



Designation: **D 5632 – 9501**

An American National Standard

Standard Specification for Halon 1301, Bromotrifluoromethane (CF₃Br) ¹

This standard is issued under the fixed designation D 5632; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the requirements for Halon 1301 as a fire-fighting medium.

1.2 This specification does not address the fire-fighting equipment or hardware that employs Halon 1301 or the conditions of employing such equipment (for example, handhelds, fixed installations, etc.).

1.3 This specification does not address the storage or transportation of Halon 1301. Storage, handling, and transportation issues may be addressed in future ASTM specifications. Practice D 5631.

1.4 The following safety hazards caveat pertains only to the test methods portion, Section 6, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

Specific hazards statements are given in ~~Note 1~~, 4.3.

2. Referenced Documents

2.1 ASTM Standards:

~~D 4081—Specification 5631 Practice for Drycleaning Grade Perchloroethylene Handling, Transportation, and Storage of Halon 1301, Bromotrifluoromethane (CF₃Br)²~~

¹ This specification is under the jurisdiction of ASTM Committee D-26 on Halogenated Organic Solvents and Fire Extinguishing Agents, and is the direct responsibility of Subcommittee D26.09 on Recycled Halon 1301 Fire Extinguishing Agents.

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2.2 *ISO Standards:*³

- ISO- 3363 Fluorochlorinated Hydrocarbons for Industrial Use—Determination of Acidity—Titrimetric Method
- ISO- 3427 Gaseous Halogenated Hydrocarbons (Liquified Gases)—Taking of a Sample
- ISO- 5789 Fluorinated Hydrocarbons for Industrial Use—Determination of Nonvolatile Residue

2.3 *U.S. Military Standards:*

- ~~MIL-STD-105 Sampling Industry Standard:~~⁴
- ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes
- ~~MIL-STD-129 Marking for Shipment and Storage~~⁴
- ~~MIL-STD-1188 Commercial Packaging of Supplies and Equipment~~⁴ (ANSI Approved, DoD Adopted)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *halon 1301*—~~a~~—The halogenated hydrocarbon compound Bromotrifluoromethane used as a fire extinguishing medium.

3.1.1.1 *Discussion*—The halon terminology system provides a convenient means to reference halogenated hydrocarbon fire extinguishants. Halogenated hydrocarbons are acyclic saturated hydrocarbons in which one or more of the hydrogen atoms have been replaced by atoms from the halogen series (that is, fluorine, chlorine, bromine, and iodine). By definition, the first digit of the halon numbering system represents the number of carbon atoms in the compound molecule; the second digit, the number of fluorine atoms; the third digit, the number of chlorine atoms; the fourth digit, the number of bromine atoms; and the fifth digit, the number of iodine atoms. Trailing zeros are not expressed. Unaccounted for valence requirements are assumed to be hydrogen atoms.

$$\text{number of hydrogen atoms} = [((\text{number of carbon atoms} \times 2) + 2) - (\text{sum of halogen atoms})] \quad (1)$$

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For example,

$$\text{bromotrifluoromethane} - \text{CF}_3\text{Br} - \text{Halon 1301} \quad (2)$$

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bromotrifluoromethane – CF₃Br – Halon 1301 (2)

4. Material Requirements

4.1 *Type I—Mixtures of Halon 1301 and Nitrogen:*

4.1.1 The nitrogen (N₂) partial pressure shall be such that the safe working pressure of the receiving vessel is not exceeded. To prevent excessive pressure, the fill density of the halon within a container should not exceed that needed to achieve complete filling of the container at the maximum envisaged storage temperature. For example, the U.S. DOT 4BA 500 cylinder partial pressure shall not exceed 12.1 bar at 21°C (161 psig at 70°F) for a 1121-kg/m³ (70- lb/ft³) fill density (yielding a total pressure of 25.8 bar at 21°C (360 psig at 70°F)). For this example, the safe working pressure of the 4BA500 cylinder is not exceeded for temperatures below 54°C (130°F).

4.1.2 Halon 1301 shall conform to the requirements prescribed in Table 1 when tested by the appropriate test method(s) listed in Section 6.

4.1.3 When a material analysis is required, by agreement between the purchaser and the supplier, the total pressure in the Halon 1301 container, partial pressure of the N₂, the fill density of the halon within the container, and the maximum safe storage

² Annual Book of ASTM Standards, Vol 15.05.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 100 Robbins Ave., Philadelphia, PA 19111-5904, Attn: NPODS.

TABLE 1 Requirements

Property	Requirement
Halon 1301 purity, %, mol/mol, min	99.6 (exclusive of any N ₂ present)
Acidity, ppm by mass, max	3.0
Water content, ppm by mass, max	10
Nonvolatile residue, % by weight, max	0.01
Halogen ion	passes test
Halogen ion	Passes test
suspended matter or sediment	none visible
Suspended matter or sediment	None visible

temperature shall be part of the material analysis (certification). The pressure shall be reported in bar (preferred) or pound-force per square inch gage. The fill density shall be reported in kilograms per cubic metre at 21°C (preferred) or pounds per cubic foot at 70°F. The maximum safe storage temperature of the Halon 1301 container shall be reported in degrees Celsius (preferred) or in degrees Fahrenheit and shall conform to applicable regulations for the Halon 1301 container design and use.

4.2 *Type II*—Halon 1301 shall conform to the requirements of Type I, as listed in 4.1, and shall contain no more than 1.5 % by volume fixed gases in vapor phase, expressed as air when tested by the appropriate test method(s) listed in Section 6.

4.3 By agreement between the purchaser and the supplier, analysis may be required and limits established for elements or compounds not specified in Table 1.

~~NOTE 1—Warning: Exposure to concentrations of Halon 1301 in excess of 10 %~~ 7.5 % (halon volume/air volume) during periods of elevated adrenaline could produce cardiac arrhythmia in some personnel.

4.4 Unless otherwise specified, Type I is assumed.

5. Sampling

5.1 Samples of halons shall be taken from the liquid or vapor phase as appropriate. Samples of halons, taken from the liquid phase, shall be taken from filled containers in accordance with the method specified in ISO 3427 or MIL-STD-105, ASQ Z1.4, Inspection Level S-4. The sampling bottle shall be capable of safely resisting the vapor pressure of the sample at the highest temperature that could be encountered during handling, storage, or transport.

5.2 The Halon 1301 selected in accordance with 5.1 shall be tested for quality conformance in accordance with Section 6. The presence of one or more defects shall be cause for rejection.

6. Test Methods

6.1 Purity:

6.1.1 Determine the purity by gas-liquid chromatography in accordance with the technique described in ~~6.1.2-6.1.5 or another acceptable laboratory technique providing equivalent results.~~ 6.1.2-6.1.5.

6.1.1.1 Prior to sample introduction, a standardization of the GC must be performed using a known bromotrifluoromethane purity standard. The standardization must be performed as described herein.

6.1.2 *Apparatus*—The following special apparatus is required to determine the percent of Halon 1301:

6.1.2.1 *Gas Chromatograph*, equipped with a ~~1-mV recorder~~ flame ionization detector (FID) and thermal conductance detector, an electronic integrator or suitable computer data gathering and reduction system.

6.1.2.2 *Chromatographic Column*, 7.34 m (24 ft) by 1/8-in. (3.175-mm) outside diameter thin-wall stainless steel tubing; packed with 80 Carbowax B, 60 to 100-mesh Porapak Q⁵ or equivalent. 80 mesh, containing 1 % SP1000 (also known as Carbowax 20M). (Column is available, prepacked, from several chromatographic supply vendors.)

6.1.2.3 *Gas Sampling Valve*, ~~5-mL volume or a volume sufficient~~ Sample Introduction—Take sample from liquid phase and flash into evacuated 125-cc gas dispersion tube equipped with side outlet tube and septum. Bring gas dispersion tube to ~~achieve proper separation in the specified column.~~ 1 atmosphere pressure. Using standard gas tight syringe take 1/4 to 1/2 cc sample from gas dispersion tube and introduce into GC.

6.1.3 *Reagents*—The carrier gas shall be a ~~commercial chromatographic grade of helium.~~ The column Column packing shall consist of a standard solution, for example, 20 % (weight/weight) practical hexadecane, 1 % SP1000 (Carbowax 20M) weight/weight on 80 Carbowax B, 60 to 100-mesh Porapak Q⁵ or equivalent. 80 mesh.

6.1.4 *Procedure for Programmed Temperature Gas Chromatography (PTGC):*

6.1.4.1 Install the column in the gas chromatograph and adjust the temperature of the column oven to 80°C, injection port to 160°C, and detector block to 100 to 110°C. The temperature should be programmed to rise 10 to 15°C/min, to a maximum of 180°C:

6.1.4.2 Adjust 40°C. Adjust the helium carrier gas flow rate to 20 mL/min.

6.1.4.3 Adjust the detector voltage 30 cc per minute. Adjust injection port temperature to 8 V or to the mid-range of the thermal conductivity detector (TCD) instrument being used 200°C and allow the instrument detector to stabilize.

6.1.4.4 Take 250°C. Inject the sample from the liquid phase (inverted cylinder). Flush the sample loop and sample valve hold the column oven at 40°C for approximately 30 s before sampling.

6.1.4.5 Rotate six minutes, then program the gas sampling valve temperature to transfer the sample into the chromatographic system and note the time.

6.1.4.6 Close the sample cylinder valve.

6.1.4.7 Allow the sample rise 10°C per minute to elute, for approximately 18 min, attenuating as necessary to make the peak heights a convenient size. Under proper instrument settings, the Halon 1301 should elute after approximately 5 min. maximum of 180°C, then posthold for 10 min before recycling.

6.1.5 *Calculation:*

⁵ Available from Alltech, 2051 Waukegan Matheson Co., 430-T Caredean Road, Deerfield, IL 60015; Horsham, PA 19044. Phone T-800-255-8325; 215-674-0686.

6.1.5.1 Calculate weight percent and convert to mole percent Halon 1301 as follows:

$$\% \text{ CF}_3\text{Br} = \frac{A(\text{CF}_3\text{Br})}{A_s} \times 100 \quad (3)$$

$$W_i = \frac{A_i \times RRF_i \times 100}{\sum [A_i \times RRF_i]} \quad (3)$$

RRFi

where:

$A(\text{CF}_3\text{Br}) W_i$ = areaweight percent of monobromotrifluoromethane peak multiplied by recorder range setting, and component
 i

A_{si} = sumpeak area of the relative component i

RRF_i = Relative Response Factor for component i

$\sum [A_i \times RRF_i]$ = sum of all component peak heights excluding the nitrogen (air) peak height, areas times their respective relative response factors.

6.1.5.2 Percent nitrogen may

6.1.5.2 For ASTM specification, the results must be converted to and reported in mole percentages. Convert individual impurities from Wt % to Mole % as follows:

$$\% \text{ N}_2 = A_n A_s + A_n \times 100 \quad (4)$$

$$\text{Mole } \%_i = \frac{Wt \% \times 148.9}{M} \quad (4)$$

149.8

where:

$A_{nWt \%}$ = areaweight percent of nitrogen peak multiplied by the recorder range setting, and component i

149.8 = Molecular weight of Halon 1301

$A_s + A_n M$ = sumMolecular weight of the relative peak heights including the nitrogen peak, component i

It is useful to calculate percent nitrogen in order to judge a safe fill density. Percent Halon 1301 below that specified in Table 1 shall constitute failure of this test method.

6.2 Methanol Impurity—The methanol impurity may be determined using capillary column programmed temperature gas chromatography. The column is 105 meter DB-1701 \times 0.25 mm inside diameter. The presence of methanol may cause inaccurate indication of other contaminants such as R115 and R22, possibly causing artificial enhancement of the R115/R22 contaminant peaks when present.

6.3 Acidity—From the Halon 1301 liquid phase, vaporize a large sample in the presence of distilled water. Determine the acidity of the solution by the appropriate method specified in ISO 3363, titration in accordance with 6.23.1.2-6.23.2.3, using a pH indicator; or another acceptable laboratory technique providing equivalent results.

6.23.1 Sodium Hydroxide Titration:

6.23.1.1 Reagents:

(1) Sodium Hydroxide, 0.01 N Hydroxide, 0.01 N solution, standardized against reagent grade potassium acid phthalate.

(2) Methyl Red Indicator, 0.1 % solution.

6.23.1.2 Procedure—Place 10—Measure (graduate) 50 mL of a crushed ice-distilled ice-cold distilled water slurry (stored in a 34°F refrigerator) in a 250-mL stoppered Erlenmeyer flask. Sparge 50g of bromotrifluoromethane into the cold water. Swirl the flask and gently during the addition or, alternatively, add 50 g of monobromotrifluoromethane to a magnetic stirring bar and stir the slurry. Place solution during the stopper in addition. Following the flask loosely, sample addition, pipet 5.0 mL of the water solution into a small glass vial, cap, and swirl save for the flask gently from time to time until Halogen ion test, 6.5. To the ice is melted completely. Add 1 drop remaining water in the flask, add two drops of methyl red indicator, swirl, and if a reddish color remains, titrate to a yellow end point with 0.01-N normal sodium hydroxide solution: (NaOH). Run a crushed ice-distilled water blank (with no (no Halon 1301) along with by titrating 45 mL of the sample.

6.2.1.3 cold DI water.

6.3.1.3 Calculation—Calculate parts per million acid halides, as HBr, as follows:

$$\text{acid halides, ppm} = (A - B) \times N \text{ NaOH} \times 0.0809 \times 10^6 \text{ weight of sample, g} \quad (5)$$

$$\text{acid halides, ppm} = \frac{(A - B) \times N \times 80.9 \times 10^3}{\text{grams of sample} \times 0.9} \quad (5)$$

where:

A = mL of NaOH for sample, mL, and sample,

B = mL of NaOH for blank,

- N = normality of the NaOH titrant
- $NaOH$ = sodium hydroxide
- 80.9×10^3 = equivalent weight of HBr (hydrogen bromide)
- 10^3 = Factor to convert result to ppm

Acid halides in excess of the amount specified in Table 1 shall constitute test failure ~~of by this method.~~ Should no acidity be detected (that is, no color change of the indicator is observed), report result as “passes test.”

6.23.2 *Acidity by Universal Indicator:*

6.23.2.1 *Apparatus:*

(1) *Fritted Glass Sparger*, of coarse porosity, contained in a 100-mL glass scrubbing bottle provided with inlet and outlet tubes.

(2) *Neoprene Connecting Tubing*.

(3) *Wet Test Meter*, 0.1 ft³ revolutions.

(4) *Needle Valve Control*, No. 55-660, Matheson Co⁵., or equivalent.

6.23.2.2 *Reagent Universal Indicator*,⁶ with color chart, or equivalent.

6.23.2.3 *Procedure*—Prepare neutralized distilled water by adding 0.4-mL ml of ~~U~~ universal-I indicator solution to 100-mL ml of distilled water; and titrate to a pH of 7.0 with 0.01 N sodium hydroxide (if acidic) or with 0.01N HCl (if alkali) solution until the water shows reads a pH of 7.0 when compared to the ~~U~~ universal-C color-C chart. Add 50-mL ml of the neutralized water to the glass scrubbing bottle fitted with the glass-gas sparger. Attach a needle valve control to the sample cylinder, and connect the cylinder, inverted, to an empty safety trap. Connect the safety trap outlet to the scrubbing bottle inlet. Connect the scrubbing bottle outlet to the inlet of the wet test meter. Open the needle valve slowly and pass 20-L litres (66 gm) of sample through the scrubber at a flow rate of approximately 500 mL/min. Turn off the needle valve and disconnect the sample cylinder from the scrubbing bottle. ~~¶~~ Also transfer 10 to 12 mL ml of the water solution to a clean test tube: small glass vial, cap, and save for the Halogen Ion test, 6.5. Add 0.3-mL ml of ~~U~~ universal-I indicator solution and swirl. Read the pH of the solution by comparison with the ~~U~~ universal-C color-C chart. Report the pH reading. No observable change in pH indicates an acidity of less than 3-0_3 ppm.

6.3 *Water Content*—Test Halon 1301 for water content. The analysis may be conducted by the phosphorus pentoxide method, infrared absorption, electrolytic moisture analysis, piezoelectric analyzer, or another acceptable laboratory technique. The accuracy of the results and the standard method shall be by orthodox Karl Fischer method. Water content greater than specified in Table 1 shall constitute failure of this test.

6.4 *Water Content*—Moisture determination shall be performed by Coulometric Karl Fischer titration or suitable alternative methodology. Water content greater than specified in Table 1 shall constitute failure of this test.

6.5 *Qualitative Test for Halogen Ion*—Test a sample for the presence of halogen ions in accordance with 6.4.1-6.4.3 6.5.1-6.5.4 or by another acceptable laboratory technique providing equivalent results. Generally, a sample treated with an alcoholic solution of silver nitrate shall exhibit no turbidity or precipitation of silver halide.

6.4.1 *Apparatus:*

6.4.1.1 *Fritted Glass Gas Sparger*, of coarse or A porosity, contained in a 100-mL glass scrubbing bottle provided with inlet and outlet tubes:

6.4.1.2 *Neoprene Tubing*.

6.4.1.3 *Wet Test Meter*, 0 to 1 ft³/revolutions.

6.4.1.4 *Needle Valve Control*, No. 55-660, Matheson Co.,⁶ or equivalent.

6.4.2—

6.5.1 *Reagents:*

6.4.2.1 *Methyl Alcohol*, absolute.

6.4.2.2 *Silver*

6.5.2 *3M silver Nitrate, saturated solution*—Dissolve 5.1 g of anhydrous silver nitrate in methyl alcohol.

6.4.3—DI water to give a total volume of 10.0 mL. Store in a brown glass bottle away from light.

6.5.3 *Nitric Acid*, 1:1 v/v in water:

6.5.4 *Procedure*—Add 10 mL of methyl alcohol into—To the water scrubber assembly and solution saved during the acidity test (from 6.3.2.3), add 1 drop of 1:1 HNO₃, swirl to mix. Then add 3 to 4 drops of saturated alcoholic 3M silver nitrate solution. Attach a needle valve control to the sample cylinder. Connect the sample cylinder in the upright position to an empty safety trap with neoprene tubing. connect the outlet of the safety trap to the inlet of the scrubbing bottle assembly with neoprene tubing. Connect the outlet of the scrubbing bottle assembly to the inlet of the wet test meter. Open the needle valve slowly solution and pass approximately 2 L of sample through the scrubber at a flow rate of approximately 100 mL/min. Turn off the needle valve and disconnect the scrubber assembly from the sample cylinder and the wet test meter. Examine the contents of the scrubber visually for the presence of turbidity. Report the halide present if any turbidity develops: swirl to mix. The appearance of any turbidity shall constitute failure of this test.

⁶ Available from Matheson Fisher Scientific Co., 430-T Caredean Road, Horsham, Mid-Atlantic Region, 585 A Drive, Pittsburgh, PA 19044; 15238. Phone 215-674-0686; 1-800-766-7000.

NOTE 2—The approximate ratio of methyl alcohol to monobromotrifluoromethane must be maintained. An excess of sample will cause the silver nitrate to precipitate, yielding a false turbidity reading as halide.

6.5 Suspended Matter and Sediment—Examine visually for any suspended matter haze or sediment. Observation of any suspended matter or sediment turbidity shall constitute failure of this test.

6.6 Nonvolatile Residue—Determine the nonvolatile residue in accordance with the method specified in ISO 5789 or another accepted laboratory technique providing equivalent results.

6.7 Suspended Matter and Sediment—During the Halon 1301 evaporation step of the nonvolatile residue test (see 6.6), examine visually for any suspended matter or sediment. Observation of any suspended matter or sediment shall constitute failure of this test.

6.8 Fixed or Nonabsorbable Gases (NAG) in the Vapor Phase—Test Halon 1301 for air in the vapor phase by the determination of gases not absorbable in perchloroethylene, by using isothermal gas chromatography; or another accepted laboratory technique providing equivalent results.

6.7.1 Perchloroethylene Absorption—Halon 1301 may be tested for air in the vapor phase

6.8.1 Prior to sample introduction, calibration of the container by the determination of gases not absorbable in perchloroethylene GC using water as a sealant. The test may be conducted by the determination of gases not absorbable 15 % air or nitrogen calibration standard in perchloroethylene using mercury helium must be performed as a sealant or by the described for determination of gases remaining when the extinguishant is frozen. The determination of gases not absorbable NAG in perchloroethylene using water as a sealant shall Halon 1301 sample.

6.8.1.1 Percent NAG may be the standard:

6.7.1.1 Apparatus:

(1) calculated using isothermal gas chromatography as follows:

$$RF = N_1/A_1 \tag{6}$$

$$C_2 = A_2 \times RF$$

Absorption Vessel, Lab Glass Co., No. LG-11119,⁷ or equivalent.

$$C_1 = \frac{C_2 \times P_2 \times 2.397}{T_2 (\text{°R})} \tag{7}$$

(2) Leveling Bulb and Connecting Tubing.

(3) Perchloroethylene Reagent—Solvent quality in accordance with Specification D 4081.

(4) Silicone Solution—One part Organo Silane Ester A-1230 or Amino Silane A-1106,⁷ or equivalent,

where:

RF = Response factor for NAG

N₁ = Volume % nitrogen in 100 parts standard

A₁ = Peak area of water

6.7.1.2 Procedure—Wash the absorption vessel thoroughly and rinse nitrogen determination

A₂ = Peak area of NAG in distilled water. Coat the inside with the silicone solution, let stand 5 min, and discard the solution. Rinse again with distilled water and dry at 212°F for 10 min. When cool, add 20 mL sample

C₁ = NAG volume % @ 75°F

C₂ = NAG volume % @ sampling temperature

P₂ = Vapor pressure in psia of distilled water and fill with perchloroethylene. Add sufficient water to bromotrifluoromethane at the leveling bulb to give a water seal. Collect a 100-mL sample at the sampling temperature in degrees F

T₂ = Sampling temperature in degrees Rankine (°R)

2.397 = Pressure/temp ratio for CF₃ sample from the vapor space of the Halon 1301 cylinder directly into the absorption vessel. A slight positive pressure at 75°F

It is needed useful to prevent entry of extraneous air. Tilt the vessel calculate percent nitrogen (air) in such a way as order to remove all the water lock judge a safe fill density. Percent NAG in Halon 1301 above that specified in Table 1 shall constitute failure of this test method.

NOTE 1—The 1.5 % NAG limit is for Type II material only.

6.8.1.2 Gas chromatograph, equipped with a thermal conductivity detector (TCD) and an integrator, 1-mV recorder, or other output recording device.

6.8.1.3 Chromatographic Column, 2 m (6 ft) by 1/8 in. (3.175-mm) outside diameter thin-wall stainless steel tubing packed with Porapak Q, 80 to 100 mesh, or equivalent. (Column is available prepacked from the gas. Allow the perchloroethylene several chromatographic supply vendors).

6.8.1.4 Reagents—The carrier gas shall be a chromatographic grade of helium. Column packing shall consist of Porapak Q, 80 to flow into 100 mesh, or equivalent.

6.8.1.5 Install the upper chamber of column in the vessel gas chromatograph and gently agitate to aid in adjust the absorption temperature of the gas. Return the vessel column oven to an upright position 100°C (isothermal analysis), injection port to 100°C, and allow the water layer detector block to flow back into 125°C.

~~6.8.1.6 Adjust the burette section. Adjust the leveling bulb so that the liquid layers are at the same level. Read percent nonabsorbable carrier gas from the burette.~~

~~6.7.1.3 Calculation—Make a blank run flow rate to 30 cc helium/min.~~

~~6.8.1.7 Use autoinjection method with a 1cc loop. The sample is taken from the liquid gas phase of the cylinder and subtract the result from the analysis of the vapor phase. The presence of air in the vapor phase in excess of 1.5 % by volume shall constitute failure of this test.~~

~~6.7.2 Gas Chromatography—Halon 1301 may be tested for the concentration of air in the vapor phase by gas chromatography. A concentration of air in excess of 1.5 % by volume shall constitute failure of this test. container.~~

7. Container, Packaging, and Package Marking

7.1 Containers used for shipping and storage of Halon 1301 conforming to this specification shall be marked in accordance with MIL-STD-129 or MIL-STD-1188, whichever Code of Federal Regulations (CFR) Title 49, Part 172 Subpart D “Marking Requirements of Packaging for Transportation”. The proper shipping name for ASTM D 5632 Type II (pure) Halon 1301 is “Liquefied Gas, n.o.s.” UN 1009 (49 CFR 172.101). The proper shipping name for nitrogen superpressurized Halon 1301 is “Liquefied Gas, nonflammable charged with nitrogen”, UN1058 (49 CFR 172.101). In addition to DOT requirements, containers must be marked with the following information as a minimum:

7.1.1 Supplier’s name and address,

7.1.2 Halon 1301,

7.1.3 Statement that material conforms to Specification D 5632, and

7.1.4 For storage or transportation within the United States, a warning label shall be affixed to the container conforming with United States Environmental Protection Agency requirements, in accordance with Section 611 of the Clean Air Act, as amended.

8. Keywords

8.1 bromotrifluoromethane; CF₃Br; fire fighting; firefighting agent; fire protection; fire suppressant; fluorohalobrominated hydrocarbon; Halon 1301

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