CRT 20B

Colour sensors

Part No. 50109619

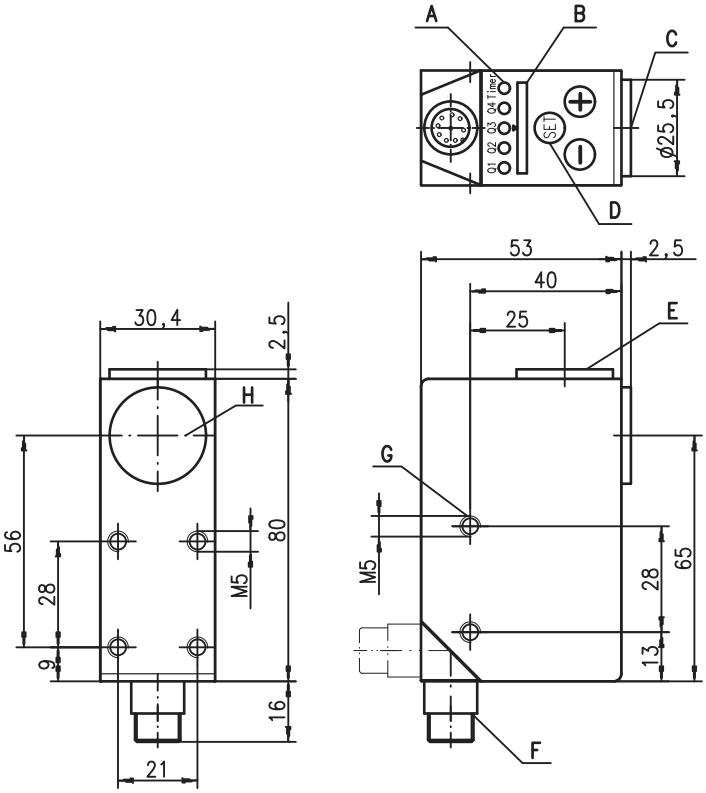
12.5mm
60mm

10 - 30 V DC

6 kHz

- Scanner for colour detection
- Very short response time ≥ 85µs for detection of fast or small objects and marks
- Direct indication of colour quality by means of bargraph display
- Simultaneous selection of up to 4 colours
- Teach-in via buttons or control line
- Temperature compensation for reproducible colour detection

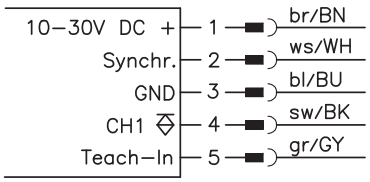
Dimensioned drawing



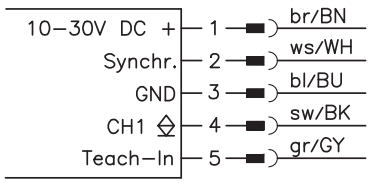
A Function indicator (yellow)
B Bargraph display (green), Power On = left LED
C Dimensioned drawing of the objective
D Teach-in button, '+' and '-' buttons
E Dummy screw fitting, interchangeable with **H**
F 90° turning connector
G Mounting thread M5 – 5.5mm deep
H Objective (light beam gate)

Electrical connection

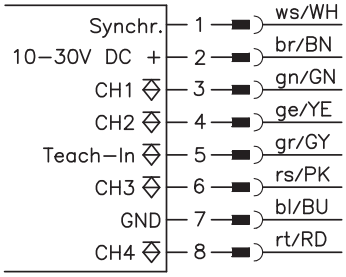
CRT 20B M/P...001-S12



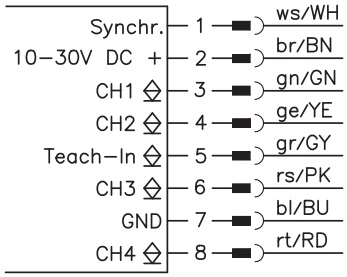
CRT 20B M/N...001-S12



CRT 20B M/P...004-S12



CRT 20B M/N...004-S12



IEC 60947...

IEC 60947...

IP 67

Accessories:

(available separately)

- Cable with M12 connector, 5-pin
- Cable with M12 connector, 8-pin
- Reflectors

Specifications

Optical data		**Objective 1**	**Objective 2**
Scanning range (see remarks)		12.5mm ± 3mm	60mm ± 9mm
Light spot dimensions (in scanning range)		4.0mmx2.0mm	13.0mmx13.0mm
Operating range with reflector [1]		100 … 250mm	250 … 1000mm
Light spot orientation		vertical	
Light source [2]		LEDs (red, green, blue)	
Wavelength		640nm, 525nm, 470nm	
Timing		**CRT 20B…-001**	**CRT 20B…-004**
Switching frequency [3]	adjustable:	1kHz, 3kHz, 6kHz	0.5kHz, 1kHz, 3.5kHz
Response time [3]	adjustable:	500µs, 160µs, 85µs	1ms, 500µs, 145µs
Delay before start-up		≤ 500ms	
Storage time		25ms, non-volatile storage	
Electrical data			
Operating voltage U_B		10 … 30VDC (incl. residual ripple)	
Residual ripple [4]		≤ 15% of U_B	
Switching output		1x PNP / 1x NPN (for one colour assignment)	4x PNP / 4x NPN (for four colour assignments)
Function characteristics		light/dark switching for all outputs	
Signal voltage high/low		PNP: ≥ (U_B-2V)/0V NPN: U_B/≤ 2V	
Output current		max. 120mA per output	
Open-circuit current		≤ 80mA	
Indicators			
Q LED(s) - yellow		Q: object 1 detected	Q1-Q4: object 1-4 detected
Timer LED - yellow		timer activated	
Bargraph display LEDs - green		left LED = Power On remaining LEDs = colour value display	
Mechanical data			
Housing		diecast zinc	
Optics cover		glass	
Weight		approx. 400g	
Connection type		M12 connector, 5-pin	M12 connector, 8-pin
Environmental data			
Ambient temp. (operation/storage)		-10°C … +55°C/-25°C … +75°C	
Protection class		IP 67	
LED class		1 (acc. to EN 60825-1)	
VDE safety class [5]		II, all-insulated	
Protective circuit [6]		2, 3	
Standards applied		IEC 60947-5-2	
Certifications		UL 508 [7]	
Options			
Teach-in input			
PNP: Teach-in / Run		> 10V … ≤ U_B / 0V or not connected	
NPN: Teach-in / Run		≤ 2V / U_B or not connected	
Teach duration		> 2ms	
Synchronous input			
PNP: Stop/Start measurement		> 10V … ≤ U_B / 0V or not connected	
NPN: Stop/Start measurement		≤ 2V / U_B or not connected	
Synchronisation delay		> 0,2ms	
Pulse stretching [8]		20ms, can be switched on	

1) With reflector TKS 100x100
2) Average life expectancy 100,000h at an ambient temperature of 25°C
3) With light-dark ratio 1:1
4) Must lie within U_B ± tolerance
5) Rating voltage 50VDC
6) 2=polarity reversal protection, 3=short-circuit protection for all outputs
7) For UL applications: for use in class 2 circuits according to NEC only
8) Relative to object

Order guide

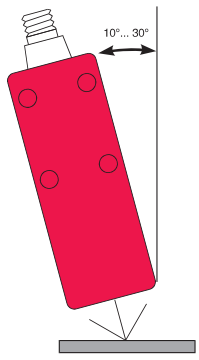
See section **Preferred types**

Tables

Diagrams

Remarks

- **Approved purpose**:
  The CRT 20B colour sensors are optoelectronic sensors and are used for optical, contactless detection of coloured objects with incident light (scanner operation) and transmitted light (reflector operation). A reflector is necessary for operation in transmitted light.
- With shiny objects, the sensor is to be mounted at an angle of approx. 10 … 30° to the object surface.



Function principle of the colour sensor

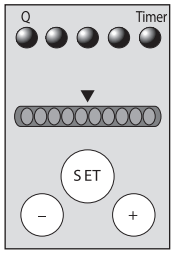
Many sensors are capable of differentiating between light and dark or matt and shiny. As soon as colour is to serve as a distinguishing criterion, however, normal sensors are quickly pushed to their limits.
As a result, colour sensors are of increasing importance in industrial automation.
The applications range from sorting coloured objects to the detection or inspection of coloured surfaces. Materials such as powders, granulates, fluids as well as metals, glasses, papers, plastics and textiles can be reliably detected in this way.

Simple operation makes it possible to teach-in the reference colour and to adjust the tolerance range.

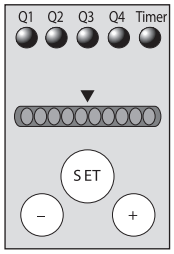
During operation, the colour sensor compares the taught-in colour with the measured colour. If the values lie within the set tolerance range, the sensor passes on the match to the controller via a switching output.

Controls and indicators

CRT 20B…001



CRT 20B…004



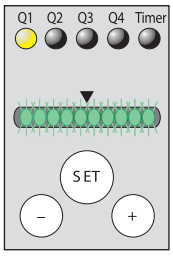
Function indicator LEDs Q/timer (yellow)

Bargraph display (green), Power On = left LED on

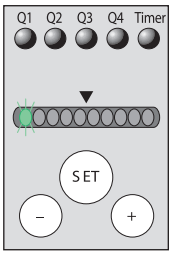
Teach-in button (SET), "+" and "-" buttons

Operation

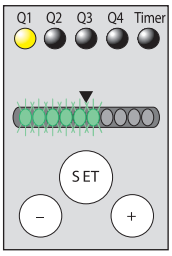
During operation, the bargraph display indicates the colour quality, i.e. the degree of matching with the taught colour (with the CRT 20B…004 according to the selected colour channel, see Special settings). If above or below the arrow, the switching output changes its state.



Full match
Colour detected
Switching output active



No match
Colour not detected
Switching output not active



Tolerance edge
Colour detected
Switching output active

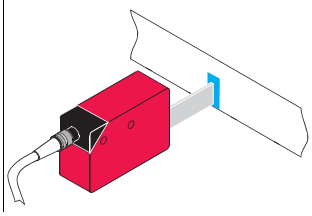
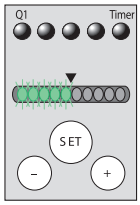
The colour tolerance can be readjusted during operation:

- To do this, press the "+" button and release after > 1 s.
- Then use "+" or "-" to adjust the tolerance
- Confirm with "SET"

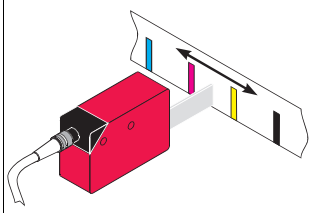
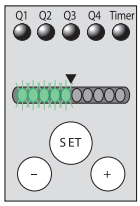
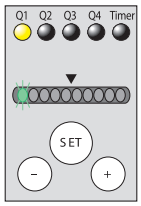
This function can be switched on and off in the special settings (see "Tolerance adjustable during operation"). With the CRT 20B…004, the tolerance refers to the selected channel (see "Quality indicator during operation" under Special settings).

Teach-in of the switching threshold

With the CRT 20B…001:

Position colour	Press SET > 1 s and release	Adjust tolerance with "+" or "-"	Briefly press SET to confirm
	 > 1 s		

With the CRT 20B…004:

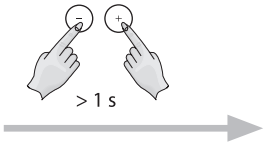
Position colour	Press SET > 1 s and release	Adjust tolerance with "+" or "-"	Briefly press SET to confirm	Select channel with "+" or "-"	Briefly press SET to confirm
	 > 1 s				

The teach event must be repeated for each colour that is to be taught. Each colour must be assigned its own channel (Q1-Q4).

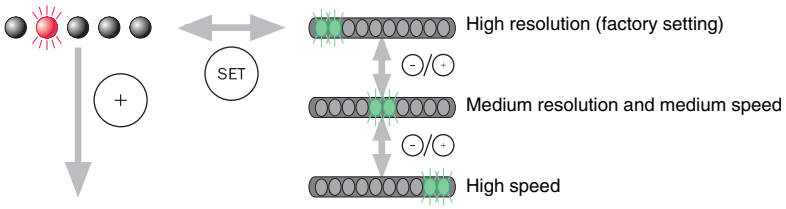
Alternatively, the teach-in can also be performed via the teach line. The tolerance setting is not performed in this case. With the CRT 20B…004, only channel Q1 is set via the line teach.

Special settings

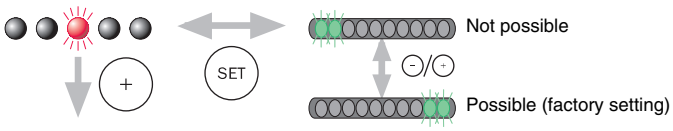
- Simultaneously press the "+" and "-" buttons > 1 s to enter and exit. Active special settings are indicated by flashing of one or more of the Q-LEDs.
- Use "+" or "-" to navigate / make settings
- Use "SET" to select / confirm
- Simultaneously press the "+" and "-" buttons > 5 s to reset to factory settings.



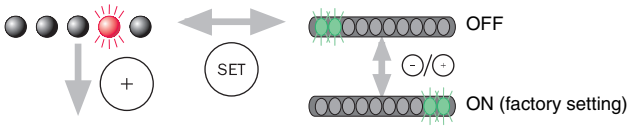
Operating mode



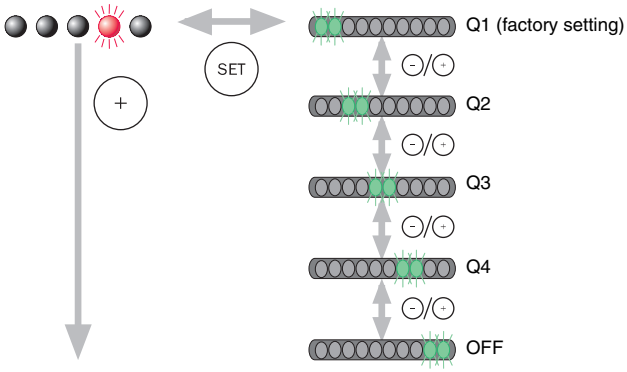
Tolerance adjustable during operation



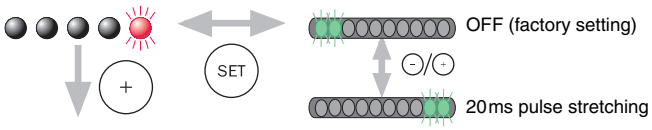
Quality indicator during operation (CRT 20B…001)



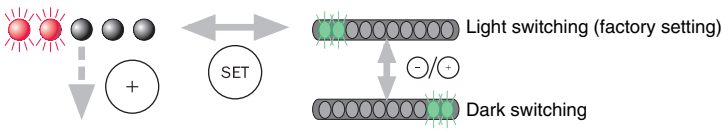
Quality indicator during operation (CRT 20B…004)

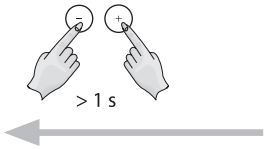


Switching delay



Output logic





Preferred types

Selection table Equipment ↓	Order code →	CRT 20B M/N-12-001-S12 Part No. 501 09594	CRT 20B M/N-60-001-S12 Part No. 501 09595	CRT 20B M/P-12-001-S12 Part No. 501 09596	CRT 20B M/P-60-001-S12 Part No. 501 09597	CRT 20B M/N-12-004-S12 Part No. 501 09598	CRT 20B M/N-60-004-S12 Part No. 501 09599	CRT 20B M/P-12-004-S12 Part No. 501 09600	CRT 20B M/P-60-004-S12 Part No. 501 09601
Scanning range	12,5mm	●		●		●		●	
	60mm		●		●		●		●
Light spot size	4mm x 2mm	●		●		●		●	
	13mm x 13mm		●		●		●		●
Light spot orientation	vertical	●	●	●	●	●	●	●	●
	horizontal								
Optical outlet	front								
	head	●	●	●	●	●	●	●	●
Switching output	1x PNP			●	●				
	1x NPN	●	●						
	4x PNP							●	●
	4x NPN					●	●		
M12 connector	5-pin	●	●	●	●				
	8-pin					●	●	●	●
Adjustment	Teach-in via control buttons	●	●	●	●	●	●	●	●
	Teach-in via line	●	●	●	●	●	●	●	●
Options	synchronisation via line	●	●	●	●	●	●	●	●
	20ms pulse stretching	●	●	●	●	●	●	●	●
	light/dark switching for all outputs	●	●	●	●	●	●	●	●

Additional types on request