Minidiff Plus
Diffuse Reflectance Accessory

User Manual

2I-04510-4

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1. Introduction

Thank you for buying a Specac product. We trust it will provide you with invaluable and excellent service in use.

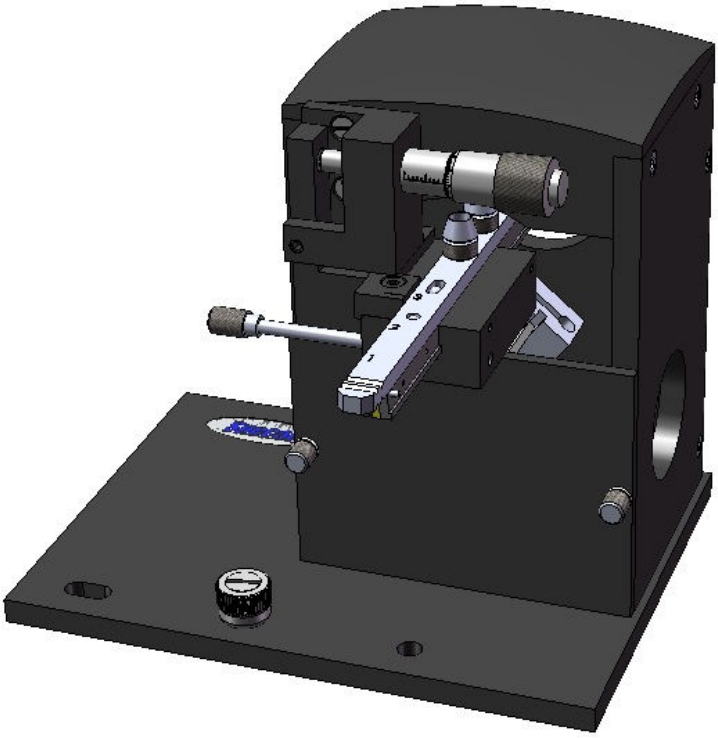
Infrared radiant light when reflected from a solid surface can be either diffusely or specularly scattered (or both - total reflectance) in nature.

Diffuse reflectance is based upon the collection of radiation that has been **diffusely scattered** from the sample. From illumination by infrared radiation of a solid sample surface that can be deemed non-linear or irregular (e.g. powdered, granular or fabric/textile type samples), although there will be components of some specularly reflected light from the surface, the majority of light to collect for a measurement will be diffusely scattered.

The diffuse reflectance technique has been used routinely for many years to analyse such sample types from collection of an Infrared spectrum. This has been achieved because of the relative simplicity of the sampling technique and the low cost of diffuse reflectance accessories for use within an Infrared spectrometer.

The Minidiff Plus P/N GS04510 is a versatile high performance diffuse reflectance accessory from Specac. It has an “on-axis” design for the optical IR beam pathway of analysis light from source to sample to detector and collects for a **total reflectance** of light. (Both diffuse and specular reflected light components.) This allows for a high level energy throughput of IR light to be measureable when the Minidiff Plus has been installed correctly into the sample compartment of many commercially available IR spectrometer systems.

For a correct fitting of the Minidiff Plus into the spectrometer it is mounted on an appropriate Benchmark™ baseplate that matches the spectrometer system. Baseplate mounting provides for added stability of the accessory in use and consistent reproducibility for any sampling measurements.



Minidiff Plus Diffuse Reflectance Accessory

2. Safety Considerations

With use of any spectroscopic accessory that involves the study of a wide range of chemical samples, the associated risk in operation may mostly be attributed to the specific sample type to be handled itself. As far as it is possible you should follow a procedure for safe handling and containment of the type of sample to be used.

With respect to safety of use specifically for the Minidiff Plus diffuse reflectance accessory, the main risk is from the potential contact with any sample type that may be injurious to health when exposed to the local environment. An appropriate sample type for a Minidiff Plus diffuse reflectance measurement is contained in an open sampling cup or transferred to an abrasive pad surface for direct measurement of the sample from an analysis beam of light projected to the exposed surface.

Important:

*The general rule when working with **any** chemical materials **is to always wear protective clothing,** specifically gloves and safety spectacles when handling, to obviate the risk of contact with the skin.*

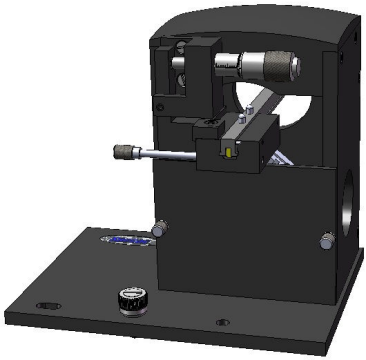
If possible, always keep any sampling time to a minimum for exposure of a chemical substance and store the sample safely away as soon as possible, or where necessary, after analysis.

The same considerations for safety in handling of the Minidiff Plus diffuse reflectance accessory should be observed when the equipment is being cleaned and cared for between sampling.

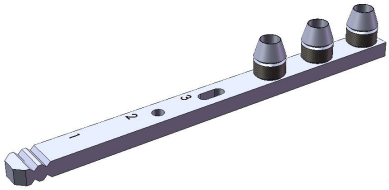
3. Checklist of Contents

The Minidiff Plus diffuse reflectance accessory P/N GS04510 is provided as packed in a carry case. Open up the carry case and carefully remove the items within for checking and inspection. On receipt of the accessory please check that the following have been supplied:

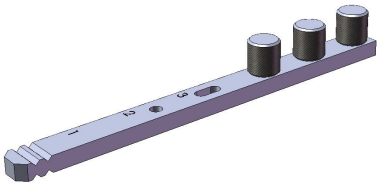
- Minidiff Plus optical unit.



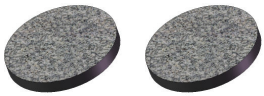
- One 3-position sample cup holder mount assemblies (with 1 fixed sample cup on each and 4 spare sample cups).



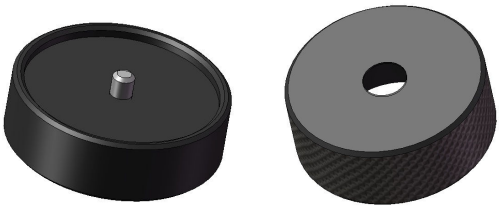
- One 3-position abrasive sample pad mount assemblies (with 1 fixed abrasive sample pad mount on each and 4 spare pad mounts).



- 20 Diabrase sample pads (for abrasive pad mounts).



- Sample filler parts.



- Spectroscopic grade KBr powder (50g).
- Pestle and Mortar.
- Spatula.
- Benchmark™ baseplate ordered with Minidiff Plus for installation into a specific spectrometer.
- Set of Allen keys – 1.5mm A/F, and 2.5 mm A/F.
- User Instruction Manual for the Minidiff Plus.
- Benchmark™ baseplate User Installation Manual.

Note! *The Minidiff Plus is factory aligned before despatch and care should be taken when unpacking not to disturb the two flat mirrors or micrometer screw. The mirrors can be misaligned by careless handling or from any excessive force.*

Before use, protective tissue covers need to be removed from the internal flat mirrors within the Minidiff Plus accessory. To gain access for the protective covers removal, please carry out the following sequence.

1. Carefully lift the Minidiff Plus optical unit out of the carry case from the base support plate and the sides of the accessory.

2. Loosen the two front metal cover plate thumbscrews (**1**) by turning them anticlockwise and remove the front metal cover plate (**2**) to gain access to the internal flat mirror optics. (See **Fig 1**.)

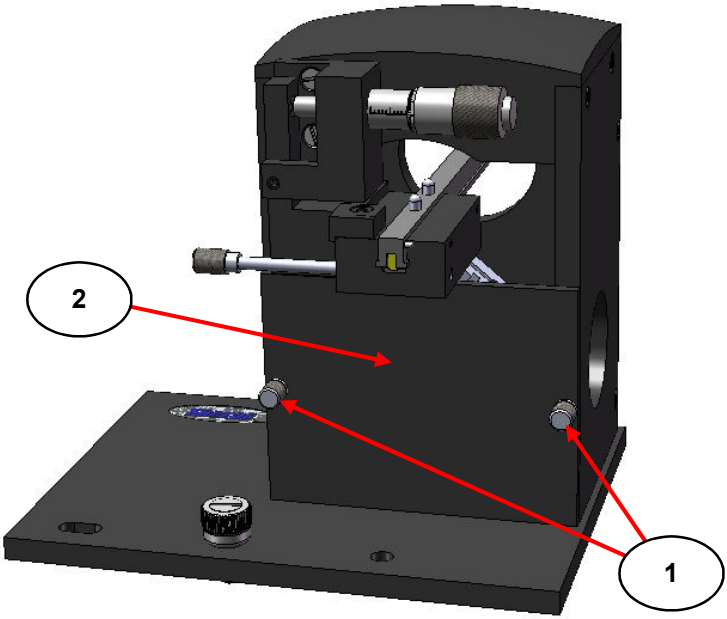


Fig 1. Front Metal Cover Plate of Minidiff Plus Optical Unit

3. Remove all the protective covers from the flat mirrors (**3**) and (**4**) and check the ellipsoid mirror (**5**). (See **Fig 2**. and **Fig 3**).

4. With the protective mirror covers removed, replace the front metal cover plate (**2**) and tighten (turn clockwise) the front metal cover plate thumbscrews (**1**) to re-secure.

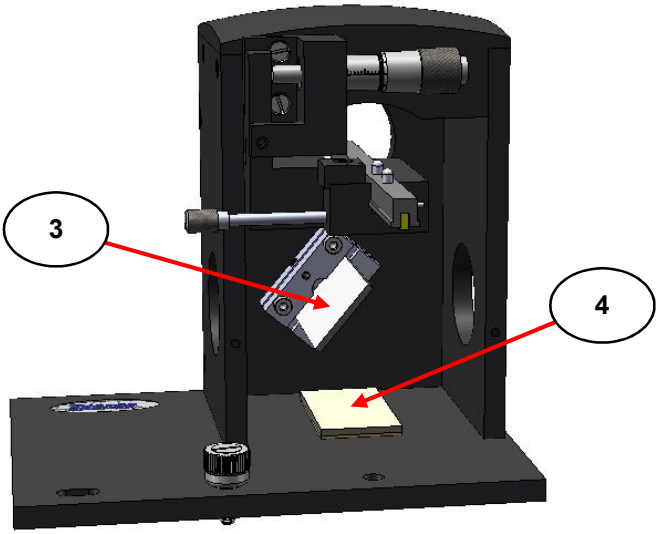


Fig 2. Minidiff Plus Flat Mirror Assemblies Below Sample Position

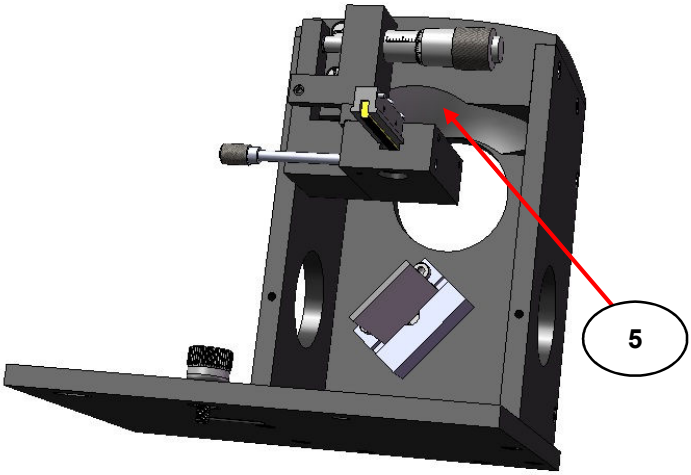


Fig 3. Minidiff Plus Ellipsoid Mirror Above Sample Position

4. Installation Using Benchmark™ Baseplate

The Minidiff Plus accessory is Benchmark™ baseplate mounted for a correct installation and positioning within the sample compartment of the IR spectrometer system. Initially, any spectrometers own 3” x 2” slide sample mount will normally have to be removed before the Minidiff Plus accessory on the Benchmark™ baseplate can be installed.

Note: *It is best to install the Benchmark™ baseplate in the spectrometer first before fixing the Minidiff Plus into position.*

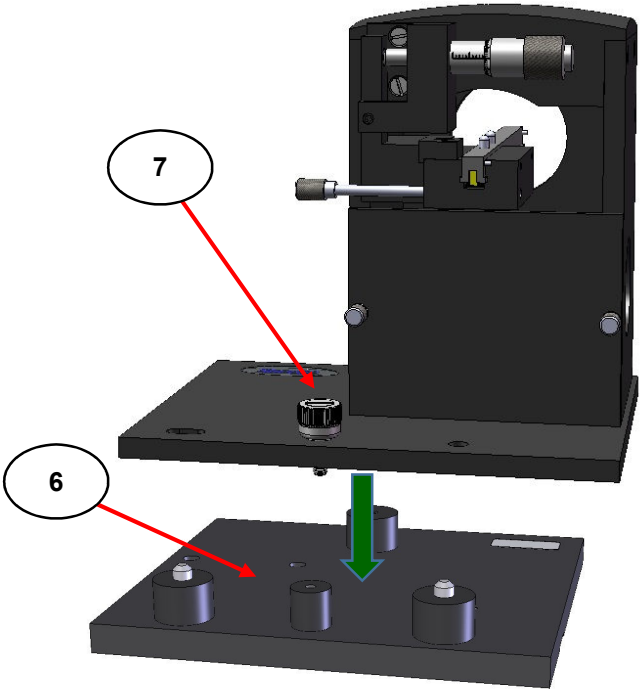


Fig 4. Minidiff Plus Accessory Fitted to a Benchmark™ Baseplate

The Benchmark™ baseplate (**6**) typically has three support pillars (one flat support pillar towards the rear and two at the front with location pins) and a fourth front central pillar into which the fixing thumb screw (**7**) of the Minidiff Plus is tightened.

Fixing holes and studs in the Benchmark™ baseplate (**6**) will vary depending upon the make and model of the spectrometer into which the Minidiff Plus accessory is to be installed. For details on how to install the Benchmark™ baseplate in the spectrometer, refer to the Benchmark™ Baseplate User Installation Manual guide supplied.

When the Benchmark™ baseplate (**6**) has been installed, carefully align the Minidiff Plus accessory over the Benchmark™ baseplate and secure it in position by a simultaneous pushing down and clockwise rotation of the fixing thumbscrew (**7**) into the Benchmark™ baseplates (**6**) front central location pillar. (See **Fig 4.**)

Removal of the Minidiff Plus away from the Benchmark™ baseplate (**6**) is a reverse action in anticlockwise rotation for loosening of the fixing thumbscrew (**7**) and separation of the parts.

5. Alignment Procedure for the Minidiff Plus Diffuse Reflectance Accessory

When the Minidiff Plus accessory has been installed into the spectrometer correctly on a Benchmark™ baseplate (**6**), there will be a need to optimize for the IR beam energy throughput of the accessory from an alignment procedure. The alignment procedure involves an adjustment to the ***focal point position*** of an incoming IR analysis beam from the overhead ellipsoid mirror (**5**) towards the sample surface prior to any diffuse or specular reflectance scatter of light from the sample.

Note: *Any Minidiff Plus will be supplied from Specac already preliminarily aligned to give an energy throughput reading when initially installed into the spectrometer sample compartment. It is necessary to finely adjust the sample surface focal position for optimisation of a throughput energy level specifically for an installation into any new spectrometer system.*

To align for the sample surface focal point position, one of the sample cups (**8**) is used in the **sampling position** with the Minidiff Plus sample cup mount holder assembly (**9**). (See **Fig 5**.)

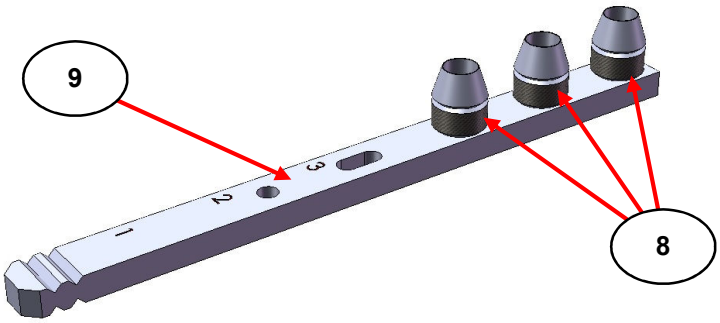


Fig 5. Minidiff Plus Sample Cups on Mount Holder Assembly

Sample Cups for the Minidiff Plus Accessory

A sample cup (**8**) is 5mm diameter and 3mm deep for powder sample containment. It simply push fits over a location pin on the mount holder assembly (**9**) for its particular **sampling position**. (See **Fig 6**.)

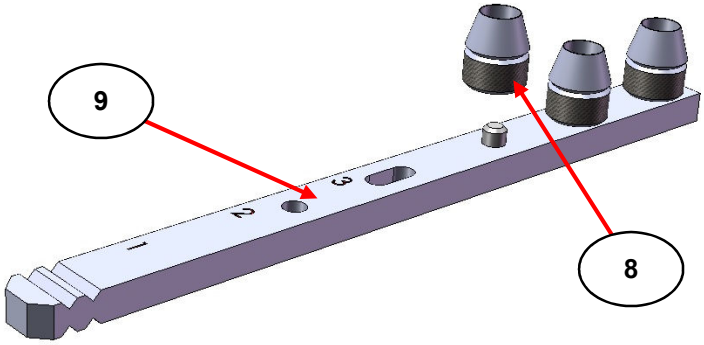


Fig 6. Fitting of Sample Cup to the Mount Holder Assembly

Figs 5 and **6** show three sample cups (**8**) fitted to the mount holder assembly (**9**). The positions of the cups as shown from left to right correspond to the loaded **sampling positions 1**, **2** or **3** as marked on the mount holder assembly (**9**).

Note: *The sample cup (**8**) that is already affixed to the sample cup mount holder assembly (**9**) at **sampling position 3** can be used for the alignment procedure if preferred.*

Filling a Sample Cup with Powder Sample

Any sample cup (**8**) affixed to the mount holder assembly (**9**) can be used for the alignment procedure and is filled with dry, finely ground Potassium Bromide (KBr) or Potassium Iodide (KI) powder, to make a diffuse reflectance sample measurement for optimization of the light beam pathway and throughput from the Minidiff Plus accessory.

It may be more convenient and easier to use the sample filler parts (**10**) and (**11**) supplied to correctly fill the sample cup (**8**) with KBr or KI powder, prior to the fitting of the sample cup (**8**) to the mount holder assembly (**9**), if the fixed sample cup (**8**) at **sampling position 3** is not wished to be used.

The sequence for filling a sample cup (**8**) is as follows. Take the sample filler base (**10**) and place it on a flat surface. Position an empty sample cup (**8**) over the central location pin of the sample filler base (**10**). Now position the sample filler cap (**11**) over the base (**10**) with cup (**8**), such that the top edge of the cup (**8**) is flush level with the top surface of the cap (**11**). (See **Fig 7.**)

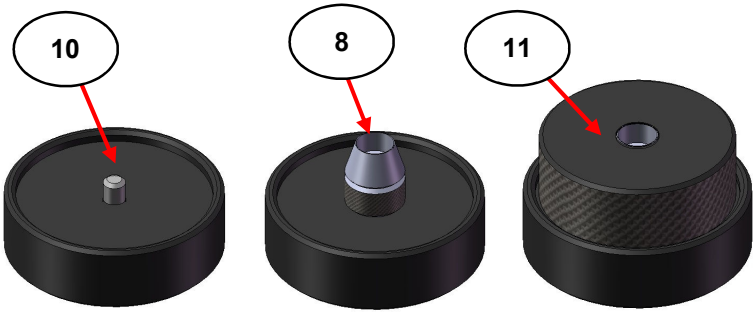


Fig 7. Sample Cup Filling Sequence Using Sample Filler Parts

Fill the sample cup (**8**) with KBr or KI powder, and gently flatten down the powder surface with a flat piece of glass or polished metal, so that it is level with the top of the sample cup (**8**) and filler cap (**11**). Any excess powder sample will be spread over the surface of the filler cap (**11**).

Now, carefully remove the filler cap (**11**) away from the cup (**8**) and base (**10**) to remove the excess powder sample, leaving a flat, level surface for the sample in the sample cup (**8**). Then carefully remove the filled sample cup (**8**) away from the base (**10**).

Carefully place the filled sample cup (**8**) onto pin location position **1** or **2** on the mount holder assembly (**9**).

Should any further powder sample be accidently spilt from the sample cup (**8**) when transferring to the mount holder assembly (**9**), use a soft brush or tissue to remove away from the sample cup mount holder assembly (**9**). Any loose powder outside of the sample cup (**8**) may fall onto the lower adjustable (**3**) and base flat (**4**) mirror assemblies during sampling or when the sample cup mount holder (**9**) is being loaded into the **sampling position**.

Loading a Sample Cup into the Sampling Position

When a sample cup (**8**) has been filled with powder sample, the complete cup and mount holder assembly (**9**) is placed onto the sliding support rod (**12**) of the Minidiff Plus accessory for loading into the **sampling position**.

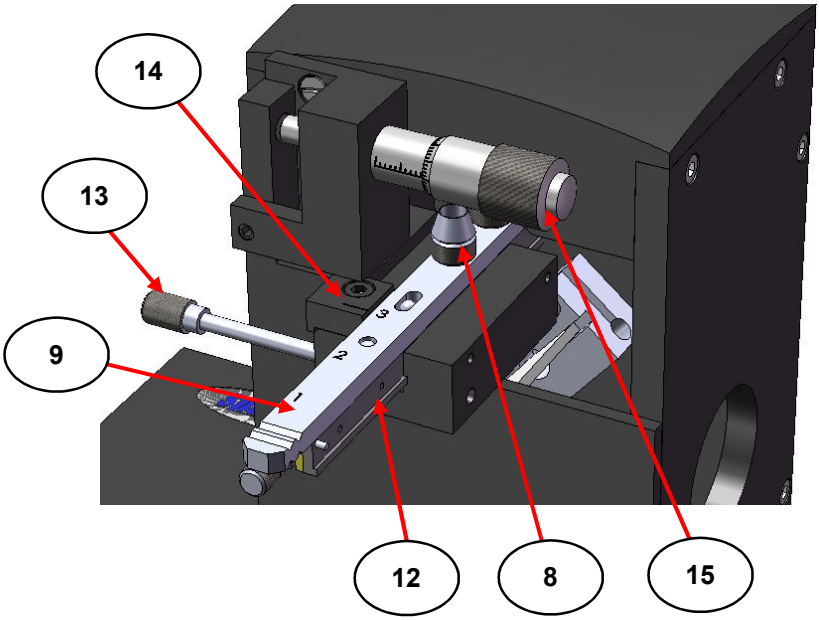


Fig 8. Minidiff Plus Sampling Position Indication

To place the mount holder assembly (**9**) onto the sliding support rod (**12**), first wind out the support rod (**12**) by clockwise rotation of the sample positioning screw (**13**), until the support rod (**12**) comes to its end stop position. Very carefully place to rest the mount holder assembly (**9**) into position over the two locating studs of the support rod (**12**) as shown at **Fig 8,** with the sample cups (**8**) end of the mount holder assembly (**9**) nearest towards the Minidiff Plus optical unit. Rotate the sample positioning screw (**13**) anti-clockwise, to position the filled sample cup (**8**) directly and centrally beneath the ellipsoid mirror (**5**) for its **sampling position**.

A “click” sound will be heard when a particular **sampling position** for cup position **1**, **2** or **3** has been set. The mount holder assembly (**9**) has three sample cup (**8**) positions to allow for up to three sample cups (**8**) to be filled and placed on the support rod (**10**) at any one time. An appropriate **sampling position** to be set for the specific sample cup (**8**) position on the mount holder (**9**) is indicated by the number **1**, **2** or **3** as this number aligns with the engraved mark (**14**) from rotation of the sample positioning screw (**13**). (From **Fig 8**, the **sampling position** for the fixed sample cup (**8**) at position **3** has been set as shown.)

Note: *If any accidental spillage of powder onto the mirrors (**3**) and (**4**) below happens from selecting a **sampling position**, this should be removed carefully with a soft brush or tissue at this stage. The front metal cover plate (**2**) may need to be removed to gain access for cleaning,*

Alignment Procedure

Note: *The Minidiff Plus will be pre-aligned before despatch from Specac and will only require minor adjustments for the sample surface focal point position to maximize for a throughput energy using the test powder sample.*

With introduction of a filled sample cup (**8**) into the **sampling position**, at this stage some throughput energy should be registered on the spectrometer. To measure, the spectrometer display can be set to

register an energy throughput level or signal strength for the spectrometers system. It is a requirement to know what a ***typical energy*** level is for the spectrometers system that corresponds to a 100% transmission throughput of light when there is nothing in the beam path of the IR light from the source to the detector of the spectrometer. This known typical energy throughput value is used to compare to an energy throughput level attained from a good alignment of the Minidiff Plus accessory on the particular spectrometer system into which it has been installed and is to be used.

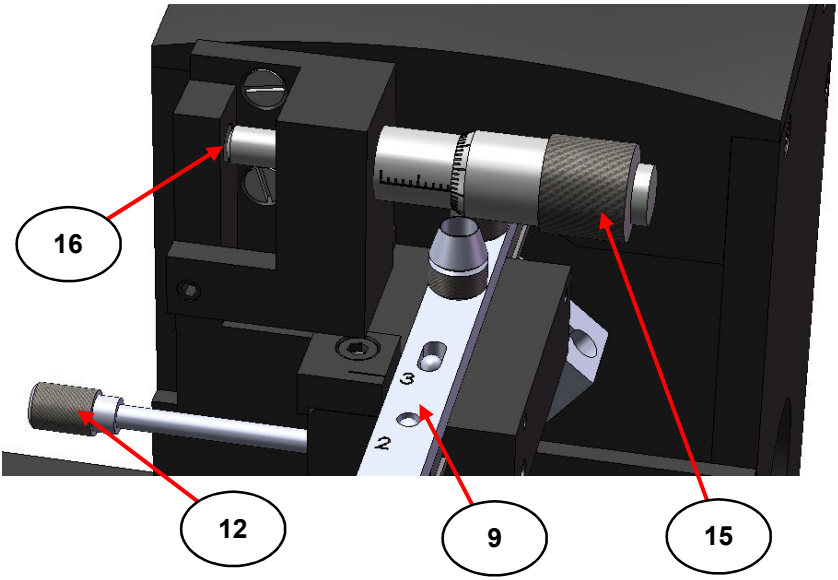


Fig 9. Minidiff Plus Micrometer Adjustment Screw Mechanism

To maximize the energy throughput of the Minidiff Plus accessory, gently turn the micrometer adjustment screw (**15**) clockwise or anti-clockwise to adjust for the IR beam focal point position for the sample surface, as contained and filled in the sample cup (**8**). The “L” shaped pivot bracket and support table assembly for the sliding support rod (**12**) is attached to the micrometer adjustment screw tip with a magnet

(**16**) to ensure that this adjustment operates correctly. The micrometer adjustment screw (**15**) tip is always in contact with the magnet (**16**) in the pivot assembly such that if rotation of the micrometer screw (**15**) in one direction decreases the energy throughput level being seen, then rotation of the micrometer screw (**15**) in the opposite direction is required until an energy maximum has been established.

When correctly aligned an energy signal of between 10-20% throughput value for KBr or KI sample powder as compared to the 100% value of an unobstructed beam energy throughput should be obtained on most spectrometers.

6. Optical Beam Pathway of the Minidiff Plus and Mirror Alignment

Having installed the MInidiff Plus accessory and followed the alignment procedure from Section 5) of this User Instruction Manual, the Minidiff Plus accessory is ready to use for sampling of a wide variety of solid/powder sample types.

It is usually not necessary to make any further adjustments to the optical components of the Minidiff Plus accessory to achieve a good throughput energy level of operation, but there may be an occasion whereby the adjustable mirror assembly (**3**) needs to be repositioned to achieve an optimum throughput from this mirror assembly (**3**) realignment. (e.g. the mirror assembly (**3**) might have been accidentally moved out of the factory alignment position when the protective mirror covers were removed from the unpacking and checking stage.)

Realignment of the Adjustable Mirror Assembly (3)

If the adjustable mirror assembly (**3**) has moved out of alignment the following procedure and instructions can be followed to help in a re-alignment.

Important! *If needing to replace any damaged mirror (**3**) or (**4**) components with new parts, or to realign the mirror assembly (**3**), take care not to handle or touch the mirror surfaces.*

The optical components of the Minidiff Plus accessory consists of two flat mirror assemblies (**3**) and (**4**), below the **sampling position** level and one large ellipsoid (domed) mirror (**5**) that covers completely over and above the **sampling position** level. The optical beam path from source to sample and to detector for the Minidiff Plus accessory is shown in **Fig 10.**

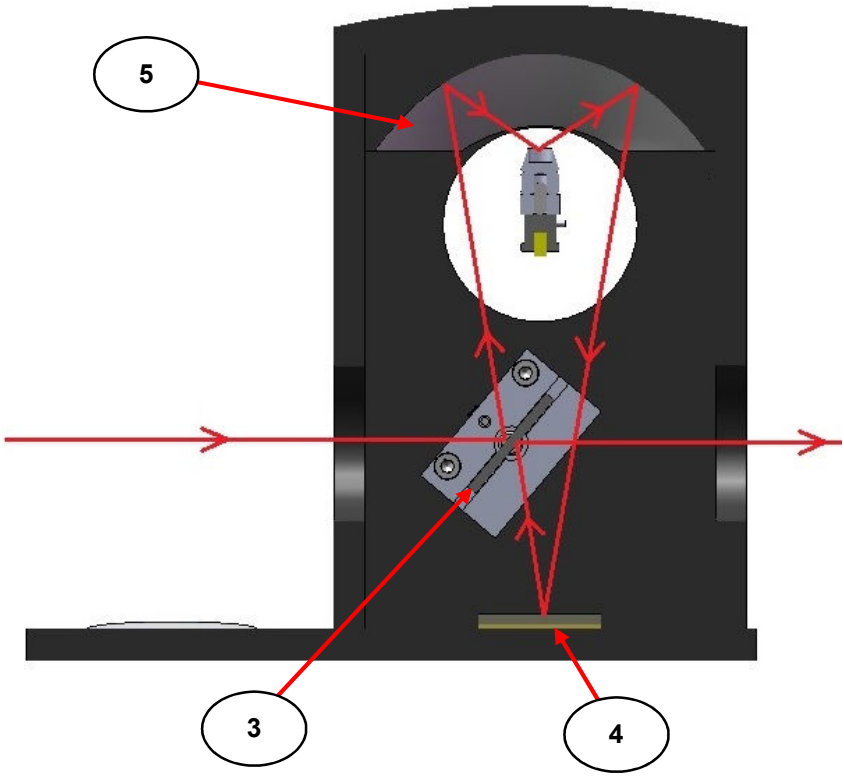


Fig 10. Beam Pathway Schematic for the Minidiff Plus Diffuse Reflectance Accessory

Fig 10 shows a front cutaway, cross section view of the Minidiff Plus accessory. The mirror assembly (**3**) consists of a double sided mirror (**17**) on an adjustable mount (**18**). The mirror (**4**) is a single sided flat mirror affixed to the base of the Minidiff Plus accessory and cannot be adjusted. Similarly, the ellipsoid mirror (**5**) is also fixed in position at the top of the Minidiff Plus accessory and cannot be adjusted.

A light beam from a source on the left side of a spectrometer system and traversing parallel for the beam height of the instrument strikes the

top surface of the double sided mirror (**17**) of the mirror assembly (**3**).

From the angle setting of the mirror assembly (**3**), the light beam is reflected up towards the left side half dome of the ellipsoid mirror (**5**) and is then directed down towards the sample cup (**8**) surface level for its **sampling position**. Any diffusely or specularly reflected components of light from the sample surface are collected by the right side half dome of the ellipsoid mirror (**5**) and are reflected downwards to the flat mirror assembly surface (**4**) at the base of the optical unit.

The light beam is then reflected from mirror (**4**) to the underside surface of the double mirror (**17**) on mirror assembly (**3**), for a final reflection towards the right side and the detector of the spectrometer system.

Note: *The beam path for the Minidiff Plus has been shown for a left to right beam direction passage from source to sample to detector through the sample compartment of a spectrometer. For a system that has a right to left beam direction from source to detector, the performance of the Minidiff Plus is unaffected.*

Adjustable Mirror Assembly (3) Alignment Procedure

If the mirror assembly (**3**) needs to be realigned, carry out the following procedure.

Take a KBr or KI powder sample for use and follow the procedure for **sampling position alignment** as described in Section 5), pages 12 to 18 of this User Instruction Manual.

When the filled sample cup (**8**) is in its loaded **sampling position**, (the numbers **1**, **2** or **3** are by the alignment mark (**14**) for the appropriate cup position), loosen the two front metal cover plate thumbscrews (**1**) and remove the front metal cover plate (**2**) to gain access to the lower mirror (**3**) and (**4**) assemblies.

Fig 11 shows a detailed close up of the mirror assembly (**3**) when the front metal cover plate (**2**) has been removed.

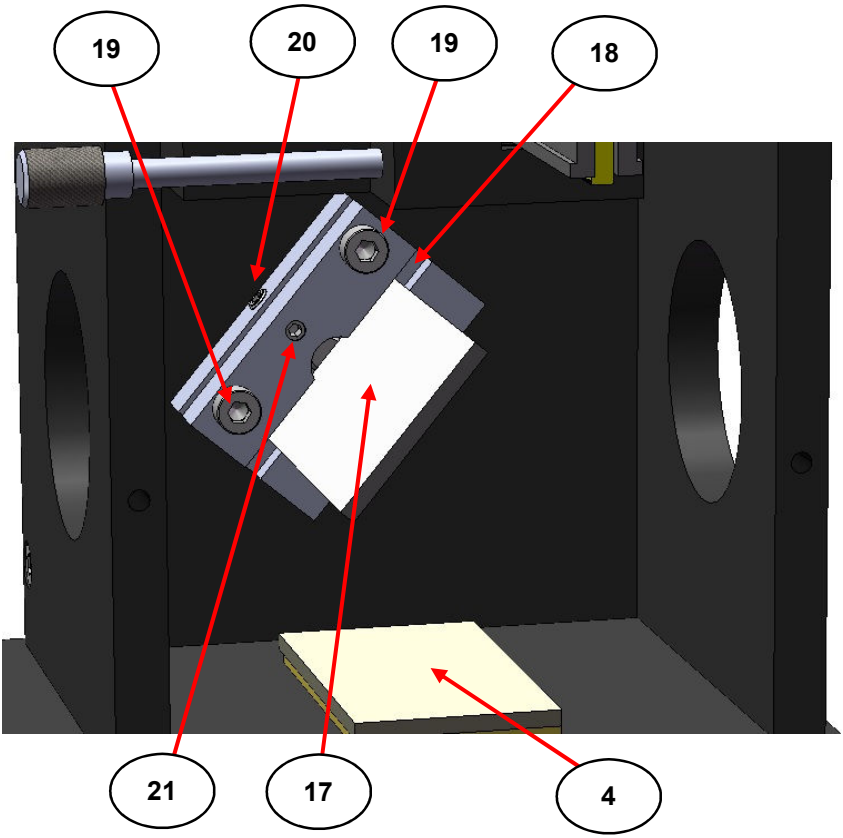


Fig 11. Minidiff Plus Adjustable Mirror Assembly Detail

Using the 2.5mm Allen key supplied, loosen the two cap head screws (**19**) in the mirror mount (**18**) of the mirror assembly (**3**). The cap head screws (**19**) lock the mirror mount (**18**) into position for the entire mirror assembly (**3**) when set at the correct angle for alignment.

Take the 1.5mm Allen key and loosen the locking grub screw (**20**) to allow the mirror mount (**18**) to be gently rotated about its fixing screw

support shaft. Use the 1.5mm Allen key whilst it is located in the loosened grub screw (**20**) to act as a turning lever and gently **rotate** the mirror mount (**18**) clockwise or anti-clockwise until a maximum energy throughput reading is obtained at the detector of the spectrometer.

When an optimum throughput energy has been established from a rotation of the double sided mirror (**17**), retighten the grub screw (**20**) to prevent further rotation of the mirror mount (**18**) to occur.

The double sided mirror (**17**) may also need to be **tilted** for its angle setting to optimize the throughput energy. To adjust the double sided mirror (**17**) tilt position insert the 1.5mm Allen key into the grub screw (**21**) and turn it similarly clockwise or anti clockwise to maximize the energy.

Note: *Always complete a **rotation** movement for a throughput energy maximum setting before stepping to a **tilt** movement for any adjustment in setting (or vice versa).*

Now, re-adjust the **sampling position** surface level by turning the micrometer screw (**15**) clockwise or anti-clockwise to maximize the energy.

It may be necessary to repeat the **rotate**, **tilt** and **sampling position** adjustment steps a second time until the maximum energy throughput has been achieved.

When the mirror assembly (**3**) setting has been established to achieve an optimum energy throughput, carefully tighten the cap head screws (**19**) to lock the double sided mirror (**17**) on its mount (**18**) into position for the new angle setting.

Replace the front metal cover plate (**2**) and tighten the front metal cover plate thumbscrews (**1**) to re-secure.

7. Sampling With The Minidiff Plus Diffuse Reflectance Accessory

Sample Cup or Diabraze Pad for Use

To sample with the Minidiff Plus diffuse reflectance accessory there is a choice in use of a sample cup (**8**) for powder solid sampling (See **Fig 5.**), or a diabraze pad surface (**22**) that is affixed to its own mount (**23**). (See **Fig 12.**)

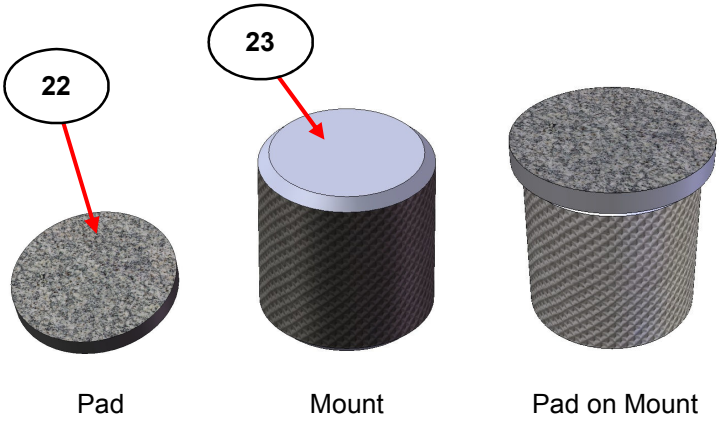


Fig 12. Minidiff Plus Diabraze Pad and Mount

The diabraze pad (**22**) is 9mm diameter and 1mm thick and consists of a rough surface of fine diamond chips embedded into a cloth fabric to produce an abrasive surface for sampling. The diabraze pad (**22**) has an adhesive backed surface to allow it to stick to its mount (**23**). The protective backing of the adhesive surface is simply peeled away to fix a diabraze pad (**22**) centrally to the surface of its support mount (**23**). The diabraze pad (**22**) and mount (**23**) assembly is placed into the Minidiff Plus for a **sampling position** being supported on its own diabraze pad mount holder assembly (**24**). (See **Fig 13**.)

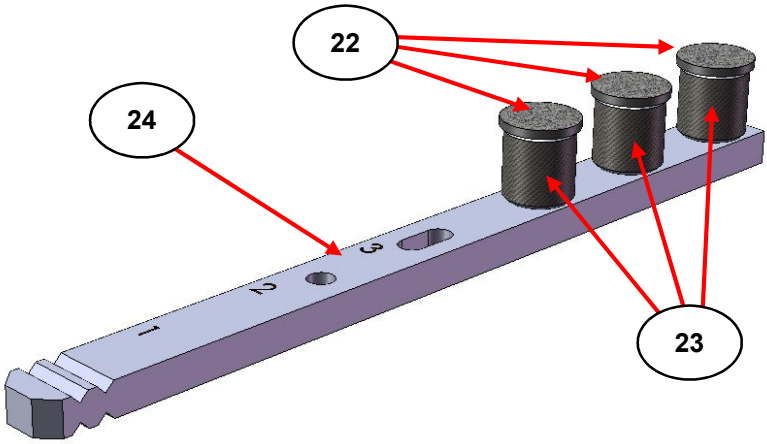


Fig 13. Minidiff Plus Diabraze Pad Mount Holder Assembly

The diabraze pad (**22**) can be used to transfer a sample type to the diabraze pad surface by simple abrasion of the diabraze pad (**22**) against the sample of interest. (e.g. the plastic surface of a moulded part). It may be preferable to transfer a small amount of the sample type this way to record a diffuse reflectance spectral measurement, rather than being able to sample the plastic material itself by an alternative method of spectral collection. (e.g. ATR – Attenuated Total Reflectance.)

Note: *Similar to the sample cup mount holder assembly (**9**), the diabraze pad mounter holder assembly (**24**) has a mount pad (**23**) fixed into **sampling position 3**. It may be preferable to use this **sampling position** for the reference measurement when fixing a diabraze pad (**22**) to the mount (**23**).*

In summary, the sample cup (**8**) is preferable to use for the diffuse reflectance measurement of powder type solid samples, whereas the diabraze pad (**22**) can be used to collect “difficult to obtain” samples for a diffuse reflectance measurement by transfer of the sample to the diabraze pad (**22**) surface from abrasive contact.

Procedure for Measurement with the Sample Cup (8)

For any **sampling** measurement to be taken, a background reference spectrum must be recorded first for comparison. When using the sample cup (**8**) for sample measurements, normally the background reference spectrum to use would be created from measurement of KBr or KI powder material as used for the alignment procedure. (See Section 5 page 16).

Collecting a Background Spectrum

Fill the sample cup (**8**) with either KBr or KI powder or any suitable powder material that could act as an appropriate background "blank" for your sample material.

Load the filled sample cup (**8**) into the **sampling position** as explained in Section 5) page 15 and then collect and store a background spectrum against the spectral acquisition parameters set on your spectrometer system. (e.g. 16 scans at 4cm-1 resolution.)

Collecting a Sample Spectrum

When a background spectrum has been collected, remove the background sample cup (**8**) from its **sampling position** and replace with a new filled cup (**8**) with the powder sample to analyse. The spectral acquisition parameter conditions for recording of a sample spectrum should be identical to those for obtaining the background reference spectrum.

As mentioned in Section 5), (See **Fig 5**.), the sample cup mount holder (**9**) has three sampling positions to place a filled sample cup (**8**). Hence on the sample cup mount holder (**9**) you may already wish to have sample cup position **1** occupied for the blank reference material in a sample cup (**8**) and the spare sample cup positions **2** and **3** for actual samples. It is then a simple matter of turning the sample position screw (**13**) accordingly to change the reference sample cup (**8**) from its background blank **sampling position** at the **1** position to load a filled sample cup (**8**) at the **2** or **3** position into the **sampling position**.

Procedure for Measurement with the Diabraze Pad (22)

Similar to use of a sample cup (**8**), for any **sampling** measurement to be taken using the diabraze pad (**22**), a background reference spectrum must be recorded first for comparison. When using the diabraze pad (**22**) for sample measurements, normally the background reference spectrum to use would be a spectral collection of the surface of a clean, new diabraze pad (**22**) itself, before any sample has been abraded for transference to the diabraze pad (**22**) surface.

Collecting a Background Spectrum

Take a new, clean diabraze pad (**22**), peel away the protective backing to expose the adhesive surface and stick the pad centrally to its mount (**23**). Fit the diabraze pad (**22**) and mount (**23**) onto one of the 3 location pin positions on the diabraze pad mount holder assembly (**24**).

To place the diabraze pad mount holder assembly (**24**) onto the sliding support rod (**12**), first wind out the support rod (**12**) by clockwise rotation of the sample positioning screw (**13**), until the support rod (**12**) comes to its end stop position. Place the mount holder assembly (**24**) into position on the two locating studs of the support rod (**12**) with the diabraze pad (**22**) and mount (**23**) parts nearest towards the Minidiff Plus optical unit. Rotate the sample positioning screw (**13**) anti-clockwise, to position the diabraze pad (**22**) on its mount (**23**) centrally beneath the ellipsoid mirror (**5**) for its **sampling position**. The appropriate sample position number **1**, **2** or **3** on the diabraze pad mount holder assembly (**24**) is indicated by the alignment mark (**14**) when the diabraze pad (**22**) is in its correct **sampling position**.

Collect and store a background spectrum against the spectral acquisition parameters set on your spectrometer system. (e.g. 16 scans at 4cm-1 resolution.) for the new, clean diabraze pad (**22**).

Collecting a Sample Spectrum

When a background spectrum has been collected, remove the diabraze pad (**22**) on its mount (**23**) from its **sampling position** and

then remove the diabraze pad (**22**) and mount (**23**) from its position on the diabraze pad mount holder assembly (**24**).

Abrade the diabraze pad (**22**) surface against the sample of interest to transfer the sample to the surface of the diabraze pad (**22**) for spectral analysis.

Now, reposition the diabraze pad (**22**) on its mount (**23**) with the sample coating back onto the diabraze pad mount holder assembly (**24**) and proceed to load the sample into the Minidiff Plus for its **sampling position** for a spectral collection. The spectral acquisition parameter conditions for recording of a sample spectrum should be identical to those for obtaining the background reference spectrum.

As mentioned in Section 5) for the sample cup holder mount assembly (**9**), the diabraze pad mount holder assembly (**24**) has three sampling positions to place a diabraze pad (**12**) as affixed to its mount (**23**). (**See Fig 13**.) Hence on the diabraze pad mount holder assembly (**24**), you may already wish to have position **1** occupied for a blank (no sample coating) diabraze pad (**22**) and mount (**23**) and the spare diabraze pad (**22**) and mount (**23**) positions **2** and **3** for actual samples. It is then a simple matter of turning the sample position screw (**13**) accordingly to change the reference blank diabraze pad (**22**) from its **sampling position** to load a sample coated diabraze pad (**22**) at the **2** or **3** position into the **sampling position**.

Note: *This method of sampling can be done assuming that the reference diabraze pad (**22**) taken for the background measurement is representative of all of the diabraze pad (**22**) surfaces being used. For consistency of results between the background and sample conditions in any spectral acquisition it may be preferable to **use the same diabraze pad (22**).*

8. Cleaning the Minidiff Plus after Use

When sampling has been completed using the Minidiff Plus accessory, solid/powder samples that have been used in a sample cup (**8**) may be emptied out of the sample cup (**8**) and saved for further purposes if desired. The sample cup (**8**) may then be rinsed with water, followed by methanol or acetone and then dried with clean tisue for further use.

If sampling has been carried out using a diabraze pad (**22**) on its mount (**23**), peel away and remove the used diabraze pad (**22**) from the mount (**23**) and throw the diabraze pad (**22**) away. The surface of the mount (**23**) may need to be cleaned of any residual adhesive for use when affixing a new diabraze pad (**22**). Acetone solvent can be used to moisten a tissue to wipe away at any adhesive residues.

If there has been any spillage of sample within the Minidiff Plus accessory, this should be cleaned away. If sample has fallen onto the mirror assemblies (**3**) and (4) to contaminate the mirror surfaces, then it's possible the sample can be removed carefully by gently blowing it away with air and using a fine haired brush.

Note: *If possible, try to avoid actually touching or wiping the mirror surfaces, as if scratches or blemishes are introduced to the reflecting surface, the performance of the Minidiff Plus accessory will be impaired.*

When any sampling cups (**8**) and the Minidiff Plus accessory have been cleaned after use, the accessory and any appropiate parts can be stored in the original carry case for safe keeping until use next time.

9. Minidiff Plus Accessory "Bubble Numbers" Part Identification List

(**1**) Fixing thumbscrew for front metal cover plate.
(**2**) Front metal cover plate.
(**3**) Adjustable double sided mirror assembly.
(**4**) Fixed single sided mirror assembly at base of unit.
(**5**) Fixed ellipsoid (domed) mirror at top of unit.
(**6**) Benchmark™ baseplate.
(**7**) Fixing thumbscrew of Minidiff Plus to Benchmark™ baseplate.
(**8**) Sample cup. (5mm diameter, 3mm deep for sample.)
(**9**) Sample cup mount holder assembly.
(**10**) Sample filler base part.
(**11**) Sample filler cap part.
(**12**) Adjustable support rod for mount holder assembly.
(**13**) Sample positioning screw.
(**14**) Alignment mark for sampling position **1**, **2** or **3**.
(**15**) Micrometer adjustment screw for beam focal point position.
(**16**) Magnet to engage with micrometer adjustment screw tip.
(**17**) Double sided mirror.
(**18**) Adjustable mirror mount for double sided mirror.
(**19**) Fixing cap head screws for adjustable mirror mount.
(**20**) Grub screw to unlock and rotate adjustable mirror mount.
(**21**) Grub screw to tilt double sided mirror.
(**22**) Diabraze pad. (9mm diameter for surface).
(**23**) Mount for diabraze pad.
(**24**) Diabraze pad mount holder assembly.

10. Minidiff Plus Accessory Spare Parts

Minidiff Plus Accessory

P/N GS04510 Minidiff Plus Accessory complete. (Specify spectrometer to be used when ordering to receive appropriate Benchmark™ baseplate.)

Minidiff Plus Parts

P/N GS04505 Sample cup mount holder assembly with 3 sampling cups. (2 assemblies supplied.)
P/N GS04506 Diabraze abrasive pads, 9mm diameter. (Packet of 100 pads supplied.)
P/N GS04508 Diabraze pad mount holder assembly sample with 3 diabraze pad mounts (2 assemblies supplied.)
P/N GS03610 KBr powder. (50 g supplied.)

11. Minidiff Plus Accessory Serial Numbering

A Minidiff Plus accessory will be provided marked with an identifying serial number. The serial number is a five figure number prefixed by a letter and found on a silver coloured label.

If there are any issues arising in use of the Minidiff Plus accessory, it is useful to have the serial number information to hand when contacting Specac.

Please use the table below to make a note of the serial number for your received Minidiff Plus accessory.

Minidiff Plus Diffuse Reflectance Accessory	Serial Number
P/N GS04510	

Worldwide Distribution

France
Eurolabo - Paris.
Tel.01 42 08 01 28
Fax 01 42 08 13 65
email: contact@eurolabo.fr

Germany
L.O.T. - Oriel GmbH & Co,
KG - Darmstadt
Tel: 06151 88060
Fax: 06151 880689
email:info@LOT-Oriel.de
Website: www.LOT-Oriel.com/de

Japan
Systems Engineering Inc. -Tokyo
Tel: 03 3946 4993
Fax: 03 3946 4983
email:systems-eng@systems-eng.co.jp
Website: www.systems-eng.co.jp

Spain
Teknokroma S.Coop C. Ltda
Barcelona
Tel: 93 674 8800
Fax: 93 675 2405
email: comercial@teknokroma.es

Switzerland
Portmann InstrumentsAG
Biel-Benken
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Fax: 061 726 6550
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Website:www.portmann-instruments.ch

USA
Specac Inc.
414 Commerce Drive
Suite 175
Fort Washington
PA 19034, USA
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