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Gaseous fire-extinguishing systems -- Physical properties and system design -- Part 8: HFC 125 extinguishant

Systèmes d'extinction d'incendie utilisant des agents gazeux -- Propriétés physiques et conception des systèmes -- Partie 8: Agent extincteur HCFC 125

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INTERNATIONAL STANDARD

ISO 14520-8

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

Part 8: HFC 125 extinguishant

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

Partie 8: Agent extincteur HCFC 125

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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 14520-8 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 14520-8:2000), 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 8: HFC 125 extinguishant

1 Scope

This part of ISO 14520 gives specific requirements for gaseous fire-extinguishing systems, with respect to the HFC 125 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 14520-1:2006, *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 125 shall comply with the specification according to Table 1.

HFC 125 is a colourless, almost odourless electrically non-conductive gas with a density approximately four times that of air.

The physical properties are given in Table 2.

HFC 125 extinguishes fires mainly by physical means, but also by some chemical means.

Table 1 — Specification for HFC 125

Property	Requirement
Purity	99,6 % by mass, min.
Acidity	3×10^{-4} % by mass (3 ppm), max.
Water content	10×10^{-4} % by mass (10 ppm), max.
Non-volatile residue	0,01 % by mass, max.
Suspended matter or sediment	None visible

Table 2 — Physical properties of HFC 125

Property	Unit	Value
Molecular mass	—	120,02
Boiling point at 1,013 bar (absolute) [a]	°C	−48,09
Freezing point	°C	−101
Critical temperature	°C	66,02
Critical pressure	bar abs [a]	36,18
Critical volume	cm^3/mol	210
Critical density	kg/m^3	573,6
Vapour pressure 20 °C	bar abs [a]	12,05
Liquid density 20 °C	kg/m^3	1 218,0
Saturated vapour density 20 °C	kg/m^3	77,97
Specific volume of superheated vapour at 1,013 bar and 20 °C	m^3/kg	0,1972
Chemical formula	CF_3CHF_2	
Chemical name	Pentafluoroethane	

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

4.2 Use of HFC 125 systems

HFC 125 total flooding systems may be used for extinguishing fires of all classes within the limits specified in ISO 14520-1:2006, 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 14520-1:2006, 7.6.

The extinguishing concentrations and design concentrations for *n*-heptane and Surface class A hazards are given in Table 4, and those for other fuels in Table 5.

Table 3 — HFC 125 total flooding quantity

Temperature T	Specific vapour volume S	**HFC 125 mass requirements per unit volume of protected space, m/V (kg/m³)** This information refers only to HFC 125, and may not represent any other products containing pentafluoroethane as a component.									
		Design concentration (by volume)									
°C	m³/kg	7 %	8 %	9 %	10 %	11 %	12 %	13 %	14 %	15 %	16 %
−45	0,1497	0,5028	0,5809	0,6607	0,7422	0,8256	0,9109	0,9982	1,0874	1,1788	1,2724
−40	0,1534	0,4907	0,5669	0,6447	0,7243	0,8057	0,8889	0,9741	1,0612	1,1504	1,2417
−35	0,1572	0,4788	0,5532	0,6291	0,7068	0,7862	0,8675	0,9505	1,0356	1,1226	1,2117
−30	0,1608	0,4681	0,5408	0,6151	0,6910	0,7686	0,8480	0,9293	1,0124	1,0975	1,1846
−25	0,1645	0,4576	0,5286	0,6012	0,6754	0,7513	0,8290	0,9084	0,9896	1,0728	1,1579
−20	0,1682	0,4475	0,5170	0,5880	0,6606	0,7348	0,8107	0,8884	0,9678	1,0492	1,1324
−15	0,1719	0,4379	0,5059	0,5753	0,6464	0,7190	0,7933	0,8693	0,9470	1,0266	1,1081
−10	0,1755	0,4289	0,4955	0,5635	0,6331	0,7042	0,7770	0,8514	0,9276	1,0055	1,0853
−5	0,1791	0,4203	0,4855	0,5522	0,6204	0,6901	0,7614	0,8343	0,9089	0,9853	1,0635
0	0,1828	0,4118	0,4757	0,5410	0,6078	0,6761	0,7460	0,8174	0,8905	0,9654	1,0420
5	0,1864	0,4038	0,4665	0,5306	0,5961	0,6631	0,7316	0,8016	0,8733	0,9467	1,0219
10	0,1900	0,3962	0,4577	0,5205	0,5848	0,6505	0,7177	0,7864	0,8568	0,9288	1,0025
15	0,1935	0,3890	0,4494	0,5111	0,5742	0,6387	0,7047	0,7722	0,8413	0,9120	0,9844
20	0,1971	0,3819	0,4412	0,5018	0,5637	0,6271	0,6919	0,7581	0,8259	0,8953	0,9664
25	0,2007	0,3750	0,4333	0,4928	0,5536	0,6158	0,6794	0,7445	0,8111	0,8793	0,9491
30	0,2042	0,3686	0,4258	0,4843	0,5441	0,6053	0,6678	0,7318	0,7972	0,8642	0,9328
35	0,2078	0,3622	0,4185	0,4759	0,5347	0,5948	0,6562	0,7191	0,7834	0,8492	0,9166
40	0,2113	0,3562	0,4115	0,4681	0,5258	0,5849	0,6454	0,7072	0,7704	0,8352	0,9014
45	0,2149	0,3503	0,4046	0,4602	0,5170	0,5751	0,6345	0,6953	0,7575	0,8212	0,8863
50	0,2184	0,3446	0,3982	0,4528	0,5088	0,5659	0,6244	0,6842	0,7454	0,8080	0,8721
55	0,2219	0,3392	0,3919	0,4457	0,5007	0,5570	0,6145	0,6734	0,7336	0,7953	0,8584
60	0,2254	0,3339	0,3858	0,4388	0,4930	0,5483	0,6050	0,6629	0,7222	0,7829	0,8451
65	0,2289	0,3288	0,3799	0,4321	0,4854	0,5400	0,5957	0,6528	0,7112	0,7710	0,8321
70	0,2324	0,3239	0,3742	0,4256	0,4781	0,5318	0,5868	0,6430	0,7005	0,7593	0,8196
75	0,2358	0,3192	0,3688	0,4194	0,4712	0,5242	0,5783	0,6337	0,6904	0,7484	0,8078
80	0,2393	0,3145	0,3634	0,4133	0,4643	0,5165	0,5698	0,6244	0,6803	0,7374	0,7960
85	0,2428	0,3100	0,3581	0,4073	0,4576	0,5090	0,5616	0,6154	0,6705	0,7268	0,7845
90	0,2463	0,3056	0,3531	0,4015	0,4511	0,5018	0,5536	0,6067	0,6609	0,7165	0,7734
95	0,2498	0,3013	0,3481	0,3959	0,4448	0,4948	0,5459	0,5982	0,6517	0,7064	0,7625

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 125 vapour at a pressure of 1,013 bar may be approximated by

$$S = k_1 + k_2 T$$

where $k_1 = 0{,}182\,5$; $k_2 = 0{,}000\,7$

c is the concentration (in percent); i.e. the volumetric concentration of HFC 125 in air at the temperature indicated, and a pressure of 1,013 bar absolute.

