

# Color Control & Color Measurement

DURCHMESSER **DICKE** FLUORESZENZ  
 SPEKTRALANALYSE KONTRAST  
 ABSTAND DICHTER DEHNUNG FARBE GLANZ  
 TRÜBUNG POSITION FREQUENZ REFLEXION  
 GESCHWINDIGKEIT KANTENDETEKTION STREUUNG ABSORPTION  
 DIAMETER THICKNESS FLUORESCENCE NIR  
 SPECTRAL ANALYSIS CONTRAST GLOSS  
 DISTANCE DENSITY ELONGATION COLOR REFLECTION  
 TURBIDITY POSITION FREQUENCY  
 VELOCITY EDGE DETECTION DISPERSION

SI-COLO Color Sensors

SPECTRO Spectrometers

LWL Optical Fibers



**Sensor**



**Instruments**

*Let's make sensors more individual*

# Color Control & Color measurement

## Color Sensors, Color Checking Systems

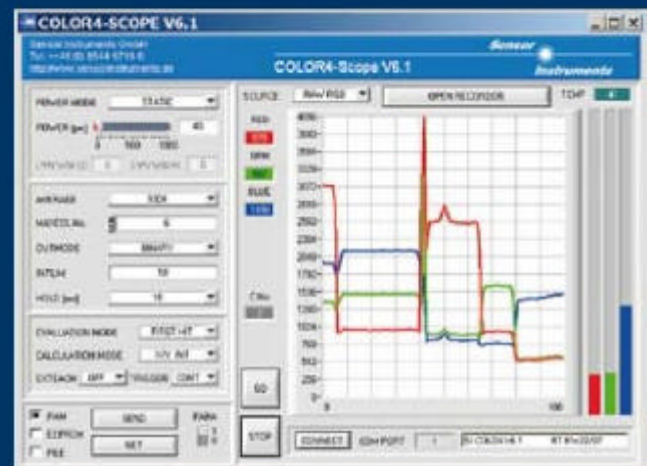
The color sensors of the SI-COLO series operate with the 3-color-range method. As a light source they use pulsed white-light LEDs, the luminescence color sensors use UV LEDs. Modulation is done with 30 kHz or 100 kHz, respectively, and the lock-in-technology guarantees an extremely high insensitivity to outside light.

Various types of color sensors were specifically designed for the respective applications, so that for example in case of high gloss objects the color also can be detected with highest reliability by using polarization filters (type -POL).

„True-color-detection“ on the one hand is realised by means of a special color detector that perceives color like the human eye, and on the other hand by way of a light source that is adapted to daylight (D65), which is achieved by means of special patented optical filtering and to a very large extent suppresses the so-called metamerism effect (type -TC).

The compact optical-fiber versions with corresponding optical attachment units (type -LWL) are ideal for applications with limited available space for installation. If, on the other hand, the application requires an operating distance of 1000 mm, this can be covered by a version with integrated optical unit and super-bright ring lighting (type -FCL).

With the COLOR-Scope Windows® user interface, different evaluation modes can be easily selected for the color sensors of the SI-COLO series. Both the raw data and the calculated color values are displayed in graphical and numerical form. LEARNING can be performed with the software, with the PLC, or directly with the button that is integrated in the sensor.



## Spectrometers, Color Measuring Systems

As opposed to color checking systems, color measuring systems perform color determination according to a specified standard. The color measuring systems of the SPECTRO series mainly operate with the 0°/45° method. A line detector with 256 pixels or a true-color chip that provides 3 color values is used as a detector.

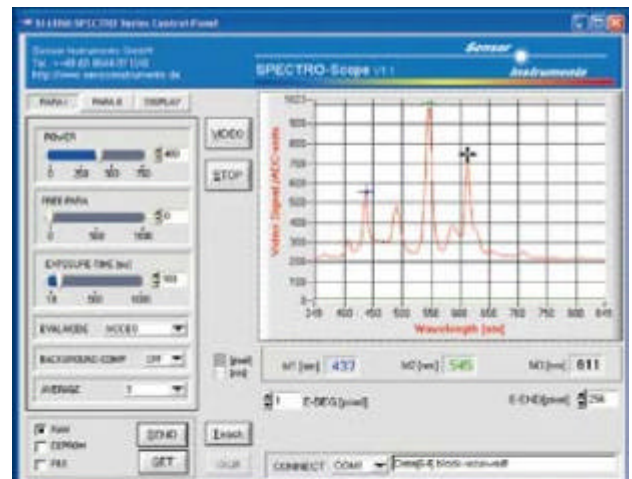
In the 0°/45° method the object to be measured is illuminated at an angle of 45° and is viewed at an angle of 0° (vertical to the surface). A combination of white-light and blue-light LEDs which by means of an optical filter almost supply the D65 standard is used as a light source. The available wavelength range is 380 nm to 780 nm. Evaluation is performed according to the L\*a\*b\*, L\*u\*v\*, or x,y,Y standard, or the complete spectral curve or sections of the spectrum are assigned a tolerance band. Furthermore, a special function makes it possible to monitor individual peak values in predefined wavelength windows.

With the SPECTRO-Scope Windows® user interface the data can be easily represented in graphical and numerical form. Parameters such as exposure time, light power, averaging, evaluation algorithm, sub-pixeling, and number of colors to be taught, can be entered. Graphical representation is provided as a spectrum or as an a,b- or x,y-chart.

Due to their sturdy design the sensors of the SPECTRO series are excellently suited for applications in a rough industrial environment.

## Optical Fibers

Optical fibers can be used universally offer solutions for difficult tasks in optoelectronics. A great variety of available standard sensor heads and special designs as well as various types of fibers and add-on optical units allows flexible applications. Our optical fibers of LWL Series are characterized by highest quality and thermal stability.



# SI-COLO1 Series

## Analog Color Sensors



MODEL	OPERATING RANGE (TYP.)	SPOT SIZE/OBJECT DISTANCE (TYP.)	ANALOG BAND WIDTH	OUTPUTS	MAX. NO. OF LEARN COLORS	DIMENSION S (L X W X H)	TRANSMITTER POWER	LIGHT SOURCE
<b>SI-COLO1-30-DIL</b>	10 mm ... 60 mm	Ø 2 mm/20 mm, Ø 20 mm/40 mm	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	108 x 50 x 35 mm	Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse
<b>SI-COLO1-30-FCL</b>	10 mm ... 60 mm	Ø 12 mm/20 mm, Ø 31 mm/100 mm	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	108 x 50 x 35 mm	Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse
<b>SI-COLO1-50-DIL</b>	20 mm ... 80 mm	Ø 20 mm/60 mm, Ø 40 mm/100 mm	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	108 x 50 x 35 mm	Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse
<b>SI-COLO1-50-FCL</b>	20 mm ... 80 mm	Ø 20 mm/50 mm, Ø 31 mm/100 mm	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	108 x 50 x 35 mm	Potentiometer Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse
<b>SI-COLO1-80-DIL</b>	40 mm ... 200 mm	Ø 25 mm/80 mm	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	115 x Ø 62 mm	Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse
<b>SI-COLO1-80-FCL</b>	40 mm ... 200 mm	Ø 25 mm/80 mm	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	115 x Ø 62 mm	Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse
<b>SI-COLO1-200-d1</b> <b>SI-COLO1-200-d2</b>	100 mm ... 350 mm 100 mm ... 350 mm	Ø 12 mm/200 mm Ø 25 mm/200 mm	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	120 x 54 x 54 mm	Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse
<b>SI-COLO1-LwL-SP</b>	1 mm ... 250 mm <sup>1)</sup>	1 mm ... 250 mm <sup>1)</sup>	typ. 2 kHz (-3dB)	3x ANA (0...+10V)	3 (red, green, blue)	90 x 50 x 35 mm	Adjustable with potentiometer	8x white-light LED, modulated 100 kHz, diffuse

<sup>1)</sup> Depends on light source and add-on optics used

# LWL Series

## Mounted Optical units

MODEL	FOR USE WITH OPTICAL FIBER	WORKING DISTANCE	CHARACTERISTICS
<b>KL-2</b> Focus lens	D-S-A2.0-(2.5)-...-67° D-S-A2.0-(2.5)-...-22°	typ. 50 ... 200 mm in transmitted light operation	increase of range
<b>KL-3</b> Focus lens	D- / R-S-A2.0-(2.5)-...-67°	typ. 10 ... 20 mm (Ø 1 mm/10 mm) Color	measurement at small objects in relative big distance
<b>KL-4</b> Focus lens	R-S-A1.1-(1.5)-...-67° R-S-A1.1-(1.5)-...-22°	typ. 10 ... 15 mm (Ø 0.5 mm/10 mm)	Color measurement at small objects in relative big distance
<b>KL-6</b> Reflex optics	D-S-A2.0-(2.5)-...-67°	typ. 100 ... 250 mm (Ø 31 mm/200 mm)	Minimal color change when changing distance, can be
<b>KL-14</b> Reflex optics	D-S-A2.0-(2.5)-...-67°	typ. 60 ... 120 mm (Ø 11 mm/80 mm)	Minimal color change when changing distance, can be
<b>KL-28</b> Reflex optics	D-S-A2.0-(2.5)-...-67°	typ. 20 ... 30 mm (Ø 6 mm/25 mm)	Minimal color change when changing distance, can be
<b>KL-40</b> Reflex optics	D-S-A2.0-(2.5)-...-67°	typ. 15 ... 25 mm (Ø 2 mm/10 mm)	Minimal color change when changing distance, can be
<b>KL-M18</b> Reflex optics	R-P-A2.0-(2.5)-...-67°	typ. 20 ... 65 mm (Ø 2 mm/10 mm)	Minimal color change when changing distance, can be
<b>KL-M34</b> Reflex optics	R-P-A2.0-(2.5)-...-67°	typ. 100 ... 250 mm (Ø 31 mm/200 mm)	Minimal color change when changing distance, can be
<b>KL-3/30</b> Reflex optics	R/D-S-A2.0-(2.5/1.75)-...-67°	typ. 30 mm	) Suitable for detection of transported fluids (in spray)

Wide range of focus lenses and mounted optical units for the reflected-light and transmitted-light optical fiber cables to extend the measuring range























## Optical Fiber Cables

MODEL	OPERATING MODE	SHEATHING TYPE	CROSS-SECTION FIBER OPTICS
<b>R-S-A1.1-(1.5)-...</b>	Reflected light	sheathing	Ø 1.5 mm
<b>R-S-A2.0-(2.5)-...</b>	Reflected light	Silicone metal sheathing	Ø 2.5 mm
<b>R-P-B1.1-(0.6)-...</b>	Reflected light	PVC specials Sheathing	Ø 0.6 mm
<b>R-S-C1.0-(1.0)-...</b>	Reflected light	Silicone metal sheathing	Ø 1.0 mm
<b>R-S-D1.1-(0.6)-...</b>	Reflected light	Silicone metal sheathing	Ø 0.6 mm
<b>R-E-Q3-(18x0.3)-...</b>	Reflected light	Stainless steel sheathing	18 mm x 0.3 mm
<b>R-S-R1.1-(3x0.5)-...</b>	Reflected light	Silicone metal sheathing	3 mm x 0.5 mm
<b>R-S-R1.2-(6x1)-...</b>	Reflected light	Silicone metal sheathing	6 mm x 1 mm
<b>D-M-M1.1-(0.6)-...</b>	Transmitted light	sheathing	Ø 0.6 mm
<b>D-S-A2.0-(2.5)-...</b>	Transmitted light	Silicone metal sheathing	Ø 2.5 mm

Wide range of reflected-light and transmitted-light optical fiber cables with different sensor heads (beam angle of 67° or 22°) and various sheathings (also in special lengths).

# Si-COLO2 Series

## Color Sensors 8 bit A/D Conversion

MODEL	OPERATING RANGE (TYP.)	SPOT SIZE/OBJECT DISTANCE (TYP.)	SWITCHING FREQUENCY	DIGITAL OUTPUTS	NO. OF COLORS TO BE TAUGHT	DIMENSIONS (L X W X H)	EXTERNAL LEARNING	LIGHT SOURCE
 SI-COLO2-20-d0	18 mm ... 24 mm	Ø 0.8 mm/20 mm	max. 10 kHz	4	max. 15	100 x 42 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO2-30-d0  SI-COLO2-30-d1  SI-COLO2-30-d2  SI-COLO2-50-d0	... 55 mm 25 mm ... 55 mm	Ø 1.5 mm/30 mm mm Ø 2.0 mm/30 mm	max. 10 kHz	4	max. 15	80 x 42 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO2-50-d1  SI-COLO2-50-d2  SI-COLO2-50-d3	30 mm ... 90 mm 30 mm ... 90 mm	Ø 3.5 mm/50 mm Ø 5.5 mm/50 mm	max. 10 kHz	4	max. 15	73 x 38 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO2-80-d1  SI-COLO2-80-d2  SI-COLO2-80-d3	50 mm ... 150 mm 50 mm ... 150 mm	Ø 6.5 mm/80 mm mm Ø 9.0 mm/80 mm	max. 10 kHz	4	max. 15	73 x 38 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO2-200-d1  SI-COLO2-200-d2	100 mm ... 350 mm 100 mm ... 400 mm	Ø 12.0 mm/200 mm Ø 25.0 mm/200 mm	max. 10 kHz	4	max. 15	108 x 54 x 54 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO2-500-d2  SI-COLO2-500-d3	200 mm ... 600 mm 50 mm ... 800 mm	Ø 23.0 mm/500 mm Ø 50.0 mm/500 mm	max. 10 kHz	4	max. 15	108 x 54 x 54 mm	LEARN button (INO)	100 kHz White-light LED, modulated 100 kHz
 SI-COLO2-20-LUMI	18 mm ... 24 mm	2 mm x 1 mm/20 mm 4 mm x 2 mm/30 mm	max. 10 kHz	4	max. 15	100 x 42 x 35 mm	LEARN button (INO)	UV LED, modulated 100 kHz
 SI-COLO2-30-DIL	10 mm ... 60 mm	Ø 12 mm/20 mm Ø 20 mm/40 mm	max. 10 kHz	4	max. 15	98 x 35 (Ø 35) x 30 mm	LEARN button (INO)	4x white-light LED, modulated 100 kHz diffuse
 SI-COLO2-30/90-DIL	10 mm ... 60 mm	Ø 12 mm/20 mm Ø 20 mm/40 mm	max. 10 kHz	4	max. 15	80 x 35 x 48 mm	LEARN button (INO)	4x white-light LED, modulated 100 kHz diffuse
 SI-COLO2-50-FCL	20 mm ... 200 mm	Ø 13 mm/20 mm mm Ø 31 mm/100 mm	max. 10 kHz	4	max. 15	98 x 35 (Ø 35) x 30 mm	LEARN button (INO)	white-light LED, modulated 100 kHz focused
 SI-COLO2-LWL	(depends on optical fiber and add-on optics used)	depends on optical fiber and add-on optics	max. 10 kHz	4	max. 15	80 x 30 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO2-LWL-Sp	(depends on optical fiber and add-on optics used)	depends on optical fiber and add-on optics	max. 10 kHz	4	max. 15	80 x 30 x 35 mm	LEARN button (INO)	Super-bright white-light LED, modulated 100 kHz
 SI-COLO2-LWL-8X	(depends on optical fiber and add-on optics used)	depends on optical fiber and add-on optics	max. 10 kHz	4	max. 15	280 x 80 x 40 mm	LEARN button (INO)	8x white-light LED, modulated 100 kHz
SI-COLO2-LWL-HAMP-COL4 (+ COL-LEARN)	depends on optical fiber and add-on optics used)	optical fiber and add-on optics used)	max. 10 kHz	4	max. 4	80 x 30 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
SI-COLO2-LWL-ACL-4X (+ R-p-Ap1.0-800-4X-MS) Active Light	depends on light source that is to be detected)	depends on light source that is to be detected)	max. 10 kHz	4	max. 15	98 x 30 x 35 mm	(INO) LEARN button (INO)	4x Measuring object (luminous object, e.g. LED)
SI-COLO2-LWL-ACL-MUX08 (+ R-p-Ap1.0-1000-1X-MS) Active Light	(depends on light source that is to be detected)	(depends on light source that is to be detected)	max. 10 kHz	4	max. 15	170 x 75 x 35 mm	(INO) LEARN button (INO)	8x Measuring object (luminous object, e.g. LED)
SI-COLO2-LWL-MTO (+ D-S-A2.0-(2.5)-600-...) Moved Transparent	depends on optical fiber and add-on optics used)	(depends on optical fiber and add-on optics	max. 11 kHz	4	max. 15	80 x 30 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz

# Si-COLO3 Serie

## Color Sensors 12 bit a/d Conversion

MODEL	OPERATING RANGE (TYP.)	SPOT SIZE OBJECT DISTANCE (TYP.)	SWITCHING FREQUENCY	SPECIALS FITTINGS	DIGITAL OUTPUTS	NO. OF COLORS TO BE TAUGHT	DIMENSIONS (L x W x H)	EXTERNAL LEARNING	LIGHT SOURCE
 SI-COLO3-20-d0 (-TC)	18 mm ... 14 mm	Ø 0.8 mm/20 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	100 x 42 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-30-d0 (-TC)	25 mm ... 55 mm	Ø 1.5 mm/30 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	80 x 42 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-30-d1 (-TC)	55 mm 25 mm ... 55 mm 25 mm	Ø 2.0 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	73 x 38 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-50-d1 (-TC)	30 mm ... 90 mm	Ø 3.5 mm/50 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	73 x 38 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-50-d2 (-TC)	30 mm ... 90 mm	Ø 5.5 mm/50 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	73 x 38 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-80-d1 (-TC)	50 mm ... 150 mm	Ø 6.5 mm/80 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	73 x 38 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-80-d2 (-TC)	50 mm ... 150 mm	Ø 7.0 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	73 x 38 x 35 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-200-d1 (-TC)	100 mm ... 350 mm	Ø 12.0 mm/200 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	108 x 54 x 54 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-200-d2 (-TC)	100 mm ... 400 mm	Ø 25.0 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	108 x 54 x 54 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-500-d2 (-TC)	200 mm ... 600 mm	Ø 23.0 mm/500 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	108 x 54 x 54 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-500-d1 (-TC)	50 mm ... 800 mm	Ø 50.0 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	108 x 54 x 54 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-200-SLU (-TC) (+ SI-SLU)	100 mm ... 350 mm	Depends on the position of the sensor	max. 32 kHz	Optional: True Color Chip	4	max. 15	108 x 54 x 54 mm	LEARN button (INO)	White-light LED, modulated 100 kHz
 SI-COLO3-20-LUMI (-TC)	18 mm ... 24 mm	2 mm x 1 mm/20 mm 4 mm x 2 mm/30 mm	max. 32 kHz	Optional: True Color Chip Für fluoreszierende	4	max. 15	100 x 42 x 35 mm	LEARN button (INO)	UV LED, modulated 100 kHz
 SI-COLO3-30-DIL (-TC)	10 mm ... 60 mm	Ø 12 mm/20 mm, Ø 20 mm/40 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	98 x 35 (Ø 35) x 30 mm	LEARN button (INO)	8x white-light LED, modulated 100 kHz,
 SI-COLO3-30-FCL (-TC)	10 mm ... 150 mm	Ø 12 mm/20 mm, Ø 31 mm/100 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	98 x 35 (Ø 35) x 30 mm	LEARN button (INO)	white-light LED, modulated 100 kHz,
 SI-COLO3-30/90-DIL (-TC)	10 mm ... 60 mm	Ø 12 mm/20 mm, Ø 20 mm/40 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	80 x 35 x 48 mm	LEARN button (INO)	8x white-light LED, modulated 100 kHz,
 SI-COLO3-30/90-FCL (-TC)	10 mm ... 150 mm	Ø 12 mm/20 mm, Ø 31 mm/100 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	80 x 35 x 48 mm	LEARN button (INO)	8x white-light LED, modulated 100 kHz,
 SI-COLO3-50-DIL (-TC)	20 mm ... 80 mm	Ø 20 mm/60 mm, Ø 40 mm/100 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	98 x 35 (Ø 35) x 30 mm	LEARN button (INO)	white-light LED, modulated 100 kHz, focused
 SI-COLO3-50-FCL (-TC)	20 mm ... 200 mm	Ø 20 mm/50 mm, Ø 40 mm/100 mm	max. 32 kHz	Optional: True Color Chip	4	max. 15	98 x 35 (Ø 35) x 30 mm	LEARN button (INO)	white-light LED, modulated 100 kHz, focused
 SI-COLO3-LWL-SP (-TC)	(depends on optical fiber and add-on optics used)	depends on optical fiber and add-on optics used)	max. 32 kHz	Optional: True Color Chip	4	max. 15	80 x 30 x 35 mm	LEARN button (INO)	Super-bright white-light LED, modulated 100 kHz
 SI-COLO3-LWL-SP-RA (-TC)	(depends on optical fiber and add-on optics used)	depends on optical fiber and add-on optics used)	max. 32 kHz	Optional: True Color Chip	4	max. 15	80 x 30 x 35 mm	LEARN button (INO)	Super-bright white-light LED, modulated 100 kHz
 SI-COLO3-LWL-8X (-TC)	depends on optical fiber and add-on optics used)	depends on optical fiber and add-on optics used)	max. 32 kHz	Optional: True Color Chip	4	max. 15	280 x 80 x 40 mm	LEARN button (INO)	white-light LED, modulated 100 kHz, focused
SI-COLO3-LWL-SP-HAMP (-TC) (+ COL-LEARN)	(depends on optical fiber and add-on optics used)	depends on optical fiber and add-on optics used)	max. 32 kHz	Optional: True Color Chip	4	max. 4	80 x 30 x 35 mm	LEARN button (INO)	Super-bright white-light LED, modulated 100 kHz
SI-COLO3-LWL-ACL (-TC)	depends on light source that is to be detected)	depends on light source that is to be detected)	max. 32 kHz	Optional: True Color Chip	4	max. 15	98 x 30 x 35 mm	LEARN button (INO)	Measuring object (luminous object, e.g. LED)
SI-COLO3-LWL-ACL-RA (-TC)	depends on light source that is to be detected)	depends on light source that is to be detected)	max. 32 kHz	Optional: True Color Chip	4	max. 15	98 x 30 x 35 mm	LEARN button (INO)	Measuring object (luminous object, e.g. LED)
SI-COLO3-LWL-ACL-4X (+ R-P-AP1.0-800-4X Me)	(depends on light source that is to be detected)	(depends on light source that is to be detected)	max. 32 kHz	Optional: True Color Chip	4	max. 15	98 x 30 x 35 mm	LEARN button (INO)	8x Measuring object (luminous object, e.g. LED)
SI-COLO3-LWL-ACL-MUX08 (-TC) (+ R-P-AP1.0-1000-4X Me)	(depends on light source that is to be detected)	depends on light source that is to be detected)	max. 32 kHz	Optional: True Color Chip	4	max. 15	170 x 75 x 35 mm	LEARN button (INO)	8x Measuring object (luminous object, e.g. LED)

# Si-COLO4 Series

## Color Sensors 12 bit A/D Conversion



MODEL	OPERATING RANGE (TYP.)	SPOT SIZE OBJECT DISTANCE (TYP.)	SWITCHING FREQUENCY	SPECIALS FITTINGS (-TC)	DIGITAL OUTPUTS	NO. OF COLORS TO BE TAUGHT	DIMENSIONS (L X W X H)	EXTERNAL LEARNING	LIGHT SOURCE
<b>SI-COLO4-80-d1 (-TC)</b> <b>SI-COLO4-80-d2</b>	50 mm ... 150 mm	Ø 6.5 mm/80 mm Ø 9.0 mm/80 mm Ø 13.0 mm/80 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	80 x 43 x 40 mm	LEARN button (INO)	White-light LED, modulated 30 kHz
<b>SI-COLO4-30-DIL (-TC) SI-</b>	10 mm ... 60 mm 10 mm ... 40 mm	Ø 12 mm/20 mm, Ø 20 mm/40 mm, Ø 5 mm/20 mm, Ø 10 mm/40 mm, Ø 12 mm/20 mm, Ø 20 mm/40 mm	max. 32 kHz	Optional: True Color Chip Blende/	5	max. 31	108 x 50 x 35 mm	LEARN button (INO)	White-light LED, modulated 30 kHz
<b>SI-COLO4-30-FCL (-TC) SI-</b>	10 mm ... 150 mm 10 mm ... 150 mm 150 mm 20 mm ... 80 mm	Ø 12 mm/20 mm, Ø 31 mm/100 mm, Ø 5 mm/20 mm, Ø 15 mm/80 mm, Ø 10 mm/50 mm, Ø 20 mm/80 mm	max. 32 kHz	Optional: True Color Chip Blende/	5	max. 31	108 x 50 x 35 mm	LEARN button (INO)	White-light LED, modulated 30 kHz
<b>SI-COLO4-30/90-DIL (-TC)</b>	10 mm ... 60 mm	Ø 12 mm/20 mm, Ø 20 mm/40 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	90 x 50 x 53 mm	LEARN button (INO)	30 kHz White-light LED, modulated 30 kHz
<b>SI-COLO4-30/90-FCL (-TC)</b>	10 mm ... 150 mm	Ø 12 mm/20 mm, Ø 31 mm/100 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	90 x 50 x 53 mm	LEARN button (INO)	30 kHz White-light LED, modulated 30 kHz
<b>SI-COLO4-50-DIL (-TC) SI-COLO4-50-DIL-d5 (-TC)</b>	20 mm ... 80 mm 20 mm ... 80 mm	Ø 20 mm/50 mm, Ø 40 mm/100 mm, Ø 10 mm/50 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	108 x 50 x 35 mm	LEARN button (INO)	30 kHz White-light LED, modulated 30 kHz
<b>SI-COLO4-50-FCL (-TC) SI-COLO4-50-FCL-</b>	20 mm ... 200 mm 20 mm ... 200 mm	Ø 20 mm/50 mm, Ø 40 mm/100 mm, Ø 10 mm/50 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	108 x 50 x 35 mm	LEARN button (INO)	30 kHz White-light LED, modulated 30 kHz
<b>SI-COLO4-80-DIL (-TC)</b>	40 mm ... 120 mm	Ø 25 mm/80 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	115 x 50 (Ø 62) x 35 mm	LEARN button (INO)	12x white-light LED, modulated 30 kHz, focused
<b>SI-COLO4-80-FCL (-TC)</b>	40 mm ... 300 mm	Ø 25 mm/80 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	115 x 50 (Ø 62) x 35 mm	LEARN button (INO)	12x white-light LED, modulated 30 kHz, focused
<b>SI-COLO4-200-DIL (-TC) SI-COLO4-</b>	50 mm ... 300 mm 50 mm ... 100 mm	Ø 20 mm/200 mm, Ø 20 mm/150 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	115 x Ø65 mm 115 x Ø65 mm	LEARN button (INO)	10x white-light LED, modulated 30 kHz, focused
<b>SI-COLO4-200-FCL (-TC) SI-COLO4-</b>	50 mm ... 400 mm 20 mm ... 200 mm	Ø 20 mm/200 mm, Ø 20 mm/200 mm	max. 32 kHz	Optional: True Color Chip	5	max. 31	115 x Ø 65 mm	LEARN button (INO)	10x white-light LED, modulated 30 kHz, focused
<b>SI-COLO4-LwL-SP (-TC) SI-COLO4-LwL-SP-RA (-TC)</b>	depends on optical fiber and add-on optics used)	(depends on optical fiber and add-on optics used)	max. 32 kHz	Optional: True Color Chip	5	max. 31	90 x 50 x 35 mm	LEARN button (INO)	Super-bright white-light LED, modulated 30 kHz

# SPECTRO Series

## Spectrometers, Color Measurement Systems



MODEL 1)	MEAS. METHOD	OPERATING RANGE (TYP.)	DETECTION RANGE/ REFERENCE DISTANCE (TYP.)	SWITCHING FREQUENCY	REPRODUCIBILITY A E	DETECTOR TYPE	WAVE LENGTH RANGE	DIMENSIONS (L X W X H)	EXTERNAL LEARNING	LIGHT SOURCE
<b>SPECTRO -256-0/45</b>	0°/45°	25 mm ... 31 mm	Ø 3 mm / 28 mm	max. 100 Hz	typ. 0.3	Spectrometer with line sensor 256 pixels	380 nm ... 780 nm	200 x 95 x 95 mm		white, blue LED (D65 approximate)
<b>SPECTRO -256-ACL</b>	0° Optical fiber	Depends on object (ext. light source)	200 mm	max. 100 Hz	typ. 0.3	Spectrometer with line sensor 256 pixels	380 nm ... 780 nm	205 x 70 x 70 mm	LEARN but- ton (INO)	-
<b>SPECTRO -256-ACL-</b>	0°/- Optical fiber	Depends on object (luminous source)	1 mm...100 mm at optical fiber with root Ø 0,1 mm / 1	max. 100 Hz	typ. 0.3	Spectrometer with line sensor 256 pixels	380 nm ... 780 nm	205 x 70 x 70 mm	LEARN but- ton (INO)	-
<b>SPECTRO -256-LwL</b>	Optical fiber	Depends on object (luminous objects) and optical	Ø 60 mm / 1 mm ... 300 mm at optical fiber Ø typ. 0,6 mm ... 3 mm incl. front end optics up to Ø 60 mm / 1 mm ... 300 mm	max. 100 Hz	typ. 0.3	Spectrometer with line sensor 256 pixels	380 nm ... 780 nm	205 x 70 x 70 mm	LEARN but- ton (INO)	white, blue LED (D65 approximate)
<b>SPECTRO -3-0/45</b>	0°/45°	23 mm ... 33 mm	Ø 5 mm / 28 mm	typ. 1 kHz		True Color Sensor (True Color Chip) 3-color-range	(True Color Chip) 400 nm ... 700 nm	115 x 100 x 40 mm	LEARN but- ton (INO)	white, blue LED (D65 approximate)
<b>SPECTRO -3-50-DIL</b>	0°/11°	40 mm ... 60 mm	Ø 15 mm / 50 mm	typ. 1 kHz	typ. 1.0	(True Color Chip) 3-color-range sensor	(True Color Chip) 400 nm ... 700 nm	117 x M34x1,5	LEARN but- ton (INO)	white, blue LED (D65 approximate)
<b>SPECTRO -3-50-FCL</b>	0°/11°	40 mm ... 60 mm	Ø 15 mm / 50 mm	typ. 1 kHz	typ. 1.0	(True Color Chip) 3-color-range sensor (True Color Chip)	400 nm ... 700 nm	117 x M34x1,5	LEARN but- ton (INO)	white, blue LED (D65 approximate)

1 / 1)all models: 5 digital outputs and max. 31 colors to be taught