
**Leather — Per- and polyfluoroalkyl
substances —**

**Part 1:
Determination of non-volatile
compounds by extraction method
using liquid chromatography**

Cuir — Substances perfluoroalkylées et polyfluoroalkylées —

*Partie 1: Détermination des composés non volatils par une méthode
d'extraction utilisant la chromatographie en phase liquide*

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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.

IULTCS, originally formed in 1897, is a world-wide organization of professional leather societies to further the advancement of leather science and technology. IULTCS has three Commissions, which are responsible for establishing international methods for the sampling and testing of leather. ISO recognizes IULTCS as an international standardizing body for the preparation of test methods for leather.

This document was prepared by the Chemical Test Commission of the International Union of Leather Technologists and Chemists Societies (IUC Commission, IULTCS), in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 289, *Leather*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 23702-1:2018), which has been technically revised.

The main changes are as follows:

- to clarify the relevant organic fluorine compounds, the title has been modified;
- the Introduction, Scope and [Clauses 3](#) to [10](#) have been editorially and technically modified;
- the previous Clause 7 has been split into two separate clauses, [Clause 7](#), “Sampling”, and [Clause 8](#), “Procedure”;
- the previous Clause 8 is now [Clause 9](#), “Expression of results” and includes the previous Clause 9, “Precision”, as [9.4](#);
- a new [Annex A](#), listing the category of application of the per- and polyfluoroalkyl substances (PFAS), has been inserted and the subsequent annexes relettered accordingly;
- [Annexes B](#) and [C](#) have been technically modified and are now lists of “PFAS regulated substances” and “PFAS non-regulated substances”, respectively;

- a new [Annex D](#), listing the usable ions and possible quantification limits for PFAS analysis by LC-MS/MS, has been inserted and the subsequent annexes relettered accordingly;
- [Annex E](#) has been technically modified.

A list of all parts in the ISO 23702 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.

Introduction

The per- and polyfluoroalkyl substances (PFAS) consists of a large group of surface active compounds. The most well-known are perfluorooctanoic sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). [Table A.1](#) presents PFAS substance categories and applications.

Perfluorooctanoic sulfonic acid (PFOS) is classified as persistent, bio-accumulative and toxic (PBT). PFOS and its salts are restricted and regulated in many countries regarding their marketing and use (see References [4] and [7]).

Perfluorooctanoic acid (PFOA) and its salts and related substances are suspected of having a similar risk profile to PFOS and are also restricted and regulated in many countries regarding their marketing and use (see Reference [4]).

Furthermore, restrictions on perfluorocarboxylic acids containing 9 to 14 carbon atoms in the chain (C_9 - C_{14} PFCAs), their salts and C_9 - C_{14} PFCA-related substances are restricted in some countries (see References [5] and [8]).

A number of long-chain per- and polyfluoroalkyl compounds have been included in the EU Candidate List of Substances of Very High Concern (SVHC), which is available at: <https://echa.europa.eu/candidate-list-table>.^[6]

The regulatory thresholds for restricted per- and polyfluoroalkyl compounds limit their use to a level below which they cannot be meaningfully used. The thresholds must take into consideration the possible presence of unavoidable impurities and unintentional trace contaminants.

The long-chain, fully fluorinated anions are non-volatile. They are heat-stable and resistant to breaking down in the environment. The per- and polyfluoroalkyl compounds have been widely used in many industries, including in oil-, soil- and water-repellent finishes for textiles, leather products, paper, furniture and carpets.

Leather — Per- and polyfluoroalkyl substances —

Part 1:

Determination of non-volatile compounds by extraction method using liquid chromatography

WARNING — The use of this document involves hazardous materials. It does not purport to address all of the safety or environmental problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel and the environment prior to application of this document and to fulfil the relevant requirements for this purpose.

1 Scope

This document specifies a test method for detection and quantification of extractable non-volatile per- and polyfluoroalkyl substances (PFAS) in leather and coated leather by solvent extraction and liquid chromatography coupled with mass spectrometry.

This document, taking into account the three-dimensional distribution of the fibres within leather, makes the evaluation of the PFAS with respect to the mass.

PFAS substances categories and applications are listed in [Annex A, Table A.1](#). Classes of PFAS regulated compounds listed in [Annex B, Table B.1](#), include acids, telomers, sulfonates and sulphonamide alcohols. Classes of other non-regulated compounds that can be determined by this document are listed in [Annex C, Table C.1](#).

NOTE 1 By applying the method specified in this document, the concentration of free fluorotelomer alcohols (FTOH) in a sample cannot be correctly quantified if perfluoropolymers that release FTOH due to transesterification with the extraction solvent methanol are present in the sample.

NOTE 2 Some regulations (e.g. Reference [4]) also restrict perfluoropolymers having a linear or branched perfluoroheptyl group with the moiety (C₇F₁₅)C as one of the structural elements that can degrade to PFOA, e.g. polymers containing 2-perfluorooctylethanol (8:2 FTOH, CAS Registry Number^{®1} 678-39-7) bonded as esters. To determine whether these perfluoropolymers are intentionally present, it could be necessary to introduce an alkaline hydrolysis method to remove the 8:2 FTOH side-chain from the polymer. In addition, other FTOH, e.g. 6:2 FTOH or 10:2 FTOH, will be released from relevant perfluoropolymers by alkaline hydrolysis.^[3]

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 2418, *Leather — Chemical, physical, mechanical and fastness tests — Position and preparation of specimens for testing*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 4044, *Leather — Chemical tests — Preparation of chemical test samples*

EN 15987, *Leather — Terminology — Key definitions for the leather trade*.

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