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Fireworks — Categories 1, 2 and 3 —

Part 5: Requirements for construction and performance

Artifices de divertissement — Catégories 1, 2 et 3 —

Partie 5: Exigences de construction et de performances

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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).

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 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 264, *Fireworks*.

A list of all parts in the ISO 25947 series can be found on the ISO website.

Fireworks — Categories 1, 2 and 3 —

Part 5: Requirements for construction and performance

1 Scope

This document specifies requirements for the construction, performance and primary packaging of fireworks of category 1, 2 and 3 of the following types:

— aerial wheels;

— bangers;

— batteries;

— batteries requiring external support;

— Bengal flames;

— Bengal matches;

— Bengal sticks;

— Christmas crackers;

— combinations;

— combinations requiring external support;

— compound fireworks;

— crackling granules;

— double bangers;

— double flash bangers;

— flash bangers;

— flash pellets;

— fountains;

— ground movers;

— ground spinners;

— hand-held sparklers;

— jumping crackers;

— jumping ground spinners;

— mines;

— mini rockets;

— nezumi-hanabi;

- non-hand-held sparklers;
- novelty matches;
- party poppers;
- rockets;
- Roman candles;
- senko-hanabi;
- serpents;
- shot tubes;
- snaps;
- spinners;
- table bombs;
- throwdowns;
- wheels.

This document does not apply to articles containing pyrotechnic composition that includes any of the following substances:

- arsenic or arsenic compounds;
- hexachlorobenzene;
- mixtures containing a mass fraction of chlorates greater than 80 %;
- mixtures of chlorates with metals;
- mixtures of chlorates with red phosphorus (except when used in Christmas crackers, party poppers, snaps and throwdowns);
- mixtures of chlorates with potassium hexacyanoferrate(II);
- mixtures of chlorates with sulfur (these mixtures are allowed for friction heads only);
- mixtures of chlorates with sulfides;
- lead or lead compounds;
- mercury compounds;
- white phosphorus;
- picrates or picric acid;
- potassium chlorate with a mass fraction of bromates greater than 0,15 %;
- sulfur with an acidity, expressed in mass fraction of sulphuric acid, greater than 0,002 %;
- zirconium with a particle size of less than 40 µm.

This document does not apply for theatrical pyrotechnic articles which are designed for indoor or outdoor stage use, including film and television productions or similar use.

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 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 25947-1, *Fireworks, Categories 1, 2 and 3 — Part 1: Terminology*

ISO 25947-2, *Fireworks, Categories 1, 2 and 3 — Part 2: Categories and types of firework*

ISO 25947-3, *Fireworks, Categories 1, 2 and 3 — Part 3: Minimum labelling requirements*

ISO 25947-4:2017, *Fireworks, Categories 1, 2 and 3 — Part 4: Test Methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 25947-1 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

4 Construction

4.1 Construction materials (type test and batch test)

4.1.1 General requirements

— The body of the firework case shall be made of paper, cardboard, plastics or other non-metallic materials which do not produce hard or brittle fragments. The base (end closures) or means of fixing shall be made of non-metallic material. Where technically necessary, wood, staples, nails, aluminium coated foil or binding wires may be used. Conformity to this requirement shall be verified by visual examination.

— For articles fitted with a friction head, the primary pack shall be fitted with a striking surface for safety matches. Conformity to this requirement shall be verified by visual examination.

— The striking surface shall be resistant enough to allow ignition of all the articles included within the primary pack when tested in accordance with ISO 25947-4:2017, 6.17. The striking surface on the pack shall be covered or the pack shall be sealed, verified by visual examination.

4.1.2 Specific requirements

— For bangers and flash bangers, cardboard wrapped in cord is permitted as construction material.

— Double flash bangers shall have a base plate.

— For double flash bangers, the inside diameter of the tube shall not exceed 30 mm. Conformity to this requirement shall be verified by the method described in ISO 25947-4:2017, 6.2.5.

— For batteries and batteries requiring external support the tubes of mines, Roman candles or shot tubes shall have a maximum angle of 30° to the vertical, when tested in accordance with ISO 25947-4:2017, 6.19. For combinations and combinations requiring external support, this requirement applies to the tubes of mines, Roman candles and shot tubes.

— For Bengal matches and Bengal sticks: the stick shall be made of wood or bamboo.

— For Christmas crackers and snaps, the overlapping strips shall be made of cardboard, paper or string.

— For jumping crackers, the firework case shall be made of paper only.

— For mini rockets, the tube containing the propellant charge shall be made of cardboard or, when no report charge is present, plastics.

— For novelty matches, the stick shall be made of cardboard or wood.

— For party poppers, the shape shall not be confused with a gun.

— For rockets, the tube containing the propellant charge shall be made of cardboard, plastics or sheathed aluminium.

— For Roman candles and shot tubes, the case, if any, of the pyrotechnic unit, shall be made of paper, cardboard or plastics.

— For Roman candles, the inside diameter of the tube shall not exceed 30 mm. Conformity to this requirement shall be verified by the method described in ISO 25947-4:2017, 6.2.5.

— For shot tubes, the inside diameter of the tube shall not exceed 30 mm (category 2) or 50 mm (category 3). Conformity to these requirements shall be verified by the method described in ISO 25947-4:2017, 6.2.5.

— For spinners, the aerofoils, if any, shall be made of cardboard or plastics.

— For throwdowns, the body shall be made of tissue paper or foil.

Conformity to above requirements shall be verified by visual examination, unless stated otherwise.

4.2 Length of handle (type test and batch test)

— For Bengal matches, the uncoated end of a Bengal match (handle) shall have a length of at least 40 % of the total length of the Bengal match with a minimum of 20 mm.

— For Bengal sticks, the uncoated end of a Bengal stick (handle) shall have a minimum length of 75 mm.

— For hand-held fountains, the end of the firework case of a hand-held fountain which is not filled with pyrotechnic composition and which acts as a handle, or the handle, if the handle is a separate component, shall have a minimum length of 100 mm.

— For hand-held sparklers, a category 1 hand-held sparkler shall have a minimum handle length of 75 mm; a category 2 hand-held sparkler shall have a minimum handle length of 75 mm when the total length does not exceed 450 mm and 150 mm when the total length is more than 450 mm.

— For novelty matches, the uncoated end of a novelty match (handle) shall have a minimum length of 20 mm.

— For senko-hanabi, the handle shall have a minimum length of 80 mm and shall not burn.

Conformity to above requirements shall be verified by the test method described in ISO 25947-4:2017, 6.2.1.2.1 or 6.2.4.

— For Christmas crackers and snaps, the total length of the pull-strip or -string shall be at least 50 mm.

— For party poppers, the length of the pull-string shall be at least 75 mm.

Conformity to above requirements shall be verified by the method described in ISO 25947-4:2017, 6.2.4.

4.3 Permitted elements in batteries, batteries requiring external support, combinations and combinations requiring external support (type and batch test)

The following elements can be used in batteries and batteries requiring external support: bangers and flash bangers, Bengal flames, crackling granules, fountains, ground spinners, mines, party poppers, rockets (assembled in a launcher), Roman candles, spinners, shot tubes and wheels; the same limits (mass, composition, etc.) as given in Table 1 apply to these elements.

The following elements can be used in combinations and combinations requiring external support: bangers and flash bangers, Bengal flames, fountains, mines, Roman candles, shot tubes, spinners and wheels; the same limits (mass, composition, etc.) as given in Table 1 apply to these elements.

Conformity to above requirements shall be verified by visual examination.

4.4 Dimensions for mini rockets (type test and batch test)

When tested in accordance with ISO 25947-4:2017, 6.2.5 and 6.2.3, mini rockets shall have the following dimensions:

— outer diameter of tube: maximum 10 mm;

— length of tube: maximum 60 mm;

— total length: minimum 250 mm, maximum 350 mm.

4.5 Specific requirements for compound firework (type and batch test)

Only type and batch tested articles from categories 1, 2, 3 or pyrotechnic cords and fuses are permitted to be used in compound fireworks.

Any constructional changes of the individually type and batch tested articles within the compound firework are not permitted. The connection between the fireworks articles shall be done by the manufacturers only.

Category of a compound firework is determined by the highest category amongst the individual fireworks in the compound firework and the NEC limits given in Table 1, whichever is the highest. The requirements for the single fireworks shall comply with the requirements of this document.

The single fireworks shall be fixed onto a non-metallic base plate to increase stability during functioning. All single fireworks shall remain in their initial position during functioning.

The manufacturer shall provide technical drawings of the compound fireworks and part lists of all incorporated pyrotechnic articles (fireworks category 1, 2, 3 as well as pyrotechnic cords and fuses). The type and batch tests shall include a check of the documents and outer dimensions. The outer dimensions shall be verified by the method described in ISO 25947-4:2017, 6.2.3.

If transmitting fuses are used to connect the individual fireworks articles, only protruding fuses, which not burn instantaneously, are permitted.

Every single article in a compound firework shall be oriented as individually type tested.

Elements which guarantee the stability of the firework during its functioning as single article may be omitted if a sufficient fixing on a base plate is made. Relevant elements are, for example, loose attachment bases, metal fixings (loops)/spikes to be inserted in the ground, foldable bases or packings with fixing function.

The use of a primary pack is mandatory for compound fireworks.

5 Pyrotechnic composition (type test)

When tested in accordance with ISO 25947-4:2017, 6.3.2, the net explosive contents or the total NEC shall comply with Table 1. For report and/or bursting charges with a composition other than black powder, nitrate/metal-based compositions or perchlorate/metal-based compositions the same upper limits as for perchlorate/metal-based compositions apply.

Table 1 — Pyrotechnic composition

Firework types	Cat.	Net explosive content
aerial wheels	3	Not more than 160 g, shall not contain more than eight pyrotechnic units. A pyrotechnic unit shall have a net explosive content of not more than 20 g. A report charge, if any, shall have a net explosive content of not more than 10 g of black powder or 4,0 g of nitrate/metal-based report composition or 2,0 g of perchlorate/metal-based report composition.
bangers	2	Not more than 6,0 g black powder.
	3	Not more than 10 g black powder.
batteries, batteries requiring external support, combinations, combinations requiring external support	1	The net explosive contents of batteries consisting of party poppers shall have no more than 0,05 g.
	2	A battery, battery requiring external support, combination or combination requiring external support, except a combination and combination requiring external support containing fountains, shall have a net explosive content of not more than 500 g; the net explosive content of a combination and combination requiring external support containing fountains shall have a net explosive content of not more than 600 g, of which not more than 500 g shall be contained in elements other than fountains; the net explosive content of a battery and a battery requiring external support containing fountains shall have a net explosive content of not more than 600 g. Bangers used in batteries, batteries requiring external support, combinations or combinations requiring external support shall have a total net explosive content of not more than 100 g. Flash bangers used in batteries, batteries requiring external support, combinations or combinations requiring external support shall have a total net explosive content of not more than 25 g.
	3	A battery, battery requiring external support, combination or combination requiring external support, except a combination and combination requiring external support containing fountains, shall have a net explosive content of not more than 1 000 g; a combination and a combination requiring external support containing fountains shall have a net explosive content of not more than 3 000 g, of which not more than 1 000 g shall be contained in elements other than fountains; a battery and a battery requiring external support containing fountains shall have a net explosive content of not more than 3 000 g. Bangers used in batteries, batteries requiring external support, combinations or combinations requiring external support shall have a total net explosive content of not more than 1 000 g. Flash bangers used in batteries, batteries requiring external support, combinations or combinations requiring external support shall have a total net explosive content of not more than 250 g.
Bengal flames	1	Not more than 20 g.
	2	Not more than 250 g.
	3	Not more than 1 000 g.
Bengal matches	1	Not more than 3,0 g.
Bengal sticks	1	Not more than 7,5 g.
	2	Not more than 50 g.
Christmas crackers	1	Not more than 16,0 mg report composition based on potassium chlorate and red phosphorous, or not more than 1,6 mg silver fulminate as report composition.

