184
FT 20 WT	White LED	17 ± 2 mm		186

FT 25-W

White-light contrast sensor

PRODUCT HIGHLIGHTS

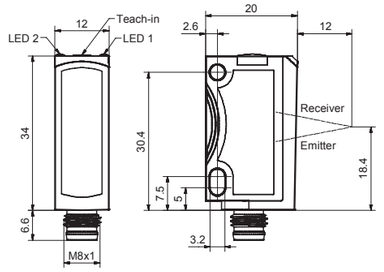
- Precise detection of the slightest contrast differences
- Very robust operation despite fluttering and glossy objects
- Simple alignment through very precise and easily visible light spot
- Housings that are many times smaller than standard housings – and offer better performance
- Very high positioning accuracy with 10 µs scanning

Optical data		Functions	
Scanning distance	12 mm	Indicator LED, green	Operating voltage indicator
Depth of field	± 2.5 mm	Indicator LED, yellow	Switching output indicator
Type of light	White LED, 400 … 780 nm	Sensitivity adjustment	Via teach-in button and control line
		Teach-in modes	Mode 1: with running process Mode 2: with standing process
		Adjustment possibilities	LO / DO DO via Teach-in button and control line Button lock via control input
Electrical data		**Mechanical data**	
Operating voltage, $+U_B$	10 … 30 V DC[1]	Dimensions	34 x 20 x 12 mm[3]
No-load current, I_0	≤ 25 mA	Enclosure rating	IP 69K & IP 67[3]
Output current, Ie	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Material, front screen	PMMA
		Type of connection	(See Selection Table)
Protection Class	2	Ambient temperature: operation	-20 … +55 °C
Standby time	< 300 ms	Ambient temperature: storage	-20 … +80 °C
Switching output, Q	PNP / NPN, push-pull	Weight (plug device)	10 g
Output function	LO / DO	Weight (integrated cable)	20 g
Switching frequency, f (ti/tp 1:1)[2]	(See Selection Table)	Vibration and impact resistance	EN 60947-5-2
Response time	(See Selection Table)		
Jitter (electrical)	(See Selection Table)		

[1] Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz [2] f = 1 / (T x Nyq x 2) [3] With connected IP 67 / IP 69K plug

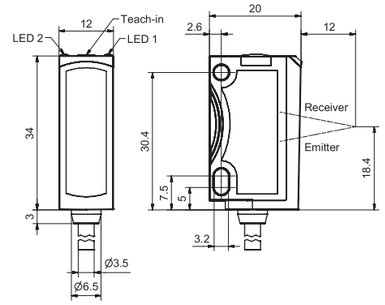
Switching frequency, f (ti/tp 1:1)[2]	Response time	Jitter (electrical)	Type of connection	Part number	Article number
≤ 25000 Hz	≤ 20 µs	10 µs	Metal plug, M8x1, 4-pin	FT 25-W1-GS-M4M	607-21013
≤ 25000 Hz	≤ 20 µs	10 µs	Integrated cable: 150 mm with plug M12x1, 4-pin	FT 25-W1-GS-KL4	607-21012
≤ 10000 Hz	≤ 50 µs	25 µs	Plug, M8x1, 4-pin	FT 25-W2-GS-M4	607-21014
≤ 10000 Hz	≤ 50 µs	25 µs	Integrated cable: 150 mm with plug M12x1, 4-pin	FT 25-W2-GS-KL4	607-21015

Plug connection



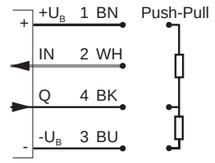
153-00995

Integrated cable



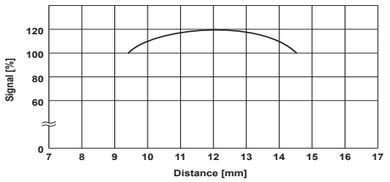
153-00996

Connection, 4-pin



154-00320

Signal process



155-01647

Accessories

Connection cables	From Page 670
Brackets	From Page 642

FT 25-RGB

Multi-colour contrast sensor

PRODUCT HIGHLIGHTS

- Precise detection of the slightest of contrast differences through multi-colour RGB evaluation
- Very robust operation despite fluttering and glossy objects
- Simple alignment thanks to very precise and easily visible light spot
- Communication via 3-colour light spot (simple, comprehensible, clearly defined)
- Very accurate positioning due to rapid scanning rate of 10 µs

Optical data	
Scanning distance	12 mm
Depth of field	± 3 mm
Type of light	Red LED Green LED Blue LED

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Sensitivity adjustment	Via teach-in button and control line
Teach-in modes	Mode 1: with running process Mode 2: with standing process
Adjustment possibilities	LO / DO via Teach-in button and control line Button lock via control input

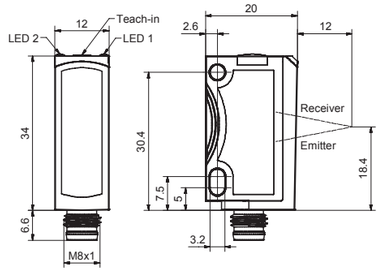
Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[1]
No-load current, I_0	≤ 25 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Switching output, Q	PNP / NPN, push-pull
Output function	LO / DO
Switching frequency, f (ti/tp 1:1)[2]	≤ 25000 Hz
Response time	≤ 20 µs
Jitter (electrical)	10 µs

Mechanical data	
Dimensions	34 x 20 x 12 mm[3]
Enclosure rating	IP 69K & IP 67[3]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-20 … +55 °C
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	10 g
Weight (integrated cable)	20 g
Vibration and impact resistance	EN 60947-5-2

[1] Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz [2] f = 1 / (T x Nyq x 2) [3] With connected IP 67 / IP 69K plug

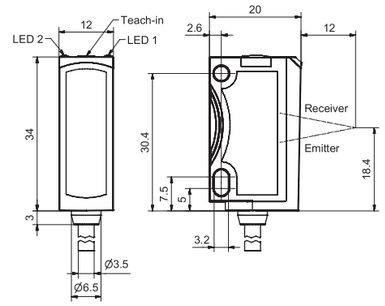
Scanning distance	Switching output	Type of connection	Part number	Article number
12 ± 3 mm	PNP / NPN, push-pull	Metal plug, M8x1, 4-pin	FT 25-RGB1-GS-M4M	607-21011
12 ± 3 mm	PNP / NPN, push-pull	Integrated cable: 150 mm with plug M12, 4-pin	FT 25-RGB1-GS-KL4	607-21010

Plug connection



153-00995

Integrated cable



153-00996

Connection, 4-pin

154-00320

Signal process

155-01648

Accessories

Connection cables	From Page 670
Brackets	From Page 642

FT 25-RL

Laser contrast sensor

PRODUCT HIGHLIGHTS

- Differentiation even with low grey value differences at long scanning distances
- Sensor setup via teach-in and control input
- Resilient laser printing
- Very small, easily visible laser light spot
- Large range of variants

Optical data	
Scanning distance	1 … 250 mm[1]
Adjustment range	25 … 250 mm[1]
Type of light	Laser, red, 650 nm
Light spot size	See diagram
Laser Class (DIN EN 60825-1:2008-5)	1
Hysteresis	≤ 10%[2]

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Sensitivity adjustment	Via teach-in button and control line
Teach-in modes	Mode 1: with running process Mode 2: with standing process
Adjustment possibilities	LO / DO via Teach-in button and control line Button lock via control input
Default setting	Max. scanning distance and N.O.

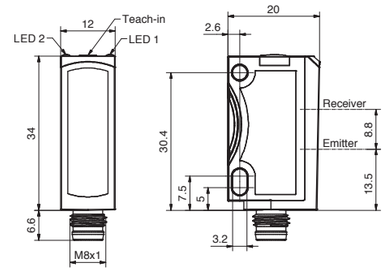
Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[3]
No-load current, I_0	≤ 30 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Switching output, Q	PNP / NPN (See Selection Table)
Output function	LO / DO
Switching frequency, f (ti/tp 1:1)	≤ 1500 Hz
Response time	333 µs
Control input, IN	$+U_B$ = teach-in $-U_B$ = button locked open = normal operation

Mechanical data	
Dimensions	34 x 20 x 12 mm[3]
Enclosure rating	IP 69K & IP 67[4]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-20 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	10 g
Weight (cable device)	40 g
Weight (integrated cable)	20 g
Vibration and impact resistance	EN 60947-5-2

[1] Reference material: white, 90 % reflectivity [2] Up to scanning distance of 150 mm [3] Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz [4] With connected IP 67 / IP 69K plug

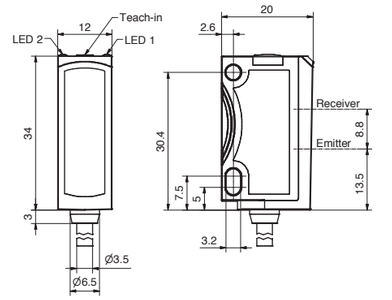
Scanning distance	Switching output	Type of connection	Part number	Article number
1 … 250 mm	PNP	Metal plug, M8x1, 4-pin	FT 25-RL-PS-M4M	609-21013
1 … 250 mm	NPN	Metal plug, M8x1, 4-pin	FT 25-RL-NS-M4M	609-21014
1 … 250 mm	PNP	Cable, 2 m, 4-wire	FT 25-RL-PS-K4	609-21010
1 … 250 mm	NPN	Cable, 2 m, 4-wire	FT 25-RL-NS-K4	609-21008
1 … 250 mm	PNP	Integrated cable: 150 mm with plug M12, 4-pin	FT 25-RL-PS-KL4	609-21012
1 … 250 mm	NPN	Integrated cable: 150 mm with plug M12, 4-pin	FT 25-RL-NS-KL4	609-21009

Plug connection



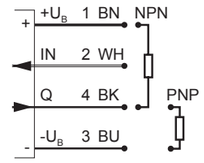
153-00937

Integrated cable



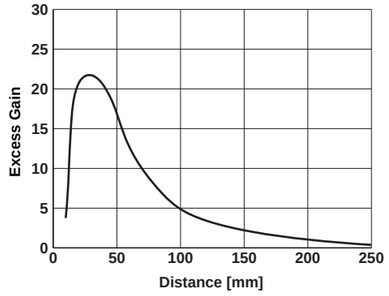
153-00936

Connection, 4-pin



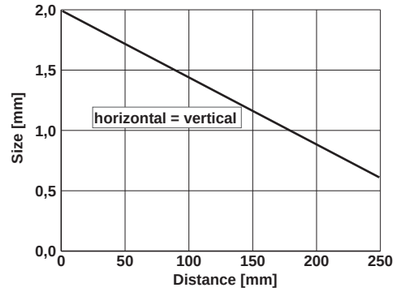
154-00312

Functional reserves



155-01384

Light spot size



155-01383

Reference material	Detection range
White (90 %)	1 … 250 mm
Grey (18 %)	6 … 100 mm
Black (6 %)	20 … 60 mm

Accessories	
Connection cables	From Page 670
Brackets	From Page 642

FT 20 WT

White-lighht contrast sensor

PRODUCT HIGHLIGHTS

- Small rectangular light spot – ideal for detecting even the smallest of marks
- 30 contrast levels (resolution)
- Depth of field: ± 2 mm
- Switching frequency: 5 khz
- N.O. / N.C. selectable
- Dynamic / static / external teach-in possible

Optical data	
Scanning distance	17 mm
Depth of field	± 2 mm
Type of light	LED, white, 400 … 600 nm
Light spot size	< 1.5 x 4 mm
Resolution	30 contrast levels

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Sensitivity adjustment	Via teach-in button and control line
Teach-in modes	Mode 1: with running process Mode 2: with standing process
Adjustment possibilities	Light-switching /dark-switching via Teach-in button and control input Button lock via control input
Default setting	Max. sensitivity and dark-switching

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC
No-load current, I_0	≤ 25 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Switching output, Q	PNP / NPN (see Selection Table)
Output function	Light-switching / dark-switching
Switching frequency, f (ti/tp 1:1)	≤ 5000 Hz
Response time	100 µs
Control input, IN	$+U_B$ = teach-in $-U_B$ = button locked open = normal operation

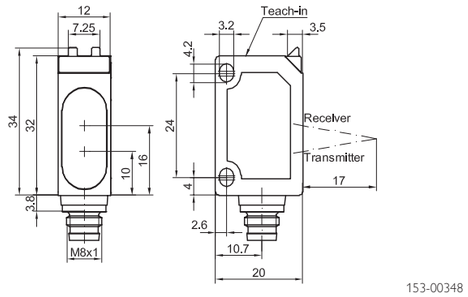
Mechanical data	
Dimensions	32 x 20 x 12 mm³
Enclosure rating	IP 67[1]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-20 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	10 g
Weight (cable device)	40 g
Vibration and impact resistance	EN 60947-5-2

[1] With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
17 ± 2 mm	PNP	Metal plug, M8x1, 4-pin	FT 20 WT-PSM4	551-61000
17 ± 2 mm	NPN	Metal plug, M8x1, 4-pin	FT 20 WT-NSM4	551-61001
17 ± 2 mm	PNP	Cable, 2 m, 4-wire	FT 20 WT-PSK4	551-61002
17 ± 2 mm	NPN	Cable, 2 m, 4-wire	FT 20 WT-NSK4	551-61003

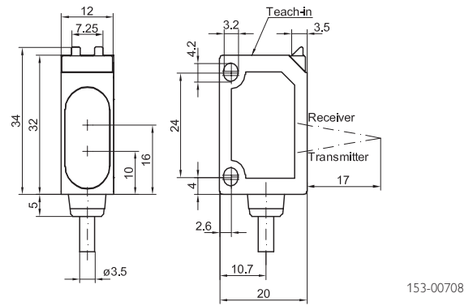
SENSOPART

Plug connection



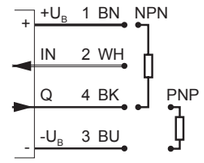
153-00348

Integrated cable



153-00708

Connection, 4-pin



154-00312

Accessories

Connection cables	From Page 670
Brackets	From Page 642

FT 50 C-UV – luminescence sensor

An eye for the invisible

Low contrast or colour differences between printed marks and objects, or uneven object surfaces (e.g. rough, mottled or printed surfaces), frequently prove problematic for conventional colour and contrast sensors. The evaluation of luminescent features offers a simple and reliable alternative in these cases, or when marks are intended to be invisible on a product. Thus printed labels or the package inserts for medicines can be checked, chalk marks on wooden surfaces can be detected, and bottles can be positioned in the filling plant with the help of invisible printed marks. Other applications include checking the presence of oils with added luminescent materials, or monitoring glue application on paper.

With its three-range reception system, the FT 50 C-UV can evaluate luminescences over the entire spectral range of visible light – users can easily choose the desired RGB partial spectrum via teach-in. This differentiates the SensoPart solution from most of the UV sensors available on the market, which require appropriate filters to achieve this. The FT 50 C-UV can also distinguish between differing luminophores on the basis of the frequency of the emitted light.

The powerful sensor detects even minimal amounts of luminophores, and thus operates very reliably. Highly reflective surfaces or varying object distances, e.g. with fluttering objects such as paper or when there is a batch change, have no effect at all on proper function. An absolutely reliable automation solution made by SensoPart!

Simple sensor adjustment via Teach-in button or external control line.

The FT 50 C-UV is very robust and dazzle-proof due to its reliable optical concept.

TYPICAL FT 50 C-UV

- Very reliable detection regardless of object surface
- Teach-in for setup of differing objects by means of button or external control line
- Reliable detection even with minimum amounts of luminophores
- Wide scanning range provides reliable detection with varying object distances
- Small precise light spot for maximum positioning & small part accuracy
- Robust and dazzle-proof operation, e.g. on glass and highly reflective metals
- Rotatable plug (270°)
- UL certification

FT 50 C-UV – Product Overview

	Type of light	Scanning distance	Page
FT 50 C-UV	UV diode	5 … 50 mm	190

FT 50 C-UV

Luminescence sensor

PRODUCT HIGHLIGHTS

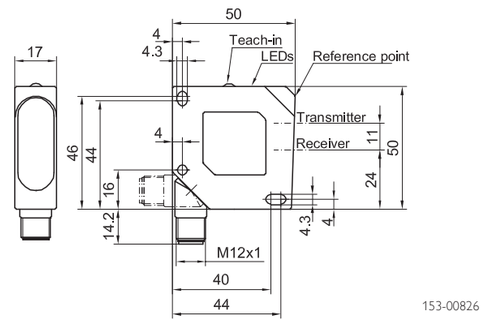
- Detection of luminescent materials, e.g. in paper, oil and glues
- Precise, small light spot for maximum positioning accuracy
- Flexibility through large scanning range
- Robust, dazzle-proof operation
- Plug rotatable for simple integration in the machine

Optical data		Functions	
Scanning distance	5 … 50 mm	Indicator LED, green	Operating voltage indicator
Optimum scanning distance	18 mm	Indicator LED, yellow	Switching output indicator
Type of light	UV diode, 375 nm[1]	Sensitivity adjustment	Via teach-in button and control line
Light spot size	See diagram	Teach-in	During standing process
		Adjustment possibilities	Button lock via control input
		Default setting	Max. sensitivity and N.O.
Electrical data		**Mechanical data**	
Operating voltage, $+U_B$	12 … 28 V DC[2]	Dimensions	50 x 50 x 17 mm[3]
No-load current, I_0	≤ 40 mA	Enclosure rating	IP 67[4]
Output current, Ie	≤ 100 mA	Material, housing	ABS
Voltage drop, U_D	≤ 2.4 V	Material, front screen	Glass
Max. capacitive load	< 100 nF	Type of connection	(See Selection Table)
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Ambient temperature: operation	-10 … +55 °C
		Ambient temperature: storage	-20 … +80 °C
Protection Class	2	Weight (plug device)	40 g
Standby time	< 300 ms	Vibration and impact resistance	EN 60947-5-2
Switching output, Q	PNP		
Output function	N.O.		
Switching frequency, f (ti/tp 1:1)	≤ 500 Hz		
Response time	1 ms		
Control input, ET[3]	12 V … 28 V = teach-in < 3 V / open = normal operation		
Control input, Lock	12 V … 28 V = button locked < 3 V / open = normal operation (button free)		

[1] Risk-free at observation distances of > 60 mm acc. to DIN EN 62471:2008. Do not look into beam at observation distances of < 60 mm.
[2] Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz [3] Min. response time 100 ms [4] With connected IP 67 / IP 69K plug

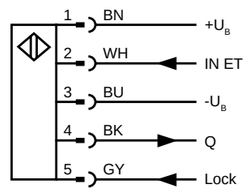
Scanning distance	Switching output	Type of connection	Part number	Article number
5 … 50 mm	PNP	Plug, M12x1, 5-pin	FT 50 C-UV-1-PSL5	575-11020

Plug connection



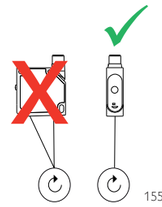
153-00826

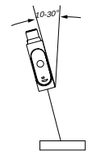
Connection, 5-pin



154-00262

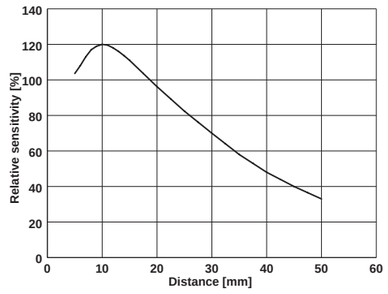
Installation


155-01167



155-01228

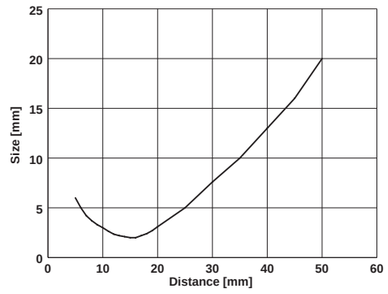
Relative sensitivity*



155-01320

* Reference material: white, 90 % reflectivity

Light spot size



155-01319

Accessories

Connection cables	From Page 670
Brackets	From Page 642