

E-Line Gemological Refractometer



User Guide



**Bellingham
+ Stanley**

E-Line Gemological Refractometer User Guide (Eng)

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<i>Order Code</i>	<i>Description</i>
44-861	E-Line Gemological Refractometer

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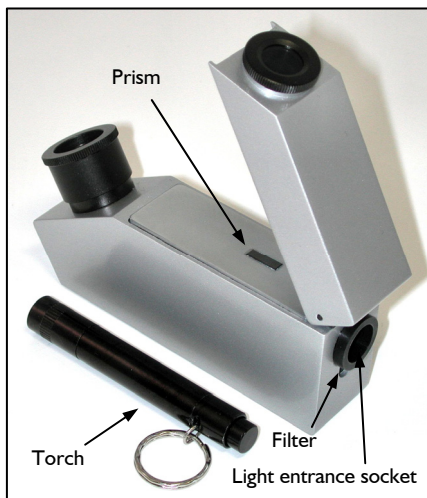
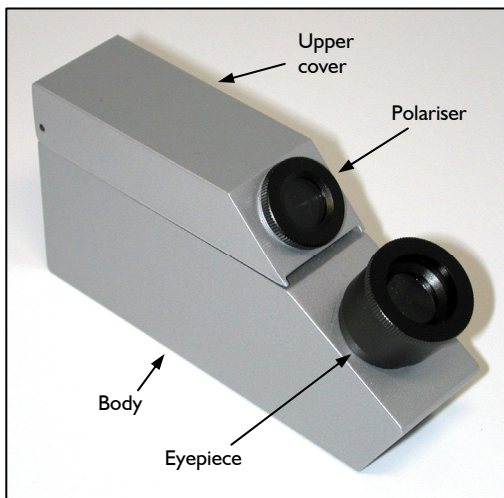
Longfield Road, Tunbridge Wells,
Kent, TN2 3EY, United Kingdom
Phone: +44 (0) 1892 500400
Fax: +44 (0) 1892 543115
sales@bellinghamandstanley.co.uk

Bellingham+Stanley Inc.

1000 Hurricane Shoals Road, Building D,
Suite 300, Lawrenceville, GA 30043, USA
Phone: 770 822 6898
Fax: 770 822 9165
sales@bs-rfm-inc.com

Product Description

Refractive Index is one of the most important optical parameters used to identify and authenticate polished precious and semi-precious gemstones. The E-Line Gemological refractometer is a low cost, lightweight measuring instrument used by jewellers and traders of gemstones. The Gemological refractometer can also be used to identify whether a particular stone is Isotropic or Anisotropic (uniaxial or biaxial).



Attention and Maintenance



CAUTION:

The instrument is a delicate scientific instrument and should be treated accordingly. It has no user serviceable parts. After use, the instrument should be placed in its carry case and stored in a dry place. Remove battery from light source (torch) after use to prevent acid leakage on to the instrument. Take care with contact liquids (CAUTION: Contact Liquid – Read Material Safety Data Sheet).

Operating Instructions

Method of Operation (Singly Refractive)

1. Place the instrument on a suitable table. Open the upper cover. Drop a few drops of contact liquid (see table over page) onto the surface of the prism using a thin glass bar or soft wooden stick. (CAUTION: Contact Liquid - Read Material Safety Data Sheet).
2. Gently place the polished surface of gemstone on the prism, depressing it lightly to make sure contact liquid is distributed evenly between the gemstone and measuring prism.
3. Close the upper cover.
4. Place the light source in the light entrance socket of refractometer.
5. Look through the eyepiece and by a push/pull action; focus so that the light/dark demarcation line can be seen in the field of view against the refractive index scale.
6. Read the refractive index of the gemstone from the scale where the demarcation line crosses the refractive index scale.

Anisotropic Gemstones (Doubly Refractive)

Anisotropic gemstones will display two demarcation lines when viewed through the eyepiece. These stones are sometimes known as 'bi-fringent' or 'doubly refractive'. There are two types of Anisotropic gemstones: (1) uniaxial, which has a single optical axis that does not cause light to doubly refract, and (2) biaxial, which has two optical axes that do not cause the light to doubly refract.

It is possible to identify whether a stone is uniaxial or biaxial by using the polariser and/or by rotating the gemstone through steps of 90°, taking refractive index measurements and monitoring the movement or prominence of the demarcation lines. Simple differentiation between uniaxial gemstones and biaxial gemstones can easily be achieved by rotating either the polariser or gemstone, where one demarcation line will remain static (uniaxial) as opposed to both demarcation lines varying in position (biaxial). More complex determination can be achieved by measuring the angle of double refraction as detailed below:

Using the polariser to identify Anisotropic Gemstones

1. Place the gemstone on the refractometer following the steps above.
2. Place the polariser on the eyepiece.
3. Turn the polariser in the eyepiece until a single borderline is seen (light is vibrating in one direction only, eliminating the extra-ordinary rays caused by birefringence).
4. Read the refractive index.
5. Gently rotate the gemstone on the prism by 90° taking care not to scratch the prism.
6. Turn the polariser by 90°
7. Measure the refractive index of the light vibrating at 90° to the measurement in point 4.
8. Repeat steps 5 to 7 until the stone has passed through 180°

Interpretation of the results will identify the value of double refraction by calculating the difference between the measurement group with the maximum refractive index and the measurement group with the lowest refractive index and comparing to known data.

Contact Liquids

Contact liquids are required to expel air between the measuring prism and gemstone under test. The contact liquid must be of a higher refractive index value than the gemstone under test; otherwise the refractive index of the contact liquid will be read. Contact liquids may be extremely harmful if not handled correctly – make sure that the guidelines for the liquids are followed carefully and read the Health & Safety data supplied (also available from the Technical Centre which forms part of B+S website at www.bellinghamandstanley.com).

Contact liquids are available from Bellingham+Stanley as listed below:

<i>Order Code</i>	<i>Description</i>	<i>Refractive Index Value (RI)</i>
10-43	Monobromonaphthelene (6ml)	1.65
10-61	Methyl Iodide (3ml)	1.74
10-62	Sulphated methyliodide (10ml)	1.79

Specification

Measuring range	1.30 - 1.81
Minimum graduation value	0.01
Size	30 x 70 x 130mm
Weight	400g
Batteries	AAA 1.5V battery

Typical Refractive Index values Gemstones

Agate	1.544 - 1.553	Jade, Nephrite	1.600 - 1.641
Alexandrite	1.746 - 1.755	Jet	1.660
Almandine	1.750 - 1.830	Pearl	1.530 - 1.690
Amber	1.539 - 1.545	Peridot	1.635 - 1.690
Amethyst	1.532 - 1.554	Quartz	1.544 - 1.553
Ammolite	1.520 - 1.680	Ruby	1.757 - 1.779
Andalusite	1.629 - 1.650	Sapphire	1.757 - 1.779
Apatite	1.632 - 1.420	Sapphire, Star	1.760 - 1.773
Aquamarine	1.567 - 1.590	Spessarite	1.790 - 1.810
Axenite	1.674 - 1.704	Spinel	1.712 - 1.717
Beryl	1.570 - 1.60	Spinel, Blue	1.712 - 1.747
Beryl, Red	1.570 - 1.598	Spinel, Red	1.708 - 1.735
Chalcedony	1.544 - 1.553	Star Ruby	1.760 - 1.773
Chrome Tourmaline	1.610 - 1.640	Tanzanite	1.690 - 1.700
Citrine	1.532 - 1.554	Topaz	1.607 - 1.627
Clinohumite	1.625 - 1.675	Topaz, Imperial	1.605 - 1.640
Coral	1.486 - 1.658	Tourmaline	1.603 - 1.655
Crystal	2.000	Tourmaline, Blue	1.610 - 1.640
Crysoberyl, Catseye	1.746 - 1.755	Tourmaline, Catseye	1.610 - 1.640
Danburite	1.627 - 1.641	Tourmaline, Green	1.610 - 1.640
Diamond	2.417	Tourmaline, Paraiba	1.610 - 1.650
Emerald	1.560 - 1.605	Tourmaline, Red	1.610 - 1.640
Emerald Catseye	1.560 - 1.605	Zircon	1.777 - 1.987
Flourite	1.434	Zirconia, Cubic	2.173 - 2.210
Garnet, Grossular	1.720 - 1.800	Kunzite	1.660 - 1.676
Garnet, Andradite	1.880 - 1.940	Labradorite	1.560 - 1.572
Garnet, Demantiod	1.880 - 1.900	Lapis Lazuli	1.500 - 1.550
Garnet, Mandarin	1.790 - 1.800	Moonstone	1.518 - 1.526
Garnet, Pyrope	1.730 - 1.760	Morganite	1.585 - 1.594
Garnet, Rhodolite	1.740 - 1.770	Obsidian	1.500
Garnet, Tsavorite	1.739 - 1.744	Opal, Black	1.440 - 1.460
Garnet, Uvarovite	1.740 - 1.870	Opal, Fire	1.430 - 1.460
Hauyn	1.490 - 1.505	Opal, White	1.440 - 1.460
Iolite	1.522 - 1.578	Oregon Sunstone	1.560 - 1.572
Jade, Jadeite	1.640 - 1.667	Padparadja	1.760 - 1.773

The above table is a guide only. Bellingham+Stanley does not take any responsibility due to loss or damage caused by use of data contained in this instruction manual.

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