



More Precision

colorSENSOR // True Color Measuring Systems





| | |
|------------|---|
| ΔE | Repeatability in color $\Delta E \leq 0.5$ |
| Hz | Measuring rate max. 10 kHz |
| INTERFACE | 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.

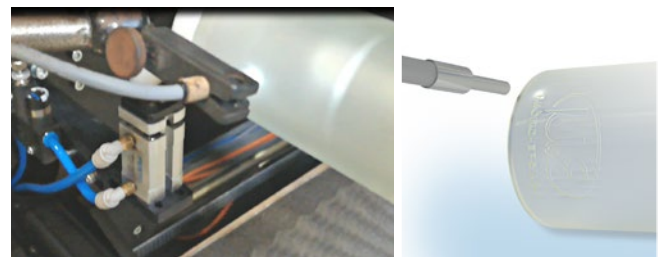
Using a modulated high-power white light LED, a white light spot is projected via the fiber optics onto the surface of the measuring object. Part of the light that is back scattered from the target is directed onto a perceptive True Color detector via the same fiber optics, separated into long-, medium- 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⁾ | $\Delta E \leq 0.5$ | |
| Color distance | $\Delta E \leq 1.0$ | |
| 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. 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 μ s | |

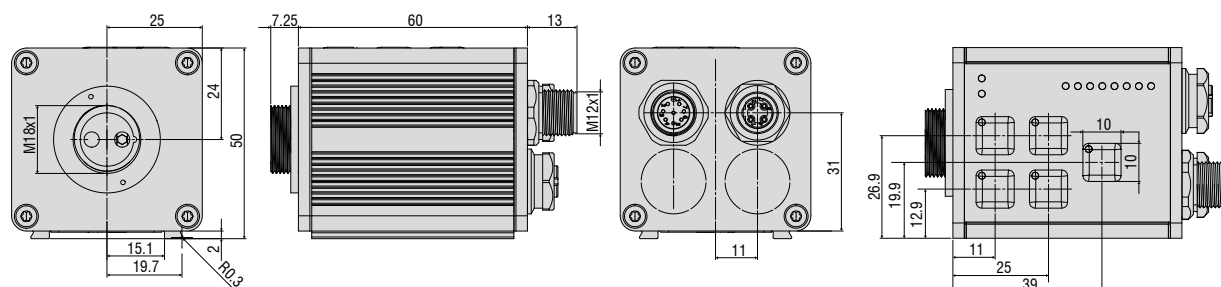
FSO = Full Scale Output

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 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 $\Delta E \leq 0.3$ |
|  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 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 | 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 , $\Delta a b$); 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 | 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⁾ | |
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| 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 | |

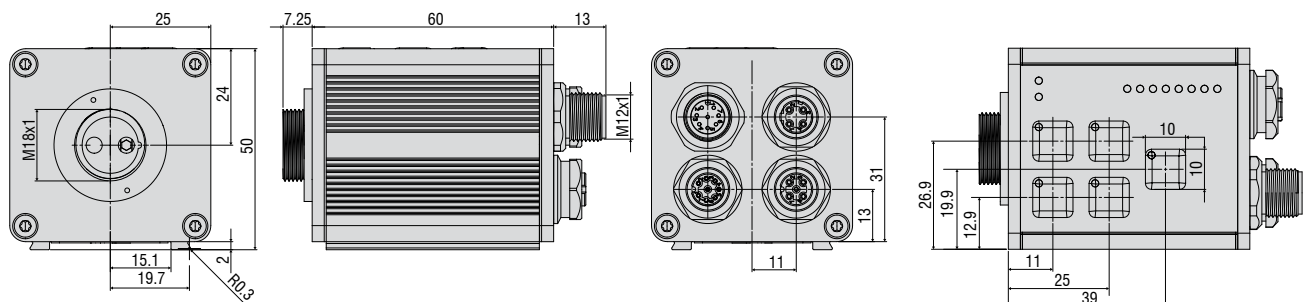
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⁴⁾ Also compatible with previous series (FAR, FAD, FAL, FAZ and FAS)



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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

