More Precision

toCONTROL CLS1000 // Fiber optic sensor for industrial applications
Fiber optic sensor for industrial applications

Fiber optic sensors from Micro-Epsilon are an optoelectronic sensor solution consisting of a controller and a sensor (sensor head and fiber optic cable). The optoCONTROL CLS1000 controllers are composed of a compact transmitter and receiver unit with integrated signal evaluation. The infrared light is transmitted to the object and back via a high-quality fiber optic cable that works on the principle of total reflection.

The received light intensity is used for evaluation. Due to the large number of sheaths and sensor head variants, the sensors can be adapted to any application and are therefore very versatile in installation. The high-quality fiber optic light guides are characterized by small installation dimensions and robust materials. This makes them particularly suitable for use in harsh ambient conditions such as high temperatures.

### Large detection and operating ranges

The controller achieves peak values for operation and detection ranges thanks to its high luminous intensity and resolution. This increases process reliability when used in plants and systems.

### Extremely high resistance to ambient light

Up to 50,000 lx

### OLED display for fast and easy configuration

Simple commissioning directly via the controller or via external teach-in. All programming steps, status displays as well as the set and actual values are visualized via two 4-digit digital displays.

### numerous teach-in methods

- Switching output functions
- On-/Off-delayed
- Pulse output
- Adjustable hysteresis
  2 … 26%

### Push-pull switching output

Switch between positive operating voltage potential (+VS) and reference potential.

### Switchable NPN, PNP, PP

Switch between 3 switching outputs

### Extremely robust and compact

The sturdy plastic housing made of polycarbonate and its compact, slim design allow easy integration in limited installation space.

### High-performance fiber optic sensors for numerous monitoring tasks

Fiber optic sensors from Micro-Epsilon are an optoelectronic sensor solution consisting of a controller and a sensor (sensor head and fiber optic cable). The optoCONTROL CLS1000 controllers are composed of a compact transmitter and receiver unit with integrated signal evaluation. The infrared light is transmitted to the object and back via a high-quality fiber optic cable that works on the principle of total reflection.

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Presence and diameter detection with high temperatures
After the hardening process of steel bars, they are tempered at temperatures of 600 °C to relieve stresses. Optical fiber sensors from Micro-Epsilon are used to quickly determine the presence as well as possible changes in the diameter of the rods. The detection is performed without contact and at a high measuring rate.
Recommended system: CLS1000-AI-NPN + CFS4-C10-E-T400

Breakage inspection of belt material
Due to the low response time of 100 µs, the optoelectronic fiber optic sensors are able to quickly detect disturbances such as breakage of strip materials. Their high switching frequency of 2.5 kHz also enables fast signal output via the analog output. In addition, the high detection range of up to 430 mm allows the sensor to be mounted safely outside the hazardous area.
Recommended system: CLS1000-AU-PP + CFS4-A30

Detection of envelope windows
During the production of envelopes, quality assurance must check whether the window has been inserted. The fiber optic sensors of the optoCONTROL CLS1000 series reliably detect the windows of the envelopes at a frequency of up to 2.5 kHz. The CFS4-A20 sensor is positioned at a distance of 30 mm and an angle of 60° above the window.
Recommended system: CLS1000-2Q + CFS-4-A20

Groove detection on the shaft
After the mechanical processing of shafts, fiber optic sensors from Micro-Epsilon automatically check the required depth and height of the milled groove. For testing, the CLS1000-AU controller is used in combination with the CFS4-A20 sensor. The sensor measures the required depth of 3 mm at a distance of 5 to 8 mm. The output analog signal between 4 ... 20 mA is passed on to the IF2030/ETH interface module.
Recommended system: CLS1000-AU + CFS4-A20

Presence detection of a thread
When texturing threads, the presence of the thread must be continuously checked, as the very thin threads of approx. 80 µm break easily. For presence monitoring, the optoCONTROL CLS1000-AI is used together with the CFS3-R11 sensor. The distance between sensor and receiver is approx. 65 mm. The IF1032 interface module is used to evaluate the output signal at the controller. This setup is also suitable for droplet measurement when detecting leaks.
Recommended system: CLS1000-AI + CFS3-R11

Packaging control of blisters
When packaging tablets in blisters, the presence detection of the medication is required. For this purpose, the fiber optic sensors detect the tablets through the transparent layer of the blister. The challenge here is to capture all pockets of the blister at the high speed at which the belt travels. The system can then filter out incorrectly or insufficiently filled blisters.
Recommended system: CLS1000-QN + CFS4-A11

Application examples
optoCONTROL CLS1000
Reliable presence detection and position control
The fiber optic sensor comprises a CPS sensor and a CLS1000 controller. The wide detection and operating ranges of up to 2000 mm make the fiber optic sensor ideal for the detection of components even at great distances.

The optoCONTROL CLS1000 optoelectronic fiber optic sensor is suitable for use in automation thanks to its variable switching outputs. The fiber optic sensor is used, for example, in position control and for position and presence detection.

The CLS1000 controller is available in five different versions: CLS1000-QN with antivalence function (normally open/ normally closed), CLS1000-2Q with two switching outputs, CLS1000-AU with optocoupler, CLS1000-AI with voltage output and CLS1000-AI with current output. Each model is available in NPN, PNP or push-pull versions, each with or without trigger.

Due to the high resistance to ambient light and the possibility to adapt the controller in OEM applications, the CLS1000 can be used in almost all environments, whether high temperatures or confined installation spaces.

Controller variants
- Controller with optocoupler
  optoCONTROL CLS1000-OC
  - Optocoupler output for potential-free switching
  - Galvanic isolation of the output circuitry

- Controller with two switching outputs
  optoCONTROL CLS1000-2Q
  - Two independently adjustable switching outputs
  - Two individual switching thresholds

- Controller with antivalence function
  optoCONTROL CLS1000-QN
  - Two antivalent switching outputs: Q and QN
  - Wire breakage protection thanks to antivalent switching output

- Controller with voltage output
  optoCONTROL CLS1000-AU
  - Freely scalable analog output voltage from 0 ... 10 V
  - Analog output as intensity output
  - Analog output and switching output

- Controller with current output
  optoCONTROL CLS1000-AI
  - Freely scalable analog output current from 0 ... 20 mA or 4 ... 20 mA
  - Analog output as intensity output
  - Analog output and switching output
## Controller optoCONTROL CLS1000

<table>
<thead>
<tr>
<th>Type</th>
<th>Switching output is switchable</th>
<th>Analog output</th>
<th>Trigger</th>
<th>Switching type (switchable)</th>
<th>Connection</th>
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<td>0 ... 10 V</td>
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<td>Agaristic switching</td>
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<td>PNP</td>
<td>x</td>
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<td>PP</td>
<td>x</td>
<td>0 ... 10 V</td>
<td>Off</td>
<td>0 ... 10 V</td>
<td>5-pin socket</td>
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*Switching output can be optionally switched via the menu.*

## Controller with antivalence function optoCONTROL CLS1000-QN

### Two antivalent switching outputs Q and QN

<table>
<thead>
<tr>
<th>Switchable NPN, PNP, PP</th>
</tr>
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### Wire breakage protection thanks to antivalent switching output

<table>
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<tr>
<th>Model</th>
<th>CLS1000-QN-NPN</th>
<th>CLS1000-QN-PNP</th>
<th>CLS1000-QN-PP</th>
<th>CLS1000-QN-NPN-T</th>
<th>CLS1000-QN-PNP-T</th>
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<td>10089103</td>
<td>10089104</td>
<td>10089105</td>
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<td>max. 1000 mm</td>
<td>max. 1000 mm</td>
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<td>max. 1000 mm</td>
<td>max. 1000 mm</td>
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<td>100 µs</td>
<td>100 µs</td>
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<td>2.5 kHz</td>
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<td>≤ 0.1 % FSO / K</td>
<td>≤ 0.1 % FSO / K</td>
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<td>Permissible ambient light</td>
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<td>50,000 lx</td>
<td>50,000 lx</td>
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<td>12 ... 30 VDC</td>
<td>12 ... 30 VDC</td>
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<td>50 mA</td>
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<tr>
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<td>2x NPN normally open/normally closed</td>
<td>2x PNP normally open/normally closed</td>
<td>2x PP normally open/normally closed</td>
<td>2x NPN normally open/normally closed</td>
<td>2x PNP normally open/normally closed</td>
<td>2x PP normally open/normally closed</td>
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<td>Electrical</td>
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<td>5-pin socket M12 for power supply and signals</td>
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<td>Temperature range</td>
<td>-10 ... +70 °C</td>
<td>-10 ... +70 °C</td>
<td>-10 ... +70 °C</td>
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<td>Shock (DIN EN 60068-2-27)</td>
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<td>Vibration (DIN EN 60608-2-4)</td>
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<td>Weight</td>
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<tr>
<td>Control and indicator elements</td>
<td>Parameterization/operation via membrane keypad and OLED display on controller; LED for power on</td>
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<tr>
<td>Special features</td>
<td>up to 7 teach-in modes; adjustable switching output functions on-delayed and off-delayed as well as pulse output; adjustable hysteresis 2 ... 25 %</td>
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</table>

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### Connection diagram

**CLS1000-QN-xx**

1. **Power supply**
2. **Switching output**
3. **Signal input**
4. **Trigger output**
5. **Antivalence output**

**CLS1000-QN-xx-T**

1. **Power supply**
2. **Switching output**
3. **Signal input**
4. **Trigger output**
5. **Antivalence output**

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*FSO = Full Scale Output*

The specified data apply for a consistent room temperature of 22 °C, sensor is continuously in operation, open signal outputs.

*Residual ripple ≤ 10%*
Controller with two switching outputs

**optoCONTROL CLS1000-2Q**

- Two independently adjustable switching outputs
- Two individual switching thresholds

**Model** | **CLS1000-2Q-NPN** | **CLS1000-2Q-PNP** | **CLS1000-2Q-PP** | **CLS1000-2Q-NPN-T** | **CLS1000-2Q-PNP-T** | **CLS1000-2Q-PP-T**
---|---|---|---|---|---|---
**Article number** | 10085107 | 10085108 | 10085109 | 10085110 | 10085111 | 10085112
**Operating range** | max. 3000 mm (depending on transmission sensor) | max. 2000 mm (depending on transmission sensor) | max. 1200 mm (depending on reflex sensor) | max. 2000 mm (depending on transmission sensor) | max. 1200 mm (depending on reflex sensor) | max. 1200 mm (depending on reflex sensor)
**Response time** | 100 µs | 100 µs | 100 µs | 100 µs | 100 µs | 100 µs
**Switching frequency** | 2.5 kHz (depending on pulse/pause ratio) | 2.5 kHz (depending on pulse/pause ratio) | 2.5 kHz (depending on pulse/pause ratio) | 2.5 kHz (depending on pulse/pause ratio) | 2.5 kHz (depending on pulse/pause ratio) | 2.5 kHz (depending on pulse/pause ratio)
**Temperature stability** | ≤ 0.1 % FSO / K | ≤ 0.1 % FSO / K | ≤ 0.1 % FSO / K | ≤ 0.1 % FSO / K | ≤ 0.1 % FSO / K | ≤ 0.1 % FSO / K
**Max. current consumption** | 50 mA | 50 mA | 50 mA | 50 mA | 50 mA | 50 mA
**Supply voltage** | 12 … 30 VDC | 12 … 30 VDC | 12 … 30 VDC | 12 … 30 VDC | 12 … 30 VDC | 12 … 30 VDC
**Switching output** | 2x NPN (Q1/Q2) 2x PNP (Q1/Q2) 2x PP (Q1/Q2) | 2x NPN (Q1/Q2) 2x PNP (Q1/Q2) 2x PP (Q1/Q2) | 2x NPN (Q1/Q2) 2x PNP (Q1/Q2) 2x PP (Q1/Q2) | 2x NPN (Q1/Q2) 2x PNP (Q1/Q2) 2x PP (Q1/Q2) | 2x NPN (Q1/Q2) 2x PNP (Q1/Q2) 2x PP (Q1/Q2) | 2x NPN (Q1/Q2) 2x PNP (Q1/Q2) 2x PP (Q1/Q2)
**Signal input** | Trigger In | Trigger In | Trigger In | Trigger In | Trigger In | Trigger In
**Special features** | Adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types | Adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types | Adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types | Adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types | Adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types | Adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types

**Connection diagram**

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Controller with optocoupler

**optoCONTROL CLS1000-OC**

- Optocoupler output for potential-free switching
- Galvanic isolation of the output circuit

**Model** | **CLS1000-OC** | **CLS1000-OC-T**
---|---|---
**Article number** | 10085113 | 10085114
**Operating range** | max. 2000 mm (depending on transmission sensor) | max. 2000 mm (depending on transmission sensor)
**Response time** | 100 µs | 100 µs
**Switching frequency** | 2.5 kHz (depending on pulse/pause ratio) | 2.5 kHz (depending on pulse/pause ratio)
**Temperature stability** | ≤ 0.1 % FSO / K | ≤ 0.1 % FSO / K
**Light source** | Infrared LED 870 nm | Infrared LED 870 nm
**Permissible ambient light** | 50,000 lx | 50,000 lx
**Supply voltage** | 12 … 30 VDC | 12 … 30 VDC
**Max. current consumption** | 50 mA | 50 mA
**Switching output** | Optocoupler (OC) | Optocoupler (OC)
**Switching** | light/dark switching (switchable) | light/dark switching (switchable)
**Signal input** | - | Trigger In
**Connection** | Optical | Electrical
**Connection cable** | (connection cable see accessories) | (connection cable see accessories)
**Mounting** | DIN rail, mounting rail (see accessories), mounting holes | DIN rail, mounting rail (see accessories), mounting holes
**Temperature range** | -10 ... +70 °C | -10 ... +70 °C
**Shock (DIN EN 60068-2-27)** | 20 g / 11 ms in 3 axes, two directions and 1000 shocks each | 20 g / 11 ms in 3 axes, two directions and 1000 shocks each
**Vibration (DIN EN 60068-2-6)** | 15 g / 10 ... 1000 Hz in 3 axes, 10 cycles each | 15 g / 10 ... 1000 Hz in 3 axes, 10 cycles each
**Protection class (DIN EN 60529)** | IP67 | IP67
**Material** | Plastic housing (polycarbonate) | Plastic housing (polycarbonate)
**Weight** | 200 g | 200 g
**Compatibility** | with all CFS sensors (FAR, FAD, FAZ and FAS) | with all CFS sensors (FAR, FAD, FAZ and FAS)
**Control and indicator elements** | Parameterization/operation via membrane keypad and OLED display on controller; LED for power on | Parameterization/operation via membrane keypad and OLED display on controller; LED for power on
**Special features** | up to 7 teach-in modes; adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types | up to 7 teach-in modes; adjustable switching output functions on-delayed and off-delayed as well as pulse output, adjustable hysteresis 2 ... 25 %; variety of trigger types

**FSO = Full Scale Output**

*The specified data apply for a consistent room temperature of 20 °C, sensor is continuously in operation, open signal outputs.

*Residual ripple ≤ 10%
Controller with voltage output

### optoCONTROL CLS1000-AU

- Freely scalable analog output
- Voltage from 0 ... 10 V
- Analogue output as intensity output
- Analogue output and switching output

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<td>Temperature range</td>
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<td>Special features</td>
<td>up to 9 teach-in modes; adjustable switching output functions on-delay and off-delay as well as pulse output adjustable hysteresis 2 ... 25%</td>
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<td>up to 9 teach-in modes; adjustable switching output functions on-delay and off-delay as well as pulse output adjustable hysteresis 2 ... 25%</td>
<td>variety of trigger types</td>
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Optical FA socket M12x1 for screwable optical fiber (length 0.3 ... 15 m, min. bending radius 18 mm)

**Connection diagram**

![Connection diagram for CLS1000-AU-NPN](image1)

![Connection diagram for CLS1000-AU-PPN](image2)

**Connection diagram**

![Connection diagram for CLS1000-AU-PP](image3)

![Connection diagram for CLS1000-AU-NPN-T](image4)

![Connection diagram for CLS1000-AU-PPN-T](image5)

![Connection diagram for CLS1000-AU-T](image6)

![Connection diagram for CLS1000-AU-NPN](image7)

![Connection diagram for CLS1000-AU-PPN](image8)

![Connection diagram for CLS1000-AU-PP](image9)

![Connection diagram for CLS1000-AU-NPN-T](image10)

![Connection diagram for CLS1000-AU-PPN-T](image11)

![Connection diagram for CLS1000-AU-T](image12)

---

Controller with current output

### optoCONTROL CLS1000-AI

- Freely scalable analog output current from 0 ... 20 mA or 4 ... 20 mA
- Analogue output as intensity output
- Analogue output and switching output

<table>
<thead>
<tr>
<th>Model</th>
<th>CLS1000-AI-NPN</th>
<th>CLS1000-AI-PPN</th>
<th>CLS1000-AI-PP</th>
<th>CLS1000-AI-NPN-T</th>
<th>CLS1000-AI-PPN-T</th>
<th>CLS1000-AI-T</th>
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<tr>
<td>Article number</td>
<td>10085121</td>
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<td>10085123</td>
<td>10085124</td>
<td>10085125</td>
<td>10085126</td>
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<tr>
<td>Operating range</td>
<td>max. 2000 mm</td>
<td>(depending on transmission sensor)</td>
<td>max. 1200 mm</td>
<td>(depending on reflex sensor)</td>
<td>max. 1200 mm</td>
<td>(depending on reflex sensor)</td>
</tr>
<tr>
<td>Response time</td>
<td>100 µs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching frequency</td>
<td>2.5 kHz</td>
<td>(depending on pulse/pause ratio)</td>
<td>10 kHz</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Frequency response</td>
<td>&lt; 0.1 % FSO / K</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Temperature stability</td>
<td></td>
<td></td>
<td>≤ 0.1 % FSO / K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light source</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permissible ambient light</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>12 – 30 VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. current consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog output</td>
<td>switchable 0 ... 20 mA or 4 ... 20 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching output</td>
<td>NPN PP PP NPN PP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching</td>
<td>light/dark switching (switchable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Signal input</td>
<td>Optical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Connection</td>
<td>FA socket M12x1 for screwable optical fiber (length 0.3 ... 15 m, min. bending radius 18 mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mounting</td>
<td>DIN rail, DIN rail mounting (see accessories), mounting holes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>-10 ... +70 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock (DIN EN 60068-2-27)</td>
<td>20 g / 11 ms in 3 secs, two directions and 1000 shocks each</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vibration (DIN EN 60068-2-4)</td>
<td>15 g / 10 ... 1000 Hz / 3 secs, 10 cycles each</td>
<td></td>
<td></td>
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<tr>
<td>Protection class (DIN EN 60529)</td>
<td>IP67</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Material</td>
<td>Plastic housing (polycarbonate)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Weight</td>
<td>200 g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Compatibility</td>
<td>with all CFS sensors (FAR, FAD, FAZ and FAS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control and indicator elements</td>
<td>Parameterization/operation via membrane keypad and OLED display on controller; LED for power on</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special features</td>
<td>up to 9 teach-in modes; adjustable switching output functions on-delay and off-delay as well as pulse output adjustable hysteresis 2 ... 25%</td>
<td></td>
<td>up to 9 teach-in modes; adjustable switching output functions on-delay and off-delay as well as pulse output adjustable hysteresis 2 ... 25%</td>
<td>variety of trigger types</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optical FA socket M12x1 for screwable optical fiber (length 0.3 ... 15 m, min. bending radius 18 mm)

**Connection diagram**

![Connection diagram for CLS1000-AI-NPN](image13)

![Connection diagram for CLS1000-AI-PPN](image14)

![Connection diagram for CLS1000-AI-PP](image15)

![Connection diagram for CLS1000-AI-NPN-T](image16)

![Connection diagram for CLS1000-AI-PPN-T](image17)

![Connection diagram for CLS1000-AI-T](image18)

![Connection diagram for CLS1000-AI-NPN](image19)

![Connection diagram for CLS1000-AI-PPN](image20)

![Connection diagram for CLS1000-AI-PP](image21)

![Connection diagram for CLS1000-AI-NPN-T](image22)

![Connection diagram for CLS1000-AI-PPN-T](image23)

![Connection diagram for CLS1000-AI-T](image24)
Fiber optic sensors
optoCONTROL CFS

Customer-specific adaptations are possible for all sensors. We would be pleased to manufacture your sensor according to your drawing. Please contact us directly for more information!

Examples of customer-specific modifications

- Special types for CFS4 reflex sensor
- Special types for transmission sensor CFS3

Optical fiber sheath
- Silicone-metal sheath
- VA stainless-steel sheath
- Metal sheath
- PVC-metal sheath
- PVC-special sheath
- BDA special sheath
- MA-radius-limiting special sheath

Fiber bundle diameter
- Ø 0.6 / 1 / 1.5 / 2.5 / 3 mm

Optical fiber (length)
- Available from 300 mm
- Standard length 1,200 mm
- 600, 1,800 and 2,400 mm optionally available
- Individual length of 0.3 ... 2.4 m possible

Aperture angle
- Standard 67°
- Optional 22° / 30°

Ambient conditions
- Special versions with increased vibration resistance (VS)
- Special variants with special bonding for high temperatures (T250 / T400)
- Pressure-tight special variants with vacuum feed-through (up to 10⁻⁵ mbar)

Sensor heads
- Sensor heads with straight output
- 90° output for confined installation spaces
- Sensor head with wide light band (width between 5 to 88 mm)
- Sensor heads with and without external thread
- Thin sensor heads with bendable head

Notes on the function of the CFS sensors
Application instructions on selecting the appropriate function.

Surface-dependent range

<table>
<thead>
<tr>
<th>Range</th>
<th>Transmitted light mode (typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90 mm</td>
</tr>
<tr>
<td>Min. object size (typ.) copper</td>
<td>0.05 mm</td>
</tr>
<tr>
<td>raw aluminum</td>
<td>24 mm</td>
</tr>
<tr>
<td>stainless steel</td>
<td>21 mm</td>
</tr>
<tr>
<td>white, rough plastics</td>
<td>13 mm</td>
</tr>
<tr>
<td>mat black cardboard</td>
<td>6 mm</td>
</tr>
<tr>
<td>Required fiber bundle ØF</td>
<td>0.6 mm</td>
</tr>
</tbody>
</table>

* Analog output 5V and max. gain

Fiber optic sensors and fiber optic cables are built with passive components and do not emit heat to the environment. In vacuum, sensors (temperature bonding T250), optical fibers (stainless steel sheath), and the vacuum feed-through up to 10⁻⁵ mbar can be used.

Vacuum suitability

For multiple reflex mode
Transmitting and receiving units are statistically mixed in two or more separate sensor heads. Therefore, several positions can be detected using only one sensor.

For transmission mode
The light path of the axially opposite sensor heads is interrupted or attenuated by one or more objects.

Special types

- Optical fiber sheath
- Silicone-metal sheath
- VA stainless-steel sheath
- Metal sheath
- PVC-metal sheath
- PVC-special sheath
- BDA special sheath
- MA-radius-limiting special sheath

Fiber bundle diameter
- Ø 0.6 / 1 / 1.5 / 2.5 / 3 mm

Optical fiber (length)
- Available from 300 mm
- Standard length 1,200 mm
- 600, 1,800 and 2,400 mm optionally available
- Individual length of 0.3 ... 2.4 m possible

Aperture angle
- Standard 67°
- Optional 22° / 30°

Ambient conditions
- Special versions with increased vibration resistance (VS)
- Special variants with special bonding for high temperatures (T250 / T400)
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Sensor heads
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The fiber optic sensors and fiber optic cables are built with passive components and do not emit heat to the environment. In vacuum, sensors (temperature bonding T250), optical fibers (stainless steel sheath), and the vacuum feed-through up to 10⁻⁵ mbar can be used.
Transmission sensor for translucent objects

**optoCONTROL CFS3**

- Simple and space-saving mounting
- No exact positioning of the measuring object necessary
- Models with and without external thread
- Large operating range between receiver and transmitter unit with up to 2000 mm

With the transmission sensor, the infrared light emitted by the controller is guided via the optical fiber to the transmitter and from there to the detecting object. There, the light beam is either interrupted or transmitted, depending on the target. The receiving unit of the sensor receives the remaining light and sends it back to the controller via the optical fiber. The remaining light component consists of either the unshielded light component or light transmitted from the object. By illuminating the transmitter through the object, it is possible to detect levels of liquids in jars as well as transparent objects. In addition to detecting transparent and semi-transparent objects, the sensor arrangement of the transmission sensor in transmitted light (180°) is ideally suited for area detection, as a light barrier, for distinguishing sizes and diameters, for tolerance inspection and for web edge detection.

The CFS3 sensors, in combination with the performance of the CLS1000 series, provide reliable results. Here, the distance variation between the test specimen and receiver or illumination has no noticeable influence on the result. The transmission sensor can be universally used but is also suitable for special solutions (customer-specific adaptations).

The sensors are available with different operating ranges, temperature ranges and lengths. This enables a wide range of applications. The fiber optic cable has a sensor head, which is available in different versions:

- With external thread: For example, threaded sensors can be easily fixed on a mounting bracket.
- Without external thread: Cylindrical sensor heads are suitable for space-saving mounting. This is achieved by simply setting a grub screw.

**Measurement geometry**

Transmission sensor 0°:180°

With the transmission sensor, the infrared light emitted by the controller is guided via the optical fiber to the transmitter and from there to the detecting object. There, the light beam is either interrupted or transmitted, depending on the target. The receiving unit of the sensor receives the remaining light and sends it back to the controller via the optical fiber. The remaining light component consists of either the unshielded light component or light transmitted from the object. By illuminating the transmitter through the object, it is possible to detect levels of liquids in jars as well as transparent objects. In addition to detecting transparent and semi-transparent objects, the sensor arrangement of the transmission sensor in transmitted light (180°) is ideally suited for area detection, as a light barrier, for distinguishing sizes and diameters, for tolerance inspection and for web edge detection.

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The sensors are available with different operating ranges, temperature ranges and lengths. This enables a wide range of applications. The fiber optic cable has a sensor head, which is available in different versions:

- With external thread: For example, threaded sensors can be easily fixed on a mounting bracket.
- Without external thread: Cylindrical sensor heads are suitable for space-saving mounting. This is achieved by simply setting a grub screw.
Reflex sensor for the distinction of materials and parts

control CFS4

**Detection range up to 430 mm**

**Options with light band and 90° output**

**Simple and space saving mounting**

**Models with and without external thread**

---

In the case of the reflex sensor, the infrared light emitted by the controller is guided to the detecting object via the sensor’s fiber-optic light guides and reflected there. Both diffuse and directly reflected components are present in the back-reflected infrared light. The reflected light components of the object to be detected are received by the same sensor and transmitted back to the controller via the optical fiber for evaluation.

The high-quality reflective sensor, in combination with the performance of the CFS4 series, delivers even more precise detection of a wide variety of objects and structures. The sensors are available with a wide range of detection ranges, temperature ranges and lengths. This enables a wide range of applications. The fiber optic cable has a sensor head, which is available in different versions:

With external thread: For example, threaded sensors can be easily fixed on a mounting bracket.

Without external thread: Cylindrical sensor heads are suitable for space-saving mounting. This is achieved by simply setting a grub screw.

90° deflection: If the installation depth and the mounting space are very limited, sensors with integrated 90° deflection are the optimal solution.

Flat sensor head: Thanks to the light band, flat sensor heads are best suited for detecting larger objects. These can be located anywhere in the light band.

---

<table>
<thead>
<tr>
<th>Model</th>
<th>CFS4-A11</th>
<th>CFS4-A20</th>
<th>CFS4-A30</th>
<th>CFS4-C10-M</th>
<th>CFS4-B11-P</th>
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<td>Article number</td>
<td>10810487</td>
<td>10810351</td>
<td>10810584</td>
<td>10810383</td>
<td>10810254</td>
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<td>Sensor type</td>
<td>Reflex sensor</td>
<td>Reflex sensor</td>
<td>Reflex sensor</td>
<td>Reflex sensor</td>
<td>Reflex sensor</td>
</tr>
<tr>
<td>Detection range</td>
<td>Start 1 mm</td>
<td>1 mm</td>
<td>1 mm</td>
<td>1 mm</td>
<td>1 mm</td>
</tr>
<tr>
<td></td>
<td>End 132 mm</td>
<td>394 mm</td>
<td>430 mm</td>
<td>50 mm</td>
<td>19 mm</td>
</tr>
<tr>
<td>Measurement geometry</td>
<td>0° 0°</td>
<td>0° 0°</td>
<td>0° 0°</td>
<td>0° 0°</td>
<td>0° 0°</td>
</tr>
<tr>
<td>Connection</td>
<td>max. bending radius 13.2 mm</td>
<td>max. bending radius 17.4 mm</td>
<td>max. bending radius 22.5 mm</td>
<td>max. bending radius 13.2 mm</td>
<td>max. bending radius 6 mm</td>
</tr>
<tr>
<td>Mounting</td>
<td>FA (M18x1)</td>
<td>FA (M18x1)</td>
<td>FA (M18x1)</td>
<td>FA (M18x1)</td>
<td>FA (M18x1)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>Sensor head: -10 ... +80 °C, Fiber optic cable: -60 ... +180 °C</td>
<td>Sensor head: -10 ... +80 °C, Fiber optic cable: -40 ... +300 °C</td>
<td>Sensor head: -10 ... +80 °C, Fiber optic cable: -20 ... +80 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity (non-condensing)</td>
<td>20 ... 80 % H,</td>
<td>20 ... 60 % H,</td>
<td>20 ... 80 % H,</td>
<td></td>
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</tr>
<tr>
<td>Protection class (DIN EN 60529)</td>
<td>P64</td>
<td>P40</td>
<td>P64</td>
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<td></td>
</tr>
<tr>
<td>Sensor head</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Optical fiber</td>
<td>Optical fiber</td>
<td>Optical fiber</td>
<td>Optical fiber</td>
<td>Optical fiber</td>
</tr>
<tr>
<td></td>
<td>integrated glass fiber (Ø1.5 mm) and metal-silicone sheathing (T)</td>
<td>integrated glass fiber (Ø3.0 mm) and metal-silicone (T) sheathing</td>
<td>integrated glass fiber (Ø1.5 mm) and metal (M) sheathing</td>
<td>integrated glass fiber (Ø0.5 mm) and PVC plastic (P) sheathing</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>50 g</td>
<td>90 g</td>
<td>114 g</td>
<td>60 g</td>
<td>15 g</td>
</tr>
<tr>
<td>Compatibility</td>
<td>compatible with all CLS and CFO controllers</td>
<td>compatible with all CLS and CFO controllers</td>
<td>compatible with all CLS and CFO controllers</td>
<td>compatible with all CLS and CFO controllers</td>
<td>compatible with all CLS and CFO controllers</td>
</tr>
<tr>
<td>Special features</td>
<td>All variants are also available with different sheath length: 0.3 ... 10 m, vibration protection, P6 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.</td>
<td>All variants are also available with different sheath length: 0.3 ... 10 m, vibration protection, P6 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.</td>
<td>All variants are also available with different sheath length: 0.3 ... 10 m, vibration protection, P6 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.</td>
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</tr>
</tbody>
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* Detection range refers to polished stainless steel.
## Accessories

### optoCONTROL CLS1000

<table>
<thead>
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<th>Art. no.</th>
<th>Model</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>11245551</td>
<td>PC1000-2-T</td>
<td>Signal / supply cable, 2 m, 5-pin unshielded</td>
</tr>
<tr>
<td>11245300</td>
<td>PC1000-5-T</td>
<td>Signal / supply cable, 5 m, 5-pin unshielded</td>
</tr>
<tr>
<td>11245301</td>
<td>PC1000-10-T</td>
<td>Signal / supply cable, 10 m, 5-pin unshielded</td>
</tr>
<tr>
<td>11245302</td>
<td>PC1000-2</td>
<td>Signal / supply cable, 2 m, 4-pin unshielded</td>
</tr>
<tr>
<td>11245303</td>
<td>PC1000-5</td>
<td>Signal / supply cable, 5 m, 4-pin unshielded</td>
</tr>
<tr>
<td>11245304</td>
<td>PC1000-10</td>
<td>Signal / supply cable, 10 m, 4-pole unshielded</td>
</tr>
<tr>
<td>11245305</td>
<td>PC1000/90-2</td>
<td>Signal / supply cable, 2 m, 4-pole unshielded, 90° outlet</td>
</tr>
<tr>
<td>11245306</td>
<td>PC1000/90-5</td>
<td>Signal / supply cable, 5 m, 4-pin unshielded, 90° outlet</td>
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<td>2420096</td>
<td>PS2031</td>
<td>Plug-in power supply universal 100 … 240 V / 24 V / 1 A</td>
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<td>2420062</td>
<td>PS2020</td>
<td>PS2020 Power supply unit 24 V</td>
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<td>10811916</td>
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<td>Pressure-tight feedthrough for vacuum</td>
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