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Fire protection — Fire extinguishing media — Powder

Protection contre l'incendie — Agents extincteurs — Poudres

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

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 firefighting*, Subcommittee SC 6, *Foam and powder media and firefighting systems using foam and powder*.

This third edition cancels and replaces the second edition (ISO 7202:2012), which has been technically revised.

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

— A new subclause 5.5 was introduced requesting the testing of the content of MAP in dry chemical powders of the ABC-type.

— A new subclause 13.10 was introduced with the description of the method to evaluate the MAP content in Class ABC powders.

— A NOTE was added to subclause 13.10 referring to an alternate method described in Annex E.

— A new Annex E was added introducing the Japanese titration method for MAP testing in ABC-type powders.

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.

Introduction

This document is one of a series giving specifications for fire extinguishing media in common use and which are in need of specification for firefighting 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.

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

Annexes A to D provide important information and give recommendations relating to the use of extinguishing powders, and they should be read carefully by all concerned with the use of extinguishing powders. They do not, however, form part of the document.

Fire protection — Fire extinguishing media — Powder

1 Scope

This document specifies requirements for the chemical and physical properties, and for minimum performance in defined test methods, of fire extinguishing powders suitable for use against fires of classes A, B, C and D. Requirements are also given for the information and data to be declared by the manufacturer.

NOTE The classification of fires is given in ISO 3941.

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 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 4788, *Laboratory glassware — Graduated measuring cylinders*

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

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:

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

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

3.1
batch
single charge of material in the processing equipment that has been made homogeneous by subjection to the same unit and physical processing

Note 1 to entry: This is for the purposes of acceptance and verification testing by an inspecting authority.

3.2
characterization statement
information and data declared by the manufacturer regarding the chemical and physical properties of the powder

3.3
extinguishing powder
extinguishing medium composed of finely divided solid chemical products consisting of one or more principal components, which are combined with additives to improve its characteristics

Note 1 to entry: The term "dry powder" is sometimes used to denote special metal fire extinguishing agents and the term "dry chemical extinguishing agent" refers to the extinguishing medium covered by this document.

Note 2 to entry: When it is useful to indicate the class of fire for which a particular powder is designed, capital letters may be added before the term. The letters used in this document are those defined in ISO 3941.

EXAMPLE "BC" powder is designed to extinguish class B (liquids or liquefiable solids) and class C (gases) fires; "ABC" powder is designed to extinguish class A (solids that normally form glowing embers), class B and class C fires; "D" powder is designed to extinguish metal fires.

3.4
lot
one or more batches but not more than 25 t of powder, manufactured to the same formulation by the same manufacturing process and under the same environmental conditions

Note 1 to entry: Any substantial change in production personnel, manufacturing process, source of raw materials, or change in environmental conditions may justify identifying the material as a different lot.

4 Sampling

Samples for testing in accordance with this document shall be taken using a method which will provide a sample which is as representative as possible. In order to avoid any risk of condensation, it is essential that the temperature of the powder in its original container is not lower than the ambient air temperature when the sample is being taken. Sample containers should not be opened until temperature equilibrium with the laboratory air has been reached.

When sampling a lot, not less than 12 kg of material shall be taken at random from a batch. For batch testing, not less than 2,5 kg selected from a container shall be taken at random. Suitably identified samples shall be stored in individual, clean, dry, airtight, non-reactive containers.

In addition to these samples, an inspecting authority may require additional samples for verification testing.

NOTE One suitable method of sampling is suggested in Annex C.

5 Characterization statement and requirements

5.1 General

The manufacturer shall declare, on demand, the information and data specified in 5.2 to 5.5. The manufacturer should conduct statistical measurements to ensure that the values declared correspond to the mean values of the range of values inherent to the manufacturing process.

NOTE The characterization statement is primarily for identification and information purposes and to provide the reference values for the tolerance requirements of 5.2, 5.3 and 5.4, but particular attention is drawn to 5.5.

5.2 Bulk density

The bulk density of the powder shall be determined in accordance with 13.1. The bulk density shall be within ±0,07 g/ml of the value declared by the manufacturer.

5.3 Sieve analysis

When tested using the method specified in 13.2.2 or 13.2.3, the quantity retained on the 40 µm sieve and on the 63 µm sieve shall not differ from the declared value by more than ±8 % of the total mass of the sample, and the quantity retained on the 125 µm sieve shall not differ from the declared value by more than ±5 % of the total mass of the sample. The test method shall be declared with the results.

5.4 Chemical content

Characteristic values for chemical content shall be expressed as percentages (mass fraction) of the total content.

The characteristic values for chemical content shall include all constituents present in the powder at a concentration representing 10 % or more of the total content. The sum of the characteristic values for chemical content shall be 90 % or more of the total content. Each constituent given a characteristic value shall be identified by its chemical name, or as the reaction product of a chemical process between reactants identified by their chemical names.

In the latter case, the chemical process shall be specified, for example by reference to a published patent. The content of a declared constituent shall be as follows:

— within ±1,0 % of the total chemical content for constituents of characteristic value more than 10 % but not more than 15 %;

— within ±1,5 % of the total chemical content for constituents of characteristic value more than 15 % but not more than 25 %;

— within ±2,0 % of the total chemical content for constituents of characteristic value more than 25 % but not more than 65 %;

— within ±3,0 % of the total chemical content for constituents of characteristic value more than 65 % and above.

NOTE 1 For example, a constituent with a characteristic value of 20 % has tolerance limits of 18,5 % and 21,5 % and a constituent with a characteristic value of 80 % has tolerance limits of 77 % and 83 %.

NOTE 2 The compatibility of the powder with foam depends on the powder's chemical content. The test described in Annex A can allow a determination of foam/powder compatibility to be made.

WARNING — It is important that under normal conditions of use the various materials and additives used to produce powders be generally recognized as being non-toxic to humans. In some countries there may be a legal obligation to disclose to designated authorities the complete chemical content, and any proposed changes of chemical content, with documented details of non-toxicity.

WARNING — The mixing of different types of powders (e.g. ABC and BC) consisting of certain compounds (e.g. $NH_4H_2PO_4$, $NaHCO_3$ or $CaCO_3$) and/or the mixing of these compounds as raw materials into one powder may result in caking, and the production of gas which will increase pressure in the container to an unsafe level. Such increases in pressure have been known to cause containers to rupture, and to cause bodily injury and damage.

WARNING — Recovered powder may have been previously contaminated, and may have absorbed moisture. If it is then recycled, the powder may eventually become lumpy and interrupt the flow of powder when used on a fire.

5.5 Content of mono ammonium phosphate in Class ABC powders

The content of ammonium phosphate in Class ABC powders shall be determined in accordance to 13.10.

5.6 Toxicity

It is important that, under normal conditions of use for fire extinguishing, the various materials and additives used to produce extinguishing powders shall be generally recognized as being non-toxic to humans per material safety data sheet according to local jurisdictional requirements.

6 Fire test performance

6.1 General

The fire performance of extinguishing powders shall be evaluated following the procedures given in ISO 7165.

6.2 Class A

When tested using the method specified in 13.3.1.1, extinguishing powders claimed by the manufacturer to be suitable for class A fires shall comply with ISO 7165 for one of the minimum class A ratings, specified therein.

6.3 Class B

When tested using the method specified in 13.3.1.2, extinguishing powders claimed by the manufacturer to be suitable for class B fires shall comply with ISO 7165 for one of the minimum class B ratings, specified therein.

6.4 Class C

Extinguishing powders claimed by the manufacturer to be suitable for class C fires shall comply with 6.3.

NOTE There are no fire test requirements for the performance of extinguishing powders against class C fires included in this document. Suitability for use against class C can claimed for class B or class AB extinguishing powders only.

6.5 Class D

When tested using the method specified in 13.3.1.3, extinguishing powders claimed by the manufacturer to be suitable for class D fires shall comply with ISO 7165.

Extinguishing powders suitable for class D fires are typically not suitable for use on fires of other classes. Specialized media and applicators are typically used.

7 Fluidity testing

When tested using the method specified in 13.4, extinguishing powders shall not exceed an average flow time of 8 s taken as an average of 20 single measurements.

8 Resistance to caking and lumping

Any lumps formed shall not be retained on the 425 m sieve when the powder is tested in accordance with 13.5.

9 Water repellence

There shall be no complete absorption of the water droplets when the powder is tested in accordance with 13.6.

10 Moisture content

The moisture content shall not exceed a mass fraction of 0,25 % when determined in accordance with 13.7.

NOTE 1 An alternative method is to analyse the moisture by use of an infrared moisture meter which has been adjusted to provide results equal to the method described in 13.7.

NOTE 2 A second alternative testing method is described in Annex D.

11 Electrical insulation value

The powder shall have a dielectric strength of not less than 5 kV, when measured using the method specified in 13.8.

This requirement shall not apply to class D powders.

12 Moisture absorbance

The rate of weight increase of a saturated dry powder agent attained by exposing it to an environment with a temperature of 30 °C and 60 % relative humidity for 48 h shall be less than 2 % upon exposure to an environment with a temperature of 30 °C and 80 % relative humidity for 48 h when tested in accordance with 13.9.

13 Test methods

13.1 Bulk density

13.1.1 Apparatus

13.1.1.1 250 ml stoppered glass measuring cylinder, conforming to ISO 4788, having an approximate height of 320 mm and an approximate internal diameter of 40 mm.

13.1.1.2 Scale, accurate to 0,001 g.

NOTE See 5.2.

13.1.2 Procedure

Place (100 ± 0,1) g of the powder in a clean, dry, 250 ml stoppered glass measuring cylinder, conforming to ISO 4788, having an approximate height of 320 mm and an approximate internal diameter of 40 mm. Secure the stopper in the cylinder. Rotate the cylinder end over end for ten complete revolutions, at approximately one revolution every 2 s. Immediately after the ten revolutions have been completed, set the cylinder upright on a level surface and allow the powder to settle for (180 ± 2) s. Read off the volume occupied by the powder. Calculate the bulk density, ρ_b, from Formula (1):

$$\rho_b = \frac{m}{V} \tag{1}$$

where

m is the mass of the powder (i.e. 100 g);

V is the volume occupied by the powder.

NOTE 1 Electrostatic phenomena can cause difficulty in testing powders containing stearates. The problem is reduced by prior testing of a siliconized powder.

NOTE 2 After long-term storage, the bulk density can increase.

13.2 Sieve analysis

13.2.1 General

The two methods specified below (Method 1 and Method 2) can give slightly differing results.

NOTE See 5.3.

13.2.2 Method 1

It is recommended to use sieve balls or cubes on every deck when applying the rotap-sieve method.

13.2.2.1 Apparatus

The apparatus shall comprise the following items:

13.2.2.1.1 Nest of sieves, having a nominal diameter of 200 mm and nominal sizes of 125 µm, 63 µm and 40 µm, conforming to ISO 3310-1, a lid and a collecting pan with the 125 µm sieve as the top sieve with the lid placed on top and the 40 µm sieve as the bottom sieve with the collecting pan placed underneath.

13.2.2.1.2 Sieve-shaking device, capable of moving the nest in a horizontal ellipse with an impact from the bottom to the top of the nest at every ninth pass.

13.2.2.2 Procedure

Accurately weigh to ±0,02 g approximately 20 g of the powder into the top sieve. Assemble on the shaking device and shake for at least 10 min. Weigh the quantity of powder retained on each sieve and report as cumulative percentage of the original sample mass retained.

13.2.3 Method 2

13.2.3.1 Apparatus

The apparatus shall comprise the following items:

13.2.3.1.1 Three sieves, as described in 13.2.2.1.1.

13.2.3.1.2 Air-jet sieving device[1], which provides an air flow from above to below the sieve with a reverse air-jet from a rotating arm beneath the sieve (see Figure 1).

13.2.3.2 Procedure

Carry out three tests using the 125 µm, 63 µm and the 40 µm sieves in turn.

Follow the air-jet sieving device manufacturer's instructions. Use a 20 g sample of powder and sieve for (300 ± 5) s. Report as percentage retained on each sieve.

1) A suitable apparatus, available commercially, is Model A200 LS manufactured by Alpine AG, 89 Augsburg, P.O. Box 101109, Germany. This information is given for the convenience of the users of this document and does not constitute an endorsement of this apparatus by ISO.

