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Gaseous fire-extinguishing systems -- Physical properties and system design -- Part 11: HFC 236fa extinguishant

Systèmes d'extinction d'incendie utilisant des agents gazeux -- Propriétés physiques et conception des systèmes -- Partie 11: Agent extincteur HFC 236fa

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INTERNATIONAL STANDARD

ISO 14520-11

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Gaseous fire-extinguishing systems — Physical properties and system design —

Part 11: HFC 236fa extinguishant

Systèmes d'extinction d'incendie utilisant des agents gazeux — Propriétés physiques et conception des systèmes

Partie 11: Agent extincteur HFC 236fa

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14520-11 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 8, *Gaseous media and firefighting systems using gas*.

This second edition cancels and replaces the first edition (ISO 14520-11:2000), which has been technically revised.

ISO 14520 consists of the following parts, under the general title *Gaseous fire-extinguishing systems — Physical properties and system design*:

— *Part 1: General requirements*

— *Part 2: CF_3I extinguishant*

— *Part 5: FK-5-1-12 extinguishant*

— *Part 6: HCFC Blend A extinguishant*

— *Part 8: HFC 125 extinguishant*

— *Part 9: HFC 227ea extinguishant*

— *Part 10: HFC 23 extinguishant*

— *Part 11: HFC 236fa extinguishant*

— *Part 12: IG-01 extinguishant*

— *Part 13: IG-100 extinguishant*

— *Part 14: IG-55 extinguishant*

— *Part 15: IG-541 extinguishant*

Parts 3, 4 and 7, which dealt with FC-2-1-8, FC-3-1-10 and HCFC 124 extinguishants, respectively, have been withdrawn, as these types are no longer manufactured.

Gaseous fire-extinguishing systems — Physical properties and system design —

Part 11:
HFC 236fa extinguishant

1 Scope

This part of ISO 14520 gives specific requirements for gaseous fire-extinguishing systems, with respect to the HFC 236fa extinguishant. It includes details of physical properties, specification, usage and safety aspects and is applicable to systems operating at nominal pressures of 25 bar and 42 bar superpressurized with nitrogen. This does not preclude the use of other systems.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14520-1:—[1)], *Gaseous fire-extinguishing systems — Physical properties and system design — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14520-1 apply.

4 Characteristics and uses

4.1 General

Extinguishant HFC 236fa shall comply with the specification according to Table 1.

HFC 236fa is a colourless, almost odourless, electrically non-conductive gas with a density approximately five times that of air.

The physical properties are given in Table 2.

HFC 236fa extinguishes fires mainly by physical means, but also by some chemical means.

1) To be published. (Revision of ISO 14520-1:2000)

Table 1 — Specification for HFC 236fa

Property	Requirement
Purity	99,6 % (mol/mol), min.
Acidity	3×10^{-6} by mass, max.
Water content	10×10^{-6} by mass, max.
Non-volatile residue	0,01 % by mass, max.
Suspended matter or sediment	None visible

Table 2 — Physical properties of HFC 236fa

Property	Unit	Value
Molecular mass	—	152
Boiling point at 1,013 bar (absolute) [a]	°C	–1,4
Freezing point	°C	–103
Critical temperature	°C	124,9
Critical pressure	bar abs [a]	32,00
Critical volume	cm^3/mol	274,0
Critical density	kg/m^3	551,3
Vapour pressure 20 °C	bar abs [a]	2,296
Liquid density 20 °C	kg/m^3	1 377
Saturated vapour density 20 °C	kg/m^3	15,58
Specific volume of superheated vapour at 1,013 bar and 20 °C	m^3/kg	0,1529
Chemical formula	$CHF_3CH_2CF_3$	
Chemical name	Hexafluoropropane	

[a] 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

4.2 Use of HFC 236fa systems

HFC 236fa total flooding systems may be used for extinguishing fires of all classes within the limits specified in ISO 14520-1:— [2], Clause 4.

The extinguishant requirements per volume of protected space are given in Table 3 for various levels of concentration. These are based on methods given in ISO 14520-1— [2], 7.6.

The extinguishing concentrations and design concentrations for various types of hazard are given in Table 4, and concentrations for other fuels in Table 5.

2) To be published. (Revision of ISO 14520-1:2000)

Table 3 — HFC 236fa total flooding quantity

Temperature T	**Specific vapour volume** S	**HFC 236fa mass requirements per unit volume of protected space**, m/V (kg/m^3) This information refers only to HFC 236fa, and may not represent any other products containing 1,1,1,3,3,3-hexafluoropropane as a component.										
		Design concentration (by volume)										
°C	m^3/kg	5 %	6 %	7 %	8 %	9 %	10 %	11 %	12 %	13 %	14 %	15 %
0	0,1413	0,3725	0,4517	0,5327	0,6154	0,6999	0,7863	0,8747	0,9651	1,0575	1,1521	1,2489
5	0,1442	0,3650	0,4427	0,5220	0,6031	0,6860	0,7706	0,8572	0,9458	1,0364	1,1291	1,2240
10	0,1471	0,3579	0,4340	0,5118	0,5913	0,6725	0,7555	0,8404	0,9273	1,0161	1,1070	1,2000
15	0,1499	0,3510	0,4257	0,5020	0,5799	0,6596	0,7410	0,8243	0,9095	0,9966	1,0857	1,1769
20	0,1528	0,3444	0,4177	0,4925	0,5690	0,6472	0,7271	0,8088	0,8923	0,9778	1,0652	1,1548
25	0,1557	0,3380	0,4100	0,4834	0,5585	0,6352	0,7136	0,7938	0,8758	0,9597	1,0455	1,1334
30	0,1586	0,3319	0,4025	0,4746	0,5483	0,6237	0,7007	0,7794	0,8599	0,9423	1,0266	1,1128
35	0,1615	0,3260	0,3953	0,4662	0,5386	0,6125	0,6882	0,7655	0,8446	0,9255	1,0082	1,0930
40	0,1643	0,3203	0,3884	0,4580	0,5291	0,6018	0,6761	0,7521	0,8298	0,9092	0,9906	1,0738
45	0,1672	0,3147	0,3817	0,4501	0,5200	0,5914	0,6645	0,7391	0,8155	0,8936	0,9735	1,0553
50	0,1701	0,3094	0,3752	0,4425	0,5112	0,5814	0,6532	0,7266	0,8017	0,8785	0,9570	1,0375
55	0,1730	0,3043	0,3690	0,4351	0,5027	0,5717	0,6423	0,7145	0,7883	0,8638	0,9411	1,0202
60	0,1759	0,2993	0,3630	0,4280	0,4945	0,5624	0,6318	0,7028	0,7754	0,8497	0,9257	1,0035
65	0,1787	0,2945	0,3571	0,4211	0,4865	0,5533	0,6216	0,6915	0,7629	0,8360	0,9108	0,9873
70	0,1816	0,2898	0,3514	0,4144	0,4788	0,5445	0,6118	0,6805	0,7508	0,8227	0,8963	0,9716
75	0,1845	0,2853	0,3460	0,4080	0,4713	0,5360	0,6022	0,6699	0,7391	0,8099	0,8823	0,9565
80	0,1874	0,2809	0,3406	0,4017	0,4641	0,5278	0,5930	0,6596	0,7277	0,7974	0,8688	0,9418
85	0,1903	0,2766	0,3355	0,3956	0,4570	0,5198	0,5840	0,6496	0,7167	0,7854	0,8556	0,9275
90	0,1931	0,2725	0,3305	0,3897	0,4502	0,5121	0,5753	0,6399	0,7060	0,7737	0,8429	0,9137
95	0,1960	0,2685	0,3256	0,3840	0,4436	0,5045	0,5668	0,6305	0,6957	0,7623	0,8305	0,9003

m/V is the agent mass requirement (in kilograms per cubic metre); i.e. mass, m, in kilograms of agent required per cubic metre of protected volume V to produce the indicated concentration at the temperature specified;

V is the net volume of hazard (in cubic metres); i.e. the enclosed volume minus the fixed structures impervious to extinguishant

$$m = \left(\frac{c}{100 - c}\right)\frac{V}{S}$$

T is the temperature (in degrees Celsius); i.e. the design temperature in the hazard area;

S is the specific volume (in cubic metres per kilogram); the specific volume of superheated HFC 236fa vapour at a pressure of 1,013 bar may be approximated by

$$S = k_1 + k_2 T$$

where k_1 = 0,141 3; k_2 = 0,000 6

c is the concentration (in percent); i.e. the volumetric concentration of HFC 236fa in air at the temperature indicated, and a pressure of 1,013 bar absolute.