



มาตรฐานผลิตภัณฑ์อุตสาหกรรม

THAI INDUSTRIAL STANDARD

มอก. 1838—2553

IEC 60335—2—5(2008—09)

ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัย  
และงานที่มีลักษณะคล้ายกัน  
ข้อกำหนดเฉพาะสำหรับเครื่องล้างจาน

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES - SAFETY

PART 2-5 : PARTICULAR REQUIREMENTS FOR DISHWASHERS

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

กระทรวงอุตสาหกรรม

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สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม  
กระทรวงอุตสาหกรรม ถนนพระรามที่ 6 กรุงเทพฯ 10400  
โทรศัพท์ 02 202 3300

ประกาศในราชกิจจานุเบกษา ฉบับประกาศและงานทั่วไป เล่ม 128 ตอนพิเศษ 56 ง  
วันที่ 20 พฤษภาคม พุทธศักราช 2554

มาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน  
ข้อกำหนดเฉพาะสำหรับเครื่องล้างจาน นี้ได้ประกาศใช้ครั้งแรกเป็นมาตรฐานเลขที่ มอก.1838-2542 ในราชกิจจานุ  
เบกษา ฉบับประกาศทั่วไป เล่ม 117 ตอนพิเศษ 133 ง วันที่ 28 ธันวาคม พุทธศักราช 2543 ต่อมาได้พิจารณา  
เห็นสมควรแก้ไขปรับปรุงเพื่อให้ทันสมัยและเป็นไปตามเอกสารอ้างอิงฉบับล่าสุด จึงได้แก้ไขปรับปรุงโดยการยกเลิก  
มาตรฐานเดิมและกำหนดมาตรฐานนี้ขึ้นใหม่

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นโดยรับ IEC 60335-2-5(2008-09) Household and similar electrical  
appliances – Safety – Part 2-5: Particular requirements for dishwashers มาใช้ในระดับเหมือนกันทุกประการ  
(identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นเพื่อให้ทันกับความต้องการของผู้ใช้ และจักได้แปลเป็นภาษาไทย  
ในโอกาสอันควร หากมีข้อสงสัยโปรดติดต่อสอบถามที่สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

คณะกรรมการมาตรฐานผลิตภัณฑ์อุตสาหกรรมได้พิจารณามาตรฐานนี้แล้ว เห็นสมควรเสนอรัฐมนตรีประกาศตาม  
มาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511



## ประกาศกระทรวงอุตสาหกรรม

ฉบับที่ 4310 ( พ.ศ. 2554 )

ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม

พ.ศ. 2511

เรื่อง ยกเลิกและกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม

ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน

ข้อกำหนดเฉพาะสำหรับเครื่องล้างจาน

โดยที่เป็นการสมควรปรับปรุงมาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องล้างจาน มาตรฐานเลขที่ มอก.1838-2542

อาศัยอำนาจตามความในมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511 รัฐมนตรีว่าการกระทรวงอุตสาหกรรมออกประกาศยกเลิกประกาศกระทรวงอุตสาหกรรม ฉบับที่ 2740 (พ.ศ.2543) ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ.2511 เรื่อง กำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องล้างจาน ลงวันที่ 9 ตุลาคม พ.ศ.2543 และออกประกาศกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องล้างจาน มาตรฐานเลขที่ มอก.1838-2553 ขึ้นใหม่ ดังมีรายละเอียดต่อท้ายประกาศนี้

ทั้งนี้ให้มีผลตั้งแต่วันที่ถัดจากวันที่ประกาศในราชกิจจานุเบกษา เป็นต้นไป

ประกาศ ณ วันที่ 10 มกราคม พ.ศ. 2554

ชัยวุฒิ บรรณวัฒน์

รัฐมนตรีว่าการกระทรวงอุตสาหกรรม

# มาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัย และงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องล้างจาน

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นโดยรับ IEC 60335-2-5(2008-09) Household and similar electrical appliances – Safety – Part 2-5: Particular requirements for dishwashers มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ต้องใช้ร่วมกับมาตรฐานผลิตภัณฑ์อุตสาหกรรมความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและเครื่องใช้ไฟฟ้าอื่นที่คล้ายกัน ข้อกำหนดทั่วไป มาตรฐานเลขที่ มอก.1375-2547

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดคุณลักษณะที่ต้องการด้านความปลอดภัยของเครื่องล้างจานไฟฟ้าที่ใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกันซึ่งเจตนาให้ใช้ล้างจาน เครื่องใช้บนโต๊ะอาหาร และภาชนะอื่น มีแรงดันไฟฟ้าที่กำหนดไม่เกิน 250 โวลต์ สำหรับเครื่องล้างจานเฟสเดียว และไม่เกิน 480 โวลต์ สำหรับเครื่องล้างจานอื่น

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ครอบคลุมถึงเครื่องล้างจานซึ่งเจตนาให้ใช้งานในที่อยู่อาศัยตามปกติและงานที่มีลักษณะคล้ายกัน และเครื่องล้างจานที่อาจใช้ในร้านค้า ในอุตสาหกรรมขนาดย่อม และในฟาร์ม อย่างไรก็ตาม ถ้าเครื่องล้างจานมีเจตนาให้ใช้เป็นอาชีพเพื่อล้างจาน เครื่องใช้บนโต๊ะอาหาร และภาชนะอื่นซึ่งใช้สำหรับจุดประสงค์เชิงพาณิชย์ ก็จะไม่ถือว่าเป็นเครื่องล้างจานที่ใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกันเท่านั้น

ตราบเท่าที่เป็นไปได้ในทางปฏิบัติ มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้เกี่ยวข้องกับอันตรายทั่วไปที่เกิดจากเครื่องล้างจานซึ่งทุกคนเผชิญทั้งภายในและรอบๆ ที่อยู่อาศัย อย่างไรก็ตาม โดยทั่วไปมาตรฐานนี้ไม่ได้คำนึงถึง

- บุคคล (รวมถึงเด็กเล็ก) ผู้ซึ่ง
  - มีความบกพร่องทางด้านร่างกาย การรับรู้ หรือจิตใจ หรือ
  - ขาดความรู้หรือประสบการณ์ป้องกันบุคคลเหล่านี้จากการใช้งานเครื่องล้างจานโดยไม่ได้รับการดูแล
- การเล่นเครื่องล้างจานโดยเด็กเล็ก

**หมายเหตุ 101** ข้อควรคำนึง

- เครื่องล้างานที่เจตนาให้ใช้งานในยานพาหนะ บนเรือ หรือบนเครื่องบิน อาจจำเป็นต้องมีข้อกำหนดเพิ่มเติม
- ข้อกำหนดเพิ่มเติมอาจจะระบุโดยกระทรวงสาธารณสุข กระทรวงแรงงาน การประปา และองค์กรที่คล้ายกัน

**หมายเหตุ 102** มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ไม่ครอบคลุมถึง

- เครื่องล้างานไฟฟ้าเชิงพาณิชย์ (มอก.1839)
- เครื่องล้างานที่เจตนาให้ใช้งานในอุตสาหกรรม
- เครื่องล้างานที่เจตนาให้ใช้งานในสถานที่ที่มีภาวะพิเศษ เช่น บรรยากาศที่อาจก่อให้เกิดการกัดกร่อน หรือการระเบิด (ฝุ่น ไอ หรือก๊าซ)

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดบทนิยาม ข้อกำหนดทั่วไป ภาวะทั่วไปสำหรับการทดสอบ การจำแนกประเภท การทำเครื่องหมายและฉลาก และข้อแนะนำ การป้องกันการเข้าถึงส่วนที่มีไฟฟ้า การเริ่มเดินเครื่องใช้ไฟฟ้าทำงานด้วยมอเตอร์ กำลังไฟฟ้าเข้าและกระแสไฟฟ้า การเกิดความร้อน กระแสไฟฟ้ารั่ว และความทนทานไฟฟ้าที่อุณหภูมิทำงาน แรงดันไฟฟ้าเกินชั่วครู่ ความต้านทานต่อความชื้น กระแสไฟฟ้ารั่ว และความทนทานไฟฟ้า การป้องกันโหลดเกินของหม้อแปลงไฟฟ้าและวงจรไฟฟ้าที่เกี่ยวข้อง ความทนทาน การทำงานผิดปกติ เสถียรภาพและอันตรายทางกล ความแข็งแรงทางกล การสร้าง สายไฟฟ้าภายใน ส่วนประกอบ การต่อกับแหล่งจ่ายไฟฟ้าและสายอ่อนภายนอก ขั้วต่อสายสำหรับตัวนำภายนอก การเตรียมการสำหรับการต่อลงดิน หมุดเกลียวและจุดต่อ ระยะห่างในอากาศ ระยะห่างตามผิวฉนวน และฉนวนตัน ความทนความร้อนและไฟ ความต้านทานการเป็นสนิม และการแผ่รังสี ความเป็นพิษ และอันตรายที่คล้ายกัน

รายละเอียดให้เป็นไปตาม IEC 60335-2-5(2008-09)

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ส่วนหนึ่งส่วนใดไปทำซ้ำหรือใช้ประโยชน์ในรูปแบบ หรือโดยวิธีใด ๆ ไม่ว่าจะเป็นรูปแบบ  
อิเล็กทรอนิกส์หรือทางกล รวมถึงการถ่ายสำเนา ถ่ายไมโครฟิล์ม โดยไม่ได้รับอนุญาตเป็น  
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IEC Central office

3, rue de Varembe',

CH-1211 Geneva 20

Switzerland

E-mail : [inmail@iec.ch](mailto:inmail@iec.ch)

Web : [www.iec.ch](http://www.iec.ch)

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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### HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

#### Part 2-5: Particular requirements for dishwashers

### FOREWORD

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- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This consolidated version of IEC 60335-2-5 consists of the fifth edition (2002) [documents 61/2099/FDIS and 61/2130/RVD], its amendment 1 (2005) [documents 61/2788/FDIS and 61/2813/RVD] and its amendment 2 (2008) [documents 61/3639/FDIS and 61/3679/RVD].

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience.

It bears the edition number 5.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

The French version of this standard has not been voted upon.

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 electric dishwashers.

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 associated noun are also in bold.

The following differences exist in the countries indicated below.

- 6.1: Appliances may be of class 0I, if the rated voltage does not exceed 150 V (Japan).
- 20.102: A 30 000 cycle endurance test is carried out on door interlocks (USA).
- 25.7: The supply cord is required to have a free length of at least 1,5 m (USA).
- Annex AA: The detergent and rinsing agent are different (USA).
- Annex BB: Different tests are carried out (USA).

The committee has decided that the contents of the base publication and its amendments 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 4 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 the amendment 2 be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of 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 which 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.

## HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

### Part 2-5: Particular requirements for dishwashers

#### 1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric dishwashers for household and similar purposes that are intended for washing and rinsing dishes, cutlery and other utensils, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

Appliances intended for normal household and similar use and that may also be used by laymen in shops, in light industry and on farms, are within the scope of this standard. However, if the appliance is intended to be used professionally for washing and rinsing dishes and cutlery and other utensils that are used for commercial purposes, the appliance is not considered to be for household and similar use only.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account

- persons (including children) whose
  - physical, sensory or mental capabilities; or
  - lack of experience and knowledge
 prevents them from using the appliance safely without supervision or instruction;
- children playing with the appliance.

NOTE 101 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 102 This standard does not apply to

- commercial electric dishwashing machines (IEC 60335-2-58);
- appliances intended 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 60436, *Methods for measuring the performance of electric dishwashers*

ISO 1817:1999, *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 appliance under the following conditions.

The appliance is operated with the maximum quantity of water for which it is constructed, without detergents or rinsing agents and without place settings or serving pieces. However if it is apparent that the test results will be affected by the load, the appliance is loaded with the maximum number of place settings and serving pieces specified in the instructions.

NOTE 101 The place settings and serving pieces to be used are specified in IEC 60436.

The water is supplied at any convenient pressure within the range specified in the instructions, the temperature of the water at the inlet being

- 60 °C ± 5 °C or that specified in the instructions if it is higher, for inlets intended for hot water only;
- 15 °C ± 5 °C for inlets intended for cold water only.

If the appliance has an inlet intended for hot or cold water, the most unfavourable water temperature is used

### 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.

#### 5.3 *Addition:*

*The test of 15.101 is carried out before the test of 15.3.*

### 6 Classification

This clause of Part 1 is applicable except as follows.

#### 6.1 *Modification:*

Appliances shall be **class I**, **class II** or **class III**.

#### 6.2 *Addition:*

Appliances intended to stand on a draining board shall be at least IPX1.

### 7 Marking and instructions

This clause of Part 1 is applicable except as follows.

**7.1 Addition:**

Appliances without automatic water-level control shall be marked with the maximum permissible water level.

**7.10 Addition:**

If the **off position** is only indicated by letters, the word "off" shall be used.

**7.12 Addition:**

The instructions shall state

- the maximum number of place settings to be washed;
- that the door should not be left in the open position since this could present a tripping hazard;
- how to load the dishwasher, and the substance of the following:

WARNING: Knives and other utensils with sharp points must be loaded in the basket with their points down or placed in a horizontal position.

The instructions shall include the substance of the following:

This appliance is intended to be used in household and similar applications such as:

- staff kitchen areas in shops, offices and other working environments;
- farm houses;
- by clients in hotels, motels and other residential type environments;
- bed and breakfast type environments.

NOTE 101 If the manufacturer wants to limit the use of the appliance to less than the above, this must be clearly stated in the instructions.

**7.12.1 Addition:**

For dishwashers having ventilation openings in the base, the instructions shall state that the openings must not be obstructed by a carpet.

**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 applicable except as follows.

#### 10.1 Addition:

NOTE 101 The selected representative period is the period during which the power input is the highest.

#### 10.2 Addition:

NOTE 101 The selected representative period is the period during which the current is the highest.

### 11 Heating

This clause of Part 1 is applicable except as follows.

#### 11.7 Replacement:

*Appliances incorporating a programmer or timer are operated for two cycles with the programme that results in the highest temperature rises. The cycles are separated by a rest period of 15 min with the door or lid open.*

*Other appliances are subjected to two cycles of the sequence stated in the instructions that results in the highest temperature rises or for two periods of 15 min each, whichever is longer. The cycles or periods are separated by a rest period of 15 min with the door or lid open. Discharge pumps driven by a separate motor are then subjected to three periods of operation, each separated by a rest period of 15 min. The duration of each period of operation is 1,5 times the period necessary to empty the appliance when it is filled with the maximum quantity of water for which it is constructed. The level of the water discharge is*

- 90 cm above the floor, for appliances standing on the floor;
- the maximum height above the supporting surface, as stated in the instructions, for other appliances.

### 12 Void

### 13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable except as follows.

#### 13.2 Modification:

*For **stationary class I appliances**, the leakage current shall not exceed 3,5 mA, or 1 mA/kW rated power input with a limit of 5 mA, whichever is higher.*

### 14 Transient overvoltages

This clause of Part 1 is applicable.

### 15 Moisture resistance

This clause of Part 1 is applicable except as follows.

#### 15.1 Addition:

*Magnetic valves and similar components incorporated in external hoses for connection to the water mains are subjected to the test specified for IPX7 appliances.*

## 15.2 Replacement:

Appliances shall be constructed so that spillage of liquid in normal use does not affect their electrical insulation, even if an inlet valve fails to close.

*Compliance is checked by the following test.*

*Appliances with a **type X attachment**, except those having a specially prepared cord, are fitted with the lightest permissible type of flexible cord of the smallest cross-sectional area specified in Table 13.*

*Appliances intended to be filled with water by the user are completely filled with water containing approximately 1 % NaCl. A further quantity of this solution equal to 15 % of the capacity of the appliance or 0,25 l, whichever is greater, is poured in steadily over a period of 1 min.*

*Other appliances are operated until the maximum water level is reached, and 5 g of the detergent specified in Annex AA is added for each litre of water in the appliance. The inlet valve is held open and the filling continued for 15 min after first evidence of overflow or until the inflow is automatically stopped by other means.*

*For appliances that are loaded from the front, the door is then opened if this can be achieved manually and without damage to the door interlock system.*

*For appliances having a working surface, 0,5 l of water containing approximately 1 % NaCl and 0,6 % of rinsing agent, as specified in Annex AA, is poured over the top of the appliance, the controls being placed in the on position. The controls are then operated through their working range, this operation being repeated after a period of 5 min.*

*The appliance shall then withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation that could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

**15.101** Appliances shall be constructed so that foaming does not affect electrical insulation.

*Compliance is checked by the following test which is carried out immediately after that of 15.2.*

*The appliance is operated under the conditions specified in Clause 11 but for one complete cycle with the programme that results in the longest period of operation. A solution consisting of 20 g of NaCl and 1 ml of a solution of 28 % by mass of dodecyl sodium sulphate ( $C_{12}H_{25}Na_2SO_4$ ), is added for each 8 l of water in the appliance.*

*For appliances incorporating a detergent dispenser, the solution is added manually at the point in the cycle when it would normally be dispensed automatically. For other appliances, the solution is added before starting the cycle.*

*The appliance shall then withstand the electric strength test of 16.3.*

*The appliance is then operated for two cycles under the same conditions, except that the solution is not added. It shall then withstand the electric strength test of 16.3.*

*The appliance is kept in a test room having a normal atmosphere for 24 h before being subjected to the test of 15.3.*

NOTE The solution used for this test has to be stored in a cool atmosphere and used within seven days of its preparation.



## 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 except as follows.

### 19.1 Addition:

*For appliances incorporating a programmer or timer, the tests of 19.2 and 19.3 are replaced by the test of 19.101.*

### 19.2 Addition:

*Restricted heat dissipation is obtained without water in the appliance or with just sufficient water to cover the heating elements, whichever is the more unfavourable.*

**19.9** Not applicable.

### 19.13 Addition:

*During the tests of 19.101, the temperature of windings shall not exceed the values specified in Table 8.*

**19.101** *The appliance is supplied at **rated voltage** and operated under **normal operation**. Any fault condition or unexpected operation that may be applied in normal use is introduced.*

NOTE 1 Examples of fault conditions and unexpected operations are

- the programmer stopping in any position;
- disconnection and reconnection of one or more phases of the supply during any part of the programme;
- open-circuiting or short-circuiting of components;
- failure of a magnetic valve;
- opening and reclosing of the door or lid during any part of the programme, if this is possible;
- failure or blocking of the mechanical part of a water level switch. This fault condition is not applied if
  - the cross section of the tube supplying the air chamber with water is greater than 5 cm<sup>2</sup> with no dimension smaller than 10 mm; and
  - the outlet of the chamber is at least 20 mm above the highest water level; and
  - the tube connecting the air-chamber to the water level switch is fixed so that there is no likelihood of bending or pinching.

NOTE 2 Locking the main contacts of a contactor, used for energizing heating elements, in the 'on' position, is considered to be a fault condition, unless at least two independent sets of contacts are provided. This may be achieved by two contactors operating independently of each other or by one contactor having two independent armatures operating two independent sets of contacts.

NOTE 3 In general, tests are limited to the fault conditions that may be expected to give the most unfavourable results.

The simulation of component faults is limited to those that could expose the user to a hazard.

NOTE 4 If operation without water in the appliance is a more unfavourable condition for starting any programme, the tests with that programme are carried out with the water valve closed. This valve is not closed after the programme has started to operate.

NOTE 5 If the appliance stops at any particular point in the programme, the test with that fault condition is considered to be ended.

NOTE 6 The fault condition with

- the automatic filling device held open is covered by 15.2;
- thermal controls short-circuited is covered by 19.4;
- motor capacitors short-circuited or open-circuited are covered by 19.7;
- the failure of door interlocks is covered by 24.1.4.

## 20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

### 20.1 Modification:

*The appliance is empty or filled as specified for **normal operation**, whichever is more unfavourable. Doors and lids are closed and any castors turned to the most unfavourable position.*

*Addition:*

*For appliances that are loaded from the front, compliance is also checked by the test of 20.101.*

**20.101** *The appliance is placed on a horizontal surface and a mass of 23 kg is placed on, or suspended from, the centre of the open door or any fully opened drawer, whichever is more unfavourable. Any castors are turned to the most unfavourable position.*

*For appliances normally used on a table or similar support and incorporating a door having horizontal hinges and a horizontal rest position, a mass of 7 kg is used instead of a mass of 23 kg.*

*Appliances normally used on a table or similar support and which have a drawer are additionally tested with the drawer placed in the most unfavourable position and loaded with the maximum number of place settings in accordance with the instructions.*

*If a dishwasher is combined with a hob, the test is carried out with the appliance loaded as specified in IEC 60436, the point of application of the mass being at the centre of the outer edge of the open door or drawer.*

*The appliance shall not tilt.*

**20.102** Doors and lids shall be interlocked so that the appliance can only be operated when the door or lid is closed, unless there is adequate protection against ejection of hot water when the door or lid is opened.

*Compliance is checked by inspection and by manual test.*

NOTE Slight splashing occurring immediately after the door or lid has been opened is neglected.

## 21 Mechanical strength

This clause of Part 1 is applicable.

## 22 Construction

This clause of Part 1 is applicable except as follows.

### 22.6 Modification:

*Instead of coloured water, a solution composed of 0,6 ml of the rinsing agent specified in Annex AA per litre of distilled water is used.*

*Addition:*

NOTE 101 Parts that withstand the ageing test specified in Annex BB are not considered to be parts where leakage could occur.

*Drops of undiluted rinsing agent, as specified in Annex AA, are applied to the external surface of the parts from which rinsing agent could leak if a seal fails.*

*After the test, there shall be no rinsing agent on the insulation of internal wiring, if deterioration of the insulation could result in a hazard.*

NOTE 102 The influence of opening and closing the door is taken into account.

NOTE 103 Leakage of rinsing agent onto porous material is taken into account if this material is in contact with internal wiring.

**22.101** Appliances shall withstand the water pressure expected in normal use.

*Compliance is checked by connecting the appliance to a water supply having a static pressure equal to twice the maximum permissible inlet water pressure or 1,2 MPa, whichever is higher, for a period of 5 min.*

*There shall be no leakage from any part, including the inlet water hose.*

**22.102** Appliances shall be constructed so that heating elements cannot come into contact with combustible material inside the appliance as a result of deformation of the heating elements or of parts supporting them.

*Compliance is checked by inspection.*

**22.103** Appliances shall be constructed so that dishes and cutlery contacting heating elements during the drying period do not give rise to a fire hazard.

*Compliance is checked by the following test.*

*The appliance is placed on a piece of white pinewood board covered with tissue paper. Polyethylene disks, approximately 80 mm in diameter and 2 mm thick, are placed at the most unfavourable location, where possible directly in contact with the heating element. The appliance is supplied at 1,1 times **rated voltage** and operated for a drying period under **normal operation**.*

*When smoke or odour is evident, or when one-third of the drying period has elapsed, whichever occurs first, the door or lid is opened.*

*Any flames, burning drops or glowing particles shall not spread fire to other parts of the appliance. Flames, except from the disks, shall extinguish within 30 s of opening the door or lid. The tissue paper shall not burn or the board become scorched.*

NOTE 1 Tissue paper is specified in 4.215 of ISO 4046-4 as thin, soft and strong lightweight wrapping paper generally intended for packing delicate articles, its substance being between 12 g/m<sup>2</sup> and 30 g/m<sup>2</sup>.

NOTE 2 The material of the disks used for the test is unfilled natural colour polyethylene without flame-retardants and has a relative density of  $0,96 \pm 0,005$ .

## 23 Internal wiring

This clause of Part 1 is applicable except as follows.

### 23.3 Modification:

*Instead of the test being carried out while the appliance is in operation, it is carried out with the appliance disconnected from the supply.*

*The number of flexings is increased to 100 000.*

*Addition:*

*After the test, not more than 10 % of the strands of any conductor of the internal wiring between the main part of the appliance and the door shall be broken.*

**23.101** The insulation and sheath of internal wiring for the supply of magnetic valves and similar components incorporated in external hoses for connection to the water mains shall be at least equivalent to light polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 52).

*Compliance is checked by inspection.*

NOTE The mechanical characteristics specified in IEC 60227 are not checked.

## 24 Components

This clause of Part 1 is applicable except as follows.

### 24.1.4 Addition:

*The number of cycles of operation for programmers is 3 000.*

*The number of cycles of operation for door interlocks is 30 000.*

**24.101 Thermal cut-outs** incorporated in dishwashers for compliance with 19.4 shall not be self-resetting.

*Compliance is checked by inspection.*

## 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 Addition:**

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 appliance due to

- condensation produced by the appliance;
- chemicals, such as detergent or rinse aid.

## **30 Resistance to heat and fire**

This clause of Part 1 is applicable except as follows.

### **30.2 Addition:**

*For appliances incorporating a programmer or a timer, 30.2.3 is applicable. For other appliances, 30.2.2 is 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.

## Annexes

The annexes of Part 1 are applicable except as follows.

### Annex AA (normative)

#### Detergent and rinsing agent

##### AA.1 Detergent

The composition of the detergent is as follows:

Substance	Parts by mass %
Penta-sodiumtriphosphate ("Tripoly") Thermphos NW	50,00
Sodium metasilicate KO (anhydrous)	40,00
Sodium sulphate (anhydrous)	5,75
Sodium dichlorisocyanurate-dihydrate CDB 56 C	2,25
Plurafac RA 43 <sup>1)</sup>	2,00

The plurafac RA 43 is thoroughly mixed with the silicate and sulphate. The sodium dichlorisocyanurate-dihydrate is mixed into the phosphate. The two are then thoroughly mixed together.

NOTE The detergent should be stored in a cool atmosphere in a waterproof bag in quantities not exceeding 1 kg. It should be used within three months.

##### AA.2 Rinsing agent

The composition of the rinsing agent is as follows:

Substance	Parts by mass %
Plurafac LF 221 <sup>2)</sup>	15,0
Cumene sulfonate (40 % solution)	11,5
Citric acid (anhydrous)	3,0
Deionized water	70,5

The rinsing agent has the following properties:

- viscosity, 17 mPa·s;
- pH, 2,2 (1 % in water).

NOTE 1 Any commercially available rinsing agent may be used, but if there is any doubt with regards to the test results, this composition is to be used.

NOTE 2 The composition of the rinsing agent is extracted from IEC 60436.

1) Plurafac RA 43 is the trade name of a product supplied by BASF. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of this product.

2) Plurafac LF 221 is the trade name of a product supplied by BASF. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of this product.

## Annex BB (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 solutions of detergent and rinsing agent at elevated temperature.*

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

#### 4 Test liquids

*Two test liquids are used:*

- one liquid is obtained by dissolving 6 g of the detergent specified in Annex AA per litre of distilled water;*
- the other liquid is composed of 0,6 ml of rinsing agent as specified in Annex AA per litre of distilled water.*

NOTE Care is to be taken to ensure that the total mass of the test pieces immersed does not exceed 100 g for each litre of solution, that the test pieces are completely immersed and that their entire surface is freely exposed to the solution. During the tests, the test pieces are not to be exposed to direct light. Test pieces of different compounds are not to be immersed at the same time in the same solution.

#### 5 Test pieces

##### 5.4 Conditioning of test pieces

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

#### 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  $75^{+5}_0\text{ }^{\circ}\text{C}$  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  $48^{+1}_0\text{ h}$ .*

*The test pieces are then immediately immersed in a fresh solution, which 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  $15\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  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.*



## Bibliography

The bibliography of Part 1 is applicable except as follows.

*Addition:*

IEC 60335-2-58, *Household and similar electrical appliances – Safety – Part 2-58: Particular requirements for commercial electric dishwashing machines*

ISO 4046-4:2002, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

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

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