

# **IRT-5100**

**Infrared Microscope**



**JASCO Corporation** - Japan was founded in 1958 to provide the scientific community with optical spectroscopy products.

In the mid-1950's a group of researchers in the Institute of Optics of what is now Tsukuba University needed an Infrared Spectrophotometer for their research.

Since a commercially available instrument was not yet existing at the time, they undertook the challenge to develop their own.

The result was quite a success - a reliable instrument with excellent optical performance. As a second result, other research groups asked them to replicate the instrument for use within their laboratories.

*“serving the Science and Technology World by providing most advanced analytical instrumentation”*

With the introduction of HPLC in the mid-1970's JASCO's experience in highly sensitive and accurate optical systems led to the development of a series of chromatographic detection systems. Fixed and variable wavelength UV/Visible and Fluorescence detectors were introduced featuring excellent sensitivity and reliability in compact modules. In order to offer complete HPLC systems JASCO developed a variety of novel solvent delivery systems as well as other accessories such as column ovens, autosamplers, and PC based control and analysis software.

Today JASCO offers a wide variety of **HPLC modules**, accessories and analysis software. The new **JASCO LC-4000 Liquid Chromatography** series is designed to operate at pressures approaching 15,000 psi for either gradient or isocratic separations, providing researchers with a powerful tool when using the new generation of small particle columns. LC-4000 Series includes a versatile series of components offering unique flexibility to build systems for routine and specialized applications. LC-4000 features the widest choice of optical HPLC detector: UV, diode array, fluorescence, chemiluminescence, CD, chiral and refractive index detector.

Finally JASCO's modular **Supercritical Fluid Chromatography** and **Supercritical Fluid Extraction** platforms provide a low-cost, fast, green technology with reliable and worry-free performance for a wide variety of applications.



Over the years the JASCO product line has grown to cover instruments used, not only in research but also for routine analysis applications in areas such as quality control, environmental analysis, and process control. The current spectroscopy product line encompasses instrumentation for the following methods:

- **UV/Visible and NIR**
- **Microscope Spectrophotometers**
- **FT-IR, microscope FT-IR and FT-Raman**
- **Dispersive RAMAN**
- **Polarimeters**
- **Spectrofluorometers**
- **Portable Raman**
- **Portable FT-IR**
- **Fully Automated Dissolution Tester**

JASCO is also the world leader in the field of **Circular Dichroism Spectropolarimeters** and **Vibrational Circular Dichroism Spectrometers**.



JASCO has a strong global presence, supplying customers in **over 45 different countries**.

**JASCO Europe** is responsible for marketing, sales, service and support for all Jasco products throughout **Europe, Middle East and Africa**.



### JASCO Europe S.r.l.

Via Cadorna, 1 - 23894 Cremella (LC)

Tel. +39-0399215811

Fax +39-0399215835

jasco@jasco-europe.com

[www.jasco-europe.com](http://www.jasco-europe.com)

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### Make the most of your investment with **JASCO Service and Support**

JASCO Service and Support agreement plans are designed for those laboratories pursuing superior productivity through the highest level of professional services.

The use of automated instrumentation is the right approach to meet today's laboratories productivity requirements, reducing analysis run times, enhancing sample throughput, and increasing analytical accuracy and precision. In this view, preventive maintenance is very important to maximize laboratory uptime and avoid unexpected expenses.

In addition to the analytical goal, proper installation and maintenance are required to achieve optimal performance. JASCO provides flexible service and support management solutions focused on your laboratory real objectives.

With its service network, JASCO is ready to maintain the perfect reliability of customer's instrumentation and minimize the laboratory down time.

- Superior productivity
- Optimized analytical performance
- Lower cost of ownership
- Extended instrument life

If your laboratory has specific Service and Support requirements, JASCO can help you with customized contract agreements. In addition, a full set of Installation Qualification (IQ), Operational Qualification (OQ), and Performance Qualification (PQ) tests are available to verify the system proper installation, operation and performance, respectively.

### Get the most from your investment with **JASCO Training Courses**

JASCO Training Courses ensure maximum skill development for the best value of your laboratory. Our team of highly-experienced specialists can help your staff to get the most from your instrument reducing your analysis run time and improve performance.

Build your knowledge with JASCO Training Courses:

- Instrument and Software operation
- troubleshooting
- Maintenance
- Calibration
- Applications and Methods developments
- Operating Techniques



## FT-IR Microscope JASCO IRT-5100

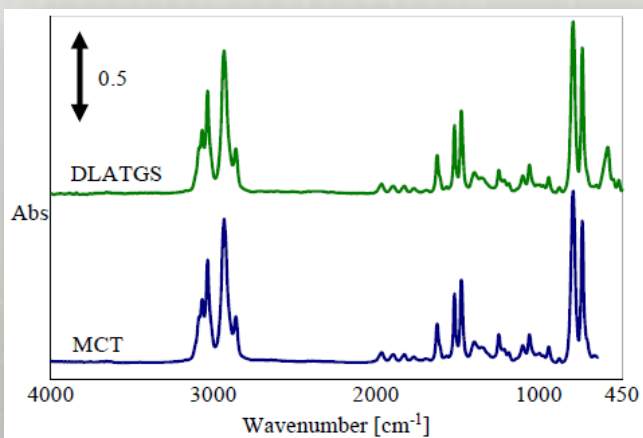
JASCO's innovative FT-IR Microscope, the IRT-5100 provides new functions that dramatically improve infrared micro-spectroscopy analyses. This microscope can be easily interfaced with either the FT/IR-4000 or FT/IR-6000 series spectrometers, offering the most advanced microscopy and imaging systems available in the market today. Coupling JASCO's proven technology for infrared spectroscopy (over 50 years experience) with the most advanced optical design, the IRT-5100 offers the best solution for even the most challenging sample analyses.

## JASCO IRT-5100 KEY FEATURES

**WIDE RANGE OF DETECTORS** - The IRT-5100 is a general purpose FT-IR microscope employing a standard DLATGS detector with no need for liquid nitrogen cooling.

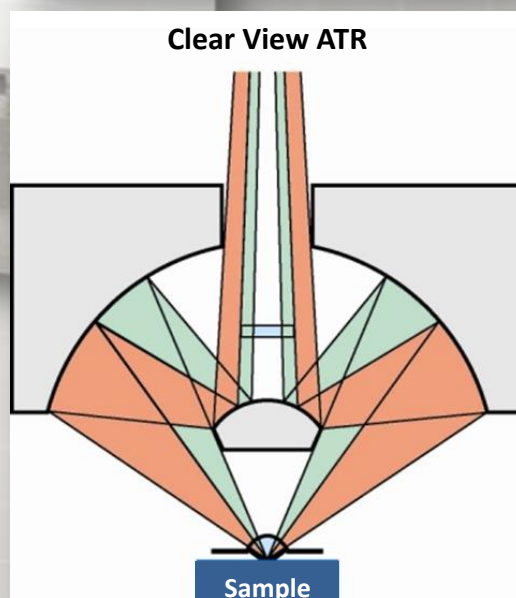
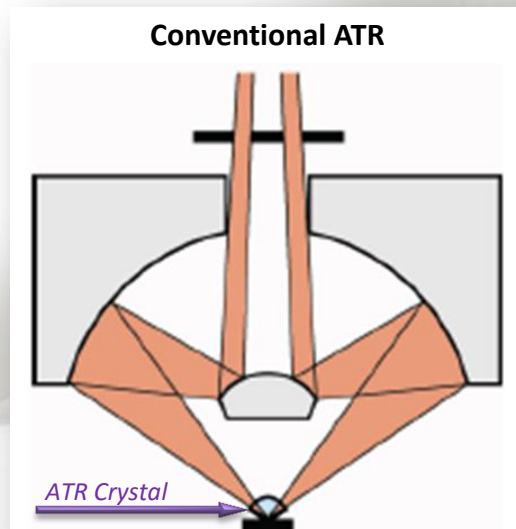
Up to two detectors can be installed simultaneously to expand the spectral range of the microscope systems. Upon request, the standard mid-band MCT detector can be exchanged for a narrow or wide-band MCT detector. A range of optional detectors are available to expand the spectral range of the microscope systems.

JASCO has developed a dedicated DLATGS detector for infrared microscopy, especially focusing on an increased sensitivity, with results comparable with standard MCT detector but with extended wavenumber range.



Spectrum of a polystyrene film using the new DLATGS and an MCT detector

**“Clear View” ATR OBJECTIVES** - Conventional ATR objectives can only provide sample measurements at the immediate center of the crystal, requiring movement of the ATR objective and sample stage for data collection of multiple sampling sites. In addition, JASCO's unique **“Clear-View” ATR** objective enables a simultaneous sample view even during ATR data collection after the ATR crystal element contacts the sample.



### With “Clear View” ATR Objectives ...

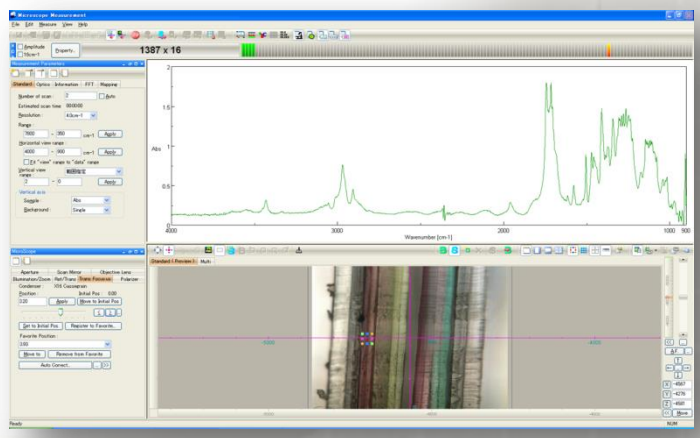
- It is possible to observe/measure the sample by using ATR objective lens only.
- It is possible to observe the sample even when the ATR crystal touches the sample.
- It is possible to perform ATR measurements while observing the sample in real-time.

**AUTOMATIC STAGE** - An optional automatic X-Y-Z sample stage for the IRT-5100 enables auto-focus and mapping analysis of large sample areas. The joystick option for the IRT-5100 provides an alternative control method for stage movement and sample positioning when using the auto-stage.

The auto-stage is integrated with the IQ Monitor microscope control software to provide video image display and control of the aperture size and orientation; automated capture and simultaneous display of the sample image during spectral collection; the capability to collect a video 'map' of the sample with a variable area plus auto-illumination, auto-diffraction compensation and auto-focus functions. Video capture images may also be copied to an integrated 'thumbnail' display or the Windows clipboard.



**IQ Monitor** - The spectrum and the sample image are observed simultaneously. A dichroic mirror directs IR and visible light to the sample, thus, there is no need to switch the optical path for observation or data collection.



**CASSEGRAIN Objectives** - An electronically-controlled, 4-position objective carousel can be fitted with any combination of 10x, 16x, 32x (Au or Al coated), or grazing-angle Cassegrain objectives, 10x or 20x refractive objectives or micro-ATR objectives. These objectives are automatically recognized when connected.

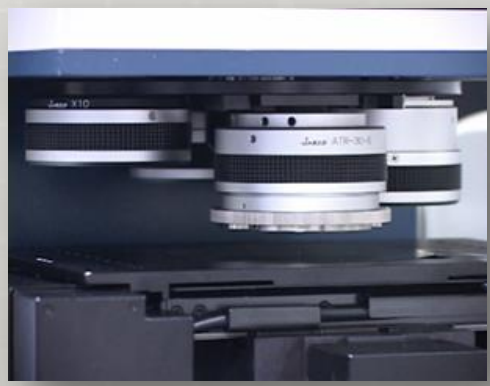


**RAS-5000 Grazing angle reflection objective** - The grazing-angle reflection method is utilized for measurement of a thin film on a metal surface (Å to several μm in thickness) using polarized light. This objective greatly improves the sensitivity over the standard reflection method.

RAS-5000 requires an Infrared Polarizer (PL-IR-5000), the polarizer is integrated into the FT-IR microscope and all polarizer control such as angle setting and insertion in the light path is accomplished by the software.



Cassegrain	Minimum Sampling Area
32x	25 μm x 25 μm
16x	50 μm x 50 μm
10x	100 μm x 100 μm



**Standard ATR Objectives** - The ATR-5000-Z (ZnSe crystal) is useful when the sample has a low refractive index and for cases when deep penetration into a sample is required.

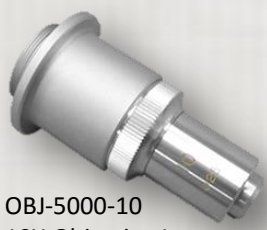
The ATR-5000-G (Ge crystal) is useful when the sample has a high refractive index and for cases where a shallow penetration depth is required.

The ATR-5000-D (diamond crystal) features are used for extremely hard samples or for chemically reactive samples.

The ATR-5000-G45 is designed for better contact with samples that have a rough topography.

The pressure sensor is required for the ATR Cassegrain objectives and is used to maintain constant pressure during an ATR measurement. The alarm functions when the sensor recognizes excessive pressure between the sample and the crystal. The pressure sensor display panel is standard and can be mounted on the control panel of the microscope.

**Sample observation and Polarization observation** - Polarized illumination light heightens the observation of materials such as single crystals, minerals or other foreign objects inside a polymer film which are otherwise difficult to observe using the standard visible illumination.

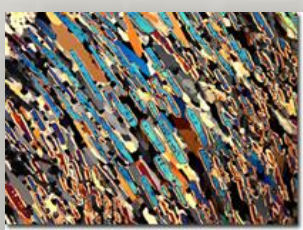


OBJ-5000-10  
10X Objective Lens



OBJ-5000-20  
20X Objective Lens

For contaminants in polymer film, single crystal and minerals that are difficult to observe using visible light, observation with good contrast is possible by applying polarized light.



**Fluorescence Observation** - Selecting specific excitation and emission wavelengths, fluorescent portions of a sample can be vividly observed as a visible image, thus highlighting specific sample features of interest.

When a sample is observed only by visual light, it is very difficult to identify the measurement position if there is a discolored site on the sample surface. However, when the measurement position emits fluorescence, this option can perform fluorescence observation to identify sample sites not possible by visible light.

Fluorescence observation accessory for UV-Vis range of excitation and examination of fluorescent samples.

Fluorescence excitation/emission range of 400-700 nm (MF-5000VIS) or 250-700 nm (MF-5000UV), selectable ranges using band-pass filters for exclusion of excitation or emission activity outside band-pass range.

**Differential Interference Contrast observation** - For colorless or transparent samples, light and dark interference patterns from the sample can be used to highlight and observe the sample image as a stereoscopically bright image with shading.



Conventional Method

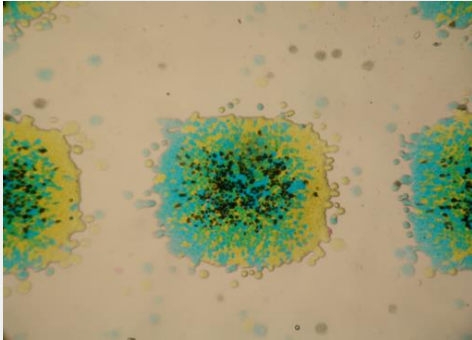


Differential Interference observation

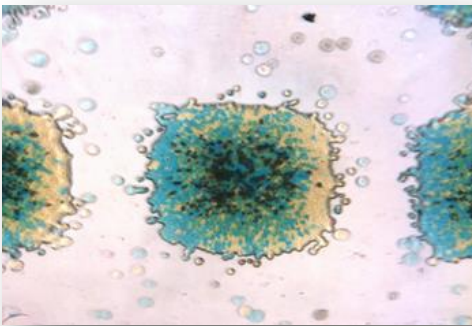
**Nitrogen Purge case** - The IRT-5100 system have a nitrogen purge capability as standard. An optional purge casing for the sample stage area is available for further elimination of the influence of CO2 and water vapor bands.



**Microscope Features** – IRT-5100 IR microscope is equipped with a high-resolution CMOS camera (3 Mega pixels) with a high image quality.



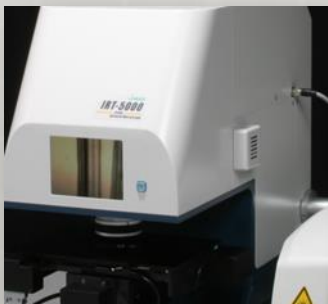
Stereomicroscope – 20x Objective Lens



IRT-5100 - 16X Cassegrain (Zoom 1x)

**Color LCD monitor** – A 5.7 inch TFT color LCD monitor can be installed in the microscope system, providing a sample view for sample positioning/area selection and simultaneous observation during data collection.

**Binocular** – A binocular option, with 10x oculars, enables direct visual observation of the sample with the ATOS system. The ATOS (Aperture Through Optical System) sample observation allows the operator to view the measurement area to be specified using the aperture, observing the whole sample including the specified area.



**SliceMaster** – The SliceMaster is a handy compact slicer that can create thin sections quickly and easily. It is a powerful tool for multi-layer film analysis and/or cross sectional analysis. Three models are available, and can be selected for different sample preparation capabilities.

### HS-1 Vertical slicer

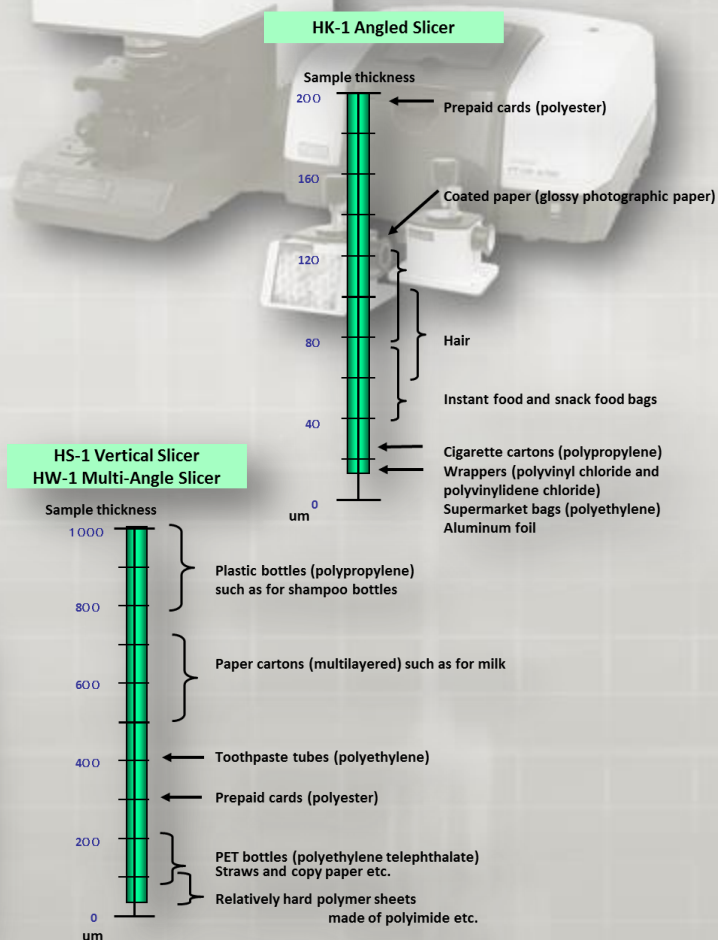
Cutting angle: 90° (against the surface of the sample)  
Sample thickness: Max 3 mm

### HK-1 Angled slicer

Cutting angle: 15° (against the surface of the sample)  
Sample thickness: Max 0.2 mm

### HW-1 Multi-angle slicer

Cutting angle: 45°~ 90° (against the surface of the sample)  
Sample thickness: Max 2 mm





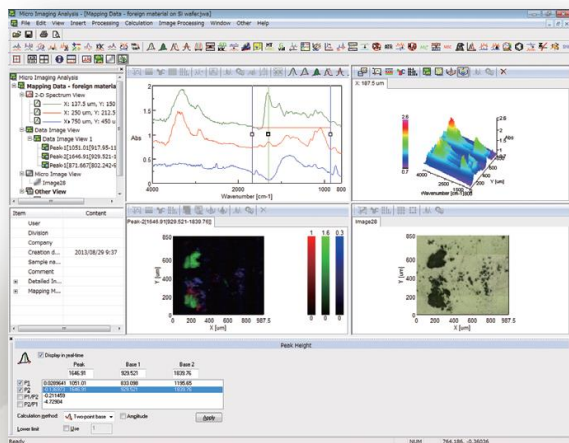
## JASCO IRT-5100 Unique Features

- **Standard working range (7,800 to 400  $\text{cm}^{-1}$ )** thanks to new DLATGS detector with no need for liquid nitrogen cooling.
- **New DLATGS detector** for infrared microscopy, especially focusing on an increased sensitivity, with results comparable with standard MCT detector but with extended wavenumber range.
- **Up to two detectors** can be installed simultaneously to expand the spectral range and sensitivity of the system.
- IRT-5100 is available with **10x, 16x and 32x Cassegrain objectives** and additional grazing-angle objectives, 10x or 20x refractive objectives and micro-ATR objectives. These objectives are automatically recognized when connected and automatically selected by a **4-position objective carousel**.
- **Flexible system**, FTIR optical bench (FTIR4000 or FTIR6000 series) can be used as stand-alone FTIR including macro **ATR Pro ONE** and macro **ATR Pro ONE View** accessories.
- **IQ Monitor** features, the spectrum and the sample image are observed simultaneously. A dichroic mirror directs IR and visible light to the sample, thus, there is no need to switch the optical path for observation or data collection.
- JASCO's unique "**Clear-View**" ATR objective enables a simultaneous sample view even during ATR data collection after the ATR crystal element contacts the sample.
- Cross-platform software package, **SPECTRA MANAGER II**, for controlling JASCO spectroscopic instrumentation.



## Software JASCO SPECTRA MANAGER II

A full-featured software package, Spectra Manager™ II provides automatic functions and simplified operational procedures to minimize manual operations. Measurement conditions, microscope sample monitoring/control operations and measurement results can be reviewed in a single screen. The dedicated microscope interface provides various types of measurements such as single and multiple points, mapping, and linear array measurements using a single mouse-click for mode selection. Real time monitoring of the spectrum and a calculated chemical image can be specified during the mapping measurement.



## MAIN FEATURES

- *Auto-focus/Auto-illumination*
- *Registration of commonly used aperture settings*
- *Automatic recognition of microscope objectives*
- *Thumbnail display memorizing the sample position with focus and aperture information*
- *Spectrum preview to check conditions before measurement*
- *IQ Monitoring for simultaneous observation of the spectrum and sample image*
- *Macro-stage control to quickly move to the desired sample position*
- *Auto-adjustment of condenser Cassegrain objective*
- *Data storage linked with sample image and aperture information*
- *Report publishing capability (JASCO Canvas)*

### Auto-focus function

The auto-focus function is standard for the IRT-7100 and IRT-7200. Contrast dynamics of the sample image are shown in a graph after initialization of the auto-focus function. The stage can be automatically moved to a target focal point by clicking a peak maximum in the contrast graph.

### Macro-stage control

On the macro-stage map, designed as the image of the sample holder, the current stage position is indicated with a red point. By double-clicking a target point on the macro-stage map, the auto-stage quickly moves itself to the desired position for sample observation or measurement.

### PCA mapping data analysis program

Standard for IRT-7100 and IRT-7200, PCA (Principal Components Analysis) mapping data analysis program creates chemical images based on the differences in spectral characteristics of the infrared spectra, analyzing those differences and grouping them as principal components.

### IR mapping secondary structure analysis program

Based on the IR mapping data of a protein or other tissue sample, the optional secondary structure estimation (SSE) software analyzes the secondary structure of the sample based on the Amide I and II absorptions, providing chemical image maps based on the contributions of the secondary structures of the proteins in the sample.

### Chemical imaging features

By simply clicking on a spectral feature in the 'Monitor' display, a chemical image can be displayed as a color 3-D image, a 3-D figure, a contour plot, or a color-coded plot. The microscope image and the chemical image can be overlaid in a single screen by selecting the chemical image and configuring the image transparency.

**Software JASCO SPECTRA MANAGER II**

The SPECTRA MANAGER II program is a comprehensive package for capturing and processing data, eliminating the need to learn multiple software packages and offering the user a shallower learning curve. Several types of measurement data files can be viewed in a single window, and processed using a full range of data manipulation functions.

*The basic package includes:*

**QUICK START MEASUREMENT PROGRAM** - The Quick Start Measurement Program can automatically perform a series of operations as specified by a user, from measuring samples and processing data to saving and printing results, with a single click of the start button. The procedure is stored in memory for repeated use. The data processing functions include comparison of an obtained spectrum with spectra specified by a user.

**SPECTRA MEASUREMENT PROGRAM** - The Spectra Measurement program features the advanced mode and the basic mode. In the basic mode, measurements can be simply carried out by setting basic parameters. The advanced mode allows the user to establish detailed measurement conditions such as settings for the optional optics and Fourier transform protocols. In the parameters dialog, the spectrum preview function enables the user to optimize instrument parameters before actual measurement.

**ANALYSIS PROGRAM** - The Analysis program includes a wide range of data processing functions including peak detection, smoothing, derivatives, various correction programs (baseline correction and ATR correction), among others. Spectral data can be saved in JASCO's standard file format, as well as JCAMP-DX format, and even ASCII text or CSV format.

**CANVAS PROGRAM** - JASCO Canvas Program allows the user to prepare publication quality layouts of spectra, measurement parameters, text, images (BMP and WMF formats) to meet the user's own report requirements. The program also includes a set of drawing tools for professional documentation. Newly created documents can be stored as templates for routine data presentation.

**VALIDATION PROGRAM** - The Validation Program offers assistance for verifying instrument performance to meet regulatory requirements set by GxP and standards established by ISO. The test methods are compliant with ASTM, EP and JP procedures. Six different validation tests are available.

**QUANTITATIVE ANALYSIS PROGRAM (QAU-4000)**  
Samples can be quantified by using peak height, peak height ratio, peak area or peak area ratio. Several types of calibration curves are offered including linear, quadratic or cubic fitting functions.

SPECTRA MANAGER II can be field upgraded to CFR Edition. **SPECTRA MANAGER CFR** provides features to support laboratories in compliance with 21 CFR Part 11. A choice of complete pull-down task menus, user-friendly icons, and easily accessible pop-up menus enables new users to manage security information, control user access, and record audit trails.

**KnowItAll Informatics package**

The industry standard KnowItAll Informatics package with JASCO edition FT-IR library (13,000 spectra included) provides not only an excellent search tool, but also includes a range of analysis, molecule modeling and reporting tools.



<b>IRT-5100 Version</b>	<ul style="list-style-type: none"> <li>• IRT-5100-10 – with 10x Cassegrain objectives</li> <li>• IRT-5100-16 – with 16x Cassegrain objectives</li> <li>• IRT-5100-32 – with 32x Cassegrain objectives</li> </ul>
<b>Standard Detector</b>	DLATGS detector - 7,800 to 400 $\text{cm}^{-1}$
<b>Detector capabilities</b>	Up 2 detectors mounted simultaneously and software controlled
<b>Optional Single element Detectors</b>	<ul style="list-style-type: none"> <li>• Narrow-band MCT (5000 - 750 <math>\text{cm}^{-1}</math>)</li> <li>• Mid-band MCT (7800 - 600 <math>\text{cm}^{-1}</math>)</li> <li>• Wide-band MCT (7800 - 450 <math>\text{cm}^{-1}</math>)</li> <li>• InSb (15000 - 1850 <math>\text{cm}^{-1}</math>)</li> <li>• InGaAs (12000 - 4000 <math>\text{cm}^{-1}</math>)</li> </ul>
<b>S/N Ratio</b>	1500:1 (Aperture size 300 $\mu\text{m}^2$ , resolution 4 $\text{cm}^{-1}$ , 1 min acquisition, near 2200 $\text{cm}^{-1}$ , p-p)
<b>Minimum Sampling Area</b>	25 $\mu\text{m}$ x 25 $\mu\text{m}$
<b>Microscope objectives</b>	Cassegrain: 16 $\times$ , 32 $\times$ or 10 $\times$ Automatic objective recognition function (standard) Up to four objectives can be selected by the software.
<b>Condenser mirror</b>	Cassegrain: 16 $\times$ , 32 $\times$ or 10 $\times$ (manual exchange) Automatic condenser mirror recognition function (standard)
<b>Condenser mirror compensation</b>	Standard auto-compensation function
<b>Aperture</b>	PC-controlled vertical/horizontal adjustment and angle of rotation
<b>Sample Stage</b>	Manual stage with fine adjustment (Movable distance: X: 70, Y: 50, Z: 20 mm)
<b>Sample Automatic Stage</b>	Optional Auto XYZ stage with auto-focus function (Movable distance X: 100, Y: 75, Z: 25 mm, 1 $\mu\text{m}$ step) Joystick for auto XYZ stage control
<b>Auto Focus</b>	Optional
<b>Sample observation</b>	<ul style="list-style-type: none"> <li>• High resolution, 3 Megapixel CMOS camera</li> <li>• IQ Monitor</li> <li>• 5.7 inch integrated color LCD display (option)</li> <li>• Binocular (option)</li> </ul>
<b>Observation options</b>	Optional Visible polarization observation, Differential interference contrast observation, Fluorescence observation, Refractive objectives (10 $\times$ , 20 $\times$ )
<b>ATR measurement</b>	<ul style="list-style-type: none"> <li>• Optional "Clear-View" ATR objectives</li> <li>• Optional Conventional ATR objectives</li> <li>• Optional Stage-mounted micro ATR using transmittance light path</li> </ul>
<b>Grazing angle measurement</b>	Optional Cassegrain grazing angle objective
<b>Purge</b>	Sample area purge case is available as option
<b>Dimension and weight</b>	587 (H) $\times$ 302 (W) $\times$ 695 (D) mm, 54 kg
<b>Power consumption</b>	AC 100 - 240 V, 50/60 Hz, max. 60 VA



## JASCO Europe S.r.l.

Via Cadorna, 1 - 23894 Cremella (LC)

[jasco@jasco-europe.com](mailto:jasco@jasco-europe.com)

[www.jasco-europe.com](http://www.jasco-europe.com)

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