Stem-Microtensiometer

FloraPulse

Technical Specifications

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Sensor model name	**FloraPulse stem water potential sensor**
Scope of application	For continuous measurement of water potential in woody plants.
Suitable for	- Large probe with 9 mm installation sleeve) for stem diameters of > 5 cm - Small probe with 2 (experimental use), 3 or 7 (standard) mm installation sleeves for stem diameters of 8 to 10 mm, 11 to 16 mm or > 16 mm respectively (cf. probe type selection guide below)
Special feature / limitation	Recommended for operation at temperatures between 5 to 50°C. Temperatures < 0°C may damage the sensor.
Measurement range	0 to -35 bar
Resolution	Theoretically infinite, depending on data logger used, e.g.: Campbell-Logger or Multi-Interface: < 0.1 bar
Accuracy	Better than +/- 5% of the reading.
Logger requirements and sensor output signal	Analog sensor: - regulated, low-noise and switchable excitation voltage (1 bis 5 V) - differential channel with measurement range 0 to 32 mV per volt Vex (i.e. at Vex = 1V output up to 32 mV, at Vex = 2 V up to 64 mV); in case that expected water potential range is limited, required electrical measurement range can also be limited (detailed advice on request) - Resolution: 12 Bit in relevant measurement range from 0 to 32 mV per volt Vex - Input impedance of analog channels at least 1MOhm - Conversion of the raw sensor signal in mV to bar via provided calibration function SDI-12 sensor: - SDI-12 port All Campbell loggers and our Multi-Interface meet the above requirements.
Power supply	Vex (! regulated, low-noise !) 1 to 5 VDC, excitation duration max. 50 ms Power consumption is negligible.
Operational conditions	Temperature: 5 to 50 ° C, humidity: 0 to 100%
Size & Weight	Diameter sensor 12 mm, weight 20 g (only sensor, without cable)
Sensor cable length	Analog sensor: 0.15 m + 3 m pluggable extension, extension to up to 20 m possible. SDI-12 Sensor: 0.15 m + 5 m pluggable extension, extension to up to 60 m possible.

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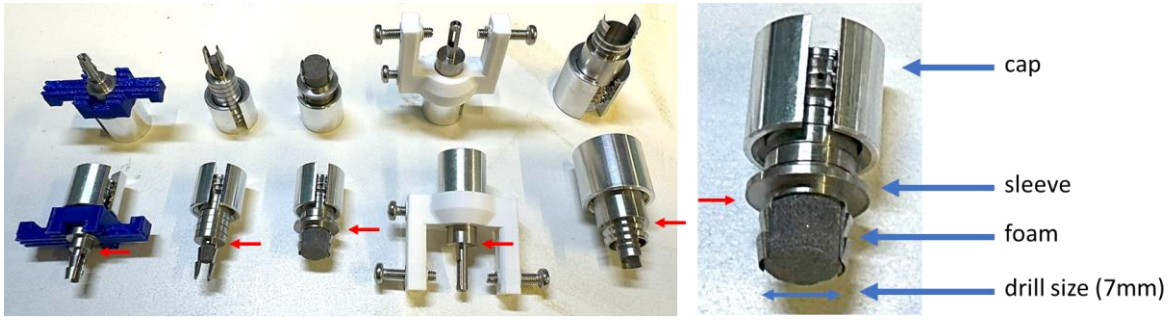
How to pick a FloraPulse sensor

FloraPulse sells various versions of the new 'small probe' for installation into different plant species and sizes. The FloraPulse small probe is actually always the same, but the installation hardware is different. Here is a list of our 'versions' and how to pick which one to use for your specific crop or experiment.



SMALL SENSOR INSTALLATION HARDWARE VERSIONS

- **7mm** – We recommend this sensor for the vast majority of crops types and trunk sizes. This sleeve has a 7mm front opening for measuring water potential – this relatively large area allows faster transport of water between sensor and tree and thus has the quickest response and is less susceptible to clogging or temperature effects. It is the easiest to install and most robust of our versions.
  - Use in: branches/trunks of 17+ mm in size, with bark thickness < 10 mm
  - Installation video (with clamp), with hammer
- **3mm** – We recommend this sensor for crops that are too small for the 7mm version. The 3mm version creates a smaller wound and allows installation into smaller crops, but it has a smaller water-exchange area and this makes it more susceptible to clogging and temperature effects. It is thus less reliable and accurate than the 7mm version, but can work well in smaller crops.
  - Use in: branches/trunks of 11 to 16 mm in size.
  - Installation video
- **Thick bark** – Generally sensors should be installed into branches, as branches have thinner bark and allow easier installation. But in many forest species, there is only access to the large trunk with very thick bark. This sensor version allows installation into tree trunks that have bark as thick as 2" or more.
  - Use in: trunks with bark thicker than 10 mm.
  - Installation video
- **Walnut** – FloraPulse sensors are generally installed on the side of a branch or the trunk, but there are 'wet' crops that create a strong wound response and prevent SWP measurement using our typical installation method. The walnut installation method places the sensor inside a branch pith, which in some species circumvents the wounding response and allows measurement.
  - Use in: walnut (experimental), pecan (still testing) and avocado (still testing)
  - Installation video
- **2mm** – This sensor version is generally only recommended for very small stems, if you have no other choice, and without guarantees of accuracy. The 2mm version only has 8% of the surface exchange area compared to our standard 7mm version. This smaller area dramatically slows down the sensor response and creates more potential for issues with clogging and temperature effects. This smaller sensor also has weaker attachment to the trunk and should be reinforced with a 3d printed bracket.
  - Use in: branches/trunks of 8 to 10 mm in size.

BIG SENSOR INSTALLATION HARDWARE VERSION

- **9mm** – The tried and true big sensor that has been for sale since 2020. We still recommend this sensor for prunus crops (prune, almond, cherry, plums, peach, apricot) and apple.
  - Use in: prunus/apple crops with trunk sizes of 2" or larger.
  - Installation video