CI-203 Handheld Laser Leaf Area Meter

- ✔ Ideal for field use
- ✔ Easy to use
- ✔ Non-destructive measurements
- ✔ Measures area, length, width, and perimeter and calculates shape factor and aspect ratio
- ✔ High resolution of 0.1mm²
- ✔ No calibration required
- ✔ Stores up to 15,000 single measurements
- ✔ Light-weight and self-contained instrument with built-in data logger and Graphic display
- ✔ Rechargeable battery
- ✔ Measures objects up to 150mm wide, 25mm thick and of virtually unlimited length
- ✔ Conveyor Attachment (CI-203CA) is available for fast measurement in the field or lab
- ✔ Root Length Measurement Attachment (CI-203RL) is available
- ✔ RS232 port transfers data to computer

CI-203

HOW IT WORKS

The CI-203 Handheld Laser Area Meter uses advanced laser technology to enable researchers a precise and convenient way to measure leaf area (or the areas of leaf-like objects). The high-resolution laser scanner, data logger, and display are all enclosed in a single, handheld wand unit weighing 910g. Researchers can perform non-destructive measurements on leaves of living plants by simply pulling a leaf through the instrument, enabling collection of data from the same plant, or even the same leaf, throughout its life span. For rapid measurement of detached leaves, the CI-203CA, conveyor attachment makes a perfect complement to the CI-203.

In addition to the conveyor attachment, the CI-203 also has an optional attachment, CI-203RL for measuring the area of roots and other irregularly-shaped matter. All six measurement parameters (area, width, length, perimeter, shape factor, and aspect ratio) comprise a data set and are compiled at the same time, and over 15,000 data points can be stored and transferred to a computer.

FAST
Conveyor Attachment (CI-203CA) is available for fast measurement anywhere.

PRECISE
Self-contained instrument with built-in data logger and Graphic display

PORTABLE
Weighing only 910g...the CI-203 is ready for long hours in the field.

HOW TO USE

This is as easy as data collection gets. To measure leaf area, simply sweep the leaf through the measuring wand, and the CI-203 instantly scans and calculates the leaf area, width, length, perimeter, shape factor and aspect ratio.

The CI-203 is flexible as well as fast: use in the field to measure living leaves on plants one-by-one, or add the conveyor attachment and measure hundreds of individual leaves in minutes. The CI-203 stores over 15,000 data points, and displays data on the LCD screen. Download measurements to a computer later at your leisure via the RS232 port.

THEORY OF OPERATION

The CI-203 collects length, width, perimeter, and area measurements directly using a combination of a sweeping laser beam and a roller position encoder. After activating the device by opening the wand JAW, a low energy laser beam sweeps across the laser window 500 times per second at a rate of 150 m/s. As the user moves the CI-203 wand down the leaf, the roller encoder records the motion, and the onboard processing unit collects the data. Each laser sweep provides data that accurately accumulates the area and perimeter measurements. When the roller detects that motion has stopped, the laser subsystem stops taking measurements and the processing unit computes and posts the final results.

The perimeter increment is calculated and added to the perimeter accumulator. The perimeter increment is calculated using the function:

$$\Delta p = \sqrt{4\Delta l^2 + (W_0 - W_1)^2}$$

Where Δp is the perimeter increment Δl is the length increment (always 1mm) W_0 is the current width measurement and W_1 is the previous width measurement

Computing Ratio and Shape Factor
Aspect ratio and shape factor information can be easily calculated from the other information gathered. These derived quantities are calculated for the purposes of display or data dumping. The calculations used are shown below.

Aspect ratio is the ratio of the leaf length to its maximum width. It can be calculated from the equation:

$$r = \frac{l}{W_m}$$

Where r is the aspect ratio, Wm is the maximum width, and l is the length

Shape factor is the ratio of the leaf area to the leaf perimeter, corrected so that the shape factor of a circle is equal to 1. It can be calculated from the equation:
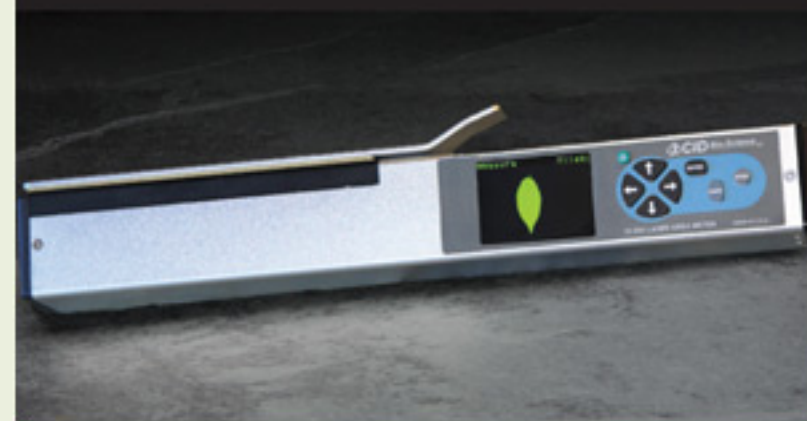
$$f = 4\pi \frac{a}{p^2}$$

Where f is the shape factor, a is the area, and p is the perimeter