

MIRacle

AT A GLANCE

- ▶ Highest IR throughput ATR
- ▶ Complete flexibility
- ▶ Fully configurable
- ▶ Pinned-in-place, changeable crystal plates
- ▶ Optional specular reflection plate
- ▶ Temperature control, flow-through attachment and sealed clamp

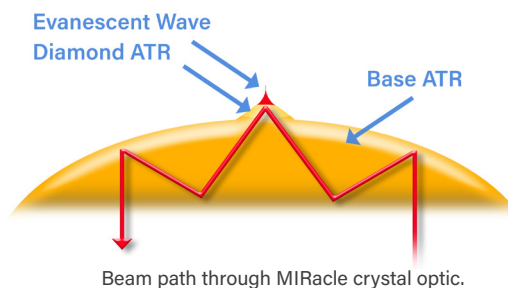


TEMPERATURE CONTROL
OPTIONS AVAILABLE

The MIRacle™ ATR is a high-performance FTIR sampling tool for solid, liquid, or polymer samples. With options for interchangeable single, 3- or 9-reflection crystal plates, and for heating or cooling, the MIRacle offers a flexible platform to address a wide range of FTIR sampling applications.

MIRACLE OPTICAL DESIGN

In the patented MIRacle optical design, the ATR crystal focuses the IR beam and also provides the ATR sampling interface. This technology delivers the greatest energy throughput for a commercially-available, small area ATR, that saves considerable data collection time and produces high quality spectra.



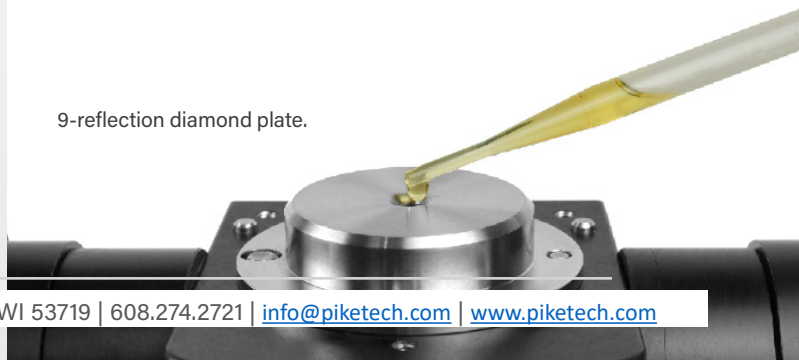
ATR PLATES

The MIRacle is one of our most configurable ATR accessories. The crystal plates are pinned in place and easily changeable within seconds with no alignment required. With this flexibility, you can change the crystal type to precisely match your sampling requirements.

The single reflection diamond/ZnSe is the most popular MIRacle ATR plate, and is an ideal universal ATR element that can accommodate samples across the pH spectrum and extremely hard samples. Table 1 summarizes the various MIRacle ATR crystal characteristics and typical applications for each.

For applications requiring enhanced spectral sensitivity for measuring minor components, the MIRacle may be configured with multiple reflection ATR plates. The 3-reflection diamond/ZnSe crystal plates are available in flat and trough style, and 9-reflection diamond/ZnSe is offered in trough style only.

9-reflection diamond plate.



MIRacle Crystal Plate	Application	Hardness (kg/mm ²)	Cutoff cm ⁻¹ Spectral Range	Refractive Index @ 1000 cm ⁻¹	Depth of Penetration @ 45°, μ	pH Range of Sample
Diamond/ZnSe	Ideal for hard samples, acids or alkaline	5700	525	2.4	2.0	1-14
Diamond/KRS-5	When you need full mid-IR spectral range	5700	250	2.4	2.0	1-14
Ge	General purpose and carbon filled or rubber	550	575	4.0	0.66	1-14
Si	Excellent for far-IR spectral measurement	1150	8900-1500, 475-40	3.4	0.85	1-12
ZnSe	General purpose ATR crystal	120	520	2.4	2.0	5-9
Note: crystal plates are covered by PIKE Technologies' patent numbers 5,965,889 and 6,128,075 or are manufactured under license of 5,200,609, 5,552,604 and 5,703,366.						

PRESS CLAMP OPTIONS

Recommended for most applications, the high-pressure clamps are calibrated to deliver over 10,000 psi of pressure when used with the single reflection crystal plates, and have a slip-clutch mechanism to prevent excessive pressure from being applied to the crystal. All clamps include three tips to accommodate hard, soft and pellet-shaped samples.



High-Pressure Clamp for routine sampling.



Confined Space Clamp for limited area in sample compartment.



Micrometer Clamp for low pressure.

MIRacle Clamp Pressure	Max Force (lbf)	Crystal Diameter (mm)	Pressure (psi)
High-Pressure Clamps	40	1.8	10,141
		6.0	913
Micrometer Pressure Clamp	8	1.8	2,028
		6.0	183

DIGITAL FORCE ADAPTER

The high-pressure clamp may be mated with the Digital Force Adapter (DFA), which attaches directly to the clamping assembly. The DFA's embedded load cell exhibits high linearity, reproducibility, and exceptional accuracy. The magnitude of applied force is displayed on an external easy-to-read LCD readout.



SEALED CLAMP

The Sealed Sample Chamber for the MIRacle Single Reflection ATR accessory attaches to dedicated single reflection diamond, ZnSe or Ge crystal ATR plates allowing the complete assembly to be moved from the spectrometer to a protective environment for sample handling. Once the sample has been loaded onto the ATR crystal, the sealed clamp may be engaged, shielding the sample from the external environment. Typical applications include studies of toxic or chemically aggressive solids and powders.

The chamber is made of stainless steel and is sealed against the crystal plate with a chemically resistant O-ring. The chamber contains an internal, spring-loaded anvil that compresses the sample against the ATR crystal at a preset, clutch-controlled setting.



Sealed Sample Chamber.

TEMPERATURE CONTROL

The MIRacle can be configured with temperature-controlled ATR plates. For resistively heated and Peltier plates, the temperature controller has a touch-screen panel, and is ready to use with PIKE TempPRO software. This program offers a graphical user interface for easy profile set up, and initiates data collection as a function of time and temperature when used with most commercial spectrometers. The liquid jacketed and Peltier plates require user-provided liquid circulator.

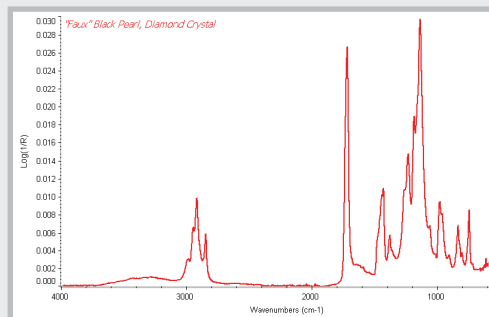


SPECIFICATIONS

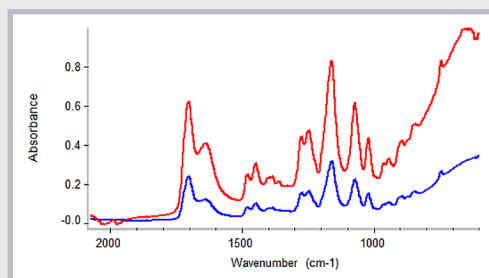
ATR Crystal Choices	Diamond/ZnSe, Diamond/KRS-5, Ge, ZnSe, Si
Crystal Plate Mounting	User-changeable plates
Crystal Plate Housing	Stainless steel or Hastelloy
Angle Of Incidence	45 degrees, nominal
Crystal Dimensions (surface)	1.8 mm single reflection 6.0 mm 3- and 9-reflection
Pressure Device	Rotating, continuously variable pressure; click-stop at maximum (high-pressure clamp)
Digital Force Adapter (option)	Load cell sensor for precise and reproducible pressure control. Attaches directly to high-pressure MIRacle clamps. Digital readout. Not for use with heated plates.
Maximum Pressure	10,000 psi
Sample Access	55 mm, ATR crystal to pressure mount
Heating Options	Ambient to 60 or 130 °C maximum
Peltier Option	Ambient to 10 or 90 °C maximum
Accuracy	+/- 0.5° up to 100 °C +/- 0.5% of set point > 100 °C
Sensor Type	3 wire Pt RTD (low drift, high stability)
Temperature Control	Touch-panel display with USB interface. PIKE TempPRO software for PC control with unlimited ramps and automated data collection.
Input	100-240 VAC, auto setting, external power supply
Output	1.3A/24 VDC 30 W maximum
Specular Reflection Option	Optional, 45 degree nominal angle of incidence
Purge Sealing	Purge tubes and purge line connector included
Accessory Dimensions (W X D X H)	104 x 103 x 210 mm (excludes FTIR baseplate and mount)
FTIR Compatibility	Most, specify model and type

MIRACLE APPLICATION

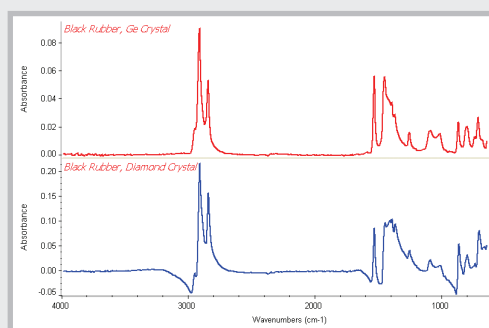
The MIRacle ATR is a universal sampling accessory. With its wide range of plates available, including single and multiple reflection, this accessory can accommodate most all samples.



Faux black pearl spectrum, collected using MIRacle diamond ATR crystal. Diamond is the most robust of all ATR elements, and is ideal for hard samples.



Hydrogel spectrum, collected using the 3-reflection diamond/ZnSe crystal (red) and single reflection diamond/ZnSe (blue). Multiple reflection ATR crystals increase sensitivity for liquid and pliable solids.



Black rubber spectrum, collected using a single reflection Ge crystal (red) and a single reflection diamond crystal (blue).

The spectrum run on the Ge crystal plate exhibits a normal baseline and symmetric absorbance bands, while the spectrum run on the diamond crystal plate has a baseline shifted and asymmetric absorbance bands.

For high refractive index samples such as carbon-filled rubber and some inorganic samples, Ge crystal is best.

PART NUMBER	DESCRIPTION
Base Optics (<i>required</i>)	
025-18XX	MIRacle Notes: Replace XX with your spectrometer's Instrument Code listed in the back of the catalog. Base includes purge tubes, purge kit, and selected spectrometer base mount.
Crystal Plates (<i>must select 1 or more</i>)	
025-2108	Diamond/ZnSe Performance Crystal Plate
025-2107	Diamond/ZnSe HS Performance Crystal Plate
025-2028	Diamond/KRS-5 Performance Crystal Plate
025-2027	Diamond/KRS-5 HS Performance Crystal Plate
025-2018	ZnSe Performance Crystal Plate
025-2058	Ge Performance Crystal Plate
025-2098	Si Performance Crystal Plate
025-2118	3-Reflection Diamond/ZnSe Performance Crystal Plate
025-2120	3-Reflection Diamond/ZnSe Performance Crystal Plate, Trough
025-2038	3-Reflection ZnSe Performance Crystal Plate
025-2218	9-Reflection Diamond/ZnSe Performance Crystal Plate, Trough
025-2208	Specular Reflection Performance Plate Notes: Crystal plates are pre-aligned. Plate housing is stainless steel. Contact PIKE for more Hastelloy (HS) options.
Pressure Clamps (<i>required for solid and powdered samples</i>)	
025-3025	Performance High-Pressure Clamp
076-6025	Digital Force Adapter for High-Pressure Clamp
025-3029	Performance Micrometric, Low-Pressure Clamp
025-3027	Performance High-Pressure Confined Space Clamp
076-6028	Digital Force Adapter for High-Pressure Confined Space Clamp Notes: The High-Pressure Clamp is recommended for general applications. Pressure clamps include a flat tip, a swivel tip and a concave tip. The Digital Force Adapter requires High-Pressure Clamp, P/N 025-3025 or 025-3027 (sold separately), and may not be used at temperatures above ambient.

PART NUMBER	DESCRIPTION
Sampling Options	
025-4018	Heated ZnSe Performance Crystal Plate
025-4058	Heated Ge Performance Crystal Plate
025-4108	Heated Diamond/ZnSe Performance Crystal Plate (60 °C max.)
025-4025	MIRacle Peltier ZnSe Plate
025-4026	MIRacle Peltier Ge Plate
025-2104	Liquid Jacketed Diamond/ZnSe Performance Crystal Plate (60 °C max.)
025-2014	Liquid Jacketed ZnSe Performance Crystal Plate
025-2054	Liquid Jacketed Ge Performance Crystal Plate
025-2094	Liquid Jacketed Si Performance Crystal Plate
026-5014	Flow-Through Attachment, 100 µL
026-5013	Liquids Retainer and Volatiles Cover Set
076-1610	Digital Temperature Control Module
007-0207	PIKE TempPRO Software
076-1625	Digital Temperature Control Module – Peltier ATR Note: For heated diamond/ZnSe crystal plate, the maximum crystal temperature is 60 °C. The maximum temperature for ZnSe heated plate is 130 °C. Germanium become optically opaque at 90 °C. Temperature controller 076-1610 is required for heated crystal plates. Digital Temperature Control Module 076-1625 is required for Peltier plates. If PC control is desired, TempPRO software must be purchased (sold separately). Liquid jacketed crystal plates require customer-provided circulator.
Sealed High-Pressure Clamp (<i>must select the sealed clamp and at least one crystal ATR plate</i>)	
025-6020	Sealed High-Pressure Clamp
025-6108	Diamond/ZnSe Sealed Clamp Performance Plate
025-6018	ZnSe Sealed Clamp Performance Plate
025-6058	Ge Sealed Clamp Performance Plate
Replacement Parts	
025-3099	Tip Assortment for High-Pressure Clamp
025-3095	Flat Tip for High-Pressure Clamp
025-3093	Swivel Tip for High-Pressure Clamp
025-3092	Concave Tip for High-Pressure Clamp
025-3053	MIRacle Micrometer Clamp Tip Assortment
025-3052	Flat Tip for Micrometric Clamp
025-3061	Swivel Tip for Micrometric Clamp
025-3054	Concave Tip for Micrometric Clamp
025-3094	7.8 mm ATR Pressure Tip for High-Pressure Clamp
025-3096	7.8 mm ATR Pressure Tip for Micrometer Clamp Notes: Please contact us for items not described in this list. Reconditioning service for used MIRacle crystal plates is available.