Berlin Adlershof

LLA Instruments is located on the Science and Technology Park in Berlin Adlershof

# COMPANY PROFILE


*UV-VIS Hyperspectral Imaging Cameras*
*NIR Hyperspectral Imaging Cameras*
*64-ch. Multiplexed NIR Spectrometer*
*On-Line XRF Process Analyser*
*Echelle Spectrograph*
*Illumination Systems*

**LLA Instruments GmbH & Co. KG**

# Product Portfolio – NIR/SWIR and UV/VIS Spectrographs, RGB Compact Hyperspectral

LLA Instruments GmbH & Co. KG develops and manufactures spectrographs and cameras i spectrograph and camera production is complemented by inhouse development of control ar high spectral resolution.

*Multiplexed NIR spectrograph KUSTAx.xMPL in combination with process probe line PMAmpl*

## NIR/SWIR Spectrographs and Cameras

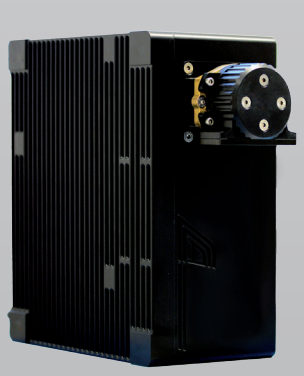
### Multiplexed NIR Spectrometer
***KUSTA1.9MPL-24V and uniSPEC1.9MPL-24V***

Multiplexed NIR Spectrometers are fibre-optical multiplexed NIR spectrographs for process monitoring and sensor-based sorting. The spectrometer optics can be connected to up to 64 measurement tracks via optical fibers. The fiber optics can be combined in one probe line for linescan detection across a conveyor belt. In addition, free arrangement of measurement spots in a plant is possible by usage of single probes. Control and analysis software as well as a control cabinet (IP65) are included in delivery. An RGB color sensor is integrated as standard. The technology is suitable for the identification of materials >30 mm in a wavelength range of 1,36 µm – 1,94 µm.

*NIR Hyperspectral imaging cameras KUSTAx.xMSI and uniSPECx.xHSI in combination with an installation bridge*

### High Performance NIR Hyperspectral Cameras
***KUSTAx.xMSI and uniSPECx.xHSI***

KUSTAx.xMSI and uniSPECx.xHSI are hyperspectral imaging cameras for process implementation and laboratory usage. The high spatial resolution of up to 320 measurement tracks at full frame rates of up to 795 Hz allows the identification of even small particles (2 - 40 mm). The protection level of the cameras is IP67. An illumination unit PMAmsi, electric control cabinet, deflexion unit 90°, RGB line scan camera as well as control and analysis software are available. Camera models covering wavelength ranges from 0.95 µm - 1.7 µm (KUSTA1.7MSI), 1.32 µm - 1.9 µm (KUSTA1.9MSI), 1.25 µm - 2.17 µm (KUSTA2.2MSI) and 1.62 µm - 2.19 µm (KUSTA2.2MSI$^{sens}$).

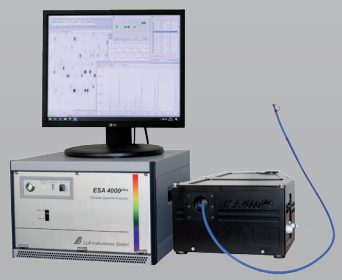


*UV-VIS Hyperspectral camera uniSPEC0.9HSI*

## UV/VIS camera and spectrograph

### UV-VIS Hyperspectral Camera
***uniSPEC0.9HSI***

The UV-Visible (UV-VIS) hyperspectral imaging camera uniSPEC0.9HSI is developed for analytical imaging in the UV to visible range (0.35 µm - 0.95 µm), covering a wide field of applications e.g. advanced colorimetry, quality control in printing and coating processes, sorting and quality control of food, feed or minerals. Camera key parameters for successful process analytical technology are high spectral resolution (down to 0.365 nm/pixel), high spatial resolution (up to 1920 tracks are detected simultaneously) and high frame rates (up to 579 fps).



*Echelle spectrograph ESA 4000$^{plus}$*

### Echelle Spectrograph
***ESA4000$^{plus}$***

The Echelle spectra analyzer ESA4000$^{plus}$ is a compact spectrograph for simultaneous detection of complex spectra within the UV/ VIS range. A spectral resolution of few picometers is achieved. The device consists of the Echelle spectrograph with the integrated ICCD camera and the electronic control unit for camera steering and synchronisation of data recording. It can be coupled with different external radiation sources like a pulsed laser system. The device has been developed for different applications in atomic spectroscopy, especially for LIBS measurements. The ESA4000$^{plus}$ is widely used for research and development as well as real-time process monitoring.

# B Line Scan Camera, On-Line XRF Process Analyser and Scanning System

ncluding probes and illumination units for process implementation and laboratory usage. The nd analysis software. The equipment is characterised by high measurement frequencies and

## RGB Line Scan Camera

### RGB line scan camera
***uniScanRGB***

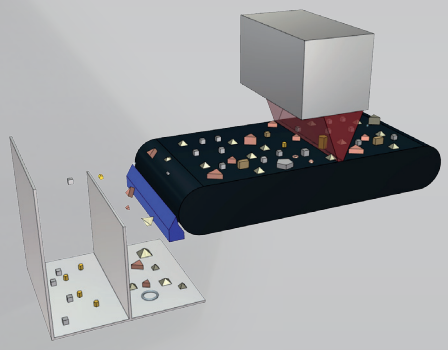
The RGB line scan camera uniScanRGB is suitable for color machine vision applications. The camera is based on newest CMOS chip technology. The high sensitivity CMOS sensor is characterised by minimised noise level, high image contrast and low power consumption. The resolution of 2048 tracks combined with a digital resolution of 12 bit and a full frame rate of 260 Hz to 850 Hz provide an outstanding performance of uniScanRGB. Even smallest objects are scanned in detail at high frame rates, enabling the usage of uniScanRGB in sorting and screening applications requiring high resolution and high speed.

*RGB line scan camera uniScanRGB as add-on for hyperspectral imaging cameras KUSTAx.xMSI and uniSPECx.xHSI*

## On-line XRF Analyser

### XRFline

The on-line XRF analyser line XRFline is suitable for detection of all elements with an atomic number higher than Potassium (in special cases even below). The system uses state-of-the-art X-Ray detector technology. The performance of the detector is characterised by high count rate capability (>1 Mcps), excellent peak-to-background ratio, good energy resolution (~130 eV), wide energy range (0.2 keV to 30 keV). The housing of the XRFline fulfils the radiation safety requirements according to the Radiation Protection Ordinance of Germany. The radiation protection at and around the conveyor belt has to be provided by the manufacturer according to the effective Radiation Protection Ordinance at the place of operation. Furthermore the XRF line camera is integrated into a IP 65 rated housing, enabling maintenance-free 24h/7d operation.



*On-line XRF analyser XRFline*

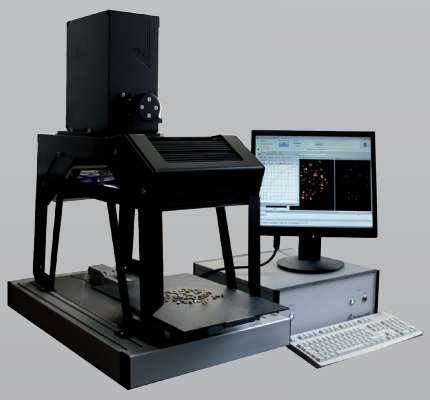
## Compact Hyperspectral Scanning System

### ProScan-HSI

ProScan-HSI is the latest turnkey system developed by LLA. Based on the combination of LLA´s high performance hyperspectral imagers, a rapid scanning table and an optimised line-illumination system, ProScan-HSI is the perfect solution for laboratory users or process developers who want to perform rapid chemical imaging analysis of small to medium-sized samples, at high spectral and spatial resolution. ProScan-HSI is developed to offer a high level of modularity in terms of spectral bandwidth and resolution, along with user-friendliness:

- Position the sample on the scanning table,
- Start the scan and
- Within seconds the results of the analysis are available.

ProScan-HSI is fully compatible with the data-processing software suite developed by LLA, and can also be delivered with the Prediktera´s software EVINCE for quick and easy visualisation.



*Hyperspectral scanning system ProScan-HSI*

# nline Quality Control and Scientific Applications

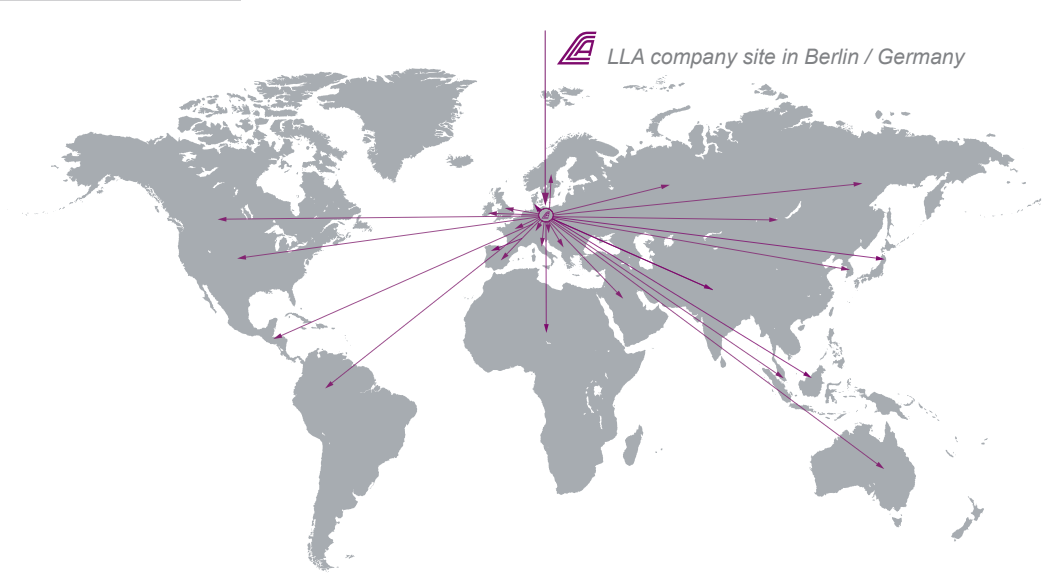
# Company profile

LLA Instruments GmbH & Co. KG (LLA) develops and manufactures analytical spectral imaging process techno- logy, hyperspectral cameras and optical spectrographs for R&D. The company is established as a reliable partner for sensor-based sorting technology especially for the evaluation of material streams in production processes. The company is market leading in the area of hyperspectral imaging for industrial usage.

LLA provides process analytical technology (PAT) and optical spectroscopy equipment directly or by local resellers and OEM partners across the world. Since 1993, LLA is situated in the Science and Technology Park Berlin-Adlershof, the largest technology and science park in Germany. At this site, universities, national research institutes and high technology companies as well as media are located. In addition to the comprehensive in-house research department including electrical engineers, optical development and software development, also the mechanical design and production of LLA spectrographs and cameras are situated in Adlershof. A qualified and highly motivated team is guaranteeing high production standards. LLA is also working in national and international research projects in cooperation with federal and private research institutes. In 2017, the LLA portfolio is complemented by an on-line XRF system as well as a hyperspectral scanning system as a turn-key solution for laboratory usage.

# Export markets – Reseller & OEM partner

LLA Instruments GmbH & Co. KG delivers NIR process spectrographs and cameras to **machine builders** specialised in the manufacturing of equipment for optical sorting and to **resellers** across the world.




## History

| | |
|---|---|
| 1993 | Founded in Berlin as spin-off of the Academy of Sciences |
| | First fluorescence spectrograph for environmental analysis delivered |
| 1994 | First NIR spectrograph with PbS-sensors delivered (KUSTA2000) |
| | First Echelle spectrograph for LIBS measurements developed |
| 1998 | First Echelle spectrograph ESA 3000 delivered |
| 1999 | First multiplexed “MPL” system for plastic recycling delivered |
| 2006 | First ESA 4000 system delivered |
| 2007 | Inauguration of the new LLA main building |
| 2008 | 15th anniversary |
| 2010 | 1st hyperspectral imaging camera KUSTA1.7MSI for recycling delivered, pioneer in hyperspectral imaging technology for industrial usage |
| | 500th multiplexed MPL system delivered |
| 2012 | KUSTA2.2MSI launched |
| 2013 | uniSPEC1.9HSI launched |
| 2014 | Expansion company site, new production facility 20th anniversary of company |
| 2015 | RGB line scan camera uniScanRGB launched |
| 2016 | UV-VIS Hyperspectral camera uniSPEC0.9HSI launched |
| 2017 | On-line XRF analyser, hyperspectral scanning system ProScan-HSI, KUSTA2.2MSIsens launched |

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