

25 Years With You

Bring to us your ideas and we'll show you the possibilities!

SOL
instruments®

Confotec® NR500

3D Scanning Laser Raman Microscope

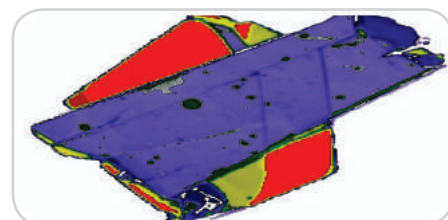
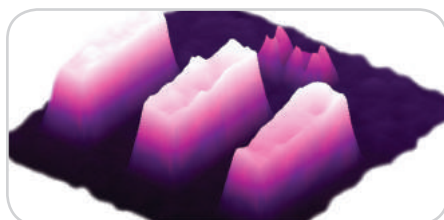
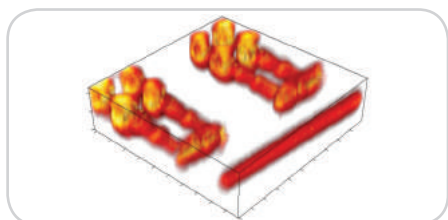


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Confotec® NR500

Simultaneous / Multifunctional Analysis

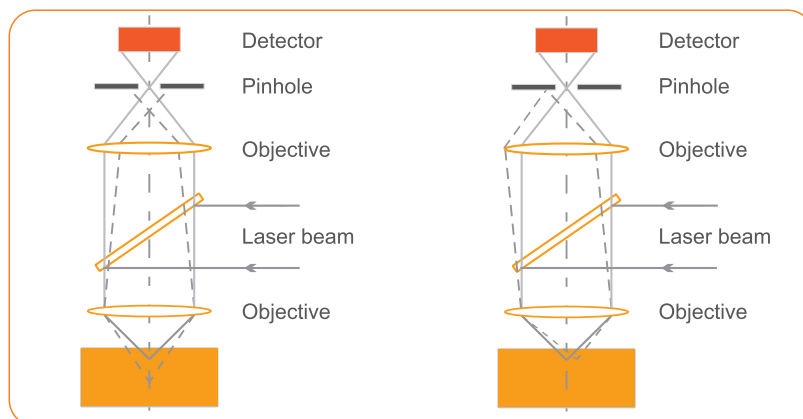
- Raman Measurements
- Luminescence Measurements
- Laser Reflection & Transmission Measurements
- Spectral and polarization measurements



3D high - contrast images in reflected light
3D Raman confocal measurements

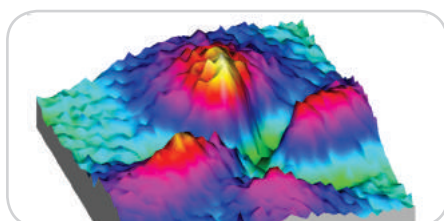
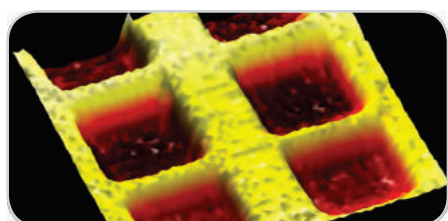
Principle of Confocal Detection

Confocal Laser Scanning Raman Microscope has become a widely recognized research instrument in recent years. Confocal microscopy offers several advantages over conventional widefield optical microscopy, including the ability to control depth of field, elimination or reduction of background information away from the focal plane and the capability to collect serial optical sections from thick samples. The image of the extended sample is generated by scanning the focused laser beam across a defined area.

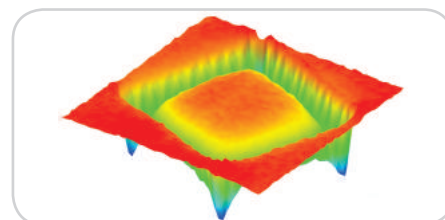
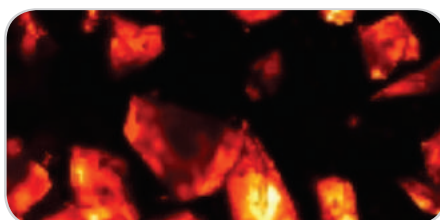
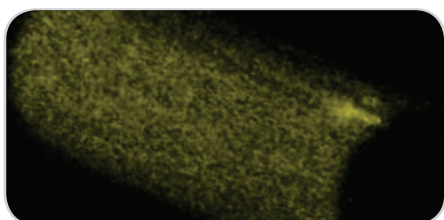


▲ The pinhole aperture rejects the residual scattered rays originated from any out-of-focus points on a sample.

We have created the instrument that is right for you



High spectral resolution



Spatial resolution: less than 500 nm (Z), 200 nm (X, Y)

Spectral resolution: $\sim 0.25 \text{ cm}^{-1}$

Wavelength accuracy in spectrum with CCD detector: 0.005 nm (1800 l / mm)

Applications

Semiconductors

High spatial resolution Raman confocal microscopy can provide information on dopant concentrations and stress distribution in semiconductor materials.

Biology

Raman spectroscopy allows easy visualization of cellular components with minimum perturbation.

Pharmaceutics

Confocal Raman spectroscopy allows chemical compounds and molecular conformers in various drugs to be identified and their distribution mapped with high spatial resolution.

Geology

Confocal Raman microscopy is an excellent technique for characterization of minerals, detection of components distribution and their phase transitions.

Cosmetology

Confocal Raman microspectroscopy is a promising technique which enables measuring the skin care products as well as their penetration capability.

Forensics

Application areas include identification of unknown substances, different types of fibers, glasses, paints, explosive materials, inks, narcotic and toxic substances, proof of authenticity of documents.

Material science

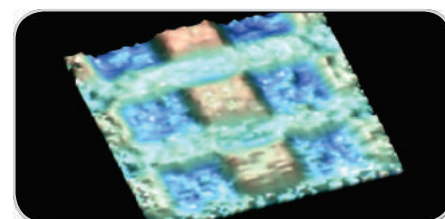
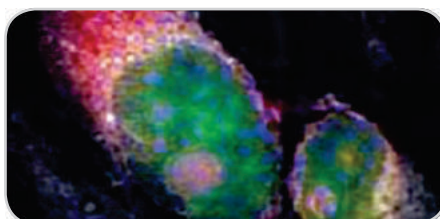
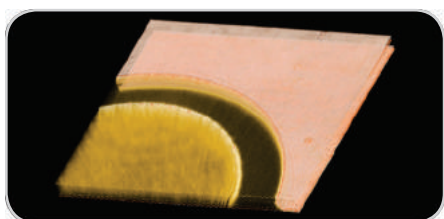
Confocal Raman offers very good spatial resolution for characterization of materials (superconductor, polymers, coatings, composites, carbon nanotubes, graphene, etc.)

Art. Gemology

Raman spectroscopy allows identification of pigments and binders used in paintings. The spectroscopic analysis of archaeological samples (ceramics, glasses, etc.) provides information on their origin and history. Raman technique allows rapid identification of colored stones, natural and synthetic diamonds.

and many more...

Raman megapixel image for 3 sec
Fully automated system with up to 5 integrated lasers



Confotec® NR500

High spatial resolution and sensitivity

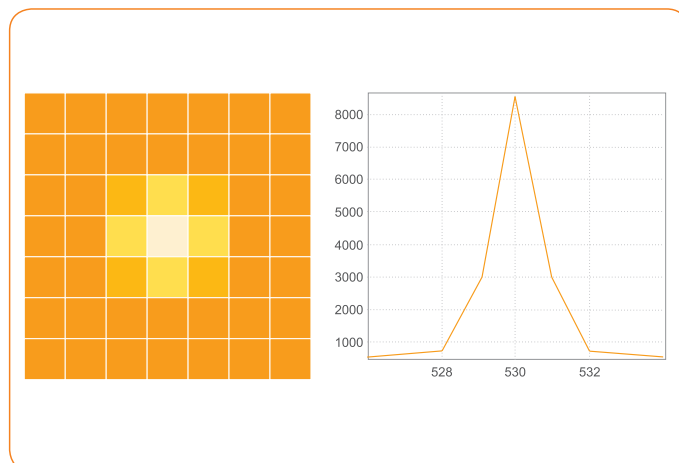
Major features

The highest spectral and imaging resolution with specially designed spectrometer

Specially designed imaging spectrometer incorporates many features that make it ideal for Raman confocal measurements. The image of pinhole is projected to a multichannel detector without any aberrations.

The smaller amount of illuminated pixels on the CCD matrix leads to the smaller dark counts and the higher spectral resolution.

Spectral resolution of Confotec® NR500 with an Echelle grating is 0.25 cm^{-1} .

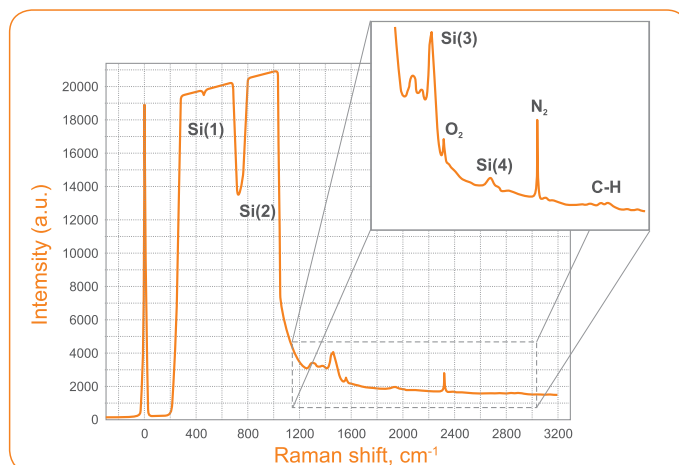


▲ Spectral image of the pinhole on the CCD camera (aberration free). CCD pixel size is $12 \mu\text{m}$.

High optical throughput for enhanced sensitivity

The 4th order Silicon band at 1940 cm^{-1} can be observed in less than one minute using a low intensity laser.

2D / 3D images can be acquired rapidly.



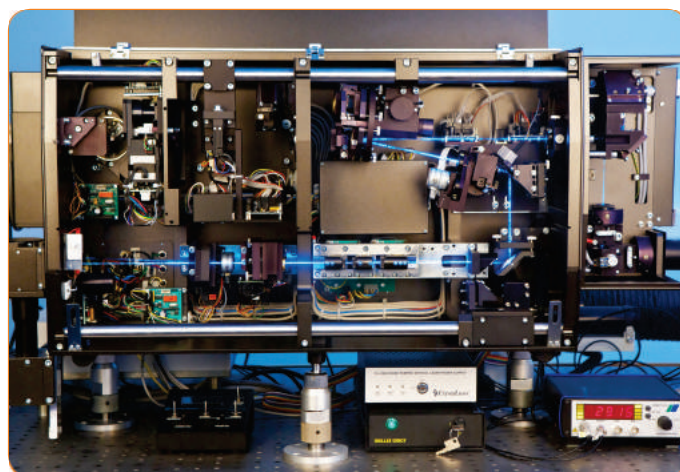
▲ Silicon 4th order sensitivity.

Fully automated

People with little or no experience in Raman spectroscopy can use Confotec® NR500. The system is highly modular and fully automated. Up to 5 lasers can be used.

The lasers can be switched from one to the other by just a click.

Motorized control for laser power, beam diameter, polarization orientation, pinhole size and grating is provided.



▲ Fully automated system.

Low frequency Raman shift measurements (down to 5 cm^{-1})
with Bragg Super-Notch filters

True confocal design High spatial resolution

Laser Raman microscope Confotec® NR500 can achieve:

- *lateral* resolution which is close to theoretical limitation

Laser wavelength, nm	Objective	XY - plane resolution, nm
488	100 \times , NA = 0.95	250
532	100 \times , NA = 0.95	275
633	100 \times , NA = 0.95	320
785	100 \times , NA = 0.95	390

- *axial* resolution
(in depth direction, 100 \times , NA = 0.95)

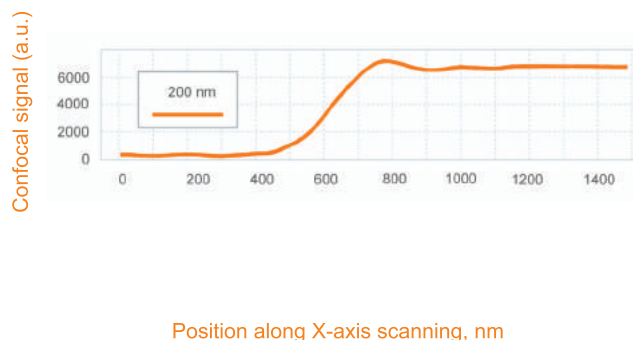
Laser wavelength, nm	Z (axial) resolution, nm
355	370
488	450
532	550
633	600
785	750

Wide Raman shift measurement range

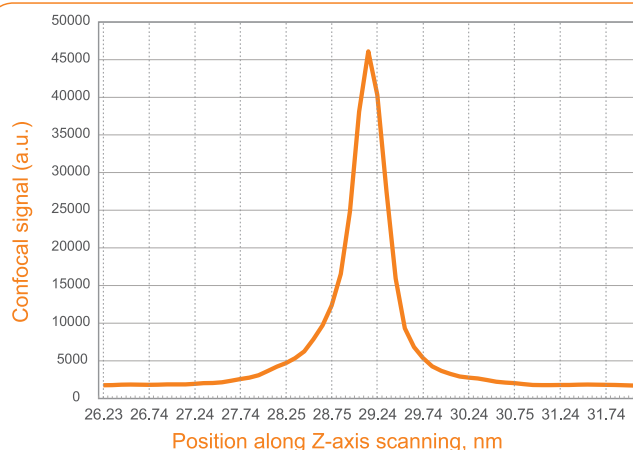
Raman shift measurement range:

Laser wavelength, nm	Wavenumber range, cm^{-1}
325	125 - 8000
355	115 - 8000
473	80 - 6000
532	50 - 8000
633	50 - 6000
785	40 - 2800

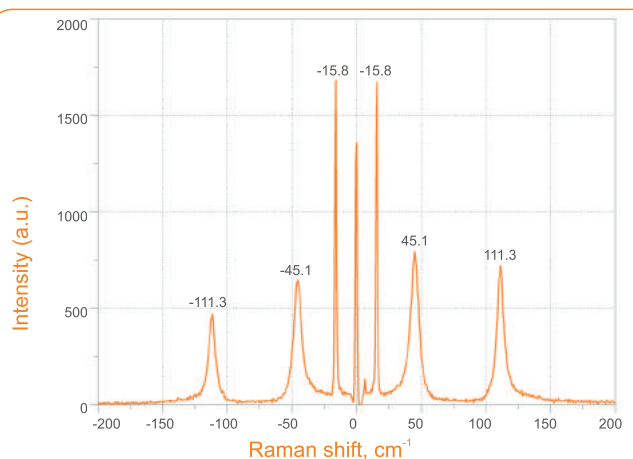
Low frequency Raman shift measurement range can be expanded using Bragg notch filters.



- ▲ Confotec® NR500 can take high definition Raman imaging with lateral resolution which is close to theoretical limitation ($\lambda = 514\text{ nm}$, 100 \times , NA = 1.4).



- ▲ Axial resolution of 450 nm ($\lambda = 488\text{ nm}$, 100 \times , NA = 0.95).



- ▲ Low frequency Raman bands of cadmium iodide (lower than 200 cm^{-1} , 633 nm laser)

Confotec® NR500

Megapixel Raman image for 3 sec

Ultra fast imaging mode with PMT

3D scanning laser confocal Raman microscope Confotec® NR500 provides acquisition of two images within a single scan: a Rayleigh image (using laser light reflected from a sample) and a spectral image by Raman scattering.

Ultrafast imaging option allows to get confocal image in 3 sec (3 μ s / pixel).

Confotec® NR500 uses fast beam scanning by galvanomirrors.

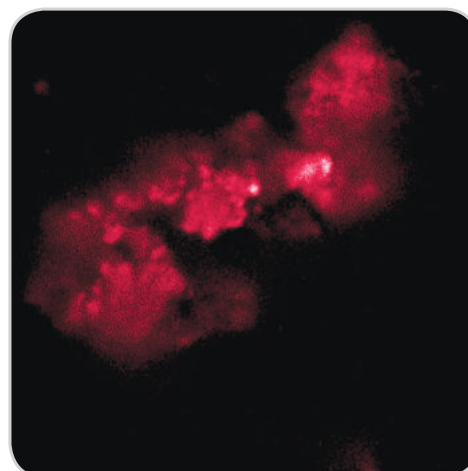
Layout of galvano mirror scanner module allows mapping with no intensity losses from image center to its edges.

Fast imaging mode with EMCCD / CCD

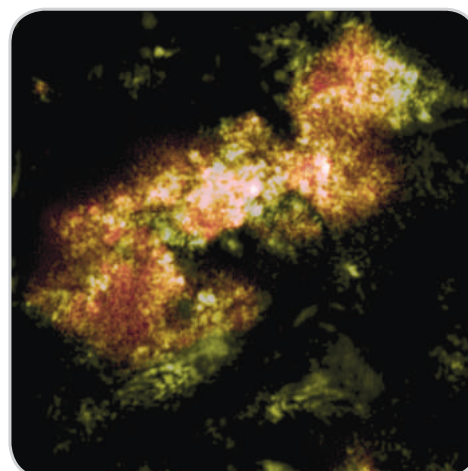
Confotec® NR500 system can be used with a number of different detectors.

Up to three detectors can be used simultaneously. Proprietary algorithm for taking high speed of Raman imaging with fast spectral CCD (EMCCD) is offered.

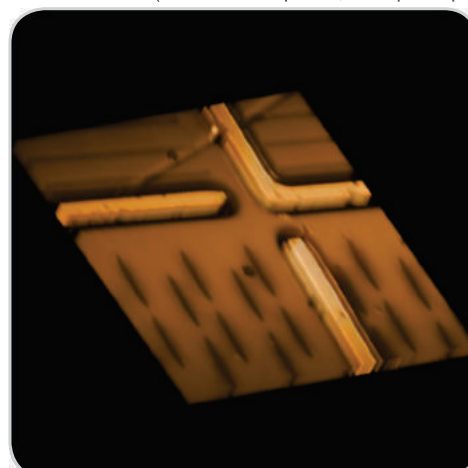
The use of an EMCCD (Electron Multiplying CCD) camera can greatly increase Raman detection efficiency and speed.



▲ Rayleigh image of Granite Gneiss India.
Anatase distribution (1000 x 1000 pixels, time per 1 pixel is 3 μ s).



▲ Raman image of Granite Gneiss India.
Anatase distribution (1000 x 1000 pixels, time per 1 pixel is 43 μ s).



▲ Raman image of Silicon / SiO₂ sample.
Si distribution (500 x 500 pixels, time per pixel is 5 ms).

Fully automated system
Software package with powerful analytical functionality

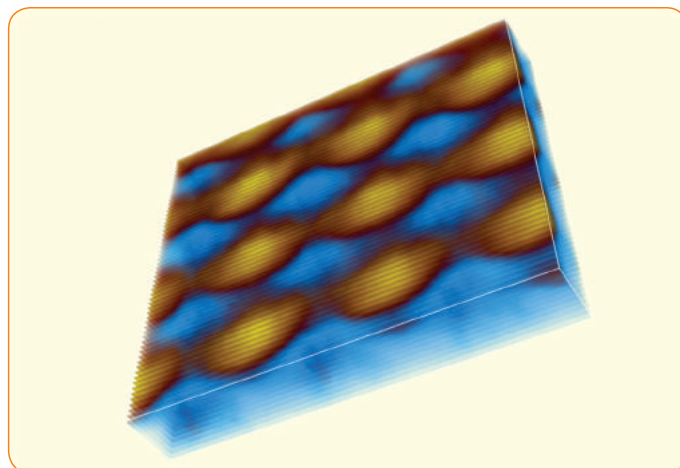
Ultrawide field Raman imaging

Uniform, large size scanning area of a galvanic scanner module:

- 150 μm x 150 μm (objective lens 100x)
- 320 μm x 320 μm (objective lens 40x)
- 680 μm x 680 μm (objective lens 20x)

Automatic XY stage can be used for ultrawide field imaging.

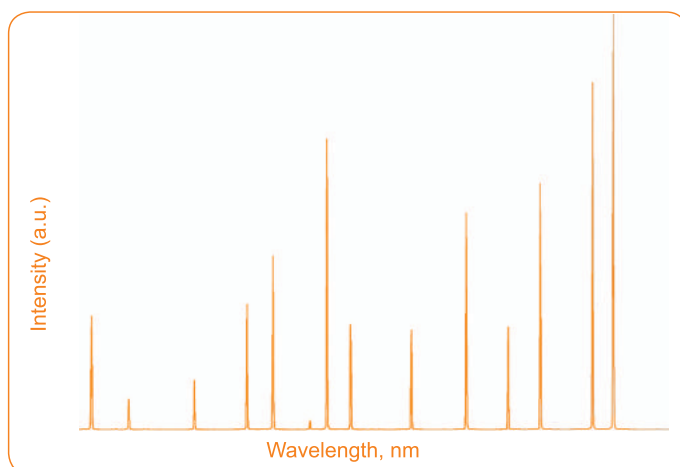
The panoramic image (hyper image) by automatic stitching of a series of images obtained with the use of galvanic scanner.



High precision spectrometer calibration

Confotec® NR500 is equipped with a neon lamp (option) for spectral calibration.

Calibration is possible at any wavelength by a click in the program.



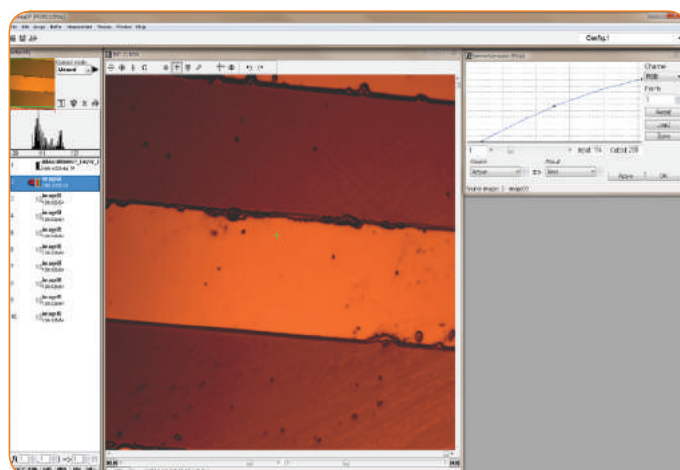
More capabilities

- microscope can be equipped with a warm or cooling stage, vacuum or high pressure cell
- fiber optics probe for remote measurements

Data Acquisition and Data Analysis software

“Nano SP” software with powerful analytical functionality is designed for hardware operating, data acquisition and data analysis in Confotec® NR500 system.

2D and 3D image creation
Autofocus control during mapping
Automatic background subtraction, cosmic ray removing, peak shift imaging, etc.
Support for external spectral databases
Export of the data to popular file formats
Intuitive user-friendly interface
Compatible with Windows XP, Vista, 7



SPECIFICATION

*MICROSCOPE, model Nikon Ti		
Type:	inverted	
*Objective lenses:	CFI Plan Fluor 4x, 10x, 20x, 40x, 60x, CF Epi Plan APO 100x	
Stage:	automated	
- travel range:	114 x 75 mm	
- accuracy (1 mm of translation) / XY repeatability:	0.06 μm / ± 1 μm	
Z-scanner:	piezo scanner	
- objective translation range:	80 μm	
- minimal translation step / repeatability:	50 nm / < 6 nm	
OPTICAL-MECHANICAL UNIT (OMU)		
Optimized optics for the spectral range:	325 - 1100 nm	
Laser radiation delivery:	single, double, triple or penta input port	
Polarizers (excitation and detection channels):	Glan-Taylor prism, 325 - 1000 nm	
Half-wave plate (λ / 2) positioner:	five-position	
Beam expander:	magnification factor 1 - 4	
Edge filter positioner:	five-position	
Interference filter positioner:	six-position	
OMU and microscope coupling:	three- or five-position switch	
IMAGING MONOCHROMATOR-SPECTROGRAPH MS5004i		
Optical configuration:	vertical	
Focal length:	520 mm	
Imaging spatial resolution (aberration limited):	compensated, < 5 μm	
Ports:	1 input, 2 output	
Flat field:	28 x 10 mm	
Grating unit:	4-position turret	
Grating choice:	150, 300, 600, 1200, 2400, 3600, l / mm, Echelle (75 l / mm)	
Spectral resolution:	0.25 cm ⁻¹ Echelle grating, wavelength 500 nm)	
	0.9 cm ⁻¹ (1800 l / mm grating)	
Confocal pinhole:	width 0 - 1.5 mm; step size 0.5 μm	
Wavelength accuracy with CCD camera:	0.005 nm (1800 l / mm grating)	
SCANNING UNIT		
Scanning method:	galvanometer scanners of X - Y mirrors	
Scanning speed:	3 sec (1001 x 1001 pixels, min step 20 nm)	
Scanning region:	150 μm x 150 μm (using 100x objective lens)	
CCD CAMERA FOR SPECTROGRAPH		
Type:	digital CCD camera HS101H	
Sensor:	back-thinned CCD array 2048 x 122	
Pixel size:	12 x 12 μm	
Cooling:	Two-stage Peltier cooling with temperature stabilization to - 45 °C	
ADC:	16 bit	
CONFOCAL LASER MICROSCOPE UNIT		
Objective positioner:	three-coordinated (X, Y, Z)	
Laser beam attenuator:	VND filter	
Confocal pinhole:	variable from 0 to 1.5 mm, step size 0.5 μm	
Detector:	PMT	
LASERS		
The system configuration allows of using up to 5 lasers:		
Type:	Wavelength, nm	Power, mW
HeCd laser:	325	10
HeCd laser:	441.6	50
DPSS laser:	473	22 50
DPSS laser:	532	22 50
Helium-neon laser:	633	10
Semiconductor laser:	785	100

* Microscope, objective lenses and type of lasers can be offered on customer's request

SOL instruments Ltd. is an innovation - focused developer and manufacturer of tech no-logically advanced instruments for light measuring, elemental analysis and nano-scale microscopy. For more than two decades we inbreed our knowledge and expertise in spectroscopy, microscopy and lasers and create robust tools for scientific and industrial applications in three core segments: analytic equipment, spectroscopy instruments and laser systems.

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