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Standard Specification for HFC-125 (Pentafluoroethane, C_2HF_5)[1]

This standard is issued under the fixed designation D6231; 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 HFC-125 as a fire–fighting medium.

1.2 This specification does not address the fire–fighting equipment or hardware that employs HFC-125 or the conditions of employing such equipment, for example, hand helds, fixed installations, etc.

1.3 This specification does not address the storage or transportation of HFC-125. Storage, handling, and transportation issues are addressed in Practice ~~D~~ D6268~~6268.~~

~~1.4.~~

1.4 The values stated in both inch-pound and SI units are to be regarded separately as the standard. The values given in parentheses are for information only.

1.5 The following safety hazards caveat pertains 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 4.3.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D6268 Practice for Handling, Transportation, and Storage of HFC-125, Pentafluoroethane (C_2HF_5~~)~~)

D6806 Practice for Analysis of Halogenated Organic Solvents and Their Admixtures by Gas Chromatography

2.2 *ISO Standards:*

~~ISO 3363Fluorinated Hydrocarbons for Industrial Use – Determination of Acidity – Titration Method~~

ISO 3427~~Gaseous Halogenated Hydrocarbons (Liquefied Gases) – Taking a Sample~~[3]

~~ISO 5789Fluorinated Hydrocarbons for Industrial Use – Determination of Nonvolatile Residue~~[3] Gaseous Halogenated Hydrocarbons (Liquefied Gases) – Taking a Sample[3]

2.3 ~~*CGA Standards:*~~

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

~~No. P-1Safe Handling of Compressed Gases in Containers~~[4] ARI Standards:

2008 Appendix C Analytical Procedures for ARI Standard 700-2006[4]

2.4 ~~*U.S. Governmental Standards:*~~ *U.S. Government Standards:*

Code of Federal Regulations (CFR) Title 49, Part 172.101, Tables of Hazardous Materials and Special Provisions[5]

~~Code of Federal Regulations (CFR) Title 49, Parts 173.302 and 173.304, Preparation and Packaging of Gases~~[5]

Code of Federal Regulations (CFR) Title 49, Part 172 Subpart D, Marking Requirements of Packaging for Transportation[5]

2.5 *American Society of Refrigeration Engineers:*

ASRE Standard 34, Designation of Refrigerants[6]

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[1] This specification is under the jurisdiction of ASTM Committee D26 on Halogenated Organic Solvents and Fire Extinguishing Agents and is the direct responsibility of Subcommittee D26.09 ~~on Halogenated Fire Extinguishants.~~

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

~~[4] Available from the Compressed Gas Association.~~

[4] Available from the Air Conditioning, Heating and Refrigeration Institute, 4100 North Fairfax Drive, Suite 200, Arlington, VA, 22203-1678.

[5] Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20036.

[6] Available from American Society of Refrigeration Engineers, *Refrigeration Engineering 65*, 49 (1957).

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3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *halogenated hydrocarbon*, *n*—the halogenated compound coding terminology system provides a convenient means to reference halogenated hydrocarbons (see ASRE 34). Halogenated hydrocarbons are saturated hydrocarbons in which one or more of the hydrogen atoms have been replaced by atoms of the halogen series: fluorine, chlorine, bromine, and iodine. It is convention to prefix the number with an abbreviation of the compound:

CFC = chlorofluorocarbon
HCFC = hydrochlorofluorocarbon
HFC = hydrofluorocarbon
FC = fluorocarbon
R = refrigerant

3.1.1.1 *Discussion*—By definition, the right–most digit of the numbering system is the number of fluorine atoms. The second digit from the right is the number of hydrogen atoms plus one (+1). The third digit from the right is one less (-1) than number of carbon atoms in the compound (when this number is zero (0) it is omitted from the number). Unaccounted for valance requirements are assumed to be chlorine atoms. When the compound contains bromine or iodine, the same rules apply except the letter "B" for bromine or "I" for iodine follows the parent compound designated number and the number of the atoms is placed after the letter.

$$\text{Example: } C_2HF_5 = R-125 = HFC-125 \quad (1)$$

3.1.2 *HFC-125*, *n*—the compound pentafluoroethane; C_2HF_5.

4. Material Requirements

4.1 *Type I*:

4.1.1 The nitrogen (N_2) 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 HFC-125/nitrogen within the container should not exceed that needed to achieve complete filling of the container at the maximum expected storage temperature. For example, the U.S. DOT 4BA500 cylinder partial pressure shall not exceed 24.8 bar at 21° C (360 psig at 70 °F) for a 833 kg/m^3(52 lb/ft^3) fill density. For this example, the safe working pressure of the 4BA500 cylinder is not exceeded for temperatures below 54 °C (130 °F).

4.1.2 HFC-125 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 material analysis is required, by agreement between the purchaser and the supplier, the total pressure in the HFC-125 container, partial pressure of the nitrogen, the fill density of the HFC-125 within the container, and the maximum safe storage temperature shall be part of the material analysis (certification). The pressure shall be reported in bar (preferred) or pound-force/in.^{2} gage (psig). The fill density shall be reported in kg/m^3 at 21°C (preferred) or lb/ft^3 at 70 °F. The maximum safe storage temperature of the HFC-125 shall be reported in °C (preferred) or in °F and shall conform to the applicable regulations for the HFC-125 container design and use.

4.2 *Type II*—HFC-125 shall conform to the requirements of Type I as listed in 4.1 and shall contain no more than 1.5 % by volume ~~fixed~~non-absorbable gases in the 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. (**Warning**—Exposure to concentrations of HFC-125 in excess of 10 % by volume in air 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 HFC-125 taken from the liquid phase, shall be taken from filled containers in accordance with the method specified in ISO 3427. The sampling bottle shall be capable of safely resisting the vapor pressure of the sample at the highest temperature that could be encountered.

5.2 The HFC-125 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.

TABLE 1 Requirements

Property	Requirement
HFC-125 purity, mol/mol, min, %	99.0
Acidity, ppm by mass, as HCl, max	3.0
Water content, ppm by mass, max	10
Nonvolatile residue, max, % by weight	0.08
Suspended matter or sediment	none visible