



NDVI SENSORS

S2-111-SS & S2-112-SS
 S2-411-SS & S2-412-SS

Analog
 SDI-12

Overview

Apogee's NDVI sensors are designed to measure reflectance in red and near infrared wavebands to calculate the normalized difference vegetation index (NDVI). NDVI is a measurement of plant greenness correlated with canopy chlorophyll content and leaf area that is used to monitor green-up in the spring and senescence in the fall.

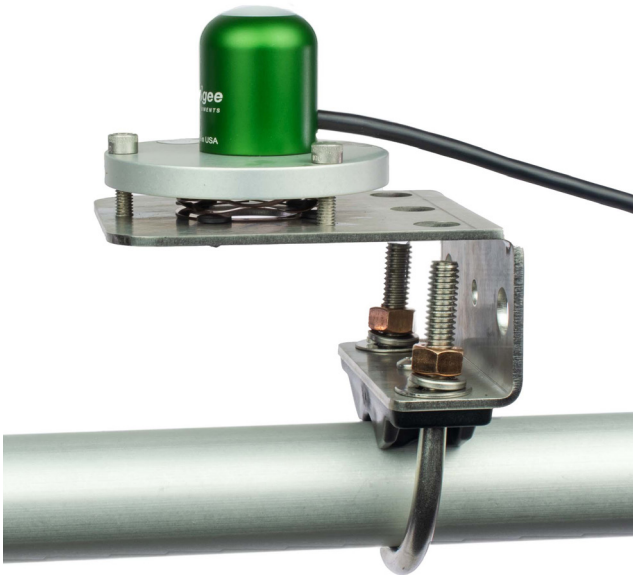
NDVI sensors are used to ground truth NDVI measurements taken from satellite imagery and continuously monitor plant health in the field and in controlled environments.

Wavelength Ranges

- NDVI
- Red detector = 650 nm ± 5 nm with 65 nm full-width half-maximum
 - NIR detector = 810 nm ± 5 nm with 65 nm full-width half-maximum

$$NDVI = \frac{\rho_{NIR} - \rho_{Red}}{\rho_{NIR} + \rho_{Red}}$$

Where ρ = reflectance (%)



Upward-Looking
NDVI Sensor



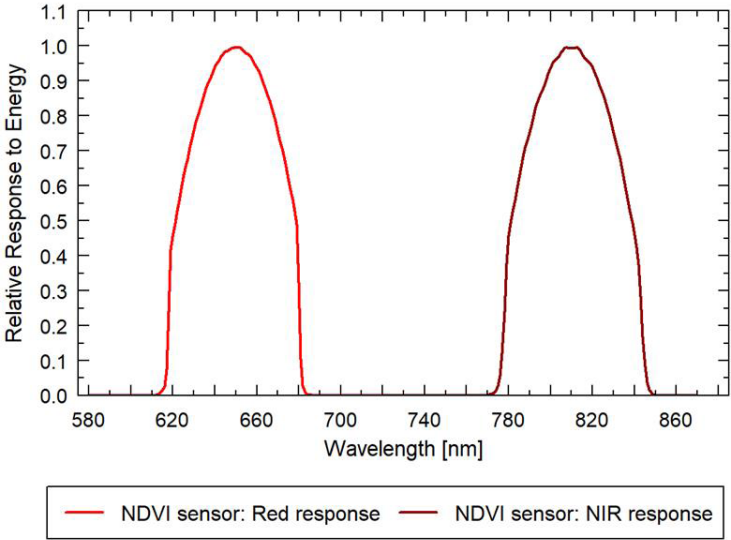
S2-111-SS &
S2-411-SS

Downward-Looking
NDVI Sensor



S2-112-SS &
S2-412-SS

Spectral Response



NDVI sensors have peak sensitivity at 650 nm (Red) and 810 nm (NIR) ± 5 nm with 65 nm full-width half-maximum. The spectral responses can be seen in the graph above.

Product Specifications

| Analog Output | | | Digital Output | |
|--|--|--|---|-------------------------------------|
| | S2-111-SS (Upward-Looking) | S2-112-SS (Downward-Looking) | S2-411-SS (Upward-Looking) | S2-412-SS (Downward-Looking) |
| Power Supply | Self-powered | | 5.5 to 24 V DC | |
| Output (sensitivity) | 14 mV per W m ⁻² nm ⁻¹ (Red) 20 mV per W m ⁻² nm ⁻¹ (NIR) | 12.5 mV per W m ⁻² nm ⁻¹ sr ⁻¹ (Red) 20 mV per W m ⁻² nm ⁻¹ sr ⁻¹ (NIR) | — | |
| Calibration Factor (reciprical of sensi- tivity) | 0.07 W m ⁻² nm ⁻¹ per mV (Red) 0.05 W m ⁻² nm ⁻¹ per mV (NIR) | 0.08 W m ⁻² nm ⁻¹ sr ⁻¹ per mV (Red) 0.04 W m ⁻² nm ⁻¹ sr ⁻¹ per mV (NIR) | Custom for each sensor and stored in firmware | |
| Calibration Uncertainty | ± 5 % | | | |
| Output Range | 40 mV (Red) 40 mV (NIR) | 15 mV (Red) 15 mV (NIR) | SDI-12 | |
| Wavelength Ranges | Red detector = 650 nm ± 5 nm with 65 FWHM* NIR detector = 810 nm ± 5 nm with 65 nm FWHM* | | | |
| Measurement Range | 2x full sunlight | | | |
| Measurement Repeatability | Less than 1 % | | | |
| Long-term Drift | Less than 2 % per year | | | |
| Response Time | Less than 1 ms | | Less than 0.6 s | |
| Field of View | 180° | 30° | 180° | 30° |
| Directional (Cosine) Response | ± 2 % at 45°; ± 5 % at 75° zenith angle | | | |
| Temperature Response | Less than 0.1 % per C | | | |
| Housing | Anodized aluminum body with acrylic diffuser | | | |
| IP Rating | IP68 | | | |
| Operating Environment | -40 to 70 C; 0 to 100 % relative humidity | | | |
| Dimensions | 30.5 mm diameter, 37 mm height | 30.5 mm diameter, 34.5 mm height | 30.5 mm diameter, 37 mm height | 30.5 mm diameter, 34.5 mm height |
| Mass (with 5 m of cable) | 140 g | | | |
| Warranty | 4 years against defects in materials and workmanship | | | |

*FWHM = full-width half-maximum

Features

KEY FEATURES

Digital SDI-12 output is standard with analog options available by request. Domed diffuser promotes self-cleaning to minimize errors from dust and debris.

HIGH QUALITY CABLE

Pigtail-lead sensors feature an IP68, marine-grade stainless-steel cable connectors attached directly to the sensor head to simplify sensor removal for maintenance and recalibration.

FOR BEST MEASUREMENTS

For best results, we recommend pairing upward-looking sensor(s) with downward-looking sensor(s).

