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Vattenundersökningar – Bestämning av turbiditet – Del 1: Kvantitativa metoder (ISO 7027-1:2016)

Water quality – Determination of turbidity – Part 1: Quantitative methods (ISO 7027-1:2016)

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Europastandarden EN ISO 7027-1:2016 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 7027-1:2016.

Denna standard ersätter SS-EN ISO 7027, utgåva 1.

The European Standard EN ISO 7027-1:2016 has the status of a Swedish Standard. This document contains the official English version of EN ISO 7027-1:2016.

This standard supersedes the Swedish Standard SS-EN ISO 7027, edition 1.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Kemiska vattenundersökningar, SIS/TK 424.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 7027-1

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ICS 13.060.60

Supersedes EN ISO 7027:1999

English Version

Water quality - Determination of turbidity - Part 1: Quantitative methods (ISO 7027-1:2016)

Qualité de l'eau - Détermination de la turbidité - Partie 1: Méthodes quantitatives (ISO 7027-1:2016)

Wasserbeschaffenheit - Bestimmung der Trübung - Teil 1: Quantitative Verfahren (ISO 7027-1:2016)

This European Standard was approved by CEN on 15 April 2016.

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European foreword

This document (EN ISO 7027-1:2016) 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 December 2016, and conflicting national standards shall be withdrawn at the latest by December 2016.

This document supersedes EN ISO 7027:1999.

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Endorsement notice

The text of ISO 7027-1:2016 has been approved by CEN as EN ISO 7027-1:2016 without any modification.

Introduction

Measurements of turbidity can be affected by the presence of dissolved light-absorbing substances (substances imparting colour). Such effects can be minimized, however, by performing measurements at wavelengths greater than 800 nm. Only carbon black and a blue colour, which can be found in certain polluted waters, slightly affects measurements of turbidity in this region of the spectrum. Air bubbles can also interfere with measurements, but such interference can be minimized by careful handling of the samples.

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

Water quality — Determination of turbidity —

Part 1: Quantitative methods

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This International Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is absolutely essential that tests conducted in accordance with this International Standard be carried out by suitably qualified staff.

1 Scope

This part of ISO 7027 specifies two quantitative methods using optical turbidimeters or nephelometers for the determination of turbidity of water:

a) nephelometry, procedure for measurement of diffuse radiation, applicable to water of low turbidity (for example drinking water);

b) turbidimetry, procedure for measurement of the attenuation of a radiant flux, more applicable to highly turbid waters (for example waste waters or other cloudy waters).

Turbidities measured according to the first method are presented as nephelometric turbidity units (NTU). The results typically range between <0,05 NTU and 400 NTU. Depending on the instrument design, it can also be applicable to waters of higher turbidity. There is numerical equivalence of the units NTU and formazin nephelometric unit (FNU).

Turbidity measured by the second method is expressed in formazin attenuation units (FAU), results typically range between 40 FAU and 4 000 FAU.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CIE Publication No. 17, *International Lighting Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CIE Publication No. 17 and the following apply.

3.1
turbidity
reduction of transparency of a liquid caused by the presence of undissolved matter

4 Sampling and samples

Maintain all containers that come into contact with the sample in a scrupulously clean condition. Wash with hydrochloric acid or surfactant cleaning solution.

Collect samples in glass or plastics bottles and carry out the determinations, as soon as possible after collection. If storage is unavoidable, store the samples in a cool, dark room but for not longer than 24 h. If the samples have been stored under cool conditions, allow them to come to room temperature before measurement. Prevent contact between the sample and air and avoid unnecessary changes in the temperature of the sample.

5 Quantitative methods of turbidity measurement using optical nephelometers and turbidimeters

5.1 General principles

A water sample coloured by dissolved substances is a homogeneous system that only attenuates radiation passing through the sample. A water sample containing undissolved substances attenuates the incident radiation and in addition the insoluble particles which are present diffuse the radiation unequally in all directions. The forward diffusion of radiation by the particles affects the attenuation so that the common spectral attenuation coefficient $\mu(\lambda)$ is the sum of the spectral diffusion coefficient $s(\lambda)$ and the spectral absorption coefficient $\alpha(\lambda)$:

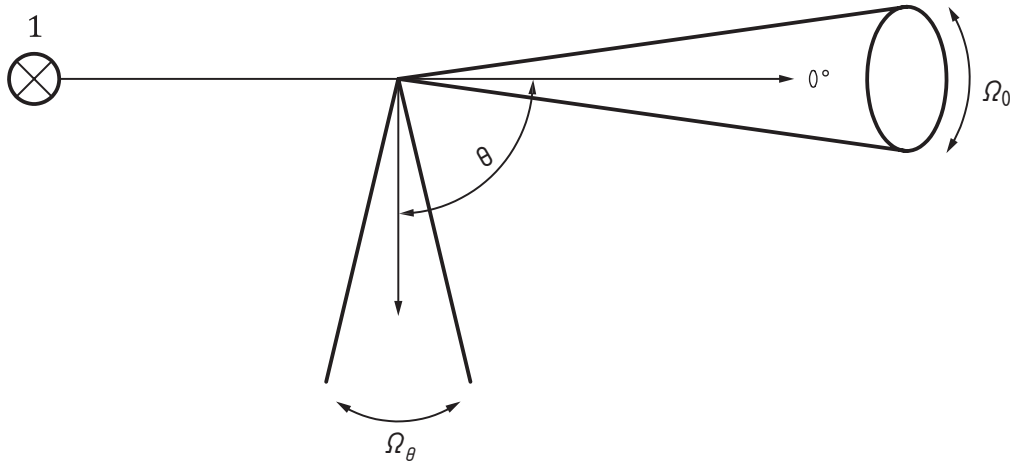
$$\mu(\lambda) = s(\lambda) + \alpha(\lambda) \tag{1}$$

To obtain the spectral diffusion coefficient $s(\lambda)$ alone, the spectral absorption coefficient $\alpha(\lambda)$ needs to be known. In order to determine the spectral absorption coefficient of the dissolved substance, the undissolved substances can, in some cases, be removed by filtration, but this may cause interferences. Therefore, it is necessary to report the results of the determination of turbidity in comparison to a calibration standard.

The intensity of the diffuse radiation depends upon the wavelength of the incident radiation, the measurement angle, and the shape, optical characteristics and particle size distribution of the particles suspended in the water.

In measurements of the attenuation of transmitted radiation, the measured value depends upon the aperture angle Ω_0 of the radiant efficiency arriving at the receiver.

When measuring the diffuse radiation, the measured values depend upon the angle θ and the aperture angle Ω_θ. The angle θ is that enclosed by the direction of the incident radiation and the direction of the measured diffuse radiation (see Figure 1).



Key

1 light source

Figure 1

Application of the measurement of the concentration of undissolved substances would be possible only if the parameters identified above were known. In general, this information is not available, so the mass concentration of the suspended particles cannot be calculated from the value of turbidity.

NOTE 1 Instrument-to-instrument comparisons are possible only if apparatus is used in accordance with this part of ISO 7027 and the same measuring principle is applied.

NOTE 2 The Jackson candle turbidimeter was originally the standard instrument for turbidity measurements. In general, Jackson turbidity units (JTU) cannot be related to other turbidity units.

5.2 Reagents

Use only reagents of recognized analytical grade. Reagents prepared in accordance with this part of ISO 7027 can be stored in hard glass, high-density polyethylene (HDPE) or low-density polyethylene (LDPE) bottles respectively.

5.2.1 **Water**, for the preparation of the formazin stock and reference suspensions.

Soak a membrane filter of pore size 0,45 µm for 1 h in 100 ml of distilled water. Filter 250 ml of distilled water through it and discard the water. Then pass a two-litre volume of distilled water twice through the membrane and reserve this water for the preparation of the formazin suspensions. Other particle free waters like reverse osmosis water can be used instead.

5.2.2 **Formazin $(C_2H_4N_2)_x$, stock suspension I (4 000 FNU)**.

Suspensions with 4 000 FNU (NTU) are commercially available. Their use is recommended. They are available from numerous sources. Possible health hazards arising from the toxicity and carcinogenicity of hydrazine sulfate used for preparing the standard on the bench can be avoided.

From some manufacturers, specific stabilized formazin suspensions are available.[1)]

These commercially available suspensions may be stable for up to one year if stored under cool temperatures and in the dark. The manufacturer's recommendations regarding preparation, usage, and storage have to be considered in this respect.

1) e.g. the StablCal™ Turbidity Standards series, available from HACH www.hach.com or T-CAL™, available from Tintometer GmbH. This information is given for the convenience of users of this part of ISO 7027 and does not constitute an endorsement by ISO of these products.