CID Bio-Science Inc.
Portable Instruments for Precision Plant Measurement

CI-340 Equations

1a. W: Mass flow rate per leaf area (mol/m²/s) for an ***open system***.

$$W = \frac{V}{60} \times \frac{273.15}{T_a} \times \frac{P}{1.013} \times \frac{1}{22.41} \times \frac{10000}{A}$$

$$W = 2005.39 \times \frac{V \times P}{T_a \times A}$$

Where V: volume flow rate (liters/minute)

T_a: air temperature (K)

P: atmospheric pressure (bar)

A: leaf area (cm²)

60: converts minutes into seconds

22.41: the volume of one mole of any gas at a standard temperature of 273.15K and the standard pressure of 1.013 bar (liters/mol).

10000: converts cm² into m²

1b. W: Mass flow rate per leaf area (mol/m²/s) for a ***closed system***

$$W = \frac{V}{\Delta t} \times \frac{273.15}{T_a} \times \frac{P}{1.013} \times \frac{1}{22.41} \times \frac{10000}{A}$$

$$W = 2005.39 \times \frac{V \times P}{\Delta t \times T_a \times A}$$

Where V: leaf chamber volume (liters)

T_a: air temperature (K)

P: atmospheric pressure (bar)

A: leaf area (cm²)

Δt: time interval (seconds)

22.41: the volume of one mole of any gas at a standard temperature of 273.15K and the standard pressure of 1.013 bar (liters/mol).

10000: converts cm² into m²