



Instruction Manual
optoCONTROL CLS-K

CLS-K-10
CLS-K-11
CLS-K-20
CLS-K-30
CLS-K-31
CLS-K-40

CLS-K-50
CLS-K-51
CLS-K-60
CLS-K-61
CLS-K-63
CLS-K-65

Fiber optics sensors for gap, diameter, edge and presence monitoring

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Certified acc. to DIN EN ISO 9001: 2008

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1. Safety

The handling of the system assumes knowledge of the instruction manual.

1.1 Symbols Used

The following symbols are used in the instruction manual.



Indicates a hazardous situation which, if not avoided, may result in minor or moderate injuries.



Indicates a situation which, if not avoided, may lead to property damage.



Indicates a user action.



Indicates a user tip.

1.2 Warnings



Connect the power supply and the display / output device in accordance with the safety regulations for electrical equipment.

- > Danger of injury
- > Damage to or destruction of the sensor

The power supply must not exceed the specified limits.

- > Danger of injury
- > Damage to or destruction of the sensor



Avoid shock and vibration to the sensor.

- > Damage to or destruction of the sensor

Never kink the fiber optics and do not bend the fiber optics in small radii.

- > Damage to or destruction of the fiber optics, failure of the sensor

Protect the ends of the fiber optics against contamination (use protective caps).

- > Failure of the sensor

1.3 Notes on CE Identification

The following applies to the optoCONTROL CLS-K: EMC regulation 2004/108/EC

Products which carry the CE mark satisfy the requirements of the EMC regulation 2004/108/EC 'Electromagnetic Compatibility' and the European standards (EN) listed therein. The EC declaration of conformity is kept available according to EC regulation, article 10 by the authorities responsible at

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The sensor is designed for use in industrial and residential areas and satisfies the requirements of the standards

- EN 61000-6-3: 2011-09
- EN 61000-6-2: 2006-03
- EN 61000-4-2: 2009-12
- EN 61000-4-3: 2011-04
- EN 61000-4-4: 2013-04
- EN 61000-4-5: 2007-06
- EN 61000-4-6: 2009-12
- EN 61000-4-11: 2005-2
- EN 55011: 2011-04

The system satisfies the requirements if they comply with the regulations described in the instruction manual for installation and operation.

1.4 Proper Use

The optical fiber amplifier series CLS-K are optical sensors. These are used with the additional use of fiber optics for optical and non-contact recording of a diameter, edge, gap and the presence of a part during

- measuring and inspection tasks
- position detection of small parts
- position and mounting control on assembly machines and feeding systems
- presence monitoring
- length and diameter control

The system may only be operated within the limits specified in the technical data, see Chap. [2.5](#).

Use the system in such a way that in case of malfunctions or failure personnel or machinery are not endangered.

Take additional precautions for safety and damage prevention for safety-related applications.

1.5 Proper Environment

- Protection class: IP 65
- Operating temperature: 0 ... 50 °C (+32 ... +122 °F)
- Storage temperature: -25 ... 70 °C (-13 ... +158 °F)
- Humidity: 5 - 95 % (non-condensing)
- Ambient pressure: Atmospheric pressure
- EMC: Acc. to ¹
 - EN 61000-6-3: 2011-09
 - EN 61000-6-2: 2006-03
 - EN 61000-4-2: 2009-12
 - EN 61000-4-3: 2011-04
 - EN 61000-4-4: 2013-04
 - EN 61000-4-5: 2007-06
 - EN 61000-4-6: 2009-12
 - EN 61000-4-11: 2005-2
 - EN 55011: 2011-04

1) In addition, it applies to all models:

When used in environments where there are particularly strong high frequency influences, it can come to deviations of the indicated accuracy tolerances.

2. Functional Principle, Technical Data

2.1 Short Description

The optoCONTROL series CLS-K offers a sensor solution, with which the sensor and the probes are coupled by fiber optics and thus arranged separately.

Therefore these optical micrometers are applicable with adverse surrounding conditions like high temperatures, small mounting dimensions and bad accessibility in the plants.

The sensor consists of a compact transmission and reception unit for infrared light with an integrated signal processing.

The transmission of the light to the target and back takes place by means of a high-quality fiber optics, which works according to the principle of total reflection.

2.2 Measuring Principle

The sensor as measuring and testing amplifier with a double-armed fiber optics in the transmitted light mode for intensity measurement, edge measurements and web edge controls with a resolution from > 0.1 mm and a measuring frequency up to 4 kHz.

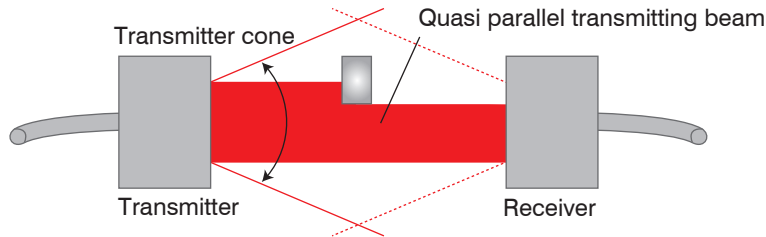


Fig. 1 Measuring principle optoCONTROL CLS-K

2.3 Range / Scanning Range

One Way ³		
Fiber strand ø mm	Range mm (type) ¹	Minimum target size (type)
0.6	90	≤ 0.05
1.0	200	≤ 0.1
1.5	500	≤ 0.1
2.5	1700	≤ 0.2
3.0	2000	≤ 0.3

Sensor ³	
Fiber strand ø mm	Scanning range mm (type) ^{1,2}
0.6	≤ 10
1.0	≤ 30
1,5	≤ 80
2.5	≤ 165
3.0	≤ 180

2.4 Functions

The sensor optoCONTROL CLS-K supports following functions:

- Precise and reliable detection of targets
- Low drift by transmitter monitoring, thereby particularly suitable for measurement tasks.
- High switching frequency and short response time
- Sensor monitoring possible via analog signal
- Scanning distance up to 200 mm⁴
- Range up to 2 m⁴
- Switching output: NPN, PNP, optocoupler, relays (depending on the model, see Chap. 2.5.1, see Chap. 2.5.2)
- Drop-out delay 5 - 100 ms adjustable (optional)
- Stable long-term behavior by controlling the transmitter diode emission
- Large selection of fiber optics available, see Chap. A 1

The amplifiers CLS-K-61/-63 offer the possibility of spreading a signal range particularly important for the solution of application on the entire analog range.

1) With 90° angular sensor mechanism reduced range

2) Related on Kodak white 90 %

3) See catalog optoCONTROL CLS-K

4) Depending on the fiber strand diameter

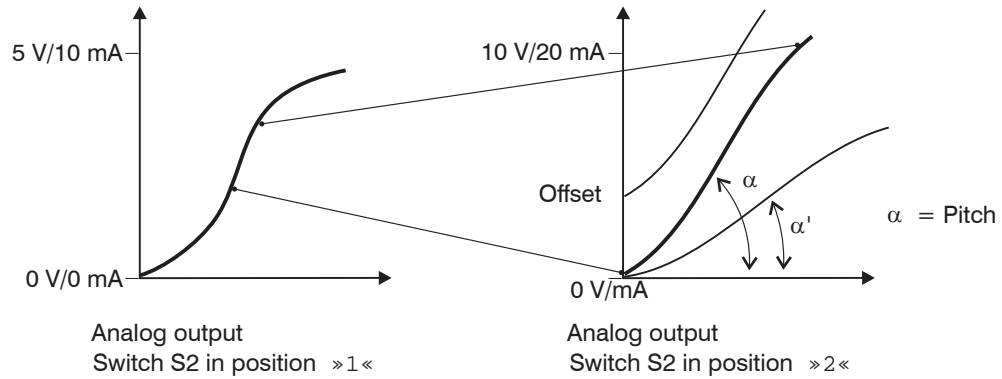


Fig. 2 Functions optoCONTROL CLS-K-61 /-63

2.5 Technical Data

2.5.1 Models CLS-K-10 up to -51

Model CLS-K-	10	11	20	30	31	40	50	51
Operating voltage VDC	10 - 30	10 - 30	24	10 - 30	10 - 30	24	10 - 30	10 - 30
Residual ripple	≤ 10 %							
Current consumption	~ 50 mA							
Switching delay	≤ 500 ms							
Response time	≤ 120 μs							
Switching frequency	≤ 4 kHz							
Temperature drift	≤ (-)0.5 % /K							
Reproducibility	≤ 1 % at Δθ = 2 K							
Switching state	LED display red and green							
Operating mode	Light and dark switch output	Light/dark switching switchable						
Sensitivity	Adjustable with 10-turn potentiometer P1							
Range switching S1	1:100 (Short range : Long range)							
Hysteresis	4 % of the measuring value range							
Protection class	IP 65 (with mounted fiber optics)							
Operating temperature	0 up to +50 °C (+32 ... +122 °F)							
Storage temperature	-25 °C up to +70 °C (-13 ... +158 °F)							
Housing material	Macrolon 8030/UL94V1, transparent cover, blue lower part							
Weight, dimensions	approx. 215 g/135 g, 125 x 42 x 45 mm							
Switching output	Transistor ¹ 2x NPN O.C.	Relays 1x change- over contact	Optocou- pler ¹	PNP ¹	Relays 1x change- over contact	Optocou- pler ¹	PNP ¹	
Switching voltage	30 VDC	0.01-250 VAC 0.01- 220 VDC	30 VDC	30 VDC	0.01-250 VAC 0.01- 220 VDC	30 VDC	30 VDC	30 VDC

1) Short-circuit proof

Model CLS-K-	10	11	20	30	31	40	50	51
Switching current	5 - 100 mA		50 μ A - 2 A	5 - 100 mA	5 - 100 mA	50 μ A - 2 A	5 - 100 mA	5 - 100 mA
Switching power			5 μ W - 60 W 125 VA			5 μ W - 60 W 125 VA		
Switching frequency max.	4 kHz	4 kHz	60 Hz	4 kHz	4 kHz	60 Hz	4 kHz	4 kHz
Saturation voltage	≤ 2.0 V	≤ 2.0 V		≤ 2.0 V	≤ 2.0 V		≤ 2.0 V	≤ 2.0 V
Pulse stretching 5 - 100 ms						Adjustable with potentiometer P2		
Analog output	0.1 - 5 VDC, output resistance 1 kOhm							
Type of connection	Line 2 m	Screw connectors 1.5 mm ² (plug-in version on request)						
Electromagnetic compatibility (EMC)	EN 61000-6-3: 2011-09, EN 61000-6-2: 2006-03, EN 61000-4-2: 2009-12, EN 61000-4-3: 2011-04, EN 61000-4-4: 2013-04, EN 61000-4-5: 2007-06, EN 61000-4-6: 2009-12, EN 61000-4-11: 2005-2, EN 55011: 2011-04							

2.5.2 Models CLS-K-60 up to -65

Model CLS-K-	60	61	63	65
Power supply	12 - 30 VDC			
Residual ripple	≤ 10 %			
Current consumption	~ 70 mA			
Switching delay	≤ 500 ms			
Switching frequency	≤ 4 kHz			
Response time	≤ 120 μ s			
Temperature drift	$\leq (-)0.5$ % /K			
Reproducibility	≤ 1 % at $\Delta\vartheta = 2$ K			
Hysteresis	4 % of the measuring value range			
Analog output	0 - 20 mA	0 - 10 VDC	0 - 20 mA	4 - 20 mA
Current output	Load ≤ 600 Ω			
Switching output	Transistor 2 x NPN O.C.			

Model CLS-K-	60	61	63	65
Switching voltage	30 VDC			
Switching current	5 - 100 mA			
Sensitivity	Adjustable via 10-level potentiometer P1			
Range switching S1	1:100 (Short range : Long range)			
Switching state	LED display red/green			
Operating mode	Light/dark switching output			
Protection class	IP 65 (with fiber optics)			
Power supply and output	Transient-protection polarity, and short-circuit proof			
Operating temperature	0 up to 50 °C (+32 ... +122 °F)			
Storage temperature	-25 °C up to 70 °C (-13 ... +158 °F)			
Type of connection	Screw connectors	Line 2 m	Screw connectors	
Housing material	Macrolon 8030 / UL94V1			
Weight	approximately 215 g / 135 g			
Electromagnetic compatibility (EMC)	EN 61000-6-3: 2011-09, EN 61000-6-2: 2006-03, EN 61000-4-2: 2009-12, EN 61000-4-3: 2011-04, EN 61000-4-4: 2013-04, EN 61000-4-5: 2007-06, EN 61000-4-6: 2009-12, EN 61000-4-11: 2005-2, EN 55011: 2011-04			

3. Delivery


3.1 Unpacking

1 Sensor (amplifier) optoCONTROL CLS-K

1 Power supply cable ¹

1 Instruction manual

Optional accessories, e.g. fiber optics, see Chap. [A 1](#).

 Check the delivery for completeness and shipping damage immediately after unpacking.

 In case of damage or missing parts, please contact the supplier.

3.2 Storage

Storage temperature: -25 up to +70 °C

Humidity: 5 - 95 % (non-condensing)

1) The models CLS-K-11, -20, -30, -31, -40, -50, -51, -60, -63, -65 are delivered with screw connectors, see Chap. [2.5](#). The models CLS-K-10 and CLS-K-61 are delivered with power supply cable.

4. Mounting

NOTICE

No sharp edged or heavy articles may affect on the cables. In any case, avoid definitely kinking of the cables.

> Damage or destruction of the cable, failure of the sensor

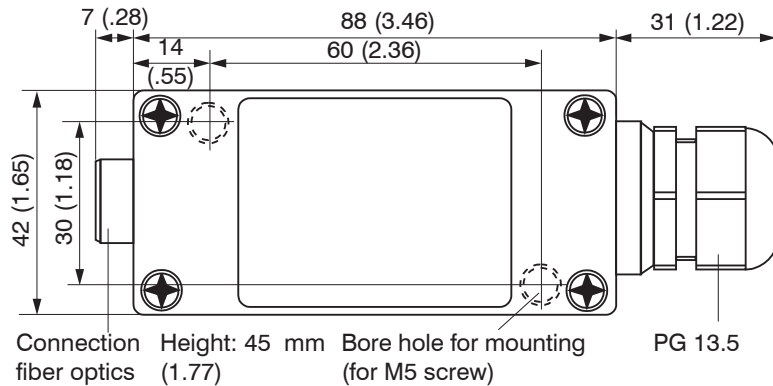


Fig. 3 Dimensional drawing of optoCONTROL CLS-K, dimensions in mm, not to scale

4.1 Fiber Optics

Various fiber optics are available for the optoCONTROL CLS-K, siehe Kap. A 1. It is possible to use an optimal probe even in confined conditions.

The fiber optics is inserted into the provided adapter and locked with the cap nut, see Chap. 4.2.

i The male connector of fiber optics is coded on the amplifier side and must not be plugged in by force!

NOTICE

Treat the fiber optics carefully. Do not fall below the bending radius of the fiber optics (3 x the outside diameter).

- > Breakage of the fiber optics fibers
- > Impairment of the switching behaviors

Do not touch the front surface of the probe.

- > Impairment of functionality by contamination

Do not install more fiber optics probes directly next to each other.

- > Mutual interference

Do not use cable ties in order to fasten the PVC coating.

- > Breakage of the fiber optics fibers

4.2 Mounting Fiber Optics and Power Supply



Fig. 4 Connection fiber optics

Fig. 5 Model optoCONTROL CLS-K-10 with removed cover

Fig. 6 Connection power supply

- Remove the cover of the amplifier, see [Fig. 5](#) and install the amplifier in accordance with the provided mounting holes on the housing.
- Connect the amplifier in accordance to the pin assignment ^{1, see Chap. 5.1}, see Chap. 5.1.
- Mount the fiber optics to the amplifier, see [Fig. 4](#) and lock it with the cap nut, see [Fig. 7](#).
- Attach the probe or the probes of the fiber optics in the required position to the target.

i Consider here background reflections!

1) The models CLS-K-11, -20, -30, -31, -40, -50, -51, -60, -63, -65 are supplied with screw terminals, see Chap. 2.5. The models CLS-K-10 and CLS-K-61 are delivered with power supply cable.

Power supply cable

Amplifier

Fiber optics



Fig. 7 Assembly of the fiber optics on the amplifier

➡ Switch on the power supply.

After switching on the power supply, the green LED or the red LED lights.

5. Electrical Connections

5.1 Pin Assignment Model CLS-K-10 up to -51

5.1.1 CLS-K-10

Pin assignment ¹	
brown	GND
pink	+24 VDC
green	Analog output +
yellow	Analog output GND
gray	NPN switching output ²
white	NPN switching output ³



Fig. 8 Power supply cable, open ends

Fig. 9 Pin assignment model CLS-K-10

5.1.2 CLS-K-11 to -51

Terminal block		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>⊗</td><td>⊗</td><td>⊗</td><td>⊗</td><td>⊗</td><td>⊗</td><td>⊗</td> </tr> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td> </tr> </table>							⊗	⊗	⊗	⊗	⊗	⊗	⊗	1	2	3	4	5	6	7
⊗	⊗	⊗	⊗	⊗	⊗	⊗																
1	2	3	4	5	6	7																
CLS-K-11	NPN O.C.	GND	+24 VDC	Analog output	Switching output																	
CLS-K-20/-40	Relay																					
CLS-K-30/-50	Optocoupler O.C. / O.E.																					
CLS-K-31/-51	PNP																					
All models light/dark switching																						

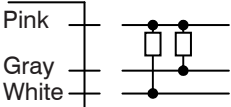
- 1) No terminal block available
- 2) Dark switching
- 3) Light switching

Fig. 10 Pin assignment models CLS-K-11 to -51

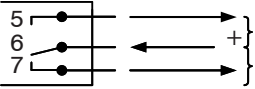
The analog output, terminal block 3 and 4 (signal depends on the amount of light 0.1 - 5 V) is particularly suitable for optimization of the probe position, for self-monitoring of the control path as well as for measuring, inspection or monitoring applications. Furthermore, this output allows the function reserve.

The minimum voltage difference for reliable switching is ≥ 0.2 V (factory setting 1.6 - 1.8 V).

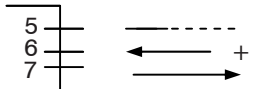
5.1.3 CLS-K-10 /-11

<p>Connection type NPN O.C</p>		<p>+ 24 VDC 0 V → active dark switching 0 V → active light switching</p>
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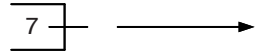
5.1.5 CLS-K-20 /-40

<p>Connection type relays</p>		<p>Close Open</p>
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5.1.7 CLS-K-30 /-50

<p>Connection type Optocoupler output Example: PNP</p>		<p>GND + voltage to be switched e.g. 24 VDC for control/consumer load to ground or PIN 5</p>
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5.1.9 CLS-K-31 /-51

<p>Connection type PNP output</p>	
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5.2 Pin Assignment Models CLS-K-60 up to -65

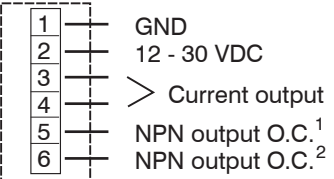
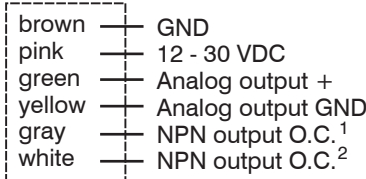
CLS-K-60/-63/-65	CLS-K-61 ³
 <p>1 — GND 2 — 12 - 30 VDC 3 — > Current output 4 — NPN output O.C.¹ 5 — NPN output O.C.² 6 — NPN output O.C.²</p>	 <p>brown — GND pink — 12 - 30 VDC green — Analog output + yellow — Analog output GND gray — NPN output O.C.¹ white — NPN output O.C.²</p>

Fig. 11 Pin assignment models CLS-K-60 up to -65

- 1) Dark switching
- 2) Light switching
- 3) No terminal block available

6. Operation and Setting

6.1 Operation and Display Elements

6.1.1 Models CLS-K-10 up to -51

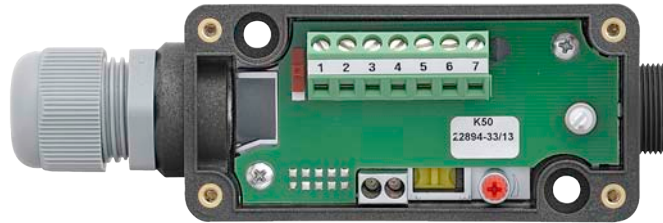
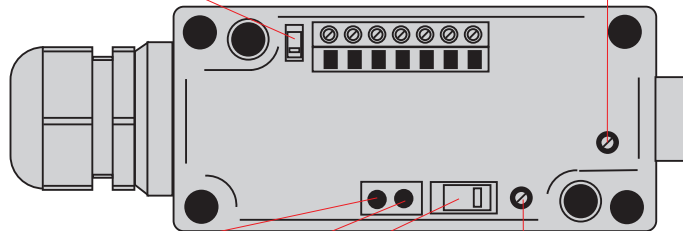


Fig. 12 View on operating and display elements models CLS-K-10 up to -51

S2 Switch for light/dark changeover ¹ P2 Potentiometer for timer ¹



LED green LED red
S1 Range switching P1 Potentiometer sensitivity

Fig. 13 Operating and display elements models CLS-K-10 up to -51

1) Not available with all versions

6.1.2 Model CLS-K-61

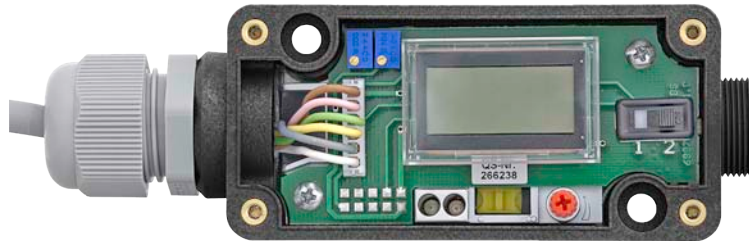


Fig. 14 View on operating and display elements model CLS-K-61

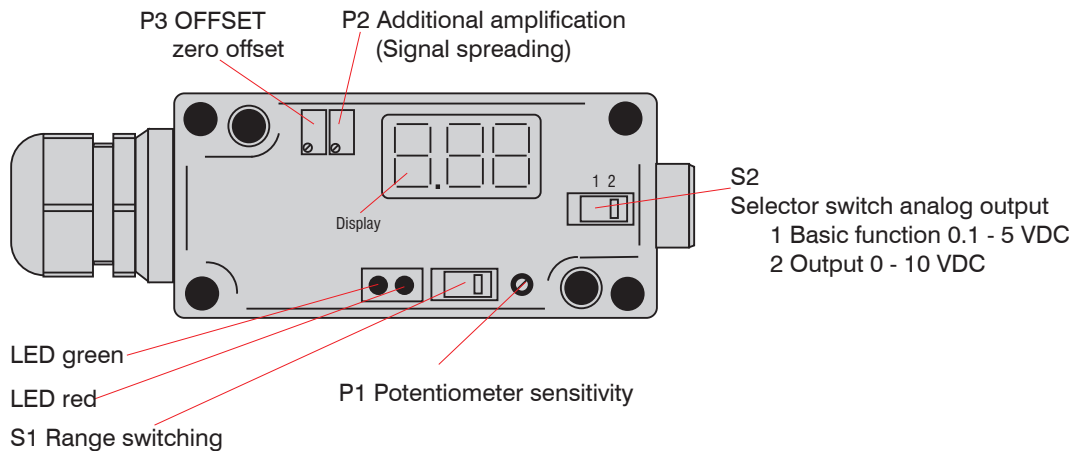


Fig. 15 Operating and display elements model CLS-K-61

6.1.3 Models CLS-K-60 /-63 /-65

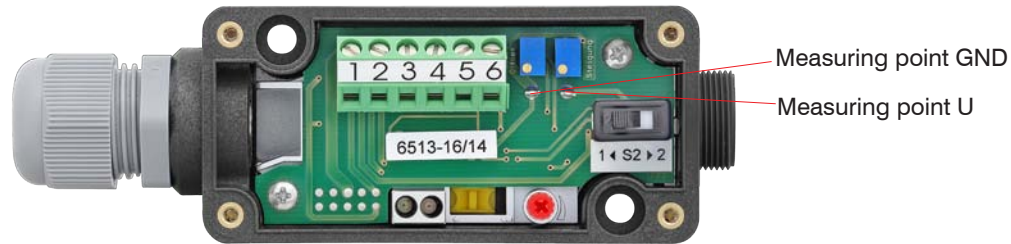


Fig. 16 View on operating and display elements models CLS-K-60 /-63/ -65

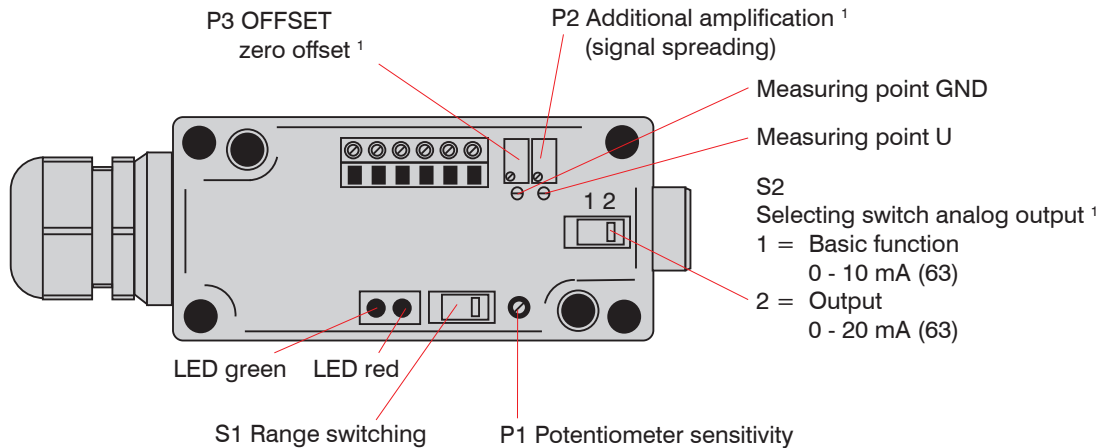


Fig. 17 Operating and display elements models CLS-K-60 /-63/ -65

1) Not available with version CLS-K-60/-65

P1 potentiometer ¹ S1 range switch LED

Far < > Near



Fig. 18 Settings of the potentiometer P1 and range switch S1

6.2 Commissioning

➡ After the assembly, set the range switch S1 on Near, see Fig. 18.
The warm-up time of the amplifier is approximately 10 min.

6.2.1 Range Switching S1

<input type="radio"/>	Near	In the case of overregulation of the amplifier (analog signal > 5 V), the sensitivity can be reduced by the <code>Near</code> setting.
<input type="radio"/>	Far	In the case of a too small scanning range /range an increase can be achieved by the <code>Far</code> setting.

- ➡ Shift the range switch S1 into the reverse position, if no `Near` or `Far` setting can be effected with the sensitivity potentiometer.
- ➡ Please use a different fiber optics or change the position of the fiber optics, if even with this measure setting is not possible.


1) P1 = Potentiometer sensitivity

6.2.2 Adjustment of the Sensibility

6.2.2.1 Settings for Reflex Operation

➡ Turn the potentiometer P1 (sensitivity) clockwise, until the LED changes from green to red (max. 15 turns), see [Fig. 18](#).

➡ Add one turn for the function reserve.

➡ In the case of a large scanning range set S1 switch to  Far.

! The analog signal can be used for finding the optimal setting.

6.2.2.2 Settings for Transmitted Light Mode

➡ Adjust the range analogously in the case of adjusted and free light path, see Chap. [6.2.2.1](#).

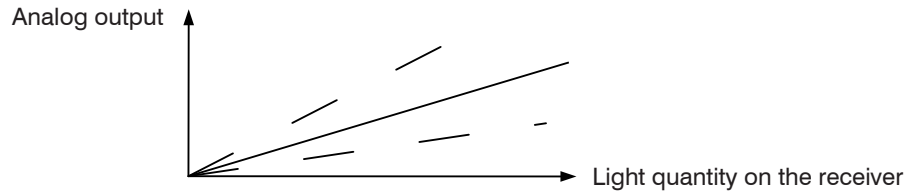


Fig. 19 Settings for transmitted light mode

6.2.3 Additional Settings with Options

- Light or dark switching is selectable with switch S2, see [Fig. 20](#).
- Pulse stretching is selectable with the potentiometer P2 by turning clockwise, see [Fig. 20](#).

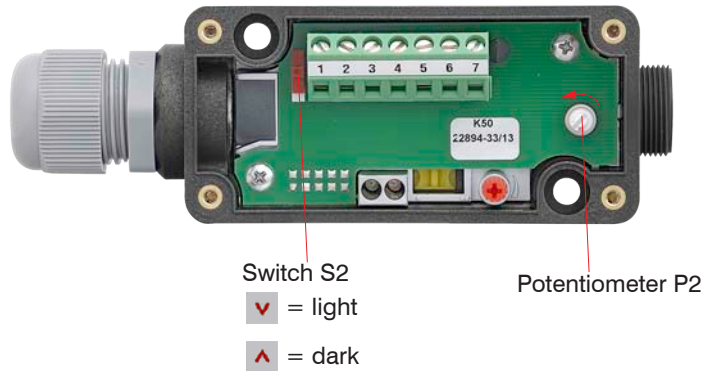


Fig. 20 Potentiometer P2 and switch S2

6.2.4 Special Function for CLS-K-61

The amplifier CLS-K-61 has the following additional special functions:

- Zero offset
- Signal spreading / Signal amplification

The amplifier offers the possibility to spread the signal range which is of special interest for the application to the analog range.

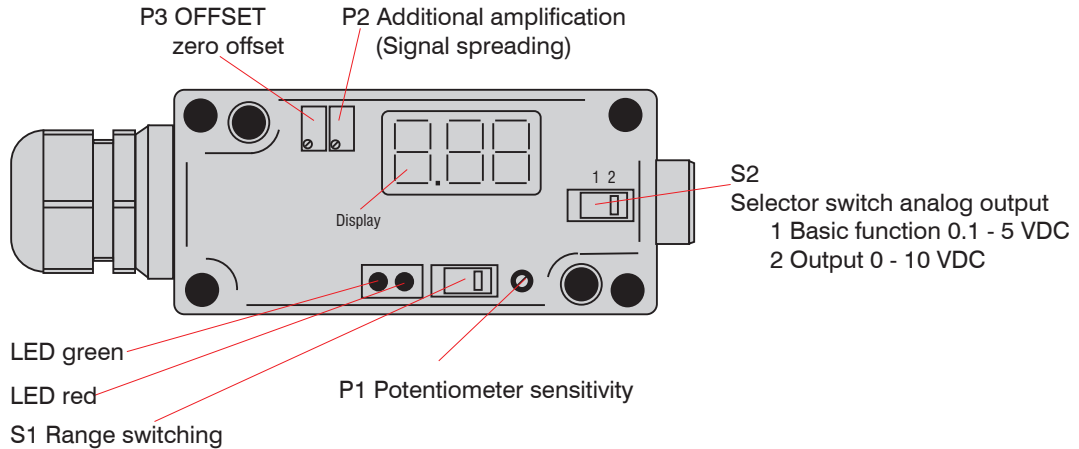



Fig. 21 Operating and display elements model CLS-K-61 / Special functions

- 1 ➡ Turn the potentiometer P1 (sensitivity) clockwise, until the LED changes from green to red (max. 15 turns), see [Fig. 18](#).
 - ➡ Add one turn for the function reserve.
 - ➡ In the case of a large scanning range set S1 switch to  Far.
 - ! The analog signal can be used for finding the optimal setting.
- 2 ➡ Set the requested lower point onto the characteristic line to 0 V using the potentiometer P3.
The value can be reduced by a maximum of 3 V.
- 3 ➡ Set the requested upper point onto the characteristic line to 10 V using the potentiometer P2.
There is a maximum of a quadrupling of the original voltage possible.
- 4 ➡ Repeat process 1 and 2 to optimize the setting.


Back to factory setting:

- ➡ Push the switch S2 in position 1.
- ➡ Set the potentiometer P1 to the left (max. 10 turns).
- ➡ Push the switch S2 in position 2.
- ➡ Set voltage with potentiometer P3 to 0 V.
- ➡ Push the switch S2 in position 1.
- ➡ Set analog voltage with potentiometer P1 to 5 V.
- ➡ Push the switch S2 in position 2.
- ➡ Set voltage with potentiometer P2 to 10 V.

6.2.5 Special Function for CLS-K-63

6.2.5.1 Setting Reflex Operation / Transmitted Light Mode

You will find the description in detail, see Chap. 6.2.2.1, see Chap. 6.2.2.2.

- 1 ➡ Turn potentiometer P1 (sensitivity) clockwise until the LED changes from green to red (Max. 15 turns).
- 2 ➡ In the case of a large scanning range S1 set to  Far.
- 3 ➡ Adjust the range analogously in the case of adjusted and free light path, see Chap. 6.2.2.1.

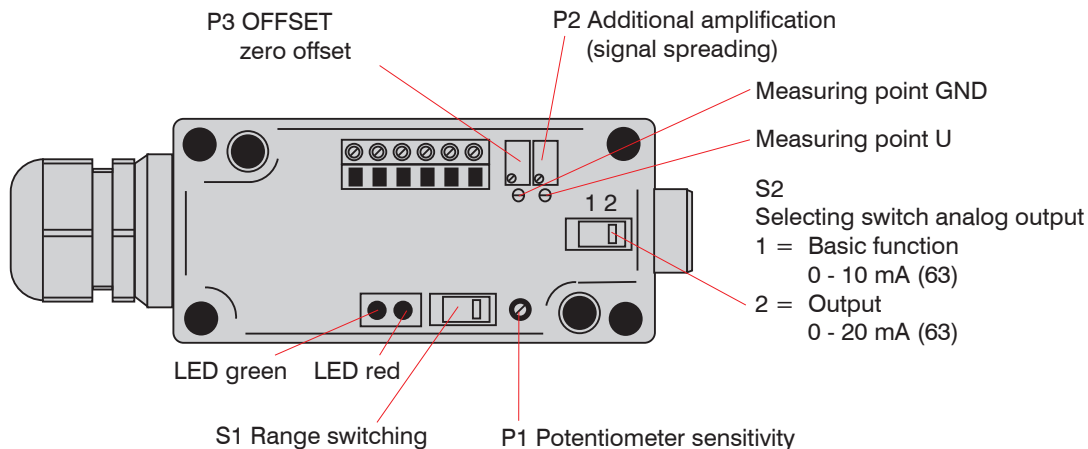


Fig. 22 Operating and display elements model CLS-K-63 / special functions

6.2.5.2 Linearization

- 1 Based on the basic function the linear part of the function is prepared with P3 “zero point“ and P2 “steepness“.
- 2 This adjustment requires repetitions as the settings of the potentiometer interfere each other.
- 3 A multimeter 0 – 10 VDC is connected to the measuring points “GND” and “U”, see [Fig. 16](#), see [Fig. 17](#) (S2: “2“; 10 V = 20 mA) for the adjustment procedure.
- 4 Start value for zero point approximately – 2 V.

7. Instructions for Operation

7.1 Cleaning

We recommend cleaning the front surface of the probe regularly.

Dry cleaning

You can use an anti-static brush for lenses, or blow down the front surface using dehumidified, clean, oil-free compressed air.

Wet cleaning

Use a clean, soft, lint-free cloth or a lens cleaning tissue and pure alcohol (isopropanol) to clean front surface. Never use commercial glass cleaners or other cleaning agents.

8. Warranty

All components of the device have been checked and tested for perfect function in the factory. In the unlikely event that errors should occur despite our thorough quality control, this should be reported immediately to MICRO-EPSILON Eltrotec.

The warranty period lasts 12 months following the day of shipment. Defective parts, except wear parts, will be repaired or replaced free of charge within this period if you return the device free of cost to MICRO-EPSILON Eltrotec. This warranty does not apply to damage resulting from abuse of the equipment and devices, from forceful handling or installation of the devices or from repair or modifications performed by third parties.

No other claims, except as warranted, are accepted. The terms of the purchasing contract apply in full. MICRO-EPSILON Eltrotec will specifically not be responsible for eventual consequential damages. MICRO-EPSILON Eltrotec always strives to supply the customers with the finest and most advanced equipment. Development and refinement is therefore performed continuously and the right to design changes without prior notice is accordingly reserved. For translations in other languages, the data and statements in the German language operation manual are to be taken as authoritative.

9. Service, Repair

In the event of a defect on the amplifier or fiber optics please send us the effected parts for repair or exchange.

In the case of faults the cause of which is not clearly identifiable, the whole measuring system must be sent back to:

MICRO-EPSILON Eltrotec GmbH
Heinkelstraße 2
73066 Uhingen / Germany

Tel: +49 (0) 7161 / 98872-300
Fax: +49 (0) 7161 / 98872-303
eltrotec@micro-epsilon.de
www.micro-epsilon.com

10. Decommissioning, Disposal



➡ Disconnect the power supply cable and the fiber optics from the amplifier.

The colorCONTROL CLS-K is produced according to the directive 2011/65/EU, "RoHS".

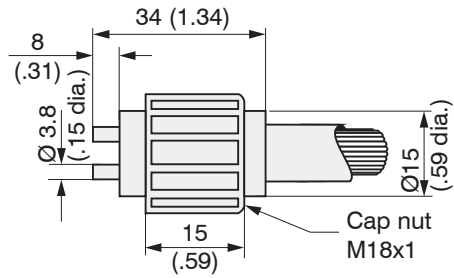
➡ Do the disposal according to the legal regulations (see directive 2002/96/EC).

Appendix

A 1 Optional Accessories

Designation	Foto	Description	Article number
Different fiber optics see catalog optoCONTROL CLS-K.			
Example: FAR- T-A2.0-2.5-1200-67°		Reflex fiber optics	10810351
FAD- M-A2.0-2.5-1200-67°		Transmitted fiber optics	10810490

A 2 Dimensions of the Fiber Optics Adapter





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