



Chroma LED Lighting Test System

Model 58158 | 58158-SC



Integrating Sphere Model 58158



Luminaire In-Line Model 58158-SC

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Integrating Sphere Model 58158

Simulates real AC test conditions and environments and ideal for individual LED lamp testing.



Luminaire In-Line Model 58158-SC

Mass production application: LED lamp, LED bulb, LED bar, LED streetlight, and other luminaires.

Chroma LED Lighting Test System

Model 58158 | Integrating Sphere Test System

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Model 58158-SC | LED Luminaire In-line Test System

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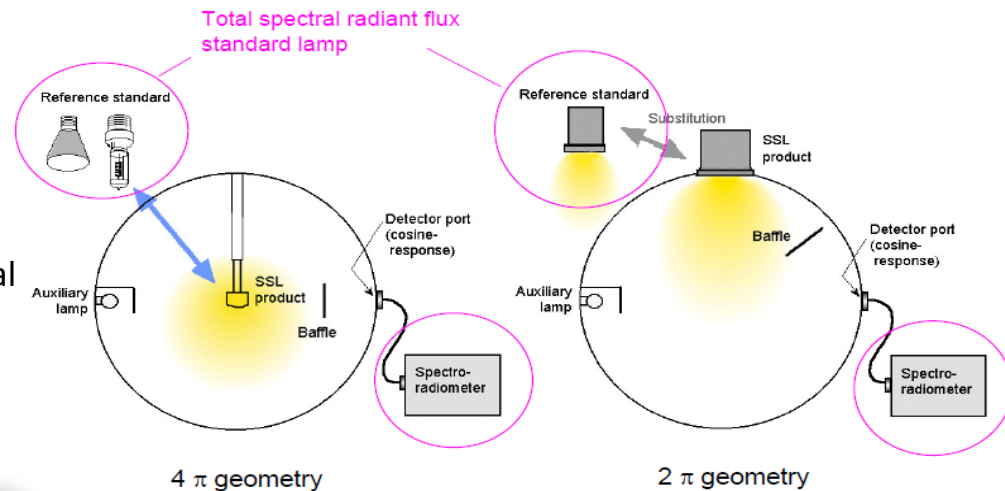
LED Lighting Test System - Integrating Sphere Model 58158

- Simulate the real AC test condition and environment
- Integrate AC, DC, and optical features test to one platform
- Support DC test for AC LED
- Support dual-optical test module in one platform (Integrating sphere or average intensity) (optional)
- Support AC /DC LIV Analysis
- Offer standard light source for calibration
- Optional additional integrating spheres



1 The Integrating Sphere

Chroma 58158 AC/DC LED Integrated Test System complies with AC LED Device National Standard and designs under the guidelines of LM-79. The system integrates Chroma's Programmable AC Power Source and Digital Power Meter, offering an accurate simulation in an AC environment for measuring optical and electrical parameters of AC/DC LED through a friendly software interface.



Integrating spheres provide faster total luminous flux measurement for LED lamp testing. The inside surface is coated with a diffusely reflecting material which guarantees complete integration and homogenization of the emitted radiation. The integrated light is then measured at the detector port to calculate net input light power.

2 Sphere Sizing

Chroma's 58158 LED Lighting Test System offers testing spheres in a range of sizes for more accurate readings based on the size of the LED lamp and the lumen range under test.



**Note images not to scale*

2 Sphere Sizing

Integrating Sphere Sizing, Application

Optical Module	20cm, 30cm, 50cm integrating sphere	1m integrating sphere	2m integrating sphere
Luminaire Under Testing	<ul style="list-style-type: none"> • Bulb • MR-16 • PAR • Small size luminaire 	<ul style="list-style-type: none"> • 2' for T8 / T5 tube • Medium size luminaire 	<ul style="list-style-type: none"> • 4' or 5' for T8 / T5 tube • Street Light • Large size luminaire
Application	Laboratory	Laboratory	Laboratory

Note: Customization for 3m integrating sphere

Chroma LED Lighting Integrating Sphere Specifications

SPECIFICATIONS		
Model		58158
Measurement Items		
Optical Measurement Items		Lumens (lm), CIE(x,y), CIE(u',v'), CCT, CRI
Electrical Measurement Items		Frequency, Real power P, power factor PF, THD (Option), Vf (Option)
Optical Measurement		
Photo Detector	Wavelength Range	380~780nm
	Lumens Range *1	<5,000 lm (>5K lm optional)
Spectrometer	Detector Type	2048 Pixels Linear CCD array (optional)
	Optical Fiber Connector	SMA 905
Lumen accuracy		± 5%
CIExy accuracy		± 0.004
Lumen Repeatability		± 2%
CIExy Repeatability *2		± 0.001
Electrical AC Source		
Output Rating-AC		500VA
Voltage	Range/Phase	150V/300V/Auto
	Accuracy	0.2%+0.2%F.S.
	Resolution	0.1V
	Line Regulation	0.10%
	Load Regulation	0.20%
Max.Current / Phase	RMS	4A/2A (150V/300V)
	peak	24A/12A (150V/300V)
Electrical AC Meter		
Power	Range (W)	1.5W~1KW (Model 66201) ; 1.5W~10KW (Model 66202)
	Power Factor Accuracy *3	0.006+(0.003/PF)KHz
Harmonic	Range	2~50 order
DC Measurement (Optional)		
DC Power Supply	Output Voltage	0~64V (> 64V optional)
	Output Current	0~3A (> 3A Optional)
	Ripple and Noise	1400 uVrms & 14 mVp-p / < 1mA
	Line Regulation	0.01% + 4mV / 0.01% + 300 μ A
	Load Regulation	< 6mV / 0.01% + 300 μ A
	Program Accuracy	0.02% + 10mV / 0.01%+1mA
	Read back Accuracy	0.02% + 10mV / 0.01%+1mA
Others		
Dimension (H x W x D)		1081 x 532 x 700 mm
Weight		100k g
Power Consumption		300 W
Operating		100~240V VAC 50/60HZ
Software Support DC Source		
Chroma 6200P-300-8, Chroma 11200 (650V), Chroma 11200 (800V), Keithley 24XX Series		

LED Luminaire In-line Test System

Model 58158-SC

- Supports Mass Production LED Light Applications: Light Bulb, Lightbar, Street Light and other emitting source applications.
- High-speed Testing
- Flicker, Spatial Distribution Measurements
- Optical Power Distribution Tests
- Compact Size / Small foot print compared to integrating sphere
- Integrates with conveyor systems
- May be provided as a complete automated solution



1 Test Capability

- Optical Power characteristic:
 - Lm, lm/w, Flicker, Optical spatial distribution
- Color characteristic:
 - CIE_{x,y}, Duv, CIEu'v', CCT, CRI, R9 and Wavelength Spectrum related items
- Power characteristic:
 - AC mode: Power, Power factor (PF), THD
 - DC mode: Forward voltage



2 Unique LED Luminaire In-Line Test System

Traditionally, LED lighting manufacturers generally have employed luxmeters as their production line test equipment. However, these devices typically result in large measurement errors and thus cannot assure reliable shipping quality.

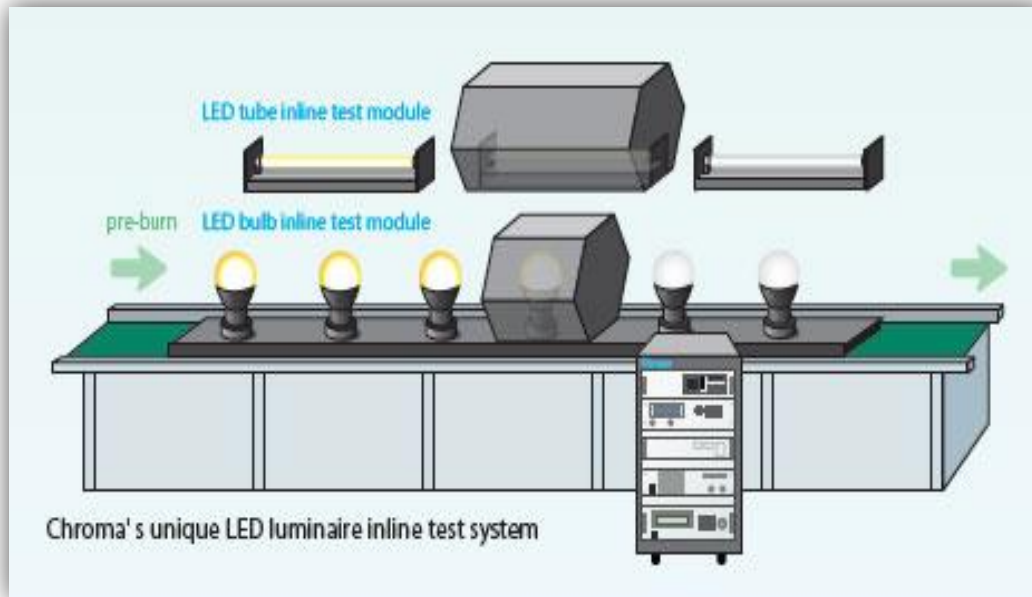
An alternative is to exclusively use integrating spheres for testing purposes. While integrating spheres solve this measurement problems and are extremely accurate in measurement readings and perfect for individual LED testing, they require manual setup and implementation; thus are not ideal for a production line style of testing.



Integrating spheres also require larger space and have higher cost requirements. Because most manufactures can only adopt this testing practice for smaller sample sizes of their LED line, the market at any given time contains an uneven distribution of quality of LED lamps.

Chroma's **58158-SC LED Luminaire In-Line Test System** resolves both these inaccurate data readings, as well as automating the entire process.

2 Unique LED Luminaire In-Line Test System

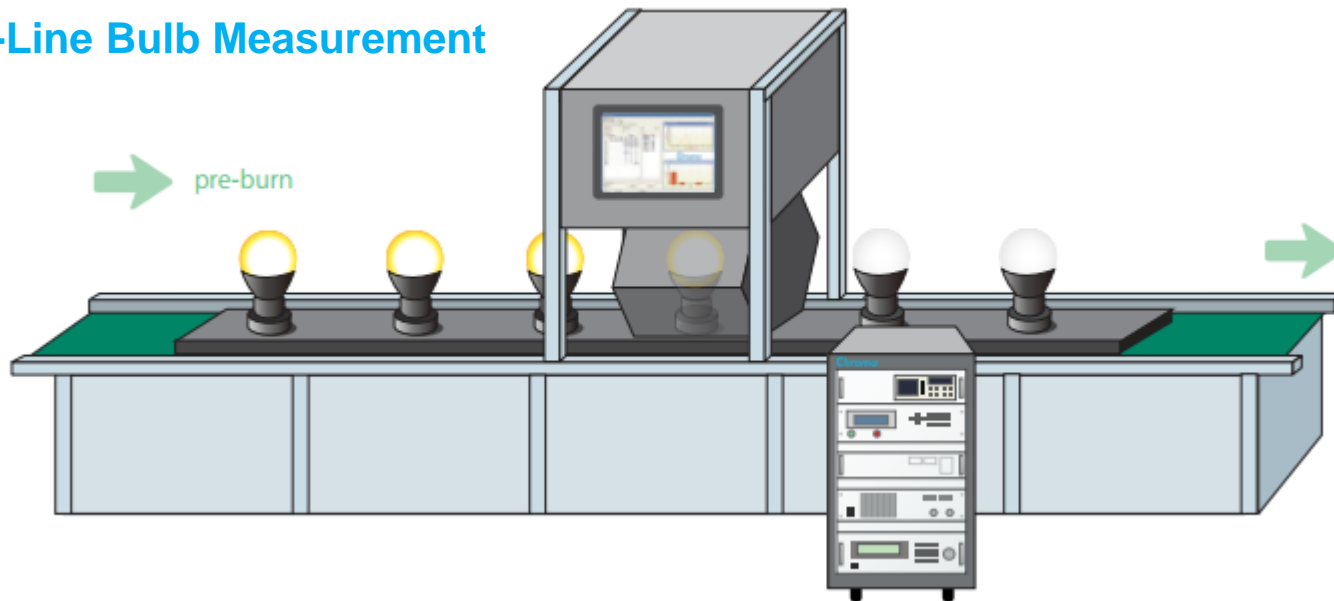


- ❑ The design concept of Chroma LED high speed measurement module is to combine several large size detectors and add up the luminous flux obtained by each detector to calculate the total flux of LED light.
- ❑ This design not only overcomes the short coming of previous inconvenient measurement for total flux by conventional integrating sphere, it also implements the inline test on production line. Chroma is able to provide a fully automatic production line that covers both quality and productivity.

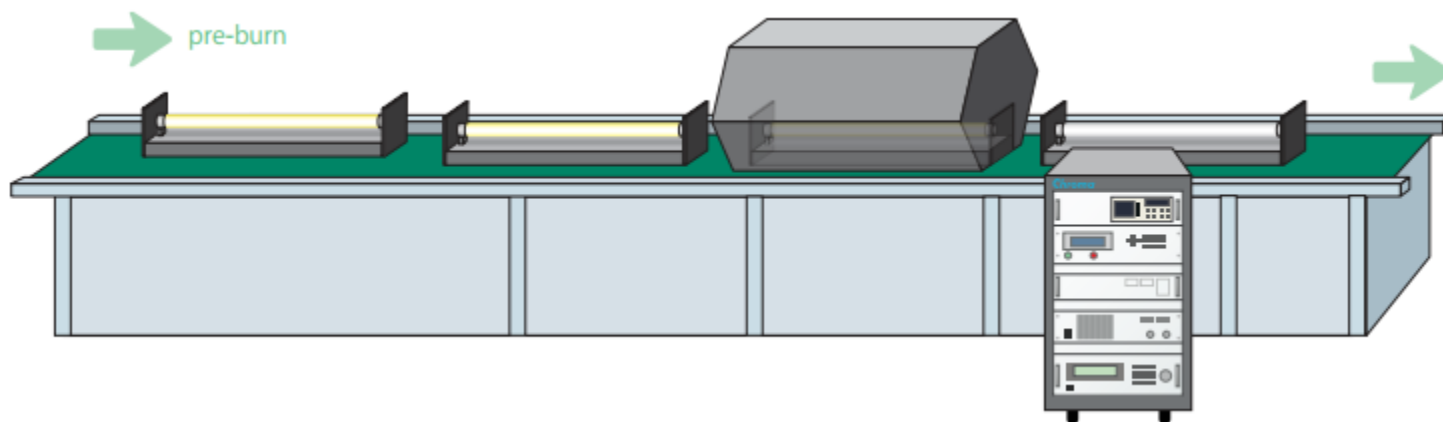
Chroma uses an unique LED lamp optical measurement technology to develop the automated test system which suits all kinds of LED luminaires. In addition to saving substantial space, the test speed could be up to 10,000 pcs per day while the measurement performance could also reach integrated sphere level. Through this unique LED lamps testing technology, the product yield distribution is identified clearly, the material cost is reduced in a timely manner, the product competitiveness is enhanced, and the personnel and material waste is lower.

3 In-Line Production Test Applications

LED In-Line Bulb Measurement



T8/T5 In-Line Light Bar Measurement



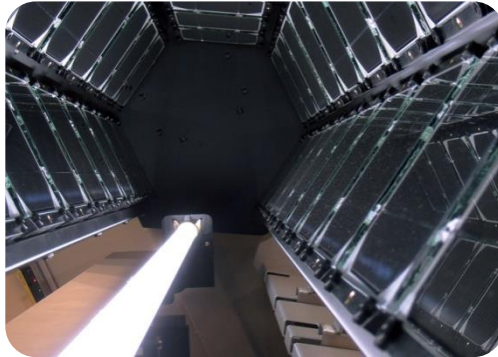
4 Fully Automation with Pre-Burn



- ❑ Test LED lamp in initial, steady state
- ❑ Over 10K pcs throughput per day

Chroma's **58158-SC LED Lighting In-line Test System** focuses on production line testing. In addition to basic measurement, automation integration, measurement data collection and analysis, and automatic calibration, this system has become the standard regarding specifications and equipment which highlights the advantages of product application on production line level.

5 LED Tube Solutions

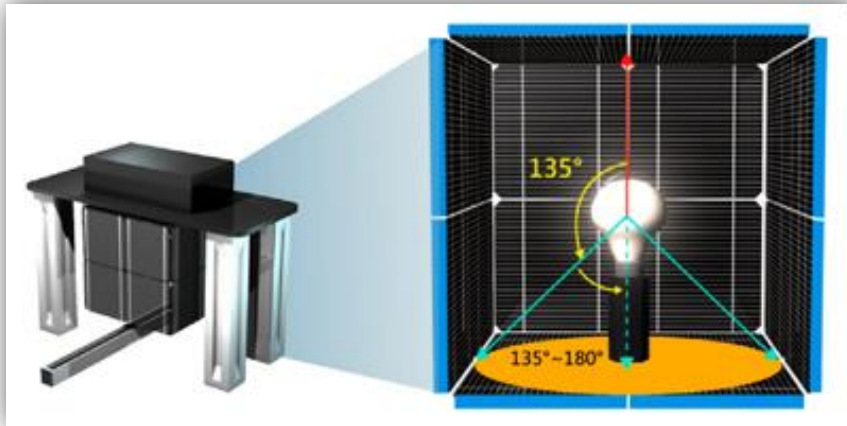


Key Features:

1. Semi-automatic loading
2. Auto Pass/NG binning
3. 6 sec/pcs high speed test cycle time
4. Flicker measurement
5. JEL 801 optical power distribution reorganization



6 LED Lighting Test System – In-Line Bulb Module

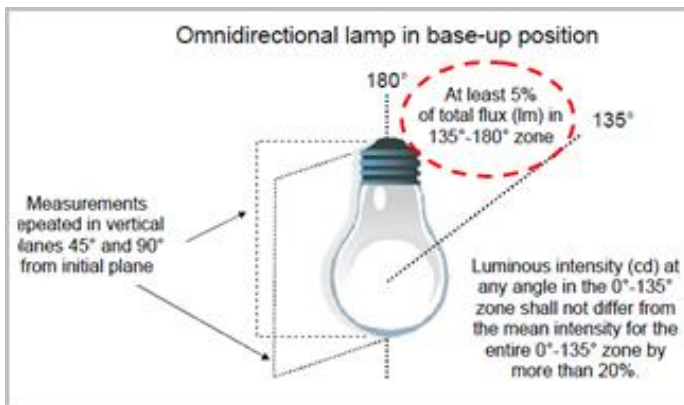


- Suitable for different kinds of LED lamps
- Flexible and scalable equipment
- Easy to integrate with other automatic systems to increase test speed, reduce measurement cost on production like automation
- Special module is used to measure luminous flux for multiple sizes or arbitrary shapes of LED lamps
- Specific modules just larger than the DUT (LED lamp)

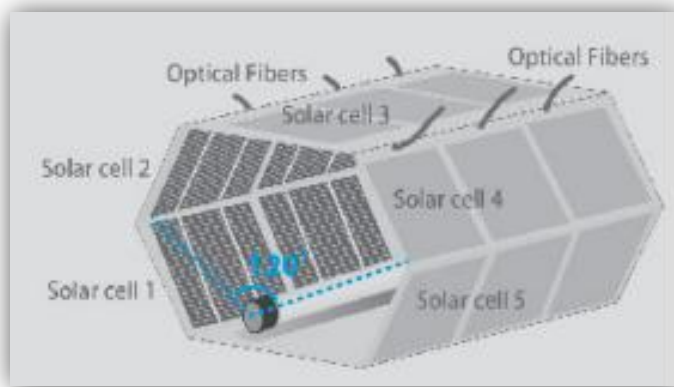
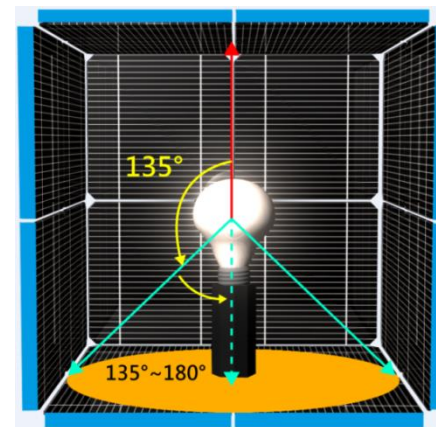
The core techniques of this test equipment are not only optical and electrical measurement, but also spatial distribution and "flicker" measurement characterizations.

Chroma's In-Line Bulb Module uses solar cells as optical detectors, which surround the LED lamp for measuring luminous flux via response spectrum. This test equipment also uses the measured parameters from solar cells- such as the angle between the cells and the luminaire- to calculate the distribution of the optical field of the LED lamp. This test system also incorporates the high-speed response and distribution of solar cells to measure the flicker of the LED lamp.

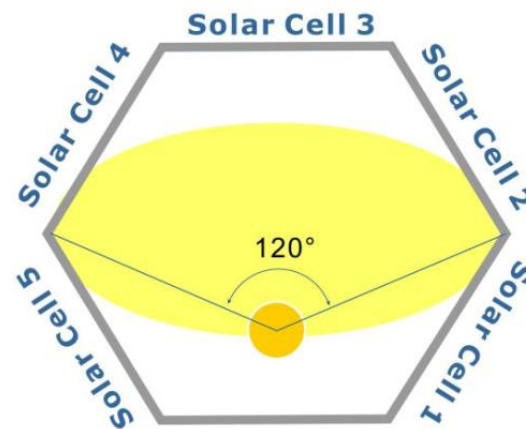
7 Spatial Distribution Measurement



Energy Star requirement

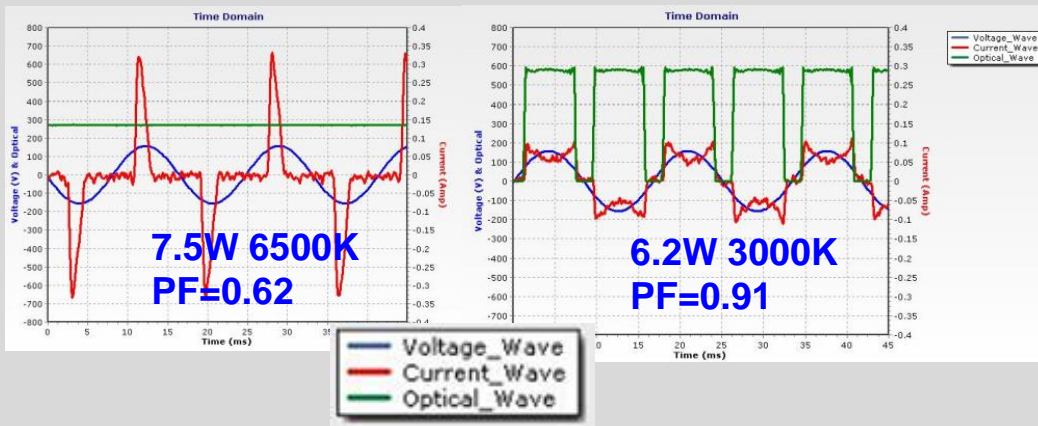


JEL 801 requirement

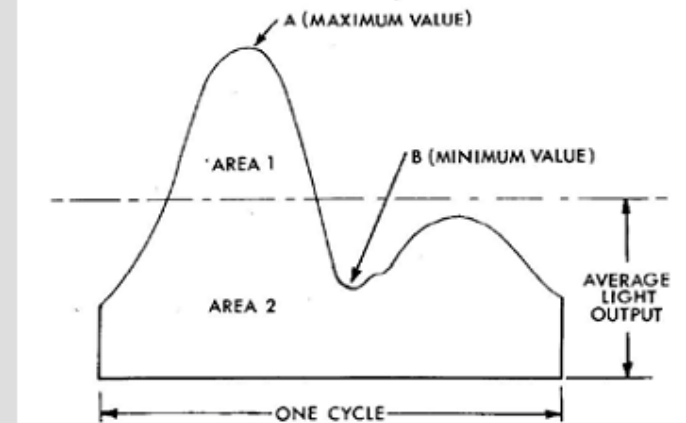


8 Flicker Measurement

- To measure flicker – log the optical waveform in time domain
- In Chroma's method, the optical waveform can be logged properly to check the flicker problem



Optical Waveform



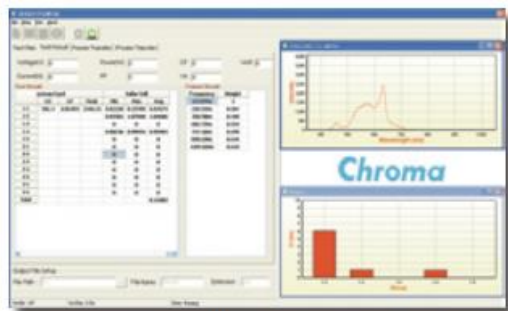
$$\text{Percent Flicker} = 100\% \times (A-B) / (A+B)$$

$$\text{Flicker Index} = \text{Area 1} / (\text{Area 1} + \text{Area 2})$$

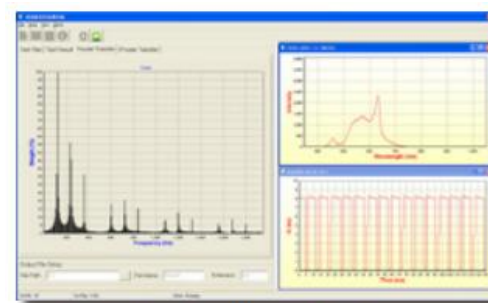
IES has defined two metrics

Periodic waveform reference
for traditional flicker metrics
Source: IESNA Lighting Handbook, 9th Edition

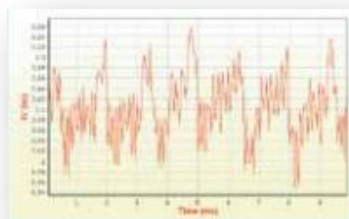
9 User Friendly Software Interface



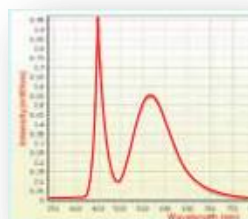
Luminaires Optical Power Distribution Analysis



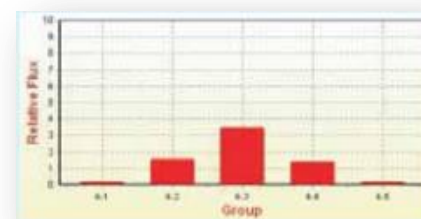
THD, Flicker & Wavelength Measurement



Flicker Analysis



Spectrum Analysis: CCT, CRI, Duv, Etc...



Optical Power Distribution

Chroma LED Luminaire In-Line Test System Specifications

SPECIFICATIONS		
Measurement Items		
Optical Measurement Items		Lumens (lm), mW, Wp, Wd, FWHM, CIE(x,y), CIE(u',v'), CCT, CRI
Electrical Measurement Items		Vdc, Idc, Vrms, Vpeak+, Vpeak-, Irms, Irms+, Irms-, Inrush current, Frequency, Real power P, reactive power VAR, apparent power VA, power factor PF, energy, THD (current and voltage), Vf, If
Optical Measurements		
Photo Detector	Wavelength Range	380 ~ 780 nm
	Lumens Range *1	1 ~ <5000 lm
Spectrometer	Detector Type	2048 Pixels Linear CCD array
	Wavelength Range	380~780 nm
	Slit	100 um
	Resolution (FWHM)	3.8 nm
	Integration Time	1.2 ms ~ 10 sec
	Dynamic Range (Single scan)	2x10 ⁸
	Fiber Optic Connector	SMA 905
Electrical AC Source		
Output Rating-AC		500 VA ~ 36 KVA
Voltage	Range/Phase	150 V / 300 V / Auto
	Accuracy	0.2% + 0.2% F.S.
	Resolution	0.1 V
	Distortion	0.3% @ 50 / 60 Hz 1%, 15~1 KHz (Typical)
	Line Regulation	0.10%
Max.Current /Phase	Load Regulation	0.20%
	RMS	32 A / 20 A (150 V / 300 V)
Frequency	Peak	192 A / 96 A (150 V / 300 V)
	Range/Phase	DC, 15~1 KHz
Harmonic-Inter Harmonic Stimulation	Accuracy	0.15%
	Bandwidth	2400 Hz
Additional System Information	Dimensions (HxWxD)	1081 x 532 x 700 mm
	Weight	100 kg
	Power Consumption	300 W
	Electrical Requirements	100 ~ 240 V VAC 50 / 60 HZ
Software Supported DC Sources		Chroma 52958, Chroma 6200P-300-8, Chroma 11200 (650 V), Chroma 11200 (800 V), Keithley 24XX Series
Electrical AC Meter		
AC Voltage	Range	150 / 300 / 500 Vrms (CF = 1.6)
	Accuracy	0.1%+0.05%*KHZ of rdg + 0.08% of rng
	Input Resistance	1 M
AC Current	Range	SHUNT H : 0.2 / 2 / 8 / 20 Arms (CF = 2 @ 0.2 / 2 / 8 A, CF = 4 @ 20 A) SHUNT L : 0.01 / 0.1 / 0.4 / 2 Arms (CF = 4)
	Accuracy *2	SHUNT H : (0.1% + 0.05%*KHz) of rdg + 0.12% rdg SHUNT L & 20A : (0.1%+0.05%*KHz) of rdg + 0.25% rng
	Range (W)	1.5 W ~ 10 KW, 24 ranges
Power	Accuracy *3	SHUNT H : [0.2% + 0.1%*KHz + (0.3 / PF) %*KHz] of rdg + 0.2% of rdg SHUNT L & 20 A : [0.2% + 0.1%*KHz + (0.3 / PF) %*KHz] of rdg + 0.33% of rdg 300 V x 0.01 A Range : 0.2%of rdg + 7 mW
	Power Factor Accuracy *4	0.006 + (0.003 / PF) KHz
Harmonic	Range	2 ~ 50 order

Note *1: Base on 60cm T8/T5 light bar test fixture. Total power test fixtures will be different by luminaires
 Note *2: The current accuracy applies temperature range 23 ± 1°C for 0.01 A & 0.2 A (CF = 2). For all other current ranges, the spec. applies under 23 ± 5°C
 Note *3: The 300 V x 0.01 A range is usually used to test No-load condition of UUT
 Note *4: The PF specification applies only when the signals are higher then 50% of the selected voltage and current ranges.



