



Adding PPFD measurement function

Illuminance spectrometer

**IM-1000***IM-1000 is suitable for measuring next generation illumination such as LED and OLED.**Nine kind of evaluations are completed at one time* *illuminance* *color temperature* *chromaticity (xy,u'v')* *color rendering property (color rendering index)* *spectral distribution* *photosynthetic photon flux density* *luminous intensity* *dominant wavelength* *excitation purity**on forms to the general AA class illuminance meter (JIS C 1609-1: 2006).**High cost-performance and high accuracy spectral illuminance meter**Photosynthetic photon flux density (PPFD) can be measured.*

# Easy operation for measuring Color rendering property, Color temperature, and Illuminance.

Measuring from low to high illuminance  
2- 1,000,000 lx  
Complying with General AA Class  
JIS C1609-1:2006

Wireless LAN  
(Japanese, Korea, USA and European Conformity market only)

Easy operation  
Handy, dry battery drive

Memory, Timer function  
Preventing measured data from reflecting light and shadow from observer

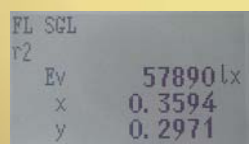


## Usage

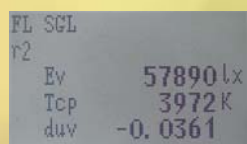
- LED (for checking illumination, Interior panel in automobile)
- Organic EL (for checking illumination)
- Performance and quality check of illumination Measuring interior illuminance.
- For Biotechnology and other academic investigation.
- Photosynthetic photon flux density (PPFD)



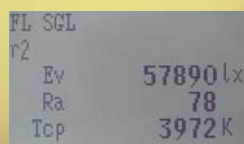
## Indication screen example



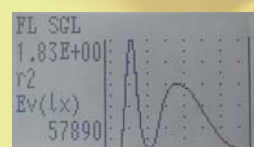
Illuminance Ev / Chromaticity xy mode



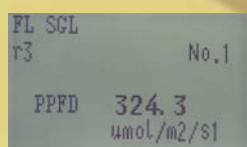
Illuminance Ev / Correlated color temperature Tcp / Deviation duv mode



Illuminance Ev / Average color rendering property evaluation Ra / Correlated color temperature Tcp mode



Spectral radiation illuminance graph / Peak wavelength spectral radiation illuminance / Illuminance Ev mode



Photosynthetic photon flux density PPFD mode

Ev / xy / u'v' / XYZ / Dominant wavelength  $\lambda_d$  / Excitation purity Pe / Correlated color temperature Tcp / Average color rendering property evaluation Ra / Special color rendering indexes Ri (i=1 - 15) / Spectral radiation illuminance graph / PPFD

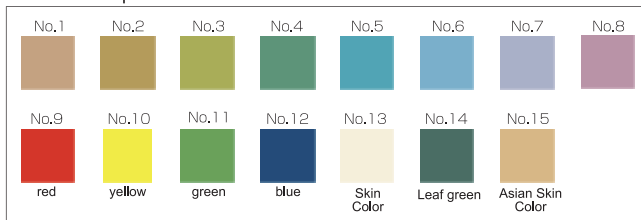
## Illuminance

When talking about “brightness”, we have to distinguish carefully between luminance and illuminance. Illuminance is the amount of luminous flux incident [lm] on a surface per unit area [m<sup>2</sup>], and unit of illuminance is lux (lx). Illuminance is used to determine if an area such as class room and office are lighted well enough for reading and other activities.

## Color rendering index (CRI)

Color rendering index is measure of how well light source render the color of object compared to reference light source. Ideal light source for CRI is rated as 100. Light sources with a high CRI are desirable. The lower the CRI rating, the less accurately colors will be reproduced.

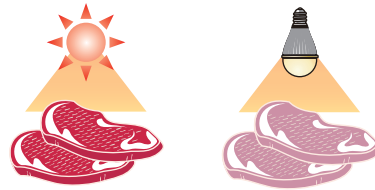
test color samples



Light sources with a high CRI are desirable

General Color index (Ra) : Average value of R1 to R8.  
Special Color index (Ri) : Average value of R1 to R15.

The appearance of colors varies with the light source's color rendering properties.



■ CRI examples of usage (CIE 1986)

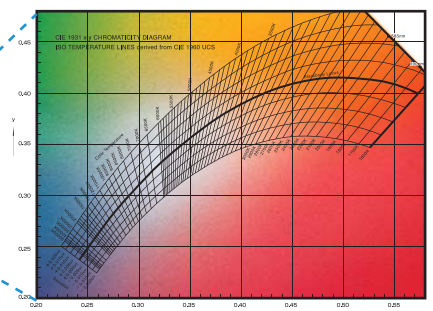
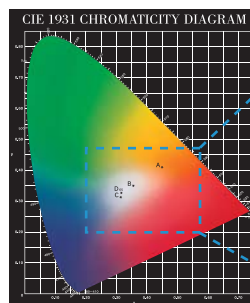
color rendering property group	CRI Ra	Examples of Usage
1A	> 90	Illumination for the place which require accurate color rendering. e.g. Color printing inspection
1B	80 - 90	Illumination for the place which require good color rendering. e.g. Display lighting
2	60 - 80	Illumination for the place which require moderate color rendering.
3	40 - 60	Illumination for the place which do not require good color rendering, but color distortion is unacceptable.
4	20 - 40	Illumination for the place where color distortion is acceptable.

## Color temperature

Color temperature is another expression of color. The unit is K (Kelvin). Color temperature are widely used showing the color of illumination such as lamp, bulb, white LED. Degree of color temperature are correlated to the colors.

For example

1800-2000K represent Red,  
2500-3000K represent Orange,  
3000-3300K represent Yellow,  
3500-5300K represent White,  
Over 5300 represent Blue.



## Photosynthetic Photon Flux Density

Additional function

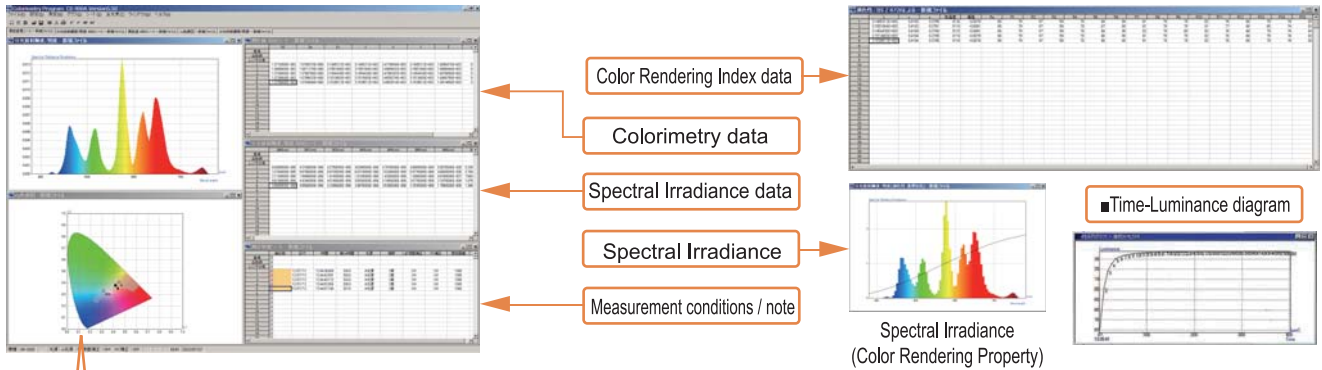
Photosynthetic photon flux density (PPFD) can newly be measured. Illuminance (lx) is common in the measurement of illumination. But illuminance is related to the sensitivity of typical human eyes, not sensitivity of vegetable. So the illuminance is not appropriate for evaluation of the effect of illumination on vegetable. PPFD expresses the number of photons in wavelengths the 400-700 nm range of the light that chlorophyll can absorb. So PPFD is used to evaluate the effect of illumination on photosynthesis in plant factory. The unit for PPFD is  $\mu\text{mol m}^{-2} \text{s}^{-1}$ .



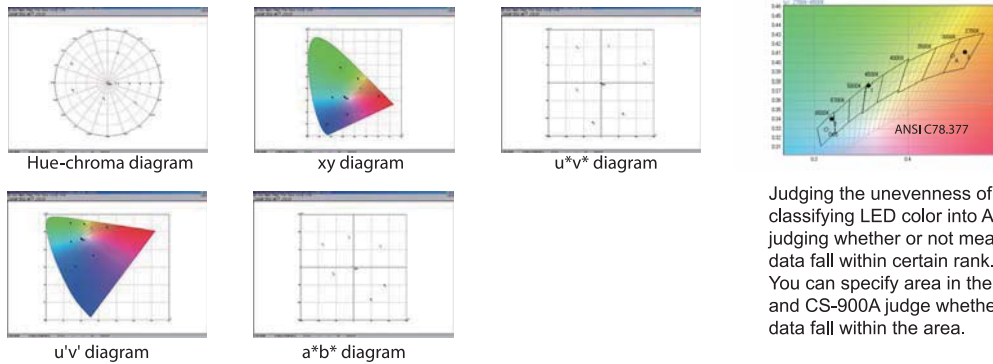
# Standard accessory software can control Spectroradiometer and can process measured data with simple operation.

## Colorimetry software CS-900A (Standard accessory)

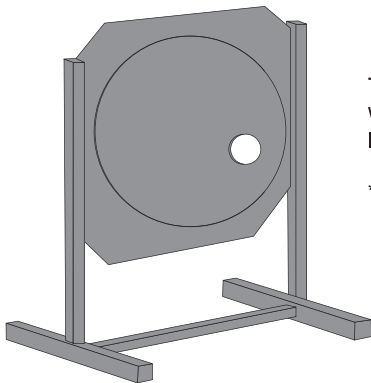
The CS-900A for Windows can control the IM-1000 and collect, save, and, graph measured data. The measurement time can be shortened by selecting Colorimetry mode. In Colorimetry mode, the instrument will omit Spectral radiation illuminance data and send the measured data of luminance, chromaticity, and color temperature.



### Chromaticity diagram



Judging the unevenness of LED color, classifying LED color into ANSI rank, and judging whether or not measured color data fall within certain rank. You can specify area in the color diagram and CS-900A judge whether or not color data fall within the area.

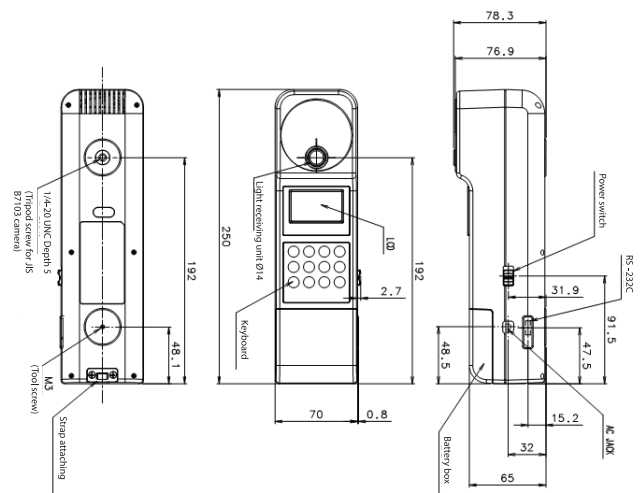
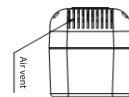


### Total luminous flux measuring function

Whit IM-1000 mounted to Integrating sphere, CS-900A calculates Total luminous flux from IM-1000's measured data.

\* Integrating sphere, standard light, Auxiliary light, and adapter for IM-1000 should be purchased in customer.

### Dimension



Display	: Spectral radiance graph, other graph
Color system	: Ev, xy, XYZ, Spectral Irradiance, $u'v'$ , $u^*v^*$ , $L^*a^*b^*$ , Color temperature, Deviation, Dominant wavelength, Excitation purity, Color Rendering Index, PPFD
Function	: Fundamental operations of Spectral data
Mode	: Spectral mode, Colorimetry mode
Condition setting	: Auto / Frequency / Integral time, Integ. delay mode, Measurement speed, Measurement angle, Average, Single / Interval / Continue
Hardware requirement	
■ OS	: Windows® XP Professional Service Pack 2 or later (32bit) Windows® XP Home Edition Service Pack 2 or later (32bit) Windows® Vista Ultimate (32bit) Windows® 7 Ultimate / Professional (32bit / 64bit)
■ CPU	: Pentium IV 2.8GHz or more
■ HDD	: 1GB or more
■ Memory	: 1GB or more
■ Port	: USB 2.0 (1pce), RS-232C serial port *use inter-link RS-232C cable for DOS/V



## ■recommended lighting levels

(Extract of JIS Z 9110-2011)

	Illumination (lx)															
	3,000	2,000	1,500	1,000	750	500	300	200	150	100	75	50	30	20	10	
Office	—			●business room ●entrance hall (day-time)		●reception room ●elevator hall		—		●corridor, elevator		●Emergency staircase (indoor)		—		
				●Meeting room, printing room		●Library, rest room		—		●Stairs						
Factory	—		●Instruments panel and control board of control room		●Design room, drawing room		—		●Electricity room, air conditioning machine room		●warehouse ●passage		●Emergency staircase (indoor)		—	
					●Control room											
School	—			●reading room, radio studio ●health room		●east room, locker room		●garage ●corridor		—						
				●Basketball court, volleyball court		●soccer ground, rugby ground										
				●Drafting room		●Schoolroom, dining room		●Stairs								
Hospital/ Health Center	—		●Operating room, first aid room		●Consultation room ●Office room, medical office		●sick nurse room, waiting room		●Porch		●Emergency staircase		—			
							●X-ray room, Endoscopy room		●Stairs		●Darkroom (for photography, etc.)					
Department Store and others	●Most important point of display		—		●General display		■General shop inside		●elevator hall, rest room		●corridor		—			
			■Display in shop						—		●Stairs					
Dining hall restaurant snack bar	—			●Sample case		●register		●Stairs		—						
				●counter, baggage office		●guest room		●Entrance ●corridor								
Movie theater, other show place	—			●ticket office		●Seat for spectator, lobby ●machine room		●Projection room ●corridor		—		Projection room (during perform) Monitoring room (during perform)		—		
						●monitoring room		●delivery entrance								
Lodging facilities (Inn-hotel)	—			●Front desk		●dining hall		●Stairs		●Important point of garden		—				
						●guest room desk, mirror of washstand		●Lobby, wash room ●saloon		●Game room ●guest room(general)		●Emergency staircase				
Beauty salon barber shop	—		●Hair dressing ●Make-up		●Hair cut ●shaving, registor		●rest room		●corridor		—					
									●Stairs							

\*Note: Average color rendering property evaluation Ra ●:90 ●:80 ●:60 ●:40 ■:80~60

### Illuminance adapter (Cosine receptor) for SR-series ZV-30 (option)



- Complying with JIS C1609-1:2006 AA class

The spectral irradiance and illuminance may be measured by attaching an illuminance adapter to the Spectroradiometer.

\*Calibration of your Spectroradiometer and Illuminance adapter is required in Topcon factory before you use the illuminance adapter with your instrument.

\*Spectral band width: 5nm or less (half width)

Measurement range :ex)SR-LEDW

0.01 to 30,000,000 lx (measuring angle 2°)  
0.03 to 90,000,000 lx (measuring angle 1°)  
0.75 to 100,000,000 lx (measuring angle 0.2°)  
3 to 40,000,000 lx (measuring angle 0.1°)

Accuracy:

Luminance : ±2%  
Chromaticity(x,y) : ±0.002  
(for standard illuminant A)

Function

■Illuminance : Ev  
■Chromaticity : xy, u'v'  
■Tristimulus values : XYZ  
■Spectral irradiance : Ee  
■Color Rendering Index : Ra, R<sub>1</sub> to R<sub>15</sub>  
■Correlated color temperature : T<sub>c</sub>, duv  
■Dominant wavelength, Purity  
■PPFD

Digital Illuminancemeter

## IM-600

**IM-600M**  
Compact photoreceptor type



- Capable of wide range measurement from low to high illuminance.  
(0.005 to 999,000 lx / 0.005 to 92,807 fc)
- Compact photoreceptor type (IM-600M)
- ◎Conforms to the general AA class illuminance meter (JIS C 1609-1 : 2006)

Digital Illuminancemeter

## IM-2D



- Wide measurement range of 0.1 to 19,990 lx (0.01 to 1,999 fc) auto-range, with LCD display.
- Photoreceptor head rotates 280°.
- A single operation of a button performs:  
(1) power on, (2) digital display(3) measurement value hold, and (4) power off.
- Auto-power-off function saves battery power.
- ◎Conforms to the general A class illuminance meter (JIS C 1609-1 : 2006).

## ■Specifications

JIS class	Conforms to the general AA class illuminance meter (JIS C 1609-1 : 2006)
Spectral method	LVF (Linear Variable Filter)
Photo detector	Silicone photo diode array
Measurable wavelength range	380 to 780 nm
Output wavelength resolution	1nm
Measurable illuminance range *1	2 to 1,000,000 lx
Accuracy *1	Illuminance Ev : $\pm 2\% \pm 1$ digit
	Chromaticity xy : $\pm 0.0020$ (50 lx or more)
	xy : $\pm 0.0035$ (10 to 50 lx)
	xy : $\pm 0.0050$ (5 to 10 lx)
Repeatability *1, *2, *3	Illuminance Ev : 0.5% + 1 digit
	Chromaticity xy : 0.0020 (50 lx or more)
	Chromaticity xy : 0.0035 (5 to 50 lx)
Visible range relative spectral sensitivity characteristics (Difference from spectral relative luminous efficiency : $f_v$ )	2% or less
Systematic difference of angular incident light characteristics : $f_\theta$	3% or less
Temperature characteristics : $f_T$	Within $\pm 3\%$ (-10 to 40°C with 23°C as reference)
Humidity characteristics : $f_H$	Within $\pm 3\%$ (without dew condensation)
Measurement range mode	AUTO (AUTO FULL / AUTO FIRST / AUTO ADJUST) / MANUAL (MANUAL RANGE)
Display mode	XYZ / Ev / xy / u'v' / Dominant wavelength $\lambda_d$ / Excitation purity Pe /
	Correlated color temperature Tcp / Average color rendering property evaluation Ra / Special color rendering indexes Ri (i=1 - 15) / Spectral radiation illuminance graph / $\Delta(XYZ)$ / $\Delta(Ev, xy)$ / $\Delta(Ev, u'v')$ / PPFD
Measurement time *4	Approx. 0.2 seconds
	(When the measurement range is "MANUAL", 100ms is fixed as the integral time and the "STR2" command is used)
	Approx. 0.5 to 50 seconds (Measurement range: AUTO)
Display	Liquid crystal display unit with 128×64 dots and back light ON / OFF function
Interface	RS-232C : Baud rate : 9600 / 9200 / 38400bps, Parity : Odd number (ODD), Data length : 7bit, Stop bit : 1bit
Power supply	Wireless LAN : IEEE802.11b / 2.4GHz band (1-13ch) / 38400bps / Security (WEP / WPA / WPA2) (exclusively for Japan)
	Nickel hydride AA battery : 4 pcs. (Standard accessory) / Exclusive AC adapter (optional accessory) *Battery life (Operable time): Approx. 7 hours
Operating conditions	Temperature -10 to 40°C, Humidity 85%R.H. or less (without dew condensation)
External dimensions	Approx. 70 (W) × 250 (D) × 78 (H) mm (Without beam detector cap and power switch)
Weight	Approx. 640g (including the batteries)
Measurement reference surface	Edge of beam detector

\*1: Standard light A : In AUTO measurement range.

\*2: Illuminance Ev (2 $\sigma$ ) : [2 standard deviation/average] in ten continuous measurements.

\*3: Chromaticity xy : [Maximum value - Minimum value] in ten continuous measurements.

\*4: The measurement time is sometimes longer due to the personal computer specification, the use environment and the command receiving timing.

\*The wireless LAN module, which conforms to the Japanese technical standards, is built in the instrument. It is not possible to use the wireless LAN in any other country or area except Japan. If you use the instrument out of Japan, turn off the wireless LAN function.

## ■Standard Package

- IM-1000 instrument body.....1ea.
- CD-ROM (Instruction manual / colorimetry program CS-900A).....1ea.
- Hand strap.....1ea.
- Beam detector cap.....1ea.
- RS-232C cable.....1ea.
- Nickel hydride battery charger set (with four nickel hydride batteries).....1ea.

## ■Option

- AC Adapter (ZV-35)
- Leather case (ZV-37)

### ○Meaning of "of rdg." and "digit"

"of rdg" is for reading values. For example, " $\pm 2\%$  of rdg" means  $\pm 2\%$  of reading values.

$\pm 1$  digit means reading values. "digit" means 1 count in digital and indicates that there may be error of one count in the last significant digit of the digital display.



\*Some screens are simulated.

\*The specifications and external appearances of product in this catalogue may be changed without prior notice due to improvements.

\*The catalogue includes products that are sold separately.

\*The actual color of products may differ slightly from the catalogue due to lighting and printing conditions.

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### 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.



TOPCON TECHNOHOUSE has been certified as a provider of optical solutions, according to the Japanese Measurement Law.

We will issue a calibration certificate bearing the JCSS logo, which guarantees the accuracy of Illuminance (Illuminance meter), and luminosity (lmp) based on national standards.

For more information please visit our website.

<http://www.topcon-techno.co.jp/en/>

