Petroleum products are omnipresent in today’s life, and have become almost natural parts of the modern world. A lot of products we use daily are derived from petroleum, just think of all kinds of fuels and oils, or the wide range of petrochemicals such as solvents, plastics or synthetic fibers.

The raw material, crude oil, and its refinery products are complex mixtures of various hydrocarbons that are usually characterized through their physical properties.

Density is one of the analytically useful characteristics. It can be determined using pycnometers, hydrometers or digital density meters.

Simple operation, display settings as requested, options for connecting the density meter to a PC, keyboard, bar code reader and printer, various integrated tables and measuring methods, optional programming of customer-specific tables and formulae - all these features and more are included in the typical equipment of our density meters.

Accurate results in wide temperature and pressure ranges

The density meters DMA 4100 M, DMA 4500 M and DMA 5000 M from Anton Paar can be used as standard measuring instruments in the petroleum industry. They cover a density range from 0 to 3000 kg/m³ and a pressure range of 0 to 10 bar. Built-in Peltier thermostats ensure stable measuring temperatures in a range of 0 to 95 °C. The DMA 4100 M provides measurement results with an accuracy of 0.1 kg/m³. The DMA 4500 M features an accuracy of 0.05 kg/m³. For highest precision, the DMA 5000 M shows an accuracy of 0.005 kg/m³.

For high pressure and/or high temperature conditions, Anton Paar offers the external density measuring cells DMA HP and DMA HPM. They operate in a temperature range of -10 to +200 °C.

The DMA HP is connected to a DMA 4100 M, DMA 4500 M, or DMA 5000 M which serves as evaluation unit. This setup can be used for pressures up to 700 bar. The measuring temperature is controlled by Peltier thermostats.

The DMA HPM sends the raw data to a mPDS 5 evaluation unit and can be applied for pressures up to 1400 bar. The required temperature is established using an external bath, climate cabinet or oven.

Anton Paar instruments for the petroleum industry at a glance:

**Measuring range:**
- DMA 4100 M:
- DMA 4500 M:
- DMA 5000 M, DMA HP:
- DMA 35 Ex Petrol:

**Temperature range:**
- DMA 4100 M:
- DMA 4500 M:
- DMA 5000 M, DMA HP:
- DMA HP, DMA HPM:
- DMA 35 Ex Petrol:

**Pressure range:**
- DMA 4100 M:
- DMA 4500 M:
- DMA 5000 M:
- DMA HP:
- DMA HPM:

**Accuracy:**
- DMA 4100 M: 0.1 kg/m³
- DMA 4500 M: 0.05 kg/m³
- DMA 5000 M: 0.005 kg/m³
- DMA HP, DMA HPM: 0.1 kg/m³
- DMA 35 Ex Petrol: 1.0 kg/m³
Smart software supports direct display of API quantities

The software of the DMA 4100 M, DMA 4500 M and DMA 5000 M includes the convenient API functions as a standard feature.

![DMA 4500 M display: Results of a fuel sample](image)

The API functions automatically convert the density values of petroleum samples measured at any temperature to density, API gravity or specific gravity at 15 °C, 20 °C or 60 °F for the product groups A, B and D. The API results can immediately be displayed, printed and stored.

Manual filling of highly viscous samples

The Heating Attachment for DMA is designed to be used with the Generation M density meters. It heats the filling adapters allowing easy injection of samples that are normally solid or very viscous at room temperature.

Keeping samples such as heavy oils and crude oils at elevated temperatures means their viscosity is reduced. Easy filling is possible - for the benefit of your application.

![Heating Attachment](image)

Anton Paar density meters meet international standards

The standards ASTM D 4052-09, ASTM D 5002-99, DIN 51757 and DIN ISO EN 12185 describe standard test methods for density determination in the petroleum industry. The instruments DMA 4100 M, DMA 4500 M and DMA 5000 M provide density measurements complying with all standard requirements.

Automation options for convenient sample handling

The Xsample 352 filling and rinsing unit for automatic filling of single samples or the Xsample 452 sample changer for filling samples from a 48 positions magazine can be integrated into a DMA 4100 M, DMA 4500 M or DMA 5000 M. These Xsample models fill the sample under pressure into the DMA M measuring cell and thus are the ideal choice for high viscous and highly volatile samples. After each measurement an automatic cleaning and drying cycle is performed.

![Xsample 452](image)

The API results can immediately be displayed, printed and stored.

Especially for very high viscous samples, Anton Paar offers the heated sample filling units Xsample 352 H and Xsample 452 H. These units decrease the sample viscosity by preheating the sample electrically up to 80 °C.

The built-in sample handling unit Xsample 52 is an option for the DMA 4100 M, DMA 4500 M and DMA 5000 M. The Xsample 52 fills samples with viscosities up to 500 mPa·s and provides for subsequent cleaning and drying.

Easy adjustment

To achieve the highest accuracy, the density and viscosity of the adjustment liquid should be similar to the density and viscosity of the sample.

Air and distilled water are sufficient for most measuring tasks. For extreme conditions (high or low temperatures and pressures) other substances, such as nitrogen or n-undecane, can be used.

The DMA 4100 M, DMA 4500 M and DMA 5000 M software features a density check function that allows you to check the validity of adjustments. A memory function can be activated to remind you that a density check is needed.

Operation according to GLP or ISO quality management systems

Anton Paar digital density meters can be operated according to GLP or ISO quality management systems. For periodical calibrations of the instruments, several standard liquids with NAMAS or DKD certificates are available.

Traceable operation

The DMA 4100 M, DMA 4500 M and DMA 5000 M have an audit trail function and different security levels available that guarantees the traceability of all procedures. The audit trail function electronically documents all operating steps (which may lead to a change in the measuring value) carried out by a user and stores these in a tamper-proof log file.

Quick density measurement in the field using the DMA 35 Ex Petrol

The hand-held density meter DMA 35 Ex Petrol is widely used for quick checks and quality control of petroleum products in the field (filling stations, trucks, ships, containers, etc.).

The special housing is resistant to petrochemicals. The DMA 35 Ex Petrol is certified for use in hazardous areas (ATEX marking: II 2 G Ex ib IIC T4).

Petroleum measurement in process applications

Inline and online petroleum measurement can be performed using Anton Paar DPR density transducers and SPR sound velocity transducers (detailed information upon request).