

# Advanced Lubricant Analysis Solutions

Instrument Portfolio



# Why Accurate Lubricant Testing Is Essential

Precise lubricant testing is essential for minimizing wear, extending equipment life, and ensuring compliance with performance and environmental standards, as well as preventing foaming and oxidation, and optimizing additive packages. Whether you're developing new formulations, certifying base oils, or monitoring in-service fluids, targeted analytical methods provide the insights needed for every step of the lubricant lifecycle.

Modern lubricant testing comprises a range of standardized, application-specific methods designed to characterize essential properties such as viscosity, density, flash point, oxidation stability, and additive health.

Anton Paar supports these requirements with precision instruments tailored to laboratory and industrial needs.

- ✓ Maximize uptime through predictive maintenance
- ✓ Reduce lubricant waste and overhaul costs
- ✓ Detect degradation and contamination early
- ✓ Improve formulation efficiency and safety compliance



# Controlling Flow, Film Strength, and Start-Up Behavior

**What is measured:** Kinematic and dynamic viscosity, temperature-dependent flow behavior, and viscosity index (VI).

**Why it matters:** These parameters govern lubrication film strength, cold-start behavior, pumpability, and shear stability. Reliable viscosity testing ensures correct lubricant classification (e.g., ISO VG, SAE grades) and consistent performance under real-world conditions – from high-speed gearboxes to electrically loaded bearings.

**Application areas:** Gear oils, engine oils, environmentally acceptable lubricants (EALs), hydraulic and transmission fluids, and greases.

**Relevant standards and instruments:** ASTM D7042, ASTM D2270, ASTM D2983 and ASTM D5133.



## Recommended Instruments



**Automatic kinematic viscometer: SVM series**

- Measurement of viscosity, density, viscosity index (VI), API, cloud point, freeze point, and more
- Fully compliant with ASTM D7042, ASTM D4052, and ASTM D2270 (on selected models)
- Fast, solvent-saving workflows with small sample volumes
- Ideal for lubricant formulation, R&D, QC, and condition monitoring



**Rotational viscometer: ViscoQC 300**

- Standard and low-temperature viscosity testing
- Supports ASTM D2983, DIN 51398, and similar methods
- Air-cooled Peltier temperature control
- Suitable for lubricants such as engine oils, gear oils, ATFs, and hydraulic fluids



**Rheometer: MCR series**

- Rheological analysis of non-Newtonian lubricants and greases
- Measurement of yield behavior and shear thinning
- Compatible with tribological and electro-tribological setups
- Ideal for QC and advanced R&D for greases, thickeners, EHL systems
- Supports Stribeck curve and temperature ramp testing

# Verifying Formulation Accuracy and Base Oil Classification

**What is measured:** Fluid density at ambient and extreme temperature and pressure conditions, refractive index, and molecular characteristics such as VGC and carbon-type composition.

**Why it matters:** These measurements ensure the accuracy of base oil formulations. Density and compositional data also support blending operations, quality control, and raw material classification, especially for transformer oils, white oils, and aviation lubricants.

**Application areas:** Base oils, white oils, transformer and insulating fluids, aviation lubricants, and process and specialty oils.

**Relevant standards and instruments:** ASTM D4052, ISO 12185, ASTM D7042, ASTM D2501, ASTM D2502, ASTM D2140, and ASTM D3238.



## Recommended Instruments

↓ Automated sample handling and digital workflows streamline lubricant testing. Anton Paar's modular sample changers (e.g., Xsample 530) and the AP Connect lab execution system integrate seamlessly with laboratory measurement systems and information systems (LIMS), helping ensure data integrity and reducing hands-on time.



### Density meter: DMA series

- High-precision density measurement across wide temperature and pressure ranges
- Chemically resistant cells for use with highly viscous or aggressive fluids
- Compliant with ASTM D4052 and ISO 12185
- Models available for ambient, sub-zero, or high-pressure operation (e.g., DMA 4200 M)



### Combination of kinematic viscometer and refractometer: SVM series + Abbemat series

- Automatic determination of carbon type composition from a single syringe
- Fully compliant with ASTM D2140 and ASTM D3238
- Additional results: Mean molecular mass (ASTM D2502), viscosity-gravity constant (VGC, ASTM D2501), viscosity (ASTM D7042), density (ASTM D4052), refractive index (ASTM D1218), and more
- All parameters are automatically calculated and displayed simultaneously



### Refractometer: Abbemat series

- Standalone refractive index measurement with high thermal stability
- Detects formulation errors, contamination, and batch-to-batch variation
- Used for quality assurance, blend verification, and R&D screening
- Compliant with ASTM and ISO methods

# Predicting Lubricant Aging and Ensuring Safe Handling

**What is measured:** Flash point, fire point, and oxidation stability – including induction time under accelerated thermal and oxygen exposure.

**Why it matters:** Flash point testing is critical for evaluating ignition risk, fuel dilution, and safe handling of fresh and used lubricants. Oxidation stability testing predicts lubricant aging, resistance to thermal degradation, and long-term usability. Together, these methods support lubricant development, quality assurance, and safety compliance.

**Application areas:** Engine oils, hydraulic fluids, gear oils, environmentally acceptable lubricants (EALs), greases, and process oils.

**Relevant standards and instruments:** ISO 2719-A, ASTM D93, ASTM D942, and ASTM D8206.



## Recommended Instruments



**Closed-cup flash point tester:  
PMA 500**

- Fully automated Pensky-Martens flash point testing
- Accurate ignition detection for flammable and semi-volatile lubricants
- Extended igniter lifetime and automatic impurity detection
- Compliant with ISO 2719-A and ASTM D93



**Open-cup flash and fire point tester:  
CLA 5**

- Determines flash and fire points of high-boiling oils and greases
- Temperature range up to 400 °C
- Supports flexible method configuration and safety checks
- Compliant with ASTM D92



**Oxidation stability tester:  
RapidOxy 100**

- Accelerated oxidation testing via RSSOT (ASTM D8206)
- Measures induction time at elevated pressure and temperature
- Ideal for ranking antioxidant performance and formulation benchmarking
- Delivers results up to 20x faster than conventional methods

# Monitoring Lubricant Degradation to Prevent Equipment Failure

**What is measured:** Viscosity changes, oxidation levels, soot content, additive depletion, and contamination markers.

**Why it matters:** In-service oils degrade through mechanical, thermal, and chemical stress. Monitoring viscosity, oxidation, and additive condition helps detect lubricant failure before it affects equipment. These methods support predictive maintenance, extend drain intervals, and reduce unplanned downtime and lubricant waste.

**Application areas:** Engine oils, hydraulic oils, turbine oils, gear oils, used oils from test benches, and fleet and industrial maintenance.

**Relevant standards and instruments:** ASTM D7042, ASTM D2270, ASTM E2412, ASTM D7844, ASTM D7412, and ASTM D7418.



## Recommended Instruments



**FTIR spectrometer:**  
**Lyza 7000 Used Oil Package**

- Measures oxidation, soot, additive depletion, and more
- Supports trending and spectral subtraction methods as per ASTM E2412, D7412, and D7844
- Fast, reagent-free analysis with minimal sample preparation
- Ideal for oil labs, fleet monitoring, and maintenance programs



**Automatic viscometer: SVM 1001**

- Simple, fast oil-condition monitoring
- Measures kinematic viscosity at up to two temperatures between 15 °C and 100 °C
- Magnetic Particle Trap (MPT) for efficient removal of ferromagnetic particles from in-service samples
- High throughput: up to 37 determinations per hour (with MPT)
- Digital results with only 6 mL of sample (with MPT)



**Kinematic viscometer: SVM 2001**

- Multiparameter oil-condition monitoring
- Measures kinematic viscosity and density at any temperature between 15 °C and 100 °C
- Wide viscosity range without changing capillaries
- Upgradable to ASTM D4052 density and viscosity index (VI)
- Optional magnetic particle trap (MPT) and automated sample changers

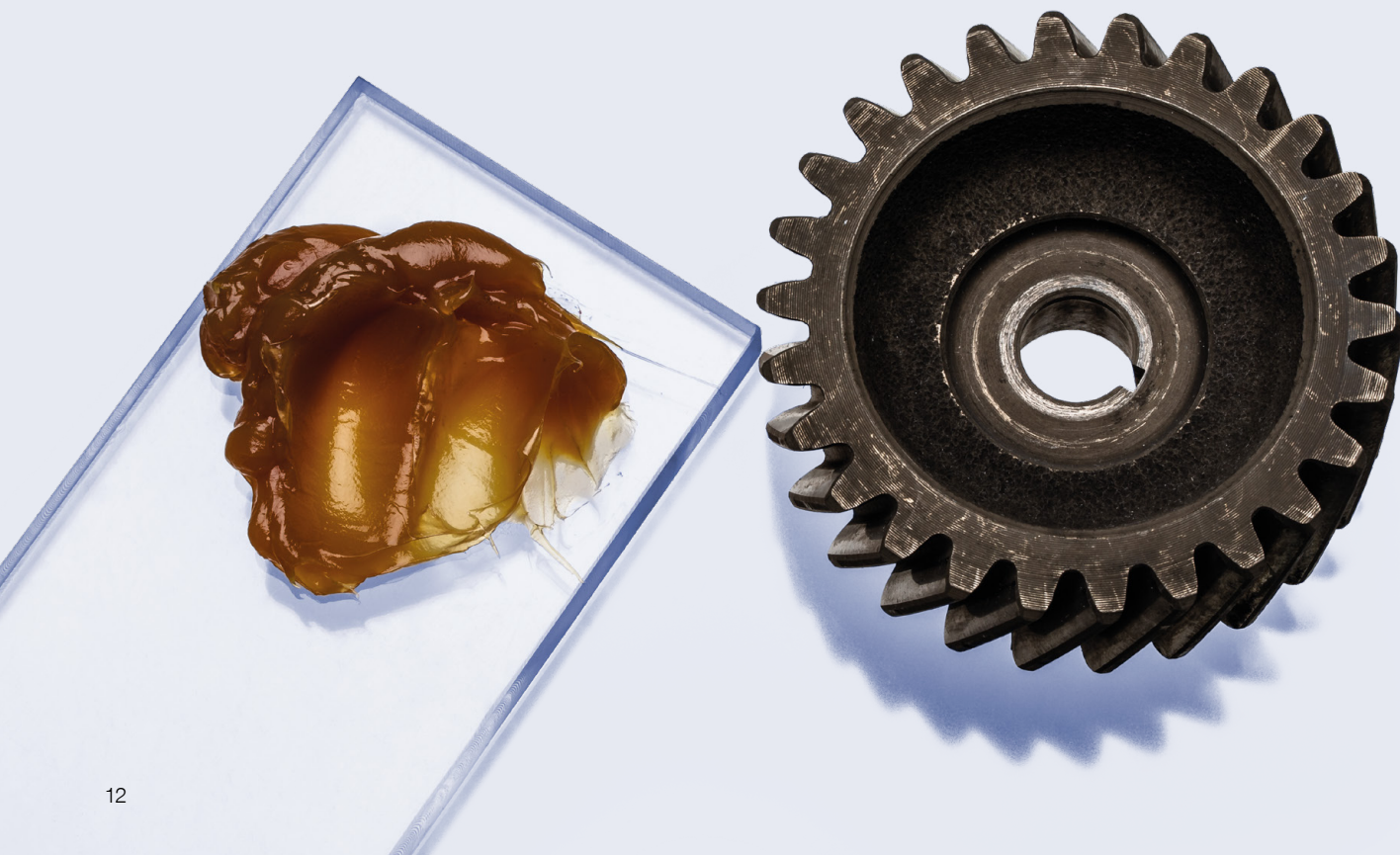
# Assessing Grease Consistency, Flow Behavior, and Structural Uniformity

**What is measured:** Penetration depth (NLGI grade), flow and yield behavior, frictional response, electrical impedance, and true (skeletal) density.

**Why it matters:** Greases must maintain stability under mechanical, thermal, and electrical stress. Testing verifies pumpability, structural resilience, and suitability for high-performance applications – from rolling bearings to e-mobility drives. Consistency and density testing ensure batch uniformity and formulation reliability.

**Application areas:** Bearing and gear greases, e-mobility lubricants, rail applications, and industrial and specialty greases.

**Relevant standards and instruments:** DIN ISO 2137.



## Recommended Instruments



### Penetrometer: PNR 12

- Measures unworked and worked penetration as per DIN ISO 2137
- Supports full-, half-, and quarter-scale cone testing (including NLGI classification)
- Validated through round-robin studies for accuracy and repeatability
- Used in QC, R&D, and batch release across grease grades and thickener types



### Rheometer system: MCR series with tribology add-ons

- Analyzes grease flow curves, yield behavior, and mechanical response
- Add-ons enable Stribeck curve testing, impedance analysis, and voltage breakdown
- Simulates tribological conditions in EV bearings, railway systems, and high-load grease applications
- Supports development of conductive, insulating, and energy-efficient greases



### Gas pycnometer: Ultrapyc 5000

- Determines true (skeletal) density of greases, pastes, and semi-solids
- Detects subtle compositional changes and formulation deviations
- Compact benchtop instrument for routine QC and R&D
- No drying, weighing, or chemical preparation required

# Verifying Additive Content and Securing Precise Lubricant Delivery

**What is measured:** Additive concentration, elemental composition (e.g., Zn, Ca, Fe), and real-time flow and density.

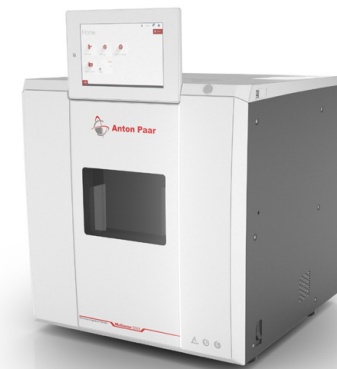
**Why it matters:** Precise additive analysis supports formulation control and early wear detection, while inline flow and density measurements prevent misfills, ensure delivery accuracy, and support traceable custody transfer. These methods safeguard product quality from blending to end-use.

**Application areas:** Oil analysis labs, lubricant blending and distribution terminals, fleet maintenance, condition monitoring, and logistics control.

**Relevant standards and instruments:** ASTM D7777.



## Recommended Instruments



### Microwave digestion system: Multiwave series

- Prepares lubricant and grease samples for ICP elemental analysis
- Compatible with detection of Ca, Zn, Fe, P, and other wear or additive metals
- High-throughput digestion with excellent recovery and reproducibility
- Suitable for QA, failure analysis, and compliance testing in oil labs



### In-line flow and density meter: L-Cor series

- Real-time measurement of mass flow and fluid density during loading/unloading
- Eliminates manual sampling, and reduces contamination risk
- Ensures accurate custody transfer, even with blended or high-viscosity fluids
- ATEX-certified models available for hazardous environments



### Portable density meter: DMA 35 Ex Petrol

- Handheld density and temperature measurement for on-site lubricant checks
- Compliant with ASTM D7777 for portable verification
- Prevents misfills, and confirms product identity during receipt or transfer
- Intrinsically safe (ATEX-certified) for hazardous area use



