



Digital Refractometers & Polarimeters

FOR PRECISE MEASUREMENT OF CONCENTRATION AND PURITY



**Bellingham
+ Stanley**

a **xylem** brand

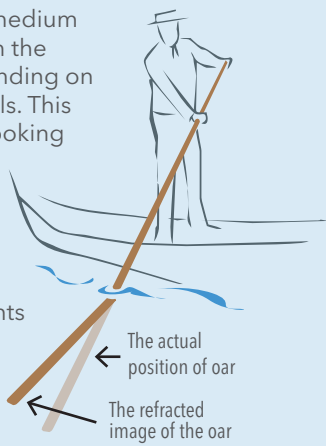
Precision measurement of concentration and purity in laboratory or factory environments

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.



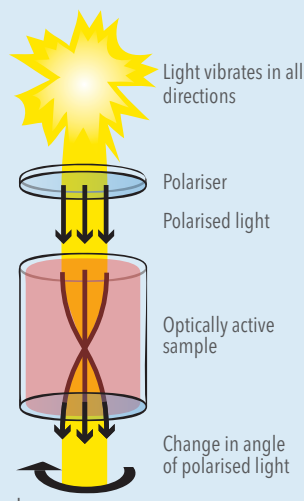
Feature Key

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

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.



All instruments shown in this brochure are made in the UK, except ADP600 series, made in USA.

ADP400 Polarimeters



The ADP400 Series of general-purpose, single wavelength polarimeters are suitable for sugar, food, chemical and pharmaceutical industries where measurement is required to 3-decimal place resolution ($^{\circ}$ A) over a length between 10 and 200mm. The ADP400 polarimeters are available with or without XPC - Xylem's patented internal Peltier temperature control system.



ADP400 series polarimeters feature a 'no maintenance' LED light source and interference filter with photodiode detector technology that provides sample readings up to 3.0 OD at the commonly used sodium (589nm) wavelength. Conveniently, ADP400 Series instruments use standard polarimeter tubes or for scarce samples, low volume luer taper tubes.

Specifications	Angular ($^{\circ}$ A)	ISS ($^{\circ}$ Z)
Scales	-355 to +355 (selectable)	-225 to +225
Resolution	0.01/0.001	0.01/0.001
Accuracy	± 0.010	± 0.030
Precision (Reproducibility)*	± 0.002	± 0.005

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)
Reading Type	Selectable continuous measurement or single shot (ADP) or continuous (ADS)
Reading Time (seconds)	4-30 selectable by Method (AD) or 20 (ADS)
Instrument Housing	Polyurethane foam with aluminum base
Power	Instrument: 24 V DC, $\pm 5\%$, $<2A$ External PSU: 100-240V, 50-60Hz (supplied)
Humidity Range	$<90\%$ RH (non condensing)

Measurement Display

Temp: 20.0 Scale: Specif. Rotation
OD: 0.0 TC: none

Zero Print Methods Menu

Measurement Display

Please wait...
Temp ± 0.2 , stable 23 of 30 secs

Temp: 20.0 Scale: angular (°A)
OD: 0.0 TC: none

Zero Print Mode Menu

Saved Results

Date	Time	Batch	Opn	Reading	Temp	OD	Settings
10/03/17	08:31:17	qcs03	admin	33.595	20.2	0.1	"A" oc
10/03/17	08:30:12	pw68	suide	72.418	20.2	1.1	"A" nc
10/03/17	08:29:51	pw68	suide	71.110	20.2	1.1	"A" oc
10/03/17	08:29:27	pw68	suide	69.591	20.2	1.1	"A" oc
10/03/17	08:28:58	qcs03	admin	33.595	20.2	0.1	"A" oc
10/03/17	08:27:18	qcs03	admin	33.763	20.2	0.1	"A" oc
10/03/17	08:26:04	qpw01	edw...	20.677	20.2	0.5	"A" nc
10/03/17	08:25:14	qpw01	edw...	22.364	20.2	0.5	"A" nc
10/03/17	08:24:48	wym26	admin	-0.001	20.2	0.0	"A" nc
10/03/17	08:24:07	wym26	admin	0.003	20.2	0.0	"A" nc

Quit Up Down Options

Maintenance Report

Last Service/Inspection
Interval: Once every six months

Service/Inspection is due within the next 5 days.

Quit Next

ADP400 Polarimeters

ADP400 Series polarimeters now feature a full colour, 4" (10 cm) high definition display. Measurement may be expressed as angular degrees (°A), sugar (ISS) or user programmable scales, with standard Methods facilitating display of invert sugar, inversion (A-B) or, when applying other factors such as tube length and concentration, Specific Rotation (or concentration when entering specific rotation).

The ADP400 Series offers both continuous and 'single-shot' reading modes, the latter being ideal for pharmaceutical applications where a discrete value is required without interpretation by an operator.

The PHR-MEAN Method, integral to both ADP400 Series polarimeters, allows a number of different readings to be taken from a batch of samples and the statistical report, showing the average, high and low results together with standard deviation can then be printed or stored to file.

The expanded memory ensures that over 8000 measurements and recorded logs of instrument configuration can be saved and viewed or output to LIMS.

Calibration and configuration can be password protected, accessible by keypad entry or, for convenience, using a fully configurable RFID tag. This, together with the audit trail, facilitates operation in environments conforming to FDA regulation 21 CFR Part 11 or GLP. ADP400 Series polarimeters are also ideal for use within laboratories where compliance with Pharmacopoeia is required.

The ADP400 Series polarimeters incorporate a number of industry standard interfaces making it easy to connect to peripheral devices including barcode readers, printers and USB memory sticks for external storage. With the addition

of a USB memory stick operators can output results to a secure PDF using the "Print to Secure PDF." The USB port can also be used to accept RS232 via an available adaptor.

There are two instruments in the ADP400 Series.





ADP430 polarimeter

The ADP430 is a fully featured instrument designed for use in applications where internal temperature control is not required or where the use of automatic temperature compensation or a water bath is preferred, such as within the food industry.

ADP450 Polarimeter

The ADP450 polarimeter with patented XPC technology features interchangeable contact Peltier plates facilitating measurement at a stable temperature using Peltier control. XPC technology conveniently stabilises the temperature of the sample being measured. With SMART temperature stability enabled, the ADP450 will only give a result when the instrument has displayed a stable temperature over a predetermined timeframe, making for reliable results in compliance with good laboratory practice.

- Peltier or waterbath
- Continuous or single read
- Three decimal places
- PHR-MEAN Method
- Conforms to USP/EP/BP
- Standard sample tubes

Temperature	ADP430	ADP450 (Peltier)
Order Code	37-30	37-50
Control	None or external waterbath	Patented XPC Technology
Compensation	None, ICUMSA, Quartz or User Defined	
Measuring Range	5-40 °C	15-35 °C
Sensor Accuracy	± 0.1 °C	± 0.1 °C
Stability	Waterbath dependent	± 0.2 °C
Stability Checks	None/delay on single-shot	None/delay or SMART



XPC Technology

- Fill the tube
- Slot the tube in to the XPC adaptor
- Place in to the ADP450
- Wait for SMART stability
- Record the reading

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 Volume
35-80	Low strain cover glasses	20	6	
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. ADP600 Series Polarimeters accept standard glass or

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 colour 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.



special low volume leur taper polarimeter tubes facilitating measurement across optical path lengths between 5 and 200mm 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

Code	Description	Wavelength(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.

BS Bellingham + Stanley	
BP06040	
Device Information	
Serial Number:	BU12147
Application SW:	22-01-03 Rev. B 100
Calibration Details	
Lead Zero:	250214 14.41, 1.33556 22.5 (n no)
Last Span:	130214 14.45, 1.43556 22.5 (n no)
Configuration	
Scale:	Unit (deg) TC: Rotation: sugar (no)
Set Temp:	22.0°C
Stability:	none
Limits:	none
Measurement Details	
Time (Date)	Reading Temperature Quality
12:21:26 20/05/14	30.34 22.0°C 101
12:21:31 20/05/14	30.35 22.0°C 100
12:21:35 20/05/14	30.34 22.0°C 101
12:21:40 20/05/14	30.35 22.0°C 101
12:21:44 20/05/14	30.35 22.0°C 100
12:21:49 20/05/14	30.35 22.0°C 100
12:21:53 20/05/14	30.35 22.0°C 100
12:21:57 20/05/14	30.35 22.0°C 100
12:22:01 20/05/14	30.35 22.0°C 100
12:22:05 20/05/14	30.35 22.0°C 100
Mean:	30.34 22.5
Std. Dev:	0.005 0.00
Min:	30.33 22.5
Max:	30.35 22.5
Spread:	0.02 0.0
200514	BU12147_14020_121215.pdf