SKZ102B Brightness Color meter

Brightness Meter is widely applied in paper and cardboard, pulp, cotton and fabric, plastic, ceramic and porcelain enamel, amylum, construction material, chemical industry, salt making and other testing department that need to test whiteness, yellowness, color and chromatism, as well as transparency, opacity, light scattering coefficient and light absorption coefficient of paper.

Function:

1. Test the color and color difference of reflective objects.
2. Test ISO brightness (Blu-ray brightness R457), as well as the degree of fluorescent whitening of fluorescent whitening materials.
3. Test CIE whiteness (W10 Gantz brightness and color cast value TW10).
4. Test Whiteness of ceramic
5. Test Non-metallic mineral products and construction materials whiteness.
6. Test Measurement System Lab Hunt and Hunt (L*a*b) whiteness.
7. Test yellowness YI
8. Test non-transparency, transparency, light scattering coefficient and light absorption.
9. Test ink absorption value.

Standards:

ISO2470: paper and board Blu-ray diffuse reflectance factor method (ISO brightness);
ISO2471: paper and cardboard is not transparent method;

Characters:

Reference can be practicality or data; The meter can maximum store ten references' information; Menstruate many times and give series of arithmetic measuring result; Digital display and the result can be printed out; The testing data will be stored while powering off for a long time.

Technical data:

1. Simulate D65 illumination lighting. Adopt CIE1964 supplement color system and CIE1976 (L * a * b *) color space color difference formula.
2. Adopt d / o observation geometry lighting conditions. Diffusion ball diameter of 150 mm, 25 mm diameter of test hole, with light absorbers to eliminate the sample mirror reflected light.
3. Indication accuracy: chromaticity coordinates 0.0001, and the remaining 0.01
4. Stability of the value: After warm-up, 30min period, Δf ≤ 0.1.
5. Repetitive: RX, RY and RZ S ≤ 0.10
   Chromaticity coordinates S ≤ 0.0010
   R457 value S ≤ 0.10
6. Sample size: test plane no less than Φ30 mm, thickness no more than 40 mm.
7. Power: AC 220V 10%, 50HZ, 0.4A.
8. Communication Interface: RS-232.
9. Working situation: Temperature 5 ~35 ℃, relative humidity no more than 85%.
10. Size and weight: 364 × 264 × 400 (mm), 20kg.

Symbols and formula of measurement terms

1.1 Color（Colour）

The diffuse reflection factors of red, green and blue colors: R_x、 R_y and R_z

Stimulus values: X_{10}、Y_{10}、Z_{10}

$$\begin{cases} X_{10} = 0.76843R_x + 0.17985R_z \\ Y_{10} = R_y \\ Z_{10} = 1.07381R_z \end{cases}$$

Chromaticity coordinates: x_{10}、y_{10}、z_{10}

$$\begin{cases} x_{10} = \dfrac{X_{10}}{X_{10} + Y_{10} + Z_{10}} \\ y_{10} = \dfrac{Y_{10}}{X_{10} + Y_{10} + Z_{10}} \\ z_{10} = 1 - x_{10} - y_{10} \end{cases}$$

Brightness index: L^*

Chroma index: a^*、b^*

Chromaticity: C^*_{ab}, $C^*_{ab} = \sqrt{a^{*2} + b^{*2}}$

Hue angle: h^*_{ab}, $h^*_{ab} = \tan^{-1}\dfrac{b^*}{a^*}$

Hunter Lab color space brightness: L

Hunter Lab color space chroma: a 、 b

$$\begin{cases} L = 10\sqrt{Y_{10}} \\ a = 17.2\dfrac{1.0547\,X_{10} - Y_{10}}{\sqrt{Y_{10}}} \\ b = 6.7\dfrac{Y_{10} - 0.9318Z_{10}}{\sqrt{Y_{10}}} \end{cases}$$

Dominant wavelength: λ_d (Unit: nm), negative value is complementary color wavelength

Excitation purity: Pe

Yellowness: YI

$$YI = 100(R_x - R_z) / R_y$$

1.2 Chromatic aberration

Brightness aberration: ΔL^*

Chromaticity aberration: $\Delta C_{ab}{}^*$

Hue aberration: $\Delta H_{ab}{}^*$

Total chromatic aberration: $\Delta E_{ab}{}^*$

$$\Delta E_{ab}{}^* = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$$

$$= \sqrt{(\Delta L^*)^2 + (\Delta C_{ab}{}^*)^2 + (\Delta H_{ab}{}^*)^2}$$

1.3 Blue whiteness (ISO whiteness): R_{457}

Fluorescent whitening degree: F

1.4 Ganz whiteness

CIE whiteness: W_{10}

$$W_{10} = Y_{10} + 800(0.3138 - x_{10}) + 1700(0.3310 - y_{10})$$

Color cast: T_{W10}

$$T_{W10} = 900(0.3138 - x_{10}) - 650(0.3310 - y_{10})$$

Applied to the conditions as follows:

$$40 < W_{10} < (5Y_{10} - 280)$$
$$-3 < T_{W10} < 3$$

Color cast value T_{W10} negative value indicates red cast and positive value indicates blue and green cast.

1.5 Ceramic whiteness W_T

The whiteness calculated by the whiteness formula of green cast and yellow cast for daily ceramics according to GB/T 1503-92 is as follows:

$$W_T = Y_{10} - 250(x_{10} - x_n) + 3(y_{10} - y_n)$$

(Green white when $135^o < h_{ab}^* < 315^o$)

$$W_T = Y_{10} + 818(x_{10} - x_n) - 1365(y_{10} - y_n)$$

(Yellow white when $h_{ab}^* \le 135^o$ or $h_{ab}^* \ge 315^o$)

In the formulas: $x_n = 0.3138$; $y_n = 0.3310$

1.6 W_J The whiteness of building materials and non-metal minerals

$$W_J = Y_{10} + 400x_{10} - 1000y_{10} + 205.5$$

1.7 Hunter whiteness W_H

$$W_H = 100 - \sqrt{(100 - L)^2 + a^2 + b^2}$$

1.8 Opacity: OP

$$OP = 100\frac{R_0}{R_\infty}$$

In the formulas: R_0 ——black back is lined with a piece of test paper, the diffuse reflection factor R_Y measured value

R_∞ ——R_Y measured value of multi-layer test sample (opaque)

1.9 T Transparency: T

$$T = 100\frac{R_{84} - R_0}{R_{84}}$$

In the formulas: R_{84}——adopt R_y=84 white board as back lining, measured value of one-layer test sample

1.10 Light scattering coefficient S, light absorption coefficient A

$$S = \frac{1000R_\infty}{g(1-R_\infty^2)} \bullet Ln\frac{R_\infty(1-R_0R_\infty)}{R_\infty - R_0}\ ,\ (m^2/kg)$$

$$A = \frac{500(1-R_\infty)^2}{g(1-R_\infty^2)} \bullet Ln\frac{R_\infty(1-R_0R_\infty)}{R_\infty - R_0}\ ,\ (m^2/kg)$$

In the formulas: g——test sample quantification（g/m^2）

1.11 Paint ink absorption value: I

$$I = 100\frac{(R - R')}{R} + c$$

In the formulas: R——test sample measured value before applying paint ink

R′——test sample measured value after applying paint ink（original test sample back lining）

c——paint ink coefficient

1.12 User-defined whiteness: W_z

$$W_z = Y_{10} + a(0.3138 - x_{10}) + b(0.3310 - y_{10})$$

In the formulas: a and b can be set by the user and can either positive or negative