Anton Paar

Abbemat

Universal Refractometer Series

::: Superior Optical Instruments

Choose One ...

Abbemat 200

Economy

Abbemat 300

Abbemat 500

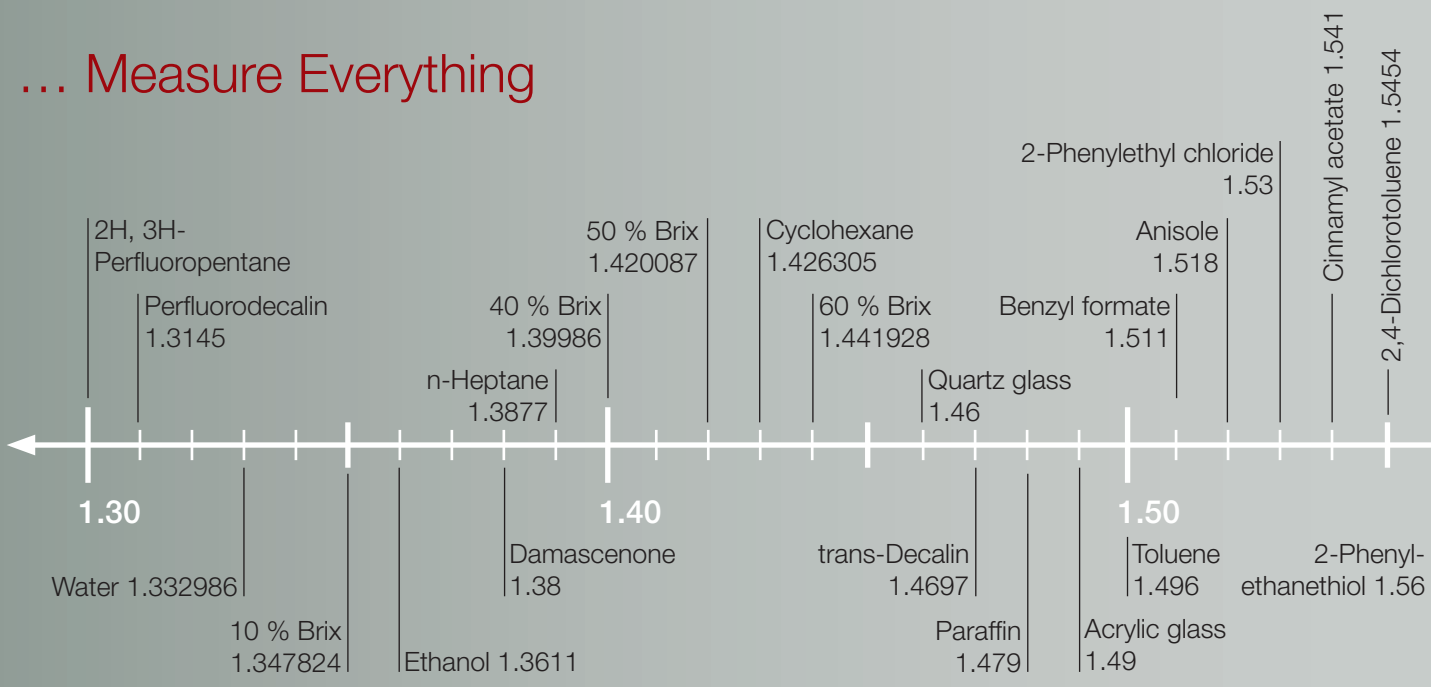
Performance

Abbemat 350

Perfor

Anton Paar's range of Abbemat refractometers embody over forty years of technical expertise. They measure the refractive index and concentration of liquids, gels and solids. These truly universal refractometers cover all applications in all industries. Abbemat refractometers are built with care and precision using the highest quality materials. An Abbemat is a secure investment for the future, providing reliable and accurate results for years to come.

… Measure Everything



Abbemat 550

mance Plus

Abbemat WR

Abbemat HT

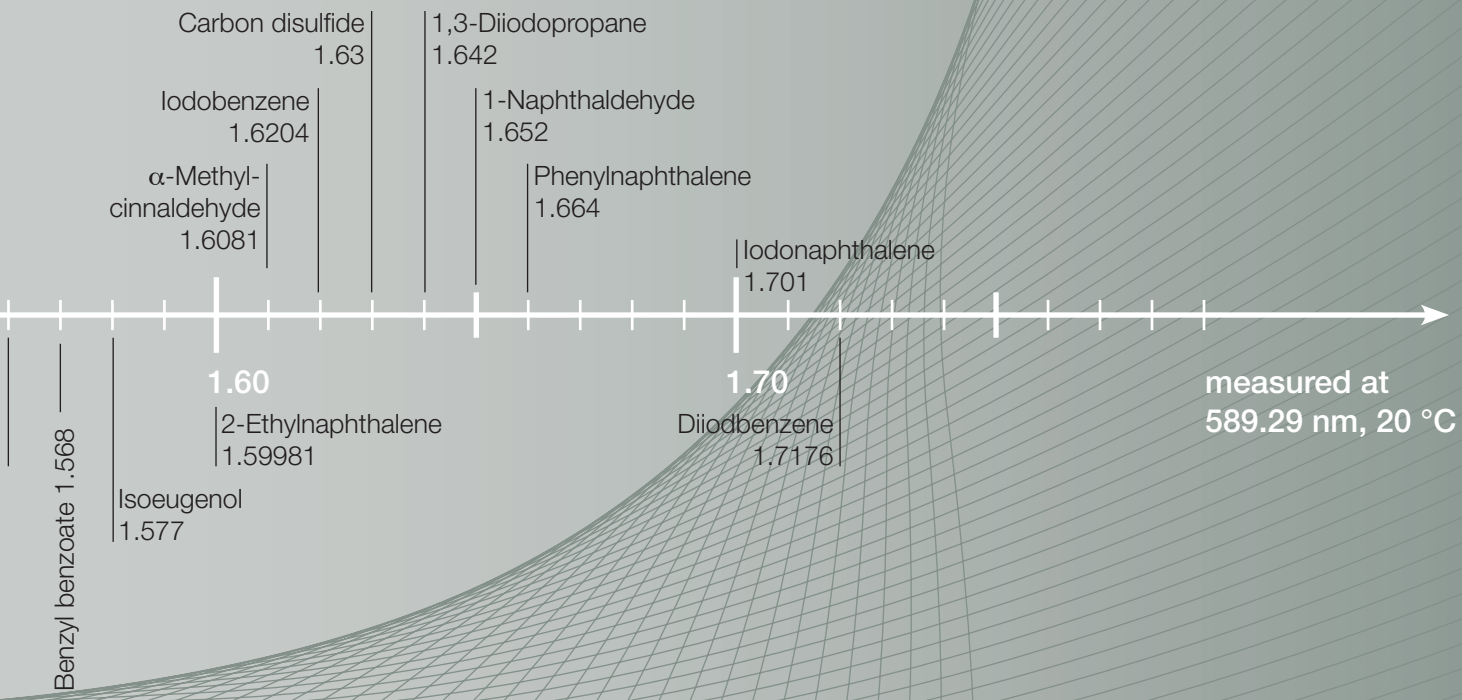
Abbemat HP

Abbemat MW

Heavy Duty

For all applications

Anton Paar refractometers differ only in their accuracy and options. Each model can be used for a wide range of applications in all industries and fields of research. Dedicated industry solutions are no longer required.



Abbemat Refractometers Measure Everything

The Abbemat refractometers are suitable for all industries, from pharmaceuticals, chemicals, flavors and fragrances to beverages and food. Depending on the accuracy, temperature range and level of automation you require, a model is available to suit your application and your budget.

➤ Pharmaceuticals

In pharmaceutical production, traceability and documentation are important requirements. The Abbemat Performance line, Performance Plus line and Heavy Duty line refractometers fully support the requirements of 21 CFR part 11, with user levels, electronic signature and audit trail. Anton Paar offers a qualification and validation package and assists during the process to ensure that your Abbemat is put into operation as quickly as possible.

➤ Beverages, juices and sirups

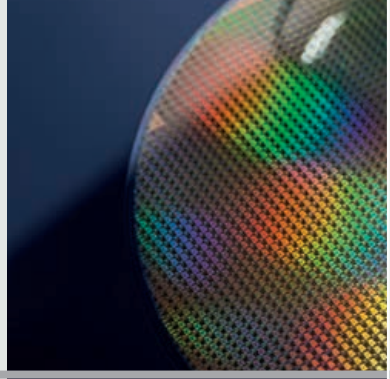
To monitor the quality of fruit juices, the concentration is measured using a refractometer. The Abbemat provides accurate data even when the juice contains fruit pulp or other particles.

➤ Sugar production

To optimize the yield in sugar production requires monitoring of Pol (°Z), %Brix (RDS) and Apparent Purity. For this task Anton Paar provides the Abbemat refractometer and MCP Sucromat saccharimeter combined in one measuring system.

➤ Flavors & fragrances

To determine the purity of valuable essential oils and ensure the consistent quality of perfumes, Abbemat refractometers in combination with Anton Paar's density meters and polarimeters are used in perfume production.

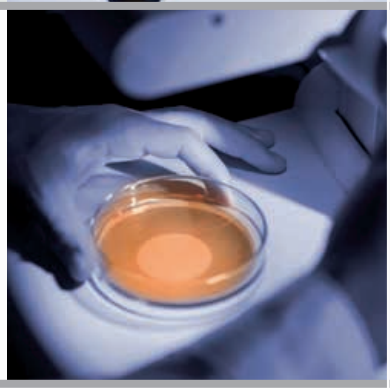


Academic research into nanoparticles

The size distribution of nanoparticles is determined by laser diffraction measurements analyzed by inverse scattering theory – a method which requires the refractive index value at the used laser wavelengths. Abbemat MW refractometers are used to determine these refractive index values.

Chemical production

Safety first: To check the concentration of aggressive chemicals, you can operate the Abbemat Heavy Duty line refractometers from a remote position and monitor the measurement from a safe distance.



Official anti-doping testing labs

To test large numbers of athletes for illegal doping on-site at international competitions such as the Olympics and World Championships requires instruments which give reliable and fast data. Abbemat refractometers analyze blood and urine and clearly show whether the sample has passed or failed according to the limits defined.

Food

To control the caramel production process, you need to check the sugar content at high temperatures. The Abbemat HT is a reliable and fast tool for analyzing this sticky sugar mass at temperatures up to 110 °C.

Petroleum products

To determine how well transformer oil circulates, the viscosity and refractive index are measured using an Abbemat refractometer combined with the Stabinger Viscometer from Anton Paar. This combined measurement gives insight into the flow properties of the transformer oil which can be optimized to ensure the economical operation of power transformers.

Medical

To check the optical properties of synthetic eye lenses for the treatment of cataracts patients, Abbemat MW with up to 8 wavelengths is used.

Abbemat Refractometers Make Work Easy

Fast filling and measurement

For measurement the sample is simply placed onto the prism using a pipette. For even more convenient manual filling, choose from a wide range of flow cells ranging from micro flow cells to cells with a filling funnel.

The built-in powerful Peltier temperature control provides fast heating and cooling rates which result in stable readings within seconds.

Optimal sample well design

The measuring prism is made of material that is almost as hard as a diamond and therefore virtually indestructible. Both the prism and the surounding stainless steel sample well are resitant to agressive chemicals.

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. The temperature sensor close to the sample/prism interface provides accurate temperature control.

Intelligent checks

Abbemat refractometers warn you if the sample volume is not large enough for a valid measurement or the prism needs extra cleaning.

The Abbemat also checks measuring results for stability and adjustments for plausibility.

Ideal for lab conditions

The Abbemat refractometers are built for life in the lab. The built-in color LCD screen and membrane keys are resistant to spillage and dirt. You can even operate the refractometer when wearing gloves or control the Abbemat via an external PC with the Abbemat PC software. 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. For easy access, the USB connectors are positioned on the side of the refractometer.

Integrated

To make the refractometer part of your workflow, the Abbemat refractometers enable communication with LIMS and other instruments via CAN-bus, USB and RS232 interfaces. Abbemat 350/550 also provides ethernet interfaces. The Abbemat refractometers can be used with an external PC, printer, bar code reader and keyboard.

Quality control mode

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.

Software which supports you

The integrated software is easy to use with intuitive method management, configurable methods and menu-guided setup for calibration and adjustment.

You configure your own reports and define which data you want to export or print. To support your corporate identity you can add your company logo and header to the reports.

To ensure that the individual settings you make are never lost after an update they can be saved on a USB memory stick and restored to the instrument afterwards.

Temperature scans

You can measure one sample several times at different temperatures by defining a temperature scan, e.g. from 10 °C to 85 °C in 5° steps.

Virtually maintenance-free

The LED light source gives you 100 000 hours of operation and is virtually maintenance-free. There are no moving parts in the refractometer and therefore no wear.

Choose One, Measure Everything

Fast results at the accuracy you define

Define the accuracy you need and choose the Abbemat which suits you best. From routine pass/fail tests to demanding research, there is an Abbemat for your application. Results are available within seconds and easy to read off the large screen.

Abbemat 200: Accuracy ±0.0001 nD

Abbemat 300: Accuracy ±0.0001 nD
Abbemat 500: Accuracy ±0.00002 nD

➤ Economy Line

"The economic Abbemat refractometer for routine measurements."

Abbemat 200

The Abbemat 200 refractometer makes the Abbemat series' sophisticated measuring technology available to users with a low budget. Offering all essential features and intuitive handling, this out-of-the-box refractometer is ideal for small laboratories that require a limited number of measurements without any complex data processing.

➤ 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 large display gives a clear pass/fail result for analysis of large numbers of samples when time is short.

➤ 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 Abbemat Performance Plus line is readily adapted to a multitude of tasks.

Abbemat 350: Accuracy ±0.0001 nD
Abbemat 550: Accuracy ±0.00002 nD

➤ Heavy Duty Line

"Measures when others fail."

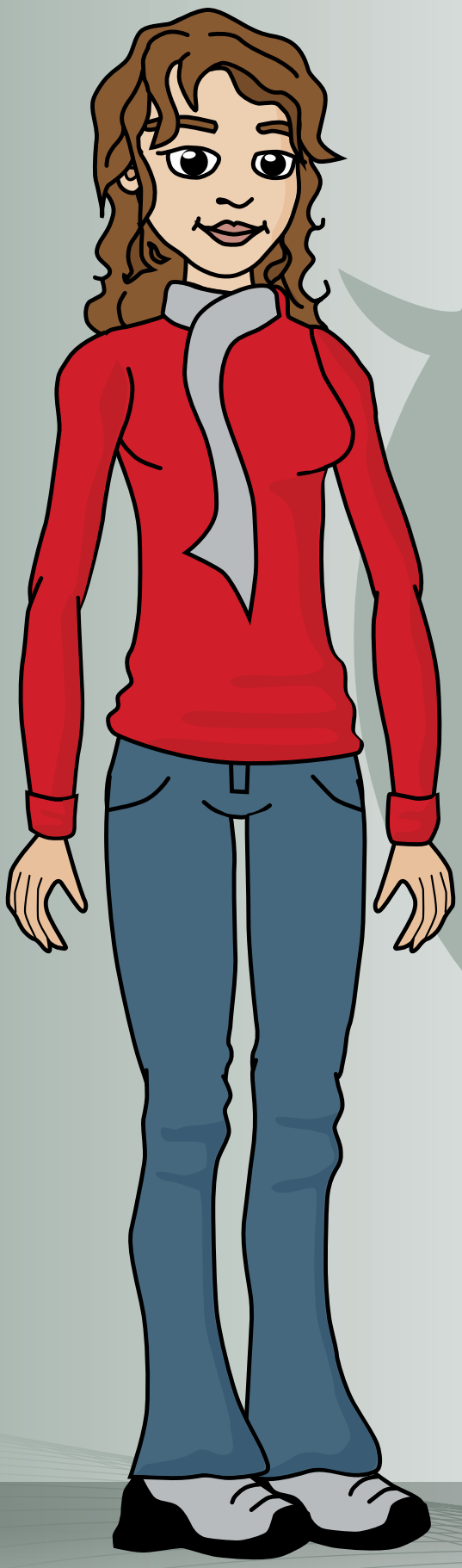
Abbemat HT, Abbemat HP, Abbemat MW, Abbemat WR

The Heavy Duty line refractometers are designed for work in harsh environments and for special applications requiring high temperature (HT model) or multiple wavelengths (MW model). The external PC monitor can be positioned away from the refractometer so you can check the results without being near the sample. To measure samples containing solid particles or air bubbles you can position the Heavy Duty Abbemat on its side to prevent sedimentation and disturbance affecting the results.

Abbemat HP: Accuracy ±0.00002 nD
Abbemat WR, MW, HT: Accuracy ±0.00004 nD

Hear What the Experts Say

Ever heard of the "Isle of Light"?
This fictional island is the setting for Anton Paar's eLearning course "Basics of Optical Analysis". There you will meet physicist Elektra Spektra and Ray, the lighthouse keeper. This is what they have to say about refractive index measurements and the Abbemat series.



To achieve high-quality measurements of refractive index (RI) a refractometer has to get three things right: temperature (T), wavelength (λ) and measuring the critical angle of total reflection (α_{crit}).

This is shown in the function: RI (α_{crit}, T, λ)

1) With Abbemat refractometers, the critical angle of total reflection is measured with a high-quality optical setup made of selected components. Minimal stray light, a high-resolution CCD sensor and Fresnel analysis result in a resolution up to 0.000001 in refractive index. The optical bench is hermetically sealed and temperature stabilized to protect it from outside influences such as condensation in tropical conditions.

2) The temperature is the biggest influencing factor on the refractive index. For this reason Abbemat refractometers control the temperature at the prism/sample interface at an accuracy of up to 0.03 °C within seconds.

3) The wavelength is tuned by Anton Paar to a bandwidth of ±0.2 nm by means of an interference filter. For the Abbemat MW each wavelength is precisely measured so that you know your true wavelengths and not only the nominal wavelengths. In contrast to simpler optical setups this technology ensures correct results for samples with different dispersions.

Anton Paar's sixth eLearning course

'Basics of Optical Analysis' is interactive learning at its best: Essential insights into basic science, presented in a highly entertaining animated story. Travel to the "Isle of Light" with physicist Elektra Spektra, meet Ray the lighthouse keeper, learn about light phenomena and how they are used for analysis – and meet Frances, a slightly frustrated fish performing magic tricks based on refraction…

Take a first look at 'Basics of Optical Analysis' here >>

It's good to know the Abbemat refractometers have the basics covered. They also get all this right, too:

Methods and scales

Abbemat refractometers cover most standards. If the numerous predefined methods do not suit your application you can easily define your own.

Automatic temperature control and correction

Abbemat refractometers precisely measure and control the temperature. They can perform automatic temperature correction that allows you to measure samples at any temperature and obtain the correct result for 20 °C. This saves you time because no temperature control is required.

Accuracy

Refractive index results from Abbemat refractometers are accurate up to ±0.00002 nD. They are factory calibrated with official standards from the PTB (Physikalisch-Technische Bundesanstalt, National Metrology Institute of Germany). To calibrate or adjust your Abbemat you can order these standards from Anton Paar.

Plausibility

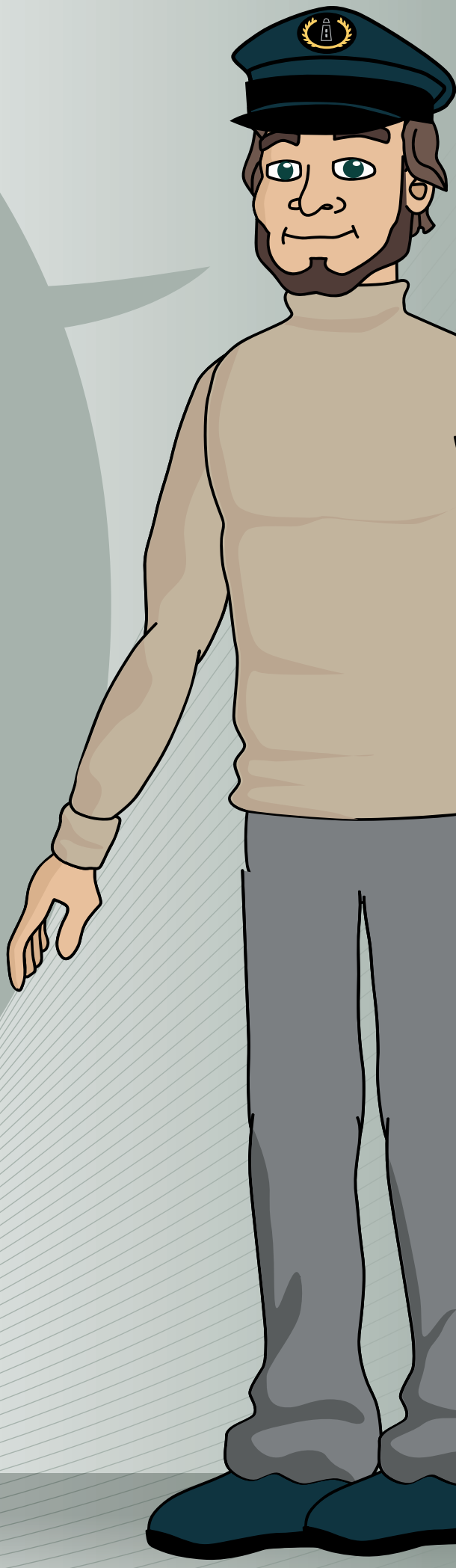
There is a plausibility test integrated in the Abbemat software which checks all your results. You define your own rules and limits for this test. Depending on the accuracy you define, you can speed up your measurements considerably.

Traceability

To ensure that only the right people are doing the right things with your Abbemat there is an advanced user management with password rules. The audit trail and electronic signature provide more data security. The Abbemat informs you about the history and current status of your results via the result memory, adjustment and check history and check intervals. It undertakes validity checks for each measurement.

Fit for pharma

The Abbemat software fully supports the requirements of the pharmaceutical industry, including GMP, 21 CFR Part 11, GAMP5 and USP<1058>.
To minimize the time it takes to integrate your new Abbemat into your workflow, Anton Paar offers a Pharma Qualification and Validation Package including DQ, IQ, OQ, PQ and Risk Analysis.



Why Measure the Refractive Index?

A measuring principle with clear benefits

Measurements of the refractive index have been used for over 100 years to identify and characterize liquid and solid samples, for example to measure the concentration of solutions. From the refractive index you can also calculate other parameters, like freezing point or specific gravity.
Knowledge of the refractive index allows you to control the quality of multi-component mixtures and check samples for purity. As refractive index measurements are quick and reliable, the method is the state of the art in many industries around the globe. Measuring refractive index is an essential part of numerous standard operating procedures and laboratory analyses.

Your benefits of this technology are:

Economic use of sample

- You only require a few microliters
- The sample can be recovered as the measurement is non-destructive
- The measurement is fast and easy
- You do not have to prepare your sample
- Just apply sample and get a reading within seconds
- A quick wipe cleans the prism after each measurement

Highly tolerant

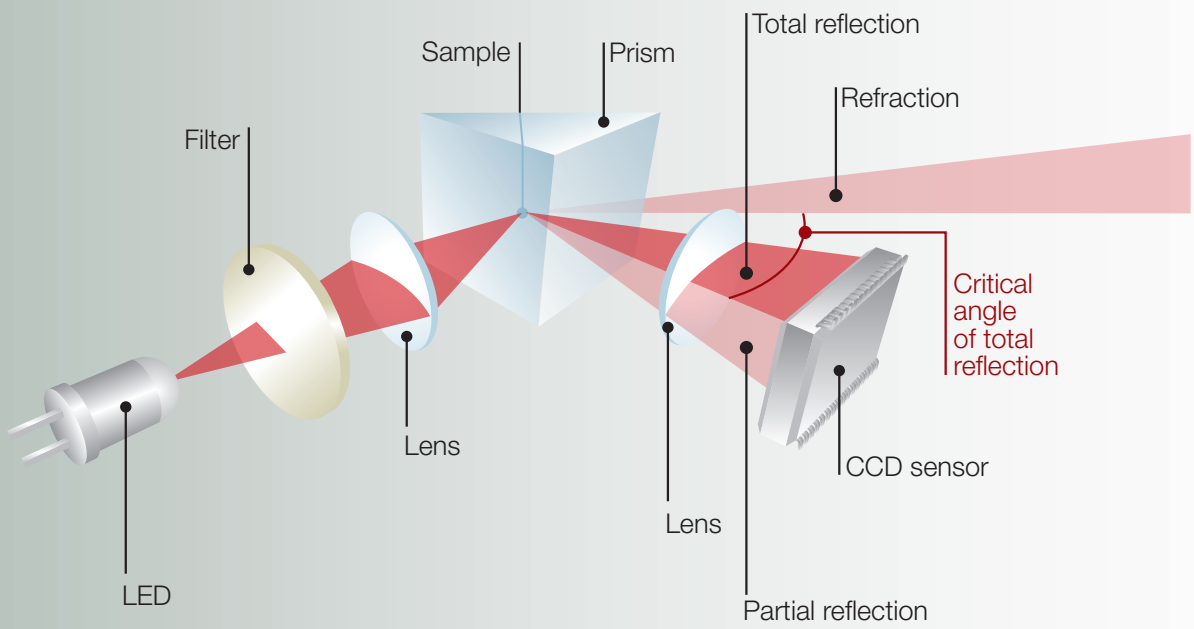
You can measure:

- all samples from liquids to pastes, polymers to solids
- turbid, colored or opaque samples
- liquids containing air bubbles or solid particles

There is no influence from vibrations or other environmental disturbances

Long-lasting

- There are no moving parts you need to change
- A long-life LED is used as the light source
- The prism material is almost as hard as a diamond
- The measuring area is made of stainless steel



A Method for Every Application

The following table lists some of the methods available.

Please contact your local representative for support concerning your application.

Industry	Method	Units	Max. resolution	Temperature [°C]
All	Refractive Index	nD	0.000001	10 to 85
Beverages	Must gauge	°KMW, °OE	0.001	20
	Zeiss	Z	0.001	20
Food	Butter fat content	%mas (g/100 g)	0.001	40
	Butter iodine number	IN	0.01	40
	Honey moisture content	%mas (g/100 g)	0.001	20
	Milk fat content	%mas (g/100 g)	0.001	20
Medical	Serum protein	%Vol	0.01	17.50
	Serum total solids	%Vol	0.001	17.50
	Urine osmotic pressure	mOsm/l	0.1	20
	Urine specific gravity	g/ml	0.00001	20
	Urine total solids	%Vol	0.001	20
Sugar	%Brix	%mas (g sucrose/100 g)	0.001	10 to 40*
	%Sucrose	%mas (g/100 g)	0.001	10 to 40*
	%Fructose	%mas (g/100 g)	0.001	20
	%Glucose	%mas (g/100 g)	0.001	20
	Invert sugar	%mas (g/100 g)	0.001	20
	Corn syrup, AC, 28DE	%mas (g/100 g)	0.01	20
Others	FSII ASTM 5006-3	%Vol	0.0001	20
	Antifreeze ethylene glycol	°C	0.01	20
	Antifreeze propylene glycol	°C	0.01	20
	Salinity	%mas (NaCl g/100 g)	0.001	20

** extrapolated above 40 °C*

Abbemat Features

	Abbemat 200 **Economy**	Abbemat 300/500 **Performance**	Abbemat 350/550 **Performance Plus**	Abbemat WR/HT/HP/MW **Heavy Duty**
Accessories and hardware				
Display	3.5", 320 x 240 Px	3.5", 320 x 240 Px	6.5", 640 x 480 Px	● [2]
Keyboard	membrane	membrane	touchscreen	● [2]
Suitable for Modulyzer	○	●	●	●
Vertical operation with flow cells	○	○	○	●
Data interfaces				
RS-232 port	printer	printer/LIMS	printer/LIMS	printer/LIMS [2]
CAN bus connection	○	slave	master/slave	slave [3]
3 USB ports	●	●	●	● [2]
Ethernet connector	○	○	●	● [2]
VGA connector	○	○	●	● [2]
Software features				
PC software	○	●	●	● [1]
Data export	MS Excel	MS Excel/PDF	MS Excel/PDF/text	MS Excel/PDF
Automatic sample name generation	○	●	●	●
User-definable sample name fields	○	●	●	●
Sample statistics	○	○	●	○
Backup and restoration of instrument settings	○	●	●	○
Manual downloadable from device	○	○	●	○
Data recording on internal memory	300 data sets	300 data sets	1000 data sets	unlimited [2]
Methods				
Predefined methods	●	●	●	●
User-definable methods	○	●	●	●
Customer calculations	○	●	●	●
Scale calculator	○	○	●	○
Statistics of measured data	○	○	●	○
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)	○	○	●	○
Quality and data 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	○	●	●	●
AOAC, ASTM, CID, DIN, FDA, ICUMSA, ISI, JIS, OIML, SSDT methods	●	●	●	●
Pharma Validation and Qualification documentation	○	●	●	●

[1] required for operation [2] depending on the connected PC hardware/software [3] with optional legacy device adapter

Specifications

	Abbemat 200	Abbemat 300 Abbemat 350	Abbemat 500 Abbemat 550	Abbemat WR Wide range	Abbemat HT High temperature	Abbemat HP High precison	Abbemat MW Multiple wave-lengths
Measuring ranges							
Refractive Index (RI)							
Range nD	1.30 to 1.72	1.26 to 1.72	1.30 to 1.72	1.30 to 1.72	1.30 to 1.72	1.32 to 1.56	1.30 to 1.72
Resolution nD	± 0.0001	± 0.00001	± 0.000001	± 0.000001	± 0.000001	± 0.000001	± 0.000001
Accuracy nD[1)]	± 0.0001	± 0.0001	± 0.00002	± 0.00004	± 0.00004	± 0.00002	± 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 %	0 to 100 %	0 to 100 %
Resolution	0.01 %	0.01 %	0.001 %	0.001 %	0.001 %	0.001 %	0.001 %
Accuracy	0.05 %	0.05 %	0.015 %	0.03 %	0.03 %	0.015 %	0.03 %
Sample/prism temperature control by built-in solid state thermostat (Peltier)							
Temperature range	10 °C to 60 °C	10 °C to 85 °C	10 °C to 85 °C	10 °C to 70 °C	10 °C to 110 °C	10 °C to 70 °C	10 °C to 70 °C
Temperature probe accuracy[1)]	± 0.05 °C	± 0.05 °C	± 0.03 °C	± 0.03 °C	± 0.03 °C	± 0.03 °C	± 0.03 °C
Temperature probe stability[1)]	± 0.002 °C	± 0.002 °C	± 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 mold	Stainless steel						
Seal	FFKM (Perfluoroelastomer)						
Components							
Light source	LED light source, average lifetime > 100,000 h						
Wavelength (by wavelength-adjusted interference filter)	589 nm						Up to 8 in the 436 nm to 656 nm range[2)]
Power requirements	100-240 VAC +10%/-15%, 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			180 x 120 x 250			
Weight [kg]	6.5			6			

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

2) *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*

More than Refractive Index

To measure density, optical rotation, viscosity or pH 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 provides all results on one report.

DMA Generation M
Density meter

Abbemat
Refractometer

Xsample
Sample changer

HazeQC ME
Turbidity meter

Modulyzer **Prime Class**

Modulyzer

To measure several parameters at once, Anton Paar provides the Modulyzer systems.

Refractive index + density

Modulyzer Prime Class

Whenever you combine an Abbemat refractometer with Anton Paar's DMA M density meter the result is a Modulyzer Prime Class system. Depending on how you custom-tailor your Modulyzer to suit your application, you determine the density and refractive index - even when samples are aggressive or volatile. You save time by measuring these parameters in one step. With an optional Xsample sample changer you can measure up to 96 sample automatically without any user interaction. Results are shown on one screen and summarized in one report.

Refractive index + density + optical rotation + viscosity + …

Modulyzer Unlimited Class

Anton Paar provides customizable multiparameter measuring systems. These Modulyzer Unlimited Class systems consist of an Abbemat refractometer and DMA M density meter with modules such as a turbidity measuring module, pH meter, polarimeter, viscometer or colorimeter. An Unlimited Class Modulyzer can be expanded with further modules at any time later.

Depending on the setup, your Modulyzer Unlimited Class system determines:

- density
- refractive index
- optical rotation
- turbidity
- pH
- viscosity
- color and
- calculated quality parameters of liquids

Up to 96 samples are filled and measured; the sample cells are rinsed and dried automatically. Results are shown on one screen and summarized in one report.

pH ME
pH meter

Lovis 2000 ME
Viscometer

MCP
Polarimeter

Future modules

tiamo™
Software

Colorimeter*

Unlimited Class

Refractive index + pH

For simultaneous measurement of pH and refractive index in one step, a pH sensor can be added to the Abbemat Performance Plus line via a simple magnetic attachment. You can fill sample manually with a syringe or automatically. If a peristaltic pump or sample changer is connected, the pH sensor is filled in the same cycle as the refractometer. Results are shown on the Abbemat screen and summarized in one report.

Sugar content + °Brix + apparent purity + pH + conductivity ash + solution color + reflectance color

The combination of Abbemat and an MCP Sucromat saccharimeter is ideal for determining °Z, %Pol, °Brix and apparent purity in order to analyze the raw, intermediate and final products of sugar manufacturing. For convenience, the results are shown on the MCP Sucromat screen and summarized in one report.
The comprehensive Sucrolyser system provides automated analysis of sugar content (%Pol), dry substance (°Brix), apparent purity, and optionally also pH, conductivity ash, solution color, reflectance color and loss on drying. Results are shown on the connected PC screen.

Simplify Your Work

➤ You want 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 an optional built-in peristaltic pump to fill samples into the measuring cell.

➤ You want monitoring of the reaction in a batch reactor?

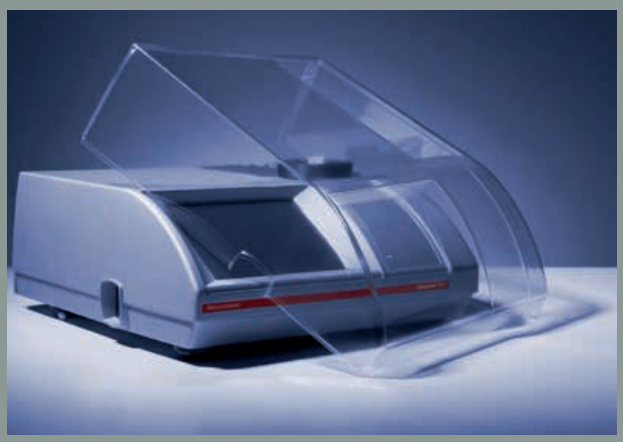
The optional built-in peristaltic pump for the Abbemat Performance Plus line fills sample automatically into the measuring cell.

➤ You measure toxic samples?

To reduce your contact with toxic chemicals, use the Abbemat Performance Plus line with the peristaltic pump, connect an Xsample 122 sample changer or fill the micro flow cell manually using a syringe.

➤ You have volatile sample or solvent?

Flow cells and the magnetic sample cover are particularly useful for measuring volatile samples or when using volatile solvents. They seal the measuring area and prevent the sample or solvent evaporating.



➤ You have small sample volumes?

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

➤ You want 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.

➤ You need a refractometer which withstands dirt and spills?

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

➤ You want to measure foils or solids?

Use the sample presser to press foils or solids onto the prism to ensure optimal contact between the sample and measuring prism.

Photos: Croce & Wir

Anton Paar

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Instruments for:
Density and concentration measurement

Rheometry

Viscometry

Sample preparation

Microwave synthesis

Colloid science

X-ray structure analysis

Refractometry

Polarimetry

Petroleum testing

High-precision temperature measurement

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