KONICA MINOLTA

Illuminance Spectrophotometer
CL-500A

For evaluation of high-class next-generation lamps such as LED illumination and EL illumination
Now scotopic illuminance can also be measured.

Both instrument and included software have been upgraded to provide improved instrument operation and software display of MacAdam SDCM levels.

The first illuminance spectrophotometer that conforms to both DIN and JIS standards. Includes convenient, easy-to-use PC software.

The Standard in Measuring Color & Light

Giving Shape to Ideas
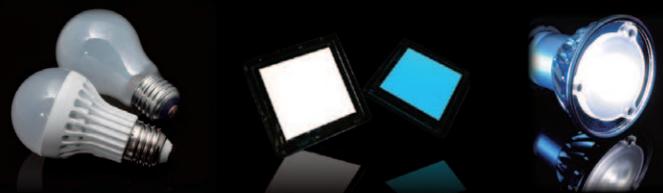
Use the CL-500A for CRI (color rendering index) evaluation!

Handheld illuminance spectrophotometer conforms to both DIN and JIS standards.

The CL-500A conforms to DIN 5032 Part 7 Class B and JIS C 1609-1:2006 General Class AA, making it the first compact, lightweight, handheld illuminance spectrophotometer to conform to both DIN and JIS standards.
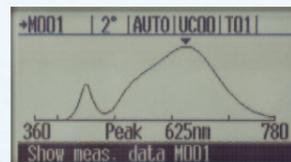
Compact, light-weight, handheld

The CL-500A weighs only 350g, making it easy to take along or to hold in your hand for measurements.

All-in-one type. No PC needed.

The CL-500A can be used by itself for measuring CRI or color temperature of lamps.
In addition, the spectral irradiance waveform and peak wavelength can also be checked.

Measurement of spectral irradiance (w/m^2) at each wavelength.

The spectral irradiance can be measured at 1-nm pitch from 360 to 780 nm, so the CL-500A can be used not only for measuring the color of light but also for measuring photosynthetic photon flux density (PPFD).

High-speed measurement possible

Using the *SDK, high-speed measurements at 5 times/ sec. can be taken.
*Software Development Kit

Measures and displays both the general color-rendering index Ra as well as the special color-rendering indexes R1 to R15.

The special color-rendering indexes R1 to R15 can be displayed, so the color-rendering index for a specific color such as for R9 (red) can be easily measured and displayed.

# Illuminance measurements (JIS AA Class) also possible

Scotopic illuminance can also be measured.

Most conventional illuminance meters can only measure photopic illuminance, but the CL-500A can also measure *scotopic (dark-adapted) illuminance both with the instrument alone and when used with the included software. Plus, the S/P ratio of scotopic illuminance and photopic illuminance can also be displayed.

*Scotopic vision vs. photopic vision
The sensitivity of the human eye under low-light conditions is different than that under bright conditions. The vision of the human eye under low-light conditions is termed "scotopic vision", with a sensitivity peak wavelength which is shifted toward the shorter wavelengths compared to vision under bright conditions, which is termed "photopic vision". The respective spectral luminous efficiency curves for each type of vision are shown at right.
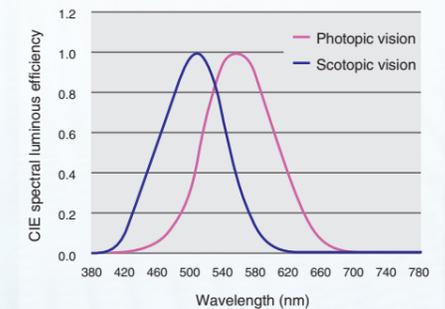
Convenient measurement functions

1) Continuous measurement mode : For monitoring changes in illuminance levels or spectral power distribution.
2) Display of the average of multiple measurements : Useful for evaluation of projectors, etc.
3) Delayed-measurement function : The CL-500A can be set to wait for a specific time after the measuring button is pressed before starting measurements, so you can get out of the way before the measurement is taken to make sure that light reflected from you or your clothes do not affect measurements.
4) Display of data at specific wavelength : Allows monitoring of spectral irradiance at a specific wavelength.

Main applications:

- Measurement and evaluation of the illuminance, color temperature, and color-rendering index of indoor illumination sources such as LEDs, organic EL sources, fluorescent lamps, etc.
- Measurement and evaluation of the illuminance, color temperature, and color-rendering index of special illumination sources used for TV broadcasting stations, studios, stages, events, etc.
- Measurement of ambient lighting including sunlight.
- Measurement of the illumination and color temperature of various types of projectors.
- Measurement of the photosynthetic photon flux density (PPFD) of light sources used for agriculture.
- Standard instrument for illuminance meters or illuminance colorimeters.
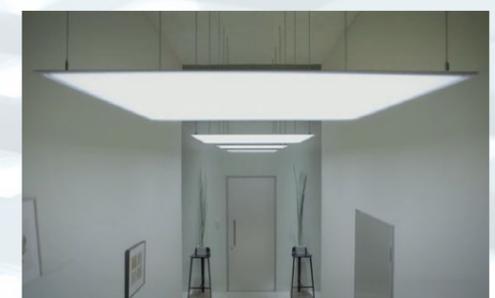
Comprehensive software included

## Includes Excel® add-in software as standard accessory.

Convenient, easy-to-use Excel® add-in software

Reads measurement data from the CL-500A directly into Excel®. Further processing of data can then be performed easily using the various functions of Excel®.
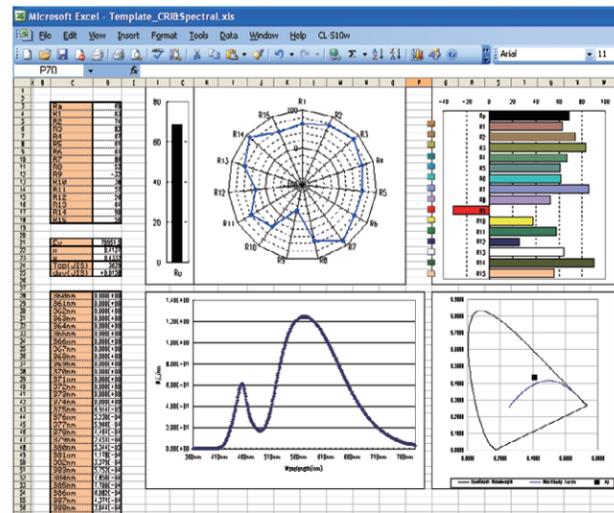
Spectral irradiance waveform display

Since peak wavelengths can be seen easily, classification and grading of light sources can be performed easily at high accuracy. In addition, numerical data at 1 nm can also be viewed in list form.
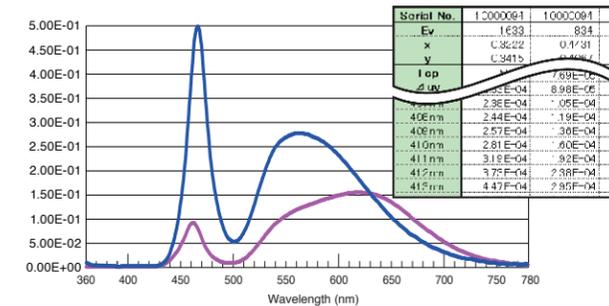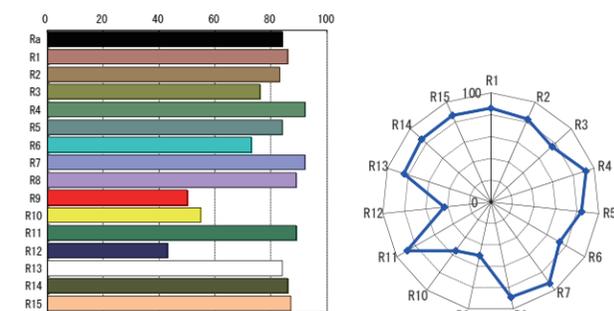
Multi-point measurement possible using multiple CL-500A units

Data Management Software CL-S10w can be used to control up to 10 CL-500A units for multi-point measurements. Using the SDK, this can be further expanded. Please contact our sales person for further information.
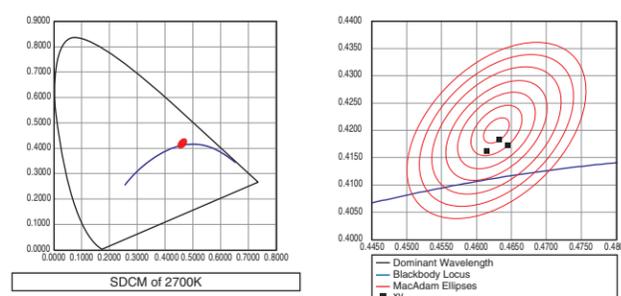
Informative color-rendering index display

Color-rendering indexes are shown visually for easy understanding. The shifts between a test light source and a standard light source can be seen at a glance, with bar graphs showing the general color-rendering index Ra (the average of special color-rendering indexes R1 to R8) and the special color-rendering indexes for a total of 15 colors (R1 to R15).

Equipped with LED binning function

In addition to quantifying the color variations which are a major problem in the LED industry, the software is also equipped with function to enable easy binning.
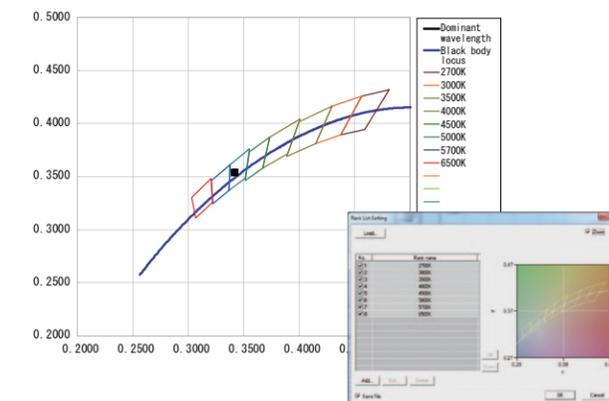
MacAdam SDCM level display

CL-S10w includes a template for expressing the chromaticity variation of illumination light sources such as LEDs or organic EL sources in terms of the MacAdam SDCM (Standard Deviation of Color Matching) step. This allows display of color differences that closely match visual judgment.

What is color-rendering property?

Colors are generally compared by arranging objects side-by-side and looking at them under natural light (sunlight).
When comparing how lamps such as fluorescent lamps, LEDs (light emitting diodes), etc. make objects look against how natural light makes them look, how closely the appearances match is called the "color-rendering property" of the lamp. A lamp that produces a hue similar to that of natural light is said to have a good (high) color-rendering property. The color-rendering index is an objective quantification of the color-rendering properties of a light source. The color-rendering index expresses the comparison between the light source being tested and a standard illuminant*. The maximum value is 100, with the value decreasing as the color-rendering difference increases, indicating how far the appearance under the test light source is from the natural color under sunlight.

* Standard illuminant with the same color temperature as the light source being tested. (Light along the blackbody locus corresponds to sunlight.)

Standard illuminant (CIE daylight) **Light source being tested**
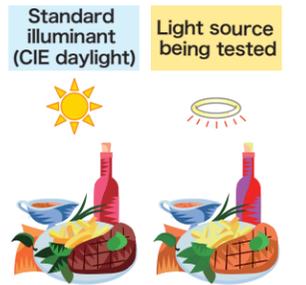
Color-rendering indexes include the general color-rendering index (Ra) and special color-rendering indexes (R1 to R15)

Test - color samples

No.1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8

The general color-rendering index uses low-chroma colors with a Munsell Value of 6 and Chroma between 4 and 8.

No. 9	No.10	No.11	No.12	No.13	No.14	No.15

No. 9 to No. 15 are realistic colors.

To learn more about the theory and practice of light and color measurement, please visit
https://www.konicaminolta.com/instruments/knowledge/index.html

Konica Minolta Measurement Fundamentals	🔍

Konica Minolta's Illuminance Measurement Trio

Illuminance Spectrophotometer CL-500A Measures color-rendering properties

Measures color-rendering properties as well as illumination. Displays spectral waveform using included CL-S10w software. Conforms to DIN and JIS standards.
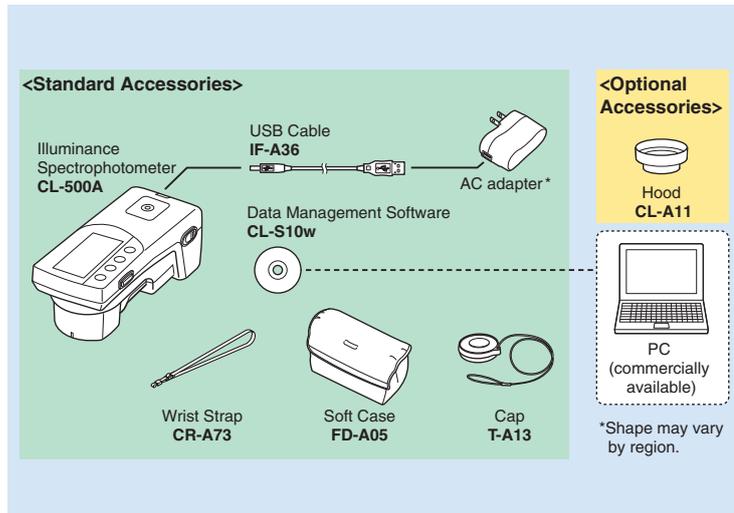
Chroma Meter CL-200A Measures color temperature

A de facto industry standard for color-temperature measurement. Can also perform illuminance measurements (JIS AA Class).
Compact and lightweight with removable receptor connectable with extension cables.
Includes simple, convenient PC software as standard accessory.

Illuminance Meter T-10A Can measure PWM-controlled lighting
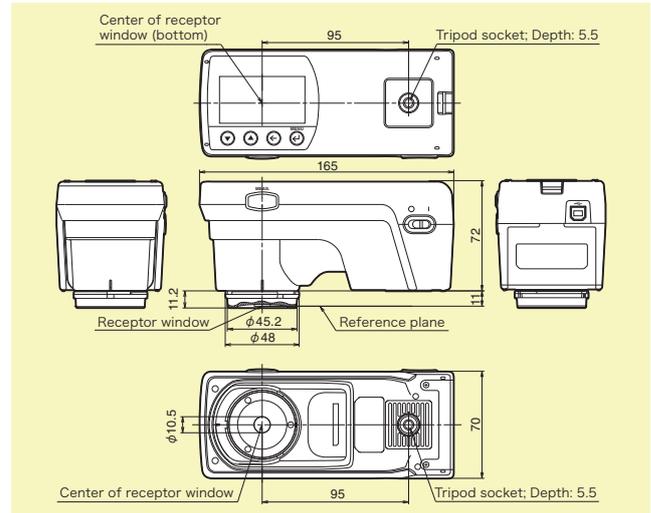
Conforms to DIN Class B and JIS AA Class. Capable of accurately measuring next-generation lamps including PWM-controlled lighting.
Multiple receptors can be used for multi-point measurement.
A miniature receptor T-10MA is also available for measuring illuminance in narrow spaces.

*Both CL-200A and CL-500A can measure PWM-controlled light.

System Diagram

<Standard Accessories>

Illuminance Spectrophotometer **CL-500A**

USB Cable **IF-A36**

AC adapter *

Data Management Software **CL-S10w**

Wrist Strap **CR-A73**

Soft Case **FD-A05**

Cap **T-A13**

<Optional Accessories>

Hood **CL-A11**

PC (commercially available)

*Shape may vary by region.

Dimensions (Units: mm)

Center of receptor window (bottom)

95

Tripod socket; Depth: 5.5

165

72

11.2

Receptor window

ϕ45.2

ϕ48

Reference plane

111

Center of receptor window

ϕ10.5

95

Tripod socket; Depth: 5.5

70

Main Specifications of CL-500A

Model	Illuminance Spectrophotometer CL-500A
Illuminance meter class	Conforms to requirements for Class AA of JIS C 1609-1: 2006 "Illuminance meters Part 1: General measuring instruments"*1 Conforms to DIN 5032 Part 7 Class B
Wavelength range	360 to 780 nm
Output wavelength pitch	1 nm
Spectral bandwidth	Approx. 10 nm (half bandwidth)
Wavelength precision	±0.3 nm (Median wavelengths of 435.8 nm, 546.1 nm, and 585.3 nm*2 as specified in JIS Z 8724)*3
Measuring range	0.1 to 100,000 lx (chromaticity display requires 5 lx or more)
Accuracy*4, 5 (Standard Illuminant A)	E_v (Illuminance) : ±2%±1 digit of displayed value
	xy: ±0.0015 (10 to 100,000 lx)
	xy: ±0.002 (5 to 10 lx)
Repeatability (2σ)*4 (Standard Illuminant A)	E_v: 0.5%+1 digit
	xy: 0.0005 (500 to 100,000 lx)
	xy: 0.001 (100 to 500 lx)
	xy: 0.002 (30 to 100 lx)
	xy: 0.004 (5 to 30 lx)
Visible-region relative spectral responsivity characteristics (f_1')	Within 1.5% of spectral luminous efficiency V (λ)
Cosine correction characteristics (f_2)	E_v: Within 3%
Temperature drift (f_T)	E_v: ±3% of displayed value; xy: ±0.003
Humidity drift (f_H)	E_v: ±3% of displayed value; xy: ±0.003
Measurement time	Super Fast mode: Approx. 0.2 sec. (when connected to computer); Fast mode: Approx. 0.5 sec.; Slow mode: Approx. 2.5 sec.; Automatic exposure time setting (high accuracy) mode: Approx. 0.5 to 27 sec.
Display mode	XYZ; $X_{10}Y_{10}Z_{10}$; $E_v$xy; E_vu'v'; E_v; Dominant wavelength, Excitation purity; Correlated color temperature, duv; General color-rendering index (Ra); Special color-rendering indexes (Ri (i=1~15)); Spectral graph; Peak wavelength; Δ (XYZ); Δ ($X_{10}Y_{10}Z_{10}$); Δ (E_v xy); Δ (E_v u'v'); Rank display; Scotopic illuminance; S/P ratio; Spectral irradiance
Other functions	Data memory: 100 data; User calibration function (when connected to computer); Continuous measurement (when connected to computer); Auto power off function
Display languages	English, Japanese, Chinese (Simplified)

Interface	USB 2.0
Power	Rechargeable internal lithium-ion battery (Operating time per charge: Approx. 6 hours when new); AC adapter; USB power bus
Operation temperature/humidity range	-10 to 40°C, relative humidity of 85% or less (at 35°C) with no condensation
Storage temperature/ humidity range	-10 to 45°C, relative humidity of 85% or less (at 35°C) with no condensation
Size (W × D × H)	70 × 165 × 83 mm
Weight	350 g

*1 For Section 7.6.3 Response Time, when measurement speed mode is set to FAST mode.
*2 For 585.3 nm, evaluation performed using substitute wavelength of 587.5 nm.
*3 Based on Konica Minolta test standards (change in temperature of 5°C or less after zero calibration.)
*4 Automatic exposure time setting (high accuracy) mode
*5 Linear for E_v (Illuminance)

Main specifications of Data Management Software CL-S10w

Type	Add-in for Excel® (Excel® is required to use this add-in.)
Operating environment	One of the following environments: Windows® 7 Professional 32-bit or 64-bit + Excel® 2007 32-bit or Excel® 2010 32-bit Windows® 8.1 Pro 32-bit + Excel® 2010 32-bit or Excel® 2013 32-bit Windows® 8.1 Pro 64-bit + Excel® 2010 32-bit, Excel® 2013 32-bit, or Excel® 2013 64-bit Windows® 10 Pro 32-bit + Excel® 2013 32-bit or Excel® 2016 32-bit Windows® 10 Pro 64-bit + Excel® 2013 32-bit or 64-bit, or Excel® 2016 32-bit or 64-bit • OS languages: English, Japanese, Simplified Chinese, Traditional Chinese • For details on system requirements for above versions of Windows® and/or Excel®, refer to their respective specifications.
Compatible instruments	CL-500A, CL-200A, CL-200* * Some functions not usable with CL-200.
Display items	Spectral irradiance (W/m²/nm); Illuminance; general color-rendering index Ra; correlated color temperature; etc.

ISO Certifications of KONICA MINOLTA, Inc., Sakai Site

JQA-QMA15888
Design, development, manufacture/ manufacturing management, calibration, and service of measuring instruments
ISO 9001

JQA-E-80027
Design, development, manufacture, service and sales of measuring instruments
ISO 14001