Digital Refractometers & Polarimeters

FOR PRECISE MEASUREMENT OF CONCENTRATION AND PURITY

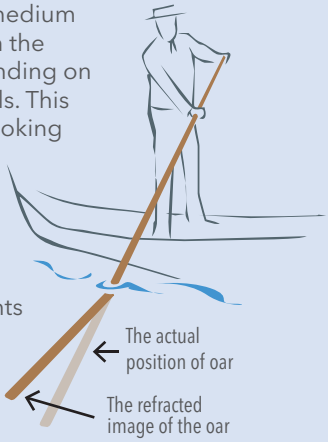
Bellingham + Stanley

a xylem brand

Precision measurement of concentration and purity in laboratory or factory environments

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.



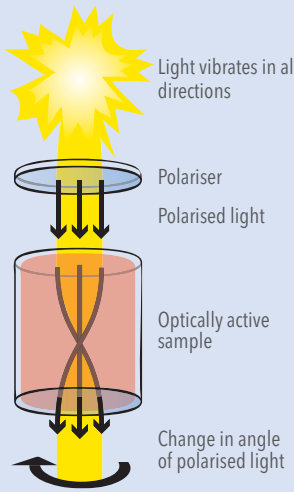
The ratio or change in the speed of light is called refractive index and instruments that measure this are called refractometers.

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 (sucrose), glucose, sodium chloride, urea and urine specific gravity to name just a few.

What is Optical Rotation?

When plane-polarised light passes through an optically active substance, the plane of polarisation will rotate by an amount that is specifically related to the product through which it travelled.

As many chemical compounds display this chiral characteristic, the measurement of optical rotation using a polarimeter is commonplace within the sugar, food, chemical and pharmaceutical manufacturing industries as a production control and quality assurance tool.



Feature Key

- NEW
- 21 CFR 11 — 21 CFR Part 11
- Peltier Temperature Control
- RFID User Identity
- Factory Friendly
- USB Connectivity
- HD — HD Colour Display

UK MADE

All instruments shown in this brochure are "Made in the UK"

RFM700 Refractometers

RFM700 series refractometers are robust, low cost, fully automatic instruments that are ideally suited to the food, sugar and beverage industries but can also be used in many other non-food applications where temperature control is not required.

The instruments are configured to operate in the °Brix scale with results temperature-compensated to 20°C in accordance with ICUMSA. Additionally, two standard user scales may be installed from an extensive online library, or product-specific custom scales and temperature compensation may be created using PC software available free of charge from our website prior to downloading to the instrument.

Inherent to the robust design is a sapphire prism mounted in an easy-clean stainless steel dish and an outer casing that is sealed and shaped to withstand sample spillage and moisture ingress. This, together with the external power supply and bright LED display, makes the RFM700 ideal for use in busy laboratories or harsh factory environments. The instrument can also be connected to a printer or laboratory PC, with results being output in standard or CSV formats.

Other software features include special AG temperature compensation that facilitates a SPAN calibration when using AG calibration fluids, and a time delay before reading, ensuring reliable results every time.

- Multiple scale
- Factory model
- Simple operation
- Reading delay

Specifications	RFM712 (71F)	RFM732 (73F)	RFM742 (74F)	RFM745
Order Code	29-12	29-32	29-42	29-45
Scales				
°Brix	0 – 50	0 – 100	0 – 100	0 – 100
User Defined (RI equivalent)	2 (1.33-1.42)	2 (1.33-1.54)	2 (1.33-1.54)	NO
Resolution (°Brix/RI equivalent)	0.1 (0.0001)	0.1 (0.0001)	0.01 (0.00001)	0.01 (NO)
Accuracy (°Brix/RI equivalent)	±0.1 (±0.0001)	±0.1 (±0.0001)	±0.04 (±0.00005)	±0.04 (NO)
Other Scales	User Defined – RI, Oechsle, Probable Alcohol (A.P.), Báume, Babo, Sodium Chloride, HFCS, Butyro, FSII etc. or custom scales, all loaded by PC software.			42% HFCS 55% HFCS 90% HFCS
Temperature Range	5-40°C			
Temperature Compensation	ICUMSA, AG, None or User Defined			ICUMSA, AG, None
Temperature Control	None – Temperature Compensation (ATC)			
Temperature Sensor Accuracy	±0.05°C			
Temperature Stability Checks	Delay time (programmable in seconds)			
Interface	RS232			

RFM300+ Refractometers

RFM300+ series refractometers are considered by many leading companies as the ultimate instrument for installation in demanding factory environments, as well as for use as a primary quality control tool. Since its original launch in 1992, over 5,000 models have been installed across the globe, and following a complete re-design, the RFM300+ series of refractometers still offers all the original design attributes but with a wider refractive index range, Peltier temperature control and a more versatile software structure. A shallow, easy-to-clean prism dish houses a single sapphire prism optical system protected by a sample presser that may also be used to instigate a measurement without the need to press the read button.

A large sampling area on the prism surface allows measurement of not only homogenous fluids like juices, sodas, sauces and edible oils, but also difficult to read samples like fruit pulps and industrial resins.

Intelligent software ensures rapid temperature response to changes in prism temperature, whilst the SMART temperature stability check makes sure that the result is displayed only when the sample is stable. A Methods system allows rapid configuration of instrument setup and provides limit checks against stored data as well as product-specific offsets and acid corrections. Over 4000 readings may be stored within the instrument memory and the on-screen menu may be displayed in a number of different languages.

The instrument is available in two formats, the most popular being the 2-decimal place RFM340+ refractometer, which, following improvements to the thermodynamic control system, now has an increased measurement performance between 0-20°Brix and so reduces potential measurement error in the critical range covering finished products like the aforementioned juices and sodas. By improving the performance at the low end of the scale, users may now trim syrup dilution to the absolute minimum without the risk of breaching manufacturing specifications.

SG scales for sucrose are also common to the series. These scales may be used to express the relative density of pure sucrose solutions and, when used in conjunction with a

product offset from within the Methods system, can express finished beverages as an equivalent SG. By doing so, contract packers of beverage products may now use a refractometer in situations where density °Brix or SG is dictated as the method of analysis, whilst retaining all the measurement advantages held by a refractometer.

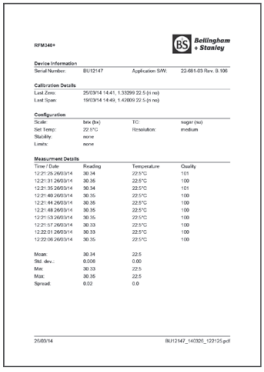
Additionally, all RFM300+ series refractometers have the ability to display the measured result in two scale formats such as a °Brix value based on SG alongside the original refractive index measurement. Optional software is also available at point of order to allow use in an environment controlled by FDA regulation 21 CFR Part 11, as well as optional devices that allow use in wet and humid factory environments, offering ultimate protection under the worst of environmental conditions.

- High accuracy (±0.01°Brix)
- Robust factory model
- Easy clean prism
- Smart temperature stability
- PIN menu protection
- Print to secure PDF

Specifications	RFM330+ (RFM33F)	RFM340+ (RFM34F)
Order Code	22-30	22-40
Scales		
Refractive Index	1.32 – 1.58	1.32 – 1.58
Sugar (°Brix)	0 – 100	0 – 100
User Defined	100	100
Resolution		
Refractive Index	0.0001	0.00001
Sugar (°Brix)	0.1	0.01
Accuracy		
Refractive Index	± 0.0001	± 0.00002 (1.32 – 1.36 RI) ± 0.00004 (1.36 – 1.58 RI)
Sugar (°Brix)	± 0.1	±0.01 (0 – 20 °Brix) ±0.03 (20 – 100 °Brix)
User Scale Library on-board	20+ preprogrammed scales including HFCS (3), wine (5), sugar (4), urine SG (3), Urea, sucrose SG (3), FSII, NaCl, Butyro etc. Plus customer programmable scales via PC.	
Presser Type	Polyacetal	
Reading Time	Minimum 4 seconds	
Measuring Temperature Range	10°C below ambient to 70°C	
Temperature Sensor Accuracy	± 0.03°C	
Sample Temperature Stability	± 0.05°C	
Temperature Compensation		
Sucrose (°Brix)	5 – 70 °C	
AG Fluids	5 – 40 °C	
User Defined	Simple coefficient (units/°C) or polynomial function	
Temperature Stability Checks	None/delay time/repeatability/ Smart (independently selectable by Method)	
Interfaces	3 x USB (A), 1 x USB (B), 1 x Ethernet, 1 x Serial (RS232)	
Prism Seal	Silicon/Resin	

RFM340+ Refractometer Enhanced Performance

RFM340+	RI	°Brix
Scale	1.32-1.58 1) 1.32-1.36 2) 1.36-1.58	0-100 1) 0-20 2) 20-100
Accuracy	1) ±0.00002 2) ±0.00004	1) ±0.01 2) ±0.03



RFM900 Refractometers

The RFM900 series of refractometers combine the latest opto-electronic principles with durability and ease of use. RFM900 refractometers feature RFID (Radio Frequency Identification) that allows users to identify themselves by simply swiping a tag across the top of the instrument to enable measurement and, in certain cases, access to the configuration menu.

A low-profile sample dish and non-contact presser makes sample application and cleaning easy. Readings can be taken automatically on the replacement of the presser, and over 4000 stored results can be easily viewed in tabular form on the instrument display. Peltier temperature control and intelligent temperature management ensures readings are only taken when the sample and refractometer temperatures are both stable.

The instruments conform to a number of industry measurement standards and offer operational features that allow use in an environment controlled by FDA regulation 21 CFR Part 11.

Specifications	RFM960	RFM970	RFM990-Flow	RFM990-AUS32
Order Code	22-60	22-70	22-90	22-71
Scales				
Refractive Index	1.30 – 1.70	1.30 – 1.70	1.30 – 1.70	1.30 – 1.70
Sugar (°Brix)	0 – 100	0 – 100	0 – 100	0 – 100
User Defined	100	100	100	0 - 40% Urea
Resolution				
Refractive Index	0.0001	0.00001	0.00001	0.00001
Sugar (°Brix)	0.1	0.01	0.01	0.01
Accuracy				
Refractive Index	± 0.0001	± 0.00002	± 0.00002	± 0.00002
Sugar (°Brix)	± 0.1	± 0.02	±0.02	±0.02
Presser Type	Polyacetal	Polyacetal	Flowcell (optional)	Polyacetal
Temperature Compensation				Urea, ICUMSA (sugar),
Sucrose (Brix°)	5 – 80 °C			AG, None or
AG Fluids	5 – 40 °C			User Defined
User Defined	Simple coefficient (units/°C) or polynomial function			
Temperature Control	Peltier			
Temperature Stability Checks	None/delay time/repeatability/ Smart (independently selectable by Method)			
Measuring Temperature Range	0°C or 10°C below ambient whichever is the greater to 80°C			
Temperature Sensor Accuracy	± 0.03°C			±0.02 °C (at 20 °C[1])
Sample Temperature Stability	± 0.02°C			±0.01 °C (at 20 °C[1])
Prism Seal	Kalrez®			
Interfaces	1 Parallel (printer), 2 x Serial (RS232)			

- Pharmaceutical
- Chemical
- Widest RI range
- Highest accuracy (±0.00002RI)
- MEAN Method (USP/EP/BP)
- All RFM900s conform to ASTM D 1218, 1747, 2140 & 5006

The use of a Kalrez® gasket and sapphire prism facilitates placement in the harshest measurement environments including those in the pharmaceutical, petrochemical, aroma, flavour, fragrance and other high RI sectors.

The RFM990-Flow model facilitates automation by way of an optionally supplied flowcell attachment.

RFM990-AUS32 Refractometer

The RFM990-AUS32 is an extremely high accuracy refractometer specifically designed to meet the stringent needs of the chemical manufacturing industry. Of particular interest is its compliance with the strictest of ISO procedures in relation to the manufacture of urea-based NOx reduction agents used as Diesel Exhaust Fluids, also known as DEF, AUS32 and AdBlue®.

ISO 22241 dictates the highest level of measurement must be achieved under the tightest limits of temperature control. In addition to the compliance with this norm, the RFM990-AUS32 is fitted with specific Urea scales and temperature compensation as well as an AUS32 Method that allows input of both the F factor and biuret content of the solution that is included in the analysis.

Being part of the RFM900 series of refractometers, users of the RFM990-AUS32 also benefit from common features such as RFID user identity/clearance, on-board data storage, limit checking and audit trails.

No matter how good the instrument performance, without good verification it is not possible to confirm the instrument meets the specification laid down in ISO 22241. Bellingham + Stanley offer a UKAS Certified Reference Material for this purpose at the equivalent RI value of Urea stated in the norm.

- Petrochemical model
- Premium performance
- Conforms to ISO 22241
- AdBlue®/Urea/DEF
- AUS32 Method (input criteria)

AdBlue® is a registered trademark of VDMA, GmbH

1. AUS32 performance – 20°C is mandatory

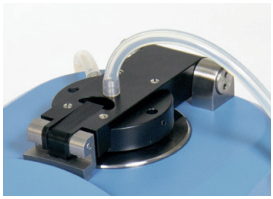
Common Specifications – **Laboratory Refractometers**

Prism	Artificial Sapphire (1.76RI - Hardness 9.0 Mohs)
Prism Dish	316 Stainless Steel (RFM900/300+ Series: PEEK spill barrier)
Sample Illumination	Light Emitting Diode 589nm (100,000+ hours)
Reading Time	Minimum 4 seconds (stability checks on all models)
Instrument Housing	Polyurethane Foam with aluminium base
Power	Instrument: 24 V DC, ±5%, <2A Power Supply Unit: 100-240V, 50-60Hz (supplied with instrument)
Humidity Range	<90% RH (non condensing)

RFM Flow Refractometers

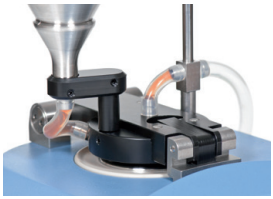
Micro Flowcell

Micro flowcells are used to transfer volatile or limited volume low viscosity liquids as part of a single or multiple instrument analysis, often incorporating an autosampler and pump within the beverage, brewing, flavours, fragrance or essential oil industries.



Macro Flowcell

Macro flowcells are used where sample viscosity limits the use of micro-flowcells or for connection to a pilot plant or small-batch process line, where a normal process refractometer may not be suitable.



Funnel Flowcell

Where larger volumes of sample are available, a funnel flowcell may be used. These negate the need to clean the instrument prism between sample measurements, providing a rapid sample turnaround, such as in Tare Houses of grape growers co-operatives and sugar mill receiving stations.

RFM990 Flow Refractometer

The RFM990-Flow is a wide range Peltier temperature controlled refractometer that has been carefully adapted for use with samples under flow conditions; in particular by ensuring that the sample is presented to the prism without entrapped air.

Supplied as an instrument module only, the user can choose from a number of standard cells, or for special applications, a custom design chamber may be offered at extra cost depending on viability.

Available as a five decimal place RI instrument only, customers requiring a lower level of accuracy have the option to switch the resolution.

- Wide range
- High accuracy
- Selectable resolution
- Facilitates automation
- Choice of flow cells
- Optional materials traceability certificate

Instrument	Micro	Macro	Funnel (75mm)	Micro UNF
RFM990-Flow	22-91	22-92	22-93	22-94

See page 6 for instrument specifications
Flowcells for RFM990-Flow refractometer are an optional extra.

RFM300+ Flow Refractometers

RFM300+ Flow refractometers are especially suited to applications requiring temperature controlled high accuracy measurement of samples in the low to mid refractive index range that do not present any chemical compatibility issues. RFM300+ Flow refractometers are ideally suited towards food and beverage applications as well as high performance operation in sugar industry Tare Houses.

Instrument	Funnel (50mm)	Funnel (75mm)	Macro
RFM33F	22-33	22-36	22-37
RFM34F	22-43	22-46	22-47

RFM300 Flow refractometers are supplied complete with the flowcell.
See page 5 for instrument specifications.

RFM700 Flow Refractometers

In applications where empirical data may be used to compensate for temperature deviations, RFM700 Flow refractometers offer the most viable solution for laboratory automation and Tare House use. Typical applications include the final °Brix measurement of beverages in busy production halls as well as for rapid payment and processing of raw material delivery at the Tare Houses of sugar and wine cooperatives.

Instrument	Funnel (50mm)	Funnel (75mm)	Macro
RFM71F	29-13	29-16	29-17
RFM73F	29-33	29-36	29-37
RFM74F	29-43	29-46	29-47

RFM700 Flow refractometers are supplied complete with the flowcell.
See page 3 for instrument specifications.

Common Specifications – **Flowcells**

			Micro	Macro	Funnel	Micro UNF
Cell volume (including nozzle)		ml	0.6	1.2	1.2	0.6
Flushing Volume		ml	–	–	50 – 100	–
Sample Inlet Tubing Bore		mm	2	4	–	2
Sample Inlet/Waste Nozzle Outer Diameter		mm	3	6	6	3
Sample Waste Tubing Bore		mm	2	4	6	2
Sample Pressure (max.)		bar	2	2	–	2
Chamber Material			Polyacetyl or PEEK (RFM990)			
Nozzle Material			316 Stainless Steel			
Sealing Ring			Silicon or Chemraz® (RFM990)			
Connections			Pushfit			¼" UNF
RFM990 Stand Dimensions	Width	mm	230	230	230	230
	Depth	mm	330	330	330	330
	Height	mm	430	430		430
	Weight	kg	2	2		2

Pro-Juice Refractometer

For many years, beverage manufacturers have adopted digital refractometers as their primary instrument for measuring the final dilution ratio (°Brix) of re-constituted fruit juice not only to assure product quality but also in an attempt to reduce losses by tightly controlling concentrate yields. For most fruit types this has been successful but for one of the most commonly produced juices, the high accuracy measurement achieved by latest technology digital refractometers has unmasked an erratic behaviour within an orange juice sample that prevents tighter dilution control, which in turn negates any opportunity of cost reduction by way of lowering target values without the risk of compromising minimum specifications defined by regulation.

The Pro-Juice refractometer has been specifically developed to overcome the erratic behaviour of orange juice by focussing on the practical handling of the sample prior to high accuracy measurement in order to achieve a measurement accuracy of 0.01 °Brix for sucrose solutions and more importantly, a reproducibility of 0.02 °Brix between orange juice samples, regardless of temperature deviation or operator skill level. The Pro-Juice refractometer has two modes of operation allowing standard juices to be measured in a conventional manner.

- Application Specific
- Premium performance
- Improves concentrate yield
- Dual mode

Specifications	Pro-Juice Refractometer
Order Code	22-10
Scale: Sugar (°Brix)	0 – 100
Resolution: Sugar (°Brix)	0.01
Accuracy: Sugar (°Brix)	±0.01 (0 – 20 °Brix) ±0.03 (20 – 100 °Brix)
Reproducibility: Sugar (°Brix)	±0.02 for orange juice
Modes	Conventional & Pro-Juice
Reading Time	4-180 seconds (mode dependant)
Methods	Multiple Methods with citric acid correction and offset
Presser Type	Polyacetal funnel flow through or conventional operation
Measuring Temperature Range	0°C or 10°C below ambient whichever is the greater to 70°C
Temperature Sensor Accuracy	± 0.03°C
Sample Temperature Stability	± 0.05°C
Temperature Stability Checks	None/delay time/repeatability/Smart/Pro-Juice
Interfaces	1 Parallel (printer), 1 x Serial (RS232)
Prism Seal	Silicon/Resin

ADP410 Polarimeter

The ADP410 is a dual scale, fully automatic polarimeter designed for use in many applications that require measurement of optical rotation. The instrument is housed in a rugged chemical-resistant case, making it suitable for use in factory environments as well as in the laboratory. Standard, jacketed and flow type tubes may be used, possibly requiring the use of specially suited slotted lids.

Operation is very simple by way of four graphically identified push buttons including scale and compensation selection, zero calibration and the display of optical density (OD) and temperature. Results are shown on a bright LED display and may be printed via an RS232 interface.

Temperature compensation can be achieved from a single sensor, which can measure either the temperature within the sample chamber or, when placed in the centre-filling arm of the measurement tube, the temperature of the actual sample.

The sample reading value and optical density are alternately displayed by repeatedly pressing the READ key. The instrument can be checked and calibrated using quartz control plates by accessing the span facility in the setup menu.

If a sample is too dark, the instrument will display an error message.

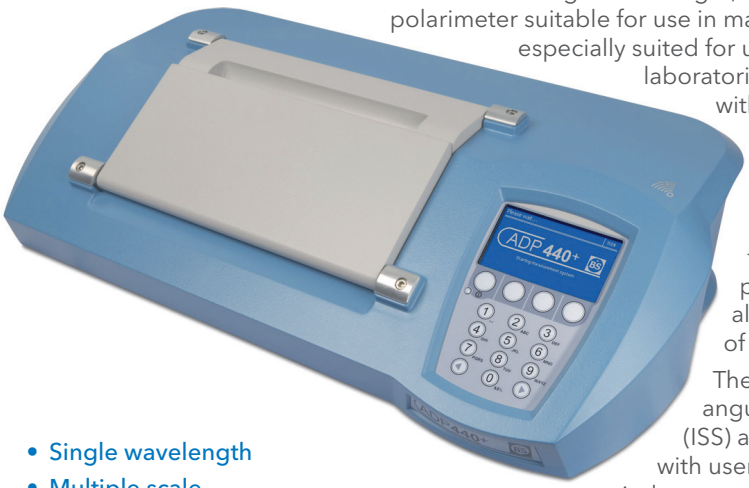
- High quality – low cost
- Dual scale (°A/°Z)
- OD & °C display
- Simple operation

Specifications	Angular (°A)	ISS (°Z)
Range	–90 to +90	–225 to +225
Resolution	0.01	0.01
Reproducibility	0.01	0.02
Accuracy	±0.02	±0.05
Order Code	37-10	

Common Specifications – **Laboratory Polarimeters & Saccharimeters (ADP/S 400 Series)**

Sample Illumination	Light Emitting Diode (100,000 hrs). Interference Filter 589nm (except ADS480: 850nm)
Beam Diameter	4mm
Optical Path Length	10 to 200mm
Optical Density Range	0.0 to 3.0 OD (except ADS480)
Temperature	Range: 5 – 40 °C Compensation: sugar/quartz/none (ADP440+: additional user defined)
Reading Type	Continuous measurement and display
Reading Time (seconds)	4 (ADP410) 20 (ADS) 4-30 (ADP440+: selectable by Method)
Instrument Housing	Polyurethane Foam with aluminum base
Power	Instrument: 24 V DC, ±5%, <2A Power Supply Unit: 100-240V, 50-60Hz (supplied with instrument)
Humidity Range	<90% RH (non condensing)

ADP440+ Polarimeter



The ADP440+ is a single wavelength, high accuracy polarimeter suitable for use in many applications, and is especially suited for use in pharmaceutical laboratories where compliance with Pharmacopoeia is required.

New optics featuring a 'no maintenance' yellow LED and interference filter together with a photodiode detector allows reading of samples of up to 3.0 OD.

The instrument has both angular and sugar scales (ISS) and can be programmed with user scales as well as industry standard methods for displaying concentration and specific rotation directly.

- Single wavelength
- Multiple scale
- High Accuracy
- Conforms USP/EP/BP
- MEAN Method

When used in the sugar industry, the ADP440+ may also form the central hub of a purity system, providing the measurement of a Saccharimeter. In the 'purity mode' the instrument will calculate and display 'sugar purity' with Brix values being input automatically from an RFM refractometer or via the simple keypad. For rapid measurements, funnel and flow-through cells are available and require the use of specially suited slotted lids.

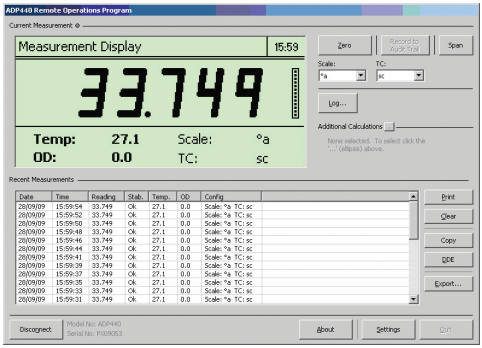
Data handling is in accordance with GLP providing a record of measurement date, time, batch and operator numbers. A calibration record is also available to be displayed or printed. Data handling may also be configured in accordance with the technical requirements of FDA regulation – 21 CFR Part 11 with users being identified and cleared by swiping an RFID tag across the instrument surface or by traditional keypad PIN entry.

Specifications	Angular (°A)	ISS (°Z)
Range	–355 to +355 selectable	–225 to +225
Resolution	0.01/0.001	0.01/0.001
Reproducibility	0.002	0.005
Accuracy	± 0.01	±0.03
Interfaces	2 x RS232, parallel printer port	

Code	Description
37-40	ADP440+ digital polarimeter supplied with one centre filling tube (200mm), pack of three RFID tags, instruction manual and certificate of conformity

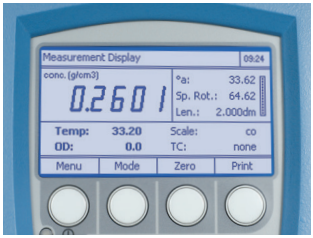
Operation is very simple by way of four push buttons including scale and compensation selection, zero calibration and the displaying of optical density and temperature.

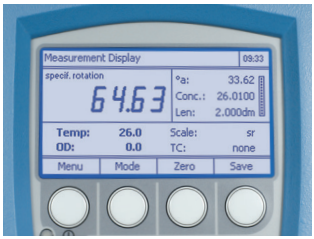
On-screen menus in English, French, Spanish or German are selectable. Temperature compensation can be achieved from a single sensor, which can measure either the temperature within the sample chamber or, when placed in the centre filling arm of the measurement tube, the temperature of the actual sample.



The instrument can be checked and calibrated using a quartz control plate by accessing the span facility in the setup menu. If a sample is too dark, the instrument will display an error message.

PC software provides remote control with functions including data logging and kinetic temperature experiment configuration. The software is provided free of charge and can be downloaded from our website. Validation (IQ/OQ/PQ) documentation is also available.

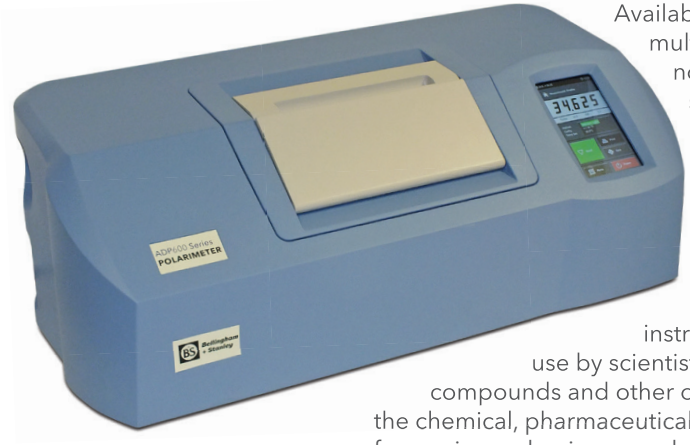




Polarimeter Tube – Spare Parts

Order Code	Description	Diameter	Quantity	Tube Type
35-60	Low strain cover glasses	15.5	12	Glass
35-64	Rubber washers for use between cover glass and end cap	15.5	12	
35-68	End caps, plastic	15.5	2	
35-20	End caps, metal	15.5	2	Glass
35-21	Rubber Glands for metal end cap tubes & fitting tool	15.5	12	
35-62	Low strain cover glasses	22.5	2	Flow
35-66	Rubber washers for use between cover glass and end cap	22.5	2	
35-88	End Caps, stainless steel	22.5	2	
35-79	Temperature sensor saddle	–	1	Low
35-80	Low strain cover glasses	20	6	Volume
35-81	Rubber washers for use between cover glass and end cap	20	10	

ADP600 Polarimeters



Available as single, dual and multiple wavelength derivatives not only covering the visible spectrum, the new ADP600 Series of Peltier temperature controlled polarimeters are capable of measuring optical rotation to four decimal places in the highly sensitive ultra-violet region. This capability makes the instrument particularly suited for use by scientists wishing to measure chiral compounds and other optically active substances in the chemical, pharmaceutical and food sectors as well as for use in academic research.

- Single, dual & multiple wavelength models
- Four decimal place resolution
- Peltier temperature controlled
- High definition 7.4" touch-screen display

Peltier technology is intelligently applied to the sample chamber of the new polarimeters so that measurement can be accurately made without the need of an external waterbath. The ADP600 Series Polarimeters have two preset operating temperatures being 20 and 25 °C in accordance with European and United States Pharmacopoeia respectively and other user temperatures between 20 and 30°C may be configured via the instrument user interface.

Specifications

Range (°A)	± 89 (-355 to +355 via Method selection)
Resolution (°A)	0.0001
Accuracy (°A)	± 0.003 (@546 & 589nm) / ± 0.005 (@325, 365, 405 & 436nm)
Temperature Range	15-35°C
Temperature Control / Accuracy	Peltier / ± 0.2°C
Temperature Compensation	None, sugar, quartz, user defined
Optical Density Range	0.0 to 3.0 OD
Methods	Specific Rotation, % Concentration, % Invert Sugar, % Inversion (A-B)
Temperature Set Points	20 & 25 °C (variable between 20-30 °C via Method)
Reading Time	15-60 seconds @ 546/589nm and 20/20°C (instrument/sample)
Tube Length	5-200mm
Tube Diameter	3-8mm
User Interface	High Definition 7.4" touch-screen color display
Light Source	UV/Vis lamp (6V, 2A >1000hrs) and narrow band pass filter(s)
Interfaces	3 x USB (A), 1 x USB (B), 1 x Ethernet, 1 x Serial (RS232)
Power Supply	100-250V~, 50-60 Hz. <6A.

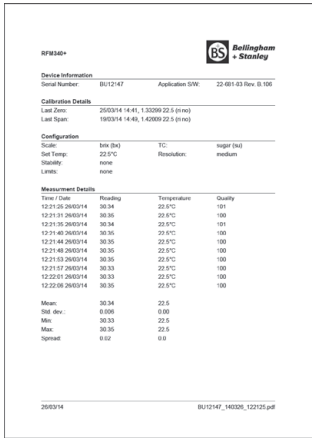
ADP600 Series Polarimeters accept standard glass or special low volume leur taper polarimeter tubes facilitating measurement across optical path lengths between 5 and 200m with tube diameters from 3 to 8mm being readable. Optional lids may be easily be fitted to the ADP600 Series Polarimeters, facilitating sample tube entry and exit.

Integral to operational simplicity is the full colour, high definition, touch-screen graphical user interface. A menu structure featuring a METHODS system makes for one-touch calibration and instrument configuration; especially where the specific rotation of a number of samples is being analysed over a wide range of concentrations, path lengths, temperatures and wavelengths. A “Mean Method” is also available, allowing a number of readings to be taken from a production batch with the mean being calculated and recorded once the experiment has been completed.

ADP600 Series Polarimeters have an extensive interfacing capability. Four USB ports provide excellent connectivity to, for example, convenient remote keyboards, printers, barcode readers and LIMS or PC, whilst the Ethernet connection may be used for networking as well as remote diagnostics or certification. The ADP600 Series on-board RFID reader may be used to identify users as well as sample tube lengths for recording and in particular, calculation of Specific Rotation.

Additionally the ADP600 Series Polarimeters feature a secure “print to PDF” function that may be configured to operate in secure environments in accordance with FDA regulation 21 CFR Part 11 and importantly, the ADP600 Series polarimeters meet all of the requirements, including wavelength directives of British, United States, European and Japanese Pharmacopoeia.

- Simple Methods system
- Accepts standard & low volume sample tubes
- Supports FDA regulation 21 CFR Part 11
- US/EP/BP/JP compliant


RFM340+

Bellingham + Stanley

Device Information

Serial Number:	BU12147	Application S/W:	22-681-03 Rev. B.106

Calibration Details

Last Zero:	25/03/14 14:41, 1.33299 22.5 (n:no)
Last Span:	19/03/14 14:49, 1.42699 22.5 (n:no)

Configuration

Scale:	brix (bx)	TC:	sugar (su)
Set Temp:	22.5°C	Resolution:	medium
Stability:	none		
Limits:	none		

Measurement Details

Time / Date	Reading	Temperature	Quality
12:21:26 26/03/14	30.34	22.5°C	101
12:21:31 26/03/14	30.35	22.5°C	100
12:21:35 26/03/14	30.34	22.5°C	101
12:21:40 26/03/14	30.35	22.5°C	100
12:21:44 26/03/14	30.35	22.5°C	100
12:21:48 26/03/14	30.35	22.5°C	100
12:21:53 26/03/14	30.35	22.5°C	100
12:21:57 26/03/14	30.33	22.5°C	100
12:22:01 26/03/14	30.33	22.5°C	100
12:22:06 26/03/14	30.35	22.5°C	100
Mean:	30.34	22.5	
Std. dev.:	0.006	0.00	
Min:	30.33	22.5	
Max:	30.35	22.5	
%mean:	0.02	0.0	

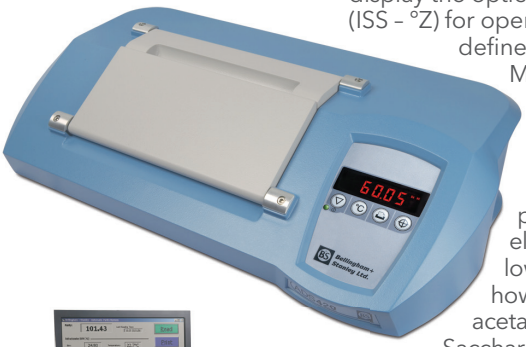
26/03/14 BU12147_140326_122125.pdf

Code	Description	Wavelengths(s)
37-61	**ADP610** single wavelength polarimeter	589nm
37-62	**ADP620** dual wavelength polarimeter	546 & 589nm
37-63	**ADP622** dual wavelength polarimeter	365 & 589nm
37-64	**ADP640** multiple wavelength polarimeter	405, 436, 546 & 589nm
37-65	**ADP650** multiple wavelength polarimeter	365, 405, 436, 546 & 589nm
37-66	**ADP660** multiple wavelength polarimeter	325, 365, 405, 436, 546 & 589nm

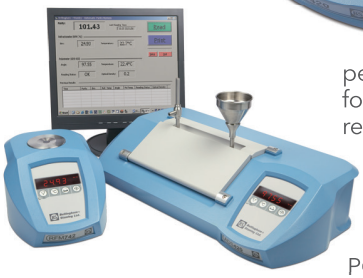
All ADP600 Series Peltier temperature controlled polarimeters are supplied with standard lids, two RFID tags, instruction manual and certificate of conformity.

Saccharimeter

A Saccharimeter is a polarimeter that has been configured to display the optical rotation in the International Sugar Scale (ISS – °Z) for operation in the sugar processing industry as defined by the International Commission for Uniform Methods of Sugar Analysis (ICUMSA).



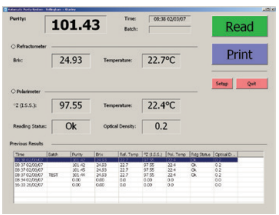
Two single wavelength Saccharimeters are available from Bellingham + Stanley, differentiated only by the frequency of the low maintenance LED light source used as part of the analysis. Latest specification opto-electronics allows measurement of samples with low transmittance even at sodium wavelength; however, for applications where the use of lead acetate is prohibited, the near infrared ADS480 Saccharimeter and Celite® filtrate offers supreme performance. Commonly, operation is made easy by way of four graphically presented push button keys and the continuous reading mode that updates the bright LED display, gives the user total confidence in the instrument's performance. A single temperature sensor provides the measurement for sugar compensation, whilst quartz compensation facilitates accurate verification and calibration using a Quartz Control Plate.

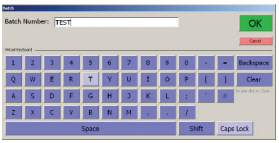


PC software is included with all Saccharimeter packages, providing simultaneous measurement of Brix by refractometer to calculate PURITY. A robust touch sensitive LCD screen is available as an optional extra for use with any PC[1].

A number of different flow packages are available making the ADS Saccharimeter ideal for use in any busy Tare House or refinery laboratory.

- Single ISS Sugar Scale
- 589nm or NIR
- Conforms to ICUMSA[2]
- OD indicator
- Simple operation
- Low maintenance LED
- Flow Packages
- PURITY package





Specifications	ADS420	ADS480
Range	–225 to +225 °Z	–225 to +225 °Z
Resolution	0.01 °Z	0.01 °Z
Reproducibility	0.02 °Z	0.03 °Z
Accuracy	±0.03 °Z	±0.06 °Z
Interfaces	1 x RS232	1 x RS232

ADS420	ADS480	Saccharimeter Package
37-20	37-80	**Standard** Saccharimeter, 200mm centre filling glass sample tube and standard lid
37-21	37-81	**Flow-100** Saccharimeter, 100mm water jacketed funnel flow tube and slotted lid
37-22	37-82	**Flow-200** Saccharimeter, 200mm water jacketed funnel flow tube and slotted lid
55-31		Touch sensitive LCD VDU for purity system

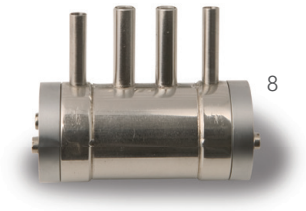
1. PC not included 2. Sodium wavelength (NIR recognised).

Polarimeter Tubes

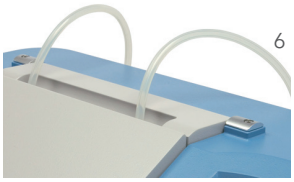
Bellingham + Stanley polarimeter tubes are manufactured to high quality standards conforming to ICUMSA recommendations and are compatible with most makes of polarimeter.

Tube ends are precision ground with windows made from specially selected low strain glass in order to achieve highest accuracy optical rotation measurement.

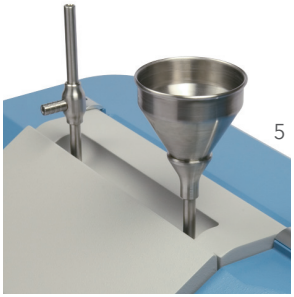
Code	Standard Glass – 8mm	Length	Fig.
35-29 35-30 35-28	Bubble type – to clear bubble from field of view Most suited to Model D7	100 200 50 – 200	1
35-46 35-47 35-45	Centre fill – for easy filling and placement of ADP temperature sensor	100 200 50 – 200	2
35-57 35-58 35-56	Cup – funnel shaped centre fill for viscous samples	100 200 50 – 200	3
35-10 35-11	Metal end – centre fill for aggressive chemicals and solvents	100 200	4
Volume: 5.02ml/100mm.			



Code	Flow & Temperature Control – 8mm	Lid code	Length	Fig.
36-57 36-58	Funnel flow-through tube	37-012 37-011	100 200	5
36-67 36-68	Continuous flow-through tube	37-012 37-011	100 200	6
36-77 36-78	Centre fill tube	37-010 37-009	100 200	7



Code	Low Volume – Leur – 5mm	Volume	Lid/Fig.
35-71	50mm stainless steel tube	1.0	37-010 Fig 8
35-72	25mm stainless steel tube	0.5	
35-73	10mm stainless steel tube	0.2	
35-74	5mm stainless steel tube	0.1	
35-76	50mm stainless steel tube with water jacket	1.0	
35-75	25mm stainless steel tube with water jacket	0.5	
35-78	50mm glass loaded PTFE tube	1.0	
35-77	25mm glass loaded PTFE tube	0.5	



All lengths in millimetres. Volumes in millilitres. All collar sizes 30mm diameter.
For use with ADP/S models, polarimeter tubes figure 5 to 8 require slotted lids.

Accessories

Code	Peripherals and Cables	Model
55-11	CBM-910 Dot Matrix Printer Parallel: UK/Euro Plug 230V	RFM300+ / RFM900 / ADP440+
55-13	CBM-910 Dot Matrix Printer Parallel: USA Plug 110V	RFM300+ / RFM900 / ADP440+
55-14	CBM-910 Dot Matrix Printer Serial: UK/Euro Plug 230V	All RFM and ADP instruments
55-16	CBM-910 Dot Matrix Printer Serial: USA Plug 110V	All RFM and ADP instruments
54-02	Serial Cable for CBM910 Serial	RFM700 / ADP410 / ADS / ADP600
54-03	Parallel Cable for CBM910	RFM300+ / RFM900 / ADP440+
54-07	Serial Cable for PC	RFM700 / RFM300+ / RFM900 ADP410 / ADP440+ / ADS
55-85	RS232 to USB Converter	RFM300+ / RFM900 / ADP440+
55-80	Barcode Reader 230V	RFM300+ / RFM900 / ADP440+ / ADP600
55-81	Barcode Reader 110V	RFM300+ / RFM900 / ADP440+ / ADP600
55-86	USB Mini Keyboard	RFM300+ / ADP600

Printers may be compatible with earlier instrumentation not listed above.
Contact Bellingham + Stanley or a recognised distributor for further advice.

Code	Spare Parts
22-80	EPP- RFM Enhanced Protection Pack
22-088	EPP Spare Filters (20 pk)
26-292	Standard Spare Filters (20 pk)
55-250	Waterproof Power Supply (IP65)
26-155	Splash Cover
22-071	RFID tags (3 pk)
22-072	RFID tags (10 pk)

Code	Waterbaths	Stability
56-44	Waterbath and Circulator Heat Model: 230V 50/60Hz	0.02 °C
56-45	Waterbath and Circulator Heat Model: 110V 50/60Hz	0.02 °C
56-46	Waterbath and Circulator Refrigerated Model: 230V 50Hz	0.05 °C
56-47	Waterbath and Circulator Refrigerated Model: 110V 60Hz	0.05 °C

Heat only model for use 5°C above ambient to upper limit of instrument.
Refrigerated models 3°C to upper limit of instruments.

Features Guide

Refractometers

	RFM700	RFM300+	RFM900
Brix / Refractive Index / User Scales	✓	✓	✓
Dual Scale Display Function		✓	
Equivalent SG Scale for Beverage		✓	
High RI Range			✓
Peltier Temperature Control		✓	✓
ATC (Brix/AG/User/None)	✓	✓	✓
Delay Before Reading	✓	✓	✓
SMART Temperature Stability		✓	✓
Presser with Auto Read Function		✓	✓
Zero & Span Calibration	✓	✓	✓
Zero Calibration at any value < Span		✓	✓
Calibration & Configuration Audit Trail		✓	✓
Simple Factory Use	✓	✓	
On-board Multi-lingual Menu Structure		✓	✓
Installation Wizard		✓	✓
Security (Password)		✓	✓
Facilitates 21 CFR Part 11		OPT	✓
RFID User Clearance			✓
Reading Log (4000 results)		✓	✓
GLP Printout (Date/Time)	OPT	✓	✓
CSV Data String for LIMS	✓	✓	✓
Methods System		✓	✓
Mean Method (USP/EP/BP)		✓	✓
Petroleum Method ASTM D 2140, 1218, 1747, 5006			✓
Coffee Method		✓	✓
Beverage Method Citric Acid Correction, Apparent Brix/SG		✓	
Flow Cell Option	OPT	OPT	OPT
Hi Accuracy "Urea" option			✓
Remote PC Software	✓	✓	✓

Polarimeters

	ADS400	ADP410	ADP440+	ADP600
Single Wavelength	✓	✓	✓	✓
Multiple Wavelength				✓
Peltier Temperature Control				✓
Angular (°A)		✓	✓	✓
ISS (°Z)	✓	✓	✓	
Specific Rotation / Concentration			✓	✓
Range Configuration (-355 to +355°A)			✓	✓
Optical Density Display	✓	✓	✓	
ATC (Sugar/Quartz/None)	✓	✓	✓	✓
Zero & Span Calibration	✓	✓	✓	✓
Calibration & Configuration Audit Trail			✓	✓
Touch-screen Display				✓
On-board Multi-lingual Menu Structure			✓	✓
Security (password)			✓	✓
Facilitates 21 CFR 11			✓	✓
RFID User / Tube (tube on ADP600 only)			✓	✓
Reading Log (4000 results)			✓	✓
GLP Printout (Date/Time/Batch)			✓	✓
CSV Data String for LIMS	✓	✓	✓	✓
Print to Secure PDF				✓
NIR Wavelength	OPT			
High OD Performance	✓		✓	
Methods System			✓	✓
Mean Method (USP/EP/BP)			✓	✓
Specific Rotation Method			✓	✓
Concentration Method			✓	✓
% Inversion (Sucrose) or Invert Sugar			✓	✓
Purity Method (Direct RFM)			✓	
USB Connectivity				✓
Flow Package Options	✓	OPT	OPT	OPT
Low Volume Cell Options	OPT	OPT	OPT	OPT
PC Remote / Purity Software	✓	✓	✓	✓

OPT - optional extra at time of purchase.

Bellingham + Stanley

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