

### IRAffinity-1

Shimadzu Fourier Transform Infrared Spectrophotometer





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Surpassing General-Purpose Instruments in Sensitivity and Performance Easy-to-Use, Advanced Software: IRsolution Broader Range of Applications

The IRAffinity-1 is a compact Fourier transform infrared spectrophotometer that is housed within an elegant form. The interferometer is continuously optimized by a dynamic alignment mechanism, and a built-in auto dryer helps ensure ease of maintenance. The IRAffinity-1 offers the highest S/N ratio in its class\* (30,000:1, 1-minute accumulation, neighborhood of 2,100 cm<sup>-1</sup>, peak-to-peak), a maximum resolution of 0.5 cm<sup>-1</sup>, and compact dimensions. Furthermore, the high-performance IRsolution software, which emphasizes operability, and analysis support programs (Contaminant analysis program and Pharma Report program) make it easier to perform data processing and analysis.

\* As of January 2008, according to Shimadzu investigations.

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### **IRAffinity-1: Meeting the Needs of a Wide Range of Analyses**

Fourier transform infrared spectrophotometers are used in numerous fields and applications; some of the most common ones are listed below. The IRAffinity-1 is a highly effective tool for these types of analyses\*.

\* Appropriate accessories and software for analysis are required in addition to the IRAffinity-1.

#### Automobiles

- Material identification tests
- Analysis of contaminant
- Failure analysis

#### **Food Products**

- Raw material identification tests
- Packaging material identification tests
- Analysis of contaminant

#### Metals

- Qualitative analysis of thin films on metal plates
- Analysis and thickness measurement of thin films
- Analysis of contaminant

#### **Chemicals and Polymers**

- Raw material identification tests
- Qualitative analysis of plastics and rubber
- Identification of functional groups of synthetic products
- Analysis of surface preparation agents
- Analysis and thickness measurement of thin films
- Analysis of catalysts
- Analysis of paints and coatings
- Analysis of contaminant
- Quantitative analysis

#### Medicine

- Raw material identification tests
- Identification of functional groups of synthetic products
- Identification of functional groups of natural products
- Analysis of contaminant

### Electricity, Electronics, and Semiconductors

- Thickness measurement of epitaxial films
- Quantitative analysis of interstitial oxygen and substituted carbon
- Quantitative analysis of phosphorus and boron in BPGS
- Quantitative analysis of hydrogen concentration in nitride film
- Quantitative analysis of hydrogen concentration in amorphous silicon
- Detection of brominated flame retardants
- Analysis of thin films
- Analysis of contaminant
- Failure analysis
- Analysis of semiconductor gases

#### Cosmetics

- Material identification tests
- Analysis of contaminant
- Failure analysis

#### Construction

- Material identification tests
- Degradation analysis of coatings

## Surpassing General-Purpose Instruments in Sensitivity and Performance

The IRAffinity-1 incorporates a high-throughput optical element and a dynamic alignment mechanism. These features allow the user to experience a level of performance that surpasses that of generalpurpose instruments.

### Highest S/N Ratio in Its Class: 30,000:1

Through the incorporation of a high-energy ceramic light source, a temperature-controlled, high-sensitivity DLATGS detector, a high-throughput optical element, and the optimization of the electrical system and optical system, the IRAffinity-1 achieves the highest S/N ratio in its class.

### Highly Stable Interferometer Achieved with Dynamic Alignment Mechanism

The state of interference in an FTIR instrument is extremely delicate, and the interferometer must be controlled with high precision. With the IRAffinity-1, the moving mirror is run very smoothly and precisely by a flexible joint system (FJS; JPN patented), and the interferometer is optimized and stabilized by an improved dynamic alignment mechanism (patent pending). This makes it possible to perform measurement in a stable state with a short warming-up time.

### Dynamic Alignment Mechanism (JPN patent. No.2115670 No.3613171)

The state of interference of the He-Ne laser used for sampling by the interferometer is continuously monitored and compared with the state under the optimum conditions previously recorded by the system. The difference between these states is calculated by an advanced digital signal processor, and the inclination of the fixed mirror is changed continuously in order to eliminate any difference. This feedback is even provided during sample measurement. There is also an automatic adjustment for the interferometer that performs this operation.



### Ease of Maintenance Ensured by Built-in Auto Dryer

(JPN registration of utility model No.3116465)

Beam splitters in the interferometers of FTIR instruments are susceptible to humidity. In order to maintain the long-term stability of the interferometer, the beam splitter must be protected. In the IRAffinity-1, the interferometer is airtight and incorporates a unique internal auto dryer.

### Measures Taken to Protect the Optical Element in the Interferometer

- The interferometer has an airtight structure.
- Moisture inside the interferometer is continuously removed by an auto dryer.
- The beam splitter is coated with a moisture-resistant protective film.

### Principle of the Auto Dryer

The IRAffinity-1 incorporates an auto dryer that electrolytically removes the moisture inside the interferometer using a solid polymer electrolyte membrane.

- When porous electrodes are attached to a solid polymer electrolyte membrane and direct current is applied, moisture on the anode side (i.e., the desiccation side) dissociates into hydrogen ions and oxygen.
- The hydrogen ions travel through the solid polymer electrolyte membrane and reach the cathode side (i.e., the moisture discharge side).
- At the cathode, the hydrogen ions react with oxygen in the air to form (gaseous) water vapor, which is released outside the interferometer.

Anode (desiccation side)

$$H_2 O \rightarrow 2H^+ + \frac{1}{2}O_2 + 2e^{-\frac{1}{2}}$$

Cathode (moisture discharge side)

$$2H^+ + \frac{1}{2}O_2 + 2e^- \rightarrow H_2O$$



### **Instrument Monitoring**

### [Continuous Monitoring and Reporting of Instrument Status] Increased Reliability Achieved by Instrument Monitoring

In order to increase reliability, not only does the IRAffinity-1 execute self-diagnosis at initialization, it also monitors the state of the instrument during operation. It is also possible to check basic performance using a validation program that is incorporated as a standard feature.

### Sequential Display of Diagnostic Results

The IRAffinity-1 executes self-diagnosis at instrument initialization, in which it checks the electrical, signalling, and optical systems. If the interference conditions are poor, they are adjusted and optimized using the dynamic alignment mechanism. Additionally, the light source, the He-Ne laser, humidity, information related to accessories, and the auto sample changer settings are continuously monitored by the status monitor function. If accessories are installed, they are automatically identified, and the optimum measurement conditions are set<sup>\*</sup>.

These diagnostic and monitor results are recorded in logs. \* Only when QuickStart accessories are installed.



### Validation Program

The IRAffinity-1 is equipped with a validation program that complies with the European and Japanese Pharmacopoeias and with ASTM (American Society for Testing and Materials). This validation program checks the basic performance of the instrument using a polystyrene film, and creates reports of the results.

• Test Items Complying with the European and Japanese Pharmacopoeias

Shape and intensity of a power spectrum

The following items for a polystyrene spectrum:

- Resolution
- · Wavenumber accuracy
- · Wavenumber reproducibility
- · Transmittance (absorbance) reproducibility
- Test items for ASTM (ASTM 1421 Level Zero)
  - $\cdot$  Energy intensity test based on power spectrum
  - · Noise test based on 100% transmittance spectrum
  - · Reproducibility test based on polystyrene spectrum



RAffinity-1 Diagnostic Instrument found

ID: IRAffinity SerNo:

### Analysis Support Programs

### [Adapting to a Wide Range of Analysis Scenarios] Equipped with Analysis Support Programs

The two main applications of infrared analysis are the analysis of contaminant and identification tests. At Shimadzu, in order to allow operators with little experience in infrared analysis to fully utilize the functionality of the IRAffinity-1, we have prepared analysis support programs. These programs are useful in a variety of analysis scenarios where infrared spectra are used.

### **Contaminant Analysis Program (Patent pending)**

By combining a library of spectra for substances that are often detected as contaminant and Shimadzu's own algorithms, this program identifies contaminant with a high degree of accuracy. Reports are automatically created after analysis, so operators with little knowledge of infrared analysis can perform analysis easily.

- Contains spectra for over 300 highly-selected inorganic substances, organic substances, and polymers that are often detected as contaminant in Shimadzu's Analytical Applications Department.
- Incorporates algorithms that focus on spectral characteristics, rather than performing simple spectrum searches.
- Allows the automation of the process, including searching, judgment, and report creation.

### Pharma Report Program

This program makes pass/fail judgments about samples in accordance with the tests specified under "Infrared Spectrophotometry" in the Japanese Pharmacopoeia. In addition to identification tests for pharmaceutical products, use this program for incoming inspections and pre-shipment inspections. Its functions are described below.

- Prints out the spectra for standards and samples in order to facilitate easy comparison.
- Detection and print out of just the peaks that are specified for pass/fail judgment.
- Calculation of the differences between the peak wavenumbers for standards and samples, differences in intensity ratios between peaks, pass/fail judgments, and print out of reports.





### Smart Design

### [Ensuring a Spacious Working Environment] Smart Design

In addition to all the new features and functions, such as the highest S/N ratio in its class, a resolution of 0.5 cm<sup>-1</sup>, dynamic alignment, and an interferometer equipped with an auto dryer, the IRAffinity-1 also achieves a reduction of approximately 20% in installation area and width (compared with other Shimadzu products).



FTIR-8400S 622mm (W) x 584mm (D) x 250mm (H)

### Easy-to-Use, Advanced Software:

With IRsolution, the series of operations required in FTIR analysis, including measurement, display, data processing, quantitative analysis, search, and printing, can be performed easily using specialized windows. In addition to these standard functions, a variety of optional programs, such as those facilitating PLS quantitation, waveform separation, and mapping measurement, is available. A comprehensive help utility is available for software operations. Customizing the graphical user interface (GUI) makes it possible to use these various functions simply and quickly.

#### **Measurement Tab Page**

The tab page is used to measure spectra. For ease of use the buttons related to measurement operations, such as background measurement and sample measurement, are positioned together at the top. The windows used to set measurement parameters, such as the number of scans and the resolution, are positioned at the bottom-right of the page in a compact, switchable format. The hardware status is displayed by the status monitor, and the instrument status can be checked at any time on the "Measurement" tab page.



### IRsolution

### **Functions Supporting Measurement**

IRsolution is equipped with various functions that support measurement.

- Simple measurement mode: allows all the operations from spectrum measurement to peak detection and printing to be performed interactively with the windows
- Atmospheric correction function: automatically removes the peaks corresponding to water vapor and carbon dioxide in the atmosphere that otherwise appear in spectra like noise
- · Continuous measurement mode: obtains spectra continuously

### Simple Measurement Mode

In this mode, all the operations from spectrum measurement to peak detection and printing can be performed interactively with the windows. In situations where many different operators use a single FTIR, or where a single operator handles several instruments, this mode can be used to reduce the amount of time required for the instruction and mastering of operation methods. Also, if an accessory equipped with the automatic recognition function (i.e., a QuickStart-series accessory) is installed in the sample compartment, measurement parameters set for simple measurement mode, such as the resolution and the number of scans, are automatically changed to the values set for that accessory. Not having to manually change the measurement parameters in accordance with accessories helps increase the efficiency of the measurement environment.



### Easy-to-Use, Advanced Software:

### **Atmospheric Correction Function**

This function automatically removes interference peaks corresponding to water vapor and carbon dioxide from spectra. In the ranges of 4,000 to 3,300 cm<sup>-1</sup> and 2,100 to 1,300 cm<sup>-1</sup>, which coincide with water vapor peaks, sample spectra can be displayed with almost no interference from water vapor. It is also possible to correct spectra automatically while measurement is being executed, and to manually correct spectra after measurement.



In this mode, immediately after a spectrum measurement has been completed with the set number of scans, it is repeated with the same parameters.

This measurement mode is useful for keeping track of changing phenomena, such as the hardening process of resin.



Removal of water vapor and carbon dioxide peaks from a spectrum using the atmospheric correction function



### **Checking Spectra with the View Tab Page**

After the completion of measurement, the acquired spectrum is displayed on the "View" tab page. Here, spectra can be enlarged or displayed together with other spectra, and spectra that have been subjected to data processing are also displayed. There is also an annotation function, making it possible to write comments or even paste images from an infrared microscope in the spectra. The displayed spectra can also be copied to the clipboard and pasted into other software applications.



Simultaneous display of multiple spectra

### IRsolution

### Equipped with a Variety of Data Processing Functions

In addition to functions that process the acquired spectra, such as peak detection, spectral subtraction, Kubelka-Munk conversion, and ATR correction, IRsolution is also equipped with quantitation and spectral search functions to positively identify substances. It is also possible to copy film thickness calculation results and quantitation results into spreadsheet software.





Spectral search

#### Quantitative calculation

### **Report Generator that Allows Free Editing**

IRsolution is equipped with a powerful free-layout printing Report Generator. With the Report Generator, layouts can be created by freely combining graphical data, such as spectra and calibration curves, and tabulated data, such as quantitation results and peak detection results. It is possible to set the thickness and color of the graph lines as well as the font size. The print layout can be saved as a template for later use.



### Easy-to-Use, Advanced Software:

### Security Functions Supporting Compliance with GLP/GMP and FDA 21 CFR Part 11

ISO standards and FDA regulations, such as those on GLP/GMP that apply to the pharmaceutical and food industries, require not only the increased reliability of the FTIR itself, but also the increased reliability and safety of the software and the data created. In combination with IRsolution Agent, IRsolution provides powerful support for GLP/GMP and ISO with the following functions:

- Software security and log function based on user name and password
- Restriction of user rights by user group
- Preservation of raw data, including interferograms and background spectra obtained before Fourier transformation
- Recording of data processing history
- Electronic signature

It is also possible to strengthen data security functions in order to comply with FDA 21 CFR Part 11 and the Japanese version of Part 11.

### Software Security Based on User Name and Password

In addition to increasing the security of IRsolution by requiring a user name and password upon startup of IRsolution, it is also possible to restrict the functions and methods that are available to a user. An administrator can restrict the functions available to the users of IRsolution, and can control all the user rights. The logon information is recorded in a log file with the date, time, and user name. User information can be printed together with spectra.

sers				×	Login	3
User Name Administrator Shimadzu Suzuki	Section Admin Operator Developer	Status active active	Full Name Administrator Genzo Shimadzu Ichiro Suzuki		Enter your user name and password. User name: Shimadzu Password: ********* DK Cancel Logon window	
Add er list	<u>E</u> dit	<u>R</u> en	jove D)	0		

### IRsolution

### Preservation of Raw Data and Recording of Data Processing History

Of the data obtained with IRsolution, scan parameters, interferograms of samples obtained before Fourier transformation, and interferograms of the background spectra used are stored in a "container" file. After some processes, such as spectral subtraction, are applied to the data, the date and time of processing, the user name, and the processing method are saved along with the pre- and post-processing spectra. Raw data, scan parameters, post-processing data, and the history are saved in the container file in order to easily obtain an audit trail and reliably save data. Electronic signatures\* are also supported.

\* In order to comply with FDA 21 CFR Part 11, implement electronic signatures using IRsolution Agent software.



ply Liection	c Signature
Identification User name:	Administrator
Password:	жилиники
Signature	
<u>R</u> eason:	Authorize
	OK. Cancel

Container file

### **Instrument Audit Trails**

Information such as the date and time at software startup, user name, results of instrument initialization, date and time of measurements, and the accessories used are recorded as an audit trail. This file is protected so it can be displayed but not altered.

Parame	eter			
Data	Mea	surement Hi	story	
Date		Time	Reason	Username
12/17/	/2007	2:55:34 PM	Scan on IRAlfinity, SND:	FTIR
12/17,	/2007	2:55:34 PM	Measured in GLP mode	FTIR
12/17/	/2007	2:55:34 PM	Auto: Gain=1	FTIR
12/17/	/2007	2:55:34 PM	Auto: Aperture=open	FTIR
12/17/	/2007	2:55:34 PM	Atmosphere correction	FTIR
12/17/	/2007	2:55:44 PM	PeakTable calculation: 30 peak(s) found (Noise: 0.1, Height: 0.25, Area: 0.5)	FTIR
12/17/	/2007	2:56:36 PM	Electronic signature applied with reason "Authorize"	Administrator
Data lo	og	665	(1+1)	

Date	2002	2/03/13	Time: 1	1:28:57	Export
Date	-	Time	Operator	Operation	
2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0 2002/0	3/14 3/14 3/14 3/14 3/14 3/14 3/14 3/14	112835 112800 112713 112713 112656 112656 112640 112640 112640 112623 112623 112623 112612 112606 112657 112651	Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat. Administrat.	Manipulation Advanced Peak Picking Manipulation Linear Baselinecorrecti FTIR Measurement ready Measurement Kidelault2smf aswed Scan requested default2smf SetParameters OK FTIR Measurement ready Measurement OVProgram FilesVShim Data stored as default background as Settine Lang to Infrared Setting Date Scan requested LastElke smf SetParameters OK INIT success Init VIFM FTIR System Initializing: IRPrestige=21 log on logout	on Linear Baselinecorrec on on Spectrum 1 adzuWIReolution0311¥Adm sectrum cor: standard Chaneine Br
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### A Wide Variety of Optional Software

There is a wide variety of optional software products available for IRsolution, the Windows-based IRAffinity-1 control software that offers high levels of operability and functionality. IRsolution incorporates data processing functions, such as spectral subtraction and Kubelka-Munk conversion, quantitation functions, such as the multi-point calibration curve method and the multiple regression analysis method, as well as the spectral searching function as standard features. However, adding the following optional software products makes it possible to further increase the application range.

### **IRsolution Agent**

IRsolution Agent is a tool used to manage the results obtained with IRsolution in a database. It enables data management for the entire recording life cycle, which consists of the creation (measurement), inspection, approval, storage, browsing, backup, and disposal of analysis data.

- It complies with FDA 21 CFR Part 11 (electronic records and electronic signatures), and can perform operations, such as those related to security management and electronic signatures, on the data stored and recorded in the database.
- Measurement data is automatically stored in the database, and it is easy to search for the data at a later date.
- Information contained in the data stored in the database, such as spectral waveforms and peak detection tables, can be browsed directly.

### **Mapping Program**

This program captures microscope images and uses them to create composite visual images that cover a large range. Mapping parameters, such as the mapping range, the scan intervals, and the background positions, can be set on the composite images. Operations related to the infrared microscope and mapping, such as switching between transmittance and reflectance modes, can be performed using icons. Area mapping, line mapping, and random mapping (in which measurement is automatically performed when a few measurement points are recorded) are supported. Also, in addition to mapping in the conventional transmittance and reflectance modes, micro-ATR mapping with an optional ATR objective is also available. From the acquired mapping data, it is possible to extract spectra and to perform calculations on functionalgroup mappings for specific peaks. The data can be displayed as 3D images or contour plots, or in spectral overlay mode.



Example of area mapping data (Area mapping of flux on a circuit board)

### (P/N 206-72330-91)

Macro Platform

The Macro Platform is required to run the customized macro programs created by Shimadzu (for a fee). If, for example, you wish to perform routine work in which certain functions are used in a pre-determined order, or you wish to run an automatic measurement system in combination with an auto sample changer, please contact your Shimadzu representative for details.

#### (P/N 206-21600-92)

(P/N 206-72332-91)



Note: This product cannot be used for data that is measured or analyzed with the mapping program.

### Products

### **3D Display Program**

The 3D display program offers the following functionality.

- Changes the method of displaying data Data can be displayed in bird's eye view (3D), as an intensity distribution or using contour lines, as a spectral overlay, or rotated.
- 3D data processing Changes at specific wavenumbers can be isolated.
- Functions include data extraction, data points thinning, smoothing, zero-baseline, background correction, normalization, log conversion, first- or second-order derivative, and ATR correction.
- Creation of 3D data from spectra Spectra measured at fixed intervals, such as by repeated measurements, can be arranged consecutively to create 3D data.
  Note: The 3D display program cannot control mapping measurements or AIM-8800 series infrared microscopes.



(P/N 206-73737-91)

### **PLS Quantitation Program**

PLS (partial least squares) quantitation is a chemometrics method that, like multiple linear regression analysis, is widely used for the simultaneous quantitation of multiple components. The PLS quantitation program incorporates PLS I and PLS II methods. It is possible to display calculation values based on input values, PLS factors based on "PRESS" values, loading vectors, and score values, and analysis can be performed on the regression equations obtained with the PLS method.



PLS quantitation program window

#### (P/N 206-72333-91)

(P/N 206-72331-91)

### Curve-Fitting (Peak-Splitting) Program

Usually, absorption bands in infrared spectra consist of overlapping peaks. The curve-fitting (peak-splitting) program can be used to separate absorption bands into individual peaks, separate peaks that have been influenced by hydrogen bonding, and identify the peaks of functional groups that are hidden by absorption bands. Six types of curves, such as Gaussian, Lorentzian, and Gaussian+Lorentzian, are available for separation. The curve can be selected in accordance with the form of the peaks in the absorption band. The separated component peaks are displayed together with the spectra that they form, making it possible to evaluate the separation accurately.



Curve-fitting results for ABS resin in the range of 3,150 to 2,750 cm<sup>-1</sup> (Top: Window used to set peak wavenumbers and calculation range; Bottom: Window showing separated peaks)







### DRS-8000A (P/N 206-62301-91)

Although powder samples are mixed with KBr, as with the KBr pellet method, they are analyzed in their original state. It is not necessary to create pellets. For plastic moldings, part of the surface is scraped off with the emery paper attached to the SiC sampler (P/N 200-66750), and the powdered sample formed on the paper is analyzed. Diffuse reflectance spectra that are similar to transmittance spectra are produced by Kubelka-Munk conversion.





### SRM-8000A (P/N 206-62304-91)

A specular reflectance accessory with a 10° incidence angle is used for the analysis of thin films on a metal plate with a  $\mu$ m order of thickness. In the case of mirror-like plastic samples, the light specularly reflected from the sample surface is measured. Specular reflectance spectra that are similar to transmittance spectra are produced by Kramers-Kronig analysis.





### RAS-8000A (P/N 206-62302-91)

A high-sensitivity reflection measurement accessory with incidence angles of  $70^{\circ}$  and  $75^{\circ}$  is used for the analysis of thin films on a metal plate with an nm order of thickness. Using it in combination with the GPR-8000 infrared polarizer (P/N 206-61550) enables measurement with an even higher level of sensitivity.











### ATR-8000A (P/N 206-62303-91)

This accessory obtains spectra for the surfaces of film-like samples that are clamped firmly on the surface of a prism. Incidence angles of  $30^{\circ}$ ,  $45^{\circ}$ , and  $60^{\circ}$  can be selected. The KRS-5 prism is standard. A Ge prism is also available for samples with a high refractive index.



### ATR-8200HA (P/N 208-97240-91)

Prisms for liquid and solid samples are available. In order to obtain spectra for the sample surfaces, liquids are simply dripped onto the prism, whereas films and rubber samples are clamped firmly on the prism surface. The incidence angle is 45°. The ZnSe prism is standard. A Ge prism is also available for samples with a high refractive index.





### (ZnSe: P/N 208-97247-95) Ge: P/N 208-97247-96)

A single-bounce ATR accessory. In order to obtain spectra for the sample surfaces, liquids are simply dripped onto the prism, whereas other samples are clamped firmly on the prism surface. The incidence angle is 45°. A Ge prism is available for samples with a high refractive index.



### DuraSampIIR A Series

This single-bounce ATR accessory uses a diamond prism, which makes it possible to analyze hard samples. In order to obtain spectra for the sample surfaces, liquids are simply dripped onto the prism, whereas other samples are clamped firmly on the prism surface. The incidence angle is 45°. A standard type, a type equipped with a pressure sensor, and a ViewIR type are available.

DuraSampIIR System	(ZnSe: P/N 208-92143-11) (KRS-5: P/N 208-92143-12)
DuraSampIIR System I (With Pressure Sensor)	(ZnSe: P/N 208-92144-11 (KRS-5: P/N 208-92144-12)
DuraSampIIR System H	(ZnSe: P/N 208-92145-11) (KRS-5: P/N 208-92145-12)





length is selected according to the concentration. There are gas cells with short path lengths of 5 or 10 cm, and long path lengths of 10 m or more. Please contact your Shimadzu representative for details on long-path gas cells.

Long-path gas cell

### **Accessories for Automated Analysis**

An automatic measurement system can also be configured using an autosampler. The autosampler is controlled by IRsolution.







An auto sample changer that can perform automatic transmission measurement for up to 18 KBr pellets with a diameter of 13 mm. Film holders and cell plates for Nujol mulls are available as options.



DRS-8010ASC (P/I

(P/N 206-62308)

An automatic diffuse reflectance accessory that can automatically analyze up to 24 powder samples.



### Sample Switcher 21 (P/N 206-63663-92)

Transmission-type sample switcher that switches between the sample and the background.

\* This accessories is not applicable CE marking.

Please check with your Shimadzu representative for detail.



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### **Accessories for Minute Samples**

A single-bounce ATR accessory, such as a MIRacle or DuraSampIIR, is useful for the analysis of sample sizes of the order of a few mm. The sample is taken out, placed on a prism, and firmly secured with the clamp provided. An infrared microscope is useful for the analysis of sample sizes from a few mm down to approximately 10  $\mu$ m. In addition to transmission and reflection modes, the ATR mode is also available, enabling the analysis of various forms of minute samples.

#### **IR Microscope**

### AIM-8800 (P/N 206-73700-92/96/38/39)

Minute Samples

The AIM-8800 is an infrared microscope that is installed on the right side of the IRAffinity-1. It incorporates a bright, optimized optical system and a high-sensitivity MCT detector, enabling the high-sensitivity analysis of minute samples. It is full of functions, such as the auto aperture and auto focus functions, which greatly simplify the analysis of minute samples. It is possible to switch between measurement in the sample compartment of the IRAffinity-1 and measurement with the infrared microscope using IRsolution software.



#### Features of AIM-8800

- Incorporates a bright, optimized optical system and a high-sensitivity MCT detector to enable highsensitivity measurement.
- The auto aperture, auto centering, and auto X-Y stage functions simplify determination of the desired analysis location.
- The auto focus function makes focusing simple.
- Up to 10 sample positions and 2 background measurement positions can be stored in memory.
- All microscope operations, such as stage movement, aperture setting and focusing, and switching between transmission/reflection and measurement/observation modes, can be controlled from the computer screen.
- Operation is also possible from the microscope's own keyboard.







A single-bounce ATR objective that uses a semicircular Ge prism with a diameter of 3 mm is used when performing ATR measurement with the AIM-8800 infrared microscope. The prism is slid to one side when the sample is observed, and slid back into position for measurement.

### **Other Accessories**

Please contact your Shimadzu representative about accessories that do not appear in this catalog. We will provide details on accessories that are appropriate for specific samples and applications. Also note that it may not be possible to use FTIR-8000-series accessories. If necessary, please check with your Shimadzu representative.

### A Wide Range of Accessories

If an accessory is installed in the sample compartment, the name and identification (machine) number of the installed accessory is displayed in IRsolution. In addition to being displayed on the status monitor, it is also recorded in the log file. The optimum measurement parameters for the installed accessory are automatically set.

In addition to original Shimadzu accessories, unique FTIR accessories and software products from all over the world can be used. For details, please refer to the accessories handbook or contact your Shimadzu representative.



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### **Specifications**

### Hardware

Interferometer	Michelson interferometer (30° incident angle)
	Equipped with dynamic alignment system (JPN patent No.2115670 No.3613171)
	Sealed interferometer with auto dryer (JPN registration of utility model No.3116465)
Optical system	Single-beam optics
Beam splitter	Germanium-coated KBr
Light source	High-energy ceramic light source
Detector	DLATGS detector equipped with temperature control mechanism
Wavenumber range	7,800 to 350 cm <sup>-1</sup>
Resolution	0.5, 1, 2, 4, 8, or 16 cm <sup>-1</sup>
S/N ratio	30,000:1 or higher (peak-to-peak, 4 cm <sup>-1</sup> resolution, in a neighborhood of 2,100 cm <sup>-1</sup> , 1-minute accumulation)
Mirror speed	4-step selection of 2.0, 2.8, 5, or 9 mm/sec
Data sampling	He-Ne laser
Gain	Automatic or manual setting (x1 to x128)
Sample compartment	Equipped with automatic accessory recognition mechanism
	200 (W) x 230 (D) x 170 (H) mm
	Center focus
Dimensions	514 (W) x 606 (D) x 273 (H) mm
Weight	35 kg



#### Software

Windows XP <sup>™</sup> Professional SP2
USB 2.0 standard
Self-diagnosis function, status monitor
Complies with European and Japanese Pharmacopoeias and ASTM
Spectrum measurement, continuous measurement, atmospheric correction measurement,
continuous measurement using ASC, simple measurement mode
Addition, subtraction, multiplication, division, normalization, baseline correction, log conversion, smoothing,
differentiation, ATR correction, Kubelka-Munk correction, Kramers-Kronig analysis, wavenumber/wavelength
conversion, peak detection, peak area calculation, film thickness measurement, atmospheric correction
Contaminant program (patent pending), Pharma Report program
Peak height, peak area, multi-point calibration curve method using ratio, multiple linear regression (MLR)
Spectrum search (based on similarity), peak search, text search, compound search, setting of search conditions,
search of user library and commercial library, creation of user library, Free libraries are included.
Report Generator function
Compression of wavenumber axis, enlargement/reduction, auto scale, overlap, stack display, shift display
Copy, cut, paste
Customization of GUI
Macro Platform, PLS quantitation, curve-fitting, mapping measurement, 3D display, and IRsolution Agent software
Auto file-saving function, saving of sample/background interferogram, saving of data processing history
User administration based on passwords and creation of user groups
Log recording
Functions supporting compliance with FDA 21 CFR Part 11 requirements such as electronic signatures (IRsolution
Agent software required)
Automatic recognition of installed accessories, automatic setting of measurement parameters (QuickStart accessories only)

### **Computer/Printer**

Туре	Desktop or laptop
Specifications	Provide a computer and printer of a type recommended by Shimadzu. Enquire separately for detailed specifications.

### **Other Specifications**

Installation site	Temperature: 15°C to 30°C; humidity regulated by air-conditioning equipment
	Humidity: 70% max.; with no condensation
	When analyzing or using organic solvents, provide local ventilation systems as required by the applicable laws and regulations.
Power requirements*	100/120/220/230/240 VAC, 50/60 Hz, 150 VA for operation, 4 VA for standby

\* An additional power supply is required for the computer set. Microsoft and Windows are registered trademarks of Microsoft Corporation in the U.S.A. and other countries. Other company names or product names that appear in this document are trademarks or registered trademarks of their respective companies.



Dimensions

![](_page_26_Picture_1.jpeg)

![](_page_27_Picture_0.jpeg)

JQA-0376

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![](_page_27_Picture_3.jpeg)

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