EN

wenglor
the innovative family

OPT2001 OPT2002
OPT2003 OPT2004
OPT2005 OPT2006

High-performance distance sensor

Operating Instructions

Available as PDF only
Status: 28.01.2016
www.wenglor.com

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Index

1. Proper Use

This wenglor product has to be used according to the following functional principle:
High-performance distance sensor
High performance distance sensors which use the principle of angle measurement determine the distance between the sensor and the object. These sensors have small working ranges (under 1 m) and recognize objects with high precision. Some sensors use a high-resolution CMOS line array and DSP signal processing. The color, shape and texture of the objects to be recognized does not affect the sensors' measurements. Even dark objects can be reliably detected against a bright background.
They can be operated with very high speeds or very high resolutions. The measured value can be output as an analog value. Furthermore, Teach-In, filter functions for adjusting a switching output, and an error output are available. The measuring range can be selected individually within the working range.

2. Safety Precautions

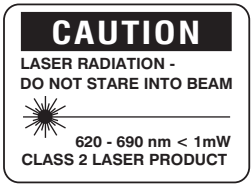
- This operating instruction is part of the product and must be kept during its entire service life.
- Read this operating instruction carefully before using the product.
- This product is not suitable for safety applications.
- Installation, start-up and maintenance of this product has only to be carried out by trained personal.
- Tampering with or modifying the product is not permissible.
- Protect the product against contamination during start-up.

Laser/LED warning

For the respective Laser Class/LED Group please view the technical data of the product.

Class Laser 1 (EN 60825-1)
Observe all applicable standards and safety precautions.

Class Laser 2 (EN 60825-1)
Observe all applicable standards and safety precautions.
The enclosed laser warning labels must be attached and visible at all time. Do not stare into beam.



Caution: Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

3. Declaration of Conformity

The EC declaration of conformity can be found on our website at www.wenglor.com in download area.

4. Technical Data

	OPT2001	OPT2003	OPT2005
Optical Data			
Working Range	30…80 mm	40...160 mm	50...350 mm
Measuring Range	50 mm	120 mm	300 mm
Resolution	< 8 µm	< 20 µm	< 50 µm
Resolution (Speed-Mode)	< 12 µm	< 30 µm	< 80 µm
Linearity	0,1 %	0,1 %	0,15 %
Linearity (Speed-Mode)	0,2 %	0,2 %	0,2 %
Light Source	Laser (red)	Laser (red)	Laser (red)
Wave Length	660 nm	660 nm	660 nm
Laser Class	2	2	2
Service Life (25 °C)	100000 h	100000 h	100000 h
max. Ambient Light	10000 Lux	10000 Lux	10000 Lux
Electrical Data			
Supply Voltage	18…30 V DC	18…30 V DC	18…30 V DC
Light Spot Size at begin working range	0,4×0,8 mm	0,4×0,9 mm	0,4×1 mm
Light Spot Size at end working range	0,7×1,4 mm	0,9×1,8 mm	1,4×3,1 mm
Current Consumption (Ub = 24 V)	< 80 mA	< 80 mA	< 80 mA
Measurement Rate	1500/s	1500/s	800/s
Response Time	660 µs	660 µs	1250 µs
Response Time (Resolution-Mode)	1660 µs	1660 µs	2500 µs
Temperature Drift	< 5 µm/°C	< 10 µm/°C	< 25 µm/°C
Temperature Range	–25...50 °C	–25...50 °C	–25...50 °C
Analog Output	0…10 V	0…10 V	0…10 V
Current Output Load Resistance	< 1 mA	< 1 mA	< 1 mA
Analog Output	4…20 mA	4…20 mA	4…20 mA
Current Output Load Resistance	< 500 Ohm	< 500 Ohm	< 500 Ohm
Voltagedrop PNP-Error Output	< 2,5 V	< 2,5 V	< 2,5 V
Switching Current PNP-Error Output	< 200 mA	< 200 mA	< 200 mA
Short-Circuit Protection	yes	yes	yes
Reverse Polarity Protection	yes	yes	yes
Mechanical Data			
Adjustment	Teach-In	Teach-In	Teach-In
Housing	Plastic	Plastic	Plastic
Protection Mode	IP67	IP67	IP67
Connection	M12×1, 8-pin	M12×1, 8-pin	M12×1, 8-pin
Protection Class	III	III	III

Reference material: Kodak white 90 % remission

	OPT2002	OPT2004	OPT2006
Optical Data			
Working Range	30…80 mm	40…160 mm	50…350 mm
Measuring Range	50 mm	120 mm	300 mm
Resolution	< 8 µm	< 20 µm	< 50 µm
Resolution (Speed-Mode)	< 12 µm	< 30 µm	< 80 µm
Linearity	0,1 %	0,1 %	0,15 %
Linearity (Speed-Mode)	0,2 %	0,2 %	0,2 %
Light Source	Laser (red)	Laser (red)	Laser (red)
Wave Length	660 nm	660 nm	660 nm
Laser Class	1	1	1
Service Life (25 °C)	100000 h	100000 h	100000 h
max. Ambient Light	10000 Lux	10000 Lux	10000 Lux
Electrical Data			
Supply Voltage	18…30 V DC	18…30 V DC	18…30 V DC
Light Spot Size at begin working range	0,5×1 mm	0,5×1,2 mm	0,6×1,5 mm
Light Spot Size at end working range	1×2 mm	1×2,5 mm	1,5×4 mm
Current Consumption (Ub = 24 V)	< 80 mA	< 80 mA	< 80 mA
Measurement Rate	1000/s	1000/s	500/s
Response Time	1000 µs	1000 µs	2000 µs
Response Time (Resolution-Mode)	2000 µs	2000 µs	4000 µs
Temperature Drift	< 5 µm/°C	< 10 µm/°C	< 25 µm/°C
Temperature Range	–25…50 °C	–25…50 °C	–25…50 °C
Analog Output	0…10 V	0…10 V	0…10 V
Current Output Load Resistance	< 1 mA	< 1 mA	< 1 mA
Analog Output	4…20 mA	4…20 mA	4…20 mA
Current Output Load Resistance	< 500 Ohm	< 500 Ohm	< 500 Ohm
Voltagedrop PNP-Error Output	< 2,5 V	< 2,5 V	< 2,5 V
Switching Current PNP-Error Output	< 200 mA	< 200 mA	< 200 mA
Short-Circuit Protection	yes	yes	yes
Reverse Polarity Protection	yes	yes	yes
Mechanical Data			
Adjustment	Teach-In	Teach-In	Teach-In
Housing	Plastic	Plastic	Plastic
Protection Mode	IP67	IP67	IP67
Connection	M12×1, 8-pin	M12×1, 8-pin	M12×1, 8-pin
Protection Class	III	III	III

Reference material: Kodak white 90 % remission

Connection Diagram

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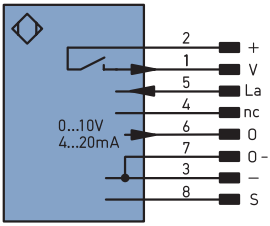
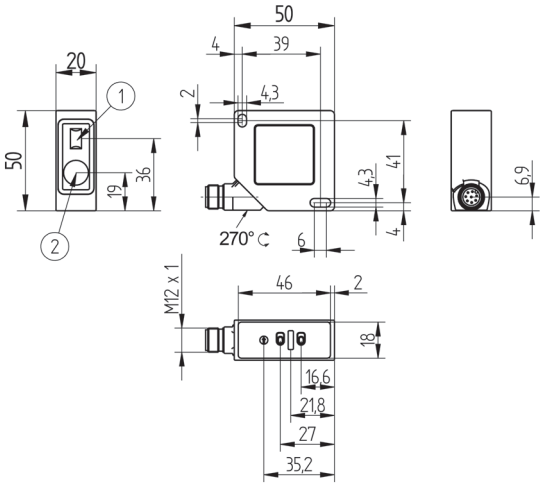


+	Supply Voltage +
V	Contamination/Error output (NO)
La	Emitted light disengageable
O	Analogue output
O–	Ground for the analogue output
–	Supply Voltage 0 V
S	Shielding

Housing Dimensions

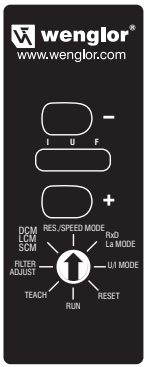


① = Transmitter Diode

② = Receiver Diode

Control Panel

On the control panel you find the Plus key and the Minus key, several LEDs and the rotary selector switch. The rotary selector switch is used for choosing the setting- and operation functions.



⊖	= Minus key (with LED)
⊕	= Plus key (with LED)
I-LED (yellow)	= Current output
U-LED (yellow)	= Voltage Output. Brightness is proportional to the output voltage
F-LED (rot)	= Error Output
⟲	= Rotary selector switch
RUN	= Sensor operation
TEACH	= Teach measurement range
FILTER ADJUST	= Filter adjustment
DCM/SCM/LCM	= Switching Default Capture Mode/Short Capture Mode/Long Capture Mode
RES./SPEED-MODE	= Switch Resolution/Speed
RxD/La Mode	= Emitted Light can be switched off
U/I Mode	= Switching 0…10 V/4…20 mA
RESET	= Reset

5. Installation Instructions

During use of the sensors, applicable electrical and mechanical regulations, standards and safety precautions must be adhered to. The sensor has to be protected against mechanical influences.
In case of very glossy surfaces the sensor has to be mounted slightly inclined and has to be mounted on a plane surface (approx. 5°), to inhibit a direct reflection of the laser beam into the optics.

6. Initial Operation

Please control the proper connection of all conductors.
Impress a supply voltage of 18...30 V DC with ripple of < 10 % (within the indicated voltage range).

7. Function

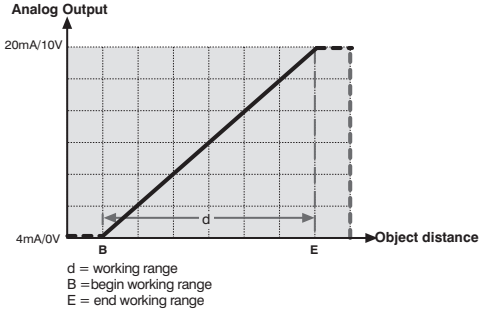
The sensor uses a high-resolution CMOS line array and DSP technology, virtually eliminating material, color and brightness related measurement value differences. Alternatively high speed (Speed-Mode) or high resolution (Resolution-Mode) are adjustable. Integrated analogue output can be configured for voltage 0…10 V or current 4…20 mA. Teach-In, an Error Output and filter functions are available.

Outputs

Analog Output

The analog output is connected to analog earth. The analog output can be configured as a current output or a voltage output. If you have the choice we recommend the use of the voltage output (reduced current consumption).

The analog output reads out a standard signal of 0...10 V when configured as a current output (see settings).
The analog output reads out a standard signal of 4...20 mA when configured as a voltage output (see settings).



d = working range
B =begin working range
E = end working range

Error Outputs

The PNP error output is switched to positive if no object is detected within the selected working range, or if an error has occurred (e.g. an interrupted conductor at the current output). The red F LED lights up to indicate that the error output has been activated.

8. Adjustment

8.1. Manual Adjustments

Reset:

- Set the rotary selector switch to **RESET**
- Briefly press the minus-key ⊖ or the plus-key ⊕
  ➔ red F-LED lights up
  ➔ Delivery status restored (RES. MODE, rising characteristic function, full measuring range, filter function off.) The adjusted transmission speed (Baud rate) and the setting Current or Voltage Output is not changed by the **RESET**.
- Set the rotary selector switch to **RUN**

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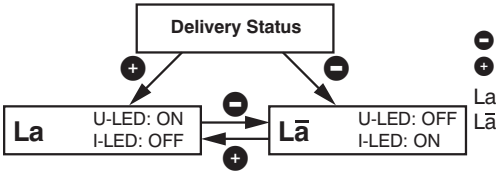
Set Input

The Input can be used as follows: Emitted Light can be switched off at 24 V (La) or Emitted Light can be switched off at 0 V (L$\bar{a}$).

- Rotary Selector Switch ⏀ **to RxD/La Mode**
  ➔ The **U-LED** and I-**LED** indicate the current configuration. **RxD** is preset in the delivery status. By pressing the Plus or the Minus key, the configuration can be changed.



⊖ = Minus Button/LED
⊕ = Plus Button/LED
La = Emitted Light can be switched off at 24 V
Lā = Emitted Light can be switched off at 0 V

- Set the rotary selector switch ⏀ to **RUN**

Adjustment of the Output

Configuring the analog output as a voltage output:

- Set the rotary selector switch ⏀ to **U/I MODE**
  ➔ The red **F-LED** lights up
  ➔ If the yellow **U-LED** lights up: Analog output presently set to 0...10 V
  ➔ If the yellow **I-LED** lights up: Analog output presently set to 4...20 mA
- Briefly press the plus-key ⊕
  ➔ The Yellow **U-LED** lights up: Analog output reconfigured to 0...10 V (voltage output)
- Set the rotary selector switch ⏀ to **RUN**

Configuring the analog output as a current output:

- Set the rotary selector switch ⏀ to **U/I MODE**
  ➔ The red **F-LED** lights up
  ➔ If the yellow **U-LED** lights up: Analog output presently set to 0...10 V
  ➔ If the yellow **I-LED** lights up: Analog output presently set to 4...20 mA
- Briefly press the minus-key ⊖
  ➔ The yellow **I-LED** lights up: Analog output reconfigured to 4...20 mA (current output)
- Set the rotary selector switch ⏀ to **RUN**

Operate the sensor with high resolution (Resolution-Mode)

- Set the rotary selector switch ⏀ to **RES./SPEED-MODE**
  ➔ The red **F-LED** lights up
  ➔ The yellow **U-LED** lights up: Sensor presently set to high speed
  ➔ The yellow **I-LED** lights up: Sensor presently set to high resolution
- Briefly press the minus-key ⊖
  The yellow **I-LED** lights up: Sensor now operates with high resolution.
- Set the rotary selector switch ⏀ to **RUN**

Operate the sensor with high speed (Speed-Mode)

- Set the rotary selector switch ↻ to **RES./SPEED-MODE**
  - ➔ The red F-LED lights up
  - ➔ The yellow U-LED lights up: Sensor presently set to high speed
  - ➔ The yellow I-LED lights up: Sensor presently set to high Resolution
- Briefly press the plus-key ⊕
  The yellow U-LED lights up: Sensor now operates with high speed.
- Set the rotary selector switch ↻ to **RUN**

Adjustment of Measuring Range

You can either adjust the zero point (begin of working range) of the rising characteristic function (vide point A) or you can set the Measuring Range individually by means of the zoom function (vide points B and C). The zoom function is possible for rising and falling characteristic functions. You can restore the the full Measuring Range with Reset.

A) Adjust zero point of the Measuring Range:

- Set the rotary selector switch ↻ to **TEACH**
- Press and holt the minus-key ⊖ until the yellow **LEDs** blink
  - ➔ yellow **LEDs** blink
  - ➔ Characteristic curve is now rising with slope over the full measuring range and the selected zero point
- Set the rotary selector switch ↻ to **RUN**

B) Setting the measuring range for a rising characteristic function (Zoom function):

- Set the rotary selector switch ↻ to **TEACH**
  - ➔ red **F-LED** lights up
- Place the object at the most distant point of the desired working range
- Briefly press the plus-key ⊕
  - ➔ yellow **I-LED** lights up
- Place the object at the nearest point of the desired working range
- Briefly press the minus-key ⊖
  - ➔ yellow **LEDs** light up: The two points have now been taught in
  - ➔ yellow **LEDs** do not light up: Teach-In must be repeated because the two points are too close to each other, or they are outside of the measuring range
- Set the rotary selector switch ↻ to **RUN**

C) Setting the measuring range for a falling characteristic function (Zoom function):

- Set the rotary selector switch ↻ to **TEACH**
  - ➔ red **F-LED** lights up
- Place the object at the most distant point of the desired working range
- Briefly press the minus-key ⊖
  - ➔ yellow **U-LED** lights up
- Place the object at the nearest point of the desired working range
- Briefly press the plus-key ⊕
  - ➔ yellow **LEDs** light up: The two points have now been taught in
  - ➔ yellow **LEDs** do not light up: Teach-In must be repeated because the two points are too close to each other, or they are outside of the measuring range
- Set the rotary selector switch ↻ to **RUN**

8.2. Special Settings

Adjusting the filter function:

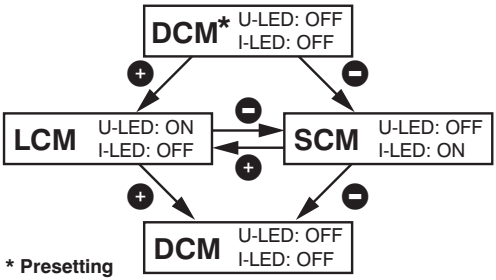
- Set the rotary selector switch ⍾ to **FILTER ADJUST**
  - ➔ The red **F-LED** lights up
  - ➔ The yellow **LEDs** are off: Filter function is presently disabled
  - ➔ Yellow **LEDs** blink once followed by a pause: filter currently set to level 1 (1/4 cut-off frequency)
  - ➔ Yellow **LEDs** blink twice followed by a pause: filter currently set to level 2 (1/16 cut-off frequency)
  - ➔ Yellow **LEDs** blink three times followed by a pause: filter currently set to level 3 (1/64 cut-off frequency)
- Briefly press the minus-key ⊖ 1 to 3 times
  - ➔ The filter level is reduced by one each time the key is pressed
  - ➔ The blinking pattern of the yellow LEDs indicates the newly selected filter level
- Briefly press the plus-key ⊕ 1 to 3 times
  - ➔ The filter level is increased by one each time the key is pressed
  - ➔ The blinking pattern of the yellow LEDs indicates the newly selected filter level
- Set the rotary selector switch ⍾ to **RUN**

Optimize the exposure time

The exposure time is adapted automatically by the sensor. In the presetted DCM (Default Capture Mode) the Sensor has a fixed maximal possible Exposure Time. It can be adjusted manually in addition in case of difficult applications.

By means of the LCM (Long Capture Mode) the Exposure Time of the sensor can be elongated for dark or highly glossy objects (e.g. black lack) in order to achieve a more exact measurement.
By means of the SCM (Short Capture Mode) the Exposure Time of the sensor can be reduced for dark or highly glossy objects (e.g. black lack) in order to achieve a reduction of the drop down of the Measurement Rate.
The shining of the **U-LED** and the **I-LED** the current setting is indicated. DCM is preset in delivery status. By pressing of the Plus respectively Minus key the current setting can be changed.

- Set the rotary selector switch ⍾ to **DCM**/**LCM**/**SCM**



⊖ = Minus Button/LED
⊕ = Plus Button/LED
DCM = Default Capture Mode
SCM = Short Capture Mode
LCM = Long Capture Mode

- Set the rotary selector switch ⍾ to **RUN**

9. Maintenance Instructions

- This wenglor sensor is maintenance-free.
- It is advisable to clean the lens and the display, and to check the plug connections at regular intervals.
- Do not clean with solvents or cleansers which could damage the device.

10. Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.