SLOVENSKI STANDARD
oSIST prEN 15004-11:2023

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Vgrajeni gasilni sistemi - Sistemi za gašenje s plinom - 11. del: Fizikalne lastnosti in načrtovanje sistema za gašenje z gasilnim sredstvom Halocarbon Blend 55 (ISO 14520-17:2022, spremenjen)

Fixed firefighting systems - Gas extinguishing systems - Part 11: Physical properties and systems design of gas extinguishing systems for Halocarbon Blend 55 extinguishant (ISO 14520-17:2022, modified)

Ortsfeste Brandbekämpfungsanlagen - Löschanlagen mit gasförmigen Löschmitteln - Teil 11: Physikalische Eigenschaften und Anlagenauslegung für Feuerlöschmittel Halocarbon Blend 55 (ISO 14520 17:2022, modifiziert)

Installations fixes de lutte contre l'incendie - Installations d'extinction à gaz - Partie 11 : Propriétés physiques et conception des systèmes des installations d'extinction à gaz pour agent extincteur hydrocarbure halogéné, mélange 55 (ISO 14520-17:2022, modifiée)

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 191.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 15004-11:2023) has been prepared by Technical Committee EN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

The text of ISO 14520-17:2022 has been prepared by Technical Committee ISO/TC 21 “Equipment for fire protection and fire fighting” of the International Organization for Standardization (ISO) and has been taken over as prEN 15004-11:2023 by Technical Committee CEN/TC 191 “Fixed firefighing systems”, the secretariat of which is held by BSI; with common modifications which are indicated by a straight line in the margin of the text.

This European Standard will consist of the following parts, under the general title *Fixed firefighting systems — Gas extinguishing systems:*

— *Part 1: Design, installation and maintenance;*

— *Part 2: Physical properties and system design of gas extinguishing systems for FK-5-1-12 extinguishant;*

— *Part 4: Physical properties and system design of gas extinguishing systems for HFC 125 extinguishant;*

— *Part 5: Physical properties and system design of gas extinguishing systems for HFC 227ea extinguishant;*

— *Part 6: Physical properties and system design of gas extinguishing systems for HFC 23 extinguishant;*

— *Part 7: Physical properties and system design of gas extinguishing systems for IG-01 extinguishant;*

— *Part 8: Physical properties and system design of gas extinguishing systems for IG-100 extinguishant;*

— *Part 9: Physical properties and system design of gas extinguishing systems for IG-55 extinguishant;*

— *Part 10: Physical properties and system design of gas extinguishing systems for IG-541 extinguishant;*

— *Part 11: Physical properties and systems design of gas extinguishing systems for Halocarbon Blend 55 extinguishant.*

The International Standards ISO 14520-2 and ISO 14520-11, which dealt with CF_3I and HFC 236fa extinguishants, respectively, have not been implemented by CEN, as CF_3I is only valid for local application and HFC 236fa extinguishant is only applicable for portable fire extinguishers and local application, respectively, which is not covered by the scope.

1 Scope

This document provides specific requirements for gaseous fire-extinguishing systems with respect to the Halocarbon Blend 55 extinguishant. It includes details of physical properties, specification, usage and safety aspects. It also covers systems operating at nominal pressures of 25 bar, 35 bar, and 42 bar and 50 bar, superpressurized with nitrogen. This document does not preclude the use of other systems.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 15004-1:2019[1], *Fixed firefighting systems - Gas extinguishing systems - Part 1: Design, installation and maintenance (ISO 14520-1:2015, modified)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15004-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Characteristics and uses

4.1 General

Extinguishant Halocarbon Blend 55 shall comply with the specifications shown in Table 1.

Halocarbon Blend 55 [blend of (50 ± 3) % HFO-1233zd(E) and (50 ± 3) % FK-5-1-12 (by mass)] is a colourless, almost odourless, electrically non-conductive gas, with a density approximately 6,38 times that of air.

Its physical properties are shown in Table 2.

Halocarbon Blend 55 extinguishes fires mainly by physical means, but also by some chemical means.

[1] Under revision.

Table 1 — Specifications for Halocarbon Blend 55

Property	Requirement
Purity	99,5 % by mass, min.
Acidity	3×10^{-4} % by mass, max.
Water content	10×10^{-4} % by mass, max.
Non-volatile residue	300×10^{-4} % by mass, max.
Suspended matter or sediment	None visible
Kinetic dimers of HFP[a]	< 5 600 mg/kg
Thermodynamic dimer of HFP + HF adduct[b]	< 190 mg/kg

[a] Kinetic dimers of HFP (CAS 2070-70-4).

[b] Thermodynamic dimer of HFP (CAS 1584-03-8) + its HF adduct (CAS 30320-28-6).

Table 2 — Physical properties of Halocarbon Blend 55

Property	Units	Value
Molecular mass	—	184,72
Boiling point at 1,013 bar (absolute)	°C	20,7
Freezing point	°C	–107
Critical temperature	°C	159,2
Critical pressure	bar (absolute)	28,92
Critical volume	cm^3/mol	354,2
Critical density	kg/m^3	521,6
Vapour pressure 20 °C	bar (absolute)	0,988 0
Liquid density 20 °C	kg/m^3	1 431,6
Saturated vapour density 20 °C	kg/m^3	6,67
Specific volume of vapour at 1,013 bar (absolute) and 20,0 °C	m^3/kg	0,125 6
Chemical formula	$CF_3CH=CClH/C_6F_{12}O$ 50/50 % (by mass)	
Chemical name	Trans-1-chloro-3,3,3-trifluoroprop-1-ene/ 1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	

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

4.2 Use of Halocarbon Blend 55

Halocarbon Blend 55 total flooding systems may be used for extinguishing fires of all classes within the limits specified in EN 15004-1:2019, Clause 4.

The extinguishant requirements per volume of protected space are shown in Table 3 for various levels of concentration. These are based on methods shown in EN 15004-1:2019, 7.7.

The extinguishing concentrations and design concentrations for *n*-heptane and surface class A hazards are shown in Table 4. Concentrations for other fuels are shown in Table 4.

Table 3 — Extinguishant requirements per volume of protected space

Temperature	**Specific vapour volume**	**HFO-1233zd(E)/FK-5-1-12 mass requirements per unit volume of protected space, *m* / *V* (kg/m³)**						
T	***S***	**Design concentration (by volume)**						
°C	m³/kg	4 %	5 %	6 %	7 %	8 %	9 %	10 %
-10	0,112 2	0,371 3	0,469 0	0,568 8	0,670 7	0,774 8	0,881 3	0,990 1
-5	0,114 5	0,364 0	0,459 9	0,557 7	0,657 6	0,759 8	0,864 1	0,970 8
0	0,116 7	0,357 1	0,451 1	0,547 0	0,645 1	0,745 2	0,847 6	0,952 3
5	0,118 9	0,350 4	0,442 6	0,536 8	0,633 0	0,731 3	0,831 7	0,934 4
10	0,121 1	0,344 0	0,434 5	0,526 9	0,621 4	0,717 8	0,816 4	0,917 2
15	0,123 4	0,337 8	0,426 6	0,517 4	0,610 1	0,704 9	0,801 7	0,900 7
20	0,125 6	0,331 8	0,419 1	0,508 2	0,599 3	0,692 4	0,787 5	0,884 7
25	0,127 8	0,326 0	0,411 8	0,499 4	0,588 9	0,680 3	0,773 8	0,869 3
30	0,130 0	0,320 4	0,404 7	0,490 8	0,578 8	0,668 7	0,760 5	0,854 4
35	0,132 3	0,315 0	0,397 9	0,482 6	0,569 0	0,657 4	0,747 7	0,840 0
40	0,134 5	0,309 8	0,391 3	0,474 6	0,559 6	0,646 5	0,735 3	0,826 1
45	0,136 7	0,304 7	0,384 9	0,466 8	0,550 5	0,636 0	0,723 3	0,812 6
50	0,139 0	0,299 9	0,378 8	0,459 4	0,541 7	0,625 8	0,711 7	0,799 6
55	0,141 2	0,295 1	0,372 8	0,452 1	0,533 1	0,615 9	0,700 5	0,787 0
60	0,143 4	0,290 5	0,367 0	0,445 1	0,524 8	0,606 3	0,689 6	0,774 8
65	0,145 6	0,286 1	0,361 4	0,438 3	0,516 8	0,597 1	0,679 1	0,762 9
70	0,147 9	0,281 8	0,355 9	0,431 7	0,509 0	0,588 1	0,668 9	0,751 4
75	0,150 1	0,277 6	0,350 7	0,425 3	0,501 5	0,579 3	0,658 9	0,740 3
80	0,152 3	0,273 5	0,345 5	0,419 0	0,494 1	0,570 9	0,649 3	0,729 5
85	0,154 5	0,269 6	0,340 5	0,413 0	0,487 0	0,562 6	0,639 9	0,718 9

NOTE 1 This information refers only to the product Halocarbon Blend 55 and does not represent any other products containing HFO-1233zd(E) or FK-5-1-12 as components.

Key

m / V is the agent mass requirements (kg/m³); i.e. mass, m, in kg of agent required per m³ of protected volume, V, to produce the indicated concentration at the temperature specified;

V is the net volume of hazard (m³); 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 (°C); i.e. the design temperature in the hazard area;

S is the specific volume (m³/kg); the specific volume of superheated Halocarbon Blend 55 vapour at a pressure of 1,013 bar (absolute) may be approximated by the formula:

$$S = k_1 + k_2 \ T$$

where

k_1 = 0,116 7

k_2 = 0,000 445

c is the concentration (%); i.e. the volumetric concentration of Halocarbon Blend 55 in air at the temperature indicated, and a pressure of 1,013 bar (absolute).

NOTE 2 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm².

Table 4 — Halocarbon Blend 55 reference extinguishing and design concentrations

Fuel[a]	Extinguishment[b] % by volume	Minimum design[b] % by volume
Class B[c, d]		7,8
Heptane (cup burner)	5,5	
Heptane (room test)	6,0	
Surface Class A[c, e]		7,8
Wood Crib	6,0	
PMMA	5,4	
PP	5,4	
ABS	5,4	
Higher Hazard Class A	[f]	7,8

[a] See EN 15004-1:2019, 7.6.1.3 for guidance on Class A fuels.

[b] The extinguishing and design concentrations for room-scale test fires are for informational purposes only. Lower and higher extinguishing concentrations than those shown for room-scale test-fires may be achieved and allowed when validated by test reports from internationally recognized laboratories.

[c] The extinguishment values for the Class B and the Surface Class A fuels are determined by testing in accordance with EN 15004-1:2019, Annex B and Annex C.

[d] The minimum design concentration for the Class B fuel is the higher value of the heptane cup burner or room test heptane extinguishment concentration multiplied by 1,3.

[e] The minimum design concentration for Surface Class A fuel is the highest value of the wood crib, PMMA, PP or ABS extinguishment concentrations multiplied by 1,30. In the absence of any of the four extinguishment values, the minimum design concentration for Surface Class A is that of Higher Hazard Class A.

[f] The minimum design concentration for Higher Hazard Class A fuels shall be the higher of the Surface Class A or 95 % of the Class B minimum design concentration.

5 Safety of personnel

Any hazard to personnel created by the discharge of Halocarbon Blend 55 shall be considered in the design of the system.

Potential hazards can arise from the following:

a) the extinguishant itself;

b) the combustion products of the fire; and

c) breakdown products of the extinguishant resulting from exposure to fire.

For minimum safety requirements, see EN 15004-1:2019, Clause 5.

Toxicological information for Halocarbon Blend 55 is shown in Table 5.