IRIS User Guide

The PIKE IRIS ATR Installation and User Guide

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Contents

Introduction

The IRIS accessory is the go-to diamond ATR for every lab, designed to make IR sampling easy. You can expect high-quality spectra covering a wide range of samples from powders, gels, liquids, solids, and more. It is ideal for research, QA/QC, and sample identification. Data collection for most samples may be completed in less than one minute.

The backbone of the IRIS is its high-precision optics. IRIS' internal curved mirrors have been designed and processed using diamond-turning technology to achieve optimal performance. All internal mirrors are gold-coated for maximum reflectivity.

The diamond ATR element, with a diameter of 1.8 mm, offers the ultimate sampling element for most all samples. It provides extreme hardness, and is suitable for testing samples with pH between 1-14. IRIS' unique PTFE sealing method of the diamond ATR element in its stainless-steel mounting plate adds to the accessory's universal applicability for the analysis of a wide range of organic and caustic samples, due to the inertness of PTFE. Other commercial ATR accessories rely on an epoxy seal, which may dissolve with continuous exposure to some organic solvents.

IRIS diamond ATR plate uses a small crystal to minimize the IR absorption due to the diamond phonon bands, inherent to all diamonds. The diamond crystal is supported by a strong metal brace to prevent microscopic movements of the ATR crystal. Together, these two features allow the diamond phonon bands to ratio out in sample spectra resulting in the highest quality data.

PIKE Technologies offers two diamond plate options. Our diamond ATR plate with an anti-reflective coated prism faces is the most popular with a spectral range of 4000 – 400 cm^{-1}. The function of the anti-reflective coating is to optimize energy throughput. An Extended Range Diamond is also available to allow use in the mid- and far-IR spectral regions.

To offer the most flexibility, IRIS may also be fitted with a Ge ATR plate for measuring sample a sample with a high refractive index. Types of high refractive materials that would benefit from sampling on the Ge ATR crystal plate are carbon black filled samples and inorganic materials such as oxides, aluminas, titanias, and minerals. IRIS' Ge element offers a wide transmittance range spanning 4000 – 450 cm^{-1}.

ATR Outline

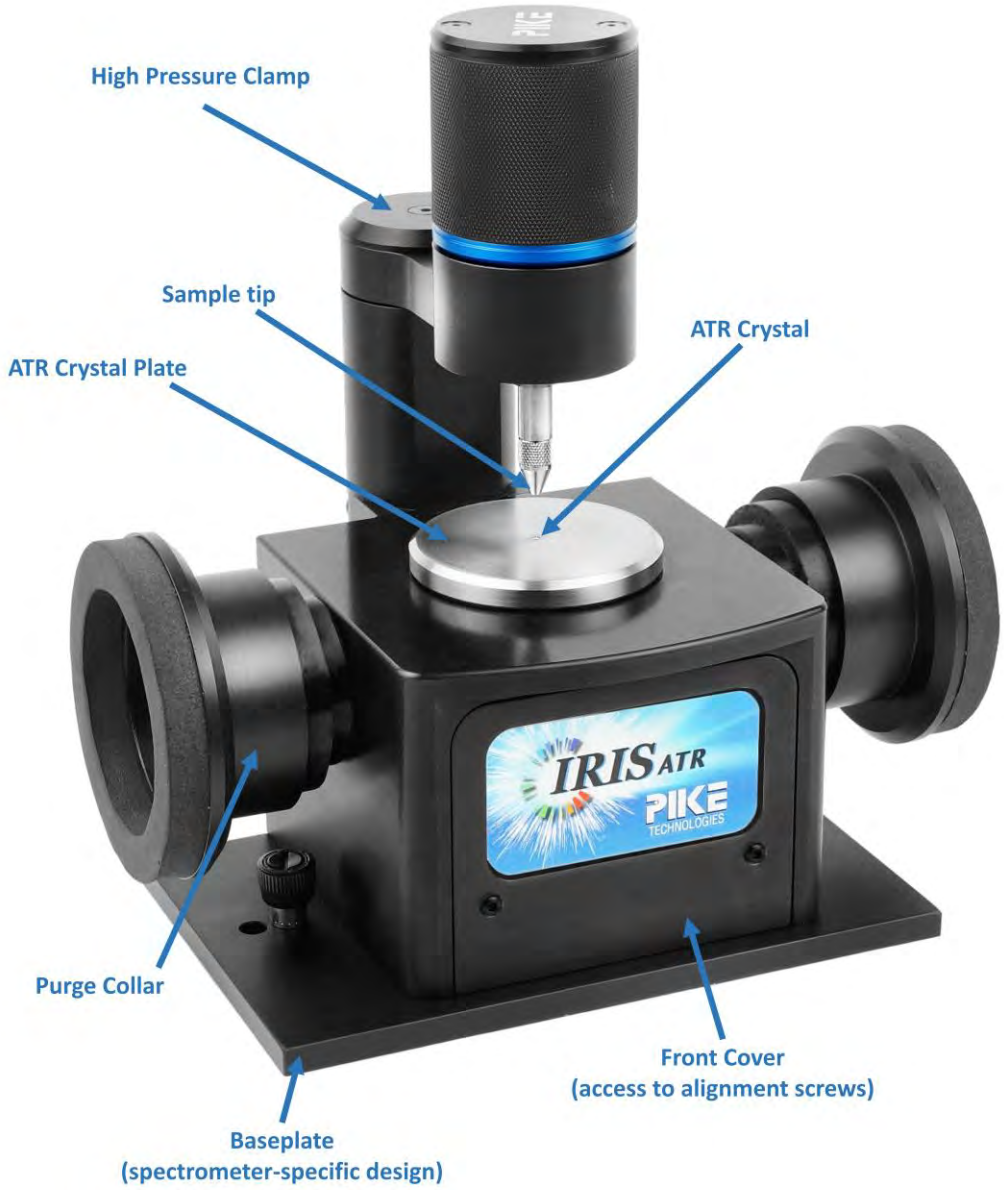


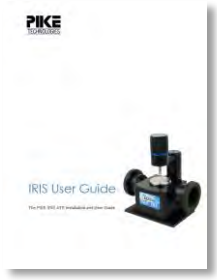
Figure 1. Overview of IRIS ATR components.

Unpacking Your Accessory

In order for you to quickly verify receipt of your accessory, we have included a packing list. Please inspect the package carefully. Contact PIKE Technologies immediately if any discrepancies are found.

Packing List

IRIS ATR Manual
PN 350-027018
Quantity 1



IRIS ATR Base Unit
PN 027-18XX
Quantity 1

IRIS ATR High-Pressure Clamp
PN 027-30XX
(Ordered separately)

Purge Tubing Kit

PN 025-3055
Quantity 1

Liquids Retainer and Volatiles Cover
PN 026-5013
(Ordered separately)

Press Tips
(Included with Clamp)
PN 025-3099
One set

M2 and 3/32" Hex Wrenches

Quantity 1

M4 Hex Wrench
(Included with Clamp)
Quantity 1

Packing List (Continued)

IRIS ATR Crystal Plate Options

Table 1. Available IRIS ATR crystals.

Description	Part Number
Diamond Crystal Plate	027-2100
Diamond Crystal Plate, Extended Range	027-2110
Ge Crystal Plate	027-2120

The IRIS ATR base optics assembly has attached purge tubes. Some base optics assemblies may appear different due to specific baseplate mountings for your FTIR.

The pressure clamp, press tips, purge tubing kit, ATR crystal plate, and wrench set are packed separately in the IRIS packaging. The purge tubing kit is not needed with most FTIR models. The swivel tip is attached to the pressure clamp assembly.

Assembly

Your IRIS ATR accessory has been configured to fit the sample compartment of the FTIR make/model specified in the sales order. Attach the IRIS body to the baseplate. If purging is required, press the included blue tubing onto the brass barb located on the purge tube.

ATR Crystal Plate Installation

Install the ATR crystal plate by placing the plate over raised guide on the top of the IRIS. Ensure that the alignment pin of the ATR crystal plate is oriented such that it fits into the pin notch of the raised guide (see Figure 2). Press the ATR plate down to ensure the magnets are engaged.

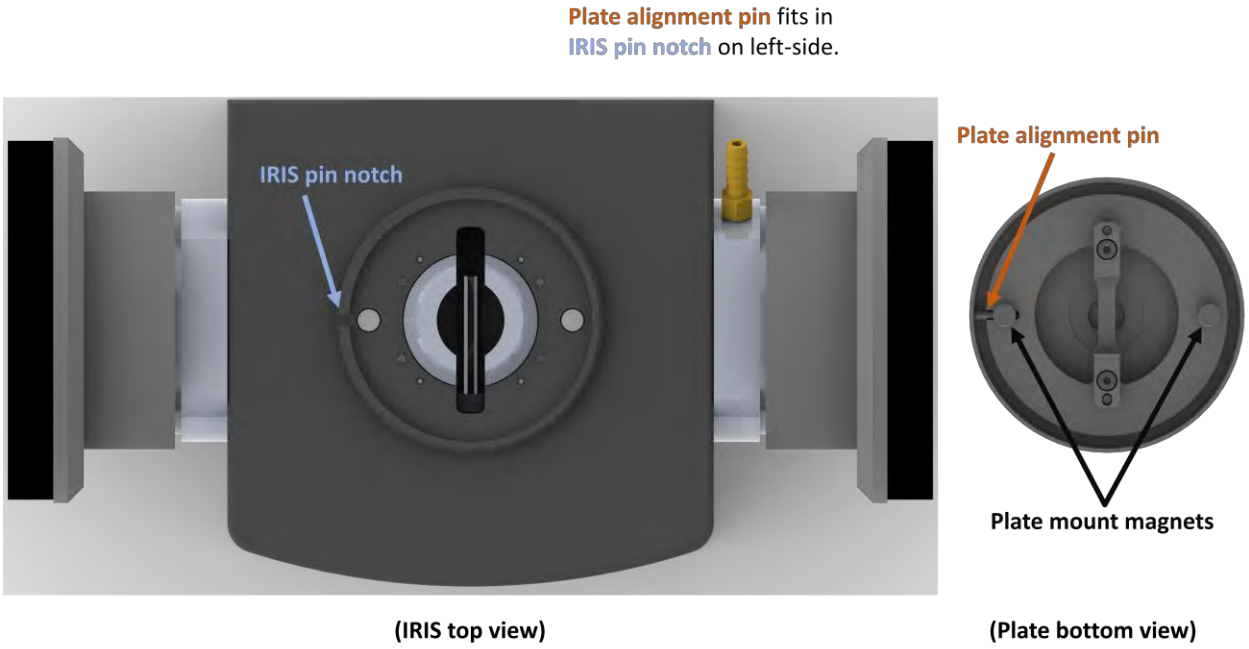


Figure 2. ATR Plate alignment pin mating.

Clamp Installation

The high-pressure clamp is required when testing solid samples to establish intimate contact between the ATR crystal and the sample. To install, place the clamp over the dowel pins located on the backside of the IRIS base (see Figure 3). Secure using the two M4 hex screws (M4 wrench included).

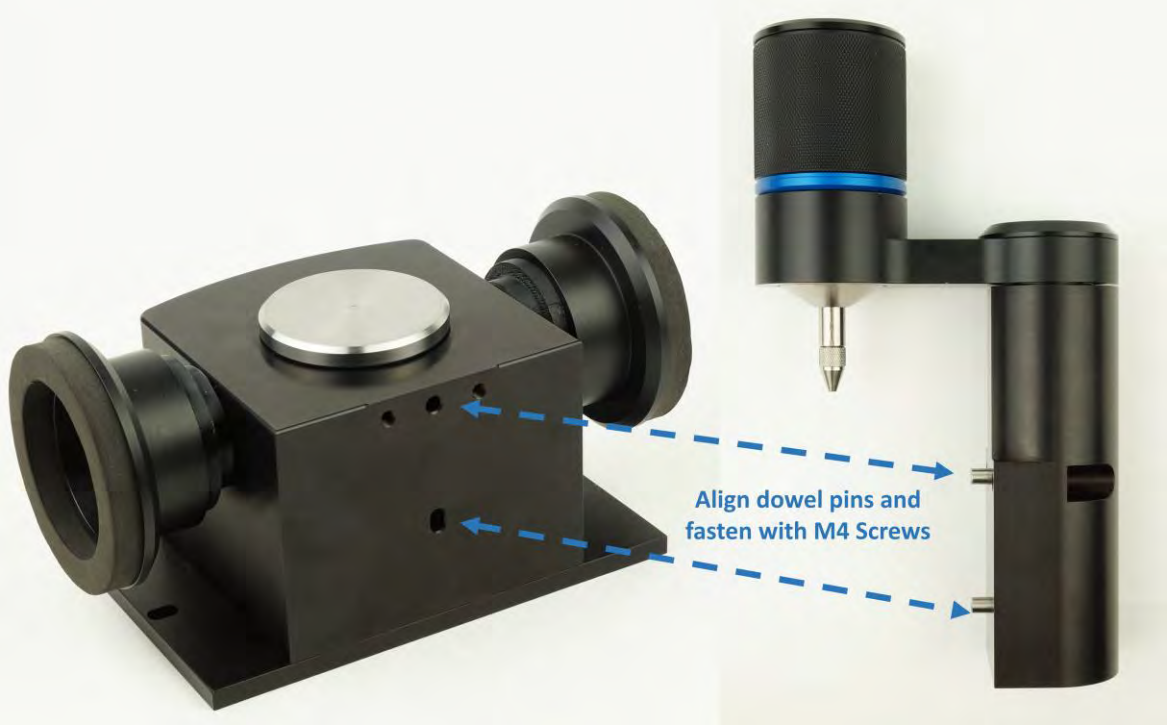


Figure 3. Installing the IRIS high-pressure clamp.

Installation

The IRIS ATR accessory has been aligned and tested at the PIKE Technologies facility on the make of your FTIR spectrometer to ensure that it performs to specifications. However, some variation in optical alignment can occur from spectrometer to spectrometer. To allow for this difference, alignment screws are located within the IRIS ATR base optics assembly for fine-tuning once the accessory is installed in the spectrometer.

1. Set your FTIR spectrometer to collect data at 4 cm^{-1} spectral resolution (including the FTIR J-stop).

2. Your IRIS ATR is provided with the appropriate sample compartment baseplate for the model FTIR instrument you specified. Before inserting the accessory in the sample compartment, ensure that your spectrometer is aligned. If the instrument is not aligned, maximize the interferogram signal (the IR energy throughput) of your FTIR spectrometer. This should be performed by following the manufacturer's instructions.

3. Collect an open beam measurement as the background scan.

4. Fasten the accessory directly into the FTIR sample compartment or onto the FTIR sample compartment baseplate. In order to locate the accessory in the correct position, simply place the entire accessory into the FTIR sample compartment with the IRIS ATR label facing the front and line up the baseplate provided with the holes/pins in your model FTIR spectrometer.

5. Tighten the mounting screws to firmly position the accessory baseplate onto the FTIR sample compartment baseplate.

Alignment

The IRIS ATR accessory may not require any alignment when installed (see page 11 for minimum energy throughput values). However, should you choose to fine-tune the accessory in an effort to improve throughput, a field alignment can be performed using the 3/32" hex wrench stored in the body of the IRIS.

The IRIs has 4 internal flat mirrors, denoted FM_1, … FM_4. The flat mirrors FM_1 and FM_4 are the only mirrors involved in the field alignment (see Figure 4). To ensure proper alignment, it is important to follow the order of adjustments as described in the field alignment procedure.

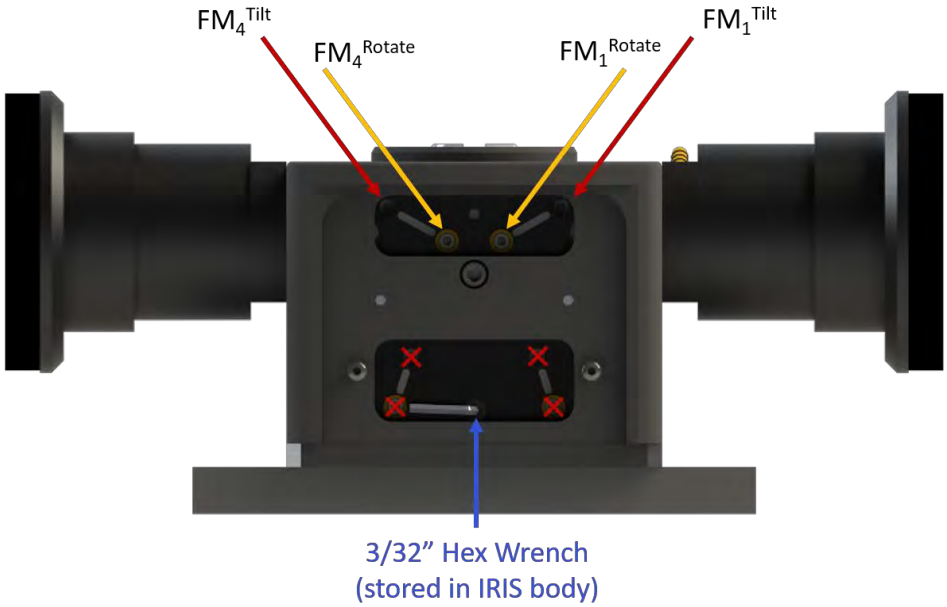


Figure 4. Schematic of the IRIS mirror adjustment screws used to perform a field alignment. Red x-marks denote the screws that should not be adjusted.

Field Alignment Procedure

This is a one-time alignment procedure that optimizes the IRIS ATR to work with an individual optical bench. Once completed, the alignment does not have to be repeated unless accessory adjustments have been moved or it is to be used in a different FTIR instrument.

1. Collect an open beam background measurement.

2. Install the IRIS accessory and set the spectrometer scan mode to an active monitor mode. Active monitoring of the energy will provide the user with the feedback necessary to make mirror adjustments that improve throughput.

3. Using the included M2 hex wrench remove the 2 screws supporting the IRIS' front plate.

4. Using the included 3/32" hex wrench, follow the (Right-to-Left) or (Left-to-Right) IR Beam-Direction-specific alignment procedure, below.

CAUTION: Alignment adjustments to mirrors not mentioned below and/or adjustments made in a different sequential order than defined below, may result in misalignment, possibly requiring that the IRIS accessory be serviced.

Right-to-Left IR Beam-Direction Spectrometer

5. Adjust FM_1^{Tilt} screw to maximize the energy.

   NOTE: The transmittance amplitude maximum does not occur at 1000 cm^{-1}. Step 3 specifies 1000 cm^{-1} purely as a reference point at which the impact of alignment adjustments can be evaluated.

6. Adjust FM_4^{Tilt} screw to maximize the energy.

7. Adjust FM_1^{Rotate} screw to maximize the energy.

8. Adjust FM_4^{Rotate} screw to maximize the energy.

9. If further throughput improvement is desired, repeat steps 5-8.

   You are now ready to verify the IRIS optical throughput performance.

Left-to-Right IR Beam-Direction Spectrometer

5. Adjust FM_4^{Tilt} screw to maximize the energy.

   NOTE: The transmittance amplitude maximum does not occur at 1000 cm^{-1}. Step 3 specifies 1000 cm^{-1} purely as a reference point at which the impact of alignment adjustments can be evaluated.

6. Adjust FM_1^{Tilt} screw to maximize the energy.

7. Adjust FM_4^{Rotate} screw to maximize the energy.

8. Adjust FM_1^{Rotate} screw to maximize the energy.

9. If further throughput improvement is desired, repeat steps 5-8.

   You are now ready to verify the IRIS optical throughput performance.

Performance Verification

1. Collect an open beam background spectrum before the accessory is placed in the sample compartment.
2. Place the aligned IRIS ATR accessory into the instrument.
3. Collect a transmittance spectrum using the same collection parameters as used to collect the background spectrum. This resulting spectrum is termed a Throughput Spectrum and measures the IR spectrum through the IRIS ATR accessory.
4. Place a cursor on the throughput spectrum at 1000 cm^{-1} and record the value in % transmittance.

Table 2 shows the expected IRIS performance specifications for each available ATR crystal type.

Table 2. Minimum IRIS energy throughput value and spectral range for IRIS ATR crystals.

Crystal Plate Type	Part Number	Throughput at 1000 cm^{-1}	Spectral Range
Diamond	027-2100	>14%	5000 – 400 cm^{-1}
Diamond, Extended Range	027-2110	>8%	15000 – 30 cm^{-1}
Ge	027-2120	>14%	5000 – 450 cm^{-1}

NOTE: The standard diamond ATR plate (027-2100) has an anti-reflective coating on the prism faces to maximize transmittance of the IR beam and minimize reflection losses. The extended range diamond plate (027-2110) does not have an anti-reflective coating on the prism face; thus, the energy throughput is lower while the spectral range is increased.

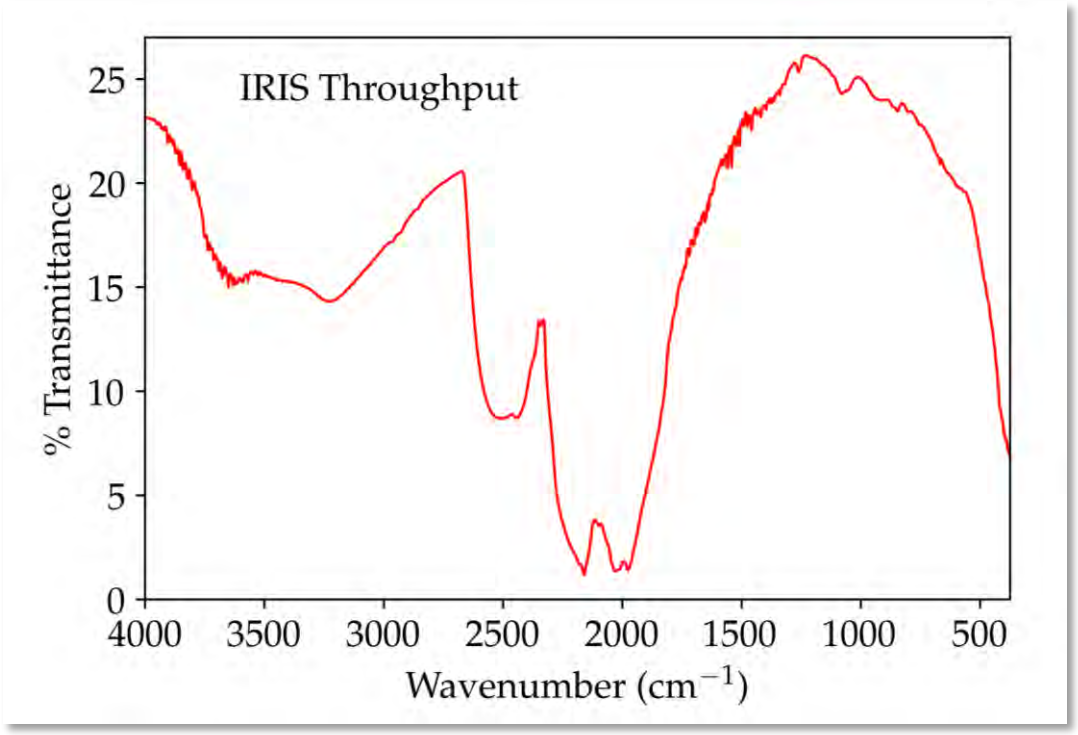


Figure 5. Representative IRIS diamond ATR crystal throughput spectrum. The throughput spectrum of each individual IRIS accessory may vary but should match or exceed the specifications listed in Table 2.

NOTE: The energy throughput spectrum depends on the ATR crystal (diamond or Ge). An example throughput spectrum for diamond is shown in Figure 5. Diamond has strong, broad phonon absorbance bands in the region of 2100 cm^{-1}. This is normal and will ratio out relatively well in resulting spectra.

Sampling Procedures

Collect the background spectrum with the accessory in the sample compartment. Make sure the ATR crystal is clean and free of any residues. Once completed, place the sample on the crystal surface (apply the clamp if solid) and collect sample spectrum. A single crystal plate is design for the analysis of all types of samples (liquids, pastes, powders, soft pliable films and solids).

The sample must be in intimate contact with the ATR crystal surface for the evanescent wave to provide an ATR signal. Note that the Ge crystal is made of materials considerably softer than diamond. Ge can be scratched if care is not used to remove samples. Scratches on the surface of the crystal will result in a reduction in the throughput of the accessory. Remove the sample gently with a non-abrasive cotton tissue and clean with solvent. The crystal plate should be cleaned with an appropriate mild solvent, such as isopropyl alcohol or a stronger solvent when necessary. Cotton swabs are highly recommended for ease of cleaning without scratching the ATR crystal surface.

Sometimes "carry over" may occur from one sample to another due to incomplete cleaning of a prior sample from the face of the crystal. This effect may be minimized by collecting a new background spectrum before each sample spectrum.

Samples should not be left in contact with the crystal for an extended period of time since some samples may degrade the crystal material and discoloration of the metal plate can occur. Once the measurement has been made, remove the sample from the crystal and clean the surface of the crystal and the surrounding plate area with a suitable solvent. Note that the High-Pressure Clamp for the IRIS ATR can be swung to the side to give more access to the ATR crystal area.

Configuration for Liquid Sampling

The crystal plate assembly of the IRIS single reflection ATR features a round plate design, with a 1.8 mm diameter sampling area. The sample must be in intimate contact with the sampling area in order to obtain an FTIR spectrum. For routine sampling, place a drop of your sample on the ATR crystal and collect data. Caution must be exercised when removing the sample from the crystal. It is desired that the sample be removed without scratching the surface of the crystal.

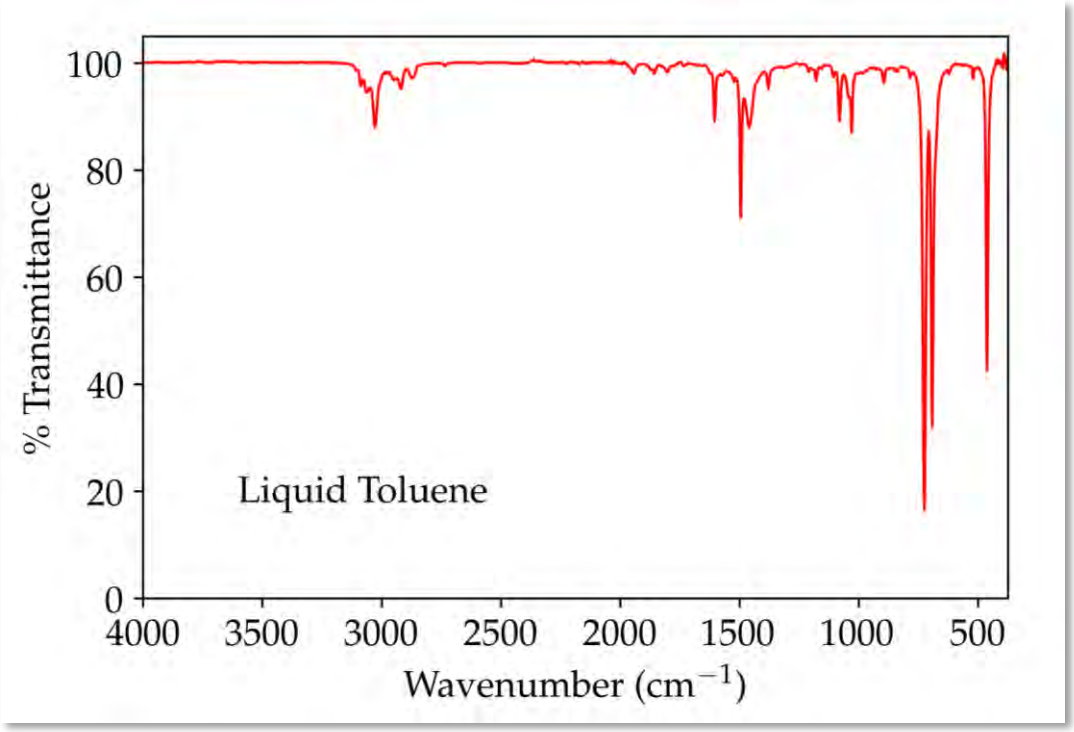


Figure 6. Example of a toluene spectrum collected using the IRIS ATR.

Once the measurement has been made, remove the sample from the crystal and clean the surface of the crystal and the surrounding plate area with a suitable solvent.

CAUTION: Samples should not be left in contact with the crystal for an extended period of time since some samples may degrade the crystal material and discoloration of the metal plate can occur.

NOTE: The Ge ATR crystal is more brittle than diamond. Scratches on the surface of the crystal will result in a reduction in the throughput of the accessory.

Liquid Sampling Tools

An optional liquids retainer and volatiles cover are available for quickly-evaporating liquid samples. For volatile liquids, the liquid retainer with volatiles cover reduces the amount of evaporation of the sample on the surface of the crystal (Figure 7, left). To use, place the retainer disk over the ATR crystal. Place the U-shaped bridge over the retainer disk. Apply pressure to the U-shaped bridge using the pressure clamp. Fill the reservoir of the liquid retainer with the volatile liquid. Slide the volatiles cover between the retainer disk and the U-shaped bridge. Liquids retainer may be used with the high-pressure clamp only.

Figure 7. IRIS ATR Volatile Liquids Retainer (left) and Flow-Through Attachment (right).

For continuous sample monitoring, or for applications where sample needs to be completely enclosed for safety or reactivity reasons, an optional Flow-Through Attachment is available. To use, place the Flow-Through Attachment over the ATR crystal. Apply the clamp to the top of the Flow-Through Attachment, which creates a seal between the O-ring located on the underneath side of the Flow-Through Attachment and the ATR crystal plate (Figure 7, right). Using the Luer fittings, load the sample by connecting a syringe or a flow line. Optional 1/16th inch compression fittings available.

Configuration for Solid Sampling

For measurements of soft, pliable films, powders and select solid samples, the sample is placed onto the surface of the crystal. Since the ATR effect only takes place very close to the surface of the crystal, an intimate contact has to be made by the sample on the ATR crystal surface. This is achieved by using the high-pressure clamp ordered with your IRIS ATR accessory. With the sample in place on the crystal, lower the pressure tip by turning the clamp knob so that the clamp tip is in contact with the sample. In most cases, it is recommended to apply the maximum pressure allowed by turning the clamp clockwise until the slip clutch is engaged to ensure the best contact and highest sampling sensitivity. The slip clutch mechanism avoids surpassing the maximum acceptable pressure, which could damage the ATR crystal. The maximum force applied by the high-pressure clamp is 40 pounds (~10,000 psi).

CAUTION: If the sample contains grit or abrasive materials, the sample motion may damage the surface of the crystal while pressure is being applied. Ensure that the sample remains stationary while applying load to the clamp. In addition, Ge needs to be handled with care when running hard or sharp sample types. Do not apply the maximum pressure to these types of samples on softer ATR crystals to avoid scratching or denting. Never apply the clamp directly to the ATR crystal in the absence of a sample.

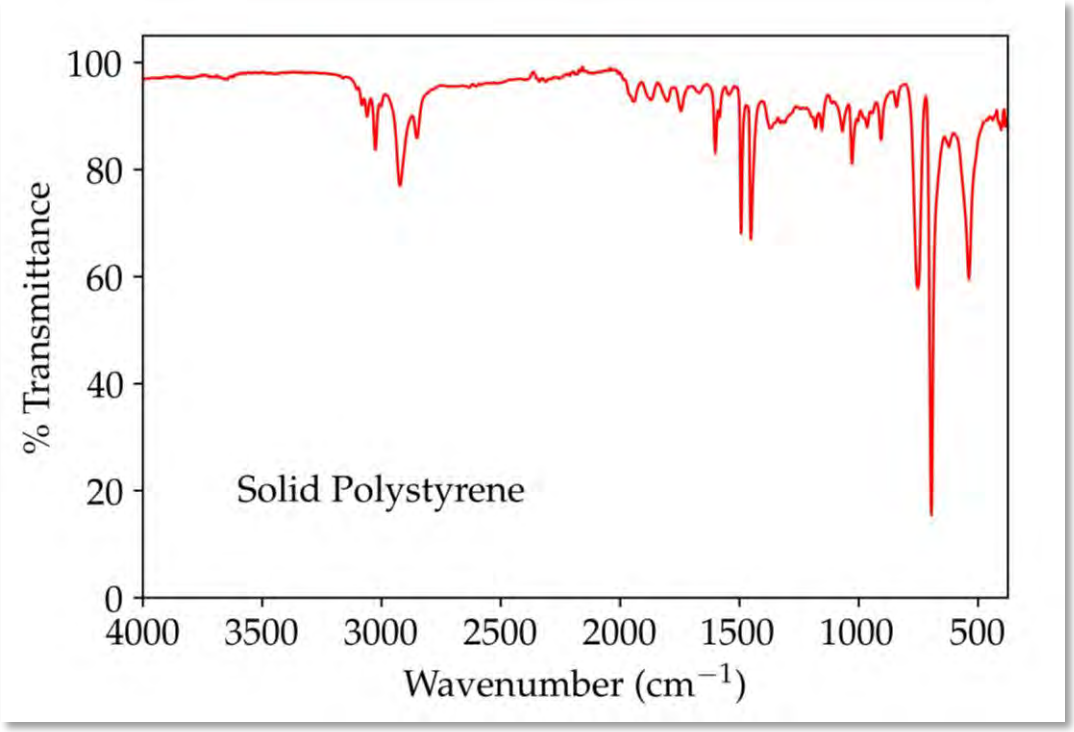


Figure 8. Example of spectrum of polystyrene collected using IRIS ATR.

NOTE: The IRIS ATR high-pressure clamp has the ability to swing sideways for ease of accessing the crystal surface for cleaning and to safely remove the ATR crystal plate.

CAUTION: IRIS ATR crystal damage caused by excessive clamp pressure cannot be covered by the warranty. To prevent damage to the IRIS ATR crystal and possible void of warranty, the factory-set slip-force settings of the high-pressure clamp should not be modified.

Extra caution should be taken when using the High-Pressure Clamp with the Ge ATR plate due to its greater vulnerability to mechanical damage when compared to diamond. The diamond crystal plate is very rugged. The diamond crystal will withstand higher pressures than traditional IR materials, but it still may be damaged by excessive force. For this reason, do not exceed the pressure originally set by the factory on the High-Pressure Clamp. The applied pressure is a function of the size of the press tip for large samples or the size of the sample for small samples.

Pressure Clamp Tip Attachments

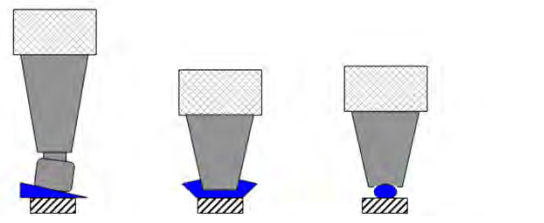


Figure 9. Included IRIS sample tips.

The success of an ATR measurement depends upon the quality of the contact between the sample and the crystal. Since there is an infinite number of sample shapes and types, a single configuration of the sample press tip may not be adequate. For this reason, the IRIS ATR pressure clamp is designed to accept three different tip attachments, providing the best possible configuration for any given sample.

The accessory is shipped with the swivel tip attached to the pressure clamp ordered with the IRIS ATR accessory. This tip features an end cap mounted onto a small ball joint. Such design allows the press tip to move and adjust its position to the shape of the sample and maintain the sample position parallel to the crystal surface. This tip allows for better positioning and optimal contact of thin materials with the ATR crystal surface. The swivel tip is used with irregularly shaped samples, films, semi-rigid polymers.

The flat tip attachment is a flat-tipped cone and it is used when analyzing thin films, fibers, small particles, rubber samples and other elastic polymers. The flat tip may also be used for powdered samples.

The concave tip was developed specifically to work with granules, large beads and polymer pellets. The tip features a concave surface, which prevents the sample from escaping from underneath the press. It also forces the spherical samples to stay in the center of the crystal assuring maximum IR signal strength. Do not use the concave tip for powdered samples or samples which do not completely protect the concave edges of the steel tip from pressing against the crystal - this will damage the ATR crystal.

Crystal Cleaning

The solvent used for cleaning your crystal is dependent on the sample that has been analyzed. In all cases it is best to attempt to clean the crystal with the mildest solvent possible. For most cases, the preferred solvent is isopropyl alcohol. A stronger solvent may be used when necessary. In very stubborn cases dimethylformamide may be used. In all cases when using solvents, inspect the materials safety data sheet associated with the solvent you are using and comply with any recommended handling procedures. Apply the solvent to the crystal with a cotton swab and gently remove using the cotton swab or non-abrasive wipe. Repeat this procedure until all traces of the sample have been removed. Under no circumstances should the softer crystal materials (Ge) be rubbed with paper-derived products, because many paper products are abrasive and could cause scratching of the softer crystal surfaces.

Effects of Temperature

This sealing mechanism allows some flexibility and hot samples may be placed on the crystal without damaging the crystal or seal. However, it is recommended that the temperature difference between the sample and the crystal be not more than 30 °C.

ATR Spectra

ATR spectra are similar to transmittance spectra. A careful comparison of ATR spectra and transmittance spectra reveals that the intensities of the spectral features in an ATR spectrum are of lower absorbance than the corresponding features in a transmittance spectrum and especially in the high wavenumber (short wavelength) region of the spectrum. The intensity of the ATR spectrum is related to the penetration depth of the evanescent wave into the sample. This depth is dependent on the refractive index of the crystal and the sample, with shorter wavelengths penetrating a shorter distance than longer wavelengths of IR radiation.

The relatively thin depth of penetration of the IR beam into the sample creates the main benefit of ATR sampling, avoidance of complete IR radiation absorption. This is in contrast to traditional FTIR sampling by transmittance where the sample must be diluted with IR transparent salt, pressed into a pellet or pressed to a thin film, prior to analysis to prevent complete absorption of the IR radiation.

A comparison of transmittance vs. ATR sampling spectra for a thick polymer sample is shown in Figure 10, where the sample is too thick for high quality transmittance analysis (blue spectrum). In transmittance spectroscopy, the IR beam passes through the sample and the effective path length is determined by the thickness of the sample and its orientation to the directional plane of the IR beam.

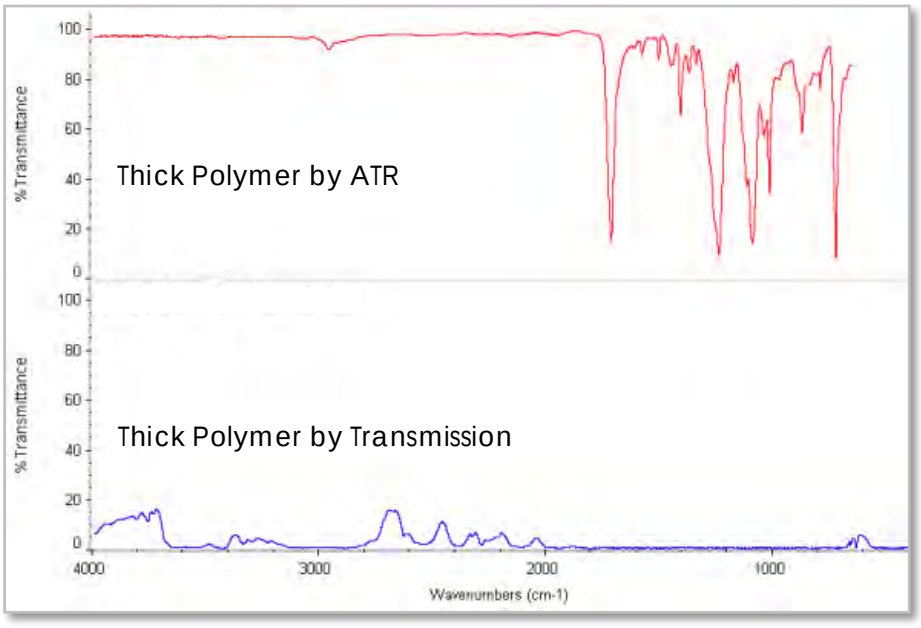


Figure 10. Thick polymer sample FTIR spectrum collected by ATR (red) and transmittance (blue).

Clearly in this example the sample is too thick for transmittance analysis because most of the IR spectrum exhibits a Transmittance < 1%. However, simply placing the thick sample on the ATR crystal and applying pressure provides sufficiently good contact for the evanescent wave to penetrate into the sample a short distance, resulting in a high-quality ATR Transmittance spectrum (upper red spectrum) free of spectral regions of complete IR beam absorbance. The quality of this ATR Transmittance spectrum is indicated by successful chemometric identification of the sample (polybutylene terephthalate) by library search. The total analysis time for the thick polymer by ATR was less than one minute.

ATR Correction Post-processing

If an ATR spectrum representative of a transmittance spectrum is desired, the ATR spectrum must be processed with the ATR correction program available in your instrument software. An example of the effect of this correction on a spectrum is shown in the following example for polystyrene. The middle spectrum is the original ATR spectrum of polystyrene. The lower spectrum is the transmittance spectrum of polystyrene. Clearly the IR bands around 3000 cm^{-1} in the ATR spectrum are weaker relative to the IR bands at longer wavelength.

However, in the upper red spectrum after ATR correction, the relative IR band intensities are very similar to those from the polystyrene run by transmittance.

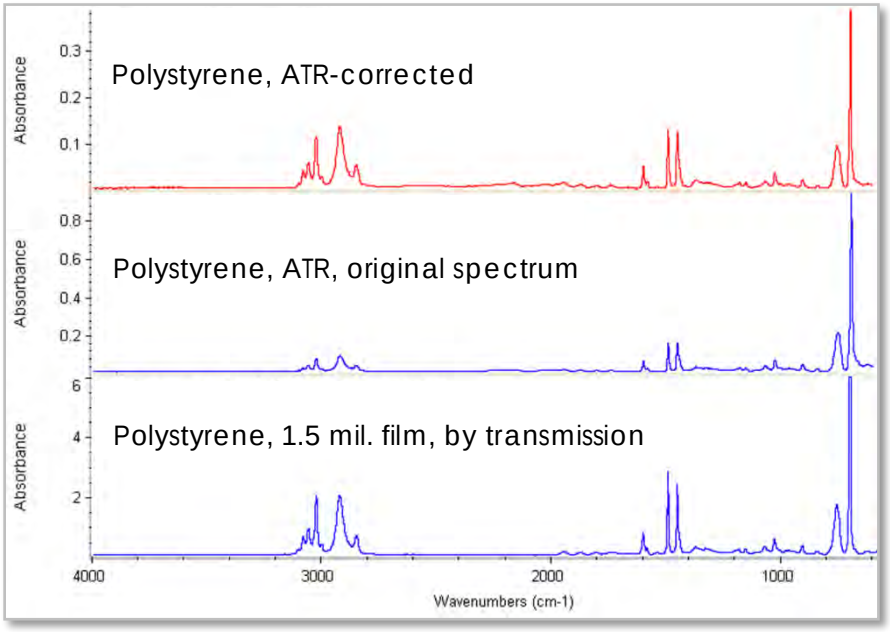


Figure 11. ATR-corrected polystyrene spectrum.

Useful Equations

The depth of penetration (d_p) provides a relative measure of the intensity of the resulting spectrum and is expressed by the following equation:

$$d_p = \frac{\lambda}{2\pi(\, n_1^2\, sin^2\, \theta - n_2^2\,)^{1/2}}$$

Where λ is the wavelength of light, n_1 is the refractive index of the crystal, n_2 is the refractive index of the sample and θ is the effective angle of incidence.

Depth of penetration in microns as a function of crystal material is shown in Table 3. The penetration depth is calculated for a sample with a refractive index of 1.5 at 1000 cm^{-1}.

Table 3. Material properties of diamond and germanium ATR crystals.

Material	Refr. Index	d_p (**μ**) @1000 cm^{-1}	pH Range	Long Wave Cutoff
Diamond	2.4	2.0	1-14	30 cm^{-1}
Ge	4.0	0.66	1-14	450 cm^{-1}

Crystal ATR Materials

Diamond

Diamond is one of the most rugged optical materials. It can be used for analysis of a wide range of samples, including acids, bases, and oxidizing agents. Diamond is also scratch and abrasion resistant. Its disadvantage is the intrinsic absorption from approximately 2300 to 1800 cm^{-1} which limits its usefulness for detecting extremely small absorbance across this spectral range.

Germanium

Germanium has been used extensively in the past as a higher refractive index material for samples that produce strong absorptions such as rubber O-rings. The crystal is also used when analyzing samples that have a high refractive index, such as in passivation studies on silicon.

Precautions

Mirrors

In order to provide the maximum reflectivity in the infrared, with the minimum spectral interferences, the mirrors used in this device are gold-coated. Normally, these mirrors will not require cleaning, since they are contained within the housing of the accessory. If they do need cleaning, please contact PIKE for recommendations. Under no circumstances must the mirrors be rubbed with paper products since this will produce scratching of the mirror surface.

SAFETY

Caution should be used when handling and using ATR crystals since some of the materials can be hazardous. If the crystal is broken or pulverized, the dust may be harmful by inhalation, ingestion or skin absorption.

Protection provided by the equipment may be impaired if the equipment is used with accessories not provided or recommended by the manufacturer, or is used in a manner not specified by the manufacturer.

Environmental Ratings

Installation Category II	Transient over-voltage
Pollution Degree 2	Temporary conductivity caused by condensation
Altitude Limit	2,000 meters
Use	"Indoor" use
Ambient Temperature	40 °C max
Humidity	80% RH non-condensing

Specifications

ATR Crystal Choices	Diamond, germanium
Crystal Plate Mounting	User changeable plates
Crystal Type	Monolithic
Diamond Set	Mechanical With PTFE Seal
Crystal Plate Mounts	Stainless steel
Angle of Incidence	45°, nominal
Diamond Surface	1.8 mm diameter
Optics	All reflective
Pressure Device	Rotating, continuously variable pressure; click stop at maximum
Maximum Pressure	10,000 psi
Sample Access	46 mm, ATR crystal to pressure mount
Spectral Range, Diamond	4000 to 30 cm^{-1} (IR optics dependent)
Specular Reflection Option	Optional, 45° nominal angle of incidence
Purge	Purge tubes and purge line connector included
Accessory Dimensions (W x D x H)	102 x 102 x 84 mm (excludes FTIR baseplate and High-Pressure Clamp)
FTIR Compatibility	Most, specify model and type

Replacement Parts and Options

The following parts and options may be ordered for the IRIS ATR accessory.

Crystal Plates

Part Number	Description
027-2100	Diamond Crystal Plate
027-2110	Diamond Crystal Plate, Extended Range
027-2120	Ge Crystal Plate

Pressure Clamp

Part Number	Description
027-3025	High-Pressure Clamp

Other Attachments

Part Number	Description
026-5012	Flow-Through Attachment
026-5013	Liquids Retainer and Volatiles Cover Set
026-5010	Liquids Retainer for Performance Plates
026-3051	Volatiles Cover for Performance Plates
025-3095	Flat Press Tip
025-3093	Swivel Press Tip
025-3092	Concave Press Tip
025-3099	Press Tip Assortment

RoHS 3.0: 2015/863/EU

	The crossed out wheeled bin is a clear reminder that the product must NOT be disposed with household waste. It is the responsibility of the buyer to discard the product in accordance with Federal, regional and local environmental regulations.	This label is located outside the accessory, on the back cover.