

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Household and similar electrical appliances – Safety –  
Part 2-108: Particular requirements for electrolyzers

Appareils électrodomestiques et analogues – Sécurité –  
Partie 2-108: Règles particulières pour les électrolyseurs

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –  
SAFETY –****Part 2-108: Particular requirements for electrolyzers****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

It forms the first edition of IEC 60335-2-108.

The text of this part of IEC 60335 is based on the following documents:

FDIS	Report on voting
61/3413/FDIS	61/3426/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) of that standard.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for electrical electrolyzers.

NOTE 2 The following annexes contain provisions suitably modified from other IEC or ISO standards.

Annex AA Aging tests for elastomeric parts ISO 1817

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 3 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.

NOTE 4 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.

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – safety*, can be found on the IEC website.

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The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

NOTE 5 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this standard be adopted for implementation nationally not earlier than 12 months from the date of its publication.

## 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 electrolyzers

### 1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of **electrolyzers** 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 **electrolyzers** 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 **electrolyzers** 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 **electrolyzers** 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  $15\text{ }^{\circ}\text{C} \begin{smallmatrix} +10 \\ -5 \end{smallmatrix} \text{ }^{\circ}\text{C}$ .

#### 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**. They may be **class 0** if their **rated voltage** does not exceed 150 V.

#### 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<sup>2</sup> 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 °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.*

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*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.