International Standard 7201

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Fire protection — Fire extinguishing media — Halogenated hydrocarbons

Protection contre l'incendie — Agents extincteurs — Hydrocarbures halogénés

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 7201 was developed by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, and was circulated to the member bodies in January 1981.

It has been approved by the member bodies of the following countries :

Belgium	Iraq	South Africa, Rep. of
Brazil	Israel	Spain
Canada	Japan	Sri Lanka
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Egypt, Arab Rep. of	Netherlands	Switzerland
France	New Zealand	United Kingdom
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India	Portugal	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Italy

Printed in Switzerland

Fire protection — Fire extinguishing media — Halogenated hydrocarbons

0 Introduction

0.1 This International Standard is one of a series giving specifications for fire extinguishing media in common use and which are in need of standardization for fire fighting purposes. These specifications are designed to establish that the medium in question has at least a minimum useful fire extinguishing capability and can therefore be reasonably sold for fire extinguishing purposes.

0.2 Requirements for media used in particular equipment will form the subject of future International Standards.

0.3 The annexes to this International Standard provide important information on, and give recommendations relating to, the safety and use of halons, and they should be read carefully by all concerned with these media. They do not, however, form part of the specification.

1 Scope and field of application

This International Standard specifies requirements for the following halogenated hydrocarbons for use as fire extinguishing media :

a) halon 1211 [bromochlorodifluoromethane (CF_2ClBr)];

b) halon 1301 [bromotrifluoromethane (CF_3Br)].

Other halons may be considered at a later date once their safe and effective use has been demonstrated.

This International Standard does not deal with the conditions of use of these products in fire fighting equipment. Such equipment (portable fire extinguishers, fixed installations, etc.) will be dealt with in future International Standards.

2 References

ISO 1393, *Liquid halogenated hydrocarbons for industrial use — Determination of acidity — Titrimetric method.*

ISO 2210, *Liquid halogenated hydrocarbons for industrial use — Determination of residue on evaporation.*

ISO 3427, *Gaseous halogenated hydrocarbons (liquified gases) — Taking of a sample.*

3 Definition

For the purpose of this International Standard, the following definition applies.

halon : A halogenated hydrocarbon used as a fire extinguishing medium.

NOTE — The following numbering system is used to identify halons. The word "halon" is followed by a number, usually of four digits, giving, in turn, the number of carbon, fluorine, chlorine and bromine atoms. Terminal zeros are omitted. Thus halon 1211 is bromochlorodifluoromethane (CF_2ClBr) and halon 1301 is bromotrifluoromethane (CF_3Br).

4 Requirements

Halons 1211 and 1301 shall comply with the requirements of table 1, when tested by the appropriate method of test specified in clause 6.

Table 1 — Requirements

Property	Requirement	
	Halon 1211	Halon 1301
Purity, % (mol/mol) min.	99,0	99,6
Acidity, ppm by mass, max.	3,0	3,0
Water content, ppm by mass, max.	20	10
High boiling impurities, % (*m*/*m*) max.	0,01	0,01
Halogen ion	Passes test	Passes test
Inert gases in vapour phase, % (mol/mol) max.	Not applicable	1,5
Suspended matter or sediment	None visible	None visible

5 Sampling

Samples of halons shall be taken from the manufacturer's shipping container. When halons are in the liquid phase (see clause 6), the samples shall be taken adopting the method specified in ISO 3427.[1)]

1) The sampling bottle should be capable of safely resisting the vapour pressure of the sample at the highest temperature that could be encountered.

6 Methods of test

6.1 General

For all tests except that for inert gases in the vapour phase (see 6.7), the sample shall be taken from the liquid phase.

6.2 Purity

Determine the purity by gas-liquid chromatography, using generally accepted laboratory techniques.

6.3 Acidity

Determine the acidity by the method specified in ISO 1393 with the following modifications to the procedure.

6.3.1 Test portion

Take 50 g of the sample and bubble it through 100 ml of distilled water.

6.3.2 Determination

Begin with 10 ml of slurry comprising crushed ice and distilled water.

6.4 Water content

Determine the water content by the orthodox Karl Fischer method or by any other method giving equivalent results.

6.5 High-boiling impurities

Determine the high-boiling impurities by the method specified in ISO 2210, or by any other method giving equivalent results, with the following modifications for halon 1301 only.

6.5.1 Apparatus

6.5.1.1 Use a Goetz tube, of capacity 100 ml.

6.5.1.2 Use a temperature-controlled cabinet.

6.5.2 Procedure

Set the temperature of the cabinet (6.5.1.2) to 0 ± 2 °C.

6.6 Halogen ion

Mix 5 g of the sample with 5 ml of absolute methanol containing several drops of a saturated methanolic silver nitrate ($AgNO_3$) solution. The resulting solution shall exhibit no turbidity or precipitation of silver halide.

6.7 Inert gases in vapour phase

Determine inert gases by vapour-phase chromatography, using generally accepted laboratory techniques.

6.8 Suspended matter or sediment

Examine the liquid phase of the sample visually.

7 Packaging and labelling

7.1 Halons shall be shipped and stored in containers which will not alter the medium or be detrimentally affected by it.

NOTE — The containers may need to comply with national regulations.

7.2 Containers shall be marked with the following information :

a) supplier's name and address;

b) "Halon 1211" or "Halon 1301", as appropriate;

c) package identification number;

d) the number of this International Standard, i.e. ISO 7201;

e) recommended storage precautions.

Annex A

General properties

(This annex does not form part of the standard.)

A.1 Physical properties

Halon 1211 is a colourless, faintly sweet-smelling gas. Halon 1301 is an odourless gas. A number of their other more important physical properties are given in table 2.

A.2 Electrical conductivity

Halons 1211 and 1301 have a very low electrical conductivity. In many cases they can be used to extinguish fires involving live electrical equipment, but this, to a significant extent, may depend on the circumstances, particularly the method of discharge. In case of doubt, reference should be made to the instructions on the fire extinguishing equipment to be used.

A.3 Effects on materials

Halons 1211 and 1301 are stable and inert to most common construction materials. Manufacturers' test data should be consulted for effects on specific materials.

NOTE — During fire extinguishing, decomposition products will be produced which are potentially corrosive. Concentrations are usually low and problems can be avoided by ventilation of the area.

A.4 Toxicology

Information on the toxicology of halons 1211 and 1301 is given in annex D.

Table 2 — Physical properties of halons 1211 and 1301

Property	Halon 1211	Halon 1301
Relative molecular mass	165,38	148,93
Boiling point at 1,013 bar*, °C	−4,0	−57,8
Freezing point, °C	−160,5	−168,0
Critical temperature, °C	153,8	67,0
Critical pressure, bar	42,06	39,6
Critical volume, m^3/kg	0,001 41	0,001 34
Critical density, kg/m^3	713	745
Vapour pressure at 20 °C, bar at 60 °C, bar	 2,53 7,20	 14,63 34,58
Liquid density at 20 °C, kg/m^3	1 830	1 575
Saturated vapour density at 20 °C, kg/m^3	17,4	115,6
Specific volume of superheated vapour at 1,013 bar and 20 °C, m^3/kg	0,145	0,159

* 1 bar = 10^5 Pa

Annex B

Safety precautions for handling

(This annex does not form part of the standard.)

B.1 Halons 1211 and 1301 are shipped from the manufacturer and are handled as liquefied gases under pressure. All precautions pertaining to the safe handling and operation of containers, piping and equipment under pressure should be observed when filling fire fighting equipment with the media.

B.2 Direct contact with liquid halons 1211 or 1301 can degrease the skin and cause a strong chilling effect. Gloves and eye protection should be worn when transferring these halons from one container to another.

Annex C

Compatibility and avoidance of contamination of halons

(This annex does not form part of the standard.)

C.1 Halon 1211 is miscible with halon 1301 in all proportions. When mixed for fire extinguishing purposes, such mixtures should be regarded as separate extinguishing media with their own physical, toxicological and extinguishing properties.

C.2 Halons 1211 and 1301 can be propelled by nitrogen, carbon dioxide or, where permitted, fluorocarbon-12 (dichlorodifluoromethane) in quantities not to exceed 20 % (m/m). However, compressed gases, used either for the transfer or for the superpressurization of halons, should be as dry as possible to avoid contamination of the halons and subsequent corrosion of the containers.

C.3 Provided halon 1211 and halon 1301 are each discharged from separate equipment, they may be used to extinguish the same fire. Moreover, they can also be used in conjunction with other sorts of extinguishing media without the extinguishing efficiency of the halons being adversely affected.

C.4 The extinguishing efficiency of halons 1211 and 1301 depend upon the method of application and use. Except in special circumstances, they should not be substituted one for the other in the same equipment.

Annex D

Toxicology

(This annex does not form part of the standard.)

D.1 Introduction

The conditions of use, for example in portable fire extinguishers, in fixed extinguishing systems etc., will determine the specific safety precautions to be taken.

D.2 Natural (undecomposed) halons

D.2.1 Effects of exposure

Tests conducted with halons 1211 and 1301 on both animals and human beings have shown that brief exposure to halon 1211 concentrations up to 4 % (*V*/*V*) and to halon 1301 concentrations up to 7 % (*V*/*V*) produce little, if any, noticeable effect. At concentrations between 4 and 5 % of halon 1211, or between 7 and 10 % of halon 1301, mild toxic effects begin to occur, which become more pronounced at higher concentrations or after longer exposure periods. Exposure to concentrations higher than 5 % (*V*/*V*) of halon 1211 (0,37 kg per cubic metre of free space at 20 °C) or 10 % (*V*/*V*) of halon 1301 (0,66 kg per cubic metre of free space at 20 °C) is hazardous, and special precautions should be taken depending upon the specific conditions of use.

D.2.2 Precautions and treatment

It is good practice to avoid all unnecessary exposure to halons. Persons suffering from over-exposure to halon vapour should immediately move, or be moved, to fresh air. In treating persons suffering toxic effects due to over-exposure to these media, the use of epinephrine (adrenaline) and similar drugs should be avoided because they may produce cardiac arrhythmias, including ventricular fibrillation.

D.3 Decomposition products

On exposure to a flame or hot surface, halons pyrolyse into decomposition products usually identified as halogen acids (HF, HCl, HBr) and free halogens (Cl_2, Br_2). When halons are correctly used, decomposition products are formed in relatively small amounts. However, the toxic hazard results from a combination of the combustion products from the fire itself, as well as from the halon used. Halon decomposition products have a characteristic sharp, acrid odour even in minute concentrations that are far below the concentrations considered to be immediately dangerous. This irritation provides a built-in warning system and encourages people to evacuate the area.