

# Applications

## Note

*Insight on Color*

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## RxRyRz Reflection Factors

### Background

The Reflection Density Color Scale, Rx, Ry, Rz, is a variation of the CIE XYZ scale, where Rx is corrected to represent only the amber peak of the tristimulus X bi-modal response. This scale was originally developed for measurement of pulp and paper using tristimulus colorimeters.

Ry is also often used by itself as Ry luminous reflectance factor, expressed as a % ratio, and primarily used for white or neutral colors as an overall indicator of reflectance. Ry is equivalent to Y Brightness.

### Conditions for Measurement

**Instrumental:** Any HunterLab spectrophotometer operating with EasyMatch OL or EasyMatch QC software

**Illuminant:** Any

**Standard Observer Function:** 2 or 10 degree

**Transmittance and/or Reflectance:** Either.

### Formulas

$$R_x = (100 * X / X_{wp}) - 0.202 * R_z$$

$$R_y = Y$$

$$R_z = 100 * Z / Z_{wp}$$

where

$X_{wp}$  = X of white point for selected illuminant/observer combination

$Z_{wp}$  = Z of white point for selected illuminant/observer combination.

$$dR_x = R_{xSMP} - R_{xSTD}$$

$$dR_y = R_{ySMP} - R_{ySTD}$$

$$dR_z = R_{zSMP} - R_{zSTD}$$

### Typical Applications

This color scale may be used for measurement of the color of any object whose color can be measured, but is typically used for the measurement of pulp and paper.

Some industrial test methods that reference  $R_xR_yR_z$  reflectance factors or densities are as follows:

- DIN 53145-1, “Testing of paper and board - Basic parameters for determination of reflectance factor - Part 1: Measurements made on non-fluorescent specimens”
- DIN 53145-2, “Testing of paper and board - Basic parameters for determination of reflectance factor - Part 2: Measurements made on fluorescent specimens”
- DIN 53163, “Testing of pigments and extenders; determination of lightness of extenders and white pigments in powder form”
- ISO 3858, “Rubber compounding ingredients -- Carbon black -- Determination of light transmittance of toluene extract”
- ISO 12625-7, “Tissue paper and tissue products -- Part 7: Determination of optical properties”
- SCAN-G 5, “Pulp, papers, and boards - Basic equations for optical properties”
- TAPPI T524, “Color of Paper and Paperboard (45/0, C/2)”
- TAPPI T527, “Color of Paper and Paperboard (d/0, C/2).”

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