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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.

Table 1 *(continued)*

Firework types	Cat.	Net explosive content
compound fireworks	2	Not more than 2 000 g, the respective NEC limits of the included fireworks types apply independently.
	3	Not more than 6 000 g, the respective NEC limits of the included fireworks types apply independently.
crackling granules	1	Not more than 3,0 g.
	2	Not more than 15 g.
double banger	2	Not more than 10 g black powder.
double flash bangers	3	Not more than 12 g in total and not more than 8 g for perchlorate/metal-based report composition.
flash bangers	1	Not more than 0,05 g perchlorate/metal-based report composition.
	2	Not more than 1,0 g for nitrate/metal-based report composition or not more than 0,5 g for perchlorate/metal-based report composition.
	3	Not more than 10 g for nitrate/metal-based report composition or not more than 5,0 g for perchlorate/metal-based report composition.
flash pellet	1	Not more than 2,0 g.
	2	Not more than 30 g.
fountains	1	Not more than 7,5 g (for indoor use: pyrotechnic composition that is based on nitrocellulose with a mass fraction of not more than 12,6 % of nitrogen, with no additional oxidizing substances).
	2	Not more than 250 g, each whistle unit, if any, not more than 5,0 g.
	3	Not more than 1 000 g, each whistle unit, if any, not more than 20 g.
ground movers	1	Not more than 2,0 g black powder, no report charge allowed.
	2	Not more than 25 g, each pyrotechnic unit not more than 3,0 g, no report charge allowed.
ground spinners	1	Not more than, 5,0 g.
	2	Not more than 25 g and each pyrotechnic unit not more than 8,0 g.
jumping crackers	1	Not more than 1,0 g black powder.
	2	Not more than 10 g black powder.
jumping ground spinners	2	Not more than 25 g, each pyrotechnic unit not more than 5,0 g.
mines	2	Not more than 50 g, shall not contain more than five pyrotechnic units containing report composition and each of these pyrotechnic units shall not contain more than 5,0 g of black powder or 2,0 g of nitrate/metal-based report composition or 1,0 g of perchlorate/metal-based report composition. For mines with non-pyrotechnic objects not more than 8,0 g nitrocellulose, with a mass fraction of nitrogen of not more than 12,6 %.
	3	Not more than 200 g, shall not contain more than 25 pyrotechnic units containing report composition and each of these pyrotechnic units shall not contain more than 5,0 g of black powder or 2,0 g of nitrate/metal-based report composition or 1,0 g of perchlorate/metal-based report composition.
mini rocket	2	Not more than 1,5 g, not more than 0,13 g report composition.
nezumi-hanabi	1	Not more than 1,0 g.
novelty matches	1	Not more than 50,0 mg, shall only contain one report charge, if any, the report charge shall have a mean net explosive content of not more than 2,5 mg silver fulminate.
party poppers	1	Not more than 16,0 mg of pyrotechnic composition that is based on potassium chlorate and red phosphorous.

Table 1 *(continued)*

Firework types	Cat.	Net explosive content
rockets	2	Not more than 75 g, report and/or bursting charge, if any, shall be not more than 10 g of black powder or 4,0 g of nitrate/metal-based composition or 2,0 g of perchlorate/metal-based composition.
	3	Not more than 200 g, report and/or bursting charge, if any, shall be not more than 50 g of black powder or 20 g of nitrate/metal-based composition or 10 g of perchlorate/metal-based composition.
Roman candles	2	Not more than 50 g, each pyrotechnic unit not more than 10 g, shall not contain more than five pyrotechnic units containing report composition and each of these pyrotechnic units not more than 10 g of black powder or 4,0 g nitrate/metal-based report composition or 2,0 g perchlorate/metal-based report composition.
	3	Not more than 250 g, each pyrotechnic unit not more than 50 g, shall not contain more than ten pyrotechnic units containing report composition and each of these pyrotechnic units not more than 20 g of black powder or 8,0 g of nitrate/metal-based report composition or 4,0 g of perchlorate/metal-based report composition.
senko-hanabi	1	Not more than 0,5 g.
serpents	1	Not more than 3,0 g.
shot tubes	2	Not more than 25 g, mass of the report and/or bursting charge in the pyrotechnic unit: 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.
	3	Not more than 40 g; mass of the report and/or bursting charge in the pyrotechnic unit: not more than 20 g of black powder or 8,0 g of nitrate/metal-based report composition or 4,0 g of perchlorate/metal-based report composition.
snaps	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.
sparklers	1	Not more than 7,5 g.
	2	Not more than 50 g.
spinners	2	Not more than 30 g.
table bombs	1	Not more than 2,0 g nitrocellulose, with a mass fraction of nitrogen of not more than 12,6 %.
throwdowns	1	Not more than 2,5 mg silver fulminate or not more than 16 mg potassium chlorate and red phosphorous mixture.
wheels	1	Not more than 4,0 g; each whistle unit, if any, not more than 1,0 g.
	2	Not more than 100 g; each whistle unit, if any, not more than 5,0 g.
	3	Not more than 900 g; each single unit not more than 150,0 g; each whistle unit, if any, not more than 20 g.

6 Means of ignition

6.1 Permitted means of ignition (type test and batch test)

Conformity to the following requirements in Table 2 shall be verified by visual examination.

Table 2 — Permitted means of ignition (type test and batch test)

Article	Protruding fuse	Ignition head	Sealing paper	Friction head
Aerial wheels	+	–	–	–
Bangers	+	+	–	+
Batteries, except batteries of party poppers[a]	+	–	–	–
Batteries requiring external support	+	–	–	–
Bengal flames	+	+	+	–
Bengal matches	–	–	–	+
Bengal sticks	N.A.	N.A.	N.A.	N.A.
Christmas crackers	N.A.	N.A.	N.A.	N.A.
Combinations	+	–	–	–
Combinations requiring external support	+	–	–	–
Compound firework	+	–	–	–
Crackling granules	+	–	–	–
Double bangers	+	–	–	–
Double flash bangers	+	–	–	–
Flash bangers	+	–	–	–
Flash pellets	+	+	–	–
Fountains (indoor use)	+	+	+	–
Fountains (outdoor use)	+	+	+	+
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	N.A.	N.A.	N.A.	N.A.
Rockets	+	–	–	–
Roman candles	+	–	–	–
Serpents	+	+	–	–
Senko-hanabi	–	–	+	–
Shot tubes	+	–	–	–
Snaps	N.A.	N.A.	N.A.	N.A.
Spinners	+	–	–	–

[a] Batteries of party poppers are usually ignited by pull-string.

\+ : permitted.

–: not permitted.

N.A.: not applicable.

Table 2 *(continued)*

Article	Protruding fuse	Ignition head	Sealing paper	Friction head
Table bombs	+	–	–	–
Throwdowns	N.A.	N.A.	N.A.	N.A.
Wheels	+	–	–	–

[a] Batteries of party poppers are usually ignited by pull-string.

\+ : permitted.

–: not permitted.

N.A.: not applicable.

The following remarks apply to specific firework types.

— Batteries, batteries requiring external support, combinations, combinations requiring external support and compound fireworks may be fitted with two fuses, both meeting the requirements given in 6.4.1.

— Bengal flames of category 1 with sealing paper usually have no initial fuse.

— Bengal sticks usually have no initial fuse.

— Christmas crackers and snaps have no initial fuse.

— Compound fireworks: connection points shall be securely covered and not exposed/directly accessible.

— Small flash pellets usually have no initial fuse.

— Fountains for indoor use usually have no initial fuse.

— Senko-hanabi with wooden stick usually have no initial fuse.

— Small handheld fountains usually have no initial fuse.

— Snaps, party poppers and batteries of party poppers are usually ignited by pull-string.

— Some serpents have no initial fuse.

6.2 Protection of initial fuse (type test and batch test)

— The initial fuse and reserve fuse, if applicable, shall be protected by an orange fuse cover, a primary pack or a selection pack.

— The use of a primary pack is mandatory for Bengal matches, flash bangers of category 1, friction ignited bangers, friction ignited outdoor fountains, hand-held sparklers, non-hand-held sparklers, novelty matches and throwdowns.

— The use of a primary or selection pack is mandatory for Bengal sticks, Christmas crackers, flash pellets, jumping crackers, mini rockets, party poppers, serpents, snaps and spinners.

— Throwdowns shall be embedded in sawdust.

— There shall be no exposed instantaneous fuse in any firework.

Conformity to these requirements shall be verified by visual examination.

6.3 Attachment of means of ignition (type test and batch test)

The attachment of the protruding fuse, ignition head, the sealing paper or the friction head of the firework shall be secure when tested in accordance with ISO 25947-4:2017, 6.2.6 (protruding fuse) or 6.2.7 (other means of ignition).

6.4 Fuse requirements (type test and batch test)

6.4.1 General requirements

When tested in accordance with ISO 25947-4:2017, 6.18, means of ignition shall be clearly visible or shall be indicated by labelling or instructions. When tested in accordance with ISO 25947-4:2017, 6.7.2.1, the initial fuse and reserve fuse shall ignite within 10 s and the ignition shall be visible, or the friction-ignited head shall ignite and the ignition shall be visible.

When tested in accordance with ISO 25947-4:2017, 6.7.2.2, for category 1 and 2 fireworks, the duration of the initial fuse burning shall be 3,0 s to 8,0 s and for category 3 fireworks 5,0 s to 13,0 s.

For fireworks fitted with a friction head: when tested in accordance with ISO 25947-4:2017, 6.2.8, the friction head shall not ignite.

6.4.2 Specific requirements

For indoor fountains of category 1, when tested in accordance with ISO 25947-4:2017, 6.7.2.1, the fountain shall ignite within 5,0 s.

For Roman candles, when tested in accordance with ISO 25947-4:2017, 6.7.2.3, the period of invisible burning occurring after the preliminary effect shall not exceed 5,0 s (category 2) or 10,0 s (category 3).

For spinners and jumping ground spinners, the point of ignition shall be visible from the top of the article, verified by visual examination.

Hand-held sparklers and non-hand-held sparklers shall ignite within 15 s when tested in accordance with ISO 25947-4:2017, 6.7.2.1.

For wheels of category 3, the initial fuse of the mounted wheel shall not be more than 1,75 m above the ground when measured in accordance with ISO 25947-4:2017, 6.2.9.

For compound fireworks, the delay time between the functioning of the fireworks articles included within the compound firework shall not exceed 15 s when measured in accordance with ISO 25947-4:2017, 6.7.2.4.

7 Performance

7.1 Properties to be checked before functioning tests

7.1.1 Loose pyrotechnic composition after mechanical conditioning (type test)

When tested in accordance with ISO 25947-4:2017, 6.15, the mass of loose pyrotechnic composition shall not exceed 100,0 mg for each item tested.

The mass of loose pyrotechnic composition of Christmas crackers and snaps shall not exceed 1,0 mg when tested in accordance with ISO 25947-4:2017, 6.15, for each item tested.

7.1.2 Integrity (type test and batch test)

7.1.2.1 General requirements

— There shall be no holes, splits, dents or bulges in the body of the firework case, except those technically necessary for the correct functioning of the firework. There shall be no holes or splits in the end closures. If the end closures are separate components, they shall be securely in place. Conformity to these requirements shall be verified by visual examination.

— For fireworks with separate components (e.g. base or handle) these components shall be securely attached in place. Conformity to this requirement shall be examined in accordance with ISO 25947-4:2017, 6.2.2. If the handle is an integral part of the body, it shall be clearly identified. Conformity to this requirement shall be verified by visual examination.

7.1.2.2 Specific requirements

— For batteries, batteries requiring external support, combinations and combinations requiring external support, each individual element shall be securely attached, other than by the transmitting fuse(s) alone (except for banger and flash banger elements), to the other elements or to the framework. For a battery or a battery requiring external support of rockets, this requirement shall apply to the rocket launchers, not to the rockets.

— The articles within in the compound fireworks shall be securely attached to the base.

— Elements in banger batteries or batteries requiring external support and flash banger batteries or flash banger batteries requiring external support may be joined entirely by the transmitting fuse only if it is sufficient to keep the elements joined together during normal handling.

— For Bengal flames, holes and splits in the end closures intended for fixing the Bengal flame are allowed.

— For Bengal matches, Bengal sticks and novelty matches: the wooden sticks shall have no splits.

— For Christmas crackers and snaps, the pyrotechnic composition shall not be visible. The strip cover shall not be loose, but allow sufficient movement for functioning.

— For party poppers and table bombs, there shall be no holes or splits in the closure of the mouth which shall be in place so that it retains the contents.

— For throwdowns, the casing shall retain the contents.

Conformity to these requirements shall be verified by visual examination.

7.1.3 Stabilisation of flight (type test and batch test)

— For mini rockets, the article shall be fitted with a stick or sticks as a means of stabilisation.

— For rockets, the article shall either be fitted with a stick or sticks or be fitted with other means for stabilization of flight (for example fins, basket or ring).

The means for stabilization of flight shall be made of non-metallic materials, other than staples used to fix a stick or sticks to the rocket.

Conformity to these requirements shall be verified by visual examination.

7.1.4 Other requirements (type test)

For throwdowns, when tested in accordance with ISO 25947-4:2017, 6.15, the throwdown shall not explode during mechanical conditioning, and when tested subsequently, it shall produce a single report.

7.2 Properties to be checked during functioning tests (type test and batch test)

7.2.1 Principal effects

When tested in accordance with ISO 25947-4:2017, 6.18, the principal effects of each firework shall conform to the effects described in ISO 25947-2.

7.2.2 Functioning

When tested in accordance with ISO 25947-4:2017, 6.18, the firework shall function completely.

For compound fireworks, the functioning of the individual fireworks within the compound firework shall not adversely affect any other included articles.

7.2.3 Angle of ascent or flight

— For aerial wheels, the angle of ascent of the aerial wheel shall not exceed 15° to the vertical up to a height of 20 m above ground.

— For double bangers and double flash bangers, the angle of flight of a double banger or double flash bangers shall not exceed 8° to the vertical up to a height of 3 m above ground.

— For mini rockets, the angle of flight of the rockets shall not exceed 30° to the vertical.

— For rockets, the angle of flight of the rockets shall not exceed 15° to the vertical up to a height of 20 m above ground.

— For spinners, the angle of flight of the spinner shall not exceed 30° to the vertical up to a height of 3 m above ground.

Conformity to above requirements shall be verified by the relevant method described in ISO 25947-4:2017, 6.5.

7.2.4 Motion

— For ground movers, while functioning, the ground mover shall not move more than 8,0 m away from the testing point.

— For ground spinners and nezumi-hanabi, the article shall not move more than 1,0 m (category 1) or 8,0 m (category 2) away from the testing point; in case of ascent or jump the height shall not be greater than 0,2 m.

— For jumping ground spinners, the article shall not move more than 8,0 m away from the testing point; the height of ascent shall be not greater than 3 m.

Conformity to above requirements shall be verified by the relevant method described in IISO 25947-4:2017, 6.5.3.

7.2.5 Stability during functioning

When tested in accordance with ISO 25947-4:2017, 6.18.2, the following fireworks shall remain upright whilst functioning:

— batteries, batteries requiring external support, combinations and combinations requiring external support, except the bangers and flash bangers elements (for batteries and batteries requiring external support of rockets, the requirement applies to the launcher);

— Bengal flames;

— compound fireworks, except the banger and flash banger elements;

— fountains designed to be placed on the ground;

— mines;

— Roman candles;

— shot tubes;

— table bombs.

7.2.6 Height of explosion

— For aerial wheels, no explosion shall occur below a height of 20 m.

— For compound fireworks, as per individual article/type.

— For double bangers, the second report of a double banger shall be at least 3 m above the ground.

— For double flash bangers, the second report of a double flash banger shall be at least 20 m above the ground.

— For mini rockets, no explosion shall occur below a height of 8 m.

— For rockets, no explosion shall occur and the article shall not burst, below a height of 20 m.

— For Roman candles, the pyrotechnic units shall not explode or burst below a height of 8 m (category 2) or below a height of 30 m (category 3).

— For shot tubes, the pyrotechnic unit shall not explode or burst below a height of 8 m (category 2) or below a height of 30 m (category 3).

Conformity to above requirements shall be verified by the relevant method described in ISO 25947-4:2017, 6.5.

7.2.7 Sound pressure level

When tested in accordance with ISO 25947-4:2017, 6.6.1, 6.6.2 or 6.6.3, no firework shall produce a maximum A-weighted impulse sound pressure level (L_{AImax}) exceeding 120 dB(AI) or equivalent.

7.2.8 Explosions and other failures

The following firework types shall not explode during normal functioning:

— Bengal flames;

— flash pellets;

— fountains;

— ground spinners;

— hand-held sparklers;

— jumping ground spinners;

— non-hand-held sparklers;

— senko-hanabi;

— spinners;

— wheels.

For fountains, the casing shall not rupture during functioning.

For batteries, batteries requiring external support, combinations, combinations requiring external support and compound fireworks: the article shall not produce an explosion damaging the integrity of the firework. This requirement is not applicable to banger batteries, banger batteries requiring external support, flash banger batteries, flash banger batteries requiring external support and compound firework containing only bangers or flash bangers.

Conformity to these requirements shall be verified by the method described in ISO 25947-4:2017, 6.18.2.

7.2.9 Burning or incandescent matter

No burning or incandescent matter shall fall to the ground more than 1,0 m (category 1), 8,0 m (category 2) or 15,0 m (category 3) from the testing point when tested in accordance with ISO 25947-4:2017, 6.13.

For fountains, sparklers, Bengal matches, flash pellets, novelty matches, serpents and table bombs intended for indoor use: functioning shall not cause any holes to be burnt in the test paper when tested in accordance with ISO 25947-4:2017, 6.4.1.

For aerial wheels, rockets and shot tubes: any burning effect produced by the fireworks, other than effects associated with ascent, shall be extinguished at least 3 m above the ground when tested in accordance with ISO 25947-4:2017, 6.5.3.

For Christmas crackers, party poppers and table bombs, the functioning of the fireworks shall not cause the ejected material to catch fire, verified by visual examination.

7.2.10 Extinguishing of flames

Any flames caused by the functioning of the firework shall be extinguished within 5,0 s after the firework ceased to function when tested in accordance with ISO 25947-4:2017, 6.9.2. This requirement applies to the following firework types:

— bangers;

— Bengal matches;

— Bengal sticks;

— crackling granules;

— double bangers;

— double flash bangers;

— flash bangers;

— flash pellets (without base);

— fountains (for indoor use);

— jumping crackers;

— nezumi-hanabi;

— serpents.

Any flames caused by the functioning of the firework shall be extinguished within 10,0 s after the firework ceased to function when tested in accordance with ISO 25947-4:2017, 6.9.2. This requirement applies to hand-held fountains for outdoor use and spinners.

Any flames caused by the functioning of the firework shall be extinguished within 120 s after the firework ceased to function when tested in accordance with ISO 25947-4:2017, 6.9.2. This requirement applies to the following firework types:

— batteries;

— batteries requiring external support;

— Bengal flames;

— combinations;

— combinations requiring external support;

— compound fireworks;

— flash pellet (with base);

— fountains (for outdoor use);

— ground movers;

— ground spinners;

— jumping ground spinners;

— mines;

— Roman candles;

— shot tubes;

— wheels.

7.2.11 Projected debris

There shall be no projected debris of metal, verified by visual examination.

No debris from the fireworks shall be projected laterally more than 1,0 m (category 1), 8,0 m (category 2) or 15,0 m (category 3) from the testing point when tested in accordance with ISO 25947-4:2017, 6.12.2. This requirement applies to the following firework types:

— bangers;

— batteries, batteries requiring external support, combinations and combinations requiring external support;

— crackling granules;

— double bangers;

— double flash bangers;

— flash bangers;

— ground spinners;

— jumping crackers;

— jumping ground spinners;

— mines;

— rockets;

— Roman candles;

— shot tubes.

For aerial wheels, the means for stabilization of flight shall not become detached before the principal effects, other than ascent, occur (verified by visual examination) and any particle of debris shall not exceed a mass of 150 g, when tested in accordance with ISO 25947-4:2017, 6.12.2.

For compound fireworks, the requirement applies as for the individual articles included within the compound firework.

For party poppers and table bombs, when tested in accordance with, ISO 25947-4:2017, 6.4.2 and 6.4.3, the projected material shall not penetrate the test paper.

For rockets and mini rockets, the means for stabilization of flight shall not become detached until the rocket has burst (verified by visual examination) and any particle of debris shall not exceed a mass of 100 g (category 2) or 150 g (category 3), when tested in accordance with ISO 25947-4:2017, 6.12.2.

For table bombs, the ejected objects shall not be made of glass or sharp metal, verified by visual examination.

7.2.12 Burning rate of pyrotechnic composition

For Bengal flames, when tested in accordance with ISO 25947-4:2017, 6.10, the pyrotechnic composition shall have a burning rate of less than 1,7 g/s.

For Bengal matches and sticks, when tested in accordance with ISO 25947-4:2017, 6.10, the pyrotechnic composition shall have a burning rate of less than 0,17 g/s.

7.2.13 Pull-string or -strip

When used in accordance with the instructions the pull-string or -strip shall not break, verified in accordance with ISO 25947-4:2017, 6.6.2.2 and 6.6.3.2.

7.3 Properties to be checked after functioning tests (type test and batch test)

7.3.1 Droop

For hand-held sparklers, when tested in accordance with ISO 25947-4:2017, 6.11, the droop of the wire shall be less than 45° from the horizontal.

7.3.2 Plastics body

For bangers, crackling granules and flash bangers: when tested in accordance with ISO 25947-4:2017, 6.18.2, if the article has a plastics body, the body shall not splinter.

7.3.3 Rocket motor

For rockets, if the propellant charge of the rocket is contained in a sheathed aluminium tube, the aluminium tube shall not splinter when tested in accordance with ISO 25947-4:2017, 6.18.2.

7.3.4 Integrity after functioning

The firework case shall have no additional holes or splits after functioning. This requirement applies to the following fireworks types:

— compound fireworks (if applicable to the individual types);

— mines;

— party poppers;

— Roman candles;

— shot tubes;

— table bombs.

Conformity to these requirements shall be verified by visual examination.

8 Primary pack or selection pack (type test and batch test)

If a primary pack or selection pack is required to protect the initial fuse(s), the pack shall completely enclose the firework(s). There shall be no holes or splits in the pack, except those which are intended to enable the packaging to be opened and those which are otherwise technically necessary.

Conformity to these requirements shall be verified by visual examination.

9 Type testing

9.1 General

Each firework to be type tested, except those required for the determination of net explosive content, shall meet with the following requirements.

— Clause 4;

— Clause 6;

— Clause 7;

— Clause 8;

— ISO 25947-3.

9.2 Number of items to be tested

Table 3 — Number of items to be tested

Number of fireworks to be tested	Condition	Tests
10	As received	Visual examination Clause 4 Clause 6 Clause 7 Clause 8 Labelling (ISO 25947-3)
10	After thermal conditioning (see ISO 25947-4:2017, 6.16)	Visual examination Clause 6 Clause 7
10	After mechanical conditioning (see ISO 25947-4:2017, 6.15)	Visual examination Clause 6 Clause 7
3	Determination of net explosive content and verify the construction to the technical documents of the manufacturer (see ISO 25947-4:2017, 6.3)	

For fireworks fitted with a friction head, ten extra items for the determination of resistance to ignition by an abrasive surface using the relevant test method.

For ground spinners and jumping crackers, ten extra items for sound pressure level measurement while the item is in a fixed position, using the relevant test method.

For compound fireworks only, Table 4 applies.

Table 4 — Number of items of compound fireworks to be tested

Number of fireworks to be tested	Condition	Tests
5	As received	Visual examination 4.5 Clause 6 Clause 7 Clause 8 Labelling (ISO 25947-3)

Dismantling, thermal and mechanical conditioning are not required for compound fireworks.

9.3 Number of primary packs to be examined

Fireworks which are supplied in primary packs shall be tested for thermal and mechanical conditioning within the primary pack.

For fireworks which are supplied in primary packs or selection packs in order to protect the initial fuses, examine at least five packs to assess conformity to Clause 8 and to ISO 25947-3. The packs to be examined shall include all those whose contents are used for the tests described in ISO 25947-4.

9.4 Test report

The test report shall include at least a reference to this standard (i.e. ISO 25947-5), the complete identification of the sample under test, the date of completion of testing and the relevant observations concerning the applicable type test requirements for the fireworks under tests given in Table 3. The test report shall include information about the chosen protection of the initial fuse and whether the primary pack or selection pack is used for labelling. For batteries, batteries requiring external support, combinations, combinations requiring external support and compound fireworks the participating elements shall be listed.

10 Batch testing

10.1 General

For the purposes of batch testing, acceptance sampling in accordance with 10.2 to 10.4 shall be applied.

10.2 Sampling plans

10.2.1 General sampling plans

Sampling shall be in accordance with ISO 2859-1 using double sampling plans and applying the switching procedures for normal, tightened and reduced inspection. Inspection level S-4 shall apply.

10.2.2 Sample size for small batches

In the case of batches smaller than 35 001 articles, the sampling plans of ISO 2859-1 are not applicable for the AQL specified in 10.2.1 and the single sampling plan given in Table 5 shall be applied.

Table 5 — Batch test sampling plan for lot sizes smaller than 35001

Lot size	Number of destructive tests	Acceptable critical non-conformities	Acceptable major non-conformities	Acceptable minor non-conformities
2 to 15	1	0	0	0
16 to 25	2	0	0	0
26 to 90	3	0	0	0
91 to 150	5	0	0	1
151 to 500	8	0	0	2
501 to 1 200	13	0	0	3
1 201 to 10 000	32	0	2	7
10 001 to 35 000	80	1	5	14

10.3 Unit of product

For fireworks which are not supplied in primary packs, the unit of product on which the sample size is based shall be the individual firework.

For fireworks supplied in primary packs, the unit of product shall be an individual firework and the sample shall comprise the contents of the appropriate number of primary packs.

For primary packs, the appropriate number of primary packs shall be sampled and examined for faults.

For compound fireworks, the unit of product shall be the entire compound firework.

10.4 Nonconformities

Nonconformities shall be classified in accordance with Table 6.

Table 6 — Nonconformities

Requirement		Type of nonconformity
Construction materials (4.1)		Critical
Length of handle (4.2)		Minor
Elements in batteries, batteries requiring external support, combinations and combinations requiring external support (4.3)		Major
Dimensions for mini rockets (4.4)		Minor
Requirements for compound fireworks (4.5)		Critical
Permitted means of ignition (6.1)		Major
Protection of initial fuse and reserve fuse (if applicable) (6.2)		Major
Protection of throwdowns (6.2)		Major
Attachment of means of ignition (6.3)		Major
Ignition of initial fuse and reserve fuse (if applicable) (6.4.1)		Major
Duration of initial fuse and reserve fuse (if applicable) (6.4.1)	for category 1 and 2 items:	<2,0 s or >10,0 s: Critical ≥2,0 s and <3,0 s: Major >8,0 s and ≤10,0 s: Major
	for category 3 items:	<3,0 s or >15,0 s: Critical ≥3,0 s and <5,0 s: Major >13,0 s and ≤15,0 s: Major
Resistance to ignition of friction head by an abrasive surface (6.4.1)		Major
Ignition time of indoor fountains, category 1 (6.4.2)		Major
Invisible burning of Roman candles (6.4.2)		Major
Visibility of point of ignition from top of spinners and jumping ground spinners (6.4.2)		Minor
Ignition time of sparklers (6.4.2)		Major
Height of fuse above the ground for category 3 wheels (6.4.2)		Major
Delay time between fireworks in compound fireworks (6.4.2)		Major
Integrity (7.1.2)		Major
Stabilisation of flight (7.1.3)		Critical
Principal effects (7.2.1)		Minor
Functioning (7.2.2)		Major
Angle of ascent or flight (7.2.3)	for aerial wheels, rockets	>15° and ≤30°: Minor
		>30°: Major
	for double bangers and double flash bangers	>8° and ≤16°: Minor
		>16°: Major
	for mini rockets and spinners	>30°: Major
Motion (7.2.4)		Major

Table 6 *(continued)*

Requirement		Type of nonconformity
Stability during functioning (7.2.5)		Critical
Height of explosion (7.2.6)		Major
Sound pressure level (7.2.7)		Major
Explosion and other failures (7.2.8)		Critical
Burning or incandescent matter (7.2.9)		Major
Extinguishing of flames (7.2.10)		Minor
Projected debris (7.2.11)		Major
Burning rate of pyrotechnic composition (7.2.12)		Major
Pull-string or -strip (7.2.13)		Major
Droop (7.3.1)		Major
Plastics body (7.3.2)		Major
Rocket motor (7.3.3)		Major
Integrity after functioning (7.3.4)		Minor
Primary pack or selection pack (Clause 8)		Major

For compounds fireworks, the respective nonconformities of the individual articles apply.

10.5 Test report

The test report shall include at least a reference to this document (i.e. ISO 25947-5), the complete identification of the sample under test, the date of completion of testing and the relevant observations concerning the applicable batch test requirements for the firework type under test given in Table 6. The test report shall include information about the chosen protection of the initial fuse and reserve fuse, if applicable, and whether the primary pack or selection pack is used for labelling. For batteries, batteries requiring external support, combinations, combinations requiring external support and compound fireworks the participating elements shall be listed.

10.6 Acceptance or rejection of a batch

10.6.1 Nonconforming units

Acceptance or rejection of the batch shall be determined by the number of nonconforming units of each type, in accordance with 10.6.2 to 10.6.4.

NOTE Acceptance or rejection of the batch is determined by the number of nonconforming units of each type and not necessarily by the number of nonconformities found.

10.6.2 Critical nonconforming units

For critical nonconforming units an Acceptance Quality Limit (AQL) of 0,65 % shall apply. If the batch fails to meet this criterion, it shall be rejected. Any critical nonconforming units shall not also be counted as major nonconforming units or minor nonconforming units.

10.6.3 Major nonconforming units

For major nonconforming units an AQL of 2,5 % shall apply. If the batch fails to meet this criterion, it shall be rejected. Any major nonconforming units shall not also be counted as minor nonconforming units.

10.6.4 Minor nonconforming units

For minor nonconforming units an AQL of 10 % shall apply. If the batch fails to meet this criterion, it shall be rejected.

10.6.5 Fireworks supplied in primary packs or selection packs[1)]

For fireworks which are supplied in primary packs or selection packs, the acceptance criteria in 10.6.2 to 10.6.4 shall be applied separately to the fireworks and to the primary packs or selection packs (see 10.3).

1) If a selection pack is required to protect the initial fuse.

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Price based on 23 pages