

MINOLTA

CHROMA METERS

CR-100, CR-110, CR-121, CR-131, CT-100, and
Data Processor DP-100



MINOLTA CHROMA METERS

For measuring reflected- or transmitted-light color

Minolta tristimulus colorimeters provide color and color-difference measurements from a wide variety of samples. Compact and lightweight, these durable instruments are ideally suited for high-volume use in both production and laboratory applications.

Color and color-difference readings

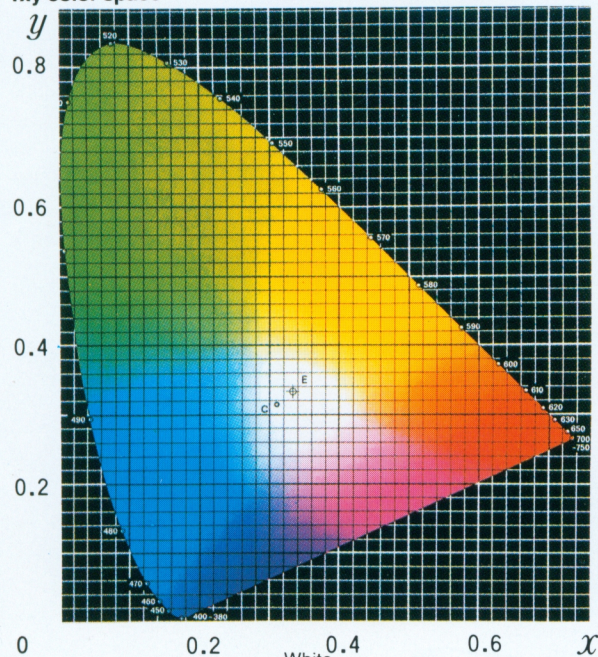
Minolta Chroma Meters provide highly accurate measurements of chromaticity and illuminance, and also enable quick, objective comparisons between two samples for matching colors or setting tolerances.

CIE standard illuminant (Illuminant C or D₆₅ selectable) and observer conditions are used when measuring the sample's spectral characteristics, enabling determination of X, Y, and Z tristimulus values.

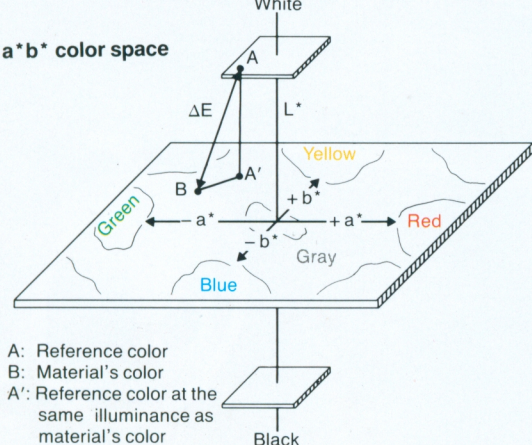
For color readings, these values are translated into Yxy coordinates (accepted internationally as the standard in color communication) or L*a*b* coordinates, whose spacing correlates more closely with color change as perceived by the human eye.

For color-difference readings, data is displayed in terms of $\Delta(Yxy)$, $\Delta(L^*a^*b^*)$, or ΔE . Readings can be converted instantly from one color system to the other at the push of a button.

Yxy color space



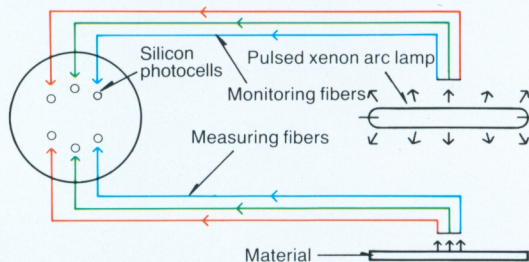
L*a*b* color space



Consistent, diffuse illumination

Minolta Chroma Meters use a pulsed xenon arc lamp inside a mixing chamber to provide diffuse, even lighting over the sample. A double-beam feedback system is also incorporated to ensure that lighting remains consistent for each measurement.

In addition to the sensors which measure the light from the sample, three other photocells read the color of the incident light each time the lamp is fired. The microcomputer then uses this data to check and compensate for any changes in the illumination.



Measuring system

The measuring system employed by these colorimeters is designed to provide accurate readings and uniform response. Light from the PXA lamp evenly illuminates the sample, and only that reflected (or transmitted) along the normal to the surface is collected by the optical cable for color analysis.

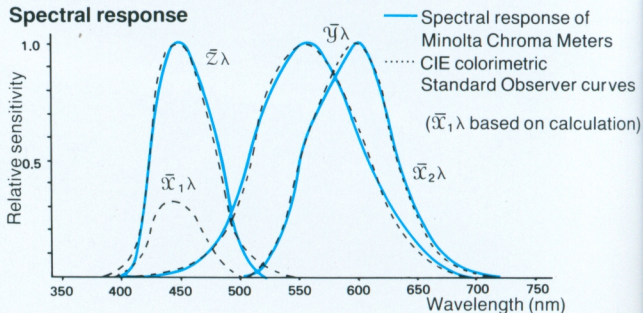
The light received is divided three ways and passed through special filters whose light-absorbing characteristics combine with the spectral response of the photocells to duplicate CIE 1931 Standard Observer functions.

Upon striking the silicon photocells, light energy is converted into electrical signals and sent to the microprocessor, where it is adjusted for the illuminating condition desired and then converted into coordinates for the chosen color space.

Readings are displayed in the LCD panel and can be transferred to a separate computer or processor through the data output terminal.

- Minolta also sells incident-light Chroma Meters for measuring the chromaticity and color temperature of light sources and other luminous objects.

Spectral response



Minolta Chroma Meters: models and applications

Five different models allow you to choose the meter most suited to your needs.

Each meter has its own combination of measuring area and illuminating/viewing geometry in order to provide the most accurate readings for a specific type of surface.



CR-100

d/0 geometry
Measuring area: ϕ 8mm
General-purpose model of the CR-series; provides accurate readings from a wide variety of samples and surfaces.



CR-110

d/0 geometry
Measuring area: ϕ 50mm
For textured surfaces where a smaller measuring area might give inaccurate readings. Use with non-glossy samples only.



CR-121

45/0 geometry
Measuring area: ϕ 3mm
Enables precise targeting on glossy samples; capable of measuring colors reproduced by printing or coating.



CR-131

45/0 geometry
Measuring area: ϕ 25mm
Designed to measure smooth, glossy surfaces that are painted or dyed; large measuring area provides uniform response.



CT-100

0/0 geometry
Measuring area: ϕ 4mm
For color measurements of transparent and semitransparent fluids, such as oils, resins, liquid dyes, etc.

APPLICATIONS

	CR-100	CR-110	CR-121	CR-131	CT-100
• Applied Coatings					
paints	✓		✓	✓	
metallic powders	✓	✓	✓	✓	
metal plating	✓		✓	✓	
printing inks	✓		✓	✓	
powdered pigments	✓		✓	✓	
• Processed Materials					
paper	✓		✓	✓	
plastic	✓	✓	✓	✓	
rubber	✓				
glass	✓				
sheet metal	✓		✓	✓	
metal cable	✓		✓		
• Clothing/Textiles					
natural fibers		✓			
carpeting		✓			
thread	✓				
leather	✓				
dyed fabric	✓	✓	✓	✓	
• Chemicals					
liquids					✓
• Building Materials					
concrete	✓	✓			
drywall		✓			
wood		✓			
• Processed Foods					
powders	✓	✓			
granules	✓	✓			
pastes	✓	✓			
liquids or syrups					✓
• Agriculture					
soil	✓	✓			
fruit	✓				
vegetables	✓				
leaves	✓	✓			
grass		✓			
• Medicine/Cosmetics					
powders	✓	✓			
granules	✓	✓			
ointments	✓	✓			
human skin	✓				
liquids					✓

Minolta Data Processor DP-100



The portable DP-100 can be used with Minolta Chroma Meters to expand the meter's measuring capabilities and provide such processing features as memory storage and hard-copy printout. The memory holds up to 300 readings which can be divided into 16 pages for easy organization of data.

Up to four calibration standards and 17 target colors can also be stored, allowing users to handle a wide range of applications quickly and easily.

Two more color spaces, L*C*H° and Munsell are added to those selectable on the meter alone, and calculation of maximum, minimum, mean, and standard deviation can be performed at the push of a button. A built-in timer allows users to take measurements at selectable intervals up to 99 minutes. For further information, see page 7.



CHROMA METER CR-100

The general-purpose model of Minolta CR-series colorimeters, this unit's 8mm diameter measuring area and d/0 geometry provide users with the flexibility to measure a wide range of sample types.

Main features

- **Precise readings with high repeatability**
The latest advances in microprocessing are integrated with time-tested technology developed over years of colorimeter manufacturing.
- **Lightweight and battery powered**
Compact size and cordless operation permit users to take readings direct from the product instead of prepared samples.
- **Readings displayed in Yxy or L*a*b* color space**
Measurements can be converted into values for either system at the push of a button, freeing the user from time-consuming calculations.
- **Built-in memory for measuring color difference**
Color difference from a user-selected target color can be determined and displayed in $\Delta(Yxy)$, $\Delta(L^*a^*b^*)$, or ΔE .
- **Choice of calibration standards**
Calibration can be done using the white plate supplied or another reference selected by the user. This enables a number of meters to be standardized for consistent response.
- **Choice of two illuminants**
Either Illuminant C or D₆₅ can be selected, providing lighting conditions that closely approximate average daylight.
- **Efficient, consistent illumination**
An energy-efficient pulsed xenon arc lamp is used to ensure that output and spectral distribution remain constant for each reading.
- **Illumination monitoring system**
A double-beam feedback system checks the chromaticity of the illumination and compensates for any deviations that might occur.
- **Interfacing with peripheral units**
The Minolta Data Processor DP-100 can be connected for additional data-processing and timer functions. Other terminals are also provided for interfacing with compatible remote controls and computers.

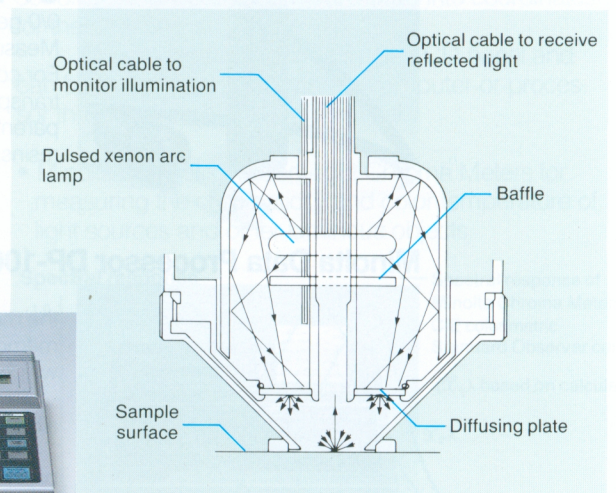


Applications

- **Manufacturing:**
Color control of painted and coated surfaces
Color control of rubber and plastic parts
- **Printing:**
Control of color density and ink characteristics
- **Textiles:**
Color monitoring of thread, fabric, etc.
- **Agriculture:**
Color analysis of soil, fruits, grain, etc.
- **Molding:**
Color control of ceramic and glass products
- **Medicine:**
Color analysis of skin, tissues, etc.

Illuminating system

The CR-100 uses d/0 geometry to obtain a reading that correlates well with color as seen under typical lighting conditions. Since illumination both in- and outdoors is usually diffused, this system employs a mixing box and diffusing plate to project light evenly onto the sample from all angles. Light reflected vertically from the 8mm diameter measuring area is picked up by the optical cable for color analysis.



Minolta Data Processor
DP-100



CHROMA METER CR-110

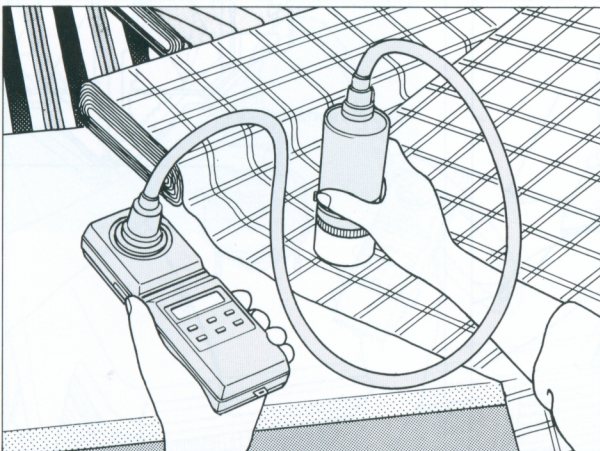
The 50mm diameter measuring area of this meter enables readings to be averaged over a relatively wide area. This is especially useful for metering samples where a smaller measurement might give inaccurate readings, such as with textured surfaces or samples with slight color variation. Employing d/0 geometry, the CR-110 is for use with only non-glossy surfaces such as cloth and carpets.

Main features

- Precise readings with high repeatability
- Lightweight and battery powered
- Readings displayed in Yxy or L*a*b* color space
- Built-in memory for measuring color difference
- Choice of calibration standards
- Choice of two illuminants
- Efficient, consistent illumination
- Illumination monitoring system
- Interfacing with peripheral units



Minolta Data Processor
DP-100



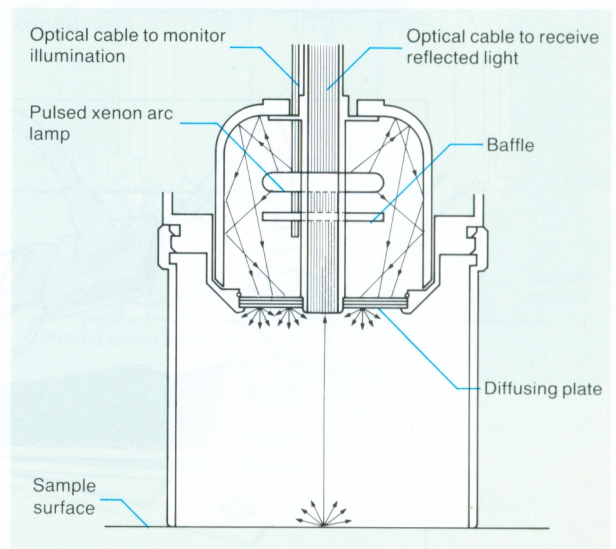
Applications

- **Textiles:**
Color control in thread and fabric dyeing
- **Agriculture:**
Color analysis of soil, leaves, etc.

Illuminating system

The CR-110 uses d/0 geometry to obtain readings that correlate well with color as seen under typical lighting conditions. Since illumination both indoors and out is usually diffused, this system uses a mixing chamber and diffusing plate to illuminate the sample evenly from all angles. Light reflected vertically from the 50mm diameter measuring area is picked up by an optical cable and sent to the silicon photocells for color evaluation.

This system's use of diffuse illumination and a large measuring area result in a reading which is influenced by the amount of specular reflection present. A high specular component will bias the chromaticity value towards that of the illumination. For this reason, glossy surfaces should not be measured with this meter.





CHROMA METER CR-121

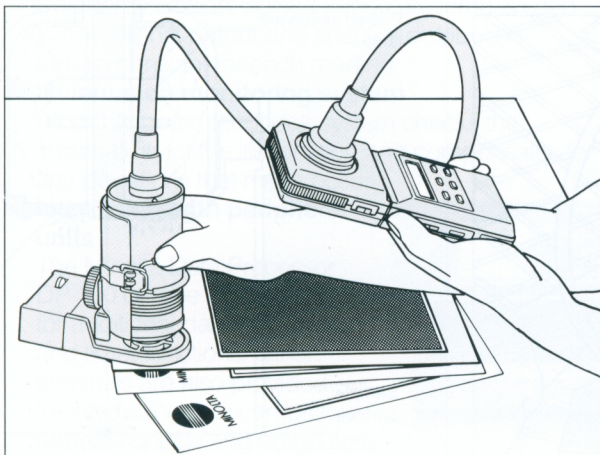
The CR-121's illuminating system, using 45/0 geometry, is identical to that used by densitometers in the printing industry, allowing users to measure color from printed matter and other glossy surfaces. In addition, its 3mm diameter measuring area enables precise targeting for spot color readings.

Main features

- Precise readings with high repeatability
- Lightweight and battery powered
- Readings displayed in Yxy or L*a*b* color space
- Built-in memory for measuring color difference
- Choice of calibration standards
- Choice of two illuminants
- Efficient, consistent illumination
- Illumination monitoring system
- Interfacing with peripheral units



Minolta Data Processor
DP-100

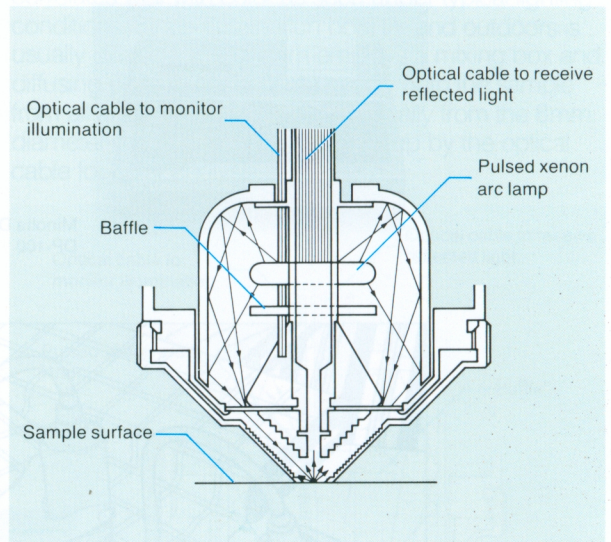


Applications

- **Manufacturing:**
Color control of painted and coated surfaces
- **Printing:**
Control of color density, ink characteristics, etc.

Illuminating system

Light from the pulsed xenon arc lamp is diffused in the mixing chamber and projected onto the sample at a controlled angle of 45°. The light reflected vertically from the sample is collected by the optical cable and sent to the silicon photocells for color evaluation. Specularly reflected light is blocked from reaching the optical cable, enabling more accurate measurement of glossy surfaces.





CHROMA METER CR-131

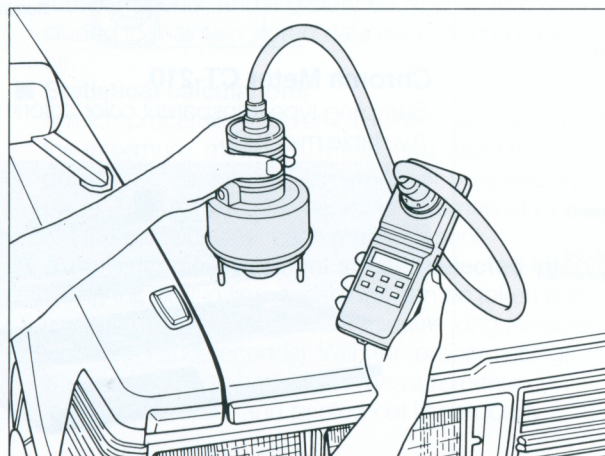
The CR-131 is designed to measure the color of smooth surfaces that are painted or dyed. Its illuminating system uses 45/0 geometry to allow accurate measurements from glossy surfaces. Color readings are averaged over a relatively large area of 25mm in diameter for a more uniform response.

Main features

- Precise readings with high repeatability
- Lightweight and battery powered
- Readings displayed in Yxy or L*a*b* color space
- Built-in memory for measuring color difference
- Choice of calibration standards
- Choice of two illuminants
- Efficient, consistent illumination
- Illumination monitoring system
- Interfacing with peripheral units



Minolta Data Processor
DP-100

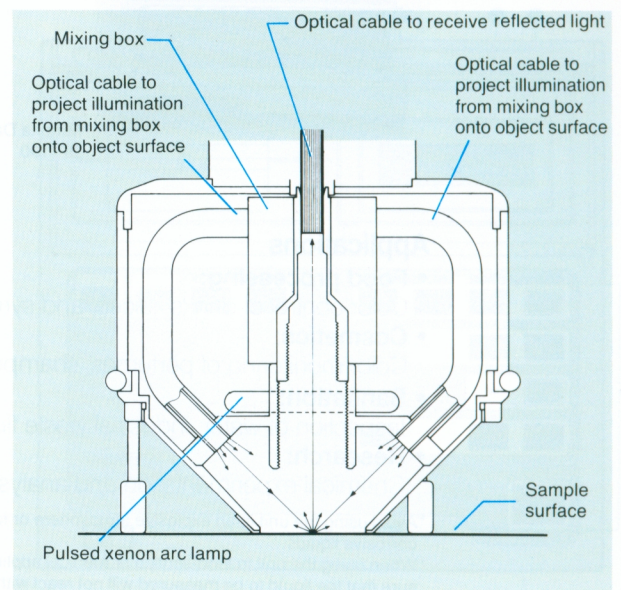


Applications

- **Textiles:**
Color control of metal-coated and silk fibers
- **Manufacturing:**
Color control of painted and coated surfaces

Illuminating system

Light from the pulsed xenon arc lamp is diffused in the mixing chamber and projected onto the sample at a controlled angle of 45°. Only the light reflected perpendicular to the surface is allowed to reach the optical cable for color evaluation. Specularly reflected light is prevented from reaching the cable and influencing the color reading, enabling accurate and objective chromaticity measurements even from glossy surfaces.





CHROMA METER CT-100

Immersible measuring head enables high-accuracy readings of transmitted color from transparent and semi-transparent fluids.

Main features

- Precise readings with high repeatability
- Lightweight and battery powered
- Readings displayed in Yxy or L*a*b* color space
- Built-in memory for measuring color difference
- Choice of calibration standards
- Choice of two illuminants
- Efficient, consistent illumination
- Illumination monitoring system
- Interfacing with peripheral units



Minolta Data Processor
DP-100

Applications

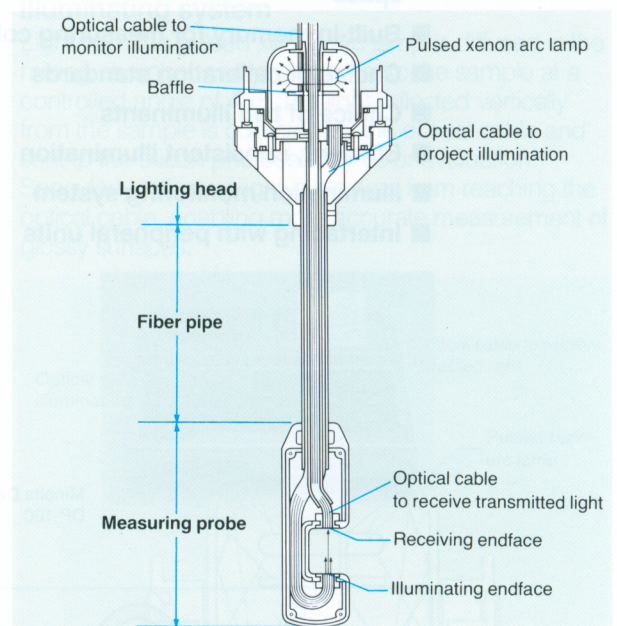
- **Food processing:**
Color control of drinks, juices, and syrups
- **Cosmetics:**
Color monitoring of perfumes, shampoo, etc.
- **Sanitation:**
Inspection of water, industrial waste fluids
- **Research:**
Chemical experimentation and analysis

* Avoid using the unit in an explosive atmosphere or to measure corrosive liquids.

* When using the unit in food-service or medical applications, be sure that the liquid to be measured will not react with the materials of the measuring probe and fiber pipe. Please refer to the specifications for a list of the materials used.

Illuminating system

Light from the pulsed xenon arc lamp is diffused in a mixing box then passed through an optical cable to the sample, where it illuminates an area approximately 5mm in diameter. Only the light transmitted through the sample and striking the endface of the receiving cable is sent to the silicon photocells for color evaluation. This endface is restricted to 4mm in diameter to ensure even illumination over the entire receptor area.



Chroma Meter CT-210

Sampling type transparent color colorimeter.
Available mid 1986.





DATA PROCESSOR DP-100

This compact, multi-function processor connects with Minolta Chroma Meters to provide such features as data storage, statistical calculation, and timer operation. The unit also increases the number of color spaces available for data readout.

Main features

Very portable for convenient use

The DP-100's compact size and cordless operation (powered by six AA-size batteries) allows it to be taken virtually anywhere color measurements are needed. For extended use without battery recharging, an optional AC adapter is also available, enabling the data processor to be run from an ordinary AC outlet.

LCD display and printout capability

Measurements are displayed on an LCD panel which is adjustable for easy viewing from any angle. A thermal-dot printer is also built in to enable data printout automatically or at the touch of a button.

Readings in four color-space notations

With the DP-100 connected to a Minolta Chroma Meter, two more color spaces, $L^*C^*H^\circ$ and Munsell, are added to those selectable on the meter alone. Chromaticity readings can be expressed in coordinates for Yxy, $L^*a^*b^*$, $L^*C^*H^\circ$, and Munsell systems; color-difference readings are shown in terms of $\Delta(Yxy)$, $\Delta(L^*a^*b^*)$, $\Delta(L^*C^*H^\circ)$, and ΔE . Displayed data can be converted from one space to another with push-button ease, and the unit can be set to automatically print out values for all spaces with each measurement.

Data storage with memory backup

The built-in memory stores up to 300 sets of measurements, and a battery backup system is included to maintain stored data even when power is off.

Statistical calculations

A microprocessor enables calculation and display of the maximum, minimum, mean, and standard deviation of all data in the memory or on a selected page. The unit can also be set to automatically print out the statistics after each measurement.

Automatic measurement at user-selected intervals

Using the built-in timer, readings can be taken automatically at intervals up to 99 minutes long (selected in minutes and seconds). With the proper settings, it is also possible to have timer measurements displayed, stored, and printed out in hardcopy.

Calibration standards

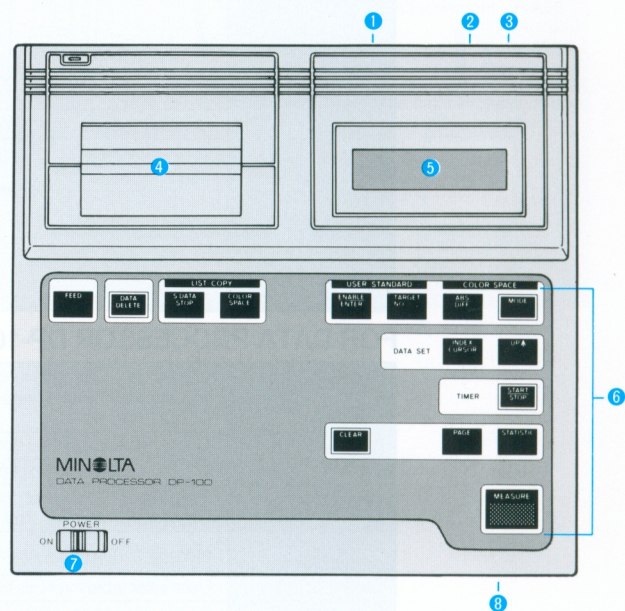
Values for four separate calibration standards can be input to the memory for easy access and optimum accuracy when evaluating the color of objects with different chromaticity.

Memory space for up to 17 target colors

The memory can hold up to 17 sets of color coordinates for use as target colors in color-difference measurements. A special temporary target channel permits quick memory input for applications where target colors are used briefly and then changed.

Data output terminal

The DP-100's data output terminal (RS-232C) allows the unit to function as an intelligent terminal for a computer-controlled color-monitoring system.



- 1 Data input terminal
- 2 Remote control socket
- 3 AC adapter socket
- 4 Printer
- 5 LCD display
- 6 Control keys
- 7 Power switch
- 8 Data output terminal

SPECIFICATIONS FOR CHROMA METERS CR-SERIES AND CT-100

	CR-100	CR-110	CR-121	CR-131	CT-100
Type	Hand-held dual-function reflected subject-color colorimeter with pulsed xenon light source				Hand-held dual-function transparent-color colorimeter with pulsed xenon light source
Receptors	6 silicon photocells (for double-beam feedback system) filtered to detect primary stimulus values for red, green, and blue light				
Spectral response	Within 2% of CIE Standard Observer curves (\bar{x}_λ , \bar{y}_λ , and \bar{z}_λ)				
Measuring modes and chromatic system	Yxy (CIE 1931) and L*a*b* (CIE 1976) for chromaticity; $\pm \Delta(Yxy)$, $\pm \Delta(L^*a^*b^*)$, and ΔE for color deviation				
Color deviation mode	One channel for memory of reference color (measured or input); deviation from reference color determined and displayed				
Calibration standard	WHITE: Minolta standard-white reflector plate VARI: User-selected calibration standard				WHITE: Calibrated by distilled water VARI: User-selected calibration standard
Lighting	Pulsed xenon arc lamp built into measuring head with double-beam feedback system for accuracy control				
	d/0 illuminating system		45/0 illuminating system		Measuring distance: 20mm
Illuminant conditions	CIE Illuminant C (6774K) or D ₆₅ (6504K)				
Display	11 digit LCD type; desired readout selectable by pressing appropriate key before/after reading made; "E9" displayed when measured value is out of display range				
Measuring area	$\phi 8\text{mm}$	$\phi 50\text{mm}$	$\phi 3\text{mm}$	$\phi 25\text{mm}$	$\phi 4\text{mm}$ (minimum depth of object liquid: 45mm)
Measuring range	1.0—100% reflectance ratio; display blinks when measured value is under range				1.5—100% transmittance; display blinks when measured value is under range
Short-term repeatability	Chromaticity (x, y): ± 0.0005 ; color deviation (ΔE): 0.4				
Terminals	Remote-control socket, data-output terminal				
Data output	1-bit serial, open-collector; remote-control operable				
Power source	Meter body: one 9v battery (Eveready 216 or equivalent) Measuring head: built-in nickel-cadmium battery with Ni-Cd charger or four 1.5v AA-size batteries in external battery pack				
Dimensions	Meter body: 195 × 72 × 33mm (7 ¹¹ / ₁₆ × 2 ¹³ / ₁₆ × 1 ⁵ / ₁₆ in.)				
	Measuring head: $\phi 60 \times 138\text{mm}$ ($\phi 2^{3}/_8 \times 5^{7}/_{16}$ in.)	Measuring head: $\phi 56 \times 155.5\text{mm}$ ($\phi 2^{3}/_{16} \times 6^{1}/_8$ in.)	Measuring head: $\phi 60 \times 138\text{mm}$ ($\phi 2^{3}/_8 \times 5^{7}/_{16}$ in.)	Measuring head: $\phi 117 \times 176\text{mm}$ ($\phi 4^{5}/_8 \times 6^{15}/_{16}$ in.)	Lighting head: $\phi 65 \times 166\text{mm}$ ($\phi 2^{9}/_{16} \times 6^{9}/_{16}$ in.) Measuring probe: 18 × 28 × 88mm (1 ¹ / ₁₆ × 1 ¹ / ₈ × 3 ⁷ / ₁₆ in.) Fiber pipe: 85mm (3 ⁵ / ₁₆ in.)
	Optical fiber cable for measuring head: $\phi 14.5 \times 1000\text{mm}$ ($\phi 9^{9}/_{16} \times 39^{3}/_8$ in.)				
Weight (without battery)	910g (32 ¹ / ₈ oz.)			1400g (49 ³ / ₈ oz.)	1300g (45 ⁷ / ₈ oz.)
Other					Material (Measuring probe and fiber pipe): SUS316, compound glass, epoxy resin, silicone resin

FOR DATA PROCESSOR DP-100

Type	Battery-powered multi-function data processor for use with Minolta Chroma Meter CR-series, CT-100 and CL-100 models	Calculating speed	Absolute value: approximately 0.5 seconds Color difference: approximately 0.7 seconds
Display	16 characters × 2 lines; dot-matrix LCD type	Calibration channels	Four (W, 1, 2, 3)
Print out	24-character thermal-dot printer	Target color channels	17 (four per each calibration channel, plus 1 temporary target channel)
Data storage	Stores up to 300 sets of color coordinates; 16-page capability in memory area; built-in memory backup	Data output	RS-232C format; transmission rate is 600-9600 BPS; output voltage is CMOS $\pm 5\text{v}$; output terminal uses DIN 8 pin connector
Statistical calculations	Maximum, minimum, mean, and standard deviation	Other	High-repeatability multiple averaging mode; remote control socket
Timer	User-selectable intervals from approx. 6sec. to 99min.	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
Color space systems	For Chroma Meters CR-series, CT-100 absolute color: Yxy (C.I.E. 1931), L*a*b* (C.I.E. 1976), L*C*H°, Munsell; color difference: $\Delta(Yxy)$, $\Delta(L^*a^*b^*)$, $\Delta(L^*C^*H^°)$, ΔE ; For Chroma Meter CL-100 absolute color: Yxy, Yu'v', color temperature, color distance from blackbody by u'v'; color difference: (Yxy), (Y'u'v'), u'v'	Dimensions	50 × 220 × 200mm (1 ⁵ / ₁₆ × 8 ¹¹ / ₁₆ × 7 ⁷ / ₈ in.)
		Weight	1.3kg (2 lb. 13 ⁷ / ₈ oz.) without battery

Specifications subject to change without notice

OPTIONAL ACCESSORIES FOR CR-SERIES CHROMA METERS



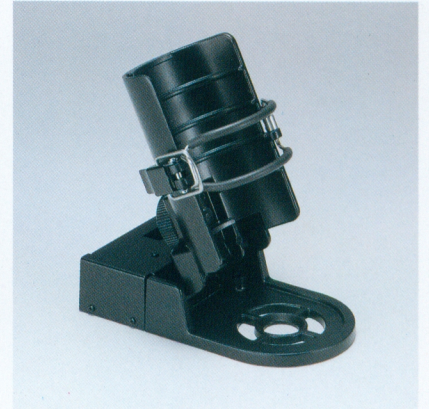
Glass Light Projection Tube
(for CR-100)

The Glass Light Projection Tube replaces the original light projection tube of the CR-100 for precise color measurements of fruits, vegetables, grains, etc.



Granular-Materials Attachment CR-A50 (for CR-100 and CR-110)

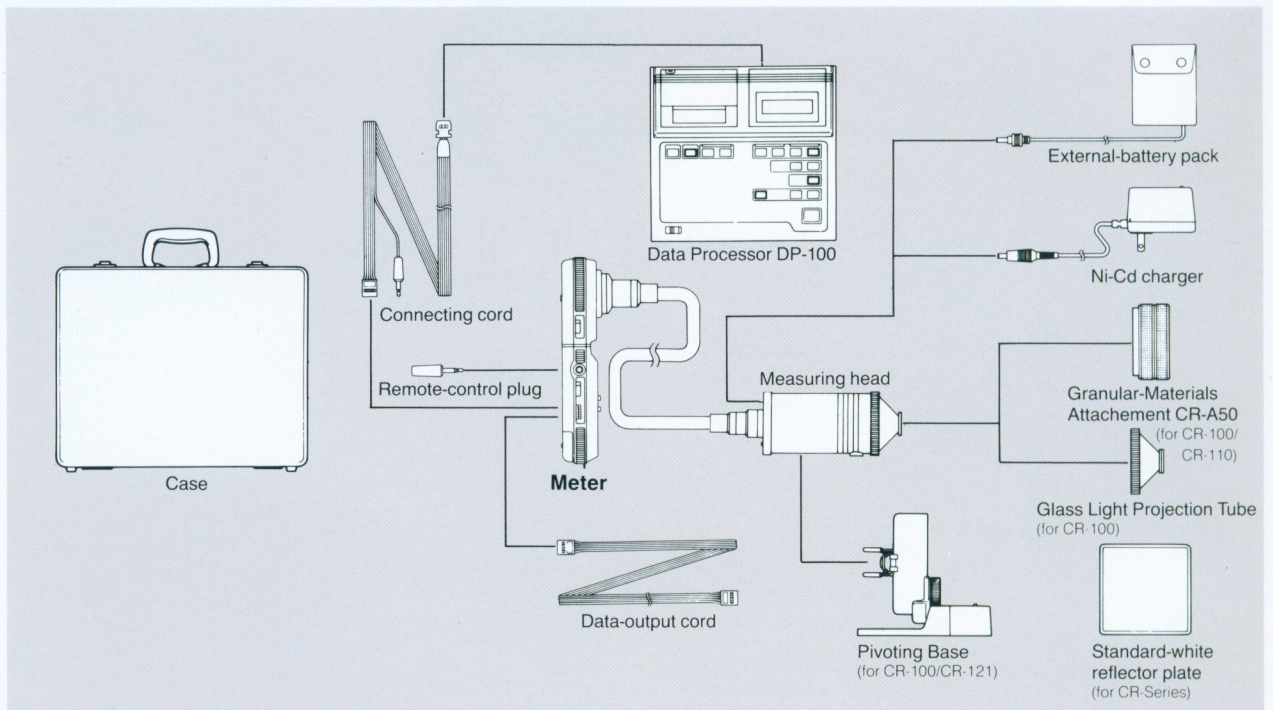
With the Granular-Materials Attachment CR-A50, the user can make color measurements of powders, pastes, grains and other granular substances previously difficult to measure.

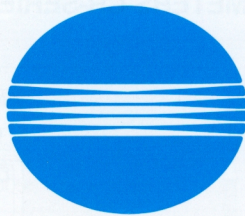


Pivoting Base CR-A10
(for CR-100)

Attaching the Pivoting Base CR-A10 to the measuring head of the CR-100 ensures stability and accuracy in measurements.

SYSTEM CHART FOR CHROMA METERS CR-SERIES AND CT-100 MODELS





MINOLTA

Minolta Camera Co., Ltd.

Minolta Corporation

Head Office (Meter Div.)

Minolta Camera Handelsgesellschaft m.b.H.

Minolta France S.A.

Minolta (UK) Limited

Minolta Austria Gesellschaft m.b.H.

Minolta Camera Benelux B.V.

Minolta (Schweiz) GmbH

Minolta Svenska AB

Minolta Hong Kong Limited

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