High-End Spectroradiometer with High Accuracy and High Stability
The CS-2000 and CS-2000A accurately measure luminance and chromaticity thanks to an optical design and signal processing found only at Konica Minolta. This includes thoroughly eliminating mechanical and electrical noise factors in the design to enable high repeatability and rapid-interval measurements from super-faint luminances as low as 0.0005 cd/m². Moreover, both models ensure half-bandwidths of 5 nm or less, which is recommended for accurate color measurement (JIS Z 8724-1997, CIE122-1996), across the whole wavelength spectrum.

### Capable of highly accurate and stable measurements!

- **Highly visible color LCD and easy-to-use operating panel**
- **USB support**
- **New RS-232C support**
- **Wireless communication support**

#### Repeatability

Repeatability 0.15%

### Accuracy (Chromaticity)

- **0.05 cd/m²**
- **Minimal polarization error**

### Measurements of various objects are possible by selecting the best-suited measuring angle.

<table>
<thead>
<tr>
<th>Measuring angle</th>
<th>1°</th>
<th>0.2°</th>
<th>0.1°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring distance (Units: mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When a close-up lens is attached</td>
<td>Ø1.00</td>
<td>Ø0.20</td>
<td>Ø0.10</td>
</tr>
<tr>
<td>55.0</td>
<td>Ø1.39</td>
<td>Ø0.28</td>
<td>Ø0.14</td>
</tr>
<tr>
<td>70.9</td>
<td>Ø1.00</td>
<td>Ø0.20</td>
<td>Ø0.10</td>
</tr>
<tr>
<td>350</td>
<td>Ø0.76</td>
<td>Ø0.56</td>
<td>Ø0.28</td>
</tr>
<tr>
<td>500</td>
<td>Ø0.65</td>
<td>Ø0.33</td>
<td>Ø0.17</td>
</tr>
<tr>
<td>1,000</td>
<td>Ø2.00</td>
<td>Ø0.64</td>
<td>Ø0.42</td>
</tr>
</tbody>
</table>

- **1°** is suitable for:
  - Typical targets such as middle- and large-size display units
  - LCD, PDP, or EL display panels
  - LCD panels of cellular phones and digital cameras
  - Radar and other instrument panels used in airplane cockpits
  - Large outdoor display screens
- **0.2°** is suitable for:
  - Small light sources such as LEDs
  - Car audio systems
  - Instrument panels for automobiles
  - Lamps, fluorescent tube backlights, and other light sources
- **0.1°** is suitable for:
  - Extremely small light sources or distant lights
  - POP or LCD pixels
  - Cold-cathode tubes
  - Brake lamps of automobiles
  - Traffic signals

#### Minimal polarization error

Polarization errors that occur when using a reflective diffraction grating are reduced to a manageable 2% (at a 1° measuring angle), thus enabling stable measurements of display devices that utilize polarized light such as LCDs.

#### User-selectable measuring angle (1°, 0.2°, 0.1°)

- **Close-up lens for measurement of even tinier areas**
  - (Optional accessory)
  - A CCD camera can be mounted on the viewfinder via the CS-A36 adapter (Optional accessory).

#### Close-up lens

- **PWM light sources**

#### Wide luminance measurement range (CS-2000A)

Luminance can be measured between 0.0005 cd/m² and 50,000 cd/m².

- *The measuring distance is the distance from the objective lens or the end of the metal frame of the close-up lens.

#### Camera mounting

A CCD camera can be mounted on the viewfinder via the CS-A36 adapter (Optional accessory).

#### Measuring distance vs. measuring area

<table>
<thead>
<tr>
<th>Measuring distance (Units: mm)</th>
<th>Ø5.00</th>
<th>Ø2.00</th>
<th>Ø1.00</th>
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<td>1,000</td>
<td>Ø2.00</td>
<td>Ø0.64</td>
<td>Ø0.42</td>
</tr>
</tbody>
</table>

#### Repeatable measurement ensured

1. **Internally synchronized measurement**
   - Flashing frequency can be freely set by numerical input.
2. **Externally synchronized measurement**
   - Vertical synchronization signals can be input to the instrument over a cable connection.
3. **Prolonged exposure measurement**
   - For high luminance measurements, variations in luminance during unsynchronized readings can be reduced by using the multi-integration mode to prolong exposure without saturating the sensor.

#### Stable measurement ensured

- **Lightning measurement**
  - Internal synchronized measurement
  - Flashing the measuring frequency can be freely set by numerical input.
  - Externally synchronized measurement
  - Vertical synchronization signals can be input to the instrument via a cable connection.
  - Prolonged exposure measurement
  - For high luminance measurements, variations in luminance during unsynchronized readings can be reduced by using the multi-integration mode to prolong exposure without saturating the sensor.

#### Measurements of super-low luminances

- **CS-2000 and CS-2000A**
  - Luminance can be measured between 0.0005 cd/m² and 50,000 cd/m².
  - *The measuring distance is the distance from the objective lens or the end of the metal frame of the close-up lens.*
Using as a reference instrument

CS-2000/CS-2000A can be used as a reference instrument for Konica Minolta’s other light-measuring instruments in various industrial fields.

Illuminance spectroradiometer CS-2000A-I (customized product)

The CS-2000A-I is an accurate illuminance spectroradiometer ideal for evaluating projectors and LED or EL lighting. The illuminance adapter can also be removed to use the instrument as a spectroradiometer.

User-friendly standard software

Data Management Software CS-S10w Professional (Standard accessory)

With this software, the CS-2000 and CS-2000A can be controlled from a personal computer to display measured data in various graphs or lists, to transfer data to spreadsheet software, or to copy and paste data. CS-S10w offers various data management, analysis and evaluation options to assist in research and development or quality control.

Scotopic vision measurement

It is known that the sensitivity of human vision shifts to blue region in dark environments, but past instruments did not have a scotopic measurement function. CS-2000A achieves sufficient capability to make it possible with CS-S10w Professional (standard accessory).

Scotopic vision

In the human eye, there are 2 types of photoreceptor cells, which are cone cells and rod cells. Cone cells are sensitive to color and rod cells are sensitive to only brightness. As brightness decreases, the activity of rod cells becomes stronger, and the condition in which only rods cells are working is called scotopic vision. The peak of spectral luminous efficiency of scotopic vision is shifted toward blue from the green peak of photopic vision (vision under brighter conditions) and thus blue objects are perceived to be brighter.
### Main specifications of CS-2000/2000A

<table>
<thead>
<tr>
<th>Model</th>
<th>CS-2000/2000A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength range</td>
<td>380 to 780 nm</td>
</tr>
<tr>
<td>Wavelength resolution</td>
<td>0.9 nm/pixel</td>
</tr>
<tr>
<td>Display wavelength bandwidth</td>
<td>±0.3 mm (Median wavelength: 435.8 nm, 546.1 nm, 643.8 nm; Hg-Cd lamp)</td>
</tr>
<tr>
<td>Wavelength precision</td>
<td>±0.6 nm at 400 nm, ±0.1 nm at 650 nm</td>
</tr>
<tr>
<td>Spectral bandwidth</td>
<td>5 nm or less (half bandwidth)</td>
</tr>
<tr>
<td>Measuring angle (selectable)</td>
<td>1°, 2°, 0.1°</td>
</tr>
<tr>
<td>Measurement luminance range</td>
<td>0.0005 to 5,000 cd/m², 0.0125 to 125,000 cd/m², 0.05 to 500,000 cd/m²</td>
</tr>
<tr>
<td>Minimum measuring area</td>
<td>ø5 mm (ø0.2 mm when using close-up lens)</td>
</tr>
<tr>
<td>Minimum measuring distance</td>
<td>350 mm (55 mm when using close-up lens)</td>
</tr>
<tr>
<td>Minimum spectral radiance display</td>
<td>1.0x10⁻⁷ W/sr·m²·nm</td>
</tr>
<tr>
<td>Accuracy: Luminance (Standard light source A)</td>
<td>±2%</td>
</tr>
<tr>
<td>Repeatability: Luminance (2σ) (Standard light source A)</td>
<td>±0.0005 (0.05 to 1.25 cd/m²)</td>
</tr>
<tr>
<td>Repeatability: Chromaticity (2σ) (Standard light source A)</td>
<td>±0.001 (0.1 to 5 cd/m²)</td>
</tr>
<tr>
<td>Polarization error</td>
<td>1°: 2% or less (400 to 780 nm); 0.2°: 3% or less (400 to 780 nm)</td>
</tr>
<tr>
<td>Interface</td>
<td>USB 1.1, RS-232C</td>
</tr>
<tr>
<td>Color space</td>
<td>Luv, Luv', LvT, Scotopic luminosity (with CS-S10w Professional)</td>
</tr>
<tr>
<td>Integration time</td>
<td>Fast: 0.005 to 16 sec.; Normal: 0.005 to 120 sec.</td>
</tr>
<tr>
<td>Measurement time</td>
<td>0.005 to 16 sec.; Normal: 0.005 to 120 sec.</td>
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<td>Polarization error</td>
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</tr>
<tr>
<td>Storage temperature/humidity range</td>
<td>0 to 35°C, relative humidity 80% or less with no condensation</td>
</tr>
<tr>
<td>Power</td>
<td>Dedicated AC Adapter (100 - 240 V, 50/60 Hz)</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Approx. 20 W</td>
</tr>
<tr>
<td>Size (W x H x D)</td>
<td>158 x 262 x 392 mm (Main unit), ø70 x 95 mm (Lens)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 6.2 kg</td>
</tr>
</tbody>
</table>

### SAFETY PRECAUTIONS

- For correct use and for your safety, be sure to read the instruction manual before using the instrument.
- Always connect the instrument to the specified power supply voltage. Improper connection may cause a fire or electric shock.

**KONICA MINOLTA, INC.**

Osaka, Japan
New York, U.S.A.
European Headquarters/BELENEX
German Office
French Office
UK Office
Italian Office
Swiss Office
Nordic Office
Polish Office
Turkish Office
US Sales Division
Beijing Office
Guangzhou Office
Chengdu Office
Gongqing Office
Wuhan Office

Phone: 81-6-6753-2666 (in Japan), 201-3263-4200 (outside Japan)
Fax: 81-6-6753-1566

Konica Minolta Sensing Europe B.V.

München, Germany
Relaxy CDG, France
Warrington, United Kingdom
Grivitze Bâle, Italy
Dietikon, Switzerland
Västra Frölunda, Sweden
Wiesbaden, Poland
Istanbul, Turkey
Shanghai, China
Beijing, China
Guangdong, China
Chongqing, China
Shandong, China
Hubei, China

Phone: +49 (0) 89 4957 156 0
Fax: +49 (0) 89 4957 156 99

Konica Minolta Sensing America, Inc.

New Jersey, N.J.
European Headquarters/BELENEX
German Office
French Office
UK Office
Italian Office
Swiss Office
Nordic Office
Polish Office
Turkish Office
US Sales Division

Phone: +1 (90) 30 24 81 11
Fax: +1 (90) 30 24 81 99

Konica Minolta Sensing Singapore Pte. Ltd.

Singapore

Phone: +65-6566-5533
Fax: +65-6560-9721

Konica Minolta Sensing Korea Co., Ltd.

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Addresses and telephone/fax numbers are subject to change without notice. For the latest contact information, please refer to the KONICA MINOLTA Worldwide Offices web page.