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Standard Test Method for Dryness of Propane (Valve Freeze Method)¹

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1. Scope*

1.1 This test method covers the measurement of the dryness of propane products that do not contain antifreeze agents such as, but not limited to, commercial propane and special duty propane (see Specification [D1835](#)).

1.2 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

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:*²

[D1265 Practice for Sampling Liquefied Petroleum \(LP\) Gases, Manual Method](#)

[D1835 Specification for Liquefied Petroleum \(LP\) Gases](#)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *freeze-off time, n*—the time, in s, for a propane water test valve to freeze under the conditions of this test method.

3.1.2 *propane water test valve, n*—a specific valve designed and manufactured for performing in this test method.

3.1.3 *valve freeze, adj*—relating to the procedure for determining the dryness of propane for this test method.

4. Summary of Test Method

4.1 A liquid-phase sample of the product to be tested is flowed through the propane water test valve to cool the valve body. After cooling, the test valve is partially closed to a small

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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.

preset flow rate and the time required for the valve to freeze, due to water dissolved in the sample and thus interrupt the normal flow, is recorded. Higher dissolved water concentrations will result in shorter freeze-off times. The average observed time for several successive observations is recorded as the observed valve freeze time.

5. Significance and Use

5.1 This test is a functional test in which the water concentration in the product is related to product behavior characteristics in a pressure-reducing system of special design to arrive at a measure of product acceptability in common use applications. Experience has demonstrated that excessive water content (dissolved water) will cause freeze-up difficulties in pressure reducing systems.

6. Interferences

6.1 Antifreeze agents will interfere with this test method and can indicate that the product is drier than it really is. However, the relative freeze-off times of such materials tested by this procedure can be an indication of the tendency of these products to cause freezing in pressure-reducing regulators.

7. Apparatus

7.1 *Propane Water Test Valve*³—A specially constructed and calibrated valve manufactured solely for this test ([Note 1](#)). The valve has two open positions, a wide open position for flushing, and a small preset flow position for testing.

NOTE 1—The propane water test valve is a precision instrument and it should be so treated. It should not be dropped, strained in any way, or disassembled, except to clean the filter in accordance with the manufacturer's instructions. Valves suspected of being defective should be returned to the manufacturer for inspection, reconditioning or recalibration.

7.2 *Stop Watch or Timer*, measuring in seconds.

7.3 *LP Gas Sample Cylinder*, having a minimum capacity of 11 L (3 U.S. gal).

7.4 *Cloth*, dry, clean.

³ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report D02-1423.

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

7.5 *Connection Tubing*, clean pipe or metallic tubing for connecting the propane water test valve to the sample point or sample cylinder. Do not use a rubber hose or plastic-lined hose.

8. Hazards

8.1 The primary hazards of handling propane are fire, explosion, and freezing “burns” due to the autorefrigeration of LP gas as it expands

9. Sampling

9.1 Moisture test measurements on propane samples should be performed by connecting the test valve directly to the bulk supply if possible, rather than on samples taken from the bulk supply, due to the risk of uncontrollable sampling errors that can affect the sensitivity of moisture test measurements. Referee tests should be conducted on the bulk supply.

9.2 If the test cannot be run by connecting the apparatus directly to the bulk propane supply, a sample may be taken into a clean, dry sample cylinder (7.3). In such cases, the sample shall be collected strictly in accordance with directions given in Practice D1265.

10. Procedure

10.1 Sample pressure, at the inlet to the test valve, shall not be more than 100 psi (690 kPa) above the vapor pressure of the product at the sample temperature. When sample source pressure is above this limit, use a liquid propane pressure regulator to hold the pressure, at the inlet to the test valve, within this limit.

10.2 Connect (see 7.5) the propane water test valve to the liquid line of the bulk product source or to the liquid phase connection of the sample cylinder (7.3), so that the body of the valve is horizontal and the outlet opening is aimed vertically upward. The valve shall be positioned so that the internal surfaces of the outlet opening are clearly visible to the operator.

10.3 Open the main valve on the sample source (Note 2) and set the valve on the test apparatus in the purge position. Purge the sample line and the apparatus for 15 s.

10.4 Close the test valve for 2 or 3 s, open it for 2 or 3 s, close it for 2 or 3 s, and continue this intermittent opening and closing until a uniform frost cover has accumulated on the housing around the outlet of the test valve.

10.5 Snap the valve to the test position and simultaneously start the stop watch.

10.6 Stop the watch at the instant the liquid propane ceases to flow through the valve (Note 2).

NOTE 2—The instant liquid propane stops flowing through the valve,

frost will form on the internal surfaces of the valve outlet. The watch shall be stopped at this instant. The operator is forewarned of this instant of stoppage by watching the frost line climb and roll over the lip of the valve outlet.

10.7 Disregard the observed time for the initial freeze-off run. Quickly wipe the test valve outlet threads with a clean, dry cloth.

10.8 Open the test valve to the purge position for about 15 s to ensure the removal of ice from the preset opening.

NOTE 3—Failure to purge the apparatus with the valve open to the purge position for about 15 s between tests will give erroneous results. Purging assures that ice formed in the preset opening in the preceding test will be removed.

10.9 Repeat the operations as described in the trial run (beginning at 10.4) until three successive freeze-off times agree with each other to within ± 2 s.

NOTE 4—For freeze-off times of less than 1 min, this may require as many as seven or eight test runs.

10.9.1 If the freeze-off time on three consecutive test runs is 3 min or greater, the test on the product may be discontinued and the freeze-off time recorded as greater than 3 min.

10.9.2 For freeze-off times shorter than 3 min, record the average time for three consecutive determinations as the freeze-time, to the nearest whole seconds.

11. Report

11.1 If the valve does not freeze off within 60 s, report the result as “pass” in accordance with this test method. If the valve does freeze off within 60 s, report the result as a “fail” in accordance with this test method.

12. Precision and Bias

12.1 In the case of pass–fail data or results from other qualitative tests, no generally accepted method for determining precision or bias is currently available.

NOTE 5—Data from a series of tests conducted in 1967 indicate the following: At moisture levels of 14 and 26 ppm, all valves can be expected to give freeze times over 3 min; at a moisture level of 49 ppm it can be expected that none of the valves will give freeze times over 18 s; at a moisture level of 93 ppm it can be expected that none of the valves will give freeze times over 5 s.

12.2 *Bias*—The procedure in this test method for measuring dryness of propane has no bias because the value of dryness is defined only in terms of this test method.

13. Keywords

13.1 dryness; freeze valve; propane; water

SUMMARY OF CHANGES

Committee D02 has identified the location of selected changes to this standard since the last issue (D2713 – 91 (2001)) that may impact the use of this standard. (Approved Dec. 15, 2007.)

- (1) Revised 1.1, 7.2, and 7.3.
- (2) Added Sections 3, 6, and 8.

- (3) Added 7.5.
- (4) Revised Sections 4, 9, 10, and 11.

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