

**JASCO**



# *FTIR 4700*

*Fourier Transform Infrared Spectrometer*



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



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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

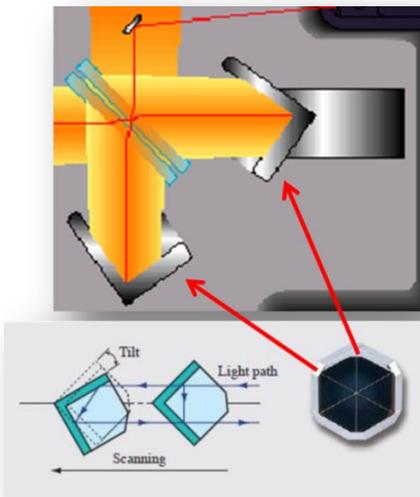


## FT-IR Spectrometer JASCO FTIR-4700

Based on over fifty years of experience in infrared spectroscopy and the most advanced technology, JASCO offers the best solutions for FT-IR analyses with a complete range of application-focused FT-IR spectrometers and sampling accessories as well as a dedicated instrument control and data analysis interface. The FT/R-4700 Spectrometer provides capabilities from education and routine analysis to high-end research applications, featuring high quality, performance and reliability.

### JASCO FTIR-4700 KEY FEATURES

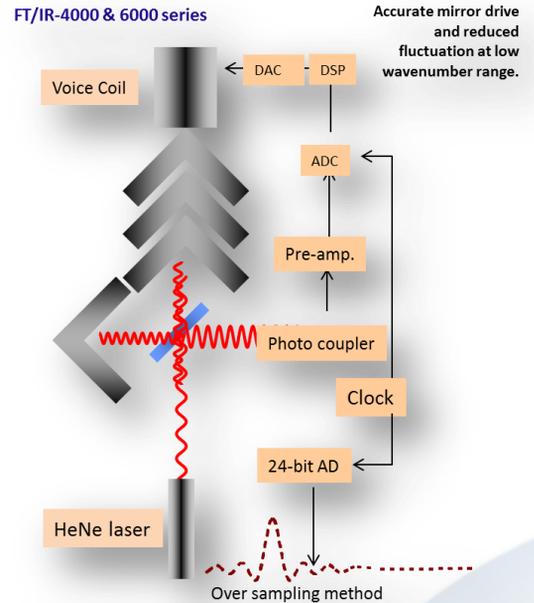
**Corner Cube Mirrors** - All JASCO interferometers utilize corner cube mirrors. These mirrors independently and automatically correct for any light path deviation, enabling optical stability at all times.



**Highly sensitive detector** - highly sensitive and stable DLATGS detector is standard for all instrument models. The DLATGS detector element is temperature-controlled using the Peltier effect.

**Vibration-free scanning** - A specially designed vibration-proof mounting of the optical bench completely eliminates interference from external vibrations.

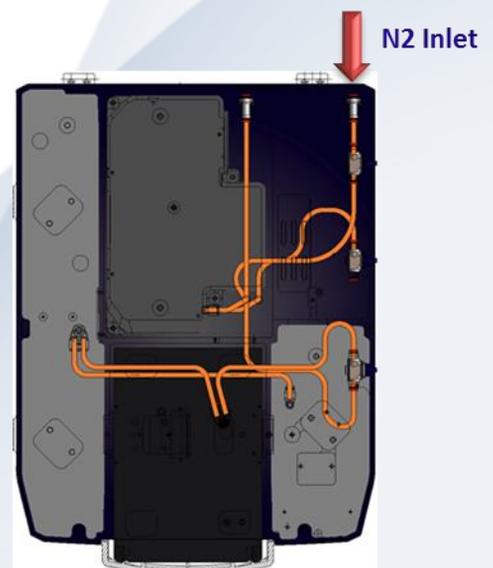
**Excellent S/N ratio** – Featuring a highly stable interferometer and **AccuTrac™ DSP technology** enabling rapid and accurate tracking of mirror position and velocity for optimum signal-to-noise performance.



Reduction of high frequency noise by over sampling with a 16 times greater number of sampling points enables improvement of the S/N ratio.

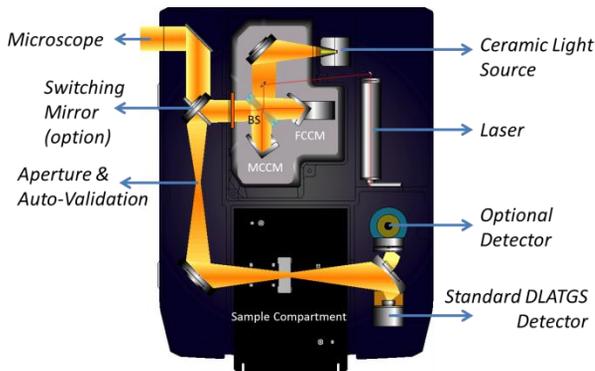
**Purgeable Optics** – All models include a fully purgeable optical system as standard. Interferometer purging is recommended when high hygroscopic optical components are used, such as CsI Beam Splitter.

The sample compartment purging capability improves the stability of measurement for higher sensitivity.

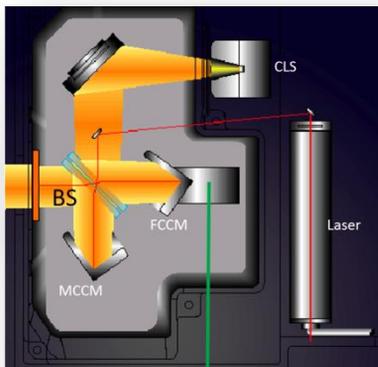


**Microscope/IR Imaging** – on ALL JASCO FTIR models several different infrared microscope can be easily interfaced.

JASCO's FT-IR **microscope systems** feature an innovative capability for sample analysis called **IQ Mapping**. This function enables automated multi-point mapping, line mapping and IR Imaging analyses of a microscopic area with a manual sample stage and a single element detector. The microscope system automatically scans the specified points or area, rapidly collecting a full spectrum of each point without moving the sample stage.



**Moisture removal** – Sealed structure of Interferometer for highest thermal stability, thanks to the power management system which keeps the CLS at low level power supply to increase the lifetime of optical components and keeping the interferometer free from moisture. Highly stable power supply ensure the lifetime of the CLS.



**CLS:** High Intensity Ceramic Light Source (air cooled, 1350 °C)  
**FCCM:** Fixed Mirror  
**MCCM:** Moving Mirror  
**BS:** Beam Splitter

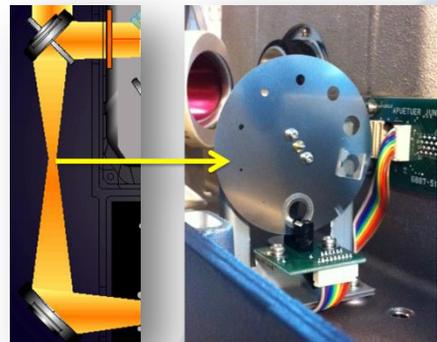
**Motorized Fixed Mirror for Auto-Alignment capability**

**Stable Laser emission** – FTIR 4700 uses a HeNe laser as an internal wavelength standard. The infrared wavelengths are calculated using the laser wavelength, itself a very precise and repeatable 'standard'.

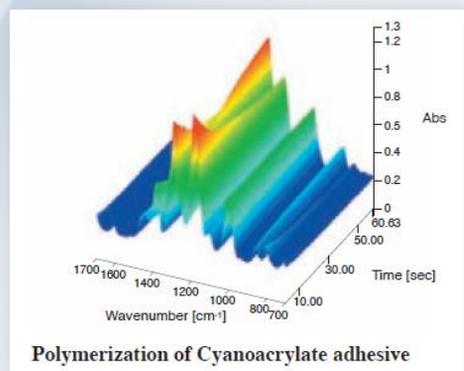
Together with the AccuTrac™ DSP driving, the wavelength assignment for the FT-IR spectrum is very repeatable and reproducible.

**Aperture and Auto-Validation** – The Automatic Validation system includes a Polystyrene standard film and a Glass filter for the verification of instrument performances. The Validation program allows the user to completely automate the routine.

The use of a combination of circular apertures and interferometer travel define resolution. To improve signal-to-noise ratio, one simply collects more scans. More energy is available for the normal infrared scan and various accessories can be used to solve various sample handling problems.



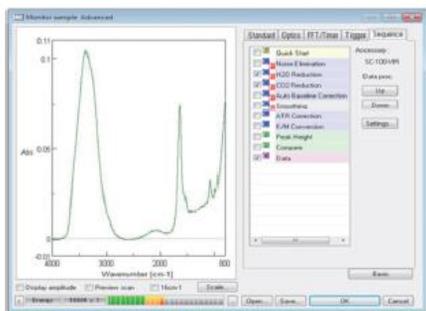
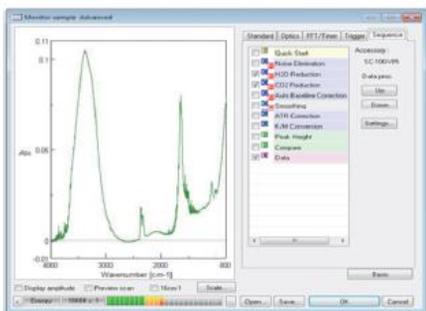
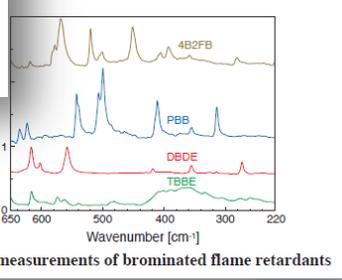
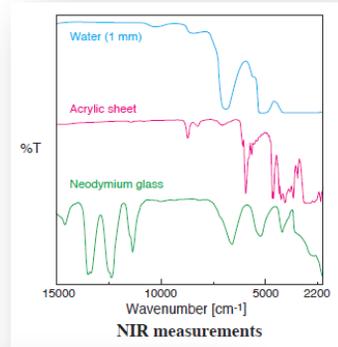
**Rapid Scan Option** – Rapid-scan measurement enables spectral measurement at a temporal resolution of up to 10 Hz (resolution of 16 cm<sup>-1</sup>). The detector used in this case is an MCT detector (optional) that features a fast response time. The rapid-scan measurement function includes an interval analysis program.



**Multiple Detector Capability** – Large detectors compartment allows the installation of two detectors with automatic software selection. On-field upgrade is also possible. When high sensitivity measurement are requested, an MCT detector can be added.

**CO<sub>2</sub> and H<sub>2</sub>O Interferences removal** – FTIR-4700 has preloaded the spectra of pure standards that can be used for the automatic subtraction of CO<sub>2</sub> and Moisture. This therefore allows to have both raw spectrum and spectrum with removal of CO<sub>2</sub> and Moisture for a comprehensive evaluation of the data obtained.

**Wavenumber extension** – FTIR-4000 Series can mount two detectors inside of the main unit and then switch between them using software control. The standard working range, 7,800 to 350 cm<sup>-1</sup> (mid-infrared) can be modified to cover the NIR (15,000 to 2,200 cm<sup>-1</sup>) or Far-IR (5,000 to 220 cm<sup>-1</sup>).



Before data processing

After data processing  
(CO<sub>2</sub> reduction and H<sub>2</sub>O correction)

**Wide Range of Sample accessories** – Single Reflection ATR (Attenuated Total Reflectance), Multiple Reflections ATR, Grazing Angle Reflection accessories, Diffuse Reflection accessories, Specular Reflection accessories are just an example of the widest range of sampling tools available from JASCO can grant you the maximum productivity of FTIR systems.

**IQ Accessory function** - for automatic recognition of any accessory inserted into the sample compartment. When an accessory supported by IQ Accessory is inserted into the sample compartment, **SPECTRA MANAGER II** automatically recognizes the accessory, and the accessory's information such as model name and serial number are recorded for a fully traceability.

All models have a **Start Button** for immediate sample measurement. After placing a sample in the sample compartment, simply press the Start Button on the instrument to begin measurement.





## JASCO FTIR-4700 Unique Features

- Outstanding **Signal-to-Noise ratio** (35,000:1) and **Resolution** ( $0.4\text{ cm}^{-1}$ ) provide capabilities from education and routine analysis to high-end research applications.
- Standard working range ( $7,800\text{ to }350\text{ cm}^{-1}$ ) can be extended to NIR ( $15,000\text{ to }2,200\text{ cm}^{-1}$ ) or FIR ( $5,000\text{ to }220\text{ cm}^{-1}$ ) and maximum flexibility can be achieved by using **two detectors mounted simultaneously**.
- On FTIR-4700, **infrared microscopes** can be easily interfaced, including compact **IRT-1000** sample compartment IR-Microscope.
- Possibility to have access both raw spectrum and spectrum with removal of CO<sub>2</sub> and Moisture for a **comprehensive evaluation** of the data obtained.
- Sealed structure of Interferometer for highest thermal stability, thanks to the **power management system** which keeps the CLS at low level power supply to **increase the lifetime of optical components** and keeping the interferometer **free from moisture**.
- **Rapid-scan measurement** enables spectral measurement at a temporal resolution of up to 10 Hz (resolution of  $16\text{ cm}^{-1}$ ).
- **IQ Accessory function** for automatic recognition of any accessory (including **ATR Pro ONE** and **ATR Pro ONE View**) inserted into the sample compartment.
- Cross-platform software package, **SPECTRA MANAGER II**, for controlling JASCO spectroscopic instrumentation, upgradable on-field to **CFR version**.
- **KnowItAll Informatics** package including a library of 13,000 spectra.

## 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.



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.

## AnalyzeIT™

Identification of FT-IR spectra of unknown compounds, Classification-pattern characterization of chemicals, Supplemental to other methods of spectral interpretation.

### Key Features

- Knowledgebase of over 200 functional groups
- Knowledgebase contains hundreds of interpretation wavelengths
- Intelligent "Suggest a Peak" feature
- Summarize negative or positive interpretations
- Peak overlay display
- Import experimental spectral data
- Determine if a structure matches a spectrum
- Display & highlight structural bonds
- Browse knowledgebase by chemical class
- Link to additional functional group information in Sadtler Handbook
- View notes for functional groups
- Build your own knowledgebase to use in analyses
- For those expert and non-expert in spectral interpretation alike

## SearchIT™ Database Searching

SearchIt™ - import data and search against KnowItAll user-generated or reference databases. Searches are fully customizable and are driven by powerful algorithms and can be performed by name, structure, substructure, properties, spectra and peak—in any combination.

## Advanced Spectral Searching

SearchIt permits both full spectrum searching, as well as peak searching. Euclidean Distance, First Derivative Euclidean Distance, Second Derivative Euclidean Distance, and Correlation algorithms are available for full-spectrum searches. For peak searches, manually select peaks or use the automated peak picking capability.

## Minelt™ Database Viewing & Mining

With Minelt you can view reference or user created databases or search results.

## Advanced Datamining Capabilities

With KnowItAll's Minelt application, users can view reference databases, user-created databases, or hit lists generated by the companion SearchIt application. This interface allows the user to access databases containing many types of data, such as IR, UVVis, Raman, NIR, structures, chromatograms, physical properties, and more. Minelt also includes the capability to compare variables in databases using a scatter-plot diagram.

## DrawIT™

A fully-featured 2D structure drawing program using ChemWindow Technology DrawIt provides an advanced set of drawing tools – just click and drag to draw any chemical structure.

Access the most comprehensive set of tools to draw rings, bonds, atoms, electrons, charges, chains, arrows, and more.

### Key Features

- Customizable toolbars with tools to draw chemical structures easily, including bonds, rings, atom labels, charges etc.
- Chemical recognition features such as hot keys, chemical syntax checker, tools to calculate mass and formula, etc.
- Stereochemical recognition including R/S and E/Z isomers
- OLE technology for in-place editing in word processing and presentation software
- Predefined styles for captions and structures

## ReportIt™ create standard reports, presentations, and publications

- Create reports that include structures, spectra, and other chemical data
- Use one of several pre-defined templates or create custom templates
- Easy-to-use tools to draw chemical reactions, such as arrows, text boxes, shapes, etc.
- Import chemical structures in common formats
- Import spectra and chromatograms in common native file formats
- Multi-spectrum display: overlay, stack, and offset
- OLE technology (Object Linking and Embedding) for in-place editing in word processing and presentation software (Word, Powerpoint, etc.)
- 3D chemical structure visualization (spacefill, ball & stick, stick, wire frame display options)
- Clip art libraries with laboratory glassware drawings and engineering symbols
- Directly import chemical structures drawn in KnowItAll's DrawIt applications

**OPTIONAL PROGRAMS**

**ITM-4000 Interval Scan Program** - ITM-4000 allows the long-term observation of slow reactions. During a measurement, the change at a specified wavenumber can be monitored. The obtained data can be displayed as a 2-D spectral display at a specified time, a 3-D spectral display, contour map, color-image, etc. The time course data based on peak height, peak area or peak shift at a specified wavenumber can be calculated and displayed as a 2-D trace.

**Multivariate Analysis Programs** - Multivariate analysis techniques are widely used for multicomponent mixtures. Four types of multivariate analysis program are available. The classical least squares (CLS-4000), the principal components regression (PCR-4000), and the partial least squares (PLS-4000) methods are generally used for quantitative analysis of multi-component samples. The principal component analysis (PCA-4000) is suitable for classification of multi-component samples.

**SSE-4000 Secondary Structure Estimation Program** - The amide peak in the IR spectrum of a protein changes slightly according to changes in protein secondary structure. To analyze such changes, SSE-4000 estimates protein secondary structure using a PCR or PLS method based on the JASCO protein library and/or user input data. The FT-IR can measure either liquid or solid (crystal and amorphous) samples, which is difficult for structural analysis using X-ray and Circular Dichroism.

**2-D Correlation Analysis Program** - 2-dimensional correlation performs a time domain Fourier transform of time resolved spectra obtained by, for example, interval scan measurements, and then plots correlation intensities of the real part (synchronous correlation) and imaginary part (asynchronous correlation) as separate contour maps. Analyzing the correlation spectra of each plot enables the estimation of chemical and/or structural changes of samples. By combining the results of other spectral analysis techniques (including near-IR, Raman, UV-Vis or CD) and infrared analysis, 2-D correlation provides analysis of peak assignments, lattice vibrations, the relationship between intramolecular vibrations and color/chiral information.

**MCR-4000 Macro Command Program** - MCR-4000 automates a series of tasks, from various types of measurements to analysis and printing. MCR-4000 includes the Macro Script Generator to edit macro scripts. Its user-friendly tool buttons allows users to easily create macro scripts without any special programming knowledge.





## ATR Pro ONE – Single Reflection ATR accessory

Various types ATR crystals are available to obtain data for different types of samples to reduce the cost and time for infrared sample analysis.

A ‘torque-limiter’ pressure applicator provides significant improvement in sample pressure contact and a standard purge capability can be utilized to obtain quality spectra without atmospheric interferences.

Since the active sample contact area is extremely small, trace samples and minute contaminants can be easily measured.

The ATR Pro ONE is a multi-purpose ATR accessory for liquid, solid and powder samples, available with the optional ZnSe, Ge or Monolithic Diamond crystal kit(s), depending upon the desired applications.

## Why is a Monolithic Diamond important ?

Diamond ATR Accessories on the market are generally available in two forms: those that feature a solid monolithic diamond and those with a thin diamond wafer supported by an optical element (typically ZnSe).

Monolithic diamond ATR accessories are seen to benefit from the inherent robustness and durability of a solid diamond element, and are particularly resilient to high point loads typically encountered when analysing hard irregularly-formed samples. They can also take advantage of the broad transmission window of diamond (10,000 to 30cm<sup>-1</sup>).

Conversely, diamond wafer ATR accessories are seen to be more fragile under point loads, can suffer delamination from the supporting element, and have a useable transmission range that is often limited by the support material. However, featuring a thinner diamond, they also have weaker diamond absorption features at 1,800 to 2,500 cm<sup>-1</sup>.

### High Throughput Monolithic Diamond Crystal

- Range: 10.000 to 300 cm<sup>-1</sup>
- Press: 700 Kg/cm<sup>2</sup>
- Sampling area: 1.8 mm dia.

### Extended Monolithic Diamond Crystal

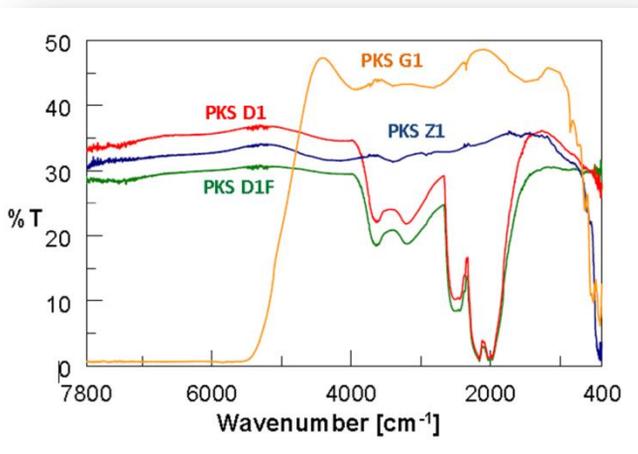
- Range: 10.000 to 30 cm<sup>-1</sup>
- Press: 700 Kg/cm<sup>2</sup>
- Sampling area: 1.8 mm dia.

### ZnSe Crystal

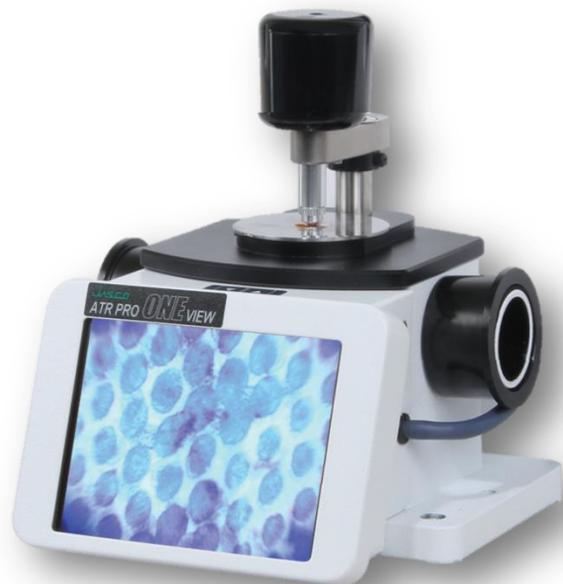
- Range: 15.000 to 500 cm<sup>-1</sup>
- Press: 400 Kg/cm<sup>2</sup>
- Sampling area: 2.5 mm dia.

### Ge Crystal

- Range: 5.200 to 550 cm<sup>-1</sup>
- Press: 400 Kg/cm<sup>2</sup>
- Sampling area: 2.5 mm dia.

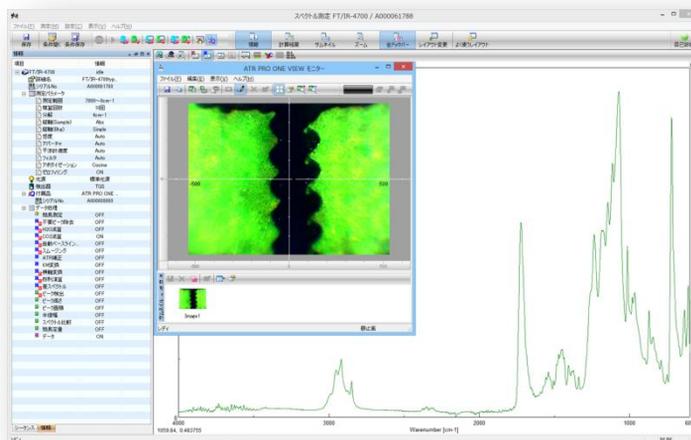


ATR Pro ONE –prisms specifications



## ATR Pro ONE View in Spectra Manager II

The ATR Pro ONE View is used to control the sample position and the applied pressure. View the image as the pressure clamp is applied to obtain optimal contact with the prism.



## ATR Pro ONE View Single Reflection ATR accessory

The ATR Pro ONE View uses the latest high-throughput diamond prism for sample measurement and observation directly through the prism.

Wide area and high-definition viewing are achieved using a combination of a unique illumination method and survey optics. The observed image is combined with spectral data and collected automatically.

The ATR Pro ONE View system uses the simplicity of ATR to measure very small samples with detailed observation for accurate sample positioning with a permanent record of the measurement location.

## System Highlights

- Measurement range 10,000 to 30 cm<sup>-1</sup>
- High clarity sample observation with picture recorded in the sample spectrum file
- Measure samples as small as 50 to 100 μm
- The ATR Pro One View without LCD monitor can be worked for sample observation in evacuated system

<b>Prism</b>	Observation: View-through diamond (high-throughput type, wide wavenumber range type) Non observation on ZnSe, Ge prisms
<b>Sample fitting area</b>	1.8 mm dia. (Diamond) 2.5 mm dia. (ZnSe, Ge)
<b>Number of reflection</b>	1 time
<b>Incident angle</b>	45 degree
<b>Pressure-resistant</b>	700 kg/cm <sup>2</sup> (Diamond) 400 kg/cm <sup>2</sup> (ZnSe, Ge)
<b>Measurement range</b>	10000-300cm <sup>-1</sup> (High-throughput type) 10000-30cm <sup>-1</sup> (Wide wavenumber range type) 10000-500cm <sup>-1</sup> (ZnSe) 10000-550cm <sup>-1</sup> (Ge)
<b>Observation Camera</b>	Field Size: 1.1x0.8mm LCD Size: 5 inch VGA
<b>Software</b>	Spectral data with image, dimension measurement tool, image processing



<b>Standard wavenumber measurement range</b>	7,800 to 350 $\text{cm}^{-1}$
<b>Optional extended wavenumber range</b>	15,000 to 2,200 $\text{cm}^{-1}$ 5,000 to 220 $\text{cm}^{-1}$
<b>Wavenumber accuracy</b>	Within $\pm 0.01 \text{ cm}^{-1}$
<b>Minimum resolution</b>	0.4 $\text{cm}^{-1}$
<b>Optical system</b>	Single beam
<b>Interferometer</b>	45° Michelson interferometer Corner cube mirror interferometer, with auto-alignment mechanism, sealed structure, DSP control
<b>Mirrors Coating</b>	Aluminum
<b>Drive method</b>	Mechanical bearing, electromagnetic drive
<b>Drive Speed</b>	AUTO, 1, 2, 3, 4 mm/sec AUTO DLATGS 2.0 mm/sec. MCT (optional) 4.0 mm/sec.
<b>Rapid Scan</b>	10 Hz (optional)
<b>Beam Splitter</b>	Standard: Ge/KBr Option: Si/CaF <sub>2</sub> , Ge/CsI (not interchangeable)
<b>Light source</b>	Standard: High-intensity ceramic source Option: Halogen lamp (factory option only)
<b>Detector</b>	DLATGS (with Peltier temperature control) (standard) W-MCT, M-MCT, N-MCT, Si, InSb, InGaAs (optional) Two detectors may be mounted simultaneously within the instrument
<b>Purging</b>	Interferometer, Sample compartment/Detector
<b>Signal-to-noise ratio</b> (4 $\text{cm}^{-1}$ , 1 min, near 2,200 $\text{cm}^{-1}$ )	35,000:1
<b>Gain switching</b>	AUTO, 1, 2, 4, 8, 16, 32, 64, 128
<b>100%T line flatness</b>	Within $100 \pm 1.0\%T$ (4,000 to 700 $\text{cm}^{-1}$ , continuous repetitive measurement)
<b>Communication</b>	USB2.0
<b>FTIR main unit</b>	Dimensions: 460 (W) × 645 (D) × 290 (H) mm Weight:33 kg

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