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Interested committees:

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

DRAFT INTERNATIONAL STANDARD

ISO/DIS 5667-27

ISO/TC 147/SC 6

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Voting begins on:
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Water quality — Sampling —

Part 27:

Guidance on sampling for microplastics in water

ICS: 13.060.45

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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).

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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 147 *Water quality*, Subcommittee SC 6, *Sampling (general methods)*.

A list of all parts in the ISO 5667 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

Microplastic occurrence in the environment is a prominent concern both to the public and to the scientific community. Determining the amount and distribution of microplastics in water bodies and domestic water is therefore a critical task^[1-6]. However, the methodology for sampling microplastics in water samples is still lacking in precision. Consistent methodology is only starting to emerge, but still no universal protocol exists for the sampling of these contaminants in water.

The presence of small plastic fragments in the ocean was first reported in the 1972^[7], but it was in 2004 that the term “microplastics” was proposed for the first time to describe plastic particles of a few microns in diameter^[8]. Since then, a wealth of information became available on the abundance and type of microplastics in the marine environment, freshwater and estuarine systems. However, the different studies have used diverse techniques to sample, extract, treat and detect microplastic present in water.

There are many reasons why different studies investigating microplastic occurrence in water and wastewater show different results. The disparity between some of the findings (for microplastic type and abundance) may be partially explained by the fact that differing sampling techniques have been used. Variables pertaining to both time of year and time of day, flowrate and volume of water sampled, grab sampling or sieving the water over an extended period, the use of plastic containers or tubing, selection of a few parts of the sample for analysis, or dissimilar devices to capture the microplastic fragments, may be the causes of variation in study results.

While several standards for water sampling and water quality already exist (for example, ISO 5667 series, and in particular ISO 5667-17, Guidance on sampling of bulk suspended solids), microplastics as particular determinands pose a specific challenge that requires a more specific approach. For example, microplastics sampling requires the use of very specific materials for collecting, handling and storing to avoid cross-contamination. Also, microplastic buoyancy can vary depending on their composition, size/shape, or colonization by microorganisms, and microplastics are not homogeneously distributed in the water column. Therefore, a more targeted and detailed set of sampling protocols is required to account for these differences. To better understand the fate and impact of microplastics in the environment, a more specific standardized sampling approach should be adopted and applied.

Water quality — Sampling —

Part 27:

Guidance on sampling for microplastics in water

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is essential that tests conducted according to this document be carried out by suitably trained staff.

1 Scope

This part of ISO 5667 describes the basic methods for sampling suspended microplastics in water (domestic water, freshwater, seawater, treated wastewater, and untreated wastewater), for their subsequent characterization. Suspended particles could also include synthetic or semi-synthetic polymeric materials (such as rubber). This standard does not cover chemical analysis, biological (ecotoxicological) methods or physical methods, nor the pre-treatment or digestion methods intrinsic to such analyses.

This document covers general methodologies for grab sampling, sampling using a set of successive filters of different pore sizes (cascade filtration), for water samples with low, medium and high content of suspended solids; and net sampling, using, for example, manta, plankton or neuston nets.

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 5667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques*

ISO 5667-3, *Water quality - Sampling - Part 3: Preservation and handling of water samples*

ISO 5667-4, *Water quality — Sampling — Part 4: Guidance on sampling from lakes, natural and man-made*

ISO 5667-5, *Water quality — Sampling — Part 5: Guidance on sampling of drinking water from treatment works and piped distribution systems*

ISO 5667-6, *Water quality — Sampling — Part 6: Guidance on sampling of rivers and streams*

ISO 5667-9, *Water quality — Sampling — Part 9: Guidance on sampling from marine waters*

ISO 5667-10, *Water quality — Sampling — Part 10: Guidance on sampling of waste water*

ISO 5667-14, *Water quality — Sampling — Part 14: Guidance on quality assurance and quality control of environmental water sampling and handling*

ISO 5667-17, *Water quality — Sampling — Part 17: Guidance on sampling of bulk suspended solids*

ISO 5667-23, *Water quality — Sampling — Part 23: Guidance on passive sampling in surface waters*

ISO 6107, *Water quality — Vocabulary*

ISO 14644-1, *Cleanrooms and associated controlled environments — Part 1: Classification of air cleanliness by particle concentration*

ISO/TR 21960, *Plastics — Environmental aspects — State of knowledge and methodologies*

ISO/DIS 24187, *Principles for the analysis of plastics and microplastics present in the environment*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

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/>

3.1 microplastic

any solid plastic or synthetic polymer particle insoluble in water with the largest dimension between 1 µm and 5 mm

Note 1 to entry: This definition encompasses the ISO/TR 21960 definitions of large microplastics and microplastics

3.2 plastic

material which contains as an essential ingredient a high polymer and which, at some stage in its processing into finished products, can be shaped by flow (ISO 472:2013)

3.3 rubber

family of polymeric materials which are flexible and elastic (ISO 1382:2020)

3.4 suspended solids

solids that can be removed from water by filtration, settling or centrifuging under specified conditions (ISO 5667-17, 3.2 “bulk suspended solids”)

3.4.1 high suspended solid content

concentration of solids suspended in water is more than 500 mg/l^[5]

3.4.2 medium suspended solid content:

concentration of solids suspended in water ranges between 100–500 mg/l^[5]

3.4.3 low suspended solid content:

concentration of solids suspended in water ranges between 1–100 mg/l^[5]

3.4.4 very low suspended solid content:

concentration of solids suspended in water is below 1 mg/l^[5]

3.5 grab sample

single discrete sample directly collected from a water body at a specific time and location (and depth when relevant)

3.6**volume-reduced sample**

concentrated water sample by reducing its volume during sampling, preserving only the portion that is of interest for further processing

3.7**blank**

sample identical to the sample of interest, but in the absence of the determinand

3.8**field blank**

blank to verify possible contamination during sampling, prepared in the laboratory using water (filtered through a $< 1 \mu\text{m}$ pore size inert filter before use), and sent with the sampling personnel for exposure to the sampling environment

3.9**domestic water**

all water either in its original state or after treatment, intended for human use, such as cooking, food preparation, washing, drinking or other domestic purposes

3.10**limit of detection**

for microplastics, the limit of detection is defined as the methods' capability of reliably detecting at least one particle or a defined mass with statistical rigour

4 Principles and general considerations**4.1 Methodologies****4.1.1 General**

The microplastic sampling approaches described in this document can be grouped mainly as grab sampling and volume-reduced sampling.

Grab sampling (also known as spot sampling) consists of collecting a given volume of water (without reducing it during this procedure). Subsequent separation, pre-treatment (when required) and analysis of the microplastics are done in a laboratory. In volume-reduced sampling, the microplastics are collected while reducing the volume of water during the sampling process, by passing the water through nets or sieves. The collected microplastics are preserved for further processing in a laboratory.

4.1.2 Grab sampling

The methodology for the sampling of microplastics via grab sampling entails filling non-plastic containers (or made of materials which are less present in the environment or not part of the measurement concept) with domestic water, freshwater, treated or untreated wastewater, or surface, near surface or deep-water samples, for the subsequent pre-treatment and analysis in a laboratory. The container material must be suitable for the sample. The sampling time, location, depth (when relevant) and collected volume are registered.

The main advantage of grab sampling is that all the microplastics present in the sampled water are collected without size limitation, in contrast to volume-reduced sampling, where the selected mesh size determines the smallest size of sampled particles. In grab sampling, risks of contamination are reduced when compared to volume-reducing sampling in an open system (e.g. using manta trawls, plankton or neuston nets), because handling of the sample and time of exposure to the surrounding environment are shorter. However, the main disadvantage consists of the limited volume of sample that can be collected, stored, and processed^[9].