



## Standard Test Methods for Pressure in Metal Aerosol Containers<sup>1</sup>

This standard is issued under the fixed designation D 3074; 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 These test methods cover the determination of pressure in metal aerosol containers.

1.2 The test methods appear in the following order:

|                          |                    |
|--------------------------|--------------------|
| Can-Piercing Method      | Sections<br>6 to 9 |
| Valve Measurement Method | 10 to 13           |

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 whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

2.1 *ASTM Standards:*

D 996 Terminology of Packaging and Distribution Environments<sup>2</sup>

D 3064 Terminology Relating to Aerosol Products<sup>2</sup>

E 1 Specification for ASTM Thermometers<sup>3</sup>

### 3. Terminology

3.1 General definitions for packaging and distribution environments are found in Terminology D 996.

3.2 General definitions of terms relating to aerosol products are found in Definitions D 3064.

### 4. Summary of Test Methods

4.1 The Can-Piercing Test Method utilizes can-puncturing devices for vapor-phase measurements.

4.2 The Valve Measurement Test Method measures the pressure through the valve, using adapters that are inserted in the valve stem, or form a seal around the top of the stem.

### 5. Significance and Use

5.1 The type of container specified by the Department of Transportation (DOT) for an aerosol product is determined, in part, by the pressure of the product. For many years, the

standard temperature for pressure measurements was 70°F (21°C). In recent years, the temperature was changed from 70 to 130°F (54°C).

5.2 A survey at the time the temperature was changed showed that these two methods for measuring pressures at 130°F (54°C) were in general use. These test methods can also be used for measuring pressures at temperatures other than 130°F (for example, 70°F (21°C)).

5.3 There is little possibility of contaminating the gage with the use of the Can-Piercing Test Method. However, the aerosol container is destroyed. The use of the Valve Measurement Test Method does not destroy the container.

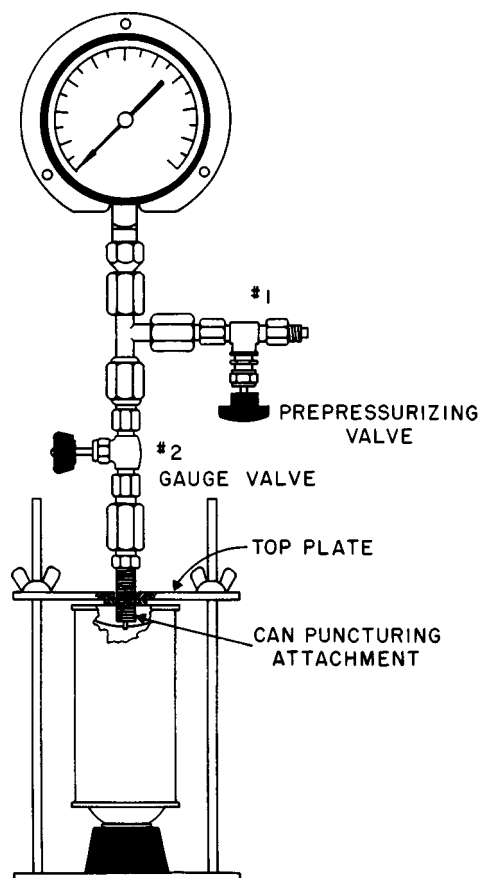


FIG. 1 Can-Piercing Assembly for Vapor Pressure Measurement

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D-10 on Packaging and are the direct responsibility of Subcommittee D10.32 on Consumer Packages. These test methods were originally developed by the Chemical Specialties Manufacturers Assn.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.09.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.03.

## CAN-PIERCING TEST METHOD

### 6. Apparatus

6.1 *Bath*, constant-temperature, automatically controlled, with a maximum temperature variation of not more than  $\pm 0.5^{\circ}\text{F}$  ( $0.25^{\circ}\text{C}$ ). Since temperatures other than  $130^{\circ}\text{F}$  ( $54^{\circ}\text{C}$ ) are often desired, the bath should have an operating range from approximately 60 to  $150^{\circ}\text{F}$  (15 to  $65^{\circ}\text{C}$ ). The bath should be at least 10 in. (254 mm) deep, and of sufficient radius to enable a minimum of three containers to be thermostated simultaneously. A method of stirring should be provided to maintain a uniform temperature throughout the bath.

6.2 *Thermometer*, with  $0.5^{\circ}\text{F}$  ( $0.25^{\circ}\text{C}$ ) graduations. ASTM Thermometer 12°F, in accordance with Specification E 1, has been found satisfactory.

6.3 *Pressure Gage Assembly* (Fig. 1), calibrated, with a range from 0 to 200 psi (0 to 1.4 MPa). Calibration can be carried out with a dead-mass tester, or with another gage of known accuracy reserved for calibration purposes. Since the pressures of most products do not exceed 160 psi (1 MPa) at  $130^{\circ}\text{F}$  ( $54^{\circ}\text{C}$ ), a gage with a range from 0 to 200 psi is generally sufficient. The assembly is equipped with two valves. The prepressurizing valve provides an inlet or outlet for compressed air. The gage valve isolates the aerosol container from the gage assembly until the pressure is measured.

NOTE 1—The gage is prepressurized for several reasons. All aerosols contain air, and prepressurizing the gage avoids loss of air from the container into the gage. Loss of air from the aerosol during the test decreases the pressure in the container and produces erroneous results.

6.4 *Safety Equipment*—Leather gloves and a face shield must be used when handling aerosol containers at  $130^{\circ}\text{F}$  ( $54^{\circ}\text{C}$ ). A safety shield must be placed in front of the bath to protect the operator in case a container ruptures while in the bath.

6.5 *Can-Puncturing Unit* (Fig. 1), that can be easily constructed.<sup>4</sup> The container is held in an inverted position in the framework and punctured through the bottom. The top plate of the framework, which contacts the bottom seam of the container, has a threaded center hole. The puncturing device is screwed through this hole until it contacts and punctures the bottom of the aerosol container.

NOTE 2—Can-piercing units that puncture the side of the container are also available. Gage assemblies with units of this type can also be used for pressure measurements. However, the unit that punctures the bottom of the container was selected because it is satisfactory for both tinplate and aluminum containers. Side-puncturing units are not satisfactory for all aluminum containers. In some cases, the aluminum wall has too much give to permit a leaktight seal with the puncturing unit.

### 7. Materials

7.1 *Inert Gas*, needed for prepressurizing the gage. Nitrogen and compressed air are the most commonly used but, any gas that does not liquefy at the pressures encountered at  $130^{\circ}\text{F}$  ( $54^{\circ}\text{C}$ ) is satisfactory.

7.2 *Stopcock Grease*, silicone.

### 8. Preparation of Apparatus

8.1 Check the gage assembly to make certain that the can-piercing unit is not clogged, by attaching a compressed gas line to the prepressurizing valve and noting whether or not the gas flows through the apparatus.

8.2 Inspect the can-piercing needle to see if it is sharp enough to puncture the container. If not, sharpen the needle with a file.

### 9. Procedure

9.1 Apply a light film of stopcock grease to the bottom of the container, and place the container in the framework in an inverted position. The threaded hole in the top plate should be located as close to the center of the container bottom as possible. Clamp the container securely by tightening down evenly with the wing nuts above the top plate.

9.2 Tighten all of the connections on the gage assembly and close both of the valves. Rotate the gage assembly until the piercing needle punctures the bottom of the container; then tighten it slightly to form a seal with the container.

9.3 Attach the hose from the compressed gas supply to the prepressurizing valve. Carefully open the prepressurizing valve until the gage is pressurized to the expected pressure in the container. This step is to determine whether or not the gage assembly is gas tight.

9.4 Clamp the entire unit in the bath and adjust the water level to slightly above the can bottom. Check the connection between the piercing unit and the container bottom noting if any gas bubbles are escaping at this location.

9.5 Check the gage assembly to determine if the pressure has been maintained. Eliminate any leaks that are present.

9.6 Suspend the thermometer by the side of the container. Place the safety shield in front of the bath, and heat the bath to  $130^{\circ}\text{F}$  ( $54^{\circ}\text{C}$ ).

9.7 When the temperature has remained constant for 30 min, remove the container from the bath (using the leather gloves and face shield) and vigorously shake it six times. Reclamp the unit in the bath for an additional 30 min, and repeat the shaking.

9.8 Reclamp the unit in the bath and check the gage to be certain that it is still prepressurized to the expected pressure in the container.

9.9 Carefully open the gage valve, to a slight crack. Note whether the needle moves up or down; *then immediately close the valve*. The procedure at this point depends upon the direction that the needle moved, as follows:

9.9.1 If the gage needle moved up, indicating a higher container pressure than gage pressure:

9.9.1.1 Increase the pressure in the gage by 5 psi (34 kPa) with the compressed gas.

9.9.1.2 Open the gage valve a slight crack. If the gage needle still moves up, repeat 9.9.1.1 until ultimately the gage pressure becomes higher than the container pressure and the gage needle moves down when the gage valve is open.

9.9.1.3 When this happens, close the gage valve and reduce the gage pressure by 2 psi (13.7 kPa), by venting the excess pressure through the prepressurizing valve.

9.9.1.4 Close the prepressurizing valve and open with the

<sup>4</sup> Similar equipment is available from Builders Sheet Metal Works, Inc., 7640 Gloria Ave., Van Nuys, CA 91406.