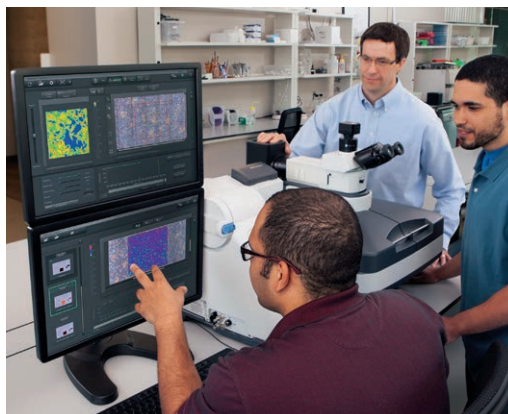


# Thermo Scientific DXR Raman Family

Focus on answers, not the technique

Easily adapt to any sample challenge while maintaining reproducibility and speed using the Thermo Scientific™ DXR™ family of Raman instruments. With expertise built in, you get results faster than ever before.



## DXRxi Raman Imaging Microscope

- High-performance Raman imaging system in a complete, integrated package
- Produces stunning chemical images and gives rapid, research-quality results for all users from basic to advanced



## DXR Raman Microscope

- Workhorse research-grade microscope offering superior combination of performance and ease-of-use
- Offers high spatial resolution point-and-shoot Raman for the most demanding analytical tasks



## DXR SmartRaman Spectrometer

- Built for dedicated bulk sample analysis and designed for busy multi-purpose analytical labs
- Provides reproducible and accurate results in a dependable, low-maintenance platform



**Thermo**  
SCIENTIFIC

# DXR Raman Microscope

- Industry-leading reliability, performance, and reproducibility
- Versatile platform with research-grade optics and light microscopy options
- Walk-up ease-of-use for rapid, high-quality point-and-shoot results
- High-precision motorized stage control provides intuitive mapping of lines, areas, depth profiles, and cross-sectional slices



## Performance Specifications

Spatial Resolution <sup>1</sup>	Resolution (X, Y axes) with standard motorized stage	3 $\mu\text{m}$
	Resolution (X, Y axes) with high-precision motorized stage	1 $\mu\text{m}$
	Confocal depth resolution	2 $\mu\text{m}$
Wavenumber Accuracy <sup>2</sup>		$\pm 2 \text{ cm}^{-1}$

1. Measured with 532 nm excitation and 100 $\times$  objective. Spatial resolution depends on the wavelength of the excitation laser and the objective used.

2. Wavenumber accuracy is measured with full-range grating and without changing lasers or gratings. Accuracy is based on measurement of polystyrene using peaks at 1001.4, 1602.3, and 3054.3  $\text{cm}^{-1}$ .

## Spectrograph

Design	Triplet Spectrograph	No moving parts
Spectral Dispersion	Full-range Grating	Average 2 $\text{cm}^{-1}$ per CCD pixel element
	High-resolution Grating	Average 1 $\text{cm}^{-1}$ per CCD pixel element
Aperture	Four Software-selectable Apertures	25 and 50 $\mu\text{m}$ confocal pinhole apertures; 25 and 50 $\mu\text{m}$ slit apertures

## Stage Options

Manual Stage	50 mm $\times$ 75 mm travel X and Y dimensions Manual Z focus control
Standard Motorized Stage	125 mm $\times$ 75 mm travel X and Y dimensions Step size 1 $\mu\text{m}$ Software-controlled Z focus Joystick controller with focus control knob
High-precision Motorized Stage	100 mm $\times$ 75 mm travel X and Y dimensions Step size 0.1 $\mu\text{m}$ Software-controlled Z focus Joystick controller with focus control knob

## Physical Dimensions

Width	94 cm
Depth	68 cm
Height	61 cm
Weight	66.5 kg



## DXR Family Shared Component Specifications

The DXR family of Raman benchtop instruments is based on the same reliable design, allowing users to easily exchange pre-aligned laser, filter, and grating components among instruments without using tools.

### General System Features

Lasers	Multiple Excitation Lasers	Supported wavelengths 455 nm, 532 nm, 633 nm, 780 nm
	Laser Safety	Class 1 standard Class 3B when fiber optic interface installed and on some specialized accessories
	Laser Power Regulator	Active feedback system to control absolute laser power delivered to the sample. Facilitates laser-to-laser and system-to-system reproducibility.
Replaceable Components	Smart Components	Pre-aligned, user-exchangeable system components (lasers, filters, gratings, fiber optic port) lock into place and automatically optimize system alignment and calibration upon installation
		Software checks for laser, grating, filter compatibility
		Software restores alignment and calibration settings when lasers are exchanged
Computer Interface		Through single USB 2.0 connector. Some accessories may require additional USB or serial ports.



# DXRxi Raman Imaging Microscope

- Exceptional stability for highest quality Raman imaging over small and large areas
- Intelligent autofocus and automatic feature identification tools reduce total experiment time
- Powerful, real-time component analysis provides immediate information about your sample
- Visual control and parameter optimization lets you focus on the answer, not the technique



## Performance Specifications

Spatial Resolution <sup>1</sup>	Resolution (X, Y axes) with high-precision motorized stage	0.5 $\mu\text{m}$
	Confocal depth resolution	2 $\mu\text{m}$
Wavenumber Accuracy <sup>2</sup>		$\pm 2 \text{ cm}^{-1}$

1. Measured with 532 nm excitation and 100 $\times$  objective. Spatial resolution depends on the wavelength of the excitation laser and the objective used.

2. Wavenumber accuracy is measured with full-range grating and without changing lasers or gratings. Accuracy is based on measurement of polystyrene using peaks at 1001.4, 1602.3, and 3054.3  $\text{cm}^{-1}$ .

## Spectrograph

Design	Triplet Spectrograph	No moving parts
	Camera Technology	TE cooled EMCCD
Spectral Dispersion	Full-range Grating	Average 2 $\text{cm}^{-1}$ per CCD pixel element
	High-resolution Grating	Average 1 $\text{cm}^{-1}$ per CCD pixel element
Aperture	Four Software-selectable Apertures	25 and 50 $\mu\text{m}$ confocal pinhole apertures; 25 and 50 $\mu\text{m}$ slit apertures

## Imaging Performance

Typical Image Collection Time	10 mm diameter tablet with 20 $\mu\text{m}$ step size in both directions	11 minutes
	Single 100 $\mu\text{m}$ $\times$ 100 $\mu\text{m}$ image with 1 $\mu\text{m}$ step size in both directions	35 seconds
Typical Spectral Acquisition Rate		>540 spectra per second
Maximum Image Area		100 mm x 75 mm
Minimum Step Size in X and Y		100 nm
Minimum Step Size in Z		200 nm

## Physical Dimensions

Width	94 cm
Depth	68 cm
Height	61 cm
Weight	86 kg



## DXR Family Shared Component Specifications

### Lasers

General	System Alignment	Automatically optimized upon exchange			
	Fine Laser Power Control	Power controlled and reported at samples in 0.1 mW increments			
	Filtering	All lasers include laser line filters to prevent laser artifacts from showing up in measured spectra			

Lasers	455 nm	532 nm	633 nm	780 nm (high brightness)	780 nm (high power) <sup>3</sup>
Laser Type	Frequency-stabilized single mode diode laser	Diode-pumped, solid state (DPSS)	HeNe gas	Frequency-stabilized single mode diode laser	Multiple transverse mode, narrow-spectrum diode
Laser Output Power	Maximum power at sample 6 mW	Maximum power at sample 10 mW	Maximum power at sample 8 mW	Maximum power at sample 24 mW	Maximum power at sample 150 mW
Lifetime	Warranty for 12 months	Warranty for 12 months	Warranty for 12 months	Warranty for 12 months	Warranty for 12 months
High Brightness	Yes	Yes	Yes	Yes	No
Center Wavelength	455 $\pm$ 0.2 nm	532 $\pm$ 1 nm	632.8 nm	780 $\pm$ 0.2 nm	780 $\pm$ 0.5 nm
Transverse Mode	TEM <sub>00</sub>	TEM <sub>00</sub>	TEM <sub>00</sub>	TEM <sub>00</sub>	–
Beam Quality (M <sup>2</sup> )	<1.5	<1.3	<1.2	<1.5	N/A

3. 780 nm high-power laser recommended for fiber optic measurements only. Not recommended for microscope work.

# DXR SmartRaman Spectrometer

- Large sampling compartment without compromising laser safety
- Broad range of sampling accessories for most applications and sample formats
- Ideal for bottles to vials to bulk powders – and everything in-between
- Powerful, variable dynamic point sampling enables rapid averaging over large sample area



## Performance Specifications

Laser Spot Size at Sample <sup>4</sup>	Nominal 10 $\mu\text{m}$
Sampling Area	User-selectable from single spot to 5 mm $\times$ 5 mm with Variable Dynamic Point Sampling (VDPS) technology (available with the Universal Platform Sampling Accessory)
Wavenumber Accuracy <sup>2</sup>	$\pm 2 \text{ cm}^{-1}$

2. Wavenumber accuracy is measured with full-range grating and without changing lasers or gratings. Accuracy is based on measurement of polystyrene using peaks at 1001.4, 1602.3, and 3054.3  $\text{cm}^{-1}$ .

4. Note that scattering within the sample may make the measured area of the sample much larger.

## Spectrograph

Design	Triplet Spectrograph	No moving parts
Spectral Dispersion	Full-range Grating	Average 2 $\text{cm}^{-1}$ per CCD pixel element
	High-resolution Grating	Average 1 $\text{cm}^{-1}$ per CCD pixel element
Aperture	Software-selectable Apertures	25 and 50 $\mu\text{m}$ apertures

## Physical Dimensions

Width	94 cm
Depth	56 cm
Height	44 cm
Weight	52.8 kg



## DXR Family Shared Component Specifications

### System Performance – Spectral Range and Resolution

		Lasers			
		455 nm	532 nm	633 nm	780 nm
Full-Range Grating	Spectral Resolution <sup>5</sup>	5.0 $\text{cm}^{-1}$ FWHM	5.0 $\text{cm}^{-1}$ FWHM	5.0 $\text{cm}^{-1}$ FWHM	5.0 $\text{cm}^{-1}$ FWHM
	Upper Cutoff	3500 $\text{cm}^{-1}$	3500 $\text{cm}^{-1}$ <sup>7</sup>	3500 $\text{cm}^{-1}$	3300 $\text{cm}^{-1}$
	Lower Cutoff <sup>6</sup>	85 $\text{cm}^{-1}$	50 $\text{cm}^{-1}$	50 $\text{cm}^{-1}$	50 $\text{cm}^{-1}$
High-Resolution Grating	Spectral Resolution		2 $\text{cm}^{-1}$ FWHM	2 $\text{cm}^{-1}$ FWHM	2 $\text{cm}^{-1}$ FWHM
	Upper Cutoff		1800 $\text{cm}^{-1}$	1800 $\text{cm}^{-1}$	1800 $\text{cm}^{-1}$
	Lower Cutoff <sup>6</sup>		50 $\text{cm}^{-1}$	50 $\text{cm}^{-1}$	50 $\text{cm}^{-1}$
Extended-Range Grating	Spectral Resolution		11 $\text{cm}^{-1}$ FWHM		
	Upper Cutoff		6000 $\text{cm}^{-1}$		
	Lower Cutoff <sup>6</sup>		50 $\text{cm}^{-1}$		

5. The system spectral resolution is measured using ASTM Method E 2529 – 06 and a 100 $\times$  objective.

The difference between system spectral resolution and spectrograph resolution is primarily determined by the excitation laser bandwidth.

6. 50% maximum transmitted power. The use of some accessories such as fiber optic probes may reduce the spectral range. Check accessory specifications.

7. The DXRxi upper cutoff for the 532 nm full-range grating spectral range is 3400  $\text{cm}^{-1}$ .

# DXR Microscopy Options

## Illuminator Options

Brightfield Microscope Illuminator, plus Nosepiece	Reflection illumination. Accepts brightfield objectives.
Brightfield/Darkfield Microscope Illuminator, plus Nosepiece	Reflection illumination. Accepts brightfield/darkfield objectives, plus brightfield-only objectives, with adaptor. Supports optional transmission illumination.

## Objectives

Standard Working Distance Objectives	4×, 10×, 20×, 50×, 100×
Long Working Distance Objectives	10×, 20×, 50×, 100×
Oil Immersion Objectives	50×, 100×
Macro Sampling Adapter	Includes 4× objective, accepts brightfield objectives
User-supplied Objective	Must be compatible with Olympus® BF or BD nosepieces <sup>8</sup>

<sup>8</sup> Note that some objectives may be Raman-active and may contribute artifacts to the sample Raman spectrum. Objectives offered by Thermo Scientific have been tested to ensure there is no significant interference with sample measurement.

# DXR Macro Sampling Options

## Sampling Accessories<sup>9</sup>

### Universal Platform Sampling Accessory

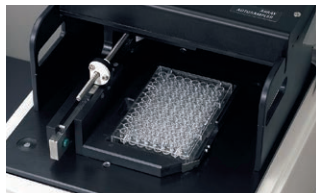
Toolheads for Universal Platform Sampling accessory, Well-Plate/Tablet Autosampler, Tablet Holder, Bottle Holder, Universal Plate

### Carousel Autosampler Sampling Accessory

### 180 Degree Sampling Accessory

Hot-swappable  
Pinned-in-place  
Smart: report identity and serial number to Thermo Scientific™ OMNIC™ software

<sup>9</sup> Sampling accessory specification details available in separate specification sheets.



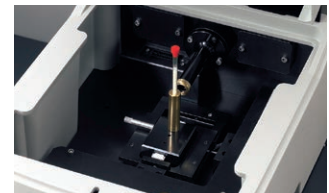
The Universal Platform Sampling accessory with Well-Plate



The Universal Platform Sampling accessory with Bottle Holder



The DXR SmartRaman spectrometer with the Carousel Autosampler Sampling accessory



The 180 Degree Sampling accessory for the DXR SmartRaman spectrometer

# Fiber Optic Port for DXR Raman Family

Installation	Pre-aligned, user-installable/removable without the need for tools
SmartLock Installation	Fiber optic port is precision-locked into place
Compatibility	Compatible with all four standard excitation laser frequencies Accepts probes with standard FC connectors
Smart Technology	Fiber optic port stores serial number



## Microscopy Options

Reflected Light Polarized Light Kit/Fixed Analyzer
Reflected Light DIC Illumination Kit

## Sampling Stage Options

Single and Dual Slide Insert	Holds one or two standard microscope slides (75 mm × 25 mm)
Rotating Stage Insert	Accepts standard microscope slide, provides manual rotation to any arbitrary position
Sample Holder Breadboard with Clips	Provides maximum flexibility for holding small and uniquely shaped samples without the risk of contamination with adhesives
Microtiter Well-plate Holder	Holds standard 96 well microplates
Capillary Tube Array Holder	Accommodates up to 16 capillary tubes
XPS Sample Holder	Permits easy transfer of samples from the Thermo Scientific™ K-Alpha™ X-ray photoelectron spectrometer

# Shared Family Specifications

In addition to the common components, the DXR instruments share the following general specifications.

## Available Thermo Scientific Software Options<sup>10</sup>

OMNIC Software	Full featured molecular spectroscopy acquisition and analysis software
OMNIC Series Software	Supports time-evolved data collection
OMNIC Array™ Automation Software	Automated data collection and post-collection data analysis from multi-well plates and similar array formats
OMNIC Atlus™ Software	Provides software-controlled hyperspectral mapping and image analysis
OMNIC Macros\Pro™ Software	Interface for advanced Visual Basic programming
OMNICxi Raman Imaging Software	Visually driven chemical imaging and analysis software
ValPro™ System Qualification Software	Full feature system qualification package for verifying design and performance

10. Not all software packages available on all systems

## Instrument Alignment, Calibration, and Optimization

Alignment	Entirely Software-controlled	Autoalignment technique aligns laser, Raman emission and visual beam paths to microscope crosshairs
Calibration <sup>11</sup>	Wavelength	Software-controlled calibration using multiple neon emission lines
	Laser Frequency	Software-controlled calibration using multiple polystyrene Raman peaks
	Intensity	Software-controlled calibration using standardized white light source
Automated Intensity Correction		Consistent instrument response with all excitation laser
Laser Power Regulator		Absolute excitation laser power at the sample controlled by OMNIC software
		Laser power at sample reported in mW
Automatic Fluorescence Correction		Compensates for fluorescence prior to data analysis; available for 455 nm, 532 nm, 633 nm and 780 nm excitation wavelengths
User Interface	Autofocus	Optimizes signal from sample
	Smart Background	Automatically accounts for background noise, improving spectral quality

11. Standards incorporated into patented Alignment/Calibration Tool†

## Instrument Serviceability

Replacement Lasers	User-installable without tools
Instrument Performance Monitoring	Software provides real-time visual status of system readiness, including error condition checking and diagnostics
Additional Laser, Filter, Grating Sets	User-installable without tools



The DXR SmartRaman spectrometer, DXR Raman microscope, and DXRxi Raman imaging microscope, in their default configurations, are Class 1 laser-safe products. Installation of a fiber optic port and fiber optic probe will convert all DXR family instruments to Class 3B laser-safe.

† DXR Raman microscope and DXR SmartRaman spectrometer may be manufactured under or covered by US Patents 7345760, 7471390, 7233870, 7605918, 7688530, and 8111392. DXRxi Raman imaging microscope may be manufactured under or covered by US Patents 7233870, 7345760, 7688530, and 8111392. The Universal Platform Sampling Accessory may be manufactured under or covered by US Patent 7595873.

## Other Specifications

Environmental	Minimum temperature: 16 °C
	Maximum temperature: 27 °C
	Humidity range: 20–80%
Electric Requirements	100–240 VAC, 47–63 Hz
Regulatory Approval	CE, UL/CSA/ETL, 21CFR1040.10
Warranty Information	12-month warranty standard on the complete DXR SmartRaman spectrometer, DXRxi Raman imaging microscope and DXR Raman microscope. Extended warranties are available.

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Thermo Electron Scientific Instruments LLC, Madison, WI USA is ISO Certified.

<b>Africa</b> +43 1 333 50 34 0	<b>Denmark</b> +45 70 23 62 60	<b>India</b> +91 22 6742 9494	<b>New Zealand</b> +64 9 980 6700
<b>Australia</b> +61 3 9757 4300	<b>Europe-Other</b> +43 1 333 50 34 0	<b>Italy</b> +39 02 950 591	<b>Russia/CIS</b> +43 1 333 50 34 0
<b>Austria</b> +43 810 282 206	<b>Finland/Norway/Sweden</b> +46 8 556 468 00	<b>Japan</b> +81 45 453 9100	<b>Spain</b> +34 914 845 965
<b>Belgium</b> +32 53 73 42 41	<b>France</b> +33 1 60 92 48 00	<b>Latin America</b> +1 561 688 8700	<b>Switzerland</b> +41 61 716 77 00
<b>Canada</b> +1 800 530 8447	<b>Germany</b> +49 6103 408 1014	<b>Middle East</b> +43 1 333 50 34 0	<b>UK</b> +44 1442 233555
<b>China</b> +86 21 6865 4588		<b>Netherlands</b> +31 76 579 55 55	<b>USA</b> +1 800 532 4752