

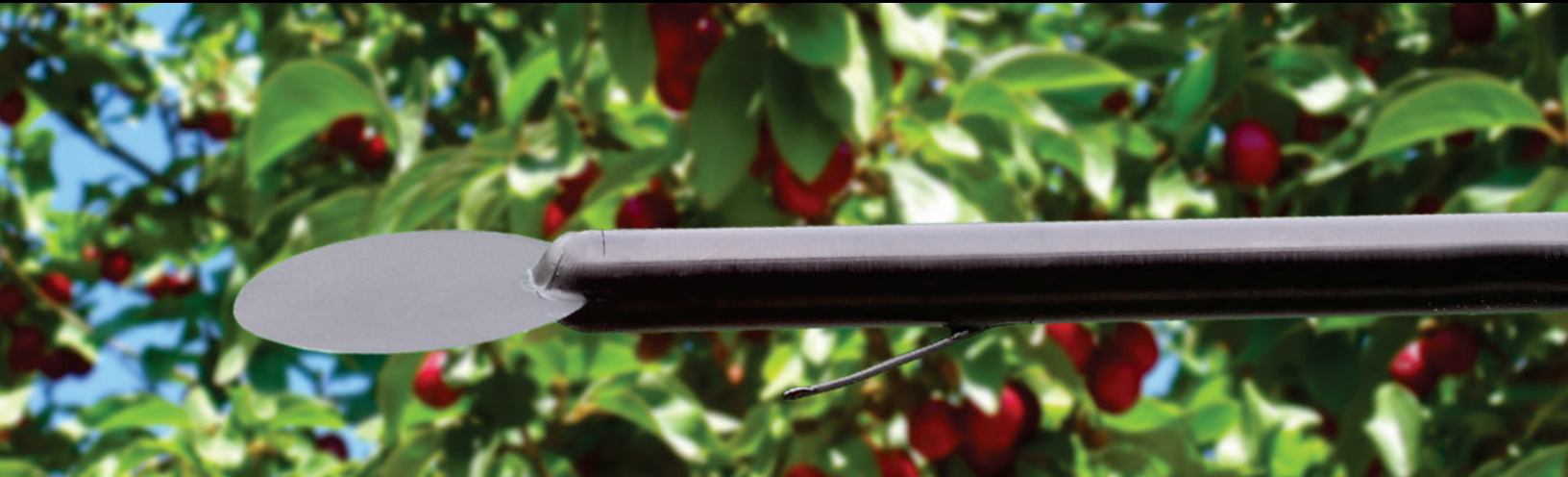
Radiation Frost Detector

SF-110



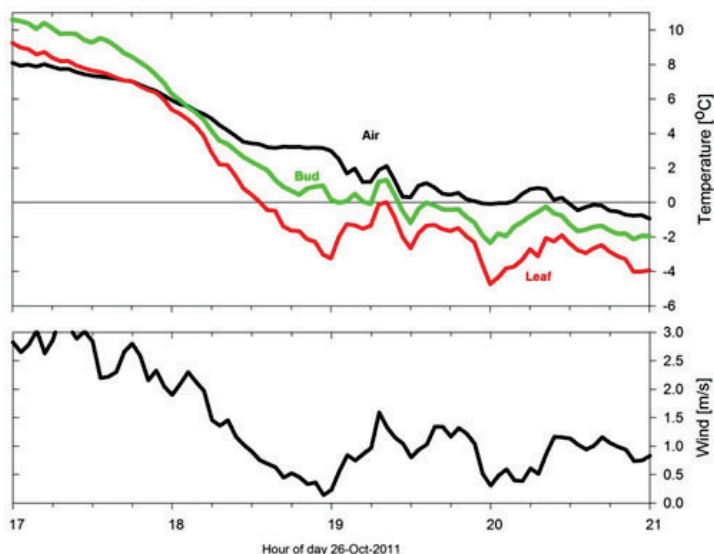
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The SF-110 is a combination of two temperature sensors (precision thermistors) in a single housing. One sensor is designed to mimic a plant leaf and the other a flower bud. The SF-110 provides close approximations to leaf and bud temperatures and can be used for prediction of frost on leaves and buds. On clear, calm nights, leaf and bud temperature can drop below freezing even if air temperature remains slightly above 0 °C (see Figure 1 below). This is called a radiation frost and is due to the lack of air mixing (wind) near the surface, and a negative net longwave radiation balance at the surface (more longwave radiation is being emitted from the surface than what the surface is absorbing from the clear sky). Under cloudy and/or windy conditions, radiation frost events do not occur.

The temperature measurement range of the SF-110 is -40 to +70 °C with an accuracy of ± 0.1 °C from 0 to +70 °C. However, the sensor is intended for applications in cropped fields and orchards when temperatures will be near freezing, and where air temperature measurements are not a good predictor of frost formation (Figure 1).



Leaf and bud temperature approximations measured with an Apogee SF-110 compared to air temperature (top panel) and wind speed (bottom panel) on the evening of October 26, 2011. Leaf and bud temperatures were both below air temperature after 6 PM (hour 18) and reached the freezing point well before the air.

SPECIFICATIONS

Measurement Range: -50 to 70 C

Measurement Uncertainty: 0.1 C (from 0 to 70 C)
0.2 C (from -25 to 0 C)
0.4 C (from -50 to -25 C)

Measurement Repeatability: < 0.05 C

Non-stability (Long-term Drift): < 0.02 C per year (when used in non-condensing environments where the annual average temperature is less than 30 C; continuously high temperatures or continuously humid environments increase drift rate)

Equilibration Time: 10 s

Self-Heating: < 0.01 C (typical, assuming pulsed excitation of 2.5 V DC)
0.08 C at 5 C (maximum, assuming continuous input excitation of 2.5 V DC)

Operating Environment: -50 to 70 C
0 to 100 % relative humidity

Input Voltage Requirement: 2.5 V DC excitation (recommended, see Operation and Measurement section)

Output Voltage Range: 0 to 2.5 V DC (assuming input excitation of 2.5 V DC)

Current Drain: 0.1 mA DC (per thermistor) at 70 C (maximum, assuming continuous input excitation of 2.5 V DC)

Dimensions: 57 cm length, 2.1 cm pipe diameter, 7.0 cm disk diameter (see diagram below)

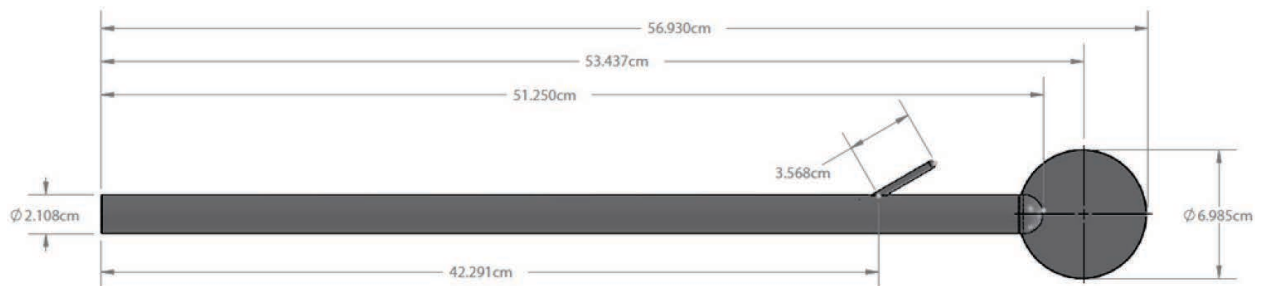
Mass: 400 g

Cable: 5 m of shielded, twisted-pair wire.

Additional cable available in multiples of 5 m

Santoprene rubber jacket (high water resistance, high UV stability, flexibility in cold conditions)

Pigtail lead wires



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