

Hydraulic Conductivity in Plant Stems Non-Destructive & Continuous

Hydraulic conductance is a measure of the efficiency of bulk flow through a material and is defined as the flow rate per unit pressure driving force.

By combining the [SFM1 Sap Flow Meter](#) with the [PSY1 Stem Psychrometer](#) ICT International has developed an in-situ hydraulic conductivity meter. This technique allows continuous logging of hydraulic conductance over days to weeks at a time as it is non-destructive to the plant stem.



The combination of the techniques of sap flow measurement and in situ stem psychrometry provides enough information to calculate both the hydraulic conductance (kh , $g/s /MPa$) and, with the appropriate dimensional measurement or length of stem (L , m), the hydraulic conductivity (Kh $g/s m /MPa$) of a section of plant stem.



Solutions for soil, plant & environmental monitoring

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How the system works

Install a pair of [PSY1 Stem Psychrometers](#) on a single stem approximately one metre apart in combination with an [SFM1 Sap Flow Meter](#) installed between the psychrometers. The stem sample should be chosen to avoid significant changes in diameter or hydraulic architecture (ie. major branches) between the psychrometers. Measure the stem diameter and length of stem between the psychrometer installations.

Continuous measurements of stem water potential (above and below the sap flow meter) and sap flow between the psychrometers will determine both the flux of xylem sap and the driving water potential gradient in the stem. Thus, measuring the mass flow of water that can pass through the tree for a given water potential gradient or the Hydraulic Conductance ($kh = F/\Delta P$, g/s /MPa)).

By ensuring a single uninterrupted path length of 1 metre between the two psychrometers the measurement can be normalised to yield Hydraulic Conductivity ($Kh = F L / (\Delta P)$, g/s m /MPa)

These measurements will provide insight into adaptations to drought stress, relative effects of cavitation or tissue rehydration diurnally and non-destructive in situ monitoring of the effects of water stress and recovery.

SFM1 Sap Flow Meter (Heat Ratio Method)

A self contained, stand-alone instrument for the measurement of sap flow or transpiration in plants.

Utilising the Heat Ratio Method (HRM) principle the Sap Flow Meter is able to measure high, low, reverse and zero flow rates in both small woody stems & roots as well as large trees.

<http://www.ictinternational.com/hrm.html>



PSY1 Stem Psychrometer

For the measurement of stem water potential in plants The PSY1 Stem Psychrometer is a very powerful tool integrating all the ambient environmental parameters acting upon the plant such as solar radiation, temperature, humidity, wind speed and water availability into a single continuously measurable variable.

<http://www.ictinternational.com/psy1.html>



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