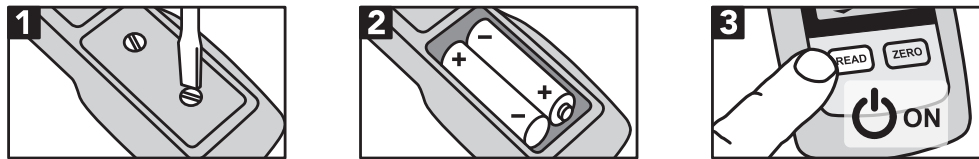
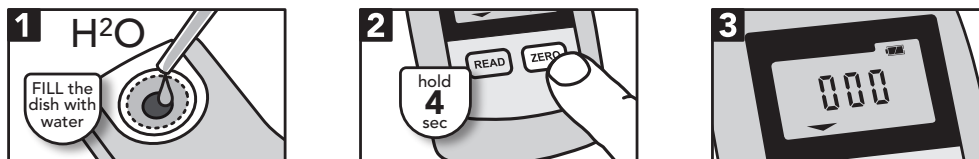


Quick start guide

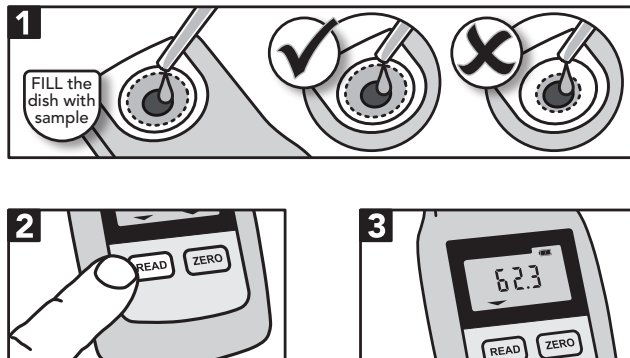
Installing batteries



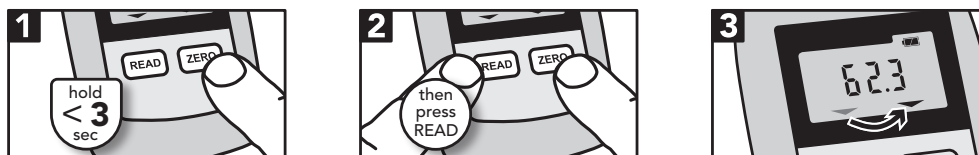
Zero calibration



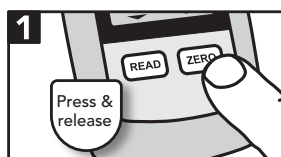
Taking a reading



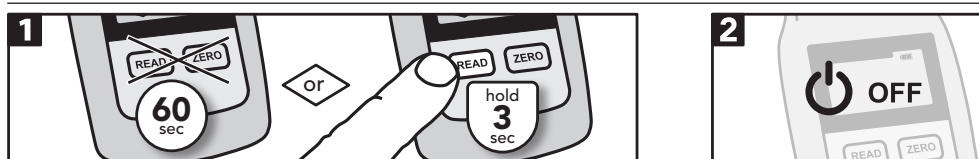
Changing measurement scale



Displaying the measurement temperature



Turning off



Manufacturer's details

Bellingham + Stanley, a Xylem brand
Xylem, Longfield Road, Tunbridge Wells, Kent, TN2 3EY, UK.
sales.bs.uk@xyleminc.com
www.bellinghamandstanley.com

Thank you for purchasing this OPTi® Multiple Scale Digital Handheld Refractometer. In order to ensure that this product provides many years of service, please follow the guidance in this document.

In order to register your instrument with the manufacturer and print a warranty certificate, please visit:

www.bellinghamandstanley.com

User Guide Code: 38-421'01PA-EN

Unpacking the instrument

Check that all parts listed below are present and that no transit damage has occurred.

Contents list

- 1 OPTi Digital Handheld Refractometer
- 2 AAA alkaline battery (LR03)
- 1 User guide

Instrument overview



Safety precautions

WARNINGS

Always check the relevant Material Safety Data Sheet for a sample before applying it to the refractometer. Wear appropriate protective equipment (PPE) when applying samples that may be harmful to the skin or eyes. Avoid unnecessary contamination of the refractometer by confining samples to the prism dish.

CAUTION

This refractometer is a precision optical instrument and should be handled with care. Do not drop or subject the instrument to sharp knocks. The instrument housing and display panel areas are constructed from plastic materials that may suffer damage if contacted with aggressive solvents. For example, avoid contact with solvents such as acetone and certain aromatics.

Maintain your refractometer in a clean condition and avoid use and storage of the instrument outside the specified temperature range. Avoid dusty and high humidity environments and prolonged exposure to direct sunlight. Use the case provided to protect the instrument. Deterioration/loss of the display may be indicative of low battery power or low ambient temperature. Do not persist in using the instrument with low battery power. Check/replace the batteries as necessary.

INTENDED USE

This product is for general laboratory, manufacturing and research use only and is not intended for any animal or human therapeutic or diagnostic use.

Installing the batteries and switching ON & OFF

Installing batteries

Remove the battery compartment cover by turning the two retaining screws in an anti-clockwise direction. Before inserting the batteries check that the compartment is clean and dry, and that the cover seal is in good order. Insert the batteries, ensuring that the battery polarity is correct. Replace the cover by turning the two retaining screws in a clockwise direction whilst the cover is in position.

It is recommended that alkaline batteries are used to reduce the frequency of battery changes. It is also recommended that the batteries should be removed during international transit or for long periods without use.

The battery indicator will show the current state of the batteries. When the indicator shows empty replace the batteries.

Turning on and off

Press READ to turn the refractometer on.

Alternatively press and hold READ for 3 seconds to switch the instrument off.

The instrument will automatically turn off if no keys are pressed for 60 seconds.

Manufacturer's details

Bellingham + Stanley, a Xylem brand
Xylem, Longfield Road, Tunbridge Wells, Kent, TN2 3EY, UK.
sales.bs.uk@xylem-inc.com
www.bellinghamandstanley.com

Setting up your OPTi

Your OPTi has been delivered with "Brix" in scale position A (5.80 °). For many applications this is enough to start working straight out of the box.

When first switching on, the instrument will briefly display the scale loaded to each channel. As there is only one scale active, the initial display will be:

OPTi	>>	5.80 °
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To overwrite and/or load other scales in A, B and C, the instrument's special features menu must be accessed. Once loaded, the scale list on start-up will expand to show the active scales:

OPTi	>>	5.80 ° >>	5.6.34 >>	5.6.22
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Please note that some distributors may pre-configure your OPTi so that the scales you require are correctly installed. If so, please skip this initial process.

Special features menu

Accessing the special features menu

To access the special features menu:

1. Switch on the OPTi
2. Press and hold READ until -0FF- is displayed
3. Whilst -0FF- is still displayed, quickly release READ and press and release ZERO

Navigate through the menu and configure the instrument using the ZERO and READ keys.

- ZERO = Step through the menu
- READ = Enter a function
- ZERO = Step through the function options (if applicable)
- READ = Set the option and exit the feature

Display	Feature	Access	Actions
- 0FF -	AG Test Mode	Open	Press READ to switch on AG Test Mode The instrument will enter the AG Test Mode Switch the instrument OFF to exit the AG Test Mode
- 5.8 -	Scale A	Open or PIN	Press ZERO to step through the list and find a scale Press READ to set and return to the menu
- 5.6 -	Scale B		
- 5.6 -	Scale C		
- 5.5 -	Temperature display	Open or PIN	Press ZERO to step through °F or °C Press READ to set and return to the menu
- 0.0 -	Delay before Read/ Zero	Open or PIN	Press ZERO to step through 0 to 60 in 5-second intervals Press READ to set and return to the menu
- P in -	Set /Remove PIN protection	Open or PIN	To set your PIN: 1. Press ZERO to increment the flashing digit 2. Press READ to select the number and move to the next digit 3. Repeat to confirm 4. If correct then - 5.5 - is displayed 5. The instrument will leave the menu To remove PIN protection: 1. Enter the previously set PIN (see steps 1 and 2 above) 2. If the entered PIN is correct P.55 is displayed and the PIN is removed 3. The instrument will return to the menu
- 0.0 -	Version	Open	View software version and serial number
- 0.0 -	Save/Exit	Open	Save settings and leave the menu

Certificate of verification

This instrument has been calibrated and checked for precision at 20°C.

Analytical Grade Water¹ and AG Calibration Fluids² were employed to check the accuracy of the instrument for the primary scales. All other scales are assumed as correct as their results are calculated empirically from these values.

Sample Type	Certified Value (Brix/RI)	Acceptance Limits
Analytical Grade Water	0.00 / 1.33299	±0.2 Brix / ±0.0003 RI
AG30 Fluid	30.00 / 1.38115	
AG50 Fluid	50.00 / 1.42009	

All materials used to verify the performance of this OPTi refractometer were calibrated by Bellingham & Stanley Ltd., UKAS accredited calibration laboratory no. 0834, accredited to ISO/IEC 17025:2017.

1. Refractive index values for Water are obtained from "Revised Formulation for the Refractive Index of Water and Steam as a Function of Wavelength, Temperature and Density", adopted by the International Association for the Properties of Water and Steam (IAPWS) and available as part of NIST Standard Reference Database 10. Refractive indices calculated from the formulation are absolute refractive indices; conversion to refractive index against air requires division by the respective absolute refractive index of air (NIST Engineering Metrology Toolbox).

2. AG calibration fluids are prepared by mixing water with a soluble chemical of higher refractive index. The Brix value of the fluid is determined using a high accuracy digital refractometer at 20.0°C, which has been calibrated with a NIST traceable sucrose calibration standard of Brix value equal to the target value for the AG fluid according to a Laboratory Procedure

QL-103. The AG fluid composition is finely adjusted to give a measured value to within ± 0.01 Brix (± 0.00002 RI) at 20.0°C.

Scale list

Index	Application	Scale	Units	Range
01	Primary	°Brix (ATC)		0-95
02	Primary	°Brix (no TC)		0-95
03	Primary	Refractive Index (ATC)		1.33-1.53
04	Primary	Refractive Index (no TC)		1.33-1.53
05	Automotive	AdBlue®/DEF (NOx reduction)	% Weight / Weight	0-40
06	Automotive	Ethylene Glycol	°C Freezing Point	0 to -50
07	Automotive	Ethylene Glycol	°F Freezing Point	30 to -40
08	Automotive	Propylene Glycol	°C Freezing Point	0 to -50
09	Automotive	Propylene Glycol	°F Freezing Point	30 to -40
10	Food & Beverage	°Butyro		0-100
11	Food & Beverage	Fructose	% Weight / Weight	0-85
12	Food & Beverage	Glucose	% Weight / Weight	0-85
13	Food & Beverage	42 HFCS (High Fructose Corn Syrup)	% Weight / Weight	0-95
14	Food & Beverage	55 HFCS (High Fructose Corn Syrup)	% Weight / Weight	0-95
15	Food & Beverage	90 HFCS (High Fructose Corn Syrup)	% Weight / Weight	0-95
16	Food & Beverage	Invert Sugar	% Weight / Weight	0-85
17	Food & Beverage	Maltose	% Weight / Weight	0-60
18	Food & Beverage	Salinity (NaCl)	% Weight / Volume	0-28
19	Food & Beverage	Total Solids of Waste Milk	%	5-15
20	Food & Beverage	Water in Honey	% Weight / Weight	10-30
21	Industrial	Arbitrary		0-95
22	Industrial	Calcium Chloride	% Weight / Weight	0-40
23	Industrial	Ethanol	% Volume / Volume	0-20
24	Industrial	Ethylene Glycol	% Volume / Volume	0-60
25	Industrial	Ethylene Glycol	% Weight / Weight	0-60
26	Industrial	FSII DiEGME (ASTM D 5006)	% Volume / Volume	0.0-0.25
27	Industrial	Hydrogen Peroxide	% Weight / Weight	0-50
28	Industrial	Methanol	% Weight / Weight	0-40
29	Industrial	Propylene Glycol	% Volume / Volume	0-60
30	Industrial	Sodium Sulphate	% Weight / Weight	0-22
31	Industrial	Starch	%	0-30
32	Industrial	Sulphuric Acid (Battery Acid)	Specific Gravity (d20/20)	1.000-1.501
33	Industrial	Urea (CRC data)	% Weight / Weight	0-40
34	Life Science	Colostrum Quality		Poor / PASS
35	Life Science	Seawater (Practical Salt Units)	Part Per Thousand	0-180
36	Life Science	Seawater (Practical Salt Units)	Specific Gravity (d20/20)	1.000-1.090
37	Life Science	Serum Protein	g/100ml	0-30
38	Life Science	Urine (SG) Human ³	Specific Gravity (d20/20)	1.000-1.050
39	Life Science	Urine (SG) Large Mammal	Specific Gravity (d20/20)	1.000-1.050
40	Life Science	Urine (SG) Small Mammal	Specific Gravity (d20/20)	1.000-1.050
41	Wine & Beer	°Baumé		0-50
42	Wine & Beer	°Zeiss (ABV)	% Volume / Volume	10-135
43	Wine & Beer	Alcohol Probable (AP)		0-22
44	Wine & Beer	KMW (Babo)		0-25
45	Wine & Beer	Oechsle (German)		30-130
46	Wine & Beer	Oechsle (Swiss)		0-130
47	Wine & Beer	°Plato		0-30
48	Wine & Beer	Mass Sugar (°Brix) (ATC)	% Weight / Weight	0-95
49	Wine & Beer	Mass Sugar (°Brix) (no TC)	% Weight / Weight	0-95
50	Wine & Beer	Wort (Sucrose Equivalent)	Specific Gravity (d20/20)	1.000-1.120

3. For first line medical assessment and sporting performance use only. Not for IVD.
AdBlue® is a registered trademark of the VDA Verband der Automobilindustrie e.V.

User operation

Taking a reading

Before taking a reading clean the prism surface thoroughly using a suitable solvent, eg water or methyl alcohol depending on the sample being measured.

1. Fill the prism dish
2. Press READ (the display will clear)
3. A few seconds later the reading will be displayed

After a measurement has been taken the sample should be removed and the prism cleaned

Changing the measurement scale (A > B > C)

The refractometer has three measurement scales. The selected scale will be indicated by an arrow on the display. To change the scale:

1. Press and HOLD the ZERO key
2. Within 3 seconds PRESS and RELEASE the READ key to toggle to the next scale



Changing scale requires the ZERO key to be held. Holding the ZERO key for longer than specified will cause a zero calibration to be performed.

Verify performance

The refractometer has a number of special features that allow the user to configure and verify the way the instrument operates.

Verifying the instrument using a sucrose solution

The measurement performance of the refractometer may be verified using a sucrose solution (weight/weight) of known concentration using the Brix scale with ATC (Scale 01):

1. Perform a zero calibration
2. Fill the prism dish with the sample
3. Allow sufficient time for temperature stabilisation (typically 10 seconds)
4. Press READ
5. The refractometer may be considered to be performing correctly if the reading is equal to the concentration of the sucrose solution ± 0.2 °Brix (or equivalent for non-Brix scales)

NOTE: If the instrument is found to be out of specification, repeat the test and if necessary contact the manufacturer for further advice.

Zero calibration

The zero calibration is essential to ensure accurate readings. A zero calibration should be carried out daily.

Use distilled water if possible. Should tap water be used please be aware that subsequent measurement accuracy may vary depending upon the purity of the tap water.

1. Clean and dry the prism
2. Fill the sample dish with water
3. Allow sufficient time for temperature stabilisation (typically 10 seconds)
4. Press and HOLD the ZERO key for 4 seconds
5. The display will show "000" as the calibration starts
6. When complete the display will show "000"



Remember to hold the ZERO key for 4 seconds when calibrating with water.

Displaying the temperature

The refractometer can display the temperature of the last reading:

1. Quickly press & RELEASE the ZERO key
2. The temperature will be displayed in the configured unit

NOTE: If a reading has not been taken the display will show "-.-.°C" (or °F if selected)

Verifying the instrument using the "AG Test Mode"

As an alternative to using a sucrose based solution of limited shelf life, the refractometer may be verified using a convenient "long-life" AG Fluid. However, as the AG Fluid is not sucrose based, it cannot be corrected for temperature using ICUMSA (sucrose) compensation, so the refractometer incorporates a special "Test Mode" to facilitate the use of the AG Fluids as follows:

1. Perform a zero calibration
2. Access the Special Features menu
3. Press the READ key ("°RFL" flashes)
4. Fill the prism dish with the AG Fluid
5. Allow sufficient time for temperature stabilisation (typically 10 seconds)
6. Press READ (the instrument will alternate between the result and "°RFL" to indicate that it is in the AG Test Mode)
7. The refractometer may be considered to be performing correctly if the reading is equal to the concentration of the AG Fluid ± 0.2 °Brix
8. Turn OFF the instrument to EXIT the Test Mode

Additional information

For calculation of ABV of finished wine, beer and cider using a refractometer and hydrometer, please use our ABV Calculator:



www.bellinghamandstanley.com/en/customer-support/calculators



This symbol is an internationally agreed indicator that the product bearing it should not be disposed of as general waste or garbage which might end up in landfill sites, but should instead be sent for special processing and/or recycling in those countries where appropriate legislation and facilities are in place.



This symbol indicates a caution or warning, please refer to the manual.



Instructions / Mode d'emploi / Anleitung /
Instrucciones / Istruzione:

www.bellinghamandstanley.com/en/home/OPTi-UG

Error messages

In order to achieve the maximum performance from the refractometer, it is essential that care is taken when cleaning the instrument and applying sample to the prism. Sample concentration may vary considerably from the surface to the centre of a mass whether in a beaker or on a spoon or spatula. Evaporation will cause the reading to drift unless care is taken.

H i	Lo	Measured sample out of range Sample either too low or high or of insufficient volume
LL	LH	Temperature too low or high.
  		Battery condition (too low / OK / good)
12.3 (flashes)		Insufficient sample volume or high ambient light
- HAL -		High Ambient Light - cover prism or move away from bright source
-.- C/F		No recorded temperature
- AGT - / 40.1 (alternates)		AG Test Mode is active
FAIL		Confirmation of PIN did not match original during set up
NONE		Invalid PIN entered

General specification

Prism and dish

Dish material	316 stainless steel
Prism seal	Silicone rubber
Prism material	Optical glass
Sample surface	8 mm diameter

Housing

Material	Acrylonitrile Butadiene Styrene
IP rating	IP65 water resistant
Relative humidity	95% RH

Measurement accuracy

Brix / Refractive Index	±0.2 / ±0.0003
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Physical

Length	115 mm
Width	54 mm
Height	30 mm
Weight	85g (without batteries fitted)

Temperature

Storage	-10 to 60°C
Operating	5 to 40°C
Brix measurement	5 to 60°C
Other scale measurement	5 to 40°C

Automatic temperature compensation

Automatic temperature compensation will correct readings of water and sucrose solutions to 20°C. It conforms to the published ICUMSA 1978 correction tables which covers the ranges 10 to 40°C and 0 to 80° Brix and has been extended to cover 5 to 70°C by using additional data. Although the correction is specifically applicable to pure sucrose solutions, it is also valid for many sugar based food products. Application (scale) specific temperature compensation has been applied to non-sugar related scales using published or experimental data as appropriate.

Declaration of conformity

According to ISO/IEC 17050-1 & 2 : 2004 Bellingham + Stanley declares that the OPTi Digital Handheld Refractometer (all models) conforms to the following technical requirements:

EMC	Emissions	
	EN 61326-1:2006 & 2013	CISPR 11:2003, Class B
	AS/NZS CISPR 11	CISPR 11:2003, Class B
	FCC/CFR 47:Part 15	ANSI C63.4:2003, Class B
	Canadian Standard ICES-003:Issue 4	CISPR 22:1997 inc A2:2003
	Immunity	
	EN 61326-1:2006 & 2013	IEC 61000-4-2:1995 inc A2:2001
	EN 61326-1:2006 & 2013	IEC 61000-4-3:2002 & 2006
Supplementary	The product herewith complies with the requirements of the EMC Directive 2014/30/EU	

Warranty and customer care

This refractometer is warranted for 12 months after the date of purchase against any manufacturer defect in materials or workmanship. As this refractometer is a precision optical instrument, care must be taken to ensure correct storage, handling and use of the instrument. Failure to do so could invalidate the instrument's warranty.