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

**Part 10:  
Nitrogen content in nitrocellulose by  
iron(II) sulfate titration**

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

*Partie 10: Taux d'azote dans la nitrocellulose par titration de l'ion  
sulfate de fer (II)*

ISO 22863-10:2021

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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](http://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](http://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](http://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](http://www.iso.org/members.html).

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

## Part 10: Nitrogen content in nitrocellulose by iron(II) sulfate titration

### 1 Scope

This document specifies the method for determination of the nitrogen content in nitrocellulose within pyrotechnic compositions of fireworks by iron(II) sulphate titration.

### 2 Normative reference

The following referenced documents are indispensable for the application of this document. For dated reference documents, only dated editions are applicable to be used. For undated references, the latest edition of the referenced document (including any subsequent amendments) applies.

ISO 22863-1, *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.

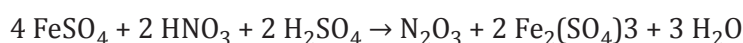
ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

### 4 Principle

In a preliminary step, samples of pyrotechnic compositions containing nitrocellulose are submitted to special treatment to make them suitable to the determination, without error, of the nitrogen content of nitrocellulose. Thereby, the other molecules that possibly contain nitrogen atoms such as nitrates - except nitrocellulose (cellulose nitrate) - shall be removed from the sample before that determination.

The remaining cellulose nitrate in the sample is released by concentrated sulphuric acid, forming nitric acid which is then titrated with iron(II) sulphate ( $\text{FeSO}_4$ ) according to the following reaction:



The reaction is followed by potentiometry. The titration curve obtained exhibits an inflexion point corresponding to the quantitative neutralization of the nitrogen radicals of the sample.

### 5 Reagents and materials

All reagents shall be of recognized analytical grade. Verify whether the reagents are applicable for this specific purpose and free of interfering compounds.

#### 5.1 Sulphuric acid ( $\text{H}_2\text{SO}_4$ ) Chemical purity 94-97 %

**5.2 Potassium Nitrate (Pure)**

**5.3 Iron(II) sulphate ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ) Crystals (pure)**

**5.4 Distilled Water**

**5.5 Acetone (Pure and anhydrous)**

## **6 Apparatus**

**6.1 Any (manual or automatic) pH meter capable of measuring pH with a precision better than 0,1**

**6.2 Platinum Electrode for pH measurement**

**6.3 Glass, graphite or tungsten Electrode for pH measurement (reference electrode)**

**6.4 Magnetic Stirrer base with stirring bar**

**6.5 Blender**

**6.6 Cooling bath (e.g. ice bath) and/or other mechanical cooling system**

**6.7 Opaque vessel**

**6.8 Agate mortar**

**6.9 150 ml and 200 ml beakers**

**6.10 Petri dishes**

**6.11 250 ml Erlenmeyer**

**6.12 Antistatic plastic bags**

**6.13 Balance, accurate to 0,0001 gram or 1/10000**

**6.14 Desiccator with drying agent (with colour indicator)**

**6.15 Laboratory reflux apparatus**

**6.16 100 °C drying oven**

**6.17 40 °C drying oven**

**6.18 50 °C drying oven**

**6.19 Timer (seconds)**

**6.20 Tissue paper or filtration paper**