

FULLY AUTOMATIC KINEMATIC VISCOSITY TESTER



Fully Automatic Kinematic Viscosity Tester TT-445Z

Fully Automatic Kinematic Viscosity Tester TT-445Z conforms to the ASTM D445 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity).

Fully Automatic Kinematic Viscosity Tester TT-445Z is utilized to measure the viscosity of liquid petroleum products, both transparent and opaque, by determining the time it takes for a volume of liquid to flow under gravity through a calibrated glass capillary viscometer. The dynamic viscosity, η , can be obtained by multiplying the kinematic viscosity, ν , by the density, ρ , of the liquid, under certain constant temperature conditions. This apparatus method covers a range of kinematic viscosities from 0.2 to 300,000 mm²/s at all temperatures.

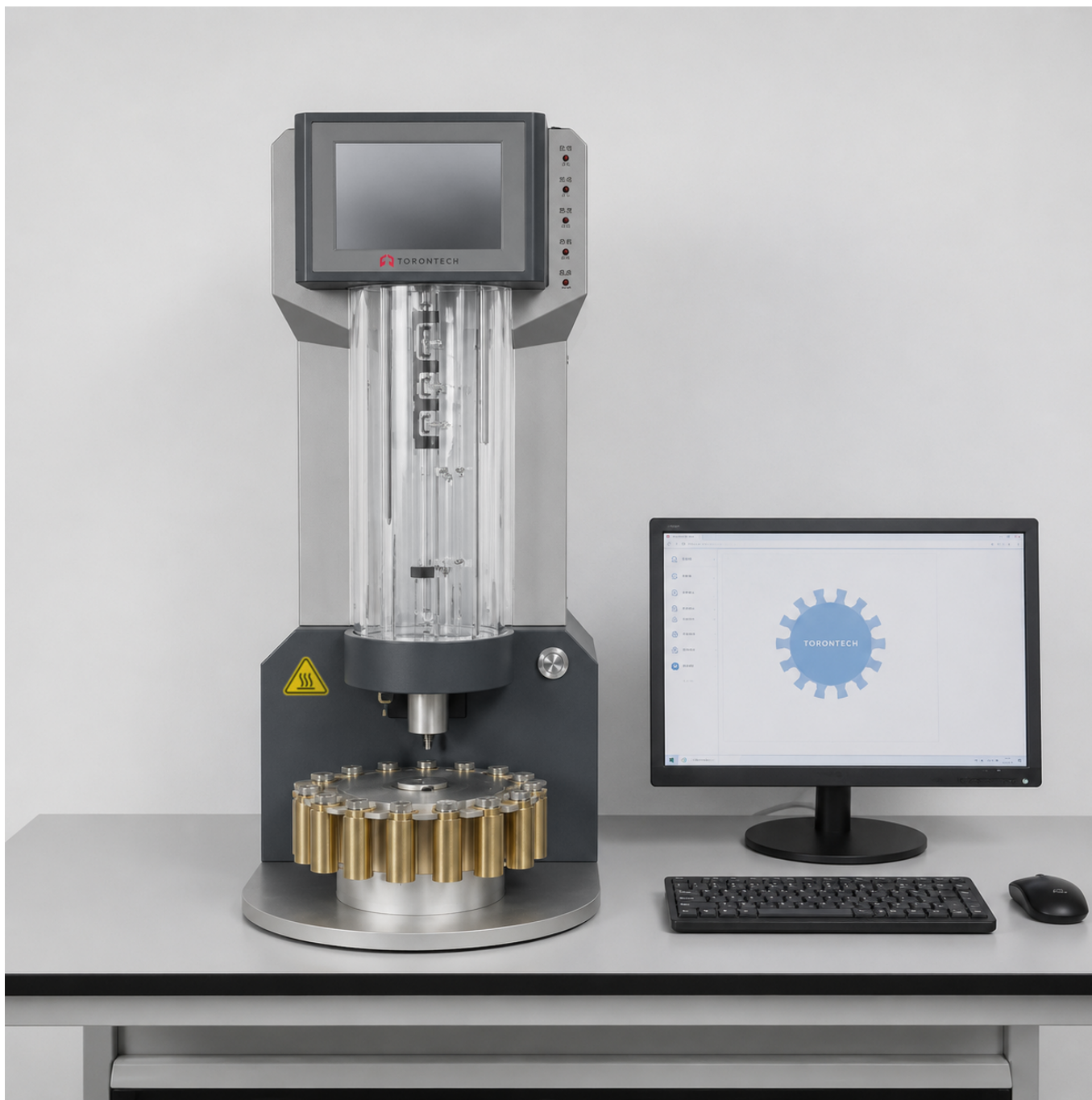
APPLICATIONS

The primary application of the Fully Automatic Kinematic Viscosity Tester TT-445Z is the **fully automated determination of the kinematic viscosity** of a wide range of transparent and opaque liquid petroleum products, in compliance with the **ASTM D445** standard. Designed for high-throughput laboratories, the instrument automates the entire process, from sample injection and preheating to measurement, cleaning, and result calculation. This makes it an important tool for quality control and for verifying that products like fuels and lubricants meet their required viscosity specifications.

Key Industries

- **Lubricant Manufacturing:** Viscosity is the most important property of a lubricant. Manufacturers rely on this automated tester for high-volume quality control of base oils and finished products (e.g., engine oils, hydraulic fluids) to ensure they meet precise viscosity grades (like SAE grades).
- **Petroleum Refining:** Refineries use this instrument for routine quality control on a wide array of products, including fuels (diesel, jet fuel, kerosene) and the base oils that serve as the foundation for lubricants, to certify that they meet commercial and regulatory specifications.

- **Third-Party Testing Laboratories (In-Service Oil Analysis):** These commercial labs provide analytical services to all other industries, and kinematic viscosity is one of the most frequently requested tests. The high level of automation is ideal for processing hundreds of in-service oil samples daily as part of predictive maintenance programs for industrial, automotive, and aerospace clients.



FEATURES

- Equipped with a 16-bit sample tray, capable of continuous operation. Features intelligent preheating, injection, measurement, cleaning, drying, result calculation, and repetitive calculations.
- The apparatus utilizes photoelectric or thermal detection, enabling measurement of both transparent and opaque samples, including Newtonian fluids such as gasoline, diesel, kerosene, cutting fluid, heat-conducting oil, additives, fresh and used lubricating oils, etc.
- Includes a PTC sample intelligent preheating function. The apparatus can automatically control the preheating temperature based on the expected sample temperature.
 - Preheat temperature range: room temperature to 120°C
 - Heating rate: 15°C/min
 - Significantly reduces sample thermostatic time during testing.
- Features a built-in Peltier refrigeration system. It uses thermostatic bath liquid as a cooling medium directly, resulting in fast cooling speed.
- Applies self-adaptive liquid level balance technology, adapting to large-span adjustments of test temperature. It can automatically increase and decrease the thermostatic medium during the heating and cooling process to maintain the same immersion depth.
- The apparatus incorporates a built-in Windows operating system for easy operation and can be connected to LIMS systems and barcode scanners for automatic sample information input.
- The system includes automatic calibration functions for the viscometer constant, temperature, and internal clock timing, and can automatically convert kinematic viscosity into Engler viscosity and calculate viscosity index, among other functions.
- Features both software and hardware overtemperature protection functions, including overtemperature alarm, dry heat protection, insufficient cleaning solution prompt, waste liquid cleaning prompt, and other functions to ensure safe operation.
- Utilizes a double glass bath design, PT1000 high-precision temperature sensor, and double-blade stirrer to maintain stable and accurate thermostatic bath temperature. Temperature precision is 0.005°C.
- Includes an automatic intelligent dual solvent cleaning function, with customizable cleaning modes.

- Equipped with a timing verification port for accurate time verification of the instrument through a standard time calibrator.

THEORY & METHOD

Kinematic viscosity measures how readily a liquid flows under the force of gravity. It is one of the most common quality tests for oils, fuels, and lubricants, because viscosity directly affects how a fluid performs in an engine, a pump, or a process line.

The Capillary Flow Method

The test uses a calibrated glass capillary viscometer held at a precisely controlled temperature in a heated bath. A measured volume of sample is drawn into the viscometer, then released to flow down through the narrow capillary under its own weight. The instrument records the time the liquid takes to flow between two timing marks.

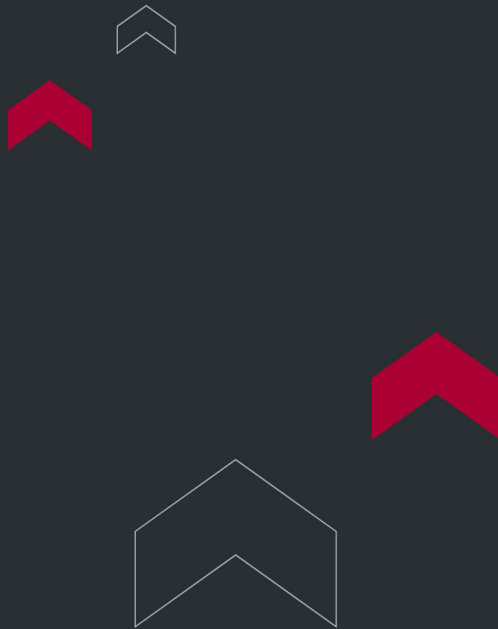
From Flow Time to Viscosity

Each viscometer has a known calibration constant. The kinematic viscosity equals the measured flow time multiplied by that constant, with the result reported in centistokes (mm²/s). Because viscosity changes sharply with temperature, the bath must hold the set temperature within tight limits, which is why temperature control is central to the method. The procedure follows ASTM D445 and ISO 3104, so results stay comparable between laboratories.

TECHNICAL SPECIFICATIONS

Specification	Details
Applicable Standards	ASTM D445, ASTM D446, ISO 3104
Measuring Range	0.3 to 10,000 mm ² /s (100x measuring span per viscometer tube)

Specification	Details
Sample Capacity	16 samples
Bath Volume	3 L
Temperature Control Range	20°C to 100°C (built-in Peltier cooling)
Temperature Control Accuracy	±0.005°C
Timing Accuracy	0.01 s
Repeatability	≤ 0.4%
Total Power	≤ 1000 W
Main Unit Dimensions	400 × 700 × 800 mm
Rated Voltage	AC 220V ±10%, 50Hz ±10% (110V optional)
Operating Environment	Temperature: 10°C to 28°C Relative Humidity: < 80% RH
Operating Conditions	Free from strong vibration, airflow, strong electromagnetic interference, and corrosive gases



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