BS ISO 11601:2017

BSI Standards Publication

Fire fighting — Wheeled fire extinguishers — Performance and construction

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee FSH/2, Fire extinguishers.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Foreword

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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).

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For an explanation on 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 the following URL: 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 2, *Manually transportable fire extinguishers*.

This third edition cancels and replaces the second edition (ISO 11601:2008), which has been technically revised.

The main changes compared to the previous editions are as follows:

— new requirements for four clean agents have been added;

— marking requirements for water-based extinguishers found suitable for use on polar solvents has been added.

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Fire fighting — Wheeled fire extinguishers — Performance and construction

1 Scope

This document specifies the principal requirements intended to ensure the safety, reliability and performance of wheeled fire extinguishers.

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 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 5923, *Equipment for fire protection and fire fighting — Fire extinguishing media — Carbon dioxide*

ISO 7165:2017, *Fire fighting — Portable fire extinguishers — Performance and construction*

ISO 7202, *Fire protection — Fire extinguishing media — Powder*

ISO 7203-1, *Fire extinguishing media — Foam concentrates — Part 1: Specification for low-expansion foam concentrates for top application to water-immiscible liquids*

ISO 7203-2, *Fire extinguishing media — Foam concentrates — Part 2: Specification for medium- and high-expansion foam concentrates for top application to water-immiscible liquids*

3 Terms and definitions

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

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

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

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

3.1
batch
group of the same products made on the same production line using the same lot of materials during one production shift

3.2
body
metal shell of an extinguisher designed to contain the extinguishing media including any skirt

3.3
bulk range
range of the extinguisher when 50 % of its media has been expelled

3.4
burst pressure
P_b
pressure at which the extinguisher cylinder ruptures

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3.5
charge of extinguisher
mass or volume of extinguishing medium contained in the extinguisher expressed in volume (litres) for water-based extinguishers and in mass (kilograms) for other extinguishers

3.6
classification of fires

Class A fires involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers

Class B fires involving liquids or liquefiable solids

Class C fires involving gases

Class D fires involving metals

Class F fires involving cooking media (vegetable or animal oils and fats) in cooking appliances

Note 1 to entry: Class definitions are in accordance with ISO 3941.

3.7
clean agent
electrically non-conducting gaseous or vapourizing liquid fire extinguishant that does not leave residue upon evaporation

Note 1 to entry: For conductive properties and amount of residue, see Annexes A, B, C and D.

3.8
closure
component, other than a safety device or pressure indicator, subject to internal pressure and used to close off and seal the body

3.9
complete discharge
point in the discharge of an extinguisher when the internal pressure has equalized with the external pressure with the control valve being kept fully open

3.10
effective discharge time
time from the commencement of discharge of the extinguishing medium at the nozzle to the gas point of the discharge stream with the control valve fully open

3.11
extinguisher
appliance containing an extinguishing medium which may be discharged and directed onto a fire by the action of internal pressure

Note 1 to entry: Discharge may be achieved by

a) stored pressure (constant pressurization of the extinguishing media container), or

b) cartridge or cylinder operated device (pressurization at the time of use by the release of a pressurizing gas stored in a separate high-pressure cartridge or container).

3.12
extinguishing medium
substance contained in the extinguisher which causes extinguishment

3.13
fill density
mass in kilograms of extinguishing medium per litre of container volume as fitted for use, complete with valve and internal fittings

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3.14
gas point
point where the medium discharge changes from predominately medium to predominately expellant gas

3.15
lowest observable adverse effect level
LOAEL
lowest concentration at which an adverse physiological or toxicological effect has been observed

3.16
maximum service pressure
P_{ms}
equilibrium pressure developed in a normally charged and pressurized extinguisher which is conditioned at 60 °C for at least 18 h

3.17
propellant
non-flammable compressed gas used to expel the extinguishing medium

3.18
rechargeable extinguisher
extinguisher designed and intended to be recharged after use

3.19
service pressure
P_s
equilibrium pressure developed in a normally charged and pressurized extinguisher conditioned at 20 °C for at least 18 h

3.20
test pressure
P_t
<low-pressure wheeled extinguishers> the higher of 1,43 × P_{ms}, 2,5 × P_s or 2,0 MPa

3.21
wheeled fire extinguisher
appliance on wheels having a total mass more than 20 kg but not greater than 450 kg, which is designed to be operated and transported to the fire by one person

4 Types of wheeled fire extinguishers

4.1 Wheeled fire extinguishers are described by the type of extinguishing medium which they contain. At present, the types of wheeled fire extinguishers are

— water-based,

— powder,

— carbon dioxide, and

— clean agent.

NOTE In some countries, the manufacture and use of clean agents is regulated by the Montreal Protocol or by national regulations.

4.2 Water-based wheeled fire extinguishers may contain plain water or water with additives such as wetting agents, viscosity-increasing agents or flame-retardant, or foaming agents.

NOTE Currently there are no International Standards covering additives added to water to produce antifreeze, wetting or other special characteristics.

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4.3 Powders may be of the "BC" or "ABC" types, or may be specially prepared for Class D fires.

4.4 Wheeled fire extinguishers may have two extinguisher bodies per axle. Each extinguisher body may contain the same or a different extinguishing medium provided they are compatible with each other.

5 Extinguishing media, propellants and fill densities

5.1 Extinguishing media

5.1.1 Carbon dioxide

Carbon dioxide used in wheeled fire extinguishers shall comply with ISO 5923.

5.1.2 Clean agents

Clean agents used in wheeled fire extinguishers shall comply with Annex A for FK-5-1-12, Annex B for HCFC Blend B, Annex C for HFC-227ea or Annex D for HFC 236fa as appropriate or shall be regulated by the national environmental regulatory body of a country.

NOTE In some countries, the manufacture and use of clean agents is regulated by the Montreal Protocol or by national regulations.

5.1.3 Powder

Powder used in wheeled fire extinguishers shall comply with ISO 7202.

IMPORTANT — Exception: powders for use on Class D fires.

5.1.4 Foam concentrates

Foam concentrates used in wheeled fire extinguishers shall comply with ISO 7203-1 (alternatively, ISO 7203-2).

5.2 Propellants

The propellant for stored pressure and cartridge-operated wheeled fire extinguishers shall be air, argon, carbon dioxide, helium, nitrogen or mixtures of these gases having a maximum dewpoint of −60 °C.

IMPORTANT — Exception: propellant for stored pressure water-based wheeled fire extinguishers need not meet the dewpoint requirement.

5.3 Fill density

The fill density for carbon dioxide wheeled fire extinguishers shall not exceed 0,75 kg/l.

The fill density for clean agent wheeled fire extinguishers shall not exceed the values given in Annex A, Annex B, Annex C or Annex D, as appropriate.

These fill densities may be modified subject to national pressure vessel regulations.

5.4 Filling tolerance

The actual charge of a wheeled fire extinguisher shall be the nominal charge within the following limits:

a) water-based extinguishers: +0, −5 % by volume;

b) powder-based extinguishers: ±2 % by mass;

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c) carbon dioxide and clean agent extinguishers: +0, −5 % by mass.

5.5 Charges

5.5.1 Nominal charge

The following are the recommended charges for wheeled fire extinguishers:

a) water-based extinguishers: 20 l, 45 l, 60 l and 125 l;

b) powder-based extinguishers: 20 kg, 50 kg, 100 kg and 150 kg;

c) carbon dioxide and clean agent extinguishers: 10 kg, 20 kg, 30 kg, 50 kg and 70 kg

NOTE Other nominal capacities are allowed.

5.5.2 Gross weight

The gross weight of a wheeled fire extinguisher shall not exceed 450 kg.

6 Performance

6.1 Operating temperatures

Wheeled fire extinguishers shall be capable of operating reliably within one of the following temperature ranges:

a) +5 °C to +60 °C;

b) −5 °C to +60 °C;

c) −10 °C to +60 °C;

d) −20 °C to +60 °C;

e) −30 °C to +60 °C;

f) −40 °C to +60 °C;

g) −55 °C to +60 °C.

The temperature range selected from the above ranges shall be marked on the extinguisher (see 9.2.5).

6.2 Effective discharge time and bulk range of discharge

6.2.1 Effective discharge time

6.2.1.1 The effective discharge time of water-based type wheeled fire extinguishers shall be not less than 40 s or more than 210 s.

6.2.1.2 The effective discharge time of wheeled fire extinguishers other than water-based types shall be not less than 20 s.

6.2.2 Bulk range

6.2.2.1 The bulk range of wheeled fire extinguishers with a Class A rating shall be not less than 6 m when tested in accordance with 6.2.2.2.

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IMPORTANT — Exception: for water-based type wheeled fire extinguishers fitted with a spray nozzle, the bulk range maybe reduced to 3 m.

6.2.2.2 Condition the extinguisher for not less than 18 h at a temperature of (20 ± 3) °C and place it in its normal operating position with the discharge nozzle held horizontally at a height of 1 m.

Fully discharge the extinguisher with the control valve fully open within 5 min of conditioning.

Record the bulk range at the time corresponding to 50 % of the effective discharge time.

If the range of effective discharge is difficult to determine visually, supplementary means, such as collection boxes for water, foam or powder extinguishers or condensing plates for carbon dioxide and clean agent extinguishers may be used.

6.3 Resistance to temperature changes

6.3.1 Requirements

Wheeled fire extinguishers shall be able to operate at temperatures between the minimum marked on the extinguisher (see 6.1) and +60 °C. After the test described in 6.3.2, they shall satisfy the following requirements:

a) the extinguisher shall operate as intended;

b) the extinguisher shall commence discharge within 5 s of the control valve being opened;

c) not more than 10 % of the initial charge of media shall remain within the extinguisher after complete discharge.

6.3.2 Test procedure

Subject four extinguishers to the temperature cycles defined in Table 1, two extinguishers to each cycle.

Table 1 — Temperature cycles

Duration h	Cycle No. 1	Cycle No. 2[a]
24 ± 1	Store at minimum storage[a] and use temperature (+0, −2) °C	Store at (60 ± 2) °C
24 ± 1	Store at (20 ± 5) °C	Store at (20 ± 5) °C
24 ± 1	Store at (60 ± 2) °C	Store at minimum storage and use temperature (+0, −2) °C

[a] The storage temperatures refer to the ambient temperature within the conditioning chamber.

Operate the extinguisher with the control valve fully open within 5 min of its removal from the conditioning chamber.

If it is not possible to operate the extinguisher within 5 min after its removal from the conditioning chamber, suitable means, such as insulation shall be used to maintain the extinguisher at the conditioning temperature until discharge.

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6.4 Retention of charge

6.4.1 Checking

6.4.1.1 Wheeled fire extinguishers and gas cartridges or cylinders shall be designed so as to permit their charge to be checked at regular intervals when they are installed.

6.4.1.2 The charge of the following types of wheeled fire extinguishers shall be measured by weighing:

a) all types of gas cartridges for wheeled fire extinguishers;

b) carbon dioxide wheeled fire extinguishers;

c) stored pressure wheeled fire extinguishers of various types including some clean agents in which a loss of 1 % of total charged extinguisher mass is accompanied by a pressure loss of not more than 10 % of the service pressure at (20 ± 2) °C.

6.4.1.3 The charge of stored pressure wheeled fire extinguishers of types not covered by 6.4.1.2 b) and 6.4.1.2 c) and non-liquefied gas containers fitted with a gauge shall be checked by direct measurement of internal pressure at (20 ± 2) °C. For this purpose, the extinguisher shall be fitted with a pressure gauge ported into the extinguisher body.

NOTE If a connection is provided to which an independent pressure measuring appliance can be attached for checking the pressure gauge, the connection is equipped with a pressure retaining cap.

6.5 Intermittent discharge test

6.5.1 A wheeled fire extinguisher conditioned at (20 ± 5) °C and at (60 ± 2) °C shall operate in such a manner that not more than 1 s elapses from the time the control valve is operated until the extinguishing medium starts to discharge and shall cease the discharge of medium within 1 s after closing the control valve. Not more than 10 % of the initial charge remains within the extinguisher after complete discharge.

6.5.2 The test shall be conducted following conditioning at each of the temperatures specified in 6.5.1 for at least 18 h. The extinguisher shall be operated intermittently by opening and closing the control valve in cycles of 5 s open and 5 s closed until the end of discharge.

6.6 Resistance to corrosion

6.6.1 External corrosion test

Wheeled fire extinguishers shall be subjected to a salt spray test as defined in ISO 9227 for a period of 480 h and then shall be washed carefully to remove any salt deposits. Two samples shall be tested, either two of the same size or one sample each of two different sizes from the same family.

The operating forces, or energy if applicable, shall comply with the method of operation specified in 8.14.

The pressure gauge on stored pressure extinguishers shall remain watertight and functional. See 8.16.7.

There shall be no corrosion of the metal of the extinguisher likely to impair its operation or safety. Discolouration or superficial corrosion of non-ferrous materials is acceptable but galvanic corrosion between dissimilar metals is not permitted.

Test samples employing smaller extinguisher bodies are permitted to be used for this test provided they are fabricated using the same material and processes and have the same protective coatings or corrosion protection system.

The length of the discharge hose assembly is permitted to be reduced to 1,4 m for this test.

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