



INSTALLATION AND USER GUIDE

# GladiATR™

Single Reflection ATR Accessory

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## Introduction

The GladiATR is an all new attenuated total reflectance (ATR) accessory created for demanding applications. It utilizes a monolithic diamond crystal which can withstand pressure application up to 30,000 psi (2,110 kg/cm<sup>2</sup>) and provides the ability to fully compress samples to make intimate contact for excellent ATR spectral data. The type IIa diamond used in the GladiATR is the hardest known material for infrared (IR) sampling – Knoop hardness of 5700 kgf/mm<sup>2</sup> compared to 120 kgf/mm<sup>2</sup> for zinc selenide (ZnSe). The hardness of diamond prevents the possibility of scratching the crystal so common with ZnSe based ATR crystals, especially with very hard or abrasive materials. Diamond is also compatible with high and low pH samples so the combination of these materials in the GladiATR offers exceptional long-term operation without loss of performance.

The GladiATR utilizes a unique focusing design to maximize IR throughput within a small diamond crystal and thereby provides the highest signal-to-noise ratio (SNR) in your spectral data. High SNR spectral data improves sample identification and enables shortening of the data collection time.

The GladiATR is available with an optional germanium (Ge) crystal plate for analysis of high refractive index samples such as carbon filled rubber. The crystal plates are easily exchangeable with one another. The IR beam makes a single reflection within the GladiATR crystal and its angle of incidence is 45° relative to the sampling surface. An optional specular reflection plate is available for the GladiATR with specular reflection analysis at 45° angle of incidence.

Utilizing the diamond crystal of the GladiATR with its 45° angle of incidence the depth of penetration of the IR beam for most organic samples is about 2 microns at 1000 cm<sup>-1</sup>. This small depth of penetration enables most liquid, solid, polymer, gels or paste samples to be measured without any sample preparation – greatly saving analysis time compared to conventional transmission sampling techniques. Solid samples are placed upon the diamond ATR crystal, pressure is applied via the click-stop pressure clamp and the spectrum is collected. Liquid samples are simply applied to the ATR crystal and the spectrum is collected. If the liquid sample is volatile the optional Liquids Retainer should be attached to the crystal plate and the included Volatiles Cover is placed over the sample before the spectrum is collected.

The GladiATR offers optional resistively heated crystal plates with maximum temperature operation to 210 °C or 300 °C. These heated crystal plates are operated via PIKE digital PC or digital temperature controllers. Using the PIKE digital PC temperature controller temperature, up to 10 different ramps with automatic data collection at specified temperature or time intervals may be programmed. Liquid jacketed crystal plates are also available for the GladiATR. With these plates you can connect a liquid circulator to heat or cool the ATR sampling surface.

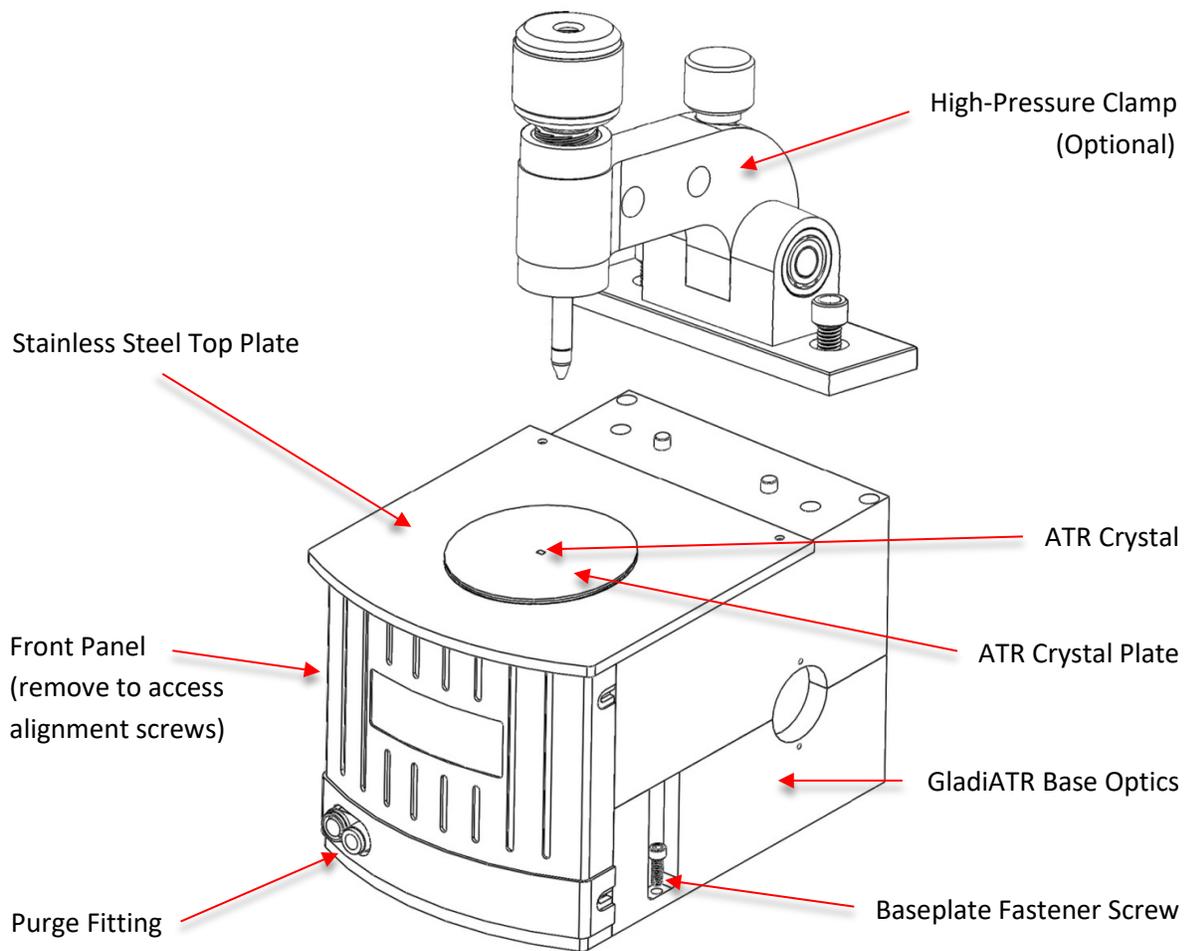


Figure 1. Assembly view of the GladiATR ATR accessory

**NOTE:** High-Pressure Clamp, Liquids Retainer and Volatiles Cover are optional and need to be ordered separately.

# 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

GladiATR Manual  
PN 350-026018  
Quantity 1

The image shows the cover of the GladiATR manual. It features the PIKE Technologies logo at the top left, a photograph of the GladiATR unit in the center, and the text "INSTALLATION AND USER GUIDE" on the right side. At the bottom, it reads "GladiATR™ Single Reflection ATR Accessory".

GladiATR Base Unit  
PN 026-18XX or 026-17XX  
Quantity 1

The image shows the GladiATR Base Unit, a rectangular metal device with a blue base and a silver top. It has a circular opening on the top surface and a black cylindrical component on the left side. The PIKE GladiATR logo is visible on the front.

GladiATR Top Plate  
PN 026-2001/2 or 3  
Must Select

The image shows the GladiATR Top Plate, a square metal plate with a circular hole in the center.

GladiATR High-Pressure Clamp  
PN 026-3020  
Optional

The image shows the GladiATR High-Pressure Clamp, a mechanical device with a black base and a silver upper section. It has a large black knob on top and a small nozzle at the bottom.

Press Tips  
PN 025-3099  
One set

The image shows three different sizes of press tips, which are small, conical metal components with a textured surface.

Foam Gaskets  
for Purge Tubes  
Quantity 4

The image shows four black foam gaskets, which are circular rings used for sealing purge tubes.

Purge Tubing Kit  
PN 025-3055  
Quantity 1

The image shows the Purge Tubing Kit, which includes a long coil of blue tubing and three small blue and yellow fittings.

Hex Wrenches  
One set

The image shows a set of hex wrenches, including several standard hex keys and one longer, curved hex key, all with a yellow and black handle.

Liquids Retainer and Volatiles Cover  
PN 026-5013  
Optional

The image shows the Liquids Retainer and Volatiles Cover, which consists of a black plastic cover, a black metal bracket, and a black circular gasket.

## Packing List (Continued)

### GladiATR Crystal Plate Options



Description	Part Number
Diamond Crystal Plate	026-2100
Ge Crystal Plate	026-2050
Specular Reflection Plate	026-2200
Heated Diamond Crystal Plate, 300 °C	026-4102
Heated Diamond Crystal Plate, 210 °C	026-4100
Heated Ge Crystal Plate, 130 °C	026-4050
Liquid Jacketed Diamond Crystal Plate	026-4110
Liquid Jacketed Ge Crystal Plate	026-4150

**Notes:** Requires appropriate stainless top. 300 °C heated diamond plate does not require top.

The GladiATR base optics assembly has a crystal plate and the purge tubes attached. Some base optics assemblies may appear different due to specific baseplate mountings for your FTIR.

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

## Assembly

1. Attach the GladiATR base optics to its baseplate. This is done by securing the optics base with two screws, one on each side (Figure2).



Figure 2. Location of screws securing the optics base

2. Install the ATR crystal plate. For proper orientation the engraved work 'back' is situated at the 12 o'clock position. With a diamond plate, you are also able to notice a vertical support bar oriented from front to back on the accessory (Figure 3). The support bar is not visible when using the Ge ATR plate. Installing the ATR crystal plate improperly will result in no or very low throughput energy through the accessory.

When installing the 210 °C heated diamond plate and the heated Ge plate align the electrical pins on the plate to the connector pad located on the top of the base optics and continue to follow the instructions for the standard diamond plate described in step 2.

The 300 °C diamond ATR crystal plate assembly is permanently fixed to the ceramoplastic top plate. Do not remove the puck from its top plate. To install, place the 300 °C assembly, which includes the diamond ATR crystal, onto pins located on the top of the base optics.

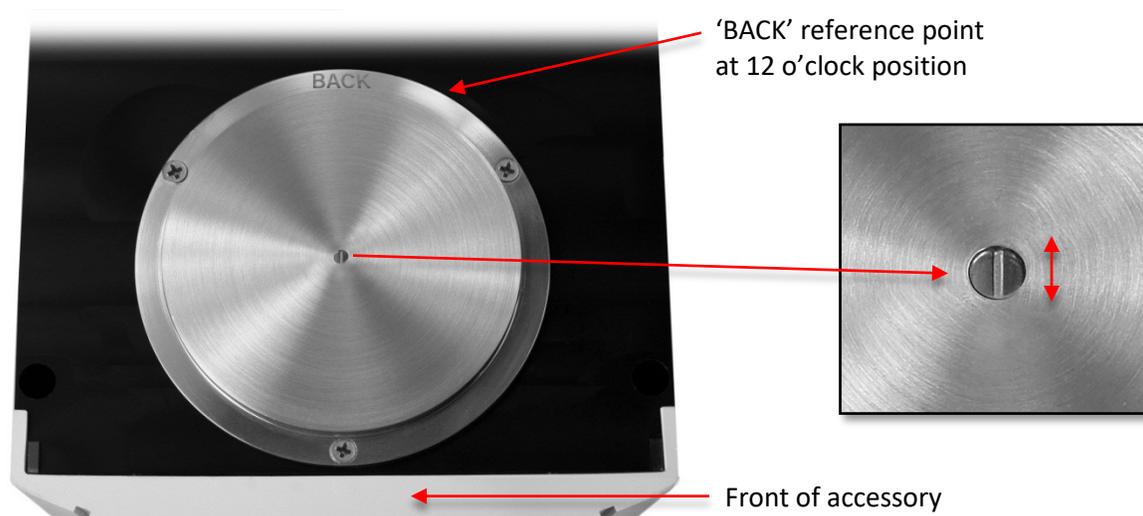


Figure 3. Top view of crystal plate properly seated on the accessory

If the crystal plate is inscribed with the serial number on the back, place the 5-digit serial number face down and to the front of the accessory.

3. Place the clamp over the dowel pins located on the top of the accessory. Secure using the two large hex nuts (Figure 4). Instructions for clamp operation are detailed on page 11 of this manual.
4. Complete accessory assembly by pressing the stainless steel top plate over the crystal ATR plate (Figure 5). No stainless steel top plate required for the 300 °C diamond heated plate.



*Figure 4. Proper placement of clamp on the top of the accessory*



*Figure 5. Proper placement of top plate over the crystal ATR plate*

5. If purging is required, press the blue tubing included with the GladiATR into the quick-disconnect port located on the front of the base optics (Figure 1). To remove the tubing, press the black ring of the opening in and pull the tubing out.
6. The GladiATR may be configured for either heating up to 210 °C or 300 °C. For the 210 °C version, connect the communication cable between to the connector located on the lower left side of the front panel and the temperature controller (Figure 6). For the 300 °C version, connect the communication cable between the connector located on the front of the ceramoplastic top plate and the temperature controller (Figure 7).



Figure 6. 210 °C heated GladiATR

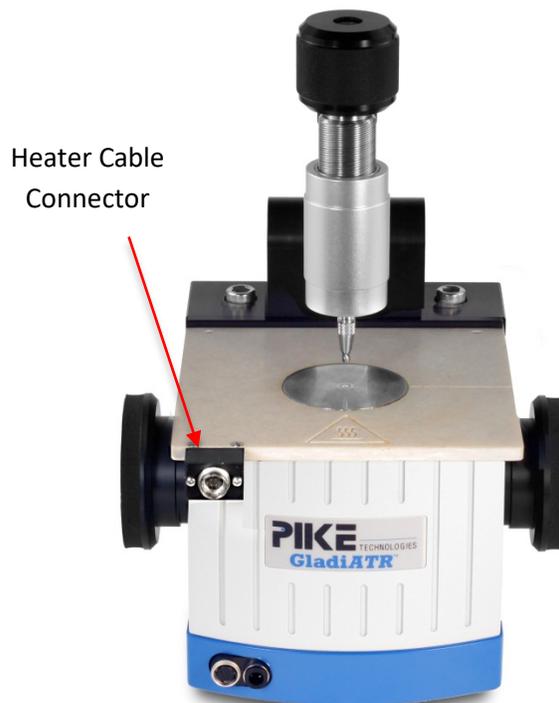


Figure 7. 300 °C heated GladiATR with ceramoplastic top plate

## Installation

The GladiATR accessory has been aligned and tested in 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 GladiATR base optics assembly for fine-tuning once the accessory is installed in the spectrometer.

1. Set your FTIR spectrometer to collect data at 4  $\text{cm}^{-1}$  spectral resolution (including the FTIR J-stop).
2. Your GladiATR 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. Fasten the accessory directly into the FTIR sample compartment or onto the FTIR sample compartment baseplate using the 2 screws located one on each side of the GladiATR base optics

(Figure 1). In order to locate the accessory in the correct position, simply place the entire accessory into the FTIR sample compartment with the GladiATR label facing the front and line up the baseplate provided with the holes/pins in your model FTIR spectrometer.

4. Tighten the mounting screws to firmly position the accessory baseplate onto the FTIR sample compartment baseplate.
5. Mount the pressure clamp onto the accessory using the two alignment dowel pins on top of the GladiATR base and fasten using the two hex-head screws into the clamp frame.

## Alignment

The GladiATR accessory may not require any alignment when installed (see page 10 for minimum energy throughput values). However, should you choose to fine-tune the accessory, follow these steps:

1. Remove the front panel of the GladiATR accessory by loosening the hex-head retaining screws, two on each side of the front panel. Gently pull the front panel forward to release from the screws.
2. Display the live interferogram of the FTIR spectrometer and adjust the input optic, the crystal focus mirror, and the relay mirror. The locations of these mirrors are shown in Figure 8. Turn the individual screws one at a time slightly clockwise and check the signal. If it increases, continue until the maximum signal is obtained. If it decreases, turn the screw counterclockwise to get the highest possible reading. Follow the order shown in the alignment image, first adjusting the input optic screw to obtain the maximum signal, then go to the 2 sets of crystal focus screws and optimize the interferogram signal.
3. Finally, adjust the relay mirror screws to optimize the interferogram signal.
4. Repeat the entire procedure 2-3 times to fine-tune the accessory. This is an initial alignment procedure which optimizes the GladiATR to work with an individual optical bench. Once completed, the alignment does not have to be repeated unless the accessory adjustments have been moved or it has been placed in a different FTIR instrument. You are now ready to verify the GladiATR optical throughput performance.

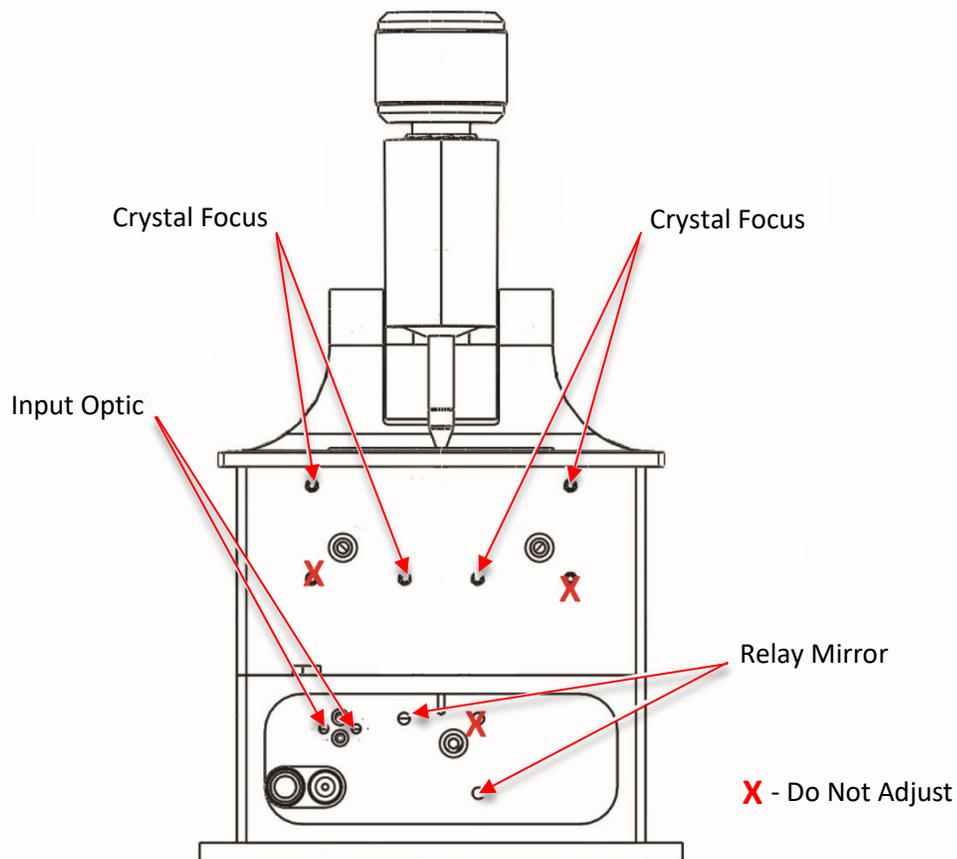


Figure 8. Schematic of the GladiATR showing the location of the focusing optic dial and alignment adjustment optics

## Performance Verification

1. Collect an open beam background spectrum before the accessory is placed in the sample compartment.
2. Place the aligned GladiATR accessory into the instrument.
3. Collect a transmission 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 GladiATR accessory.
4. Place a cursor on the throughput spectrum at  $1000\text{ cm}^{-1}$  and record the value in % transmission.

**NOTE:** The energy throughput spectrum from different crystals (diamond or Ge) will appear different. An example throughput spectrum for diamond is shown below. Diamond has strong, broad phonon absorbance bands in the region of  $2100\text{ cm}^{-1}$ . This is normal and will ratio out relatively well in resulting spectra. The following are minimum % transmission values the accessory should achieve with different crystal configurations at  $1000\text{ cm}^{-1}$ . If the energy throughput is extremely low, check for proper crystal plate orientation.

Diamond Crystal Plate	Greater than 12%T
Ge Crystal Plate	Greater than 12%T

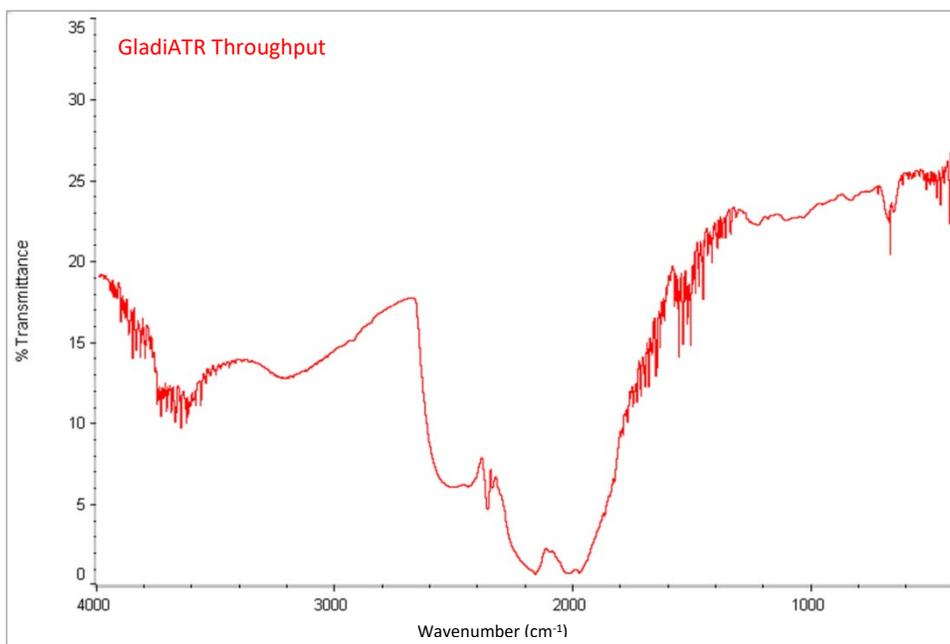


Figure 9. A GladiATR throughput spectrum

## 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 design is used for all types of samples (liquids, pastes, powders, soft pliable films and solids).

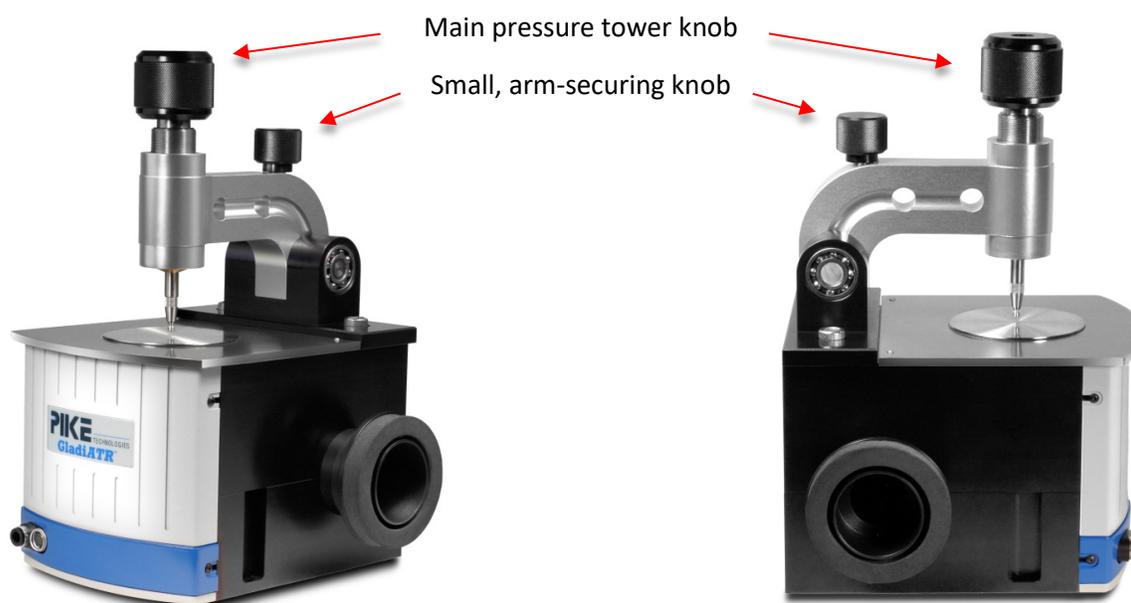
The sample must be in intimate contact with the ATR crystal surface for the evanescent wave to provide an ATR signal. Note that the Ge crystal used in the accessory is made of materials considerably softer than diamond. Ge can be scratched if care is not used to remove samples. Scratches on the surface 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, such as acetone. 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 GladiATR can be swung back to give more access to the ATR crystal area by loosening the smaller clamp knob.

## Sample Analysis with High-Pressure Clamp

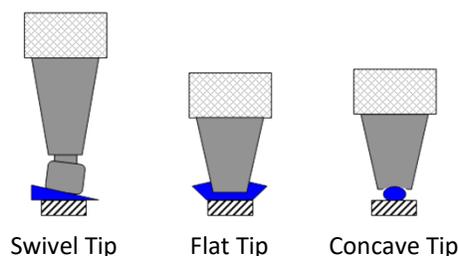
1. Loosen the small, arm-securing knob.
2. Raise the clamp arm up and place your sample on the diamond crystal. Some friction during the arm movement is normal as it prevents its accidental drop and crystal damage.
3. Lower the arm, slightly push the arm-securing knob down and tighten it all the way (please do not use any tools in this process as finger pressure alone is sufficient).
4. Turn the large clamp knob clockwise to compress the sample. Two “clicks” indicate that the optimum pressure has been achieved.
5. After the measurement is completed, release the main knob first and the small knob second if the arm needs to be raised. Please keep in mind that the small knob is spring loaded and it needs to be pressed in for the screw to engage again.



PIKE Technologies also offers a Digital Force Adapter, which allows the user to monitor the applied force using an external monitor. By embedding a precision digital load cell into the vertical pressure arm of the GladiATR High-Pressure Clamp, users gain added control of the pressure applied to samples. The Digital Force Adapter may be retrofitted in the field to any existing GladiATR High-Pressure Clamp. Please see the Digital Force Adapter manual for installation and use.

**CAUTION:** A GladiATR crystal damaged by excessive pressure cannot be covered by the warranty. Caution is required when using the High-Pressure Clamp with the Ge ATR plate. The diamond crystal plate is very rugged. This 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



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 GladiATR 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 GladiATR 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.

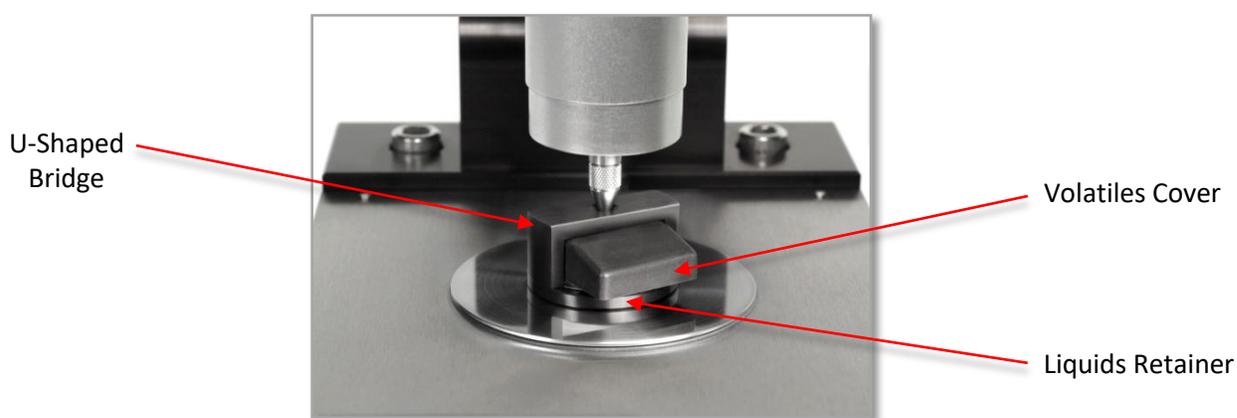
The **flat tip** attachment is a flat-tipped cone and it is used when analyzing thin films, fibers, small particles, rubber samples and other elastic polymers. The flat tip may also be used for powdered samples.

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.

## Configuration for Liquid Sampling

The crystal plate assembly of the GladiATR accessory features a round plate design with a 3.0 mm diameter ATR crystal sampling area located in the center of the plate. For liquid sampling, a droplet of the sample is placed onto the ATR crystal.

For volatile liquids, the optional Liquids Retainer with Volatiles Cover reduces the amount of evaporation of the sample on the surface of the crystal. 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 Liquids Retainer with the volatile liquid. Slide the Volatiles Cover between the retainer disk and the U-shaped bridge (Figure 10).



*Figure 10. Proper placement of a Liquids Retainer and Volatiles Cover on the GladiATR accessory*

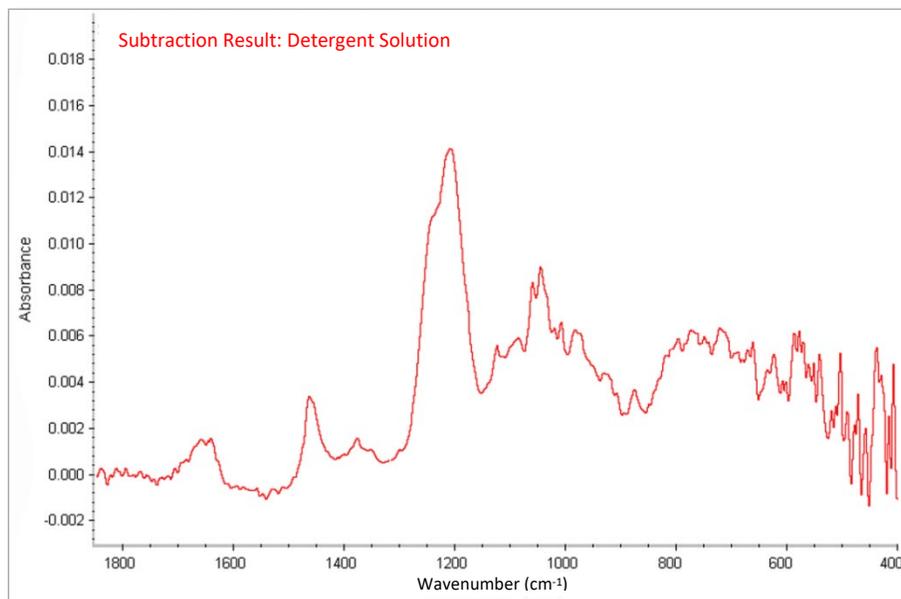
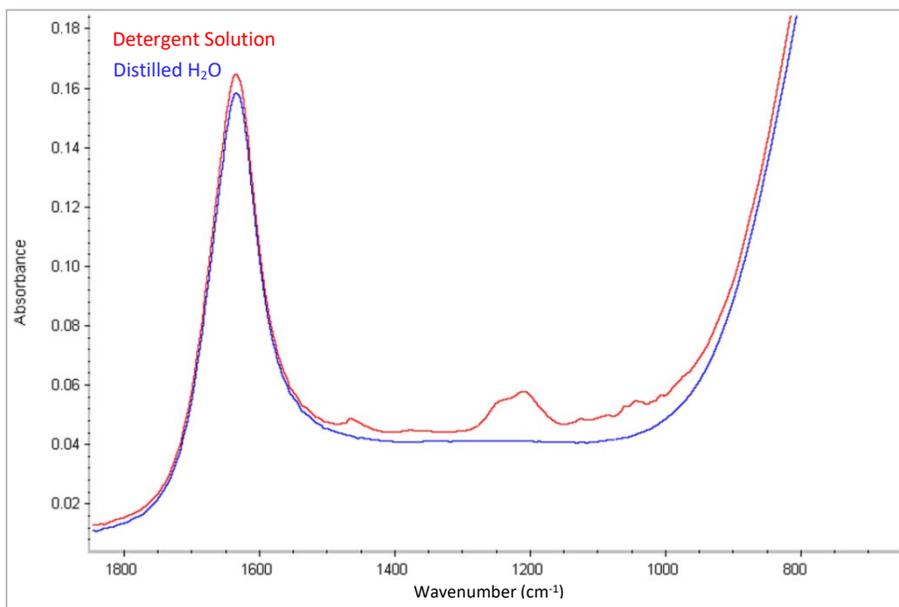
For continuous sample monitoring, or for applications where sample needs to be completely enclosed for safety or reactivity reasons, an optional Flow-Through Attachment is available. To use, place the Flow-Through Attachment over the ATR crystal. Apply the clamp to the top of the Flow-Through Attachment, which creates a seal between the O-ring located on the underneath side of the Flow-Through Attachment and the ATR crystal plate (Figure 11). Using the Luer-Loc fitting, load the sample by connecting a syringe or a flow line.



*Figure 11. GladiATR with Flow-Through Attachment*

One minute,  $4\text{ cm}^{-1}$  resolution spectra of a dilute detergent solution and distilled water were collected using the GladiATR with diamond crystal. These samples were applied directly onto the GladiATR diamond ATR crystal for analysis.

The red spectrum is the detergent solution and the blue spectrum is that for distilled water. A spectral subtraction can be applied to obtain the spectrum of the detergent component. This is shown in the red spectrum on the right, and the result will represent the detergent contribution of the liquid sample.



## Configuration for Solid Sampling

For the analysis of solid samples the pressure clamp of the GladiATR is required. The sample is placed face down onto the diamond crystal and force is applied to make intimate contact onto the ATR crystal.

For measurements of soft pliable films and selected 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 pressure clamp ordered with your GladiATR system. With the sample in place on the crystal, lower the press tip so that it is in contact with the sample. You can continue to turn the pressure knob and increase pressure to a desired level to obtain a spectrum. However, in most cases, it is recommended to apply the maximum pressure allowed to ensure the best contact and highest sampling sensitivity. The force applied by the High-Pressure Clamp is factory set to 40 pounds. The applied pressure is then a function of the size of the press tip for large samples or the size of the sample for small samples. For example, 40 pounds of force upon a sample which completely covers the crystal will generate 6,789 psi whereas 40 pounds of force upon a 1.0 mm diameter flat sample will generate 32,858 psi. The High-Pressure Clamp has a slip clutch mechanism to avoid exceeding 40 pounds of force.

**CAUTION:** Care must be used in operating the pressure clamps because for small, hard samples the maximum pressure may be exceeded.

## Configuration for Powder Sampling

Most powders may be analyzed with an ATR accessory. Since the ATR effect requires the sample to be in intimate contact with the crystal, using the High-Pressure Clamp is required when analyzing soft powders.

## 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. If a stronger solvent is required, acetone may be used. 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

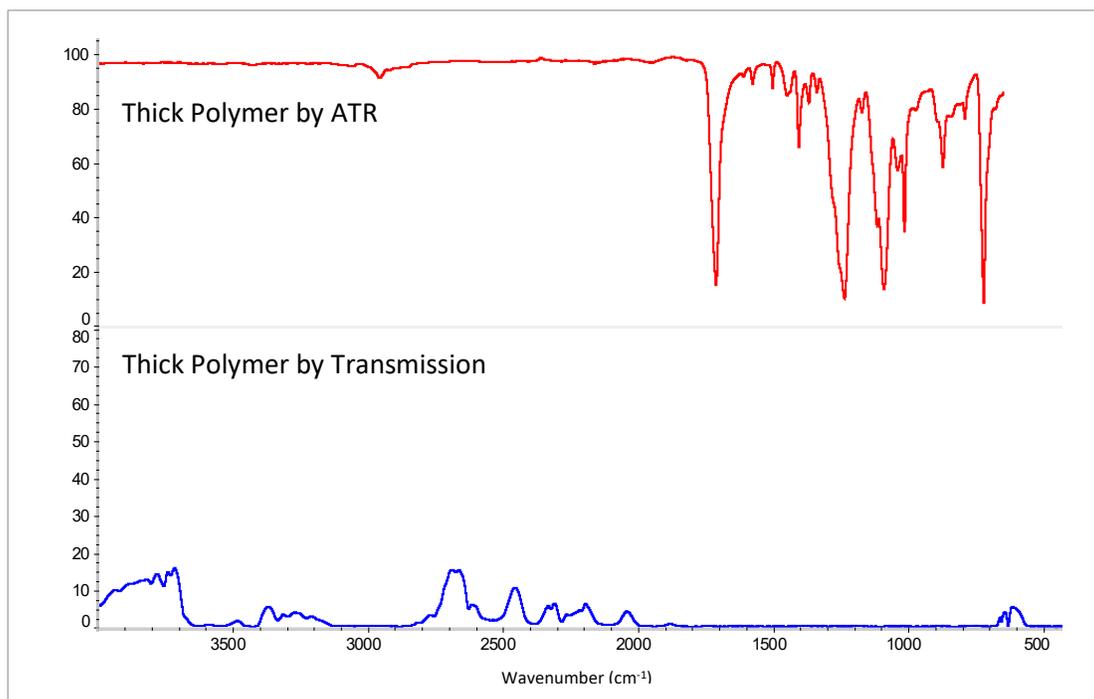
The PIKE Technologies GladiATR utilizes brazing and bonding technology to seal the crystal to its mount. This sealing mechanism allows some flexibility and hot samples may be placed on the crystal without damaging the crystal or seal. However, it is recommended that the temperature difference between the sample and the crystal be not more than 30 °C.

## ATR Spectra

ATR spectra are similar to transmission spectra. A careful comparison of ATR spectra and transmission spectra reveals that the intensities of the spectral features in an ATR spectrum are of lower absorbance than the corresponding features in a transmission 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, and upon the wavelength of the IR radiation.

The relatively thin depth of penetration of the IR beam into the sample creates the main benefit of ATR sampling. This is in contrast to traditional FTIR sampling by transmission 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 totally absorbing IR bands.

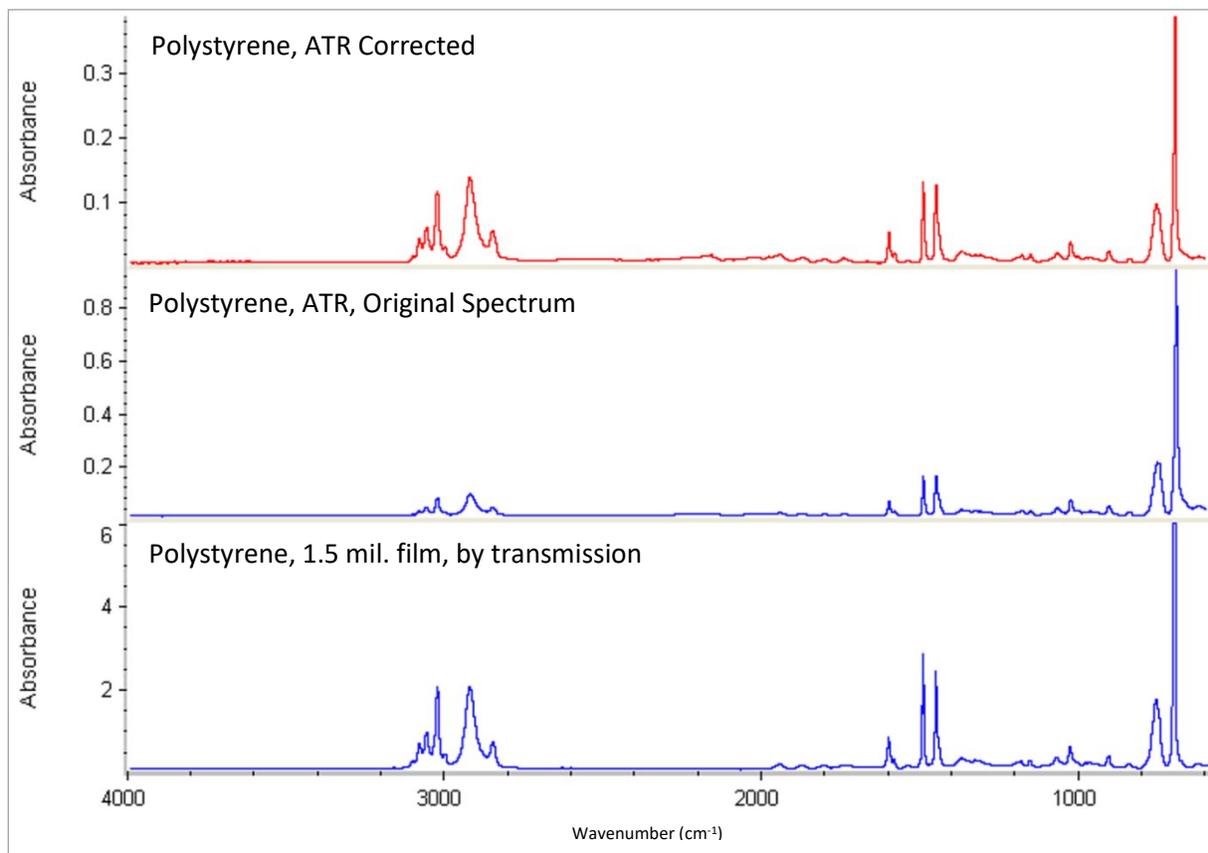
A comparison of transmission vs. ATR sampling spectra for a thick polymer sample is shown below where the sample is too thick for high quality transmission analysis (blue spectrum). In transmission spectroscopy, the IR beam passes through the sample and the effective path length is determined by the thickness of the sample and its orientation to the directional plane of the IR beam. Clearly in this example the sample is too thick for transmission analysis because most of the IR bands are totally absorbing. However, simply placing the thick sample on the ATR crystal and applying pressure generates a high quality spectral result (upper red spectrum) - identified by library search as a polybutylene terephthalate. The total analysis time for the thick polymer by ATR was less than one minute.



## ATR Correction

If an ATR spectrum representative of a transmission 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 transmission spectrum of polystyrene. Clearly the IR bands around 3000  $\text{cm}^{-1}$  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 transmission.



## Useful Equations

The depth of penetration gives us 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  $\lambda$  is the wavelength of light,  $n_1$  is the refractive index of the crystal,  $n_2$  is the refractive index of the sample and  $\theta$  is the effective angle of incidence.

Depth of penetration in microns as a function of crystal material is shown in the table below. The penetration depth is calculated for a sample with a refractive index of 1.5 at  $1000 \text{ cm}^{-1}$ . Also the safe pH range of samples for use with each material is listed.

## Crystal ATR Materials

Material	RI	$d_p$ ( $\mu$ ) @ $1000 \text{ cm}^{-1}$	pH Range	Long Wave Cutoff
Diamond	2.4	2.0	1-14	$10 \text{ cm}^{-1}$
Ge	4.0	0.66	1-14	$450 \text{ cm}^{-1}$

### 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  $1800 \text{ cm}^{-1}$  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 uncoated (bare) aluminum. 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

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

## Specifications

<b>ATR Crystal Choices</b>	Diamond, germanium
<b>Crystal Plate Mounting</b>	User changeable plates
<b>Crystal Type</b>	Monolithic
<b>Diamond Set</b>	Brazed
<b>Crystal Plate Mounts</b>	Stainless steel
<b>Angle of Incidence</b>	45°, nominal
<b>Crystal Dimensions, Surface</b>	3.0 mm diameter
<b>Optics</b>	All reflective
<b>Pressure Device</b>	Rotating, continuously variable pressure; click stop at maximum
<b>Maximum Pressure</b>	30,000 psi
<b>Sample Access</b>	80 mm, ATR crystal to pressure mount
<b>Spectral Range, Diamond</b>	4000 to 10 cm <sup>-1</sup> (IR optics dependent)
<b>Specular Reflection Option</b>	Optional, 45° nominal angle of incidence
<b>Purge</b>	Purge tubes and purge line connector included
<b>Accessory Dimensions (W x D x H)</b>	140 x 205 x 340 mm (excludes FTIR baseplate and mount)
<b>FTIR Compatibility</b>	Most, specify model and type

## Replacement Parts and Options

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

### Crystal Plates

Part Number	Description
026-2100	Diamond Crystal Plate
026-2050	Ge Crystal Plate
026-2200	Specular Reflection Plate
026-4102	Heated Diamond Crystal Plate, 300 °C
026-4100	Heated Diamond Crystal Plate, 210 °C
026-4050	Heated Ge Crystal Plate, 130 °C
026-4110	Liquid Jacketed Diamond Crystal Plate
026-4150	Liquid Jacketed Ge Crystal Plate

### Temperature Controllers

Part Number	Description
076-1610	Universal Temperature Controller
007-0207	TempPRO software

### Pressure Clamp

Part Number	Description
026-3020	High-Pressure Clamp
076-6026	Digital Force Adapter for 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

## Regulatory Compliance

We hereby declare that this product conforms to the following standards:

Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use – Part 1: General Requirements [IEC 61010-1:2010 Ed.3+A1]

Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use Part 2-010: Particular Requirements For Laboratory Equipment For The Heating Of Materials [IEC 61010-2-010:2003 Ed.2]

Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use – Part 1: General Requirements [UL 61010-1:2012 Ed.3+R:29Apr2016]

Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use – Part 1: General Requirements (R2017) [CSA C22.2#61010-1-12:2012 Ed.3+U1;U2]

Safety Requirements For Electrical Equipment For Measurement, Control And Laboratory Use - Part 2-010: Particular Requirements For Laboratory Equipment For The Heating Of Materials [UL 61010-2-010:2015 Ed.3]

Safety Requirements For Electrical Equipment For Measurement, Control And Laboratory Use - Part 2-010: Particular Requirements For Laboratory Equipment For The Heating Of Materials [CSA C22.2#61010-2-010:2015 Ed.3]

RoHS 2.0: 2011/65/EU

	<p>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.</p>	<p>This label is located outside the accessory, on the back cover.</p>
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