

## Specialty Color Scales and Indices

In general, the Hunter L, a, b and CIELAB color scales or well-documented indices such as brightness, whiteness, and yellowness are perfectly acceptable and descriptive for color measurement. However, there are also numerous specialized indices that can be useful in niche applications. Several of these specialty indices are described below.

### Coal Colour Index for Powdered Brown Coal

The Coal Colour Index dates back to the 1960s and was cited in a report by the Research and Development Department of the State Electricity Commission of Victoria (Australia) in 1984, where a “HunterLab colorimeter” was used to measure powdered brown coals (generally for research and development purposes). The index is calculated as follows:

$$\text{Coal Colour Index for Powdered Brown Coals} = 10 (L' + a' + b') + 100$$

where

$$L' = (L - 16.966)/2.050$$

$$a' = (a - 2.534)/0.604$$

$$b' = (b - 4.421)/1.304$$

L, a, and b are the Hunter L, a, b values for C/2° conditions.

Using the custom formula field feature in EasyMatch QC (Versions 3.40 and higher) and Universal Software, the formula for Coal Colour may be entered for display in your Color Data Table view. Refer to your User’s Manual for instructions on using this feature.

### International Commission for Uniform Methods of Sugar Analysis (ICUMSA) 420 Sugar Score

This organization is based in England and develops standard measurement methods for characterizing the whiteness of sugar. However, it isn’t really whiteness that is being measured—it’s yellowness. For highly-refined, white glucose sugars, there are trace amounts of yellowness due to residual trace amounts of molasses from the refining process or the aging of glucose into diglycerides.

To prepare the sample for measurement, a 50 Brix sugar solution is prepared as a mixture of 50% sugar solids in filtered water (i.e., 50 g sugar in 50 mL water). The solution is then filtered with a 0.45-micron filter to remove any undissolved sugar solids. Then, the sample is poured into a transmission cell and its absorbance at 420 nm is measured. The sugar score is then calculated as follows:

$$\text{ICUMSA 420 Sugar Score} = \frac{(\text{Absorbance}_{420\text{nm}} \text{ of 50 Brix white sugar solution} * 1000)}{cb}$$

where

c = concentration of sugar solution in g/mL

b = cell path length expressed in cm.

Transmission cells with 10-, 20- or 50-mm path lengths may be used, with the following recommendations:

ICUMSA Color Range	Appropriate Cell Path Length (mm)
100-200	50
200-500	20
500-13,000	10

This formula can be found in ICUMSA Method GS1/3-7 (“Raw Sugar Solution Colour at pH 7.0, Official”), ICUMSA Method GS 2/3-10 (“The Determination of White Sugar Solution Colour”), and ICUMSA Method GS 2/3-9 (“The Determination of Sugar Solution Colour at pH 7.0”).

A special (CMR 2739) ColorQuest XT applet that calculates the ICUMSA 420 Sugar Score is available from HunterLab.

## Kent-Jones Flour Color

In 1950, Kent Jones developed the first practical instrumental method of evaluating flour color, creating the Kent-Jones and Martin Flour Color Grader. This instrument was a reflectometer using a green (530 nanometers peak transmission) filter which produced a color grade value. Their process involved making a slurry of the flour with water (30 grams of flour in 50 milliliters of water) and measuring it with their reflectometer. They then determined the degree of extraction of the bran (the actual parameter of interest) by correlating it with the color grade.

A CIE Y filter is also suitable for measuring flour color. A whiteness index for flour was calculated by Croes in 1961 as follows:

$$\text{Whiteness Index} = G - A + B$$

where

G, A, and B correlate to the readings using the CIE green, amber, and blue filters used in HunterLab’s colorimeters. More specifically,  $G = Y\%$ ,  $A = 1.25X\% - 0.25Z\%$ , and  $B = Z\%$ .

## Specialty Coffee Association of America (SCAA) Color Standards for Agreement on the Degree of Roast

This is not really a scale, but a set of eight colored disks to which roast coffee may be visually (or instrumentally) compared and assigned a grade of “very light” to “very dark.” This kit is designed to enhance consistency and assure that roasters and their customers are in agreement with regards to degree of roast.



The standards can be ordered through [www.scaa.org](http://www.scaa.org) using item number R4001.

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