

Golden Gate™ Single Reflection Diamond ATR Series MkII

The Golden Gate™ is the world's most versatile Infrared sampling system. It analyzes all types of samples, from hard solids to corrosive liquids, and it is easy to use, sensitive, and robust



Golden Gate™ Diamond ATR

Outstanding sensitivity is achieved using high pressure contact against a solid, type IIIa diamond, selected for its unparalleled sensitivity as a single reflection ATR element together with its unique physical and chemical stability.

The accessory can be used to analyze a range of samples from single particles and fibers to corrosive liquids. While the large working area sample platform is ideal for macro sampling.

The diamond is high temperature bonded into its tungsten carbide mount, giving performance and strength to withstand the high pressures required for maximum optical contact with hard samples.

The quick lock and release bridge allows for fast sample change around. The built-in pressure control mechanism means reproducible results are obtainable and optimum sample clamping is achieved.

Polarization studies can be carried out using the benchmark polarizer mount P/N GS 12510 (See page 52)

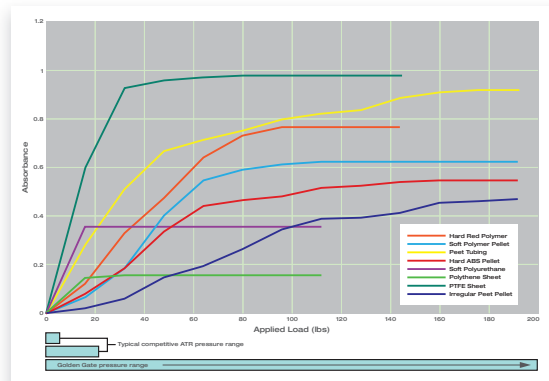
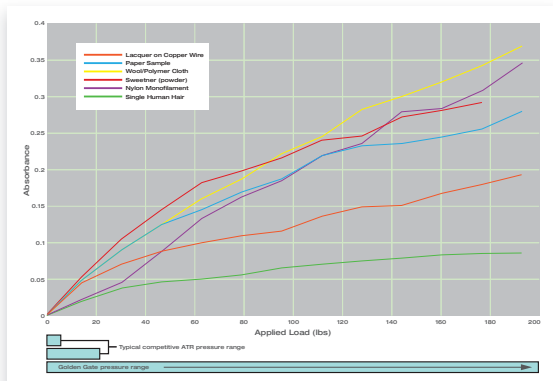
Key Features

- High sample throughput - no sample preparation
- Rugged type IIIa diamond ATR metal-bonded into a tungsten carbide mount
- Hard, inert, sapphire self-levelling pressure anvil
- Pressure bridge for highest sensitivity
- A wide choice of available options
- Quick release bridge with safety interlock
- Built-in pressure control for reproducible results

Applications

- QA on pharmaceutical powders
- Analysis of hard and soft polymer pellets
- Forensic sampling, paint chips and single fibers
- Hard samples, e.g. rock and geochemicals
- Corrosive liquids
- Coated wires
- Air sensitive samples

Reproducibility and Sensitivity of the Golden Gate™ Single Reflection ATR System



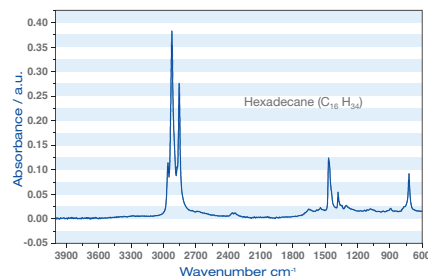
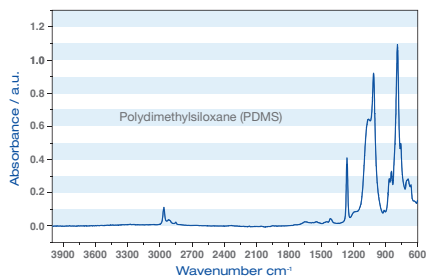
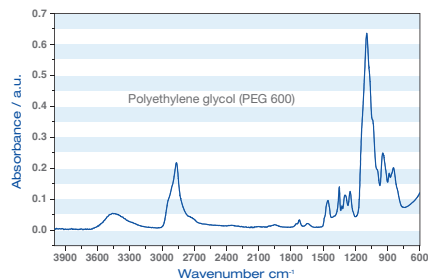
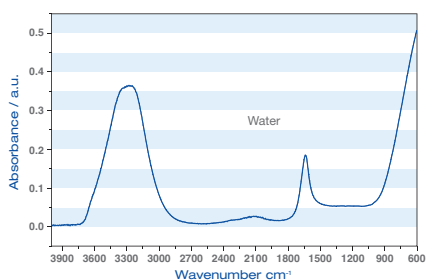
The effect of load on ATR sensitivity

A key feature of the Golden Gate™ Single Reflection ATR System is the outstanding contact achievable between solid samples and the diamond crystal.

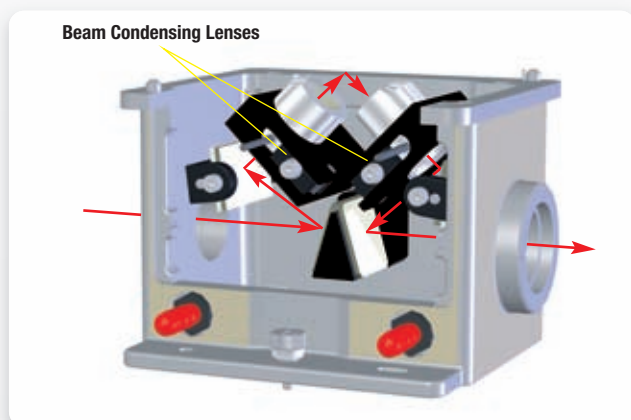
For many sample types (particularly powders and fibers), as the load is applied to the sample and optical contact between the diamond and the sample increases, the intensity of the absorbance bands also increase. In other words, increasing the load increases the sensitivity. The Golden Gate™ gives the highest load capability of any commercial diamond ATR (over 180 lbs) and the diagrams above illustrate how that impacts sensitivity for a variety of sample types.

For softer samples, such as polymers, a similar effect is seen. However, once the sample has fully contacted the ATR surface, the absorbance stops increasing with increasing pressure.

In order to achieve the best measurement repeatability and reproducibility for these samples, the instrument should ideally apply a load above the “knee” of the curve where the absorbance becomes much less sensitive to load. The diagram above right illustrates some measurements for typical samples. Note how the harder sample types need a higher load to reach this ideal situation - and very often the Golden Gate™ is the only product that can do it.



Schematic of the Golden Gate™ Single Reflection ATR system



The Top-plates of the Golden Gate™ Single Reflection ATR Series are supplied on an optical unit which contains mirrors and a choice of beam condensing optics (ZnSe or KRS-5).

All Top-plates are interchangeable with the optical unit.

A schematic is shown opposite of the beam path through the Golden Gate™ optical system. The symmetrical design coupled with the use of the Benchmark™ base-plate system means that the Golden Gate™ can be used in most commercially available FTIR instruments.

Golden Gate™ Anvil Options

A variety of special anvils are available for use with the Golden Gate™ Top-plates. The use of an appropriate anvil improves the sample handling capabilities of the Golden Gate™ Single Reflection ATR System.



1 Reactive Sample Anvil

Samples which are sensitive to air or moisture can be loaded and pressed in a dry box. The anvil has a seal which compresses as the sample is pressed, thus keeping it in an inert environment while the spectrum is being run.

2 & 5 Grooved Anvils

(Narrow and Wide) To study the coating on transformer wire the grooved anvils hold the wire exactly in the middle of the diamond.

3 Sapphire Anvil

This is the standard anvil and is used for most sample types. It has the advantage of being very hard, and easy to clean to prevent sample carry-over. It is also self-leveling to accommodate non-flat samples.

4 Stainless Steel Flat Anvil

This is used for fibers or fine wires. It is not self-

leveling, which can be an advantage with this type of sample.

6 Pellet Anvil

Polymer pellets are held firmly in position with this concave anvil. With a flat anvil they could move when pressure is applied.

7 Volatiles Cover

If liquid samples are very volatile the cover is useful to minimize evaporation.

8 View-Thru Anvil

The View-Thru Anvil allows the sample to be viewed through a 4x lens system with a built-in reflective illuminator.

9 Flow-Thru Anvil

This micro flow cell anvil seals under pressure around the diamond. Its volume is 28 microliters and it can operate at 1000 psi. It may be used as a flow cell or as a micro reaction chamber.

Golden Gate™ Top-plate Options

High Temperature Top-plate

P/N GS10640



Many reactions and processes occur at high temperatures. The Heated Diamond Top-plate includes all the normal features of the Golden Gate™ sampling technique but with the added benefit of heating samples up to 300°C. Diamond has a uniquely high thermal conductivity. The Top-plate has a low thermal mass, and in combination with high power heaters in close proximity to the diamond, both rapid and efficient heating is achieved. This gives a high degree of temperature control. A rapid sample turn around is therefore possible. The Top-plate can be used

Reaction Cell

P/N GS10507



The Reaction Cell allows in-compartment reaction monitoring over a broad range of extreme conditions. The diamond is metal bonded into a tungsten carbide mount and this is contained within a high pressure reaction vessel. The unique strength and durability of the diamond element makes it ideal for withstanding combinations of aggressive chemical contact at high temperatures and pressures.

Key Features

- Heatable to 300°C
- Diamond in tungsten carbide mount
- Low voltage heaters
- Thermal safety fuses
- Programmable temperature control via optional RS232, RS485 or USB connection
- Complies with CE regulations
- Low thermal mass

Applications

- Polymerization studies
- Thermochemical studies
- Curing reactions
- Degradation / decomposition

with a computer controlled temperature controller with digital readout to 1°C. With safety in mind, low voltage (30V) heaters are used, and for additional protection thermal fuses are fitted as standard. The controller complies with European CE regulations.

ELECTRIC

COMMS

Key Features

- Controlled temperatures to 200°C
- Low voltage (30V)
- Cell volume 28ml
- Pressures up to 3000psi
- Water jacket to prevent overheating
- Stainless steel construction with a choice of other materials
- Stirring option
- Flow through configuration option

Applications

- Chemical reaction analysis at high temperatures and pressures
- Caustic solutions
- Slurries with abrasive particulates
- Acidic reactions
- Optimization of process parameters

ELECTRIC

GAS

WATER 5ltr

COMMS

Low Temperature Top-plate

P/N GS10590



The Golden Gate™ low temperature diamond ATR system is the first ATR accessory to provide high performance ATR measurements down to near liquid nitrogen temperature. The system uses a thermally insulated copper and stainless steel dewar in conjunction with an integral heater

The high thermal conductivity of the diamond crystal provides rapid temperature stabilization, accurate temperature measurement, and avoids temperature gradients across the sample.

The diamond ATR crystal is high temperature metal bonded into a tungsten carbide support disk and the top plate is hard-anodized to make the accessory chemically resistant and capable of withstanding the pressures required for optimum crystal and sample contact. Pressure is applied to the sample using the quick lock and release bridge from the proven Golden Gate™ diamond ATR system.

Micro Specular Reflectance Top-plate

P/N GS10514



Key Features

- Continuous control of sample temperature from -150°C to 80°C.
- High thermal conductivity provides rapid cooling and temperature stabilization
- Proven, strong clamping device, based on the Golden Gate™ Diamond ATR, allows rapid, reproducible sample throughput.
- Thermally insulated copper and stainless steel dewar allows for the use of liquid nitrogen, dry ice, or salt & water mixtures.

This clamping device allows rapid sample throughput and reproducible solid sampling. It also has a built-in torque limiter to control the loads applied to the diamond.

The Golden Gate™ low temperature diamond ATR is constructed in such a way that the crystal mounting is under a constant load. This ensures that the diamond is kept in constant optical alignment, negating the effects of thermal expansion and contraction. The upper thermal dewar body of the system is separated from the top-plate by a replaceable, thermally conducting spacer, avoiding the need for use of sealants that may contaminate the diamond surface. The system is easily and quickly taken apart for cleaning.

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Applications

- Micro reflectance samples
- Very highly absorbing samples
- Carbon black containing polymers

A 45° angle Micro Specular Reflection Top-plate is for flat samples of greater than 3mm x 6mm, or powders that can be pressed into a self-supporting wafer. A scribed reference grid allows accurate repeat positioning of samples.

Supercritical Fluids Top-plate



The Supercritical Fluids Analyzer version of the Golden Gate™ Diamond ATR is designed for operation at extreme temperatures and pressures. The diamond ATR element is high temperature metal bonded into a tungsten carbide disk, avoiding the use of adhesives or resins that may be dissolved or attacked by the chemical aggressiveness of supercritical fluids. The sample chamber has been specially constructed using stainless steel and is capable

Key Features

- Pressures up to 6000 p.s.i
- Temperature controlled to 300°C
- Low volume 28µl stainless steel sample cell
- Standard 1/16th inch fittings
- CE Marked

Applications

- Supercritical and Near Supercritical fluids
- Extreme condition analysis of polymers
- In-situ ATR studies at high temperatures and pressures

temperatures up to 300°C. The high thermal conductivity of the diamond element is ideal for fast temperature equilibrium and accurate temperature measurement, reducing analysis time and increasing sample throughput. The analyzer is equipped with a thermal protection system to prevent thermal runaway.

ELECTRIC

GAS

COMMS

Envirochamber ATR Top-plate



The Envirochamber Golden Gate™ diamond Top-plate is designed for analysing samples in a sealed or controlled environment. It has an external chamber attached to the bridge and clamp anvil assembly which is used to enclose the diamond/tungsten carbide puck at the sample analysis area of the top-plate. Flow tubes are provided on the chamber to introduce a flow of vapour into the surrounding environment or to evacuate the chamber if necessary.

Key Features

- Quick release sealed chamber
- Flow fittings on chamber
- Chamber is integrated with removable Golden Gate™ top-plate
- Heated versions available

Applications

- Analyse solid or liquid samples in a sealed environment
- Analyse solid or liquid samples in a controlled environment

The chamber enables a solid or liquid sample to be measured using the ATR method where the sample can be isolated from an external environment. Samples can be measured for their interaction under a controlled environment for humidity or various gas flow experimentation at ambient or elevated temperatures up to 300°C.

ELECTRIC

GAS

COMMS

Ordering Information

Golden Gate™ ATR Mk II series

A Complete Golden Gate™ ATR Mk II System consists of an Optics Unit with ZnSe or KRS-5 Lenses, Top-plate (**GS10563**), Baseplate and Purge Bellows.

GS10500 Complete Golden Gate™ ATR Mk II with ZnSe Lenses

GS10515 Complete Golden Gate™ ATR Mk II with KRS-5 Lenses

A Golden Gate™ top-plate can be provided as a complete accessory on a ZnSe or KRS-5 lens optical unit or as an upgrade additional top-plate

ESK

Please specify Spectrometer make and model for the appropriate baseplate

Top-plate Options

GS10563 Diamond ATR Top-plate Mk II
Includes: Sapphire and Pellet anvils, volatiles cover

GS10566 Germanium ATR Top-plate Mk II
Includes: Large stainless steel anvil and volatiles cover

GS10514 Micro Specular Reflectance Top-plate

GS10507 Includes: Reference mirror
In-Situ Reaction Cell Top Plate
Includes Temperature controller.

Specify 220V or 110V and country for controller

GS10513 Stirring option for Reaction Cell

GS10585 Supercritical fluids top-plate.
Includes Temperature controller

Specify 220V or 110V and country for controller

GS10590 Low Temperature Diamond ATR Top Plate
Includes Temperature controller

Specify 220V or 110V and country for controller

GS10640 High Temperature top-plate
Includes Sapphire and Pellet anvils, volatiles cover and temperature controller

Specify 220V or 110V and country for controller

GS10650 Envirochamber Top-plate
Includes: Sapphire anvil GS10531 and Pellet anvil GS10532

GS10660 Heated Envirochamber Top-plate 200°C
Includes: Temperature controller, Sapphire anvil GS10531 and Pellet anvil GS10532

Specify 220V or 110V and country for controller

GS10665 Heated Envirochamber Top-plate 300°C
Includes: Temperature controller, Sapphire anvil GS10531 and Pellet anvil GS10532

Specify 220V or 110V and country for controller

Accessory Options

GS10642 High Temp. Golden Gate™ ATR Mk II
A Complete Heatable Golden Gate™ ATR Mk II System consisting of an Optics Unit with ZnSe or KRS-5 lenses, Heated Top-plate, Baseplate, Purge Bellows and Temperature Controller.

ESK

Specify Spectrometer make and model for the appropriate baseplate - 220V or 110V and country for the Controller and ZnSe or KRS-5 lenses.

GS10586 Supercritical fluids Golden Gate™ ATR MK II

ESK

A Complete Supercritical fluids Golden Gate™ ATR Mk II System consisting of an Optics Unit with ZnSe or KRS-5 lenses, Supercritical fluids top-plate, Baseplate, Purge Bellows and Temperature Controller.

Specify Spectrometer make and model for the appropriate baseplate - 220V or 110V and country for the Controller and ZnSe or KRS-5 lenses.

GS10592 Low Temp. Golden Gate™ ATR MK II

ESK

A Complete Low Temperature Golden Gate™ ATR Mk II System consisting of an Optics Unit with ZnSe or KRS-5 lenses, Low Temperature top-plate, Baseplate, Purge Bellows and Temperature Controller.

Specify Spectrometer make and model for the appropriate baseplate. 220V or 110V and country for the Controller and ZnSe or KRS-5 lenses.

GS10525 Reaction Cell Golden Gate™ ATR MK II

ESK

A Complete Reaction Cell Golden Gate™ ATR Mk II System consisting of an Optics Unit with ZnSe or KRS-5 lenses, Reaction Cell Top-plate, Baseplate, Purge Bellows and Temperature Controller.

Specify Spectrometer make and model for the appropriate baseplate. 220V or 110V and country for the Controller and ZnSe or KRS-5 lenses.

GS10513 Stirring option for Reaction Cell

Cont'd

Ordering Information cont'd

Accessory Options cont'd

GS10652 Envirochamber
Golden Gate™ ATR MKII
ESK
A complete Envirochamber
Golden Gate™ ATR MKII System
Consisting of an Optics Unit with
ZnSe or KRS-5 lenses,
Envirochamber top-plate,
baseplate and purge bellows.

Specify Spectrometer make and model for the appropriate baseplate.

GS10662 Envirochamber
Golden Gate™ ATR MKII 200°C
ESK
A complete Heated Envirochamber
Golden Gate™ ATR MKII System
Consisting of an Optics Unit with
ZnSe or KRS-5 lenses,
Heated Envirochamber top-plate,
baseplate, purge bellows and
temperature controller.

Specify Spectrometer make and model for the appropriate baseplate - 220V or 110V and country for the Controller and ZnSe or KRS-5 lenses.

GS10667 Envirochamber
Golden Gate™ ATR MKII 300°C
ESK
A complete Heated Envirochamber
Golden Gate™ ATR MKII System
Consisting of an Optics Unit with
ZnSe or KRS-5 lenses,
Heated Envirochamber top-plate,
baseplate, purge bellows and
temperature controller.

Specify Spectrometer make and model for the appropriate baseplate - 220V or 110V and country for the Controller and ZnSe or KRS-5 lenses.

Upgrade - Lenses

GS10552 ZnSe lens upgrade kit
6500 - 600cm⁻¹

GS10508 KRS-5 lens upgrade kit
6500 - 400cm⁻¹

Anvil Options - Mk II Golden Gate™ Top-plates

GS10503 Volatiles cover

GS10531 Sapphire anvil

GS10532 Pellet anvil

GS10536 Reactive sample anvil

GS10547 Grooved anvil - narrow gauge

GS10548 Grooved anvil - wide gauge

GS10549 Stainless steel flat anvil

GS10567 Stainless steel large anvil for
Germanium Top-plate

GS10568 Micro Reaction/Flow Cell anvil

GS10569 View-Thru Anvil/Bridge assembly

Spares

GS10707 Purge bellows

Mk I to Mk II Top-plate Upgrade

GS10564 Specac can upgrade an existing
Mk I (Pre Oct 1999) Golden Gate™
Top-plate to a Mk II version with a
quick lock and release bridge and
in-built pressure mechanism.

The upgrade includes
Sapphire anvil P/N **GS10531**
and Pellet anvil P/N **GS10532**

Return your Mk I Top-plate to your Specac Dealer for the upgrade.

GS10550 Golden Gate™ ATR
Accessories ESK

GS10527 Golden Gate™ Microspecular
ATR ESK

GS10528 Golden Gate™ Reaction Cell
ATR ESK

GS10529 Golden Gate™ SCF ATR ESK

Options

GS28000 RS232 Connection kit

GS28001 USB Connection kit

GS28002 RS485 Connection kit

GS12510 Benchmark polarizer mount



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