MICRO-EPSILON

More Precision

colorSENSOR // True Color Measuring Systems

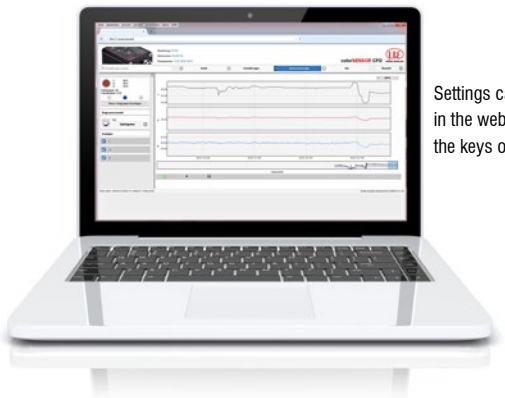
- ΔE — Repeatability in color ΔE ≤ 0.5
- Hz — Measuring rate max. 10 kHz
- INTER FACE — Interfaces: Ethernet / RS232
- Color memory for 256 colors in 6 color groups
- Configurable via web interface or function keys
- High light output >130 lm
- Multi-teach feature

The colorSENSOR CFO100 is a powerful 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.

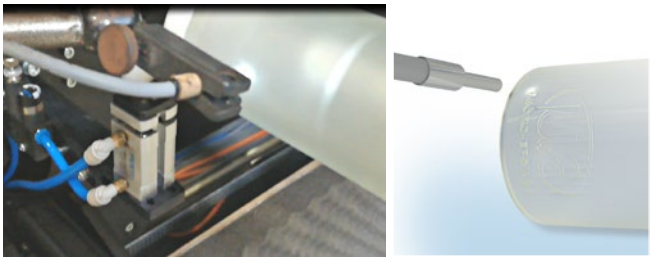
Using a modulated high-power white light LED, a white light spot is projected via the fiber optics onto the surface of the measuring object. Part of the light that is back scattered from the target is directed onto a perceptive True Color detector via the same fiber optics, separated into long-, medium- 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 6 color groups with up to 256 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 three digital outputs. Using the binary output switching ensures reliable test performance in the face of a discontinuity while providing output of up to 6 color groups.



Settings can also be made in the web interface or via the keys on the controller.



Marking detection on cosmetics bottles

When automatically printing on semi-transparent glass ceramic bottles, it is necessary to determine the exact position for the printing. Therefore, a reference mark for printing is embossed into the bottles. The embossing causes a slight color difference compared to the rest of the bottle surface. This color deviation is detected by the CFO100. This determines the position for the print that is applied below the embossing. If the marking is missing, the bottle is considered as faulty and will be rejected immediately. Therefore at the same time, a good / bad evaluation can be carried out as part of a quality control.

Model		CFO100	CFO100(100)
Part number		10234670	10234670.100
No. of measurement channels		1	
Repeatability [1]		ΔE ≤ 0.5	
Color distance		ΔE ≤ 1.0	
Spectral range		400 ... 680 nm	
Color spaces		XYZ, xyY, L*a*b*, L*u*v*, u'v'L	
Illuminants		D65	
Standard observer		10°	
Tolerance model		Classification; sphere (ΔE); cylinder (ΔL, Δab); box (ΔL, Δa, Δb)	
Color memory		max. 256 colors in non-volatile EEPROM with parameter sets	
Measuring rate		max. 10 kHz, standard 1 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 130 lm) (adjustable or OFF for primary light source, switchable via software)	
Permissible ambient light		max. 40,000 lx (depending on the CFS sensor)	
Synchronization		Possibility of synchronization is given	
Supply voltage		18 ... 28 VDC	
Max. current consumption		500 mA	
Signal input		1 (IN0), configurable via keys or web interface (trigger, teach, delete, lock, calibration)	
Digital interface		RS232 (standard 19200 Baud) [2], Ethernet	Ethernet, Modbus (TCP/RTU), PROFINET [3], EtherNet/IP [3], EtherCAT [3]
Switching output		OUT0 - OUT2 Push-Pull / NPN / PNP (color recognition, binary coding 6 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 connector M12A (Power/PLC); 4-pin flange socket M12D (PC/Ethernet DHCP-capable); (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 µs	

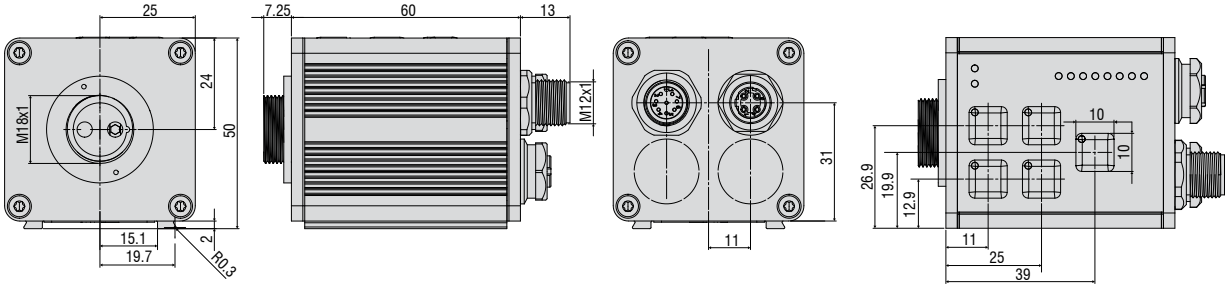
FSO = Full Scale Output

[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 Baud

[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

- ΔE — Repeatability in color ΔE ≤ 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

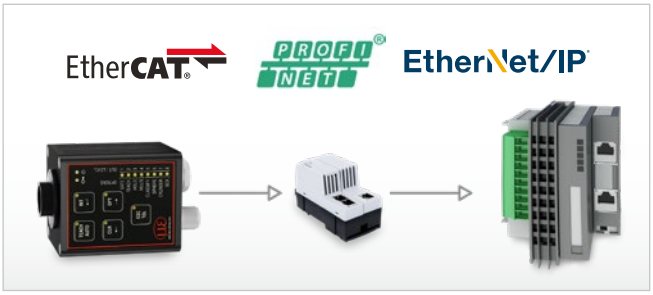
The colorSENSOR CFO200 is a high-performance controller for precise color recognition in industrial measurement tasks. The controller is distinguished by high color accuracy, state-of-the-art interfaces and intuitive operation.

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
Part number		10234671
No. of measurement channels		1
Repeatability [1]		ΔE ≤ 0.3
Color distance		ΔE ≤ 0.6
Spectral range		400 ... 680 nm
Color spaces		XYZ, xyY, L*a*b*, L*u*v*, u'v'L
Illuminants		D65
Standard observer		10°
Tolerance model		Classification; sphere (ΔE); cylinder (ΔL, Δab); 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 19200 Baud) [2], Ethernet, USB
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 [3]
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 µs

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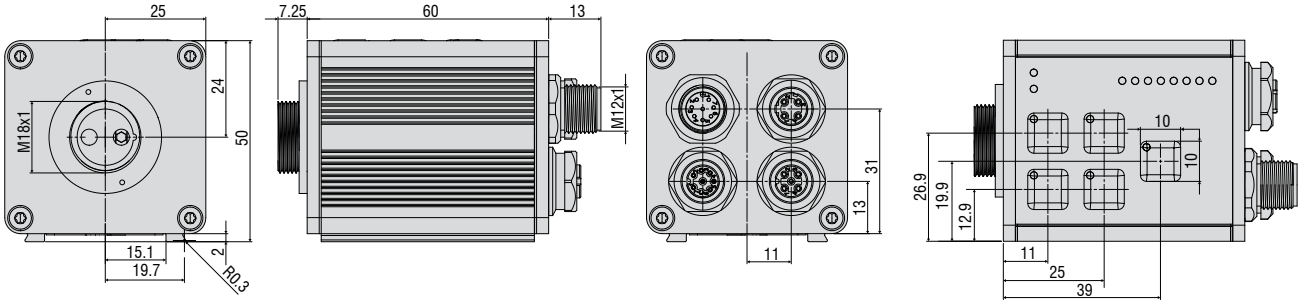
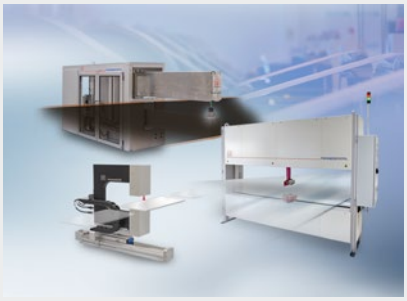


Dimensions:
Dimensions in mm, not to scale

Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

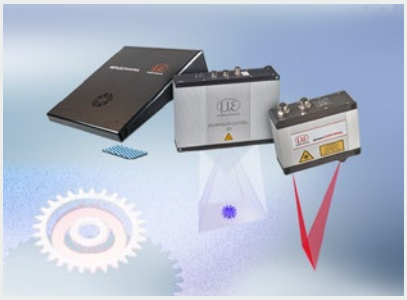
Sensors and measurement devices for non-contact temperature measurement



Measuring and inspection systems for metal strips, plastics and rubber

Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection

Modifications reserved / Y9766371-F102016GKE

MICRO-EPSILON

MICRO-EPSILON USA
8120 Brownleigh Dr. · Raleigh, NC 27617 / USA
Phone +1/919/787-9707 · Fax +1/919/787-9706
me-usa@micro-epsilon.com · **www.micro-epsilon.com**