BS EN 16261-2:2013

BSI Standards Publication

Pyrotechnic articles — Fireworks, Category 4

Part 2: Requirements

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National foreword

This British Standard is the UK implementation of EN 16261-2:2013.

The UK participation in its preparation was entrusted to Technical Committee CII/47, Pyrotechnic articles.

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

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

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Compliance with a British Standard cannot confer immunity from legal obligations.

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This European Standard was approved by CEN on 24 November 2012.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 16261-2:2013) has been prepared by Technical Committee CEN/TC 212 “Pyrotechnic articles”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential 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 16261-1, *Pyrotechnic articles — Fireworks, Category 4 — Part 1 Terminology*;

— EN 16261-3, *Pyrotechnic articles — Fireworks, Category 4 — Part 3 Test methods*;

— EN 16261-4, *Pyrotechnic articles — Fireworks, Category 4 — Part 4 Minimum labelling requirements and instructions for use*.

CEN/TC 212 has also developed European Standards for:

— Pyrotechnic articles — Fireworks Categories 1, 2 and 3;

— Pyrotechnic articles — Theatrical pyrotechnic articles;

— Pyrotechnic articles — Pyrotechnic articles for vehicles;

— Pyrotechnic articles — Other pyrotechnic articles;

— Pyrotechnic articles — Ignition devices.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies requirements for the construction, performance and protective packaging of Category 4 fireworks, as listed in EN 16261-1.

This European Standard does not apply for articles containing pyrotechnic compositions that include any of the following substances:

— arsenic or arsenic compounds;

— polychlorobenzenes;

— lead or lead compounds;

— mercury compounds;

— white phosphorus;

— picrates or picric acid.

This European Standard does not apply for articles containing military explosives or commercial blasting agents except for black powder or flash composition.

In addition, any European regulation regarding forbidden substances should be taken into account.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16261-1:2012, *Pyrotechnic articles — Fireworks, Category 4 — Part 1: Terminology*

EN 16261-3:2012, *Pyrotechnic articles — Fireworks, Category 4 — Part 3: Test methods*

EN 16261-4:2012*, Pyrotechnic articles — Fireworks, Category 4 — Part 4: Minimum labelling requirements and instructions for use*

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 EN 16261-1:2012 apply.

4 Pyrotechnic composition

No limits are given for the net explosive content (NEC)[1)] of Category 4 articles in this standard.

5 Construction (type test and batch test)

When tested in accordance with 6.1 and 6.2 of EN 16261-3:2012, the article dimensions and gross mass shall be in accordance with the manufacturer's declaration (including tolerances).

The orientation of mortars shall be verified by inspection according to 6.3 of EN 16261-3:2012, during type test.

When the orientation of mortars in combinations is not visible, the maximum firing angle shall be displayed on the label and verified by visual inspection according to 6.7 of EN 16261-3:2012.

6 Means of ignition

6.1 Identification (type test and batch test)

The means of ignition shall be clearly visible or shall be indicated by labelling or instructions where applicable.

Conformity to this requirement shall be verified by visual examination according to 6.7 of EN 16261-3:2012.

6.2 Protection (type test and batch test)

Where appropriate, the means of ignition shall be protected to avoid accidental ignition of the fireworks.

Conformity to this requirement shall be verified by visual examination according to 6.7 of EN 16261-3:2012.

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 6.8 of EN 16261-3:2012, the loose pyrotechnic composition found outside the article after mechanical conditioning shall be weighed. The mass of the whole loose material shall comply with manufacturer's specifications (if any) and the mass of loose pyrotechnic composition shall not exceed 3 % of the NEC and not more than 1 g for each item tested. If the pyrotechnic composition cannot be separated from the loose material, the same limits shall apply to the whole loose material.

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1) The NEC has an influence (directly or indirectly) on the safety distances. For Category 4 fireworks, it is agreed that no fixed minimum safety distances are defined, contrary to Category 1, 2 and 3 fireworks. The safe use of Category 4 fireworks is one of the major responsibilities of the person with specialist knowledge who should determine the minimum safety distance by using the information given in prEN 16261-4:2011, Clause 4.

7.1.2 Integrity (type test and batch test)

7.1.2.1 General requirements

There shall be no holes, splits, dents or bulges either in the body of the firework case or in the end closures, except those technically necessary for the correct functioning of the firework. If the end closures are separate components, they shall be in place. There shall be no pyrotechnic leakage of the article to be tested when it is received for testing.

Conformity to these requirements shall be verified by visual examination according to 6.7 of EN 16261-3:2012.

7.1.2.2 Specific requirements

For combinations: each individual element shall be securely attached to the other elements or to the framework. Attachment by the transmitting fuse(s) alone shall be allowed if it is sufficient to keep the elements joined together during normal handling.

Conformity to above requirements shall be checked by visual examination according to 6.7 of EN 16261-3:2012.

7.2 Properties to be checked during functioning tests

7.2.1 Principal effects (type test and batch test)

When tested in accordance with 6.10 of EN 16261-3:2012, the principal effects of each firework shall conform to those specified by the manufacturer or importer as described in EN 16261-1.

7.2.2 Functioning (type test and batch test)

For type test only, functioning test in accordance with 6.10 of EN 16261-3:2012, shall be performed in as received conditions and, after mechanical and thermal conditions in accordance with 6.8 and 6.9 of EN 16261-3:2012.

For type test and batch test, when tested in accordance with 6.10 of EN 16261-3:2012, the article shall function as intended and shall not function in an erratic and unforeseeable manner.

7.2.3 Stability during functioning (type test and batch test)

When used according to the instructions for use, the article shall remain in its initial position and maintain its integrity whilst functioning, if applicable. Conformity to these requirements shall be checked by the method described in 6.10 of EN 16261-3:2012.

7.2.4 Performance parameters (type test and batch test)

The mandatory parameters listed in Annex A shall be measured and recorded according to 6.4, 6.5, 6.10.3 and 6.10.4 of EN 16261-3:2012 (if applicable).

During type tests, all test results shall be within a tolerance of ± 20 % of the measured average, except as otherwise justified by the manufacturers. The measured average value shall be displayed on the label. This value may be rounded. Tolerances regarding performance parameters are only applicable to articles in as received condition. During batch tests, all test results shall be within a tolerance of ± 30 % from the value which is displayed on the label.

These tolerances are not applicable for sound pressure.

7.2.5 Sound pressure level (type test and batch test)

For articles which have report, explosion, and/or whistling effects as part of their performance, the sound pressure level shall be measured and recorded at a predefined distance from the firing point according to 6.5 of EN 16261-3:2012.

The maximum measured value or a higher value if specified by the manufacturer shall be displayed on label.

During batch test, the measured value shall not exceed the displayed value.

7.2.6 Extinguishing of flames (type test)

When tested in accordance with 6.6 of EN 16261-3:2012, the existence of flames observed more than 2 min after the end of functioning of the article shall be displayed on the label or in the instructions for use.

Conformity to this requirement shall be tested by visual examination according to 6.7 of EN 16261-3:2012.

7.2.7 Projected debris (type test and batch test)

If the type test has shown projection of debris, the design of the firework shall be examined in accordance with 6.2 of EN 16261-3:2012 to establish whether the debris is a result of the design or malfunction of the article.

If the debris is the result of design, the instructions for use shall be checked according to 6.7 of EN 16261-3:2012, to establish whether the projection of debris has been addressed (including expected distance according to 6.10.2 of EN 16261-3:2012).

When tested in accordance with 6.7 of EN 16261-3:2012, the maximum debris distance found during batch tests shall not exceed the distance displayed on the label.

7.2.8 Burning or incandescent matter (type test and batch test)

The fall of burning or incandescent matter to the ground shall be checked during the functioning test (see 6.10 of EN 16261-3:2012).

7.3 Requirements for components (type test and batch test)

The following requirements shall apply on components:

— construction (see Clause 5);

— thermal conditioning (type test only: see 6.9 of EN 16261-3:2012);

— loose composition after mechanical conditioning (type test only: see 7.1.1).

8 Protective pack (type test and batch test)

Protective packs (if any) shall provide on their label the necessary information as required by 4.11 of EN 16261-4:2012. This shall be verified according to 6.7 of EN 16261-3:2012, by visual examination.

The means of ignition of pyrotechnic articles within protective pack shall be protected according to 6.2. This shall be verified by visual examination according to 6.7 of EN 16261-3:2012.

9 Type testing

9.1 General

Each firework to be type tested shall meet the following requirements:

— Clause 5: Construction;

— Clause 6: Means of ignition;

— Clause 7: Performance;

— Clause 8: Protective pack;

— EN 16261-4 "*Pyrotechnic articles – Fireworks, Category 4 – Part 4: Minimum labelling requirements and instructions for use*".

9.2 Number of items to be tested

In accordance with Table 1, a total number of nine pyrotechnic articles shall be tested.

Table 1 — Number of items to be tested

Number of fireworks to be tested	Condition	Tests in accordance with
3	As received	— Clause 5 — Clause 6 — Clause 7 — EN 16261-4 — Clause 8
3	After thermal conditioning (see 6.9 of EN 16261-3:2012)	— Clause 6 — Clause 7
3	After mechanical conditioning (see 6.8 of EN 16261-3:2012)	— Clause 6 — Clause 7

For aquatic fireworks and for each condition presented in Table 1, two items shall be tested to determine the effect range and to check the waterproofness iin accordance with 6.1.4 of EN 16261-3:2012.

9.3 Fireworks supplied in protective packs

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

9.4 Test report

The test report shall include at least a reference to this standard (EN 16261-2), the complete identification of the sample under test, the date of completion of testing and the relevant observations concerning the applicable test requirements for the articles under test according to Table 1. The test report shall include information about the observations concerning the labelling, instructions for use, the chosen protection of the means of ignition (where appropriate) and whether a protective pack is used for labelling. For combinations, the participating elements should be listed.

The assessment whether the fireworks type meets the requirements of this standard shall be done by the Notified Body.

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 (destructive tests)

In the case of batches with a lot size smaller than 1201 pieces, sampling shall be done according to Table 2.

If Table 2 is applied, no critical or major nonconformities as defined in Table 3 are acceptable:

Table 2 — Distribution of tests for small batch sizes

Batch size	Sample size	Acceptable minor non conformities
2 - 25	1	0
26 - 150	2	0
151 - 500	3	1
501 - 1200	8	2

10.3 Fireworks in protective packs

For fireworks supplied in protective packs, the appropriate number of protective packs shall be sampled and examined.

10.4 Nonconformities

10.4.1 Construction and performances

Nonconformities are classed in accordance with Table 3.

Table 3 — Nonconformities *(1 of 2)*

Requirement	Type of nonconformity	Comments
Construction (see Clause 5)	Major: For shells when their calibre is outside the manufacturer's declaration including tolerances.	_
	Minor: Articles dimensions – other than calibre for shells - when they are outside the manufacturer's declaration including tolerances.	
	Major: Gross mass when it is outside the manufacturer's declaration including tolerances.	
Identification of means of ignition (see 6.1)	Minor	–
Protection of means of ignition, where appropriate (see 6.2)	Critical	–
Integrity (see 7.1.2): Pyrotechnic leakage	Critical	–
Integrity (see 7.1.2): Other cases	Major	–
Principal effects (see 7.2.1)	Minor	_
Functioning (see 7.2.2): Incomplete functioning	Critical for projected or propelled articles, minor in other cases	See Annex B For cases not mentioned in Annex B, the general rule as stated in column "Type of nonconformity" is applicable
Functioning (see 7.2.2): Erratic or unforeseeable manner	Critical, Major or minor depending on the possible impact on the correct functioning of the item	See Annex B For cases not mentioned in Annex B, the general rule as stated in column "Type of nonconformity" is applicable
Stability during functioning (see 7.2.3)	Critical	_
Performance parameters (see 7.2.4)	Major	See Annex A
Sound pressure level (see 7.2.5)	Major	_
Projected debris (see 7.2.7)	Major for unexpected projected debris	_
Protective pack (see Clause 8)	Major	_

Table 3 — Nonconformities *(2 of 2)*

Requirement	Type of nonconformity	Comments
Verification of labelling and instructions for use	Critical : For combinations where the orientation of mortars is not visible, if the maximum firing angle is not displayed on the label	
	Critical when the information on the label or in the instructions for use changes the meaning of the text, making it misleading or incomplete	EXAMPLE: Wrong or incomplete type; wrong or incomplete performance data which could lead to an incorrect safety distance being determined.
NOTE Tolerances are those that were declared by the manufacturer for EC-type certification or tighter		

10.4.2 Labelling

In the case where the same label is used throughout a batch, the text of one label shall be examined.

In the case where a batch contains different variants, the number of different labels used in the batch shall be determined and the text of one label of each kind should be examined.

The label shall be examined in accordance with the minimum labelling requirements in EN 16261-4.

The information on the label shall not be misleading or incomplete.

EXAMPLE:

— wrong or incomplete type;

— wrong or incomplete performance data which could lead to an incorrect safety distance being determined.

No spelling mistake that changes the meaning of the text shall be allowed.

A maximum of three spelling mistakes that do not change the meaning of the text shall be allowed.

10.5 Test report

The test report shall include at least a reference to this standard (EN 16261-2), 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 articles under tests given in Table 3. The test report shall include information about the observations concerning the labelling, instructions for use, the chosen protection of the means of ignition (where appropriate) and whether a protective pack is used for labelling. For combinations, the participating elements should 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.

Annex A
(normative)

Mandatory performance parameters

Table A.1 — Mandatory performance parameters for generic type

Generic type	Effect/burst height (See NOTE 1)	Drop height [a]	Sound pressure level	Additional parameters	Comments
Aerial wheel	n/a	n/a	See 7.2.5	(Overall duration) **X**	n/a
Aquatic Firework	n/a	n/a	See 7.2.5	(Range) **T**	n/a
Combination	n/a	n/a	See 7.2.5	n/a	As per constituent types (See NOTE 2)
Components	n/a	n/a	n/a	n/a	n/a
Fountain	**X**	n/a	See 7.2.5	n/a	n/a
Guided Firework	n/a	**T**	See 7.2.5	n/a	n/a
Mine	**X**	n/a	See 7.2.5	n/a	n/a
Report	n/a	n/a	**X**		n/a
Rocket	**X**	**T**	See 7.2.5	n/a	n/a
Roman Candle	**X**	**T**	See 7.2.5	n/a	Applies to shot tubes as well
Shell	**X**	**T**	**X**	n/a	n/a
Smoke / aerosol Generator	n/a	n/a	n/a	n/a	n/a

Key

T = Type test

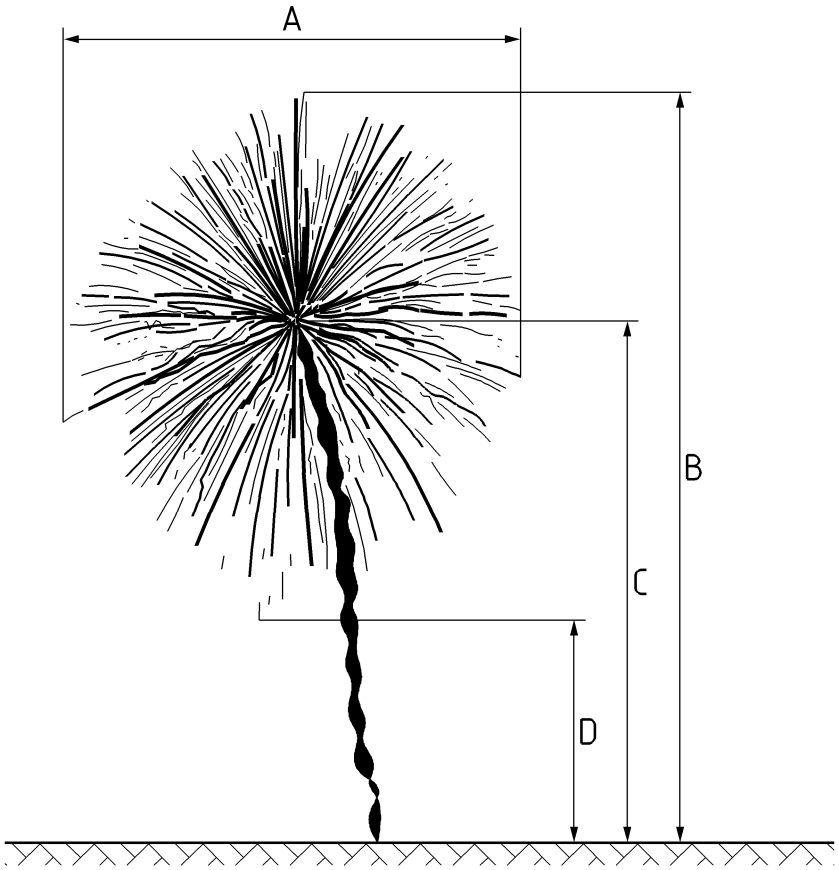
X = Type test and Batch test

n/a = not applicable

NOTE 1 The burst height is chosen for all effects that burst. The effect height is chosen in all other cases.

NOTE 2 For combinations, the effect/burst height is the maximum effect/burst height.

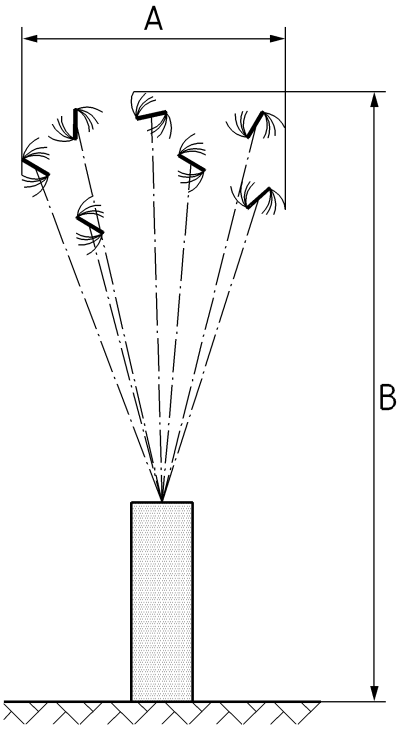
[a] Drop height will not be measured, but information will be given if the effects reach the ground.



Key

A effect width
B effect height
C rising/bursting height
D drop height

Figure A.1 — Example of burst height for shells



Key

A effect width
B effect height

Figure A.2 — Example of effect height for fountains

Annex B
(normative)

List of nonconformities for Category 4 fireworks regarding safety in functioning

Table B.1 — List of nonconformities for articles regarding safety in functioning *(1 of 2)*

GENERIC TYPE	CRITICAL nonconformities	MAJOR nonconformities	MINOR nonconformities
Aerial Wheel	— Explosion (in the event that the internal pressure exceeds the strength of the tubes) — Falling to the ground during functioning — No stability during flight or angle of ascent > 45°	— If drivers flight from (or devices are thrown from) the wheel	
Aquatic firework	— Observed effect range is more than 30 % greater than as declared by the manufacturer	— No functioning on the water	
Combination	— As per constituents parts — Unintentional explosion leading to loss of physical integrity of the combination during functioning	— As per constituents parts — Unintentional loss of integrity (except by intended explosion) during functioning	— As per constituents parts — Interrupted ignition of the combination (not all parts/tubes functioned)
Fountain	— Explosion (in the event that the internal pressure exceeds the strength of the tube)		
Guided Firework	— Malfunction of the guided firework by separation from the guide — Unintentional explosion of the guided firework		

Table B.1 — List of nonconformities for articles regarding safety in functioning *(2 of 2)*

GENERIC TYPE	CRITICAL nonconformities	MAJOR nonconformities	MINOR nonconformities
Mine	— Violent explosion within the mortar leading to loss of integrity of the mortar	— Incandescent or burning matter projected to the ground (if not part of the effect)	
Rocket	— No stability during flight or angle of ascent > 30°	— Incandescent or burning matter falling to the ground — Explosion of the rocket at an altitude of more than 30 % below the average height	
Roman candle	— In-tube explosions leading to loss of integrity	— Incandescent or burning matter falling to the ground	— Not all effects ejected
Shell	— In-mortar explosion leading to loss of integrity of the mortar	— Incandescent or burning matter falling to the ground — Explosion of the shell at an altitude of more than 30 % below the average height	
Smoke / Fog generator	— Explosion of the generator		

Annex C
(informative)

Overview of essential safety requirements and corresponding clauses of all parts of this European Standard

The correspondence between the parts of this European Standard and Directive 2007/23/EC on the placing on the market of pyrotechnic articles can be found in Annex ZA of each Part of the standard.
Table C.1 gives an overview about all essential safety requirements and the corresponding clauses and subclauses of all parts of the European Standard.

Table C.1 — Overview of essential safety requirements and corresponding clauses of all parts of this European Standard

Essential Requirements (ESR) of Directive 2007/23/EC	Clause(s)/sub-clause(s) of			Qualifying remarks/Notes
	EN 16261-2:2013	EN 16261-3:2012	EN 16261-4:2012	
(1)	Clause 7			
(2)	Clause 1		5	
(3) 1st paragraph	7.2, Clause 9, Clause 10, Annex B	6.10		
(3) 2nd paragraph		Clause 4		
3 (a)	Clause 5	6.1, 6.2, 6.3, 6.10		
3 (b)	Clause 1, 7.1, 7.2.2, 9.2	6.8, 6.9		
3 (c)	7.1, 7.2.2, 9.2	6.8		
3 (d)	7.2.2, 9.2	6.9		
3 (e)	9.2	4.1, 6.10		Specially for aquatic fireworks
3 (f)	7.2.2, 9.2	6.9		
3 (g)	6.2, Clause 8, 9.3			
3 (h)			4.6, Clause 5, Annex A	
3 (i)	7.1, 7.2.2, Clause 8, 9.2, 9.3	6.8, 6.9		
3 (j)		5.12	Clause 5, Annex A	
3 (last paragraph)	7.1	6.8		
4 (a)	Clause 1	Clause 1	1	
4 (b)	Clause 1	Clause 1	1	
5 A (1)			4.3	
5 A.(2)	Clause 1, Clause 5, 7.2.7	6.2, 6.10.2	Annex A	
5 A.(3)	6.1		4.12, Clause 5	
5 A.(4)	7.2.2, 7.2.3	6.10		
5 A.(5)	6.2, Clause 8, 9.3			

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2007/23/EC on the placing on the market of pyrotechnic articles

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2007/23/EC on the placing on the market of pyrotechnic articles. The Parts 1, 3 and 4 of the standard will support Part 2 to fulfil the Essential Requirements of the Directive 2007/23/EC Annex 1.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard as given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2007/23/EC on the placing on the market of pyrotechnic articles

Essential Requirements (ESR) of Directive 2007/23/EC	Clause(s)/sub-clause(s) of this EN	Qualifying remarks/Notes
(1)	Clause 7	
(2)	Clause 1	
(3) 1st paragraph	7.2, Clause 9, Clause 10, Annex B	
3 (a)	Clause 5	
3 (b)	Clause 1, 7.1, 7.2.2, 9.2	
3 (c)	7.1, 7.2.2, 9.2	
3 (d)	7.2.2, 9.2	
3 (e)	9.2	Specially for aquatic fireworks
3 (f)	7.2.2, 9.2	
3 (g)	6.2, Clause 8, 9.3	
3 (i)	7.1, 7.2.2, Clause 8, 9.2, 9.3	
3 (last paragraph)	7.1	
4 (a)	Clause 1	
4 (b)	Clause 1	
5 A.(2)	Clause 1, Clause 5, 7.2.7	
5 A.(3)	6.1	
5 A.(4)	7.2.2, 7.2.3	
5 A.(5)	6.2, 8, 9.3	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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