

## Abbemat Series

# The Universal Refractometer



## Choose One ...

Anton Paar's range of Abbemat refractometers embody over forty years of technical expertise. They are built with care and precision using the highest quality materials. Abbemat refractometers measure the refractive index and concentration of liquids, gels and solids.

These truly universal refractometers cover a broad range of applications in all industries. Depending on the accuracy, temperature range and level of automation you require, a model is available to suit your application and your budget. An Abbemat is a secure investment for the future, providing reliable and accurate results for years to come.

## ... Measure Everything

Each Abbemat model can be used for a wide range of applications in all industries and fields of research. Dedicated industry solutions are not required.

# UNIVERSAL REFRACTOMETER SERIES

### Economy line

"Economic routine analysis."

#### Abbemat 200

Offering all essential features and intuitive handling, this out-of-the-box refractometer is ideal for small laboratories that require straightforward measurements without any complex data processing.



### Performance Plus line

"Ready for any job today and fit for tomorrow."

#### Abbemat 350, Abbemat 550

The versatile, high-end Abbemat 350/550 refractometers of the Performance Plus line are designed for research and development as well as demanding quality control applications. They can be operated with a peristaltic pump or sample changer to simplify filling and are easily expanded by a wide range of accessories. The large and intuitive touchscreen display simplifies navigation.



### Performance line

"Measures, measures, measures."

#### Abbemat 300, Abbemat 500

The robust and easy-to-operate Abbemat 300/500 refractometers of the Performance line are ideal solutions for routine analysis and quality control. The display gives a clear pass/fail result for analysis of large numbers of samples when time is short.



### Heavy Duty line

"Measure when others fail."

#### Abbemat 450, Abbemat 650

The Abbemat 450/650 refractometers are extremely robust and the measuring unit is waterproof (IP68). To measure samples containing solid particles or air bubbles you can position the Heavy Duty Abbemat on its side to prevent sedimentation and bubbles from affecting the results.



#### Abbemat MW

The Abbemat MW is the multi-wavelength refractometer for determining refractive dispersion and Abbe number determinations.

#### Abbemat HT

The Abbemat High Temperature (HT) model offers temperature control up to 110 °C.











# Abbemat Refractometers Measure Everything

The Abbemat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications.

## A short overview of Abbemat applications

	Application	Example method	Measuring range
	Concentration measurement of binary solutions, e.g. acids, bases and salts	<ul style="list-style-type: none"><li>Percentage by mass of sodium hydroxide in water solutions, e.g. in paper production.</li></ul>	0 %mas to 50 %mas
	Refractive index measurement according to international pharmacopoeias e.g. EUP, USP, JP	<ul style="list-style-type: none"><li>According to the US Pharmacopeia, the refractive index of e.g. dexpantenol needs to be between 1.495 and 1.502 at 20 °C and 589 nm.</li></ul>	1.26 n <sub>D</sub> <sup>20</sup> to 1.72 n <sub>D</sub> <sup>20</sup>
	Dry substance of sugar beet and sugar cane	<ul style="list-style-type: none"><li>Sucrose concentration measurement of high-purity sucrose solutions in compliance with ICUMSA standards.</li></ul>	0 °Brix to 100 °Brix
	Ensuring specified shelf-life for jams, jellies, honey and fruit juices by determining total solids or moisture content	<ul style="list-style-type: none"><li>In a finished product, soluble solids at 20 °C should be e.g. 65 °Brix for jams and jellies.</li><li>Moisture content in honey according to the Codex Alimentarius.</li></ul>	0 °Brix to 100 °Brix 13 %mas to 25 %mas
	Quality control, total solids and potential alcohol in beverage production	<ul style="list-style-type: none"><li>Total solids in beverages such as coffee and fruit juices.</li><li>Oechsle scale for determining the potential alcohol content.</li></ul>	0 °Brix to 100 °Brix 6 °Oe to 216 °Oe

Application	Example method	Measuring range	
Quality control of flavors and fragrances	<ul style="list-style-type: none"><li>According to the US Pharmacopeia, the refractive index of orange oil at 20 °C and 589.3 nm needs to be between 1.472 and 1.474.</li></ul>	1.26 n <sub>D</sub> <sup>20</sup> to 1.72 n <sub>D</sub> <sup>20</sup>	
Concentration and freezing point of antifreeze agents	<ul style="list-style-type: none"><li>Fuel system icing inhibitors in aviation fuels according to ASTM D5006.</li><li>Freezing point of antifreeze propylene/ethylene glycol.</li></ul>	0 %vol to 100 %vol -51 °C to +2 °C -50 °C to 0 °C	
Quality control of glasses and polymers	<ul style="list-style-type: none"><li>Refractive index, dispersion and anisotropy of glasses and polymers with or without contact liquid, according to ASTM D 542.</li><li>Abbe numbers of glass or contact lenses.</li></ul>	1.26 nD up to 1.72 nD  Depending on Abbe number	
Quality control of petroleum products e.g. viscous oils, fuels and hydrocarbon liquids	<ul style="list-style-type: none"><li>Refractive index of light-colored waxes and lube oils according to ASTM D1747.</li><li>Determination of true urea concentration in diesel exhaust fluid (DEF) according to ISO 22241.</li></ul>	1.26 nD up to 1.72 nD  30 %mas to 35 %mas	
Quality control of raw material for cosmetics	<ul style="list-style-type: none"><li>Refractive index or butyro value of cacao butter according to AOAC 920.78.</li></ul>	0 to 100 1.26 nD up to 1.72 nD	
Quality control of food oils	<ul style="list-style-type: none"><li>Butyro reading of frying oil in compliance with ISO and AOAC standards.</li><li>Iodine number of butter.</li></ul>	0 to 100  10 IN to 71 IN	
Quick determination of vital human urine parameters	<ul style="list-style-type: none"><li>Urine specific gravity</li><li>Urine total solids</li></ul>	1.000 to 1.039 0 %mas to 9.9 %mas	
Quality control of milk products	<ul style="list-style-type: none"><li>Refractometric determination of total solids in milk and sweetened condensed milk.</li></ul>	Depending on the sample	



# Abbemat Refractometers

## Features and Benefits

### Software with benefits

Configure, export and import methods. Create your own data reports and enrich them with a company logo and address. Benefit from menu-guided setup for calibration and adjustment.

### High level of flexibility

You benefit from easy configuration of single/multiple measurements, multi-fill, temperature and time scans.

### Communication unlimited

The Abbemat refractometers communicate with LIMS and other instruments via CAN bus, USB and RS232 interfaces. Abbemat 350/450/550/650 also provides ethernet interfaces. The Abbemat refractometers can be used with an external PC, printer, bar code reader, keyboard or mouse.

### Fit for the pharmaceutical industry

The Abbemat software fully supports the requirements of the pharmaceutical industry, including GMP, 21 CFR Part 11, GAMP 5, USP<1058> and international pharmacopoeia (e.g. Ph. Eur., JP).

### Fast and accurate temperature control

The temperature is the biggest influencing factor on the refractive index. To ensure accurate results, the built-in Peltier temperature control adjusts the temperature at the prism/sample interface at an unmatched accuracy within seconds.

### Designed for maximum accuracy

The optical bench is hermetically sealed and temperature stabilized to protect it from outside influences such as condensation in tropical conditions. Before sealing, the measuring wavelength is tuned to a bandwidth of  $\pm 0.2$  nm to ensure correct results for samples with different dispersions.

### Optimal sample well design

The sample well is smooth and easy to clean. The shape of the measuring area ensures minimum evaporation of sample and prevents samples with low surface tension from flowing apart. To drain liquids spilled during filling, there is a spill lip and a drip plate fixed with a magnet which can be easily removed for cleaning.

### Intelligent checks

Abbemat refractometers warn you if the sample volume is too small or the prism needs extra cleaning. They also check the measuring results and adjustments for stability and plausibility.

### Operating convenience

The built-in color LCD screen and membrane keys are resistant to spillage and dirt and can even be operated when wearing gloves. For easy access, the USB ports are positioned on the side of the refractometer.

### Durability for a long life

Apart from the fan, there are no moving parts in the refractometer and therefore no wear. The LED light source guarantees 100 000 hours of operation. The measuring prism is almost as hard as a diamond and therefore virtually indestructible. Both the prism and the surrounding sample well are resistant to aggressive chemicals.

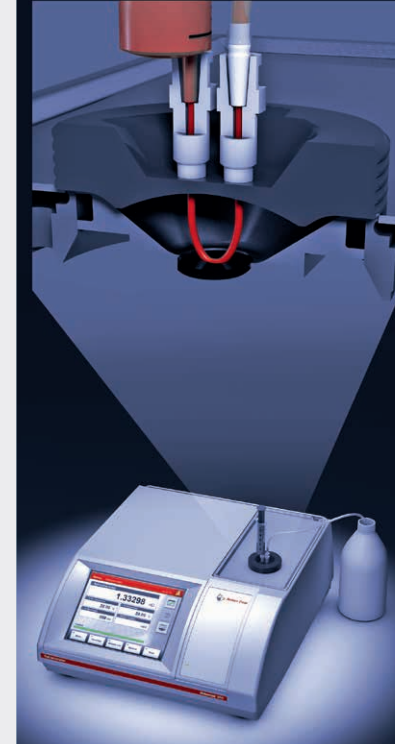
### On-site temperature calibration and adjustment

The Abbemat T-Check calibrates and adjusts the surface temperature of the measuring prism for precise and fully traceable results.





# Simplify Your Work

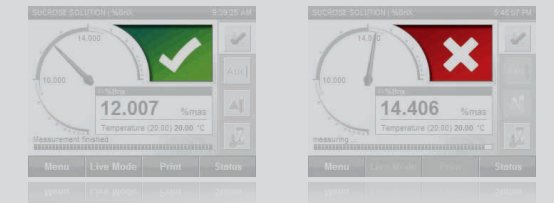


## Small sample volumes

Micro flow cells require only a small sample volume. They are filled manually using a syringe. After measurement, the sample can easily be recovered.

## Quality control results at a glance

The limit check in the quality control mode clearly shows whether the result is "OK" or "not OK". The Performance line refractometers also give the position of the result on an easy-to-read dial compared to limits you define.



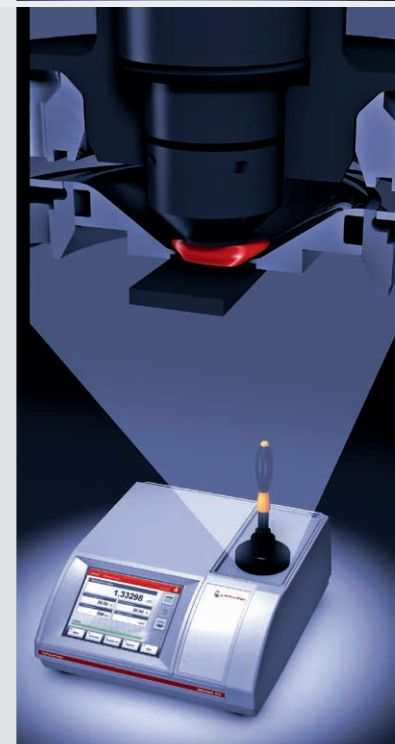
## Samples containing particles or pulp

The vertical setup of the Abbemat Juice Station avoids sedimentation of particles like pulp on the measuring prism and ensures reliable and stable measuring results.

Abbemat Juice Station is available based on an Abbemat 200, 300 or 550.

## More than refractive index

To measure density, optical rotation, viscosity or pH value alongside refractive index and concentration, the Abbemat refractometers can be connected to other Anton Paar instruments – at the time of purchase or in the future. This saves time and sample and gives you all results in one report.

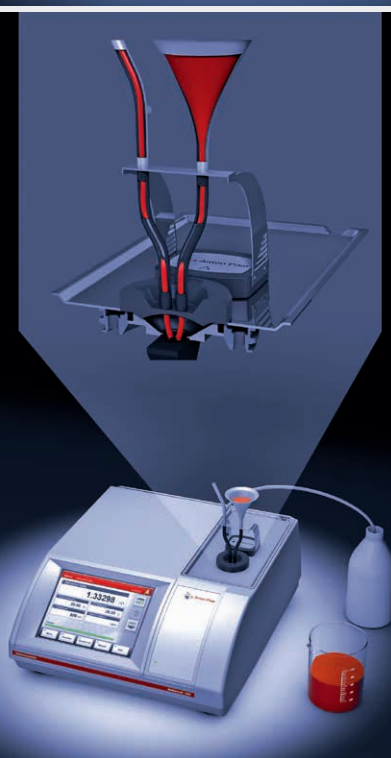
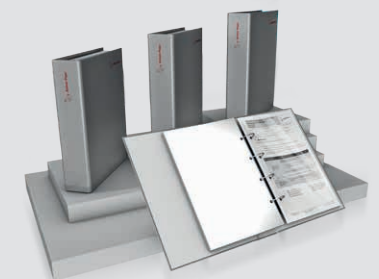


## Measure foils or solids

Use the sample presser to press foils, films or solids onto the measuring prism to ensure optimal contact between the two surfaces.

## Assistance with qualification and validation

The Abbemat software fully supports the requirements of the pharmaceutical industry, including GMP, 21 CFR Part 11, GAMP 5, USP<1058> and international pharmacopoeia (e.g. Ph. Eur., JP). To minimize the time it takes to integrate your new Abbemat into your workflow, Anton Paar offers a Pharma Qualification and Validation Package.

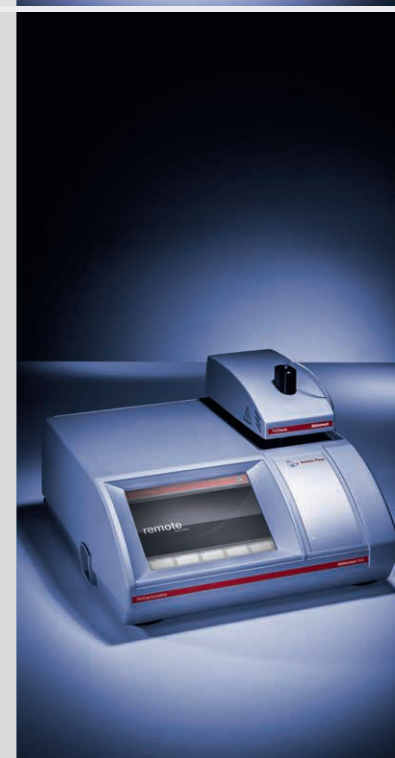
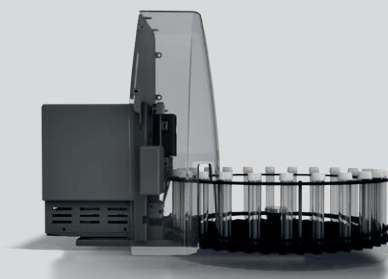


## Fast quality control for routine analysis

The flow cell with filling funnel is the right choice for measuring a large number of samples quickly in routine quality control when there is enough sample available. To fill this flow cell you just pour one sample after the other into the filling funnel. The new sample flushes the previous sample out.

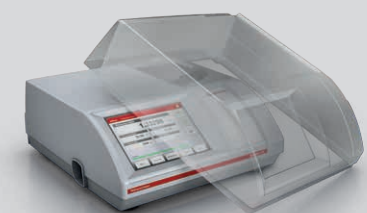
## Automated filling and measurement

With the Performance Plus line refractometers you can automate sample filling and measurement of up to 96 samples with an Xsample 122 sample changer or use, for instance, an optional built-in peristaltic pump to fill the measuring cell with your sample.



## On-site temperature calibration and adjustment

With the Abbemat T-Check you can precisely calibrate and adjust the temperature sensor of your Abbemat to ensure accurate refractive index measurements. To ensure full traceability, the temperature adjustments are automatically documented in the Audit Trail of the Abbemat.



## Withstanding dirt and spills

The protection cover shields the housing from damage and dirt, extending the working life of the refractometer.



## Learn more

Enjoy the tour of the world of Abbemat on your tablet PC.

Check for the Abbemat refractometer app in the App or Play Store.

Abbemat Features

	Abbemat 200	Abbemat 300/500	Abbemat 350/550	Abbemat 450/650	Abbemat HT/MW
	Economy	Performance	Performance Plus	Heavy Duty	Heavy Duty
Accessories and hardware					
Display	3.5", 320 x 240 Px	3.5", 320 x 240 Px	6.5", 640 x 480 Px	5.7", 640 x 480 Px	● <sup>1)</sup>
Keyboard	membrane	membrane	touchscreen	touchscreen	● <sup>1)</sup>
Suitable for Modulyzer	○	●	●	●	○
Vertical operation with flow cells	○	○	○	●	●
Data interfaces					
RS232 port	printer	printer/LIMS	printer/LIMS	printer/LIMS	printer/LIMS <sup>1)</sup>
CAN bus connection	○	slave	master/slave	master/slave	slave <sup>2)</sup>
3 USB ports	●	●	●	●	●
Ethernet connector	○	○	●	●	●
VGA connector	○	○	●	●	●
Software features					
Predefined methods	●	●	●	●	●
User-definable methods	○	●	●	●	●
Customer calculations	○	●	●	●	●
PC software (option)	○	●	●	●	● <sup>3)</sup>
Data export	MS Excel	MS Excel/PDF	MS Excel/PDF/text	MS Excel/PDF/text	MS Excel/PDF
Automatic sample name generation	○	●	●	●	●
User-definable sample name fields	○	●	●	●	●
Sample statistics (e.g. mean value)	○	○	●	●	○
Backup and restoration of instrument settings	○	●	●	●	○
Manual downloadable from device	○	○	●	●	○
Data recording on internal memory	300 data sets	300 data sets	1000 data sets	1000 data sets	unlimited <sup>1)</sup>
Scale calculator	○	○	●	●	○
User-selectable display layout	○	●	●	●	●
User-configurable display and result output	○	○	●	●	○
Quality control mode with limit checks	○	●	●	●	○
Automatic temperature correction	●	●	●	●	●
Several measuring modes (standard, check, multiple measurement, multi-fill, temperature scan, time scan)	○	○	●	●	○
Quality and security					
Advanced user level management	○	●	●	●	●
Password rules, audit trail, electronic signature	○	●	●	●	●
Adjustment and checks history	○	●	●	●	●
Definition of check intervals	○	●	●	●	○
Check for stability of measured data	●	●	●	●	●
User-definable checks	○	○	●	●	○
Compliance					
21 CFR Part 11, GXP compliant	○	●	●	●	●
Disabling of data memory	○	○	●	●	○
AOAC, ASTM, CID, DIN, FDA, ICUMSA, ISI, JIS, OIML, SSDT methods	●	●	●	●	●
Pharma Qualification Package	●	●	●	●	●

Specifications

	Abbemat 200	Abbemat 300	Abbemat 500	Abbemat HT	Abbemat MW
	Abbemat 200 Juice Station	Abbemat 300 Juice Station	Abbemat 550 Juice Station	High Temperature	Multiple Wavelengths
		Abbemat 350 Abbemat 450	Abbemat 650		
Measuring ranges					
Refractive Index (RI)					
Range n <sub>D</sub>	1.30 to 1.72	1.26 to 1.72	1.26 to 1.72	1.30 to 1.72	1.30 to 1.72
Resolution n <sub>D</sub>	± 0.0001	± 0.00001	± 0.000001	± 0.000001	± 0.000001
Accuracy n <sub>D</sub> <sup>1)</sup>	± 0.0001	± 0.0001	± 0.00002	± 0.00004	± 0.00004
Measuring principle	Critical angle of total reflection measurement by shadowline detection with CCD array				
Brix					
Range	0 to 100 %	0 to 100 %	0 to 100 %	0 to 100 %	0 to 100 %
Resolution	0.01 %	0.01 %	0.001 %	0.001 %	0.001 %
Accuracy <sup>1)</sup>	0.05 %	0.05 %	0.015 %	0.03 %	0.03 %
Sample/prism temperature control by built-in solid state thermostat (Peltier)					
Temperature range	10 °C to 60 °C	4 °C <sup>2)</sup> to 85 °C	4 °C <sup>2)</sup> to 85 °C	10 °C to 110 °C	10 °C to 70 °C
Temperature probe accuracy <sup>1)</sup>	± 0.05 °C	± 0.05 °C	± 0.03 °C	± 0.03 °C	± 0.03 °C
Temperature probe stability <sup>1)</sup>	± 0.002 °C	± 0.002 °C	± 0.002 °C	± 0.002 °C	± 0.002 °C
Materials in contact with samples					
Prism	Synthetic sapphire			YAG (Yttrium-Aluminum-Garnet)	
Sample well	Stainless steel, optionally Ni alloy				
Seal	FFKM (perfluoroelastomer)				
Components					
Light source	LED light source, average lifetime > 100 000 h				
Wavelength	589 nm (by wavelength-adjusted interference filter)				Up to 8 in the range of 436 nm to 656 nm <sup>3)</sup>
Power requirements	100-240 VAC +/-10 %, 50/60 Hz, min. 10 W, max. 100 W, depending on sample temperature setting and ambient temperature				
Dimensions					
W x H x D [mm]	300 x 145 x 330			195 x 145 x 245	
	Abbemat 450/650:	Control unit: 220 x 100 x 295 Measuring unit: 200 x 135 x 200			
Weight [kg]	6.5			6	
	Abbemat 450/650:	Control unit: 2.4 Measuring unit: 6.1			
Further specifications					
Max. allowed pressure in flow cell	10 bar			pressureless	
Protection class	n.a.	Measuring unit Abbemat 450/650: IP68			n.a.

<sup>1)</sup> depending on the connected PC hardware/software | <sup>2)</sup> with optional legacy device adapter | <sup>3)</sup> required for operation

<sup>1)</sup> valid at refractometric standard conditions (T= 20 °C, λ = 589 nm, ambient temperature = 23 °C)

<sup>2)</sup> at max. ambient temperature of 30 °C

<sup>3)</sup> 589.3 nm Na-D; 435.8 nm Hg-g; 480.0 nm Cd-F; 486.1 nm H-F; 488.0 nm Ar/Ion; 514.5 nm Ar/Ion; 532.0 nm Nd/Yag; 546.1 nm Hg-e; 632.8 nm He/Ne; 643.8 nm Cd-C; 656.3 nm H-F, others on request

