

English Version

## Characterization of waste - Determination of total dissolved solids (TDS) in water and eluates

Caractérisation des déchets - Détermination de la concentration en matières solides dissoutes totales (TDS) de l'eau et des éluats

Charakterisierung von Abfällen - Bestimmung des Gesamtgehaltes an gelösten Feststoffen (TDS) in Wasser und Eluaten

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## Foreword

This document (EN 15216:2007) has been prepared by Technical Committee CEN/TC 292 “Characterization of waste”, the secretariat of which is held by NEN, in cooperation with CEN/TC 230.

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of an identical text or by endorsement, at the latest by April 2008, and conflicting national standards shall be withdrawn at the latest by April 2008.

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.

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Introduction

Total dissolved solids are a common sum parameter which is in use in water analysis and in analysis of eluates. TC 292 and TC 230 cooperated on this item to create one horizontal standard which is of most practical use for laboratories.

## 1 Scope

This European standard specifies a method for the determination of total dissolved solids (TDS) in water and eluates, provided they are not volatile under the conditions specified or that they do not release water molecules from hydration. It applies to water and eluates containing more than 200 mg/l of total dissolved solids. Samples with lower amounts of dissolved solids can be analyzed by repetition of the drying step.

## 2 Terms and definitions

For the purposes of this document, the following term and definition applies.

### 2.1

#### total dissolved solids

#### TDS

$\rho_{\text{TDS}}$

mass of dissolved constituents per unit volume of water remaining after a specified filtering and drying process

NOTE TDS is expressed in milligrams per litre.

## 3 Principle

The test sample is filtered and then dried in a dish to a constant mass in an oven at  $(105 \pm 3) ^\circ\text{C}$ .

## 4 Sample storage and preparation

During storage, the laboratory sample may be subject to changes which are liable to influence the analysis result. If storage is necessary, samples shall be kept at  $(4 \pm 2) ^\circ\text{C}$ .

NOTE Freezing should be avoided due to risk of formation of precipitation.

It is recommended to carry out the test immediately after sampling of the water sample or preparation of the eluate.

## 5 Equipment

**5.1** Drying system thermostatically controlled and capable of maintaining a temperature of  $(105 \pm 3) ^\circ\text{C}$ ; e.g. drying oven, infrared system.

**5.2** Desiccator with an active drying agent such as silica gel.

**5.3** Analytical balance with an accuracy of 1 mg or better.

**5.4** Membrane filter (porosity of  $0,45 \mu\text{m}$ ).

**5.5** Filtration apparatus.

**5.6** Evaporation dish or crucible. Temperature tolerant laboratory vessel withstanding  $105 ^\circ\text{C}$ . Suitable materials are glass, ceramic, porcelain, aluminium and other materials inert to the test portion.

6 Procedure

Filter the test sample through the membrane filter as specified in 5.4 unless it has been membrane filtered before (e. g. eluates prepared according to EN 12457).

Dry the dish, for example in the oven, at  $(105 \pm 3) \text{ }^{\circ}\text{C}$  and weigh to the nearest 1 mg (to obtain  $m_a$ ) after cooling to ambient temperature in the desiccator.

Homogenise and transfer a proper aliquot ( $V_{\text{FB}}$ ) if necessary in stages, into the dish to ensure that not less than 20 mg and not more than 1 000 mg of dry mass,  $m_{\text{D}}$ , remains after evaporation to dryness.

Evaporate the sample to dryness by a drying system according to 5.1 and weigh to the nearest 1 mg (to obtain  $m_b$ ) after cooling to ambient temperature in the desiccator.

The mass of the dry matter,  $m_{\text{D}}$ , shall be considered constant if, after drying for a further half-hour period, the mass obtained does not differ by more than 0,5 % of the previous value or 2 mg whichever is the greater. Otherwise, drying shall be repeated until constant mass has been reached.

NOTE If a constant value is not obtained even after drying for a third time, record the value determined last and note this in the test report.

7 Calculation of results

Calculate the total dissolved solids from equation (1):

$$\rho_{\text{TDS}} = \frac{m_{\text{D}}}{V_{\text{FB}}}$$

(1)

with  $m_{\text{D}} = m_{\text{b}} - m_{\text{a}}$

where

- $\rho_{\text{TDS}}$  is the concentration of total dissolved solids, in mg/l;
- $m_{\text{D}}$  is the mass of the dry matter, in mg;
- $m_{\text{a}}$  is the mass of the empty dish, in mg;
- $m_{\text{b}}$  is the mass of the dish containing the dry matter, in mg;
- $V_{\text{FB}}$  is the volume of the filtered test sample taken, in l.

Values shall be rounded to the nearest 1 mg/l.

8 Quality control

Where uncertainty exists about the homogeneity or behaviour of the sample, it is recommended that the analysis is carried out in duplicate.

9 Performance characteristics

The method performance characteristics given in Table 1 have been established in a European intercomparison study on two surface water samples, two waste water samples and two eluates, carried out in 2006.

Table 1 — Performance characteristics for the determination of total dissolved solids in water and eluates

Material	<i>p</i>	<i>N</i>	<b>O</b> %	Mean mg/l	<i>S<sub>r</sub></i> %	<i>S<sub>R</sub></i> %
Surface water A	17	34	0	478	2,15	4,49
Surface water B	17	34	0	3810	0,39	2,53
Waste water A	17	34	0	27300	1,34	4,33
Waste water B	17	34	0	4840	1,28	5,55
Eluate A	17	34	0	4090	1,74	6,27
Eluate B	17	34	0	3440	0,71	3,16
<i>p</i> is number of participating laboratories <i>N</i> is the number of outlier-free individual analytical results <b>O</b> is the percentage of outliers <i>S<sub>r</sub></i> is the estimate of the relative repeatability standard deviation <i>S<sub>R</sub></i> is the estimate of the relative reproducibility standard deviation						

10 Test report

The test report shall contain at least the following details:

- a) reference to this European standard;
- b) all data which are necessary to identify the sample;
- c) calculated concentration of total dissolved solids;
- d) details of all procedural steps which deviate from this standard together with all circumstances that may have influenced the results;
- e) type of drying procedure.

**Annex A**  
(informative)

**Summary of general requirements and recommendations**

Purpose of this summary is to support the organization of sampling and sample pre-treatment processes. The information given should be helpful to prepare a sampling plan.

Requirements not mentioned in the normative part of this document are considered as recommendations.

**Table A.1**

Matrix restrictions	Water and eluates.
Typical working range	Above 100 mg/l; lower values possible by repetition.
Sampling instruments	Any instrument that does not release soluble solids.
Bottle pre-treatment	Clean and dry.
Bottle material	Any bottle that does not release soluble solids.
Transport conditions	Dark and cool.
Preservation	Cooling at about 4 °C.
Storage conditions	At 4 °C in the dark not longer than 1 week; longer storage not recommended.
Required amount	Depends on expected results. For 1 000 mg/l TDS about 250 ml of sample are sufficient.
Test portion	Typically 100 ml.

## Bibliography

- [1] EN 12457 (all parts), Characterization of waste — Leaching — Compliance test for leaching of granular waste materials and sludges