



Fourier Transform Infrared Spectrophotometer

IRAffinity-1





IRAffinity-1
SHIMADZU



IRAffinity-1

Fourier Transform Infrared Spectrophotometer

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^{-1} , peak-to-peak), a maximum resolution of 0.5 cm^{-1} , 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.

Applicable to Various Fields

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

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

Construction

- Material identification tests
- Degradation analysis of coatings

Food Products

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

Medicine

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

Metals

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

Realizing High Performance

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 general-purpose instruments.

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

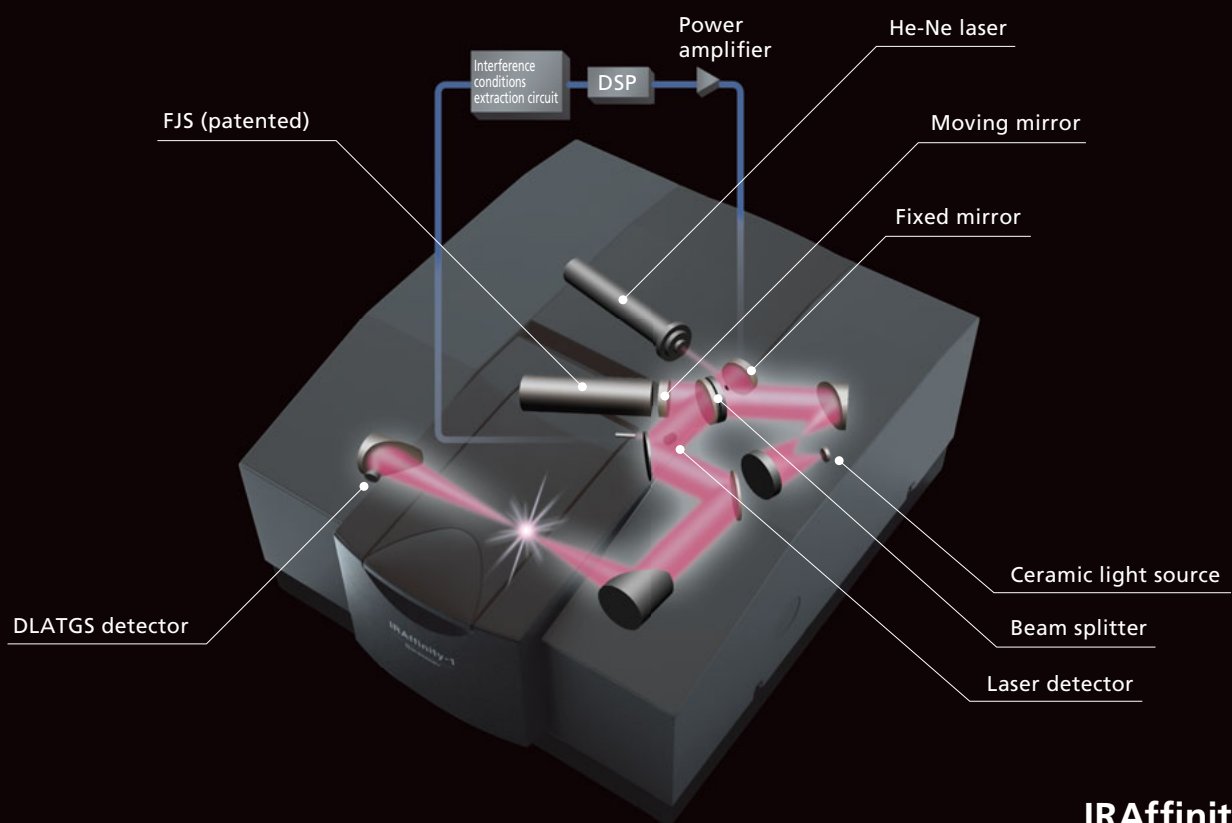
Through the incorporation of a high-energy ceramic light source, a temperature-controlled, high-sensitivity DLATGS detector, a high-throughput optical element, and the optimization of the electrical system and optical system, the IRAffinity-1 achieves the highest S/N ratio in its class.

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.



IRAffinity-1

Fourier Transform Infrared Spectrophotometer

Easier Maintenance

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.

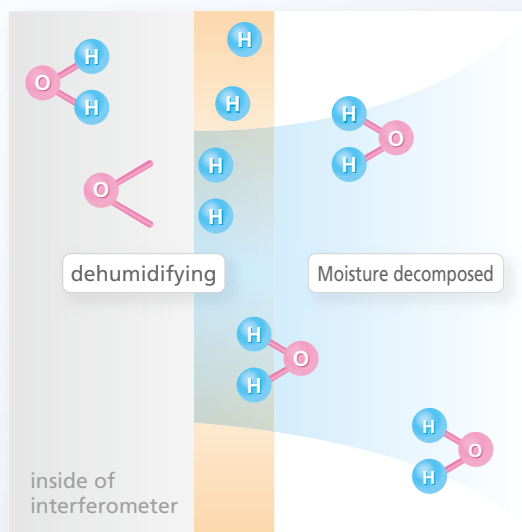
Measures Taken to Protect the Optical Element in the Interferometer

- 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.

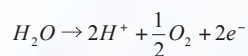
Principle of the Auto Dryer

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

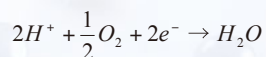
- When porous electrodes are attached to a solid polymer electrolyte membrane and direct current is applied, moisture on the anode side (i.e., the desiccation side) dissociates into hydrogen ions and oxygen.
- The hydrogen ions travel through the solid polymer electrolyte membrane and reach the cathode 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)



Cathode (moisture discharge side)

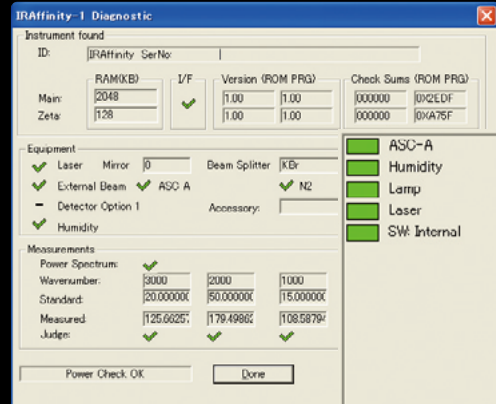


Increased Reliability Achieved by Instrument Monitoring

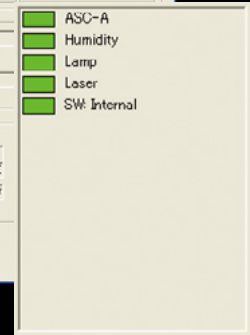
In order to increase reliability, not only does the IRAffinity-1 execute self-diagnosis at initialization, it also monitors the state of the instrument during operation. It is also possible to check basic performance using a validation program that is incorporated as a standard feature.

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



Self-Diagnosis Window

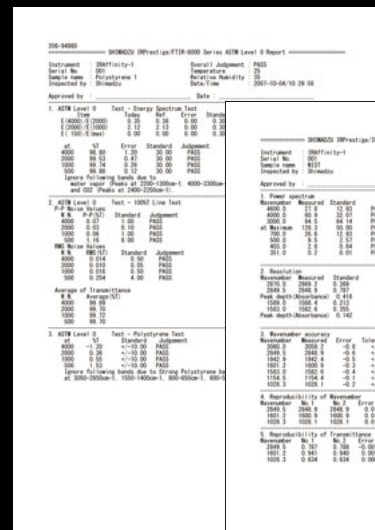


Status Monitor Window

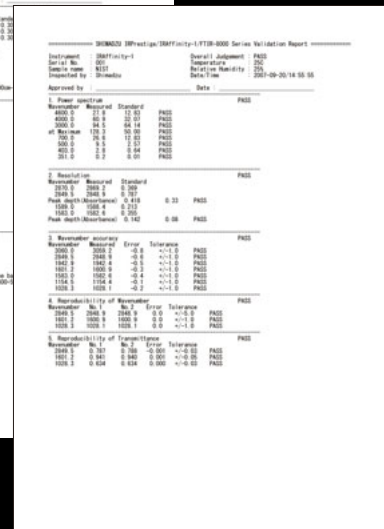
Validation Program

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.

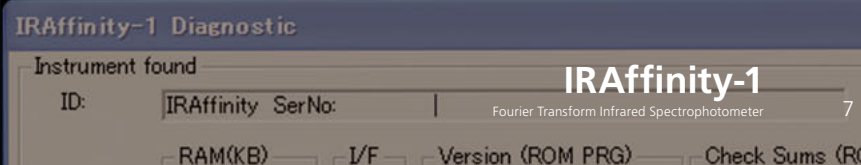
- Test Items Complying with the European and Japanese Pharmacopoeias
 - Shape and intensity of a power spectrum
 - The following items for a polystyrene spectrum:
 - Resolution
 - Wavenumber accuracy
 - Wavenumber reproducibility
 - Transmittance (absorbance) reproducibility
- Test items for ASTM (ASTM 1421 Level Zero)
 - Energy intensity test based on power spectrum
 - Noise test based on 100% transmittance spectrum
 - Reproducibility test based on polystyrene spectrum



Example of ASTM report output



Example of Japanese Pharmacopoeia report output



Adapting to a Wide Range of Analysis Scenarios

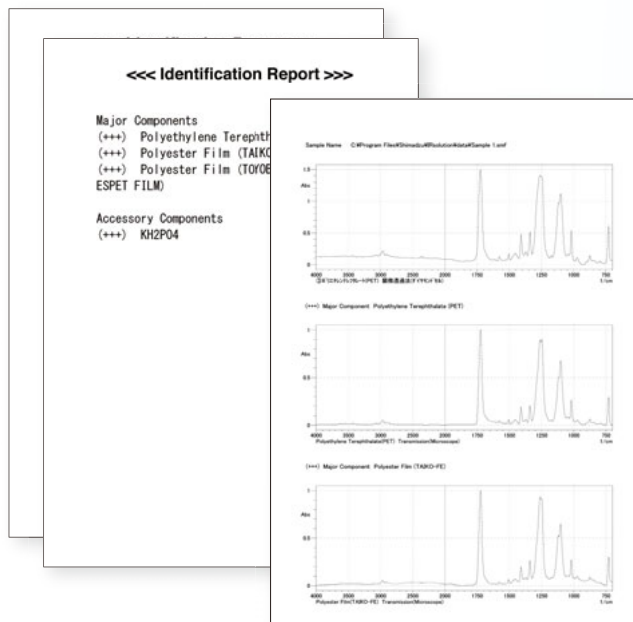
Equipped with Analysis Support Programs

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.

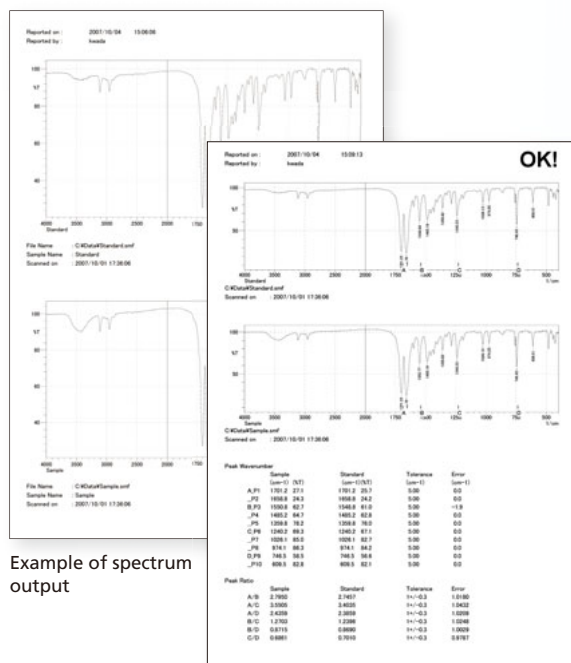


Example of report output

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 of 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.



Example of spectrum output

Example of report output

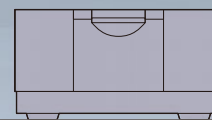
Ensuring a Spacious Working Environment

Smart Design

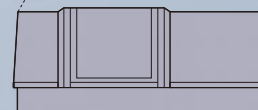
In addition to all the new features and functions, such as the highest *S/N* ratio in its class, a resolution of 0.5 cm^{-1} , dynamic alignment, and an interferometer equipped with an auto dryer, the IRAffinity-1 also achieves a reduction of approximately 20% in installation area and width (compared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



IRAffinity-1
514mm(W)×606mm(D)×273mm(H)



FTIR-8400S
622mm(W)×584mm(D)×250mm(H)



IRAffinity-1

Fourier Transform Infrared Spectrophotometer

Easy-to-Use, Advanced Software: IRsolution

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.

Status Inspection with the Status Monitor

The ON/OFF status of the light source or laser installed in the instrument, the status of the humidity inside the interferometer, and status information related to the accessories set in the sample compartment* are all displayed by the status monitor.

* Only when QuickStart accessories are used.

The screenshot displays the IRsolution software interface. The main window shows a spectral plot with a y-axis from 0 to 90 and an x-axis from 4000 to 1000 cm⁻¹. The plot shows a complex spectrum with several sharp absorption bands. To the right of the plot is a status monitor panel with five green indicator lights labeled: ASC-A, Humidity, Lamp, Laser, and SW Internal. Below the plot is a status log window showing a list of measurement events with timestamps and status messages. At the bottom right, there are several overlapping windows for measurement parameters, including 'Data Evaluation', 'Data Instrument', and 'Advanced' settings, which allow users to adjust parameters like 'Beam', 'Detector', 'Gain', 'Resolution', and 'Power'.

Real-Time Display of Spectra

Measurement can be executed simply by pressing the "Measurement" button at the top of the window. After measurement starts, the spectrum is displayed in the window in real time.

Compact Measurement Menus

The measurement parameters are displayed in a compact format in five different types of windows.

Functions Supporting Measurement

IRResolution 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.

Parameter Setting Window

Indication Window

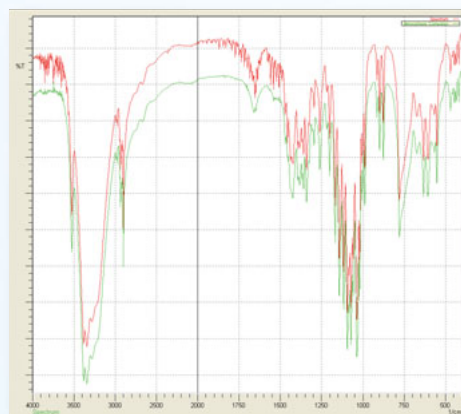
Peak Detection Window

Printing Results

Peak	Intensity	Scan Intensity	Wave (cm ⁻¹)	Wave (μm)	Area	Scan Area
1	10000	10000	2950	3.4	10000	10000
2	10000	10000	1715	5.8	10000	10000
3	10000	10000	1275	7.8	10000	10000
4	10000	10000	1100	9.1	10000	10000
5	10000	10000	1070	9.3	10000	10000
6	10000	10000	1030	9.7	10000	10000
7	10000	10000	990	10.1	10000	10000
8	10000	10000	950	10.5	10000	10000
9	10000	10000	910	10.9	10000	10000
10	10000	10000	870	11.3	10000	10000
11	10000	10000	830	11.8	10000	10000
12	10000	10000	790	12.4	10000	10000
13	10000	10000	750	13.1	10000	10000
14	10000	10000	710	13.9	10000	10000
15	10000	10000	670	14.6	10000	10000
16	10000	10000	630	15.5	10000	10000
17	10000	10000	590	16.4	10000	10000
18	10000	10000	550	17.6	10000	10000
19	10000	10000	510	18.8	10000	10000
20	10000	10000	470	20.2	10000	10000

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^{-1} and 2,100 to 1,300 cm^{-1} , 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.

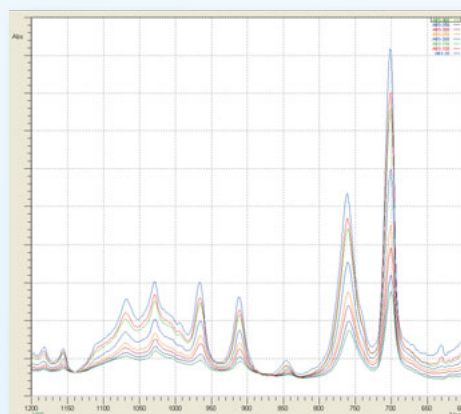


Removal of water vapor and carbon dioxide peaks from a spectrum using the atmospheric correction function

Continuous Measurement Mode

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

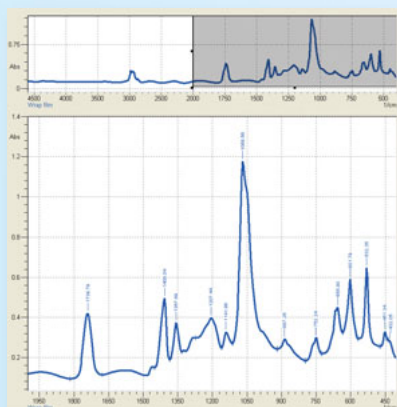
This measurement mode is useful for keeping track of changing phenomena, such as the hardening process of resin.



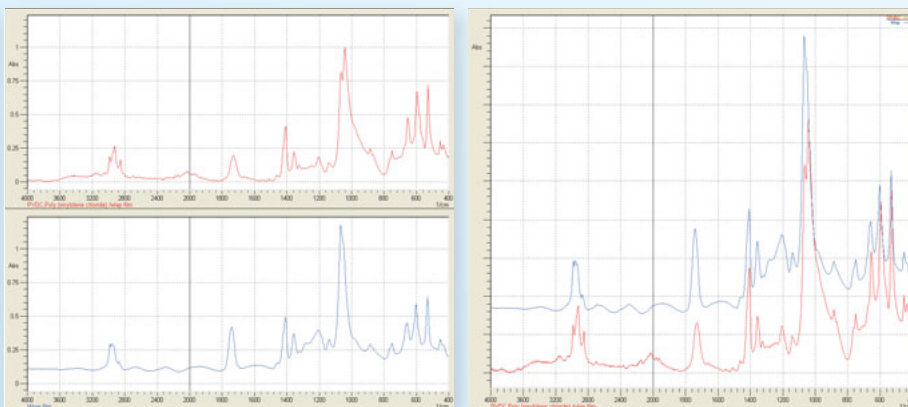
Continuous Measurement Window

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.



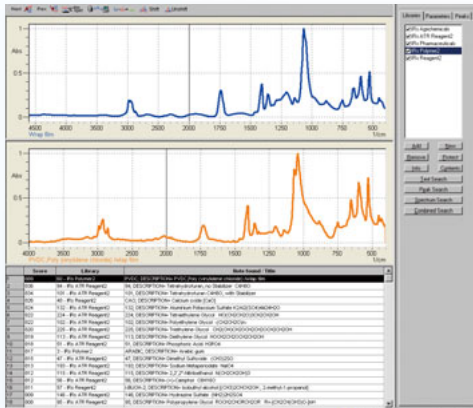
Enlargement of spectra



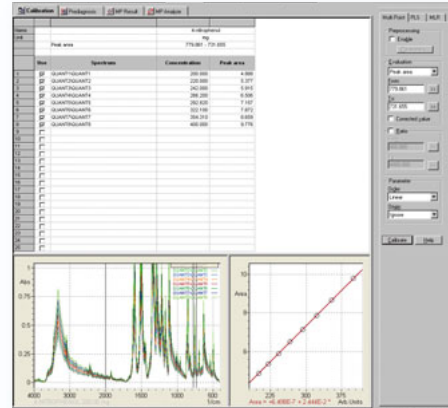
Simultaneous display of multiple spectra

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



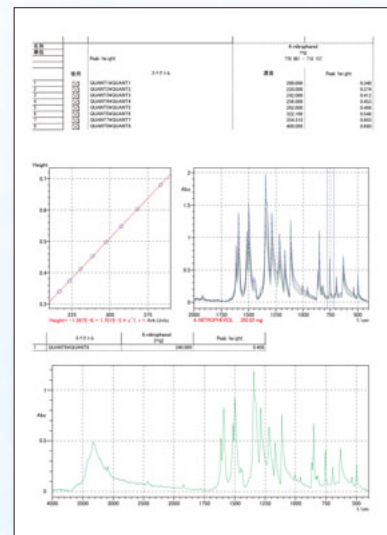
Quantitative calculation

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.



Printing window



Example of report

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

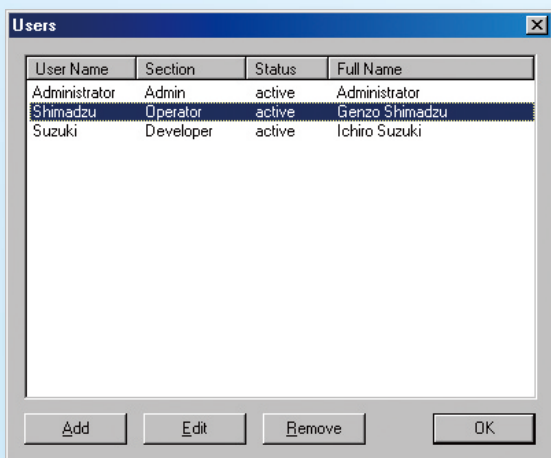
ISO standards and FDA regulations, such as those on GLP/GMP that apply to the pharmaceutical and food industries, require not only the increased reliability of the FTIR itself, but also the increased reliability and safety of the software and the data created. In combination with IRsolution Agent, IRsolution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

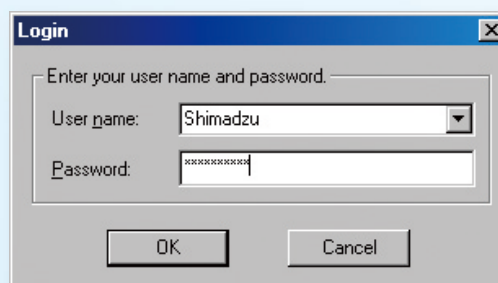
It is also possible to strengthen data security functions in order to comply with FDA 21 CFR Part 11 and the Japanese version of Part 11.

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.



User list

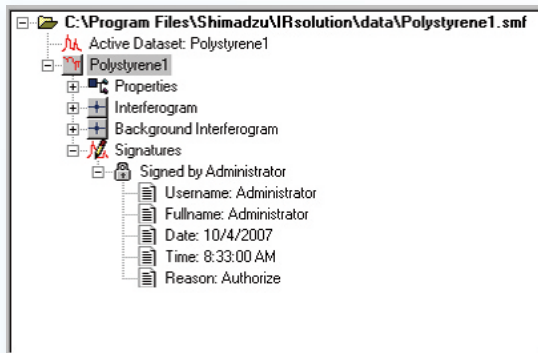


Login window

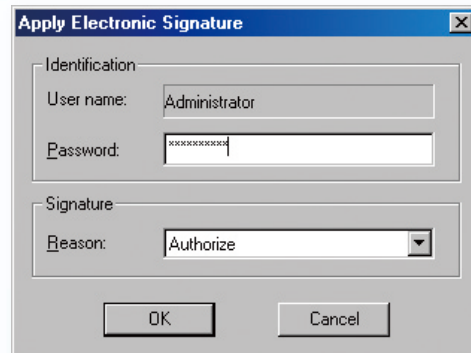
Preservation of Raw Data and Recording of Data Processing History

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.



Container file



Electronic signature

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.

Parameter				
Date	Measurement	History		
Date	Time	Reason		Username
12/17/2007	2:55:34 PM	Scan on IRAffinity-1 SMD		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	Peak table 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 log

Operation Log				
Date	Time	Operator	Operation	
2002/03/14	11:29:35	Administrat.	Manipulation: Advanced Peak Picking on Linear Baselinecorrect	
2002/03/14	11:29:00	Administrat.	Manipulation: Linear Baselinecorrection on Spectrum 1	
2002/03/14	11:27:13	Administrat.	FTIR Measurement ready	
2002/03/14	11:27:13	Administrat.	Measurement: default2.smf saved	
2002/03/14	11:26:56	Administrat.	Scan requested: default2.smf	
2002/03/14	11:26:56	Administrat.	SetParameters OK	
2002/03/14	11:26:40	Administrat.	FTIR Measurement ready	
2002/03/14	11:26:40	Administrat.	Measurement: C:\Program Files\Shimadzu\IRsolution\0311\Adm	
2002/03/14	11:26:40	Administrat.	Data stored as default background spectrum	
2002/03/14	11:26:23	Administrat.	Setting lamp to Infrared Setting: Detector: standard Changing Be	
2002/03/14	11:26:23	Administrat.	Scan requested: LastBkz.smf	
2002/03/14	11:26:23	Administrat.	SetParameters OK	
2002/03/14	11:26:12	Administrat.	INIT success	
2002/03/14	11:26:07	Administrat.	Init VPM FTIR System	
2002/03/14	11:26:06	Administrat.	Initializing: IRPrestage=21	
2002/03/14	11:25:57	Administrat.	log on	
2002/03/14	11:25:51	Administrat.	logout	

Operation log

A Wide Variety of Optional Software Products

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.

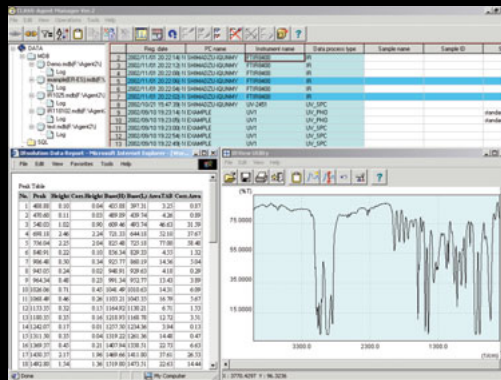
IRsolution incorporates data processing functions, such as spectral subtraction and Kubelka-Munk conversion, quantitation functions, such as the multi-point calibration curve method and the multiple regression analysis method, as well as the spectral searching function as standard features. However, adding the following optional software products makes it possible to further increase the application range.

IRsolution Agent

(P/N 206-21600-92)

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.

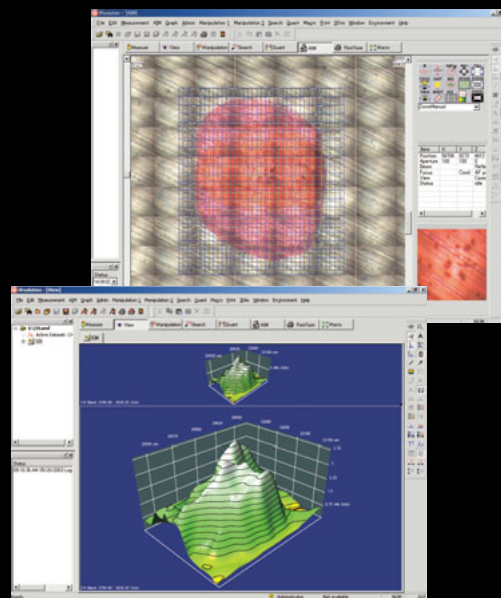


Note: This product cannot be used for data that is measured or analyzed with the mapping program.

Mapping Program

(P/N 206-72332-91)

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 functional-group 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)

Macro Platform

(P/N 206-72330-91)

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.

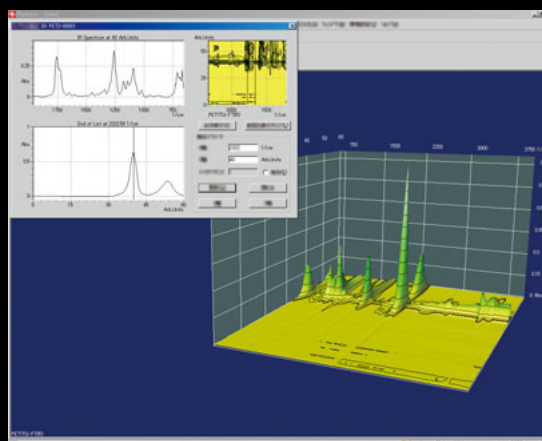
3D Display Program

(P/N 206-73737-91)

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.

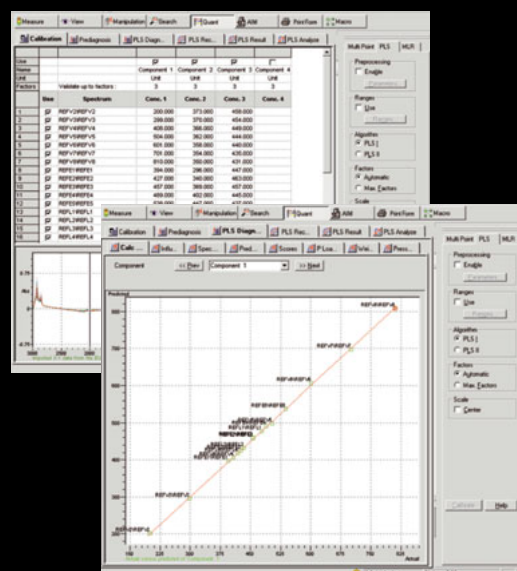
Note: The 3D display program cannot control mapping measurements or AIM-8800 series infrared microscopes.



PLS Quantitation Program

(P/N 206-72331-91)

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.



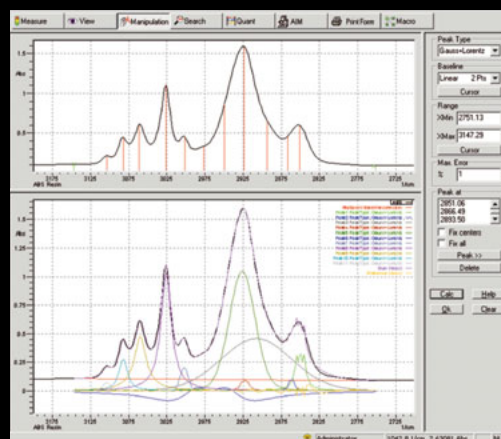
PLS quantitation program window

Curve-Fitting (Peak-Splitting) Program

(P/N 206-72333-91)

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^{-1} (Top: Window used to set peak wavenumbers and calculation range; Bottom: Window showing separated peaks)

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.



This is a series of horizontal ATR accessories integrated with sample compartments. The ease of purging has been improved, and there is no concern with dust entering the IRAffinity-1 sample compartment.



Powders

Moldings

Thin Films

Films

Liquids

Rubber

MIRacle 10

(P/N 206-74127-xx)



This is a single-reflection ATR accessory. To measure the spectrum of a liquid, simply drip it on the prism. To measure the spectrum of the surface of other samples, clamp them firmly on the surface of the prism. Large samples (with a large surface area) can be measured without cutting them. The incidence angle is 45°.

Select from three types of prism: ZnSe, Ge, and diamond/ZnSe. Also, select whether the respective prism is equipped with a pressure sensor. The Ge prism is ideal for samples with a high refractive index.



Powders

Moldings

Thin Films

Films

Liquids

Rubber

GladiATR 10

(P/N 206-74128-91)
(With pressure sensor P/N 206-74128-93)



This is a single-reflection ATR accessory. Since the prism is made solely of diamond, it is capable of measuring spectra up to 400 cm⁻¹. To measure the spectrum of a liquid, simply drip it on the prism. To measure the spectrum of the surface of other samples, clamp them firmly on the surface of the prism. The incidence angle is 45°. Select whether the prism is equipped with a pressure sensor. The Ge prism is ideal for samples with a high refractive index.



Films

Liquids

Rubber

HATR 10

(P/N 206-74126-91)



This is a horizontal ATR accessory. There are prisms for liquids and solids. To measure the spectrum of a liquid sample, simply drip it on the prism. To measure the spectrum of the surface of film and rubber samples, clamp them firmly on the surface of the prism. The incidence angle is 45°, and the number of reflections is 10.

The ZnSe prism is included as standard, but the Ge prism is ideal for samples with a high refractive index.



SiC Sampler
(Option)



Powders



Moldings



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.



Thin Films



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 mm 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.



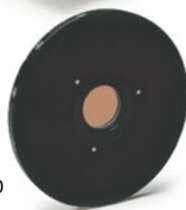
Thin Films



RAS-8000A

(P/N 206-62302-91)

A high-sensitivity reflection measurement accessory with incidence angles of 70° and 75° 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.



GPR-8000
(Option)



Films



Rubber

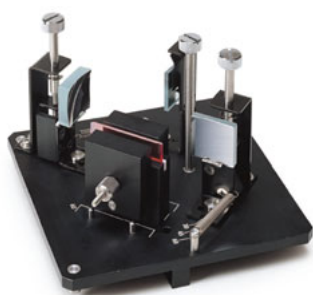


ATR-8000A

(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°, 45°, and 60° can be selected. The KRS-5 prism is standard.

A Ge prism is also available for samples with a high refractive index.



* ATR spectra similar to transmittance spectra are produced by ATR correction.



5-cm gas cell



Long-path gas cell



Gases

5-cm Gas Cell 10-cm Gas Cell Long-Path Gas Cell

(P/N 202-32006-XX)

(P/N 202-32007-XX)

Gas cells are used for the analysis of gas samples, and the path 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.

Accessories for Automated Analysis

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



Powders

Films

Liquids

ASC-8000T

(P/N 206-63900)

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.

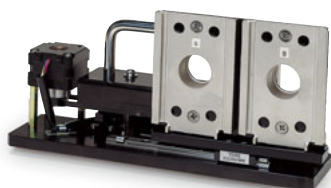


Powders

DRS-8010ASC

(P/N 206-62308)

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



Powders

Films

Liquids

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.

* An optional ASC cable is required.

Accessories for Minute Samples

A single-reflection ATR accessory, such as a MIRacle or DuraSamplIR, 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 μ m.

In addition to transmission and reflection modes, the ATR mode is also available, enabling the analysis of various forms of minute samples.



Minute Samples

IR Microscope AIM-8800

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

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 high-sensitivity 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.



Minute Samples

ATR Objective (Slide-On Type) ATR-8800M

(P/N 206-70450-91)

A single-reflection 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

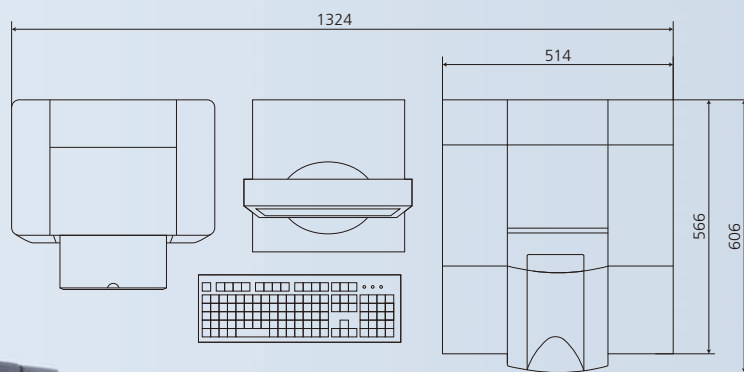
In addition to original Shimadzu accessories, unique FTIR accessories and software products from all over the world can be used. Please contact your Shimadzu representative about accessories that do not appear in this catalog. We will provide details on accessories that are appropriate for specific samples and applications. Also note that it may not be possible to use FTIR-8000-series accessories. If necessary, please check with your Shimadzu representative.

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 with 3 years guaranteed
Light source	High-energy ceramic light source
Detector	DLATGS detector equipped with temperature control mechanism
Wavenumber range	7,800 to 350 cm^{-1}
Resolution	0.5, 1, 2, 4, 8, or 16 cm^{-1}
S/N ratio	30,000:1 or higher (peak-to-peak, 4 cm^{-1} resolution, in a neighborhood of 2,100 cm^{-1} , 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 ($\times 1$ to $\times 128$)
Sample compartment	Equipped with automatic accessory recognition mechanism 200 (W) \times 230 (D) \times 170 (H) mm Center focus
Dimensions	514 (W) \times 606 (D) \times 273 (H) mm
Weight	35 kg

Dimensions



Unit: mm



Software

OS	Windows 7 Professional (32 bit) / XP Professional SP2 / Vista Business
Interface	USB 2.0 standard
Hardware monitor	Self-diagnosis function, status monitor
Validation program	Complies with European and Japanese Pharmacopoeias and ASTM
Measurement	Spectrum measurement, continuous measurement, atmospheric correction measurement, continuous measurement using ASC, simple measurement mode
Data processing	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
Analysis support programs	Contaminant program (patent pending), Pharma Report program
Quantitative calculations	Peak height, peak area, multi-point calibration curve method using ratio, multiple linear regression (MLR)
Spectrum search	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.
Printing	Report Generator function
Display	Compression of wavenumber axis, enlargement/reduction, auto scale, overlap, stack display, shift display
Editing	Copy, cut, paste
Other items	Customization of GUI
Optional software	Macro Platform, PLS quantitation, curve-fitting, mapping measurement, 3D display, and IRsolution Agent software
Audit trail	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)
Recognition of accessories	Automatic recognition of installed accessories, automatic setting of measurement parameters (QuickStart accessories only)

Computer / Printer

Type	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.

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