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

**Part 1:
General requirements**

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

Partie 1: Exigences générales



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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document 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 fourth edition cancels and replaces the third edition (ISO 14520-1:2015), which has been technically revised. It also cancels and replaces ISO/TR 23107:2021.

The main changes are as follows:

- the Scope has been extended to cover an additional agent, halocarbon blend 55;
- [subclause 5.2.1](#) has been amended to require upper limit threshold concentrations to be established for any impurity that could result in acute toxicity at concentrations below the cardiac sensitization NOAEL of the agent. [Subclause G.4.4](#) has also been added to provide further information on these requirements;
- a new subclause ([6.4.4.2](#)) has been added requiring that in the event of an electrical actuator being removed from a container valve or selector valve, an audible and visual alarm is to be provided at the control panel;
- [subclause 7.4.1](#) has been amended to draw attention to ISO 21805;
- a new subclause ([7.5](#)) has been added providing guidance regarding the effects of noise that can be caused by the alarm devices or the discharge of the agent;
- [subclause 7.6.1.3](#), (previously 7.5.1.3) has been amended to give several scenarios to explain the recommended selection of regular and high hazard design concentrations;
- Annex I has been added to reflect the content of the withdrawn document ISO/TR 12854;
- Annex J has been added to reflect the content of ISO/TR 23107 (to be withdrawn).

A list of all parts in the ISO 14520 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Firefighting systems covered in this document are designed to provide information on a supply of gaseous extinguishing medium for the extinction of fire.

Several different methods of supplying extinguishant to, and applying it at, the required point of discharge for fire extinction have been developed in recent years, and there is a need for dissemination of information on established systems and methods. This document has been prepared to meet this need.

The requirements of this document are made in the light of the best technical data known to the working group at the time of writing but, since a wide field is covered, it has been impracticable to consider every possible factor or circumstance that can potentially affect the implementation of the recommendations.

It has been assumed in the preparation of this document that the execution of its provisions is entrusted to people appropriately qualified and experienced in the specification, design, installation, testing, approval, inspection, operation and maintenance of systems and equipment, for whose guidance it has been prepared, and who can be expected to exercise a duty of care to avoid unnecessary release of extinguishant.

Attention is drawn to the Montreal Protocol on substances that deplete the ozone layer and those that contribute towards climate change.

It is important to consider the fire protection of a building or plant as a whole. Gaseous extinguishant systems form only a part of the available facilities. It should not be assumed that their adoption removes the need to consider supplementary measures, for example, the provision of portable fire extinguishers or other mobile appliances for first aid, emergency use or for dealing with special hazards.

Gaseous extinguishants have been a recognized effective medium for the extinction of flammable liquid fires and fires in the presence of electrical and ordinary Class A hazards for many years. However, in the planning of comprehensive schemes, it should be remembered that these media are not suitable for all hazards. Additionally, in certain circumstances or situations there can be dangers relating to their use which require special precautions.

Advice on these matters can be obtained from the appropriate manufacturer of the extinguishant or the extinguishing system. Information may also be sought from the appropriate fire authority, the health and safety authorities and insurers. Also, reference should be made as necessary to other national standards and statutory regulations of the particular country.

It is essential that fire-fighting equipment be carefully maintained to ensure instant readiness when required. Routine maintenance is liable to be overlooked or given insufficient attention by the owner of the system. It is, however, neglected at peril to the lives of occupants of the premises and the risk of crippling financial loss. The importance of maintenance cannot be too highly emphasized. Installation and maintenance should only be done by qualified personnel.

Inspection, preferably by a third party, should include an evaluation that the extinguishing system continues to provide adequate protection for the risk (protected zones, as well as state of the art, can change over time).

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

Part 1: General requirements

1 Scope

This document specifies requirements and gives recommendations for the design, installation, testing, maintenance and safety of gaseous firefighting systems in buildings, plants or other structures, and the characteristics of the various extinguishants and types of fire for which they are a suitable extinguishing medium.

It covers total flooding systems primarily related to buildings, plants and other specific applications, utilizing electrically non-conducting gaseous fire extinguishants that do not leave a residue after discharge and for which there are sufficient data currently available to enable validation of performance and safety characteristics by an appropriate independent authority. This document does not apply to explosion suppression.

This document is not intended to indicate approval of the extinguishants listed therein by the appropriate authorities, as other extinguishants can be equally acceptable. CO₂ is not included as it is covered by other International Standards.

This document applies to the extinguishants listed in [Table 1](#). It is essential that it be used in conjunction with the separate parts of the ISO 14520 series for specific extinguishants, as cited in [Table 1](#).

Table 1 — Listed extinguishant

Extinguishant	Chemical	Formula	CAS No.	International Standard
FK-5-1-12	Dodecafluoro-2-methylpentan-3-one	$\text{CF}_3\text{CF}_2\text{C}(\text{O})\text{CF}(\text{CF}_3)_2$	756-13-8	ISO 14520-5
HCFC-123	Dichlorotrifluoroethane	CHCl_2CF_3	306-83-2	
HCFC-22	Chlorodifluoromethane	CHClF_2	75-45-6	ISO 14520-6
HCFC-124	Chlorotetrafluoroethane	CFCFClCF_3	2837-89-0	
	Isopropenyl-1-methylcyclohexene	$\text{C}_{10}\text{H}_{16}$	5989-27-5	
HFC 125	Pentafluoroethane	CHF_2CF_3	354-33-6	ISO 14520-8
HFC 227ea	Heptafluoropropane	$\text{CF}_3\text{CHFCF}_3$	2252-84-8	ISO 14520-9
HFC 23	Trifluoromethane	CHF_3	75-46-7	ISO 14520-10
IG-01	Argon	Ar	74040-37-1	ISO 14520-12
IG-100	Nitrogen	N_2	7727-37-9	ISO 14520-13
IG-55	Nitrogen (50 %)	N_2	7727-37-9	ISO 14520-14
	Argon (50 %)	Ar	74040-37-1	
IG-541	Nitrogen (52 %)	N_2	7727-37-9	ISO 14520-15
	Argon (40 %)	Ar	74040-37-1	
	Carbon dioxide (8 %)	CO_2	124-38-9	
Halocarbon Blend 55	E-1-chloro-3,3,3-trifluoropropene (50 % by mass)	CF_3CHCHCl	102687-65-0	ISO 14520-17
	Dodecafluoro-2-methylpentan-3-one (50% by mass)	$\text{CF}_3\text{CF}_2\text{C}(\text{O})\text{CF}(\text{CF}_3)_2$	756-13-8	

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.

ISO 14520-5:2019, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 5: FK-5-1-12 extinguishant*

ISO 14520-8:2019, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 8: HFC 125 extinguishant*

ISO 14520-9:2019, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 9: HFC 227ea extinguishant*

ISO 14520-10:2019, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 10: HFC 23 extinguishant*

ISO 14520-12:2015, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 12: IG-01 extinguishant*

ISO 14520-13:2015, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 13: IG-100 extinguishant*

ISO 14520-14:2015, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 14: IG-55 extinguishant*

ISO 14520-15:2015, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 15: IG-541 extinguishant*

ISO 14520-17:2022, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 17: Halocarbon Blend 55*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

NOTE For the purposes of this document, the term “bar”¹⁾ is taken as “gauge”, unless otherwise indicated. Concentrations or quantities expressed in percentages (%) are taken as by volume unless otherwise indicated.

3.1

approved

acceptable to a relevant *authority* (3.2)

Note 1 to entry: In determining the acceptability of installations or procedures, equipment, or materials, the authority can base acceptance on conformance with the appropriate International Standards.

3.2

authority

organization, office, or individual responsible for approving equipment, installations or procedures

3.3

automatic/manual switch

means of converting the system from automatic to manual actuation

Note 1 to entry: This can be in the form of a manual switch on the control panel or other units, or a personnel door interlock. In all cases, this changes the actuation mode of the system from automatic and manual to manual only or vice versa.

3.4

extinguishant

electrically non-conducting gaseous fire extinguishing agent that, upon evaporation, does not leave a residue

Note 1 to entry: See [Table 1](#).

Note 2 to entry: The terms “extinguishant” and “agent” are used interchangeably throughout this document.

3.5

clearance

air gap between equipment, including piping and nozzles and unenclosed or uninsulated live electrical components at other than the ground potential

3.6 Terms relating to concentration

3.6.1

design concentration

concentration of extinguishant, including a safety factor, required for system design purposes

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1N/mm²