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**Kakovost tal - Določevanje izbranih eksplozivov in podobnih spojin - 3. del:  
Metoda s tekočinsko kromatografijo s tandemsko masno spektrometrijo (LC-  
MS/MS) (ISO 11916-3:2021)**

Soil quality - Determination of selected explosives and related compounds - Part 3:  
Method using liquid chromatography-tandem mass spectrometry (LC-MS/MS) (ISO  
11916-3:2021)

Bodenbeschaffenheit - Bestimmung von ausgewählten Explosivstoffen und verwandten  
Verbindungen - Teil 3: Verfahren mittels Flüssigkeitschromatographie mit Tandem-  
Massenspektrometrie (LC-MS/MS) (ISO 11916-3:2021)

Qualité du sol - Dosage d'une sélection d'explosifs et de composés apparentés - Partie  
3: Méthode utilisant la chromatographie en phase liquide couplée à la spectrométrie de  
masse en tandem (LC-MS/MS) (ISO 11916-3:2021)

**Ta slovenski standard je istoveten z: EN ISO 11916-3:2021**

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71.040.50	Fizikalnokemijske analitske metode	Physicochemical methods of analysis

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English Version

Soil quality - Determination of selected explosives and related compounds - Part 3: Method using liquid chromatography-tandem mass spectrometry (LC-MS/MS) (ISO 11916-3:2021)

Qualité du sol - Dosage d'une sélection d'explosifs et de composés apparentés - Partie 3: Méthode utilisant la chromatographie en phase liquide couplée à la spectrométrie de masse en tandem (CL-SM/SM) (ISO 11916-3:2021)

Bodenbeschaffenheit - Bestimmung von ausgewählten Explosivstoffen und verwandten Verbindungen - Teil 3: Verfahren mittels Flüssigkeitschromatographie mit Tandem-Massenspektrometrie (LC-MS/MS) (ISO 11916-3:2021)

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## European foreword

This document (EN ISO 11916-3:2021) has been prepared by Technical Committee ISO/TC 190 "Soil quality" in collaboration with Technical Committee CEN/TC 444 "Environmental characterization of solid matrices" 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of an identical text or by endorsement, at the latest by April 2022, and conflicting national standards shall be withdrawn at the latest by April 2022.

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selected explosives and related  
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Part 3:

**Method using liquid chromatography-  
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## ISO 11916-3:2021(E)

### 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](http://www.iso.org/directives)).

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This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical and physical characterization*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 444, *Environmental characterization of solid matrices*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 11916 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).

## Introduction

Currently two ISO standards exist for the analysis of explosives and related compounds in soil: ISO 11916-1 (HPLC with UV detection method), ISO 11916-2 (GC-ECD or MS). According to the results of inter-laboratory trial with ISO 11916-1, it showed some problematic aspects to analyze PETN, 1,3,5-TNB and tetryl. In case of ISO 11916-2, it also gave poor inter-laboratory trial results for 1,3,5-TNB. Therefore, it is necessary to develop new method effectively applicable to the determination of PETN, 1,3,5-TNB and tetryl. In addition to this, lower risk-based PRGs (Preliminary Remediation Goal), new regulatory concerns, and change of land use have created the atmosphere to apply more sensitive and selective instruments to determine explosive and related compounds. From the view of these aspects, liquid chromatography–tandem mass spectrometry (LC-MS/MS) is one of alternative methods for these purposes. LC-MS/MS method provides 10-20 times or more lower detection limit than that of HPLC/UV method. In this document, LC-MS/MS method is intended for the trace analysis of explosives and related compounds and applicable to 12 compounds (1,3-DNB, 1,3,5-TNB, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, 4-A- 2,6-DNT, 2-A-4,6-DNT, Tetryl, Hexyl, RDX, HMX, PETN) listed in ISO 11916-1 (soil, HPLC with UV detection method) except for nitrobenzene, 2-nitrotoluene, 3-nitrotoluene and 4-nitrotoluene (see [Annex E](#)). In case of nitrobenzene and nitrotoluenes, they have the low sensitivity in LC-MS/MS measurement than using HPLC with UV detection method. In particular LC-MS/MS measurement is effective for the analysis of PETN, 1,3,5-TNB and tetryl when comparing with the method using HPLC with UV detection method. Also LC-MS/MS method is getting more familiar in ISO standard development (e.g. ISO 22104 Water quality-Microcystins, ISO/NP 21677 Water quality-HBCD, ISO 21675 Water quality-PFAS).

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