

GIA Polariscope

USER GUIDE SCIENTIFIC INSTRUMENTATION BY GIA



IMPORTANT!

READ THIS USER GUIDE BEFORE SETTING UP AND USING THIS PRODUCT



The device should be used in the manner specified by manufacturer. Using the device in any other way may result in electrical shock.

Spray and moisture can cause an electric shock or hardware damage. D0 NOT use the polariscope where it is likely to be affected by moisture or spray of fluids. Improper cabling can cause injury or a shock. D0 NOT let anything rest on the power cord. D0 NOT locate the polariscope where people will walk on the cord. When routing the cord, try to make rounded bends rather than sharp ones that can kink the cord.

Unstable positions can cause serious damage to the polariscope or personal

danger, if it falls. DO NOT put the polariscope on an unstable cart, stand, or table. Always position the polariscope so that it is easy to operate the disconnect device (power supply cord plug).

ACTION IF FAULT OCCURS

A fault can cause electric shock or injury. Unplug the polariscope from the power outlet and contact qualified service personnel if the following conditions occur:

- The power cord or plug is damaged or frayed
- Liquid has been spilled into the polariscope
- The polariscope has been exposed to water

CAUTION!

For indoor use only. Use only in a dry location. Pollution Degree 2.

Installation Category (CATII).

Ambient temperature range should not exceed 5°C to 40°C (41°F to 104°F).

Input: AC 90-240V, 0.5A HZ: 50 and 60 kHz Working Temperature: 10 to 35°C (50°F to 95°F)

Maximum relative humidity should not exceed 80% max at 31°C decreasing linearly to 50% at 40°C.

Main supply voltage fluctuations can reach +/- 10% of the normal voltage.

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For the online and translated versions of the user guide, visit **GIA.edu/instruments-user-guides-manuals-download**

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General Information

The polariscope is used primarily to determine the optic character of transparent to translucent gem materials; in other words, it determines whether a stone is singly refractive (SR), doubly refractive (DR), or is an aggregate (AGG). The polariscope is not used with opaque materials. Doubly refractive stones may be divided further as to whether they are uniaxial or biaxial. Pleochroism may also be detected in stones that possess this characteristic to a fairly marked degree. Diamond cutters use the polariscope to determine the strain characteristics of diamonds.



Getting Started

Read this section thoroughly before you begin using the GIA Polariscope.

The GIA Polariscope has two polarizing filters: the polarizer at the bottom and the analyzer at the top. The polariscope also includes a removable sample plate to hold the gem material, a removable 4X magnifier, an optic figure sphere, a power cord and a universal plug adapter. The device includes an LED light source that provides the main illumination and an LED white light source and port for use with the GIA Refractometer.

To get started:

- 1. Unpack the device and confirm all parts are included. See parts list below.
- 2. Place the polariscope on a stable surface.
- 3. Select the appropriate universal plug adapter and plug the device into a working electrical outlet.
- 4. Place the sample plate on top of the polarizer.
- 5. Place the optic figure sphere in its holder.
- 6. To turn on the polariscope, flip the rocker switch at the back of the device to the ON position. The polariscope can be turned off at any time by flipping the rocker switch to the OFF position.

Parts List



The GIA Polariscope includes the following items:

- a) Polariscope with built-in power supply 1 piece
- b) Sample Plate 1 piece
- c) Large Magnifier 1 piece
- d) Optic Figure Sphere 1 piece
- e) Power Cord
- f) Universal Plug Adapter

Using the Polariscope

Before you test any stone with the polariscope, clean it with a gem cloth and confirm that it is transparent to translucent and not assembled. The polariscope is not used to test opaque or assembled stones.

To test a stone:

- 1. Place the rotatable sample plate on top of the polarizer.
- 2. Turn on the polariscope using the ON/OFF switch on the back of the device.
- 3. While looking through the analyzer with the light source on, note that continuous rotation of the analyzer causes the field to become alternately light and dark. Turn the analyzer to the position where the field is darkest (analyzer and polarizer are in a crossed position).
- 4. Place the stone on the sample plate.
- 5. Rotate the sample plate a full 360° and observe the stone's reaction while looking through the analyzer. The stone's reaction will indicate one of the following results.

Singly Refractive (SR): If the stone remains dark during rotation, it could be singly refractive or it could be a doubly refractive stone that is positioned along its optic axis. In this case, reposition the stone so that it is viewed in a second and then a third direction. If the stone remains dark in three positions, it is singly refractive.

Doubly Refractive (DR) or Anomalous Double Refraction (ADR): If the stone alternates from dark to light every 90° (see figure 1), it indicates that the stone is doubly refractive or it is a singly refractive stone that shows anomalous double refraction. To confirm that the stone is doubly refractive, rotate the stone to its lightest position and then turn the analyzer from dark to light position. If the stone remains the same or appears darker as you turn the analyzer, it is doubly refractive. If the stone gets lighter as you turn the analyzer, it is singly refractive with internal strain showing anomalous double refraction.

Aggregate (AGG): If the stone remains light during rotation, it is an aggregate. Note that highly included stones can give a false AGG reaction. Consider only the transparent areas of the stone.

Precautions and Limitations

- The stone must be large enough for you to detect and interpret its reactions. If the stone is very small, try placing the magnifier on top of the analyzer to better observe the reaction.
- Never determine a transparent red stone to be doubly refractive until it has been checked for pleochroism.
- Stones that are over the limits of a refractometer (OTL) can give indefinite results in the polariscope. It's best to confirm if the stone is singly or doubly refractive by looking for pleochroism or the presence or lack of doubling in a microscope.



Figure 1. At left, the gem is dark but turns light as the stone is rotated (right).

Locating Optic Axis and Optic Figure

Every doubly refractive stone cut from a single crystal has either one direction (uniaxial) or two directions (biaxial) along which it is singly refractive, called its optic axis. With the polariscope and an optic figure sphere, uniaxial and biaxial stones display distinctly different characteristic patterns called optic figures.

To locate the optic axis and an optic figure:

- 1. Turn the analyzer to the crossed (dark) position.
- 2. Place the magnifier on top of the analyzer.
- 3. Hold the stone between the polarizer and the analyzer with your fingers.
- 4. Rotate the stone between your fingers as you look through the analyzer.
- 5. As an optic axis is approached, interference colors, which faintly resemble the play-of-color in opal, should become visible. When the axis is exactly vertical, these colors will be most pronounced. Strength of intensity of the interference colors varies with the type of material being tested.
- 6. Place the optic figure sphere over, close to or touching the area with the brightest interference colors to observe the optic figure (see figure 2). See typical patterns of uniaxial and biaxial gems in figure 3, next page.

Interference colors are not always visible. In this case, rotate the stone horizontally and look for a dark shadow, or "brush," that sweeps across the stone when you move it (see figure 4, next page). Touch the optic figure sphere to the narrowest part of the brush to observe the optic figure.



Figure 2. Interference colors appear along an optic axis (right). Place the optic figure sphere over the area with the brightest interference colors to observe the optic figure.



Figure 3. A typical uniaxial figure (left) and a typical biaxial figure (right).



Figure 4. If optic colors are not visible, look for a dark shadow or "brush." Touch the optic figure sphere to the narrowest part of the brush to observe the optic figure.

Detecting Pleochroism

The polariscope may be used to detect pleochroism in doubly refractive colored stones.

To check for pleochroism:

- 1. Turn the analyzer to the uncrossed (light) position.
- 2. Place the stone on the sample plate or hold it between the polarizer and the analyzer with your fingers.
- 3. Rotate the stone as you look through the analyzer noting any change in color as the stone is rotated. Be sure to check in at least three different positions to be sure you are not looking through an optic axis.

Use with Refractometer

The polariscope may be used to provide a white light source for the GIA Refractometer as illustrated in figure 5.



(Refractometer not included) Figure 5. Position the Refractometer in front of the white light port of the polariscope.

Maintenance

The GIA Polariscope should be handled with care. Following the recommendations here, your GIA Polariscope should remain in excellent condition.

Cleaning



CAUTION! When cleaning, turn off the polariscope and disconnect the device.

Solvents may damage the polariscope. DO NOT use liquid or aerosol cleaners to clean the surface of polariscope. Wet a damp cloth with a mild dish washing detergent and apply it to the polariscope. Wipe dry with soft cloth.

Use lens paper and lens cleaner or a clean gem cloth to remove any fingerprints or smudges on the polarizer, analyzer, magnifier, sample plate and white light port.

Avoid using tweezers to place or pickup stones off of the sample plate as they may scratch the glass.

Technical Support

For technical support please contact:

Country/Region	Contact Info
USA (and all other areas not specified below)	GIA (Gemological Institute of America) The Robert Mouawad Campus 5345 Armada Drive Carlsbad, California 92008 USA Tel: +1 917 286 3678 Email: instrumentsupport@gia.edu
India	Email: instrumentsupportindia@gia.edu
Europe	Email: instrumentsupporteurope@gia.edu
Israel	Email: instrumentsupportisrael@gia.edu
China, Hong Kong, South Korea and Taiwan	Email: instrumentsupporthongkong@gia.edu
Japan	Email: instrumentsupportjapan@gia.edu
Thailand	Email: instrumentsupportthailand@gia.edu

To send the device or an accessory to GIA for repair, please first request a Return Material Authorization (RMA) number and any other instructions.

Ordering Parts

Please visit the GIA website at **store.GIA.edu** to see parts available to purchase.

Return Information

Packing: Packing materials are specifically designed to provide maximum protection for your GIA Polariscope during transport.

Important, remove the optic figure sphere from the holder before placing the instrument back in the packing material.

Before returning any product, please contact GIA toll free at +1 800 421 8161 for a Return Material Authorization (RMA). International + 1 760 603 4200 or email giastore@gia.edu

Warranty and Terms

LIMITED WARRANTY

Subject to the exclusions, limitations and conditions set forth below, GIA warrants to the original purchaser of the GIA Polariscope that the GIA Polariscope will be free from defects in material and workmanship (each a "defect" and a GIA Polariscope with a defect is said to be "defective"), when subjected to normal, proper and intended usage by properly trained and informed users, for twelve (12) months from the date of shipment of the GIA Polariscope to the original purchaser (the "Warranty Period").

Notwithstanding the foregoing, products offered by GIA but manufactured by another party are not covered under the warranty but may be separately warrantied by the manufacturer. Consumable components, such as lamps, tubes, filters, liquids and batteries are guaranteed for 30 days.

LIMITATION OF USE

The result from using the GIA Polariscope should not be considered analogous to or a substitute for information provided by GIA on a GIA Report and should not be represented or interpreted as the opinion of GIA.

GIA DOES NOT WARRANT THAT THE GIA POLARISCOPE IS ERROR-FREE OR WILL ACCOMPLISH ANY PARTICULAR RESULT.

SOLE AND EXCLUSIVE REMEDY

For any defective GIA Polariscope that is returned to GIA by the original purchaser during the Warranty Period in compliance with the process specified below, GIA will, at GIA's option, request that the manufacturer repair or replace the defective GIA Polariscope. A replacement may be a new or refurbished GIA Polariscope, at the sole discretion of GIA or the manufacturer, and any such replacement will continue to be subject to the warranty provided by the manufacturer, if any.

THE FORGOING REMEDY SHALL BE THE SOLE AND EXCLUSIVE REMEDY IN THE EVENT OF A DEFECTIVE GIA POLARISCOPE.

EXCLUSIONS FROM THE LIMITED WARRANTY

A GIA Polariscope will not be deemed defective and neither the manufacturer nor GIA will have any obligation to repair or replace a GIA Polariscope as a result of any one or more of the following: (i) normal wear and tear, (ii) accident, disaster, or event of force majeure, (iii) misuse, fault, or negligence of or by any user or other person, (iv) use of the GIA Polariscope in a manner for which it was not designed, (v) causes external to the GIA Polariscope such as, but not limited to, power failure, electrical power surges, exposure to fire, water, other liquids, excessive humidity or temperature, (vi) improper storage or handling of the GIA Polariscope, or (vii) use of the GIA Polariscope in combination with equipment or materials not supplied by GIA.

ANY MAINTENANCE, REPAIR, OTHER SERVICE, MODIFICATION, ALTERATION, OR OTHER TAMPERING WITH THE GIA POLARISCOPE (INCLUDING BUT NOT LIMITED TO OPENING OR ATTEMPTING TO OPEN THE GIA POLARISCOPE OR ANY PART OF THE GIA POLARISCOPE) THAT IS PERFORMED BY ANY PERSON OR ENTITY OTHER THAN GIA WITHOUT GIA'S PRIOR WRITTEN APPROVAL, OR THE USE OF ANY REPLACEMENT PARTS NOT SUPPLIED BY GIA, SHALL IMMEDIATELY VOID AND CANCEL ALL WARRANTIES WITH RESPECT TO THE AFFECTED GIA POLARISCOPE.

GIA POLARISCOPE WARRANTY CLAIM PROCESS

If the original purchaser of the GIA Polariscope believes that the GIA Polariscope is defective, then the original purchaser will promptly contact GIA technical service at +1 917 286 3678 or instrumentsupport@gia.edu. The original purchaser will provide to the GIA customer service representative the product model and serial number (if applicable), the date of purchase, and details of the alleged defect. In addition, if requested by the GIA customer service representative, the original purchaser will also provide to the GIA customer service representative. The original purchaser will also provide to the GIA customer service representative. After (a) GIA's review of the information provided by the original purchaser, (b) GIA confirming that the Warranty Period has not yet expired, and (c) GIA's belief that the GIA Polariscope is likely defective, GIA will provide the original purchaser a Return Material Authorization ("RMA"). An RMA may include specific handling and labeling instructions and the original purchaser will comply with such instructions.

If the GIA Polariscope is returned to GIA without an RMA or without the proper handling and labeling, the delivery of the GIA Polariscope may be refused by GIA.

After receipt of an RMA from GIA, the original purchaser may return the allegedly defective GIA Polariscope to GIA to the address specified by the GIA customer service representative with all shipment and insurance costs prepaid by the original purchaser. If the GIA Polariscope is being returned within the 30-day period after the original shipment of the GIA Polariscope to the original purchaser and the GIA Polariscope is in fact defective, then GIA will reimburse the original purchaser the reasonable shipment and insurance costs. If the GIA Polariscope is being returned more than 30 days after shipment of the GIA Polariscope to the original purchaser and the GIA Polariscope is in fact defective, then GIA may, in its discretion, reimburse the original purchaser the reasonable shipment and insurance costs.

Any returned GIA Polariscope must be packaged in the original packaging or in packaging that is described in the RMA or is otherwise approved in advance by GIA and which adequately protects the GIA Polariscope during shipment to GIA. Any loss or damage to the GIA Polariscope that occurs during shipment to GIA will be at the original purchaser's sole risk.

If the returned GIA Polariscope is defective, then GIA will provide one of the remedies set forth above. Replacement parts included by GIA in a repaired GIA Polariscope may be new or refurbished, at the discretion of GIA. All parts that are replaced shall become the property of GIA.

Shipment to the original purchaser of the repaired or replacement GIA Polariscope shall be at GIA's cost and expense. Any loss or damage to the GIA Polariscope that occurs during return shipment by GIA to the original purchaser will be at GIA's sole risk.

If GIA determines that a GIA Polariscope returned to GIA is not defective or is not covered by the limited warranty set forth above, the original purchaser shall pay or reimburse GIA for all costs of investigating and responding to such request at GIA's then-prevailing time and materials rates, including but not limited to the cost of shipping the GIA Polariscope back to the original purchaser.

If GIA provides repair services or replacement parts that are not covered by the limited warranty, the original purchaser shall pay GIA for such services and parts at GIA's then current rates and prices.

DISCLAIMER OF ALL OTHER WARRANTIES

EXCEPT FOR THE LIMITED EXPRESS WARRANTY SET FORTH ABOVE, GIA, ITS SUPPLIERS AND ITS LICENSORS AND MANUFACTURERS MAKE NO OTHER REPRESENTATIONS, WARRANTIES, GUARANTEES OR CONDITIONS, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, WRITTEN OR ORAL, WITH RESPECT TO THE GIA POLARISCOPE OR WITH RESPECT TO THE RESULTS THAT WILL OR WILL NOT BE ACHIEVED USING THE GIA POLARISCOPE, INCLUDING THE GIA POLARISCOPE IS PROVIDED "AS IS". ALL IMPLIED WARRANTIES ARE HEREBY DISCLAIMED, INCLUDING WITHOUT LIMITATION ALL IMPLIED WARRANTIES AND CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, USAGE, TRADE OR ANY OTHER MANNER.

LIMITATION OF LIABILITY

TO THE FULL EXTENT PERMITTED BY APPLICABLE LAW, NEITHER GIA NOR ANY OF ITS SUPPLIERS OR LICENSORS OR MANUFACTURERS SHALL BE LIABLE TO THE ORIGINAL PURCHASER OR ANY OTHER PERSON OR ENTITY FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, EXEMPLARY, INCIDENTAL, RELIANCE, PUNITIVE, OR EXEMPLARY DAMAGES, LOST REVENUES, PROFITS OR BUSINESS, OR THE COST OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES ARISING FROM OR RELATED TO THE GIA POLARISCOPE, THE USE OF THE GIA POLARISCOPE, OR THE RESULTS OR OUTPUT FROM THE GIA POLARISCOPE, EVEN IF AN AUTHORIZED REPRESENTATIVE OF GIA IS AWARE OF OR IS ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF ANY SUCH DAMAGES OR AMOUNTS.

TO THE FULL EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL GIA'S TOTAL CUMULATIVE LIABILITY TO THE ORIGINAL PURCHASER OR ANY OTHER PERSON OR ENTITY ARISING FROM OR RELATED TO THE GIA POLARISCOPE, THE USE OF THE GIA POLARISCOPE, OR THE RESULTS OR OUTPUT FROM THE GIA POLARISCOPE EXCEED THE PRICE PAID TO GIA FOR THE GIA POLARISCOPE OR IF NO PURCHASE PRICE WAS PAID TO GIA, THEN THE SUM OF ONE HUNDRED U.S. DOLLARS (US\$100).

THE TERMS IN THIS SECTION (LIMITATION OF LIABILITY) AND IN THE SECTIONS RELATED TO THE WARRANTY MADE BY GIA (INCLUDING BUT NOT LIMITED TO REMEDIES, WARRANTY EXCLUSIONS AND WARRANTY DISCLAIMERS) SHALL APPLY (A) TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, (B) REGARDLESS OF THE NATURE OF THE CLAIM OR THEORY OF LIABILITY, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, STRICT LIABILITY AND NEGLIGENCE), BREACH OF WARRANTY, OR ANY OTHER THEORY OF LIABILITY, AND (C) EVEN IF A LIMITED REMEDY FAILS OF ITS ESSENTIAL PURPOSE. SOME STATES DO NOT PERMIT THE LIMITATION/EXCLUSION OF DAMAGES IN CERTAIN CIRCUMSTANCES AND SO PORTIONS OF THE FOREGOING LIMITATION/EXCLUSION OF DAMAGES MAY NOT APPLY IN ALL CIRCUMSTANCES.

THE TERMS IN THIS SECTION (LIMITATION OF LIABILITY) AND IN THE SECTION ENTITLED "SOLE AND EXCLUSIVE REMEDY" ARE AN ESSENTIAL BASIS OF THE BARGAIN BETWEEN THE PARTIES.

If you have any questions concerning use and care of your product, available accessories, or service, please call +1 760 603 4200, or toll free +1 800 421 8161 (U.S. only). You may also fax to +1 760 603 4262, or toll free +1 888 421 7728 (U.S. only). Or please write to GIA, World Headquarters, The Robert Mouawad Campus, 5345 Armada Drive, Carlsbad, CA 92008, USA. Don't forget to visit our website at GIA.edu for customer support service and our catalog online for the latest available products and accessories.

Notes	Notes



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