

Water quality — Determination of mercury

The European Standard EN 1483 : 1997 has the status of a
British Standard

ICS 13.060.01

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National foreword

This British Standard is the English language version of EN 1483 : 1997. It supersedes BS 6068 : Sections 2.4 : 1984 and 2.6 : 1984, which are withdrawn.

The UK participation in its preparation was entrusted by Technical Committee EH/3, Water quality, to Subcommittee EH/3/2, Physical, chemical and biochemical methods, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

The main British Standard on water quality is BS 6068. The various Sections of BS 6068 comprise Parts 1 to 7, which, together with Part 0, are listed below.

- Part 0 *Introduction*
- Part 1 *Glossary*
- Part 2 *Physical, chemical and biochemical methods*
- Part 3 *Radiological methods*
- Part 4 *Microbiological methods*
- Part 5 *Biological methods*
- Part 6 *Sampling*
- Part 7 *Precision and accuracy*

NOTE. The tests described in this standard should only be carried out by suitably qualified persons with an appropriate level of chemical expertise. Standard chemical procedures should be followed throughout.

It is essential that users evaluate this standard in their own laboratories and demonstrate its fitness for purpose.

The provisions of this standard allow alternative procedures (for example, those described in annex A) to be carried out in place of those specified in the standard. Alternative procedures should be used only where it can be demonstrated that performance data generated using these procedures is equivalent to, or better than, the performance data, shown in table 2, obtained using the procedures described in this standard. Appropriate calculations, using procedures given in BS 5497 : Part 1, should be used.

When comparing the performance data obtained using the alternative procedures with those obtained using procedures given in this standard, appropriate calculations, using procedures given in BS 2846 : Part 4, should be used.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled 'International Standards Correspondence Index', or using the 'Find' facility of the BSI Standards Electronic Catalogue.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, an EN title page, pages 2 to 12, an inside back cover and a back cover.

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English version

Water quality — Determination of mercury

Qualité de l'eau — Détermination du mercure

Wasserbeschaffenheit — Bestimmung von
Quecksilber

This European Standard was approved by CEN on 1997-04-06. 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.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 230, Water analysis, the Secretariat of which is held by DIN.

This European Standard contains three informative annexes.

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 November 1997, and conflicting national standards shall be withdrawn at the latest by November 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

It should be investigated whether and to what extent particular problems will require the specification of additional marginal conditions.

It is absolutely essential that tests conducted according to this standard are carried out by suitably qualified staff.

In natural water sources, mercury compounds generally occur only in very small concentrations of less than 0,1 µg/l. Higher concentrations may be found, for example, in waste water.

Both inorganic and organic compounds of mercury may be present. Mercury can accumulate in sediment and sludge.

In order to fully decompose all of the mercury compounds, a digestion procedure is necessary. Digestion can be omitted only if it is certain that the mercury concentration can be measured without this pretreatment.

For measurements in the low concentration range, highest purity reagents, clean reaction vessels, mercury-free air in the laboratory and a very stable measurement system are essential.

1 Scope

This standard specifies two methods for the determination of mercury. In the method described in clause 4, tin (II) chloride is used as reducing agent. In the method given in clause 5, sodium tetrahydroborate serves as reducing agent. The choice of the method depends on the equipment available and the matrix (see clause 3). Both methods are suitable for the determination of mercury in water, for example in ground, surface and waste waters, in the concentration range from 0,1 µg/l to 10 µg/l. Higher concentrations can be determined if the water sample is diluted.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendment to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- EN 25667-1 : 1993 *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes* (ISO 5667-1 : 1980)
- EN 25667-2 : 1993 *Water quality — Sampling — Part 2: Guidance on sampling techniques* (ISO 5667-2 : 1991)
- EN ISO 5667-3 : 1995 *Water quality — Sampling — Part 3: Guidance on the preservation and handling of samples* (ISO 5667-3 : 1994)

3 General interferences

With mercury there is a risk that exchange reactions, that is adsorption and desorption, will occur on the walls of the reaction vessel (see 4.4).

Mercury vapour can diffuse through various plastics, this phenomenon needs to be taken into consideration in the choice of tubing material. Glass or special plastics tubing, e.g. FEP tubes may be used (FEP = fluorinated ethylene propylene). Silicone tubing, for example, is unsuitable.

Volatile organic substances can absorb in the UV range and be mistaken for mercury. These are for the most part removed by adding potassium permanganate until the solution is permanently coloured red and aerating for 10 min with an inert gas, before reduction of the mercury compounds. Often, such interference by non-specific absorption can also be eliminated using a background compensation system.

All solutions have to be brought to the same temperature (< 25 °C) before reduction and stripping of the mercury vapour. Water condensation on the cuvette windows can be prevented by heating the cuvette with, for example, an infrared lamp.

The interferences which occur due to the presence of other elements in the matrix are dependent on the choice of reducing agent. Element concentrations in excess of those listed in table 1 can cause results which are too low.

Fewer interferences from heavy metals arise if tin (II) chloride is used rather than sodium tetrahydroborate. Using flow systems, interference effects due to heavy metals can be less than indicated in table 1.

Table 1. Acceptable concentrations of some matrix elements in a measurement solution in milligrams per litre

Reducing agent	NaBH ₄ directly	NaBH ₄ directly	SnCl ₂ directly
Medium	0,5 mol/l HCl	5 mol/l HCl + 0,2 g/l Fe (III)	0,5 mol/l HCl
Element			
Cu(II)	10	10	500
Ni(II)	1	500	500
Ag(I)	0,1	10	1
I	100	10	0,1
As (V)	0,5	0,5	0,5
Bi(III)	0,05	0,5	0,5
Sb(III)	0,5	0,5	0,5
Se(IV)	0,005	0,05	0,05

Tin (II) chloride causes such extensive contamination of the apparatus with tin that considerable interferences occur if sodium tetrahydroborate is used afterwards. Separate systems are therefore essential for reductions with tin (II) chloride and with sodium tetrahydroborate.

WARNING. Mercury and mercury compounds are very toxic. Extreme caution should be exercised when handling samples and solutions which contain or may contain mercury.