

SI-COLO Series

▶ SI-COLO2-LWL-MTO

This color sensor is perfectly suited to the color checking of transparent PET-bottles (solid blanks)

- Self-triggering
- Ultrahigh accuracy color check
- External teaching via push button or PLC
- Various optical fiber heads are available
- Dynamic teaching process (in adaptation to the respective velocity of the measuring objects)
- Possibility of averaging by means of teaching several objects
- Sturdy aluminum housing
- RS232 interface

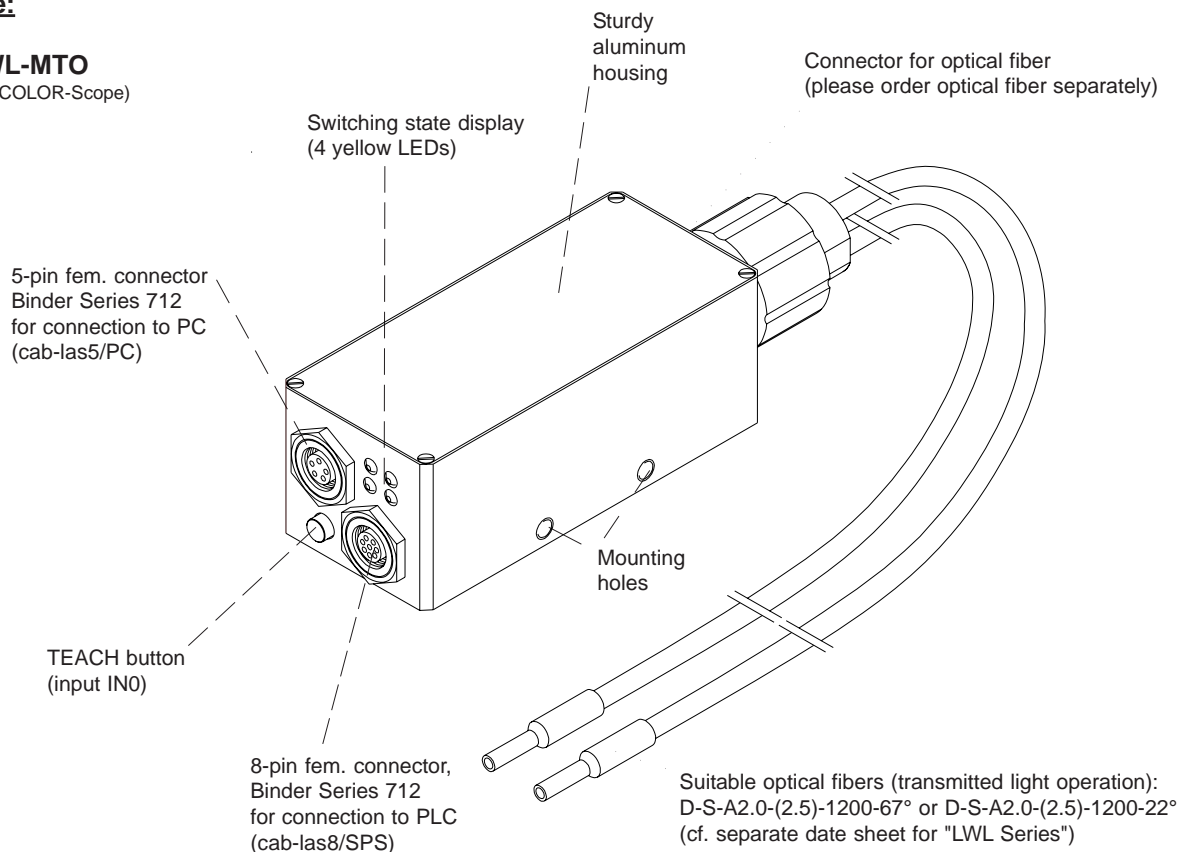


Design

Product name:

SI-COLO2-LWL-MTO

(incl. software MTO-COLOR-Scope)



Parameterization under Windows® with software MTO-COLOR-Scope:

The SI-COLO2-LWL-MTO color sensor can be parameterized via serial interface (RS232) under Windows® (please cf. pages 4-6). Up to 10 colors can be taught, and stored in the sensor. If the sensor detects one of the taught colors, a change of switching state is performed through 4 encoded digital outputs (visual display by means of 4 yellow LEDs at the housing).

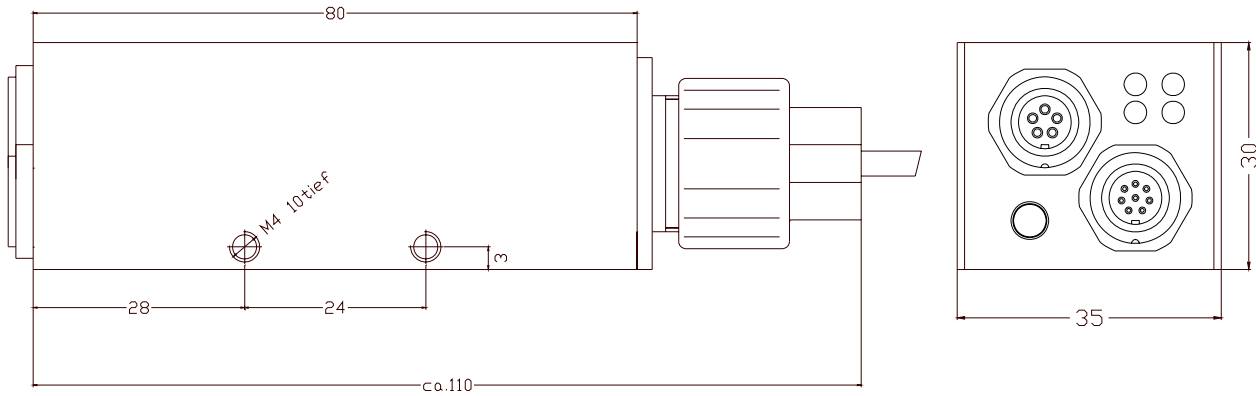


Technical Data

Model	SI-COLO2-LWL-MTO
Light source	White-light LED, modulated 100 kHz
Reproducibility	In the x,y color range 1 digit each at 8-bit A/D conversion
Distance transmitter/receiver	typ. 2 mm ... 100 mm (depends on the optical fiber used) With optical fiber and with prism optics KL-90: typ. 20 mm ... 200 mm
Receiver	3-color filter detector
Pulsating light operation	100 kHz
Ambient light	up to 5000 Lux
Type of protection	IP64
Current consumption	typ. 180 mA
Interface	RS232, parameterizable under Windows®
Connector type	Connection to PLC: 8-pin female connector (Binder Series 712) Connection to PC: 5-pin female connector (Binder Series 712)
EMC test acc. to	IEC - 801...
Housing	Aluminum, anodized in blue
Operating temperature range	-20°C ... +55°C
Storage temperature range	-20°C ... +85°C
Pulse lengthening	adjustable under Windows® 0 ms ... 100 ms
Max. switching current	100 mA, short-circuit-proof
Switching frequency	max. 11 kHz with AVERAGE 1
Outputs	OUT0 to OUT3, short-circuit-proof
Averaging	over 128 values max.
Voltage supply	+12VDC ... +30VDC, protected against polarity reversal, overload-protected
Switching state display	Visualization by means of 4 yellow LEDs
Size of color memory	non-volatile EEPROM
Suitable optical fibers	Optical fibers with transmitted light operation: either D-S-A2.0-1200-67° or D-S-A2.0-1200-22° (please cf. catalog "LWL Series")
Teach button	for external teaching of color reference values via input IN0

Dimensions

All dimensions in mm

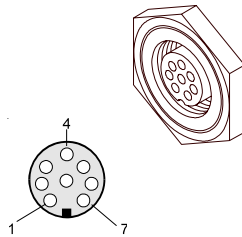


Connector Assignment

Connection of SI-COLO2-LWL-MTO to PLC:

8-pin female connector Binder Series 712

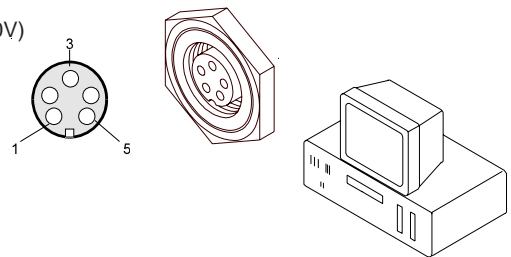
Pin:	Color:	Assignment:
1	wht	GND (0V)
2	brn	+12 ... +30VDC
3	grn	IN0
4	yel	OUT0
5	gry	OUT1
6	pnk	OUT2
7	blu	OUT3
8	red	n.c.



Connection of SI-COLO2-LWL-MTO to PC:

5-pin female connector Binder Series 712

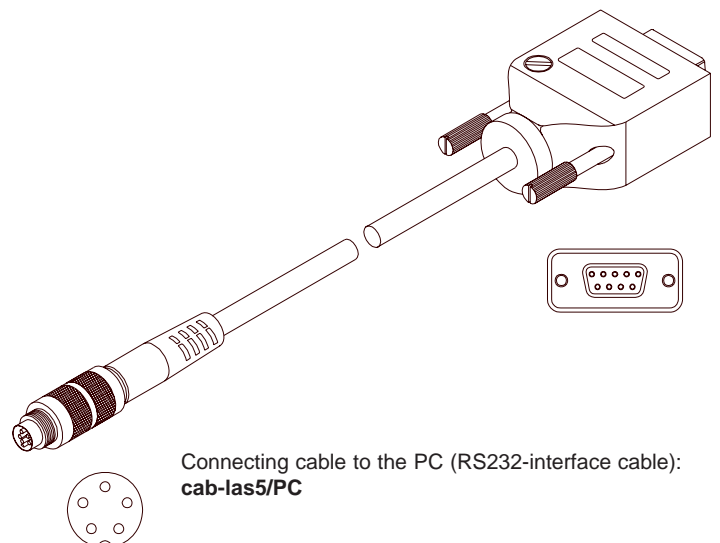
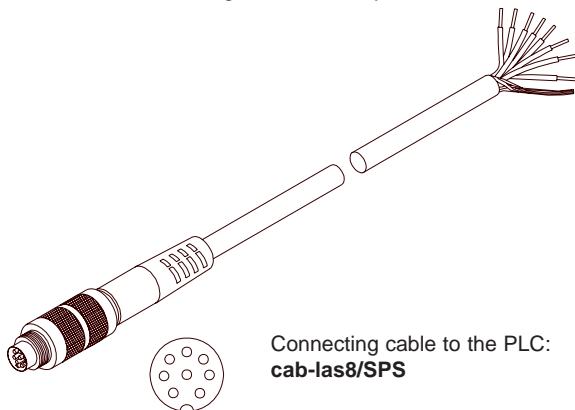
Pin:	Assignment:
1	GND (0V)
2	TX0
3	RX0
4	n.c.
5	n.c.





Connecting Cables

Connecting cables for SI-COLO2-LWL-MTO:

- cab-las8/SPS** Length: 2m Outer jacket: PUR
- cab-las5/PC** Length: 2m Outer jacket: PUR





Measuring Principle
Measuring principle:

Through a fiber optic cable a modulated white-light LED projects a white-light spot onto a surface to be checked. Through the glass fiber bundle part of the light that is reflected from the target is then directed onto a color-sensitive detector element. The received light is separated according to the 3-color-range process (red, green, blue).



Parameterization
Parameterization under Windows® with the MTO-COLOR-Scope software:

The SI-COLO2-LWL-MTO color sensor is parameterized under Windows® with the MTO-COLOR-Scope software. The RS232 interface is used for setting parameters such as:

- Averaging over a maximum of 128 values
- Number of colors to be checked
- Light power of the white-light LED
- Automatic light power control ON/OFF
- Pulse lengthening up to 100ms max.
- External or continuous trigger
- Minimum intensity required for color evaluation

Visualization:

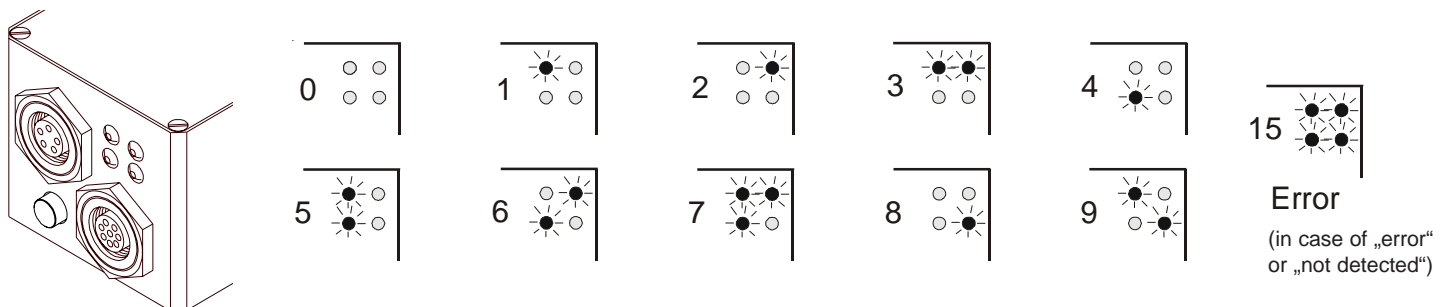
Under Windows® representation of the color value on a PC in numeric form and in a color chart, and representation of RGB values in a time chart. In addition the current RGB values are displayed as a bar chart.

The following evaluation algorithms can also be selected:

- Target lies within the color tolerance circle of a taught color and within an intensity window (FIRST HIT)
- Determination of the taught color that is most similar to the target (minimum distance between target color and reference color in the color chart) (MINIMAL DIST)
- Checking of the target's color series with a taught color sequence (SENSOR SERIES)
- Contrast check of the target. In this case only one primary color (freely selectable) is used for evaluation (CONTRAST)
Advantage: Possibility of using a very high scanning rate of up to 10 kHz.
- EXTERN TEACH: With this function field the color sensor can be taught by means of a LOW-signal at pin 3 (for instance via push button, or PLC). During this procedure the object to be taught has to be in the visibility range of the color sensor. The yellow LEDs indicate a successful teaching procedure. This mode only checks for the current taught color.

LED display:

The color code is visualized by means of 4 yellow LEDs at the housing of the SI-COLO2-LWL-MTO color sensor. At the same time the color code indicated at the LED display is output as 4-bit binary information at the digital outputs OUT0 to OUT3 of the 8-pin SI-COLO2/PLC connector.



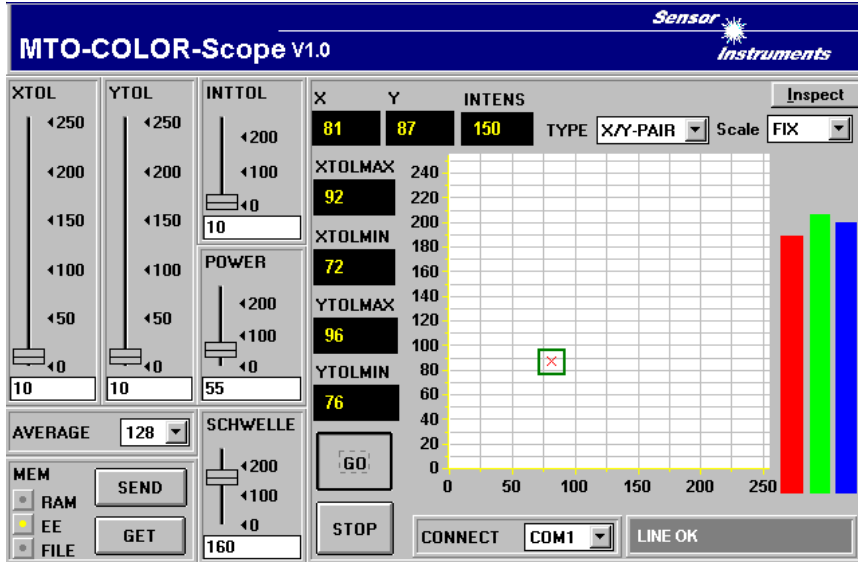
In the DIRECT mode the maximum numbers of colors to be taught is 4 (color no. 0,1,2,3). These 4 colors can be directly output at the 4 digital outputs. The respective detected color is displayed by means of the 4 yellow LEDs at the color sensor housing.

Parameterization

Windows® user interface:

The Windows® user interface facilitates the teach-in process at the SI-COLO2-LWL-MTO color sensor and supports the operator in the task of adjustment and commissioning of the color sensor.

X,Y-chart:

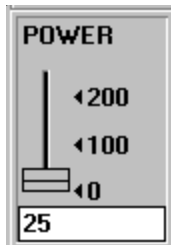


The color value is displayed graphically by way of the X,Y-color triangle and also in the numerical output fields. The current raw data (red, green, blue) from the color detector are visualized in a bar chart. If a color is detected during measuring operation, the currently detected color is displayed in a numeric output field:

Display of the current raw data (red, green, blue) from the color sensor in „scroll mode“ (oscilloscope function). In addition the current raw data are visualized as a bar display. This facilitates the adjustment of the SI-COLO2-LWL-MTO color sensor.

Parameter setting:

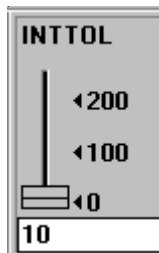
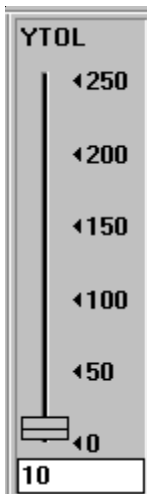
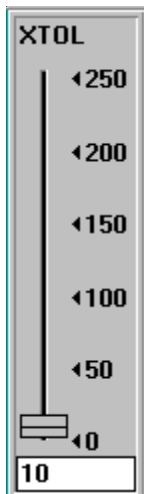
Among others the following parameters can be set:



POWER:

In this function field the intensity of the white-light transmitter LED can be adjusted with the slide or by entering a value in the edit box.

A value of 255 stands for full intensity at the transmitter LED, a value of 0 represents the lowest intensity at the transmitter.



XTOL:

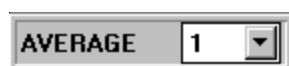
In this function field the tolerance for the X coordinate can be set by using the slide or by entering a value in the edit box.

YTOL:

In this function field the tolerance for the Y coordinate can be set by using the slide or by entering a value in the edit box.

INTTOL:

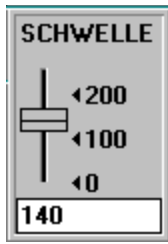
In this function field the tolerance for the intensity can be set by using the slide or by entering a value in the edit box.



AVERAGE:

This function field serves for setting the number of scanning values (measured values) over which the raw signal measured at the receiver is averaged. A higher AVERAGE default value reduces the noise of the raw signals at the receiver unit.

Parameterization



SCHWELLE (THRESHOLD):

In this function field the threshold, starting from an object should be measured, can be set by using the slide or by entering a value in the edit box.



X, Y:

This numerical-value output field displays the red content (x-axis) or green content (y-axis) of the scattered light currently arriving at the receiver.

INTENS:

This numerical-value output field displays the currently measured intensity (proportional to the average of the intensities at the 3-fold receiver).



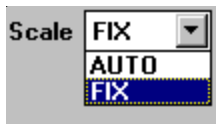
TYPE:

A click on the arrow button opens a selection field for selecting a display mode in the graphic display window.

X/Y-PAIR: Display of the X/Y coordinates, and of the set tolerance

INTENS: Display of the currently determined total intensity

RAW: Display of the current raw signals of the 3-fold receiver (red, green, blue)



SCALE:

FIX: This setting has the effect that the y-axis of the graphic display window remains unchanged.

A y-value range of 0...255 A/D units is shown. The value range results from the converter values of the 8-bit analog/digital converter in the SI-COLO-LWL-MTO color sensor.

AUTO: This setting has the effect that the y-axis of the graphic display window is automatically scaled (zoom function). The scaling of the y-axis is automatically adapted in accordance with the values to be displayed.



MEM:

This function key group serves or exchanging parameters between the PC and the SI-COLO2-LWL-MTO color sensor through the serial RS232 interface.



INSPECT:

This button fixes the current screen of the display window. A dialog box then opens and offers different possibilities for further processing of the display window under Windows®.

The individual function elements of the INSPECT button are excellently suited for documentation purposes.

PRINT: Prints the current display window

COPY PAGE: Copies the display window to the Windows® clipboard, from where it can be inserted and further edited in various Windows® programs (documentation in the word processor, graphics software, spreadsheet, ...)

ZOOM: For zooming in or zooming out the display window

MTO-COLOR-Scope as an aid for sensor adjustment:

Prior to the use of the software aids (graphic display of the sensor signals) the split optical fiber used with the SI-COLO2-LWL-MTO color sensor must be manually adjusted to the respective target as accurately as possible.

Fine adjustment of the SI-COLO2-LWL-MTO color sensor is facilitated by means of the graphical representation of the analog signals (raw signals from the 3-fold receiver diode).

