**Designation: ~~D3240 – 22~~ D3240 – 22a**

# Standard Test Method for Undissolved Water In Aviation Turbine Fuels[1]

This standard is issued under the fixed designation D3240; 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.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

## 1. Scope*

1.1 This test method covers the measurement of undissolved water in aviation turbine fuels in flowing fuel streams without exposing the fuel sample to the atmosphere or to a sample container. The usual range of test readings covers from 1 ppm to 60 ppm of free water. This test method does not detect water dissolved in the fuel, and thus test results for comparable fuel streams can vary with fuel temperature and the degree of water solubility in the fuel.

1.2 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

## 3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *free water, n*—water not dissolved in the fuel.

3.2.2 *Free Water Independent of Pad Reader (FWIPR), n*—a calculated result which provides free water independent of test pad reader used for measurement. FWIPR equations were developed from the 2011 ILS data.[3]

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.J0.05 on Fuel Cleanliness.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1804. Contact ASTM Customer Service at service@astm.org.

***A Summary of Changes section appears at the end of this standard**

## 4. Summary of Test Method

4.1 A measured sample of fuel is passed through as uranine dye-treated filter pad. Undissolved (free) water in the fuel will react with the uranine dye. When the pad is subsequently illuminated by ultraviolet (UV) light, the dye previously contacted by free water will fluoresce a bright yellow with the brightness increasing for increasing amounts of free water in the fuel. The light-illuminated pad is compared to a known standard using a photocell comparator, and the free water in the fuel sample is read out in parts per million by volume. By varying the fuel sample size, the range of the test method can be increased.

## 5. Significance and Use

5.1 Undissolved (free) water in aviation fuel can encourage the growth of microorganisms and subsequent corrosion in the tanks of aircraft and can also lead to icing of filters in the fuel system. Control of free water is exercised in ground fueling equipment by use of filter-coalescers and water separators.

## 6. Apparatus

6.1 *Test Pad Rater (UV Source Device)*—A device[4,5,6,7] for comparing the fluorescence of the test pad to a known standard, while both are illuminated by the same source of UV light, shall be used. The amount of UV light striking the standard shall be modulated until the total fluorescence of the test pad and the standard are equal; this shall be determined using a photocell bridge circuit null indicator. The light modulating device for controlling the UV light striking the standard shall provide a direct reading in parts per million by volume of free water.

6.2 *Test Pad Rater (LED Source Device)*—A device[7,8] for rating the fluorescence of the test pad directly by illumination by a narrow band light source provided by colored LED's. The total fluorescence of the test pad is measured directly using a photo sensitive transistor. The intensity of the fluorescence measurement is converted by the device and shall provide a direct reading in parts per million by volume of free water.



6.3 *Test Pads*—Absorbent filter disks of 25 mm diameter shall be coated on one side with uranine (sodium fluorescein) dye at a concentration of 0.23 mg to 0.29 mg per 25 mm pad. The test pads[5,9] shall be individually packaged in hermetically sealed envelopes or other suitable containers. Fresh, unused test pads shall have an orange color over the dyed surface. Any discoloration, unevenness in dye content, or faded (to a yellow color) appearance shall be cause for rejection.



6.4 *Test Pad Holder*[5,10] and Sampling Line—A test pad holder and sampling line shall be used to draw the fuel sample through the test pad at a rate of 600 mL/min to 800 mL/min. Means shall be provided to flush the test pad sampling line and holder immediately prior to use. The test pad holder shall include an orifice of 1 mm (0.040 in.) diameter upstream of the pad to disperse water droplets in the fuel.

6.5 *Tweezers*—Suitable clean, dry tweezers shall be used at all times when handling the test pad.

6.6 *Blotting Paper*—Clean, dry, absorbent paper towels, blotters, etc., shall be provided for blotting the test pad prior to rating to remove excess fuel. The blotter paper shall neither impart color or stain nor leave any residue on the test pads.

6.7 *Sampling Valve Connection,* designed to meet the following requirements: (*1*) It shall be mounted in the sampling point and

[4] The Aqua-Glo Series II instrument manufactured by Gammon Technical Products, Inc., P.O. Box 400, Manasquan, NJ 08736-0400 was used in the original precision test program (RR:D02-1195). The unit is currently available in a Series V configuration, which is changed only in the power supply. All water content measuring components remain of the same configuration as the Series II instrument. Manufacturers who wish to offer similar products are referred to Committee D02 Equipment Replacement Guidelines.

[5] The sole source of supply of the apparatus known to the committee at this time is Gammon Technical Products Inc., P.O. Box 400, Manasquan, NJ 08736-0400.

[6] The Digital Aqua-Glo (trademarked) instrument is manufactured by Gammon Technical Products, Inc., P.O. Box 400, Manasquan, NJ 08736-0400. At instrument start-up, the display of software version 5.0 indicates that the electronic settings of the prototype units utilized in the 2011 ILS are in use. Because the electronic settings were not optizimed at the time of the 2011 ILS, these units are only permitted to display calculated FWIPR results. Gammon Technical Products is working toward ASTM approval of Digital Aqua-Glo instruments with optimized electronic settings.

[7] If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

[8] The sole source of supply of the LED Source Device JF-WA1 instrument known to the committee at this time is manufactured by D-2 Incorporated, 19 Commerce Park Road, Pocasset, MA 02559. This instrument was used in a precision test program; reference Research Report RR:D02-1712.

[9] Aqua-Glo test pads were used in the Precision Test Program.

[10] A test pad holder was used in the Precision Test Program.