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Edition 2.0 2024-03
REDLINE VERSION

INTERNATIONAL STANDARD



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





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Part 2-108: Particular requirements for electrolyzers**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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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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- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60335-2-108:2008. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 60335-2-108 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the text has been aligned with IEC 60335-1:2020;
- b) some notes have been converted to normative text (Clause 1, 22.012);
- c) application of test probe 19 has been introduced (8.1.1, 20.2, B22.3, B22.4);
- d) addition of external accessible surface temperatures (Clause 11).

The text of this International Standard is based on the following documents:

Draft	Report on voting
61/6955/CDV	61/7056A/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments unless that edition precludes it; in that case, the latest edition that does not preclude it is used. It was established on the basis of the sixth edition (2020) 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: Particular requirements for electrolyzers.

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 2 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 3 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.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations can 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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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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.

Guidance documents concerning the application of the safety requirements for appliances can be accessed via TC 61 supporting documents on the IEC website
<https://www.iec.ch/tc61/supportingdocuments>

This information is given for the convenience of users of this International Standard and does not constitute a replacement for the normative text in this standard.

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~~ can 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~~ Horizontal publications, basic safety publications and group safety publications 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. Testing of the appliance ~~should~~ may 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.

NOTE 3 Standards dealing with non-safety aspects of household appliances are:

- IEC standards published by TC 59 concerning methods of measuring performance;
- CISPR 11, CISPR 14-1 and relevant IEC 61000-3 series standards concerning electromagnetic emissions;
- CISPR 14-2 concerning electromagnetic immunity;
- IEC standards published by TC 111 concerning environmental matters.

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 part of IEC 60335 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~~ can be expected to occur in normal use, their **rated voltage** being not more than 250 V including direct current (DC) supplied appliances and **battery-operated appliances**.

~~NOTE 101~~ Examples of appliances that ~~may~~ can 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~~ can be unnecessary in the particular appliance or assembly. If the **electrolyser** control system is associated with the particular appliance control system, additional tests ~~may~~ can be necessary on the final appliance. Guidance for additional requirements to be considered for inclusion in the end product standards for appliances that use **electrolyzers** is given in **informative** 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~~ can 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, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

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

IEC 60584-1, *Thermocouples – Part 1: EMF specifications and tolerances*

ISO 1817:2005/2022, *Rubber, vulcanized or thermoplastic– Determination of the effect of liquids*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1 Definitions relating to physical characteristics

3.1.9 ~~Replacement~~ Modification: normal operation

Replace the first paragraph with the following:

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 $15\text{ °C} \begin{smallmatrix} +10 \\ -5 \end{smallmatrix} \text{ °C}$.

3.5 Definitions relating to types of appliances

3.5.101

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.

6.1 Modification:

Replace the first paragraph with the following:

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~~ can 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~~ can 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 *except as follows*.

8.1.1 Addition:

For parts of appliances situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18.

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.

11.3 Addition:

*Where the external **accessible surfaces** are suitably flat and access permits, then the test probe of Figure 101 is used to measure the temperature rises of external accessible surfaces specified in Table 101. The probe is applied with a force of $4\text{ N} \pm 1\text{ N}$ to the surface in such a way that the best possible contact between the probe and the surface is ensured. The measurement is performed after a contact period of 30 s.*

The probe may be held in place using a laboratory stand clamp or similar device. Any measuring instrument giving the same results as the probe may be used.

11.7 ~~Replacement~~ Modification:

Replace the first paragraph with the following:

Electrolysers are operated until steady conditions are established.

11.8 Modification:

Replace the first paragraph with the following:

During the test, the temperature rises are monitored continuously and shall not exceed the values shown in Table 3 and Table 101.

Table 101 – Maximum temperature rises for specified external accessible surfaces under normal operating conditions

Surface	Temperature rise of external accessible surfaces ^a	
	K	
	Surfaces of appliances situated not more than 850 mm above the floor after installation or in normal use	Surfaces of appliances situated more than 850 mm above the floor after installation or in normal use
Bare metal	38	42
Coated metal ^b	42	49
Glass and ceramic	51	56
Plastic and plastic coating > 0,4 mm ^{c, d}	58	62

NOTE The temperature rise limits of handles, knobs, grips, keyboards, keypads and similar parts are specified in Table 3.

^a Temperature rises are not measured on:

- the underside of appliances intended to be used on a working surface or floor, where these surfaces are inaccessible to a 75 mm diameter probe having a hemispherical end;
- the rear surface of appliances which, according to the instructions, shall be placed against a wall and where these surfaces are inaccessible to a 75 mm diameter probe having a hemispherical end.

^b Metal is considered coated when a coating having a minimum thickness of 90 µm made of enamel, powder or non-substantially plastic coating is used.

^c The temperature rise limit of plastic also applies for plastic material having a metal finish of thickness less than 0,1 mm.

^d When the thickness of the plastic coating does not exceed 0,4 mm, the temperature rise limits of coated metal for underlying metal apply or the temperature rise limits for glass or ceramic material for underlying glass or ceramic material apply.

12 ~~Void~~ Charging of metal-ion batteries

This clause of Part 1 is applicable.

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 *except as follows*.

20.2 *Addition:*

For parts of appliances situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18.

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 *normative* 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 mm² 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~~ can 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 instruments 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 42 Other instruments ~~are not precluded from being~~ can be 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° to 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 Clause 8 and Clause 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:

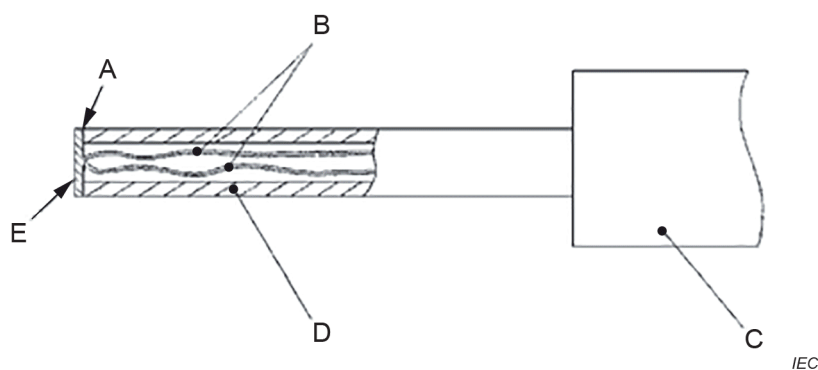
The ozone concentration produced by the chemical reactions in the **electrolyser** shall not be excessive.

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} .



Key

- A adhesive
- B thermocouple wires 0,3 mm diameter to IEC 60584-1 Type K
- C handle arrangement permitting a contact force of $4 \text{ N} \pm 1 \text{ N}$
- D polycarbonate tube: inside diameter 3 mm, outside diameter 5 mm
- E tinned copper disc: 5 mm diameter, 0,5 mm thick with a flat contact face

Figure 101 – Probe for measuring surface temperatures

Annexes

The annexes of Part 1 are applicable except as follows.

Annex B (normative)

Battery-operated appliances, separable batteries and detachable batteries for battery-operated appliances

Annex B of Part 1 Is applicable except as follows.

B.22.3 Addition:

For parts of appliances situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18.

B.22.4 Addition:

For parts of appliances situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18.

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 1817:2022, with the following modifications.

46 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.

57 Test pieces

57.4 Conditioning

The temperature is $23\text{ °C} \pm 2\text{ °C}$ and the relative humidity is $(50 \pm 5)\%$.

68 Immersion in the test liquid

68.1 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.

68.2 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 $45\text{ min} \pm 15\text{ min}$.

After having been removed from the solution, the test pieces are rinsed in cold water at $15\text{ °C} \pm 5\text{ °C}$ and then dried with blotting paper.

7.9 Procedure

7.29.3 Change in mass

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

9.7.6 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.