
Vpliv organskih materialov na pitno vodo - Ugotavljanje vonja in okusa vode v vodovodnih instalacijah - 1. del: Preskusne metode

Influence of organic materials on water intended for human consumption - Determination of odour and flavour assessment of water in piping systems - Part 1: Test method

Einfluß von Werkstoffen auf Wasser für den menschlichen Gebrauch - Bestimmung des Geruchs und Geshmacks des Wassers in Rohrleitungssystemen Teil 1: Prüfverfahren

Influence des matériaux organiques sur l'eau destinée a la consommation humaine - Détermination de l'odeur et de la flaveur de l'eau dans les réseaux de conduites - Partie 1: Méthode d'essai

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Ta slovenski standard je istoveten z: EN 1420-1:1999

ICS:

13.060.20	Pitna voda	Drinking water
91.140.60	Sistemi za oskrbo z vodo	Water supply systems

SIST EN 1420-1:2000**en**

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EUROPEAN STANDARD

EN 1420-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 1999

ICS 13.060.20

English version

Influence of organic materials on water intended for human consumption - Determination of odour and flavour assessment of water in piping systems - Part 1: Test method

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This European Standard was approved by CEN on 1 August 1999.

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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 164 "Water supply", the secretariat of which is held by AFNOR.

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 February 2000, and conflicting national standards shall be withdrawn at the latest by August 2002.

This European Standard consists of two parts :

- Part 1 : Test method
- Part 2 : Interpretation of laboratory values relative to field-use conditions

This standard is part 1. It contains the following two annexes :

- annex A, which is informative, describes an arrangement for flushing large diameter pipes ;
- annex B, which is informative, is a schematic presentation of the test method.

The material-dependent parameters and/or performance requirements are incorporated into the Product Standards, for example the System Standards for plastics piping systems.

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

In respect of potential adverse effects on the quality of the water intended for human consumption caused by the materials, it is recalled to mind that, while awaiting the adoption of verifiable European acceptance criteria, national regulations remain in force

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1 Scope

This standard specifies a test method for determining the odour and flavour of test waters after their contact with the organic materials used in piping systems, where the term products comprises pipes, fittings and ancillaries including their coatings and joints.

The test method described in this standard is applicable to products to be used under various conditions for the transport of water intended for human consumption and raw water used for the manufacture of water intended for human consumption. Coatings or protective layers on products which are not intended to be in contact with these types of water are not covered by this method.

This standard specifies the test method comprising a set of procedures with and without a disinfection pretreatment and possible temperatures for the test waters. The use of the disinfection pretreatment and the choice of the test temperature are dependent on the relevant national regulations and/or the system or product standards.

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.

ISO 5492, *Sensory analysis – Vocabulary*.

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*.

EN 1622:1997, *Water analysis - Method for the determination of threshold odour number (TON) and threshold flavour number (TFN)*.

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3 Terms and Definitions

For the purposes of this standard the following definitions apply.

3.1

odour

organoleptic attribute perceptible by olfactory organ on sniffing certain volatile substances (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 (ISO 5492)

NOTE The term taste should not be used to designate the combination of gustatory, olfactory and trigeminal sensations which are designated by the term flavour. If, in informal language, this term is used in this sense, it should always be associated with a qualifying term, e.g. musty taste, raspberry taste, corky taste.

3.3

threshold odour number (TON)

dilution ratio of the migration water with the reference water at the same temperature, beyond which this diluted sample does not have any perceptible odour

3.4

threshold flavour number (TFN)

dilution ratio of the migration water with the reference water at the same temperature, beyond which this sample does not have any perceptible flavour

3.5**reference water**

water described as without any perceptible odour and flavour

3.6**test water**

water used for testing purposes prepared as described in 6.3.2 and 6.3.3

3.7**migration water**

test water which has been in contact with a test piece under specified conditions

3.8**blank water**

test water which has been kept at the same specified conditions as migration water but without contact with the test piece

3.9**prewashing water**

tapwater without any odour and flavour and a chlorine content less than 0,05 mg/l as Cl₂

3.10**disinfection treatment water**

water containing chlorine prepared as described in 6.3.4

3.11**testing panel**

group of people meeting the relevant requirements of EN 1622:1997

3.12**fitting, ancillary**

complete functional unit made up of one or more components and materials, parts of which are in contact with drinking water, e.g. taps, valves, water filters

3.13**product**

a manufactured item, in its finished form

3.14**sample**

one or more units, or a specified quantity, drawn from a batch or lot, selected at random for inspection, e.g. in a laboratory

3.15**specimen**

a single sample of a product, to be prepared for testing

3.16**test piece**

the specimen or portion which is conditioned, treated or otherwise prepared to be tested to obtain a single test result

4 Principle

Following a defined pretreatment procedure of flushing, stagnation with or without disinfection and then prewashing, the surface of the test pieces, exposed in practice to drinking water, is brought into contact with test waters.

The migration procedure is carried out three times on the same test piece under specified conditions as follows :

Test pieces are put in contact with chlorinated and unchlorinated waters for 72 h at 23 °C, or put in contact with unchlorinated water for 24 h at a specified temperature in the range 60 to 85°C.

After this contact the migration water is assessed by a test panel to determine the TON and TFN.

Additional information is given in the relevant product standard, system standard or in national regulation concerning :

- the temperature to be used in the test ;
- the need for a disinfection pretreatment ;
- the need to carry out a 23°C test, using chlorinated water, for products being tested at elevated temperatures.

5 Test environment

The test environment shall conform to the requirements given in EN 1622:1997.

6 Reagents

6.1 Sodium thiosulfate solution

Sodium thiosulfate solution, comprising a solution of 3,5 g per litre of sodium thiosulfate pentahydrate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) analytical grade, stored in the absence of light at a temperature below 10°C, for a maximum of 4 months.

6.2 Sodium hypochlorite solution

Sodium hypochlorite solution, prepared from a commercial solution of sodium hypochlorite (NaOCl) and having a known concentration of about 0,1 % by mass of free chlorine determined in accordance with ISO 7393-2.

This sodium hypochlorite solution is unstable and shall be prepared on the day of use.

6.3 Waters to be used for testing

6.3.1 Reference water shall be without any perceptible odour and flavour, and conforms to EN 1622:1997.

When a reference water is chlorinated to 1,0 mg/l free chlorine and then dechlorinated after 72 h (see 12.1) with sodium thiosulfate, it shall have no perceptible odour and flavour.

6.3.2 Test water without chlorine content, shall consist of a batch of reference water (see 6.3.1) used for contact with test pieces and preparation of the blank water.

6.3.3 Test water with chlorine content, shall consist of reference water (see 6.3.1) with a free chlorine content of $(1 \pm 0,2)$ mg/l as Cl_2 after addition of sodium hypochlorite solution (see 6.2).

6.3.4 Disinfection treatment water, shall consist of reference water (see 6.3.1) with a free chlorine content of (50 ± 5) mg/l as Cl_2 after addition of sodium hypochlorite solution (see 6.2).

6.4 Cleaning liquids for glassware

Use one or more of the following cleaning liquids for glassware :

- non-perfumed biodegradable detergent ;
- hydrochloric acid, 2 mol/l (analytical grade) ;

— hydrogen peroxide, 3 % vol/vol (analytical grade).

7 Apparatus

7.1 Apparatus for migration test procedure

The following equipment shall be used.

7.1.1 Vessels, containers, connectors and stoppers, made of materials which do not affect the odour and flavour assessment under the specified test conditions, such as glass, polytetrafluorethylene (PTFE) or stainless steel.

NOTE The material PTFE should only be used when there is a small contact area with the test water. Thus PTFE is unsuitable for containers.

7.1.2 Equipment, capable of maintaining the test temperature within $\pm 2^\circ\text{C}$, for the duration of the test.

7.2 Apparatus for odour and flavour assessment

The following equipment shall be used.

7.2.1 Erlenmeyer and volumetric flasks, beakers, measuring cylinders, immersion tanks, volumetric pipettes, funnels and stoppers made of glass, PTFE or stainless steel.

NOTE The material PTFE should only be used when there is a small contact area with the test water. Thus PTFE is unsuitable for containers.

7.2.2 Testing vessels, comprising the following glassware (which shall be reserved for odour and flavour assessment only and cleaned separately from other items): testing bottles for odour assessment and testing glasses for flavour assessment conforming to the requirements given in EN 1622:1997.

7.2.3 Waterbath or incubator, conforming to the requirements given in EN 1622:1997.

8 Samples of product and test pieces

8.1 General

8.1.1 Sampling of products shall be performed in accordance with the relevant product standard, system standard or the national regulations when applicable.

8.1.2 If it is necessary to store samples before testing, they shall be protected from contamination. If the manufacturer provides written storage instructions they shall be followed. The samples shall be stored in their original form as delivered. Where appropriate, storage containers shall be cleaned using the same procedures as are used for the test containers.

8.1.3 The test pieces shall be prepared such that only the surface intended to come into contact with drinking water is exposed to the test waters (see 6.3.2 and 6.3.3). When the product has the same material composition for the outside and inside surfaces, the test pieces may be immersed in test water.

Use the appropriate S/V ratios according to 8.2.2 and 8.2.3.1.

NOTE It may be necessary to seal the cut edges of test pieces.

8.1.4 If the preparation procedure for a test piece for a particular type of product has not been covered in this standard, deviation from this procedure is allowable under the following conditions :

- a) the finished product and the test piece shall be produced in the same manner ;
- b) the preparation of test pieces before testing shall include the procedures which are performed in practice before the system is put into operation, e.g. curing and cleaning procedures.

8.1.5 Ensure that the surface of the test pieces intended to come into contact with test water shall be free from adhesive tape, labels, ink or pencil marks. Care shall be taken that the transport conditions shall not influence the test results.

8.1.6 The minimum age of the test pieces shall conform to the relevant product standard, system standard or, if not given in such a standard, to that recommended by the manufacturer for the product to be ready for use.

8.2 Surface-area-to-volume ratio (S/V)

8.2.1 General

The surface area of the test pieces exposed to the test water shall relate to realistic conditions and are expressed in Table 1.

The surface-area-to-volume ratio, S/V, shall be expressed per decimeter, i.e. dm^{-1} (which is $\text{dm}^2 / \text{dm}^3$ or dm^2 / l), where :

- S is the surface area of the test piece in contact with the test water, in square decimeters ;
- V is the volume of test water in contact with the test piece, in litres.

8.2.2 Pipes

For each test, take from a pipe a specimen of sufficient length to give the internal volume (V) of the test water necessary. Some typical S/V ratios are given in Table 1.

When no difference in material composition and production process exists in the range of sizes produced, testing of the smallest size is sufficient.

Table 1 - Typical internal S/V ratios for pipes

Application group	Typical internal diameter mm	Typical S/V dm^{-1}
Pipes inside buildings (domestic pipes)	16	25
Service pipes	40	10
Distribution pipes	160	2,5
Trunk mains	400	1,0

8.2.3 Fittings, ancillaries and joints

8.2.3.1 For each test take one or more fittings, ancillaries or joints to give the internal volume of the test water sufficient to provide enough water for the odour and flavour assessment procedure. This volume of test water is V litres.

In the case when it is not possible to obtain enough water for the odour and flavour assessment, the procedures 8.1.3 and 8.2.3.2 shall be applied, taking into account the calculated surface area-to-volume S/V ratio.

The test pieces for the different types shall conform to Table 2, except that when no difference in the material composition and production process exists in the range of types of products testing of the largest S/V ratio is sufficient.