Color Measurement with DR 6000

Application APP-PHM-0015

DOC042.52.20125

Introduction

Color measurement is becoming more and more important in the chemical, cosmetic and pharmaceutical industries as awareness of quality increases.

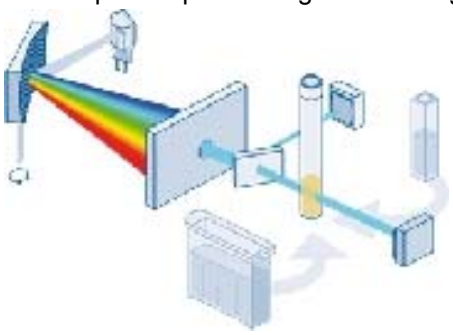
For historical reasons, a large number of color scales exist for the color assessment of liquid products, such as the Iodine, Hazen and Gardner color scales [1]. The yellowness index as per ASTM D1925 was originally a color index for surface color measurement, but the new ASTM D5386-93b now also defines the yellowness index for transparent liquids.

The DR 6000 can identify the following color scales according to the spectral method:

- CIE L*a*b* system
- Gardner color scale
- Hazen color scale
- Iodine color scale
- Yellowness index
- EBC (Z)

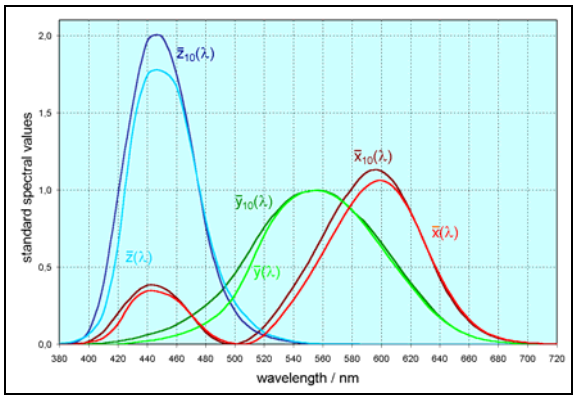
Basics

The spectral method for color measurement involves dissecting the white light from the light source into its spectral parts using a concave grid and determining the transmission level of the sample in a wavelength range of 380 nm to 720 nm.

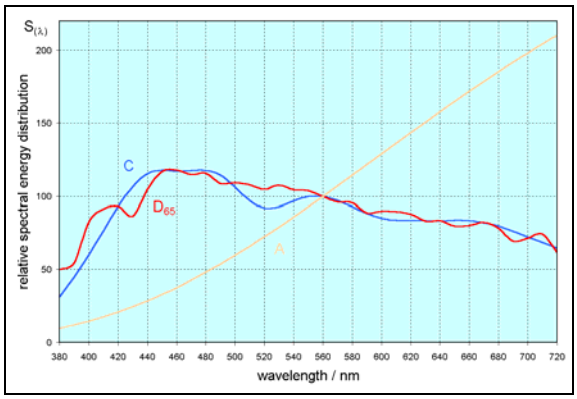


In accordance with DIN 5033 [2], the DR 6000 measures the transmission levels T_{380}–T_{720} of the optically clear solutions to be analyzed in 1-cm cells (exception: also measured in a 5-cm cell for the Hazen color scale).

The measured transmission levels are converted into the standard color values X, Y and Z using the standard illuminant and the standard spectral value functions in accordance with DIN 5033 [2].



Standard observer 2° and 10°



Standard illuminant A, C, D65

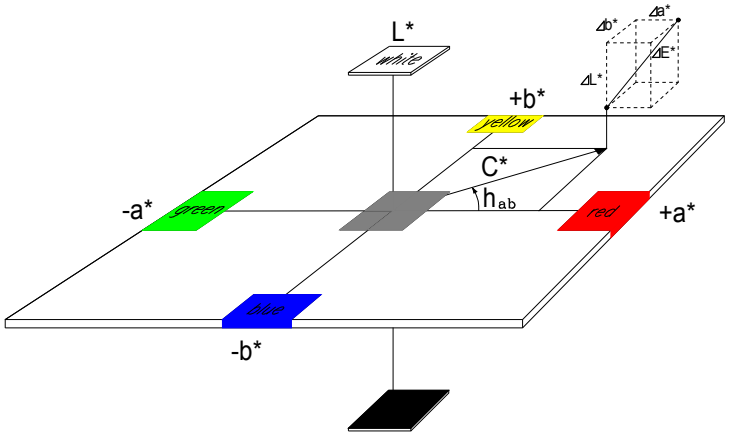
The 2° standard observer and standard illuminant C are used as the basis for this procedure.

The standard color values X, Y and Z form the basis for colorimetry. However, as these values do not supply any information regarding, for example, the lightness, hue or color saturation of the samples, the standard color values are converted into more descriptive color systems, such as CIE Lab.

The CIE L*a*b* system (DIN 5033, DIN 6174) is a three-dimensional color system adapted to subjective color perception.

The L* axis gives the lightness of a color, the a* axis the red-green and the b* axis the yellow-blue share.

.



Programs supported:
The DR 6000 supports color measurement with the following programs:

Program number	Color scale	Cell	Measurement range
2301	CIE L*a*b*	10 mm	
2302	Hazen	10 mm	0-1000 H
2308	Hazen	50 mm	0-1000 H
2303	Iodine	10 mm	0-7 I
2304	Gardner	10 mm	0-4 G
2309	Gardner	10 mm	4-8 G
2310	Gardner	10 mm	8-12 G
2305	Yellowness	10 mm	0-500 Yi
2306	EBC (Z)	10 mm	0-60 EBC (I)

Areas of application
Optically clear, faintly colored liquids

Literature
[1]: Hach Lange Application Report No. 3.9.e
[2]: DIN 5033: (1976)

Procedure

Sample preparation
If necessary, filter the sample using a filter with a pore width of 0.45 µm.

Evaluation
1. Program ▸ Select saved programs
2. Select test number (see above).
3. Insert a blank value cell (visually clear water) and press **zero**.
4. Insert the sample cell and press **Measure**.

Material:
- 10-mm square cell (glass or plastic)
- 50-mm square cell (glass or plastic) for program 2308 (Hazen 50 mm)