

Smart iTR

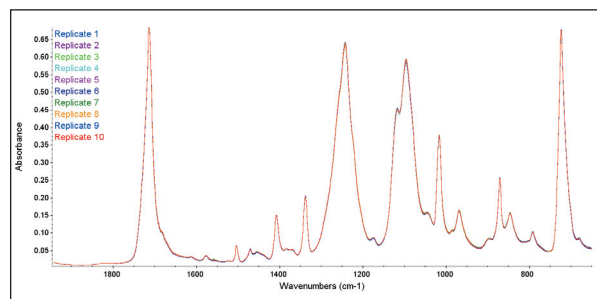
For Multi-purpose ATR Sampling

The Thermo Scientific Smart iTR™ is an ultra-high-performance, versatile Attenuated Total Reflectance (ATR) sampling accessory. Primarily designed for use with a single bounce diamond crystal, the Smart iTR also offers other options for full configurability. Each of the ATR crystals is designed for maximum infrared throughput and spectroscopic performance.

ATR is the technique of choice for infrared and the Smart iTR is the accessory of choice for Thermo Scientific spectrometers. It provides exceptional sensitivity and IR throughput. ATR crystals come in a variety of configurations suitable for every need. Solid materials can be pressed onto the ATR crystal using a high pressure tower to provide consistent results. Single bounce ATR works for many strongly absorbing materials like polymers, chemicals, etc.

Example Applications

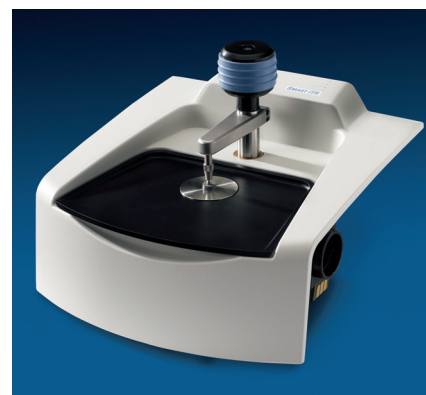
- Most solids
- Liquids ranging from pH 1 to 14
- Acidic or alkaline materials
- Fibers
- Hard or oddly shaped samples
- Abrasive, caustic or corrosive materials
- Large or small samples
- Paint chips



Ten replicated PET spectra collected from different locations on the same sample using a Nicolet iS10 spectrometer with the Smart iTR

Unique Features

The Smart iTR is a versatile ATR for analysis of solids, liquids, pastes and gels. It is available with different crystal materials for different sampling needs. Single reflection ATR provides general purpose use, while an optional three reflection ATR can be used to optimize analysis of minor components. Crystal plates are pinned in place and easily switched with no alignment required. ATR crystal plates are backed with a ZnSe focusing optic for optimal performance. An optional specular plate gives extra flexibility when analyzing coatings on reflective materials.



The black top plate is over seven inches wide at the front, and more than five inches from front to back, providing excellent space for most samples. The plate is Teflon™ coated and lifts clear easily, making clean-up very simple. Precision machining and an unreactive-gasket provide a tight interface between the top plate and the crystal housing, so spills are not a problem. A quick-release mounting of the crystals provides rapid and reproducible crystal insertion and removal for cleaning or swapping.

The Smart iTR's high pressure clamp comes with interchangeable tips for hard, soft and pellet shaped samples. The clamp is calibrated to deliver over 10,000 psi of pressure when applied to the single reflection crystal plates.

The Smart iTR accessory is compatible with the Thermo Scientific Nicolet™ iS™ 10 FT-IR spectrometer, the Thermo Scientific Nicolet iZ™ 10 auxiliary module, and the Thermo Scientific Nicolet 6700 and Nicolet 8700 FT-IR spectrometers.

Choice of ATR Crystal Materials

The Smart iTR accessory can be ordered with three common ATR crystals fixed in stainless steel as standard: diamond, ZnSe and germanium. Each crystal performs strongly under specific circumstances.

The diamond crystal is excellent for the analysis of hard, abrasive, reactive, caustic or corrosive materials, since it is inert and robust. It is also a multi-purpose ATR with a depth of penetration of over 2 microns at 1000 cm^{-1} and is used with a wide variety of samples. Its disadvantage is the intrinsic absorption from approximately 2300 to 1800 cm^{-1} .

The ZnSe crystal offers similarly outstanding throughput and a depth of penetration similar to diamond. It can be used for a wide variety of samples, but over time it can be etched by acids and scratched by hard samples. ZnSe is soft and not as chemically inert as the other crystals, but provides an excellent performing, lower cost option for general analyses.

A five-year warranty is provided with the diamond ATR crystal. Both the diamond and ZnSe configurations can be validated.

Germanium is also hard and inert (although not as robust as diamond). Germanium provides a much shallower depth of penetration, making it ideal for highly absorbing or scattering samples such as carbon-black containing rubbers. The exclusive germanium crystal used in the Smart iTR provides huge performance through the mid-IR range, with upwards of 50% transmittance. Germanium has a limited range, but offers good chemical resistivity to both acids and bases.

An additional ATR crystal that can be added to any of the accessories is silicon. Silicon is a very hard ATR crystal with a high refractive index. This makes it useful for strong absorbers or abrasive samples. Silicon withstands thermal shock, so it is suitable for temperature studies. Silicon is typically absorbing below 1500 cm^{-1} , but the composite design results in a much broader range.

Specifications

Diamond ATR Crystal: Diamond is one of the most rugged optical materials available.

- Low wavenumber cutoff 650 cm^{-1} (due to ZnSe lens)
- Depth of penetration 2.03 micrometers at 1000 cm^{-1}
- Refractive index 2.4
- Useful pH range 1–14 (ZnSe 5–9)
- Incident angle 42

ZnSe ATR Crystal: ZnSe is the most common ATR crystal. It has limited uses with strong acids, alkalis. The surface can be scratched by hard materials, which will eventually reduce sensitivity. Complexing agents (EDTA and ammonium) will also attack the crystal surface.

- Low wavenumber cutoff 650 cm^{-1}
- Depth of penetration 2.03 micrometers at 1000 cm^{-1}
- Refractive index 2.4
- Useful pH range 5–9
- Incident angle 42

Germanium ATR Crystal: Ge is a hard ATR crystal with a high refractive index. This makes it useful for strong absorbers or samples with a high refractive index. The new germanium crystal provides enormous throughput over the mid-IR range.

- Low wavenumber cutoff 700 cm^{-1}
- Depth of penetration 0.67 micrometers at 1000 cm^{-1}
- Refractive index 4.0
- Useful pH range 1–14
- Incident angle 42

Silicon ATR Crystal: Si is a very hard ATR crystal with a high refractive index.

- Low wavenumber cutoff 700 cm^{-1}
- Depth of penetration 0.84 micrometers at 1000 cm^{-1}
- Refractive index 3.4
- Useful pH range 1–12
- Incident angle 42

Active Sample Area: The ATR active sample area is 1.5 mm for the single bounce ATR and 6 mm for the 3 bounce ATR.

Specular Plate: Spectral range dependent on spectrometer. Incident angle is 45 degrees.

Ordering Information

Accessory	Part Number
Smart iTR with Diamond Plate for iS10	222-247000
Smart iTR with ZnSe Plate	222-247100
Smart iTR with Diamond and Ge Plate	222-247200
Smart iTR with ZnSe and Ge Plate	222-247300

Check configuration guide or contact Thermo Fisher Scientific representative for additional options.