BRITISH STANDARD

BS EN 60335-2-108: 2008

Household and similar electrical appliances — Safety —

Part 2-108: Particular requirements for electrolysers

ICS 97.060

BSI British Standards

National foreword

This British Standard is the UK implementation of EN 60335-2-108:2008. It is identical to IEC 60335-2-108:2008.

The UK participation in its preparation was entrusted by Technical Committee CPL/61, Safety of household and similar electrical appliances, to Subcommittee CPL/61/14, Home laundry and dishwashers.

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.

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

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 61/3413/FDIS, future edition 1 of IEC 60335-2-108, prepared by IEC Technical Committee 61, Safety of household and similar electrical appliances, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60335-2-108 on 2008-05-01 with a common modification maintaining the coherence with Clause 6 of EN 60335-1:2002.

The following dates are applicable:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2009-02-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2011-05-01

This part 2 has to be used in conjunction with EN 60335-1, Household and similar electrical appliances – Safety – Part 1: General requirements. It was established on the basis of the 2002 edition of that standard. Amendments and revisions of Part 1 have also to be taken into account and the dates when such changes become applicable will be stated in the relevant amendment of revision of Part 1.

This part 2 supplements or modifies the corresponding clauses in EN 60335-1, so as to convert it into the European Standard: Safety requirements for electrical electrolysers.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

NOTE 1 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

– subclauses, notes and annexes that are additional to those in the IEC standard are prefixed with the letter Z.

NOTE 2 The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

There are no special national conditions causing a deviation from this European Standard, other than those listed in Annex ZA to EN 60335-1.

There are no national deviations from this European Standard, other than those listed in Annex ZB to EN 60335-1.

Introduction

An investigation by CENELEC TC 61 has shown that all risks from products within the scope of this standard are fully covered by the Low Voltage Directive, 2006/95/EC. For products having mechanical moving parts, a risk assessment in accordance with the Machinery Directive, 2006/42/EC, has shown that the risks are mainly of electrical origin and consequently this directive is not applicable. However, the relevant essential safety requirements of the Machinery Directive are covered by this standard together with the principal objectives of the Low Voltage Directive.

Endorsement notice

The text of the International Standard IEC 60335-2-108:2008 was approved by CENELEC as a European Standard with agreed common modification.

CONTENTS

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

For **electrolysers**, testing in accordance with this standard is an option and cannot be required as a precondition for testing the complete appliance, for example by reference in Clause 24 of a part 2 of IEC 60335. However, testing of the appliance should be reduced if an incorporated **electrolyser** including its protection system or control system, if any, complies with this standard.

In particular, the construction detail inspection and testing may be done separately on the **electrolysers,** thereby eliminating the need for inspection and testing when the **electrolysers** is applied to different appliances.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-108: Particular requirements for electrolysers

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of **electrolysers** that produce low viscosity, ionized liquids intended for use as detergent free wash water in appliances for household and similar purposes and which conform with the standards applicable to such appliances. It applies to **electrolysers** tested separately, under the most severe conditions that may be expected to occur in normal use, their **rated voltage** being not more than 250 V.

NOTE 101 Examples of appliances that may contain **electrolysers** are

– dishwashers (IEC 60335-2-5);

– washing machines (IEC 60335-2-7);

– appliances producing wash water for hygiene purposes.

NOTE 102 This standard does not supersede the requirements of standards relevant to the particular appliance in which the **electrolyser** is used. However, if the **electrolyser** used complies with this standard, the tests for the **electrolyser** specified in the particular appliance standard may not need to be made in the particular appliance or assembly. If the **electrolyser** control system is associated with the particular appliance control system, additional tests may be necessary on the final appliance. A guide for additional requirements to be considered for inclusion in the end product standards for appliances that use **electrolysers** is given in Annex BB.

NOTE 103 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;

– in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

NOTE 104 This standard does not apply to

– appliances intended exclusively for industrial purposes;

– appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60068-2-52, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60079-15:2005, *Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection, "n" electrical apparatus*

ISO 1817:2005, *Rubber, vulcanized – Determination of the effect of liquids*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 *Replacement:*

normal operation
operation of the **electrolyser** under the following conditions:

If the **electrolyser** is intended to be filled by the user, it is filled with the amount and type of electrolyte specified in the instructions.

Water is passed through the **electrolyser**, the temperature of the water being 15 °C $^{+10}_{-5}$ °C.

3.101
electrolyser
device to produce ionized washing water

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.101 ***Electrolysers*** *are tested as* ***motor-operated appliances.***

6 Classification

This clause of Part 1 is applicable except as follows.

Modification:

Electrolysers shall be of **class I, class II** or **class III**.

6.101 **Electrolysers** are classified as being

– intended for direct connection of the appliance **supply cord** to the **electrolyser** terminals, or
– not intended for direct connection of the appliance **supply cord** to the **electrolyser** terminals.

NOTE 1 **Electrolysers** can, in both cases, be delivered with or without the **supply cord**.

NOTE 2 **Electrolysers** intended for direct connection of the appliance **supply cord** to their terminals may also be used without the **supply cord** being connected directly to their terminals.

Compliance is checked by inspection and by the relevant tests.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Modification:*

The **rated power input** or **rated current** need not be marked.

7.5 Not applicable.

7.7 Not applicable.

7.12 *Replacement:*

The instructions shall contain the quantity and details of the electrolyte to be used and details of the chemical reactions that occur in the **electrolyser**.

NOTE Details of the electrolyte used may be given, for example, in terms of a generic name or a manufacturer's part number.

8 Protection against access to live parts

This clause of Part 1 is applicable.

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is not applicable.

11 Heating

This clause of Part 1 is applicable except as follows.

11.7 *Replacement:*

Electrolysers are operated until steady conditions are established.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable

16 Leakage current and electric strength

This clause of Part 1 is applicable.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable.

20 Stability and mechanical hazards

This clause of Part 1 is applicable.

21 Mechanical strength

This clause of Part 1 is applicable.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

Elastomeric parts that withstand the ageing test specified in Annex AA are not considered to be parts where leakage could occur.

Modification:

Instead of coloured water, a coloured solution from the electrolysed wash water is used.

22.101 **Electrolysers** shall be constructed so that they are always open to the atmosphere through an aperture of at least 5 mm in diameter, or 20 mm^2 in area with a width of at least 3 mm. The aperture shall be located so that it is unlikely to be obstructed in normal use.

Compliance is checked by inspection and by measurement.

22.102 During normal use of the **electrolyser**, the chemical reaction in the **electrolyser** shall not produce hydrogen gas that is released in hazardous amounts into areas

- where electrical components that produce arcs and sparks during **normal operation** or abnormal operation are mounted, unless these components have been tested and found at least to comply with IEC 60079-15 for group IIC gases; or
- that contain surfaces with a temperature exceeding 460 ^{o}C during **normal operation** or abnormal operation and that may be exposed to the released hydrogen gas.

*Compliance is checked by inspection, by measuring the temperature of the relevant surfaces during **normal operation** and abnormal operation and by the following test.*

*The **electrolyser** is operated for one cycle under conditions of **normal operation**.*

The concentration of hydrogen gas in the relevant areas is measured continuously from the beginning of the test until the end of the cycle. The background hydrogen concentration measured prior to the test is subtracted from the maximum concentration measured during the test.

The measured value shall not exceed 50 % of the lower flammability limit (LFL) of hydrogen.

NOTE 1 The LFL of hydrogen gas is 4 %V/V of air.

NOTE 2 The instrument used for monitoring gas concentration, such as those which use infrared sensing techniques, should have a fast response, typically 2 s to 3 s and should not unduly influence the result of the test.

NOTE 3 If gas chromatography is to be used, the gas sampling in confined areas should occur at a rate not exceeding 2 ml every 30 s.

NOTE 4 Other instruments are not precluded from being used provided that they do not unduly influence the results.

22.103 During normal use of the **electrolyser**, the chemical reaction in the **electrolyser** shall not produce wash water that causes corrosion due to the pH value of the wash water.

Compliance is checked by the salt mist test, Kb of IEC 60068-2-52, severity 2 being applicable. The pH value of the solution used shall be approximately equal to that of the wash water as measured during normal use of the appliance if the value is greater than that specified in IEC 60068-2-52.

Before the test, enclosures having a coating are scratched by means of a hardened steel pin, the end of which has the form of a cone with a top angle of 40°. Its tip is rounded with a radius of 0,25 mm ± 0,02 mm. The pin is loaded so that the force exerted along its axis is 10 N ± 0,5 N. The pin is held at an angle of 80°– 85° to the horizontal and scratches are made by drawing the pin along the surface of the coating at a speed of approximately 20 mm/s. Five scratches are made at least 5 mm apart and at least 5 mm from the edges.

*After the test, the **electrolyser** shall not have deteriorated to such an extent that compliance with this standard, in particular with Clauses 8 and 27, is impaired. The coating shall not be broken and shall not have loosened from the surface.*

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part 1 is applicable.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

29.2 *Replacement:*

The microenvironment is pollution degree 3, and the insulation shall have a CTI not less than 250, unless the insulation is enclosed or located so that it is unlikely to be exposed to pollution during normal use of the **electrolyser** due to electrolyte used.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.2.2 Not applicable.

31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable except as follows.

Addition:

The ozone concentration produced by the chemical reactions in the **electrolyser** shall not be excessive.

Compliance is checked by the following test, which is carried out in a room without openings having dimensions of 2,5 m × 3,5 m × 3,0 m, the walls being covered with polyethylene sheet.

*The room is maintained at approximately 25 °C and 50 % relative humidity. The **electrolyser** is positioned in accordance with the instructions and then operated for one cycle under conditions of **normal operation**.*

The ozone sampling tube is to be located 10 mm from the gas outlet aperture specified in 22.101. The background ozone concentration measured prior to the test is subtracted from the maximum concentration measured during the test.

The percentage of ozone in the room shall not exceed 5×10^{-6}.

Annexes

The annexes of Part 1 are applicable except as follows.

Annex AA
(normative)

Ageing test for elastomeric parts

The ageing test on elastomeric parts is carried out by measuring their hardness and mass before and after immersion in a solution of the electrolysed portion of the wash water at elevated temperature.

The test is carried out on at least three samples of each part. The samples and test procedure are as specified in ISO 1817, with the following modifications.

4 Test liquids

The liquid used is the electrolysed portion of the wash water obtained under the conditions of Clause 11.

The total mass of the test pieces immersed shall not exceed 100 g for each litre of solution. The test pieces are completely immersed with their entire surface freely exposed to the solution. During the tests, the test pieces shall not be exposed to direct light. Test pieces of different compounds shall not be immersed in the same solution at the same time.

5 Test pieces

5.4 Conditioning

The temperature is 23 °C ± 2 °C and the relative humidity is (50 ± 5) %.

6 Immersion in the test liquid

6.1 Temperature

The solution is heated within 1 h with the test pieces immersed, to a temperature of 75^{+5}_{0} °C and maintained at this value. The solution is renewed every 24 h and heated in the same way.

NOTE To avoid undue evaporation of the solution, it is recommended to use a closed-circuit system or similar method for renewing the solution.

6.2 Duration

The test pieces are immersed for a total period of 48^{+1}_{0} h.

The test pieces are then immediately immersed in a fresh solution that is maintained at ambient temperature. The pieces are immersed for 45 min ± 15 min.

After having been removed from the solution, the test pieces are rinsed in cold water at 15 °C ± 5 °C and then dried with blotting paper.

7 Procedure

7.2 Change in mass

The increase in mass of the test pieces shall not exceed 10 % of the value determined before immersion.

7.6 Change in hardness

The micro-test for hardness applies.

The hardness of the test pieces shall not have changed by more than 8 IRHD. Their surface shall not have become sticky and shall show no crack visible to the naked eye or any other deterioration.

Annex BB
(informative)

Guide for additional requirements to be considered for inclusion in the end product standards for appliances that incorporate electrolysers

The following list is given as a guide for the detailed information that may need to be specified in the end product standards for appliances that incorporate **electrolysers**:

- instruction to the user to avoid blocking the **electrolyser** aperture during use;
- application of 22.17 to spacers intended to prevent the **electrolyser** aperture being blocked by walls;
- the need to apply 22.102 to the end product to check that hydrogen gas does not accumulate in the vicinity of critical components;
- the need to apply 22.103 to the end product to check that the electrolysed water does not cause corrosion of critical parts.

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 60335-2-5, *Household and similar electrical appliances – Safety – Part 2: Particular requirements for dishwashers*

NOTE Harmonized as EN 60335-2-5:2003 (modified).

IEC 60335-2-7, *Household and similar electrical appliances – Safety – Part 2: Particular requirements for washing machines*

NOTE Harmonized as EN 60335-2-7:2003 (modified).

ISO 13732-1, *Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces*

NOTE Harmonized as EN ISO 13732-1:2006 (not modified).

Annex ZC
(normative)

Normative references to international publications with their corresponding European publications

Publication	Year	Title	EN/HD	Year
IEC 60068-2-52	-[1)]	Environmental testing - Part 2: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)	EN 60068-2-52	1996[2)]
IEC 60079-15	2005	Electrical apparatus for explosive gas atmospheres - Part 15: Construction, test and marking of type of protection "n" electrical apparatus	EN 60079-15	2005
ISO 1817	2005	Rubber, vulcanized - Determination of the effect of liquids	-	-

[1)] Undated reference.

[2)] Valid edition at date of issue.

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