TechNote

T030 // colorCONTROL

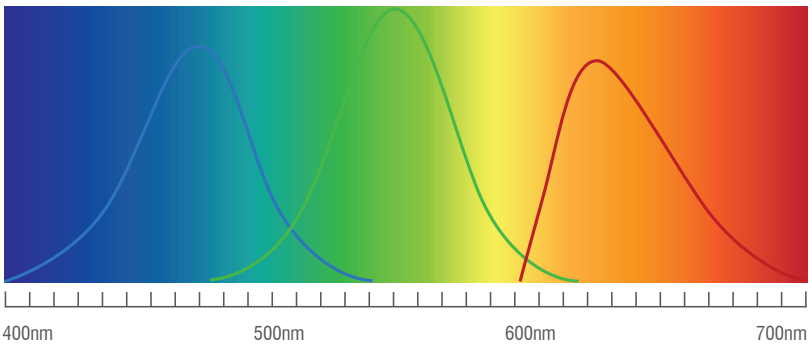
Distinction of RGB sensor, True Color sensor & spectrometer

RGB sensor:

Narrow-band color filters divide the received light spectrum into the following three color coordinates:

R = red, **G = green** and **B = blue** (Figure 1)

The sensor evaluates the intensity of the respective color coordinates and outputs them as analog signal. As a result, one gets three color values which, however, have only little information value about the color as an RGB sensor can only image a small part of the color spectrum. Furthermore, an RGB sensor cannot separate color information and brightness, i.e., changing the brightness also changes the displayed color.



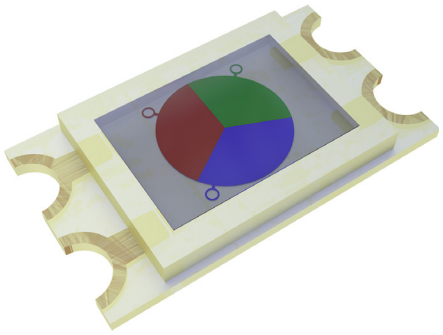


Figure 1
This method is applied with MFA LED Analyzers

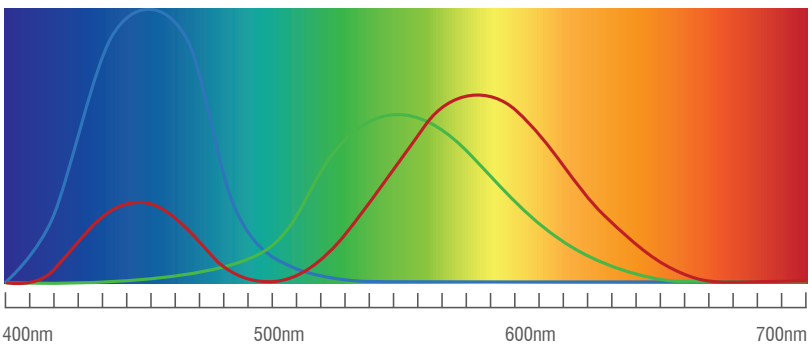
XYZ sensor (True Color Sensor):

Three high-resolution color filters divide the received light spectrum into the following three color coordinates:

X= red, **Y = green** and **Z = blue** (Figure 2)

Similar to the so-called cones in the human eye, these color filters image the **entire spectral sensitivity of the eye**. Due to these broad-band color filters, the wavelengths of the light spectrum are imaged in more detail and contain more information about the color composition. Based on stored standard formulas, the values are converted into the standardized L*a*b* color space. Due to this standardization, changing the brightness (e.g. fluctuating distance between sensor and target) has only little influence on the color value.

True Color sensors are designed for **relative color inspection**



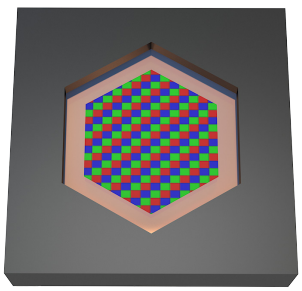
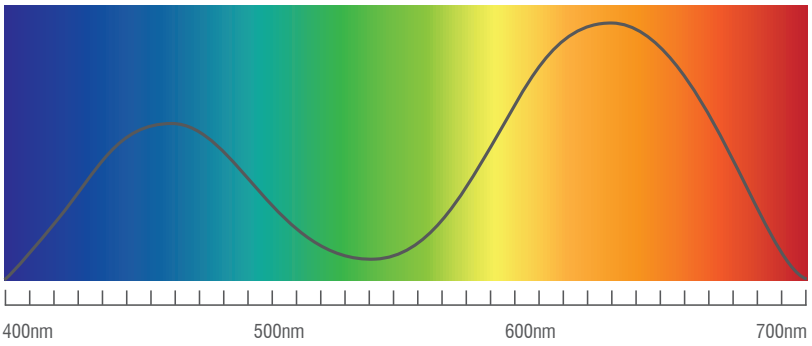


Figure 2
This method is applied with all colorSENSOR models (CFO, OT, LT)

Spectral sensors:

Sensors based on spectral technology are color measuring systems. A grid divides the received light into individual wavelengths. These individual information are projected onto the CCD line. Furthermore, each of the 256 measurement pixels of this line is assigned to a certain wavelength. Based on interpolation, an intensity value (0-100%) of the received color wavelength is then output for each pixel. This allows for the computing unit to image and output the full spectral curve of the visible light (Figure 3). Based on its spectral curve, the color obtained can be clearly identified. With the freely selectable standard observers and illuminants stored in the controller, the values and spectral curves received can be converted and output in the desired color space. "White referencing" makes it possible to largely eliminate any ambient influences onto the measurement result.

Sensors operating according to the spectral technology are **color measuring sensors.**



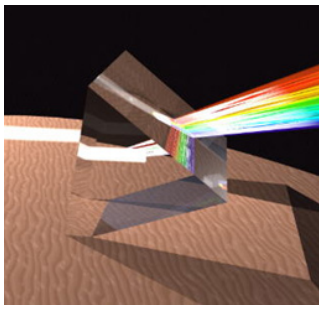


Figure 3
This method is applied with the colorCONTROL ACS color measuring system

RGB sensor:

- Max. color accuracy attainable is $\Delta E_{rel} = 2$
- Not standardized
- Does not image the full color spectrum
- Changes of brightness or distance = Change of displayed color

XYZ sensor (True Color Sensor):

- Max. color accuracy attainable is $\Delta E_{rel} = 0.2$
- Standardized (color space based on stored formulas, illumination integrated in the sensor)
- Color spectrum is largely covered
- Changes of brightness are compensated for to a limited extent = little influence onto the displayed color

Spectral sensors:

- Max. color accuracy attainable is $\Delta E_{abs} = 0.03$
- Standardized (color space based on stored formulas, illumination integrated in the sensor)
- Freely selectable, standardized color spaces and standard illuminants
- Color spectrum is fully covered
- Color measuring system
- Highest accuracy