



Standard Test Method for Measurement of Thermal Stability of Aviation Turbine Fuels under Turbulent Flow Conditions (HiReTS Method)^{1,2}

This standard is issued under the fixed designation D 6811; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers a laboratory thermal process,³ using a specified apparatus for measuring the tendencies of aviation turbine fuels to deposit insoluble materials and decomposition products, such as lacquers, within a fuel system. This test method provides a quantitative result for fuel under turbulent flow conditions in 65 or 125 min.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products⁴

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products⁴

D 4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination⁴

E 128 Test Method for Maximum Pore Diameter and Permeability of Rigid Porous Filters for Laboratory Use⁵

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.14 on Stability and Cleanliness of Liquid Fuels.

Current edition approved June 10, 2002. Published September 2002.

² This test method is being jointly developed with the Institute of Petroleum, where it is designated IP 482.

³ This process is covered by a patent. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to the ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

⁴ *Annual Book of ASTM Standards*, Vol 05.02.

⁵ *Annual Book of ASTM Standards*, Vol 14.04.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *capillary tube, n*—a coated resistively heated stainless steel tube through which fuel is pumped and controlled to give a predefined constant fuel exit temperature.

3.1.2 *deposits, n*—oxidative products, such as lacquers, laid down predominantly at the fuel exit end (hottest), on the inside of the heated capillary tube.

3.1.3 *HiReTS, n*—high Reynolds number thermal stability.

3.1.4 *HiReTS Peak (P) number and Total (T) number, n*—the quantitative results of the test.

3.1.5 *tubeways, n*—plastic and metal tubes through which fuel flows during cleaning and the test.

4. Summary of Test Method

4.1 Fuel is pumped, at pressure, through an electrically heated capillary tube at a constant rate. The heating of the capillary tube is controlled to maintain a constant fuel temperature of $290 \pm 3^\circ\text{C}$ at the exit of the capillary tube. A flow rate of greater than 20 mL/min and the specified capillary bore of less than 0.300 mm ensures that turbulent flow is maintained (see Appendix X1) within the capillary. The formation of lacquers and fuel degradation products act as a thermal insulator between the cooler fuel and hotter capillary tube, resulting in an increase in temperature of the capillary tube which is measured at a number of positions by a contactless pyrometer. The HiReTS Total (T) number is displayed during and at the end of the test. The HiReTS Peak (P) number can be determined from analysis of the results.

5. Significance and Use

5.1 The thermal stresses experienced by aviation fuel in modern jet engines may lead to the formation of undesirable and possibly harmful insoluble materials, such as lacquers, on heat exchangers and control surfaces, that reduce efficiency and require extra maintenance.