
**Fireworks — Test methods for
determination of specific chemical
substances —**

**Part 3:
Lead and lead compounds by atomic
absorption**

*Artifices de divertissement — Méthodes d'essai pour la détermination
de substances chimiques spécifiques —*

Partie 3: Plomb et composés du plomb par absorption atomique

ISO 22863-3:2020

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 264, *Fireworks*.

A list of all the parts in the ISO 22863 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Fireworks — Test methods for determination of specific chemical substances —

Part 3: Lead and lead compounds by atomic absorption

1 Scope

This document specifies the test method for determination of the lead content in pyrotechnic compositions of fireworks by flame atomic absorption spectrophotometry, with a minimum detection limit of 10 mg/kg.

It is generally recommended to perform a simple preliminary qualitative test to check whether a quantitative analysis is required.

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 22863-1:2020, *Fireworks — Test methods for determination of specific chemical substances — Part 1: General*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Principle

The test method consists to digest the samples with hydrochloric acid, nitric acid, hydrofluoric acid and perchloric acid and then to use atomic absorption spectrophotometer to determine the lead content.

5 Reagents

Unless otherwise stated, only confirmed as analytical reagent, distilled water or deionized water or equivalent purity water shall be used.

5.1 Hydrochloric acid ($\rho = 1,19$ g/ml).

5.2 Perchloric acid ($\rho = 1,67$ g/ml).

5.3 Nitric acid ($\rho = 1,42$ g/ml).

5.4 Hydrofluoric acid ($\rho = 1,15$ g/ml).

5.5 Diluted hydrochloric acid (1 part acid + 11 parts water).

5.6 Diluted hydrochloric acid (1 part acid + 1 part water).

5.7 Mixed acid (4 parts nitric acid+ 1 part perchloric acid).

5.8 Standard solution of lead (1 000 $\mu\text{g/ml}$).

5.9 Standard diluted solution of lead (100 $\mu\text{g/ml}$): Pour 10,00 ml of lead standard solution (5.8) into a 100 ml flask, add diluted hydrochloric acid (5.5) up to the 100 ml graduation, then mix.

6 Apparatus

6.1 Microwave digestion oven, equipped with PTFE or other suitable digestion vessel. Operating conditions of the apparatus and the corresponding digestion times shall follow the manufacturer's instructions.

NOTE Other equipment can be used provided it complies with the same purpose.

6.2 Flame atomic absorption spectrophotometer, equipped with lead element hollow cathode lamp. Operating conditions shall follow the manufacturer's instructions.

6.3 Analytical balance, accuracy 0,1 mg.

6.4 Electric hot plate, capable of reaching 500 °C.

7 Preparations

Preparation of sample shall be performed according to ISO 22863-1:2020, 5.2 to 5.3.

8 Analysis steps

8.1 Sample size

Take 1,0 g sample, using the analytical balance (6.3).

Duplicate the sample.

8.2 General requirement

The analysis of the two samples shall be carried out simultaneously.

For error correction, a blank test shall be carried out in parallel with a lead-free blank solution.