Benchmark™ Rotator Mount GS12510 Series For GS57010 Series Polarizers With 38mm Clear Aperture

User Manual

2I-12510-4

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1. Introduction

Thank you for purchasing a Specac Product.

The Benchmark™ Rotator Mount GS12510 Series is fitted with a 38mm diameter clear aperture (C.A.) polarizer from the family of Specac GS57010 Series polarizers. The rotator mount with fitted polarizer is attached directly to the aperture ports of any optical unit used with Specac Benchmark™ baseplate compatible accessories. Such accessories include the Golden Gate™, Silver Gate™ and Gateway™ horizontal ATR systems and the Cyclone™ and Tornado™ long pathlength gas cells.

With a particular option of 38mm diameter C.A. GS57010 Series polarizer fitted within the GS12510 Series rotator mount as attached to an optical unit, the polarizer can be rotated for a particular angular degree of polarized light by adjustment of an outer rotating ring on the polarizer mount itself. The GS12510 Series rotator mount with polarizer can be used when polarized light experimentation is to be carried out using any of the aforementioned Specac accessories, particularly if there is limited spectrometer sample compartment space.

The standard aperture ports of the Benchmark™ baseplate compatible optical units have been designed to accept an alternative GS12000 Series polarizer offered by Specac. To rotate this type of polarizer, it must be removed from the aperture port and turned to align with the indicating grooves in the aperture port ring for either parallel or perpendicular polarization and then re-inserted. There is always a potential risk of getting fingermarks on the polarizer substrate when placing the GS12000 Series polarizer into or removing it from the aperture mounting ports. Thus, if there is a requirement for continual changing of the polarizer grid orientation whilst a polarizer is fitted to a Benchmark™ baseplate compatible optical unit, the use of the GS12510 rotator mount with a fitted GS57010 Series polarizer makes this operation far easier to achieve than use of a GS12000 Series polarizer and may help to minimise the risk of any markings or damage to the polarizer grid on the substrate surface from less handling after initial installation for use.

2. Safety Considerations

When handling a polarizer correctly as advised, there are inherently minimal safety concerns to follow involved with their use.

Despite the general safety precaution to avoid touching any of the substrate materials and photo-etched polarizer grid where at all possible, depending upon **which** particular substrate material type for the GS57010 Series polarizer that has been supplied and is to be used, there are certain safety precautions to observe associated with the substrate material.

Related to the particular polarizer substrate material type you have received or are using for the 38mm diameter C.A. GS57010 Series polarizer, please refer to the relevant substrate material safety and handling information in Section 7 of this instruction manual.

3. Unpacking and Checklist

The GS12510 Series rotator mount can be purchased on its own against P/N GS12510. However, it will usually be supplied with an appropriate 38mm diameter C.A. GS57010 Series polarizer of choice already fitted within the rotator mount against an appropriate part number to order for the entire assembly.

Subsequent 38mm diameter C.A. GS57010 Series polarizers can be purchased as a replacement polarizer and fitted into the GS12510 Series rotator mount should they be required at a future date.

Any further GS12510 Series rotator mounts can be supplied already fitted with an alternative substrate polarizer or just as the P/N GS12510 mount without a polarizer – whichever is preferred.

On receipt please check that the following items have been supplied.

- GS12510 Series rotator mount with GS57010 Series polarizer of your choice in a plastic carry case. (If ordered as a particular part number – see spare parts list)
- GS12510 Series rotator mount in plastic carry case. (If ordered as P/N GS12510).
- GS57010 Series polarizer 38mm diameter C.A. of choice in its own container. (If ordered as particular part number).

Caution!

*When removing the items from their packing be especially careful with the GS57010 Series polarizer. The polarizer grid is very fragile and you **must** avoid contact with the polarizer substrate surface, otherwise the polarizer grid could be irreparably damaged. It is advisable to store the GS57010 Series polarizer in its original packing container when not being used.*

4. Instructions for Use

The GS12510 Series Rotator Mount

The GS12510 Series rotator mount (**1**) can be supplied on its own if ordered as P/N GS12510 for fitting of a 38mm diameter C.A. GS57010 Series polarizer, or will already be supplied with an appropriate size GS57010 polarizer fitted in position if ordered against its specific part number for the complete assembly. Whichever option is supplied the rotator mount (**1**) will be supplied with a front (**2**) and rear (**3**) protective cover which are used for storage and protection of any polarizer when fitted and not in use. Please see **Fig 1.** to show the front and rear views of the rotator mount for the protective covers as fitted.

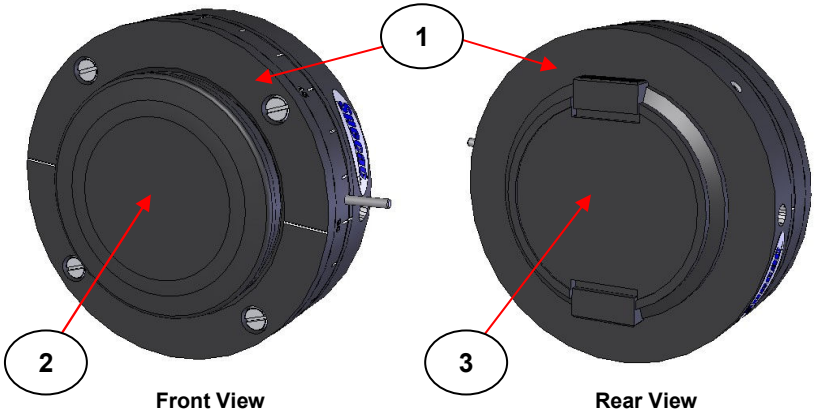

Fig 1. Front and Rear Views of Benchmark™ Rotator Mount P/N GS12510

In use, the front (**2**) and rear (**3**) covers are removed from the rotator mount (**1**). The front cover (**2**) is a “friction fit” over the circumference ring “boss” (**4**) on the front face of the rotator mount (**1**) and is pulled away to reveal any 38mm diameter C.A. GS57010 Series polarizer that would be installed into the rotator mount. The rear cover (**3**) is removed by pinching together the two spring clips of this cover and pulling away.

From removal of the front (**2**) and rear (**3**) covers, the rotator mount (**1**) is supplied as shown for the front and rear views in **Fig 2** (no polarizer) and **Fig 3.** (polarizer fitted).

Fig 2. Front and Rear Views of Rotator Mount P/N GS12510 with Protective Covers Removed (No Polarizer Fitted)

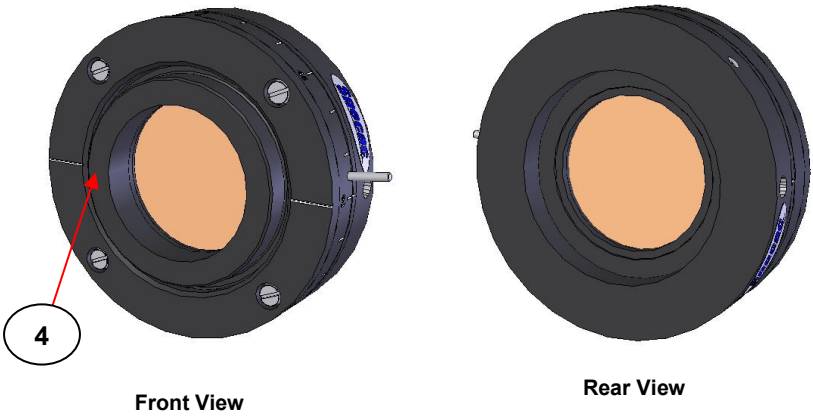

Fig 3. Front and Rear Views of Rotator Mount P/N GS12510 with Protective Covers Removed (Polarizer Fitted)

Fitting the GS12510 Series Rotator Mount to the Benchmark™ Compatible Optical Unit Aperture Port

As explained in the Introduction, when the GS12510 Series rotator mount fitted with a polarizer is fixed to the aperture port (**5**) of a Benchmark™ compatible optical, the assembly allows for a particular angular degree of polarized light to be transmitted by adjustment of an outer rotating ring (**6**) on the polarizer mount (**1**) itself. The design of the rotator mount (**1**) allows for a change of polarized light orientation to be made without the need for removal of the polarizer itself and reorientation of the polarizer back into the aperture port position of the optical unit. In turn there is no requirement to remove the complete Benchmark™ optical unit (and relevant Accessory) from the sample compartment of the spectrometer to gain access to the polarizer for such a rotational operation. If the accessory being used has been set up with appropriate ancillary services (gas pipes, water cooling tubing, electrical supplies etc for operation) then there is also no need to disturb this set up to make the change for any polarizing light orientation of operation, which would occur from removal of the optical unit.

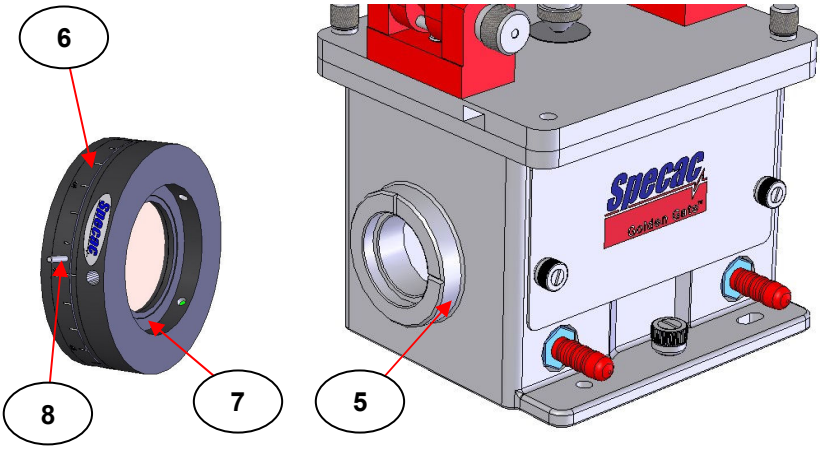

Fig 4. Fitting of GS12510 Series Rotator Mount to Aperture Port of Optical Unit (Example - Heated Golden Gate™ Accessory)

As shown in **Fig 2**. and **Fig 3**. the circular recessed part (**7**) of the rear view face of the rotator mount (**1**) fits over the protruding “boss” circular ring of the aperture port (**5**) on the optical unit. It does not matter which aperture port of the optical unit is used for attachment of the rotator mount (**1**) with respect to an IR beam direction through the spectrometers sample compartment from source to detector, as the polarizing effect is the same before or after the polarized light has passed through any sample. (See **Fig 4.)**

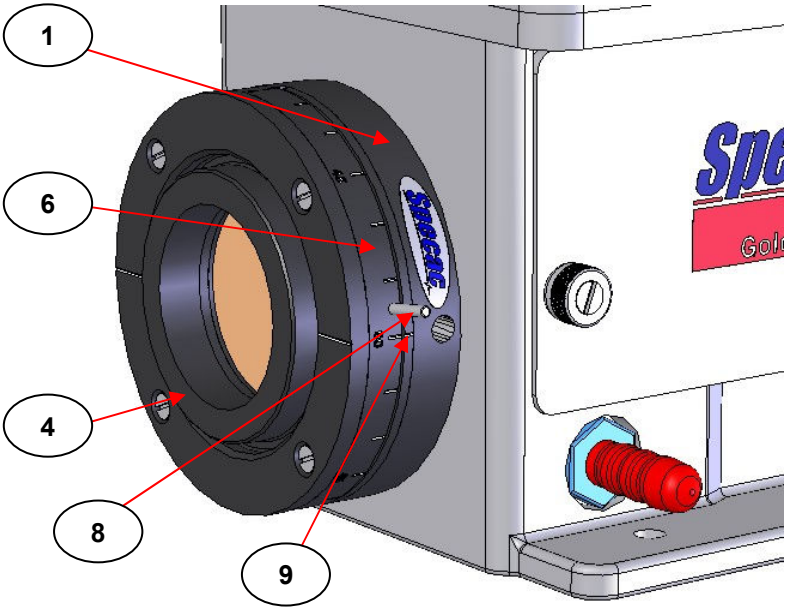

Fig 5. Close Up Front View of GS12510 Rotator Mount Fixed to the Benchmark™ Optical Unit

Fit the rotator mount (**1**) onto the aperture port (**5**) but ensure that the toggle bar (**8**) on the rotating ring (**6**) of the polarizer mount (**1**) is facing towards the front of the optical unit when the accessory is to be installed in the spectrometer sample compartment, allowing for easy operation in changing of the polarizer grid angular orientation. When

the toggle bar (**8**) is facing towards the front, the angular notch indicator (**9**) will also be seen. (The toggle bar (**8**) is fixed between the 75° and 90° angle marks on the rotating ring (**6**)). To set a particular angle of orientation for the polarizer grid the angle mark on the rotating ring (**6**) is aligned with the notch indicator (**9**) by turning of the rotating ring using the toggle bar (**8**). (See **Fig 5.**)

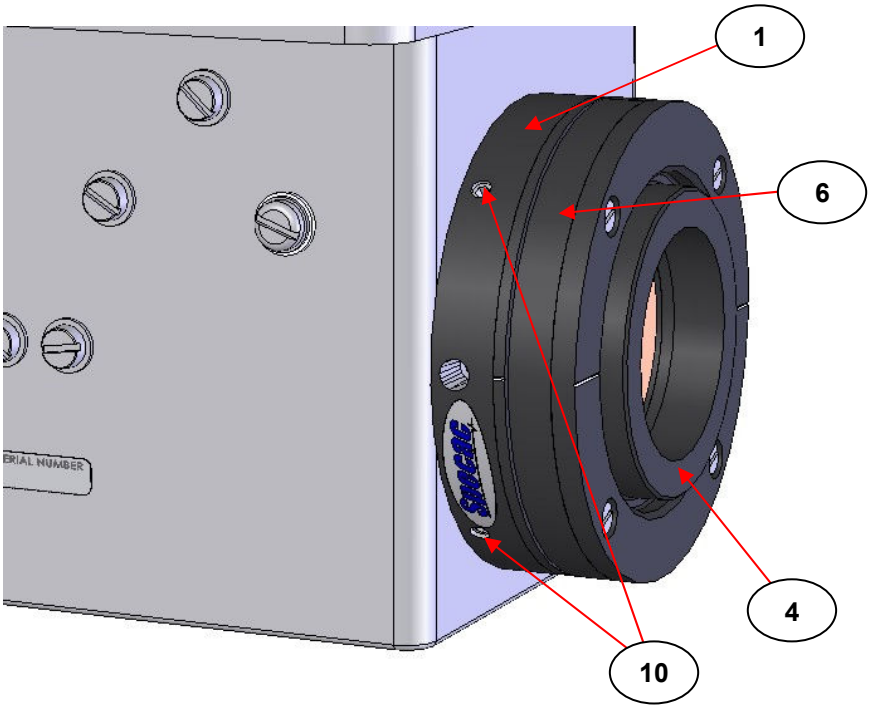

Fig 6. Close Up Rear View of GS12510 Rotator Mount Fixed to the Benchmark™ Optical Unit (Grub Screw Fixings)

To secure the polarizer mount (**1**) to the aperture port (**5**) there are two grub screws (**10**) to tighten (See **Fig 6.**) The grub screws (**10**) are on the opposite side of the rotator mount (**1**) when the toggle bar (**8**) on the rotating ring (**6**) aligns with the angular notch indicator (**9**) and is pointing towards the front of the optical unit as shown in **Fig 5.**

Changing the Angular Orientation of Polarizer Grid

When the GS12510 Series rotator mount with polarizer (**1**) has been installed onto the optical unit and fixed to the aperture port (**5**) by tightening of the two grub screws (**10**), the angle of polarized light from the deposited polarizer grid can be changed from turning of the rotating ring (**6**) by the toggle bar (**8**).

Installed as instructed, the angle indicator notch (**9**) will be facing the front of the optical unit and if the toggle bar (**8**) is also facing the front then an angle corresponding to 90° as indicated on the rotating ring (**6**) can be set to align with the indicator notch mark (**9**). This orientation for fixing of the rotator mount (**1**) allows for ease of rotational movement of the polarizer through a 90° angular range such that the angle of orientation marking on the rotating ring (**6**) can be read when it is alignment with the angular notch indicator (**9**).

If the GS12510 Series mount has been supplied already fitted with a 38mm diameter C.A. GS57010 Series polarizer, the parallel grid lines on the polarizer itself will have been set to align with the 90° angle mark indication on the rotating ring (**6**). (See section on the polarizer grid laid onto GS57010 Series polarizers in this manual – page 13). Therefore when a 90° angle for the rotating ring (**6**) has been set to align with the indicator notch (**9**), if the indicator notch (**9**) is effectively fixed at a 3 O'clock position as viewed from the side of the optical unit, then the lines of parallelism for the polarizer grid will run from the 3 O'clock to the 9 O'clock position at a set 90° angle. For this orientation of the polarizer grid, the lines of parallelism can be considered to be at an angle of 90° (ninety degrees) compared to a 0° positioning of the rotating ring (**6**) in alignment with the indicator notch (**9**) and by convention in this orientation of the polarizer, light that is P (parallel) polarized is transmitted through the polarizer.

If the rotating ring (**6**) is moved to the 0° angle position by pushing the toggle bar (**8**) to a 12 O'clock position, then for this orientation of the polarizer grid, the lines of parallelism can be considered to be at an angle of 0° (zero degrees) and by convention in this orientation of the polarizer, light that is S (perpendicular) polarized is transmitted through the polarizer.

Fitting of Purge Bellows (P/N GS10707)

The Benchmark™ compatible optical unit, to which a GS12510 Series rotator mount with polarizer can be affixed, may need to be operated under purge gas (typically N2) conditions. To purge the optical unit with a flow of N2 gas, purge bellows (**11**) (P/N GS10707) are supplied to bridge the air gap between the optical unit aperture ports and the inlet (from source) and outlet (to detector) bulkhead ports of the spectrometer systems sample compartment.

If it is necessary to do so under such operating conditions, a purge bellow (**11**) can be fitted over the circumference ring boss (**4**) on the front of the rotator mount (**1**) to bridge any air gap in the spectrometer sample compartment on the side of the optical unit where the GS12510 Series rotator mount with polarizer has been affixed. A purge bellow (**11**) can be fitted to the other aperture port on the optical unit in the usual way to establish a condition for purging. (See **Fig 7**.)

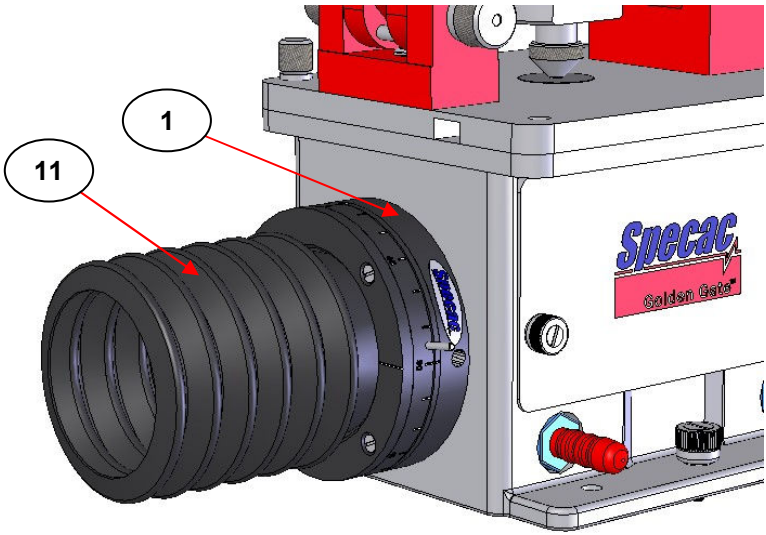

Fig 7. Purge Bellow Fitted to the GS12510 Series Rotator Mount

Fitting or Replacing a 38mm Diameter C.A. GS57010 Series Polarizer in the GS12510 Series Rotator Mount

If the GS12510 Series rotator mount has been supplied without a polarizer fitted (as P/N GS12510), or as a complete assembly with a polarizer under a particular part number, to fit or replace a 38mm diameter C.A. GS57010 Series polarizer into the rotator mount the following procedure is adopted.

Polarizer Grid Orientation on the GS57010 Series Polarizer

If a GS57010 Series polarizer has been supplied on its own against any order it will be provided with a user instruction manual to follow for safe handling and how to remove it carefully from its packaging.

For fitting of a GS57010 Series polarizer into the GS12510 Series rotator mount, the polarizer grid orientation must be identified.
All 38mm diameter C.A. GS57010 Series polarizers are supplied with a black coloured, anodized aluminium ring mount (**12**) that holds the polarizer substrate material of choice (**13**).

Note: *On no account is the polarizer substrate (**13**) to be removed from the ring mount (**12**).*

The polarizer grid is deposited onto one surface of the substrate (**13**) material. On the circumference edge of the anodized aluminium ring mount (**12**) there is a 'V' notch mark (**14**) and the direction point of the 'V' denotes which side of the substrate (**13**) the polarizing grid has been deposited. (See **Fig 8.**) In addition, the surface of the ring mount that carries the labeling of the polarizer for the substrate material type and whether it is a Standard, HER or IQ polarizer, is on the same side of the substrate (**13**) as the polarized grid.

Note: *It is advisable to wear gloves when handling any polarizer to avoid getting fingermarks on the polarizer substrate material (**13**) and to prevent any damage to the polarizer grid.*

The centre of the 'V' notch also acts to determine the lines of polarization laid down as the polarizing grid. (See **Fig 9.**)

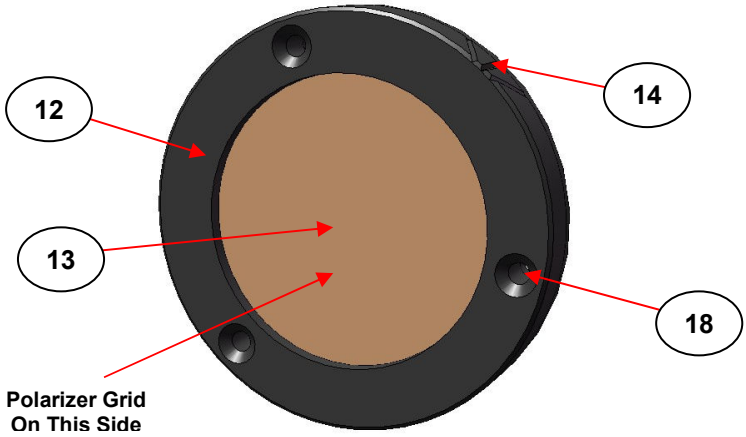

Fig 8. Polarizer Grid Surface Side of GS57010 Series Polarizers

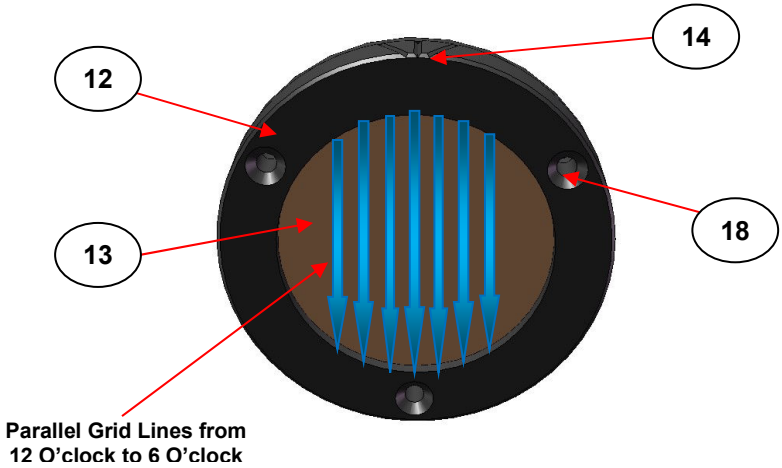

Fig 9. Polarizer Grid Line Orientation of Parallel Lines on the Substrate Surface of the GS57010 Polarizer

To determine the polarizer grid line pattern (4000 lines per mm) that has been deposited onto the substrate (**13**), if the 'V' notch mark (**14**) is positioned at a 12 O'clock position, the grid lines of the polarizer run parallel to the diameter of the substrate that passes through the 'V' notch mark (**14**) to a 6 O'clock position on the aluminium ring mount (**12**). For this orientation of the polarizer grid, the lines of parallelism can be considered to be at an angle of 0° (zero degrees) and by convention in this orientation of the polarizer, light that is S (perpendicular) polarized is transmitted through the polarizer.

If the GS57010 Series polarizer grid is orientated such that the 'V' notch mark (**14**) is at a 9 O'clock position, the grid lines of the polarizer run parallel to the diameter of the substrate that passes through the 'V' notch mark (**14**) to a 3 O'clock position on the aluminium ring mount (**12**). For this orientation of the polarizer grid, the lines of parallelism can be considered to be at an angle of 90° (ninety degrees) compared to the 0° positioning and by convention in this orientation of the polarizer, light that is P (parallel) polarized is transmitted through the polarizer.

Fitting the Polarizer into the Rotator Mount

If the GS12510 rotator mount is provided without a polarizer, a GS57010 Series polarizer is fitted as follows.

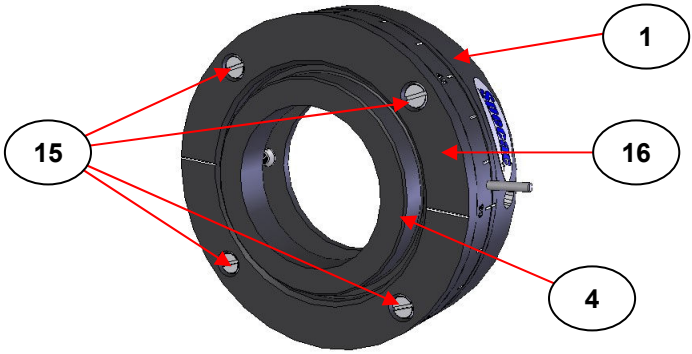

Fig 10. Slot Head Screws to Remove to Fit a Polarizer

Note: *It is advisable to wear gloves when handling any polarizer to avoid getting fingermarks on the polarizer substrate material and to prevent any damage to the polarizer grid.*

Take the rotator mount (**1**) and having removed both the front (**2**) and rear (**3**) protective covers, turn the rotator mount rotating ring (**6**) with the toggle bar (**8**) such that the 90° angle mark is set to align with the angular indicator notch (**9**). (This is similar to how the rotator mount (**1**) would be set when fitted to the Benchmark™ optical unit for use – see **Fig 5.** The toggle bar (**8**) will be facing towards the front). Now unscrew and remove the four slot head screws (**15**) from the front face of the rotator mount to remove the circular plate (**16**) as seen at **Fig 10**.

The circular plate (**16)** with the circumference ring “boss” (**4**) on the front face is removed by pulling out away from the rotating ring (**6**) housing. On the rear face of this circular plate (**16**) are a further three slot head screws (**17**) that are used to secure the GS57010 Series polarizer into place on this circular plate through the three fixing holes (**18**) of the polarizer ring mount (**12**). (See **Figs 8, 9 and 11.)**

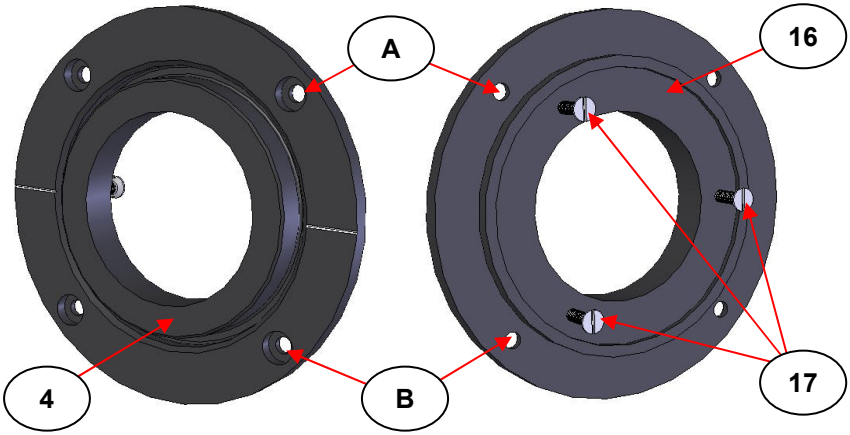

Fig 11. Front and Rear Views of Circular Plate That Holds the GS57010 Series Polarizer

The 38mm diameter C.A. GS57010 Series polarizer can now be fitted to the rear face of the circular plate (**16**) by removal of the three fixing screws (**17**) and then retightening them back into their holes having passed through the three screw fixing holes (**18**) on the polarizer ring mount (**12**). However, the positioning of the polarizer itself when fitted to the circular plate (**16**), with respect to the 'V' notch mark (**14**) on the ring mount (**12**), **is very important to get right** such that the polarizer grid orientation aligns correctly with the 90° angle mark on the rotating ring (**6**) when this 90° angle mark is in turn in alignment with the angular notch indicator (**9**) from the rotational operation.

Therefore, having preset the rotator mount (**1**) to read a 90° angle setting before removal of the circular plate (**16**) (to coincide with the image as seen from **Fig 10.**), two of the screw holes in the circular plate (**16**) have been identified as (**A**) and (**B**) for the orientation of the front face of the circular plate (**16**) in relationship to the three screw fixings (**17**) on the rear face to allow for a correct fit. (See **Fig 11**.).

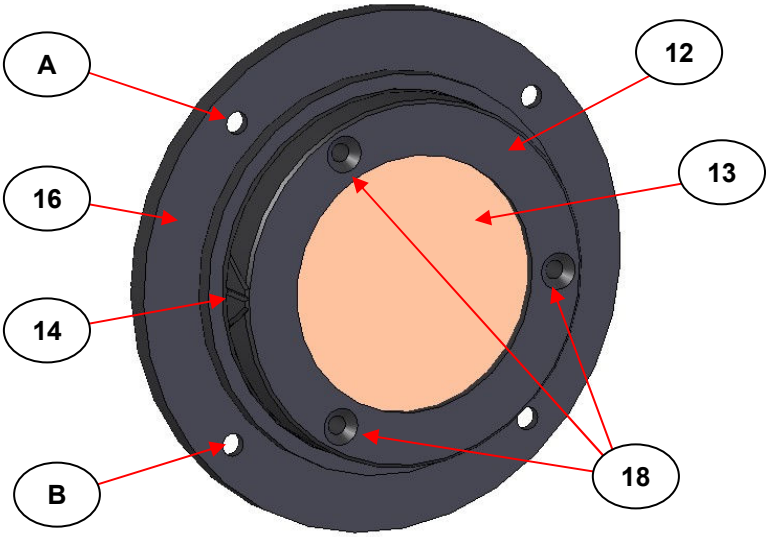

Fig 12. GS57010 Series Polarizer Correctly Orientated to Circular Plate of GS12510 Series Rotator Mount

With the three screws (**17**) removed, lay the circular plate (**16**) on a flat surface with the rear face upper most and place the GS57010 Series polarizer very carefully with the polarizer grid surface on the substrate (**13**) uppermost over the three screw holes in the circular plate (**16**) to align with the three fixing holes (**18**) in the polarizer ring mount (**12**). The 'V' notch mark (**14**) on the ring mount (**12**) **must be positioned** between the two holes (**A**) and (**B**) as seen from **Fig 12.** to coincide with the polarizer being fixed at the correct 90° angular setting for the grid orientation.

When the polarizer has been orientated correctly to the circular plate (**16**), re-secure the three fixing screws (**17**) through the holes (**18**). This complete circular plate with fitted 38mm diameter C.A. GS57010 Series polarizer assembly can now be carefully reinserted into the rotator mount (**1**), but ensure that it is repositioned **in exactly the same orientation** as when the circular plate (**16**) was removed, such that the fixing screws (**15**) pass through the same (**A**) and (**B**) designated holes. (See **Fig 13**.)

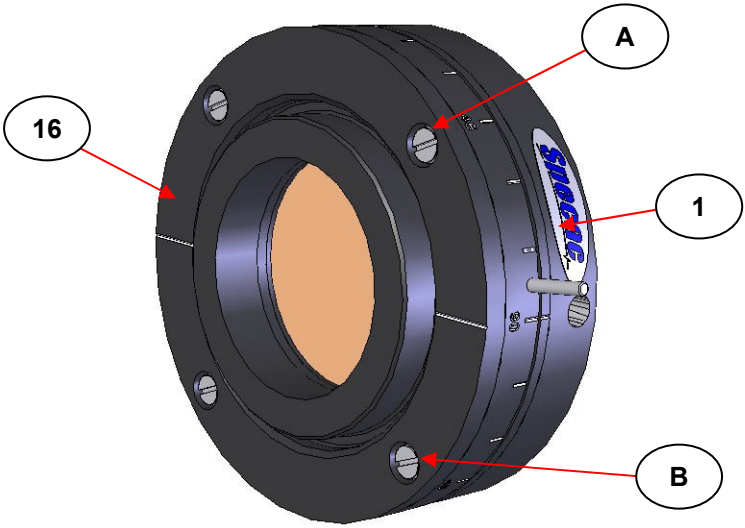

Fig 13. GS12510 Series Rotator Mount With Fitted 38mm Diameter C.A. GS57010 Series Polarizer

The completed assembly of GS12510 Series rotator mount fitted with a 38mm diameter C.A. GS57010 Series polarizer can now be used by fixing to a Benchmark™ compatible optical unit as instructed from pages 8 to 10 of this instruction manual.

Replacing a GS57010 Series Polarizer in the Rotator Mount

The procedure for installation of a new 38mm diameter C.A GS57010 Series polarizer into an empty GS12510 Series rotator mount (**1**) can easily be adapted for **replacement** of an existing polarizer in the rotator mount.

The initial presetting of the rotator mount (**1**) for an angle of 90° from the rotating ring (**6**) angle mark aligning with the angular notch indicator (**9**) is still required, but after removal of the circular plate (**16**) by unscrewing of the four fixing screws (**15**), an originally fitted GS57010 Series polarizer will be removed affixed to the circular plate (**16**). (See **Fig 14.**) The procedure for replacement of a polarizer is a straightforward swap over after the fixing screws (**17**) have been removed and the new polarizer to fit has been aligned accordingly for the 'V' notch mark (**14**) orientation.

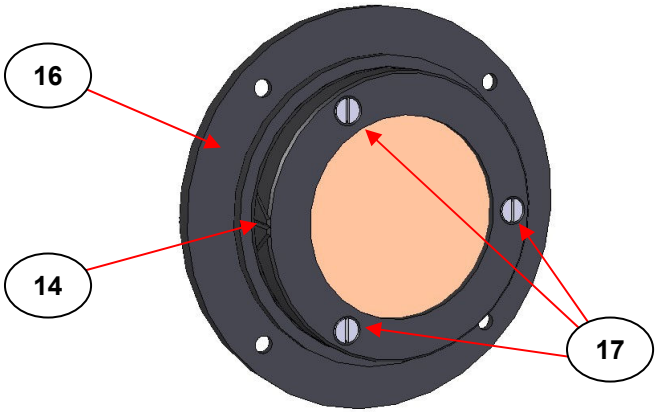

Fig 14. Removed Assembly of Polarizer Already Fitted to the Circular Plate for a Polarizer Replacement

General Cautions and Care of the Polarizer

The GS57010 Series polarizer grid consists essentially of very fine aluminium lines being deposited on a substrate material and they can very easily be damaged due to incorrect handling of the polarizer.

Should the polarizer grid be affected in any way by finger marks, dust or dirt, it is very likely that the performance of the polarizer will be seriously impaired, and in certain cases the damage that has been sustained is irreparable. A new polarizer will be required.

Hence, some general rules to follow to care for your polarizer are:-

- Do not touch, rub or abrade the polarizing grid or substrate surface.
- Do not wash the polarizing grid with organic solvents.
- Any dust that may be present on either surface of the substrate material should be gently blown clear using an air or nitrogen line.
- Always store the polarizer in its original packing container when not being used. If a GS12510 Series Benchmark™ rotator mount with an already fitted GS57010 Series polarizer was supplied, then the protective front (**2**) and rear (**3**) covers can be reattached and used for storage.

5. Legend – Bubble Part Number Identification

(**1**) Benchmark™ rotator mount assembly.
(**2**) Front face protective cover.
(**3**) Rear face protective cover.
(**4**) Circumference ring boss on front face of rotator mount.
(**5**) Aperture port of Benchmark™ compatible optical unit.
(**6**) Rotating ring of the rotator mount assembly.
(**7**) Circular recessed part at rear of the rotator mount assembly.
(**8**) Toggle bar on rotating ring.
(**9**) Angular notch indicator.
(**10**) Fixing grub screws.
(**11**) Purge bellow.
(**12**) Anodized aluminium ring mount of GS57010 Series polarizer.
(**13**) Optical substrate material of GS57010 Series polarizer.
(**14**) 'V' notch mark on ring mount of GS57010 Series polarizer.
(**15**) Fixing screw of circular mount plate for the polarizer.
(**16**) Circular mount plate.
(**17**) Fixing screw of polarizer to circular mount plate.
(**18**) Fixing holes in ring mount of GS57010 Series polarizer.

6. Spares for GS12510 Series Rotator Mount

A GS12510 Series Benchmark™ Rotator Mount on its own can be purchased against P/N GS12510.

GS57010 Series Polarizers

There are many configurations of 38mm diameter C.A. GS57010 Series polarizer options available of **Standard**, **HER** and **IQ** versions for a particular substrate. Please consult the Specac catalogue or website for an appropriate part number for a particular version of 38mm diameter C.A. GS57010 Series polarizer for fit into a GS12510 Series Benchmark™ rotator mount.

GS12510 Series Rotator Mounts Fitted With 38mm Diameter C.A. GS57010 Series Polarizer

P/N GS12511 Rotator mount fitted with KRS-5 polarizer.
P/N GS12512 Rotator mount fitted with Ge polarizer.
P/N GS12513 Rotator mount fitted with CaF_2 polarizer.
P/N GS12514 Rotator mount fitted with BaF_2 polarizer.
P/N GS12515 Rotator mount fitted with ZnSe polarizer.
P/N GS12516 Rotator mount fitted with KRS-5 - HER polarizer.
P/N GS12517 Rotator mount fitted with Ge - HER polarizer.
P/N GS12518 Rotator mount fitted with CaF_2 - HER polarizer.
P/N GS12519 Rotator mount fitted with BaF_2 - HER polarizer.
P/N GS12520 Rotator mount fitted with ZnSe - HER polarizer.
P/N GS12521 Rotator mount fitted with Ge - IQ polarizer.
P/N GS12522 Rotator mount fitted with ZnSe – IQ (8 -12 um) polarizer.
P/N GS12523 Rotator mount fitted with ZnSe - IQ (3 - 5 um) polarizer.

7. Substrate Material Safety Information

KRS-5 Substrate Material – e.g. P/N GS57010 (25mm C.A.)

General
Synonyms: Mixture of Thallium Bromide and Thallium Iodide (typically 58% Iodide content).
Very toxic red coloured soft crystalline powder when fused together as a solid can be used as a transmission window material or as a crystal material for attenuated total reflectance (ATR) FTIR spectroscopy.
Slightly soluble in water, soluble in bases, but not soluble in acids. Not hygroscopic.
Organic solvents have no effect.
Soft window material and easily deformed.
Molecular formula: $TlBr_{0.4}I_{0.6}$

Physical Data
Appearance: Red, soft crystals, granular powder or red coloured window material
Melting point: 414°C
Solubility in water: 36g/100g at 0°C.
Hardness: 40 Kg/mm^2.
Refractive Index: 2.38 (at 2000cm-1 - wavenumbers).
Spectroscopic transmission range: 17,000 to 250 cm-1 (wavenumbers).

Stability
Stable.

Toxicology

Very toxic if small amounts are inhaled or swallowed. May be fatal if swallowed. May be absorbed through the skin. Irritant.

Personal Protection
Always wear safety spectacles and gloves when handling the powder or window material.
Allow for good ventilation. If material is machined, polished or ground, precautions must be taken against inhalation of dust.

Storage
Keep powder or windows stored in a cool, dry container, with appropriate safety labelling.

Germanium Substrate Material – e.g. P/N GS57070 (25mm C.A.)

General
Hard and very brittle material, but can be shaped, cut and polished to form spectral transmission window or crystal for ATR spectroscopy.
Because of its high Refractive Index value suffers from large reflection losses but these can be improved with antireflection optical coatings
Is temperature sensitive and loses transmission when heated. (Is optically opaque to IR transmission at 190°C temperature.)
Insoluble in water and alcohols. Soluble in hot sulphuric acid and aqua regia.
Element symbol: Ge
Chemical Abstracts Service (CAS) No: 7440-56-4.

Physical Data
Appearance: Greyish/black, opaque, elemental, metallic solid. Has no odour.
Melting point: 737°C.
Boiling point: 2830°C.
Vapour pressure: 2.66 x 10^{-56} mm Hg at 25°C.
Specific gravity: 5.323 g cm^{-3}.
Solubility in water: Insoluble
Hardness: 780 Kg/mm^2.
Refractive Index: 4.01 (at 2000cm-1 - wavenumbers).
Spectroscopic transmission range: 5,500 to 500 cm-1 (wavenumbers).

Stability
Stable.

Toxicology

Harmful if ingested in large amounts, if inhaled, or if in repeated contact with the skin.

Personal Protection
Always wear safety spectacles and gloves when handling the window or crystal material.
Allow for adequate ventilation.

Storage
Keep windows or crystal stored in a cool, dry container.

CaF_2 Substrate Material – e.g. P/N GS57080 (25mm C.A.)

General
Known as Calcium Fluoride, Calcium Difluoride, Fluorspar or Irtran 3.
When powder is fused together, is used as a transmission window material.
Insoluble in water, resists most acids and alkalis. Is soluble in ammonium salts.
Its high mechanical strength makes it particularly useful for high pressure work.
Brittle material sensitive to mechanical and thermal shock. Does not fog.
Molecular formula: CaF2.
Chemical Abstracts Service (CAS) No: 7789-75-5.

Physical Data
Appearance: Odourless, white or colourless crystalline solid.
Melting point: 1360°C.
Boiling point: 2500°C.
Solubility in water: 0.0017g/100g at 0°C.
Hardness: 158 Kg/mm^2.
Refractive Index: 1.40 (at 2000cm-1 - wavenumbers).
Spectroscopic transmission range: 77,000 * to 900 cm-1 (wavenumbers).

Stability
Stable.
Incompatible with acids.

Toxicology

Harmful if ingested in large amounts, if inhaled, or if in repeated contact with the skin.

Personal Protection
Always wear safety spectacles and gloves when handling the powder or window material.
Allow for adequate ventilation.

Storage
Keep powder or windows stored in a cool, dry container.

(* UV Grade material required for this range limit.)

BaF_2 Substrate Material – e.g. P/N GS57090 (25mm C.A.)

General
Synonyms: Barium Difluoride.
When powder is fused together, is used as a transmission window material.
Very slightly soluble in water, soluble in acids and ammonium chloride. Good resistance to fluorine and fluorides. Does not fog.
Its high mechanical strength makes it particularly useful for high pressure work.
Brittle material - very sensitive to mechanical and thermal shock.
Molecular formula: BaF2.
Chemical Abstracts Service (CAS) No: 7787-32-8.

Physical Data
Appearance: Odourless, white or colourless crystalline solid.
Melting point: 1280°C.
Boiling point: 2137°C.
Solubility in water: 0.17g/100g at 0°C.
Hardness: 82 Kg/mm^2.
Refractive Index: 1.45 (at 2000cm-1 - wavenumbers).
Spectroscopic transmission range: 66,666 * to 800 cm-1 (wavenumbers).

Stability
Stable.
Incompatible with acids.

Toxicology

Harmful if ingested in large amounts, if inhaled, or if in repeated contact with the skin.

Personal Protection
Always wear safety spectacles and gloves when handling the powder or window material.
Allow for adequate ventilation.

Storage
Keep powder or windows stored in a cool, dry container.

(* UV Grade material required for this range limit.)

ZnSe Substrate Material – e.g. P/N GS57050 (25mm C.A.)

General
Toxic and hard yellow coloured crystalline powder when fused together as a solid can be used as a transmission window material or as a crystal material for attenuated total reflectance (ATR) FTIR spectroscopy.
Insoluble in water, but attacked by strong acids and bases. (pH range 4 to 11 tolerant).
Organic solvents have no effect.
Fairly brittle as a window material and sensitive to thermal and mechanical shock.
Molecular formula: ZnSe
Chemical Abstracts Service (CAS) No: 1315-09-9.

Physical Data
Appearance: Yellow crystals, granular powder or amber coloured window material
Melting point: 1515°C at 1.8 atmospheres. (26.5psi)
Solubility in water: 0g/100g at 0°C.
Hardness: 120 Kg/mm^2.
Refractive Index: 2.43 (at 2000cm-1 - wavenumbers).
Spectroscopic transmission range: 20,000 to 500 cm-1 (wavenumbers).

Stability
Stable.
Reacts with acids to give highly toxic hydrogen selenide. May be air and moisture sensitive. Incompatible with strong acids, strong bases and strong oxidising agents.

Toxicology

Toxic if small amounts are inhaled or swallowed. In stomach toxic hydrogen selenide (H2Se) is liberated. Skin and eye irritant. Danger of cumulative effects from frequent handling without protection.

Personal Protection
Always wear safety spectacles and gloves when handling the powder or window material.
Allow for good ventilation.

Storage
Keep powder or windows stored in a cool, dry container, with appropriate safety labelling.

Notes for GS12510 Series Rotator Mount Use

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
Tel: 061 726 6555
Fax: 061 726 6550
email: info@portmann-instruments.ch
Website:www.portmann-instruments.ch

USA
SPECAC INC.
414 Commerce Drive
Suite 175,
Fort Washington,
PA 19034, USA
Tel: 215 793 4044
Fax: 215 793 4011

United Kingdom
Specac Ltd. - London
River House, 97 Cray Avenue,
Orpington
Kent BR5 4HE
Tel: +44 (0) 1689 873134
Fax: +44 (0) 1689 878527
Registered No. 1008689 England

Brilliant Spectroscopy™

www.specac.com

SPECAC INC.
414 Commerce Drive
Suite 175,
Fort Washington,
PA 19034, USA
Tel: 215 793 4044
Fax: 215 793 4011

SPECAC LTD.
River House, 97 Cray Avenue,
Orpington
Kent BR5 4HE
Tel: +44 (0) 1689 873134
Fax: +44 (0) 1689 878527
Registered No. 1008689 England