

# Spotlight 200 and Spotlight 400 FT-IR, NIR Microscopy and Imaging Systems

FT-IR, NIR Microscopy and Imaging



## Introduction

PerkinElmer Spotlight™ FT-IR, NIR Microscopy and Imaging Systems are built to the highest ISO-9001 manufacturing standards. This document presents technical information and typical performance specifications based on factory tests.

The Spotlight systems take the proven and popular IR microscopy technique and add a new level of speed and applications capability. Spotlight systems incorporate high performance detectors, which deliver the ultimate in sensitivity, out-performing competitive top-of-the line IR microscopy systems. The revolutionary imaging capabilities enable previously time-consuming and difficult chemical composition studies to be performed without compromising data quality.

### SPOTLIGHT 200 IR Microscopy System

Choose the Spotlight 200 Microscope for the most challenging IR microscopy problems. The superior signal-to-noise and wide spectral range enable the most information to be obtained from your samples in the quickest time possible thanks to the extensive automated microscope setup capabilities pioneered by Perkin Elmer. The Spotlight 200 can be easily upgraded to provide full imaging capabilities.



### SPOTLIGHT 400 Microscopy and Imaging System

Choose the Spotlight 400 Imaging System for ultimate IR imaging speed, efficiency and accuracy. The Spotlight 400 incorporates a number of unique productivity tools and features plus the unique revolutionary PerkinElmer small array of detectors, providing optimized imaging for a range of mid-IR and NIR imaging applications.



## Technical Description and Specifications

### Spotlight 200

### Spotlight 400

#### Optical System

Microscope Platform	All reflective, triple cassegrain optical system. One touch software switches between transmission and reflectance modes. Lower cassegrain automatically optimizes throughput for transmission measurements.	All reflective, triple cassegrain optical system. One touch software switches between transmission and reflectance modes. Lower cassegrain automatically optimizes throughput for transmission measurements.
Numerical Aperture (N.A.)	0.6	0.6
Upgradability <sup>6</sup>	Fully compatible with PerkinElmer Frontier, Spectrum 65, 100, 400 FT-IR systems.	Fully compatible with PerkinElmer Frontier, Spectrum 65, 100, 400 FT-IR systems.
Spectrometer	Improved Michelson interferometer, self-compensating for dynamic alignment changes due to tilt and shear, incorporating high reflectivity first-surface aluminum-coated optics.	Improved Michelson interferometer, self-compensating for dynamic alignment changes due to tilt and shear, incorporating high reflectivity first-surface aluminum-coated optics.
IR Source (MIR) <sup>1</sup>	Long-life source with proprietary hot-spot stabilization. User replaceable.	Long-life source with proprietary hot-spot stabilization. User replaceable.
IR Source (NIR)	Tungsten halogen lamp	Tungsten halogen lamp
Micro-Attenuated Total Reflection (ATR) <sup>1</sup>	Optional integrated Micro-ATR with 100 $\mu$ Silicon or Germanium ATR crystal. ATR objective does not require re-alignment before or after use.	Optional integrated Micro-ATR with 100 $\mu$ Silicon or Germanium ATR crystal. ATR objective does not require re-alignment before or after use.
Imaging-Attenuated Total Reflection (ATR) <sup>1</sup>		Optional stage mounted Germanium ATR imaging crystal providing a maximum ATR imaging circular area of diameter of 500 $\mu$ or 1200 $\mu$ . ATR imaging software wizard automates alignment procedure and guides users through data collection ensuring the highest quality of data. Crystal can be inverted for easy cleaning.
Purge	Sample area purge available. Optional environmental enclosure available	Sample area purge available. Optional environmental enclosure available

#### Sample Viewing

Sample Illumination	White light LED illumination for true color display. Auto-illumination function available as well as easy access to wide-range brightness and contrast controls. Focus software or joystick control of focus. One-touch autofocus mode available.	White light LED illumination for true color display. Auto-illumination function available as well as easy access to wide-range brightness and contrast controls. Focus software or joystick control of focus. One-touch autofocus mode available.
Mode Switching	Dichroic mirrors provide mechanism-free switching between IR and visible viewing. IR and visible beam use identical beam paths for optimum geometric image accuracy.  Micro-ATR accessory can be permanently mounted and lowered into measurement position. No manual re-alignment required.	Dichroic mirrors provide mechanism-free switching between IR and visible viewing. IR and visible beam use identical beam paths for optimum geometric image accuracy.  Micro-ATR accessory can be permanently mounted and lowered into measurement position. No manual re-alignment required.  Drop-in stage mounted ATR imaging accessory enables quick and easy switching between ATR and traditional transmission or reflectance measurements.
Image	On screen viewing of image with over 32,000 colors. Image size is scalable to full screen.	On screen viewing of image with over 32,000 colors. Image size is scalable to full screen.
Magnification	Continuously variable magnification. Simultaneous Variable Magnification (SVM) enables views of the samples at different magnifications to be viewed at the same time.	Continuously variable magnification. Simultaneous Variable Magnification (SVM) enables views of the samples at different magnifications to be viewed at the same time.
Sample Area	75 x 50 mm (3 x 2 in.)	160 x 60 mm (6.3 x 2.4 in.) or 75 x 50 mm (3 x 2 in.)
Stage Accuracy	Stage movement accuracy of 0.1 $\mu$	Stage movement accuracy of 0.1 $\mu$

## Spotlight 200

## Spotlight 400

### Software

General	A single software platform incorporates all of the functions required for infrared micro spectroscopy; instrument control, data-manipulation and analysis. Optional software packages provide advanced capabilities or functions designed for specific applications areas.	A single software platform incorporates all of the functions required for infrared micro spectroscopy; instrument control, data-manipulation and analysis. Optional software packages provide advanced capabilities or functions designed for specific applications areas.
Data Display	Real time data display. Full spectra are live during data collection.	Real time image display. 10 updates per second.
Show Structure	Single button-click chemometrics-based function to automate contrast enhancement in collected images by identifying and revealing true spectral differences.	Single button-click chemometrics-based function to automate contrast enhancement in collected images by identifying and revealing true spectral differences.
Interactive Multimedia	Integral video camera provides on-screen visible image. Sampling points for all data collection modes are defined by direct interaction with live visible image.	Integral video camera provides on-screen visible image. Sampling points for all data collection modes are defined by direct interaction with live visible image.
System Diagnostics	Key microscope and instrument components are checked on startup. Status of all Spotlight components are displayed via PC control toolbox.	Key microscope and instrument components are checked on startup. Status of all Spotlight components are displayed via PC control toolbox.
Atmospheric Compensation	Minimizes effect of atmospheric water and CO <sub>2</sub> on the sample spectra without the need for reference or calibration spectra.	Minimizes effect of atmospheric water and CO <sub>2</sub> on the sample spectra without the need for reference or calibration spectra.

### Accessories

Polarizers <sup>1</sup>	Visible and IR polarizers available.	Visible and IR polarizers available.
Hot and Cold Sample Stage	Optional sample stage covering temperature range -196 °C-600 °C.	Optional sample stage covering temperature range -196 °C-600 °C.
Sampling Options	Include compression cell, hot stage, diamond anvil cell and micro-sampling tools. Stage mounted tablet autosampler accessory. Provided with 11, 15 and 22 mm diameter tablet holders. Compatible with PerkinElmer Tablet Autosampler molds for accommodating irregular shaped samples. Compatible with Leica® EM Trim supports for depth profiling. Sample cup version for powder or blend analyses available.	Include compression cell, hot stage, diamond anvil cell and micro-sampling tools. Stage mounted tablet autosampler accessory. Provided with 11, 15 and 22 mm diameter tablet holders. Compatible with PerkinElmer Tablet Autosampler molds for accommodating irregular shaped samples. Compatible with Leica® EM Trim supports for depth profiling. Sample cup version for powder or blend analyses available.
Large Detector Dewar <sup>2</sup>	Additional Liquid N <sub>2</sub> dewar providing total detector cool time greater than 18 hours.	Additional Liquid N <sub>2</sub> dewar providing total detector cool time greater than 18 hours.

### IR Optics Description

Objectives <sup>1</sup>	Ge, Si Micro-ATR Objective	Ge, Si Micro-ATR Objective Ge ATR imaging Objective Z-fold magnification system provides automatic switching between wide area survey and high definition imaging modes.
Detector Type	Single element medium-band or wide-band MCT detector. Other point detector options available on request.	Single element medium-band MCT detector and dual mode detector (Duet) containing single element and array detector on common dewar. Requires no mechanical switchover. Wide-band MCT array option available for extended long wavelength coverage NIR InGaAs point and array detector option for high performance dedicated NIR microscopy and imaging.
Detector Technology	Single element: 100 μ wide-band or medium-band detector	Single element: 100 μ medium-band MCT. Array: Photoconductive array exclusive for PerkinElmer with guaranteed 0 dead pixels. Wide band photoconductive MCT and NIR photovoltaic InGaAs options available.
Detector Switching	Upgrade required	One-touch software switch between imaging and single element mode where applicable.

	Spotlight 200	Spotlight 400		
		MCT Duet	W-B MCT Array	InGaAs NIR Duet
<b>Single Element Specifications</b>				
Wavelength Range with standard detector	7800-600 cm <sup>-1</sup>	7800-600 cm <sup>-1</sup>	N/A	10,000-4000 cm <sup>-1</sup> <sup>3</sup>
Wavelength range with wide-band detector	7800-450 cm <sup>-1</sup>	N/A	N/A	N/A
Signal-to-noise (2 min scan, 4 cm <sup>-1</sup> resolution)	>40,000:1 <sup>4</sup>	50,000:1 <sup>4</sup>	N/A	20000:1 <sup>5</sup>
<b>IR Imaging Specifications</b>				
Image Pixel Size	Upgrade required	50 μ, 25 μ, 6.25 μ	50 μ, 25 μ, 6.25 μ	50 μ, 25 μ, 6.25 μ
ATR Image Pixel Sizes	Upgrade required	6.25 μ, 1.56 μ	6.25 μ, 1.56 μ	N/A
Number of dead pixels	Upgrade required	Zero	Zero	Zero
Wavelength Range	Upgrade required	7800-710 cm <sup>-1</sup>	7800-580 cm <sup>-1</sup>	7800-4000 cm <sup>-1</sup>
Sampling/detector fill-factor	Upgrade required	100%	100%	100%
Signal-to-noise (25 μ pixel size, 16 cm <sup>-1</sup> spectral resolution, 4 scans)	Upgrade required	>800:1	>100:1	>1000:1
Signal-to-noise (6.25 μ pixel size, 16 cm <sup>-1</sup> spectral resolution, 4 scans)	Upgrade required	>400:1	>50:1	>600:1
Image Size	Upgrade required	Continuously variable image size and aspect ratio, limited by PC's RAM memory.		
<b>IR Imaging Collection Speeds</b>				
100 x 100 μ, 6.25 μ, full ramp	Upgrade required	1.6 seconds	1.6 seconds	1.6 seconds
400 x 400 μ, 25 μ, full ramp	Upgrade required	1.6 seconds	1.6 seconds	1.6 seconds
0.8 mm x 0.8 mm μ, 50 μ, full ramp	Upgrade required	1.6 seconds	1.6 seconds	1.6 seconds
Spectrum Acquisition Rate	Upgrade required	170 full range spectra/second (16 cm <sup>-1</sup> , 7,800-700 cm <sup>-1</sup> )		

1. Not generally applicable for NIR operation
2. Not applicable for InGaAs array detector option
3. Coverage of 10000-7800 cm<sup>-1</sup> region may require filter reconfiguration
4. 2100-2000 cm<sup>-1</sup> range
5. 4900-4700 cm<sup>-1</sup> range
6. For further information, contact your local PerkinElmer representative.

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