



Standard Practice for Handling, Transportation, and Storage of Halon 1301, Bromotrifluoromethane (CF₃BR)¹

This standard is issued under the fixed designation D 5631; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice covers guidance and direction to suppliers, recyclers, reclaimers, purchasers, and users in the handling, transportation, and storage of Halon 1301.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 5632 Specification for Halon 1301, Bromotrifluoromethane (CF₃Br)²

2.2 CGA Standards:

No. C-1 Methods for Hydrostatic Testing of Compressed Gas Cylinders³

No. C-4 American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained³

No. C-6 Standards for Visual Inspection of Steel Compressed Gas Cylinders³

No. P-1 Safe Handling of Compressed Gases in Containers³

No. S-1.1 Pressure Relief Device Standards— Part 1 – Cylinders for Compressed Gases³

No. S-1.2 Pressure Relief Device Standards – Part 2 – Cargo and Portable Tanks for Compressed Gases³

No. S-1.3 Pressure Relief Device Standards – Part 3 – Stationary Storage Containers for Compressed Gases³

No. SB-1 Hazards of Refilling Compressed Refrigerant (Halogenated Hydrocarbon) Gas Cylinders³

No. SB-5 Hazards of Reusing Disposable Refrigerant (Halogenated Hydrocarbon) Gas Cylinders³

No. SB-18 Use of Refrigerant (Halogenated Hydrocarbon)

Recovery Cylinders³

2.3 U.S. Government Standards:

Code of Federal Regulations (CFR) Title 40, Part 82.106⁴

Code of Federal Regulations (CFR) Title 49, Part 173, U.S. Department of Transportation (DOT) Specifications, Shippers-General Requirements for Shipping and Packagings⁴

Code of Federal Regulations (CFR) Title 49, Part 178, U.S. DOT Specifications for Packagings⁴

2.4 Other Documents:

Safety Guide for Decommissioning Halon Systems, Volume 2 of the U.S. Environmental Protection Agency Outreach Report, Moving Towards a World Without Halon⁵

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *containers*—storage vessel for Halon 1301.

3.1.2 *cylinders*—containers of Halon 1301.

3.1.3 *Halon 1301*—bromotrifluoromethane, a compound used to inert or suppress a fire or explosion hazard.

3.1.4 *insulated*—placed in an isolated situation to protect and prevent the transfer of damage.

4. Summary of Practice

4.1 Personnel shall be trained in accordance with Title 49 CFR, Part 172, Subpart H, to ensure safe handling, loading, unloading, storing, and transporting of material.

4.2 Handling:

4.2.1 Handling shall be in accordance with CGA Publication No P-1, Safe Handling of Compressed Gases in Containers and as specified by the manufacturer.

4.2.1.1 Personnel who handle or store, or both, cylinders of Halon 1301 shall be trained properly to recognize and identify the characteristics of the product and the proper methods of safely handling full, partly full, and empty cylinders.

4.2.2 All Halon transfers between storage containers and recycling processes shall be performed by personnel trained in handling procedures.

4.2.2.1 Facility personnel shall be trained in applicable Title

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² *Annual Book of ASTM Standards*, Vol 15.05.

³ Available from the Compressed Gas Association.

⁴ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20036.

⁵ Available by means of the Internet: <http://128.174.5.51/denix/Public/News/DLA/Halon/hall.html>

49 CFR, Parts 173 and 178, and the CGA documents referenced in 2.2.

4.2.3 Halon 1301 recycling and transfer processes shall be in conjunction with the equipment requirements specified by the manufacturer.

4.2.4 Halon handling shall be in nonsmoking, heater-free, ventilated areas to preclude product accumulation. Provisions shall be made to ensure that service areas limit Halon 1301 concentrations to not exceed 10 % for 1 min and 0.1 % for 8 h.

4.2.5 Cylinders shall not be over filled. The maximum permitted filling density for Type II product in accordance with Specification D 5632 shall be 77 lb/ft³. The maximum permitted filling density for Type I product in accordance with Specification D 5632 shall be 70 lb/ft³. The liquid portion of the liquefied gas shall not completely fill the container's internal volume and the pressure shall not exceed five fourths the service pressure of the container at any temperature up to and including 130°F (54°C). The filling density requirements for pure specification quality (Type II) product are specified in Title 49 CFR 173.304 and 173.305.

4.2.6 Handling of materials should be done in a manner that prevents contamination of commingling of materials other than Halon 1301.

4.2.7 Cylinders shall be free of dirt and contamination that would contribute to or would cause deterioration of the product during shipment or storage. Precautions should be taken to prevent the entry of oil, water, or any other foreign matter into the container. Unique coatings or preservatives applied prior to shipment to protect the containers are not considered contamination.

4.3 *Transportation:*

4.3.1 Shipment of materials between distributors, collectors, recyclers, and reclaimers shall be as specified in accordance with DOT regulations Title 49 CFR.

4.3.1.1 The minimum design pressure requirements shall be as stated in Title 49 CFR Part 173.301. The pressure inside the container at 70°F (21°C) shall not exceed the service pressure for which the container is marked. The pressure inside the container at 130°F (54°C) shall not exceed five fourths the service pressure for which the container is marked. Fig. 1 illustrates the effect of temperature on cylinders filled with mixtures of Halon 1301 and nitrogen.

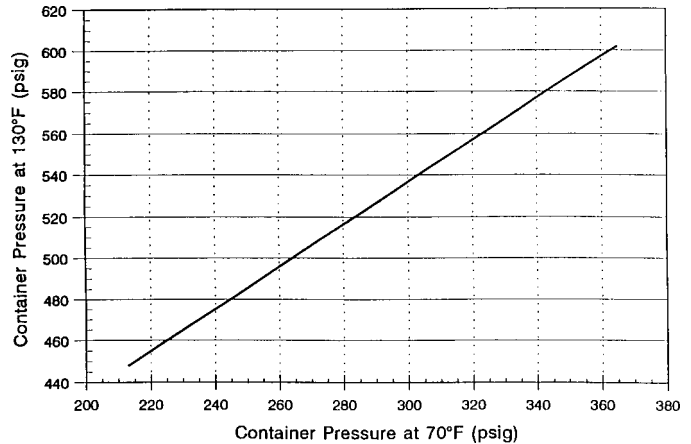
4.3.2 Transportation shall be in suitable vehicles to preclude cylinder damage by excessive mechanical vibration, shock, freezing, or deleterious high temperatures throughout the entire transport route.

4.3.2.1 If cylinders are expected to be subject to unacceptable transport conditions, the cylinders should be placed under insulated conditions.

4.3.3 Compressed gas cylinder permanent marking requirements shall be in accordance with Part 178 of Title 49 CFR and shall be maintained in legible condition as required by Part 173 of Title 49 CFR. Warning labels shall be affixed to the cylinders conforming to the requirements of 82.106 of Title 40 CFR.

4.4 *Storage:*

4.4.1 Storage shall be in accordance with CGA Publication No. P-1, in qualified cylinders in accordance with Parts 173 and 178 of Title 49 CFR.



NOTE 1—Applicable to a container fill density less than or equal to 77 lb/ft³.

FIG. 1 Effect of Temperature on Storage Cylinder Pressure (Halon 1301 Mixed with Nitrogen)

4.4.2 Cylinders should be stored in areas that will protect vessels from physical and environmental damage, and tampering from unauthorized personnel.

4.4.2.1 Facilities should be constructed and oriented so that safety requirements are fulfilled for storage of pressurized cylinders.

4.4.3 Storage containers shall be fitted with pressure-release mechanisms to limit vessel pressure to not more than the minimum required test pressure of the cylinder. Safety relief valves shall be set at no less than 75 %, nor more than 100 % of the minimum required test pressure of the cylinder. Safety relief valves shall be in contact with the vapor space of the cylinder.

4.4.3.1 Periodic hydrostatic testing and reinspection of cylinders used for Halon 1301 shall comply with Part 173.34 of Title 49 CFR.

4.4.4 Containers shall be clearly marked and labeled to identify whether the Halon 1301 contained conforms to either Type I or Type II of Specification D 5632.

4.4.5 Insulation shall be placed on pallets or shoring and provisions should be made to prevent excessive shock or thermal fluctuations to cylinders.

4.4.6 Cylinders shall be stored in a manner that will prevent contamination from external sources.

4.4.6.1 If Halon 1301 in accordance with Specification D 5632 is stored in the same area as material not in accordance with the specification, storage shall be segregated or clearly identifiable as not being similar.

5. **Significance and Use**

5.1 This practice provides requirements for the handling, transportation, and storage of Halon 1301 encountered in distribution through both commercial and military channels. It is intended to ensure that Halon 1301 is handled, transported, and stored in such a way that its physical property values are not degraded. Transport may be by various means, such as, but not limited to, highway, rail, water, and air.

6. **Inspection**

6.1 Halon 1301 that has been reclaimed or recycled using

approved reclamation systems may be released for reissue, provided test examination to validate the material to specification is fulfilled.

6.1.1 Reclaimed or recycled Halon 1301 that cannot be proven to comply with Specification D 5632 shall not be reissued. The material will be processed by environmentally safe methods until conformance to product standard is achieved.

7. Keywords

7.1 Bromotrifluorometane; CF_3Br ; compressed gas; compressed liquefied gas; cylinders; explosion suppressant; fire suppressant; Halon 1301; handling; reclamation; recovery; recycling; storage; transport

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