colorSENSOR OT Series

colorSENSOR OT-3-LU-80

- Up to 31 colors can be stored
- RS232 interface (USB adapter is available)
- Up to 31 colors can be stored
- RS232 interface (USB adapter is available)
- 12x UV-LED, 382 nm, focused (AC-/DC-/PULSE-
  operation or OFF for luminous objects can be switched)
- Detection of different luminescent colors
- Insensitive to outside light in AC-operation and PULSE-operation
- Brightness correction can be activated
- Switching frequency up to 35 kHz
- Several TEACH functions (via PC, PLC, or push button)
- Various evaluation algorithms can be activated
- Switching state display by means of 5 yellow LEDs
- Temperature compensated in climatic cabinet
- "BEST HIT" mode ("human color assessment")
- Averaging' can be activated (from 1 up to over 32000 values)
- 3-color filter detector (true color detector: "human color perception")

Design

Product name:

colorSENSOR OT-3-LU-80-36
(incl. Software colorCONTROL-S)

Sturdy aluminum
housing, anodized
in blue

**Mounting
accessories:**
(p. 7)

FL-34 (flange)
WFL-34 (flange)

Optics holding device
(aluminum, anodized
in blue)

Receiver optics and
transmitter optics with 12x UV LED
incl. 3-color filter detector (True Color)
(scratch-resistant optics cover
made of glass)

4-pole fem. connector
Binder Series 707
(RS232-interface)

Connecting cable:
CAB-M5-4P-St-ge; xm-PUR; RS232 or
CAB-M5-4P-St-ge; xm-PVC; USB

TEACH button
(external teaching
via input IN0)

8-pole fem. connector
Binder Series 712
(connection to PLC)
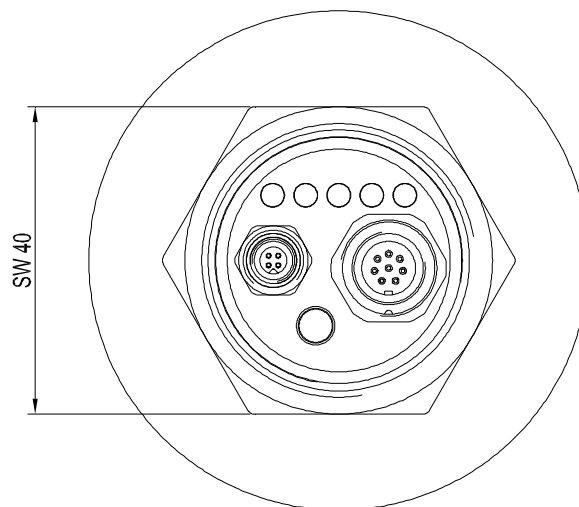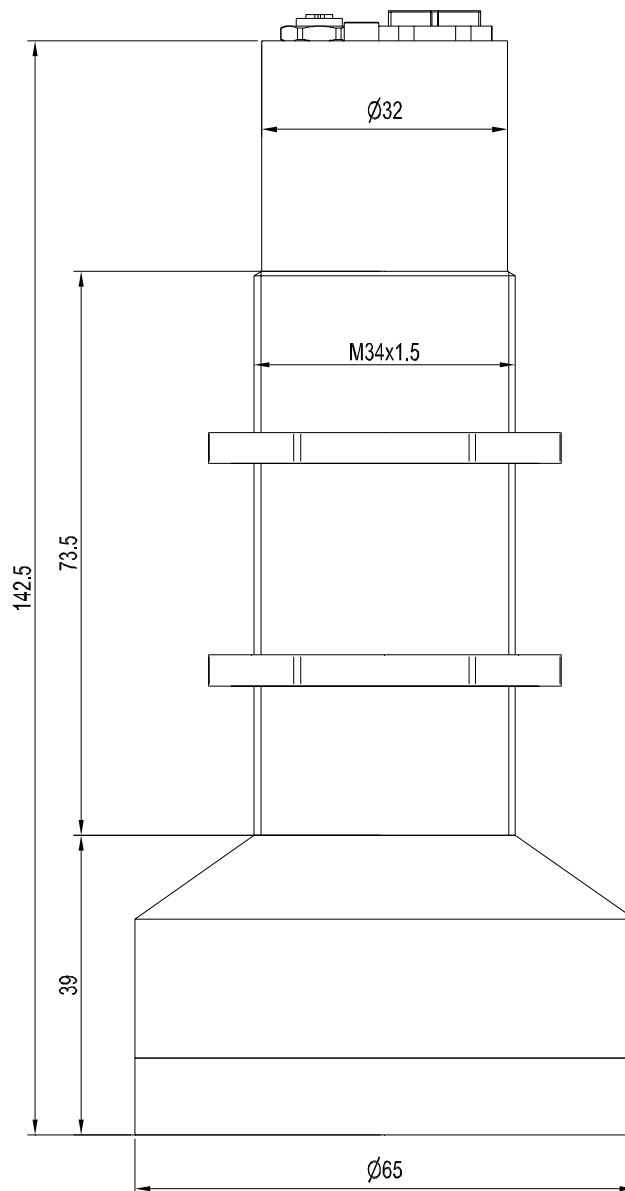
Connecting cable:
CAB-M9-8P-St-ge; xm-PUR; open

Mounting screws
(M34)

LED display:
Switching state indication
by means of 5 yellow LED

Technical Data

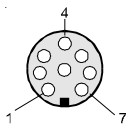| Type	OT-3-LU-80-36
Light source	12x UV-LED, 385 nm AC-, DC-operation (adjustable or OFF in case of luminous objects adjustable via software)
Illumination technique	UV 385 nm, focused
Effect of illumination	luminescent colors
Target distance	typ. 40 mm - 100 mm ideal distance 80 mm
Light spot size	Ø 36 mm at 80 mm
Reproducibility	in the X, Y color range each 1 digit at 12-bit A/D conversion
Color distance	$\Delta E \geq 0.8$
Receiver	3-color filter detector (TRUE COLOR Detector, color filter bend according to CIE 1931)
Alternating light operation	depends on the gain step (AMP1 up to AMP8) DC: adjustable via PC software
Ambient light	up to 5000 Lux (in AC-operation)
Protection class	IP 67 (optics), IP 64 (controller)
Current consumption	typ. 320 mA
Interface	RS 232 (optional USB)
Connector type	to PLC: 8-pole female connector (Binder series 712) to PC: 4-pole female connector (Binder series 707)
Connection cable	to PLC: CAB-M9-8P-St-ge; xm-PUR; open to PC: CAB-M5-4P-St-ge; xm-PUR; RS232; CAB-M5-4P-St-ge; xm-PVC; USB
Housing material	Aluminum, anodized in black
Operating temperature	20°C - + 55°C (-4°F up to +131°)
Storage temperature	20°C - + 85°C (-4°F up to +185°)
Pulse lengthening	adjustable 0 ms - 100 ms
Max. switching current	100 mA, short-circuit-proof
Switching frequency	max. 30 kHz (depends on the number of teach-colors and averaging value)
Outputs	OUT 0 - OUT 4, digital (0V/+Ub), short-circuit-proof 100 mA max. switching current npn-, pnp-available (bright-, dark-switching can be switched over)
Averaging	over 32768 values max.
Voltage supply	+24 VDC (± 10 %), protected against polarity reversal, overload protected
Switching state display	Visualization by means of 5 yellow LED's
Color memory capacity	non-volatile EEPROM with parameter sets for 31 colors max.
TEACH button	for external teaching of color reference values via input IN0
Temperature drift X,Y	< 0.01% / K
Signal gain	8 steps (AMP1 - AMP8), adjustable
EMV test	according to DIN EN 60947-5-2
Color spaces	X/Y INT; s/i M (Lab)

Dimensions

Ø32

M34x1.5

142.5

73.5

39

Ø65

SW 40

All dimensions in mm

Connector Assignment

Connection to PLC:
8-pole fem. connector Binder Series 712

Pin: Color: Assignment:

Pin	Color	Assignment
1	white	GND (0V)
2	brown	+24VDC (±10%)
3	green	IN0
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
CAB-M9-8P-St-ge; 2m-PUR; open
CAB-M9-8P-St-ge; 5m-PUR; open
(Standard length 2 m)

Connecting cable to PLC:
CAB-M9-8P-St-ge; xm-PUR; open

Connection to PC:
4-pole fem. connector Binder Series 707

Pin: Assignment:

Pin	Assignment
1	+24VDC (+Ub, OUT)
2	GND (0V)
3	RxD
4	TxD

Connecting cable:
CAB-M5-4P-St-ge; 2m-PUR; RS232
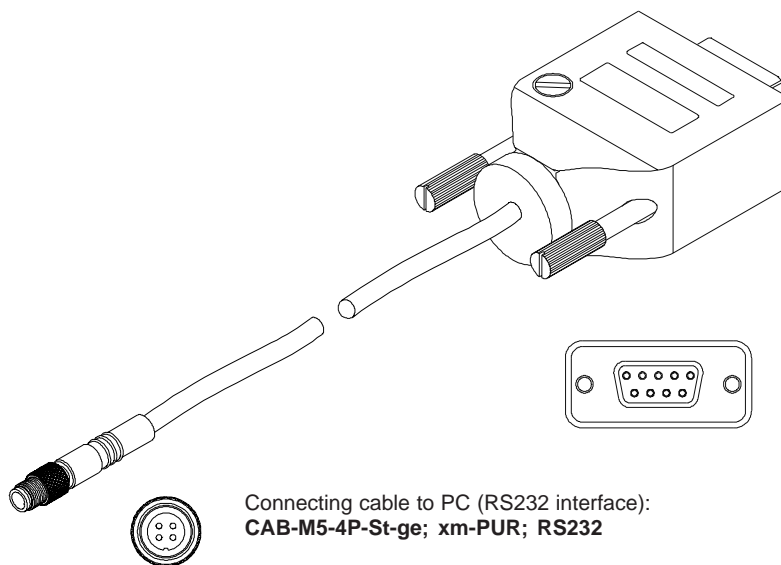CAB-M5-4P-St-ge; 5m-PUR; RS232
(Standard length 2 m)

alternatively:
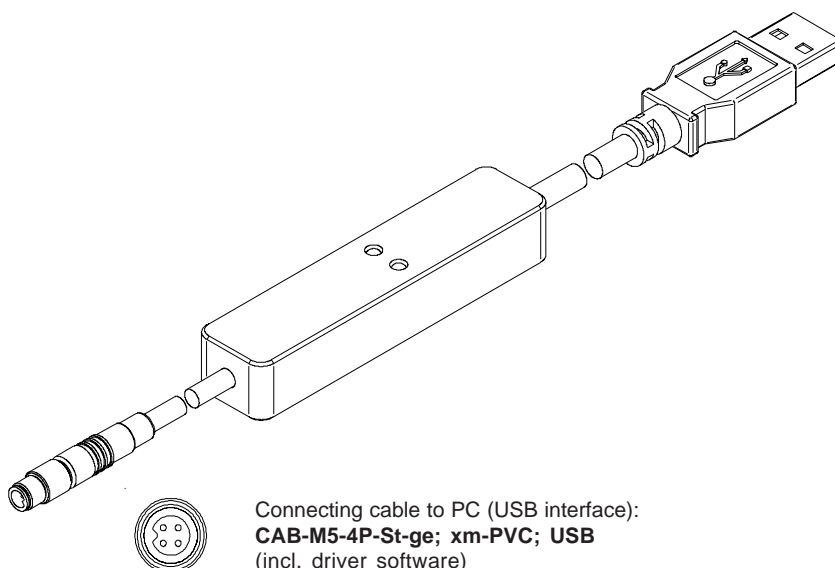Connecting cable (incl. driver software):
CAB-M5-4P-St-ge; 2m-PVC; USB
CAB-M5-4P-St-ge; 5m-PVC; USB
(Standard length 2 m)

Connecting cable to PC (RS232 interface):
CAB-M5-4P-St-ge; xm-PUR; RS232

Connecting cable to PC (USB interface):
CAB-M5-4P-St-ge; xm-PVC; USB
(incl. driver software)

Measuring Principle

Measuring principle of color sensor colorSENSOR OT-3-LU-80 series:

The colorSENSOR OT-3 series provides highly flexible signal acquisition. For example, the sensor can be operated in alternating-light mode (AC mode), which makes the sensor insensitive to extraneous light. It also can be set to constant-light mode (DC mode), which makes the sensor extremely fast and allows a scan-frequency of more than 35 kHz.

When the integrated light source of the colorSENSOR OT-3-LU-80 color sensor is activated, the sensor detects the radiation that is diffusely reflected from the object to be measured.

As a light source the colorSENSOR OT-3-LU-80 color sensor uses eight UV-LED (385nm) with adjustable transmitter power to excite the luminescent marking. An integrated 3-fold receiver for the red, green, and blue content of the visible light that is emitted by the luminescent marking is used as a receiver. As mentioned above, a special feature here is that the gain of the receiver can be set in 8 steps. This makes it possible to optimally adjust the sensor to almost any luminescent colorant that can be excited in the long-wave UV range (365nm or 385nm).

The colorSENSOR OT-3 color sensor can be "taught" up to 31 colors. For each of these taught colors it is possible to set tolerances.
In X/Y INT or s/i M mode these tolerances form a color cylinder in space. In X/Y/INT or s/i/M mode the tolerances form a color sphere in space. Color evaluation according to s/i M is based on the lab calculation method. All modes can be used in combination with several operating modes such as "FIRST HIT" and "BEST HIT". Raw data are represented with 12 bit resolution.

Color detection either operates continuously or is started through an external PLC trigger signal. The respective detected color either is provided as a binary code at the 5 digital outputs or can be sent directly to the outputs, if only up to 5 colors are to be detected. At the same time the detected color code is visualised by means of 5 LEDs at the housing of the colorSENSOR OT-3.
[Please note: Visualisation by means of LEDs not available with colorSENSOR LT-1-LC-20 types.]

With a TEACH button at the sensor housing the color sensor can be taught up to 31 colors. For this purpose the corresponding evaluation mode must be set with the software. The TEACH button is connected in parallel to the input IN0 (green wire at cable CAB-M9-8P-St-ge; xm-PUR; open). [Please note: TEACH button not available with colorSENSOR LT-1-LC-20 types.]

Parameters and measurement values can be exchanged between a PC and the colorSENSOR OT-3 color sensor through the serial RS232 interface. All the parameters for color detection also can be saved to the non-volatile EEPROM of the colorSENSOR OT-3 color sensor through this serial RS232 interface. When parameterisation is finished, the color sensor continues to operate with the current parameters in STAND-ALONE mode without a PC.

The sensors of the colorSENSOR OT-3-LU-80 series also can be calibrated. Analogous to white-light balancing with color sensors, balancing of the colorSENSOR OT-3-LU-80 could be performed to any luminescent color marking.

Visualization

Visualization of the color code:

The color code is visualised by way of 5 yellow LEDs at the housing of the colorSENSOR OT-3 color sensor. At the same time in the binary mode (OUT BINARY) the color code indicated on the LED display is output as 5-bit binary information at the digital outputs OUT0 to OUT4 of the 8-pin colorSENSOR OT-3/PLC socket.

The colorSENSOR OT-3 color sensor is able to process a maximum of 31 colors (color code 0 ... 30) in accordance with the corresponding rows in the COLOR TEACH TABLE. An "error" respectively a "not detected color" is displayed by the lighting of all LED (OUT0 ... OUT4 digital outputs are set to HIGH-level).

In the DIRECT mode (OUT DIRECT HI or OUT DIRECT LO) the maximum numbers of colors to be taught is 5 (color no. 0, 1, 2, 3, 4). If DIRECT HI is activated, the specially digital output is set to HI, while the other 4 are set to LO. If the current color does not correspond with any of the teach-in colors, all digital outputs are set to LOW (no LED is lighting).
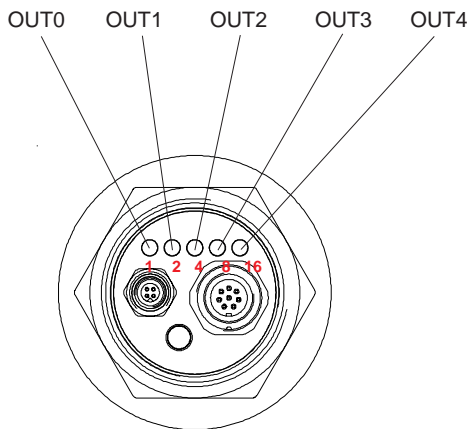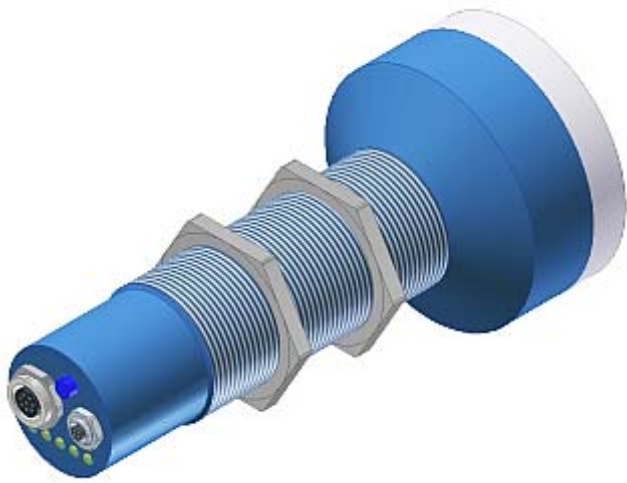
If DIRECT LO is activated, the specially digital output is set to LO, while the other 4 are set to HI. If the current color does not correspond with any of the teach-in colors, all digital outputs are set to HIGH (all LED are lighting).

LED Display

LED display:

The color code is visualized by means of 5 yellow LEDs at the housing of the color sensor. At the same time the color code indicated at the LED display is output as 5-bit binary information at the digital outputs OUT0 ... OUT4 of the 8-pole PLC connector.

In the DIRECT mode the maximum number of color codes to be taught is 5. These 5 color codes can be directly output at the 5 digital outputs. The respective detected color code is displayed by means of the 5 yellow LEDs at the color sensor housing.
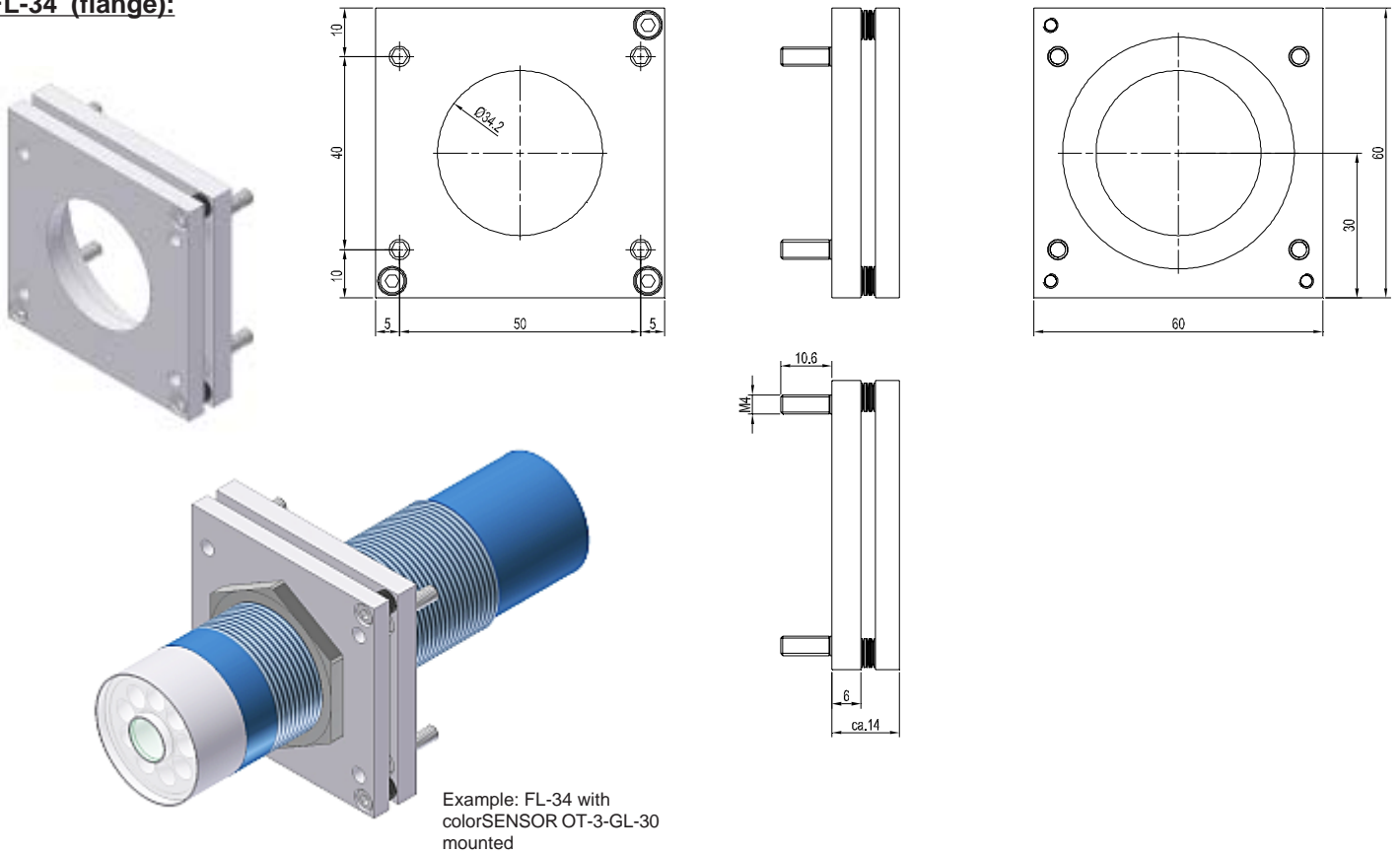
○○○○○ ●○○○○ ○○●○○
0   1   2

●●○○○ ○○●○○ ●○●○○
3   4   5

○●●○○ ●●●○○ ○○○●○
6   7   8

●○○●○ ○●○●○ ●●○●○
9   10   11

○○●●○ ●○●●○ ○●●●○
12   13   14

●●●●○ ○○○○● ●○○○●
15   16   17

○●○○● ●●○○● ○○●○●
18   19   20

●○●○● ○●●○● ●●●○●
21   22   23

○○○●● ●○○●● ○●○●●
24   25   26

●●○●● ○○●●● ●○●●●
27   28   29

○●●●●   ●●●●●
30   Error or
                   „not detected"

OUT0   OUT1   OUT2   OUT3   OUT4

1 2 4 8 16

Mounting Accessories

FL-34 (flange):

Example: FL-34 with
colorSENSOR OT-3-GL-30
mounted

WFL-34 (flange, angle type 90°):

Example: WFL-34 with
colorSENSOR OT-3-GL-30
mounted

(All dimensions in mm)