



HCPA'S 10TH EDITION **AEROSOL GUIDE**



Innovative Products For **Home. Work. Life.**

10th EDITION AEROSOL GUIDE (2026)

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INTRODUCTION

The methods have been developed by The Household & Commercial Products Association (“HCPA”) as a result of many years of work and validation amongst cross-industry members.

The information contained in this guide should be useful in conducting evaluations to address regulatory requirements and identifying appropriate measurements during the development of and manufacturing of Aerosol Products in various container materials.

The guide features standard definitions, voluntary standard practices, and test methods for the determination of key attributes associated with an aerosol product. This work continues and methods will be developed as needed.

The terminology and voluntary standard practices and methods that follow are intended to raise awareness of key attributes that are unique to aerosol products, to promote a safe and validated means of assessing such attributes. These methods are not all-encompassing but are designed to provide direction useful in development and/or determining root cause analysis, which may potentially impact the finished goods filling process of capping, labeling, conveying, packing and shipping.

As always, new regulations, new techniques, improved equipment, improved materials, further studies, new processes, and revised dimensions may be developed in the future. These may be expected to elaborate, augment, refine, or otherwise change the material that is presented in this section. It is advisable to seek advice from container, suppliers, valve suppliers, contract fillers, recent literature, and/or consultants before adopting the guidelines or other criteria that may be different than those recommended here.

The guide is organized as a PDF Portfolio. Navigate using the Table of Contents on the left-hand tool bar.

LIMITATION OF LIABILITY: THE HCPA DOES NOT WARRANT OR GUARANTEE THAT ADHERENCE TO THE PRACTICES OR METHODOLOGIES PRESENTED HEREIN WILL ENSURE THAT ANY PRODUCT DEVELOPED USING THESE GUIDELINES IS MERCHANTIBLE OR FIT FOR A PARTICULAR PURPOSE. IT IS THE SOLE RESPONSIBILITY OF THE MANUFACTURER OF THE AEROSOL PRODUCT TO ENSURE THAT IT WILL NOT CAUSE INJURY OR DAMAGE TO THE USER, WHILE MEETING APPLICABLE REGULATORY REQUIREMENTS.

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1-piece container A container made entirely from one piece of metal, without welds or seams.

2-piece container A can with double seamed top or bottom section.

3-piece container A container made utilizing a top (dome), body and bottom.

A to D – centerline dimension from the top plane of the valve mounting cup curl to the far end of the dip tube A-D Dimension: A dimension used mainly in the USA and Canada to specify dip tube length of a finished valve to the nearest 1/16 in. (± 1.6 mm); the distance between two parallel planes, one defined by the top surface of the valve cup, the other intersecting the endpoint of the straightened dip tube.

Actuator The button, tip, press-pad or nozzle of a valve. It may be incorporated in a spray dome or spray cap.

Aluminum A lightweight metal often used in can-making in the form of alloys. High purity alloys containing 99.6% or more aluminum are preferred for impact extrusions, but have limited strength.

Bag on valve A type of compartmentalized aerosol dispenser, featuring a composite metal/plastic bag, attached to the valve body.

Bead

- 1.) Circumferential continuous groove around a container body, transverse to the center axis. A bead may be part of a pattern involving multiple beads or bead clusters designed for ergonomic and/or structural advantage.
- 2.) To form or incorporate beads into container bodies during container manufacture.
- 3.) The curl of an aerosol container

Bead profile The depth of a container bead. Container sidewall bead pattern, including: number of beads, distance between beads, and depth of beads.

Black plate Light gauge, low carbon cold reduced steel intended for use in the non-tinned state or for the production of other Tin Mill products.

Body The principal part of a container, usually the largest and widest part of the container.

Bottom component Bottom – The end unit or base segment used for the bottom section of a can.

Brimful capacity Approximately 3 mL less than that of the capacity of the container.

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Buckle A pressure relief feature where the material deforms as a result of internal pressure.

Burst 1.) A container breaking suddenly and violently apart as a result of impact or internal pressure.

2.) A catastrophic rupture or failure as a result of internal pressure.

Button placer A machine that places the valve actuator onto the aerosol valve after the propellant has been added to the aerosol container.

Capillary dip tube A dip tube where the inside diameter generally does not exceed 0.060 in. (1.5 mm). It may be selected for metering purposes, or to minimize possible product stratification effects.

Capper A machine designed to semi-automatically or automatically apply caps to aerosol containers during the packaging process.

Checkweigher A machine that checks the weight of the commodity after filling.

Clinch The result of inwardly compressing the metal skirt of a valve ferrule to undertuck it to the top flange finish of aerosol containers.

Clinch Height The distance from the horizontal plane of the top of the valve cup to the underside of the clinched area between the collet segments.

Cold filling A production process where the liquid propellant is added to aerosol dispensers under very cold conditions.

Compressed Gas: a substance or mixture of substances that is a gas at normal room temperature and pressure, and is stored under pressure in a container. Compressed gases include both permanent gases and liquefied compressed gases.

Compressed gas Permanent Gas: a gas or mixture of gases which container not be liquefied except at extremely low temperatures (i.e., cryogenic temperatures). Permanent gases include air and nitrogen. In aerosol applications a permanent gas will exist in the aerosol container in a gaseous state only.

Liquefied compressed gas: a gas or mixture of gases which can be liquefied at normal room temperature. Liquefied compressed gases include HFCs like HFC-152a and HFOs like HFO-1234zeE. In aerosol applications, a liquefied compressed gas exists in the aerosol container in both the liquid and the gaseous state.

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Corrosion The deterioration of a metal, rubber, plastic or other material by exposure to the product or environment.

Crimp The seal or method of seal, between the valve cup and one-inch (25.4 mm) curl.

Crimp chives An uncommon term for crimping collet segments or tines.

Crimp depth The distance from the horizontal plane of the crown of the valve cup to the plain of maximum crimp diameter.

Crimp gauge A dial micrometer, attached to a fitment capable of measuring crimp depth, crimp diameter, or both, and very frequently used as a setting and control instrument in can sealing operations.

Crimp height The distance from the top of the container curl to the center of a ball of radius R_2 that touches the inside of the container dome tangent to the dome at the point of hard contact.

Crimp segments Refers to the portion of the mounting cup deformed by the crimping collet. Crimping collets are produced from multiple segments, typically six or more, that deforms the metal of an aerosol valve to produce the hermetic seal between the valve and container. The area of the valve mounting cup that is deformed by a crimp collet segment is referred to as the crimp segment.

Crimper A machine that crimps the aerosol valve to the container.

Cylinder The body, particularly of a C/CO or steel aerosol can. The body of an aluminum can, as it is formed in the impact extrusion process, or also after trimming. The pressure loading section of an aerosol propellant gasser, into which the piston is fitted for metering purposes.

De-tinning Dissolution of free tin from tin plate steel exposing darker plate underneath due to exposure to the product or environment.

Dip tube A length of slightly curved plastic tubing, extending from the lowest portion of the valve to typically the bottom of the container, and used to transfer liquid product into the valve.

DOT Specification 2N Can A can having no minimum wall thickness, no required markings, but capable of withstanding 140 psig without buckling and 210 psig without bursting.

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DOT Specification 2P Can	A can having a minimum thickness of 0.007" (0.178mm), marked "DOT 2P", and capable of withstanding a pressure of 160 psig (11.2 kg/cm ²) without buckling and a pressure of 240 psig (16.8 kg/cm ²) without bursting.
DOT Specification 2Q Can	A can having a minimum thickness of 0.008" (0.203mm), marked "DOT 2Q", and capable of withstanding a pressure of 180 psig (12.6 kg/cm ²) without buckling, and a pressure of 270 psig (18.9 kg/cm ²) without bursting.
Double reduced	A product which is given a partial cold reduction to reach an intermediate gauge then annealed and given another cold reduction to final thickness. Resulting product is stiffer, harder and stronger than single reduced steel.
Double seam	The ring-shaped interlocking area where the top and/or bottom are attached to the body of a two or three-piece aerosol can.
ECCS – Electrolytically chromium coated steel	Light-gauge, low-carbon, cold-reduced steel on which chromium and oxides have been electro-deposited. Also known as TFS – Tin Free Steel
Eco-gorge	A shoulder notch with rimmed component.
ECS – Electrolytically coated steel	Means the process of coating steel plate by passing through a tank of tin anodes, where electricity is used to electroplate tin onto the steel. Also known as ETP – Electrolytical Tinplated Steel
Emulsion	A colloidal dispersion of one liquid in another.
FBOC – from bottom of cup	A measure of dip tube length, as used in Western Europe. It is derived from the phrase, "from bottom of cup" (i.e., mounting cup) and is a measurement of diptube length from bottom of mounting cup to bottom of diptube. It is different than the "A-D Dimension", used in the USA and Canada for one-inch nominal (25.4 mm) valves.
Female valve	A form of vertical valve where the stem and actuator are of one-piece construction, plus insert, for some valves. The pedestal opening leads to a hole, into which the stem section is inserted during final assembly.
Ferrule	An aluminum, cup-like form, having a diameter from approximately 13 to 27 mm and a skirt of varying dimensions but approximating 6 mm, used to connect the components of a tube or container valve to the container by a clinching operation. May be plain, silver anodized or gold anodized. Sometimes produced in soft steel.

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Fill volume	1.) The volume to be filled in production that meets local regulatory selling criteria.
	2.) The amount of space inside a container for a given amount of product. The normal volume (usually measured in ccs, mls, ounces, or grams) of a container, published in standard sizes used by industry. When a container is filled to standard capacity, the contents usually fill it up to its shoulder area.
	3.) The volume to be filled in production that meets local regulatory selling criteria.
Flammable	Capable of being easily ignited.
Gasser	A machine used to inject propellant into aerosol dispensers. Injection may be through the aerosol valve, around the aerosol valve, or through a bottom orifice that is then plugged.
Hook	The essentially 180° bend of container body and container end-section during formation of the double seam; with the bent areas known as the body hook and cover hook, respectively.
Hydrocarbon	Any chemical compound consisting solely of carbon and hydrogen atoms.
Hydrocarbon Blends	“A” Blends are mixtures of propane and isobutane with pressure between 32-110 psig at 70°F. “AB” (or “B”) Blends are mixtures of propane and n-butane with pressure between 18 – 110 psig at 70°F. “AP” (or “NIP”) Blends are mixtures of propane, isobutane and n-butane with pressure between 18 – 109 psig at 70°F. All blends are named by the specific type of blend followed by the pressure (in psig) at 70°F.
Hydrofluorocarbon (HFC)	A class of normally gaseous, flammable or nonflammable aerosol propellants, containing carbon, hydrogen and fluorine atoms. For example, see HFC-152a (1,1-difluoroethane)
Hydrofluoroolefin (HFO)	A class of normally gaseous, flammable or nonflammable aerosol propellants that are an alkene (also known as an olefin), containing carbon, hydrogen and fluorine atoms. For example, see HFO-1234ze (1,3,3,3-tetrafluoroprop-1-ene)
Ignition distance test	A standard flammability test, designed to determine the greatest distance at which an aerosol spray can cause the propagation of a small gas burner flame.
Impact extrusion	The impact shaping of metal slugs into cylinders as one of the initial steps in one or two piece can-making.
Insert	A small disc or cup, containing the terminal orifice and any channels, which is forcefully inserted into valve actuators.

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Insert orifice	The hole on the insert.
Inside Diameter (Curl)	The inner diameter of the one-inch (25.4mm) opening
Lacquer	Organic materials applied to the interior and/or exterior of the can for protection purposes.
Laminated cup	A valve cup that is laminated while the metal is in the flat, using a elastomeric material, which is bonded to the metal. The cup is then formed. The elastomeric material acts as both the sealing material and as a coating or lining, to protect the underlying metal.
Male valve	A valve having a stem, permanently affixed within the valve body.
Maximum Incremental Reactivity (MIR)	The estimated amount of tropospheric ozone formed in ambient air due to photochemical reactions from emission of a given amount of a volatile organic compound (VOC) in ambient atmospheric conditions most sensitive to VOCs.
MBU or mechanical break up unit	An actuator design used to form a spray by mechanical swirling action. Straight taper, reverse taper and regular taper modifications of the terminal orifice provide additional variations of the spray.
Metered dose	A fixed volume of product that is sprayed upon activation.
Metering valve	A valve used to emit a fixed volume of product per actuation usually on the down-stroke.
Mounting cup	Steel – A die-formed structure, produced from electro-tinplated (ETP) steel, which is often coated, lined or laminated with suitable polymers and then used to mount other valve components and also provide an hermetic seal to the opening of aerosol containers. Aluminum – A die-formed valve component, often lined and coated with epoxy or other cured polymers, and used to mount other valve components and provide an hermetic attachment to the opening of aerosol containers. Usually produced from soft Alloy No. 3004 or 5052 aluminum.
Nominal volume	The target volume for a given specification.
Outside Diameter	The maximum diameter of the body of the can, as measured outside the wall of the can
Outside Diameter (Curl)	The outer diameter of the one-inch (25.4mm) opening

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Particle	A small, localized object which can be attributed to several physical or chemicals properties such as volume, density or mass.
Particle size	The actual or aerodynamic diameter of an aerosol particle, or the mean diameter of a distribution of particles. Usually expressed in microns.
PE Sleeve	A close-fitting tube of polyethylene, covering most of the outer wall, up to the peak of the inner rim arch, and acting as a cup gasket.
Pedestal	The protrusion of metal in the center of a valve cup, which surrounds the valve body, spring and lower portion of the valve stem. The "male" cup has an axial hole in the top, through which the shank of the valve stem projects or is inserted. The "female" cup is where the axial orifice accommodates the shank of the actuator.
Pressure	Force exerted by a substance or mixture per unit area of a container. The common unit in the U.S. is psig.
Pressure filling	Pressure loading of propellant, such as through the valve and into the aerosol dispenser.
Pressure tester	A measuring instrument, referred to as a gauge, often containing a graduated dial or barrel, measuring the net force above atmospheric pressure exerted per unit surface by an aerosol product.
Reverse taper	The profile of an orifice (usually referring to an actuator exit orifice) that decreases in diameter in the direction of the product stream.
Sealing Compound	An organic elastomeric material used to provide a hermetic seal between two opposed metal surfaces. Used on body and end-components.
Seaming	The formation of a side seam, double seam, or composite double seam by mechanical operations or welding in body makers, double seamers and top or bottom seam.
Shoulder	The upper area of an aerosol container, especially the rounded sections of the container.
Single reduced	Steel that is cold rolled to the final thickness.
Skirt length	The vertical length, measured from the top edge of the ferrule, or the top rim of the mounting cup, to the cut edge.
Spray	The collective term for an emission of small liquid or liquid/solid particles from an aerosol or other dispenser.

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Spray through cap

A functional cap that allows for product usage while the cap is on the container. A plastic fitment incorporating the actuator and protective cap in the same unit. The actuator is normally recessed in the cap structure to prevent possible damage or actuation if the dispenser is dropped.

Spring

The open coil, sealed-end spring, common in most aerosol valves, exceptions being rubber toggle-action valves and plastic-cone alternatives. Spring metal is almost always stainless steel.

Stem

The tubular valve component connecting the valve body and stem gasket to the actuator.

Stem orifice or IMO (internal metering orifice)

The round or rectangular orifice found near the bottom of male valve stems, and at the extreme bottom of female valve stems. Multiple stem orifices are sometimes used to get high delivery rates or for other purposes.

Stem seat

A valve component located at the base of the actuator stem, in the case of female valves. Supported by the spring, it converts the stem slots into orifices, that produces the hermetic seal when the valve is at rest.

Swage

A British term for crimping

Temper

A process of heating metal materials to reduce any temper due to work-hardening or rapid cooling, thus facilitating the impact extrusion process that follows.

Under-the-cup filling

The trade name for a popular vacuum-gasser-crimper in the U.S.A. and which adds liquid propellant to aerosol containers around the slightly lifted valve cup. This type of filling also crimps the valve cup to the container at the end of the filling sequence.

Valve Body

The housing component of a valve; the valve component by which valve components are staked to the mounting cup.

Vapor phase

The space above the liquid content of an aerosol dispenser.

Vapor phase tap

An orifice bored laterally or vertically through the wall of the valve body, for the purpose of blending the head space gas with the liquid stream, as they meet within the valve chamber during actuation.

Vapor pressure

The pressure exerted by a vapor in thermodynamic equilibrium with its condensed phases at a given temperature within a closed system.

Viscosity

The resistance experienced by one portion of a fluid in moving over another portion.

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Volatile Organic Compound (VOC)

Any compound containing carbon with a measurable vapor pressure that participates in photochemical reactions faster than ethane.

Wall thickness

The thickness of the wall metal.

Water bath

A large piece of equipment used to heat aerosol containers until the internal pressure is at least equal to the 130°F pressure of the contents, while allowing for leakage and permanent distortion checks and providing a rinsing action for most spilled contents.

Weld or side seam

Side seam - An overlap or folded joint in a can.

1. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

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1. PURPOSE

- 1.1. In the interests of uniformity and quality, the aerosol industry has developed dimensional guidelines, which are suggested for U.S.A. three-piece steel and tinplate aerosol cans of straight-wall and necked-in design. Domestic can makers uniformly agreed to comply with these guidelines and were instrumental in their development. A series of standard methods and gauges were also developed to uniformly determine specific dimensions. The tolerances established for these dimensions allow for can manufacturing and filling process variations.
- 1.2. Tables 1 and 2 present the Sales Code Diameter and Height of straight-wall and necked-in three-piece aerosol cans. The figures in parentheses are in metric format, they are based on International
- 1.3. Organization for Standardization (ISO) inside diameters to the nearest whole millimeter. Can heights are based on heights over the doubleseam (HCPA dimension "D") converted to the nearest whole millimeter.

2. APPARATUS

- 2.1. Height gauge
- 2.2. Caliper
- 2.3. Depth gauge
- 2.4. Plug gauge
- 2.5. Optical Comparator, CMM, Laser or equivalent, for non-destructive, electronic measuring
- 2.6. Cutting tool-used for cutting samples

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers randomly selected from beginning, middle and end of run

4. PROCEDURE

- 4.1. Mark the samples for recording identification.
- 4.2. Measure desired dimensions using the appropriate means to yield most accurate measuring.
- 4.3. Record data for each sample and analyze.
- 4.4. Specific dimensions used in these guidelines are described below and correspond to those associated with the cross-sectional drawings of straight-wall and necked-in aerosol cans (Figure 1 and 2, respectively).

Dimension	Definition	Dimension	Definition
A	Inside diameter of the 1-inch (25.4mm) opening.	L*	Width of the countersink at the maximum snap-lock diameter.
B	Outside diameter of the 1-inch (25.4mm) opening.	M*	Snap-lock undertuck.
C	Distance from the top of the curl of the 1-inch (25.4mm) opening to the top of the double seam.	N*	Outside diameter of the snap-lock.
D	Distance from the top of the top double seam to the bottom of the bottom double seam.	P*	Snap-lock wall length, as measured vertically from the maximum snap-lock

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			diameter to the point of maximum undertuck.
E	Distance from the top of the curl of the 1-inch (25.4 mm) opening to the bottom of the bottom double seam.	S	The average of three measurements taken at 60°±10°, 180°±10°, and 300°±10° from the side seam, each representing the vertical distance tangent to the top double seam, from the top of the double seam to the adjacent necked-in area of the can sidewall.
F	Distance between the bottom of the top double seam and the top of the bottom double seam.	T	Width or height of the double seam.
HF	Vertical distance between the plane defined by the top of the curl around the one-inch opening and any point on the dust shelf where its diameter is 1.285in (32.64mm). Dust shelf height.	V*	Body outside diameter of the neck-in can.
G	Curl thickness of the 1-inch (25.4 mm) opening measured using the special micrometer.	W	Top neck angle of the body wall.
J*	Vertical distance from the maximum snap-lock diameter to the bottom of the countersink.	X	Vertical distance from the top of the top doubleseam to the intersection of the can dome with a cylinder 1.375 in. (34.9mm) in diameter concentric to the 1-inch (25.4mm) opening.
K	Outside diameter of the top double seam (excluding crossover).		

*Method of measurement denoted to be agreed upon between supplier and interested party, if needed.

4.5. The following tables provide guideline dimensions for straight-wall and necked-in three-piece aerosol cans (alternate tables furnish metric equivalents).

4.6. Various container heights (D, E, & F) are based on the examples below: A typical 211X413 aerosol can has a Sales Code height of 413, or 4 13/16in, which converted to its decimal equivalent, is 4.812in. However, Dimension "D" is derived by subtracting 0.020in from the decimal conversion of the Sales Code height:

"D" = 4.812in - 0.020in = 4.792in Dimension

"E" is obtained by adding the "C" Dimension to the "D" Dimension. The "C" Dimension is found in tables 3 through 6, depending on end diameter and unit of measure.

"E" = "C" + "D" = 0.798in + 4.792in = 5.590in

4.7. In all tables, the guidelines refer to Figures 1 and 2, which illustrate the dimensions. Tables 3 and 4 give straight-wall aerosol can height and curl dimensions. Tables 5 and 6 give comparable information for necked-in aerosol cans.

4.8. Overcap Fit Dimensions

4.8.1. Table 7 provides the dimensions of top end and body, which are critical for overcap fit.

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4.9. Vacuum/Propellant machine seal height or “X” dimension

4.9.1. Table 8 provides the dimensional guideline.

TABLE 1. Sales Code Height for Various Diameters of Straight-Wall Aerosol Cans (metric equivalent)

202(52mm) X	200 (46)	214 (73)	314 (98)	406 (111)	505 (134)	509 (141)	605 (159)
	700 (177)	708 (190)					
211 (65mm) X	315 (100)	413 (122)	604 (158)	610 (168)	612 (171)	710 (193)	713 (198)
	908 (241)						
300 (73mm) X	709 (192)	714 (200)					

Table 2. Sales Code Height for Various Diameters of Necked-In Aerosol Cans (metric equivalent)

111/112(45mm) X	214 (73)	312 (95)	410 (117)	508 (139)	608 (165)		
200/202(52mm) X	214 (73)	306 (86)	314 (98)	406 (111)	509 (141)	514 (149)	605 (161)
	700 (177)	708 (190)					
202/205(57mm) X	410 (117)	604 (158)	607.5 (164)	608 (165)	701 (179)	704 (184)	710 (193)
	802 (206)	803 (207)	900 (228)	903 (233)			
207.5/211(65mm) X	315 (100)	413 (122)	512 (146)	604 (158)	612 (171)	713 (198)	804 (209)
	1113 (299)						
211/214 (70mm) X	315 (100)	413 (122)	714 (200)	804 (209)	1006 (263)		

Table 3. Straight-Wall Aerosol Cans Guideline Dimensions (inches)

Nominal Can Size	"A" ±0.004	"B" ±0.010	"C" ±0.016	"D" ±0.031	"E" ±0.035	"F" (MIN.)	"G" ±0.007
202x200	1.000	1.221	0.396	1.980	2.376	2.096	0.130
202x214	1.000	1.221	0.396	2.855	3.251	2.575	0.130
202x314	1.000	1.221	0.396	3.855	4.251	3.575	0.130
202x406	1.000	1.221	0.396	4.355	4.751	4.075	0.130
202x505	1.000	1.221	0.396	5.293	5.689	5.013	0.130
202x509	1.000	1.221	0.396	5.542	5.938	5.262	0.130
202x605	1.000	1.221	0.396	6.293	6.689	6.013	0.130
202x700	1.000	1.221	0.396	6.980	7.376	6.700	0.130
202x708	1.000	1.221	0.396	7.480	7.876	7.200	0.130
211x315	1.000	1.221	0.798	3.918	4.716	3.368	0.130
211x413	1.000	1.221	0.798	4.792	5.590	4.512	0.130
211x604	1.000	1.221	0.798	6.230	7.028	5.950	0.130
211x610	1.000	1.221	0.798	6.605	7.403	6.325	0.130
211x612	1.000	1.221	0.798	6.730	7.528	6.450	0.130
211x710	1.000	1.221	0.798	7.605	8.403	7.325	0.130
211x713	1.000	1.221	0.798	7.792	8.590	7.512	0.130
211x908	1.000	1.221	0.798	9.480	10.278	9.200	0.130
211x315	1.000	1.221	0.798	3.918	4.716	3.368	0.130

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Nominal Can Size	"A" ±0.004	"B" ±0.010	"C" ±0.016	"D" ±0.031	"E" ±0.035	"F" (MIN.)	"G" ±0.007
300x709	1.000	1.221	0.798	7.542	8.340	7.260	0.130
300x714	1.000	1.221	0.798	7.855	8.653	7.575	0.130

Table 4. Straight-Wall Aerosol Cans Guideline Dimensions (millimeters)

Nominal Can Size	"A" ±0.10	"B" ±0.25	"C" ±0.41	"D" ±0.79	"E" ±0.89	"F" (MIN.)	"G" ±0.18
52x46	25.40	31.01	10.06	50.29	60.35	53.24	3.30
52x73	25.40	31.01	10.06	72.52	82.58	65.41	3.30
52x98	25.40	31.01	10.06	97.92	107.98	90.81	3.30
52x111	25.40	31.01	10.06	110.62	120.68	103.51	3.30
52x134	25.40	31.01	10.06	134.43	144.49	127.32	3.30
52x141	25.40	31.01	10.06	140.78	150.84	133.67	3.30
52x159	25.40	31.01	10.06	159.84	169.90	152.73	3.30
52x177	25.40	31.01	10.06	177.29	187.35	170.18	3.30
52x190	25.40	31.01	10.06	189.99	200.05	182.88	3.30
65x100	25.40	31.01	20.27	99.51	119.79	85.55	3.30
65x122	25.40	31.01	20.27	121.72	141.99	114.62	3.30
65x158	25.40	31.01	20.27	158.24	178.51	151.13	3.30
65x168	25.40	31.01	20.27	167.77	188.04	160.66	3.30
65x171	25.40	31.01	20.27	170.94	191.21	163.83	3.30
65x193	25.40	31.01	20.27	193.17	213.44	186.06	3.30
65x198	25.40	31.01	20.27	197.93	218.20	190.82	3.30
65x241	25.40	31.01	20.27	240.79	261.06	233.68	3.30
73x192	25.40	31.01	20.27	191.58	211.85	184.47	3.30
73x200	25.40	31.01	20.27	199.52	219.79	192.41	3.30

Table 5. Necked-In Aerosol Cans Guideline Dimensions (inches)

Nominal Can Size	"A" ±0.004	"B" ±0.010	"C" ±0.016	"D" ±0.031	"E" ±0.035	"F" (MIN.)	"G" ±0.007
111/112 X							
214*	1.000	1.221	0.225	2.855	3.080	2.575	0.130
312*	1.000	1.221	0.225	3.730	3.955	3.450	0.130
410*	1.000	1.221	0.225	4.604	4.830	4.325	0.130
508*	1.000	1.221	0.225	5.480	5.705	5.200	0.130
608*	1.000	1.221	0.225	6.480	6.705	6.200	0.130
200/202 X							
214	1.000	1.221	0.370	2.855	3.225	2.575	0.130
306*	1.000	1.221	0.370	3.355	3.725	3.075	0.130
314*	1.000	1.221	0.370	3.855	4.225	3.575	0.130
406*	1.000	1.221	0.370	4.355	4.725	4.075	0.130

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Nominal Can Size	"A" ±0.004	"B" ±0.010	"C" ±0.016	"D" ±0.031	"E" ±0.035	"F" (MIN.)	"G" ±0.007
200/202 X							
509*	1.000	1.221	0.370	5.542	5.912	5.262	0.130
514*	1.000	1.221	0.370	5.855	6.225	5.575	0.130
605*	1.000	1.221	0.370	6.293	6.663	6.013	0.130
700*	1.000	1.221	0.370	6.980	7.350	6.700	0.130
708*	1.000	1.221	0.370	7.480	7.850	7.200	0.130
202/205 X							
410	1.000	1.221	0.396	4.605	5.001	4.325	0.130
604*	1.000	1.221	0.396	6.230	6.626	5.948	0.130
607.5	1.000	1.221	0.396	6.449	6.845	6.169	0.130
608	1.000	1.221	0.396	6.480	6.876	6.200	0.130
701	1.000	1.221	0.396	7.043	7.439	6.763	0.130
704	1.000	1.221	0.396	7.230	7.626	6.948	0.130
710	1.000	1.221	0.396	7.605	8.003	7.325	0.130
802	1.000	1.221	0.396	8.105	8.501	7.825	0.130
803	1.000	1.221	0.396	8.168	8.564	7.888	0.130
900	1.000	1.221	0.396	8.980	9.376	8.700	0.130
903	1.000	1.221	0.396	9.168	9.564	8.888	0.130
207.5/211 X							
315	1.000	1.221	0.798	3.918	4.716	3.638	0.130
413*	1.000	1.221	0.798	4.792	5.590	4.512	0.130
512	1.000	1.221	0.798	5.730	7.528	6.450	0.130
604*	1.000	1.221	0.798	6.230	7.028	5.950	0.130
612	1.000	1.221	0.798	6.730	7.528	6.450	0.130
713*	1.000	1.221	0.798	7.792	8.590	7.512	0.130
804	1.000	1.221	0.798	8.230	9.028	7.950	0.130
1113	1.000	1.221	0.798	11.792	12.590	11.512	0.130
211/214 X							
315	1.000	1.221	0.798	3.918	4.716	3.638	0.130
413	1.000	1.221	0.798	4.792	5.590	4.512	0.130
714	1.000	1.221	0.798	7.855	8.653	7.575	0.130
804	1.000	1.221	0.798	8.230	9.028	7.950	0.130
1006	1.000	1.221	0.798	10.355	11.153	10.075	0.130

Not all suppliers manufacture cans with "D", "E", and "F" dimensions in the indicated () sizes to conform to the Sales Code height formula. Purchasers should work with their supplier(s) to determine suitable "D", "E" and "F" dimensions for their operations.

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Table 6. Necked-In Aerosol Cans Guideline Dimensions (millimeters)

Nominal Can Size	"A" ±0.10	"B" ±0.25	"C" ±0.41	"D" ±0.79	"E" ±0.89	"F" (MIN.)	"G" ±0.18
45mm X							
73*	25.40	31.01	5.72	72.56	78.23	65.41	3.30
95*	25.40	31.01	5.72	94.74	100.46	87.63	3.30
117*	25.40	31.01	5.72	116.97	122.68	109.86	3.30
139*	25.40	31.01	5.72	139.19	144.91	132.08	3.30
165*	25.40	31.01	5.72	164.59	170.31	157.48	3.30
52mm X							
73	25.40	31.01	9.40	72.52	82.58	65.41	3.30
86*	25.40	31.01	9.40	85.23	94.62	78.11	3.30
98*	25.40	31.01	9.40	97.92	107.98	90.81	3.30
111*	25.40	31.01	9.40	110.62	120.68	103.51	3.30
141*	25.40	31.01	9.40	140.78	150.84	133.67	3.30
149*	25.40	31.01	9.40	148.72	158.78	141.61	3.30
161	25.40	31.01	9.40	159.84	169.24	152.73	3.30
177*	25.40	31.01	9.40	177.29	187.35	170.18	3.30
190	25.40	31.01	9.40	189.99	200.05	182.88	3.30
57mm X							
117	25.40	31.01	10.06	116.97	127.03	109.86	3.30
158*	25.40	31.01	10.06	158.24	168.30	151.13	3.30
164	25.40	31.01	10.06	163.80	173.86	156.69	3.30
165	25.40	31.01	10.06	164.59	174.65	157.48	3.30
179	25.40	31.01	10.06	178.88	188.94	171.77	3.30
184	25.40	31.01	10.06	183.64	193.70	176.53	3.30
193	25.40	31.01	10.06	193.17	203.23	186.06	3.30
206	25.40	31.01	10.06	205.87	215.93	198.76	3.30
207	25.40	31.01	10.06	207.45	217.51	200.34	3.30
57mm X							
228	25.40	31.01	10.06	228.09	238.15	220.98	3.30
233	25.40	31.01	10.06	232.86	242.93	225.76	3.30
65mm X							
100*	25.40	31.01	20.27	99.52	119.79	92.41	3.30
122*	25.40	31.01	20.27	121.72	141.99	114.62	3.30
146	25.40	31.01	20.27	145.54	191.21	163.83	3.30
158*	25.40	31.01	20.27	158.24	178.51	151.13	3.30
171	25.40	31.01	20.27	170.94	191.21	163.83	3.30
198*	25.40	31.01	20.27	197.93	218.20	190.82	3.30
209	25.40	31.01	20.27	209.04	229.31	201.93	3.30
299	25.40	31.01	20.27	299.54	319.79	292.40	3.30

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Nominal Can Size	"A" ±0.10	"B" ±0.25	"C" ±0.41	"D" ±0.79	"E" ±0.89	"F" (MIN.)	"G" ±0.18
70mm X							
100	25.40	31.01	20.27	99.50	119.77	92.39	3.30
122	25.40	31.01	20.27	121.73	142.00	114.62	3.30
200	25.40	31.01	20.27	199.52	219.79	192.41	3.30
209	25.40	31.01	20.27	209.04	229.31	201.93	3.30
263	25.40	31.01	20.27	263.02	283.29	255.91	3.30

Not all suppliers manufacture cans with "D", "E", and "F" dimensions in the indicated () sizes to conform to the Sales Code height formula. Purchasers should work with their supplier(s) to determine suitable "D", "E" and "F" dimensions for their operations.

Table 7. Straight-Wall and Necked-In Aerosol Can Guideline Dimensions for Overcap Fit in Inches (millimeters)

Straight-Wall Aerosol Cans							
Nominal Can Size	"J" Min**	"K" ±0.010 (0.25)*	"L" Min**	"M" ±0.004 (0.10)**	"N" ±0.004 (0.10)	"P" Min**	"T" ±0.010 (0.25)
202 (52mm)	0.100 (2.54)	2.182 (55.42)	0.100 (2.54)	0.003 (0.08)	1.788 (45.42)	0.050 (1.27)	0.128 (3.25)
211 (64mm)	0.135 (3.43)	2.700 (68.58)	0.100 (2.54)	0.003 (0.08)	2.303 (58.50)	0.040 (1.02)	0.128 (3.25)
300 (73mm)	0.145 (3.68)	3.005 (76.33)	0.100 (2.54)	0.003 (0.08)	2.598 (65.99)	0.040 (1.02)	0.128 (3.25)

Note: Dimensions J, L, M, N and P are listed to provide guidelines for use in the development of new ends to maximize component compatibility. They are best determined by casting, cross-sectioning and measurement on an optical comparator.

Necked-In Aerosol Cans					
Nominal Can Size	"K" ±0.010 (0.25)**	"S" ±0.012 (0.30)	"T" " ±0.010 (0.25)	"V" ±0.006 (0.15)**	"W" ± 8° **
111/112 (45mm)	1.715 (43.56)	0.210 (5.33)	0.125 (3.18)	1.770 (44.96)	35
200/202 (52mm)	1.996 (50.70)	0.260 (6.60)	0.128 (3.25)	2.074 (52.68)	35
202/205 (57mm)	2.182 (55.42)	0.260 (6.60)	0.128 (3.25)	2.273 (57.73)	35
207.5/211 (65mm)	2.487 (63.17)	0.260 (6.60)	0.128 (3.25)	2.594 (65.89)	35
211/214 (70mm)	2.700 (68.58)	0.260 (6.60)	0.128 (3.25)	2.762 (70.15)	35

Note: Intended only for DOT Non-Spec aerosol can. DOT specifications 2P and 2Q or Special Permit cans may vary.
**METHOD OF MEASUREMENT TO BE AGREED UPON BETWEEN SUPPLIER AND USER IF NEEDED.

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Table 8. Straight-Wall and Necked-In Aerosol Can Guideline Dimension for Vacuum/Propellant Seal Height or “X” Dimension in Inches (millimeters)

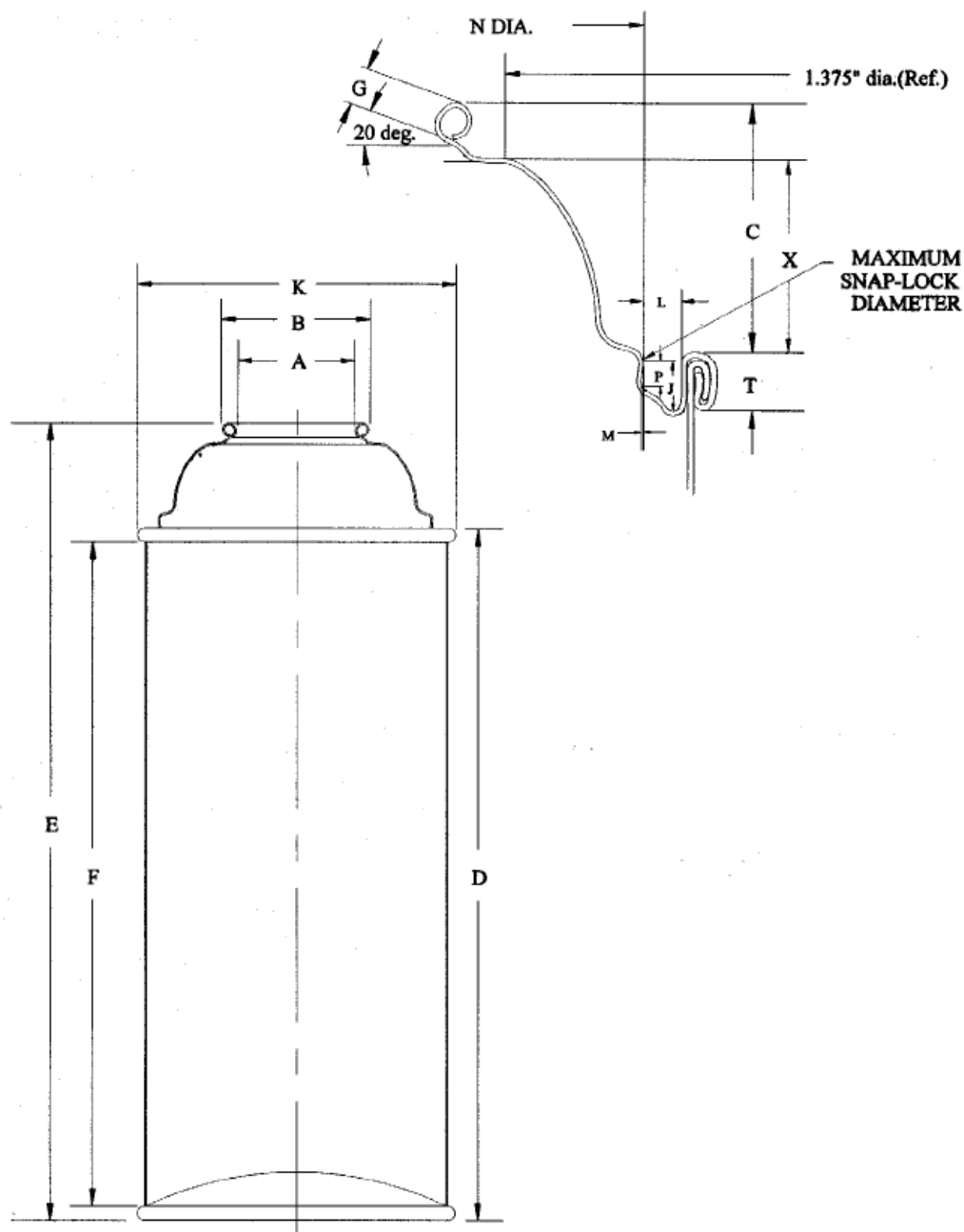
Straight-Wall Aerosol Cans	
Nominal Can Size	"X" ±0.025 (0.635)
202 (52mm)	0.196 (4.98)
211 (65mm)	0.615 (15.62)
300 (73mm)	Not established

Necked-In Aerosol Cans	
Nominal Can Size	"X" ±0.025 (0.635)
111/112 (45mm)	Not Applicable since the seal surface is the double seam.
200/202 (52mm)	0.185 (4.70)
202/205 (57mm)	0.196 (4.98)
207.5/211 (65mm)	0.585 (14.86)** / 0.610 (15.49)**
211/214 (70mm)	0.615 (15.62)

**Consult manufacturer to determine proper size range.

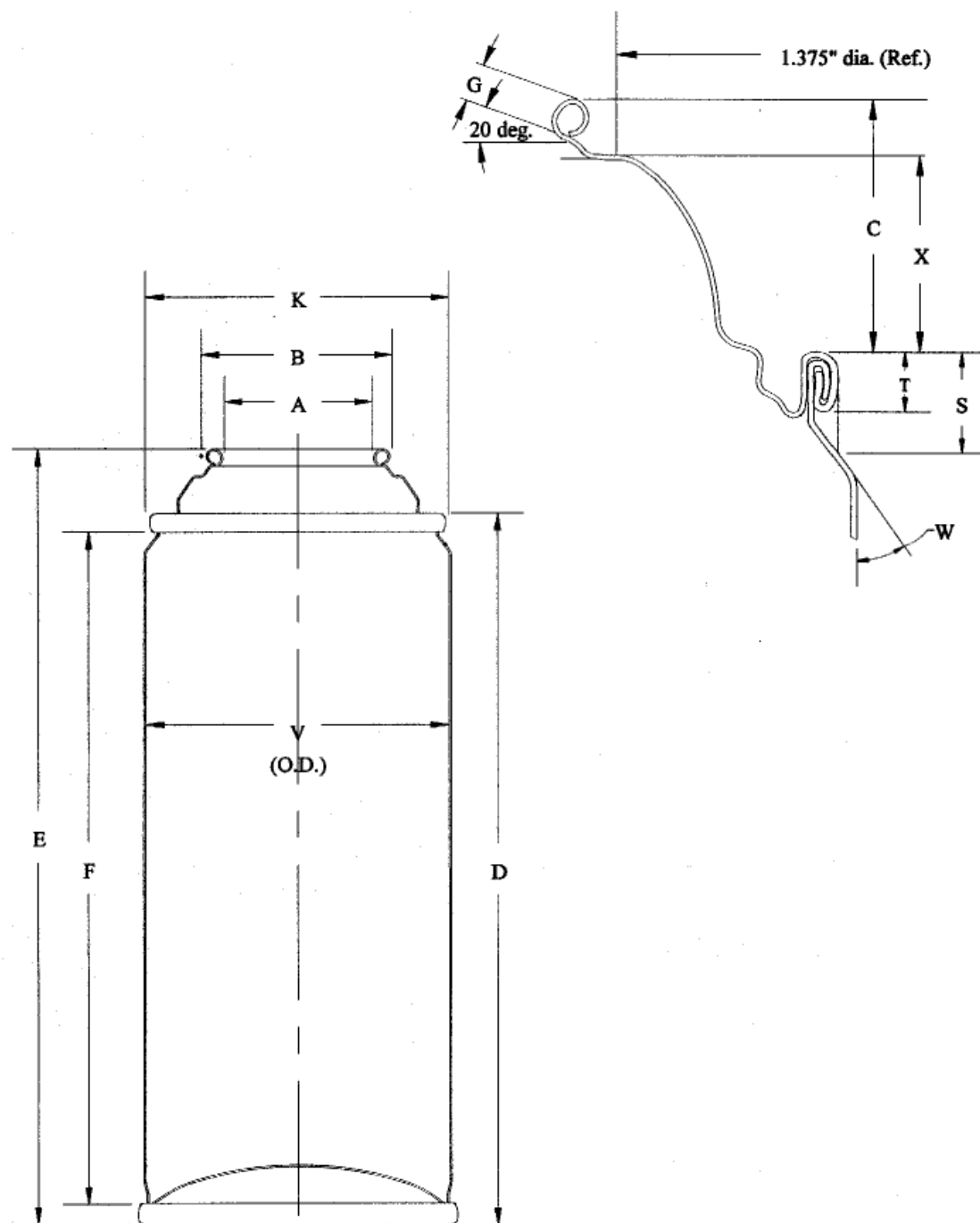
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Figure 1. Straight-Wall Aerosol Can



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Figure 2. Necked-In Aerosol Can



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5. ACCEPTANCE CRITERIA

5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. Not applicable at this time.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-1.02	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE A-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to check the inside diameter of the one-inch (25.4 mm) opening ("A" Dimension) of a three-piece aerosol can. This dimension has the ability to effect a long-term hermetic seal, at the point of valve cup and container 1-inch (25.4 mm) curl interface, is directly related to the consistency of the opening and its inside diameter.

2. APPARATUS

- 2.1. Inside curl diameter GO/NO-GO plug or equivalent. (See figure 1).
- 2.2. The GO/NO-GO plug gauge should be checked, periodically, for any excessive wear, nicking, warp or other conditions which could affect the accuracy of the gauge.
- 2.3. To ensure proper calibration, one should determine the outside diameter of the gauge's measurement surfaces.
- 2.4. Diameters of both the GO (lower) and NO-GO (upper) limit gauge plugs must be calibrated in the same manner to ensure consistency throughout 360°.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Holding the aerosol can in one hand, place the NO-GO (upper limit) gauge plug into the 1-inch (25.4 mm) opening, allowing the gauge measurement surface to ride concentrically in the opening. Care must be taken not to force the gauge to seat on the NO-GO plug.
- 4.2. Aerosol 1-inch (25.4 mm) openings which are below the upper limit of the "A" Dimension will not allow the NO-GO (upper limit) plug to fully seat in the opening, indicating that the diameter is acceptable.
- 4.3. While still holding the can, place the GO (lower limit) plug into the 1-inch (25.4 mm) opening, allowing the gauge measurement surface to ride concentrically in the opening. Care must be taken not to force the gauge to seat on the GO plug.
- 4.4. Aerosol cans with 1-inch (25.4 mm) openings which are above the lower limit of the "A" Dimension will allow seating of the GO plug, indicating that the opening's inside diameter is acceptable.
- 4.5. Record results for each can examined.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

EDITION: 10 METHOD NO: HCPA-1.02	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 2 OF 2
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE A-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1. Go/No-Go Bar Gauge



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-1.03	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE B-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to check the outside diameter of the curl ("B" Dimension) around the 1-inch (25.4 mm) opening of a three-piece aerosol can. This dimension as the ability to effect a long-term hermetic seal at the valve cup and container curl interface is directly related to the consistency of the curl and its outside diameter.
- 1.2. The ability to properly mate attachments to the finished aerosol can is also related to the consistency and outside diameter of the 1-inch (25.4 mm) curl.

2. APPARATUS

- 2.1. Outside curl diameter GO/NO-GO ring or equivalent. (See figure 1).
- 2.2. The GO/NO-GO ring gauge should be checked, periodically, for any excessive wear, nicking, warp or other conditions which could affect the accuracy of the gauge.
- 2.3. To ensure proper calibration, one should determine the inside diameter of the gauge's measurement surfaces.
- 2.4. Diameters of both the GO (upper) and NO-GO (lower) limit gauge rings must be calibrated in the same manner to ensure consistency throughout 360°.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Holding the aerosol can in one hand, place the NO-GO (lower limit) gauge recess over the 1-inch (25.4 mm) opening curl, allowing the gauge measurement surface to ride concentrically on top of the curl. Care must be taken not to force the curl to seat in the NO-GO recess.
- 4.2. Aerosol cans with 1-inch (25.4 mm) opening curls which are above the lower limit of the "B" Dimension will not allow seating of curl into the NO-GO recess, indicating that the curl's outside diameter is acceptable.
- 4.3. While still holding the can, place the GO (upper limit) recess over the 1-inch (25.4 mm) opening curl, allowing the gauge measurement surface to ride concentrically on top of the curl. Care must be taken not to force the curl to seat in the GO recess.
- 4.4. Aerosol can curls which are below the upper limit of the "B" Dimension will allow the GO (upper limit) recess to fully seat around the curl's outside diameter, indicating that the curl's outside diameter is acceptable.
- 4.5. Record results from each container examined.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.

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5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

5.4. This ring gauge only detects the maximum axis of the curl and does not detect ovality of the curl.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

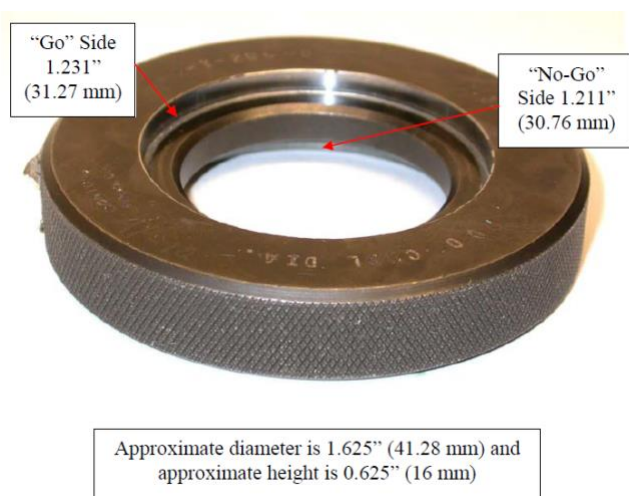
7. REFERENCES

7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1. Go/No-Go Ring Gauge



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-1.04	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE C-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the difference in height between a point on the top of the curl of a 1-inch (25.4mm) opening to the top of the top double seam ("C" Dimension).
- 1.2. Assure dimensional interchangeability of 3-piece cans within the industry.
- 1.3. Establish compatibility with mating components, filling equipment and processes.

2. APPARATUS

- 2.1. Height gauge, e.g., digital or analog linear gauge attached to a base and post, capable of being adjusted. (See Figure 1).
- 2.2. The height gauge must be calibrated to the appropriate height being measured with a height block that has been accurately prepared for use as a standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology) or equivalent certification.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Raise the tip of the height gauge and place the can to be measured on the base of the stand so that the tip of the gauge will come to rest on the top of the top double seam.
- 4.2. Zero the gauge, then raise the gauge tip above the one-inch curl and reposition the can so that the gauge tip is directly over the crown of the curl.
- 4.3. Lower the gauge tip until it contacts the top of the curl. This constitutes one reading.
- 4.4. If more than one reading is desired, mark the can curl and slightly raise the gauge tip, while rotating the can to another point.
- 4.5. Repeat the procedure outlined in 4.1 through 4.3.
- 4.6. Record results from each container measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

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8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1. Height Gauges



9. REVISIONS

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EDITION: 10 METHOD NO: HCPA-1.05	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE D-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance from a point on the top of the top double seam to the bottom of the bottom double seam ("D" Dimension).
- 1.2. Assure dimensional interchangeability of 3-Piece cans within the industry.
- 1.3. Establish compatibility with mating components, filling equipment and processes.

2. APPARATUS

- 2.1. Height gauge, e.g., digital or analog linear gauge attached to a base and post, capable of being adjusted. (See Figure 1).
- 2.2. The height gauge must be calibrated to the appropriate height being measured with a height block that has been accurately prepared for use as a standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology) or equivalent certification.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Raise the tip of the height gauge and place the can to be measured on the base of the stand so that the tip of the gauge will come to rest on the uppermost surface of the top double seam. This constitutes one reading.
- 4.2. If more than one reading is desired, mark the double seam and slightly raise the gauge tip, while rotating the can to another point, then allow the gauge tip to come to rest on the double seam.
- 4.3. Repeat the procedure outlined in 4.1 through 4.2.
- 4.4. Record results from each container measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

EDITION: 10 METHOD NO: HCPA-1.05	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 2 OF 2
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Figure 1. Height Gauges



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
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EDITION: 10 METHOD NO: HCPA-1.06	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE E-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance from a point on the top of the curl of the 1-inch (25.4mm) opening to the bottom of the bottom double seam ("E" Dimension).
- 1.2. Assure dimensional interchangeability of 3-Piece cans within the industry, with respect to overall height.
- 1.3. Establish compatibility with mating components, filling equipment and processes.

2. APPARATUS

- 2.1. Height gauge, e.g., digital or analog linear gauge attached to a base and post, capable of being adjusted. (See Figure 1).
- 2.2. The height gauge must be calibrated to the appropriate height being measured with a height block that has been accurately prepared for use as a standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology) or equivalent certification.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Raise the tip of the height gauge and place the can to be measured on the base of the stand so that the tip of the gauge will come to rest on the crown of the can curl radius. This constitutes one reading.
- 4.2. If more than one reading is desired, mark the can curl and slightly raise the gauge tip, while rotating the can to another point, then allow the gauge tip to come to rest on the can curl.
- 4.3. Repeat the procedure outlined in 4.1 through 4.2.
- 4.4. Record results from each container measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

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Figure 1. Height Gauges



9. REVISIONS

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EDITION: 10 METHOD NO: HCPA-1.07	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE F-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance between the bottom of the top double seam and the top of the bottom double seam ("F" Dimension).
- 1.2. Assure dimensional interchangeability of 3-Piece cans within the industry, with respect to between double seams ("F" Dimension).
- 1.3. Establish compatibility with mating components, filling equipment and processes.

2. APPARATUS

- 2.1. Height gauge, e.g., digital or analog linear gauge attached to a base and post, capable of being adjusted. (See Figure 1).
 - 2.1.1. The height gauge must be calibrated to the appropriate height being measured with a height block that has been accurately prepared for use as a standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology) or equivalent certification.
- 2.2. Double seam micrometer, capable of measuring necked-in or straight-wall can double seam height or "T" Dimension. Example, as illustrated in Figure 2: 0.000 - 0.375in (0.00 – 9.53mm) Range, 0.001in (0.025mm) Graduation.
 - 2.2.1. The micrometer should be calibrated before use with a 0.125in (3.18mm) Standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology), or equivalent certification.
 - 2.2.2. Measure the thickness and adjust the micrometer to read the same as the standard.
 - 2.2.3. The micrometer should be zeroed before each use. Turn the micrometer thimble to zero before each use. The Scales on the Sleeve or Barrel and Thimble should show "0". Anvil and Spindle faces must be clean and free of any debris which can affect zeroing.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Raise the tip of the height gauge and place the can to be measured on the base of the stand so that the tip of the gauge will come to rest on the uppermost surface of the top double seam. This constitutes one reading of the "D" Dimension. (Mark the top and bottom double seams at this point).
- 4.2. Open the micrometer sufficiently to allow the double seam to easily fit between the Anvil and Spindle.
- 4.3. Using both hands, and with the can on the horizontal plane, place the Anvil of the micrometer against the can body at the mark made on the double seam in step 4.1 and position the barrel and thimble squarely with the double seam.
- 4.4. With the right hand pull the micrometer until the Anvil contacts the double seam. Exert slight downward and outward pressure on the micrometer to maintain contact of the Anvil against the double seam and can body.

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- 4.5. While maintaining this pressure, close the micrometer, until the Spindle contacts the outer surface of the double seam. (Since this style of micrometer does not have a Ratchet, care must be taken to prevent overtightening). The micrometer reading is the double seam width or "T" Dimension.
- 4.6. Repeat steps 4.2 through 4.5 at the corresponding mark made on the opposite double seam.
- 4.7. Add both top and bottom double seam widths ("T" Dimensions). Subtract the total obtained from the measurement attained in step 4.1 (the "D" Dimension). The resulting value is the "F" Dimension.
- 4.8. If more than one set of readings is desired, repeat the procedure.
- 4.9. Record results from each container measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

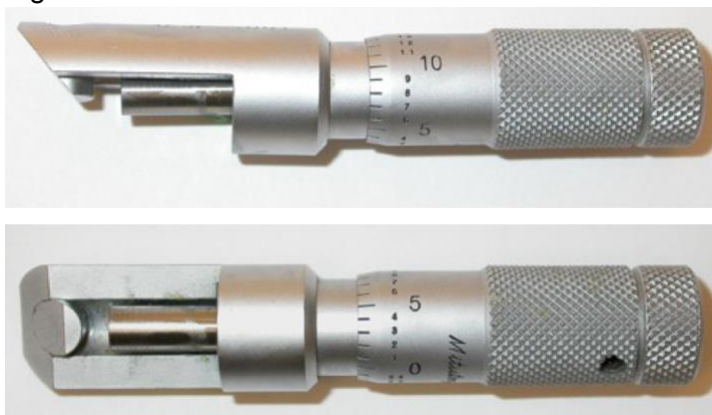
- 8.1. Not Applicable at this time.

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Figure 1. Height Gauges



Figure 2. Double Seam Micrometer



9. REVISIONS

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0	02 May 2023	Updating to tenth edition of guide	
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EDITION: 10 METHOD NO: HCPA-1.08	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE G-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to measure the thickness of the curl surrounding the 1-inch (25.4 mm) opening ("G" Dimension). This measurement is taken at an angular offset of 20° as shown in Figures 1 and 2.
- 1.2. It is important to maintain uniformity and consistency of curl thickness to facilitate crimp seal integrity.
- 1.3. Because of the component and processing variables, consistency of the "G" dimension is critical to their interchangeability.

2. APPARATUS

- 2.1. PLEASE NOTE: The micrometer described in this method was discontinued from production at the beginning of 2025. Interested parties should determine the appropriate method if it varies from this standard.
- 2.2. 0.50in. (12.70mm) curl thickness micrometer, example as illustrated in Figure 3.
- 2.3. The micrometer should be calibrated before use with a 0.125in. (3.18mm) Standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology), or equivalent certification. Measure the thickness and adjust the micrometer to read the same as the standard.
- 2.4. The micrometer should be zeroed before each use. Turn the micrometer Thimble to zero before each use. The Scales on the Sleeve or Barrel and Thimble should show "0". Anvil and Spindle faces must be clean and free of any debris which can affect zeroing.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Raise the Grasp the micrometer (right-handed gauge shown in figure 1), placing the ring finger into the Finger Ring on the micrometer Frame.
- 4.2. Open the micrometer to about 0.200in. (5.08mm) and insert the Stop and Anvil into the can opening, with the Anvil under the can curl and the Spindle face over the curl. (See Figure 1).
- 4.3. Exert slight downward and backward pressure with the ring finger, allowing the micrometer Stop or Saddle to seat on top of, and against, the opposite inside surface of the curl.
- 4.4. Hold the micrometer in this position while using your fore-finger and thumb to close the micrometer by clockwise rotation of the Ratchet until the Spindle comes in contact with the curl, plus two clicks of the Ratchet.
- 4.5. Determine the can curl thickness at that point from the reading of the Sleeve or Barrel and Thimble Scales.
- 4.6. The "G" dimension is the perpendicular distance between the Spindle face and center line of the crowned Anvil face.
- 4.7. Release the Spindle slightly, by counter clockwise rotation of the Ratchet. Turn the micrometer approximately 20-40 degrees on the plane of the can curl to take another reading.
- 4.8. If more than one set of readings is desired, repeat the procedure.

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4.9. Record results from each container measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

Figure 1. Curl Thickness Measurement Example



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Figure 2. Can Curl Cross Section

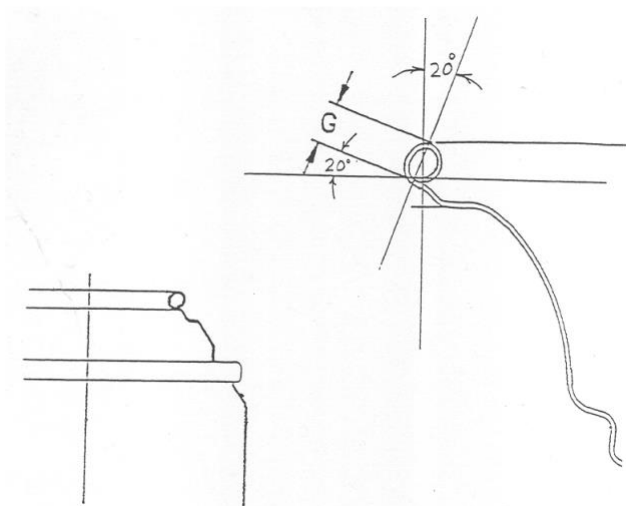


Figure 3. Curl Thickness Micrometer



9. REVISIONS

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EDITION: 10 METHOD NO: HCPA-1.09	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE K-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. This method covers the measurement of the outside diameter of the top double seam, excluding the cross-over area, for both straight-wall and necked-in 3-Piece tinplate aerosol cans.
- 1.2. A standardized "K" Dimension is important to assure dimensional compatibility with top double seam fitments, e.g., proper retention and removability of full diameter plastic overcaps. Guidelines for K-dimension are shown in Table 1. The K-dimension is shown schematically in Figure 1.

2. APPARATUS

- 2.1. Using a fixture, reference Figure 2 as an example, that has precision gauge block for each diameter.
- 2.2. An optical comparator or coordinated-measuring machine (CMM) may also be used.
- 2.3. The caliper should be calibrated before use with a 2 or 3in (50.8 or 76.2mm) Standard Gauge Block, certified and traceable to N.I.S.T. (National Institute of Standards and Technology), or equivalent certification.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Marking of each container and capturing the full identification of the can(s) tested; e.g., can maker, lot number, product identification (if any), date received, etc.
- 4.2. Choose the gauge block associated to the can diameter to be measured and ensure fixture is calibrated.
- 4.3. After calibration of fixture, zero the indicator.
- 4.4. Insert the can into the fixture and read dimensions at 3 positions, approximately 120° apart.
- 4.5. Record each dimension to the: nearest +0.001in. (±0.02 mm).
- 4.6. Average the three dimensions.

NOTE: It is recommended that at least two "K" Dimension readings be taken for each can tested. Angular separation between measurement axes should be about equal and no measurement should be impacted by the cross-over or junctural area.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

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7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

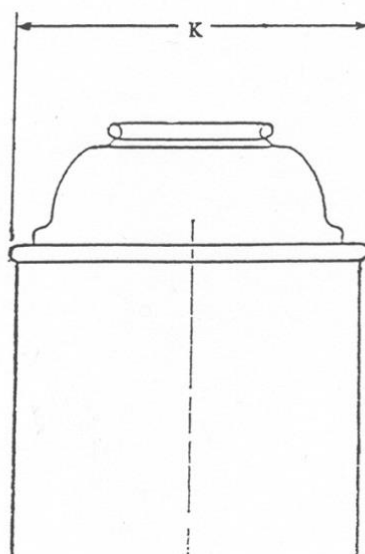
- 8.1. Not Applicable at this time.

Table 1. Guideline for “K” Dimension for Straight-Wall and Necked-In Tinplate Aerosol Cans

Can Style	Nominal Can Diameter		Nominal “K” Dimension	
	HCPA Sales Code	Metric Equivalent (mm)	Inches ± 0.010	Millimeters ± 0.25
Straight-Wall	202	52	2.182	55.42
Straight-Wall	207.5	60	2.487	63.17
Straight-Wall	211	65	2.700	68.58
Straight-Wall	300	73	3.005	76.33
Necked-In	111/112	45	1.715	43.56
Necked-In	200/202	52	1.996	50.70
Necked-In	202/205	57	2.182	55.42
Necked-In	207.5/211	65	2.487	63.17
Necked-In	211/214	70	2.700	68.58

Note: For various US-DOT rated cans the sizes may vary due to body wall thickness

Figure 1. Upper Area of 3-Piece Can Indicating the “K” Dimension



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Figure 2. Example of a Measuring Fixture with a Diameter Calibration Gauge Block.



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METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE S-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance, tangent to the top double seam, from the top of the top double seam to the adjacent necked-in area of the can sidewall. ("S" Dimension), refer to Figure 1.
- 1.2. The average of three such measurements taken at 60°+ 10°, 180°+ 10° and 300°+ 10° from the side seam, shall be defined as the "S" Dimension. Refer to Table 1, for guideline of given can sizes.
- 1.3. The "S" Dimension is important in insuring the proper mechanical and esthetic fit of full diameter overcaps.

2. APPARATUS

- 2.1. Optical Comparator (Shadowgraph): A device having at least 10X magnification, presenting a sharply defined profiled image of the top double seam and shoulder area. The apparatus should be configured to measure to an accuracy of 0.001in and a resolution of 0.0005in.
- 2.2. The optical comparator must be calibrated, using a 0.250in. (6.35 mm) gauge block that has been accurately prepared for use as a "Standard", and which is certified and traceable to the N.I.S.T. (National Institute of Standards and Technology) organization, or another certification.

Note: Custom gauging devices may be used if properly validated against the optical comparator results.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Select an optical comparator of acceptable magnification and delineation.
- 4.2. Number each container and capture the full identification of the can(s) tested; e.g., can maker, lot number, product identification (if any), date received, etc.
- 4.3. Mark the top double seam of the test can at points 60°, 180° and 300°, away from the juncture with the side seam.
- 4.4. Set the can with the 60° mark to obtain a well centered, sharp profile of the top double seam and necked-in area at this location. Assure the side wall of the can and the axis of the optical comparator are parallel.
- 4.5. Measure and record the "S" dimension as defined in 1.1.
- 4.6. Set the can at the 120° mark and repeat 4.3 and 4.4 (replacing the 60° mark with 120°).
- 4.7. Set the can at the 300° mark and repeat 4.3 and 4.4 (replacing the 60° mark with 300°)
- 4.8. Average the readings of 4.4, 4.6 and 4.7. This gives the "S" Dimension of the aerosol can being measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.

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5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.

5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

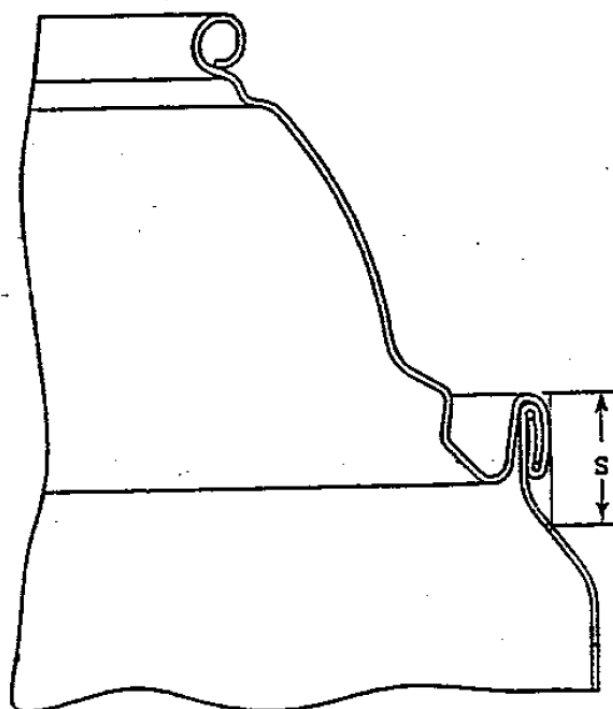
Table 1. Guideline for “S” Dimension for Straight-Wall and Necked-In Tinplate Aerosol Cans

Can Style	Nominal Can Diameter		Nominal “S” Dimension	
	HCPA Sales Code	Metric Equivalent (mm)	Inches	Millimeters
Necked-In	111/112	45	0.210 ± 0.012	5.33 ± 0.31
Necked-In	200/202	52	0.260 +0.018 -0.012	6.60 +0.46 -0.31
Necked-In	202/205	57		
Necked-In	207.5/211	65		
Necked-In	211/214	70		

Note: As defined in 1.2 this is the average of the 3 measurements taken on each can. No measurement is to be taken within 10° of the side seam.

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METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE S-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

Figure 1. Partial Dome Area of 3-Piece Can Indicating the “S” Dimension



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide; Updated tolerance for all sizes except 111/112 per can supplier reviews by J.Blum, D.McFadden, K.Richards and D.Blythe.	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-1.11	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE T-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the width or height of the top double seam ("T" Dimension) at any point at least 10° away from the side seam juncture.
- 1.2. Assure dimensional interchangeability of 3-Piece cans within the industry, with respect to the width or height of the double seam ("T" Dimension).
- 1.3. The ability to properly mate attachments (i.e., overcaps, spouts, etc.) to the finished aerosol can is related to the consistency of the double seam width or height.

2. APPARATUS

- 2.1. Double seam micrometer, capable of measuring necked-in or straight-wall can double seam height or "T" Dimension. Example, as illustrated in Figure 1: 0.000 - 0.375in (0.00 – 9.53mm) Range, 0.001in (0.025mm) Graduation.
 - 2.1.1. The micrometer should be calibrated before use with a 0.125in (3.18mm) Standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology), or equivalent certification.
 - 2.1.2. Measure the thickness and adjust the micrometer to read the same as the standard.
 - 2.1.3. The micrometer should be zeroed before each use. Turn the micrometer thimble to zero before each use. The Scales on the Sleeve or Barrel and Thimble should show "0". Anvil and Spindle faces must be clean and free of any debris which can affect zeroing.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Open the micrometer sufficiently to allow the double seam to easily fit between the Anvil and Spindle.
- 4.2. Using both hands, and with the can on the horizontal plane, place the Anvil of the micrometer against the can body at the mark made on the double seam in step 4.1 and position the barrel and thimble squarely with the double seam.
- 4.3. With the right hand pull the micrometer until the Anvil contacts the double seam. Exert slight downward and outward pressure on the micrometer to maintain contact of the Anvil against the double seam and can body.
- 4.4. While maintaining this pressure, close the micrometer, until the Spindle contacts the outer surface of the double seam. (Since this style of micrometer does not have a Ratchet, care must be taken to prevent overtightening). The micrometer reading is the double seam width or "T" Dimension.
- 4.5. Repeat steps 4.1 through 4.4, if more than one set of readings is desired, repeat the procedure, assuring measurement axes are evenly separated from each other, all being at least $\geq 10^\circ$ away from the side seam juncture.
- 4.6. Record results from each container measured.

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METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE T-DIMENSION OF A 3-PIECE TINPLATE STRAIGHT-WALL AND NECK-IN AEROSOL CONTAINERS	

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

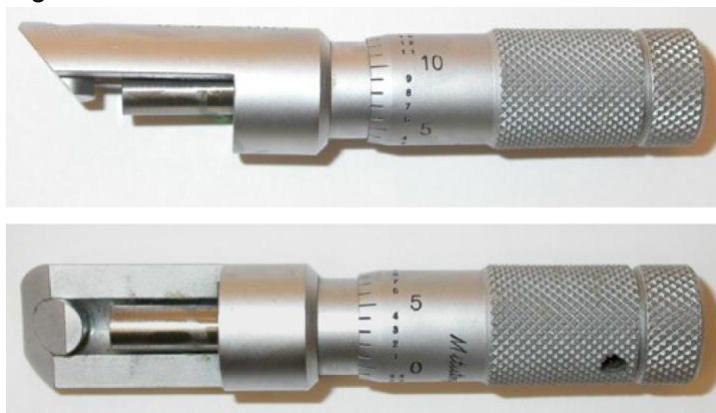
7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

Figure 1. Double Seam Micrometer



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-1.12	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE HF-DIMENSION ("DUST SHELF") OF 3-PIECE TINPLATE STRAIGHT-WALL AND NECKED-IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance from the top of the curl of the one-inch opening to a point on the dome at a reference diameter of 1.285". ("HF" Dimension), refer to Figure 1.
- 1.2. The average of three such measurements taken at 60°+ 10°, 180°+ 10° and 300°+ 10° from the side seam, shall be defined as the "HF" Dimension.
- 1.3. The "HF" Dimension is important in insuring the proper mechanical and esthetic fit of caps.

2. APPARATUS

- 2.1. Optical Comparator (Shadowgraph): A device having at least 10X magnification, presenting a sharply defined profiled image of the top double seam and shoulder area. The apparatus should be configured to measure to an accuracy of 0.001in and a resolution of 0.0005in.
- 2.2. The optical comparator must be calibrated, using a 0.250in. (6.35 mm) gauge block that has been accurately prepared for use as a "Standard", and which is certified and traceable to the N.I.S.T. (National Institute of Standards and Technology) organization, or another certification.

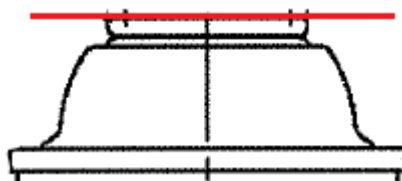
Note: Custom gauging devices may be used if properly validated against the optical comparator results.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Select an optical comparator of acceptable magnification and delineation.
- 4.2. Number each container and capture the full identification of the can(s) tested; e.g., can maker, lot number, product identification (if any), date received, etc.
- 4.3. Mark the can curl of the test can at points 60°, 180° and 300°, away from the juncture with the side seam.
 - 4.3.1. NOTE: As defined in 1.2 this is the average of the 3 measurements taken on each can. No measurement is to be taken within 10° of the side seam.
- 4.4. Measure and record the curl OD at 60°, 180° and 300°.
- 4.5. Determine the horizontal distance to move the optical comparator by subtracting the curl OD from 1.285". The difference from the two values is the horizontal distance to move the optical comparator from the OD of the can curl.
- 4.6. Zero the X or vertical dimension of the optical comparator to the plane at the top of the can curl as shown in the following image



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METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE HF-DIMENSION ("DUST SHELF") OF 3-PIECE TINPLATE STRAIGHT-WALL AND NECKED-IN AEROSOL CONTAINERS	

- 4.7. Set the can with the 60° mark to obtain a well centered, sharp profile of the dome area at this location. Assure the side wall of the can and the axis of the optical comparator are parallel. Move the optical comparator horizontally to the 1.285" reference diameter.
- 4.8. Move the optical comparator vertically until it intersects the dome and record the dimension from the comparator.
- 4.9. Set the can at the 180° mark and repeat 4.5 through 4.8 (replacing the 60° mark with 180°).
- 4.10. Set the can at the 300° mark and repeat 4.5 through 4.8 (replacing the 60° mark with 300°)
- 4.11. Average the readings of 4.8, 4.9 and 4.10. This gives the "HF" Dimension of the aerosol can being measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

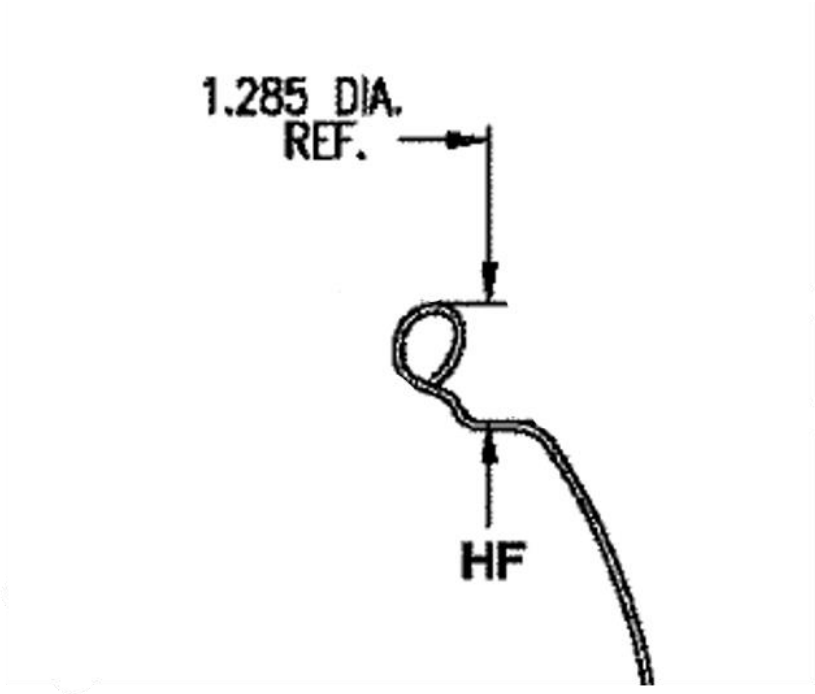
- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

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METHOD CLASSIFICATION: 3-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE HF-DIMENSION (“DUST SHELF”) OF 3-PIECE TINPLATE STRAIGHT-WALL AND NECKED-IN AEROSOL CONTAINERS	

Figure 1. Partial Dome Area of 3-Piece Can Indicating the “HF” Dimension



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide.	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-2.01	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CURL INSIDE DIAMETER (CID DIMENSION) OF THE ONE-INCH (25.4MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

1. PURPOSE

- 1.1. The purpose of this practice is to check the curl inside diameter (CID Dimension) of the one-inch (25.4 mm) opening of inside curl or outside curl one-piece aluminum aerosol cans.
- 1.2. The ability to effect long-term hermetic seal at the interface of a steel or aluminum valve cup and one-inch (25.4 mm) container opening is directly related to the consistency of the opening and its inside diameter. The CID Dimension must be within defined limits to help assure a satisfactory seal when the valve cup is crimped in place.

2. APPARATUS

- 2.1. Curl Inside Diameter "Go/No-Go" Plug Gauge (see Figure 1) or equivalent.
 - 2.1.1. The gauge should be stepped with the minimum dimension (0.996" or 25.30 mm) as the outer portion, and the maximum dimension (1.004" or 25.50 mm) as the inner or handled portion.
 - 2.1.2. The gauge should also be hardened and ground to prevent wear and maintain accuracy.
- 2.2. Alternatively, the Curl Inside Diameter "Go/No-Go" Plug Gauge recommended for steel and tinplate cans may also be used.
- 2.3. The plug gauge should be checked periodically for any excessive wear, nicking, warping, rusting or other condition which could affect the accuracy of the tool.
- 2.4. To ensure proper calibration one should check the outside diameter of the gauge's measurement surfaces at two or three different points for each. A calibrated, ratchet-type micrometer is preferred for these measurements. A one-inch (25.40 mm) micrometer will handle the required range of testing.
- 2.5. Diameters of both the "GO" and "NO-GO" surfaces must be calibrated with the same instrument and in the same manner to ensure consistency through the 360° measuring faces.

3. PRECAUTIONS

- 3.1. No known hazardous conditions exist for this method. Conduct your own job safety analysis prior to initiating this test.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: 30 Containers

5. PROCEDURE

- 5.1. Grasping the aerosol can in one hand, take the gauge in the other hand, holding the handle between middle finger, fore-finger and thumb (like a pencil) with the plug head downward.
- 5.2. Insert the plug gauge into the aerosol can opening, holding it exactly perpendicular to the plane of that opening.
- 5.3. If the can opening is at the minimum acceptable dimension (0.996" or 25.30 mm), there may be some metal-to-metal interference and/or resistance. However, the gauge should never be forced into a can opening.

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METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CURL INSIDE DIAMETER (CID DIMENSION) OF THE ONE-INCH (25.4MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

5.4. Record pertinent data, such as can maker, can size, inside or outside curl, lot number and (if decorated) the product identification.

5.5. Record the "GO/NO-GO" results for each can examined.

5.5.1. Reference the specification of 1.000 ± 0.004 " (25.40 ± 0.10 mm).

6. ACCEPTANCE CRITERIA

6.1. Report results using predetermined criteria established by the Interested Parties.

6.2. The CID Dimension is considered to conform to the specification if the minimum steep of the gauge can be placed into the can opening without the use of excessive force.

7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

8.1. HCPA-1.02: Standard Practice for Measuring the A-Dimension of a 3-Piece Tinplate Aerosol Container.

9. OTHER RESOURCES

9.1. Not Applicable at this time.

EDITION: 10 METHOD NO: HCPA-2.02	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR CHECKING THE CURL INSIDE DIAMETER (CID DIMENSION) OF THE ONE-INCH (25.4MM) OPENING OF ONE-PIECE ALUMINUM AEROSOL CANS	

1. PURPOSE

- 1.1. The purpose of this method is to check the curl inside diameter (CID Dimension) of the one-inch (25.4mm) opening of inside-curl or outside-curl, one-piece aluminum aerosol cans. This dimension has the ability to affect a long-term hermetic seal, at the point of valve cup and container one-inch (25.4 mm) curl interface, is directly related to the consistency of the opening and its inside diameter. The CID Dimension must be within defined limits to help assure a satisfactory seal when the valve cup is crimped in place.

2. APPARATUS

- 2.1. Inside curl diameter GO/NO-GO plug or equivalent. (See figure 1).
- 2.2. The gauge should be stepped with the minimum dimension (0.996" or 25.30mm) as the outer portion, and the maximum dimension (1.004" or 25.50mm) as the inner or handled portion.
- 2.3. The gauge should also be hardened and ground to prevent wear and maintain accuracy.
- 2.4. Alternatively, the Curl Inside Diameter "Go/No-Go" Plug Gauge recommended for steel and tinplate cans (Section 1) may also be used.
- 2.5. The plug gauge should be checked periodically for any sign of excessive wear, nicking, warping, rusting or other condition which could affect the accuracy of the tool.
- 2.6. To ensure proper calibration one should check the outside diameter of the gauge's measurement surfaces at two or three different points for each. A calibrated, ratchet-type micrometer is preferred for these measurements. A one-inch (25.40mm) micrometer will handle the required range of testing
- 2.7. Diameters of both the "GO" and "NO-GO" surfaces must be calibrated with the same instrument and in the same manner to ensure consistency through the 360° measuring faces.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers.

4. PROCEDURE

- 4.1. Grasping the aerosol can in one hand, take the gauge in the other hand, holding the handle between middle finger, fore-finger and thumb (like a pencil) with the plug head downward.
- 4.2. Insert the plug gauge into the aerosol can opening, holding it exactly perpendicular to the plane of that opening.
- 4.3. If the can opening is at the minimum acceptable dimension (0.996" or 25.30mm), there may be some metal-to-metal interference and/or resistance. However, the gauge should never be forced into a can opening.
- 4.4. Reference the specification of 1.000 ± 0.004 " (25.40 $\pm$ 0.10mm).
- 4.5. Record pertinent data, such as can maker, can size, inside or outside curl, lot number and (if decorated) the product identification.
- 4.6. Record the "GO/NO-GO" results for each can examined.

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METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR CHECKING THE CURL INSIDE DIAMETER (CID DIMENSION) OF THE ONE-INCH (25.4MM) OPENING OF ONE-PIECE ALUMINUM AEROSOL CANS	

5. ACCEPTANCE CRITERIA

5.1. The CID Dimension is considered to conform to the specification if the minimum steep of the gauge can be placed into the can opening without the use of excessive force.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

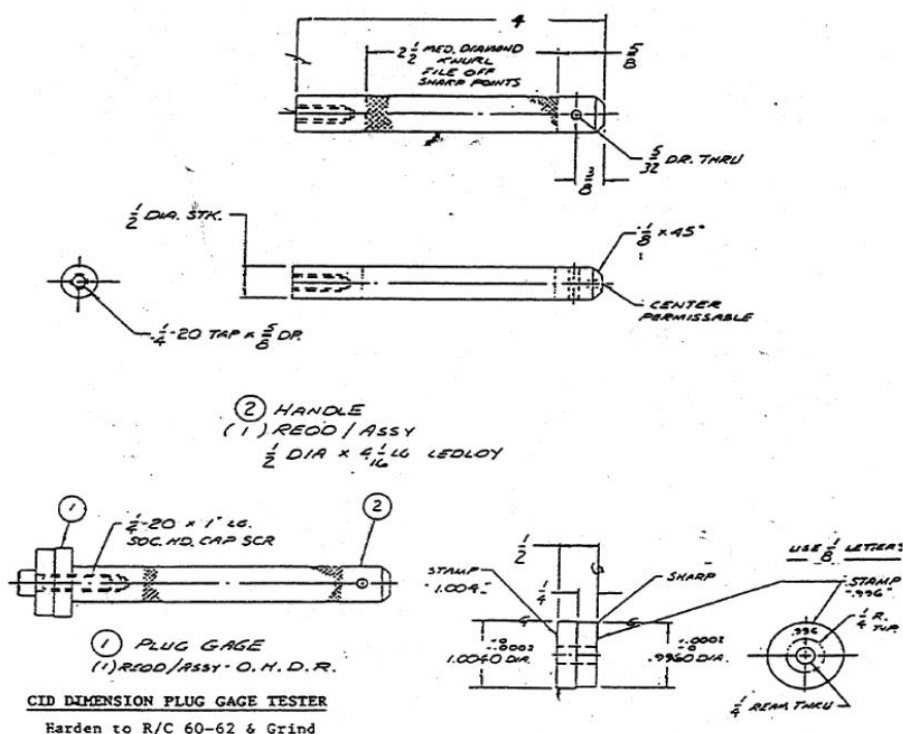
7. REFERENCES

7.1. HCPA-2.02: Standard Practice for checking the curl inside diameter of the one-inch (25.4mm) opening of one-piece Aluminum aerosol cans.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1.



9. REVISIONS

EDITION: 10 METHOD NO: HCPA-2.02	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 3 OF 3
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR CHECKING THE CURL INSIDE DIAMETER (CID DIMENSION) OF THE ONE-INCH (25.4MM) OPENING OF ONE-PIECE ALUMINUM AEROSOL CANS	

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-2.03	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CURL OUTSIDE DIAMETER (COD DIMENSION) OF A ONE-INCH (25.4MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

1. PURPOSE

- 1.1. The purpose of the practice is to check the curl outside diameter (COD) of the one-inch (25.4mm) curl of inside-curl or outside-curl, on-piece aluminum aerosol cans. This dimension has the ability to effect long-term hermetic seal at the interface of the steel or aluminum valve cup and one-inch (25.4mm) container opening is directly related to the consistency of the curl, including its respective COD dimension. The COD Dimension must be within defined limits to help assure a satisfactory seal when the valve cup is crimped in place.

2. APPARATUS

- 2.1. Curl Outside Diameter "Go/No-Go" Ring Gauge or equivalent (see Figure 1).
- 2.2. The bore of the gauge should be stepped with the maximum dimension (1.240" or 31.40mm) at the top side and the minimum dimension (1.224" or 31.09mm) at the bottom side.
- 2.3. The top and bottom faces of the gauge should be stamped with the appropriate bore dimension. (Note: The "Go/No-Go" gauge used for the "B" Dimension of steel and tinplate aerosol cans cannot be used for this method, since the dimensions are different).
- 2.4. The "Hole Mike" has a range of 1.200-1.400" (30.48-35.56mm) and a precision of ± 0.0002 " (± 0.0051 mm). It has three carbide measuring anvils and a ratchet stop. The calibration ring is accurate to ± 0.000020 " (± 0.00051 mm).
 - 2.4.1. Reference Swiss Precision Instruments, Inc. Cat. No. 10-733-4.
- 2.5. The COD ring gauge should be checked periodically for any excessive wear, nicking, warping, rusting or other condition which could affect the accuracy of the tool.
- 2.6. To ensure proper calibration, grasp the gauge in one hand, and then measure each inside diameter of the gauge's two measurement surfaces using a bore micrometer.
- 2.7. When inserted with the gauge surface recess, proper gauge measurement values may be taken directly from the bore micrometer's indicator dial, or thimble and sleeve, depending upon micrometer choice.
- 2.8. The values recorded for the bore diameter must be equal to the lower or upper dimensional tolerance limit for the COD Dimension.
- 2.9. The surfaces of both the lower and upper limit gauge must be calibrated in the same fashion, ensuring consistency about a 360° rotation, and reliability that they represent both lower and upper limits of specification.

3. PRECAUTIONS

- 3.1. No known hazardous conditions exist for this method. Conduct your own job safety analysis prior to initiating this test.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: 30 containers

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METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CURL OUTSIDE DIAMETER (COD DIMENSION) OF A ONE-INCH (25.4MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

5. PROCEDURE

- 5.1. Grasping the aerosol can in one hand, place the lower limit gauge recess over and around-the one-inch (25.4mm) can curl, allowing the gauge measurement surface to ride concentrically on top of the one-inch (25.4mm) curl. Care should be taken to ensure force is not used to seat the lower limit gauge recess.
- 5.2. Aerosol can curls which are above the lower specified limit of the COD Dimension will not allow the lower limit gauge recess to be seated around the can's one-inch (25.4mm) curl, thus being considered acceptable.
- 5.3. While grasping the aerosol can in one hand, now place the upper limit recess over and around the one-inch (25.4mm) curl, allowing the gauge measurement surface to ride concentrically on top of the curl. Care should be taken to ensure that force is not used to seat the upper limit gauge recess.
- 5.4. Aerosol can curls which are below the upper specified limit will allow the upper limit gauge recess to become fully seated around the outside diameter of the curl, thus being considered acceptable.
- 5.5. Record pertinent data, such as can maker, can size, inside or outside curl, lot number and (if decorated) the product identification. If more than one can is to be tested, mark each with an identifying number or letter.
- 5.6. Record the "Go/No-Go" results for each can examined.
 - 5.6.1. Reference the specification of 1.232 ± 0.008 " (31.30 ± 0.20 mm).

6. ACCEPTANCE CRITERIA

- 6.1. Report results using predetermined criteria established by the Interested Parties.
- 6.2. The COD Dimension is considered to conform to the specification if the minimum step of the gauge cannot be seated around the curl without force, and if the maximum step of the gauge can be fitted around the curl without force; or.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

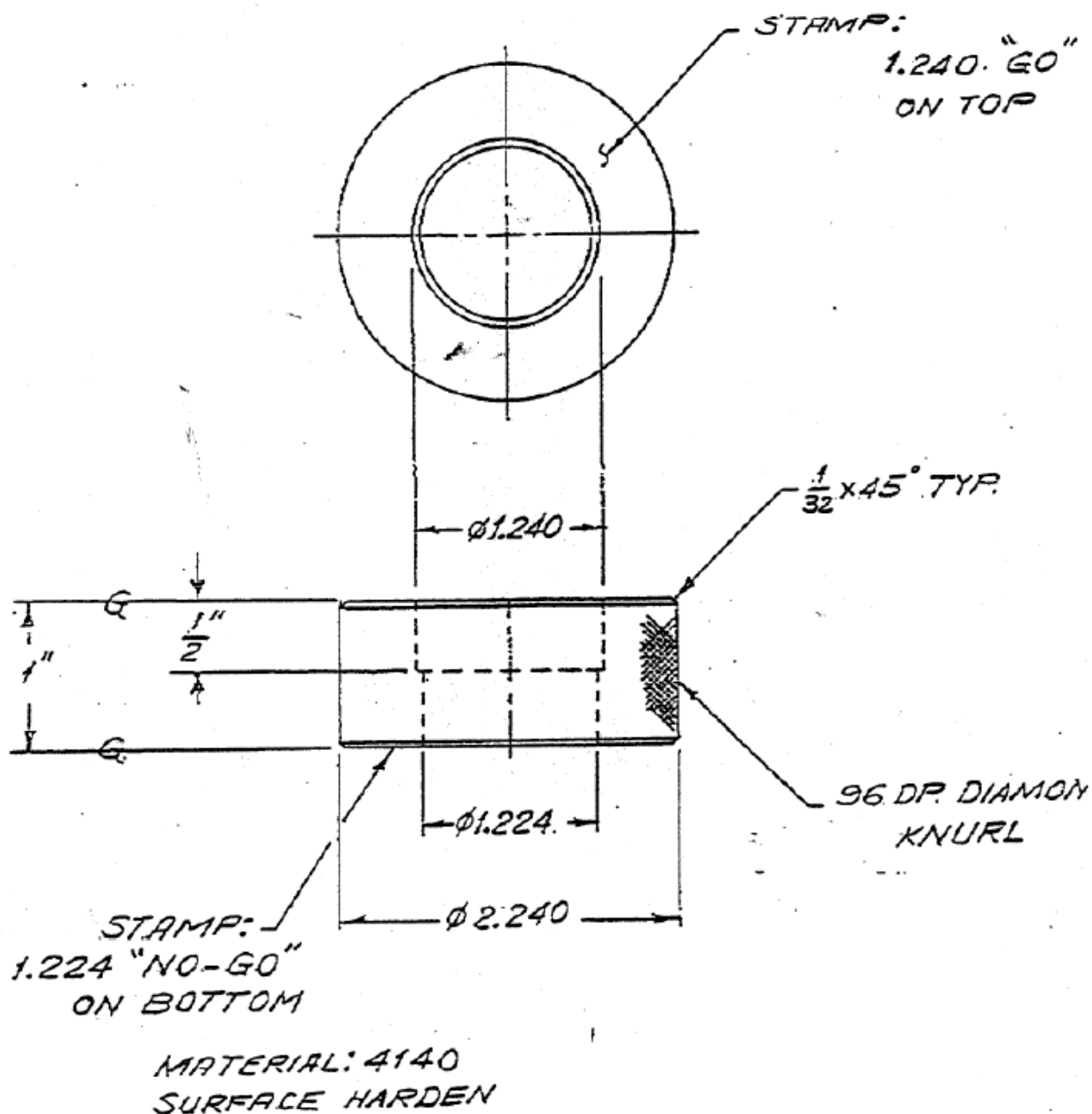
- 8.1. Not Applicable at this time.

9. OTHER RESOURCES

- 9.1. Not Applicable at this time.

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METHOD NO: HCPA-2.03		PAGE 3 OF 4
METHOD CLASSIFICATION: Aluminum Container	AEROSOL GUIDE TITLE: STANDARD PRACTICE FOR MEASURING THE CURL OUTSIDE DIAMETER (COD DIMENSION) OF A ONE-INCH (25.4MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

Figure 1: Gauge for determining "COD" dimension of aluminum aerosol cans



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METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CURL OUTSIDE DIAMETER (COD DIMENSION) OF A ONE-INCH (25.4MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

Figure 2: “Hole Mike” bore micrometer with ratchet



10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-2.04	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 5
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CONTACT HEIGHT ECCENTRICITY OF A 1-INCH (25.4 MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

1. PURPOSE

- 1.1. The ability to affect a long-term hermetic seal at the interface of the steel or aluminum valve cup and the one-inch (25.4mm) container opening is directly related to the consistency of the opening, including it's possible eccentricity at the point of hard contact. The purpose of this method is to check the eccentricity of the throat of a one-piece, one-inch (25.4mm) opening aluminum aerosol cans at the locus of hard contact with the expanded valve cup; i.e., the contact height.

2. APPARATUS

- 2.1. No official gauge has been selected, but candidates include the following:
 - 2.1.1. *The Boxal Contact Height Gauge.* (Has modifications.) Boxal France, S.A. (38 Beaurepaire, France).
 - 2.1.2. *The Kroplin Contact Height Gauge Model S-2002.* H.C. Kroplin GmbH. (649 Schluchtern Germany).
 - 2.1.3. *The (Custom) Paramount Contact Height Gauge.* Paramount Machine and Tool Corp. (Fairfield, NJ).
 - 2.1.4. *The British Aerosol Manufacturers Assn. (BAMA) Contact Height Gauge.* (93 Albert Embankment, London, SE1 7TU, England).¹
- 2.2. The spherical measuring anvil must have a radius of 0.059 in. (1.5mm).
- 2.3. Most instruments have a 0.014 in. (0.36mm) set-back built in, so that measurements are automatically taken with the center of the ball being 0.014 inches in from the edge of the one-inch (25.4mm) opening. See Figure 1A, 1B and 2.
- 2.4. The ball of the gauge should be checked regularly for any sign of wear, nicking or corrosion, conditions that could adversely affect the accuracy of the tool.
- 2.5. To ensure proper calibration, the gauge should be checked against an appropriately machined gauge block prior to use. Such blocks are provided by gauge manufacturers.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30

4. PROCEDURE

- 4.1. Grasp the gauge in one hand, taking the aerosol can in the other, and insert the ball into the can throat.
- 4.2. With the base of the instrument firmly against the top plane of the can curl, note depth to the center line of the ball when it makes contact with the curl internal radius (CIR), sometimes called the curl profile.
- 4.3. Remove the gauge, rotate the can 40-60° and repeat 5.2.
- 4.4. Repeat 5.3 several times, to get a sufficient set of individual CH Dimensions that any eccentricity of the locus of hard contact can be determined.

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METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CONTACT HEIGHT ECCENTRICITY OF A 1-INCH (25.4 MM) OPENING OF AN ALUMINUM AEROSOL CONTAINER	

4.4.1. [Note: Different gauges may require somewhat different manipulations than those given in 5.1 and 5.2]

4.5. Reporting

- 4.5.1. Reference the nominal specification of 0.167 ± 0.010 in. (4.25 ± 0.25 mm) for machined curl cans (only).
- 4.5.2. Record pertinent data, such as can maker, can size, inside or outside curl, machined or non-machined curl, lot number and (if decorated) the product identification.
- 4.5.3. Record the individual gauge results for each can examined.
- 4.5.4. Note eccentricity (range) of CH Dimensions, and out-of-specification results.

4.6. Precision

- 4.6.1. At tolerance extremes, results may vary due to the subjectiveness of the operator technique, gauge accuracy, repeatability and reproducibility.
- 4.6.2. Cans failing the test may be additionally examined by Shadowgraph or other acceptable methods.
- 4.6.3. Attempts to develop a precision statement have not been successful. For this reason, data on precision cannot be giving.

5. ACCEPTANCE CRITERIA

- 5.1. Report Results using predetermined criteria establish by the interested Parties.
- 5.2. Or if there is known specific criteria then list that otherwise default to 6.1.
- 5.3. The CH Dimension must be within defined limits to help assure a satisfactory seal when the valve cup is crimped in place.
- 5.4. Precision
 - 5.4.1. At tolerance extremes, results may vary due to subjectiveness of the operator technique, gauge accuracy, repeatability, and reproducibility.
 - 5.4.2. Cans failing the test may be additionally examined by Shadowgraph or other acceptable methods.
 - 5.4.3. Attempts to develop a precision statement have not been successful. For this reason, data on precision cannot be given.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

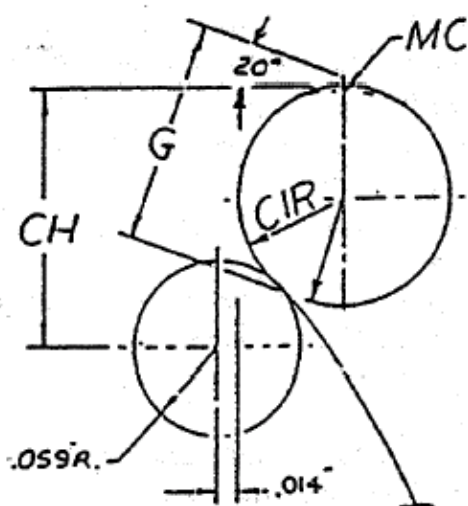
7. REFERENCES

- 7.1. HCPA-1.04 Tentative Method for Checking the Contact Height (CH Dimension) Eccentricity of One-Inch (25.4mm) Once-Piece Opening Aluminum Aerosol Cans
- 7.2. This method was initially approved by the CSPA Aerosol Division Commercial Standards Committee on April 26, 1994. Subsequent editorial changes were approved by the Committee in 2009.

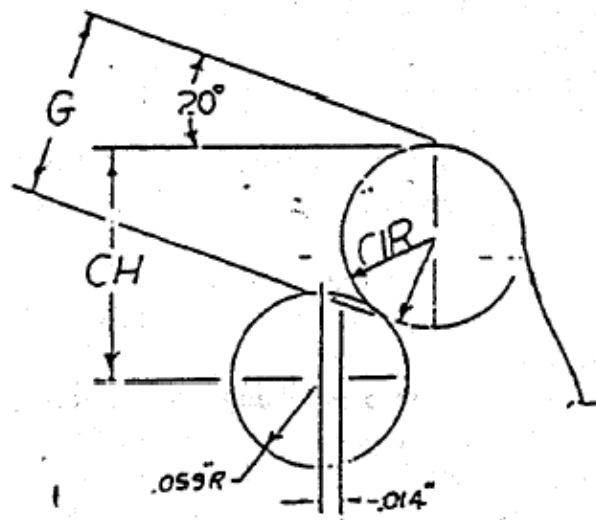
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8. OTHER RESOURCES

8.1. Figure 1A & 1B.



**OUTSIDE CAN CURL
FIGURE 1A**



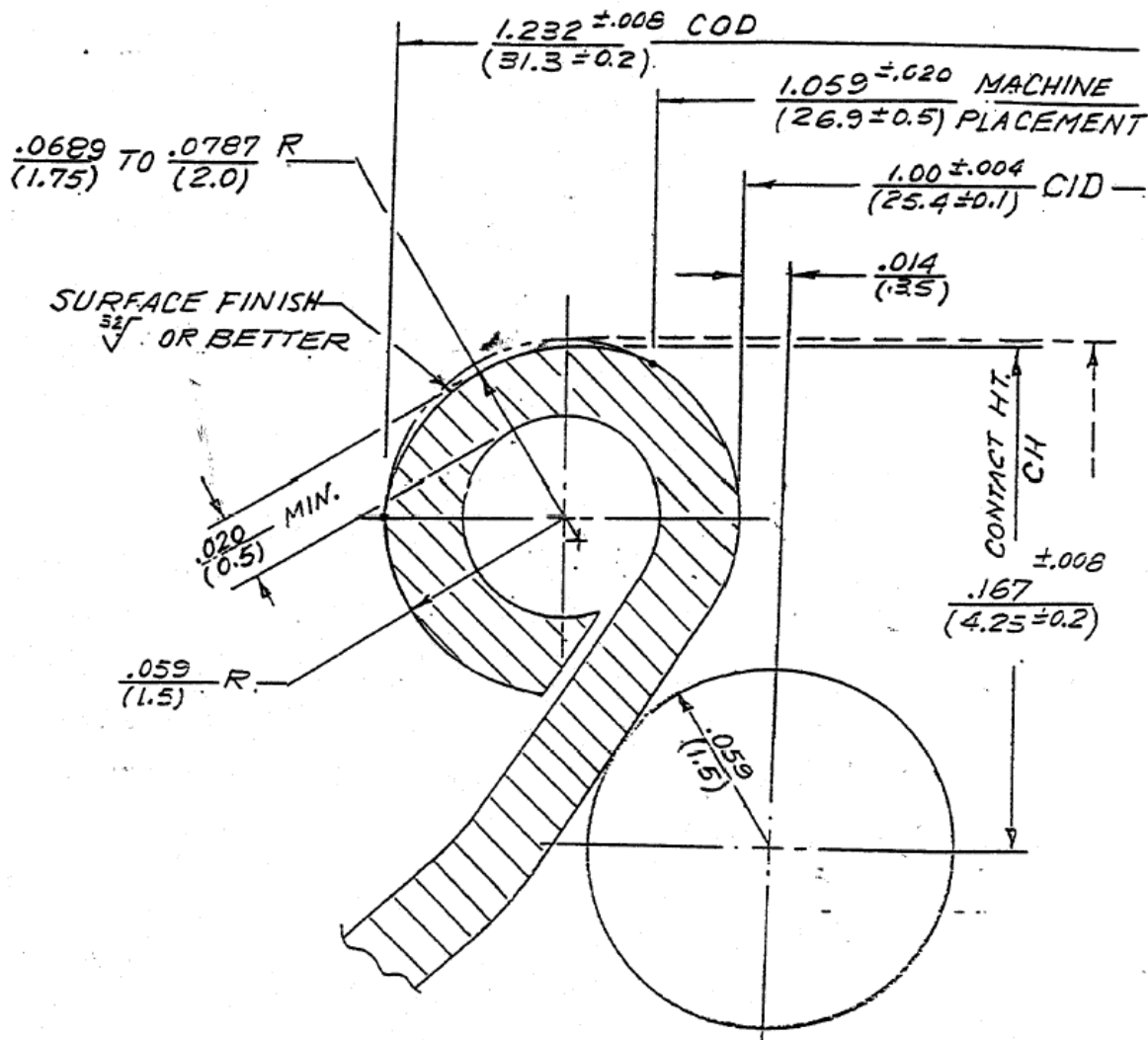
**INSIDE CAN CURL
FIGURE 1B**

8.2. Figure 2.

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FIGURE 2

ALUMINUM AEROSOL CAN - MACHINE-CURL PARAMETERS
(ALL OTHER ALUMINUM AEROSOL CURLS ARE UNDER STUDY)



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9. REVISIONS

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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
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EDITION: 10 METHOD NO: HCPA-2.05	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR CHECKING THE OUTSIDE DIAMETER OF ONE-INCH ONE-PIECE ALUMINUM AEROSOL CANS	

1. PURPOSE

- 1.1. The purpose of this method is to check the outside diameter (OD Dimension) of the one-inch (25.4mm) aluminum aerosol can.
- 1.2. The method has not been applied to 13, 15, 18, and 20mm aluminum aerosol cans, except informally, but appears to be suitable for these as well.

2. APPARATUS

- 2.1. Outside *Diameter "Go/No-Go" Ring Gauges*. (Two for each nominal can diameter to be studied.) See Figure 1.
- 2.2. *Calibration Bore Micrometer*. See Figure 2 for one option.
- 2.3. The various "OD" Dimension ring gauges should be regularly checked for any excessive wear, nicking, warp, rust or other conditions which could affect the accuracy of the measurement.
- 2.4. To ensure proper calibration, grasp the ring gauge in one hand and measure the inside diameter of the measurement surface, using a bore micrometer.
- 2.5. When inserted vertically within the hole of the ring gauge, the measurement may be taken directly from the bore micrometer spindle-sleeve or dial.
- 2.6. Values obtained from the bore micrometer must be equal to the upper dimensional tolerance limit for the "GO" Ring Gauge and to the lower dimensional tolerance limit for the "NO-GO" Ring Gauge.
- 2.7. Surfaces of both gauges must be calibrated in the same fashion, to ensure consistence, and reliability that they accurately represent both specification limits.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Grasping the aerosol can in one hand, center the lower limit ring gauge over the can bottom, concentric to the axis of the aerosol, and allow the measurement surface of the gauge to concentrically contact the can bottom.
- 4.2. With minimal force, attempt to slide the lower limit ring gauge around the lower end of the can.
- 4.3. Aerosol cans which are within the lower limit of the "OD" Dimension will disallow the lower limit ring gauge from sliding up the side wall, and are thus considered as acceptably within lower limit of the specification.
- 4.4. While still holding the aerosol can in one hand, now place the upper limit ring gauge over the bottom end of the aerosol, allowing the measurement surface of the gauge to contact the bottom of the can.
- 4.5. Attempt to slide the upper limit ring gauge from the bottom, up to one-third the height of the aerosol's side wall.
- 4.6. Aerosols that are within the upper limit of the "OD" Dimension will allow the upper limit ring gauge to slide completely up from the can bottom to one-third the height of the aerosol can wall, thus being considered as acceptably within the upper limit of specification.
- 4.7. Reference the specification for the nominal can diameter being tested.
- 4.8. Record pertinent data, such as can maker, can size, lot number, and (if decorated) the product identification.
- 4.9. Record the "Go/No-Go" results for each can examined.

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4.9.1. The "OD" Dimension is considered to conform to the specification if the minimum (NO-GO) gauge cannot be fitted around the can, and if the maximum (GO) gauge can be fitted around the can, up to the one-third height of the can wall, without the use of excessive force.

5. ACCEPTANCE CRITERIA

5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. HCPA-2.05: Standard Method For Checking The Outside Diameter (OD Dimension) Of One-Inch (25.4mm) One-Piece Aluminum Aerosol Cans

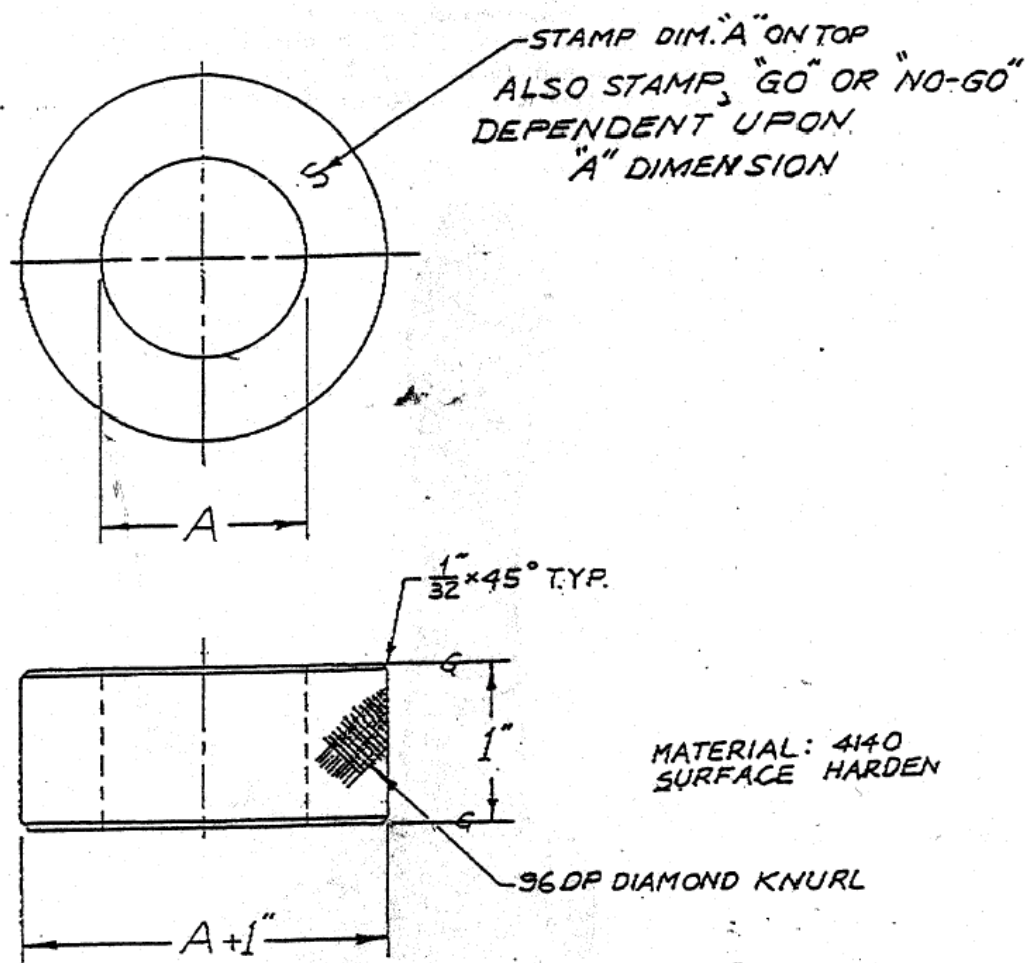
8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1. Go/No-Go Outside Diameter Ring Gauge

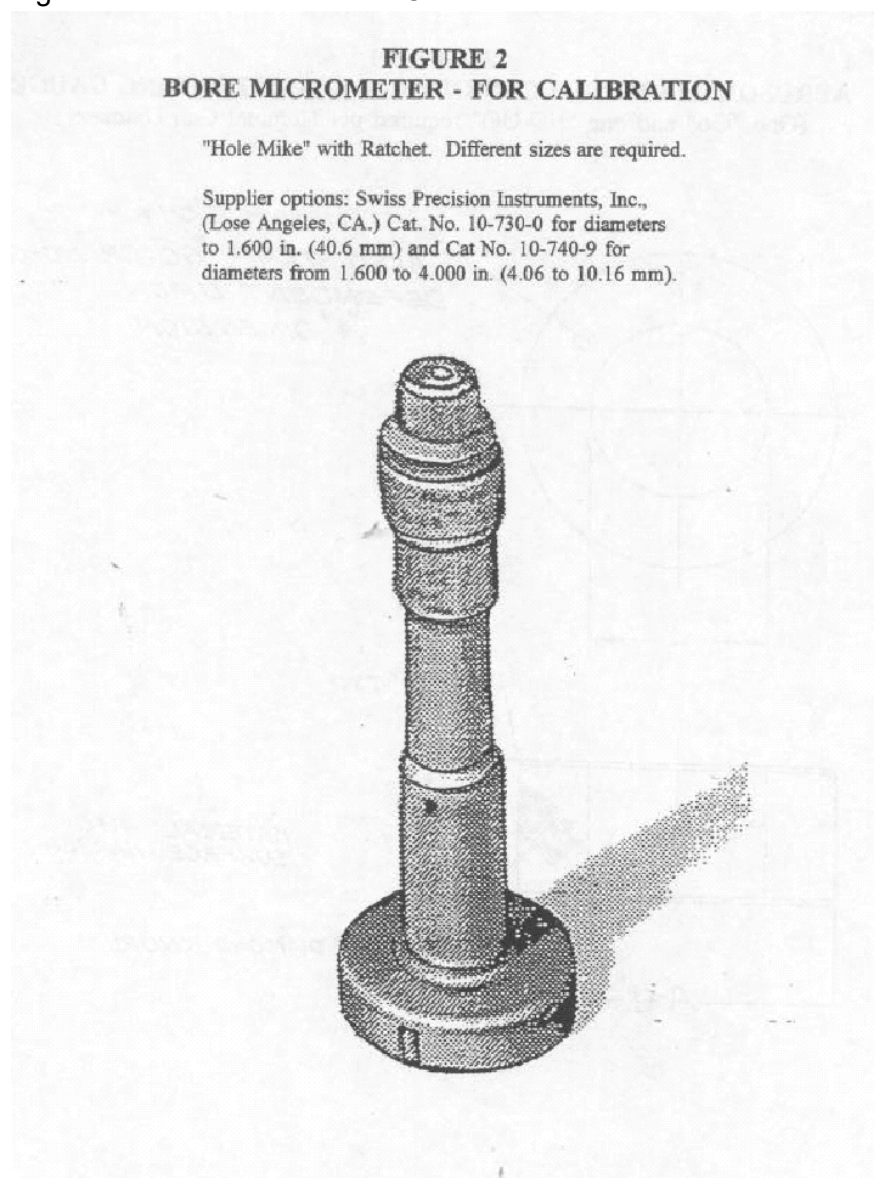
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FIGURE 1
AEROSOL ALUMINUM CAN OUTSIDE DIAMETER RING GAUGE
(One "Go" and one "NO-GO" required per Nominal Can Diameter)



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Figure 2. Bore Micrometer for Calibration



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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-2.06	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE BOTTOM DEPTH (BD DIMENSION) OF A BUMPED/DOME-TYPE ALUMINUM AEROSOL CONTAINER	

1. PURPOSE

- 1.1. The purpose of this method is to check the bottom depth (BD Dimension) of the bump or dome of a one-piece, one-inch (25.4mm) opening aluminum aerosol can.
- 1.2. This method is considered to also apply to all other types of aluminum cans, as well as those fashioned of steel or tinplate. See Figure 1.
- 1.3. Consistency in the BD Dimension permits various packagers who use contact stamped or label-placed encoders to set or adjust this equipment so that acceptable codes are placed on the bottom of all cans having the same BD Dimension.
- 1.4. Inconsistency of this dimension may, under rare circumstances, interfere with dip tube performance.

2. APPARATUS

- 2.1. Dial Gauge Depth Micrometer. Range 0-1.000 in. (0-25.4mm).
 - 2.1.1. Reference Federal Tool Works, Inc. (Providence, RI) Model No. C-81 S, with Model P-61 S base, or equivalent. See Figure 2.
- 2.2. The contact point must have a radius of 0.0156 in. (4.00mm) or greater. Alternatively, it may be ground down, leaving a central flat section of not more than 0.100 in. (2.54mm). The use of sharp or flat contact points will give erroneous results.
- 2.3. Alternatively, other devices, such as a standard depth micrometer or digital depth micrometer may be used, provided the base is at least 2.500 in. (63.5mm) long, and the contact point is contoured as in 2.2.
- 2.4. The gauge should be calibrated or zeroed before each use or series of uses. To zero the gauge, draw the spindle up, inside the base, then lay the base flat on a level plane, such as a Gauge Block, a hardened and ground steel plate, or a toolmaker's granite surface plate. Let the spindle descent to the planar surface. Adjust the dial to zero.
- 2.5. A Master Depth Block, provided by gauge manufacturers, may also be used to calibrate the gauge.

3. PRECAUTIONS

- 3.1. No known hazardous conditions exist for this method. Conduct your own job safety analysis prior to initiating this test.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: 30 containers.

5. PROCEDURE

- 5.1. Invert can so that the bottom surface is up.
- 5.2. Place the base of the dial gauge across the bottom, resting upon the junction radius of wall and bottom (bottom rim) and position the spindle or rod of the gauge to the exact center of the can bottom.
- 5.3. Bring the spindle against the bottom, while applying a slight downward pressure to the base to hold the device in place. Move the spindle slightly in all directions to see if there is a deeper area.

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- 5.4. With the spindle touching the deepest area of the can base, note the reading. This is the BD distance. (Note: In the case of aluminum cans where the base is pre-punctured with a typical 0.118 in. (3.00mm) hole for subsequent gasser-plugger operation, or where it is prefitted with a hole and rubber Nicholson or "umbrella" valve, the measurement cannot be applied with accuracy. It may not be required, since such bases cannot be contact coded. The distance to the center of the inserted valve grommet may be determined usefully, in the event that a code label is to be placed over the valve, using contact adhesive).
- 5.5. Record pertinent data, such as can maker, can size and base contour type (domed or concave, bumped or flat), lot number and (if decorated) the product decoration.
- 5.6. Record the BD distance for each can examined.

6. ACCEPTANCE CRITERIA

- 6.1. Reference the applicable BD Dimension specification as developed in consultation with the can maker for the specific can being tested; or
- 6.2. Report results using predetermined criteria established by the Interested Parties.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

- 8.1. Not Applicable at this time.

9. OTHER RESOURCES

- 9.1. Not Applicable at this time.

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Figure 1: Various Bottom Configurations

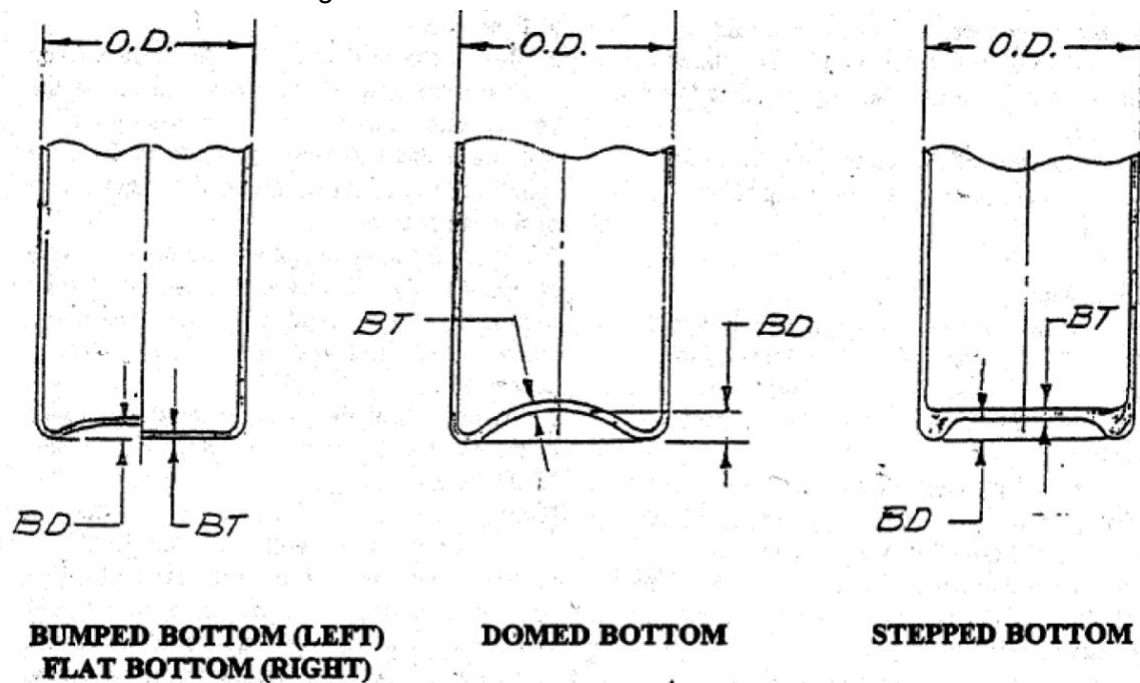


Figure 2: Dial Depth Micrometer



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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
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EDITION: 10 METHOD NO: HCPA-2.07	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE DOME DIAMETER OF ECO-GORGE (NOTCHED) ALUMINUM AEROSOL CONTAINER	

1. PURPOSE

- 1.1. The ability to firmly hold full diameter plastic overcaps, with their lugs in the "ecogorge" (notch) of the can depends in large measure on the diameter of the dome section, immediately about that circular indentation.
- 1.2. If the DDM Dimension is exceeded, the overcaps may seat with difficulty, and be excessively hard for the consumer to remove. They might also crack upon aging.
- 1.3. If the DDM Dimension is not large enough to be within the tentative specification, overcaps may fit loosely into the slot and come off too easily.
- 1.4. The purpose of this tentative method is to check the dome section of "eco-gorge"(notched) one-piece, one-inch (25.4mm) aluminum aerosols to determine the diameter at its widest point. This is the DDM Dimension.
[Note: In general, an overcap is not excessively loose if it can be used to hold the filled dispenser horizontally for ten seconds without separation. This it not a specification]

2. APPARATUS

- 2.1. An Outside Diameter "GO" Ring Gauge. See Figure 1.
- 2.2. An Outside Diameter "NO-GO" Ring Gauge. [Note: A combination "GO/NO-GO" Ring Gauge may be alternatively used, provided the measuring surfaces are at least 0.700 in. (17.8mm) long.]
- 2.3. The ring gauges should be checked periodically for signs of excessive wear, nicking, warping, corrosion or other conditions that could adversely affect the accuracy of the tools.
- 2.4. To ensure proper calibration one should periodically check the inside diameter of the gauge's measuring surface, at two or three different points for each instrument.
- 2.5. Diameters of both the "GO" and "NOGO" Ring Gauge measuring surfaces must be calibrated with the same instrument and in the same manner to ensure consistency, throughout the 360° face of each.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30

4. PROCEDURE

- 4.1. Grasping the wall of the aerosol can in one hand, take the "GO" gauge in the other and attempt to slide it gently past the maximum diameter locus of the can dome.
- 4.2. If the dome diameter is within the maximum of the DDM Dimension, the gauge will slide past it, showing that the dome diameter is acceptably within the
- 4.3. Repeat 5.1, using the "NO-GO" gauge.
- 4.4. If the dome diameter is within the maximum of the DDM Dimension, the gauge will not slide past it, showing that the dome diameter is acceptably within the specification. (Never use force to press the gauge past the dome diameter.)
- 4.5. Confirm the specification with the can maker prior to ordering cans and reference this specification in the report. (This is because the specification given earlier in this section of *The Aerosol Guide* are tentative and also incomplete. As yet they do not constitute an industry voluntary standard.
- 4.6. Record pertinent data, such as can maker, can size, lot number and (if decorated) the product identification.

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METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE DOME DIAMETER OF ECO-GORGE (NOTCHED) ALUMINUM AEROSOL CONTAINER	

4.7. Record the "GO" and "NO-GO" results for each can examined.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Or if there is known specific criteria then list that otherwise default to 6.1.
- 5.3. At tolerance extremes, results may vary, due to the subjectiveness of the operator's touch and technique, gauge accuracy, repeatability, and reproducibility.
- 5.4. These ring gauges will only measure the maximum axis of the dome diameter; if the
- 5.5. Cans failing the test may be optionally examined for ovality and complex shape by the use of calipers or other tools, to establish the cause of the defect.
- 5.6. Attempts to develop a precision statement have not been successful. For this reason, data on precision cannot be given.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. Not Applicable at this time.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

9. REVISIONS

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1	30 April 2026	Finalization of tenth edition guide	
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EDITION: 10 METHOD NO: HCPA-2.08	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Aluminum Container	TITLE: STANDARD PRACTICE FOR MEASURING THE CAP SEAT HEIGHT FOR ALUMINUM AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to check the vertical distance from the top plane of the one-inch (25.4mm) outside curl to the horizontal plane of the spherical or ogival shoulder at a diameter that is 0.078 in. (2.0mm) less than the full diameter of the can.
- 1.2. The dimensions are illustrated in Figure 1.
- 1.3. The method is limited to outside curl cans at this time. The HS Dimension, sometimes called "Height of Shoulder", is different for cans with ogival and spherical domes. The HS-O Dimension is for ogival cans, while the HS-S Dimension is applied to spherical cans.
- 1.4.

2. APPARATUS

- 2.1. Standard Ring, with a bore of appropriate size and a height of approximate size for the specific can being tested.
 - 2.1.1. Note: For example, a Standard Ring for a can with a nominal diameter of 1.772 in. (45mm) would have a bore of 1.693 in. (43mm) and a height of about 0.800 in. (20.3mm).
- 2.2. Depth Micrometer (or Digital Depth Micrometer), with 4 in. (101.6mm) base. See Figure 2A and 2B.
- 2.3. The standard ring should be regularly checked for any sign of excessive wear on the sharp, 90° angle of bore to flat.
- 2.4. The depth micrometer should be zeroed by retracting the measuring rod, placing the instrument on a Gauge Block or other very flat surface, and then extending the rod to the flat surface. The device can be reset to zero, if necessary.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Holding the aerosol can on a flat surface, place the Standard Ring upon the dome, positioning it as flat as possible.
- 4.2. While holding the Standard Ring firmly in place, insert the Depth Micrometer into the ring opening, above the right-hand side of the can curl and with the base resting upon the top surface of the ring.
- 4.3. Press gently downward upon the micrometer base, while lengthening the rod until it contacts the crown of the can curl. Record the reading.
- 4.4. Repeat 4.2 and 4.3 to measure the height of the left-side of the can curl. Record the reading.
- 4.5. Average the readings of 4.3 and 4.4 and subtract this figure from the height of the Standard Ring. This gives the HS Dimension.

$$4.5.1. \text{ HS Dimension} = \text{Standard Ring Height} - \left(\frac{\text{Reading in 4.3} + \text{Reading in 4.4}}{2} \right)$$

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.

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- 5.2. Reference the tentative specification for the can diameter and dome contour under study. Preferably, this will be provided by the can maker; otherwise use the table of earlier in this section.
- 5.3. Record pertinent data, such as the can maker, can size, dome configuration, lot number and (if decorated) the product identification.
- 5.4. At tolerance extremes, results may vary due to the subjectiveness of the operator's touch and technique, gauge and Standard Ring accuracy, roundness of the dome contour at the contact point, repeatability and reproducibility.
- 5.5. Attempts to develop a precision statement have not been successful. For this reason, data on precision cannot be given.

6. SAFETY

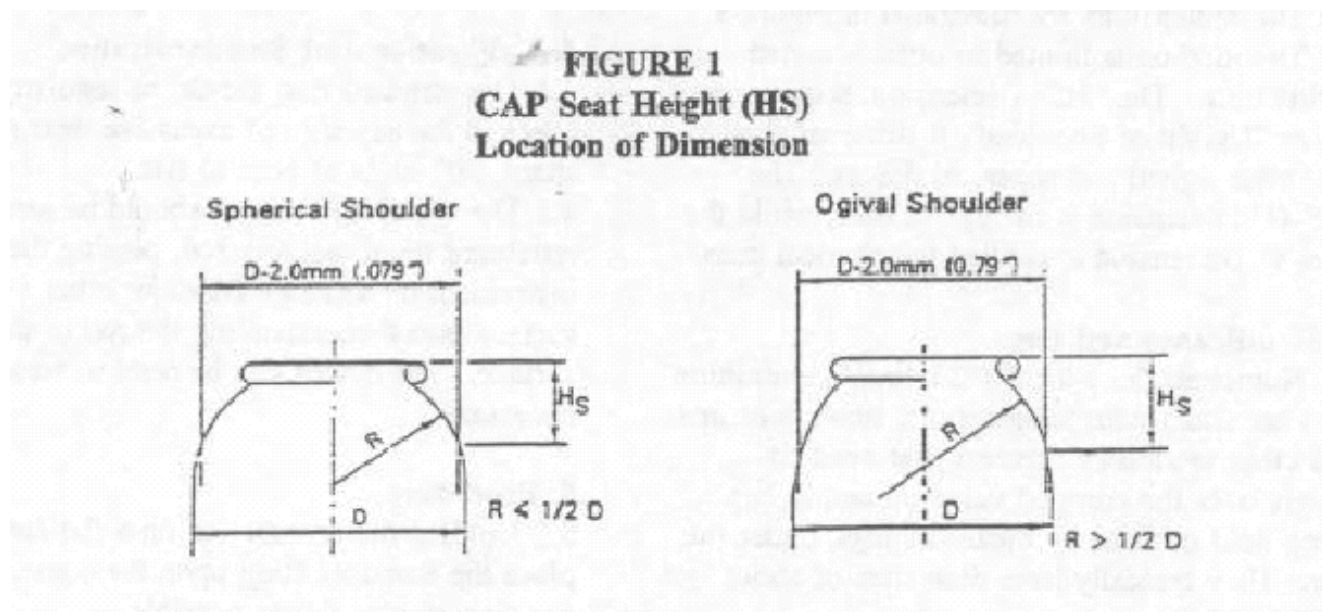
- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

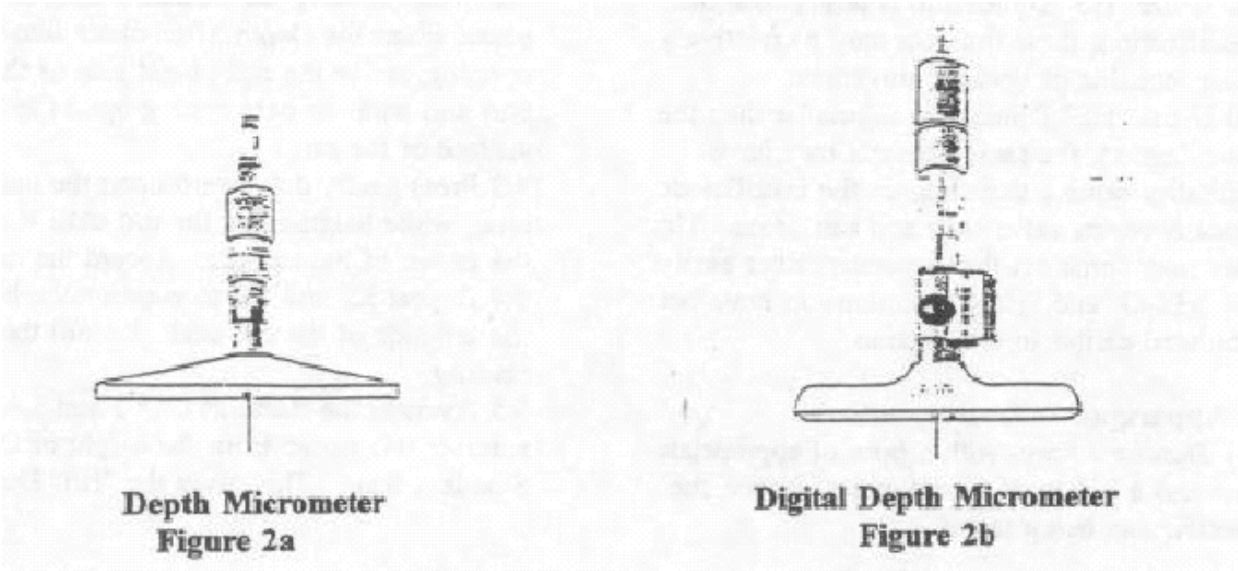
8. Not Applicable at this time.

9. OTHER RESOURCES

- 9.1. Not Applicable at this time.



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EDITION: 10 METHOD NO: HCPA-3.01	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 7
METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR DIMENSIONAL MEASUREMENT FOR 2-PIECE TINPLATE AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. In the interests of uniformity and quality, the aerosol industry has developed dimensional guidelines, which are suggested for U.S.A. two-piece steel and tinplate aerosol cans. Domestic can makers uniformly agreed to comply with these guidelines and were instrumental in their development. A series of standard methods and gauges were also developed to uniformly determine specific dimensions. The tolerances established for these dimensions allow for can manufacturing and filling process variations.
- 1.2. Table 1 presents the Sales Code Diameter and Height of two-piece necked-in aerosol cans. The figures in parentheses are in metric format, they are based on International Organization for Standardization (ISO) inside diameters to the nearest whole millimeter. Can heights are based on heights over the doubleseam (HCPA 3-Pc Container dimension "D") converted to the nearest whole millimeter.

2. APPARATUS

- 2.1. Height gauge
- 2.2. Caliper
- 2.3. Depth gauge
- 2.4. Plug gauge
- 2.5. Optical Comparator, CMM, Laser or equivalent, for non-destructive, electronic measuring
- 2.6. Cutting tool-used for cutting samples

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers randomly selected from beginning, middle and end of run

4. PROCEDURE

- 4.1. Mark the samples for recording identification.
- 4.2. Measure desired dimensions using the appropriate means to yield most accurate measuring.
- 4.3. Record data for each sample and analyze.
- 4.4. Specific dimensions used in these guidelines are described below and correspond to those associated with the cross-sectional drawings of two-piece necked-in aerosol cans (Figure 1).

Dimension	Definition	Dimension	Definition
A	Inside diameter of the 1-inch (25.4mm) opening.	G	Curl thickness of the 1-inch (25.4 mm) opening measured using the special micrometer.
B	Outside diameter of the 1-inch (25.4mm) opening.	S	The average of three measurements taken at $60^{\circ} \pm 10^{\circ}$, $180^{\circ} \pm 10^{\circ}$, and $300^{\circ} \pm 10^{\circ}$ from the side seam, each representing the vertical distance tangent to the top double seam, from the top of the double seam to the adjacent necked-in area of the can sidewall.
E	Distance from the top of the curl of the 1-inch (25.4 mm) opening to the bottom of the bottom double seam.	V*	Body outside diameter of the necked-in can.

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HF	Vertical distance between the plane defined by the top of the curl around the one-inch opening and any point on the dust shelf where its diameter is 1.285in (32.64mm). Dust shelf height.		
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*Method of measurement denoted to be agreed upon between supplier and interested party, if needed.

- 4.5. The following tables provide guideline dimensions for two-piece necked-in aerosol cans (alternate tables furnish metric equivalents).
- 4.6. In all tables, the guidelines refer to Figure 1, which illustrate the dimensions. Tables 2 and 3 give the information for two-piece necked-in aerosol cans.
- 4.7. NOTE: Due to varying neck profile differences between two-piece can suppliers, standard dimensions for the "S" and "HF" dimensions are not provided. These dimensions should be determined by the can supplier and other interested parties during the design process.

Table 1. Sales Code Height for Various Diameters of Necked-In Aerosol Cans (metric equivalent)

111/112(45mm) X	214 (73)	312 (95)	410 (117)	508 (139)	608 (165)		
200/202(52mm) X	214 (73)	306 (86)	314 (98)	406 (111)	509 (141)	514 (149)	605 (161)
	700 (177)	708 (190)					
202/205(57mm) X	410 (117)	604 (158)	607.5 (164)	608 (165)	701 (179)	704 (184)	710 (193)
	802 (206)	803 (207)	900 (228)	903 (233)			
207.5/211(65mm) X	315 (100)	413 (122)	512 (146)	604 (158)	612 (171)	713 (198)	804 (209)
	1113 (299)						
211/214 (70mm) X	315 (100)	413 (122)	714 (200)	804 (209)	1006 (263)		

Table 2. Two-Piece Necked-In Aerosol Cans Guideline Dimensions (inches)

Nominal Can Size	"A" ±0.004	"B" ±0.010	"E" ±0.035	"G" ±0.007	"V" ±0.006
111/112 X					
214*	1.000	1.221	3.080	0.130	1.770
312*	1.000	1.221	3.955	0.130	1.770
410*	1.000	1.221	4.830	0.130	1.770
508*	1.000	1.221	5.705	0.130	1.770
608*	1.000	1.221	6.705	0.130	1.770
200/202 X					
214	1.000	1.221	3.225	0.130	2.074
306*	1.000	1.221	3.725	0.130	2.074
314*	1.000	1.221	4.225	0.130	2.074
406*	1.000	1.221	4.725	0.130	2.074

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Nominal Can Size	"A" ±0.004	"B" ±0.010	"E" ±0.035	"G" ±0.007	"V" ±0.006
200/202 X					
509*	1.000	1.221	5.912	0.130	2.074
514*	1.000	1.221	6.225	0.130	2.074
605*	1.000	1.221	6.663	0.130	2.074
700*	1.000	1.221	7.350	0.130	2.074
708*	1.000	1.221	7.850	0.130	2.074
202/205 X					
410	1.000	1.221	5.001	0.130	2.273
604*	1.000	1.221	6.626	0.130	2.273
607.5	1.000	1.221	6.845	0.130	2.273
608	1.000	1.221	6.876	0.130	2.273
701	1.000	1.221	7.439	0.130	2.273
704	1.000	1.221	7.626	0.130	2.273
710	1.000	1.221	8.003	0.130	2.273
802	1.000	1.221	8.501	0.130	2.273
803	1.000	1.221	8.564	0.130	2.273
900	1.000	1.221	9.376	0.130	2.273
903	1.000	1.221	9.564	0.130	2.273
207.5/211 X					
315	1.000	1.221	4.716	0.130	2.594
413*	1.000	1.221	5.590	0.130	2.594
512	1.000	1.221	7.528	0.130	2.594
604*	1.000	1.221	7.028	0.130	2.594
612	1.000	1.221	7.528	0.130	2.594
713*	1.000	1.221	8.590	0.130	2.594
804	1.000	1.221	9.028	0.130	2.594
1113	1.000	1.221	12.590	0.130	2.594
211/214 X					
315	1.000	1.221	4.716	0.130	2.762
413	1.000	1.221	5.590	0.130	2.762
714	1.000	1.221	8.653	0.130	2.762
804	1.000	1.221	9.028	0.130	2.762
1006	1.000	1.221	11.153	0.130	2.762

*Not all suppliers manufacture cans with "E" dimensions in the indicated (") sizes to conform to the Sales Code height formula. Purchasers should work with their supplier(s) to determine a suitable "E" dimension for their operations.

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Table 3. Two-Piece Necked-In Aerosol Cans Guideline Dimensions (millimeters)

Nominal Can Size	"A" ± 0.10	"B" ± 0.25	"E" ± 0.89	"G" ± 0.18	"V" ± 0.15
45mm X					
73*	25.40	31.01	78.23	3.30	44.96
95*	25.40	31.01	100.46	3.30	44.96
117*	25.40	31.01	122.68	3.30	44.96
139*	25.40	31.01	144.91	3.30	44.96
165*	25.40	31.01	170.31	3.30	44.96
52mm X					
73	25.40	31.01	82.58	3.30	52.68
86*	25.40	31.01	94.62	3.30	52.68
98*	25.40	31.01	107.98	3.30	52.68
111*	25.40	31.01	120.68	3.30	52.68
141*	25.40	31.01	150.84	3.30	52.68
149*	25.40	31.01	158.78	3.30	52.68
161	25.40	31.01	169.24	3.30	52.68
177*	25.40	31.01	187.35	3.30	52.68
190	25.40	31.01	200.05	3.30	52.68
57mm X					
117	25.40	31.01	127.03	3.30	57.73
158*	25.40	31.01	168.30	3.30	57.73
164	25.40	31.01	173.86	3.30	57.73
165	25.40	31.01	174.65	3.30	57.73
179	25.40	31.01	188.94	3.30	57.73
184	25.40	31.01	193.70	3.30	57.73
193	25.40	31.01	203.23	3.30	57.73
206	25.40	31.01	215.93	3.30	57.73
207	25.40	31.01	217.51	3.30	57.73
57mm X					
228	25.40	31.01	238.15	3.30	57.73
233	25.40	31.01	242.93	3.30	57.73
65mm X					
100*	25.40	31.01	119.79	3.30	65.89
122*	25.40	31.01	141.99	3.30	65.89
146	25.40	31.01	191.21	3.30	65.89
158*	25.40	31.01	178.51	3.30	65.89
171	25.40	31.01	191.21	3.30	65.89
198*	25.40	31.01	218.20	3.30	65.89
209	25.40	31.01	229.31	3.30	65.89
299	25.40	31.01	319.79	3.30	65.89

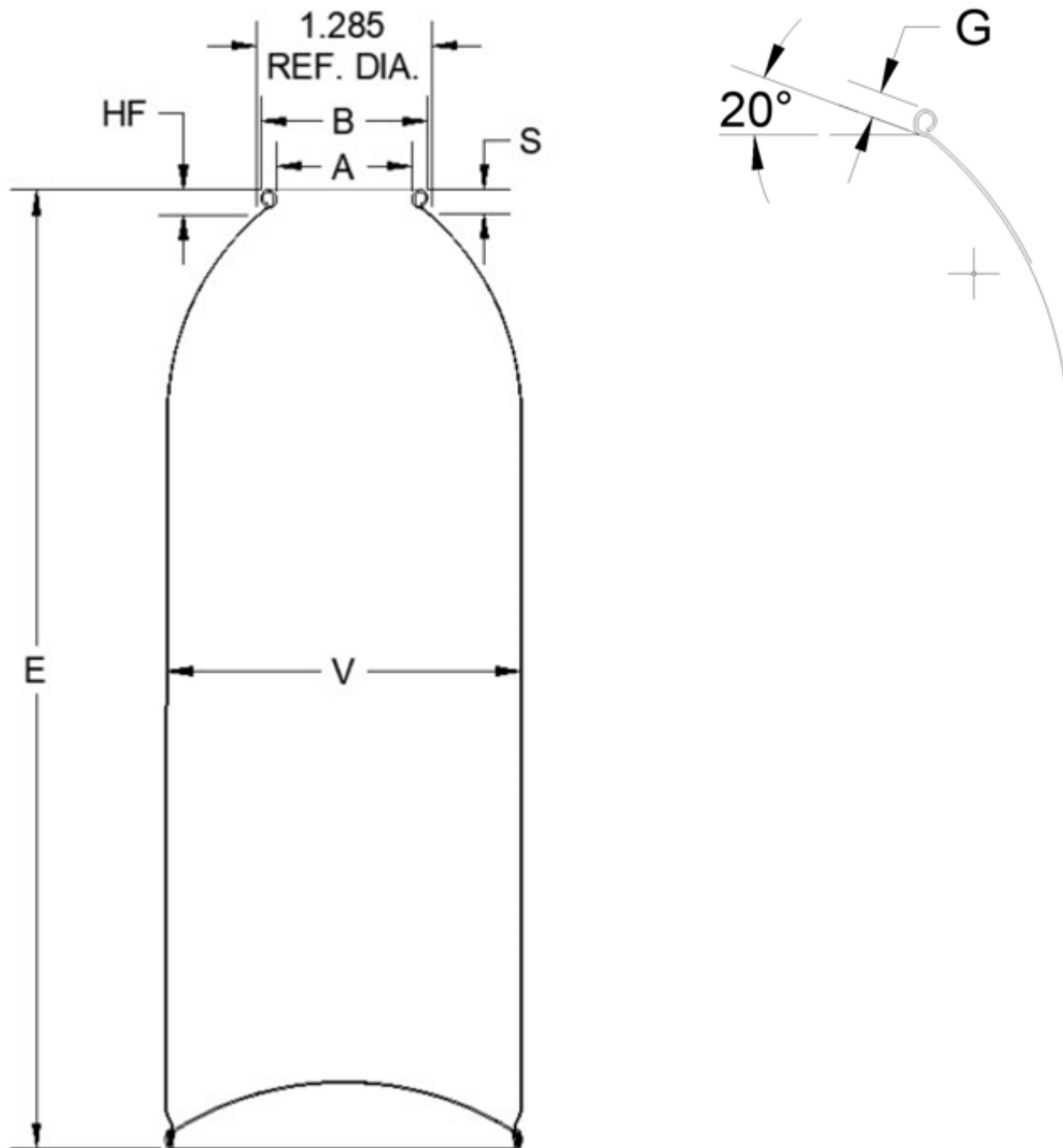
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Nominal Can Size	"A" ±0.10	"B" ±0.25	"E" ±0.89	"G" ±0.18	"V" ±0.15
70mm X					
100	25.40	31.01	119.77	3.30	70.15
122	25.40	31.01	142.00	3.30	70.15
200	25.40	31.01	219.79	3.30	70.15
209	25.40	31.01	229.31	3.30	70.15
263	25.40	31.01	283.29	3.30	70.15

*Not all suppliers manufacture cans with "E" dimensions in the indicated (") sizes to conform to the Sales Code height formula. Purchasers should work with their supplier(s) to determine a suitable "E" dimension for their operations.

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Figure 1. Two-Piece Aerosol Can



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5. ACCEPTANCE CRITERIA

5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. Not applicable at this time.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-3.02	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE A-DIMENSION OF 2-PIECE TINPLATE AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to check the inside diameter of the one-inch (25.4 mm) opening ("A" Dimension) of a two-piece aerosol can. This dimension has the ability to effect a long-term hermetic seal, at the point of valve cup and container 1-inch (25.4 mm) curl interface, is directly related to the consistency of the opening and its inside diameter.

2. APPARATUS

- 2.1. Inside curl diameter GO/NO-GO plug or equivalent. (See figure 1).
- 2.2. The GO/NO-GO plug gauge should be checked, periodically, for any excessive wear, nicking, warp or other conditions which could affect the accuracy of the gauge.
- 2.3. To ensure proper calibration, one should determine the outside diameter of the gauge's measurement surfaces.
- 2.4. Diameters of both the GO (lower) and NO-GO (upper) limit gauge plugs must be calibrated in the same manner to ensure consistency throughout 360°.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Holding the aerosol can in one hand, place the NO-GO (upper limit) gauge plug into the 1-inch (25.4 mm) opening, allowing the gauge measurement surface to ride concentrically in the opening. Care must be taken not to force the gauge to seat on the NO-GO plug.
- 4.2. Aerosol 1-inch (25.4 mm) openings which are below the upper limit of the "A" Dimension will not allow the NO-GO (upper limit) plug to fully seat in the opening, indicating that the diameter is acceptable.
- 4.3. While still holding the can, place the GO (lower limit) plug into the 1-inch (25.4 mm) opening, allowing the gauge measurement surface to ride concentrically in the opening. Care must be taken not to force the gauge to seat on the GO plug.
- 4.4. Aerosol cans with 1-inch (25.4 mm) openings which are above the lower limit of the "A" Dimension will allow seating of the GO plug, indicating that the opening's inside diameter is acceptable.
- 4.5. Record results for each can examined.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-3.01: Standard Practice for Dimensional Measurement for 2-Piece Tinplate Aerosol Containers.

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8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1. Go/No-Go Bar Gauge



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-3.03	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE B-DIMENSION OF A 2-PIECE TINPLATE AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to check the outside diameter of the curl ("B" Dimension) around the 1-inch (25.4 mm) opening of a two-piece aerosol can. This dimension as the ability to effect a long-term hermetic seal at the valve cup and container curl interface is directly related to the consistency of the curl and its outside diameter.
- 1.2. The ability to properly mate attachments to the finished aerosol can is also related to the consistency and outside diameter of the 1-inch (25.4 mm) curl.

2. APPARATUS

- 2.1. Outside curl diameter GO/NO-GO ring or equivalent. (See figure 1).
- 2.2. The GO/NO-GO ring gauge should be checked, periodically, for any excessive wear, nicking, warp or other conditions which could affect the accuracy of the gauge.
- 2.3. To ensure proper calibration, one should determine the inside diameter of the gauge's measurement surfaces.
- 2.4. Diameters of both the GO (upper) and NO-GO (lower) limit gauge rings must be calibrated in the same manner to ensure consistency throughout 360°.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Holding the aerosol can in one hand, place the NO-GO (lower limit) gauge recess over the 1-inch (25.4 mm) opening curl, allowing the gauge measurement surface to ride concentrically on top of the curl. Care must be taken not to force the curl to seat in the NO-GO recess.
- 4.2. Aerosol cans with 1-inch (25.4 mm) opening curls which are above the lower limit of the "B" Dimension will not allow seating of curl into the NO-GO recess, indicating that the curl's outside diameter is acceptable.
- 4.3. While still holding the can, place the GO (upper limit) recess over the 1-inch (25.4 mm) opening curl, allowing the gauge measurement surface to ride concentrically on top of the curl. Care must be taken not to force the curl to seat in the GO recess.
- 4.4. Aerosol can curls which are below the upper limit of the "B" Dimension will allow the GO (upper limit) recess to fully seat around the curl's outside diameter, indicating that the curl's outside diameter is acceptable.
- 4.5. Record results from each container examined.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.

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5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

5.4. This ring gauge only detects the maximum axis of the curl and does not detect ovality of the curl.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

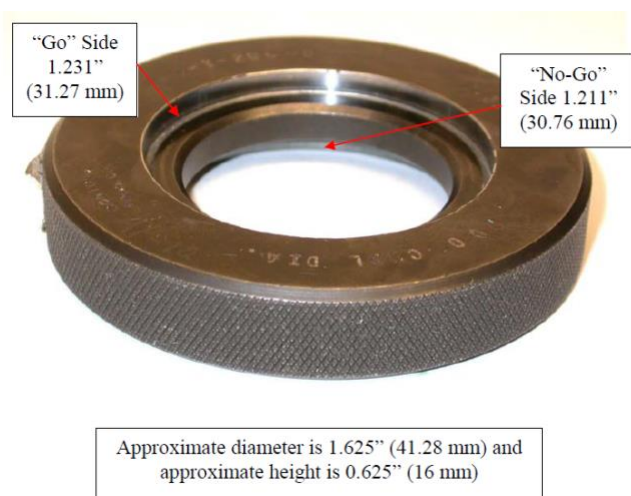
7. REFERENCES

7.1. HCPA-3.01: Standard Practice for Dimensional Measurement for 2-Piece Tinplate Aerosol Containers.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1. Go/No-Go Ring Gauge



9. REVISIONS

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METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE E-DIMENSION OF A 2-PIECE TINPLATE AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance from a point on the top of the curl of the 1-inch (25.4mm) opening to the bottom of the bottom double seam ("E" Dimension).
- 1.2. Assure dimensional interchangeability of 2-Piece cans within the industry, with respect to overall height.
- 1.3. Establish compatibility with mating components, filling equipment and processes.

2. APPARATUS

- 2.1. Height gauge, e.g., digital or analog linear gauge attached to a base and post, capable of being adjusted. (See Figure 1).
- 2.2. The height gauge must be calibrated to the appropriate height being measured with a height block that has been accurately prepared for use as a standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology) or equivalent certification.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Raise the tip of the height gauge and place the can to be measured on the base of the stand so that the tip of the gauge will come to rest on the crown of the can curl radius. This constitutes one reading.
- 4.2. If more than one reading is desired, mark the can curl and slightly raise the gauge tip, while rotating the can to another point, then allow the gauge tip to come to rest on the can curl.
- 4.3. Repeat the procedure outlined in 4.1 through 4.2.
- 4.4. Record results from each container measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

HCPA-3.01: Standard Practice for Dimensional Measurement for 2-Piece Tinplate Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

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Figure 1. Height Gauges



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METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE G-DIMENSION OF A 2-PIECE TINPLATE AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to measure the thickness of the curl surrounding the 1-inch (25.4 mm) opening ("G" Dimension). This measurement is taken at an angular offset of 20° as shown in Figures 1 and 2.
- 1.2. It is important to maintain uniformity and consistency of curl thickness to facilitate crimp seal integrity.
- 1.3. Because of the component and processing variables, consistency of the "G" dimension is critical to their interchangeability.

2. APPARATUS

- 2.1. 0.50in. (12.70mm) curl thickness micrometer, example as illustrated in Figure 3.
- 2.2. The micrometer should be calibrated before use with a 0.125in. (3.18mm) Standard, certified and traceable to N.I.S.T. (National Institute of Standards and Technology), or equivalent certification. Measure the thickness and adjust the micrometer to read the same as the standard.
- 2.3. The micrometer should be zeroed before each use. Turn the micrometer Thimble to zero before each use. The Scales on the Sleeve or Barrel and Thimble should show "0". Anvil and Spindle faces must be clean and free of any debris which can affect zeroing.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Raise the Grasp the micrometer (right-handed gauge shown in figure 1), placing the ring finger into the Finger Ring on the micrometer Frame.
- 4.2. Open the micrometer to about 0.200in. (5.08mm) and insert the Stop and Anvil into the can opening, with the Anvil under the can curl and the Spindle face over the curl. (See Figure 1).
- 4.3. Exert slight downward and backward pressure with the ring finger, allowing the micrometer Stop or Saddle to seat on top of, and against, the opposite inside surface of the curl.
- 4.4. Hold the micrometer in this position while using your fore-finger and thumb to close the micrometer by clockwise rotation of the Ratchet until the Spindle comes in contact with the curl, plus two clicks of the Ratchet.
- 4.5. Determine the can curl thickness at that point from the reading of the Sleeve or Barrel and Thimble Scales.
- 4.6. The "G" dimension is the perpendicular distance between the Spindle face and center line of the crowned Anvil face.
- 4.7. Release the Spindle slightly, by counter clockwise rotation of the Ratchet. Turn the micrometer approximately 20-40 degrees on the plane of the can curl to take another reading.
- 4.8. If more than one set of readings is desired, repeat the procedure.
- 4.9. Record results from each container measured.

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5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-3.01: Standard Practice for Dimensional Measurement for 2-Piece Tinplate Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

Figure 1. Curl Thickness Measurement Example



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Figure 2. Can Curl Cross Section

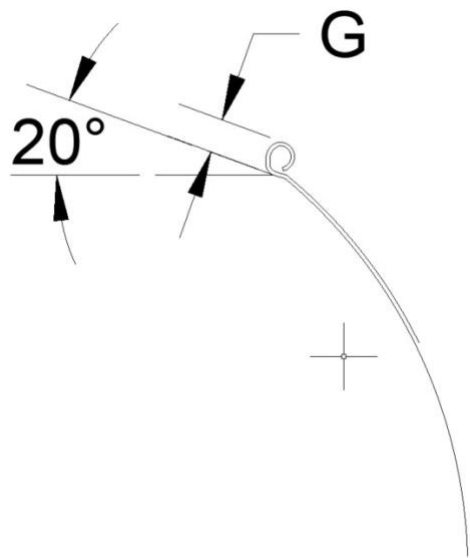


Figure 3. Curl Thickness Micrometer



9. REVISIONS

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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-3.06	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE S-DIMENSION OF A 2-PIECE TINPLATE AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance, tangent to the curl, from the top of the curl to the adjacent necked-in area of the can sidewall. ("S" Dimension), refer to Figure 1.
- 1.2. The average of three such measurements taken approximately equally spaced around the can circumference shall be defined as the "S" Dimension.
- 1.3. The "S" Dimension is important in insuring the proper mechanical and esthetic fit of full diameter overcaps.

2. APPARATUS

- 2.1. Optical Comparator (Shadowgraph): A device having at least 10X magnification, presenting a sharply defined profiled image of the top double seam and shoulder area. The apparatus should be configured to measure to an accuracy of 0.001in and a resolution of 0.0005in.
- 2.2. The optical comparator must be calibrated, using a 0.250in. (6.35 mm) gauge block that has been accurately prepared for use as a "Standard", and which is certified and traceable to the N.I.S.T. (National Institute of Standards and Technology) organization, or another certification.

Note: Custom gauging devices may be used if properly validated against the optical comparator results.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Select an optical comparator of acceptable magnification and delineation.
- 4.2. Number each container and capture the full identification of the can(s) tested; e.g., can maker, lot number, product identification (if any), date received, etc.
- 4.3. Mark the top double seam of the test can at points 0°, 120° and 240°.
- 4.4. Set the can with the 0° mark to obtain a well centered, sharp profile of the top double seam and necked-in area at this location. Assure the side wall of the can and the axis of the optical comparator are parallel.
- 4.5. Measure and record the "S" dimension as defined in 1.1.
- 4.6. Set the can at the 120° mark and repeat 4.3 and 4.4 (replacing the 0° mark with 120°).
- 4.7. Set the can at the 240° mark and repeat 4.3 and 4.4 (replacing the 120° mark with 240°)
- 4.8. Average the readings of 4.4, 4.6 and 4.7. This gives the "S" Dimension of the aerosol can being measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.

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5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

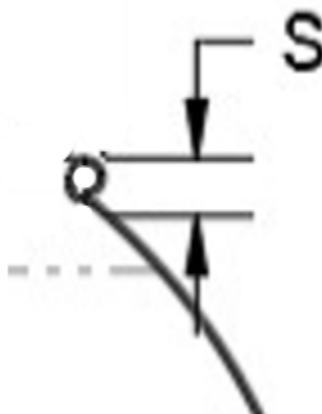
7. REFERENCES

7.1. HCPA-3.01: Standard Practice for Dimensional Measurement for 2-Piece Tinplate Aerosol Containers.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1. Partial Dome Area of 2-Piece Can Indicating the “S” Dimension



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-3.07	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE HF-DIMENSION ("DUST SHELF") OF 2-PIECE TINPLATE AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the vertical distance from the top of the curl of the one-inch opening to a point on the dome at a reference diameter of 1.285". ("HF" Dimension), refer to Figure 1.
- 1.2. The average of three such measurements taken at 0°, 120°, and 240° around the can circumference, shall be defined as the "HF" Dimension.
- 1.3. The "HF" Dimension is important in insuring the proper mechanical and esthetic fit of caps.

2. APPARATUS

- 2.1. Optical Comparator (Shadowgraph): A device having at least 10X magnification, presenting a sharply defined profiled image of the top double seam and shoulder area. The apparatus should be configured to measure to an accuracy of 0.001in and a resolution of 0.0005in.
- 2.2. The optical comparator must be calibrated, using a 0.250in. (6.35 mm) gauge block that has been accurately prepared for use as a "Standard", and which is certified and traceable to the N.I.S.T. (National Institute of Standards and Technology) organization, or another certification.

Note: Custom gauging devices may be used if properly validated against the optical comparator results.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Select an optical comparator of acceptable magnification and delineation.
- 4.2. Number each container and capture the full identification of the can(s) tested; e.g., can maker, lot number, product identification (if any), date received, etc.
- 4.3. Mark the can curl of the test can at points 0°, 120° and 240°,
 - 4.3.1. NOTE: As defined in 1.2 this is the average of the 3 measurements taken on each can.
- 4.4. Measure and record the curl OD at 60°, 120° and 240°.
- 4.5. Determine the horizontal distance to move the optical comparator by subtracting the curl OD from 1.285". The difference from the two values is the horizontal distance to move the optical comparator from the OD of the can curl.
- 4.6. Zero the X or vertical dimension of the optical comparator to the plane at the top of the can curl as shown in the following image



- 4.7. Set the can with the 0° mark to obtain a well centered, sharp profile of the dome area at this location. Assure the side wall of the can and the axis of the optical comparator are parallel. Move the optical comparator horizontally to the 1.285" reference diameter.
- 4.8. Move the optical comparator vertically until it intersects the dome and record the dimension from the comparator.

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METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE HF-DIMENSION ("DUST SHELF") OF 2-PIECE TINPLATE AEROSOL CONTAINERS	

- 4.9. Set the can at the 120° mark and repeat 4.5 through 4.8 (replacing the 0° mark with 120°).
- 4.10. Set the can at the 240° mark and repeat 4.5 through 4.8 (replacing the 120° mark with 240°)
- 4.11. Average the readings of 4.8, 4.9 and 4.10. This gives the "HF" Dimension of the aerosol can being measured.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Results may vary due to the subjectiveness of the operator technique and gauge accuracy, repeatability and reproducibility.
- 5.3. Precision and bias associated with this method can be evaluated by conducting appropriate gauge repeatability and reproducibility studies.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

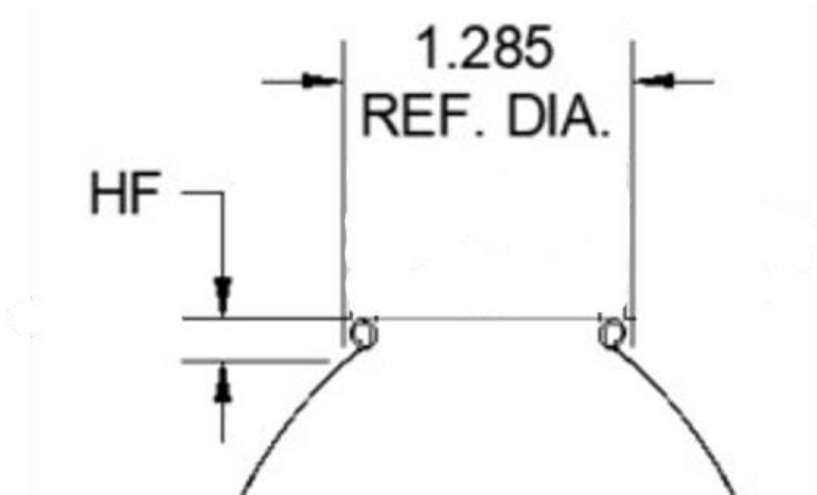
- 7.1. HCPA-3.01: Standard Practice for Dimensional Measurement for 2-Piece Tinplate Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

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METHOD CLASSIFICATION: 2-PC Container	TITLE: STANDARD PRACTICE FOR MEASURING THE HF-DIMENSION (“DUST SHELF”) OF 2-PIECE TINPLATE AEROSOL CONTAINERS	

Figure 1. Partial Dome Area of 3-Piece Can Indicating the “S” Dimension



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide.	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.01	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR DIMENSIONAL MEASUREMENT FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. These procedures are intended to serve as a guide for measuring plastic container dimensions. The measuring instruments illustrated are commonly used, however instruments of equivalent accuracy may be substituted for those shown. These readings may differ from those taken by hand, depending on the experience of the inspector. Consistent measurement and nomenclature is essential to develop meaningful specifications for both the container manufacturer and end user.

2. APPARATUS

- 2.1. Height gauge
- 2.2. Caliper
- 2.3. Depth gauge
- 2.4. Plug gauge
- 2.5. Optical Comparator, CMM, Laser or equivalent, for non-destructive, electronic measuring
- 2.6. Knife or cutting tool-used for cutting samples

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 6 containers for routine measurements, or 30 containers for mold qualification, per mold cavity.

4. PROCEDURE

- 4.1. Verify calibration of equipment
- 4.2. At time of testing, containers to be tested should be at a consistent age and condition
- 4.3. Recommendations for conditions are:
 - 4.3.1. As produced: Test containers as soon as desired, but no less than one hour after manufacture.
 - 4.3.2. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ condition for 40 hours².
- 4.4. Finish Dimension terminology
 - 4.4.1. Reference HCPA-4.02
- 4.5. Overall Height
 - 4.5.1. Is a measure from the base of the bottle to the top of the finish.
 - 4.5.2. Height to the bottom of the support ledge (if applicable) may also be desired for height comparisons between filled and empty containers.
- 4.6. Body width or Diameter (if applicable)
 - 4.6.1. Is a measure from one outside surface to the other outside surface at the major and minor axis.
 - 4.6.2. Width is defined as the longer dimension.
 - 4.6.3. For round bottles, bottle ovality may be measured. In this case record the measurements of the major and minor axis.
- 4.7. Body depth (if applicable)
 - 4.7.1. Is a measure from one outside surface to the other outside surface at the major and minor axis.

¹ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH, per ASTM D4332).

² Per Procedure A of ASTM D618.

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR DIMENSIONAL MEASUREMENT FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

4.7.2. Depth is defined as the smaller dimension.

4.8. Base Clearance (if applicable)

4.8.1. Place bottle flat on depth gauge measuring base.

4.8.2. Extend the spindle until it touches the base push up contour.

4.8.3. Move the depth gauge over bottom, adjusting spindle for continuous contact with container push-up in specified area, not on the parting line area.

4.8.4. Record minimum and maximum readings.

4.9. Capacity at Fill Point and Overflow

4.9.1. Reference HCPA-4.03

4.10. Wall Thickness

4.10.1. Reference HCPA-4.04

4.11. Record results.

5. ACCEPTANCE CRITERIA

5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. HCPA-4.02: Standard Practice for Measuring the Finish dimensions of container (preform) for aerosol products in plastic containers

7.2. HCPA-4.03: Standard Practice for Measuring Capacity for aerosol products in plastic containers

7.3. HCPA-4.04: Standard Practice for Measuring Wall thickness for aerosol products in plastic containers

8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	Initial release by PARG	
1	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
2	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.02	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING THE FINISH OF A CONTAINER (PREFORM) FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

1.1. Various factors of package quality, including seal integrity, are dependent on the quality of the container's finish. The purpose of this method is to verify those finish dimensions.

2. APPARATUS

- 2.1. Optical Projection Comparator, CMM or Laser
- 2.2. Vernier or Digital Calipers
- 2.3. Plug Gauge
- 2.4. Height Gauge with Flat Surface

3. TEST SPECIMENS

3.1. The number of test replications depends on the desired objectives of the testing and the availability of duplicate plastic aerosol containers/preforms. Replicate testing should be conducted to improve the reliability of the test results.

4. PROCEDURE

- 4.1. Verify calibration of apparatus equipment.
- 4.2. Observe and record incident of gross defects such as "blown necks" and other deformations.
- 4.3. Observe quality of sealing surfaces. Mark and note instances of short shots, nicks, dents, molding flash, etc.
- 4.4. At time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are as follows:
 - 4.4.1. As produced: Test containers once the container has sufficiently cooled, per operator's blow molding quality procedures.
 - 4.4.2. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ temperature for 40 hours².
- 4.5. Measure required finish dimensions.
 - 4.5.1. Reference MEASUREMENTS, below, for recommended measurements and nomenclature.
 - 4.5.1.1. Dimensions to be measured are dependent on design.
 - 4.5.2. Each diameter dimension should be measured at approximately 10° and 90° to the parting line.
 - 4.5.3. Height and vertical dimensions should not be measured on the parting line.
- 4.6. Record all data.

5. MEASUREMENTS

- 5.1. **B** – Height of Seal Beads
- 5.2. **T** – Lip Clinch Diameter
- 5.3. **E** – Lip Root Diameter
- 5.4. **H_i** – Minimum clearance from TOF³ on inner diameter for proper valve application

¹ Ambient is Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332

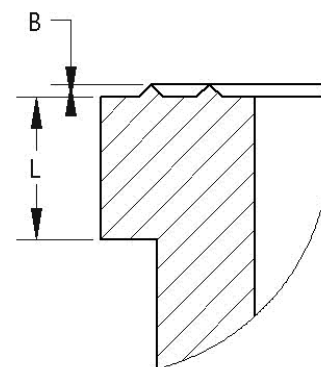
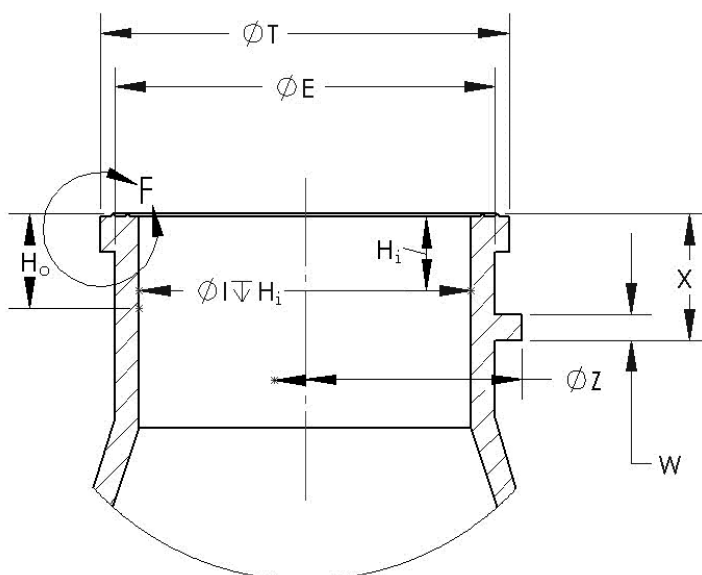
² Per procedure A of ASTM D618

³ TOF is defined as Top Of Finish (tip of seal beads, if applicable)

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- 5.5. **H_o** – Minimum clearance, at “E” diameter, from TOF for proper valve application
5.6. **I** – Minimum diameter through the finish to a depth of H_i
5.7. **L** – Lip Clinch height
5.8. **W** – Support Ledge height
5.9. **X** – Height from TOF to bottom of Support Ledge (W)
5.10. **Z** – Diameter of the Support Ledge

6. DRAWING



DETAIL F
SCALE 8 : 1

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

- 8.1. None.

9. OTHER RESOURCES

- 9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	Initial release	
1	11 June 2016	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.02	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 3 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING THE FINISH OF A CONTAINER (PREFORM) FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

EDITION: 10 METHOD NO: HCPA-4.03	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING CAPACITY FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1 This is a method for determining the capacity of plastic containers at the fill point and at overflow. Accurate assessment of capacity is required to ensure that plastic containers, when filled with product, will meet advertised and legal capacities. The data can also be used to verify sufficient headspace.

2. APPARATUS

- 2.1 Balance with accuracy of at least ± 0.01 gram
- 2.2 Micrometer depth gauge
- 2.3 Vented bulb syringe
- 2.4 Thermometer with accuracy of at least 0.5°C (1°F)
- 2.5 Distilled water
- 2.6 Vented top plate (reduces surface tension variability for overflow)
- 2.7 Table for density of water per CRC Handbook of Chemistry and Physics
- 2.8 A timing device (e.g. stop watch) is used to ensure all bottles are measured within a given amount of time. This allows for a consistent amount of panel expansion during and after fill between the samples.
- 2.9 Wetting agent, such as 10% Igepal CO-630 or equivalent nonionic surfactant

3. TEST SPECIMENS

- 3.1 Recommended Quantity: 6 mold rounds or minimum of 12 samples for single cavity mold.

4. PROCEDURE

- 4.1 Verify calibration of equipment.
- 4.2 At time of testing, containers to be tested should be at a consistent age and condition. Recommendations for conditions are as follows:
 - 4.2.1 As produced: Test containers once the container has sufficiently cooled, per operator's blow molding quality procedures.
 - 4.2.2 As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ temperature for 40 hours².
- 4.3 Record the actual temperature of the water (target $22^{\circ}\text{C}/72^{\circ}\text{F}$).
- 4.4 Identify container samples
- 4.5 Determine the weight to $\pm 0.1\text{g}$ of the (first) empty container, record the weight and tare the weight.
- 4.6 Prepare a sufficient quantity of test solution, consisting of clean ambient¹ water containing a wetting agent sufficient to flatten the meniscus and eliminate air bubbles. Sufficient wetting agents typically consist of one or two drops of ten percent Igepal CO-630 or equivalent nonionic surfactant.
- 4.7 Add the wetting agent, one drop at a time followed by agitation, until the test solution can be transferred without air bubbles. The presence of foaming indicates excessive wetting agent.
- 4.8 The solution can be used from bottle-to-bottle, as long as it is not contaminated with solid particles.

¹ Ambient is Standard Conditioning Atmosphere ($23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($73.4^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) and $50 \pm 5\%$ RH), per ASTM D4332

² Per procedure A of ASTM D618

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5. Capacity at Overflow

- 5.1 Weigh the empty bottle and record its weight to the nearest 0.1 gram.
- 5.2 Place the bottle on a level, vibration-free surface.
- 5.3 Start timing and transfer test solution to the bottle to just below point of overflow. Eliminate air bubbles, if present, as they interfere with accuracy of the test measurements.
- 5.4 Add additional test solution in small amounts with the pipette until the meniscus is tangent with the top of the finish.
- 5.5 The total elapsed time permitted for steps 4.12 through 4.13 must be consistent for a given bottle size and design.
- 5.6 Weigh the filled bottle and record its weight to the nearest 0.1 gram.
- 5.7 Repeat the procedure for each bottle on which the capacity at overflow is to be determined.

6. Capacity at Fill Point using Depth Micrometer

- 6.1 Set the micrometer depth gauge to the specified fill point, as agreed on by parties involved. The fill point is the specified distance below the top of the bottle finish.
- 6.2 Place the bottle on a level, vibration-free surface.
- 6.3 Start timing and transfer test solution to the bottle to just below the fill point as rapidly as possible. Eliminate any air bubbles, if present, as they interfere with the accuracy of the measurement. Slight tapping of the bottle will facilitate bubble removal.
- 6.4 Place the micrometer depth gauge on top of the bottle finish with its stem tip centered inside the bottle and set at the specified fill point.
- 6.5 Add additional testing solution in small amounts with the pipette until the level of the solution just touches the tip of the depth gauge, and note the elapsed time.
- 6.6 The total elapsed time permitted for steps 4.20 through 4.22, must be consistent for a given bottle size and design.
- 6.7 Remove depth gauge and weigh the filled bottle. Record its weight to the nearest 0.1 gram.
- 6.8 Repeat procedure steps 4.18 through 4.24 for each container.

7. Calculations

- 7.1 Capacity at fill point and at overflow is determined by subtracting the empty bottle weight from the filled bottle weight.
- 7.2 The result is the weight of the test solution used to fill the bottle to fill point or to overflow.
- 7.3 Divide the result by the appropriate volumetric conversion factor to determine capacity in fluid ounces, cubic centimeters, or milliliters.
- 7.4 The conversion factor for fluid ounce determination of water at 23°C +/- 2°C (73.4 +/- 3.6°F) is approximately 29.50 grams per fluid ounce.
- 7.5 The averaged conversion factor for determination of volume in cubic centimeters for water at 23°C +/- 2°C (73.4°F +/- 3.6°F) is 0.99756 grams per cubic centimeter.
- 7.6 The conversion factor for determination of volume in milliliters is 0.99756 grams per milliliter.
- 7.7 NOTE 1: These conversion factors were developed using the relative density of water at 23°C +/- 2°C (73.4°F +/- 3.6°F). They are normally used in volumetric calculations. Any two labs involved in volumetric determinations of representative samples should establish a common factor at the outset.
- 7.8 Determine the density of water at the respective temperature as derived from the water density table in the CRC Handbook of Chemistry and Physics.

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7.9 Covert the overflow and fill level weights to volumetric data using the following calculation:
Volume (mL) = Net Weight (g) / Water Density (g/mL)

8. ACCEPTANCE CRITERIA

8.1 Report results using predetermined criteria established by Interested Parties.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. Chemical Technician's Ready Reference Handbook, Fourth Edition, McGraw-Hill, Inc.
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8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	22 November 2016	Initial release by PARG	
1	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
2	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.04	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING WALL THICKNESS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. Successful performance of a plastic container is related to many critical properties that are dependent on the container wall thickness profile consistency (e.g., propellant permeation rate, O₂ ingress, water vapor transmission rate, volume change, top-load strength). The purpose of this test is to measure wall thickness in distinct regions of plastic containers in order to monitor and compare with physical performance.

2. APPARATUS

- 2.1. Ultrasonic, Magna Mike, IR-Based, Confocal, or other non-destructive thickness testers
- 2.2. Micrometer with ball ends or equivalent with minimum resolution of 0.025mm (0.001 inch).
- 2.3. Height gauge with ink marking or scribe tip.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 12 containers

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At the time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are:
 - 4.2.1. As produced: Test containers as soon as desired, but no less than one hour after manufacture.
 - 4.2.2. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ condition for 40 hours².
- 4.3. Non-Destructive (direct contact measurements):
 - 4.3.1. The container should be marked at the desired test locations based on container design and interested parties' specifications.
 - 4.3.2. Measure the thickness to 0.025mm (0.001 inch) at all intersecting points marked above.
- 4.4. Destructive (Optional): Divide the container into 3 broad regions (shoulder, panel and base).
 - 4.4.1. Cut out a section of the container in the area to be measured for gauge access.
 - 4.4.2. Measure the wall thickness across the container surface for each of these regions and record minimum values.
 - 4.4.3. Measure the thickness in several places with the gauge.
- 4.5. Record results.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

¹ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH, per ASTM D4332).

² Per Procedure A of ASTM D618.

EDITION: 10 METHOD NO: HCPA-4.04	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 2 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING WALL THICKNESS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

7. REFERENCES

7.1. None.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	22 November 2016	Initial release by PARG	
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2	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.05	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 1
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING SECTION WEIGHT FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. A container has a unique material distribution profile depending on the container gram weight and processing technique. Consistency of weight distribution is an important factor in container performance. The purpose of container sectioning is to allow measurement of the weight of a specific segment (such as shoulder, panel and base) of a container.

2. APPARATUS

- 2.1. Laboratory scale with capacity of 100 grams minimum and an accuracy of ± 0.01 gram.
- 2.2. Container sectioning location guidelines, based on applicable marketer's specification drawing.
- 2.3. Equipment for cutting or sectioning container such as a Hot Wire Bottle Cutter.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 12 containers

4. PROCEDURE

- 4.1. Verify calibration of scale.
- 4.2. Inspect for and remove any foreign matter from containers.
- 4.3. Cut each container into sections based on container drawing.
- 4.4. Determine each section weight to nearest 0.1 gram.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. None.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	PARG Initial release	
1	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
2	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.06	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR DETERMINING SEAL INTEGRITY FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. The container finish and external clinch dimensions on a plastic aerosol are critical to obtain a tightly sealed container and maintain the desired pressure over the life of the product to ensure product performance. This test evaluates the integrity of the seal to make sure the finish adequately contains the product and propellant at the target pressures.

2. APPARATUS

- 2.1. Calibrated Secure Seal Tester (SST) or equivalent with appropriate fixture
- 2.2. Valves with a mounting cup designed for an outside clinch
- 2.3. Clinching device capable of applying valves to the containers

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 12 containers

4. PROCEDURE

- 4.1. Measure key dimensions on the finish of the container.
 - 4.1.1. Reference HCPA-4.02
- 4.2. Inspect for consistency of container surface finish and seal bead(s), if present.
- 4.3. Apply valves to all container samples plus an additional 3 samples in case samples are damaged during preparation.
- 4.4. Inspect the valves to make sure they are properly clinched.
- 4.5. Cut the finish/valve assembly off at the neck of the container, without causing damage to the finish.
- 4.6. Secure a sample in the fixture of the device.
- 4.7. Pressurize the specimen at a rate of 0.34 bar/sec (5 psi/sec) under water.
- 4.8. Pressurize the specimen to test pressure¹
 - 4.8.1. Optional: The pressure in the container may be increased until a failure occurs, for clinch evaluation purposes only.
- 4.9. Stop the test as soon as a continuous stream of bubbles becomes visible.
- 4.10. Record the pressure and repeat steps 4.1 to 4.9 for the remaining samples.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
 - 5.1.1. Pressure shall be greater than the test pressure of the intended container.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

¹ "Test Pressure" is 50% more than the pressure a nominally filled package reaches at 55°C (130°F).

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR DETERMINING SEAL INTEGRITY FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

7. REFERENCES

- 7.1. HCPA-4.02 Standard Practice for Measuring the Finish of a Container (Preform) for Aerosol Products in Plastic Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	Initial release by PARG	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.07	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR FILLING SAMPLES USED IN TEST METHOD DEVELOPMENT FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. This procedure is intended to serve as a guide for filling aerosol products in plastic containers. Primarily for use during the development phase when conducting applicable plastic aerosol test methods, not necessarily for production.

2. APPARATUS

- 2.1. Constant temperature water bath capable of maintaining 21.1°C.
- 2.2. Constant temperature water bath capable of maintaining 38°C.
- 2.3. A calibrated digital pressure gauge, capable of recording pressure through the valve stem
- 2.4. Digital or analog thermometer
- 2.5. Proper Personal Protective Equipment

3. TEST SPECIMENS

- 3.1. Minimum of 8 containers.

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. Inspect a set of 8 containers to ensure all samples meet bottle specifications.
- 4.3. Fill with Deionized¹ water² to appropriate level.
- 4.4. Clinch valve.
- 4.5. Pressurize to nominal pressure³.
- 4.6. Use appropriate pressure gauge to validate proper pressure.
- 4.7. Immediately after filling, shake the cans (10 times with a stroke length of approximately 35cm (12 inches)).
- 4.8. Record the initial pressure prior to placing in the water bath.
- 4.9. Condition 4 containers for a minimum of 1 hour in the 21.1°C (70.0°F) condition bath.
- 4.10. Condition 4 containers for a minimum of 1 hour in the 38°C (100°F) condition bath (Use to establish baseline for elevated temperature performance (as an early warning)).
- 4.11. Remove containers from bath and immediately shake (10 times with a stroke length of approximately 35cm (12 inches)).
- 4.12. Record the final shaken condition pressure.
- 4.13. Adjust charging pressure to the value that would be the difference between the immediate filling room pressure and the resulting 21.1°C (70.0°F) conditioning pressure, which will yield the desired nominal pressure.

5. PRESSURE SAMPLING

¹ Deionized water could be used as a proxy for preliminary testing with air, nitrogen or other non-volatile propellant.

² The quality of tap water varies by location and could affect the integrity of PET.

³ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR FILLING SAMPLES USED IN TEST METHOD DEVELOPMENT FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

5.1. Continue to take random pressure checks throughout the filling production to ensure the desired pressure range is being maintained.

6. ACCEPTANCE CRITERIA

6.1. Product and container meets predetermined criteria established by interested parties and label claim⁴.

7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

- 8.1. National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155.
- 8.2. HCPA-4.01: Standard practice for dimensional measurement for aerosol products in plastic containers
- 8.3. HCPA-4.02: Standard practice for measuring the Finish container (preform) for aerosol products in plastic containers
- 8.4. HCPA-4.03: Standard practice for measuring capacity for aerosol products in plastic containers
- 8.5. HCPA-4.06: Method for determining seal integrity for aerosol products in plastic containers

9. OTHER RESOURCES

9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
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⁴ For U.S.A. Label claim: National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155.

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR DETERMINING ENVIRONMENTAL STRESS CRACK (PET) FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

1.1. The hydroxide ion is the main catalyst of stress cracking in PET containers. A container that has more resistance to Sodium Hydroxide attack should be more resistant to stress crack initiators that a container may be exposed to during its lifetime. This test is used to evaluate the resistance PET containers have to cracking when exposed to a catalyst. This test evaluates stress cracking from external attacks; marketers should also evaluate product compatibility with the container to avoid stress cracking from internal agents.

2. APPARATUS

- 2.1. Individual testing stations with safety chambers
- 2.2. Stop watch or timer
- 2.3. Compressed air regulated to “nominal pressure”¹ at ambient² conditions
- 2.4. Distilled Water
- 2.5. Container valves
- 2.6. Clinch device and means of pressurization
- 2.7. Titration apparatus (to determine alkalinity of NaOH solution)
- 2.8. pH paper
- 2.9. Dye additive (to be used when container is not transparent)
- 2.10. 0.200% NaOH (sodium hydroxide), solution shall be prepared with distilled water and solid NaOH

3. PRECAUTIONS

- 3.1. The following list outlines known hazardous conditions. Conduct your own job safety analysis prior to initiating this test.
 - 3.1.1. NaOH is a strong alkali, which is corrosive to skin and eyes. Solid NaOH is also hygroscopic. Dilution of solid NaOH with water is an exothermic reaction. Always add NaOH slowly to water. Do not add water to NaOH. The pH of the 0.200% solution is about 12.7.
 - 3.1.2. Total body protection is recommended when handling the solution and the pressurized containers.
 - 3.1.3. It is highly likely the containers will burst during the test procedure. It is imperative to take proper precautions to prevent injury.
 - 3.1.4. NaOH solution must be disposed of according to SDS requirements.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: 30 containers per orientation

5. PROCEDURE

¹ “Nominal Pressure” is the pressure at which the package is nominally filled at ambient conditions.

² Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH, per ASTM D4332

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR DETERMINING ENVIRONMENTAL STRESS CRACK (PET) FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

- 5.1. Containers should be less than 2 weeks old, then aged at 50°C ± 2°C (122°F ± 3.6°F) and 50 ± 5% RH for 24 hours. After aging, the containers should be stored at ambient conditions for a minimum of 16 hours.
- 5.2. Prepare the NaOH solution according to the procedure in the precautions section.
- 5.3. Verify the NaOH solution is equilibrated to ambient² conditions. The solution shall be stored in a closed container to minimize absorption of CO₂. The container should be maintained at ambient² conditions and used within 8 hours of preparation.
- 5.4. Measure the alkalinity level of the 0.200% NaOH solution. The acceptable range of alkalinity is 2402-2602 mg/l CaCO₃.
- 5.5. Label each container in the order the testing will occur.
- 5.6. Inspect a set of 60 containers to ensure all samples meet bottle specifications.
- 5.7. Initial filling setup, follow procedure PARG-7.0.
- 5.8. Fill 60 containers with water, as described in 5.7.
- 5.9. Clinch valve.
- 5.10. Pressurize to nominal pressure³, as described in 5.7.
- 5.11. Use appropriate pressure gauge to validate proper pressure.
- 5.12. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)).
 - 5.12.1. For final testing and for packages intended to be used with liquefied petroleum gas (LPG's):
 - 5.12.1.1. Fill³ the product in the container as it would be filled for commercial distribution, clinch and then fill with the selected propellant, both at nominal fill levels.
- 5.13. Five (5) minutes after pressurizing the containers, mark⁴ the fill level on each container according to orientation and gently place each container into an individual pocket of 0.200% NaOH solution at ambient conditions.
 - 5.13.1. For normal orientation
 - 5.13.1.1. Mark⁴ the liquid level on each container, if applicable.
 - 5.13.1.2. The solution shall cover the base (to the top of the strap if applicable).
 - 5.13.2. For inverted orientation
 - 5.13.2.1. Mark⁴ the liquid level on each container, if applicable.
 - 5.13.2.2. The solution shall cover the amorphous region of the neck/shoulder of the bottle.
- 5.14. Record the start time as the time that the container was placed in the 0.200% NaOH solution.
- 5.15. The containers should be checked on the following frequency:
 - 5.15.1. 0-30 minutes: Continual monitoring
 - 5.15.2. 30-60 minutes: Check every 2 minutes
 - 5.15.3. 60-90 minutes: Check every 5 minutes
 - 5.15.4. >90 minutes: Check every 10 minutes, up to 3 hours maximum.
 - 5.15.5. If the technician leaves the room, it should be noted on the data collection sheet.

³ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

⁴ Marking only a transparent container is needed, if opaque containers, then reference footnote 3.

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5.16. Record the time to failure in minutes for each container.

5.17. After each use, carefully rinse and dry each test station.

6. ACCEPTANCE CRITERIA

6.1. Failure is defined as a burst or a slow leak. A slow leak is evidenced by a visual fill point drop from the marked line or presence of dye additive leaking into the test solution.

7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

8.1. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.

8.2. International Society of Beverage Technologists, Test Method for Evaluating the Relative Stress Crack Resistance of Poly(ethylene terephthalate) Carbonated Soft Drink Bottles, 03/12/2007.

9. OTHER RESOURCES

9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
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EDITION: 10 METHOD NO: HCPA-4.09	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR MEASURING THE THERMAL STABILITY FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

1.1. The propellant in an aerosol package exerts a pressure on the container walls. As temperature increases, pressure increases, causing the container to expand and creep¹. Expansion will cause the product fill level to drop, which may negatively affect package appearance and will affect how the container fits into a carrier shell, sits on a shelf, etc. Expansion will affect the internal volume of the container and may reduce internal pressure, thereby affecting long-term dispensing performance of the product. The purpose of this test is to measure a container's expansion.

2. APPARATUS

- 2.1. Equipment or chemicals to fill and pressurize the container.
- 2.2. An oven or environmentally controlled room set to 38°C ± 2°C (100°F ± 3.6°F)².
- 2.3. Equipment to measure max pressure.
- 2.4. Measurement tools: Pi tape, height gauge, calipers, volume displacement gauge, optical comparator, etc.
- 2.5. Appropriate safety equipment as defined by the marketer's safety protocol.

3. TEST SPECIMENS

3.1. The number of test replications depends on the desired objectives of the testing and the availability of duplicate plastic aerosol products. Replicate testing is recommended to improve the reliability of the test results.

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At the time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are:
 - 4.2.1. As produced: Test containers as soon as desired, but no less than one hour after manufacture.
 - 4.2.2. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient³ condition for 40 hours⁴.
- 4.3. Determine the amount of test specimens, per 3.1.
- 4.4. Inspect containers to ensure all samples meet bottle specifications.
- 4.5. The container should be marked at the desired test locations based on container design and Interested Party's specifications.
- 4.6. Measure the test locations (and/or immersion volume) on empty containers.
- 4.7. Initial filling setup, follow procedure HCPA-4.07, if non-compressed gas.
- 4.8. For packages intended to be used with liquefied petroleum gas (LPG's), fill the container as it would be filled for commercial distribution, with product and selected propellant to nominal fill levels.

¹ Creep: To permanently deform under the influence of an applied stress.

² Relative Humidity condition to be determined based on marketer's expected conditions, ± 5%.

³ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH, per ASTM D4332).

⁴ Per Procedure A of ASTM D618.

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4.9. Clinch valve.

4.10. Pressurize to nominal pressure⁵, as described in 4.7 or 4.8.

4.11. Use appropriate pressure gauge to validate proper pressure.

4.12. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)).

4.13. Mark the target fill level height on each container, if applicable (transparent container).

4.14. For preliminary testing the containers can be evaluated not fully dressed. For final testing it is recommended the containers be evaluated fully dressed to determine how creep affects total package performance and aesthetics.

4.15. Immediately check pressures of containers after filling and mark for appropriately for further pressure testing.

4.16. Store all containers at ambient³ conditions for minimum of 24 hours.

4.17. Record pressures on the containers.

4.18. Divide the user desired amount of filled containers, per 4.3, into two halves (Set A and Set B).

4.18.1. Test Set A:

4.18.1.1. Place containers in 38°C ± 2°C (100°F ± 3.6°F)² for 24 hours.

4.18.1.2. After 24 hours remove the containers from the 38°C ± 2°C (100°F ± 3.6°F)² condition, place them in ambient³ conditions for minimum of 2 hours then:

4.18.1.2.1. Measure the dimensions of the containers.

4.18.1.2.2. Measure the fill point change from the original mark, if applicable (transparent container).

4.18.1.2.3. Record pressures after completion of measuring.

4.18.1.2.4. Note any visual abnormalities (bulge, tilt, etc.)

4.18.2. Test Set B:

4.18.2.1. Place containers in ambient³ conditions for 24 hours.

4.18.2.2. After 24 hours then:

4.18.2.2.1. Measure the dimensions of the containers.

4.18.2.2.2. Measure the fill point change from the original mark, if applicable (transparent container).

4.18.2.2.3. Record pressures after completion of measuring.

4.18.2.2.4. Note any visual abnormalities (bulge, tilt, etc.)

4.19. Additionally, the Interested Party should consider other cyclic temperature profiles based on the party's known distribution and product use environments, whereby repeating the procedure from 4.1 to 4.17, and then subjecting the samples to such environment(s).

4.20. Record all data.

5. ACCEPTANCE CRITERIA

⁵ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

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5.1. Report results using predetermined criteria established by Interested Parties, pertaining to labeling, production process and distribution requirements.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	04 December 2016	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
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EDITION: 10	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026
METHOD NO: HCPA-4.10		PAGE 1 OF 4
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR BURST PERFORMANCE FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. Plastic aerosol containers are subjected to pressure during filling, distribution, and use. The purpose of this test is to determine the resistance to burst of the plastic container when pressurized under specific conditions to meet regulatory requirements.

2. APPARATUS

- 2.1. Calibrated Hydrostatic burst pressure tester with fill programmable ramping capabilities.
- 2.2. Special equipment may be necessary to deliver and control pressure at rates that simulate aerosol filling conditions

3. TEST SPECIMENS

- 3.1. Recommended Quantity: Minimum of 50 containers per condition. For production at least one (1) out of each lot of 5,000 must be tested¹.

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At the time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are:
 - 4.2.1. As produced: Test containers once the container has sufficiently cooled, per operator's blow molding quality procedures.
 - 4.2.2. As received: Test containers that have been aged at least 72 hours and conditioned at ambient² conditions for 40 hours³.
- 4.3. Place one container at a time in the burst tester. Ensure that the container is properly fitted into the container support and close the safety chamber door.
- 4.4. Initiate/Start the burst tester using one of the appropriate test profiles:
 - 4.4.1. *Regulatory Requirement*⁴:
 - 4.4.1.1. Pressurize to "test pressure"⁵ at 1.0 bar/sec (14.5psig/sec); hold for 25 seconds; ramp at 1.0 bar/sec (14.5psig/sec) to burst or exceeds requirement pressure, reference 'acceptable criteria' section, below.

¹ Per Title 49: Transportation, Part 178, Subpart B, 178.33b-b, Production Tests.

² Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH, per ASTM D4332).

³ Per Procedure A of ASTM D618.

⁴ The ramp profile is derived from FEA Directive 75/324/EEC, Section 6.1.1.1, annexed in FEA 621E method, per "Verification of the test pressure".

⁵ "Test Pressure" is 50% more than the pressure a nominally filled package reaches at 55°C (130°F).

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4.4.2. *Development Evaluation (Filling Simulation) – Optional for Evaluation Only:*

- 4.4.2.1. Pressurize to “nominal pressure”⁶, at “Fill Rate”⁷; hold for 25 seconds; ramp at 1.0 bar/sec (14.5psig/sec) to burst or maximum pressure achieved (machine capability), whichever comes first.

4.5. After the machine has finished, remove the container.

4.6. Record the following test results for each container.

- 4.6.1. Burst pressure or maximum pressure achieved (mandatory).
- 4.6.2. Record percent container expansion after 25 second hold and final expansion (optional).
- 4.6.3. Time duration for each container tested (optional).
- 4.6.4. Note location of failure (side wall, base, neck, etc.) and if it is a base failure, describe the location of the failure: through the gate, around the gate, foot to foot, etc. (mandatory).
- 4.6.5. Note whether or not splintering occurred during failure.
 - 4.6.5.1. Splintering is not preferred even if the container bursts above 16.55 bar (240 psig).
- 4.6.6. Record the water temperature for each series of tests, should be 20°C ± 5°C.

5. ACCEPTANCE CRITERIA

5.1. *Regulatory Requirement*

- 5.1.1. Per U.S. DOT⁸: Pressure in the container must not exceed 160 psig at 130°F. If the pressure in the container is less than 140 psig at 130°F, a non-DOT specification container may be used. If the pressure in the container exceeds 140 psig at 130°F (54.4°C) but does not exceed 160 psig at 130 °F (54.4°C), the container must conform to specification DOT 2S.
 - 5.1.1.1. All non-DOT specification and specification DOT 2S containers must be capable of withstanding, without bursting, a pressure of one and one-half times the equilibrium pressure of the contents at 130°F (54.4°C).
 - 5.1.1.2. Production Tests (Title 49CFR: Transportation, Part 178, Subpart B, Section 178.33b-8) for DOT-2S containers:
 - 5.1.1.2.1. One out of each lot of 5,000 containers or less, successively produced per day must be pressure tested to destruction and must not burst below 240 psig. The container tested must be complete as intended for transportation.
 - 5.1.1.3. Each such 5,000 containers or less, successively produced per day, shall constitute a lot and if the test container shall fail, the lot shall be rejected or ten additional containers may be selected at random and subjected to the test under which failure occurred. These containers shall be complete as intended for transportation. Should any of the ten containers thus tested fail, the entire lot must be rejected. All containers constituting a lot shall be of like material, size, design construction, finish, and quality.

⁶ “Nominal Pressure” is the pressure at which the package is nominally filled at ambient conditions.

⁷ “Fill Rate” is the rate at which the package is nominally pressure filled.

⁸ Title 49CFR: Transportation, Part 173, Subpart G, Section 173.306 (5)(ii)

EDITION: 10 METHOD NO: HCPA-4.10	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 3 OF 4
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5.1.2. Per FEA⁹:

5.1.2.1. For containers filled at a pressure of less than 6.7 bars at 50°C, the test pressure must be equal to at least 10 bars.

5.1.2.2. For containers filled at a pressure equal to or greater than 6.7 bars at 50°C, the test pressure must be 50% higher than the internal pressure at 50°C.

5.1.2.3. The burst pressure of plastic containers shall be at least 20% higher than test pressure.

5.1.2.4. "Plastic containers showing asymmetrical or major distortions or other similar faults shall be rejected. A slight symmetrical distortion shall be allowed provided that the container passes the bursting pressure test"¹⁰.

5.1.3. Per Canadian TC-2S¹¹:

5.1.3.1. For containers filled at a pressure greater than 0 kPa (0psig) but less than or equal to 1105 kPa (160psig) at 50°C, the test pressure of each finished container shall withstand, without leaking or bursting, the minimum burst pressure of 1655 kPa (240psig).

5.1.3.2. One completed container from each lot of 5000 or fewer containers shall be randomly selected and pressurized to destruction. The rate of pressurization shall not exceed a rate that allows for accurate detection of the burst pressure. The pressure at which the container bursts shall be recorded.

5.1.3.3. 4.4.4.2 Should the container leak or burst below the minimum burst pressure specified in 4.3.3, the lot shall either be condemned or ten additional containers shall be randomly selected from the same lot and subjected to the burst test. Should any of the ten containers tested fail, the entire lot shall be condemned.

5.2. *Development Evaluation (Filling Simulation)*: Evaluation purposes only, acceptance criteria to be determined by Interested Parties.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. None.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

⁹ Plastic aerosol dispensers technical requirements, FEA 647E (03/2020)

¹⁰ FEA Plastic Aerosol Dispensers Technical Requirements, FEA 647E (03/2020), Part 1, *Development of the aerosol containers*, Section 3, *Hydraulic Test*.

¹¹ Canadian General Standards Board, CGSB-43.123-210, Aerosol Containers and Gas Cartridges for Transport of Dangerous Goods, Sections 4.3 and 4.4 (TC-2S).

EDITION: 10 METHOD NO: HCPA-4.10	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 4 OF 4
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR BURST PERFORMANCE FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	08 November 2016	PARG Initial release	
1	11 June 2020	References to FEA Plastic Aerosol Dispensers Technical Requirements	- Referencing the latest version dated 03/2020 - Verified the criteria is represented
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.11	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR DROP IMPACT FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. An important feature of plastic containers is their resistance to failure on drop impact. The purpose of this test is to determine the ability of the container to withstand free-fall impact forces.

2. APPARATUS

- 2.1. Drop Tester; reference ASTM D5276-Section 5 and ISO 2248-Section 4, for apparatus set up.
 - 2.1.1. Impact surface shall be smooth and free from imperfection.
- 2.2. Appropriate safety precautions should be taken to prevent harm to operators and equipment when containers fall.
 - 2.2.1. Recommend a complete enclosure around drop test apparatus with impact resistant walls.

3. TEST SPECIMENS

- 3.1. Recommended Quantity:
 - 3.1.1. Development Evaluation: 90 containers per conditioning group (reference 4.8.1).
 - 3.1.2. Design Qualification: 25 containers per conditioning group (reference 4.8.2)

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are as follows:
 - 4.2.1. As produced: Test containers once the container has sufficiently cooled, per operator's blow molding quality procedures.
 - 4.2.2. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ temperature for 40 hours².
- 4.3. Inspect the required set of containers, determined in 3.1, to ensure they meet required specifications.
- 4.4. Sample containers must be filled as outlined below for appropriate application:
 - 4.4.1. For preliminary testing and for packages intended to be used with an air, nitrogen or other non-volatile propellants:
 - 4.4.1.1. Initial filling setup, follow procedure HCPA-4.07.
 - 4.4.1.2. Fill required set of containers, as described in 4.4.1.1.
 - 4.4.1.3. Clinch valve.
 - 4.4.1.4. Pressurize to nominal pressure³, as described in 4.4.1.1.
 - 4.4.1.5. Use appropriate pressure gauge to validate proper pressure.
 - 4.4.1.6. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)).
 - 4.4.2. For final testing and for packages intended to be used with liquefied petroleum gas (LPG's):

¹ Ambient is Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332

² Per procedure A of ASTM D618

³ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

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- 4.4.2.1. Fill the container as it would be filled for commercial distribution, with product and selected propellant at nominal fill levels.
- 4.5. It is recommended that the drop impact test be conducted with the containers in their “normal”⁴ state.
- 4.5.1. For example: If the container is normally distributed with a base cup, it is recommended that the drop impact test be conducted with the base cup applied.
- 4.5.2. Containers need not be fully dressed for drop impact test and shall not have an overcap or fitment protecting the valve.
- 4.5.3. Interested Parties can choose to include other test configurations at their discretion.
- 4.6. Test samples must be conditioned according to the following:
- 4.6.1. DOT-2S⁵ Requirements:
- 4.6.1.1. Group 1: 38°C (100°F) for 26 weeks
- 4.6.1.2. Group 2: 50°C (122°F) for 100 hours
- 4.6.1.3. Group 3: 55°C (131°F) for 18 hours
- 4.6.2. FEA Requirements⁶:
- 4.6.2.1. Group 1: -18°C (-0.4°F) for minimum of 24 hours
- 4.6.2.1.1. Substitute test medium that has a relative density to water and remains liquid.
- 4.6.2.2. Group 2: 40°C (104°F) for minimum of 3 months
- 4.6.2.3. Group 3: 55°C (131°F) for minimum of 6 hours
- 4.6.3. Canadian Transport of Dangerous Goods TC-2S⁷ requirements:
- 4.6.3.1. Same requirements as 4.6.1
- 4.6.3.2. Additionally, Group 4: -18°C (-0.4°F) for minimum of 24 hours
- 4.6.3.2.1. Substitute test medium that has a relative density to water and remains liquid.
- 4.6.4. Conditioning apparatus should maintain a relative humidity (RH) of 50% ± 5% RH, per ASTM D4332, for all groups, except 4.5.2.1.
- 4.7. Drop samples individually onto drop surface from 1.8m (71 inches):
- 4.7.1. Measured from the touch point of container on the drop lever to drop plate surface.
- 4.7.2. Closure, or sealing component of the container, must not be protected during the test.
- 4.7.2.1. Overcaps, actuators, etc. must be removed.
- 4.7.3. Avoid dropping on the valve.
- 4.7.4. Conduct tests within 20 minutes of removal from the specified conditioning environments.
- 4.8. The containers should be dropped for development and final design qualification.
- 4.8.1. Development Evaluation:

⁴ Normal state is which the product would be commonly used throughout the distribution and use of the product.

⁵ DOT-2S is specified in the U.S. Code of Federal Regulations, Title 49: Transportation, Part 178, Subpart B, Section 178.33b, Specification 2S.

⁶ FEA Plastic Aerosol Dispensers Technical Requirements, FEA 647E (03/2020), Part 2, *Development of the filled aerosol packs*, Section 3, *Material resistance to temperature – Drop Test*.

⁷ Canadian General Standards Board, CGSB-43.123-210, Aerosol Containers and Gas Cartridges for Transport of Dangerous Goods, Sections 4.3 and 4.4 (TC-2S).

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4.8.1.1. NOTE: During development and/or design comparisons for typical container geometries, based on 90 containers per temperature condition, as reference in section 4.6, the following orientations are suggested within $\pm 5^\circ$ for each drop orientation:

4.8.1.2. 30 samples dropped vertically on to the container base: 0° from vertical (flat base).

4.8.1.3. 30 samples dropped vertically on to the container base: 45° from vertical (corner).

4.8.1.4. 30 samples dropped horizontally on to the container side: 90° from vertical (side).

4.8.2. Design Qualification:

4.8.2.1. Repeat 4.8.1, per the discretion of the Interested Party.

4.8.2.2. The containers shall be dropped in statistically random⁸ orientations around their vertical axis, based on 25 containers per temperature condition, as referenced in section 4.6.

4.9. Each sample is tested once, then discarded.

4.10. Observe effect of initial impact only, as opposed to the effects of secondary impacts and exclude effects of subsequent or direct impacts to the valve.

4.11. Record leaks or ruptures.

4.11.1. Submerge suspect containers in water to inspect for small leaks.

5. ACCEPTANCE CRITERIA

5.1. DOT-2S⁵, FEA⁶ and TC-2S⁷ Requirements: There is no acceptable failure rate for this test, packages FAIL when product or propellant is able to leak from crack or rupture, following procedure 4.9 and 4.10.

5.2. Non-Spec DOT Plastic Aerosol: There are no mandated drop tests, nor acceptance criteria.

5.2.1. Recommendation is to test per procedure 4.5.1 and use acceptance criteria section 5.1, regardless of non-spec DOT pressure.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.

7.2. US Code of Federal Regulations, Title 49: Transportation, Part 178, Subpart B, Section 178.33b, Specification 2S; inner non-refillable plastic receptacles.

7.3. US Code of Federal Regulations, Title 49: Transportation, Part 173, Subpart G, Section 173.306 (5)(ii), Limited quantities of compressed gases.

7.4. FEA, Plastic aerosol dispensers technical requirements, FEA 647E (03/2020).

7.5. FEA Directive 75/324/EEC.

7.6. Canadian General Standards Board, CGSB-43.123-210, Aerosol Containers and Gas Cartridges for Transport of Dangerous Goods, Sections 4.3 and 4.4 (TC-2S).

⁸ A numeric sequence is said to be **statistically random** when it contains no recognizable patterns or regularities.

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR DROP IMPACT FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	PARG Initial release	
1	11 June 2020	- References of word crimp changed to clinch - Reference to FEA technical requirements - Added sections 3.1.2 and 4.8.2	- Align with industry terminology - FEA 647E, dated 03/2020
2	18 June 2020	Changed Design "Qualification" to "Evaluation", section 3.1.2 and 4.8.1	Aligns with verbiage used in other PARG methods
3	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
4	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.12	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR VERTICAL COMPRESSION UNFILLED CONTAINER FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. Empty containers must be able to withstand a top load force during palletizing, filling and clinching. This test method measures the mechanical properties of a plastic container when subjected to a compressive force at a constant rate of deflection.

2. APPARATUS

- 2.1. Compression Testing Machine, as described in ASTM D2659, or equivalent, which will apply a force at a constant displacement rate and will record the load-deflection curve for the test container.
- 2.2. Balance capable of measuring the container weight to the nearest 0.1 gram.
- 2.3. Bottle venting device, reference example Figure 1.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: Minimum of 30 containers.

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are as follows:
 - 4.2.1. As produced: Test containers once the container has sufficiently cooled, per operator's blow molding quality procedures.
- 4.3. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ temperature for 40 hours².
- 4.4. Mark all test containers with a unique number for traceability back to mold cavity, sample number, and test results.
- 4.5. Weigh containers and record the weight.
- 4.6. Set-Up Test Machine according to operating guidelines of equipment being used.
- 4.7. Attach appropriate load cell³ to use with the samples, based on required manufacturing load conditions.
- 4.8. Calibrate the load cell.
- 4.9. Set the crosshead speed per user defined application.
- 4.10. Place container on testing platform.
- 4.11. Place venting device on top of the container, reference section for Apparatus 2.3, centering the hole in the venting device with the center of the container opening.
 - 4.11.1. NOTE: Containers are tested with venting. Venting is provided to allow equalization of air pressure during testing when determining strength for palletizing, filling and clinching operations.

¹ Ambient is Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332

² Per procedure A of ASTM D618

³ load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured.

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- 4.12. Lower the crosshead so there is minimal distance between the upper platen and the top of the venting device without actual contact.
- 4.13. Tare or zero out crosshead movement, if necessary.
- 4.14. Initiate the test and compress the container until its compressive yield load has been exceeded or when a maximum deflection has been reached (user defined).
- 4.15. Record the compressive yield load, deflection, and any critical deformations at the point of failure.
- 4.16. Continue with remaining containers repeating steps 4.10 through 4.15.

5. ACCEPTANCE CRITERIA

- 5.1. A container is considered a failure if the maximum yield load is below the minimum top load requirements for the bottle. Minimum top load requirements are determined by the filling capping/operation and distribution requirements which are predetermined by Interested Parties.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

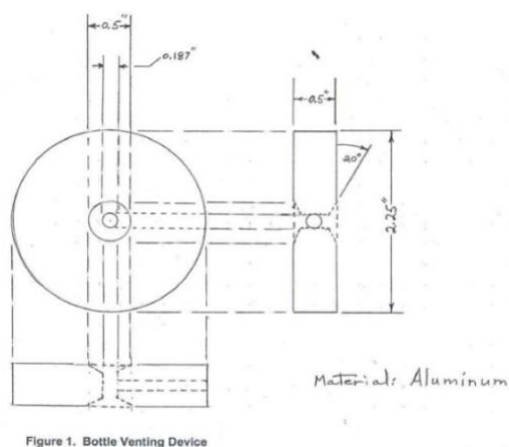
7. REFERENCES

- 7.1. None.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

Figure 1:



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.13	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR VERTICAL COMPRESSION FILLED AND PRESSURIZED CONTAINER FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. Filled and pressurized containers must be able to withstand a top load force during capping operation and distribution. This test method measures the mechanical properties of a plastic container when subjected to a compressive force at a constant rate of deflection.

2. APPARATUS

- 2.1. Compression Testing Machine, as described in ASTM D2659, or equivalent, which will apply a force at a constant displacement rate and will record the load-deflection curve for the test container.
- 2.2. Balance capable of measuring the container weight to the nearest 0.1 gram.
- 2.3. Valve Stem protection device, similar to Figure 1, custom to valve used.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: Minimum of 30 containers.

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are as follows:
 - 4.2.1. As produced: Test containers once the container has sufficiently cooled, per operator's blow molding quality procedures.
- 4.3. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ temperature for 40 hours².
- 4.4. Mark all test containers with a unique number for traceability back to mold cavity, sample number, and test results.
- 4.5. Weigh containers and record the weight.
- 4.6. Initial filling setup, follow procedure HCPA-4.07, if non-compressed gas, reference section 4.7.
- 4.7. For packages intended to be used with liquefied petroleum gas (LPG's), fill the container as it would be filled for commercial distribution, with product and selected propellant to nominal fill levels.
- 4.8. Clinch valve.
- 4.9. Pressurize to nominal pressure³, as described in 4.6 or 4.7.
- 4.10. Use appropriate pressure gauge to validate proper pressure.
- 4.11. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)).
- 4.12. Set-Up Test Machine according to operating guidelines of equipment being used.
- 4.13. Attach appropriate load cell⁴ to use with the samples, based on required manufacturing load conditions.

¹ Ambient is Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332

² Per procedure A of ASTM D618

³ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

EDITION: 10 METHOD NO: HCPA-4.13	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 2 OF 3
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- 4.14. Calibrate the load cell.
- 4.15. Set the crosshead speed per user defined application.
- 4.16. Place container on testing platform.
- 4.17. Place valve stem protection device on top of the container, reference section for Apparatus 2.3, centering the hole in the device over the valve stem.

NOTE: Containers are tested filled and pressurized. Pressurization is used to determine strength for capping and distribution operations.

- 4.18. Lower the crosshead so there is minimal distance between the upper platen and the top of the valve protection device without actual contact.
- 4.19. Tare or zero out crosshead movement, if necessary.
- 4.20. Initiate the test and compress the container until its compressive yield load has been exceeded or when a maximum deflection has been reached (user defined).
- 4.21. Record the compressive yield load, deflection, and any critical deformations at the point of failure.
- 4.22. Continue with remaining containers repeating steps 4.8 through 4.21.

5. ACCEPTANCE CRITERIA

- 5.1. A container is considered a failure if the maximum yield load is below the minimum top load requirements for the bottle. Minimum top load requirements are determined by the filling capping/operation and distribution requirements which are predetermined by Interested Parties.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.

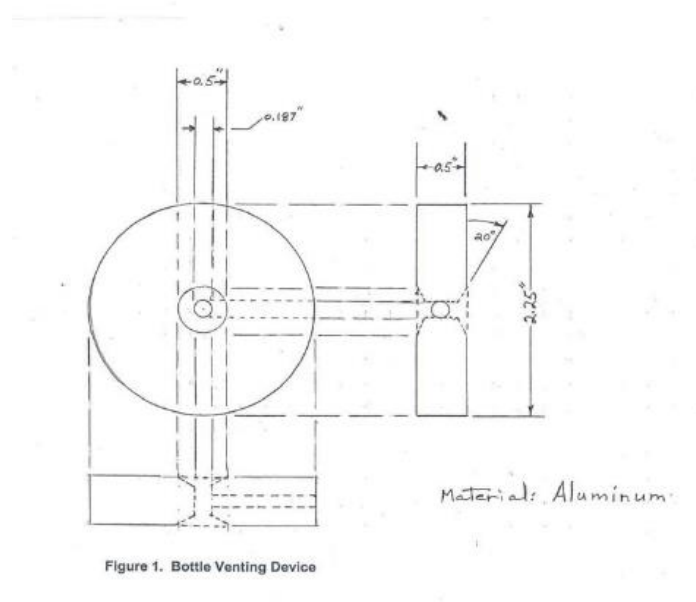
8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

⁴ load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured.

EDITION: 10 METHOD NO: HCPA-4.13	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 3 OF 3
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Figure 1:



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	09 May 2016	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.14	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR MATERIAL RESISTANCE TO CONSTANT TEMPERATURE EVALUATION FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. The propellant in an aerosol package exerts a pressure on the container walls. As temperature increases, pressure increases, causing the container to expand and creep. As temperatures approach the material's glass transition (T_g) the material will begin to soften, increasing the likelihood of deformation and/or failure. The purpose of this test is for evaluation purpose only, when comparing designs, as an indication of how the plastic container will react when subjected to a constant elevated temperature. The final container design shall be verified by using HCPA-4.15.

2. APPARATUS

- 2.1. Equipment and chemicals to fill and pressurized the container
- 2.2. Appropriate Environmental Chamber, appropriate for product type, capable of maintaining a temperature 64°C ($\pm 2^{\circ}\text{C}$) at 50% RH.
- 2.3. Equipment to measure pressure through the valve stem.
- 2.4. Equipment capable to be submersible in water to measure and record pressure gain/loss (optional).
- 2.5. Thermometer.
- 2.6. Timer (optional depending on equipment).
- 2.7. Appropriate containment of samples to capture leak or rupture when being tested without restricting temperature exposure to container.
- 2.8. Video recording camera (optional).
- 2.9. Appropriate safety equipment as defined by the testing party's safety protocols.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 12 containers

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. Inspect a set of 12 containers to ensure all samples meet bottle specifications.
- 4.3. Initial filling setup, follow procedure HCPA-4.07, if non-compressed gas, reference 4.4.
- 4.4. For packages intended to be used with liquefied petroleum gas (LPG's), fill the container as it would be filled for commercial distribution, with product and selected propellant to nominal fill levels.
- 4.5. Fill 12 containers, as described in 4.3.
- 4.6. Optional, insert submersible recorders.
- 4.7. Clinch valve.
- 4.8. Pressurize to nominal pressure¹, as described in 4.3 or 4.4.
- 4.9. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)).
- 4.10. Inspect all test containers for abnormal features to ensure they meet manufacturing specifications prior to using them for the test. Optionally, photograph representative test containers before placing them into test, and at the conclusion of the cycle.

¹ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions.

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- 4.11. At the time of testing, containers to be tested should be at a consistent age and condition.
- 4.12. Recommendations for conditions are:
 - 4.12.1. As produced: Test bottles as soon as delivered, but no less than one hour after manufacture.
 - 4.12.2. As received: Test bottles that have been aged a minimum of 72 hours and conditioned at ambient² temperature for 40 hours³.
- 4.13. Place the filled containers into an ambient temperature storage and condition for 24 hours.
- 4.14. Measure the initial pressure of each container, using a pressure gauge through the valve stem.
- 4.15. Pre-condition the chamber to 64°C at 50% RH.
- 4.16. Once at proper condition temperature:
 - 4.16.1. Place containers into the test chamber using containment per Apparatus section 2.7.
 - 4.16.2. Place the containment apparatus or samples in the middle of the chamber.
 - 4.16.3. Containers should be oriented vertically in an orientation where the valve is in contact with headspace, not product.
- 4.17. Start timer for 5 hours.
- 4.18. Optional, use video recording if chamber has a glass viewing window to understand the failure or deformation mode.
- 4.19. After 5 hours, allow to cool to ambient temperature.
- 4.20. Measure and record pressure (if applicable).
- 4.21. Remove the data recorders and download the data (if applicable).
- 4.22. Record the time, temperature and pressure corresponding to rupture/leak event (if applicable).
- 4.23. Record how and where the container ruptured or leaked (if applicable).

5. ACCEPTANCE CRITERIA

- 5.1.1. Report results, for evaluation purposes only.
- 5.1.2. Once design evaluation is complete, the Interested Party shall test the container using HCPA-4.15, to validate the design.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.
- 7.2. HCPA-4.15: Method for Material resistance to temperature for aerosol products in plastic containers.
- 7.3. Study of Internal Automobile Temperature Profiling, Plastic Aerosol Research Group, LLC, July 2015.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

² Ambient is Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332

³ Per procedure A of ASTM D618

EDITION: 10 METHOD NO: HCPA-4.14	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 3 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR MATERIAL RESISTANCE TO CONSTANT TEMPERATURE EVALUATION FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	22 November 2016	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026
METHOD NO: HCPA-4.15		PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR MATERIAL RESISTANCE TO INDUCED HEAT CONDITIONS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

1.1. The propellant in an aerosol package exerts a pressure on the container walls. As temperature increases, pressure increases, causing the container to expand and creep. As temperatures approach the material's glass transition (T_g) the material will begin to soften, increasing the likelihood of deformation and/or failure. The purpose of this test is to assess a container's integrity within confined spaces, such as a motor vehicle, as temperatures are induced and fluctuate with external environmental conditions over the course of a day.

2. APPARATUS

- 2.1. Equipment and chemicals to fill and pressurized the container.
- 2.2. Environmental Chamber, appropriate for product type, capable of automatically changing the temperature OR an appropriate chamber that can be manually changed, either shall be based on the profile schedule (reference Figure 1) over time with a capable temperature range of 23°C to 70°C ($\pm 2^\circ\text{C}$) at 50% ($\pm 5^\circ\text{C}$) RH.
- 2.3. Equipment to measure pressure through the valve stem.
- 2.4. Equipment capable to be submersible in water to measure and record pressure gain/loss (optional).
- 2.5. Thermometer.
- 2.6. Timer (optional depending on equipment).
- 2.7. Appropriate containment of samples to capture leak or rupture when being tested without restricting temperature exposure to container.
- 2.8. Video recording camera (optional).
- 2.9. Appropriate safety equipment as defined by the Interested Party's safety protocols.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 12 containers

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. Inspect a set of 12 containers to ensure all samples meet bottle specifications.
- 4.3. Initial filling setup, follow procedure HCPA-4.07, if non-compressed gas, reference 4.4.
- 4.4. For packages intended to be used with liquefied petroleum gas (LPG's), fill the container as it would be filled for commercial distribution, with product and selected propellant to nominal fill levels.
- 4.5. Fill 12 containers, as described in 4.3.
- 4.6. Optional, insert submersible recorders.
- 4.7. Clinch valve.
- 4.8. Pressurize to nominal pressure¹, as described in 4.3 or 4.4.
- 4.9. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)).

¹ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions.

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR MATERIAL RESISTANCE TO INDUCED HEAT CONDITIONS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

- 4.10. Inspect all test containers for abnormal features to ensure they meet manufacturing specifications prior to using them for the test. Optionally, photograph representative test containers before placing them into test, and at the conclusion of the cycle.
- 4.11. At the time of testing, containers to be tested should be at a consistent age and condition.
- 4.12. Recommendations for conditions are:
 - 4.12.1. As produced: Test bottles as soon as delivered, but no less than one hour after manufacture.
 - 4.12.2. As received: Test bottles that have been aged a minimum of 72 hours and conditioned at ambient² temperature for 40 hours³.
- 4.13. Place the filled containers into an ambient temperature storage and condition for 24 hours.
- 4.14. Measure the initial pressure of each container, using a pressure gauge through the valve stem.
- 4.15. Program or manually change the chamber to the described profile referenced in Figure 1 and start the chamber.
- 4.16. Once at proper condition temperature:
 - 4.16.1. Place containers into the test chamber using containment per Apparatus section 2.7.
 - 4.16.2. Place the containment apparatus or samples in the middle of the chamber.
 - 4.16.3. Containers should be oriented vertically in an orientation where the valve is in contact with headspace, not product.
- 4.17. Optional, use video recording if chamber has a glass viewing window to understand the failure or deformation mode.
- 4.18. Once test is complete, allow to cool to ambient temperature.
- 4.19. Measure and record pressure (if applicable).
- 4.20. Remove the data recorders and download the data (if applicable).
- 4.21. Record the time, temperature and pressure corresponding to rupture/leak event (if applicable).
- 4.22. Record how and where the container ruptured or leaked (if applicable).

5. ACCEPTANCE CRITERIA

- 5.1. Of the said container, shall be the responsibility of the Interested Party, based on performance and integrity.
 - 5.1.1. Preliminary testing of the containers can be evaluated not fully dressed.
 - 5.1.2. Final validation testing of the containers shall be evaluated fully dressed.

6. SAFETY

- 6.1 Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

- 7.1. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.
- 7.2. Study of Internal Automobile Temperature Profiling, Plastic Aerosol Research Group, LLC, July 2015.

² Ambient is Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332

³ Per procedure A of ASTM D618

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8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. FIGURE 1:

Average Profile Data (5hr 20min)			
Time (Minutes)	Elapsed Clock (Hour:Minutes)	Change in Temperature (°C)	Temperature (°C)
15	N/A	0.0 → 50.8	50.8
Insert Samples			
40	0:40	50.8 → 54.6	54.6
40	1:20	54.6 → 57.9	57.9
40	2:00	57.9 → 60.5	60.5
40	2:40	60.5 → 62.4	62.4
40	3:20	62.4 → 63.6	63.6
40	4:00	63.6 → 64.0	64.0
40	4:40	64.0 → 63.6	63.6
40	5:20	63.6 → 62.7	62.7

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	22 November 2016	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026
METHOD NO: HCPA-4.16		PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR COMPRESSED GAS PRESSURE LOSS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. This method covers the measurement of potential pressure loss, for compressed gases, caused by permeation, creep, expansion and leakage. Pressure loss may affect the spray performance, delivery rate, total delivery and product retention. Each sample is used sequentially throughout the test and a “valve correction factor” is applied to accommodate gauge measurement loss. Data may be used to inform manufacturing on target filling conditions.

2. APPARATUS

- 2.1. A calibrated digital pressure gauge, capable of recording pressure through the valve stem
- 2.2. Proper Personal Protective Equipment
- 2.3. Permanent black ink marking pen
- 2.4. Environmentally controlled chambers capable of maintaining a constant ambient¹ and elevated² temperature conditions.

3. TEST SPECIMENS

- 3.1. Minimum of 64 containers.

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At the time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are:
 - 4.2.1. As produced: Test containers as soon as desired, but no less than one hour after manufacture.
- 4.3. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient condition for 40 hours³.
- 4.4. Inspect a set of 64 containers to ensure all samples meet bottle specifications.
- 4.5. Initial filling setup, follow procedure HCPA-4.07.
- 4.6. Fill 64 containers with product, as described in 4.3.
- 4.7. Clinch valve.
- 4.8. Pressurize to nominal pressure⁴, as described in 4.3.
- 4.9. Use appropriate pressure gauge to validate proper pressure.
- 4.10. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)), measure and record room temperature equilibrium pressures within 60 seconds, keeping sequential recording.
- 4.11. Using the marking pen, number samples 1-60, on dust cap, avoiding direct contact on the plastic container.

¹ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332.

² 38°C ± 2°C (100°F ± 3.6°F) @ Minimum 10% RH.

³ Per Procedure A of ASTM D618.

⁴ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

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- 4.12. Take 4 samples. Measure and record a minimum of 15 consecutive room temperature shaken pressures for each sample.
- 4.13. Calculate the Valve Correction Factor^{5,6}.
- 4.14. Apply valve correction factor to account for any pressure loss due to the gauge, during sample testing measurements⁷.
- 4.15. Store 30 containers in an environmental chamber at ambient¹, for the duration of the test.
- 4.16. Store 30 containers in an environmental chamber at elevated², for the duration of the test.

5. SAMPLING

5.1. Recommended Test Conditions and Durations:

- 5.1.1. Ambient¹ temperature Intervals: 2, 4 weeks, 3, 6, 9 (optional), and 12, 18 and 24 months
- 5.1.2. Elevated² temperature Intervals: 2, 4 weeks and 3, 6 months (place the test interval containers in ambient¹ condition to ensure product has equilibrated to ambient¹ temperature prior to measuring the pressure).
- 5.1.3. Use the pressure gauge to record the equilibrium pressure of each sample per interval and apply the “valve correction factor” for each sequential measurement.

5.2. Report Pressure and Temperature for each container including Mean, Standard Deviation, and Range (both minimum and maximum) for the pressure at each time interval.

6. ACCEPTANCE CRITERIA

- 6.1. Product and container shall meet the predetermined criteria established by Interested Parties and label claim⁸.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

- 8.1. National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155.
- 8.2. HCPA-4.03: Method for measuring capacity for aerosol products in plastic containers
- 8.3. HCPA-4.06: Method for determining seal integrity for aerosol products in plastic containers

⁵ Valve Correction Factor = (Final pressure – Initial pressure)/# of pressure readings; where the time between the initial pressure and final pressure readings is short.

⁶ Variables that may affect the valve correction factor include the target propellant pressure, type of valve, type of pressure gauge and operator technique.

⁷ Apply valve correction factor to each sequential pressure readings as follows: Pressure Reading = Equilibrium Pressure + (N * Valve Correction Factor); N is the number of pressure readings following initial being 1. Example, 2 week interval would be: Equilibrium Pressure + (2 * Valve Correction Factor); next reading at 4 week interval would be: Equilibrium Pressure + (3 * Valve Correction Factor), etc.

⁸ For U.S.A. Label claim: National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155.

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8.4. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.

9. OTHER RESOURCES

9.1. HCPA-7.01: Method for determination of spray pattern for aerosol products

9.2. HCPA-7.03: Method for determining delivery rate of aerosol products

9.3. HCPA-7.15: Standard practice for storage testing of aerosol products

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	22 November 2016	Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	30 April 2026	Finalization of tenth edition guide	
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EDITION: 10 METHOD NO: HCPA-4.17	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR COMPRESSED GAS PRESSURE LOSS (ALTERNATIVE METHOD) FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

1.1. This method covers the measurement of potential pressure loss, for compressed gases, caused by permeation, creep, expansion and leakage. Pressure loss may affect the spray performance, delivery rate, total delivery and product retention. Each sample is measured only once throughout test conditions and durations. Data can also be used to inform manufacturing on target filling conditions.

2. APPARATUS

- 2.1. A calibrated digital pressure gauge, capable of recording pressure through the valve stem
- 2.2. Proper Personal Protective Equipment
- 2.3. Permanent black ink marking pen
- 2.4. Environmentally controlled chambers capable of maintaining a constant ambient¹ and elevated² temperature conditions.

3. TEST SPECIMENS

- 3.1. Minimum of 360 containers (30 containers per interval).

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. At the time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are:
 - 4.2.1. As produced: Test containers as soon as desired, but no less than one hour after manufacture.
- 4.3. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient condition for 40 hours³.
- 4.4. Inspect a set of 360 containers to ensure all samples meet bottle specifications.
- 4.5. Initial filling setup, follow procedure HCPA-4.07.
- 4.6. Fill 360 containers with product, as described in 4.3.
- 4.7. Clinch valve.
- 4.8. Pressurize to nominal pressure⁴, as described in 4.3.
- 4.9. Use appropriate pressure gauge to validate proper pressure.
- 4.10. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)), measure 30 containers and record room temperature equilibrium pressures within 60 seconds, discard the 30 tested samples.
- 4.11. Using the marking pen, number samples 1-330, on dust cap, avoiding direct contact on the plastic container.
- 4.12. Store 190 containers in an environmental chamber at ambient¹ for the duration of the test.

¹ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332.

² 38°C ± 2°C (100°F ± 3.6°F) @ Minimum 10% RH.

³ Per Procedure A of ASTM D618.

⁴ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR COMPRESSED GAS PRESSURE LOSS (ALTERNATIVE METHOD) FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

4.13. Store 120 containers in an environmental chamber at elevated² temperature for the duration of the test.

5. SAMPLING

5.1. Recommended Test Conditions and Durations:

5.1.1. Ambient¹ temperature Intervals: 2, 4 weeks, 3, 6, 9 (optional), and 12, 18 and 24 months

5.1.2. Elevated² temperature Intervals: 2, 4 weeks and 3, 6 months (place the test interval containers in ambient¹ condition to ensure product has equilibrated to ambient¹ temperature prior to measuring the pressure).

5.1.3. Use the pressure gauge to record the equilibrium pressure of each sample per interval, then discard the tested samples.

5.2. Report Pressure and Temperature for each container including Mean, Standard Deviation, and Range (both minimum and maximum) for the pressure at each time interval.

6. ACCEPTANCE CRITERIA

6.1. Product and container shall meet the predetermined criteria established by Interested Parties and label claim⁵.

7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

8.1. National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155.

8.2. HCPA-4.03: Method for measuring capacity for aerosol products in plastic containers

8.3. HCPA-4.06: Method for determining seal integrity for aerosol products in plastic containers

8.4. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.

9. OTHER RESOURCES

9.1. HCPA-7.01: Method for determination of spray pattern for aerosol products

9.2. HCPA-7.03: Method for determining delivery rate of aerosol products

9.3. HCPA-7.15: Standard practice for storage testing of aerosol products

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	22 November 2016	PARC Initial release	
1	11 June 2020	Reference of word crimp changed to	Align with industry terminology

⁵ For U.S.A. Label claim: National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155. Other countries to verify with their respective local regulatory standards.

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR COMPRESSED GAS PRESSURE LOSS (ALTERNATIVE METHOD) FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

		clinch	
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.18	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR WEIGHT LOSS USING LIQUIFIED GAS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. This method covers the measurement of the product and/or propellant loss (live and dead storage) due to permeation and leakage resulting in weight (mass) reduction of product inside a plastic aerosol container using LPG. Pressure loss may affect the spray performance, delivery rate, total delivery and product retention.

2. APPARATUS

- 2.1. Constant temperature water bath capable of reaching 38°C.
- 2.2. A calibrated digital pressure gauge, capable of recording pressure through the valve stem.
- 2.3. Digital or analog thermometer
- 2.4. Proper Personal Protective Equipment
- 2.5. Permanent black ink marking pen
- 2.6. Environmentally controlled chambers capable of maintaining a constant ambient¹ and elevated² temperature conditions

3. TEST SPECIMENS

- 3.1. Refer to HCPA-7.15: Standard practice for storage testing of aerosol products, to determine sample size.

4. PROCEDURE

- 4.1. At the time of testing, containers to be tested should be at a consistent age and condition.
Recommendations for conditions are:
 - 4.1.1. As produced: Test containers as soon as desired, but no less than one hour after manufacture.
- 4.2. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient² condition for 40 hours³.

5. SAMPLING

- 5.1. Recommended Test Conditions and Durations:
 - 5.1.1. Ambient¹ temperature Intervals: 2, 4 weeks, 3, 6, 9 (optional), and 12, 18 and 24 months
 - 5.1.2. Elevated⁴ temperature Intervals: 2, 4 weeks and 3, 6 months (place the test interval containers in ambient¹ condition to ensure product has equilibrated to ambient¹ temperature prior to measuring the pressure).
 - 5.1.3. Use the pressure gauge to record the equilibrium pressure of each sample per interval.
- 5.2. Report Pressure and Temperature for each container including Mean, Standard Deviation, and Range (both minimum and maximum) for the pressure at each time interval.

¹ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332.

² Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH, per ASTM D4332).

³ Per Procedure A of ASTM D618.

⁴ 38°C ± 2°C (100°F ± 3.6°F) @ Minimum 10% RH.

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR WEIGHT LOSS USING LIQUIFIED GAS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

6. ACCEPTANCE CRITERIA

- 6.1. Product and container shall meet the predetermined criteria established by Interested Parties and label claim⁵.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

- 8.1. National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155.
- 8.2. HCPA-4.03: Method for measuring capacity for aerosol products in plastic containers
- 8.3. HCPA-4.06: Method for determining seal integrity for aerosol products in plastic containers
- 8.4. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.

9. OTHER RESOURCES

- 9.1. HCPA-7.01: Method for determination of spray pattern for aerosol products
- 9.2. HCPA-7.03: Method for determining delivery rate of aerosol products
- 9.3. HCPA-7.15: Standard practice for storage testing of aerosol products

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	21 April 2020	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

⁵ For U.S.A. Label claim: National Institute of Standards and Technology (NIST), Weights and Measures Program Requirements, NIST Handbook 155.

EDITION: 10 METHOD NO: HCPA-4.19	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING THE DIMENSIONS OF AN OUTSIDE CLINCH 1-INCH (25.4MM) VALVE FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

1.1. Various factors of package quality, including seal integrity, are dependent on the quality of the clinch and valve to container fit. The purpose of this method is to verify those dimensions.

2. APPARATUS

2.1. Optical Projection Comparator, CMM or Laser, Vernier or Digital Calipers

3. TEST SPECIMENS

3.1. The number of test replications depends on the desired objectives of the testing. Replicate testing should be conducted to improve the reliability of the test results.

4. PROCEDURE

4.1. Verify calibration of apparatus equipment.

4.2. Observe and record incidents of gross defects such as “blown necks” and other deformations.

4.3. Observe quality of sealing surfaces and valve cup forming. Mark and note instances of nicks, dents, pedestal crimp abnormalities, sealing gasket present, rust/corrosion (if applicable), and etc.

4.4. At time of testing, containers to be tested should be at a consistent age and condition.

Recommendations for conditions are as follows:

4.4.1. As produced: Test containers once the container has sufficiently cooled, per operator’s blow molding quality procedures.

4.4.2. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient¹ temperature for 40 hours².

4.5. Record all data.

5. MEASUREMENTS

5.1. **F** – Thickness of Cup Plate

5.2. **G** – Thickness of virgin sealing gasket

5.3. **S** – Skirt Inside Diameter

5.4. **D** – Cup Outside Diameter

5.5. **A** – Cup Body Outside Diameter

5.6. **H** – Overall Cup Height

5.7. **C** – Skirt Height

5.8. **M** – Clinch Height

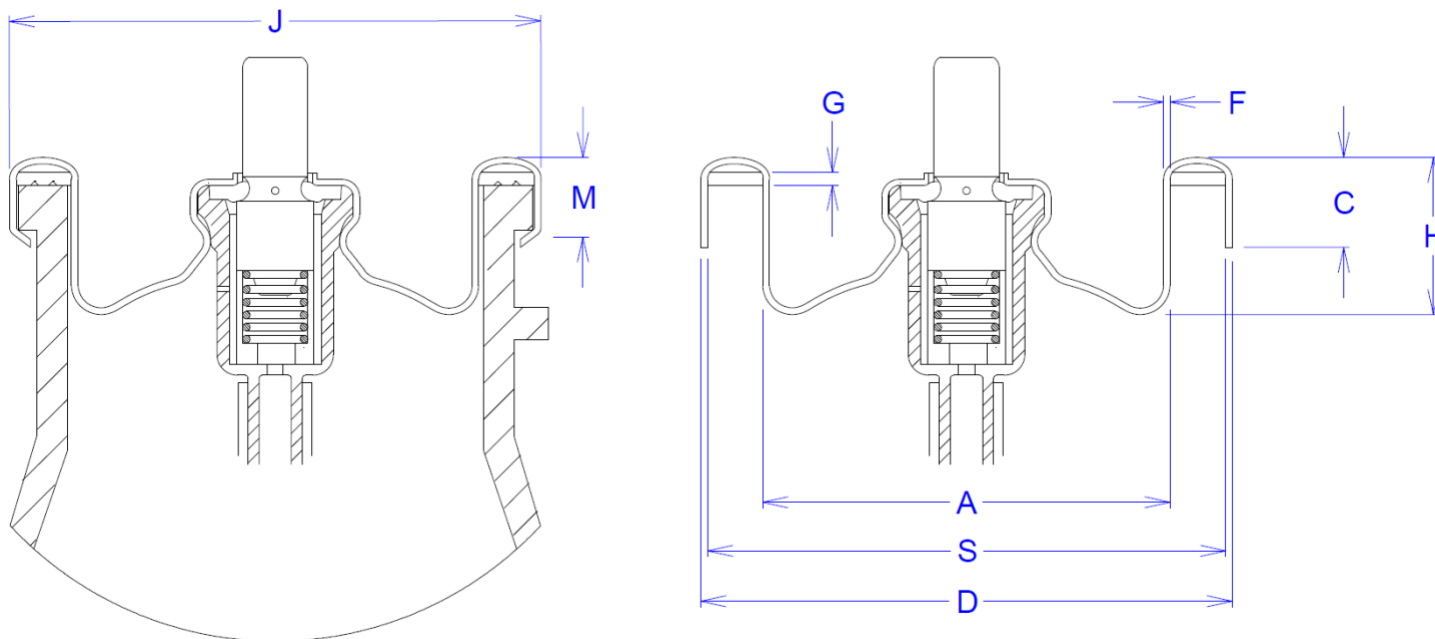
5.9. **J** – Clinch Diameter

¹ Ambient is Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332

² Per procedure A of ASTM D618

EDITION: 10 METHOD NO: HCPA-4.19	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 2 OF 2
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: STANDARD PRACTICE FOR MEASURING THE DIMENSIONS OF AN OUTSIDE CLINCH 1-INCH (25.4MM) VALVE FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

6. DRAWING



7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

8.1. None.

9. OTHER RESOURCES

9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	15 May 2017	PARG initial release	
1	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
2	30 April 2026	Finalization of tenth edition guide	
3			

EDITION: 10 METHOD NO: HCPA-4.20	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR UV EXPOSURE TO PET USING XENON ARC LIGHT APPARATUS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this test is to determine the impact or degradation from UV radiation that may occur to the material (resin) or pigment (container colorant), if applicable. The unfilled and unpressurized specimens are exposed to filtered xenon-arc light under controlled conditions (temperature and humidity) to represent such exposure on a consumer's windowsill. The comparison should be made versus a control by means of visual inspection, and physical performance testing (pressure loss, burst and drop testing).

2. APPARATUS

- 2.1. Light source consisting of calibrated quartz jacketed xenon-arc lamps, fitted with suitable window filters, to simulate the spectral power distribution of daylight in the ultraviolet (UV) and visible regions of the spectrum with a chiller system to control the black plate-standard.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 110 containers (50 empty containers and 60 filled containers)

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. Before beginning any UV testing, the interested party should test their container as referenced in HCPA-4.14, to ensure it can withstand the temperature conditions that are potential inside the UV Xenon-Arc equipment.
- 4.3. At the time of testing, containers to be tested should be at a consistent age and condition. Recommendations for conditions are:
 - 4.3.1. As produced: Test containers as soon as desired, but no less than one hour after manufacture.
- 4.4. As received: Test containers that have been aged a minimum of 72 hours and conditioned at ambient condition for 40 hours¹.
- 4.5. Inspect a set of 110 containers to ensure all samples meet bottle specifications.
- 4.6. Initial filling setup, follow procedure HCPA-4.07.
- 4.7. Fill 60 containers with product, as described in 4.5.
- 4.8. Clinch valve.
- 4.9. Pressurize to nominal pressure², as described in 4.5.
- 4.10. At the time of testing, containers to be tested should be at a consistent age and condition.

¹ Per Procedure A of ASTM D618.

² Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

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METHOD NO: HCPA-4.20		PAGE 2 OF 4
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR UV EXPOSURE TO PET USING XENON ARC LIGHT APPARATUS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

4.11. Testing:

- 4.11.1. Place 55 of the specimens (25 empty and 30 filled) in a closed box in standard conditioning atmosphere, for control purposes.
- 4.11.2. Place 55 of the specimens (25 empty and 30 filled) in the Xenon Arc chamber, set chamber to the conditions stated in Table 1, cycling with light and dark periods.
 - 4.11.2.1. Cycle Light for 3 hours and 30 minutes
 - 4.11.2.2. Cycle Dark (no light exposure) for 30 minutes
 - 4.11.2.3. Cycle between 4.3.2.1 and 4.3.2.2 continuously for the determined amount of exposure in relation to being placed on windowsill timeframe, reference Table 2.

- 4.12. Upon completion of testing period, remove samples, visually inspect for abnormalities and do a performance test, comparing to samples that were un-exposed to UV (i.e. control).

4.12.1. Burst Test:

- 4.12.1.1. Using twenty-five (25) of the UV exposed and twenty-five (25) of the un-exposed specimens, place in burst tester and follow HCPA-4.10 method.
- 4.12.1.2. Records burst results.

4.12.2. Drop Test:

- 4.12.2.1. Drop thirty (30) of the UV exposed and thirty (30) of the un-exposed specimens, whereby utilizing ten samples, from each set, to be dropped in three orientations. Reference drop height and orientation guidelines as described in HCPA-4.11.
- 4.12.2.2. Record results.

5. ACCEPTANCE CRITERIA

- 5.1. The resultant values should show no gross/significant difference between the UV exposed and un-exposed specimens.
- 5.2. Method was validated for PET resin. Any other resin material should be validated by the Interested Party.

Table 1.

Exposure Period	Time	Narrowband (420 n/m) W/(m ² *nm)	Black-Panel Temperature (BPT) °C	Chamber Air Temperature (AT) °C	Relative Humidity %
Light ON	30hr 30min	0.45 ± 0.02	35	25-29	50 ± 10
Light OFF	30min	N/A	N/A	23	50 ± 10

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Table 2.

Expected Number of Months Exposure Behind Single Pane of Glass	Equivalent PARG Chamber Dosage Duration (Hours)*
1	405
2	810
3	1214
4	1618
5	2021
6	2450
7	2830
8	3235
9	3640
10	4045
11	4449
12	4852
18	7280
24	9705

*Based on TUVR comparison to 12 month outdoor Florida exposure,
under glass, per ISO 877-2 Method B (2009)

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc. Operate the closed chamber under corporate guidelines to handling flammable products, when applicable.

7. REFERENCES

- 7.1. Study of UV Degradation on Plastic Aerosols, Plastic Aerosol Research Group, LLC, 2019
- 7.2. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.
- 7.3. HCPA-4.10: Method for burst performance for aerosol products in plastic containers
- 7.4. HCPA-4.11: Method for drop impact for aerosol products in plastic containers.
- 7.5. HCPA-4.14: Method for material resistance to constant temperature for aerosol products in plastic containers.

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METHOD CLASSIFICATION: Plastic Aerosol	AUTHOR(S): Scientific Committee	APPROVED BY: Andrew W. Franckhauser HCPA CHAIRPERSON

8. OTHER RESOURCES

- 8.1. ASTM G155-05a, Standard Practice for Operating Xenon Arc Light Apparatus for exposure of Non-Metallic Materials.
- 8.2. ASTM G151, Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that use Laboratory Light Sources.
- 8.3. ASTM G113, Terminology Relating to Natural and Artificial Weathering Tests for Nonmetallic Materials.
- 8.4. ASTM D5870, Practice for Calculating Property Retention Index of Plastics.
- 8.5. ISO 4892-1, Plastics-Methods of Exposure to Laboratory Light Sources - Part 1: General guidance
- 8.6. ISO 4892-2, Plastics-Methods for Exposure to Laboratory Light Sources - Part 2: Xenon Arc Lamps.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	30 April 2019	PARG Initial release	
1	02 May 2023	Updated for HCPA	PARG transfer to HCPA
2	30 April 2026	Finalization of tenth edition guide	
3			

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METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR UV EXPOSURE OF PRODUCT FORMULA USING XENON ARC LIGHT APPARATUS FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this test is to determine the impact or degradation from UV radiation that may occur to the product formula. The specimens are exposed to filtered xenon-arc light under controlled conditions (temperature and humidity) to represent such exposure on a consumer's windowsill. The comparison should be made versus a control by means of visual inspection and product performance testing. PARG makes no evaluation requirement nor recommendation for product performance.

2. APPARATUS

- 2.1. Light source consisting of calibrated quartz jacketed xenon-arc lamps fitted with suitable window filters, to simulate the spectral power distribution of daylight in the ultraviolet (UV) and visible regions of the spectrum with a chiller system to control the black-standard.
- 2.2. Filling and Pressurizing process.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 24 containers

4. PROCEDURE

- 4.1. Before beginning any UV testing, the interested party should test their container as referenced in HCPA-4.14, to ensure it can withstand the temperature conditions that are potential inside the UV Xenon-Arc equipment.
- 4.2. Verify calibration of equipment.
- 4.3. At the time of testing, containers to be tested should be at a consistent age and condition. Recommendations for conditions are:
 - 4.3.1. As produced: Test containers once the container has sufficiently cooled, per operator's blow molding quality procedures.
 - 4.3.2. As received: Test containers that have been aged at least 72 hours and conditioned at ambient¹ conditions for 40 hours².
 - 4.3.3. Fill the test specimens, with interested party's product formula.
 - 4.3.4. Clinch valve.
 - 4.3.5. Pressurize to nominal pressure³.
 - 4.3.6. Immediately after filling, shake each container (10 times with a stroke length of approximately 35cm (12 inches)).
 - 4.3.7. Use appropriate pressure gauge to validate proper pressure, mark and record for all specimens.

¹ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH, per ASTM D4332).

² Per Procedure A of ASTM D618.

³ Nominal pressure is the pressure at which the package is nominally filled at ambient conditions

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4.4. Testing:

- 4.4.1. Place 12 of the specimens in a closed box in standard conditioning atmosphere, for control purposes.
- 4.4.2. Place 12 of the specimens in the Xenon Arc chamber, set chamber to the conditions stated in Table 1, cycling with light and dark periods.
 - 4.4.2.1. Cycle Light for 3 hours and 30 minutes
 - 4.4.2.2. Cycle Dark (no light exposure) for 30 minutes
 - 4.4.2.3. Cycle between 4.4.2.1 and 4.4.2.2 continuously for the determined amount of exposure in relation to being placed on windowsill timeframe, reference Table 2.
- 4.4.3. Upon completion of testing period, remove samples, visually inspect for abnormalities and do a performance test, comparing to samples un-exposed to UV.
 - 4.4.3.1. **Pressure Test:**
 - 4.4.3.1.1. Measure and record post pressures for each specimen.
 - 4.4.3.1.2. Record results.
 - 4.4.3.2. **Product Performance Test:**
 - 4.4.3.2.1. To be determined by the interested party.

5. ACCEPTANCE CRITERIA

- 5.1. The resultant values should show no gross/significant difference between the UV exposed and un-exposed specimens and product performance shall be determined by the interested party.

Table 1.

Exposure Period	Time	Narrowband (420 n/m) W/(m ² *nm)	Black-Panel Temperature (BPT) °C	Chamber Air Temperature (AT) °C	Relative Humidity %
Light ON	30hr 30min	0.45 ± 0.02	35	25-29	50 ± 10
Light OFF	30min	N/A	N/A	23	50 ± 10

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Table 2.

Expected Number of Months Exposure Behind Single Pane of Glass	Equivalent PARG Chamber Dosage Duration (Hours)*
1	405
2	810
3	1214
4	1618
5	2021
6	2450
7	2830
8	3235
9	3640
10	4045
11	4449
12	4852
18	7280
24	9705

*Based on TUVR comparison to 12 month outdoor Florida exposure,
under glass, per ISO 877-2 Method B (2009)

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc. Operate the closed chamber under corporate guidelines to handling flammable products, when applicable.

7. REFERENCES

- 7.1. Study of UV Degradation on Plastic Aerosols, Plastic Aerosol Research Group, LLC, 2019
- 7.2. HCPA-4.07: Standard practice for filling samples used in test method development for aerosol products in plastic containers.
- 7.3. HCPA-4.14: Method for material resistance to constant temperature for evaluation of aerosol products in plastic containers.

8. OTHER RESOURCES

- 8.1. ASTM G155-05a, Standard Practice for Operating Xenon Arc Light Apparatus for exposure of Non-Metallic Materials.

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- 8.2. ASTM G151, Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that use Laboratory Light Sources.
- 8.3. ASTM G113, Terminology Relating to Natural and Artificial Weathering Tests for Nonmetallic Materials.
- 8.4. ASTM D5870, Practice for Calculating Property Retention Index of Plastics.
- 8.5. ISO 4892-1, Plastics-Methods of Exposure to Laboratory Light Sources - Part 1: General guidance
- 8.6. ISO 4892-2, Plastics-Methods for Exposure to Laboratory Light Sources - Part 2: Xenon Arc Lamps.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	30 April 2019	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated for HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-4.22	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Plastic Aerosol	TITLE: METHOD FOR NON-DESTRUCTIVE GASKET COMPRESSION EVALUATION FOR AEROSOL PRODUCTS IN PLASTIC CONTAINERS	

1. PURPOSE

1.1. The external clinch on a plastic aerosol is critical to obtain a tightly sealed container, by maintaining the desired pressure over the life of the product to ensure product performance. This method details the steps to calculate the minimum % gasket compression for a non-pressurized clinched container. This involves taking two height measurements, without removing a clinched valve. The difference in the measurements can then be used to calculate the minimum % Gasket Compression for the container.

1.2. Methods appear in the following order:

1.2.1. Method 1: Gasket Compression with a Support Ledge feature

1.2.2. Method 2: Gasket Compression without a Support Ledge feature

2. APPARATUS

2.1. Valves with a mounting cup designed for an external clinch.

2.2. Clinching device capable of securely applying valves to the containers.

2.3. Apparatus (Method 1) capable of securely holding under the support ledge and a gauge capable of measuring top of container (with and without valve attached) utilizing a measurement probe, offset calipers, optical comparator, Kroeplin/Socage gauge, or other calibrated gauge apparatus.

2.4. Apparatus (Method 2) capable of measuring clinched valve from top of mounting cup to under the clinch.

2.5. Filling and Pressurizing process (optional).

3. TEST SPECIMENS

3.1. Recommended Quantity: 30 containers (either method)

4. Method 1: Gasket Compression with a Support Ledge feature

4.1.1. Mark a minimum of four (4) equidistant points on the Support Ledge feature¹, on all 30 containers.

4.1.2. Reference Figure 1, for subsequent measuring points.

4.1.3. Measure and record the N-dimension, at the points marked in 4.1.1.

4.1.3.1. N = Height from Top of Finish (which is X+B, reference HCPA-4.02, or just X if no seal bead is present) to underside of Support Ledge, use the Mean of the measurements.

4.1.4. Optional: Fill the 30 containers as it would be filled for commercial distribution, with product to nominal fill levels.

4.1.5. Clinch valves on each container, record clinch settings.

4.1.6. Measure and record P-Dimension at the points marked in 4.1.1.

¹ If the container does not have a Support Ledge, this method will not apply, interested party shall find another robust datum point or refer to Method 2.

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4.1.6.1. P = Height from top of Mounting Cup to underside of Support Ledge, use the Mean of the measurements recorded in 4.1.6.

4.1.7. G = Nominal thickness of the virgin Sealing Gasket per supplier drawing (or measured by taking an average of a minimum of twelve (12) valve samples by removing the gaskets without causing stretch or damage).

4.1.8. F = Nominal thickness of the Cup Plate, at the top of the Mounting Cup, per supplier drawing (or measured by taking an average of a minimum of twelve (12) valve “metal” thicknesses at the top of the mounting cup location).

4.1.9. Calculate the minimum % Gasket Compression using Equation 1, then proceed to Acceptance Criteria section:

Equation 1:

$$\% C = \left[1 - \left[\frac{(P-N-F)}{G} \right] \right] \times 100$$

5. Method 2: Gasket Compression without a Support Ledge feature

5.1.1. Mark a minimum of four (4) equidistant points on the container neck under the Lip Clinch, on all 30 containers.

5.1.2. Reference Figure 1, for subsequent measuring points.

5.1.3. Measure and record the R-dimension, at the points marked in 5.1.1.

5.1.3.1. R = Height from Top of Finish (which is L+B, reference HCPA-4.02, or just L if no seal bead is present) to underside of Lip Clinch area, use the Mean of the measurements.

5.1.4. Optional: Fill the 30 containers as it would be filled for commercial distribution, with product to nominal fill levels.

5.1.5. Clinch valves on each container, record clinch settings.

5.1.6. Measure and record the M-dimension, at the points marked in 5.1.1.

5.1.6.1. M = Height from Top of Mounting Cup to underside of valve skirt, use the Mean of the measurements.

5.1.7. G = Nominal thickness of the virgin Sealing Gasket per supplier drawing (or measured by taking an average of a minimum of twelve (12) valve samples by removing the gaskets without causing stretch or damage).

5.1.8. F = Nominal thickness of the Cup Plate, at the top of the Mounting Cup, per supplier drawing (or measured by taking an average of a minimum of twelve (12) valve “metal” thicknesses at the top of the mounting cup location).

5.1.9. Calculate the minimum % Gasket Compression using Equation 2, then proceed to Acceptance Criteria section:

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Equation 2:

$$\%C = \left[\frac{(G + 2F + R) - M}{G} \right] \times 100$$

6. ACCEPTANCE CRITERIA

- 6.1. The resultant value can be used to calculate the minimum % Gasket Compression.
- 6.2. In order to obtain good clinch integrity on the neck of a container, the sealing gasket material (rubber) must have some amount of compression. The amount of compression is dependent on multiple variables such as gasket material, durometer, clincher settings, and other factors. Therefore, acceptable compression is to be determined by the interested party, which can be correlated to attributes, such as, but not limited to, pressure or weight loss (reference methods HCPA-4.16 to 4.18), Seal Integrity (reference HCPA-4.06) or other attributes.
- 6.3. Although this method references unpressurized containers, interested parties may also use this method on pressurized containers to get a correlation between pre- and post-pressurized conditions. Interested parties should determine acceptable compression for post-pressurized containers specific to their respective process and/or product performance expectations.

7. NOTES

- 7.1. Method 1 provides more accuracy than Method 2. However, Method 2 may be used when a Support Ledge feature is not present or when desired by an interested party for any reason.

8. REFERENCES

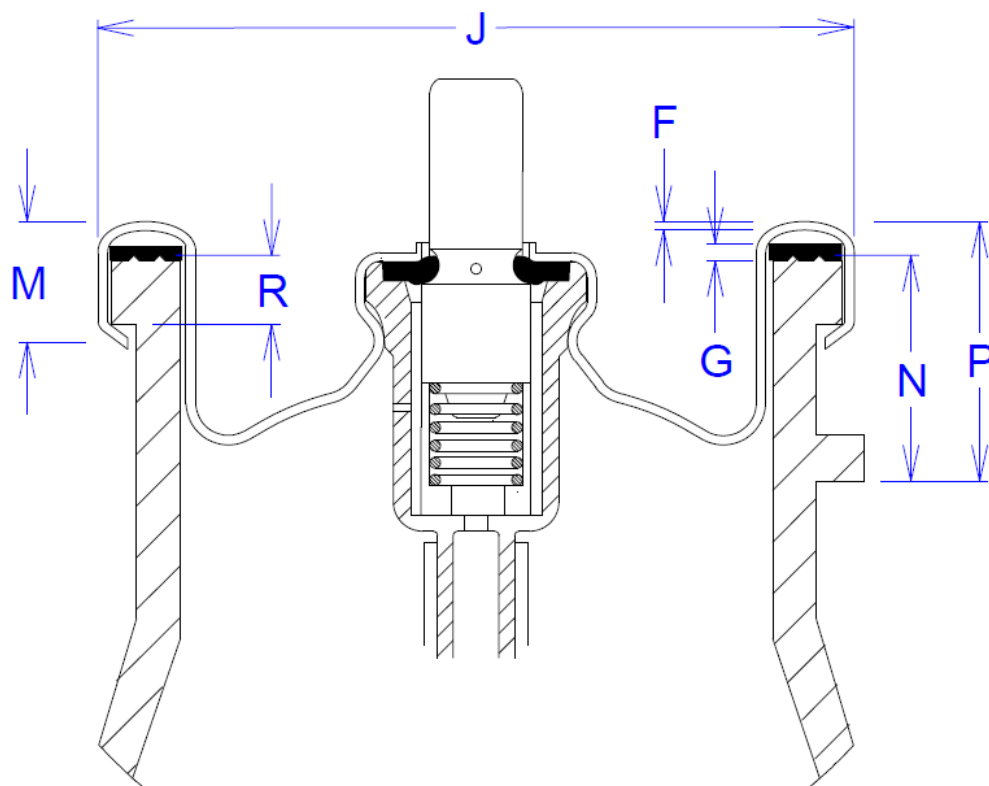
- 8.1. HCPA-4.19: Standard Practice for Measuring the Dimensions of an Outside Clinch 1-Inch (25.4mm) Valve for Aerosol Products in Plastic Containers.

9. OTHER RESOURCES

- 9.1. Not Applicable at this time.

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FIGURE 1



10. REVISIONS

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0	08 December 2019	PARG Initial release	
1	11 June 2020	References of word crimp changed to clinch	Align with industry terminology
2	02 May 2023	Updated to HCPA guide	PARG transfer to HCPA
3	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-5.01	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 6
METHOD CLASSIFICATION: Glass Container	TITLE: METHOD FOR PRESSURE DETERMINATION FOR AEROSOLS IN GLASS CONTAINERS	

1. PURPOSE

- 1.1. This method covers the determination of pressure in glass aerosol bottles, both plain and coated with vinyl plastics. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of any person intending to use this standard to first consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations.

2. SIGNIFICANCE

- 2.1. Aerosols packaged in containers having a capacity of 4 fluid ounces (118.2 mL) or less are exempt from the pressure regulations of the Department of Transportation (DOT). Since most glass aerosol bottles are in this range¹, they have no official pressure limitations, and therefore there is no regulatory rationale to measure the pressure at the usual reference temperature of 130°F (54.4°C). However, for safety reasons, the U.S. aerosol industry has unofficially limited the pressure in plain (uncoated) glass bottles to 15 psi-g (103 kPa) at 70°F (21°C), and the pressure in vinyl coated glass bottles to 25 psi-g (172 kPa) at 70°F (21°C).
- 2.2. For aerosol products packaged in glass containers having a capacity of greater than 4 fluid ounces (118.2 mL), the DOT regulations for interstate shipment do not permit such transport except by a specific exemption that is usually limited to a particular container and product. Such an exemption requires the submission of significant amounts of persuasive technical data, which include the pressure-temperature curve for the candidate product.
- 2.3. For the preceding reasons, it is necessary to have an accurate method for measuring the pressure in glass aerosol containers at various temperatures. In addition, such methods would be useful for quality control purposes during aerosol productions.

3. APPARATUS

- 3.1. Water Bath, constant-temperature, having an automatic temperature control with a maximum temperature variation of $\pm 0.5^{\circ}\text{F}$ ($\pm 0.28^{\circ}\text{C}$). Stirring (by means of a built-in or accessory device) is recommended to maintain a uniform temperature. The bath should have sufficient capacity for both glass bottles and metal containers.
- 3.2. Thermometer (ASTM 12F, conforming to Specification E-1, or equivalent), with 0.5° to 1.0°F (0.25° to 0.50°C) graduations.
- 3.3. Pressure Gauge, with a range of from 0-200 psi-g (0 to 1.37 Mpa). The gauges in use for metal containers are also satisfactory for glass aerosol bottles, although smaller diameter gauges are sometimes preferred, due to the small size of many glass aerosol products. In some cases, gauges with a smaller pressure range may give greater accuracy, since maximum accuracy is generally obtained when readings are in the middle third of the range.

¹ Glass aerosols having capacities of less than 1 fluid ounce (30 mL) may be plain, but are more often vinyl plastic coated. Those in the range of 1 to 4 fluid ounces (30 to 118 mL) are always vinyl plastic coated for added safety. Coated glass aerosol bottles in sizes from about 4.1 to 10 fluid ounces (119 to 296 mL) are produced in the USA, but are used only for export or laboratory testing.

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METHOD CLASSIFICATION: Glass Container	TITLE: METHOD FOR PRESSURE DETERMINATION FOR AEROSOLS IN GLASS CONTAINERS	

3.4. Pressure Gauge Assembly (Fig. 1), equipped with two Hoke (or similar) valves. The pre-pressurizing valve (A) may be used either for pre-pressurizing the gauge, or as an outlet for reducing the pressure in the gauge. The gauge valve (B) separates the aerosol container from the gauge assembly until the pressure is to be taken.

3.4.1. Note: Alternative assemblies are often used where gauge valve (A) and the related fitting are eliminated. The gauge is pressurized or de-pressurized through toggle valve (A) before engaging the adapter to the aerosol can. This decreases the internal volume of the gauge assembly – important for small aerosols -- and also reduces cost and bulkiness.

3.5. Adapters (Fig. 2 and 3) that can be prepared, are illustrated. They make a connection to the valve stem as follows:

3.5.1. The tapered adapter (Fig. 2) achieves a gas-tight connection by partial insertion of the tapered (male) stem portion into the valve stem bore.

3.5.1.1. Note: For a hermetic seal, the bore of the plastic or metal valve stem must be round, and extra compressive pressure must be exerted on metal-to-metal junctures.

3.6. The straight adapter (shown attached to the gauge valve in Fig. 1) forms a seal around the top of the valve stem by means of a typically 1/16 in. (1.6 mm) thick gasket or "O"-ring of suitable inside and outside diameters. The stem portion is principally for alignment purposes and to hold the gasket in place.

3.6.1. Note: Other adapter options include a threaded polypropylene fitment machined with a hollow tapered inlet that is designed to fit hermetically around the valve stem by sealing around the outer diameter of the end of the valve stem (Fig. 3). In the case of "female" or stem-less valves, in most cases plastic stem adapters can be provided by valve-makers to convert them to the "male" equivalent. In some cases specialized brass or stainless steel adapters must be custom made, using drawings available from the manufacturer. The Bepak valve adapter sits upon the crown of the "one-inch" cup or the top of the 20 mm ferrule, to prevent it from possibly damaging sensitive components by over insertion.

3.7. Safety Shield, such as transparent Plexiglass.

3.8. Gloves, such as heavy leather.

4. TEST SPECIMENS

4.1. Recommended Quantity: 3

5. PROCEDURE

5.1. High pressure gases are necessary for pre-pressurizing the gauge. The following may be used:

5.1.1. Compressed Air

5.1.2. Nitrogen

5.1.3. Carbon Dioxide

5.1.4. Propane

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5.2. Preparation of Apparatus

5.2.1. Attach the hose from a compressed gas supply to the pre-pressurizing valve and allow a slow stream of gas to flow through the gauge assembly to make sure it is not clogged in the pathway between valves.

5.2.2. Pre-pressurize the gauge to about 25 psi-g (172 kPa) with the compressed gas. With both valves closed, check for possible leakage. If the gauge pressure remains constant during the preparation for measurement, the assembly is sufficiently tight.

5.3. Calibration

5.3.1. Calibrate the gauge with either a dead-mass tester or with another gauge of known accuracy, such as an Inspector's Gauge.

5.4. Place three specimens of the aerosol product to be tested into the water bath, after removing the actuator or spout.

5.5. Adjust the water level until it is just below the top of the valve stem.

5.6. Suspend the thermometer beside the samples.

5.7. Adjust the bath temperature to 70°F (21°C).

5.8. After the bath temperature has remained constant for at least 30 min, remove the specimens and shake them six times using the transparent safety shield and leather gloves in the event that any bottles break.

Note: It is very unlikely that breakage will occur. A scratched or severely bruised plain glass bottle, or one that is carelessly impacted against a hard surface during shaking, may occasionally break dispersing glass shards and product in all available directions. Flammable products pose an additional hazard. At ambient pressures, vinyl plastic sheaths will contain glass fragments and the product for significant time periods.

5.9. Return the shaken dispensers to the water bath for an additional 30 min, then remove them and shake them another six times, as in 5.8. Finally return them to the bath.

5.10. Check the pressure in the gauge assembly. If the pressure has decreased by more than about 2 psi (17.6 kPa), indicating a significant leak in the system, tighten all connections and re-pressurize. If leakage continues, immerse the assembly under water to locate the leakage site. Replace worn Teflon or other gasket material, metal components, or take such other measures as necessary to assure a tight gauge assembly before proceeding to the next step.

5.11. Press the gauge assembly adapter squarely upon the valve stem and firmly squeeze the two together to open the aerosol valve.

5.12. Open the gauge valve wide, and read the pressure to the nearest ± 0.5 psi (3.4 kPa). Close the gauge valve and remove the gauge assembly from the specimen. Tap the gauge lightly with a pencil or other firm object and then recheck the pressure. Correct the pressure in the report if necessary.

5.13. Pre-pressurize the gauge to the pressure of the first sample plus 1 psi (6.9 kPa); then place the gauge assembly on top of the valve stem of the second sample and press down firmly to open the aerosol valve.

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- 5.14. Open the gauge valve widely and read the pressure to the nearest ± 0.5 psi (3.4 kPa). Close the valve and remove the gauge assembly from the product. Tap the gauge lightly and recheck the pressure.
- 5.15. Correct the initial pressure reading if the gauge needle moves.
- 5.16. For the measurement of the third sample, pre-pressurize the gauge to the pressure of the second sample, plus 1 psi (6.9 kPa), then repeat 5.13 and 5.14.
- 5.17. Average the readings obtained from the second and third samples.

Note: The gauge is pre-pressurized to 25 psi-g (172.3 kPa) initially in order to minimize the possibility of gauge contamination by the aerosol product. However, if it is known that the aerosol pressure is higher than that, the gauge should be pre-pressurized to the higher pressure, plus about 3 psi (20.6 kPa). When the gauge is opened, a small amount of compressed gas will enter the product and cause pressure elevation. For this reason the first sample is discarded.

If the pressure of samples two and three fail to agree within about 3 psi (20.6 kPa) another sample or two should be tested. For accurate work it is sometimes desirable to convert pressures to the equivalent pressure at standard sea-level conditions (14.67 psi-abs. or 760mm). The barometric pressure must then be available at the time of testing. If, for example, the barometer read 29.00 in. Hg -- equivalent to 737 mm or 14.22 psi-abs. -- the ambient air pressure would be considered 0.45 psi below normal, which amount would be subtracted from the gauge reading for correction to equivalent pressure at Standard sea-level conditions. This type of correction is more important at higher altitudes, and for low pressure aerosol formulas.

This method cannot be meaningfully performed on micro-meter (aka metered dose) spray dispensers, such as medical inhalant sprays, unless special test cans are fitted with sustained delivery valves.

With very small aerosols, where transfer of minor amounts of compressed gas or propellant may occur when taking pressures, two or three additional units are often tested for pressure reliability. A small gauge and assembly cavity are also desired features.

- 5.18. Report:
 - 5.18.1. A complete description of the aerosol bottles being tested.
 - 5.18.2. The average pressure of units two and three.
 - 5.18.3. The optional correction for barometric pressure.

6. ACCEPTANCE CRITERIA

- 6.1. Report results using predetermined criteria established by the Interested Parties.

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7. SAFETY

7.1. Use appropriate personal protective equipment, such as face shield, safety glasses, gloves, etc.

8. REFERENCES

8.1. None at this time.

9. OTHER RESOURCES

9.1. Not Applicable at this time.

Figure 1. Gauge Assembly Apparatus

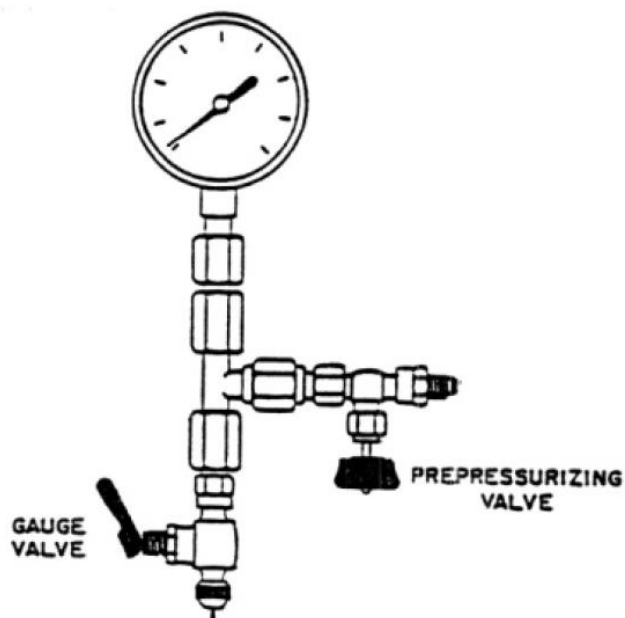
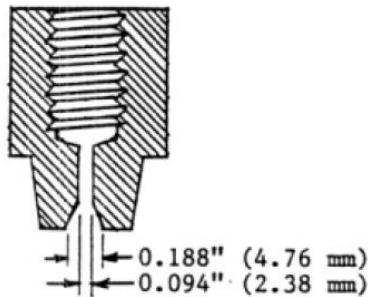


Figure 2. Tapered Adapter (Male)



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Figure 3. Tapered Adapter (Female)



10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	24 July 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-6.01	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 6
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD INDUSTRY RECOMMENDATIONS FOR IDENTIFYING KEY DIMENSIONS OF VALVE CUPS	

1. PURPOSE

- 1.1. The purpose of the practice is to establish industry guidelines for key dimensions of tinplate and aluminum one-inch (25.4 mm) aerosol valve cups.
 - 1.1.1. Please note that the values and dimensions listed below are not industry specifications or tolerances.
- 1.2. Eleven key dimensions (listed below) are presented for three tinplate and two aluminum aerosol valve cup variables and the suggested gauging instruments are given for each dimension.
 - 1.2.1. Dimension A: Outside Skirt Diameter
 - 1.2.2. Dimension B: Outside Body Diameter
 - 1.2.3. Dimension C: Skirt Length
 - 1.2.4. Dimension D: Gasket Thickness
 - 1.2.5. Dimension E: Gasket Length
 - 1.2.6. Dimension F: Depth to Centerline Dimples
 - 1.2.7. Dimension G: Diameter over Dimples
 - 1.2.8. Dimension H: Overall Height
 - 1.2.9. Dimension R: Outside Skirt Radius
 - 1.2.10. Dimension T: Material Metal Thickness
 - 1.2.11. Dimension J: Inside Diameter of Body
- 1.3. The only cup metals considered are tinplate (0.0104 in. or 0.264 mm thick) and aluminum (0.0160 in. or 0.406 mm thick). For example, heavier gauge tinplate is available for special applications but is not considered here.
- 1.4. The dimensions shown are those for raw valve mounting cups prior to any crimping or filling operation.

2. APPARATUS

- 2.1. Table 1 lists the suggested gauging instruments for each dimension.

Table 1: Suggested Gauging Instruments

Dimension	Instrument
A	Average of three caliper readings
B	Average of three caliper readings
C	Average of three caliper readings
D	CSPA "Three Point" Gauge. Alternatively, remove gasket (if practical) and measure with a ratchet-type micrometer
E	Steel Scribe
F	Min/Max Steel Scribe
G	Ring Gauge
H	Caliper
R	Radius Gauge
T	Cone-Point or Ball-Point Micrometer
J	Caliper

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD INDUSTRY RECOMMENDATIONS FOR IDENTIFYING KEY DIMENSIONS OF VALVE CUPS	

3. TEST SPECIMENS

- 3.1. The recommended quantity of samples is enough to set up good parameters during the crimping process to establish a good hermetic seal between the valve cup and the aerosol container. The data is useful for the following:
 - 3.1.1. For the establishment of minimum collet foot circumscribing diameters to prevent abrasion or jamming in the valve cup.
 - 3.1.2. For the establishment of crimp depth and diameter specifications.
 - 3.1.3. Incoming quality control purposes.
 - 3.1.4. It also provides an aid to those developing new collet profiles or doing research in the crimping area.

4. PROCEDURE

- 4.1. Results may vary based upon the subjectivity of operator technique, gauge accuracy, number of readings taken, and repeatability and reproducibility of the gauge.
 - 4.1.1. Attempts to develop a precision statement for the methods used in determining aerosol valve cup dimensions have not been successful to date. Therefore, data on precision cannot be given.
- 4.2. Table 2 provides minimum and maximum data for the identified key valve cup dimensions in English units. Table 3 provides the same data in Metric units.
 - 4.2.1. All dimensions shown are recorded as “minimum of minimum” and “maximum of maximum.”
 - 4.2.2. The dimensions are illustrated in Figure 1 in section 8 of the document.

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Table 2: Summary on One-Inch (25.4 mm) Mounting Cup Dimensions (Inches)

Key	Dimension	Limit	<u>Tinplate</u>			<u>Aluminum</u>	
			Laid-In Lathe-Cut	Polyprop Laminate	PE Sleeve	Laid-In Lathe-Cut	PE Sleeve
A	Outside Skirt Diameter	Min	1.272	1.272	1.277	1.277	1.277
		Max	1.290	1.285	1.283	1.290	1.283
B	Outside Body Diameter	Min	0.986	0.986	0.986*	0.986	---
		Max	0.994	0.994	0.994*	0.994	0.994*
C	Skirt Length	Min	0.120	0.120	0.120	0.120	0.120
		Max	0.140	0.140	0.140	0.140	0.140
D	Gasket Thickness	Min	0.032	0.006	0.011	0.032	0.011
		Max	0.046	0.010	0.0165	0.046	0.0165
E	Gasket Length	Min	n/a	n/a	0.170	n/a	0.175
		Max	n/a	n/a	0.205	n/a	0.210
F	Depth to Centerline Dimples	Min	0.240	0.215	0.245	0.220	**
		Max	0.276	0.255	0.275	0.250	**
G	Diameter over Dimples	Min	1.004	1.004	1.011	1.004	**
		Max	1.018	1.018	1.014	1.018	**
H	Overall Height	Min	0.345	0.345	0.364	0.355	0.364
		Max	0.375	0.376	0.376	0.375	0.376
R	Outside Skirt Radius	Min	0.031	0.039	0.038	0.036	0.038
		Max	0.083	0.082	0.083	0.096	0.089
T	Material Metal Thickness	Min	0.0075	0.0075	0.0075	0.012	0.012
		Max	0.0135	0.0135	0.0135	0.018	0.018
J	Inside Diameter of Body	Min	0.948	0.933	0.939	0.938	0.928
		Max	0.971	0.972	0.958	0.962	0.934

* The metal dimensions are 0.960" min and 0.969 max.

** Dimples not available

All dimensions are in inches.

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Table 3: Summary on One-Inch (25.4 mm) Mounting Cup Dimensions (Metric)

Key	Dimension	Limit	<u>Tinplate</u>			<u>Aluminum</u>	
			Laid-In Lathe-Cut	Polyprop Laminate	PE Sleeve	Laid-In Lathe-Cut	PE Sleeve
A	Outside Skirt Diameter	Min	32.31	32.31	32.44	32.44	32.44
		Max	32.77	32.64	32.59	32.77	32.59
B	Outside Body Diameter	Min	25.04	25.04	25.04*	25.04	---
		Max	25.25	25.25	25.25*	25.25	25.25*
C	Skirt Length	Min	3.05	3.05	3.05	3.05	3.05
		Max	3.56	3.56	3.56	3.56	3.56
D	Gasket Thickness	Min	0.81	0.15	0.28	0.81	0.28
		Max	1.17	0.25	0.42	1.17	0.41
E	Gasket Length	Min	n/a	n/a	4.32	n/a	4.45
		Max	n/a	n/a	5.21	n/a	5.33
F	Depth to Centerline Dimples	Min	6.10	5.46	6.22	5.59	**
		Max	7.01	6.48	6.99	6.35	**
G	Diameter over Dimples	Min	25.50	25.50	25.68	25.50	**
		Max	25.86	25.86	25.76	25.86	**
H	Overall Height	Min	8.76	8.76	9.25	9.02	9.25
		Max	9.53	9.55	9.55	9.53	9.55
R	Outside Skirt Radius	Min	0.79	0.99	0.97	0.91	0.97
		Max	2.11	2.08	2.11	2.44	2.26
T	Material Metal Thickness	Min	0.191	0.191	0.191	0.305	0.305
		Max	0.343	0.343	0.343	0.457	0.457
J	Inside Diameter of Body	Min	24.08	23.69	23.85	23.83	23.57
		Max	24.66	24.70	24.33	24.44	23.72

*The metal dimensions are 24.38 mm min and 24.61 mm max

**Dimples are not available

All dimensions are in millimeters (mm).

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD INDUSTRY RECOMMENDATIONS FOR IDENTIFYING KEY DIMENSIONS OF VALVE CUPS	

5. ACCEPTANCE CRITERIA

- 5.1. The Commercial Standards Committee, Aerosol Division, CSPA, Inc. has not developed any tentative or standard methods for measuring the above dimensions.
- 5.2. Valve cups having non-standard metal thickness, non-standard skirt lengths and special cup gaskets are available on both an experimental and production basis. Such specialty cups are not covered in these industry guidelines.
- 5.3. Firms wishing to include one or more of these dimensions in their quality control specifications should consult with their valve supplier so that both parties can agree.
- 5.4. The dimensional ranges in Tables 1 and 2 represent “sales dimensions” rather than the more exact “engineering specifications”. The latter are normally considered as confidential business data.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

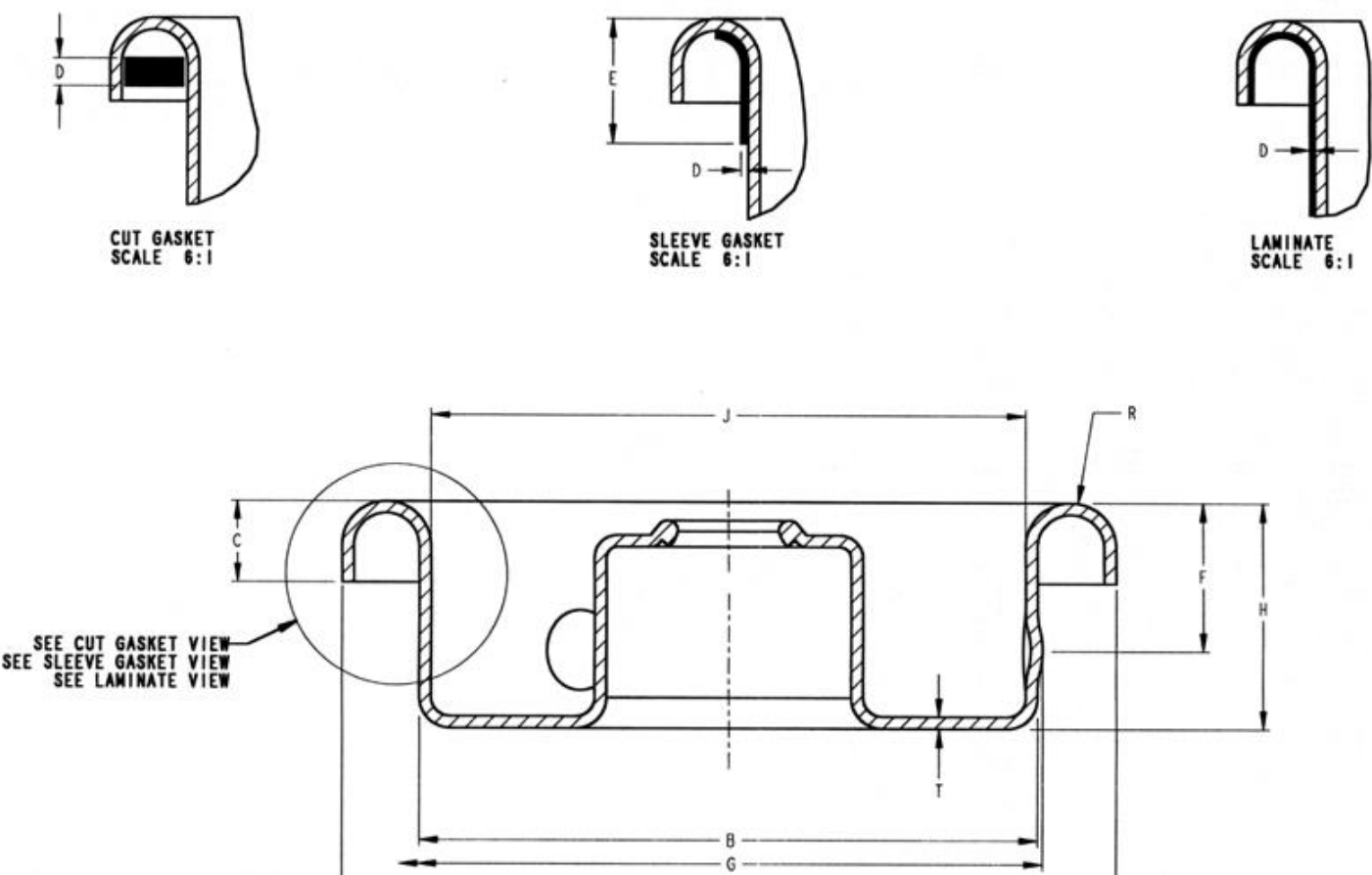
- 7.1. F. P. Ricucci, “Aluminum Can Standards”, Aerosol Age, 42. (Dec. 1989) Industry Publications, Inc. (Fairfield, NJ 07004). Sponsored by Sub-committee A. Commercial Standards Committee, Aerosol Division, CSPA, Inc. (Washington, D.C.)
- 7.2. M. A. Johnsen, The Aerosol Handbook (Second Edition) (1982). Wayne E. Dorland, Inc. (Mendham, NJ).

8. OTHER RESOURCES

- 8.1. Figure 1 shows the profile drawing of a one-inch valve mounting cup with the key dimensions identified.

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Figure 2: Profile of one-inch (25.4 mm) valve mounting cup.



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-6.02	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR MEASURING THE "A-D" DIMENSION OF AEROSOL VALVE WITH DIPTUBE	

1. PURPOSE

- 1.1. A method is presented for the rapid measurement of the "A-D" Dimension defined as the centerline dimension from the top plane of the valve mounting cup curl to the far end of the dip tube. See Figure 1.
- 1.2. The method is limited to valves with one-inch (25.4mm) mounting cups.
- 1.3. Using dip tubes of correct length helps enable the discharge of essentially all the product from the dispenser; prevents the dip tube from becoming jammed into an incorrect position as a result of gassing; prevents the (non-dimpled) valve mounting cup from excessively protruding from the can one-inch opening and perhaps causing production problems at the crimper or gasser/crimper; and prevents the dip tube from bottoming and sealing against the flat base of some aluminum cans, and some short steel cans, thereby restricting or preventing flow of product into the tube when the valve is actuated.
- 1.4. Dip tubes that extend fully to the bottom of the dispenser, without excessive distortion, can also aid in retaining their connection to the valve body tail-piece, which may be important if the aerosol content exerts a very significant swelling action upon the dip tube plastic.
- 1.5. Factors that should be considered in specifying "A-D" Dimension include:
 - 1.5.1. Dip tube curvature - which may vary considerably between dip tubes.
 - 1.5.2. Variation of valve mounting cup and valve mounting cup gasket thickness.
 - 1.5.3. Elevation or suppression of the valve pedestal (thus top end of the dip tube) upon crimping.
 - 1.5.4. Swelling (or shrinking) effect of the product on the dip tube.

2. APPARATUS

- 2.1. Gauge for measuring "A-D" Dimension: Figure 2 or equivalent.
 - 2.1.1. This device consists of four machined parts. In addition, a scale graduated in 1/32 in. (ruler) is attached to the scale block and a foam pad base may be added to achieve non-slip characteristics.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 Valves

4. PROCEDURE

- 4.1. Ensure that the reference plane against which the top of the valve mounting cup rests is at zero on the scale.
- 4.2. Hold the gauge represented by Figure 2 in the hand or on a flat surface and insert the valve, placing the valve cup end to the base end of the device. The slide bar is then pushed firmly to seat the mounting cup against the base end.
- 4.3. The reading is then taken off the scale at the end of the dip tube, giving the "A-D" Dimension.

5. ACCEPTANCE CRITERIA

- 5.1. Report results using predetermined criteria established by the Interested Parties.
- 5.2. Record all details concerning the valve being tested, such as lot number, date received, supplier, and product for which it is intended.
- 5.3. Record the "A-D" Dimension specification.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR MEASURING THE "A-D" DIMENSION OF AEROSOL VALVE WITH DIPTUBE	

5.4. Record measurement to the nearest 1/32 in. (0.80mm).

5.5. Results may vary due to the subjectiveness of the operator touch and technique, gauge type and gauge accuracy - as shown by limited repeatability and reproducibility studies.

5.6. Attempts to develop a precision statement have not been successful. For this reason, data on precision cannot be given.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. Johnsen, M.A., The Aerosol Handbook (Second Edition), 167 and 182, (1982). Wayne E. Dorland Co. (Mendham, NJ).

8. OTHER RESOURCES

8.1. Not Applicable at this time.

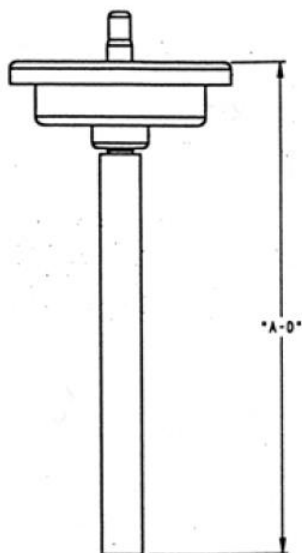


FIG. 1 Aerosol Valve "A-D" Dimension

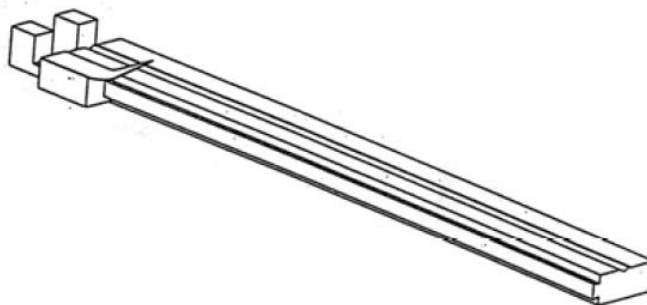


FIG. 2 Aerosol Valve Diptube Measurement Gage

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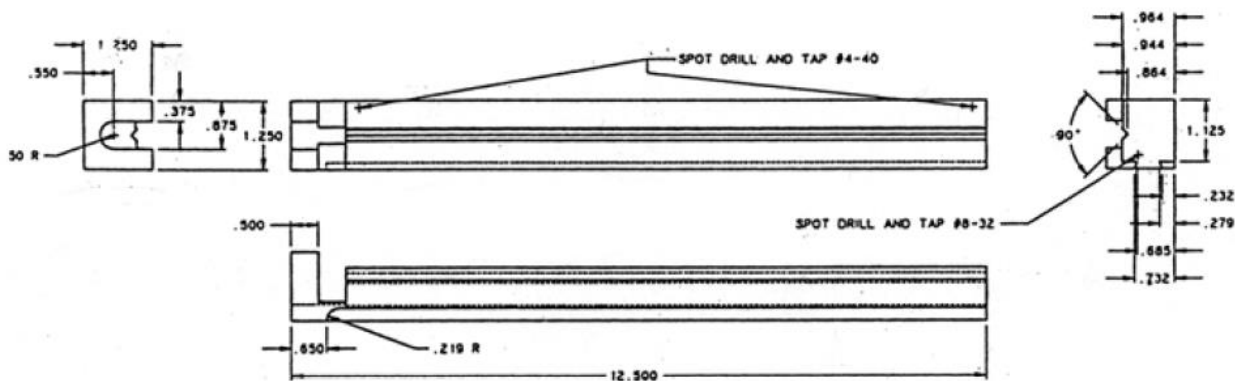


FIG. 3 Base Slide (material: 1¼ by 1¼ by 12½)

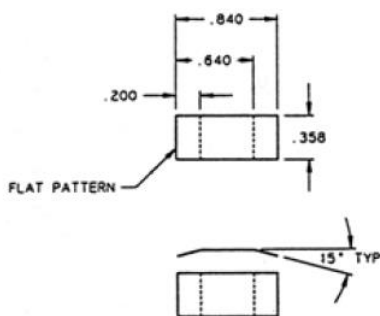


FIG. 4 Slide Bearing (material thickness: 0.020)

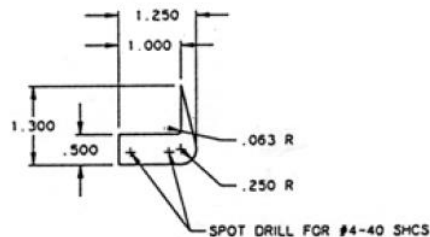


FIG. 5 Indicator Blade (material thickness: 0.015)

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	05 December 2023	The format	Updating to tenth edition of guide
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-6.03	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD METHOD FOR MEASURING THE HARDNESS OF ELASTOMERIC AEROSOL VALVE GASKETS	

1. PURPOSE

- 1.1. This method covers the determination of Durometer hardness for aerosol valve stem gaskets, seat gaskets and the sealing gaskets that may be positioned between valve and container. The hardness is commensurate to resistance to indentation. It is expressed according to the scale of the measuring instrument, which is generally from 1 to 100.
- 1.2. This standard may be used for elastomeric, essentially flat gaskets that range from 0.035 to 0.062 in. (0.89 to 1.58 mm) in thickness, and which are often comprised of buna, neoprene (nitrile), butyl, chlorobutyl or Viton rubbers.
- 1.3. This method was developed to replace, for the intended uses, the need to employ the "A" Durometer of ASTM D2240, which requires that test specimens have a minimum thickness of 0.250 in. (6.4 mm). The much thinner aerosol type gaskets can be plied up to this thickness, but inconsistencies have developed when using this technique for smaller gaskets. The Shore "M" Micro-Durometer of this method can measure samples with cross-sections as small as 0.030 in. (0.76 mm). If the gaskets are stacked to 0.250 in. it will produce the same reading. The indenter is pointed and impacts a very small area with penetration to only a small distance for a full-scale reading.

2. APPARATUS

- 2.1. Durometer "M" - Micro tester, designed to cause an indenter to descend under hydraulically controlled velocity, applying a constant load to the surface of the test specimen. The tester base has a circular hole into which interchangeable metal disk fixtures are inserted. Fixtures include one for flat material and others for 'O'-rings.
- 2.2. Using the flat fixture, obtain readings on the rubber test blocks supplied with the instrument, or their replacements.
- 2.3. The average of the four readings should correspond within one point of the calibration readings supplied with the instrument.

3. PRECAUTIONS

- 3.1. No known hazardous conditions exist for this method. Conduct your own job safety analysis prior to initiating this test.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: 30 Gaskets

5. PROCEDURE

- 5.1. Select the flat fixture, to test aerosol valve gaskets.
- 5.2. Equilibrate the test specimens to 70E to 78EF (21.1E to 25.6EC) if necessary.
- 5.3. Arrange the device so that the vertical distance between the indenter and tester base is 0.500 to 0.750 in. (12.7 to 19.1 mm).
- 5.4. Position gasket specimen below indenter.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD METHOD FOR MEASURING THE HARDNESS OF ELASTOMERIC AEROSOL VALVE GASKETS	

5.5. Release indenter, allowing it to descend at a controlled velocity and come to rest on the gasket under a constant load.

5.6. Read the hardness directly from the dial-type or digital-type readout.

5.7. Repeat three times, using different locations, each about equidistant from adjacent locations, so as to obtain a total of four readings evenly distributed on the surface of the test specimen.

6. ACCEPTANCE CRITERIA

6.1. Report results using predetermined criteria established by the Interested Parties.

6.2. The Report shall include:

6.2.1. The average of the four hardness readings obtained.

6.2.2. Identification of gasket material.

6.2.3. Standard specification of hardness on material tested.

7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

8.1. ASTM D2240 – Standard Test Method for Hardness of Elastomers

8.2. Johnsen, M.A. *The Aerosol Handbook (Second Edition)*, 156-163 (1982); Wayne Dorland (Mendham, NJ)

9. OTHER RESOURCES

9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-6.04	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 8
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD METHODS FOR THE MEASUREMENT OF GASKET COMPRESSION OF OUTSIDE CRIMPED VALVES ON AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to cover the measurement of gasket compression on outside crimped valves within the wide parameters of valves and container, both metallic and non-metallic.
- 1.2. Gasket compression is considered essential to the sealability of containers.
- 1.3. In order to obtain good crimp integrity on the neck of a container, the thickness of the sealing rubber gasket must be reduced by approximately 20%.
- 1.4. These methods provide information for the development of component specifications and establishment of quality control procedures on filling lines.
- 1.5. The methods appear in the following order:
 - 1.5.1. Optical Comparator Method – Section 5.1.
 - 1.5.2. Caliper Method – Section 5.2.
 - 1.5.3. Socoge Gauge Method – Section 5.3.
 - 1.5.4. Overall Height Method – Section 5.4.

2. APPARATUS

- 2.1. Optical Comparator Method
 - 2.1.1. Optical Comparator.
 - 2.1.2. Clamping Jig, fastened to the comparator bench.
 - 2.1.3. Handheld Grinder.
- 2.2. Caliper Method
 - 2.2.1. Calipers.
- 2.3. Socoge Gauge Method
 - 2.3.1. Socoge Internation Gauge with appropriate mandrel for valve ferrule size (See Figure 1).
 - 2.3.2. Calibration Gauge block consisting of a cylindrical two-step ring with a rod like handle (See Figure 1).
 - 2.3.3. Overall Height Method
 - 2.3.3.1. Caliper, Stationary Height Gauge, or comparable device.

3. PRECAUTIONS

- 3.1. 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.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: 5 Containers/Valves
- 4.2. Alternatively, quantity should be determined by all interested parties.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD METHODS FOR THE MEASUREMENT OF GASKET COMPRESSION OF OUTSIDE CRIMPED VALVES ON AEROSOL CONTAINERS	

5. PROCEDURE

5.1. Optical Comparator Method

- 5.1.1. This method involves drawing a projected, enlarged profile of the crimped container and valve, then removing the valve and drawing the projected profile of the container finish. Measuring the resultant distance between the two profiles and subtracting the thickness of the non-compressed components from this value results in a value representing the compressed thickness of the valve sealing gasket, which is then converted to % Gasket Compression.
- 5.1.2. Crimp a valve on an empty container
- 5.1.3. Measure and record any crimp dimensions by nondestructive technique if necessary.
- 5.1.4. Clamp the container in the jig on the comparator bench.
- 5.1.5. Draw the projected, enlarged image on tracing paper
 - 5.1.5.1. Note – Grid ruled tracing paper makes tracing much easier.
- 5.1.6. Without disturbing the paper or container, cut a wedge out of the valve with the electric grinder, and remove the valve.
- 5.1.7. Trace the projected image of the container alone on the same paper.
- 5.1.8. Measure the distance (“H”) between the two silhouettes (Figure 2) excluding the sealing bead if present.
- 5.1.9. Calculate the % Gasket Compression as follows:

$$\%C = \left(1 - \left(\frac{(H/E) - B - F}{G} \right) \right) \times 100$$

Where:

H = Distance measured on optical comparator

E = Comparator Enlargement factor (not required if measurement is taken directly on comparator)

B = Thickness of the valve body flange if present (excluding the sealing bead)

F = Thickness of the valve ferrule

G = Thickness of the virgin sealing gasket

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5.2. Caliper Method

- 5.2.1. This method involves a measurement of the crimped valve height (See Figure 3A and 3B) using a caliper. The resulting value can be used to calculate the % Gasket Compression
- 5.2.2. Select a crimped container.
- 5.2.3. Mark off three (3) points approximately, 120° apart, on the valve ferrule, carefully avoiding areas where stake marks occur.
- 5.2.4. Position the caliper with the inner jaw on the top of the valve.
- 5.2.5. For uncoated containers, slide the outer jaw up the container neck until it stops at the bottom of the crimped ferrule (See Figure 3A)
- 5.2.6. For coated containers, slide the jaw toward the valve skirt until it stops due to the abrupt directional change in the skirt. (See Figure 3B)
- 5.2.7. Repeat this process at the other locations marked on the ferrule.
- 5.2.8. Calculate the % Gasket Compression as follows:

$$\%C = \left(1 - \left(\frac{M - 2F - B - L}{G} \right) \right) \times 100$$

Where:

M = Measured crimp height

L = Height of the container lip (excluding the sealing bead)

G = Thickness of the virgin sealing gasket

B = Thickness of the valve body flange if present (excluding the sealing bead)

F = Thickness of the valve ferrule

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5.3. Socoge Gauge Method

- 5.3.1. This method involves measuring the crimp height of a container using a specialized gauge. This reading can then be used to calculate % Gasket Compression.
- 5.3.2. Gauge Calibration
 - 5.3.2.1. Inspect gauge for any damage or wear.
 - 5.3.2.2. Slide the locking ring up toward the indicator.
 - 5.3.2.3. Insert and secure the calibration gauge block inside the mandrel
 - 5.3.2.4. Fully push down the locking ring.
 - 5.3.2.5. Once the calibration gauge block is secured in the gauge, adjust the gauge to match the calibration gauge dimensions. Remove the block by sliding the locking ring upward.
- 5.3.3. Slide the locking ring upward and place the device on the crimped container, pressing it so that the valve enters the jaws.
- 5.3.4. Fully push down the locking ring.
- 5.3.5. Move the crimped container that is being tested both up and down in the mandrel as well as rotating the container to attain the truest depth reading possible.
- 5.3.6. Record reading ("M").
- 5.3.7. Slide the locking ring upward to disengage container.
- 5.3.8. Calculate the % Gasket Compression as follows:

$$\%C = \left(1 - \left(\frac{M - 2F - B - L}{G} \right) \right) \times 100$$

Where:

M = Measured crimp height

L = Height of the container lip (excluding the sealing bead)

G = Thickness of the virgin sealing gasket

B = Thickness of the valve body flange if present (excluding the sealing bead)

F = Thickness of the valve ferrule

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5.4. Overall Height Method

- 5.4.1. This method involves taking two overall height measurements, with and without a crimped valve. The difference in the measurements can then be used to calculate the % Gasket Compression.
- 5.4.2. Select a crimped container.
- 5.4.3. Mark four (4) equidistant points on the valve and container, measure the overall height of the crimped container at each of the four (4) points, from the top of the ferrule to the container bottom (Figure 3A – “OH1”)
- 5.4.4. Remove the valve without distorting the container or the curl.
- 5.4.5. At the four (4) equidistant points, measure the overall height of the container, from the top of the curl to the container bottom (Figure 3A – “OH2”).
- 5.4.6. Calculate the % Gasket Compression as follows:

$$\%C = \left(1 - \left(\frac{OH_1 - OH_2 - F - B}{G} \right) \right) \times 100$$

Where:

G = Thickness of the virgin sealing gasket

OH₁ = Overall height of the crimped container. Distance from the top of the valve ferrule to the bottom of the container. See Figure 3A.

OH₂ = Overall height of the decrimped container. Distance from the top of the container curl to the bottom of the container. See Figure 3A.

F = Thickness of the valve ferrule

B = Thickness of the valve body flange – if present (excluding the seal bead)

6. ACCEPTANCE CRITERIA

- 6.1. Report results using predetermined criteria established by the Interested Parties.
- 6.2. Analyzing the similarities and differences between effective sealing of inside crimped valves and outside crimped valves, it becomes readily apparent that the main factor to consider for the effective sealing in both cases is the compression of the sealing gasket of the valve.
- 6.3. Where a standard dimension is offered to the trade for inside crimped valves, such a single dimension or dimension range cannot readily be obtained for outside crimped valves due to wide tolerances on the essential dimensions of containers and the wide variation between valves offered to the trade for aerosol containers. Therefore, separate dimensions must be established for each valve/container combination.
- 6.4. In calculating compression of the rubber gasket, the sealing beads on both the container and valve body flange are ignored.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

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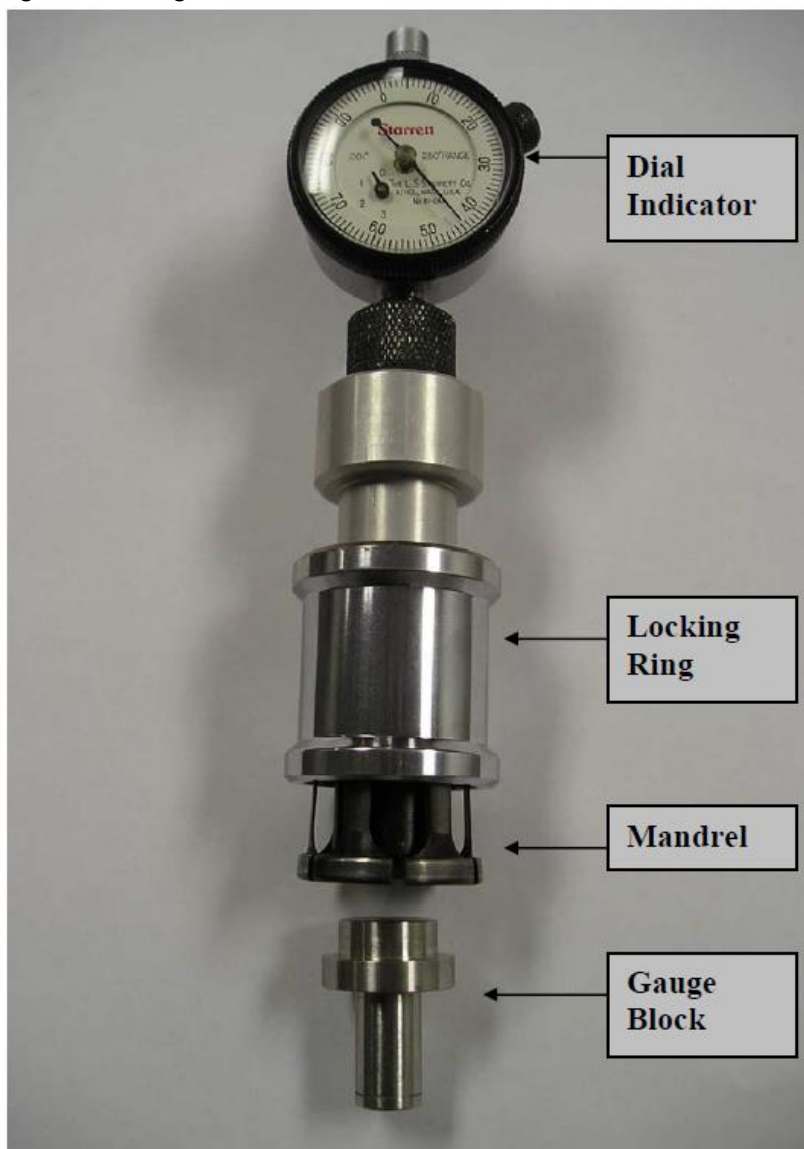
8. REFERENCES

- 8.1. ASTM D996: Terminology of Packaging and Distribution Environments
- 8.2. ASTM D3064: Terminology Relating to Aerosol Products

9. OTHER RESOURCES

- 9.1. List resources or default: Not Applicable at this time.

Figure 1: Socoge Gauge and Gauge Block



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Figure 2: Optical Comparator Profile

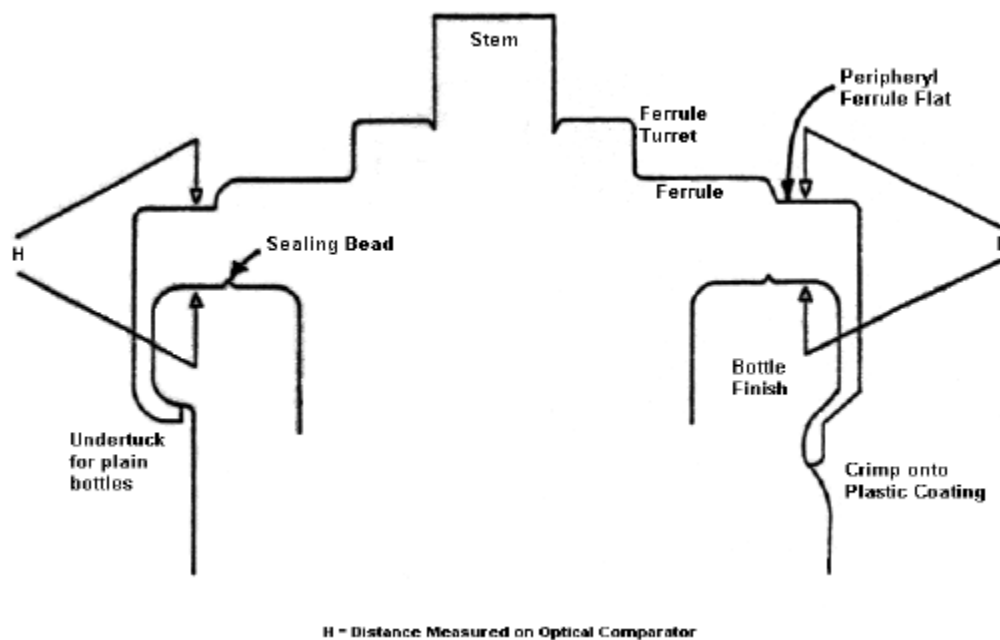
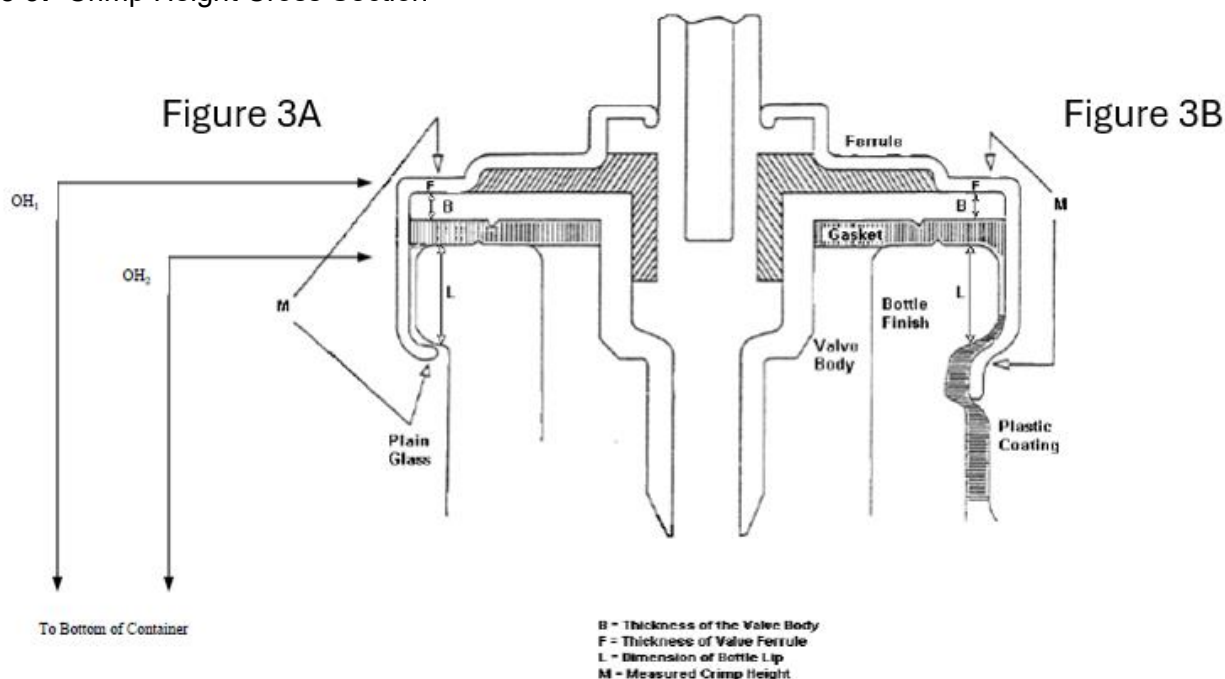


Figure 3: Crimp Height Cross Section



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10. REVISIONS

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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-6.05	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD INDUSTRY RECOMMENDATIONS FOR MEASURING KEY DIMENSIONS OF BAG-ON-VALVE (BOV) IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of the practice is to establish industry guidelines for key dimensions for Bag-On-Valve for Aerosol Containers.
- 1.2. Ten key dimensions (listed below) are presented and the suggested gauging instruments are given for each dimension.
 - 1.2.1. Dimension A: Bag Width
 - 1.2.2. Dimension B: Bag Height
 - 1.2.3. Dimension C: Weld Widths
 - 1.2.4. Dimension D: Bag Volume
 - 1.2.5. Dimension E: Stem Height
 - 1.2.6. Dimension F: Pedestal Height
 - 1.2.7. Dimension G: Cup Diameter
 - 1.2.8. Dimension H: Gasket Thickness
 - 1.2.9. Dimension I: Stem Orifice Diameter (if applicable)
 - 1.2.10. Dimension J: Diptube Length

2. APPARATUS

- 2.1. Table 1 lists the suggested gauging instruments for each dimension.

Table 1: Suggested Gauging Instruments

Dimension	Instrument
A	Average of three ruler measurements
B	Average of three ruler measurements
C	Average of three ruler measurements
D	Scale to measure by weight
E	Stem Height Gauge
F	Pedestal Height Gauge
G	Average of three caliper measurements
H	Average of three caliper measurements
I	Pin gauges or measurement microscope
J	Ruler

3. TEST SPECIMENS

- 3.1. The recommended quantity of samples is enough to setup good parameters during the manufacturing and filling processes. Exact quantities should be determined by the relevant interested parties.

4. PROCEDURE

- 4.1. Results may vary based upon the subjectivity of operator technique, gauge accuracy, number of readings taken, and repeatability and reproducibility of the gauge.

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4.1.1. Attempts to develop a precision statement for the methods used in determining aerosol Bag-On-Valve dimensions have not been attempted to date. Therefore, data on precision cannot be given.

5. ACCEPTANCE CRITERIA

5.1. Report results using predetermined criteria established by the interested parties.

5.2. Criteria for acceptance including any targets and tolerances must be determined by the interested parties.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. Not Applicable at this time.

8. OTHER RESOURCES

8.1. Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-6.06	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR DETERMINATION OF VALVE CRIMP DEPTH FOR 1-INCH (25.4MM) AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the crimp depth for aerosols having one-inch (25.4 mm) valves. This dimension has the ability to effect a long-term hermetic seal, at the point of valve cup and container curl interface.
- 1.2. This standard should be used to measure and describe a dimension of the valve cup after the crimping operation has been performed.
- 1.3. The results of the test may be used as an element of an overall leakage or leakage risk assessment, which takes into account all of the factors which are pertinent to such an assessment. This method was developed as a standard of measurement for the aerosol industry, and as a means for leakage minimization.

2. DEFINITION

- 2.1. Crimp depth is the vertical distance from the top of a crimped one-inch (25.4 mm) to the center point of the swaged groove, i.e., collet indentation.

3. APPARATUS

- 3.1. A Dial-type Crimp Diameter Gauge
 - 3.1.1. Gauge 444P-161 (0.046 in. radius contact point preferred). Federal Products Corporation, Providence, RI.
 - 3.1.2. Crimp Depth Gauge. Kile Machine and Tool, Inc., R.R. 5, Route #136 East, Danville, IL
- 3.2. Standard Ring Gauge Block, for gauge calibration
 - 3.2.1. The gauge block shall consist of a rectangular steel ring with a precisely squared and flat top edge, having a groove with a radius equal to that of the gauge contact ball (foot) which is machined parallel to the squared edge at a distance within the range of crimp depths to be measured, and where the distance between the squared edge and the groove center point shall be known to the nearest ± 0.0005 in. (± 0.013 mm).

4. PROCEDURE

- 4.1. **Method A** (Federal Products Corporation Gauge 444P-161)
 - 4.1.1. Calibrate the gauge by placing it upon the ring-gauge block so that the contact ball fits into the machined groove and the base of the gauges snugly pressed onto the top surface of the block.
 - 4.1.2. Adjust the dial so that the gauge reads zero.
 - 4.1.3. Remove any spray dome, foam spout or extra-large actuator from the aerosol dispenser to be tested.
 - 4.1.4. Insert the contact ball of the gauge into the collet segment indentation, bringing the base of the gauge down onto the top of the valve cup.
 - 4.1.5. Firmly slide the gauge horizontally so that the contact ball seats at the center point of the collet segment indentation.
 - 4.1.6. Orient the contact ball to the horizontal center of the collet segment indentation.
 - 4.1.7. Determine the dial reading.
 - 4.1.8. Either add or subtract the dial reading, depending upon which side of the dial (+ or -) the pointer is on, from the gauge block dimension to yield the crimp depth of that segment indentation.
 - 4.1.9. Repeat 4.1.4 through 4.1.8 for all other segment indentations. [Note: Valve cups will normally have a total of six or eight indentations.]

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4.2. Method B (Kile Machine and Tool Depth Gauge)

- 4.2.1. Calibrate the gauge according to directions supplied by the manufacturer, using a standard ring gauge block.
- 4.2.2. Remove any spray dome, foam spout or extra-large actuator from the aerosol dispenser to be tested.
- 4.2.3. Insert the left leg of the depth gauge into the crimped valve cup, moving the gauge to the left until the right toe of the gauge engages the valve cup crimped area, with the anvil of the dial indicator resting on the top of the valve cup.
- 4.2.4. Slowly counter-rotate the can and depth gauge until a smooth feel is developed near the horizontal center of one crimping collet indentation.
- 4.2.5. Slowly rock the depth gauge forward and backward to change its perpendicular position with respect to the dispenser. This will permit the dial indicator to reflect the shortest distance between the anvil and the toe of the gauge; i.e., between the anvil and right toe.
- 4.2.6. Record the dial reading (minimum value).
- 4.2.7. Add 0.100 in. to the dial reading (in thousandths of an inch) to give the true crimp depth reading. [Note: For example, if the dial minimum reading is "85", the true depth reading will be 0.185 in. (4.70 mm).]
- 4.2.8. Repeat 4.2.3 through 4.2.7 for all other crimp segment indentations.

5. REPORT

- 5.1. The report shall include the following:
 - 5.1.1. A complete description of the aerosol being tested, including production date and time, if applicable.
 - 5.1.2. The individual crimp depth value for each segment indentation.
- 5.2. Note: Do not report averages or ranges, since this data is valueless and often misleading. An average value may appear satisfactory, but if one individual depth reading is unusually low the dispenser may leak.

6. PRECISION

- 6.1. The results of the two gauges cannot be precisely compared, since the Federal Products Corporation Gauge measures depths from the plane of the crown of the valve cup, while the Kile Machine and Tool Depth Gauge measures depths from a point on the crown of the valve cup directly overhead. The results of the two methods will be in perfect agreement only if the crown of the valve cup is perfectly planar.
- 6.2. The following data may be used for judging the acceptability of results obtained with either instrument:
 - 6.2.1. Duplicate results by the same operator with the same instrument should be considered suspect if they differ by more than 0.001 in. (repeatability)

7. KEY WORDS

- 7.1. Crimp depth, crimp measurements

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8. ACCEPTANCE CRITERIA

8.1. Report results using predetermined criteria established by the Interested Parties

9. SAFETY

9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

10. REFERENCES

- 10.1. Montfort A. Johnsen, *The Aerosol Handbook* (Second Edition) (1982). The Wayne E. Dorland Company (Mendham, NJ)
- 10.2. Alfred Herzka, *International Encyclopedia of Pressurized Packaging (Aerosols)*, 103-105, (1966). Pergamon Press, (New York, NY)
- 10.3. CSPA AEROSOL GUIDE – NINTH EDITION – 2009

11. OTHER RESOURCES

11.1. Not Applicable at this time.

12. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	10 November 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-6.07	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR DETERMINATION OF VALVE CRIMP DIAMETER FOR 1-INCH (25.4MM) AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the crimp diameter for aerosols having one-inch (25.4 mm) valves. This dimension has the ability to effect a long-term hermetic seal, at the point of valve cup and container curl interface.
- 1.2. This standard should be used to measure and describe a dimension of the valve cup after the crimping operation has been performed.
- 1.3. The results of the test may be used as an element of an overall leakage or leakage risk assessment, which takes into account all of the factors which are pertinent to such an assessment. This method was developed as a standard of measurement for the aerosol industry, and as a means for leakage minimization.

2. DEFINITION

- 2.1. Crimp diameter is the distance from the center point of the swaged groove (collet indentation) to a corresponding point 180° around the periphery of the valve mounting cup.

3. APPARATUS

- 3.1. A Dial-type Crimp Diameter Gauge
 - 3.1.1. Gauge 149P-611. Federal Products Corporation, Providence, RI
 - 3.1.2. Crimp Diameter Gauge. Kile Machine and Tool, Inc., R.R. 5, Route #136 East, Danville, IL
- 3.2. Standard Ring Gauge Block, for gauge calibration
 - 3.2.1. The gauge block shall consist of a rectangular steel ring, having an inside diameter (or inside groove with a radius equal to that of the gauge contact ball or foot) between about 1.060 and 1.080 in. (26.92 to 27.43 mm). The diameter shall be stamped onto the gauge, accurate to the nearest ± 0.0005 in. (± 0.013 mm). [Note: Most ring gauge blocks are available from the gauge manufacturers having a groove with the centerline 0.185 in (4.70mm) below the flat face and a diameter of 1.070 in. (27.18 mm). They can be used for the calibration of both crimp depth and crimp diameter gauges.]

4. PROCEDURE

- 4.1. Method A** (Federal Products Corporation Gauge 149P-611)
 - 4.1.1. Calibrate the gauge by placing the two legs into the inner diameter or inner groove of the ring-gauge block.
 - 4.1.2. Adjust the dial so that the gauge reads the same as the known dimension of the calibrating gauge block.
 - 4.1.3. Remove any spray-dome, foam spout or extra-large actuator from the test dispenser.
 - 4.1.4. Select one pair of opposing collet indentation segments.
 - 4.1.5. Press the lever of the gauge to allow clearance of the gauge and contact points to enter the well of the valve cup; then release the lever so that the contact points can fit into the opposing indentations.
 - 4.1.6. Maneuver the gauge to locate the maximum reading. This is normally with the points at the horizontal center of each indentation.
 - 4.1.7. Record the gauge reading to the nearest ± 0.001 in. (± 0.025 mm) (maximum value).
 - 4.1.8. Repeat 4.1.5 through 4.1.7 for each additional pair of opposing indentations.

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4.2. **Method B** (Kile Machine and Tool Diameter Gauge)

- 4.2.1. Standardize the gauge according to directions supplied by the manufacturer, using a standard ring gauge block.
- 4.2.2. Remove any spray-dome, foam spout or extra-large actuator from the test dispenser.
- 4.2.3. Insert the left leg of the diameter gauge into the crimped valve cup, moving the gauge to the left until the right leg of the gauge can also be fitted into the valve cup and engage the opposite crimped indentation.
- 4.2.4. Slowly counter-rotate the can and diameter gauge until a smooth feel is developed between opposite crimp indentations.
- 4.2.5. With the diameter gauge held perpendicular to the can curl, record the highest number shown on the dial. This is normally with the contact points near the horizontal center of each opposing segment indentation.
- 4.2.6. Record the dial reading (maximum value).
- 4.2.7. Add 1.00 in. to the dial reading (in thousandths of an inch) to give the true crimp diameter reading. [Note: For example, if the dial maximum reading is "70", the true diameter reading will be 1.070 in. (27.18 mm).]
- 4.2.8. Repeat 4.2.3 through 4.2.7 for all other opposing collet segment indentations. [Note: Deviations from this procedure, such as hanging the dispenser from the legs of the diameter gauge, may result in fallacious readings.]

5. **REPORT**

5.1. The report shall include the following:

- 5.1.1. A complete description of the aerosol being tested, including production date and time, if applicable
- 5.1.2. The crimp diameters across each opposing pair of collet indentations

5.2. Note: Do not report averages or ranges, since this data is valueless and often misleading. An average value may appear satisfactory, but if one diameter reading is unusually low the dispenser may leak.

6. **PRECISION**

6.1. The following data may be used for judging the acceptability of results obtained with either instrument:

- 6.1.1. Duplicate results by the same operator with the same instrument should be considered suspect if they differ by more than 0.001 in. (repeatability)

7. **KEY WORDS**

- 7.1. Crimp diameter, crimp measurements

8. **ACCEPTANCE CRITERIA**

- 8.1. Report results using predetermined criteria established by the Interested Parties

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9. SAFETY

9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

10. REFERENCES

- 10.1. Montfort A. Johnsen, *The Aerosol Handbook* (Second Edition) (1982). The Wayne E. Dorland Company (Mendham, NJ)
- 10.2. Alfred Herzka, *International Encyclopedia of Pressurized Packaging (Aerosols)*, 103-105, (1966). Pergamon Press, (New York, NY)
- 10.3. CSPA AEROSOL GUIDE – NINTH EDITION – 2009

11. OTHER RESOURCES

11.1. Not Applicable at this time.

12. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	26 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-6.08	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR MEASURING MAJOR AND MINOR STEM HEIGHTS FOR AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. To confirm that minimum and maximum stem heights (Figure 1) will facilitate proper fitment of the actuator overcap and measure the effects of internal can pressure on stem height.
- 1.2. This practice should be applied to traditional aerosols when:
 - 1.2.1. New aerosol products are developed.
 - 1.2.2. Changes to formula, can, valve, or process are made to existing aerosol products.
 - 1.2.3. Establishing specification limits for manufacturing and actuator overcap design engineering.

2. APPARATUS

- 2.1. Major and minor stem height gauges.
 - 2.1.1. Gauge for Major Stem Height shown in Figure 2.
 - 2.1.2. Gauge for Minor Stem Height shown in Figure 3.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 containers

4. PROCEDURE

- 4.1. Samples should represent each of the following points in processing:
 - 4.1.1. After crimping of the valve.
 - 4.1.1.1. When collecting data from production line, it is recommended that you track which cans came from which crimping heads.
 - 4.1.2. After charging with LPG or compressed gas propellant.
 - 4.1.2.1. When collecting data from production line, it is recommended that you track which cans came from which crimping heads, if more than one head.
 - 4.1.3. After water bath exposure.
 - 4.1.4. After conditioning at room temperature (20-25°C) for at least 24 hours.
- 4.2. Randomly select cans from the processing line representing the four points in production described in Step 4.1.
- 4.3. Select the applicable stem height gauge corresponding to the can diameter.
- 4.4. For best practice, place the stem height gauge on top of the corresponding calibration block to verify that the reading is zero.
- 4.5. Place the major stem height gauge on top of the can and record the reading on the gauge.
- 4.6. Repeat Step 4.5 with all remaining cans.
- 4.7. Select the minor stem height gauge.
- 4.8. Place the minor stem height gauge on top of the corresponding calibration block to verify that the reading is zero.
- 4.9. Place the minor stem height gauge on top of the can and record the reading on the gauge.
- 4.10. Repeat Step 4.9 with all remaining cans.
- 4.11. Calculate the average major and minor stem heights that were measured, and report the average, minimum, and maximum values of each.

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- 4.12. Calculate and report the standard deviations for the major and minor stem heights that were measured:

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Where: s = standard deviation of set of measurements
x = individual measurement in series
 $\bar{x}$ = average of entire set of measurements
n = sample size = 30

5. ACCEPTANCE CRITERIA

- 5.1. Major and minor stem heights, including the average, minimum, maximum, and standard deviation are to be verified against processing limits.
5.2. The major and minor stem heights must enable proper fitment of the actuator overcap.
5.3. Report results using predetermined criteria established by the Interested Parties.

6. SAFETY

- 6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

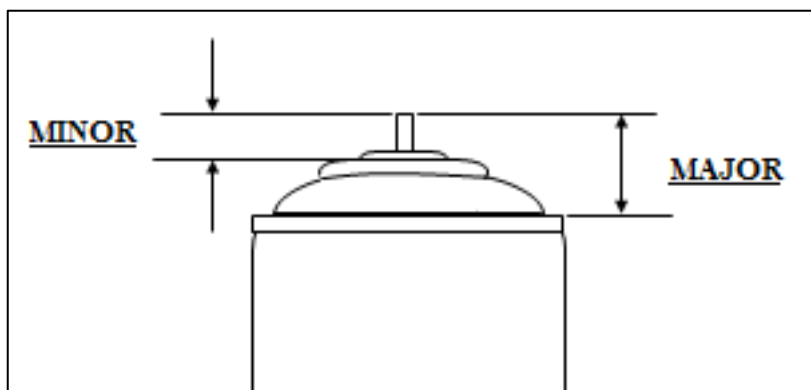
7. REFERENCES

- 7.1. HCPA-1.01: Standard Practice for Dimensional Measurement for 3-Piece Tinplate Straight-Wall and Necked-In Aerosol Containers.

8. OTHER RESOURCES

- 8.1. Not Applicable at this time.

Figure 1. Diagram showing the Major and Minor stem height reference on a 3-Piece aerosol can



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Figure 2. Major Stem Height Measuring and Zero Calibration Block example.



Figure 3. Minor Stem Height Measuring and Zero Calibration Block example.



9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	New	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-6.09	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR DETERMINATION OF FUNCTIONAL STEM HEIGHT RANGE FOR AEROSOL ACTUATOR OVERCAPS	

1. PURPOSE

- 1.1. This test method describes the determination of aerosol functional stem heights.
- 1.2. This procedure applies to actuator overcaps that attach to the can curl and actuators that attach to the one-inch diameter valve cup.
- 1.3. To determine the minimum and maximum stem heights at which a given actuator-overcap functions properly.

2. APPARATUS

- 2.1. Pilot or production aerosol filling equipment, or benchtop valve crimping device in conjunction with LPG filling equipment.
- 2.2. Major or minor stem height gauges (Figure 1).



Figure 1: Starrett Stem Height Gauges

- 2.3. Gauge master blocks (Figure 2) for verifying calibration of the gauges.



Figure 2: Starrett Master Blocks

- 2.4. A stem height raising/lowering tool will be needed to achieve the desired, repeatable stem heights.

3. PRECAUTIONS

- 3.1. Care should be taken when using pressurized cans to avoid actuating the tip unexpectedly.
- 3.2. If the stem heights are being raised/lowered after crimping, care must be taken to ensure the stem socket is not damaged or misaligned.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR DETERMINATION OF FUNCTIONAL STEM HEIGHT RANGE FOR AEROSOL ACTUATOR OVERCAPS	

4. TEST SPECIMENS

- 4.1. Recommended Quantity: Approximately 30 cans split into groups.
 - 4.1.1. Approximately 10 samples are needed to find the upper limit.
 - 4.1.2. Approximately 10 samples are needed to find the lower limit.
 - 4.1.3. 5 samples are needed to test the upper limit.
 - 4.1.4. 5 samples are needed to test the lower limit.
- 4.2. Fill the cans with an appropriate, non-corrosive, non-hazardous formula. Crimp a valve onto each can using appropriate crimp dimensions. It is recommended to use compressed gas filled samples for testing at the upper end of the pressure range for the formula or cap requirement.
- 4.3. A viewing window must be cut into the cap that allows the tester to observe the function of the valve stem with the actuator. The viewing window should not interfere with the actuator or ruin the structural integrity of the shroud.



Figure 3: Viewing window in the cap

- 4.4. Create a range of stem heights to find the maximum and minimum limits of the major or minor stem heights to determine the functional range of the actuator overcap. Stem heights should be measured using calibrated height gauges.

5. PROCEDURE

- 5.1. Mark the test sample cans with four lines separated by approximately 90 degrees. The four markings are different points at which the tester should actuate the valve when testing at each stem height adjustment. When looking for failure modes involving actuation, the unit should be tested at each of these locations.
- 5.2. Using the stem height adjustment tools, use ten aerosol units to find the upper end of the functional range of the cap. Adjust the samples in small increments to approach the upper end failure point of the actuator overcap. When making adjustments, it may be necessary to use increments as small as 0.005 inches (0.13 mm).
 - 5.2.1. The upper end functional range failure modes may include but are not limited to by the following:
 - 5.2.1.1. Actuation during capping.

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5.2.1.2. Blow-by during spray between the valve stem and actuator stem socket during actuation or between the valve stem, gasket, and pedestal. **Note:** Blow-by coming from the valve between the valve stem, stem gasket, and pedestal may indicate a defective valve, damage during adjusting the stem height, or the upper range interaction of that specific valve design with the actuator overcap.

5.2.1.3. Unacceptable spray impingement as defined by the project team during actuation

5.2.1.4. Unacceptable exposure of the actuator.

5.2.1.5. Breaking of trigger ties

5.2.1.6. Improper function of the actuator overcap and valve as defined by a subject matter expert.

5.2.2. When one or more of the upper end failure modes are found, major or minor stem heights of the samples should be reduced to eliminate the failure modes.

5.3. Using the stem height adjustment tools, use ten aerosol samples to find the lower end of the functional range of the cap. Adjust the samples in small increments to approach the lower end failure point of the actuator overcap. It may be necessary to use increments as small as 0.005 inches (0.13 mm) when making stem height adjustments.

5.3.1. The lower end functional range failure modes may include but are not limited to by the following:

5.3.1.1. Blow-by during spray between the valve stem and actuator stem socket during actuation or between the valve stem, gasket, and pedestal. It should be noted that blow-by coming from the valve between the valve stem, stem gasket, and pedestal may indicate a defective valve, damage during adjusting the stem height, or the upper range interaction of that specific valve design with the actuator overcap.

5.3.1.2. Unacceptable spray impingement as defined by the project team during actuation

5.3.1.3. Interference between the actuator, can, and valve that prevents proper function or full actuation of the valve.

5.3.1.4. Unseating of the valve stem from the stem socket following actuation. This failure mode can be ignored if it intended as part of the design.

5.3.1.5. Improper function of the actuator overcap and valve as defined by a subject matter expert.

5.3.2. When one or more of the upper end failure modes are found, major or minor stem heights of the samples should be increased to eliminate the failure modes.

5.4. Once upper and lower limits are established adjust six samples to the upper end of the determined functional range and six samples to the lower end of the determined functional range. Repeat testing performed in 5.5 and 5.6 to verify the range. No failure modes should be present

6. ACCEPTANCE CRITERIA

6.1. The functional stem height range that is defined by the minimum and maximum stem heights must enable proper fitment of the actuator.

6.2. Proper function of the actuator overcap defined in steps 5.5 and 5.6.

6.3. A safety factor should be applied to the upper maximum functional stem height and the lower minimum functional stem height to account for component variation and tolerance stack up.

7. SAFETY

7.1. Suitable personal protective equipment (PPE) should always be worn in the processing environment.

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7.2. Protective gloves should be worn when taking major and minor stem height measurements if valve actuation occurs.

8. REFERENCES

8.1. Not Applicable at this time.

9. OTHER RESOURCES

9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-6.10	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR MEASURING THE STEM SOCKET INSIDE DIAMETER OF AN AEROSOL OVERCAP OR SPRAYER BUTTON IN AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to determine the stem socket inside diameter of an aerosol overcap or sprayer button to ensure that there is a good fit with the actuator stem.

2. APPARATUS

- 2.1. Set of calibrated pins of varying diameters in 0.001" increments at minimum.
2.1.1. The pins should cover a range of diameters from at least 0.002" below the lower specification to 0.002" above the upper specification.

3. PRECAUTIONS

- 3.1. No known hazardous conditions exist for this method. Conduct your own job safety analysis prior to initiating this test.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: 30

5. PROCEDURE

- 5.1. Start with a pin that is 0.002" below the lower specification of the stem socket ID.
5.2. Insert the pin into the stem socket, if there is no resistance or it does not catch move to the next larger diameter pin.
5.3. Repeat this process until there is resistance on the pin or it catches inside stem socket.
5.4. Record this values as the stem socket inside diameter.

6. ACCEPTANCE CRITERIA

- 6.1. Report results using predetermined criteria established by the Interested Parties.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

- 8.1. Not Applicable at this time.

9. OTHER RESOURCES

- 9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-6.10	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 2 OF 2
METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR MEASURING THE STEM SOCKET INSIDE DIAMETER OF AN AEROSOL OVERCAP OR SPRAYER BUTTON IN AEROSOL CONTAINERS	

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR MEASURING DIP TUBE RETENTION FOR AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. This procedure covers the determination of the force necessary to separate the dip tube from the body of a dispenser.
- 1.2. The procedure can also be used to assess dip tube retention after product exposure.

2. APPARATUS

- 2.1. Gauge: the test apparatus shall be capable of applying a smooth increasing load to the test part until the dip tube is separated from the pump dispenser.

Note 1--A motor driven constant rate of elongation tester may be used.

Note 2--The gauge should incorporate a maximum force indicator.

- 2.2. Dispenser Clamp: to hold the dispenser. The clamp shall hold the dispenser in such a way that there is no slippage between the test part and the clamp.

- 2.3. Dip Tube Clamp: to hold the dispensers dip tube. The clamp should hold the dip tube in such a way that there is no slippage between the dip tube and the clamp.

NOTE: Both clamps should be arranged so that the tube is maintained in a position parallel to, and in the plane of the applied force.

- 2.4. Ruler: graduated in either millimeters or inches.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 30 random samples from production

4. PROCEDURE

- 4.1. Samples should be conditioned for 24 hours at standard laboratory conditions¹.

- 4.2. Attach clamps to the force gauge in accordance with the manufacturer's instructions or in a manner consistent with the pump's geometry.

- 4.3. Insert the dip tube approximately 12 to 18mm into the clamp and tighten to prevent slippage.

NOTE: Dip tubes shorter than 100mm, insert only enough of the tube into clamp to ensure that no slippage occurs.

- 4.4. Adjust the test table so that the dip tube is fully extended with no force acting on it. There should be a zero reading on the force gauge.

- 4.5. Run test at 508 mm/min (20 in/min) until the dip tube has separated from the dispenser, or the dip tube begins to elongate. Stop the test if the dip tube begins elongating.

- 4.6. Record the maximum force reading.

- 4.7. Indicate whether dip tube was separated from the dispenser or was elongated.

5. CALCULATIONS

- 5.1. Calculate the minimum, maximum, and average force at which the set of dip tubes broke free from the pump dispenser

¹ Standard Conditioning Atmosphere (23°C ± 2°C (73.4°F ± 3.6°F) and 50 ± 5% RH), per ASTM D4332.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: STANDARD PRACTICE FOR MEASURING DIP TUBE RETENTION FOR AEROSOL CONTAINERS	

6. ACCEPTANCE CRITERIA

6.1. Report results using predetermined criteria established by the Interested Parties.

7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

8.1. None

9. OTHER RESOURCES

9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	07 April 2025	New	
1	30 April 2026	Finalization of tenth edition guide	

EDITION: 10 METHOD NO: HCPA-6.12	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Physical Attributes	TITLE: Standard Practice for Determining Buckle and Burst Pressures Using Hydrostatic for 1-Piece, 2-Piece and 3-Piece ‘Metallic’ Aerosol Containers	

1. PURPOSE

- 1.1. Aerosol containers are subjected to pressure during filling, distribution and use. The purpose of this test is to determine the resistance to burst of the plastic container when pressurized under specific conditions to meet regulatory requirements.

2. APPARATUS

- 2.1. Calibrated Hydro Burst Pressure Tester with fill programmable ramping capabilities
- 2.2. Special equipment may be necessary to deliver and control pressure at rates that simulate aerosol filling conditions.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: Minimum of 50 containers. For production at least one (1) out of each lot of 25,000 must be tested for DOT Specification containers.¹

4. PROCEDURE

- 4.1. Verify calibration of equipment.
- 4.2. Place one container at a time in the burst tester. Ensure that the container is properly fitted into the container support and close the safety chamber door.
- 4.3. Initiate/Start the burst tester.
 - 4.3.1. Pressurize container to failure(s).
 - 4.3.1.1. Recommended: Pressurize at 1.0 bar/sec (14.5psig/sec).²
- 4.4. After container has ruptured, remove the container.
- 4.5. Record the following test results for each container.
 - 4.5.1. Buckle pressure and location.
 - 4.5.2. Burst pressure or maximum pressure achieved (mandatory)
 - 4.5.3. Record percent container expansion after 25 second hold and final expansion (optional).
 - 4.5.4. Time duration for each container tested (optional).
 - 4.5.5. Note location of failure (side wall, bottom dome, etc.) and failure mode.
- 4.6. After the machine has finished, remove the container.
- 4.7. Record the following test results for each container.

5. ACCEPTANCE CRITERIA

5.1. Regulatory Requirements

- 5.1.1. Per U.S. DOT³: Pressure in the container must not exceed 180 psig at 130°F. If the pressure in the container is less than 140 psig at 130°F, a non-DOT specification container may be used. If the pressure in the container exceeds 140 psig at 130°F. (54.4°C) but does not exceed 160 psig at 130°F (54.4°C) the container must conform to specification DOT-2P. If the pressure in the

¹ Per Title 49: Transportation, Part 178, Subpart B, 178.33-8 and 178.33-8a, Production Tests for 2P and 2Q, respectfully

² The ramp profile is derived from FEA Directive 75/324/EEC, Section 6.1.1.1, annexed in FEA 621E method, per “Verification of the test pressure”.

³ Title 49CFR: Transportation, Part 173, Subpart G, Section 173.306 (5)(ii)

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METHOD CLASSIFICATION: Physical Attributes	TITLE: Standard Practice for Determining Buckle and Burst Pressures Using Hydrostatic for 1-Piece, 2-Piece and 3-Piece ‘Metallic’ Aerosol Containers	

container exceeds 160 psig at 130°F. (54.4°C) but does not exceed 180 psig at 130°F (54.4°C) the container must conform to specification DOT-2Q.

5.1.1.1. All containers must be capable of withstanding, without bursting, a pressure of one and one-half times the equilibrium pressure of the contents at 130°F (54.4°C)

5.1.1.2. Production Tests

5.1.1.2.1. DOT-2P Containers

5.1.1.2.1.1. One out of each lot of 25,000 containers or less, successively produced per day must be pressure tested to destruction and must not burst below 240psig. The container tested must be complete as intended for transportation.

5.1.1.2.2. DOT-2Q Containers

5.1.1.2.2.1. One out of each lot of 25,000 containers or less, successively produced per day must be pressure tested to destruction and must not burst below 270psig. The container tested must be complete as intended for transportation.

6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

7. REFERENCES

7.1. List any references to other literature, regulations, practices or methods that support.

8. OTHER RESOURCES

8.1. List resources or default: Not Applicable at this time.

9. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
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EDITION: 10 METHOD NO: HCPA-7.01	 HOUSEHOLD & COMMERCIAL PRODUCTS ASSOCIATION Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINATION OF SPRAY PATTERN FOR AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. The purpose of this test is to characterize the spray pattern and cone angle of an aerosol product. The spray pattern of a product can significantly impact its aesthetics, safety, performance, and stability. The optimal spray pattern will vary widely, depending on the target application of the product. Spray pattern is largely affected by valve and spray nozzle design and can also be influenced by propellant and formula composition. It is important to ensure that the spray characteristics of every product are suitable for achieving the intended function of the product. Liquids with differing physical properties (density, viscosity, etc.) will not necessarily yield the same spray pattern when sprayed through the same valve under the same temperature conditions.
- 1.2. The method is designed to demonstrate in quantifiable terms the spray patterns obtained from:
 - 1.2.1. Valves from the same lot, with a given product.
 - 1.2.2. Valves from the same lot, but with different actuators, for a given product.
 - 1.2.3. A series of related products, with valves from the same lot.
 - 1.2.4. A single actuator is sometimes used on all valves, to eliminate any effect of this variable on the results.
 - 1.2.5. The spray patterns of a given product and valve may be compared at different product temperatures.
 - 1.2.6. The spray patterns of a given product and valve may be compared when the dispenser is full, and then at various degrees of emptying
 - 1.2.7. The quality of the spray pattern, plus its uniformity, represent product values to the consumer.

2. APPARATUS

- 2.1. Moisture-sensitive paper for testing water-based aerosol products.
 - 2.1.1. Cobalt chloride and chlorophenol red moisture detection paper supplied by Indigo Instruments are both suitable:
https://www.indigoinstruments.com/test_strips/leak_detection/water-leak-test-detection-paper-33813-Co8.html
https://www.indigoinstruments.com/test_strips/leak_detection/water-leak-indicator-test-sheet-33813-CR8.html
- 2.2. Thermal printing paper for testing alcohol-based and acetone-based products.
 - 2.2.1. Thermal fax paper is recommended because of its relatively large size and commercial availability.
- 2.3. Tan packaging paper (Kraft paper) for testing organic solvent-based products.
- 2.4. Ruler or tape measure
- 2.5. Scissors
- 2.6. Adhesive tape
- 2.7. Latex or Nitrile rubber gloves
- 2.8. Camera (optional)

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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINATION OF SPRAY PATTERN FOR AEROSOL PRODUCTS	

3. PRECAUTIONS

- 3.1. The containers of packaged aerosol products are under pressure and should not be punctured, broken or subjected to temperatures above 120°F (49°C). The fumes and suspension of finely divided product may be irritating and/or flammable. Therefore, the exhausting procedure must be conducted in a well-ventilated area, (e.g., an exhaust hood), away from any source of open flame or spark.

4. TEST SPECIMENS

- 4.1. Recommended Quantity: Six (6)

5. PROCEDURE

5.1. Spray Test

- 5.1.1. Wear gloves when handling the test paper.
- 5.1.2. Tape a section of test paper with minimum dimensions of 8.5 inch x 11 inch (22 cm x 28 cm) onto a flat vertical surface.
- 5.1.3. Equilibrate the test aerosol at 70° ± 1°F (21° ± 0.5°C).
- 5.1.4. Shake the aerosol can for 5-10 seconds.
- 5.1.5. Actuate the valve and spray for one second to clear the dip tube of air.
- 5.1.6. Position the aerosol upon the support stand, facing the target paper at the desired test distance from the actuator face.
- 5.1.7. Holding the can upright, aim the actuator at the center of the test paper and move the can to the proper spray distance from the paper surface. Record the spray distance that is used.
 - 5.1.7.1. The proper spray distance is 8 to 12 inches (20-30 cm) for many products; however, this distance may be different with some products.
- 5.1.8. Depress the actuator for 1 to 3 seconds. For metered valves, one actuation should be conducted.
- 5.1.9. Measure the spray pattern diameter where it is clearly defined with a tape measure or ruler.
 - 5.1.9.1. When the spray pattern is not circular, measure both the height and width.
 - 5.1.9.2. The spray pattern may optionally be photographed with a tape measure or ruler being held in the view for illustration.
- 5.1.10. Note and record the spray pattern. The most common spray patterns are illustrated in Figure 1.
- 5.1.11. Remove the test paper from the vertical surface and set aside.
- 5.1.12. Repeat Steps 5.1.2 through 5.1.11 with all can replicates.

6. ACCEPTANCE CRITERIA

- 6.1. Report results using predetermined criteria established by the Interested Parties as they are product-dependent.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, fume hood, etc.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINATION OF SPRAY PATTERN FOR AEROSOL PRODUCTS	

8. CALCULATIONS

- 8.1. The spray distance that was used for testing is reported.
- 8.2. For circular spray patterns, the spray diameter is reported as the average of the set of diameter measurements.
- 8.3. For non-circular or oblong spray patterns, the height and width are reported as average values.

9. METHOD UNCERTAINTY

- 9.1. The estimated measurement uncertainty with each spray pattern measurement is ± 0.5 inches (± 1.2 cm).

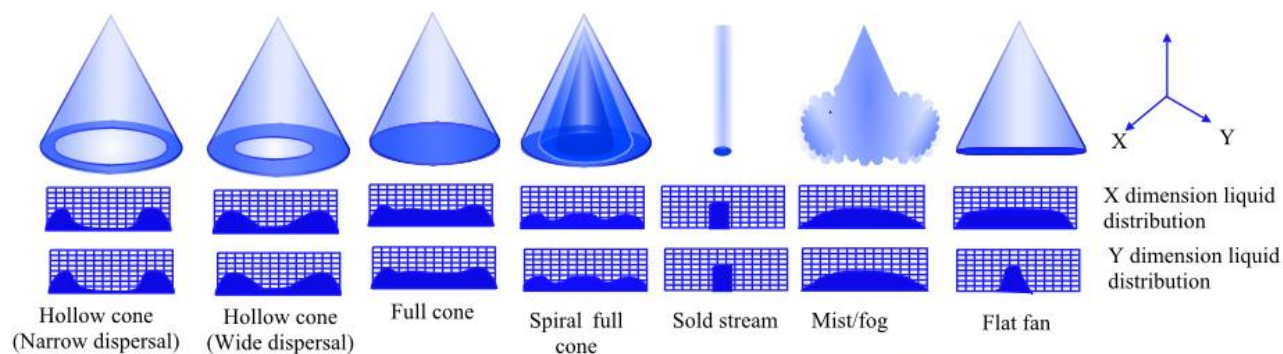
10. REFERENCES

- 10.1. Figure 1 – Spray distribution diagrams of common spray patterns Source:
<http://www.bete.co.uk/resources/engineering-resources/guide-to-spray-properties/2--basic-spray-patterns>

11. OTHER RESOURCES

- 11.1. Not Applicable at this time.

Figure 1.



12. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	23 July 2023	Updating to tenth edition of guide; Added Figure 1.	
1	30 April 2026	Finalization of tenth aerosol guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-7.02	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 5
METHOD CLASSIFICATION: Physical Attributes	TITLE: Method for Determining Particle Size Using Low Angle Laser Light Scattering (LALLS) for Aerosol Products	

1. PURPOSE

- 1.1. This test method covers characterization of the spray particle size of an aerosol product using Low Angle Laser Light Scattering (LALLS). Particle size measurements may be used for establishing performance specifications. The spray particle size of a product can significantly impact its aesthetics, safety, performance, and stability. The optimal particle size will vary widely, depending on the target application of the product. Particle size is affected by a wide range of factors, including exit orifice diameter, insert geometry, can pressure, formula viscosity, type of propellant, and amount of propellant used, as well as the presence or absence of a vapor tap in the aerosol valve. It is important to ensure that the spray characteristics of every product are suitable for achieving the intended function of the product.

2. SUMMARY OF TEST METHOD

- 2.1. A filled can representing final product is sprayed through a laser detector beam for several seconds.
- 2.2. The detector in conjunction with the software measures key characteristics of the spray, including the particle size distribution.
- 2.3. The pertinent particle size aspects are determined for that product, and the results are compared to the requirements for the product.
- 2.4. Discharge rate can be determined per HCPA-7.03 while conducting these tests by measuring the can weight following each actuation.

3. APPARATUS

- 3.1. A Low Angle Laser Light Scattering (LALLS) spray analyzer system such as the Malvern Spraytec, located inside of a room with consistent lighting. This instrument has two sets of lenses available.
 - 3.1.1. 300 mm lens: 0.1 – 900 µm for Dv(50) of 0.5 to 600 µm.
 - 3.1.2. 750 mm lens: 2.0 – 2,000 µm for Dv(50) of 5 to 1,600 µm.
- 3.2. Windows-based computer equipped with operation and analysis software for the LALLS analyzer.
- 3.3. Laboratory ventilation hood with optional product recovery tray. The tray should be inside of the laboratory hood, positioned directly behind the spray target area.
- 3.4. Laboratory balance (for determining discharge rate).

4. TEST SPECIMENS

- 4.1. Recommended Quantity: Three (3)
- 4.2. Filled cans representing final product are used for spray testing.
 - 4.2.1. When establishing specifications, components influencing the spray particle size should be at dimensional tolerance extremes. This might include insert orifice diameter and insert/actuator assembly variables.
- 4.3. The cans must be conditioned at room temperature (23 ± 2°C) for 24 hours prior to testing.
- 4.4. Compressed gas aerosols and LPG aerosols with a vapor tap shall be evaluated for particle size with the can is 100%, 50%, and 25% full by weight. Testing at the 75% level is optional.
- 4.5. To assure plastic components are dimensionally stable, test specimens must be aged 72 hrs. after molding. If assembly is required, test specimens must be tested 24 hrs. after assembly.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: Method for Determining Particle Size Using Low Angle Laser Light Scattering (LALLS) for Aerosol Products	

5. PROCEDURE

- 5.1. Activate the laboratory ventilation hood behind the spray analyzer.
- 5.2. Use a soft cloth, free of any oils, with a small amount of ethyl alcohol to clean the transmitter and receiver lenses of the spray analyzer.
- 5.3. A standardized operating procedure is needed for each individual product to obtain meaningful test results.
 - 5.3.1. Test results are influenced by distance from the laser beam as well as the position of the laser beam within the spray plume.
 - 5.3.2. Specific spray distances that have been established for certain products need to be used for measuring particle size distributions of these products if spraying from the specified distance does not deposit product onto the instrument lenses. Products with narrow spray cones may be sprayed further from the laser beam, while products with wide spray cones will need to be sprayed closer to the beam to avoid contamination of the lens with the sprayed product.
 - 5.3.3. An optimal spray distance range can be determined for a given product by characterizing the spray at a series of different distances.
 - 5.3.3.1. Using a continuous measurement cycle, spray the product through the laser beam for five seconds starting at four inches (10 cm) from the laser beam.
 - 5.3.3.2. Add one inch (2.5 cm) to the spray distance and spray the product through the laser beam for five seconds.
 - 5.3.3.3. Repeat Step 6.3.4.2 until one of the following conditions is met:
 - 5.3.3.3.1. The spray plume begins to wet the transmitter and receiver lens protectors.
 - 5.3.3.3.2. The spray distance reaches 16 inches (40 cm).
 - 5.3.3.4. Analyze the spray data that was collected in Steps 6.3.4.1 through 6.3.4.3. The optimal spray distance range is the range over which the Dv(50) particle size percentile remains relative constant, with changes of less than 10%.
 - 5.3.3.5. If product deposits onto the instrument lenses using the optimal spray distance that was determined in Steps 6.3.4.1 through 6.3.4.4, a shorter spray distance must be used.
 - 5.3.4. The first and last detector channels are often disabled, depending on the nature of the product to minimize erroneous influences of vignetting and beam steering by evaluating the histogram produced with no corrections (raw light scattering).
 - 5.3.4.1. Vignetting is caused by spraying outside the working distance of the focusing lens, and results in detection of wide-angle scattered light from small particles as illustrated in Figure 1. The effects can be minimized by spraying closer to the receiving lens or by disabling the higher channels that are impacted by this phenomenon.
 - 5.3.4.2. Beam steering is caused by evaporation of LPG propellant within the spray cone and can lead to artificial bimodal particle size distributions with artificially high particle size measurements. The influence of beam steering can be determined on a product using the same packaging components, where the can is filled with only propellant, and the propellant without the intermediate is sprayed through the laser beam and characterized. The effects can be minimized by disabling the lower detector channels that are impacted by this phenomenon (Figure 2).
- 5.4. Perform the background correction on the spray analyzer using the associated software. Once an test has been started and the sample identification has been specified, click "OK" and the instrument will collect and make corrections for the background noise and align the detectors. Conduct the verifications below during this process. If these conditions are not met, use a soft cloth with ethyl

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alcohol to clean the transmitter and receiver lenses and then repeat the background collection and detector alignment step.

5.4.1. The Y-axis scale is correct.

5.4.2. The Cumulative Volume % is 0 to 20.

5.4.3. The X-axis and Particle Diameter has no signal above 10% volume.

5.5. If shaking is required for consumer use, vertically shake the can for 8 – 10 seconds, spray the test can outside of the measurement zone for 1 to 2 seconds to clear the dip tube. This is critical for aqueous formulas that will not emulsify within the confined dip tube.

5.6. **Record the weight of the can if discharge rate is being measured.**

5.7. Spray the product through the laser beam from the optimal distance that was determined for the product using a continuous measurement cycle and ensure that the spray is being detected. The spray duration used for measuring discharge rate per HCPA-7.03 may be used, although a longer spray duration is acceptable if discharge rate is not being measured. Use the Particle Size History (.psh) of spray interval to analyze/measure common particle size aspects and produce the Particle Size Data (.psd) report at each can fill level using a continuous measurement cycle at a measurement frequency of 10 kHz. The common measurement aspects are selected in the “Derived Parameters” list on the particle size data (.psd) report. Repeated replicate measurements are made once the analysis cycle has been initiated. Six 10-second actuations will suffice to produce three readings, and **the can weight must be recorded following each actuation if measuring discharge rate.**

5.7.1. Spray volume concentration (Cv)

5.7.2. Particle size percentiles: Dv(10), Dv(50), and Dv(90)

5.7.3. Particle size span

5.7.4. Volume mean diameter D[4,3]

5.7.5. Surface area mean diameter D[3,2]

5.7.6. Volume percentage of particles with sizes below 10 µm %V(<10 µm)

6. A unimodal particle size distribution (bell curve) generally represents aerosol products when proper spraying technique is used. A bimodal distribution could be observed if unusually large particles are sampled because of improper spraying technique, and if such a distribution is observed, the distribution with the larger particles should be excluded from the analysis. This is done by removing/disabling the channel detectors that measure the larger particles using the Spraytec software, these will be the first detectors when editing the settings used to do the calculations for the analysis.

7. CALCULATIONS

7.1. Store the measurement results from Step 6.6 in a spreadsheet such as Microsoft Excel and use the software to calculate the average and standard deviation of each set of measurements.

7.2. Calculate discharge rate following HCPA-7.03, if applicable.

8. ACCEPTANCE CRITERIA

8.1. Report results which are product-dependent and should be established by the Interested Parties.

8.1.1. Aerosol spray particles of very low diameter, less than 10 µm, at greater than 1% of volume of the sample measured, are potential inhalation hazards, Interested Parties shall determine acceptability.

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8.1.2. Larger particles [Dv(50) > 100 µm] may be too large and heavy to remain suspended in air before falling to the floor, which presents a potential slip/fall hazard.

8.2. In compressed gas aerosols, particle size increases as the product is used up due to internal can pressure reduction.

9. METHOD UNCERTAINTY

9.1. LALLS measurements have been demonstrated to have a maximum uncertainty of $\pm 1\%$ on the Dv(50) values for NIST-traceable latex standards, with a repeatability of $\pm 1\%$ coefficient of variation (COV) on these standards.

10. SAFETY

- 10.1. Safety glasses must be worn during spray testing due to the possibility of inserts being projected.
- 10.2. Appropriate gloves must be worn during spraying to protect against sustained contact with product.
- 10.3. Delivered product must be disposed of in accordance with specified waste disposal procedures.

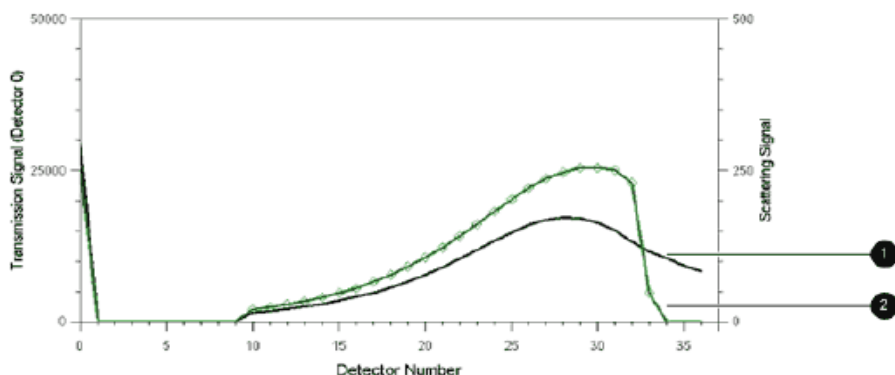
11. REFERENCES

- 11.1. Rawle, A., 2000, Basic Principles of Particle Size Analysis, Malvern Instruments Ltd., Worcestershire, England.
- 11.2. Spraytec User Manual, MAN0368 Issue 2.0 May 2006, Malvern Instruments Ltd., Worcestershire, England.

12. OTHER RESOURCES

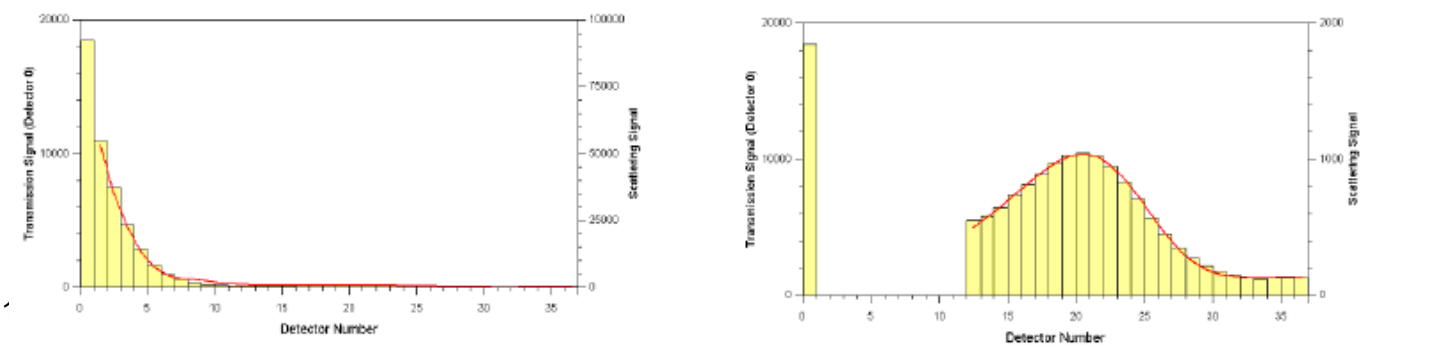
- 12.1. Not Applicable at this time.

Figure 1: Curve 1 shows the measurement made within the working range, while Curve 2 shows the measurement outside of the working range where data is absent from the last five detectors as a result of vignetting.



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Figure 2: The effects of beam steering can be seen with raw light scattering, where artificially high particle size measurements develop in the test results (left) and can produce bimodal particle size distributions. Beam steering effects can be removed from the results by disabling the affected lower detector channels (right).



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0	23 July 2023	New for Tenth Edition.	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-7.03	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINING DELIVERY RATE OF AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. This method covers the determination of delivery rate of aerosol products. This procedure will determine the amount of product being released over a certain timeframe. This procedure can be used to correlate product release rate with internal can pressure. The results of this test can be used to identify proper actuator orifice size for releasing product at the desired rate.

2. SIGNIFICANCE

- 2.1. This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety issues associated with its use. It is the responsibility of any person intending to use this standard to first consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations.
- 2.2. The delivery rate of an aerosol dispenser is determined by measuring the quantity of material expelled through the valve in a given time. The exact duration of discharge and the temperature of the dispenser must be carefully controlled for good reproducibility.
- 2.3. Biological and clinical tests are often made with one or two dispensers selected from a group that is similar in all respects, with the exception of delivery rate. When it is desirable to select dispensers with equal delivery rates, three tests should be performed on each dispenser.
- 2.4. In the case of storage tests, a single delivery rate test is often performed on one or more dispensers at each examination period, to conserve the contents and extend the life of the dispenser.
- 2.5. Such tests should not be performed on cans being evaluated for weight loss during storage.
- 2.6. Initial delivery rates may be slightly higher than later ones, since the product may contain entrapped air, and valve elastomers may not have had a chance to swell or shrink to their equilibrium dimensions. The effect of air is particularly important for dispensers using vapor-tap valves.
- 2.7. Unless otherwise stipulated, the delivery rate of an aerosol is presumed to mean its initial delivery rate, after clearing product or gas from the dip tube, and with the dispenser shaken or non-shaken per the label, and in the normal position for use.
- 2.8. Delivery rate affects objective test results such as flame projection and flashback distances and therefore, in many cases, impacts product labeling. Delivery rate also influences subjective test results as perceptions of relative "wetness" and "forcefulness" of spray.

3. APPARATUS

- 3.1. Vented laboratory hood appropriate for sustained spraying of aerosol products.
- 3.2. Controlled-temperature water bath.
- 3.3. Laboratory balance.
 - 3.3.1. A precision of 0.001 grams is required for testing products with metered-dose valves.
 - 3.3.2. A precision of 0.01 grams is adequate for testing products with continuous spray valves.
- 3.4. Pressure gauge fitted with an inlet adaptor suitable for measuring aerosol can pressure through the valve stem.
- 3.5. Timer or stopwatch.
- 3.6. Dry cloths.

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4. PRECAUTIONS

- 4.1. The containers of packaged aerosol products are under pressure and should not be punctured, broken, or subjected to temperatures above 120°F (49°C). The fumes and suspension of finely divided product may be irritating and/or flammable. Therefore, the exhausting procedure must be conducted in a well-ventilated area, (e.g., an exhaust hood), away from any source of open flame or spark.

5. TEST SPECIMENS

- 5.1. Recommended Quantity: Six (6)

6. PROCEDURE

- 6.1. Condition products at 70°F (21.1°C) for a minimum of 24 hours before testing.

6.2. Compressed gas (CGA)

- 6.2.1. Prior to the evacuation of any contents, wipe the unit with a clean, dry cloth to remove any exterior residue.
- 6.2.2. Actuate the valve and spray for one second to clear the dip tube of air.
- 6.2.3. Record the initial weight and pressure of the full aerosol container.
- 6.2.4. Hold aerosol at the normal use position, actuate for five seconds, and remove any residual product at the spray nozzle with a dry cloth. Record the actual spray time (T)
- 6.2.5. Record the can weight before spraying (W_{bs}).
- 6.2.6. The can pressure may optionally be measured if this is feasible and beneficial. If measuring the pressure, the weight must be remeasured following the pressure measurement to account for any product lost during the pressure measurement.
- 6.2.7. Hold aerosol at the normal use position, actuate for five seconds, and remove any residual product at the spray nozzle with a dry cloth. Record the actual spray time (T)
- 6.2.8. Record the can weight after spraying (W_{as}).
- 6.2.9. Repeat Steps 6.1.8 and 6.1.9 at least twice, resulting in a minimum of three five-second sprays.
- 6.2.10. Repeat Steps 6.1.1 through 6.1.10 with the can 75% full, 50% full, and 25% full by weight.
Testing is complete once sputtering begins to occur.

6.3. Liquefied petroleum gas (LPG)

- 6.3.1. Prior to evacuation of any contents, wipe the unit with a clean, dry cloth to remove any exterior residue.
- 6.3.2. Prime the valve before taking initial weight measurements.
- 6.3.3. For continuous spray valves, actuate the valve and spray for one second, then wipe any residual product from the spray nozzle.
- 6.3.4. For metered dose valves, actuate the valve five times, then wipe any residual product from the spray nozzle.
- 6.3.5. Record the weight before spraying (W_{bs}).

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6.3.6. The can pressure may optionally be measured if this is feasible and beneficial. If measuring the pressure, the weight must be remeasured following the pressure measurement to account for any product lost during the pressure measurement.

6.3.7. If shaking is required for consumer use, vertically shake the can for 5 to 10 seconds.

6.3.8. Hold the aerosol at the normal use position and actuate as described below.

6.3.9. When evaluating single-use products that are intended to be sprayed until empty during the first use, record the amount of time required (T) to spray the product until it is empty, remove any residual product at the spray nozzle using a dry cloth, record the empty can weight, and proceed to Step 6.

6.3.10. When evaluating miniature aerosols with a can volume below 100 ml, spray for three seconds (with a continuous-spray valve) or actuate six times (with a metered valve) and remove any residual product at the spray nozzle and valve cup using a dry cloth. Record the actual spray time (T) after ensuring the valve and nozzle are completely dry.

6.3.11. When evaluating standard aerosols with a can volume of 100 ml or higher, the spray time is dependent on the formula type.

6.3.12. For aqueous formulas and products utilizing vapor tap valves, spray for five seconds (with a continuous spray valve) or actuate ten times (with a metered valve). Dry the valve and nozzle using a clean cloth.

6.3.13. For organic solvent-based formulas, spray for ten seconds (with a continuous spray valve) or actuate ten times (with a metered valve). Dry the valve and nozzle using a clean cloth.

6.3.14. Remove any residual products at the spray nozzle using a dry cloth and record the actual spray time (T).

6.3.15. Record the weight of the container after spraying (W_{as}).

6.3.16. Equilibrate the can at 75 to 79°F (24 to 26°C) using a water bath for a minimum of 30 minutes.

6.3.17. Repeat Steps 6.2.7 through 6.2.16 twice, resulting in a total of three sprays (or sets of sprays for metered dose valves) followed by weight measurements.

6.3.18. For LPG products utilizing vapor tap valves, repeat Steps 6.2.5 through 6.2.17 with the can 75% full, 50% full, and 25% full by weight. Testing is complete once sputtering is observed.

7. CALCULATIONS

7.1. Determine Discharge Rate (DR) at all specified time intervals:

$$DR_T = \frac{(W_{bs} - W_{as})}{T}$$

Where: DR_T = Discharge rate in grams per second

W_{bs} = Weight before spray in grams

W_{as} = Weight after spray in grams

T = Spray time in seconds

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8. ACCEPTANCE CRITERIA

8.1. Report results using predetermined criteria established by the Interested Parties.

9. SAFETY

9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

10. REFERENCES

10.1. HCPA-4.16 Method for Compressed Gas Pressure Loss for Aerosol Products in Plastic Containers.

10.2. HCPA-4.17 Method for Compressed Gas Pressure Loss (Alternative Method) for Aerosol Products in Plastic Containers.

10.3. HCPA-7.06 Method for Determination of Pressure Drop Rate of Compressed Gas Aerosol Products.

11. OTHER RESOURCES

11.1. Not Applicable at this time.

12. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	23 July 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			

EDITION: 10 METHOD NO: HCPA-7.04	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: System Validation	TITLE: STANDARD METHOD FOR RAPID PRESSURE DETERMINATION OF AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. The purpose of this method is to describe the process for rapid pressure determination for aerosol products.
- 1.2. Pressure is a fundamental property of all aerosols and pressure limitations are the subject of both domestic and international aerosol regulations.
- 1.3. Incorrect pressure can mean that the aerosol product was formulated incorrectly, or that the vacuum crimping operation (used for some filling programs) had gone out of control.
- 1.4. This method provides a rapid assessment of pressure for purposes of formula development or quality control, where speed is important and extreme accuracy is not a requirement. If greater accuracy is required, test in accordance with D3074.

2. APPARATUS

- 2.1. Pressure Gauge, preferably stainless steel construction, with brass as an acceptable alternative. The range should be from 0 - 200 psi (1.4 Mpa). See Figure 1.
- 2.2. Needle Valve Connector, comprising a stainless steel, 1/8 in. SPT-M Hoke or similar valve, with a toggle action or alternately rotary action shut-off, and connected to the typically 1/4" SPT-M connection of the gauge by a reducing coupling.
- 2.3. Adapter, with 1/8 in. SPT-F for attachment to the Hoke valve. Several models are available, to fit either inside or outside the stem of the aerosol valve, or with a hollow tube to fit against the seat of female valves (See ASTM D3063 for examples of adaptors).
- 2.4. Gauges of smaller ranges should be used for most 70°F (21°C), 77°F (25°C) and other ambient temperature readings, such as 0 - 100 psi-gauge (0 - 7 kg/cm² - gauge). Ideally, the aerosol pressure should lie within 30 to 70% of the range of the gauge. Gauges having diameters of 2.5 in (64 mm) to 3.5 in (89 mm) are normally used, and the smaller size is preferred for smaller aerosol dispensers.
- 2.5. Take care that there are no leaks in the assembled apparatus. This can be checked by occasionally making a measurement with the assembly under water.
- 2.6. Care should be taken to clean the gauge daily by injection and venting of an approved cleaning solution containing a bacteriostat. After cleaning, rinse the gauge and apparatus with clean water and purge them with the pre-pressurizing gas before use.
- 2.7. For non-food products, the gauge apparatus may be cleaned between product uses by forcing suitable solvents into the gauge, then venting it. This should be repeated several times until the gauge is free of contamination.
 - 2.7.1. When changing from chlorinated solvents to water-base products, and vice-versa, the above is particularly important to avoid possible contamination.
- 2.8. Use a separate gauge for food products only.
- 2.9. Water Bath, constant temperature, accurate to at least ±1°F (±0.5°C).
 - 2.9.1. Thermometer, for water bath. Range 0° - 230°F (-20° - 110°C).
- 2.10. A suitable standard check, accurate to ±0.5 psi (3.4 kPa or 0.04 kg/cm²) should be set up in the laboratory for quick calibration of the test gauge.

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- 2.11. Gauges in constant use should be checked approximately one each week, or at any time after the gauge has been subjected to mechanical shock, such as dropping or over-pressurization.
- 2.12. "Dead-Weight (Mass) Tester" may be used if available. Inspector's Gauges used only for reference work may be employed as secondary standards.
- 2.13. Attempts to develop a precision and bias statement have not been successful. For this reason, data on precision and bias cannot be given.

3. PRECAUTIONS

- 3.1. This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety issues associated with its use. It is the responsibility of any person intending to use this standard to first consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations.

4. TEST SPECIMENS

- 4.1. Normal production or laboratory samples shall be used for this test.

5. PROCEDURE

- 5.1. Immerse the test can in the constant-temperature water bath. The immersion time required depends on the initial can temperature. If the can temperature is roughly within $\pm 10^{\circ}\text{F}$ ($\pm 5.5^{\circ}\text{C}$) of the bath temperature, immerse the can for 15 min, agitating it every 5 min., unless the bath is equipped with an agitator.
 - 5.1.1. For water-based products having higher specific heats, for viscous products of low heat transfer coefficients, for products in larger cans (over 12 fl.oz./355 mL), or for cans varying widely in initial temperature, immerse for at least 45 to 60 min.
- 5.2. Pre-pressurize the gauge assembly as nearly as possible to the anticipated can pressure. Reagents that can be used are:
 - 5.2.1. For non-food products:
 - 5.2.1.1. Carbon Dioxide (CO_2)
 - 5.2.1.2. Compressed Air
 - 5.2.1.3. Nitrogen (N_2)
 - 5.2.1.4. Hydrocarbon Propellant Blend – typically "HAP A-70" (40% propane and 60% isobutane) to "HAP A-108" (propane)
 - 5.2.1.5. Dimethyl Ether $[(\text{CH}_3)_2\text{O}]$
 - 5.2.1.6. These propellants described in the previous two paragraphs are most commonly available and most easily used, but should be limited to products already containing hydrocarbon or dimethyl ether propellants, respectively.
 - 5.2.2. For food products:
 - 5.2.2.1. Carbon Dioxide (CO_2)
 - 5.2.2.2. Nitrogen (N_2)

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- 5.2.2.3. Nitrous Oxide (N₂O)
- 5.2.2.4. Hydrocarbon Propellant Blend (see 5.2.1.4) for products that contain hydrocarbon as a propellant.
- 5.2.2.5. Nitrogen (N₂)
- 5.2.2.6. Compressed air must not be used, due to its oxygen, water, and bacterial content. Dimethyl ether cannot be used since it is not approved for food products.

5.3. While keeping the test can in the water bath, but turning it upright if necessary, agitate it briefly, attach the assembly to the valve, press the valve open, and open the Hoke valve.

- 5.3.1. Care should be taken not to "over-handle" the cans with bare hands after the cans have reached constant temperature, since the pressure is a function of the can temperature. Similarly, no prior removal of can contents should be done if initial can pressure is being determined. This is especially important in the case of vapor-tap dispensers.

5.4. Record the pressure and the exact bath temperate.

5.5. Close the Hoke valve and remove the assembly.

5.6. Optionally, repeat 5.1 through 5.5 twice again, and average the three results.

5.7. After pressures are taken on sterile food, sterile drug, or sterile drug device aerosols, the dispenser contents may no longer be sterile, and the tested units should be discarded.

6. ACCEPTANCE CRITERIA

6.1. Report results using predetermined criteria established by the Interested Parties.

6.2. The report shall include the following:

- 6.2.1. The complete identification of the product being tested (lot number, etc.).
- 6.2.2. The exact water bath temperature.
- 6.2.3. The pressure.
- 6.2.4. Where the optional three readings are taken, the individual readings and the average of the three readings.

7. SAFETY

7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

8. REFERENCES

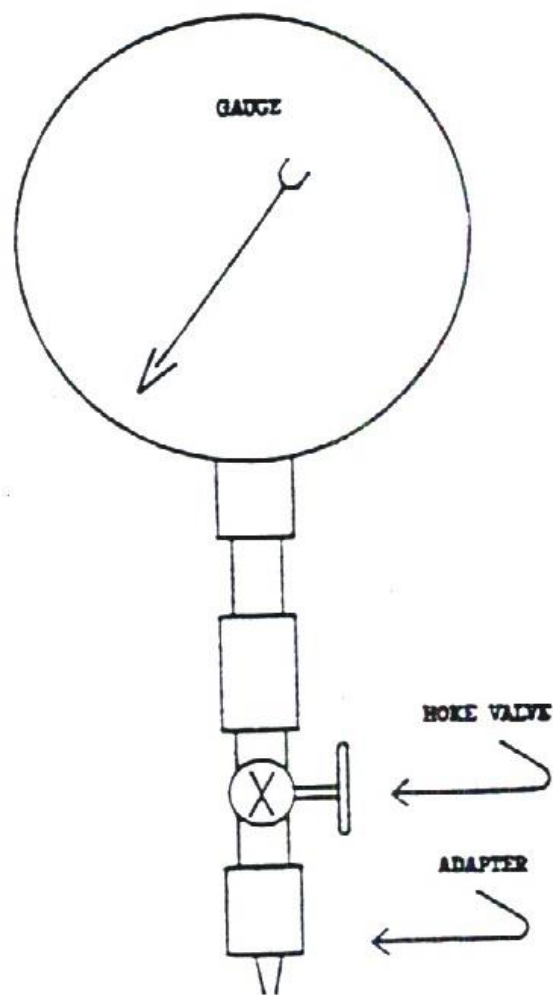
8.1. ASTM Standards

- 8.1.1. D3060 Test Method for Pressure drop Rate of Compressed Gas-Propelled Products
- 8.1.2. D3074 Test Methods for Pressure in Metal Aerosol Containers
- 8.1.3. D3063 Test Method for Pressure Determination in Glass Aerosol Containers
- 8.1.4. E1 Specification for ASTM Thermometers

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9. OTHER RESOURCES

Figure 1: Pressure Gauge and Assembly for Pre-Pressurization



10. REVISIONS

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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
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EDITION: 10 METHOD NO: HCPA-7.05	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: System Validation	TITLE: ALTERNATE METHOD FOR RAPID PRESSURE DETERMINATION OF AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. The purpose of this method is to describe an alternate process for rapid pressure determination for aerosol products.
- 1.2. This method rapidly checks aerosol pressures, which are a fundamental property of all aerosols, a measure of quality assurance, and a subject of both domestic and international aerosol regulations.

2. APPARATUS

- 2.1. Pressure Gauge and Assembly (see Figure 1), consisting of a small pressure gauge with a range from 0 to 100 psi-g (0 to 7 kg/cm²) for room temperature readings, a 1/8" NPT-M Hoke toggle valve, and adapter, and any required brass fittings.
 - 2.1.1. For aerosols tested typically at 130°F (54.4°C) and for those which contain high pressure gas propellants, a gauge of 0 to 200 psi-g (0 to 14 kg/cm²) range is suggested.
 - 2.1.2. A variety of adapters are made, depending upon the design of the valve. Some are illustrated in other pressure-taking methods in this guide.
- 2.2. Constant Temperature Bath, of sufficient size for complete immersion of the number of cans to be tested. Accuracy should be ±0.5°F (±0.3°C). An agitation mechanism should be provided, or else an auxiliary stirrer must be utilized to equilibrate bath temperatures.
- 2.3. Thermometer, for constant temperature bath. Typically, 0 to 230°F (-20° to 110°C).
- 2.4. Attempts to develop a precision and bias statement have not been successful. For this reason, data on precision and bias cannot be given.

3. PRECAUTIONS

- 3.1. This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety issues associated with its use. It is the responsibility of any person intending to use this standard to first consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations.

4. TEST SPECIMENS

- 4.1. Normal production or laboratory samples shall be used for this test.

5. PROCEDURE

- 5.1. Assemble the apparatus of 4.1 and check by pre-pressurization to assure that it does not leak.
- 5.2. Equilibrate test cans, preferably for 1 hour with intermittent brief shakings.
- 5.3. Pre-pressurize the gauge assembly to about 5 psi (0.35 kg/cm²) higher than the expected test can pressure. Reagents that can be used are:
 - 5.3.1. For non-food products:
 - 5.3.1.1. Carbon Dioxide (CO₂)
 - 5.3.1.2. Compressed Air
 - 5.3.1.3. Nitrogen (N₂)

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5.3.1.4. Hydrocarbon Propellant Blend – typically “HAP A-70” (40% propane and 60% isobutane) to “HAP A-108” (propane)

5.3.1.5. Dimethyl Ether [(CH)₂O]

5.3.1.6. These propellants described in the previous two paragraphs are most commonly available and most easily used, but should be limited to products already containing hydrocarbon or dimethyl ether propellants, respectively.

5.3.2. For food products:

5.3.2.1. Carbon Dioxide (CO₂)

5.3.2.2. Nitrogen (N₂)

5.3.2.3. Nitrous Oxide (N₂O)

5.3.2.4. Hydrocarbon Propellant Blend (see 5.2.1.4) for products that contain hydrocarbon as a propellant.

5.3.2.5. Nitrogen (N₂)

5.3.2.6. Compressed air must not be used, due to its oxygen, water, and bacterial content. Dimethyl ether cannot be used since it is not approved for food products.

5.4. Hold the test can vertical, but still in the bath, determine the pressure and record the value.

5.5. Re-pressurize the gauge assembly to the pressure of 5.3 and repeat 5.4.

5.6. Repeat steps 5.4 and 5.5.

5.7. Repeat steps 5.3 through 5.6 for additional can samples as required.

5.8. If the second reading (5.7) reproduces the first reading (5.4), that reading may be considered as the container pressure.

5.9. If the second reading is higher than the first, indicating that the gauge assembly is pre-pressurized to a higher pressure than the can, a brief calculation is necessary, as indicated by this example:

5.9.1. Assume the can has an initial pressure of 50 psi-g (3.5 kg/cm²) and the gauge assembly is pre-pressurized to 55 psi-g (3.85 kg /cm²). Assume 20% of the pressure differential passes from the gauge assembly into the can at each pressure check. Values will then be:

$$50 + 20\% \text{ of } (55-50) = 50 + 1.0 = 51.0$$

$$51 + 20\% \text{ of } (55-51) = 51 + 0.8 = 51.8$$

$$51.8 + 20\% \text{ of } (55 - 51.8) = 51.8 + 0.64 = 52.4$$

Working backward from the three pressure determinations, the initial pressure can be deduced as 50.0 psi-g (3.5 kg/ cm²). The progression would be:

0th Pressure: 50.0

1st Pressure: 51.0 (1.0 psi higher than before)*

2nd Pressure: 51.8 (0.8 psi higher than before)**

3rd Pressure: 52.4 (0.6 psi higher than before)**

* Extrapolated value

** Actual values

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- 5.10. If the second reading is lower than the first, indicating that the gauge assembly is pre-pressurized to a lower pressure than the can, a similar calculation can be used to establish the "0th" pressure, i.e., the initial actual can pressure.
- 5.11. In general, 5.8 will apply and 5.9 or 5.10 need not be considered. If accuracy to the nearest ± 1.0 psi (± 0.07 kg /cm²) is sufficient, 5.8 will nearly always prevail.
- 5.12. Dispensers favoring the approach of 5.8 include those with no vapor-taps, those that have been vacuum crimped, those with relatively large head spaces, and relatively large amounts of propellant.

6. ACCEPTANCE CRITERIA

- 6.1. Report results using predetermined criteria established by the Interested Parties.
- 6.2. The report shall contain the following:
 - 6.2.1. The full identification of the test samples; e.g. lot number, product name, etc.
 - 6.2.2. The three pressures for each can, at the stipulated temperature.
 - 6.2.3. The calculated "0th" pressure for each can, if required.

7. SAFETY

- 7.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

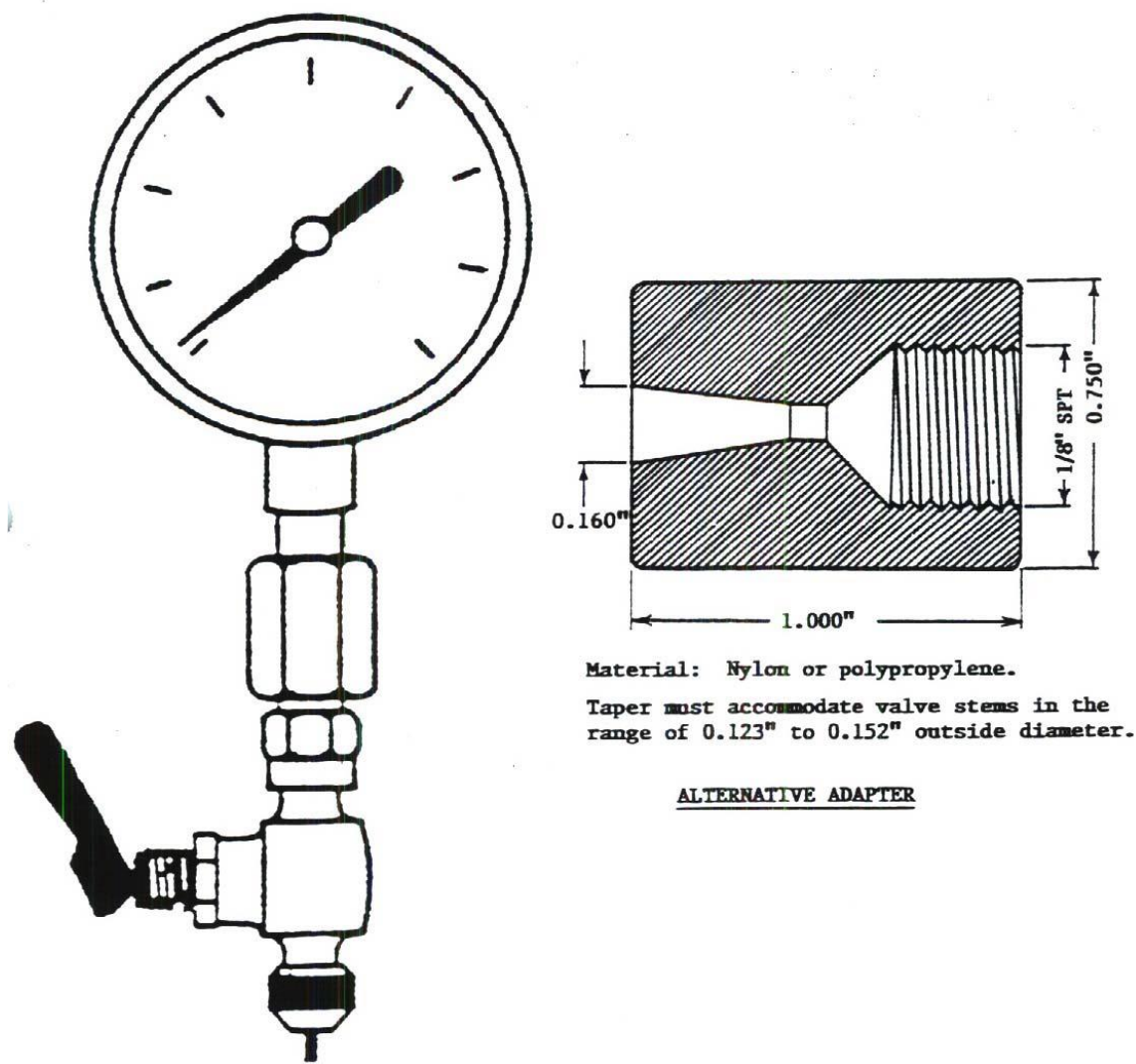
8. REFERENCES

- 8.1. ASTM Standards
 - 8.1.1. D3060 Test Method for Pressure drop Rate of Compressed Gas-Propelled Products
 - 8.1.2. D3074 Test Methods for Pressure in Metal Aerosol Containers
 - 8.1.3. D3063 Test Method for Pressure Determination in Glass Aerosol Containers
- 8.2. M. A. Johnsen, The Aerosol Handbook (Second Edition) (1982). Wayne E. Dorland, Inc. (Mendham, NJ).

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9. OTHER RESOURCES

Figure 1: Pre-Pressurized Gauge Assembly



10. REVISIONS

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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
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EDITION: 10 METHOD NO: HCPA-7.06	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 3
METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINATION OF PRESSURE DROP RATE OF COMPRESSED GAS AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. This test method covers the determination of the pressure drop rate of compressed gas propelled aerosol products. Compressed gases are typically carbon dioxide (CO₂), nitrous oxide (N₂O), nitrogen (N₂) and compressed air (CAIR).

2. SIGNIFICANCE

- 2.1. This method is applicable to products packaged in pre-pressurized containers, and is both rapid and reproducible.
- 2.2. Actual usage dispensing conditions are simulated in the test.
- 2.3. The method is such that any slight variance in valves and actuators is overcome, and the final equilibrium pressure in the container is correlated to the amount of product dispensed.

3. APPARATUS

- 3.1. Vented laboratory hood appropriate for sustained spraying of aerosol products.
- 3.2. Controlled-temperature chambers or laboratory, as applicable to product.
- 3.3. Laboratory balance.
 - 3.3.1. A precision of 0.01 grams is adequate for testing products with continuous spray valves.
- 3.4. Pressure gauge fitted with an inlet adaptor suitable for measuring aerosol can pressure through the valve stem.
- 3.5. Timer or stopwatch.
- 3.6. Dry cloths.

4. PRECAUTIONS

- 4.1. The containers of packaged aerosol products are under pressure and should not be punctured, broken, or subjected to temperatures above 120°F (49°C). The fumes and suspension of finely divided product may be irritating and/or flammable. Therefore, the exhausting procedure must be conducted in a well-ventilated area, (e.g., an exhaust hood), away from any source of open flame or spark.

5. TEST SPECIMENS

- 5.1. Recommended Quantity: Six (6)

6. PROCEDURE

- 6.1. Condition products normally refrigerated at 40°F (4.4°C) for at least 24 hours before testing.
- 6.2. Condition non-refrigerated products at 70°F (21.1°C) for a minimum of 24 hours before testing.
- 6.3. Prior to the evacuation of any contents, wipe the unit with a clean, dry cloth to remove any exterior residue.
- 6.4. Actuate the valve and spray for one second to clear the dip tube of air.
- 6.5. Mass Determination. Weigh a replicate of six filled containers, and record the mass in grams.
- 6.6. Pressure Determination:

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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINATION OF PRESSURE DROP RATE OF COMPRESSED GAS AEROSOL PRODUCTS	

6.6.1. Using the pre-pressurized gauge, check the equilibrium pressure in the container to minimize product or pressure loss.

6.6.2. For products that require shaking, as indicated in the directions on the label, shake as follows:

6.6.3. Grasp the container in an upright position, and move the arm downward in an arc. As the arm moves downward, invert the container. Exert enough force in the motion to throw the product to the top end of the container. Then bring the container back to the starting position.

6.6.4. Repeat 6.9 for a total of ten times, pausing for a few seconds between cycles.

6.6.5. Do not agitate products that are dispensed without shaking, before determining the equilibrium pressure.

6.7. Dispensing:

6.7.1. If required, shake the container in accordance with 6.9 and 6.10 and record the pressure before each dispensing.

6.7.2. Holding the container in the proper position, dispense a weighed amount at 5-minute intervals.

6.7.3. Regulate the rate of dispensing so that the product is expelled in a given number of dispensings (more-or-less). See Table 1 for the suggested number of dispensings by can size and product type.

6.7.4. Record the mass in grams of the product dispensed after each dispensing.

6.7.5. Stop dispensing when the first gas discharge is observed. Weigh the container and record the final equilibrium pressure.

6.8. Maximum Delivery:

6.8.1. Hold the container, without dispensing, in the dispensing position (inverted for invert style valves and upright for dip tube valves) for a 2-min period.

Note: Do not shake the container after standing.

6.8.2. Dispense the product until the gas supply is exhausted; then weigh the container.

6.9. Tare Mass:

6.9.1. To obtain the tare mass, cut open the container, wash and dry it. Heat for 10 minutes at 220°F (105°C) to drive off interstitial moisture. Allow to cool, then weigh the container and record the mass in grams, as the tare mass.

7. CALCULATIONS

7.1. Tabulate the mass of the product in grams versus the equilibrium pressure in the container.

7.2. Derive a pressure drop graph by plotting the mass of the product in grams on the abscissa and the equilibrium pressure on the axis of ordinates.

8. ACCEPTANCE CRITERIA

8.1. Report results using predetermined criteria established by the Interested Parties.

9. SAFETY

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9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

10. REFERENCES

- 10.1. HCPA-4.16 Method for Compressed Gas Pressure Loss for Aerosol Products in Plastic Containers.
- 10.2. HCPA-4.17 Method for Compressed Gas Pressure Loss (Alternative Method) for Aerosol Products in Plastic Containers.
- 10.3. HCPA-7.03 Method for Determining Delivery Rate of Aerosol Products.

11. OTHER RESOURCES

- 11.1. Not Applicable at this time.

Table 1. Suggested number of dispensings by can size and product type

Container Size	Total Capacity		Suggested Dispensings		
	Fl.oz.	mL	Foam	Stream	Spray
202 x 214	4.9	145	2	3	3
202 x 314	6.4	89	3	4	4
202 x 409	7.7	228	4	5	5
202 x 509	9.8	290	5	6	6
205 x 508	11.4	337	6	7	7
211 x 413	13.7	405	6	9	9
211 x 510	15.9	470	8	10	10
211 x 604	17.8	526	10	12	12
211 x 713	22.3	657	12	14	14

12. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	11 August 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
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EDITION: 10 METHOD NO: HCPA-7.07	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 5
METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINATION OF SEEPAGE RATE OF AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. This method is used to determine short-term weight loss of aerosol products through the valve and/or between valve and container.

2. SIGNIFICANCE

- 2.1. The usual procedure for determining weight loss (seepage rate) is to determine the reduction in weight over a fixed time and extrapolate this to an annual rate. This process measures only the total loss, from all seepage locations, and involves marking test cans, accurate weighings and subtractions of final from initial weight to obtain the desired results.
- 2.2. By the seepage rate method, the collection of permeated gas is done in either a special eudiometer tube, or simply a glass or plastic vial, and the amount of gas collected in a given time can be related to annual weight loss from either the valve stem gasket seal, the valve crimp/clinch seal, or both.
- 2.3. It is sometimes useful to determine the seepage rate (usually very low) for tinplate can seams. This can be done by a subtraction of the valve seepage rate from the total dispenser rate, obtained by weight loss, for the same period.
- 2.4. The seepage test can be readily applied to 100 to 1000 dispensers at a time, and thus used to single out those with the greatest seepage rate for special study.

3. APPARATUS

- 3.1. Constant Temperature Bath, used if measurements of seepage rate are required at other than ambient temperatures (rarely required). The tank should be of sufficient size to accommodate the required number of dispensers in an upright position, so that each unit is surrounded by about 0.5 in. (12.7 mm) of circulating water at the desired temperature.
- 3.2. Eudiometer Tubes for the collection of seepage gases, and consisting of glass or clear plastic tubes or vials, which may be graduated in mL. See Figure 1.
- 3.3. For stem gasket seepage studies, short, fat test tubes have been used, with graduations in mL inscribed on the glass with a triangular file. The barrel of polypropylene disposable syringes in the 10 and 20 mL size may also be used, provided the offset Luer-tips are sealed or plugged. Vials of polycarbonate or polypropylene are most commonly used for measurements of combined valve stem gasket and crimp or clinch seal seepage.
- 3.4. Gas Measuring Syringe, for determining the volume of trapped gases. Typically a 2 mL capacity syringe, with polypropylene barrel and rigid polyethylene plunger, fitted with a centered Luer-fitting hub, to which a stainless steel needle in a polypropylene connector is attached. The end of the needle is custom square-cut, such as by the use of a rotary abrasive disc.

4. PRECAUTIONS

- 4.1. The containers of packaged aerosol products are under pressure and should not be punctured, broken, or subjected to temperatures above 120°F (49°C) and away from any source of open flame or spark.

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5. TEST SPECIMENS

5.1. Recommended Quantity: Six (6)

6. PROCEDURE

- 6.1. Prepare test samples by the use of production equipment if possible, assuring that crimp or clinch dimensions are in agreement with interested party's specifications or industry standards.
- 6.2. New units should be pre-tested for leakage by heating them to 130°F (54.4°C) in a water bath and checking for appearance of gas bubbles. Leaking units should be noted and disqualified from further leak testing.
- 6.3. Fill bath or laboratory sink basin with tap water and allow to stand for 30 minutes for de-aeration. Wipe off any air bubbles from surfaces.
- 6.4. Submerge cans in water, holding them down if necessary, and give each one a hard knock to dislodge any air bubbles. Inspect for any remaining bubbles and remove them with fingers or a small brush.
- 6.5. Submerge eudiometer tube or vial in the water, assuring that no bubbles are attached.
- 6.6. Place eudiometer tube or vial over the valve and re-check for the absence of air bubbles.
- 6.7. Optionally, turn the dispenser upright and carefully remove from the water, setting it on a laboratory bench top. No air should enter the tube or vial during this process.
- 6.8. Permit the dispenser to remain for at least 48 hours (preferably 72 to 96 hours if time and space permit), then inspect for gas in the tube or vial.
- 6.9. The eudiometer tube or vial may be tapped lightly, with a pencil for example, to free isolated bubbles of gas and cause them to join in one larger bubble.
- 6.10. Record the size of the gas bubble and the aging time for each can tested.

Note: If a more precise measurement of the amount of gas is desired, transfer the dispenser back to the bath or sink full of water and carefully disengage the eudiometer tube or vial. With the syringe and needle described in section 3.4, suck the entrapped gas bubble into the syringe. Holding the syringe more or less vertically, with the needle pointing downward, pull back the plunger until it matches a major graduation, such as 2.00 mL. Read the meniscal level of the bottom of the bubble, and from this calculate the exact volume.

7. CALCULATIONS

- 7.1. The volume of gas collected in the eudiometer tube or vial must be corrected to allow for water solubility.
- 7.2. Solubilities differ with the composition of the escaped gas mixture. For pure gases, see Table 1.
- 7.3. Example: If a 5.0 mL eudiometer tube shows a collection of 1.0 mL of carbon dioxide gas in 72 hours, this is the equivalent of 1.8 mg at 77°F (25°C). However, the 5 mL of water had to become saturated with carbon dioxide gas before a bubble could form. This amount would be 4.1 mL, or 7.25 mg. Adding the weights, it is apparent that 9.05 mg of carbon dioxide escaped, indicating a weight loss of 1.10g of carbon dioxide per year.

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7.4. Example: If in the previous example the test period had been only 48 hours, only 6.03 mg of carbon dioxide would have escaped, and the water would have been only 83.2% saturated with the gas. No bubble would have appeared. This demonstrates the importance of minimizing the volume of the eudiometer tube or vial, and maximizing the storage time.

7.4.1. Note: The gas volumes of several propellants are known at 77°F (25°C) and sea-level (760 mm). For example: Carbon dioxide and nitrous oxide: 549 mL, propane: 540 mL, n-butane and isobutane: 414 mL, and HFC-152a: 363 mL per g.

7.4.2. Note: The high solubility of dimethyl ether (DME) precludes this propellant from producing gas bubbles unless extremely fast seepage is taking place. The gas bubbles often found for products where the sole propellant is DME are presumed to be from air, trapped in the dispenser.

7.5. Example:

Problem: If a 20.0 mL eudiometer tube shows a collection of 3.0 mL of gas in 48 hours, and the propellant is A-70 (blend of 42% propane and 58% butanes by weight), what is the annual weight loss?

Solution: Assuming the head space contained no air, the composition can then be approximated from the equation:

$$7.5.1. \text{ Propane (w. \%)} = \frac{(42\% * 124\text{psi,abs.})}{(42\% * 124\text{psi,abs.}) + (58\% * 45\text{psi,abs.})} = 66$$

where: 124 psi,abs. = the absolute pressure of propane at 70°F (21.1°C) and 45 psi, abs.= the absolute pressure of the butanes at 70°F (21.1°C).

7.5.2. By gas chromatography it can be shown that the escaped gas actually has the composition of 7% air, 76% propane and 17% butanes. Since all these gases are rather insoluble in water, the analysis is not necessary unless an average molecular weight is needed for very precise results. As a close approximation, the water solubility can be fixed as 0.13 mL mixed gases per mL of water. The soluble gases then amount to 2.6 mL. Assigning an average molecular weight of 47, the weight then becomes 5.06 mg of gas dissolved in the water.

7.5.3. Considering the 3.0 mL of gas in the bubble, it is apparent that a total of 5.6 mL of gas seeped through the container in 48 hours, and this converts to a volume of 1.02 liters per year. The annual weight loss is then 1.99 g.

7.5.4. In practice, complex mathematical developments are generally avoided. Eudiometric assays of carbon dioxide and dimethyl ether aerosols are only made on rare occasions, by operators who recognize the water solubility problems. In the case of most other propellants, operators follow the general rule that seepages in excess of about 3 mL per 48 hours indicate excessive weight loss. Note: When testing a product containing only (or principally) HFC-152a (CH₃-CHF₂) which displays considerable water solubility, it is advisable to use 96 hours and a small tube or vial. If the pack to be tested is large, several cans should be checked for weight loss, to serve as controls. In

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this fashion, the weight loss corresponding to various bubble sizes can be determined for this and all subsequent studies made with the same tubes and time period.

7.5.4.1. Note: It is unnecessary to consider such aspects as exact temperature or barometric pressure. The "pull" of the water on the bubble in bench-top dispenser studies can likewise be discounted.

7.5.4.2. Note: It should be noted that the seepage rate of elastomeric gaskets is highest during the first 10 to 14 days after production, unless eventual degradation of these gaskets is encountered. These initial rates may range from 50 to 150% higher than the later rate, which varies very little over time. This is due to the seating and setting of the gaskets to their abutting metal or plastic surfaces. The process can be sped up by warming for a day at 120°F (48.9°C). Laminated polypropylene gaskets are subject to similar seasoning problems.

8. ACCEPTANCE CRITERIA

8.1. Report results using predetermined criteria established by the Interested Parties.

9. SAFETY

9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

10. REFERENCES

10.1. HCPA-4.16 Method for Compressed Gas Pressure Loss for Aerosol Products in Plastic Containers.

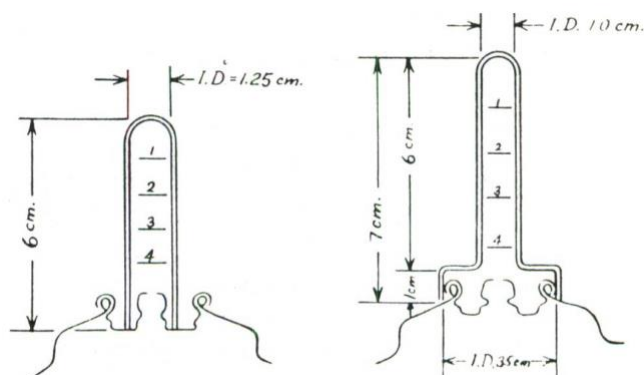
10.2. HCPA-4.17 Method for Compressed Gas Pressure Loss (Alternative Method) for Aerosol Products in Plastic Containers.

10.3. HCPA-7.03 Method for Determining Delivery Rate of Aerosol Products.

11. OTHER RESOURCES

11.1. Not Applicable at this time.

Figure 1. Example of Eudiometers



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Table 1. Solubility of the gas in water @ 77°F (25°C), except as denoted

Gas	mL Gas / mL Water	g. Gas / g. Water
Nitrogen	n/a	0.0000175
Oxygen	0.0283	0.0000393
Helium	0.009	n/a
Carbon Dioxide	0.820	0.00145
Nitrous Oxide	0.600	0.00106
Methane	0.031	0.0000209
Ethane	0.043	0.0000535
*Propane	0.065	0.00013
*n-Butane	0.130	0.00047
*Isobutane	0.150	0.00054
HFC-152a (CH ₃ -CHF ₂)	1.02	0.0028
*Dimethyl Ether	3700.0	0.456
*Solubility determined @ 64.4°F (18°C)		

12. REVISIONS

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0	11 August 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
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EDITION: 10 METHOD NO: HCPA-7.08	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 4
METHOD CLASSIFICATION: Product Delivery and Validation	TITLE: STANDARD METHOD FOR DETERMINATION OF IMMERSION TIME FOR HOT WATER TEST BATHS FOR AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. DOT regulations require a pressure test of pressurized products. The test must be conducted in a hot water test bath. Quoting reference 7.3 below: “...*each container, after it is filled, must be subjected to a test performed in a hot water bath; the temperature of the bath and the duration of the test must be such that the internal pressure reaches that which would be reached at 55 °C (131 °F), or 50 °C (122 °F) if the liquid phase does not exceed 95% of the capacity of the container at 50 °C (122 °F).*” A valid test does not require that the entire contents of the container be heated to the noted temperatures; only that the pressure in the container reaches the equivalent equilibrium pressure.
- 1.2. Testing in production is usually carried out by means of a conveyORIZED magnetic hot water test bath. Pressurized products enter the bath on a conveyor and remain submerged for a time period defined by the conveyor speed and the length of the bath. Another design of test bath clamps a row of containers and rotates it through 360°, submerging containers as it rotates. Immersion time is determined by the cycle rate of the rotational mechanism. An additional design utilizes conveyORIZED clamps that attach to the container valve and move the containers through a hot water bath. The conveyor rate and length determine immersion time.
- 1.3. The pressure that is created in the pressurized product depends upon the water temperature and flow rate past the container in the test bath, the pressurized product design, and the immersion time in the test bath. If the water temperature is set at a temperature higher than the equilibrium temperatures noted in 7.3 below then the required internal pressure can be achieved in the pressurized product in a shorter period of time without bringing the entire contents of the product to 55°C (131°F) or 50°C (122°F) as noted.
- 1.4. Before specifying a production hot water test bath, it is necessary to test every pressurized product design and formulation that will be tested in the bath. It is important to note that the product formulation cannot normally be changed to accommodate the hot water test.
- 1.5. *Caution:* In addition, the maximum water temperature of the hot water test bath is limited by safety considerations for personnel and maximum pressure capability of the pressurized products. Therefore, immersion time must be determined with the above variables fixed. The resultant immersion times and required production rates will then determine the design capacity of the test bath.
- 1.6. This method describes a means to determine, in the laboratory, the immersion time required in a production hot water test bath used for meeting DOT requirements for testing pressurized products. The data can then be used to determine design parameters and/or production rates for the hot water test bath.
- 1.7. This method requires an additional method for determining pressure in the pressurized product. Several methods are described in the referenced documents and will not be repeated as part of this method.

2. APPARATUS

- 2.1. Pressure testing equipment as required for pressure determination. Equipment will vary dependent upon which method of pressure determination is used. See referenced documents for alternative methods of pressure determination and required equipment.

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2.2. Two laboratory water test baths. The baths should be equipped with a means to circulate water past the test container similar to the rate at which water will be circulated in the production test bath. Note that the flow speed past the test container in the laboratory bath should equal the water flow speed in the production test bath plus the speed at which the pressurized products are conveyed through the production test bath. One bath must be equipped with cooling as well as heating capability.

2.3. A timing device accurate to within one second with manual start/stop feature.

3. TEST SPECIMENS

3.1. Recommended Quantity: 3 containers of each product configuration and formulation for which submersion time is needed for production testing.

4. PROCEDURE

- 4.1. Determine the proper test temperature that applies to the pressurized products to be tested. Refer to paragraph 1.1 above.
- 4.2. Choose a method of pressure determination from the standards referenced in paragraph 7 below.
- 4.3. Determine the equilibrium pressure of each pressurized product at the temperature required by regulation (see 1.1 above) by submerging it in a laboratory test bath at the required temperature until the contents of the test product equalize at the required temperature ((either 55° C (131° F) or 50° C (122° F) as noted.))
- 4.4. Determine the lowest temperature at which normal production line conditions will produce the pressurized products. Ideally samples should be taken from the production line when conditions will produce the lowest temperatures. This is not normally practical. Alternately, the temperature can be determined empirically by estimating the temperature of the components at the coldest time of the year and calculating the resultant temperature of the mixture. Estimates should include a safety factor (10% lower) to prevent specifying a test bath that is too small.
- 4.5. Prepare each product individually by the following method: Place three samples in a water bath set at the beginning (production) temperature as determined in paragraph 4.4 above. The temperature of this bath is usually cooler than ambient therefore cooling capability is required. Keep the samples in the bath for at least 60 minutes agitating them at 10-minute intervals to assure that each sample equalizes at the set temperature.
- 4.6. Remove one sample and immediately immerse it in a second test bath. Start the timer and monitor the pressure of the sample. Do not agitate the sample for this phase of the test. The temperature of the second test bath must be set at the temperature of the production test bath and must remain at that temperature throughout the test. Assure that water is circulating in the second bath as described in 2.2 above. When the pressure of the sample reaches the equilibrium pressure measured in paragraph 4.3 above, stop the timer. The timer reading equals the immersion time for the production water bath.
- 4.7. Record the time measured and the temperature of the water bath.
- 4.8. Repeat steps 4.6 and 4.7 for all three samples then average the results of all three tests. Use this average time for the immersion time of the production hot water test bath.

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4.9. The times determined by this test should be verified by tests in production conditions. Measure the pressure of containers exiting the production hot water test bath to assure that the equilibrium pressure determined in 4.3 above is achieved. Care should be taken not to over-pressurize containers. Assure that the test bath does not have any hot spots by checking can pressure at various points along the can path through the test bath.

4.10. If production conditions vary from the lab tests, adjust the temperature of the hot water test bath to assure proper pressure of each product formulation as it exits the bath. Do not exceed the maximum safe temperature of the bath as determined by maximum container pressure capacity and personnel safety considerations.

5. ACCEPTANCE CRITERIA

5.1. The report should include the following:

- 5.1.1. The complete identification of the product being tested (product designation, formulation, etc.)
- 5.1.2. The equilibrium temperature required by DOT regulation.
- 5.1.3. The equilibrium pressure measured at the DOT required temperature.
- 5.1.4. The beginning (production) temperature of the pressurized product samples used for the test.
- 5.1.5. The temperature of the water in the laboratory test bath used for the test.
- 5.1.6. The three timer readings and the average of these readings.

6. SAFETY

6.1. This method may involve hazardous materials, operations and equipment. There is a risk of can rupture with flying debris, hot water and possibly hazardous materials. This method does not purport to address all of the safety problems associated with its use. It is the responsibility of any person intending to use this method to first consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations.

7. REFERENCES

7.1. ASTM Standards:

- 7.1.1. D3070 Standard Method for Rapid Pressure Determination of Pressurized Products.
- 7.1.2. D3074 Standard Test Methods for Pressure in Metal Aerosol Containers (Withdrawn 2000)

7.2. "Alternative Method for Rapid Pressure Determination of Pressurized Products" in Section K of this Guide.

7.3. Code of Federal Register 49 CFR Part 173.306

8. OTHER RESOURCES

8.1. The Aerosol Handbook (Second Edition), M.A. Johnsen, 495 (1982) Wayne E. Dorland and Company (Mendham, N.J.).

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9. REVISIONS

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0	02 May 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	

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METHOD CLASSIFICATION: Product Delivery and Validation	TITLE: STANDARD PRACTICE FOR MEASURING THE PRESSURE OF PISTON-BASED AEROSOL CONTAINERS	

1. PURPOSE

- 1.1. The purpose of this method is to check the active pressure of a plastic piston type aerosol container that utilizes gassing through the base of the container, which is then regulated through an internal valve system that would cause a differentiation between the external top clinch valve and bottom base reservoir of compressed air. This method if repeated multiple times can have effect on the long term gasket seal in the base piece of the piston-type container.

2. APPARATUS

- 2.1. LEO2 Type Keller Manometer with custom needle adapter or equivalent pressure gauge with ability to insert a pharmaceutical grade needle of 28 Gauge or smaller.
- 2.2. Before use, make sure the base piece plug was inserted squarely, showing that container was correctly pressurized.
- 2.3. Before measuring, make sure pressure gauge display reads zero, is calibrated according to the reference standard, the needle is sharp, and the needle is straight.
- 2.4. Recommended to replace needle after 10 readings.

3. TEST SPECIMENS

- 3.1. Recommended Quantity: 1 Container at a time

4. PROCEDURE

- 4.1. Holding pressurized and filled container upside down in one hand and pressure gauge in the other, insert the needle through the center of the lower base piece plug, making sure that the needle is kept straight, see Figure 1.
- 4.2. Hold needle straight inside the plug for a maximum of 3 seconds.
- 4.3. Read the pressure output from the gauge. Pressure should not exceed 8.5 Bar at ambient temperature of 20°C.
- 4.4. Quickly pull the needle of the pressure gauge out of the plug.
- 4.5. Record the pressure results.
- 4.6. Repeat process as needed. Note that each pressure measurement causes a pressure drop of 0.03 bar in 53mm containers and 0.10 bar in 38mm containers.

5. ACCEPTANCE CRITERIA

- 5.1. If utilizing regulated pressure system, pressure should be measured at system pressure of gassing unit, not exceeding 8.5 Bar at ambient temperature of 20°C. Upper dispensing pressure will be regulated at a constant 2.0-2.5 Bar rating depending on age of container. Not regulated systems will match pressure in lower pressure chambers and dispensing chambers.

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6. SAFETY

6.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

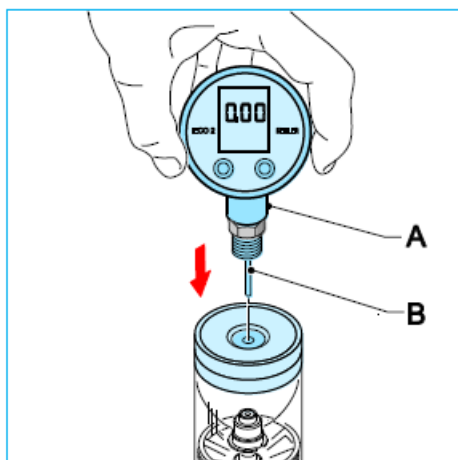
7. REFERENCES

7.1. Airopack BV: RTF Pressurizing Unit Operating Manual Rev – 06.18.2018

8. OTHER RESOURCES

8.1. Not Applicable at this time.

Figure 1:



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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINING THE LIQUID DENSITY USING GRADUATED PRESSURE TUBE FOR AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. This method will provide data on the density of self-pressurized liquids at temperatures from about 36° to 100°F (2° to 38°C).

2. SIGNIFICANCE

- 2.1. The per cent fill volume of aerosols has been a subject of commercial and regulatory importance.
- 2.2. During product development, density determinations can be made with reasonable assurance, but allowances should be made for variations in the density of commercially produced products, due to fluctuations in the ingredients and/or the filler.
- 2.3. Density determinations made on "unknown" samples are less reliable.
- 2.4. Two-phase systems may not transfer uniformly into the test apparatus.
- 2.5. Such systems cannot be tested hydrometrically, in any case.
- 2.6. One obtains a "snap-shot" density, which may only approximate the target density.
- 2.7. Certain formulations such as paints may act to obscure sighting through glass testing apparatus, rendering methods inoperable or less accurate.

3. APPARATUS

- 3.1. Controlled-temperature chambers or incubator, designed as applicable to flammability of product.
- 3.2. Glass Pressure Tube, having an inner diameter of about 1.00 in. (25.4 mm) and a length of either 8 in. (203 mm) or 15 in. (381 mm), and preferably marked with an indelible scale of millimeters on the side wall. The top is flared to accept an aerosol valve, sealed to the glass finish by means of an "O"-ring of neoprene rubber, and compression-fitted by means of aluminum, screw-type fittings.
- 3.3. Glass Tube Protector, consisting of a Lucite (methylmethacrylate plastic) tube, with perforated plastic base, screwed to the wall section, and screw-threads at the top of the wall section to engage the aluminum fitting. The tube is designed to contain possible glass shards, but releases propellant gases through the ports in the base section.
- 3.4. Balance, with a capacity to 800 g (minimum) and an accuracy of ± 0.05 g.
- 3.5. Oven or Incubator, capable of attaining up to 140°F (60°C) (minimum) to an accuracy of $\pm 1^\circ\text{F}$ ($\pm 0.5^\circ\text{C}$).
- 3.6. Face Mask, with heavy plastic visor.
- 3.7. Leather, Long-Cuff Gloves, suitable for holding the tube and protector.

4. PRECAUTIONS

- 4.1. Inspect the glass tube carefully for possible scratches, bruises or imperfections that could impair its ability to safely hold pressure.
- 4.2. Inspect the Lucite protective casing to make sure it is transparent, and not crazed or rendered translucent by solvent or cleaning activities.

5. TEST SPECIMENS

- 5.1. Recommended Quantity: Six (6)

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6. PROCEDURE

- 6.1. Assemble the apparatus, using a fast-gassing aerosol valve without a dip tube. Tighten the screw-threaded metal compression rings to hermetically seal the assembly.
 - 6.1.1. Caution: Some operators prefer to purge the air from the tube, before sealing it. This is preferably done using the same propellant as is used for the test sample (if known), and generally in an explosion-proof exhaust hood. This procedure facilitates the addition of test product to the tube and does not affect the density result.
- 6.2. Weigh the empty apparatus to ± 0.05 g.
- 6.3. If the test can have a standard (nonvapor-tap) valve with dip tube, warm it in warm water to about 86°F (30°C). Using a plastic stem sleeve (transfer sleeve), connect the valve stems of the tester and test can, inverting the tester apparatus over the test can and pressing them together to cause a flow of product into the glass pressure tube.
 - 6.3.1. Note:
 - 6.3.1.1. If the composition of the aerosol to be tested is two-phase (or unknown) shake the connected tester and test can vigorously while transferring contents.
 - 6.3.1.2. If the test can has a vapor-tap valve, orient the can so that both the vapor-tap and liquid-tap (dip tube) orifices will be below the liquid level, and then begin the transfer process.
 - 6.3.1.3. If the test can does not have a dip tube (i.e., is designed for inverted use) orient the can above the tester before actuating the valves.
 - 6.3.1.4. If the test can is known to have a two-phase content, and also a vapor tap valve (as in many air fresheners and insecticides), transfer the entire content into a secondary can, purged with propellant gas before sealing, which contains a standard (non vapor-tap) valve. It may be necessary to strongly chill the secondary can to facilitate rapid transfer.
 - 6.3.1.5. If the test container is too small to provide sufficient product to the tester, two or more highly similar dispensers may be used.
- 6.4. Continue the transfer process until the glass compatibility tube is about 75 to 85 v. per cent full.
- 6.5. Re-weigh the filled tester to ± 0.05 g.
- 6.6. Thermally equilibrate the tester, to the desired temperature.
 - 6.6.1. Note: Overnight storage in a reliable oven or incubator is preferred for higher temperature studies. Overnight standing in tempered laboratory air is a good way to determine ambient densities.
- 6.7. Caution: Temperature equilibration in a constant temperature bath can be done, but at a somewhat increased hazard, since the exo-space between glass tube and plastic protective tube will quickly fill with water, so that if the glass should break a "torpedo effect" will ensue, perhaps causing the plastic to shatter and be only partly protective. Extra precautions should be taken if this approach is taken, in order to achieve 70°F (21.1°C) or some other selected temperature for the tube contents. At least 2 hr. of residency in the constant temperature bath is required, due to slow heat transfer effects.
- 6.8. For testers equilibrated in air, re-weigh to ± 0.05 g to assure that no leakage has occurred. (This is not possible for water equilibrated testers.)

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- 6.9. Shake the tester and then allow liquid to drain from the valve cup and upper wall surfaces while gently tapping the protective shield with the finger knuckles.
- 6.10. Determine the height of the liquid meniscus on the millimeter scale.
- 6.11. If a reading at a different temperature is desired (for graph preparation purposes) repeat 6.6 through 6.10.
- 6.12. Spray out the contents of the tester and depressurize.
- 6.13. Remove the upper metal screw-threaded fitting and valve; then lift out the glass tube and carefully flush and dry it.
- 6.14. Replace the tube in the plastic canister and weigh to ± 0.05 g.
- 6.15. Fill the tube to the height of 5.11 with the reference density liquid and re-weigh to ± 0.05 g.

6.15.1. Note: For purposes of obtaining a similar meniscal profile ethanol is often selected as the reference fluid. Some typical gravities are as follows:

Fluid	@60°F/60°F (15.6°C/15.6°C)	@68°F/68°F (20°C/20°C)	@75°F/75°F (25°C/25°C)	@68°F/39°F (20°C/4°C)
S.D. Alcohol 40-1 (or 40-2), Anhydrous	0.7939	0.7907	0.7873	0.7891
Isopropanol	n/a	n/a	n/a	0.7849
Acetone	n/a	n/a	n/a	0.7912
	n/a	@60°F/39°F (15.6°C/4°C)	@77°F/39°F (25°C/4°C)	@68°F/39°F (20°C/4°C)
Water		0.9990	0.9982	0.9970

Specific gravity values relative to water at 39°F (4°C) are equal to density values in g/mL. To convert S.D. Alcohol values to density values in g/mL, multiply by the specific gravity of water at that temperature, compared to 39°F (4°C); i.e., density of S.D. Alcohol at 77°F (25°C) = 0.7891 x 0.9970 = 0.7867 g/mL.

- 6.16. Clean and dry all apparatuses.

7. CALCULATIONS

- 7.1. Subtract the empty (tare) weight of the tester from the filled weight to get the weight of contained aerosol product (g).
- 7.2. Subtract the empty (tare) weight of the tester tube and protective shield from the weight when filled to the mark with reference liquid to get the weight of the reference liquid (g).
- 7.3. Divide the weight of reference liquid by its density at the measuring temperature to get the volume to the mark (mL).
- 7.4. Divide the weight of aerosol product by the volume to the mark to obtain its density at the measuring temperature (g/mL).
- 7.5. Note:
- 7.5.1. The weight of gaseous material over the test aerosol liquid, less that in the complete tester prior to filling, is negligible for testers that are typically filled to 75 to 85 v. per cent.

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7.5.2. The separation of immiscible liquids or insoluble solids from liquids in the tester has no effect upon the results.

7.6. Report:

7.6.1. The report shall contain the following:

7.6.1.1. The complete identification of the test aerosol.

7.6.1.2. The density of the test aerosol at each temperature tested.

7.6.1.3. Optionally: A graph of density vs. temperature for the test aerosol, provided at least three, reasonably separated density/temperature points are available.

7.7. Additional:

7.7.1. In the case of aerosols having an immiscible propellant layer, it is appropriate to determine the volume of the concentrate by hydrometer or pycnometer measurements, and the volume of the propellant by means of tabulated or graphic data, adding these volume increments to get the volume of the complete aerosol. This method gives only approximate results in the case of soluble or single-phase aerosols, since shrinkage or dilational effects are normally encountered.

7.7.2. The density of an aerosol formula can be used to determine the volume of the reasonably foreseeable maximum filling weight. The minimum volume of the dispenser (with valve in place) is then determined by filling it with water to overflow. The volume per cent of the fill can then be calculated for each temperature at which the density was determined. In some cases, volumetric subsidiary net contents labeling is utilized, based on the product density at 70°F (21.1°C).

8. ACCEPTANCE CRITERIA

8.1. Report results using predetermined criteria established by the Interested Parties.

9. SAFETY

9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

10. REFERENCES

10.1. Not Applicable at this time.

11. OTHER RESOURCES

11.1. Not Applicable at this time.

12. REVISIONS

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0	11 August 2023	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINING THE LIQUID DENSITY USING HYDROMETER FOR AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. This test method covers the determination of the liquid density of a self-pressurized product by the use of a hydrometer.

2. SIGNIFICANCE

- 2.1. The density of aerosol products has been used to determine fill volumes, and from this the selection of can sizes for given fills (or a fill for a given can size) that will meet various federal regulations and marketer needs.

3. APPARATUS

- 3.1. Hydrometer, with a range suitable for the test, in a scale of 0.001 to 0.002 g/mL divisions, readable from both sides of the stem. Limit length to about 9 in. (229 mm).
- 3.2. Since no hazard results from implosion of the hydrometer, it is not necessary to test the instrument prior to use.
- 3.3. Pressure Tube, constructed from a borosilicate glass pipe, 1 in. (25.4 mm) in internal diameter, 15 in. (381 mm) long, and sealed off in a round end at the bottom. The other end terminates in a standard borosilicate standard metal flange fitting.
- 3.4. Pressure Tube Lucite Shield, consisting of a heavy-duty clear, colorless cylinder about 2 in. (50.8 mm) in diameter by about 16 in. (406 mm) long, encasing the pressure tube in case of breakage. The base is perforated to allow any gases to escape, should breakage occur. The top is screw-threaded to an aluminum holder for the glass tube.
- 3.5. Fittings, including threaded aluminum compression caps, a Nylon flare liner, and an "O"-ring for the aerosol valve.
- 3.6. Constant Temperature Bath, constructed of non-rusting metal, and tall enough to accommodate the entire length of the pressure tube and attached valve beneath the liquid surface.
 - 3.6.1. Note: The bath may be either a custom-made, thermostatically controlled unit, or more simply a cylindrical metal container, wrapped or coated with heavy insulation, where the temperature is maintained to within about $\pm 1^{\circ}\text{F}$ ($\pm 0.5^{\circ}\text{C}$) of the desired value by appropriate additions of cold or hot water. The thermostatic system is preferred if many determinations are to be made in the 120° to 180°F (39° to 82°C) range.
- 3.7. Agitator, electrical or air-powered, which may be integral with the constant temperature bath, or a separate item.
- 3.8. Thermometer, having an accuracy of $\pm 1^{\circ}\text{F}$ ($\pm 0.5^{\circ}\text{C}$).
- 3.9. Leather Gloves, for operator protection.
- 3.10. Safety Shield, Lucite or Plexiglas, for operator protection in case of breakage and possible gas/air ignition.
 - 3.10.1. Caution: When dealing with flammable propellants or solvents, great care should be taken to minimize danger to the operator and surroundings in the event of pressure tube breakage. The area within at least 6.5 ft. (2.0 m) of the pressure tube should be explosion-proof and devoid of any flammable materials.
 - 3.10.2. Note: The amount of aerosol product added to the pressure tube should be the minimum required to float the hydrometer, typically 4 fl.oz. (118 mL) or less.

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4. PRECAUTIONS

- 4.1. Most approaches to the determination of liquid density involve the use of heavy-wall, pressure-resistant glass equipment. Since such equipment is subject to very occasional breakage, with dissemination of glass shards and possibly flammable materials, great care should be taken by the operator.

5. TEST SPECIMENS

- 5.1. Recommended Quantity: Six (6)

6. PROCEDURE

6.1. Preparation of Apparatus:

- 6.1.1. Inspect the pressure tube and hydrometer very carefully for cracks, chips, abrasions or other flaws.
- 6.1.2. Likewise, inspect the Lucite protective cylinder for cleanliness, absence of cracks, crazing, blushed areas and so forth that could indicate structural weakness or partial obscuration of the hydrometer graduations and meniscal level.
- 6.1.3. Optionally, place a tiny amount of water-soluble or oil-soluble dye within the pressure tube, according to product type, to slightly tinge it and improve readability.
- 6.1.4. Very carefully, tilt the open pressure tube almost sideways and slide the hydrometer into it, allowing it to finally rest upon the bottom.
- 6.1.5. Purge the air from the pressure tube, preferably using the same propellant as was used in the preparation of the test aerosol product.
- 6.1.6. Immediately place an "O"-ring into the valve cup of a pressure-filling aerosol valve (with no dip tube), and place this subassembly on the top finish surface of the pressure tube. Place the female aluminum threaded cap on the unit and screw firmly into place, thus creating a hermetic seal.
- 6.1.7. The apparatus is now ready to use.
- 6.2. Fill the constant temperature bath with water to the level at which the pressure tube tester will be entirely submerged.
 - 6.2.1. Note: By the addition of 0.5% sodium mexametaphosphate (Calgon) to the water, drainage from the outside glass and both inside and outside plastic surfaces can be facilitated. This will enhance hydrometer scale readability.
- 6.3. After warming the contents of the test aerosol to about 86°F (30°C) to facilitate transfer, connect a transfer sleeve to one stem, and holding the test can below the inverted pressure tube assembly, add
- 6.4. sufficient liquid to float the hydrometer, plus another 5 to 10 mL.
- 6.5. Very carefully turn the pressure tube 180° until it is upright-vertical. Avoid bumping the hydrometer against the pressure tube inner walls.
- 6.6. Allow the system to equilibrate to the desired temperature for at least 1 hour for ambient temperatures, or 1.5 hours for temperatures of 113°F (45°C) or above.

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6.7. Grasping the pressure tube assembly, first with suitable tongs, and then with the leather gloves (at the top), hold only sufficiently high to read the hydrometer without parallax.

6.8. If further assurance of the reading is desired, return to the bath for 20 min. more and repeat 6.7.

6.9. Note:

6.9.1. With reference to 3.3, if the very small vent is not bored through the plastic protective cylinder, only a small amount of bath water will enter at the bottom, permitting the tube to float, in some tests. Heated bath water may also cause fogging of the upper glass and inside plastic surfaces, impairing vision.

6.9.2. An idea of the importance of temperature can be obtained from the fact that hydrocarbon propellants change only about 1% in density in going from 70° to 80°F (21.1° to 26.7°C). Water solutions are much less affected.

6.10. At the conclusion of the test, allow the pressure tube assembly to cool to room temperature, such as by standing overnight in the bath, and then, using face mask and gloves, remove it from the bath and spray out the contents in suitable exhaust hood.

6.11. Carefully remove the hydrometer and clean the apparatus.

6.12. Report should contain the following:

6.12.1. The complete identification of the test aerosol.

6.12.2. The density of the test aerosol at each temperature tested.

6.12.3. Optionally: A graph of density vs. temperature for the test aerosol, provided at least three, reasonably separated density/temperature points are available.

7. ACCEPTANCE CRITERIA

7.1. Report results using predetermined criteria established by the Interested Parties.

8. SAFETY

8.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

9. REFERENCES

9.1. Not Applicable at this time.

10. OTHER RESOURCES

10.1. Not Applicable at this time.

11. REVISIONS

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EDITION: 10 METHOD NO: HCPA-7.12	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 1 OF 2
METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DEGREE OF COVERAGE OF ORGANIC LINING IN AEROSOL PRODUCT CONTAINERS	

1. PURPOSE

- 1.1. This method covers the determination of voids, crazed spots, porous areas, cracks, and other vulnerable locations in the internal organic linings applied to either tin plate, ECCS or aluminum aerosol cans.

2. SIGNIFICANCE

- 2.1. The method is suitable for incoming inspections of lined aerosol cans, and for laboratory comparison purposes.

3. APPARATUS

3.1. Equipment

- 3.1.1. Balance, 0-2000 g capacity.
3.1.2. Can Opening Tools, such as deseamers, seam cutters, nippers for unwrapping the double seams, tin-snips, and related laboratory equipment.

3.2. Reagents

- 3.2.1. Copper (II) Sulfate 5-Hydrate; minimum 99.9% purity.
3.2.2. Hydrochloric Acid; typical 36 – 38% purity in water.

3.3. Standard Test Solution

- 3.3.1. The solution may be purchased premixed.
3.3.2. The standard test solution shown below may be used in the practice of this method.
3.3.3. Solutions Parts by Weight:

Solution	Part by Weight
Copper (II) Sulfate S-Hydrate (CuSO $\pm$ SH ₂ O)	20.00
Hydrochloric Acid: 36-38% HCl	10.00
De-ionized (or Distilled) Water	70.00
Total	100.00

- 3.3.4. To prepare this solution, dissolve the acid in the de-ionized water after preweighing the desired amounts on the balance. Then add the copper (II) sulfate 5-Hydratae crystal and stir until dissolved, using a glass or Teflon-coated stirring rod.

- 3.3.5. Use all solutions at room temperature.

4. PRECAUTIONS

- 4.1. The solution is both acidic and poisonous. Handle with care, including gloves. Use appropriate safety equipment.

5. TEST SPECIMENS

- 5.1. Recommended Quantity: Random sample from a given lot – minimum of Twelve (12)

6. PROCEDURE

- 6.1. Prepare the standard test solution. If it is cloudy, filter it through a medium-coarse grade of filter paper before storing it in a labeled bottle.

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- 6.2. Select a sample empty can and carefully fill it to the brim with the standard test solution.
- 6.3. Allow the solution to remain in the container for one minute at room temperature.
- 6.4. Pour the solution into a suitable beaker and immediately flush the aerosol container three times with de-ionized (or distilled) water.
- 6.5. Open the can for inspection and examine for any red-brown deposits (on tin plate or ECCS) or dark-brown deposits on aluminum surfaces. Note size and location plus any special characteristics.
- 6.6. Optional: Compare against control(s).
- 6.7. The standard test solution may be reused until it gets cloudy or shows a significant color change (blue to green). Cloudiness may be correctable by filtration. Discolored solutions must be replaced.
- 6.8. Report should contain:
 - 6.8.1. The can size, supplier, lot number and all information pertinent to the samples being tested.
 - 6.8.2. Resultant of the copper sulfate test.

7. ACCEPTANCE CRITERIA

- 7.1. Report results using predetermined criteria established by the Interested Parties.

8. SAFETY

- 8.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

9. REFERENCES

- 9.1. Not Applicable at this time.

10. OTHER RESOURCES

- 10.1. Not Applicable at this time.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINING MOISTURE CONTENT IN AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. This test method delivers the determination of moisture in aerosol products.
- 1.2. Moisture is determined in an aerosol product by back-titrating the specimen, to which “Karl Fischer Reagent” has been added, with a methanol-water solution. A ratio between the methanol and “Karl Fischer Reagent” is obtained, and the “Karl Fischer Reagent” is standardized against sodium tartrate 2-hydrate.
- 1.3. This method is useful for moisture assay of aerosol concentrates, but not for completed aerosols unless a customized transfer device is utilized.

2. SIGNIFICANCE

- 2.1. Moderate concentrations of water in certain aerosol formulations can lead to metallic can corrosion.

3. APPARATUS

3.1. Equipment

- 3.1.1. Closed Containers (3): Glass
- 3.1.2. Stirrer: Magnetic

3.2. Reagents

- 3.2.1. Purity of Water: Unless otherwise indicated, references to water shall be understood to mean water conforming to ASTM D-1193, Standard Specification for Reagent Water.
- 3.2.2. “Karl Fischer Reagent”, consists of iodine, sulfur dioxide, a base and a solvent, such as alcohol.
- 3.2.3. Methanol (Anhydrous methyl alcohol), CH₃OH.
- 3.2.4. Methanol-Water Standard Solution.
- 3.2.5. Sodium Tartrate, 2-Hydrate Standard (C₄H₄Na₂O₆ · 2H₂O)

3.3. Standard Test Solution

- 3.3.1. Ratio of “Karl Fischer Reagent” to Methanol-Water Solution:
 - 3.3.1.1. Place approximately 60mL of methanol into a closed glass container and add from 2 to 3mL of “Karl Fischer Reagent”.
 - 3.3.1.2. Agitate the solution with the magnetic stirrer for approximately 5 minutes.
- 3.3.2. Back-titrate the solution with the methanol-water solution until the end point is reached; then add 10mL of “Karl Fischer Reagent”. Back-titrate with the methanol-water solution until the end point is reached.
- 3.3.3. Calculate the ration of the “Karl Fischer Reagent” to methanol-water solution, X, as follows:
 - 3.3.3.1. X = A/B where:
 - 3.3.3.1.1. A = “Karl Fischer Reagent” used, mL
 - 3.3.3.1.2. B = Methanol-Water solution used, mL
 - 3.3.3.1.2.1. Note: a solution close to 1:1 is recommended
- 3.3.4. Standardization of “Karl Fischer Reagent”:
 - 3.3.4.1. Place approximately 60mL of methanol into a closed glass container and add from 2 to 3mL of “Karl Fischer Reagent”.
 - 3.3.4.2. Agitate the solution for 5 minutes with the magnetic stirrer.
 - 3.3.4.3. Back-titrate the solution with methanol-water solution until the end point is reached. Add 0.32g of sodium tartrate 2-hydrate and approximately 6mL of “Karl Fischer Reagent”. Agitate

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until the salt is completely dissolved, then back-titrate with methanol-water solution until the end point is reached.

3.3.5. Calculate the volume, milliliters (mL), of “Karl Fischer Reagent” used to combine with the water in the sodium tartrate 2-hydrate standard, C, as follows:

$$3.3.5.1. \quad C = A - (BX)$$

3.3.6. Calculate the milligrams of water for 1mL of “Karl Fischer Reagent”, y, as follows:

$$3.3.6.1. \quad y = W/C \text{ where:}$$

$$3.3.6.1.1. \quad W = \text{Total water in the sodium tartrate 2-hydrate, milligrams (mg).}$$

4. PRECAUTIONS

4.1. This standard involves hazardous materials and it is the responsibility of any person intending to use this standard to first consult and establish appropriate safety and health practices.

4.2. Contaminated primary alcohols with water levels of 1 to 2% can produce hydrogen gas in aluminum containers, causing them to rupture.

4.3. Ketones, such as acetone, can produce falsely high results.

5. TEST SPECIMENS

5.1. Recommended Quantity: Random sampling from production – minimum of Three (3)

6. PROCEDURE

6.1. Place approximately 60 mL of methanol in a closed glass container, and add from 2 to 3 mL of “Karl Fischer Reagent”. Agitate the solution with the magnetic stirrer for 5 min. Then back-titrate until the end point is reached.

6.2. Add a weighed amount of the specimen, and an excess of the “Karl Fischer Reagent”. Agitate the solution for 5 min. then back titrate with the methanol-water solution until the end point is reached.

6.3. The report should include the following:

6.4. Product being tested and water content of product (mass percent), using calculation in section 7.

7. CALCULATION

7.1. Calculate the water content (mass percent), M, as follows:

$$7.1.1. \quad M = (A * y * 100)/S \text{ where:}$$

$$7.1.1.1. \quad S = \text{Specimen, grams (g).}$$

8. ACCEPTANCE CRITERIA

8.1. Report results using predetermined criteria established by the Interested Parties.

9. SAFETY

9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINING MOISTURE CONTENT IN AEROSOL PRODUCTS	

10. REFERENCES

- 10.1. ASTM D1193, Standard Specification for Reagent Water, ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959 USA.
- 10.2. American Chemical Society (ACS), 1155 Sixteenth Street N.W., Washington, DC 20036, USA.

11. OTHER RESOURCES

- 11.1. Not Applicable at this time.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINING CONTAMINATION OF TERTIARY BUTYL HYDROPEROXIDE (TBHP) IN AEROSOL PROPELLANTS AND AEROSOL PRODUCTS	

1. PURPOSE

- 1.1. This method covers the determination of tertiary butyl hydroperoxide (TBHP) in either hydrocarbon propellants or aerosol compositions.
- 1.2. The procedure is limited to unreacted TBHP when assaying aerosols.
- 1.3. Aerosol ingredients, such as water, which form two-phase systems with chloroform, render the analysis more cumbersome, less accurate or unworkable.
- 1.4. A known weight of hydrocarbon gas/liquid aerosol propellant is sampled and allowed to fully evaporate. The residue is diluted with a fixed volume of chloroform and assayed by gas/liquid chromatography against a standard TBHP solution in chloroform.
- 1.5. A known weight of aerosol formulation is sampled, allowed to warm to room temperature to evaporate most of the propellant, then filtered if particulate matter is present. The resulting liquid is made up to a standard volume using chloroform, then assayed by gas/liquid chromatography against a TBHP standard.

2. SIGNIFICANCE

- 2.1. To determine if hydrocarbon gas/liquid propellants, or completed aerosols, are contaminated with TBHP in sufficient quantities to cause unwanted odors, new compounds and other sequelae that might warrant rejection of the lot.

3. APPARATUS

3.1. Equipment

- 3.1.1. Two nested polystyrene cups of about 240 mL capacity.
- 3.1.2. Polyethylene-tipped metal tongs, about eight inches long.
- 3.1.3. 20 mL screw-threaded glass vial (26 x 57 mm high), weighing about 14.9 g with matching plastic screw-cap.
- 3.1.4. 1.00 mL pipette.
- 3.1.5. 10 mL plastic, disposable syringe fitted with 0.45 micron fritted glass filtering disc.
- 3.1.6. Gas/liquid chromatograph with Flame Ionization System for detection.
- 3.1.7. Absorption Column.

3.2. Reagents

- 3.2.1. Isobutane (C₄H₁₀). Aerosol Grade, TBHP-free.
- 3.2.2. Chloroform (CHCl₃).
- 3.2.3. Tertiary Butyl Hydroperoxide (C₄H₁₀O₂). TBHP: 90% or 70% Commercial Grades.
- 3.2.4. Liquid Nitrogen (N₂).
- 3.2.5. TBHP Standard Solution (50 ppm). Add 0.555 mL (0.50 g) of 90% TBHP to a lined aerosol can of about 500 mL capacity
 - 3.2.5.1. Alternatively, add 0.642 g of 70% TBHP.
- 3.2.6. Seal the can with a suitable aerosol valve and pressure fill with 224.5 g of TBHP-free isobutane (Aerosol Grade). This solution is 0.2% TBHP. Into a second aerosol can, sealed with a suitable valve, pressure fill 5.00 g of the 0.2% TBHP solution and then dilute with 195 g of additional TBHP-free isobutane (Aerosol Grade). This solution is 0.005% (50 ppm) TBHP.

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4. PRECAUTIONS

- 4.1. This standard involves hazardous materials and it is the responsibility of any person intending to use this standard to first consult and establish appropriate safety and health practices.
- 4.2. Certain C₆ and C₇ branched hydrocarbons may be present in isobutane at low levels and may under certain conditions elute at about the same rate as TBHP, thus confounding the analysis unless crosschecked by mass spectroscopy or other alternative approaches.
- 4.3. In the case of propellant analysis, the option of sampling 25 mL, or so, of liquid propellant into a polystyrene or glass cup, letting it almost totally evaporate, and then smelling the possible residue, may serve to detect levels of contained TBHP as low as about 2 to 3 ppm.

5. TEST SPECIMENS

- 5.1. Recommended Quantity: Random sampling from production – minimum of Three (3)

6. PROCEDURE

- 6.1. Preparation of standard GLC curve for 50 ppm TBHP in isobutane.
- 6.2. Fit the aerosol can containing the standard 50 ppm TBHP solution with a valve button to which a polypropylene 0.060" inside diameter capillary tube is attached. The tube should be about 5in (13cm) long.
- 6.3. Cool to 36 to 40° F (2 to 4° C).
- 6.4. Pour about 120 mL of liquid nitrogen into the inner of two nested polystyrene cups of about 240 mL capacity.
- 6.5. Using tongs, carefully float an empty 20 mL screw threaded glass vial in the liquid nitrogen.
- 6.6. Take the cooled aerosol and place the end of the eductor tube deep within the vial and slowly inject about 15 mL (10 g) of liquid. Determine the amount by measuring the weight loss of the aerosol can to the nearest ±0.010 g.
- 6.7. The chilled vial is transferred, using tongs to an explosion-proof exhaust hood, where the content is allowed to warm from -321°F (-196°C) to 11°F (-12°C) to facilitate complete evaporation of the isobutane.
- 6.8. As soon as the last bit of isobutane evaporates, transfer 0.500 mL of chloroform to the vial, washing down the walls in the process. Cap the vial.
- 6.9. Prepare the GLC for analysis by setting the following operational parameters:
 - 6.9.1. Injection Port Temperature: 220°C
 - 6.9.2. Detector Temperature: 250°C
 - 6.9.3. Initial Column Temperature: 40°C
 - 6.9.4. Initial Time: 7 minutes
 - 6.9.5. Final Column Temperature: 300°C
 - 6.9.6. Final Time: 10 minutes

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- 6.10. Inject 0.500 microliter of the standard into the instrument. Alternatively, 1.000 mL of chloroform may be added to the vial, from step 6.8, and 1.000 microliter of this solution injected into the gas chromatograph. Run the sample.
- 6.11. Repeat the procedure using TBHP free isobutane (Aerosol Grade) and the chloroform, to show that the peak denoting TBHP in the standard is totally missing from these reagents.
- 6.12. Preparation of GLC curve for TBHP contaminated isobutane.
- 6.13. Pressure-fill the tank car or bulk tank sample into an aerosol can carrying a valve fitted with a 5in (13cm) long, 0.060in (1.5mm) inside diameter eductor tube.
- 6.14. Repeat steps 6.3 through 6.10.
- 6.15. Preparation of GLC Curve for TBHP contaminated aerosol products.
 - 6.15.1. Fit the aerosol sample dispenser with a suitable valve button and the eductor tube described in 6.2.
- 6.16. Repeat steps 6.3 through 6.9.
 - 6.16.1. Depending upon the amount of low-volatiles remaining in the vial following complete evaporation of the isobutene, add another 0.500 mL to 1.000 mL of chloroform. The contents of the vial are then passed into a disposable syringe fitted with a 0.45 micron fritted disc, so that the liquid portion can be expressed through the disc and into a second 20 mL vial, which is then capped. The weight of this liquid must be determined to the nearest ± 0.01 g, and density to ± 0.01 g/mL.
- 6.17. Repeat step 6.10. Inject 10% of sample or adjust calculations.
- 6.18. The report should include the following:
- 6.19. Product being tested and TBHP content, using calculation in section 7.

7. CALCULATION

- 7.1. Calculate the TBHP content (ppm) in iso-butane, as follows:

$$TBHP (ppm) = \frac{\text{Area of Sample Solution GLC Peak}}{\text{Area of Standard Solution Peak}} * TBHP (ppm) \text{ In Standard}$$

- 7.2. Calculate the TBHP content (ppm) in aerosol composition as follows:

$$TBHP (ppm) = \frac{\text{Area of Sample Solution GLC Peak}}{\text{Area of Standard Solution Peak}} * \frac{\text{Wt. of Liquid } (S + C)}{\text{Wt. of C}} * \frac{\text{Density of C}}{\text{Density of } (S + C)} * TBHP (ppm) \text{ In Standard}$$

- 7.2.1. where:

- 7.2.1.1. S = Grams of liquid from the aerosol, expressed through the filter

- 7.2.1.2. C = Grams of chloroform (1.489 * mL), expressed through the filter

8. ACCEPTANCE CRITERIA

- 8.1. Report results using predetermined criteria established by the Interested Parties.

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METHOD CLASSIFICATION: Physical Attributes	TITLE: METHOD FOR DETERMINING CONTAMINATION OF TERTIARY BUTYL HYDROPEROXIDE (TBHP) IN AEROSOL PROPELLANTS AND AEROSOL PRODUCTS	

9. SAFETY

9.1. Use appropriate personal protective equipment, such as safety glasses, gloves, etc.

10. REFERENCES

10.1. ASTM Standard D1022-49T, Peroxide in Butadiene (ferrous Titanous Method), ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959 USA.

10.2. ASTM Standard: D1563-58, Peroxide Number of Mineral Insulating Oils., ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959 USA.

11. OTHER RESOURCES

11.1. Not Applicable at this time.

12. REVISIONS

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METHOD CLASSIFICATION: System Validation	TITLE: STANDARD PRACTICE FOR STORAGE TESTING OF AEROSOL PRODUCT	

1. PURPOSE

- 1.1. The purpose of this standard practice is to assess the stability and safety of the product under foreseeable storage and usage conditions.
- 1.2. This standard practice is recommended for the long-term testing of the hermeticity and the storage of all aerosol products in metal, glass, and plastic containers.
- 1.3. The objective of this practice is to determine the loss of weight and/or pressure in storage at different temperatures and during a given period of time, as well as under, under the same conditions, the stability of the product, considering both the formulation and packaging components.
- 1.4. For plastic aerosol products, this standard practice is to determine the effect of exposure to visible and/or non-visible light.

2. APPARATUS

- 2.1. Laboratory balance with a precision of 0.01g for most aerosol products.
- 2.2. Gauge for the determination of the pressure.
- 2.3. Storage space at room temperature (20°C (68°F) to 25°C (77°F)), and at one or more elevated temperatures in the range of 35°C (90°F) to 65°C (149°F) equipped with controls for the regulation of temperature to within $\pm 3^{\circ}\text{C}$ (5°F). The storage space must ensure that its content reaches the range required for the test.
- 2.4. For plastic aerosols, light source consisting of calibrated quartz jacketed xenon-arc lamps equipment which simulates exposure to visible and non-visible light following appropriate methods in this guide.

3. PRECAUTIONS

- 3.1. Most aerosol storage tests involve a container, valve, or product of unknown compatibility and performance. It is the responsibility of any person intending to use this standard to first consult and establish appropriate safety and health practices.
- 3.2. The operator should, at minimum, utilize gloves, face shields (or glasses), and testing equipment having proper controls.
- 3.3. The storage unit should take into account the possibility that leakage, or even explosions, may occur, perhaps with the release of flammable chemicals into confined spaces.
- 3.4. If during a storage test, container perforations or signs of advanced corrosion are found, or if the product or dispenser becomes otherwise unfit for commercialization, the entire lot of test samples should be destroyed. Continued testing would not allow approval of the test materials while potentially exposing operators to unsafe conditions.

4. TEST SPECIMENS

- 4.1. Test specimens must be identical with the containers and valves envisaged for the proposed production using equipment capable of meeting the specifications that would be used for finished product.

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METHOD CLASSIFICATION: System Validation	TITLE: STANDARD PRACTICE FOR STORAGE TESTING OF AEROSOL PRODUCT	

- 4.2. If several types of containers or valves are to be compared, they should be subject to the same test, with the same conditions of preparation, and the same temperature and duration of storage.
- 4.3. All the samples destined for stability testing shall be prepared in accordance with the manufacturing procedures, including appropriate burst and leak testing.
- 4.4. Recommended Quantity: A statistical approach should be undertaken to understand a sufficient sample size. Regulatory considerations may also influence sample size.

5. PROCEDURE

- 5.1. Before the storage, and at least 24 hours after filling, the following operations must be performed:
- 5.1.1. All the samples will be carefully coded for identification.
- 5.1.2. The pressure at storage conditions should be measured on all samples.
- 5.1.3. All samples should be weight and recorded.
- 5.2. The storage temperature, the minimum storage time, and the minimum quantity of samples for every variant of packs should be entered in the tables below.
- 5.2.1. Table 5.2.1 – Example of test protocol for aerosols (in general)

Minimum number of samples ^a	Storage temperature ^b		Position of storage	Minimum time of storage ^c (months)
	°C	°F		
12	Room Temperature		Half in normal position Half upside down	12
12	36 – 40	97 – 104	Half in normal position Half upside down	4
12	47 – 54.4	117 - 130	Half in normal position Half upside down	2 ^d

Notes

^a When assessing formulation stability, it is advised to further use transparent aerosols for comparison.

^b Typical but slightly different temperatures may be used depending on the end market. The ranges capture typical temperatures, but a fixed temperature needs to be used throughout.

^c The time can be extended for products with long shelf-life.

^d When using plastic aerosols, the container may deform (creep) during long-term testing at high temperatures.

- 5.3. After the fixed duration of storage, it is necessary to proceed in the following way:
- 5.3.1. Take the samples out of the storage room and store them for 24 hours at room temperature.
- 5.3.2. Weight the sample to determine the loss of weight during the time of storage.
- 5.3.3. Determine the pressures in the samples at the various testing temperatures.
- 5.3.4. Actuate the valves to verify their good functioning. In case of poor functioning, an examination will be made after observing final result.
- 5.3.5. While utilizing appropriate personal protective equipment (PPE), depressurize the test samples and obtain product for comparison to control sample.

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5.3.6. Examine the inner and outer walls of the containers and the mounting cups of the opened samples for signs of compatibility issues (e.g., corrosion, det-tinning). Non-metallic containers should be examined for any signs of stress.

5.3.7. Examine any valves which did not function correctly to determine the cause.

6. ACCEPTANCE CRITERIA

6.1. Only the comparison of observation made from all the test at different temperatures defined above and at the end of the fixed minimum times will give maximum efficiency for this standard practice.

6.2. Final report of results must indicate:

6.2.1. Identification of the samples, including the parameters which are controlled.

6.2.2. The number of samples submitted to the test.

6.2.3. The test conditions.

6.2.4. The loss of weight ascertained on every sample.

6.2.5. The original pressure and the final pressure of every sample.

6.2.6. The changes found in the internal protection of the containers or of the valves, the mechanical resistance, the functioning of the valves, the physicochemical properties of the formulation.

6.2.7. The time elapsed from the filling until the start of the test.

6.2.7.1. Note, the time elapsed from the filling until the start has an influence on the loss of weight of the aerosol because of the period of stabilization proper to every type of pack.

6.2.8. The working details not provided for in this standard as well as the eventual incidents suspected of having influenced the results.

7. SAFETY

7.1. The operator should, at minimum, utilize gloves, face shields (or glasses), and testing equipment having proper controls.

7.2. Additional personal protective equipment may be necessary depending on the formulation

8. REFERENCES

8.1. HCPA-4.08 Method for Determining Environmental Stress Crack (PET) for Aerosol Products in Plastic Containers

8.2. HCPA-4.14, Method for Material Resistance to Contant Temperature Evaluation for Aerosol Products in Plastic Containers

8.3. HCPA-4.15, Method for Material Resistance to Induced Heat Conditions for Aerosol Products In Plastic Containers

8.4. HCPA-4.20, Method for UV Exposure to PET using Xenon Arc Light Apparatus for Aerosol Products in Plastic Containers

8.5. HCPA-4.21, Method for UV Exposure of Product Formula using Xenon Arc Light Apparatus for Aerosol Products in Plastic Containers

8.6. HCPA-7.03, Method for Determining Delivery Rate of Aerosol Products

EDITION: 10 METHOD NO: HCPA-7.15	 Innovative Products For Home. Work. Life. AEROSOL GUIDE	EFFECTIVE DATE: 30 APRIL 2026 PAGE 4 OF 4
METHOD CLASSIFICATION: System Validation	TITLE: STANDARD PRACTICE FOR STORAGE TESTING OF AEROSOL PRODUCT	

9. OTHER RESOURCES

9.1. Not Applicable at this time.

10. REVISIONS

Revision Number	Date	What is changing	Why is it changing
0	01 Oct 2025	Updating to tenth edition of guide	
1	30 April 2026	Finalization of tenth edition guide	
2			
3			