



Designation: ~~D6126/D6126M—11 (Reapproved 2015)~~ D6126/D6126M – 21

## Standard Specification for HFC-23 (Trifluoromethane, CHF<sub>3</sub>)<sup>1</sup>

This standard is issued under the fixed designation D6126/D6126M; 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-23 as a fire fighting medium.

1.2 This specification does not address the fire fighting equipment or hardware that employs HFC-23 or the conditions of employing such equipment (for example: handshields, fixed installations, etc.).

1.3 This specification does not address the storage or transportation of HFC-23. Storage handling, and transportation issues are addressed in Practice [D6127](#).

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[D6127 Practice for Handling, Transportation, and Storage of HFC-23 \(Trifluoromethane, CHF<sub>3</sub>\)](#)

[D6806 Practice for Analysis of Halogenated Organic Solvents and Their Admixtures by Gas Chromatography](#)

2.2 *ISO-U.S. Government Standards:*<sup>3</sup>

[ISO 3427:1999 CFR Part 172 Gaseous Halogenated Hydrocarbons \(Liquefied Gases\)—Taking a Sample](#) [Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans](#)

[49 CFR Part 172.101 Purpose and Use of Hazardous Materials Table](#)

<sup>1</sup> 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 Fire Extinguishing Agents.

Current edition approved June 1, 2021. Published June 2021. Originally approved in 1997. Last previous edition approved in 2015 as D6126/D6126M-11ε-(2015). DOI: 10.1520/D6126-D6126M-11R15.10.1520/D6126\_D6126M-21.

<sup>2</sup> 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.



2.3 ~~AHRI Standards: Standard:~~<sup>4</sup>

2008 Appendix C for Analytical Procedures for ~~ARI~~AHRI Standard 700-2006700-2014

2.4 ~~U.S. Government Standards:~~<sup>5</sup>

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

~~Code of Federal Regulations (CFR) Title 49, Part 172 Sub D Marking Requirements of Packaging for Transportation~~

2.4 ~~American Society of Refrigerating Engineers~~ASHRAE Standard:<sup>5</sup>

ASREASHRAE Standard 34,34 Designation and Safety Classification of Refrigerants

### 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 ~~halogenated hydrocarbon—hydrocarbon, n—the~~ halogenated compound coding terminology system provides a convenient means to reference halogenated hydrocarbons (see ASHRAE Standard 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
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3.1.1.1 *Discussion—*

By definitions, the right most digit of the numbering system is the number of fluorine atoms.

3.1.1.2 *Discussion—*

The second digit from the right is the number of hydrogen atoms plus one (+1).

3.1.1.3 *Discussion—*

The third digit from the right is one less ( $\pm$ )(-1) than number of carbon atoms in the compound (when this number is zero (0) it is omitted from the number.

3.1.1.4 *Discussion—*

Unaccounted for valance requirements are assumed to be chlorine atoms.

3.1.1.5 *Discussion—*

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.

3.1.1.6 *Discussion—*

*Example—*CHF<sub>3</sub> = R-23 = HFC-23.

3.1.2 ~~HFC-23—HFC-23, n—the~~ compound trifluoromethane; CHF<sub>3</sub>.

### 4. Material Requirements

4.1 Nitrogen (N<sub>2</sub>) partial pressure is not required for this product, it is shipped neat. The saturated vapor pressure of HFC-23 is

<sup>4</sup> Available from Air Conditioning, Heating & Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2442311 Wilson Blvd., Suite 500,400, Arlington, VA 22201, <http://www.ahrinet.org>.

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>. Code of Federal Regulations (CFR) documents are available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, <http://www.gpo.gov>.

<sup>5</sup> Available from U.S. Government Publishing Office, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.gpo.gov>. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329, <http://www.ashrae.org>.

42 bars at  $21^{\circ}\text{C}$   $21^{\circ}\text{C}$  [610 psig at  $70^{\circ}\text{F}$ ]. HFC-23 has a critical temperature of  $25.9^{\circ}\text{C}$  [ $78.6^{\circ}\text{F}$ ]. The filling density should be that which will not liquid fill the container at temperatures below  $25.9^{\circ}\text{C}$  [ $78.6^{\circ}\text{F}$ ] or exceed 5/4 the pressure rating of the container at  $130^{\circ}\text{F}$ . For example, the U.S. Department of Transportation (DOT) 3AL cylinder with a minimum working pressure of 1800 psig shall not exceed 42 bar at  $21^{\circ}\text{C}$  [610 psig at  $70^{\circ}\text{F}$ ] for a maximum filling density of 84.4 %. For this example the cylinder pressure is 141 bars at  $54^{\circ}\text{C}$  [2045 psig at  $130^{\circ}\text{F}$ ].

4.1.1 HFC-23 shall conform to the requirements prescribed in **Table 1** when tested by the appropriate test method(s) listed in Section 6.

4.1.2 When material analysis is required, by agreement between the purchaser and the supplier, the total pressure in the HFC-23 container, the fill density of the HFC-23 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 per square inch gage (psig). The fill density shall be reported in kilograms per cubic metre at  $21^{\circ}\text{C}$  (preferred) or pounds per cubic foot at  $70^{\circ}\text{F}$ . The maximum safe storage temperature of the HFC-23 shall be reported in degrees Celsius (preferred) or in degrees Fahrenheit and shall conform to the applicable regulations for the HFC-23 container design and use.

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

4.3 *Product Requirements*—See **Table 1**.

## 5. Sampling

5.1 Samples of HFC-23 shall be taken from the liquid phase, shall be taken from filled containers in accordance with the method specified in ISO 3427, phase in a closed system as described in 2008 Appendix C to AHRI Standard 700-2014, Part 7. 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-23 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*—Determine purity using the method specified in Conduct the analysis in accordance with Practice **D6806**, or in accordance with 2008 Appendix C to AHRI Standard 700-2014, Part 7.

6.2 *Acidity*—Determine acidity using the method specified in 2008 Appendix C to ARI Standard 700-2006, part 1.

6.2 *Water Content*—*Acidity*—Determine water content using the Conduct the analysis in accordance with the method specified in 2008 Appendix C to ARI Standard 700-2006, part 2. AHRI Standard 700-2014, Part 1.

6.3 *Nonvolatile Residue*—*Water Content*—Determine nonvolatile residue using the Conduct the analysis in accordance with the method specified in 2008 Appendix C to ARI Standard 700-2006, part 3. AHRI Standard 700-2014, Part 2.

6.4 *Non-absorbable Gases*—*Nonvolatile Residue*—Determine non-absorbable gases using the Conduct the analysis in accordance with the method specified in 2008 Appendix C to ARI Standard 700-2006, part 5. AHRI Standard 700-2014, Part 3.

**TABLE 1 Requirements**

Property	Requirement
HFC-23 purity, %, mol/mol, max	99.0
Acidity, ppm by mass, as HCl, max	3.0
Water content, ppm by mass, max	10
Nonvolatile residue, % by weight, max	0.08
Suspended matter or sediment	none visible