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KONICA MINOLTA

Display Color Analyzer **CA-310** 9

Support for LED backlights

The next-generation model that surpasses the CA-210

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

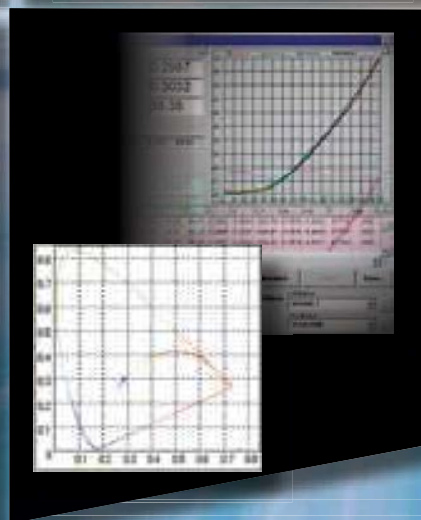
LED television



Smartphone



Uniformity



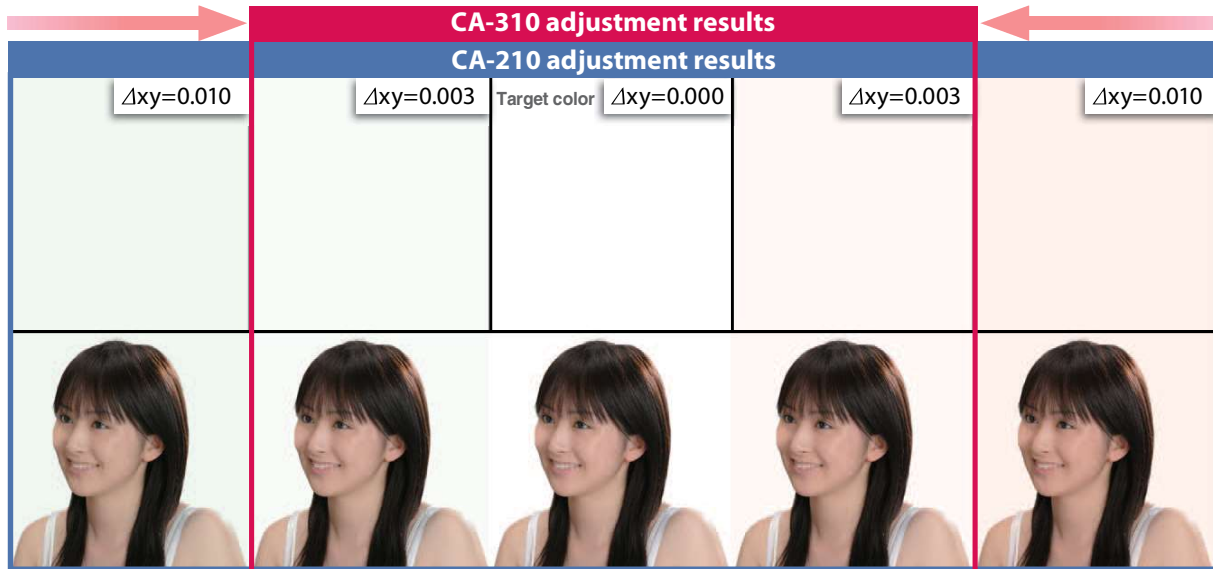
Giving Shape to Ideas

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/m²

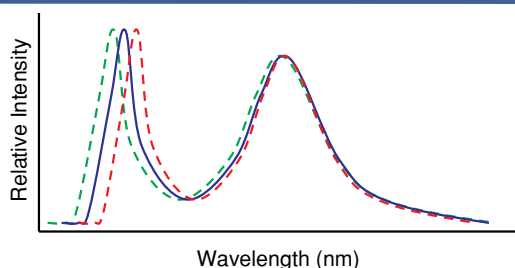
Sensor noise reduction technology has been used to enable measurements even in the extremely low luminance region around 0.005 cd/m² at speeds as fast as 4 times per second. This allows the high-speed high-accuracy measurement essential for manufacturing high-grade displays. In addition, at luminances higher than 2.0 cd/m², 20 measurements per second are possible.



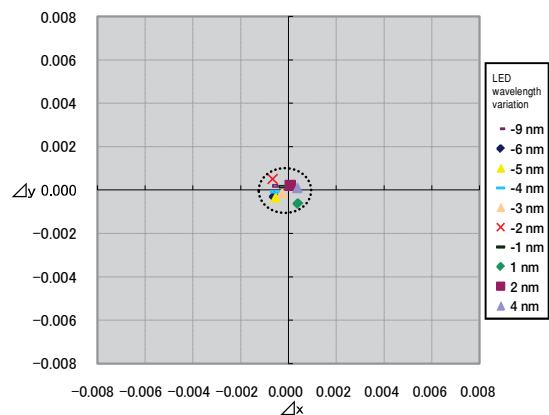
Reduces errors due to LED emission distribution variations to less than 1/3.

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



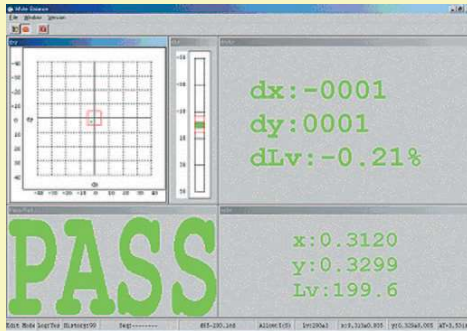
Measurement errors for LED backlights



*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)

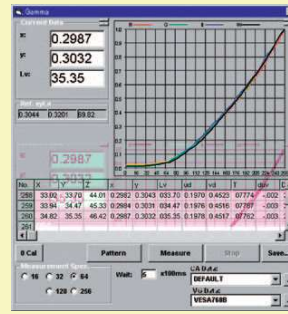
Standard accessory SDK helps create software easily according to needs.
Sample software is bundled; you can start data collection easily.



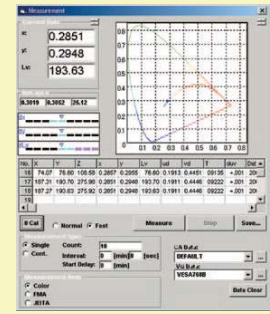
Example of White Balance Adjustment Software made by SDK

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)

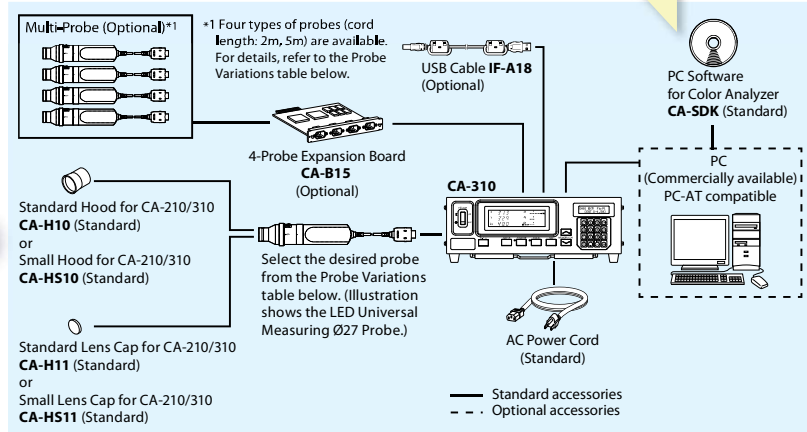
- Cal** CA-210 can be corrected in the matrix calibration method using Konica Minolta's spectroradiometer CS-1000A.
- Color** The measurement data of CA-210 can be acquired into the PC. Drift tests, LCD stability test and so on can be performed easily. The acquired data can be read with Excel® or other 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

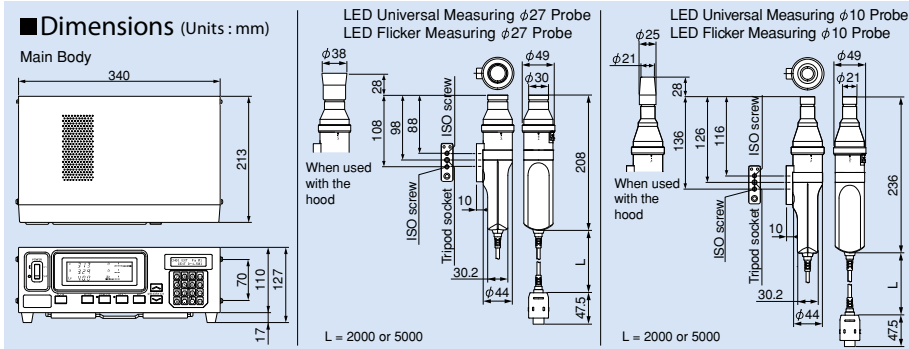
		CA-310 Probe				
		LED Universal Measuring Probe		LED Flicker Measuring Probe		
		Ø27 Probe CA-PU32 (2m) CA-PU35 (5m)	Ø10 Probe CA-PSU32 (2m) CA-PSU35 (5m)	Ø27 Probe CA-P32 (2m) CA-P35 (5m)	Ø10 Probe CA-PS32 (2m) CA-PS35 (5m)	
Applicability for different display types						
Transmissive / semi-transmissive 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	○	△	×	×
	DLP	○	△	×	×	
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)
Receptor	Detector: Silicon photo cell			
Measurement area	Ø27mm	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 ² Chromaticity Displayed in 4 or 3-digit value (Can be chosen)	0.0001 to 3000 cd/m ²	0.0001 to 1000 cd/m ²	0.0001 to 3000 cd/m ²
Luminance	Measurement range 0.0050 to 1000 cd/m ² Accuracy (for white)*1 0.0050 to 0.9999 cd/m ² ±4%±0.0015 cd/m ² 0.1000 to 9.999 cd/m ² ±3%±0.0010 cd/m ² 10.00 to 1000 cd/m ² ±2%±0.0010 cd/m ² Repeatability(2σ)*1 0.0050 to 0.9999 cd/m ² 1% + 0.0010 cd/m ² 0.1000 to 9.9999 cd/m ² 0.2% + 0.0010 cd/m ² 1.000 to 1000 cd/m ² 0.1%+0.0010 cd/m ²	0.0150 to 3000 cd/m ² 0.0150 to 2.9999 cd/m ² ±4%±0.0045 cd/m ² 0.3000 to 29.999 cd/m ² ±3%±0.0030 cd/m ² 30.00 to 3000 cd/m ² ±2%±0.0030 cd/m ² 0.0150 to 0.2999 cd/m ² 1% + 0.0030 cd/m ² 0.3000 to 2.999 cd/m ² 0.2% + 0.0030 cd/m ² 3.000 to 3000 cd/m ² 0.1% + 0.0030 cd/m ²	0.0050 to 1000 cd/m ² 0.0050 to 0.9999 cd/m ² ±4%±0.0015 cd/m ² 0.1000 to 9.999 cd/m ² ±3%±0.0010 cd/m ² 10.00 to 1000 cd/m ² ±2%±0.0010 cd/m ² 0.0050 to 0.9999 cd/m ² 1% + 0.0010 cd/m ² 0.1000 to 9.9999 cd/m ² 0.2% + 0.0010 cd/m ² 1.000 to 1000 cd/m ² 0.1%+0.0010 cd/m ²	0.0150 to 3000 cd/m ² 0.0150 to 2.9999 cd/m ² ±4%±0.0045 cd/m ² 0.3000 to 29.999 cd/m ² ±3%±0.0030 cd/m ² 30.00 to 3000 cd/m ² ±2%±0.0030 cd/m ² 0.0150 to 0.2999 cd/m ² 1% + 0.0010 cd/m ² 0.3000 to 2.999 cd/m ² 0.2% + 0.0030 cd/m ² 3.000 to 3000 cd/m ² 0.1% + 0.0030 cd/m ²
Chromaticity	Measurement range 0.0500 to 1000 cd/m ² Accuracy *1 (temperature:23±2°, relative humidity: (40±10)%) 0.0500 to 4.9999 cd/m ² ±0.005 for white 5.000 to 19.99 cd/m ² ±0.004 for white 20.00 to 1000 cd/m ² ±0.003 for white 120 cd/m ² ±0.002 for white (±0.004 for monochrome)*2 Repeatability(2σ)*1 0.0500 to 0.9999 cd/m ² 0.010 0.1000 to 0.1999 cd/m ² 0.004 0.2000 to 0.4999 cd/m ² 0.002 0.5000 to 1000 cd/m ² 0.001	0.1500 to 14.99 cd/m ² ±0.005 for white 15.00 to 59.99 cd/m ² ±0.004 for white 60.00 to 3000 cd/m ² ±0.003 for white 120 cd/m ² ±0.002 for white (±0.004 for monochrome)*2 0.1500 to 0.2999 cd/m ² 0.010 0.3000 to 0.5999 cd/m ² 0.004 0.6000 to 1.499 cd/m ² 0.002 1.500 to 3000 cd/m ² 0.001	0.0500 to 1000 cd/m ² 0.0500 to 4.999 cd/m ² ±0.005 for white 5.000 to 19.99 cd/m ² ±0.004 for white 20.00 to 1000 cd/m ² ±0.003 for white 120 cd/m ² ±0.002 for white (±0.004 for monochrome)*2 0.0500 to 0.9999 cd/m ² 0.010 0.1000 to 0.1999 cd/m ² 0.004 0.2000 to 0.4999 cd/m ² 0.002 0.5000 to 1000 cd/m ² 0.001	0.1500 to 14.99 cd/m ² ±0.005 for white 15.00 to 59.99 cd/m ² ±0.004 for white 60.00 to 3000 cd/m ² ±0.003 for white 120 cd/m ² ±0.002 for white (±0.004 for monochrome)*2 0.1500 to 0.2999 cd/m ² 0.010 0.3000 to 0.5999 cd/m ² 0.004 0.6000 to 1.499 cd/m ² 0.002 1.500 to 3000 cd/m ² 0.001
Flicker Contrast method	Measurement range Display range Accuracy Repeatability(2σ)	- - - -	5 cd/m ² or higher 0.0 ~ 999.9 % ±1 % (Flicker frequency: 30 Hz AC/DC 10% sine wave) ±2 % (Flicker frequency: 60 Hz AC/DC 10% sine wave) 1 % (Flicker frequency: 20 to 65 Hz AC/DC 10% sine wave)	15 cd/m ² or higher
Flicker JEITA method *3	Measurement range Accuracy Repeatability(2σ)	- - -	5 cd/m ² or higher ±0.5 dB (Flicker frequency: 30 Hz AC/DC 10% sine wave) 0.3 dB (Flicker frequency: 30 Hz AC/DC 10% sine wave)	15 cd/m ² or higher
Measurement speed*4	xyL _w 0.0050 to 0.9999 cd/m ² 4(3.5) times/sec. 0.1000 to 1.999 cd/m ² 5(4.5) times/sec. 2.000 to 1000 cd/m ² 20(17) times/sec. Flicker Contrast Flicker JEITA *3	0.0150 to 0.2999 cd/m ² 4(3.5) times/sec. 0.3000 to 5.999 cd/m ² 5(4.5) times/sec. 6.000 to 3000 cd/m ² 20(17) times/sec. -	0.0050 to 0.9999 cd/m ² 4(3.5) times/sec. 0.1000 to 1.999 cd/m ² 5(4.5) times/sec. 2.000 to 1000 cd/m ² 20(17) times/sec. 16(16) times/sec. 0.5 (0.3) times/sec. *5	0.0150 to 0.2999 cd/m ² 4(3.5) times/sec. 0.3000 to 5.999 cd/m ² 5(4.5) times/sec. 6.000 to 3000 cd/m ² 20(17) times/sec.
Display	Digital Analog LCD	xyL _w , TΔuvL _w , RGB analyze, XYZ, u'v'L _w Δx/Δy/ΔL _w , R/G B/G ΔG, ΔR B/R G/R 16 characters by 2 lines (with backlight)	xyL _w , TΔuvL _w , RGB analyze, XYZ, u'v'L _w , Flicker (Contrast method) *3 Δx/Δy/ΔL _w , R/G B/G ΔG, ΔR B/R G/R, Flicker (Contrast method) *3	
SYNC mode	NTSC, PAL, EXT, UNIV, INT			
Object under measurement	Vertical synchronization frequency: 40 to 200 Hz		Vertical synchronization frequency: 40 to 200 Hz (Luminance or chromaticity measurement), 40 to 130 Hz (Flicker measurement)	
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 ² , 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	Main body 340(W)×127(H)×216(D) mm/3.58 kg	Probe Ø49×236 mm / 550 g	Probe Ø49×208 mm / 530 g	Probe 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/m². *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 and the Konica Minolta logo and the 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.: LRO 0960094/A
 Registration Date: March 3, 1995



Certificate No.: JOA-E-90027
 Registration Date: March 12, 1997

KONICA MINOLTA, INC.
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 Konica Minolta Sensing Europe B.V.

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Konica Minolta (CHINA) Investment Ltd.

Konica Minolta Sensing Singapore Pte Ltd.
 Konica Minolta Sensing Korea Co., Ltd.
 Konica Minolta, Inc.

Sensing Business
 Thailand Representative Office

Phone : 888-473-2656 (in USA), 201-236-4300 (outside USA)
 Nieuwegein, Netherlands Phone : +31 (0) 30 248-1193
 München, Germany Phone : +49 (0) 89 4357 156 0
 Roissy CDG, France Phone : +33 (0) 1 80 11 10 70
 Warrington, United Kingdom Phone : +44 (0) 1925 467300
 Cinisello Balsamo, Italy Phone : +39 02849488.00
 Dietikon, Switzerland Phone : +41 (0) 43 322-9800
 Västra Frölunda, Sweden Phone : +46 (0) 31 7099464
 Wrocław, Poland Phone : +48 (0) 71 73452-11
 Shanghai, China Phone : +86 (0) 21-5489 0202
 Beijing, China Phone : +86 (0) 10-8522 1551
 Guangdong, China Phone : +86 (0) 20-3826 4220
 Chongqing, China Phone : +86 (0) 23-6773 4988
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 Hubei, China Phone : +86 (0) 27-8544 9942
 Singapore Phone : +65 6563-5533
 Goyang-si, Korea Phone : +82 (0) 2-523-9726
 Bangkok, Thailand Phone : +66-2361-3730

Fax : 201-785-2482
 Fax : +31 (0) 30 248-1280
 Fax : +49 (0) 89 4357 156 99
 Fax : +33 (0) 1 80 11 10 82
 Fax : +44 (0) 1925 711143
 Fax : +39 02849488.30
 Fax : +41 (0) 43 322-9809

Fax : +48 (0) 71 734 52 10
 Fax : +86- (0) 21-5489 0005
 Fax : +86- (0) 10-8522 1241
 Fax : +86- (0) 20-3826 4223
 Fax : +86- (0) 23-6773 4799
 Fax : +86- (0) 532-8079 1873
 Fax : +86- (0) 27-8544 9991
 Fax : +65 6560-9721
 Fax : +82 (0) 31-995-6511
 Fax : +66-2361-3771

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

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