Ideal for display mura (nonuniformity) evaluation and inspection on smartphones and tablet PCs.

Accurately and easily measures the distribution of luminance and chromaticity.

Advanced Mura Evaluation Software (optional accessory) also available.
2D Color Analyzer CA-2500

**XYZ filters provide high correlation with the spectral response of the human eye.**

Instead of the RGB color-separation filters used by digital video cameras, etc., the CA-2500 uses XYZ filters that closely match the CIE 1931 color-matching functions to provide luminance and chromaticity measurements that have high correlation with the spectral response of the human eye.

![XYZ Filters](image)

**Comprehensive factory calibration**

Each lens is individually factory-calibrated at multiple focal points to correct for sensitivity variations due to the combination of sensor, optical filters, and the lens itself. By using the included calibration data, high-accuracy measurements of luminance and chromaticity distribution can be taken immediately after receiving the product without being restricted to a particular measurement method, subject size or subject brightness.

**Even flickering light sources such as OLED televisions or PDP can be measured with good accuracy.**

The synchronization frequency (4 to 2,000 Hz) of display devices and pulsed light sources can be input to enable synchronized measurements.

**Expanded low-luminance measurement range**

The minimum measurable luminance has been improved from 0.1 cd/m² to 0.05 cd/m².

**Improved durability**

Service life measurement cycles have been increased to approximately 5 times that of the CA-2000.

**Interchangeable lenses for measurements of various subjects**

Standard, wide-angle, and telephoto lenses (plus two macro rings for the telephoto lens) are available, enabling the optimum lens to be selected according to the particular subject, measurement area, or measurement method.
The small, lightweight body lets the CA-2500 be used in a wide variety of fields, such as display, illumination, automotive, aviation, and other industries.

**Includes advanced Data Management Software CA-S25w as standard accessory**

Advanced functions such as focus assist, positioning assist, and automatic measurement area extraction greatly simplify troublesome measurement preparations and data evaluation.

**Includes SDK (software development kit)**

The SDK can be used by customers to efficiently create their own software for controlling the CA-2500. SDK for Labview® also available.

**Optional Mura Evaluation Software**

This optional software uses an exclusive algorithm to enable mura (unevenness) evaluation that more closely correlates with visual evaluation. (Details on later page.)

**Applications**

- Simultaneous luminance/chromaticity distribution measurement of multiple small- or medium-sized LCD or organic EL panels
- Luminance/chromaticity measurement of single large-sized LCD or organic EL panels
- Display mura (unevenness) evaluation
- Luminance distribution measurements in illumination field
- Measurements of luminance/correlated color temperature distribution of various light-emitting subjects
- Luminance distribution measurements of automobile instrument panel meters
- Measurement of distribution of luminance and chromaticity on screen image from projectors

**Dimensions (Unit: mm)**

*When standard lens and lens hood are attached*

- Reference position: 160
- Tripod socket: UNC 1/4, Depth: 6.5
- Positioning hole Depth: 4.5
- Rubber foot diameter: Ø15
- M5, Depth: Ø6.5
- Ø5 positioning hole Depth: Ø6
Data Management Software CA-S25w

The included software provides advanced functionality with simple operation to make the entire measurement process easier, from measurement preparations such as focusing and positioning through measurements of luminance and chromaticity distribution to evaluation of measurement results.

GUI assists with normal workflow

Easy-to-understand screens with easy-to-use tools
The new CA-S25w software can also be used with existing CA-2000 instruments. It provides vast improvements over the previous CA-S20w software, while also being able to read data measured and saved using CA-S20w. Visit our website to download the latest CA-S25w free of charge.

**Focus assist function**
Focus adjustment can be performed easily by viewing the cross-sectional slope of the luminance at the border between bright and dark areas.

**Positioning assist function**
The positioning and orientation (tilt and twist) of the CA-2500 relative to the measurement subject can be easily checked while making fine adjustments, reducing the work and time required to achieve proper positioning and orientation.

**Automatic measurement area extraction function**
The light-emitting areas of measurement subjects can be automatically extracted and set as evaluation regions. This eliminates the need for manually defining and positioning evaluation regions, reducing the setup time required.

**Multi-subject measurement capability**
Evaluation of the mura (unevenness) of multiple subjects can now be performed simultaneously. With the previous CA-S20w, the same tone gradation scale was used for all subjects; if subject luminances were very different, adjusting the scale to properly view one subject caused saturation of tones in evaluation areas for other subjects. But with CA-S25w, each evaluation area has its own tone gradation scale which can be individually adjusted according to the subject luminance. This allows the mura of multiple subjects with widely different luminances to be viewed simultaneously on the same screen.

**Positioning assist function**
The positioning and orientation (tilt and twist) of the CA-2500 relative to the measurement subject can be easily checked while making fine adjustments, reducing the work and time required to achieve proper positioning and orientation.

**Other convenient functions**

**Data transfer to Excel®, etc.**
The desired range of data or spot values can be selected and transferred to Excel®, Word®, etc. via the clipboard. The various graphs and displays can also be copied and pasted, making it easy to create reports.

**Multiple exposure function**
By combining measurement data obtained using exposure times optimized for different luminance levels, subjects requiring a wide dynamic range (such as a gray scale) can be easily measured.

**CSV file import**
Measurement data can be stored in CSV format. The stored CSV-format data can then be imported and displayed in pseudocolor graphs, etc.

**User color gamut calibration**
User calibration can be performed for each color gamut of the measurement subject, improving chromaticity measurement accuracy when measuring subjects that use multiple colors, such as automobile instrument panels that use LEDs of various colors.
Quantification of luminance and chromaticity mura (unevenness) of various types of displays using 3 original index values: Luminance evaluation value, Color evaluation value, and Generic mura evaluation value

In the past, it has been difficult to quantitatively define the degree of mura of displays. Mura Evaluation Software CA-Mura processes the measurement data from the 2D Color Analyzer CA-2500 to provide mura values that closely correlate with the degree of mura determined by visual evaluation. The closer these values are to zero, the less mura exhibited by the display.

**Mura Evaluation Software CA-Mura system requirements**

In addition to the system requirements for Data Management Software CA-S25w

<Compatible instruments>
CA-2000 or CA-2500 controlled by CA-S25w

<Display language>
English, Simplified Chinese, or Japanese (Selectable at time of installation)

**CA-Mura evaluation**

Shown below are the CA-Mura evaluation data for three kinds of displays with different degrees of mura measured using the 2D Color Analyzer CA-2500. *Sample display images are examples only.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Luminance Evaluation Value</th>
<th>Color Evaluation Value</th>
<th>Generic Mura Evaluation Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample A</td>
<td>13.0</td>
<td>8.8</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>Luminance distribution</td>
<td>Correlated color</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>temperature distribution</td>
<td></td>
</tr>
<tr>
<td>Sample B</td>
<td>9.9</td>
<td>6.0</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>Luminance distribution</td>
<td>Correlated color</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>temperature distribution</td>
<td></td>
</tr>
<tr>
<td>Sample C</td>
<td>0.4</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Luminance distribution</td>
<td>Correlated color</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>temperature distribution</td>
<td></td>
</tr>
</tbody>
</table>

**Algorithm**

CA-Mura determines the luminance distribution and chromaticity distribution from the XYZ data measured by the 2D Color Analyzer, and applies the spatial characteristics of human vision.

These data are then converted to the L*a*b* color space, and after edge and light/dark processing (for luminance mura) and high-chromaticity processing (for chromaticity mura), the Luminance evaluation value (LEV), Color evaluation value (CEV), and the Generic mura evaluation value (GMEV) based on LEV and CEV are calculated.

Determination of these values is performed using the mura quantitative evaluation method developed by Sony Corporation.
## System Diagram

### Components other than those shown in the areas shaded are common for all packages.

* Each lens comes with a lens cap, mount cap, and calibration data DVD.

### Measurable object size with typical measurement distances (Width/height of measurement square)

<table>
<thead>
<tr>
<th>Distance (mm)</th>
<th>Standard lens</th>
<th>Wide lens</th>
<th>Telephoto lens</th>
<th>Low magnification macro ring</th>
<th>High magnification macro ring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measurement size (mm)</td>
<td>Measurement display size (inches)</td>
<td>Measurement size (mm)</td>
<td>Measurement display size (inches)</td>
<td>Measurement size (mm)</td>
</tr>
<tr>
<td>250</td>
<td>98</td>
<td>4.4</td>
<td>190</td>
<td>8.8</td>
<td>9.3</td>
</tr>
<tr>
<td>300</td>
<td>121</td>
<td>5.5</td>
<td>235</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>500</td>
<td>212</td>
<td>9.6</td>
<td>416</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>1,000</td>
<td>439</td>
<td>16.9</td>
<td>869</td>
<td>28</td>
<td>39</td>
</tr>
<tr>
<td>2,000</td>
<td>892</td>
<td>22</td>
<td>1,776</td>
<td>55</td>
<td>80</td>
</tr>
<tr>
<td>3,000</td>
<td>1,345</td>
<td>22</td>
<td>2,682</td>
<td>121</td>
<td>133</td>
</tr>
<tr>
<td>5,000</td>
<td>2,252</td>
<td>111</td>
<td>4,496</td>
<td>203</td>
<td>221</td>
</tr>
</tbody>
</table>

### Data Management Software CA-S25w

**System Requirements**

- **OS**: Windows® 7 Professional 32-bit, 64-bit
- **CPU**: Pentium® 4 2.8 GHz equivalent or higher
- **Memory**: 1,024 MB or more
- **Hard Disk**: Needs free space of at least 80 MB on system drive (where OS is installed)
- **Display**: Display capable of at least 1,280 x 768 dots / 65,536 colors (High color, 16-bit)
- **Others**: Optical drive capable of reading CD-ROM (for installing software) and DVD-ROM (for installing calibration data) necessary.

**Controllable instruments**: CA-2000; CA-2500

**Display language**: English, Simplified Chinese, or Japanese (Selectable at time of installation)
## Main Specifications CA-2500

<table>
<thead>
<tr>
<th>Model</th>
<th>CA-2500S</th>
<th>CA-2500W</th>
<th>CA-2500T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptor</td>
<td>CCD image sensor (monochrome); 2/3-inch; Effective number of pixels: 1,000 x 1,000 pixels; Equipped with XYZ filter (closely matches CIE 1931 (CIE-Gamut function) and ND filter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lens</td>
<td>Interchangeable: Standard, wide, and telephoto lenses; low-magnification and high-magnification macro rings (for use with telephoto lens)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement points (Resolution)</td>
<td>980 x 980 (490 x 490 or 196 x 196 selectable by using Data Management Software CA-525w)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color indication modes</td>
<td>XYZ, Luv, Luv, T Au , Dominant wavelength, Excitation purity, L v contrast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display modes</td>
<td>Pseudocolor, Chromaticity diagram, Spot, Cross section, Color difference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement sizes (length per side of square) (*1)</td>
<td>Standard lens</td>
<td>Wide lens</td>
<td>Telescope lens</td>
</tr>
<tr>
<td>Approx. 98 mm or more (depending on the distance)</td>
<td>Approx. 145 mm or more (depending on the distance)</td>
<td>Approx. 115 mm or more (depending on the distance)</td>
<td></td>
</tr>
<tr>
<td>Measurable size for typical measurement distances (size/distance)</td>
<td>Approx. 115 mm or more (depending on the distance)</td>
<td>Approx. 57 mm / 500 mm (Approx. Fixed)</td>
<td>27 mm / 300 mm (Approx. Fixed)</td>
</tr>
<tr>
<td>Measurement range (including ND filter use)</td>
<td>0.05 - 100,000 cd/m²</td>
<td>0.05 - 100,000 cd/m²</td>
<td>0.25 - 100,000 cd/m²</td>
</tr>
<tr>
<td>Measurement time (*2)</td>
<td>Single: Approx. 5 sec. or more; 4-time integration: Approx. 6 sec. or more; 16-time integration: Approx. 10 sec. or more; 64-time integration: Approx. 30 sec. or more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature / humidity range (*8)</td>
<td>0-30°C, Relative humidity 70% or less/No condensation</td>
<td>30-35°C, Relative humidity 55% or less/No condensation</td>
<td></td>
</tr>
<tr>
<td>Power AC Adapter</td>
<td>100-240 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>3.5 kg approx. (when standard lens and lens hood are attached)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Cautions Regarding Temperature / Humidity Conditions for CA-2500

It is recommended that the instrument be used and stored under standard conditions (Temperature: 23°C; Relative humidity: 40%), and that areas subject to high temperature and/or humidity be avoided. In addition, in order to maintain the measurement accuracy of this instrument, it is recommended that it be inspected regularly about once a year. For details on having the instrument inspected, please contact the nearest Konica Minolta authorized service facility.

If the instrument is left under the following high-temperature conditions for a long period of time, the displayed values may change as follows:

- **Temperature**:
  - Temperature/humidity range: 10-30°C, Relative humidity 70% or less/No condensation
  - Temperature/humidity range: 30-35°C, Relative humidity 55% or less/No condensation

### CAUTIONS REGARDING TEMPERATURE / HUMIDITY CONDITONS FOR CA-2500

- Improper connection may cause a fire or electric shock.
- Be careful of the temperature and humidity conditions during the inspection of the instrument. Improper conditions may cause incorrect measurement results.
- Improper use of the instrument may cause electric shock or personal injury.
- Be careful when handling the instrument to ensure safe use.
- Be sure to use the instrument properly.

### 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.

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**KONICA MINOLTA, INC.**

Konica Minolta Sensing Americas, Inc.

Konica Minolta Sensing Europe B.V.

Addresses and telephone numbers are subject to change without notice. For the latest contact information, please refer to the KONICA MINOLTA World Wide Web site: [http://www.konicaminolta.com/instruments/network](http://www.konicaminolta.com/instruments/network)

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