More Precision

**optoCONTROL CLS-K** // Fiber optic sensors
The optoCONTROL CLS-K series is an opto-electronic sensor solution where the electronics and the probe heads are coupled via optical fibers and therefore arranged separately. Due to numerous sheathings and probe heads, these optical fibers can be adapted to any application, therefore being flexible in use. Sophisticated, optical glass fibers stand out due to minimal installation dimensions and robust materials and are ideally suitable for harsh ambient conditions and high temperatures.

The optoCONTROL CLS-K series includes a compact transmitter and receiver unit for infrared light with integrated signal evaluation. The light transmission to the object and back is based on high-quality, optical glass fibers according to the principle of total reflection. The received light intensity is used for evaluation.

The optoCONTROL CLS-K electronics offers variable amplification possibilities; the output signal is available for downstream systems as a voltage or current signal. In addition to these, there are versions with electrically isolated optocoupler or relay outputs, displays, as well as a special version that provides temperature compensation and is protected to IP65.

These fiber optic sensors enable a wide variety of applications, from monitoring the presence of and recognizing the position of components in automatic assembly machines, feeding systems, test and inspection applications, through to gap and web-edge detection.
CLS-K Controller
- Compact and robust, direct integration into machine
- Ideal for monitoring of high-speed processes
- High light intensity
- Stable long-term behavior / transmission monitoring

High-quality glass and special fibers for long-life operation
Micro-Epsilon optical fibers feature high processing and transmission quality. Ground and polished end-faces ensure excellent optical integration with adapted sensors. These high-quality, optical glass fibers are extremely robust and ideally suitable for use in harsh ambient conditions.

Characteristics
- Temperature resistance from -270°C to +2000°C
- Flexible and highly flexible with flux
- Cut and polished surfaces
- Wavelength from 180nm (UV) to 3500nm (IR)
- Customer-specific modification even for 1 single piece only

Probe heads for versatile applications

Reflex mode
V arrangement in reflex mode
Transmitted light mode
Order code for optical fibers

1. Function
   (D = transmitted light mode, R = reflex mode)

Please define the accessibility of the spot to be inspected and the size of the measurement object for the appropriate function of the optical fiber and the diameter of the glass fiber bundle.

<table>
<thead>
<tr>
<th>Range</th>
<th>Transmitted light mode (typ.)</th>
<th>90mm</th>
<th>200mm</th>
<th>500mm</th>
<th>1700mm</th>
<th>2000mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. object size (typ.)</td>
<td></td>
<td>≤ 0.05mm</td>
<td>≤ 0.1mm</td>
<td>≤ 0.1mm</td>
<td>≤ 0.2mm</td>
<td>≤ 0.3mm</td>
</tr>
<tr>
<td>polished stainless steel</td>
<td></td>
<td>≤ 11mm</td>
<td>≤ 24mm</td>
<td>≤ 44mm</td>
<td>≤ 150mm</td>
<td>≤ 188mm</td>
</tr>
<tr>
<td>raw aluminum</td>
<td></td>
<td>≤ 8mm</td>
<td>≤ 21mm</td>
<td>≤ 40mm</td>
<td>≤ 139mm</td>
<td>≤ 170mm</td>
</tr>
<tr>
<td>white, rough plastics</td>
<td></td>
<td>≤ 6mm</td>
<td>≤ 10mm</td>
<td>≤ 21mm</td>
<td>≤ 21mm</td>
<td>≤ 80mm</td>
</tr>
<tr>
<td>mat black cardboard</td>
<td></td>
<td>≤ 3mm</td>
<td>≤ 3mm</td>
<td>≤ 6mm</td>
<td>≤ 6mm</td>
<td>≤ 21mm</td>
</tr>
<tr>
<td>Required fiber bundle øF</td>
<td></td>
<td>0.6mm</td>
<td>1mm</td>
<td>1.5mm</td>
<td>2.5mm</td>
<td>3mm</td>
</tr>
</tbody>
</table>

*1: reduced range with 90° angular probe heads
*2: influences during reflex mode: distance, fiber bundle, reflectivity of surface (color, structure, gloss and surface treatment)

The probe heads to be used depend on the diameter of the fiber bundle.
## Sheathing

Please determine the sheathing and the bonding of the optical fiber based on the prevailing environmental conditions and mechanical stress. Please contact use in case of high temperature applications or extreme, mechanical stress.

<table>
<thead>
<tr>
<th>Sheathing Type</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| **Silicone-metal sheath** | Metal wire-spiral-reinforced hose with glass-fiber braiding and silicone rubber sheathing | - Very flexible, ideal for frequent bending  
- Highly resistant to bending, torsion and torsion  
- Temperature-stable from -60°C to +180°C  
- Liquid-tight |
| **VA stainless-steel sheath** | Flexible stainless steel wire-spiral-reinforced hose | - Flexible  
- Protection against mechanical stress  
- Temperature-stable to +400°C  
- Stainless, ideal for the food industry |
| **Metal sheath** | Flexible brass wire-spiral-reinforced hose, chrome-plated | - Flexible  
- Protection against mechanical stress  
- Temperature-stable to +300°C |
| **PVC-metal sheath** | Flexible brass spiral-reinforced hose coated with PVC sheathing | - Flexible  
- Protection against mechanical stress such as pressure and tension  
- Temperature-stable from -20°C to +80°C |
| **PVC special sheath** | Plastic hose | - For rigid installation  
- Small sheath diameter  
- Temperature-stable to 60°C |
| **BOA special sheath** | Corrugated tube with stainless steel braiding | - Protection against mechanical stress  
- Ideal for drag-chain applications  
- Temperature-stable from -270°C to +600°C |

### Special models

**Optical fibers with increased vibration protection - VS option**

Optical fibers can be manufactured with increased vibration protection for use with mechanical loads such as shock, acceleration, and movement. This special treatment minimizes friction between fibers and reduces shocks. The fibers are embedded into a gel cushion.

**Optical fibers with special bonding for high temperatures**

Standard bonding is suitable for maximum temperatures up to 80°C. Special adhesives allow for temperatures of up to 250°C and even 400°C. These higher temperature ranges require the use of Type E stainless steel sheathing. With quartz and sapphire fibers and appropriate adhesive, special optical fibers for use in environments up to 2000°C can be produced.

1) Bending radius corresponds to three times the external diameter of the sheath.  
2) Bending radius corresponds to twice the external diameter of the sheath.

Details about sheath diameters can be found in section 3.
3 Probe heads and fiber bundles

Please choose a probe head type and ensure that the probe head is compatible with the fiber bundle diameter øF (see 1) and the sheath (see 2).

Standard probe head bonding for -10°C to +80°C
Please refer to the technical data for special models (T250, T400).

All details in mm; tolerances: typ. ±0.1mm
Alu ferrules, black anodized

Please contact us if you require other dimensions.

A Type A ferrule, stainless steel

B Type B ferrule
(only suitable for PVC sheathing)

C Type C ferrule, stainless steel

D Type D ferrule, stainless steel
With angular probe heads, a reduction in range can be expected compared to axially emerging versions.

E Type E ferrule, stainless steel
(* E1.0 only suitable for PVC sheathing)
**Type F ferrule, stainless steel**

With angular probe heads, a reduction in range can be expected compared to axially emerging versions.

<table>
<thead>
<tr>
<th>Ø F</th>
<th>Type</th>
<th>Ø A</th>
<th>Ø E</th>
<th>H</th>
<th>K</th>
<th>P</th>
<th>Ø J</th>
<th>Ø M</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>F 1.0</td>
<td>8</td>
<td>6</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>F 2.0</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>F 3.0</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>7.5</td>
<td></td>
</tr>
</tbody>
</table>

**Type M ferrule, aluminum / stainless steel**

Larger fiber cross-sections are possible

<table>
<thead>
<tr>
<th>Ø F</th>
<th>Type</th>
<th>Ø A</th>
<th>Ø E</th>
<th>H</th>
<th>Ø J</th>
<th>Ø M</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>M 1.1</td>
<td>6</td>
<td>30</td>
<td>1</td>
<td>10</td>
<td>5</td>
<td>4.4</td>
</tr>
<tr>
<td>0.6</td>
<td>M 1.2</td>
<td>6</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>5</td>
<td>4.4</td>
</tr>
<tr>
<td>1</td>
<td>M 2.0</td>
<td>6</td>
<td>10</td>
<td>2</td>
<td>10</td>
<td>5</td>
<td>4.4</td>
</tr>
<tr>
<td>2.5</td>
<td>M 3.0</td>
<td>7</td>
<td>12</td>
<td>4</td>
<td>12</td>
<td>6</td>
<td>5.8</td>
</tr>
<tr>
<td>3.5</td>
<td>M 4.0</td>
<td>9</td>
<td>12</td>
<td>6</td>
<td>12</td>
<td>7</td>
<td>7.5</td>
</tr>
</tbody>
</table>

**Type O ferrule, bendable to a certain extent**

With angular probe heads, a reduction in range can be expected compared to axially emerging versions.

<table>
<thead>
<tr>
<th>Ø F</th>
<th>Type</th>
<th>Ø A</th>
<th>Ø E</th>
<th>H</th>
<th>P</th>
<th>Ø J</th>
<th>Ø M</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>O 1.0</td>
<td>2</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>0.6</td>
<td>O 1.1</td>
<td>7</td>
<td>1</td>
<td>20</td>
<td>–</td>
<td>5</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>O 2.0</td>
<td>3</td>
<td>1.3</td>
<td>10</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1</td>
<td>O 2.1</td>
<td>7</td>
<td>1.3</td>
<td>20</td>
<td>–</td>
<td>5</td>
<td>4.4</td>
<td></td>
</tr>
</tbody>
</table>

**Type P ferrule, aluminum**

* R1.0 and R2.0 only suitable for PVC sheathing

** at 6x1mm², can be made to a length of 1200

<table>
<thead>
<tr>
<th>Ø F</th>
<th>Type</th>
<th>Ø A</th>
<th>Ø E</th>
<th>Ø F</th>
<th>Ø G</th>
<th>Ø J</th>
<th>Ø M</th>
<th>Ø T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>P 1.0</td>
<td>8</td>
<td>15</td>
<td>25</td>
<td>3</td>
<td>0.1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.1</td>
<td>P 2.1</td>
<td>8</td>
<td>17</td>
<td>30</td>
<td>6</td>
<td>0.3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>3.1</td>
<td>P 3.1</td>
<td>12</td>
<td>17</td>
<td>30</td>
<td>10</td>
<td>0.5</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

**Type Q, aluminum**

Also available in stainless steel

<table>
<thead>
<tr>
<th>Type</th>
<th>Ø A</th>
<th>Ø B</th>
<th>Ø C</th>
<th>Ø D</th>
<th>Ø E</th>
<th>Ø F</th>
<th>Ø G</th>
<th>Ø J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>12</td>
<td>25</td>
<td>9</td>
<td>15</td>
<td>15</td>
<td>5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>12</td>
<td>30</td>
<td>14</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>12</td>
<td>35</td>
<td>24</td>
<td>25</td>
<td>30</td>
<td>18</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>12</td>
<td>55</td>
<td>34</td>
<td>40</td>
<td>40</td>
<td>28</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>12</td>
<td>55</td>
<td>44</td>
<td>40</td>
<td>50</td>
<td>38</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>12</td>
<td>55</td>
<td>54</td>
<td>40</td>
<td>60</td>
<td>48</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>16</td>
<td>75</td>
<td>64</td>
<td>60</td>
<td>70</td>
<td>58</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Q8</td>
<td>16</td>
<td>75</td>
<td>74</td>
<td>60</td>
<td>80</td>
<td>68</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>20</td>
<td>90</td>
<td>84</td>
<td>75</td>
<td>90</td>
<td>78</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>20</td>
<td>90</td>
<td>94</td>
<td>75</td>
<td>100</td>
<td>88</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

FxG max. 9.62mm²

F=3.5 mm as special model

Q7 to Q10 only available as FAR special model
**Technical data // Optical fibers**

<table>
<thead>
<tr>
<th><strong>Length</strong></th>
<th>Standard lengths: 600, 1200, 1800 and 2400mm, up to 30m on request</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aperture angle</strong></td>
<td>Standard fiber 67° (NA 0.56)¹</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Optical glass; quartz glass or sapphire glass on request</td>
</tr>
<tr>
<td><strong>Dielectric strength</strong></td>
<td>50kV/m with PVC protective sheath</td>
</tr>
<tr>
<td><strong>Probe head Temperature range</strong></td>
<td>Standard -10°C up to +80°C</td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
<td>T250 -40°C up to +250°C</td>
</tr>
<tr>
<td><strong>Fiber bonding</strong></td>
<td>T400 -40°C up to +400°C</td>
</tr>
<tr>
<td><strong>T600 special model</strong></td>
<td>0°C up to +600°C</td>
</tr>
<tr>
<td><strong>T2000 special model</strong></td>
<td>0°C up to +2000°C</td>
</tr>
<tr>
<td><strong>Permissible temperature range with sheathing that has appropriate fiber bonding</strong></td>
<td>PVC (Type P / Type Z) -20°C up to +80°C</td>
</tr>
<tr>
<td><strong>Metal (type M)</strong></td>
<td>-40°C up to +300°C</td>
</tr>
<tr>
<td><strong>Metal with special bonding (Type E)</strong></td>
<td>-40°C up to +400°C</td>
</tr>
<tr>
<td><strong>Metal/silicone (Type T)</strong></td>
<td>-40°C up to +180°C</td>
</tr>
<tr>
<td><strong>Fiber transmission</strong></td>
<td>Different types for wavelengths from UV 180nm to IR 3500nm. We can provide the most suitable solution depending on your requirements. Transmission curves on request.</td>
</tr>
<tr>
<td><strong>Vibration protection</strong></td>
<td>Increased vibration protection (VS option)</td>
</tr>
</tbody>
</table>

¹) Fiber transmission standard fiber 380 - 1200nm

**Extensions / feed-through**

For extension or feed-through of the optical fibers please use the Type LV ferrule.

**LV Type LV ferrule**

Fiber optic extension / feed-through

<table>
<thead>
<tr>
<th>Fiber bundle Ø</th>
<th>P</th>
<th>Ø</th>
<th>J</th>
<th>M</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3mm) / channel</td>
<td>12</td>
<td>13</td>
<td>13.5</td>
<td>variable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Available on request**

Pressure-proof feed-through
Housing feed-through
Adapter fiber-optic cable FA on FA
Optical fiber functions

Application instructions on selecting the appropriate function.

**Reflex mode**
- Max. measurement distance 180mm
- Easy and fast installation
- Detection of smallest objects from 0.2mm
- Intensity evaluation to determine position, gloss level, gray value, presence
- Ideal for part recognition, counting tasks, presence monitoring

**Reflex mode V arrangement**
- Max. measurement distance 1000mm (with reflecting surfaces)
- Easy adjustment due to mounting accessories
- Very exact positioning of the switching point
- Objects generate highest intensity on the intersection
- Immune to dust and particles in the beam path

**Transmitted light mode**
- Large distance between receiving and transmission unit up to 2000mm
- Objects are detected by interruption of light beam
- Arbitrary point of light transmission
- High reproducibility of the object transmission
- Intensity measurement with semi-transparent objects
- Ideal for part recognition, counting tasks, edge detection, presence monitoring

Special types for multiple reflex mode
Transmission and receiving fibers are, statistically mixed, guided in two or more separated optical fibers. Therefore, several positions can be detected using only one sensor.

Special types for multiple transmitted light mode
The light path of the axially opposing probe head ferrules is interrupted or damped by one or more objects.

Available on request
Mountable lenses for optical fibers

KL-xx/xx series

- Focusing of fiber optic sensors
- Improving the efficiency of the application
- Many possible applications

Features:
- Working distances from 8mm to 200mm
- Scratch-resistant glass lens
- Robust aluminum housing (black anodized)
- Bundling to a small light spot
- Increasing the range
- Minimum color change when the distance is altered
- High luminous efficiency
- Special designs according to customer requirements
- Recognition of highly absorbent objects

Available on request
Focus lenses for special applications
Focusing of fiber optic sensors

- Improving the efficiency of the application
- Many possible applications

- Detection and inspection of small objects
- Edge detection of PCBs
- Counting tasks with bulk material
- Presence check of components
- Packaging control of blisters
- Inspection tasks with high ambient temperatures
Features:
- Scanning distance up to 180mm*
- Range of up to 2m*
  * depending on the fiber bundle diameter
- Switching output: NPN, PNP, optocoupler, relay (depending on the version)
- Adjustable drop-out delay 5-100ms (optional)

Applications:
- Test & measurement tasks
- Position recognition of small parts
- Position and assembly monitoring on automatic assembly machines and feeding systems
- Presence monitoring
- Checking length and diameter

Advantages:
- Precise and reliable object detection
- Low drift due to transmission monitoring, making it particularly suitable for measuring tasks
- High switching frequency and short response time
- Sensor monitoring via analog signal
- Stable long-term behavior by monitoring and regulating the emission of the transmitter diode

Response time ≤ 120μs
Switching frequency ≤ 4kHz
Analog output 0.1 - 5VDC
**Type CLS-K**

<table>
<thead>
<tr>
<th>Type</th>
<th>10</th>
<th>11</th>
<th>20</th>
<th>30</th>
<th>31</th>
<th>40</th>
<th>50</th>
<th>51</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>10010023</td>
<td>10010024</td>
<td>10040025</td>
<td>10040027</td>
<td>10020028</td>
<td>10040029</td>
<td>10040030</td>
<td>10040031</td>
</tr>
<tr>
<td>Residual ripple</td>
<td>≤10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>−50mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching delay</td>
<td>≤500ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>≤120μs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature drift</td>
<td>≤-(+0.5% /K)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reproducibility</td>
<td>≤1% with ΔΘ = 2K</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching state</td>
<td>LED display red and green</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating mode</td>
<td>light and dark switch output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>switchable light/dark switching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range switching</td>
<td>1:100 (Short range : Long range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>4% of the measuring range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection class</td>
<td>IP65 (with mounted optical fiber)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0°C to +50°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25°C to +70°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing material</td>
<td>Makrolon® 8035/UL94V1, transparent cover, black lower part</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight, Dimensions</td>
<td>approx. 215g/135g, 125x42x45mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Switching output** (*short-circuit protected*)

<table>
<thead>
<tr>
<th></th>
<th>Transistor*</th>
<th>Relays 1x changeover contact</th>
<th>Optocoupler*</th>
<th>Relays 1x changeover contact</th>
<th>Optocoupler*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching voltage</td>
<td>30VDC</td>
<td>0.01-250VAC</td>
<td>0.01-220VDC</td>
<td>30VDC</td>
<td>0.01-250VAC</td>
</tr>
<tr>
<td>Switching current</td>
<td>5-100mA</td>
<td>50μA-2 A</td>
<td>5-100mA</td>
<td>5-100mA</td>
<td>50μA-2 A</td>
</tr>
<tr>
<td>Switching power</td>
<td>5 μW-60W</td>
<td>125VA</td>
<td>5 μW-60W</td>
<td>125VA</td>
<td>5 μW-60W</td>
</tr>
<tr>
<td>Max. switching frequency</td>
<td>4kHz</td>
<td>60Hz</td>
<td>4kHz</td>
<td>4kHz</td>
<td>60Hz</td>
</tr>
<tr>
<td>Saturation voltage</td>
<td>≤ 2.0V</td>
<td>≤ 2.0V</td>
<td>≤ 2.0V</td>
<td>5-100mA</td>
<td>5-100mA</td>
</tr>
</tbody>
</table>

**Pulse stretching**

- 5-100ms adjustable with potentiometer P2

**Analog output**

- 0.1-5 VDC, output resistance 1kOhm

**Type of connection**

- 2m cable
- screw clamps 1.5mm²
- connector
- screw clamps 1.5mm²

---

**Dimensions in mm, not to scale**

[Diagram of Dimensions]

**Control and display interface**

[Diagram of Control and display interface]

**Connections:**

**Terminal block**

[Diagram of Terminal block]

**Output:**

- CLS-K-11: NPN O.C.
- CLS-K-20/40: Relay
- CLS-K-30/50: Optocoupler O.C./O.E
- CLS-K-31/51: PNP

All light/dark switches version

**Connection cable**

- brown = GND
- pink = +24 VDC
- green = Analog output +
- yellow = Analog GND output
- grey = NPN-Switching output
- white = NPN-Switching output

**Output:**

- CLS-K-10: NPN O.C.
- CLS-K-30/50: Relay
- CLS-K-31/51: Optocoupler O.C./O.E

*1: NPN-Switching output
*2: PNP-Switching output

* not available with all versions

---

**Weight, Dimensions**

- approx. 215g/135g, 125x42x45mm

---

**Dimensions in mm, not to scale**

[Diagram of Dimensions]

**Control and display interface**

[Diagram of Control and display interface]
**Features:**
- Scanning distance up to 180mm*
- Range up to 2m*
  * depending on the fiber bundle diameter
- Supply 12-30VDC
- NPN switching output
- Stable long-term behavior by monitoring and regulating the emission of the transmitter diode

**Applications:**
- Test & measurement tasks
- Checking length and diameter
- Production monitoring via analog output and display
- Assembly control
- Indirect displacement measurement via optical fiber with cross-section converter

**Advantages:**
- Low drift by transmission monitoring
- Fast response time
- Sensor monitoring via analog signal

---

**Scaling of analog output**

The CLS-K-61/63 amplifier offers the possibility to scale the important signal range over the entire analog range. This enables to increase the sensitivity in a certain range, e.g. for the detection of small objects.
Dimensions:
Dimensions in mm, not to scale

<table>
<thead>
<tr>
<th>Type CLS-K</th>
<th>60</th>
<th>61</th>
<th>63</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>10030032</td>
<td>10030033</td>
<td>10040035</td>
<td>10040036</td>
</tr>
<tr>
<td>Supply</td>
<td>12-30VDC</td>
<td>≤ 10%</td>
<td>70mA</td>
<td>500ms</td>
</tr>
<tr>
<td>Residual ripple</td>
<td>≤ 4kHz</td>
<td>≤ 12μs</td>
<td>≤ 0.5% /K</td>
<td>4% of the measuring range value</td>
</tr>
<tr>
<td>Current consumption</td>
<td>≤ 10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
</tr>
<tr>
<td>Switching delay</td>
<td>≤ 500ms</td>
<td>≤ 4kHz</td>
<td>≤ 12μs</td>
<td>≤ 0.5% /K</td>
</tr>
<tr>
<td>Response time</td>
<td>≤ 20ms</td>
<td>120μs</td>
<td>≤ 200μs</td>
<td>≤ 120μs</td>
</tr>
<tr>
<td>Temperature drift</td>
<td>≤ (-)0.5%/K</td>
<td>≤ 0.5%/K</td>
<td>≤ 0.5%/K</td>
<td>≤ 0.5%/K</td>
</tr>
<tr>
<td>Reproducibility</td>
<td>≤ 1% with ∆Ω = 2K</td>
<td>≤ 1% with ∆Ω = 2K</td>
<td>≤ 1% with ∆Ω = 2K</td>
<td>≤ 1% with ∆Ω = 2K</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>≤ 4% of the measuring range value</td>
<td>≤ 4% of the measuring range value</td>
<td>≤ 4% of the measuring range value</td>
<td>≤ 4% of the measuring range value</td>
</tr>
<tr>
<td>Analog Output</td>
<td>0-20mA</td>
<td>0-20mA</td>
<td>0-20mA</td>
<td>4-20mA</td>
</tr>
<tr>
<td>Voltage output</td>
<td>0-10VDC</td>
<td>0-10VDC</td>
<td>0-10VDC</td>
<td>0-10VDC</td>
</tr>
<tr>
<td>Switching output</td>
<td>transistor 2x NPN O.C.</td>
<td>transistor 2x NPN O.C.</td>
<td>transistor 2x NPN O.C.</td>
<td>transistor 2x NPN O.C.</td>
</tr>
<tr>
<td>Switching voltage</td>
<td>≤ 100mA</td>
<td>≤ 100mA</td>
<td>≤ 100mA</td>
<td>≤ 100mA</td>
</tr>
<tr>
<td>Range switching</td>
<td>1:100 (Short range : Long range)</td>
<td>1:100 (Short range : Long range)</td>
<td>1:100 (Short range : Long range)</td>
<td>1:100 (Short range : Long range)</td>
</tr>
<tr>
<td>Switching state</td>
<td>light/dark switching output</td>
<td>light/dark switching output</td>
<td>light/dark switching output</td>
<td>light/dark switching output</td>
</tr>
<tr>
<td>Operating mode</td>
<td>LED-display red/green</td>
<td>LED-display red/green</td>
<td>LED-display red/green</td>
<td>LED-display red/green</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP65 (with optical fiber)</td>
<td>IP65 (with optical fiber)</td>
<td>IP65 (with optical fiber)</td>
<td>IP65 (with optical fiber)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 to 50°C</td>
<td>0 to 50°C</td>
<td>0 to 50°C</td>
<td>0 to 50°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25°C to 70°C</td>
<td>-25°C to 70°C</td>
<td>-25°C to 70°C</td>
<td>-25°C to 70°C</td>
</tr>
<tr>
<td>Type of connection</td>
<td>screw connectors</td>
<td>2m cable</td>
<td>screw connectors</td>
<td>screw connectors</td>
</tr>
<tr>
<td>Display</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Housing material</td>
<td>Makrolon® 8035 / UL94V1</td>
<td>Makrolon® 8035 / UL94V1</td>
<td>Makrolon® 8035 / UL94V1</td>
<td>Makrolon® 8035 / UL94V1</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 215g/135g</td>
<td>approx. 215g/135g</td>
<td>approx. 215g/135g</td>
<td>approx. 215g/135g</td>
</tr>
</tbody>
</table>

Connections:

**CLS-K-60/63/65**

1. GND
2. 12-30VDC
3. Voltage output
4. NPN output O.C.
5. NPN output O.C.

**CLS-K-61**

1. GND
2. 12-30VDC
3. Analog output +
4. Analog GND output
5. NPN-Switching output
6. NPN-Switching output

Control and display interface:

Example CLS-K-61

1. Sensitivity
2. Range switching
3. LED
4. Display
5. P1
6. P2
7. P3
8. S1
9. S2
10. PG 13.5

*1 dark switching
*2 light switching

*1 Basic function: 0.1-5VDC/0-10mA (63)
*1 Outputs: 0-10VDC/0-20mA (65)
*2 Additional amplification
*2 (signal spread spectrum)

* Not available with version CLS-K-60/65
High performance sensors made by Micro-Epsilon

Sensors and systems for displacement and position

Sensors and measurement devices for non-contact temperature measurement

2D/3D profile sensors (laser scanner)

Optical micrometers, fiber optic sensors and fiber optics

Color recognition sensors, LED analyzers and color online spectrometer

Measurement and inspection systems