



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-type products such as, but not limited to, commercial propane (see Specification D 1835).

NOTE 1—This test method is not applicable to propane-type products containing antifreeze agents. However, the relative freeze times of such materials tested by this procedure may be an indication of the tendency of these products to cause freezing in pressure reducing regulators.

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:

- D 1265 Practice for Sampling Liquefied Petroleum (LP) Gases - Manual Method²
- D 1835 Specification for Liquefied Petroleum (LP) Gases²

3. Summary of Test Method

3.1 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 preset flow rate and the time required for the valve to freeze, and thus interrupt the normal flow, is recorded. The average observed time for several successive observations is recorded as the observed freeze time.

4. Significance and Use

4.1 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 applica-

tions. Experience has demonstrated that excessive water content (dissolved water) will cause freeze-up difficulties in pressure reducing systems.

5. Apparatus

5.1 *Propane Water Test Valve*³—A specially constructed and calibrated valve manufactured solely for this test (Note 2). The valve has two open positions, a wide open position for flushing, and a small preset flow position for testing.

NOTE 2—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.

5.2 Stop Watch.

5.3 Sample Cylinder, having a minimum capacity of 11.4 L (3 gal).

5.4 Cloth, dry, clean.

6. Sampling

6.1 The sensitivity of moisture test measurements to uncontrollable sampling errors is such as to warrant conducting all important tests at the propane supply source rather than on samples taken from the bulk supply. Referee tests should be conducted on the bulk supply.

6.2 If the test cannot be run by connecting the apparatus directly to the bulk propane supply, a sample can be taken into a sample cylinder having a minimum capacity of 11.4 L. In such cases, the sample shall be taken strictly in accordance with directions given in Practice D 1265.

7. Procedure

7.1 Connect (Note 3) the propane water test valve to the liquid line of the bulk product source or to the liquid phase connection of the sample cylinder described in 6.2, so that the body of the valve is horizontal and the outlet opening is aimed vertically upward. The valve should be positioned so that the internal surfaces of the outlet opening are clearly visible to the

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² *Annual Book of ASTM Standards*, Vol 05.01.

³ A list of suppliers of LP-Gas freeze valves is available from ASTM as a research report. Request D02-1423.

operator. Open the main valve on the sample source (Note 4) and set the valve on the test apparatus in the purge position. Purge the sample line and the apparatus for 15 s. 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. Snap the valve closed to the test position and simultaneously start the stop watch. Stop the watch at the instant the liquid propane ceases to flow through the valve (Note 4).

NOTE 3—Use only clean, dry pipe or metallic tubing for making this connection. Do not use rubber hose or plastic lined hose.

7.2 Sample pressure, at the inlet to the test valve, must 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 a liquid propane pressure regulator must be used to hold the pressure, at the inlet to the test valve, within this limit.

NOTE 4—The instant liquid propane stops flowing through the valve, frost will form on the internal surfaces of the valve outlet. The watch should be stopped at this instant. The operator is forewarned of this instant of stoppage if he will watch the frost line climb and roll over the lip of the valve outlet.

7.3 Disregard the observed time for the initial freeze-off run. Quickly wipe the test valve outlet threads with a clean, dry cloth. Open the test valve to the purge position for about 15 s to ensure the removal of ice from the preset opening. Repeat the operations as described in the trial run until three successive freeze-off times check each other to within ± 2 s. For freeze-off times of less than 1 min this may require as many as

seven or eight test runs. If the freeze-off time on three consecutive test runs is 3 min or greater, the test on the product can be discontinued and the freeze-off time recorded as greater than 3 min. For freeze-off times shorter than 3 min record the average time for three consecutive determinations as the freeze-time.

NOTE 5—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.

8. Report

8.1 If the valve does not freeze off within 60 s, report the product as “pass.”

9. Precision and Bias

9.1 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 6—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.

9.2 *Bias*—The procedure in Test Method D 2713 for measuring dryness of propane has no bias because the value of dryness is defined only in terms of this test method.

10. Keywords

10.1 dryness; freeze valve; propane; water

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