



KONICA MINOLTA

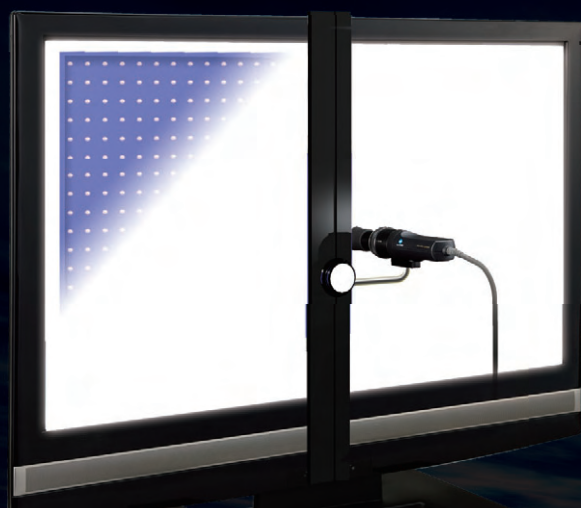
# Display Color Analyzer CA-310 <sup>11</sup>

Support for LED backlights

*The next-generation model that surpasses the CA-210*

*For high-speed, high-accuracy measurements  
of LED-backlit LCD TVs*

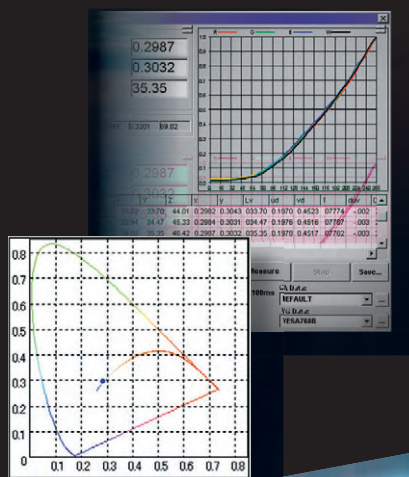
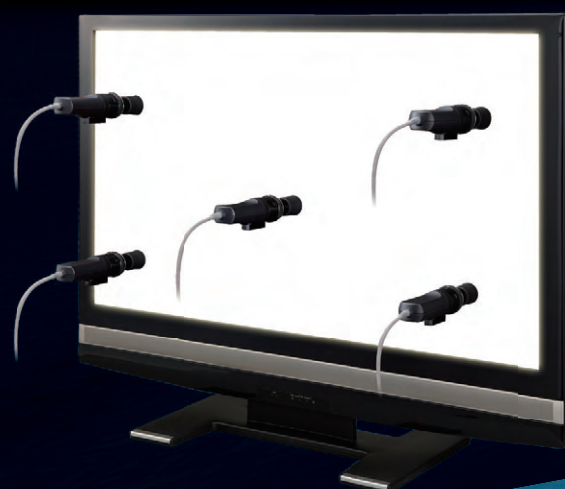
LED television



Smartphone



Uniformity



The Standard in Measuring Color & Light

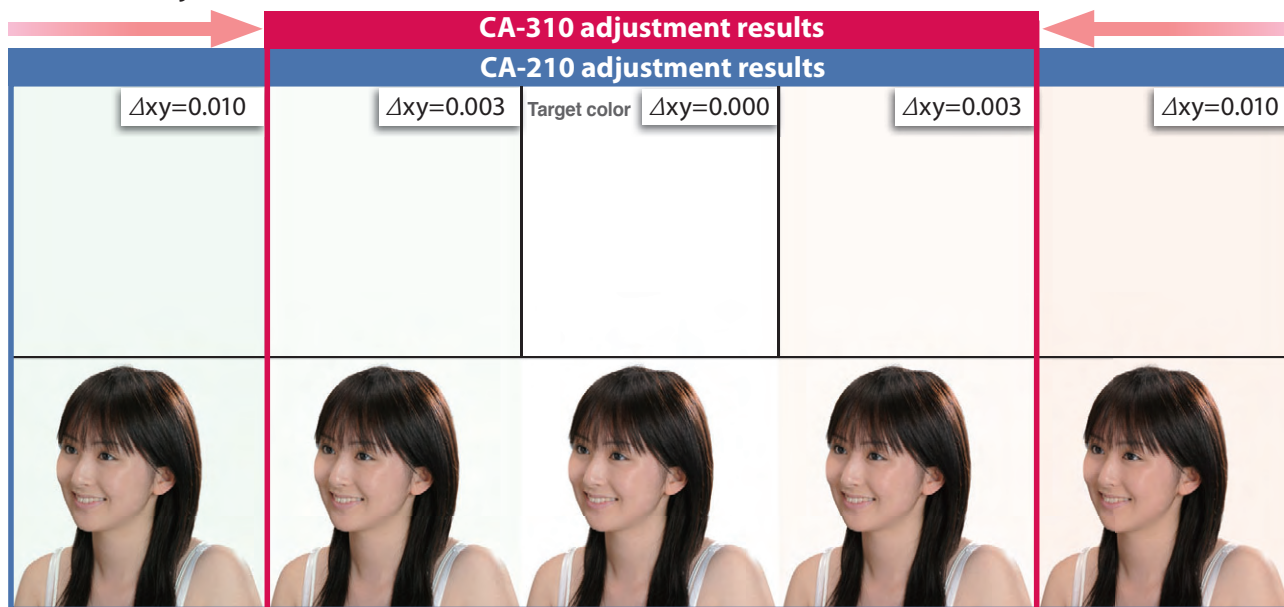
Giving Shape to Ideas

# Enables high-accuracy adjustment of EL/LED-backlit LCD TV gamma/white balance to greatly improve efficiency.

## White balance adjustment has advanced even further!

Our previous Display Color Analyzer CA-210 could adjust the white balance of LED-backlit LCD TVs to  $\Delta xy=0.010$ , but the new Display Color Analyzer CA-310 enables adjustment to  $\Delta xy=0.003$  so colors are even more true, as can be seen below.

### White balance adjustment of LED-backlit LCD TVs



## Enables high-speed measurement of even extremely low luminances down to 0.005 cd/m<sup>2</sup>

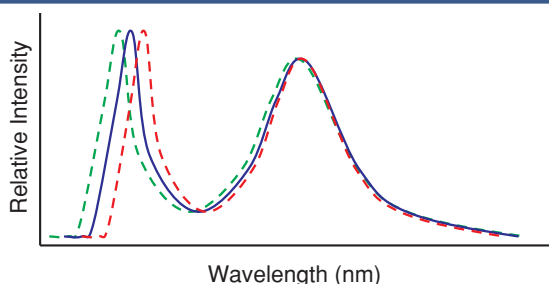
Sensor noise reduction technology has been used to enable measurements even in the extremely low luminance region around 0.005 cd/m<sup>2</sup> at speeds as fast as 4 times per second. This allows the high-speed high-accuracy measurement essential for manufacturing high-grade displays. In addition, at luminances higher than 2.0 cd/m<sup>2</sup>, 20 measurements per second are possible.



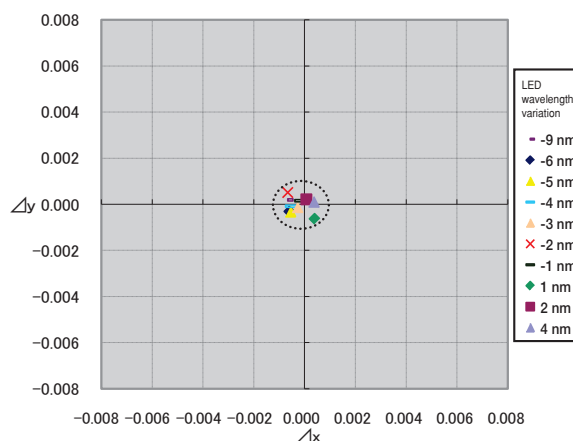
## Reduces errors due to LED emission distribution variations to less than 1/3.

Variations in the emission distribution of LED backlights result in individual differences of about 10nm in peak intensity wavelength. If LED-backlit LCD TVs with such individual differences are adjusted using conventional color analyzers, color differences of close to 0.010 on the xy chromaticity diagram may occur. But the CA-310 has sensor sensitivities that more closely match the CIE 1931 color-matching functions, enabling the color difference in the same case to be reduced to around 0.003, suppressing errors to less than 1/3.

### Variations in the emission distribution of LED backlights



### Measurement errors for LED backlights



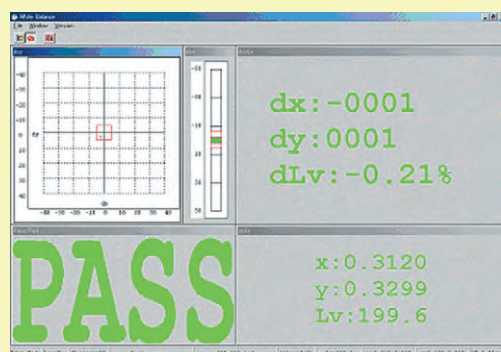
\*Errors (differences from true values) for white LEDs with different peak wavelengths when measured using CA-310. User calibration to standard LED performed.



## PC Software for Color Analyzer CA-SDK (Standard accessory)

Standard accessory SDK helps create software easily according to needs.

Sample software is bundled; you can start data collection easily.

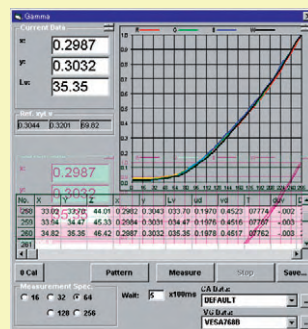


Example of White Balance Adjustment Software made by SDK

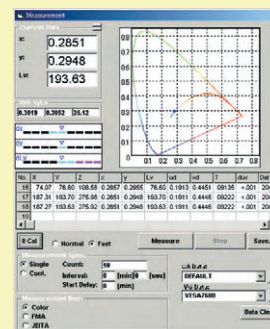
### Required system

OS: Windows® XP, Vista, 7

Windows® and Excel® are a trademark of Microsoft Corporation in the USA and other countries.



Sample software Gamma



Sample software Color

## Sample software (Standard)

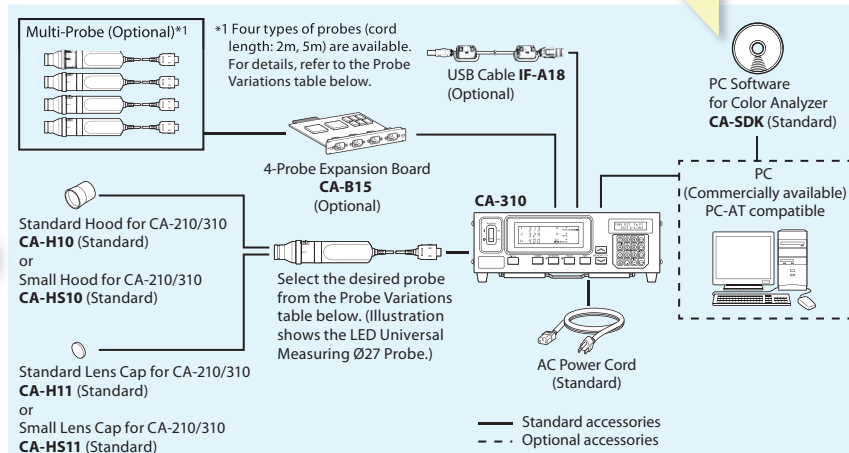
- Cal** CA-210 can be corrected in the matrix calibration method using Konica Minolta's spectroradiometer CS-1000A.
- Color** The measurement data of CA-210 can be acquired into the PC. Drift tests, LCD stability test and so on can be performed easily. The acquired data can be read with Excel® or other spreadsheet software.
- Contrast** Multi-point measurement (5, 9, or 25 points) can be made for white uniformity and contrast measurement.
- Gamma** R, G, B, and W gamma measurements for gradations of 16, 32, 64, 128, and 256 steps.

Expandable up to 5 measuring probes. (Requires expansion board CA-B15)



Number of digits for luminance display increased, enabling display to 0.0001 cd/m².

## System Diagram



## Probe variations

This table is based on the most popular method for controlling emission intensity for each display type.

\* Measurements of displays using certain control methods are not possible. For details of measurement compatibility, contact your nearest Konica Minolta representative.

Examples for which measurement is not possible:

- Displays which use PWM, etc. for control of emission intensity.
- Displays with backlights which emit intermittently.
- Displays which write black for each frame, etc.

- Recommended
- △ Measurement possible with restrictions, but probes marked with ○ are recommended
- × Measurement not possible

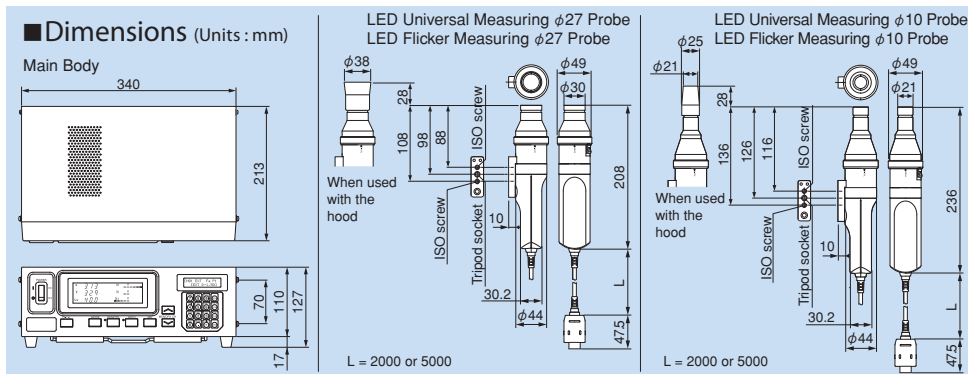
		CA-310 Probe			
		LED Universal Measuring Probe		LED Flicker Measuring Probe	
		Ø27 Probe CA-PU32 (2m) CA-PU35 (5m)	Ø10 Probe CA-PSU32 (2m) CA-PSU35 (5m)	Ø27 Probe CA-P32 (2m) CA-P35 (5m)	Ø10 Probe CA-PS32 (2m) CA-PS35 (5m)
Applicability for different display types					
Transmissive / semi-transmissive LCD	Active Matrix Driven	○	○	○*	○*
	Passive Matrix Driven	○	○	×	×
OLED	Active Matrix Driven	○	○	○*	○*
	Passive Matrix Driven	○	○	×	×
PDP		○	△	×	×
FED		○	○	×	×
Rear Screen Projector	LCD	Active Matrix Driven	○	△	○*
		Passive Matrix Driven	○	△	×
	CRT	○	△	×	×

(LED Flicker Measuring Probes are unsuitable for measurements of CRTs.)

# Specifications

Model	CA-310(LED Universal Measuring Ø27 Probe)	CA-310(LED Universal Measuring Ø10 Probe)	CA-310(LED Flicker Measuring Ø27 Probe)	CA-310(LED Flicker Measuring Ø10 Probe)
Detector	Silicon photo cell			
Measurement area	Ø27 mm	Ø10 mm	Ø27 mm	Ø10 mm
Acceptance angle	±2.5°	±5°	±2.5°	±5°
Measurement distance	30±10 mm	30±5 mm	30±10 mm	30±5 mm
Display range	Luminance	0.0001 to 1000 cd/m <sup>2</sup>	0.0001 to 1000 cd/m <sup>2</sup>	0.0001 to 3000 cd/m <sup>2</sup>
Luminance	Chromaticity	Displayed in 4 or 3-digit value (Can be chosen)		
	Measurement range	0.0050 to 1000 cd/m <sup>2</sup>	0.0150 to 3000 cd/m <sup>2</sup>	0.0050 to 1000 cd/m <sup>2</sup>
	Accuracy (for white)*1	0.0050 to 0.0999 cd/m <sup>2</sup> ±4%±0.0015 cd/m <sup>2</sup> 0.1000 to 9.999 cd/m <sup>2</sup> ±3%±0.0010 cd/m <sup>2</sup> 10.00 to 1000 cd/m <sup>2</sup> ±2%±0.0010 cd/m <sup>2</sup>	0.0150 to 0.2999 cd/m <sup>2</sup> ±4%±0.0045 cd/m <sup>2</sup> 0.3000 to 29.999 cd/m <sup>2</sup> ±3%±0.0030 cd/m <sup>2</sup> 30.00 to 3000 cd/m <sup>2</sup> ±2%±0.0030 cd/m <sup>2</sup>	0.0050 to 0.0999 cd/m <sup>2</sup> ±4%±0.0015 cd/m <sup>2</sup> 0.1000 to 9.999 cd/m <sup>2</sup> ±3%±0.0010 cd/m <sup>2</sup> 10.00 to 1000 cd/m <sup>2</sup> ±2%±0.0010 cd/m <sup>2</sup>
	Repeatability(2σ)*1	0.0050 to 0.0999 cd/m <sup>2</sup> 1% + 0.0010 cd/m <sup>2</sup> 0.1000 to 0.9999 cd/m <sup>2</sup> 0.2% + 0.0010 cd/m <sup>2</sup> 1.000 to 1000 cd/m <sup>2</sup> 0.1%+0.0010 cd/m <sup>2</sup>	0.0150 to 0.2999 cd/m <sup>2</sup> 1% + 0.0030 cd/m <sup>2</sup> 0.3000 to 2.999 cd/m <sup>2</sup> 0.2% + 0.0030 cd/m <sup>2</sup> 3.000 to 3000 cd/m <sup>2</sup> 0.1% + 0.0030 cd/m <sup>2</sup>	0.0050 to 0.0999 cd/m <sup>2</sup> 1% + 0.0010 cd/m <sup>2</sup> 0.1000 to 0.9999 cd/m <sup>2</sup> 0.2% + 0.0010 cd/m <sup>2</sup> 1.000 to 1000 cd/m <sup>2</sup> 0.1%+0.0010 cd/m <sup>2</sup>
Chromaticity	Measurement range	0.0500 to 1000 cd/m <sup>2</sup>	0.1500 to 3000 cd/m <sup>2</sup>	0.0500 to 1000 cd/m <sup>2</sup>
	Accuracy *1 (temperature:23±2°, relative humidity: (40±10%))	0.0500 to 4.999 cd/m <sup>2</sup> ±0.005 for white 5.000 to 19.99 cd/m <sup>2</sup> ±0.004 for white 20.00 to 1000 cd/m <sup>2</sup> ±0.003 for white 120 cd/m <sup>2</sup> ±0.002 for white (±0.004 for monochrome)*2	0.1500 to 14.99 cd/m <sup>2</sup> ±0.005 for white 15.00 to 59.99 cd/m <sup>2</sup> ±0.004 for white 60.00 to 3000 cd/m <sup>2</sup> ±0.003 for white 120 cd/m <sup>2</sup> ±0.002 for white (±0.004 for monochrome)*2	0.0500 to 4.999 cd/m <sup>2</sup> ±0.005 for white 5.000 to 19.99 cd/m <sup>2</sup> ±0.004 for white 20.00 to 1000 cd/m <sup>2</sup> ±0.003 for white 120 cd/m <sup>2</sup> ±0.002 for white (±0.004 for monochrome)*2
	Repeatability(2σ)*1	0.0500 to 0.0999 cd/m <sup>2</sup> 0.010 0.1000 to 0.1999 cd/m <sup>2</sup> 0.004 0.2000 to 0.4999 cd/m <sup>2</sup> 0.002 0.5000 to 1000 cd/m <sup>2</sup> 0.001	0.1500 to 0.2999 cd/m <sup>2</sup> 0.010 0.3000 to 0.5999 cd/m <sup>2</sup> 0.004 0.6000 to 1.499 cd/m <sup>2</sup> 0.002 1.500 to 3000 cd/m <sup>2</sup> 0.001	0.0500 to 0.0999 cd/m <sup>2</sup> 0.010 0.1000 to 0.1999 cd/m <sup>2</sup> 0.004 0.2000 to 0.4999 cd/m <sup>2</sup> 0.002 0.5000 to 1000 cd/m <sup>2</sup> 0.001
	Repeatability(2σ)*1	0.0500 to 0.0999 cd/m <sup>2</sup> 0.010 0.1000 to 0.1999 cd/m <sup>2</sup> 0.004 0.2000 to 0.4999 cd/m <sup>2</sup> 0.002 0.5000 to 1000 cd/m <sup>2</sup> 0.001	0.1500 to 0.2999 cd/m <sup>2</sup> 0.010 0.3000 to 0.5999 cd/m <sup>2</sup> 0.004 0.6000 to 1.499 cd/m <sup>2</sup> 0.002 1.500 to 3000 cd/m <sup>2</sup> 0.001	0.0500 to 0.0999 cd/m <sup>2</sup> 0.010 0.1000 to 0.1999 cd/m <sup>2</sup> 0.004 0.2000 to 0.4999 cd/m <sup>2</sup> 0.002 0.5000 to 1000 cd/m <sup>2</sup> 0.001
Flicker Contrast method	Measurement range	-	5 cd/m <sup>2</sup> or higher	15 cd/m <sup>2</sup> or higher
	Display range	-	0.0 ~ 999.9 %	-
	Accuracy	-	±1 % (Flicker frequency: 30 Hz AC/DC 10% sine wave) ±2 % (Flicker frequency: 60 Hz AC/DC 10% sine wave)	-
	Repeatability(2σ)	-	1 % (Flicker frequency: 20 to 65 Hz AC/DC 10% sine wave)	-
Flicker JEITA method *3	Measurement range	-	5 cd/m <sup>2</sup> or higher	15 cd/m <sup>2</sup> or higher
	Accuracy	-	±0.5 dB (Flicker frequency: 30 Hz AC/DC 4% (-40 dB) sine wave) ±1.0 dB (Flicker frequency: 30 Hz AC/DC 1.2% (-50 dB) sine wave)	-
	Repeatability(2σ)	-	0.1 dB (Flicker frequency: 30 Hz AC/DC 4% (-40 dB) sine wave) 0.3 dB (Flicker frequency: 30 Hz AC/DC 1.2% (-50 dB) sine wave)	-
	Repeatability(2σ)	-	0.0050 to 0.0999 cd/m <sup>2</sup> 4(3.5) times/sec. 0.1000 to 1.999 cd/m <sup>2</sup> 5(4.5) times/sec. 2.000 to 1000 cd/m <sup>2</sup> 20(17) times/sec.	-
Measure-ment speed*4	xyl <sub>v</sub>	0.0050 to 0.0999 cd/m <sup>2</sup> 4(3.5) times/sec. 0.1000 to 1.999 cd/m <sup>2</sup> 5(4.5) times/sec. 2.000 to 1000 cd/m <sup>2</sup> 20(17) times/sec.	0.0150 to 0.2999 cd/m <sup>2</sup> 4(3.5) times/sec. 0.3000 to 5.999 cd/m <sup>2</sup> 5(4.5) times/sec. 6.000 to 3000 cd/m <sup>2</sup> 20(17) times/sec.	0.0050 to 0.0999 cd/m <sup>2</sup> 4(3.5) times/sec. 0.1000 to 1.999 cd/m <sup>2</sup> 5(4.5) times/sec. 2.000 to 1000 cd/m <sup>2</sup> 20(17) times/sec.
	Flicker Contrast	-	16(16) times/sec.	-
	Flicker JEITA *3	-	0.5 (0.3)times/sec. *5	-
	Flicker JEITA *3	-	0.5 (0.3)times/sec. *5	-
Display	Digital	xyl <sub>v</sub> , TΔuv <sub>L</sub> , RGB analyze, XYZ, u'v' <sub>L</sub>	xyl <sub>v</sub> , TΔuv <sub>L</sub> , RGB analyze, XYZ, u'v' <sub>L</sub> , Flicker (Contrast method) *3	xyl <sub>v</sub> , TΔuv <sub>L</sub> , RGB analyze, XYZ, u'v' <sub>L</sub> , Flicker (Contrast method) *3
	Analog	ΔxΔyΔz, R/G B/G ΔG, ΔR B/R G/R	ΔxΔyΔz, R/G B/G ΔG, ΔR B/R G/R, Flicker (Contrast method) *3	ΔxΔyΔz, R/G B/G ΔG, ΔR B/R G/R, Flicker (Contrast method) *3
	LCD	16 characters by 2 lines (with backlight)	-	-
	LCD	16 characters by 2 lines (with backlight)	-	-
SYNC mode	NTSC, PAL, EXT, UNIV, INT			
Object under measurement	Vertical synchronization frequency: 40 to 200 Hz			
Memory channel	100 channels			
Analyzer function	Standard function			
Interface	USB; RS-232C (38,400 bps or below)			
Multi-point Measurement	Max. 5 points (Use 4-Probe Expansion Board CA-B15)			
Operation temperature/humidity range	Temperature: 10 to 28°C; relative humidity 70% or less with no condensation Luminance change: ±2% of reading for white Chromaticity change ±0.002 for white, ±0.006 for monochrome from reading of Konica Minolta's standard LCD *1, 120 cd/m <sup>2</sup> , with 23°C 40%			
Storage temperature/humidity range	0 to 28°C; relative humidity 70% or less with no condensation 28 to 40°C: relative humidity 40% or less with no condensation			
Input voltage range	100-240V~, 50-60 Hz, 50 VA			
Size/weight	340(W)×127(H)×216(D) mm/3.58 kg			
Probe	Ø49×208 mm / 530 g	Ø49×236 mm / 550 g	Ø49×208 mm / 530 g	Ø49×236 mm / 550 g

\*1 The chromaticity and luminance are measured under Konica Minolta's condition (standard LCD(6500K, 9300K) is used). \*2 The luminance for monochrome is measured when the reading of luminance for white is 120 cd/m<sup>2</sup>.  
\*3 Measurement of flicker (JEITA method) is supported by SDK software. \*4 Measuring probe connected to probe connector P1 only, used USB(used RS-232C Baud rate: 38400 bps) \*5 Measured by Konica Minolta's PC (P3-600 MHz)



- Select the desired type of LED Universal Measuring type probe or LED Flicker Measuring type probe.
- Contains mercury in the backlighting of LCD used for display. Dispose of according to local, state or federal laws.
- KONICA MINOLTA, the Konica Minolta logo and symbol mark, and "Giving Shape to ideas" are registered trademarks or trademarks of KONICA MINOLTA, INC.
- Screens shown are for illustration purpose only.
- The specifications and appearance shown herein are subject to change without notice.
- Some lamp control methods may make accurate measurements difficult. For details, please contact your nearest Konica Minolta sales office or dealer.



## 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.



Certificate No : LQA 0960094/A  
Registration Date : March 3, 1995



Certificate No : JQA-E-80027  
Registration Date : March 12, 1997

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