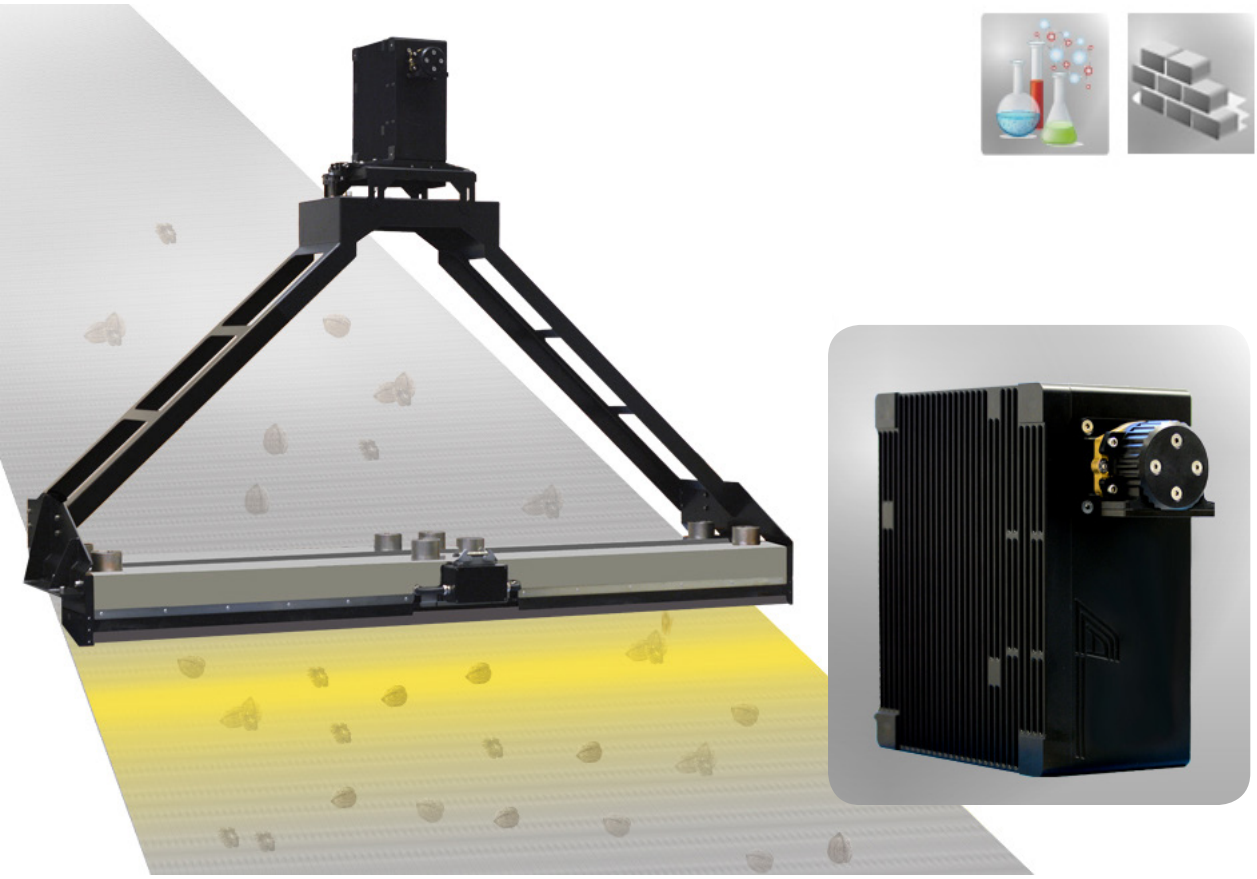
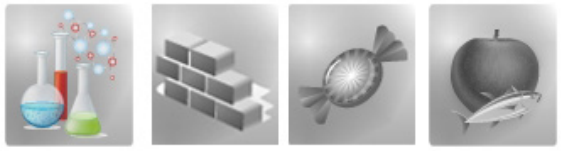
uniSPEC1.7HSI
uniSPEC1.9HSI
uniSPEC2.2HSI^{sens}

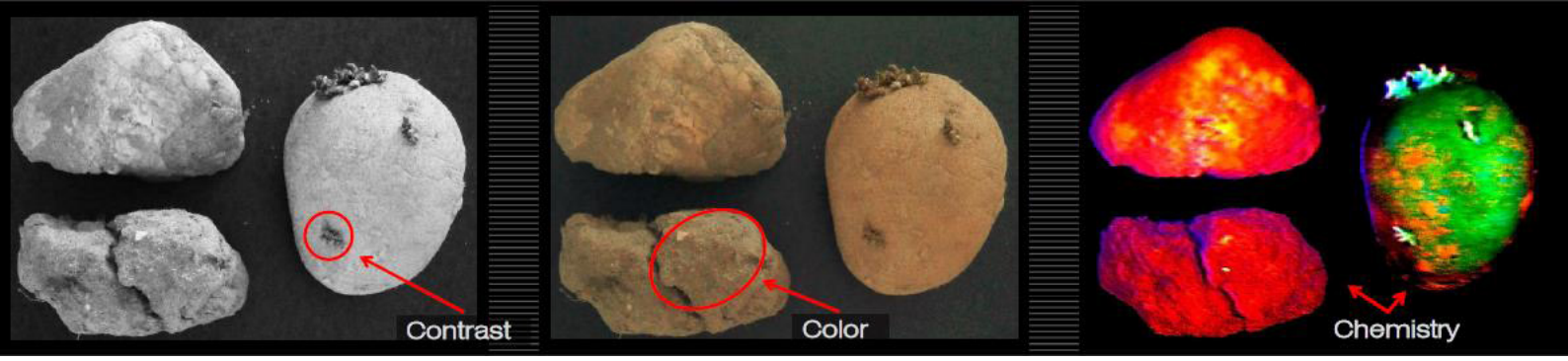




NIR HYPERSPECTRAL CAMERAS

for science and industry

Product Brochure



The NIR hyperspectral imaging cameras uniSPEC1.7HSI, uniSPEC1.9HSI and uniSPEC2.2HSI^{sens} (uniSPECx.xHSI, figure 1) feature three key parameters for successful process analytical technology: high spectral resolution, high spatial resolution and high frame rates. The NIR hyperspectral imaging cameras are suitable for near infrared (NIR) imaging analysis in a wide field of applications. Applications include quality control in printing and coating processes, sorting and quality control of food/feed, minerals or online analysis of polymers and paper. Due to the high spatial resolution, even small objects such as polymeric granulate or seeds can be analysed reliably. In general, all NIR-active materials can be investigated.

High-performance with breakthrough technology

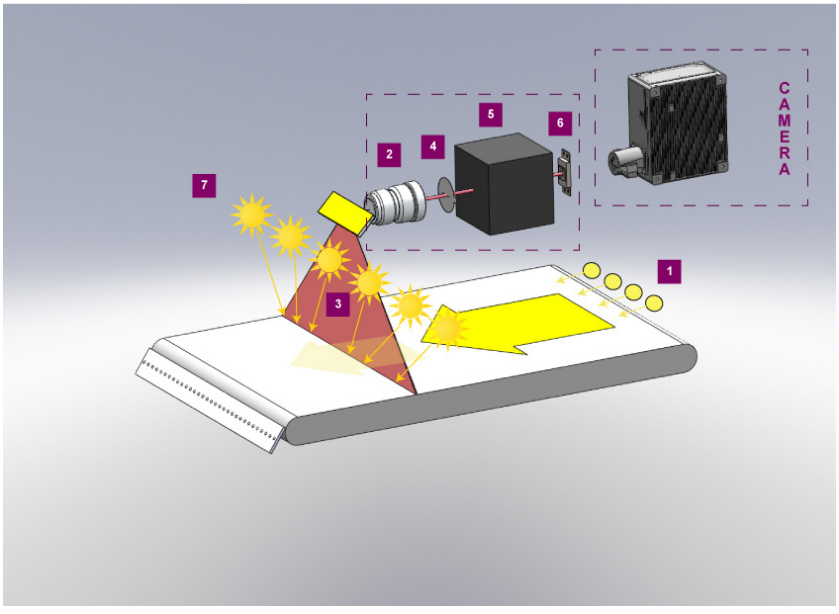
The uniSPECx.xHSI is based on push-broom imaging technology (figure 2). The camera consists of an optical NIR spectrograph and a 2D InGaAs sensor array (cooled by peltier elements) as detector. Both components are integrated in a dust and waterproof housing (IP67). The reflectance spectrometer features distortion-free optical components which were especially designed for NIR application. This enables the generation of a distortion-free image of the line shaped detection area, eliminating the mixture of spectra for adjacent objects. In addition, the lens is NIR-corrected and exhibits a short focal length, allowing the detection of a large field of view at small working distances.

Faster and high resolution

For each image point of the line shaped detection area, a complete NIR spectrum is recorded simultaneously. A spatially resolved analysis is achieved by subsequent line scans of the object. The spatial resolution enables the identification of small objects in a material stream (≥ 2 mm). For applications requiring a high spatial resolution (≤1 mm), especially designed lenses are available upon request.

Set up

The NIR hyperspectral imaging cameras are offered in combination with an industrial PC and preinstalled camera control software. Installation bridge, illumination unit, RGB line scan camera and application development software are available as further accessories.



Push-broom imaging technology
1-Material stream
2-Lens
3-Reflected NIR radiation,
4-Entrance slit
5-Imaging spectrograph
6-Sensor array
7-Illumination unit

Applications

Food industries
- Quality control of food and feed (determination of fat, carbohydrate protein or water content)
- Identification of foreign material (production residues or packaging material) e.g. paper, cardboard, plastics,stone, insects, stems and leaves

Polymer compounding industries
- Composition monitoring in production (analysis of educts, monitoring of mixture ratio)

Paper industries
- Analysis of paper ingredients
- Thickness determination of coatings
- Monitoring of UV curing for coatings

Mineral industries
- Mineral analysis in stone
- Optical sorting of valuable stone from waste rock

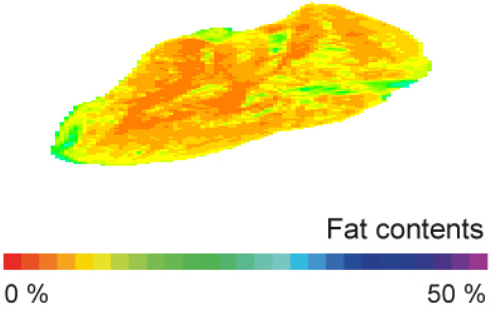
Printed circuit boards (idPCB)
- Chemical imaging of NIR active materials
- Aerial and area scanner for geological or vegetation survey and mapping

Analytical and control software

The uniSPECx.xHSI cameras are delivered including a comprehensive set of software. The control software KustaMSI (figure 5) permits adjusting of camera parameters, monitoring of camera status and NIR data acquisition. In addition to the camera control options, several standardised interfaces are implemented in KustaMSI for data transfer to an external process control device. Important device parameters are password protected and therefore changeable by service personnel only. The application routine can be changed, enabling an easy adaption of the NIR hyperspectral imaging cameras to different analysis tasks.

LLA offers software KustaSpec including AnaTools for chemometric application development. Implemented chemometric analysis algorithms include: PCR, PLS, Euklid, Fuzzy, neuronal networks and many more. Software for real-time and offline visualisation of material streams complete the software portfolio. Alternatively camera data formats for Evince and Camo Unscrambler are available.

Application in food analysis, determination of fat content in meat



Specifications

Imaging spectrograph	**uniSPEC1.7HSI**	**uniSPEC1.9HSI**	**uniSPEC2.2HSI^{sens}**
Camera type		Push-broom imaging camera	
Spectral range	0.95 µm – 1.7 µm	1.32 µm – 1.9 µm	1.62 µm – 2.19 µm
Dispersion		120.7 nm/mm	
Spectral resolution		< 8 nm	
Numeric aperture		F/2.4	
Lens		NIR-corrected, Zeiss F2.4 / 10 mm (standard), other lenses available	

2D spectral camera: uniSPEC			
Sensor		InGaAs photo diode array, thermo electrical cooling	
Image frame (spatial x spectral)	320 pixel x 256 pixel	192 pixel x 96 pixel	192 pixel x 96 pixel
Dispersion	3.61 nm/pixel	6 nm/pixel	6 nm/pixel
Digital resolution /grey scale levels	14 bit	16 bit	16 bit
Exposure time	100 µs – 5 s	1 µs – 10 ms	1 µs – 10 ms
Frame rate	Max. 270 (optional 310) frames/s	Max. 795 frames/s, no ROI mode available	Max. 795 frames/s, no ROI mode available
Sensor cooling		Peltier element, cooling by convection of heat	
Camera cooling		Passive	
Lens connection		Standard C-mount	
Chassis dimensions (LxWxH)		295 mm x 345 mm x 166 mm	
Weight		16.8 kg	
Power supply		24 VDC (20...30 VDC), 2.5 A	
Power consumption		< 70 W	
Permitted environmental operating temperature range	0 °C bis +50 °C	0 °C bis +50 °C	0 °C bis +45 °C
Permitted environmental relative humidity	20 % to 90 %, non-condensing	20 % to 90 %, non-condensing	20 % to 80 %, non-condensing

Illumination unit: PMAmsi	
Setup	Double-sided illumination, angle of incidence 15° resp. 22°
Illumination area 300 mm measurement distance 500 mm measurement distance	 25 mm x max. 2 m 30 mm x max. 2 m
NIR radiation source	Halogen light bulbs R7s 118 mm, 115 V or 230 V
Power supply Input Output	 230 VAC - 10% to + 15% 50...60 Hz, 115 VAC available 80 VDC to 230 VDC / 200 W to 500 W

Setup	**30 µm slit**	**50 µm slit**	**50 µm slit**
Spatial resolution Standard at 1 m FoV Minimum at 160 mm FoV	 3.2 mm x 3.2 mm 0.5 mm x 0.5 mm	 5.2 mm x 5.2 mm 0.9 mm x 0.9 mm	 5.2 mm x 5.2 mm 0.9 mm x 0.9 mm

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