MICRO-EPSILON

# More Precision

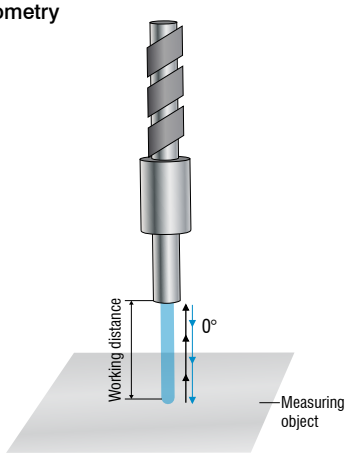
## colorSENSOR // True Color Measuring Systems

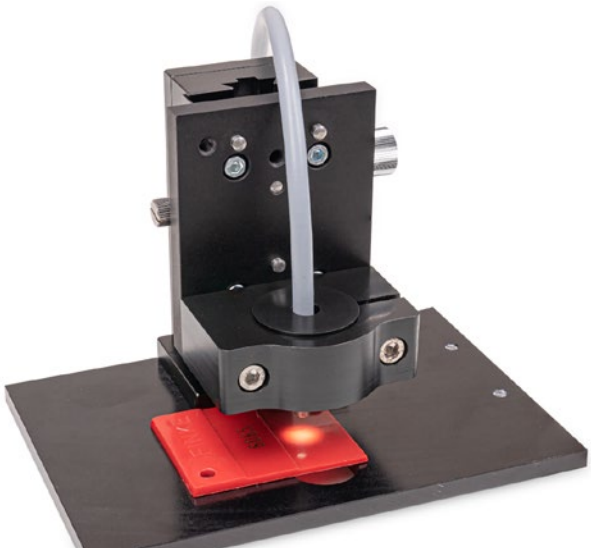

With the reflex sensor, the light emitted by the controller is sent at 0° (parallel) to the surface of the part to be tested. Both diffuse and directly reflected portions are present in the back reflex (surface color + surface gloss). The reflected light components of the sample are also detected by the sensor at 0° (parallel) to the surface and transmitted to the controller via an optical fiber. The sensors are available for different working distances and spot sizes. Other versions in other lengths or temperature ranges are optionally available.

The reflex sensor, combined with the performance of the CFO series, provides even more precise differentiation of the surface characteristics of materials. The measurement arrangement in the reflex sensor of transmitter and receiver in 0°:0° allows a quality control not only by color but also in combination with the reflection properties of the surfaces of the product. This is needed, for example, when sorting different materials such as stainless steel, steel, tin, zinc, aluminum, brass, gold or other colored parts.

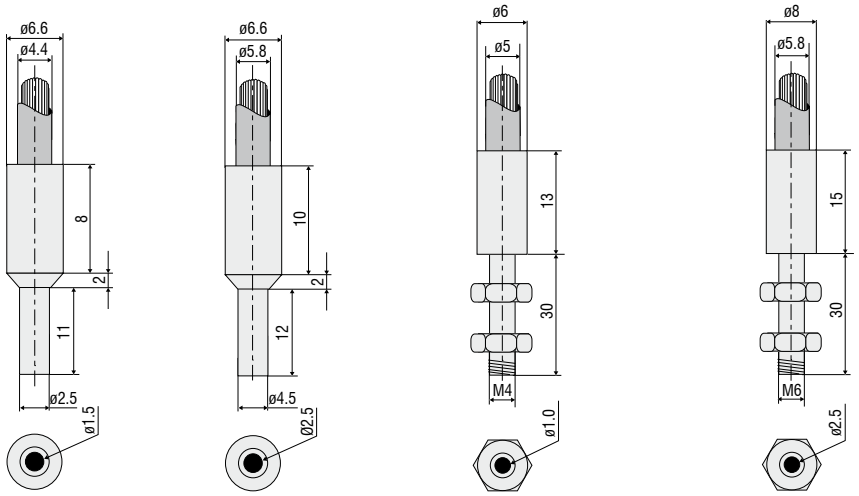
Due to the standard FA connection, the optical fiber is also compatible with other controllers (previous series such as LT or WLCS). The reflex sensor offers many advantages in terms of performance and installation possibilities. Due to the external controller, less installation space is required at the measuring point.

**Measurement geometry**
Reflex sensor 0°:0°



The CFS4 sensors are suitable for color measurements of numerous surfaces such as plastics or metal.




| Model | | CFS4-A11 | CFS4-A20 | CFS4-C10 | CFS4-C20 |
|---|---|---|---|---|---|
| Part number | | 10810487 | 10810351 | 10810383 | 10810568 |
| Type of sensor | | Reflex sensor | | | |
| Working distance [1] | Start | 5 mm | 5 mm | 5 mm | 5 mm |
| | Optimal | 5 mm | 5 mm | 5 mm | 5 mm |
| | End | 15 mm | 20 mm | 15 mm | 20 mm |
| Measurement spot diameter [1] | Start | 8 mm | 10 mm | 8 mm | 10 mm |
| | Optimal | 8 mm | 10 mm | 8 mm | 10 mm |
| | End | 22 mm | 28 mm | 20 mm | 28 mm |
| Light spot diameter [1] | Start | 10 mm | 12 mm | 8 mm | 12 mm |
| | Optimal | 10 mm | 12 mm | 8 mm | 12 mm |
| | End | 24 mm | 30 mm | 26 mm | 30 mm |
| Repeatability in rotation [1] [2] [4] | | ΔE ≤ 1.2 | ΔE ≤ 0.6 | ΔE ≤ 1.8 | ΔE ≤ 0.6 |
| Measurement geometry | | 0°:0° | | | |
| Min. target size (flat) | | Ø 8 mm | Ø 10 mm | Ø 8 mm | Ø 10 mm |
| Minimum curvature radius of target (curved) | | 80 mm | 100 mm | 80 mm | 100 mm |
| Sensitivity | Distance [1] [4] | < 13.3 ΔE / mm | < 10.4 ΔE / mm | < 13.0 ΔE / mm | < 10.4 ΔE / mm |
| | Tilt angle [1] [4] | < 0.3 ΔE / ° | | | |
| | Ambient light [1] [4] | < 0.3 ΔE / 1,000 lx | | | |
| Permissible ambient light [1] [4] | | < 40,000 lx | | < 16,000 lx | < 40,000 lx |
| Max. tilt angle [1] [4] | | ±45° | | | |
| Connection | | integrated fiber-optic cable (axial) with metal-silicone (T) sheath, standard length 1.2 m; other lengths 0.3 m ... 2.4 m optionally available | | integrated fiber-optic cable (axial) with metal (M) sheath, standard length 1.2 m; other lengths 0.3 m ... 2.4 m optionally available | integrated fiber-optic cable (axial) with metal-silicone (T) sheath, standard length 1.2 m; other lengths 0.3 m ... 2.4 m optionally available |
| Mounting | | FA (M18x1) | | | |
| Temperature range | Storage / operation | Sensor head: -10 … +80 °C; Cable: -60 … +180 °C | | Sensor head: -10 … +80 °C Cable: -40 … +300 °C | Sensor head: -10 … +80 °C Cable: -60 … +180 °C |
| Humidity | | 20 … 80 % r.H. (non-condensing) | | 20 … 60 % r.H. (non-condensing) | 20 … 80 % r.H. (non-condensing) |
| Protection class (DIN EN 60529) | | IP64 | | IP40 | IP64 |
| Material | | Stainless steel, glass fiber bundle with metal-silicone sheath (T) | | Stainless steel, glass fiber bundle with metal sheath (M) | Stainless steel, glass fiber bundle with metal-silicone sheath (T) |
| Weight | | 50 g | 90 g | 60 g | 100 g |
| Compatibility | | CFO controller (LT, WLCS, FES) | | | |
| Features | | All variants are also available with different cable sheath, length 0.3 ... 2.4 m, vibration protection, IP protection, suitable for drag chains and for temperature ranges up to 2,000 °C. In combination with a pressure-tight feed-through, a stainless steel sheath and T250° bonding, vacuum applications down to 10-5 mbar are also possible. | | | |

The specified data apply to a white, diffuse reflecting surface (zenith white reference)

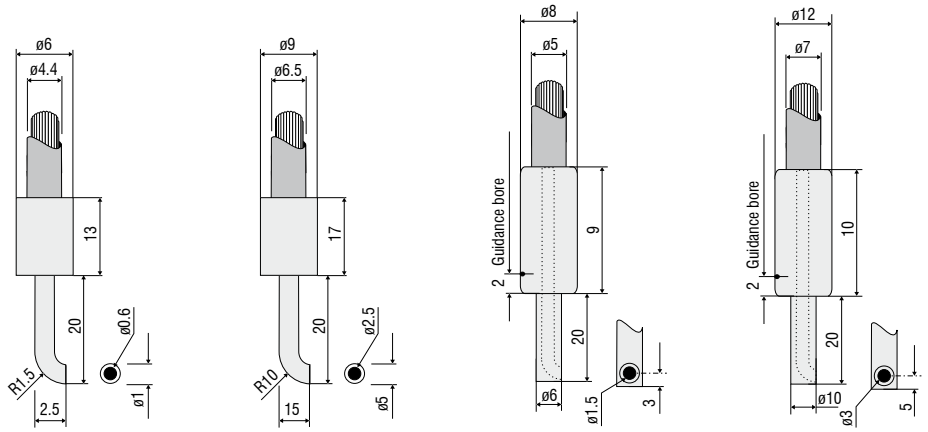
[1] In combination with colorSENSOR CFO200 and a repeatability of ΔE ≤0.3

[2] On titanium pearl mica from a distance of 30 mm

[3] With potted connection cable also available with IP67

[4] Valid for optimal working distance

[5] Only possible in combination with external illumination




| Model | | CFS4-D11/90 | CFS4-D30/90 | CFS4-F10/90 | CFS4-F30/90 |
|---|---|---|---|---|---|
| Part number | | 10810575 | 10810699 | 10810427 | 10811491 |
| Type of sensor | | Reflex sensor | | | |
| Working distance [1] | Start | 5 mm | 5 mm | 5 mm | 5 mm |
| | Optimal | 5 mm | 5 mm | 5 mm | 5 mm |
| | End | 15 mm | 20 mm | 15 mm | 20 mm |
| Measurement spot diameter [1] | Start | 8 mm | 10 mm | 8 mm | 10 mm |
| | Optimal | 8 mm | 10 mm | 8 mm | 10 mm |
| | End | 22 mm | 28 mm | 20 mm | 28 mm |
| Light spot diameter [1] | Start | 10 mm | 12 mm | 8 mm | 12 mm |
| | Optimal | 10 mm | 12 mm | 8 mm | 12 mm |
| | End | 24 mm | 30 mm | 26 mm | 30 mm |
| Repeatability in rotation [1] [2] [4] | | ΔE ≤ 0.9 | ΔE ≤ 0.6 | ΔE ≤ 1.8 | ΔE ≤ 0.4 |
| Measurement geometry | | 0°:0° | | | |
| Min. target size (flat) | | Ø 8 mm | Ø 10 mm | Ø 8 mm | Ø 10 mm |
| Minimum curvature radius of target (curved) | | 80 mm | 100 mm | 80 mm | 100 mm |
| Sensitivity | Distance [1] [4] | < 13.3 ΔE / mm | < 10.4 ΔE / mm | < 13.0 ΔE / mm | < 10.4 ΔE / mm |
| | Tilt angle [1] [4] | < 0.3 ΔE / ° | | | |
| | Ambient light [1] [4] | < 0.3 ΔE / 1,000 lx | | | |
| Permissible ambient light [1] [4] | | < 40,000 lx | | | |
| Max. tilt angle [1] [4] | | ±45° | | | ±30° |
| Connection | | integrated fiber-optic cable (axial) with metal-silicone (T) sheath, standard length 1.2 m; other lengths 0.3 ... 2.4 m optionally available | | integrated fiber-optic cable (axial) with metal (M) sheath, standard length 1.2 m; other lengths 0.3 ... 2.4 m optionally available | |
| Mounting | | FA (M18x1) | | | |
| Temperature range | Storage / operation | Sensor head: -10 … +80 °C; Cable: -60 … +180 °C | | Sensor head: -10 … +80 °C; Cable: -40 … +300 °C | |
| Humidity | | 20 … 80 % r.H. (non-condensing) | | 20 … 60 % r.H. (non-condensing) | |
| Protection class (DIN EN 60529) | | IP64 | | IP40 | |
| Material | | Stainless steel, glass fiber bundle with metal-silicone sheath (T) | | Stainless steel, glass fiber bundle with metal sheath (M) | |
| Weight | | 70 g | 110 g | 60 g | 100 g |
| Compatibility | | CFO controller (LT, WLCS, FES) | | | |
| Features | | All variants are also available with different cable sheath, length: 0.3 ... 2.4 m, vibration protection, IP protection, suitable for drag chains and available for temperature ranges up to 2,000 °C. In combination with a pressure-tight feed-through, a stainless steel sheath and T250° bonding, vacuum applications down to $10^{-5}$ mbar are also possible. | | | |

The specified data apply to a white, diffuse reflecting surface (zenith white reference)
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[4] Valid for optimal working distance
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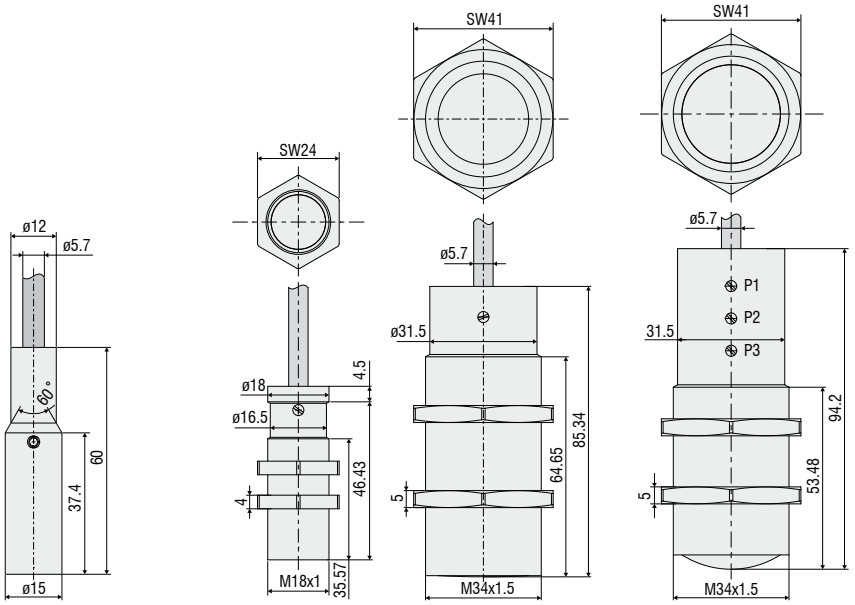


| Model | | CFS4-J03-0,8 | CFS4-J04 | CFS4-J03 | CFS4-K18 | CFS4-K34 | CFS4-K34-XL | | |
|---|---|---|---|---|---|---|---|---|---|
| Part number | | 10824987 | 10824988 | 10824989 | 10824990 | 10824991 | 10824992 | | |
| Type of sensor | | Reflex sensor | | | | | | | |
| | | | | | | | P1 | P2 | P3 |
| Working distance [1] | Start | 8 mm | 9 mm | 7 mm | 7 mm | 25 mm | 70 mm | 80 mm | 90 mm |
| | Optimal | 10 mm | 11 mm | 10 mm | 25 mm | 170 mm | 110 mm | 140 mm | 200 mm |
| | End | 11 mm | 13 mm | 14 mm | 55 mm | 270 mm | 150 mm | 260 mm | 320 mm |
| Measurement spot diameter [1] | Start | 2 mm | 1.5 mm | 5 mm | 9 mm | 21 mm | 11 mm | 16 mm | 26 mm |
| | Optimal | 0.8 mm | 2 mm | 2 mm | 6 mm | 17 mm | 7 mm | 8 mm | 22 mm |
| | End | 1.5 mm | 4 mm | 6 mm | 12 mm | 21 mm | 17 mm | 26 mm | 22 mm |
| Light spot diameter [1] | Start | 2 mm | 1.5 mm | 5 mm | 9 mm | 22 mm | 12 mm | 20 mm | 28 mm |
| | Optimal | 0.8 mm | 2 mm | 3 mm | 7 mm | 18 mm | 7 mm | 13 mm | 28 mm |
| | End | 2 mm | 3 mm | 6 mm | 24 mm | 23 mm | 18 mm | 28 mm | 30 mm |
| Repeatability in rotation [1] [2] [4] | | ΔE ≤ 13.5 | ΔE ≤ 34.0 | ΔE ≤ 4.3 | ΔE ≤ 1.5 | ΔE ≤ 1.2 | ΔE ≤ 2.0 | ΔE ≤ 1.2 | ΔE ≤ 3.5 |
| Measurement geometry | | 0°:0° | | | | | | | |
| Min. target size (flat) | | Ø 1 mm | Ø 1.5 mm | Ø 2 mm | Ø 6 mm | Ø 17 mm | Ø 7 mm | Ø 8 mm | Ø 22 mm |
| Minimum curvature radius of target (curved) | | 10 mm | 15 mm | 20 mm | 60 mm | 170 mm | 70 mm | 80 mm | 22 mm |
| Sensitivity | Distance [1] [4] | < 33 ΔE / mm | < 18 ΔE / mm | < 11 ΔE / mm | < 2 ΔE / mm | < 0.3 ΔE / mm | < 3 ΔE / mm | < 0.7 ΔE / mm | < 0.3 ΔE / mm |
| | Tilt angle [1] [4] | < 0.6 ΔE / ° | < 0.4 ΔE / ° | < 0.3 ΔE / ° | | | | | |
| | Ambient light [1] [4] | < 0.3 ΔE / 1,000 lx | | | | | | | |
| Permissible ambient light [1] [4] | | < 40,000 lx | | | | < 4,800 lx | < 30,000 lx | < 10,000 lx | < 4,500 lx |
| Max. tilt angle [1] [4] | | ±45° | | | | | | | |
| Connection | | integrated fiber optic cable axial with metal-silicone (T) sheath, standard length 1.2 m; other lengths 0.3 ... 2.4 m optionally available | | | | | | | |
| Mounting | | FA (M18x1) | | | | | | | |
| Temperature range | Storage / operation | Sensor head: -10 °C … +80 °C; cable: -60 °C … +180 °C | | | | | | | |
| Humidity | | 20 … 60 % r.H. (non-condensing) | | | | | | | |
| Protection class (DIN EN 60529) | | IP54 [3] | | | | | | | |
| Material | | Aluminum black anodized, glass, glass fiber bundle with metal-silicone coating (T) | | | | | | | |
| Weight | | 103 g | 110 g | 117 g | 128 g | 290 g | 290 g | | |
| Compatibility | | CFO controller (LT, WLCS, FES) | | | | | | | |
| Features | | All cable variants are also available with different cable sheath, length: 0.3 ... 2.4 m, vibration protection, IP protection and suitable for drag chains. | | | | | | | |

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