



# SLOVENSKI STANDARD

## oSIST prEN 15947-5:2018

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### Pirotehnični izdelki - Ognjemetni izdelki, kategorije F1, F2 in F3 - 5. del: Zahteve za izdelavo in delovanje

Pyrotechnic articles - Fireworks, Categories F1, F2 and F3 - Part 5: Requirements for construction and performance

Pyrotechnische Gegenstände - Feuerwerkskörper, Kategorien F1, F2 und F3 - Teil 5: Anforderungen an Konstruktion und Funktion

Articles pyrotechniques - Artifices de divertissement, Catégories F1, F2 et F3 - Partie 5: Exigences de construction et de performances

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#### **ICS:**

71.100.30	Eksplzivni. Pirotehnika in ognjemeti	Explosives. Pyrotechnics and fireworks
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EUROPEAN STANDARD  
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**prEN 15947-5**

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## Pyrotechnic articles - Fireworks, Categories F1, F2 and F3 - Part 5: Requirements for construction and performance

Articles pyrotechniques - Artifices de divertissement,  
Catégories F1, F2 et F3 - Partie 5: Exigences de  
construction et de performances

Pyrotechnische Gegenstände - Feuerwerkskörper,  
Kategorien F1, F2 und F3 - Teil 5: Anforderungen an  
Konstruktion und Funktion

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 212.

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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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**prEN 15947-5:2018 (E)****European foreword**

This document (prEN 15947-5:2018) has been prepared by Technical Committee CEN/TC 212 “Pyrotechnic articles”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15947-5:2015.

In comparison with the previous edition, the following essential technical modifications have been made:

- for batteries, batteries requiring external support, combinations and combinations requiring external support: increase of NEC to 2 000 g in F2 and 4 000 g in F3;
- new fireworks type “report rockets” in F3 with corresponding requirements;
- requirements for hand-held Bengal flames has been added;
- procedure to check the labelling during type testing has been revised;
- requirements on elements in batteries, batteries requiring external support, combinations and combinations requiring external support has been revised.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential safety requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This European Standard is one of the series of standards as listed below:

- EN 15947-1, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 1: Terminology*
- EN 15947-2, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 2: Categories and types of firework*
- EN 15947-3, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 3: Minimum labelling requirements*
- EN 15947-4, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 4: Test methods*
- EN 15947-5, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 5: Requirements for construction and performance*

## 1 Scope

This document specifies requirements for construction, performance and primary or selection packaging of fireworks. It is applicable to fireworks in categories F1, F2 and F3 according to prEN 15947-2:2018.

This document does not apply for articles containing detonative explosives except for black powder or flash composition.

This document does not apply for 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 or snaps);
- 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.

## 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.

prEN 15947-1:2018, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 1: Terminology*

prEN 15947-2:2018, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 2: Categories and types of firework*

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prEN 15947-3:2018, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 3: Minimum labelling requirements*

prEN 15947-4:2018, *Pyrotechnic articles — Fireworks, Categories F1, F2 and F3 — Part 4: Test methods*

prEN 16265:2018, *Pyrotechnic articles — Other pyrotechnic articles — Ignition devices*

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

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in prEN 15947-1:2018 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 or plastics. 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 prEN 15947-4:2018, 6.16. 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.
- For batteries and batteries requiring external support, the angle to the vertical of tubes of mines, Roman candles or shot tubes shall not exceed 30°, when tested in accordance with prEN 15947-4:2018, 6.18. 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.
- 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 and report 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 prEN 15947-4:2018, 6.1.5.
- For shot tubes: the inside diameter of the tube shall not exceed 30 mm (category F2) or 50 mm (category F3). Conformity to these requirements shall be verified by the method described in prEN 15947-4:2018, 6.1.5.
- For spinners: the aerofoils, if any, shall be made of cardboard or plastics.
- For throwdowns: the body shall be made of soft material that does not produce hard fragments.

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 and hand-held Bengal flames: the end of the firework case of a hand-held fountain or hand-held Bengal flame 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 40 mm.
- For hand-held sparklers: a category F1 hand-held sparkler shall have a minimum handle length of 75 mm; a category F2 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 prEN 15947-4:2018, 6.1.1.2.1 or 6.1.1.2.2.

- 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.

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Conformity to above requirements for Christmas crackers and party poppers shall be verified by the method described in prEN 15947-4:2018, 6.1.4.

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

Any elements are permitted as long as the requirements of EN 15947-5 are met.

Elements in category F2 batteries, batteries requiring external support, combinations and combinations requiring external support shall be of category F1 or F2. Elements in category F3 batteries, batteries requiring external support, combinations and combinations requiring external support shall be of category F1, F2 or F3.

Elements in batteries, batteries requiring external support, combinations and combinations requiring external support shall comply with requirements applicable to the type and the category of the elements

**4.4 Dimensions for mini rocket (type test and batch test)**

When tested in accordance with prEN 15947-4:2018, 6.1.5 and 6.1.3, 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 test and batch test)**

Only CE marked articles from categories F1, F2, F3 or P1 (pyrotechnic cords and fuses only, as specified in prEN 16265:2018) shall be used in compound fireworks.

There shall be no constructional changes of the individually CE marked articles within the compound firework. The connection between the fireworks articles shall be done by the manufacturer only.

The category of a compound firework shall be 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 standard.

The single fireworks shall be fixed onto a non-metallic base plate to increase stability during functioning. All firework cases and launchers for rockets 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 F1, F2, F3 as well as P1). 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 prEN 15947-4:2018, 6.1.3.

If transmitting fuses are used to connect the individual fireworks articles, only P1 fuses, which do not burn instantaneously, shall be used. Only one initial fuse shall be visible.

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 articles may be omitted if fixing on the base plate is sufficient. Such elements include loose attachment bases, metal fixings (loops)/spikes to be inserted in the ground, foldable bases and packaging with fixing functions.

Compound fireworks shall be supplied in a primary pack.

## 5 Pyrotechnic composition (type test)

When tested in accordance with prEN 15947-4:2018, 6.2.2, the net explosive contents 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**

Fireworks type	Category F	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. Each 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 charge or 2,0 g of perchlorate/metal-based report charge.
bangers	2	Not more than 6,0 g black powder in case of no preliminary effect. In case of preliminary effect not more than 3,0 g black powder and 4,5 g other effects (in case of whistle unit, not more than 1,0 g and only one unit).
	3	Not more than 10 g black powder in case of no preliminary effect. In case of preliminary effect not more than 5,0 black powder and 7,5 g other effects (in case of whistle unit, not more than 2,0 g and only one unit).
batteries, batteries requiring external support, combinations and combinations requiring external support	2	Not more than 2 000 g; the respective NEC limits of the included fireworks types apply independently. 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	Not more than 4 000 g; the respective NEC limits of the included fireworks types apply independently. 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 mg report charge based on potassium chlorate and red phosphorous, or not more than 1,6 mg silver fulminate as report charge.
compound fireworks	2	Not more than 2 000 g; the respective NEC limits of the included fireworks types apply independently.

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Fireworks type	Category F	Net explosive content
	3	Not more than 4 000 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.
flash bangers	2	Not more than 1,0 g for nitrate/metal-based report charge or not more than 0,5 g for perchlorate/metal-based report charge in case of no preliminary effect. In case of preliminary effect not more than 0,6 g nitrate/metal-based report charge or not more than 0,3 g perchlorate/metal-based report charge and 4,5 g other effects (in case of whistle unit, not more than 2,0 and only one unit).
	3	Not more than 10 g for nitrate/metal-based report composition charge or not more than 5,0 g for perchlorate/metal-based report composition charge. in case of no preliminary effect. In case of preliminary effect not more than 5,0 g nitrate/metal-based report charge or not more than 2,5 g perchlorate/metal-based report charge and 7,5 g other effects (in case of whistle unit, not more than 2,0 g and only one unit).
flash pellet	1	Not more than 2,0 g.
	2	Not more than 30 g.
fountains	1	Not more than 7,5 g, no whistle unit (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	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	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 charge 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 composition or 1,0 g of perchlorate/metal-based 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 charge 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 composition or 1,0 g of perchlorate/metal-based composition.
Fireworks type	Category F	Net explosive content