
Vpliv materiala na pitno vodo - Vpliv migracije - 2. del: Metoda preskušanja nekovinskih in necementnih materialov

Influence of materials on water intended for human consumption - Influence due to migration - Part 2: Test method for non-metallic and noncementitious site-applied materials

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Einfluss von Materialien auf Trinkwasser - Einfluss infolge der Migration - Teil 2: Prüfverfahren für vor Ort aufgebrachte nicht metallische und nicht zementgebundene Materialien

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Influence des matériaux en contact sur l'eau destinée à la consommation humaine - Influence due à la migration - Partie 2: Méthode d'essai des matériaux appliqués sur site, excepté les matériaux métalliques et ceux à base de ciment

Ta slovenski standard je istoveten z: EN 12873-2:2021

ICS:

13.060.20	Pitna voda	Drinking water
67.250	Materiali in predmeti v stiku z živili	Materials and articles in contact with foodstuffs

SIST EN 12873-2:2022**en,fr,de**

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12873-2

December 2021

ICS 13.060.20; 67.250

Supersedes EN 12873-2:2005

English Version

Influence of materials on water intended for human consumption - Influence due to migration - Part 2: Test method for non-metallic and noncementitious site-applied materials

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This European Standard was approved by CEN on 15 November 2021.

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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.

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European foreword

This document (EN 12873-2:2021) 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of an identical text or by endorsement, at the latest by June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document will supersede EN 12873-2:2005.

Significant technical difference between this edition and EN 12873-2:2005 is as follows:

- the test temperatures, outlined in Clause 4 ‘Principle’, are more specific;
- the use of chromic acid is removed because of safety concerns;
- the use of sulphuric acid has been removed;
- the examples of extended collection and analysis of migration waters (Annex C) are more systematic.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

EN 12873-2:2021 (E)**Introduction**

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

This document has been drawn up with the objective to describe a test method to determine the migration of substances from products made from, or incorporating, organic and glassy (porcelain/vitreous enamel) material for use in contact with water intended for human consumption.

Annex A, which is normative, describes an alternative arrangement for flushing pipes having a nominal size greater than DN 80.

Annex B, which is informative, describes additional procedures for testing non-homogeneous products and pipes having a nominal size greater than DN 80.

Annex C, which is informative, describes a schedule for the preparation of migration waters.

Annex D, which is informative, describes procedural tests using standard additions (positive controls).

Annex E, which is informative, describes the migration test procedure in a schematic manner.

This document will result in one of a series of standards on test methods which support the appropriate standards.

With regards to potential adverse effect on the quality of water intended for human consumption, caused by the material testing covered by this document:

- 1) This document provides no information as to whether the final product tested using this methodology may be used without restriction in any of the Member States of the EU or EFTA.
- 2) It should be noted that, whilst awaiting the adoption of verifiable European criteria, existing national regulations concerning the use of this material test method remain in force.

NOTE Conformity with this document does not confer or imply acceptance or approval of the material in any of the Member States of the EU or EFTA. The use of the methodology covered by this document is subject to regulation or control by National Authorities.

This document, Part 2, is the second in a series of standards for dealing with the influence of migration from materials on water intended for human consumption, including:

- Part 1: Test method for factory-made products made from or incorporating organic and glassy (porcelain/vitreous enamel) materials;
- Part 2: Test method for non-metallic and non-cementitious site-applied products;
- Part 3: Test method for ion exchange and absorbent resins;
- Part 4: Test method for water treatment membranes.

1 Scope

This document specifies a procedure to determine the migration of substances from non-metallic and non-cementitious site-applied materials for use in contact with water intended for human consumption.

It is applicable to site-applied materials intended to be used under various conditions for the transport and storage of water intended for human consumption, including raw water used for the production of water intended for human consumption. It covers the extraction by water of substances from these materials after their application on site.

The document is applicable to materials whose physical or chemical properties alter during or after on-site application, such as coatings, paints, and adhesives. In addition, some site-applied materials that do not change in such a manner, e.g. greases or lubricants, are also included.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN ISO 7393-2, *Water quality - Determination of free chlorine and total chlorine - Part 2: Colorimetric method using N,N-dialkyl-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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1

test

technical operation that consists of the determination of one or more characteristics of a given product

3.2

test procedure

specified technical method for performing a test

3.3

test report

document that presents test results and other information relevant to a test

3.4

testing laboratory

laboratory that performs tests

3.5

material

manufactured items(s) for application on site and subsequent contact with water intended for human consumption

EN 12873-2:2021 (E)**3.6****product**

applied items, in its finished form after application on site, that comes into contact with water intended for human consumption

3.7**test piece**

product to be tested

3.8**tap water**

water intended for human consumption

Note 1 to entry: see 5.2.1.

3.9**test water**

water used for migration testing

Note 1 to entry: see 5.2.2 and 5.2.3.

3.10**prewashing water**

water used for prewashing

Note 1 to entry: see 5.2.4.

3.11**blank water**

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

Note 1 to entry: for test water, see 5.2.2 and 5.2.3; for migration water, see 3.15.

3.12**migration**

movement of a substance or substances from test pieces into test water

3.13**migration period**

period of time in which the migration is carried out under specified conditions

Note 1 to entry: the period of time can be 24 h or 72 h, see Clause 4.

3.14**migration water**

test water after exposure to a test piece under specified conditions

3.15**migration rate**

mass of a measured substance or substances (in mg) migrating from one square decimetre of a test piece into the test water in one day at a specified temperature (°C)

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3.16 lining

layer(s) of material(s) applied on site intended as the finished product to come into contact with water intended for human consumption, e.g. the inside surfaces of pipes, fittings or storage vessels

Note 1 to entry: Excluded are layers, such as coatings, not intended for contact with drinking water, e.g. as applied to the outside surfaces of pipes and fittings for corrosion protection.

3.17 cure

conversion of a material into its final form

Note 1 to entry: For example by chemical reaction or drying.

4 Principle

Each test piece is taken on site or prepared under specific conditions that are intended to simulate site-application taking into account the manufacturer's written instructions.

Each test piece is subjected to a specified pre-treatment procedure of stagnation and prewashing. The surface of the test piece that is exposed in practice to water intended for human consumption is brought into contact with test water during at least three sequential migration periods. A migration period is either;

- 72 h at (23 ± 2) °C for products intended to come into contact with cold water.
- 24 h at a specified temperature at (60 ± 2) °C (warm water test) and/or (85 ± 2) °C (hot water test) for products intended to come into contact with warm or hot water.

Migration rates for the first three migration periods are determined by analysis of the required substances in the corresponding migration waters. Referring product standards and/or national regulatory authorities may specify the number of sequential migration periods to be carried out.

NOTE 1 The test is carried out under conditions to ensure that calculation of a reliable migration rate is facilitated. These conditions are not meant to simulate any 'real use conditions'. Relating the results obtained from this document to the 'real use conditions' is carried out using a conversion procedure. This procedure will be specified in product standards or national regulations.

NOTE 2 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.

NOTE 3 If testing at warm or hot temperature is required, national regulations can require additional cold water testing.

5 Reagents

5.1 General

For the purpose of this document, the listed reagents in Clause 5 will apply.

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5.2 Waters to be used for testing

5.2.1 Tap water, water that is intended for human consumption with a free chlorine content less than 0,2 mg/l as Cl₂.

5.2.2 Test water, chlorine-free water with a conductivity of < 2 mS/m and a total organic content (TOC) of < 0,2 mg/l C, e.g. prepared by reverse osmosis, deionization or distillation, followed by activated carbon filtration.

5.2.3 Chlorinated test water, test water according to 5.2.2 having an active chlorine content of $(1 \pm 0,2)$ mg/l as Cl₂ (5.4).

5.2.4 Prewashing water, tap water (5.2.1).

5.3 Cleaning liquids for glassware

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

5.3.2 Hydrochloric acid solution, prepared by slowly adding $(0,5 \pm 0,01)$ l of concentrated hydrochloric acid (5.3.1) to $(0,5 \pm 0,01)$ l of test water (5.2.2).

WARNING Care is needed because preparing the solution can generate heat.

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

5.3.4 Nitric acid solution, prepared by slowly adding $(0,5 \pm 0,01)$ l of concentrated nitric acid (5.3.3) to $(0,5 \pm 0,01)$ l of test water (5.2.2).

WARNING Care is needed because preparing the solution can generate heat.

5.4 Other reagents

5.4.1 Sodium hypochlorite solution, prepared from a technical or general purpose reagent grade of sodium hypochlorite (NaOCl), using test water (5.2.2) and having a known concentration of about 0,1 % mass of free chlorine determined in accordance with EN ISO 7393-2.

Unless tests have proven otherwise, the sodium hypochlorite solution should be considered unstable and prepared on the day of use.

6 Apparatus

6.1 Vessels, containers, stoppers and connections, shall consist of a material, such as glass, PTFE, steel and stainless steel, which is inert under the specified test conditions (Clause 9).

The material Polytetrafluoroethylene (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 the material. The plates shall be covered completely with 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 Laboratory glassware, steel, stainless steel plates and sand blasted glass plates shall be cleaned by washing with a biodegradable laboratory detergent, followed by exposing to either hydrochloric acid solution (5.3.2) (except for stainless steel) or nitric acid solution (5.3.4) for 2 to 3 days and finally by thoroughly rinsing with test water (5.2.2). Drain the plates and dry them in a hot air cabinet.

7 Test pieces

7.1 General requirements

The manufacturer shall provide a copy of the detailed instructions for application that accompany the material(s).

The application instructions shall cover aspects such as:

- a) surface preparation;
- b) mix ratios and method of mixing;
- c) method of application;
- d) minimum curing temperature and time;
- e) product film thickness;
- f) associated materials, e.g. primers and undercoats.

The manufacturer shall provide all necessary information on material and chemical safety.

Test pieces shall be prepared in the test laboratory by the test laboratory in accordance with the manufacturer's written instructions. If specialized equipment for application is required then the test pieces may be prepared by the manufacturer/contractor under the supervision of the test laboratory under conditions that simulate site application. Where it is found necessary to deviate from these instructions, this shall only be done with the prior agreement of the test laboratory and manufacturer or contractor.

If test pieces cannot be prepared at the test laboratory then they shall be prepared under the supervision of the test laboratory. The transportation conditions shall ensure that the curing conditions are observed (e.g. time and temperature).

The test laboratory shall prepare a detailed record of test piece preparation and curing conditions.

Care shall be taken to ensure that test pieces are not contaminated during transport.

7.2 Requirements for the preparation of test piece

7.2.1 Site-applied organic lining systems for pipes

7.2.1.1 Prepare test pieces in accordance with the requirements in 7.1.

It is recommended to line pipes of the smallest diameter for which the product is intended to be used on in order to meet the requirements in 7.3.

7.2.1.2 Cut test pieces of suitable length from the lined pipe.

Test pieces do not need to be cut if the lined pipe is already of suitable length.

7.2.1.3 Pipes with DN > 80 see testing in accordance with Annex B to meet the requirements in 7.3.

7.2.1.4 Pre-treat the test pieces according to Clause 8.

EN 12873-2:2021 (E)**7.2.2 Jointing compounds (solvent cements, adhesives)**

7.2.2.1 Join eleven lengths of pipe with ten double sockets using the cement/adhesive in accordance with both the pipe/fittings and the cement/adhesive manufacturer's instructions or relevant product/system standards to give a test piece of 1 m. Where this cannot be done, use as many joints as possible in 1 m.

7.2.2.2 Cure the test pieces in accordance with the manufacturer's instructions.

7.2.2.3 Pre-treat the test piece according to Clause 8.

It is recommended that this test should be undertaken using the smallest diameter pipe and double-sockets for which the product is intended to be used on in order to meet the requirements in 7.3.

The pipe and double sockets to be used may be specified by either the manufacturer or in relevant product/system standards.

NOTE Additional information can also be found in regulations.

7.2.3 Other site-applied materials (e.g. linings for tanks, greases and sealants)

7.2.3.1 Prepare test pieces by coating plates (6.2) and in accordance with the requirements in 7.1.

7.2.3.2 Pre-treat the coated plates in accordance with Clause 8.

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

The ratio of the surface area (S) of the test piece intended to come into contact with test water to the volume (V) of the test water shall be expressed per decimetre, i.e. dm^{-1} (which is dm^2/dm^3 or dm^2/l). Use a surface area-to-volume ratio in the range of 5 dm^{-1} to 40 dm^{-1} .

NOTE S/V ratios can be specified by national regulations.

If the test piece has an irregular or textured surface then, for calculations, the surface is considered to be smooth. If the shape of the test piece is such that accurate calculation of the surface is impracticable then use an estimated surface area of the test piece. In this case the length and width shall be recorded together with a sufficiently detailed description of the product(s) to enable further test pieces to be prepared that will be within $\pm 10 \%$ of the surface area of the original test piece.

The supplier of the test samples shall be instructed to ensure that they represent the product as it is used in contact with water intended for human consumption.

8 Pre-treatment of test pieces**8.1 General**

Test pieces are pre-treated prior to migration testing by procedures involving flushing, stagnation and prewashing.

Start the pre-treatment immediately after the curing period specified by the manufacturer.

NOTE The curing period can also be specified in regulations.

The migration periods shall be consecutive and without a break.