



KONICA MINOLTA

Multi-Angle Spectrophotometer CM-512m3

***Ideal for On-site Operation &
Curved Surface Measurement!***

***Multi-angle type
spectrophotometer***



***The color of metallic/pearl coatings
can be inspected easily.***

The essentials of imaging

The CM-512m3 measures colors by illuminating subjects from three angles simultaneously (25°, 45° and 75°), making it suitable for subjects such as metallic/pearl coatings used for automotive exteriors or for the textured materials used for automotive interiors and allowing the changes in color according to the illumination angle to be measured.

Unlike conventional spectrophotometers, correlation of the measurement results with visual evaluation of such subjects can be achieved.

The ring-shaped illumination ensures stable measurement without being affected by the orientation (rotational deviation) of the instrument.

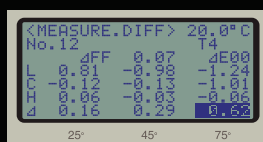
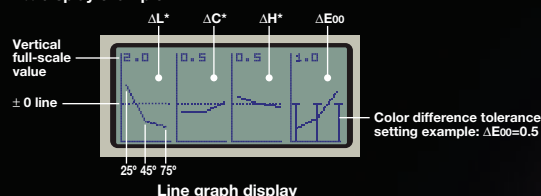
Measurement is stable even for curved surfaces, such as automotive components.

Not only flat surfaces but also curved surfaces can be measured stably with the large measurement area, the two extension feet and the optional grip attached to the instrument.

The graph display function enables easy color judgment even on production sites without using a personal computer.

Tolerance (allowable range) can be set for each target data.

ΔL^* ΔC^* ΔH^* ΔE_{00} display example



Original development

Evaluation equation suitable for measurements of metallic/pearl coating correlates well with visual evaluation.

With the conventional ΔE^*_{ab} equation, the values in the highlight direction (25°) become larger and do not correlate well with the results of visual evaluation. With the CM-512m3, the ΔE_{00} (CIEDE2000) equation is used with parameters fine-tuned based on proprietary knowhow to provide measurement data for metallic/pearl coatings which correlate well with visual evaluation.



Multi-angle method (Ring illumination from three angles / Light reception in one direction)

Illumination: 25°, 45°, 75°

Light reception: 0°

The measurement sample is illuminated from three angles and the reflection in one direction is received. Metallic/pearl colors may result in great differences in color appearance depending on the observation angle. Like visual evaluation, the multi-angle method obtains measured data by applying illumination from three different angles. Consequently, it is suitable for the evaluation of metallic/pearl colors.

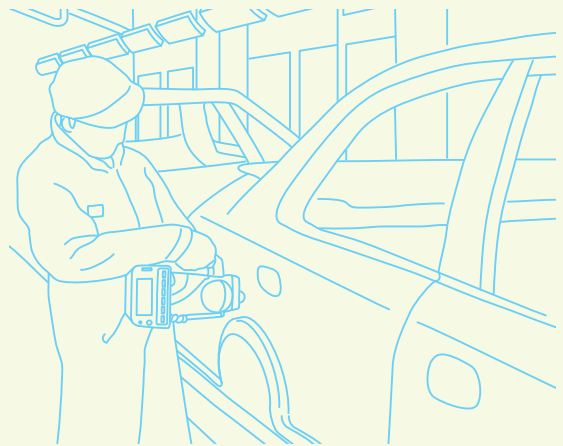
Applications for coating measurements

- Automotive exterior

Even curved surfaces of car bodies or bumpers can be measured stably.



The portable, handheld design ensures easy and stable measurement on production sites.



The instrument can be held easily and firmly, and measurements can be taken without being concerned about its orientation (rotational deviation).

- Personal computers and home appliances
- Construction materials such as exterior walls and kitchen panels
- Office furniture



Applications for texture measurements

- Textured materials used for automotive interiors

With the recently popular textured materials that have large and deep geometrical patterns, it is difficult to obtain color differences with integrating sphere (d/0) or 45/0 instruments. The CM-512m3 allows evaluation that correlates well with visual evaluation by obtaining data at the angles of 25° and 75°.



Measurement Principle

■ Illuminating/viewing optical system

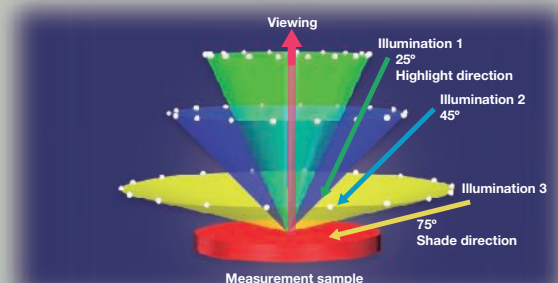
Illumination is applied in the form of rings at angles of 25°, 45° and 75° away from the perpendicular to the sample surface. The light reflected in the direction perpendicular to the sample surface is received.

25°: Corresponds to the highlight direction of visual evaluation

75°: Corresponds to the shade direction of visual evaluation

■ Pre-flash function

Pre-flash (at 2% of the intensity of full emission) is performed at the beginning of measurement to determine the optimal intensity for measurement according to the reflectance of the sample. This function reduces power consumption and improves repeatability when measuring samples with low reflectance.



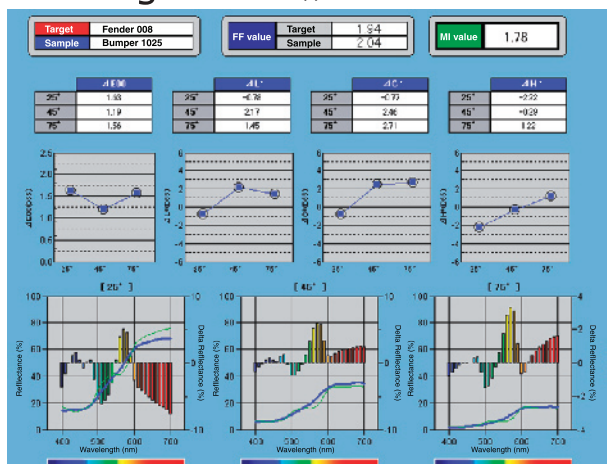
Major specifications

Illumination /viewing system	3 angle circumferential illumination / 1 angle perpendicular viewing: 25°C: 0°, 45°C: 0°, 75°C: 0° Detector Silicon photodiode array with spectral filter array
Wavelength range	400 to 700 nm
Wavelength pitch	20 nm
Reflectance range	25°: 0% to 300%, 45° and 75°: 0% to 200% (Resolution: 0.01%)
Light source	Three pulsed xenon lamps
Minimum measurement interval	7 seconds (when measuring a white calibration plate at 23°C)
Battery life	Approx. 400 measurements at 10-second intervals (when a dark color is measured with alkaline batteries at 23°C)
Measurement /illumination area	ø12 mm /ø20 mm
Repeatability	Spectral reflectance: Within 0.3% (standard deviation) Chromaticity value: Within ΔE^*ab 0.05 (standard deviation) (When a white calibration plate is measured 30 times at 11-second intervals after white calibration) ; When AC adapter is used
Interface	RS-232C Terminal: D-Sub 9-pin (female)/IrDA
Display	Dot-matrix reflective LCD with 21 characters x 7 lines (128 x 56 dots) With contrast control slide
Displayed data	Colorimetric data: L*a*b*, L*C*h Color difference data: $\Delta(L^*a^*b^*)$, $\Delta(L^*C^*H^*)$, ΔE^*ab , CMC(l:c), ΔE_{00} (CIEDE2000) Other data display: FF value, line graph, temperature
Storable data sets	440 data sets max. (total of sample and target data)
Illuminant /Observer conditions	Light source: A, C, D50, D65, F2, F6, F7, F8, F10, F11, F12 Observer: 2°, 10°
Temperature detection	Detector: Thermopile Wavelength: 8 to 13 μ m Measurement/display range: -10° to 80°C (0.1°C increments) Measurement diameter: ø20 mm Measurement rating: 0° to 50°C: $\pm 2.5^\circ C \pm 1$ digit (when an object of 0.93 emissivity is measured at ambient temperatures of 18° to 28°C)
Operating temperature /humidity range (*1)	0°C to 40°C, relative humidity 85% or less (at 35°C) with no condensation
Storage temperature /humidity range	-20°C to 45°C, relative humidity 85% or less (at 35°C) with no condensation
Power	Four AA-size batteries or special AC adapter
Size	115 (W) x 257 (H) x 164 (D) mm
Weight	Approx. 1.4 kg (without batteries)

*1 Operating temperature/humidity range of products for North America : 5 to 40°C, relative humidity 80% or less (at 31°C) with no condensation

Color Data Software CM-S100w (optional) SpectraMagic™ NX

Supports Windows® 2000/XP



By using the Color Data Software CM-S100w (optional), you can display the data for the 3 different illumination angles simultaneously. Or, you can create a line graph that visually shows the angle characteristics specific to a multi-angle spectrophotometer.

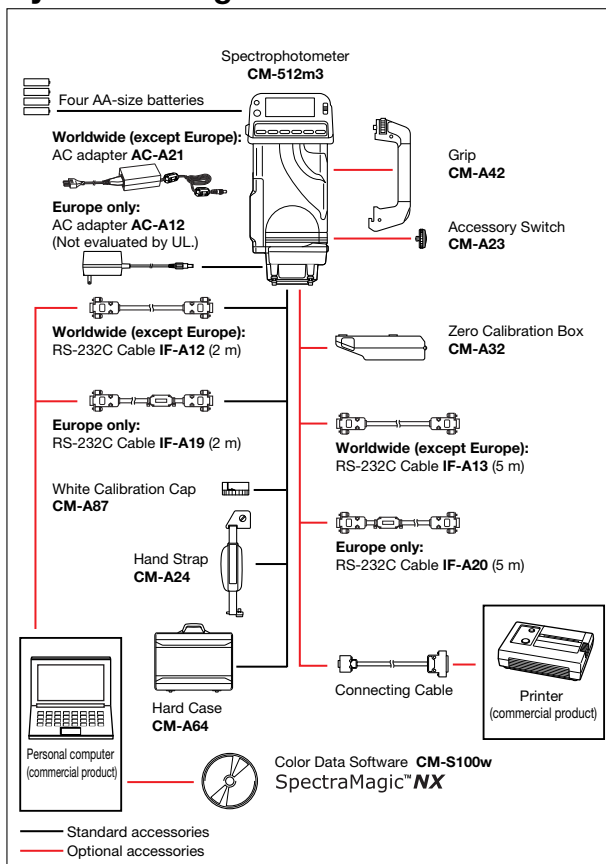
SAFETY PRECAUTIONS



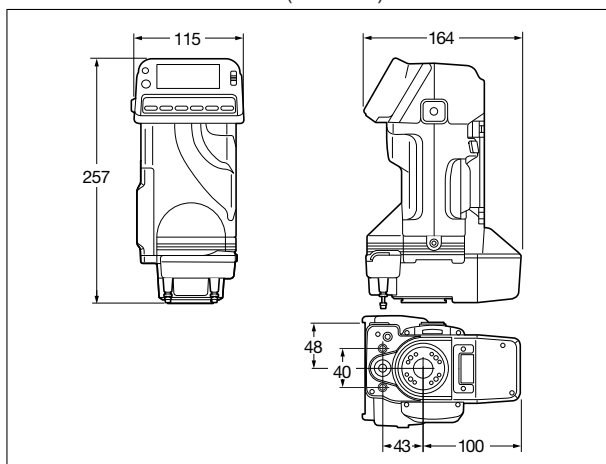
For correct use and for your safety, be sure to read the instruction manual before using the instrument.

- Always connect the instrument to the specified power supply voltage. Improper connection may cause a fire or electric shock.
- Be sure to use the specified batteries. Using improper batteries may cause a fire or electric shock.

System Configuration



Outer dimensions (Unit: mm)



• Specifications and drawings are subject to change without prior notice.



Certificate No.: YKA 0937154
Registration Date: March 3, 1995



Certificate No.: JQA-E-80027
Registration Date: March 12, 1997

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9242-4843-10 AGMCPK④ Printed in Japan