

Hand-Held Refractometers & Optical Instrumentation



***Bellingham +
Stanley Ltd.***

Quality Scientific Instruments

Who are Bellingham + Stanley?

Bellingham + Stanley Ltd. has been at the forefront of instrument design and manufacture since 1914. Today, supported by a subsidiary in the USA and a global network of fully trained distributors, instruments are exported throughout the world from their UK manufacturing facility.

The current range of products includes hand refractometers for on-the-spot measurements, Abbe refractometers for science and academia and a new optical polarimeter as well as a full range of digital bench mounted and process control instruments. Bellingham + Stanley Ltd. has also been awarded UKAS accreditation for Calibration and can supply calibration materials for refractometers and polarimeters, traceable to ICUMSA and NIST or PTB.

Detailed information about the products and services offered by Bellingham + Stanley Ltd. may be found on the company website, some of which is summarized in this hand held and optical instrumentation booklet.

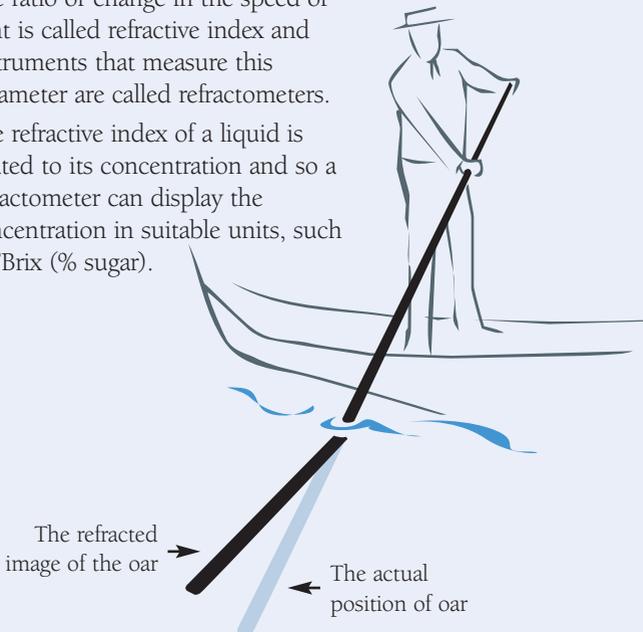
What is Refractive Index?

When light passes from one medium to another, the speed at which the light travels will change depending on the parameters of the materials.

This principle can be seen when looking at a straw in a glass or an oarsman on the river, as shown in the diagram.

The ratio or change in the speed of light is called refractive index and instruments that measure this parameter are called refractometers.

The refractive index of a liquid is related to its concentration and so a refractometer can display the concentration in suitable units, such as °Brix (% sugar).



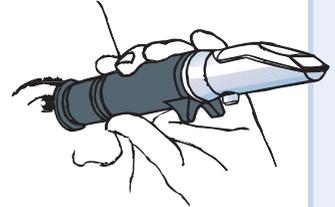
Visit www.bellinghamandstanley.com for technical information such as application & instrument selection guides, temperature compensation tables, spare instruction manuals.

How do I use a refractometer?

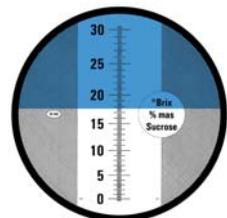
Apply the sample to the prism.



Hold up to the light.



Take the reading from the scale.



Hand-Held Refractometers:

Eclipse Range

Manufactured in the UK using only the highest quality optical components and the most modern manufacturing practices, the Eclipse refractometer is the ultimate hand held refractometer on the market today. A comprehensive choice of scale types offers versatility across a wide application scope from testing fruit ripeness in the field to monitoring industrial fluids in harsh machine shop environments. Eclipse refractometers have a number of unique features not available on many other brands of refractometer.

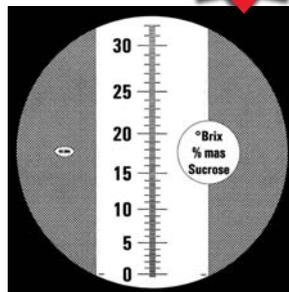


IP66 Water Resistant

Code	Food, Beverage, Sugar & General Models	Range	Scale Division
45-01	Sugar % (°Brix)	0-15	0.1
45-02	Sugar % (°Brix)	0-30	0.2
45-07	Sugar % (°Brix)	0-32	0.2
45-03	Sugar % (°Brix)	0-50	0.5
45-08	Sugar % (°Brix)	28-65	0.2
45-05	Sugar % (°Brix)	45-80	0.2
45-06	Sugar % (°Brix)	72-95	0.2
45-22	Wine - °Zeiss (ABV)	10-135	1
45-27	Water-in-Honey (%)	10-30	0.2
45-81	Low Volume (Nectar <1-micro-litre)	0-50	0.5
45-82	Low Volume (Nectar <1-micro-litre)	45-80	0.5
45-91	Sugar % (°Brix) with Automatic Temperature Compensation	0-30	0.2

Industrial Models			
45-26	Starch (%)	0-30	0.2
45-41	Refractive Index	1.330-1.420	0.001
45-44	Antifreeze – °C protection – Battery acid SG	0 to -40	5
		1.1-1.35	0.05
45-45	Antifreeze – °F protection – Battery acid SG	30 to -40	5
		1.1-1.35	0.05
45-46	Antifreeze – % Ethylene Glycol – % Propylene Glycol	0-60	2.5
		0-60	2.5
45-65	Salinity (% NaCl)	0-28	0.2
45-63	Sea-water (‰)	0-180	1

High Quality Wine Refractometers with ATC			
45-91	Sugar % (°Brix)	0-30	0.2
45-92	Baumé Probable Alcohol	0-16	0.2
		0-18	0.2
45-93	Oechsle (CH-Swiss Data) Sugar % (°Brix)	0-130	1
		0-30	0.2
45-94	Oechsle (D-German Data) Sugar % (°Brix)	30-130	1
		0-30	0.2



Special features make measurement easy and reliable

- All metal construction
- Rubber handgrip for insulation
- Robust ergonomics for easy handling
- Anti-roll supports
- High precision, clear scale
- Sample 'dribble' feed
- Zero adjust with lock
- Push on prism flap
- Ideal for hot & cold samples
- Serial numbered
- Certificate of Conformity

Spare illuminator flaps (5)

Code 45-003

Hand-Held Refractometers:

E-line ATC Range

The E-Line Automatic Temperature Compensation (ATC) Range of hand-held refractometers offers versatility at a low price. They are ideal for use in many applications including: fruit, beverage, sugar, food and industrial applications where concentration measurements are required.



Code	Range	Scale Division
44-801	0-10 °Brix ATC	0.1
44-802	0-18 °Brix ATC	0.1
44-803	0-32 °Brix ATC	0.2
44-804	28-62 °Brix ATC	0.2
44-805	45-82 °Brix ATC	0.5

Reference temperature for compensation: 20 °C.
Compensation Range: 10-30 °C

E-Line 80 Refractometer

The E-Line 80 is a dual scale Brix refractometer ideal for use in the food industry and other applications requiring concentration measurements over a wide measuring range.

The instrument is of all metal construction with range selection being made by a simple rotary control on the instrument barrel. The E-line 80 is calibrated to read accurately at 20°C. Readings can be taken at any other temperature by applying a correction factor or by adjusting the 'zero calibration screw' to offset the effects of temperature comparing to the reading of water.



Specification	
Range	0-80 °Brix
Scale One	0-50 °Brix
Scale Two	50-80 °Brix
Scale Division	1 °Brix
Code	Description
44-807	E-Line 80 Refractometer

E-Line 90 Refractometer

The E-Line 90 is a full scale Brix refractometer ideal for use in the food industry and other applications requiring concentration measurements over a wide measurement range.

The E-line 90 has the additional feature of having achromatising prisms, making it ideal for use with samples that do not have the same dispersion characteristics as sugars. This allows the instrument to be used for measuring mineral oils, essential oils and other industrial chemicals, with refractive index values being taken from a table. The instrument has two optical inputs allowing readings to be made in either transmissive or reflective modes, the latter being ideal for dark samples. Temperature correction is by table only, with the actual instrument temperature being obtained from the prism thermometer.



Specification	
Range	0-90 °Brix
Scale One	0-42 °Brix
Scale Two	42-71 °Brix
Scale Three	71-90 °Brix
Scale Division	0.2 °Brix
Code	Description
44-806	E-Line 90 Refractometer

Hand-Held Refractometers:

Digital Range

The DR range of low cost digital hand refractometers provide temperature compensated sugar measurements at the touch of a button, eliminating operator error often associated with optical refractometers. The instruments are small and robust, allowing use in the field or laboratory alike. Typical applications include use in the beverage, sugar, agricultural, industrial and food sectors.

DR refractometers are fully inspected by Bellingham + Stanley Ltd. prior to shipment and all models carry a 12-month warranty. All instruments are supplied with instruction manual, soft carrying case and Certificate of Conformity.

There are a number of models to choose from depending on the measurement range and application.



Specification and Order Codes

Model	Code	°Brix Range	Refractive Index Range
DR103L	44-903	0-45	1.3330-1.4098
DR112	44-904	28-65	1.3800-1.4535
DR122	44-905	60-92	1.4400-1.5230

DR Wine Models

Model	Code	Scale	Range	Resolution	Accuracy
DR401	44-906	Mass SW % (°Brix)	0-35	0.1	±0.2
		Probable Alcohol	0-22°	0.1	±0.2
		Oechsle (D)	0-150°	1	±1
		KMW (Babo)	0-25°	0.1	±0.2
DR402	44-907	Mass SW % (°Brix)	0-35	0.1	±0.2
		Probable Alcohol	0-22°	0.1	±0.2
		Oechsle (CH)	0-150	1	±1
		Baumé	0-18°	0.1	±0.2

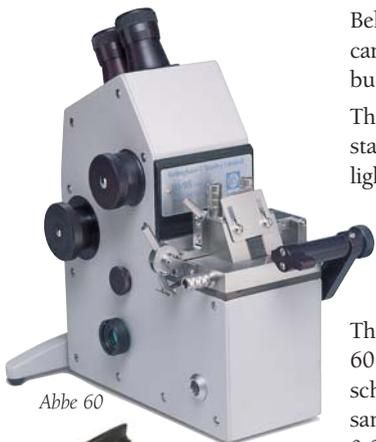
Common Specifications

Resolution (°Brix / Refractive Index)	0.1 / 0.0001
Accuracy (°Brix / Refractive Index)	± 0.2 / ±0.0003
Automatic Temperature Compensation	To 20 °C
Working Temperature Range	5 – 40 °C
Measurement Time	<0.5 seconds
Battery	9V (MN1604, 6LR61 or PP3)
Dimensions	L 183mm x D 55mm x H 46mm

D = German Data CH = Swiss Data



Abbe Refractometers



Abbe 60



Abbe 5

Bellingham+Stanley offer a number of Abbe refractometers and a choice can be made in accordance with the measurement requirement and budget availability.

The Abbe 60 direct reading models are manufactured to extremely high standards. The latest designs incorporate an externally mounted LED light source for sample illumination with a second internally mounted LED for scale illumination. Wavelength compensation is by achromatizing prisms to 589.3nm. Refractive Index measurements are made directly from the scale to 0.001 RI allowing estimation to ± 0.0001 RI.

The Abbe 5 refractometer has similar operational features to the Abbe 60 but has been designed with budget in mind, so is ideal for use in schools, colleges and commercial laboratories with a low throughput of samples. Refractive Index readings may be read directly from the scale to 0.0005RI. Simple dispersion measurements may also be performed with the Abbe 5 Refractometer.

Some applications dictate that readings must be carried out at wavelengths other than 589.3nm. The Abbe 60ED and 60LR models facilitate measurement at any wavelength within the visible spectrum and by adopting a monochromatic light source and an evenly divided scale; by using PC software, readings may be obtained to an accuracy of ± 0.00004 RI. Typical applications include investigation of polymer films, hydrocarbons, fibre optics, semi-solids and glass. A full set of accessory items are available, including spectral emission lamps, interference filters, etc., details of which may be found on the Company website.

All models have a digital temperature display and may be connected to a waterbath for temperature control.

Code	Model	Scale and Scale Division	
		Refractive Index	Sugar % (Brix)
10-99	60/DR	1.30-1.74 x 0.001	0-95 x 0.5
10-03	60/95	1.30-1.535 x 0.001	0-50 x 0.2 & 50-95 x 0.1
10-04	60/ED	1.30-1.74 (equivalent to)	0-95 (equivalent to)
10-06	60/LR	1.20-1.70 (equivalent to)	0-95 (equivalent to)
44-501	Abbe 5	1.30 – 1.70 x 0.0005	0-95 x 0.25

The working temperature range for these instruments is from +5 to 75°C



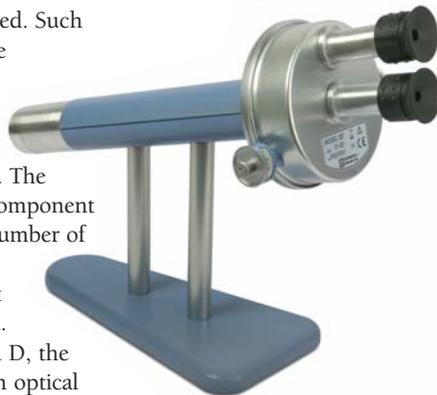
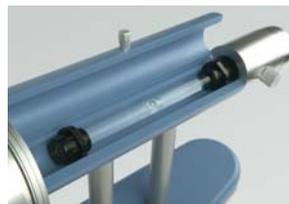
Description	Code (230V)	Code (110V)
Sodium Lamp Outfit (free standing) for 60ED and 60LR	59-01	59-06
Spectral Lamp Outfit (free standing) for 60ED and 60LR	59-20	59-25
Abbe 5 Light Source (bench mounted)	44-520	
Abbe 5 Light Source (clip mounted)	44-521	

Model D7 Polarimeter

For over 40-years, the Model D polarimeter and sodium lamp outfit has been the primary choice of leading industrial and academic institutions throughout the world, offering practical assessment of optically active materials combined with high accuracy measurement.

Changes in legislation, particularly within the sugar and pharmaceutical sectors, has demanded a shift towards digital instrumentation, however, the need for a high quality optical polarimeter is still paramount where circumstances dictate that an optical instrument should be used. Such applications include use in contract laboratories of low sample throughput and of course the continued use in both physics and chemical departments within the education field.

Bellingham + Stanley Ltd. has updated the original Model D design to meet the requirements of 21st Century applications. The instrument body has been replaced with a new 'low weight' component that reduces shipping costs, significantly important where a number of instruments are supplied to one destination, and the sodium lamp has been replaced with a lightweight, low cost LED light source with an interference filter and integral intensity control. Retaining the measurement specification of the original Model D, the new D7 provides the user with one of the highest specification optical measurements of rotation at a fraction of the cost of its predecessor.



Specification

	Angular ($^{\circ}$ A)	ISS ($^{\circ}$ Z)
Range	0-360	-30 to +130
Scale Division	1	1
Resolution by Micrometer Drum	0.05	0.1
Reading by Estimation	± 0.02	± 0.05

Features:

- Dual scale
- LED light source
- Intensity control
- 90-230V~, 50/60Hz
- Lightweight

Code Description

31-02	Model D7 Polarimeter with integral LED light source, intensity control, power supply, 200mm 'bubble' polarimeter tube and instructions for use.
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E-Line Gemological

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).



Features:

- Internal LED illumination
- Battery operated
- Portable

Specification

Measuring range	1.30-1.81
Resolution	0.01

Code Description

44-861	E-Line Gemological Refractometer
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Other instruments available from Bellingham + Stanley



Digital Refractometers with Peltier Temperature Control for chemical, pharmaceutical and petrochemical applications.



High Accuracy Digital Polarimeters for all applications.



Digital Refractometers for sugar, beverage, food and general industry.



Low cost Digital Polarimeters & Saccharimeters.



UKAS Calibration materials for refractometers and polarimeters traceable to international standards.



Process Refractometers for on-line applications.



Distributor:



Bellingham + Stanley Ltd operates a Quality Management System complying with BS EN ISO 9001:2000 (Certificate No. LRQ 0963791).

Bellingham + Stanley Ltd pursues a policy of continuous product development and improvement and as such, information given on this Data Sheet may be updated or withdrawn without notice.



These products comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC

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