

MINOLTA

INDUSTRIAL METERS

ILLUMINANCE METER T-1/T-1H/T-1M
LUMINANCE METER nt-1°/ft-1°/nt-1/3°
CHROMA METER CL-100
DATA PROCESSOR DP-100
CHROMA METER xy-1
TV-COLOR ANALYZER II





ILLUMINANCE METERS

Minolta Illuminance Meters offer excellent light-measuring capabilities with superb accuracy and simple operation. This is achieved by combining a silicon photocell with a microprocessor for compact, lightweight design. Their convenience and portability are invaluable for the control of lighting in industrial and recreational areas, as well as in laboratory and environmental control applications.

Measuring time can be adjusted for accurate readings of both continuous and flickering light sources. Illuminance deviation between sources can also be determined, or integrated illuminance over a period of time can be calculated. Three models are available, offering different features to meet any user requirement.

Features

- Three modes of operation:
 1. Illuminance metering of continuous or flickering light sources possible by adjusting response time.
 2. Illumination can also be integrated over a period of time, with both the total illuminance and time period displayed.
 3. Two different sources of illumination can be compared by using the meter's memory.
- Illuminance can be measured in either lux or ft-cd.
- Range can be automatically selected by meter, or user can select one of five fixed ranges.
- Zero calibration is quick and convenient, and display reminds user that calibration is necessary.
- Custom-designed liquid-crystal display clearly shows meter readings and other essential information.
- Minolta Illuminance Meters are extremely portable, weighing only 220g (not including battery) and requiring only one 9v battery.
- Additional features include an instruction plate on the back of the meter listing basic operational steps; an analog output jack for connection to a separate data recorder; and an external power socket allowing use of commercially-available 9v DC power supplies for extended measuring times.

- Receptor head can be detached from the meter body and connected to one of four optional Minolta Adapter Cords for remote metering of controlled lighting setups.



Applications

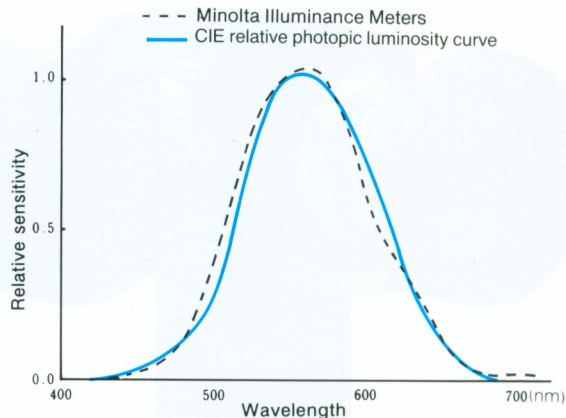
Minolta Illuminance Meters are ideal for measuring illumination and exposure levels in a wide variety of industrial, recreational, and scientific applications. To best meet user requirements, Minolta offers three different models:

- Model T-1, with a metering range of 0.01 to 99,900 lux (0.001 to 9,990 ft-c), is ideal for measurements in most situations.
- Model T-1M, with the same metering range as Model T-1, is equipped with a 14mm diameter remote receptor for use in small areas.
- Model T-1H has an increased metering range, from 0.1 to 999,000 lux (0.01 to 99,900 ft-c), for measuring very high illumination levels.



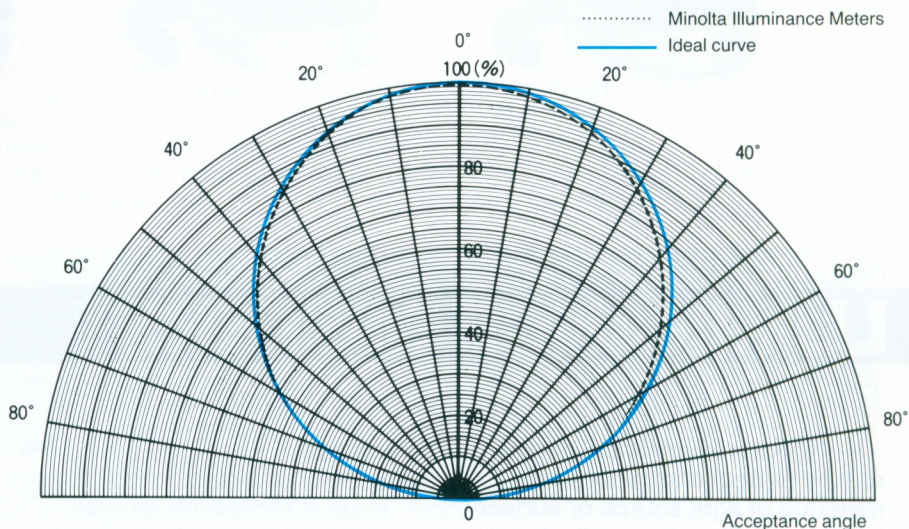
Spectral response

As indicated in the graph at right, the spectral response of Minolta Illuminance Meters is within 2 percent of the CIE (Commission Internationale de l'Eclairage) relative photopic luminosity curve.



Acceptance angle characteristics

The incident light acceptance characteristics of Minolta Illuminance Meters are compared with the ideal acceptance curve in the graph at right. The difference is within 2 percent at a 30° angle of acceptance, 7 percent at 60°, and 25 percent at 80°.



TECHNICAL DETAILS

Type: Multi-function illuminance meter with microprocessor and liquid-crystal display for continuous and flickering light sources

Receptor: Silicon photocell; receptor head detachable

Spectral response: 400 to 760 nm within $\pm 2\%$ (integrated) of CIE photopic luminosity curve

Response time: "FAST" setting: 1msec. (0.001 sec.) "SLOW" setting: 1 sec.

Measuring functions: Illuminance in lux (lx) or footcandles (ft-c); integrated illuminance in lux-hours (lx•h) or footcandle-hours (ft-c•h); integration time in hours (h)

Measuring ranges:

T-1/T-1M:

Illuminance: 0.01 to 99,900 lx (0.01 to 300,000 lx*)
0.001 to 9,990 ft-c (0.001 to 30,000 ft-c*)

* analog-output ranges

5 ranges in Manual mode

Integrated illuminance: 0.01 to 999,000 lx•h
0.001 to 99,900 ft-c•h

Integration period: 0.01 to 999 hours

T-1H:

Illuminance: 0.1 to 999,000 lx (0.1 to 3,000,000 lx*)
0.01 to 99,900 ft-c (0.01 to 300,000 ft-c*)

* analog-output ranges

5 ranges in Manual mode

Integrated illuminance: 0.1 to 9,990,000 lx•h
0.01 to 999,000 ft-c•h

Integration period: 0.01 to 999 hours

Accuracy: $\pm 2\%$ of CIE standard, ± 1 digit in last changing display position

Analog output: 1mv per digit; 3v at maximum reading; 10 kilo ohms impedance

Power source: One 9v battery (Eveready 216 or equivalent) or external 9v 7mA DC source

Accessories:

Included with unit: Receptor cap, web neck strap, analog-output plug, belt case

Optional: Adapter Cord MA-1 (2m or 6.6ft.), MA-2 (1m or 3.3ft.), MA-3 (5m or 16.4ft) and MA-4 (10m or 32.8ft.)

Dimensions:

Meter body: 170 x 72 x 33mm (6-11/16 x 2-13/16 x 1-5/16 in.)

T-1M: Receptor head: $\phi 16.5 \times 12$ mm ($\phi 5/8 \times 1/2$ in.)

Receptor surface: $\phi 14$ mm ($\phi 9/16$ in.)

Cord: 1m (3 ft. 3-3/8 in.)

Weight: 220g (7-3/4 oz.) without battery

Specifications subject to change without notice



nt-1/3°

nt-1°

ft-1°

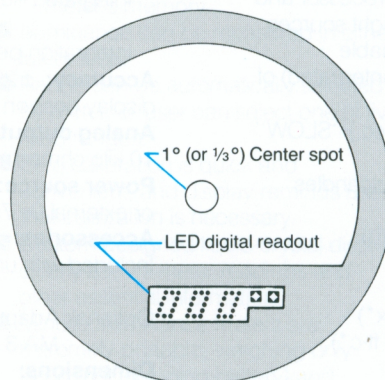
LUMINANCE METERS

Minolta Luminance Meters are the perfect choice for spot metering of light source or surface brightness. Flare-free optical design and a highly sensitive silicon photocell combine for extremely accurate readings. The single-lens-reflex viewing system provides a bright field of view, and the center spot indicates exactly what is being measured.

An LED digital display inside the viewfinder allows readings to be taken while viewing the object. The meter will automatically select the measuring range, or one of several fixed ranges can be selected by the user. Measurements can be made of both continuous and flickering light sources, and optional close-up lenses can be used for metering of small objects. Minolta offers three models to meet the needs of different applications.

Features

- Acceptance angle of 1° (1/3° on model nt-1/3°) permits accurate luminance measurements of small subject areas.
- Minolta SLR viewing system ensures that only the indicated area is measured.
- Digital display inside viewfinder allows user to take measurements while viewing object.



- Flare-free optical system eliminates interference from light outside measuring area.
- Metering range can be automatically selected by meter, or user can select one of several fixed ranges.
- Metering circuit allows accurate measurement of continuous light

- sources or flickering light sources (such as TV screens, CRTs, etc).
- Compact, lightweight body and low power consumption (only one 9v battery required) increase portability.
- Additional features include a chart on side of meter listing conversion factors for other units; an analog output jack for connection to a separate data recorder; and optional close-up lenses for accurate metering of areas as small as 0.4mm in diameter (when using nt-1/3°).

Applications

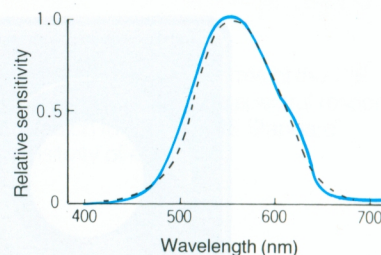
Minolta Luminance Meters are ideal for spot readings of light source or surface luminance. To better meet user needs, Minolta offers three models:

- ft-1° has a 1° acceptance angle and measures from 0.01 to 99,900 ft-L in manual mode (five fixed metering ranges) or automatic mode.
- nt-1° also has a 1° acceptance angle, but measures in terms of nt (cd/m²) from 0.1 to 99,900 nt in manual mode (four fixed metering ranges) or automatic mode.
- nt-1/3° has a 1/3° acceptance angle and measures from 1 to 99,900 nt in manual mode (three fixed metering ranges) or automatic mode.



Spectral response

As shown in the graph at right, the spectral response of Minolta Luminance Meters is within 2 percent of the CIE (Commission Internationale de l'Éclairage) relative photopic luminosity curve.

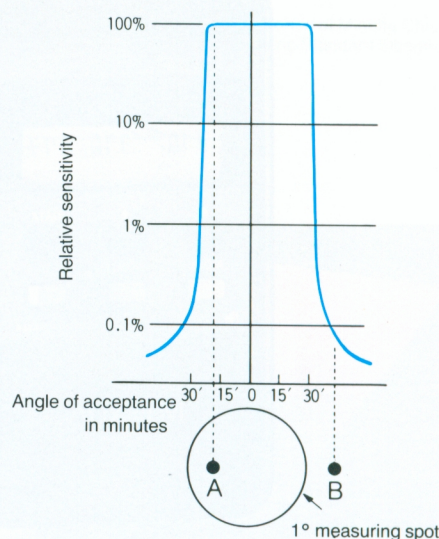


— Spectral response of Minolta Luminance Meters
 - - - CIE relative photopic luminosity curve

Reduction of flare

One of the most important considerations in the construction of a spot luminance meter is the reduction of influence from light outside the photocell's angle of acceptance. Two important design features make Minolta Luminance Meters virtually the most accurate luminance meters available. First, the objective lens precisely focuses the light entering the meter so that only those rays within the center spot are measured. Then, instead of a pellicle-type mirror which could diffuse the light before it strikes the photocell, Minolta utilizes a "total-reflection" mirror to transmit the subject image to the viewfinder. These features, along with careful construction and quality control, result in a flare factor of below 1.5 percent.

When a small, bright area moves from point A to point B in the graph at right, its measured value at B is less than 0.1 percent of the value measured at point A inside the center spot.



Close-up lenses

Optional Minolta Close-up Lenses reduce the meters' measuring areas for accurate close-up readings of small light source and surface areas. The chart at right indicates focusing ranges and measuring areas.

Close-up lens	* Angle of acceptance	** Focus distance		Measuring circle	
		Min.	Max.	at min. focus distance	at max. focus distance
No close-up lens	1/3°	1014 mm (3'4")	∞	∅ 4.8 mm	—
	1°	1014 mm (3'4")	∞	∅14.4 mm	—
No. 153	1/3°	623 mm (2'1")	1210 mm (4')	∅ 2.7 mm	∅6.3 mm
	1°	623 mm (2'1")	1210 mm (4')	∅ 8.0 mm	∅18.7 mm
No. 135	1/3°	447 mm (1'6")	615 mm (2')	∅ 1.8 mm	∅2.9 mm
	1°	447 mm (1'6")	615 mm (2')	∅ 5.2 mm	∅8.7 mm
No. 122	1/3°	323 mm (1'1")	368 mm (1')	∅ 1.1 mm	∅1.5 mm
	1°	323 mm (1'1")	368 mm (1')	∅ 3.2 mm	∅4.3 mm
No. 110	1/3°	203 mm (8")	205 mm (8")	∅ 0.5 mm	∅0.4 mm
	1°	203 mm (8")	205 mm (8")	∅ 1.5 mm	∅1.3 mm

* 1/3°—Minolta Luminance Meter nt-1/3° 1°—Minolta Luminance Meter nt-1°, ft-1°

** Meter-to-subject distance measured from the focal plane index (∅)

TECHNICAL DETAILS

Type: Reflex-viewing spot-reading automatic/manual luminance meter

Measuring method: Reflected light by silicon photocell with 1° (1/3° in model nt-1/3°) angle of acceptance

Viewing system: Focusing, through-the-lens reflex type

Objective lens: 85mm f/2.8

Angle of view: Circular 9° with central 1°

(1/3° in model nt-1/3°) center spot

Magnification: 2.96X focused at infinity

Focusing: 1m (3.3 ft.) to infinity by objective-component single helicoid; eyepiece adjustable from -4.6 to +2.7 diopters

Minimum measuring area:

ft-1°/nt-1°: ∅15mm at 1m (∅1.3mm with close-up lens)

nt-1/3°: ∅5mm at 1m (∅0.4mm with close-up lens)

Finder indication: By light-emitting-diode (LED) digital readout in the finder; cd/m² (ft-L on model ft-1°) numbers 000 to 999 with floating or manually-set decimal point and LED indication for 10X and 100X displayed value

Measuring range:

nt-1°: 0.1 to 99,900 cd/m² (nt)

nt-1/3°: 1 to 99,900 cd/m² (nt)

ft-1°: 0.01 to 99,900 ft-L

Response time:

Automatic: Approx. 3 sec. from 0.1 to 99,900

Manual: Approx. 2 sec. from 0.1 to 999

Analog: 90% within 0.4 sec.

Spectral response: Within ±2% of CIE relative photopic

luminosity curve

Accuracy: Within ±4% of Minolta standard, ±1 digit in last display position

Temperature/humidity error: Within ±3% from 0° to 40°C with up to 85% humidity

Influence of flare: Less than 1.5% from outside angle of acceptance

Analog output:

Output voltage: 1v full scale

Output impedance: 10 kilo ohms

Power source: One 9v battery (Eveready 216 or equivalent)

Battery check: By lighting of LED display when measuring trigger pulled

Other: Folding rubber lens hood, rubber eyepiece guard, table for conversion of ft-L to cd/m² (nt), cd/ft², and asb (for model nt-1°/nt-1/3°, conversion of cd/m² (nt) to ft-L, cd/ft², and asb) on side of meter, tripod socket on end of handgrip, screw for zero adjustment, wrist strap

Size: 62 × 162 × 119mm (2-7/8 × 6-3/8 × 4-11/16 in.)

Weight: 510g (18-1/8 oz.) without battery

Accessories: Analog-output jack; adjustable eyepiece; lens shade

Optional accessories: Close-up lenses

Specifications subject to change without notice



CHROMA METER CL-100

Minolta's Chroma Meter CL-100 combines the latest in microprocessor technology with three high-sensitivity silicon photocells to produce a compact light-source color meter offering superior accuracy. Its ease of use and wide range of features make it ideal for a variety of applications in both production and research. Chromaticity can be measured in both Y_{xy} (CIE 1931) and $Y_u'v'$ (CIE 1976) color systems, and color difference can be measured as $\Delta(Y_{xy})$, $\Delta(Y_u'v')$, or total color difference $\Delta u'v'$.

Zero calibration is quick and easy, and the meter can also be calibrated to any user standard. Precisely-controlled measuring time allows use with both continuous and flickering light sources. Remote control is possible, and the CL-100 can also be interfaced with the Data Processor DP-100, increasing its versatility and convenience.

Features

- Two modes of operation:
 1. Chromaticity can be measured and displayed in either Y_{xy} (CIE 1931) or $Y_u'v'$ (CIE 1976) notation.
 2. Color difference can be measured and displayed in $\Delta(Y_{xy})$ or $\Delta(Y_u'v')$ notation or as total color difference $\Delta u'v'$.
- Conversion between notations is automatically calculated by meter.
- Precise measuring time of 100.0ms allows accurate measurement of both continuous and flickering light sources.
- Zero calibration is easy, and meter reminds user when calibration is necessary.
- Calibration to any user reference is also possible to standardize meters.
- Automatic cancelling feature clears display after three minutes to conserve battery power, yet keeps meter always ready for instant use.
- Meter is lightweight and compact, and requires only one 9v battery, making it extremely portable.
- Other features include detachable head for use with turn adapter or optional adapter cords; CRT reading hood for measuring cathode-ray tubes; and remote-control and data-output jacks for connection with a separate data processor.



Minolta Data Processor DP-100

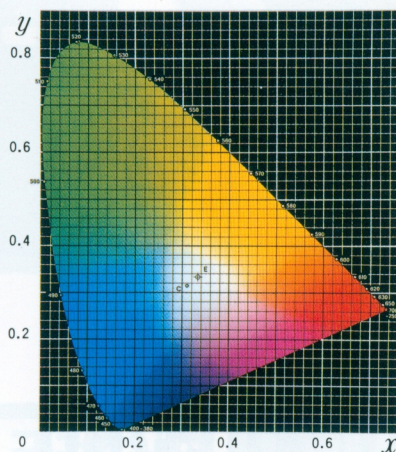
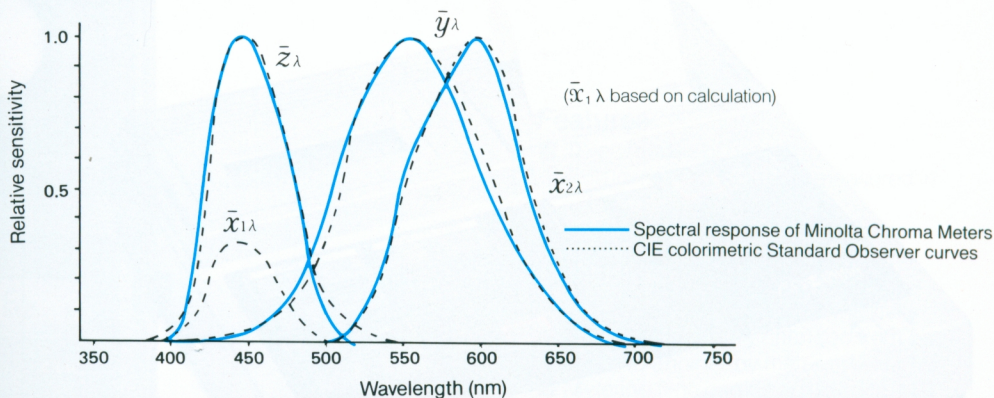
Applications

- Measuring chromaticity of light sources
- Determining color difference between two light sources or between a light source and a standard
- As an aid in adjusting source output to industry standards or user reference



Principles of basic colorimetry

Minolta Chroma Meters measure source and sample color in terms of the CIE (Commission Internationale de l'Eclairage) XYZ tristimulus values. The spectral response of each meter's three sensors is filtered to closely match that of the CIE Standard Observer. The graph below shows the relative sensitivity of each.



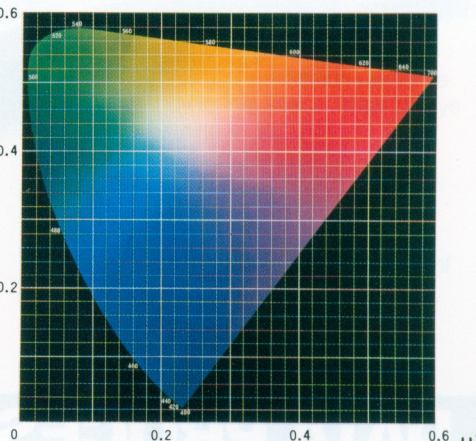
Each meter then immediately performs a series of calculations to compute the characteristics of the source according to color temperature and CIE chromaticity standards.

The equations of the chromaticity coordinates xy in terms of the XYZ tristimulus values are:

$$x = X/[X + Y + Z]$$

$$y = Y/[X + Y + Z]$$

The xy chromaticity diagram is shown above.



The equations of the chromaticity coordinates $u'v'$ in terms of the chromaticity coordinates xy are:

$$u' = 4x/[-2x + 12y + 3]$$

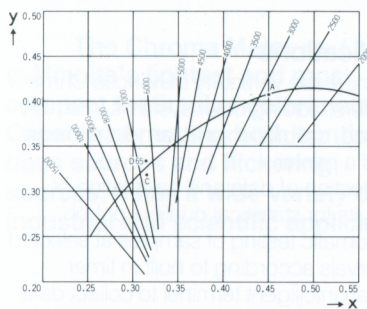
$$v' = 9y/[-2x + 12y + 3]$$

The equation for the total color difference $\Delta u'v'$ is:

$$\Delta u'v' = [(\Delta u')^2 + (\Delta v')^2]^{1/2}$$

The $u'v'$ chromaticity diagram is shown above.

The color temperature of a source is the temperature in Kelvins at which an ideal black-body radiator would emit the same spectral power distribution. The black-body locus on the xy color system is shown below.



TECHNICAL DETAILS

Type: Hand-held dual-function light-source colorimeter with CIE standard digital readout by microprocessor and liquid-crystal display

Receptor: 3 silicon photocells filtered to detect primary stimulus values for blue, green, and red light

Spectral response: Closely approximates CIE (Commission Internationale de l'Eclairage) colorimetric Standard Observer curves (\bar{x}_λ , \bar{y}_λ , and \bar{z}_λ)

Measuring modes and chromatic systems: Y_{xy} (CIE 1931) and $Y_{u'v'}$ (CIE 1976) for chromaticity: $\pm \Delta(Y_{xy})$, $\pm \Delta(Y_{u'v'})$ and $\Delta u'v'$ for color difference

Color deviation mode: One channel for memory of reference color (measured or input); measured value compared by microprocessor and color difference displayed on LCD

Calibration standard:

PRESET: Minolta calibration standard

VARI: User's selected calibration standard

Display: LCD type; 11 digits with decimal and unit identifications as applicable; desired readout selectable by pressing appropriate key before/after reading made; "E9" displayed when measured value is out of display range; display cancels

approx. 3 minutes after last control released

Measuring range: 5.1—32,700 lx; display blinks when measured value under range, "E0" appears on display when measured value over range

Repeatability: Chromaticity (x, y): ± 0.0005

Controls: Measuring button, mode selector key, data-selector key, increase key, decrease key, function key, data-output key, calibration-selector switch, deviation-setting switch

Terminals: Remote-control socket, data-output terminal

Data output: 1-bit serial, open collector; remote-control operable

Electronic components: Hermetically sealed microprocessor chip; custom-designed liquid-crystal display; gold-plated data-out and receptor-head plug contacts

Power source: One 9v battery (Eveready 216 or equivalent)

Accessories: CRT-reading hood, calibration cap, turn adapter, case, strap

Optional accessories: Adapter Cord MA-1, MA-2, MA-3 and MA-4

Dimensions: 195 × 72 × 39mm (7-11/16 × 2-13/16 × 1-9/16 in.)

Weight: 290g (10-1/4 oz.) without battery



DATA PROCESSOR DP-100

The Minolta Data Processor DP-100 greatly increases the flexibility of the already versatile Minolta Chroma Meter CL-100. The DP-100 adds determination of color temperature and deviation from black-body standard to the CL-100. Additional memory, a built-in printer, and automatic statistical calculations make the DP-100 a valuable accessory.

Features

- The Data Processor DP-100 is compatible with Minolta Chroma Meter CL-100, CT-100 and CR-series models.
- When used with CR-series meters, the DP-100 adds use of the Munsell and CIE L*a*b* color systems; when used with the CL-100, determination of color temperature (K) and deviation from black-body standards is added.

- User standards may be stored in any of four calibration channels, and target colors may be entered into any of 17 color channels (four per calibration channel, plus one temporary target channel).
- Up to 300 sets of color data can be stored in the memory, and the stored data can be divided into as many as 16 pages for better organization. A built-in Ni-Cd battery supplies power to the memory even when main power switch is off, thus preventing memory loss.
- Statistical calculations may be performed using the data on each individual page or all pages, and both data and results can be printed out on the built-in 24-character thermal-dot printer.
- The built-in timer can be set for intervals from six seconds to 99 minutes, to automatically control the taking of measurements.
- Power is supplied by six AA batteries, or by AC adapter included with unit.
- Other features include a standard RS-232C data output terminal; a bracket for mounting the DP-100 together with a Minolta Chroma Meter; and a remote control socket for connection to an external switch.

Applications

- To increase versatility of Minolta Chroma Meters, adding color systems, memory space, calibration and target channels, and a printer
- Collection of data and calculation of results for statistical quality control
- Automatic testing of samples at selected intervals according to built-in timer
- As an intelligent terminal to collect data for later input to computerized manufacturing system

TECHNICAL DETAILS

Type: Battery-powered multi-function data processor for use with Minolta Chroma Meter CL-100, CR-series and CT-100

Display: 16 characters x 2 lines; dot-matrix LCD type

Print out: 24-character thermal-dot printer

Data storage: Stores up to 300 sets of color coordinates; 16-page capability in memory area; built-in memory backup

Statistical calculations: Maximum, minimum, mean, and standard deviation

Timer: User-selectable intervals from approx. 6 sec. to 99 min.

Color space systems:

For Chroma Meter CL-100

absolute color: Yxy (CIE 1931), Yu'v', color temperature, color distance from blackbody by $\Delta u'v'$; color difference: $\Delta(Yxy)$, $\Delta(Yu'v')$, $\Delta u'v'$

For Chroma Meter CR-series and CT-100

absolute color: Yxy (CIE 1931), L*a*b* (CIE 1976), L*C*H°, Munsell; color difference: $\Delta(Yxy)$, $\Delta(L*a*b*)$, $\Delta(L*C*H°)$, ΔE^*ab

Calculating speed: Absolute value: approximately 0.5 seconds; color difference: approximately 0.7 seconds

Calibration channels: 4 (W, 1, 2, 3)

Target color channels: 17 (four per each calibration channel, plus 1 temporary target channel)

Data output: RS-232C format; transmission rate is 600-9600 BPS; output voltage is CMOS $\pm 5v$; output terminal uses DIN 8 pin connector

Other: High-repeatability multiple averaging mode; remote control socket

Power: Six AA-size alkaline-manganese (1.5v) batteries or included AC adapter connected to AC power source; memory backup uses built-in Ni-Cd battery

Dimensions: 50 x 220 x 200mm (1-15/16 x 8-11/16 x 7-7/8 in.)

Weight: 1.3 Kg (2 lb. 13-7/8 oz.) without battery

Specifications subject to change without notice



Features

- Three modes of operation:
 1. Illuminance (Y) can be measured in lux.
 2. Chromaticity coordinates can be determined in terms of x and y.
 3. Color temperature in K (Kelvins) is calculated by meter automatically.
- Readings are easily changed from one mode to another by meter.
- Metering time can be adjusted to measure continuous or flickering light sources.
- Automatic cancelling feature clears display after four minutes to conserve battery power, yet keeps meter always ready for instant use.
- Portability is assured by the meter's lightweight, compact design and 9v battery.
- Other features include a chart of CIE Standard Illuminant values on back of meter; detachable head for use with optional adapter cords; and data-output jack for connection to a separate data processor.

CHROMA METER xy-1

The Chroma Meter xy-1 is Minolta's lightest and most compact tristimulus colorimeter. Capable of reading both continuous sources and flickering sources, it has a wide variety of industrial and scientific applica-

tions. It is ideal for on-the-spot quality control. Measurements are made by simply pressing a button, and illuminance, chromaticity coordinates, and color temperature are digitally shown in the liquid-crystal display.

Applications

- Determining chromaticity and color temperature of light sources
- As an aid in adjusting source chromaticity or color temperature to industry standards or desired user reference

TECHNICAL DETAILS

Type: Hand-held light-source/object colorimeter with CIE-standard digital readout by liquid-crystal display and microprocessor

Receptor: 3 silicon photocells (respectively filtered to detect primary stimulus values for blue, green, and red light), under shielded integrating flat opal diffuser; receptor head detachable

Spectral response: Closely approximates CIE (Commission Internationale de l'Eclairage) colorimetric Standard Observer curves

Calibration settings: "E" for measuring effective chromaticity; "STD-C" for measuring chromaticity under CIE Standard-Illuminant condition "C"

Measuring functions: Chromaticity and illuminance of light sources, color temperature of tungsten sources

Measurement readouts:

- 1) Illuminance (Y) value in lx
- 2) Chromaticity coordinates (x, y)
- 3) Color temperature in K (Kelvins) calculated automatically

Ranges and repeatability: x, y: 3 figures, $\pm 1.4\%$ for stimulus ratio X/Y, Z/X; Y: 10 to 200,000 lx, $\pm 2.5\%$ at maximum reading;

color temperature: 1,600 to 40,000K (blackbody radiant emittance), ± 2 MIRE

Minimum illumination required: 10 lx

Controls: Measuring button with lock to prevent readings or read continuously; "NORM/FLICKER" light-source and "E/STD-C" observing-condition selectors; C-calibration/memory and data-output keys; "x", "y", "Y", and "K" display keys

Displays: LCD type; 6 digits with decimal and unit identifications as applicable; desired readout selectable by pressing appropriate key before/after reading made; display blinks as over-/under-range warning, cancels approx. 4 min. after measuring button released

Power source: One 9v battery (Eveready 216 or equivalent)

Other: Body housing and head of reinforced molded ABS synthetic resin; chromaticity chart "XY-AC", table of CIE standard-illuminant values on back of body; tripod socket; strap eyelet

Dimensions: 170 x 73 x 33mm (6-11/16 x 2-13/16 x 1-5/16 in.)

Weight: 230 g (8-1/8 oz.) without battery

Specifications subject to change without notice



TV-COLOR ANALYZER II

Minolta's TV-Color Analyzer II combines the latest in electronic technology with years of experience in photometry and colorimetry. It is ideal for objective white-balance measurement and color adjustment of television sets, computer monitors, and video projectors, and also for prototype testing of new products. Luminance and chromaticity can be measured in addition to primary beam intensities.

In chroma mode, any white standard or reference color can be input directly in Yxy units (Yu'v' units on model TV-2120), thus eliminating the need for white masters or comparators. In analyzer mode, primary beam measurements simplify setting white balance by allowing the user to individually adjust the red, blue, and green intensities of any CRT. Microcomputer processing of data and both analog and digital displays further increase the ease of operation.

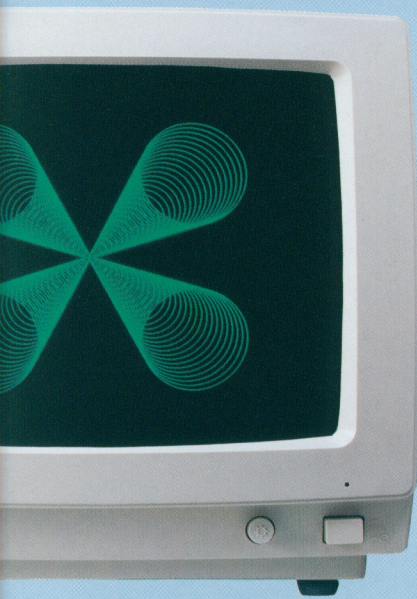
Features

- Two modes of operation:
 1. Chroma mode can be used to measure luminance and chromaticity in terms of Yxy (Yu'v' on model TV-2120).
 2. Analyzer mode can be used to measure primary beam intensities with respect to any user-selected white standard or reference color.
- Two types of display:
 1. Three 3-figure digital displays allow precise measurements.
 2. Three 10-segment analog bar graphs clearly show deviation from a white standard or reference color.
- Two types of memory:
 1. Four color channels (sixteen on models TV-2140, TV-2160, and TV-2240) for storing white standards and reference colors.
 2. Four CRT channels for storing monitor phosphor characteristics.
- Luminance can be measured in either cd/m^2 (nt) or ft-L.
- Zero calibration is easy, and meter reminds user when to calibrate.
- Meter automatically checks itself when turned on and indicates any problems.
- Battery back-up and key-lock switch prevent memory loss.

- Additional features include a chart of CIE Standard Illuminant values on top of meter; an RS-232C data output terminal for connection to a separate data processor; and, on models TV-2140, TV-2160, and TV-2240, remote control is possible.

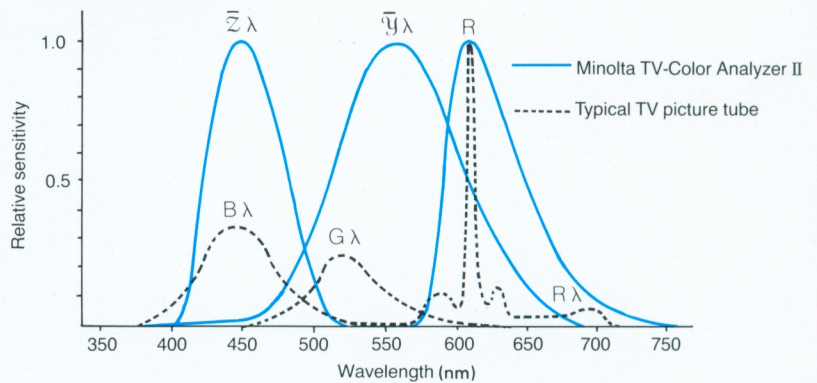
Applications

- Measurement of chromaticity and white balance of television sets, computer monitors, and video projectors.
- Determination of color differences between CRTs.
- Adjustment of chromaticity and white balance of television sets and monitors to industry standard or user reference.

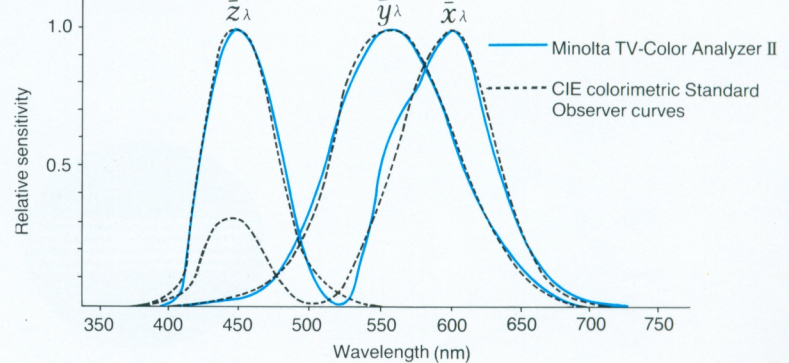


Spectral response

Analyzer mode



Chroma mode



Choice of different models

The various models in this line of TV-Color Analyzers are listed at right. A choice of two luminance ranges, four or sixteen color memory channels, plus Yxy or Yu'v' color space systems allows users to select the features that best suit their needs. In addition, different models are available to provide color-balance values based on either red- or green-beam output of a monitor.

Model	Luminance range	Color memory	Beam standard	Color space
TV-2120	3—999 cd/m ² (1—290 ft-L)	4 channels	green	Yu'v'
TV-2130	3—999 cd/m ² (1—290 ft-L)	4 channels	green	Yxy
TV-2140	3—999 cd/m ² (1—290 ft-L)	16 channels	green	Yxy
TV-2150	0.6—200 cd/m ² (0.2—58 ft-L)	4 channels	green	Yxy
TV-2160	0.6—200 cd/m ² (0.2—58 ft-L)	16 channels	green	Yxy
TV-2230	3—999 cd/m ² (1—290 ft-L)	4 channels	red	Yxy
TV-2240	3—999 cd/m ² (1—290 ft-L)	16 channels	red	Yxy
TV-2250	0.6—200 cd/m ² (0.2—58 ft-L)	4 channels	red	Yxy

TECHNICAL DETAILS

Type: Color-TV white-balance analyzer and chromaticity meter with digital/analog display

Measurement modes: Analyzer: primary-color intensities (R, B, G) based on reference memory; Chroma: chromaticity coordinates x, y (u' and v' values in Model 2120) and luminance Y

Chromaticity error: ±0.005 or less (under Illuminant C conditions at 999 cd/m²)

Repeatability: Y: ±0.1% (±1 digit) at full scale, xy: ±0.002 (under Illuminant C conditions at 25 cd/m²)

Operating temperature range: 0°C to 40°C

Display: Digital: R, B, G, or x, y, Y (u', v', Y) in three figures; analog: three 10-LED deviation arrays giving ΔR/G, ΔB/G, ΔG (for models TV-2120 ~ 2160), ΔG/R, ΔB/R, ΔR (for models TV-2230 ~ 2250) or Δx, Δy, ΔY (Δu', Δv', ΔY)

Luminance unit: cd/m² or ft-L (selectable by switch on bottom panel)

Response time: Approx. 0.5 sec.

Memory: "COLOR": four (sixteen) white-standard/reference-color channels; "CRT": four phosphor-characteristic channels

Memory life: 1500 hours (approx. 2 months), provided unit used at least 7 hours per week

Data output: RS-232C standard; transmission rate: 4800 BPS (adjustable from 300 to 9600 BPS by service station)

Power source: AC 100, 115, 200, 220, 240v (selectable on rear panel), 50—60Hz, 10vA

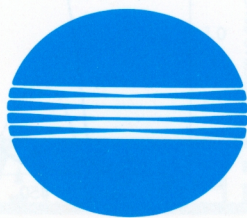
Dimensions: 120 × 300 × 200mm (4-3/4 × 11-13/16 × 7-7/8 in.)

Weight: Approx. 4 kg (8 lb. 13 oz.) including probe

Accessories: Probe, calibration cap, power cord, tripod-socket screw

Optional accessories: Hard case, soft case

Specifications subject to change without notice



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