



HSI

Technical Specifications For Desktop HSI Scanning Systems

COMPLETE HIGH-PERFORMANCE HSI PUSH-BROOM DESKTOP SCANNING SYSTEMS

Hyperspectral Imaging applications have expanded markedly in the last years. However, there remains a common problem and that is: providing a complete integrated solution to capture 2-D hyperspectral images in a compact desktop manner that provides detailed sample spectral information to determine components, quantities and their distributions across the scanning plane.

Each HSI scanner comprises of a complete turn-key hyperspectral solution that includes: spectral camera, scanning stage, interchangeable sample trays, lighting system, focus target, reflectance standard, data acquisition, viewing and analysis software.

Two desktop scanning units are available and four spectral camera options. These scanners can be quickly set-up on standard tables and can acquire high-resolution spectral images in seconds.

All scanners can hold up to two spectral cameras thus offering both VNIR and NIR spectral ranges at the same time. Each spectral camera unit comes with an objective lens that covers the full cross-track of the scanner.

Once the objective lens is focussed to target, the whole spectral camera can be adjusted in stand-off distance to accommodate samples of different thickness without the need to refocus. By using a shorter stand-off distance, the cross-track length can be reduced, and the spatial resolution increased.

Similarly, the objective lens can be easily swapped by the user for other focal lengths to cover higher spatial resolution needs, including macro work.

Ease-of-use and speed-of-acquisition are key features of these systems. Spectral imaging methods and settings can be easily transferred to real-time process monitoring applications.

INSTRUMENT CALIBRATION

Each instrument is delivered fully calibrated and with a certificate of conformance. The spectral calibration is made, and the image performance tested and demonstrated using calibration targets.

SPECTRAL CAMERAS

Spectral Camera	VNIR-S	VNIR-HR	NIR-HR	NIR-HR+
Mode	High-speed push-broom scanning			
Spectral Range	400 – 1000 nm		900 - 1700 nm	
Spectral resolution (FWHM)	8 nm	<3 nm	5 nm	5 nm
Spectral dispersion	1.0 nm/pix	0.7 nm/pix	3 nm/pix	1.5 nm/pix
Spectral bands from RLD *	892 / 446 / 223	830 / 415 / 208	250	500
Spectral bands from OSR *	75	200	160	160
No. Pixels in Cross-track	1400	1600	320	640
Line Frame Rate	100 lf/s	100 lf/s	344 lf/s	300 lf/s
Smile and Keystone error	Sub-pixel across the spectrograph output field			
Interface	GiGe			

*Depends on spectral binning conditions, and RLD - reciprocal linear dispersion/ pixels, or OSR - optical spectral resolution - spectral range / spectral resolution

Objective Lens	VNIR	VNIR-HR	NIR-HR	NIR-HR+
Focal length *	23 mm		22 mm	
Spectral Range	400 to 1000 nm		900 to 2500 nm	
Aperture	f/1.4		f/2.0	
Cross-track length	10 (macro) to 300 mm			
Pixel size on target	15 (macro) to 200 μm		30 (macro) to 1000 μm	15 (macro) to 500 μm

*Other objectives lenses are available: VNIR Range f=17, 23, 35, 50, etc ; NIR / SWIR Range f=15, 22, 30, 56, etc. Macro options are also available: please consult Clyde HSI

Complete integrated desktop unit including all power supplies for camera, scanner and lighting control systems as well auxiliary power output for optional sensors that fits on a standard laboratory bench.

Desktop Scanner	A4	A3
Scanning Area	250 x 300 mm ²	300 x 500 mm ²
Camera Height Adjustment	200 mm	
Spectral camera mount	1 or 2 spectral cameras at time	
Scanning Rate at 100 Ifps	Depends upon pixel size on target, for example: 5 mm / s with 50 µm pixel 50 mm / s with 500 µm pixel	
Scanner Track Range	300 mm	500 mm
Typical Acquisition Time	<10 s for 640 x 640 pixels x 250 spectral bands	
Lighting Control	Current stabilised DC supply, individual lamp side control	
Scanner Depth	550 mm	
Scanner Length	750 mm	1200 mm
Control interface	USB 2.0	
Ethernet	Powered GiGe switch	
Power	90 to 260V AC, 50/60 Hz	

Conveyor Scanner	
Scanning area	250mm wide
Scan speed	0.2mm/s to 750mm/s
Scanner track range	Determined by sample length
Feed in / out	Gravity roller system
Sensors	Speed adjustment for square pixels

Lighting	Parameter
Type	Quartz Tungsten Halogen, DC Operated
Colour Temperature	4700 K
Spectral Range	350 to 3000 nm
Power (electrical)	6 x 50 W
Illumination	Line-width adjustable
Angle	Adjustable incident angle
Cooling	Air-cooled



HYPERION HSI system configured with dual camera mount (VNIR and NIR cameras) and conveyor scanning stage. On/off rollers not shown

DATA ACQUISITION, DISPLAY & ADVANCED SIGNAL PROCESSING

Software Control Features	
Wavelength selections	Spatial Selections
Spectral resolution	Spatial Resolution
Frame rates and integration time per line image	Uni- or bidirectional scanning
Electron multiplying CCD gain and control (where applicable)	Live spectrum: by pixel or by area
Live signal counts for sample and illumination position optimisation	Waterfall acquisition display
Frame image and hyperspectral cube display	False colour images
Auto white and dark field measurements	Auto calculation: Raw data to %R
Spectral calibration	Export functions: images, spectra, etc.
File formats: BIL, BIP, ENVI Compatible	

Display	Analysis
Waterfall	Spectral and Spatial
Image rotation	Principal Component Analysis
Spatial Selection	Spectral Angle Mapping
False Colour RGB (VNIR, NIR & SWIR data)	Support Vector Machine
Histogram and Levels Adjustment	End-member Classifications
Spectral Slicing	Partial Least Squares
Hi-Resolution RGB camera	Image Fusion

Other	
Target Referencing	Calibration Files: Spectral, Radiometric, Sample
Spectral Database (user populated for their application needs)	Geometric Corrections
Comprehensive data and image export facilities	Import of high resolution photogrammetry images and other image modes.

INTELLIGENT HYPERSPECTRAL IMAGING SOLUTIONS

At Clyde HSI, we have delivered complete hyperspectral imaging systems in a diverse range of application areas. Examples include:

- Agri-Food
- Art Conservation
- Chemical Imaging
- Colour Measurement
- Change Detection
- Forensics
- Industrial Quality Control
- Inspection
- Materials Identification
- Medical
- Recycling

ABOUT US

Clyde HSI are specialists in optical spectroscopy and provide a wide range of both hyperspectral and conventional spectroscopy instruments and full systems. All our products are supported by leading software for data acquisition, analysis and display. At Clyde HSI we take care of the technology, so you can focus on what matters to you.

We believe in high quality engineering and design, allowing us to develop market leading products and services. Within our Photonics Research Facility, we have the capability to rapidly develop new products and systems and welcome the opportunity to partner with our customers on new developments – both within the scientific research community and for equipment for industrial applications.



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