

PETROLEUM DENSITY TESTER



Petroleum Density Tester - ToronPDT™ 4052

ToronPDT™ 4052 is a fully automated petroleum density tester based on the U-tube vibrating tube oscillation method, designed and manufactured in compliance with ASTM D4052 and equivalent international standards. By measuring the natural frequency of a U-shaped vibrating tube filled with sample, the instrument directly and accurately determines liquid density without the manual sampling, temperature equilibration, and calculation steps required by traditional methods.

The petroleum density tester integrates automated injection and drainage, Peltier-based dual-chamber temperature control (± 0.05 °C), HD camera video monitoring of the injection process, and an intuitive 7-inch color touchscreen. With a measurement resolution of 0.0001 g/cm^3 , a 2 mL/test sample volume, and results typically available within 3 minutes, the ToronPDT™ 4052 is well-suited for petroleum refineries, petrochemical quality control laboratories, fuel testing facilities, and research institutions requiring reliable, high-throughput liquid density measurement.

APPLICATIONS

Petroleum Density Tester - ToronPDT™ 4052 Applications

- Density measurement of crude oil, refined petroleum products, and fuel blends
- Quality control in petroleum refining, petrochemical processing, and fuel distribution
- API gravity and specific gravity determination for custody transfer and product specification compliance
- Density analysis of lubricating oils, base oils, and hydraulic fluids
- Liquid density determination for acids, bases, and chemically aggressive industrial samples
- Research and development laboratories requiring rapid, precise density characterization of liquids
- Compliance testing for petroleum product specifications per ASTM, EN, and ISO standards



Standards & Compliance

- ASTM D4052: Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

FEATURES

Petroleum Density Tester – ToronPDT™ 4052 Key Features

- 7-inch color touchscreen display for intuitive, user-friendly instrument operation
- Electronic excitation with vibration frequency counting and real-time frequency display for enhanced measurement accuracy
- Micro-sample volume: only 2 mL per test, significantly reducing sample consumption and chemical waste
- Built-in measurement modes with quick selection buttons for diverse testing requirements across multiple sample types
- Rapid analysis: results typically available within 3 minutes for high-throughput quality control workflows
- Peltier dual-chamber temperature control (± 0.05 °C) for precise, stable, and repeatable density measurements at defined reference temperatures
- Corrosion-resistant tubing fabricated from imported materials, compatible with acids, bases, and chemically aggressive sample matrices
- Simple auto-calibration using air and pure water as reference standards; error correction is straightforward and traceable
- Multi-interface connectivity: data export, internal storage (128 groups, ≥ 1000 groups capacity), and direct printing capabilities
- HD camera video monitoring of the injection process for real-time visual verification of sample filling quality
- Fully automatic injection mode (manual-compatible) with automated drainage for safe, clean sample handling

THEORY & METHOD

Theory and Method

The ToronPDT™ 4052 uses the oscillating U-tube (vibrating tube) measurement principle. A hollow U-shaped tube — filled with the liquid sample — is set into oscillation at its natural resonant frequency by an electromagnetic drive. The resonant frequency of the filled tube is a direct function of the combined mass of the tube and sample. Because the tube volume is fixed and precisely known, the density of the sample can be calculated from the measured oscillation frequency using the relationship:

$$\rho = A \cdot T^2 - B$$

where T is the oscillation period and A and B are instrument constants determined during calibration with air and pure water as reference standards.

Temperature is precisely maintained by a Peltier dual-chamber system (±0.05 °C) to ensure measurements are traceable to a defined reference temperature. HD camera monitoring of the injection process verifies complete bubble-free sample filling, a prerequisite for accurate oscillating U-tube measurement.

TECHNICAL SPECIFICATIONS

Petroleum Density Tester - ToronPDT™ 4052 Technical Specifications

Parameter	Specification
Measurement Range	0 - 3.0000 g/cm³
Measurement Resolution	0.0001 g/cm³
Measurement Accuracy	0.0002 g/cm³
Temperature Control Range	5 - 50 °C

Parameter	Specification
Temperature Control Accuracy	0.01 °C
Temperature Stability	±0.05 °C (Peltier dual-chamber)
Sample Volume	2 mL per test
Injection Mode	Fully Automatic (manual compatible)
Injection Observation	HD Camera Video Monitoring
Data Storage	128 groups (expandable to ≥ 1000 groups)
Total Power	≤ 120 W
Main Unit Size (W × D × H)	430 × 350 × 217 mm
Voltage	AC 220 V ± 10%, 50 Hz ± 10% (110V is also available)
Relative Humidity	< 80% RH
Ambient Temperature	5 – 40 °C
Other Notes	No strong vibration, airflow, strong electromagnetic interference, or corrosive gases near instrument



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