# Hyperspectral Imaging Sensor with co-registered pixels for superb imaging performance from 400-2500nm.

As the industry's most versatile sensor system, Headwall's VNIR-SWIR imaging sensor leverages Headwall's patented aberration-corrected design which provides very high spectral and spatial resolution with stable measurement accuracy. With diffractive optics specifically designed and manufactured by Headwall, the hyperspectral sensor does not exhibit image aberrations such as stray light, optical distortions, or thermal instabilities. Along with aberration-corrected imaging, the Hyperspec VNIR-SWIR sensor offers a wide field of view and high signal-to-noise (SNR) performance.

Headwall's Hyperspec® VNIR-SWIR sensor delivers fully co-registered pixels, reducing processing times and yielding superior imaging performance. The sensor accomplishes this by combining the high diffraction efficiency for the VNIR and SWIR spectral regions coupled with very high quantum efficiency of the electronic subsystems. The result is extremely high SNR performance.

The VNIR sensor uses a Silicon Scientific-CMOS focal-plane-array, while the SWIR sensor uses a Stirling-cooled MCT array. Headwall's VNIR-SWIR airborne sensor is approximately 15" x 14" x 8" (381mm x 355mm x 203mm) in size and weighs approximately 25 pounds (11.4 kg). This includes the compact data system, making the overall package ideally-sized for airborne platforms that can include moderate-sized UAVs.

By establishing hyperspectral benchmarks and cost-effective performance, Headwall's Co-registered VNIR-SWIR sensor is a perfect solution for demanding airborne remote sensing applications.

## Application-Specific Solutions For Critical Environments
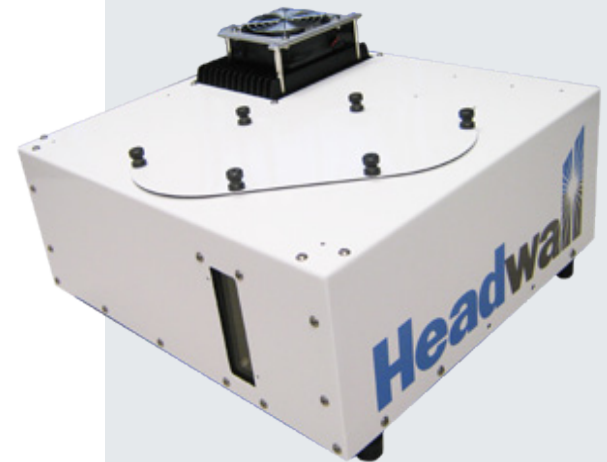
## Applications:

· Airborne remote sensing

· Precison agriculture

· Minerals & mining exploration

· Environmental monitoring

· Petroleum & pipeline monitoring

## Key Benefits:

· Superb imaging performance

· Wideband coverage

· Co-registered VNIR/SWIR pixels

· Small form-factor, lightweight

· Robust and environmentally rugged

· Aberration-corrected

· High spatial and spectral resolution

· Wide field-of-view

## VNIR/SWIR with Co-Registered Pixels

| Spectral Range | VNIR (400-1000nm) | SWIR (950-2500nm) |
|---|---|---|
| Spectrograph Design | High throughput aberration-corrected concentric imager | |
| Wavelength range (nm) | 400 - 2500nm | |
| Spatial pixels | 1600 (VNIR) | 384 (SWIR) |
| Co-registered spatial pixels | 380 (VNIR / SWIR) | |
| Entrance Slit Width (µm) | 20 | 25 |
| Dispersion/Pixel (nm/pixel) | 1.6 | 9.6 |
| FWHM Slit Image (nm) | 5 | 10 |
| ƒ/# | 2.5 | |
| Camera Technology | Scientific-CMOS | Stirling-cooled MCT |
| Camera Digitization | 16-bit | |
| Maximum Frame Rate (Hz) | 200 | |
| Max Power (W) | 90 | |
| Size | approx. 15" x 14" x 8" (381mm x 355mm x 203mm) | |
| Weight (lb / kg) | 25 / 11.3 | |

| FEATURE | FUNCTION | BENEFIT |
|---|---|---|
| Complete solar reflectivity spectrum captured | Single VNIR-SWIR datacube | Provides all available spectral information |
| Co-registered pixels | VNIR and SWIR pixels looking at same sample on the ground | Simplified analysis for quick turnaround of data products |
| Compact, lightweight, low power (data system included) | Deployable on platforms requiring small form-factor payloads | Longer flight duration for UAVs & manned aircraft |
| High throughput and quantum efficiency | Very high signal-to-noise ratios (SNR) | High performance across the VNIR and SWIR spectral ranges |
| High efficiency aberration-corrected design | Low distortion, no chromatic dispersion, low stray light. | Highest image quality and spectral/spatial resolution |
| High radiometric accuracy and stability | Excellent repeatability of measurements | Excellent spectral fidelity for dependable results |

## All-Reflective Concentric Imager

*Headwall's hyperspectral sensors deliver aberration-corrected imaging characterized by high spatial and spectral resolution, a wide field of view, and very high signal throughput. Headwall's own application-specific diffraction gratings are fundamental to these key specifications, which are crucial for airborne hyperspectral sensors. Headwall's all-reflective, concentric sensor design is robust and thermally stable.*



SLIT

HIGH-PERFORMANCE DIFFRACTION GRATING

CONCAVE MIRROR

CAMERA FOCAL PLANE
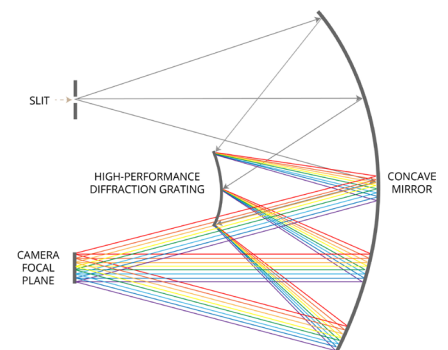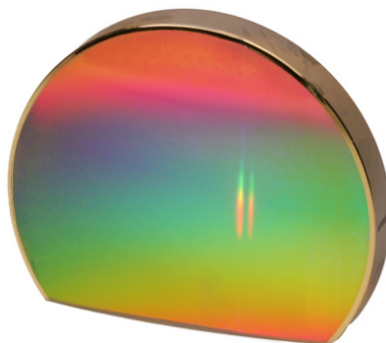
**About Headwall Photonics:** Headwall is the leading designer and manufacturer of imaging spectrometers and spectral instrumentation for industrial, commercial, and government markets. Headwall's high performance spectrometers, spectral engines, and holographic diffraction gratings have been selected by OEM and end-user customers around the world for use in critical application environments. As a pioneer in advanced, patented optics technology, Headwall enjoys a market-leading position through the design and manufacture of spectral instrumentation that is customized for application-specific performance.

**Headwall**

February 2016

**Polytec**

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