

# Hue and Saturation

## Hue

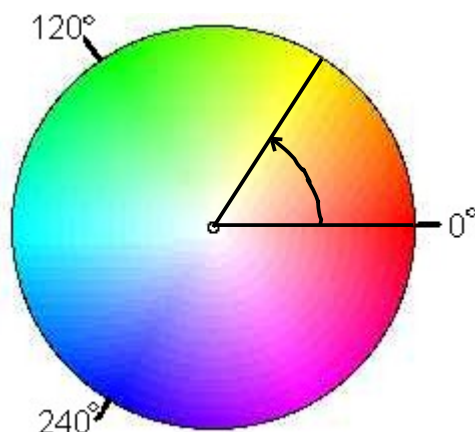


Figure 1: Hue (Colour) Wheel

<b>RED</b>	=	0°
<b>GREEN</b>	=	120°
<b>BLUE</b>	=	240°

Hue describes the Colour of an object such as Red, Green, Yellow, etc.

These Colours can be represented by a 360° degree circular Colour wheel (See Figure 1). Any point on the Colour Wheel can be represented by an angle offset from 0° and by its distance from the center. By convention, the angles are measured in an anticlockwise direction from 0°.

Looking at the Colour Wheel it can be seen that Red occupies angles near 0° and 360°. Green occupies angles near 120° and Blue occupies angles near 240°. These are the three Primary Colours.

Yellow, Magenta and Cyan are known as Secondary Colours and their angles bisect the three Primary Colours. Since Yellow is a mixture of Red and Green in equal proportions then the angle for Yellow is  $120/2 = 60^\circ$ . Similarly, the angles for Cyan is 180° and Magenta is 300°.

Any Hue on the Colour Wheel can be represented by its angle measured from 0° in an anticlockwise direction. Therefore Red will have a Hue of 0, Green a Hue of 120 and Blue a Hue of 240.



# Hue and Saturation

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## Saturation

A pure colour will be represented on the Colour Wheel as a point near the outer edge. This is said to be a *saturated* colour. White will be represented by a point near the center of the wheel and is said to be *unsaturated*. White is not a colour but instead is a mixture of all the colours on the wheel.

The degree of whiteness in a LED will affect its distance from the center of the wheel - the greater the amount of white the closer it will be to the center.

The degree of whiteness emitted by the LED is represented by the term *Saturation*. A Saturation value of 0% represents pure White. A Saturation value of 100% represents a pure Colour such as Red, Blue, Green, etc.

It can be seen from the Colour Wheel that any Hue will have a Saturation value associated with it. The center can be approached from any point on the wheel. This is an important consideration when testing Tri-Colour (RGB) LED's. Since the Red, Green and Blue Colours can be individually controlled then any value of Hue and Saturation could be (theoretically) generated.

In summary, the Hue value indicates the colour of the LED and the Saturation value indicates the *whiteness* of the LED. In practice most pure colour LED's (Red, Yellow, Green, Blue, etc) will have Saturation values > 95%. However, White Leds may have varying values of Saturation. It is not uncommon for White LED's to have Saturation values of 30% - 50%.

Usually the user must determine the Hue and Saturation values by testing a number of LED's and recording the results.