

VEE KVALITEET. PROOVIVÕTT. OSA 23: JUHISED
PINNAVEE PASSIIVSEKS PROOVIVÕTUKS

Water quality - Sampling - Part 23: Guidance on passive
sampling in surface waters (ISO 5667-23:2011)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 5667-23:2011 sisaldab Euroopa standardi EN ISO 5667-23:2011 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 5667-23:2011 consists of the English text of the European standard EN ISO 5667-23:2011.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 01.03.2011.	Date of Availability of the European standard is 01.03.2011.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 13.060.45

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

ICS 13.060.45

English Version

**Water quality - Sampling - Part 23: Guidance on passive
sampling in surface waters (ISO 5667-23:2011)**

Qualité de l'eau - Échantillonnage - Partie 23: Lignes
directrices pour l'échantillonnage passif dans les eaux de
surface (ISO 5667-23:2011)

Wasserbeschaffenheit - Probenahme - Teil 23: Anleitung
zur Anwendung von Passivsammlern (ISO 5667-23:2011)

This European Standard was approved by CEN on 27 February 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

This document (EN ISO 5667-23:2011) has been prepared by Technical Committee ISO/TC 147 "Water quality" in collaboration with Technical Committee CEN/TC 230 "Water analysis" the secretariat of which is held by DIN.

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 September 2011, and conflicting national standards shall be withdrawn at the latest by September 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 5667-23:2011 has been approved by CEN as a EN ISO 5667-23:2011 without any modification.

Contents

Page

Foreword	iv
Introduction.....	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Principle	3
5 Handling passive sampling devices	4
5.1 General	4
5.2 Passive sampling devices for organic compounds	5
5.3 Passive sampling devices for metals	5
6 Estimation of appropriate field deployment time	6
7 Passive sampling device preparation and assembly	6
7.1 Passive sampling device preparation	6
7.2 Passive sampling device assembly	7
7.3 Passive sampling device storage	7
8 Quality assurance	7
8.1 General	7
8.2 Replicate passive sampling devices in field deployment	7
8.3 Replicate quality control passive sampling devices	7
8.4 Passive sampling device controls	8
9 Selection of sampling site and safety precautions	9
9.1 Selection of sampling site	9
9.2 Appropriate precautions against accidents	9
10 Passive sampling device deployment and retrieval	10
10.1 Materials and apparatus	10
10.2 Transport	10
10.3 Deployment procedure	10
10.4 Retrieval procedure	11
11 Extraction of analytes from passive sampling devices and preparation for analysis	12
12 Analysis	12
13 Calculations	13
14 Test report	15
Annex A (informative) Tables providing a summary of the main types of passive sampling devices and a summary of the methods for their calibration	17
Annex B (normative) Materials and apparatus to be taken to the field for use in the deployment of passive sampling devices	19
Annex C (informative) Quality control measures	20
Bibliography	22

Introduction

Passive sampling devices can be used for monitoring concentrations of a wide range of analytes, including metals, inorganic anions, polar organic compounds (e.g. polar pesticides and pharmaceutical compounds), non-polar organic compounds (e.g. non-polar pesticides), and industrial chemicals (e.g. polyaromatic hydrocarbons and polychlorinated biphenyls) in aquatic environments.

Pollutant levels in surface water have traditionally been monitored by spot sampling (also known as bottle or grab sampling). Such sampling gives a snapshot of pollutant levels at a particular time. Pollutant levels in surface water have a tendency to fluctuate over time and so it may be more desirable to monitor pollutants over an extended period in order to obtain a more representative measure of the chemical quality of a water body. This can be achieved by repeated spot sampling, continuous monitoring, biomonitoring or passive sampling.

Passive sampling involves the deployment of a passive sampling device that uses a diffusion gradient to collect pollutants over a period of days to weeks. This process is followed by extraction and analysis of the pollutants in a laboratory.

Passive sampling devices can be used in kinetic or equilibrium modes. In equilibrium mode, the passive sampling device reaches equilibrium with the sampled medium, and provides a measure of the concentration at the time of retrieval from the environment. In the kinetic mode, the passive sampling device samples in an integrative way, and provides a measure of the time-weighted average concentration of a pollutant in the water over the exposure period. Where uptake into the receiving phase is under membrane control, then passive sampling devices operate as integrative samplers between the time of deployment and an exposure period of up to the time to half maximum accumulation in the receiving phase. Membrane control means that the transport resistance of the membrane is larger than that of the water boundary layer. In stagnant water, uptake is generally controlled by the water boundary layer. Under highly turbulent conditions, uptake is membrane controlled. Where uptake is controlled by the water boundary layer, then the passive samplers behave in a manner similar to those where uptake is under membrane control, but the sampling rate depends on flow conditions. Where flow conditions vary over time, uptake can be under water boundary control when turbulence is low, but change to membrane control when turbulence increases.

Diffusion into the receiving phase is driven by the free dissolved concentration of pollutant, and not that bound to particulate matter and to large molecular mass organic compounds (e.g. humic and fulvic acids). This technique provides a measure of the time-weighted average concentration of the free dissolved fraction of pollutant to which the passive sampling device has been exposed. For some passive sampling devices for metals, the concentration of analyte measured includes both the free dissolved fraction and that fraction of the analyte bound to small molecular mass inorganic and organic compounds that can diffuse into and dissociate in the permeation layer. Pollutant bound to large molecular mass compounds diffuses only very slowly into the diffusion layer. The concentration measured by a passive sampling device can be different from that measured in a spot (bottle) sample. In a spot sample, the fraction of pollutant measured is determined by a combination of factors such as the proportion of pollutant bound to particulate matter and to large organic compounds, and the treatment (e.g. filtration at 0,45 µm or ultrafiltration) applied prior to analysis. Passive sampling devices used in surface water typically consist of a receiving phase (typically a solvent, polymer or sorbent) that has a high affinity for pollutants of interest and so collects them. This receiving phase can be retained behind, or surrounded by, a membrane through which the target analytes can permeate. A schematic representation of such a passive sampling device is shown in Figure 1. In its simplest form, a passive sampling device is comprised solely of a naked membrane, fibre or bulk sorbent which acts as a receiving phase. In such passive sampling devices, the polymer acts as both receiving phase and permeation membrane. The polymers used in these passive sampling devices usually have a high permeation, and uptake is controlled by the water boundary layer. Uptake comes under membrane control only at very high flow rates. Different combinations of permeation layer and receiving phase are used for the different classes of pollutant (non-polar organic, polar organic, and inorganic). Passive sampling devices are designed for use with one of these main classes of pollutant.

Passive sampling devices can be used in a number of modes including qualitative or semi-quantitative which can be applied in the detection of sources of pollution, for example. When appropriate calibration data are available, passive sampling devices can also be used quantitatively for measuring the concentration of the free dissolved species of a pollutant.

Water quality — Sampling —

Part 23:

Guidance on passive sampling in surface waters

1 Scope

This part of ISO 5667 specifies procedures for the determination of time-weighted average concentrations and equilibrium concentrations of the free dissolved fraction of organic and organometallic compounds and inorganic substances, including metals, in surface water by passive sampling, followed by analysis.

2 Normative references

The following referenced documents are indispensable for the application 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 5667-6, *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 5667-14, *Water quality — Sampling — Part 14: Guidance on quality assurance of environmental water sampling and handling*

ISO 6107-2, *Water quality — Vocabulary — Part 2*

ISO/TS 13530, *Water quality — Guidance on analytical quality control for chemical and physicochemical water analysis*

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