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Fireworks — Test methods for determination of specific chemical substances —

Part 11: Phosphorus content by inductively coupled plasma optical emission spectrometry (ICP-OES)

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Foreword

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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).

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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 11: Phosphorus content by inductively coupled plasma optical emission spectrometry (ICP-OES)

1 Scope

This document specifies the test method for the determination of phosphorus content in firework compositions by inductively coupled plasma optical emission spectrometry (ICP-AES).

Such test is applied to fireworks excluding Christmas crackers, party poppers, or snaps according to ISO 25947-5. The use of white phosphorus can lead to fireworks of hazardous chemical stability that can be detected by possible self-ignition during the thermal conditioning test according to ISO 25947-4:2017, 6.16 (75,0 ± 2,5 °C for 48 h).

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 terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Principle

The sample of pyrotechnic composition is digested and decomposed by nitric acid and hydrogen peroxide in a microwave nitrification oven, then diluted to a certain volume and sprayed into the plasma. The sample solution is used as a light source. Its spectral intensity is measured at the wavelength of phosphorus element by use of an inductively coupled plasma optical emission spectrometer. the content of elements is calculated by comparison to a calibration curve obtained from spectrometric measurements of standard solutions with different concentrations.

5 Reagents

Except as otherwise specified, the reagents of high purity shall be used. Water shall be preferably deeply demineralized by reverse osmosis process (“deionized water”).