

ICS 71.100.30

English Version

**Pyrotechnic articles - Other pyrotechnic articles, category P1  
and P2 - Overview of harmonized standards that will be  
developed by CEN/TC 212/WG 5**

Articles pyrotechniques - Autres articles pyrotechniques de  
catégories P1 et P2 - Vue d'ensemble des normes  
harmonisées qui seront élaborées par le CEN/TC 212/WG

5

Pyrotechnische Gegenstände - Sonstige pyrotechnische  
Gegenstände, Kategorien P1 und P2 - Überblick über  
harmonisierte Normen, die von CEN/TC 212/WG 5  
erarbeitet werden

This Technical Report was approved by CEN on 17 August 2009. It has been drawn up by the Technical Committee CEN/TC 212.

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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## Foreword

This document (CEN/TR 15953:2009) has been prepared by Technical Committee CEN/TC 212 “Pyrotechnic articles”, the secretariat of which is held by NEN.

This document (CEN/TR 15953:2009) has been prepared by Working Group 5 “Other pyrotechnic articles” of Technical Committee CEN/TC 212 “Pyrotechnic articles”, the convenor and secretary of which are French. Experts from eleven countries have participated in its elaboration: Belgium, Czech Republic, Denmark, France, Germany, Italy, Romania, Spain, Switzerland, The Netherlands and United Kingdom.

It has been approved by votes of all the members of CEN/TC 212 “Pyrotechnic articles” on August 2009.

## Introduction

Directive 2007/23/EC of May 23<sup>rd</sup> 2007 on the placing on the market of pyrotechnic articles, has been published on June 14<sup>th</sup> 2007 in the Official Journal of the European Community. (Ref. Mandate M 416).

In its Annex 1, Directive 2007/23/EC gives the essential safety requirements (ESR) pyrotechnic articles shall comply with. In order to facilitate the process of demonstrating compliance with these ESR, harmonized standards for the design, manufacture and testing of pyrotechnic articles must be developed.

CEN has been mandated by the European Commission (EC) to develop these harmonized standards: Mandate M 416 describes the work that CEN shall perform.

CEN has entrusted coordination of this work to CEN/TC 212 'Pyrotechnic articles' with the following scope:

"Standardization of fireworks, theatrical pyrotechnic articles, pyrotechnic articles for vehicles and other pyrotechnic articles, particularly from the point of view of their safe use".

During its meeting in Delft on October 16<sup>th</sup> and 17<sup>th</sup> 2007, CEN/TC 212 has decided to share the corresponding work to be done between several Working Groups. Resolutions have been voted to establish five Working Groups, one of which is Working Group 5 (CEN/TC 212 / WG 5) in charge of standardization of "Other Pyrotechnic Articles".

Because no European standards exist at present for "Other Pyrotechnic Articles", preliminary work needs to be performed before a list of standards to be developed by WG 5 can be drawn up. It has been accepted by CEN/TC 212 and proposed to the European Community a one-year period will be allocated to WG5 to prepare a CEN Technical Report in which its future work program will be described and an overview of the harmonized standards it will develop will be given including the reasons why WG 5 has proposed to develop these standards.

Five work sessions have taken place, respectively in NEN – Delft – Netherlands on February 7<sup>th</sup> 2008, in BAM – Berlin – Germany on May 22<sup>nd</sup> 2008, in NEN – Delft – Netherlands on September 9<sup>th</sup> 2008, in AFNOR – Paris – France on November 13<sup>th</sup> 2008 and in UNI – Milano – Italy on February 2 2009.

The present document is the final draft of the Technical Report for "Other Pyrotechnic Articles". It has been written in close coordination with the other working groups of CEN/TC 212/WG 1 "Fireworks, Categories 1, 2 and 3", WG 2 "Fireworks, Category 4", WG 3 "Theatrical Pyrotechnic articles" and WG 4 "Pyrotechnic articles for vehicles".

## 1 Scope

This Technical Report gives an overview of harmonized standards which will be proposed to be developed by CEN/TC 212 WG 5, "Other Pyrotechnic Articles". Under this expression, it must be understood, are all pyrotechnic articles which are not designed and intended for entertainment purposes ("fireworks"), for indoor or outdoor stage use, including film and television productions or similar use ("theatrical pyrotechnic articles"), and for automotive industry ("pyrotechnic articles for vehicles").

It also gives the interpretation WG5 experts have made of some terms, definitions and requirements of Directive 2007/23/EC in order to assure future harmonized standards will encompass all varieties of "other pyrotechnic articles", which are presently placed on the European market, in a consistent way and take the benefit of all the practical experience and usages of those articles in the Member States.

## 2 Terminology

### 2.1 Definition of "Other pyrotechnic articles"

In its Article 2, Directive 2007/23/EC gives a definition of a "pyrotechnic article" as *"any article containing explosive substances or an explosive mixture of substances designed to produce heat, light, sound, gas or smoke or a combination of such effects through self-sustained exothermic chemical reactions"*.

Although heat, light, sound, gas or smoke or combination of such effects are more frequently obtained through combustive or deflagrating reactions, this definition does not exclude substances or mixture of substances which exhibit a detonative behaviour.

WG5 experts have considered that no other interpretation of the definition of pyrotechnic articles given by Directive 2007/23/EC is required.

See Annex A for further information.

### 2.2 Other terms

Collections of articles: individual item/ article, type, group/family, generic type.

The future harmonized standards for "other pyrotechnic articles" will identify the design parameters and performance characteristics to be taken into consideration for the corresponding articles to meet the essential safety requirements of Directive 2007/23/EC. Where appropriate, for each design parameter or performance characteristic they will state requirements and criteria which shall be complied with.

According to the large variety of other pyrotechnic articles and significant differences they exhibit in design, functioning and conditions of use, it is clearly noticeable these articles will not have all in common the same design parameters and performance characteristics. However, collections of articles sharing the same design parameters and performance characteristics exist. Then WG 5 experts have considered it was necessary to identify these collections of articles and draw up their list.

The future harmonized standards will state requirements and criteria for each identified homogeneous collection, which does not mean there may not exist requirements or criteria applicable to several collections as well as to all pyrotechnic articles whatever their design or behaviour in normal use.

The following terms and definitions will be used hereafter and in the harmonized standard(s) to be developed by Working Group5:

— **Type:** sample representative of the production envisaged.

NOTE 1 This definition corresponds to the use of the term 'type' in Annex II §2(c) of Directive 2007/23/EC for the purposes of type-examination.

— **Generic type:** set of articles with a common, very general, design feature and/or with a common characteristic effect.

— **Subtype:** set of articles within a **generic type** with specific design features.

— **Individual item:** article within a **generic type** or **subtype** for which every possible feature and characteristic has been fixed.

NOTE 2 Each feature and characteristic will be specified in the **technical name** or a technical data sheet, as appropriate.

— **Technical name:** general description of an individual item.

— **Trade name:** description of an individual item from a particular supplier.

— **Family:** set of individual items that will be considered together for the purposes of testing and approval.

NOTE 3 This last definition is fully compliant with Directive 2007/23/EC which states in "Whereas (18)": "Groups of pyrotechnic articles that are similar in design, function or behaviour should be assessed by the notified bodies as product families".

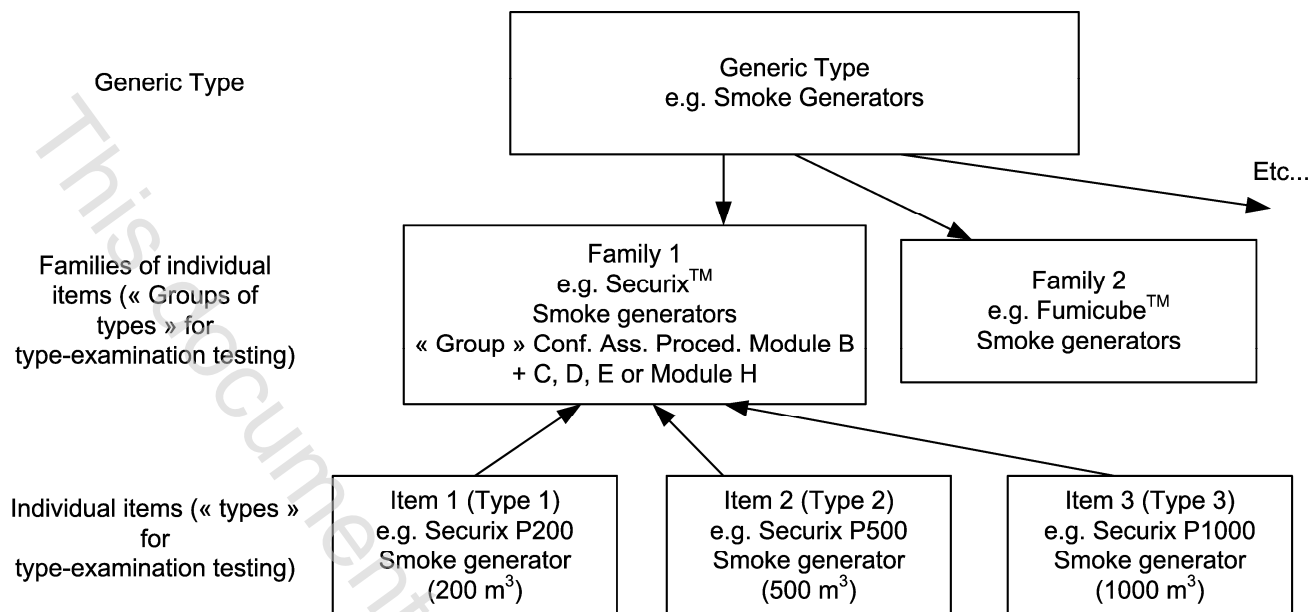
The figure hereafter shows how WG 5 experts intend to organize "other pyrotechnic articles" in "individual items" (samples of which will be "types"), "families" and "generic types", starting from the precise design level to the general design level. Example is given for "smoke generators".

This will be very useful and efficient to clarify and solve the complexity of their work resulting from the large variety of design of these "other pyrotechnic articles". Even for a given kind of pyrotechnic article, developed for the same type of use, strong variations in design may exist between manufacturers.

At the bottom, "individual items" correspond to the various individual smoke generators in a manufacturer's product range, under the brand name "Securix™", submitted to conformity assessment procedures by the means of "types".

In the middle are set up "families" of individual items (e.g. family of "Securix™ Smoke generators") which may be considered together for the purposes of testing and certification in compliance with Directive 2007/23/EC.

At the top, the highest level of generalization of the characteristics of types corresponds to "Smoke generators", independently from who is the manufacturer and what is the typical design within a product range. WG5 experts think all types of smoke generators can be put together in a unique collection of groups because it is highly possible that the essential safety requirements of Directive 2007/23/EC will only imply design and performance requirements which will be common to every type of smoke generators and none at a lower level (e.g. that of a family). Then WG 5 harmonized standards will only deal with these "generic types".



**Figure 1 – Generic type, family and item**

For some applications it may be useful to take account of “field of use” (See Annex B). However, WG 5 experts have decided to develop future harmonized standards on generic types, not on the field of use.

## 2.3 Use of blasting agents and military explosives

In its Annex I § (4) (a) and (b), Directive 2007/23/EC of 23 May 2007 “on the placing on the market of pyrotechnic articles” states pyrotechnic articles must contain neither commercial blasting agents, except for black powder or flash composition, nor military explosives.

As some T1 and T2 articles and C4 Fireworks, P1 and P2 articles already contain small amounts of explosives (e.g. nitrocellulose with high nitrogen content, single base or double base propellants one component of which is nitroglycerine) and must not be excluded from the European market as far as they comply with all the other essential safety requirements, except this § (4) (a) (b) of Directive 2007/23/EC / Annex I. Hence they must be included within the scope of preparing Standards for “other pyrotechnic articles” and to prepare suitable guidance.

CEN/TC 212 will prepare a specific resolution on that topic.

## 3 Interfaces between Working Groups

### 3.1 Interfaces between WG 5 and WG 1

WG1 has proposed to transfer:

- electric igniters used for fireworks ignition to WG 5
- friction-ignited flash bangers to WG 3 or WG 5
- whistlers to WG 3 or WG 5

“Electric igniters used for fireworks ignition”: WG 5 accepts this proposal without restriction.

“Friction-ignited flash bangers” and “whistlers”: WG 5 experts consider these products may enter into its scope of work: for instance, they can be used as bird-scaring articles. They can also be used as “theatrical pyrotechnic articles” for indoor or outdoor stage use, including film and television productions or similar use. Is a common harmonized standard appropriate? Answer to this question will be given as early as possible during the development phase of the corresponding harmonized standards: WG 3 and WG 5 experts will compare their respective construction and performance requirements and propose their common view of the problem.

At present, WG 5 experts propose to create a corresponding generic type, called “Sound / Noise Emitters”, which will include these two articles as well as other electrically or percussion actuated ones (See 4.3).

### 3.2 Interfaces between WG 5 and WG 2

Components of firework articles are often sold by manufacturers to other manufacturers in some European countries. Is Directive 2007/23/EC applicable in that case? Do “Category 4 firework articles” include components of fireworks such as stars, crackers, volcanoes, tourbillions, quick match, black match, cord igniters, fuses or delays... from the point of view of Directive 2007/23/EC?

WG 5 experts consider the answer is positive, but with the following approach: components of fireworks must be taken in consideration – if necessary and pertinent – by WG5 as “other pyrotechnic articles”.

WG 2 and WG 5 experts have met the following agreement:

- WG 5 will treat components of fireworks when they are used in other fields than fireworks (for example, electric igniters, quick match, black match, cord igniters, pressed fuses, stars...).
- When these components are strictly relevant to the fireworks market, they will enter into the scope of work of WG 2 (for example, crackers, volcanoes, tourbillions).

### 3.3 Interfaces between WG 5 and WG 3

“Friction-ignited flash bangers” and “whistlers”: See sub clause § 3.1 of this document.

Interpretation of “low hazard”: Definitions of T1 and P1 articles of Directive 2007/23/EC refer to “low hazard” as a criterion to determine whether a “theatrical” or “other” pyrotechnic article is T1 or T2, P1 or P2. Because “low hazard” is a very imprecise term and pyrotechnic articles already placed on the consumers market may intrinsically present medium or high hazard from the point of view of some market surveillance organizations, WG 3 and WG 5 have joined their efforts to give a common operative interpretation of “low hazard” for their respective products (See 5.1 of this document).

### 3.4 Interfaces between WG5 and WG4

WG 4 experts consider igniters used as components in airbag inflators and other automotive pyrotechnic devices must enter in the field of “pyrotechnic articles for vehicles” since they are specially designed for automotive applications. In that case, WG 4 will create the corresponding standard and they will not be taken in account by WG 5.

Such igniters may be used without modification or adaptation in other applications than automotive. WG 4 and WG 5 experts agree on the following approach:

- Every automotive igniter will have a specific reference for its use in pyrotechnic devices for vehicles. This reference will correspond to specific automotive specifications and qualification tests will aim to confirm their compliance to these specifications. Type-certification will be made according to the applicable WG 4 standard. The data sheet of the product will indicate “to be only used for automotive applications”.



- For other applications, even with an identical design, the automotive igniters will preferably have a different reference, as they are supposed to comply with different specifications and be possibly submitted to a different qualification process. Because WG 5 and WG 4 shall prepare separate standards for electric igniters, a comparison of these two standards will be made to determine what standard – the most restrictive – will be applicable when electric igniters developed for automotive industry are used outside this industry.
- In every case, igniters which will have been submitted to type-examination according to the more restrictive harmonized standard will not need to be tested again.

## 4 List of Other Pyrotechnic Articles and definitions

### 4.1 Preliminary inventory and definitions

An extraction of articles liable to enter in categories P1-P2 has been made from the lists of pyrotechnic articles given in Annexes I and II of Directive 2004/57/EC of 23 April 2004. But WG 5 experts have considered these two lists were not exhaustive enough. They have also considered some UN definitions needed to be improved whenever it was necessary for the purpose of their future development work of harmonized standards.

Then, WG 5 experts have tried to inventory more adapted collections of articles and have drawn up a new list of possible “other pyrotechnic articles”, with corresponding definitions. This list is given in Annex C.

This inventory has been based on the knowledge of WG 5 experts who attended the different meetings of this working group. Examples have been given by each of them to illustrate the above definitions. These examples are not cited in the present Technical Report, but they remain available as working documents which will possibly be used by Project Leaders during the development phase of harmonised standards.

To assure exhaustiveness of their inventory, WG 5 experts have also made a review of substances and articles which have been attributed a UN Number – and which are not obviously “ammunition”, “articles for use by the police or armed forces” or “articles and substances falling merely and undoubtedly under Directive 93/15/EEC” – has also been made to identify those which may be considered as “pyrotechnic articles” provided some conditions are met to be determined and proposed by WG 5 experts, then fixed by the corresponding harmonized standards.

### 4.2 Criteria used to determine “generic types”

This inventory shows articles which correspond to very different situations:

- some are associated to rather precise product architectures or designs, others are very general, others are located at mid distance between these “very general” and “rather precise” articles;
- others may appear to be collections of several generic types;
- others belong to specific fields of use.

Development of harmonized standards for “other pyrotechnic articles” requires a preliminary determination of “generic types”. WG5 experts have decided to give priority to “generic types” based on general construction or performance characteristics without reference to their possible field of use. Exceptions would be treated later if and only if a professional sector requires them and justifies the specific character of its requirements (See 4.4).

WG 5 experts have decided to generalize the construction and performance characteristics as much as possible, after having taken notice that:

- from the point of view of public safety, it may not be relevant to distinguish such effects as heat, light, fog and smoke, but on the contrary it may be important to keep pressure or gas flow separate when building “generic types”;
- “generic types” must be strictly determined only by the technical design and performance characteristics which are relevant from the point of view of the essential safety requirements of Directive 2007/23/EC; this will lead to determine requirements on a limited number of construction and performance characteristics;
- as a consequence of this limited number of construction and performance characteristics, possible candidates can be grouped under a sole generic type as far as specific requirements resulting from their different general design will be limited to a few short chapters in the corresponding harmonized standards.

WG 5 experts have then decided to determine these generic types using two alternative criteria:

- common architecture whatever the effect as far as it leads to similar consequences in terms of public safety: e.g. “other generators” including heat, light, fog and smoke generators (but not gas generators), the architecture of which consists of “a casing, with an ignition device and a combusive pyrotechnic grain, and may include a safe and arm device, filters, heat exchangers, drying charges, etc.”
- or common generic function to be fulfilled whatever the differences of design and the field of use: e.g. “igniters and primers” including electrically, optically or mechanically actuated items, the function of which is to “to start deflagration in an explosive train”.

### 4.3 Generic types: list, definitions and examples

Doing this, WG 5 experts have determined 16 generic types on which will be placed design and performance requirements in the future harmonized standards for “other pyrotechnic articles”.

These “generic types” are the following:

<i>Flash cartridges</i>	<i>Gas generators (including power cartridges)</i>
<i>Other cartridges</i>	<i>Smoke / Fog generators</i>
<i>Components for pyrotechnic trains</i>	<i>Igniters (including primers)</i>
<i>Pyrotechnic cords and fuses</i>	<i>Pyrotechnic matches</i>
<i>Pressed fuses</i>	<i>Pyromechanical devices</i>
<i>Flares</i>	<i>Semi finished pyrotechnic products</i>
<i>Noise emitters</i>	<i>Rockets and their motors</i>
<i>Fuzes</i>	<i>Heaters</i>

For corresponding definitions, comments and description of principal effects, see Annex D.

#### 4.4 ESR

As said before, WG 5 experts have decided to give priority to “generic types” based on general construction or performance characteristics without reference to their possible field of use. The construction and performance requirements will be determined for these general characteristics in the WG 5 harmonized standards.

However, a generic function to be fulfilled in a common field of use by a given “generic type” may lead to the necessity of specific complementary requirements. This will be treated in a specific paragraph of the harmonized standard of this “generic type” (See 6.2).

In that harmonised standard, a specific paragraph will also be necessary to describe what must be done in the case a new field of use lead to the same situation.

However this rule may suffer exceptions if a given field of use implies specific requirements which are too distant from other uses of similar products to be encompassed in the same harmonized standards (e.g. “distress signals submitted to SOLAS regulations” but, in that case, specific standards have already been developed).

Such exceptions would be treated later if and only if a professional sector requires them and justify the specific character of its requirements.

### 5 Criteria to determine whether an article belongs to Category P1 or P2

#### 5.1 Interpretation of “low hazard”

Directive 2007/23/EC gives the following definitions of P1 and P2 articles:

*Category P1: pyrotechnic articles other than fireworks and theatrical pyrotechnic articles which present a low hazard;*

*Category P2: pyrotechnic articles other than fireworks and theatrical pyrotechnic articles which are intended for handling or use only by persons with specialist knowledge.*

These definitions raise the following questions:

- What means “low hazard”?
- What about products which present more than a “low hazard” and are intended for handling or use by persons without specialist knowledge? (See Annex E).

Then WG5 experts agree that articles, under certain conditions to be detailed in the corresponding standard, may be P1 if user’s instructions can be easily understood by every person and applied without ambiguity.

They propose to state their interpretation of “low hazard” as follows:

- 1) Criteria for P1 will be based on the article’s hazard and/or pyrotechnic content and weight.
- 2) Articles, under certain conditions to be detailed in the corresponding standards (e.g. use of a specific tool, capacity to assure safety distances), may be P1 if user’s instructions can be easily understood by every person and applied without ambiguity.

CEN/TC 212 has approved this interpretation at its plenary meeting on November 14<sup>th</sup> 2008 in Paris (See Resolution Nr 37/2008).

## 6 Harmonized Standards

### 6.1 Existing documents

The only documents concerning “other pyrotechnic articles” which have been found by WG 5 experts deal with “fastening cartridges” (See Ref. [3]). A link will be necessary with CEN/TC/213 which has the mandate to develop harmonized standards for the tools used for wall sealing and similar appliances.

### 6.2 List and Titles of Harmonized Standards to be developed

WG 5 experts propose to limit the list of harmonized standards to be developed for other pyrotechnic articles to:

- a specific standard for “ignition devices” (Cf. specific Essential Safety Requirements in Directive 2007/23/EC – See Annex I - § (5) C).
- a specific standard for other generic types, composed of five parts in the same manner as done by WG 1:
  - Part 1: Terminology
  - Part 2: Requirements (construction and performance requirements to comply with ESR)
  - Part 3: Categorization (P1 or P2?)
  - Part 4: Test Methods
  - Part 5: Labelling and user’s documentation

### 6.3 Justification of the list of harmonized standards

The reason why a specific standard will be developed for “ignition devices” comes from the fact that Directive 2007/23/EC, in its Annex I - § (5) C), sets specific Essential Safety Requirements for such articles or components of articles.

“Ignition devices” will include the following “generic types”:

*Igniters (including primers)*

*Pyrotechnic cords and fuses*

*Pressed fuses*

*Fuzes*

*Components for pyrotechnic trains*

The reason why all the other eleven “generic types” can be encompassed in a sole set of standards comes from the review of some examples of these “generic types” WG5 experts have made during their meetings. This review included a first attempt to determine, for each example, what could be the characteristics to be examined and the tests to be performed to check compliance with the Essential Safety Requirements of Directive 2007/23/EC.

WG 5 experts have concluded that corresponding construction and performance requirements would probably be sufficiently close – if not identical – to allow their insertion in a sole set of complementary standards.

However if, during the development phase, it appears necessary to elaborate complementary standards or if it is difficult to develop this unique set of standards, a new proposal will be made to CEN/TC 212 in due time.

## 6.4 Structure and Table of Contents

Possible "Table of Contents" for the WG 5 "Other pyrotechnic articles" harmonized standards:

### Part 1: Terminology

1. Scope
2. Normative references
3. Terminology
  - 3.1. Generic types
  - 3.2. Technical terms

### Part 2: Requirements

1. Scope
2. Normative references.
3. Construction requirements
  - 3.1. General
  - 3.2. Specific per principal effect<sup>1)</sup>
  - 3.3. Specific per field of use<sup>1)</sup>
4. Performance requirements
  - 4.1. General
  - 4.2. Specific per principal effect<sup>1)</sup>
  - 4.3. Specific per field of use<sup>1)</sup>
5. Temperature limits (if appropriate)
6. Other features related to ESR<sup>2)</sup>
  - 6.1. Method of ignition
  - 6.2. 'Use by' date

### Part 3: Categorization

1. Scope
2. Normative references
3. Conditions determining whether an article is P1 or P2
4. Safety distances (if appropriate)

### Part 4: Test methods

1. Scope

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1) If necessary.

2) Paragraphs § 7.1 and § 7.2 correspond to specific essential safety requirements of Directive 2007/23/EC for "other pyrotechnic articles" (See its Annex I B (2) and B (4)). Type certification tests and batch tests.

- 2 Normative references
- 3 Recommendations for tests
  - 3.1 Recommended test methods<sup>3)</sup>
  - 3.2 Accuracy and statistical approach<sup>4)</sup>
  - 3.3 Approval of alternative test methods

Part 5: Labelling and user's documentation

- 1 Scope
- 2 Normative references
- 3 Labelling and user's documentation
  - 3.1 General
  - 3.2 Specific per principal effect<sup>1)</sup>
  - 3.3 Specific per field of use<sup>1)</sup>
  - 3.4 Safety Data Sheets<sup>5)</sup>

WG 5 experts recommend distinguishing clearly “requirements” and “guidelines” (if any) in the future harmonized standards. They also invite to clearly show the link between the parameters to be submitted to requirements, these requirements and the corresponding check (or inspection) and test methods on one hand and the essential safety requirements they aim to comply with on the other hand.

## 7 Projects to be initiated within WG 5 (List and Mandates)

Following their proposal to develop two standards (one of which divided in five parts) in paragraph 6.2, WG 2 experts propose to initiate six projects with the following mandates:

### **PROJECT Nr 1:**

**Title: Development of a specific standard for “ignition devices”.**

#### **Mandate:**

“Ignition devices” will include the following “generic types”:

- *Igniters (including primers)*
- *Pyrotechnic cords and fuses*
- *Presses fuses*
- *Fuzes*
- *Components for pyrotechnic trains*

- 
- 3) See specific additional standards (if necessary).
  - 4) Type certification tests and batch tests.
  - 5) Hazard description and related data.