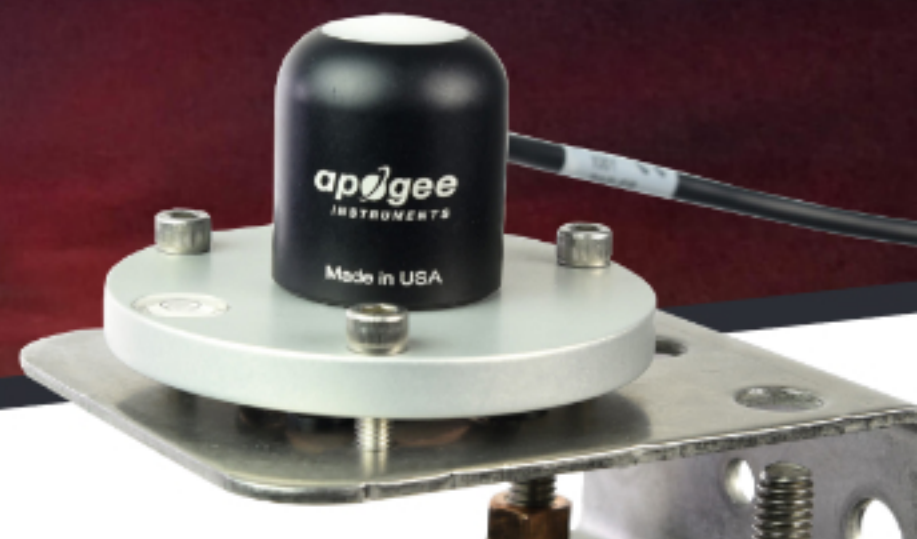


PAR-FAR Sensors

Two-band sensor for measuring both PAR and Far-red light



	S2-141-SS	S2-441-SS	S2-442-SS
Power Supply	Self-powered	5.5 to 24 V DC	
Current Draw	—	1.4 mA (quiescent), 1.8 mA (active)	RS-232 37 mA; RS-485 quiescent 37 mA, active 42 mA
Output (sensitivity)	0.02 mV per $\mu\text{mol m}^{-2} \text{s}^{-1}$ (PAR) 0.03 mV $\mu\text{mol m}^{-2} \text{s}^{-1}$ (Far-red) [typical values; variable from sensor to sensor]	—	
Calibration Factor (reciprocal of sensitivity)	60 $\mu\text{mol m}^{-2} \text{s}^{-1}$ per mV (PAR) 40 $\mu\text{mol m}^{-2} \text{s}^{-1}$ per mV (Far-red) [typical values; variable from sensor to sensor]	Custom for each sensor and stored in firmware	
Calibration Uncertainty	± 5 %		
Output Range	0 to 67 mV (PAR) 0 to 25 mV (Far-red)	SDI-12	Modbus
Measurement Repeatability	Less than 1 %		
Long-term Drift	Less than 2 % per year		
Non-linearity	Less than 1 % (up to 4000 $\mu\text{mol m}^{-2} \text{s}^{-1}$) (PAR) Less than 1 % (up to 1000 $\mu\text{mol m}^{-2} \text{s}^{-1}$) (Far-red)		
Response Time	Less than 1 ms	Less than 0.6 s	—
Field of View	180°		
Spectral Ranges	389 to 692 nm ± 5 nm (PAR) 700 to 750 nm ± 5 nm (Far-red)		
Directional (cosine) Response	± 2 % at 45°; ± 5 % at 75° zenith angle		
Temperature Response	Less than 0.1 % per C		
Operating Environment	-40 to 70 C; 0 to 100 % relative humidity		
Dimensions	30.5 mm diameter, 37 mm height		
Mass (with 5 m of cable)	140 g		
Warranty	4 years against defects in materials and workmanship		

Overview

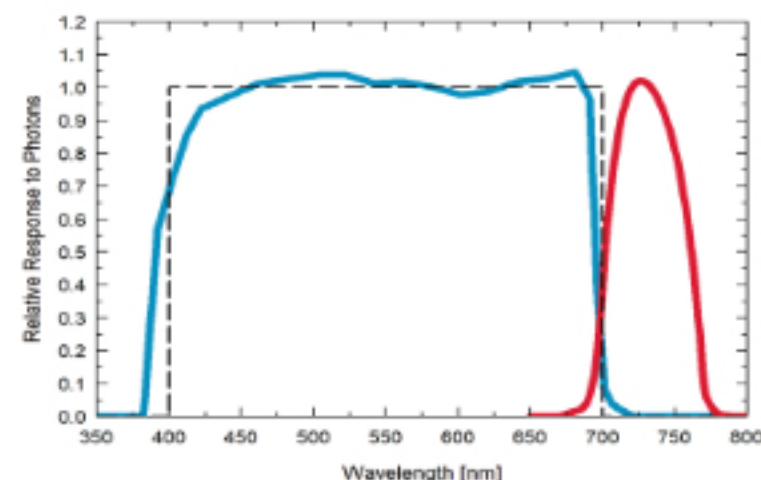
The Apogee PAR-FAR sensor is a research-grade tool for measuring both the traditional PPFD photosynthetic photon flux and separately quantifying the photon flux of far-red photons (700-760 nm). The outputs include the traditional quantum flux, the far-red photon flux, and the far-red fraction (far-red photon flux density / sum of PPFD and far-red photon flux density). For many applications, this sensor reduces the need for more complex measurements from a spectroradiometer.

Typical Applications

- Monitoring plant light environments
- Researching plant morphogenic activity
- Studying photobiology

Key Features

Available in digital SDI-12 output, digital Modbus, or with an analog output. A domed diffuser promotes self-cleaning to minimize errors from dust and debris.



Spectral response of PAR detector (blue) and Far-red detector (red) compared to defined response of plants to radiation (dashed).