



Gem-A
INSTRUMENTS



Gem-A
Refractometer

Gem-A Refractometer

The refractometer is used for measuring the refractive indices of transparent, translucent and opaque gemstones with a flat polished facet. This instrument can also be used to test cabochons, carvings and even some crystal faces. Stones which are set within an item of jewellery may be tested (depending on the setting), but great care is required.

The range of the Gem-A Refractometer is from 1.30 to 1.81. The error in measuring a faceted stone is not above 0.005 and for cabochon stones is 0.01.

With many flat-polished stones it is possible to determine:

- Whether the stone is optically isotropic (and thus singly refractive) or anisotropic (doubly refractive)
- The refractive index of an isotropic gemstone
- The maximum and minimum refractive indices of an anisotropic gemstone and, therefore, the birefringence of an anisotropic gemstone
- Whether an anisotropic gemstone is optically uniaxial or biaxial
- Whether an anisotropic gemstone is optically positive or negative.

USING THE REFRACTOMETER

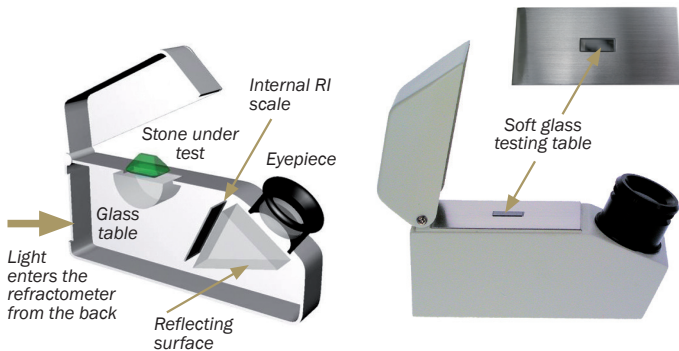
The total internal reflection (TIR) type of refractometer has a 'table' of high refractive index glass which is very soft: great care must be taken not to damage the table surface. Most gem materials have fairly limited RI ranges, and their optical characteristics do not vary widely.

N.B.: The upper limit of RI readings is at the RI of the contact liquid, this is usually in the range of 1.78 to 1.81.

- Choose a suitable facet to test; ideally a flat polished surface, the table facet.
- Place a small drop of contact liquid onto the prism. If left too long, the

contact liquid will dry out and sulphur may crystallize out, so it becomes progressively more difficult to obtain clear readings. If this happens clean the stone and the table gently and start again.

- Place the largest facet onto the liquid on the glass table. Facets smaller than $\frac{1}{8}$ of an inch will be difficult to get a reading from. Slide the stone to the top of the glass table, look into the eye piece and slide the stone gently back down the glass table towards you – the shadow edge will appear. You now have the stone in the best position.
- Try to keep the stone centred in this position and try to keep your eye at a set position for all readings. These avoid possible variations in RI reading caused by optical shifts in the shadow edge position.
- Look into the eye piece at the shadow edge/edges and rotate the stone using your fingers. Rotate the stone 360° – watch how the shadow edge/edges move.
- When you are finished remove all contact liquid from the prism with a tissue.
- The polaroid lens can be used to help clarify the readings of anisotropic stones.

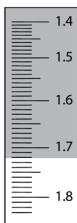


IMPORTANT SAFETY NOTICE

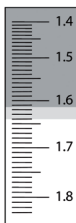
RI liquid is poisonous and corrosive. Keep locked away when not in use. Use in a well-ventilated area and wash hands after use. Not to be ingested. If splashed in the eyes wash with plenty of water and seek medical attention immediately.

Notes about lighting:

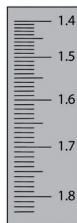
- A monochromatic filter is built into this refractometer so a white light source should be used. Adjust the intensity as necessary ensuring that the light source is aligned with the refractometer window.
- Work in darkened surroundings away from direct daylight and overhead lights. Room lighting can reflect in the eyepiece or through the glass table producing confusing images and colour effects; it should be reduced wherever possible.
- If surrounding light cannot be avoided, try resting the lid of the refractometer over your fingers or holding your cupped hands around the test stone.



Single shadow
edge from a
SR stone



Two shadow
edges from a
DR stone



A dark scale
with no
reading

Shadow-edge observation readings

SHADOW-EDGE OBSERVATION

Observation	Conclusion
Scale remains dark but may be crossed by vague shadows or coloured line	Negative reading – RI of test stone is higher than that of the contact liquid Faulty set-up – see below
Indistinct shadow edge(s)	Possible cause: Dirty glass table or stone; inadequate or dried out contact fluid; badly polished or scratched facet Solution: Clean glass table and stone; check fluid; try another facet or use a distant vision test
Single clear shadow edge on rotation of stone through 360	Optically isotropic: cubic or amorphous
Two shadow edges	Optically anisotropic: uniaxial or biaxial.
One shadow edge remains constant on rotation of stone	Uniaxial
Both shadow edges vary	Biaxial
Both shadow edges remain constant when stone is rotated through 360	Uniaxial. Optic axis perpendicular to the facet tested. Make sure that one of the lines is not that of the contact liquid
One shadow edge remains constant, but both vary when another facet is tested	Biaxial



For more information please contact instruments@gem-a.com.

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