

# Chlorophyll Meter CM-3502

A Lightweight handheld meter for measuring the chlorophyll content of leaves without causing damage to plants.





## The CM-3502 is a compact meter

designed to help users improve crop quality and increase crop yield by providing an indication of the amount of chlorophyll present in plant leaves. The chlorophyll content of plant leaves is related to the condition of the plant, and thus can be used to determine when additional fertilizer is necessary. By optimizing nutrient conditions, healthier plants can be grown, resulting in a larger crop yield of higher quality.

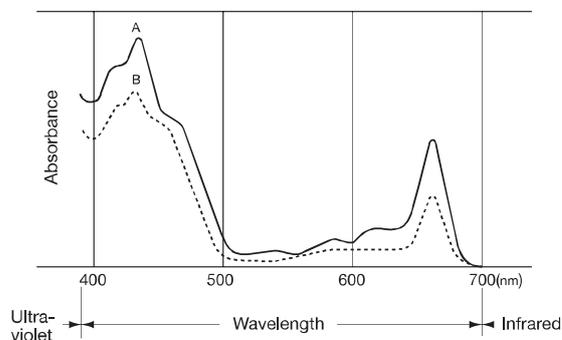
### ▶▶▶ Theory

The CM-3502 determines the relative amount of chlorophyll present by measuring the absorbance of the leaf in two wavelength regions.

The graph below shows the spectral absorbance of chlorophyll extracted from two leaf sample using 80% acetone.

From the diagram, it can be seen that chlorophyll has absorbance peaks in the blue (400-500 nm) and red (600-700 nm) regions, with no absorbance in the near-infrared region.

To take advantage of this characteristic of chlorophyll, the CM-3502 measures the absorbances of the leaf in the red and near-infrared regions. Using these two absorbances, the meter calculates a numerical Chlorophyll Meter value which is proportional to the amount of chlorophyll present in the leaf.



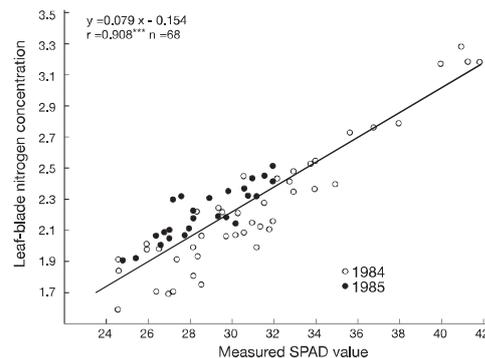
### ▶▶▶ Wheat, Rice, Corn, Cotton and Beyond

The CM-3502 serves in a wide variety of plant applications. Through its history, the CM-3502 Series has established itself as a leading brand in chlorophyll measurement across the world. It has been serving researchers and growers, enabling them to perform field tests quickly and easily. The CM-3502 series has been used for various kinds of plants of and its applications are still growing.



### Checking the nutritional condition of plants

The chlorophyll present in the plant leaves is closely related to the nutritional condition of the plant. As can be seen from the graph below, the chlorophyll content (represented by the measured CM value) will increase in proportion to the amount of nitrogen (an important plant nutrient) present in the leaf. For a particular plant species, a higher CM value indicates a healthier plant.



▶▶▶ **Features:**

**Trend graph display**

Changes in measurement data over time can be seen, and abnormal values can be noticed at a glance.

**Compact and lightweight for portability**

The CM-3502 is small enough to fit in a pocket and is extremely lightweight (only 200g) so it can be easily taken anywhere.

**Quick, easy measurements**

Measurements are taken by simple inserting a leaf and closing the measuring head. It is not necessary to cut the leaf, so the same leaf can be measured throughout the growing process.

**Water-resistant**

The CM-3502 is water-resistant (IPX-4), so it can be used outside even in the rain.

\*It is not immersible, and should not be cleaned with water.

**Low power consumption**

The CM-3502 uses LED light sources, resulting in extremely low power consumption. One set of two AA-size alkaline-measurements.

**Small measuring area**

The measuring area is only 2x3 mm, allowing measurements of even small leaves. A sliding depth stop is included for accurate positioning on sample leaves.

**High accuracy**

High measuring accuracy ( $\pm 1.0$  CM unit for rice-plant leaves) allows close examination of growing conditions.

▶▶▶ **Nitrogen management**

Nitrogen (N) management is a very important issue for plant growers and for the environment. For growers, knowing the N requirement of plant enables the proper amount of N fertilizer supply to be managed. Some experiments show that the CM-3502 series contributed to reductions in the use of N fertilizer by tens of percents with no loss in yield. By optimizing the N fertilization efficiency in the field, proper N fertilizer management reduces the possibility

**Date memory**

The CM-3502 has memory space for 30 measurements. Data in memory can be recalled or deleted at a later time, and the average value of all data in memory can be automatically calculated.



**Reading checker**

A reading checker enables users to check that the CM-3502 is functioning correctly and providing accurate readings.



of excessive supply of fertilizer, which can cause diseases in plants and environmental contamination. There is increasing awareness of the need for applying the proper amount of N fertilizer in respect to water contamination in both flowing streams and underground water due to nutrient leaching through the field's soil. The CM-3502 series is playing a significant role in day to day development of N fertilizer application techniques.



## ►► Specifications:

Type	Chlorophyll Meter CM-3502	
Measurement subject	Crop leaves	
Measurement method	Optical density difference at 2 wavelengths	
Measurement area	2 mmx3 mm	
Subject thickness	1.2 mm maximum	
Subject insertion depth	12 mm (with stopper having position adjustable from 0 to 6 mm)	
Light source	2 LED elements	
Receptor	1 SPD (silicon photodiode)	
Display	LCD panel showing 4-digit measurement value (values shown to first decimal place) and 2-digit number of measurements; Trend graph of values in memory can also be shown.	
Display Range:	-9.9 to 199.9 CM units	
Memory function:	Memory capacity for up to 30 values; Calculation/display of average of data in memory also possible	
Power source	2 AA-size alkaline batteries	
Battery life	More than 20,000 measurements (when using new alkaline batteries under Konica Minolta test conditions)	
Minimum interval between measurements	Approx. 2 seconds	
Accuracy	Eithin $\pm 1.0$ CM units (for CM value between 0.0 and 50.0 under normal temperature/humidity) “*” added to display when measurement exceeds 50.0 CM units.	
Repeatability	Within $\pm 0.3$ CM units	For CM value between 0.00 and 50.0 (with no change in sample position)
Reproducibility	Within $\pm 0.5$ CM units	
Temperature drift	Within $\pm 0.4$ CM units/ $^{\circ}$ C	
Operating temperature/humidity range	0 to 50 $^{\circ}$ C; Relative humidity of 85% or less (at 35 $^{\circ}$ C) with no condensation	
Storage temperature/humidity range	-20 to 55 $^{\circ}$ C; Relative humidity of 85% or less (at 35 $^{\circ}$ C) with no condensation	
Size; Weight	78(W) x 164(H) x 49(D) mm, 200 g (excluding batteries)	
Other	Warning buzzer; User compensation factor	
Standard accessories	Depth stop; Strap; 2 AA-size alkaline batteries; Soft case; Reading checker	

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