



# AEROSPACE RECOMMENDED PRACTICE

ARP6992™

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## Evaluation of Thermal Stability and Corrosivity of Aviation Lubricants

### RATIONALE

Corrosivity and thermal stability are critical performance parameters of an aviation turbine lubricant. AS5780 defines the performance specification limits for corrosivity and thermal stability, but the corresponding reference (FED-STD-791D, Method 3411) is no longer supported by the sanctioning organization. This test method will specify an updated means for determination of corrosivity and thermal stability as called out in AS5780.

#### 1. SCOPE

This test method describes a standardized process to evaluate an aviation lubricant's resistance to thermal degradation and to evaluate the fluid's tendency to corrode a steel specimen. Fluids are evaluated in an environment free of both air and moisture at a specified temperature and for a specified time period.

#### 2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

##### 2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

ARP5088 Test Method for the Determination of Total Acidity in Polyol Ester and Diester Gas Turbine Lubricants by Automatic Potentiometric Titration

AS5780 Specification for Aero and Aero-Derived Gas Turbine Engine Lubricants

##### 2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM D445 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

ASTM G46 Standard Guide for Examination and Evaluation of Pitting Corrosion

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## 2.3 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

FED-STD-791D, Method 3411 Testing Method of Lubricants, Liquid Fuels, and Related Products

## 3. WARNING

The procedures described in this document may involve hazardous materials, operations, and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

## 4. OUTLINE OF METHOD

A steel specimen is weighed and placed into a test cell filled with a specified volume of sample fluid. The test cell is shaken under heat and vacuum to remove the air and moisture present in the system. The cell is then sealed by melting and fusion of the glass. Once the test cell is sealed, it is inserted into a thermostatic bath for a specified period. After the specified period has passed, the test fluid is removed from the cell and evaluated for changes in appearance, viscosity, and total acid number as measures of the thermal stability of the sample. Likewise, the steel specimen is evaluated for appearance and is reweighed to determine the mass loss due to corrosion from the sample.

## 5. APPARATUS

5.1 Borosilicate glass test cell, conforming to the dimensions in Figure 1 or 2 (available from DC Scientific).

NOTE: The test cell in Figure 1 is recommended, as it avoids one of two dangerous glass-cutting steps. These test cells are hereby referred to as Test Cells 1 and 2, respectively.

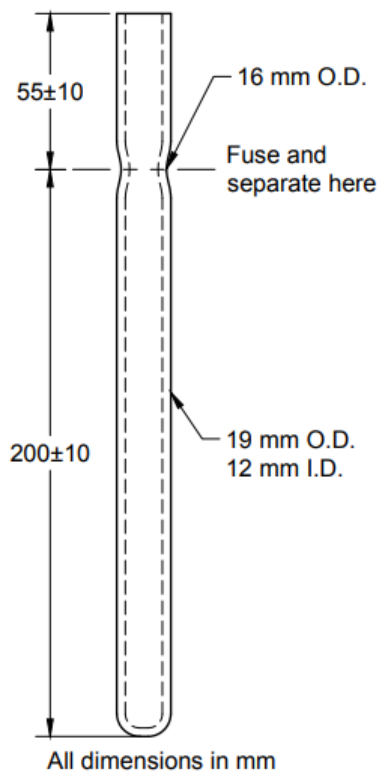


**Figure 1 - Test cell 1 with tapered neck for fusion by melting**

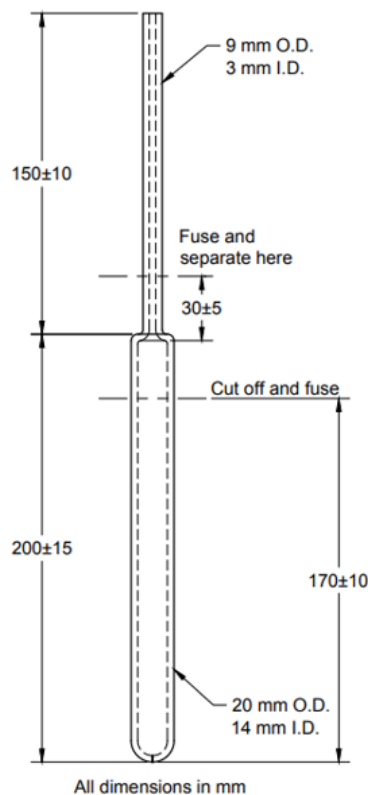


**Figure 2 - Test cell 2 with capillary section for cutting and sealing**

- 5.2 Aluminum heating block, capable of maintaining the test temperature at  $274\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ , with sample wells of dimensions  $21\text{ mm} \pm 1\text{ mm}$  diameter and depth  $220\text{ mm} \pm 10\text{ mm}$ , so that the sealed test cell is completely immersed in the heater.
- 5.2.1 The heater block must also be capable of maintaining a temperature differential between the heater block and the sample of less than  $1\text{ }^{\circ}\text{C}$  during testing.
- 5.3 Vacuum pump, capable of reducing absolute pressure to 1.3 Pa or less.
- 5.4 Vacuum gauge capable of measuring absolute pressure to a precision of 0.1 Torr.
- 5.5 Vacuum hose, static-dissipative silicon rubber, with 0.75 in ID and 1 in OD.
- 5.6 Water bath, capable of maintaining a temperature of  $80\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$  and large enough to contain the test cell.
- 5.6.1 Shaking apparatus, optional.
- 5.7 Laboratory safety shield, safety glass, or wire-reinforced plastic.
- 5.8 Analytical balance, with sensitivity of 0.1 mg.
- 5.9 Jeweler's loupe, 10X magnification.