KEY FEATURES

- Luminance and chromaticity measurement of Color Display
- Support LED backlights display
- 0.005 cd/m² low luminance measurement (A712301)
- Wide luminance display range : (option)
  0.0001 to 25,000 cd/m² (A712301)
  0.01 to 200,000 cd/m² (A712302)
  0.01 to 6,000 cd/m² (A712200)
- High accuracy measurement
- Maximum 9 display modes: xyY, T△uvY, u' v' Y, RGB, XYZ, FMA(A712200), FLVL(A712200), Contrast, Program
- Support contrast, JEITA and VESA for flicker measurements (A712200)
- Able to control Video Pattern Generator and UUT (Unit Under Test)
- Built-in contrast measurement function to calculate the contrast ratio directly
- Equipped with programmable test items that can complete the planned tests with one single button
- Support USB flash disk that can copy the test procedures to other station for use
- Judgment function embedded to judge the test result automatically with one single button
- Calibration period setting and reminding function
- Memory for storing 100 channels of standard color data and calibration data
- Built-in flat display calibration data LCD-D65 & LED-D65 to be applied for chromaticity measurement instantly
- Optional display white balance alignment system can be used to integrate all optical test stations to one single station

xyY | T△uvY | u'v'Y | RGB | XYZ | FLVL | FMA | Contrast | Program

DISPLAY COLOR ANALYZER
MODEL 7123

Chroma 7123 Display Color Analyzer adopts the design of contact and non-contact type measurements based on the probe selected to measure the luminance and chromaticity of display panels. Developed with the most advanced digital signal processor and the technology of optoelectronic transfer as well as precision optical parts and circuit design, the 7123 Display Color Analyzer is capable of performing high speed, accurate and stable color tests.

The configuration of Chroma 7123 complies with the color matching function sensor of CIE 1931 and CIE1976 UCS that can measure the luminance and chromaticity of display panel accurately. Users can switch to various types of chromaticity coordinates freely including xyY, T△uvY, u'v'Y, RGB, XYZ, FMA (A712200), FLVL (A712200), Contrast and Program 9 modes in total. The A712301 that is designed to test the LCD characteristics with LED backlight is able to meet the low luminance test requirements of 0.005cd/m². In addition, the A712302, designed for small size display in particular can solve the problem of color analyzer measurement area larger than the display area with its Ø5mm measurement area.

To satisfy the needs for automation, the 7123 is equipped with the function to control the video pattern generator and the UUT without using a personal computer to cut down the acquisition and management cost. The 7123 also has the functions of contrast measurement, result judgment and programmable test items that can fulfill the auto test requirements to enhance the production efficiency.

The Optical Measurement Software incorporated by Chroma 7123 is able to do chromaticity, luminance, Flicker (A712200) and Gamma measurements on PC, and then show the measured data on CIE 1931 and CIE1976 UCS chromaticity coordinate chart directly. Besides the function of drawing Gamma curve, the measured data can also be stored on PC and exported to EXCEL® for process. The example programs enclosed in optical measurement software allow users to develop the test programs that suit their needs.
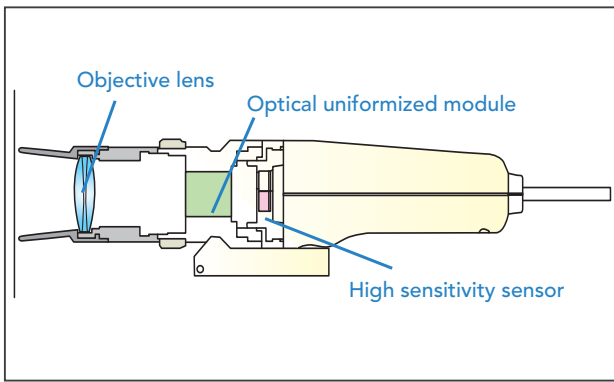
Chroma 7123 Display Color Analyzer has 100 channels of built-in memory for storing the value of standard colors and calibrated data. In addition, Chroma 7123 also provides many friendly user interfaces for operation such as the way test data shows, the position set for push buttons, the positioning projector, USB and RS-232 interfaces for data transmission, calibration period setting as well as reminding function and etc. to satisfy the requirements for actual measures. Using the USB flash disk, the test procedures can be copied to other stations for use and reduce the time for repeated editing considerably.

As the technology and products of flat displays have become the mainstream in the market today, every manufacturer is seeking for high value-added and low cost measurement solutions to raise its competitiveness ; Chroma 7123 Display Color Analyzer is the excellent tool to assist in achieving that purpose.

USB Flash Disk | IIC | USB 2.0 | RS-232C

CE

Chroma

OPTICAL SYSTEM STRUCTURE

Objective lens
Optical uniformized module
High sensitivity sensor

The Optical System Structure (patent) of Chroma Display Color Analyzer is featured in 3 parts - 1. Objective lens, 2. Optical uniformized module, 3. High sensitivity sensor. It can measure various display devices and other soft display devices precisely.

The light projected by the light source to be measured is gathered into the optical uniformized module through the objective lens. After uniformizing the light of each dot on the area to be tested in the module, it projects equally to a probe device with X, Y and Z filter compensation.

LOW LUMINANCE MEASUREMENT

LED Backlight Matrix

Diagram of Optical Uniformized Module
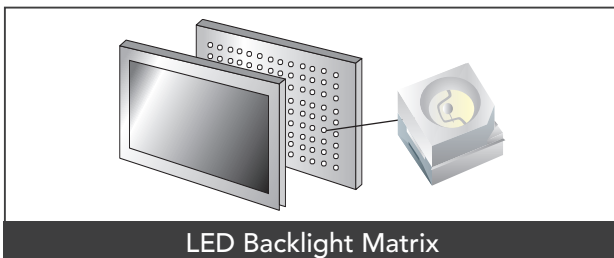
The low luminance applied to the display or TV using the LED backlight is able to be lower than 0.01cd/m2 and it is way beyond the capability the common color analyzer can afford. The 7123(A712301) is specially designed and developed to meet this requirement that it is capable of measuring the 0.005cd/m2 low luminance.

Reducing the light loss during transmission in the system hence increasing the use rate of input light quantity is the main factor that the system can accomplish rapid and accurate measures under low luminance measurement mode.

The optical uniformized module implemented in 7123 not only uniformizes the input light quantity but also reduces its loss significantly due to transmission, moreover raises the use rate. The high sensitive detection device of 7123 formed by high transmission Y filter and high light sensitivity detector further increases the use rate of input light quantity for outputting accurate low-luminance test results.
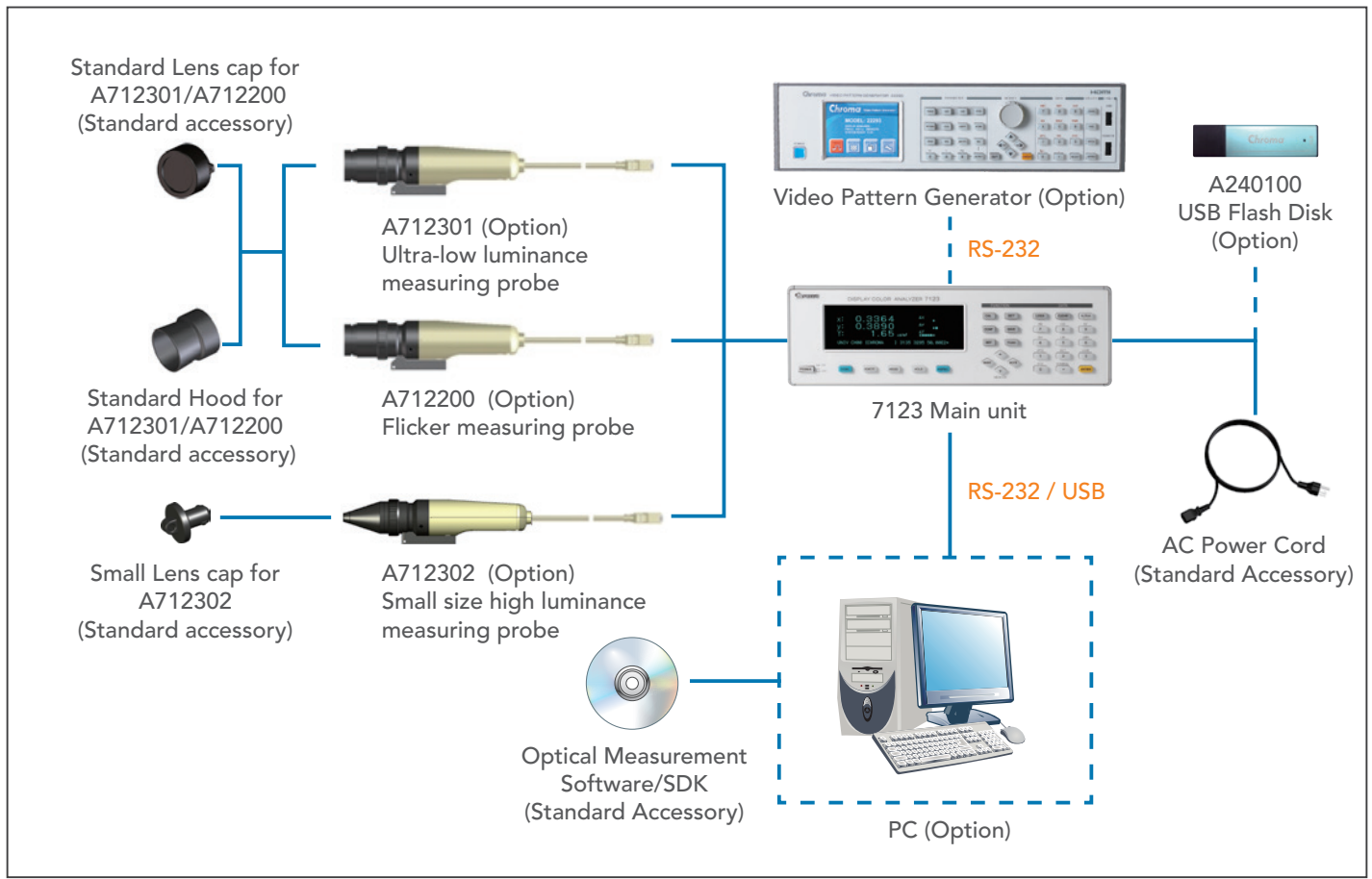
OBJECT-SIDE TELECENTRIC OPTICAL SYSTEM

量測角度示意圖
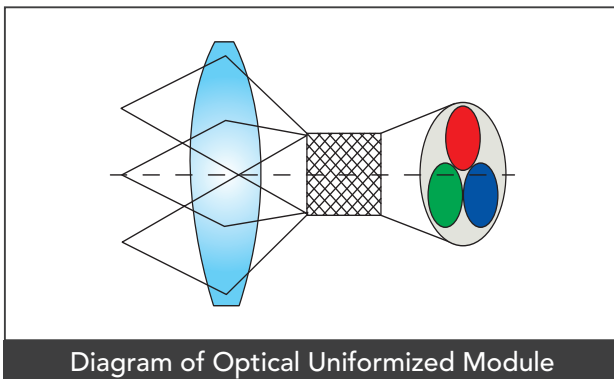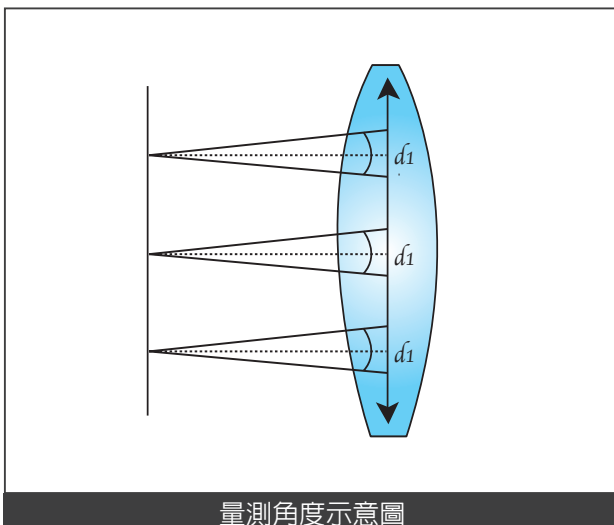
Certain types of displays (ex. LCD) have stronger directive that can adhere to human eyes when watching a display device. For the feature of receiving smaller emission angle, the light acceptance angle should be within 5° according to the recommendation of IEC 61747-6 and EIAJ ED-2522 standards.

Chroma Display Color Analyzer designs the light acceptance angle to 5° in comply with the IEC standards. With the object-side telecentric optical system design the light acceptance angle in the measurement range will show symmetry along the flat surface of display in vertical direction. Therefore, the light acceptance angle of Color Analyzer for normal direction of display flat surface is ±2.5° only (as the figure shows.) Moreover, the telecentricity of Color Analyzer that is the middle line of light acceptance angle and the normal included angle of device flat surface has the error less than 0.25°.

SYSTEM DIAGRAM

Standard Lens cap for
A712301/A712200
(Standard accessory)

A712301 (Option)
Ultra-low luminance
measuring probe

Standard Hood for
A712301/A712200
(Standard accessory)

A712200 (Option)
Flicker measuring probe

Small Lens cap for
A712302
(Standard accessory)

A712302 (Option)
Small size high luminance
measuring probe

Video Pattern Generator (Option)

RS-232

A240100
USB Flash Disk
(Option)

7123 Main unit

RS-232 / USB

AC Power Cord
(Standard Accessory)

Optical Measurement
Software/SDK
(Standard Accessory)

PC (Option)

Probe Model Selection Table

Probe Model	Display Type					
	LCD	CRT	PDP	OLED	Rear Projection Display	
					LCD	DLP
A712300	√	√	√	√	√	√
A712302*1	√	△	△	√	√	△
A712200*2	√	X	X	√	√	X
√ Recommended ; △ Applicable for certain devices ; X not applicable						

*1 : Since the measurement area of A712302 is small, only certain devices are applicable.

*2 : Since the A712200 has additional flicker measurement function, only specific display devices are applicable due varied measurement method. Following are the

display types known as not applicable:

- The CRT, PDP and rear projection displays using DLP technology.
- The display is Passive Matrix Driven.
- The display backlight module uses PWM control (except LCD).
- The display backlight module uses dynamic backlight control technology.
- There is black frame inserted between every frame of the display.

ORDERING INFORMATION

7123 Main unit

A712200 : Flicker measuring probe (with 2.5m signal cable)

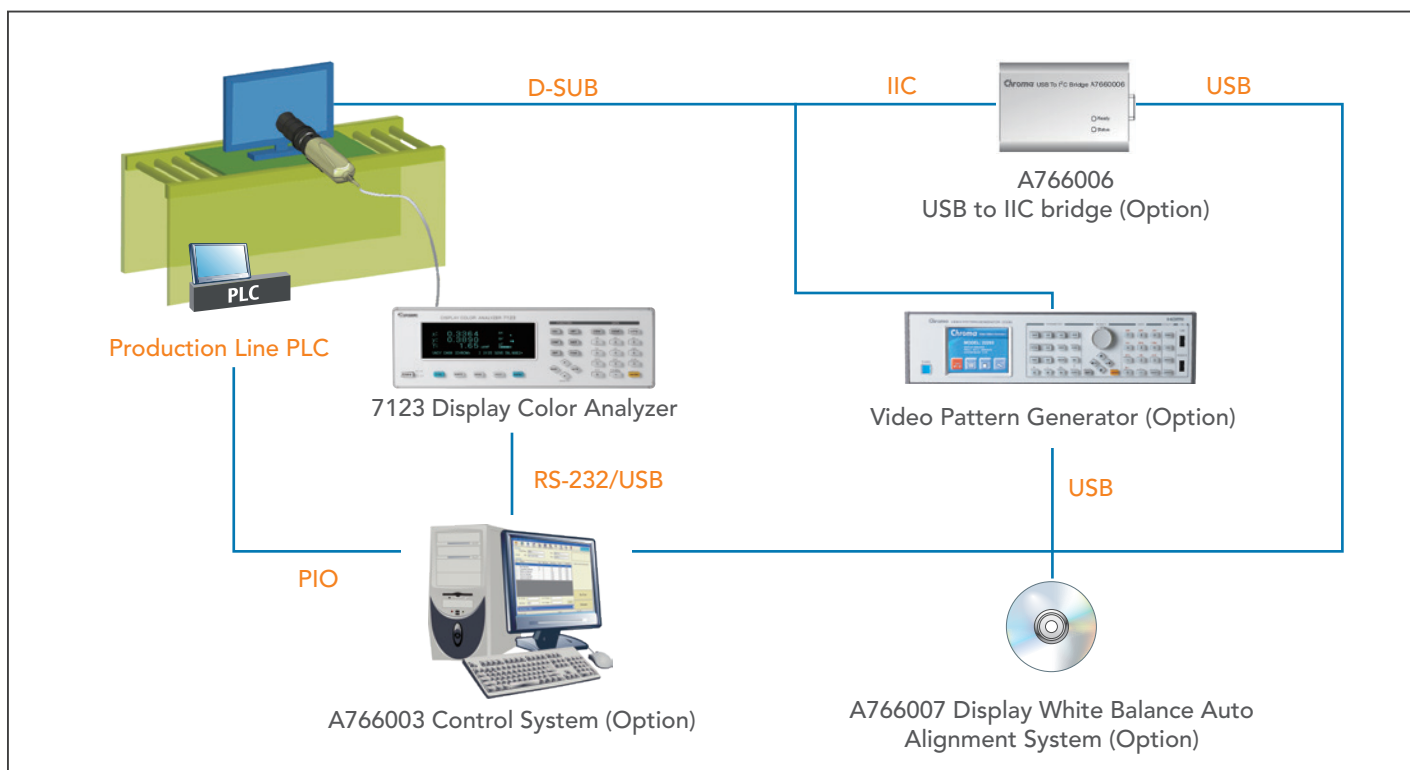A712301 : Ultra-low luminance measuring probe (with 2.5m signal cable)

A712302 : Small size high luminance measuring probe (with 2.5m signal cable)

A712102 : Tripod (including a level gauge)

A240100 : USB flash disk

Video Pattern Generator (refer to Chroma Model)

DISPLAY WHITE BALANCE ALIGNMENT SYSTEM DIAGRAM (OPTION)

D-SUB   IIC   USB

A766006
USB to IIC bridge (Option)

Production Line PLC

7123 Display Color Analyzer

Video Pattern Generator (Option)

RS-232/USB   USB

PIO

A766003 Control System (Option)

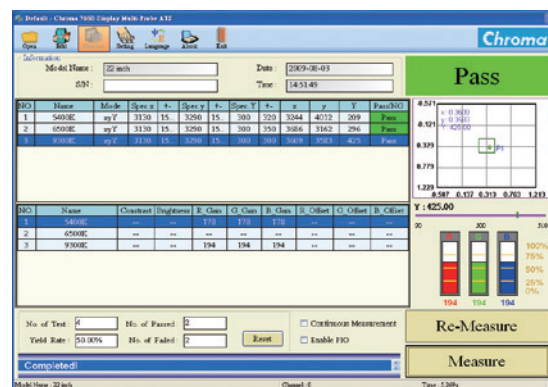A766007 Display White Balance Auto
Alignment System (Option)

Display White Balance Alignment Function

An optional Display White Balance Auto Alignment System can be purchased and connected to the 7123 Display Color Analyzer via the IIC or RS-232 interface to adjust the UUT parameters for white balance alignment. The algorithm embedded with learning capability (patent pending) is able to adjust the color to the desired color coordinate. Each test program can set and adjust various kinds of color temperatures with automatic switch. The alignment and test functions can be merged into one station when working with the test system and consequently it can reduce the connection and save test time, cost as well as manpower.

Key Features

- Able to work with 7123 Display Color Analyzer or 7660 Multi-probe Display ATS
- Chinese-English switchable operating interface
- Support UUT control function to manage the UUT status before and after test
- Control command formats comply with the regulation of VESA DDC/CI
- Support IIC and RS-232 UUT control interface
- Multiple color temperatures alignment for setting various color
- Algorithm embedded with learning capability reduces the alignment time greatly
- Able to fix a certain gain value by UUT feature and decrease the alignment time
- Able to adjust multiple dots when working with 7660. Different probes can measure different grayscales at the same time to reduce the probe moving time and then lower down the production cost as a result

## DISPLAY WHITE BALANCE AUTO ALIGNMENT SYSTEM ORDERING INFORMATION

A766003 : Control system (including PIO module)
A766006 : USB to IIC bridge
A766007 : Display white balance auto alignment system software (with keypro)

Chroma 7123 Display Color Analyzer working with the optical measurement software is able to grab the measured data to PC and store it or export it to EXCEL® for process. The example programs of optical measurement software are also enclosed for users to develop the application that suits their need.
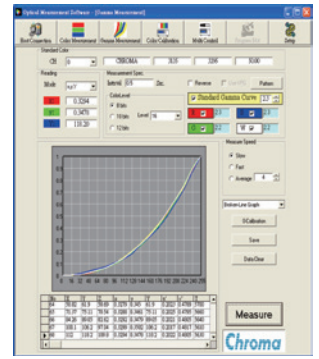
Color Measurement

It shows both digital and analog at the same time and there are xyY, T△uvY, u' v' Y, RGB, XYZ, FMA (A712200) and FLVL (A712200) seven display modes available for setting one time or continuous measurement as desired.
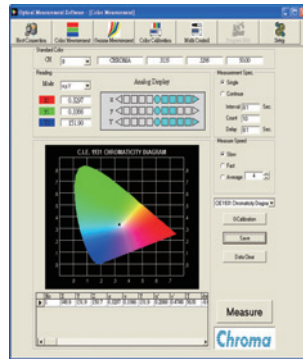
Gamma Measurement

Gamma measurement for red, green, blue and white four colors can be done when it is connected to the VPG of Chroma. The measurement can be set for 16, 32, 64, 128 and 256 levels as need. Besides the standard Gamma curve, it can also show the Gamma curve and value of each tested color up 4096 (12bit) levels measurement as set by request.

Flicker Measurement

The A712200 probe supports FMA and FLVL two Flicker measurement modes. The FMA Flicker measurement can see the ratio of luminance change (AC) and fundamental quantity (DC) (AC/DC); while the FLVL (JEITA/VESA) Flicker measurement can separate the AC quantity of all different frequencies. With the Optical Measurement Software the Flicker of each frequency can be shown on the graph and it makes the frequency spot that generates the Flicker easily identified.
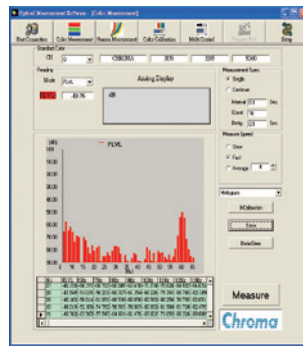
Program Editing

The test item programmable function allows programming the test items and specifications on the main unit directly; also a program interface is supplied for users to program on the PC and save the edited programs for other systems' use without re-edit that increases the operating efficiency.
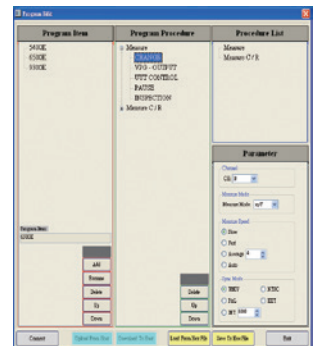
The programs can be saved to a USB flash disk and downloaded to the devices on the production line through the USB flash disk without moving the devices back to the lab.

Color Calibration

For calibration requirements, the Optical Software Measurement is able to read the UUT readings directly and save the work from copying data by user also prevent the problem caused by copy error to improve the calibration efficiency and accuracy.
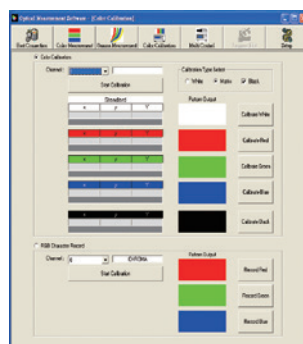
Software Development Kit (SDK)

■ Example Program:
  ◇ Color Measurement
  ◇ Gamma Measurement
  ◇ Color Calibration
  ◇ Multiple Control
■ API Development Library

System Requirements
Operating System: Windows® 2000/XP

Windows® & EXCEL® are the trademarks of Microsoft in United States and other countries.

SPECIFICATIONS

		A712301 (Ultra Low luminance measuring probe)	A712302 (Small size high lvminace measuring probe)	A712200 (Flicker measuring probe)
Model			7123	
Probe				
Probe Model		A712301 (Ultra Low luminance measuring probe)	A712302 (Small size high lvminace measuring probe)	A712200 (Flicker measuring probe)
Measurement Area		Ø27 mm / Ø1.06 inch	Ø5 mm / Ø0.20 inch	Ø27 mm / Ø1.06 inch
Measurement Distance		30±10mm	0~10mm	30±10mm
Acceptance Angle		± 2.5˚	± 5˚	± 2.5˚
Display Range	Luminance	0.0001 to 25,000 cd/m²	0.01 to 200,000 cd/m²	0.01 to 6,000 cd/m²
	Chromaticity		4 or 3 digits display	
Luminance unit			cd/m² or fL, selectable via button on the front panel	
Display Mode	Digital	xyY ; TΔuvY; u' v' Y ; RGB ; XYZ ; Contrast; Program		xyY; TΔuvY; u' v' Y; RGB; XYZ; FMA; FLVL; Contrast; Program
	Analog	Δx Δy ΔY; ΔR ΔG ΔB; ΔR G/R B/R; R/G ΔG B/G		Δx Δy ΔY; ΔR ΔG ΔB; ΔR G/R B/R; R/G ΔG B/G;FMA
Luminance *1	Meas. Range	0.0050 to 6,000cd/m² (0.001 to 1751fL)	0.30 to 6,000 cd/m²(0.09 to 1751fL)	0.10 to 6,000 cd/m²(0.03 to 1751 fL)
	Accuracy	0.0050 to 0.0199 cd/m²: ± 0.0005 cd/m² 0.020 to 0.099 cd/m² : ±4% ±2 digits 0.100 cd/m² to 6,000cd/m²: ±2% ±1 digit	0.30 to 6,000 cd/m²:±2%±1 digit	0.10 to 6,000 cd/m²:±2%±1 digit
	Repeatability	0.0050 to 0.0199 cd/m²: ± 0.0003 cd/m² 0.020 to 0.099 cd/m²: 1% + 2 digits(2σ) 0.100 to 0.999 cd/m²: 0.2% + 1 digit(2σ) 1.00 cd/m² to 6,000 cd/m²: 0.1% + 1 digit (2σ)	0.30 to 2.99cd/m²: 0.2% +1 digit(2σ) 3.00 to 6,000cd/m²:0.1%+1 digit(2σ)	0.10 to 0.99 cd/m² : 0.2% + 1 digit (2σ) 1.00 to 6,000cd/m²: 0.1% + 1 digit (2σ)
Chromaticity *1	Accuracy	0.100 to 2.99cd/m²: ±0.008 3.00 to 4.99cd/m² : ±0.005 5.00 to 9.99 cd/m² : ± 0.003 10.00 to 6,000 cd/m²: ± 0.002	0.30 to 14.99 cd/m²: ± 0.008 15.00 to 119.9 cd/m²: ± 0.005 120.0 to 6,000 cd/m²: ± 0.003	0.1 to 2.99 cd/m²: ± 0.008 3.00 to 4.99 cd/m²: ± 0.005 5.00 to 9.99 cd/m²: ± 0.003 10.00 to 6,000 cd/m²: ± 0.002
	Repeatability	0.100 to 0.199cd/m² : 0.015(2σ) 0.200 to 0.499cd/m² : 0.008(2σ) 0.500 to 1.99cd/m² : 0.003(2σ) 2.00 to 6,000cd/m²: 0.001(2σ)	0.30 to 0.59 cd/m²: 0.015 (2σ) 0.60 to 1.49 cd/m²: 0.008 (2σ) 1.50 to 7.99 cd/m²: 0.003 (2σ) 8.00 to 6,000 cd/m²: 0.001 (2σ)	0.10 to 0.19 cd/m²: 0.015 (2σ) 0.20 to 0.49 cd/m²: 0.008 (2σ) 0.50 to 1.99 cd/m²: 0.003 (2σ) 2.00 to 6,000 cd/m²: 0.001 (2σ)
Flicker -Contrast Method(FMA)	Range	---	---	5 cd/m² or higher
	Display Range	---	---	0.0 to 100%
	Accuracy	---	---	±1% (Flicker frequency:30 Hz AC/DC 10 % sine wave) ±2% (Flicker frequency:60 Hz AC/DC 10 % sine wave)
	Repeatability	---	---	1% (2σ) (Flicker frequency:20 to 65 Hz AC/DC 10 % sine wave)
Flicker -JEITA/ VESA Method	Range	---	---	5 cd/m² or higher
	Display Range	---	---	6~240Hz
	Accuracy	---	---	±0.5dB (Flicker frequency:30 Hz AC/DC 10 % sine wave)
	Repeatability	---	---	0.3dB (2σ) (Flicker frequency:30 Hz AC/DC 10 % sine wave)
Measurement Speed	xyY	Y:0.0050 to 0.0199 cd/m² : 1 times/sec. (Low luminance mode) ; Y:0.020 to 1.99 cd/m² :4 times/sec.(Auto mode) 2.00 cd/m² and above: 15 times/sec.	0.3 to 7.99 cd/m²:1 time/sec. 8.00 cd/m²: and above:15 times/sec.	0.1 to 3.99 cd/m²: 5 times/sec. ; 4.00 cd/m² and above: 15 times/sec.
	FMA	---	---	6 times/sec. (UNIV) ; 20 time/sec.(NTSC) ; 16 times/sec. (PAL)
	FLVL	---	---	0.5 time/sec.
Dimension		Ø 46 x 234.9(D) mm / Ø 1.81 x 9.25(D) inch	Ø 46 x 221.9(D) mm / Ø 1.81 x 8.74 (D) inch	Ø 46 x 234.9(D) mm / Ø 1.81 x 9.25(D) inch
Weight		0.5 kg / 1.1 lbs	0.5 kg / 1.1 lbs	0.5 kg / 1.1 lbs
Cord Length			2.5m / 98.43 inch	
Optical System			LED positioning function	
Main unit				
Memory Channel			100 Channels	
Sync Mode			NTSC, PAL, EXT, UNIV, INT	
Object Under Measurement			10~240 Hz	
Interface			USB(2.0), USB flash disk port, RS232C (Baud rate max. 115200)	
Input Voltage Range			AC 100~240V, 50/60 Hz, 50VA	
Operating Temperature/ Humidity Range			10˚ C to 30˚ C (50˚ F to 86˚ F); less than 75% relative humidity (with no condensation)	
Storage Temperature /Humidity Range			0˚ C to 40˚ C (32˚ F to 104˚ F); less than 75% relative humidity (with no condensation)	
Dimension (H x W x D)			115x320x260 mm / 4.5x12.6x10.2 inch	
Weight			2.7 Kg / 5.95lbs	
Other Functions			Customized light source calibration, memory channel ID storage, variable analog display range, display pause, remote control, comparison, video pattern generator and UUT control, programmable test item, test result judgment, calibration period setting and reminding function, USB flash disk supported. *2	
Certification			CE	

All specifications are subject to change without prior notices. Please visit our website for the most up to date specifications.   *Reference standards: IEC 61747-6, EIAJ ED-2522, ASTM E455-03, VESA Standard

*1: Standard illuminant A is used for test according to Chroma's test condition.

*2: Only the USB flash disks certified by Chroma are supported.