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Kakovost vode - Določanje praga/indeksa vonja in praga/indeksa okusa

Water quality - Determination of the threshold odour number (TON) and threshold flavour number (TFN)

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Water quality - Determination of the threshold odour number (TON) and threshold flavour number (TFN)

Qualité de l'eau - Détermination du seuil d'odeur (TON) et du seuil de flaveur (TFN)

Wasserbeschaffenheit - Bestimmung des Geruchsschwellenwerts (TON) und des Geschmacksschwellenwerts (TFN)

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Foreword

This document (prEN 1622) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1622:1997.

Introduction

This European Standard gives quantitative methods for the determination of the threshold odour number (TON) and the threshold flavour number (TFN). The main methodology (unforced choice) widely used in Europe is described in the standard.

Another methodology, used by a limited number of member state (forced choice) is described in Annex B.

A simplified qualitative method, is also described in Annex C.

The methods specified in this European Standard are based on the standard methods for sensory analysis. However, some differences are noted, as compared with those methods, due to water specificity.

This European Standard is primarily intended to give a quantitative measure of odour and flavour of a water sample at a temperature of 25 °C.

NOTE The method can be used to determine the odour and flavour of a water sample at other temperatures but there will be no correlation between results obtained at different temperatures.

WARNING — Persons using this European Standard should be familiar with normal laboratory practice. This 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 according to this European Standard be carried out by suitably trained staff.

1 Scope

This European Standard specifies quantitative methods for determining the TON and TFN of waters and also a qualitative method for determining any abnormal odour and/or flavour. It is essential that the safety remarks in Clause 5 are taken into account.

Two quantitative methods are described:

— a short method applicable when either a sample has no odour and flavour or when the odour and flavour are to be compared with a specified threshold number;

— a full method applicable when the threshold number for the sample is to be determined.

For both quantitative methods, two different methodologies are described:

— unforced choice in the standard,

— forced choice in Annex B.

Both methods are applicable for quantifying the odour and flavour of drinking water and/or migration waters from materials in contact with waters.

NOTE The choice of the quantitative or qualitative method is depending on the national regulations, and on the type of water to be assessed (raw water, distribution water, migration water ….)

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 3591, *Sensory analysis — Apparatus — Wine-tasting glass*.

ISO 5492, *Sensory analysis — Vocabulary*.

ISO 8589, *Sensory Analysis — General guidance for the design of test rooms*.

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

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
odour
organoleptic attribute perceptible by the olfactory organ on sniffing certain volatile substances (see ISO 5492)

3.2
flavour
complex combination of the olfactory, gustatory and trigeminal sensations perceived during tasting. The flavour may be influenced by tactile, thermal, painful and/or kinaesthetic effects (see ISO 5492)

3.3
threshold odour number (TON)
dilution ratio beyond which the diluted sample does not have any perceptible odour

$$TON = \frac{A + B}{A} \quad (1)$$

where

A is the volume of sample;

B is the volume of reference water.

3.4
threshold flavour number (TFN)
dilution ratio beyond which the diluted sample does not have any perceptible flavour

$$TFN = \frac{A + B}{A} \quad (2)$$

where

A is the volume of sample;

B is the volume of reference water.

3.5
reference water
the water described as without any perceptible odour and flavour by individual selected assessor

3.6
test panel
a group of selected assessors used to evaluate flavour and odour

NOTE For guidance on the selection of the test panel, see Annexes E or G.

3.7
selected assessor
assessor chosen for his/her ability to perform a sensory test (see ISO 5492)

3.8
sample
water intended for odour and flavour assessment

3.9
triangle test
three test samples, two of which are reference water, and the third the sample or a dilution of it

3.10
paired test
two test samples, one is the sample or a dilution of it, and the other is reference water

3.11
forced choice
even if the selected assessor is unable to perceive a difference between the two or three samples, the selected assessor shall chose one sample as having the greater flavour or odour and record his/her choice

3.12
unforced choice
the selected assessor shall record if he/she notes or does not note a difference between the two or three samples

4 Principle

The odour and flavour of a water sample are quantitatively assessed by a test panel by comparing that sample and/or dilutions of that sample with a reference water.

The odour and flavour of a water sample may also be assessed qualitatively by only one selected assessor or a test panel to detect any abnormal odour and/or flavour.

5 Hazards

Care shall be taken to ensure that the samples are safe for selected assessors. If there is any suspicion of the presence of harmful microorganisms or of toxic substances at a toxic concentration, the samples shall not be tested without further precautions being taken.

Depending on the type of sample being tested, the selected assessors shall be instructed not to swallow any test sample.

6 Test environment

The room used for odour and flavour assessment has to be free from obtrusive draughts and noise and the general environment such that the selected assessors shall perform their task without being influenced by other selected assessors.

No air fresheners or room deodorisers shall be used in the room. The room shall be sited away from any activity that could generate interfering odours. The temperature of the room shall be maintained with a system for the regulation of temperature at (23 ± 2) °C. It is advisable that this room is only used for odour and flavour assessment. Suggestions on the design of suitable facilities are given in ISO 8589.

7 Apparatus and reagents

7.1 Glassware, reserved solely for TON and TFN assessment.

Glassware shall be cleaned separately from other laboratory items and, when not in use, shall be stored in clean conditions in order to avoid accidental contamination.

Sample bottles, tasting glasses and volumetric glassware shall be cleaned before use so that they have no perceptible influence on the result of the assessment.

Tasting glasses can be as specified by ISO 3591.

NOTE Sample bottles should be of glass and of a suitable capacity. Stoppers should be of glass or polytetrafluoroethene (PTFE) and capable of yielding no headspace in the sample.

7.2 Water bath or incubator, capable of maintaining an homogeneous temperature of (23 ± 2) °C.

7.3 Reference water

Odour and flavour free water used for rinsing, dilution and reference, preferably appropriate to the area and where possible similar in mineral character to the type of water being tested.

NOTE Reference water can be tap water, mineral bottled water, or prepared according to Annex D.

7.4 Cleaning liquids; use one of the following cleaning liquids for glassware.

7.4.1 Non-perfumed biodegradable laboratory detergent

7.4.2 Hydrochloric acid, $c(HCl) \approx 2$ mol/l.

7.4.3 Hydrogen peroxide, $w(H_2O_2)$, approximately 3 %.

NOTE Other cleaning liquids such as acetic acid can be used before the rinsing procedure of the glassware, provided they yield glassware free from interfering taste and odour.

8 Sampling and sample preservation

Collect the samples (with no headspace) in the clean, well stoppered sample bottles (7.1). Keep the samples cool and in the absence of light during transportation and storage. If storage is necessary, store in a refrigerator at (4 ± 2) °C. Storage time shall be as short as possible, in no case longer than 72 h, and be specified with the result.

9 Test panel and selected assessors

A test panel shall consist of at least three selected assessors (3.7) for unforced choice (see Clause 10 and eight selected assessors (3.7) for forced choice (see Annex B).

For the simplified qualitative method (see Annex C), only one selected assessor may perform the assessment.

NOTE 1 When a new test panel is started, the selected assessors will be untrained but will undergo training with flavours and odours to increase their precision. It is accepted that after a period of training and experience, the test panel will become both more selective and more precise than the general population.

NOTE 2 Guidance on training the selected assessor is given in Annex E.

New selected assessors shall be introduced to the odour and flavour test method by an experienced selected assessor or consultant. Selected assessors shall have gained experience in the method before being integrated into regular test panel sessions.

Selected assessors shall be willing to serve, and shall be disqualified if they suffer from allergy or of unusual sensitivity. It is desirable that the sensitivities in a test panel to odour and flavour do not differ widely.

The performance of individual selected assessors and test panels shall be monitored. This shall be done by interlaboratory tests depending on the laboratory objectives..

NOTE 3 If the laboratory has to determine TON/TFN for approving drinking water materials, the need for interlaboratory test seems obvious. Intralaboratory exercises on a regular basis may also be carried out with the use of a common spiking tasty or odorous solution. This can be done as a part of interlaboratory quality control of the panellists.

This need is not obvious if the laboratory is only checking for the presence/absence of abnormal taste or odour.

The precision of the result is dependant on the test panel size.

See Annexes E and G for information.

10 Procedure for unforced choice

10.1 General

The principle of the method is to quantify the odour and flavour of a sample by the use of a test panel, comparing sample or dilution of it with the reference water. A coordinator organises the activities of the test panel.

Before testing, samples of chlorinated water shall be dechlorinated according to the procedure described in Annex A.

10.2 Type of test

10.2.1 The triangle test

Three samples (3.8) two of which are reference water (7.3) and the third the sample or a dilution of it are presented simultaneously to the selected assessors. The selected assessors shall select the sample perceived as different.

10.2.2 The paired test

Two samples (3.8) one of which is reference water (7.3) and the second the sample or a dilution of it are presented simultaneously to the selected assessors. The selected assessors shall select the sample perceived to have the greater odour and flavour.

10.3 Type of method

10.3.1 Short method

10.3.1.1 Applicability

This short method is applicable when either a sample has no odour and flavour or for compliance of odour and flavour with a specified level. Only one dilution is prepared.

10.3.1.2 Test procedure

Prepare a dilution of the water to be evaluated using reference water (7.3), according to the threshold of interest. Adjust the temperature of this dilution and one reference water (for paired test) or two reference waters (for triangle test) at (23 ± 2) °C by placing them in a temperature controlled device (7.2).

Alternatively, in order to avoid unnecessary quantity of glassware, only one large flask per sample can be used for all the selected assessors, instead of a set of flasks and glasses per selected assessor, sample dilution and reference water.

An appropriate volume shall be prepared in order that all the selected assessors could have a sufficient volume for the assessment of odour and flavour.

NOTE Instead of the preliminary preparation of the dilutions in flasks, intended for comparison with reference water, another equivalent procedure can be applied. The selected assessor(s) can prepare in a measuring cylinder the successive appropriate dilutions just before the odour and flavour assessment. The sample or dilution of it should be compared directly with the reference water.