Laboratory density and concentration meters

Anton Paar

DMA 4100 M
DMA 4500 M
DMA 5000 M

Perfection
in every detail

Anton Paar's density meters have been innovating the market since the initial spark of invention led to the launch of the first-ever digital density meter. A new era has just begun with the development and implementation of the Pulsed Excitation Method taking density measurement to a whole new level.

DMA density meters are at work all around the world, as trusted and indispensable tools in over a tens of thousands of laboratories and workspaces.

Our DMA density meters have always been the benchmark. But even a well-engineered product cannot stand still. While up-to-date DMA density meters have been delivering density results of renowned Anton Paar quality, our development team has been focusing on further innovations. We have put even more emphasis on the details to create a density meter which is more intelligent and stronger than ever.

The heart of the density meter – the oscillating U-tube handmade from glass – is now more brilliant than ever before. Numerous further developments bring you perfection in every detail and result in a powerful and intelligent density meter that is ready to take on measuring tasks at the highest level of accuracy and reliability for years to come. The details make the difference: when it comes to obtaining the highest stability of measurement under hot and humid conditions, when compensating for the influence of viscosity on the results, and to ensure that the density meter is unaffected despite being operated by many different users.

DMA 4100 M

DMA 4100 M delivers 4-digit density values for quick and easy quality control and is not affected by temperature fluctuations, humidity, air pressure, and changing users with differing filling approaches.

DMA 4500 M
DMA 4500 M Chemicals

For thousands of users around the world, density measurement means DMA 4500 M.
These leading density meters are in use day in, day out, wherever reliable and accurate 5-digit density values are required.

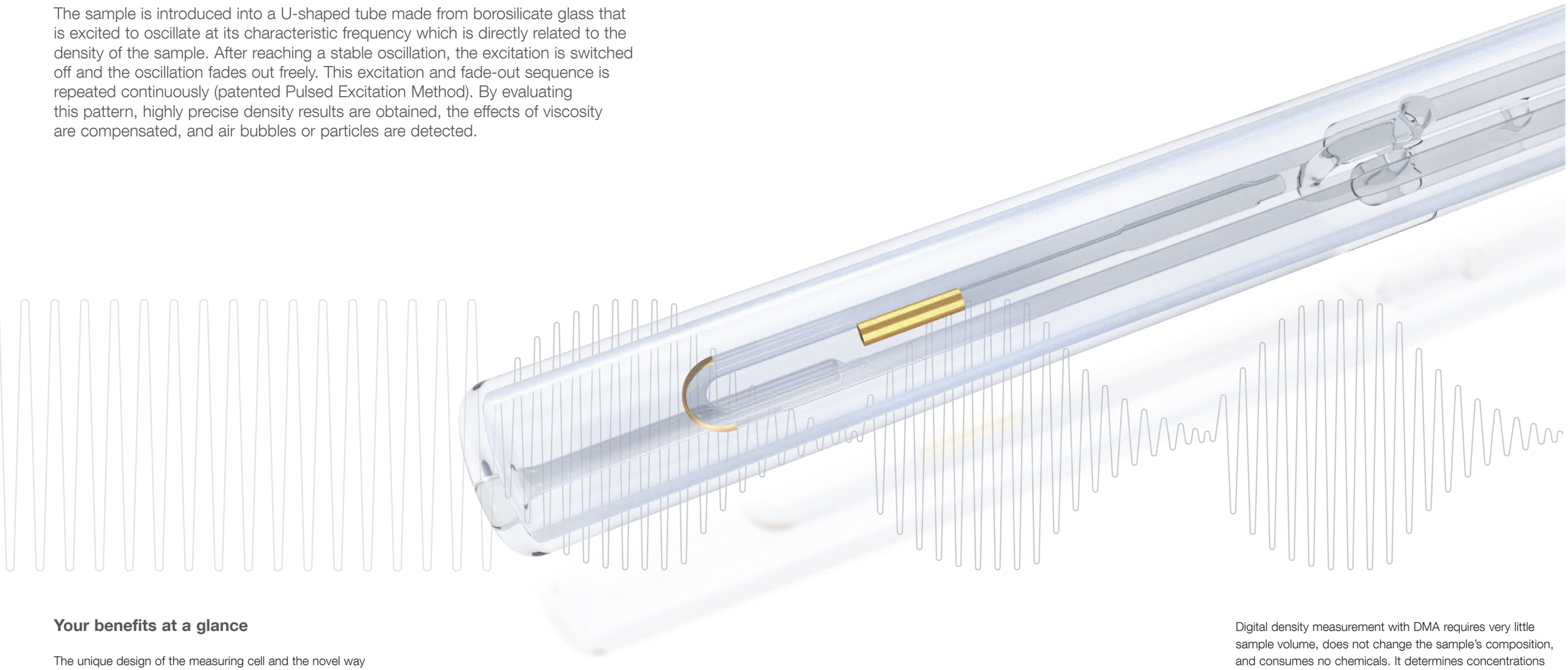
DMA 4500 M Chemicals with its dedicated and compact feature set comes with more than 140 built-in conversion tables covering salts, acids, alkalis, alcohols, sugar, and many more.

DMA 5000 M

With its six-digit accuracy DMA 5000 M is the most precise digital density meter in the world. It is ideal for your high-end R&D applications and sets the tone at authorities as well as standards organizations.

A revolutionary measuring principle

The sample is introduced into a U-shaped tube made from borosilicate glass that is excited to oscillate at its characteristic frequency which is directly related to the density of the sample. After reaching a stable oscillation, the excitation is switched off and the oscillation fades out freely. This excitation and fade-out sequence is repeated continuously (patented Pulsed Excitation Method). By evaluating this pattern, highly precise density results are obtained, the effects of viscosity are compensated, and air bubbles or particles are detected.



Your benefits at a glance

The unique design of the measuring cell and the novel way of evaluating the oscillation characteristics with the Pulsed Excitation Method lead to …

Digital density measurement with DMA requires very little sample volume, does not change the sample's composition, and consumes no chemicals. It determines concentrations from 0 % to 100 % with the utmost precision and allows you to always offer first-rate product quality.

viscosity correction two times better than with any other density meter

highest precision up to the 7th digit

measurement of the sample´s viscosity

better detection of gas bubbles or particles in the sample

improved temperature management

measuring results unaffected by external influences

Excellent features for excellent results

The patented Pulsed Excitation Method delivers the most stable density results based on comprehensive knowledge of the oscillation characteristics resulting in …

FillingCheck™

- Automatic alert in case of a filling error
- Real-time detection of bubbles and particles in the sample
- Correct sample filling ensured: manually as well as using automatic sampling systems

Viscosity correction

- Automatic viscosity correction across the entire viscosity range of samples
- Eliminates viscosity-related errors twice as effectively as ever before
- No viscosity standards or adjustments required

Viscosity measurement

- Additional quality parameter for newtonian liquids
- Accuracy up to 5 %
- Measuring range from 10 to 3000 mPa.s

ThermoBalance™

- No temperature-related fluctuations
- No temperature-related aging effects on the measuring cell
- Change between temperatures quickly without drifts and rely on immediate temperature stability

PCAP touchscreen

- The only density meter with PCAP touchscreen technology for unmatched sensitivity and robustness at the same time
- Easy operation, even when wearing gloves
- Large 10.4” screen, readable from a distance due to customizable content

QM compliance

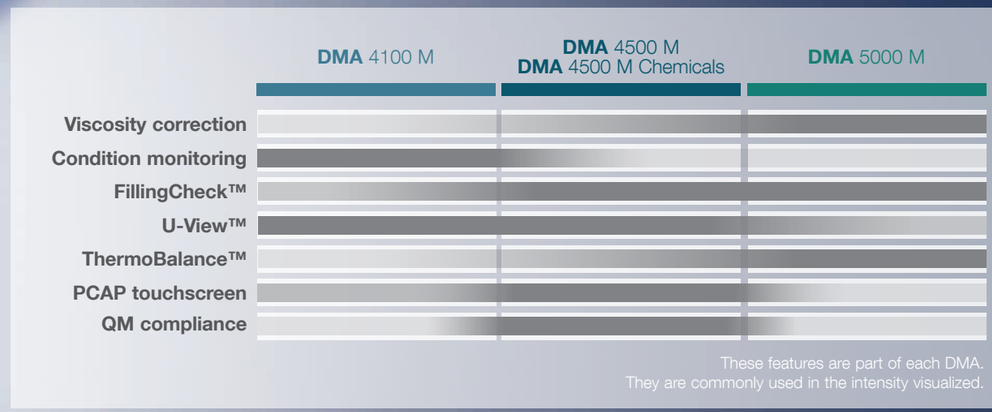
- Full QM, GMP/GLP, and 21 CFR Part 11 compliance
- Audit Trail
- Password protection with three user levels and customizable user group administration
- Electronic signature and forgery-proof data export

Condition monitoring

- Stable results under varying conditions, such as humidity, temperature, and air pressure
- Housing withstands shocks, dirt, and spillages
- Frequently changing users and filling styles do not influence the measurement results

U-View™

- High-quality image of the measuring cell on the screen
- Stored images of the entire filled-in sample
- Print results and pictures as PDF files



These features are part of each DMA.
They are commonly used in the intensity visualized.

DMA in action

Throughout the years DMA density meters have proven themselves in the following situations:

	DMA 4100 M	**DMA** 4500 M **DMA** 4500 M Chemicals	**DMA** 5000 M
Incoming quality control and product identification			
Process monitoring			
Quality control of final products			
R&D: development and description of new formulations			
Filling volume control			

Each DMA can be used in all of the situations listed. They are commonly used in the intensity visualized.

Calibration offices, testing agencies, authorities and standards organizations	

These organizations establish directives in all industries to ensure comparability in international trade and taxation. Since DMA 5000 M – as the most accurate density meter in the world – sets the tone in density measurement this is the only instrument of choice for those organizations.

Applications and industries

DMA density meters are used in numerous industries and applications worldwide. Apart from them being most frequently used in the industries focused on below, they are also employed in fertilizer production, semiconductor production, wastewater treatment, and many others that are also part of the chemical industry.

Alcoholic beverages

- Extract (°Plato, °Balling) and alcohol (<0.01 %v/v, <0.02 °Proof) concentration of beer, wine, spirits, liqueurs
- Wort concentration during the brewing process

Standards: AOAC, international | OIV, international | Official methods of the National Tax Agency Japan (alcohol content after distillation) | ASBC, TTB (USA) | MEBAK, EBC international

Non-alcoholic beverages

- Sugar content (<0.01 °Brix, g/L) for quality control of syrup concentrate and finished soft drinks
- Total extract content (°Brix) of tea and coffee

Standards: AOAC, international | ICUMSA | NBS 113

Food

- Density and specific gravity of animal and vegetable fats and oils
- Extract content of sauces, pastes, seasonings, and dressings
- Density and specific gravity of chocolate, molasses, starch, and broth
- Total solid and solid non-fat content of dairy products
- Density (g/cm³) and specific gravity (25/25 °C) of raw material used in food

Standards: ISO 18301

Flavors and fragrances

- Product identification of incoming raw materials
- Quality control of final flavors and fragrances for beverage, tobacco, food, cosmetics, or pharmaceuticals

Cosmetics

- Quality control of finished creams and sprays
- Quality control of raw materials

Standards: 21 CFR Part 11 | cGLP/GMP

Pharmaceuticals

- Density (g/cm³) and specific gravity (25/25 °C) of infusions
- Density (g/cm³) and specific gravity (25/25 °C) of raw material used in drug production
- Filling volume control of sprays

Standards: 21 CFR Part 11 | USP 841 | cGLP/GMP | Pharma Eu. 2.2.5 | USP 1058 | GAMP 5 Class 3

Chemical industries

- Quality control of raw materials (°Baumé, g/cm³, kg/m³) and final products
- Concentration determination of acids and bases (%w/w, %m/m, mol/L)

Standards: ISO 15212, 2811-3 | JIS K0061

Petroleum

- Quality control (°API, kg/m³) of crude oil, fuels, and lubricants
- Blending checks and quality control of raw materials and final biofuels (%v/v, °Proof, g/cm³)
- Concentration (%w/w) determination of by-products (acids)
- Density (kg/m³) measurement of gases

Standards: ASTM D1250, D4052, D5002, D5931 | DIN 51757, ISO 12185 | JIS K02249

The modular concept | Accessories

Automation

Anton Paar's plug-and-play sample changers are designed to fit into your density meter in order to save space on your lab bench. They manage sample viscosities up to 36,000 mPa.s. Select an automatic sample changer according to your sample's characteristics, plug it in and the density meter automatically recognizes it. Rely on regular checks and let the optional bar code reader scan the labels for you. While your system automatically measures large numbers of samples, you are free to perform other important tasks. Depending on the sample's characteristics, variety, and throughput, a whole fleet of sample changers offering different degrees of automation is available to improve the efficiency in your lab.

Modular extensions

Expand your DMA 4100 M, DMA 4500 M, or DMA 5000 M density meter with CO_2, O_2, color, turbidity, pH, diet concentration, or alcohol measuring modules as well as modules for viscosity, optical rotation, or refractive index according to your individual requirements.

Aerosol Adapter

Using the optional Aerosol Adapter, you can measure volatile liquids directly from aerosol cans. The sample remains under pressure while being filled into the high-precision instruments without bubbles and under safe conditions.

Heating Attachment

The Heating Attachment heats the filling adapters, allowing for easy injection of pre-heated samples that are commonly solid or highly viscous at room temperature ensuring that your entire sample remains liquid.

Specifications

	DMA 4100 M	**DMA** 4500 M **DMA** 4500 M Chemicals	**DMA** 5000 M
Measuring range			
Density	0 to 3 g/cm³		
Temperature	0 to 100 °C (32 to 212 °F)		
Pressure	up to 10 bar (145 psi) absolute pressure		
Accuracy*			
Density	0.0001 g/cm³	0.00005 g/cm³ (full range) 0.00001 g/cm³ (0.8-1 g/cm³, 15-20 °C)	0.000007 g/cm³
Temperature	0.03 °C (0.05 °F)	0.02 °C (0.04 °F)	0.01 °C (0.02 °F)
Dynamic Viscosity**	10 %	10 %	5 %
Repeatability* s. d.**			
Density	0.00001 g/cm³	0.000005 g/cm³	0.000001 g/cm³
Temperature	0.02 °C/0.04 °F	0.01 °C/0.02 °F	0.001 °C (0.002 °F)
Reproducibility* s. d.**			
Density	0.00005 g/cm³	0.00002 g/cm³	0.000005 g/cm³
Resolution			
Density	0.0001 g/cm³	0.00001 g/cm³	0.000001 g/cm³
Viscosity	0.1 %		
Temperature	0.01 °C		0.001 °C
Patents			
granted	AT 516420 (B1) | AT 517082 (B1)		
pending	AT 517486 (A1)		
Features			
USP's	U-View™, FillingCheck™, ThermoBalance™, Full range viscosity correction		
Special functions	QM compliance, temperature scan, built-in pressure sensor, condition monitoring Adjustment at high viscosity (only DMA 5000 M)		
Automation	Automatic sample changers		
Modularity**	Measurement of viscosity, pH, diet concentration, refractive index, alcohol, CO_2, O_2, color, turbidity, optical rotation		
Optional accessories	Aerosol Adapter, Heating Attachment		
Technical data			
Typical measuring time/sample***	30 s	30 s	40 s
Minimal sample volume	Approx. 1 mL		
Dynamic viscosity**	10 to 3000 mPa.s		
Wetted materials	PTFE, borosilicate glass		
Dimensions (L x W x H)	495 mm x 330 mm x 230 mm (19.5 x 13 x 9.1 inches)		
Weight	22.5 kg (49.6 lbs)		
Power supply	AC 100 to 240 V; 50 to 60 Hz; 190 VA		
Display	10.4 inches, TFT PCAP touchscreen 640 x 480 Px		
Controls	Touchscreen, optional keyboard, mouse, bar code reader and gesture control		
Communication interfaces	4 x USB, Ethernet, VGA, CAN, RS-232		
Internal storage	1000 measuring results (ring buffer option)		

** under ideal conditions and for low densities/viscosities | ** for newtonian fluids only | *** according to ISO 5725 | **** except DMA 4500 M Chemicals | ***** After temperature equilibration*

Service

In-house ISO/IEC 17025 calibration service
Anton Paar is officially accredited to calibrate density meters according to ISO/IEC 17025.

Custom-tailored after-sales service for you
Our sales and service network of trained engineers is dedicated to customer support. The Anton Paar service team is always available – simply place your call. Receive product training and application support and benefit from maintenance contracts for long-lasting satisfaction with your instrument.

Density standards provided by Anton Paar
Ultrapure water standards are manufactured by Anton Paar and available upon request to guarantee high-quality density adjustments. Other liquid density standards with different densities and uncertainties are available on request.

Further safety measures
A Pharma Qualification Package is also available, containing all relevant documents for instrument qualification in pharmaceutical companies. For added security and long-term stability you can use the optional MKT 10 (0.01 K) and MKT 50 (0.001 K) thermometers for quick temperature checks.

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