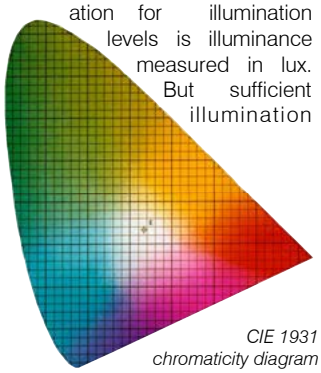
HCT-99 Hand-held Luminous Color Meter

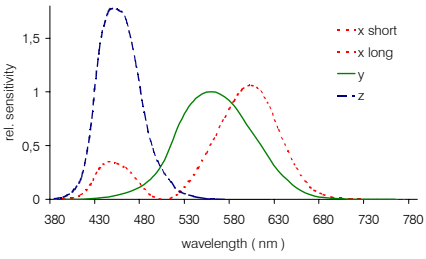
- © **Compact Luminous Color Meter for**
  - **Correlated Color Temperature**
  - **x,y and u',v' Chromaticity Coordinates**
  - **Illuminance**
  - **Optional Luminance, Luminous Flux and Luminous Intensity**
- © **Tristimulus Detector with Real X_{short}, X_{long}, Y and Z Spectral Functions**
- © **Field Service and Laboratory Use**
- © **USB Interface for Remote Control Operation**
- © **Economical Price**
- © **OEM Labeling**
- © **Battery Operation**

Luminous color
Color is defined as the attribute of visual perception consisting of any combination of chromatic and achromatic content. This attribute can be described by chromatic color names such as yellow, orange, brown, red, pink, green, blue, purple, etc., or by achromatic color names such as white, gray, black, etc., and qualified by bright, dim, light, dark or by combinations of such names.
Perceived color depends on the spectral distribution of the color stimulus, on the size, shape, structure and surroundings of the stimulus area, on the state of adaptation of the observer's visual system, and on the person's experience of prevailing and similar situations of observation.

Illuminance and Color
It has been known for many years and prescribed that high illumination levels will have positive effects on spiritual and physical performance. In comparison, low illumination levels can cause depression and even physical illness.
The classical photometric evaluation for illumination levels is illuminance measured in lux. But sufficient illumination is not the only factor for a healthy physical-biological home or work environment. Well balanced illumination and light-colors are necessary and conducive to a long term healthy life. A life surrounded by optical radiation.
So new generation light meters should also measure color since it is a significant part of the total visual sensation.

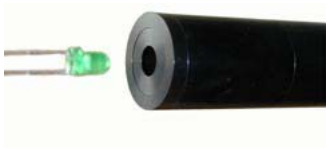

CIE 1931 chromaticity diagram

Luminous Flux and Color
Light source manufacturers and other users need to know the luminous flux and color temperature they are working with. Typically integrating spheres are used to measure these quantites.



Luminance and Color
Besides illuminance, luminance is one of the most important light measurement quantities used to specify the contrast situation on work stations and monitors.

Luminous Intensity and Color
Spot lamps, like LED's for example, are very often qualified by their directional light intensity.



HCT-99 Color Meter
The HCT-99 is a compact portable light-meter for general lighting applications which also measures chromaticity coordinates x,y and u',v' as well as correlated color temperature. The ergonomically designed meter is simple to use for the benefit of inexperienced users.

CT-4501 Detector Head
A compact design, 20 mm flat tristimulus detector is designed to measure broad-band light sources. Precisely corrected four cell design including the X_{short} function ensure precise luminous color measurement independent from the light source emission spectrum.

Optional Components To extend the unit's light measurement application range beyond luminous color, add:

- Integrating Spheres: luminous flux (calibration in lm)
- Front lens: luminance (calibration in cd/m²)
- Steradian front tube: luminous intensity (calibration in cd)

Traceable Calibration
Calibration is traceable to the ISO EN 17025 accredited part of Gigahertz-Optik's Calibration Laboratory for Optical Radiation Quantities and NIST standards.
Calibration of detector sensitivity as well as an individually measured plot of spectral sensitivity is included as part of the calibration certificate.

Custom Labeling:
The HCT-99 is ready made for custom design and labeling. Customization may include the meter front panel, function/mode set-up, detector heads, manuals and calibration certificates. Contact the factory for details and application assistance.

Operation
The HCT-99 is simple to operate To measure, connect the detector and switch on the meter.

CW Measurement
CW mode is used to measure continuous DC or AC signals. Color temperature, x/y or u'/v' and illuminance are displayed all at once.

Stop/Run Function
Current reading can be 'frozen' on display by pressing 'stop' button.

Calibration Selection
To re-set the measurement application add the attachment to the CT-4501 and select the calibration in the menu mode.

HCT-99 Specifications & Ordering Information

Specifications: HCT-99 Meter

Signal Input	
Detector Input	4 photocurrent signal inputs with multiplex electronic function to one photocurrent to voltage converter amplifier with following voltage to voltage amplifier (x10). 6 decade stepped gain ranges with max. gain signal values from 20.0 µA to 200.0 pA . Automatic range switching. 12 bit ADC with up to 14 bits at longer integration times.
Signal Processing	A/D converter with 1 ms time interval. Variable integration time through averaging of multiple measurements. Selectable from 1 ms to 1 s per channel.
Measurement Time	4 times the selected integrating time..
Frequency Range	Signal conversion from 0.166 Hz to >300 MHz.
Detector Connector	9 pin MDSM9 socket, 4 measurement inputs

Range Specifications				
Range (A/V)	Max. Input Value	Slew-Rate (10 - 90%)	Error (with offset compensation) 1 year, 23°C ±5°C ±(% of reading + % of range),	Permitted Detector Capacitance
1x10-5	20,00 µA	3 ms	0.2 % + 0.05 %	2 nF
1x10-6	2,000 µA	3 ms	0.2 % + 0.05 %	2 nF
1x10-7	200,0 A	3 ms	0.2 % + 0.05 %	10 nF
1x10-8	20,00 nA	3 ms	0.2 % + 0.05 %	10 nF
1x10-9	2,000 nA	30 ms	0.2 % + 0.05 %	10 nF
1x10-10	200,0 pA	30 ms	0.2 % + 0.05 %	10 nF

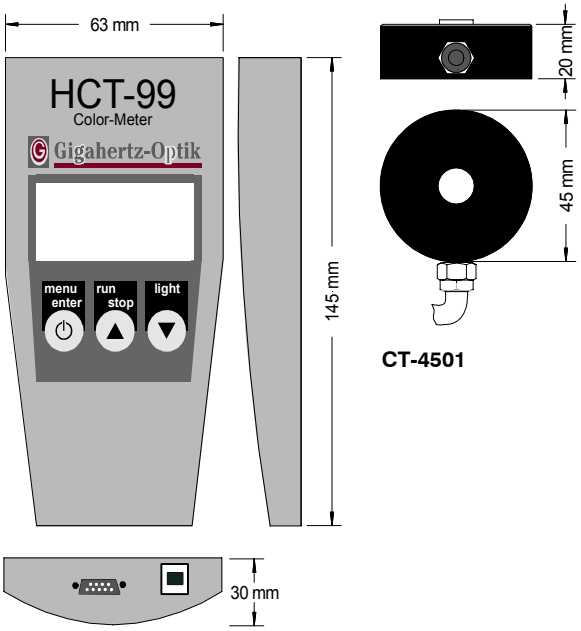
Functions	
Parameter Settings	Retention of the last settings in continuous memory. 3 function buttons.
Measurement Quantity	Ampere calibrated with DKD calibrated current source. Current signal multiplied with calibration correction factor to display in the different measurement quantities.

General	
Display	LCD graphic display (97 x 32 pixel). Text: 4 rows each 14 characters. LED background illumination (switchable)
Operating Temperature	10 to 40° C (50 to 104° F) (75 % rel. H, non-condensing). Storage Temperature: 0 to 50°C (32 to 122° F).
Dimensions/Weight	145 x 63 x 30 mm / 150 g (5.7 x 2.5 x 1.2 in / 0.33 lb).
Power	2x battery size AA (2.2 - 3.2V). Current consumption: 6mA + 30mA (display illumination). USB: bus powered

Interface	
USB	USB Spec. 1.1 (HID device)

Specifications with CT-4501 Detector Head (typical Values)	
Illuminance	0.5 to 199999 lx with 0.01 lx resolution
Luminance	1° Lens / ≈ 2.5 to ≈ 5 x 10^8 cd/m² 5° Lens / ≈ 0.1 to ≈ 2 x 10^7 cd/m² 10° Lens / ≈ 0.02 to ≈ 3 x 10^6 cd/m²
Min. Illuminance for Color Meas.	0.5 lx (CIE standard illuminant A)
	0.5 lx (CIE standard illuminant D_{65})
Color uncertainty	0% with CIE standard illuminant A,
• filter illuminated with standard illuminant A	< 1 % with BG 34, nom. x0.3914/y0.3925
	< 1 % with BG 7, nom. x0.2646/y0.4057
	< 1 % with OG 530, nom. x0.5417/y 0.4538
• nominal x 0.4476, y 0.4074	< 1 % with VG 3, nom. x0.3656/y0.5272
	< 2 % with RG 6, nom. x0.6860/y0.3135
	< 20 % with SFK 100, nom. x0.1450/y0.0426
	< 1 % with SFK 101, nom. x0.4299/y0.5376
	< 2 % with SFK 102, nom. x0.5457/y0.4511
X_{short} f_1 Error	≤ 8.5 %
X_{long} f_1 Error	≤ 7 %
Y f_1 Error	≤ 4 % (also photopic vision detector)
Z f_1 Error	≤ 3 %
f_2 Cosine Error	≤ 3 % (for illuminance measurements)
Cal. Uncertainty	≤ 1.1 % ((V(λ))
Size & Weight	45 mm dia. x 20 mm; 2 m cable with -4

Dimensions



Ordering Information	
HCT-99	Luminous color meter with CT-4501-4, hard carrying case, batteries, USB cable, USB DLL and manual
Luminance Option	See section light detectors: SRT front lenses for 45-type model CT-4501
Luminous Flux Option	See section integrating spheres
OS-X1	Software for remote control operation of the X11