BS EN 1420:2016

BSI Standards Publication

Influence of organic materials on water intended for human consumption — Determination of odour and flavour assessment of water in piping systems

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 1420:2016. It supersedes BS EN 1420-1:1999 which is withdrawn.

Further information can be obtained for UK approvals from the Drinking Water Inspectorate and the Water Regulations Advisory Scheme.

The UK participation in its preparation was entrusted to Technical Committee EH/6, Effects of materials on water quality.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2016.
Published by BSI Standards Limited 2016

ISBN 978 0 580 86031 7

ICS 13.060.20; 67.250

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 February 2016.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1420

January 2016

ICS 13.060.20; 67.250

Supersedes EN 1420-1:1999

English Version

Influence of organic materials on water intended for human consumption - Determination of odour and flavour assessment of water in piping systems

Influence des matériaux organiques sur l'eau destinée à la consommation humaine - Détermination de l'odeur et de la flaveur de l'eau dans les réseaux de conduites

Einfluss von organischen Werkstoffen auf Wasser für den menschlichen Gebrauch - Bestimmung des Geruchs und Geschmacks des Wassers in Rohrleitungssystemen

This European Standard was approved by CEN on 27 November 2015.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2016 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Contents

Page

European foreword

This document (EN 1420:2016) 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 July 2016, and conflicting national standards shall be withdrawn at the latest by July 2016.

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.

This document supersedes EN 1420-1:1999.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

With regard to the former edition EN 1420-1:1999, the following changes were made:

— the test method for TON /TFN according to EN 1622 has been specified,

— a procedure for the panel qualification has been introduced,

— the preparation of the migration waters has been specified and is now in accordance with EN 12873-1,

— the scope of the standard has been extended: all organic products in contact with drinking water (including coatings and side applied products) can be tested according to this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

In respect of potential adverse effects on the quality of the water intended for human consumption, arising from contact with materials used for conveying and distribution, it is recalled to mind that, national regulations remain in force.

1 Scope

This European Standard specifies a procedure for obtaining a migration water to determine odour and flavour for products made from organic materials intended to come in contact with water for human consumption (drinking water) and used in piping systems. Such products include pipes, fittings, ancillaries and coatings.

This standard is applicable to products to be used under various conditions for the transport, storage and distribution of water intended for human consumption and raw water used for the manufacture of water intended for human consumption.

This standard specifies a test method comprising of a set of procedures. The use may be dependent on the relevant national regulations and/or the system or product standards.

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.

EN 1622:2006, *Water quality — Determination of the threshold odour number (TON) and threshold flavour number (TFN)*

EN 12873-1:2014, *Influence of materials on water intended for human consumption — Influence due to migration — Part 1: Test method for factory-made products made from or incorporating organic or glassy (porcelain/vitreous enamel) materials*

EN 12873-2, *Influence of materials on water intended for human consumption — Influence due to migration — Part 2: Test method for non-metallic and non-cementitious site-applied materials*

EN 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 (ISO 7393-2)*

3 Terms and definitions

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

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

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

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

[SOURCE: EN 1622:2006, 3.3]

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

[SOURCE: EN 1622:2006, 3.4]

3.5
test water
water without any perceptible odour and flavour used for testing purposes prepared as described in 5.1.1 and 5.1.2

3.6
migration water
test water which has been in contact with a test piece under specified conditions

3.7
blank water
test water which has been kept at the same specified conditions as migration water but without contact with the test piece

3.8
prewashing water
tapwater without any odour and flavour and a chlorine content less than 0,05 mg/l as Cl_2

3.9
testing panel
group of people meeting the relevant requirements of EN 1622

3.10
product
manufactured item, in its finished form

3.11
site-applied product
product where the final surface in contact with drinking water is prepared on site

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

EXAMPLES Taps, valves, water filters.

3.13
membranes
elastomer as used in pressure relief devices

3.14
sample
one or more units, or a specified quantity, drawn from a batch or lot, selected at random for inspection

3.15
test piece
sample or portion of sample that is conditioned, treated or otherwise prepared to be tested to obtain a single test result

3.16
panel coordinator
person responsible for the qualification of the members of the odour/flavour panel (panellists) and the check of the reliability of the determined TON-/TFN-results

4 Principle

Following a defined pretreatment procedure of flushing, stagnation with test water 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 under specified conditions as follows: test pieces are put in contact with chlorinated and where required unchlorinated test waters for 72 h at 23 °C (cold water test), or put in contact with unchlorinated test water for 24 h at a temperature of 60 °C (warm water test) or 85 °C (hot water test). If warm or hot water test is required, additionally a cold water test shall be performed.

NOTE The choice of the type of test water (chlorinated and/or chlorine-free), the temperature of the test water, the number of additional migration periods will be specified in product standards or national regulations.

After this contact the migration water is assessed by a test panel to determine the TON and TFN (see Clause 11).

Additional information concerning the temperature to be used in the test and the sequence of extraction periods is given in Clause 10.

5 Reagents

5.1 Waters to be used for testing.

5.1.1 Test water shall be without any perceptible odour and flavour, and conform to the reference water in EN 1622.

5.1.2 Chlorinated test water shall consist of test water (5.1.1) with a free chlorine content of (1 ± 0,2) mg/l as Cl_2 after addition of sodium hypochlorite solution (5.2). When chlorinated test water is dechlorinated after 72 h (see 11.1) with sodium thiosulfate (5.3) or ascorbic acid (5.4), it shall have no perceptible odour and flavour.

5.2 Sodium hypochlorite solution.

Sodium hypochlorite solution, prepared from a technical or general purpose reagent grade of sodium hypochlorite (NaOCl), using test water (5.1.1) and having a known concentration of about 0,1 % by mass of free chlorine determined in accordance with EN ISO 7393-2.

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

5.3 Sodium thiosulfate solution.

Sodium thiosulfate solution, comprising a solution of 3,5 g per litre of sodium thiosulfate pentahydrate ($Na_2S_2O_3 \cdot 5H_2O$) analytical grade, stored in the absence of light at a temperature below 10 °C, for a maximum of 1 week. 2 ml of this solution will neutralize 1 mg l^{-1} of residual chlorine in 1 l of water.

Occasionally this solution causes odours/flavours that interfere with analyses. An alternative (5.4) is available.

5.4 Ascorbic acid solution.

Ascorbic acid solution, comprising a solution of 4,0 g per litre of L (+)-ascorbic acid analytical grade, stored in the absence of light at a temperature below 10 °C, for a maximum of one month. 2 ml of this solution will neutralize 1 mg l^{-1} of residual chlorine in 1 l of water.

5.5 1-Butanol (analytic reagent grade).

5.6 2-Methoxy-2-methylpropane (Methyl-*tert*-butyl ether, MtBE) (analytic reagent grade).

5.7 Methanol (analytic reagent grade).

5.8 Cleaning liquids for glassware:

5.8.1 Hydrochloric acid, concentrated (30 % mass per volume) analytical reagent grade.

5.8.2 Hydrochloric acid solution, prepared by slowly adding (0,5 ± 0,01) l of concentrated hydrochloric acid (5.8.1) to (0,5 ± 0,01) l of test water (5.1.1).

NOTE Care is needed because preparing the solution may generate heat.

5.8.3 Nitric acid, concentrated (65 % mass per volume) analytical reagent grade.

5.8.4 Nitric acid solution, (2 % mass per volume) is prepared by slowly adding (0,15 ± 0,01) l of concentrated nitric acid (5.8.3) to (5,0 ± 0,1) l of test water (5.1.1).

NOTE Care is needed because preparing the solution may generate heat.

5.8.5 Hydrogen peroxide, 3 % vol/vol (analytical reagent grade).

6 Apparatus

6.1 Vessels, containers, stoppers and connectors, shall consist of a material, such as glass, PTFE or stainless steel, that is inert under the specific test conditions.

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

6.2 Plates stainless steel, mild steel, sand-blasted glass or concrete/cement-mortar plates, for testing certain site-applied products. The plates shall be covered completely by the test material.

6.3 Equipment capable of maintaining the appropriate migration temperature, e.g (23 ± 2) °C, (60 ± 2) °C or (85 ± 2) °C.

6.4 500 ml Erlenmeyer flasks with ground stoppers shall be used for the presentation of the dilution series to the panellists.

7 Sampling, transport, storage, and preparation of test pieces

7.1 General

7.1.1 Sampling of products (i.e. collection of (a) sample(s) from a batch of lot) shall be performed in accordance with the relevant product standard, system standard or the national regulations when applicable.

7.1.2 During transport and storage samples shall be protected from contamination. If the manufacturer provides written transport and storage instructions they shall be followed. The samples shall be transported and stored in their original form as delivered. Transport storage and test containers shall be clean.

7.1.3 The room used for sample and test piece preparation shall be free from odour and flavour. The general environment shall not adversely affect the preparation (see EN 1622).

7.1.4 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 (5.1.1 and 5.1.2). When the product has the same material composition for the outside and inside surfaces, the test pieces may be immersed in test water.

7.1.5 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.

7.2 Site-applied products

Test samples for site-applied products shall be prepared, stored and transported in accordance to EN 12873-2 and 7.1.3.

7.3 Surface-area-to-volume ratio (*S/V*)

7.3.1 General

The surface area of the test pieces exposed to the test water shall be in accordance with Table 1. If *S/V* of the test pieces is larger than specified in Table 1 the migration water may be diluted with test water up to the given value prior determination of TON and TFN.

Table 1 — *S/V* ratios for testing

Type of product	S/V in dm^{-1}
Pipes (service and domestic pipes) DN-ID < 80	$5 < S/V \leq 40$ (fill pipe)
Pipes (distribution pipe) 80 ≤ DN-ID < 300	≥ 2,5 (fill pipe)
Pipes (large distribution) DN-ID ≥ 300	2,5 (fill with cylinder inserted[a] or fill pipe)
Fittings, ancillaries and membranes	1,5[b]
Sealings and adhesives	0,2 (immersing product)

[a] See EN 12873–1:2014, Annex B.

[b] This covers a wide range of products. This means the product may be filled, immersed, dismantled or other alternative procedure (the details of testing shall be fully described in the test report).

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

— *S* is the surface area of the test piece in contact with the test water, in square decimetres;

— *V* is the volume of test water in contact with the test piece, in litres.

7.3.2 Pipes

Pipes are filled for testing.

The *S/V* for testing is determined by the pipe under test. For a group of products made using the same process and having a range of DNs only the product with the highest *S/V* ratio (smallest diameter) need to be tested. However, if for the smallest diameter the *S/V* ratio is higher than 40 dm^{-1} (i.e. DN-ID < 10 mm) then the next larger diameter with $S/V \leq 40$ dm^{-1} shall be tested.

If for a group of products (pipes with different diameter) the smallest produced diameter is DN-ID > 80 mm then the pipe with the smallest ID shall be tested according to EN 12873-1:2014, Annex B.

For each test, take from a pipe sample a test piece of sufficient length to give the internal volume (V) of the test water necessary.

7.3.3 Fittings, ancillaries and membranes

7.3.3.1 For each test take one or more fitting or ancillary 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 in l.

When it is not possible to obtain enough migration water for the odour and flavour assessment by filling the product, the procedures 7.1.4 and 7.3.3.2 shall be applied, taking into account the calculated surface area-to-volume *S/V* ratio.

7.3.3.2 When the outside and the inside surfaces of the product have a different material composition, and therefore cannot be immersed in the test water the product shall be tested in the form of a more convenient test piece, prepared under the same manufacturing and processing conditions as for the product. It is also possible to test the dismantled parts of the products having contact with the drinking water and made of the same material.

7.3.4 Site-applied products

The *S/V* for products that are applied to plates for testing shall be according to 7.2. If products are immersed in test water then adjustments shall be made to account for the surface area in contact with test water being larger than in practice.

8 Preparation of reagents and apparatus

8.1 Test water

Determine that the water conforms to 5.1.1 for odour and/or flavour using the procedure given in Clause 11.

If the water has a perceptible odour or flavour, then reject the batch of water and test another batch or source of water.

8.2 Test water with chlorine content

Add a sufficient quantity of sodium hypochlorite solution (5.2) to the test water (8.1) to give a final free residual chlorine concentration of (1,0 ± 0,2) mg/l as Cl_2 analysed in accordance with EN ISO 7393-2.

8.3 Cleaning of glassware

8.3.1 Clean glassware using a non-perfumed biodegradable detergent. Rinse glassware in test water (8.1).

8.3.2 Clean the inner surface of glassware with hydrochloric acid (5.8.2) or nitric acid solution (5.8.4) and rinse it in test water (8.1). If further cleaning of the inner surface is necessary, repeat the cleaning using hydrogen peroxide (5.8.5) followed by rinsing with test water (8.1).

8.3.3 Before use, rinse the glassware at least three times with test water (8.1).

NOTE Erlenmeyer flasks with ground stoppers used for the presentation of the dilution series may have a glassy smell. The complete filling of the flask with test water without a stopper and the exposure overnight or the use of freshly cleaned flasks is suitable to eliminate this smell.

9 Pretreatment of test pieces

9.1 General

9.1.1 Test pieces are pretreated prior to migration testing by procedures involving flushing, stagnation and prewashing.

9.1.2 For site-applied products start the pretreatment immediately after the curing period specified by either regulations or the manufacturer, whichever is shorter.

9.1.3 If it is not possible, because of laboratory time constraints, to carry out the pretreatment and test procedure without a break, the break shall be during the pretreatment procedure. The migration periods shall be consecutive and without a break.

9.2 Test pieces to be tested at (23 ± 2) °C (Cold water test)

9.2.1 Flushing

9.2.1.1 If possible, flush test pieces with flowing tap water for (60 ± 5) min with a flushing speed of 1 m/min to 3 m/min.

In order to avoid the use of large quantities of water the arrangement described in EN 12873–1:2014, Annex A may be used to flush large diameter products.

9.2.1.2 Test pieces which cannot be flushed shall be placed in an appropriate vessel, e.g. a bucket, having a flow of water from the bottom upwards such that the calculated speed with regard to the upper open surface of the vessel is 1 m/min to 3 m/min for (60 ± 5) min.

9.2.2 Stagnation with test water

9.2.2.1 Test pieces shall be immersed in, or filled with, test water (5.1.1 and/or 5.1.2) for a period of (24 ± 1) h at (23 ± 2) °C.

9.2.2.2 Remove the water.

9.2.2.3 Prewash the test pieces according to 9.4.

9.3 Test pieces to be tested at elevated temperature (60 °C or 85 °C)

9.3.1 Flushing

Flush test pieces according to 9.2.1

9.3.2 Stagnation with test water at elevated temperature

9.3.2.1 Test pieces shall be immersed in, or filled with, test water (5.1.1) for a period of (24 ± 1) h at the elevated temperature (60 °C or 85 °C).

9.3.2.2 Remove the water.

9.3.2.3 Prewash the test pieces according to 9.4

9.4 Prewashing

9.4.1 Flush test pieces according to 9.2.1

9.4.2 Rinse the test pieces with test water (5.1.1 and/or 5.1.2) for 2 min.

In order to avoid the use of large quantities of water the arrangement described in EN 12873–1:2014, Annex A may be used to flush large diameter products.

10 Test procedure

10.1 General

10.1.1 Wherever possible the migration shall be carried out by filling the test pieces (Clause 7) with test water (5.1.1 and/or 5.1.2). If this is not possible for shape and for size reasons, immerse the test pieces in glass containers.

10.1.2 The migration procedure (10.2) shall be performed at (23 ± 2) °C. Products intended to come in contact with drinking water at elevated temperatures shall be tested at elevated temperatures (10.3) and at (23 ± 2) °C (cold water test). Depending on the intended use of the product and specified in the product standard the test at elevated temperatures shall either be carried out at (60 ± 2) °C (warm water test) or at (85 ± 2) °C (hot water test).

10.2 Cold water test procedure

10.2.1 Carry out the following procedure using test water without chlorine (5.1.1) and/or test water with chlorine (5.1.2).

10.2.2 Fill or immerse the test pieces using the appropriate test water and allow to stand for (72 ± 1) h at (23 ± 2) °C. In both cases, ensure that the test pieces or vessels/containers are completely immersed or filled and free of headspace in order to retain volatile substances. At the end of this period, collect the migration waters and immediately assess them for TON and TFN in accordance with Clause 11. Analysis shall be completed within 5 h of migration water collection.

10.2.3 Repeat 10.2.2 two more times using fresh test waters, ensuring that the test pieces are put in contact with the same type of test water (e.g. without chlorine) for all the three periods.

10.2.4 It may be necessary to increase the number of migration periods. The sequence for an extended number of migration periods shall be in accordance with Annex B, Table B.1.

10.2.5 Carry out a blank test in parallel (10.2.2 to 10.2.4) using the same test conditions and test water in order to obtain the blank water (3.7).

10.3 Elevated temperature test procedure

10.3.1 Carry out the following procedure in using test water without chlorine (5.1.1) at the test temperature detailed in 10.1.2.

10.3.2 Fill or immerse the test pieces using the test water (5.1.1) and allow to stand for (24 ± 1) h at the test temperature. The test water shall reach the test temperature within 1 h after the products are filled or immersed. At the end of this period, collect the migration water and allow to cool them to (23 ± 2) °C and then assess for TON and TFN in accordance with Clause 11.

NOTE It might be necessary to use preheated test water.

10.3.3 Repeat 10.3.2 two more times using fresh test water without chlorine (5.1.1).

10.3.4 It may be necessary to increase the number of migration periods. The sequence for an extended number of migration periods shall be in accordance with Annex B, Table B.2.

10.3.5 Carry out the blank test in parallel (see 10.3.2 to 10.3.4) using the same test conditions in order to obtain the blank water (see 3.7).

11 Determination of TON and TFN

11.1 If the test has been performed with chlorinated test water, dechlorinate the migration and blank waters with sodium thiosulfate solution (5.3) or ascorbic acid solution (5.4) to a free chlorine content less than 0,05 mg/l as Cl_2.

11.2 Determine the TON and TFN of each water sample (blank and migration waters) in accordance with EN 1622 using a ratio $x = 2$ for the concentrations of the successive dilutions.

Paired series of dilutions (200 ml each) shall be presented in 500 ml Erlenmeyer flasks (6.4).

The unforced choice test shall be performed using a minimum of 5 panellists.

Not more than 5 panellists shall use the same series of successive dilutions for the TON determination.

11.3 When carrying out the determination of TON at least three additional dilutions shall be presented to the panellist either side of the detected TON.

EXAMPLE The panel determines an average of TON = 8. The individual member may have determined a value in the range from 2 to 32. In this case the dilutions 1, 2, 4, 8, 16, 32 and 64 will need to be presented to the panel. 1 and 64 are necessary to ensure that no panellist determines a 1 or a 64 dilution.

11.4 The testing panel shall be qualified and monitored in accordance with Annex C.

It is recommended that a panel coordinator is nominated. This person should be responsible for the qualification of the panellists and the check of the reliability of the determined results.

NOTE EN 13725:2003, 6.7.1 might be used as code of behaviour for the panellists.

11.5 If at the end of the migration period, the blank water acquires a perceptible odour and/or flavour then the test is invalid and the test shall be repeated with new test pieces.

12 Expression of results

The results for each migration period shall be expressed as a threshold odour number and a threshold flavour number as described in EN 1622.

13 Test report

13.1 General information

The test report shall include the following general information:

a) name and address of testing laboratory and location where the test was carried out when different from the address of the testing laboratory;

b) unique identification of report (such as serial number) and of each page, and total number of pages of the report;

c) name and address of client;

d) description and identification of the test piece;

e) the proposed use of the product;

f) a signature and title or an equivalent marking of person (s) accepting technical responsibility for the test report and date of issue;

g) a statement to the effect that the test results relate only to the item(s) tested;

h) a statement that the report shall not be reproduced except in full without the written approval of the testing laboratory;

i) dated test report.

13.2 Information on the product/material

The test report shall includes the following information on product/material:

a) trade name or designation of manufactured product/material;

b) complete identification and date of receipt of test piece;

c) details of the sample and test piece preparation;

d) the name of the manufacturer of the product;

e) the production place and date;

f) the organization submitting the sample;

g) the organization responsible for preparing the samples;

h) description of sampling procedure.

13.3 Information for site-applied products

The test report shall include the following information on site-applied products:

a) typical uses of material;

b) source of application instructions;

c) site of test piece preparation, including ambient temperature and humidity (if appropriate);

d) person(s) responsible for test piece preparation;

e) date and time of test piece preparation;

f) full details of test piece preparation;

g) chain of custody of the test pieces; methods of transfer to the test laboratory and temperature profiles of test pieces during transport to the laboratory for final curing;

h) test piece description;

i) date and time of the start of testing;

j) any deviations from the manufacturer/supplier application instructions.

13.4 Information on the test procedure

The test report shall include the following information on the test procedure:

a) reference to this standard and (if applicable) to relevant product/system standards and/or national regulations;

b) number of test pieces used together in a migration;

c) volume of the test liquid (V) in l;

d) surface area of test piece exposed to the test liquid (S) in square decimetres calculated from the actual dimensions of the test pieces;

e) actual *S/V* ratio;

f) source of reference water and (if applicable) details of preparation;

g) test waters and test temperature;

h) any deviation from the test procedure specified in this standard;

i) any factors which may have affected the results, such as any incidents or any operating details not specified in this standard;

j) dates of start and completion of the test.

13.5 Test results

The test report shall include the following test results:

a) the threshold odour number (TON) and the threshold flavour number (TFN) for the three migration periods for the chlorinated and/or unchlorinated migration waters and blank water;

b) information relative to the results obtained from EN 1622.

Annex A
(informative)

Schematic presentation of test method

Figures A.1 and A.2 of this annex show schematically the relation between the different procedures described in this European standard.

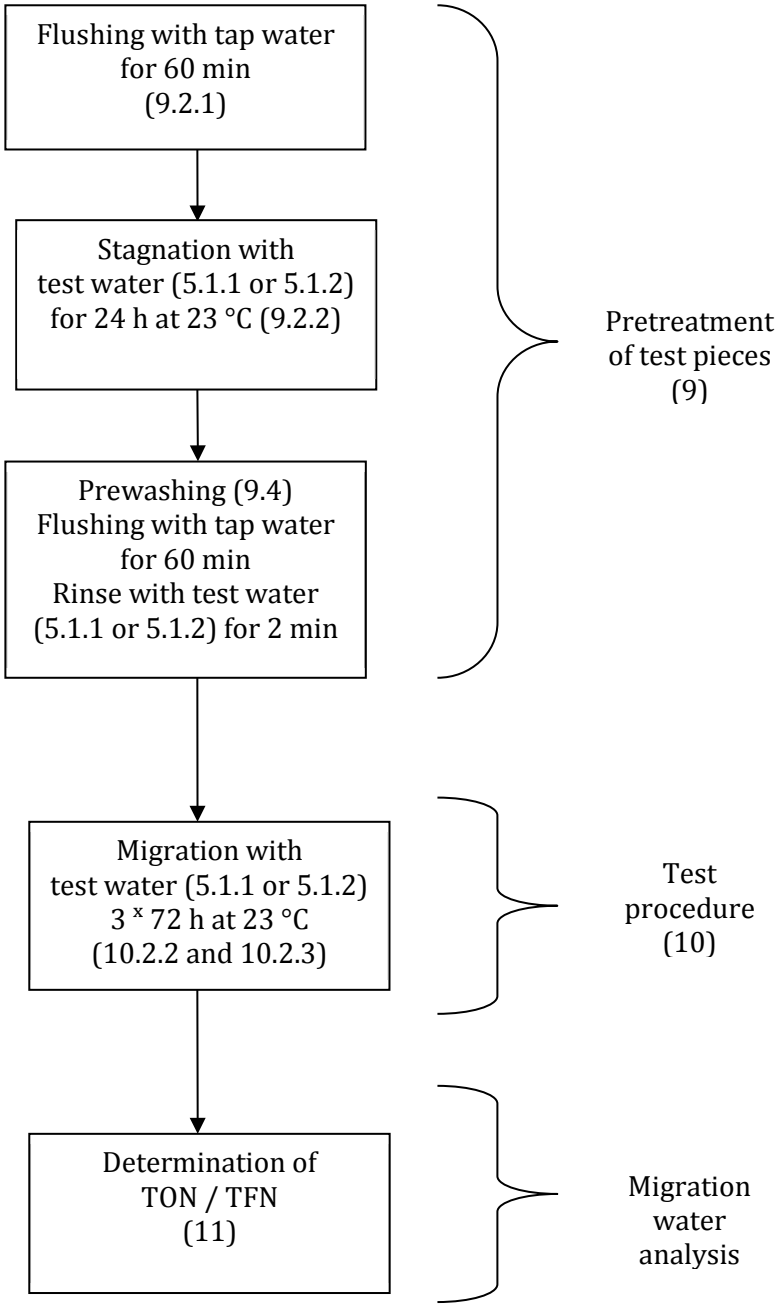

Figure A.1 — Products to be tested at (23 ± 2) °C

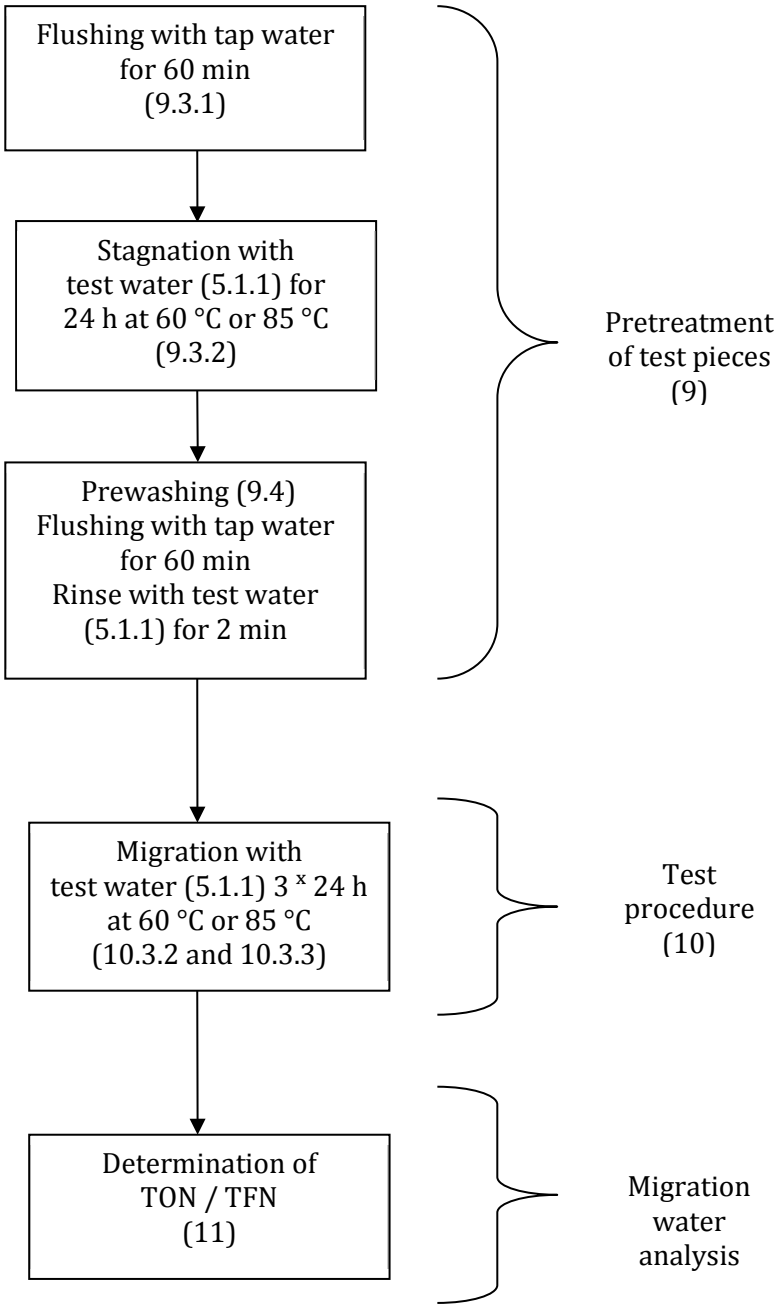

Figure A.2 — Products to be tested at elevated temperatures (60 ± 2) °C (warm water), (85 ± 2) °C (hot water)

Annex B
(normative)

Sequence of additional migration periods

If more than three migration periods are specified the migration sequence shall be in accordance with Table B.1 or Table B.2 for the cold water and warm/hot water test, respectively.

Table B.1 — Sequence for obtaining migration water for 72 h extraction periods (cold water test)

Week	Number migration period	End of migration period	Duration of test water contact	Analysis of migration water
1	0 (Pretreatment)	Tuesday		Not analysed
1	1	Friday	3 d	Analysed
2	2	Monday	3 d	Analysed
2	3	Thursday	3 d	Analysed
3	4	Monday	4d	Not analysed
3	5	Thursday	3d	May be analysed
4	6	Monday	4d	Not analysed
4	7	Thursday	3d	May be analysed
5	8	Monday	4d	Not analysed
5	9	Thursday	3d	Analysed

Table B.2 — Sequence for obtaining migration water for 24 h extraction periods (warm and hot water test)

Week	Number migration period	End of migration period	Duration of test water contact	Analysis of migration water
1	0 (Pretreatment)	Tuesday		Not analysed
1	1	Wednesday	1 d	Analysed
1	2	Thursday	1 d	Analysed
1	3	Friday	1 d	Analysed
2	4	Monday	3 d	Not analysed
2	5	Tuesday	1 d	Not analysed
2	6	Wednesday	1 d	May be analysed
2	7	Thursday	1 d	May be analysed
2	8	Friday	1 d	May be analysed
3	9	Monday	3 d	Not analysed
3	10	Tuesday	1 d	Not analysed
3	11	Wednesday	1 d	May be analysed
3	12	Thursday	1 d	May be analysed
3	13	Friday	1 d	May be analysed
4	14	Monday	3 d	Not analysed
4	15	Tuesday	1 d	Not analysed
4	16	Wednesday	1 d	May be analysed
4	17	Thursday	1 d	May be analysed
4	18	Friday	1 d	May be analysed
5	19	Monday	3 d	Not analysed
5	20	Tuesday	1 d	Not analysed
5	21	Wednesday	1 d	May be analysed
5	22	Thursday	1 d	analysed

Annex C
(normative)

Panel qualification for odour and flavour testing

C.1 General

Results for odour and flavour testing depend on the individual panellists and their training. With the following procedure the panellists shall be qualified.

NOTE The qualification will help to train the panellists and to select the members of the panel.

For the qualification two reference substances are used: 1-butanol and 2-methoxy-2-methylpropane (methyl *tert* butyl ether: MtBE).

Two different tests are performed with these reference substances:

a) Individual TON determination;

b) Ranking test of defined concentrations.

The qualification with both reference substances shall be performed at least two times a year by all panellists. A new panellist shall perform the tests at least three times in the first year.

C.2 Individual TON determination

A paired series of 9 dilutions (dilution ratio 2) of the reference substances are presented to the panellists. The target concentration (see Table C.1) shall be presented in one dilution between 4 and 64. The choice of the dilutions and the preparation of the series of dilutions shall be done by a person not being a member of the panel.

Each panellist shall determine its individual TON by unforced choice according to EN 1622. Not more than 5 panellists are allowed to use the same series of dilutions for the TON determination.

The panellist is qualified as a panel member, if he/she determines:

a) the TON of the target concentration with a tolerance of ± 2 dilutions;

b) as a geometric average of 5 TON determinations (over a period of at least 1 year) of the target concentration with a tolerance of ± 1 dilutions.

The complete panel is qualified, if the determined TON corresponds to the target concentration with a tolerance of ± 1 dilutions.

Table C.1 — Target concentrations of reference substances

Reference substance	Target concentration
1-Butanol	250 µg/l
MtBE	5,8 µg/l

C.3 Ranking test

Four flasks with concentrations of the reference substances as given in Table C.2 are presented to the panellists. The order of the flasks as presented to the panellists shall be determined by a person not being a member of the panel. Each panellist shall rank the flasks according to the odour intensity.

The panellist is qualified as a panel member, if he/she ranks the flask in a correct order. If a panellist once fails a positive retest within 3 days is accepted.

Table C.2 — Concentrations of reference substances for ranking test

Reference substance	***Concentrations***
1-Butanol	0 mg/l, 16 mg/l, 65 mg/l, 130 mg/l
MtBE	0 µg/l, 23 µg/l, 93 µg/l, 370 µg/l

C.4 Long term monitoring

For each panellist member a long term monitoring shall be performed. For all tests the panellists performed the individual deviation from the geometric mean value for the whole panel shall be calculated in dilutions according to Formula C.1:

$$D_i = \log_2 TON_i - \log_2 TON \tag{C.1}$$

where

D_i is the deviation for the individual panellist i from the geometric mean for the whole panel;

TON_i is the result of the individual panellist;

TON is the geometric mean for the whole panel.

For every 10 consequent tests the panellist performed an average is calculated according to Formula C.2:

$$\overline{D_{\mathbf{i}}} = \frac{\sum_{n=1}^{10} \left|D_{\mathbf{n}}\right|}{\mathbf{10}} \tag{C.2}$$

This average shall always be:

$$\overline{D_i} \leq 1,5 \tag{C.3}$$

for each accepted panellist.

Annex D
(informative)

Preparation of dilution series for panel qualification

D.1 Series of successive MtBE dilutions

D.1.1 MtBE spike solution

For the preparation of the MtBE dilutions a spike solution (370 mg/l) in methanol should be used.

The spike solution is prepared by dissolution of 100 µl ± 5 µl in 200 ml methanol.

The spike solution is stable for four weeks when stored at 5 °C ± 3 °C.

D.1.2 Series of successive dilutions

The target concentration should not always be presented in the same dilution. Table D.1 includes four options for the series of successive MtBE concentrations.

Table D.1 — Options for the series of successive MtBE concentrations

Options				MtBE concentration in µg/l	Volume of spike solution dissolved in 1l water in µl
1	**2**	**3**	**4**		
1				185	500
2	1			92,5	250
4	2	1		46,3	125
8	4	2	1	23,1	62,5
16	8	4	2	11,6	31,3
32	16	8	4	5,8	15,6
64	32	16	8	2,9	7,8
128	64	32	16	1,45	3,9
256	128	64	32	0,72	1,95
	256	128	64	0,36	0,98
		256	128	0,18	0,49
			256	0,09	0,24

D.2 Series of successive 1-butanol concentrations

D.2.1 1-butanol spike solution

For the preparation of the 1-butanol dilutions a spike solution (810 mg/l) in water should be used.

The spike solution is prepared by dissolution of 1,0 ml ± 0,05 ml in 1 000 ml methanol.

The spike solution is stable for two days when stored at 5 °C ± 3 °C.

D.2.2 Series of successive dilutions

The target concentration should not always be presented in the same dilution. Table D.2 includes 4 options for the series of successive 1-butanol concentrations.

Table D.2 — Options for successive dilutions

Options				1-butanol concentration in µg/l	Volume of spike solution dissolved in 1l water in µl
1	**2**	**3**	**4**		
1				8 100	10 000
2	1			4 050	5 000
4	2	1		2 030	2 500
8	4	2	1	1 020	1 250
16	8	4	2	506	625
32	16	8	4	253	313
64	32	16	8	127	156
128	64	32	16	63	78
256	128	64	32	32	39
	256	128	64	16	20
		256	128	7,9	10
			256	4,0	5

Bibliography

[1] EN 13725:2003, *Air quality — Determination of odour concentration by dynamic olfactometry*

[2] EN ISO 5492, *Sensory analysis — Vocabulary (ISO 5492)*

This page deliberately left blank

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.