

# OPT2023

Color Sensor



## Operating Instructions

Original operating instructions  
Subject to change without notice  
Available as PDF version only  
Version: 1.1.0  
Status: 03.07.2017  
[www.wenglor.com](http://www.wenglor.com)

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## 1. Proper Use

wenglor color sensors detect pre-defined colors.

## 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.
- Installation, start-up and maintenance of this product has only to be carried out by trained personnel.
- Tampering with or modifying the product is not permissible.
- Protect the product against contamination during start-up.
- Not a safety component in accordance with the EU Machinery Directive.

## 3. EU Declaration of Conformity

The EU declaration of conformity can be found on our website at [www.wenglor.com](http://www.wenglor.com) in download area.



**RoHS**

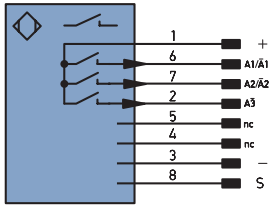
## 4. Technical Data

Order No.	OPT2023
Working Range	30...40 mm
Working Distance	35 mm
Light Source	White Light
Service Life (Tu = 25 °C)	100000 h
Max. Ambient Light	10000 Lux
Light Spot Diameter	3 mm
Supply Voltage	10...30 V
Current Consumption (Ub = 24 V)	< 80 mA
Switching Frequency	1.8 kHz
Response Time	$\sim \frac{1000}{1,8} \mu\text{s} \times \text{filter}$
Temperature Range	-25...60 °C
Switching Outputs	3
Switching Output Voltage Drop	1.5 V
PNP Switching Output/Switching Current	100 mA
Short Circuit Protection	yes
Reverse Polarity Protection	yes
Overload Protection	yes
Digital Inputs	2
Protection Class	III
Adjustment	Teach-In
Housing	Plastic
Degree of Protection	IP68
Connection	M12 × 1; 8-pin
NO/NC switchable	✓
Configurable as PNP/NPN/Push-Pull	✓
Error Output	✓
Contamination Output	✓


## 4.1 Connection Diagram

### OPT2023

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#### Legend

+	Supply Voltage +
-	Supply Voltage 0 V
~	Supply Voltage (AC Voltage)
A	Switching Output (NO)
Ā	Switching Output (NC)
V	Contamination/Error Output (NO)
∇	Contamination/Error Output (NC)
E	Input (analog or digital)
T	Teach Input
Z	Time Delay (activation)
S	Shielding
RxD	Interface Receive Path
TxD	Interface Send Path
RDY	Ready
GND	Ground
CL	Clock
E/A	Output/Input programmable
	<b>IO-Link</b>
PoE	Power over Ethernet
IN	Safety Input
OSSD	Safety Output
Signal	Signal Output
BI <sub>L</sub> D <sub>+</sub> /-	Ethernet Gigabit bidirect. data line (A-D)
EN <sub>0</sub> RS422	Encoder 0-pulse 0-0̄ (TTL)

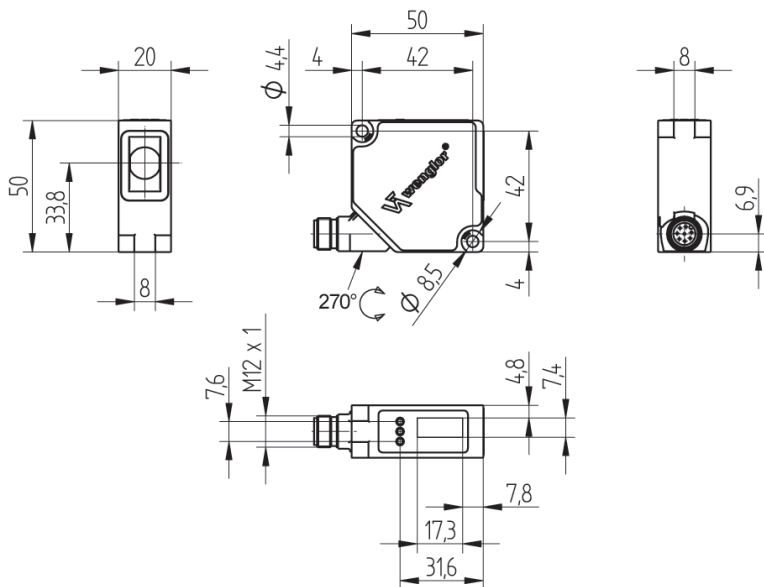
PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
O	Analog Output
O-	Ground for the Analog Output
BZ	Block Discharge
AWV	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
E+	Receiver-Line
S+	Emitter-Line
≐	Grounding
SnR	Switching Distance Reduction
Rx+/-	Ethernet Receive Path
Tx+/-	Ethernet Send Path
B <sub>us</sub>	Interfaces-Bus A(+)/B(-)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactor Monitoring
EN <sub>A</sub> RS422	Encoder A/Ā (TTL)
EN <sub>B</sub> RS422	Encoder B/B̄ (TTL)

EN <sub>A</sub>	Encoder A
EN <sub>B</sub>	Encoder B
A <sub>MIN</sub>	Digital output MIN
A <sub>MAX</sub>	Digital output MAX
A <sub>OK</sub>	Digital output OK
SY <sub>In</sub>	Synchronization In
SY <sub>OUT</sub>	Synchronization OUT
O <sub>Lt</sub>	Brightness output
M	Maintenance

#### Wire Colors according to DIN IEC 757

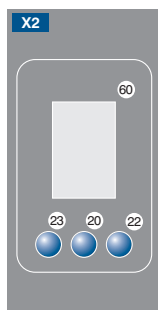
BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

## 4.2 Housing dimensions



Screw M4 = 1 Nm

## 4.3 Control Panel

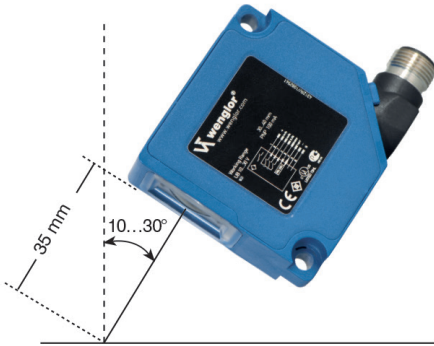


- 20 = Enter Button
- 22 = Up Button
- 23 = Down Button
- 60 = Display

## 5. Mounting instructions

During the operation of the Sensors, the corresponding electrical and mechanical regulations, as well as safety regulations must be observed. The Sensor must be protected from mechanical impact.

Mounting:



## 6. Initial Operation

### 6.1 Initial Operation

Connect the sensor to the supply voltage. After initialization the sensor shows the indication screen and is ready for operation. During the first commissioning and after a reset you can first of all select the menu language by simply pressing a button (see Fig. 1).

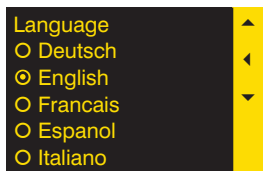


Fig. 1: Set menu language

The functions of the keys appear in the display as follows:

- ▲ : Navigate up.
- ▼ : Navigate down.
- ↵ : Selection is acknowledged with the enter key.

#### Meaning of the menu points:

- ▶ Next: One level down in the menu.
- ◀ Back: One level up in the menu.
- ◀◀ Run/Terminate: Change to the display mode:  
Change to the configuration menu by pressing any button.

**Notice:** If no setting is made in the configuration setting for a duration of 30 s, the sensor automatically jumps back into the display view.

By pressing the button once again, the sensor jumps back to the menu view used last. Settings made are adapted when quitting the configuration menu.

**Important: Do not use pointed objects for sensor setting. Otherwise you risk damaging the buttons.**

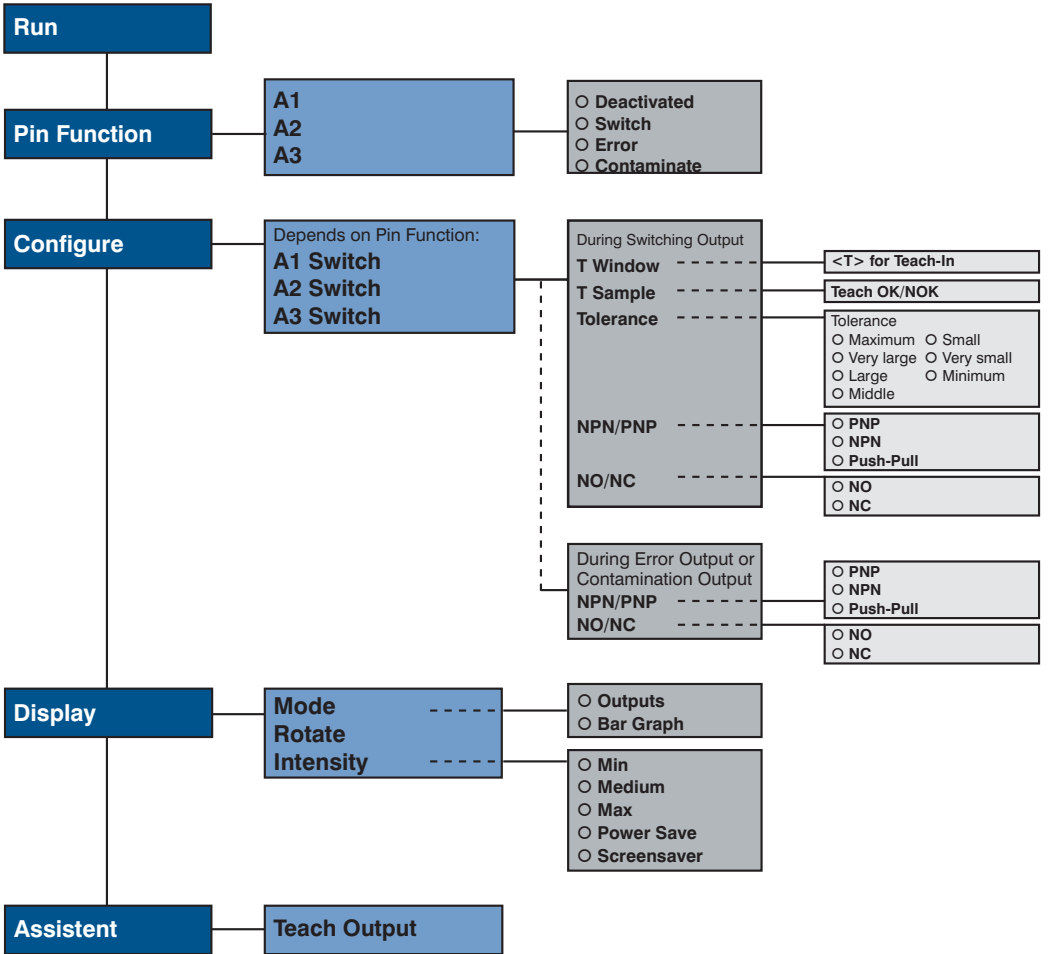
**Assistant:** The sensor is equipped with an assistant for simplified adjustment to the respective application. After cancelling the configuration assistant, the complete menu appears at the display.



## 6.2 Default Settings

		OPT2023
<b>Pin function</b>	A1	Switching Output
	A2	Switching Output
	A3	Switching Output
<b>Outputs</b>	Teach mode	T Window
	Tolerance	Small
	PNP/NPN/Push-pull	Push-pull
	NO/NC	NO
<b>Display</b>	Mode	Outputs
	Intensity	Screen saver

# 7. Functional description



Below is an explanation of the functions of each menu item.

## 7.1 RUN

Sensor switches to display mode.

Set pin function A with corresponding condition. If A is not displayed, it is deactivated in the pin function menu item.



Display of the current signal strength

Meaning	Condition 1	Condition 2	Condition 3	Condition 4
Switching Output	① Switched	① Not switched	–	–
Error Output	✔ OK	⚠ No signal	–	–
Contamination Output	✔ OK	☀ Signal too low	–	–
Signal Strength	✔ OK	☀ Signal too low	☀ Signal too high	⚠ No signal

## 7.2 Pin function

The Pin function is used to determine the function of pins A1, A2, A3 since the pins may be used for different functions.

<b>A1</b>	<b>Configuration of Pin A1</b>	
<ul style="list-style-type: none"> <li>○ Deactivated</li> <li>○ Switch</li> <li>○ Error</li> <li>○ Contamination</li> <li>◀ Back</li> <li>◀◀ Run</li> </ul>	<b>Deactivated:</b>	Deactivation of the output
	<b>Switch:</b>	Switching Output
	<b>Error:</b>	Error Output
	<b>Contamination:</b>	Contamination Output
<b>A2</b>	<b>Configuration of pin A2</b>	
<ul style="list-style-type: none"> <li>○ Deactivated</li> <li>○ Switch</li> <li>○ Error</li> <li>○ Contamination</li> <li>◀ Back</li> <li>◀◀ Run</li> </ul>	<b>Deactivated:</b>	Deactivation of the output
	<b>Switch:</b>	Switching Output
	<b>Error:</b>	Error Output
	<b>Contamination:</b>	Contamination Output
<b>A3</b>	<b>Configuration of pin A3</b>	
<ul style="list-style-type: none"> <li>○ Deactivated</li> <li>○ Switch</li> <li>○ Error</li> <li>○ Contamination</li> <li>◀ Back</li> <li>◀◀ Run</li> </ul>	<b>Deactivated:</b>	Deactivation of the output
	<b>Switch:</b>	Switching Output
	<b>Error:</b>	Error Output
	<b>Contamination:</b>	Contamination Output

## 7.3 A setting

Depending on the preset pin function, the name is displayed in this menu item, e.g. A1 Switch. Each menu item includes the following sub items:

### For Switching Output

If the pin is preset as Switching Output, the following functions may be set:

<b>Detection RGB:</b>	
T Window	<b>T Window:</b> Teach-In of a tolerance window in which the sensor is switched.
T Sample	<b>T Sample:</b> Additional Teach-In of an OK or NOK sample
Tolerance	<b>Tolerance:</b> Specification of the color tolerance level
NPN/PNP	<b>NPN/PNP:</b> Configuration of the output
NO/NC	<b>NO/NC:</b> Configuration of the output
◀ Back	
◀◀ Run	

These menu items are described in more detail in chapter [7.3.1](#) to [7.3.5](#).

### For error and contamination output

If the pin is set as error or contamination output, the following functions can be set:

<b>A1 Error (example)</b>	<b>A1 and/or A2 as error output or contamination output</b>
NPN/PNP	<b>NPN/PNP:</b> Configuration of the output
NO/NC	<b>NO/NC:</b> Configuration of the output
◀ Back	
◀◀ Run	

Explanations for “NPN/PNP” are provided in chapter [7.3.4](#), [page 13](#). Explanations for “NO/NC” are provided in chapter [7.3.5](#), [page 13](#).

### 7.3.1. Switching Output Window Teach-In

There are two switching points for window Teach-In. The size of the window is referred to as tolerance. If a color is within the window, the sensor switches.

<b>T Window</b>	<b>Window Teach-In</b>
<T> for Teach-In	Teach-In Window-Teaching process: 1) Align illuminated spot with the background (if available) or to the object. 2) Press “T” button. -> The switching points are taught in.
	<b>Notice:</b>
	<ul style="list-style-type: none"> <li>• T Sample: Additional Teach-In of OK or NOK samples in order to adjust tolerance.</li> <li>• In the “Tolerance” menu item (see chapter <a href="#">7.3.3</a>), the size of the window width can be reduced or increased.</li> </ul>

### 7.3.2. Switching Output Sample Teach-In

T Sample		Sample Teach-In
Teach OK/NOK	OK	Teach-In Sample Teaching process: 1) Teach-In of OK sample <ul style="list-style-type: none"> <li>Align light spot with the object.</li> <li>Press "OK" button. -&gt; Tolerance is increased.</li> </ul> 2) Teach-In of NOK sample <ul style="list-style-type: none"> <li>Align light spot with the object.</li> <li>Press "NOK" button. -&gt; Tolerance is decreased.</li> </ul>
	↩	
	NOK	

### 7.3.3. Switching Output Tolerance

Tolerance	Changing tolerance	
<input type="radio"/> Maximum	<b>Maximum:</b>	Tolerance is set to a maximum value.
<input type="radio"/> Very large	<b>Very large:</b>	Tolerance is set to a very large value.
<input type="radio"/> Large	<b>Large:</b>	Tolerance is set to a large value.
<input type="radio"/> Middle	<b>Middle:</b>	Tolerance is set to a medium value.
<input type="radio"/> Small	<b>Small:</b>	Tolerance is set to a small value.
<input type="radio"/> Very small	<b>Very small:</b>	Tolerance is set to a very small value.
<input type="radio"/> Minimum	<b>Minimum:</b>	Tolerance is set to a minimum value.

### 7.3.4. Switching Output NPN/PNP

NPN/PNP	Output configuration	
<input type="radio"/> PNP	<b>PNP:</b>	A load or the evaluation device is connected between the negative pole (supply) and the output. If switched, the output is connected with the positive pole via an electric switch.
<input type="radio"/> NPN	<b>NPN:</b>	A load or the evaluation device is connected between the positive pole (supply) and the output. If the sensor switches, the output is connected with the negative pole via an electric switch.
<input type="radio"/> Push-pull	<b>Push-pull:</b>	Push-pull output. Acts like an electronic switch which optionally switches the output to the positive pole or the negative pole.
⬅ Back		
⬅ Run		

### 7.3.5. Switching Output NO/NC

NO/NC	Output configuration	
<input type="radio"/> NO	<b>NO:</b>	Normally open. The output closes as soon as an object reaches the switching point.
<input type="radio"/> NC	<b>NC:</b>	Normally closed. The output opens as soon as an object reaches the switching point.
⬅ Back		
⬅ Run		

## 7.4 Display

Display	Adjusting the display device
Mode Rotate Intensity ◀ Back ◀◀ Run	<b>Mode:</b> Select display mode (see chapter “7.4.1. Display Mode”, page 14) <b>Rotate:</b> Rotate display by 180°. The display is rotated by 180° by pressing the ◀ key. The rotation is canceled by pressing this key again. <b>Intensity:</b> Set the display intensity (see chapter “7.4.2. Display Intensity”, page 14)

### 7.4.1. Display Mode

Mode	Select display mode
○ Outputs ○ Bar Graph ◀ Back ◀◀ Run	<b>Outputs:</b> The condition of each output is indicated on the display. <b>Bar Graph:</b> The RGB color spaces / shares of the object are indicated in a bar graph.

### 7.4.2. Display Intensity

Intensity	Set the display intensity
○ Min ○ Normal ○ Max ○ Power save ○ Screen saver ◀ Back ◀◀ Run	<b>Min:</b> The intensity of the display is set to a minimum value. <b>Medium:</b> The intensity of the display is set to a normal value. <b>Max:</b> The intensity of the display is set to a maximum value. <b>Power save:</b> The display switches off after one minute without a button being pressed and automatically switches back on when a button is pressed. <b>Screen saver:</b> The colors of the display are inverted every minute.

## 7.5 Assistant

Assistant	Starting/using the assistant
○ Output Teach-In ▶ Next ◀ Back ◀◀ Run	The sensor is equipped with an assistant for the simplified setting to each application. If you abort the configuration assistant, you will return to the comprehensive menu.

If you use the assistant, you will get the following support for teaching in object colors:

Select output ○ A1 ○ A2 ○ A3 ▶ Next ◀ Back ◀◀ Exit	Here you can select the output for which a color should be taught in.  Acknowledge your selection always with ▶ Next in order to access the next window.
--	--

<p>Aligning light spot with the color</p> <p><input type="radio"/> Teach-In (T)</p> <p>▶ Next</p> <p>◀ Back</p> <p>◀◀ Exit</p>	<p>Align your object with the working area and select Teach-In (T). You will get a message whether Teach-In was successful.</p>
<p>Does the sensor switch reliably?</p> <p>&lt;Ax Display&gt;</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> T Sample OK</p> <p><input type="radio"/> T Sample NOK</p> <p><input type="radio"/> No</p> <p>▶ Next</p> <p>◀ Back</p> <p>◀◀ Exit</p>	<p>Select &lt;Ax Display&gt; in order to check in the OLED display whether each taught-in output reliably switches to the taught-in color. If the output does not switch reliably, you have the following options:</p> <ul style="list-style-type: none"><li>• T Sample OK: You may teach in another OK sample. This increases the tolerance.</li><li>• T Sample NOK: You may teach in a NOK sample. This decreases the tolerance.</li><li>• No: You may completely re-Teach-In the color.</li></ul>
<p>Want to teach in another output?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p>▶ Next</p> <p>◀ Back</p> <p>◀◀ Exit</p>	<p>Select "Yes" to teach in another color on another output. Select "No" to quit the assistant.</p>

## 8. 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.

## 9. 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.

## 10. Change Index, Operating Instructions

Version	Date	Description/Change
1.0.0	17.11.2016	Initial version of the operating instructions
1.1.0	04.05.2017	Connection Diagram changed



