

Water quality — Determination of biochemical oxygen demand after n days (BOD_n) —

Part 1: Dilution and seeding method with allylthiourea addition

The European Standard EN 1889-1:1998 has the status of a
British Standard

ICS 13.060.01; 13.060.30

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National foreword

This British Standard is the English language version of EN 1899-1:1998. It supersedes BS 6068-2.14:1990 which is withdrawn.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 subcommittee can be obtained on request to its secretary.

BS EN 1899-1 is one of a series of standards on water quality, others of which have been, or will be, published as Sections of BS 6068. This standard has therefore been given the secondary identifier BS 6068-2.63. The various Sections of BS 6068 are comprised within Parts 1 to 7, which, together with Part 0, are listed below.

Part 0	<i>Introduction</i>
Part 1	<i>Glossary</i>
Part 2	<i>Physical, chemical and biochemical methods</i>
Part 3	<i>Radiological methods</i>
Part 4	<i>Microbiological methods</i>
Part 5	<i>Biological methods</i>
Part 6	<i>Sampling</i>
Part 7	<i>Precision and accuracy</i>

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

Further information

Users of this standard are informed that the UK submitted a vote of disapproval on the final voting stage of the draft EN for the following reasons.

- Although we are in general technical agreement with the basis of the draft, we are still submitting a negative vote as this standard contains two methods. We therefore consider that it should be published as two separate standards, i.e a 5 day one and a 7 day one. This would thereby avoid any possible confusion when quoting the standard or reporting the results of analysis.
- We also strongly recommend deletion of the reference to ISO 5815:1989 in the title as it serves no purpose and could be misleading. The ISO standard is for 5 days only and it is thus wrong to claim in the Foreword that it has been approved with common modifications with no reference to the major change in test conditions.

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 by using the 'Find' facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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, page 1 to 12, an inside back cover and a back cover.

Amendments issued since publication

Amd. No.	Date	Text affected

This British Standard, having been prepared under the direction of the Health and Environment Sector Committee was published under the authority of the Standards Committee and comes into effect on 15 November 1998

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Descriptors: water tests, water, chemical analysis, determination of content, biochemical oxygen demand, dilution

English version

Water quality — Determination of biochemical oxygen demand
after n days (BOD_n) —
Part 1: Dilution and seeding method with allylthiourea addition
(ISO 5815:1989, modified)

Qualité de l'eau — Détermination de la demande
biochimique en oxygène après n jours (DOB_n) —
Partie 1: Méthode par dilution et ensemencement
avec apport d'allyl thio-urée
(ISO 5815:1989, modifiée)

Wasserbeschaffenheit — Bestimmung des
Biochemischen Sauerstoffbedarfs nach n Tagen
(BSB_n) —
Teil 1: Verdünnungs- und Impfverfahren nach
Zugabe von Allylthioharnstoff
(ISO 5815:1989, modifiziert)

This European Standard was approved by CEN on 13 February 1998.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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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 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 1998, and conflicting national standards shall be withdrawn at the latest by September 1998.

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.

This European Standard consists of the following parts:

EN 1899-1, *Water quality — Determination of biochemical oxygen demand after n days (BOD_n) — Part 1: Dilution and seeding method with allylthiourea addition.*

EN 1899-2, *Water quality — Determination of biochemical oxygen demand after n days (BOD_n) — Part 2: Method for undiluted samples.*

Annex A, which is normative, concerns alternative incubation periods.

Annex B, which is informative, concerns multitesting, which may be used to obtain enhanced precision, or if the presence of substances toxic to microorganisms is suspected.

Endorsement notice

The text of the International Standard ISO 5815:1989 was approved by CEN as a European Standard with agreed common modifications as given below:

- change in setup (splitting into two parts)
- addition of annexes.

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Introduction

This European Standard EN 1899-1 is a modified version of ISO 5815:1989, *Water quality — Determination of biochemical oxygen demand after 5 days (BOD₅) — Dilution and seeding method*.

The times of incubation specified in the proposal are 5 days - as in ISO 5815 and as has been applied in many European countries - or 7 days as has been applied in several Nordic countries through the past many years. The 7 day incubation will typically give higher BOD results than 5 days incubation time.

With an incubation time of 5 days, weekend work can only be avoided if samples are collected Wednesdays, Thursdays to Fridays. With an incubation time of 7 days, samples collected on the first five weekdays can be analysed without implying weekend work. For this reason a 7 day incubation can be considered more convenient than the conventional 5 day incubation.

A new, modified 7 day incubation is described in a normative annex. The first investigations indicate that BOD results obtained by this modified method are identical to results obtained by the 5 day method described in the proposed standard. It is hoped that more comparative data on these two incubation methods will be obtained during the coming years, so that the modified 7 day incubation method can be included fully at the time of review and revision of this standard.

1 Scope

This European Standard specifies a determination of the biochemical oxygen demand of waters by dilution and seeding with suppression of nitrification.

This standard is applicable to all waters having biochemical oxygen demands greater than or equal to the limit of determination 3 mg/l of oxygen and not exceeding 6 000 mg/l of oxygen. For biochemical oxygen demands greater than 6 000 mg of oxygen/l, the method is still applicable, but the errors caused by the necessary dilutions can influence the analytical quality of the test method and the results are to be interpreted with circumspection. In this standard the limit of detection, D_L , is defined as

$$D_L = t_{0,95(f)} \cdot 2 \cdot s_B \cdot \sqrt{1 + \frac{1}{n}} \quad (1)$$

where s_B is the within series standard deviation, $t_{0,95(f)}$ is the student t -value, with f is the degrees of freedom for the determination of s_B and n is the number of analysis for determination of the blank in an analytical series. s_B is calculated from determinations of real samples with a BOD content near the estimated D_L .

In cases where the analytical method does not require any blank correction the term

$$\sqrt{1 + \frac{1}{n}} \quad (2)$$

is omitted.

The results obtained are the product of a combination of biochemical and chemical reactions. They do not have the rigorous and unambiguous character of those resulting from, for example, a single, well-defined, chemical process. Nevertheless, they provide an indication from which the quality of waters can be estimated.

The test can be influenced by the presence of various substances. Those which are toxic to microorganisms, for example bactericides, toxic metals or free chlorine, will inhibit biochemical oxidation. The presence of algae or nitrifying microorganisms can produce artificially high results.

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

Annex A describes alternative incubation periods.

Annex B describes multitesting, which can be used to obtain enhanced precision or to demonstrate the presence of substances toxic to microorganisms.

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 amendments 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 ISO 3696, *Water for analytical laboratory use — Specification and test methods* (ISO 3696:1987).

EN 25813, *Water quality — Determination of dissolved oxygen — Iodometric method* (ISO 5813:1983).

EN 25814, *Water quality — Determination of dissolved oxygen — Electrochemical probe method* (ISO 5814:1990).

EN ISO 8467, *Water quality — Determination of permanganate index* (ISO 8467:1993).

ISO 6060:1989, *Water quality — Determination of chemical oxygen demand*.

ISO 6107-2:1997, *Water quality — Vocabulary — Part 2*.

ISO 7393-1:1985, *Water quality — Determination of free chlorine and total chlorine — Part 1: Titrimetric method using N,N-diethyl-1,4-phenylenediamine*.

ISO 7393-2:1985, *Water quality — Determination of free chlorine and total chlorine — Part 2: Colorimetric method using N,N-diethyl-1,4-phenylenediamine, for routine control purposes*.

ISO 8245:1987, *Water quality — Guidelines for the determination of total organic carbon (TOC)*.