
**Naprave za gašenje s plinom - Fizikalne lastnosti in projektiranje - 15. del:
Gasilo IG-541**

Gaseous fire-extinguishing systems - Physical properties and system design - Part
15: IG-541 extinguishant

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 14520-15:2006
https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-
5e82c36f5d77/sist-iso-14520-15-2006](https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 14520-15:2006

<https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006>

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

**Part 15:
IG-541 extinguishant**

*Systèmes d'extinction d'incendie utilisant des agents gazeux —
 Propriétés physiques et conception des systèmes —
 Partie 15: Agent extincteur IG-541*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 14520-15:2006](https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006)

<https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006>



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST ISO 14520-15:2006](https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006)

<https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006>

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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 14520-15 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 14520-15:2000), 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*: [SIST ISO 14520-15:2006](https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006)

- *Part 1: General requirements*
- *Part 2: CF₃I 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 14520-15:2006

<https://standards.iteh.ai/catalog/standards/sist/92673361-03f3-4bc8-8e92-5e82c36f5d77/sist-iso-14520-15-2006>

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

Part 15: IG-541 extinguishant

1 Scope

This part of ISO 14520 gives specific requirements for gaseous fire-extinguishing systems, with respect to the IG-541 extinguishant. It includes details of physical properties, specification, usage and safety aspects and is applicable to systems operating at nominal pressures of 150 bar, 200 bar and 300 bar, at 15 °C. This does not preclude the use of other systems; however, design data for other pressures were not available at time of publication.

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 IG-541 shall comply with the specification according to Table 1.

IG-541 is a colourless, odourless, electrically non-conductive gas with a density approximately the same as that of air. It is an inert gas mixture consisting nominally of 52 % nitrogen, 40 % argon and 8 % carbon dioxide, with the following mixture specification (based on 8 % carbon dioxide with tolerance of ± 5 %).

- a) Carbon dioxide: range of 7,6 % to 8,4 %.
- b) Argon: range of 37,2 % to 42,8 %.
- c) Nitrogen: range of 48,8 % to 55,2 %.

NOTE Individual container or batch analysis is based on carbon dioxide measurement only.

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

The physical properties are given in Table 2.

IG-541 extinguishes fires mainly by a reduction of the oxygen concentration in the atmosphere of the hazard enclosure.

Table 1 — Specification for IG-541

Property	Requirement		
	Argon	Nitrogen	Carbon dioxide
Purity	99,997 % by volume, min.	99,99 % by volume, min.	99,5 % by volume, min.
Water content	4×10^{-6} by mass, max.	5×10^{-6} by mass, max.	10×10^{-6} by mass, max.
Oxygen	3×10^{-6} by mass, max.	3×10^{-6} by mass, max.	10×10^{-6} by mass, max.

Only principal contaminants are shown. Other measurements may include hydrocarbons, CO, NO, NO₂. Most are $< 20 \times 10^{-6}$.

Table 2 — Physical properties of IG-541

Property	Unit	Value
Molecular mass	—	34,0
Boiling point at 1,013 bar (absolute) ^a	°C	-196
Freezing point	°C	-78,5
Critical temperature	°C	—
Critical pressure	bar abs ^a	—
Critical volume	cm ³ /mol	—
Critical density	kg/m ³	—
Vapour pressure 20 °C	bar abs ^a	152
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	0,697
Chemical formulas	N ₂	52 % by volume
	Ar	40 % by volume
	CO ₂	8 % by volume
Chemical names	Nitrogen	
	Argon	
	Carbon dioxide	

^a 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm².

4.2 Use of IG-541 systems

IG-541 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 shown 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 *n*-heptane and Surface Class A hazards are given in Table 4, concentrations for other fuels in Table 5 and inerting concentrations in Table 6.

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

Table 3 — IG-541 total flooding quantity

Temperature <i>T</i> °C	Specific vapour volume <i>S</i> m ³ /kg	IG-541 volume requirements per unit volume of protected space, <i>V/V</i> (m ³ /m ³) This information refers only to IG-541, and may not represent any other products containing argon, nitrogen or carbon dioxide as components.							
		Design concentration (by volume)							
		34 %	38 %	42 %	46 %	50 %	54 %	58 %	62 %
-40	0,5624	0,521	0,600	0,684	0,773	0,870	0,975	1,089	1,214
-35	0,5743	0,511	0,587	0,669	0,757	0,852	0,954	1,066	1,189
-30	0,5863	0,500	0,575	0,656	0,742	0,834	0,935	1,044	1,165
-25	0,5982	0,490	0,564	0,643	0,727	0,818	0,916	1,023	1,142
-20	0,6102	0,481	0,553	0,630	0,713	0,802	0,898	1,003	1,119
-15	0,6221	0,471	0,542	0,618	0,699	0,786	0,881	0,984	1,098
-10	0,6341	0,463	0,532	0,606	0,686	0,772	0,864	0,966	1,077
-5	0,6460	0,454	0,522	0,595	0,673	0,757	0,848	0,948	1,057
0	0,6580	0,446	0,513	0,584	0,661	0,744	0,833	0,931	1,038
5	0,6699	0,438	0,504	0,574	0,649	0,730	0,818	0,914	1,019
10	0,6819	0,430	0,495	0,564	0,638	0,717	0,804	0,898	1,001
15	0,6938	0,423	0,486	0,554	0,627	0,705	0,790	0,882	0,984
20	0,7058	0,416	0,478	0,545	0,616	0,693	0,777	0,868	0,968
25	0,7177	0,409	0,470	0,536	0,606	0,682	0,764	0,853	0,951
30	0,7297	0,402	0,462	0,527	0,596	0,670	0,751	0,839	0,936
35	0,7416	0,395	0,455	0,518	0,586	0,660	0,739	0,826	0,921
40	0,7536	0,389	0,448	0,510	0,577	0,649	0,727	0,812	0,906
45	0,7655	0,383	0,441	0,502	0,568	0,639	0,716	0,800	0,892
50	0,7775	0,377	0,434	0,494	0,559	0,629	0,705	0,787	0,878
55	0,7894	0,371	0,427	0,487	0,551	0,620	0,694	0,776	0,865
60	0,8014	0,366	0,421	0,480	0,543	0,610	0,684	0,764	0,852
65	0,8133	0,361	0,415	0,473	0,535	0,601	0,674	0,753	0,840
70	0,8253	0,355	0,409	0,466	0,527	0,593	0,664	0,742	0,827
75	0,8372	0,350	0,403	0,459	0,519	0,584	0,655	0,731	0,816
80	0,8492	0,345	0,397	0,453	0,512	0,576	0,645	0,721	0,804
85	0,8611	0,341	0,392	0,446	0,505	0,568	0,636	0,711	0,793
90	0,8731	0,336	0,386	0,440	0,498	0,560	0,628	0,701	0,782
95	0,8850	0,331	0,381	0,434	0,491	0,553	0,619	0,692	0,772
100	0,8970	0,327	0,376	0,429	0,485	0,545	0,611	0,683	0,761

V/V is the agent volume requirement (in cubic metres per cubic metre); i.e. the quantity *Q* (in cubic metres) 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 (in cubic metres per kilogram); i.e. the specific vapour volume at the filling reference temperature for superheated IG-541 vapour at a pressure of 1,013 bar which may be approximated by the formula:

$$S_R = k_1 + k_2 \cdot T_R$$

where *k*₁ = 0,657 99; *k*₂ = 0,002 239; *T_R* is the reference temperature (in degrees Celsius), 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 (in cubic metres); i.e. the enclosed volume minus the fixed structures impervious to extinguishant;

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 IG-541 vapour at a pressure of 1,013 bar may be approximated by

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

c is the concentration (in percent); i.e. the volumetric concentration of IG-541 in air at the temperature indicated, and a pressure of 1,013 bar absolute.