
**Kakovost vode - Vzorčenje - 1. del: Navodilo za načrtovanje programov in
tehnika vzorčenja (ISO 5667-1:2006)**

Water quality - Sampling - Part 1: Guidance on the design of sampling programmes
and sampling techniques (ISO 5667-1:2006)

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English Version

Water quality - Sampling - Part 1: Guidance on the design of
sampling programmes and sampling techniques (ISO 5667-
1:2006)

Qualité de l'eau - Échantillonnage - Partie 1: Lignes
directrices pour la conception des programmes et des
techniques d'échantillonnage (ISO 5667-1:2006)

Wasserbeschaffenheit - Probenahme - Teil 1: Anleitung zur
Erstellung von Probenahmeprogrammen und
Probenahmetechniken (ISO 5667-1:2006)

This European Standard was approved by CEN on 25 November 2006.

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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 Central Secretariat has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN ISO 5667-1:2006) 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of an identical text or by endorsement, at the latest by June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.

This document supersedes EN 25667-1:1993.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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.

Endorsement notice

The text of ISO 5667-1:2006 has been approved by CEN as EN ISO 5667-1:2006 without any modifications.

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Water quality — Sampling —

Part 1:

**Guidance on the design of sampling
programmes and sampling techniques**

*Qualité de l'eau — Échantillonnage —
Partie 1: Lignes directrices pour la conception des programmes et des
techniques d'échantillonnage*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 5667-1 was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 6, *Sampling (general methods)*, and by Technical Committee CEN/TC 230, *Water analysis*, in collaboration.

Within ISO, this second edition cancels and replaces the first edition of ISO 5667-1:1980, ISO 5667-1:1980/Cor.1:1996 and the second edition of ISO 5667-2:1991, which have been technically revised. Within CEN, this document supersedes EN 25667-1:1993 and EN 25667-2:1993.

ISO 5667 consists of the following parts, under the general title *Water quality — Sampling*:

- *Part 1: Guidance on the design of sampling programmes and sampling techniques*
- *Part 3: Guidance on the preservation and handling of water samples*
- *Part 4: Guidance on sampling from lakes, natural and man-made*
- *Part 5: Guidance on sampling of drinking water from treatment works and piped distribution systems*
- *Part 6: Guidance on sampling of rivers and streams*
- *Part 7: Guidance on sampling of water and steam in boiler plants*
- *Part 8: Guidance on the sampling of wet deposition*
- *Part 9: Guidance on sampling from marine waters*
- *Part 10: Guidance on sampling of waste waters*
- *Part 11: Guidance on sampling of groundwaters*
- *Part 12: Guidance on sampling of bottom sediments*
- *Part 13: Guidance on sampling of sludges from sewage and water treatment works*
- *Part 14: Guidance on quality assurance of environmental water sampling and handling*
- *Part 15: Guidance on preservation and handling of sludge and sediment samples*

- *Part 16: Guidance on biotesting of samples*
- *Part 17: Guidance on sampling of suspended sediments*
- *Part 18: Guidance on sampling of groundwater at contaminated sites*
- *Part 19: Guidance on sampling of marine sediments*
- *Part 20: Guidance on the use of sampling data for decision making — Compliance with thresholds and classification systems*

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Water quality — Sampling —

Part 1:

Guidance on the design of sampling programmes and sampling techniques

1 Scope

This part of ISO 5667 sets out the general principles for, and provides guidance on, the design of sampling programmes and sampling techniques for all aspects of sampling of water (including waste waters, sludges, effluents and bottom deposits).

It does not include detailed instructions for specific sampling situations, which are covered in the various other parts of ISO 5667. Also, it does not include microbiological sampling, which is covered in ISO 19458 ^[23].

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 6107-1, *Water quality — Vocabulary — Part 1*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6107-1, ISO 6107-2 and the following apply.

3.1

periodic sampling

process of taking samples at fixed intervals which can be time-, volume- or flow-dependent

3.2

area profile sampling

process of taking samples at chosen locations in a specific area while keeping other parameters (e.g. time, depth) as constant as possible

3.3

depth profile sampling

process of taking samples at chosen depths at a specific location while keeping other parameters (e.g. time, flow) as constant as possible

4 General safety precautions

The enormously wide range of conditions encountered in sampling water bodies and bottom deposits can subject sampling personnel to a variety of safety and health risks. Precautions should be taken to avoid inhalation of toxic gases and ingestion of toxic materials through the nose, mouth and skin. Personnel responsible for the design of sampling programmes and for carrying out sampling operations should ensure that sampling personnel are informed of the necessary precautions to be taken in sampling operations.

Attention is drawn to the requirements of national and/or regional health and safety regulations.

NOTE Precautions against accidents might need to be taken. More specific situations are discussed in 5.3.

Weather conditions should be taken into account in order to ensure the safety of personnel and equipment and it is essential that life jackets and lifelines should be worn when sampling large masses of water. Before sampling from ice-covered waters, the location and extent of weak ice should be carefully checked. If self-contained underwater breathing apparatus or other diving equipment is used, it should always be checked and maintained in accordance with relevant ISO or national standards to ensure reliability.

Boats or platforms used for sampling purposes should be capable of being maintained in a stable condition. In all waters, precautions should be taken in relation to commercial ships and fishing vessels; for example, the correct signal flags should be flown to indicate the nature of the work being undertaken.

Sampling from unsafe sites, such as unstable river banks, should be avoided wherever possible. If this is not possible, the operation should be conducted by a team using appropriate precautions rather than by a single operator. Wherever possible, sampling from bridges should be used as a substitute for bank sampling unless bank conditions are the specific subject of the sampling study.

Safe access to sampling sites in all weather is essential for frequent routine sampling. Where relevant, precautions should be taken where additional natural hazards are present, such as fauna or flora, that can endanger the health or safety of personnel.

Hazardous materials (e.g. bottles containing concentrated acids) should be properly labelled.

If instruments or other items of equipment are to be installed on a river bank for sampling purposes, locations that are susceptible to flooding or vandalism should be avoided or appropriate precautions taken.

Many other situations arise during the sampling of water when special precautions should be taken to avoid accidents. For example, some industrial effluents can be corrosive or can contain toxic or flammable materials. The potential dangers associated with contact with sewage should also not be overlooked; these can be gaseous, microbiological, virological or zoological, such as from amoebae or helminthes.

Gas protection equipment, breathing apparatus, resuscitation apparatus and other safety equipment should be available when sampling personnel need to enter sampling locations containing hazardous atmospheres. In addition, the concentration of oxygen and of any likely toxic or asphyxiating vapour or gas likely to be present should be measured before personnel enter enclosed spaces.

In the sampling of steam and hot discharges, special care is necessary, and recognized sampling techniques designed to remove hazards should be applied.

The handling of radioactive samples requires special care, and the special techniques required should be strictly applied.

The use of electrically operated sampling equipment in or near water can present special electrocution hazards. Work procedures, site design and equipment maintenance should be planned so as to minimize these hazards.

5 Design of sampling programmes

5.1 General

Whenever a volume of water, bottom deposit or sludge is to be characterized, it is generally impossible to examine the whole and it is therefore necessary to take samples.

Samples are collected and examined primarily for the following reasons:

- a) to determine the concentration of associated physical, chemical, biological and radiological parameters in space and time;
- b) with bottom deposits, to obtain a visual indication of their nature;
- c) to estimate the flux of material;
- d) to assess trends over time or over space;
- e) for compliance with, or attainment of, criteria, standards or objectives.

Sampling programmes, the outcome of which will be estimates of summary statistics and trends, should be designed in full awareness of the issues of statistical sampling error and the techniques by which these errors are quantified and how they are used to take decisions.

The samples collected should be as representative as possible of the whole to be characterized, and all precautions should be taken to ensure that, as far as possible, the samples do not undergo any changes in the interval between sampling and analysis (see ISO 5667-3^[3] for additional guidance). The sampling of multiphase systems, such as water containing suspended solids or immiscible organic liquids, can present special problems and in such cases, specific advice should be sought (see Clause 6).

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5.2 Broad objectives for the design of sampling programmes

Before any sampling programme is devised, it is very important that the objectives of the programme are carefully established since they are the major factors in determining the position of sampling sites, frequency of sampling, duration of sampling, sampling procedures, subsequent treatment of samples and analytical requirements. The degree of accuracy and precision necessary for the estimation of water quality concentrations sought should also be taken into account, as should the manner in which the results are to be expressed and presented, for example, as concentrations or mass loads, maximum and/or minimum values, arithmetic means, median values, etc. The sampling programme should be designed to be capable of estimating the error in such values as affected by statistical sampling error and errors in chemical analysis.

Additionally, a list of parameters of interest should be compiled and the relevant analytical procedures consulted since these might give guidance on precautions to be observed during sampling and subsequent handling. (General guidance on handling of samples is given in ISO 5667-3^[3].)

It can often be necessary to carry out a preliminary sampling and analysis programme before the final objectives can be defined. It is important to take into account all relevant data from previous programmes at the same or similar locations and other information on local conditions. Previous personal experience of similar programmes or situations can also be very valuable when setting up a new programme for the first time. Putting sufficient effort in time and money into the design of a proper sampling programme is a good investment that will ensure that the required information is obtained both efficiently and economically; failure to put proper effort into this aspect can result in either failure of the programme to achieve its objectives and/or over-expenditure of time and money.

Three broad objectives can be distinguished as follows (these are covered in more detail in 8.2, 8.3 and 8.4):

- quality control measurements within water or waste water treatment plants used to decide when short-term process corrections are required;