

### General

SICK CS Series color sensors were specially developed for online detection of colors in industrial procedures and processes. They are ideal for effecting rapid, non-contact identification and for sorting and monitoring of solid objects using incident light, or for monitoring of transparent objects using transmitted light. During the Teach-in process, reference colors are simply stored in memory. The sensors are compact, immune to interference, unaffected by external light influence and require no maintenance. The units are available in several options.

### Applications

The CS color sensors are compact multi-functional measurement systems, which are suitable for automating all industrial procedures in which the color of an object or a color mark represents the criteria for detection and segmentation. Some examples of application for this are:

- Assigning and monitoring of packaging, labelling and content,
- Detection of tax revenue stamps,
- Detecting random color markings (printed marks, logos, defect marks, etc.),
- Detection of components (e.g. mating parts),
- Cable/wire core detection,
- Sorting of auxiliary materials, products, components,
- Control of containers, pallets and material boxes,
- Sorting of cases of drinks, detection of boxes of miscellaneous items,
- Monitoring of coating processes,
- Monitoring of the presence of items and position,
- Monitoring of printing,
- Monitoring of filling processes,
- Monitoring of colored envelopes and wrappings
- and much more.

### Selection/overview

**CS 8:** Can store up to four reference colors, different scanning distances.

**CS 8:** For applications in which only one color needs to be detected.

**CSL 1:** In cases where space is particularly limited, CS 1 is available as an option for conducting the light.

**CSM:** Compact unit and simple to operate.

## Setup and method of operation

The CS color sensors work on the principle of utilising three active ranges. In so doing, the object under inspection is illuminated by a light source having a differing spectral composition. The reflected beam is received, amplified, digitalised and assessed, then specially defined by means of an integrated microprocessor. The magnitudes of the signals thus obtained for the spectral ranges of red, green and blue then contain the total information on color, hue, saturation and brightness. The measured values are continuously compared against stored reference values. If the measured values match with the stored reference values, the condition of switching output changes.

## Interfaces

### Switching outputs

The sensors have digital switching outputs of the type PNP or NPN. These are activated as soon as a color value reading matches with a stored reference value. Additionally, a 20 ms off time delay to the signal may be selected via the programme selector switch, if required.

### Blanking input

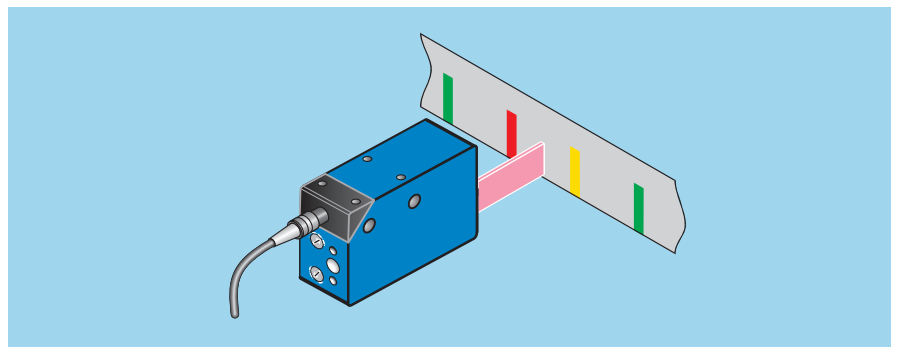
Sometimes it is necessary to take readings only if the object under investigation is precisely in the field of scan of the sensor. For this, a dynamic trigger input facility is provided, via which the scan time can be controlled with an input pulse. Interrogation then only takes place if the input is inactive or is unswitched. It is recommended to synchronise the operation, especially for high speed production sequences, objects flowing close to one another in sequential progression, cylindrical objects creating a lens effect, reflection on boundary surfaces and edges or structured and irregular color surfaces.

### Input of external Teach ET

This input is used if a reference color is to be stored for a color channel (switching output) Q1 via an external input signal. By prior verification it must be ensured that the sensor positively detects the object or the color of the marking.

## Installation

- Check the conditions of use to ensure that the permitted operating conditions during installation, are maintained whilst in operation
- Install the sensor in a position at which the object to be examined generates the least amount of movement laterally or vertically (the higher the required color resolution, the greater the requirement for accuracy of guidance). The quoted scanning distance and scanning distance tolerance must be maintained.
- In the case of color sensors generating a square shaped spot of light, the position of the spot of light and the direction of movement of the item under investigation are important. The best reproducibility is therefore achieved when the items being scanned pass through the light spot transversely.





# CS8: detect, check and sort colours



# W

When colours are the decisive criterion for detecting, checking and sorting, the CS8 color sensor is the right choice.

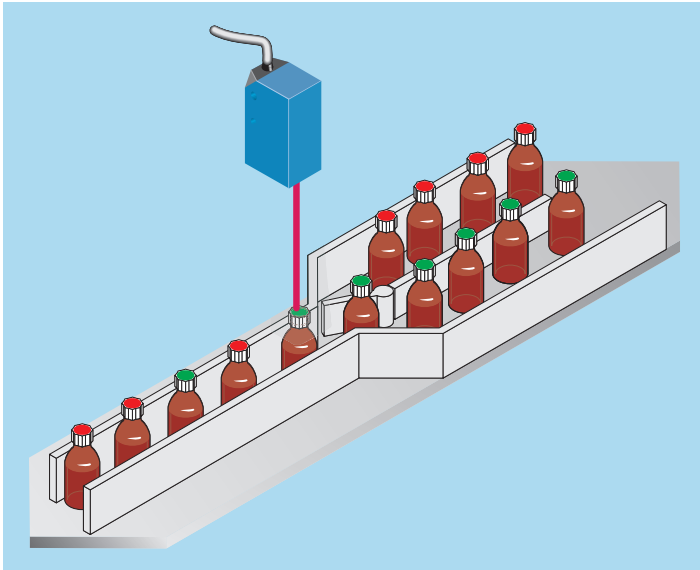
Thanks to the two scanning ranges of 12.5 mm with a precise light spot and 60 mm with a larger spot, numerous tasks can be handled. A difference in a single colour can be detected using the CS8-1. If more colour distinctions are required, the CS8-4 is available with 4 channels.

The simple teach-in and the bar display make the device especially easy to use. At the teach-in, the

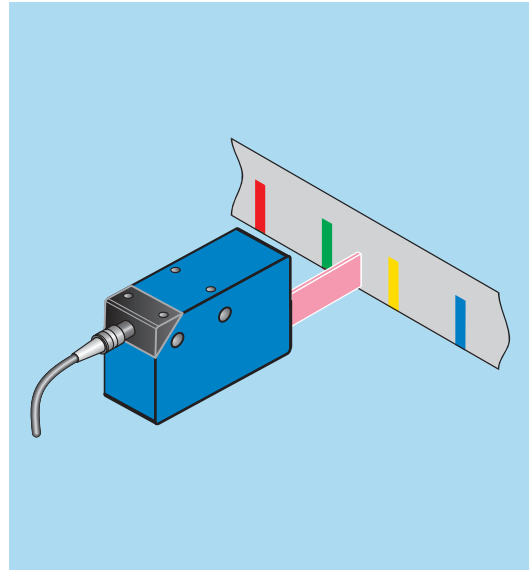
light spot is positioned on the colour to be detected, push button – ready. If required, the colour tolerance can easily be adjusted. Using the CS8-4 each channel is selected for a corresponding colour. The high performance color sensors from SICK do not require any complex set-up procedures.

The default setting is selected in such a way that it can handle the majority of applications. However, if especially high speed or high colour resolution is required, you can select from three modes (speed, resolution and combi). The sensor is then set to the different conditions. The CS8 can be installed flexibly with its robust metal housing, selectable light exits and rotatable M12 plug. Thanks to its electrical and mechanical compatibility and a common teach-in procedure, you can switch from the old generation CS1 to CS8-1 and CS3 to CS8-4 without problems.

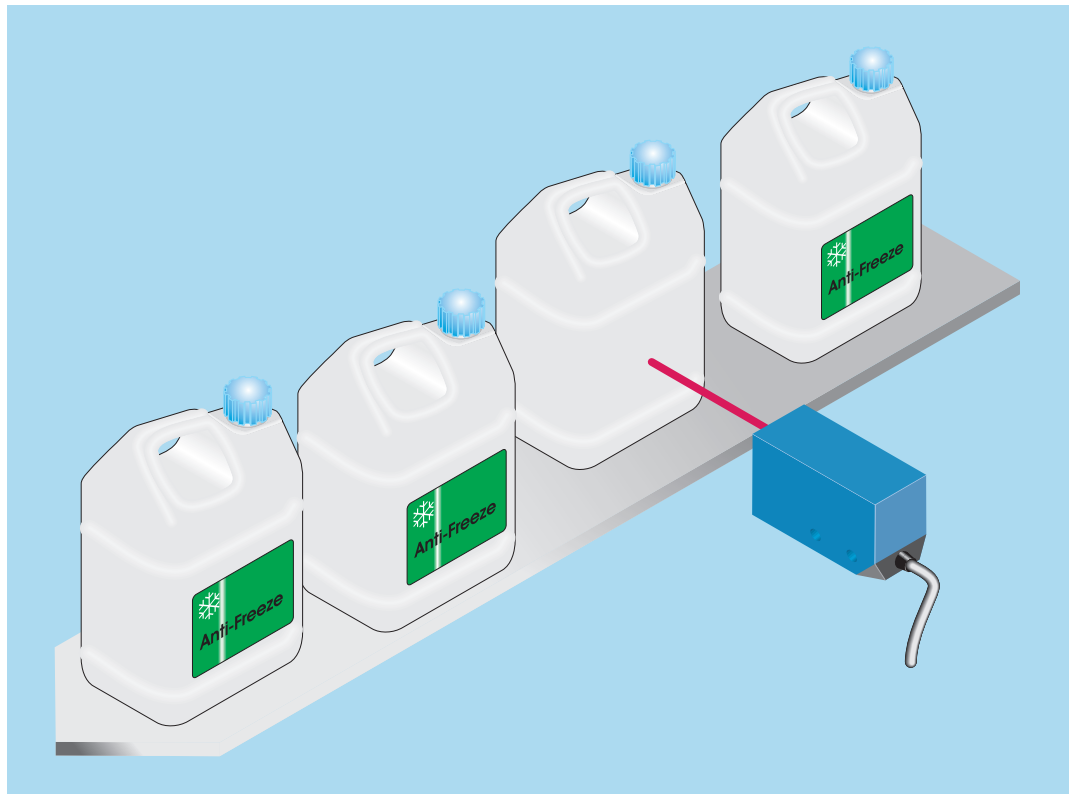
The reference channel technology guarantees working during the whole life cycle – even in alternating temperatures.



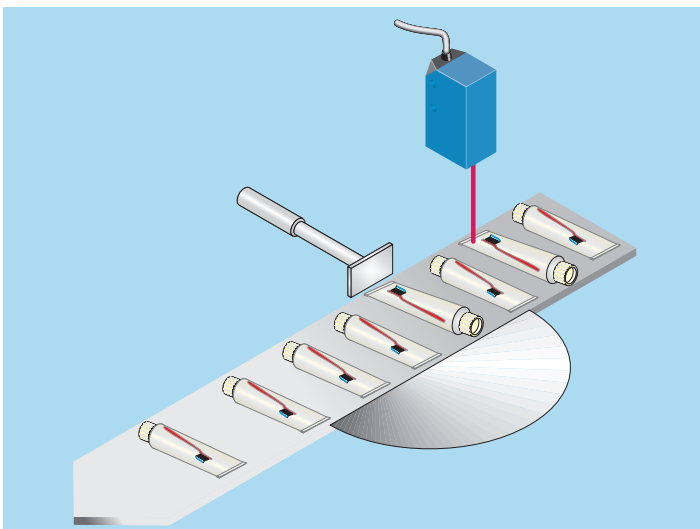
▲ The same shape, different contents: the CS8 assists in sorting if colour remains the only distinguishing feature.



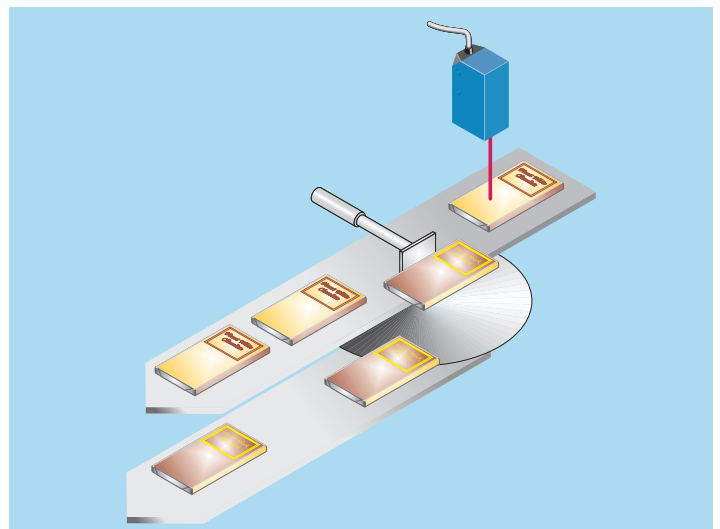
◀ Print mark control with the CS8: each channel corresponds to one coloured mark.



▶ The CS8 detects the presence or absence of the label, using the colour.



▲ The CS8 checks prior to packaging, whether the toothpaste tubes have been aligned correctly.



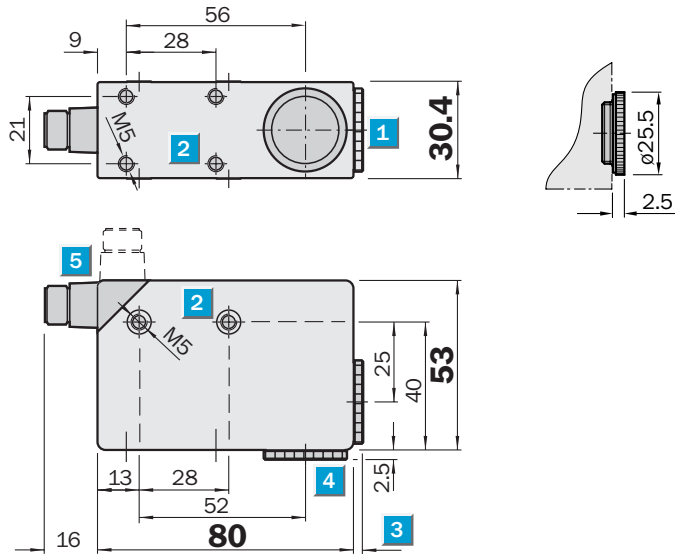
▲ The chocolate is packed, but is it the right one? The CS8 sorts according to the colour of the different packages.

**Scanning distance**  
12.5 mm/60 mm

Color sensors

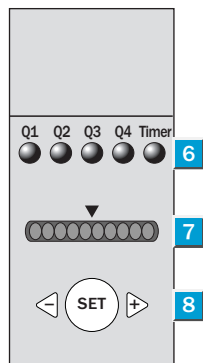
- Response time up to 85 μs
- High colour resolution
- Quality of colour indicator via bar display
- Very precise light spot
- High geometrical resolution
- Metal housing with 2 light exits (changeable)

### Dimensional drawing



### Adjustments possible

All Types

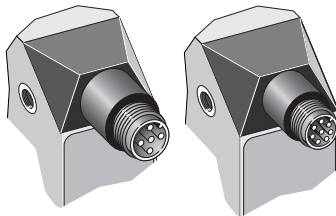


- 1 Lens (light transmission)
- 2 M5 mounting holes, 5.5 mm deep
- 3 See dimensional drawing of lens
- 4 Blind screw can be replaced by lens 1
- 5 5-pin, M12 x 1 plug (rotatable through 90°) or 8-pin, M12 x 1 plug (rotatable through 90°)
- 6 Function signal indicators (yellow)
- 7 Bar display (green), Power on  $\triangleleft$  left LED
- 8 Teach-in button/“+” and “-” button

### Connection type

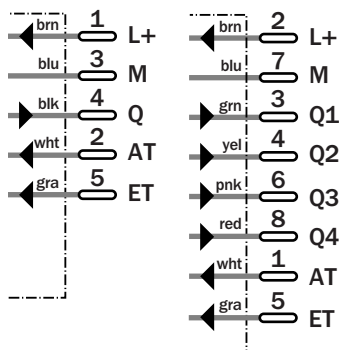
CS8-1

CS8-4



5-pin, M12

8-pin, M12



### See chapter Accessories

Cables and connectors

Technical data		CS8	1-P1112	1-P3612	4-P1112	4-P3612	1-N1112	1-N3612	4-N1112	4-N3612
<b>Scanning distance,</b> from front edge of housing	12.5 ± 3 mm									
	60 ± 9 mm									
<b>Light spot size</b>	4 x 2 mm <sup>2</sup> (at 12.5 mm)									
	13 x 13 mm <sup>2</sup> (at 60 mm)									
<b>Light source<sup>1)</sup></b>	LED; red, green, blue									
Wave length (nm)	640, 525, 470									
Light spot direction	Longitudinal									
<b>Scanning range with PL80A reflector</b>	100 ... 250 mm									
	250 ... 1000 mm									
<b>Supply voltage V<sub>S</sub></b>	10 ... 30 V DC <sup>2)</sup>									
Residual ripple <sup>3)</sup>	< 5 V									
Current consumption <sup>4)</sup>	< 80 mA									
<b>Switching outputs</b>	PNP: HIGH = V <sub>S</sub> - < 2 V / LOW = 0 V									
	NPN: HIGH = V <sub>S</sub> / LOW = < 2 V									
Output current I <sub>A</sub> max.	< 120 mA									
<b>Switching frequency <sup>5)</sup></b>	Adjustable									
	1 kHz (0,5 ms); 3 kHz (160 μs); 6 kHz (85 μs)									
	0,5 kHz (1 ms); 1 kHz (500 μs); 3,5 kHz (145 μs)									
<b>Timer</b>	Off delay 20 ms adjustable									
<b>Output (Channel)</b>	1 colour									
	4 colours									
<b>Teach-in input ET</b>	PNP: Teach > 10 V ... < V <sub>S</sub>									
	ET > 2ms									
	NPN: Teach 0 V									
	Run V <sub>S</sub> or unswitched									
<b>Blanking input AT</b>	AT > 200 μs									
Blanked	PNP: AT > 10 V									
	Free running									
	AT > 2 V or unswitched									
	NPN: AT < 2 V									
	AT > 10 V or unswitched									
<b>Retention time</b>	25 ms, non-volatile memory									
<b>Connection type</b>	M12 plug, 5-pin									
	M12 plug, 8-pin									
<b>VDE protection class <sup>6)</sup></b>	□									
<b>Circuit protection <sup>7)</sup></b>	A, B, C, D									
<b>Enclosure rating</b>	IP 67									
<b>Ambient temperature T<sub>A</sub></b>	Operation -10 ... +55 °C									
	Storage -25 ... +75 °C									
<b>Shock load</b>	To IEC 68									
<b>Weight</b>	Approx. 400 g									
<b>Housing material</b>	Cast zinc									

<sup>1)</sup> Average service life 100,000 h at T<sub>A</sub> = + 25 °C

<sup>2)</sup> Limit values

<sup>3)</sup> May not exceed or fall short of V<sub>S</sub> tolerances

<sup>4)</sup> Without load

<sup>5)</sup> With light/dark ratio 1:1

<sup>6)</sup> Reference voltage 50 V DC

<sup>7)</sup> A = V<sub>S</sub> connection reverse-polarity protected

B = Output Q or Q<sub>1</sub> to Q<sub>4</sub> short-circuit protected

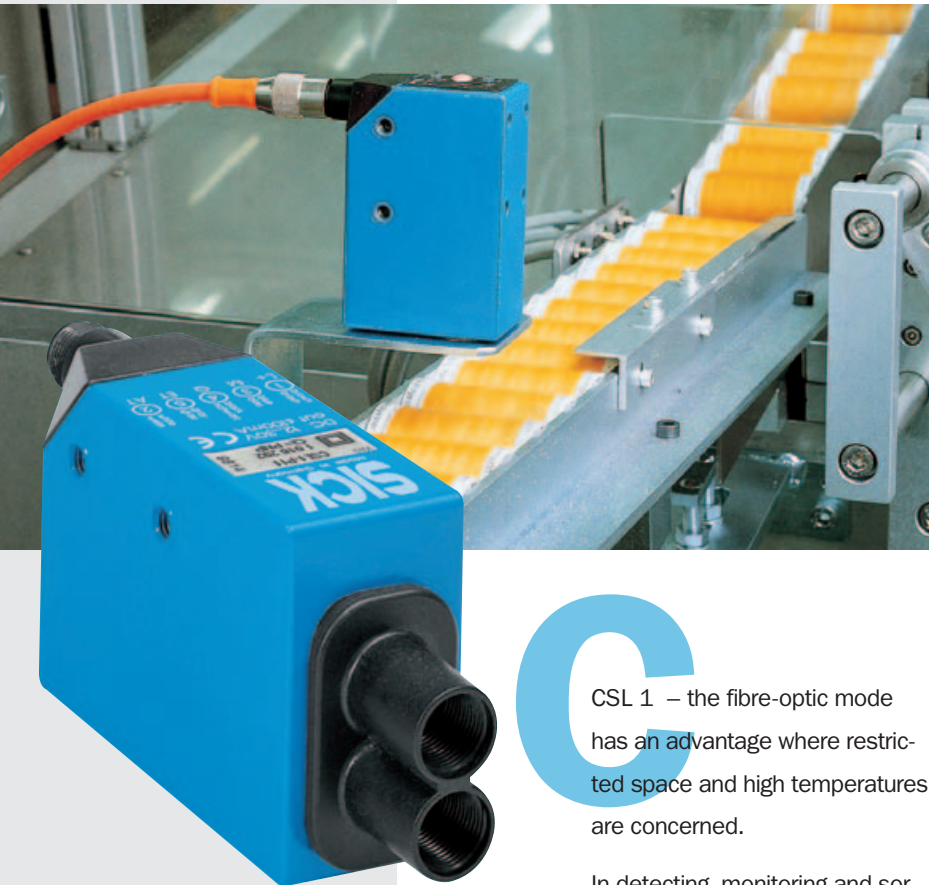
C = Interference pulse suppression

D = Output overcurrent and short-circuit protected

Order information	
Type	Order no.
CS81-P1112	1 028 224
CS81-P3612	1 028 225
CS84-P1112	1 028 226
CS84-P3612	1 028 227
CS81-N1112	1 028 228
CS81-N3612	1 028 229
CS84-N1112	1 028 230
CS84-N3612	1 028 231



# Color sensors for detection of a single color and high speed production sequences



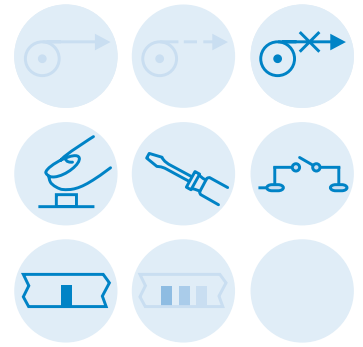
is no better sensor than the CSL 1 color sensor. High speed performance and the detection of just one color are clear advantages to choosing the CSL 1, in addition to a good price-/performance ratio.

The facility of being able to use the color sensors in both regular operation, and in synchronised mode, offers benefits regarding the speed of operation during use.

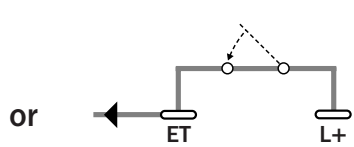
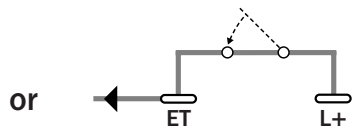
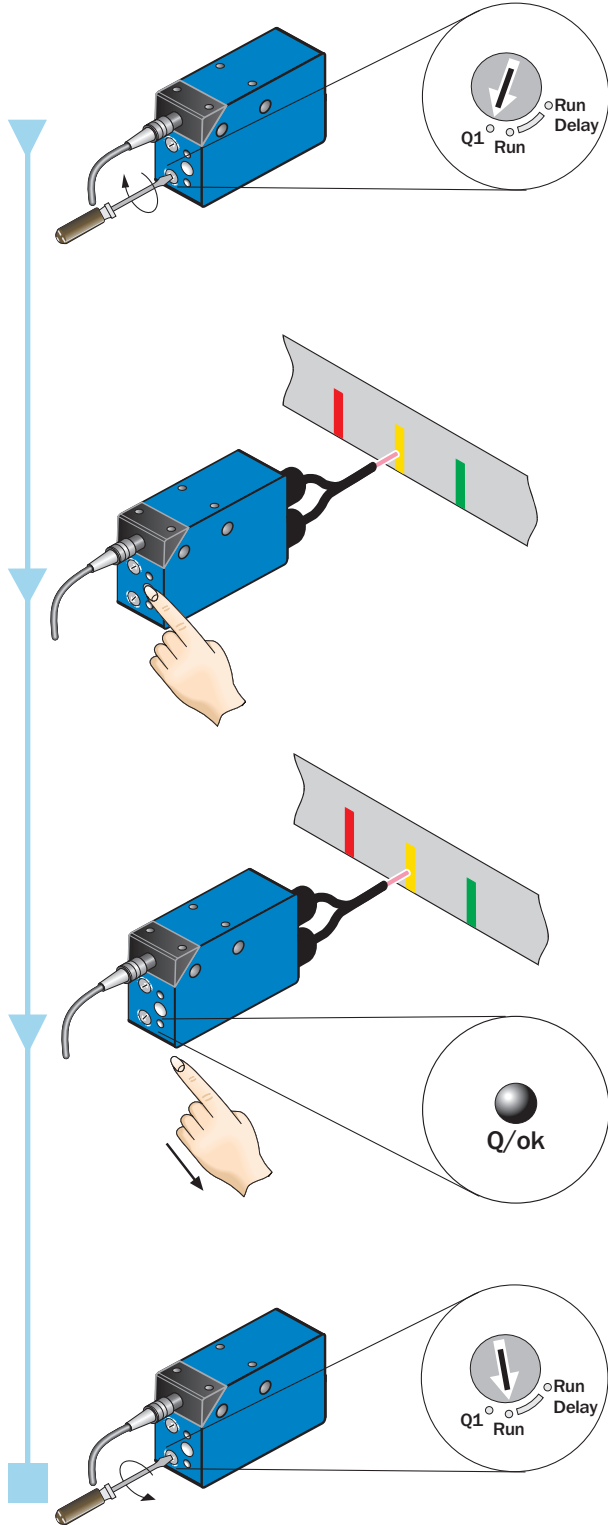
The switching frequency of 1 kHz, the scanning distances of optionally 12.5 or 60 mm, and scanning mode or reflector mode cover a broad field of applications for color detection.

**C**SL 1 – the fibre-optic mode has an advantage where restricted space and high temperatures are concerned.

In detecting, monitoring and sorting according to colors in automation technology there



Teach-in: Setting the switch threshold



Status

■ Upon successful Teach process the “Q/ok” indicator (yellow LED) illuminates.

Notes

- If the “Q/ok” indicator does not illuminate, then the intensity is too low. Increase the color tolerance of the selector switch. If the indicator flashes the intensity is too high (reflection/gloss). Reduce the color tolerance of the selector switch.
- After resetting the programme selector switch to “Run” or to “Run Delay” the sensor is ready to use.

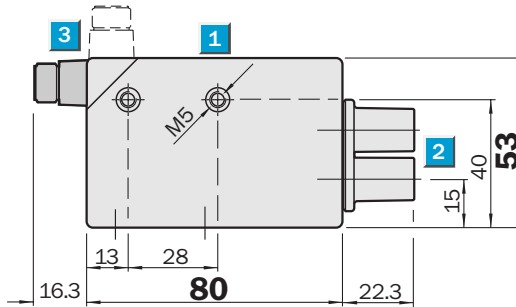
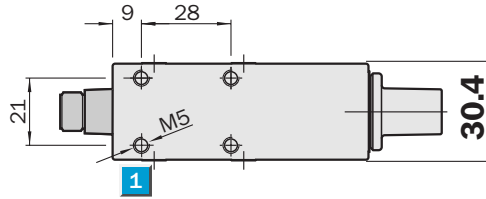


# CSL 1 Color sensors

	<b>Scanning distance</b> 0 ... 9 mm
<b>Color sensors scanning principle</b>	
	<b>Scanning distance</b> 0 ... 20 mm
<b>Color sensors through-beam principle</b>	

- Fibre optic cable connection
- Fibre optic cable for high temperatures
- Static Teach-in for objects via the control wire or the operating console
- Adjustable color selectivity
- Blanking input

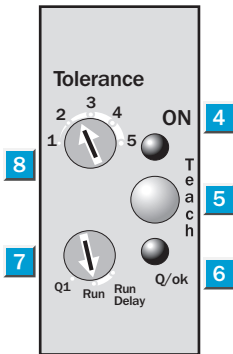
## Dimensional drawing



## Adjustments possible

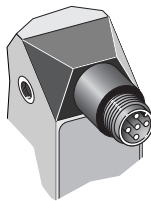
CSL 1-P 11
CSL 1-N 11

- 1 M5 threaded mounting hole, 5.5 mm deep
- 2 Centre of optical axis
- 3 5-pin, M12 plug (rotatable)
- 4 Operating indicator, green
- 5 Teach-in button
- 6 Function indicator output/teach-in (yellow)
- 7 Programme selector switch
- 8 Color tolerance selector switch

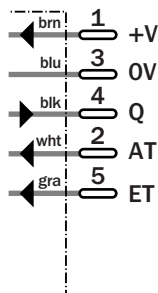


## Connection type

CSL 1-P 11
CSL 1-N 11



## M12, 5-pin



## See chapter Accessories

Cables and connectors
Reflectors
Fibre-optic cables

Technical data		CSL 1-	P 11	N 11										
<b>Scanning distance</b>	0 ... 9 mm													
<b>Scanning range</b>	0 ... 20 mm													
<b>Light source<sup>1)</sup>; light type</b>	LED; green, red, blue													
<b>Supply voltage V<sub>S</sub></b>	12 ... 30 V DC <sup>2)</sup>													
Ripple <sup>3)</sup>	< 5 V													
Current consumption <sup>4)</sup>	< 80 mA													
<b>Switching outputs</b>	PNP: HIGH = V <sub>S</sub> - < 2 V/LOW = 0 V													
	NPN: HIGH = V <sub>S</sub> /LOW = < 2 V													
Output current I <sub>A</sub> max.	100 mA													
Response time <sup>5)</sup> ; Switching frequency <sup>6)</sup>	< 700 μs; 1000/s													
<b>Time delay</b>	20 ms deactivation delay, adjustable													
<b>Teach-in-Eingang ET</b>	PNP: Teach > 12 V ... < V <sub>S</sub>													
	Run < 2 V or unswitched													
	NPN: Teach 0 V ... 12 V													
	Run V <sub>S</sub> or unswitched													
Pulse duration	ET > 0.5 ms													
<b>Blanking input AT</b>														
Blanked	PNP: > 12 V ... < V <sub>S</sub>													
Free running	< 2 V or unswitched													
Blanked	NPN: 0 V ... V <sub>S</sub>													
Free running	V <sub>S</sub> or unswitched													
Response time	< 0.2 ms													
<b>Connection type</b>	M12 plug, 5-pin													
<b>VDE protection class<sup>7)</sup></b>	□													
<b>Circuit protection<sup>8)</sup></b>	A, B, C													
<b>Enclosure rating</b>	IP 67													
<b>Ambient temperature T<sub>A</sub></b>	Operation -10 °C ... +55 °C													
	Storage -25 °C ... +70 °C													
<b>Shock load</b>	To IEC 68													
<b>Weight</b>	Approx. 400 g													
<b>Housing material</b>	Zinc die-cast housing													

<sup>1)</sup> Average service life 100,000 h at T<sub>A</sub> = +25 °C  
<sup>2)</sup> Limit values

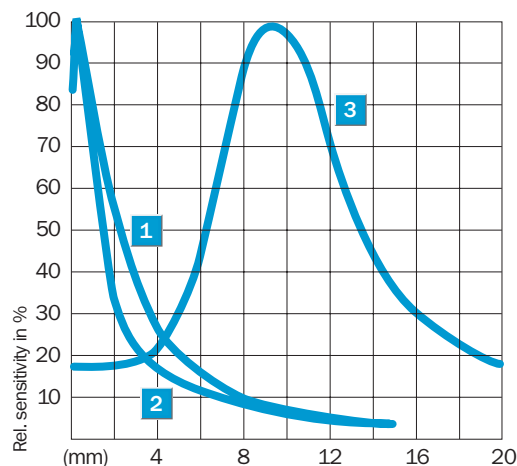
<sup>3)</sup> May not exceed or fall short of V<sub>S</sub> tolerances  
<sup>4)</sup> Without load

<sup>5)</sup> Signal transit time with resistive load  
<sup>6)</sup> With light/dark ratio 1:1  
<sup>7)</sup> Reference voltage 50 V DC

<sup>8)</sup> A = V<sub>S</sub> connections reverse-polarity protected  
 B = Outputs Q short-circuit protected  
 C = Interference pulse suppression

**Scanning distance**

- 1 Fibre-optic cable LBST 32900
- 2 Fibre-optic cable 32900
- 3 Fibre-optic cable OCSL



**Order information**

Type	Order no.
CSL 1-P 11	1 016 292
CSL 1-N 11	1 016 293



Color  
sensors

# Color sensors for the detection of a single color in restricted space conditions

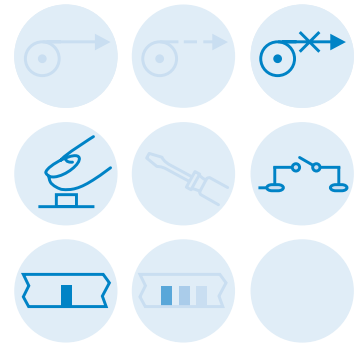


The choice of color tolerance is determined during the Teach procedure. The CSM offers the choice between “medium”, “fine” and “coarse” settings. Upon pressing the Teach-in button, the transmission light changes from “green” to “blue” and then to “red”. Depending upon which color of the Teach process is triggered, the corresponding color tolerance is automatically set. The simplicity of this procedure characterises the CSM.

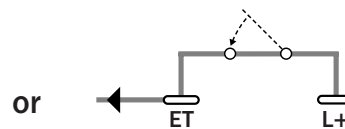
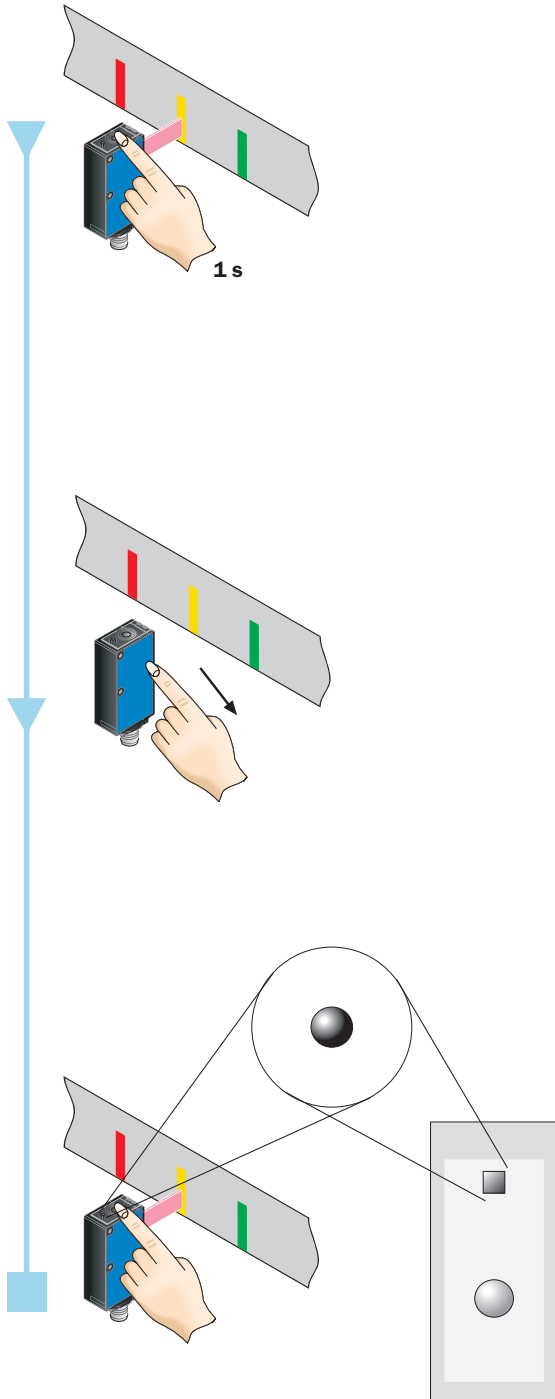
Even its switching frequency can be impressive: with 1.5 kHz it compares well to its “larger rivals”.

**D**ue to its compact design, the CSM can be used in the most confined of spaces.





Teach-in: Setting the switch threshold



Status

- Upon successfully completing the Teach process, the Receive indicator illuminates.

Notes

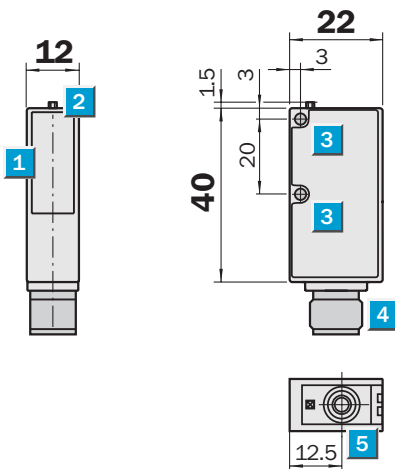
- If the Receive indicator and the red transmitting light flash, the Teach process was unsuccessful. Change the color tolerance.
- During Teach-in using the external control wire, the last color tolerance set by means of the operating console (manual operation) or the factory setting at “medium” is chosen.(i.e., setting of the color tolerance is only possible at the operating console.)
- Upon pressing the Teach-in button, the green transmitting led illuminates for 2 seconds. If in this time the Teach-in button is pressed, the Teach-in process is initiated and the “medium” color tolerance is selected. In the event that the button is not pressed the green light of the transmitting lamp will turn off and the blue light of the transmitting lamp will illuminate for approx. 1 second. If during this time the Teach-in button is pressed, the Teach process will be initiated with the selected color tolerance set to “fine”. If the Teach-in button is not pressed, the blue transmitting light will turn off and the red transmitting light will illuminate for 1 sec. In this time, the Teach-in process will be initiated with the selected color tolerance set to “coarse”.

**Scanning distance**  
12.5 mm

Color sensors scanning principle

- Color tolerance adjustable
- Static Teach-in for objects via means of the control wire or operating console
- Switching frequency 1500/s
- Plug M12

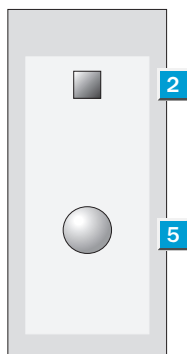
Dimensional drawing



Adjustments possible

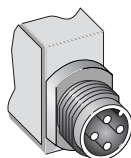
- CSM 1-P 1114
- CSM 1-N 1114

- 1 Centre of optical axis
- 2 Receive indicator
- 3 Mounting hole  $\varnothing$  3.2 mm
- 4 M12 plug, 4-pin
- 5 Teach-in button

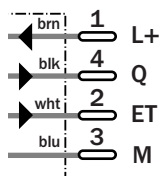


Connection type

- CSM 1-P 1114
- CSM 1-N 1114



4-pin, M12



See chapter Accessories

Cables and connectors

Technical data		CSM 1-	P 1114	N 1114							
<b>Scanning distance</b> , from front	12.5 mm										
edge of lens											
Color tolerance	± 2 mm										
<b>Light source<sup>4)</sup>; light type</b>	LED; green, red, blue										
Light spot dimension	1.5 x 6.5 mm										
<b>Supply voltage V<sub>S</sub></b>	24 V DC ±20 %										
Ripple <sup>2)</sup>	< 5 V <sub>SS</sub>										
Current consumption <sup>3)</sup>	< 35 mA										
<b>Switching outputs</b>	NPN: HIGH = V <sub>S</sub> /LOW = < 2 V										
	PNP: HIGH = V <sub>S</sub> - < 2 V/LOW = approx. 0 V										
Output current I <sub>A</sub> max.	100 mA										
Response time <sup>4)</sup>	500 μs										
Switching frequency <sup>5)</sup>	1500/s										
<b>Teach-in input ET</b>	PNP: Teach > 10 V ... < V <sub>S</sub>										
	NPN: Teach 0 V ... < 2 V										
<b>Connection type</b>	Plug M12, 4-pin										
<b>VDE protection class<sup>6)</sup></b>	□										
<b>Enclosure rating</b>	IP 67										
<b>Circuit protection<sup>7)</sup></b>	A, B, C										
<b>Ambient temperature T<sub>A</sub></b>	Operation -10 ... +55 °C										
	Storage -20 ... +75 °C										
<b>Shock load</b>	To IEC 68										
<b>Weight</b>	Approx. 11 g										
<b>Housing material</b>	ABS										

1) Average service life 100,000 h at T<sub>A</sub> = + 25 °C

2) May not exceed or fall short of V<sub>S</sub> tolerances  
3) Without load

4) Signal transit time with resistive load  
5) With light/dark ratio 1:1  
6) Reference voltage 50 V DC

7) A = V<sub>S</sub> connections reverse-polarity protected  
B = Output Q short-circuit protected  
C = Interference pulse suppression

Order information	
Type	Order no.
CSM 1-P 1114	1 022 569
CSM 1-N 1114	1 018 514