Anton Paar

Abbemat

Refractometer Series

::: Superior Optical Instruments

Define the Accuracy – Choose the Features

Anton Paar offers a range of Abbemat refractometers which embody four decades of technical know-how.

Building on the longstanding knowledge from Dr. Kernchen, Anton Paar continues the tradition of producing high-end refractometers and expands the Abbemat series.

0.0001 nD

Abbemat 300

0.00001 nD

Abbemat 500

The result:

Performance line

“Measures, measures, measures.”

The refractometers of the Performance line provide reliable results for routine applications at either 4 or 5 digits accuracy. Their sturdy design and straightforward operation make the Performance line refractometers true laboratory workhorses.

Abbemat 350

Abbemat 550

Abbemat HP
Abbemat HT
Abbemat MW
Abbemat WR

Performance Plus line

“Ready for any job today and fit for tomorrow.”

The refractometers of the Performance Plus line can be expanded with Plug and Play options which ensures your Abbemat is fit for future tasks. However often you change your application, the Performance Plus line is easily set up using intuitive touchscreen navigation.

Heavy Duty line

“Measures when others fail.”

The refractometers of the Heavy Duty line are designed for special applications and for work in harsh environments.

Performance Line

Abbemat 300 and Abbemat 500

The refractometers of the Performance line are designed for routine analyses and quality control, ranging from checks on incoming raw materials to intermediate and final products. You can select from industry-specific sets of scales.

Their sturdy design and straightforward operation make the Abbemat 300/500 true laboratory workhorses. The heart of the refractometer, the prism, is scratch-proof, easy to clean and mounted in a stainless steel sample well.

Accuracy

Judgments based on refractive index measurements must be right. Whatever the application, you want to be sure that the results are trustworthy. Refractive index results from Abbemat 300 are accurate to ±0.0001 nD*; Abbemat 500 provides an accuracy of ±0.00002 nD*. Both are factory calibrated with official standards from the Physikalisch-Technische Bundesanstalt (PTB, National Metrology Institute of Germany). You can order these standards from Anton Paar for calibration and adjustment on site.

Operation

You can't afford to lose time due to malfunctions or difficult handling. For this reason, the built-in color LCD screen and membrane keys are resistant to spillage and dirt. You can operate the refractometer even when wearing gloves. Alternatively, you can control Abbemat 300/500 via an external PC with the Abbemat PC software. The Abbemat 300/500 refractometers are easy to operate and even warn you if the sample volume is not large enough for a valid measurement.

Measurement and reference setting

Abbemat 300/500 refractometers ensure maximum efficiency. For routine measurements, no navigation is required. Values are recorded by simply pressing the Start/Stop button. To set references, the menu takes you through the procedure step-by-step at intervals you define.

**under refractometric standard conditions*

Performance Plus Line

Abbemat 350 and Abbemat 550

The refractometers of the Performance Plus line are designed for research and development as well as demanding quality control applications. Abbemat 350 and Abbemat 550 have the same accuracies and features as the refractometers of the Performance line and extra features for your convenience:

Convenience

Save time when defining individual settings or changing from one method to another: Abbemat 350/550 refractometers are set up conveniently using intuitive touchscreen navigation. Numerous predifined methods, method management as well as user-defineable methods and scales make the Performance Plus line fit to undertake every measuring task. If you ever lose the instruction manual, you can download it from the Abbemat 350/550's memory so you will always have the information at hand.

Communication

You want to make the refractometer part of your workflow. The Abbemat refractometers enable communication with LIMS and other instruments via CAN-bus, USB and RS 232 interfaces. Abbemat 350/550 also provides Ethernet interfaces. The Abbemat refractometers can be used with an external PC, printer and keyboard.

Traceability

To ensure that only the right people are doing the right things with the Abbemat there is a convenient user interface and features such as advanced user management with password rules, audit trails and electronic signature.

Abbemat informs you about the history and current status of your results via the result memory, adjustment and check history, check intervals and validity checks for each measurement.

Numerous predefined methods, method management and user-defineable methods and scales make the Performance Plus line fit for every measuring scales.

Language

The Abbemat refractometers speak to you in a language you understand. Choose between Chinese, English, French, German, Japanese, Spanish and Russian. The number of supported lanuages is continously being expanded.

Heavy Duty Line

Abbemat HP/WR/MW/HT

The refractometers of the Heavy Duty line are designed for work in harsh environments and for special applications. They have a hermetically sealed stainless steel casing and no display. The Heavy Duty refractometers form a successful team with Anton Paar's DMA density meters and MCP polarimeters.

Operation

You can be flexible in your applications: The Heavy Duty refractometers have the accessories and operation modes to suit your task. There are two operating modes available:

- Horizontal mode for manual filling using a pipette or spatula.
- Vertical mode so that solid particles and air bubbles have no effect: You can position the Abbemat on its side to prevent sedimentation and disturbance affecting the results.

Accessories

You want to save your expensive sample. You want to handle large throughput. You want to automate your measurements. There is a flow cell to suit your application.

PC software

To protect the refractometer in harsh environments, the Heavy Duty line refractometers have no display. They are controlled by an external PC which can be placed away from the workbench in another part of the laboratory.

Choose from the following Heavy Duty Abbemat refractometers:

You want to perform high-precision measurements.
Abbemat HP stands for a maximum precision of ±0.00002 nD over the entire range from 1.32 nD to 1.56 nD.

You want to measure samples with very high or very low refractive index.
Abbemat WR stands for measurements over a wide range of refractive indices, from 1.30 nD to 1.72 nD with an accuracy of ±0.00004 nD over the entire range.

You want to determine dispersion or measure refractive index at different wavelengths.
Abbemat MW stands for measurements at multiple wavelengths. You can choose up to 8 wavelengths from 436 nm to 656 nm.

You want to measure hot samples or samples with high melting points.
Abbemat HT stands for high-temperature measurements from 10 °C to 110 °C.

Abbemat Refractometers Provide 100 % Compliance

You need to fulfill exacting standards. With this in mind, all Abbemat refractometers are compliant with international standards such as ASTM, ICUMSA, OIML, AOAC, DIN/ISO, FDA, ISI, JIS and pharmacopoeias.

Abbemat refractometers provide full compliance with 21 CFR Part 11, with user levels, audit trail, electronic signature and forgery-proof data export. Anton Paar also provides a qualification documentation package (IQ/OQ/PQ).

Abbemat Refractometers Get It Right

RI (α_{crit}, T, λ)

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 for total reflection (α_{crit}).

With Abbemat refractometers, the critical angle for 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 separately temperature stabilized to protect it from outside influences such as condensation in tropical conditions.

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.

The wavelength is tuned by Anton Paar to a bandwidth of ±0.2 nm by means of an interference filter. In contrast to simpler optical setups this technology ensures correct results for samples with different dispersions.

The refractive index is a number without dimensions. However, for daily work in the lab, a number of scales with units have proven useful. Abbemat refractometers cover all standard scales. Individual scales are available on request.

Measuring Principle

Why measure the refractive index?

The refractive index of a pure material is a physical property which you can use to identify and characterize samples. For binary mixtures, e.g. dissolved substances, the refractive index is a measure of concentration. For ternary or multi-component mixtures of a given mixing ratio, you can monitor the refractive index for quality control.

As refractive index measurements are quick and reliable, the method is the state of the art in industries around the globe. Measuring refractive index is an essential part of numerous standard operating procedures and laboratory analyses.

A measuring principle with clear benefits

Anton Paar refractometers use reflected rather than transmitted light to measure the refractive index. In this approach the sample on top of the measuring prism is irradiated from different angles by an LED. At the interface between sample and prism the incident beam is either refracted into the sample or reflected back into the prism. The reflected beam is detected by a sensor array. From this the critical angle for total reflection is calculated and used to determine the refractive index (RI) of the sample.

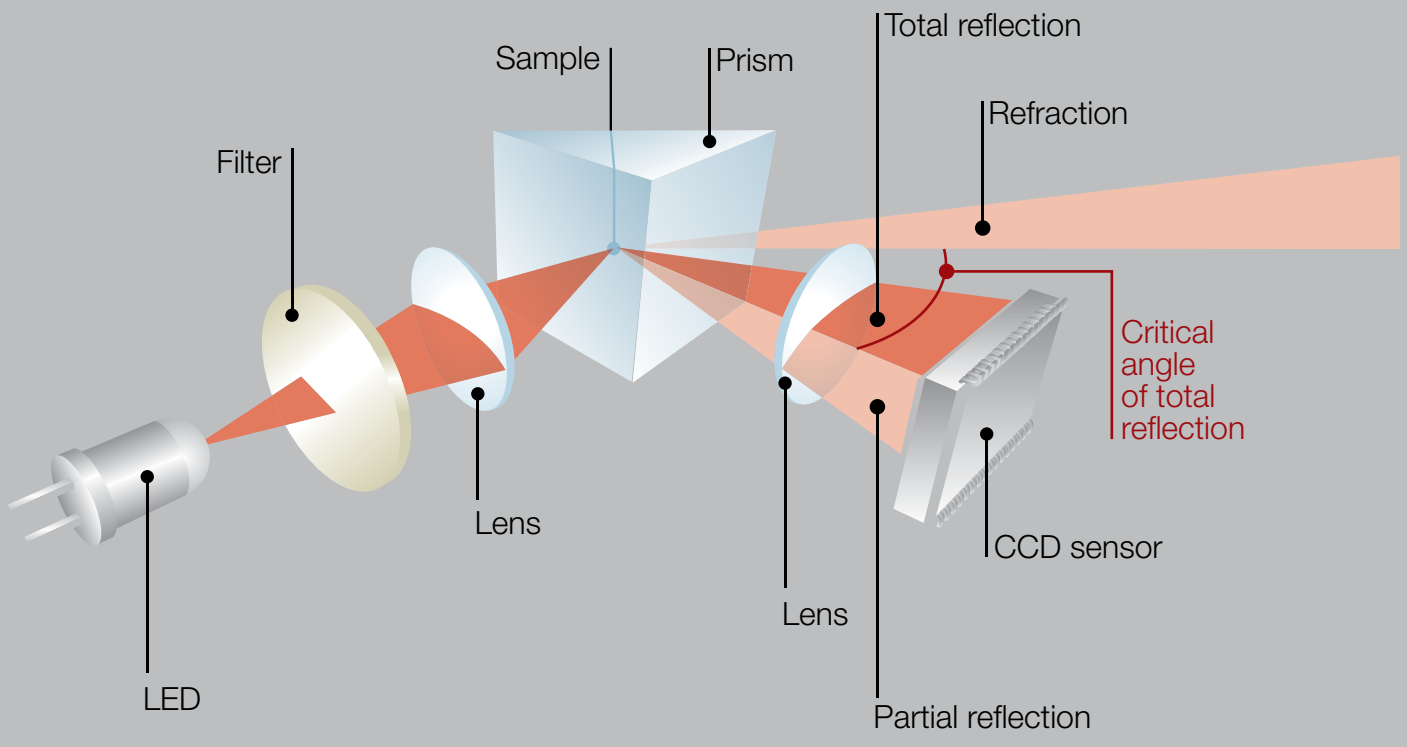
Your benefits of this technology are:

Economic use of sample
- You only require a few microliters
- The sample can be recovered as the measurement is non-destructive

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 run

Highly tolerant
- Independent of sample properties 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



Every Sample Has A Refractive Index

Drugs:
The production of pharmaceuticals is very demanding. Many national and international drug regulations and quality standards need to be fulfilled. This includes a precise identification and purity control of the raw materials as well as the final products. Anton Paar refractometers are designed to meet the standards of international pharmacopoeias. They provide 21 CFR Part 11 compliance.

Phytopharmaceuticals:
Plants containing pharmaceutical drugs can be used for medical treatment. As they are natural products, their composition depends on several environmental parameters and the concentration of the medical drugs they contain varies in a wide range. Abbemat refractometers provide correct identification and concentration measurements.

Juices and syrups:
For economic transport and stocking, fruit juices are often concentrated to save weight and volume. Before bottling, they need to be diluted to a drinkable concentration. The concentration is measured in % Brix with Anton Paar refractometers.

Sugar:
In order to maximize the yield in sugar manufacturing, the most important analytical parameters to monitor are Pol (°Z), %Brix (RDS) and Apparent Purity. For these measurements an Abbemat refractometer is directly connected to an MCP Sucromat, which then displays all these values simultaneously.

Coffee:
To ensure that coffee grounds contain at least the minimum extract content, as required by regulations, producers use Abbemat refractometers to determine the content of dry substance in the extract. The end result: a cup of coffee that tastes good and has the expected strength.

Perfume:
In perfume manufacturing, Abbemat refractometers in combination with DMA density meters and MCP polarimeters are used to carry out purity measurements on valuable essential oils and to assure the constant quality of the perfumes.

Food flavors:
Natural and artificial flavors give all of our daily food its distinctive taste. In food production, incoming raw materials and finished products are characterized and tested for purity with Abbemat refractometers in combined setups with MCP polarimeters and DMA density meters.

Concrete:
Additives in the concrete mixture influence the material properties. They are used as anti-freeze agents, to adjust the time for setting, and influence the desired texture. Abbemat refractometers have proven ideal for concentration measurements and quality control of such additives.

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 RI values. They can also measure very low concentrations of particles which tend to be hardly soluble.

Soft matter research:
Phase transitions such as sol-gel transitions manifest themselves as changes in the volume and refractive index with temperature. Abbemat HT high-temperature refractometers are used to investigate such material behavior. Refractometers are ideal here as they do not exert pressure on the sample and are not disturbed by other influences.

Abbemat Features

	Performance Plus line	Performance line	Heavy Duty Line
Accessories and hardware			
TFT touchscreen 6.5", 640 x 480 Pixels	●	○	●[2]
Membrane keyboard	○	●	○
Vertical operation mode with flow cells	○	○	●
Range of flow cells	○	○	●
Hardware prepared for additional external devices	●	○	○
Optional input/output devices			
AbbematPC software	●	●	●[1]
External USB devices	●	●	●
Printer	●	●	●
Data interfaces			
RS-232 serial port	●	●	●[2]
CAN-bus	●	●	●[2]
3 USB ports	●	●	●[2]
Ethernet connector	●	○	●[2]
VGA connector	●	○	●[2]
Software features			
Data export to MS Excel™ spreadsheet	●	●	●
Data export to text- or pdf file	●	○	●[2]
User-configurable data output (ASCII / Excel / LIMS / printer)	●	○	●[2]
Automatic data printout	●	●	●
Automatic sample name generation	●	●	●
User-definable sample name fields (e.g. batch no.)	●	●	○
Sample statistics	●	○	○
Backup and restoration of instrument settings	●	○	○
Pdf manual downloadable from device	●	○	○
Methods			
Predefined methods	●	●	●
User-definable methods and scales	●	○	●
Scale calculator	●	○	○
User-configurable display and result output	●	○	○
User-definable result range for "pass or fail"	●	○	○
Multiple measurements of sample	●	○	○
Automatic temperature correction	●	●	●
Quality and data security			
Advanced user level management	●	●	●
Password rules	●	●	●
Audit trail	●	●	●
Electronic signature	●	●	●
Adjustment and checks history	●	●	○
Check of adjustment validity	●	●	○
Definition of check intervals	●	●	○
Validity check of measuring value	●	●	●
Compliance			
21 CFR Part 11	●	●	●
AOAC, ASTM, CID, DIN, FDA, ICUMSA, ISI, JIS, OIML, SSDT methods	●	●	●

1) required for operation
2) depending on the connected PC hardware/software

Specifications

	Abbemat 300/350	Abbemat 500/550	Abbemat WR/HT	Abbemat HP	Abbemat MW
Measuring ranges					
Refractive Index scale (RI)					
Range nD	1.3 to 1.72	1.3 to 1.72	1.3 to 1.72	1.32 to 1.56	1.3 to 1.72
Resolution nD	± 0.00001	± 0.000001	± 0.000001	± 0.000001	± 0.000001
Accuracy nD [1]	± 0.0001	± 0.00002	± 0.00004	± 0.00002	± 0.00004
Brix scale					
Range	0 to 100 %	0 to 100 %	0 to 100 %	0 to 100 %	0 to 100 %
Resolution	0.01 %	0.001 %	0.001 %	0.001 %	0.001 %
Accuracy	0.05 %	0.01 %	0.03 %	0.015 %	0.03 %
Measuring principle	Critical angle of total reflection measurement by shadowline detection with CCD array				
Sample/prism temperature control by built-in solid state thermostat (Peltier)					
Temperature range	10 °C to 85 °C	10 °C to 85 °C	10 °C to 70 °C	10 °C to 70 °C	10 °C to 70 °C
Temperature probe accuracy [1]	± 0.05 °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
Optional temperature range 10 °C to 110 °C	○	○	●	○	○
Materials in contact with samples					
Prism	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	589 nm	589 nm	589 nm	Up to 8 in the range from 436 nm to 656 nm [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*

Photos: Croce & Wir

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Instruments for:
Density & concentration measurement

Rheometry & viscometry

Sample preparation

Microwave synthesis

Colloid science

X-ray structure analysis

Refractometry

Polarimetry

High-precision temperature measurement

Specifications subject to change without notice

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