



More Precision

colorSENSOR // True Color Measuring Systems





ΔE	Repeatability in color $\Delta E \leq 0.3$
Hz	Measuring rate up to 30 kHz
INTERFACE	Interfaces: Ethernet / Modbus / RS232 / USB
	Color memory for 320 colors in 254 color groups
	Configurable via web interface or function keys
	High light output >220 lm
	Multi-teach feature
	Also suitable for color control of self-luminous objects

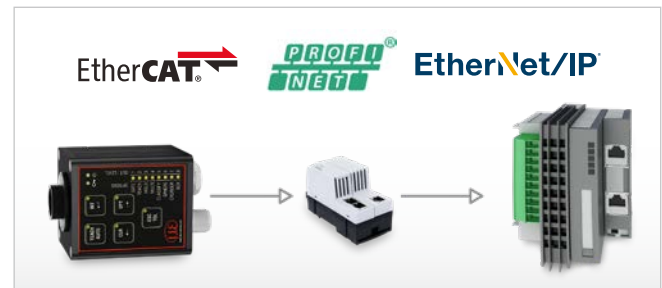
The color**SENSOR** CFO200 is a high-performance controller for precise color recognition in industrial measurement tasks. The controller is distinguished by high color accuracy, state-of-the-art interfaces and intuitive operation.

Using a modulated high-power white light LED, a white light spot is projected via the fiber optics onto the surface to be detected. Part of the light that is back scattered from the target is directed onto a perceptive True Color detector via the same fiber optics, separated into long-, medium- and short-wave light components (X=long, Y=medium, Z=short) and transformed into L*a*b* color values.

The intuitive web interface allows easy teach-in of 254 color groups with 320 colors in total. Multi-teach can alternatively be done via the keys. One function alone adapts the illumination, averaging and signal amplification to the current measurement situation. Furthermore, tolerance models and tolerance values can be adjusted individually.

If the sensor recognizes one of the taught colors, the switching state changes via 8 digital outputs. Using the binary output switching ensures reliable test performance in the face of a discontinuity while providing output of up to 254 color groups.

The CFO controller is also suitable for detecting the color of self-luminous objects. For this purpose, the internal illumination can optionally be deactivated via the software.



Ideal for integration in modern environments

The CFO200 can be connected via Ethernet, Modbus, RS232 and USB.

Via an additional interface module, PROFINET, Ethernet/IP and EtherCAT are available.



Recognition of anti-reflection coating on lenses

Optical surfaces of many lenses have an anti-reflection coating which should reduce surface reflections. These anti-reflective layers must be applied evenly; otherwise undesired color gradients may occur which might impair the function of the lens. In order to inspect the visual color impression (green-blue for highly sophisticated coatings) and the coating quality, CFO200 color sensors are used. The standard sensors detect the color reflection of the lenses. Due to its high resolution, the CFO200 detects even the slightest of color variations reliably.

Model	CFO200	CFO200(100)
Part number	10234671	10234671.100
No. of measurement channels	1	
Repeatability ¹⁾	$\Delta E \leq 0.3$	
Color distance	$\Delta E \leq 0.6$	
Spectral range	400 ... 680 nm	
Color spaces	XYZ, xyY, L*a*b*, L*u*v*, u'v'L	
Illuminants	D65	
Standard observer	2°	
Tolerance model	Classification; sphere (ΔE); cylinder (ΔL , Δa , Δb); box (ΔL , Δa , Δb)	
Color memory	max. 320 colors in non-volatile EEPROM with parameter sets	
Measuring rate	standard 1 kHz; max. 30 kHz (depending on number of colors learned and setting for averaging)	
Temperature stability	< 0.1 % FSO / K	
Light source	white light LED (425 ... 750 nm); AC operation (luminous flux at 1 kHz 220 lm) (adjustable or OFF for primary light source, switchable via software)	
Permissible ambient light	max. 40,000 lx (depending the CFS sensor)	
Synchronization	Possibility of synchronization is given	
Supply voltage	18 ... 28 VDC	
Max. current consumption	500 mA	
Signal input	4 (IN0 - IN3): IN0 via keys; IN0 - IN3 configurable via web interface (trigger, teach, delete, lock, calibration)	
Digital interface	RS232 (standard 9600 kBaud) ²⁾ , Ethernet, USB	Ethernet, Modbus (TCP/RTU), USB, PROFINET ³⁾ , EtherNet/IP ³⁾ , EtherCAT ³⁾
Switching output	OUT0 - OUT7 Push-Pull / NPN / PNP (color recognition, binary coding 254 color groups)	
Connection	optical	screwable optical fiber via FA socket M18x1, length 0.3 m ... 2.4 m, min. bending radius 18 mm
	electrical	8-pin flange socket M12A (Power/PLC); 8-pin flange socket M12A (signal); 4-pin flange socket M12D (Ethernet DHC capable); 5-pin flange socket M12A (USB) (connection cable see accessories)
Mounting	DIN rail mounting/screw connection via adapter (see accessories)	
Temperature range	Storage	-10 ... +85 °C
	Operation	-10 ... +55 °C
Humidity	20 ... 80 % r. H. (non-condensing)	
Shock (DIN-EN 60068-2-27)	15 g / 6 ms in 3 axes, 2 directions and 1000 shocks each	
Vibration (DIN EN 60068-2-6)	2 g / 10 ... 500 Hz in 3 axes, 10 cycles each	
Protection class (DIN-EN 60529)	IP65 (when connected)	
Material	Aluminum, black anodized	
Weight	approx. 200 g	
Compatibility	with all CFS sensors ⁴⁾	
Control and display elements	Operation via keys and web interface, visualization with 13 white LEDs	
Features	Multi-color teach function, automatic adjustment of illumination brightness, measurement signal amplification and averaging depending on the measurement frequency, adjustable hold time of > 30 μ s	

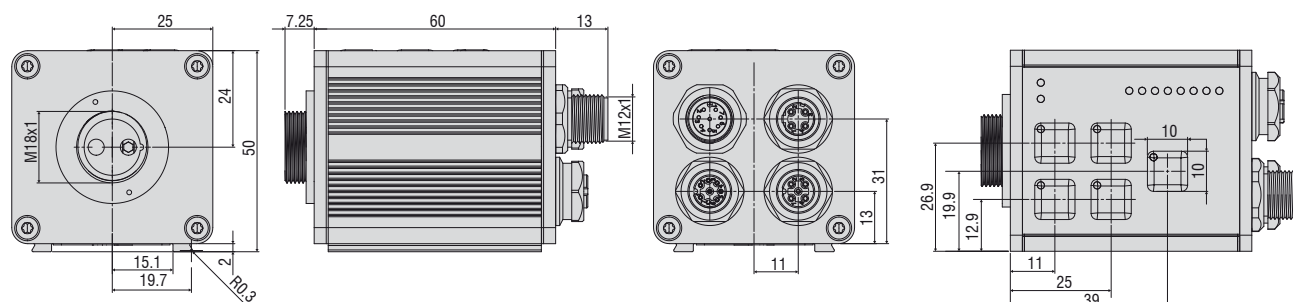
FSO = Full Scale Output

¹⁾ Maximum color distance ΔE of 1000 successive measurements of the color value of a red and a dark gray reference tile (R = 5%), measured with the CFS4-A20 sensor at 1000 Hz and brightness adjustment with a white standard (R = 95%)

²⁾ Adjustable up to max. 115200 kBaud

³⁾ Optional connection via interface module

⁴⁾ Also compatible with previous series (FAR, FAD, FAL, FAZ and FAS)



Dimensions:

Dimensions in mm, not to scale

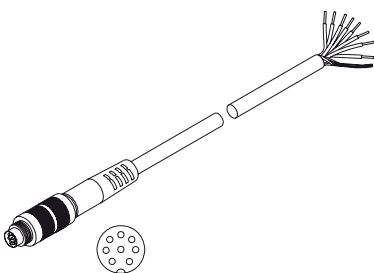
Connection cables		Mounting	Sensor	Accessories		
Supply/RS232 Power supply unit PS2031 Art. no. 2420096 Connection PLC (I/O)	Art. no. 11234717 (2 m) 11234718 (5 m)		CSF1 CSF2 CSF3 CSF4	White standard Art. no. 11234694 11234695		
Digital output/ Ethernet	Art. no. 11234735 (2 m) 11234736 (5 m)					
Connection PLC (I/O)	Art. no. 11234722 (2 m) 11234723 (5 m)					C-mount lens Art. no. 11293186 and others
Process interfaces (USB)	Art. no. 11234732 (2 m) 11234733 (5 m)					


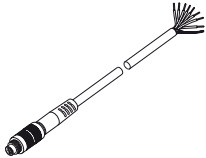
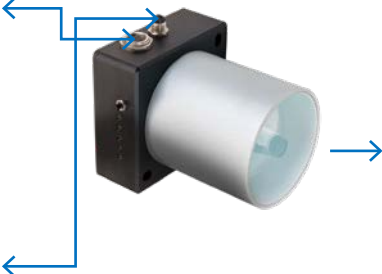


Pin assignment

CAB-M12-8P-co-fm-straight; Xm-PUR; open ends
 (Art.-No.: 11234717; 11234718)

Connection cable SYS; Power and PLC
 (max. length 10 m, PUR sheath)

Pin	Color	CFO100/200
1	white	INO
2	brown	+UB
3	green	TX
4	yellow	RX
5	gray	OUT0
6	pink	OUT1
7	blue	GND
8	red	OUT2



Connection cables		Mounting	Sensor	Accessories
Supply/PLC Power supply unit PS2031 Art. no. 2420096 	Art. no. 11234091 (2 m) 11234099 (5 m) 	 Screw connection via integrated bore holes	No separate sensor or cable - integrated in sensor head	White standard Art. no. 11234694 11234695 
Digital output/ serial/Ethernet 	RS232 Art. no. 11234095 (2 m) 11234103 (5 m) USB Art. no. 11234096 (2 m) 11234104 (5 m) Ethernet Art. no. 11234910+11234735 (2.5 m) 11234910+11234736 (5.5 m)			

Pin assignment

CAB-M9-8P-co-straight; Xm-PUR; open ends
 (Art.-No.: 11234091; 11234098)
 Connection cable to power/PLC or digital I/O
 (max. length 10 m, PUR sheath)

Pin	Color	OT-3-LD
1	white	GND (0V)
2	brown	+24 VDC ($\pm 10\%$)
3	green	IN0
4	yellow	OUT0
5	gray	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

