



SLOVENSKI STANDARD
oSIST prEN 15004-8:2015
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Vgrajeni gasilni sistemi - Sistemi za gašenje s plinom - 8. del: Fizikalne lastnosti in načrtovanje sistema za gašenje s plinom za gasilo IG-100

Fixed firefighting system - Gas extinguishing systems - Part 8: Physical properties and system design of gas extinguishing systems for IG-100 extinguishant

Ortsfeste Brandbekämpfungsanlagen - Löschanlagen mit gasförmigen Löschmitteln - Teil 8: Physikalische Eigenschaften und Anlagenauslegung für Feuerlöschmittel IG-100

Installations fixes de lutte contre l'incendie - Installations d'extinction à gaz - Partie 8: Propriétés physiques et conception des systèmes pour agent extincteur IG-100

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EUROPEAN STANDARD
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Fixed firefighting system - Gas extinguishing systems - Part 8: Physical properties and system design of gas extinguishing systems for IG-100 extinguishant

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Ortsfeste Brandbekämpfungsanlagen - Löschanlagen mit
gasförmigen Löschmitteln - Teil 8: Physikalische
Eigenschaften und Anlagenauslegung für Feuerlöschmittel
IG-100

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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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (prEN 15004-8:2014) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15004-8:2008.

EN 15004 consists 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 3: Physical properties and system design of gas extinguishing systems for HCFC Blend A extinguishant*”
- *Part 4: Physical properties and system design of gas extinguishing systems for HFC 125 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*”

1 Scope

1.1 This part of EN 15004 contains specific requirements for gaseous fire-extinguishing systems, with respect to the IG-100 extinguishant. It includes details of physical properties, specification, usage and safety aspects.

1.2 This part of EN 15004 covers systems operating at nominal pressures of 200 bar at 15 °C and 300 bar at 15 °C. This does not preclude the use of other systems, although design data for other pressures are not available at this time.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, Gaseous fire-extinguishing systems — Physical properties and system design — Part 1: General requirements.

3 Terms and definitions

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

4 Characteristics and uses

4.1 General

Extinguishant IG-100 shall comply with the specification shown in Table 1.

IG-100 is a colourless, odourless, electrically non-conductive gas with a density approximately the same as that of air.

The physical properties are shown in Table 2.

IG-100 extinguishes fires mainly by a reduction of oxygen concentration in the atmosphere of the hazard enclosure.

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Table 1 — Specification for IG-100

Property	Requirement
Purity	99,6 % by volume, min.
Moisture	50×10^{-6} by mass, max.
Oxygen	0,1 % by volume, max.
NOTE Only principal contaminants are shown. Other measurements may include hydrocarbons, CO, NO, NO ₂ , CO ₂ , etc. Most are $<20 \times 10^{-6}$.	

Table 2 — Physical properties of IG-100

Property	Units	Value
Molecular mass	—	28,02
Boiling point at 1,013 bar (absolute)	°C	-195,8
Freezing point	°C	-210,0
Critical temperature	°C	—
Critical pressure	bar abs	—
Critical volume	cm ³ /mol	—
Critical density	kg/m ³	—
Vapour pressure 20 °C	bar abs	—
Liquid density 20 °C	kg/m ³	—
Saturated vapour density 20 °C	kg/m ³	—
Specific volume of superheated vapour at 1,013 bar and 20 °C	m ³ /kg	0,858
Chemical formula	N ₂	
Chemical name	Nitrogen	

4.2 Use of IG-100 systems

IG-100 total flooding systems may be used for extinguishing fires of all classes within the limits specified in clause 4 of EN 15004-1.

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 7.6 of EN 15004-1.

The extinguishing concentrations and design concentrations for heptane and surface class A hazards are shown in Table 4.

Table 3 — IG-100 total flooding quantity

Temperature T °C	Specific vapour volume S m ³ /kg	IG-55 volume requirements per unit volume of protected space, V/V (m ³ /m ³) This information refers only to IG-100, and may not represent any other products containing nitrogen as a component							
		Design concentration (by volume)							
		34 %	38 %	42 %	46 %	50 %	54 %	58 %	62 %
-40	0,682 5	0,522	0,601	0,685	0,775	0,872	0,976	1,091	1,217
-35	0,697 1	0,511	0,588	0,671	0,758	0,853	0,956	1,068	1,191
-30	0,711 8	0,501	0,576	0,657	0,743	0,836	0,936	1,046	1,167
-25	0,726 4	0,491	0,565	0,644	0,728	0,819	0,917	1,025	1,143
-20	0,741 1	0,481	0,554	0,631	0,714	0,803	0,899	1,005	1,120
-15	0,755 7	0,472	0,543	0,619	0,700	0,787	0,882	0,985	1,099
-10	0,770 4	0,463	0,533	0,607	0,686	0,772	0,865	0,966	1,078
-5	0,785 0	0,454	0,523	0,596	0,674	0,758	0,849	0,948	1,058
0	0,799 7	0,446	0,513	0,585	0,661	0,744	0,833	0,931	1,038
5	0,814 3	0,438	0,504	0,574	0,649	0,731	0,818	0,914	1,020
10	0,829 0	0,430	0,495	0,564	0,638	0,718	0,804	0,898	1,002
15	0,843 6	0,423	0,486	0,554	0,627	0,705	0,790	0,883	0,984
20	0,858 3	0,416	0,478	0,545	0,616	0,693	0,777	0,868	0,968
25	0,872 9	0,409	0,470	0,536	0,606	0,682	0,764	0,853	0,951
30	0,887 6	0,402	0,462	0,527	0,596	0,670	0,751	0,839	0,936
35	0,902 2	0,395	0,455	0,518	0,586	0,659	0,739	0,825	0,920
40	0,916 9	0,389	0,448	0,510	0,577	0,649	0,727	0,812	0,906
45	0,931 5	0,383	0,440	0,502	0,568	0,639	0,716	0,799	0,892
50	0,946 2	0,377	0,434	0,494	0,559	0,629	0,704	0,787	0,878
55	0,960 8	0,371	0,427	0,487	0,550	0,619	0,694	0,775	0,864
60	0,975 5	0,366	0,421	0,479	0,542	0,610	0,683	0,763	0,851
65	0,990 1	0,360	0,414	0,472	0,534	0,601	0,673	0,752	0,839
70	1,004 8	0,355	0,408	0,465	0,526	0,592	0,663	0,741	0,827
75	1,019 4	0,350	0,403	0,459	0,519	0,584	0,654	0,730	0,815
80	1,034 1	0,345	0,397	0,452	0,511	0,575	0,645	0,720	0,803
85	1,048 7	0,340	0,391	0,446	0,504	0,567	0,636	0,710	0,792
90	1,063 4	0,335	0,386	0,440	0,497	0,560	0,627	0,700	0,781
95	1,078 0	0,331	0,381	0,434	0,491	0,552	0,618	0,691	0,770
100	1,092 7	0,326	0,376	0,428	0,484	0,545	0,610	0,682	0,760

NOTE This information refers only to the product IG 100, and may not represent any other products containing argon as a component

Symbols:

V/V is the agent volume requirements (m^3/m^3); i.e. the quantity Q_R (m^3) of agent required at a reference temperature of 20 °C and a pressure of 1,013 bar per cubic metre of protected volume to produce the indicated concentration at the temperature specified:

$$Q_R = m \cdot S_R ;$$

where

S_R is the specific reference volume (m^3/kg); i.e. the specific vapour volume at the filling reference temperature for superheated IG-01 vapour at a pressure of 1,013 bar which may be approximated by the formula:

$$S_R = k_1 + k_2 \cdot TR ;$$

where

$$k_1 = 0,561 \ 19$$

$$k_2 = 0,002 \ 054 \ 5$$

TR is the reference temperature (°C); i.e. filling temperature (20°C in the table)

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

V is the net volume of hazard (m^3); i.e. the enclosed volume minus the fixed structures impervious to extinguishant;

T is the temperature (°C); i.e. the design temperature of the protected area;

S is the specific volume (m^3/kg); the specific volume of superheated IG-100 vapour at a pressure of 1,013 bar may be approximated by the formula:

$$S = k_1 + k_2 \cdot T$$

where

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c is the concentration (%); i.e. the volumetric concentration of IG-100 in air at the temperature indicated, and a pressure of 1,013 bar absolute.

Table 4 — IG-100 reference extinguishing and design concentrations

Fuel	Extinguishment % by volume	Minimum design % by volume
Class B Heptane (cup burner) Heptane (room test)	32,3 36,6	47,6
Surface Class A Wood Crib PMMA PP ABS	30,0 28,8 30,0 31,0	40,3
Higher Hazard Class A	See Note 4	45,2
<p>NOTE 1 The extinguishment values for the Class B and the Surface Class A fuels are determined by testing in accordance with Annexes B and C of EN 15004-1.</p> <p>NOTE 2 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.</p> <p>NOTE 3 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 1,3. In the absence of any of the 4 extinguishment values, the minimum design concentration for Surface Class A shall be that of Higher Hazard Class A.</p> <p>NOTE 4 Higher-Hazard Class A hazards are those having the characteristics described in the CAUTION statement of EN 15004-1 paragraph 7.5.1.3. 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.</p> <p>NOTE 5 See 7.5.1.3 of EN 15004-1 for guidance on Class A fuels.</p> <p>NOTE 6 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.</p>		

5 Safety of personnel

Any hazard to personnel created by the discharge of IG-100 shall be considered in the design of the system.

Potential hazards can arise from the following:

- a) the extinguishant itself, by reduction in oxygen; and
- b) the combustion products of the fire.

For minimum safety requirements, see EN 15001-1, clause 5.

Physiological information for IG-100 is shown in Table 5.