



KONICA MINOLTA

2D Color Analyzer CA-2000

- CA-2000S (with standard lens)
- CA-2000W (with wide lens)
- CA-2000T (with telephoto lens)
- CA-2000SW (with standard & wide lenses)
- CA-2000ST (with standard & telephoto lenses)
- CA-2000WT (with wide & telephoto lenses)
- CA-2000A (with all lenses)

Easy evaluation of displays using high-resolution data !!

2D Color Analyzer for quick, accurate measurement of luminance and chromaticity distribution



The essentials of imaging



2D Color Analyzer CA-2000 for quick, accurate measurement of luminance and chromaticity distribution !

The 2D Color Analyzer CA-2000 incorporates XYZ filters and a high-resolution CCD to offer sensitivity closely matching that of the human eye. This allows accurate 2D measurement of the luminance and chromaticity distribution of FPDs, projectors, and backlights with high-resolution data. User-friendly, included software enables PC control of the CA-2000 for quick and efficient measurement, data analysis, and evaluation with easy operation. This combination is a powerful tool for development evaluation or inspection.

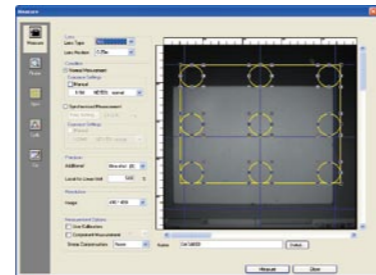
Simple measurement, analysis, and evaluation using CA-S20w (included as standard accessory) !

Step 1

Setting and measurement

Simple setting of measurement area

Measurement area can be easily adjusted while watching the viewfinder image in the screen, without moving the CA-2000.

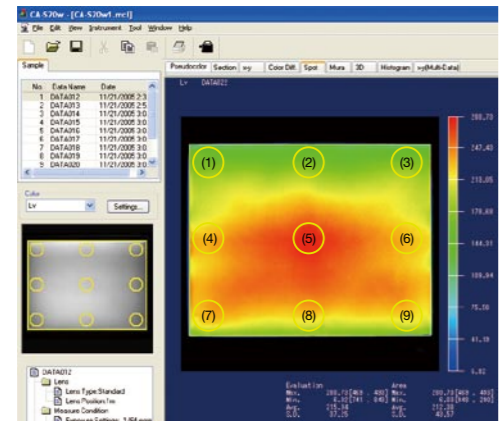


* Image shows measurement screen and finder view.

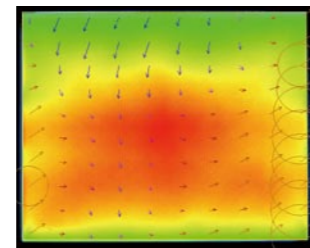
Step 2

Data analysis Screens suitable for the application can be created and saved.

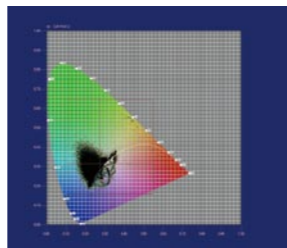
A basic screen for data analysis is provided initially, and can be used immediately after purchase. The screen layout can be changed as necessary with various graphs and data displays, and user-defined layouts can also be saved as templates.



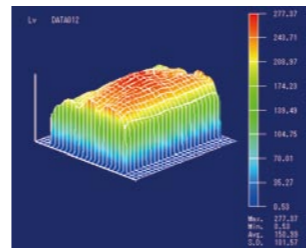
* Image shows screen example of 9-spot measurement.



Color difference display
Color differences are shown as vectors, and differences exceeding set limits are emphasized with circles.
*Image shows screen example of 100-spot color difference measurement.



Chromaticity diagram display
Clearly shows the variations in chromaticity.



3D graph display
Displays data in a 3D solid for easier understanding of overall conditions.

Pseudocolor display

For observation of luminance and chromaticity distribution.

Spot display

Measures multiple spots of user-defined size and quantity, with the measurement values for each spot determined by averaging the area within the spot.

Histogram display

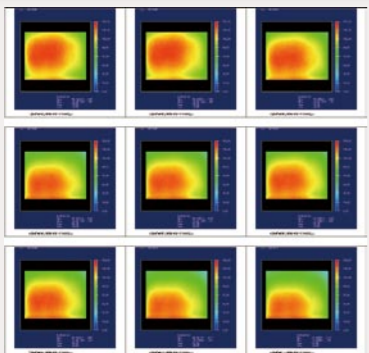
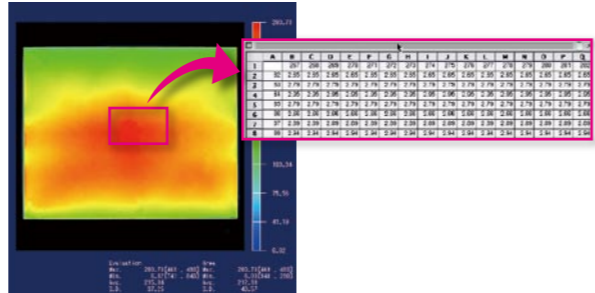
Displays a histogram (frequency distribution) to make it easier to observe variations in luminance and chromaticity.

Step 3

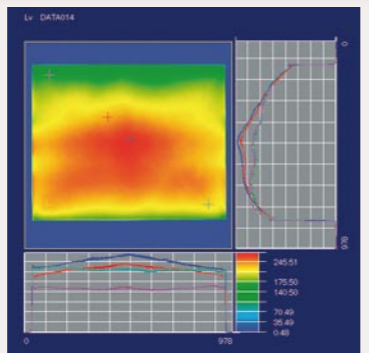
Evaluation and reporting Data transfer to Excel® and word®

The data in a specified range can be transferred to Microsoft Excel® and Word®. Copying and pasting graphs facilitates preparation of reports.

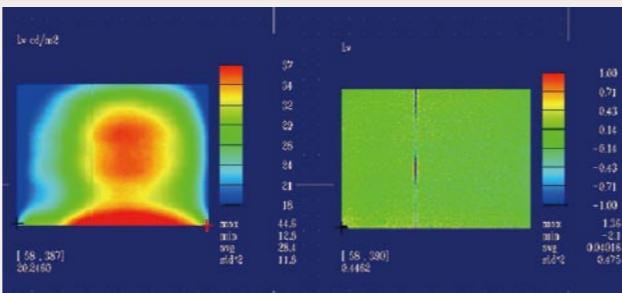
* Excel®, Word® are trademarks of Microsoft Corporation in the USA and other countries.



Multi-screen display
Thumbnails of various graphs can be displayed and compared.



Cross-section display
The horizontal and vertical cross-sections at the cursor position can be displayed.



*The screen shows examples of the pseudocolor display (left) and enhanced nonuniformity display (right) when a display showing streaks of nonuniformity is measured.

Enhanced nonuniformity display
Spots or streaks of nonuniformity can be enhanced for easier identification of defects.

Select the best lens according to the application !



Standard lens

Versatile for measuring medium- to large-size displays.

- LCD TVs, monitors, PDP, Projectors
- Car navigation systems
- Car audio systems



Wide lens

Short-distance measurement of larger displays

- Large-screen TVs, Short-focal-length projectors
- Automotive instrument panels



Telephoto lens

Small displays or long-distance measurement

Measurements with reduced influence from the angular characteristics of subjects

- Backlights
- Automotive taillights



Low magnification macro ring (Macro 1)



High magnification macro ring (Macro 2)

Close-up measurements of small areas

- Small LCDs, organic ELs and LEDs of mobile phones and digital cameras



Example

Car instrument panel measurement example



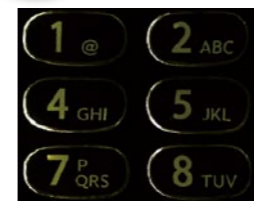
RGB image display



Pseudocolor display

Example

Cell phone keypad measurement example



RGB image display

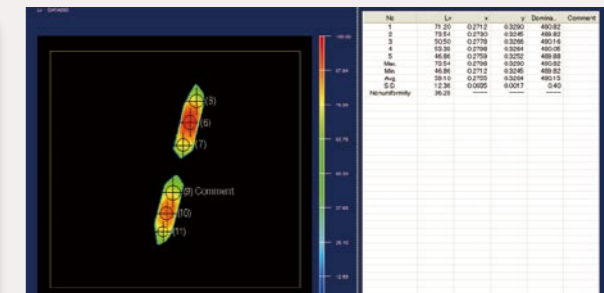


Pseudocolor display



Spot display

Statistics for areas within the spots are displayed in a list, and spots can be given numbers and labels. † mark makes verifying measurement position easy.



Improvement of luminance and chromaticity distribution!

Sensor with XYZ filters offers high correlation to the sensitivity of the human eye

The instrument features a sensor with XYZ filters to offer spectral response that correlates closely with the CIE1931 color-matching functions, instead of the RGB color-separation filters used in digital cameras or color CCD cameras. This ensures luminance/chromaticity measurements that correlate well with evaluation by human eyes.

Interchangeable lenses for measurements of various objects

The instrument can be used for various applications by selecting the optimum lens from standard, wide-angle and telephoto lenses (plus two types of macro rings for telephoto lens) according to the size of the object.

Individual lens calibration using multiple focal points

Each lens is individually calibrated for the sensitivity fluctuations caused by sensors, optical filters and the lens itself, using multiple focal points. Accurate measurement of luminance and chromaticity distribution can be started immediately after purchase.

High-resolution one-million-pixel CCD

Enables accurate measurements of even small areas.

Easy operation with included software

Other functions

- Synchronized measurement is available by numerical input of the sync frequency for the subject display device. (Settable range: 4 to 2,000 Hz)
- Integration of a maximum of 256 measurements ensures accurate measurements of even low luminance.
- User calibration for luminance and chromaticity.
- Backlight cancel function compensates for the effect of backlight variations when performing evaluation.

Compact & lightweight design enables easy setup anywhere!

Standard Model with standard lens

Lens hood for standard/telephoto lenses

Wide Model with wide lens

Wide lens
Lens hood for wide lens

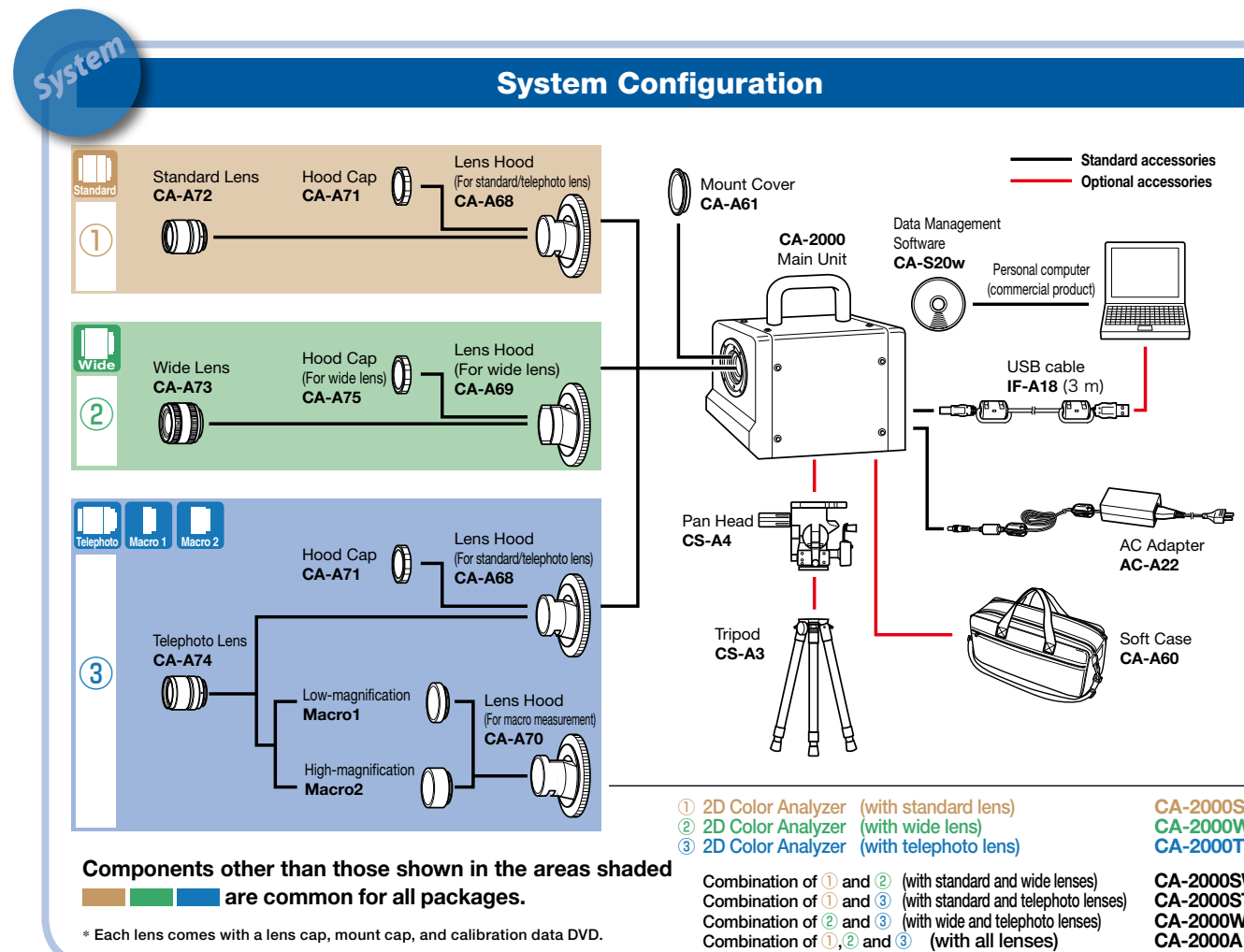
Telephoto Model with telephoto lens

Macro rings

Telephoto lens
Lens hood for macro measurement
Lens hood for standard/telephoto lenses



Main unit

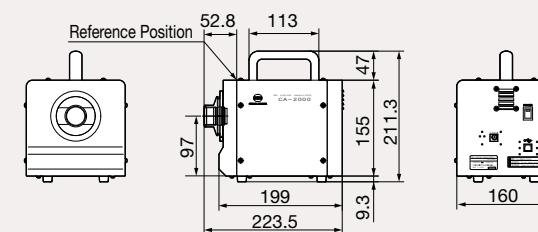


Measurable object size with typical measurement distances (Width/height of measurement square)

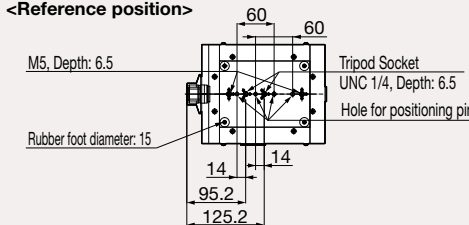
Distance (mm)	Standard lens			Wide lens			Telephoto lens			Low magnification macro ring			High magnification macro ring		
	Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)	
		16:9	4:3		16:9	4:3		16:9	4:3		16:9	4:3			
200				145	6.5	7.1									
250	98	4.4	4.8	190	8.6	9.3									
300	121	5.5	6	235	11	12							27	1.2	1.3
500	212	9.6	10.4	416	19	20				57	2.5	2.8			
900	393	18	19	779	35	38	116	5.2	5.7						
1000	439	20	22	869	39	43	130	5.9	6.4						
1500	665	30	33	1323	60	65	203	9.2	10						
2000	892	40	44	1776	80	87	275	12	14						
3000	1345	61	66	2682	121	132	420	19	21						
4000	1798	81	89	3589	162	177	566	26	28						
5000	2252	102	111	4495	203	221	711	32	35						

Dimensions (Unit: mm)

*When standard lens and lens hood are attached



<Reference position>



Main Specifications CA-2000

Model	CA-2000S	CA-2000W	CA-2000T		
Light receptor	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 color-matching function) and ND filter				
Lens	Interchangeable Standard, wide, and telephoto lenses; low-magnification and high-magnification macro rings (for use with telephoto lens)				
Measurement points (Resolution)	980 x 980 (Available to select 490 x 490 or 196 x 196 by using Data Management Software CA-S20w)				
Color indication modes	XYZ, L _y x _y , L _y u'v', TΔuv, Dominant wavelength, Excitation purity, L _y contrast				
Display modes	Pseudocolor, RGB image, Chromaticity diagram, Spot, 3D graph, Histogram, Nonuniformity enhancement, Cross section, Color difference, Multi-screen				
Measurement sizes (length per side of square) (*1)	Standard lens	Wide lens	Telephoto lens	With low-magnification macro ring	With high-magnification macro ring
	Approx. 98 mm or more (depending on the distance)	Approx. 145 mm or more (depending on the distance)	Approx. 115 mm or more (depending on the distance)	Approx. 57mm (Fixed)	Approx. 27mm (Fixed)
Measurable size for typical measurement distances (size/distance)	98 mm / 250 mm Approx.	145 mm / 200 mm Approx.	115 mm / 900 mm Approx.	57 mm / 500 mm Approx. (Fixed)	27 mm / 300 mm Approx. (Fixed)
	210 mm / 500 mm Approx.	410 mm / 500 mm Approx.	275 mm / 2,000 mm Approx.		
	440 mm / 1,000 mm Approx.	850 mm / 1,000 mm Approx.	420 mm / 3,000 mm Approx.		
Measurement luminance range (including ND filter use)	0.1 - 100,000 cd/m ²	0.1 - 100,000 cd/m ²	0.5 - 100,000 cd/m ²	0.5 - 100,000 cd/m ²	1 - 100,000 cd/m ²
Measurement time (*2)	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. 28 sec. or more; 256-time integration : Approx. 98 sec. or more				
Accuracy (*3)	Luminance	±3 %	±3 %	±3 %	±3 %
	Chromaticity	±0.005	±0.005	±0.005	±0.005
Repeatability (*4)	Luminance	0.5 %	0.5 %	0.5 %	0.5 %
	Chromaticity	0.001	0.001	0.001	0.001
Inter-point error (*5)	Luminance (*6)	±2 %	±2 %	±2 %	±2 %
	Chromaticity (*7)	±0.002	±0.002	±0.002	±0.002
Other functions	Luminance (*7)	±3 %	±3 %	±3 %	±3 %
	Chromaticity (*7)	±0.003	±0.003	±0.003	±0.003
Interface	USB 2.0 or higher				
Operating temperature and humidity range (*8)	10-30°C, Relative humidity 70% or less/No condensation				
Storage temperature and humidity range (*8)	0-30°C, Relative humidity 70% or less/No condensation, 30-35°C, Relative humidity 55% or less/No condensation				
Size	Body only	160 (W) × 164 (H) × 199 (D) mm (Height including handle: 211 mm)			
	When lens and lens hood are attached	224 (D) mm	219 (D) mm	224 (D) mm	230 (D) mm
Weight	3.5 kg approx. (when standard lens and lens hood are attached)				
Power source	AC adapter 100-240 V ~, 1.2 A, 50-60 Hz				
Standard accessories	Lens Hood	CA-A68	CA-A69	CA-A68	CA-A70
	Hood Cap	CA-A71	CA-A75	CA-A71	
	Calibration data DVD	Included with each lens.			
	Other	Mount Cover CA-A61, AC Adapter AC-A22, AC cable, USB Cable IF-A18, Data Management Software CA-S20w			
Optional accessories	Soft Case CA-A60, Tripod CS-A3, Pan Head CS-A4, Calibration certificate				

- *1: Error in angle of view: 7%
- *2: Measurement time differs depending on brightness of measurement object, PC performance, and data processing contents.
The specifications above were obtained under Konica Minolta's measurement conditions shown below:
PC's CPU : Pentium 4, 2.8GHz
Data processing : Pseudocolor display of luminance data
Resolution : 490 x 490
Shutter speed : Y measurement : 1/64 sec., XZ measurement : 1/32 sec.
Measurement subject brightness: Standard/wide lens: Approx. 80 cd/m², Telephoto lens: Approx. 300 cd/m²
Low-magnification macro ring and telephoto lens: Approx. 400 cd/m²
High-magnification macro ring and telephoto lens: Approx. 600 cd/m²
- *3: The measurement time becomes longer when the object is dark. The longest measurement time is approx. 10 seconds with 1-time integration, approx. 27 seconds with 4-time integration, approx. 95 seconds with 16-time integration, approx. 6 minutes and 8 seconds with 64-time integration and approx. 24 minutes and 19 seconds with 256-time integration
- *4: The specifications above were obtained under Konica Minolta's measurement conditions shown below:
Measurement subject brightness: Standard/wide lens: Approx. 35 cd/m², Telephoto lens: Approx. 140 cd/m²
Low-magnification macro ring and telephoto lens: Approx. 250 cd/m²
High-magnification macro ring and telephoto lens: Approx. 250 cd/m²
Distance: Minimum distance of each lens. Evaluation: Based on the average obtained within 10% range at the center of the screen. Temperature: 23°C±2°C. Relative humidity: 40%±10%. Measuring light: White, reference light source, Integration: 64 times (Normal mode)
- *5: The specifications above were obtained under Konica Minolta's measurement conditions shown below:
Resolution: 196 x 196. Shutter speed: Y measurement: 1/64 sec., XZ measurement: 1/32 sec. Gain: Normal (X1). Light intensity level: Midpoint of appropriate light intensity range. Evaluation: Based on the maximum repeatability (2σ) of all pixels. Temperature: 23°C±2°C. Relative humidity: 40%±10%. Measurement subject: White, reference light source, Integration: 64 times (Normal mode)
- *6: The specifications above were obtained under Konica Minolta's measurement conditions shown below:
Measurement subject brightness: Standard/wide lens: Approx. 40 cd/m², Telephoto lens: Approx. 160 cd/m²
Low-magnification macro ring and telephoto lens: Approx. 200 cd/m²
High-magnification macro ring and telephoto lens: Approx. 350 cd/m²
Distance: Calibration distance of each lens. Resolution: 196 x 196
Evaluation (*6): Based on the maximum/minimum values obtained in a square at the center of the screen measuring 60% of the height and width of the entire screen
(*7): Based on the maximum/minimum values obtained in the entire screen
Temperature: 23°C±2°C. Relative humidity: 40%±10%. Measurement subject: White, reference light source, Integration: 64 times (Normal mode)
- *8: Even if the instrument is stored within the specified usage (or storage) temperature humidity range, the displayed value may change depending on long-period usage or storage conditions.

CA-S20w System Requirements

OS	Windows® XP Professional SP2 (Japanese, English, and Hangul versions) Windows® XP Professional x 64 Edition (Japanese, English versions)
CPU	Pentium® 4 2.8 GHz equivalent or higher
Memory	1024 MB or more
Hard Disk	Needs free space of 80 MB at least on system drive (where OS is installed) In addition, each lens needs the following free spaces for installing calibration data. For standard lens: approx. 540 MB For wide lens: approx. 470 MB For telephoto lens: approx. 1.3 GB Also to save measurement data on hard disk, additional free space is required. (approx. 11 GB minimum for 1000 measurement data in resolution of 980 x 980)
Display	Display capable of at least 1280 x 1024 dots/65,536 colors (High color, 16 bit)
Others	CD-ROM drive (necessary to install software) DVD-ROM drive (necessary to install calibration data) (A combination drive capable of reading both CD-R and DVD-R media can be used in place of the above 2 drives.) USB port: USB ver. 2.0; Type A connector; For connecting measuring instrument Excel® 2003 (Necessary for continuous measurements using automation)
	<ul style="list-style-type: none"> Windows®, Excel® is a registered trademark or a trademark of Microsoft Corporation in the United States and other countries. Pentium® is a registered trademark or a trademark of Intel Corporation in the United States and other countries.

The specifications and drawings given here are subject to change without prior notice.
- If you have any questions about specifications, please contact your Konica Minolta representative.
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Certificate No : YKA 0937154 Registration Date : March 3, 1995
Certificate No : JQA-E-80027 Registration Date : March 12, 1997

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 SENSING, INC.
Konica Minolta Sensing Americas, Inc.
Konica Minolta Sensing Europe B.V.

Osaka, Japan
New Jersey, U.S.A.
European Headquarter / BENELUX
German Office (International)
German Office (Germany)
French Office
UK Office
Italian Office
Swiss Office
Nordic Office
Austrian Office
Polish Office

Konica Minolta (CHINA) Investment Ltd.
SE Sales Division
SE Beijing Office
SE Guangzhou Office

Konica Minolta Sensing Singapore Pte Ltd.
KONICA MINOLTA SENSING, INC. Seoul Office

Phone : 888-473-2656 (in USA), 201-236-4300 (outside USA)
Nieuwegein, Netherland
Langenhagen, Germany
München, Germany
Roissy CDG, France
Milton Keynes, United Kingdom
Milan, Italy
Dietikon, Switzerland
Västra Frölunda, Sweden
Wien, Austria
Warszawa, Poland
Shanghai, China
Beijing, China
Guangzhou, China
Singapore
Seoul, Korea

Fax : 201-785-2480
Fax : +31(0)30 248-1211
Fax : +49(0)511 7404-807
Fax : +49(0)89 630267-67
Fax : +33(0)1 493-84771
Fax : +44(0)1908 540-629
Fax : +39(0)23 9011219
Fax : +41(0)43 322-9809
Fax : +46(0)31 474945
Fax : +43(0)1 87882-431
Fax : +48(0)22 56033-01
Fax : +86-021-5489 0005
Fax : +86-010-8522 1241
Fax : +86-020-3826 4223
Fax : +65 6560-9721
Fax : 02-523-9729

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

<http://konicaminolta.com/about/se/contact.html>

CA-2000の使用・保管温湿度に関するご注意

できるだけ高温高湿環境を避けて、基準環境（温度23℃、相対湿度40％）に近い温湿度環境でご使用および保管いただくことをおすすめいたします。また本製品の測定精度を維持するために、年1回程度の定期的な点検をおすすめします。点検の詳細については、製品に同梱の“サービスのご案内”に記載の最寄りの連絡先までお問い合わせください。

使用温湿度範囲内で使用している場合や保管温湿度範囲内で保管している場合であっても、長期間の使用や保管の状況によっては指示値が変化することがあります。

下記のような高温状態が長期間続いた場合、指示値がおおよ次のように変化することがあります。

温度：30℃、相対湿度：70％、連続放置期間：720時間（30日）

確度 輝度：±0.4％、色度：±0.003

測定点間誤差 輝度：±0.2％、色度：±0.0003

温度：35℃、相対湿度：55％、連続放置期間：336時間（14日）

確度 輝度：±1％、色度：±0.006

測定点間誤差 輝度：±0.5％、色度：±0.001

これらの変化は、本製品を長期間使用・保管することにより、本製品に使用している部材が温度や湿度の影響を受けることにより発生します。特に光学フィルタは温度や湿度の影響を受けやすく、耐温湿度性向上の対策を施しておりますが、長期間の使用や保管の影響の蓄積により指示値が変化することがあります。

コニカミノルタ センシング株式会社

Cautions Regarding Temperature / Humidity Conditions for CA-2000

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 Sensing authorized service facility.

Even if the product is used within the specified operating temperature/humidity range or stored within the specified storage temperature/humidity range, the displayed values may be affected by long-term conditions of use or storage. 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: 30° C; Relative humidity:70 %; Period under these conditions: 720 hours (30 days)

Accuracy: Luminance: ± 0.4 %; Chromaticity: ± 0.003

Inter-point error: Luminance: ± 0.2 %; Chromaticity: ± 0.0003

Temperature: 35° C; Relative humidity:55 %; Period under these conditions: 336 hours (14 days)

Accuracy: Luminance: ± 1 %; Chromaticity: ± 0.006

Inter-point error: Luminance: ± 0.5 %; Chromaticity: ± 0.001

These differences in display values are due to the instrument materials and/or components being affected by the temperature and humidity conditions of long-term use or storage. In particular, optical filters are easily affected by temperature or humidity. Although measures have been taken to improve resistance to temperature/humidity changes, the accumulated effect of long-term use or storage may affect the displayed values.