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**Plinski pretočni grelniki vode za sanitarno rabo z atmosferskim gorilnikom – Dopolnilo A3**

Gas-fired instantaneous water heaters for sanitary uses production, fitted with atmospheric burners - Amendment A3

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ICS

English version

# Gas-fired instantaneous water heaters for sanitary uses production, fitted with atmospheric burners

Appareils de production instantanée d'eau chaude pour usages sanitaires équipés de brûleurs atmosphériques utilisant les combustibles gazeux

Gasbeheizte Durchlauf-Wasserheizer für den sanitären Gebrauch mit atmosphärischen Brennern

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 48.

This draft amendment A3, if approved, will modify the European Standard EN 26:1997. If this draft becomes an amendment, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration.

This draft amendment was established by CEN 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 Management Centre has the same status as the official versions.

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

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# Foreword

This document (EN 26:1997/prA3:2004) has been prepared by Technical Committee CEN/TC 48 “Gas-fired water heaters”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This amendment includes requirements relative to the metallic, non-metallic and other non-metallic materials that are used in appliances and which come into contact with water intended for human consumption. It is intended to ensure that products of this kind complying with these requirements meet current technological development and requirement resulting of the application of the EAS (European Approval Scheme) of the European Commission, with regard to appliances service life and physiological suitability.

Note : as long as no European regulations are enforced (EAS scheme) national regulations with regard to hygienic assessment stay in force.

**2 Normative references**

*Add the following standards :*

" *ISO 2722, Methods of testing vitreous enamel finishes - Resistance to citric acid at room temperature.*

*ISO 2744, Methods of testing vitreous enamel - Determination of resistance to boiling water and water vapour*."

**6.1.2 Materials**

*Replace the last paragraph by the new clause :*

« **6.1.2.1 Metallic materials**

**6.1.2.1.1 Corrosion-resistance metallic materials**

Provided that the appliances is used in accordance with the manufacturer's instructions :

— The functionning of components manufactured from corrosion-resistant metallic materials shall not be affected by corrosion within the expected service life of the appliance, and

— no special maintenance shall be required to keep the components in good working order.

**6.1.2.1.2 Requirements on metallic materials**

Materials that come into contact with water intended for human consumption shall be constituted in such way that they withstand the mechanical, chemical and thermal stresses to which they are exposed during the service life of the appliance and do not contaminate the water supplied.

Metallic materials shall be corrosion-resistant. Metallic materials are considered to satisfy the requirements with the respect to corrosion protection :

— if the material used are enamelled (one or more layers) and equipped with cathodic corrosion protection, or

— where types of stainless steel containing a minimum of 16 % chrome are used, or

— where they are assessed as acceptable to the national regulations in force.

Examples for the selection of metallic materials (steel, and copper and copper alloys) are given in L.1 and L.2.

**6.1.2.2 Enamelling**

With regard to the use of enamelling to provide protection from corrosion for surfaces of tanks that come into contact with water intended for human consumption, the following definitions and requirements should be met :

**Enamelling**
Enamelling involves the use of composite material made of a vitreous substance (enamel) suited to this purpose and steel. The enamel coating may be single or multiple-layered.

**Flaws**
Flaws are defects that leave the metallic substrate exposed (e.g. pores, scratches, cracks and chips). All flaws are electrically conductive and should not cover an area larger than 2 mm on flat surface, 10 mm on edges, weld seam overlaps, brackets, baffle plates, etc, and 4 mm on weld seams.

**Copperheads**
Copperheads are spots in enamelling formed by saturation of the material with iron oxide during firing and may be electrically conductive. Copperheads are only permissible on edges and weld seams. They should not cover an area of more than 2 mm.

**Layer thickness**
Layer thickness is the thickness of the enamel coating and shall range between 0,15 mm and 0,5 mm. If thicker coatings in specific places are inevitable for technical reasons, this is only permissible to a limited extend, and the coating may not exceed a layer thickness of 1 mm.

**Cathodic corrosion protection**
Cathodic corrosion protection is an electrochemical corrosion protection procedure, in which any flaw present in the enamelled inner surface of a tank is converted into the cathode of a galvanic element by the installation of a device that acts as an anode (galvanic anode, external current anode).

**Standard protective current requirement**
The standard protective current requirement is the current density that is calculated from the current flowing between the anode and the tank proportional to the enamel surface in contact with the water, taking account of correction values for the measuring voltage, the electrical conductivity of the test solution and the mass of the anode. It is an integral measure for the uptake of protective current by the flaws and copperheads in an enamelled steel tank.

The limit value 22,5 mA/m$^2$ should not be exceeded during the test.

The test set-up is shown in Figure 12 below.

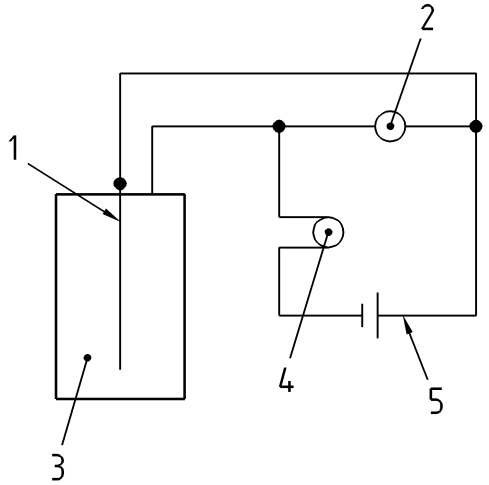


**Figure 12 - Test for the evaluating of the standard protective current**

The test solution used is tap water, to which a sodium chloride solution is added until its electrical conductivity reaches approx. 1000 µS/cm at the test temperature of 20 °C.

The test anode is a degreased magnesium rod anode with a diameter of between 22 mm to 33 mm that is built into the tank and electrically isolated. The mass of the anode shall be at least 0,2 kg/m$^2$ enamelled surface.

The tank is filled with the test solution. A 1 V test voltage is applied for two minutes, then the current and the temperature of the test solution are measured simultaneously.

The following correction values shall be taken into account when evaluating the results :

a) Anode mass correction value f(*G*)

$f(G) = (17{,}69 - 0{,}01655\ d_A)\ 10^{-6}\ d_A^3\ (d_A^2 + 4\ d_A\ l_A)/A_K + (30{,}94 + 0{,}1692\ d_A)\ 10^{-6}\ (d_A^3 + 580000)/d_A$

where :

$l_A$ is the length of anode in mm

$d_A$ is the diameter of anode in mm

$A_K$ is the enamel surface in contact with water in $m^2$

b) Conductivity correction value $f(K)$

$f(K) = 0{,}0715 + 0{,}0009285\ K_{(V)}$

where :

$K_{(V)}$ is the electrical conductivity of the test solution in µS/cm

This allows the standard protective current requirement to be calculated :

$I_N = I_M U_O / A_K U_M f(G) f(K)$

Where :

$I_M$ is the current measured in mA

$U_O$ is the reference voltage 1,5 V

$U_M$ is the measured test voltage in V

$f(G)$ is the anode mass correction value

$f(K)$ is the conductivity correction value

**Adhesion**
Enamel adhesion is tested by destructive method (e.g. with a hammer or by dropping a hardened steel ball). Definite enamel residues shall be identifiable on the destroyed surface following the test.

**Impact resistance**
Impact resistance is tested with a force of 10 N. No damage should be identifiable with the naked eye after 24 h. The test shall be carried out at 5 different points in the tank, and should not be carried out less than 20 mm from the edge.

**Thermal shock resistance**
This test may be carried out either on samples cut out of the tank or on special sample plates. At least three specimens with an area of 100 $cm^2$ shall be analysed. The specimens are heated in air approx. 200 °C and quenched immediately in water at a temperature of 15 °C. This procedure is carried out five times. The specimens shall be completely immersed in the water and then dried before re-heating.

**Resistance to boiling water**
The amount of enamel lost when resistance to boiling water is tested should not be greater than 3,5 $g/m^2$. This test shall be carried out in accordance with ISO 2744.

**Resistance to acids**
Enamelling shall comply with the requirements of ISO 2722 Class A. The test solution used is 10 % hydrochloric acid, which should be allowed to act upon the surface for 1 h.

**Physiological safety**
This test is intended to determine whether lead and cadmium ions are released into the water. Lead and cadmium should not be present in the water at levels above the following limit values :

Lead :

— cold water test : 0,3 mg/($m^2$.d)

— boiling water test : 0,3 mg/($m^2$.d)

Cadmium :

— cold water test : 0,03 mg/($m^2$.d)

— boiling water test : 0,03 mg/($m^2$.d)

Lead and cadmium levels should not exceed these limit values following the third extraction. The cold water test should be carried out using water at a temperature of 18 °C and the boiling water test using water at a temperature of 90 °C. Two parallel tests are carried out with special specimen plates. The cut edges of the specimens are covered with a coating of a material that does not contain lead or cadmium.

The cold water test is performed in 3 succeeding extractions of 72 h, the warm/hot water test in 4 succeeding tests of 24 h. The value evaluated from the last extraction (cold and warm) have to comply with the given limits for lead and cadmium. The concentration measured at the last extraction shall be equal or lower than from preceding extraction.

**Requirements on anodes**
In addition to the requirements applying to the enamelling, protective anodes should also comply with the following requirements :

— galvanic anodes : the dimensions of galvanic anodes need to be such that their protective function is ensured for at least two years. The mass of the anode shall therefore be at least 0,2 kg/$m^2$ enamelled surface. For physiological reasons, the total proportion of the mass of the anode made up of antimony, arsenic, lead, chrome and nickel shall not be greater than 0,1 %, and the total proportion of the mass of the anode made up of cadmium; mercury and selenium shall not be greater than 0,01 %. Where galvanic anodes are manufactured from magnesium and its alloys with aluminium, zinc, manganese and silicium, the total proportion of the mass of the anode made up of these elements shall be at least 99,79 %. The proportion of the mass of the anode made up of iron and copper shall not be greater than 0,1 %

— External current anodes : the design of the external current anode shall ensure that their capacity and form allow them to operate permanently without maintenance for at least two years. Only inert materials should be used for the manufacture of anodes.

— Arrangement of anodes in the tank : the anodes shall be arranged in the tank in such a way that a protective voltage of 530 mV is present throughout.

**6.1.2.3 Non metallic materials**

**6.1.2.3.1 Plastic materials**

Due to the many different types of plastic in components used in the drinking water sector, many different material properties need to be taken into consideration e.g. longitudinal expansion, joining and fixing techniques, temperature effects, effect of light (UV resistance), ageing, internal pressure, internal and external corrosion (for example as a result of using cleaning products) and also transport and storage conditions.

#### 6.1.2.3.2 Requirements of plastic materials

Only those plastic materials that can meet mechanical, chemical and thermal demands as well as physiological and hygiene requirements throughout the life of the equipment should be used in drinking water components and appliances. This means they shall be suitable for coming into direct contact with food and not pose any health threat. Special attention should be paid to prevent substances from leeching out and to the plastics' microbiological properties.

Exemples for the selection of the plastic materials are given in L.3.

#### 6.1.2.3.3 Other non-metallic operating and auxiliary materials

These materials include rubber, sealants, adhesives and also lubricants on moving parts that come into contact with the drinking water. Their use is to be limited to what is technically necessary. »