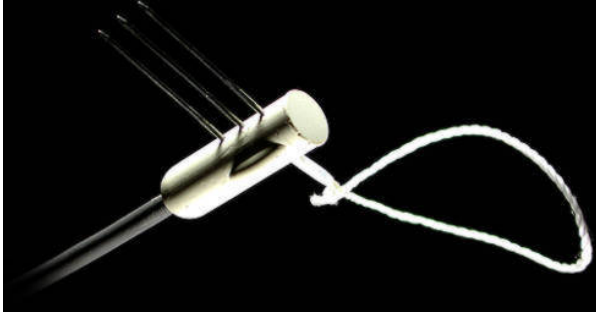


heat pulse velocity sap flow sensors



- Equidistant, 3-needle design that can be used with various heat pulse velocity methods
- Flexible approach to how you measure heat velocity in woody stems
- Use our data logger algorithm or develop your own algorithm
- Simple sturdy design allows for this sensor to be used for long periods for time
- Includes both pre-written programs for data loggers and software to quick data analysis and interpretation
- Sensors are manufactured by Implexx Sense

low cost sensors to maximise research outcomes

The HPV Sap Flow Sensors are low cost, highly accurate and reliable sensors for the measurement of sap flow, transpiration, and even stem water content, in plants.

The HPV Sap Flow Sensors are ideally suited for scientific researchers interested in plant water use, physiology, or hydrology research. The sensors provide the greatest flexibility for scientists needing to undertake field work or research in the glasshouse.

The sensors connect directly to the Campbell Scientific range of data loggers and can be used in combination with other environmental sensors such as VPD, solar radiation, soil moisture, or water potential. Edaphic Scientific can supply data logging equipment for you, or we can assist you in connecting the sensors to your

existing data logger network.

The HPV Sap Flow Sensors are also unique in that stem water content can be measured simultaneously with sap flow or transpiration. Additional equipment is not required – stem water content can be measured with the same sensors that are measuring sap flow.

who is using the HPV Sap Flow Sensor?

The HPV sensor is currently being used by researchers, students and growers in many research projects around the globe. For example, researchers in Australia at the University of Queensland, the University of Melbourne and RMIT University currently use the HPV sensors for their scientific studies. Around the globe, researchers at NASA, University of Florida, Georgia State University, and Helmholtz Centre Potsdam, Germany, are also using the HPV sensors.

related products

- [Sap flow monitoring overview](#)
- [Soil moisture sensors, probes, meters and data loggers](#)
- [Soil water potential sensors](#)
- [Weather Stations](#)
- [Soil carbon concentration](#)
- [Data loggers](#)
- [Remote downloads and data management software](#)

related articles

- [Sap flow methods and data analysis techniques](#)
- [Measuring sap flow in small stems, branches and petioles](#)

sensor design

- Number of needles: 3 – downstream and upstream temperature needles and middle heater element needle;



- Needle Length: 30 mm
- Distance between needles: Equidistant, 6 mm spacing
- Number of thermistors: 4 – 2 downstream and 2 upstream thermistors
- Position of thermistors: 10 mm and 20 mm from tip of needle (called inner and outer temp sensor positions, respectively)

sensor specifications

feature	specification
Measurement Principle	Heat Pulse Velocity
Measurement Range	-71.9 to +1063.2 cm/hr heat velocity
Accuracy	0.2 cm/hr heat velocity
Resolution	0.0001 cm/hr heat velocity
Temperature Sensors	10K Precision Thermistor
Heater Resistance	44 ohms
Cable Length	5m (standard) 20m maximum



edaphic scientific

environmental research & monitoring equipment



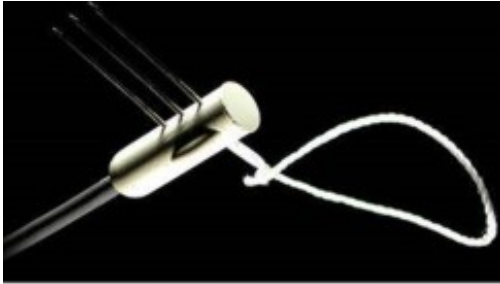
edaphic scientific

environmental research & monitoring equipment



edaphic scientific

environmental research & monitoring equipment



accessories needed

- Heater control interface: One interface will run up to 4 sensors.
- Data Logger: Campbell Scientific CR1000 Data Logger – Edaphic Scientific can supply data loggers and program them for you
- Recommended: Drilling guide for precise spacing of needles in the tree.

Edaphic Scientific's capabilities

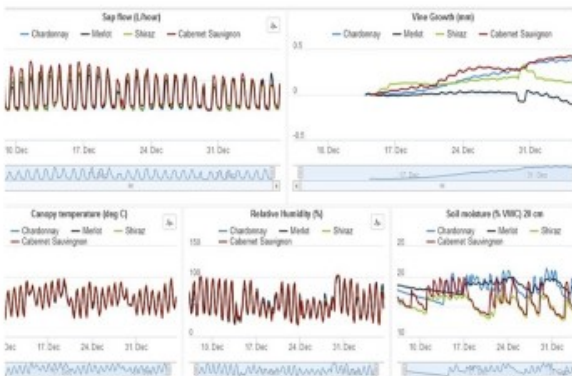
At Edaphic Scientific we want to work with you from the start of your project through to its completion. We can provide:

- Assistance with project and experimental design
- Procurement of all monitoring equipment, including sensors, data loggers and data management software. Edaphic Scientific is a one-stop shop where we can source and find any necessary equipment for your project from our preferred

suppliers or third party suppliers

- Installation and training
- On-going assistance with data interpretation and equipment maintenance
- Data correction and analysis, including statistical analysis with the R-package
- Report and publication preparation including tables, figures, graphs, and manuscript writing

advanced data collection and management solutions



Edaphic Scientific recognises the need for flexible and adaptable sensor and [data logging solutions](#) for experimental or environmental monitoring projects.

You can connect the HPV sap flow sensors to our data logging systems, or we can assist you in connecting the sap flow sensors to your existing system.

Data can be downloaded directly in the field from data loggers. Alternatively, data can be [downloaded over the internet](#) on your iPhone, iPad or desktop computer with the Eagle.io cloud-based, data management software solutions.

Edaphic Scientific provides sap flow sensors with:

Individual loggers or

Whole-System solutions with a centrally located data logger, multiplexers and additional equipment such as weather stations, soil moisture, water potential,

carbon and nutrient monitoring.

Data can be collected directly from logging units with a USB download cable or remotely, anywhere in the world, via the mobile phone network and an internet connection.



individual data loggers

Edaphic Scientific supplies a one-to-one sap flow sensor to data logger monitoring solution.

The East 30 Sensors HPV sap flow sensors are compatible with Campbell Scientific's CR300 data logger for a low cost, individual data logging solution.

Edaphic Scientific provides both the sap flow sensor and pre-programmed, pre-configured CR300 data logger. Power supply is via a solar panel and 12V battery, and the data loggers are stored in an environmentally sealed protective housing.

The individual sap flow data loggers are ideal for:

- **Urban tree monitoring:** where security and safety for equipment is paramount. The data logger and power supply can be installed high and out of reach, or installed in underground pits. The cable for the sap flow sensors can be any length and sensors can be installed on any part of the tree trunk. If the sap flow sensors were damaged or vandalised, they can be quickly and cheaply replaced as they are low cost sensors.
- **Remote tree monitoring:** in remote locations, it may not be practical to have a single, centrally located data logging system with cables extended to various trees for sap flow monitoring. The individual sap flow data loggers are ideal in such projects.



- **Horticulture and Viticulture:** growers often require to run machinery and undertake other management procedures without worrying about tripping, cutting or damaging cabling and monitoring equipment. With a individual sap flow data logger, it is possible to undertake precision plant water use measurements on individual trees or vines without the need for extensive cabling and power supplies.

whole-system monitoring solutions



Edaphic Scientific can supply multiple sap flow sensors all connected to a single, centrally located data logging system, with multiplexers, power supply and environmentally protective housing.

Additional parameters can be added to the system for the monitoring of [meteorological variables](#), [soil moisture](#), [water potential](#) and [soil carbon concentration](#).

Edaphic Scientific can supply a monitoring system that is completely pre-programmed, pre-configured and ready to be installed. We can also provide assistance with field installation and training of staff and students.

free software

When you procure sap flow equipment through Edaphic Scientific, we will provide software to you free of charge.

Why do you need software for sap flow measurements?

The East 30 Sensors measure the velocity of a heat pulse in the sapwood of trees.

Known as “heat velocity”, this parameter is useful for basic and initial interpretation of direction of sap movement as well as checking for probe misalignment and correct sensor installation.

But most researchers and managers are not interested in heat movement and really want to know how water, or sap, is moving in trees.

Therefore, the free software is required to convert the heat velocity values into sap velocity, sap flux and sap flow based on correction factors.

The free software can also be used to calculate total tree water use.

sap flow sensor installation



Sap flow sensor drill guide attached to a small stem with cable ties.

Sap flow sensors are relatively easy to install in trees – particularly with some practice. Edaphic Scientific can provide training for you on correct approach to sap flow sensor installation.



Along with your sap flow sensors, we provide additional items for sensor installation including drill guide, drill bits and grafting wax.

There is a [standardised protocol for sap flow sensor installation and measurements](#) provided on Prometheus Wiki, a website maintained by the CSIRO.

East 30 Sensors also provides a detailed manual that explains how to install sap flow sensors.



publications

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