Luminance Colorimeter

BM-5AC

BM-5A series for next-generation!
High accurate chromaticity like spectroradiometer was developed!
**Connecting to Oscilloscope through analog output**, The BM-5AC can measure build up time and fall down time of flicker light.

**Example**) Rise and fall response characteristics, frequency, etc. of a flashing light source.

<table>
<thead>
<tr>
<th>Range</th>
<th>NORMAL</th>
<th>FAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range 1</td>
<td>30ms</td>
<td>5ms</td>
</tr>
<tr>
<td>Range 2</td>
<td>30ms</td>
<td>0.5ms</td>
</tr>
<tr>
<td>Range 3</td>
<td>30ms</td>
<td>0.05ms</td>
</tr>
<tr>
<td>Range 4</td>
<td>30ms</td>
<td>0.05ms</td>
</tr>
<tr>
<td>Range 5</td>
<td>30ms</td>
<td>0.05ms</td>
</tr>
</tbody>
</table>

*The response speed in the table above is the time that it takes analog output from the instrument to reach 90% of the peak value, when measuring an LED driven by a square wave from a function generator.

**Feature**

**POINT.1 Improvement of chromaticity accuracy.**

Chromaticity accuracy is improved by realizing spectral sensitivity characteristic same as CIE 1931 color matching function that is regarded as human eye’s sensitivity.

- Chromaticity1: 
  \[ \text{dx} = \pm 0.005^*1 \]
- Chromaticity2: 
  \[ \text{dy} = \pm 0.005^*2 \]
- Chromaticity3: 
  \[ \text{dx} = \pm 0.005^*3 \]

*1: Auto range, For standard illuminant A

**POINT.2 High speed measuring for ultra low luminance.**

It can measure the luminance as ultra low as 0.005 cd/m² at about 2 second. Note: For measurement angle of 3 degree.

**POINT.3 Wide measurement area**

Selectable 5 measurement angle 0.1° / 0.2° / 1° / 2° / 3° enable you to measure the luminance from small to wide area without attachment lens.

**POINT.4 Analog output**

The BM-SAC can connect to the recorder and the oscilloscope through analog output X, Y, Z (selectable).

**POINT.5 USB Interface**

The BM-SAC is equipped with USB and RS-232C interface.

**Usage**

For measurement of luminance, chromaticity and color temperature, for example; optical characteristic test, interior panel for automobile, Speed meter for automobile, Fluorescent substance.

*FPD, Mobile phone, Car navigation, Automotive Switch, Speed meter, Fluorescent substance*

**Block diagram**

- Measured object
- Cover glass
- Objective lens
- Fixed aperture
- Relay lens
- Relicte
- Eyepiece lens
- Finder shutter
- Aperture mirror
- Relay lens
- Mirror
- A/D
- Interface
- Microcomputer
- LCD
- Operating switches
- Analog output connector
- Stop motor
- Step motor
- Filter position sensor
- Measurement angle sensor
Standard accessories software supports control of instrument and data collection

BM-5AC colorimetry software CS-900A (standard accessory)

<table>
<thead>
<tr>
<th>Color space mode:</th>
<th>L, xy, XYZ, u'v', L<em>a</em>b*, Correlated color temperature, Deviation, Dominant wavelength, Chromaticity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode selection:</td>
<td>AUTO EACH: The measuring device determines optimum measuring range for each filter automatically.</td>
</tr>
<tr>
<td></td>
<td>AUTO ALL: The measuring device determines maximum measuring range automatically based on highest value among X, Y, Z.</td>
</tr>
<tr>
<td></td>
<td>MANUAL ALL: Use this mode to set common measurement range for among X, Y, Z manually.</td>
</tr>
<tr>
<td></td>
<td>MANUAL EACH: Use this mode to set individual measurement range to each X, Y, Z filter manually.</td>
</tr>
</tbody>
</table>

Select the measurement mode:

- Color Range Setting
- The software determines whether or not the measured color data fall within the specified range in the color diagram.

System required (recommended)
- **OS**: Windows® XP Professional Service Pack2 or more (32bit)
- **CPU**: Pentium IV 2.8GHz or more
- **HDD**: 1GB or more
- **Memory**: 1GB or more
- **Ports**: USB2.0 (One port) / RS-232C serial port (One port)

*The RS-232C cable (straight cable for DOS/V PC) must be purchased separately.

- **xy chromaticity graph**
- **u'v' chromaticity graph**
- **u*v* chromaticity graph**
- **a*b* chromaticity graph**
- **Colorimetry data**
- **Measurement conditions / note**

**System diagram**

- **White board**: WS-3
- **Mach filter**: MF-10, MF-100
- **Attachment lens**: AL-6, AL-11, AL-12
- **Fiber probe**: FP-3
- **Fine Adjustment tripod stand**: S-4
- **Tripod**: SN
- **Oscilloscope**: (*)
- **Recorder**: (*)
- **Personal computer**: (*)
- **Colorimetry software CS-900A**: Commercial model (*)

**Name of the parts**

- **Measurement angle selectable switch**: (3° / 2° / 1° / 0.2° / 0.1°)
- **Objective lens**: Focusing ring
- **Panel switch**: NORMAL / FINE switch... Setting measurement range (Rotation switch: Select parameter)
- **-SINGLE / AVE switch... Setting average measurement (CHANGE switch: Change memory) **
- **-RUN / HOLD switch... Stop measurement (ENTER switch: Change display mode, memory change item)
- **-CALIBRATION switch... Start calibration (SHIFT switch: Shift the figure in display)
- **-AAP switch... ON / OFF of Back light of display
- **-MODE switch... Change color diagram mode (FUNCTION switch: Enter function mode / return)

* The switches in parentheses are enabled while in function mode.

**External dimension**

- **Finder**: Chain handle
- **Objective lens**: 1/4-20 UNC depth 6
- **Analog output**: (X2, Y, Z channel selectable)
- **DC input connector**: M49 x 0.75 depth 5
- **Power switch**: 4 M4 (for tooling)
- **Interface connector**: (USB2.0 / RS-232C)
- **Display**: Panel switch

Units: mm
**Specification**

- **Optical system**: Objective lens: f+40mm, f/2.5 | Eyepiece lens: Fixed field 3°, Diameter adjustment range ±5 diopter
- **Spectral sensitivity**: Similar to CIE1931 color matching function
- **Photo detector**: Photomultiplier tube
- **Measurement angular range**: 1° to 4° | (Select: 3°/2°/1°/0.2°/0.1°)
- **Measurement distance**: 350mm to ∞

<table>
<thead>
<tr>
<th>Measurement distance (mm)</th>
<th>350</th>
<th>500</th>
<th>1,000</th>
<th>5,000</th>
<th>10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>3°</td>
<td>15</td>
<td>23.1</td>
<td>49.2</td>
<td>255</td>
<td>510</td>
</tr>
<tr>
<td>2°</td>
<td>10</td>
<td>15.4</td>
<td>32.8</td>
<td>169</td>
<td>341</td>
</tr>
<tr>
<td>1°</td>
<td>5.0</td>
<td>7.7</td>
<td>16.4</td>
<td>85</td>
<td>170</td>
</tr>
<tr>
<td>0.2°</td>
<td>1.0</td>
<td>1.5</td>
<td>3.3</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>0.1°</td>
<td>0.5</td>
<td>0.8</td>
<td>1.6</td>
<td>8</td>
<td>17</td>
</tr>
</tbody>
</table>

- **Measurement range**: 0.00005 to 1,200,000 cd/m²

<table>
<thead>
<tr>
<th>Measurement area</th>
<th>Luminance (cd/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3°</td>
<td>0.005 to 1,500 cd/m²</td>
</tr>
<tr>
<td>2°</td>
<td>0.01 to 3,000 cd/m²</td>
</tr>
<tr>
<td>1°</td>
<td>0.04 to 12,000 cd/m²</td>
</tr>
<tr>
<td>0.2°</td>
<td>1 to 30,000 cd/m²</td>
</tr>
<tr>
<td>0.1°</td>
<td>4 to 120,000 cd/m²</td>
</tr>
</tbody>
</table>

- **Accuracy**
  - Luminance: ±4% (for standard source A)
  - Chromaticity1: dx, dy: Within ±0.005 (Auto range, for standard source A)
  - Chromaticity2: dx, dy: Within ±0.008 (D55, 43 °F, 7% RA, US Type A, B, D, E, F, G, S4)
  - Chromaticity3: dx, dy: Within ±0.005 (Our specification LED panel of RGBW)

- **Repeatability**
  - Luminance: ±2% or less
  - Chromaticity1: dx, dy: Within ±0.005 (Auto range, for standard source A)
  - Chromaticity2: dx, dy: Within ±0.008 (D55, 43 °F, 7% RA, US Type A, B, D, E, F, G, S4)
  - Chromaticity3: dx, dy: Within ±0.005 (Our specification LED panel of RGBW)

- **Measurement range**: Auto / Manual 5 steps selectable

- **Function**: Luminance, Chromaticity, Chromaticity coordinates, CIE1976 chromaticity coordinates, Tristimulus value XYZ, Correlated color temperature and Deviation, CIE1976 L*a*b*, Eab*±Δ, CIE1976 L*u*v*, Euv*±Δ

- **Output**: Analog output (X1, Y1, Z1, DC: 0 to 4V (One channel changeover type)), Digital output (Interface: USB / RS-232C)

- **Measurement time**: About 2 seconds (Single measurement mode)

- **Display**: Digit matrix 20 characters x 4 lines with backlight

- **Interface**: USB / RS-232C

- **Power supply**: Dedicated AC adapter

- **Power consumption**: Approximately 20 VA when using an AC adapter

- **Operating condition**: Temperature: 0 to 40°C, Humidity: 85% R.H. or less (no condensation)

- **Storage condition**: Temperature: -20 to 60°C, Humidity: 85% R.H. or less (no condensation)

- **External dimensions**: Approx 355mm x 154mm x 212mm (LxWxD)

- **Weight**: Approx 3.6kg (main unit only)

---

**Extra-cost option**

- **Attachment lens AL-6 / AL-11 / AL-12**

  Placing the attachment lens on the instrument's objective lens, the focal distance shorten and reduce the minimum measurement area.

<table>
<thead>
<tr>
<th>Specifications for Measuring Small Objects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AL-6</strong></td>
</tr>
<tr>
<td>3°</td>
</tr>
<tr>
<td>2°</td>
</tr>
<tr>
<td>1°</td>
</tr>
<tr>
<td>0.2°</td>
</tr>
<tr>
<td>0.1°</td>
</tr>
</tbody>
</table>

---

**SAFETY PRECAUTIONS**

Make sure to carefully read the “Manual” to ensure that you use the product properly and safely.

- Always connect the instrument to the specified power supply voltage. Improper connection may cause a fire or electric shock.

**White standard board WS-3**

Uses when measuring object color and direction high directivity light.

- Luminance factor: 99% or less (Incidence 0°, Observation 45°)
- Material: Barium sulfide (BaSO4)
- Dimension: ø78mm, h=12.5mm
- Effective white surface: ø40mm (Central portion)

**Fiber probe FP-3**

- Light guide
- Effective measuring angle 2°
- Measurement diameter: ø3 to 10mm
- Measurement distance: 31.0 to 84.9mm
- Fiber length about 1m

**ITV adapter IA-2**

Adapter for connecting CCD camera (c. mount, 1/2 inch) to the instrument.

**Mesh Filter MF-10 / MF-100**

Uses when measuring the light which is over range measurement of the instrument.

**Tripod SN**

The tripod SN make collimation easy.

- Max height: 1835mm
- Min height: 165mm
- Length when stored: 810mm
- Leg stages: 3steps
- Weight: 4.7kg with tripod head

**Fine adjustment tripod head S-4**

The S-4 makes up / down / left / right collimation easy.

- Elevation angle: 40°
- Depression angle: 80°
- Rotation: 360°
- Weight: 1.74kg

**Chromaticity Diagram : Illuminant A + Color Glass Filter**

---

**TOPCON TECHNOHOUSE CORPORATION**

7-1 Hasunuma-cho, Itabashi-ku, Tokyo 174-8580 JAPAN
Phone: +81-3-3558-2666 Fax: +81-3-3558-4661
E-mail: techno-info@topcon.co.jp

Printed in Japan 2016 09 E1