

QUALITY OF LIGHT

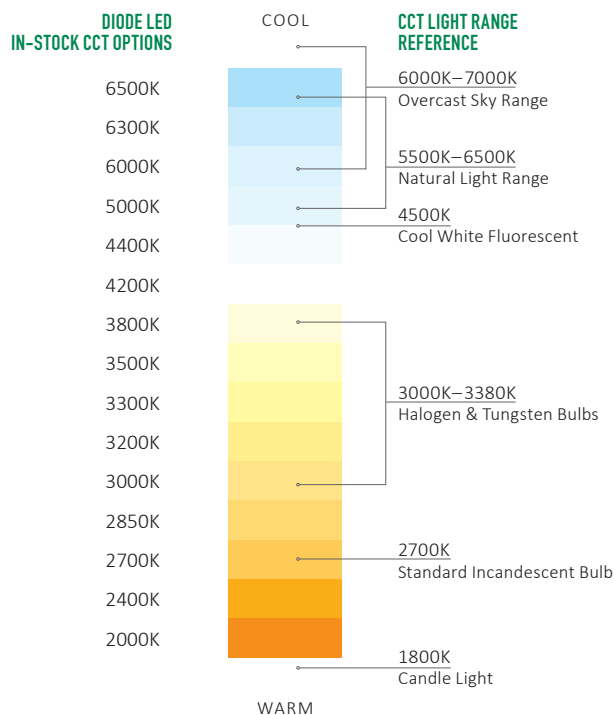
Without light, it would be impossible to view the world around us. Light illuminates objects for us to see and the spectrum emitted by a light source provides the color in these objects. Variants of color offers advantages for different lighting applications. The lighting industry uses several tools - Kelvin, CCT, CRI, R-values and TM-30 - to describe color characteristics and light quality.

THE CORRELATED COLOR TEMPERATURE SCALE

The Kelvin based CCT (Correlated Color Temperature), is a scale used in lighting to measure the color temperature of a luminaire. It puts specifics to the description of the appearance of white light as “warm”, “neutral” or “cool” (CCT chart, below). The color chosen for an application may vary based on the use of the space and the material being illuminated. For example, “warmer” light is very popular in residential applications where “cool” light is more prevalent in commercial and industrial spaces. We offer a wide variety of options to meet your needs for any lighting application.

CORRELATED COLOR TEMPERATURE (CCT) LIGHT RANGE COMPARISON CHART

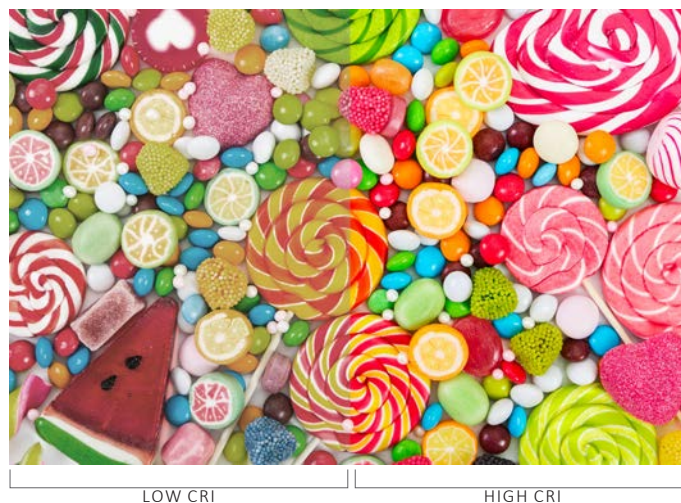
(MEASURED IN KELVIN)



OTHER CCT OPTIONS AVAILABLE BY SPECIAL ORDER ONLY.

THE IMPORTANCE OF QUALITY COLOR RENDERING

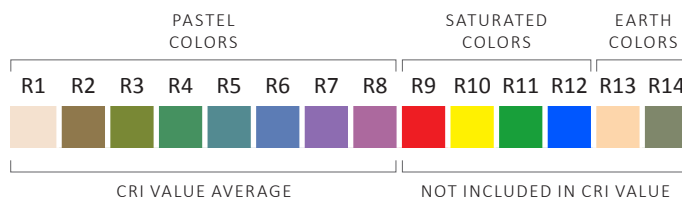
Quality color rendering is an important aspect of a light source as the light will reveal colors of objects accurately in comparison with an ideal or natural light source (daylight or incandescent bulb). A source with poor color rendering may cause objects to appear dull and unsaturated (see image below) or overly saturated and unnatural. Many artificial light sources have lower CRIs that will mute colors in food, artwork and skin tones, making them appear less vibrant. We use very high CRIs, typically in the range of 80-98 CRI, to assure that colors are rendered vibrantly and true.



Color rendering properties of a light source can be evaluated with complex calculation engines. These tools compare how a set of color samples are rendered (represented) by a light source in comparison to a reference light source.

A FAMILIAR COLOR RENDERING TOOL: CRI

The most familiar calculator is CRI (Color Rendering Index), which has been utilized to measure color rendering properties of light sources for over 50 years. CRI has been widely adopted in the lighting industry for its ease of use as it only calculates a single metric—Fidelity (Ra). Sunlight has a CRI of 100, the highest mark on the 0-100 scale. CRI is calculated using an average of 8 specific R-values representing 8 different colors within the light spectrum. The R-values measure the concentrations of 14 colors within a light source’s emitted spectrum and the ability to render individual colors. High R9, R13 and R14 values are particularly important for illuminating skin tones, decorative art and retail merchandise properly. Our products are engineered specifically to deliver high R9, R13 and R14 values to assure your installations deliver superior color rendering.



A BRIEF LOOK INTO TM-30: THE NEXT GENERATION OF COLOR RENDERING

IES TM-30-15 is a new color rendering system that remedies flaws/limitations of CRI, providing complementary and more detailed information that benefits both specifiers and manufacturers. The much wider range of colors is a more accurate reflection of the real world – allowing you to show detailed colors for skin tones, wood grains, decorative art, furnishings, merchandising and more.

While CRI isn't going anywhere soon, it's important to familiarize yourself with the new TM-30 metrics as they will become more common in years to come.

A combination of TM-30's Fidelity (Rf), Gamut (Rg) and Color Vector Graphic will help further clarify beyond the typical CRI metric how a test source compares to a reference source.

METRIC	SCALE	DESCRIPTION
Fidelity Index (Rf) NEW	0 - 100	A measurement of fidelity comparable to CIE CRI (Ra) but averages the values of 99 color samples instead of 8. A higher value typically provides a more accurate rendition of color in comparison to a natural light source.
Gamut Index (Rg) NEW	60 - 140	Gamut (Rg) measures the average hue and saturation (chroma) shift of a light source using 99 color samples. A value of 60-99 indicates average desaturation. A value of 101-160 indicates average increased saturation.
Color Vector Graphic NEW	Visual	The Color Vector Graphic shows the relative saturation of multiple hues. It's important as it quickly conveys what types of colors are more or less saturated.
Fidelity Skin (Rf,skin) NEW	0 - 100	Fidelity Skin (Rf,skin) is an average of CES15 and CES18 skin tones. A higher value typically provides natural looking 'skin tones'.
Fidelity Red (R9)	0 - 100	Fidelity Red (R9) derives from a single, saturated, red color sample. A higher value is important for illuminating red surfaces, wood grains and skin tones.
CIE CRI (Ra)	<0 - 100	CRI (Ra) is a legacy measurement of Fidelity using 8 color samples and with an undefined lower scale. A higher value typically provides more accurate average rendition of color. Comparably, TM-30 fidelity (Rf) is a much more improved metric for accurate color rendition than CRI (Ra).

WHERE CAN YOU FIND TM-30 DATA FOR DIODE LED PRODUCTS?

TM-30 data including the metrics above and other useful graphics are available for Diode LED's premier lines of lighting products at www.DiodeLED.com. Remember, not all applications require the highest quality lighting i.e. garages, warehouses and some outdoor environments. We can help you find the right light for the right application. Additionally, you can count on Diode LED to be at the forefront of understanding and implementing the latest technology to provide superior and quality products.

CRI VS TM-30 RENDERING TOOLS

CIE 13.3-1995 (CRI/Ra)

- Last major update was in 1976
- 8 main color samples (Ra), 6 special samples
- Measures Fidelity (Ra) only

IES TM-30-15

- Released in 2015
- 99 color samples
- Measures Fidelity (Rf), Gamut (Rg) and includes Color Vector Graphic for detailed hues

TM-30 COLOR CHART

TM-30 measures against 99 color samples, all used to provide Fidelity (Rf), Gamut (Rg) and Color Vector Graphics.



Visit us at www.DiodeLED.com to find up-to-date technical information about our products, including information about quality of light, compatibility charts, specification sheets, photometric data, wiring diagrams, educational tutorials, videos and more.