

MINOLTA

# SPECTRORADIOMETER

## CS-1000A (STANDARD MODEL)

### CS-1000S (SMALL MEASURING AREA MODEL)

### CS-1000T (SMALL MEASURING ANGLE MODEL)

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The essentials of imaging

[www.minolta.com](http://www.minolta.com)

ISO 9001  
CERTIFIED  
ISO 14001

Macro Lens

Small Mesuring Angle Lens

Small Mesuring Area Lens



Standard Lns

# High Performance Spectroradiometer

With the increased emphasis on ISO 9001, product quality has become a focal point in many companies. At the same time, in-house production departments are requiring systems that calibrate their measurement instruments. The CS-1000 Spectroradiometer supports these activities.

## High-Speed

- Use of polychromator enables high-speed measurements. ↻1
- Fast measurement for the low luminance target. ↻2
  - ↻1 Measurement speed varies depending on the luminance of the light source.
  - ↻2 Fast Mode

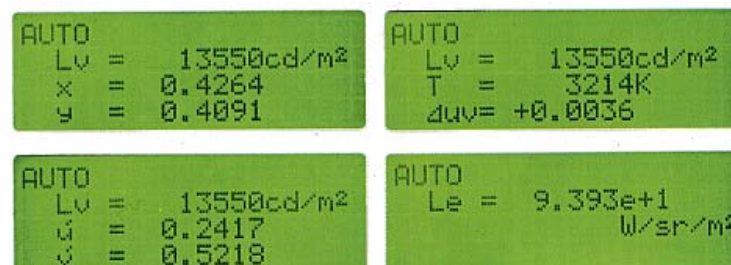
## High-Accuracy

- Repeatability of 0.1%+1 digit for Luminance, 0.0002 for Chromaticity.
  - ↻3 Nomal Mode.
 The other measurement conditions : based on Minolta standard test method.
- Measurements can be synchronized with a display device.
- Low polarization error-ideal for measuring LCD's.
- Aperture mirror eliminates misalignment between the finder target and actual measuring spot.

## Low Luminance

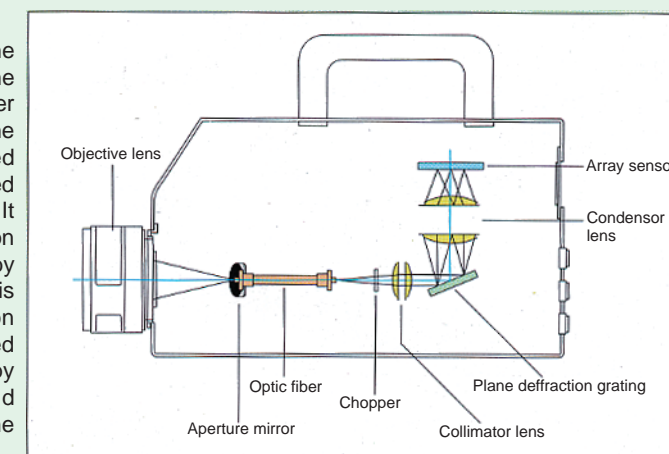
- Specifications are guaranteed even at 0.5cd/m<sup>2</sup>
- Sensor cooling improves S/N ratio, enabling measurement of low-luminance subjects.

Display Examples



## Measurement Principle

Light energy passes through the objective lens. The light from the measurement area passes through the hole in the center of the aperture mirror, while the remaining light is guided to the finder optics by the aperture mirror. As a result, the part equivalent to the measurement area looks like a black circle when observed through the finder. The light entering the optic fiber is reflected continuously so that, it is mixed and becomes virtually uniform. It then passes through the collimator lens to the plane diffraction grating. After being dispersed by the grating, the light is focused by the condensor lens according to wavelength. An array sensor is located at the focal plane. (This type of spectral separation geometry is called a polychromator.) The amount of detected energy for each wavelength is then converted to a digital value by a 16-bit A/D converter. The spectral radiant intensity and chromaticity are calculated by the processing section of the instrument.



Minolta manufactures  
reliable optical lens  
via integrated  
production system



starting from R&D  
and melting glass  
to the final production.





# 3 Different Models for the various applications

3 different optics achieved precise measurement for the various applications. Optical design technique is developed under the photographic camera engineering.

## Standard Model CS-1000A

Measuring area : 1.15mm~ (with macro lens)  
Measuring angle : 1°  
Measuring distance : 20cm~ (with macro lens)

### <Applications>

General application for the medium or large measuring size

- Display monitor such as LCD, CRT and EL.
- Illumination light source and lamps.



## Small Measuring Area Model CS-1000S

Measuring area : 0.45mm (by 3 times zoom)  
~1.10mm (by 1 time zoom)  
Measuring distance : 26.5mm (by 3 times zoom)  
~42.0mm (by 1 time zoom)  
(distance from front end the lens)

### <Applications>

Very small measuring size.

- Car audio indication lamp
- Indicator panel of the vehicle



## Small Measuring Angle Model CS-1000T

Measuring area : 1.2mm~  
Measuring angle : 0.14° (in the minimum distance 258mm)  
(Measuring angle depends on measuring distance)  
Measuring distance : 258mm~ (distance from front end of the lens)

### <Applications>

Small measuring size with distance

- Small LCD
- Small reflective LCD (Low luminance)  
(Illumination lamp can be installed between the CS-1000 and target)

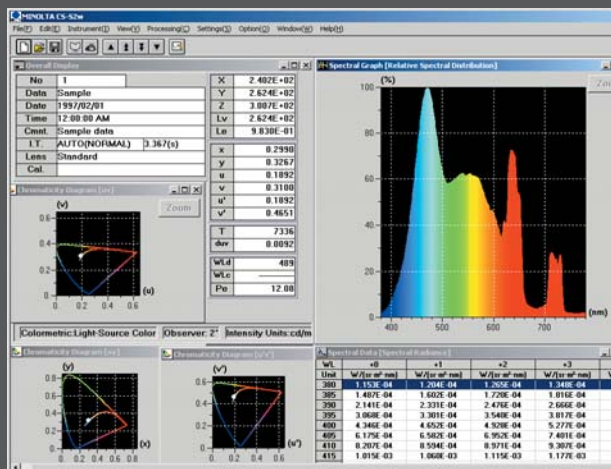


## Standard Accessory

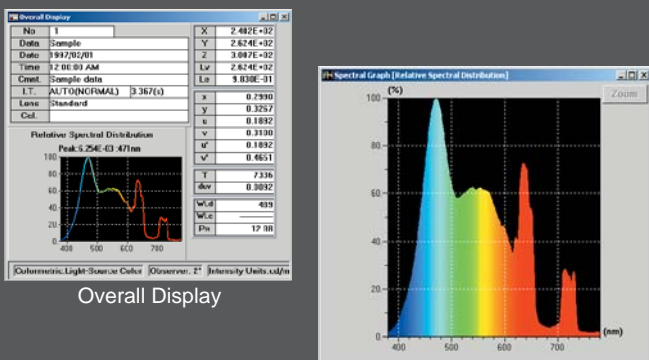
# Data Processing Software CS-S1w

Data management software CS-S1w controls CS-1000 through PC and displays measured data in numerical and graphical form. It comes with CS-1000 as the standard accessory. It assists the measurement work with powerful functions such as user calibration, mathematical processing, interval measurement, average measurement and data transfer to the spread sheet software.

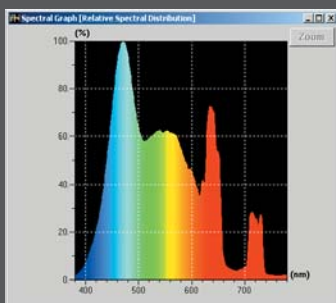
- Trimmed Measurements :  
Interval measurement, Averaged measurement
- Display :  
XYZ, Lvxy, Lvuv, Lv'u'v', T uv, Le, dominant wavelength, stimulus purity
- Display Functions :  
Display of spectral graph, Display of color space graph
- Calculation Functions :  
Mathematical operations between spectral data  
Mathematical operations between spectral data and numerical values  
Processing of spectral data  
Computed data can be processed in the same way as measured data.
- Data Memory :  
Measured data : 500; Reference data : 10
- Data Output  
Can be exported to Microsoft Excel and Lotus 1-2-3.



## Measuring Data Display



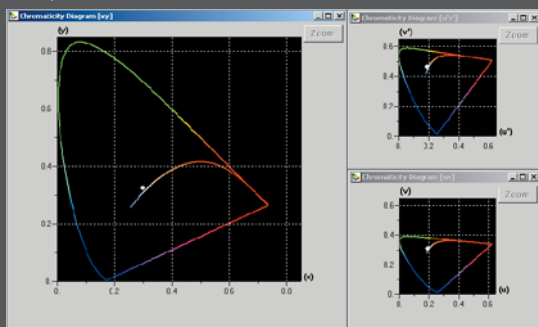
Overall Display



Spectral Graph

Wavelength (nm)	Intensity	Reference Data
380	1.157E-04	1.000E-04
390	2.141E-04	2.311E-04
395	3.608E-04	3.301E-04
400	4.346E-04	4.628E-04
405	6.179E-04	6.502E-04
410	8.207E-04	8.944E-04
415	1.015E-03	1.066E-03
420	1.299E-03	1.421E-03
425	1.617E-03	1.771E-03
430	2.041E-03	2.204E-03
435	2.586E-03	2.768E-03
440	3.147E-03	3.264E-03
445	3.761E-03	3.892E-03
450	4.406E-03	4.557E-03
455	5.101E-03	5.259E-03
460	5.792E-03	5.999E-03

Spectral Data

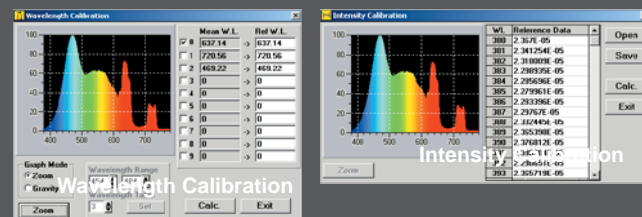


Chromaticity Diagram

Unit	X	Y	Z	Unit	T	dev	
Unit	2.482E+02	2.624E+02	3.087E+02	Unit	7336	0.8892	
Unit	Lv	u	v	Unit	Wc	WcL	
Unit	cd/m²	nm	nm	Unit	nm	%	
Unit	2.624E+02	0.1892	0.3188	Unit	489	12.08	
Unit	Lv	u'	v'	Unit	Lv	Cl	Clm
Unit	cd/m²	nm	nm	Unit	nm	nm	%
Unit	2.624E+02	0.1892	0.4651	Unit	2.624E+02	1.081E+00	0.801E+00
Unit	2.624E+02	1.081E+00	0.698E+00				

Colorimetric Data

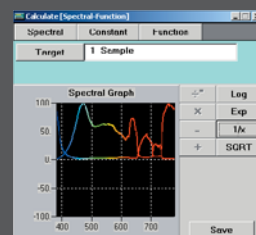
## User-Calibration



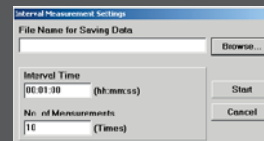
Wavelength Calibration

Intensity Calibration

## Calculation



## Interval Measurement



## Average Measurement



## Transferring data to Worksheet Programs

This screenshot shows a Microsoft Excel spreadsheet with data transferred from the software. The data is organized in columns and rows, including wavelength, intensity, and reference data.

## System Requirement

- PC Type : PC/AT compatible, or NEC PC-98 compatible
- CPU : Pentium 100MHz or higher
- Memory : 16MB or mjore
- CRT : 800 X 600 to 1024 X 768 resolution
- OS MS-DOS + Windows® 3.1 / 95 / 2000

\*Windows® is a trademark of Microsoft Corporation in the USA and other countries.

## Specifications

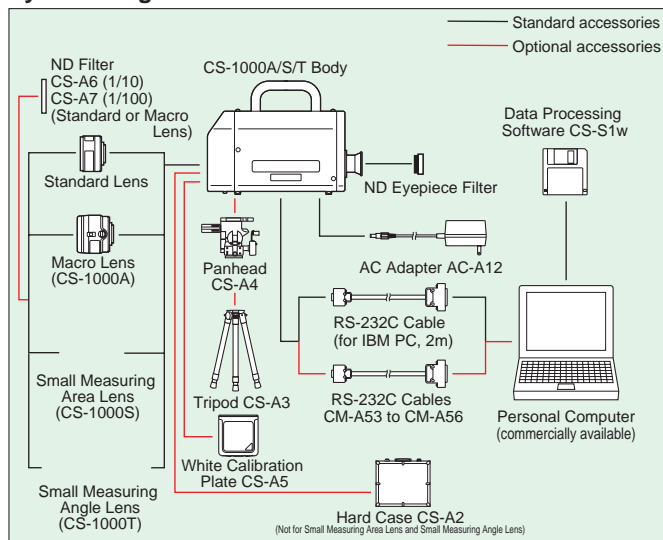
Model	CS-1000A	CS-1000S	CS-1000T
Wavelength range	380 to 780nm		
Spectral bandwidth	5nm		
Wavelength resolution	0.9nm/pixel		
Display wavelength bandwidth	1nm		
Spectral accuracy	±0.3nm(Hg lamp/Mean wavelength)		
Acceptance angle	1° (standard and macro lens)	--- (standard lens : 1°)	0.14°(standard lens : 1°)
Display	Lvxy, ΔLvxy, Lvuv, ΔLvuv, LvTDuv, Le (Observer can be switched between 2° and 10°)		
Data memory	Measurement data : 30 sets, Target data : 20 sets		
Minimum measuring distance	450mm (standard lens), 200mm (macro lens)	26.5mm*1, (standard lens : 450mm)	500mm, (standard lens : 450mm)
Minimum measuring area	7.9mm (standard lens), 1.15mm (macro lens)	0.45mm, (standard lens : 7.9mm)	1.2mm, (standard lens : 7.9mm)
Luminance display range	0.01 to 80000cd/m <sup>2</sup> (for Illuminant A)		
Accuracy (for Illuminant A, Normal Mode)	±2%±1digit, x : ±0.0015, y : ±0.001		
Repeatability (σ) (for Illuminant A)	Normal Mode	0.1%+1digit, xy : 0.0002	(Luminance range Standard lens : 1 to 8000cd/m <sup>2</sup> Other lens : 10 to 8000cd/m <sup>2</sup> )
	Fast Mode	0.1%+1digit, xy : 0.0004	
	Normal Mode	0.1%+1digit, xy : 0.0003	(Luminance range Standard lens : 0.5 to 1cd/m <sup>2</sup> Other lens : 5 to 10 cd/m <sup>2</sup> )
	Fast Mode	0.1%+1digit, xy : 0.0006	
Polarisation error	Less than 5% (400nm to 780nm)		
Integration time *2	Fast : 40msec to 15sec, Normal : 40msec to 60sec		
Power	AC 100V/120V/230V 50/60Hz (using AC adapter AC-A12)		
Operating environment	Temperature : 5 to 35°C (41 to 95°F) ; relative humidity 80% or less (at 35°C / 95°F) with no condensation, Installation category : II, Pollution degree : 2		
Storage temperature range	0 to 45°C (32 to 113°F) ; relative humidity 80% or less (at 35°C / 95°F) with no condensation		
Interface	RS-232C		
Size (body)	146 × 148 × 256mm (5-3/4 × 5-13/16 × 10-1/16 in.)		
Weight	4.7kg (10.38 lb.) (with standard lens)	5.9kg (13.01 lb.) (with small measuring area lens)	5.8kg (12.79 lb.) (with small measuring angle lens)
Standard accessories	Standard Lens, Macro Lens, Small Measuring Area Lens, Small Measuring Angle Lens, Data Processing Software CS-S1w, ND Eyepiece Filter ( for finder) CS-A1, AC Adapter AC-A12, RS-232C Cable (2m, 9-pin for IBM PC) CM-A52, Calibration Certificate		
Optional accessories	Tripod CS-A3, Panhead CS-A4, White Calibration Plate CS-A5, ND Filter CS-A6 (10% / for standard or macro lens), ND Filter CS-A7 (1% / for standard or macro lens), RS-232C Cable CM-A53 to CM-A56, Hard Case CS-A2 (Not for small measuring area lens and small measuring angle lens)		

\*1 Distance from front end of the lens

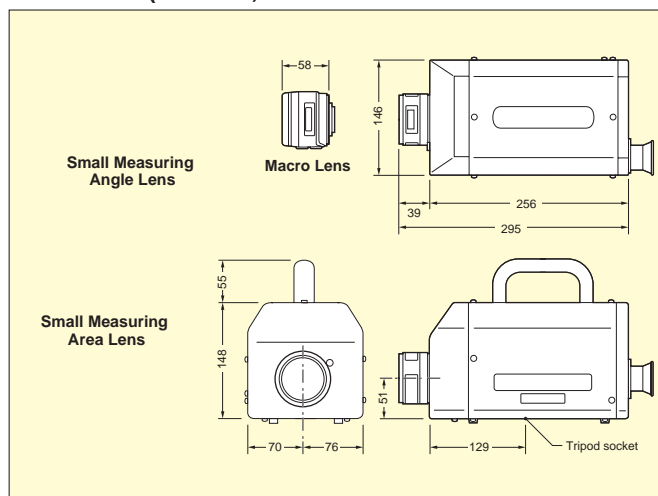
\*2 Measurement time is twice integral time plus α (α is 4 to 9sec. and varies with the measuring luminance.

- Specifications subject to change without notice.
- Windows® is a trademark of Microsoft Corporation in the USA and other countries.
- Trademarks referred to are the property of their respective owners.

## System Diagram



## Dimensions (Units : mm)



## SAFETY PRECAUTIONS

To ensure correct use of the instrument, please adhere to the following.



- Before using the instrument, be sure to read the instruction manual.
- Always use the specified power. Use of inappropriate power may result in fire or electric shock.



Toyokawa Administrative Center (Aichi Pref., Japan) of Minolta Co., Ltd. was approved by the British certification organization Lloyd's Register Quality Assurance for certification under the ISO 9001:1994 international quality assurance standards on March 3, 1995. Since the Center's establishment in 1990, Radiometric Instruments Operations in Toyokawa Administrative Center has carried out the development and production of precision instruments for the measurement of color, light, and temperature. The ISO 9001:1994 certification was awarded to the Instrument Systems Company quality control system, including the design, development, production, calibration, and servicing of the measuring instruments described above.

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